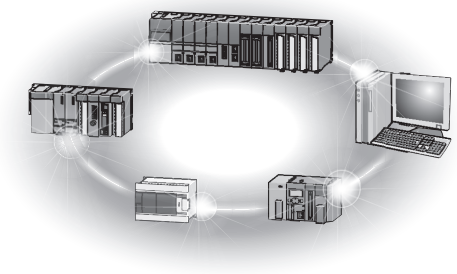
MITSUBISHI ELECTRIC

Mitsubishi Programmable Controller

Pt 100 Temperature Input Module Type AJ65BT-64RD3/AJ65BT-64RD4 User's Manual



●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 Mitsubishi equipment. Refer to the user's manual of the used CPU module for a description of the programmable controller system safety precautions.

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

⚠WARNING	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠CAUTION	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. • 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. • After installation or wiring, attach the included terminal cover to the module before turning it on for operation. Undertightening can cause short circuit or malfunction. • Ground the FG terminals to the protective ground conductor dedicated to the programmable controller. Failure to do so may result in malfunction. • 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 cable 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 and 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 the terminal screws can cause 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. • 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) • 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. • Do not remove or change the platinum temperature-measuring resistor designation pin while energizing the module. If a platinum temperature-measuring resistor designation pin is removed or changed while energizing, it may cause failure 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.

[Disposal Precautions]

⚠CAUTION
• When disposing of this product, treat it as an 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 noted at the lower left of the back cover.

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Japanese Manual Version SH-3652-G

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Introduction

Thank you for purchasing the Mitsubishi Graphic Operation Terminal.

Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the graphic operation terminal you have purchased, so as to ensure correct use.

Please forward a copy of this manual to the end user.

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About This Manual

The following are manuals related to this product.

Request for the manuals as needed according to the chart below.

Related Manuals

Manual Name	Manual Number (Model Code)
CC-Link System Master/Local Module Type AJ61BT11/A1SJ61BT11 User's Manual Describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the AJ61BT11 and A1SJ61BT11. (Sold separately)	IB-66721 (13J872)
CC-Link System Master/Local Module Type AJ61QBT11/A1SJ61QBT11 User's Manual Describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the AJ61QBT11 and A1SJ61QBT11. (Sold separately)	IB-66722 (13J873)
CC-Link System Master/Local Module User's Manual Describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the QJ61BT11N. (Sold separately)	SH-080394E (13JR64)
Programming Manual type AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode) (Dedicated Instructions) Explains the instructions extended for the AnSHCPU/AnACPU/AnUCPU/QCPU-A (A Mode). (Sold separately)	IB-66251 (13J742)
MELSEC-L CC-Link System Master/Local Module User's Manual Describes the system configuration, Performance specifications, functions, handling, wiring and troubleshooting of the L26CPU-BT and LJ61BT11. (Sold separately)	SH-080895ENG (13JZ41)

Compliance with the EMC and Low Voltage Directives

(1) For programmable controller system

To configure a system meeting the requirements of the EMC and Low Voltage Directives when incorporating the Mitsubishi programmable controller (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to the "EMC AND LOW VOLTAGE DIRECTIVES" chapter of the User's Manual for the CPU module used.

The CE mark, indicating compliance with the EMC and Low Voltage Directives, is printed on the rating plate of the programmable controller.

(2) For the product

For the compliance of this product with the EMC and Low Voltage Directives, refer to the "CC-Link module" section in the "EMC AND LOW VOLTAGE DIRECTIVES" chapter of the User's Manual for the CPU module used.

About Generic Terms and Abbreviations

Unless otherwise specified, this manual uses the following generic terms and abbreviations to explain the AJ65BT-64RD3/AJ65BT-64RD4 platinum temperature-measuring resistor Pt100 temperature input module.

Generic Term/ Abbreviation	Description
GX Developer	Product name of the software package for the MELSEC programmable controllers.
GX Works2	
ACPU	Generic term for A0J2CPU, A0J2HCPU, A1CPU, A2CPU, A2CPU-S1, A3CPU, A1SCPU, A1SCPUC24-R2, A1SHCPU, A1SJCPU, A1SJCPU-S3, A1SJHCPU, A1NCPU, A2NCPU, A2NCPU-S1, A3NCPU, A3MCPU, A3HCPU, A2SCPU, A2SHCPU, A2ACPU, A2ACPU-S1, A3ACPU, A2UCPU, A2UCPU-S1, A2USCPU, A2USCPU-S1, A2USHCPU-S1, A3UCPU and A4UCPU.
QnACPU	Generic term for Q2ACPU, Q2ACPU-S1, Q2ASCPU, Q2ASCPU-S1, Q2ASHCPU, Q2ASHCPU-S1, Q3ACPU, Q4APU and Q4ARCPU.
QCPU (A mode)	Generic term for Q02CPU-A, Q02HCPU-A and Q06HCPU-A.
QCPU (Q mode)	Generic term for Q00JCPU, Q00CPU, Q01CPU, Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU, Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU, Q12PRHCPU, Q25PRHCPU, Q00UJCPU,Q00UCPU,Q01UCPU,Q02UCPU, Q03UDCPU, Q04UDHCPU, Q06UDHCPU, Q10UDHCPU,Q13UDHCPU, Q20UDHCPU,Q26UDHCPU, Q03UDECPU, Q04UDEHCPU, Q06UDEHCPU, Q10UDEHCPU, Q13UDEHCPU, Q20UDEHCPU, Q26UDEHCPU,Q50UDEHCPU and Q100UDEHCPU.
LCPU	Generic term for L02CPU, L26CPU-BT.
Master station	Station that controls a data link system. One station is required for one system.
Local station	Station that has a programmable controller CPU and can communicate with the master station and other local stations.
Remote I/O station	Station that handles only bit unit information. (Input/output from/to external device) (AJ65BTB1-16D, AJ65SBTB1-16D, etc.)
Remote device station	Station that handles bit unit information and word unit information. (Input/output from/to external device, analog data conversion)
Remote station	Generic term for remote I/O station and remote device station. Controlled by the master station.
Intelligent device station	Station that can perform transient transmission, e.g. AJ65BT-R2. (Local station included)
Master module	Generic term for modules that can be used as the master station.
SB	Link special relay (for CC-Link) Bit unit information that indicates the module operation status or data link status of the master station/local station. Represented as SB for convenience.
SW	Link special register (for CC-Link) 16-bit unit information that indicates the module operation status or data link status of the master station/local station. Represented as SW for convenience.
RX	Remote input (for CC-Link) Information input from a remote station to the master station in bit unit. Represented as RX for convenience.
RY	Remote output (for CC-Link) Information output from the master station to a remote station in bit unit. Represented as RY for convenience.
RWw	Remote register (write area for CC-Link) Information output from the master station to a remote device station in 16-bit unit. Represented as RWw for convenience.
RWr	Remote register (read area for CC-Link) Information input from a remote device station to the master station in 16-bit unit. Represented as RWr for convenience.

Packing List

This product consists of the following items.

Product name	Quantity
AJ65BT-64RD3 platinum temperature-measuring resistor Pt100 temperature input module	1
AJ65BT-64RD4 platinum temperature-measuring resistor Pt100 temperature input module	
AJ65BT-64RD3/AJ65BT-64RD4 platinum temperature-measuring resistor Pt100 temperature input module user's manual (hardware)	1

MEMO

1. OVERVIEW

This user's manual explains the specifications, part identification and wiring for the products listed below, which are used as remote device stations for the CC-Link system:

The AJ65BT-64RD3 is a 3-wire system connecting module for the platinum temperature-measuring resistor.
The AJ65BT-64RD4 is a 4-wire system connecting module for the platinum temperature-measuring resistor.
(Hereinafter, the AJ65BT-64RD3 and AJ65BT-64RD4 will be collectively referred to as AJ65BT-64RD.)

The AJ65BT-64RD converts temperature data input from platinum temperature-measuring resistor Pt 100 (abbreviated as Pt 100 from here on) or platinum temperature-measuring resistor JPt 100 (abbreviated as JPt 100 from here on) to 16-bit signed BIN data (up to the first decimal place), or 32-bit signed BIN data (up to the third decimal place).

1.1 Features

The following describes the features of AJ65BT-64RD.

(1) Stores temperature data
By directly connecting the old JIS or new JIS IEC type platinum temperature-measuring resistor to AJ65BT-64RD, temperature data [°C] may be received as digital values.
For the detected temperature, values to the first place and third place below decimal point are stored in the remote register.

(2) Conversion is possible at four channels per module.
Conversion of temperatures into digital values can be carried out at four channels in a single AJ65BT-64RD module.
Also, the conversion enable/disable can be specified for individual channels.

(3) Designation of sampling processing and travel average processing
As a conversion method, either sampling processing or travel averaging processing can be selected for each channel.

(4) Wire breakage detection is possible at individual channels.
The wire breakage of platinum temperature-measuring resistor or cable can be detected for each channel.

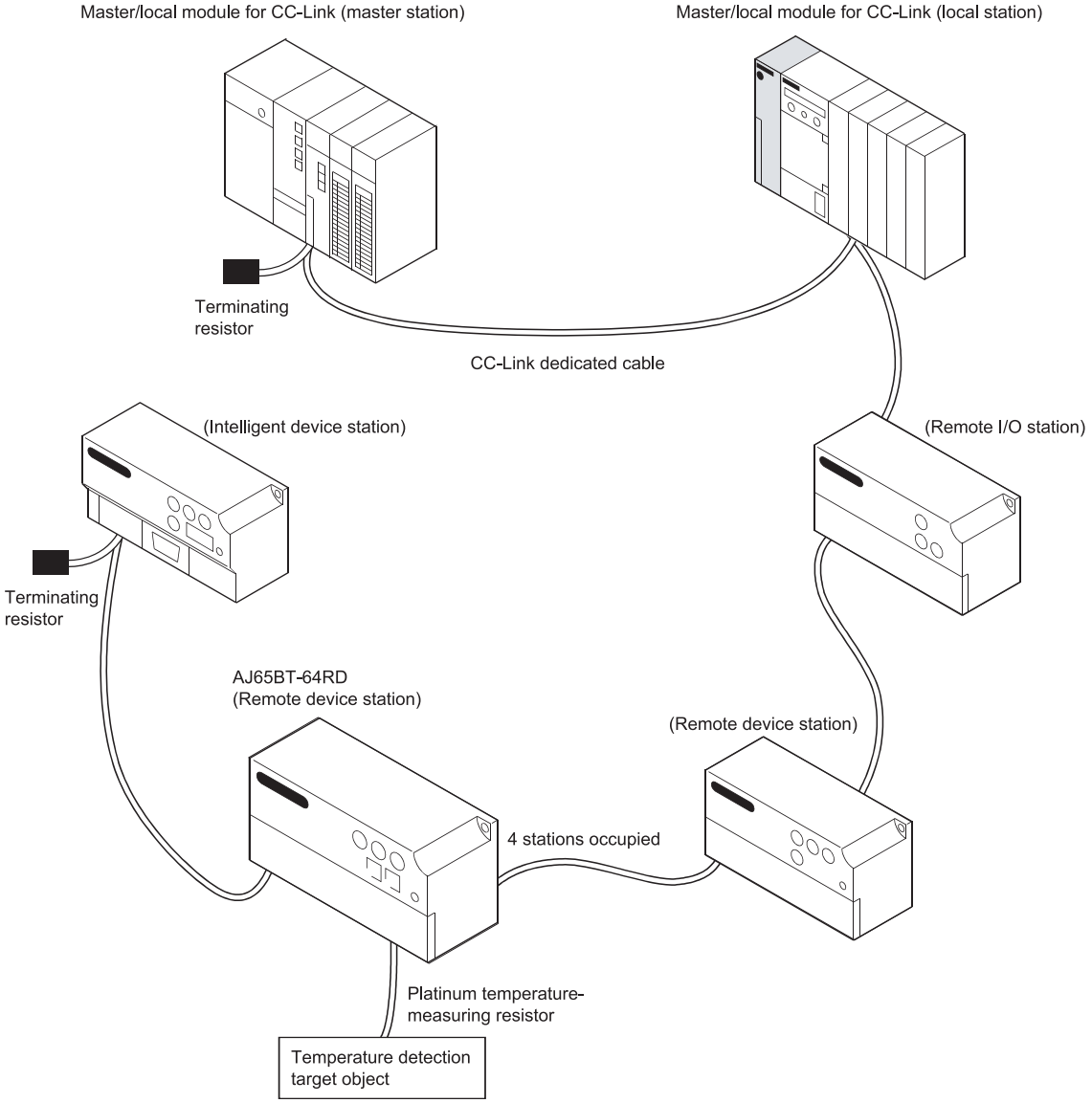
(5) High overall accuracy
High-accuracy temperature detection is feasible with a tolerance of ±0.25 % of the full scale in overall accuracy for normal temperature detection, and ±0.1 % of the full scale when the ambient temperature is in the normal temperature range (25 °C ±5 °C).

2. SYSTEM CONFIGURATION

System configuration when using the AJ65BT-64RD is explained below.

2.1 Overall Configuration

The overall configuration when using the AJ65BT-64RD is shown below.



2.2 Applicable Systems

This section explains applicable systems.

(1) Applicable master modules

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

REMARK

Check the specifications of the master module before use.

POINT

When using the AJ61BT11, A1SJ61BT11, AJ61QBT11 or A1SJ61QBT11, use the one where the following number (9707 B or later) is indicated in the DATE column of the rating plate.

The module where "9707 B" is not indicated in the DATE column cannot be used.

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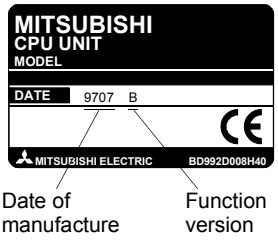


(2) Restrictions on use of CC-Link dedicated instructions (RLPA, RRPA)

The CC-Link dedicated instructions (RLPA, RRPA) may be inapplicable depending on the used programmable controller CPU and master module.

For details of the restrictions, refer to the A series master module user's manual (details) or AnSHCPU/AnACPU/AnUCPU/QCPU-A (A mode) programming manual (dedicated instructions).

The AJ65BT-64RD accepts only the dedicated instructions RLPA and RRPA.

Refer to Section 5.5 for a program example that uses the dedicated instructions (RLPA, RRPA).

3. SPECIFICATIONS

This section explains the AJ65BT-64RD the general specifications, performance specifications, and transmission specifications.

3.1 General Specification

This section explains the AJ65BT-64RD general specifications.

Table 3.1 General Specification

Item	Specifications					
Ambient operating temperature	0 to 55 °C					
Ambient storage temperature	-20 to 75 °C					
Ambient operating humidity	10 to 90 %RH, Non-condensing					
Ambient storage humidity	10 to 90 %RH, Non-condensing					
Vibration resistance	Conforming to JIS B 3502, IEC 61131-2		Frequency	Acceleration	Amplitude	No. of sweeps
		For intermittent vibration	5 to 9 Hz	—	3.5mm (0.14inches)	10 times in each direction X, Y, Z
			9 to 150 Hz	9.8 m/s^2	—	
		For continuous vibration	5 to 9 Hz	—	1.75mm (0.069inches)	—
			9 to 150 Hz	4.9 m/s^2	—	
Shock resistance	Conforming to JIS B 3502, IEC 61131-2 (147 m/s^2, 3 times in each of 3 directions X Y Z)					
Operating ambience	No corrosive gases					
Operating elevation *3	2000 m (6562 ft.) max.					
Installation location	Control panel					
Over voltage category *1	II max.					
Pollution level *2	2 max.					

*1 : 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 the 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 300 V is 2500 V.

*2 : 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 condensation must be expected occasionally.

*3 : Do not operate or store the programmable controller in the environment where the pressure applied is equal to greater than the atmospheric pressure at the altitude of 0m. Doing so may cause a malfunction. Please consult our branch office when the programmable controller is to be operated under pressure.

3.2 Performance Specification

The performance specification of the AJ65BT-64RD is explained below.

Item		AJ65BT-64RD3	AJ65BT-64RD4
Measurement method		3-wire	4-wire
Connectable platinum temperature-measuring resistor		Pt 100, JPt 100	
Output current for detecting temperature		1 mA	
Temperature input range		–180 to 600 °C	
Temperature detection value		16-bit signed binary : –1800 to 6000 (value to one decimal place × 10)	
		32-bit signed binary : –180000 to 600000 (value to three decimal places × 1000)	
Overall accuracy	Operating ambient temperature (25 ± 5 °C)	± 0.1 % (accuracy for maximum value)	
	Operating ambient temperature (less than 20 °C, more than 30 °C)	± 0.25 % (accuracy for maximum value)	
Resolution		0.025 °C	
Conversion speed (Sampling time)		40 ms/channel *1	
Temperature input point		4-channel/module	
CC-Link station type		Remote device station	
Occupied points		4-station : RX/RY 128 points each RWw/RWr 16 points each	
Connection cable		CC-Link dedicated cable	
Noise durability		Noise voltage 500 Vp-p, Noise width 1 μs by noise simulator of the noise frequency 25 to 60 Hz	
Dielectric withstand voltage		Between batch of power supply system and ground Between batch of power supply system and batch of communication system Between batch of communication system and batch of temperature input Between batch of temperature input and ground 500V AC 1 minute	
Insulation method		Between the platinum temperature-measuring resistor input and CC-Link transmission: Photocoupler insulation Between the platinum temperature-measuring resistor input and channel: no insulation	
Insulation resistor		Between batch of power supply system and ground Between batch of power supply system and batch of communication system Between batch of communication system and batch of temperature input Between batch of temperature input and ground 500 V DC, 10MΩ or more on the insulation resistance tester	
Connection terminal block		27-point terminal block (M3.5 × 7 screws)	
Supported cable size		0.75 to 2.00 mm^2	
Supported solderless terminal		RAV 1.25-3.5, RAV 2-3.5 (Conform to JIS C 2805)	
Module installation screw		M4 × 0.7 mm (0.03 in.) × 16 mm (0.63 in.) or more Installation in the rail is possible, too.	
Applicable DIN rail		TH 35-7.5 Fe, TH 35-7.5 Al, TH 35-15 Fe (conform to JIS C 2812)	

Performance specification (continued)

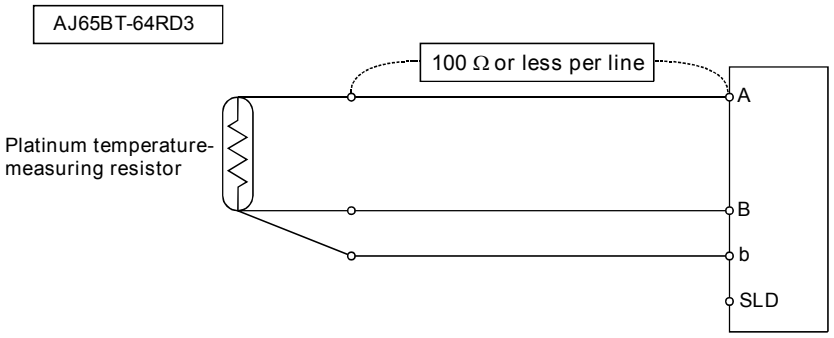
Item	AJ65BT-64RD3	AJ65BT-64RD4
External power supply	24 V DC (18 to 30 V DC)	
Internal consumed current	0.17 A (at 24VDC)	
Allowable momentary power failure period	1ms	
Weight	0.38 (0.84) kg (lb.)	

