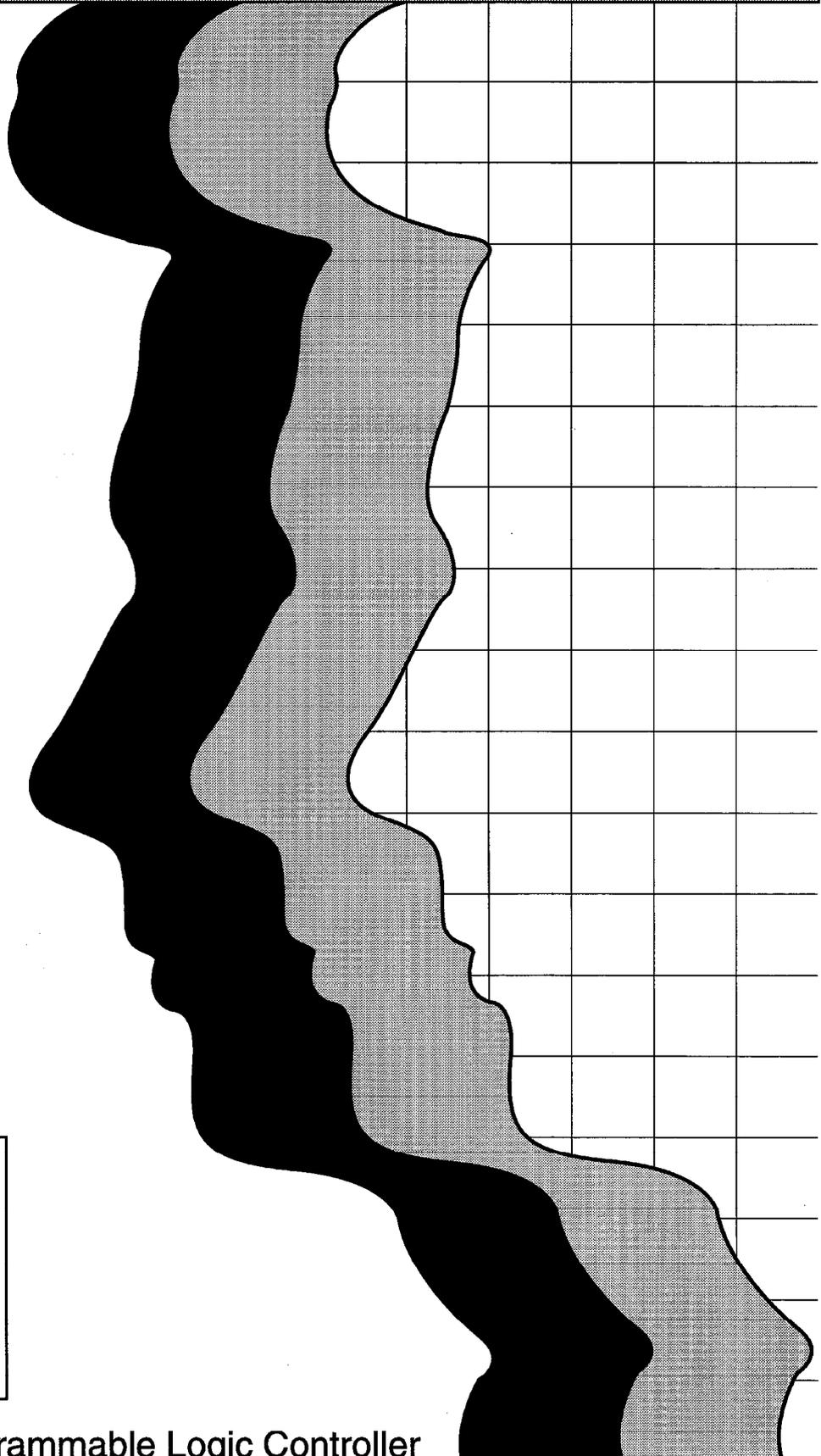


MITSUBISHI

Pt100 input module type A68RD3/4

User's Manual



Mitsubishi Programmable Logic Controller

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety, and handle the module properly.

These precautions apply only to Mitsubishi equipment. Refer to the CPU module user's manual for the description of the PLC system safety precautions.

These ● SAFETY PRECAUTIONS ● are classified into two categories: "DANGER" and "CAUTION".



DANGER

Procedures which may lead to a dangerous condition and cause death or serious injury if not carried out properly.



CAUTION

Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.

Depending on circumstances, procedures indicated by  **CAUTION** may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always make it available to the end user.

[DESIGN PRECAUTIONS]



CAUTION

- Do not bundle, or install, the control cables and communication cables with, or near, the main circuit and power cables.
Keep them at least 100 mm (3.9 inches) away from such cables.
Noise may cause erroneous operation.

[INSTALLATION PRECAUTIONS]



CAUTION

- Use the PLC in the environment given in the general specifications section of this manual.
Using the PLC outside the range of the general specifications may result in electric shock, fire, or erroneous operation or may damage or degrade the product.
- Insert the tabs at the bottom of the module into the holes in the base unit before installing the module.
Improper installation may cause erroneous operation, accidents, or the module to fall out.
- Do not touch the conductive parts and electronic parts of the module with your hands.
The module may cause erroneous operation or an accident.

[WIRING PRECAUTIONS]

 **CAUTION**

- Be sure to ground the FG and SLD terminals even if these terminals are of PLC-dedicated D type (Class 3) or higher.
Failure to do so may cause erroneous operation.
- Before beginning a wiring work to the PLC, check the rated voltage and terminal arrangement for the product.
If a power supply with a voltage different from the rated voltage is connected to the PLC or the PLC is wired erroneously, it may start fire or cause an accident.
- Tighten the terminal screws with the specified torque.
Loose terminal screws may cause a short circuit, fire, or erroneous operation.
- Be sure that cuttings, wire chips, or other foreign matter do not enter the module.
Foreign matter may start a fire or cause an accident or erroneous operation.

[STARTING AND MAINTENANCE PRECAUTIONS]

 **CAUTION**

- Do not touch live terminals without turning off the power from the outside.
It may cause erroneous operation.
- Turn off the power from the outside before cleaning the module or retightening the terminal screws.
Failure to do so may cause erroneous operation.
- Do not disassemble or rebuild the module.
It may cause an accident, erroneous operation, injury, or fire.
- Turn off the power from the outside before mounting and dismounting the module.
Failure to do so may cause a damage or erroneous operation of the module.

[DISPOSAL PRECAUTIONS]

 **CAUTION**

- When disposing off this product, handle it as industrial waste.

REVISIONS

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

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Sep., 1991	IB (NA) 66308-A	First edition
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Japanese Manual Version IB-68237-E

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INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers. Please read this manual carefully so that the equipment is used to its optimum. A copy of this manual should be forwarded to the end User.

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1. INTRODUCTION

This manual explains the specifications and methods for manipulating and programming the A68RD3/4 (hereafter called the A68RD) platinum temperature-measuring resistor Pt100 temperature input module. This module, which has 3-wire and 4-wire-type connections, is used with a PC CPU module of the MELSEC-A series.

The A68RD converts temperature data from a platinum temperature-measuring resistor JPt100 or Pt100 (hereafter called the Pt100) to either 16 or 32 bits of signed binary data. 16 bits of signed binary data are expressed to the first decimal place. 32 bits of signed binary data are expressed to the third decimal place. Figure 1.1 shows the temperature measuring process.

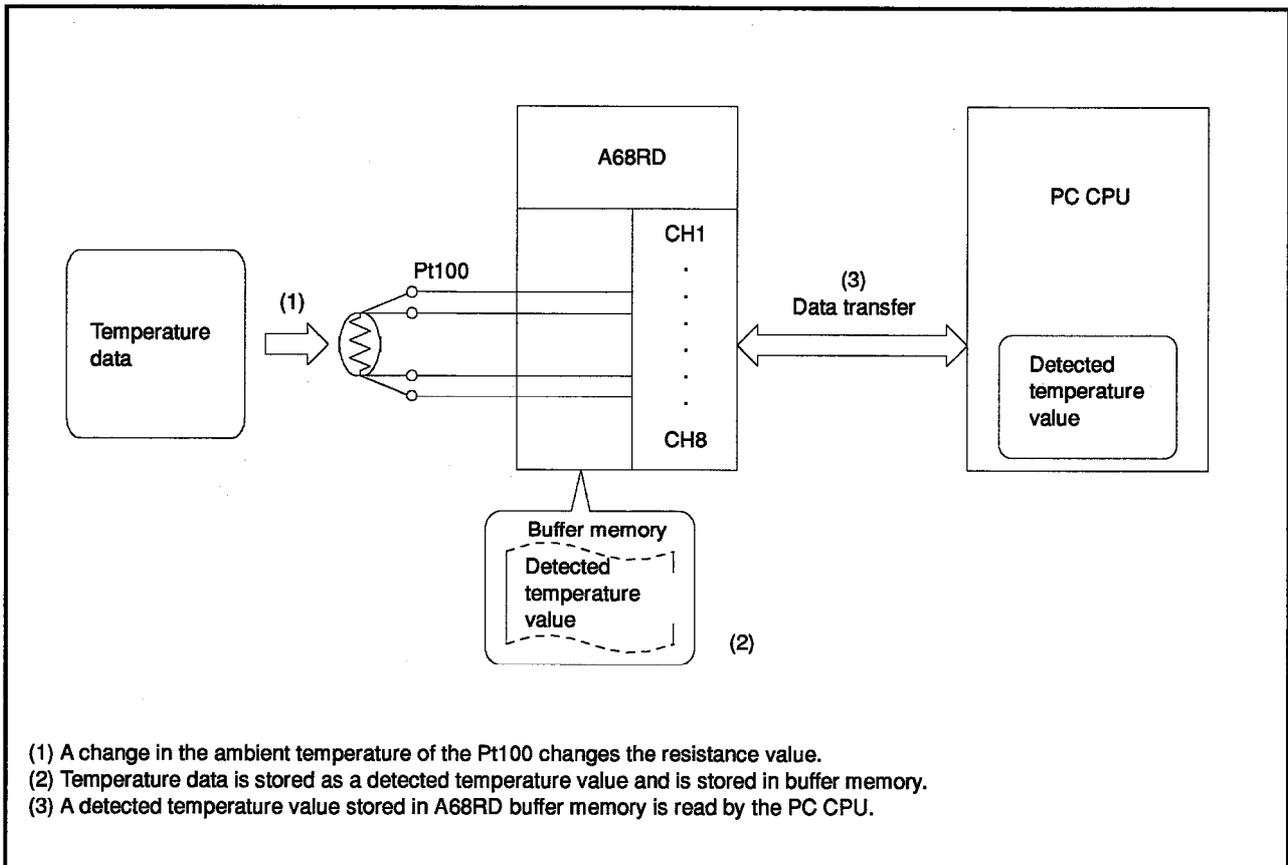


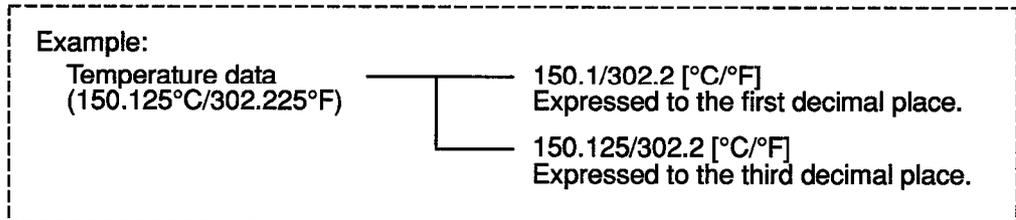
Fig. 1.1 Temperature Measuring Process

Refer to the following manuals when using the A68RD:

Manual Title	
ACPU Programming Manual (Fundamentals)	IB(NA)66249
ACPU Programming Manual (Common Instructions)	IB(NA)66250
A2A(S1)/A3ACPU Programming Manual (Dedicated Instructions)	IB(NA)66251
A0J2 CPU Programming Manual	IB(NA)66057
The User's Manual for each CPU module	

1.1 Features

- (1) The A68RD can read temperature data by connecting either an old or new JIS (DIN) platinum temperature-measuring resistor directly to the A68RD.
- (2) Input temperature data can be expressed to the first or third decimal place.



- (3) One module can be connected to eight Pt100s.
- (4) Three conversion processing methods (sampling processing, time-average processing, and count average processing) can be selected.
- (5) Disconnection of the Pt100 or cable can be detected.
 - A68RD3 - Detected by each channel
 - A68RD4 - Detected commonly with all channels.
- (6) Each channel can set conversion enable/disable.

REMARK

(1) *: The following old and new JIS (DIN) platinum temperature-measuring resistors are applicable.

Old JIS : JIS C1604-1981

New JIS : JIS C1604-1989

DIN : DIN43760-1980

1.2 Abbreviations

In this manual, CPU names are abbreviated as follows:

(1) ACPU

A0J2CPU(P23/R23)	
A0J2HCPU(P21/R21)	
A1CPU(P21/R21)	
A2CPU(P21/R21)	A2UCPU
A2CPU(P21/R21)-S1	A2UCPU-S1
A3CPU(P21/R21)	A3UCPU
A1NCPU(P21/R21)	A4UCPU
A2NCPU(P21/R21)	A73CPU(P21/R21)
A2NCPU(P21/R21)-S1	A81CPU
A3NCPU(P21/R21)	
A3HCPU(P21/R21)	
A3MCPU(P21/R21)	
A2ACPU(P21/R21)	
A2ACPU(P21/R21)-S1	
A3ACPU(P21/R21)	

(2) Building block-type CPU

A1CPU(P21/R21)	
A2CPU(P21/R21)	A2UCPU
A2CPU(P21/R21)-S1	A2UCPU-S1
A3CPU(P21/R21)	A3UCPU
A1NCPU(P21/R21)	A4UCPU
A2NCPU(P21/R21)	A73CPU(P21/R21)
A2NCPU(P21/R21)-S1	A81CPU
A3NCPU(P21/R21)	Q2ACPU
A3HCPU(P21/R21)	Q2ACPU-S1
A3MCPU(P21/R21)	Q3ACPU
A2ACPU(P21/R21)	Q4ACPU
A2ACPU(P21/R21)-S1	Q4ARCPU
A3ACPU(P21/R21)	

(3) Compact-type CPU

A0J2CPU(P23/R23)
A0J2HCPU(P21/R21)

2. SYSTEM CONFIGURATIONS

2.1 Overall Configurations

The following diagrams show the overall configurations when using the A68RD with CPUs in the MELSEC-A series.

2.1.1 Using the A68RD with a building block-type CPU

Figure 2.1 shows the overall system configuration when the A68RD is used with a building block-type CPU.

