

# User's Manual

LG Programmable Logic Controller

***GLOFA*** G3F – RD3A  
G4F – RD2A

**LG Industrial Systems**



## 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 G3F-RD3A and G4F-RD2A.

For safety precautions on the PLC system, see the GLOFA GM3/4 User's Manual or the MASTERk 1000S/300S User's Manual.

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.

 <b>WARNING</b>	⇒	If not provided with proper prevention, it can cause death or fatal injury or considerable loss of property.
 <b>CAUTION</b>	⇒	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** 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



#### CAUTION

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



#### CAUTION

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.

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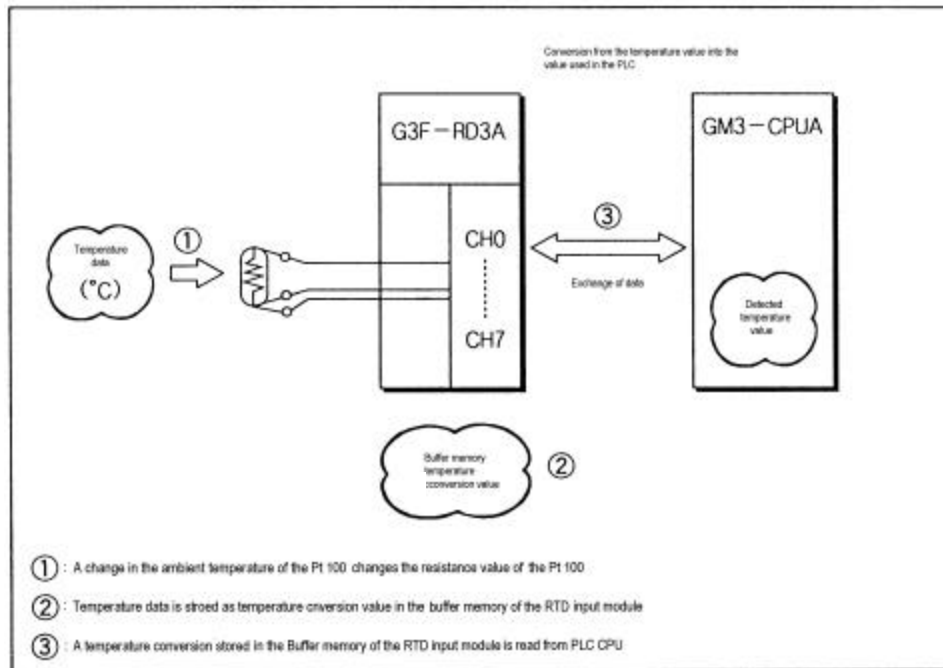
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## Chapter 1. INTRODUCTION

These two units are called G3F-RD3A and G4F-RD2A. The G3F-RD3A is an Pt input module used with the CPU of GLOFA GM1/2/3 series and MASTER-K1000S series, and the G4F-RD2A is used with the CPU of GM4 series and K 300S 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

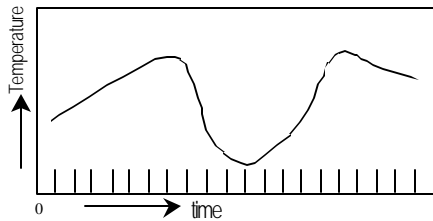


- 1) With direct connection of the RTD input module, the temperature data(°C) can be converted into a digital value to be processed in the PLC.
- 2) The temperature data(°C) input can be processed to one digit after the point as a digital value.
- 3) One module can be connected to G3F-RD3A 8-point or G4F-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.

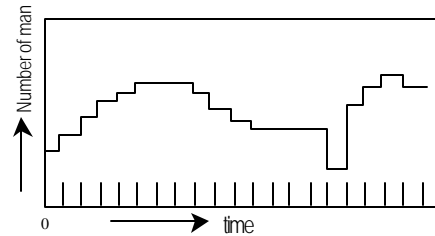


## 1.2 Glossary

### 1.2.1 A - Analog Value



[Fig 1.1] Analog Value

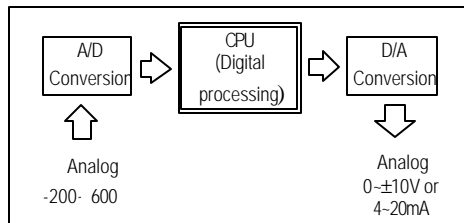


[Fig 1.2] Digital Value

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  $\Omega$  for the temperature of 0 °C

### 1.2.4 Burn-out Function

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

## Chapter 2. SPECIFICATIONS

## 2.1 General Specifications

Table 2.1 shows general specifications of the GLOFA GM series and MASTERK series

No	Item	Specifications					Reference specification
1	Operating ambient temperature	0 ~ 55 °C					
2	Storage ambient temperature	-25 ~ +75 °C					
3	Operating humidity	5 ~ 95%RH, non-condensing.					
4	Storage humidity	5 ~ 95%RH, non-condensing.					
5	Vibration	Occasional vibration					IEC 61131-2
		Frequency	Acceleration	Amplitude	Sweep Count		
		10≤ f<57 Hz	-	0.075 mm			
		57≤ f≤150 Hz	9.8 m/s <sup>2</sup> {1 G}	-			
		Continuous vibration					
		Frequency	Acceleration	Amplitude			
		10≤ f<57 Hz	-	0.035 mm			
		57≤ f≤150 Hz	4.9 m/s <sup>2</sup> {0.5G}	-			
6	Shocks	<ul style="list-style-type: none"><li>● Maximum shock acceleration: 147 m/s<sup>2</sup>{15G}</li><li>● Duration time : 11ms</li><li>● Pulse wave: half sine pulse (3 times in each of X, Y and Z directions)</li></ul>					IEC 61131-2
7	Noise Immunity	Square wave impulse noise	± 1,500 V				LGIS Standard IEC 61131-2, IEC 1000-4-2
		Electrostatic discharge	Voltage : 4 kV (contact discharge)				
		Radiated electromagnetic field	27 ~ 500 MHz, 10 V/m				IEC 61131-2, IEC 1000-4-3
		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 61131-2, IEC 1000-4-4
			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	
	G3F-RD3A	G4F-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 313.59 $\Omega$ ) JPt100 : -200.0°C to 600°C (17.14 to 317.28 $\Omega$ )	
Digital output	Digital conversion value : 0 to 16,000 Detected temperature value : -2000 to 6000 (one digit after point 5 10)	
Buffer memory	Each of three wires at every channel has detection function.	
Accuracy	$\pm 0.5$ % (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

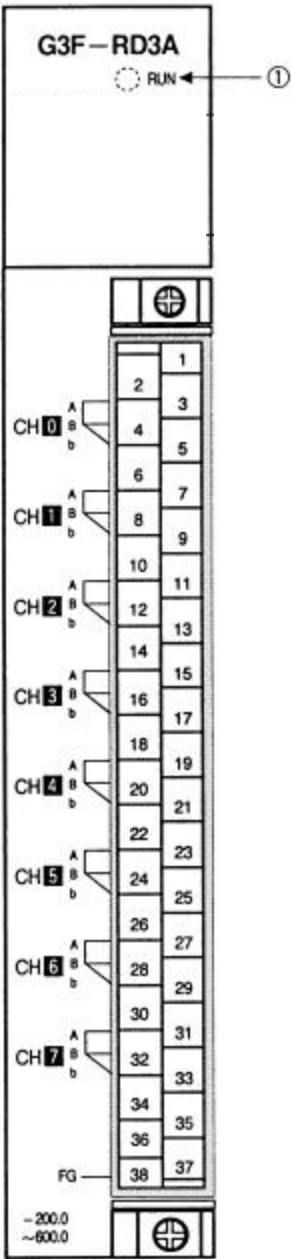
[Table. 2.2 Performance Specifications]

2.3 Names of Parts and Functions

The following gives names of parts.

2.3.1 G3F-RD3A

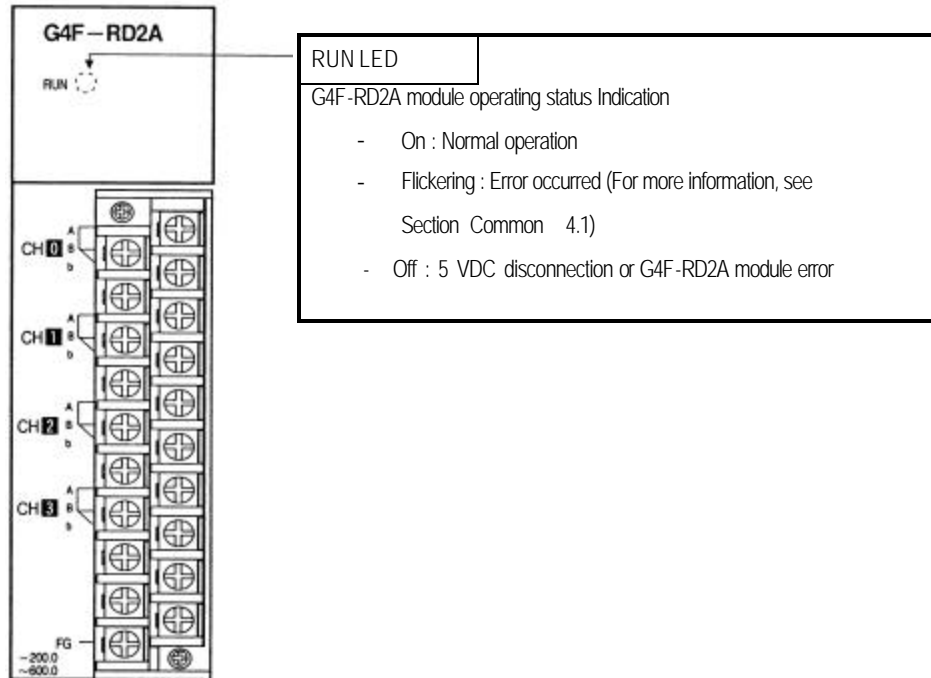
The following gives the names and functions of each part of the G3F-RD3A.



No.	Descriptions
①	<div>RUN LED</div> <div>It displays the operating status of G3F-RD3A module</div> <ul style="list-style-type: none"><li>● On : Normal Operation</li><li>● Flickering : Error occurred (For more information, see Chapter 4.1)</li><li>● Off : DC 5V disconnection or the G3F-RD3A module error</li></ul>

### 2.3.2 G4F-RD2A

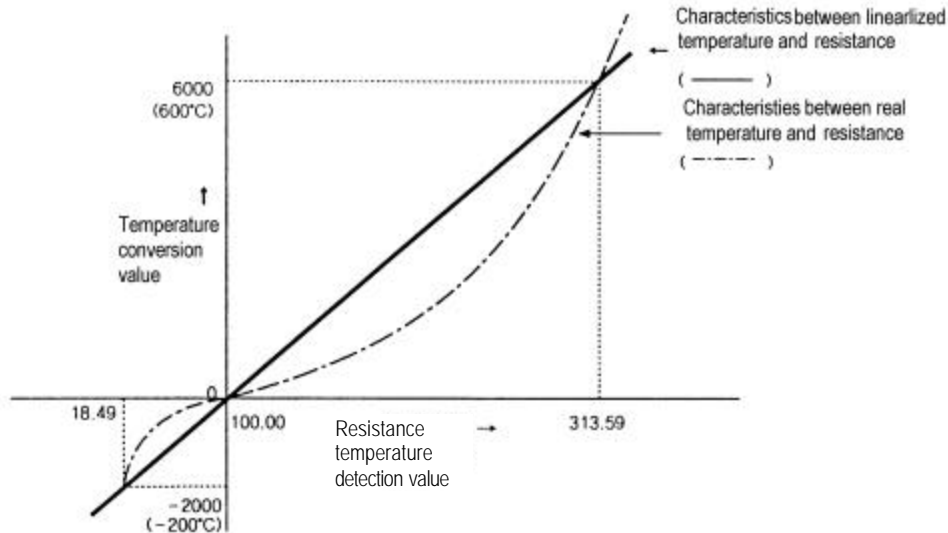
The following gives the names and functions of each part of the G4F-RD2A.



## 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  $\pm 0.5\%$  of all of the measurable temperature range.

Example) When the RTD Pt100 is used, the conversion values of  $-100^\circ\text{C}$  and  $400^\circ\text{C}$  are as below.

- Measurable temperature full range :  $800^\circ\text{C}$  ( $-200.0^\circ\text{C}$  to  $600.0^\circ\text{C}$ )
- Accuracy :  $800.5(\pm 0.5\%) = 800.5(\pm 0.005) = \pm 4^\circ\text{C}$
- Temperature conversion range :  $-104^\circ\text{C}$  to  $-96^\circ\text{C}$  when  $-100^\circ\text{C}$   
 $396^\circ\text{C}$  to  $404^\circ\text{C}$  when  $400^\circ\text{C}$

## 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

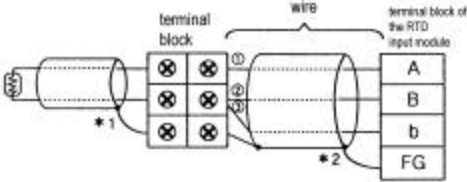
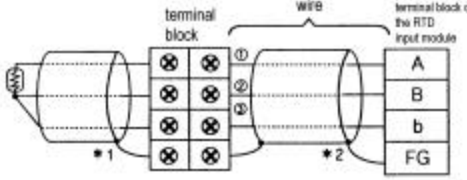
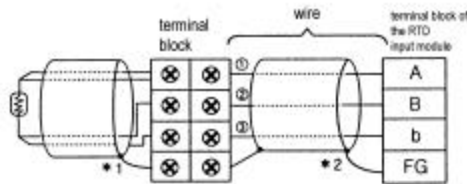
[Fig. 2.2] Burn-out Detection Area

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

Σ 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		$\aleph$ wire resistance $10\ \Omega$ $\Im$ wire resistance $10\ \Omega$ $\Re$ wire resistance $10\ \Omega$
3-wired type		The difference between the resistance values of the wires $\aleph$ and $\Im$ : $1\ \Omega$ or less The difference between the resistance values of the wires $\Im$ and $\Re$ : $1\ \Omega$ or less The difference between the resistance values of the wires $\Re$ and $\aleph$ : $1\ \Omega$ or less
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. INSTALLATION AND WIRING

### 3.1 Installation

#### 3.1.1 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.

#### 3.1.2 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.

### 3.2 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.

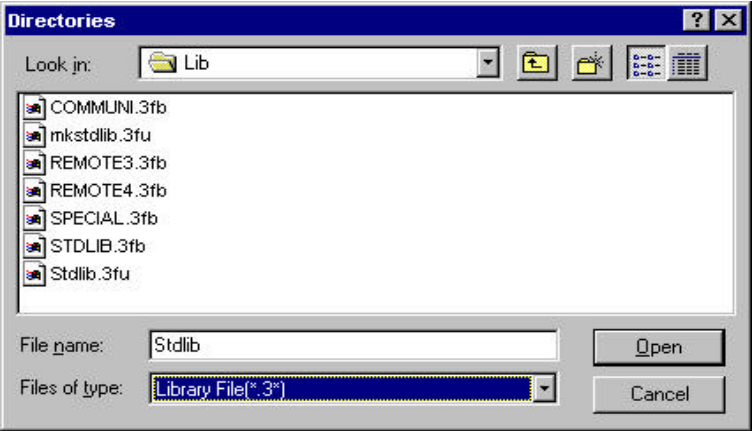
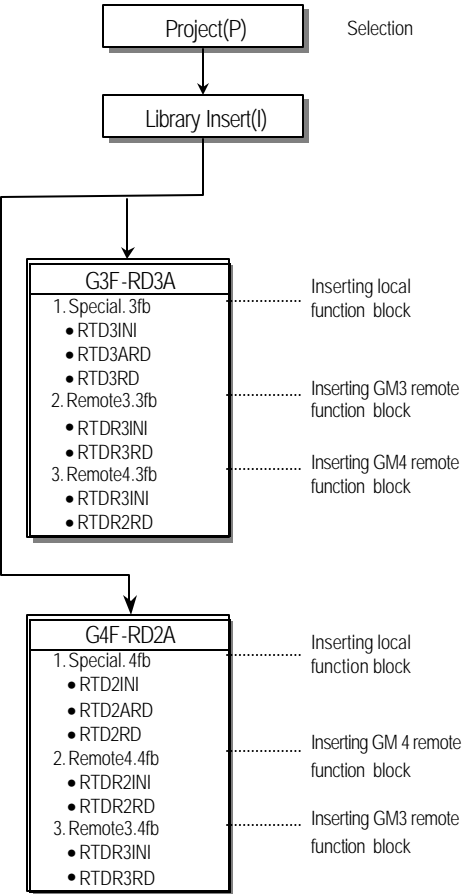
# Chapter 4. FUNCTION BLOCKS

The followings explain the function blocks for the RTD input module used in GMWIN  
The types of function block are given here.

