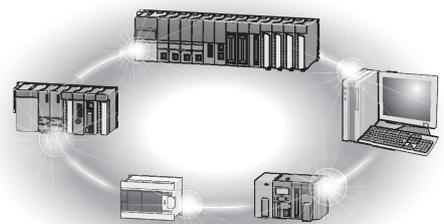




# Mitsubishi Programmable Controller

## Thermocouple Input Module User's Manual AJ65SBT2B-64TD

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# ● SAFETY PRECAUTIONS ●

(Read these precautions before using this product)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

These precautions apply only to this product. Refer to the user's manual of the CPU module to use for a description of the programmable controller system safety precautions.

In this manual, the safety precautions are classified into two levels: "⚠ WARNING" and "⚠ CAUTION".



Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.



Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠ CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety. Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

## [Design Precautions]

### ⚠ WARNING

- In the case of a communication failure in the network, data in the master module are held. Check the communication status information (SB, SW) and configure an interlock circuit in the sequence program to ensure that the entire system will operate safely.

### ⚠ CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables.  
Keep a distance of 100mm (3.94 inches) or more between them.  
Failure to do so may result in malfunction due to noise.

## [Installation Precautions]

### ⚠ CAUTION

- Use the programmable controller in an environment that meets the general specifications in this manual.  
Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.

## [Installation Precautions]

### CAUTION

- For protection of the switches, do not remove the cushioning material before installation.
- Securely fix the module with a DIN rail or mounting screws. Tighten the screws within the specified torque range.  
Undertightening can cause drop of the screw, short circuit, or malfunction.  
Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Do not directly touch any conductive part of the module.  
Doing so can cause malfunction or failure of the module.

## [Wiring Precautions]

### CAUTION

- Shut off the external power supply for the system in all phases before wiring. Failure to do so may result in damage to the product.
- Ground the FG terminals to the protective ground conductor dedicated to the programmable controller.  
Failure to do so may result in malfunction.
- Tighten any unused terminal screws within the specified torque range (0.42 to 0.50N•m).  
Failure to do so may cause a short circuit due to contact with a solderless terminal.
- Use applicable solderless terminals and tighten them within the specified torque range.  
If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and terminal layout before wiring to the module, and connect the cables correctly.  
Connecting a power supply with a different voltage rating or incorrect wiring may cause a fire or failure.
- Tighten the terminal screw within the specified torque range.  
Undertightening can cause short circuit or malfunction.  
Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Prevent foreign matter such as dust or wire chips from entering the module.  
Such foreign matter can cause a fire, failure or malfunction.
- Place the cables in a duct or clamp them.  
If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact.

## [Wiring Precautions]

### CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables.  
Failure to do so may result in malfunction due to noise.
- When disconnecting the cables from the module, do not pull the cable by the cable part.  
Loosen the screws of connector before disconnecting the cable.  
Failure to do so may result in damage to the module or cable or malfunction due to poor contact.

## [Startup/Maintenance Precautions]

### CAUTION

- Do not touch any terminal while power is on.  
Doing so may cause malfunction.
- Shut off the external power supply for the system in all phases before cleaning the module or retightening the terminal screws.  
Failure to do so may cause the module to fail or malfunction.  
Undertightening can cause drop of the screw, short circuit or malfunction.  
Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Do not disassemble or modify the modules.  
Doing so may cause failure, malfunction, injury, or a fire.
- Do not drop or apply strong shock to the module.  
Doing so may damage the module.
- Shut off the external power supply for the system in all phases before mounting or removing the module to or from the panel.  
Failure to do so may cause the module to fail or malfunction.
- After the first use of the product, do not mount/remove the terminal block to/from the module more than 50 times. (IEC 61131-2 compliant)
- Before handling the module, touch a grounded metal object to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.

## [Disposal Precautions]

### CAUTION

- When disposing of this product, treat it as industrial waste.

# ● CONDITIONS OF USE FOR THE PRODUCT ●

- (1) Mitsubishi programmable controller ("the PRODUCT") shall be used in conditions;
  - i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
  - ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.
- (2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI'S USER, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above, restrictions Mitsubishi may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi representative in your region.

## REVISIONS

\* The manual number is given on the bottom left on the back cover.

Print date	*Manual number	Revision
Aug., 2009	SH(NA)-080769ENG-A	First edition
Dec., 2010	SH(NA)-080769ENG-B	<p>[Addition] CONDITIONS OF USE FOR THE PRODUCT, Section 6.8</p> <p>[Partial correction] SAFETY PRECAUTIONS, ABOUT MANUALS, COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES, GENERIC TERMS, ABBREVIATIONS, AND TERMINOLOGY, Section 2.1, 2.2, 3.1, 3.4.2, 4.6.2</p>
Oct., 2014	SH(NA)-080769ENG-C	<p>[Addition] Section 2.4</p> <p>[Partial correction] ABOUT MANUALS, COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES, GENERIC TERMS, ABBREVIATIONS, AND TERMINOLOGY, Section 2.2, 3.1, 3.2, 4.3, 4.9, 6.7, Appendix 1</p>

Japanese manual version SH-080727-C

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## INTRODUCTION

Thank you for purchasing the Mitsubishi programmable controller.

Before using the product, please read this manual carefully to understand the features and performance of the programmable controller, and use it correctly.

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## **ABOUT MANUALS**

The following manuals are also relevant to the product.  
Order each manual as needed, referring to the following list.

Relevant manuals
------------------

<b>Manual name</b>	<b>Manual number (model code)</b>
<b>CC-Link System Master/Local Module Type AJ61BT11/A1SJ61BT11 User's Manual</b> Describes the system configuration, performance specifications, functions, handling, wiring, and troubleshooting of the AJ61BT11 and A1SJ61BT11. (Sold separately)	IB-66721 (13J872)
<b>CC-Link System Master/Local Module Type AJ61QBT11/A1SJ61QBT11 User's Manual</b> Describes the system configuration, performance specifications, functions, handling, wiring, and troubleshooting of the AJ61QBT11, A1SJ61QBT11. (Sold separately)	IB-66722 (13J873)
<b>MELSEC-Q CC-Link System Master/Local Module User's Manual</b> Describes the system configuration, performance specifications, functions, handling, wiring, and troubleshooting of the QJ61BT11N. (Sold separately)	SH-080394E (13JR64)
<b>MELSEC-L CC-Link System Master/Local Module User's Manual</b> Describes the system configuration, performance specifications, functions, handling, wiring, and troubleshooting of the LCPU with built-in CC-Link and LJ61BT11. (Sold separately)	SH-080895ENG (13JZ41)
<b>MELSEC iQ-R CC-Link System Master/Local Module User's Manual (Application)</b> Describes the functions, parameter settings, programming, troubleshooting, I/O signals, and buffer memory of the CC-Link system master/local module. (Sold separately)	SH-081270ENG (13JX19)
<b>Type AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) Programming Manual (Dedicated Instructions)</b> Describes the instructions extended for the AnSHCPU/AnACPU/AnUCPU. (Sold separately)	IB-66251 (13J512)
<b>MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks)</b> Describes instructions for the CPU module, dedicated instructions for the intelligent function modules, and standard functions/function blocks. (Sold separately)	SH-081266ENG ---

## **COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES**

### (1) Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

- User's manual for the CPU module or head module used
- Safety Guidelines

(This manual is included with the CPU module, base unit, or head module.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

### (2) Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the manuals listed under (1).

## **GENERIC TERMS, ABBREVIATIONS, AND TERMINOLOGY**

Unless otherwise specified, the following generic terms, abbreviations, and terminologies are used in this manual to describe the AJ65SBT2B-64TD Thermocouple Input Module.

<b>Generic term/ abbreviation/ terminology</b>	<b>Description</b>
GX Developer GX Works2	Product name of the software package for the MELSEC programmable controllers.
Up scale	Maximum value of the measured temperature range plus 5% value of measured temperature range
Down scale	Minimum value of the measured temperature range minus 5% value of measured temperature range
ACPU	Generic term for the A0J2CPU, A0J2HCPU, A1CPU, A2CPU, A2CPU-S1, A3CPU, A1SCPU, A1SCPUC24-R2, A1SHCPU, A1SJCPU, A1SJCPU-S3, A1SJHCPU, A1NCP, A2NCP, A2NCP-S1, A3NCP, A3MCP, A3HCP, A2SCP, A2SHCP, A2ACP, A2ACP-S1, A3ACP, A2UCP, A2UCP-S1, A2USCP, A2USCP-S1, A2USHCP-S1, A3UCP, and A4UCP
QnACPU	Generic term for the Q2ACP, Q2ACP-S1, Q2ASCP, Q2ASCP-S1, Q2ASHCP, Q2ASHCP-S1, Q3ACP, Q4ACP, and Q4ARCP
QCPU (A mode)	Generic term for the Q02CPU-A, Q02HCP-A, Q06HCP-A
QCPU (Q mode)	Generic term for Q00JCP, Q00UJCP, Q00CP, Q00UCP, Q01CP, Q01UCP, Q02CP, Q02HCP, Q02PHCP, Q02UCP, Q03UDCP, Q03UDECP, Q03UDVCP, Q04UDHCP, Q04UDEHCP, Q04UDVCP, Q06HCP, Q06PHCP, Q06UDHCP, Q06UDEHCP, Q06UDVCP, Q10UDHCP, Q10UDEHCP, Q12HCP, Q12PHCP, Q12PRHCP, Q13UDHCP, Q13UDEHCP, Q13UDVCP, Q20UDHCP, Q20UDEHCP, Q25HCP, Q25PHCP, Q25PRHCP, Q26UDHCP, Q26UDEHCP, Q26UDVCP, Q50UDEHCP, and Q100UDEHCP
LCPU	Generic term for the L02SCP, L02SCP-P, L02CP, L02CP-P, L06CP, L06CP-P, L26CP, L26CP-P, L26CP-BT, and L26CP-PBT
RCPU	Generic term for R04CP, R08CP, R16CP, R32CP, and R120CP
Master station	A station that controls data link system One master station is required for each system.
Local station	A station that is configured with a CPU module and can communicate with the master station and other local stations
Remote I/O station	A station that handles only information that is in units of bits (performs input and output with external devices) (e.g. AJ65BTB1-16D and AJ65SBTB1-16D)
Remote device station	A station that handles information that is in units of bits and in units of words (input and output of data with external devices and conversion of analog data)
Remote station	Generic term for the remote I/O station and This station is controlled by the master station
Intelligent device station	A station that can perform transient transmission, such as the AJ65BT-R2N (including local stations)
Master module	Generic term for modules that can be used as the master station
SB	Link special relay (for CC-Link) Information in units of bits that indicates the data link status and module operating status of the master station/local stations
SW	Link special register (for CC-Link) Information in units of bits that indicates the data link status and module operating status of the master station/local stations

Generic term/ abbreviation/ terminology	Description
RX	Remote input (for CC-Link) Information input in units of bits from the remote station to the master station
RY	Remote output (for CC-Link) Information output in units of bits from the master station to the remote station
RWw	Remote register (write area for CC-Link) Information output in units of 16 bits from the master station to the remote device station
RWr	Remote register (read area for CC-Link) Information input in units of 16 bits from the remote device station to the master station

**PACKING LIST**

The following table is the packing list of the AJ65SBT2B-64TD Thermocouple Input Module.

Product	Quantity
AJ65SBT2B-64TD Thermocouple Input Module	1



## CHAPTER 1 OVERVIEW

---

This manual describes the specifications, handling, and programming methods of the AJ65SBT2B-64TD Thermocouple Input Module (hereafter abbreviated as AJ65SBT2B-64TD) used as a remote device station in a CC-Link system.

The AJ65SBT2B-64TD converts temperature data [ $^{\circ}\text{C}$ ] input from thermocouple into a measured temperature value in 16-bit signed binary data (stored by a value up to the first decimal place  $\times 10$ ).

### 1.1 Features

---

This section describes the features of the AJ65SBT2B-64TD.

- (1) One module can measure temperatures up to four channels.  
One module can measure temperatures up to four channels.
- (2) A thermocouple complying with standards can be used.  
Eight types of thermocouple (B, R, S, K, E, J, T, and N) complying with JIS standard and IEC standard can be used.  
The type of thermocouple can be selected for each channel in a sequence program.
- (3) Disconnection is detectable.  
The disconnection can be detected using the Disconnection detection flag for each channel.  
Setting "Up scale" and "Down scale" to the Converted value at disconnection detection selection flag detects disconnection from a measured temperature value.
- (4) Sampling processing, time average processing, count average processing, and moving average processing are selectable.  
The conversion processing method is selectable from the sampling processing, time average processing, count average processing, and moving average processing for each channel.
- (5) RTD (Resistance Temperature Detector) Pt100 cold junction compensation is available.  
Cold junction compensation is performed automatically, because an RTD Pt100 is connected with the AJ65SBT2B-64TD.  
Disabling the cold junction compensation with the Pt100 allows cold junction compensation externally.
- (6) Saving man-hour
  - (a) The module has a built-in  $110\Omega$  terminating resistor, which eases wiring.
  - (b) Users are not required to set the transmission speed of the AJ65SBT2B-64TD.  
The transmission speed of the AJ65SBT2B-64TD is automatically set according to the transmission speed that is set in the master station.

- (7) The size is reduced, compared with an existing thermocouple input module.  
The size is reduced, compared with an existing thermocouple input module (AJ65BT-68TD).
- (8) Error correction can be performed by setting offset and gain values.  
Error correction can be performed individually for each channel by setting offset and gain values.  
Also, the offset and gain values can be either set by the user setting or factory default setting.
- (9) Up to 42 modules are connectable.  
Up to 42 modules of the AJ65SBT2B-64TD are connectable to one master station.
- (10) Maintenance is easy.  
Using a 2-piece terminal block allows the easy maintenance of the AJ65SBT2B-64TD.

## CHAPTER 2 SYSTEM CONFIGURATION

This chapter describes the system configuration where the AJ65SBT2B-64TD is used.

### 2.1 Overall Configuration

This section describes the overall configuration where the AJ65SBT2B-64TD is used.

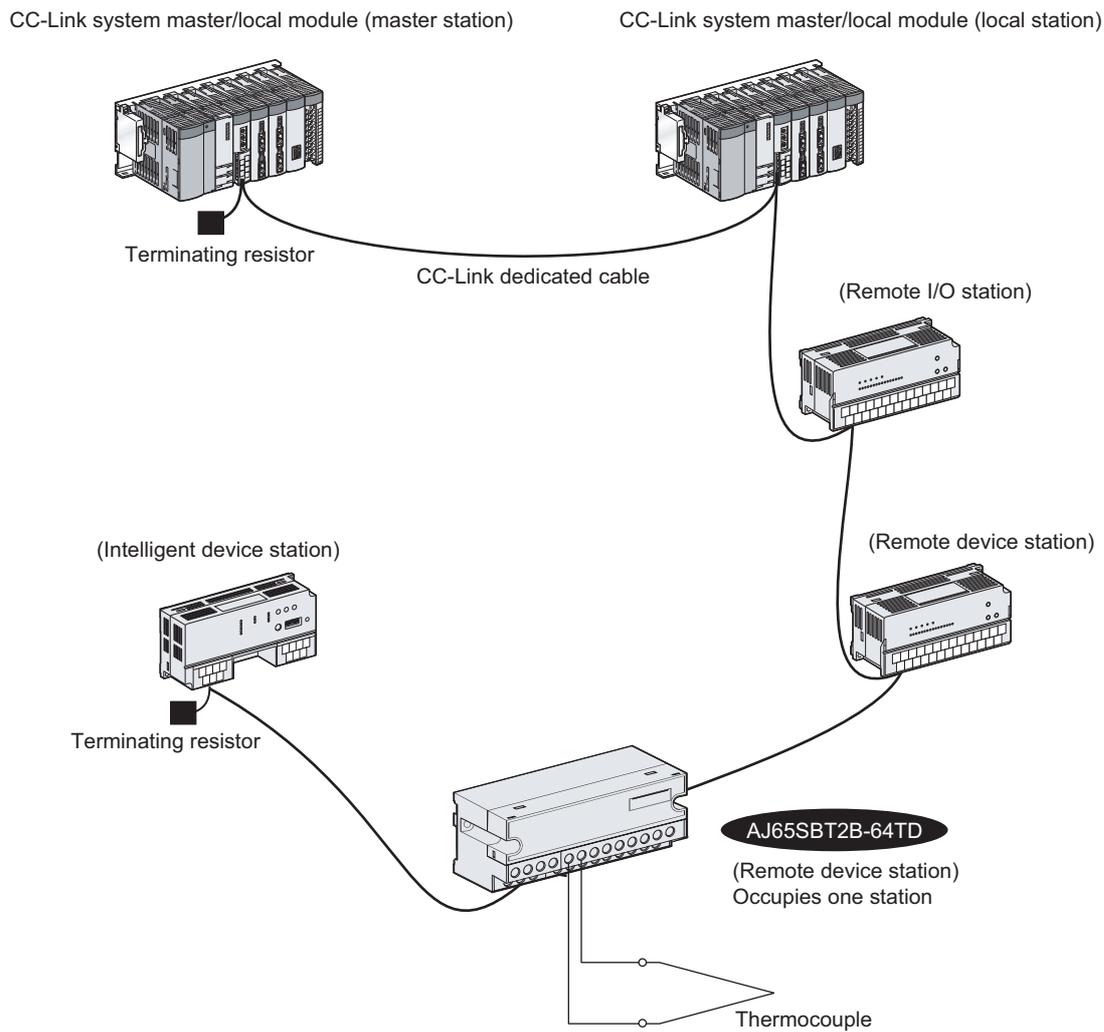


Figure 2.1 Overall configuration where the AJ65SBT2B-64TD is used

## 2.2 Applicable System

This section describes the applicable system.

(1) Applicable master module

For available master modules, visit the CC-Link Partner Association (CLPA) website at:  
[www.cc-link.org](http://www.cc-link.org)

**Remark**

Check the specifications of the master module before use.

(2) Restrictions on using the CC-Link dedicated instructions (RLPA and RRPA)

The CC-Link dedicated instructions (RLPA and RRPA) cannot be used depending on the programmable controller CPU and master module used.

For details of the restrictions, refer to the user's manual of the master module for A series and Type AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) Programming Manual (Dedicated Instructions).

Dedicated instructions other than the RLPA and RRPA cannot be used for this module.

For a program example using the dedicated instructions (RLPA and RRPA), refer to Section 5.5.

## 2.3 How to Check Hardware Version

The hardware version of the AJ65SBT2B-64TD is printed in the DATE section on the rating plate.

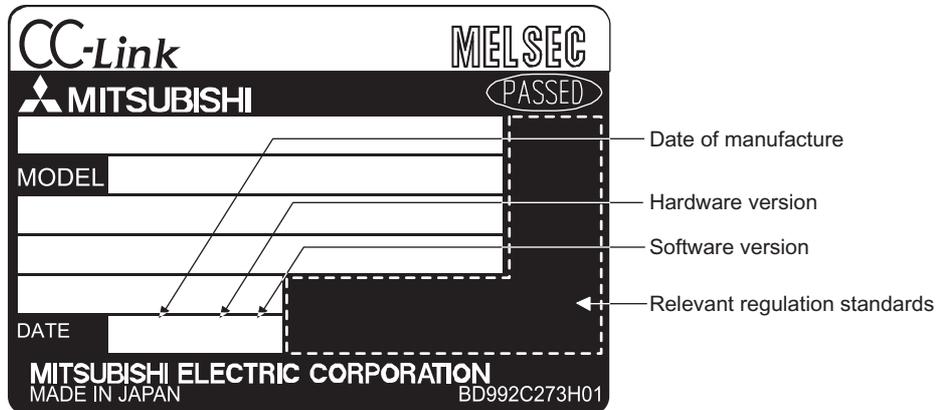


Figure 2.2 How to check the hardware version

## 2.4 How to Check Serial Number

The serial number of the AJ65SBT2B-64TD is printed in the SERIAL section on the rating plate.

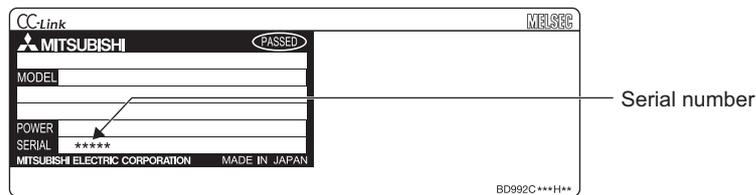


Figure 2.3 How to check the serial number

## CHAPTER 3 SPECIFICATIONS

This chapter describes the specifications of the AJ65SBT2B-64TD.

### 3.1 General Specifications

The general specifications of the AJ65SBT2B-64TD are shown in the following table.

**Table 3.1 General specifications**

Item	Specification					
Operating ambient temperature	0 to 55°C					
Storage ambient temperature	-20 to 75°C					
Operating ambient humidity	10 to 90%RH, non-condensing					
Storage ambient humidity						
Vibration resistance	Compliant with JIS B 3502, IEC 61131-2		<b>Frequency</b>	<b>Acceleration</b>	<b>Amplitude</b>	<b>Sweep count</b>
		Under intermittent vibration	5 to 8.4Hz	—	3.5mm	10 times each in X, Y, and Z directions
			8.4 to 150Hz	9.8m/s <sup>2</sup>	—	
		Under continuous vibration	5 to 8.4Hz	—	1.75mm	—
8.4 to 150Hz	4.9m/s <sup>2</sup>		—			
Shock resistance	Compliant with JIS B 3502, IEC 61131-2 (147m/s <sup>2</sup> , 3 times each in X, Y, Z directions)					
Operating atmosphere	No corrosive gases					
Operating altitude <sup>*1</sup>	0 to 2000m					
Installation location	Inside the control panel					
Overvoltage category <sup>*2</sup>	II or less					
Pollution degree <sup>*3</sup>	2 or less					

- \* 1: Do not use or store the programmable controller under pressure higher than the atmospheric pressure of altitude 0m. Doing so may cause malfunction. When using the programmable controller under pressure, please consult your local Mitsubishi Electric representative.
- \* 2: This indicates the section of the power supply to which the equipment is assumed to be connected between the public electrical power distribution network and the machinery within premises.  
Category II applies to equipment for which electrical power is supplied from fixed facilities. The surge voltage withstand level for up to the rated voltage of 300V is 2500V.
- \* 3: This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used.  
Pollution level 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensing must be expected occasionally.

## 3.2 Performance Specifications

The performance specifications for the AJ65SBT2B-64TD are shown in the following table.

