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Resistance Temperature Detector

2MLF-RD4A

User's Guide

ML200-RTD
R200
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Release 200

Honeywell

Notices and Trademarks

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About This Document

This document describes the specifications, handling, and programming methods for 2MLF-RD4A type Resistance Temperature Detector (RTD) module used in association with CPU module of MasterLogic-200 PLC series (here after referred to as 2MLF-RD4A).

Release Information

Document Name	Document ID	Release Number	Publication Date
2MLF-RD4A User's Guide - ML200	ML200-RTD	200	Apr 2010

References

The following list identifies all documents that may be source of reference for material discussed in this publication.

Document Title
SoftMaster User's Gudie

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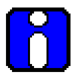
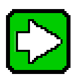
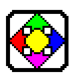
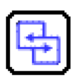
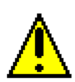
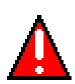
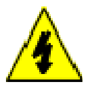
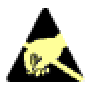
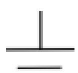
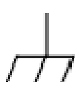
Symbol Definitions

The following table lists the symbols used in this document to denote certain conditions.

Symbol	Definition
	**ATTENTION**: Identifies information that requires special consideration.
	**TIP**: Identifies advice or hints for the user, often in terms of performing a task.
	**REFERENCE -EXTERNAL**: Identifies an additional source of information outside of the bookset.
	**REFERENCE - INTERNAL**: Identifies an additional source of information within the bookset.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	**CAUTION**: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. **CAUTION** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	**WARNING**: Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or death. **WARNING** symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.

Symbol	Definition
	**WARNING, Risk of electrical shock**: Potential shock hazard where HAZARDOUS LIVE voltages greater than 30 Vrms, 42.4 Vpeak, or 60 VDC may be accessible.
	**ESD HAZARD**: Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatically sensitive devices.
	**Protective Earth (PE) terminal**: Provided for connection of the protective earth (green or green/yellow) supply system conductor.
	**Functional earth terminal**: Used for non-safety purposes such as noise immunity improvement. **NOTE**: This connection shall be bonded to Protective Earth at the source of supply in accordance with national local electrical code requirements.
	**Earth Ground**: Functional earth connection. **NOTE:** This connection shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.
	**Chassis Ground**: Identifies a connection to the chassis or frame of the equipment shall be bonded to Protective Earth at the source of supply in accordance with national and local electrical code requirements.

Contents

Tables

Figures

1. Introduction

1.1 Introduction to Resistance Temperature Detector

This user's guide describes the specifications, handling, and programming methods of Resistance Temperature Detector (RTD), 2MLF-RD4A module.

The RTD input module converts the input temperature data (analog value) measured by platinum RTD sensor (Pt100 or JPt100), to signed 16-bit binary data (digital value).

This module is used in association with CPU module of MasterLogic-200 PLC series (hereafter referred to as 2MLF-RD4A).

1.2 Features

2MLF-RD4A has following features:

1. **Module Selection:** You can select an appropriate input module based on the application requirement.

   2MLF-RD4A: 4-channel input

2. **Choice of RTD Sensors:** Two types of RTD sensors are available:
   a) Pt100
   b) JPt100

3. **Disconnection Detection:** A function to display the connection status of each wire of the RTD sensor and channel. The internal disconnection detecting circuit detects and displays disconnection of RTD sensor wire or extended lead wire from the RTD module. This results in an 'Out-of-range' error in the output voltage.

4. **Temperature Conversion**:
   a) Temperature can be converted to Celsius or Fahrenheit scale as desired.
   b) It can also be converted to numeric value accurate up to the first decimal place.

5. **Temperature Scaling**:
   a) Temperature-converted input value can be scaled to specified 16-bit binary data.

b) Temperature-converted value can be within the range of -32768–32767 or 0–65535 after scaling.

6. **Supplementary functions:**

a) Filtering

b) Averaging (time/frequency/movement)

c) Alarm (for process/input change)

d) Maximum/Minimum detection, and so on.

7. **Parameter setting and data monitoring using Graphical User Interface (GUI)**:

The need of sequence programming is significantly reduced due to the availability of the GUI.

It helps in setting the necessary parameters as well as monitoring the RTD module through the ‘Special Module Monitor’ function.

The RTD module configuration parameters can be entered in the I/O parameter setting option in SoftMaster, this feature reduces the need of programming for configuring the module. In addition, temperature-converted value can be monitored using Special Module Monitor function.

1.3 Terminology

The terminology used in this document is as follows:

Analog value – A

A physical quantity like temperature, pressure, speed, current, and so on, which changes continuously with time, is called an analog value. The PLC cannot process an analog quantity. The RTD input module converts analog input temperature value to corresponding digital value which then can be processed by the PLC.

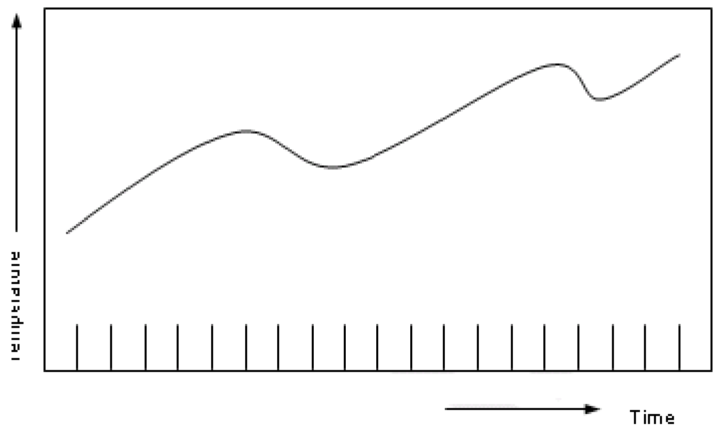


Figure 1 – Analog value is continuous in time and value

For example, **temperature** changes continuously with **time**, as shown in Figure 1.

Digital value - D

In a digital electronic circuit, data is processed and saved in the form of numbers 0 and 1. The data is processed as a string of 0s and 1s. For example, ON and OFF signals displays as 1 and 0, respectively, in a digital system. This is called as the binary numbering system. Decimals stored in binary format are called Binary Coded Decimals (BCD). BCD is thus a digital value. Figure 2 displays the digital value of the physical parameter (temperature).

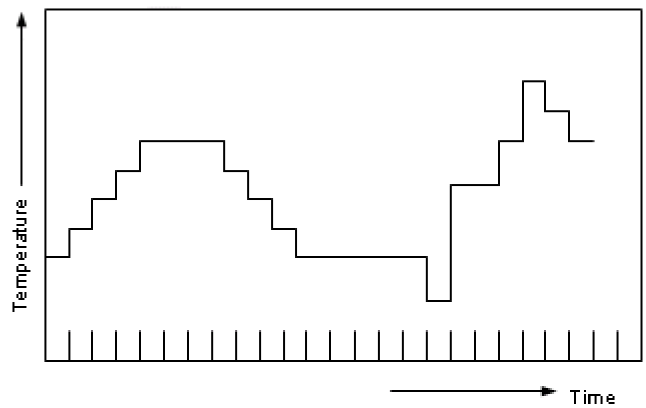


Figure 2 – Processing in the PLC

Analog values cannot be given as input to the CPU module, as the PLC processes only binary numbers (digital values). The conversion from analog to digital value (as shown in Figure 3) is required. This is done using analog to digital converter (A/D conversion module). Similarly, to get an analog output from a digital value, a digital to analog (D/A) conversion module is used.

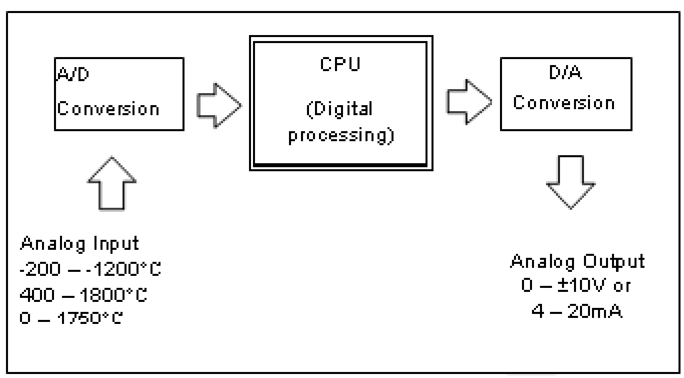


Figure 3 – Processing in the PLC

Platinum resistance temperature detector (RTD)

RTD is a sensor that detects temperature. The change in the resistance value of this device is directly proportional to the temperature. The resistance of these devices increases with temperature. At 0°C temperature, Pt100/JPt100 has the resistance value of 100.00Ω

2. Specifications

2.1 Performance specifications

The Table 1 describes performance specifications of the RTD module.

Table 1 – Performance specifications

Item	Specifications		
Number of input channels	4 channels		
Input sensor type	Pt100	JIS C1604-1997	
	JPt100	JIS C1604-1981, KS C1603-1991	
Temperature input range	Pt100	-200.0 – 850.0	
	JPt100	-200.0 – 640.0	
Digital output	Temperature display (unit: 0.1)	PT100	-200.0 – 850.0□/-328.0 – 1562.0□
		JPT100	-200.0 – 640.0□/-328.0 – 1184.0□
	Scaling display (Customize)	0 – 65535	
		-32768 – 32768	
Accuracy	Normal temp. (25□)	Within ±0.2%	
	Full temp. (0 – 55□)	Within ±0.3%	
Conversion speed	40ms / channel		
Insulation	Channel to Channel	Non-insulation	
	Terminal to PLC Power	Photo-coupler	
Wiring method	3-wire		
Function	Average	Time average (320 – 64000ms)	
		Counting average (2 – 64000 count)	
		Moving average (2 – 100 samples)	
	Alarm	Process alarm	

Item	Specifications	
		Input changing rate alarm
		Disconnection detection
	Filtering	Digital filter (160 – 64000ms)
Terminal block	18-point terminal block	
Current consumption	5V: 450mA	
Weight	150g	

2.2 Part names and functions

The following diagram of 2MLF-RD4A shows the different parts.

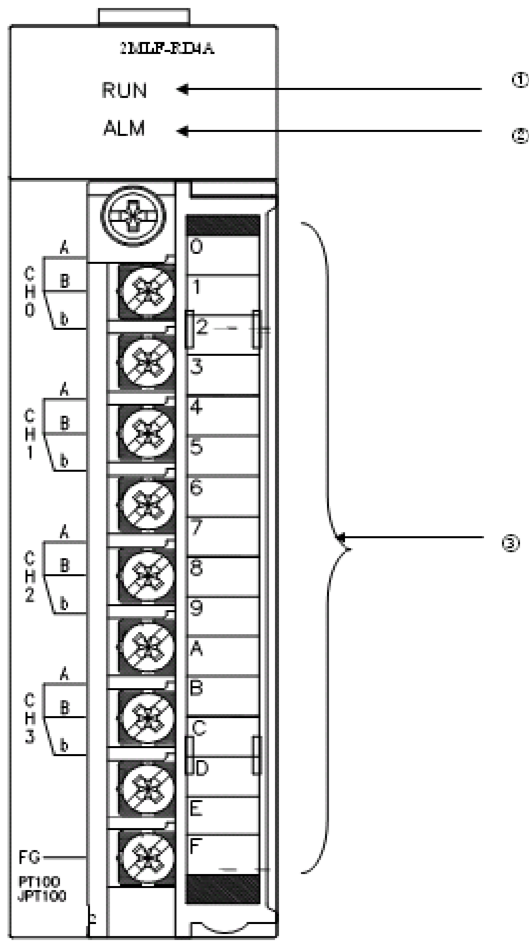


Figure 4 – Parts of 2MLF-RD4A

The respective parts of 2MLF-RD4A are as described in the Table 2.

Table 2 – Parts of 2MLF-RD4A

No	Name	Description
①	RUN LED	Displays the hardware operation status (Fatal Error) ON: Normal Blinking: Error (0.2s Blinking) OFF: DC 5V disconnected, hardware error
②	ALM LED	Displays the status of the channels (Non-Fatal Error) ON: Normal status Blinking: Disconnection is detected (1s Blinking) OFF: Operation stop of all channels
③	Terminal Block	3-wire RTD sensors can be connected

2.3 RTD input module characteristics

Temperature conversion

RTD sensor has non-linear characteristics of resistance with temperature, so RTD input module linearizes the relationship between input temperature and output voltage values in each section.

There are two types of sensors, which are connected to 2MLF-RD4A, and its input range is as follows:

1. Pt100: JIS1064-1997

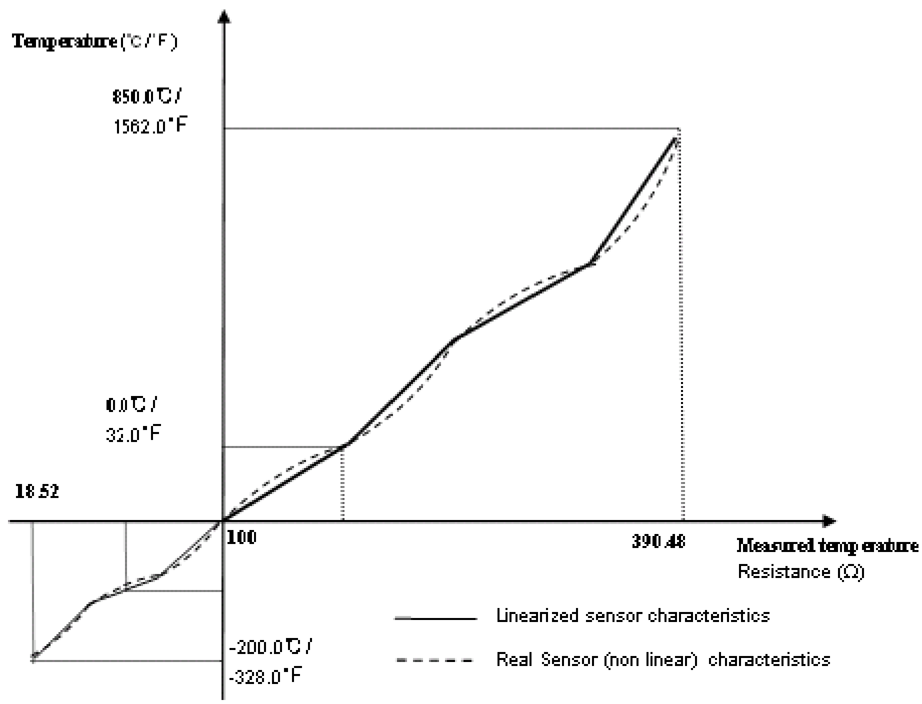


Figure 5 – Input range of Pt100

2. JPt100: JIS C1604-1981, KS C1603-1991

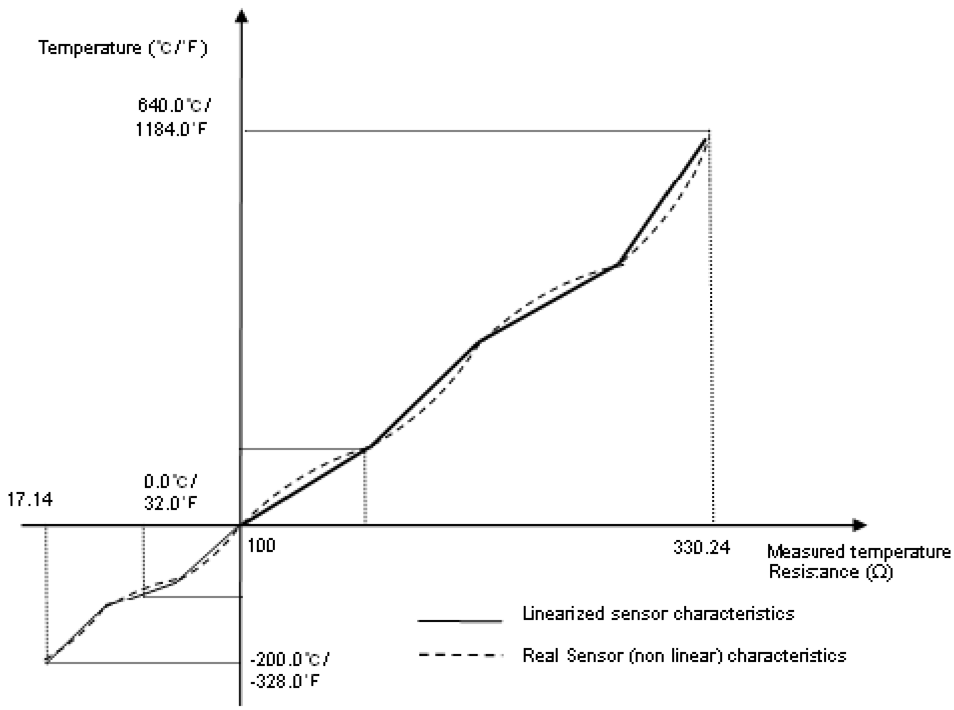


Figure 6 – Input range of JPt100

Conversion speed

The conversion speed of 2MLF-RD4A is 40ms per channel and each channel is converted sequentially, that is, channels are converted one after another. Run/stop can be specified independently for each channel.

The conversion speed includes the time to convert input temperature (resistance value) to digital value and to save the converted digital data into the internal memory.

Processing time = 40ms X Number of channels used

Example: If three channels are used: Processing time = 40ms X 3 = 120ms

Accuracy

The accuracy of RTD module is dependent on the ambient temperature.

1. When the ambient temperature is 25 ± 5°C: accuracy is within ±0.2% of the temperature input range for that sensor.
2. When the ambient temperature is 0 to 55°C: accuracy is within ±0.3% of the temperature input range for that sensor.

The normal ambient temperature is 25°C. If Pt100 is used as the sensor and the ambient temperature is normal.

To measure 100°C, the conversion data output range is as given below:

100°C - [{850 - (-200)} x 0.2%] ~ 100°C + [{850 - (-200)} x 0.2%] = 97.9 ~ 102.1 °C

Temperature display

1. The input temperature is converted to digital value to the first decimal place.

   Example: If the detected temperature is 123.4°C, its converted digital value will be saved as 1234 in the internal memory.

2. Temperature can be converted to Celsius or Fahrenheit scale as desired.

   Example: If Pt100 sensor is used, the temperature of 100.0°C can be converted to 212.0°F when Fahrenheit scale is used.

   Conversion °C to °F, $F = \frac{9}{5}C + 32$

   Conversion °F to °C, $C = \frac{5}{9}(F - 32)$

3. Maximum allowable temperature input range is within 10°C higher or lower than regular temperature input range. However, the precision cannot be guaranteed for any temperature out of the regular temperature input range.

   Maximum temperature input ranges of two sensors are as follows:

   a) Pt100: -210.0 – 860.0°C

   b) JPt100: -210.0 – 650.0°C

Scaling function

This function allows to scale the output range as specified by the user and is different from the normal temperature range for that sensor.

Default range setting is as follows:

1. Signed 16-bit data type of -32768–32767
2. Unsigned 16-bit data type of 0–65535.

If you select any one of the above two to specify the input temperature range, the input temperature will be stored in the internal memory as the scaled value.

Example: PT 100 is used as the sensor and the scaling range is set to -100 – 1100 as a signed number.

The scaled temperature value for 200°C input temperature is as follows.

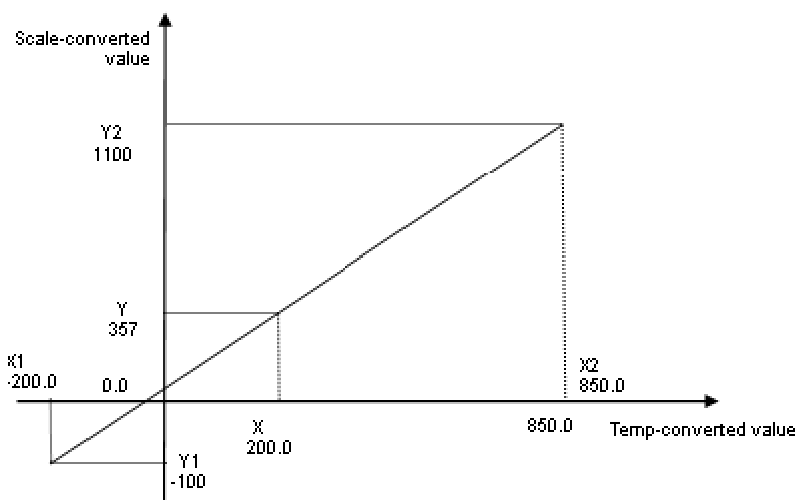


Figure 7 – Scaled output range of Pt100

Scale calculation: $Y = \frac{Y_2 - Y_1}{X_2 - X_1}(X - X_1) + Y_1$

For Pt100: X1= -200.0, X2= 850.0

JPt100: X1= -200.0, X2= 640.0 in the applicable formula.

ATTENTION

Non-linear characteristics: The resistance-temperature characteristics for RTD sensor are presented in the Appendix 1: Table (JIS C1604-1997). The characteristics table displays the resistance value of the sensor with respect to the temperature, namely, the change of the resistance value for 1°C changes the temperature. When the temperature changes by 1°C, the change in resistance is not in constant width but in different width per section. Such characteristics are called non-linear characteristics.

When consigned, the module is adjusted to Offset/Gain of each channel with standard resistant source. To maintain the accuracy of the module, this value is disabled for user to change

Disconnection detecting function

1. This function is achieved by a module used with the RTD temperature sensor directly connected to the extended lead wire. It detects and displays disconnection of the sensor and the extended lead wire. If any disconnection occurs between the sensor used and extended lead wire, LED (ALM) will blink in a cycle of 1s and generate an error code.
2. Disconnection can be detected only for the active channel. The LED (ALM) used is common for all the channels. It will blink if one or more channels are disconnected.
3. The temperature sensor of a 3-wire RTD is as shown below. (The appearance varies with the application.)

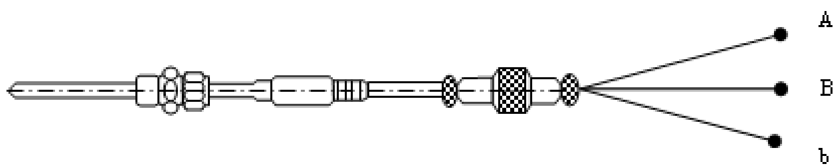


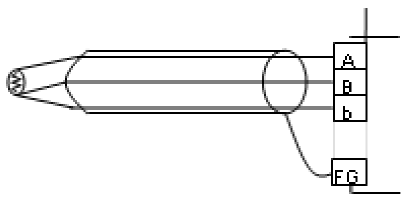
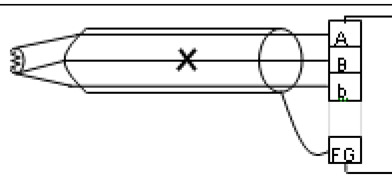
Figure 8 – 3-Wire RTD

a) ***A Disconnection**: It is a disconnection between terminal A and terminal board of the module in the sensor.

b) ***B Disconnection**: It is a disconnection between terminal B (two for 3-wire sensor) and terminal board of the module in the sensor, or a disconnection of both A and B terminals with the terminal board of the module in the sensor.

4. The standard connection between 2MLF-RD4A module and RTD sensor is based on 3-wire RTD sensor. Disconnection will be detected on the basis of 3-wire wiring even if a 2-wire or 4-wire sensor is used.

Table 3 – Disconnection detection

Connection Status	Channel Setting Status	LED Status (Disconnection Flag ON/OFF)
 Normal	Specified	OFF (Disconnection Flag OFF)
	Not specified	OFF (Disconnection Flag OFF)
 B line disconnected	Specified	Blinking (Disconnection Flag ON)
	Not specified	OFF (Disconnection Flag OFF)
Sensor not connected	Specified	Blinking (Disconnection Flag ON)
	Not specified	OFF (Disconnection Flag OFF)

Sensor connection

1. There are three types of sensor-connecting methods available.
   a) 2-wire
   b) 3-wire
   c) 4-wire
2. The standard wiring method for 2MLF-RD4A module is 3-wire.

3. When extended lead wire is used in a 3-wire sensor, the lead wire is of same specifications as that of the sensor (having similar thickness, length) for each of the terminals.

4. The resistance of each conductor should be less than 10Ω. (A resistance of more than 10Ω will cause an error.)

5. The difference in resistance of the conductors should to be less than 1Ω. (A difference of more than 1Ω will cause an error.)

6. Length of the wire should be as short as possible and the wire should be directly connected to the terminal block of 2MLF-RD4A without a connection terminal unit.

7. If a connection terminal unit is used, then the compensating wire should be connected as shown below.

    a) If 2-wire sensor is connected using (connection) terminal unit.

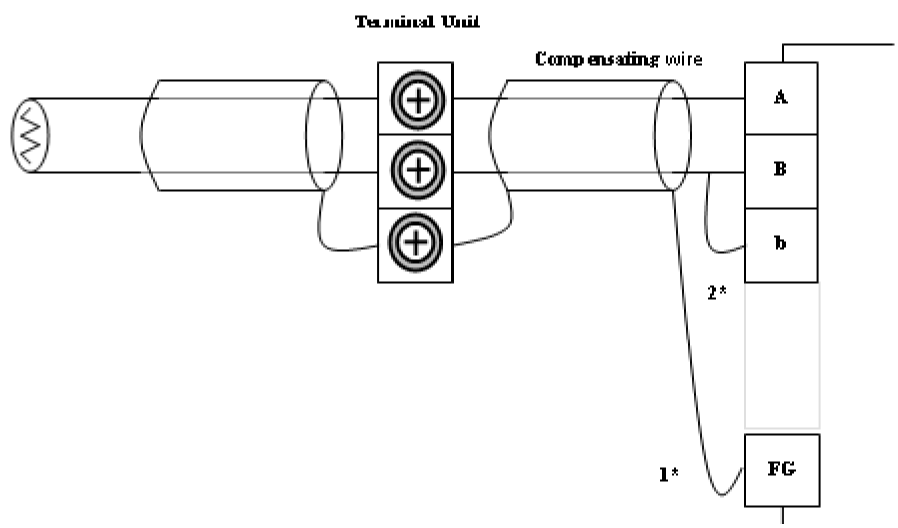


Figure 9 – 2-Wire sensor

ATTENTION

1*: If sensor and compensating wire are shielded, connect shield line to FG terminal of the module.

2*: If 2-wire sensor is connected, short the terminals B and b on the terminal block of the module.

b) If 3-wire sensor is connected using (connection) terminal unit.

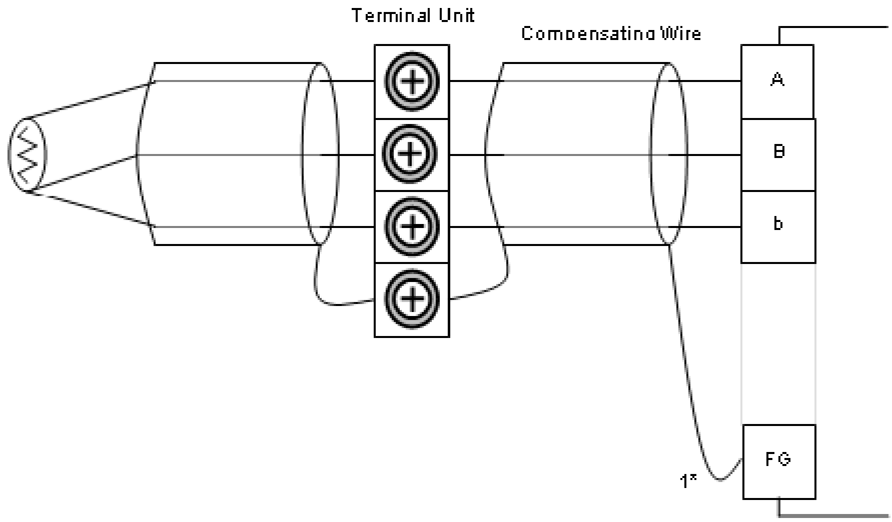


Figure 10 – 3-Wire sensor

ATTENTION

1*: If sensor and compensating wire are shielded, connect shield line to FG terminal of the module.

c) If 4-wire sensor is connected using (connection) terminal unit

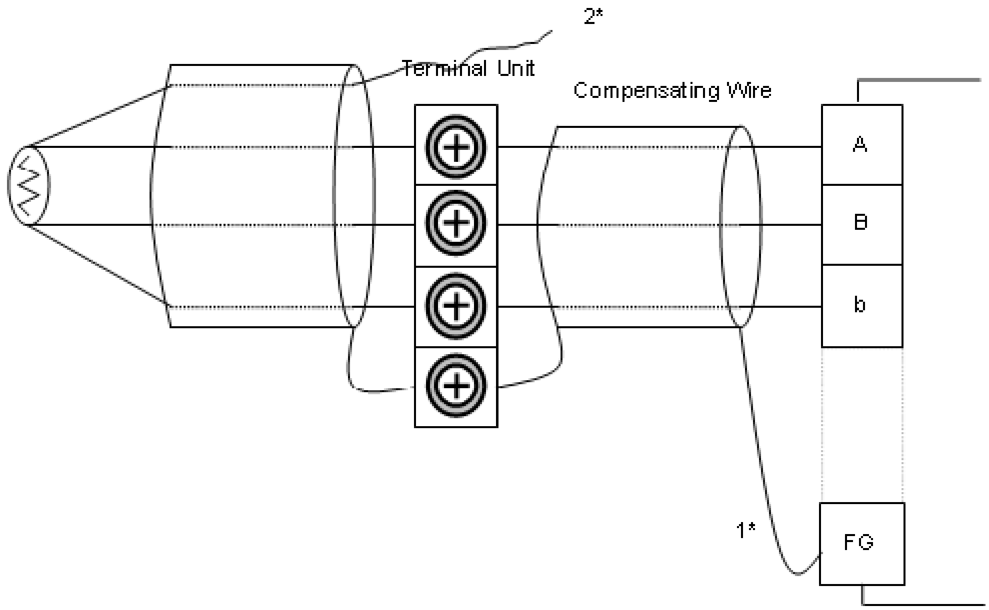


Figure 11 – 4-Wire sensor

ATTENTION

1*: If sensor and compensating wire are shielded, connect the shield to FG terminal of the module.

2*: 4-wired sensor connection is the same as 3-wire. However, there are 4 sensor wires. The wire with an identical sign to the wire connected to terminal A should not be connected to the module.