No.	G3F-RD3A		G4F-RD2A		Function
	Local	Remote	Local	Remote	
1	RTD3INI	RTDR3INI	RTD2INI	RTDR2INI	Module Initialization
2	RTD3ARD	RTDR3RD	RTD2ARD	RTDR2RD	Reading the detected temperature value (Array type)
3	RTD3RD	-	RTD2RD	-	Reading the detected temperature value (Single type)

## 4.1 Inserting Function Blocks for the RTD Input Module in GMWIN.



Function blocks can be registered with the following procedure while the GMWIN is running.  
Registering function blocks is only possible when a project is open.



## 4.2 Local Function Blocks

## 4.2.1 Module Initialization (G3F-RD3A: RTD3INI, G4F-RD2A:RTD2INI)

Module initialization function block specifies RTD input module base location, slot location, run channel enable/disable and the type of RTD for use in program.

Function Block	I/O	Variable	Data Type	Descriptions
<b>G3F – RD3A</b> 	I	REQ	BOOL	Function block execution request area - Used to request an execution of the initialization function block - If the conditions connected with this area are established while program is running and input condition changes from low to high, the initialization function block is executed
		BASE	USINT	Base location No. - Used to write the number of the base where the RTD input module is loaded. - Setting range: GM1 series(0~31), GM2 series(0~7), GM3/4 series(0~3)
		SLOT	USINT	Slot location No. - Used to write the number of the slot where the RTD input module is loaded. - Setting range: 0~7
		CH	BOOL [Array] *Note 1	Run channel enable/disable specification - Used to enable or disable a channel for run. - Specify "1" for enabling, and "0" for disabling
		TYPE	BOOL [Array] *Note 1	Specifying the type of RTD for use - Used to specify the type of "0" for Pt100 and "1" for JPt100 for each channel "0": Pt100 "1": JPt100
<b>G4F – RD2A</b> 	O	DONE	BOOL	Function block execution complete status - "1" is output when the initialization function block is finished with no error and "1" remains until next execution. If an error occur, "0" is displayed and the operation enters into the stop state.
		STAT	USINT	Error status indication area - Used to output the number of an error when it occurs during initialization function block execution. - For description of errors, see GM Section 7.4
		ACT	BOOL [Array] *Note 1	Run channel status indication area - After the initialization function block is finished with no error, "1" is output if the channel is in normal state. But "0" is output for the disabled channels.



**REMARK**

Note 1: The numbers of Array are 8 in G3F-RD3A, 4 in G4F-RD2A.

## 4.2.2 Reading the Detected Temperature Value of the Module (Array Type)

(G3F-RD3A : RTD3ARD, G4F-RD2A : RTD2ARD)

The Array type temperature conversion value reading function block executes all channels of the RTD input module in a batch processing. If a channel is enabled then the function block outputs the detected temperature value and its digital conversion value that is usable as a PV in the PID control module.

Function Block	I/O	Variable	Data Type	Descriptions
<b>G3F-RD3A</b> 	I	REQ	BOOL	Function block execution request area - Used to request an execution of the reading function block - If the conditions connected with this area are established while the program is running and "0" changes into "1", the reading function block is executed.
		BASE	USINT	Base location No. - Used to write the number of the base where the RTD input module is loaded. - Setting range: GM1 series(0-31), GM2 series(0-7), GM3/4 series(0-3)
		SLOT	USINT	Slot location No. - Used to write the number of the slot where the RTD input module is loaded. - Setting range: 0-7
		CH	BOOL [Array] *Note 1	Run channel enable/disable specification - Used to enable or disable a channel for run. - Specify "1" for enabling, and "0" for disabling
<b>G4F-RD2A</b> 	O	DONE	BOOL	Function block execution complete status - "1" is output when the reading function block is finished with no error and "1" remains until next execution. If an error occur, '0' is displayed and the operation enters into the stop state.
		STAT	USINT	Error status indication area - Used to output the number of an error when it occurs during reading function block execution. - For description of errors, see GM Section 7.4
		ACT	BOOL [Array] *Note 1	Run channel status indication area - After the reading function block is finished with no error, "1" is output if the channel is in normal state. But "0" is output for the disabled channels.
		ALM	BOOL [Array] *Note 1	Run channel error indication area - "1" is outputted when error occurs for each run channel.
		ALM_CODE	USINT [Array] *Note 1	Run channel error code area - Used to output the code of error occurred during run for each channel. - For error description, see GM Section 7.4.
		TEMP	INT [Array] *Note 1	Detected temperature value output area - The CPU module reads the detected temperature value(-200.0°C to +600.0°C) of the corresponding channel from the RTD input module and outputs it to this area. - The detected temperature value of each channel is 10 times than the real temperature value. - (Example: Detected temperature value 1234 → real temperature value 123.4°C)
		SCAL	INT [Array] *Note 1	Digital conversion value output area - The CPU module reads the digital conversion of the corresponding channel from the RTD input module and outputs it to this area. - The detected temperature value (-200.0°C to +600.0°C) of each channel is converted into the a digital value within 0 to 16000 and it is output to this area. - Value to be read from the output variable. <ul style="list-style-type: none"> <li>• <math>SCAL = (\text{the value to be read from the output variable } TEMP + 2000) \div 2</math></li> <li>• Example: Where a temperature is 234.5°C.  The value to be read from the TEMP is (temperature 510), then 2345 is the detected temperature value.  The value to be read from the SCAL is <math>(2345 + 2000) \div 2</math>, i.e., 8690.</li> </ul> - The output value converted into a digital value can be used as the PV of the PID control module.

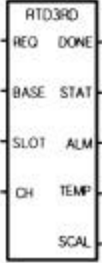
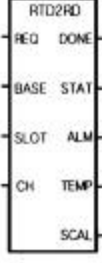
**REMARK**

Note 1: The numbers of Array are 8 in G3F-RD3A, 4 in G4F-RD2A.

## 4.2.3 Reading the Detected Temperature Value of the Module (Single Type)

(G3F-RD3A : RTD3RD, G4FRD2A : RTD2RD)

The stand-alone type Temperature conversion value reading function block processes only one channel of the RTD input module. If a channel is enabled then the function block outputs the detected temperature value and its digital conversion value that is usable as a PV in the PID control module.

Function Block	I/O	Variable	Data Type	Descriptions
<b>G3F-RD3A</b>   <b>G4F-RD2A</b> 	I	REQ	BOOL	Function block execution request area - Used to request an execution of the reading function block - If the conditions connected with this area are established while the program is running and "0" changes into "1", the reading function block is executed.
		BASE	USINT	Base location No. - Used to write the number of the base where the RTD input module is loaded. - Setting range: GM1 series(0~31), GM2 series(0~7), GM3/4 series(0~3)
		SLOT	USINT	Slot location No. - Used to write the number of the slot where the RTD input module is loaded. - Setting range: 0~7
		CH	USINT	Area for specifying the used channel. Settings : G3F-RD3A: 0 to 7, G4F-RD2A: 0 to 3
	O	DONE	BOOL	Function block execution complete status - "1" is output when the reading function block is finished with no error and "0" remains until next execution. If an error occur, "0" is displayed and the operation enters into the stop state.
		STAT	USINT	Error status indication area - Used to output the number of an error when it occurs during reading function block execution. - For description of errors, see GM Section 7.4
		ALM	BOOL	Run channel error indication area - "1" is output if error occurs for each run channel.
		TEMP	INT	Detected temperature value output area - The CPU module reads the detected temperature value(-200.0°C to +600.0°C) of the corresponding channel from the RTD input module and outputs it to this area. - The detected temperature value of each channel is 10 times than the real temperature value. (Example: Detected temperature value 1234 → real temperature value 123.4°C)
		SCAL	INT	Digital conversion value output area - The CPU module reads the digital conversion of the corresponding channel from the RTD input module and outputs it to this area. - The detected temperature value (-200.0°C to +600.0°C) of each channel is converted into a digital value within 0 to 16000 and it is output to this area. - Value to be read from the output variable. • $SCAL = \frac{\text{the value to be read from the output variable TEMP} + 2000}{52}$ • Example: Where a temperature is 234.5°C. The value to be read from the TEMP is (temperature 5 10), then 2345 is the detected temperature value. The value to be read from the SCAL is $(2345 + 2000) \div 52$ , i.e., 8690. - The output value converted into a digital value can be used as the PV of the PID control module.

## 4.3 Remote Function Block

## 4.3.1 Module Initialization (G3F-RD3A : RTDR3INI, G4F-RD2A : RTDR2INI)

The module initialization function block specifies, for use in the program, the location No. of the slot where the communication module loaded in the receiving station, the station No. of the communication module loaded in the remote I/O station, the No. of the base where the RTD input module is loaded, the use channels and the type of the RTD.

Function Block	I/O	Variable	Data Type	Descriptions
<b>G3F – RD3A</b> 	I	REQ	BOOL	Function block execution request area at rising edge. - Used to request an execution of the reading function block - If the conditions connected with this area are established while the program is running and "0" changes into "1" (rising edge), the module initialization function block is executed.
		NET_NO	USINT	Location No. of the slot where the communication module of the station to which the function block will be sent is loaded. - Setting range: 0 ~ 7
		ST_NO	USINT	Station No. of the communication module loaded in the remote I/O station. - Setting range: 0 ~ 63
		BASE	USINT	Base module location No. - Used to write the number of the base where the RTD input module is loaded. - Setting range: 0 ~ 3
		SLOT	USINT	Slot location No. - Used to write the number of the slot where the RTD input module is loaded. - Setting range: 0~7
		CH	BOOL [Array] *Note 1	Run channel enable/disable specification - Used to enable or disable a channel for run. - Specify "1" for enabling, and "0" for disabling
		TYPE	BOOL [Array] *Note 1	Specifying the type of RTD for use - Used to specify the type of "0" for Pt100 and "1" for JPt100 for each channel
<b>G4F – RD2A</b> 	O	NDR	BOOL	"1" when the function block is finished without error. "1" remains during the scan where the execution condition is being satisfied and it changes into "0" at the next scan.
		ERR	BOOL	Error information indication area - If error occurs during initialization function block execution "1" is output and the module enter into the stop state. "1" remains during the scan where the execution condition is being satisfied and it changes into "0" at the next scan.
		STAT	USINT	Error status indication area - Used to output the number of an error when it occurs during reading function block execution. - For description of errors, see GM Section 7.4
		ACT	BOOL [Array] *Note 1	Run channel status indication area - After the initialization function block is finished with no error, "1" is output if the channel is in normal state. But "0" is output for the disabled channels.


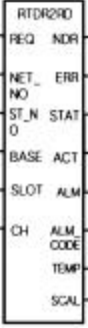
## REMARK

Note 1: The numbers of Array are 8 in G3F-RD3A, 4 in G4F-RD2A.

## 4.3.2 Reading the Detected Temperature Value of the Module

## (G3F-RD3A : RTDR3RD, G4F-RD2A : RTDR2RD)

The module temperature conversion value reading function block specifies the location No. of the slot where the communication module loaded in the receiving station, the station No. of the communication module loaded in the remote I/O station. It also processes all channels in block. The enabled channel outputs the temperature conversion value and its digital conversion value that can be used as the PV in the PID control module, and the two values are used in the program.

Function Block	I/O	Variable	Data Type	Descriptions
<b>G3F — RD3A</b> 	I	REQ	BOOL	Function block execution request area (at the ascending edge) - Used to request an execution of the reading function block - If the conditions connected with this area are established while the program is running and "0" changes into "1(rising edge)", the module reading function block is executed.
		NET_NO	USINT	Location No. of the slot where the communication module of the station to which the function block will be sent is loaded. - Setting range: 0 ~ 7
		ST_NO	USINT	Station No. of the communication module loaded in the remote I/O station. - Setting range: 0 ~ 63
		BASE	USINT	Base module location No. - Used to write the number of the base where the RTD input module is loaded. - Setting range: 0 ~ 3
		SLOT	USINT	Slot location No. - Used to write the number of the slot where the RTD input module is loaded. - Setting range: 0~7
		CH	BOOL [Array] *Note 1	Run channel enable/disable specification - Used to enable or disable a channel for run. - Specify "1" for enabling, and "0" for disabling
		NDR	BOOL	"1" when the function block is finished without error. "1" remains during the scan where the execution condition is being satisfied and changes into "0" at next scan.
<b>G4F — RD2A</b> 	O	ERR	BOOL	Error information indication area - If error occurs during reading function block execution "1" is outputted and the module enter into the stop state. "1" remains during the scan where the execution condition is being satisfied and it changes into "0" at the next scan.
		STAT	USINT	Error status indication area - Used to output the number of an error when it occurs during reading function block execution. - For description of errors, see GM Section 7.4
		ACT	BOOL [Array] *Note 1	Run channel status indication area - After the reading function block is finished with no error, "1" is output if the channel is in normal state. But "0" is output for the disabled channels.
		ALM	BOOL [Array] *Note 1	Run channel error indication area - "1" is outputted when error occurs for each run channel.
		ALM_CODE	USINT [Array] *Note 1	Run channel error code area - Used to output the code of error occurred during run for each channel. - For error description, see GM Section 7.4.
		TEMP	INT [Array] *Note 1	Detected temperature value output area - The CPU module reads the detected temperature value(-200.0°C to +600.0 °C) of the corresponding channel from the RTD input module and outputs it to this area. - The detected temperature value of each channel is 10 times than the real temperature value. - (Example: Detected temperature value 1234 → real temperature value 123.4 °C)
		SCAL	INT [Array] *Note 1	Digital conversion value output area - The CPU module reads the digital conversion of the corresponding channel from the RTD input module and outputs it to this area. - The detected temperature value (-200.0°C to +600.0°C) of each channel is converted into the a digital value within 0 to 16000 and it is outputted to this area. - Value read from the output variable, SCAL = (the value read the output variable TEMP + 2000) 5 2 <ul style="list-style-type: none"> <li>Example: Where a temperature is 234.5 °C. The value read from the TEMP is (temperature 5 10), then 2345 is the detected temperature value. The value read from the SCAL is (2345 + 2000) 5 2, i.e., 8690.</li> </ul> - The output value converted into a digital value can be used as the PV of the PID control module.