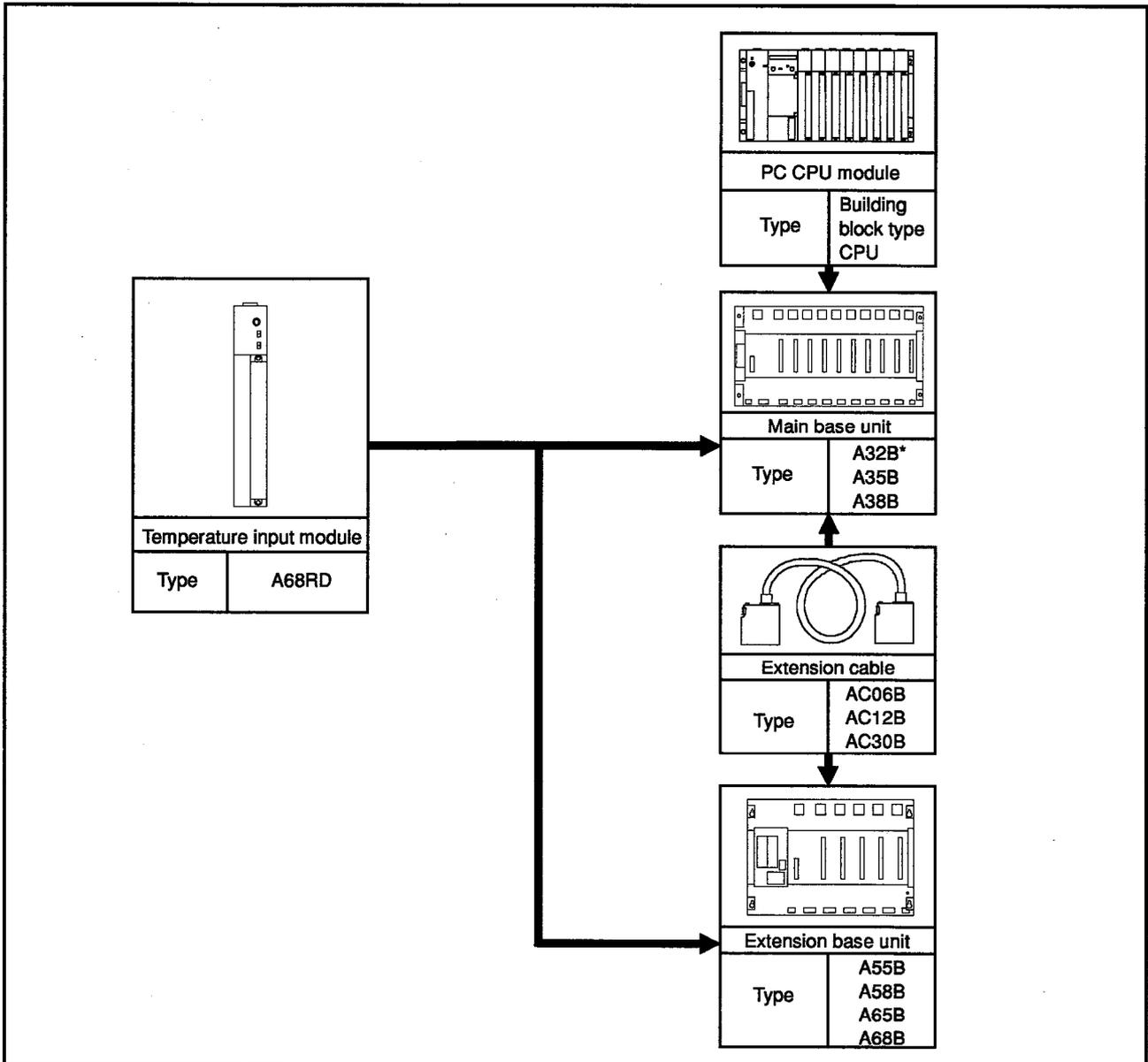


Fig. 2.1 Overall Configuration When a Building Block-Type CPU is used

REMARK

(1) The A32B cannot be connected to an extension base.

2.1.2 Using the A68RD with a compact-type CPU

Figure 2.2 shows the overall system configuration when the A68RD is used with a compact-type CPU.

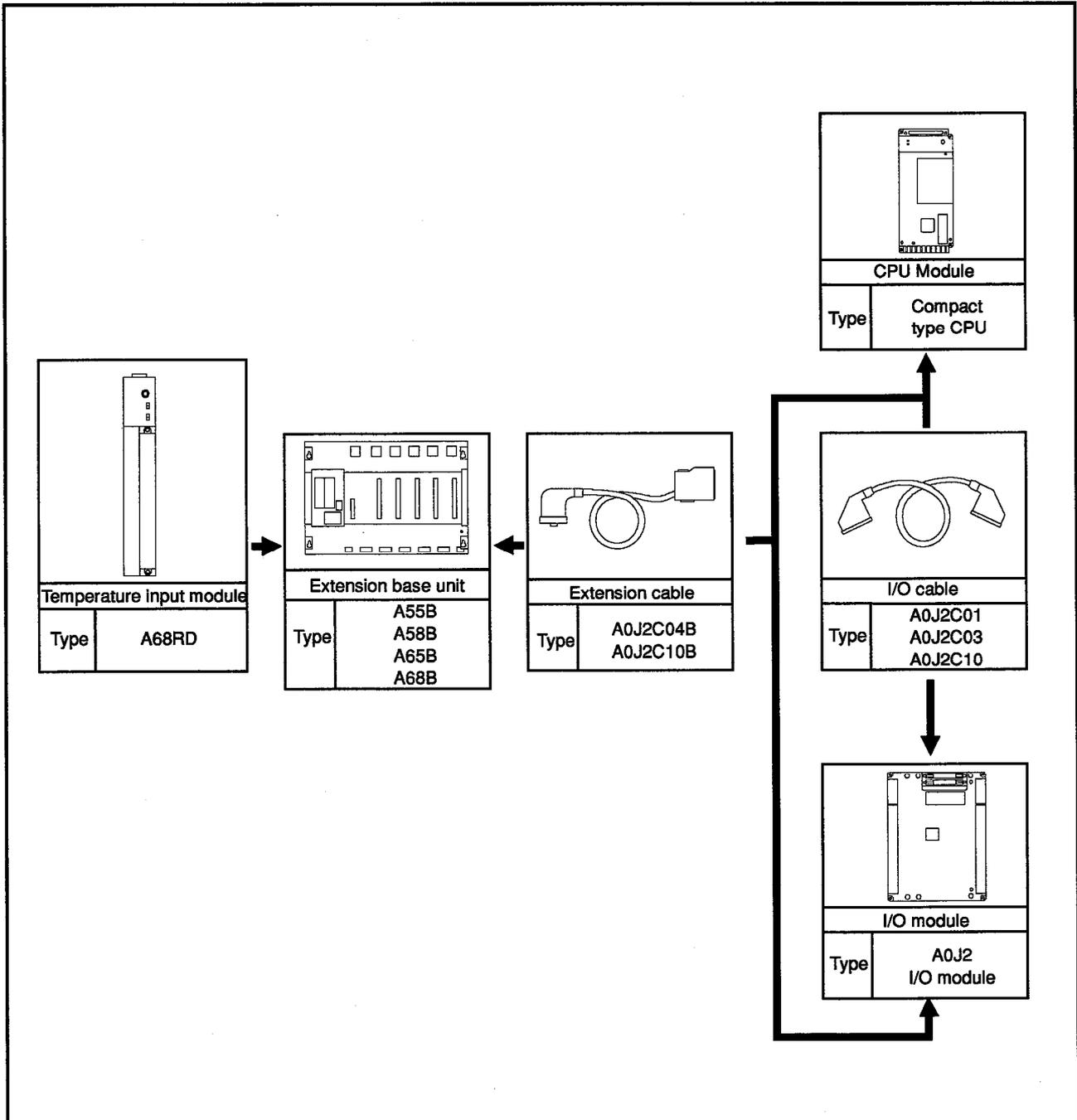


Fig. 2.2 Overall Configuration When a Compact-Type CPU is used

2.2 Applicable Systems

(1) The following CPUs can be used with the A68RD:

A0J2CPU	A2NCPU	A3ACPU	Q2ACPU
A0J2HCPU	A2NCPU-S1	A2UCPU	Q2ACPU-S1
A1CPU	A3NCPU	A2UCPU-S1	Q3ACPU
A2CPU	A3HCPU	A3UCPU	Q4ACPU
A2CPU-S1	A3MCPUCPU	A4UCPU	Q4ARCPU
A3CPU	A2ACPU	A73CPU	
A1NCPU	A2ACPU-S1	A81CPU	

(2) A68RD modules can be used to the extent that the number of A68RD modules is smaller than the number of I/O points of the CPU.

(3) The A68RD can be attached to any slot of a base unit. However, the following precautions must be taken:

(a) The power supply capacity will be exceeded if the A68RD is attached to an extension base unit (A55B and A58B) which contains no power supply. When attaching the A68RD to an extension base unit not loaded with a power supply module, the voltage drop of the power capacity of a power supply module of a main base unit and the extension cable must be considered. Keep these factors in mind when selecting a power supply module and an extension cable.

The User's Manual for each CPU module gives details.

(b) When an A3CPU (P21/R21) is used, do not use the final slot of the seventh extension unit to attach the A68RD. (This restriction does not apply to the A3NCPU, A3HCPU, A3MCPUCPU, A73CPU, and A3ACPU.)

(4) The A68RD can be connected to any given master station, local station, or remote I/O station in a data link system. However, in this system, only the following CPUs can be used.

Applicable to master station	A0J2HCPUP21/R21	A3HCPUP21/R21	A73CPUP21/R21
	A1NCPUP21/R21	A3MCPUP21/R21	A1CPUP21/R21
	A2NCPUP21/R21	A2ACPUP21/R21	A2CPUP21/R21
	A2NCPUP21/R21-S1	A2ACPUP21/R21-S1	A2CPUP21/R21-S1
	A3NCPUP21/R21	A3ACPUP21/R21	A3CPUP21/R21
Applicable to local station	A0J2CPUP23/R23	A3HCPUP21/R21	A73CPUP21/R21
	A0J2HCPUP21/R21	A3MCPUP21/R21	A1CPUP21/R21
	A1NCPUP21/R21	A2ACPUP21/R21	A2CPUP21/R21
	A2NCPUP21/R21	A2ACPUP21/R21-S1	A2CPUP21/R21-S1
	A2NCPUP21/R21-S1	A3ACPUP21/R21	A3CPUP21/R21
	A3NCPUP21/R21		
Applicable to remote station	AJ72P25/R25		

POINT

The A0J2P25/R25 cannot be connected to the A68RD as a remote I/O station.

3. SPECIFICATIONS

This section covers the general specifications, performance specifications, list of I/O to the PLC CPU, buffer memory specifications for Model A68RD. For the general specifications of the A68RD, refer to the applicable PLC CPU user's manual.

3.1 Performance Specifications

The following table gives the performance specifications of the A68RD3 and A68RD4.

Table 3.1 Performance Specifications

Item	A68RD3	A68RD4
Type of measuring system	3-wire type	4-wire type
Connectable temperature-measuring resistor	Pt100 (conforms to JIS* C1604-1989 and DIN** 43760-1980)	
	JPt100 (conforms to JIS C1604-1981)	
Output current for temperature detection (mA)	4.2 (min.), 4.7 (max.)	
Temperature input range	Pt100 : -180 °C (-292 °F) to 600 °C (1112 °F) (27.08 Ω to 313.59 Ω)	
	JPt100 : -180 °C (-292 °F) to 600 °C (1112 °F) (25.8 Ω to 317.28 Ω)	
Detected temperature value	16-bit signed binary -1800 to 6000 (value to the first decimal place x 10)	
	32-bit signed binary -180000 to 600000 (value to the third decimal place x 1000)	
Resolution	0.025 °C	
Overall accuracy	±1 % (accuracy to the full scale)	
Conversion speed	40 ms/channel	
Number of temperature input channels	8 channels/module	
Insulation method	Between channels : No insulation	
	Between an input terminal and PC CPU power : Photocoupler insulation	
Number of I/O points	32	
Terminal block	38-point terminal block	
Applicable wire gauge	0.75 to 2 mm ² (Applicable tightening torque 39 to 59 N·cm)	
Cable between A68RD and Pt100	See Section 3.1.1.	
Applicable crimp contact	V1.25-3 V1.25-YS3A V2-S3 V2-YS3A	
5 VDC internal current consumption (A)	0.94	0.75
Weight (kg)	0.615	0.595
Outside dimensions mm (in)	250(9.84)(H) x 37.5(1.48)(W) x 131(5.16)(D)	

* Japanese Industrial Standard

** German Industrial Standard

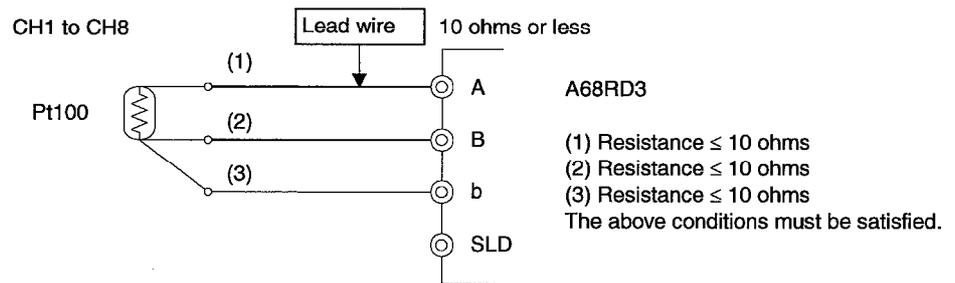
3.1.1 Connection specifications of platinum temperature-measuring resistors

This section gives the specifications of connection between an A68RD3/4 and a platinum temperature-measuring resistor.

(1) A68RD3

When a Pt100 is connected to an A68RD3, the resistance of each lead wire must be 10 ohms or less.

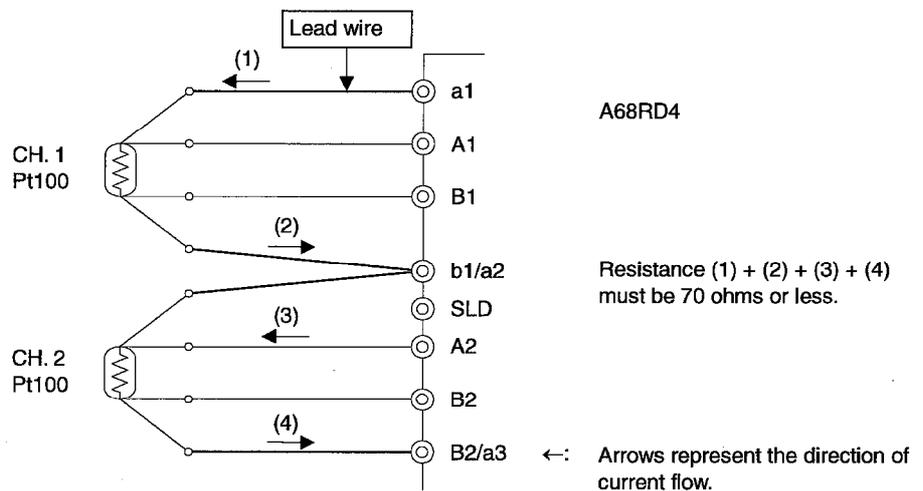
This applies to all channels of 1 through 8.



(2) A68RD4

Total of the resistance of lead wires through which currents flow (depending on channel setting) must be 70 ohms or less.

Example: When Pt100s are connected to channels 1 and 2:



3.2 Functions

This section explains the various functions of the A68RD.

3.2.1 Functions list

The following table shows the functions of the A68RD.