**Table 3.2 Performance specifications**

Item		AJ65SBT2B-64TD
Temperature sensor input		-270 to 1820°C
Measured temperature value		16-bit signed binary (-2700 to 18200: value rounded to one decimal place × 10)
Applicable thermocouples, temperature measurement range accuracy, and effect by wiring resistance of 1Ω <sup>*1</sup>		Refer to Table 3.3 Applicable thermocouples, temperature measurement range accuracy, and effect by wiring resistance of 1Ω
Cold junction compensation accuracy (Operating ambient temperature 25±10°C) <sup>*1*2</sup>		±1.0°C
Overall accuracy <sup>*1</sup>		See the calculation formula in *3.
Maximum resolution		B, R, S, N: 0.3°C K, E, J, T: 0.1°C
Conversion speed <sup>*4</sup>		640ms/4 channels
Sampling cycle <sup>*5</sup>		160ms/4 channels
Absolute maximum input		±5V
Number of analog input points		4 channels + Pt100 connection channel × 2
Built-in terminating resistor		Available (110Ω)
Number of writes to Flash memory		Up to 10,000 times
CC-Link station type		Remote device station
Number of occupied stations		1 station (RX/RY: 32 points each, RWr/RWw: 4 points each)
Connection cable		CC-Link dedicated cable
Withstand voltage		Between all power supply systems and all communication systems and cold junction compensation channels Between thermocouple input and all communication systems and cold junction compensation channels Between thermocouple input channels 500VAC for one minute
Isolation method		Between all power supply systems and all communication systems and cold junction compensation channels Between thermocouple input and all communication systems and cold junction compensation channels Between thermocouple input channels Transformer isolation
Noise immunity		Tested by a noise simulator with noise voltage of 500Vp-p, noise width of 1 μs, and noise frequency of 25 to 60Hz.
Disconnection detection		Available (for each channel)
External connection system	Communication part, module power supply part	7-point, 2-piece terminal block M3 × 5.2 Tightening torque: 0.59 to 0.88N•m Number of applicable solderless terminals: maximum 2
	I/O part	18-point, 2-piece terminal block M3 × 5.2 Tightening torque: 0.59 to 0.88N•m Number of applicable solderless terminals: maximum 2
Applicable wire size		0.3 to 2.0mm <sup>2</sup>

**Table 3.2 Performance specifications**

Item	AJ65SBT2B-64TD
Applicable solderless terminal	<ul style="list-style-type: none"> <li>•RAV1.25-3 (JIS C 2805 compliant) [Applicable wire size: 0.3 to 1.25mm<sup>2</sup>]</li> <li>•V2-MS3, RAP2-3SL, TGV2-3N [Applicable wire size: 1.25 to 2.0mm<sup>2</sup>]</li> </ul>
Module mounting screw	M4 × 0.7mm × 16mm or more screw (tightening torque range: 0.78 to 1.08N•m) The module can also be mounted with a DIN rail.
Applicable DIN rail	TH35-7.5Fe, TH35-7.5Al (IEC 60715 compliant)
External power supply	24VDC (20.4VDC to 28.8VDC)
	Inrush current: 1.5A 1.3ms
	Current consumption: 0.12A (24VDC)
Weight	0.3kg

- \* 1: Except when noise is applied. To meet the accuracy, a warm-up (power distribution) period of 30 minutes is required.
- \* 2: When the module is mounted vertically and the ambient temperature for use is from 0 to 15°C or from 35 to 55°C, the cold junction temperature compensation accuracy is ±1.5°C. For the module mounting orientation, refer to Section 4.5.
- \* 3: Calculate the overall accuracy by the following method.  
 (Overall accuracy)=(Conversion accuracy)+(Temperature characteristics)×(Operating ambient temperature variation)+(Cold junction compensation accuracy)  
 The operating ambient temperature variation indicates a deviation of an operating ambient temperature from a range of 25±5°C.  
 Example) When using the thermocouple B (refer to Table 3.2) at an operating ambient temperature of 35°C and a measured temperature of 1000°C, the overall accuracy is:  
 (±2.5°C)+(±0.4°C)×(35°C -30°C)+(±1°C)= ±5.5°C
- \* 4: The conversion speed indicates the maximum period of time from when the input temperature changes to when the measured temperature value of the remote register is updated.
- \* 5: The sampling cycle indicates a cycle that the measured temperature value of a channel is updated.

Table 3.3 Applicable thermocouples, temperature measurement range accuracy, and effect by wiring resistance of 1Ω

Applicable thermocouple type	Measured temperature range*1	Conversion accuracy (At operating ambient temperature 25±5°C)	Temperature characteristics (Per operating ambient temperature variation of 1°C)	Max. temperature error at ambient temperature 55°C	Effect by wiring resistance of 1Ω [°C/Ω]
B	0 to 600°C	—*3	—*3	—*3	—*3
	600 to 1700°C*2	±2.5°C	±0.4°C	±12.5°C	-0.042°C/Ω
	1700 to 1820°C	—*3	—*3	—*3	—*3
R	-50 to 0°C	—*3	—*3	—*3	—*3
	0 to 1600°C*2	±2.0°C	±0.4°C	±12.0°C	-0.050°C/Ω
	1600 to 1760°C	—*3	—*3	—*3	—*3
S	-50 to 0°C	—*3	—*3	—*3	—*3
	0 to 1600°C*2	±2.0°C	±0.4°C	±12.0°C	-0.050°C/Ω
	1600 to 1760°C	—*3	—*3	—*3	—*3
K	-270 to -200°C	—*3	—*3	—*3	—*3
	-200 to 0°C*2	±0.5°C or ±0.25% of measured temperature whichever greater	±0.06°C or ±0.3% of measured temperature whichever greater	±15.5°C	-0.009°C/Ω
	0 to 1200°C*2		±0.06°C or ±0.02% of measured temperature whichever greater	±9.0°C	-0.007°C/Ω
	1200 to 1370°C	—*3	—*3	—*3	—*3
E	-270 to -200°C	—*3	—*3	—*3	—*3
	-200 to 0°C*2	±0.5°C or ±0.25% of measured temperature whichever greater	±0.06°C or ±0.3% of measured temperature whichever greater	±15.5°C	-0.006°C/Ω
	0 to 900°C*2		±0.06°C or ±0.02% of measured temperature whichever greater	±6.75°C	-0.005°C/Ω
	900 to 1000°C	—*3	—*3	—*3	—*3
J	-210 to -40°C	—*3	—*3	—*3	—*3
	-40 to 750°C*2	±0.5°C or ±0.25% of measured temperature whichever greater	±0.06°C or ±0.02% of measured temperature whichever greater	±5.625°C	-0.006°C/Ω
	750 to 1200°C	—*3	—*3	—*3	—*3
T	-270 to -200°C	—*3	—*3	—*3	—*3
	-200 to 0°C*2	±0.5°C or ±0.25% of measured temperature whichever greater	±0.06°C or ±0.3% of measured temperature whichever greater	±15.5°C	-0.009°C/Ω
	0 to 350°C*2		±0.06°C or ±0.02% of measured temperature whichever greater	±2.625°C	-0.007°C/Ω
	350 to 400°C	—*3	—*3	—*3	—*3
N	-270 to -200°C	—*3	—*3	—*3	—*3
	-200 to 0°C*2	±0.5°C or ±0.25% of measured temperature whichever greater	±0.06°C or ±0.3% of measured temperature whichever greater	±15.5°C	-0.012°C/Ω
	0 to 1250°C*2		±0.06°C or ±0.02% of measured temperature whichever greater	±9.375°C	-0.010°C/Ω
	1250 to 1300°C	—*3	—*3	—*3	—*3

- \* 1: If a value input from the thermocouple is outside the measured temperature range given in this table, it is handled as the maximum or minimum value of the measured temperature range.
- \* 2: The accuracies are applied only in the temperature ranges of Class 1 to 3 (shaded area) in JIS C1602-1995.  
To meet the accuracy, a warm-up (power distribution) period of 30 minutes is required.
- \* 3: Temperature can be measured, however, the accuracy is not guaranteed.
- \* 4: This is the temperature error per 1Ω wiring resistance of the thermocouple. Check the wiring resistance value and calculate the temperature error in the system. If the temperature error exceeds the allowable range of the system used, correct the temperature error using the offset/gain setting. (Refer to Section 4.8.)

### 3.2.1 Conversion speed and transmission delay time

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#### (1) Conversion speed

The conversion speed indicates the maximum time (640ms) required for the measured temperature value that is input from outside to be stored to the remote register.

The measured temperature values stored into the remote register are updated according to the sampling cycle of 160ms. (For details of the sampling cycle, refer to Section 3.3.3 (1).)

The measured temperature values stored in the remote register, which are updated every sampling cycle of 160ms, indicate the temperature data input from the outside 640ms before.

The processing time from when temperature data are converted to measured temperature values until when the values are transmitted to the master station depends on the transmission delay time of the CC-Link system.

#### (2) Transmission delay time

For details of the transmission delay time, refer to the user's manual for the master module used.

(Example) Data link processing time when the QJ61BT11N is used as the master module in the asynchronous mode (normal value)

[Calculation formula]

$SM + LS \times 2 + \text{Remote device station processing time}$

SM: Scan time of master station sequence program

LS: Link scan time

Remote device station processing time: 800ms

## 3.3 Functions

This section describes the functions of the AJ65SBT2B-64TD.

### 3.3.1 Function list

Table 3.4 lists the functions of the AJ65SBT2B-64TD.

**Table 3.4 Functions list of the AJ65SBT2B-64TD**

Item	Description	Reference
Conversion enable/disable specification	Set the conversion enable/disable status for each channel.	Section 3.3.2
Sampling processing/average processing specification	Specify the conversion method either from the sampling processing or averaging processing (count average, time average, or moving average) for each channel.	Section 3.3.3
Disconnection detection	Detects the disconnection status of the connected thermocouple for each channel.	Section 3.3.4
Measured temperature value storage	Stores the value rounded off to one decimal place (16-bit signed binary) into the remote register.	Section 3.3.5
Thermocouple type selection	Specify the thermocouple type to be used for each channel.	Section 3.3.6
Error correction by setting offset/gain values	Perform error correction by setting offset and gain values.	Section 4.8
Pt100 cold junction compensation enable/disable specification	Specify Pt100 cold junction compensation enable/disable.	Section 4.9
Transmission speed auto-tracking function	Sets transmission speed automatically according to the setting in the master module.	-
Removable terminal block structure	A module can be replaced without removing cables from a 2-piece terminal block.	-

### 3.3.2 Conversion enable/disable specification

For the AJ65SBT2B-64TD, conversion enable/disable status can be set for each channel.

#### (1) Setting method

Conversion enable/disable status is specified by using CH□ Conversion enable flag (RYn0 to RYn3).

Table 3.5 Conversion enable/disable specification

Setting item	Description	
CH□ Conversion enable flag (RYn0 to RYn3)*1	ON	Temperature of the target device can be measured.
	OFF	Temperature of the target device cannot be measured.

\*1: This setting is activated when the Initial data setting request flag (RY(n+1)9) turns on.

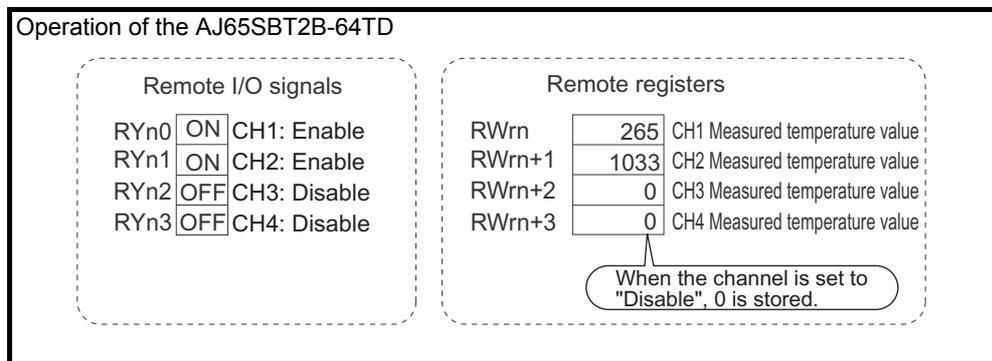


Figure 3.1 Conversion enable/disable setting

#### (2) Operation of the AJ65SBT2B-64TD according to the conversion status change

##### (a) When the conversion status is changed from "Disable" to "Enable"

The module starts converting the measured temperature value of the conversion-enabled channel.

The measured temperature value of the corresponding channel is stored into the remote register and then CH□ Conversion completion flag (RXn0 to RXn3) is turned on.

##### (b) When the conversion status is changed from "Enable" to "Disable"

The module stops converting the measured temperature value of the conversion-disabled channel.

CH□ Conversion completion flag (RXn0 to RXn3) of the corresponding channel is turned off.

The measured temperature value of the corresponding channel immediately before the conversion status is changed to "Disable" is held in the remote register.

## 3.3.3 Sampling processing or average processing specification

For the AJ65SBT2B-64TD, a conversion method (sampling processing, count average, time average, or moving average) can be set for each channel.

Conversion is specified by using CH□ Averaging processing setting (RWwm to RWwm+3).

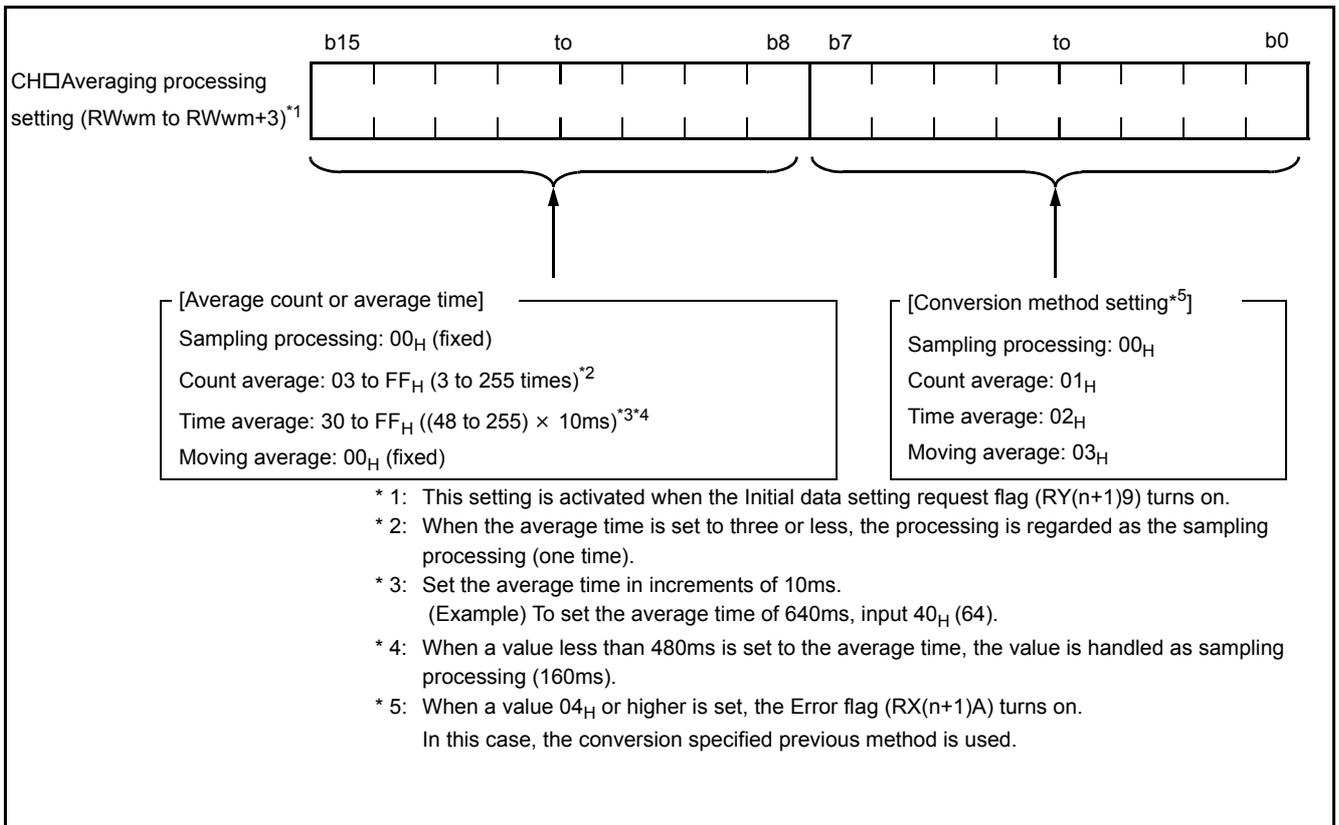


Figure 3.2 CH□ Averaging processing setting

### (1) Sampling processing

Measured temperature values are stored in the remote register according to the sampling cycle.

The sampling cycle indicates the cycle (160ms) in which a measured temperature value of a channel is updated when the sampling processing is specified in CH□ Averaging processing setting (RWwm to RWwm+3).

Regardless of the number of conversion-enabled channels, the measured temperature values are stored in the remote register every 160ms.

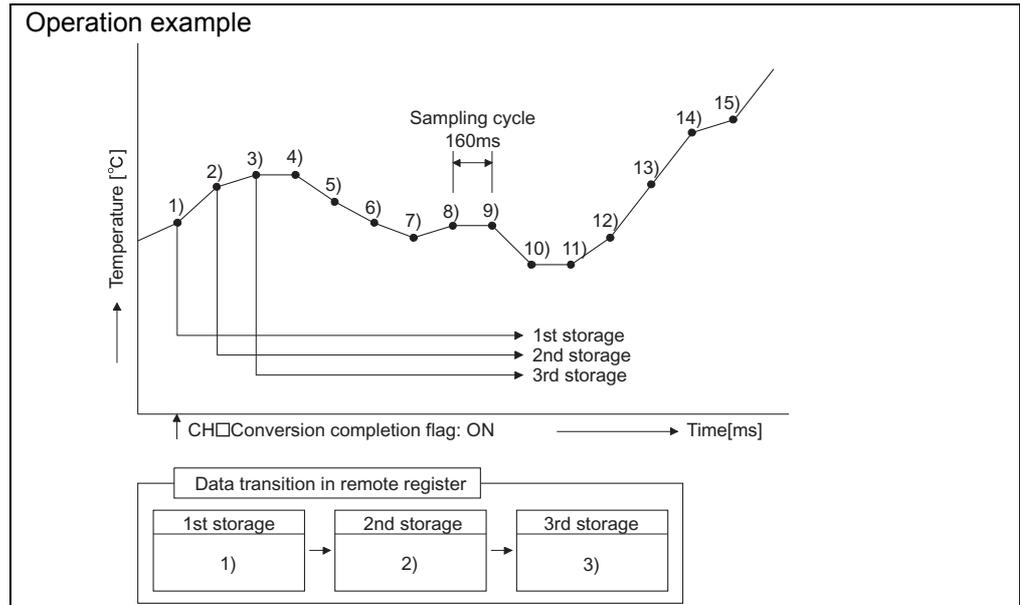


Figure 3.3 Sampling processing operation example

## (2) Count average processing

Measured temperature values are averaged according to the specified number of times, and then stored to the remote register.

The value in the remote register is updated once every following time.

Sampling cycle × count average set by a user (ms)

The measured temperature values excluding the maximum and the minimum values are averaged.

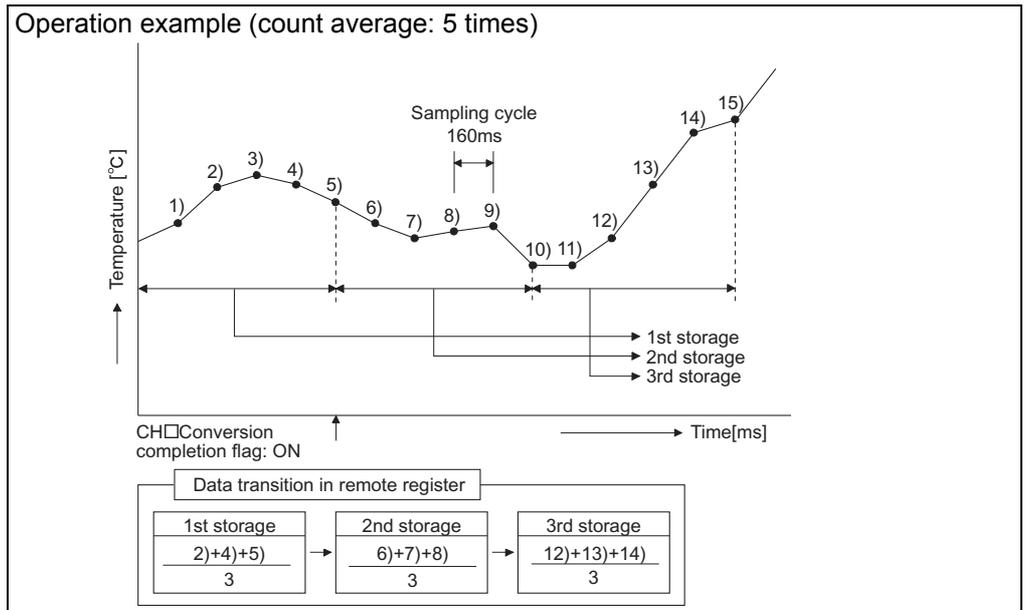


Figure 3.4 Count average processing operation example

(3) Time average processing

Measured temperature values, which are measured according to the sampling cycle, are averaged and then stored in the remote register.

The values in the remote register are updated according to the intervals set by a user. The number of processing counts within the set period of time is calculated in the following formula. (Drop the fractional part.)

$$\text{Number of processing counts} = \frac{\text{Set period of time}}{160\text{ms}}$$

The measured temperature values excluding the maximum and the minimum values are averaged.

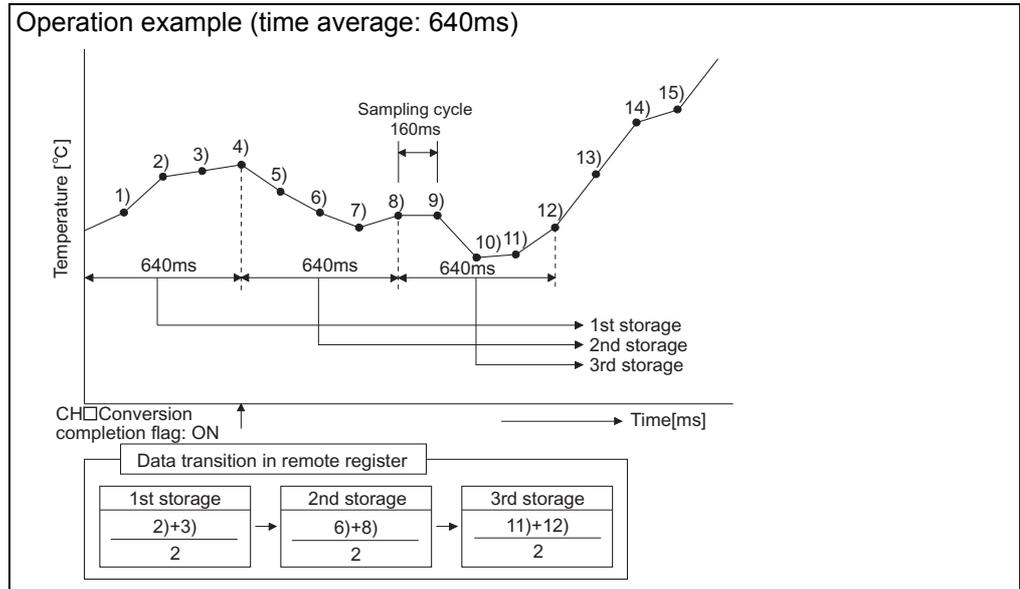


Figure 3.5 Time average processing operation example

(4) Moving average processing

Measured temperature values, which are measured for four times (current value + values of the past three times) according to the sampling cycle, are averaged and then stored in the remote register.

The latest measured temperature value can be obtained since the averaging processing is performed for each sampling cycle in the order of sampling.

