

LG Programmable Logic Controller

MASTER-K K7F – RD3A
 K4F – RD2A

LG Industrial Systems

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PRECAUTIONS

Be sure to read carefully the safety precautions given in data sheet and user's manual before operating the module and follow them.

The precautions explained here only apply to the K7F-RD3A and K4F-RD2A.

For safety precautions on the PLC system, see the MK200S/300S/1000S CPU User's Manuals.


A precaution is given with a hazard alert triangular symbol to call your attention, and precautions are represented as follows according to the degree of hazard.



If not provided with proper prevention, it can cause death or fatal injury or considerable loss of property.



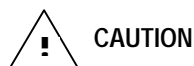
If not properly observed, it can cause a hazard situation to result in severe or slight injury or a loss of property.

However, a precaution followed with  **CAUTION** can also result in serious conditions.

Both of two symbols indicate that an important content is mentioned, therefore, be sure to observe it.

Keep this manual handy for your quick reference in necessary.

Design Precautions



- ▶ Do not run I/O signal lines and compensation wires near to high voltage line or power line. Separate them as 100 mm or more as possible. Otherwise, noise can cause module malfunction.

Installation Precautions



- ▶ Operate the PLC in the environment conditions given in the general specifications.
- ▶ If operated in other environment not specified in the general specifications, it can cause an electric shock, a fire, malfunction or damage or degradation of the module
- ▶ Make sure the module fixing projections is inserted into the module fixing hole and fixed.
- ▶ Improper installation of the module can cause malfunction, disorder or falling.

Wiring Precautions



CAUTION

- ▶ When grounding a FG terminal, be sure to provide class 3 grounding which is dedicated to the PLC. If not grounded, It can cause malfunction.
- ▶ Before the PLC wiring, be sure to check the rated voltage and terminal arrangement for the module and observe them correctly.
If a different power, not of the rated voltage, is applied or wrong wiring is provided, it can cause a fire or disorder of the module.
- ▶ Drive the terminal screws firmly to the defined torque.
If loosely driven, it can cause short circuit, a fire or malfunction.
- ▶ Be careful that any foreign matter like wire scraps should not enter into the module.
It can cause a fire, disorder or malfunction.

Test Run and Maintenance Precautions



WARNING

- ▶ Do not contact the terminals while the power is applied.
It can cause malfunction.
- ▶ When cleaning or driving a terminal screw, perform them after the power has been turned off
- ▶ Do not perform works while the power is applied, which can cause disorder or malfunction.



CAUTION

- ▶ Do not separate the module from the printed circuit board(PCB), or do not remodel the module.
They can cause disorder, malfunction, damage of the module or a fire.
When mounting or dismounting the module, perform them after the power has been turned off.
- ▶ Do not perform works while the power is applied, which can cause disorder or malfunction.

Waste Disposal Precautions



CAUTION

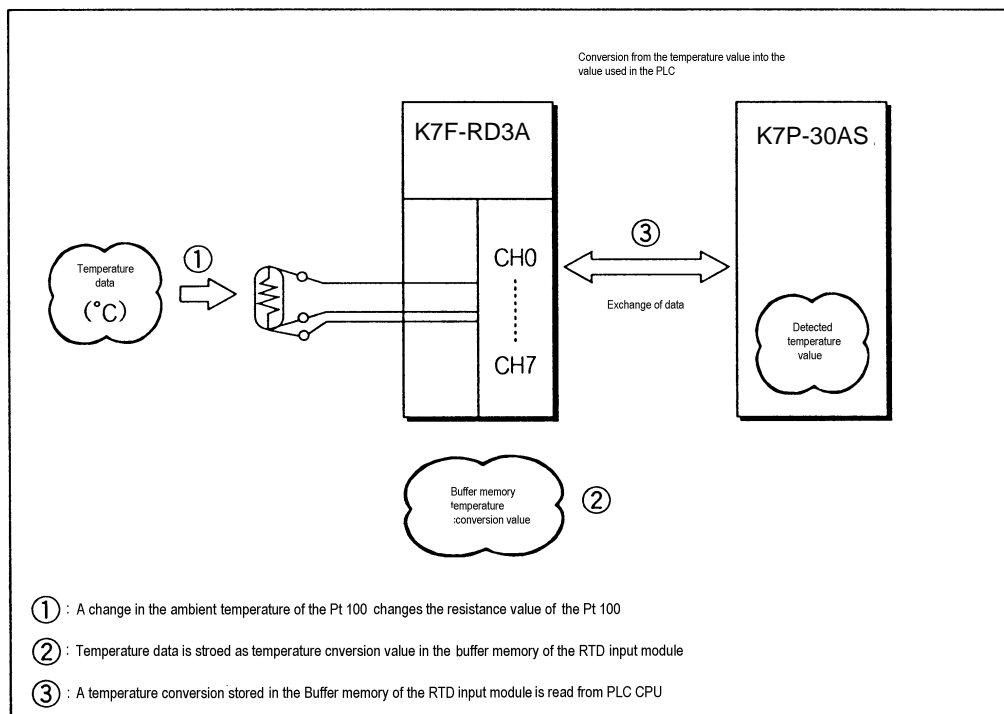
- ▶ When disposing the module, do it as an industrial waste.

Chapter 1. INTRODUCTION

These two units are called K7F-RD3A and K4F-RD2A. The K7F-RD3A is an Pt input module used with the CPU of MASTER-K PLC MK1000S, and the K4F-RD2A is used with the CPU of MK300S series. Hereafter, the two units are called the RTD input module

The RTD input module is a module that converts the temperature data(°C) input by the Pt (Pt100 or JPt100) into a signed 16 bit digital binary data and outputs it.

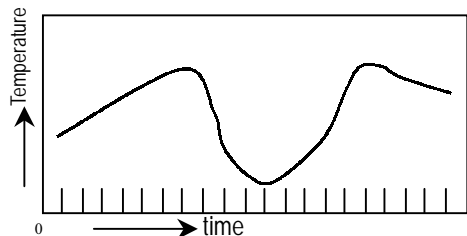
1.1 Features



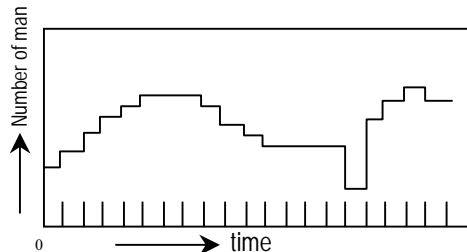
- 1) With direct connection of the RTD input module, the temperature data(°C) can be converted into a digital value to be processed in the PLC.
- 2) The temperature data(°C) input can be processed to one digit after the point as a digital value.
- 3) One module can be connected to K7F-RD3A 8-point or K4F-RD2A 4-point Pt100 or JPt100.
- 4) The RTD input module has Pt100, Jpt100 or cable burn-out function at their every channel.
- 5) The RTD input module detects the out-of-range temperature that is input by Pt100 or JPt100.

1.2 Glossary

1.2.1 A - Analog Value



[Fig 1.1] Analog Value

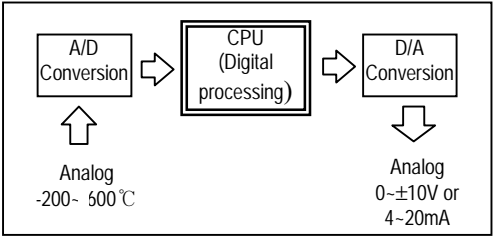


[Fig 1.2] Digital Value

The continuous changeable value such as voltage, current, temperature, velocity, pressure and flow is called analog value. For example, temperature changes continuously with time as shown in Fig. 1.1. The PLC can process that continuous changeable temperature by use of the RTD input module.

1.2.2 D - Digital Value

In Fig.1.2, the number of man can be counted as 0, 1, 2, 3. The non-continuous changeable value as such is called a digital value. On and Off signals can be denoted as a digital value 0 and 1, respectively.



[Fig 1.3] Processing in the PLC

Analog value cannot be directly input to the CPU module for digital processing. Therefore, analog value should be converted into a digital value to be input to the CPU module. In addition, for external output of analog value, digital value of the CPU module should be converted into analog value.

1.2.3 Pt

This is a sensor that detects temperature as the type of resistance.

The Pt 100 outputs the resistance value of 100.00 Ω for the temperature of 0 °C

1.2.4 Burn-out Detection Function

If a part of the connected RTD or cable is disconnected, the out-of-range voltage is input by the internal burn-out detection circuit and the connection or disconnection is detected.

Chapter 2. SPECIFICATIONS

2.1 General Specifications

Table 2.1 shows general specifications of the MASTER-K series.

No	Item	Specifications					Reference specification
1	Operating ambient temperature	0 ~ 55 °C					
2	Storage ambient temperature	-25 ~ +70 °C					
3	Operating humidity	5 ~ 95%RH, non-condensing.					
4	Storage humidity	5 ~ 95%RH, non-condensing.					
5	Vibration	Occasional vibration					IEC 1131-2
		Frequency	Acceleration	Amplitude	Sweep Count	10 times in each direction for X,Y,Z	
		10≤f<57 Hz	-	0.075 mm			
		57≤f≤150 Hz	9.8 m/s ² {1 G}	-			
		Continuous vibration					
		Frequency	Acceleration	Amplitude			
		10≤f <57 Hz	-	0.035 mm			
		57≤f≤150 Hz	4.9 m/s ² {0.5G}	-			
6	Shocks	<ul style="list-style-type: none">Maximum shock acceleration: 147 m/s²{15G}Duration time : 11msPulse wave: half sine pulse (3 times in each of X, Y and Z directions)					IEC 1131-2
7	Noise Immunity	Square wave impulse noise	± 1,500 V				
		Electrostatic discharge	Voltage : 4 kV (contact discharge)				IEC 1131-2, IEC 801-2
		Radiated electromagnetic field	27 ~ 500 MHz, 10 V/m				IEC 1131-2, IEC 801-3
		Fast transient/burst noise	Severity Level	All Power modules	Digital I/Os (Ue > 24 V)	Digital I/Os (Ue < 24 V) Analog I/Os interface communication I/Os	IEC 1131-2, IEC 801-4
			Voltage	2 kV	1 kV	0.25 kV	
8	Operating Atmosphere	Free from corrosive gases and excessive dust.					
9	Operation Altitude	Up to 2,000m					
10	Pollution degree	2					
11	Cooling method	Self-cooling					

[Table 2.1] General Specifications

REMARK

- 1) IEC(International Electromechanical Commission) : The international civilian organization which produces standards for electrical and electronic industry.
- 2) Pollution degree : It indicates a standard of operating ambient pollution level The pollution degree 2 means the condition in which normally, only con-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

2.2 Performance Specifications

Table 2.2 shows performance specifications of the RTD input module.

Item	Specifications	
	K7F-RD3A	K4F-RD2A
Connectable RTD	Pt 100 (JIS C1640-1989, DIN 43760-1980) JPt100 (KS C1603-1991, JIS C1604-1981)	
Temperature input range	Pt100 : -200.0°C to 600°C (18.48 to 313.59Ω) JPt100 : -200.0°C to 600°C (17.14 to 317.28Ω)	
Digital output	Digital conversion value : 0 to 16,000 Detected temperature value : -2000 to 6000 (one digit after point $\times 10$)	
Buffer memory	Each of three wires at every channel has detection function.	
Accuracy	± 0.5 %(full scale)	
Maximum conversion speed	50ms per channel	
Number of temperature input device points	8 channels per module	4 channels per module
Insulation method	Photo-coupler insulation between the input terminal and the PLC power supply (non-insulation between channels)	
Connection terminal block	38-point terminal block	20-point terminal block
Internal current consumption	0.5 A	0.45A
Weight	630 g	350 g

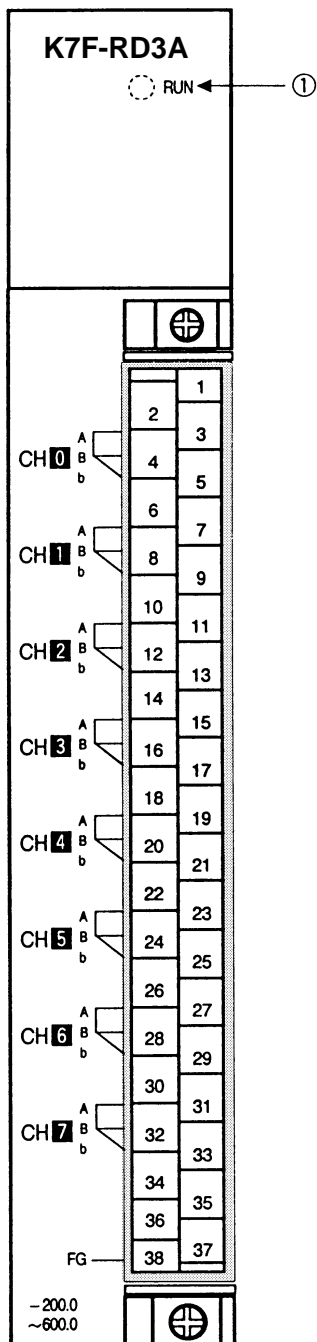
[Table. 2.2 Performance Specifications]

2.3 Names of Parts and Functions

The following gives names of parts.