2.4 RTD module functions

Averaging function

The three averaging functions are as follows:

Time average

This function adds all the temperature converted values of the specified channel for a specific time period and outputs the average of the sum as digital data.

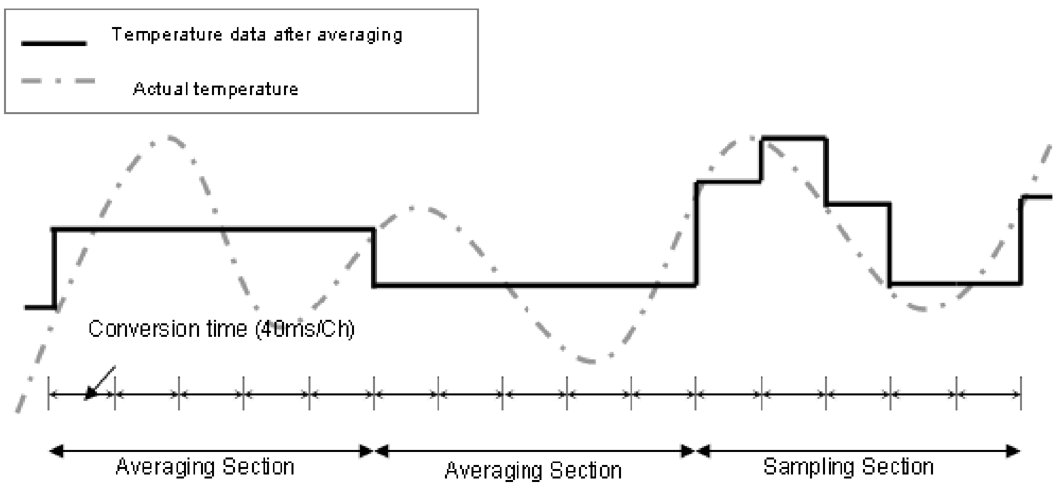


Figure 12 – Time averaging function

1. Average time setting range = 320 – 64000ms
2. Average frequency for the specified time can be calculated as below:

$$\text{Average frequency [Times]} = \frac{\text{Average time } ms}{\text{Number of channels used} \times 40\,ms}$$

Frequency average

This function adds all the temperature converted values of the specified channel for a specific number of times and outputs the average of the sum as digital data.

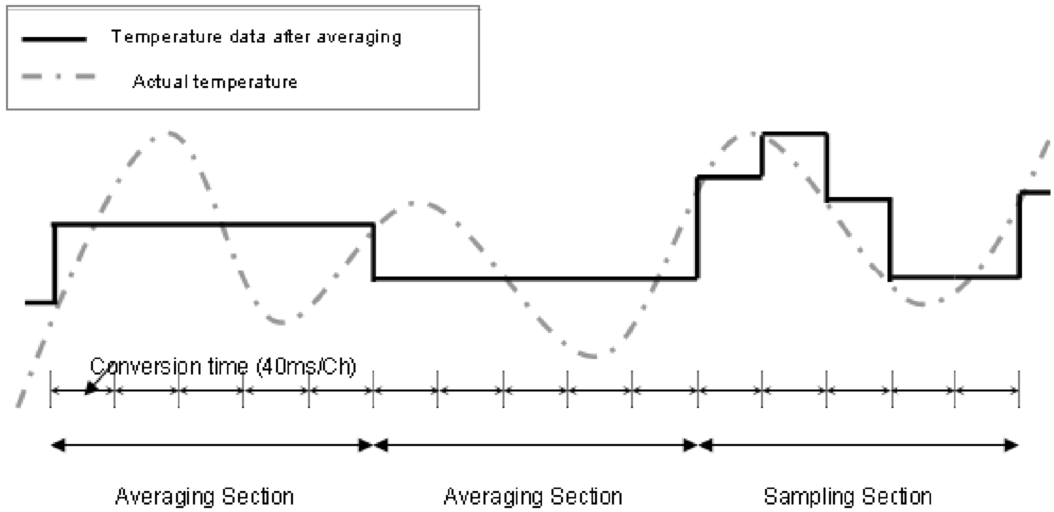


Figure 13 – Frequency averaging function

1. Average frequency setting range = 2 – 64000 [times]
2. Average interval for the channels used can be calculated as below:

   Average Interval [ms] = Average frequency x Channels used x 40ms

Movement average

This function adds all the temperature converted values of the specified channel for a specific number of times and outputs the average of the sum as digital data. However, in this case the moving average is calculated.

The samples are taken every 40ms and the moving average of these is given as the output at every scan.

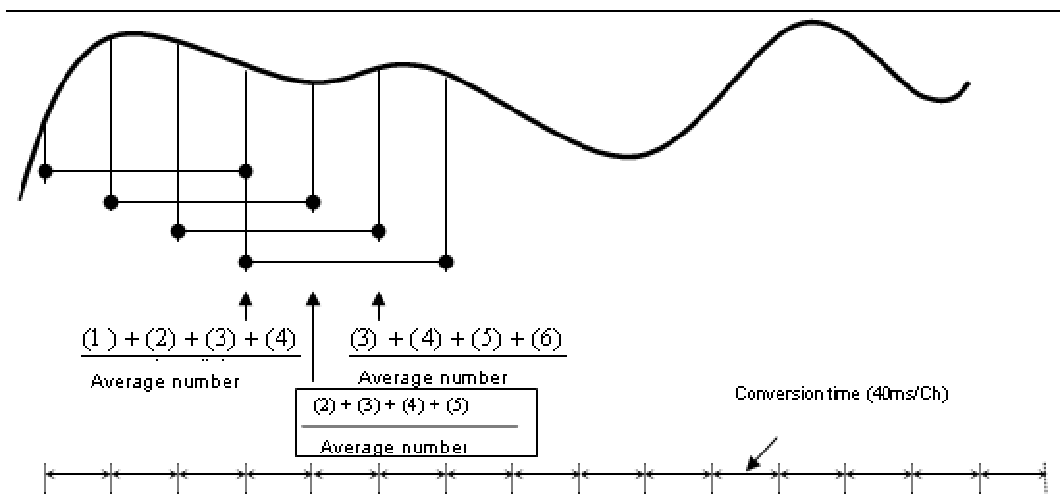


Figure 14 – Movement averaging function

Average number setting range = 2 – 100 [samples]

In the example above, the Average Number Setting is 4, so the average of four samples preceding the current sample is output at every scan.

Filtering function

This function derives the temperature-converted value of the specified channel based on the filtering constant (time-constant). The calculation is shown below:

$$\text{Filtered Temperature} = \frac{(\text{Previously filtered temp. x Filtering constant}) + (\text{Presently input temp. x 40 x Channels}}{\text{Filtering constant} + (40 \text{ x Channels used})}$$

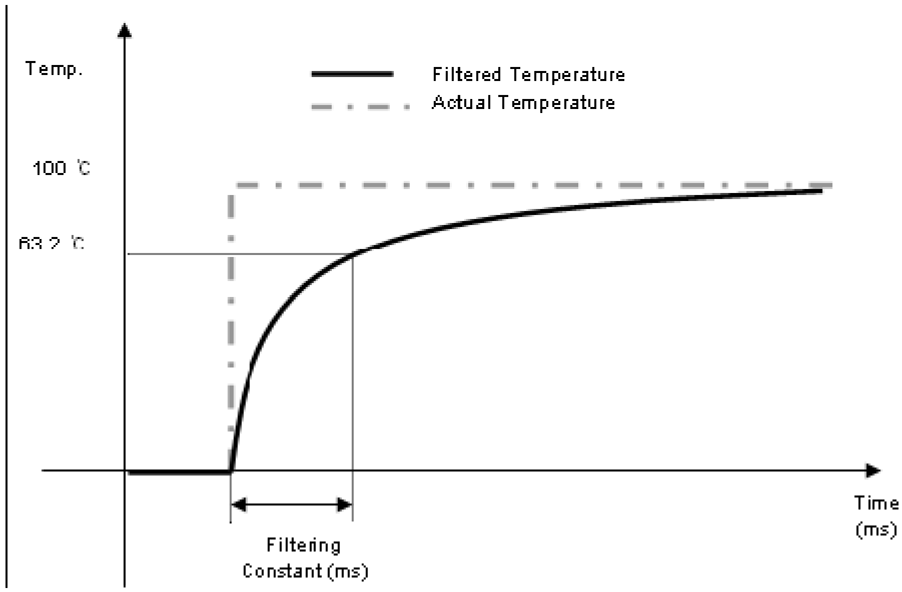


Figure 15 – Filtering function

Filtering constant setting range = 160 – 64000ms

Alarm function

The types of alarm functions are described as below.

Process alarm

This function triggers an alarm if the temperature-converted value of a specified channel exceeds the set temperature. There are four types of alarms based on four preset levels of temperature: High-High, High, Low, and Low-Low.

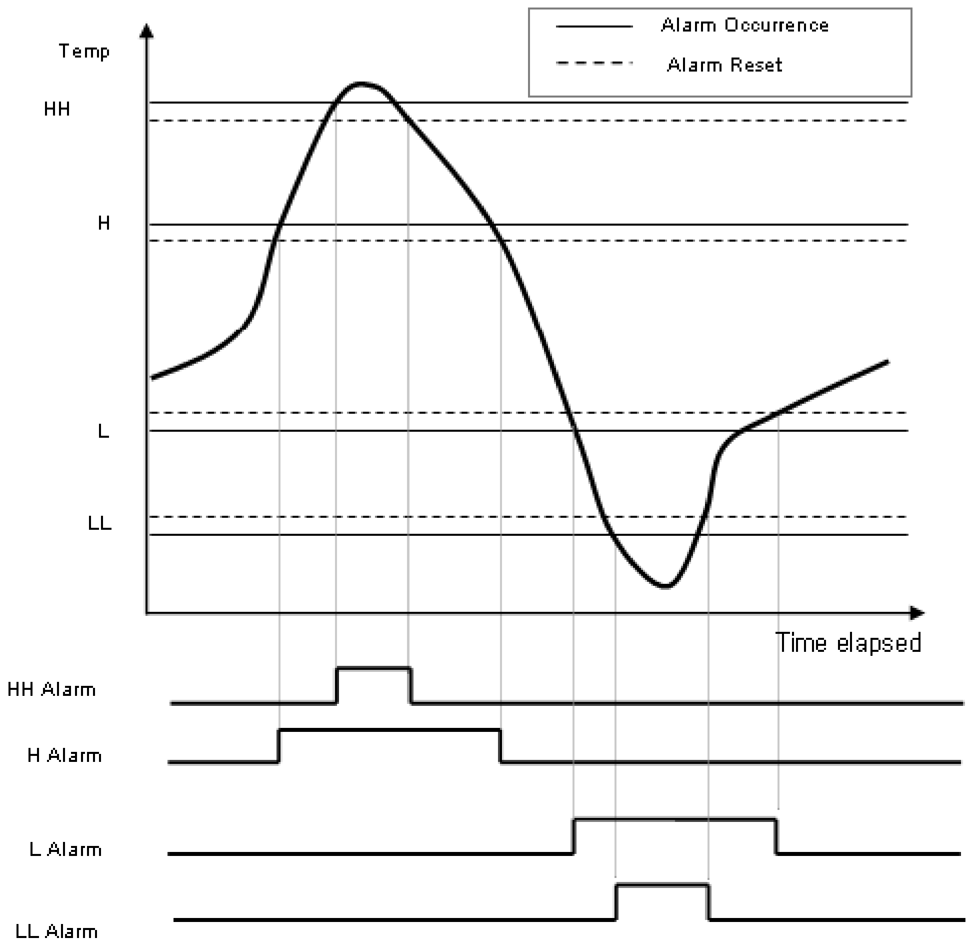


Figure 16 – Process alarm function

Input changing rate alarm (rate alarm)

This function triggers an alarm if the temperature-converted value of a specified channel changes by a value larger or smaller than the set alarm-change value (or change rate).

In case of Pt100:

$$\textbf{Change rate [\%]} = \frac{\textbf{(Present temperature-Temperature prior to alarm)} * \textbf{100}}{\textbf{(8500-(-2000)}}$$

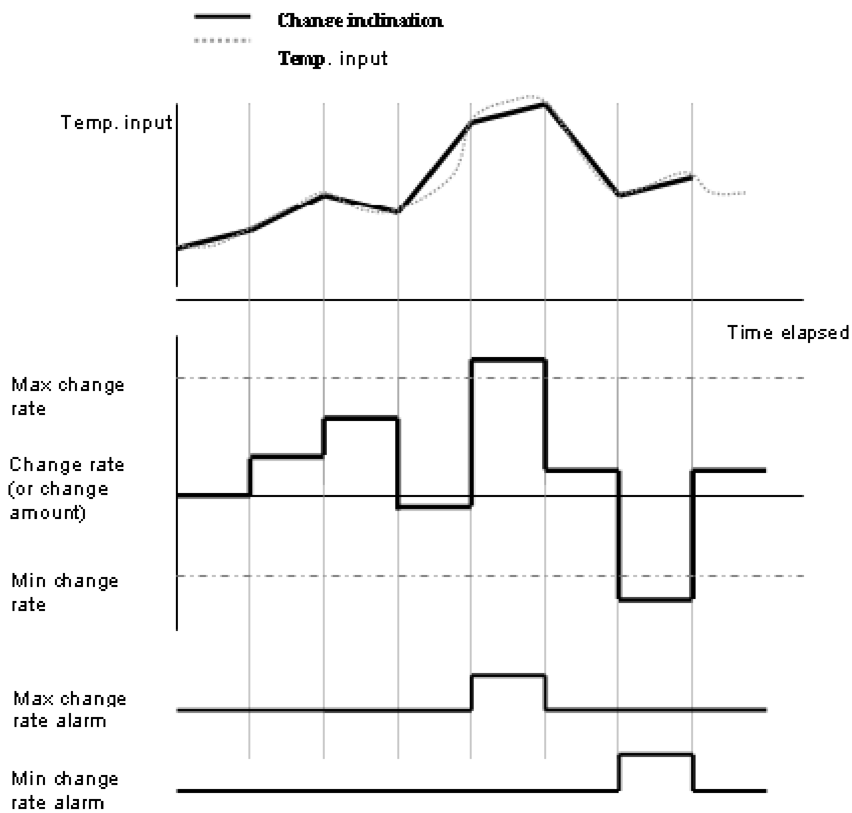


Figure 17 – Input changing rate alarm function

Maximum/minimum display function

This function displays the maximum or minimum change in the temperature-converted value of a specified channel for the specified section.

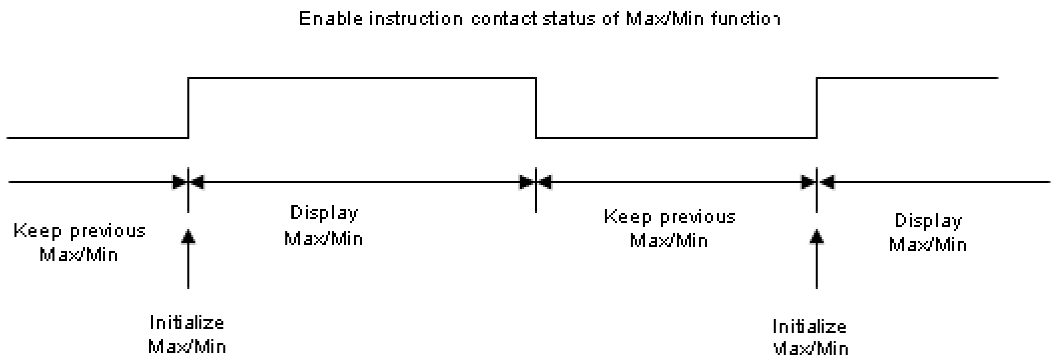


Figure 18 – Maximum/minimum display function

3. Installation and Wiring

3.1 Installation

Installation environment

The 2MLF-RD4A modules have high reliability regardless of its installation environment, but ensure the following for system reliability and stability.

Environment prerequisites

1. Avoid installing the module in places where it is subjected or exposed to:
   a) Water leakage and dust.
   b) Continuous shocks or vibrations.
   c) Direct sunlight.
   d) Temperatures outside the range of 0 to 55 °C
2. Precautions during installation and wiring
   a) Install the PLC with applicable Ingress Protection.
   b) Make sure that it is not located on the same panel where high-voltage equipment is located.
   c) Make sure that the distance from the walls of duct and external equipment is 50mm or more.
   d) Grounding/earthing of the PLC should be taken care of.

Handling precautions

1. While unpacking and installing the RTD input module, follow the precautions below:
   a) Do not drop it, and avoid any strong or sudden shocks.
   b) Do not remove the PCB from its case. It can cause damage or a typical operation.
   c) During wiring, make sure that any external matter like wire scraps does not enter into the upper side of the PLC. If any external matter enters into the PLC, always remove it.

d) Do not install or remove the module to/from the base while the power supply is turned on.

3.2 Wiring

Wiring precautions

Separate the cable for external input signals of RTD input module and keep it away from the alternating current cables to avoid surge or inductive noise produced from the alternating current wire.

1. Cable should be selected considering the ambient temperature and value of the current. The maximum size of the cable should not be less than standard cable of AWG22 (0.3mm^2).
2. Do not let the cable too close to a hot device or material and in direct contact with oil for a long period, as it can cause damage or abnormal operation due to short-circuit.
3. Check the polarity before wiring.
4. Do not wire using high-voltage line or power line, as it can produce inductive hindrance causing abnormal operation or defect.

Wiring examples

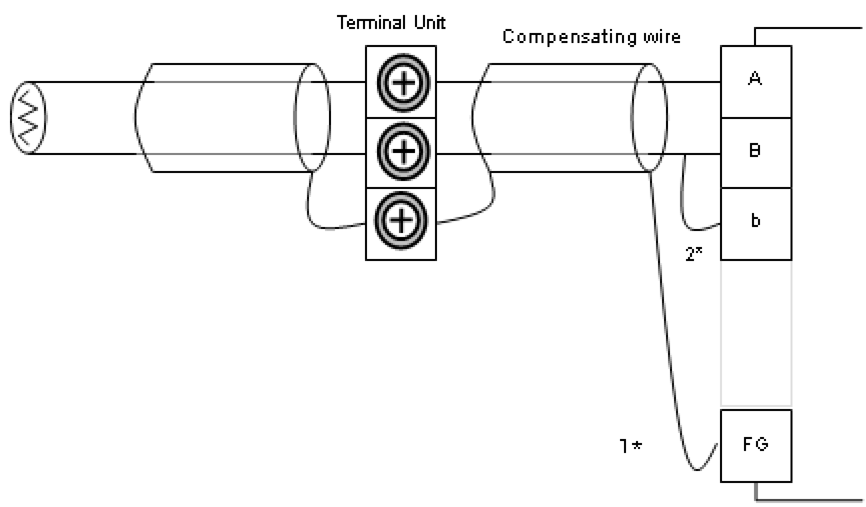


Figure 19 – 2-Wire sensor

ATTENTION

- 1*: If sensor and compensating wire are shielded, connect the shield line to FG terminal of the module.
- 2*: If 2-wired sensor is connected; short the terminals B and b on the terminal block of the module.

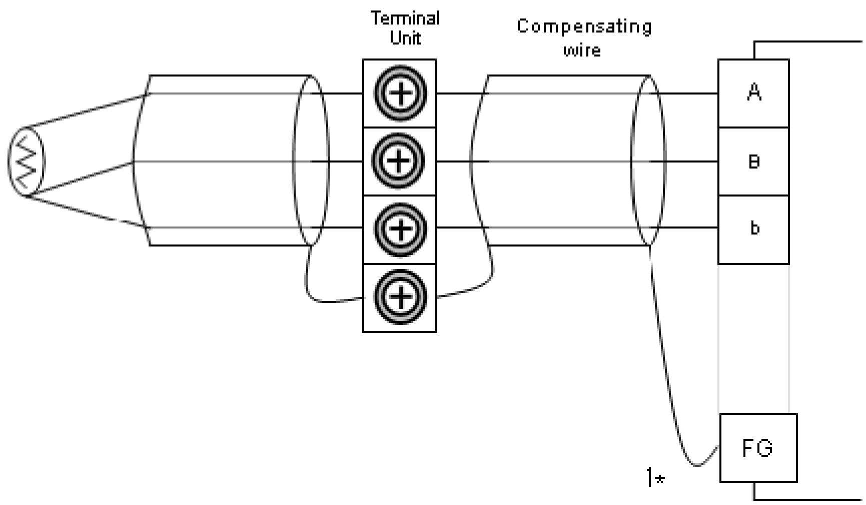


Figure 20 – 3-Wire sensor

ATTENTION

1*: If sensor and compensating wire are shielded, connect the shield line to FG terminal of the module.

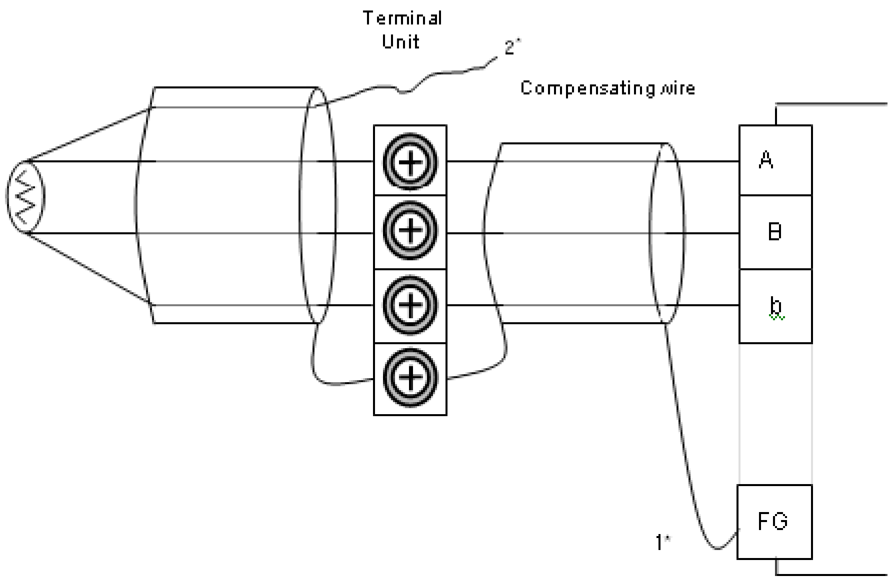


Figure 21 – 4-Wire sensor

ATTENTION

- 1*: If sensor and compensating wire are shielded, connect the shield line to FG terminal of the module.
- 2*:4-wired sensor connection is the same as in 3-wire. However, there are 4 sensor wires. The wire with an identical sign to the wire connected to terminal A should not be connected to the module.

4. Operation Setting and Monitoring

4.1 Operation procedure

Operation parameters of RTD module can be specified through I/O parameters of SoftMaster.

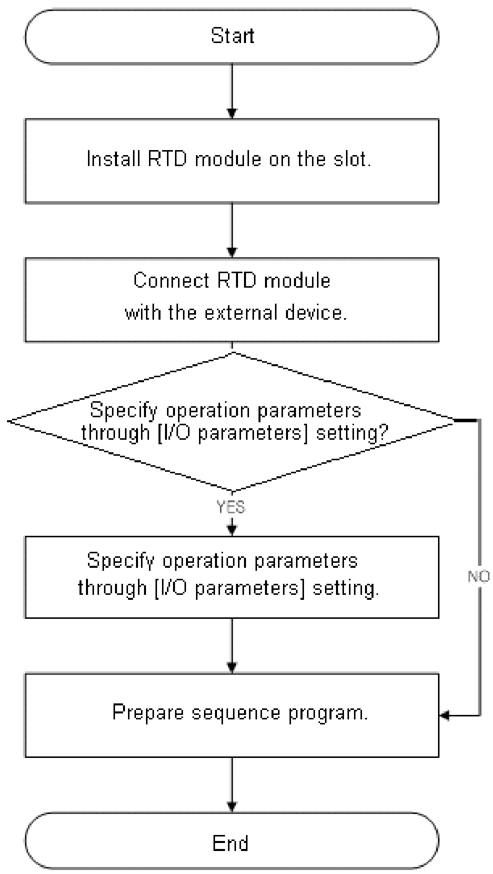


Figure 22 – Operation procedures

4.2 Operation parameters setting

Operation parameters of RTD module can be specified through I/O parameters of SoftMaster.

Setting items

For the user's convenience, SoftMaster provides GUI for parameters setting of RTD module. Setting items available through I/O parameters of the SoftMaster project window are described in Table 4.

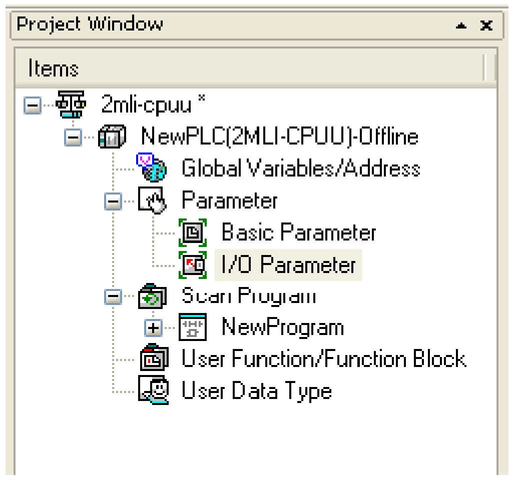
Table 4 – Function of I/O parameters

Item	Details
I/O parameters	a) Specify the following setting items necessary for the module operation. – Channel Run/Stop – Sensor type(Pt100/JPt100) – Temperature unit(℃/℉) – Filter constant – Average processing (sampling/time/frequency/movement) – Average value – Scaling data type – Scaling minimum value – Scaling maximum value – Process alarm H. H. Limit – Process alarm H. Limit – Process alarm L. Limit – Process alarm L. L. Limit – Process alarm HYS (hysteresis) – Type of rate change alarm (change value/change rate) – Rate change alarm higher value – Rate change alarm lower value – Rate change alarm period b) The data specified by user through S/W package will be saved on RTD module when I/O Parameters are downloaded. In other words, the point of time when I/O Parameters are saved on the module has nothing to do with PLC CPU's status RUN or STOP.

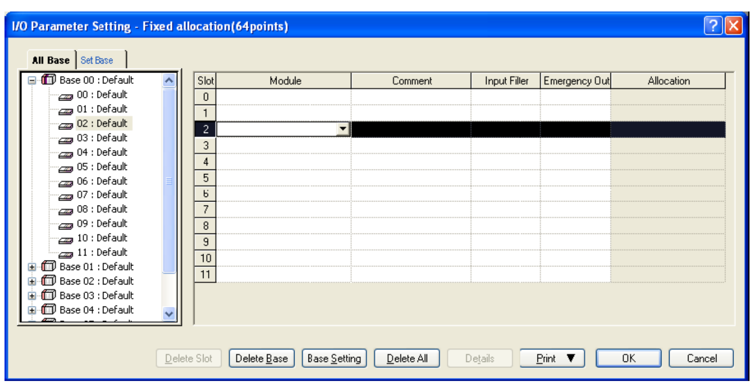
How to use I/O parameters?

Perform the following steps to explain about usage of I/O parameters.

Step	Action
1	Run SoftMaster to create a project.
2	On the **Project Window**, double-click **I/O Parameter**

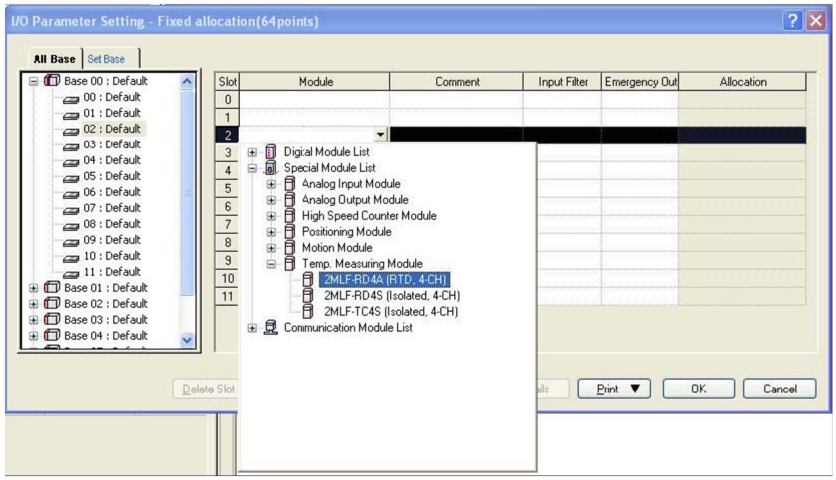


The following window appears.



Step	Action
3	On the I/**O parameters Setting** window, click the slot of the base where RTD module is installed. Here, RTD module is installed on Base No.0, Slot No.2.
4	Search for the applicable module to select.

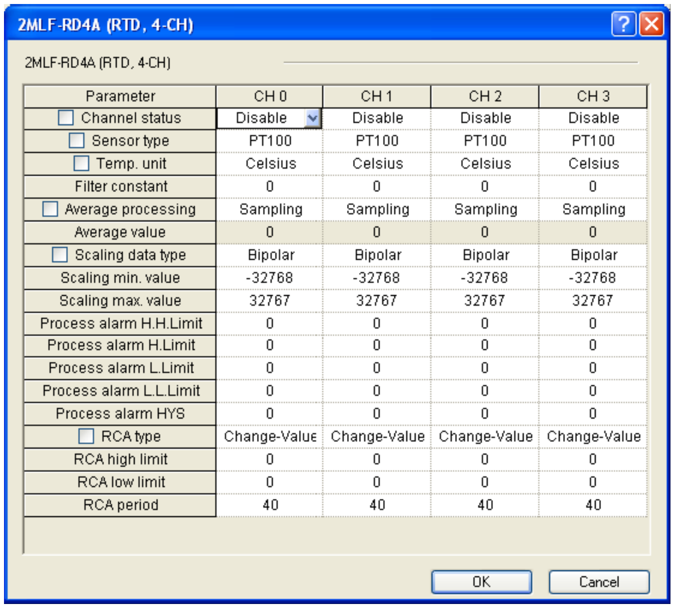
Step | **Action**



5 Select the module, click **Details**.

The following window displays to specify parameters for respective channels as shown below. Click a desired item to display parameters to set for respective items.