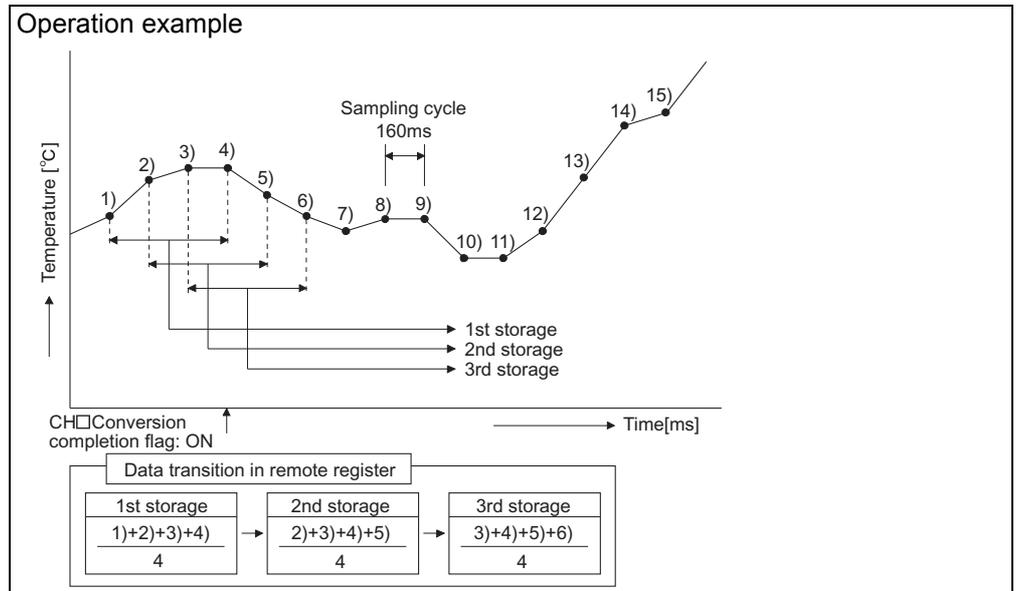


Figure 3.6 Moving average processing operation example

### 3.3.4 Disconnection detection

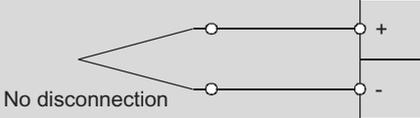
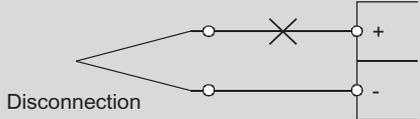
This function detects the disconnection of the thermocouple connected for each channel. When a disconnection is detected, the AJ65SBT2B-64TD;

- Turns on CH□ Disconnection detection flag (RXn4 to RXn7).
- Stores the up scale or down scale in CH□ Measured temperature value (RWrn to RWrn+3) of the disconnected channel.

#### (1) Setting method

- (a) The disconnection detection is performed only for conversion-enabled channels (channels where CH□ Conversion enable flag (RYn0 to RYn3) is set to "Enable").

**Table 3.6 Relationship between disconnection detection and conversion enable/disable specification**

Connection status	CH□ Conversion enable flag (RYn0 to RYn3)	CH□ Disconnection detection flag (RXn4 to RXn7)
 <p>No disconnection</p>	Enable	OFF
	Disable	
 <p>Disconnection</p>	Enable	ON
	Disable	OFF
 <p>No connection cable</p>	Enable	ON
	Disable	OFF

- (b) When the disconnection is detected, a value to be stored in CH□ Measured temperature value (RWrn to RWrn+3) can be set by using the Converted value at disconnection detection selection flag (RY(n+1)4).

**Table 3.7 Converted value at disconnection detection selection flag**

Setting item	Description
Converted value at disconnection detection selection flag (RY(n+1)4) <sup>*1</sup>	ON Stores the up scale value
	OFF Stores the down scale value

\*1: This setting is activated when the Initial data setting request flag (RY(n+1)9) turns on.

- (c) Measured temperature values for each thermocouple when the disconnection is detected are shown in the following table.

Table 3.8 Measured temperature value in disconnection status

Thermocouple type	Measured temperature range	Measured temperature value in disconnection detection	
		Up scale	Down scale
Thermocouple B	0 to 1820°C	1911.0°C	-91.0°C
Thermocouple R	-50 to 1760°C	1850.5°C	-140.5°C
Thermocouple S	-50 to 1760°C	1850.5°C	-140.5°C
Thermocouple K	-270 to 1370°C	1452.0°C	-352.0°C
Thermocouple E	-270 to 1000°C	1063.5°C	-333.5°C
Thermocouple J	-210 to 1200°C	1270.5°C	-280.5°C
Thermocouple T	-270 to 400°C	433.5°C	-303.5°C
Thermocouple N	-270 to 1300°C	1378.5°C	-348.5°C

## ☒ POINT

- (1) Specify "Disable" for any channel where no thermocouple is connected. If set to "Enable", CH□ Disconnection detection flag (RXn4 to RXn7) turns on.
- (2) When the connection is recovered from disconnection after the disconnection detection, updating of CH□ Measured temperature value (RWrn to RWrn + 3) will restart regardless of CH□ Disconnection detection flag (RXn4 to RXn7) status.

### 3.3.5 Measured temperature value storage

For the AJ65SBT2B-64TD, the temperature from -270°C to 1820°C can be measured.

The temperature measured at each channel is converted to measured temperature values and stored into CH□ Measured temperature value (RWn to RWn + 3).

The measured temperature value rounded off to one decimal place is multiplied by 10 and the result is stored in 16-bit signed binary.

(a) When the measured temperature value is 123.4°C (1234 is stored)

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	0	1	0	0	1	1	0	1	0	0	1	0

(b) When the measured temperature value is -123.4°C (-1234 is stored)

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
1	1	1	1	1	0	1	1	0	0	1	0	1	1	1	0

### 3.3.6 Thermocouple type selection

For the AJ65SBT2B-64TD, the thermocouple type to be used for each channel can be selected.

Select the thermocouple type to be used by using CH□ Thermocouple selection flag (RYn8 to RY(n+1)3). (Refer to Table 3.9.)

Table 3.9 Setting of thermocouple type to be used

Thermocouple type	Setting value	Thermocouple selection flag (RYn8 to RY(n+1)3)*1												
		CH4			CH3		CH2			CH1				
		RY (n+1)3	RY (n+1)2	RY (n+1)1	RY (n+1)0	RYnF	RYnE	RYnD	RYnC	RYnB	RYnA	RYn9	RYn8	
K	0	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
E	1	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	
J	2	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	
T	3	OFF	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF	ON	ON	
B	4	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	
R	5	ON	OFF	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF	ON	
S	6	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF	ON	ON	OFF	
N	7	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	

\* 1 : This setting is activated when the Initial data setting request flag (RY(n+1)9) turns on.

## 3.4 Remote I/O Signals

This section describes the assignment and functions of the remote I/O signals.

### 3.4.1 List of remote I/O signals

Remote input (RX) is an input signal from the AJ65SBT2B-64TD to the master module, and remote output (RY) is an output signal from the master module to the AJ65SBT2B-64TD.

In communications with the master station, the AJ65SBT2B-64TD uses 32 points for the remote input (RX) and the remote output (RY).

Table 3.10 List of remote I/O signals

Signal direction: AJ65SBT2B-64TD to Master module		Signal direction: Master module to AJ65SBT2B-64TD		
Remote input (RX)	Name	Remote output (RY)	Name	
RXn0	CH1 Conversion completion flag	RYn0	CH1 Conversion enable flag	
RXn1	CH2 Conversion completion flag	RYn1	CH2 Conversion enable flag	
RXn2	CH3 Conversion completion flag	RYn2	CH3 Conversion enable flag	
RXn3	CH4 Conversion completion flag	RYn3	CH4 Conversion enable flag	
RXn4	CH1 Disconnection detection flag	RYn4	Use prohibited	
RXn5	CH2 Disconnection detection flag	RYn5		
RXn6	CH3 Disconnection detection flag	RYn6		
RXn7	CH4 Disconnection detection flag	RYn7		
RXn8	Use prohibited	RYn8	CH1 Thermocouple selection bit 0	
RXn9		RYn9	CH1 Thermocouple selection bit 1	
RXnA	Flash memory read error flag	RYnA	CH1 Thermocouple selection bit 2	
RXnB	User range read error flag	RYnB	CH2 Thermocouple selection bit 0	
RXnC	Flash memory write error flag	RYnC	CH2 Thermocouple selection bit 1	
RXnD	Use prohibited	RYnD	CH2 Thermocouple selection bit 2	
RXnE		RYnE	CH3 Thermocouple selection bit 0	
RXnF	Test mode flag	RYnF	CH3 Thermocouple selection bit 1	
RX(n+1)0	Use prohibited	RY(n+1)0	CH3 Thermocouple selection bit 2	
RX(n+1)1		RY(n+1)1	CH4 Thermocouple selection bit 0	
RX(n+1)2		RY(n+1)2	CH4 Thermocouple selection bit 1	
RX(n+1)3		RY(n+1)3	CH4 Thermocouple selection bit 2	
RX(n+1)4		RY(n+1)4	Converted value at disconnection detection selection flag (all channel batch-select)	
RX(n+1)5		RY(n+1)5	Use prohibited	
RX(n+1)6		RY(n+1)6	Pt100 cold junction compensation disable flag	
RX(n+1)7		RY(n+1)7	Offset/gain value selection flag	
RX(n+1)8		Initial data processing request flag	RY(n+1)8	Initial data processing completion flag
RX(n+1)9		Initial data setting completion flag	RY(n+1)9	Initial data setting request flag
RX(n+1)A	Error flag	RY(n+1)A	Error reset request flag	
RX(n+1)B	Remote ready	RY(n+1)B	Use prohibited	
RX(n+1)C	Use prohibited	RY(n+1)C		
RX(n+1)D		RY(n+1)D		
RX(n+1)E		RY(n+1)E		
RX(n+1)F		RY(n+1)F		

n: Address assigned to the master station by station number setting

**☒ POINT**

The "Use prohibited" devices shown in Table 3.10 are used by the system and cannot be used by a user. If used (turned on or off), the functions of the AJ65SBT2B-64TD will not be guaranteed.

## 3.4.2 Details of the remote I/O signals

This section describes the functions of each remote I/O signal.

### (1) CH□ Conversion completion flag (RXn0 to RXn3)

This flag turns on when the measured temperature value of the conversion-enabled channel is stored into the remote register after the module is powered on or hardware is reset.

This flag turns on only for the conversion-enabled channel.

While averaging processing is specified, this flag turns on when averaging processing is completed and the averaged measured temperature value is stored into the remote register.

When the Pt100 cold junction compensation disable flag (RY(n+1)6) is enabled (turned off) and either or both RTD Pt100s are disconnected, CH□ Conversion completion flag (RXn0 to RXn3) of all channels turns off.

### (2) CH□ Disconnection detection flag (RXn4 to RXn7)

This flag of the corresponding channel turns on when any input signal line including the thermocouple is disconnected.

When the Error reset request flag (RY(n+1)A) turns on after the line is recovered from the disconnection, CH□ Disconnection detection flag (RXn4 to RXn7) turns off.

For details of the disconnection detection function, refer to Section 3.3.4.

### (3) Flash memory read error flag (RXnA)

This flag turns on when an error occurs while the factory default setting data are being read from the Flash memory.

If the flag turns on, the AJ65SBT2B-64TD has failed (hardware failure). Therefore, the flag cannot be turned off by the Error reset request flag (RY(n+1)A).

### (4) User range read error flag (RXnB)

This flag turns on when an error occurs while the user range setting data are being read from the Flash memory.

When the Error reset request flag (RY(n+1)A) turns on, the User read error flag (RXnB) turns off.

If the flag is not turned off while correcting the offset and gain values on all channels which use the user setting, the AJ65SBT2B-64TD may have failed.

## (5) Flash memory write error flag (RXnC)

This flag turns on when writing to the Flash memory is not performed or the number of writes to the Flash memory exceeds the limited numbers.

If this flag is not turned off after power is supplied once again and writing to the Flash memory was performed once again, the AJ65SBT2B-64TD has failed (hardware failure). Therefore, the flag cannot be turned off by the Error reset request flag (RY(n+1)A).

## (6) Test mode flag (RXnF)

This flag turns on when the module enters the test mode, which is the mode for correcting errors with the offset/gain setting.

The flag turns off when the module exits the test mode.

Use the flag as an interlock to prevent incorrect output while the error correction is performed with the offset/gain setting.

## (7) Initial data processing request flag (RX(n+1)8)

This flag turns on for the AJ65SBT2B-64TD to request the initial data setting after power-on.

The flag turns off when the Initial data processing completion flag (RY(n+1)8) is turned on.

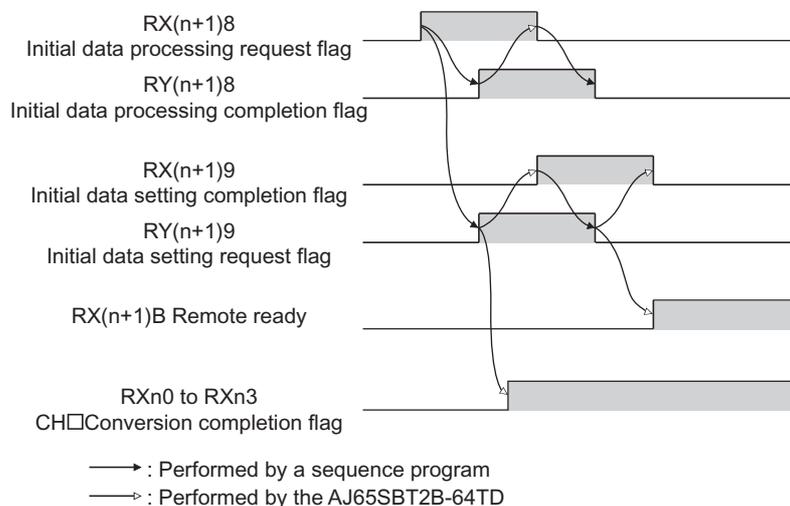


Figure 3.7 Operation at initial setting

## (8) Initial data setting completion flag (RX(n+1)9)

This flag turns on after the initial data setting is completed if the initial data setting has been requested (the Initial data setting request flag (RY(n+1)9) is turned on).

The flag also turns off when the Initial data setting request flag (RY(n+1)9) is turned off after the initial data setting is completed.

For details of on or off timing of the remote I/O signals at initial setting, refer to Figure 3.7.

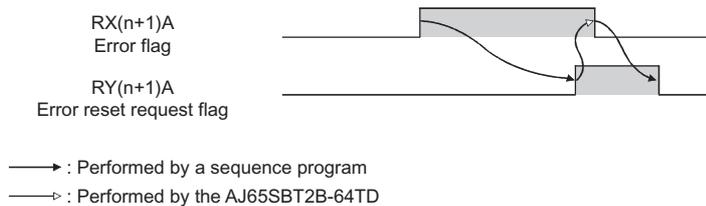
## (9) Error flag (RX(n+1)A)

This flag turns on when any of the following errors occur.

- Averaging processing setting out-of-range error
- Flash memory write error
- RTD Pt100 disconnection
- Faulty hardware

This flag does not turn on when the watchdog timer error occurs. (In this case, the RUN LED turns off.)

This flag turns off when the Error reset request flag (RY(n+1)A) turns on.



**Figure 3.8 Operation at error occurrence and reset**

## (10) Remote ready (RX(n+1)B)

This flag turns on when the initial data setting is completed and the Initial data setting completion flag (RX(n+1)9) turns off after power-on or exiting the test mode.

Use the flag as an interlock to read/write data from/to the master module.

## (11) CH□ Conversion enable flag (RYn0 to RYn3)

This Conversion enable/disable status can be set for each channel.

Setting "Disable" for unused channels can prevent unnecessary disconnection detection.

ON: Enable...Temperature of the target device is measured.

OFF: Disable...Temperature of the target device is not measured.

For details of the conversion enable/disable specification, refer to Section 3.3.2.

## (12) CH□ Thermocouple selection flag (RYn8 to RY(n+1)3)

The thermocouple type to be used for each channel is selected.

For details, refer to Section 3.3.6.

## (13) Converted value at disconnection detection selection flag (all channel batch-select) (RY(n+1)4)

A value to be stored in CH□ Measured temperature value (RWrn to RWrn+3) for disconnection detection is selected.

ON: Up scale

OFF: Down scale

For details of the disconnection detection function, refer to Section 3.3.4.

(14)Pt100 cold junction compensation disable flag (RY(n+1)6)

Whether to enable or disable the cold junction compensation using the RTD Pt100 is selected.

ON: Disable

OFF: Enable

For details of the cold junction compensation, refer to Section 4.9.

(15)Offset/gain value selection flag (RY(n+1)7)

Offset and gain values to be used for error correction are selected from "user setting" or "factory default setting".

In the Flash memory, where offset and gain values for the user setting are to be registered, the factory default setting is stored by default.

ON: Factory default setting

OFF: User setting

For details of the error correction using offset/gain setting, refer to Section 4.8.

(16)Initial data processing completion flag (RY(n+1)8)

This flag turns on when the initial data processing is completed if initial data processing is requested after power-on or exiting the test mode.

For details of on or off timing of remote I/O signals at initial data setting, refer to Figure 3.7.

(17)Initial data setting request flag (RY(n+1)9)

This flag turns on when initial data is set or changed.

Turning on the flag activates the following signals.

- CH□ Conversion enable flag (RYn0 to RYn3)
- CH□ Thermocouple selection flag (RYn8 to RY(n+1)3)
- Converted value at disconnection detection selection flag (RY(n+1)4)
- Pt100 cold junction compensation disable flag (RY(n+1)6)
- Offset/gain value selection flag (RY(n+1)7)
- CH□ Averaging processing setting (RWwm to RWwm+3)

For details of on or off timing of remote I/O signals at initial data setting, refer to Figure 3.7.

(18)Error reset request flag (RY(n+1)A)

Turning on this flag results in turning off the User range read error flag (RXnB), Error flag (RX(n+1)A), and CH□ Disconnection detection flag (RXn4 to RXn7).

## 3.5 Remote Register

The AJ65SBT2B-64TD has a remote register for data communications with a master module.

This section describes the assignment and data structure of the remote register.

### 3.5.1 Remote register list

Table 3.11 lists the assignment of remote register

**Table 3.11 Assignment of remote register**

Communication direction	Address	Description	Default value	Reference
Master to remote	RWwm	CH1 Averaging processing setting	0	Section 3.3.3
	RWwm+1	CH2 Averaging processing setting		
	RWwm+2	CH3 Averaging processing setting		
	RWwm+3	CH4 Averaging processing setting		
Remote to master	RWrn	CH1 Measured temperature value (in units of 0.1°C)	0	Section 3.3.5
	RWrn+1	CH2 Measured temperature value (in units of 0.1°C)		
	RWrn+2	CH3 Measured temperature value (in units of 0.1°C)		
	RWrn+3	CH4 Measured temperature value (in units of 0.1°C)		

m, n: Addresses assigned to the master station by station number setting

## CHAPTER 4 PROCEDURES AND SETTING BEFORE OPERATION

### 4.1 Procedures before Operation

This section describes the procedures for operating the AJ65SBT2B-64TD.

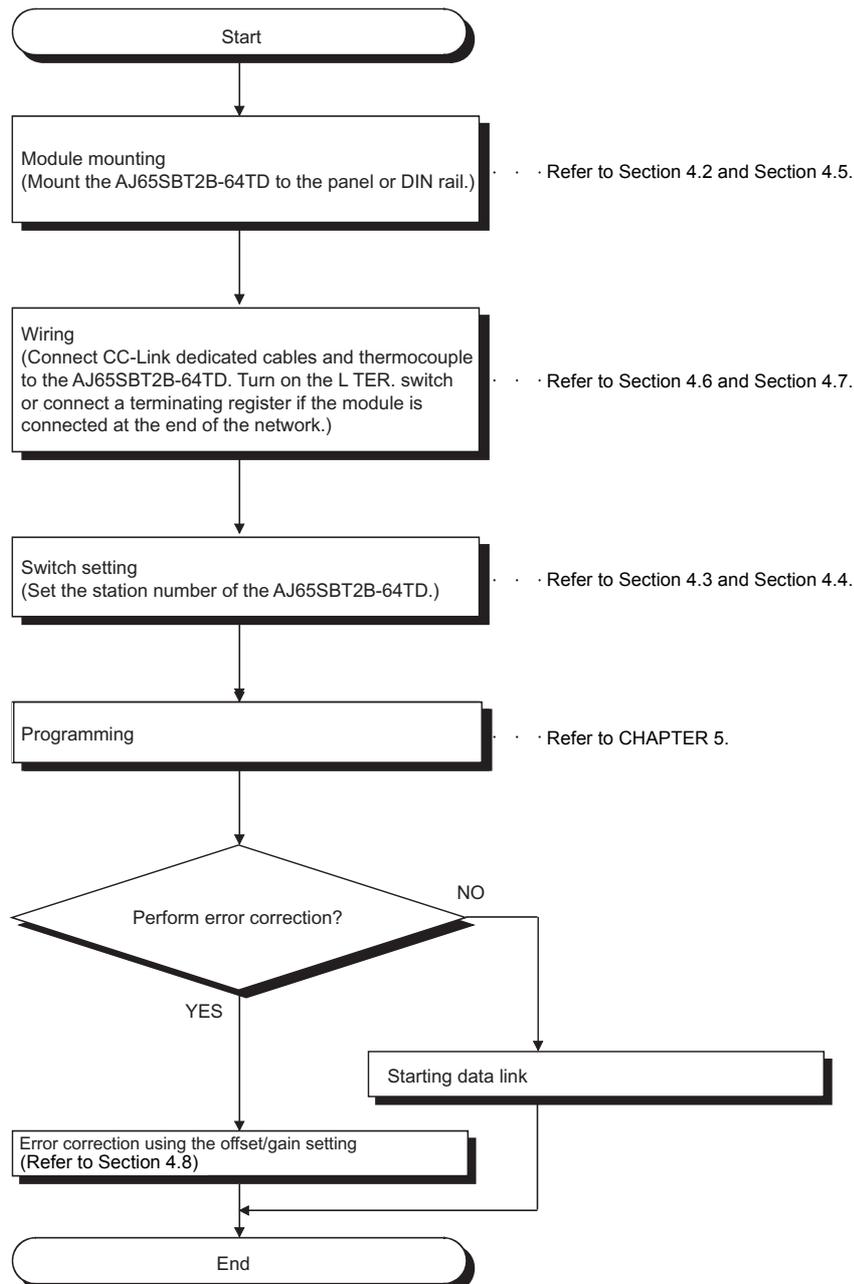


Figure 4.1 Procedures before operation

## 4.2 Handling Precautions

This section describes the precautions for handling the AJ65SBT2B-64TD.

