

Programmable Controller

FP7 Thermocouple Multi-analog Input Unit / FP7 RTD Input Unit

User's Manual

(MEMO)

Introduction

Thank you for buying a Panasonic product. Before you use the product, please carefully read the installation instructions and the users manual, and understand their contents in detail to use the product properly.

Types of Manual

- There are different types of users manual for the FP7 series, as listed below. Please refer to a relevant manual for the unit and purpose of your use.
- The manuals can be downloaded from our website: <https://industry.panasonic.com/global/en/downloads/?tab=manual>

Unit name or purpose of use		Manual name	Manual code
FP7 Power Supply Unit		FP7 CPU Unit User's Manual (Hardware)	WUME-FP7CPUH
FP7 CPU Unit		FP7 CPU Unit Command Reference Manual	WUME-FP7CPUPGR
		FP7 CPU Unit User's Manual (Logging/Trace Function)	WUME-FP7CPULOG
		FP7 CPU Unit User's Manual (Security Functions)	WUME-FP7CPUSEC
	Instructions for Built-in LAN Port	FP7 CPU Unit User's Manual (LAN Port Communication)	WUME-FP7LAN
		FP7 CPU Unit User's Manual (Ethernet Add-ons)	WUME-FP7CPUETEX
		FP7 CPU Unit User's Manual (EtherNet/IP Communication)	See our web site.
		FP7 Web Server Function Manual	See our web site.
	Instructions for Built-in COM Port		
	FP7 Extension (Communication) Cassette (RS-232C and RS485 type)	FP7 series Users Manual (SCU communication)	WUME-FP7COM
	FP7 Extension (Communication) Cassette (Ethernet type)	FP7 Series User's Manual (Communication Cassette Ethernet Type)	WUME-FP7CCET
	FP7 Extension (Function) Cassette Analog Cassette	FP7 Analog Cassette Users Manual	WUME-FP7FCA
FP7 Digital Input/Output Unit		FP7 Digital Input/Output Unit Users Manual	WUME-FP7DIO
FP7 Analog Input Unit		FP7 Analog Input Unit Users Manual	WUME-FP7AIH
FP7 Analog Output Unit		FP7 Analog Output Unit Users Manual	WUME-FP7AOH
FP7 Thermocouple Multi-analog Input Unit		FP7 Thermocouple Multi-analog Input Unit	WUME-FP7TCRTD
FP7 RTD Input Unit		User's Manual	
FP7 Multi Input/Output Unit		FP7 Multi Input/Output Unit Users Manual	WUME-FP7MXY
FP7 High-speed counter Unit		FP7 High-speed counter Unit Users Manual	WUME-FP7HSC
FP7 Pulse Output Unit		FP7 Pulse Output Unit Users Manual	WUME-FP7PG

Unit name or purpose of use	Manual name	Manual code
FP7 Positioning Unit	FP7 Positioning Unit Users Manual	WUME-FP7POSP
FP7 Serial Communication Unit	FP7 series Users Manual (SCU communication)	WUME-FP7COM
PHLS System	PHLS System Users Manual	WUME-PHLS
Programming software FPWIN GR7	FPWIN GR7 Introduction Guidance	WUME-FPWINGR7

SAFETY PRECAUTIONS

- To prevent accidents or personal injuries, please be sure to comply with the following items.
- Prior to installation, operation, maintenance and check, please read this manual carefully for proper use.
- Before using, please fully understand the knowledge related to the equipment, safety precautions and all other precautions.
- Safety precautions are divided into two levels in this manual: Warning and Caution.

WARNING

Incorrect operation may lead to death or serious injury.

- Take appropriate safety measures to the external circuit of the product to ensure the security of the whole system in case of abnormalities caused by product failure or external.
- Do not use this product in areas with inflammable gases.
Otherwise it may lead to an explosion.
- Do not put this product into a fire.
Otherwise it could cause damage to the battery or other electronic parts.

CAUTION

Incorrect operation may lead to injury or material loss.

- To prevent the excessive exothermic heat or smoke generation of the product, a certain margin is required for guaranteed characteristics and performance ratings of relative products.
- Do not decompose or transform it.
Otherwise it will lead to the excessive exothermic heat or smoke generation of the product.
- Do not touch terminal blocks during power-on.
Otherwise it may result in an electric shock.
- Set an emergency stop and interlock circuit in the external devices.
- Connect wires and connectors reliably.
Otherwise it may lead to the excessive exothermic heat or smoke generation of the product.
- Do not undertake construction (such as connection and disconnection) while the power supply is on.
It could lead to an electric shock.
- If the equipment is used in a manner not specified by the Panasonic, the protection provided by the equipment may be impaired.
- This product has been developed/produced for industrial use only.

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Handling Precautions

- In this manual, the following symbols are used to indicate safety information that must be observed.

	Indicates an action that is prohibited or a matter that requires caution.
	Indicates an action that must be taken.
 Info.	Indicates supplemental information.
 Note	Indicates details about the subject in question or information useful to remember.
 Procedure	Indicates operation procedures.

(MEMO)

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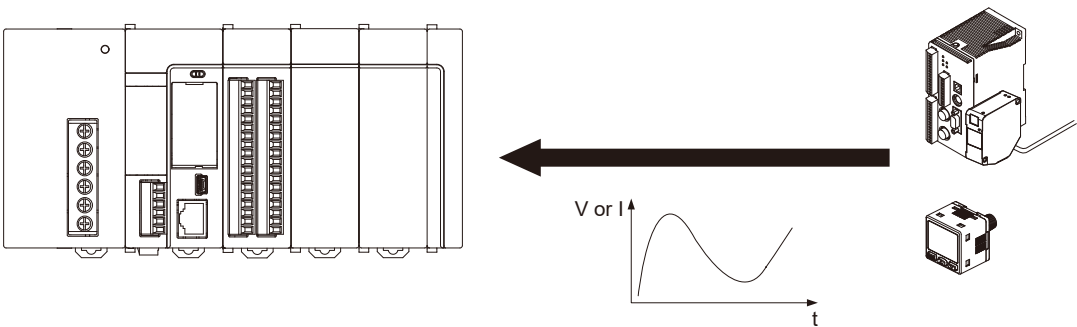
1 Unit Functions and Restrictions

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1.1 Unit Functions and How They Work

1.1 Unit Functions and How They Work

1.1.1 Functions of Unit



- **Analog input control is available in combination with the CPU unit.**
 - Temperature data measured by a thermocouple or resistance temperature detector (RTD) is converted as digital values.
- **Input with simple programs**
 - For input data, digital conversion values are read as input devices (WX).
 - At the time of the thermocouple input or the RTD input, temperatures are read as integer values in units of 0.1 degrees.
- **Ten types of thermocouples and three types of RTDs are supported for each channel.**
 - Ten types of thermocouples (K, J, T, N, R, S, B, E, PLII and WRe5-26) and three types of RTDs (Pt100, JPt100 and Pt1000) can be used. Also, on the thermocouple multi-analog input unit, they can be used in combination with voltage and current inputs.
 - Types of temperature sensors can be changed by the settings of tool software or user programs.
- **Various optional settings**

Functions to process loaded analog input data are provided. User programs can be simplified.

Function	Specifications
Average Processing Settings	Averages analog values obtained by sampling and stores them in the I/O area as digital values. It can be selected from No. of averaging times, time average and moving average.
Offset/Gain processing setting	Offset value (added correction) and gain value (magnification correction) adjustments are made to store processed data in the I/O area.
Scale conversion setting	(Only the voltage and current ranges of the thermocouple multi-analog input unit) This function makes it possible to convert values to an easy-to-use data range. Analog input data acquired in a range between preset minimum and maximum values is scale converted and stored in the I/O area. This function is convenient if used for scale unit conversion.

1.1 Unit Functions and How They Work

Function	Specifications
Upper/lower limit value comparison setting	This function compares acquired data with the upper limit and lower limit and turns ON the upper limit relay or lower limit relay if the acquired data exceeds the upper limit value or lower limit value.
Max./Min. hold setting	This function maintains the maximum and minimum values of acquired data. Holds the maximum and minimum digital conversion values when the maximum/minimum value hold setting is enabled, and stores the values in provided unit memories for each channel.
Disconnection detection	(Thermocouple multi-analog input unit) Turns ON the disconnection detection flag when input is disconnected or unconnected when selecting the thermocouple or the range of 1-5 V 4-20 mA, and warns of the error state. Also, in case of thermocouple, converts values to digital values in the range (K30000) which are different from those normally converted.
	(RTD input unit) When a line connected to the RTD input terminal is disconnected, converts values to digital values in the range (K30000) which are different from those normally converted, and warns of the error state. (Note 1)

(Note 1) The specifications of the disconnection detection function of the RTD input unit have been changed from the lot manufactured in November 2016 (production lot nos. 161100 or more). For details, refer to "6.7 Disconnection Detection (AFP7RTD8)".

1.1.2 Unit Type and Product Number

Name	Specifications	Product No.
Thermocouple Multi-analog Input Unit	8-ch input Thermocouple input range: K1, K2, J1, J2, T, N, R, S, B, E, PLII, WRe5-26 Voltage input range: -10 to +10 V, 0 to +5 V, 1 to +5 V, -100 to +100 mV Current input range: 0 to +20 mA, 4 to +20 mA	AFP7TC8
RTD Input Unit	8-ch input RTD input range: Pt100-1, Pt100-2, JPt100-1, JPt100-2, Pt1000	AFP7RTD8

1.2 Restrictions on Combinations of Units

1.2 Restrictions on Combinations of Units

1.2.1 Restrictions on Power Consumption

The internal current consumption of the unit is as follows. Make sure that the total current consumption is within the capacity of the power supply with consideration of all other units used in combination with this unit.

Name	Product No.	Consumption current
Thermocouple Multi-analog Input Unit	AFP7TC8	80mA or less
RTD Input Unit	AFP7RTD8	65mA or less

1.2.2 Applicable Versions of Unit and Software

For using the above units, the following versions of CPU units and software are required.

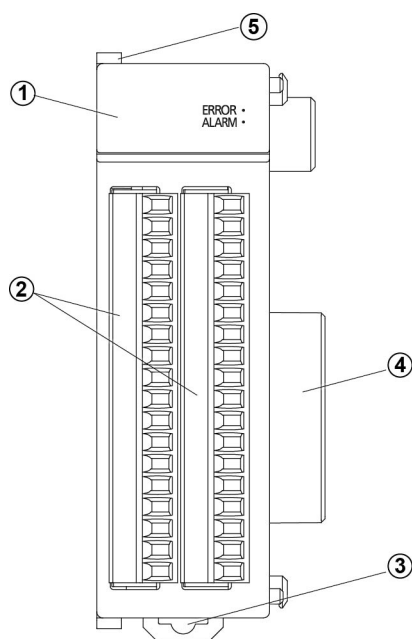
Name	Product No.	Applicable versions		
		CPU unit		FPWINGR7
		CPS4* CPS3*	CPS2*	
Thermocouple Multi-analog Input Unit	AFP7TC8	Ver.2.0 or later	Ver.1.0 or later	Ver.2.2 or later
RTD Input Unit	AFP7RTD8			

2 Names and Functions of Parts

2.1 Thermocouple Multi-analog Input Unit and RTD Input Unit	2-2
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2.1 Thermocouple Multi-analog Input Unit and RTD Input Unit

2.1 Thermocouple Multi-analog Input Unit and RTD Input Unit



■ Names and Functions of Parts

(1) Operation monitor LED

LED name	LED color	Contents
-	Blue	Lit when the CPU unit is turned ON.
ERROR	Red	Lit when the configuration settings are beyond the allowable range or A/D conversion is not possible.
ALARM	Red	Lit when the hardware has an error.

(2) Analog input terminal block

The terminal block is removable. Remove the terminal block before wiring.

(3) DIN rail attachment lever

This lever is used to fix the unit to the DIN rail.

(4) Unit connector

Connects to other I/O units and highly-functional units.

(5) Fixing hook

This hook is used to secure the unit with another unit.

3 Wiring

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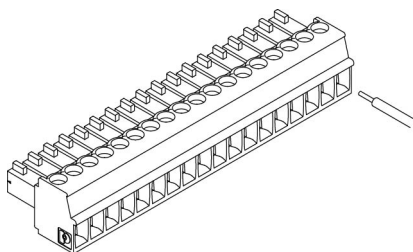
3.1 Wiring of Terminal Block

3.1 Wiring of Terminal Block

3.1.1 Terminal Block, Suitable Wires and Tools

■ Supplied terminal block and suitable wires

A screw-down connection type is used for the terminal block. Use the following suitable wires for the wiring.



Terminal block socket

No. of pins	Phoenix Contact model No.	
	Part number	Product No.
18 pins	MC1,5/18-ST-3,5BK	1840528

Suitable wires (strand wire)

No. of wires	Size	Nominal cross-sectional area
1	AWG#28 to 16	0.08 mm ² to 1.25 mm ²
2	AWG#28 to 20	0.08 mm ² to 0.5 mm ²

Pole terminals with compatible insulation sleeve

If a pole terminal is being used, the following models (made by Phoenix Contact) should be used.

Manufacturer	Cross-sectional area	Size	Phoenix Contact Par No.	
			With insulating sleeve	Without insulating sleeve
Phoenix Contact	0.25 mm ²	AWG#24	AI 0,25-6 BU	A 0,25-7
	0.34 mm ²	AWG#22	AI 0,34-6TQ	A 0,34-7
	0.50 mm ²	AWG#20	AI 0,5-6 WH	A 0,5-6
	0.75 mm ²	AWG#18	AI 0,75-6 GY	A 0,75-6
	1.00 mm ²	AWG#16	-	A 1-6
	0.5 mm ² ×2	AWG#20×2	AI-TWIN 2X 0,5-8 WH	-

Pressure welding tool for pole terminals

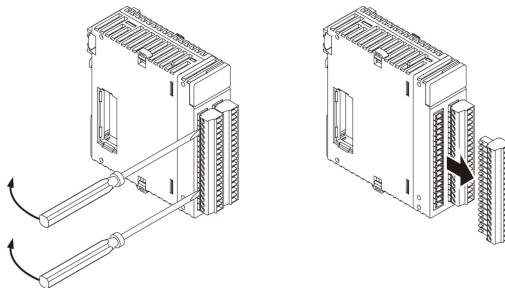
Manufacturer	Phoenix Contact model No.	
	Part number	Product No.
Phoenix Contact	CRIMPFOX 6	1212034

3.1.2 Wiring

■ Wiring method

1 2 Procedure

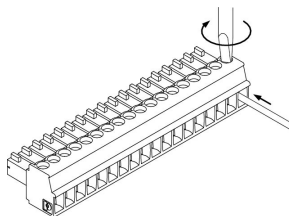
1. Insert a screwdriver between the terminal block and the case, and remove the terminal block.



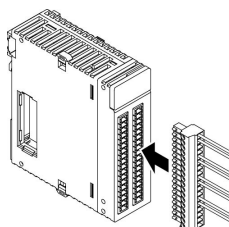
2. Remove a portion of the wire's insulation.



3. Insert the wire into the terminal block until it contacts the back of the block socket, and then tighten the screw clockwise to fix the wire in place.



4. Fit the terminal block into the unit securely.



3.1 Wiring of Terminal Block

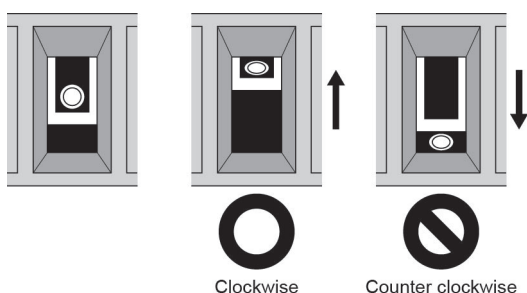
Tightening the terminal block

- When tightening the terminals of the terminal block, use a screwdriver (Phoenix Contact, Product No. 1205037) with a blade size of 0.4 x 2.5 (Part No. SZS 0,4x2,5).
- The tightening torque should be 0.22 to 0.25 N·m.

Precautions on wiring

The following precautions should be observed, to avoid broken or disconnected wires.

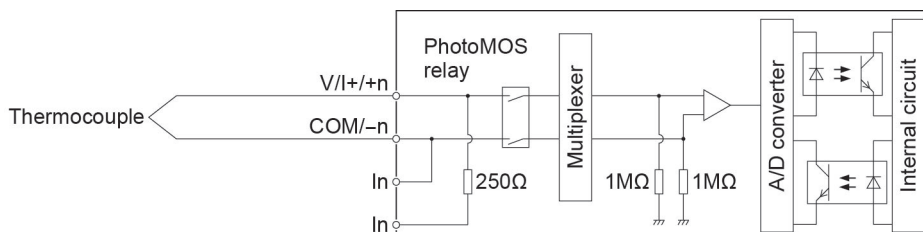
- When removing the wire's insulation, be careful not to scratch the core wire.
- Do not twist the wires to connect them.
- Do not solder the wires to connect them. The solder may break due to vibration.
- After wiring, make sure stress is not applied to the wire.
- In the terminal block socket construction, if the wire is fastened upon counter-clockwise rotation of the screw, the connection is faulty. Disconnect the wire, check the terminal hole, and then re-connect the wire.