2.3.1 K7F-RD3A

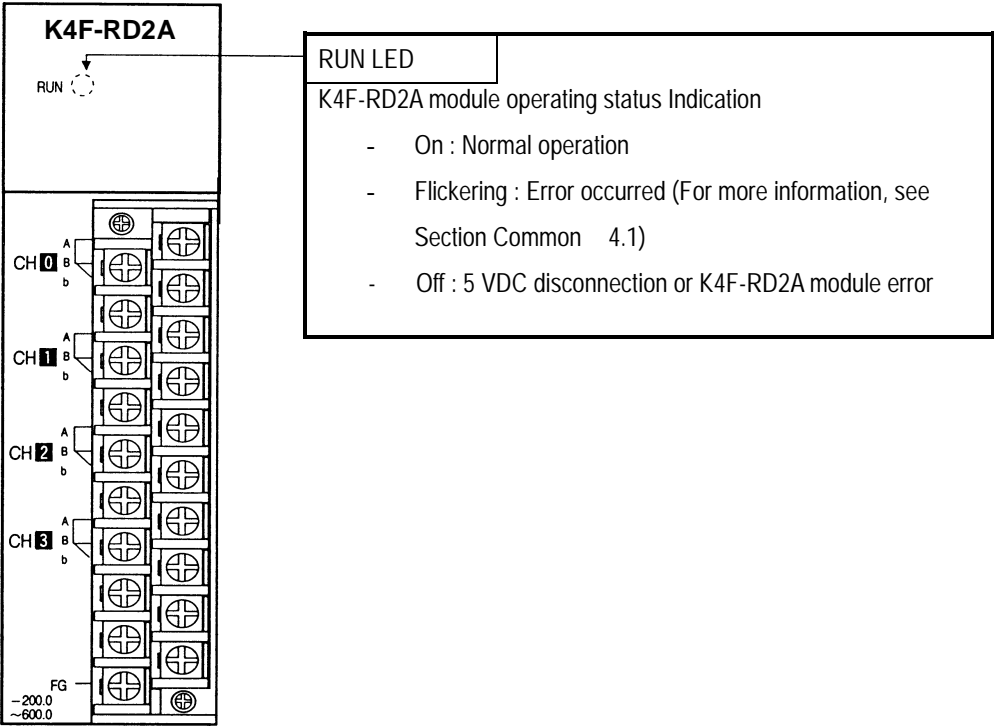
The following gives the names and functions of each part of the K7F-RD3A.



No.	Descriptions
①	<div>RUN LED</div> <div>It displays the operating status of K7F-RD3A module</div> <ul style="list-style-type: none">● On : Normal Operation● Flickering : Error occurred (For more information, see Chapter 4.1)● Off : DC 5V disconnection or the K7F-RD3A module error

2.3.2 K4F-RD2A

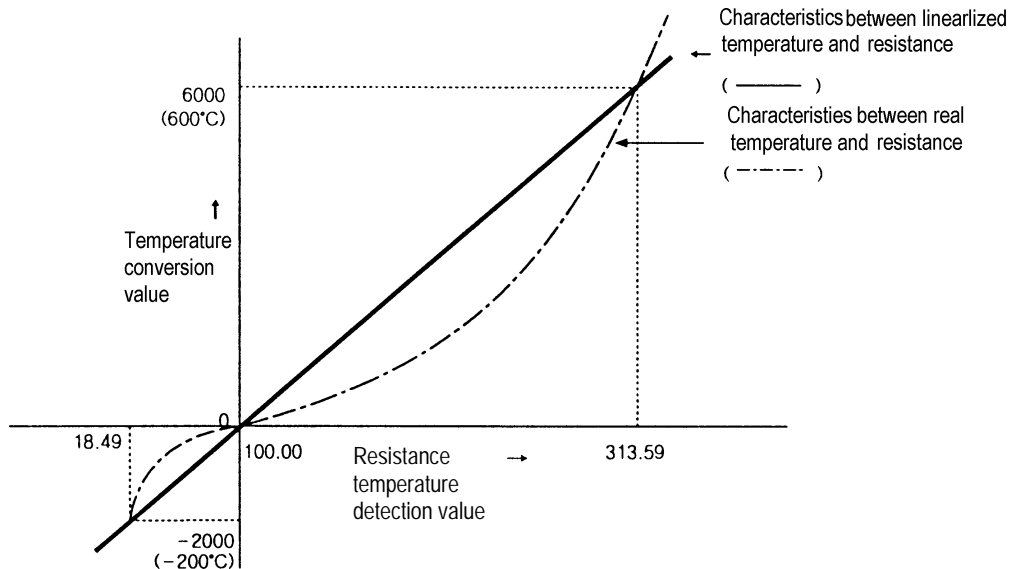
The following gives the names and functions of each part of the K4F-RD2A.



2.4 RTD Input Module Characteristics

2.4.1 Temperature Conversion Characteristics

The RTD input module, as shown in the Fig. 2.1, linearizes the non-linear characteristic resistance input of the RTD.



[Fig. 2.1] Temperature conversion characteristics(Pt100)

2.4.2 Conversion speed

The conversion speed of the RTD input module is 50 ms per channel and its processing is processed sequentially, that is, one channel is processed and then another channel is processed.

Processing time = 50 ms \times the number of the used channels

Example) When three channels are used
Processing time = 50 ms \times 3 = 150 ms

2.4.3 Accuracy

The accuracy of RTD input module is within ± 0.5 % of all of the measurable temperature range.

Example) When the RTD Pt100 is used, the conversion values of -100°C and 400°C are as below.

- Measurable temperature full range : 800°C (-200.0°C to 600.0°C)
- Accuracy : $800 \times (\pm 0.5\%) = 800 \times (\pm 0.005) = \pm 4^{\circ}\text{C}$
- Temperature conversion range : -104°C to -96°C when -100°C
 396°C to 404°C when 400°C

2.4.4 Burn-out Detection Function

The RTD input module has the function of burn-out detection on the Pt100, JPt100 or cable.

- 1) As shown in the Fig. 2.2, if disconnection occurs in the RTD or cable then a voltage outside the measurable range voltage is inputted by the internal burn-out detection circuit and burn-out detection error code is generated.
- 2) The RTD input module can detect disconnection for each channel. But, burn-out detection is possible only in the channels enabled.
- 3) If disconnection is detected in two or more wires, first, disconnection error code is generated by 'b' and then disconnection error code is generated by 'A' or 'b' sequentially. If disconnection is detected simultaneously in 'A' and 'B', only disconnection error code is generated by 'b'.

Connection Method	Connection Example	Burn-out Detection Function	Remark
2-wire type		- When specified as the enabled channel : The burn-out detection function is enabled.	- In 4-wire type, only all wires marked '2' connected to the terminal block A are all detected as disconnection then the A disconnection error can be detected.
3-wire type			
4-wire type		- When not specified as the enabled channel : The burn-out detection function is disabled	
No wiring			*1 : Pt *2: Shield wire

[Fig. 2.2] Burn-out Detection Area

2.5 Connection between a Pt and RTD input module

- Number of method of connection between Pt and RTD input module are three, that is, 2-wired type, 3-wired type and 4-wired type.
- The resistance of the wires used to connect Pt to RTD input module should be $10\ \Omega$ or less per wire. The same wire (in thickness, length, and kind, etc.) should be used for each channel.

REMARK

- * The difference between the resistance values of the wires used should be $1\ \Omega$ or less, or the accuracy shown in the Table 2.2 could not be satisfied.

Connection Method	Connection Example	Wire Conditions
2-wired type		<p>① wire resistance $\leq 10\ \Omega$ ② wire resistance $\leq 10\ \Omega$ ③ wire resistance $\leq 10\ \Omega$</p>
3-wired type		<p>The difference between the resistance values of the wires ① and ② : $1\ \Omega$ or less The difference between the resistance values of the wires ② and ③ : $1\ \Omega$ or less The difference between the resistance values of the wires ③ and ① : $1\ \Omega$ or less</p>
4-wired type		

[Fig. 2.3] Method of Connection between Pt and RTD Input Module

*1: RTD (Pt100 or JPt1000)

*2: Shielded wire

- The shields of the RTD and shields of wire should be connected to the FG of the RTD input module.

Chapter 3. BUFFER MEMORY CONFIGURATION AND FUNCTIONS

The RTD input module a PLC CPU and buffer memories for data communications.

3.1 Buffer Memory Configuration

The followings describe buffer memory configuration.

3.1.1 K7F-RD3A Buffer Memory

Address (Decimal)	Function	Descriptions	Default Setting	Read / Write	
0	Channel enable/disable specification	Bit On(1):enable, Bit Off(0):disable	disable	R/W	
1	Channel 0 Specifying RTD type	0 : Pt 100 1: JPt 100	"0" (Pt 100)	"	
2	Channel 1 Specifying RTD type			"	
3	Channel 2 Specifying RTD type			"	
4	Channel 3 Specifying RTD type			"	
5	Channel 4 Specifying RTD type			"	
6	Channel 5 Specifying RTD type			"	
7	Channel 6 Specifying RTD type			"	
8	Channel 7 Specifying RTD type			"	
9	Detected temp. value of channel 0	Detected temperature value : A value of 10 times of the real temperature is read.	-	Read only	
10	Digital conversion value of channel 0			"	
11	Error code of channel 0	"			
12	Detected temp. value of channel 1	"			
13	Digital conversion value of channel 1	"			
14	Error code of channel 1	"			
15	Detected temp. value of channel 2	"			
16	Digital conversion value of channel 2	"			
17	Error code of channel 2	"			
18	Detected temp. value of channel 3	"			
19	Digital conversion value of channel 3	"			
20	Error code of channel 3	"			
21	Detected temp. value of channel 4	"			
22	Digital conversion value of channel 4	"			
23	Error code of channel 4	"			
24	Detected temp. value of channel 5	"			
25	Digital conversion value of channel 5	"			
26	Error code of channel 5	"			
27	Detected temp. value of channel 6	"			
28	Digital conversion value of channel 6	"			
29	Error code of channel 6	"			
30	Detected temp. value of channel 7	"			
31	Digital conversion value of channel 7	"			
32	Error code of channel 7	"			
33	SET data enable/disable specification	Bit On(1) : The contents at address 0-8 are changed with new values. Bit Off(0): The contents at address 0-8 remains with the previous value.		No setting values	R/W
34	Channel run information	Bit On(1):Run, Bit Off(0): Stop		-	Read only
35	Error information specifying RTD type	Bit On(1):Outside the setting range Bit Off(0): Normal		-	"