Step	Action


2MLF-RD4A (RTD, 4-CH)

2MLF-RD4A (RTD, 4-CH)

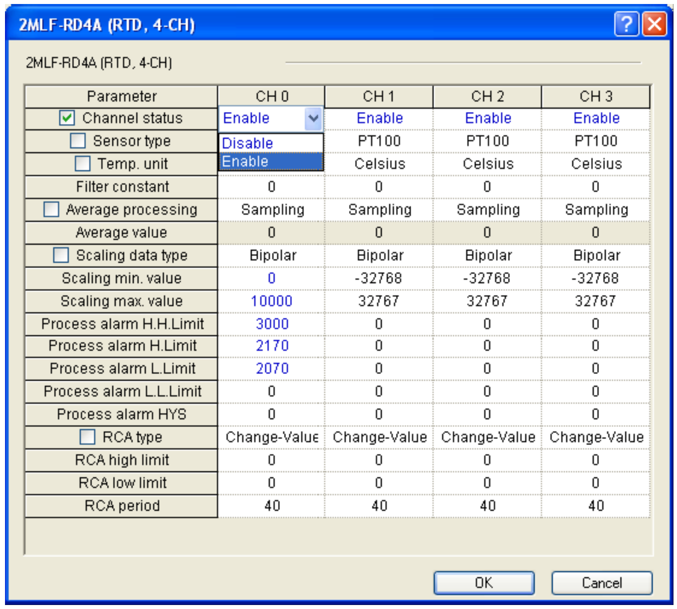
Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Disable	Disable	Disable	Disable
Sensor type	PT100	PT100	PT100	PT100
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	-32768	-32768	-32768	-32768
Scaling max. value	32767	32767	32767	32767
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

OK Cancel

6 The module parameters are explained as below.

Channel status: Select Enable or Disable. Select Enable to operate the channel.

Step	**Action**



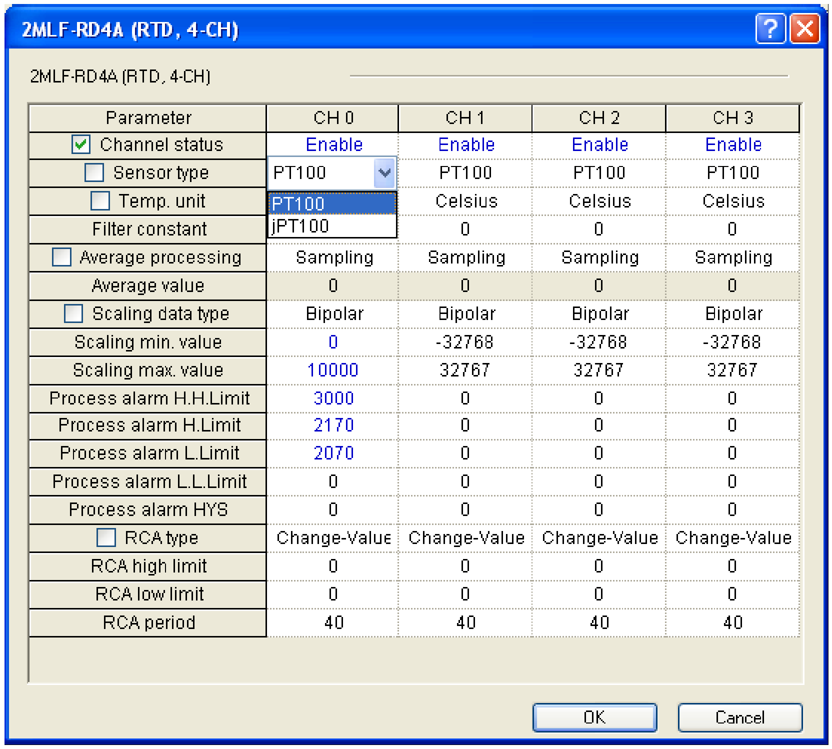
2MLF-RD4A (RTD, 4-CH)

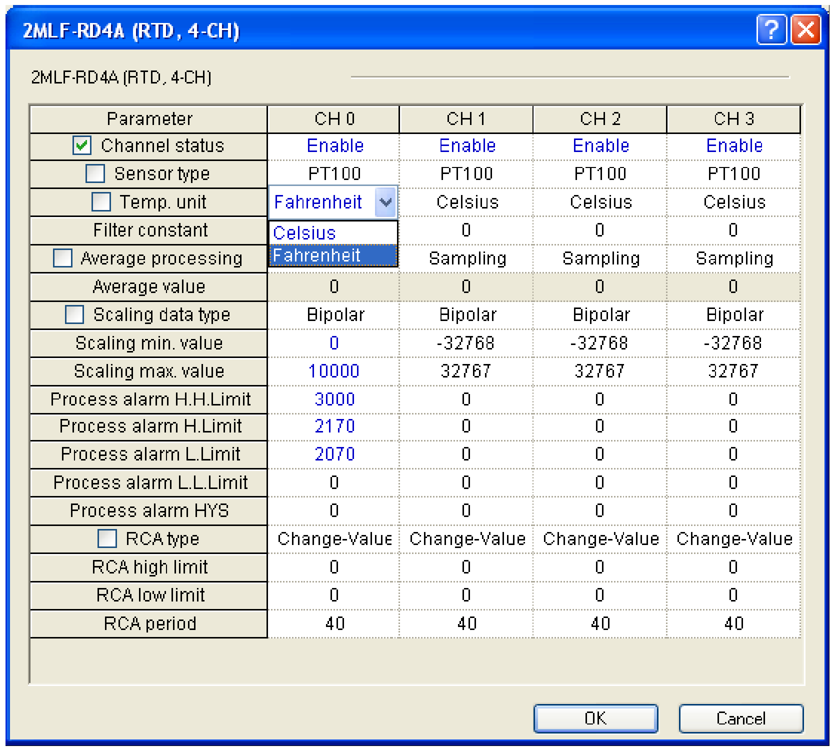
2MLF-RD4A (RTD, 4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	Disable	PT100	PT100	PT100
Temp. unit	Enable	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	0	-32768	-32768	-32768
Scaling max. value	10000	32767	32767	32767
Process alarm H.H.Limit	3000	0	0	0
Process alarm H.Limit	2170	0	0	0
Process alarm L.Limit	2070	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

OK Cancel

Sensor type: Select a sensor type to use between Pt100 and JPt100.

Step	Action
	
	Temperature unit: Select the output temperature unit among Celsius and Fahrenheit.

Step	Action
	

2MLF-RD4A (RTD, 4-CH)

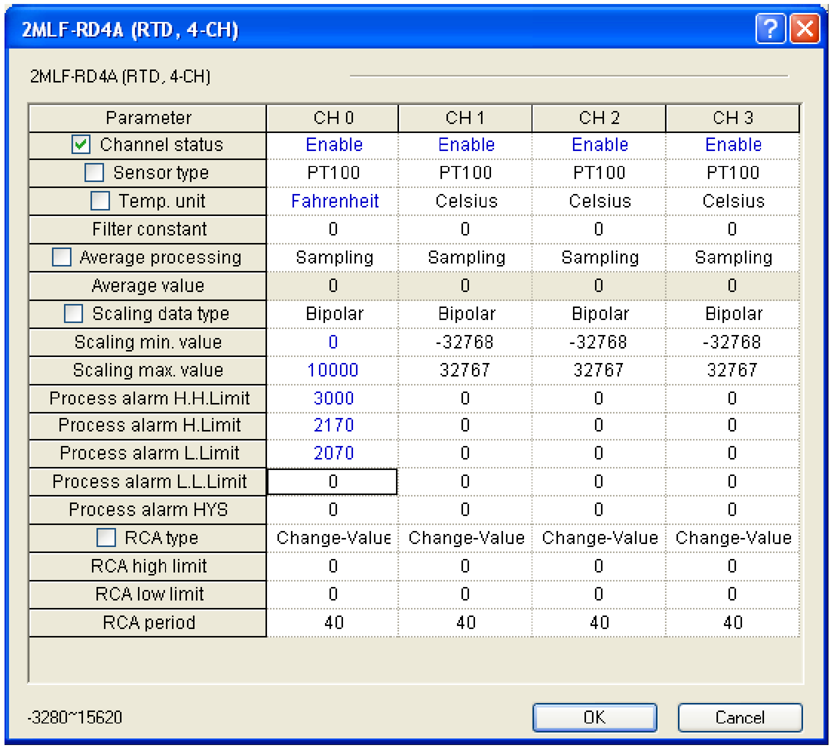
2MLF-RD4A (RTD, 4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	PT100	PT100	PT100	PT100
Temp. unit	Fahrenheit	Celsius	Celsius	Celsius
Filter constant	Celsius	0	0	0
Average processing	Fahrenheit	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	0	-32768	-32768	-32768
Scaling max. value	10000	32767	32767	32767
Process alarm H.H.Limit	3000	0	0	0
Process alarm H.Limit	2170	0	0	0
Process alarm L.Limit	2070	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

OK Cancel

Setting value input: If you select an input item, the input range of the applicable setting value displays at the lower-half of the window.

Step	**Action**



2MLF-RD4A (RTD, 4-CH)

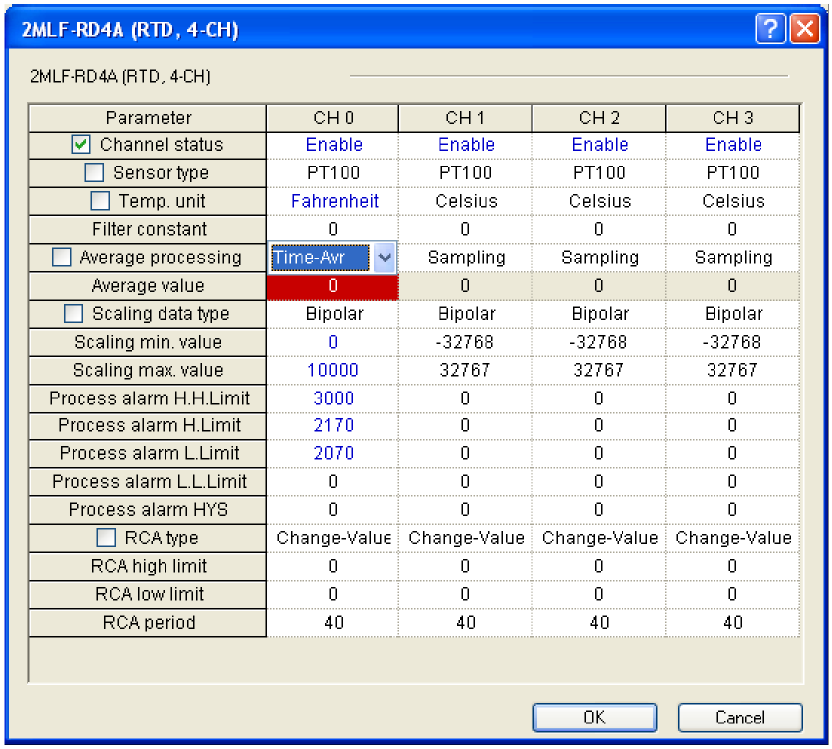
2MLF-RD4A (RTD, 4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
☑ Channel status	Enable	Enable	Enable	Enable
☐ Sensor type	PT100	PT100	PT100	PT100
☐ Temp. unit	Fahrenheit	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
☐ Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
☐ Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	0	-32768	-32768	-32768
Scaling max. value	10000	32767	32767	32767
Process alarm H.H.Limit	3000	0	0	0
Process alarm H.Limit	2170	0	0	0
Process alarm L.Limit	2070	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
☐ RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

-3280~15620 OK Cancel

Incorrect setting: If you enter any incorrect value it is turned red as shown below (if input range is incorrect).

Step	Action



Parameter	CH 0	CH 1	CH 2	CH 3
☑ Channel status	Enable	Enable	Enable	Enable
☐ Sensor type	PT100	PT100	PT100	PT100
☐ Temp. unit	Fahrenheit	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
☐ Average processing	Time-Avr	Sampling	Sampling	Sampling
Average value	0	0	0	0
☐ Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	0	-32768	-32768	-32768
Scaling max. value	10000	32767	32767	32767
Process alarm H.H.Limit	3000	0	0	0
Process alarm H.Limit	2170	0	0	0
Process alarm L.Limit	2070	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
☐ RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

7 **Applying identical settings to all channels**: Select the check box on the parameter menu to select and change setting of a channel then the setting value of all the channels will be identical to changed value.

The figure in Step 6, shows that channel status is changed to ‘Enable’ for all the channels.

4.3 Functions of Special Module Monitoring

Functions of Special Module Monitoring are as described Table 5.

Table 5 – Functions of Special Module Monitoring

Item	Details	Remarks
Special Module Monitoring	**Monitor/Test** In SoftMaster menu, click **Monitor** > **Special Module Monitorin**g, temperature-converted value can be monitored and the operation of RTD module can be tested. **Monitoring the max./min. value** The maximum/minimumvalue of the channel can be monitored during Run. However, the maximum/minimum value displayed here is based on the present value shown on the window. Accordingly, when Monitoring/Test window is closed, the maximum/minimum value will not be saved.	

ATTENTION

The window may not be normally displayed due to insufficient system resource. In such a case, close the window and other applications and restart SoftMaster.

4.4 Precautions

The parameters specified to test RTD module on the 'Special Module Monitoring' window will be deleted when 'Special Module Monitoring' window is closed. In other words, the parameters of RTD module specified on the 'Special Module Monitoring' window will not be saved in I/O parameters located on the left pane of SoftMaster.

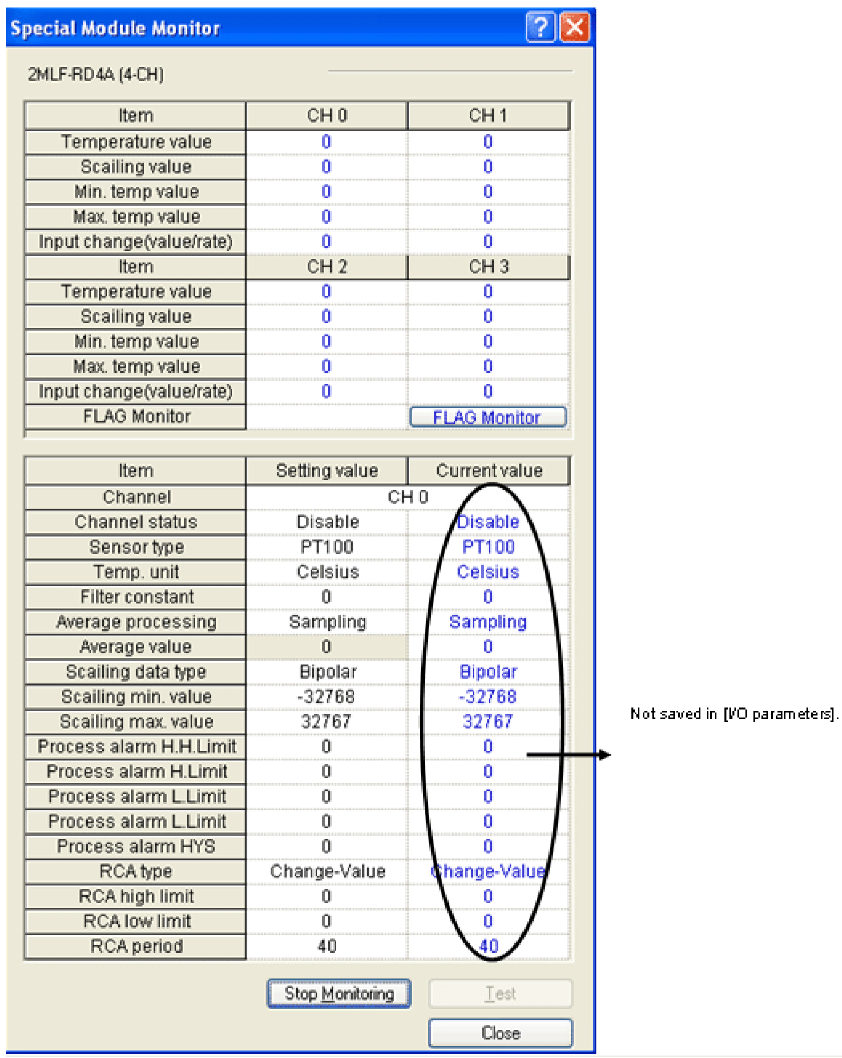


Figure 23 – Special Module Monitor

Test function of Special Module Monitor operates when the sequence program is stopped and not available while in run mode.

Test function of Special Module Monitoring is provided for user to check without sequence programming if the RTD module operates normally. If RTD module is to be used for other purposes than test, use parameters setting function in I/O parameters.

4.5 Special Module Monitoring

The usage of Special Module Monitoring is described below.

Running Special Module Monitoring

Click **Online** > **Connect and Monitor** > **Special Module Monitoring** to run **Special Module Monitoring**. If the status is not Online, Special Module Monitoring menu will not be activated.

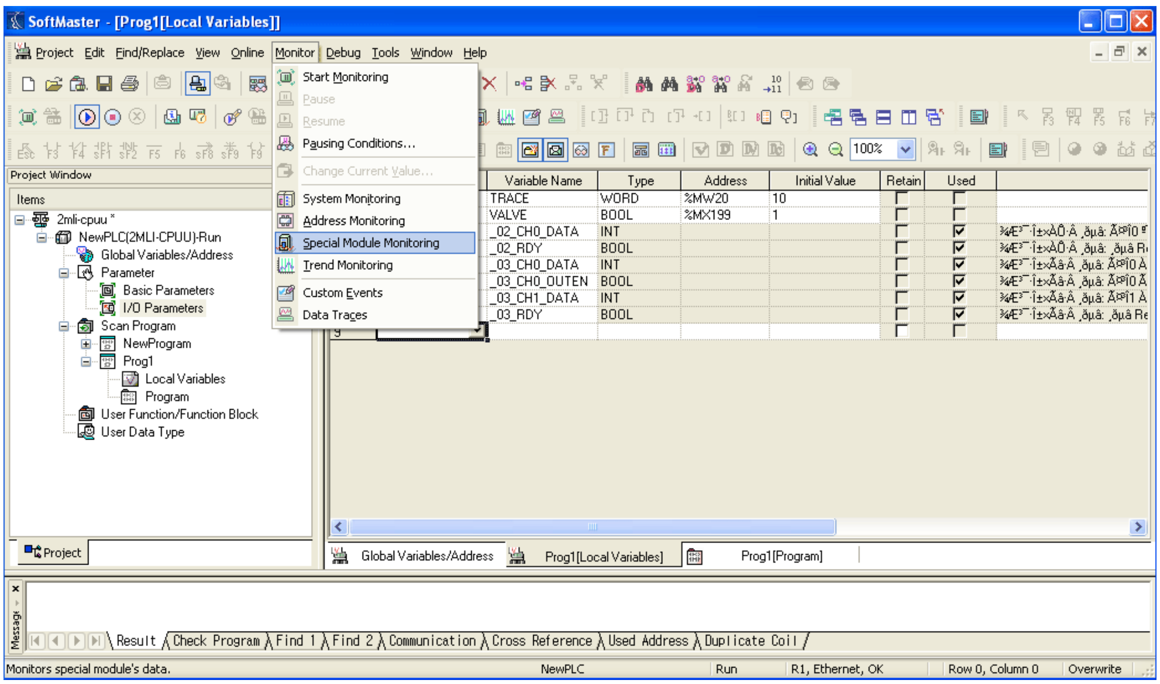


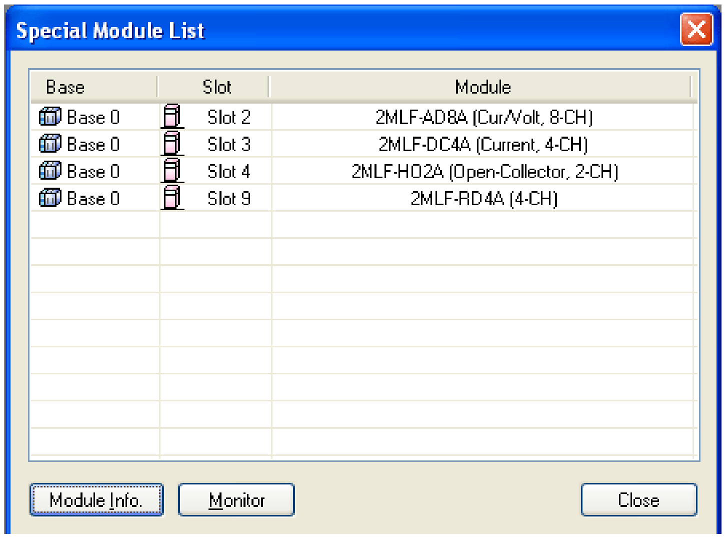
Figure 24 – Monitor menu

How to use Special Module Monitoring?

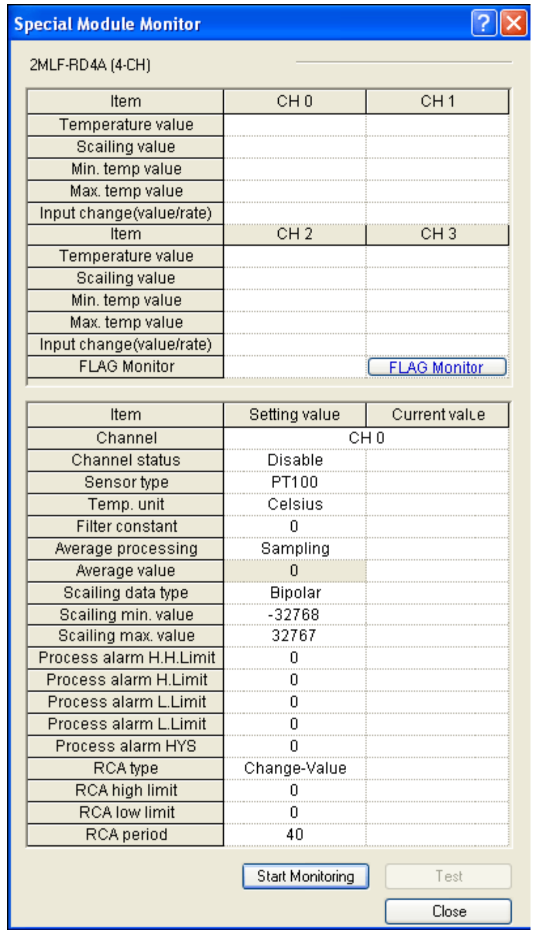
Perform the following steps to use Special Module Monitoring.

Step	Action
1	Connect SoftMaster to PLC CPU (online status), click **Monitor** > **Special Module Monitoring** to display Special Module List window as described in figure below showing base/slot information, in addition, to special module type. The module list dialog box displays the module installed on the present

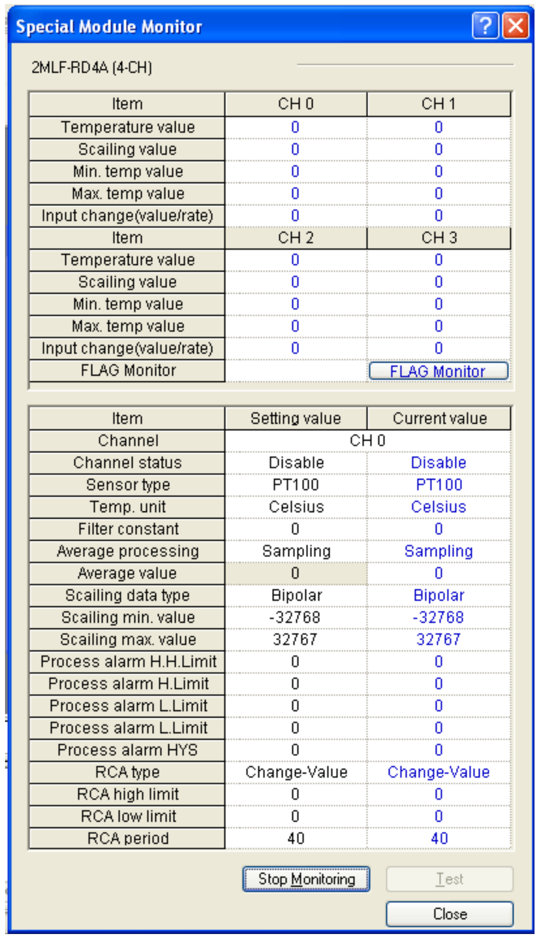
Step	Action
	PLC system.



Step	Action
2	Select the Special Module in the above figure and click **Module Info** to display the information.
3	Click Monitor on the Special Module List window to display **Special Module Monitor** window as in figure below, where four options are available, that is, FLAG Monitor, Start Monitoring, Test, and Close. RTD module's temperature-converted value and scaling value displays on the upper-half of the monitor window and parameters items of respective modules are displayed for individual setting at the lower-half of the test window.

Step	**Action**
	
4	**Start Monitoring**: Click **Start Monitoring** to display temperature-converted value of the online channel. The following figure illustrates the monitoring window displayed when all channels are in Stop status. The presently specified parameters of RTD module displays.

Step	Action



Special Module Monitoring

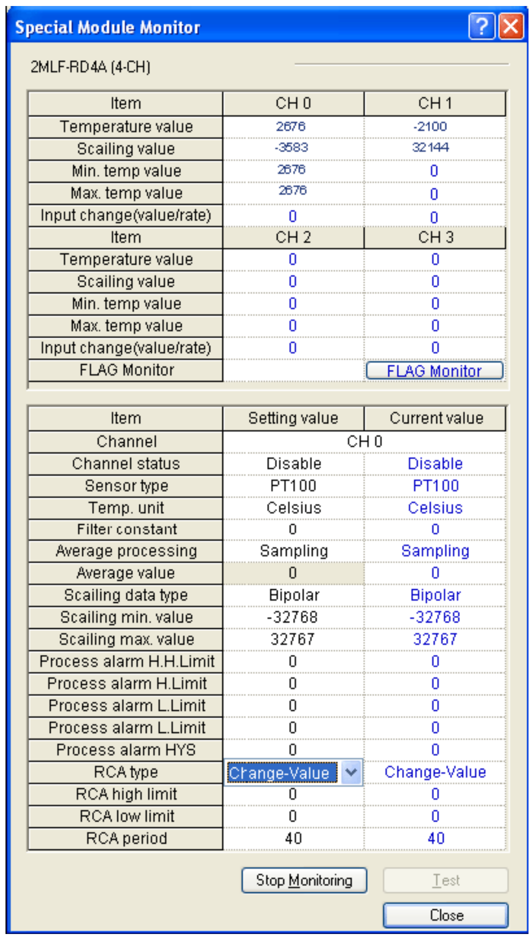
2MLF-RD4A (4-CH)

Item	CH 0	CH 1
Temperature value	0	0
Scailing value	0	0
Min. temp value	0	0
Max. temp value	0	0
Input change(value/rate)	0	0
Item	CH 2	CH 3
Temperature value	0	0
Scailing value	0	0
Min. temp value	0	0
Max. temp value	0	0
Input change(value/rate)	0	0
FLAG Monitor		FLAG Monitor

Item	Setting value	Current value
Channel	CH 0	
Channel status	Disable	Disable
Sensor type	PT100	PT100
Temp. unit	Celsius	Celsius
Filter constant	0	0
Average processing	Sampling	Sampling
Average value	0	0
Scailing data type	Bipolar	Bipolar
Scailing min. value	-32768	-32768
Scailing max. value	32767	32767
Process alarm H.H.Limit	0	0
Process alarm H.Limit	0	0
Process alarm L.Limit	0	0
Process alarm L.Limit	0	0
Process alarm HYS	0	0
RCA type	Change-Value	Change-Value
RCA high limit	0	0
RCA low limit	0	0
RCA period	40	40

Stop Monitoring | Test | Close

Step	Action
5	**Test**: Test is used to change the presently specified parameters of RTD module. Click the setting value to change the parameters. The following figure displays after Test is executed with channel 1's input sensor type changed to PT100 if the input state is not wired.


Special Module Monitor

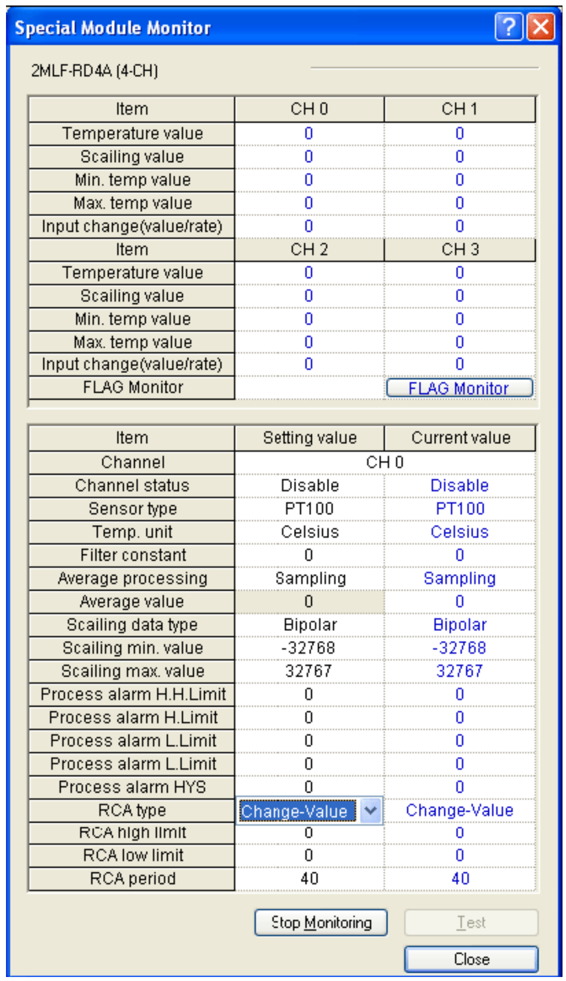
2MLF-RD4A (4-CH)

Item	CH 0	CH 1
Temperature value	2676	-2100
Scailing value	-3583	32144
Min. temp value	2676	0
Max. temp value	2676	0
Input change(value/rate)	0	0
Item	CH 2	CH 3
Temperature value	0	0
Scailing value	0	0
Min. temp value	0	0
Max. temp value	0	0
Input change(value/rate)	0	0
FLAG Monitor		FLAG Monitor

Item	Setting value	Current value
Channel	CH 0	
Channel status	Disable	Disable
Sensor type	PT100	PT100
Temp. unit	Celsius	Celsius
Filter constant	0	0
Average processing	Sampling	Sampling
Average value	0	0
Scailing data type	Bipolar	Bipolar
Scailing min. value	-32768	-32768
Scailing max. value	32767	32767
Process alarm H.H.Limit	0	0
Process alarm H.Limit	0	0
Process alarm L.Limit	0	0
Process alarm L.Limit	0	0
Process alarm HYS	0	0
RCA type	Change-Value	Change-Value
RCA high limit	0	0
RCA low limit	0	0
RCA period	40	40

Stop Monitoring
Test
Close

Step	Action
6	**Max/Min active**: Click 'FLAG Monitor' to set Max/Min active of the RTD module Enable and close the command window to monitor the maximum/minimum temperature-converted value as shown below:



Step	Action
7	**Close**: Close is used for closing from the monitoring/test window. When the monitoring/test window is closed, the maximum value, the minimum value and the present value will not be saved.