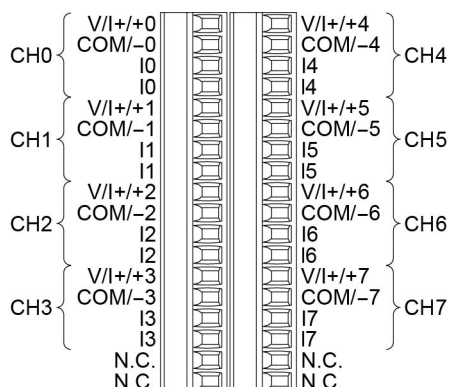
3.2 Connection of Thermocouple Multi-analog Input Unit

3.2.1 For Thermocouple Input

■ Wiring Diagram and Internal Circuit Diagram



■ Terminal layout



(Note 1) Do not connect anything to N.C terminals.

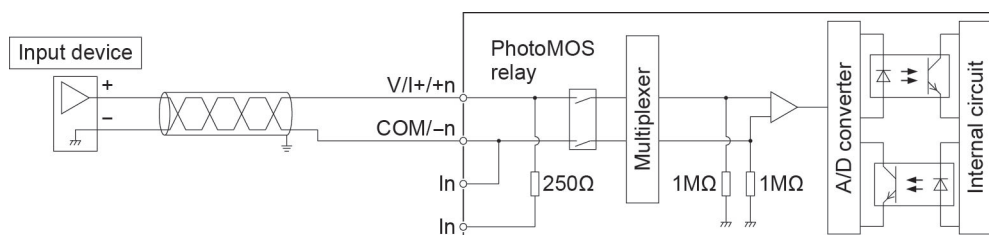
Note

- Connect wires in accordance with the polarity of the thermocouple. Also, when extending the signal line of the thermocouple, use the compensating lead wire for the used thermocouple. It is recommended to ground the unit using the shielded compensating lead wire.
- Do not have the analog input wiring close to AC wires, power wires, or load line from a device other than PLC. Also, do not bundle it with them.

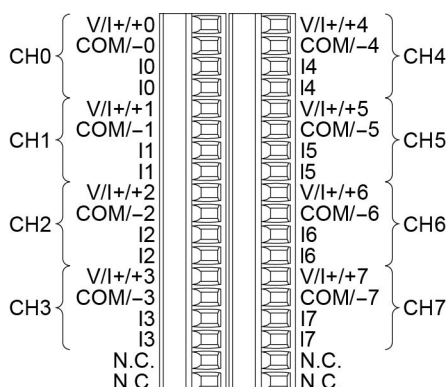
3.2 Connection of Thermocouple Multi-analog Input Unit

3.2.2 For Voltage Input

■ Wiring Diagram and Internal Circuit Diagram



■ Terminal layout



(Note 1) Do not connect anything to N.C. terminals.

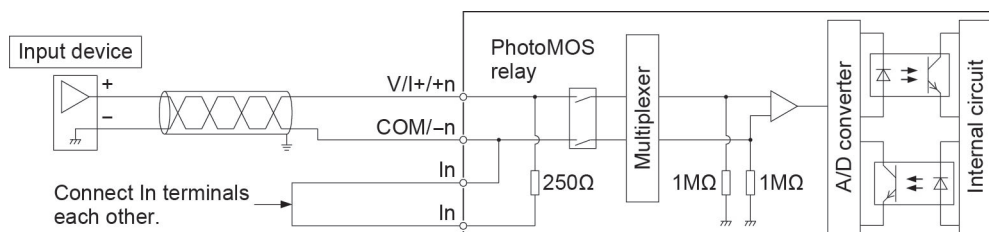
Note

- Use double-core twisted-pair shielded wires. It is recommended to ground them. However, depending on the conditions of the external noise, it may be better not to ground the shielding.
- Do not have the analog input wiring close to AC wires, power wires, or load line from a device other than PLC. Also, do not bundle it with them.

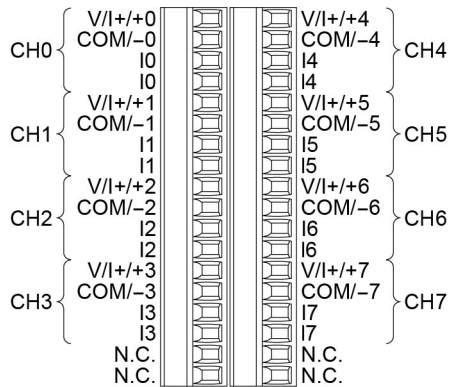
3.2.3 For Current Input

■ Wiring Diagram and Internal Circuit Diagram

In case of the current input, connect In terminals each other.



■ Terminal layout



(Note 1) Do not connect anything to N.C terminals.

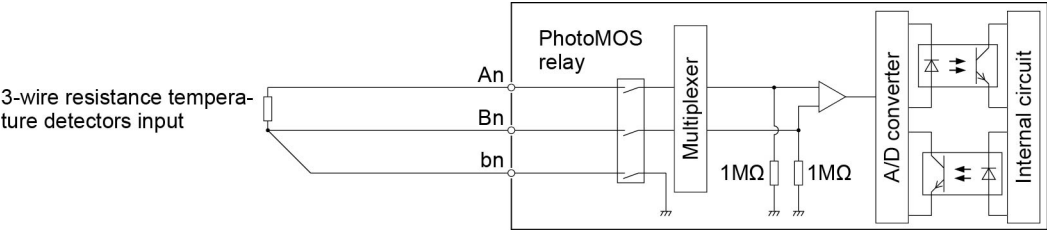
■ Note

- Use double-core twisted-pair shielded wires. It is recommended to ground them. However, depending on the conditions of the external noise, it may be better not to ground the shielding.
- Do not have the analog input wiring close to AC wires, power wires, or load line from a device other than PLC. Also, do not bundle it with them.

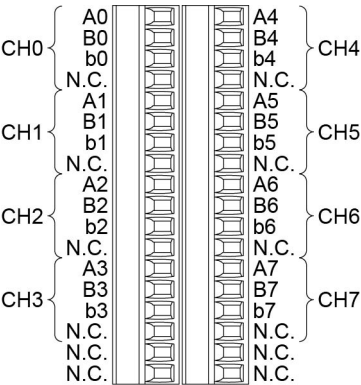
3.3 Connection of RTD Input Unit

3.3 Connection of RTD Input Unit

■ Wiring Diagram and Internal Circuit Diagram



■ Terminal layout



(Note 1) Do not connect anything to N.C terminals.

Note

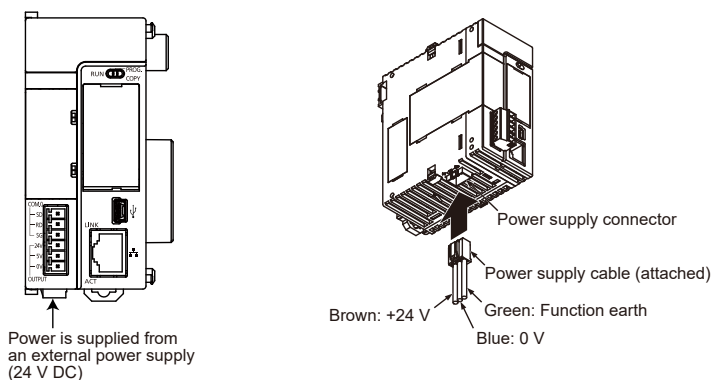
- For copper wires for wiring, use thick wires having insulation performance of JISC3307 and JISC3401 or equivalents to prevent a large increase in the electric resistance. It is recommended to ground the unit using the shielded compensating lead wire.
- Do not have the analog input wiring close to AC wires, power wires, or load line from a device other than PLC. Also, do not bundle it with them.

3.4 Connection of CPU Unit Function Earth

For using the TC Multi-analog Input Unit (AFP7TC8) or RTD Input Unit (AFP7RTD8), ground the function earth of the CPU unit.

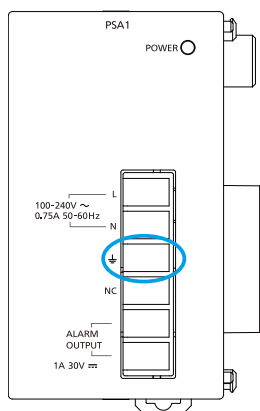
■ When using the CPU unit while supplying 24 V DC power

- The function earth wire of the power supply cable should be grounded.



■ When using the power supply unit

- The function earth terminal of the power supply unit should be grounded.



i Info.

- For details of the grounding method, refer to "4.2 Wiring the Power Supply" of *FP7 CPU Unit User's Manual (Hardware)*.

(MEMO)

4 Unit Settings and Data Reading

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4.1 Confirming the I/O Number Allocations and Starting Word Number

4.1 Confirming the I/O Number Allocations and Starting Word Number

4.1.1 Occupied I/O Area and I/O Allocation

- Input data is allocated to the external input relay areas (WX).
- To the I/O areas of the thermocouple multi analog input unit and RTD input unit, an area to set optional functions and an area to reset errors are allocated.

■ Input contact

I/O area number	Name	Default	Description
WX0	CH0 Analog conversion data	K0	Analog conversion data area Digital conversion values corresponding to analog input are stored as 16-bit signed integer data. Stored values vary by ranges. When optional average processing, scale conversion, offset/gain processing has been set, data after the processing is stored. Optional function flag area Refer to the next page.
WX1	CH0 Optional function flag	H0	
WX2	CH1 Analog conversion data	K0	
WX3	CH1 Optional function flag	H0	
WX4	CH2 Analog conversion data	K0	
WX5	CH2 Optional function flag	H0	
WX6	CH3 Analog conversion data	K0	
WX7	CH3 Optional function flag	H0	
WX8	CH4 Analog conversion data	K0	
WX9	CH4 Optional function flag	H0	
WX10	CH5 Analog conversion data	K0	
WX11	CH5 Optional function flag	H0	
WX12	CH6 Analog conversion data	K0	
WX13	CH6 Optional function flag	H0	
WX14	CH7 Analog conversion data	K0	
WX15	CH7 Optional function flag	H0	

(Note 1) The I/O numbers in the table indicate offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.

Example) When the starting word number for the unit is "10", the A/D conversion data of CH0 is WX10 and the error flag is X11F.

4.1 Confirming the I/O Number Allocations and Starting Word Number

■ Input contact (Optional functions/Error flag area)

I/O number								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
X10	X30	X50	X70	X90	X110	X130	X150	Disconnection detection flag ^{(Note 2)(Note 3)}	ON with disconnection detected and OFF with disconnection restored.
X11	X31	X51	X71	X91	X111	X131	X151	Upper limit comparison relay	Turns ON when the value exceeds the set upper limit.
X12	X32	X52	X72	X92	X112	X132	X152	Lower limit comparison relay	Turns OFF when the value drops below the set lower limit.
X13	X33	X53	X73	X93	X113	X133	X153	Upper/Lower limit Comparison execution flag	Turns ON when the upper limit/lower limit comparison function is executed.
X14	X34	X54	X74	X99	X114	X134	X154	Not used	Do not use.
X15	X35	X55	X75	X95	X115	X135	X155	Max./Min. Hold execution flag	Turns ON when the max./min. hold function is executed.
X16 to X1E	X36 to X3E	X56 to X5E	X76 to X7E	X96 to X9E	X116 to X11E	X136 to X13E	X156 to X15E	Not used	Do not use.
X1F	X3F	X5F	X7F	X9F	X11F	X13F	X15F	Error flag	Turns ON when an error occurs

(Note 1) The I/O numbers in the table indicate offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.

Example) When the starting word number for the unit is "10", the error flag is X11F, the disconnection detection execution relay of CH0 is Y100, and the error flag reset relay is Y10F.

(Note 2) For the Thermocouple Multi-analog Input Unit, the disconnection detection function is valid in the case of the following range; "Thermocouple, voltage: 1-5 V and current: 4-20 mA".

(Note 3) On the RTD input unit (AFP7RTD8), the disconnection detection execution relay and the disconnection detection flag cannot be used. Disconnection is detected by a digital value (K30000) different from normally converted values within the range.

■ Output flag

I/O number								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
Y0	Y10	Y20	Y30	Y40	Y50	Y60	Y70	Disconnection detection execution relay ^{(Note 2)(Note 3)}	ON to execute the disconnection detection function. OFF to turn OFF the disconnection detection flag (Xn0).
Y1	Y11	Y21	Y31	Y41	Y51	Y61	Y71	Not used	Do not use.
Y2	Y12	Y22	Y32	Y42	Y52	Y62	Y72		
Y3	Y13	Y23	Y33	Y43	Y53	Y63	Y73	Upper/Lower limit	ON to execute the function to compare the upper and lower limits.

4.1 Confirming the I/O Number Allocations and Starting Word Number

I/O number								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
								Comparison execution relay	OFF to turn OFF the upper limit comparison relay (Xn1) and lower limit comparison relay (Xn2).
Y4	Y14	Y24	Y34	Y44	Y54	Y64	Y74	Not used	Do not use.
Y5	Y15	Y25	Y35	Y45	Y55	Y65	Y75	Max./Min. Hold execution relay	ON to execute the max./min. hold function.
Y6 to YE	Y16 to Y1E	Y26 to Y2E	Y36 to Y3E	Y46 to Y4E	Y56 to Y5E	Y66 to Y6E	Y76 to Y7E	Not used	Do not use.
YF	Y1F	Y2F	Y3F	Y4F	Y5F	Y6F	Y7F	Error flag reset relay	Resets an error flag.

(Note 1) The I/O numbers in the table indicate offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.

Example) When the starting word number for the unit is "10", the error flag is X11F, the disconnection detection execution relay of CH0 is Y100, and the error flag reset relay is Y10F.

(Note 2) For the Thermocouple Multi-analog Input Unit, the disconnection detection function is valid in the case of the following range; "Thermocouple, voltage: 1-5 V and current: 4-20 mA".

(Note 3) On the RTD input unit (AFP7RTD8), the disconnection detection execution relay and the disconnection detection flag cannot be used. Disconnection is detected by a digital value (K30000) different from normally converted values within the range.

4.1.2 Confirming Allocation of I/O Numbers

- The I/O numbers and base word numbers are necessary when creating programs. Always check to see if the numbers match the design.
- The I/O numbers allocated to the analog input unit are determined by the starting word numbers.

■ Allocation method

Take the following procedure to set the starting word number.

12 Procedure

1. Select **Options>FP7 Configuration>I/O map** in the menu bar.
The "I/O map setting" dialog box will be displayed.
2. Double-click a desired slot.
The "Unit selection" dialog box is displayed.
3. Select "Analog I/O" for Unit type and select the unit used, and press the [OK] button.

4.1 Confirming the I/O Number Allocations and Starting Word Number

Unit selection [Slot No. 1]

Select unit to use: _____

Unit type: Analog I/O

Unit name: -

Input time constant: _____

Installation location setting: _____

Starting word No. 10 (0 - 511)

Number of input words: 0 (0 - 128)

Number of output words: 0 (0 - 128)

Option _____

☐ Exclude this unit from the target for verification.

☐ Exclude this unit from the target for I/O refresh.

OK

Cancel

Unit selection dropdown options:

- Analog input unit (high-performance type) In4
- Analog output unit (high-performance type) Out4
- Thermocouple multi analog input unit
- RTD input unit
- Analog input unit In8

The selected unit is now registered in the I/O map.

Slot No.	Product No.	Unit used	Head	Input	Outp...	Veri...	Refresh	Time ...	Consum...
☐ 0	AFP7CPS41E	FP7 CPU unit	0	10	10	Valid	Valid		200mA
☒ 1	AFP7TC8	Thermocouple multi a	10	16	8	Valid	Valid		80mA
☐ 2	AFP7RTD8	RTD input unit	26	16	8	Valid	Valid		65mA

4.2 Configuration Settings

4.2 Configuration Settings

4.2.1 Unit Configuration

The settings for the unit such as input range, channels to be converted and optional functions are specified in the configuration menu of tool software.

■ Setting method

The following procedure describes the process when the thermocouple multi-analog input unit or RTD input unit has been already allocated in the I/O map.

1 2 Procedure

1. Select **Options>FP7 Configuration** in the menu bar.
2. Select "I/O Map" in the field.
3. Select the slot where the unit has been registered, and press the [Advanced] button.
"Thermocouple multi-analog input unit or RTD input unit setting" dialog box is displayed.
4. Select items according to the conditions used.
Select optional settings as necessary.
5. Click the [OK] button.
The set values will be effective when they are downloaded with programs as a project.