*1 : Conversion speed is the time until it is converted to the corresponding digital value after the temperature has been input, and then stored in the remote register.
When the multiple channels are used, the conversion speed is “40 ms × number of the conversion enable channels”

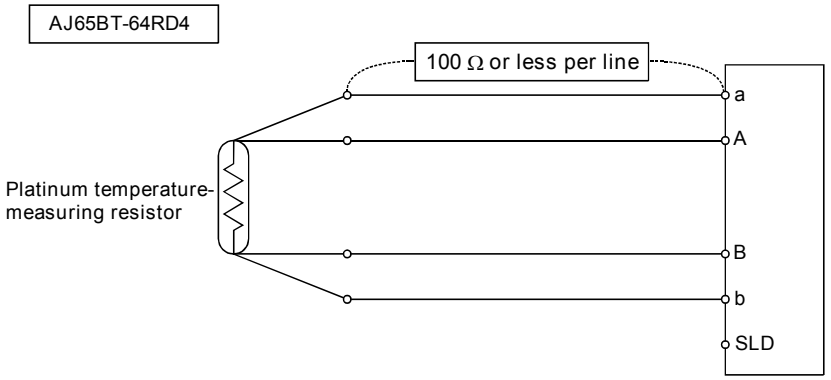
3.2.1 Specifications when connecting to a platinum temperature-measuring resistor

The following explains the specifications when connecting the AJ65BT-64RD and a platinum temperature-measuring resistor.

(1) • The effect on the measured resistance by the discrepancy in the lead resistance value connected to A, b is approximately 0.025 °C/10 m Ω.
• The lead resistance value between platinum temperature-measuring resistor and AJ65BT-64RD3 should be 100 Ω or less per line.



(2) The lead resistance value between between platinum temperature-measuring resistor and AJ65BT-64RD4 should be 100 Ω or less per line.



3.2.2 Data link processing time

For the AJ65BT-64RD, the data link processing time shown below will be required in order to execute each function.
For details of the link scan time, refer to the user's manual (details) of the used mater module.
Example) Data link processing time in asynchronous mode when the master module is the QJ61BT11 (normal value)

(1) Mater station (RY) → Remote device station (RY) processing time

[Expression]
SM + LS × 1 + Remote device station processing time [ms]
SM : Master station sequence program scan time
LS : Link scan time
Remote device station processing time: 1ms

(2) Master station (RX) ← Remote Device Station (RX) Processing Time

[Expression]
SM + LS × 1 + Remote device station processing time [ms]
SM : Master station sequence program scan time
LS : Link scan time
Remote device station processing time: (Number of used channels +1*) ×40ms
*: Internal processing time of AJ65BT-64RD

(3) Master station (RWr) ← Remote Device Station (RWr) Processing Time

[Expression]
SM + LS × 1 + Remote device station processing time [ms]
SM : Master station sequence program scan time
LS : Link scan time
Remote device station processing time: (Number of used channels +1*) ×40ms
*: Internal processing time of AJ65BT-64RD

POINT

The above are examples of processing time until the control of the output signal to the AJ65BT-64RD from the programmable controller CPU or until input signals or remote registers are read.

The maximum time that takes for updating the detected temperature read by the programmable controller CPU is “data link processing time + sampling time.”

3.3 Function

The function of AJ65BT-64RD is explained below.

3.3.1 Function list

Below is a function list of the AJ65BT-64RD.

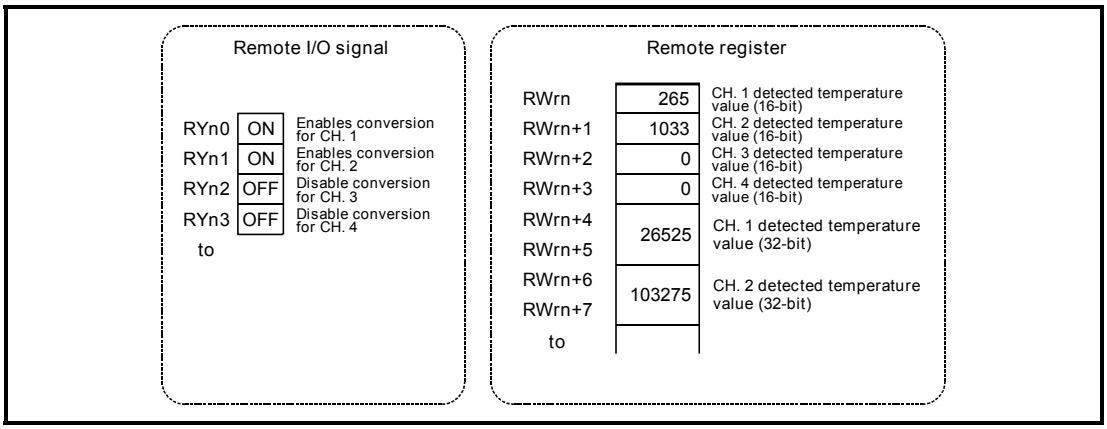
Item	Description	Reference section
Conversion enable/disable designation	• Performs conversion enable/disable settings by channel. (Default ····· All channels disabled) • Sampling time may be reduced by disabling the conversion at channels not in use.	Section 3.3.2
Sampling processing/travel average processing designation	• Designates sampling processing or travel average processing by channel. (Default ····· All channels sampling processing)	Section 3.3.3
Wire breakage detection	• Detects wire breakage for the connected thermocouple by channel.	Section 3.3.4
Detected temperature storage	• A value to one decimal place (16-bit signed binary) will be stored in the remote register.	Section 3.3.5
Designation of platinum temperature-measuring resistor type	• Designates the type of platinum temperature-measuring resistor to be used. Usable platinum temperature-measuring resistors are the following two types: • Pt100····· New JIS, IEC type (Conforms to JIS C 1604-1997, IEC 751-1983) • JPt100··· Old JIS type (Conforms to JIS C 1604-1981)	Section 3.3.6

3.3.2 Conversion enable/disable designation

Conversion may be enabled or disabled for each channel individually.
The setting of the conversion is made through the CH. ☐ conversion enable flags (RYn0 to RYn3).

Setting	Description
ON	Wire breakage detection is conducted at the same time the temperature of the target object is taken.
OFF	Neither temperature detection nor wire breakage detection is conducted.

AJ65BT-64RD



(1) Relationship between conversion enable/disable designation and sampling time

By disabling conversion at the channels not in use, sampling time may be reduced.

<If all channels are conversion enabled>

40 ms × 4 channels = 160 ms (= sampling time)

<If only one channel is conversion enabled>

40 ms × 1 channel = 40 ms (= sampling time)

(2) Changes caused by switching conversion enable/disable designation

<When changed from conversion disabled → enabled>

Sampling of the enabled channels will be commenced.

After the detected temperature values are stored in the remote register, the conversion completion flag is turned on for the corresponding channel.

<When changed from conversion enabled → disabled>

Sampling of the disabled channels will be stopped.

The conversion completion flag is turned off for the corresponding channel.

For the detected temperature value stored in the remote register, the data immediately prior to the disable setting will be retained.

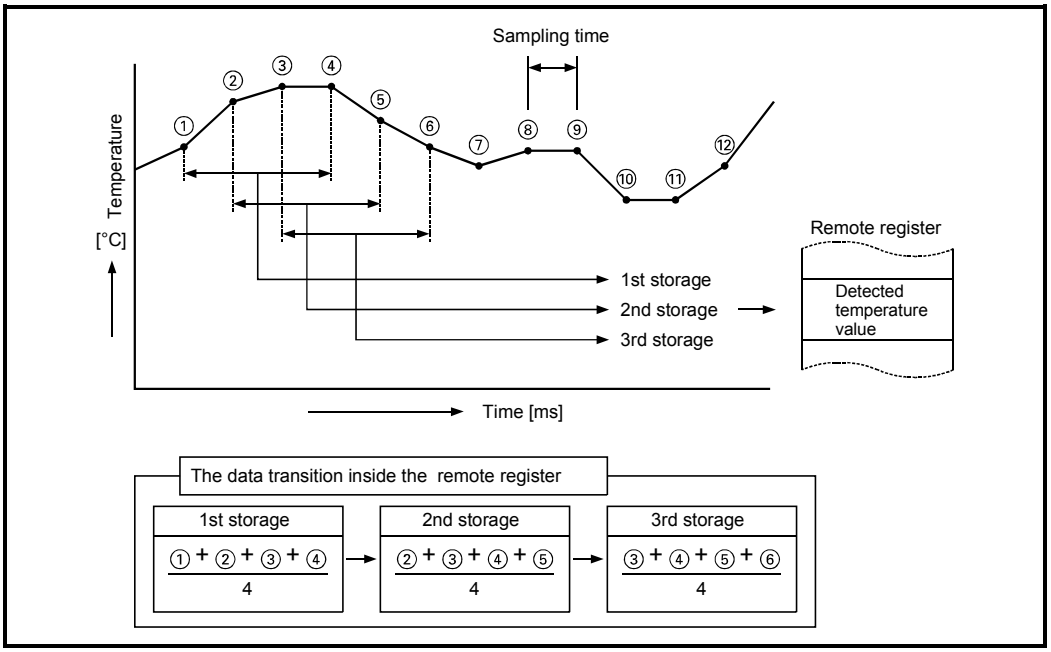
3.3.3 Sampling processing/travel average processing designation

The AJ65BT-64RD may designate sampling processing or travel average processing for each individual channel.
The setting of sampling processing or travel average processing is made through the CH. ☐ sampling processing/travel average processing designation flags (RYn4 to RYn7).

Setting	Description
ON	Travel average processing
OFF	Sampling processing

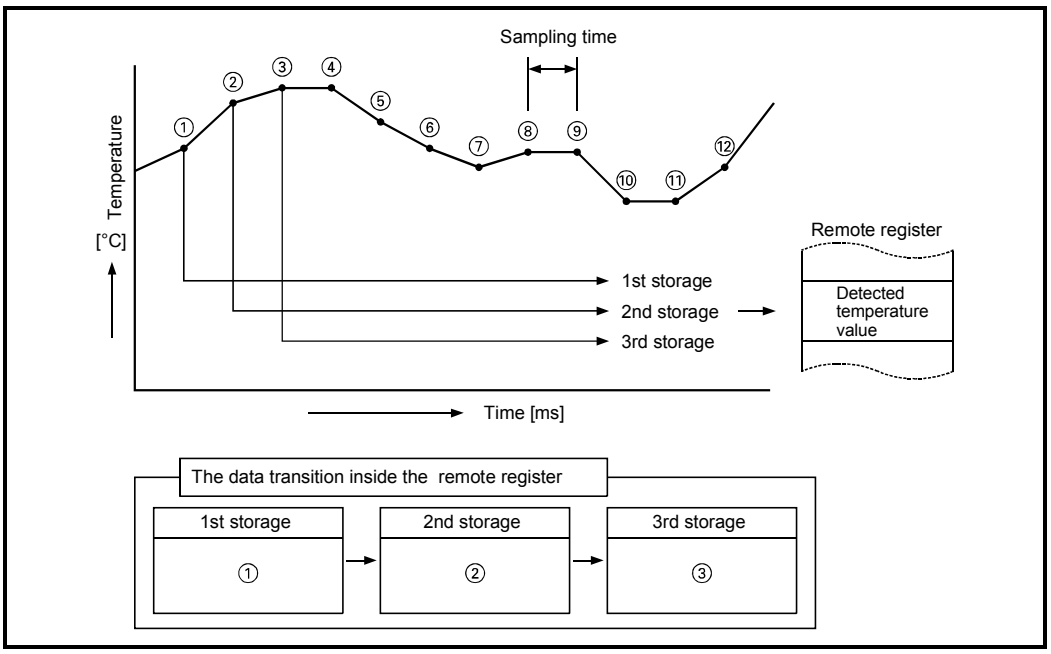
(1) Travel average processing

The average of the four detected temperature values that have been taken during each sampling time (current value + three previous values) is calculated and stored in the remote register.
Also, since the average processing travels for each sampling, the most recent measured temperature value may be obtained.
By using this, a scaling value can be obtained using the detected temperature value that has undergone the average processing and stored in the remote register.



(2) Sampling processing

Stores the detected temperature value and scaling value are stored in the remote register by each sampling time.



(3) Changes caused by altering sampling processing/travel average processing settings

<When changed from sampling processing → travel average processing>

The conversion completion flag is turned off for the corresponding channel.

After an average of four previously detected temperature values (three values from the present and past value) is calculated and stored to the remote register, the conversion completion flag for the corresponding channel is turned on.

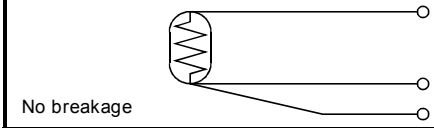
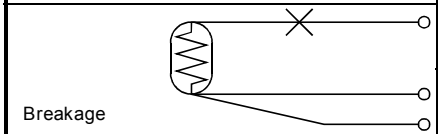
<When changed from travel average processing → sampling processing>

The conversion completion flag is turned off for the corresponding channel.

After the most recent detected temperature value is stored in the remote register, the conversion completion flag for the corresponding channel is turned on.

3.3.4 Wire breakage detection

The AJ65BT-64RD detects wire breakage in the platinum temperature-measuring resistor or cable used for each channel, and turns on the wire breakage detection flag (RXn4 to RXn7) for the corresponding channel.
On the AJ65BT-64RD, the wire breakage detection are performed for channels that are enabled for conversion.
The relationships between the wire breakage detection and conversion enable/disable are shown below.

Connection status	Conversion enabled/disabled setting	Wire breakage detection flag
 No breakage	Conversion enabled	OFF
	Conversion disabled	
 Breakage	Conversion enabled	ON
	Conversion disabled	OFF
No connection	Conversion enabled	ON
	Conversion disabled	OFF

POINT

- Be sure to set the channels having no platinum temperature-measuring resistor attached to "conversion disabled."
  If a channel having no platinum temperature-measuring resistor attached is set to "conversion enabled," the wire breakage detection flag will turn on.
- The channels for which wire breakage detection turned on will retain the detected temperature value immediately prior to the breakage detection, and the conversion completion flag for the corresponding channel will turn off.
  When the detected breakage is fixed, updating of detected temperature value after repair will be resumed and the conversion completion flag will be turned on again.
- For platinum temperature-measuring resistor wiring details, refer to Section 4.7.

3.3.5 Detected temperature

Temperatures in the range of -180 °C to +600 °C can be detected using the AJ65BT-64RD.
Of the temperature detected, the values to the first place and third place below decimal point are stored in the remote register (Refer to Section 4.7).

(1) Value to the first place below decimal point

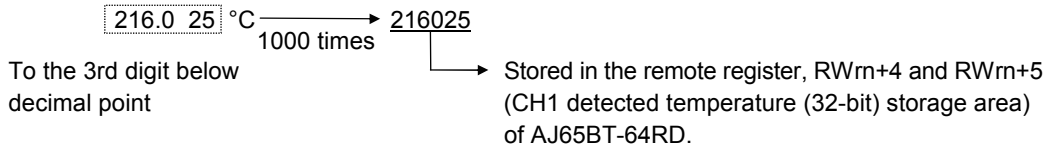
The value to the first place below the decimal point of the detected temperature is multiplied by 10, then stored as 16-bit signed binary data.
The data to be stored is in the range of – 1800 to + 6000.

Example: When the temperature detected at CH. 1 is 216.025 °C

(2) Value to the third place below decimal point

The value to the third place below decimal point of the detected temperature is multiplied by 1000, then stored as 32-bit signed binary data.
The data to be stored is in the range of -180000 to +600000.

Example: When the temperature detected at CH. is 216.025 °C



3.3.6 Designating the platinum temperature-measuring resistor type

The platinum temperature-measuring resistors listed below can be used for AJ65BT-64RD.

- Pt100 ····· New JIS, IEC type (JIS C 1604-1997, IEC 751-1983)
- JPt100 ····· Old JIS type (JIS C 1604-1981)

By setting the type of the platinum temperature-measuring resistor to be used using the platinum temperature-measuring resistor designation pin, all channels are set to the designated type.

POINT

Two types of platinum temperature-measuring resistors cannot be used simultaneously.
When two types of platinum temperature-measuring resistors are used, the channel which connects the resistor of a type different from designation cannot obtain a correct detected temperature value.

3.4 I/O Signals in Respect to the Master Module

The assignment of remote I/O signals and the functions is explained.

3.4.1 Remote I/O signal list

The AJ65BT-64RD uses 128 points for input and 128 points for output in respect to the data for the master module.
The remote I/O signal assignment and the name of each signal are shown in the table below.
Device RX indicates an input signal to the master module from the AJ65BT-64RD, and device RY indicates an output signal from the master module to the AJ65BT-64RD.