### CAUTION

- Do not touch any terminal while power is on. Doing so may cause malfunction.
- Prevent foreign matter such as dust or wire chips from entering the module.  
Such foreign matter can cause a fire, failure, or malfunction.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Do not directly touch the conductive part of the module. Doing so can cause malfunction or failure of the module.
- Do not drop or apply strong shock to the module. Doing so may damage the module.
- Tighten the terminal screw within the specified torque range.  
Undertightening can cause short circuit or malfunction.  
Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- When disposing of this product, treat it as industrial waste.
- Use the programmable controller in an environment that meets the general specifications in this manual.  
Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- For protection of the switches, do not remove the cushioning material before installation.
- Securely fix the module with a DIN rail or mounting screws. Tighten the screws within the specified torque range.  
Undertightening can cause drop of the screw, short circuit, or malfunction.  
Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Shut off the external power supply for the system in all phases before mounting or removing the module to or from the control panel. Failure to do so may cause the module to fail or malfunction.
- Before handling the module, touch a grounded metal object to discharge the static electricity from the human body.  
Failure to do so may cause the module to fail or malfunction.

- (1) Tighten the module mounting screws and terminal block screws within the following ranges.

Table 4.1 Tightening torque range

Screw location	Tightening torque range
Module mounting screw (M4 screw)	0.78 to 1.08N•m
Terminal block terminal screw (M3 screw)	0.59 to 0.88N•m
Terminal block installation screw (M3.5 screw)	0.68 to 0.98N•m

- (2) To prevent defect during transportation, a protective film is attached on the surface of the module. Remove the film before using the module.
- (3) When using the DIN rail, pay attention to the following.
- Applicable DIN rail type (Compliant with IEC 60715)  
TH35-7.5Fe  
TH35-7.5Al
  - DIN rail installation screw pitch  
When installing a DIN rail, tighten the screws at a pitch of 200mm or less.
- (4) When mounting the AJ65SBT2B-64TD to the DIN rail, press the centerline of the DIN rail hook at the bottom of the module with your finger until it clicks.

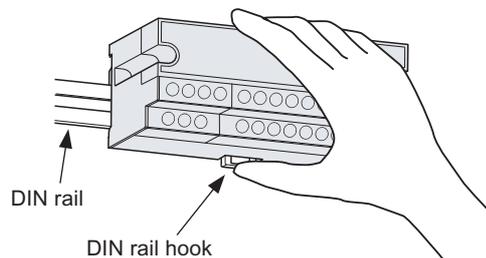


Figure 4.2 Installation to DIN rail

- (5) For the use with the AJ65SBT2B-64TD, refer to the master module user's manual for the name, specification, and manufacturer of applicable cables.
- (6) Do not touch the RTD Pt100 with a driver or the like when mounting and removing the module, and when wiring, because the RTD Pt100 is precision part.

## 4.3 Part Names

This section explains the part names for the AJ65SBT2B-64TD.

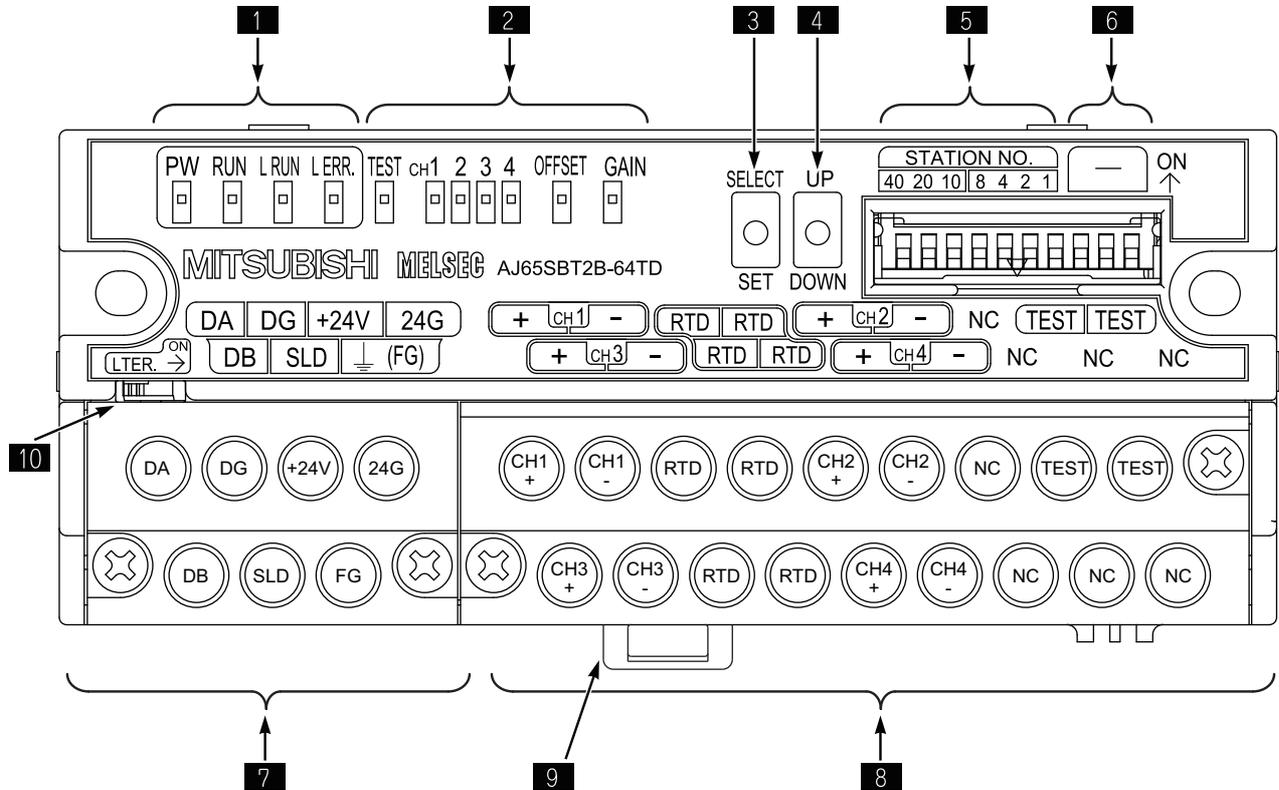


Figure 4.3 Appearance of the AJ65SBT2B-64TD

Table 4.2 Part names

No.	Name	Description		
1	Operating status indication LED	PW LED	On: Power supply on Off: Power supply off	
		RUN LED	Normal mode	On: Normal operation Flashing: Indicates that out of average processing setting range error or faulty hardware, or RTD Pt100 is disconnected, or user range read error. Off: Indicates that 24VDC power supply interrupted, watchdog timer error occurred.
			Test mode	On: Indicates that the SELECT/SET switch is in the SET position. Flashing: Indicates that the offset value or the gain value is out of the setting range, or the gain value is less than 10°C greater than the offset value, or faulty hardware, or RTD Pt100 is disconnected, or write error for Flash memory. Off: Indicates that the SELECT/SET switch is in the SELECT or center position.
		L RUN LED	On: Normal communication Off: Communication cutoff (time expiration error)	
L ERR.LED	On:	Indicates that station number setting is outside the range.		
	Flashing regularly:	Indicates that station number setting was changed from that at power-on.		
L ERR.LED	Flashing irregularly:	Indicates that the terminating register is not connected. The module or CC-Link dedicated cable is affected by noise.		
	Off:	Indicates normal communication.		

Table 4.2 Part names

No.	Name	Description																																																																																																														
2	Offset/gain adjusting LEDs	TEST CH□ OFFSET GAIN																																																																																																														
		Normal mode Test mode																																																																																																														
3	SELECT/SET switch	Always off. Turns on when the TEST terminal is short-circuited. The LEDs lit change every time the SELECT/SET switch is moved to SELECT. (Refer to Section 4.8.)																																																																																																														
4	UP/DOWN switch	When the switch is moved to SELECT during the test mode, the offset value or gain value of the specified channel can be adjusted. Moving the switch to SET determines the offset value or gain value.																																																																																																														
5	Station number setting switches	Used to adjust the offset value and gain value of the channel specified by the SELECT/SET switch. Use the switches in STATION NO. "10", "20" and "40" to set the tens place of the station number. Use the switches in STATION NO. "1", "2", "4", and "8" to set the ones place of the station number. The switches are all factory-set to off. Set the station number within the range from 1 to 64. Setting any other number than 1 to 64 will result in an error, with the L ERR. LED on. The switches cannot set the same station number to two or more stations.																																																																																																														
		<table border="1"> <thead> <tr> <th rowspan="2">Station number</th> <th colspan="3">Tens place</th> <th colspan="4">Ones place</th> </tr> <tr> <th>40</th> <th>20</th> <th>10</th> <th>8</th> <th>4</th> <th>2</th> <th>1</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>2</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>3</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>4</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> </tr> <tr> <td>10</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>11</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> <td>⋮</td> </tr> <tr> <td>64</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> <td>OFF</td> </tr> </tbody> </table> <p>(Example) To set the station number to "32", set the switches as indicated below.</p> <table border="1"> <thead> <tr> <th rowspan="2">Station number</th> <th colspan="3">Tens place</th> <th colspan="4">Ones place</th> </tr> <tr> <th>40</th> <th>20</th> <th>10</th> <th>8</th> <th>4</th> <th>2</th> <th>1</th> </tr> </thead> <tbody> <tr> <td>32</td> <td>OFF</td> <td>ON</td> <td>ON</td> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>OFF</td> </tr> </tbody> </table>	Station number	Tens place			Ones place				40	20	10	8	4	2	1	1	OFF	OFF	OFF	OFF	OFF	OFF	ON	2	OFF	OFF	OFF	OFF	OFF	ON	OFF	3	OFF	OFF	OFF	OFF	OFF	ON	ON	4	OFF	OFF	OFF	OFF	ON	OFF	OFF	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	10	OFF	OFF	ON	OFF	OFF	OFF	OFF	11	OFF	OFF	ON	OFF	OFF	OFF	ON	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	64	ON	ON	OFF	OFF	ON	OFF	OFF	Station number	Tens place			Ones place				40	20	10	8	4	2	1	32	OFF	ON	ON	OFF	OFF	ON	OFF
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32	OFF	ON	ON	OFF	OFF	ON	OFF																																																																																																									
6	Use prohibited	Do not use.																																																																																																														
7	Terminal block for transmission and module power supply	Terminal block for transmission and module power supply																																																																																																														
		<table border="1"> <thead> <tr> <th>Terminal</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>DA</td> <td rowspan="4">Connection terminal for CC-Link dedicated cable</td> </tr> <tr> <td>DB</td> </tr> <tr> <td>DG</td> </tr> <tr> <td>SLD</td> </tr> <tr> <td>FG</td> <td>Connection terminal for grounding to the protective conductor *SLD and FG terminals are connected inside of the module.</td> </tr> <tr> <td>+24V</td> <td rowspan="2">Connection terminal for external power supply</td> </tr> <tr> <td>24G</td> </tr> </tbody> </table>	Terminal	Description	DA	Connection terminal for CC-Link dedicated cable	DB	DG	SLD	FG	Connection terminal for grounding to the protective conductor *SLD and FG terminals are connected inside of the module.	+24V	Connection terminal for external power supply	24G																																																																																																		
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8	Terminal block for analog input signal	Used to connect I/O signals.																																																																																																														
		<table border="1"> <thead> <tr> <th>Terminal</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>CH□ +</td> <td rowspan="2">Connection terminal for CH□ thermocouple or compensation lead wire</td> </tr> <tr> <td>CH□ -</td> </tr> <tr> <td>TEST</td> <td>Connection terminal for short circuit at TEST mode</td> </tr> <tr> <td>RTD</td> <td>Connection terminal for RTD Pt100</td> </tr> <tr> <td>NC</td> <td>Reserved</td> </tr> </tbody> </table>	Terminal	Description	CH□ +	Connection terminal for CH□ thermocouple or compensation lead wire	CH□ -	TEST	Connection terminal for short circuit at TEST mode	RTD	Connection terminal for RTD Pt100	NC	Reserved																																																																																																			
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NC	Reserved																																																																																																															

Table 4.2 Part names

No.	Name	Description
9	DIN rail hook	Used to install the module to the DIN rail.
10	L TER. (Line Termination) switch	Turned on to use the terminating resistor built in the AJ65SBT2B-64TD. Turned on when the AJ65SBT2B-64TD is used in the end of the network.

### 4.3.1 Transmission speed auto-tracking function

The transmission speed is automatically set according to the setting of the master module.

## 4.4 Station Number Setting

The buffer memory addresses of the master module, where the remote I/O signals and read/write data are stored, are determined by the station number setting of the AJ65SBT2B-64TD.

For details, refer to the user's manual of the master module used.

## 4.5 Module Mounting Orientation

The AJ65SBT2B-64TD can be mounted in six different orientations as shown below. The module can also be mounted using a DIN rail.

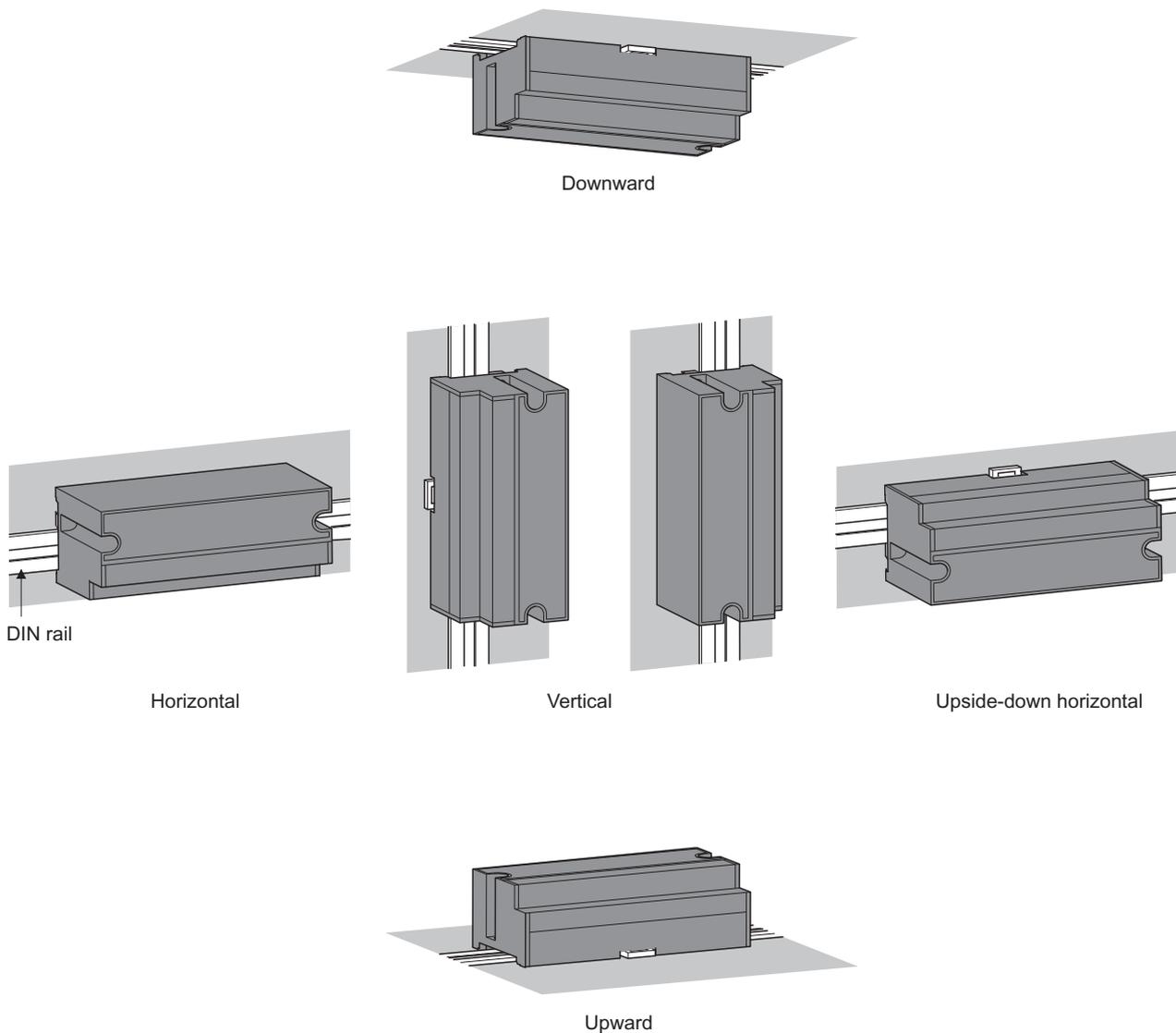


Figure 4.4 Module mounting orientation

## 4.6 Wiring of Data Link Cable

This section describes the wiring of CC-Link dedicated cables for connecting the AJ65SBT2B-64TD to the CC-Link system.

### 4.6.1 Wiring precautions

When using existing CC-Link dedicated cables, rewire the system using communication terminal block for the AJ65SBT2B-64TD.

### 4.6.2 CC-Link dedicated cable connection

The following shows a connection example of CC-Link dedicated cables for the AJ65SBT2B-64TD.

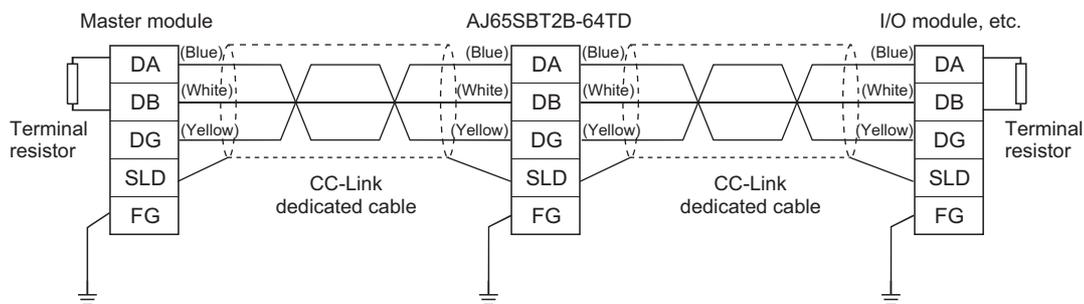


Figure 4.5 Connection of the CC-Link dedicated cables

### 4.6.3 Connection of terminating resistor

The AJ65SBT2B-64TD has a built-in terminating resistor of  $110\Omega$ . Therefore, there is no need to connect a terminating resistor externally.

#### (1) Precautions

- (a) Move the L TER. switch until it clicks.



- (b) Before wiring CC-Link dedicated cables, check between DA and DB is high resistance (when the L TER. switch is off) or is  $110\Omega$  (When the L TER. switch is on) with a tester.
- (c) The built-in terminating resistor cannot be used in the following cases. Connect a terminating resistor ( $110$  or  $130\Omega$ ).
- A CC-Link system is configured using CC-Link dedicated cable of  $130\Omega$ .
  - The AJ65SBT2B-64TD may be replaced during data link.

## 4.7 Wiring of Thermocouple

This section describes the wiring precautions and its wiring with external devices.

### 4.7.1 Wiring precautions

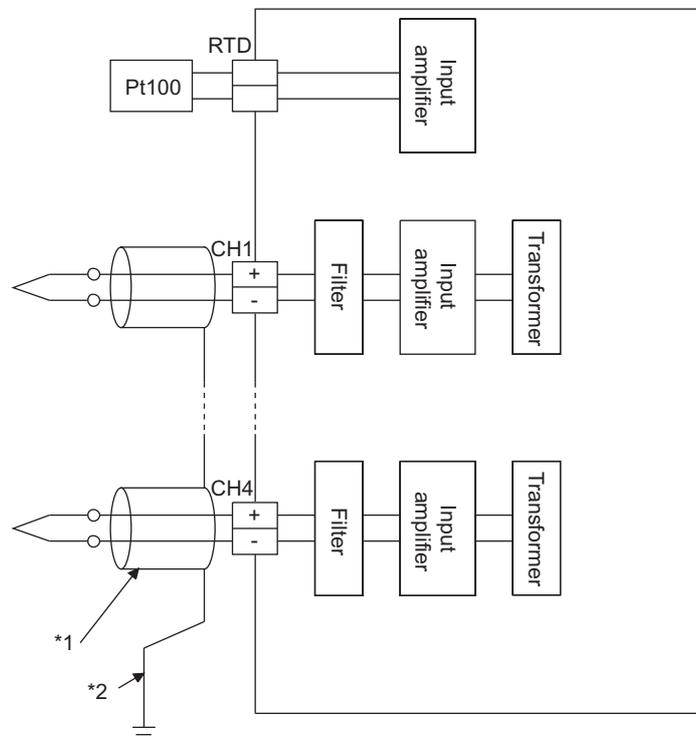
External wiring that is susceptible to noise is required as a highly reliable system and making full use of functions of the AJ65SBT2B-64TD.

The precautions when performing external wiring are as follows:

- (a) Use separate cables for the AC control circuit and the AJ65SBT2B-64TD signals output externally to avoid the influence of AC side surges and inductions.
- (b) Place the thermocouple at least 10cm away from the main circuit cables and AC control circuit lines. Keep it away from high-voltage cables and circuits, which include high frequency waves, such as an inverter's load circuit. Not doing so will cause the module more susceptible to noises, surges, and inductions.
- (c) The shield wire or the shield of the shielded cable must be grounded at one end. However, grounding outside may be suitable depending on the noise.

### 4.7.2 Wiring with thermocouple

The method for connecting between the AJ65SBT2B-64TD and the thermocouple is shown in Figure 4.5.



\* 1: Use a shielded compensation lead wire.

\* 2: The thermocouple must be used.

For details of grounding, refer to the "EMC AND LOW VOLTAGE DIRECTIVES" chapter of the user's manual for the CPU module used.

**Figure 4.6 Wiring of thermocouple**

## 4.8 Error Correction Using Offset/Gain Setting

Error correction of the AJ65SBT2B-64TD is a function that corrects values at two points (offset and gain) within the used temperature range at system start-up or when a correct measured temperature value cannot be obtained.

Error correction is performed by reading CH□ Measured temperature value (RWrn to RWrn+3) from the remote register with a sequence program and monitoring the values with a peripheral.