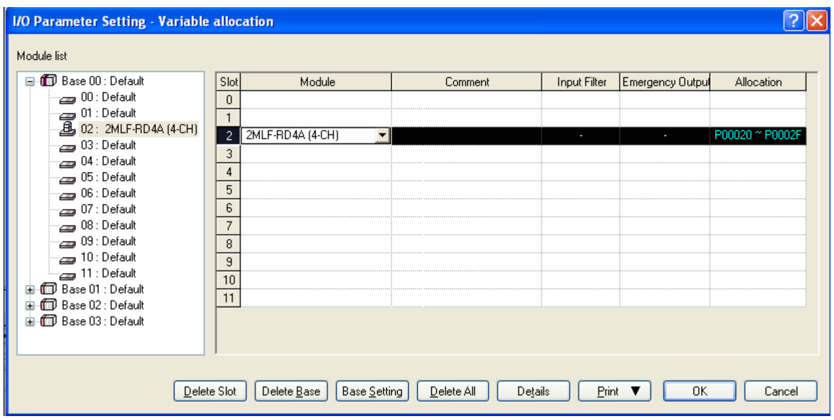
4.6 Automatic registration of Special Module Variables

Automatic registration function of SoftMaster Special Module Variables is described below.

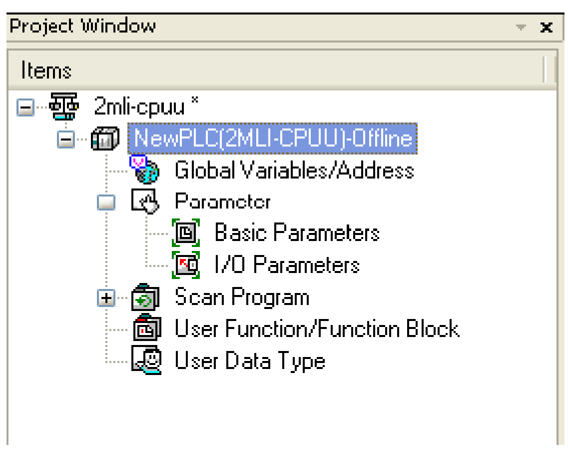
Automatic registration of special module variables

See the special module information specified in I/O parameters to register the variable of each module automatically. User can modify the variables and descriptions.

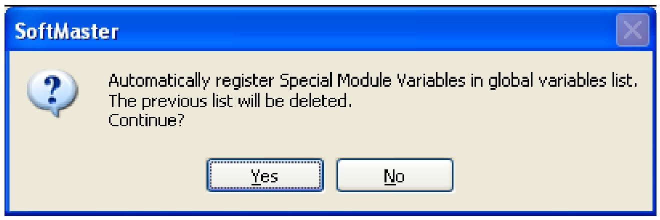
Step	Action
1	Specify the special module of the slot on I/O parameters.



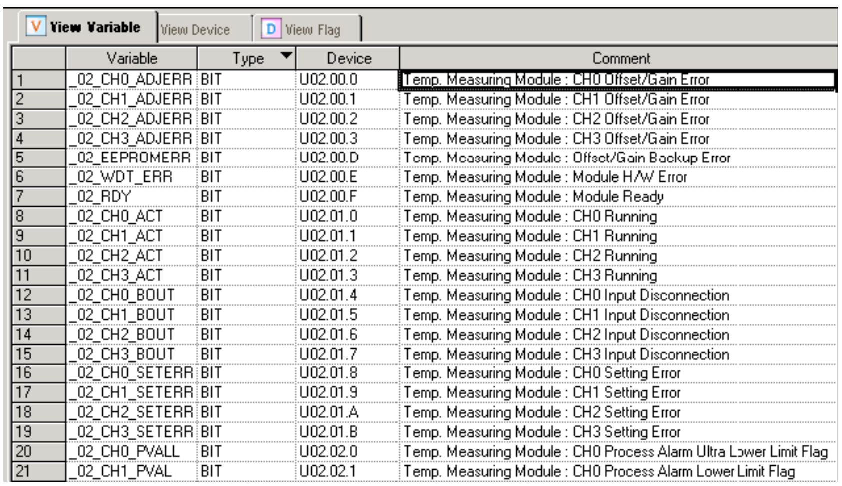
Step	Action
2	Double-click **Global Variable/Address**.



Step	Action
3	On the Edit menu, click **Register Special Module Variables**. The following confirmation message displays.



Step	Action
4	Click **Yes** to continue.
5	Variables are registered as shown in the below window.



View Variable | View Device | View Flag

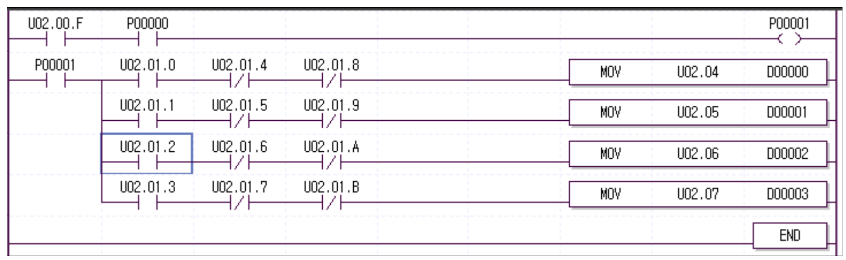
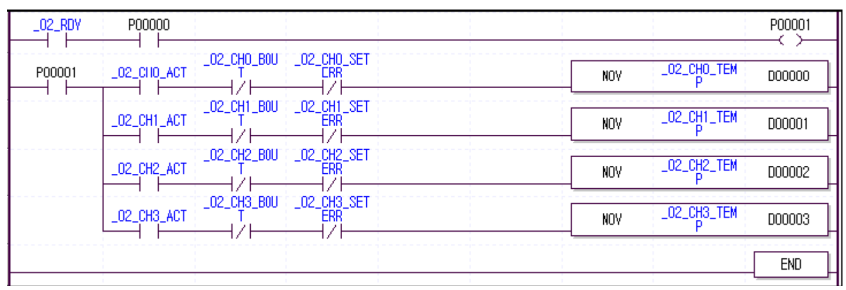
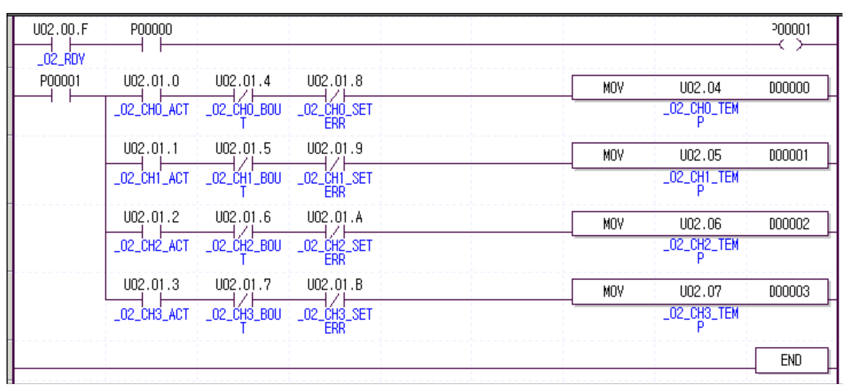
	Variable	Type	Device	Comment
1	_02_CH0_ADJERR	BIT	U02.00.0	Temp. Measuring Module : CH0 Offset/Gain Error
2	_02_CH1_ADJERR	BIT	U02.00.1	Temp. Measuring Module : CH1 Offset/Gain Error
3	_02_CH2_ADJERR	BIT	U02.00.2	Temp. Measuring Module : CH2 Offset/Gain Error
4	_02_CH3_ADJERR	BIT	U02.00.3	Temp. Measuring Module : CH3 Offset/Gain Error
5	_02_EEPROMERR	BIT	U02.00.D	Temp. Measuring Module : Offset/Gain Backup Error
6	_02_WDT_ERR	BIT	U02.00.E	Temp. Measuring Module : Module H/W Error
7	_02_RDY	BIT	U02.00.F	Temp. Measuring Module : Module Ready
8	_02_CH0_ACT	BIT	U02.01.0	Temp. Measuring Module : CH0 Running
9	_02_CH1_ACT	BIT	U02.01.1	Temp. Measuring Module : CH1 Running
10	_02_CH2_ACT	BIT	U02.01.2	Temp. Measuring Module : CH2 Running
11	_02_CH3_ACT	BIT	U02.01.3	Temp. Measuring Module : CH3 Running
12	_02_CH0_BOUT	BIT	U02.01.4	Temp. Measuring Module : CH0 Input Disconnection
13	_02_CH1_BOUT	BIT	U02.01.5	Temp. Measuring Module : CH1 Input Disconnection
14	_02_CH2_BOUT	BIT	U02.01.6	Temp. Measuring Module : CH2 Input Disconnection
15	_02_CH3_BOUT	BIT	U02.01.7	Temp. Measuring Module : CH3 Input Disconnection
16	_02_CH0_SETERR	BIT	U02.01.8	Temp. Measuring Module : CH0 Setting Error
17	_02_CH1_SETERR	BIT	U02.01.9	Temp. Measuring Module : CH1 Setting Error
18	_02_CH2_SETERR	BIT	U02.01.A	Temp. Measuring Module : CH2 Setting Error
19	_02_CH3_SETERR	BIT	U02.01.B	Temp. Measuring Module : CH3 Setting Error
20	_02_CH0_PVALL	BIT	U02.02.0	Temp. Measuring Module : CH0 Process Alarm Ultra Lower Limit Flag
21	_02_CH1_PVAL	BIT	U02.02.1	Temp. Measuring Module : CH0 Process Alarm Lower Limit Flag

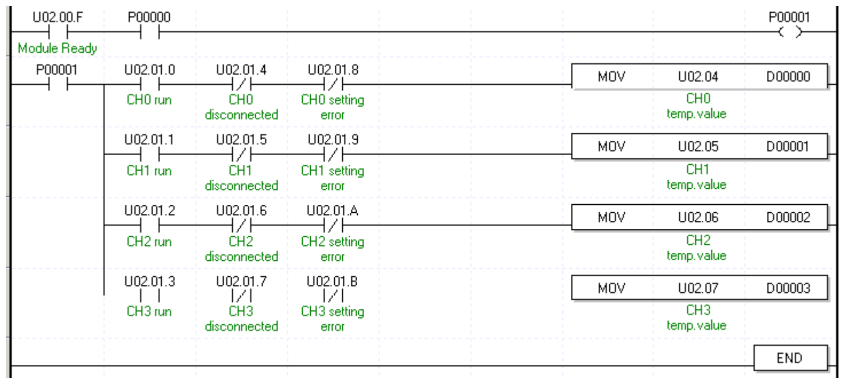
Save variables

1. Contents in the ‘View variables’ tab can be saved in a text file.
2. On the **Edit** menu, click **Save in a text file**.
3. Contents in the ‘View variables’ tab will be saved in a text file.

View variables in the program

Step	Action
1	Sample ladder program in SoftMaster is as shown below.

Step	Action
	
2	On the **View** tab, click **View variables**. Addresses are changed to variables.
	
3	On the **View** tab, click Address/Variables to see addresses and variables simultaneously.
	
4	On the **View** tab, click Addresses/Comments to see addresses and descriptions simultaneously.

Step	Action
	

U02.00.F
P00000
P00001
Module Ready
P00001
U02.01.0
U02.01.4
U02.01.8
MOV
U02.04
D00000
CH0 run
CH0 disconnected
CH0 setting error
CH0 temp.value
U02.01.1
U02.01.5
U02.01.9
MOV
U02.05
D00001
CH1 run
CH1 disconnected
CH1 setting error
CH1 temp.value
U02.01.2
U02.01.6
U02.01.A
MOV
U02.06
D00002
CH2 run
CH2 disconnected
CH2 setting error
CH2 temp.value
U02.01.3
U02.01.7
U02.01.B
MOV
U02.07
D00003
CH3 run
CH3 disconnected
CH3 setting error
CH3 temp.value
END

5. Internal Memory Configuration and Functions

The RTD input module uses internal memory for data communication with PLC CPU module.

5.1 Internal memory configuration

The following tables describes the configuration of internal memory.

Input/output area of conversion data (%U Address)

The internal memory is designated for conversion data of the RTD input module as shown in Table 6.

Table 6 – Conversion data input/output area 1

Address	Variable Name	Description	R/W	Signal Direction
%UXa.b.0	_ab_CH0_ADJERR	CH0 Offset/Gain Error	R	RTD input → CPU
%UXa.b.1	_ab_CH1_ADJERR	CH1 Offset/Gain Error		
%UXa.b.2	_ab_CH2_ADJERR	CH2 Offset/Gain Error		
%UXa.b.3	_ab_CH3_ADJERR	CH3 Offset/Gain Error		
%UXa.b.13	_ab_EEPROMERR	Offset/Gain Backup Error		
%UXa.b.14	_ab_WDT_ERR	Module H/W Error		
%UXa.b.15	_ab_RDY	Module Ready		
%UXa.b16	_ab_CH0_ACT	CH0 Running		
%UXa.b17	_ab_CH1_ACT	CH1 Running		
%UXa.b18	_ab_CH2_ACT	CH2 Running		
%UXa.b19	_ab_CH3_ACT	CH3 Running		
%UXa.b.20	_ab_CH0_BOUT	CH0 Input Disconnection		

Address	Variable Name	Description	R/W	Signal Direction
%UXa.b.21	_ab_CH1_BOUT	CH2 Input Disconnection	R	RTD input → CPU
%UXa.b.22	_ab_CH2_BOUT	CH2 Input Disconnection		
%UXa.b.23	_ab_CH3_BOUT	CH3 Input Disconnection		
%UXa.b24	_ab_CH0_SETERR	CH0 Setting Error		
%UXa.b25	_ab_CH1_SETERR	CH1 Setting Error		
%UXa.b26	_ab_CH2_SETERR	CH2 Setting Error		
%UXa.b27	_ab_CH3_SETERR	CH3 Setting Error		
%UXa.b.32	_ab_CH0_PALL	CH0 Process Alarm Ultra Lower Limit Flag		
%UXa.b.33	_ab_CH0_PAL	CH0 Process Alarm Lower Limit Flag		
%UXa.b.34	_ab_CH0_PAH	CH0 Process Alarm Upper Limit Flag		
%UXa.b.35	_ab_CH0_PAHH	CH0 Process Alarm Ultra Upper Limit Flag		
%UXa.b.36	_ab_CH1_PALL	CH1 Process Alarm Ultra Lower Limit Flag		
%UXa.b.37	_ab_CH1_PAL	CH1 Process Alarm Lower Limit Flag		
%UXa.b.38	_ab_CH1_PAH	CH1 Process Alarm Upper Limit Flag	R	RTD input → CPU
%UXa.b.39	_ab_CH1_PAHH	CH1 Process Alarm Ultra Upper Limit		

Address	Variable Name	Description	R/W	Signal Direction
		Flag		
%UXa.b.40	_ab_CH2_PALL	CH2 Process Alarm Ultra Lower Limit Flag		
%UXa.b.41	_ab_CH2_PAL	CH2 Process Alarm Lower Limit Flag		
%UXa.b.42	_ab_CH2_PAH	CH2 Process Alarm Upper Limit Flag		
%UXa.b.43	_ab_CH2_PAHH	CH2 Process Alarm Ultra Upper Limit Flag		
%UXa.b.44	_ab_CH3_PALL	CH3 Process Alarm Ultra Lower Limit Flag		
%UXa.b.45	_ab_CH3_PAL	CH3 Process Alarm Lower Limit Flag		
%UXa.b.46	_ab_CH3_PAH	CH3 Process Alarm Upper Limit Flag		
%UXa.b.47	_ab_CH3_PAHH	CH3 Process Alarm Ultra Upper Limit Flag		
%UXa.b.48	_ab_CH0_RAL	CH0 Rate-Change-Alarm Lower Limit Flag		
%UXa.b.49	_ab_CH0_RAH	CH0 Rate-Change-Alarm Upper Limit Flag		
%UXa.b.52	_ab_CH1_RAL	CH1 Rate-Change-Alarm Lower Limit Flag		
%UXa.b.53	_ab_CH1_RAH	CH1 Rate-Change-Alarm Upper Limit Flag	R	RTD input → CPU
%UX1.1.56	_ab_CH2_RAL	CH2 Rate-Change-		

Address	Variable Name	Description	R/W	Signal Direction
		Alarm Lower Limit Flag		
%UX1.1.57	_ab_CH2_RAH	CH2 Rate-Change-Alarm Upper Limit Flag		
%UX1.1.60	_ab_CH3_RAL	CH3 Rate-Change-Alarm Lower Limit Flag		
%UX1.1.61	_ab_CH3_RAH	CH3 Rate-Change-Alarm Upper Limit Flag		
%UWa.b.4	_ab_CH0_TEMP	CH0 Temp. Value		
%UWa.b.5	_ab_CH1_TEMP	CH1 Temp. Value		
%UWa.b.6	_ab_CH2_TEMP	CH2 Temp. Value		
%UWa.b.7	_ab_CH3_TEMP	CH3 Temp. Value		
%UWa.b.8	_ab_CH0_SCAL	CH0 Scaling Value		
%UW1.b.9	_ab_CH1_SCAL	CH1 Scaling Value		
%UWa.b.10	_ab_CH2_SCAL	CH2 Scaling Value		
%UWa.b.11	_ab_CH3_SCAL	CH3 Scaling Value		
%UWa.b.13	_ab_CH0_MAX	CH0 Temp. Max. Value		
%UWa.b.12	_ab_CH0_MIN	CH0 Temp. Min. Value	R	RTD input → CPU
%UWa.b.15	_ab_CH1_MAX	CH1 Temp. Max. Value		
%UWa.b.14	_ab_CH1_MIN	CH1 Temp. Min. Value		
%UWa.b.17	_ab_CH2_MAX	CH2 Temp. Max. Value		
%UWa.b.16	_ab_CH2_MIN	CH2 Temp. Min. Value		

Address	Variable Name	Description	R/W	Signal Direction
%UWa.b.19	_ab_CH3_MAX	CH3 Temp. Max. Value		
%UWa.b.18	_ab_CH3_MIN	CH3 Temp. Min. Value		
%UDa.b.10	_ab_CH0_TIME	CH0 Data Upload Time		
%UDa.b.11	_ab_CH1_TIME	CH1 Data Upload Time		
%UDa.b.12	_ab_CH2_TIME	CH2 Data Upload Time		
%UDa.b.13	_ab_CH3_TIME	CH3 Data Upload Time		

Instruction delivered from MasterLogic-200 PLC to module (MasterLogic-200 PLC output area) is as shown in Table 7.

Table 7 – Conversion data input/output area 2

Address Assignment	Variable Name	Description	R/W	Signal Direction
%UXa.b.464	_11_CH0_FINDEN	CH0 Max./Min. Search Enable/Disable	R / W	RTD input ↔ CPU
%UXa.b.465	_11_CH1_FINDEN	CH1 Max./Min. Search Enable/Disable		
%UXa.b.466	_11_CH2_FINDEN	CH2 Max./Min. Search Enable/Disable		
%UXa.b.467	_11_CH3_FINDEN	CH3 Max/Min Search Enable/Disable		
%UXa.b.468	_11_CH0_ALMEN	CH0 Alarm(PVA/RCA) Enable/Disable		
%UXa.b.469	_11_CH1_ALMEN	CH1 Alarm(PVA/RCA) Enable/Disable		
%UXa.b.470	_11_CH2_ALMEN	CH2 Alarm(PVA/RCA) Enable/Disable		
%UXa.b.471	_11_CH3_ALMEN	CH3 Alarm(PVA/RCA) Enable/Disable		

1. For the address assignment, 'a' stands for the Base No. and 'b' for the Slot No. on which RTD input module is installed.
2. .In order to read 'CH0 (Channel 0) Temp. Value ' from the RTD input module installed on Base No.0, Slot No.4, its address will be %UW04.04.

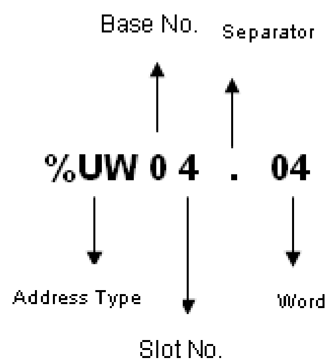


Figure 25– Memory address of CH0

3. In order to read 'the Flag status that detects CH3 (Channel 3) Input Disconnection' from the RTD module installed on Base No.0, Slot No.5, The memory address used to access the flag status will be. %UX05.23

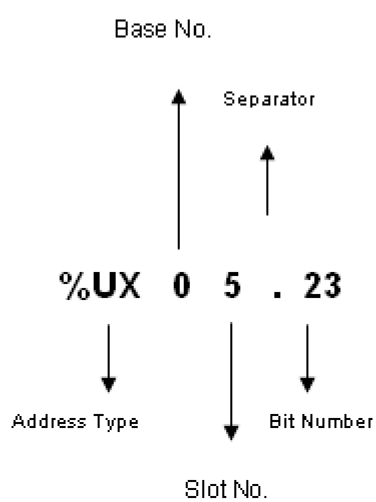


Figure 26 – Memory address of CH3

Operation parameter setting area (PUT/PUTP)

The internal memory is reserved for the 'Operation Parameter' data of the RTD module.

Table below shows the operation parameter setting area of the RTD module.

Table 8 – Operation parameter setting area

Address		Description	Default	R/W	Command Used
Hex.	Dec.				
0H	0	Using Channel Setting	0	R/W	PUT/GET
1H	1	Channel 0 Sensor Type Setting	0	R/W	
2H	2	Channel 1 Sensor Type Setting			
3H	3	Channel 2 Sensor Type Setting			
4H	4	Channel 3 Sensor Type Setting			
5H	5	Temperature Display Unit Setting	0	R/W	
6H	6	Channel 0 Filter Value Setting	0	R/W	
7H	7	Channel 1 Filter Value Setting			
8H	8	Channel 2 Filter Value Setting			
9H	9	Channel 3 Filter Value Setting			
AH	10	Channel 0 Averaging Method Setting	0	R/W	
BH	11	Channel 1 Averaging Method Setting			
CH	12	Channel 2 Averaging Method Setting			
DH	13	Channel 3 Averaging Method Setting			
EH	14	Channel 0 Average Value Setting	0	R/W	
FH	15	Channel 1 Average Value Setting			
10H	16	Channel 2 Average Value Setting			
11H	17	Channel 3 Average Value Setting			
12H	18	Scaling Type Setting	0	R/W	
13H	19	Channel 0 Scaled Range Min. Value Setting	-32768	R/W	

Address		Description	Default	R/W	Command Used
Hex.	Dec.				
14H	20	Channel 0 Scaled Range Max. Value Setting	32767		
15H	21	Channel 1 Scaled Range Min. Value Setting	-32768		
16H	22	Channel 1 Scaled Range Max. Value Setting	32767		
17H	23	Channel 2 Scaled Range Min. Value Setting	-32768		
18H	24	Channel 2 Scaled Range Max. Value Setting	32767		
19H	25	Channel 3 Scaled Range Min. Value Setting	-32768		
1AH	26	Channel 3 Scaled Range Max. Value Setting	32767		
1BH	27	Channel 0 Process Alarm H.H. Limit Setting	0	R/W	PUT/GET
1CH	28	Channel 0 Process Alarm H. Limit Setting			
1DH	29	Channel 0 Process Alarm L. Limit Setting			
1EH	30	Channel 0 Process Alarm Min. L.L. Limit Setting			
1FH	31	Channel 1 Process Alarm H.H. Limit Setting			
20H	32	Channel 1 Process Alarm H. Limit Setting			
21H	33	Channel 1 Process Alarm L. Limit Setting			
22H	34	Channel 1 Process Alarm L.L. Limit Setting			
23H	35	Channel 2 Process Alarm H.H. Limit Setting			
24H	36	Channel 2 Process Alarm H. Limit Setting			
25H	37	Channel 2 Process Alarm L. Limit Setting			
26H	38	Channel 2 Process Alarm L.L. Limit Setting			
27H	39	Channel 3 Process Alarm H.H. Limit Setting			
28H	40	Channel 3 Process Alarm H. Limit Setting			
29H	41	Channel 3 Process Alarm L. Setting			
2AH	42	Channel 3 Process Alarm L.L. Setting			

Address		Description	Default	R/W	Command Used
Hex.	Dec.				
2BH	43	Channel 0 Process Alarm Hysteresis Setting	0	R/W	
2CH	44	Channel 1 Process Alarm Hysteresis Setting			
2DH	45	Channel 2 Process Alarm Hysteresis Setting			
2EH	46	Channel 3 Process Alarm Hysteresis Setting			
2FH	47	Input Variation Alarm Value Unit Setting	0	R/W	
30H	48	Channel 0 Input Variation Alarm Upper Limit Value Setting	0	R/W	
31H	49	Channel 0 Input Variation Alarm Lower Limit Value Setting			
32H	50	Channel 1 Input Variation Alarm Upper Limit Value Setting			
33H	51	Channel 1 Input Variation Alarm Lower Limit Value Setting			
34H	52	Channel 2 Input Variation Alarm Upper Limit Value Setting			
35H	53	Channel 2 Input Variation Alarm Lower Limit Value Setting			
36H	54	Channel 3 Input Variation Alarm Upper Limit Value Setting			
37H	55	Channel 3 Input Variation Alarm Lower Limit Value Setting			
38H	56	Channel 0 Input Variation Alarm Detection Cycle Setting	40	R/W	
39H	57	Channel 1 Input Variation Alarm Detection Cycle Setting			
3AH	58	Channel 2 Input Variation Alarm Detection Cycle Setting			
3BH	59	Channel 3 Input Variation Alarm Detection Cycle Setting			

Other data monitoring area (GET/GETP)

The internal memory is allocated for storing the monitoring data of the RTD input module.

Table 9 – The other data monitoring area

Address		Description	Default	R/W	Remark
Hex.	Dec.				
3CH	60	Channel 0 Setting Error Information (Flag)	-	R	GET
3DH	61	Channel 1 Setting Error Information (Flag)			
3EH	62	Channel 2 Setting Error Information (Flag)			
3FH	63	Channel 3 Setting Error Information (Flag)			
40H	64	Channel 0 Input Variation Value (Input Variation Alarm Function Value)	-	R	
41H	65	Channel 1 Input Variation Value (Input Variation Alarm Function Value)			
42H	66	Channel 2 Input Variation Value (Input Variation Alarm Function Value)			
43H	67	Channel 3 Input Variation Value (Input Variation Alarm Function Value)			
44H	68	Channel 0 Disconnection Information (code)	-	R	
45H	69	Channel 1 Disconnection Information (code)			
46H	70	Channel 2 Disconnection Information (code)			
47H	71	Channel 3 Disconnection Information (code)			

R/W implies Read/Write availability.

TIP

1. **%U Address**: It is an internal memory of PLC CPU used to read and write to the specific area of the special/communication module (data to read periodically is specified in module) in MasterLogic-200 PLC per scan.
2. Data that is changing frequently is stored in this area of the CPU. Like the other devices, it can be directly used for general instructions such as MOV, CMP, ADD, and so on (while PUT/GET instructions need to be used for parameter area of the module.)

5.2 Internal memory functions

Read module READY/ERROR flags (internal memory address %UXa.b.14~15)

1. **%UXa.b.15**: It will be ON when PLC CPU is powered or reset with RTD module completely ready.
2. **%UXa.b.14**: Module H/W error. If ‘ON’, refer to Troubleshooting.
3. **%UXa.b.13**: Module offset/gain memory error, refer to Troubleshooting.
4. **%UXa.b.0~3**: Offset/gain adjustment error of the applicable channel. If ‘ON’, it means that Offset value, Gain value, or that there is disconnection when adjusted, refer to Troubleshooting.

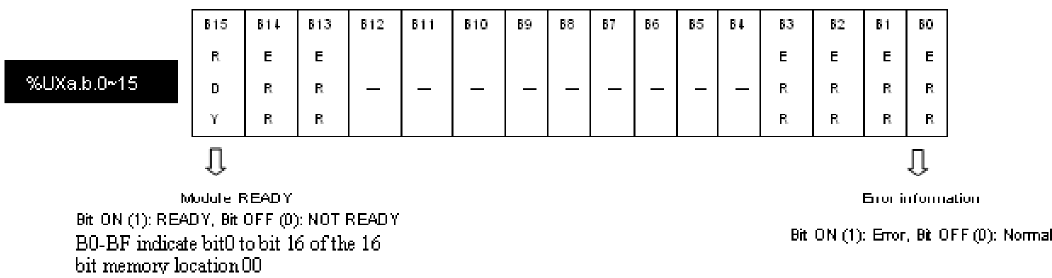


Figure 27 – READY/ERROR flag

Run channel flag (internal memory address %UXa.b.16~27)

1. Run information of respective channels is saved at memory location %UXa.b.16~27.
2. %UXa.b.19~24: Setting error information of the applicable channel. If flag status is ‘1’, see the data monitoring area for setting error information flag (addresses 60–63).
3. %UXa.b.20~23: It displays input disconnection status of the applicable channel. If flag status is ‘1’, see the data monitoring area for disconnection information code (addresses 68–71).
4. %UXa.b.16~19: It displays the run status of the applicable channel. If the applicable channel bit of ‘used CH setting area (address 0)’ is set to 1, it will be 1.