Signal direction : AJ65BT-64RD → Master module		Signal direction : Master module → AJ65BT-64RD	
Device No.	**Signal name**	**Device No.**	**Signal name**
RXn0	CH.1 conversion completion flag	RYn0	CH.1 conversion enable flag
RXn1	CH.2 conversion completion flag	RYn1	CH.2 conversion enable flag
RXn2	CH.3 conversion completion flag	RYn2	CH.3 conversion enable flag
RXn3	CH.4 conversion completion flag	RYn3	CH.4 conversion enable flag
RXn4	CH.1 wire breakage detection flag	RYn4	CH.1 sampling processing/travel average processing designation flag
RXn5	CH.2 wire breakage detection flag	RYn5	CH.2 sampling processing/travel average processing designation flag
RXn6	CH.3 wire breakage detection flag	RYn6	CH.3 sampling processing/travel average processing designation flag
RXn7	CH.4 wire breakage detection flag	RYn7	CH.4 sampling processing/travel average processing designation flag
RXn8	E^2PROM abnormal flag	RYn8 to RY (n+7) 6	Use prohibited
RXn9	Test mode flag		
RXnA to RX (n+7) 7	——	RY (n+7) 7	Offset/gain value selection flag
RX (n+7) 8	Initial data processing request flag	RY (n+7) 8	Initial data processing completion flag
RX (n+7) 9	Initial data setting completion flag	RY (n+7) 9	Initial data setting request flag
RX (n+7) A	Error status flag	RY (n+7) A	Error reset request flag
RX (n+7) B	Remote READY	RY (n+7) B to RY (n+7) F	Use prohibited
RX (n+7) C to RX (n+7) F	——		

n : Addresses assigned to the master module by the station number setting.

POINT

Do not turn on the remote output signals that are prohibited in respect to the remote device from the master module.
If the prohibited signals are output, the programmable controller system may malfunction.

3.4.2 I/O signal functions

The function of each remote I/O signal for the AJ65BT-64RD is explained below.

(1) Remote Input signal

Device No.	Signal name	Description
RXn0 to RXn3	CH. ☐ conversion completion flag	The conversion completion flag turns on when the detected temperature value at all conversion enabled channel is stored in the remote register after power on or a hardware reset. If the travel average processing is running, it will turn on when the detected temperature value is converted and stored in the remote register after the travel average processing has completed. The conversion completion flag changes according to the conditions listed below. • When conversion disabled is changed to enabled The temperature detection of the enabled channels will be commenced. After the detected temperature values are stored in the remote register, the conversion completion flag is turned on for the corresponding channel. • When conversion enabled is changed to disabled The conversion completion flag is turned off for the corresponding channel. For the values stored in the remote register, the data immediately prior to the disable setting are retained.
RXn4 to RXn7	CH. ☐ wire breakage detection flag	For the platinum temperature-measuring resistor input circuit for all channels, when only a single section of the I/O signal lines including the platinum temperature-measuring resistor is broken, the wire breakage detection flag is turned on for the corresponding channel. The detected temperature value when a wire breakage detection flag is turned on will be maintained at the value immediately prior to the wire breakage, and then the conversion completion flag will be turned off. After the wire breakage has been removed, the wire breakage detection flag may be turned off by turning on the error reset request flag. Also, after the breakage has been fixed, the updating of detected temperatures value will be resumed regardless of whether or not the wire breakage detection flag is reset, and after the first update has been completed the conversion completion flag will turn on once again.
RXn8	E^2PROM abnormal flag	After power on or a hardware reset, the internal memory (E^2PROM for offset/gain value storage) is checked, and it turns on if there is an error. At such times, the conversion function will stop. When this flag turns on, the error reset request flag may not be used to reset (off) because the module itself is malfunctioning (hardware error).
RXn9	Test mode flag	Turns on during test mode. Turns off when reverted to normal mode.
RX (n+7) 8	Initial data processing request flag	After power on or a hardware reset, this is turned on because the AJ65BT-64RD requests the initial data setting . After the initial data processing is complete (initial data processing request flag RY(n+7)8 is turned on), it turns off.
RX (n+7) 9	Initial data processing request flag	Turns on when initial data was required to change (initial data setting request flag RY(n+7)9 is turned on). After the initial data setting request flag is turned off when initial data setting is complete, this also turns off.
RX (n+7) A	Error status flag	Turns on when wire breakage detection flag or E^2PROM error flag turns on. After the cause of the error has been removed, the flag may be reset (off) by turning on the error reset request flag, but since the E^2PROM error flag cannot be reset, this flag may also not be reset.
RX (n+7) B	Remote READY	After power on or a hardware reset, this flag turns on when the initial data setting is complete and the detected temperature value at all conversion-enabled channel has been stored in the remote register. Will not turn on when all channels are conversion disabled. It will turn off for two seconds when the offset/gain switch is set to [OFFSET] during test mode or when changed from [GAIN] to [SET]. Used as an interlock for read in respect to the master module.

(2) Remote output signal

Device No.	Signal name	Description
RYn0 to RYn3	CH. ☐ conversion enable flag	It is possible to designate the conversion enabled or disabled for each channel. By disabling the conversion at channels not in use, generation of unnecessary wire breakage detection flags may be prevented and sampling time may be reduced. ON : Conversion enabled ····· wire breakage detection is conducted at the same time the temperature of the target object is taken. OFF : Conversion disabled ···· neither temperature taking or wire breakage detection is conducted. By setting of conversion enable/disable, the following changes are made. • When conversion is changed from disabled → enabled Temperature detection of the enabled channel is commenced. After the detected temperature value of the corresponding channel is stored in the remote register, the conversion completion flag of the corresponding channel is turned on. • When the conversion is changed from enabled → disabled. The conversion completion flag is turned off for the corresponding channel. For the detected temperature value stored in the remote register, the data immediately prior to the disable setting will be retained.
RYn4 to RYn7	CH. ☐ sampling processing/ travel average processing specification flag	It is possible to designate the sampling processing or travel average processing for each independent channel. ON : Travel average processing OFF : Sampling processing In travel average processing, an average value of four detected temperature value samples that were taken during each sampling time is calculated and stored in the remote register. • When changed from sampling processing → travel average processing The conversion completion flag for the corresponding channel is turned off. An average value of four detected temperature value samples is calculated, and after it has been stored to the remote register the conversion completion flag of the corresponding channel is turned on. • When changed from travel average processing → sampling processing The conversion completion flag is turned off for the corresponding channel. After the most recent detected temperature value is stored in the remote register, the conversion completion flag for the corresponding channel is turned on. Note : This flag is only valid when the initial data processing completion flag (RY (n+7) 8) or initial data setting request flag (RY (n+7) 9) is on.
RY (n+7) 7	Offset/gain value selection flag	Select whether or not the offset/gain value will be set to “user setting” or “factory setting.” At the product shipment from factory, the same values for the factory settings are stored in the E^2PROM for storing the user setting offset/gain values. ON : Factory setting (Offset-gain, 100.0 Ω (0 °C equivalent) -300 °C) OFF : User setting Note : This flag is only valid when the initial data processing compensation flag (RY (n+7) 8) or initial data setting request flag (RY (n+7) 9) is on.
RY (n+7) 8	Initial data processing completion flag	After power on or hardware reset, the initial data are set in the module by turning this flag on during the initial data processing request . Used when designating sampling processing/travel average processing designation, selecting offset/gain value.
RY (n+7) 9	Initial data setting request flag	Turned on when changing the initial values. Used when designating sampling processing/travel average processing, selecting offset/gain value.
RY (n+7) A	Error reset request flag	When this flag is turned on, the wire breakage detection flag/write data error flag are reset (turned off), and the error status flags are reset at the same time. However, the E^2PROM error flag may not be reset (turned off) and therefore the error status flag will remain on.

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

3.5 Remote Register

The AJ65BT-64RD is equipped with remote registers for data communication with the master module. The assignment and data structure of the remote register are explained below.

3.5.1 Remote register assignment

The remote register assignments are shown in the table below.

Communication direction	Address	Description	Default value	Reference section
Master → Remote	RWwm to RWwm +15	Use prohibited	—	—
Remote → Master	RWrn	CH. 1 detected temperature value (16-bit)	0	Section 3.5.2
	RWrn +1	CH. 2 detected temperature value (16-bit)		
	RWrn +2	CH. 3 detected temperature value (16-bit)		
	RWrn +3	CH. 4 detected temperature value (16-bit)		
	RWrn +4	CH. 1 detected temperature value (32-bit)		
	RWrn +5			
	RWrn +6	CH. 2 detected temperature value (32-bit)		
	RWrn +7			
	RWrn +8	CH. 3 detected temperature value (32-bit)		
	RWrn +9			
	RWrn +10	CH. 4 detected temperature value (32-bit)		
	RWrn +11			
	RWrn +12 to RWrn +15	Use prohibited	—	—

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

3.5.2 Remote register for storing detected temperature (Address : RWrn to RWrn+11)

AJ65BT-64RD has two types of remote registers, for 16-bit data and 32-bit data, to store the detected temperature values that are converted into digital values.

(1) 16-bit data storage (Address : RWrn to RWrn+3)

The value to the first place below decimal point of the detected temperature is multiplied by 10, then stored as 16-bit signed binary data.

If the detected temperature value is negative, stores the compliment of 2.

0 is stored at power on.

Example 1 : When the detected temperature is 123.025 °C (Stores 1230)

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	0	1	1	1	0

Example 2 : When the detected temperature is –123.025 °C (Stores –1230)

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	1	0	0	1	0

(2) 32-bit data storage (Address : RWrn+4 to RWrn+11)

The value to the first place below decimal point of the detected temperature is multiplied by 1000, then stored as 32-bit signed binary data.

If the detected temperature value is negative, stores the compliment of 2.

0 is stored at power on.

Example 1 : When the detected temperature is 123.025 °C (Stores 123025)

b31			to				b24	b23				to			b16	b15			to			b8	b7			to			b0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	0	1	0	0	0	1

Example 2 : When the detected temperature is –123.025 °C (Stores –123025)

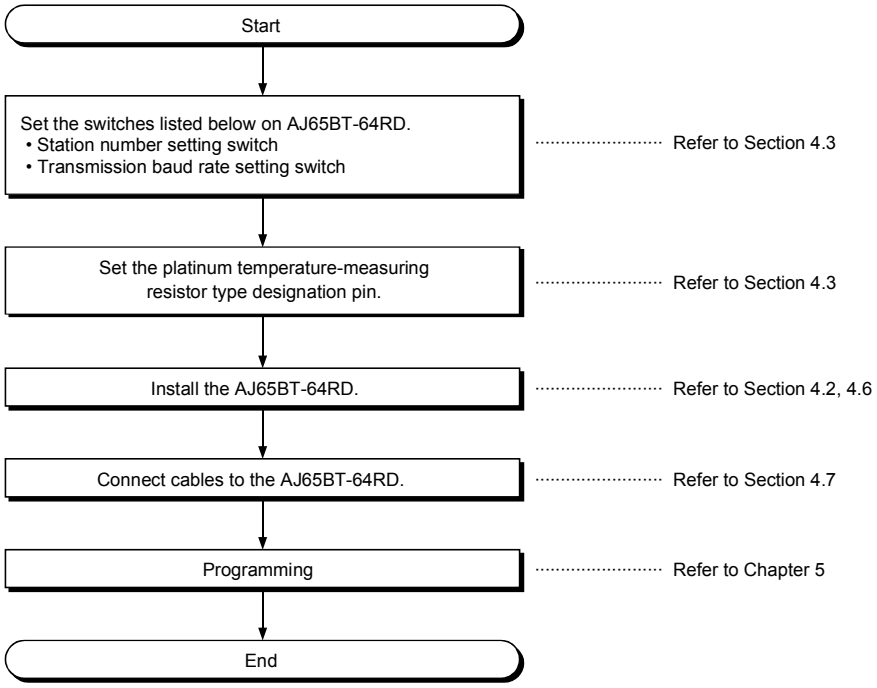
b31			to				b24	b23				to			b16	b15			to			b8	b7			to			b0
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	0	1	1	0	1	1	1	1

4. SETTING AND PROCEDURE BEFORE OPERATION

The procedure before operation of AG65BT-64RD, part identification and setting, and the wiring method are explained below.

4.1 Procedure before Operation

The procedure before operation of AJ65BT-64RD is explained below.



4.2 Handling Precautions

The handling precautions for AJ65BT-64RD is explained below.

⚠CAUTION

- 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.
- For protection of the switches, do not remove the cushioning material before installation.
- Do not directly touch any conductive part of the module.
  Doing so can cause malfunction or failure of the module.
- Tighten the 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.
- Do not touch any terminal while power is on.
  Doing so may cause 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.
- When disposing of this product, treat it as an industrial waste.

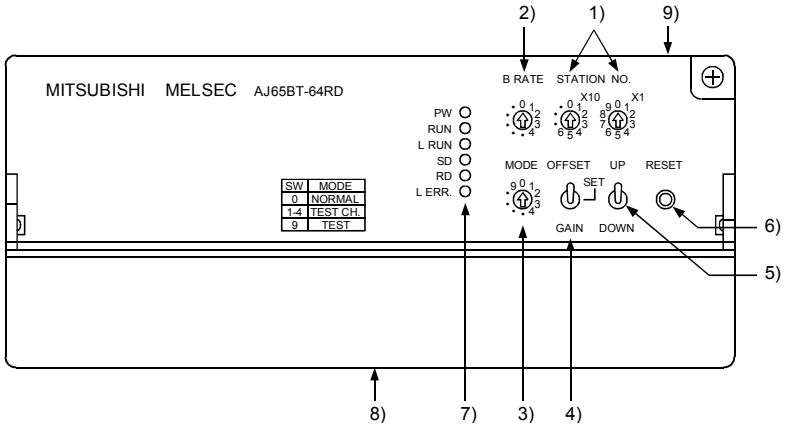
(1) Tighten the module mounting screws and terminal block screws within the following ranges.

Screw area	Tightening torque range
Module mounting screws (M4 screw)	0.78 to 1.18 N • m
Terminal block terminal screws (M3.5 screw)	0.59 to 0.88 N • m
Terminal block installation screws (M4 screw)	0.98 to 1.37 N • m

(2) When using a DIN rail adapter, install the DIN rail considering the precautions described below.
  (a) Applicable DIN rail types (conform to JIS C 2812)
    TH35-7.5Fe
    TH35-7.5Al
    TH35-15Fe
  (b) Space between DIN rail installation screws
    When installing a DIN rail, tighten the screws with a space of less than 200 mm (7.9 in.).

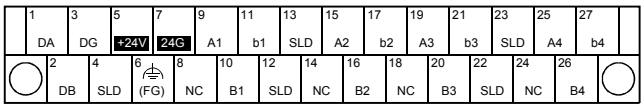
4.3 Part Identification and Setting

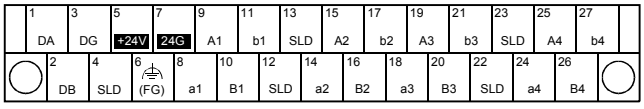
The part identification and setting method for AJ65BT-64RD is explained below.



No.	Name	Description
1)	Station setting switch STATION NO. ×10 ×1	Sets the station number of AJ65BT-64RD in the range of 1 to 61. " × 10" sets the ten's place for a station number. " × 1" sets the one's place for a station number. (Factory setting : 00)
2)	Transmission baud rate setting switch B RATE	Sets the transmission speed of AJ65BT-64RD (for data link). **Setting No.** / **Transmission baud rate** 0 / 156 kbps (factory setting) 1 / 625 kbps 2 / 2.5 Mbps 3 / 5 Mbps 4 / 10 Mbps Other than 0 to 4 / Unused (if a number other than 0 to 4 is used, the "L ERR. " LED is lit and communication error occurs.)
3)	Mode switch MODE	0 / NORMAL / During a normal operation, select this to end the test mode. (Factory setting) 1 to 4 / TEST CH. / At a test mode, select a channel to perform error compensation. 9 / TEST / When executing error compensation, select TEST to enter the test mode after 2 seconds.
4)	Offset/gain setting switch OFFSET SET GAIN	OFFSET / Compensation mode of offset value GAIN / Compensation mode of gain value SET / Store the detected temperature value when the position is switched from OFFSET/GAIN to SET as an offset value/gain value, in the internal memory of AJ65BT-64RD.