Settings

Group	Setting item	Settings	Default
Basic setting item (Common)	Power frequency	60Hz/50Hz	60 Hz
	Conversion time ^(Note 1)	25ms/5ms	25 ms
Basic setting item (for each channel)	Conversion processing		Execute
	Range setting (TC unit)	Thermocouple K1 (-100.0 to 600.0°C) K2 (-200.0 to 1370.0°C) ^(Note 2) J1 (-100.0 to 400.0°C) J2 (-200.0 to 1200.0°C) ^(Note 2) T (-270.0 to 400.0°C) N (-270.0 to 1300.0°C) R (0.0 to 1760.0°C) S (0.0 to 1760.0°C) B (0.0 to 1820.0°C) E (-270.0 to 1000.0°C) PLII (0.0 to 1390.0°C) WRe5-26 (0.0 to 2315.0°C)	-10 to +10 V
		Voltage -10 to +10 V 0 to +5 V +1 to +5 V	

4.2 Configuration Settings

Group	Setting item	Settings	Default
		-100 to +100 mV	
		Current 0 to +20 mA +4 to +20 mA	
	Range setting (RTD unit)	Pt100-1 (-100.0 to 200.0°C) Pt100-2 (-200.0 to 650.0°C) JPt100-1 (-100.0 to 200.0°C) JPt100-2 (-200.0 to 650.0°C) Pt1000 (-100.0 to 100.0°C)	Pt100-1 (-100.0 to 200.0°C)
Option Setting (for each channel)	Average Processing Settings	Not execute/No. of averaging times/ Time average/Moving average	Not execute
	Offset/Gain processing	Not execute/Execute	Not execute
	Scale conversion ^(Note 3)	Not execute/Execute	Not execute
	Comparison for Upper and Lower Limits	Not execute/Execute	Not execute
	Max./Min. hold	Not execute/Execute	Not execute
	Disconnection detection	Not execute/Execute	Not execute
	Disconnection detection reset	Auto/Manual	Auto
	Averaging constant	No. of times: 2 to 60000 [times]	8
		Time: 200 to 60000 [ms]	200
		Moving: 3 to 64 [times]	8
	Offset value	-3000 to +3000	0
	Gain value	+9000 to +11000	+10000
	Maximum value of scale conversion ^(Note 3)	-30000 to +30000	+10000
	Minimum value of scale conversion ^(Note 3)	-30000 to +30000	0
	Upper limit comparison ON level	-31250 to +31250	+1000
	Upper limit comparison OFF level	-31250 to +31250	+1000
	Lower limit comparison ON level	-31250 to +31250	0
	Lower limit comparison OFF level	-31250 to +31250	0

(Note 1) Conversion time can be set only when selecting the thermocouple multi-analog input unit.

(Note 2) For the Thermocouple Multi-analog Input Unit of Ver. 1.0, the K2 range is -200.0 to 1000.0°C, and J2 range is -200.0 to 750.0°C.

(Note 3) Scale conversion can be set only when selecting voltage or current range in the thermocouple multi-analog input unit.

4.2 Configuration Settings

4.2.2 Unit Setting and Conversion Processing Time

Conversion time varies with the configuration setting conditions.

■ Unit's conversion process cycle time

- The unit's conversion time is determined by the number of channels that the conversion process is executed.
- For the thermocouple multi-analog input unit, a conversion time per channel can be selected.

Normal mode (When conversion time is 25 ms/ch)		High-speed mode (When conversion time is 5 ms/ch) ^(Note 2)	
No. of executed channels ^(Note 1)	Conversion time + Processing time	No. of executed channels ^(Note 1)	Conversion time + Processing time
1	25 ms +25 ms	1	5 ms +5 ms
2	50 ms +25 ms	2	10 ms +5 ms
3	75 ms +25 ms	3	15 ms +5 ms
4	100 ms +25 ms	4	20 ms +5 ms
5	125 ms +25 ms	5	25 ms +5 ms
6	150 ms +25 ms	6	30 ms +5 ms
7	175 ms +25 ms	7	35 ms +5 ms
8	200 ms +25 ms	8	40 ms +5 ms

(Note 1) Channels to execute the conversion processing are set in the unit memories (UM00080/UM00090/UM000A0/UM000B0/UM000C0/UM000D0/UM000E0/UM000F0).

(Note 2) Conversion time can be set only when selecting the thermocouple multi-analog input unit. It is set in the unit memory (UM00071).

■ Normal mode and High-speed mode

- In the normal mode (conversion time: 25 ms/c), a process is available to reduce the effects of commercial frequency (50Hz/60Hz) noises by a digital filter. In the high-speed mode (conversion time: 5 ms/ch), this process is not available.
- When there are effects of commercial frequency (50Hz/60Hz) noises, it is recommended to use the normal mode.

■ Conversion processing execution/non-execution setting and conversion processing time

Select the execution or non-execution of the conversion processing of analog input on a channel-by-channel basis. This can save the conversion time for channels that do not execute conversion processing.

Example) Conversion time for two channels (with CH2 to CH7 excluded)

Conversion is executed in the order of ch0→ch1→ch0→ch1→ch0→ch1→ch0→ch1..., and the conversion time for CH2 to CH7, which are excluded, is saved.

4.3 Reading Analog Input Data

4.3.1 Reading Analog Input Data

■ Basic operation of analog input processing

(1) Receiving analog input

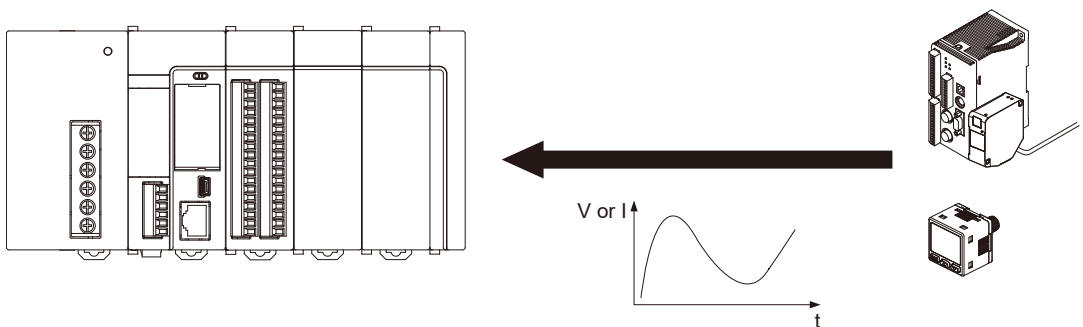
The input part of the unit receives analog input data from the thermocouple, RTD or external devices.

(2) Digital conversion processing

Analog input data received by the unit is converted into digital values in sequence automatically in the unit. The converted digital value varies with the setting of the range.

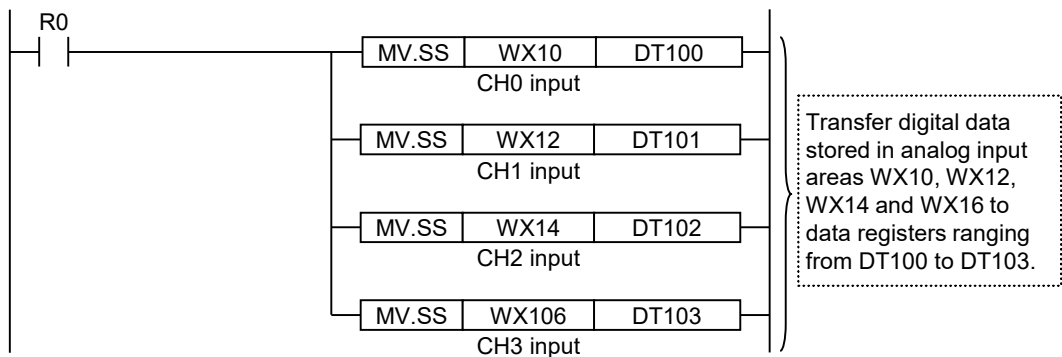
(3) Storage of digital values

A user program is used to read converted digital values as data in the unit relay area (WX). The specified area number varies depending on the installation position of the unit.



■ Program to acquire converted digital values

Reading the values in digital conversion value storage areas WX10, WX12, WX14, and WX16 to any areas of "data registers ranging from DT100 to DT103."



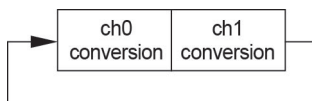
4.4 Data Acquisition Timing

■ Input conversion processing time of the unit

Conversion processing time varies with the range and the number of channels in use. The conversion execution/non-execution channel function can save the conversion time for channels that do not execute conversion processing.

Example of 2-channel conversion

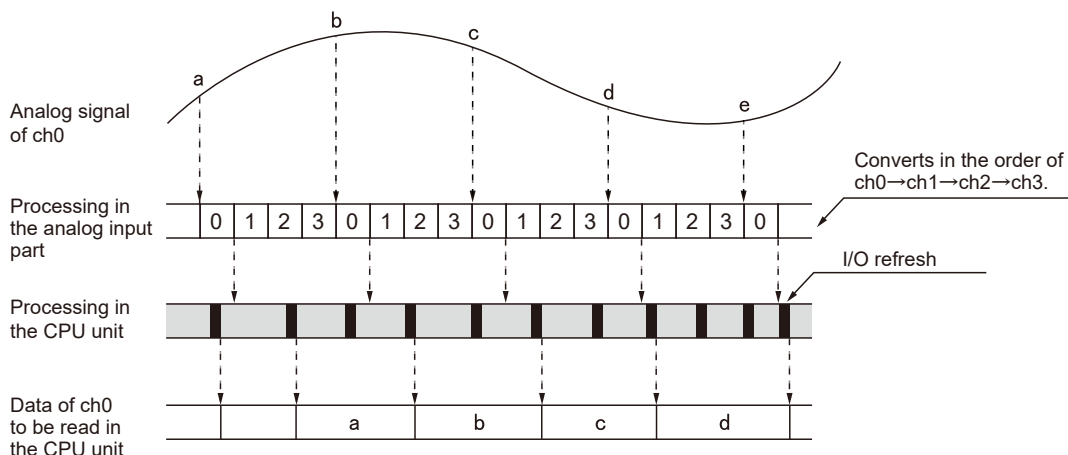
Converted in the order of ch0→ch1→ch0→ch1→...



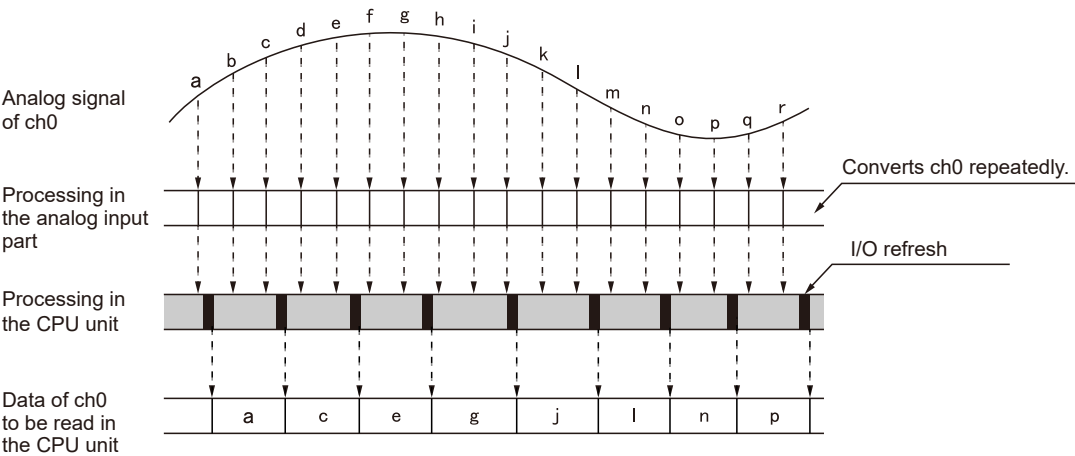
■ Data acquisition timing of CPU unit

- The conversion processing of the analog input unit is not synchronized with the I/O refreshing timing of the CPU unit.
- Therefore, the latest data is input into the operation memory of the CPU unit when the CPU unit implements I/O refreshing.

Example of 4-channel conversion



Example of 1-channel conversion



(MEMO)

5 Conversion Characteristics of Analog Input

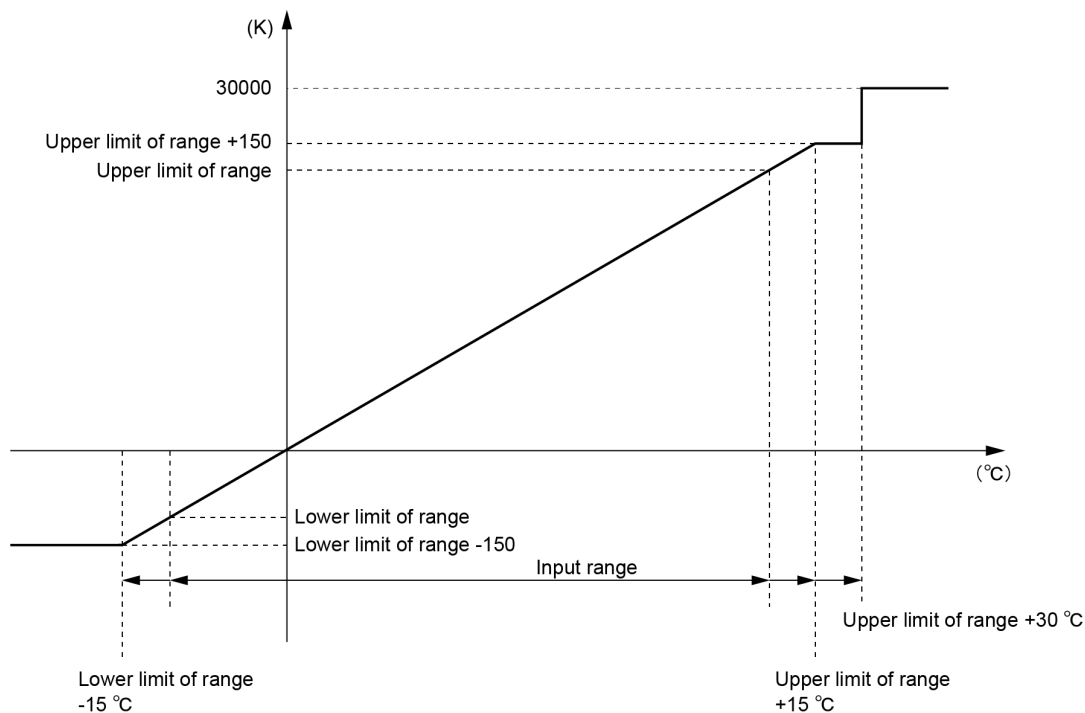
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5.1 Input Conversion Characteristics (AFP7TC8)

5.1 Input Conversion Characteristics (AFP7TC8)

5.1.1 Thermocouple Input Range

■ Conversion characteristics graph



■ When exceeding the rated range

- Up to the lower limit -15°C and the upper limit +15°C of the range, reference values for which the conversion accuracy is not assured are indicated.
- When exceeding the upper limit of the range +30°C, converted values are "30000".

Range	Input value	Converted value	Remarks
K1 (Thermocouple type K)	-115°C or less	-1150	
	+615°C or more	+6150	
K2 (Thermocouple type K)	-215°C or less	-2150	
	+1385°C or more	+13850	For the unit Ver. 1.0, the upper limit of the range is +1000°C.
J1 (Thermocouple type J)	-115°C or less	-1150	
	+415°C or more	+4150	
J2 (Thermocouple type J)	-215°C or less	-2150	

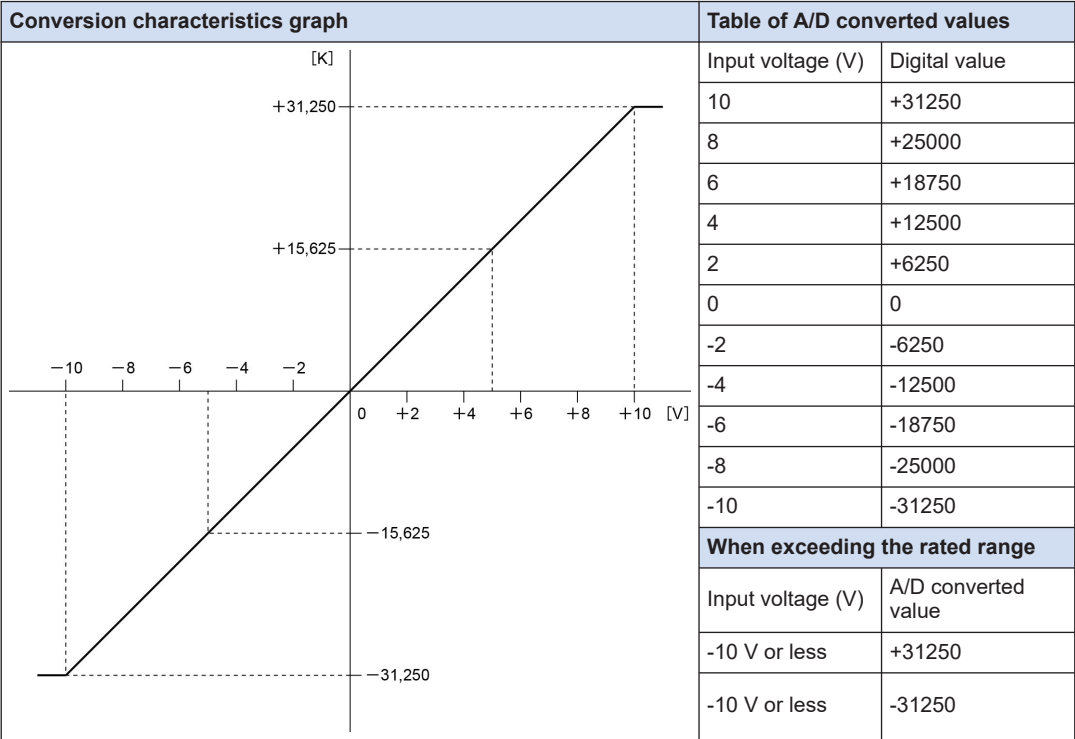
5.1 Input Conversion Characteristics (AFP7TC8)