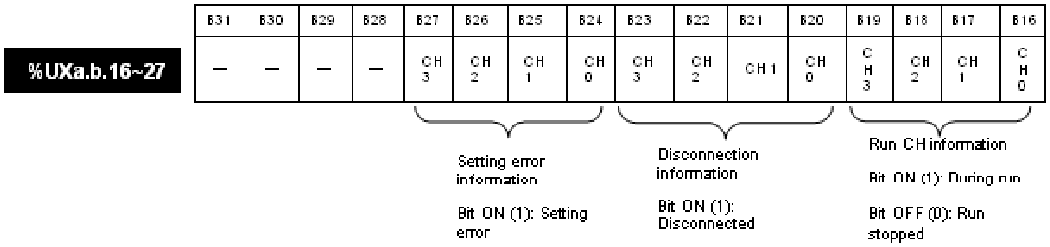


Figure 28 – Run channel flag

Process alarm flag (internal memory address: %UXa.b.32~47)

1. %UXa.b.44~47: CH3 process alarm flag (HH, H, L, LL)
2. %UXa.b.40~43 : CH2 process alarm flag (HH, H, L, LL)
3. %UXa.b.36~39: CH1 process alarm flag (H.H., H., L., L.L.)
4. %UXa.b.32~35: CH0 process alarm flag (HH, H, L, LL)

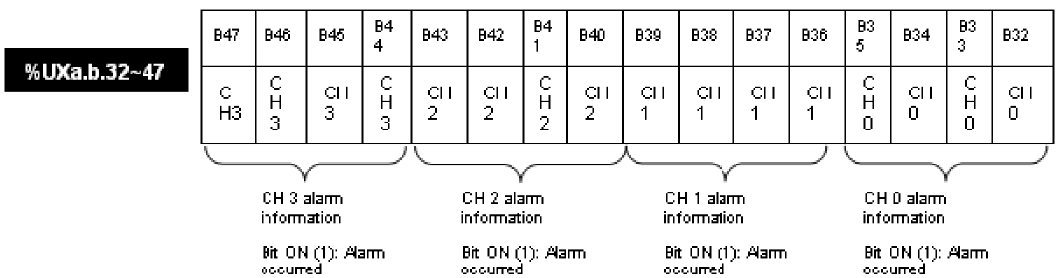


Figure 29 – Run channel flag

Rate of change alarm flag (internal memory address %UXa.b.48~61)

1. %UXa.b.56~57: CH3 rate-change-alarm flag (upper limit/lower limit)
2. %UXa.b.54~55: CH2 rate-change-alarm flag (upper limit/lower limit)
3. %UXa.b.52~53: CH1 rate-change-alarm flag (upper limit/lower limit)
4. %UXa.b.48~49: CH0 rate-change-alarm flag (upper limit/lower limit)

The flag can be set for the input variation in terms of quantity as well as rate of change.

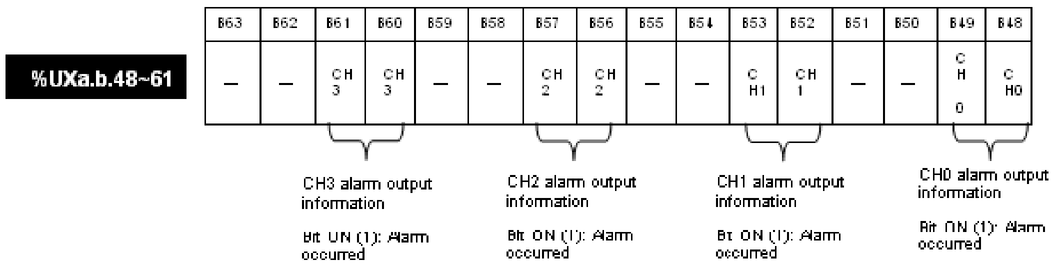


Figure 30 – Rate of change alarm flag

Temperature value (internal memory address %UWa.b.4 ~7)

1. Temperature-converted (measured temperature) value of each channel is stored as shown below.

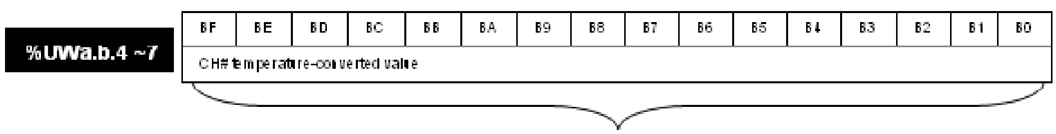


Figure 31 – Temperature-converted value

Address	Description
%UWa.b.4	CH0 Temperature Value
%UWa.b.5	CH2 Temperature Value
%UWa.b.6	CH2 Temperature Value
%UWa.b.7	CH3 Temperature Value

2. Range of the output (measured) temperature value based on sensor type is as follows:

Sensor type	Output range	Effective measuring range	Remarks
Pt100	2100 – 8600 (-210.0°C – 860.0°C)	2000 – 8500 (-200.0°C – 850.0°C)	–
JPt100	-2100 – 6500	-2100 – 6400	–

	(-210.0°C – 650.0°C)	(-200.0°C – 640.0°C)	

Scaled temperature output value (internal memory address %UWa.b.8~11)

1. Scaling value of the specified channel is stored as shown below. The scaling value depends on the range of the maximum value and the minimum value selected by the user.

Refer to Table 8 which specifies the scaled temperature values. (See Specifications for details on the scaling function.)

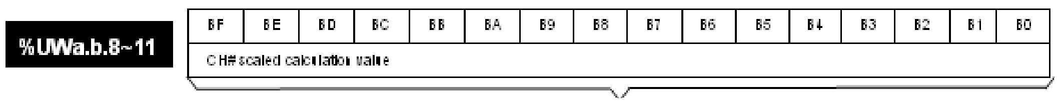


Figure 32 – Scaling value

Address	Description
%UWa.b.8	CH0 Scaling Value
%UWa.b.9	CH1 Scaling Value
%UWa.b.10	CH2 Scaling Value
%UWa.b.11	CH3 Scaling Value

Temp maximum/minimum value (internal memory address %UWa.b.12 ~19)

1. Maximum/minimum temperature value is the output when the command to search for maximum/minimum is 1. (See Specifications for details on its functions.)

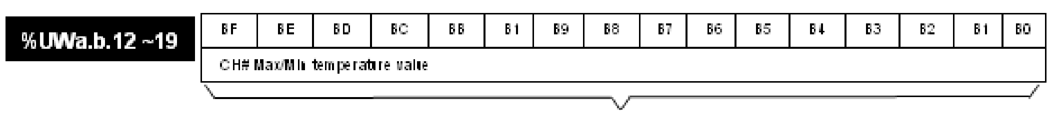


Figure 33 – Scaling value

Address	Description
%UWa.b.12	CH0 Temp. Min. Value
%UWa.b.13	CH0 Temp. Max. Value
%UWa.b.14	CH1 Temp. Min. Value
%UWa.b.15	CH1 Temp. Max. Value

Address	Description
%UWa.b.16	CH2 Temp. Min. Value
%UWa.b.17	CH2 Temp. Max. Value
%UWa.b.18	CH3 Temp. Min. Value
%UWa.b.19	CH3 Temp. Max. Value

Data upload time (internal memory address %UDa.b.10~13)

1. It is an area to store the updated interval. (**Time**: the count of data 1 in the applicable area is 0.1ms.) When module data is updated the data is shared with MasterLogic-200.
2. If temperature is controlled by MasterLogic-200 PLC, the data is used to decide the controlling cycle. (See Programming for application example.)

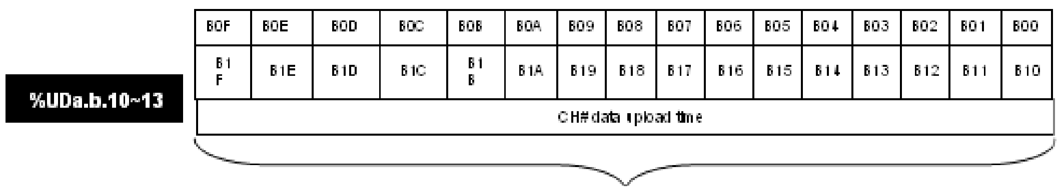


Figure 34 – Data upload time

Alarm (PVA/RCA) enable/disable (internal memory address %UXa.b.464~471)

1. Bit 468~471: The alarm(PVA/RCA) enable/disable alarm function is activated only if the alarm output enabling bit of the specific channel is set to 1.
2. Bit 464~467: Maximum/minimum search enable/disable or change in value displays the maximum/minimum detection enabling bit of the applicable channel set to 1. Once the bit is set to 0, maximum/minimum value will not be detected. But the last detected maximum/minimum value will be saved.

%UXa.b.464~471

BF	BE	BD	BC	BB	BA	B9	B8	B471	B470	B469	B468	B467	B466	B465	B464
—	—	—	—	—	—	—	—	CH3	CH2	CH1	CH0	CH3	CH2	CH1	CH0

$\underbrace{\text{B471} \sim \text{B468}}$: Alarm output enabling information of applicable channel

Bit ON (1): Enabled

Bit OFF (0): Prohibited

$\underbrace{\text{B467} \sim \text{B464}}$: Max/min temperature detection enabling information of applicable channel

Bit ON (1): Enabled

Bit OFF (0): Prohibited

Figure 35 – Alarm (PVA/RCA) enable/disable

5.3 Operation parameters setting area

Each location in the memory is used to save data in 16 bits, that is, one word. Each of these bits can be utilized to set or reset parameters. If the bit is set to '1' it enables certain functions and if it is set to '0' then it disables certain functions.

Channel enable/disable (address No.0)

1. Temperature conversion function can be enabled or disabled for respective channels.
2. The conversion cycle can be reduced by disabling temperature conversion for the channel that is not needed.
3. If the channel to be used is not specified, all the channels are in Disable state.
4. Data of the unused channel (data read from PLC) will be all cleared to '0'.

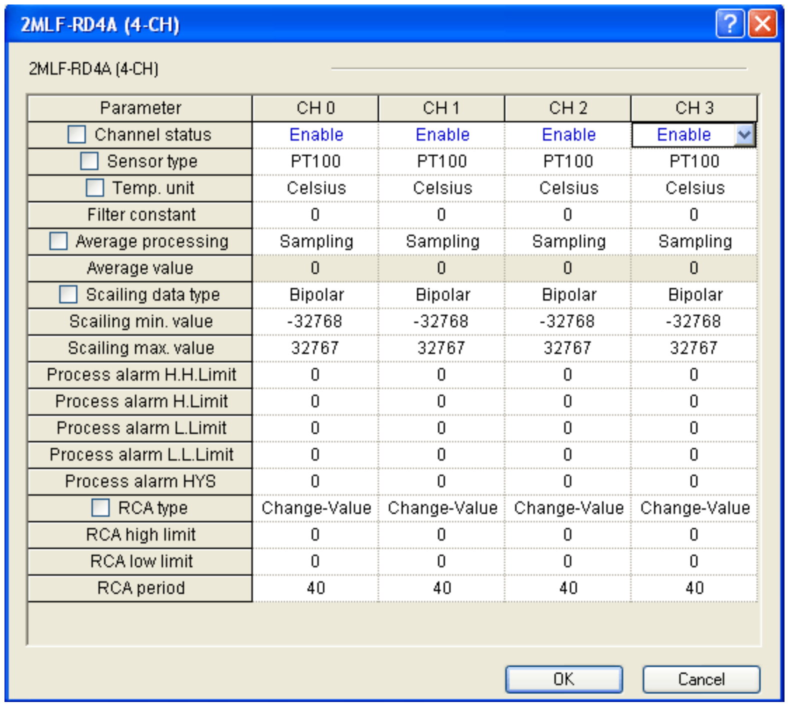
Address"0"

BF	BE	BD	BC	BB	BA	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
–	–	–	–	–	–	–	–	–	–	–	–	CH3	CH2	CH1	CH0

Figure 36 – Channel enable/disable

BIT	Description
0	Disable
1	Enable

5. The value specified in B4 – BF will be disregarded.
6. Use I/O parameter window of SoftMaster for more convenient setting of these bits.



Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	PT100	PT100	PT100	PT100
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Bipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	-32768	-32768	-32768	-32768
Scailing max. value	32767	32767	32767	32767
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

Figure 37 – I/O Parameter window 1 (channel status)

Sensor type setting (addresses 1–4)

1. There are two types of RTD sensors available for RTD input module.
2. If input is two or more, then an error will occur (UXY.01.8 – UXY.01.B) with the setting value ‘0’.

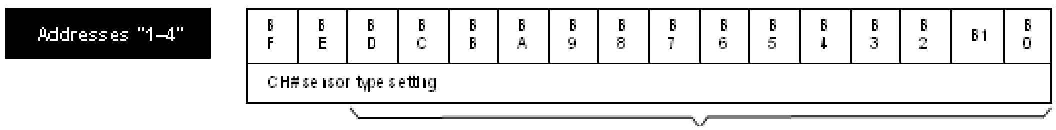
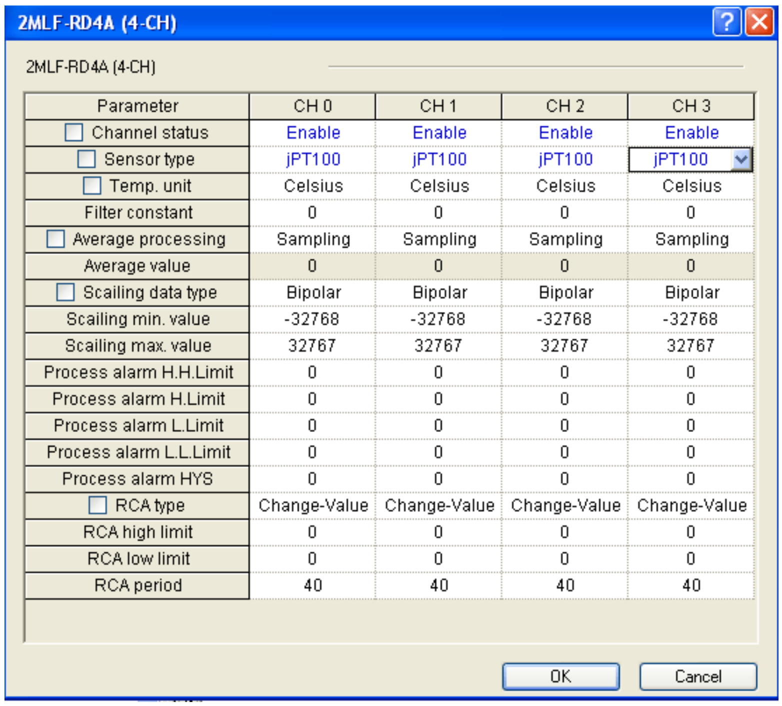


Figure 38 – Sensor type setting

WORD	Description
0	Set the sensor type to Pt100
1	Set the sensor type to JPt100

Address 1 to 4 is used for channels 0 to 3, respectively.

3. Use **I/O Parameter** window of SoftMaster for more convenient setting of the sensor type.



2MLF-RD4A (4-CH)

2MLF-RD4A (4-CH)

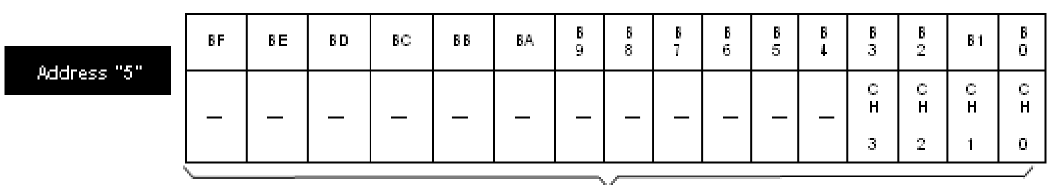
Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	jPT100	jPT100	jPT100	jPT100
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Bipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	-32768	-32768	-32768	-32768
Scailing max. value	32767	32767	32767	32767
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

OK Cancel

Figure 39 – I/O Parameter window 2 (sensor type)

Temperature conversion unit (address 5)

1. Temperature-converted value is displayed in °C or °F as specified. The bits 0 to 3 are set to 0 or 1 to specify the temperature conversion unit. The rest of the bits are ignored.



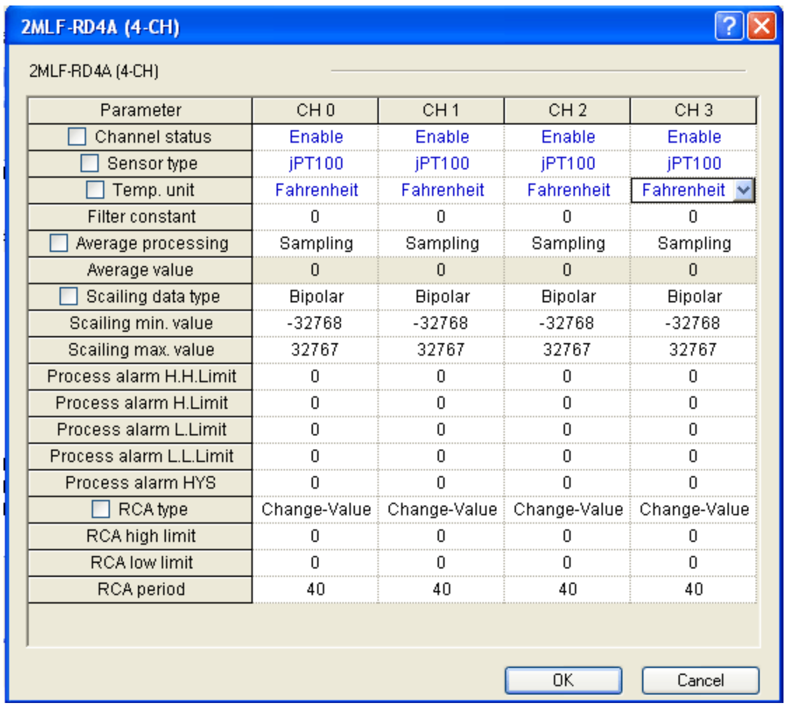
Address "5"

BF	BE	BD	BC	BB	BA	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
—	—	—	—	—	—	—	—	—	—	—	—	CH3	CH2	CH1	CH0

Figure 40 – Temperature conversion unit

BIT	Description
0	Celsius
1	Fahrenheit

2. Use I/O parameter window of SoftMaster for more convenient setting.



Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	jPT100	jPT100	jPT100	jPT100
Temp. unit	Fahrenheit	Fahrenheit	Fahrenheit	Fahrenheit
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Bipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	-32768	-32768	-32768	-32768
Scailing max. value	32767	32767	32767	32767
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

Figure 41 – I/O Parameter window 3 (temperature unit)

Filter value (addresses 6 – 9)

1. If the filtering constant value is set to '0', temperature-converted value of the sampled temperature will be the output instead of the filtered value as the specific channel will not be filtered.

2. If filtering constant value is set to '1 – 159' or '64001' or more, an error will occur, and the value will be internally reset to 0.

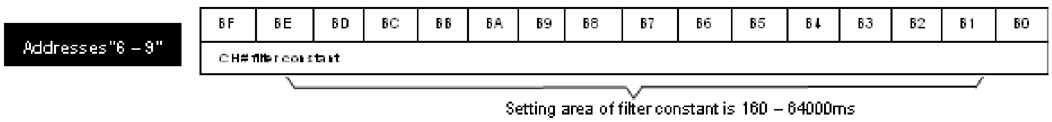


Figure 42 – Filter value

Address	Description
6	Channel 0 Filter Value Setting
7	Channel 1 Filter Value Setting
8	Channel 2 Filter Value Setting
9	Channel 3 Filter Value Setting

3. Use I/O parameter window for more convenient setting.

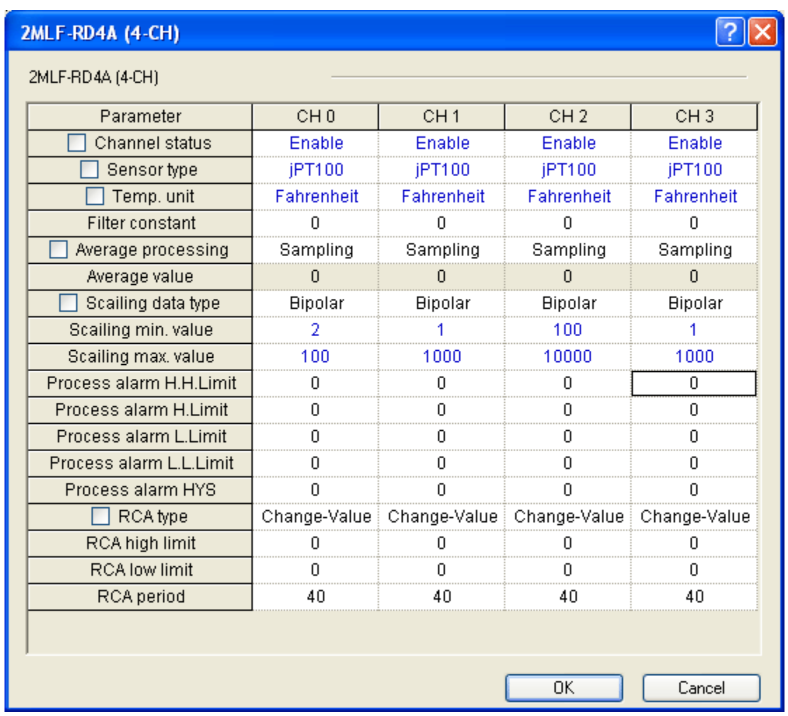


Figure 43 – I/O Parameter window 4 (filter constant)

Averaging method setting (addresses 10–13)

1. The value of this parameter can from 0 to 3 as shown below. If averaging method is set to ‘4’ or more, a setting error will occur and the parameter value will be rest to ‘0’ internally.

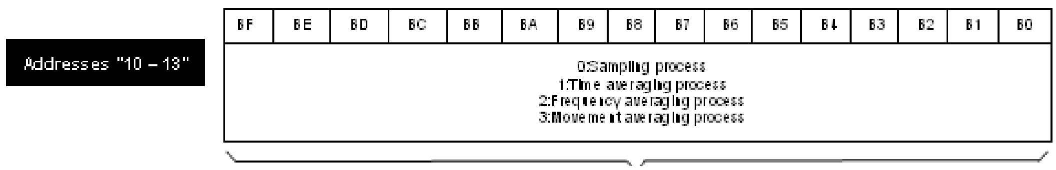


Figure 44 – Averaging method

Address	Description
10	Channel 0 Averaging Method Setting
11	Channel 1 Averaging Method Setting
12	Channel 2 Averaging Method Setting
13	Channel 3 Averaging Method Setting

2. Use I/O parameter window for more convenient setting.

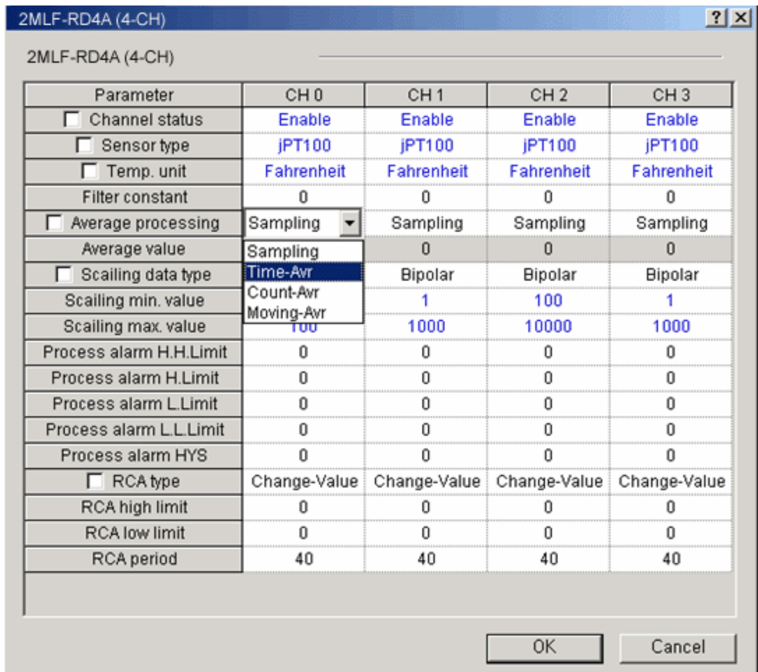


Figure 45 – I/O Parameter window 5 (average processing)

Average value setting (addresses 14–17)

1. If the averaging method is sampling, the setting value will be disregarded.

2. If the average value is set to exceed the setting range, setting error will occur and the maximum/minimum averaging value will be specified.

   Example: If time average is selected with the average value of 200, setting error will occur with the setting value of 320 internally produced.

3. When the average value is set through **I/O Parameter** window, the software does not allow for selection of values beyond the prescribed range. The specified value in such a case is displayed in RED and also generates a resetting message.

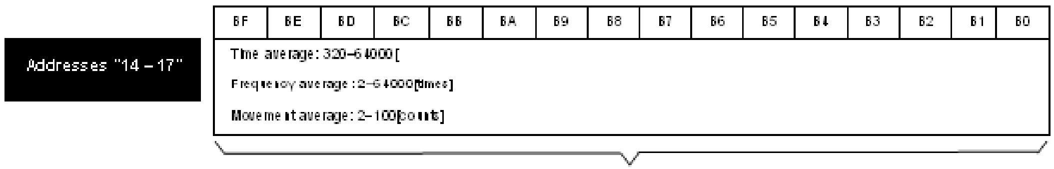
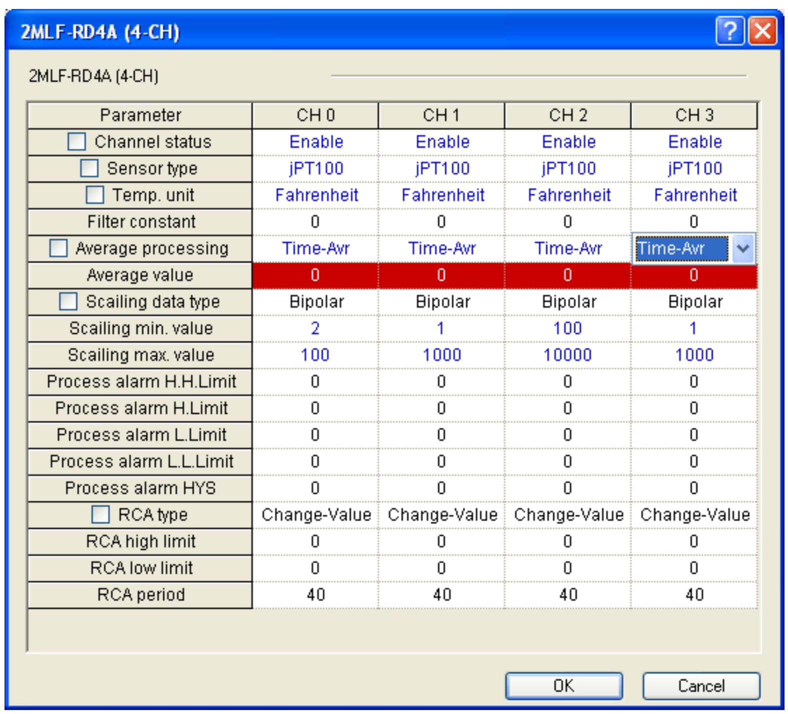


Figure 46 – Averaging value

Address	Description
14	Channel 0 Average Value Setting
15	Channel 1 Average Value Setting
16	Channel 2 Average Value Setting
17	Channel 3 Average Value Setting

4. Use I/O parameter window for more convenient setting.



2MLF-RD4A (4-CH)

2MLF-RD4A (4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	jPT100	jPT100	jPT100	jPT100
Temp. unit	Fahrenheit	Fahrenheit	Fahrenheit	Fahrenheit
Filter constant	0	0	0	0
Average processing	Time-Avr	Time-Avr	Time-Avr	Time-Avr
Average value	0	0	0	0
Scailing data type	Bipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	2	1	100	1
Scailing max. value	100	1000	10000	1000
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

OK Cancel

Figure 47 – I/O Parameter window 6 (average value)

Scaling type (address 18)

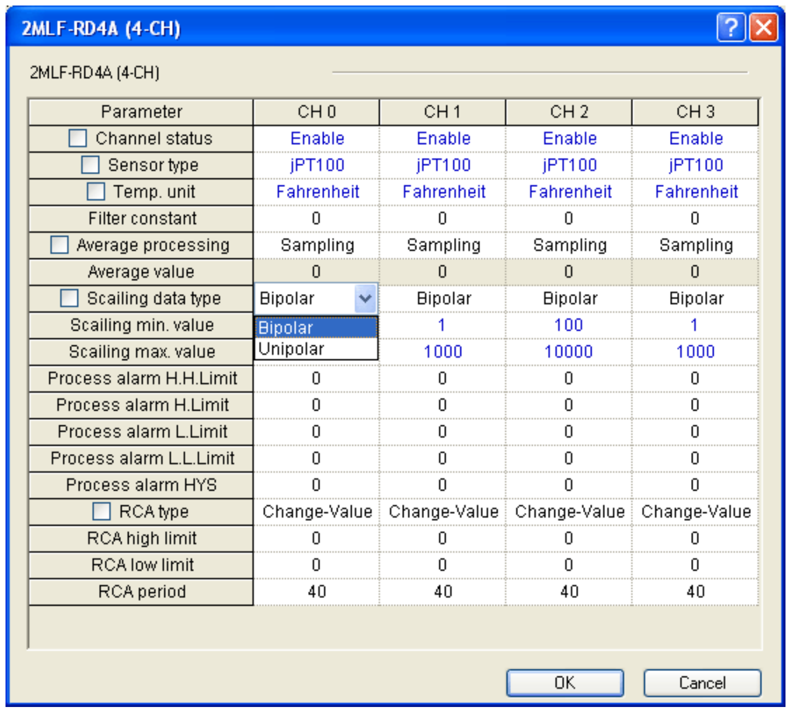
1. Bit 0 to 3 of memory address 16 is used to specify the scaling type parameter.
2. If the bit is set to ‘1’, the scale range will be an unsigned integer type (Unipolar) with the output data range of 0 – 65535 by scaled calculation.
3. If the bit is set to 0, the scale range will be signed integer type (Bipolar) with the output data range of -32768 – 32767 by scaled calculation (default).
4. Information specified in Bits 4–F will be disregarded.