<table>
<tr><th>No.</th><th>Name</th><th>Description</th></tr>
<tr><td>5)</td><td>UP/DOWN switch
UP

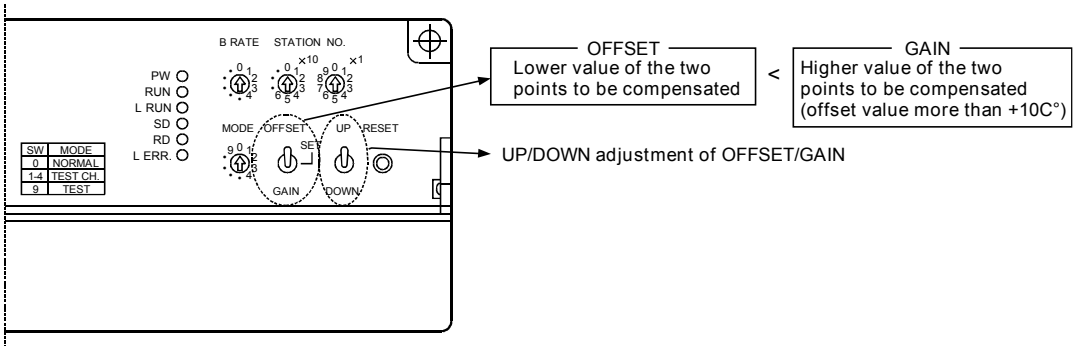
DOWN</td><td>Increase/decrease the offset value/gain value of the channel selected by the mode switch.
ON for less than 1.5 seconds : increase/decrease 0.025 °C at a time.
ON for more than 1.5 seconds : increase/decrease 0.1 °C per 0.04 second.</td></tr>
<tr><td>6)</td><td>Reset switch
RESET
 </td><td>Hardware reset
Initialize the remote register of AJ65BT-64RD.
The initial data processing request flag turns on by turning the switch on.</td></tr>
<tr><td>7)</td><td>LED for operation status display
PW ○
RUN ○
L RUN ○
SD ○
RD ○
L ERR. ○</td><td>
<table>
<tr><td>PW</td><td colspan="2">ON : Power is on
OFF : Power is off</td></tr>
<tr><td rowspan="2">RUN</td><td>Normal mode</td><td>ON : Normal operation
Flicker : Read data error occurred
OFF : 24 V DC power failure or WDT error</td></tr>
<tr><td>Test mode</td><td>Flicker : Flickers when the offset/gain setting switch is set at OFFSET or GAIN
Flickers at 0.5-second intervals when the offset value or gain value being used for compensation is within the setting range.
Flickers at 0.1-second intervals when the offset value or gain value being used for compensation is out of the setting range (out of the temperature input range or the gain value minus the offset value is smaller than +10°C). In this case, the offset or gain value cannot be memorized.
OFF : Turns off when the offset/gain setting switch is positioned at SET</td></tr>
<tr><td>L RUN</td><td colspan="2">ON : Normal communication
OFF : Communication disconnected (time over error)</td></tr>
<tr><td>SD</td><td colspan="2">The light comes on during data transmission</td></tr>
<tr><td>RD</td><td colspan="2">The light comes on during data receiving</td></tr>
<tr><td>L ERR.</td><td colspan="2">ON : Communication data error (CRC error)
Station number, baud rate switch setting error
Flicker at regular intervals: Indicates that the station number or baud rate switch setting was changed while power was on.
Flicker at irregular intervals: Indicates that the terminating resistor is not installed or the module or CC-Link dedicated cable is affected by noise.
OFF: Normal communication</td></tr>
</table>
</td></tr>
<tr><td>8)</td><td>Terminal block</td><td>AJ65BT-64RD3
 

AJ65BT-64RD4
 
</td></tr>
<tr><td>9)</td><td>Platinum temperature-measuring resistor type designation pin</td><td>Designates the type of platinum temperature-measuring resistor to be connected to AJ65BT-64RD using a short pin as either Pt100 (JIS, IEC type) or JPt100 (old JIS type).
(Factory setting is Pt100.)
When connecting Pt100

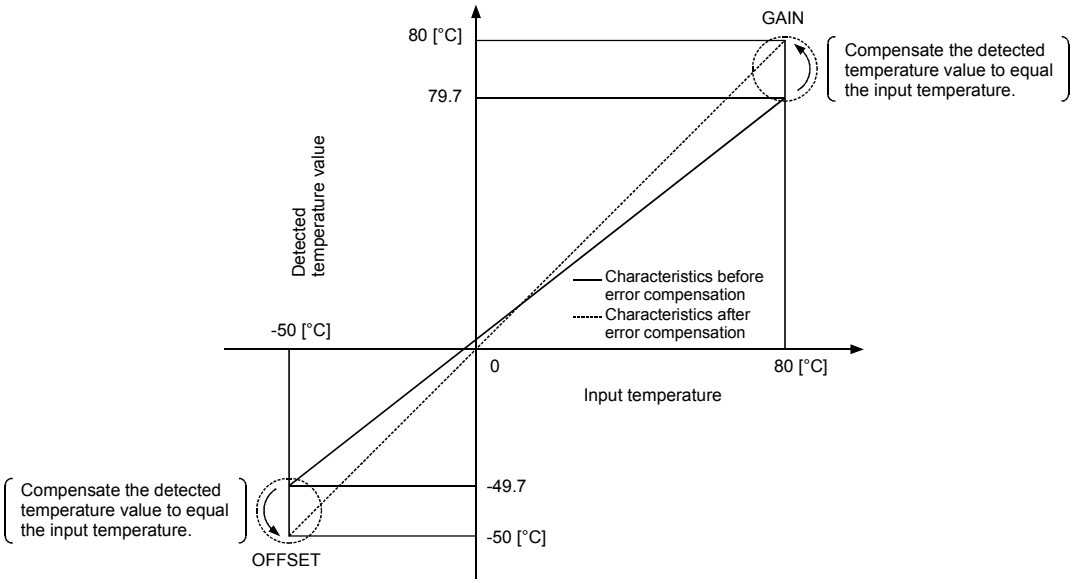
When connecting JPt100
</td></tr>
</table>

4.4 Error Compensation by the Offset Value/Gain Value Setting

The AJ65BT-64RD error compensation is a function that compensates values at arbitrary 2 points (offset value/gain value) within the usage temperature range at system startup or when a correct temperature cannot be detected.
The error compensation is executed by reading the detected temperature value in the remote register using a sequence program and monitoring the values using a peripheral device.



The following shows the characteristic of detected temperature value with respect to the input temperature.



- The error compensation can also be done by using a standard resistor instead of inputting temperature directly to the platinum temperature-measuring resistor.

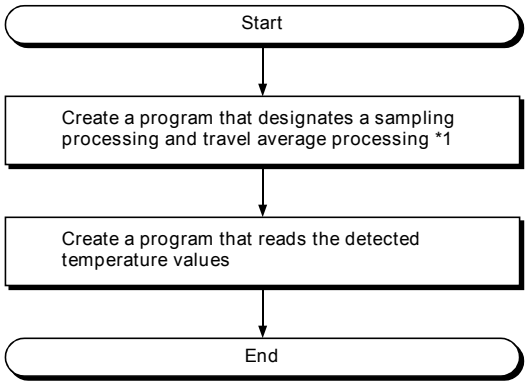
Resistive value of standard resistor	=	Standard resistive value of the platinum temperature-measuring resistor against the input temperature to be the offset value/gain value (Refer to Appendix 1).

POINT

- The offset value/gain value can be obtained with a high accuracy when error compensation is carried out at the minimum and maximum temperatures in the range used.
- Set the offset value/gain value while monitoring the detected temperature value, using a peripheral device.
- Always set the offset and gain values within the allowable temperature input range so that the gain value minus offset value is greater than or equal to 10 °C.
  If the offset value or gain value being used for compensation is out of the setting range, the RUN LED fickers at a high speed (at 0.1 second intervals) and the offset or gain value will not be stored even when the offset/gain setting switch is swiched to SET.
- The offset value and gain value are stored inside AJ65BT-64RD and are not erased even at power off.

4.4.1 Initial settings for error compensation

The following shows the initial settings using a program designed for executing error compensation.



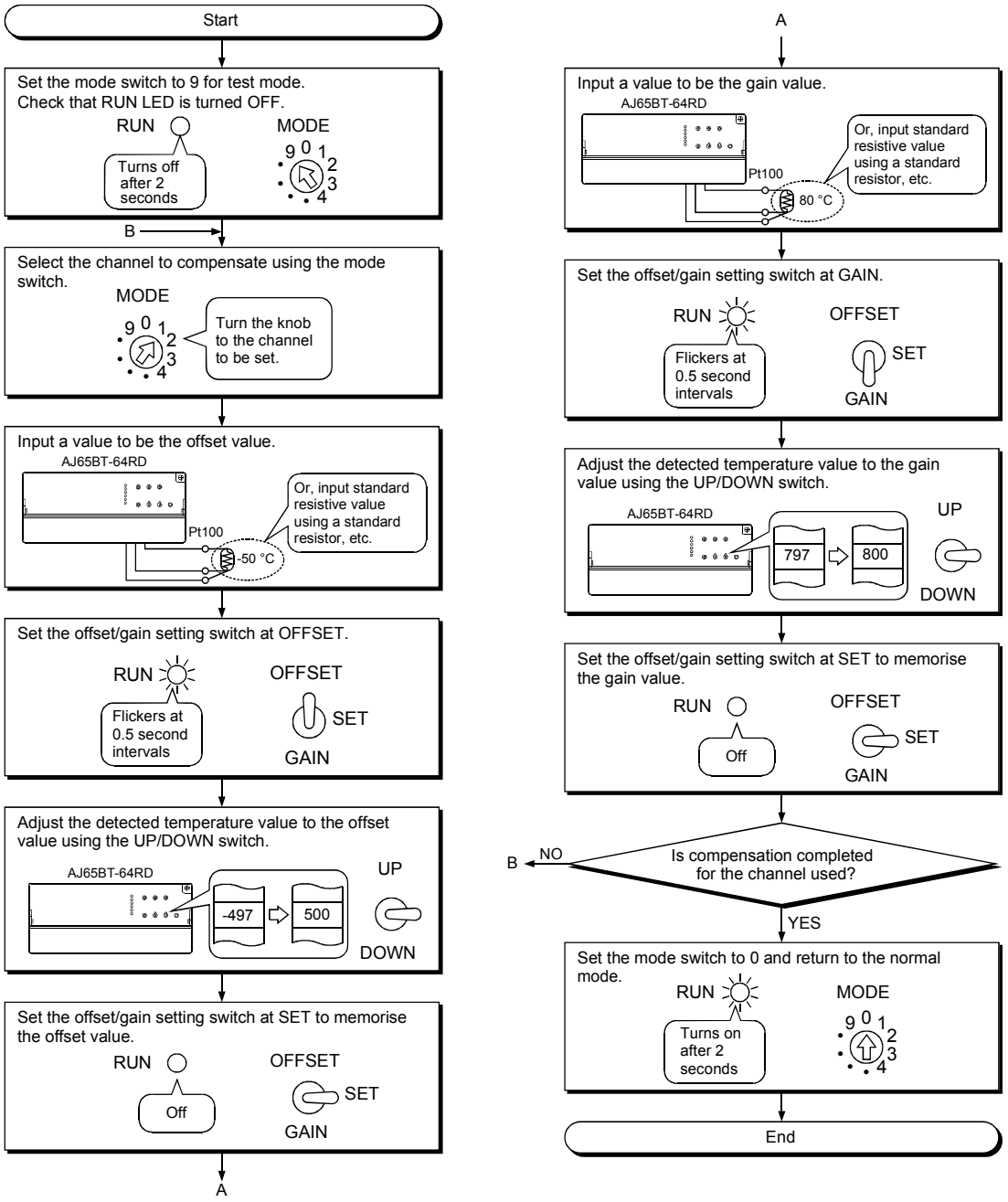
*1 Only when executing error compensation with the value detected by travel average processing.

POINT

- Perform the initial settings for error compensation prior to entering the test mode (at normal mode).
- During the test mode, disable the designation of the conversion enable/disable specification flag, and enable conversion for the automatically selected channels and disable for the unselected channels.

4.4.2 Error compensation procedure

The following shows the flow of error compensation.



POINT

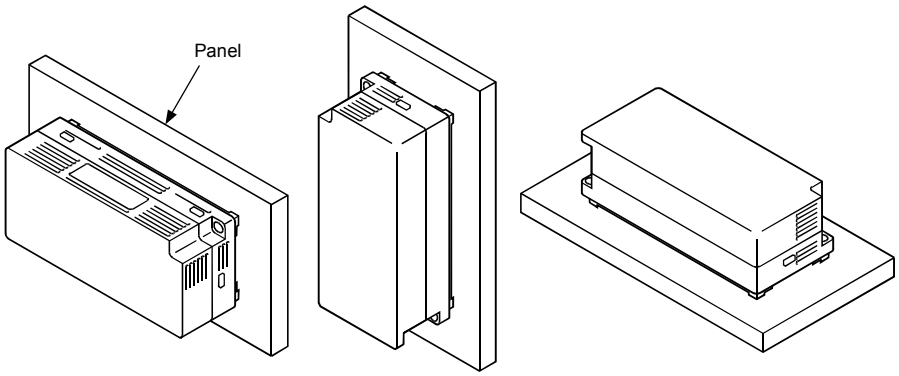
Once an offset value or gain value is set in the test mode, the set value cannot be confirmed (the set value is retained in the internal memory.)

4.5 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 AJ65BT-64RD.
For details, refer to the user's manual (details) of the used master module.

4.6 Orientation of Module Installation

The following shows the possible orientation for AJ65BT-64RD installation.



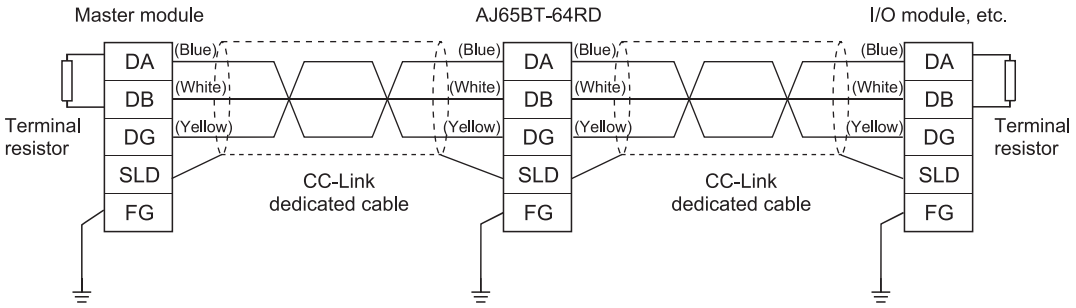
When installing alongside the panel

When installing on the panel

4.7 Wiring

4.7.1 Wiring example with CC-Link modules

The following shows the connection between the AJ65BT-64RD and master module using CC-Link dedicated cable.



POINT

For the modules at both ends of the data link, make sure to connect the “terminal resistor” that is attached to a master module (connect between DA and DB).

4.7.2 Precautions when wiring to a platinum temperature-measuring resistor

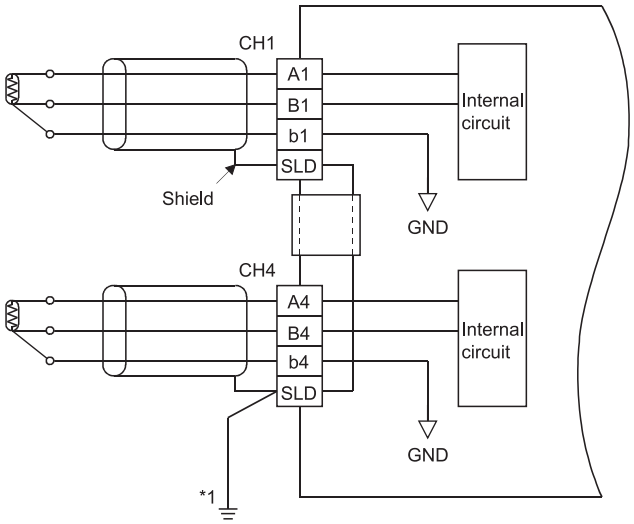
To obtain maximum performance from the functions of AJ65BT-64RD and improve the system reliability, a wiring with high durability against noise is required. The following describes the external wiring precautions.

(1) Use separate cables for the AC and the external input signals of the AJ65BT-64RD, in order not to be affected by the AC side surge or conductivity.

(2) Always place a platinum temperature-measuring resistor at least 10 cm (3.9 in.) apart from the main circuit line and AC control circuit line. Place a platinum temperature-measuring resistor sufficiently apart from circuits with high frequency, such as high-voltage lines and inverter load main circuits. If they are placed close to each other, the platinum temperature-measuring resistor is influenced more easily by the noise, surge, or conductivity.

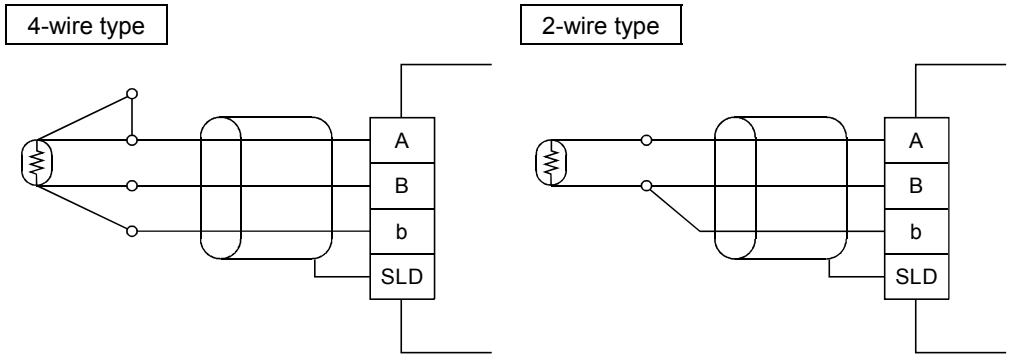
4.7.3 Connecting AJ65BT-64RD3 and platinum temperature-measuring resistor

(1) The highest accuracy can be obtained if a 3-wire type platinum temperature-measuring resistor is used for AJ65BT-64RD3.
The following shows a connection example of a 3-wire type platinum temperature-measuring resistor.



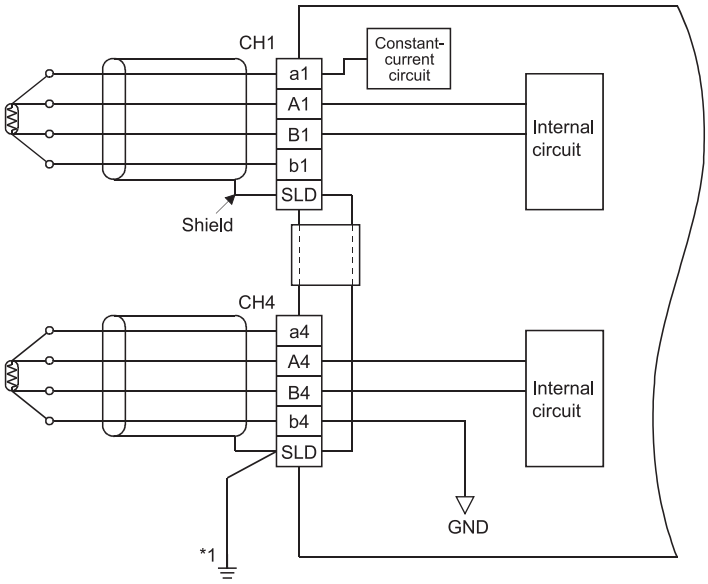
*1 May be better to connect depending on the operating environment.