3.1.2 K4F-RD2A Buffer Memory

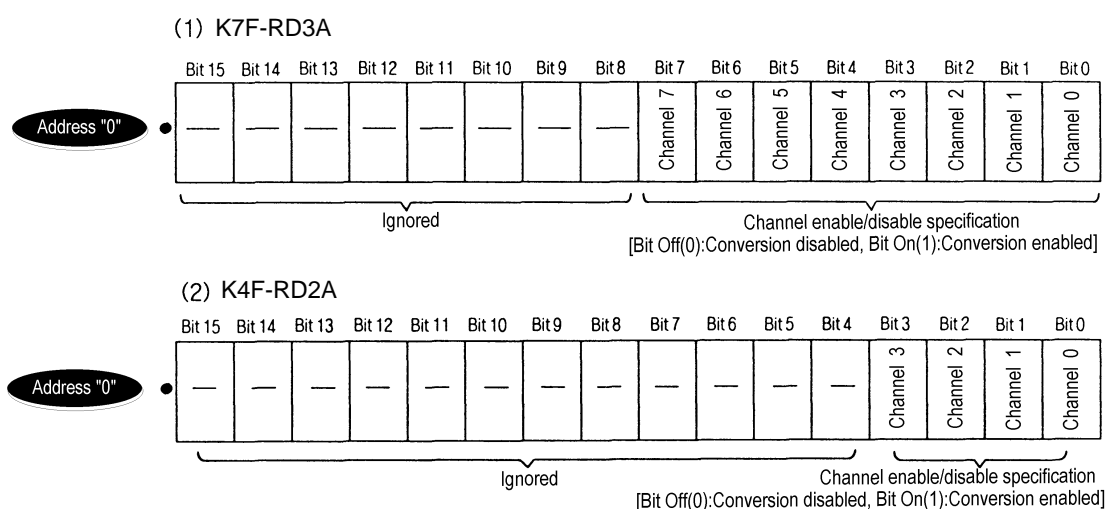
Address (Decimal)	Function	Description	Default Setting	Read / Write
0	Channel enable/disable specification	Bit On(1):enable, Bit Off(0):disable	disable	R/W
1	Channel 0 Specifying RTD type	0 : Pt 100 1: JPt 100	"0" (Pt 100)	"
2	Channel 1 Specifying RTD type			"
3	Channel 2 Specifying RTD type			"
4	Channel 3 Specifying RTD type			"
5	Detected temp. value of channel 0	<p>Detected temperature value : A value of 10 times of the real temperature is read.</p> <p>Digital conversion value : (Detected temperature value + 2000) X 2</p> <p>When the detected value of temp. is used as the current value, the value means the converted value, which is equal to the input range of the current value from 0 to 16,000.</p> <p>Error code value 16: A disconnection detected 17: B disconnection detected 18: b disconnection detected, A and B disconnection simultaneously detected. 19: Indicates that the detected temperature is outside the input range(-200~600.0℃) of the RTD.</p>	-	Read only
6	Digital conversion value of channel 0			"
7	Error code of channel 0			"
8	Detected temp. value of channel 1			"
9	Digital conversion value of channel 1			"
10	Error code of channel 1			"
11	Detected temp. value of channel 2			"
12	Digital conversion value of channel 2			"
13	Error code of channel 2			"
14	Detected temp. value of channel 3			"
15	Digital conversion value of channel 3			"
16	Error code of channel 3			"
17	SET data enable/disable specification	<p>Bit On(1) : The contents at address 0~4 are changed with new values.</p> <p>Bit Off(0): The contents at address 0~4 remains with the previous value.</p>	No setting values	R/W
18	Channel run information	Bit On(1):Run, Bit Off(0): Stop	-	Read only
19	Error information specifying RTD type	<p>Bit On(1):Outside the setting range</p> <p>Bit Off(0): Normal</p>	-	"

3.2 Functions of Buffer Memory

- ▶ Each address in the internal memory occupies one word and it is represented with 16 bits.
- ▶ In the 16 bits which compose an address, every bit can be set to either "1" when it should be turned On or "0" when Off in order to implement the function of each bit.

3.2.1 Specifying Channel Enable/Disable (K7F-RD3A : Address 0, K4F-RD2A : Address 0)

- 1) RTD conversion enable/disable specification is available on each channel.
- 2) Unused channels can be disabled to shorten the sampling cycle.
- 3) All channels will be disabled if no enable/disable specification is applied.
- 4) The following show the temperature conversion enable/disable of the RTD input module.



3.2.2 Specifying the Type of the RTD (K7F-RD3A : Addresses 1~8, K4F-RD2A : Addresses 1~4)

- 1) Each type of the RTD connected to each channel of the RTD input module can be specified at each channel.
- 2) A channel without its specification of the type of the RTD is specified to Pt 100 as its default.
- 3) The method of the type specification is same on every channel and the following shows it.

K7F-RD3A			K4F-RD2A		
Address (Decimal)	Corresponding Channel	Setting Value	Address (Decimal)	Corresponding channel	Setting Value
1	0	0 : Pt100 1 : JPt100	1	0	0 : Pt100 1 : JPt100
2	1		2	1	
3	2		3	2	
4	3		4	3	
5	4	If a value other than 0 and 1 is specified, then error is indicated at address 35 and Pt100 is specified	/		If a value other than 0 and 1 is specified, then error is indicated at address 19 and Pt100 is specified
6	5				
7	6				
8	7				

3.2.3 Detected Temperature Value

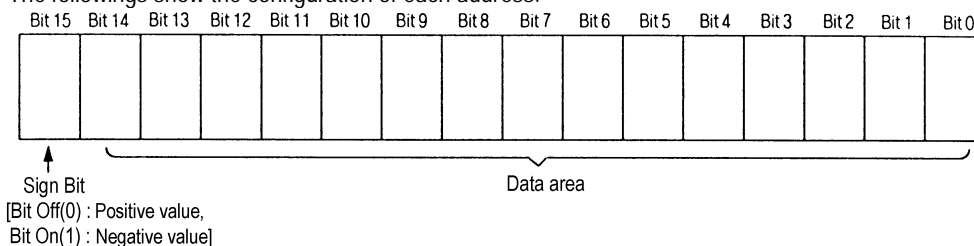
(K7F-RD2A : Addresses 9, 12, 15, 18, 24, 27 and 30, K4F-RD2A : Addresses 5, 8, 11 and 14)

- 1) This area performs sampling processing of the temperature value that is input through the RTD connected to the terminal block of a channel and stores the value of 10 times of the real temperature value.

REMARK

If a real temperature is 123.4°C the stored value is 1234. But, 123.4 is displayed on the K7F-RD3A LED display

- 2) The followings show the configuration of each address.



- 3) If the temperature conversion specification of a channel is changed from enable into disable the detected temperature value before the change remains.

3.2.4 Digital Conversion Value

(K7F-RD3A : Address 10, 13, 16, 19, 22, 25, 28 and 31, K4F-RD2A : Address 6, 9, 12 and 15)

- 1) A temperature value that is input through the RTD connected to the terminal block of a channel is represented as a value between -2000 to 6000 and then the converted value is stored. The converted value stored is called digital conversion value.
- 2) A digital conversion value that has been converted into a value between 0 to 16000 can be directly used as a process value of the PID control module.
- 3) The digital conversion value and the detected temperature value have the following arithmetic relation.

$$\text{Digital conversion value} = (\text{Detected temperature value} + 2000) \times 2$$

REMARK

If a real temperature is 123.4°C, then the detected temperature value is 1234 and the digital conversion value is 6468 since the item of the detected temperature value in the expression $(\text{Detected temperature value} + 2000) \times 2$ should be replaced with 1234.

- 4) If the temperature conversion specification of a channel is changed from enable into disable the digital conversion value before the change remains.

3.2.5 Error Code

(K7F-RD3A : Addresses 11,14, 17, 20, 23, 26, 29 and 32, K4F-RD2A : Addresses 7, 10, 13 and 16)

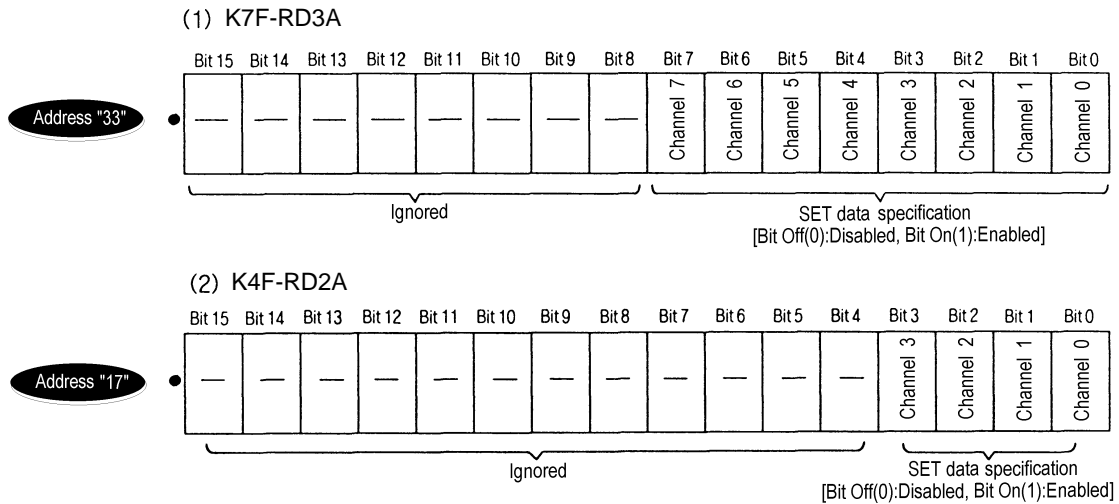
- 1) Disconnection that can occur between the RTD and the RTD input module is detected by its type, and also error information is stored when the detected temperature is outside range(-200.0 to 600.0°C)
- 2) The following shows the types of error code.

Error Code (Decimal)	Error Description	Data processing at error occurrence	RUN LED status	LED display (G3F-RD3A only)
16	A disconnection detected	Detected temperature value and digital conversion value before error occurrence remains	Flickering with 0.1 sec.	Err 4
17	B disconnection detected			Err 5
18	B disconnection detected, A and B disconnection simultaneously detected			Err 6
19	Temperature outside range			Err 7

- 3) If two or more disconnection is detected the priority order is 18, 17 or 16. If A disconnection and B disconnection occur simultaneously error code is 18.

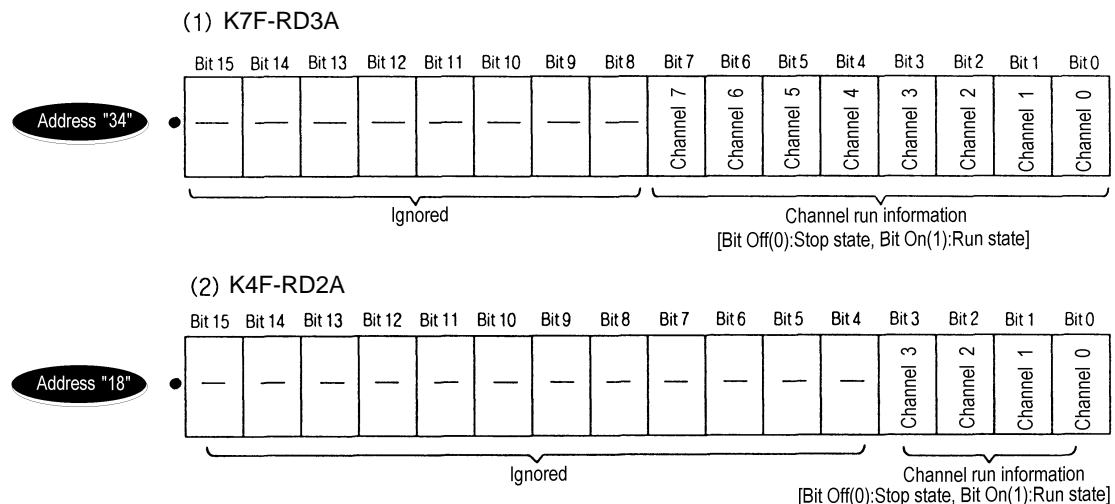
3.2.6 Specifying SET Data (K7F-RD3A : Address 33, K4F-RD2A : Address 17)

- 1) If a bit corresponding to each channel in Set Data specification area is turned On(1), then the RTD input module executes the temperature conversion with user-defined setting data at the address 0 to 8 in the K7F-RD3A and at the address 0 to 4 in the K4F-RD2A.
- 2) If the bit corresponding to each channel is not turned On(1), then the RTD input module executes the temperature conversion not with the new user-defined setting data at the address 0 to 8 in the K7F-RD3A and at the address 0 to 4 in the K4F-RD2A but with the previous setting data.
- 3) The followings show the SET data specification



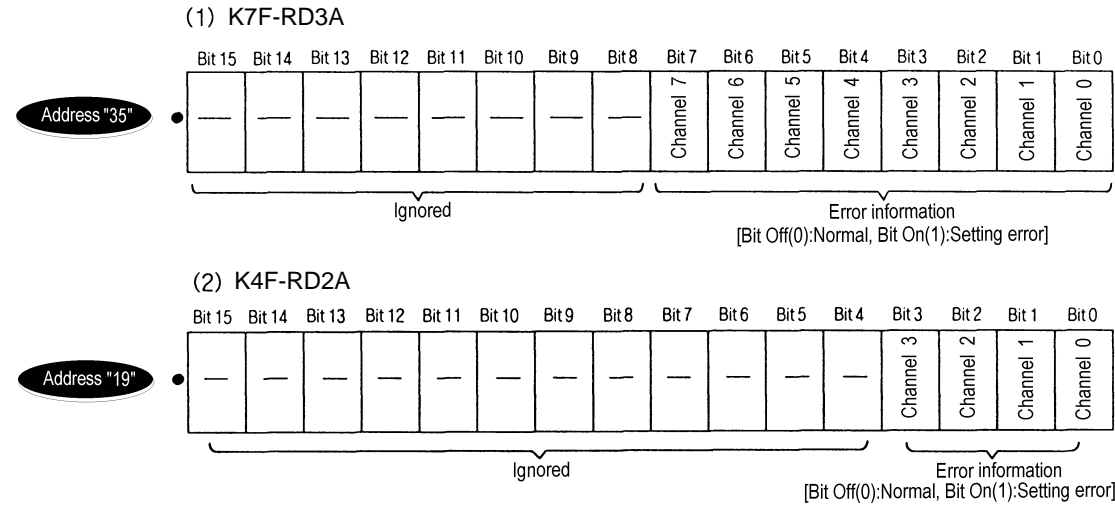
3.2.7 Information on Run Channel (K7F-RD3A : Address 34, K4F-RD2A : Address 18)

This area stores information on run status of each channel.