Address "18"	BF	BE	BD	BC	BB	BA	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
	—	—	—	—	—	—	—	—	—	—	—	—	CH 3	CH 2	CH 1	CH 0

Figure 48 – Scaling type

BIT	Description
0	Set to signed integer scale range
1	Set to unsigned integer scale range

5. Use I/O parameter window for more convenient setting.


2MLF-RD4A (4-CH)

2MLF-RD4A (4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	jPT100	jPT100	jPT100	jPT100
Temp. unit	Fahrenheit	Fahrenheit	Fahrenheit	Fahrenheit
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	Bipolar	1	100	1
Scaling max. value	Unipolar	1000	10000	1000
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

OK Cancel

Figure 49 – I/O Parameter window 7 (scaling data type)

- *** Bipolar**: Output data has positive as well as negative values (signed integer).
- **Unipolar**: Output data has positive values only (unsigned integer).

Scaling range (addresses 19–26)

1. The default values for scaling range are as shown below.
2. If a value other than range is set, setting error will occur with the setting value saved inside the module.

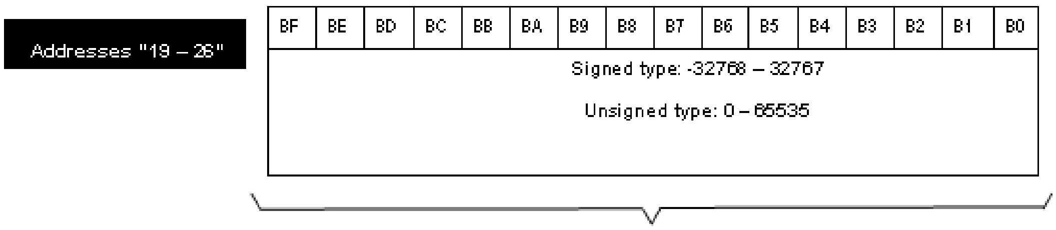
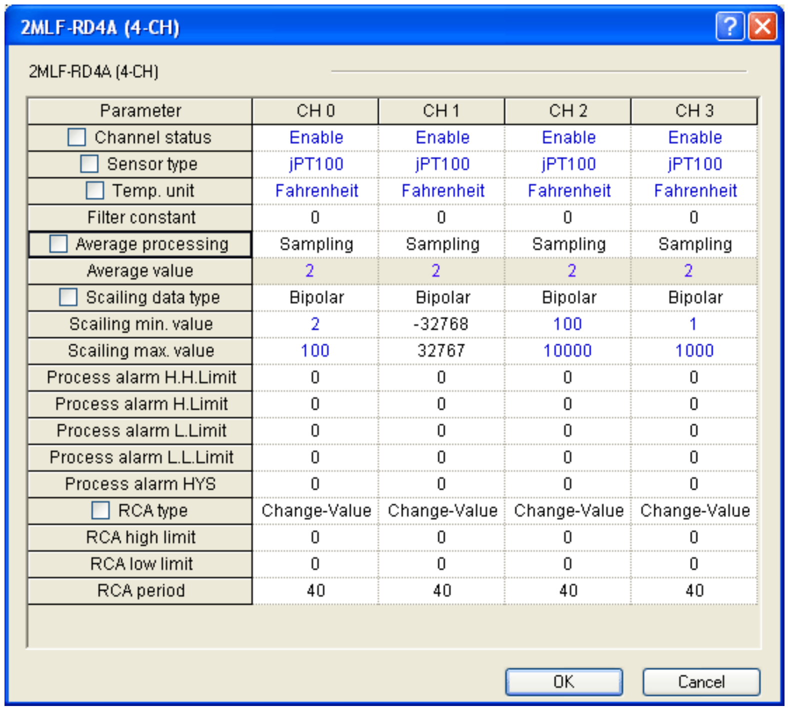


Figure 50 – Scaling range

Address	Description
19	Channel 0 Scaling Range Minimum Value Setting
20	Channel 0 Scaling Range Maximum Value Setting
21	Channel 1 Scaling Range Minimum Value Setting
22	Channel 1 Scaling Range Maximum Value Setting
23	Channel 2 Scaling Range Minimum Value Setting
24	Channel 2 Scaling Range Maximum Value Setting
25	Channel 3 Scaling Range Minimum Value Setting
26	Channel 3 Scaling Range Maximum Value Setting

3. Use **I/O Parameter** window for more convenient setting.



2MLF-RD4A (4-CH)

2MLF-RD4A (4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	jPT100	jPT100	jPT100	jPT100
Temp. unit	Fahrenheit	Fahrenheit	Fahrenheit	Fahrenheit
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	2	2	2	2
Scaling data type	Bipolar	Bipolar	Bipolar	Bipolar
Scaling min. value	2	-32768	100	1
Scaling max. value	100	32767	10000	1000
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

OK Cancel

Figure 51 – I/O Parameter window 8 (scaling range)

Process alarm limit setting (addresses 27–42)

1. Setting range can be specified individually based on the unit of temperature output (°C /°F) and the type of sensor (Pt100/JPt100).
2. If the set value is outside the range, setting error will occur with the setting value saved inside the module.

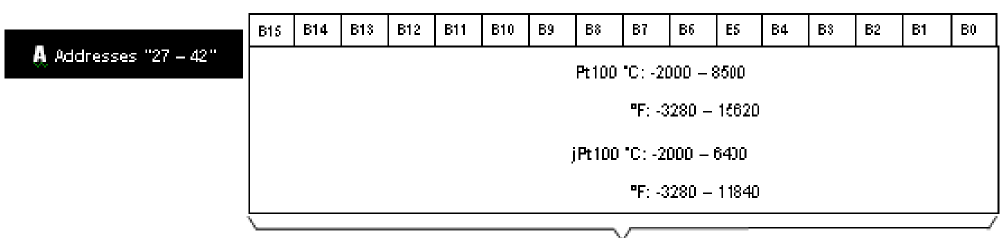
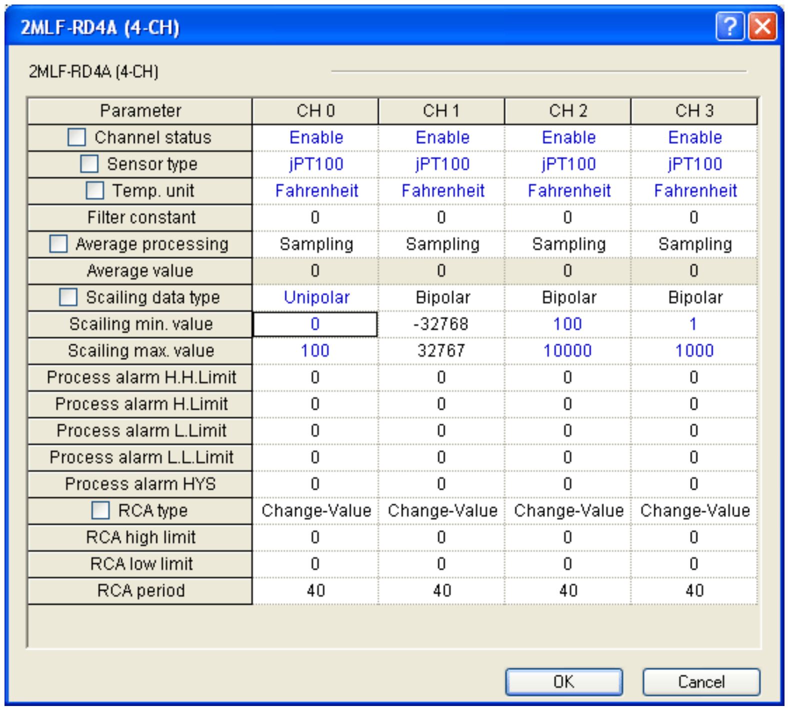


Figure 52 – Process alarm limit

Address	Description
27	Channel 0 Process Alarm HH value Setting
28	Channel 0 Process Alarm H value Setting
29	Channel 0 Process Alarm L value Setting
30	Channel 0 Process Alarm LL value Setting
31	Channel 1 Process Alarm HH value Setting
32	Channel 1 Process Alarm H value Setting
33	Channel 1 Process Alarm L value Setting
34	Channel 1 Process Alarm LL value Setting
35	Channel 2 Process Alarm HH value Setting
36	Channel 2 Process Alarm H value Setting
37	Channel 2 Process Alarm L value Setting
38	Channel 2 Process Alarm LL value Setting
39	Channel 3 Process Alarm HH value Setting
40	Channel 3 Process Alarm H value Setting
41	Channel 3 Process Alarm L value Setting
42	Channel 3 Process Alarm LL value Setting

3. Use I/O Parameter window for more convenient setting.



2MLF-RD4A (4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	jPT100	jPT100	jPT100	jPT100
Temp. unit	Fahrenheit	Fahrenheit	Fahrenheit	Fahrenheit
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Unipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	0	-32768	100	1
Scailing max. value	100	32767	10000	1000
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

OK Cancel

Figure 53 – I/O Parameter window 9 (process alarm limit)

Process alarm hysteresis setting (addresses 43–46)

1. The default range for this parameter value is as shown below. If the set value is outside the range, setting error will occur with the setting value of ‘0’ saved inside the module.

2. If process alarm function is used, the alarm output is set within the hysteresis value, though the alarming condition is cancelled.

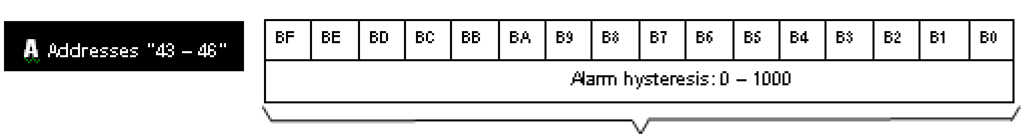
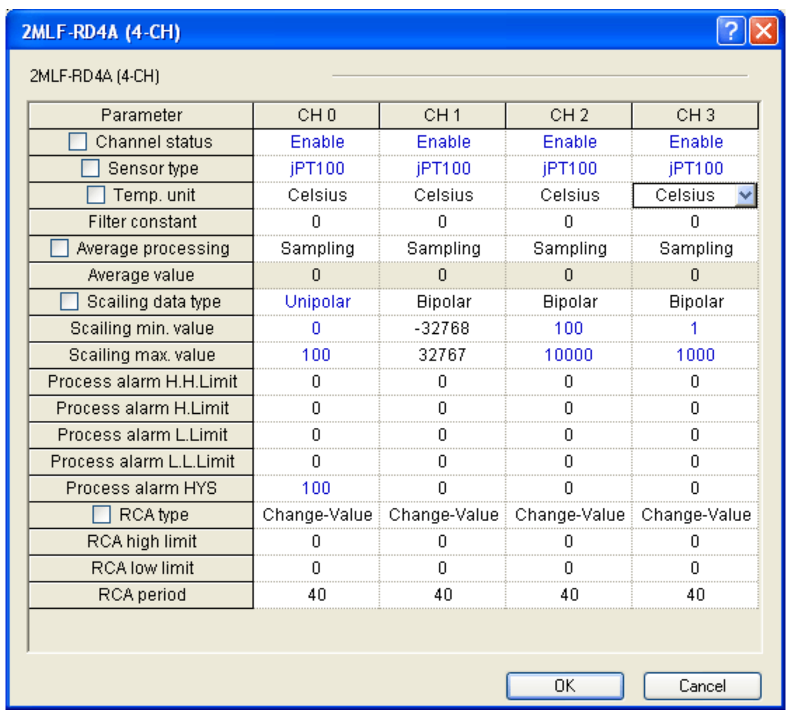


Figure 54 – Process alarm hysteresis

Address	Description
43	Channel 0 Process Alarm Hysteresis Setting
44	Channel 1 Process Alarm Hysteresis Setting
45	Channel 2 Process Alarm Hysteresis Setting
46	Channel 3 Process Alarm Hysteresis Setting

3. Use I/O Parameter window for more convenient setting.



Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	jPT100	jPT100	jPT100	jPT100
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Unipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	0	-32768	100	1
Scailing max. value	100	32767	10000	1000
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	100	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

Figure 55 – I/O Parameter window 10 (process alarm HYS)

Input variation alarm type (address 47)

1. Bit ‘0 to 3’ of memory address 47 are used to set the input variation alarm type for channel ‘0 to 3’, respectively.

2. If the bit is set to '1', temperature variation rate (rate for input temperature range based on the sensor type) is the criterion of alarm for the specified channel.

   Example: for Pt100,

   Variation rate = (Present temperature value - Temperature value prior to alarm) ∗ 100 / (8500-(-2000))

3. If the bit is set to '0', then the temperature variation value itself is criterion of the alarm.

4. The information specified in Bits 4 – F will be disregarded.

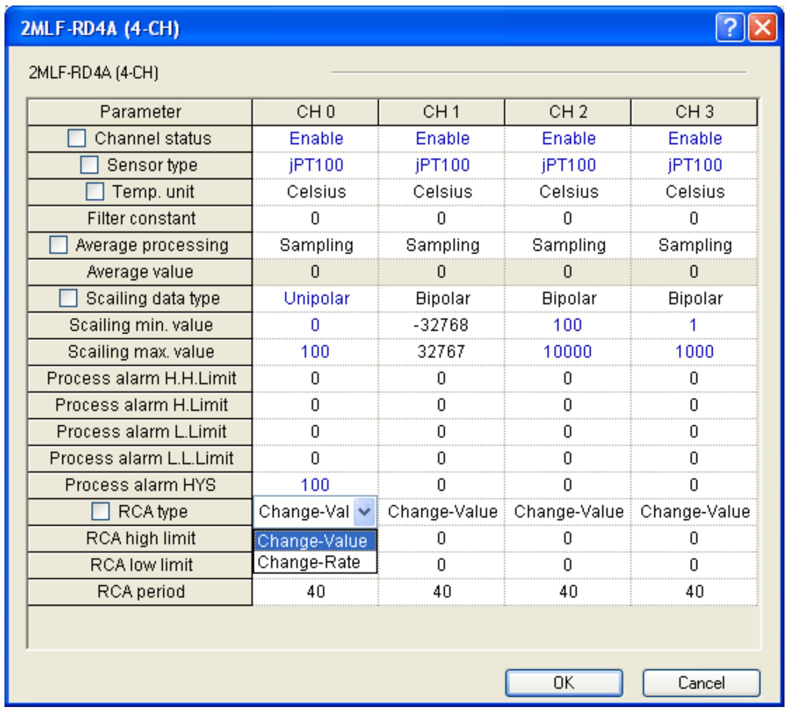
Address "47"

BF	BE	BD	BC	BB	BA	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
—	—	—	—	—	—	—	—	—	—	—	—	CH	CH	CH	CH

Figure 56 – Input variation alarm type

BIT	Description
0	Temperature variation value
1	Temperature variation rate

5. Use I/O parameter window for more convenient setting.



2MLF-RD4A (4-CH)

2MLF-RD4A (4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	jPT100	jPT100	jPT100	jPT100
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Unipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	0	-32768	100	1
Scailing max. value	100	32767	10000	1000
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	100	0	0	0
RCA type	Change-Val	Change-Value	Change-Value	Change-Value
RCA high limit	Change-Value	0	0	0
RCA low limit	Change-Rate	0	0	0
RCA period	40	40	40	40

OK Cancel

Figure 57 – I/O parameter window 11 (RCA type)

Input variation alarm upper/lower limit value (addresses 48–55)

1. The default range of values is '-1000 to 1000' as shown below. If the set value is outside the range, then setting error will occur with the setting value of '0' saved inside the module.

2. If input variation range is set in the input variation alarm type, it will be a percentage value of input variation rate specified to the first decimal point.

3. If input variation value is set in the input variation alarm type, the unit of the value to be set in this area represents temperature variation.

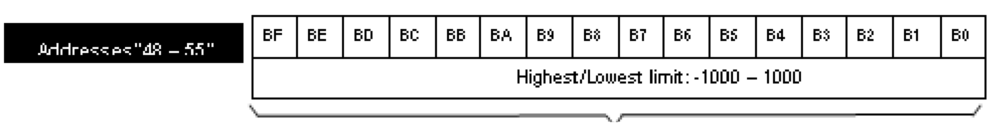
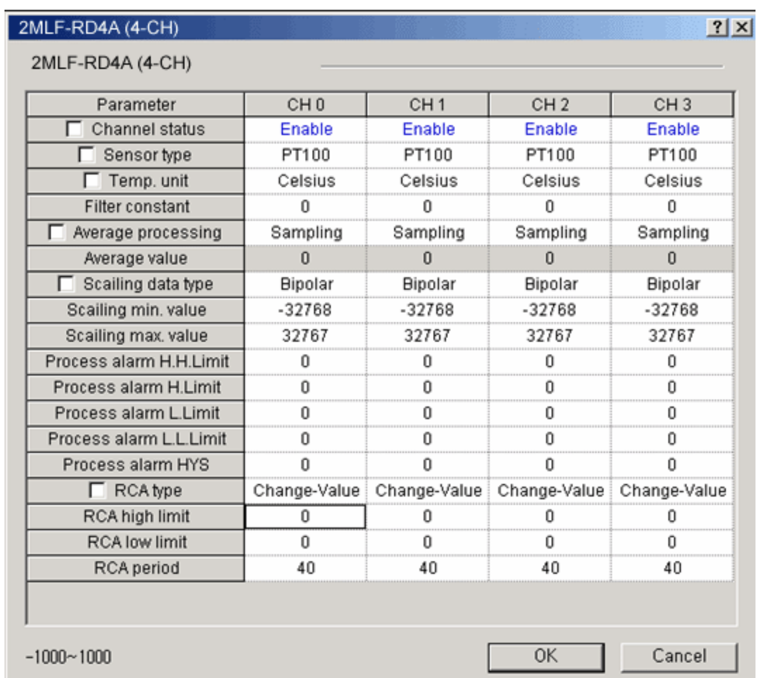


Figure 58 – Input variation alarm maximum/minimum value

Address	Description
48	Channel 0 Input Variation Alarm Upper Limit Value Setting
49	Channel 0 Input Variation Alarm Lower Limit Value Setting
50	Channel 1 Input Variation Alarm Upper Limit Value Setting
51	Channel 1 Input Variation Alarm Lower Limit Value Setting
52	Channel 2 Input Variation Alarm Upper Limit Value Setting
53	Channel 2 Input Variation Alarm Lower Limit Value Setting
54	Channel 3 Input Variation Alarm Upper Limit Value Setting
55	Channel 3 Input Variation Alarm Lower Limit Value Setting

4. Use I/O parameter window for more convenient setting.



2MLF-RD4A (4-CH)

2MLF-RD4A (4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	PT100	PT100	PT100	PT100
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Bipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	-32768	-32768	-32768	-32768
Scailing max. value	32767	32767	32767	32767
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

-1000~1000

OK Cancel

Figure 59 – I/O Parameter window 12 (RCA value)

Detection cycle of input variation alarm (addresses 56–59)

1. Input variation alarming function is used to specify the detection cycle of input variation.

2. If an input variation value other than range is set, then setting error will occur with the setting value of '40' saved inside the module.

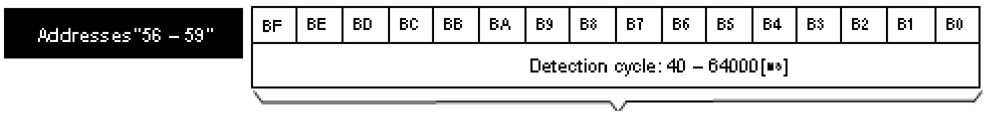
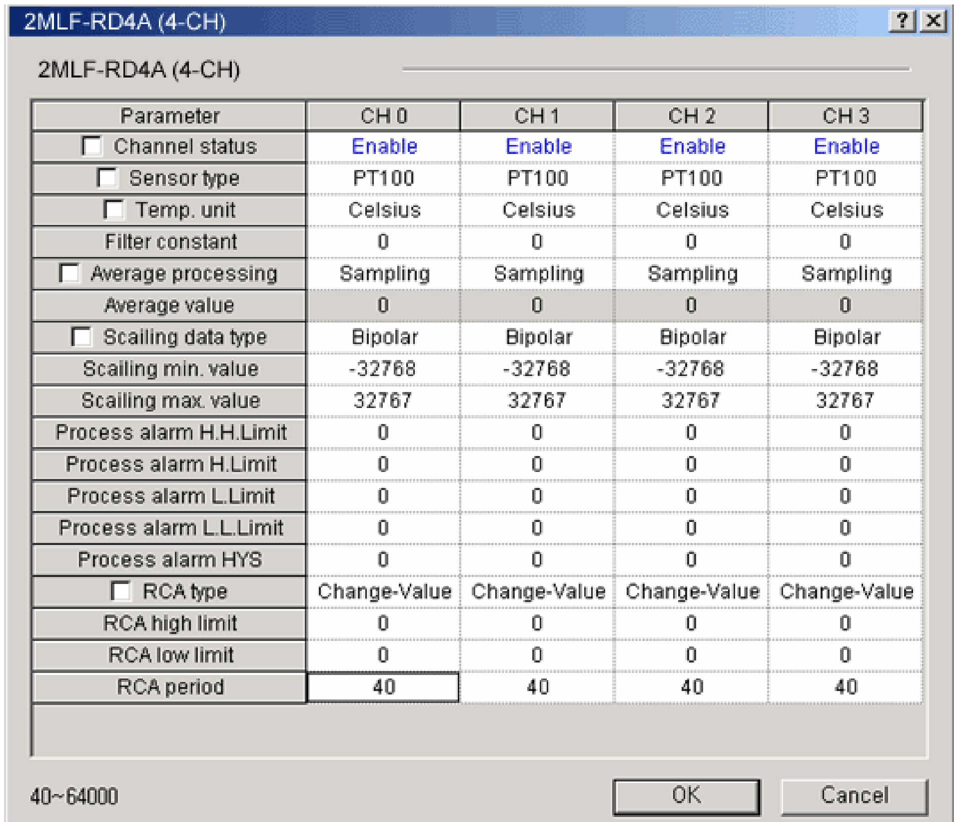


Figure 60 – Detection cycle of input variation alarm

Address	Description
56	Channel 0 Input Variation Alarm Detection Cycle Setting
57	Channel 1 Input Variation Alarm Detection Cycle Setting
58	Channel 2 Input Variation Alarm Detection Cycle Setting
59	Channel 3 Input Variation Alarm Detection Cycle Setting

3. Use I/O Parameter window for more convenient setting.



Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	PT100	PT100	PT100	PT100
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Bipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	-32768	-32768	-32768	-32768
Scailing max. value	32767	32767	32767	32767
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

Figure 61 – I/O Parameter window 13

Setting error information (addresses 60–63)

1. If a parameter value outside the default range is set (in the PLC program), the respective bit will be set to 1 for the specified channel.
2. Memory addresses 60 to 63 are used to indicate the error information for channel 0 to 3, respectively.
3. Setting error can be reset if the input value is in normal range.
4. There will be no change in the module LED when setting error occurs. If more than 1 bit of UXY.01.08–UXY.01.0B is turned ON, check the area and its settings.
5. Error details and setting address of applicable bits are shown in the Table 10.

Table 10 – Error information address

Bit	Description
Bit 0:	Setting error of CH sensor type (addresses 1–4)
Bit 1:	Setting error of CH filter value (addresses 6–9)
Bit 2:	Setting error of CH averaging type (addresses 10–13)
Bit 3:	Setting error of CH averaging value (addresses 14–17)
Bit 4:	Setting error of CH scale min. range (addresses 19, 21, 23, 25)
Bit 5:	Setting error of CH scale max. range (addresses 20, 22, 24, 26)
Bit 6:	Setting error of CH process alarm HH value (addresses 27,31,35,39)
Bit 7:	Setting error of CH process alarm H value (addresses 28, 32, 36, 40)
Bit 8:	Setting error of CH process alarm L value (addresses 29, 33, 37, 41)
Bit 9:	Setting error of CH process alarm LL. value (addresses 30, 34, 38, 42)
Bit A:	Setting error of CH process alarm hysteresis (addresses 39–46)
Bit B:	Setting error of CH input variation alarm max. value (addresses 48, 50, 52, 54)
Bit C:	Setting error of CH input variation alarm min. value (addresses 49, 51, 53, 55)
Bit D:	Setting error of CH input variation alarm detection cycle (addresses 56–59)

Addresses "60 – 63"

BF	BE	BD	BC	BB	BA	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
—	—	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH	CH

Figure 62 – Setting error information

Address	Description
60	Channel 0 Setting Error Information Output
61	Channel 1 Setting Error Information Output
62	Channel 2 Setting Error Information Output
63	Channel 3 Setting Error Information Output

Input variation value/rate output (addresses 64–67)

1. The amount of change in input temperature or variation rate (rate percentage based on the sensor range) is saved. Every detection cycle of input variation alarm is specified in the addresses 56–59.
2. Monitoring with Special Module Monitoring is also available.

Addresses "64 – 67"

BF	BE	BD	BC	BB	BA	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Variation rate: -1023 – 1023 Variation value: Pt100: -10700 – 10700 jPt100: -8600 – 8600															

Figure 63 – Input variation value/rate output

Address	Description
64	Channel 0 Variation Value (Variation Rate) Output of Input Variation Alarm
65	Channel 1 Variation Value (Variation Rate) Output of Input Variation Alarm

Address	Description
66	Channel 2 Variation Value (Variation Rate) Output of Input Variation Alarm
67	Channel 3 Variation Value (Variation Rate) Output of Input Variation Alarm

3. In order to monitor the variation value (variation rate) of input variation alarm, open FLAG monitoring window and set the alarm operation to Enable. Set the alarm operation to Enable on the **Special Module-Monitoring** window.

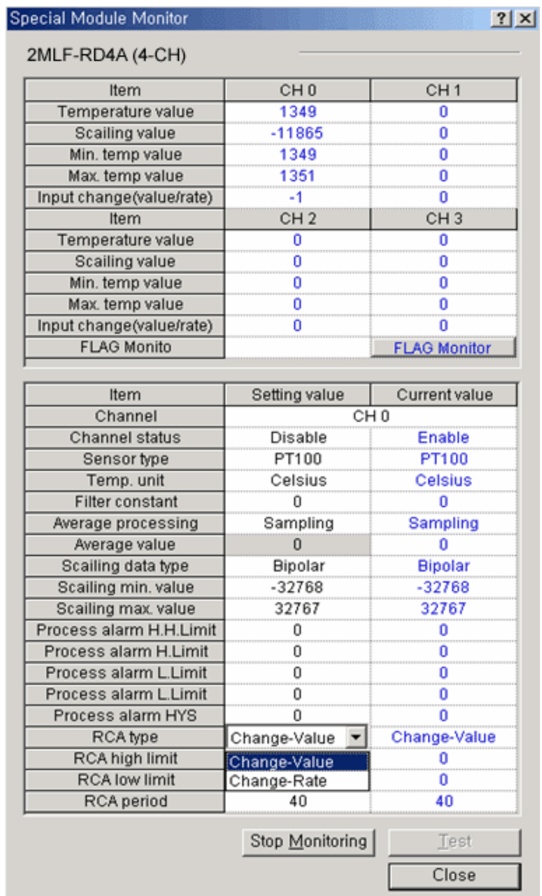
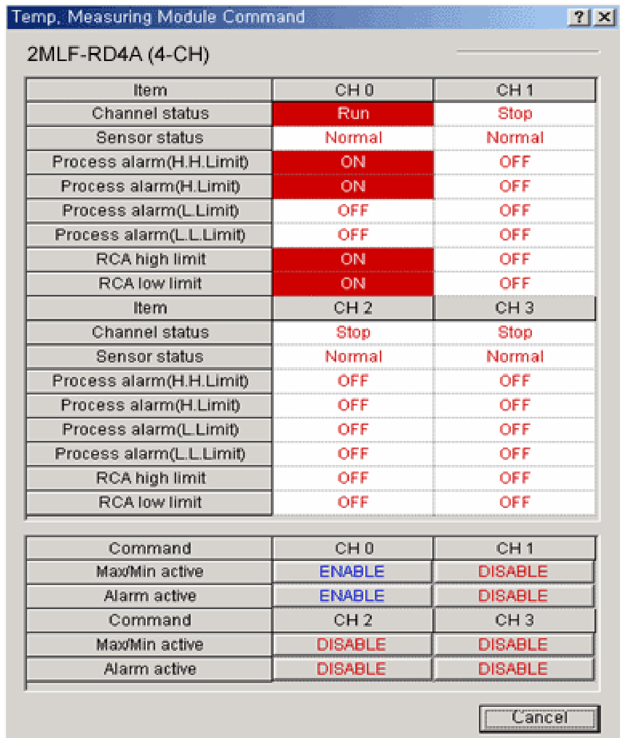


Figure 64 – Special Module Monitoring window

4. Open FLAG monitoring window to set the alarm operation to enable as shown in the below screen.



Item	CH 0	CH 1
Channel status	Run	Stop
Sensor status	Normal	Normal
Process alarm(H.H.Limit)	ON	OFF
Process alarm(H.Limit)	ON	OFF
Process alarm(L.Limit)	OFF	OFF
Process alarm(L.L.Limit)	OFF	OFF
RCA high limit	ON	OFF
RCA low limit	ON	OFF
Item	CH 2	CH 3
Channel status	Stop	Stop
Sensor status	Normal	Normal
Process alarm(H.H.Limit)	OFF	OFF
Process alarm(H.Limit)	OFF	OFF
Process alarm(L.Limit)	OFF	OFF
Process alarm(L.L.Limit)	OFF	OFF
RCA high limit	OFF	OFF
RCA low limit	OFF	OFF

Command	CH 0	CH 1
Max/Min active	ENABLE	DISABLE
Alarm active	ENABLE	DISABLE
Command	CH 2	CH 3
Max/Min active	DISABLE	DISABLE
Alarm active	DISABLE	DISABLE

Figure 65 – Flag monitoring window

Sensor disconnection information (addresses 68–71)

1. It is used to display the disconnection status information of a 3- wire sensor.

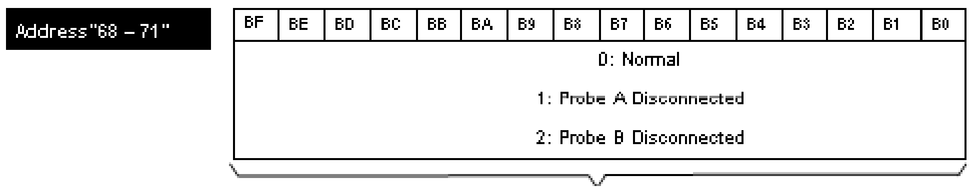


Figure 66 – Sensor disconnection information

Address	Description
68	Channel 0 Sensor Disconnection Information Output
69	Channel 1 Sensor Disconnection Information Output
70	Channel 2 Sensor Disconnection Information Output
71	Channel 3 Sensor Disconnection Information Output

6. Programming

6.1 Read/write operation of operation parameters setting area

The instructions of GET, GETP are used to read data from special modules like the RTD input module and save it in CPU memory.