Range	Input value	Converted value	Remarks
	+1215°C or more	+12150	For the unit Ver. 1.0, the upper limit of the range is +750°C.
Thermocouple type T	-285°C or less	-2850	
	+415°C or more	+4150	
Thermocouple type N	-285°C or less	-2850	
	+1315°C or more	+13150	
Thermocouple type R	-15°C or less	-150	
	+1775°C or more	+17750	
Thermocouple type S	-15°C or less	-150	
	+1775°C or more	+17750	
Thermocouple type B	-15°C or less	-150	
	+1835°C or more	+18350	
Thermocouple type E	-285°C or less	-2850	
	+1015°C or more	+10150	
Thermocouple type PLII	-15°C or less	-150	
	+1405°C or more	+14050	
Thermocouple type WRe5-26	-15°C or less	-150	
	+2330°C or more	+23300	
Disconnection	-	+30000	

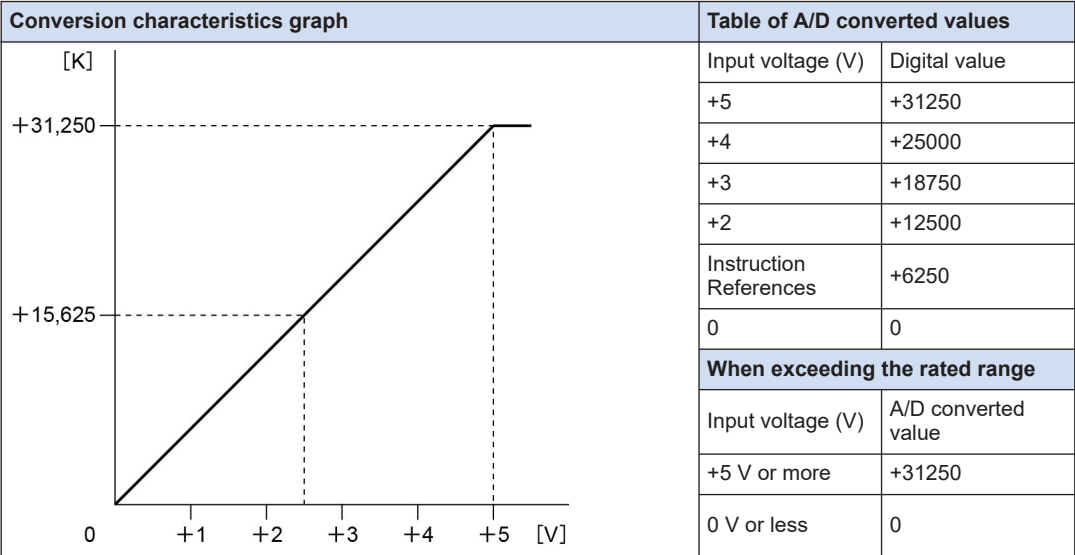
5.1 Input Conversion Characteristics (AFP7TC8)

5.1.2 Voltage Input Range

■ -10 V to +10 V DC input (0.32 mV, 1/62500)

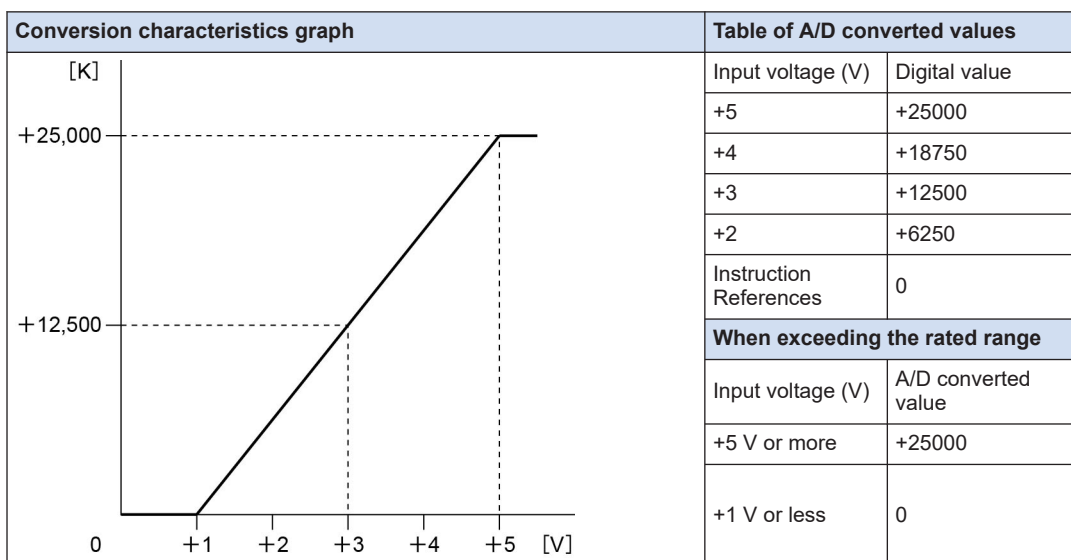


■ 0 V to 5 V DC input (0.16mV, 1/31250)

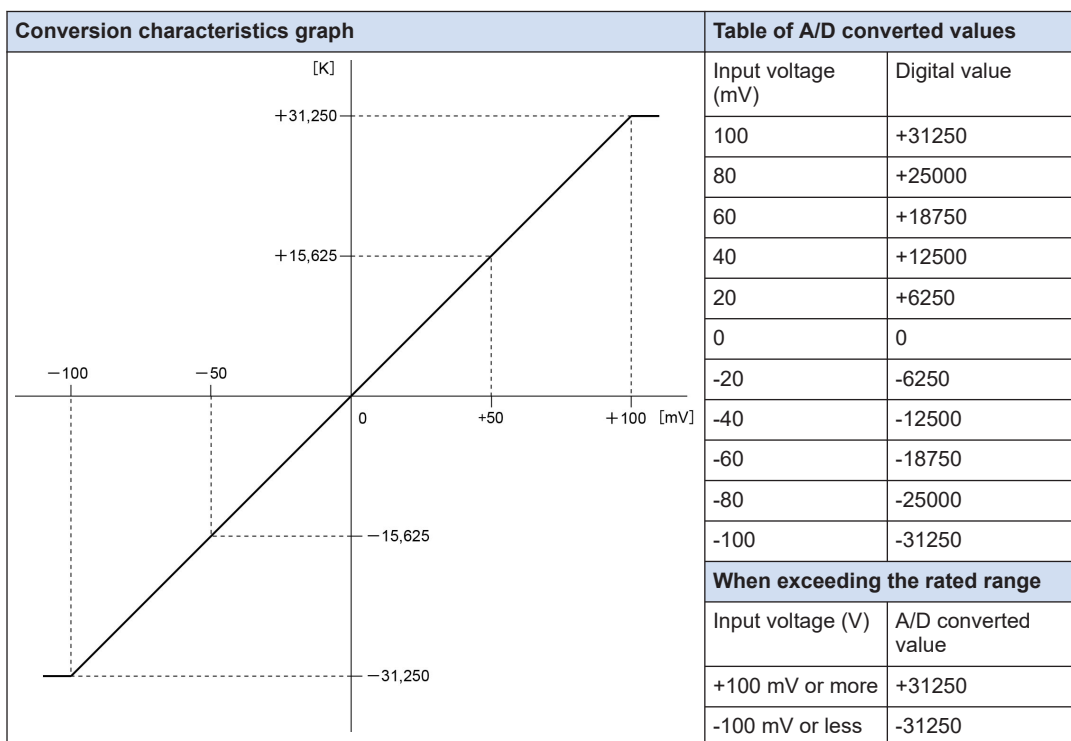


5.1 Input Conversion Characteristics (AFP7TC8)

■ 1 V to 5 V DC input (0.16mV, 1/25000)



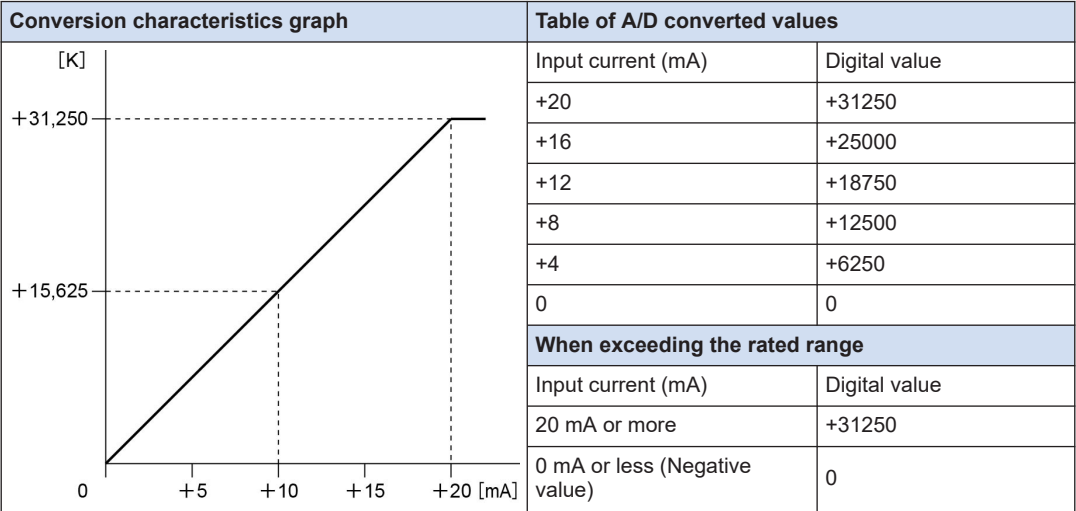
■ -100 mV to +100 mV DC input (3.2 μ V, 1/62500)



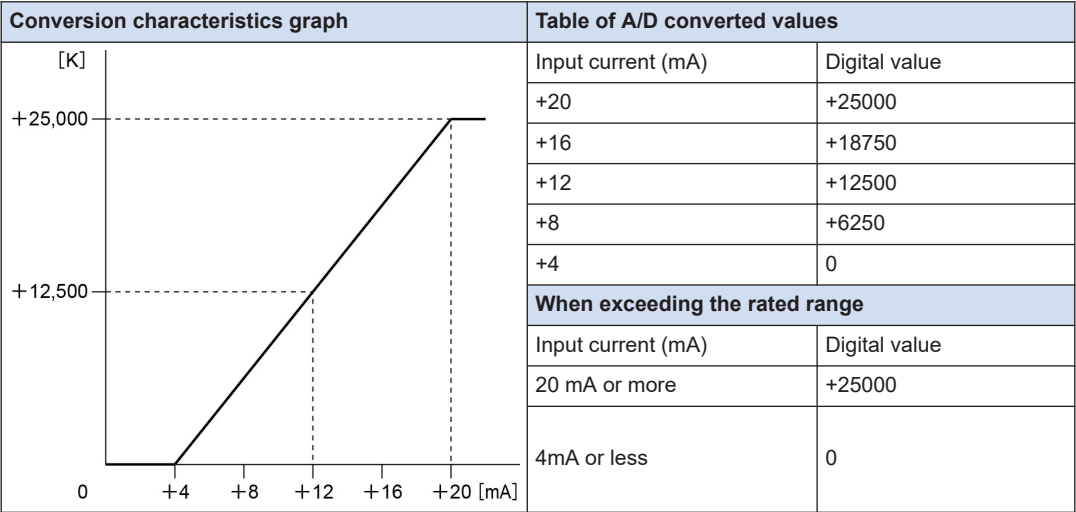
5.1 Input Conversion Characteristics (AFP7TC8)

5.1.3 Current Input Range

0 mA to 20 mA DC input (0.64 □A, 1/31250)



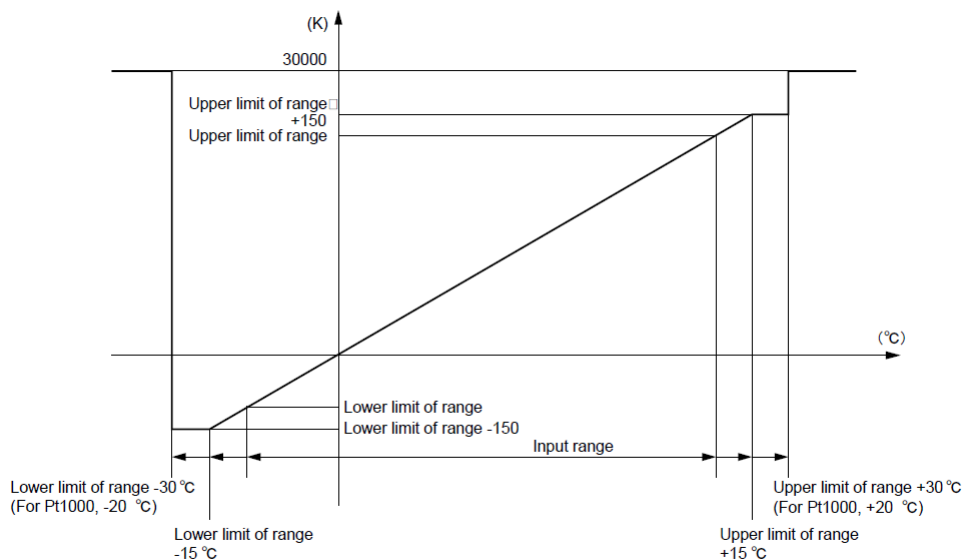
4 mA to 20 mA DC input (0.64 □A, 1/25000)



5.2 Input Conversion Characteristics (AFP7RTD8)

5.2.1 RTD Input Range

■ Conversion characteristics graph



■ When exceeding the rated range

- Up to the lower limit -15 °C and the upper limit +15 °C of the range, reference values which the conversion accuracy is not assured are indicated.
- When the lower limit of the range is -30 °C or less, or when the upper limit is +30 °C or more, the converted values are "30000". (For Pt1000, the lower limit of the range is -20 °C or less, and the upper limit is +20 °C or more.)

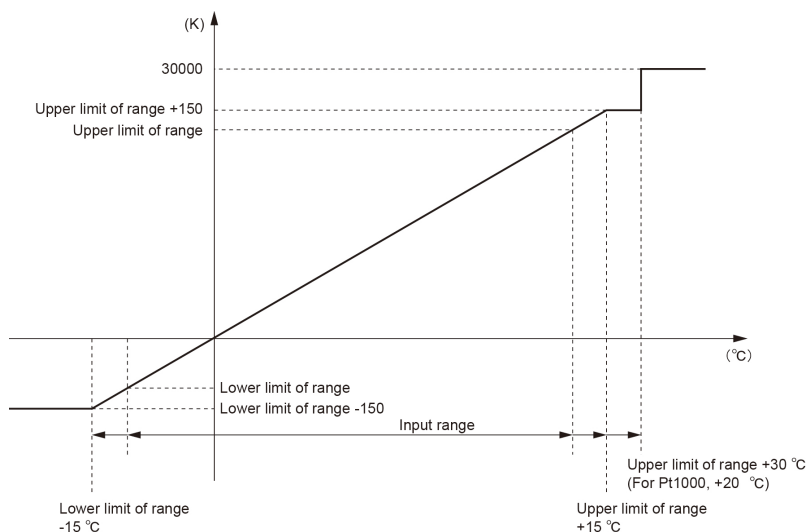
Range	Input value	Converted value
Pt100 Range1 JPt100 Range1	-130°C or less	+30000
	-130°C ~ -115°C	-1150
	+215°C ~ +230°C	+2150
	+230°C or more	+30000
Pt100 Range2 JPt100 Range2	-230°C or less	+30000
	-230°C ~ -215°C	-2150
	+665°C ~ +680°C	+6650
	+680°C or more	+30000
Pt1000	-120°C or less	+30000
	-120°C ~ -115°C	-1150
	+115°C ~ +120°C	+1150
	+120°C or more	+30000

5.2 Input Conversion Characteristics (AFP7RTD8)

(Note): The converted value is +30000 when the input is disconnected.

The characteristics described on the previous page are applied for the units manufactured in November 2016 or later (production lot nos. 161100 or more). The specifications for the units manufactured before November 2016 (production lot nos. smaller than 161100) are as follows.

■ Conversion characteristics graph



- Up to the lower limit -15 °C and the upper limit +15 °C of the range, reference values which the conversion accuracy is not assured are indicated.
- When exceeding the upper limit of the range +30°C, converted values are "30000". (For Pt1000, the upper limit of the range is +20 °C or more.)

Range	Input value	Converted value
Pt100 Range1 JPt100 Range1	-115°C or less	-1150
	+ 215°C~+ 230°C	+ 2150
	+ 230°C or more	+30000
Pt100 Range2 JPt100 Range2	-215°C or less	-2150
	+ 665°C~+ 680°C	+ 6650
	+ 680°C or more	+30000
Pt1000	-115°C or less	-1150
	+ 115°C~+120°C	+ 1150
	+ 120°C or more	+30000

(Note): The converted value is +30000 when the input is disconnected.