(2) A 4-wire type or 2-wire type platinum temperature-measuring resistor can also be used for AJ65BT-64RD3.
Connect as shown in the diagrams below when using a 4-wire type or 2-wire type platinum temperature-measuring resistor.



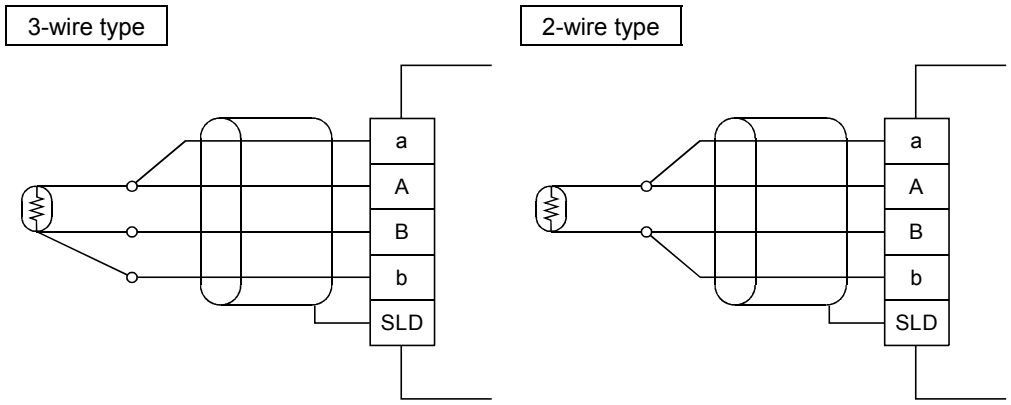
4.7.4 Connecting AJ65BT-64RD and platinum temperature-measuring resistor

(1) The highest accuracy can be obtained if a 4-wire type platinum temperature-measuring resistor is used for AJ65BT-64RD4.
The following shows a connection example of a 4-wire type platinum temperature-measuring resistor.



*1 May be better to connect depending on the operating environment.

(2) A 4-wire type or 3-wire type platinum temperature-measuring resistor can also be used for AJ65BT-64RD4.
Connect as shown in the diagrams below when using a 3-wire type or 2-wire type platinum temperature-measuring resistor.

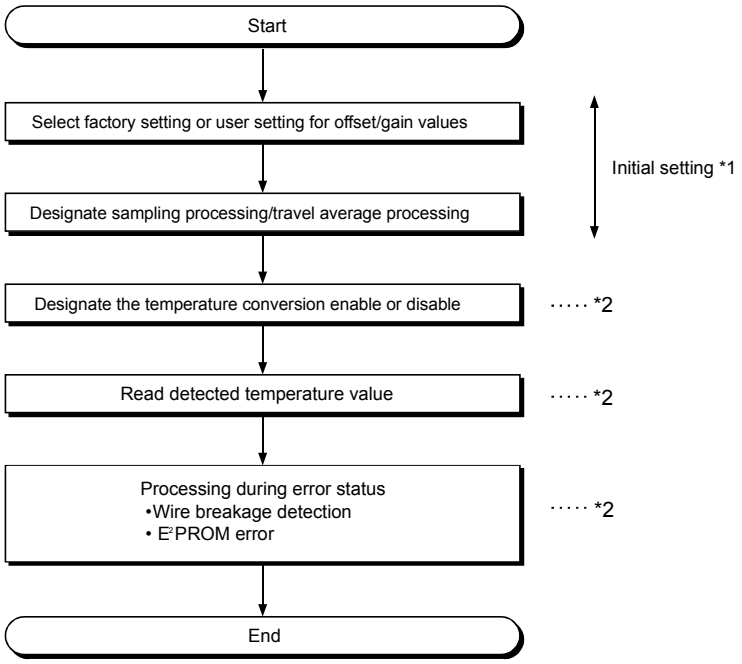


5. PROGRAMMING

The programming procedure, basic programming for read and write, as well as programming examples are explained below.
When utilizing the program examples introduced in this chapter for an actual system, fully verify that controllability in the target system has no problems.
Refer to the user's manual (details) of the used master module for the master module, to Section 3.5 for the remote registers, and to the AnSHCPU/AnACPU/AnUCPU/QCPU-A (A mode) programming manual (dedicated Instructions) for details of the dedicated instructions.

5.1 Programming Procedure

Create a program that operates the AJ65BT-64RD connected to the master module in the following procedure:



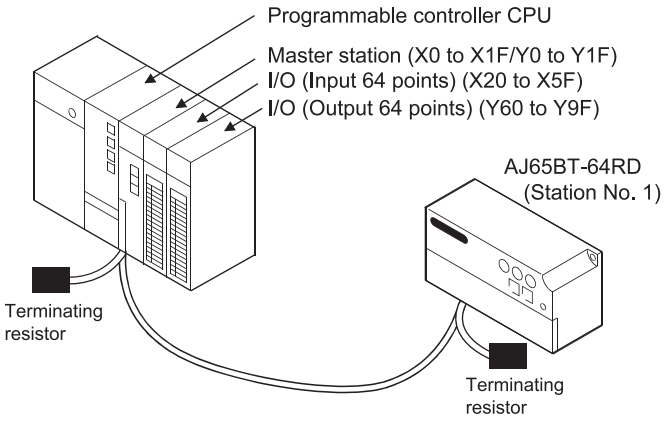
*1 When the QCPU (Q mode) is used, initial setting can be made by the remote device station initialization procedure registration function. When the ACPU, QCPU (A mode) or QnACPU is used, use a sequence program to make the setting.

*2 Setting cannot be made by the remote device station initialization procedure registration function. Use a sequence program to make the setting.

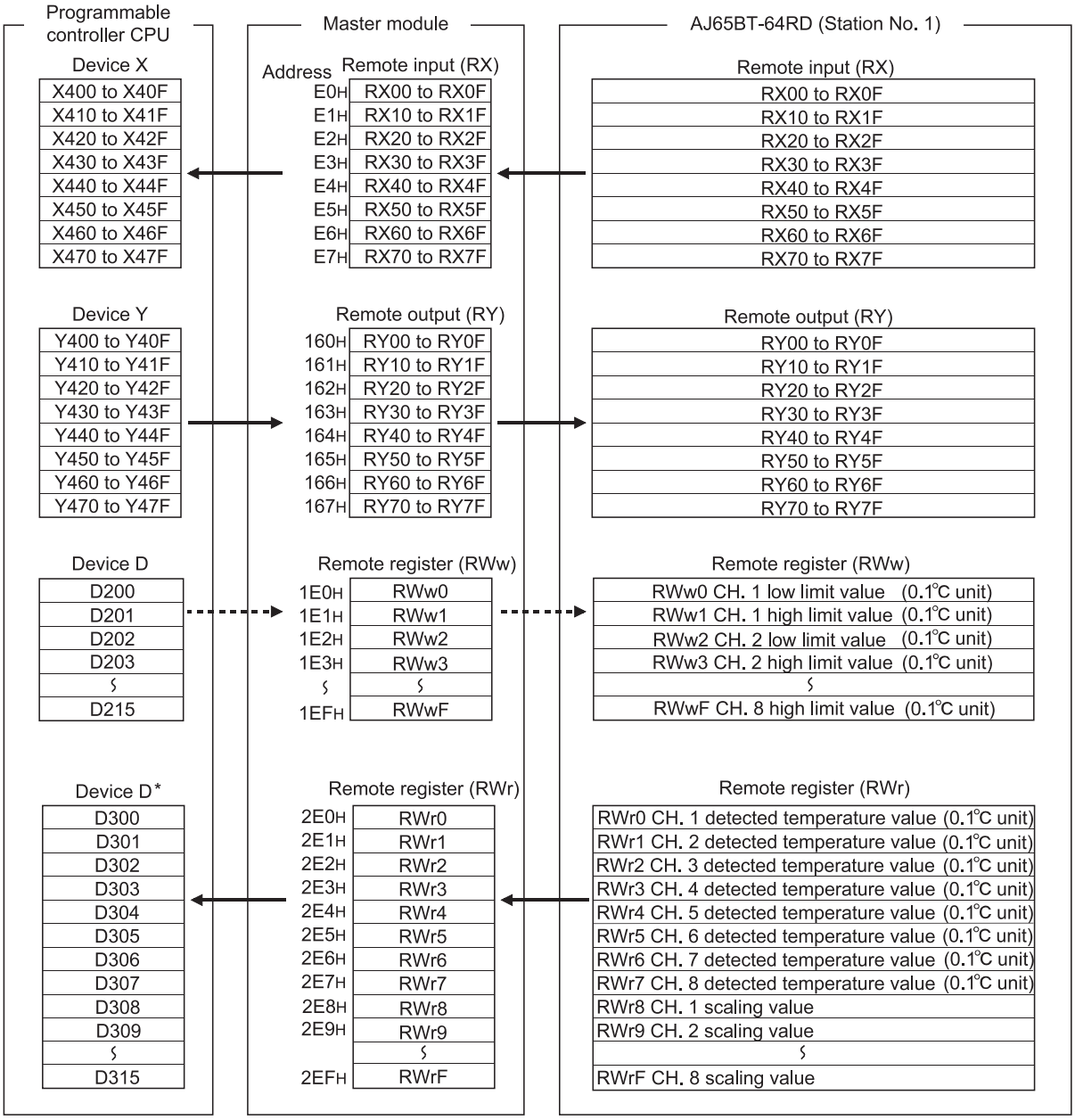
5.2 Program Example Conditions

The program examples given in this chapter have been created under the following conditions.

(1) System configuration



(2) Relationships between programmable controller CPU, master module and AJ65BT-64RD



* RWr0 to RWrF are assigned to D456 - D471 in the program example that uses the RRPA instruction (auto refresh parameter setting) on the ACPU/QCPU (A mode).

POINT

Depending on the used CPU module, the devices used in the program examples of this chapter may not be applicable. For the device setting ranges, refer to the user's manual of the used CPU module.

For example, when the A1SCPU is used, devices X100, Y100 and later are not applicable. Use devices such as B and M.

(3) Initial setting

Setting item	Description
CH. 1 sampling processing/travel average processing designation flag (RY04)	Travel average processing
CH. 2 sampling processing/travel average processing designation flag (RY05)	Travel average processing
Offset/gain value selection flag (RY77)	Factory setting

(4) Other settings

Setting item	Description
CH. 1 conversion enable flag (RY00)	Conversion enable
CH. 2 conversion enable flag (RY01)	Conversion enable

5.3 Program Examples when QCPU (Q Mode) Is Used

The network parameters and auto refresh parameters have been set by GX Developer.
Initial setting can be made easily by using the remote device station initialization procedure registration function.

(1) Parameter setting

(a) Network parameter setting

	1
Start I/O No	0000
Operational setting	Operational settings
Type	Master station
Master station data link type	PLC parameter auto start
Mode	Remote net(Ver.1 mode)
All connect count	1
Remote input(RX)	
Remote output(RY)	
Remote register(RWr)	
Remote register(RWw)	
Ver.2 Remote input(RX)	
Ver.2 Remote output(RY)	
Ver.2 Remote register(RWr)	
Ver.2 Remote register(RWw)	
Special relay(SB)	
Special register(SW)	
Retry count	3
Automatic reconnection station count	1
Stand by master station No.	
PLC down select	Stop
Scan mode setting	Asynchronous
Delay infomation setting	0
Station information setting	Station information
Remote device station initial setting	Initial settings
Interrupt setting	Interrupt settings

Station No.	Station type	Expanded cyclic setting	Exclusive station count	Remote station points	Reserve/invalid station select	Intelligent buffer select(word) Send	Receive	Automatic
1/1	Remote device station	single	Exclusive station 4	128 points	No setting			

(b) Auto refresh parameter setting

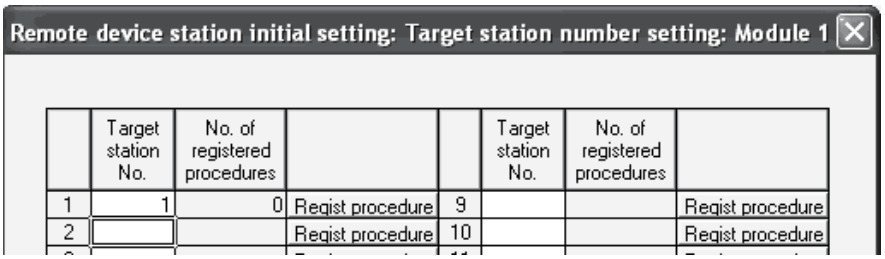
	1
Start I/O No	0000
Operational setting	Operational settings
Type	Master station
Master station data link type	PLC parameter auto start
Mode	Remote net(Ver.1 mode)
All connect count	1
Remote input(RX)	X400
Remote output(RY)	Y400
Remote register(RWr)	D300
Remote register(RWw)	
Ver.2 Remote input(RX)	
Ver.2 Remote output(RY)	
Ver.2 Remote register(RWr)	
Ver.2 Remote register(RWw)	
Special relay(SB)	SB0
Special register(SW)	SW0
Retry count	3
Automatic reconnection station count	1
Stand by master station No.	
PLC down select	Stop
Scan mode setting	Asynchronous
Delay infomation setting	0
Station information setting	Station information
Remote device station initial setting	Initial settings
Interrupt setting	Interrupt settings

(2) Initial setting by remote device station initialization procedure registration function

(a) Target station number setting

Set the target station number of initial setting.

Set the target station number to "1".



(b) Procedure registration setting

The initial setting is registered to the AJ65BT-64RD when the initial data processing request flag (RX78) turns ON and Remote device station initialization procedure registration (SB0D) is set.

The following table indicates the setting results of the initial setting.

Procedure execution condition	Execution
Initial data processing request flag (RX78) turns ON	CH. 1 sampling processing/travel average processing designation flag is set to the travel average processing. (RY04: ON)
	CH. 2 sampling processing/travel average processing designation flag is set to the travel average processing. (RY05: ON)
	Offset/gain value selection flag is set to the factory setting. (RY77: ON)
	Initial data processing completion flag (RY78) is turned ON.
	Initial data setting request flag (RY79) is turned ON.
Initial data processing request flag (RX78) turns OFF	Initial data processing completion flag (RY78) is turned OFF.
Initial data setting completion flag (RX79) turns ON	Initial data setting request flag (RY79) is turned OFF.

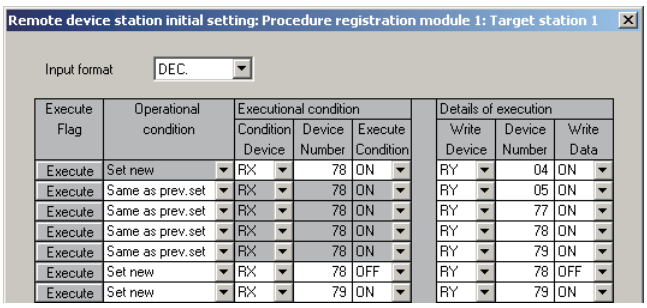
POINT

(1) When the remote device station initialization procedure registration command (SB000D) is turned OFF after initial processing, all the RY signals that turned ON in the initial procedure registration turn OFF. Hence, turn ON the "CH. ☐ conversion enable flag" in a sequence program.

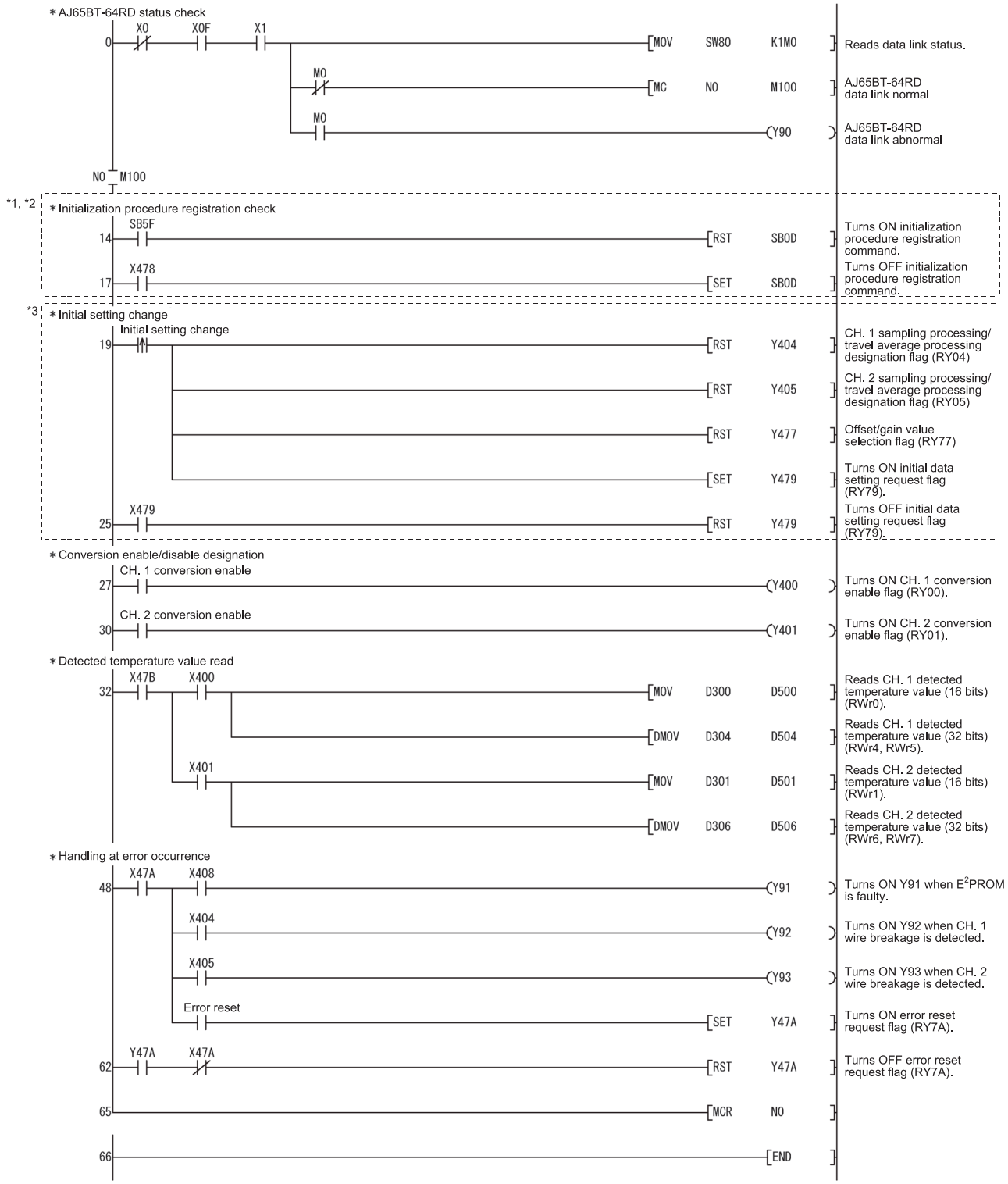
(2) When the initial setting (CH. ☐ sampling processing/travel average processing designation flag, offset/gain selection flag) is changed, the remote device station initialization procedure registration function cannot be used.
Use a sequence program to change the initial setting.