Read data from the operation parameters setting area (GET, GETP instruction)

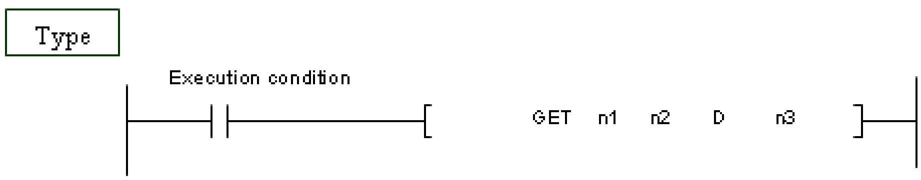


Figure 67 – Read execution

Operand	Description	Available data
n1	Slot number where the special module is installed.	Integer
n2	Start address of internal memory of special module to read.	Integer
D	Start memory address of CPU module where the read data will be saved.	M, P, K, L, T, C, D, #D
n3	Number of words (data) to read.	Integer

Difference between GET instruction and GETP instruction

- **GET**: executes at every scan when execution condition is true ON. ( )
- **GETP**: executes once at the rising edge of the execution condition. ( )

Example:

RTD module is installed on Base No.0 and Slot No.3.

The data from internal memory addresses 0 and 1 is in the RTD module and is read and saved in D0 and D1 of CPU module while M00000 bit is turned ON.

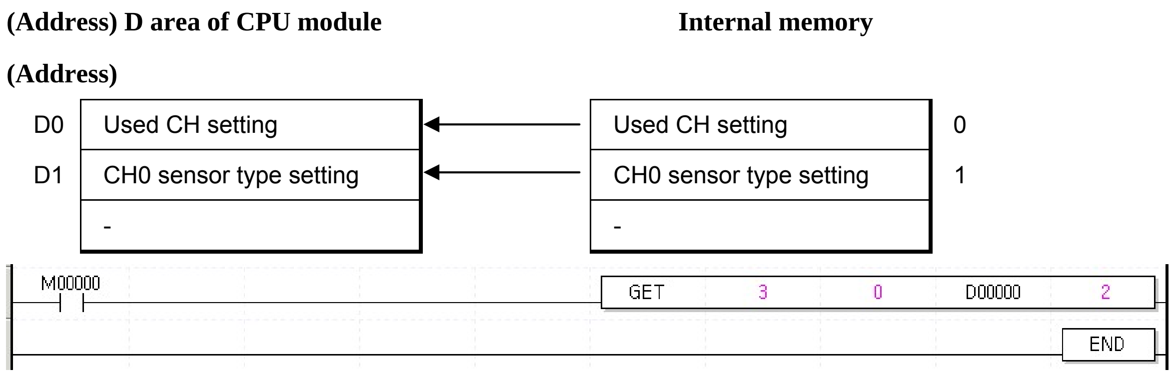


Figure 68 – Example of read execution

Write data to the operation parameters setting area (PUT, PUTP instruction)

The instructions PUT, PUTP are used to write data to the special module from the CPU memory.

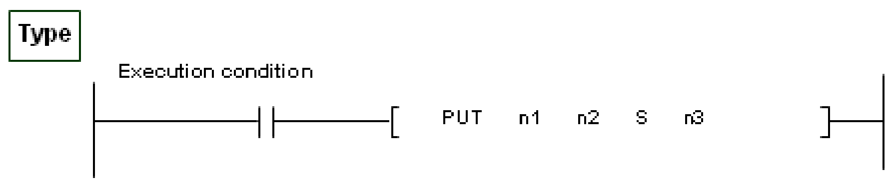


Figure 69 – Example of write execution

Operand	Description	Available data
n1	Slot number where special module is installed.	Integer
n2	Start address of internal memory of special module.	Integer
S	Start memory address of CPU module where the data to be written is saved.	M, P, K, L, T, C, D, #D, Integer
n3	Number of words (data) to write.	Integer

Difference between PUT instruction and PUTP instruction

- **PUT**: executes at every scan when execution condition is turned ON. ( )
- **PUTP**: executes once at the rising edge of the execution condition. ( )

Example:

If RTD module is installed on Base No.0 and Slot No.6, and CPU module's data at D10–D13 is written on internal memory addresses 14–17 for RTD input module while M00000 bit is turned ON.

(Address) D area of CPU module **Internal memory**

(Address)

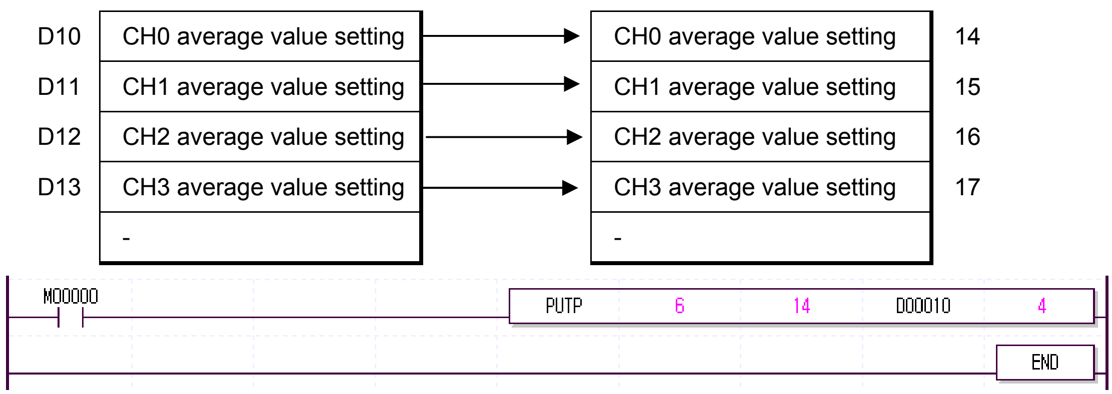


Figure 70 – Example of write execution

6.2 Basic program

The operation condition of the internal memory of RTD input module are specified below:

1. RTD module is installed on Slot No.2.
2. The number of I/O points assigned to RTD module is 16 when ‘Assign fixed points to I/O slot (64)’ option in the basic parameter is not used.
3. The setting values specified through the ‘I/O Parameter’ window will be saved on the RTD module when the parameters are downloaded and the module is initialized.

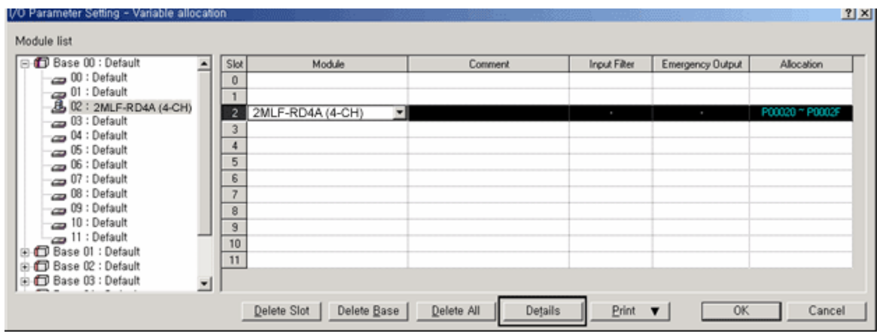
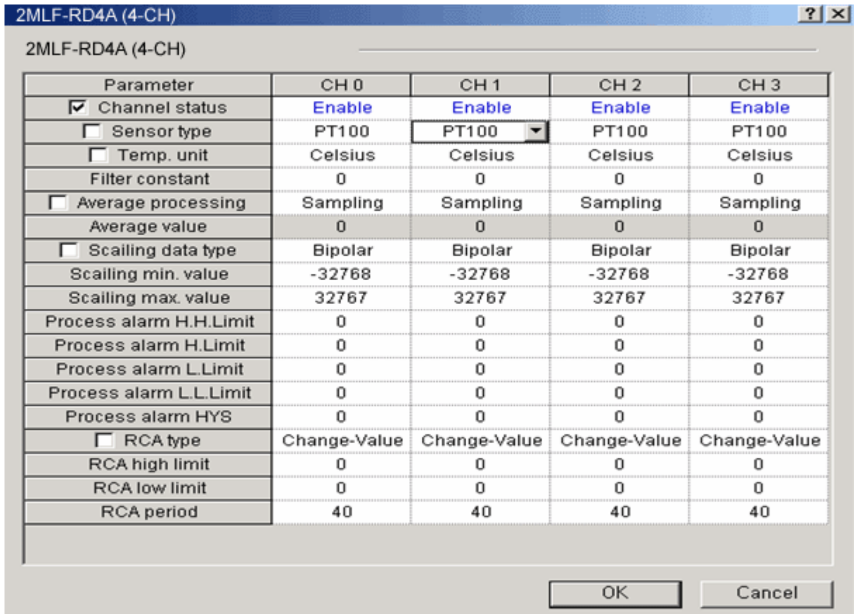


Figure 71 – I/O parameter setting window 1



Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Enable	Enable	Enable
Sensor type	PT100	PT100	PT100	PT100
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	0	0	0	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Bipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	-32768	-32768	-32768	-32768
Scailing max. value	32767	32767	32767	32767
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

Figure 72 – Parameters settings for RTD module

Select and place the applicable module in the slot where the module is physically installed and specify the operation parameters and thereafter download to PLC.

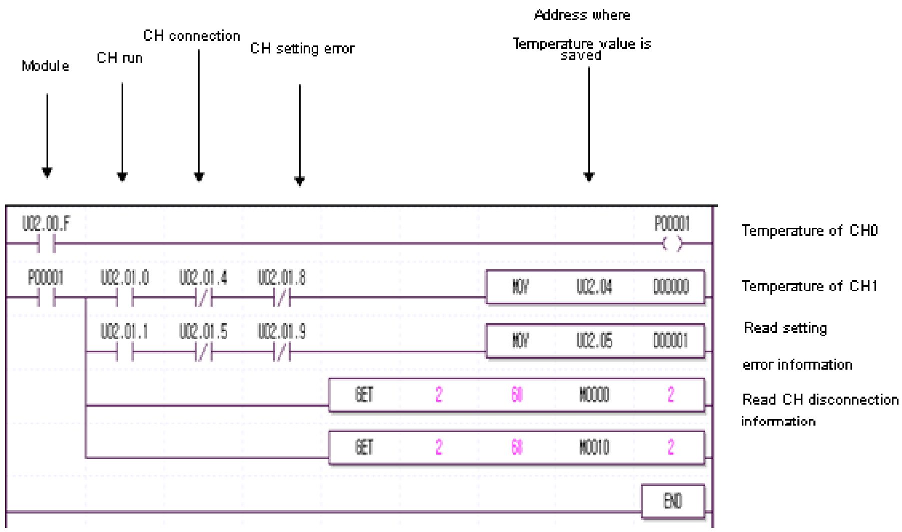


Figure 73 – Basic program example post I/O parameter setting

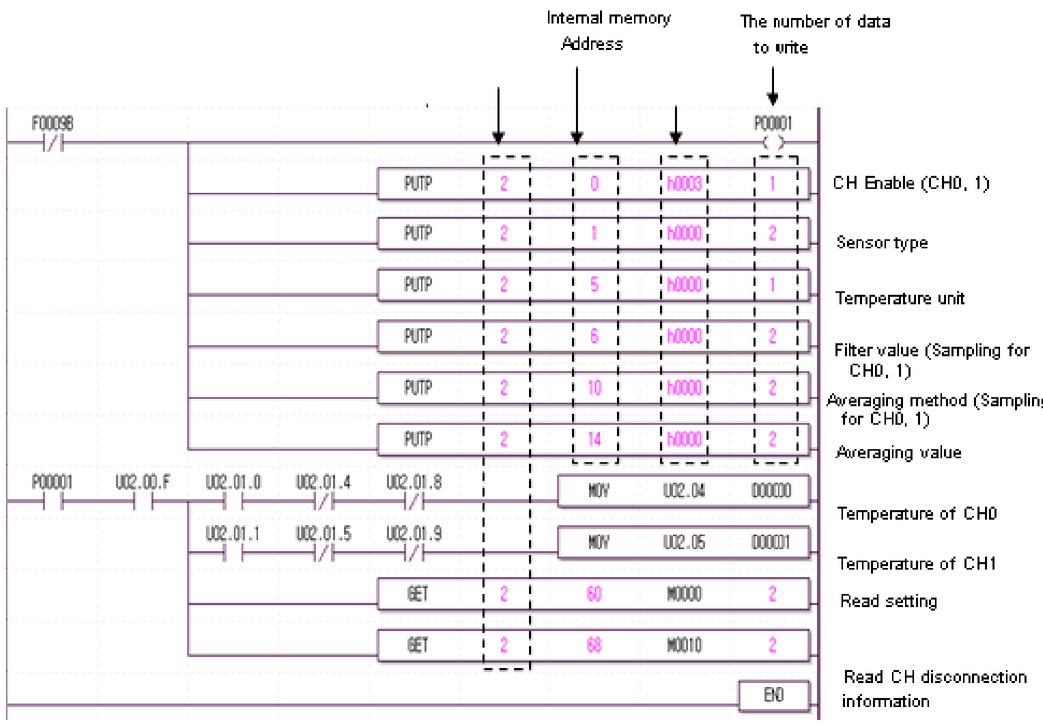


Figure 74 – Basic program example using PUT/GET instruction

6.3 Application program

Monitoring program of °C temperature-converted and scaled value ('assign fixed points to I/O slot (64)' option used).

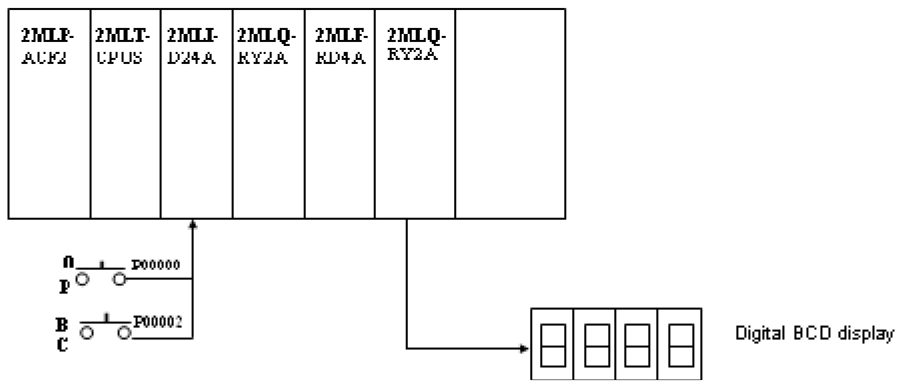


Figure 75 – System configuration

Table 11 – Details of initial setting

Item	Details of Initial Setting	Internal Memory Address	Value to Write on Internal Memory
Used CH	CH0, CH2	0	'h005' or '5'
Sensor type	Pt100 (0)	1–4	'h0000' or '0'
Temp. display unit	°C (0)	5	'h0000' or '0'
Filter value	0	6–9	'h00C8' or '200'
Scaling type	0	18	'h0000' or '0'
Scaling range Max./Min.	Max: 32767 Min: -32768	19–26	Max: 'h2710'or '10000' Min: 'h0000' or '0'

Program description

1. Temperature-converted value of CH0 and CH2 is output to D0 and D1 and scaled value is output to D10 and D11 by the operation start bit (P00000). The scaled output value for the temperature conversion range of -200 to 850°C is 0–10000.

   Calculation formula is as shown below:

Scaled calculation: $Y = \frac{10000}{10500}(X + 2000)$,

where, Y: Scaling value, X: Temperature value.

However, the temperature value will be calculated and output in a format 10 times of the actual temperature value.

2. In this case the filter value of CH0 and CH2 is set to ‘200’, respectively, so as to change the temperature value in stages against sudden change of the temperature.

3. It outputs information of setting error and disconnection to M0 and M10 and outputs information of setting error details to P0012 in BCD with bit P00002 ‘ON’.

Program

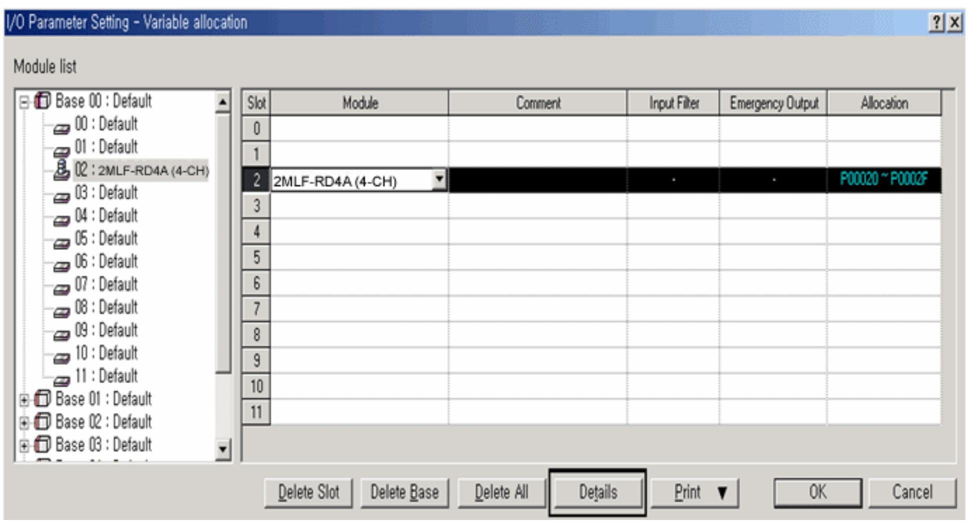
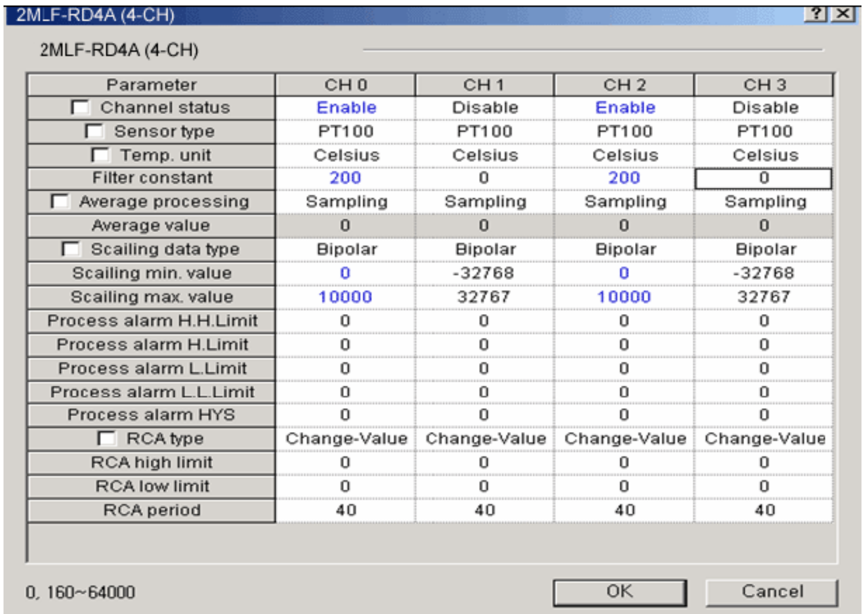


Figure 76 – I/O Parameter Setting window 2



2MLF-RD4A (4-CH)

2MLF-RD4A (4-CH)

Parameter	CH 0	CH 1	CH 2	CH 3
Channel status	Enable	Disable	Enable	Disable
Sensor type	PT100	PT100	PT100	PT100
Temp. unit	Celsius	Celsius	Celsius	Celsius
Filter constant	200	0	200	0
Average processing	Sampling	Sampling	Sampling	Sampling
Average value	0	0	0	0
Scailing data type	Bipolar	Bipolar	Bipolar	Bipolar
Scailing min. value	0	-32768	0	-32768
Scailing max. value	10000	32767	10000	32767
Process alarm H.H.Limit	0	0	0	0
Process alarm H.Limit	0	0	0	0
Process alarm L.Limit	0	0	0	0
Process alarm L.L.Limit	0	0	0	0
Process alarm HYS	0	0	0	0
RCA type	Change-Value	Change-Value	Change-Value	Change-Value
RCA high limit	0	0	0	0
RCA low limit	0	0	0	0
RCA period	40	40	40	40

0, 160~64000

OK

Cancel

Figure 77 – Parameters settings for RTD module

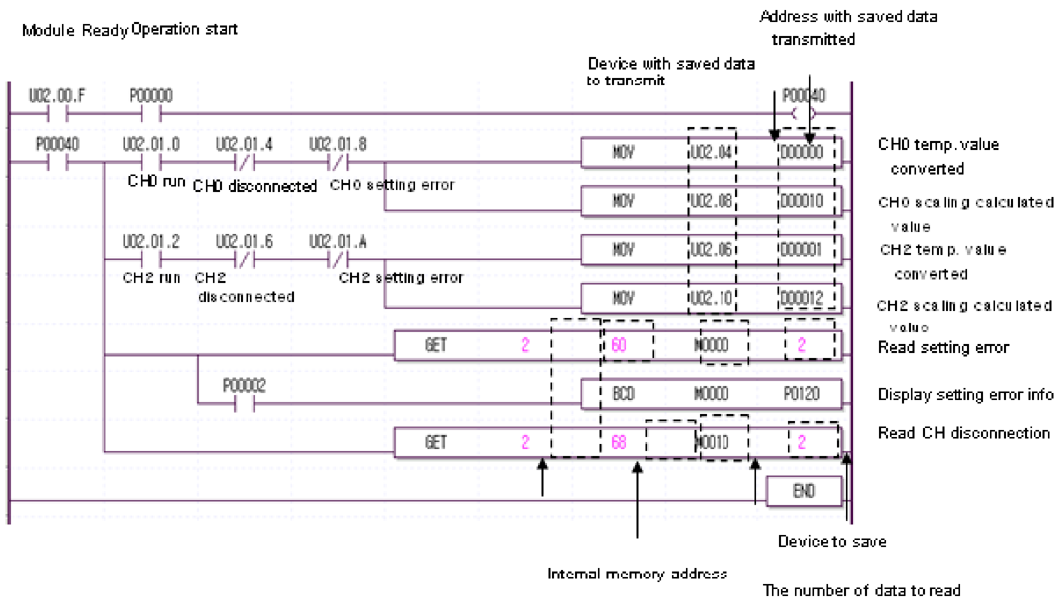


Figure 78 – Application program example post I/O parameters setting

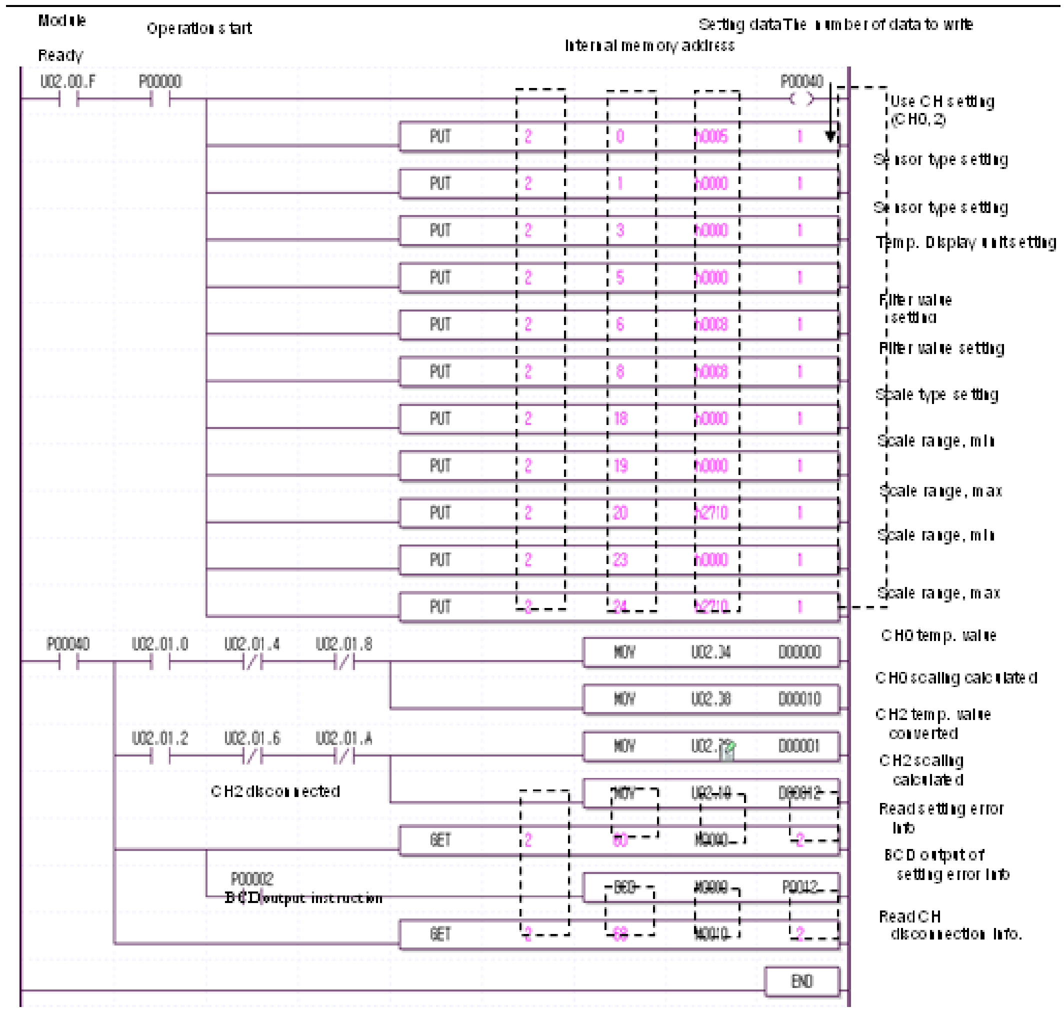


Figure 79 – Application program example with PUT/GET instruction used

Program with °F temperature-converted value and highest/lowest process alarm (I/O slot fixed-points assigned: based on changeable type)

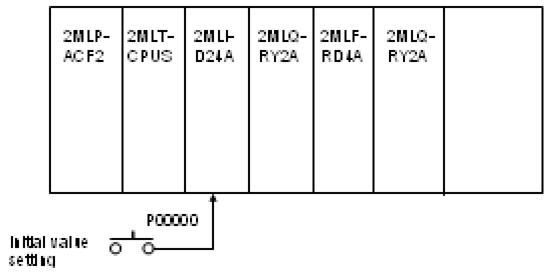


Figure 80 – System configuration

Details of initial setting

1. Used channel: CH0
2. Sensor type: Pt100
3. Temperature unit: °F
4. High/low process alarm setting: High = 2170, Low = 2070

Description of program

1. If P00000 is ON, the temperature-converted value of CH0 is output to D0.
2. The output contact is installed on the slot number 2. This program is used to trigger output (alarm) by means of the highest/lowest process function if the highest/lowest process alarm range is exceeded.

Program

Program example post I/O parameters setting

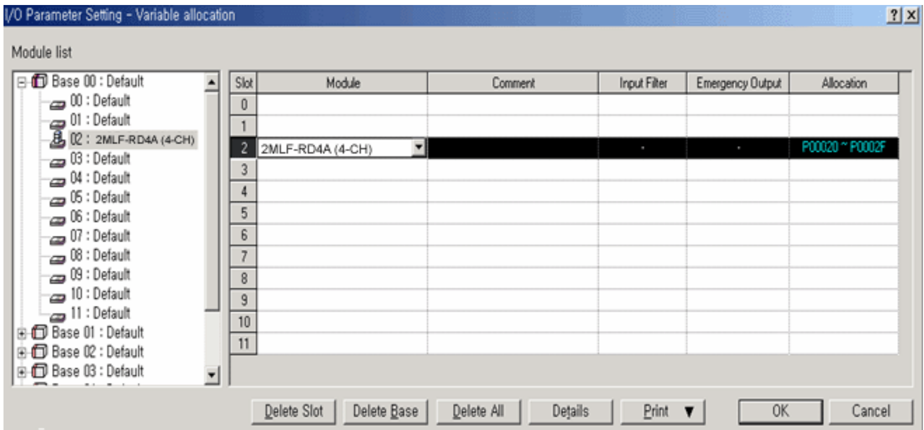


Figure 81 – I/O Parameter Setting window 3

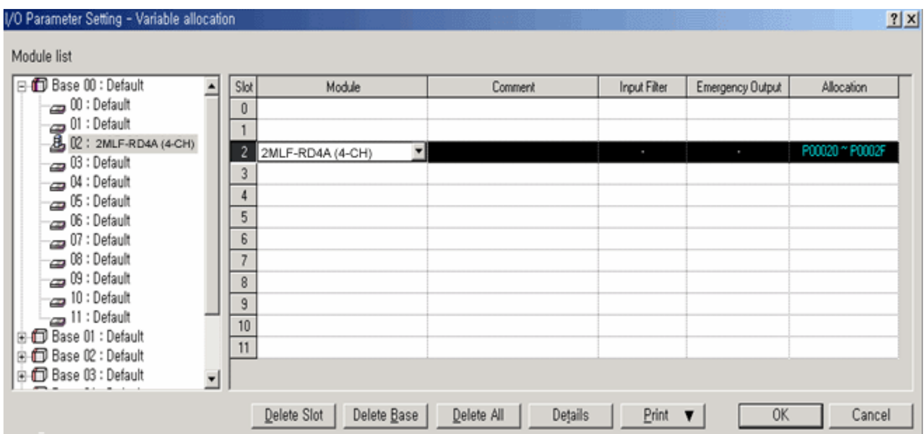


Figure 82 – Parameters settings for RTD module

1. Register the applicable module in the slot where the module is installed and specify the operation parameters that have to be downloaded to the PLC.