3.2.8 Information on RTD Specification Error
(K7F-RD3A : Address 35, K4F-RD2A : Address 19)

- 1) If error occurs in other value than "0" and "1" is set at the addresses (Address 1 to 8 in K7F-RD3A, Address 1 to 4 in K4F-RD2A) used for specifying the type of the RTD which is connected to each channel of the RTD input module
- 2) If error occurs at a channel, then the channel runs with Pt 100 as its type of the RTD.
- 3) The following shows indication of error information



Chapter 4. DEDICATED INSTRUCTIONS FOR SPECIAL MODULES

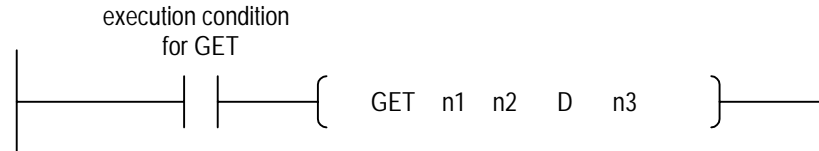
(Read from /Write to Buffer Memory)

I/O points of the RTD input module are 16.

4.1 Local


4.1.1 Read from Buffer Memory . . . GET, GETP

<Format>



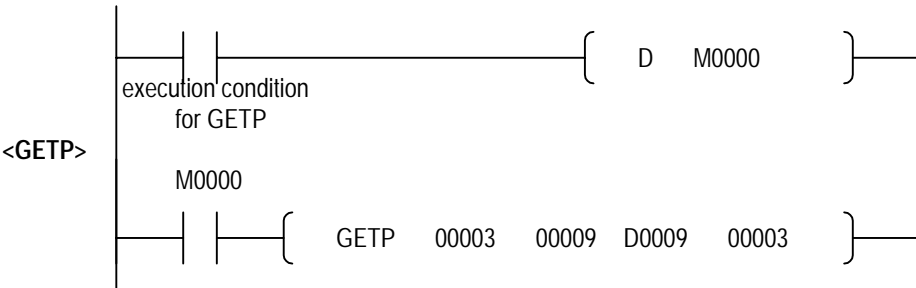
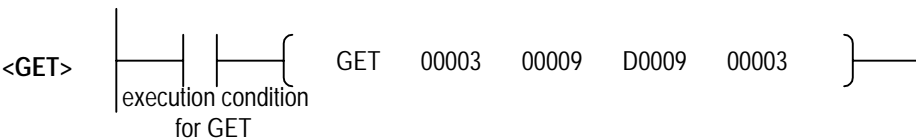
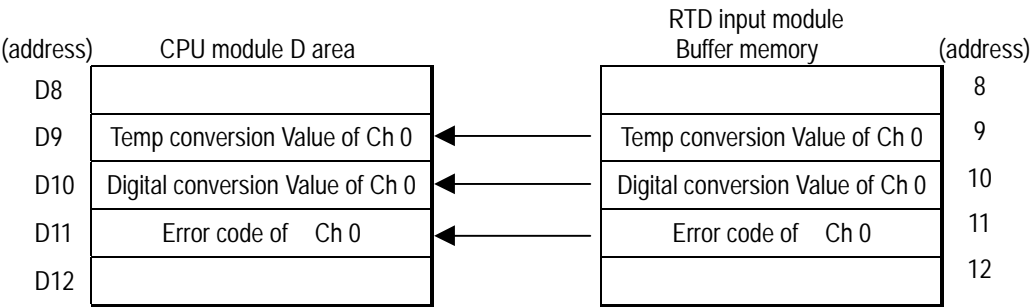
Format	Descriptions	Available Data Type
n1	The number of the slot where the special modules mounted	Integer
n2	First address of the special module buffer memory from which the data will be read.	Integer
D	First address of the device to store the data read.	M,P,K,L,T,C,D,#D
n3	Word number of data to be read .	Integer

<The difference between GET and GETP>

GET: always executed if the execution condition turns On.()

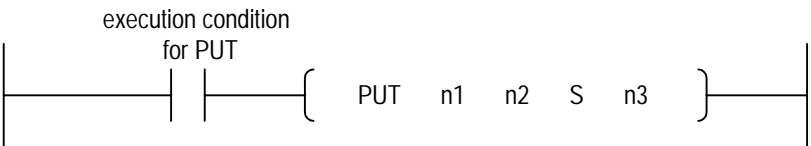
GETP: executed if the execution condition is triggered. ()

Example 1). In this example, the RTD input module is loaded on the slot 3 in the base unit and the data of the buffer memory addresses 9, 10 and 11 will be read to the CPU module addresses D9, D10 and D11.




4.1.2 Write to Buffer Memory . . . PUT, PUTP

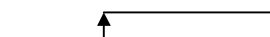
<Format>



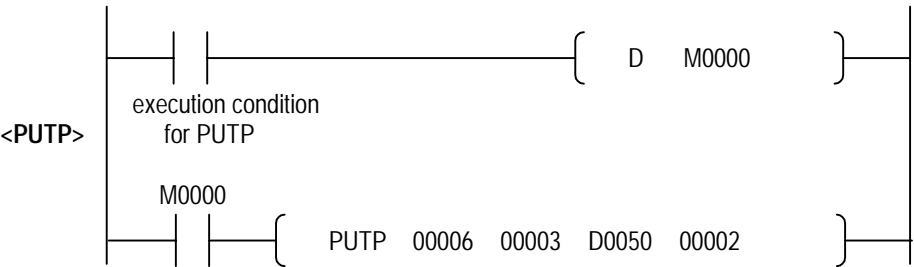
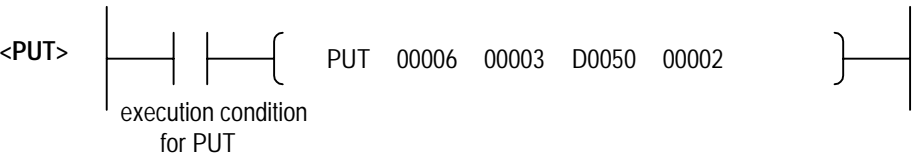
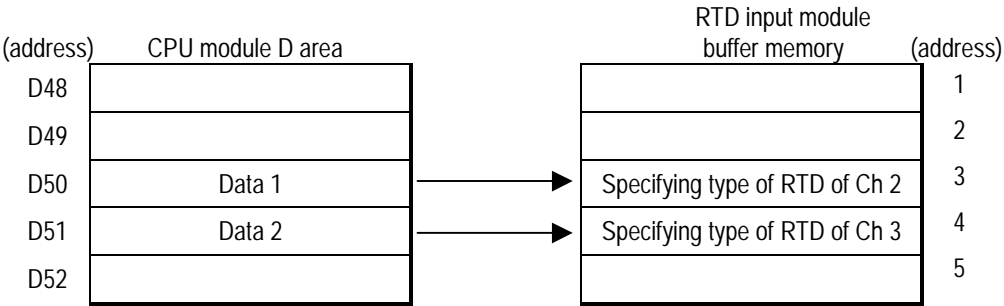
Format	Descriptions	Available Data Type
n1	The number of the slot where the specific module mounted	Integer
n2	First address of the specific module buffer memory to which the data will be written..	Integer
S	First address of the device where the data to be written has been stored, or an integer	M,P,K,L,T,C,D,#D
n3	Word number of data to be written .	Integer

<The difference between PUT and PUTP>

PUT: always executed if the execution condition turns On. . ()

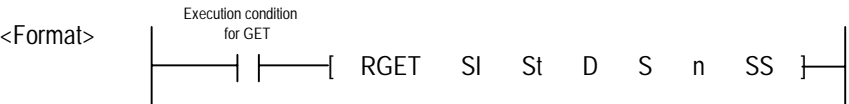
PUTP : executed if the execution condition is triggered. . ()

Example 1) In this example, the RTD input module is loaded on the slot 6 in the base unit and the data of CPU module addresses D50 and D51 will be written to the buffer memory addresses 3 and 4.



4.2 Remote

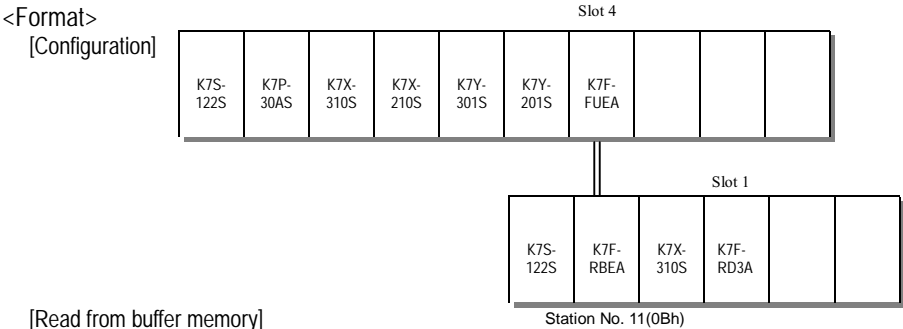
4.2.1 Read from Buffer Memory ---RGET



Format	Descriptions		Available data type
SI	<div>AB CD Upper (8bit) Lower (8bit)</div>	Higher(AB) : Code value for RTD input module K7F - RD3A : 04h K4F - RD2A : 84h Lower(CD) : Slot No. of the communications module of the local station(FUEA) Setting range : 0 to 7	Integer
St	<div>EF GH Upper (8bit) Lower (8bit)</div>	Higher(EF) : Slot No. of the RTD Input module loaded onto the remote station Setting range : 0 to 31 Lower(GH) : Station No. of the communications module loaded onto the remote station(RBEA) Setting range : 0 to 63	Integer
D	First address of the device to store the data read.		M,P,K,L,T,C,D, #D
S	First address of the specific module's buffer memory to read data		Integer
n	Word number of data to be read		Integer, D
SS	Area used for indicating the status information during link		M,P,K,L,T,C,D, #D

REMARK

If the content is read from the buffer memory of the temperature - measuring input module by use of RGET, be sure to make the program so that execution condition can transit from 0 to 1(Rising Edge : \nearrow)
Otherwise, The content in the buffer memory of the temperature - measuring input module is unreadable.