(c) Setting result

The setting result is shown below.

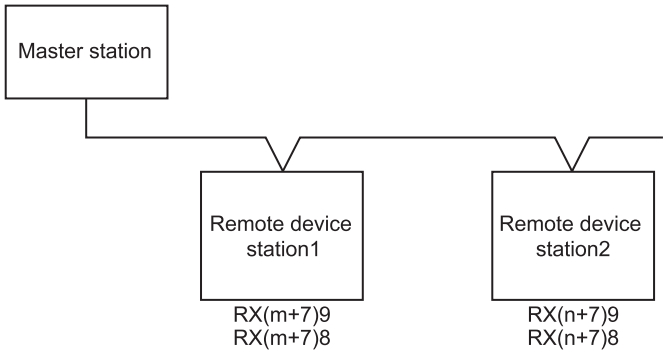


(3) Program example

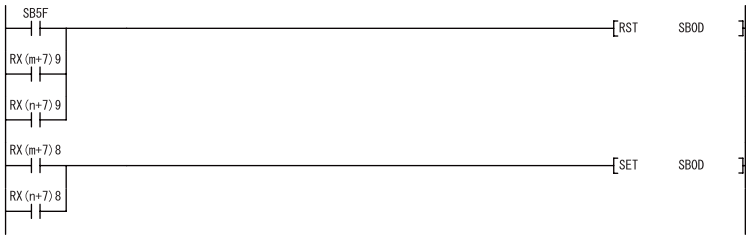


*1: When making remote device station initialization procedure registration to multiple stations, correct the program within the dotted line 1) as shown below.

[System configuration]



[Corrected program]

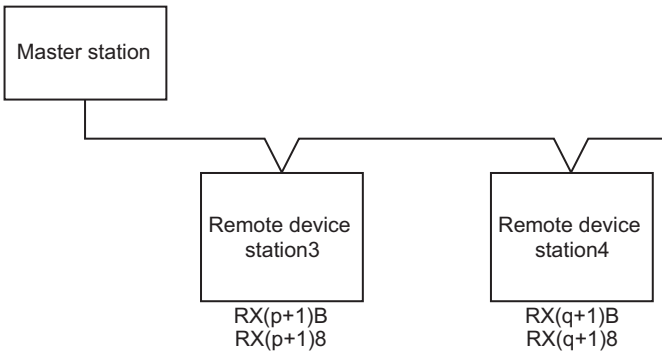


• RX(m+7)9 and RX(n+7)9 are initial data setting completion flags.
• RX(m+7)8 and RX(n+7)8 are initial data processing request flags.
Insert the remote READY and initial data processing request flags for all the stations, to which the remote device station initialization procedure registration has been made, into the program.

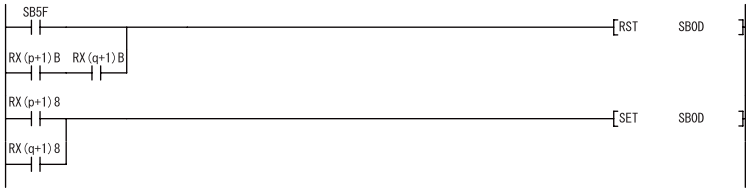
[Usage in combination with other remote device stations]

(1) Depending on the remote device stations to be used, the program enclosed by the dotted line 1) has two programming patterns as shown in the above and the below figures.
(To check which pattern can be used, refer to the manual for the remote device to be used.)

[System configuration]



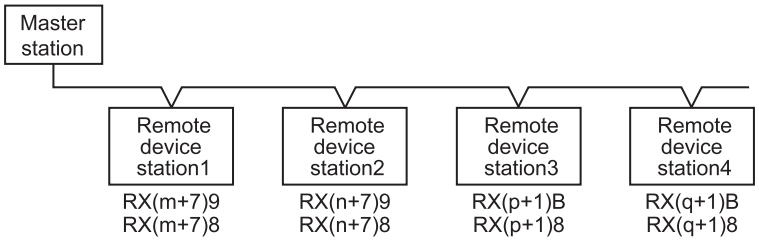
[Corrected program]



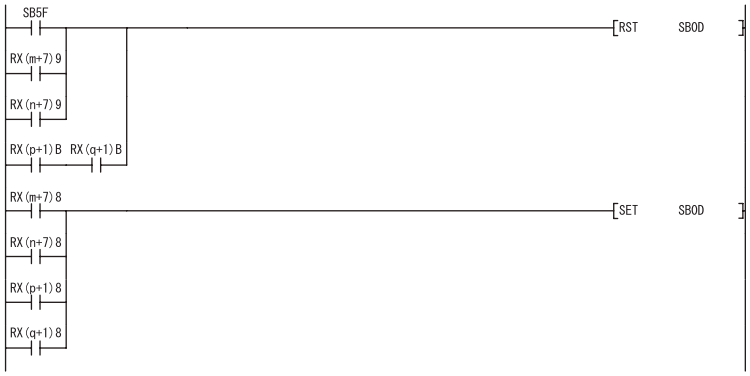
- RX(p+1)B and RX(q+1)B are remote READY.
- RX(p+1)8 and RX(q+1)8 are initial data processing request flags.

(2) When using the program enclosed by the dotted line 1) in combination with other remote device stations, correct the program as shown below.

[System configuration]



[Corrected program]



Note that the master module can register the initialization procedure of only the specified station out of the multiple remote device stations.

The master module supporting this function is the QJ61BT11N which serial No's first 5 digits is 08032 or later.

Fro details, refer to the CC-Link System Master/Local Module User's Manual, "CHAPTER 4 FUNCTIONS"

*2: Before the communication program is executed with remote device stations, the program enclosed by the dotted line 1) enables the initial setting by using the SB0D (remote device station initialization procedure registration instruction) and SB5F (completion status of remote device station initialization procedure). Initialization processing can't be made only by the parameter setting of GX Developer.

*3: The program enclosed by the dotted line 2) is necessary only when the initial settings are changed.

5.4 Program Examples when QnACPU Is Used

The network parameters and auto refresh parameters have been set by GX Developer.

(1) Parameter setting

(a) Network parameter setting

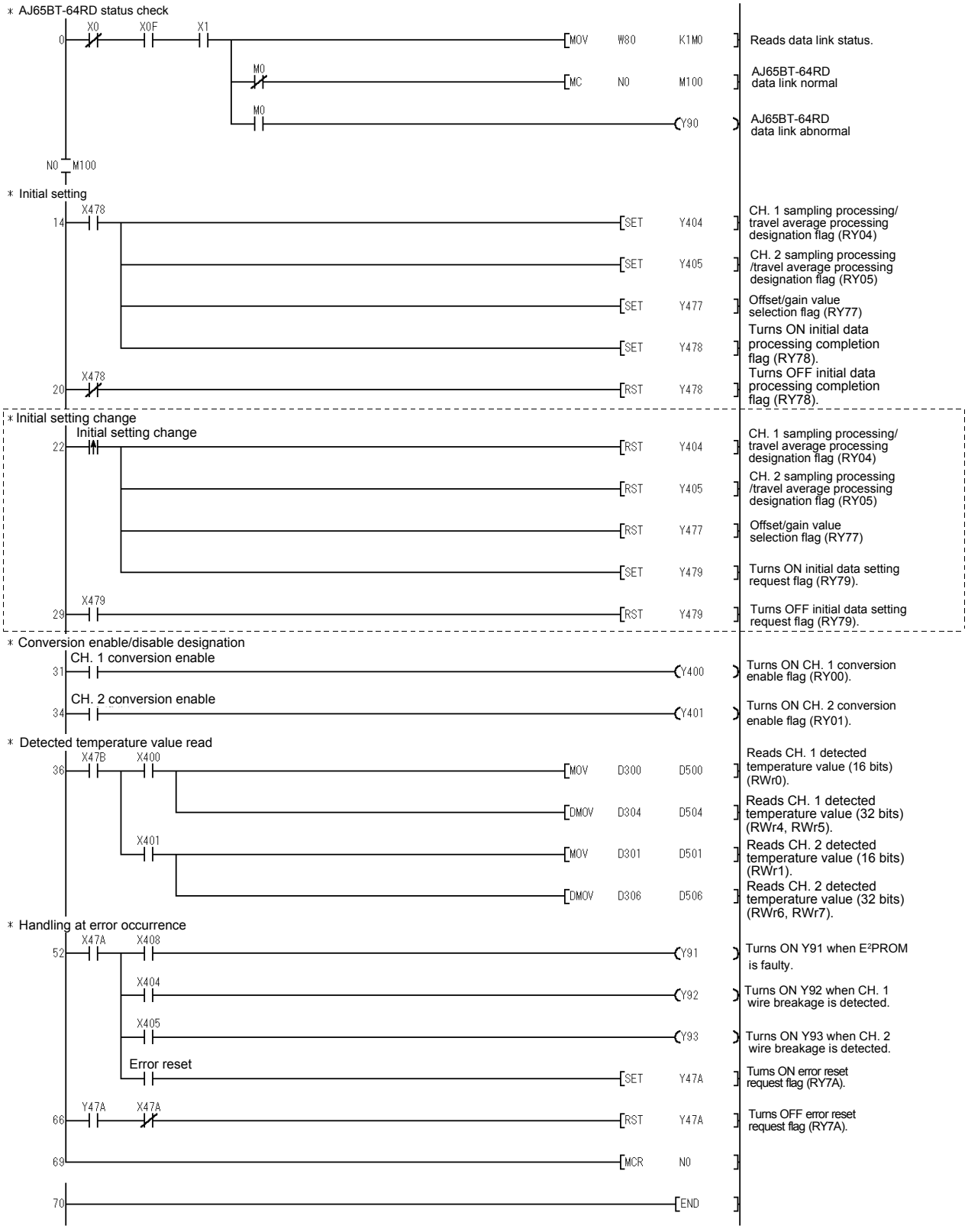
	1
Start I/O No.	0000
Type	Master station
All connect count	1
Remote input(RX)	
Remote output(RY)	
Remote register(RWr)	
Remote register(RWw)	
Special relay(SB)	
Special register(SW)	
Retry count	3
Automatic reconnection station count	1
Wait master station No.	0
PLC down select	Stop
Scan mode setting	Asynchronously
Delay information setting	0
Station information setting	Station information

StationNo.	Station type	Exclusive station count	Reserve/invalid station select	Intelligent buffer select(word)		
				Send	Receive	Automatic
1/1	Remote device station	Exclusive station 4	No setting			

(b) Auto refresh parameter setting

	1
Start I/O No.	0000
Type	Master station
All connect count	1
Remote input(RX)	X400
Remote output(RY)	Y400
Remote register(RWr)	D300
Remote register(RWw)	
Special relay(SB)	
Special register(SW)	
Retry count	3
Automatic reconnection station count	1
Wait master station No.	0
PLC down select	Stop
Scan mode setting	Asynchronously
Delay information setting	0
Station information setting	Station information

(3) Program example

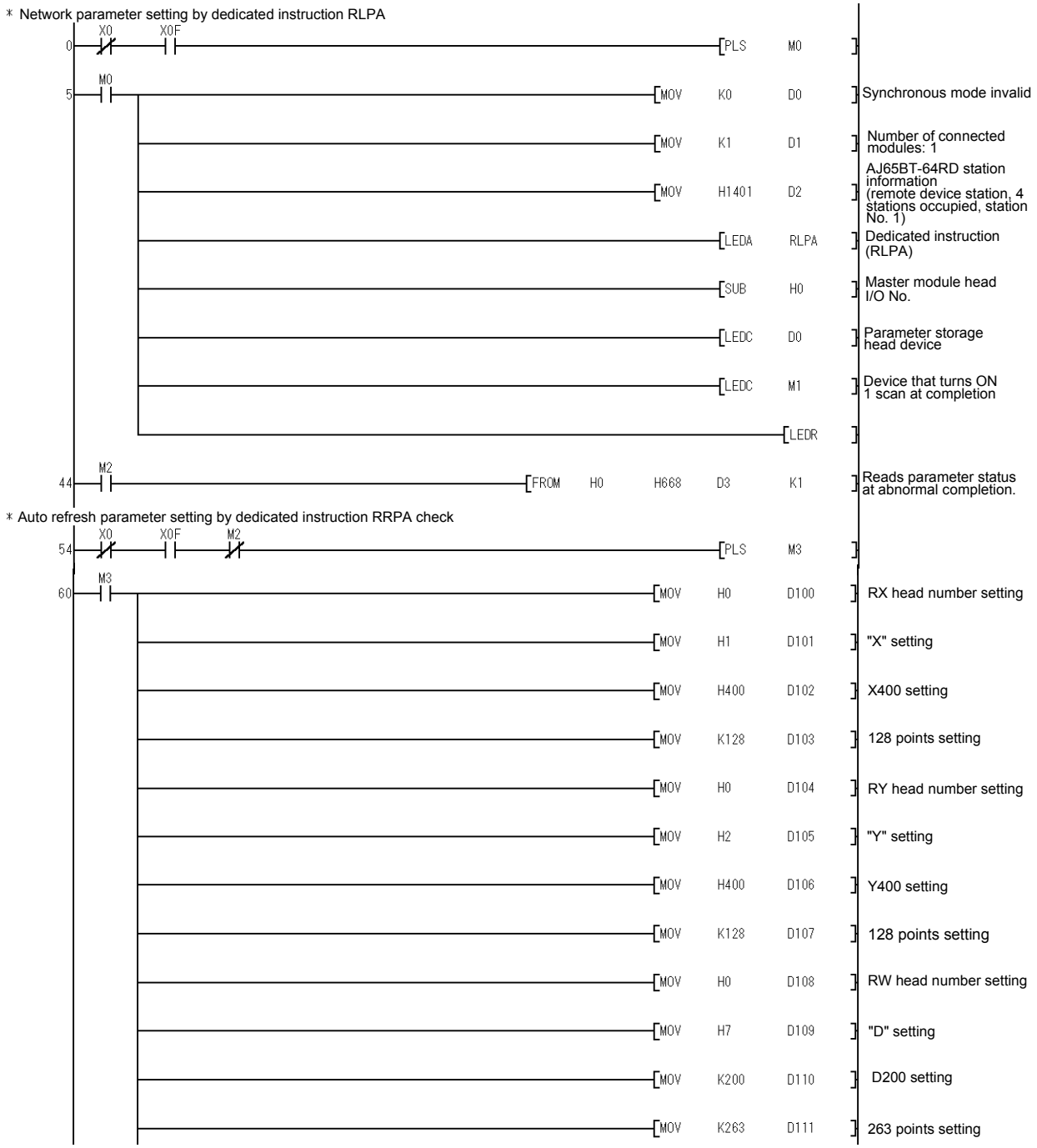


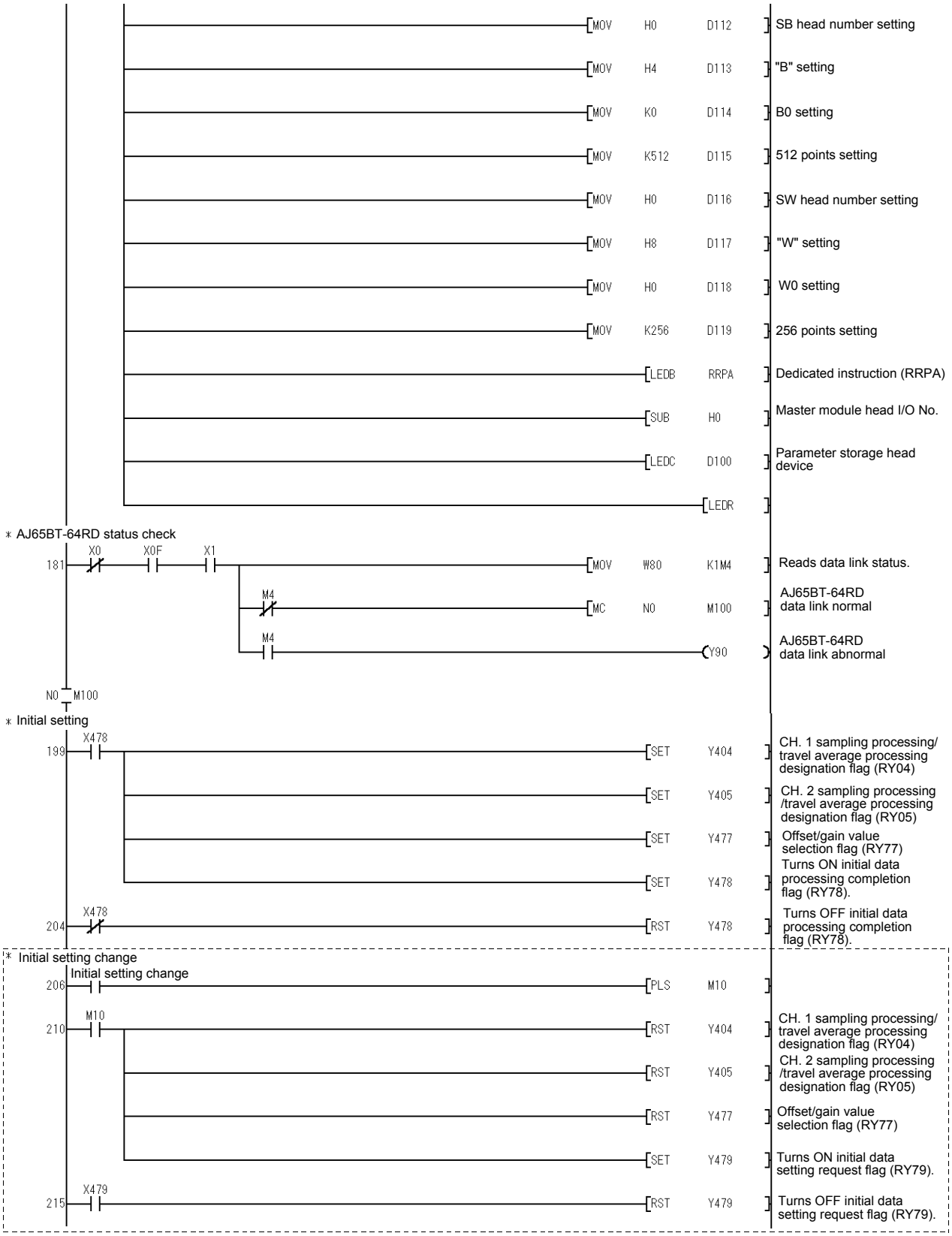
*The program within the dotted frame is necessary only when the initial setting is changed.