## REMARK

Note 1: The numbers of Array are 8 in G3F-RD3A, 4 in G4F-RD2A.



## 4.4 Errors on Function Block

## 4.4.1 Errors Indicated by the Output Variable STAT

Errors indicated the output variable STAT and their corrective actions are explained.

STAT No.	Item	Descriptions	Function Block			Corrective Action
			Initiali- zation	Reading Array	Stand- alone	
0	Local	Normal run status	0	0	0	—
1		Base location No. outside the setting range	0	0	0	Adjust it within the setting range (See GM Section 7.2)
2		The corresponding base unit hardware defect	0	0	0	Contact a service station
3		Slot location No. outside the setting range	0	0	0	Specify correctly the numbers of the slot where the RTD module is loaded.
4		The specified slot has no RTD input module	0	0	0	Load RTD input module on the specified slot.
5		A module other than RTD input module is loaded on.	0	0	0	Load RTD input module on the specified slot.
6		Channel No. outside the setting range	—	—	0	Specify correctly the No. of the run channel.
7		RTD input module hardware defect	0	0	0	Contact a service station.
8		RTD input module memory defect	0	0	0	Contact a service station.
9		The run channel was not specified in the Initialization function block.	—	0	0	Specify correctly run channels in the initialization function block.
10		Disconnection detected at one or more of the use channels, or temperature outside the range.	—	0	—	See GM Section 7.4.2.
16		A disconnection detected at the use channels	—	—	0	Fix the A terminal disconnection between the RTD input module and the temperature-measuring resistor
17		B disconnection detected at the use channels	—	—	0	Fix the B terminal disconnection between the RTD input module and the temperature-measuring resistor
18		b disconnection detected at the use channels. A and B disconnection detected simultaneously.	—	—	0	Fix the disconnection between the b terminal RTD input module and the temperature-measuring resistor. Or, Fix A and B terminals disconnection.
19		Temperature outside the range at the use channels	—	—	0	Correctly specify the type of the temperature-measuring resistor, or use the temperature within the range (200.0°C ~ 600.0°C)
128	Re- mote	Remote communications module H/W defect	0	0	—	See Remote communications module User's Manual
129		Base location No. outside the setting range	0	0	—	Adjust it within the setting range (See GM Section 7.2)
131		Slot location No. outside the setting range	0	0	—	Specify correctly the numbers of the slot where the RTD Input module is loaded.
133		Other module, not RTD input module, is loaded	0	0	—	Load RTD input module on the specified slot.
135		RTD input module hardware defect	0	0	—	Contact a service station.
136		RTD input module memory defect	0	0	—	Contact a service station.
137		The run channel was not specified in the Initialization function block.	—	0	—	Specify correctly run channels in the initialization function block.
138		Disconnection detected at one or more of the use channels, or temperature outside the range.	—	0	—	See GM Section 7.4.2.

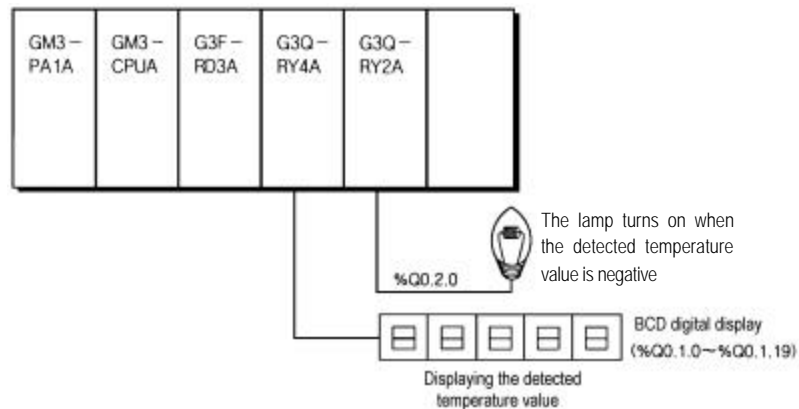
## 4.4.2 Errors Indicated by the Output Variable ALM\_CODE in the Array Type Detected Temperature Value Reading Function Block. (G3F-RD3A : RTD3ARD, RTDR3RD. G4F-RD2A : RTD2ARD, RTDR2RD)

ALM_CODE No.	Descriptions	Corrective Action
0	Normal run status	—
16	A disconnection detected	Fix the A disconnection between RTD input module and RTD.
17	B disconnection detected	Fix the A disconnection between RTD input module and RTD
18	b disconnection detected, A and B disconnection detected simultaneously.	Fix the A disconnection between RTD input module and RTD. Or, Fix the A and B disconnection.
19	Temperature outside the range	Correctly specify the type of the RTD, or use the temperature within the range (200.0°C ~ 600.0°C)

## Chapter 5. PROGRAMMING

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

#### 1) System Configuration



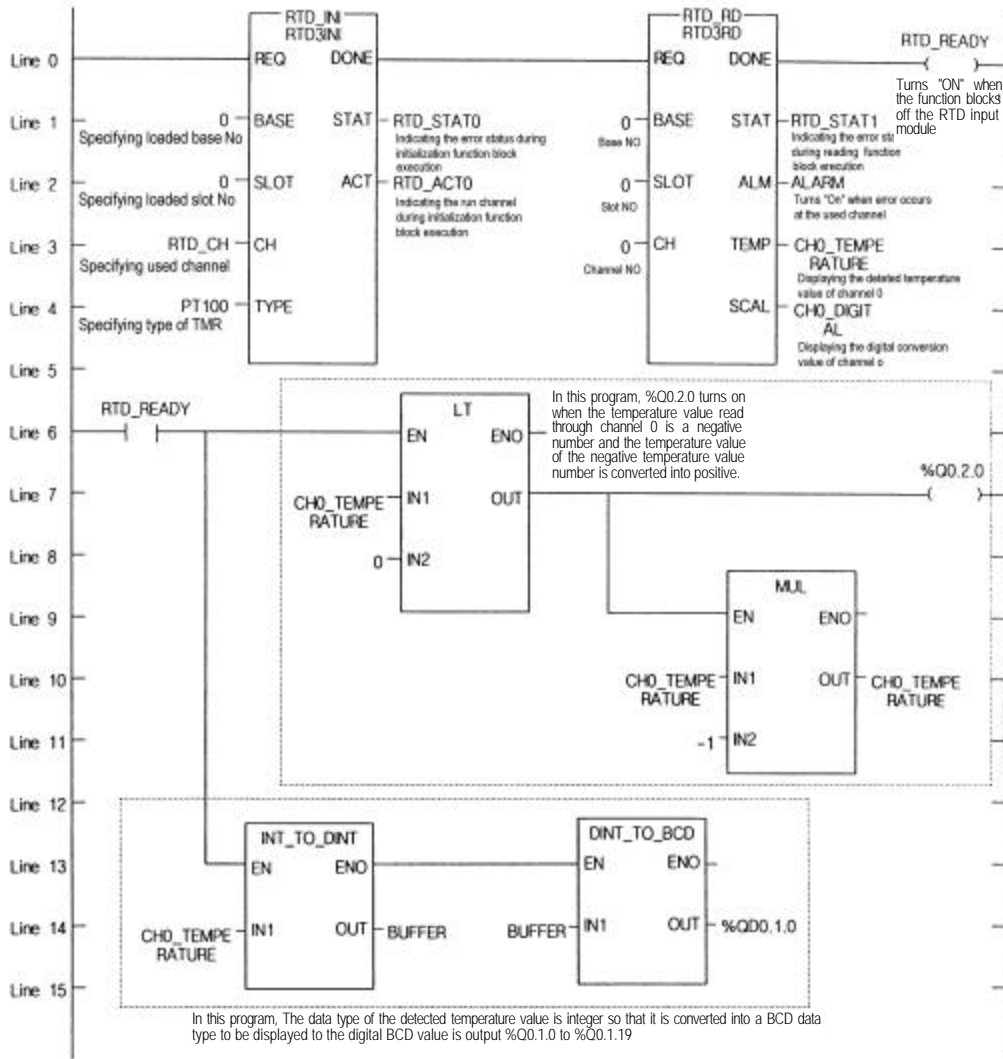
#### 2) Initial Settings

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

#### 3) Descriptions of the Program

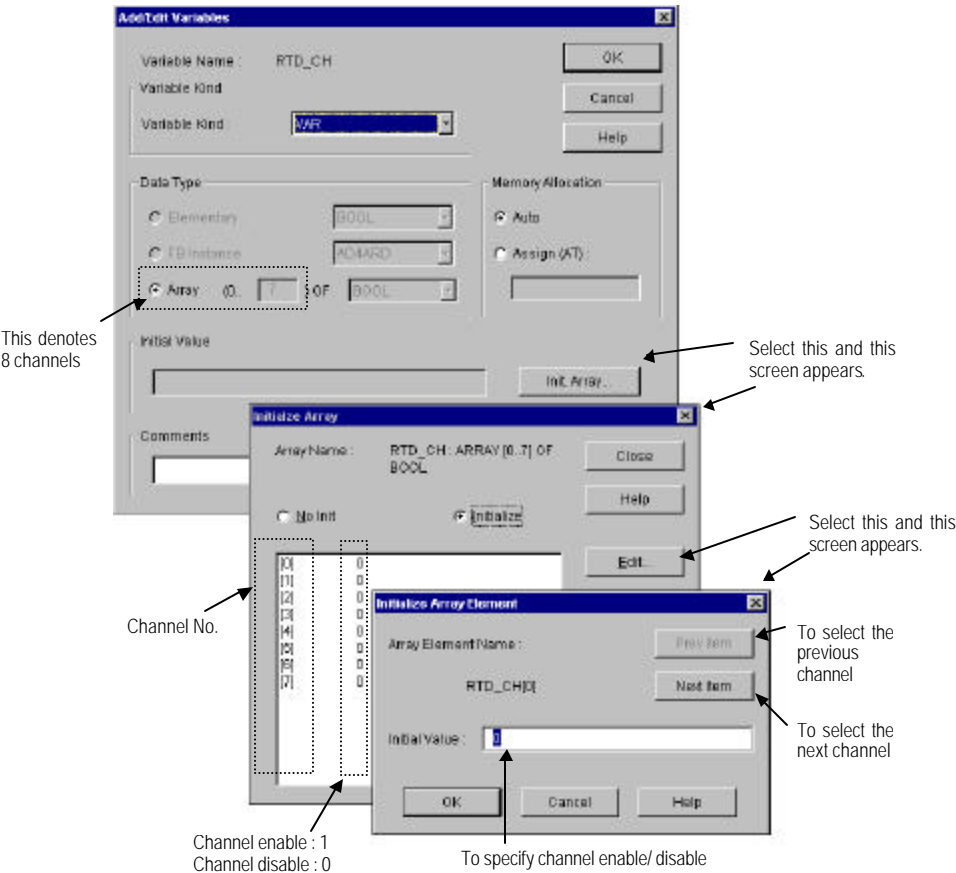
The present A/D conversion value of the detected temperature value which is detected from the temperature-measuring resistor Pt 100 is displayed on the BCD digital display by use of channel 0 of the temperature-measuring resistor input module. The lamp turns on when the detected temperature value is a negative number and turns off when it is a positive number.

4) Program

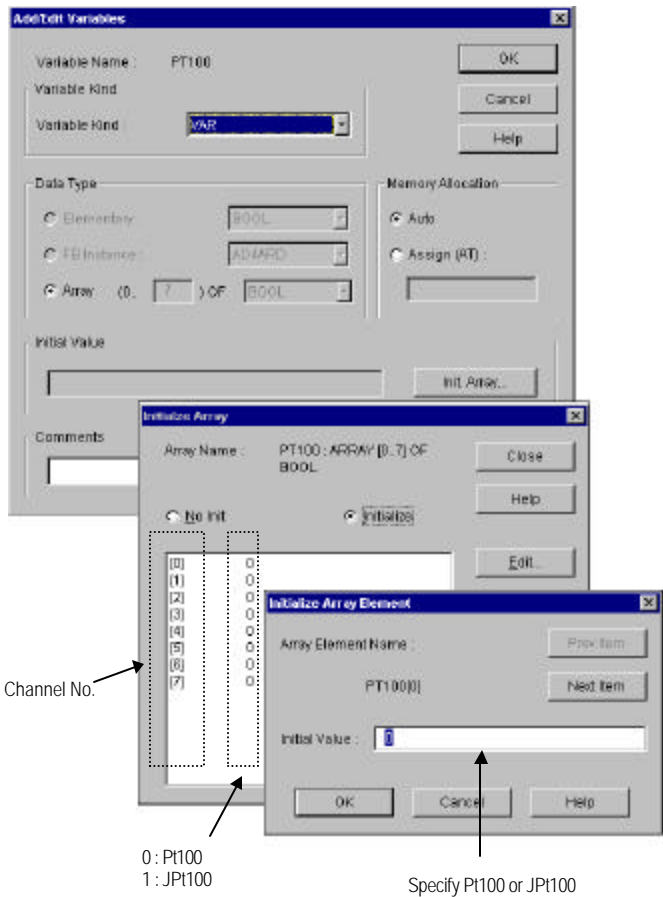


5) Setting the initial values of I/O variables

(1) specifying channel



(2) Specifying the type of the RTD

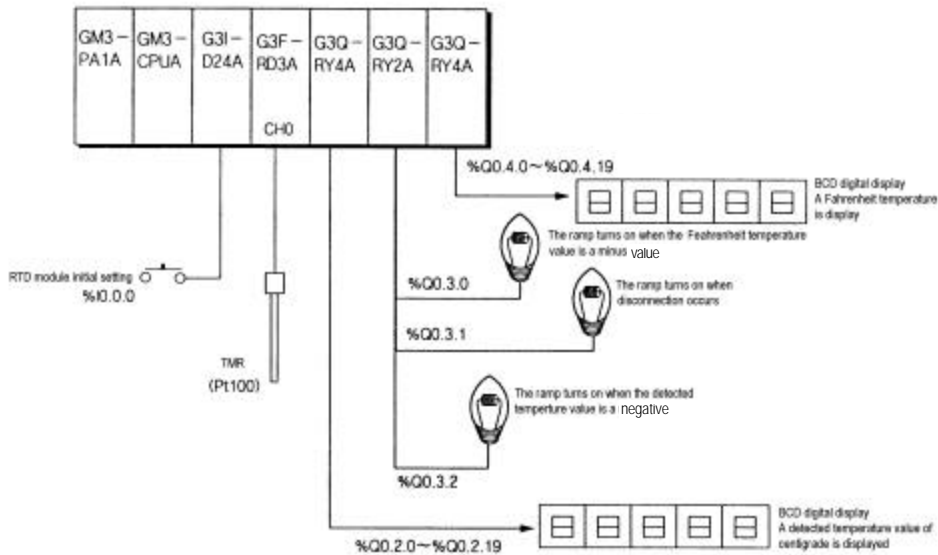


## 6) I/O variables used in the program

Variable Name	Var_Kind	Data Type	(AT Address) (Initial Value)
ALARM	: VAR	: BOOL	
BUFFER	: VAR	: DINT	
CHO_DIGITAL	: VAR	: INT	
CHO_TEMPERATURE	: VAR	: INT	
PT100	: VAR	ARRAY[0..7] OF BOOL	: = { 0, 0, 0, 0, 0, 0, 0, 0}
RTD_ACTO	: VAR	ARRAY[0..7] OF BOOL	
RTD_CH	: VAR	ARRAY[0..7] OF BOOL	: = { 1, 0, 0, 0, 0, 0, 0, 0}
RTD_INI	: VAR	FB Instance	
RTD_RD	: VAR	FB Instance	
RTD_READY	: VAR	: BOOL	
RTD_STAT0	: VAR	: USINT	
RTD_STAT1	: VAR	: USINT	