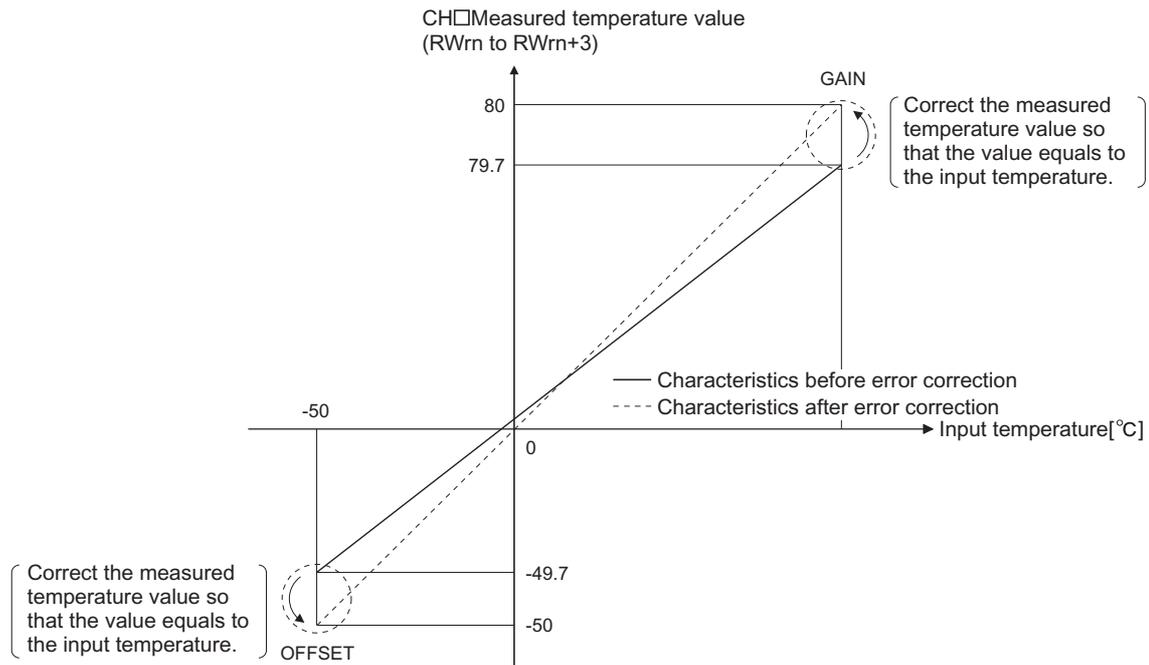
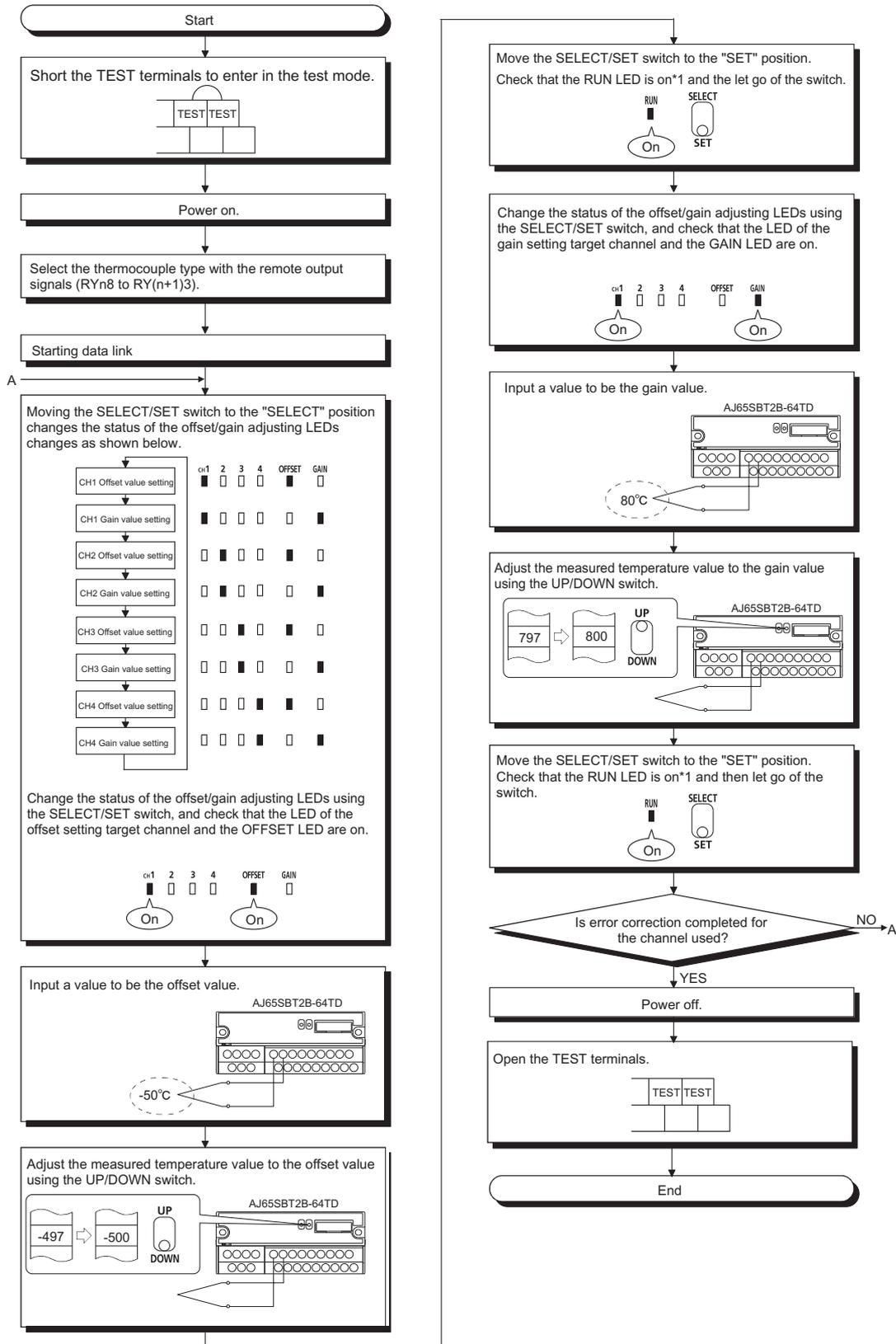


Figure 4.7 Error correction

### POINT

- (1) Perform error correction of an offset value and a gain value using the minimum and maximum temperature within the used temperature range so that the high accuracy can be obtained.
- (2) For error correction using the offset/gain setting, monitor CH□ Measured temperature value (RWrn to RWrn+3) with a peripheral.
- (3) Set the offset value and gain value under the following conditions.
  - Within the measured temperature range
  - Gain value - offset value  $\geq 10^{\circ}\text{C}$
- (4) When the corrected an offset value or a gain value are outside the setting range, the RUN LED flashes at intervals of 0.5s. If this occurs, the corrected offset value or gain value is not stored even when the SELECT/SET switch is moved to the SET position.

Perform the error correction using the offset/gain setting by following the procedure below.



**POINT**

- (1) Set the offset value and gain value in the actual operating status.
- (2) The offset value and gain value are stored in the Flash memory of the AJ65SBT2B-64TD and not cleared even at power-off.

## 4.9 Setting of whether Pt100 Cold Junction Compensation is Enabled or Disabled

The AJ65SBT2B-64TD can specify whether cold junction compensation using the RTD Pt100 is enabled or disabled.

This converts the measured temperature values to be stored into the remote register to the value to which the Pt100 performs cold junction compensation or the value (cold junction compensation performed externally) the Pt100 does not.

### (1) Setting method

Whether enabling or disabling cold junction compensation using the RTD Pt100 can be set with the Pt100 cold junction compensation disable flag (RY(n+1)6)\*<sup>1</sup>. Disable (ON) the cold junction compensation when not performing the cold junction compensation using the Pt100,

\* 1: This setting is activated when the Initial data setting request flag (RY(n+1)9) turns on.

#### (a) Performing cold junction compensation using the RTD Pt100

Cold junction compensation is performed automatically by using the RTD Pt100 included with the AJ65SBT2B-64TD.

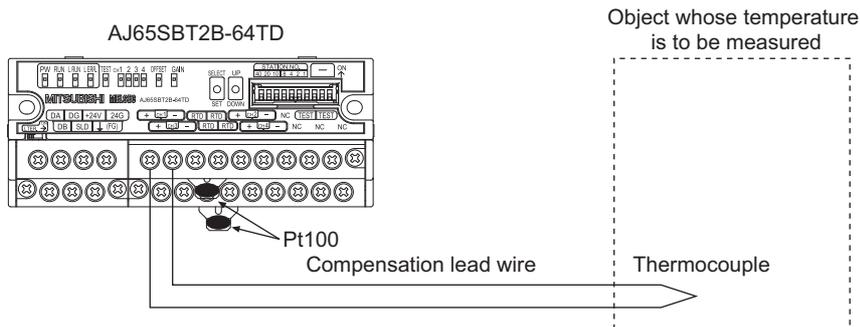


Figure 4.9 Cold junction compensation using a RTD Pt100

### POINT

- (1) Connect the two RTDs Pt100 to the module, because both RTDs Pt100 are required to perform cold junction compensation for all channels.
- (2) Even if either one of the two RTDs Pt100 is disconnected during cold junction compensation using the RTD Pt100, the CH□ Conversion completion flag (RXn0 to RXn3) of all channels turn off.

In addition, the Error flag (RX(n+1)A) turns on.

In such a case, the measured temperature value existed before the disconnection of the RTD Pt100 is detected are held.

## (b) Performing cold junction compensation externally

Perform cold junction compensation externally to measure temperatures at higher accuracy than the accuracy of the cold junction compensation using the RTD Pt100 included in the AJ65SBT2B-64TD.

By providing a precision ice bath externally, the thermoelectromotive force generated at the tip of the thermocouple can be led to the AJ65SBT2B-64TD without any change, improving the cold junction compensation accuracy.

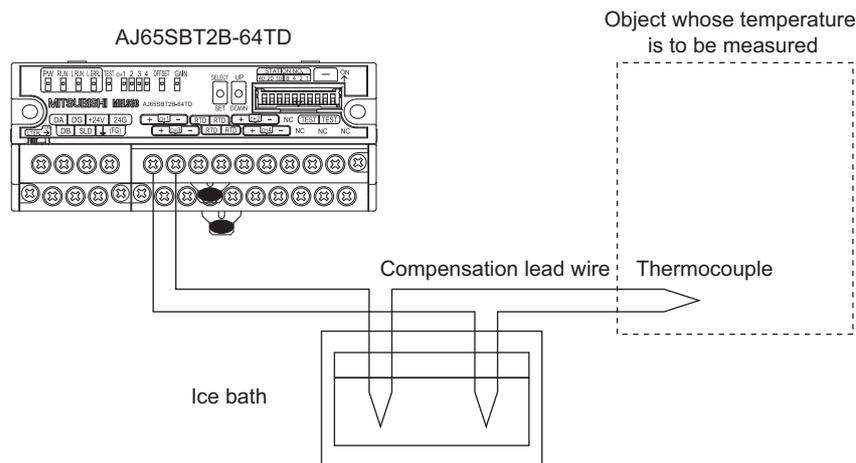


Figure 4.10 Cold junction compensation using an ice bath

The ice bath is designed to connect the thermocouple and conductor in the pot whose internal temperature is controlled to be 0°C. Hence, the thermoelectromotive force at the contact portion of the thermocouple and conductor will be 0V, preventing the generation of extra thermoelectromotive force which can cause errors.

### POINT

The RTDs Pt100 do not need to be disconnected.

## 4.10 Maintenance and Inspection

There are no special inspection items for the AJ65SBT2B-64TD. To keep the system in the best condition perform inspection following the items described in the user's manual for the CPU module.

## CHAPTER 5 PROGRAMMING

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This chapter describes the programming procedures, basic programs for reading and writing data, and program examples for the AJ65SBT2B-64TD.

When applying any of the program examples introduced in this chapter to the actual system, fully examine the applicability and check that no problems will occur in controlling the system.

For the master module, refer to the user's manual for the master module used. For the remote register, refer to Section 3.5 in this manual. For details of the dedicated instructions, refer to the Type AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) Programming Manual (Dedicated instructions).

## 5.1 Programming Procedure

Create programs for measuring temperatures with the AJ65SBT2B-64TD according to the following flowchart.

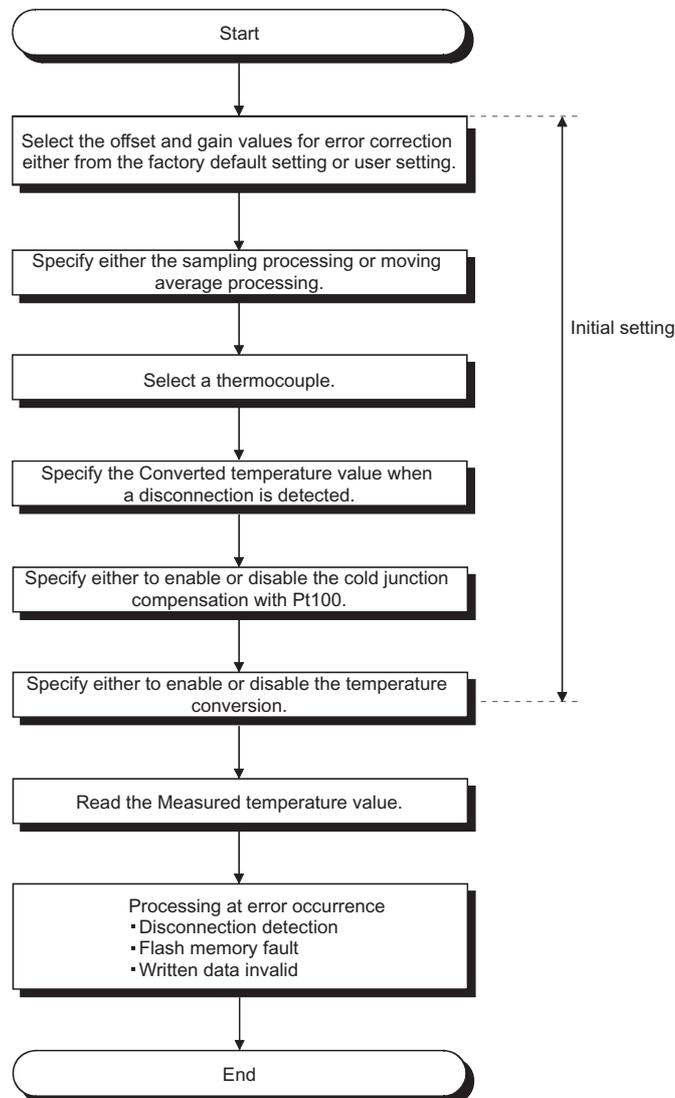


Figure 5.1 Programming procedure

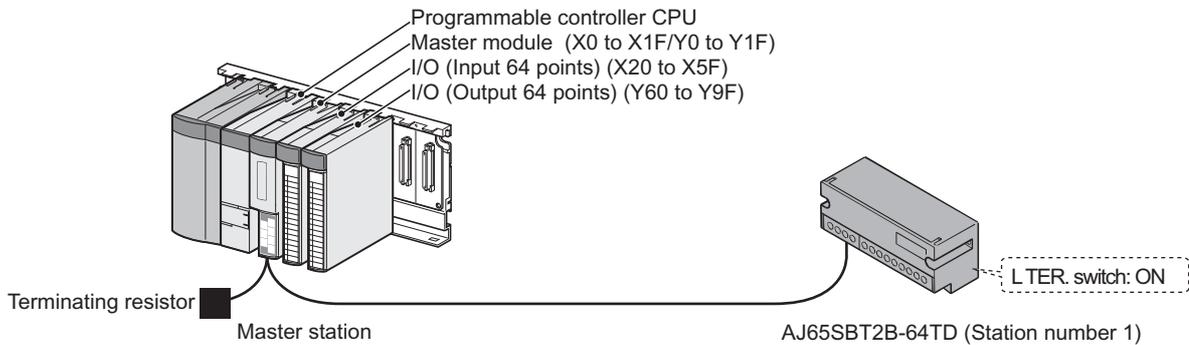
## 5.2 Conditions of Program Examples

The program examples in this chapter are created under the following conditions.

### (1) Conditions of the AJ65SBT2B-64TD

- Channels to be used: CH1 and CH2
- Averaging processing setting: Moving average processing for CH1, count average (16 times) for CH2
- Applicable thermocouples: Type K for CH1 and type E for CH2
- Pt100 cold junction compensation: Cold junction compensation with the RTD Pt100
- Offset gain value: Factory default setting
- Conversion value when disconnection is detected: Up scale
- Cable disconnection and errors are notified by the external output

### (2) System configuration



**Figure 5.2 System configuration and wiring layout**

(3) Relationship among the programmable controller CPU, master module, and AJ65SBT2B-64TD

(a) When the QCPU (Q mode) or QnACPU is used

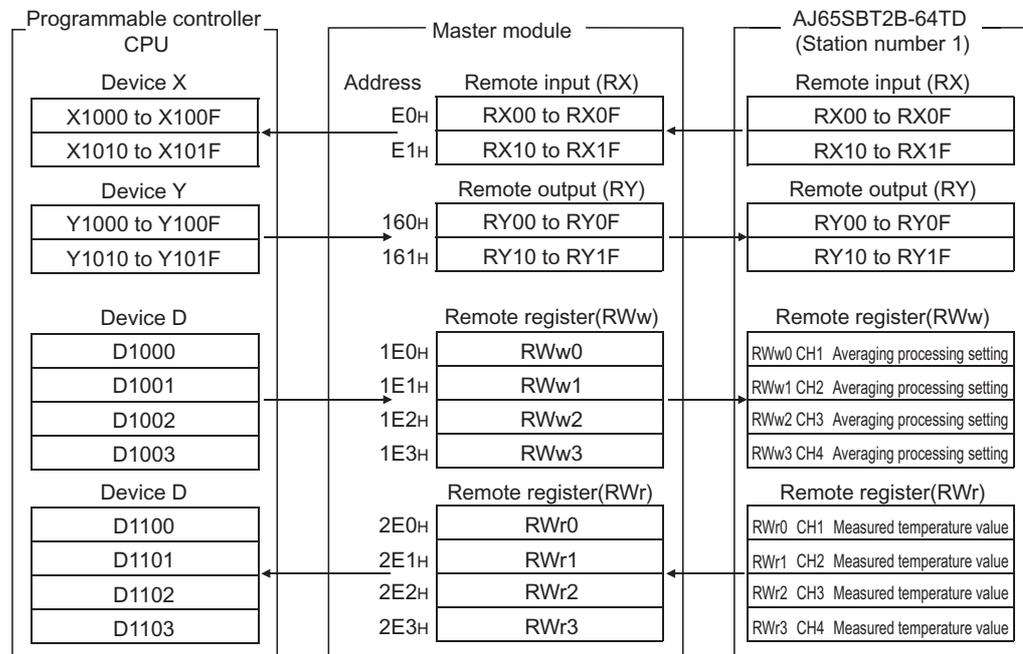


Figure 5.3 Relationship among the programmable controller CPU, master module, and AJ65SBT2B-64TD (When the QCPU (Q mode) or QnACPU is used)

(b) When the ACPU/QCPU (A mode) is used

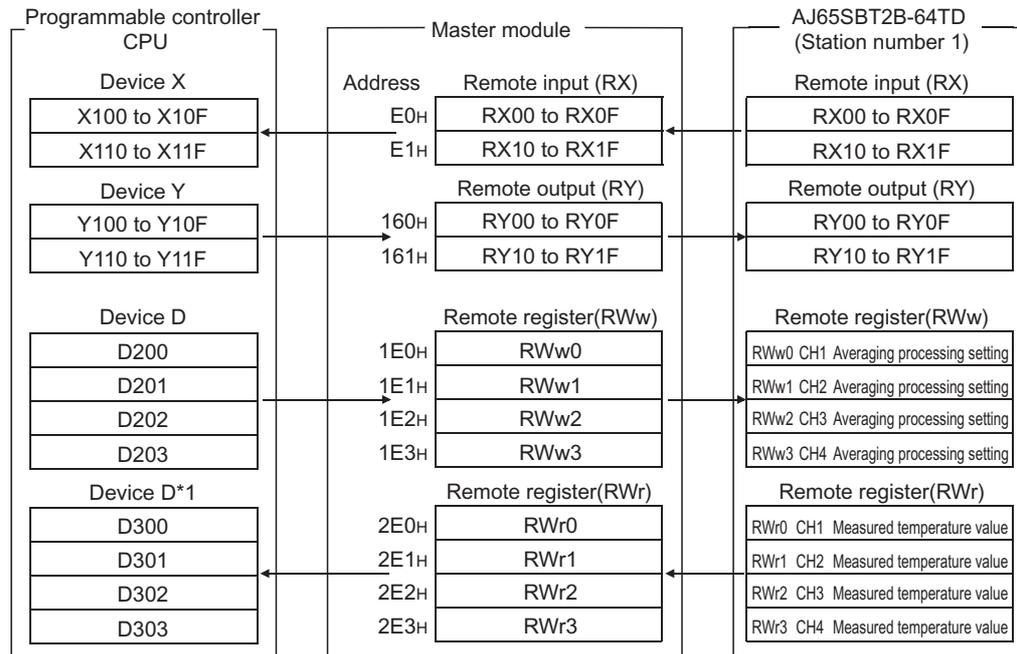


Figure 5.4 Relationship among the programmable controller CPU, master module, and AJ65SBT2B-64TD (When the ACPU/QCPU (A mode) is used)

\* 1: In the program example (refer to Section 5.5) that uses the RRPA instruction (auto refresh parameter setting) in the ACPU/QCPU (A mode), RWr0 to RWr3 are assigned to D456 to D459.

### POINT

Devices used in the program examples in this chapter may not be available depending on the programmable controller CPU.

For the available device setting range, refer to the user's manual for the programmable controller CPU used.

For example, when the A1SCPU is used, devices X100 and later, and Y100 and later cannot be used. Use other devices such as B or M.

## 5.3 Program Example when the QCPU (Q mode) is Used

Set parameters in the "Network parameter" dialog box of GX Developer.  
The initial setting of the AJ65SBT2B-64TD is not available with the remote device station initialization procedure registration function.