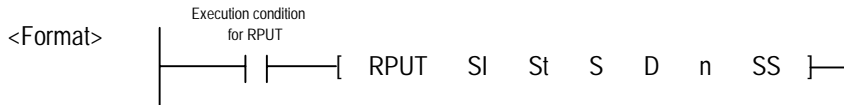
[Read from buffer memory]

- 1) The content in the buffer memory address 9(one word) is read, where the detected temperature value of the channel 0 of the RTD input module had been stored.
- 2) The data read is stored to D300
- 3) Information on the communications status is stored to D1

[Program]




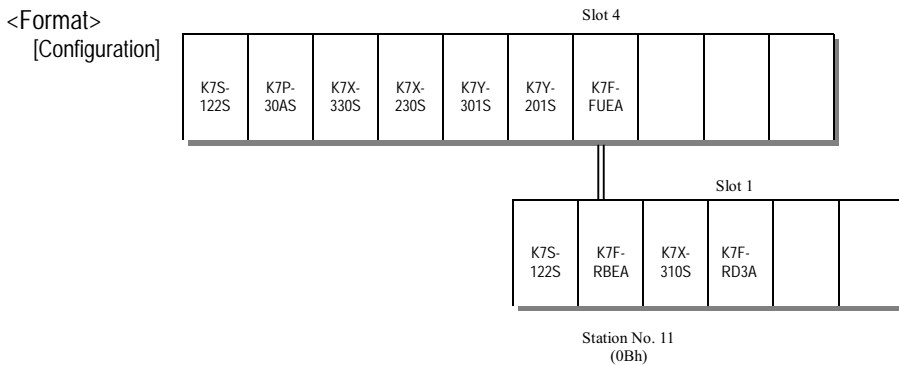
4.2.2 Write to Buffer Memory ---RPUT



Format	Description		Available data type
SI		Upper(AB) : Code value for RTD input module K7F - RD3A : 04h K4F - RD2A : 84h Lower(CD) : Slot No. of the communications module of the local station Setting range : 0 to 7	Integer
St	<div> <div>EF</div> <div>GH</div> <div>Upper (8bit)</div> <div>Lower (8bit)</div> </div>	Upper(EF) : Slot No. of the RTD Input module loaded onto the remote station Setting range : 0 to 31 Lower(GH) : Station No. of the communications module loaded onto the remote station(RBEA) Setting range : 0 to 63	Integer
S	Head address of the device to be stored the data write.		M,P,K,L,T,C,D, #D
D	Head address of the specific module's buffer memory to write data		Integer
n	Word number of data to be write		Integer, D
SS	Area used for indicating the status information during link		M,P,K,L,T,C,D, #D

REMARK

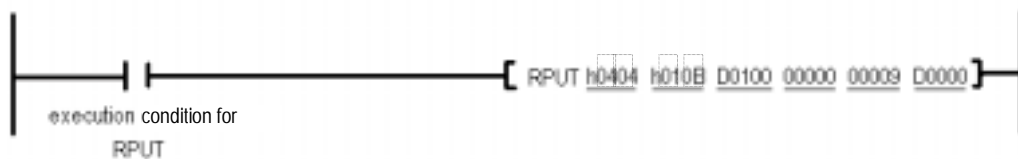
If the content is write to the buffer memory of the RTD input module by use of RPUT, be sure to make the program so that execution condition can transit from 0 to 1(Rising Edge : )
Otherwise, The content in the buffer memory of the RTD input module will not be changed with a new data.



[Write to buffer memory]

- 1) The content in the D100 to D108(9 words) of the devices in the CPU module
- 2) Will be written to addresses 0 to 8 of the buffer memory of the RTD input module, and
- 3) Information on the communication status is stored to D0

[program]

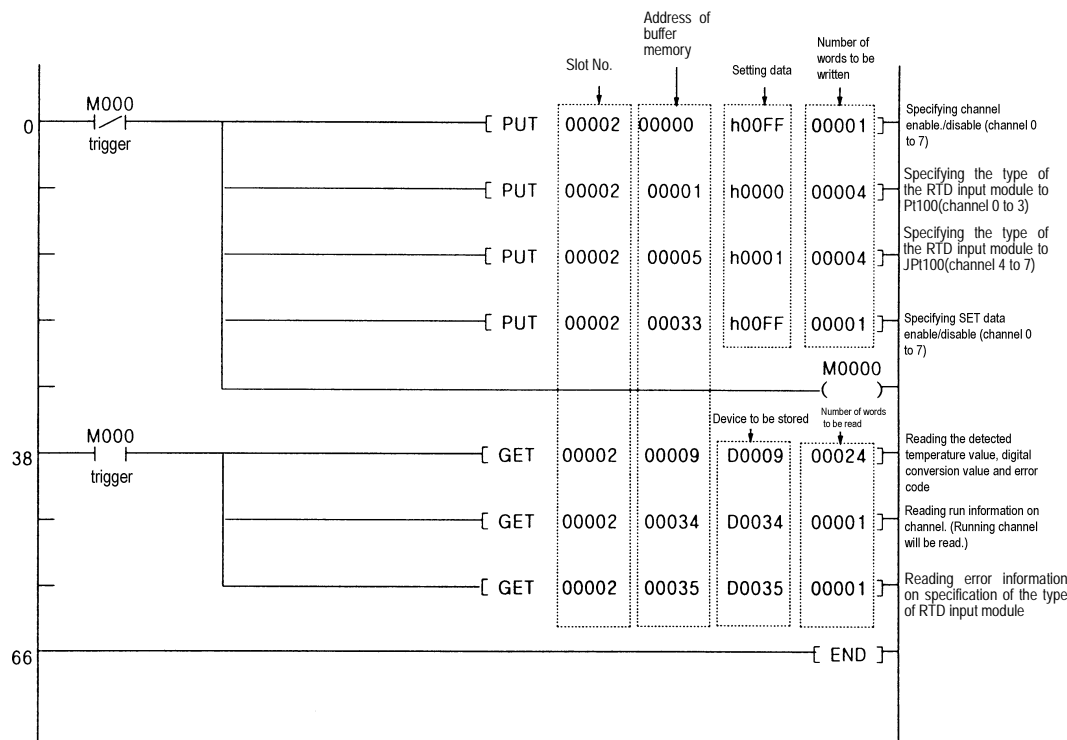


Chapter 5. PROGRAMMING

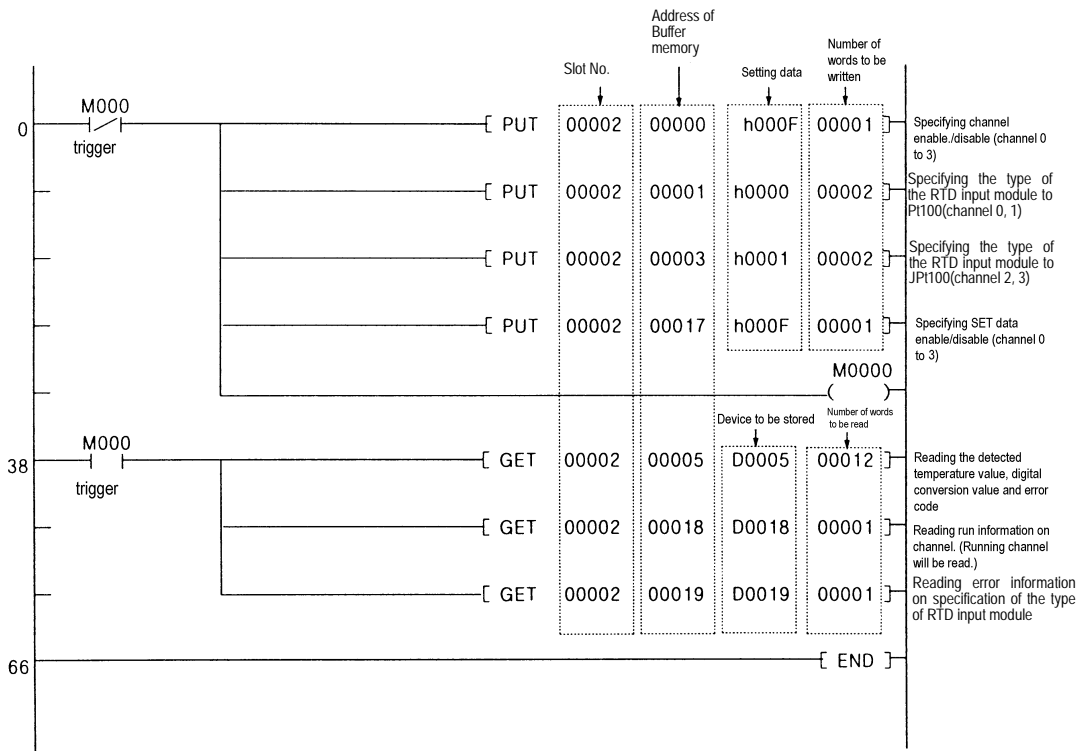
5.1 Basic Programming

- ▶ The following describes the method to set the running conditions in the buffer memories of the RTD input module.
- ▶ The RTD input module is already mounted on the slot 2.
- ▶ The I/O point of the RTD input module are 16.

5.1.1 K7F-RD3A



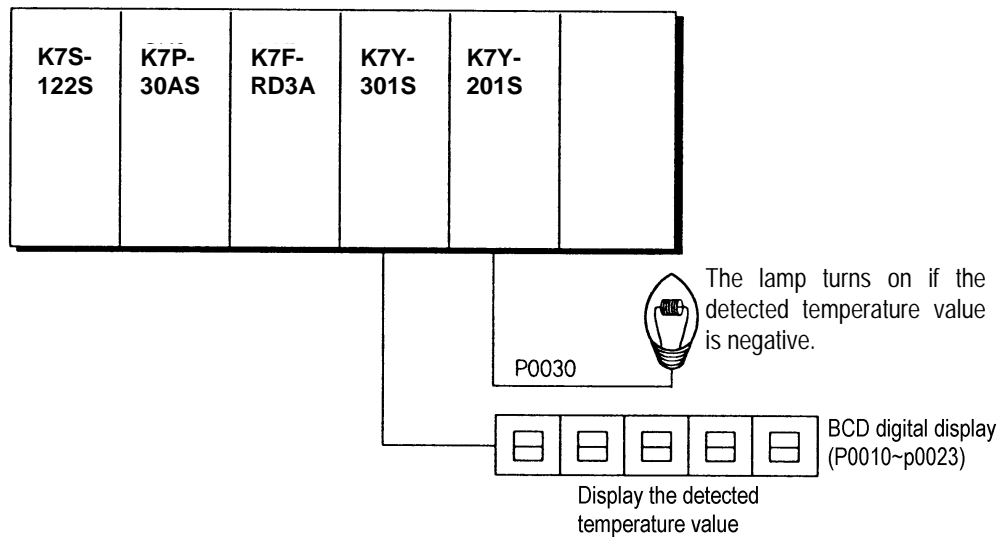
5.1.2 K4F-RD2A



5.2 Application Programming

5.2.1 A Program for Output of the Detected Temperature Value as a BCD Value

1) System Configuration



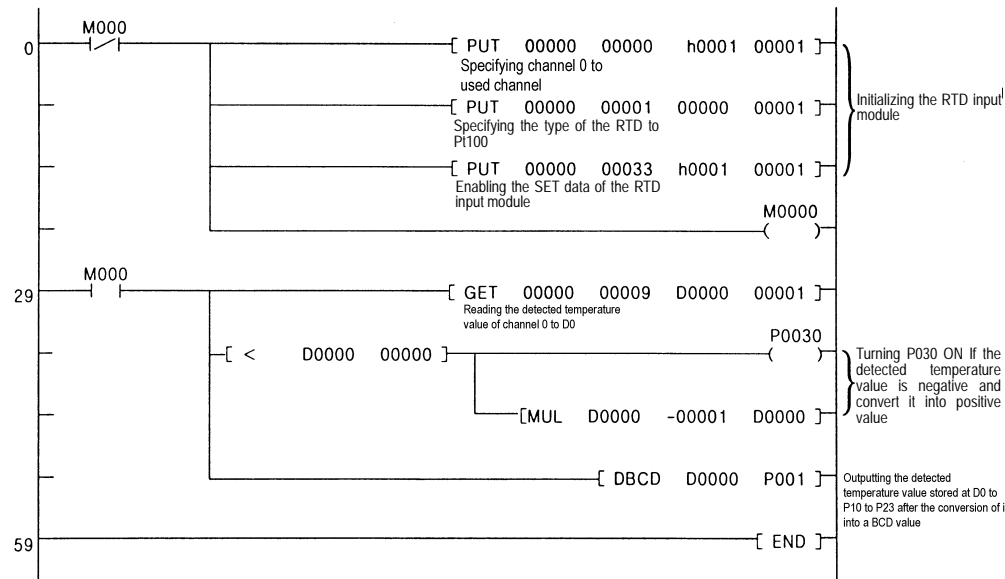
2) Initial Settings

- (1) Specifying used channel : channel 0
- (2) Specifying the type of the RTD : Pt 100