Table 3.2 List of Functions

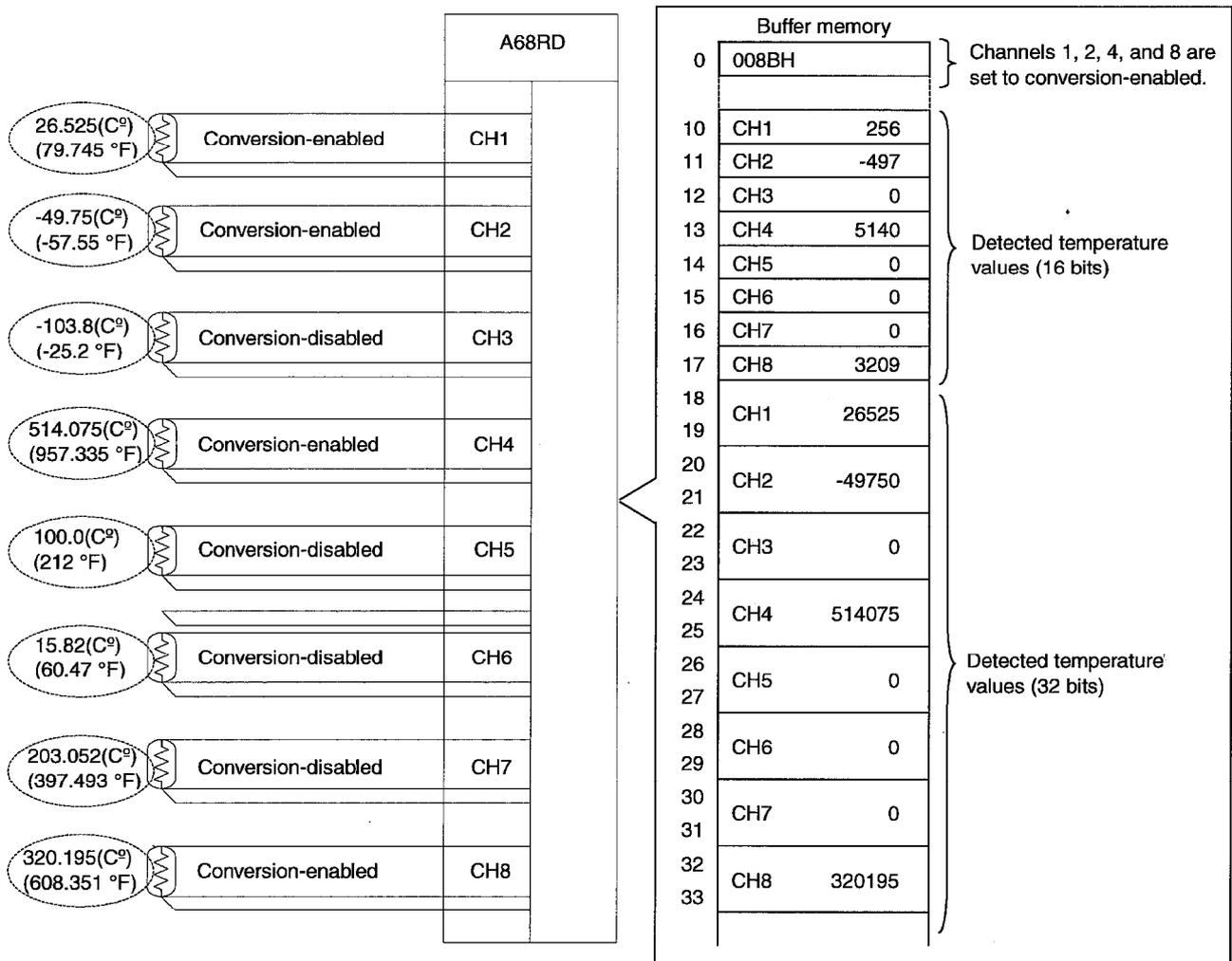
Item	Description	Reference Section
Conversion enable/disable setting of each channel	Temperature detection enable/disable is set.	3.2.2
Sampling/average processing setting	The detected temperature is processed according to the set processing method. The result is stored in buffer memory. The following three processings are available. <ul style="list-style-type: none"> • Sampling • Time averaging • Count averaging 	3.2.3
Representation of detected temperature values	Values to the first and third decimal places are given. <ul style="list-style-type: none"> • Value to the first decimal place (16-bit signed binary) Example : 53.8(°C) → 538 • Value to the third decimal place (32-bit signed binary) Example : 216.025(°C) → 216025 	3.2.4
Disconnection detection	Disconnection of a Pt100 or cable is detected. <ul style="list-style-type: none"> • A68RD3 Disconnection at each channel is detected and the disconnection-detected signal (X_3 to X_n) that corresponds to that channel goes ON. • A68RD4 Disconnection at any channel is detected and the Σ disconnection-detected signal (X_3) goes ON. 	3.2.5
Setting of platinum temperature-measuring resistor	The type of a platinum temperature-measuring resistor to be used is set. The following two kinds of platinum temperature-measuring resistors are used: <ul style="list-style-type: none"> • Pt100 : new JIS (DIN) type (JIS C1604-1989) (DIN 43760-1980) • JPt100 : old JIS type (JIS C1604-1981) 	3.2.6

3.2.2 Conversion-enabled/disabled setting with each channel

- (1) Temperature detection enable/disable is set for each channel.
 - Conversion-enabled : Outside temperature is received, and disconnection detection is done.
 - Conversion-disabled : Outside temperature is not received, and disconnection detection is not done.
- (2) All channels are set to conversion-disabled by default.

Set channels to conversion-enabled at address 0.(See Section 5.3.2)

If channels 1, 2, 4, and 8 are set to conversion-enabled



- (3) Set unused channels to conversion-disabled to shorten the sampling time.

Example:

(1) When all channels are set to conversion-enabled
Sampling time = 8 x 40 ms/channel = 320 ms

(2) When channels 1 and 3 are set to conversion-enabled
Sampling time = 2 x 40 ms/channel = 80 ms

REMARK

Section 5.3 gives details about buffer memory.

- (4) When conversion-enabled/-disabled setting is written, the processing shown below is done.
 - (a) Buffer address 35 for storing the CH1 to CH8 conversion-completed flags is reset.
 - (b) A disconnection-detected flag is reset (OFF).

POINT

The detected temperature value stored in buffer memory holds data before writing conversion-enabled/-disabled setting data.

REMARKS

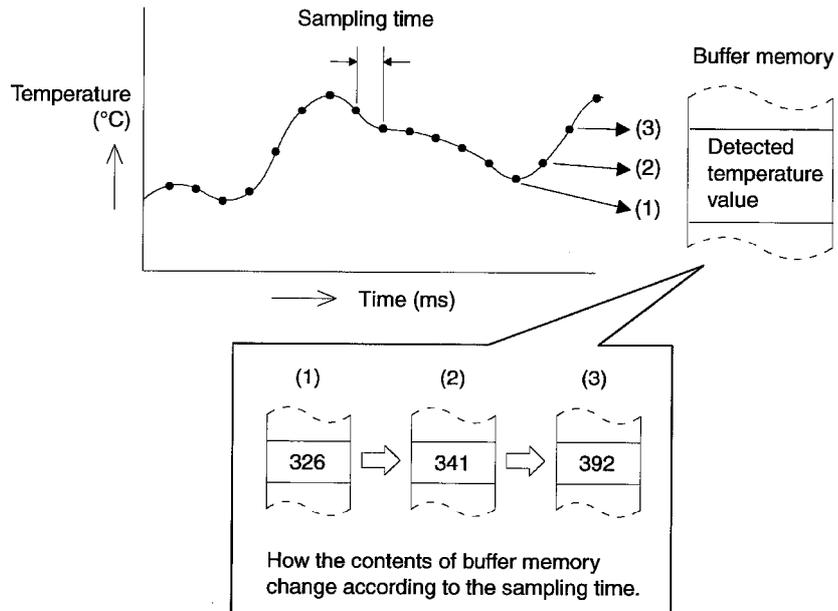
- (1) See Section 3.4 for detail of buffer.
- (2) See Section 3.2.5 for disconnection detection and Section 3.3 for the disconnection-detected flag.

3.2.3 Sampling and averaging processings

Buffer address 1 is used to designate sampling or averaging.

(1) Sampling

Data input through a channel which is specified for sampling is converted according to the sampling time set with the PC CPU. The detected temperature values are stored in buffer memory.



REMARKS

(1) The sampling time varies according to the number of channels.

$$\text{Sampling time} = \text{number of channels} \times 40 \text{ ms/channel (ms) to be used}$$

Example:

When channels 1, 2, and 4 are used

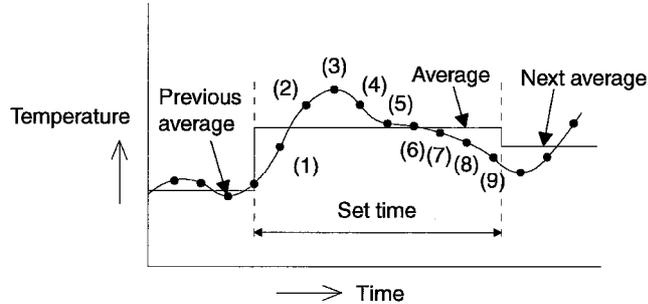
$$3 \times 40 = 120 \text{ ms}$$

(2) See Section 3.4 for buffer.

(2) Time averaging processing

Data conversion in the channel which is specified for time averaging is done in the time set with the PC CPU for averaging processing.

The average of the converted values (except the maximum and minimum values) is stored in buffer memory.



Data

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
185	210	220	215	205	200	195	180	170
Maximum value						Minimum value		

$$\text{Average} = \frac{185 + 210 + 215 + 205 + 200 + 195 + 180}{7} = 198$$

↑
Stored in buffer.

When an average is being calculated, the previous average is stored in buffer memory.

REMARKS

(1) The number of sampling times varies with the number of channels and the setting time.

$$\text{Number of sampling times} = \frac{\text{(setting time)}}{\text{(number of channels used) X (40 ms/channel)}}$$

The setting time is in 10 ms units. Values less than 10 ms are rounded down.

Example

When channels 1, 2, 4, and 8 are used, and the setting time is 1200 ms

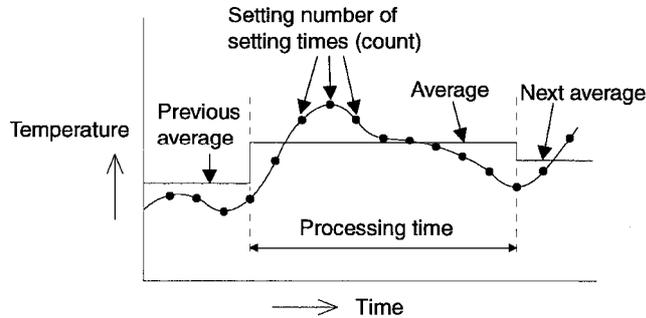
$$\begin{aligned} \text{The number of sampling times} &= \frac{1200 \text{ ms}}{40 \times (4 \text{ channels})} \\ &= 7.5 \end{aligned}$$

The number of sampling times is rounded down to 7.

(2) See Section 3.4 for buffer area in which detected temperature values are stored.

(3) Count averaging processing times

Data conversion in the channel which is specified for count averaging is done the number of times (count) set with the PC CPU for averaging processing.



When an average value is being calculated, the previous average is stored in buffer memory.

REMARKS

- (1) The sampling time in which sampling is done set number of times varies with the number of channels used.

$$\text{The number of sampling times} = (\text{set number of times}) \times (\text{number of channels}) \times (40 \text{ ms/channel})$$

Example:

When channels 1, 2, 4, and 8 are used, and the setting number of times are 10, 15, 20, and 30 times.

Channel	Setting Number of Setting Times	Sampling Time
CH1	10	10 times x 4 channels x 40 ms/channel = 1600 (ms)
CH2	15	15 times x 4 channels x 40 ms/channel = 2400 (ms)
CH4	20	20 times x 4 channels x 40 ms/channel = 3200 (ms)
CH8	30	30 times x 4 channels x 40 ms/channel = 4800 (ms)

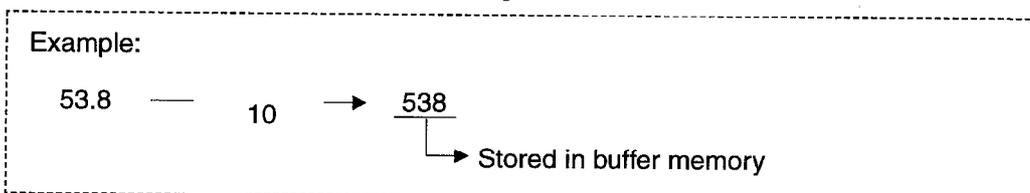
- (2) See Section 3.4 for buffer area in which detected temperature values are stored.

3.2.4 Representation of detected temperature values

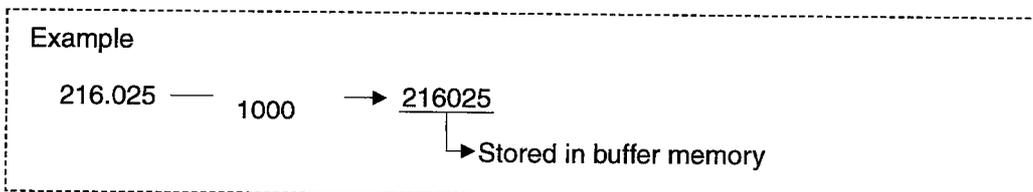
Detected temperature values are represented to the first and third decimal places (Refer to section 3.4.)

- (1) Values to the first decimal place are multiplied by 10 and represented in 16-bit signed binary values.

The detected temperature values range from -1800 to 6000.



- (2) Values to the third decimal place are multiplied by 1000, and represented in 32-bit signed binary values range from -180000 to +600000.



3.2.5 Disconnection detection

Disconnection of a Pt100 or cable is detected.

(1) A68RD3 (3-wire type)

Disconnection at each channel is detected and the disconnection-detected flag (X3 to X4) that corresponds to that channel is turned ON.

However, this only applies to in channels specified for conversion-enabled.

Connections between CH1 and a Pt100

Connection Example		Conversion-enabled/Disabled Specification	Disconnection-detected Signal (X3)
A68RD3		Conversion enabled	ON
		Conversion disabled	OFF
CH 1		Conversion enabled	ON
		Conversion disabled	OFF
		Conversion enabled	OFF
		Conversion disabled	

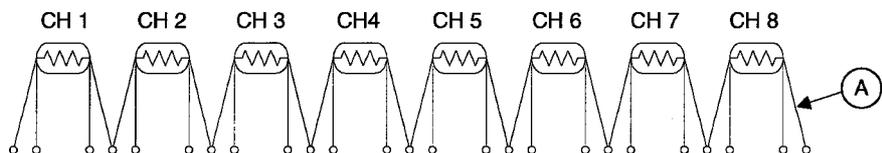
(2) A68RD4 (4-wire type)

Disconnection at any channel is detected and the Σ disconnection-detected flag (X3) is turned ON.

However, if all channels are specified for conversion-disabled, disconnections are not detected.

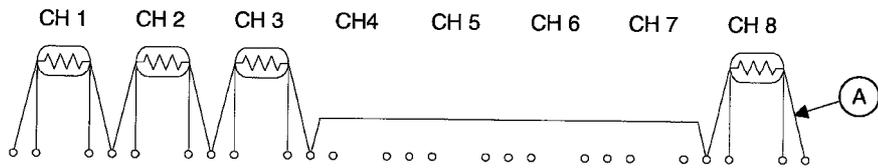
If at least one channel is specified for conversion-enabled, disconnections are detected.

All channels are used



Σ Disconnection-detected Signal (X3)	Conversion-enabled/disabled Specification		
	All Channels Enabled	All Channels Disabled	At Least One Channel is Enabled
Disconnection at [A]	ON	OFF	ON
No disconnection at [A]	OFF		OFF

Only channels 1, 2, 3, and 8 are used



Conversion-enabled/disabled Specification	All Channels Enabled	All Channels Disabled	Channels 4, 5, 6, or 7 are Enabled	Channels 1, 2, 3, or 8 are Enabled
Σ Disconnection -detected Signal (X3)				
Disconnection at [A]	ON	OFF	ON	ON
No disconnection at [A]				OFF

POINT

- Be sure to set the channels to which Pt100 is not connected to "Conversion Prohibited." If they are set to "Conversion Permitted", the cable breakage detection flag will be turned ON.
- Refer to section 3.3 for the cable breakage detection flag.
- For the connection or wiring method of Pt100, refer to section 4.5.

3.2.6 Specifying platinum temperature-measuring resistors

Two types of platinum temperature-measuring resistor - the JPt100 (old JIS type --- JIS C1604-1981) or the Pt100 (new JIS and DIN type ---JIS C1604-1989, DIN 43760-1980) - can be used with the A68RD.

The type of platinum temperature-measuring resistor that is designated in buffer address 36 is valid for all channels. (Setting done with each Pt100 is valid when the power to the PC is turned ON or reset.)

POINT

Two different types of platinum temperature-measuring resistors cannot be used simultaneously with one A68RD module. If two types are used, correct temperature detection cannot be gained in the channel which is connected to a different platinum temperature-measuring resistor than the one specified.

REMARKS

- (1) See Appendix 2 for the standard resistance of platinum temperature-measuring resistors.
- (2) See Section 3.4 for buffer.

3.3 Inputs to and Outputs from the PC CPU

The following describes the functions of the control I/O signals sent between the A68RD and a PC CPU.

Device X indicates the signals input from the A68RD to the PC CPU. Device Y indicates the signals output from the PC CPU to the A68RD.

The following tables give the I/O signals (X and Y) used when slot No. 0 of a main base unit is loaded with an A68RD3 or an A68RD4.