6 Optional settings

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6.1 Average Processing Settings

6.1.1 Number of Averaging Times

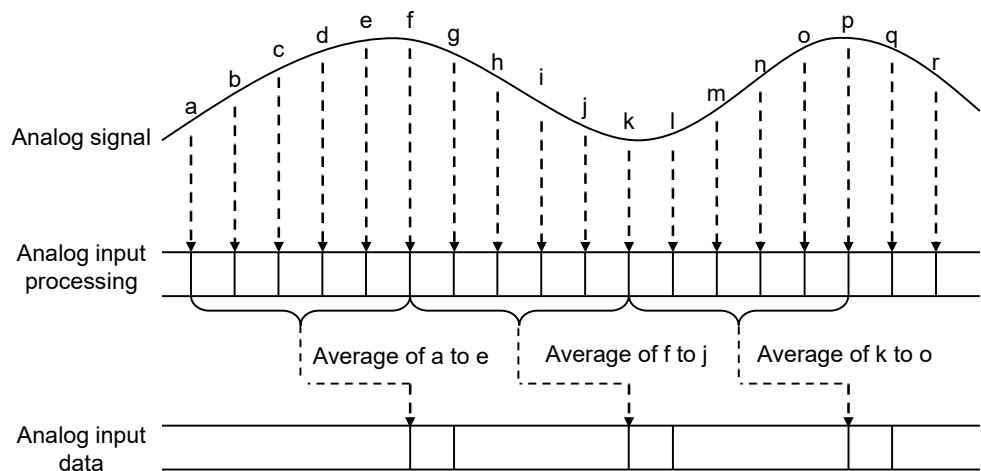
■ Overview of functions

- Analog input data sampled by the unit is averaged and stored as digital values.
- If the "number of averaging time" is set, analog input data items acquired will be stored in unit memory (UM) as digital values when the number of analog input data items reaches the set number of averaging times.
- If the number of data items acquired is less than the number of averaging times, the first acquired data will be stored in the I/O area.
- Obtain the number of averaging times to be processed from the following input.

Input	The sum of analog input data items for the number of averaging times
Output	Number of averaging times value

■ Processing during the number of averaging times

Averaging setting example: "number of averaging times", number of samples set to 5.



■ Configuration

Name		Default	Setting range and description
Function setting	Average processing	Not execute	Select "number of averaging times".
	Averaging constant	U8	Number: 2 to 60000 [times] (specified with an unsigned integer)

6.1.2 Time Average

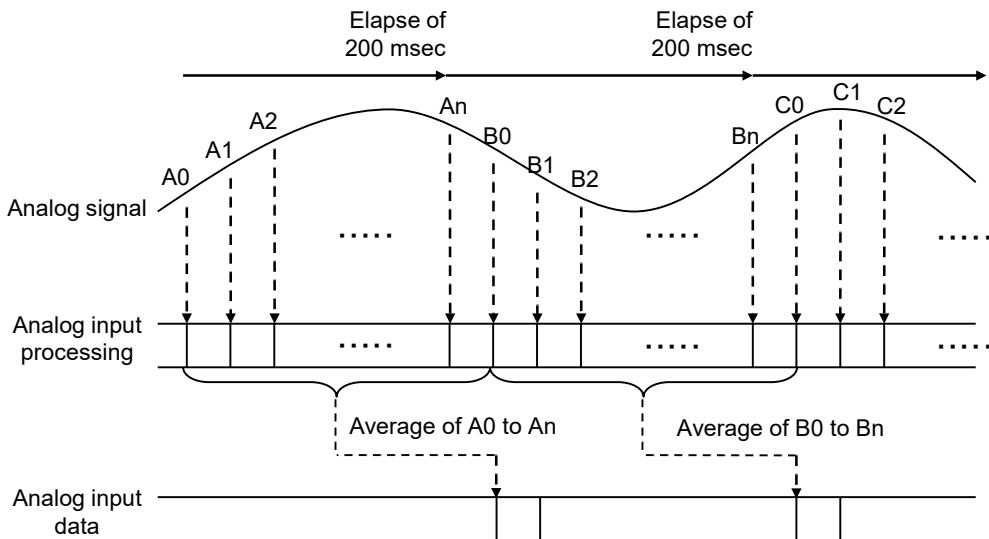
■ Overview of functions

- Analog input data sampled by the unit is averaged and stored as digital values.
- If "time average" is set, analog input data items acquired will be stored in unit memory (UM) as digital values when the acquisition period of the analog input data items reaches the set averaging time.
- Obtain the time average to be processed from the following input.

Input	The sum of analog input data items for the number of averaging time.
Output	Time average value

■ Processing during time average

Average setting example: "time average", averaging time of 200 msec



■ Configuration

Name		Default	Setting range and description
Function setting	Average processing	Not execute	Select "time average".
	Averaging constant	U200	Time: 200 to 60000 [ms] (specified with an unsigned integer)

6.1.3 Moving Average

■ Overview of functions

- Analog input data sampled by the unit is averaged and stored as digital values.

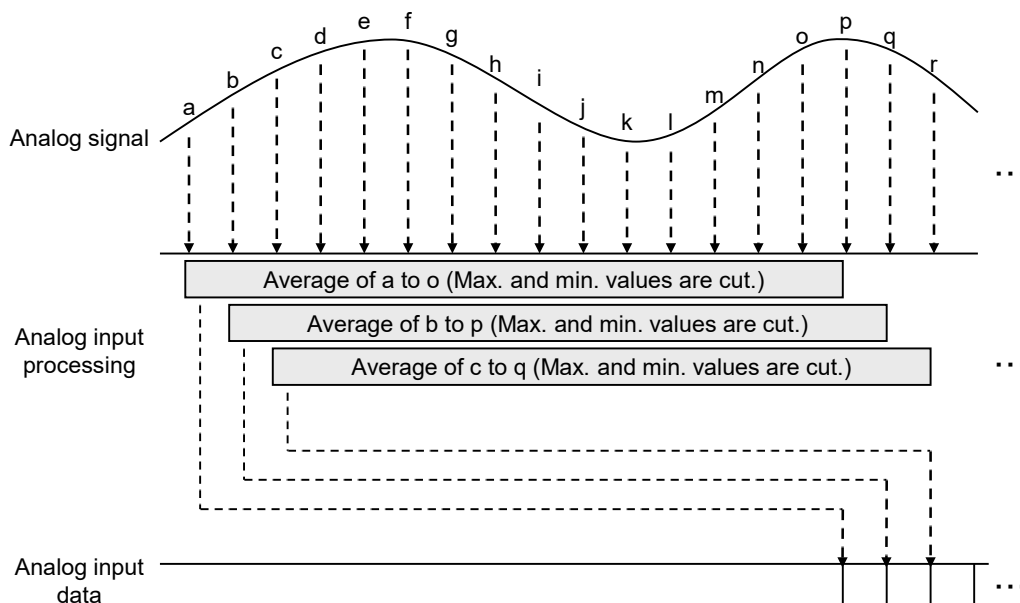
6.1 Average Processing Settings

- If "moving average" is set, analog input data items acquired will be stored in unit memory (UM) as digital values when the number of analog input data items reaches the set number of moving average times.
- When the set number of moving average times is 3 to 64, the maximum and minimum values are cut from the data for n times, and the data for $(n-2)$ times is averaged.
- When the set number of moving average times is 1 or 2, the latest measured data is stored without averaging processing.
- When data sampling for the set number of times has not been completed, data is not updated. When all data are acquired, the data will be updated.
- Obtain output (moving average value) to be processed from the following input.

Input	The number of average times, analog input data for the number of average times, the latest analog input data, and old analog input data
Output	Moving average value

■ Processing during moving average

Averaging setting example: "moving average", number of averaging times set to 15.



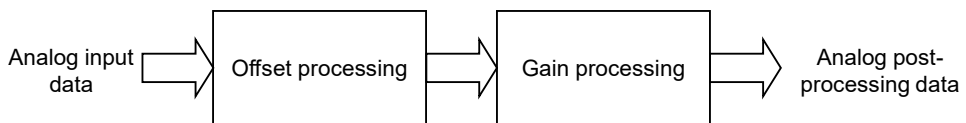
■ Configuration

Name		Default	Setting range and description
Function setting	Average processing	Not execute	Select "moving average".
	Averaging constant	U8	Number: 3 to 64 [times] (specified with an unsigned integer)

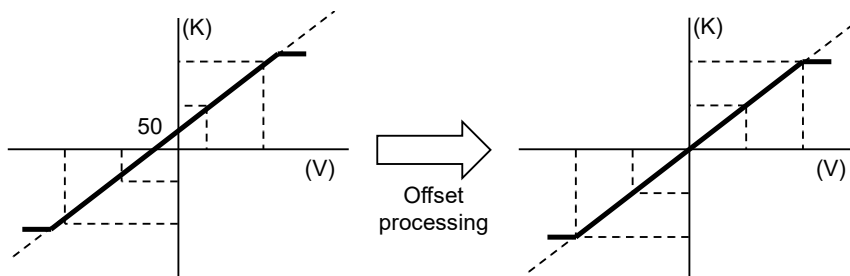
6.2 Offset/Gain Processing

■ Overview of functions

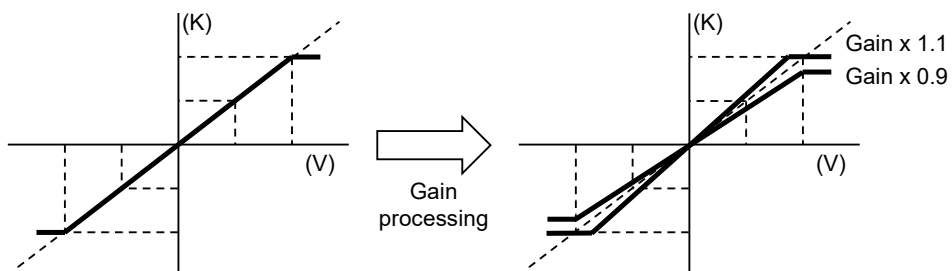
- Offset value (added correction) and gain value (magnification correction) adjustments are made to store processed data in the I/O area.



- Offset value settings are used as a function (zero-point adjustment) to make offset error adjustments between load devices. If the analog conversion value is K50 when the analog input value is 0 V, the analog conversion data is corrected to 0 V based on K-50 as an offset value.



- Gain value settings are used as a function to adjust delicate scale errors between load devices. The gain value slope can be changed in a range of $\times 0.9$ to $\times 1.1$.



- Offset/Gain processing is executed on a channel-by-channel basis.

■ Configuration

Name		Default	Setting range and description
Function setting	Offset/Gain Processing	Not execute	Select "Execute".
Offset value		K0	Set an offset value at the time of using the offset processing function. Setting range: -3000 to +3000 (specified with a signed integer)
Gain value		U10000	Set an offset value at the time of using the offset processing function.

6.2 Offset/Gain Processing

Name	Default	Setting range and description
		Setting range: +9000 to +11000 (0.9x to 1.1x: Specified with a signed integer)

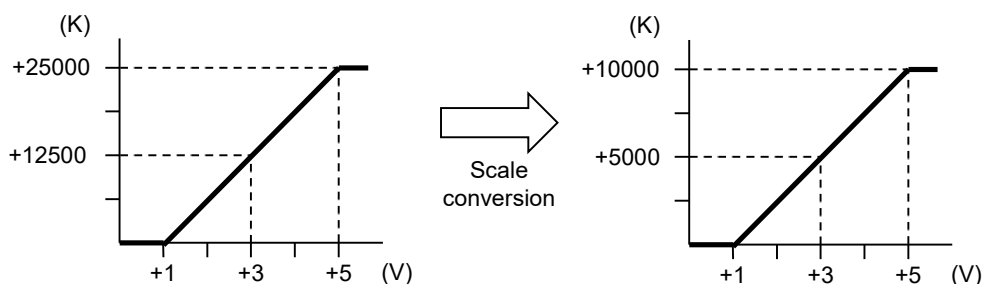
Info.

- The offset value is corrected to a value corresponding to the resolution of the input range of the original value regardless of the setting of scale conversion.

6.3 Scale Conversion (AFP7TC8 Voltage/Current Range Only)

■ Overview of functions

- This function makes it possible to convert values to an easy-to-use data range. Analog input data acquired in a range between preset minimum and maximum values is scale converted and stored in the I/O area. This function is convenient if used for scale unit conversion.
- Scale conversion is executed on a channel-by-channel basis.
- Conversion values read from the analog input unit include fractions. Therefore, convert the values to easy-to-handle figures if needed.



■ Configuration

Name		Default	Setting range and description
Function setting	Scale conversion	Not execute	Select "Execute".
Minimum value of scale conversion		K0	Set the minimum value at the time of using the scale conversion function. Setting range: -3000 to +30000 (specified with a signed integer)
Maximum value of scale conversion		K10000	Set the maximum value at the time of using the scale conversion function. Setting range: -3000 to +30000 (specified with a signed integer)

(Note 1) If data outside the minimum or maximum scale is input, scale conversion will be disabled and the minimum or maximum scale value will be stored as a conversion value.

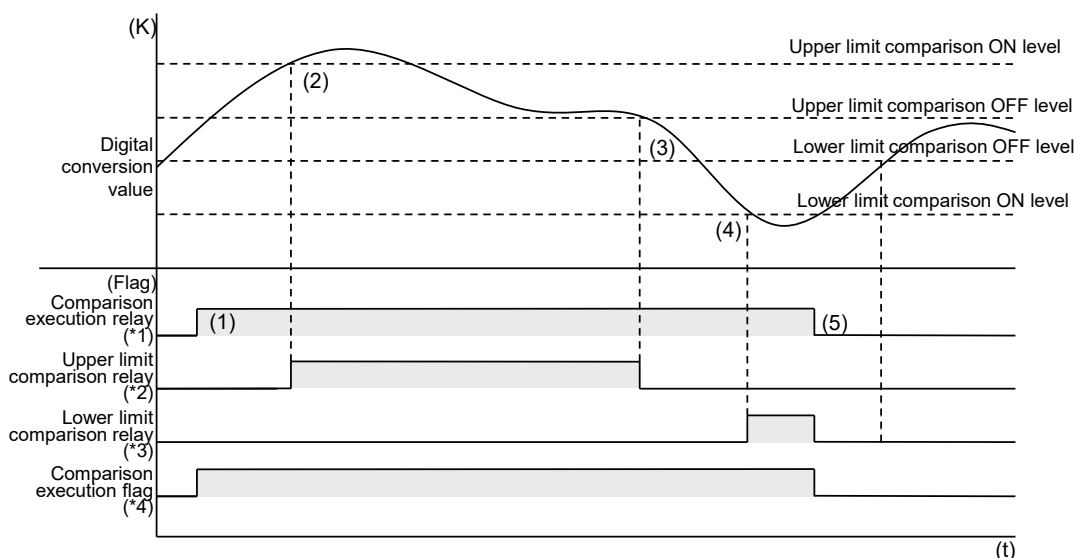
6.4 Comparison for Upper and Lower Limits

6.4 Comparison for Upper and Lower Limits

■ Overview of functions

This function compares acquired data with the upper limit and lower limit and turns ON the upper limit relay or lower limit relay if the acquired data exceeds the upper limit value or lower limit value.

- Comparison for upper and lower limits is executed on a channel-by-channel basis.
- The upper limit relay will turn ON if the digital conversion value is larger than the upper limit.
- The lower limit relay will turn ON if the digital conversion value is smaller than the lower limit.
- The function will be disabled with the comparison execution relay (Y) turned ON if the configuration-upper/lower limit comparison setting is not executed.



(1) The upper/lower limit comparison function will be executed when the user program turns ON the comparison execution relay.

(2) The upper limit comparison relay will turn ON if the upper limit comparison ON level or an upper level is detected.

(3) The upper limit comparison relay will turn OFF if the upper limit comparison OFF level or a lower level is detected.

(4) The lower limit comparison relay will turn ON if the lower limit comparison ON level or a lower level is detected.

(5) The upper/lower limit comparison relay and comparison execution flag will be forcibly turned OFF if the comparison execution relay is turned OFF.

■ I/O allocation

The I/O numbers in the timing chart and program are shown on the condition that the starting word number of the unit is "10". Actual I/O numbers allocated to the analog input unit are determined by the starting word number.