- (1) Parameter setting
  - (a) Network parameter setting

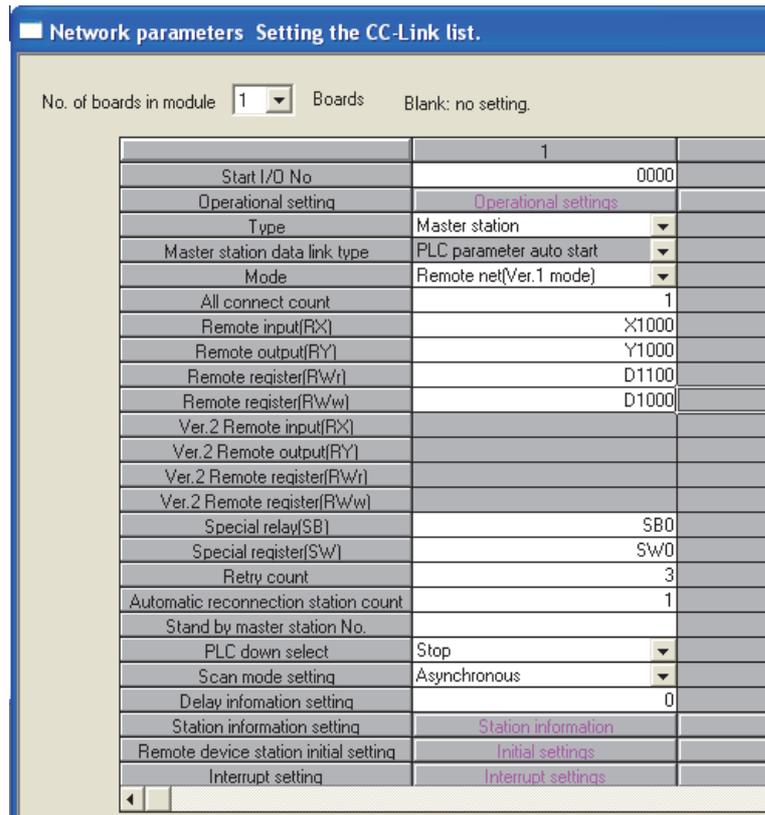


Figure 5.5 "Setting the CC-Link list." dialog box (QCPU (Q mode))

Table 5.1 Setting items on the "Setting the CC-Link list." dialog box (QCPU (Q mode))

Setting item	Setting value
No. of boards in module	1 (Boards)
Start I/O No	0000
Type	Master station
Mode	Remote net[Ver.1 mode]
All connect count	1 (module)
Remote input[RX]	X1000
Remote output[RY]	Y1000
Remote register[RWr]	D1100
Remote register[RWw]	D1000
Special relay[SB]	SB0
Special register[SW]	SW0
Station information setting	Refer to(1)(b) in this section

(b) Station information setting

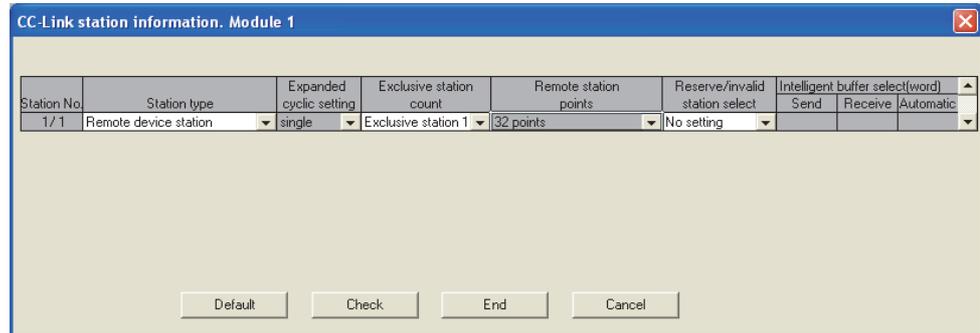


Figure 5.6 "CC-Link station information. Module 1" dialog box (QCPU (Q mode))

Table 5.2 Setting on the "CC-Link station information. Module 1" dialog box (QCPU (Q mode))

Setting item	Setting value
Station type	Remote device station
Exclusive station count	Exclusive station 1
Reserve/invalid station select	No setting

(2) List of devices used in the program example

Table 5.3 Devices used in the program example (QCPU (Q mode))

Device	Description
X0	Module failure
X1	Host station data link status
XF	Module ready
X20	Signal that is turned on to reset the Disconnection detection flag
X21	Signal that is turned on to reset the Error flag
X22	Signal that is turned on to change the initial setting
X1000	CH1 Conversion completion flag
X1001	CH2 Conversion completion flag
X1004	CH1 Disconnection detection flag
X1005	CH2 Disconnection detection flag
X100F	Test mode flag
X1018	Initial data processing request flag
X1019	Initial data setting completion flag
X101A	Error flag
X101B	Remote ready
Y60	Signal that is output when a data link error occurs
Y61	Signal that is output when CH1 disconnection is detected
Y62	Signal that is output when CH2 disconnection is detected
Y63	Signal that is output when an error occurs
Y1000 to Y101A	Signals for configuring settings of the AJ65SBT2B-64TD
M0	Signal that stores the data link status of the AJ65SBT2B-64TD 1 (ON): Data link error 0 (OFF): Data link normal
M30	Pulse signal for resetting the Disconnection detection flag
M31	Pulse signal for resetting the Error flag
M100	Master control contact
D50	Device for reading CH1 Measured temperature value (Reading starts after CH1 Conversion completion flag turns on)
D51	Device for reading CH2 Measured temperature value (Reading starts after CH2 Conversion completion flag turns on)
D1000	CH1 Averaging processing setting
D1001	CH2 Averaging processing setting
D1100	CH1 Measured temperature value
D1101	CH2 Measured temperature value
SW80	Other station data link status

## (3) Program example

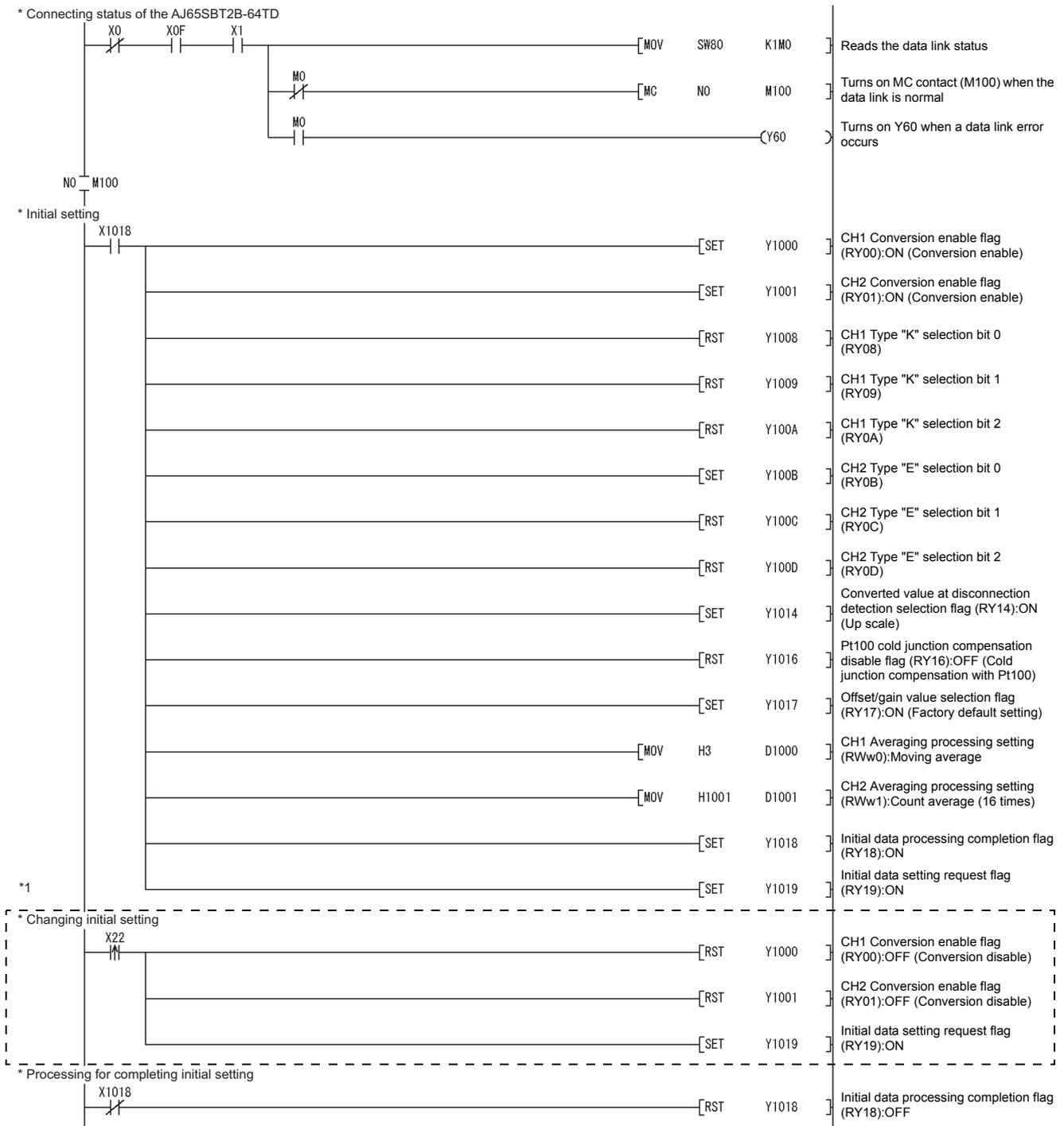


Figure 5.7 Program example (QCPU (Q mode)) 1/2

\* 1 The program in the dotted line is required only for changing the initial setting.

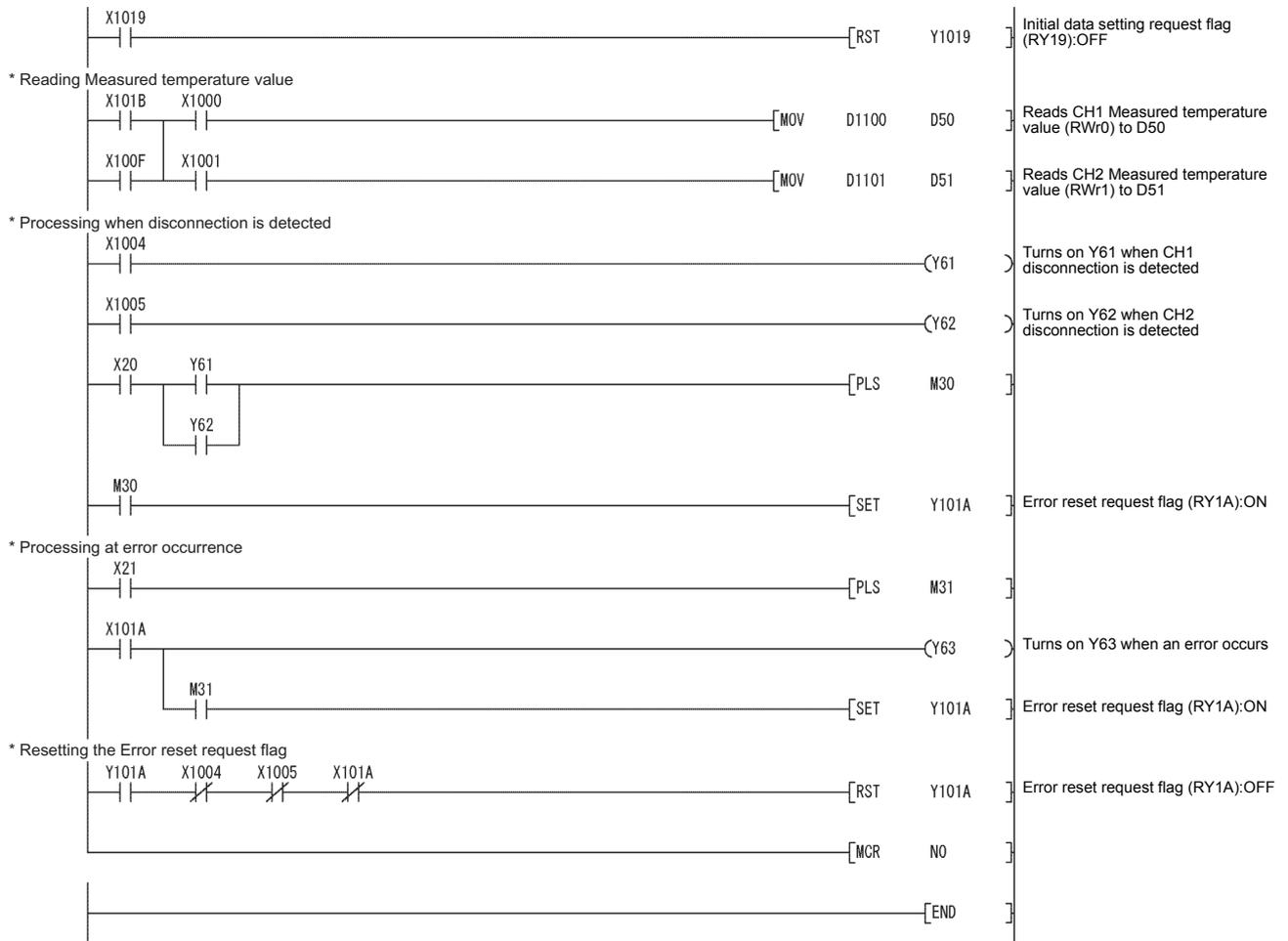


Figure 5.8 Program example (QCPU (Q mode)) 2/2

## 5.4 Program Example when the QnACPU is Used

Set parameters in the "Network parameter" dialog box of GX Developer.

- (1) Parameter setting
  - (a) Network parameter setting

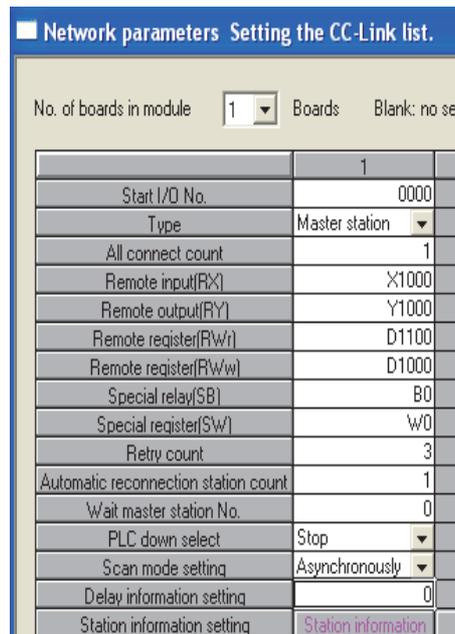


Figure 5.9 "Setting the CC-Link list." dialog box (QnACPU)

Table 5.4 Setting items on the "Setting the CC-Link list." dialog box (QnACPU)

Setting item	Setting value
No. of boards in module	1 (Boards)
Start I/O No	0000
Type	Master station
All connect count	1 (module)
Remote input[RX]	X1000
Remote output[RY]	Y1000
Remote register[RWr]	D1100
Remote register[RWw]	D1000
Special relay[SB]	B0
Special register[SW]	W0
Station information setting	Refer to(1)(b) in this section

(b) Station information setting

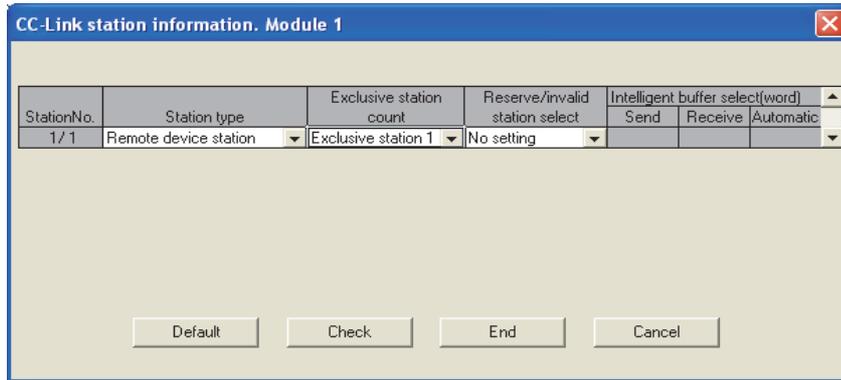


Figure 5.10 "CC-Link station information. Module 1" dialog box (QnACPU)

Table 5.5 "CC-Link station information. Module 1" dialog box (QnACPU)

Setting item	Setting value
Station type	Remote device station
Exclusive station count	Exclusive station 1
Reserve/invalid station select	No setting

**POINT**

When the QnACPU is used, the analog value may not be retained even with the HOLD setting if "Y" is specified as the remote output[RY] refresh device of the auto refresh parameter.

Specify "M" or "B" as the remote output[RY] refresh device when using the module with the HOLD setting.

## (2) List of devices used in the program example

Table 5.6 Devices used in the program example (QnACPU)

Device	Description
X0	Module failure
X1	Host station data link status
XF	Module ready
X20	Signal that is turned on to reset the Disconnection detection flag
X21	Signal that is turned on to reset the Error flag
X22	Signal that is turned on to change the initial setting
X1000	CH1 Conversion completion flag
X1001	CH2 Conversion completion flag
X1004	CH1 Disconnection detection flag
X1005	CH2 Disconnection detection flag
X100F	Test mode flag
X1018	Initial data processing request flag
X1019	Initial data setting completion flag
X101A	Error flag
X101B	Remote ready
Y60	Signal that is output when a data link error occurs
Y61	Signal that is output when CH1 disconnection is detected
Y62	Signal that is output when CH2 disconnection is detected
Y63	Signal that is output when an error occurs
Y1000 to Y101A	Signals for configuring settings of the AJ65SBT2B-64TD
M0	Signal that stores the data link status of the AJ65SBT2B-64TD 1 (ON): Data link error 0 (OFF): Data link normal
M30	Pulse signal for resetting the Disconnection detection flag
M31	Pulse signal for resetting the Error flag
M100	Master control contact
D50	Device for reading CH1 Measured temperature value (Reading starts after CH1 Conversion completion flag turns on)
D51	Device for reading CH2 Measured temperature value (Reading starts after CH2 Conversion completion flag turns on)
D1000	CH1 Averaging processing setting
D1001	CH2 Averaging processing setting
D1100	CH1 Measured temperature value
D1101	CH2 Measured temperature value
W80	Other station data link status

### (3) Program example

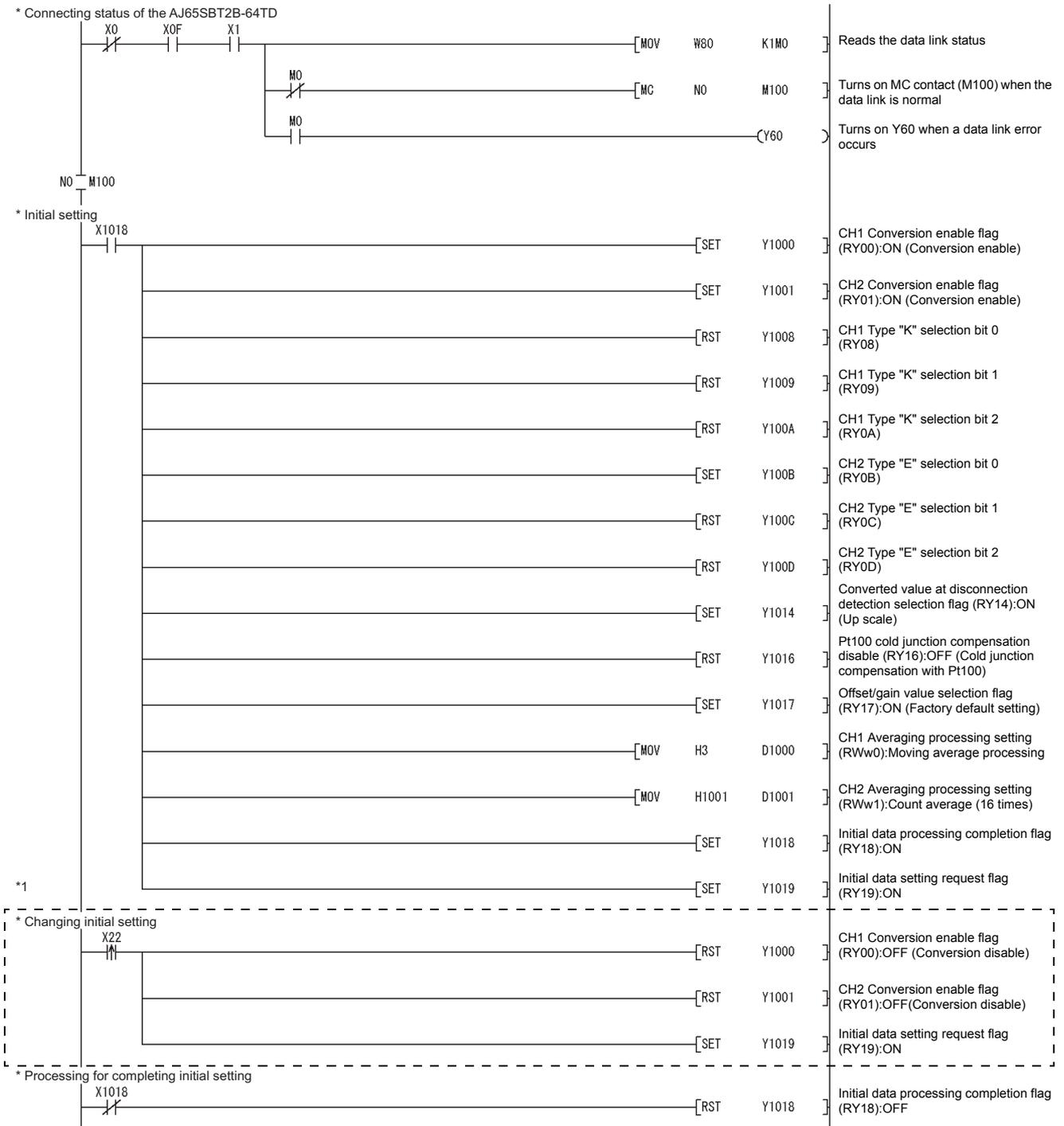


Figure 5.11 Program example (QnACPU) 1/2

\* 1 The program in the dotted line is required only for changing the initial setting.

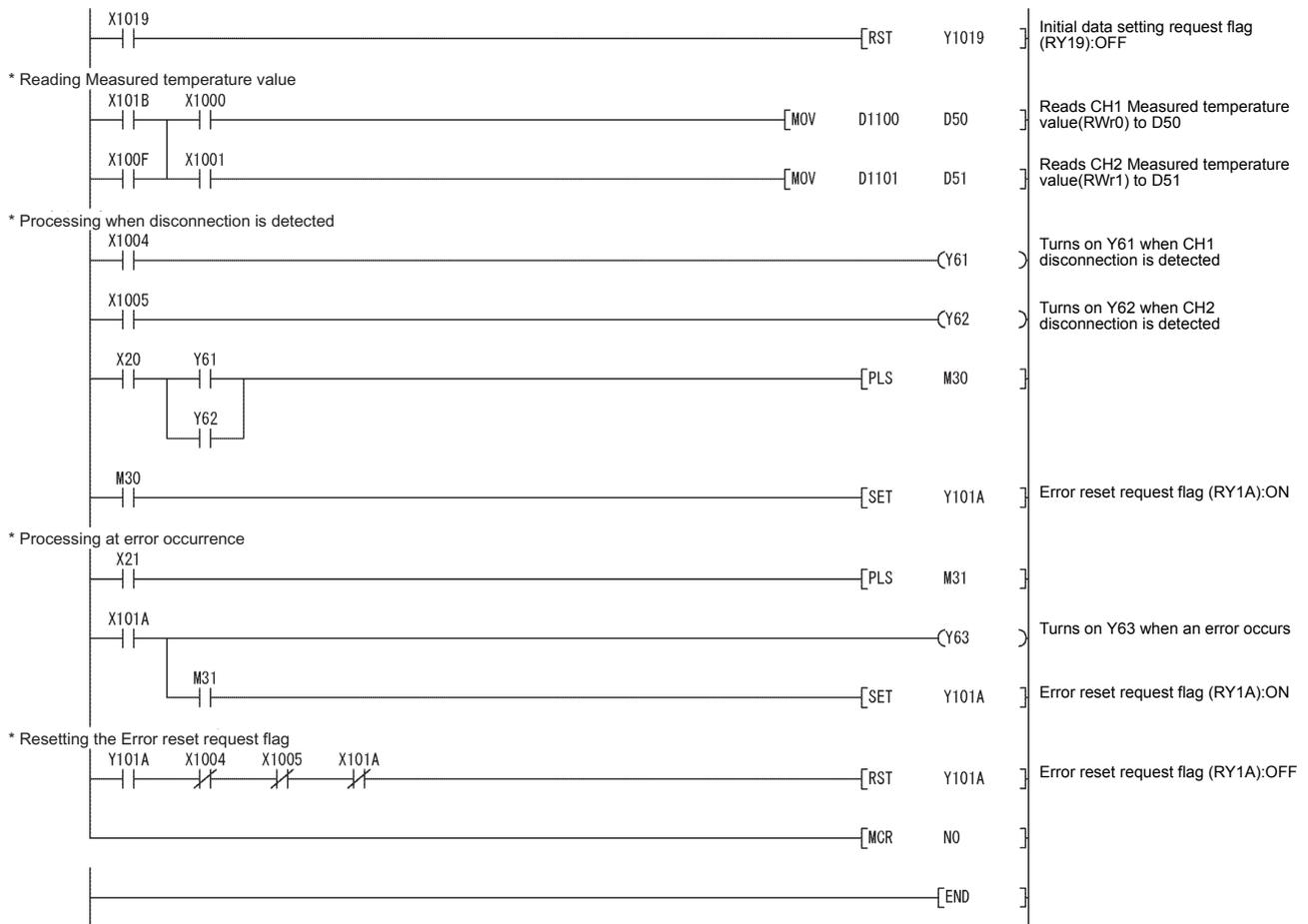


Figure 5.12 Program example (QnACPU) 2/2

## 5.5 Program Example when the ACPU/QCPU (A mode) is Used (Dedicated Instruction)

Set parameters in a sequence program.