Table 3.3 A68RD3 Inputs/Outputs

Signal Direction : A68RD3 → PC CPU		Signal Direction : PC CPU → A68RD3	
Device No.	Description	Device No.	Description
X0	Watchdog timer error flag	Y0 to YC	Unused
X1	READY flag		
X2	Write data error flag		
X3	CH1: disconnection detected flag		
X4	CH2: disconnection detected flag		
X5	CH3: disconnection detected flag	YD to YF	Interlock flag for RFRP and RTOP instructions when setting an A68RD3 to a remote I/O station
X6	CH4: disconnection detected flag		
X7	CH5: disconnection detected flag		
X8	CH6: disconnection detected flag		
X9	CH7: disconnection detected flag	Y10 to Y11	Unused
XA	CH8: disconnection detected flag		
XB to X1C	Unused	Y12	Error code reset flag
X1D to X1F	Interlock flag for RFRP and RTOP instructions when setting an A68RD3 to a remote I/O station	Y13 to Y1F	Unused

Table 3.4 A68RD4 Inputs/Outputs

Signal Direction : A68RD4 → PC CPU		Signal Direction : PC CPU → A68RD4	
Device No.	Description	Device No.	Description
X0	Watchdog timer error flag	Y0 to YC	Unused
X1	READY flag		
X2	Write data error flag		
X3	Disconnection detected flag (CH1 to CH8)	YD to YF	Interlock flag for RFRP and RTOP instructions when setting an A68RD4 to a remote I/O station
		Y10 to Y11	Unused
X4 to X1C	Unused	Y12	Error code reset flag
X1D to X1F	Interlock flag for RFRP and RTOP instructions when setting an A68RD4 to a remote I/O station	Y13 to Y1F	Unused

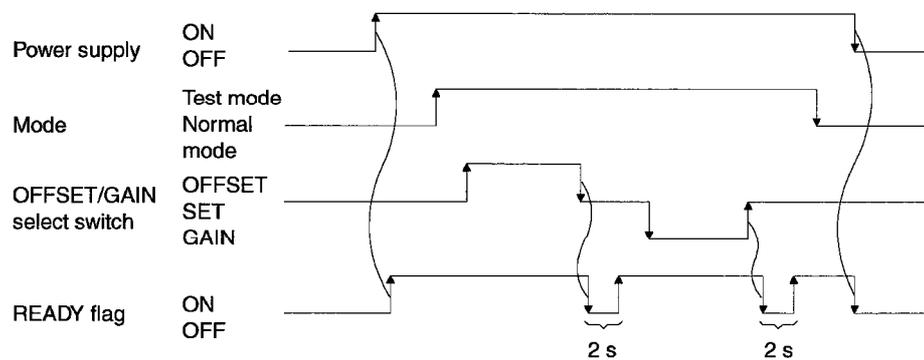
3.3.1 Watchdog timer error (X0) flag

If a watchdog timer error occurs during the self-diagnosis function of the A68RD, X0 goes ON and conversion stops. When the X0 goes ON, it indicates faulty A68RD hardware.

3.3.2 READY (X1) flag

This goes ON in normal mode (*1) after (a) turning the power supply ON, or (b) resetting the PC CPU.

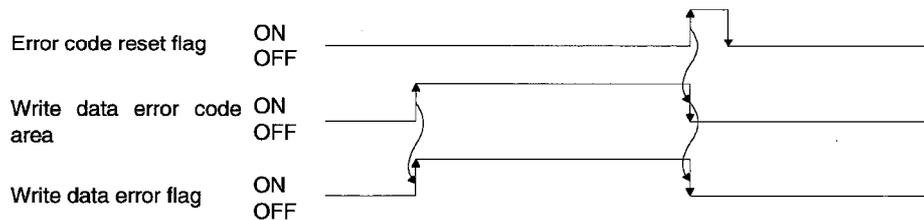
In the test mode (*2), when moving the offset/gain setting switch is moved from the OFFSET/GAIN position to the SET position, this goes OFF.



3.3.3 Write data error flag (X2) and error code reset flag (Y12)

When any error (except a watchdog timer error) occurs in the A68RD, and an error code is stored in the write data error code area (address 34) of buffer memory, this error flag is set.

The error code is reset by (a) writing "0" to the write data error code area with a sequence program, or (b) turning the error code reset flag ON.



REMARKS

- (1) See Section 3.4.6 for the write data error code.
- (2) *1: Normal mode is established when terminals 1 and 2 on an A68RD are not connected.
- (3) *2: Test mode is established when terminals 1 and 2 on an A68RD are connected (shorted). Error compensation can be done.

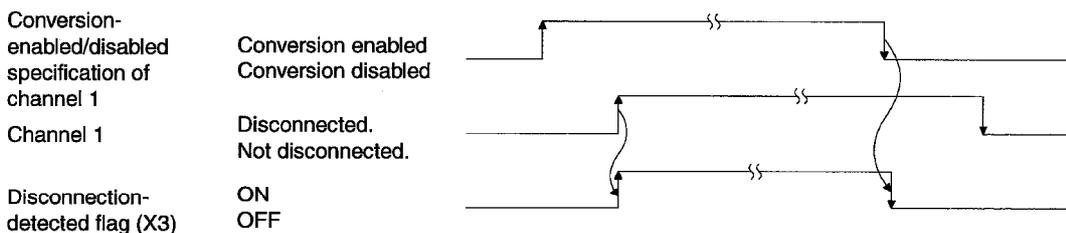
3.3.4 Disconnection-detected flag

(1) A68RD3 (X3 to XA)

When a channel set to conversion-enabled is disconnected, the disconnection-detected flag (X3 to XA) of its channel goes ON.

If a channel is set to conversion-disabled, the disconnection-detected flag always goes OFF.

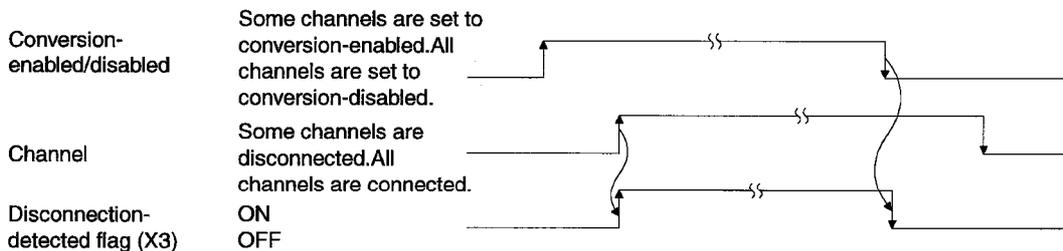
- Channel 1



(2) A68RD4 (X3)

When some channels are set to conversion-enabled, and any channel is disconnected, the disconnection-detected flag (X3) goes ON.

When all channels are set to conversion-disabled, the disconnection-detected flag (X3) always goes OFF.



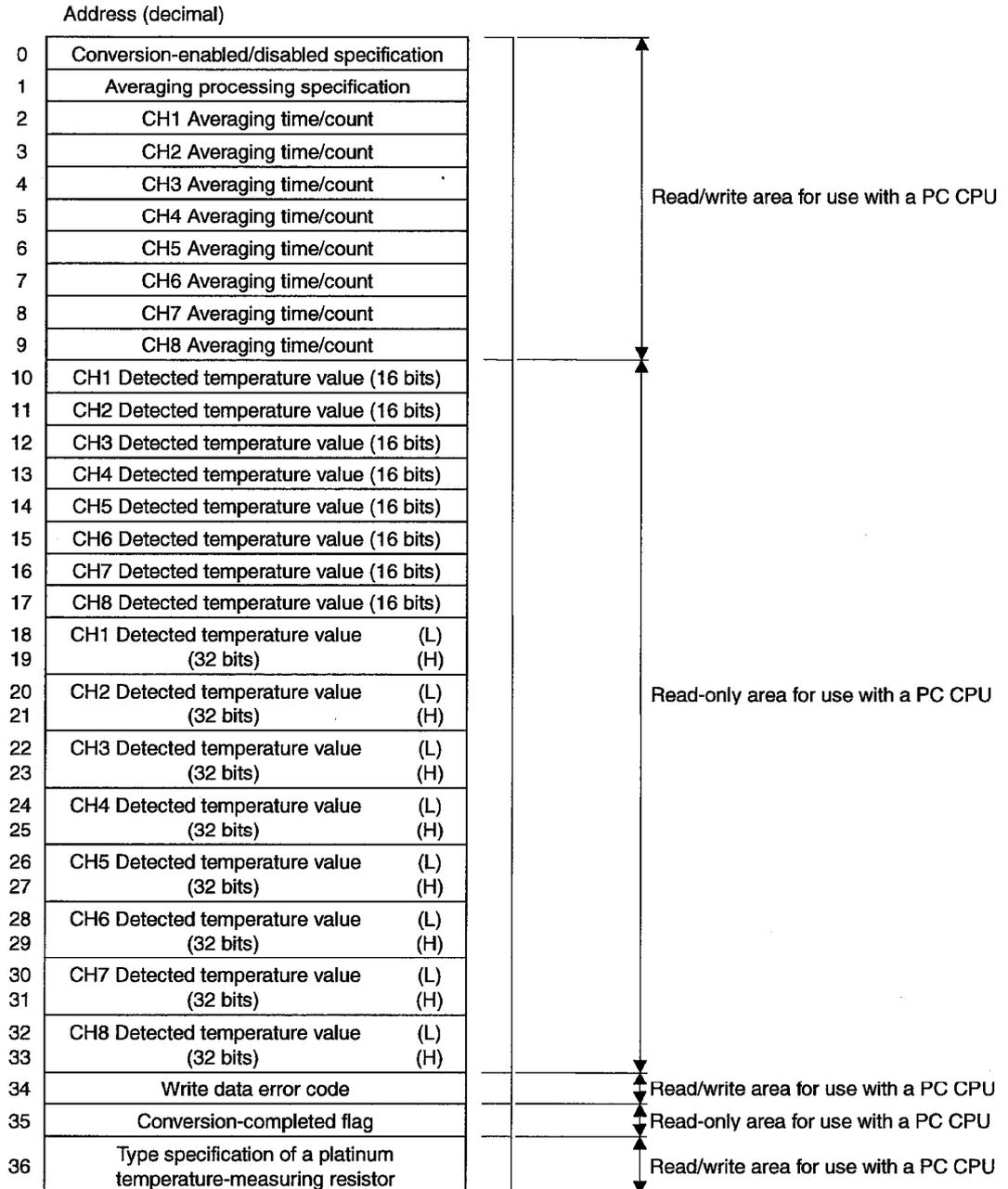
REMARK

See Section 3.2.5 for disconnection detection.

3.4 Buffer Memory

3.4.1 Buffer memory allocation

The following describes the buffer memory allocation (not battery-backed) of an A68RD.



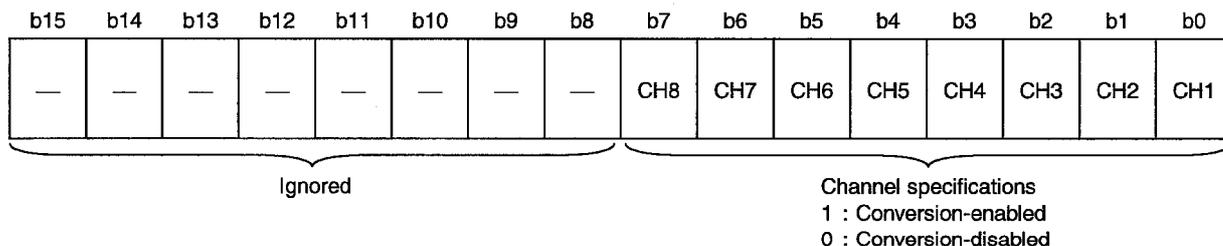
POINT

- (1) When using a PC CPU, buffer memory addresses 10 to 33 and 35 are read-only areas. Therefore, never write data to the areas with a PC CPU because the A68RD always overwrites a detected temperature value. Thus, if writing is done to these areas, buffer memory data will be destroyed.

3.4.2 Conversion-enabled/disabled specifications (address 0)

Address 0 is used to designate whether temperature detection is executed or not.

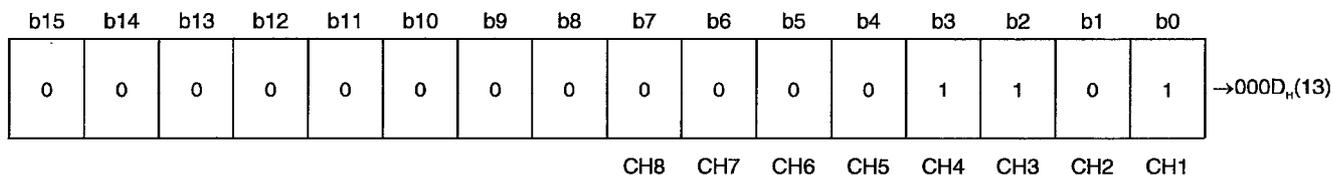
- (1) When the power is turned ON, the channel specification is set at "0000_H" for conversion-disabled for all channels.
- (2) Conversion-enabled/disabled can be changed by the sequence program to reduce sampling time.



Example:

To specify channels 1, 3, and 4 for conversion

By writing 000D_H (13) to specify channels for conversion-enabled/disabled, the sampling time is obtained as 40 ms x 3 = 120 ms.



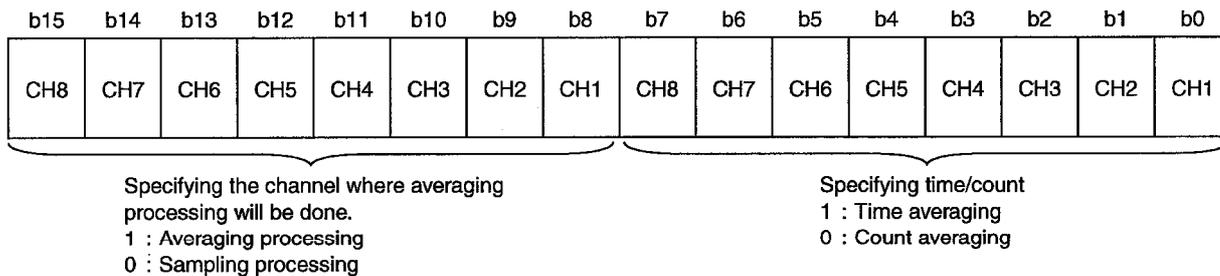
REMARK

See Section 3.2.2 for the designation of conversion enable/disable.

3.4.3 Averaging processing specifications (address 1)

Address 1 is used to designate execution of sampling or averaging.

- (1) When the power is turned ON and the READY flag of the A68RD is ON, all channels are set for sampling processing.
- (3) Use buffer memory address 1 for selection of sampling processing or averaging processing.



POINT

When averaging processing is not specified, sampling processing is set without regard to the time/count specification.

REMARK

See Section 3.2.3 for sampling and averaging.

3.4.4 Averaging time/count (addresses 2 to 9)

Addresses 2 to 9 are used to set the length of time or the number of times of averaging.

- (1) When the power is turned ON, the averaging time and averaging count are set to 0.
- (2) The setting ranges are as indicated below:

Averaging processing in terms of time : 320 to 32000 ms
 Averaging processing in terms of count : 1 to 800 times

POINT

If a value outside the above range has been written, a setting error occurs and the buffer for setting the length of time and the number of times of averaging is rewritten.
 However, the A68RD performs conversion processing at the averaging time or count previously set.

REMARK

See Section 3.2.3 for the length of time and the number of times of averaging.

3.4.5 Detected temperature value (addresses 10 to 33)

Addresses 10 to 33 are used to store detected temperature values which are handled in 16-bit or 32-bit data.

- (1) 16-bit data (addresses 10 to 17)

A detected temperature value is multiplied by 10 and represented in the range from -1800 to 6000 of 16-bit signed binary numbers.
 If a detected temperature value is negative, it is represented in 2's complement.

Example 1:

If a detected temperature value is 123.025°C (253.445°F) — 1230 is stored.

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

Example 2:

If a detected temperature value is -123.025°C (-189.445°F) — -1230 is stored.

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

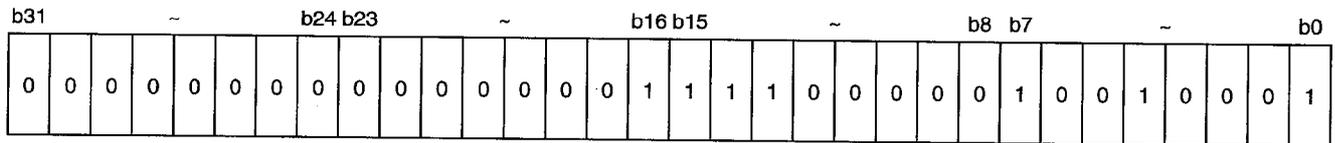
(2) 32-bit data (addresses 18 to 33)

A detected temperature value is multiplied by 1000 and represented in the range from -180000 to 600000 of 32-bit signed binary numbers.

If a detected temperature value is negative, it is represented in 2's complement.