3) Descriptions of the Program

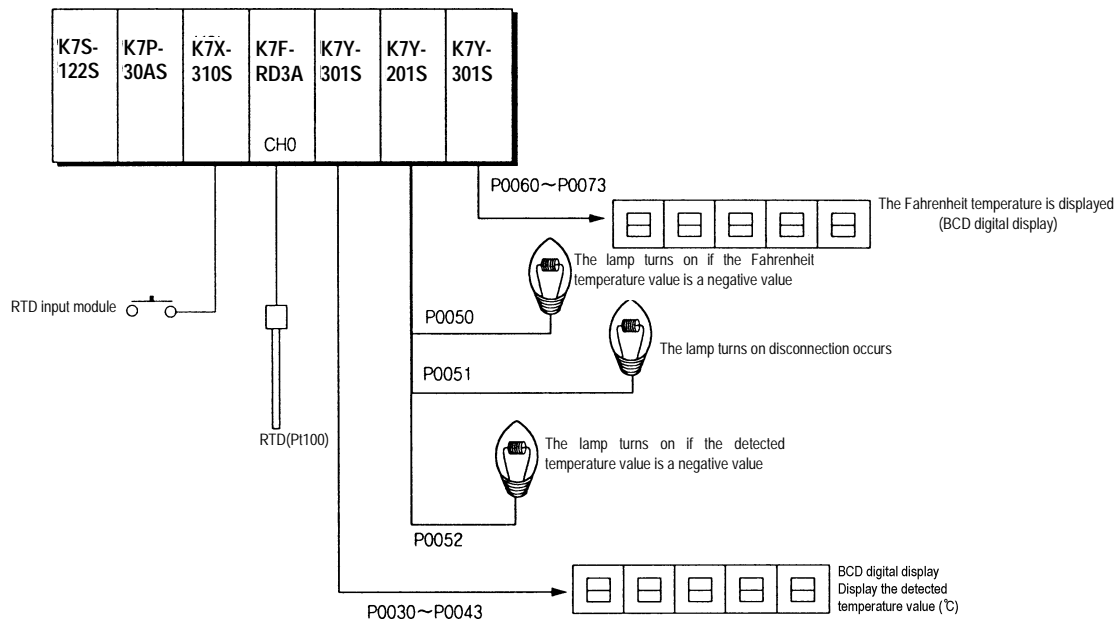
The present A/D conversion value of the detected temperature value, which is detected from the RTD Pt 100 by use of channel 0 of the RTD input module, is displayed on the BCD digital display. If the detected temperature value is negative then the ramp turns on and If positive the ramp turns off.

4) Program



5.2.2 A Program for Converting the Detected Temperature Value(°C) into Fahrenheit(°F) and Outputting a BCD Value

1) System Configuration



2) Initial Settings

- (1) Specifying used channel : channel 0
- (2) Specifying the type of the RTD : Pt 100

3) Expression for Converting the Detected Temperature Value into a Fahrenheit Temperature Value(°F)

$$\text{Detected temperature value} = \text{real temperature} \times 10$$
$$\text{Fahrenheit temperature value (}^{\circ}\text{F)} = \text{real temperature} \times 1.8 + 32$$

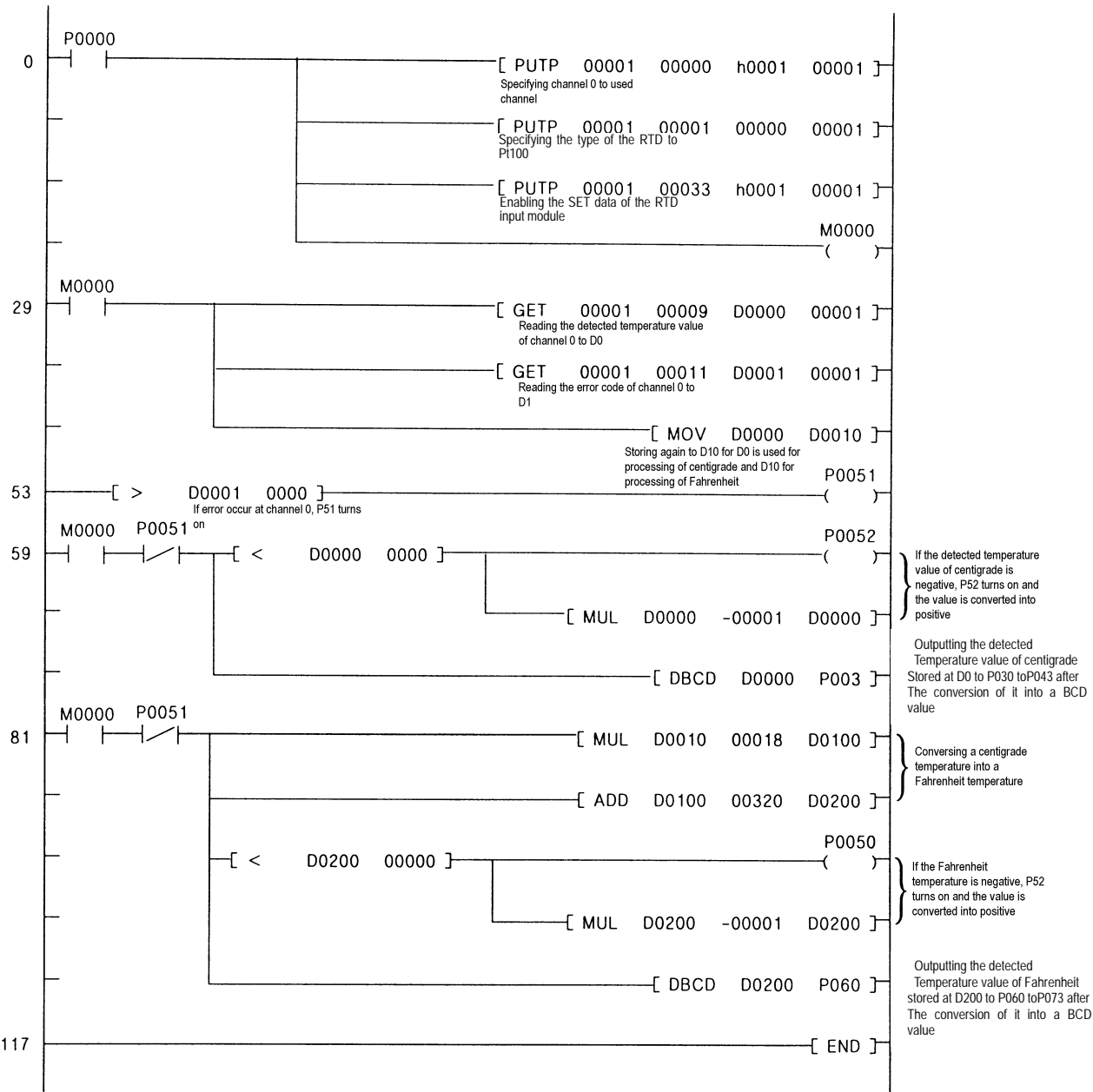
$$= \frac{\text{detected temperature value} \times 1.8}{10} + 32$$
$$= \frac{\text{detected temperature value} \times 18 \times 320}{10}$$

∴ If the BCD digital display displays the value of (real Fahrenheit (°F) temperature $\times 10$) then program has to process the calculation of "detected temperature value $\times 18 + 320$ ".

4) Descriptions of the Program

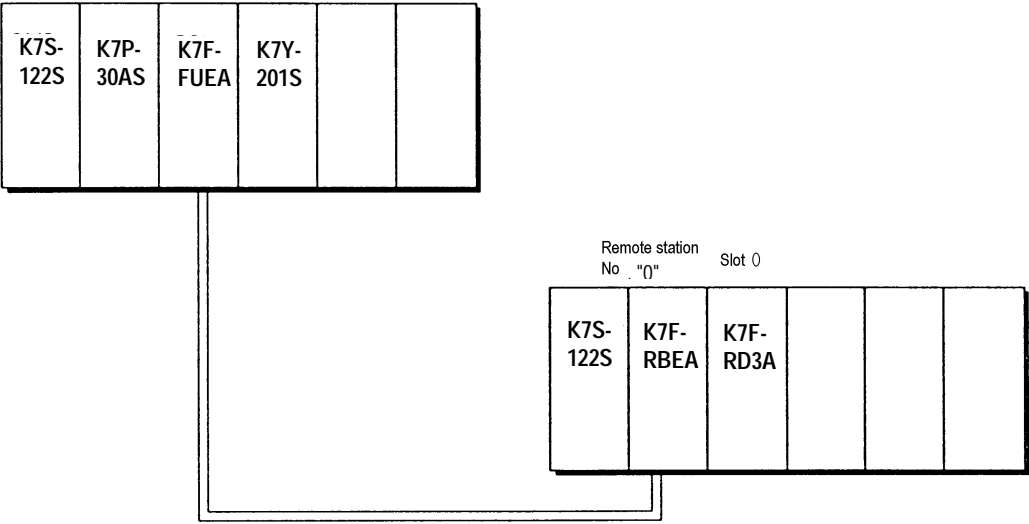
- (1) If P0000 turns on, the RTD input module is initialized.
- (2) The detected temperature value is displayed to P0030 to P0043 of the BCD digital display. If the value is negative value the ramp P0052 turns on.
- (3) The detected temperature value is converted to a Fahrenheit temperature value (°F) and displayed to P0060 to P0073 of the BCD digital display. If the value is negative the ramp P0050 turns on.
- (4) If disconnection is detected during temperature conversion of channel 0, the ramp P0051 turns on.

5) Program



5.2.3 A Program when Loading the RTD Input Module onto the Remote I/O Station

1) System Configuration



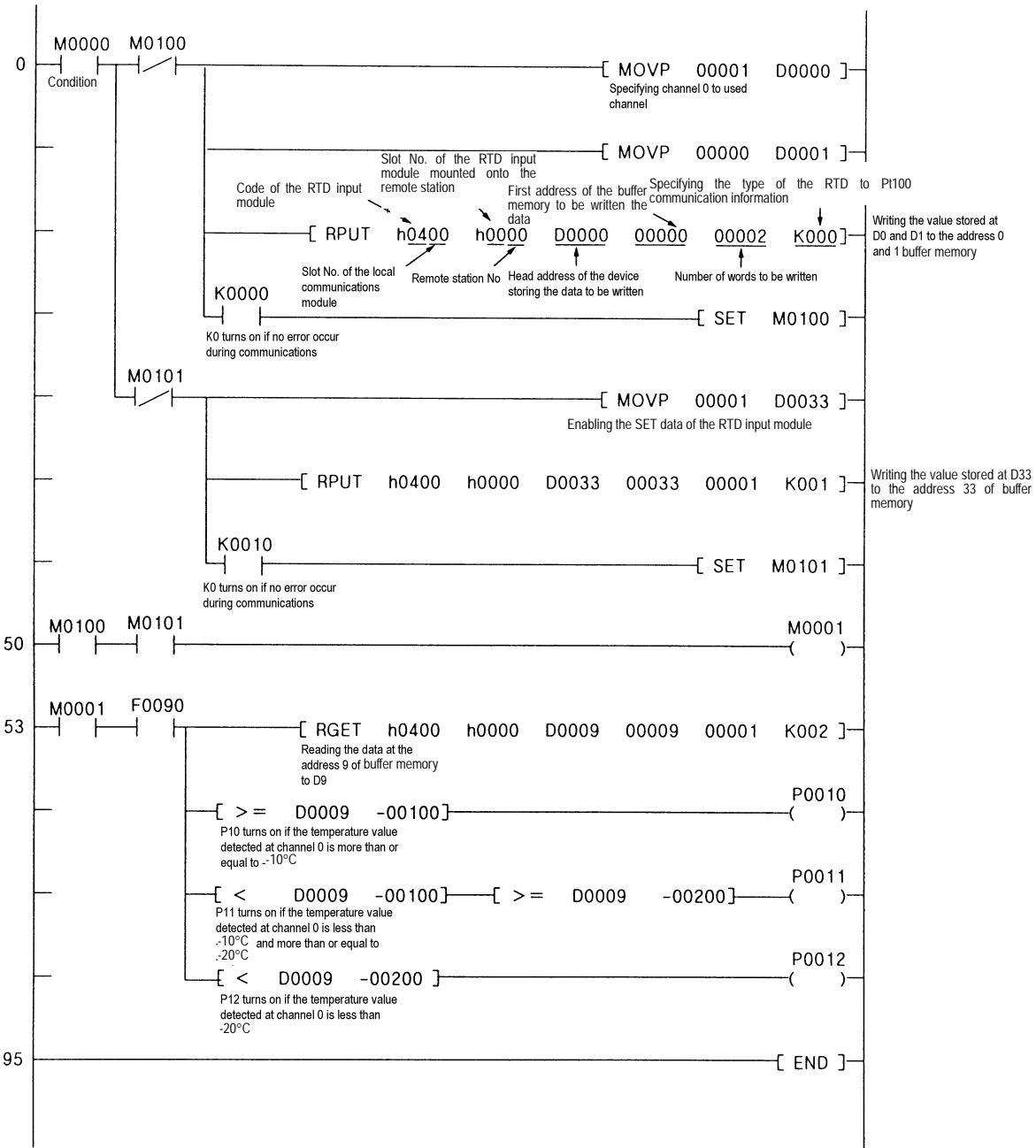
2) Initial Settings

- (1) Specifying used channel : channel 0
- (2) Specifying the type of the RTD : Pt 100