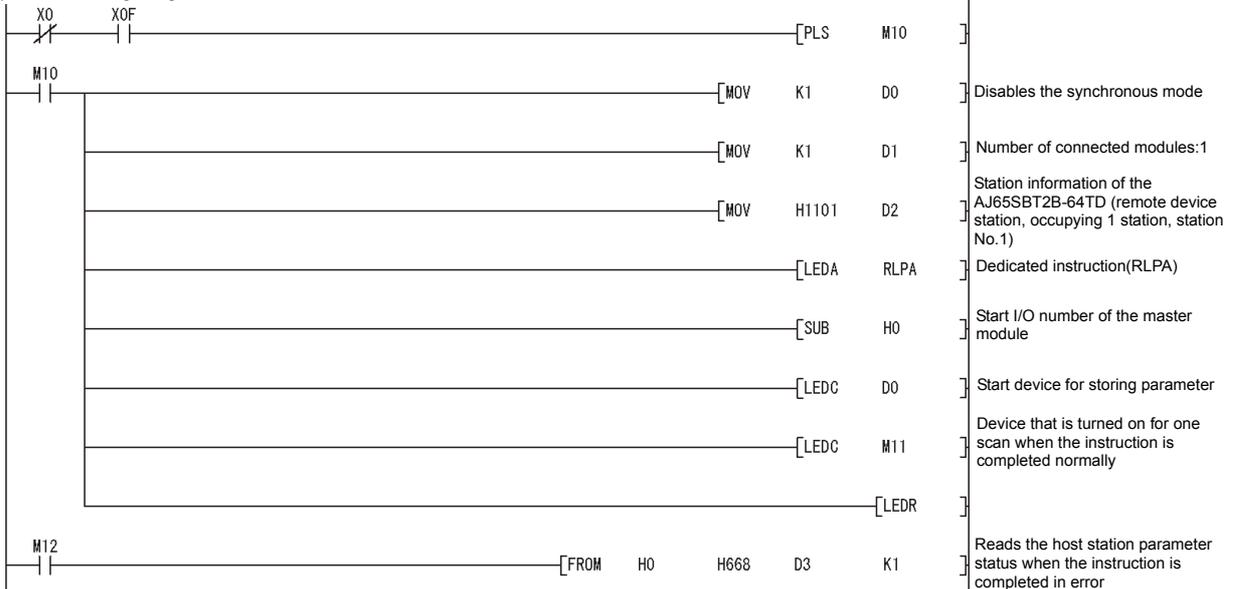
### (1) List of devices used in the program example

**Table 5.7 Devices used in the program example (ACPU/QCPU (A mode) (dedicated instructions) )**

Device	Description
X0	Module failure
X1	Host station data link status
XF	Module ready
X20	Signal that is turned on to reset the Disconnection detection flag
X21	Signal that is turned on to reset the Error flag
X22	Signal that is turned on to change the initial setting
X100	CH1 Conversion completion flag
X101	CH2 Conversion completion flag
X104	CH1 Disconnection detection flag
X105	CH2 Disconnection detection flag
X10F	Test mode flag
X118	Initial data processing request flag
X119	Initial data setting completion flag
X11A	Error flag
X11B	Remote ready
Y60	Signal that is output when a data link error occurs
Y61	Signal that is output when CH1 disconnection is detected
Y62	Signal that is output when CH2 disconnection is detected
Y63	Signal that is output when an error occurs
Y100 to Y11A	Signals for configuring settings of the AJ65SBT2B-64TD
M0	Signal that stores the data link status of the AJ65SBT2B-64TD 1 (ON): Data link error 0 (OFF): Data link normal
M10	Pulse signal for resetting the parameter setting
M11	Signal that is turned on when parameter setting is completed normally
M12	Signal that is turned on when parameter setting is completed in error
M13	Pulse signal for starting auto refresh parameter setting
M20	Pulse signal for changing the initial setting
M30	Pulse signal for resetting the Disconnection detection flag
M31	Pulse signal for resetting the Error flag
M100	Master control contact
D0 to D2	Devices for network parameter settings
D3	Devices where the host parameter setting status is stored when an instruction was completed in error
D10 to D29	Devices for auto refresh parameter settings
D50	Device for reading CH1 Measured temperature value (Reading starts after CH1 Conversion completion flag turns on)
D51	Device for reading CH2 Measured temperature value (Reading starts after CH1 Conversion completion flag turns on)
D200	CH1 Averaging processing setting
D201	CH2 Averaging processing setting
D456	CH1 Measured temperature value
D457	CH2 Measured temperature value
W80	Other station data link status

## (2) Program example

\* Network parameter setting using the RLPA instruction



\* Auto refresh parameter setting using the RLPA instruction

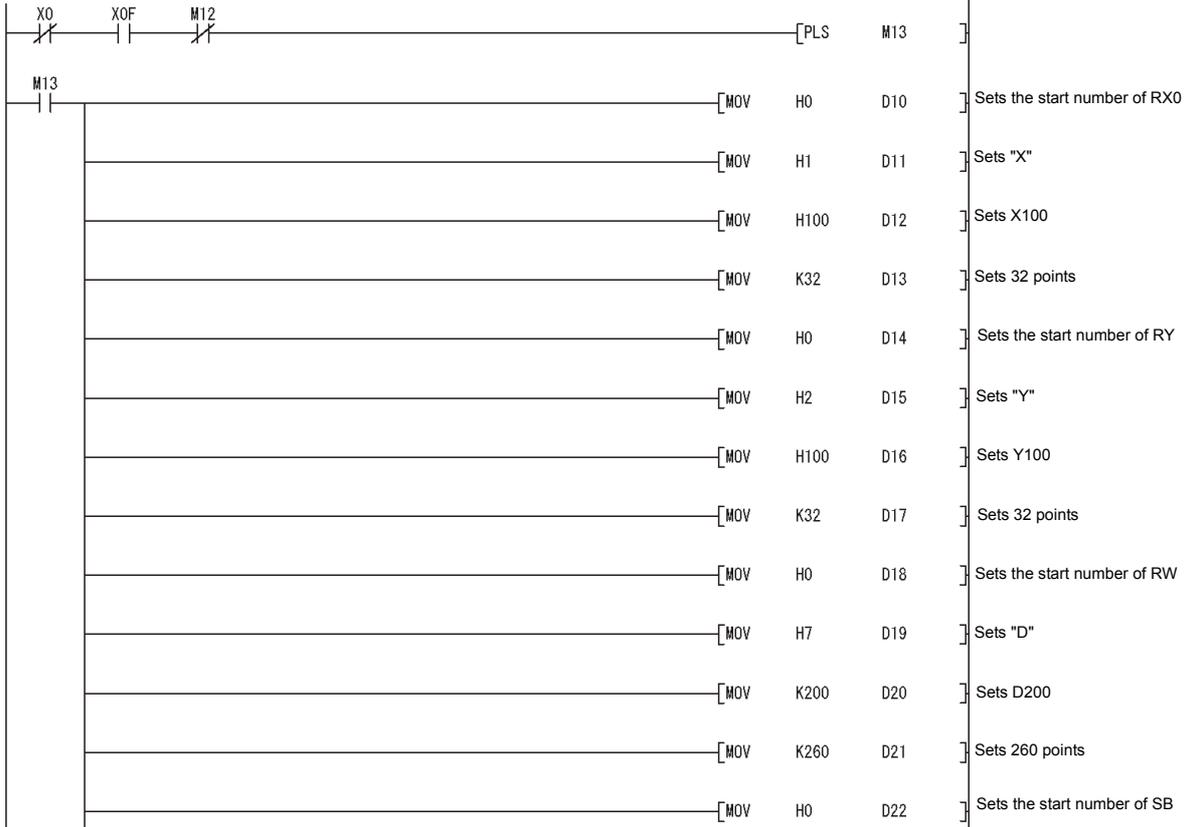


Figure 5.13 Program example (ACPU/QCPU (A mode) (dedicated instructions)) 1/3

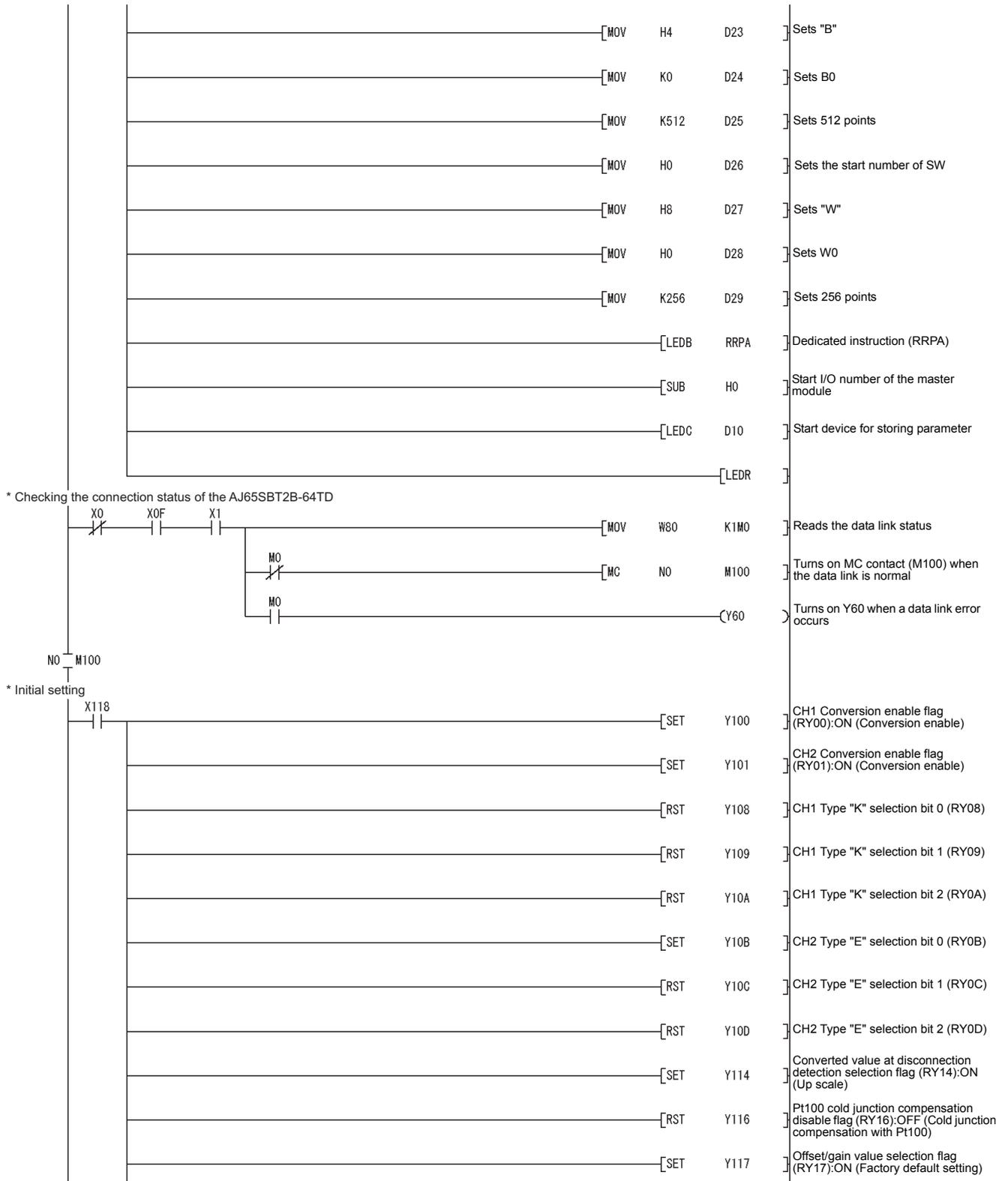


Figure 5.14 Program example (ACPU/QCPU (A mode) (dedicated instructions)) 2/3

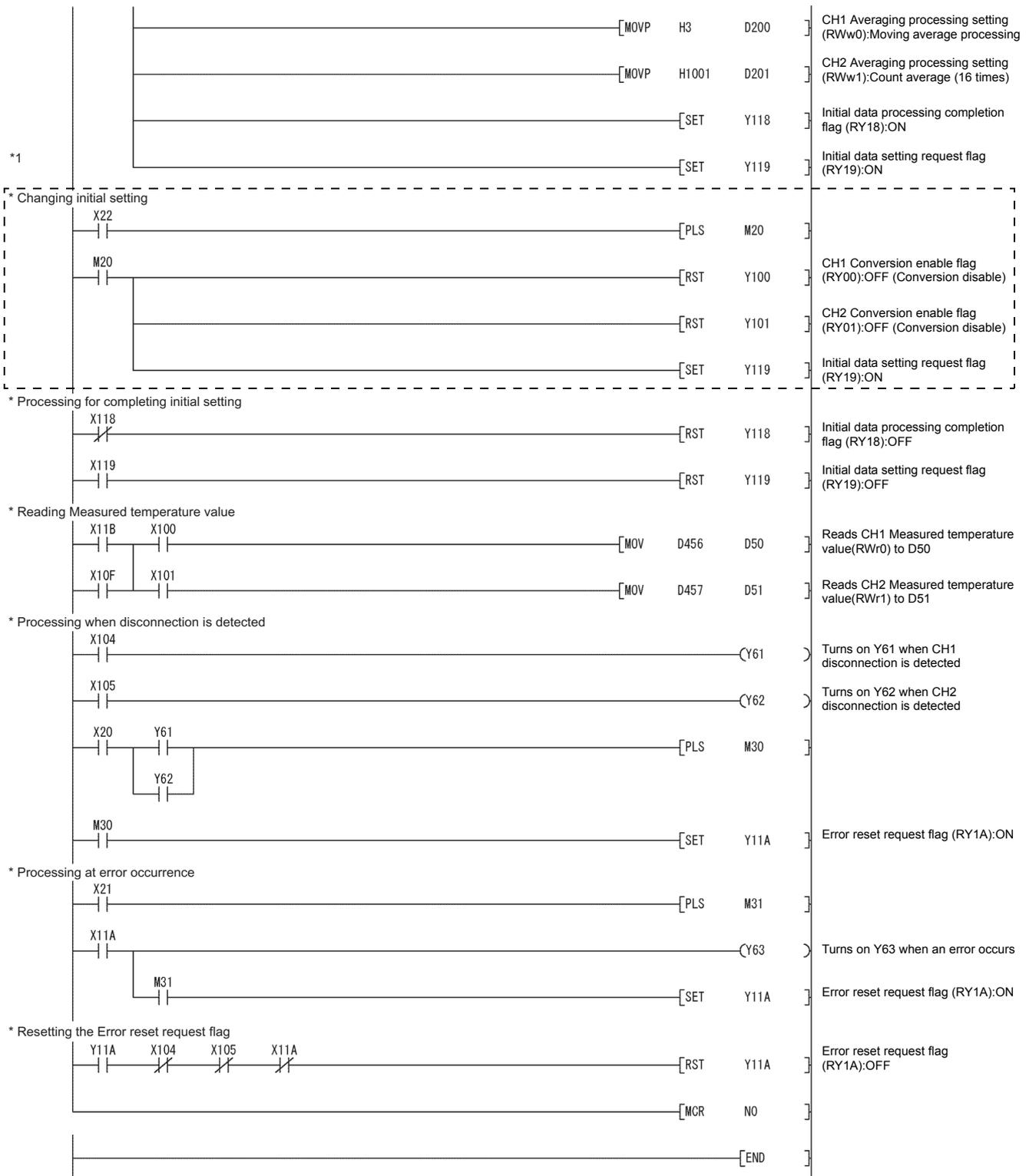


Figure 5.15 Program example (ACPU/QCPU (A mode) (dedicated instructions)) 3/3

\* 1 The program in the dotted line is required only for changing the initial setting.

## 5.6 Program Example when the ACPU/QCPU (A mode) is Used (FROM/TO Instructions)

Set parameters in a sequence program.

### (1) List of devices used in the program example

**Table 5.8 Devices used in the program example (ACPU/QCPU (A mode) (FROM/TO instructions) )**

Device	Description
X0	Module failure
X1	Host station data link status
X6	Data link start by parameters in buffer memory normally completed
X7	Data link start by parameters in buffer memory failed
XF	Module ready
X20	Signal that is turned on to reset the Disconnection detection flag
X21	Signal that is turned on to reset the Error flag
X22	Signal that is turned on to change the initial setting
X100	CH1 Conversion completion flag
X101	CH2 Conversion completion flag
X104	CH1 Disconnection detection flag
X105	CH2 Disconnection detection flag
X10F	Test mode flag
X118	Initial data processing request flag
X119	Initial data setting completion flag
X11A	Error flag
X11B	Remote ready
Y0	Refresh instruction
Y6	Request for data link start by parameters in buffer memory
Y60	Signal that is output when a data link error occurs
Y61	Signal that is output when CH1 disconnection is detected
Y62	Signal that is output when CH2 disconnection is detected
Y63	Signal that is output when an error occurs
Y100 to Y11A	Signals for configuring settings of the AJ65SBT2B-64TD
M0	Signal that stores the data link status of the AJ65SBT2B-64TD 1 (ON): Data link error 0 (OFF): Data link normal
M10	Pulse signal for starting parameter setting
M20	Pulse signal for changing the initial setting
M30	Pulse signal for resetting the Disconnection detection flag
M31	Pulse signal for resetting the Error flag
M100	Master control contact
D0 to D4	Devices for network parameter settings
D100	Device where the host parameter setting status is stored when an instruction was completed in error
D200	CH1 Averaging processing setting
D201	CH2 Averaging processing setting
D300	CH1 Measured temperature value
D301	CH2 Measured temperature value

## (2) Program example

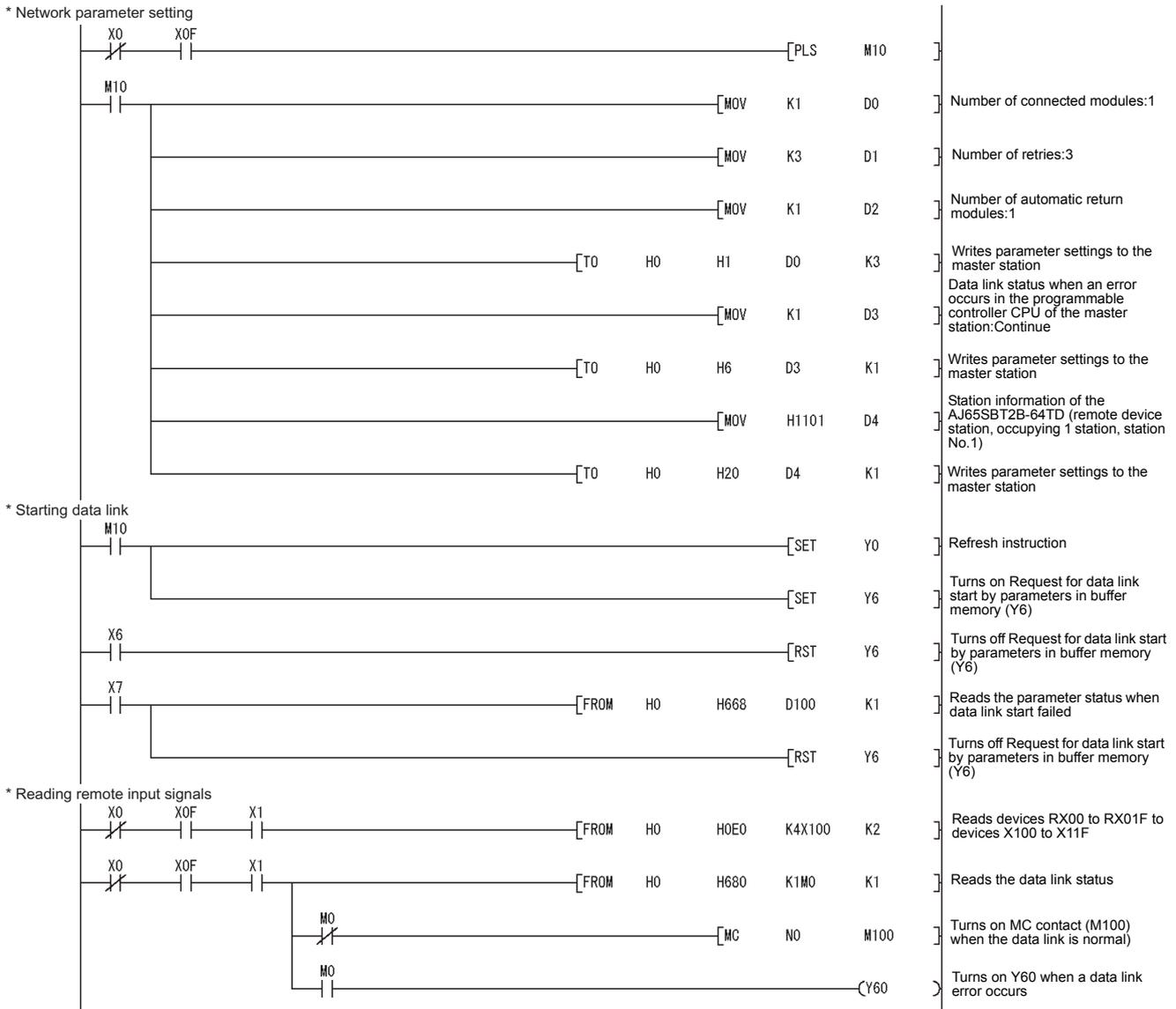


Figure 5.16 Program example (ACPU/QCPU (A mode) (FROM/TO instructions))1/3

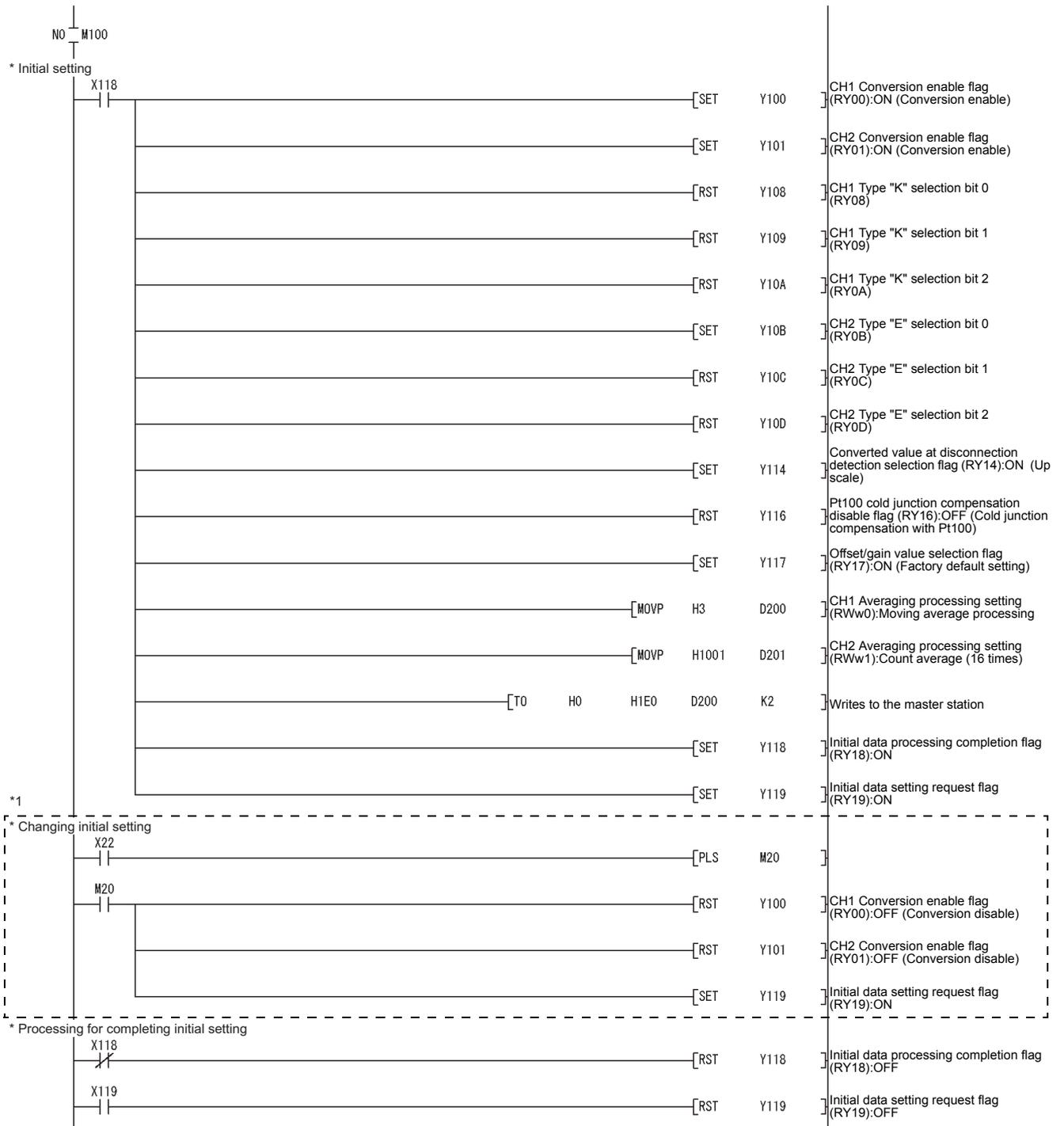


Figure 5.17 Program example (ACPU/QCPU (A mode) (FROM/TO instructions)) 2/3

\* 1 The program in the dotted line is required only for changing the initial setting.