## 5.2 A Program for Converting the Detected Temperature Value(°C) into Fahrenheit(°F) and Output as a BCD Value

### 1) System



### 2) Initial Settings

- (1) Specifying the used channel : channel 0
- (2) Specifying the type of a temperature - measuring resistor : Pt 100

### 3) The Expression that Converts the Detected Temperature Value into a Fahrenheit

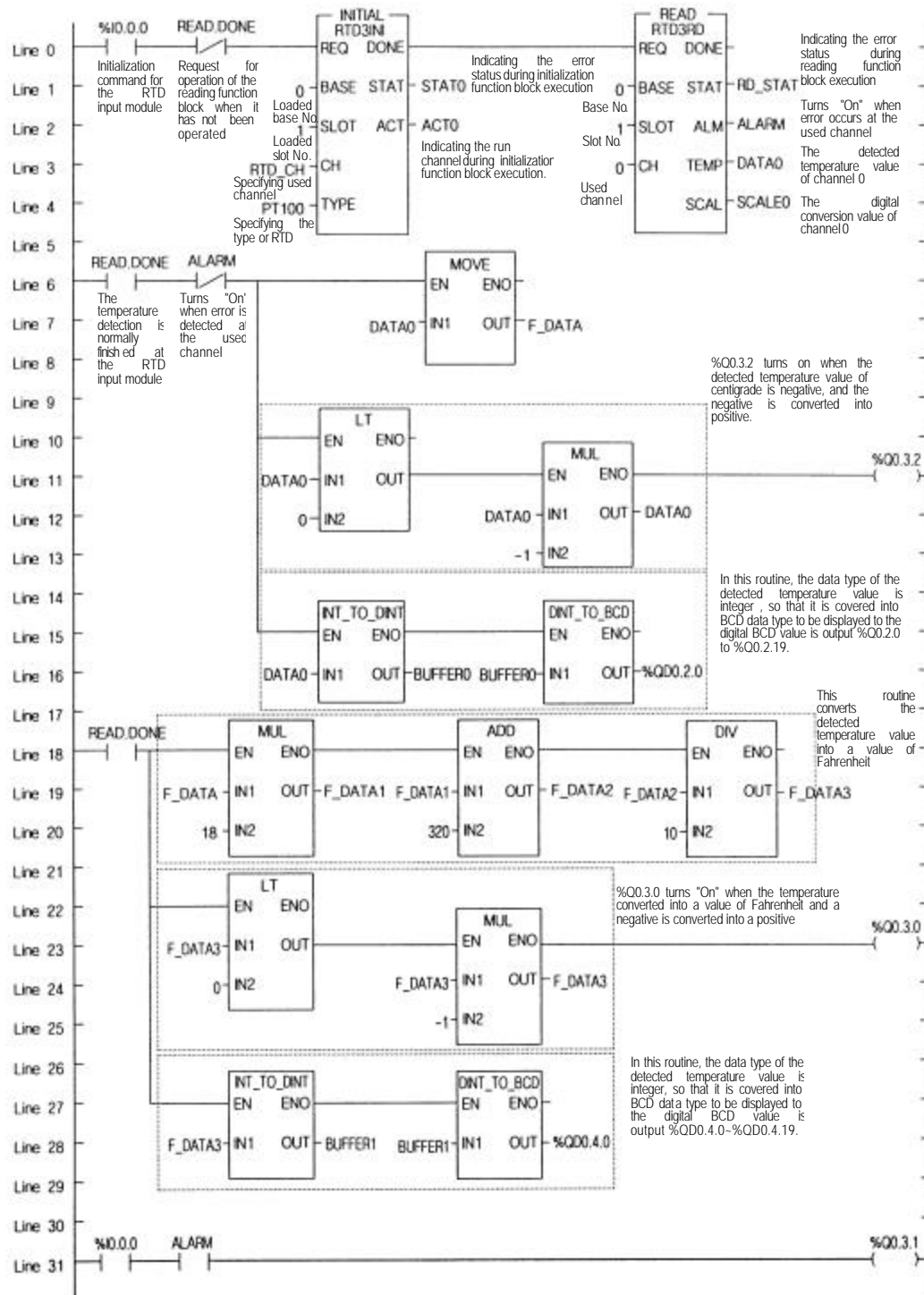
$$\begin{aligned}
 \text{Detected temperature value} &= \text{real temperature value} \times 10 \\
 \text{Fahrenheit temperature} &= \text{real temperature} \times 1.8 + 32 \\
 &= \frac{\text{Detected temperature value}}{10} \times 1.8 + 32 \\
 &= \frac{\text{Detected temperature value} \times 18 + 320}{10}
 \end{aligned}$$

∴ If the Fahrenheit temperature displayed on the BCD digital display is represented as 'the real Fahrenheit temperature x 10', "the detected temperature x 18 + 320" be processed into the program.

### 4) Descriptions of the Program

- (1) If %I0.0.0 turns on then the initialization of the RTD input module is executed.
- (2) The detected temperature value is displayed on %Q0.2.0 to %Q0.2.19 of the BCD digital display when it is negative the ramp %Q0.3.2 turns on
- (3) The detected temperature value is converted into a Fahrenheit temperature value and displayed on %Q0.4.0 to %Q0.4.19 of the BCD digital display when it is negative the ramp %Q0.3.0 turns on.
- (4) If disconnection is detected during temperature conversion at channel 0, The Lamp %Q0.3.1 turns on.

## 5) Program



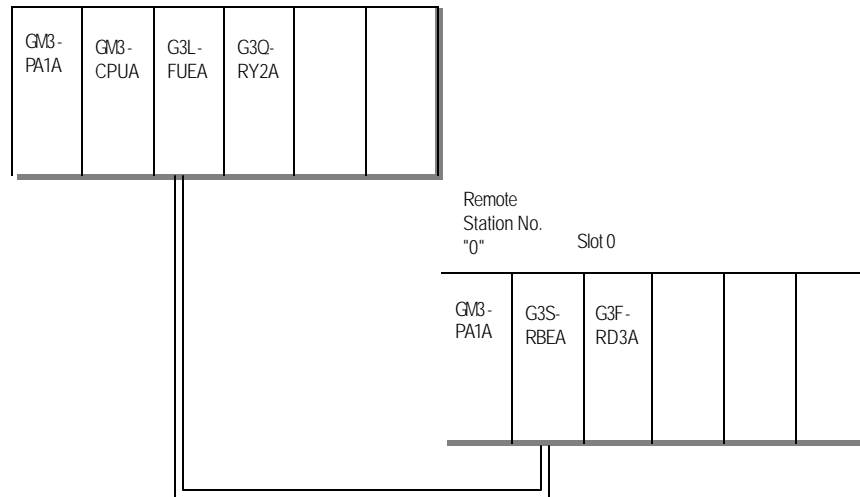


## 6) I/O variables used in the Program

Variable Name	Var_Kind	Data Type	(AT Address) (Initial Value)
ACTO	: VAR	: ARRAY [0..7] OF BOOL	
ALARM	: VAR	: BOOL	
BUFFER0	: VAR	: DINT	
BURRER1	: VAR	: DINT	
DATAO	: VAR	: INT	
F_DATA	: VAR	: INT	
F_DATA1	: VAR	: INT	
F_DATA2	: VAR	: INT	
F_DATA3	: VAR	: INT	
INTIAL	: VAR	: FB Instance	
PT100	: VAR	: ARRAY [0..7] OF BOOL	: = { 0, 0, 0, 0, 0, 0, 0, 0}
RD_STAT	: VAR	: USINT	
READ	: VAR	: FB Instance	
RTD_CH	: VAR	: ARRAY [0..7] OF BOOL	: = { 1, 0, 0, 0, 0, 0, 0, 0}
SCALEO	: VAR	: INT	
STATO	: VAR	: USINT	

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

#### 1) System Configuration



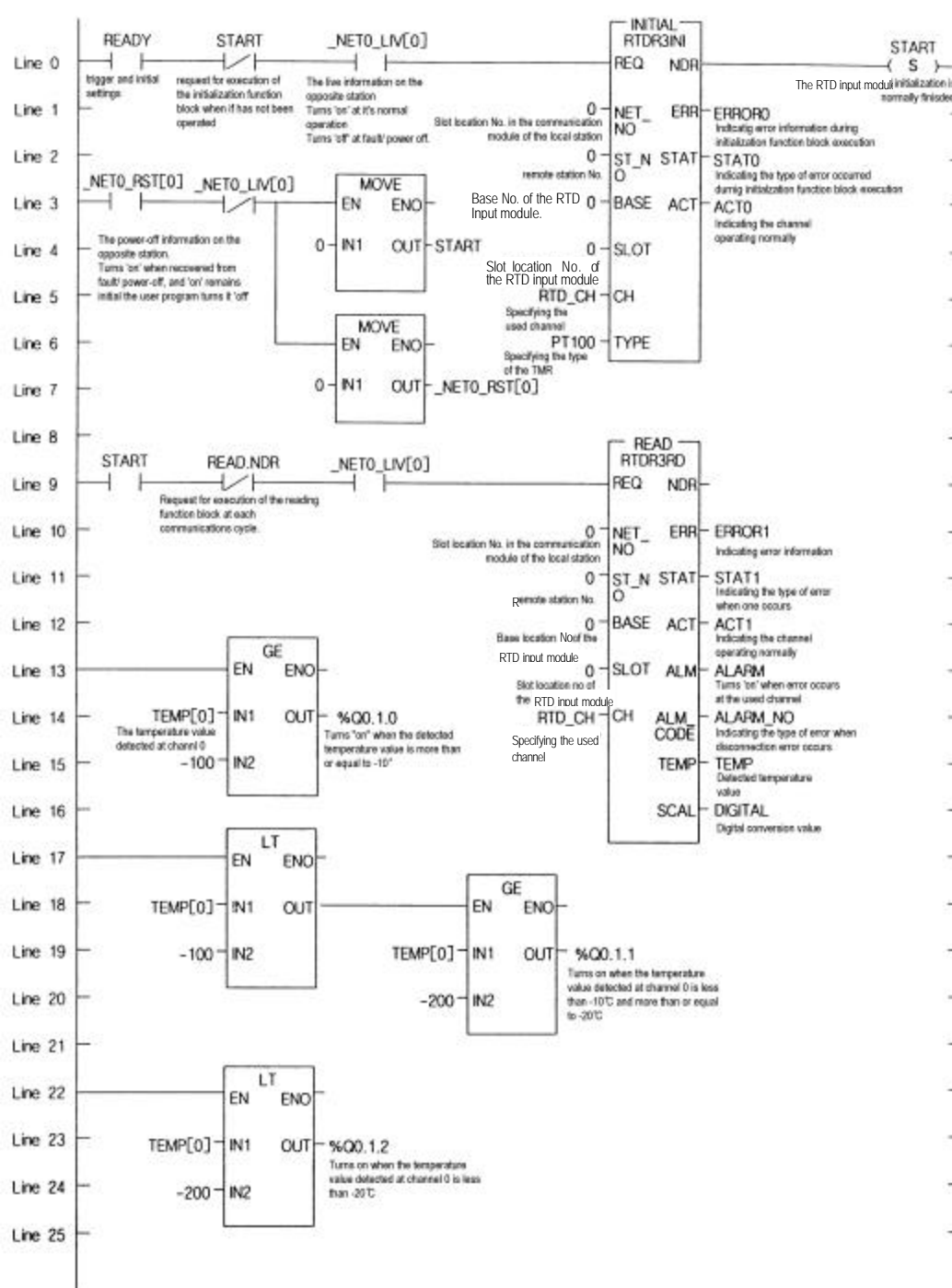
#### 2) Initial Settings

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

#### 3) Descriptions of the Program

- (1) %Q0.1.0 turns on when the temperature value detected at channel 0 is more than or equal to -10°C
- (2) %Q0.1.1 turns on when the temperature value detected at channel 0 is less than -10°C and more than or equal to -20°C
- (3) %Q0.1.2 turns on when the temperature value detected at channel 0 is less than -20°C

## 4) Program



## 7) I/O variables used in the Program

Variable Name	Var_Kind	Data Type	(AT Address) (Initial Value)
ACTO	: VAR	: ARRAY [0..7] OF BOOL	
ACT1	: VAR	: ARRAY [0..7] OF BOOL	
ALARM	: VAR	: ARRAY [0..7] OF BOOL	
ALARM_NO	: VAR	: ARRAY [0..7] OF BOOL	
DIGITAL	: VAR	: ARRAY [0..7] OF BOOL	
ERROR0	: VAR	: BOOL	
ERROR1	: VAR	: BOOL	
INITIAL	: VAR	: FB Instance	
PT100	: VAR	: ARRAY [0..7] OF BOOL	: = { 0 0, 0, 0, 0, 0, 0, 0}
READ	: VAR	: FB Instance	
READY	: VAR	: BOOL	
RTD_CH	: VAR	: ARRAY [0..7] OF BOOL	: = { 0, 0, 0, 0, 0, 0, 0, 0}
START	: VAR	: BOOL	
STAT0	: VAR	: USINT	
STAT1	: VAR	: USINT	
TEMP	: VAR	: ARRAY [0..7] OF INT	

## Chapter 6. BUFFER MEMORY CONFIGURATION AND FUNCTIONS

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

### 6.1 Buffer Memory Configuration

The followings describe buffer memory configuration.