3) Descriptions of the Program

- (1) P0010 turns on if the temperature value detected at channel 0 is more than or equal to -10°C .
- (2) P0011 turns on if the temperature value detected at channel 0 is less than -10°C and more than or equal to -20°C .
- (3) P0012 turns on if the temperature value detected at channel 0 is less than -20°C .

4) Program



Chapter 6. INSTALLATION AND WIRING

6.1 Installation

6.1.1 Installation Ambience

This module has high reliability regardless of its installation environment, but be sure to check the following for system reliability and stability.

1) Ambience requirements

Avoid installing this unit in locations which are subjected or exposed to :

- Water leakage and dust.
- Continuous shocks or vibrations.
- Direct sunlight.
- Dew condensation due to rapid temperature change.
- Higher or lower temperatures outside the range of 0 to 55 °C

2) Precautions during installing and wiring.

- During drilling or wiring, do not allow any wire scraps to enter into the PLC.
- Install it on locations that are convenient for operation.
- Make sure that it is not located on the same panel that high voltage equipment located.
- Make sure that the distance from the walls of duct and external equipment be 50 mm or more.
- Be sure to be grounded to locations that have good ambient noise immunity.

6.1.2 Handling Precautions

From unpacking to installing the RTD input module, be sure to check the following:

- 1) Do not drop it off, and make sure that strong shock should not be applied.
- 2) Do not unload the PCB from its case. It can cause faults.
- 3) During wiring, be sure to check any foreign matter like wire scraps should not enter into the upper side of the PLC. If any foreign matter has entered into it, always eliminate it.
- 4) Do not load or unload the module while the power supply is being connected.

6.2 Wiring Precautions

- 1) When connecting Pt with the RTD input module, refer to the Chapter 2.5 for wiring.
- 2) Be sure to separate the external input signal of the RTD input module from an alternating current so that surge or induction noise generated from the alternating current could not effect.
- 3) When wiring, locating this unit too near from high temperature generating devices or materials or contacting it with the material like oil can cause short-circuit and occur damage or disorder.
- 4) When wiring to the terminal block, wiring with high-pressure wire or power supply wire can occur flow inhibition and cause disorder or malfunction.
- 5) Make sure that electric wires do not pass before the LED display. It causes the digital values not to be identified.

Chapter 7. TROUBLESHOOTING

The followings explain errors that could occur during operating the RTD input module and their troubleshooting.

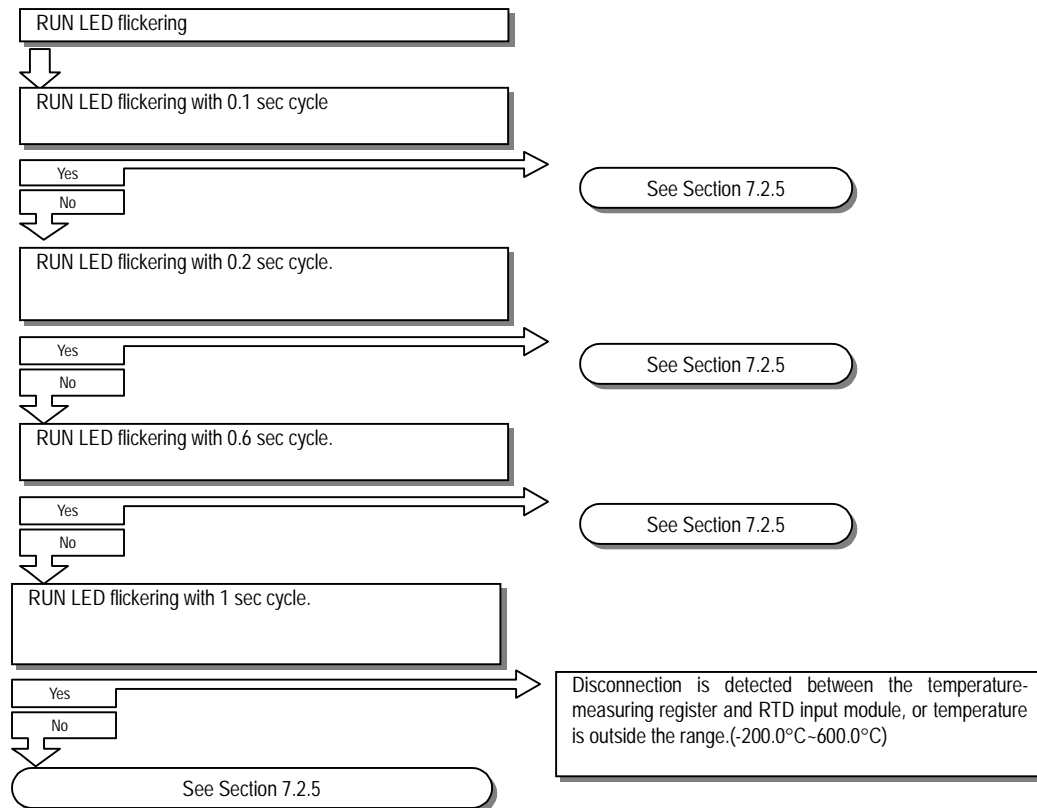
7.1 Errors Indicated by RUN LED Flickering

Errors indicated by the flickering RUN LED of RTD input module are given below.

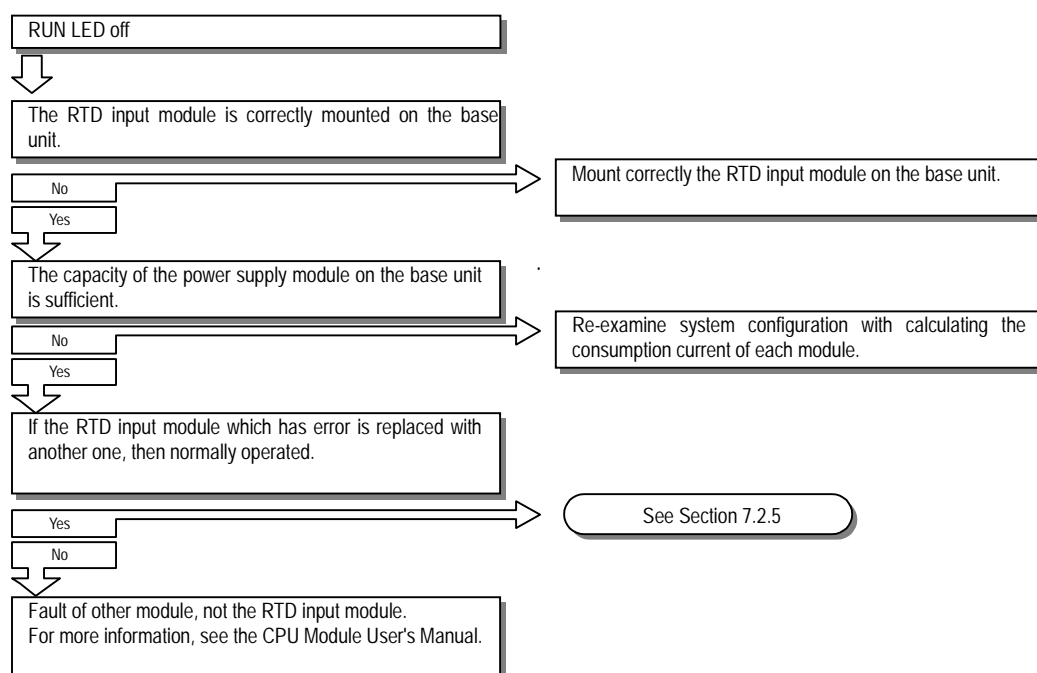
RUN LED Status	Descriptions	Remark
Flickering (cycle: 0.1 sec)	WDT error	
Flickering (cycle: 0.2 sec)	System error	
	Internal memory error	
Flickering (cycle: 0.6 sec)	A/D conversion error	
Flickering (cycle: 1.0 sec)	A disconnection detected	The data before error has occurred is maintained.
	B disconnection detected	
	b disconnection detected	
	Outside the upper or lower bound of the range	