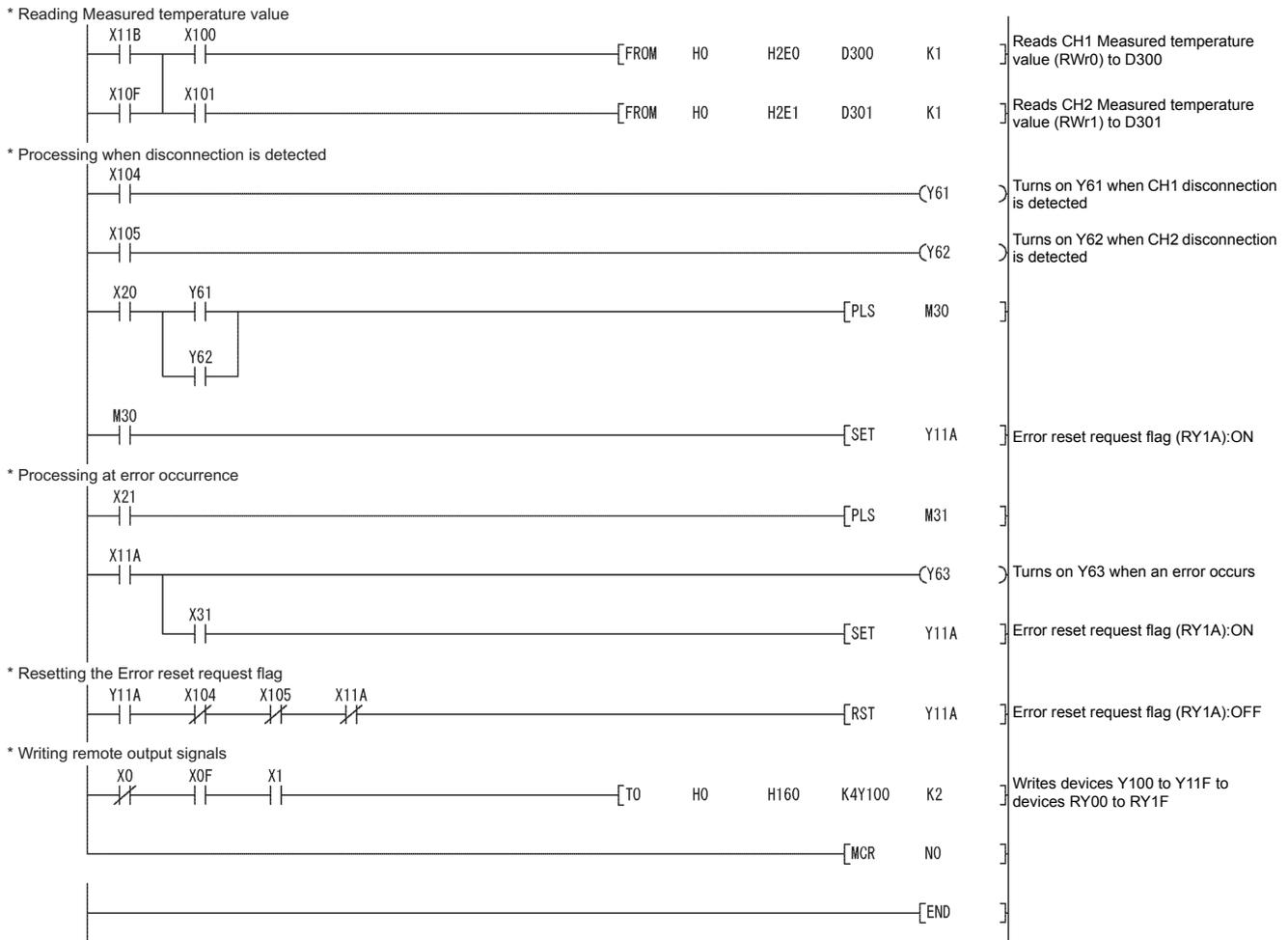


Figure 5.18 Program example (ACPU/QCPU (A mode) (FROM/TO instructions)) 3/3

## CHAPTER 6 TROUBLESHOOTING

This chapter describes the errors which may occur during the use of the AJ65SBT2B-64TD and troubleshooting against them.

### 6.1 Checking Errors by LED Indications

This section describes how to check errors by the LED indications of the AJ65SBT2B-64TD.

For the errors regarding the CPU module and master module, refer to the user's manuals for the CPU module and master module.

(1) When the PW LED of the AJ65SBT2B-64TD turns off

Table 6.1 When the PW LED of the AJ65SBT2B-64TD turned off

Check item	Corrective action
Is 24VDC power supplied?	Check the external power supply.
Is the voltage of the 24VDC power supply within the specified value?	Set the voltage value within the range of 20.4 to 28.8V.

(2) When the RUN LED of the AJ65SBT2B-64TD flashes

Table 6.2 When the RUN LED of the AJ65SBT2B-64TD flashes

Check item	Flashing interval	Check item	Corrective action
Normal mode	0.1s	Has User range read error flag (RXnB) turned on?	Perform the error correction again in the test mode by using the offset/gain setting.
	0.5s	—	Correct the setting value of CH□ Averaging processing setting (RWwm to RWwm+3).
Test mode	0.1s	—	Set the offset value and gain value for the error correction to be "gain value - offset value $\geq 10^{\circ}\text{C}$ ".
	0.5s		Change the offset value or gain value for the error correction to be within the measured temperature range.
Normal/Test mode	0.1s	Is any cable to the RTD Pt100 for cold junction compensation disconnected or is the RTD Pt100 removed from the terminal block?	Check the conductivity and connectivity of the RTD Pt100 connected with the terminal block, and reconnect or replace it as necessary. To recover from disconnection after connecting or changing, turn on Error reset request flag (RY(n+1)A).
		—	Power on the AJ65SBT2B-64TD again. If the LED is still flashing, the possible cause is the hardware fault. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

(3) When the RUN LED of the AJ65SBT2B-64TD turns off

**Table 6.3 When the RUN LED of the AJ65SBT2B-64TD turns off**

Check item	Corrective action
Has a watchdog timer error occurred?	Check the watchdog timer error in the link special register (SW0084 to SW0087) of the master module, and then power on the AJ65SBT2B-64TD again. If the RUN LED still does not turn on, the possible cause is the hardware fault. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.
Has the TEST terminals been shorted to enter to the test mode?	Correct the error with the offset/gain setting, and then open the TEST terminals.

(4) When the L RUN LED of the AJ65SBT2B-64TD turns off

Communication has been disconnected.

For details, refer to the troubleshooting section in the user's manual for the master module used.

(5) When the L ERR. LED of the AJ65SBT2B-64TD flashes regularly

**Table 6.4 When the L ERR. LED of the AJ65SBT2B-64TD flashes regularly**

Check item	Corrective action
Has the setting of the station number setting switches been changed during normal operation?	Correct the setting of the station number setting switches, and then power on the module again.
Have the station number setting switches failed?	If the L ERR. LED starts flashing without the switch setting changed during operation, the possible cause is the hardware fault. Please consult your local Mitsubishi representative.

(6) When the L ERR. LED of the AJ65SBT2B-64TD flashes irregularly

**Table 6.5 When the L ERR. LED of the AJ65SBT2B-64TD flashes irregularly**

Check item	Corrective action
Is the terminating resistor connected?	Check that the terminating resistor is connected. If not, connect it and power on the module again.
Is the L TER. switch on even when the AJ65SBT2B-64TD is not connected at the end of the network?	Turn off the L TER. switch.
Is the module or CC-Link dedicated cable affected by noise?	Ground both ends of the CC-Link dedicated cable shield part to the protective ground conductor via the SLD and FG terminals of each module. Ground the FG terminal of the module without fail. When wiring is performed by using pipes, ground the pipes without fail.

(7) When the L ERR. LED of the AJ65SBT2B-64TD turns on

**Table 6.6 When the L ERR. LED of the AJ65SBT2B-64TD turns on**

Check item	Corrective action
Is the station number setting correct?	Set the correct station number.

## 6.2 When CH1 Disconnection Detection Flag (RXn4) to CH4 Disconnection Detection Flag (RXn7) Turns On

Table 6.7 When CH□ Disconnection detection flag (RXn4 to RXn7) turns on

Check item	Corrective action
Is the thermocouple securely connected?	Securely connect the thermocouple.
Are terminal screws tightened securely?	If terminal screws are loose, retighten them within the specified torque range.
Is the cable to the connected thermocouple disconnected?	Check the conductivity of the thermocouple and replace the disconnected one.
Is the conversion status of the channel where no thermocouple is connected set to "Conversion enable"?	Check the conversion-enabled channel and the channel where a thermocouple is connected, and set the conversion status correctly.

## 6.3 When Flash Memory Read Error Flag (RXnA) Turns On

An error has occurred during reading data from the Flash memory.

When this flag turns on, power on the AJ65SBT2B-64TD again.

If Flash memory read error flag (RXnA) is still on after the module is powered on, the AJ65SBT2B-64TD may be faulty. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

## 6.4 When User Range Read Error Flag (RXnB) Turns On

An error has occurred during reading data in the user range.

When this flag turns on, redo the error correction by using the offset/gain setting to all the channels that are set to use the user setting.

If User read error flag (RXnB) is still on after the error correction, the AJ65SBT2B-64TD may be faulty. Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

## 6.5 When Flash Memory Write Error Flag (RXnC) Turns On

Writing data to the Flash memory has been failed during correcting errors by using the offset/gain setting.

Or the number of writes to the Flash memory has exceeded its limit.

When this flag turns on, power on the AJ65SBT2B-64TD again.

If Flash memory write error flag (RXnC) is still on after powered on the module and wrote the data to the Flash memory again, the AJ65SBT2B-64TD may be faulty.

Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

## 6.6 When CH1 Measured Temperature Value (RWrn) to CH4 Measured Temperature Value (RWrn+3) Cannot be Read

**Table 6.8** When CH□ Measured temperature value (RWrn to RWrn+3) cannot be read

Check item	Corrective action
Is the conversion status of the channel set to "Disable"?	Check CH□ Conversion enable flag (RYn0 to RYn3) and set the conversion status of the channel to "Enable".
Has any error occurred in the CPU module or master module?	Check the CPU module and master module.

## 6.7 When Incorrect Values are Stored in CH1 Measured Temperature Value (RWrn) to CH4 Measured Temperature Value (RWrn+3)

**Table 6.9** When incorrect values are stored in CH□ Measured temperature value (RWrn to RWrn+3)

Check item	Corrective action
Is the connected thermocouple type different from the specified one?	Check CH□ Thermocouple selection flag (RYn8 to RY(n+1)3) and select the connected thermocouple.
Is the thermocouple being affected by noise?	Check the grounding status and the thermocouple is not affected by noise from nearby devices, and take measures against the noise.
Is any cable to the RTD Pt100 for cold junction compensation disconnected or removed from the terminal block?	Check the connectivity and conductivity of the RTD Pt100 connected with the terminal block, and reconnect or change it as necessary. To recover from disconnection after connecting or changing, turn on Error reset request flag (RY(n+1)A).
In the case the cold junction compensation is performed externally, is the conversion status of the RTD Pt100 cold junction compensation set to "Enable"?	Turn on Pt100 cold junction compensation disable flag (RY(n+1)6) by using the initial data setting.
Is the cable to the connected thermocouple disconnected or is the thermocouple removed from the terminal block?	Check the connectivity and conductivity of the thermocouple, and reconnect or change it as necessary.
Temperature error by wiring resistance of a thermocouple is large.	Check the wiring resistance value of a thermocouple and calculate the temperature error of the system. (Refer to Table 3.3.) When the temperature error is large, the error may affect the measured temperature value. Correct the measured temperature value by setting the offset/gain value. (Refer to Section 4.8.)

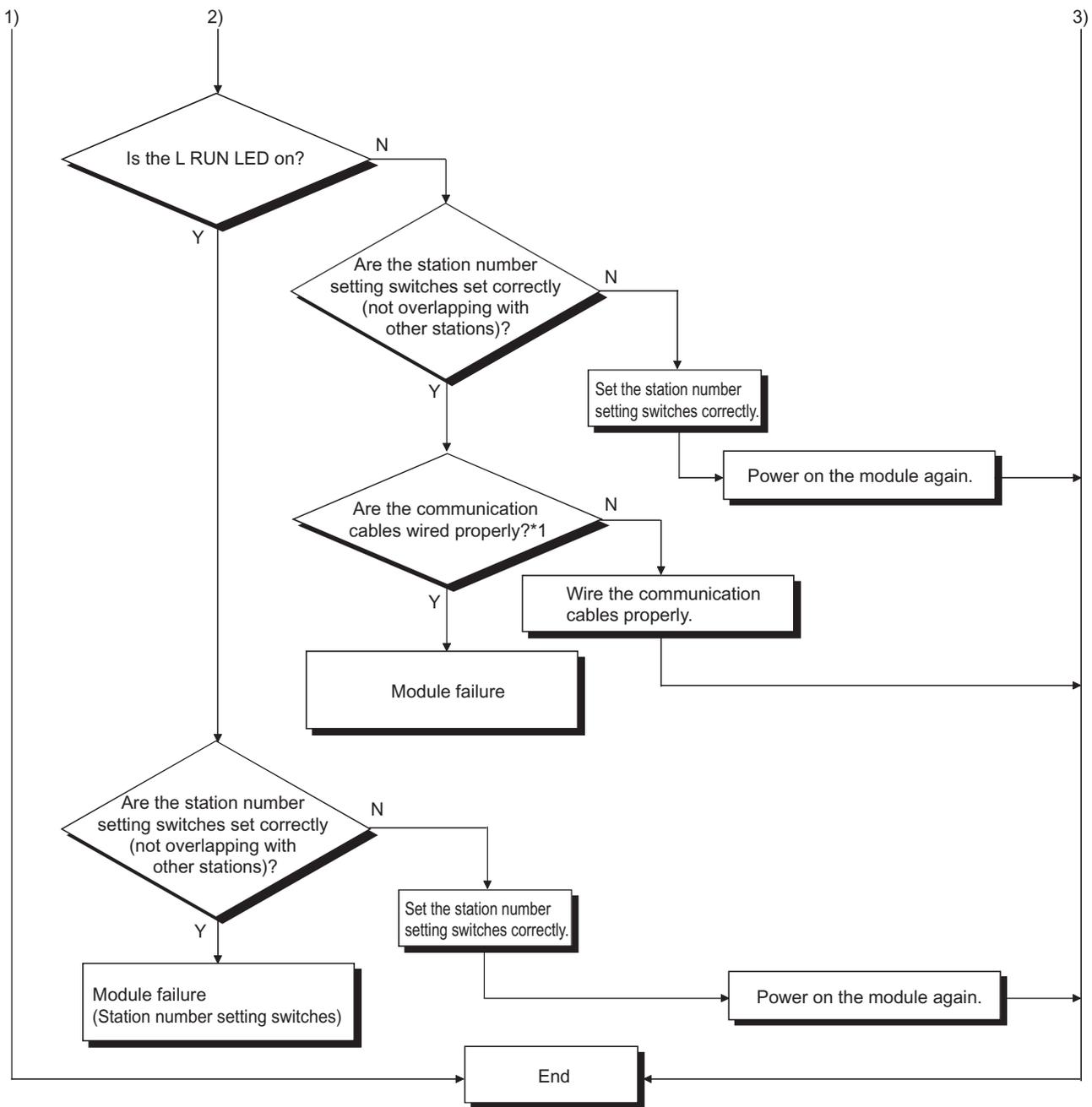
## 6.8 Troubleshooting When Data Link Execution Takes Much Time

**Table 6.10** Troubleshooting when data link execution takes much time

Check item	Corrective action
Are "Number of automatic return modules" setting values of the master module small?	Set large values for the "Number of automatic return modules" in the GX Developer network parameter. For details of the setting method, refer to the user's manual of your master module.

## 6.9 Troubleshooting when the ERR. LED of the Master Station Flashes



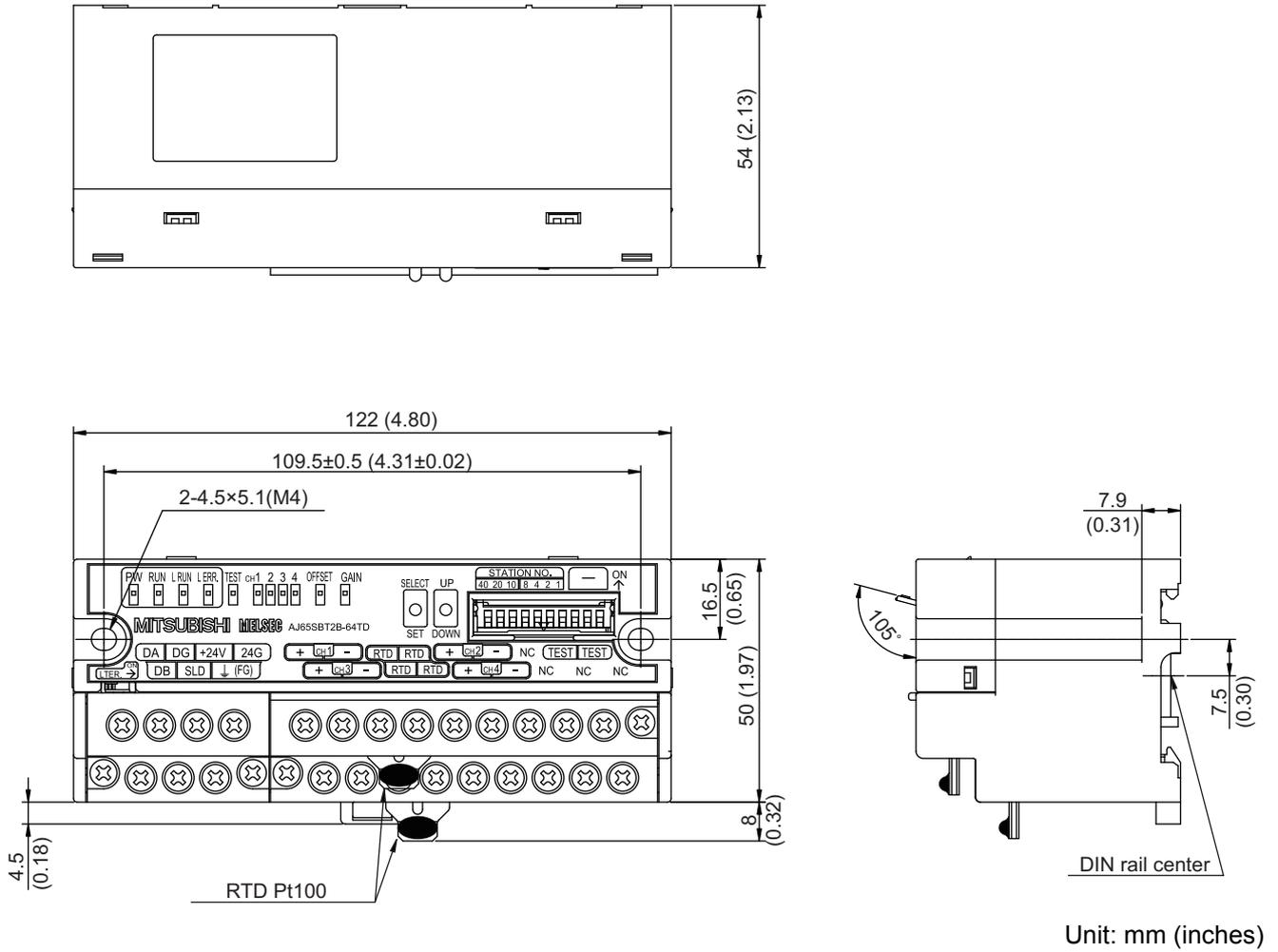


\* 1: Check for a short circuit, reversed connection, cable disconnection, terminating resistor, FG connection, overall cable distance, and station-to-station distance.

APPENDIX

Appendix 1 External Dimensions

The external dimensions of the AJ65SBT2B-64TD are shown below.





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# **WARRANTY**

Please confirm the following product warranty details before using this product.

## **1. Gratis Warranty Term and Gratis Warranty Range**

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

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- (2) Even within the gratis warranty term, repairs shall be charged for in the following cases.
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  2. Failure caused by unapproved modifications, etc., to the product by the user.
  3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
  4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
  5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
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  7. Any other failure found not to be the responsibility of Mitsubishi or that admitted not to be so by the user.

## **2. Onerous repair term after discontinuation of production**

- (1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued.

Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.
- (2) Product supply (including repair parts) is not available after production is discontinued.

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MODEL: AJ65S-64TD-U-SY-E

MODEL CODE: 13JZ20

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