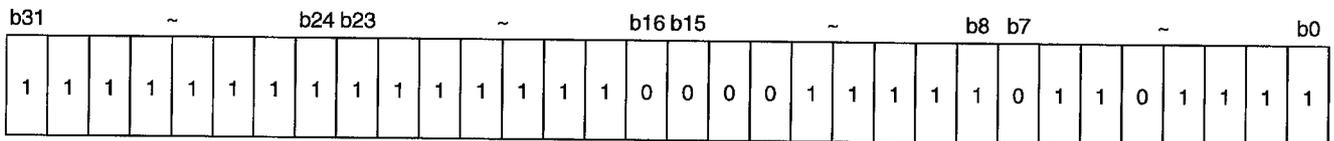
Example 1:

If a detected temperature value is 123.025°C (235.445°F) — 123025 is stored.



Example 2:

If a detected temperature value is -123.025°C (-189.445°F) — -123025 is stored.



REMARK

Refer to section 3.2.4 for the temperature values detected.

3.4.6 Write data error code (address 34)

Address 34 is used to confirm that data written from a CPU to an A68RD has been written within a set range.

(1) An A68RD checks the following when data is written from a PC CPU.

- Range of data set for time averaging or count averaging
- Data write attempted to the read-only area

If data is out of the set range or write is attempted to the read-only area, an error code in a 16-bit binary value is stored.

See Section 6.1 for error codes.

(2) If there is more than one error code, the first data error code detected by the A68RD is stored. The others are not stored.

(3) To reset an error code, write 0 from the PC CPU.

If an error is reset without correcting the error, the data error code is set to 0 and the RUN LED of A68RD stops flashing.

POINTS

- (1) If a value other than 0 was written, error code resetting is not executed and ignored.
- (2) Error code reset can be done also by turning ON the error reset flag (Y12).

3.4.7 Conversion-completed flag (address 35)

Address 35 is used to confirm that a conversion-enabled channel can detect temperature correctly.

- (1) The conversion-completed flag processing after power ON is only performed once when the channel specification for conversion-enabled/disabled (address 0) is changed.

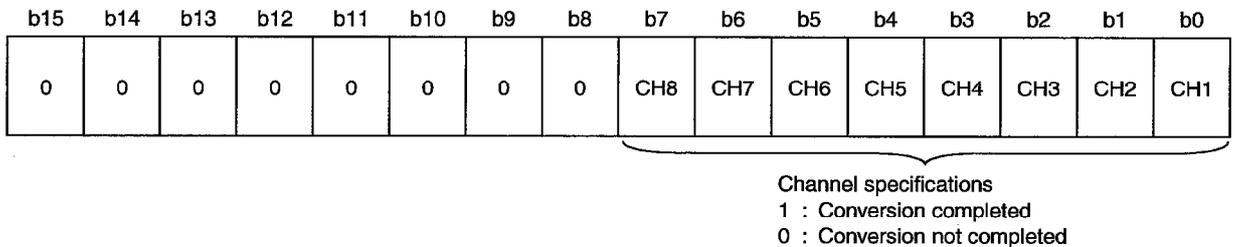
- Conversion-enabled/disabled specification change from 0 to 1:

After setting conversion enabled and storing a detected temperature value in buffer memory, the conversion-completed flag of its corresponding channel is set to 1.

- Conversion-enabled/disabled specification change from 1 to 0:

The conversion-completed flag of its corresponding channel is set to 0.

- (2) A conversion-completed flag is provided to each channel.



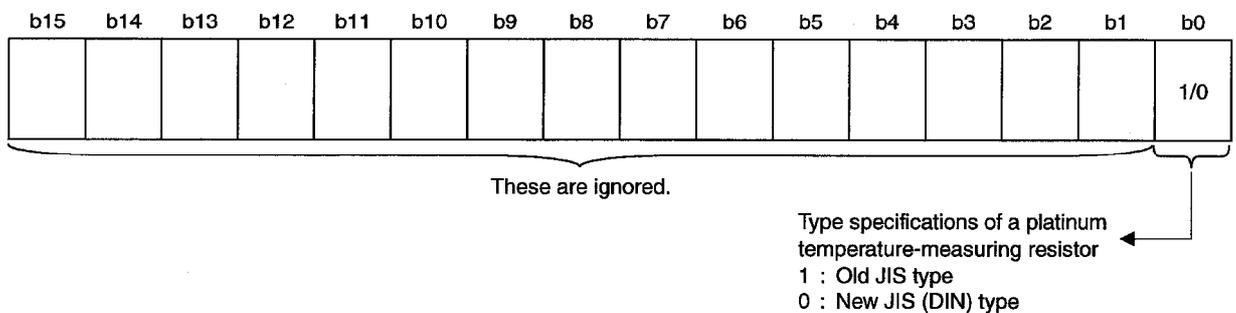
- (3) The conversion-completed flag can be used for the interlock when reading the detected temperature value of the channel where averaging processing is executed.

3.4.8 Type specification of a platinum temperature-measuring resistor

This area is used to set the type of a platinum temperature-measuring resistor.

- (1) When the power supply is turned ON, the type is set to "0", indicating the new JIS (DIN) type.

- (2) All channels correspond to a specified type.



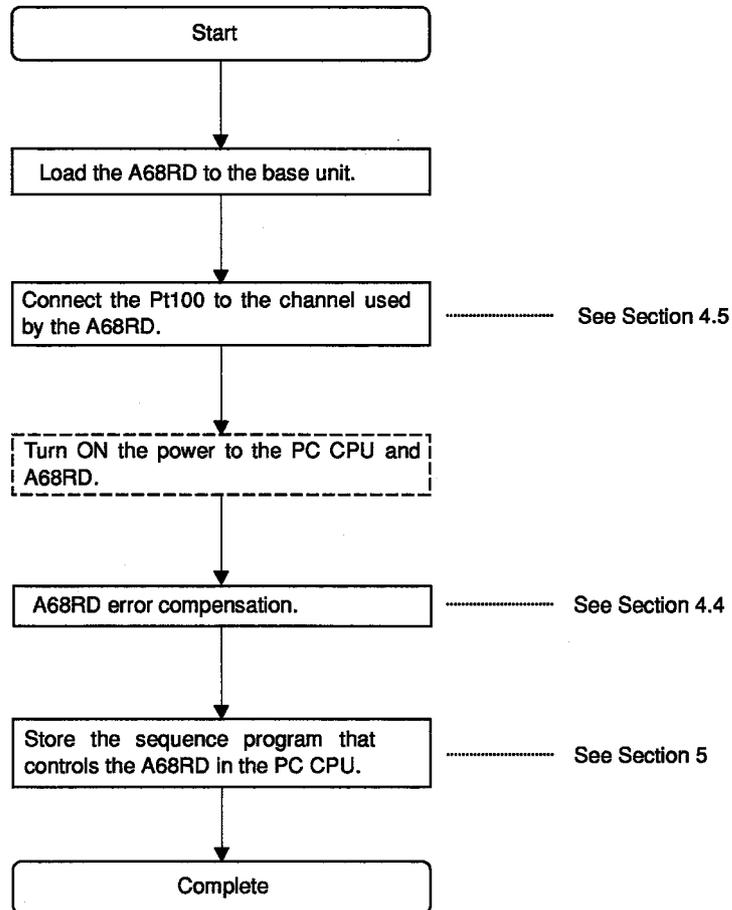
REMARK

See Section 3.2.6 for platinum temperature-measuring resistor.

4. PRE-OPERATION SETTINGS AND PROCEDURES

4.1 Pre-Operation Procedures

This section describes the pre-operation settings and procedures of the A68RD.



4. PRE-OPERATION SETTINGS AND PROCEDURES

MELSEC-A

4.2 Handling Instructions

- (1) Do not let the case and terminal block of the A68RD fall out or subject them to strong impacts because these parts are made of resin.
- (2) Do not remove printed circuit boards from the housing. There are no user-serviceable parts on the boards.
- (3) Ensure that no conductive debris can enter the module. If it does, make sure that it is removed. Guard particularly against wire offcuts.
- (4) Tighten terminal screws as specified below:

Screw	Tightening Torque Range (N-cm)
I/O terminal block terminal screws (M3)	39 to 59
I/O terminal block installation screws (M4)	78 to 118

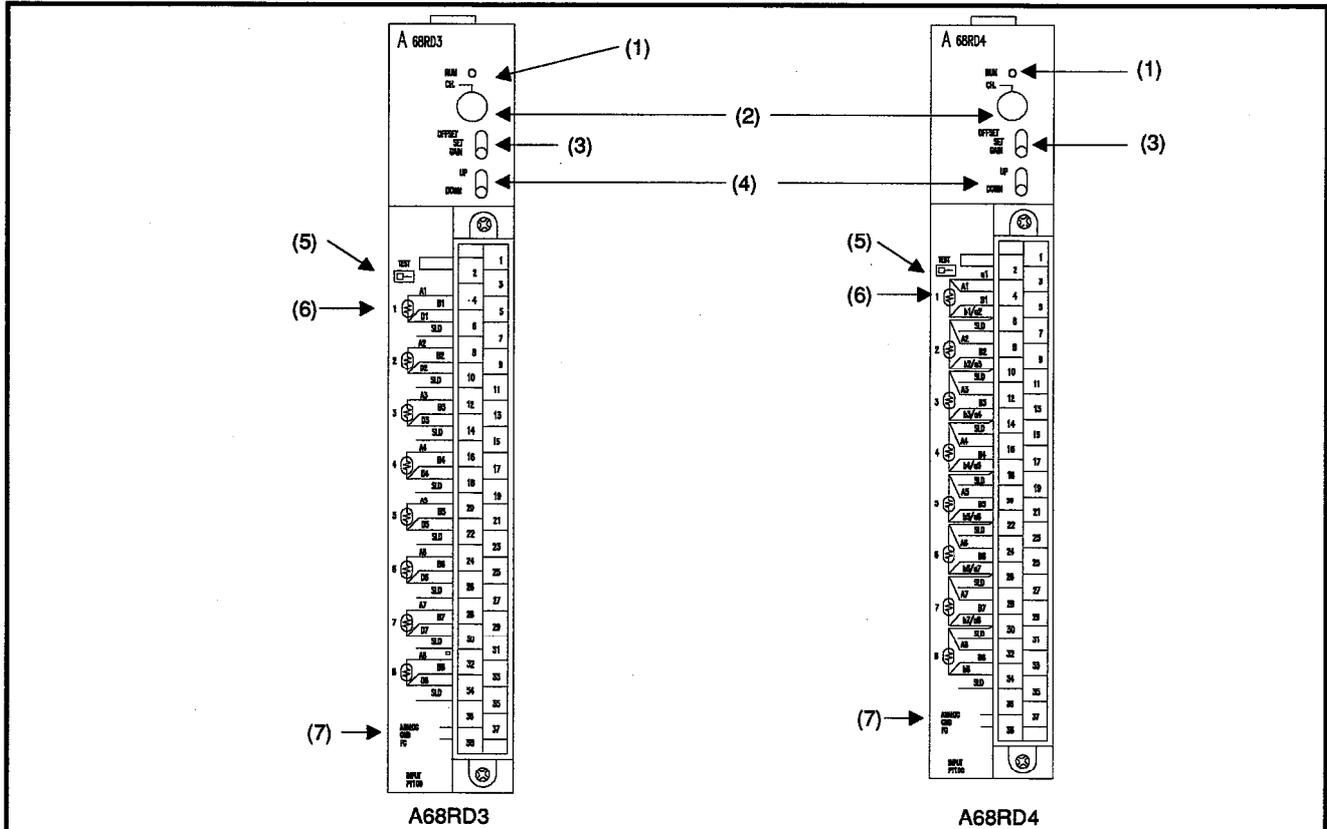
- (5) To load the module onto the base, press the module against the base so that the hook is securely locked. To unload the module, push the catch on top of the module, and, after the catch is disengaged from the base, pull the module toward you.

4. PRE-OPERATION SETTINGS AND PROCEDURES

MELSEC-A

4.3 Nomenclature

The following gives the nomenclature of each part of the A68RD3 and A68RD4.

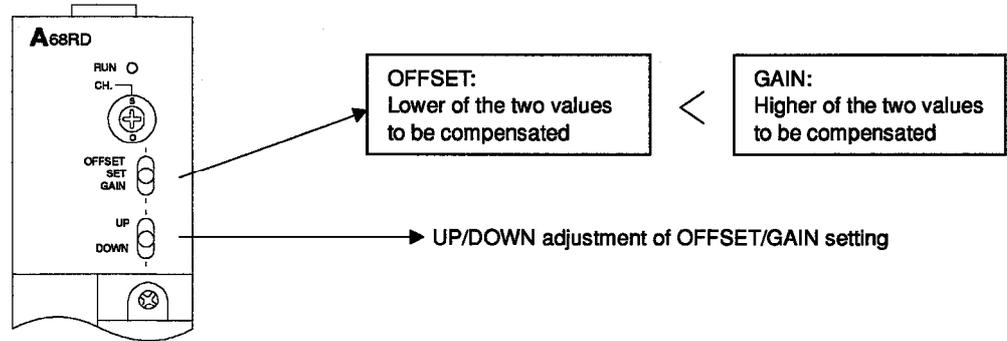


No.	Name	Description					
(1)	Operating status display LED (RUN LED)	<table border="1"> <tr> <td rowspan="2">RUN LED</td> <td>Normal mode</td> <td> ON : Normal operation Flashing : Write data error OFF : 5 VDC power OFF or WDT error </td> </tr> <tr> <td>Test mode</td> <td> Flashing : When the offset/gain select switch is set to either the OFFSET or GAIN position, this LED flashes every 0.5 seconds. OFF : When the offset/gain select switch is set to the SET position. </td> </tr> </table>	RUN LED	Normal mode	ON : Normal operation Flashing : Write data error OFF : 5 VDC power OFF or WDT error	Test mode	Flashing : When the offset/gain select switch is set to either the OFFSET or GAIN position, this LED flashes every 0.5 seconds. OFF : When the offset/gain select switch is set to the SET position.
RUN LED	Normal mode	ON : Normal operation Flashing : Write data error OFF : 5 VDC power OFF or WDT error					
	Test mode	Flashing : When the offset/gain select switch is set to either the OFFSET or GAIN position, this LED flashes every 0.5 seconds. OFF : When the offset/gain select switch is set to the SET position.					
(2)	Channel selection switch	The channel used for offset and gain adjustment for error compensation is selected. (No processed is done in the 0 and 9 positions)					
(3)	Offset/gain setting switch	This switch sets offset and gain values in the test mode (1) OFFSET position : The calibration mode of an offset value (2) GAIN position : The calibration mode of a gain value (3) SET position : Storage mode of an offset/gain value When a switch is changed from OFFSET/GAIN to SET, the detected temperature value is stored in the internal memory of the A68RD as an offset/gain value.					
(4)	UP/DOWN switch	Increases or decreases the offset/gain value of a channel to be used at the following rate: (1) ON (Less than 1.5 seconds) : The value increases or decreases every time in units of 0.025 °C (0.077 °F). (2) ON (1.5 seconds or more) : The value increases or decreases 0.025 °C (0.077 °F) every 0.05 seconds.					
(5)	Test mode terminals	Use terminals 1 and 2 to make a short circuit for error completion.					
(6)	Pt100 connecting terminal	Used to connect to a Pt100 or a standard resistor.					
(7)	Analog ground terminal	Used when each module makes grounding.					