5.5 Program Example when ACPU/QCPU (A Mode) Is Used (Dedicated Instructions)

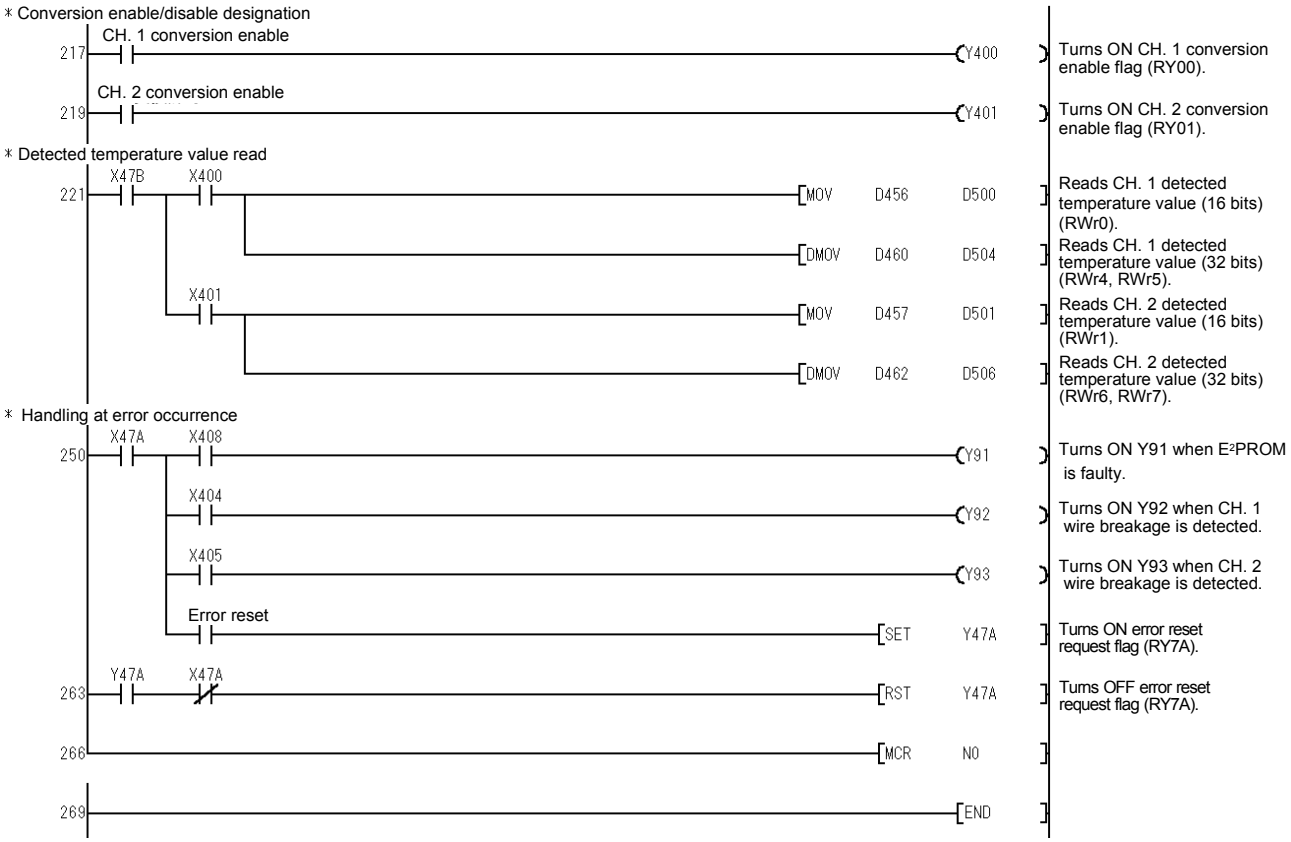
The network parameters and auto refresh parameters have been set by the sequence program.

(1) Program example





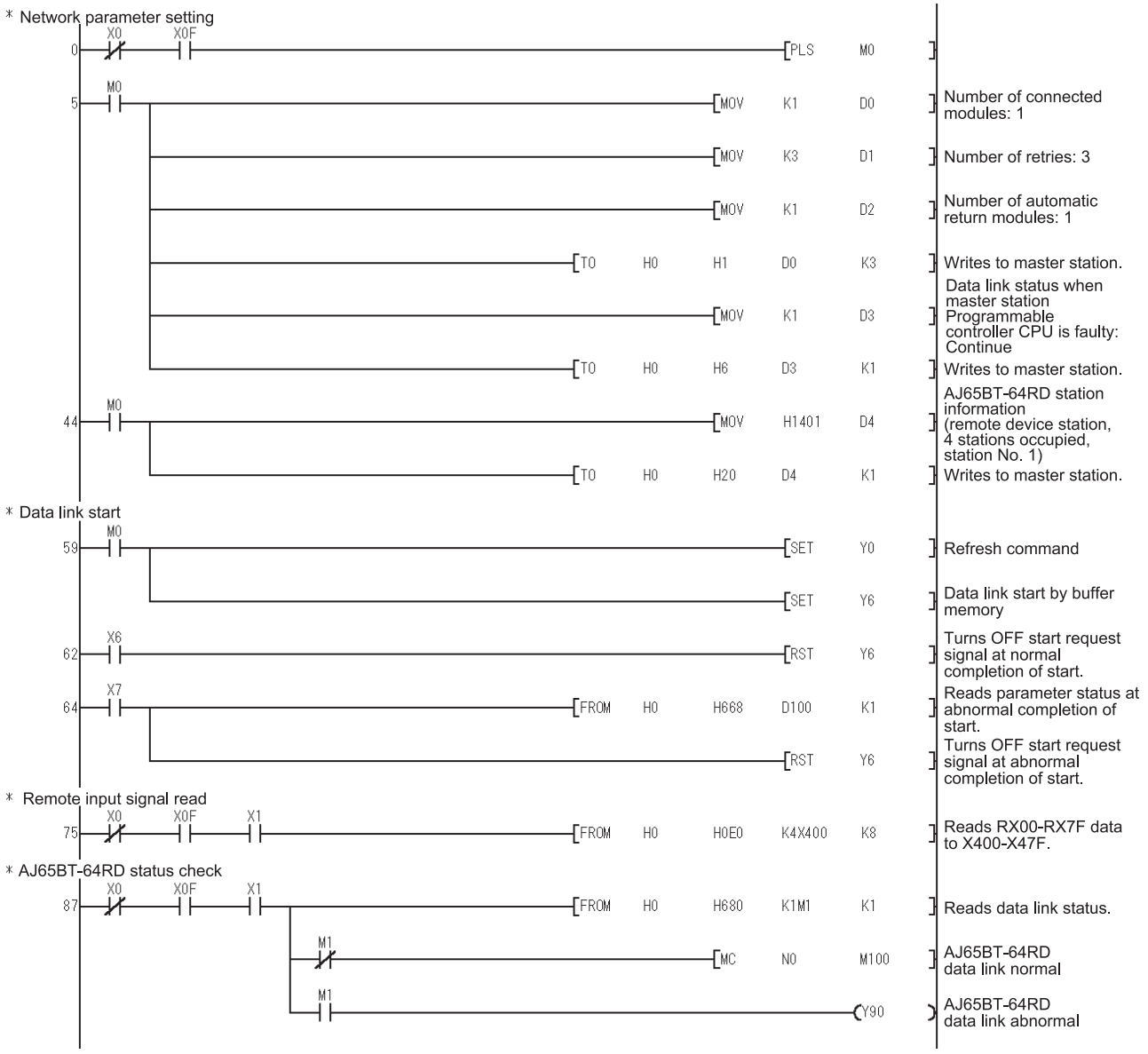
* The program within the dotted frame is necessary only when the initial setting is changed.

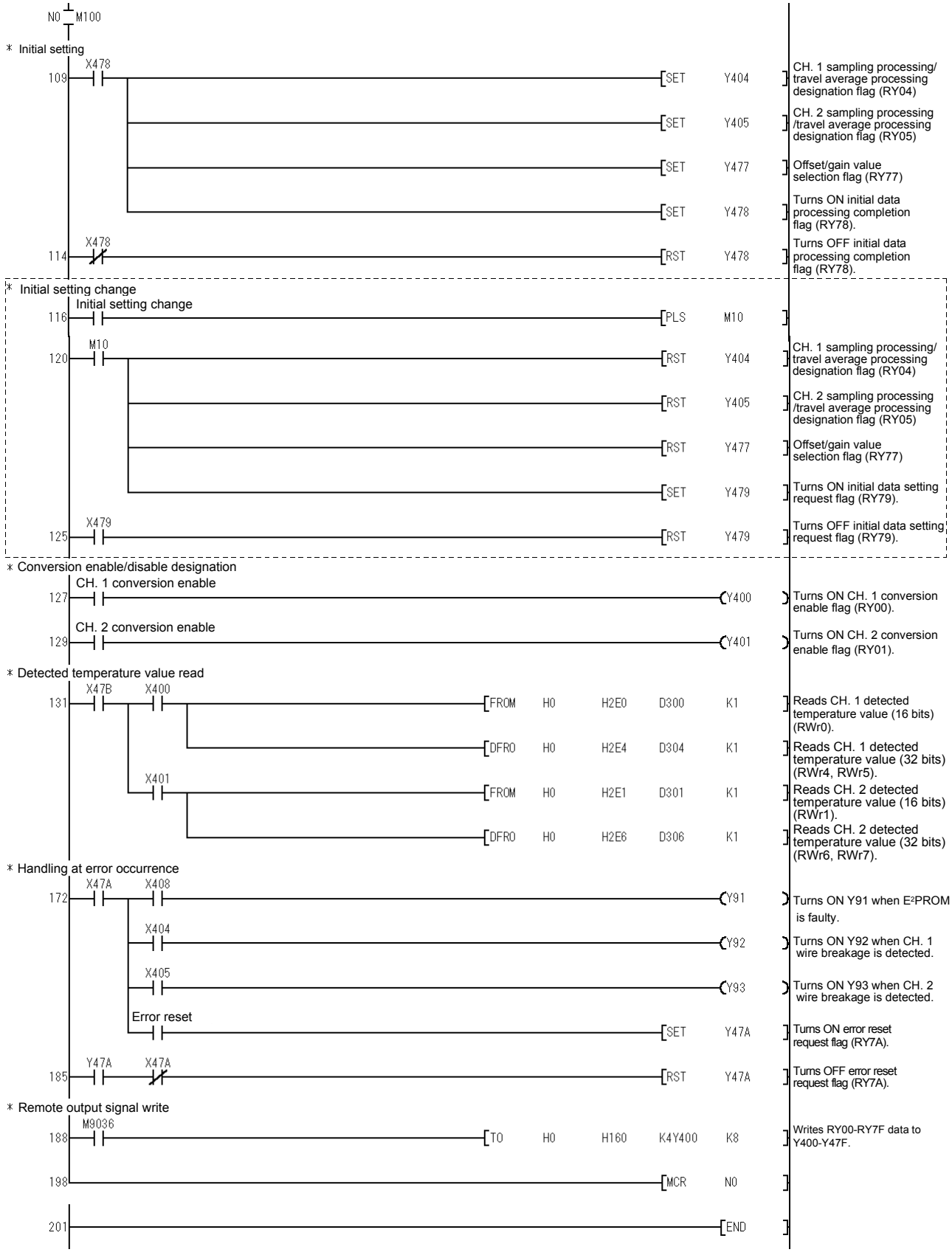

* Conversion enable/disable designation
CH. 1 conversion enable
217
Y400
Turns ON CH. 1 conversion enable flag (RY00).
CH. 2 conversion enable
219
Y401
Turns ON CH. 2 conversion enable flag (RY01).
* Detected temperature value read
X47B
X400
221
MOV D456 D500
Reads CH. 1 detected temperature value (16 bits) (RWr0).
DMOV D460 D504
Reads CH. 1 detected temperature value (32 bits) (RWr4, RWr5).
X401
MOV D457 D501
Reads CH. 2 detected temperature value (16 bits) (RWr1).
DMOV D462 D506
Reads CH. 2 detected temperature value (32 bits) (RWr6, RWr7).
* Handling at error occurrence
X47A
X408
250
Y91
Turns ON Y91 when E2PROM is faulty.
X404
Y92
Turns ON Y92 when CH. 1 wire breakage is detected.
X405
Y93
Turns ON Y93 when CH. 2 wire breakage is detected.
Error reset
SET Y47A
Turns ON error reset request flag (RY7A).
Y47A
X47A
263
RST Y47A
Turns OFF error reset request flag (RY7A).
266
MCR N0
269
END

5.6 Program Example when ACPU/QCPU (A Mode) Is Used (FROM/TO Instructions)

The network parameters have been set by the sequence program.

(1) Program example





*The program within the dotted frame is necessary only when the initial setting is changed.

6. TROUBLESHOOTING

The general troubleshooting methods for using AJ65BT-64RD is explained below.

6.1 Cause of Errors and Corrective Actions by LED Indication

The following describes the error confirmation method using the LEDs on AJ65BT-64RD.
For the errors associated with the programmable controller CPU and master module, refer to the user's manual for the programmable controller CPU and master module, respectively.

(1) When AJ65BT-64RD's "RUN" LED is off

Cause	Corrective action
Watchdog timer error occurred.	Confirm the watchdog timer error with the master module's special link register, then restart the power to AJ65BT-64RD *1. If "RUN" LED does not come on after power restart, contact the nearest representative or branch regarding the problem, as hardware may be faulty.
24 V DC power is not supplied to AJ65BT-64RD, or voltage is insufficient.	Check the voltage of 24 V DC power supply.
At test mode, the offset/gain setting switch is positioned at SET.	After setting offset/gain, position the mode switch to 0 (NORMAL).

(2) When AJ65BT-64RD's "RUN" LED flikers at 0.5-second intrvals

Cause	Corrective action
At test mode, the offset/gain setting switch is positioned at OFFSET or GAIN.	After setting offset/gain, position the mode switch to 0 (NORMAL).

(3) When AJ65BT-64RD's "RUN" LED flikers at 0.1-second intrvals

Cause	Corrective action
In the test mode the offset or gain value being used for compensation has exceeded the setting range.	Set the offset value or gain value within the following range : • Within the temperature input range • (Gain value) – (Offset value) ≥ 10 °C

(4) When AJ65BT-64RD's "L RUN." LED is off

Cause	Corrective action
Cables are broken or shorted.	Look for the broken or shorted transmission cables and repair them.
The master station has the stopped data link.	Confirm that no error has occurred in the master station.
Duplicate station number.	Correct the station number setting of the duplicate module, then restart the power *1.
The setting switch is set outside the range (station number 0, or 62 or greater, transmission speed 5 to 9).	Correct the setting switch setting, then restart the power *1.

(5) When AJ65BT-64RD's "L ERR." LED flikers

Cause	Corrective action
The setting of station number switch or transmission speed switch is changed during normal operation.	Reinstate the station number or transmission speed setting to the original setting before the change, then restart the power. *1. If "L RUN" LED does not come on after power restart, contact the nearest representative or branch regarding the problem, as hardware may be faulty.
The station number switch or transmission speed switch is faulty.	If "L ERR." LED starts to flicker while in operation even though no change has been made to the switch setting, contact the nearest representative or branch regarding the problem, as hardware may be faulty.

(6) When AJ65BT-64RD's "L ERR." LED is on

Cause	Corrective action
The setting switch is set outside the range (station number 0, or 62 or greater, transmission speed 5 to 9).	Correct the setting switch setting, then restart the power. *1
Forgot to install the terminal resistor.	Confirm whether the terminal resistor is installed. If the terminal resistor is not connected, connect it, then restart the power. *1
AJ65BT-64RD or transmission cable is affected by noise.	• Ground (class D grounding) the both ends of shield of the CC-Link dedicated cable via SLD and FG of each module. • Securely ground the FG terminal of the module. • When performing pipe wiring, securely ground the pipe.

*1 Restart power : Turn on the power supply again, or turn on the reset switch.