#### 6.1.1 G3F-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	<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
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	<p>Bit On(1) : The contents at address 0~8 are changed with new values.</p> <p>Bit Off(0): The contents at address 0~8 remains with the previous value.</p>	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	<p>Bit On(1):Outside the setting range</p> <p>Bit Off(0): Normal</p>	-	"

## 6.1.2 G4F-RD2A Buffer Memory

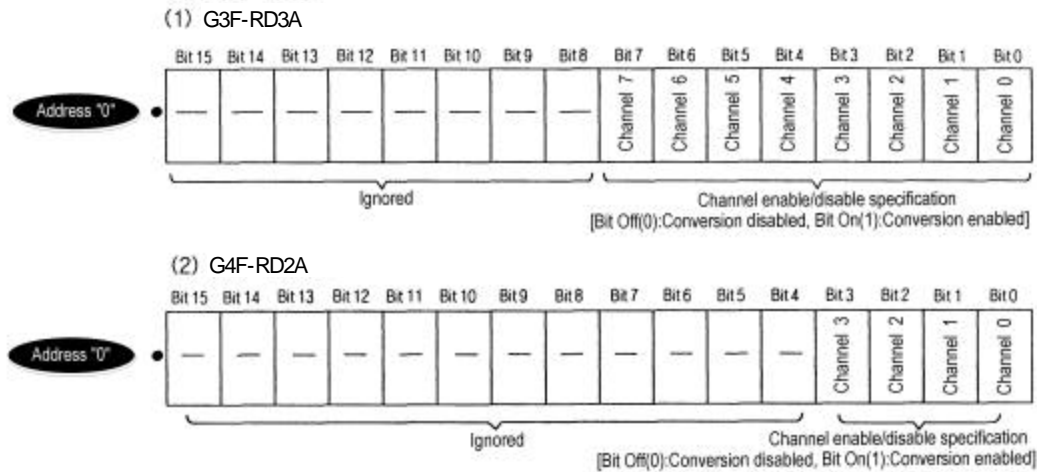
Address (Decimal)	Function	Description	Default Setting	Read / Write
0	Channel enable/disable specification	Bit On(1):enable, Bit Off(0):disable	disable	RW
1	Channel 0 Specifying RTD type	0 : Pt 100 1: JPt 100	" 0" (Pt 100)	"
2	Channel 1 Specifying RTD type			"
3	Channel 2 Specifying RTD type			"
4	Channel 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. 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. 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. Bit Off(0): The contents at address 0~4 remains with the previous value.</p>	No setting values	RW
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 Bit Off(0): Normal</p>	-	"

## 6.2 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.

### 6.2.1 Specifying Channel Enable/Disable (G3F-RD3A : Address 0, G4F-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.



### 6.2.2 Specifying the Type of the RTD (G3F-RD3A : Addresses 1-8, G4F-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.

G3F-RD3A			G4F-RD2A		
Address (Decimal)	Corresponding Channel	Setting Value	Address (Decimal)	Corresponding channel	Setting Value
1	0	0 : Pt100	1	0	0 : Pt100
2	1	1 : JPt100	2	1	1 : JPt100
3	2	If a value other than 0 and 1 is specified, then error is indicated at address 35 and Pt100 is specified	3	2	If a value other than 0 and 1 is specified, then error is indicated at address 19 and Pt100 is specified
4	3		4	3	
5	4				
6	5				
7	6				
8	7				

### 6.2.3 Detected Temperature Value

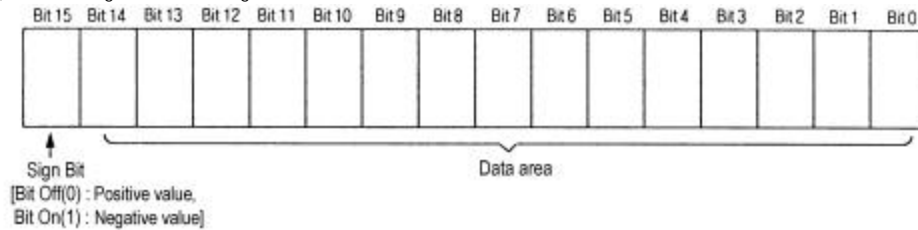
(G3F-RD2A : Addresses 9, 12, 15, 18, 24, 27 and 30, G4F-RD2A : Addresses 5, 8, 11 and 14)

- 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 G3F -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.

### 6.2.4 Digital Conversion Value

(G3F-RD3A : Address 10, 13, 16, 19, 22, 25, 28 and 31, G4F-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 (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.

### 6.2.5 Error Code

(G3F-RD3A : Addresses 11,14, 17, 20, 23, 26, 29 and 32, G4F-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.

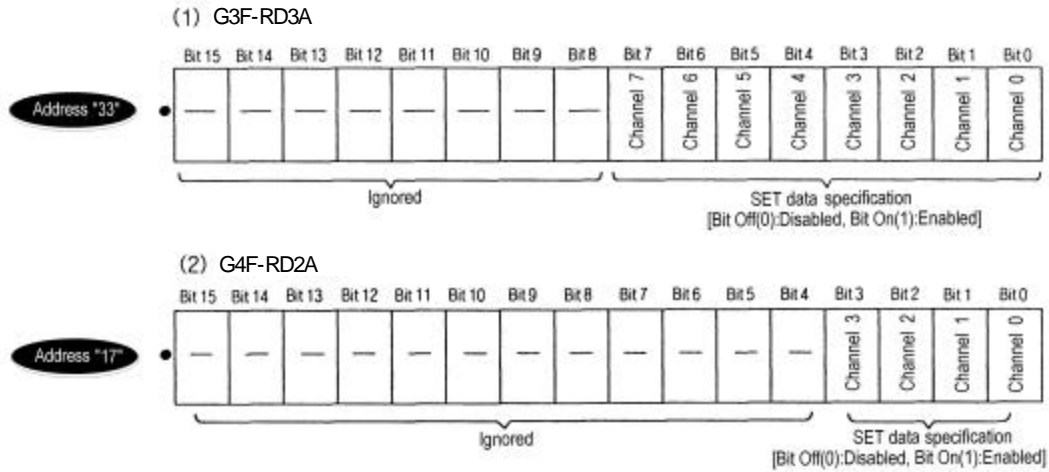
Error Code (Decimal)	Error Description	Data processing at error occurrence	RUN LED status
16	A disconnection detected	Detected temperature value and digital conversion value before error occurrence remains	Flickering with 0.1 sec.
17	B disconnection detected		
18	B disconnection detected, A and B disconnection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

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

### 6.2.6 Specifying SET Data (G3F-RD3A : Address 33, G4F-RD2A : Address 17)

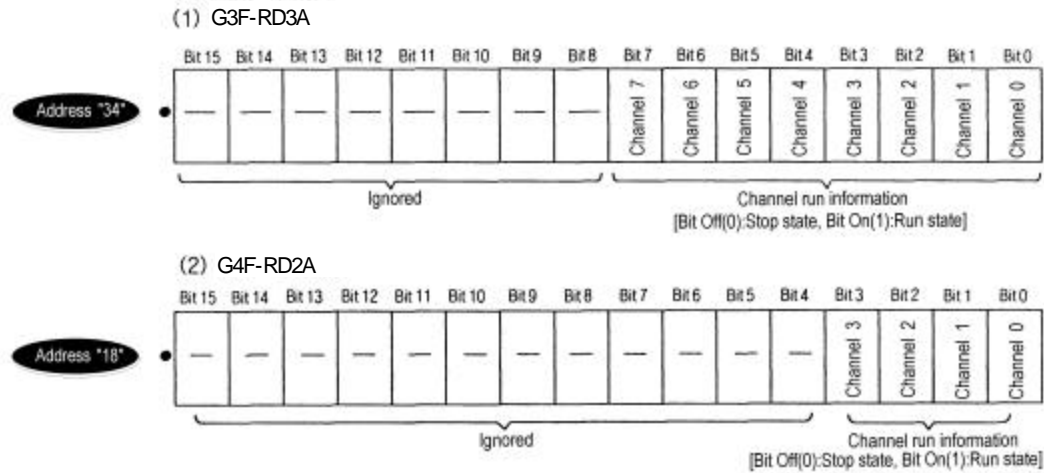


- 1) If a bit corresponding to each channel in Set Data specification area is turned On(1), then the RTD input module executes the temperature conversion with user-defined setting data at the address 0 to 8 in the G3F-RD3A and at the address 0 to 4 in the G4F-RD2A.
- 2) If the bit corresponding to each 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 G3F-RD3A and at the address 0 to 4 in the G4F-RD2A but with the previous setting data.
- 3) The followings show the SET data specification



#### 6.2.7 Information on Run Channel (G3F-RD3A : Address 34, G4F-RD2A : Address 18)

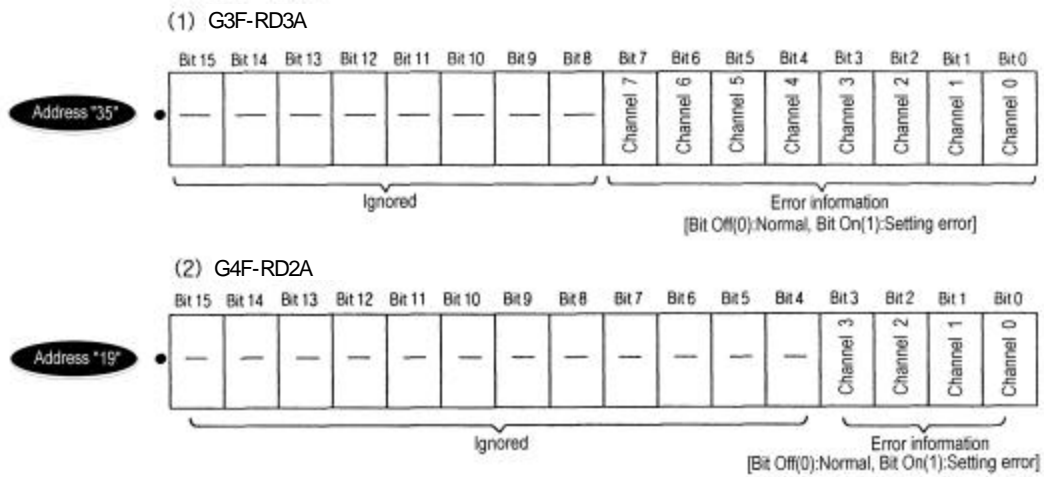
This area stores information on run status of each channel.



#### 6.2.8 Information on RTD Specification Error

(G3F-RD3A : Address 35, G4F-RD2A : Address 19)

- 1) If error occurs in other value than "0" and "1" is set at the addresses (Address 1 to 8 in G3F-RD3A, Address 1 to 4 in G4F-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 7. DEDICATED INSTRUCTIONS FOR SPECIAL MODULES

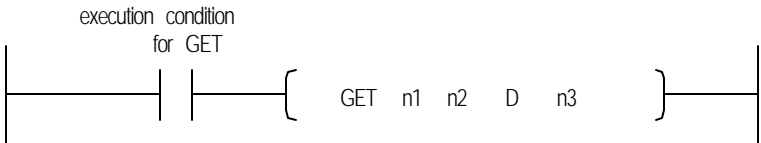
## (Read from /Write to Buffer Memory)

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

### 7.1 Local

#### 7.1.1 Read from Buffer Memory × × × GET, GETP

<Format>



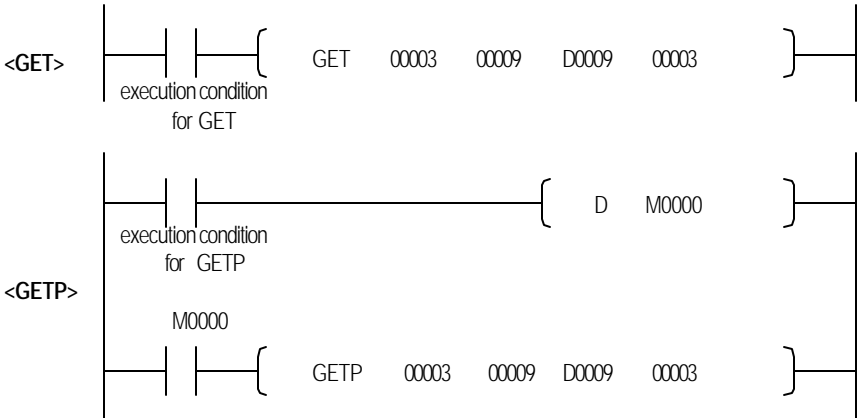
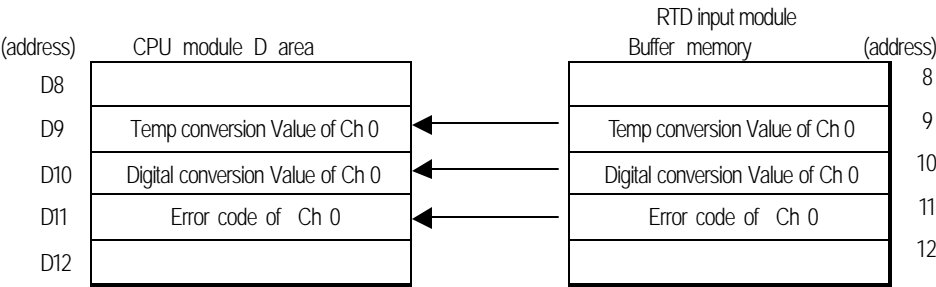
Format	Descriptions	Available Data Type
n1	The number of the slot where the special modules mounted	Integer
n2	First address of the special module buffer memory from which the data will be read.	Integer
D	First address of the device to store the data read.	M,P,K,L,T,C,D,#D
n3	Word number of data to be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

#### <The difference between GET and GETP>

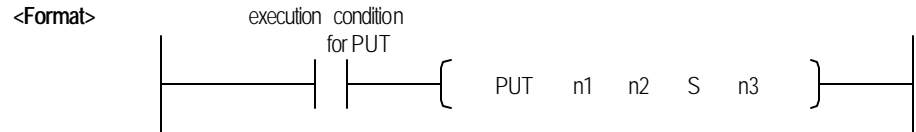
GET: always executed if the execution condition turns On. (  )

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.