4.4 Error Compensation

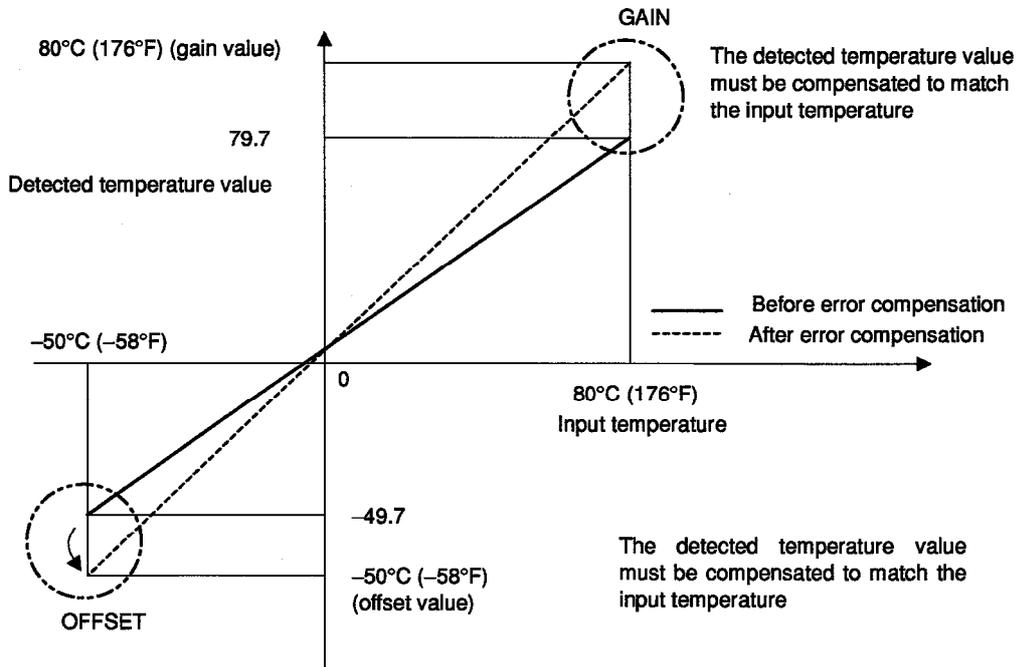
Error compensation is required (a) when starting up a system, or (b) when a correct detected temperature value cannot be obtained.

Error compensation is done by reading a detected temperature value from buffer memory with a sequence program, and monitoring it with a peripheral device.



The following explains the characteristics of the detected temperature value when compared with the input temperature.

Compensate detected temperature values so that the detected value becomes identical with the input temperature.



* Error compensation can be done using a standard resistor instead of inputting a temperature directly to the Pt100.

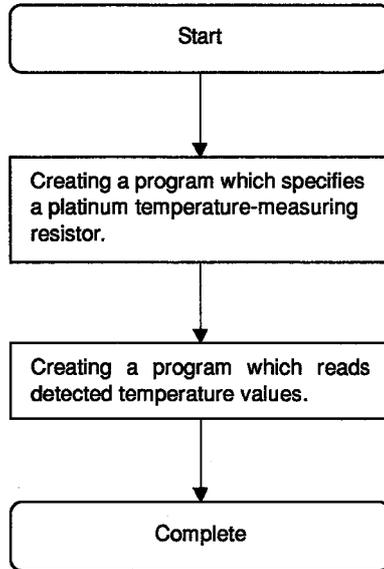
Resistance value of a standard resistor	=	Standard resistance value of Pt100 against the input temperature that is compensated an offset/gain value (see Appendix 2).
---	---	---

POINTS

- | |
|---|
| <ul style="list-style-type: none">(1) Perform error compensation at the highest and lowest temperatures of the available range. This yields a high-precision offset/gain value.(2) To set an offset/gain value, read the detected temperature value with a sequence program.
Make an interlocking sequence to read a detected temperature value when the READY flag is being set (ON).(3) The offset/gain value must be within the temperature input range.(4) The offset/gain value is stored in the A68RD.
Even if the power supply is turned OFF, this data is not cleared. |
|---|

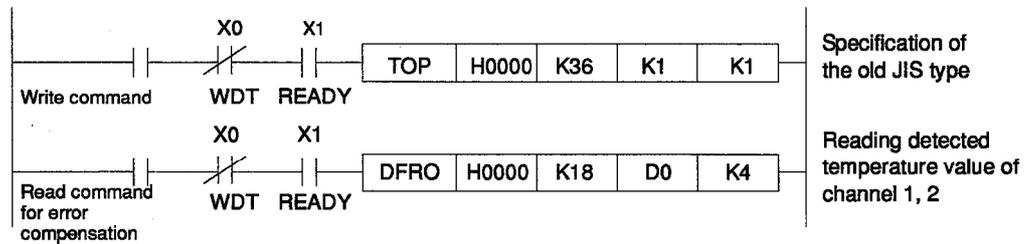
4.4.1 Initial setting for error compensation

The initial setting procedure shown below must be used for error compensation.



Sample program

When channel 1, 2 is set for the platinum temperature-measuring resistor of the old JIS type:



POINT

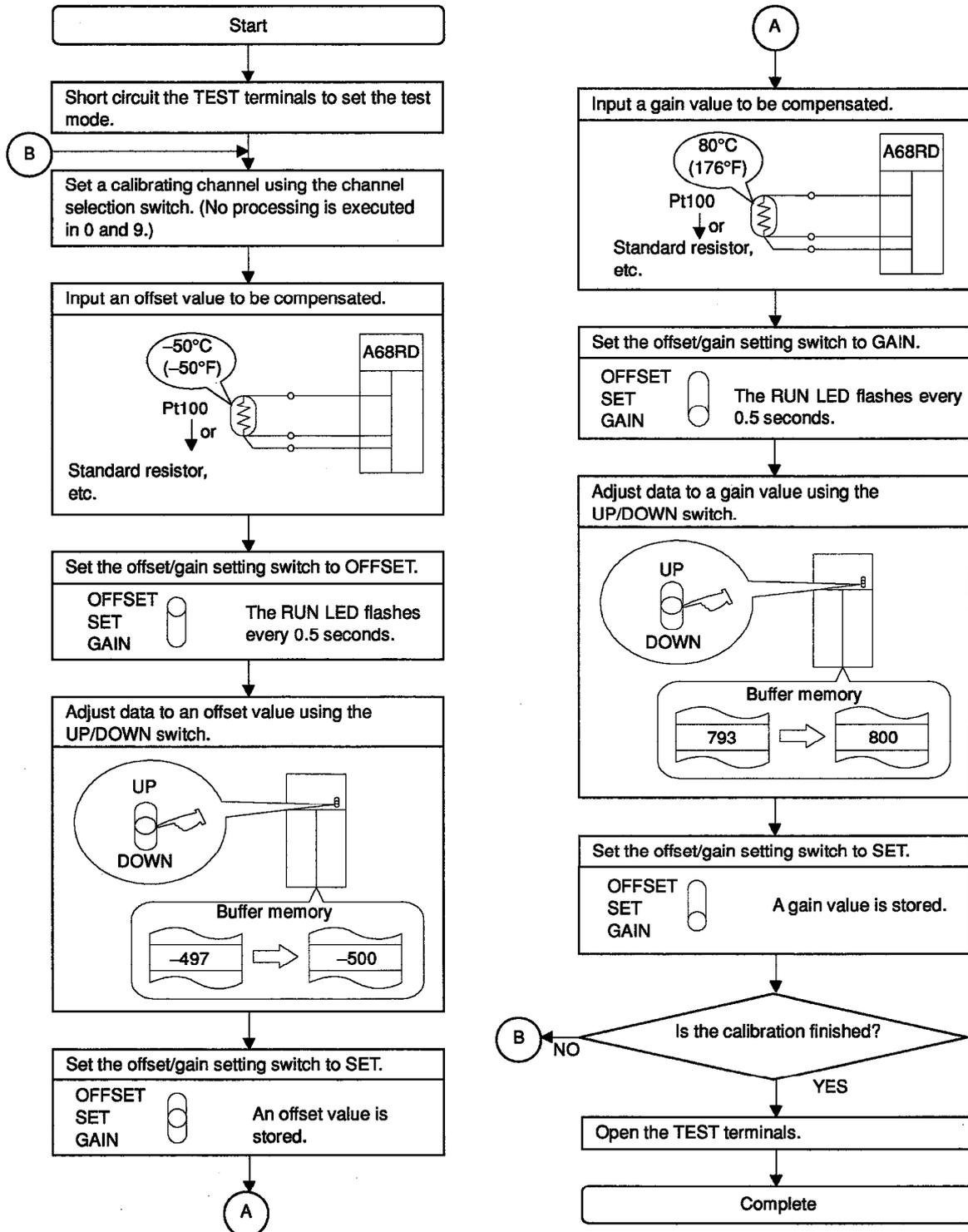
Before setting the test mode, perform the initial setting for error compensation in the normal mode.

REMARK

See Section 5.2 of this manual and the ACPU Programming Manual (Common Instructions) for TOP and DFRO instructions.

4.4.2 Error compensation procedure

The following describes the error compensation procedure.



POINTS

- (1) After offset/gain setting in the test mode, the offset value cannot be checked by setting the offset/gain switch to the OFFSET position again (the set value is retained).
- (2) After offset/gain setting in the test mode, the offset value and gain value cannot be checked by setting the test mode again from the normal mode (the set values are retained).

4.5 Connecting a Platinum Temperature-Measuring Resistor

The following describes the method for connecting and precautions on connection a Pt100 to a 3-wire (A68RD3) or 4-wire (A68RD4) type module.

4.5.1 Precautions on connection

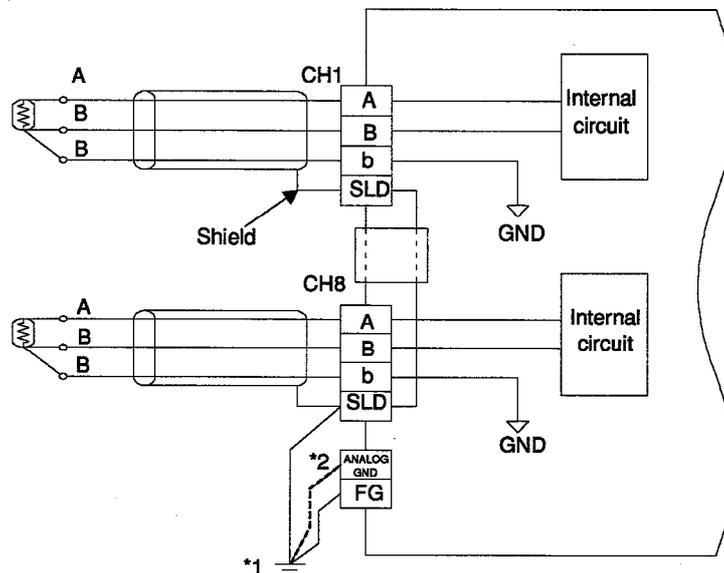
One of the conditions for obtaining the best from the A68RD functions and ensuring a high system reliability system is external wiring with a high resistance to the effects of noise.

- (1) Use separate cables for AC lines and A68RD external input signal lines to eliminate the effects of AC surge and induction.
- (2) Do not bundle these signal lines together with main circuit or high voltage lines, or load lines from equipment other than the programmable controller, or lay these lines close to each other. If these recommendations are ignored, the signal lines will be susceptible to noise, surge, and induction.
- (3) The shield of the shield wire or shield cable should normally be grounded at one point at the programmable controller side. However, depending on the external noise conditions, it may be advisable to ground it externally.

4.5.2 Connecting an A68RD3

- (1) Using a 3-wire Pt100 yields the highest precision

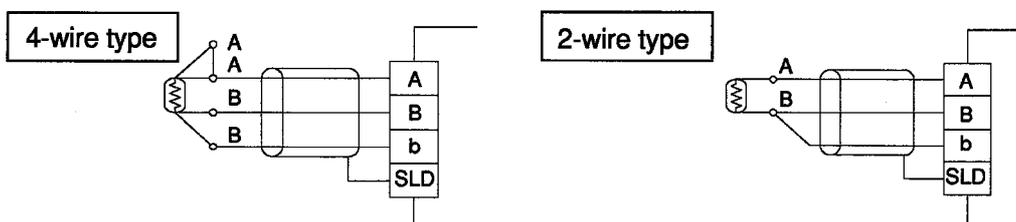
The example below shows connection of a 3-wire Pt100.



*1 Connect the FG terminal of the power supply module also.
 *2 Connection may be advisable depending on the environment of use.

- (2) A 2-wire, or 4-wire Pt100 can be used with the A68RD3.

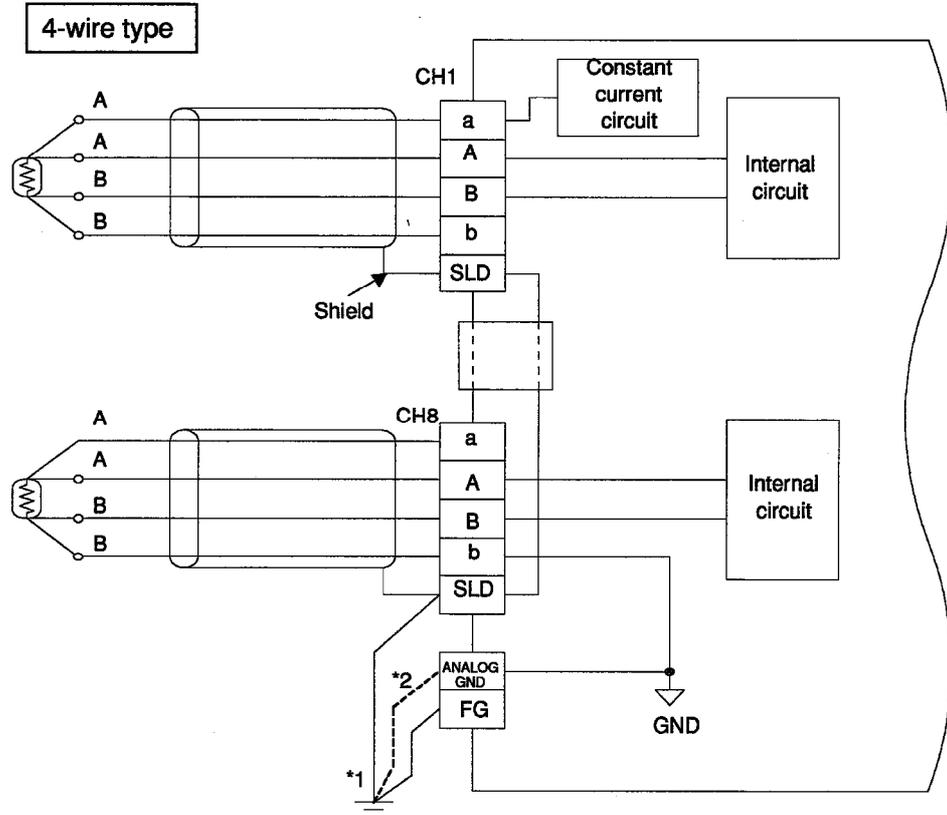
Connect as follows when using a 4-wire Pt100 or 2-wire Pt100.



4.5.3 Connecting an A68RD4 and precautions

- (1) Using a 4-wire Pt100 yields the highest precision.

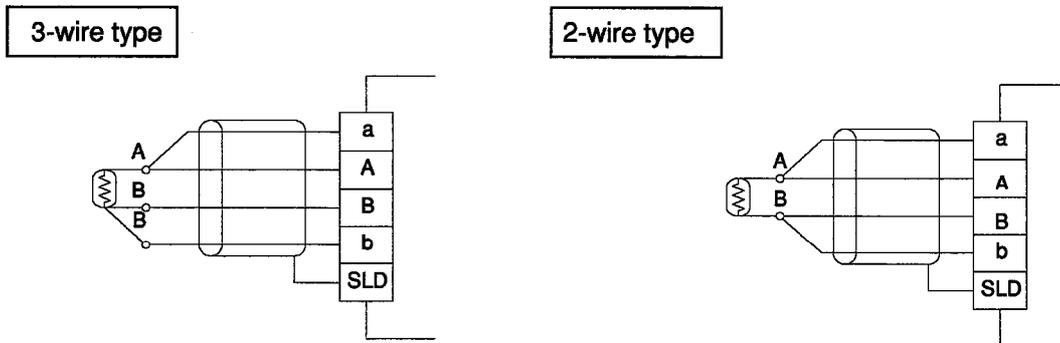
The example below shows connection of a 4-wire Pt100



- *1 Connect the FG terminal of the power supply module also.
- *2 Connection may be advisable depending on the environment of use.

- (2) A 2-wire, or 3-wire Pt100 can be used with the A68RD4.

Connect as follows when using a 3-wire Pt100 or 2-wire Pt100.



Precautions when connecting an A68RD to a Pt100

The following describes the precautions to take when connecting an A68RD4 to a Pt100.

IMPORTANT

- (1) Connect terminals a1 and b8 of A68RD (see Figure 1 below).
- (2) Skip terminals an and bn of unused channels (see Figure 2 below).
Make connections as shown below.