2. Select ‘FLAG monitor’ on the Special Module Monitoring window.

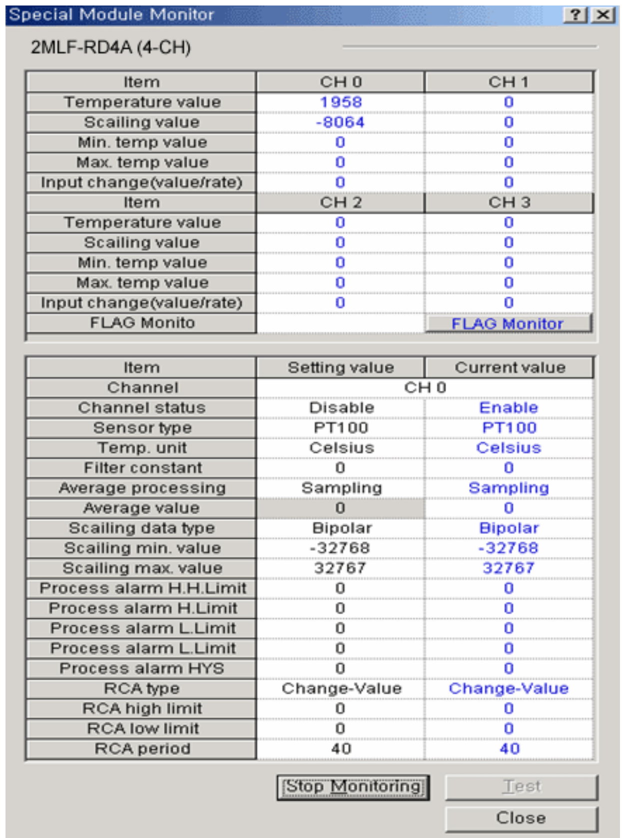
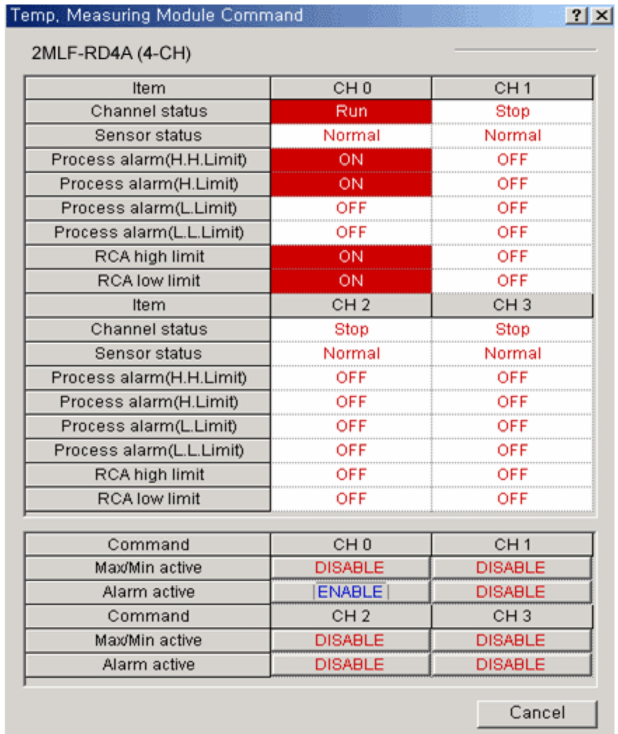


Figure 83 – Special Module Monitoring window (flag monitor)

3. Set the alarm operation of CH0 enable on the instruction window of temperature input module.



Temp. Measuring Module Command

2MLF-RD4A (4-CH)

Item	CH 0	CH 1
Channel status	Run	Stop
Sensor status	Normal	Normal
Process alarm(H.H.Limit)	ON	OFF
Process alarm(H.Limit)	ON	OFF
Process alarm(L.Limit)	OFF	OFF
Process alarm(L.L.Limit)	OFF	OFF
RCA high limit	ON	OFF
RCA low limit	ON	OFF
Item	CH 2	CH 3
Channel status	Stop	Stop
Sensor status	Normal	Normal
Process alarm(H.H.Limit)	OFF	OFF
Process alarm(H.Limit)	OFF	OFF
Process alarm(L.Limit)	OFF	OFF
Process alarm(L.L.Limit)	OFF	OFF
RCA high limit	OFF	OFF
RCA low limit	OFF	OFF

Command	CH 0	CH 1
Max/Min active	DISABLE	DISABLE
Alarm active	ENABLE	DISABLE
Command	CH 2	CH 3
Max/Min active	DISABLE	DISABLE
Alarm active	DISABLE	DISABLE

Cancel

Figure 84 – Temperature measuring module command window

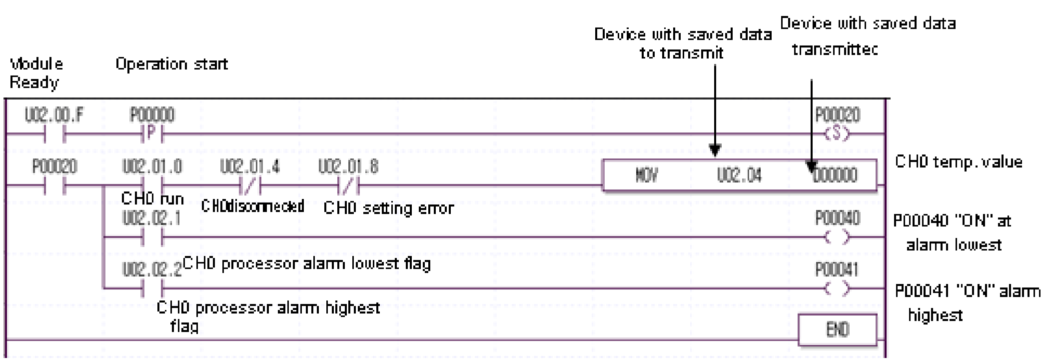


Figure 85 – Program example post I/O parameters setting

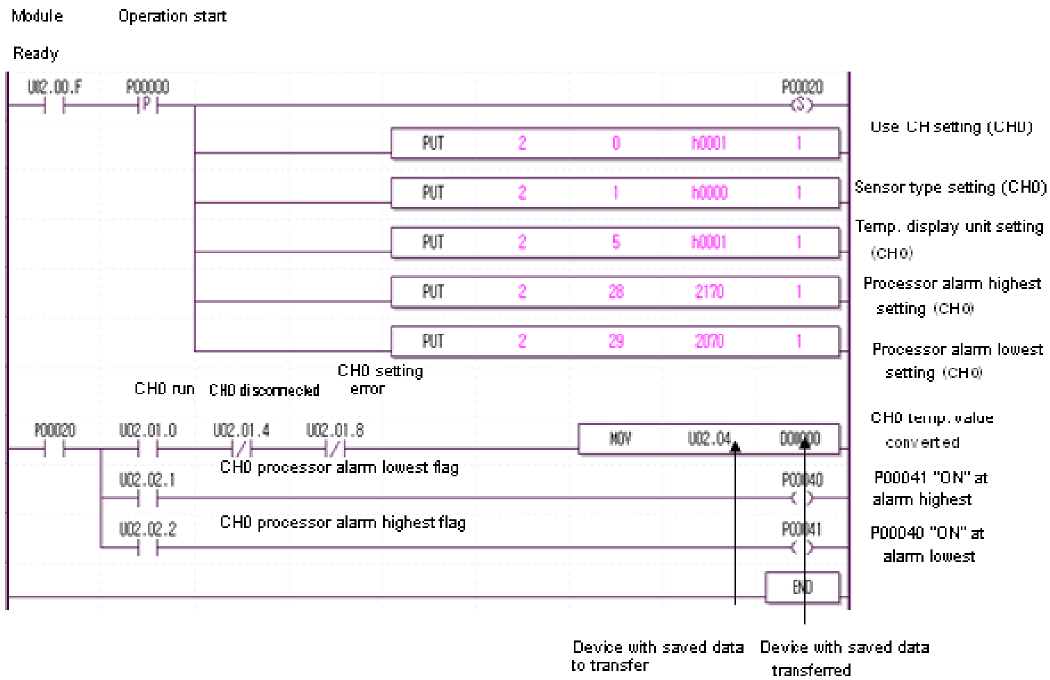


Figure 86 – Program example with PUT/GET instruction used

7. Troubleshooting

7.1 Introduction

This chapter explains the errors that could occur while the RTD module is installed and configured and their corresponding troubleshooting procedures are described below.

7.2 Error codes

Errors indicated by the flickering RUN LED/ALM LED on the input module are given below.

Table 12 – Hardware error code list

Error code (Decimal)	Description	LED	
		RUN	ALM
10	Module error (ASIC Reset Error)	Flickering (0.2s cycle)	OFF
11	Module error (ASIC RAM)		
12	Module error (Register Error)		
30	Module error (Module Refresh Area Write Error)		
32	Module error (Module Refresh Area Read Error)		
50	Offset/Gain error (EEPROM Check Error)	Flickering (5s cycle)	OFF

Table 13 – Disconnection error code list

Error Code (Decimal)	Description	Internal memory address (Operation parameter area)	LED	
			RUN	ALM
0	Normal	68 – 71	ON	Flickering (1s)
1	Sensor A disconnection		ON	Flickering (1s)
2	Sensor B disconnection		ON	Flickering (1s)

7.3 Troubleshooting procedures

RUN LED flickering

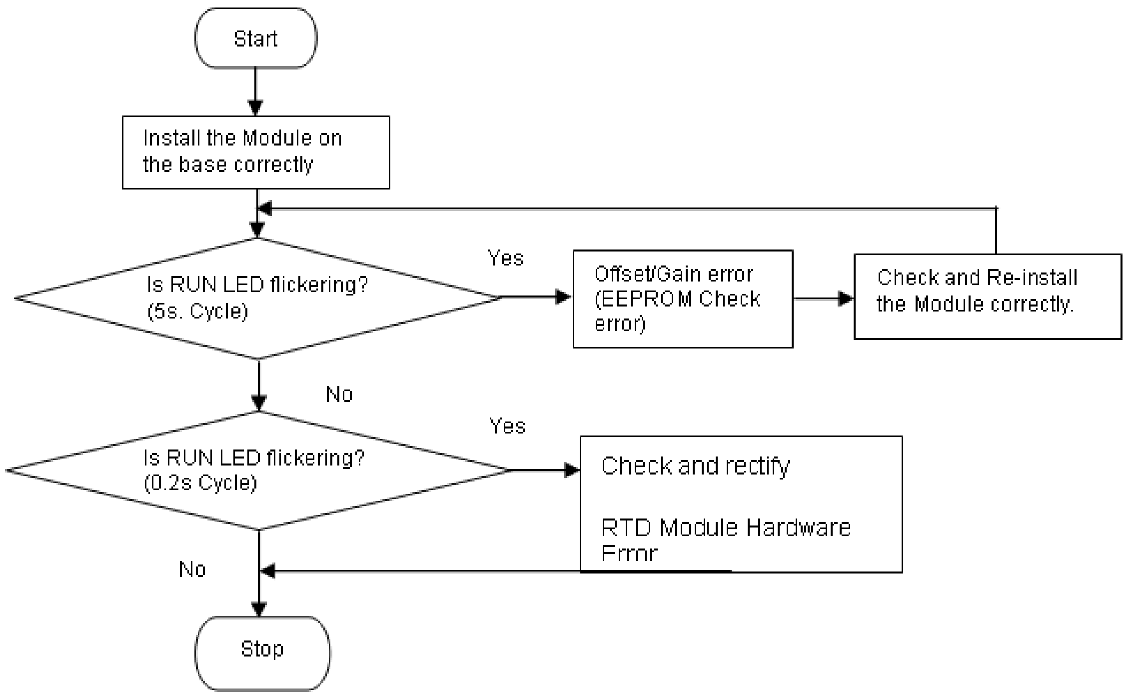


Figure 87 – Troubleshooting when RUN LED is flickering

RUN LED OFF

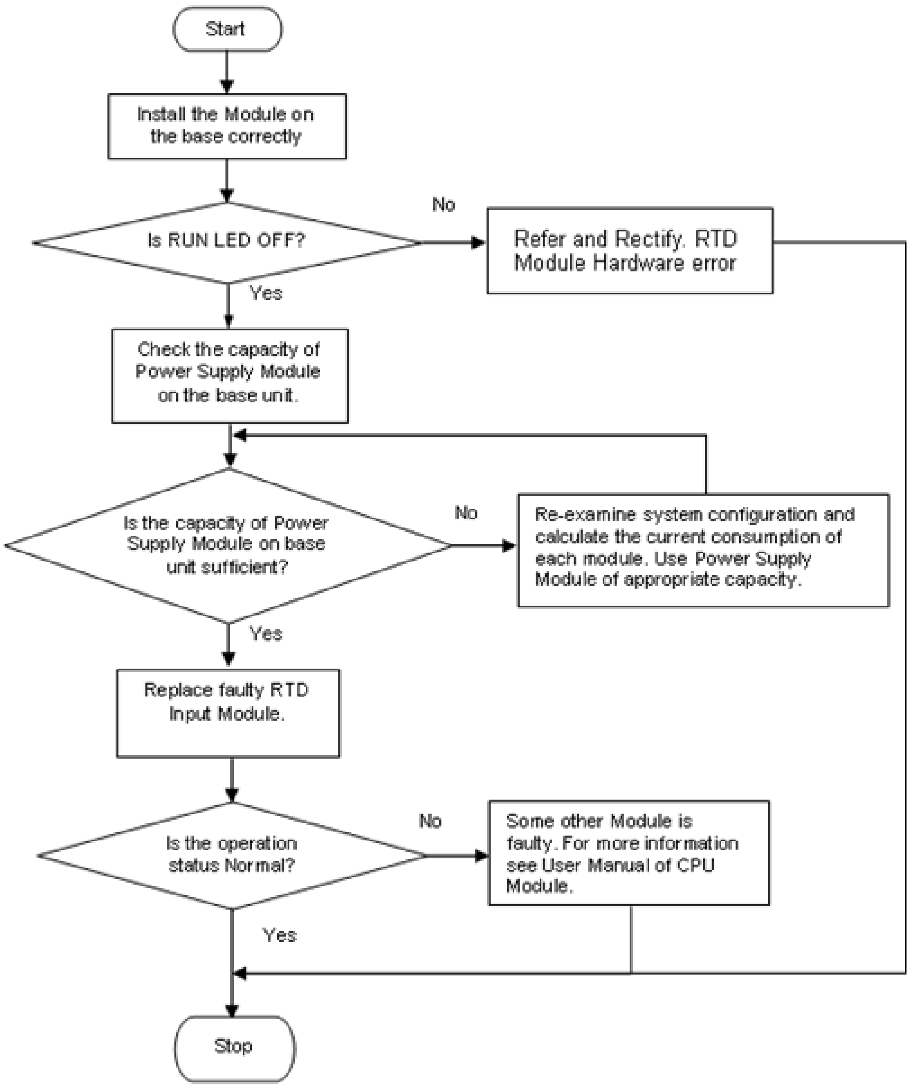


Figure 88 – Troubleshooting when RUN LED is OFF

CPU cannot read temperature conversion value

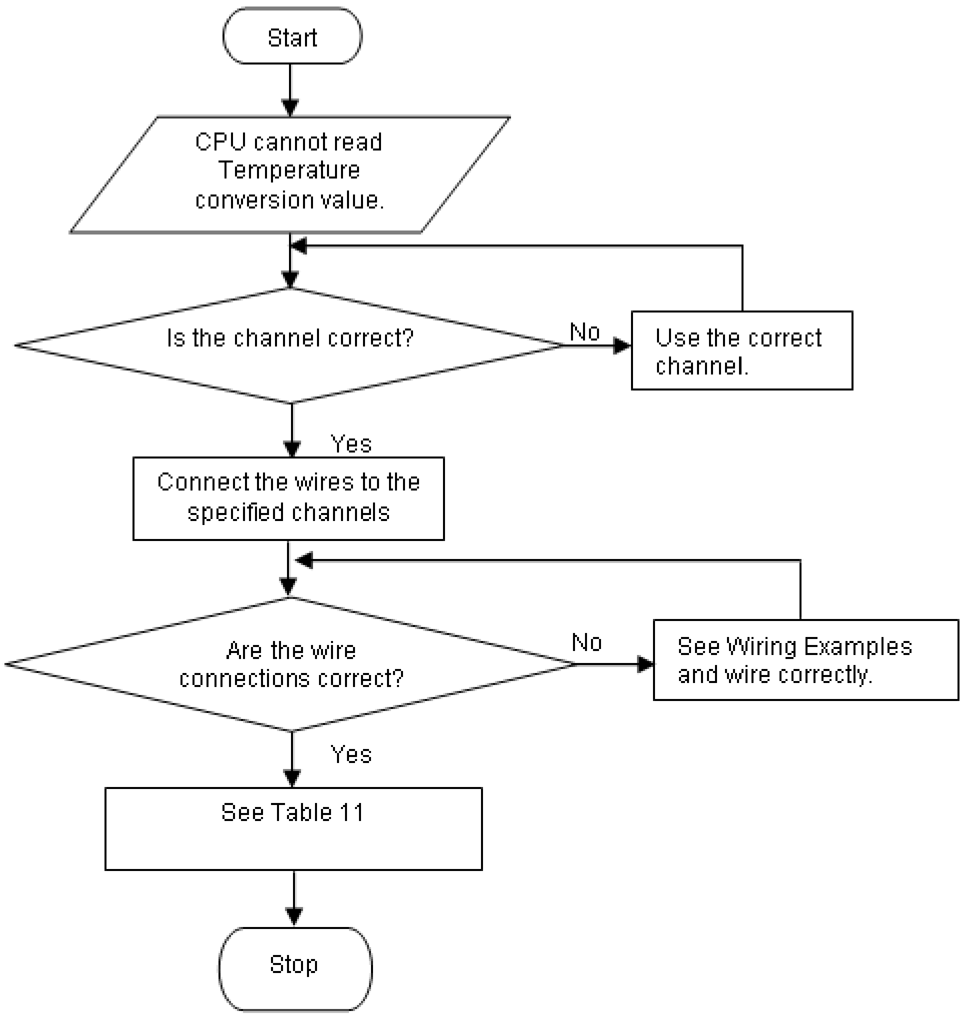


Figure 89 – Troubleshooting when CPU cannot read temperature conversion value

RTD input value is not consistent with the detected value

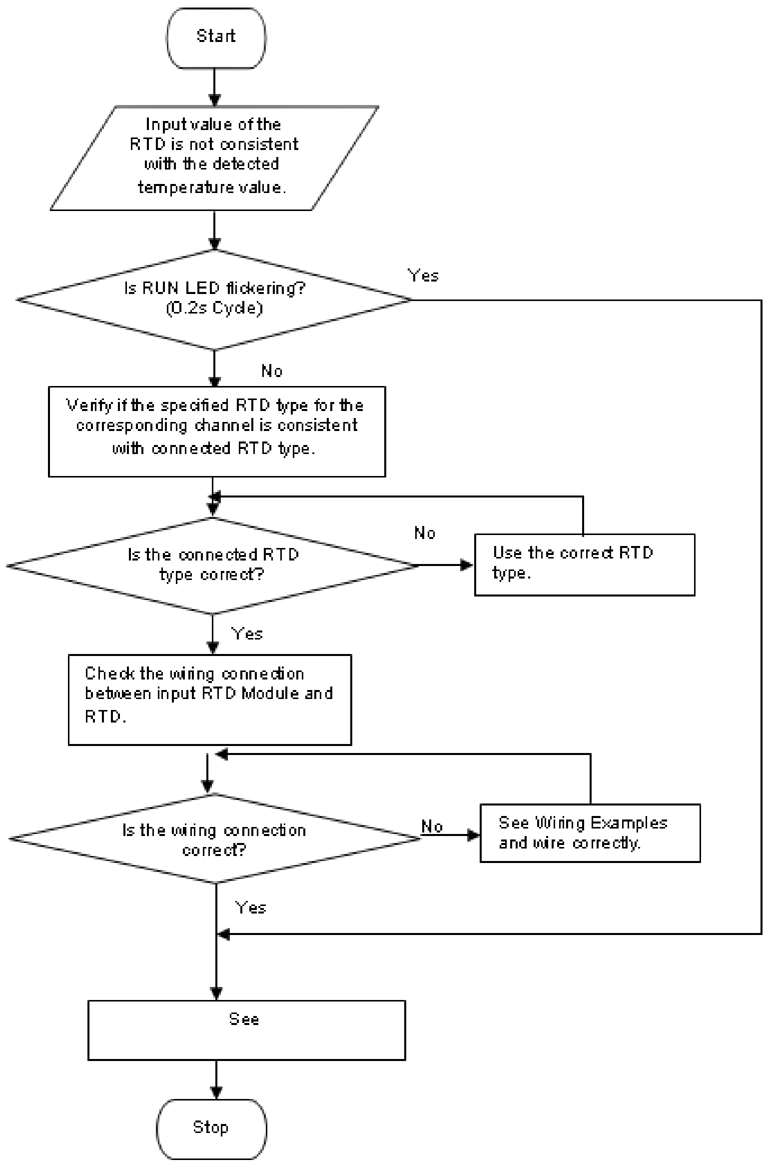


Figure 90 – Troubleshooting when RTD input is not consistent with detected value

RTD module hardware error

When hardware error occurs in the RTD module, contact the nearest agency or service center of Honeywell Co. Ltd.

It is necessary to do a status check before contacting the service agency. The status check is done as described below:

RTD module status check through SoftMaster system monitoring

SoftMaster system monitoring function can be used to gather following data:

- Module type
- Module information
- O/S version
- Status of the RTD module.

Execution sequence

Two routes available for the execution are:

1. On the module screen, click **Monitor** > **System Monitoring** and right-click to display Module Information.
2. On the module screen, click **Monitor** > **System Monitoring** > and double-click the module screen.

Module information

1. **Module Info**: shows the information of the module presently installed.
2. **OS version**: shows the O/S version information of RTD module.
3. **OS date**: shows the O/S prepared date of RTD module.
4. **Module status**: shows the present error code.

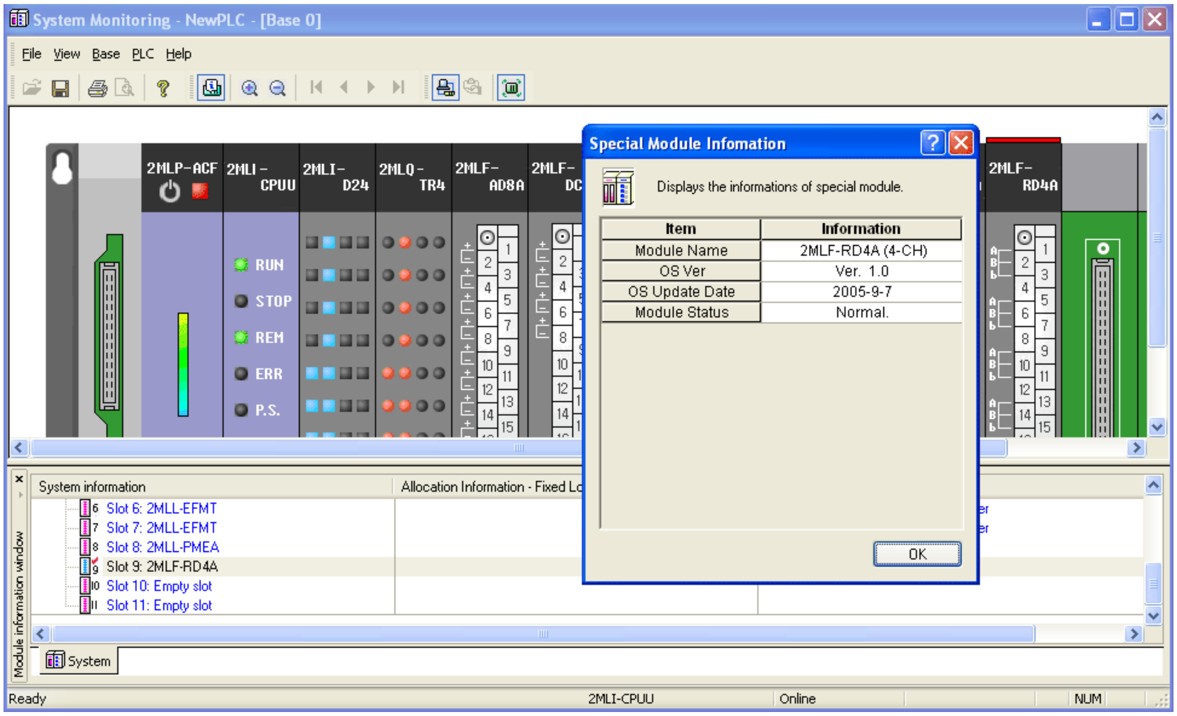


Figure 91 – Special Module Information window

8. Appendix

8.1 Appendix 1: Standard resistance values of Pt100/JPt100 sensors

Pt100Ω										
-200	18.52									
-100	60.26	56.19	52.11	48.00	43.88	39.72	35.54	31.34	27.10	22.83
0	100.00	96.09	92.55	88.22	84.27	80.31	76.33	72.33	68.33	64.30
Temperature (℃)	0	10	20	30	40	50	60	70	80	90
0	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.08	130.90	134.71
100	138.51	142.29	146.07	149.83	153.58	157.33	161.05	164.77	168.48	172.17
200	175.86	179.53	183.19	186.84	190.47	194.10	197.71	201.31	204.90	208.48
300	212.05	215.61	219.86	222.68	226.21	229.72	233.21	236.70	240.18	243.64
400	247.09	250.53	253.96	257.38	260.78	264.18	267.56	270.93	274.29	277.64
500	280.98	284.30	287.62	290.92	294.21	297.49	300.75	304.01	307.25	310.49
600	313.71	316.92	320.12	323.30	326.48	329.64	332.79	335.93	339.06	342.18
700	345.28	348.38	351.46	354.53	357.59	360.64	363.67	366.70	369.71	372.71
800	375.70	378.68	381.65	384.60	387.55					
850	390.48									

JPt100Ω										
-200	17.14									
-100	59.57	55.44	51.29	47.11	42.91	38.68	34.42	30.12	25.80	21.46
0	100.00	96.02	92.02	88.01	83.99	79.96	75.91	71.85	67.77	63.68
Temperature(℃)	0	10	20	30	40	50	60	70	80	90
0	100.00	103.97	107.93	111.88	115.81	119.73	123.64	127.54	131.42	135.3

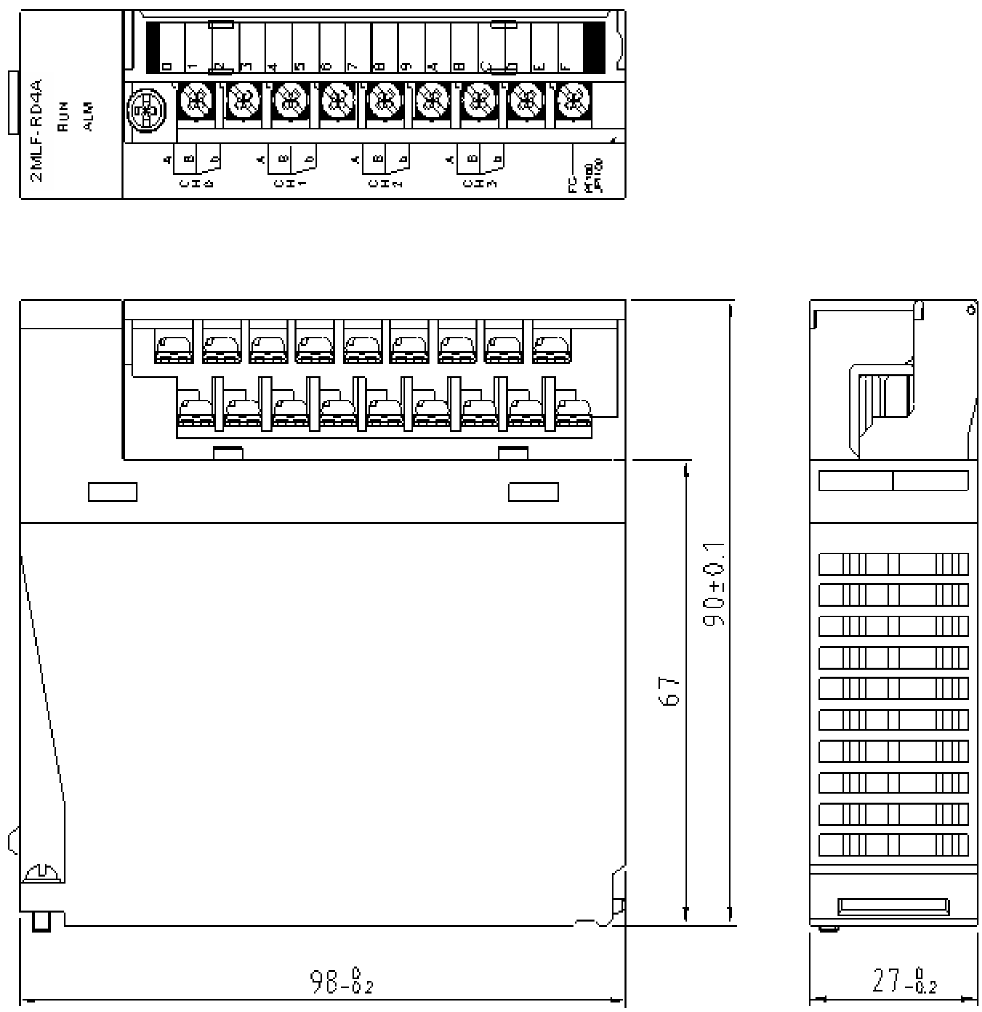
8. Appendix

8.1. Appendix 1: Standard resistance values of Pt100/JPt100 sensors

100	139.16	143.01	146.85	150.67	154.49	158.29	162.08	165.86	169.63	173.38
200	177.13	180.86	184.58	188.29	191.99	195.67	199.35	203.01	206.66	210.3
300	213.93	217.51	221.15	224.74	228.32	231.89	235.45	238.99	242.53	246.05
400	249.56	253.06	256.55	260.02	263.49	266.94	270.38	273.8	277.22	280.63
500	284.02	287.4	290.77	294.12	297.47	300.8	304.12	307.43	310.72	314.01
600	317.28	320.54	323.78	327.02	330.24					
649	333.13									

8.2 Appendix 2: Dimensions

2MLF-RD4A



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