	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7
*1 Comparison execution relay	Y103	Y113	Y123	Y133	Y143	Y153	Y163	Y173

6.4 Comparison for Upper and Lower Limits

	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7
*2 Upper limit comparison relay	X111	X131	X151	X171	X191	X211	X231	X251
*3 Lower limit comparison relay	X112	X132	X152	X172	X192	X212	X232	X252
*4 Comparison execution flag	X113	X133	X153	X173	X193	X213	X233	X253

■ Configuration

Name		Default	Setting range and description
Function setting	Comparison for Upper and Lower Limits	Not execute	Select the desired function to be used.
Comparison for Upper and Lower Limits Upper limit comparison ON level		K1000	Set the upper limit to turn ON the output flag at the time of using the upper/lower limit comparison function. Setting range: -31250 to +31250 (specified with a signed integer)
Comparison for Upper and Lower Limits Upper limit comparison OFF level		K1000	Set the upper limit to turn OFF the output flag at the time of using the upper/lower limit comparison function. Setting range: -31250 to +31250 (specified with a signed integer)
Comparison for Upper and Lower Limits Lower limit comparison OFF level		K0	Set the lower limit to turn OFF the output flag at the time of using the upper/lower limit comparison function. Setting range: -31250 to +31250 (specified with a signed integer)
Comparison for Upper and Lower Limits Lower limit comparison ON level		K0	Set the lower limit to turn ON the output flag at the time of using the upper/lower limit comparison function. Setting range: -31250 to +31250 (specified with a signed integer)

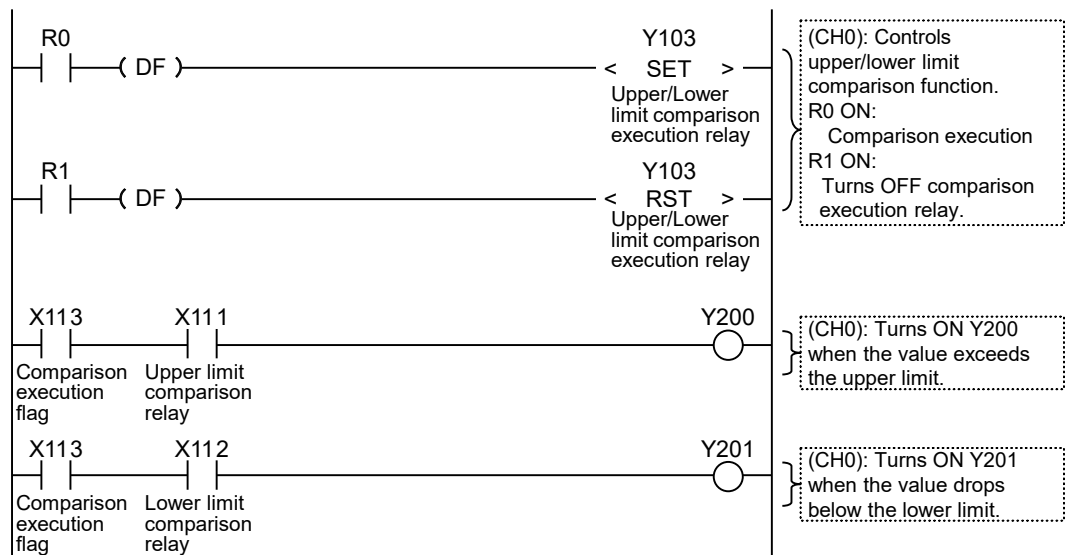
(Note 1) Make the following level settings for upper/lower limit comparison.

Lower limit comparison ON level ☐ lower limit comparison OFF level < Upper limit comparison OFF level ☐ Upper limit comparison ON level

■ Sample program

The digital conversion value on ch0 of the unit is read to detect the upper limit and lower limit, and the desired output is turned ON with the upper or lower limit detected.

6.4 Comparison for Upper and Lower Limits

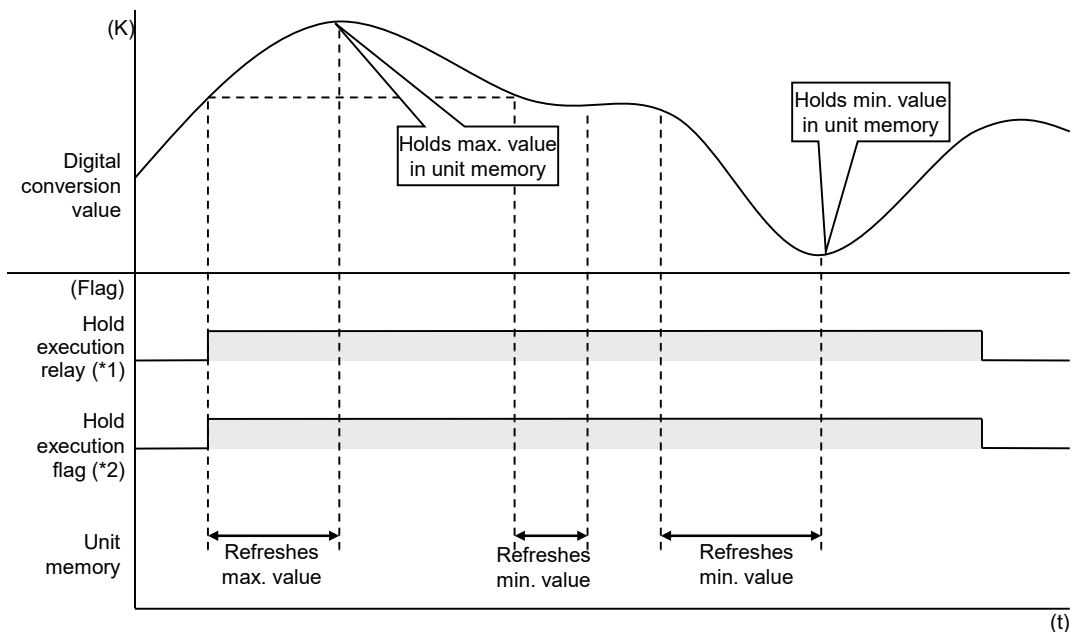


6.5 Holding max./min. values

■ Overview of functions

This function maintains the maximum and minimum values of acquired data. Holds the maximum and minimum digital conversion values when the maximum/minimum value hold setting is enabled, and stores the values in provided unit memories for each channel.

- If the function has not been enabled with the configuration settings, the function will not work with the hold execution relay turned ON.
- When the hold execution relay is turned ON, the values at the time will be preset as maximum and minimum values in the unit memories.
- The maximum and minimum values stored in the unit memories will be held even if the hold execution relay is turned OFF.
- The maximum and minimum values stored in the unit memories will be held even if the unit is set into PROG. mode.
- The maximum and minimum values are held on a channel-by-channel basis.



■ Hold data storage area

Unit memory No. (Hex)	Name	Default	Data range and description
UM 00170 UM 00171 UM 00172 UM 00173 UM 00174 UM 00175 UM 00176	Holding max. value	K0	The acquired maximum value will be held when the maximum and minimum value hold function is used. Setting range: -31250 to +31250 (specified with a signed integer)

6.5 Holding max./min. values

Unit memory No. (Hex)	Name	Default	Data range and description
UM 00177			
UM 00178 UM 00179 UM 0017A UM 0017B UM 0017C UM 0017D UM 0017E UM 0017F	Holding min. value	K0	The acquired maximum value will be held when the maximum and minimum value hold function is used. Setting range: -31250 to +31250 (specified with a signed integer)

(Note 1) The unit memory numbers in the above table are listed for CH0 to CH7 in numerical order.

■ I/O allocation

The I/O numbers in the timing chart and program are shown on the condition that the starting word number of the unit is 10. Actual I/O numbers allocated to the analog input unit are determined by the starting word number.

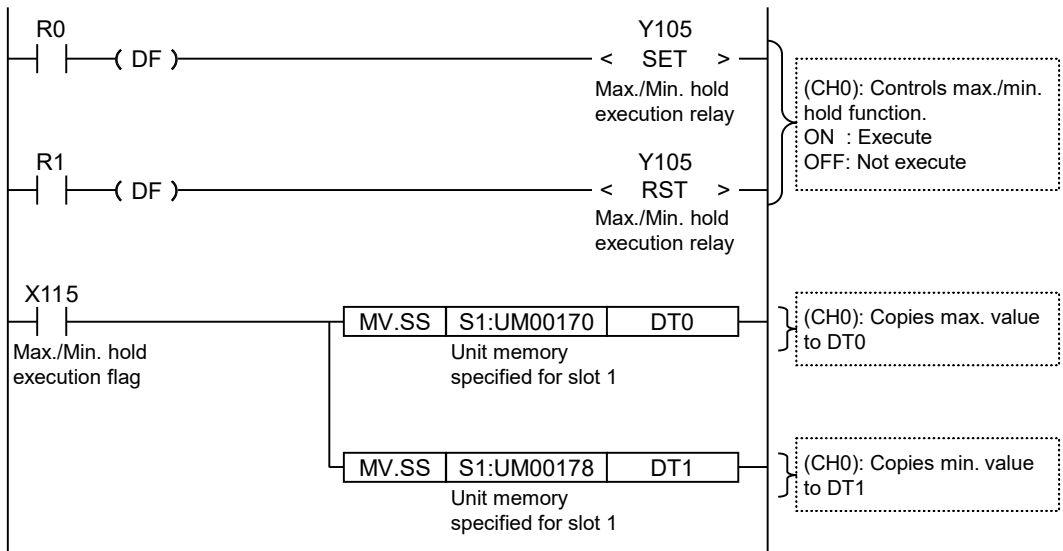
	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7
*1 Hold execution relay	Y105	Y115	Y125	Y135	Y145	Y155	Y165	Y175
*2 Hold execution flag	X115	X135	X155	X175	X195	X215	X235	X255

■ Configuration

Name		Default	Setting range and description
Function setting	Holding max./min. values	Not execute	Select "Execute".
Holding min. value		K0	Holding min. value (-31250 to +31250)
Holding max. value		K0	Holding max. value (-31250 to +31250)

■ Sample program

The analog data on ch0 of the unit is read, and the data holding the maximum and minimum values will be read at the desired data register.



6.6 Disconnection Detection (AFP7TC8)

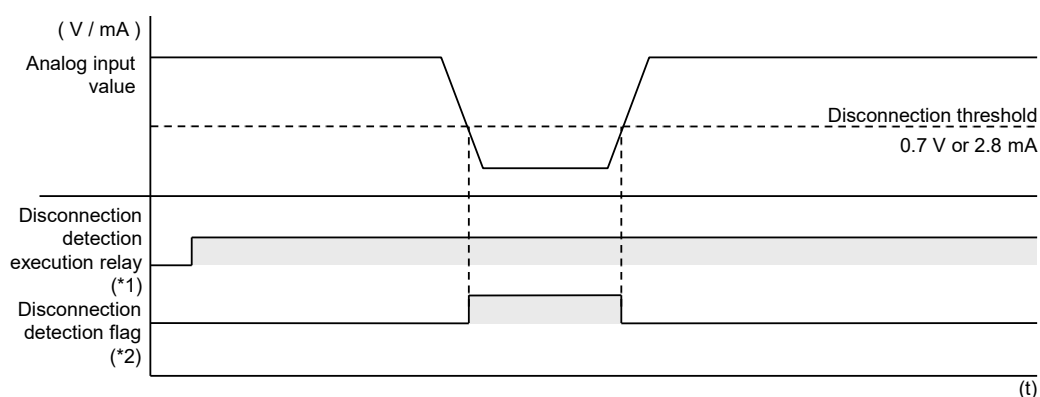
6.6 Disconnection Detection (AFP7TC8)

■ Overview of functions

This function is to announce an error with the disconnection detection flag if the result of input does not reach a certain value while thermocouple input, voltage input range of +1 to +5 V or current input range of +4 to +20 mA is set in the thermocouple multi-analog input unit.

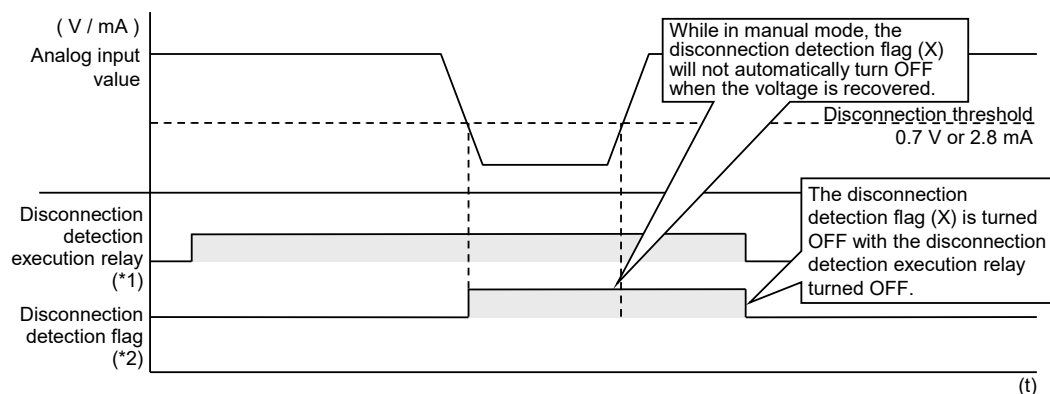
- If disconnection is detected while the disconnection detection execution relay is ON using a user program, the disconnection detection flag will be turned ON.
- There are two ways to reset the disconnection detection. When selecting "Auto", the disconnection detect flag will be automatically turned OFF at the time of reset. If the manual reset setting is made, the disconnection detection flag will be turned OFF by using a user program and turning OFF the disconnection detection execution relay.

■ Action with the detection disconnection reset setting set to auto



(Note 1) The disconnection threshold in the above figure is that when the voltage input range of +1 to +5 V or current input range of +4 to +20 mA is set.

■ Action with the detection disconnection reset setting set to manual



(Note 1) The disconnection threshold in the above figure is that when the voltage input range of +1 to +5 V or current input range of +4 to +20 mA is set.

■ I/O allocation

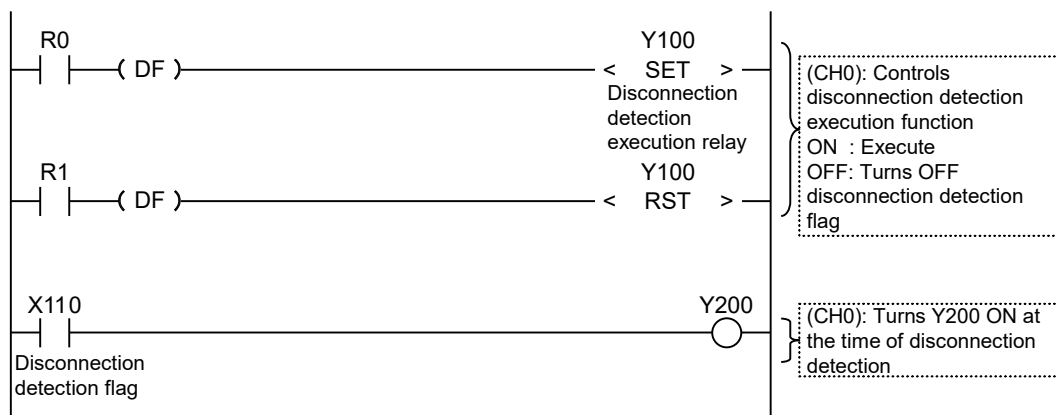
The I/O numbers in the timing chart and program are shown on the condition that the starting word number of the unit is "10". Actual I/O numbers allocated to the analog input unit are determined by the starting word number.

	CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7
*1 Disconnection detection execution relay	Y100	Y110	Y120	Y130	Y140	Y150	Y160	Y170
*2 Disconnection detection flag	X110	X130	X150	X170	X190	X210	X230	X250

■ Configuration

Name		Default	Setting range and description
Function setting	Disconnection detection	Not execute	Select "Execute".
	Disconnection detection reset	Auto	Select "Auto".

■ Sample program



i Info.

- Not executed unless thermocouple, a voltage input range of +1 to +5 V or current input range of +4 to +20 mA is set. This function will not be executed even if the disconnection detection execution relay is turned ON when the disconnection detection has been set to "Not execute" in the configuration.

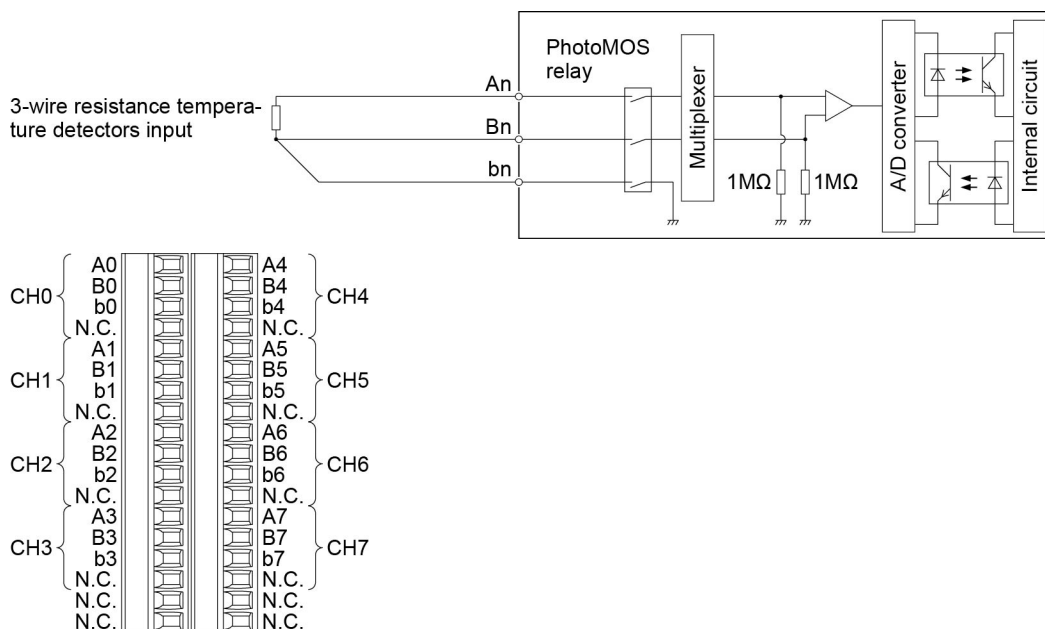
6.7 Disconnection Detection (AFP7RTD8)

6.7 Disconnection Detection (AFP7RTD8)

■ Overview of functions

This function is to warn of the error state by converting to a digital value in the range (K30000) which is different from the values converted in the normal state when the disconnection is detected in the RTD input unit.