7.2 Troubleshooting Procedure

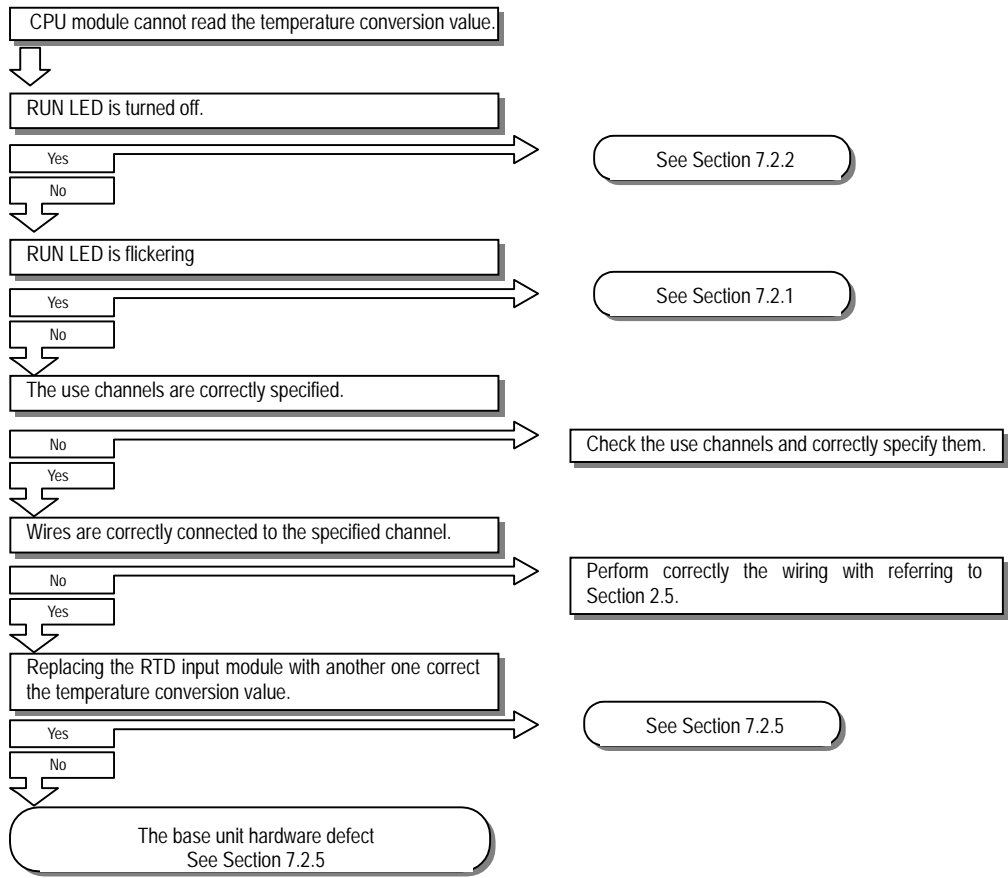
7.2.1 RUN LED Flickering



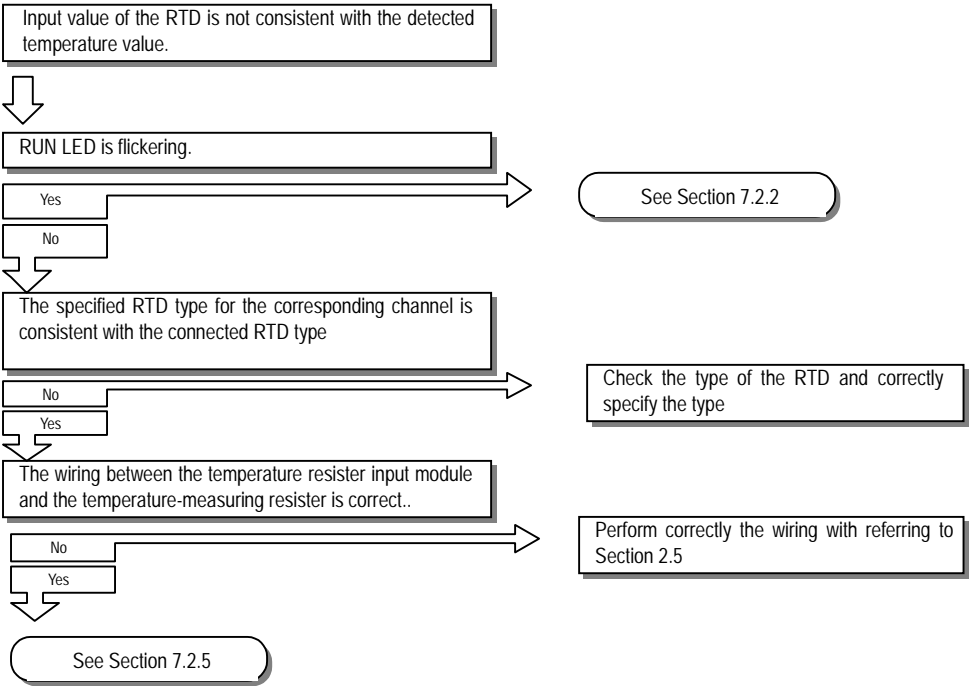
7.2.2 RUN LED Off



7.2.3 Detected Temperature Value Unreadable from the CPU Module.



7.2.4 Input value of the RTD is not consistent with the detected temperature value.

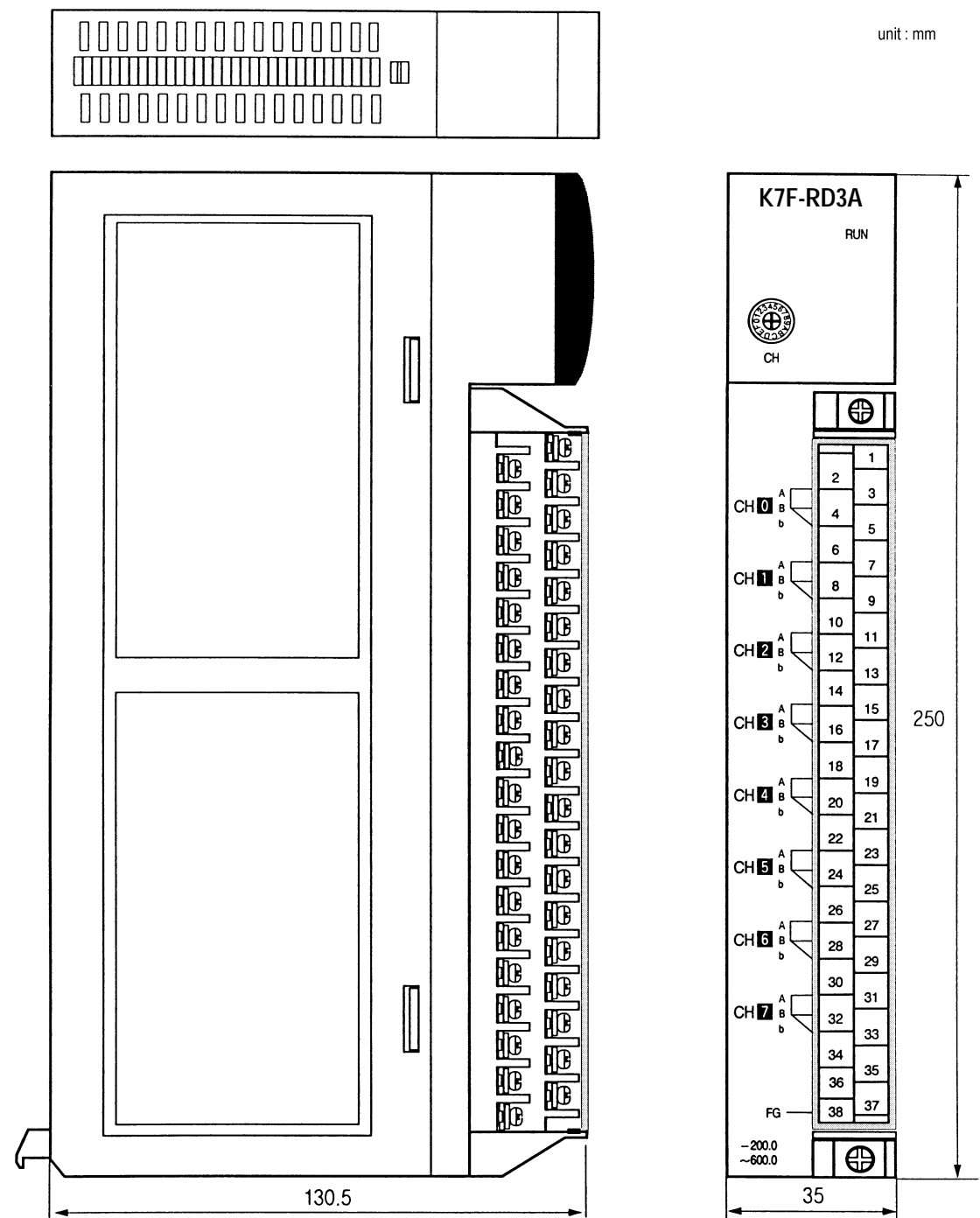


7.2.5 RTD Input Module Hardware Defect

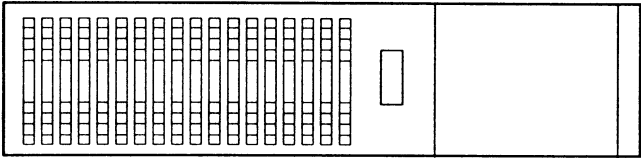
RTD input module hardware defect.
Contact the nearest agency or service station

Chapter 8. DIMENSIONS

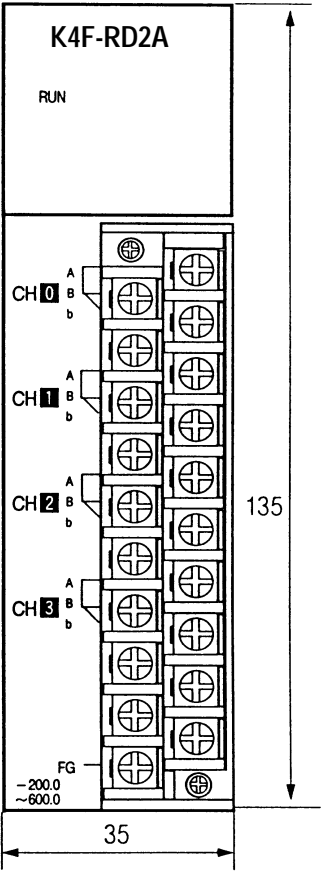
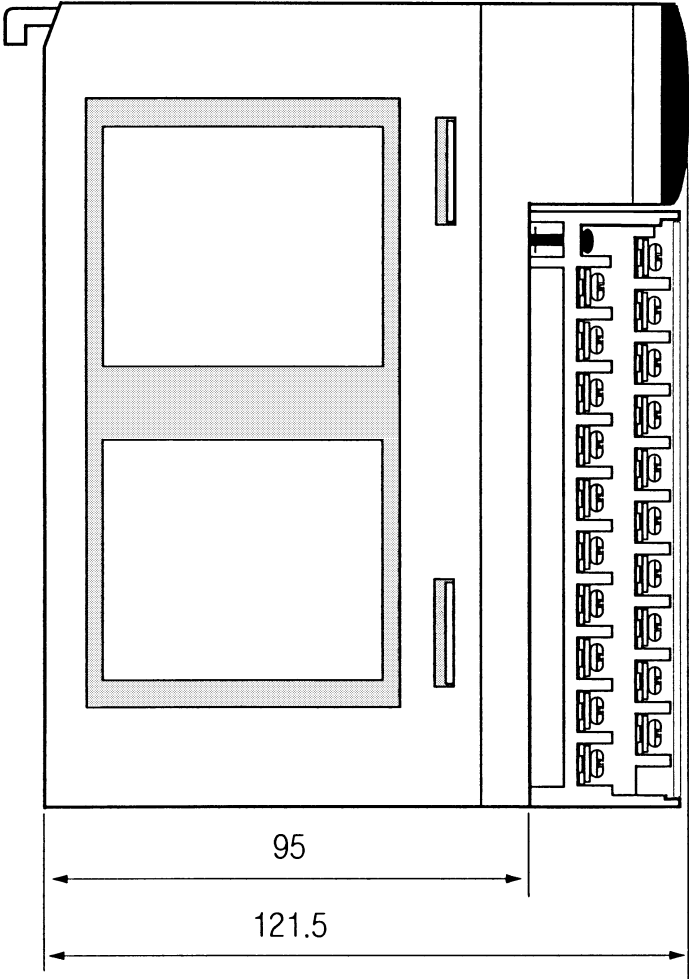
8.1 K7F-RD3A Dimensions



8.2 K4F-RD2A Dimensions



unit : mm



Chapter 9. Standard Resistance Value of Pt/RTD

Pt 100Ω

Unit : Ω

-200	-100	-0	Temperature (°C)	Temperature (°C)	0	100	200	300	400	500	600
18.49	60.25	100.00	-0	0	100.00	138.50	175.84	212.02	247.04	280.90	313.59
	56.19	96.09	-10	10	103.90	142.29	179.51	215.57	250.48	284.22	
	52.11	92.16	-20	20	107.79	146.06	183.17	219.12	253.90	287.53	
	48.00	88.22	-30	30	111.67	149.82	186.82	222.65	257.32	290.83	
	43.87	84.27	-40	40	115.54	153.58	190.45	226.17	260.72	294.11	
	39.71	80.31	-50	50	119.40	157.31	194.07	229.67	264.11	297.39	
	35.53	76.33	-60	60	123.24	161.04	197.69	233.17	267.49	300.65	
	31.32	72.33	-70	70	127.07	164.76	201.29	236.65	270.86	303.91	
	27.08	68.33	-80	80	130.89	168.46	204.88	240.13	274.22	307.15	
	22.80	64.30	-90	90	134.70	172.16	208.45	243.59	277.56	310.38	

Jpt 100Ω

Unit : Ω

-200	-100	-0	Temperature (°C)	Temperature (°C)	0	100	200	300	400	500	600
17.14	59.57	100.00	-0	0	100.00	139.16	177.13	213.30	249.56	284.02	317.28
	55.44	96.02	-10	10	103.97	143.01	180.86	217.54	253.06	284.40	
	51.29	92.02	-20	20	107.93	146.85	184.58	221.15	256.55	290.77	
	47.11	88.01	-30	30	111.88	150.67	188.29	224.74	260.02	294.12	
	42.91	83.99	-40	40	115.81	154.49	191.99	228.32	263.49	297.47	
	38.68	79.96	-50	50	119.73	158.29	195.67	231.89	266.94	300.80	
	34.42	75.91	-60	60	123.64	162.08	199.35	235.45	270.38	304.12	
	30.12	71.85	-70	70	127.54	165.86	203.01	238.99	273.80	307.43	
	25.80	67.77	-80	80	131.42	169.63	206.66	242.53	277.22	310.72	
	21.46	63.68	-90	90	135.30	173.38	210.30	246.05	280.63	314.01	