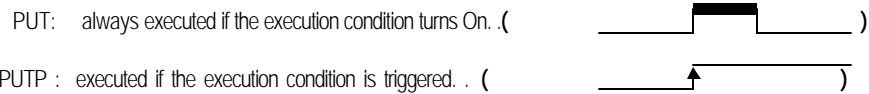


7.1.2 Write to Buffer Memory . . . PUT, PUTP

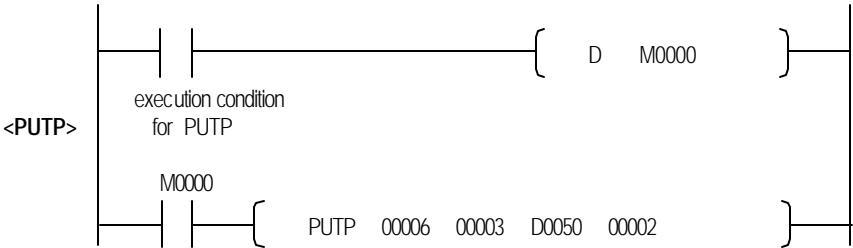
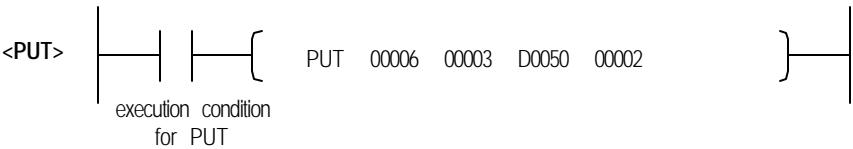
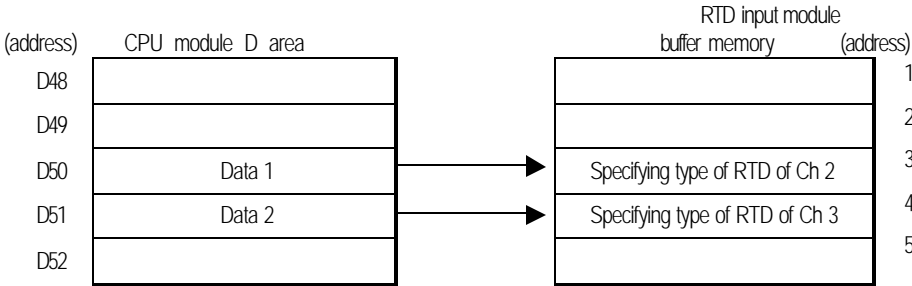


Format	Descriptions	Available Data Type
n1	The number of the slot where the specific module mounted	Integer
n2	First address of the specific module buffer memory to which the data will be written..	Integer
S	First address of the device where the data to be written has been stored, or an integer	M,P,K,L,T,C,D,#D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

<The difference between PUT and PUTP>



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.



7.2 Remote

7.2.1 Read from Buffer Memory ...RGET

<Format>

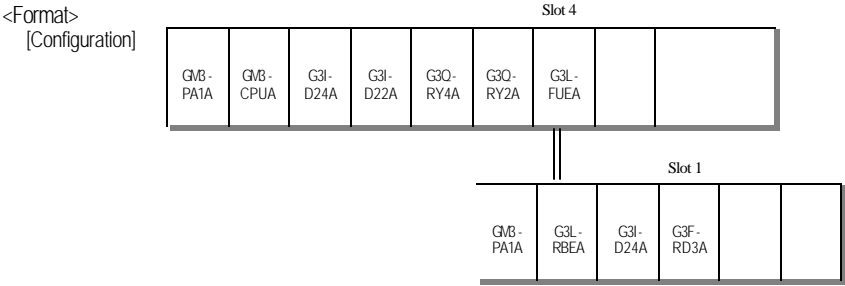
Execution condition  
for GET

[ RGET SI St D S n SS ]

Format	Descriptions	Available data type
SI	<div><div>AB CD</div><div>Upper Lower (8bit) (8bit)</div></div> Higher(AB) : Code value for RTD input module G3F - RD3A : 04h G4F - RD2A : 84h Lower(CD) : Slot No. of the communications module of the local station(FUEA) Setting range : 0 to 7	Integer
St	<div><div>EF GH</div><div>Upper Lower (8bit) (8bit)</div></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

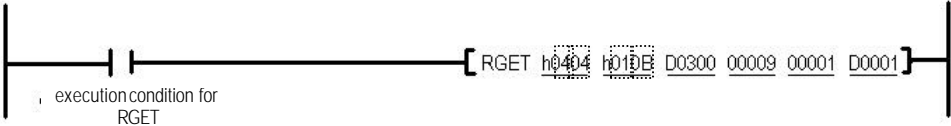
REMARK

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 : )  
Otherwise, The content in the buffer memory of the temperature - measuring input module is unreadable.

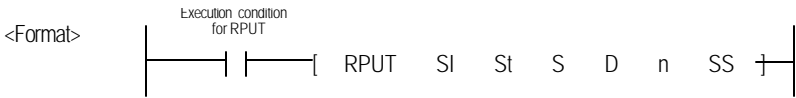


- [Read from buffer memory]
- Station No. 11(0Bh)
- 1) The content in the buffer memory address 9(one word) is read, where the detected temperature value of the channel 0 of the RTD input module had been stored.
  - 2) The data read is stored to D300
  - 3) Information on the communications status is stored to D1

[Program]



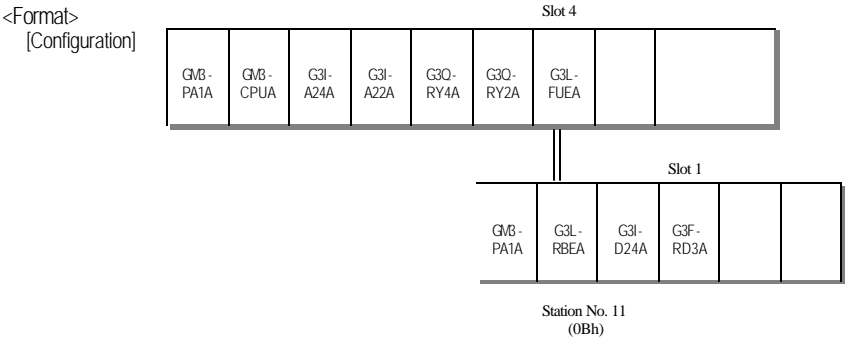
7.2.2 Write to Buffer Memory ...RPUT



Format	Description	Available data type
SI	Upper(AB) : Code value for RTD input module G3F - RD3A : 04h G4F - RD2A : 84h Lower(CD) : Slot No. of the communications module of the local station Setting range : 0 to 7	Integer
St	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

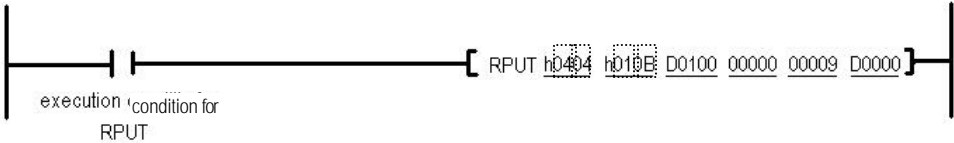
REMARK

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]

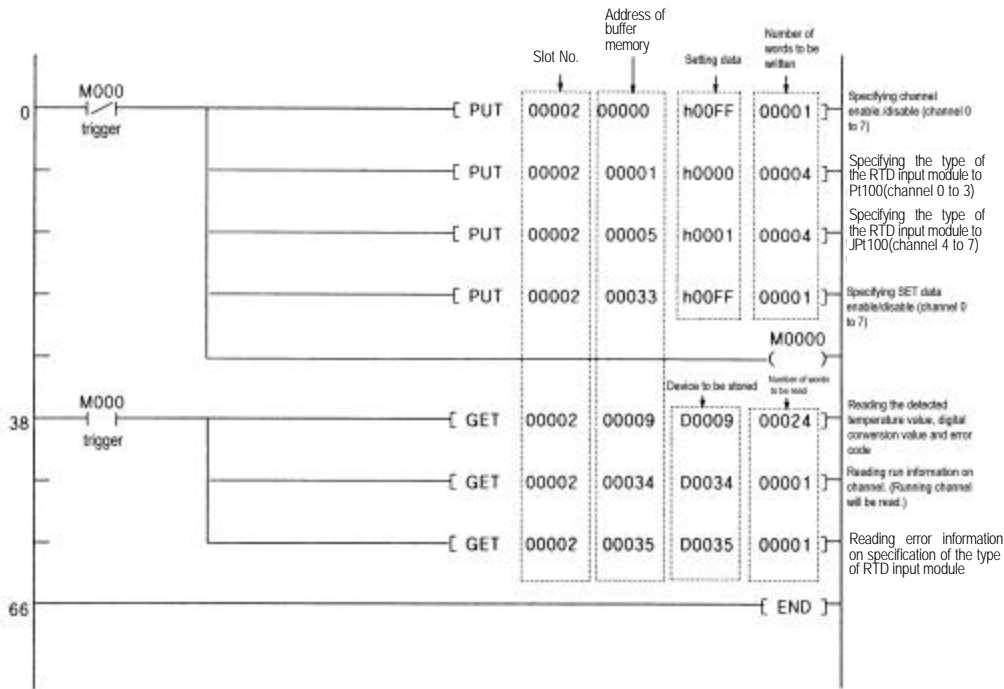


# Chapter 8. PROGRAMMING

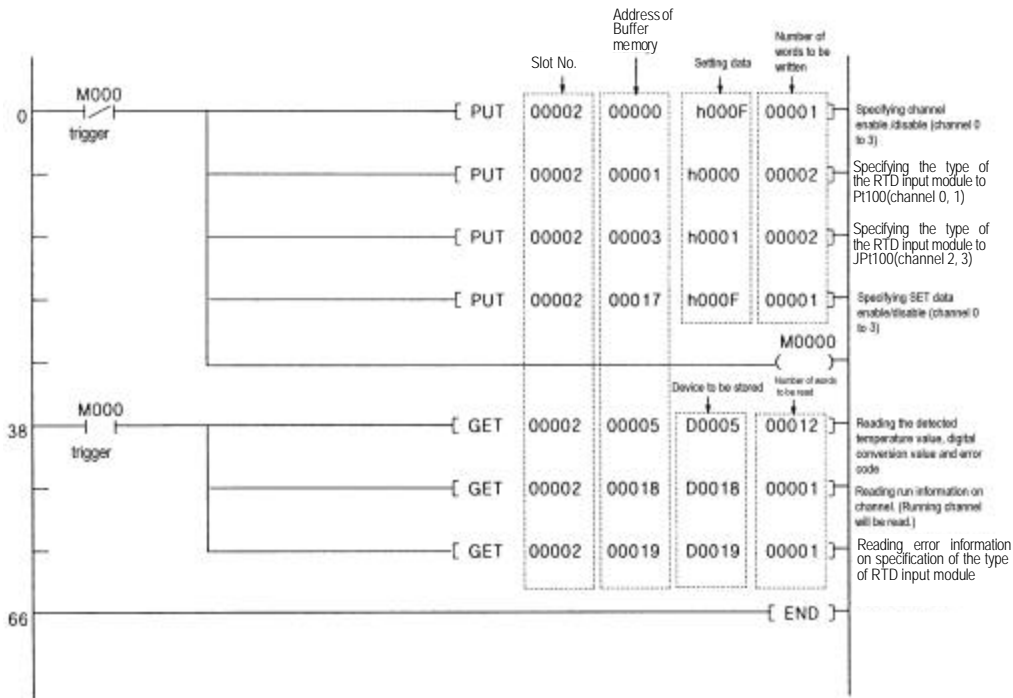
## 8.1 Basic Programming

- ▶ 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.