6.2 When Wire Breakage Detection Flag is On

Cause	Corrective action
Connection between platinum temperature-measuring resistor and cable is incomplete.	Securely connect the platinum temperature-measuring resistor and cable.
Terminal screw is loose.	Tighten the terminal screws within the specified torque range.
The connected platinum temperature-measuring resistor or cable has wire breakage.	Check the continuity of platinum temperature-measuring resistor and cable, and replace the broken platinum temperature-measuring resistor or cable.
The channel to which platinum temperature-measuring resistor is not connected is designated as conversion enabled.	Confirm the channels for which the conversion enable is designated and channel to which platinum temperature-measuring resistor is connected, then correct the conversion enable designation.

6.3 When E^2PROM Error Flag is On

Cause	Corrective action
Error in the internal memory storing the offset value/gain value set by user	Restart power for AJ65BT-64RD. *1 If the E^2PROM error flag is still on after power restart, contact the nearest representative or branch regarding the problem, as hardware may be faulty.

*1 Restart power : Turn on the power supply again, or turn on the reset switch.

6.4 When Detected Temperature Value cannot be Read

Cause	Corrective action
The channel used is designated as conversion disabled.	Designate the channel as conversion enable in sequence program.
Programmable controller CPU or master module error	Confirm the programmable controller CPU and master module.

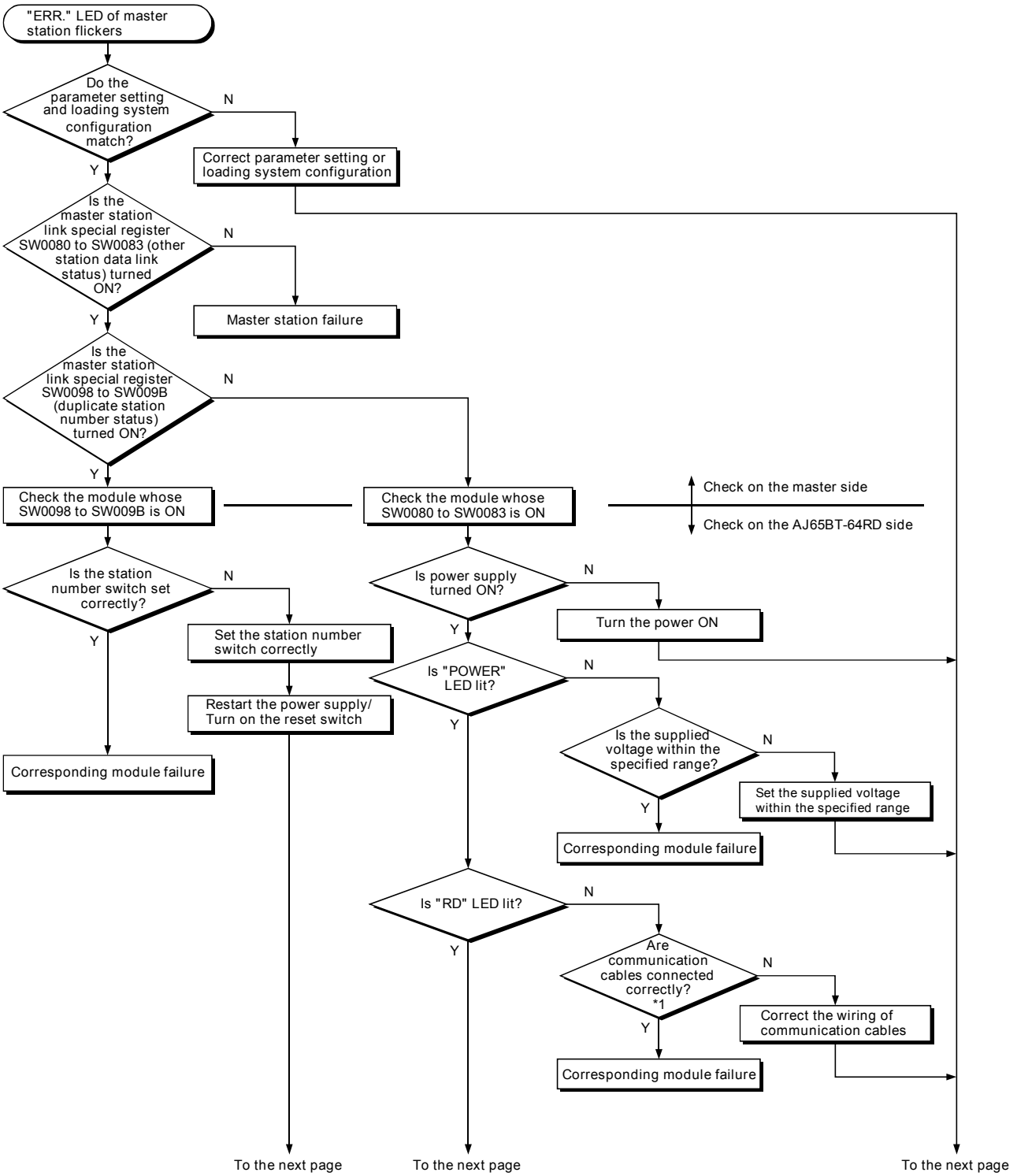
6.5 When Detected Temperature Value is Abnormal

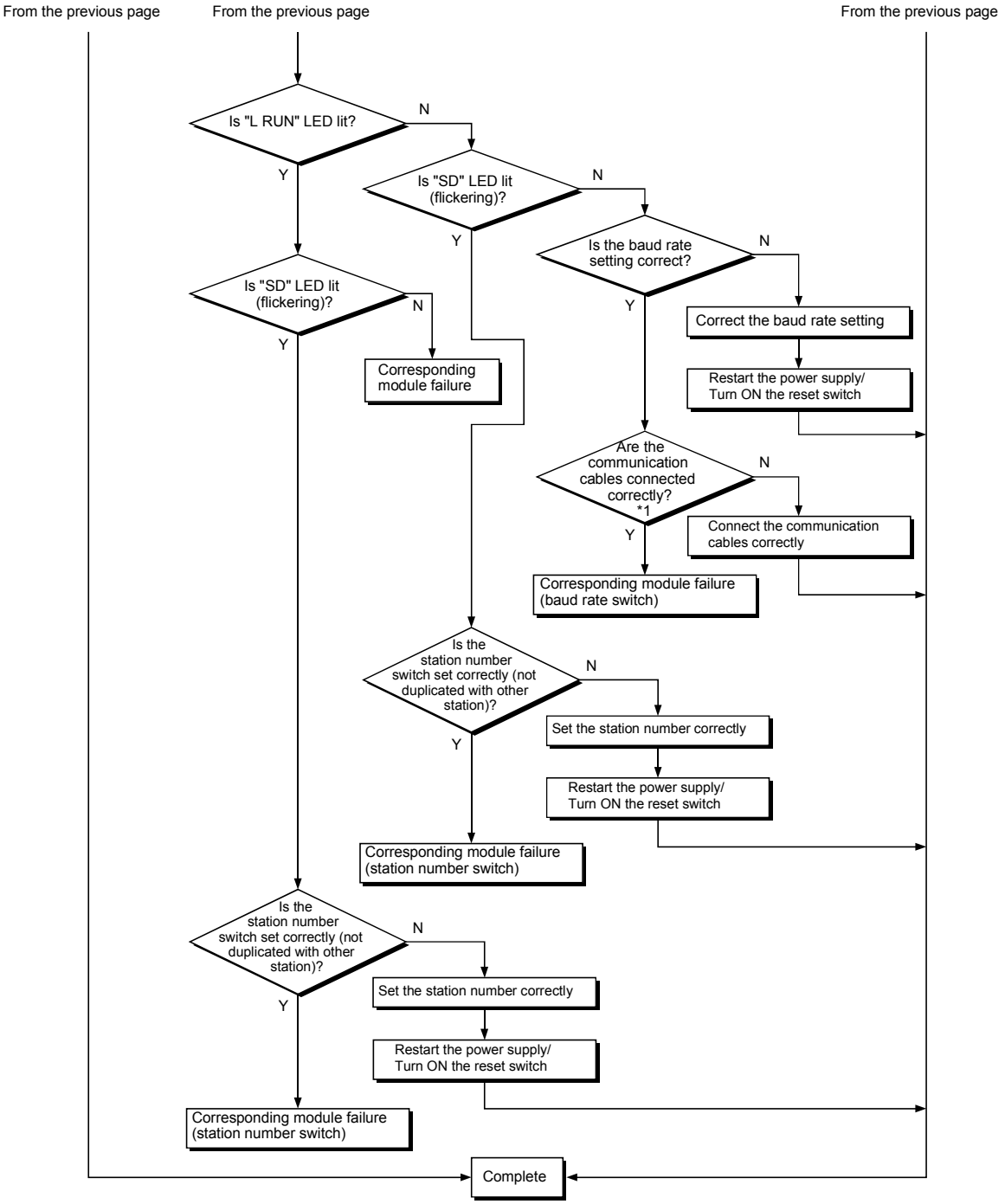
Cause	Corrective action
The platinum temperature-measuring resistor connected is different from what is designated.	Designate the platinum temperature-measuring resistor connected.
Affected by noise.	Confirm the influence from grounding and adjacent devices, then take measures against noise.

6.6 When There is a Communication Error between Master Station and AJ65BT-64RD

If the station number duplicate bit is turned on in the link special register SW0098 to SW009B (duplicate station number status), check the corresponding station number of AJ65BT-64RD using the following flow.

Troubleshooting flow when “ERR.” LED of master station is flickering





*1 Check for short-circuits, reversed connection, wire breakage, terminal resistor, FG connection, overall distance and station-to-station distance.

APPENDIX

Appendix 1 Standard Thermal Electromotive Force of Platinum Temperature-Measuring Resistor

Appendix 1.1 New JIS·IEC type (Pt100)

JIS C 1604-1997, IEC 751-1983 **Unit : Ω**

–100	–0	Temperature [°C]		Temperature [°C]	0	100	200	300	400	500	600
60.26	100.00	–0		0	100.00	138.51	175.86	212.05	247.09	280.98	313.71
56.19	96.09	–10		10	103.90	142.29	179.53	215.61	250.53	284.30	
52.11	92.16	–20		20	107.79	146.07	183.19	219.15	253.96	287.62	
48.00	88.22	–30		30	111.67	149.83	186.84	222.68	257.38	290.92	
43.88	84.27	–40		40	115.54	153.58	190.47	226.21	260.78	294.21	
39.72	80.31	–50		50	119.40	157.33	194.10	229.72	264.18	297.49	
35.54	76.33	–60		60	123.24	161.05	197.71	233.21	267.56	300.75	
31.34	72.33	–70		70	127.08	164.77	201.31	236.70	270.93	304.01	
27.10	68.33	–80		80	130.90	168.48	204.90	240.18	274.29	307.25	
	64.30	–90		90	134.71	172.17	208.48	243.64	277.64	310.49	

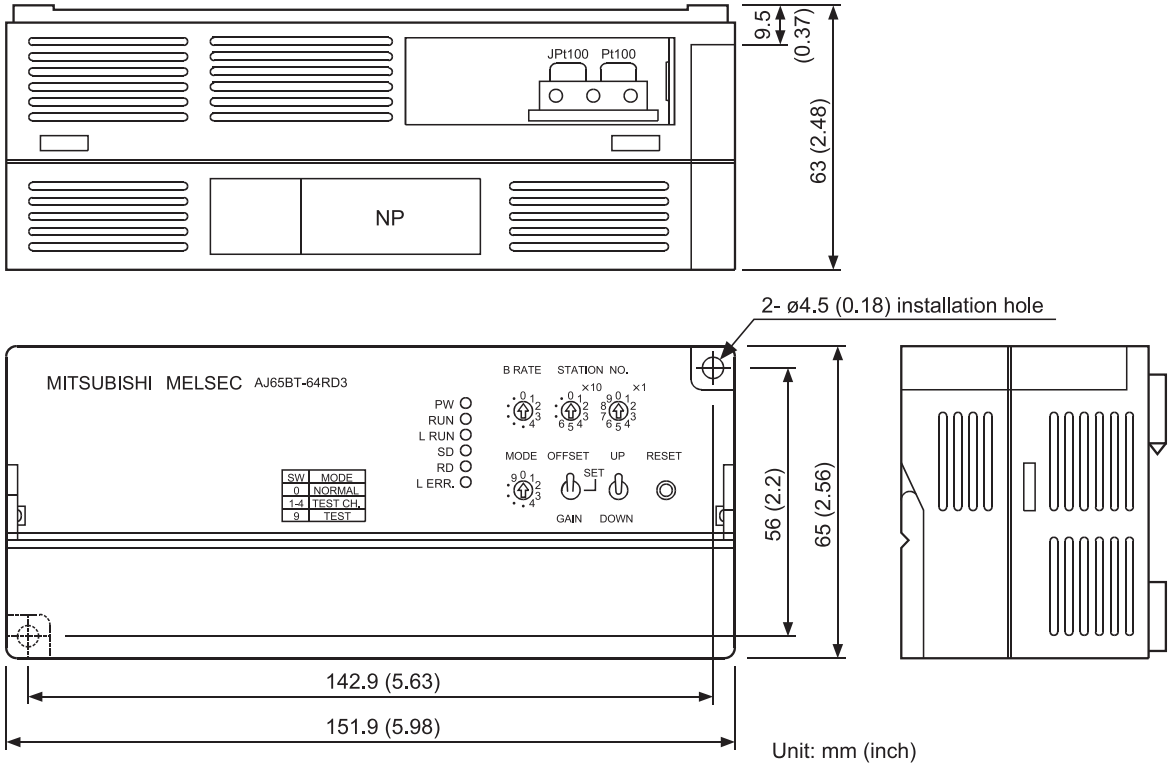
Appendix 1.2 Old JIS type (JPt100)

JIS C 1604-1981 **Unit : Ω**

–100	–0	Temperature [°C]		Temperature [°C]	0	100	200	300	400	500	600
59.57	100.00	–0		0	100.00	139.16	177.13	213.30	249.56	284.02	317.28
55.44	96.02	–10		10	103.97	143.01	180.86	217.54	253.06	287.40	
51.29	92.02	–20		20	107.93	146.85	184.58	221.15	256.55	290.77	
47.11	88.01	–30		30	111.88	150.67	188.29	224.74	260.02	294.12	
42.91	83.99	–40		40	115.81	154.49	191.99	228.32	263.49	297.47	
38.68	79.96	–50		50	119.73	158.29	195.67	231.89	266.94	300.80	
34.42	75.91	–60		60	123.64	162.08	199.35	235.45	270.38	304.12	
30.12	71.85	–70		70	127.54	165.86	203.01	238.99	273.80	307.43	
25.80	67.77	–80		80	131.42	169.63	206.66	242.53	277.22	310.72	
	63.68	–90		90	135.30	173.38	210.30	246.05	280.63	314.01	

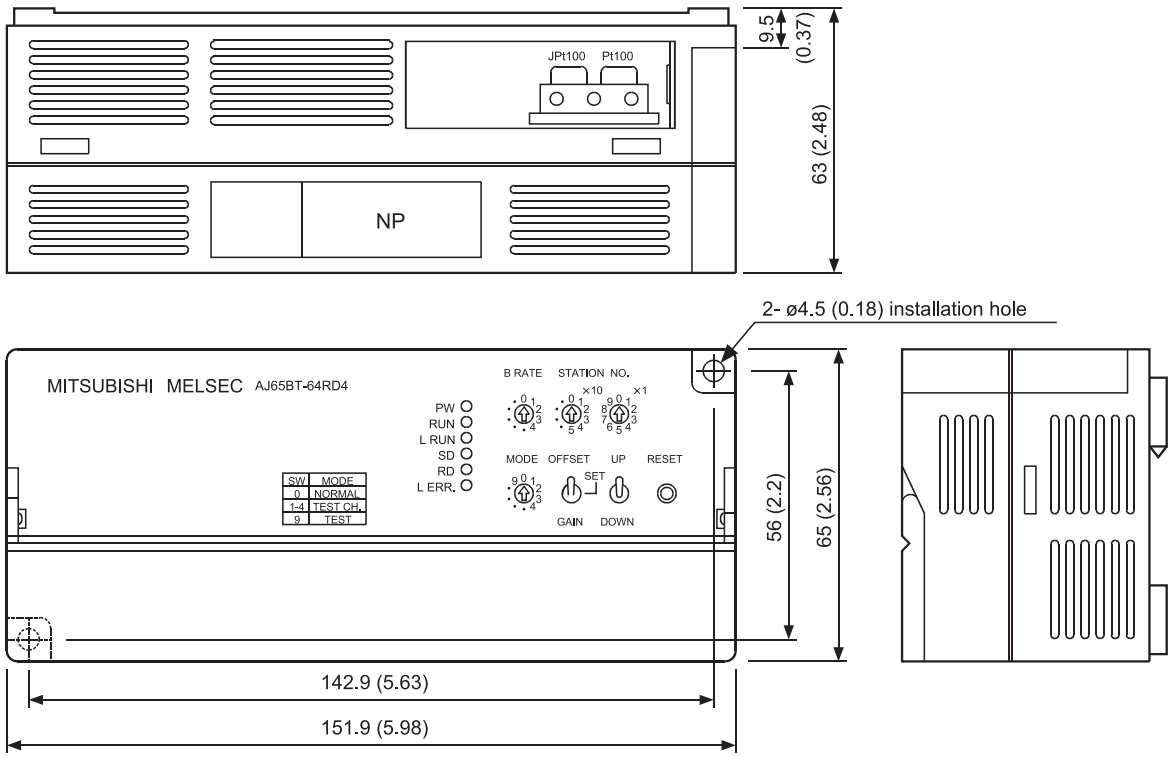
Appendix 2 External Dimensions Diagram

(1) AJ65BT–64RD3



Unit: mm (inch)

(2) AJ65BT–64RD4



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]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
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.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
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.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not , compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

SH(NA)-4001-E(1012)MEE
MODEL: AJ65BT-64RD-U-E
MODEL CODE: 13JL54

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS : 1-14 , YADA-MINAMI 5-CHOME , HIGASHI-KU, NAGOYA , JAPAN

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Specifications subject to change without notice.