- In the figure below, disconnection is detected when any of the A, B and b terminals is disconnected. Also, when all the three terminals are open, the disconnection is detected.



(Note 1) The above specifications are applied from the lot manufactured in November 2016 (production lot nos.161100 or more). The production lot number is written on the label on the side face of the unit, under the version number.

(Note 2) As for the units manufactured in November 2016 or earlier (production lot nos. smaller than 161100), the disconnection is detected only when the line of the A terminal is disconnected. When either line of the B terminal or b terminal is disconnected, it is not detected as disconnection. Also, when all the terminals are open, the instruction value becomes unstable.

i Info.

- On the RTD input unit (AFP7RTD8), the disconnection detection execution relay and the disconnection detection flag cannot be used.

(MEMO)

7 What to Do If an Error Occurs

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7.1 What to Do If an Error Occurs (Analog Input)

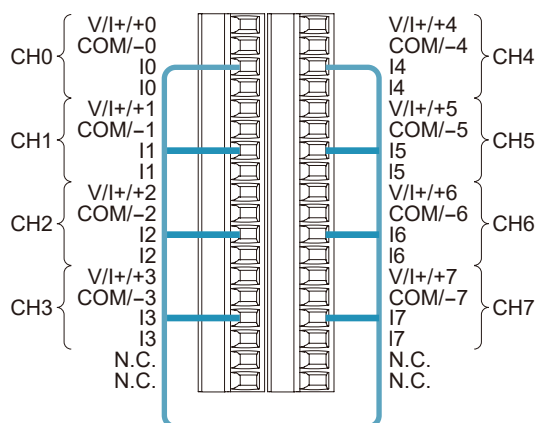
7.1 What to Do If an Error Occurs (Analog Input)

7.1.1 Failure in Reading Input Data

- Check again that I/O allocations are correct.
- Check again the connection of the terminal block.
- Check again the configuration settings.

7.1.2 Unstable Input Conversion Value

- Check that the power frequency setting (unit memory UM 00072) complies with the frequency in the region where the unit is used.
- Check that a twisted pair shielded wire is used and the wire is properly shielded.
- Check that the input wiring is not placed close to AC lines or high-tension lines or bundled with the lines.
- Check that there are not power lines, high-tension lines, high-capacity relays, or noise-generating equipment, such as inverters, close to the unit.
- When there is an influence of noise of other channels, the value may become stable by connecting the lines between the COM terminals of each channel. The I terminals adjacent to the COM terminals is connected to the COM terminals internally.



- Check if the function earth of the CPU unit is grounded properly.

i Info.

- For details of the grounding of the function earth, refer to *Wiring the Power Supply of FP7 CPU Unit User's Manual (Hardware)*.

7.1.3 No Proper Conversion Values Obtained with Current Input

- Check again the connection of the terminal block.
- Check again the connections of the output equipment.

8 Specifications

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8.1 Specifications

8.1 Specifications

8.1.1 General Specifications

Item	Specifications	
Operating ambient temperature	0°C to +55°C	
Storage ambient temperature	-40°C to +70°C	
Operating ambient humidity	10 to 95% RH (at 25°C, no condensation)	
Storage ambient humidity	10 to 95% RH (at 25°C, no condensation)	
Breakdown voltage	Between analog input terminal channels	200 V AC for 1 minute
Insulation resistance	Between I/O terminals and CPU power supply terminal/function earth	100MΩ
Vibration resistance	Conforming to JISB3502 and IEC61131—2. 5 to 8.4 Hz, 3.5-mm single amplitude 8.4 to 150 Hz, Acceleration 9.8 m/s ² 10 sweeps each in X, Y, and Z directions (1 octave/min)	
Shock resistance	Conforming to JISB3502 and IEC61131—2. 147 m/s ² , 3 times in the X, Y, and Z directions	
Noise resistance	1000 V DC [P-P] with pulse width of 50 ns or 1 μs (using a noise simulator) (applied to the power supply of the CPU unit)	
Environment	Free from corrosive gases and excessive dust. EU Directive applicable standard	
Overvoltage category	Category II	
Pollution degree	Pollution degree 2	

8.1.2 Specifications of Thermocouple Multi-Analog Input Unit (AFP7TC8)

■ Performance Specifications

Item		Specifications
Number of channels		8 channels
Input range (Resolution)	Voltage	-10 to 10 V DC (Resolution: 1/62,500) 0 to 5 V DC (Resolution: 1/31,250) 1 to 5 V DC (Resolution: 1/25,000) ^(Note 1) -100 to 100 mV DC (Resolution: 1/62,500)
	Current	0 to 20 mA (Resolution: 1/31,250) 4 to 20 mA (Resolution: 1/25,000) ^(Note 1)

Item		Specifications
	Thermocouple (Resolution: 0.1°C)	K1: -100.0 to 600.0°C / K2: -200.0 to 1370.0°C (Note 6)
		J1: -100.0 to 400.0°C / J2: -200.0 to 1200.0°C(Note 6)
		T: -270.0 to 400.0°C
		N: -270.0 to 1300.0°C
		R: 0.0 to 1760.0°C
		S: 0.0 to 1760.0°C
		B: 0.0 to 1820.0°C
		E: -270.0 to 1000.0°C
		PLII: 0.0 to 1390.0°C
		WRe5-26: 0.0 to 2315.0°C
Conversion speed		Processing time is added to the conversion time for the number of execution channels. High-speed mode: 5 ms/ch + 5 ms (Note 2) Normal mode: 25 ms/ch + 25 ms
Indication accuracy(Note 4)		±0.1% F.S. or less (at 25°C in the normal mode)(Note 3) ±0.3% F.S. or less (at 0 to +55°C)
Reference junction compensation accuracy		±1.0°C (with thermocouple input)
Input impedance	Voltage input	1 MΩ
	Current input	250 Ω
Absolute max. input		-15 to 15 V DC Voltage input
		-2 to 30 mA Current input
Insulation method	Between input terminals and internal circuit	Photocoupler Insulated DC/DC converter
	Between channels	PhotoMOS relay
Execution/Non-execution channel settings		Possible to make settings on a channel-by-channel basis
Input range selection		Possible to make settings on a channel-by-channel basis
Digital processing	Average processing	Number of averaging times, Time average, Moving average
	Scale conversion setting	A desired value within the range of ±30,000 (Voltage/current range only)
	Offset setting	A desired value within the range of ±3000
	Gain setting	±10%
Comparison for Upper and Lower Limits		Possible to make settings on a channel-by-channel basis
Holding max./min. values		Possible to make settings on a channel-by-channel basis
Disconnection detection		Available (Voltage range of 1 to 5 V, current range of 4 to 20 mA and thermocouple range only)
External connection method		Connection terminal block connection

8.1 Specifications

Item	Specifications
Weight (main unit)	145 g
Consumption current	80mA or less

- (Note 1) The full scale (F.S.) in terms of accuracy in a voltage ranging from 1 to 5 V DC and of a current ranging from 4 to 20 mA are 0 to 5 V DC and 0 to 20 mA, respectively.
- (Note 2) The indication accuracy when set to high-speed mode is $\pm 0.3\%$ (at 0 to 55°C).
- (Note 3) The indication accuracy rating of the thermocouple range varies according to the input type of the thermocouple to be used and the measurement temperature.
- (Note 4) If highly accurate temperature data is necessary, use the temperature data about 30 minutes after the unit was powered on.
- (Note 5) If a sudden temperature change occurs in the unit, the accuracy may temporarily not be stable. Install the unit so as to keep it out of direct streams of wind from devices such as a control panel cooling fan.
- (Note 6) For the unit Ver. 1.0, the K2 range is -200 to +1000°C and the J2 range is -200 to +750°C.

Info.

- Also refer to the section "[Indication accuracy rating of thermocouple range](#)" on the next page.

■ Indication accuracy rating of thermocouple range

Thermocouple	Measurement temperature range ^(Note 1)	Normal mode: 25 ms conversion		High-speed mode: 5 ms conversion
		Ambient temperature 25°C	Ambient temperature 0 to 55°C	Ambient temperature 0 to 55°C
K1	-100.0 to 600.0°C	$\pm 0.1\%$	$\pm 0.3\%$	$\pm 0.30\%$
K2	-200.0 to 1370.0°C	$\pm 0.1\%$	$\pm 0.3\%$	$\pm 0.30\%$
J1	-100.0 to 400.0°C	$\pm 0.1\%$	$\pm 0.3\%$	$\pm 0.30\%$
J2	-200.0 to 1200.0°C	$\pm 0.1\%$	$\pm 0.3\%$	$\pm 0.30\%$
T	-270.0 to -200.0°C	(Note 2)	(Note 2)	(Note 2)
	-200.0 to 0.0°C	$\pm 0.15\%$	$\pm 0.3\%$	$\pm 0.30\%$
	0.0 to 400.0°C	$\pm 0.1\%$	$\pm 0.3\%$	$\pm 0.30\%$
N	-270.0 to -200.0°C	(Note 2)	(Note 2)	(Note 2)
	-200.0 to 0.0°C	$\pm 0.15\%$	$\pm 0.3\%$	$\pm 0.30\%$
	0.0 to 1300.0°C	$\pm 0.1\%$	$\pm 0.3\%$	$\pm 0.30\%$
R	0.0 to 300.0°C	$\pm 0.15\%$	$\pm 0.3\%$	$\pm 1.00\%$
	300.0 to 1760.0°C	$\pm 0.1\%$	$\pm 0.3\%$	$\pm 0.30\%$
S	0.0 to 300.0°C	$\pm 0.15\%$	$\pm 0.3\%$	$\pm 1.00\%$
	300.0 to 1760.0°C	$\pm 0.1\%$	$\pm 0.3\%$	$\pm 0.30\%$
B	0.0 to 400.0°C	(Note 2)	(Note 2)	(Note 2)
	400.0 to 800.0°C	$\pm 0.15\%$	$\pm 0.3\%$	$\pm 1.00\%$
	800.0 to 1820.0°C	$\pm 0.1\%$	$\pm 0.3\%$	$\pm 0.30\%$
E	-270.0 to -200.0°C	(Note 2)	(Note 2)	(Note 2)

Thermocouple	Measurement temperature range ^(Note 1)		Normal mode: 25 ms conversion		High-speed mode: 5 ms conversion
			Ambient temperature 25°C	Ambient temperature 0 to 55°C	Ambient temperature 0 to 55°C
	200.0	to 0.0°C	±0.15%	±0.3%	±1.00%
	0.0	to 1000.0°C	±0.1%	±0.3%	±0.30%
PLII	0.0	to 1390.0°C	±0.1%	±0.3%	±0.30%
WRe5-26	0.0	to 2315.0°C	±0.1%	±0.3%	±0.30%

(Note 1) Although it is possible to measure the temperature in the range of $\pm 15^{\circ}\text{C}$ in the above table, the accuracy cannot be assured.

(Note 2) Although it is possible to measure temperatures, the accuracy cannot be assured.

(Note 3) For the unit Ver. 1.0, the K2 range is -200 to $+1000^{\circ}\text{C}$ and the J2 range is -200 to $+750^{\circ}\text{C}$.

8.1.3 Specifications of RTD Unit (AFP7RTD8)

Item		Specifications
Number of channels		8 channels
Input range (Resolution)	RTD (Resolution: 0.1°C)	Pt100-1: -100.0 to 200.0°C
		Pt100-2: -200.0 to 650.0°C
		JPt100-1: -100.0 to 200.0°C
		JPt100-2: -200.0 to 650.0°C
		Pt1000: -100.0 to 100.0°C
Conversion speed		Processing time is added to the conversion time for the number of execution channels. 25 ms/ch + 25 ms
Total accuracy		±0.1% F.S. or less (at 25°C) ±0.3% F.S. or less (at 0 to +55°C)
Allowable signal source resistance		RTD input: 30 Ω (3-wire balance)
Insulation method	Between input terminals and internal circuit	Photocoupler Insulated DC/DC converter
	Between channels	PhotoMOS relay
Execution/Non-execution channel settings		Possible to make settings on a channel-by-channel basis.
Input range selection		Possible to make settings on a channel-by-channel basis.
Digital processing	Average processing	Number of averaging times, Time average, Moving average
	Offset setting	A desired value within the range of ±3000
	Gain setting	±10%
Comparison for Upper and Lower Limits		Possible to make settings on a channel-by-channel basis

8.1 Specifications

Item	Specifications
Holding max./min. values	Possible to make settings on a channel-by-channel basis
Disconnection detection	Available
External connection method	Connection terminal block connection
Weight (main unit)	145 g
Consumption current	65mA or less

(Note 1) If highly accurate temperature data is necessary, use the temperature data about 30 minutes after the unit was powered on.

8.2 I/O Number Allocation

■ Input contact

I/O area number	Name	Default	Description
WX0	CH0 Analog conversion data	K0	Analog conversion data area Digital conversion values corresponding to analog input are stored as 16-bit signed integer data. Stored values vary by ranges. When optional average processing, scale conversion, offset/gain processing has been set, data after the processing is stored. Optional function flag area Refer to the following.
WX1	CH0 Optional function flag	H0	
WX2	CH1 Analog conversion data	K0	
WX3	CH1 Optional function flag	H0	
WX4	CH2 Analog conversion data	K0	
WX5	CH2 Optional function flag	H0	
WX6	CH3 Analog conversion data	K0	
WX7	CH3 Optional function flag	H0	
WX8	CH4 Analog conversion data	K0	
WX9	CH4 Optional function flag	H0	
WX10	CH5 Analog conversion data	K0	
WX11	CH5 Optional function flag	H0	
WX12	CH6 Analog conversion data	K0	
WX13	CH6 Optional function flag	H0	
WX14	CH7 Analog conversion data	K0	
WX15	CH7 Optional function flag	H0	

(Note 1) The I/O numbers in the table indicate offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.

Example) When the starting word number for the unit is "10", the A/D conversion data of CH0 is WX10 and the error flag is X11F.

■ Input contact (Optional functions/Error flag area)

I/O number								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
X10	X30	X50	X70	X90	X110	X130	X150	Disconnection detection flag (Note 2)(Note 3)	ON with disconnection detected and OFF with disconnection restored.
X11	X31	X51	X71	X91	X111	X131	X151	Upper limit comparison relay	Turns ON when the value exceeds the set upper limit.
X12	X32	X52	X72	X92	X112	X132	X152	Lower limit comparison relay	Turns OFF when the value drops below the set lower limit.

8.2 I/O Number Allocation

I/O number								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
X13	X33	X53	X73	X93	X113	X13 3	X15 3	Upper/Lower limit Comparison execution flag	Turns ON when the upper limit/lower limit comparison function is executed.
X14	X34	X54	X74	X99	X114	X13 4	X15 4	Not used	Do not use.
X15	X35	X55	X75	X95	X115	X13 5	X15 5	Max./Min. Hold execution flag	Turns ON when the max./min. hold function is executed.
X16 to X1E	X36 to X3E	X56 to X5E	X76 to X7E	X96 to X9E	X116 to X11 E	X13 6 to X13 E	X15 6 to X15 E	Not used	Do not use.
X1F	X3F	X5F	X7F	X9F	X11 F	X13 F	X15 F	Error flag	Turns ON when an error occurs

(Note 1) The I/O numbers in the table indicate offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.

Example) When the starting word number for the unit is "10", the error flag is X11F, the disconnection detection execution relay of CH0 is Y100, and the error flag reset relay is Y10F.

(Note 2) For the Thermocouple Multi-analog Input Unit, the disconnection detection function is valid in the case of the following range; "Thermocouple, voltage: 1-5 V and current: 4-20 mA".

(Note 3) On the RTD input unit (AFP7RTD8), the disconnection detection execution relay and the disconnection detection flag cannot be used. Disconnection is detected by a digital value (K30000) different from normally converted values within the range.

■ Output flag

I/O number								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
Y0	Y10	Y20	Y30	Y40	Y50	Y60	Y70	Disconnection detection execution relay ^{(Note 2)(Note 3)}	ON to execute the disconnection detection function. OFF to turn OFF the disconnection detection flag (Xn0).
Y1	Y11	Y21	Y31	Y41	Y51	Y61	Y71	Not used	Do not use.
Y2	Y12	Y22	Y32	Y42	Y52	Y62	Y72		
Y3	Y13	Y23	Y33	Y43	Y53	Y63	Y73	Upper/Lower limit Comparison execution relay	ON to execute the function to compare the upper and lower limits. OFF to turn OFF the upper limit comparison relay (Xn1) and lower limit comparison relay (Xn2).
Y4	Y14	Y24	Y34	Y44	Y54	Y64	Y74	Not used	Do not use.
Y5	Y15	Y25	Y35	Y45	Y55	Y65	Y75	Max./Min. Hold execution relay	ON to execute the max./min. hold function.
Y6	Y16	Y26	Y36	Y46	Y56	Y66	Y76	Not used	Do not use.