### 8.1.1 G3F-RD3A



8.1.2 G4F-RD2A

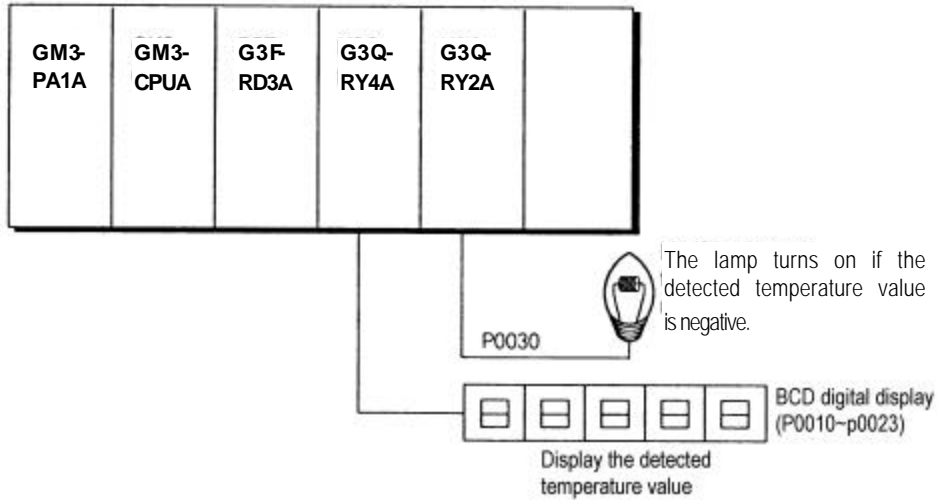




## 8.1 Application Programming

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

## 1) System Configuration



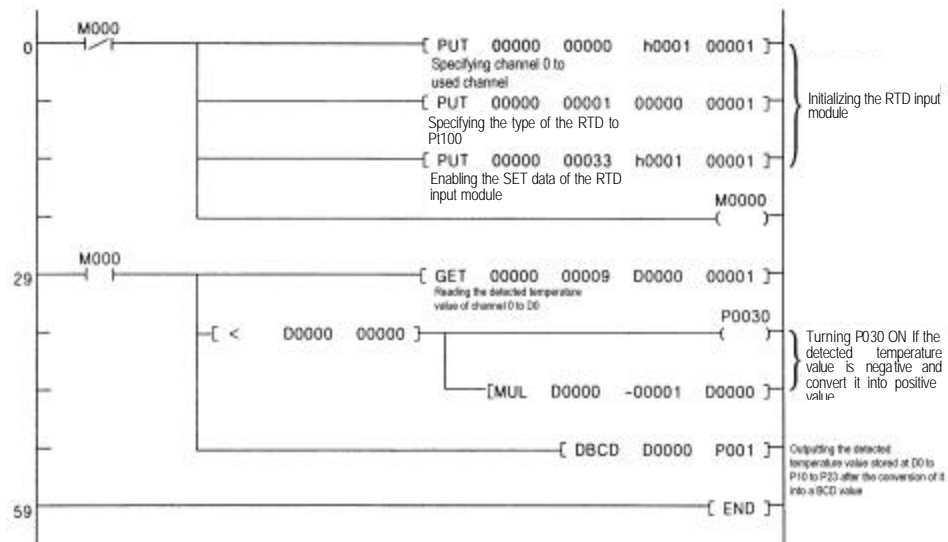
## 2) Initial Settings

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

## 3) Descriptions of the Program

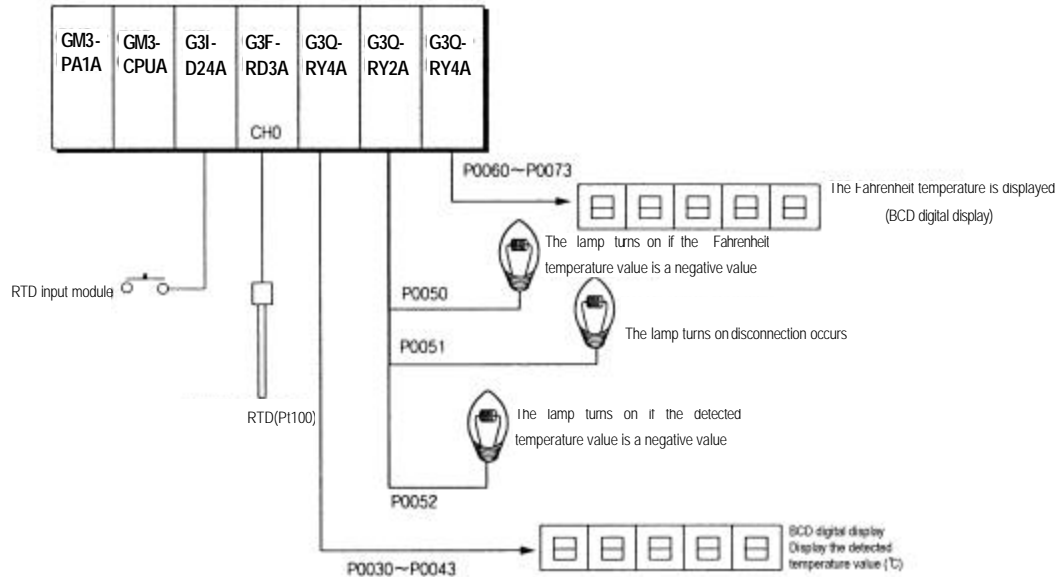
The present A/D conversion value of the detected temperature value, which is detected from the RTD Pt 100 by use of channel 0 of the RTD input module, is displayed on the BCD digital display. If the detected temperature value is negative then the lamp turns on and if positive the lamp turns off.

## 4) Program



## 8.2.2 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)

Detected temperature value = real temperature × 10

Fahrenheit temperature value (°F) = real temperature × 1.8 + 32

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

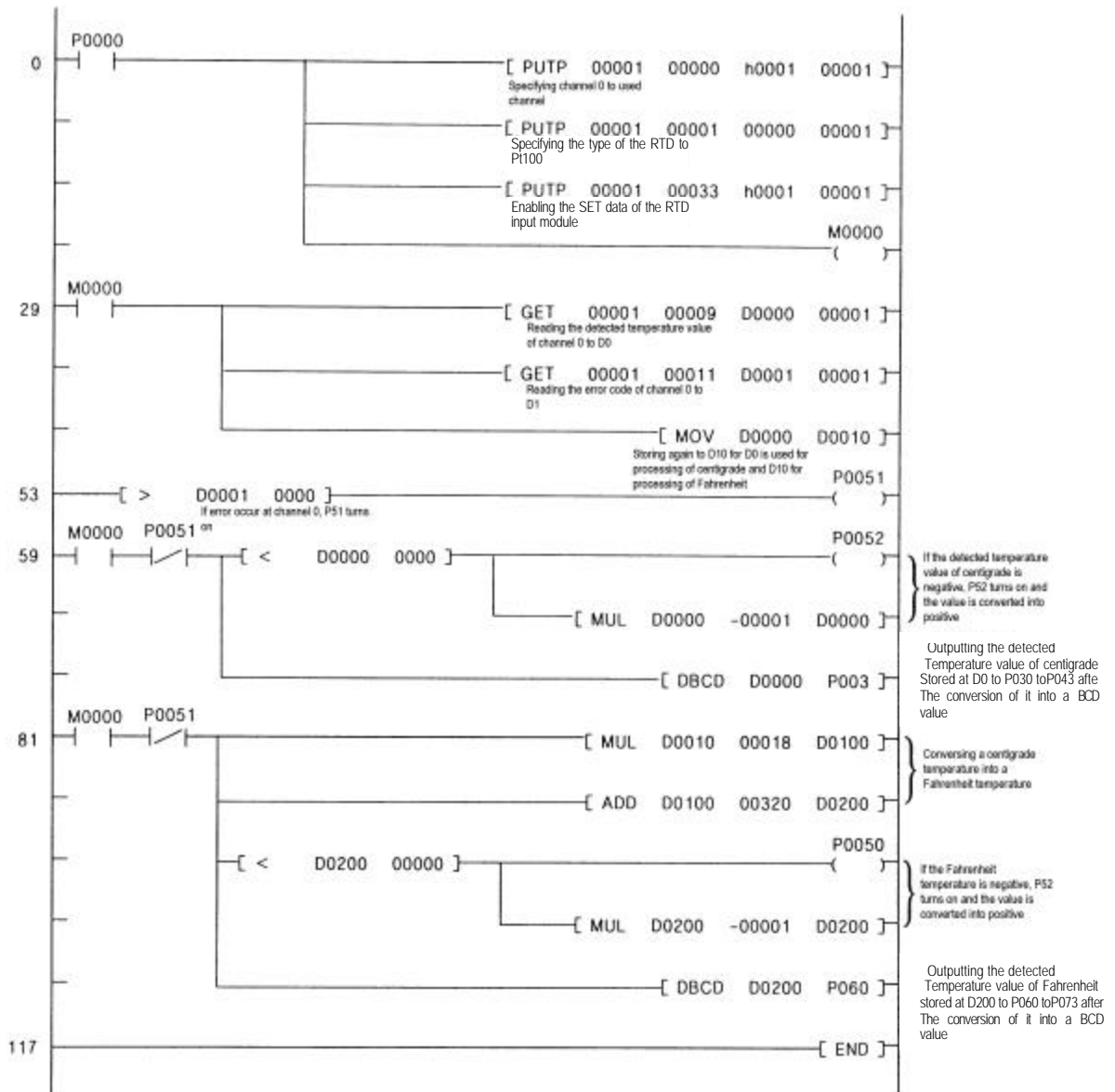
$$= \frac{\text{detected temperature value} \times 18 \times 320}{10}$$

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

### 4) Descriptions of the Program

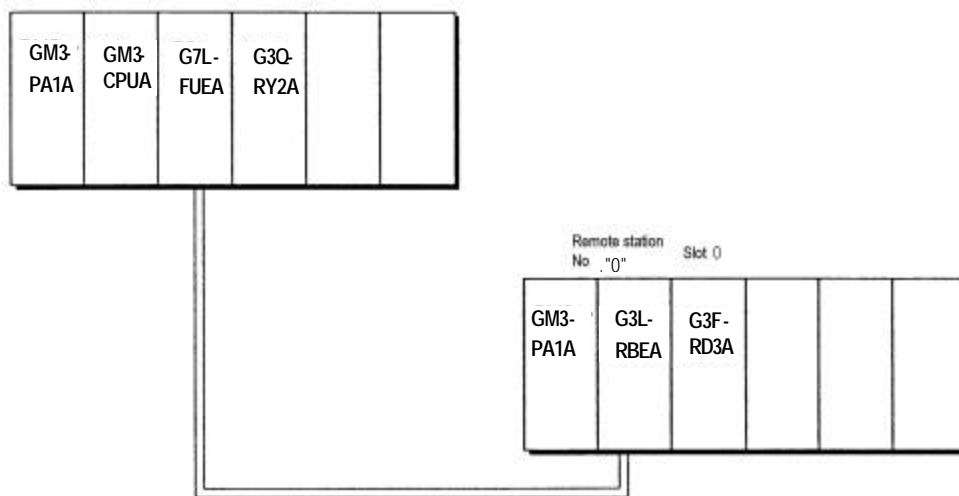
- (1) If P0000 turns on, the RTD input module is initialized.
- (2) The detected temperature value is displayed to P0030 to P0043 of the BCD digital display. If the value is negative value the ramp P0052 turns on.
- (3) The detected temperature value is converted to a Fahrenheit temperature value (°F) 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



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

#### 1) System Configuration



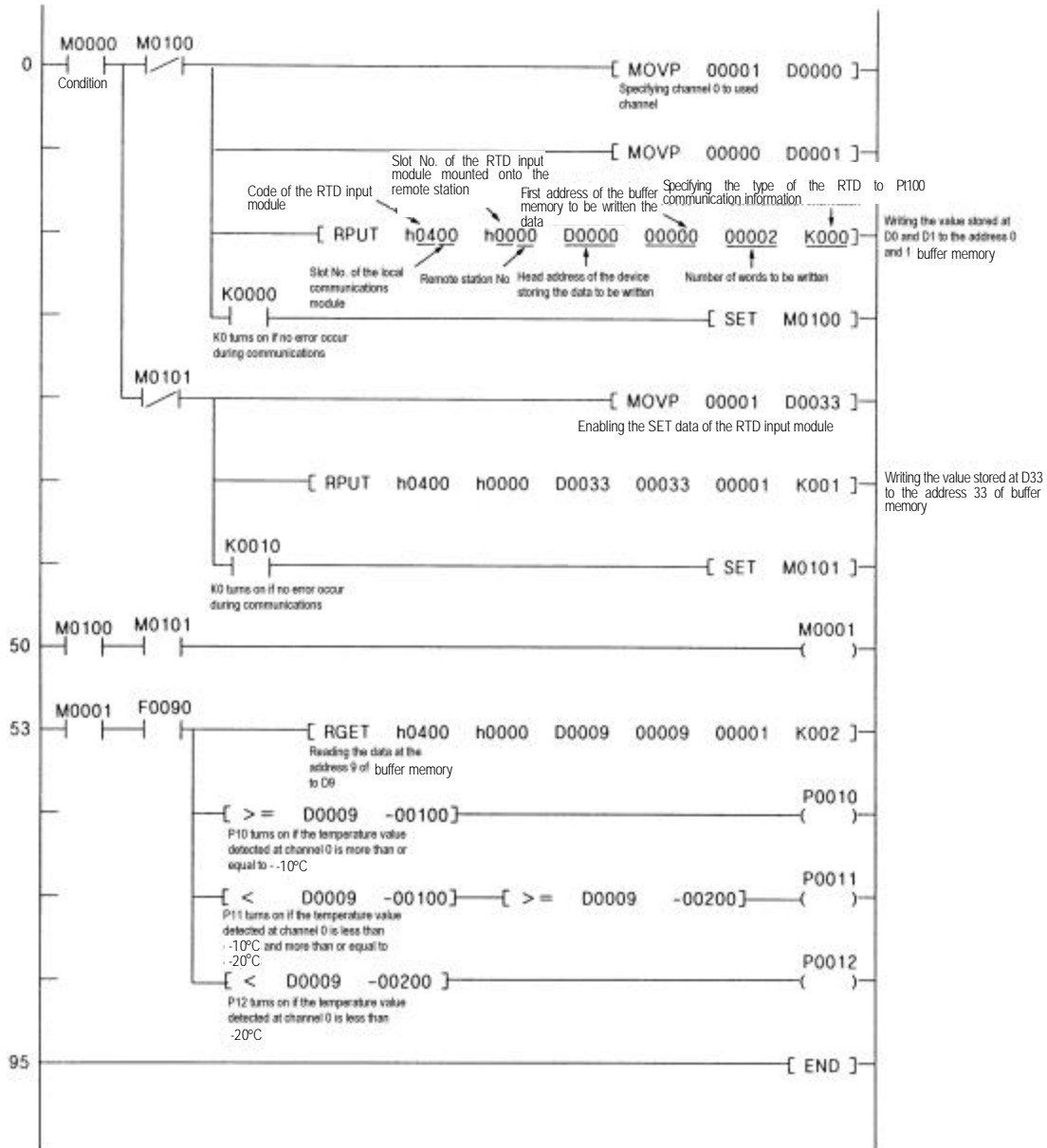
#### 2) Initial Settings

- (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  $-10^{\circ}\text{C}$ .
- (2) P0011 turns on if the temperature value detected at channel 0 is less than  $-10^{\circ}\text{C}$  and more than or equal to  $-20^{\circ}\text{C}$ .
- (3) P0012 turns on if the temperature value detected at channel 0 is less than  $-20^{\circ}\text{C}$ .

4) Program



## Chapter 9. TROUBLESHOOTING

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

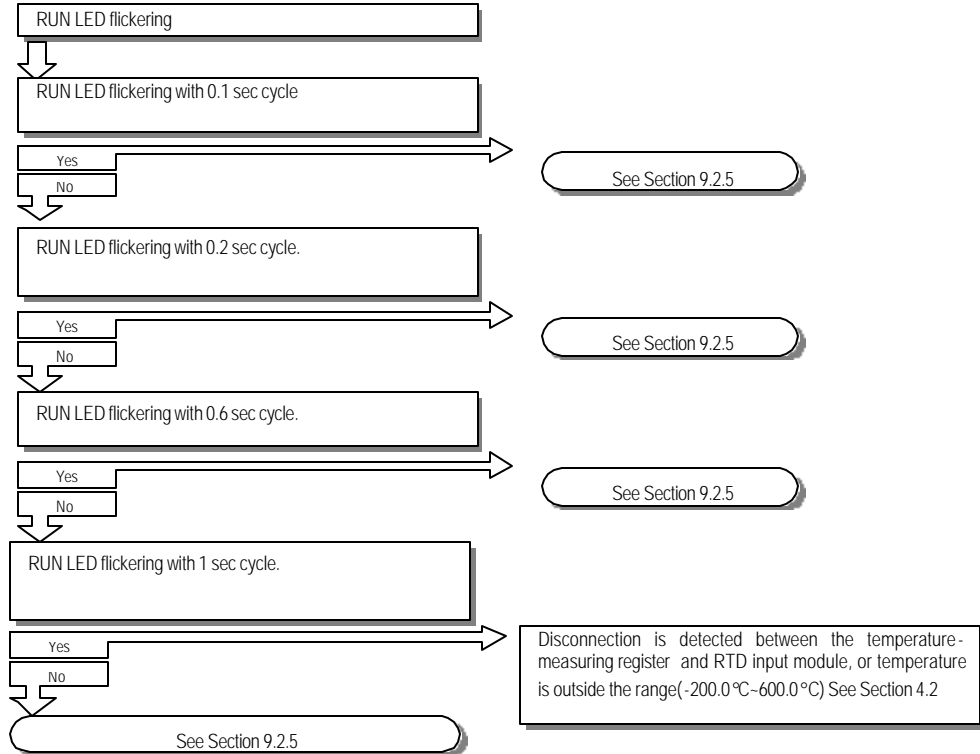
### 9.1 Errors Indicated by RUN LED Flickering