When using all channels

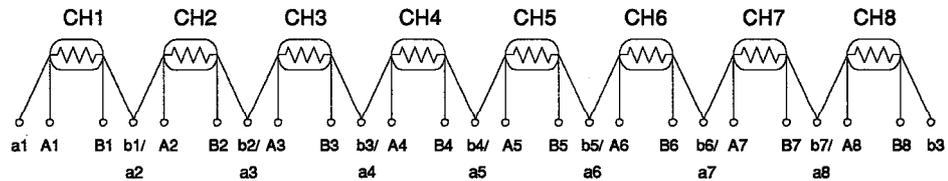


Figure 1

When using channels 1, 2, 3, 5, and 8

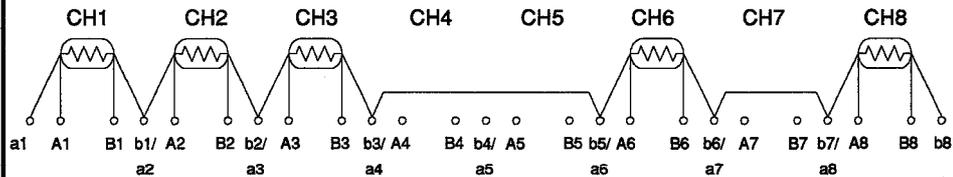


Figure 2

POINT

Be sure to specify a channel not to be used for conversion-disabled.
When a channel not to be used is specified to conversion-enabled, the disconnection-detected signal goes ON even if there is no disconnection in used channels.

5. PROGRAMMING

This section explains the programming method for use with the A68RD.

5.1 Programming Procedure

Figure 5.1 shows the programming procedure for data write/read between the A68RD and a PC CPU.

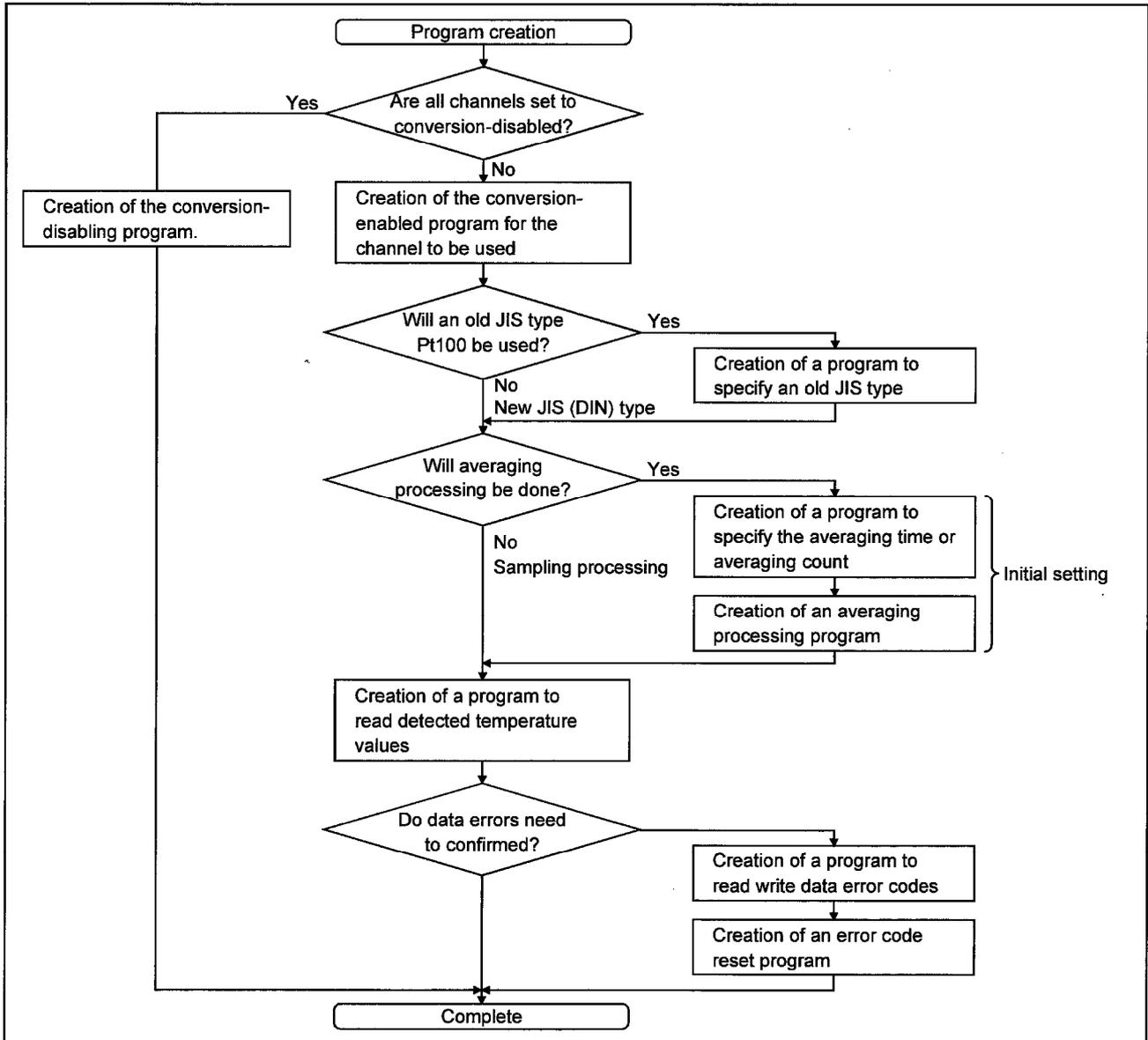


Fig. 5.1 Programming Procedure

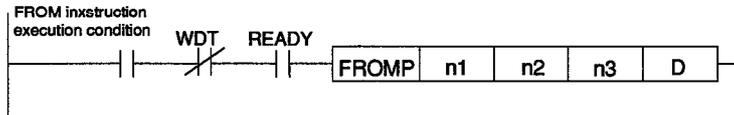
POINT

- (1) Only use the above-mentioned procedure to perform the initial settings.
If averaging processing is specified before setting averaging time or count, a write data error occurs. To avoid this, batch writing of the initial setting data is recommended.
- (2) Access from the PLC CPU takes priority among various types of processing of the special function module. If access from the PLC CPU to the buffer memory of the special function module is gained frequently, not only the scanning time of the PLC CPU will be prolonged but also the various types of processing of the special function module will be delayed. Carry out the access from the PLC CPU to the buffer memory with FROM/TO instructions only when necessary.

5.2 Basic Read/Write Programs

(1) Reading from an A68RD FROM, FROMP, DFRO, and DFROP instructions

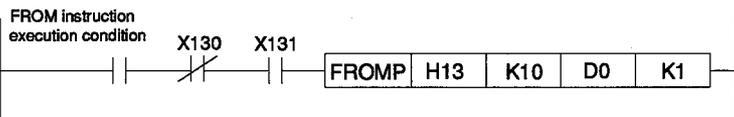
Format



Symbol	Description	Devices
n1	Higher 2 digits of 3 hexadecimal digits which represent the head I/O number allocated to the A68RD	K, H
n2	Head address of buffer where data is stored	K, H
D	Head number of devices which store read data	T, C, D, W, R
n3	Number of words of read data	K, H

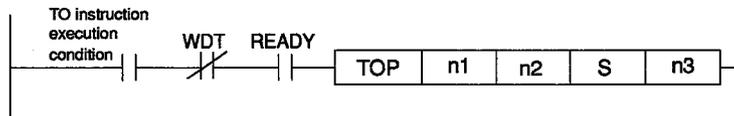
Example

To read one word from buffer address 10 to D0 when an A68RD is allocated to X130 to 14F and Y130 to 14F:



(2) Writing to an A68RD TO, TOP, DTO, and DTOPT instructions

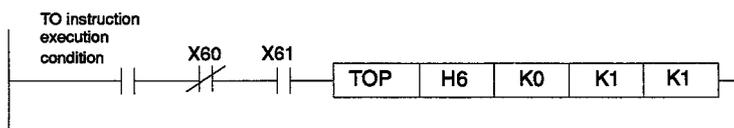
Format



Symbol	Description	Devices
n1	Higher 2 digits of 3 hexadecimal digits which represent the head I/O number allocated to the A68RD	K, H
n2	Head address of buffer where to store data	K, H
S	Head number of devices which store write data or constant	T, C, D, W, R, K, H
n3	Number of words of write data	K, H

Example

To write data to address 0 when an A68RD is allocated to X60 to 7F and Y60 to 7F:



5.3 Sample Program For a Building-Block Type CPU

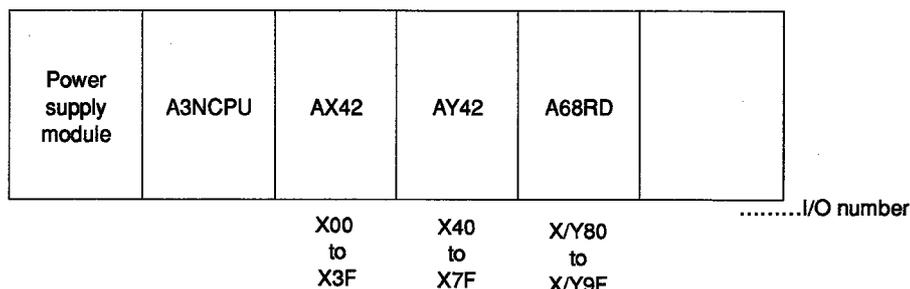
The following explains the programming for use with the A68RD.

5.3.1 Program to read detected temperature values

Time average processing of 500 ms is done in channel 1 using an old JIS-type Pt100. Detected temperature values are read after conversion-completed.

A program for reading the write data error code and reading the error code is included.

[System configuration]

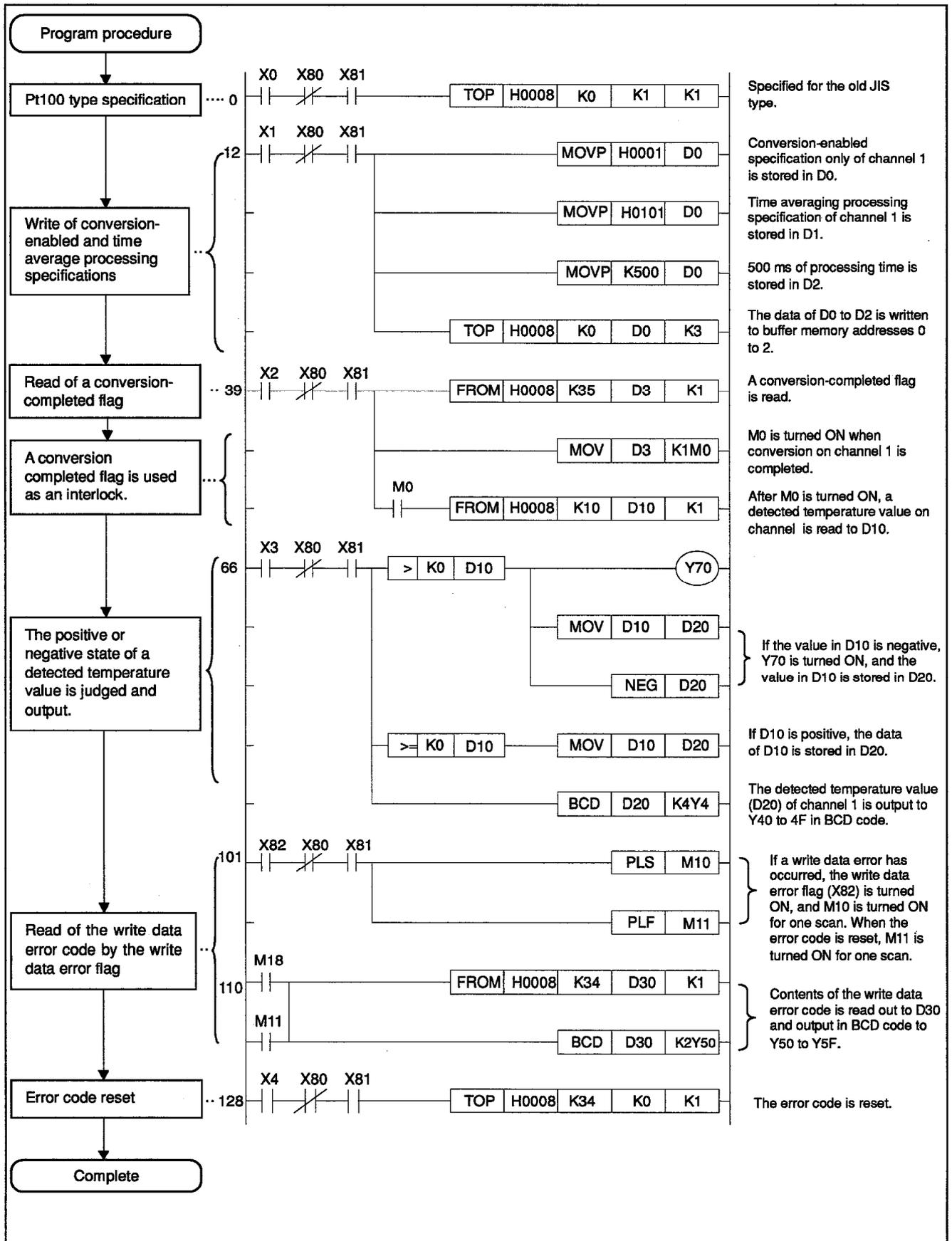


[Specifications]

- (1) Executable command
 - (a) Write command for the type specification of a platinum temperature-measuring resistor X0
 - (b) Write command for a conversion-enabled specification and time averaging processing specification X1
 - (c) Read command for a conversion-completed flag X2
 - (d) Positive/negative judgment command for detected temperature values X3
 - (e) Read command for the write data error code X82
(Write data error flag)
 - (f) Error code reset command X4
- (2) Output when a detected temperature value is negative Y70
- (3) Output of a detected temperature value (4-digit BCD) Y40 to Y4F
- (4) Output of the write data error code (2-digits BCD) Y50 to Y57
- (5) Storage register for conversion-enabled specification D0

- (6) Storage register for time average processing specification D1
- (7) Storage register for averaging time D2
- (8) Storage register for the read conversion-completed flag D3
- (9) Storage register for a read detected temperature value..... D100
- (10) Storage register for a detected temperature value after
positive/negative judgment D200
- (11) Storage register for read write data error code D300

[Sample program]



5.3.2 Program when using an A68RD at a remote I/O station

When using an old JIS-type Pt100, time averaging processing of 500 ms is done in channel 1, and a detected temperature value is read after conversion completion.

A program for reading the write data error code and resetting the error code is included.

[Instructions]

(1) Data transfer method

The ACPU has direct and refresh I/O control modes. Data transfer between the ACPU and a remote I/O station is made in the batch refresh mode after executing the END (FEND) instruction.

(2) Response delay

A time difference (response delay) occurs because control data transferred between the master station CPU and the remote I/O station A68RD is controlled through the link module. Therefore, control timing must be noted.

(3) Instructions

The following instructions are used for data transfer between the master station CPU and the remote I/O station A68RD:

(a) Data write (master station to A68RD) : RTOP instruction

(b) Data read (A68RD to master station) : RFRP instruction

(4) Devices for data transfer

Link registers (W) are used for data transfer between the master station CPU and the remote I/O station A68RD. Write either or both of the following programs to the master station as appropriate:

(a) Data write : This program transfers data (to be transferred to the remote I/O station A68RD) to the specified link registers before executing the RTOP instruction.

(b) Data read : This program transfers data from the link registers to the other device after executing the RFRP instruction.

(5) Disabled simultaneous execution of RTOP and RFRP instructions

RTOP and RFRP instructions cannot be simultaneously executed to the same A68RD. To enable simultaneous execution, data link I/O signals must be written to the program as interlock conditions.

(When two A68RDs are loaded in the same remote I/O station, the RTOP instruction may be executed to one A68RD and the RFRP instruction to the other at the same time.)

(6) Control signals to the A68RD

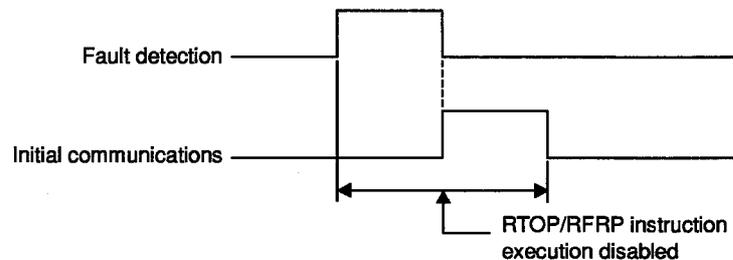
Because of the relation between the master station scan time and link scan time, a PLS Y[] signal output to the remote I/O station may not be provided to the A68RD.