I/O number								Name	Description
CH0	CH1	CH2	CH3	CH4	CH5	CH6	CH7		
to YE	to Y1E	to Y2E	to Y3E	to Y4E	to Y5E	to Y6E	to Y7E		
YF	Y1F	Y2F	Y3F	Y4F	Y5F	Y6F	Y7F	Error flag reset relay	Resets an error flag.

- (Note 1) The I/O numbers in the table indicate offset addresses. The I/O numbers actually allocated are the numbers based on the starting word number allocated to the unit.
Example) When the starting word number for the unit is "10", the error flag is X11F, the disconnection detection execution relay of CH0 is Y100, and the error flag reset relay is Y10F.
- (Note 2) For the Thermocouple Multi-analog Input Unit, the disconnection detection function is valid in the case of the following range; "Thermocouple, voltage: 1-5 V and current: 4-20 mA".
- (Note 3) On the RTD input unit (AFP7RTD8), the disconnection detection execution relay and the disconnection detection flag cannot be used. Disconnection is detected by a digital value (K30000) different from normally converted values within the range.

8.3 List of Unit Memories

8.3 List of Unit Memories

These are operation memories for accessing the "monitor area" and "configuration area" of the unit. When the mode of the CPU unit changes from PROG. to RUN, the configuration information set by the tool software will be stored. For performing the configuration with user programs, refer to ["6.8 Configuration by Programming"](#).

■ Allocation of unit memories (CH0 to CH3)

Setting monitor item		Unit memory number (Hex.)			
		CH0	CH1	CH2	CH3
Configuration refresh		UM 00028			
Power frequency setting		UM 00071			
Conversion time setting		UM 00072			
Conversion processing		UM 00080	UM 00090	UM 000A0	UM 000B0
Range setting		UM 00081	UM 00091	UM 000A1	UM 000B1
Function setting 1	Average processing	UM 00082	UM 00092	UM 000A2	UM 000B2
	Offset/Gain Processing				
	Scale conversion				
Function setting 2	Comparison for Upper and Lower Limits	UM 00083	UM 00093	UM 000A3	UM 000B3
	Holding max./min. values				
	Disconnection detection				
	Disconnection detection reset				
Averaging constant		UM 00084	UM 00094	UM 000A4	UM 000B4
Offset value		UM 00085	UM 00095	UM 000A5	UM 000B5
Gain value		UM 00086	UM 00096	UM 000A6	UM 000B6
Scale conversion	Maximum value	UM 00087	UM 00097	UM 000A7	UM 000B7
	Minimum value	UM 00088	UM 00098	UM 000A8	UM 000B8
Comparison for Upper and Lower Limits	Upper limit comparison ON level	UM 00089	UM 00099	UM 000A9	UM 000B9
	Upper limit comparison OFF level	UM 0008A	UM 0009A	UM 000AA	UM 000BA
	Lower limit comparison OFF level	UM 0008B	UM 0009B	UM 000AB	UM 000BB
	Lower limit comparison ON level	UM 0008C	UM 0009C	UM 000AC	UM 000BC
Max./Min. value hold monitor area	Holding max. value	UM 00170	UM 00171	UM 00172	UM 00173
	Holding min. value	UM 00178	UM 00179	UM 0017A	UM 0017B

■ Allocation of unit memories (CH4 to CH7)

Setting monitor item		Unit memory number (Hex.)			
		CH4	CH5	CH6	CH7
Configuration settings refresh		UM 00028			

Setting monitor item		Unit memory number (Hex.)			
		CH4	CH5	CH6	CH7
Power frequency setting		UM 00071			
Conversion time setting		UM 00072			
Conversion processing		UM 000C0	UM 000D0	UM 000E0	UM 000F0
Range setting		UM 000C1	UM 000D1	UM 000E1	UM 000F1
Function setting 1	Average processing	UM 000C2	UM 000D2	UM 000E2	UM 000F2
	Offset/Gain Processing				
	Scale conversion				
Function setting 2	Comparison for Upper and Lower Limits	UM 000C3	UM 000D3	UM 000E3	UM 000F3
	Holding max./min. values				
	Disconnection detection				
	Disconnection detection reset				
Averaging constant		UM 000C4	UM 000D4	UM 000E4	UM 000F4
Offset value		UM 000C5	UM 000D5	UM 000E5	UM 000F5
Gain value		UM 000C6	UM 000D6	UM 000E6	UM 000F6
Scale conversion	Maximum value	UM 000C7	UM 000D7	UM 000E7	UM 000F7
	Minimum value	UM 000C8	UM 000D8	UM 000E8	UM 000F8
Comparison for Upper and Lower Limits	Upper limit comparison ON level	UM 000C9	UM 000D9	UM 000E9	UM 000F9
	Upper limit comparison OFF level	UM 000CA	UM 000DA	UM 000EA	UM 000FA
	Lower limit comparison OFF level	UM 000CB	UM 000DB	UM 000EB	UM 000FB
	Lower limit comparison ON level	UM 000CC	UM 000DC	UM 000EC	UM 000FC
Max./Min. value hold monitor area	Holding max. value	UM 00174	UM 00175	UM 00176	UM 00177
	Holding min. value	UM 0017C	UM 0017D	UM 0017E	UM 0017F

Note

- Unit memories (UM) include the areas used in the system. Do not write data with user programs in areas other than the configuration area.

Unit memory number (Hex.)	Application
UM00000 to UM0006F	Area reserved for system (UM00028 can be set)
UM00070 to UM000FF	Configuration area
UM00100 to UM0016F	Area reserved for system
UM00170 to UM001FF	Monitor area
UM00200 to UM0FFFF	Area reserved for system

8.4 List of Detailed Specifications of Unit Memories

8.4 List of Detailed Specifications of Unit Memories

■ Common to all channels

Unit memory No. (Hex)	Name	Default	Setting range and description
UM 00028	Unit memory refresh	H0	This is used to rewrite configuration information using a user program. If the constant "55AA" is written to the unit memory UM 00028 after transferring a desired parameter to a unit memory, the settings will be updated. The value of unit memory UM 00028 will be set to "0" when the configuration information is refreshed.
UM 00071	Power frequency	H0	Select a power frequency. H0: 60 Hz H1: 50 Hz
UM 00072	Conversion time	H0	For the thermocouple multi-analog input unit, select a conversion time per channel. H0: 25 ms H1: 5 ms

■ Individual setting area per channel

Unit memory No. (Hex)	Name	Default	Setting range and description	
UM 00080 UM 00090 UM 000A0 UM 000B0 UM 000C0 UM 000D0 UM 000E0 UM 000F0	Conversion processing Execution/Non-execution	H 1	Select whether to execute the conversion processing or not. H0: Not execute H1: Execute	
UM 00081 UM 00091 UM 000A1 UM 000B1 UM 000C1 UM 000D1 UM 000E1 UM 000F1	Range setting For thermocouple multi-analog input unit	H 1	Select the input range.	
			0001h	Voltage input -10 V to +10 V
			0002h	Voltage input 0 V to +5 V
			0003h	Voltage input 1 V to +5 V
			0004h	Voltage input -100 mV to +100 mV
			0005h	Current input 0 mA to +20 mA
			0006h	Current input +4 mA to +20 mA
			0010h	Thermocouple input K1 (-100.0 to 600.0°C)
			0011h	Thermocouple input K2 (-200.0 to 1370.0°C)
			0012h	Thermocouple input J1 (-100.0 to 400.0°C)
			0013h	Thermocouple input J2 (-200.0 to 1200.0°C)
			0014h	Thermocouple input T (-270.0 to 400.0°C)
			0015h	Thermocouple input N (-270.0 to 1300.0°C)

8.4 List of Detailed Specifications of Unit Memories

Unit memory No. (Hex)	Name	Default	Setting range and description		
			0016h	Thermocouple input R (0.0 to 1760.0°C)	
			0017h	Thermocouple input S (0.0 to 1760.0°C)	
			0018h	Thermocouple input B (0.0 to 1820.0°C)	
			0019h	Thermocouple input E (-270.0 to 1000.0°C)	
			001Ah	Thermocouple input PLII (0.0 to 1390.0°C)	
			001Bh	Thermocouple input WRe5-26 (0.0 to 2315.0°C)	
UM 00081 UM 00091 UM 000A1 UM 000B1 UM 000C1 UM 000D1 UM 000E1 UM 000F1	Range setting For RTD input unit	H 1	Select the input range.		
			0001h	RTD input Pt100-1 (-100.0 to 200.0°C)	
			0002h	RTD input Pt100-2 (-200.0 to 650.0°C)	
			0003h	RTD input JPt100-1 (-100.0 to 200.0°C)	
			0004h	RTD input JPt100-2 (-200.0 to 650.0°C)	
			0005h	RTD input Pt1000 (-100.0 to 100.0°C)	
UM 00082 UM 00092 UM 000A2 UM 000B2 UM 000C2 UM 000D2 UM 000E2 UM 000F2	Function setting 1 Average processing Offset/Gain Processing Scale conversion	H0	Select the desired function to be used.		
			bit	Name	Settings
			3-0	Average processing	H0: Not execute H1: No. of averaging times H2: Time average H3: Moving average
			7-4	Offset/Gain Processing	H0: Not execute H1: Execute
			11-8	Scale conversion	H0: Not execute H1: Execute
			15-12	Not used	
UM 00083 UM 00093 UM 000A3 UM 000B3 UM 000C3 UM 000D3 UM 000E3 UM 000F3	Function setting 2 Comparison for Upper and Lower Limits Holding max./min. values Disconnection detection Disconnection detection reset	H0	Select the desired function to be used.		
			bit	Name	Settings
			3-0	Comparison for Upper and Lower Limits	H0: Not execute H1: Execute
			7-4	Max./Min. values hold	H0: Not execute H1: Execute
			11-8	Disconnection detection	H0: Not execute H1: Execute
			15-12	Disconnection detection reset	H0: Auto (Auto reset for reconnection) H1: Manual
UM 00084 UM 00094 UM 000A4 UM 000B4	Averaging constant	U200	Set constants for average processing.		

8.4 List of Detailed Specifications of Unit Memories

Unit memory No. (Hex)	Name	Default	Setting range and description	
			Function used	Settings
UM 000C4 UM 000D4 UM 000E4 UM 000F4			Number of Averaging Times	No. of averaging times: 2 to 60000 [times]
			Time Average	Average time: 200 to 60000 [ms]
			Moving Average	No. of moving average: 2 to 2000 [times]
UM 00085 UM 00095 UM 000A5 UM 000B5 UM 000C5 UM 000D5 UM 000E5 UM 000F5	Offset value	K0	Set an offset value at the time of using the offset processing function. Setting range: -3000 to +3000 (specified with a signed integer)	
UM 00086 UM 00096 UM 000A6 UM 000B6 UM 000C6 UM 000D6 UM 000E6 UM 000F6	Gain value	U10000	Set an offset value at the time of using the offset processing function. Setting range: +9000 to +11000 (0.9x to 1.1x: Specified with a signed integer)	
UM 00087 UM 00097 UM 000A7 UM 000B7 UM 000C7 UM 000D7 UM 000E7 UM 000F7	Scale conversion Maximum value	K10000	Set the maximum value at the time of using the scale conversion function. Setting range: -3000 to +30000 (specified with a signed integer)	
UM 00088 UM 00098 UM 000A8 UM 000B8 UM 000C8 UM 000D8 UM 000E8 UM 000F8	Scale conversion Minimum value	K0	Set the minimum value at the time of using the scale conversion function. Setting range: -3000 to +30000 (specified with a signed integer)	
UM 00089 UM 00099 UM 000A9 UM 000B9 UM 000C9 UM 000D9	Upper limit comparison ON level	K1000	Set the upper limit to turn ON the output flag at the time of using the upper/lower limit comparison function. Setting range: -31250 to +31250 (specified with a signed integer)	

8.4 List of Detailed Specifications of Unit Memories

Unit memory No. (Hex)	Name	Default	Setting range and description
UM 000E9 UM 000F9			
UM 0008A UM 0009A UM 000AA UM 000BA UM 000CA UM 000DA UM 000EA UM 000FA	Upper limit comparison OFF level	K1000	Set the upper limit to turn OFF the output flag at the time of using the upper/lower limit comparison function. Setting range: -31250 to +31250 (specified with a signed integer)
UM 0008B UM 0009B UM 000AB UM 000BB UM 000CB UM 000DB UM 000EB UM 000FB	Lower limit comparison OFF level	K0	Set the lower limit to turn OFF the output flag at the time of using the upper/lower limit comparison function. Setting range: -31250 to +31250 (specified with a signed integer)
UM 0008C UM 0009C UM 000AC UM 000BC UM 000CC UM 000DC UM 000EC UM 000FC	Lower limit comparison ON level	K0	Set the lower limit to turn ON the output flag at the time of using the upper/lower limit comparison function. Setting range: -31250 to +31250 (specified with a signed integer)

(Note 1) The unit memory numbers in the above table are listed for CH0 to CH7 in numerical order.

(Note 2) For the unit Ver. 1.0, the K2 range is -200 to +1000°C and the J2 range is -200 to +750°C.

■ Individual monitor area per channel

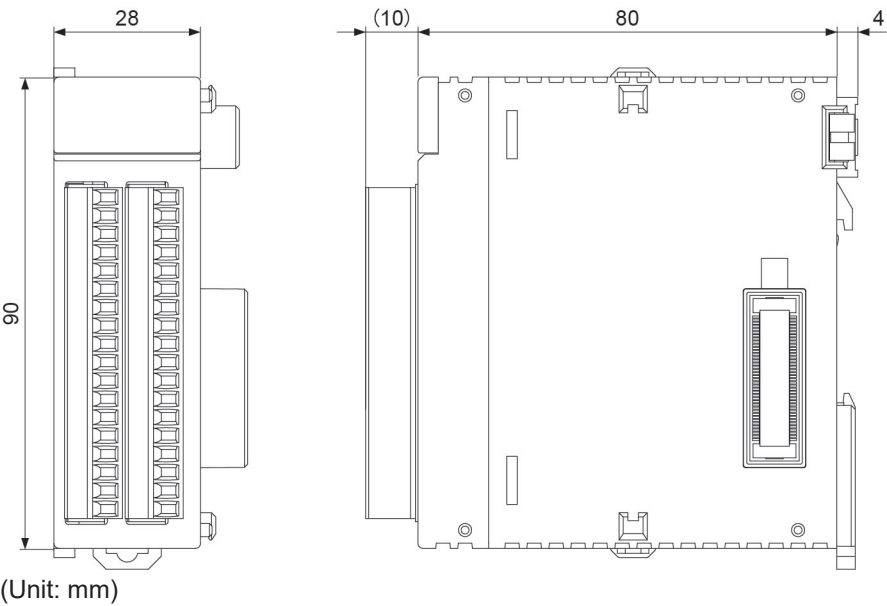
Unit memory No. (Hex)	Name	Default	Data range and description
UM 00170 UM 00171 UM 00172 UM 00173 UM 00174 UM 00175 UM 00176 UM 00177	Holding max. value	K0	The acquired maximum value will be held when the maximum and minimum value hold function is used. Setting range: -31250 to +31250 (specified with a signed integer)
UM 00178 UM 00179 UM 0017A UM 0017B	Holding min. value	K0	The acquired maximum value will be held when the maximum and minimum value hold function is used. Setting range: -31250 to +31250 (specified with a signed integer)

8.4 List of Detailed Specifications of Unit Memories

Unit memory No. (Hex)	Name	Default	Data range and description
UM 0017C UM 0017D UM 0017E UM 0017F			

(Note 1) The unit memory numbers in the above table are listed for CH0 to CH7 in numerical order.

8.5 Dimensions



(MEMO)

Record of changes

The manual number can be found at the bottom of the manual cover.

Date	Manual No.	Record of Changes
Apr. 2014	WUME-FP7TCRTD-01	1st Edition
Apr. 2016	WUME-FP7TCRTD-02	2nd Edition - Thermocouple input temperature range changed (available from unit Ver. 1.1) K2: -200 to +1000°C → -200 to +1370°C J2: -200 to +750°C → -200 to +1200°C - Error correction Added wiring notes (Sections 3-4, Chapter 7) Correction of error regarding AFP7RTD8 disconnection detection (Sections 6-7) Corrected other errors.
Nov. 2016	WUME-FP7TCRTD-03	3rd Edition AFP7RTD8 - Changed the specifications related to the disconnection detection . (Sections 1-1, 6-7) - Changed the specifications related to the I/O conversion characteristics. (Section 5-2)
Dec. 2022	WUME-FP7TCRTD-04	4th Edition - Changed the manual format. - Specification change
Apr. 2024	WUME-FP7TCRTD-05	5th Edition Change in Corporate name

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- (5) When, after our Products were incorporated into your products or equipment for use, damage resulted which could have been avoided if your products or equipment had been equipped with the functions, construction, etc. the provision of which is accepted practice in the industry.
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