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

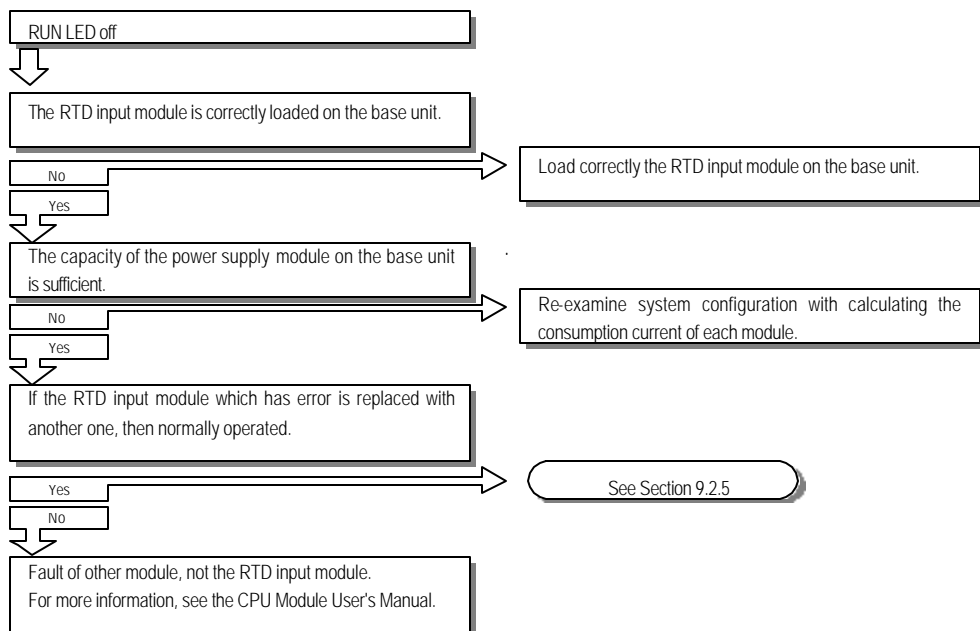
RUN LED Status	Descriptions	Remark
Flickering (cycle: 0.1 sec)	WDT error	
Flickering (cycle: 0.2 sec)	System error	
	Internal memory error	
Flickering (cycle: 0.6 sec)	A/D conversion error	
Flickering (cycle: 1.0 sec)	A disconnection detected	The data before error has occurred is maintained.
	B disconnection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

## 9.2 Troubleshooting Procedure

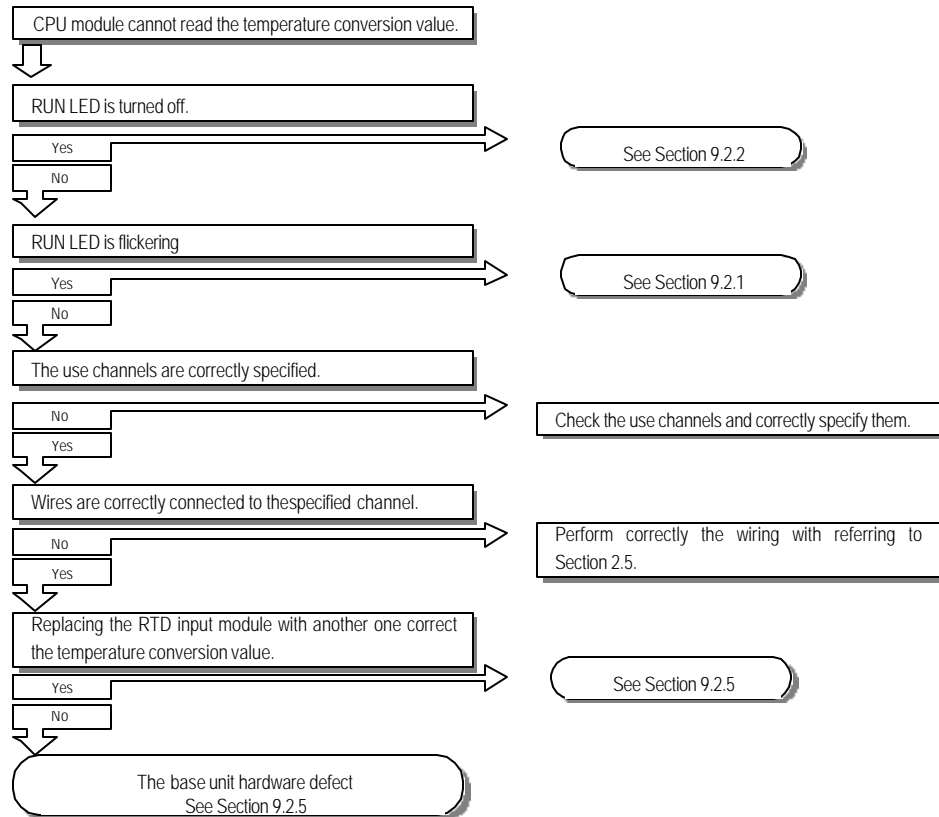
### 9.2.1 RUN LED Flickering



### 9.2.2 RUN LED Off

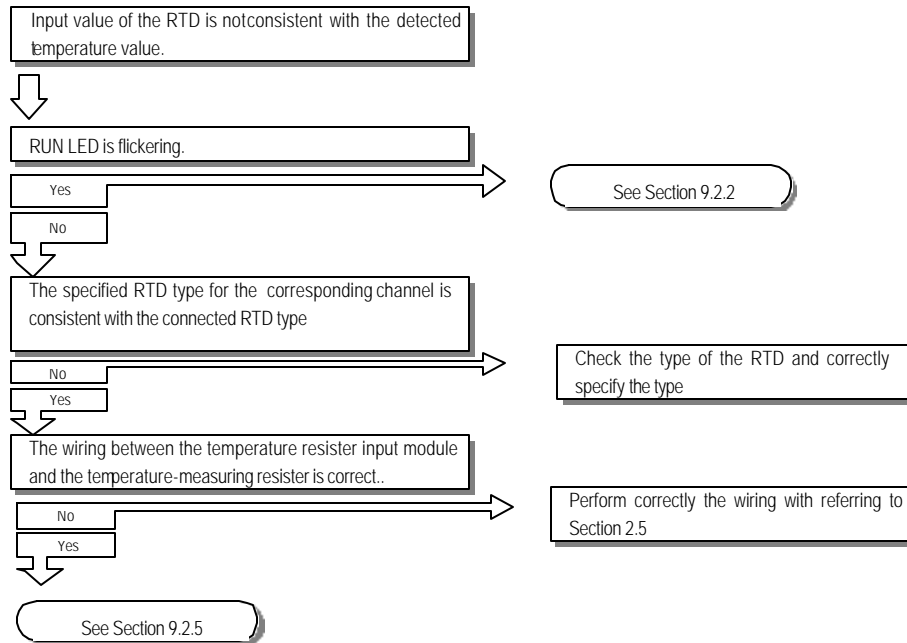


### 9.2.3 Detected Temperature Value Unreadable from the CPU Module.





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

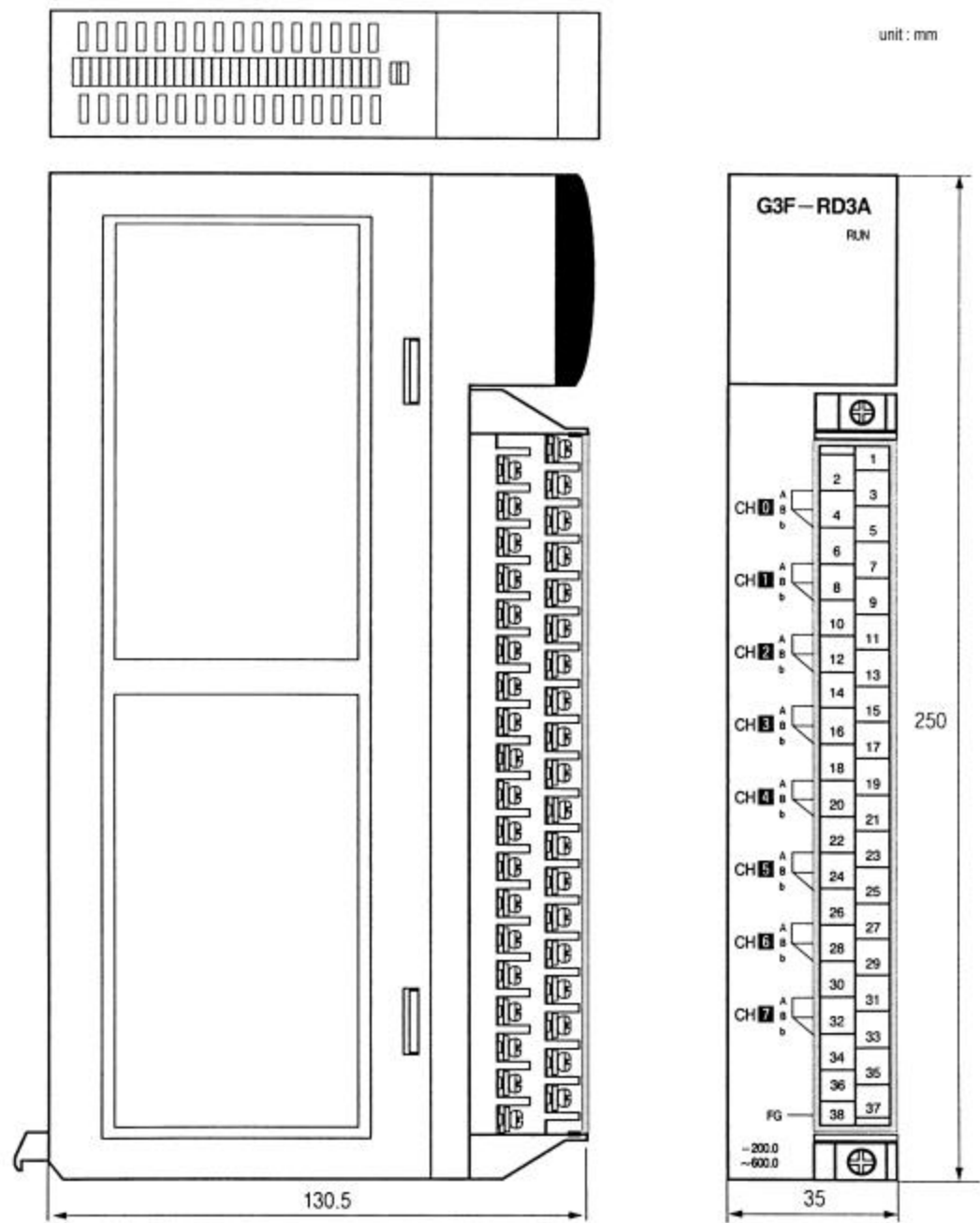


**9.2.5 RTD Input Module Hardware Defect**

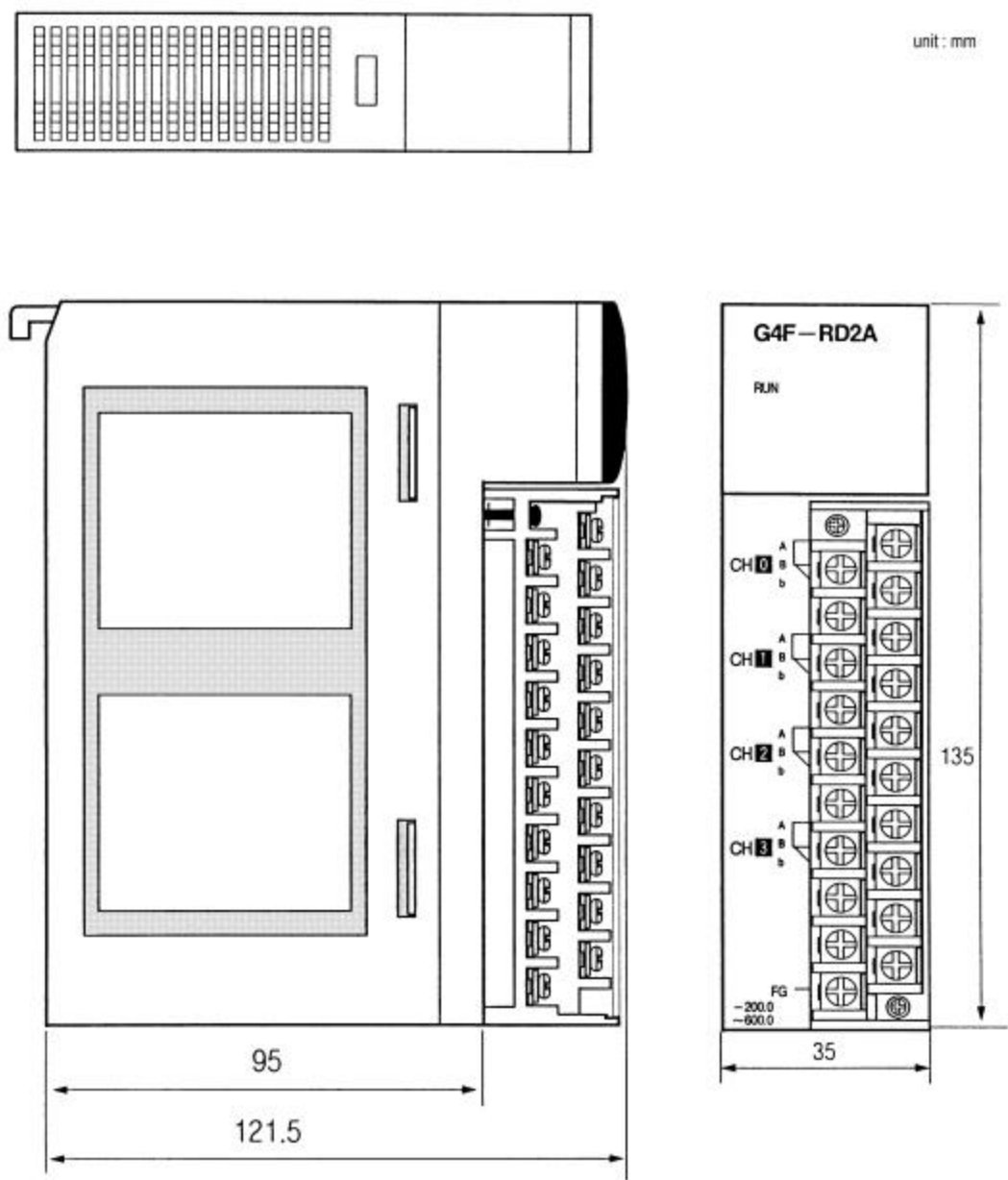
RTD input module hardware defect.  
Contact the nearest agency or service station

# Chapter 10. DIMENSIONS

## 10.1 G3F-RD3A Dimensions



10.2 G4F-RD2A Dimensions



APPENDIX 1.

## APPENDIX 1. 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	