The pulse output which executes the RST instruction after the SET instruction cannot be used because data is transferred between the master station and remote I/O station in batch refresh mode after executing the END (FEND) instruction.

(7) Detection of a faulty remote I/O station or parameter communications

(a) Interlock must be provided using the following devices so that the RTOP/RFRP instruction is not executed when the remote I/O station is faulty or during initial communications with the remote I/O station.

- 1) Remote I/O station fault detection : D9228 to D9231
- 2) Initial communications detection : D9924 to D9927



The following shows the faulty remote I/O station and detection timing during initial communications.

(b) The fault detection program must be written before the initial communications detection program.

If these programs are written in reverse order, neither error nor initial communications may be detected depending on the link refresh timing.

(8) Faulty A68RD detection

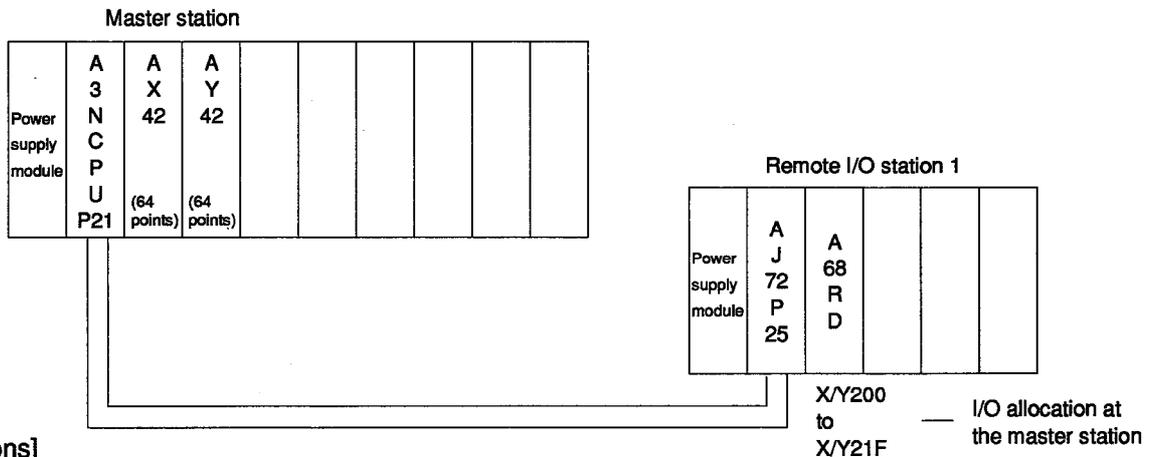
(a) X1D goes ON to indicate that the A68RD is faulty and the RFRP/RTOP instruction cannot be executed. When this happens, check the A68RD for an A68RD fault, module loading fault, etc.

(b) Switch ON YD to switch OFF X1D

YD must only be switched ON/OFF as described below, using the SET/RST instruction:

- 1) Switched ON when X1D is switched ON.
- 2) Switched OFF only once when X1D is switched OFF.

[System configuration]

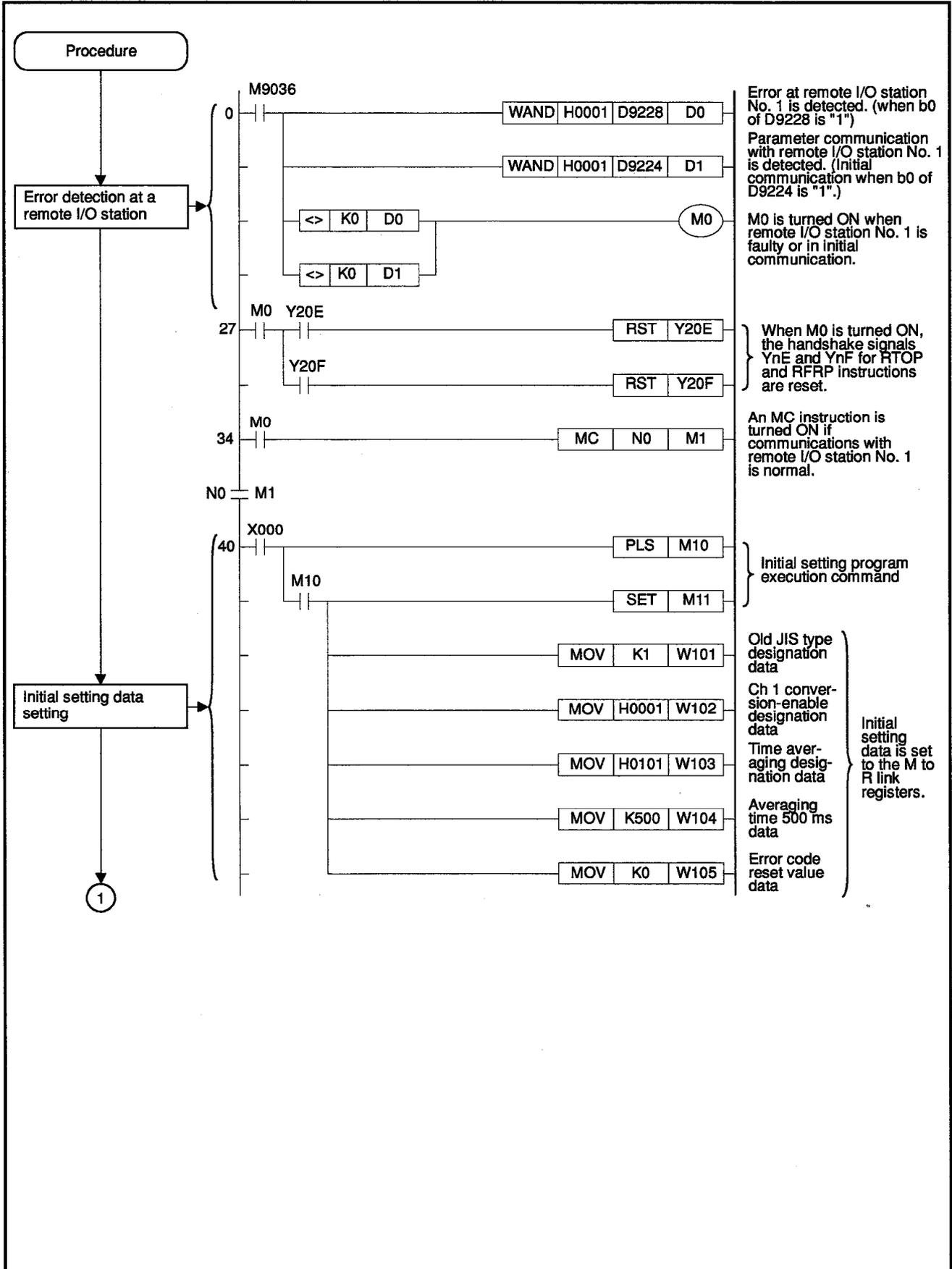


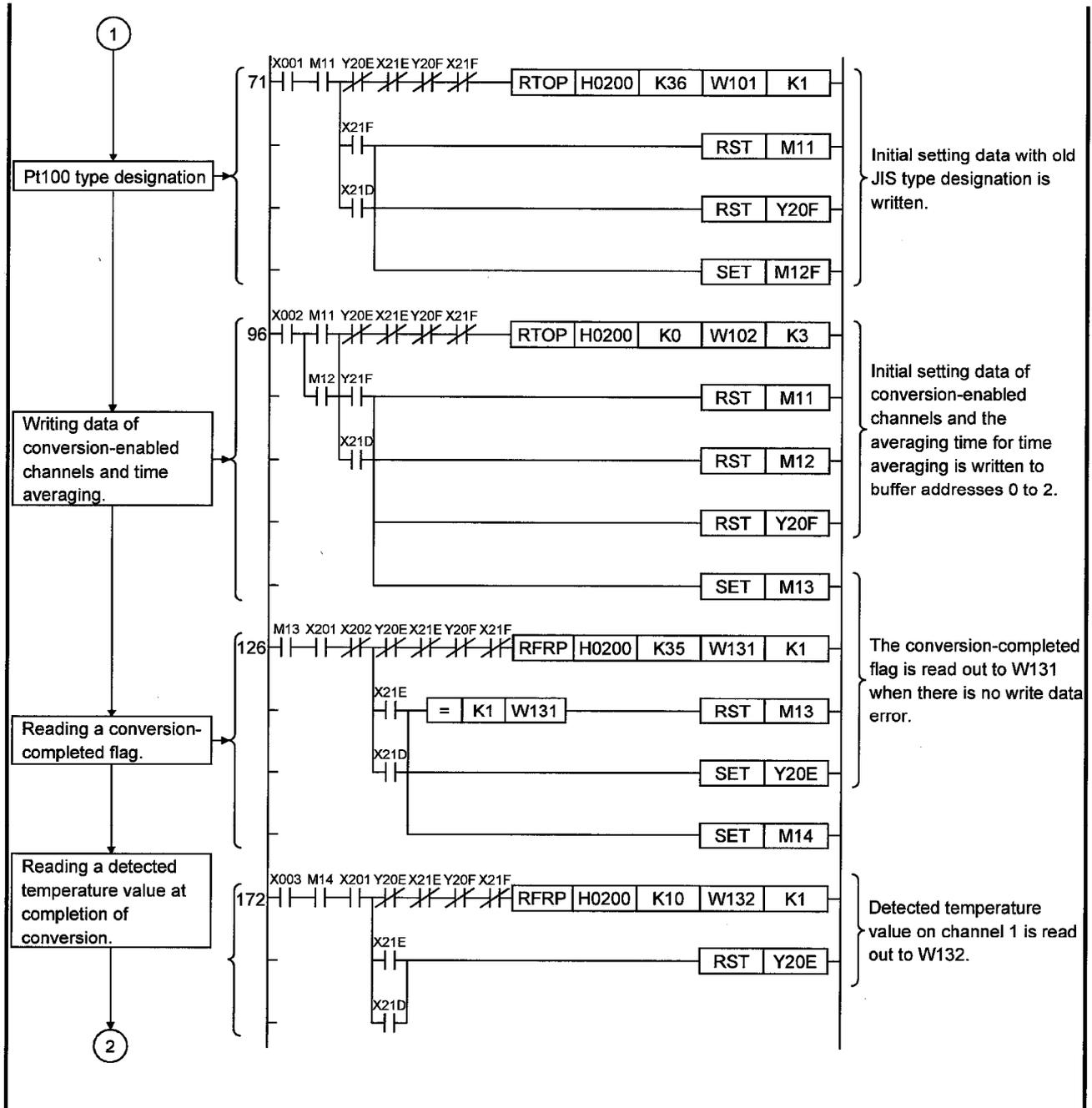
[Specifications]

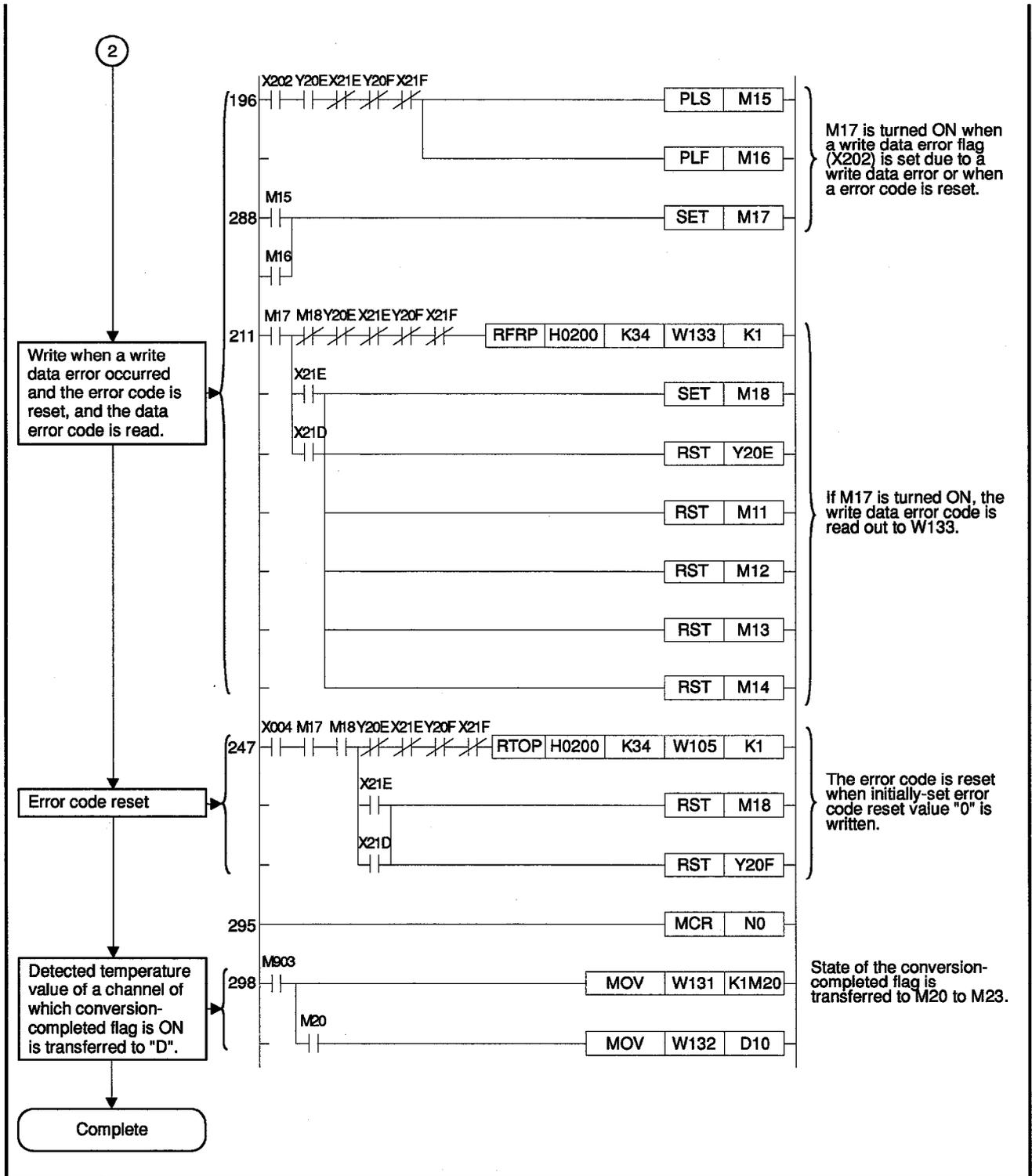
- (1) Executable commands
 - (a) Initial setting command.....X0
 - 1) Designation of type of platinum temperature-measuring resistor
 - 2) Designation of conversion-enabled channel
 - 3) Designation of time averaging
 - 4) Length of averaging time
 - 5) Error code reset command
 - (b) Command to write the designation of type of platinum temperature-measuring resistorX1
 - (c) Command to write the designation of conversion-enabled channel and time averaging.....X2
 - (d) Command to read a detected temperature valueX3
 - (e) Command to read a write data error code (Write data error flag)X202
 - (f) Command to write an error code reset value.....X4
- (2) Link registers for M to R
 - (a) Register to store the designation data of type of platinum temperature-measuring resistorW101
 - (b) Register to store the designation data of conversion-enabled channelsW102
 - (c) Register to store the designation data of time averaging W103
 - (d) Register to store the data of the length of time of averaging W104
 - (e) Register to store the error code reset value W105
- (3) Link registers for R to M
 - (a) Register to store a conversion-completed flagW131
 - (b) Register to store a detected temperature value.....W132
 - (c) Register to store a write data error codeW133

POINT

Link registers W100 to W105 are set by link parameter for writing data from a master station to remote I/O station No. 1, and W130 to W133 are set for reading data from remote I/O station No. 1 to a master station. W100 and W130 are used by the operating system to store the address of the A68RD of remote I/O station No. 1.







6. TROUBLESHOOTING

This section describes and explains troubleshooting for A68RD errors.

6.1 Error Code List

When writing averaging processing specification, averaging time and the averaging count from a PC CPU, the following errors sometimes occur:

The numerical value in the error code column indicates the channel number where the error occurred.

Table 6.1 Type of Error Code

Error Code	Cause	Corrective Action
102	Write was attempted to the read-only area (addresses 10 to 33 and 35).	Correct the data that designates the read-only area.
[] [0 to 4]	<ul style="list-style-type: none"> Value other than 320 to 32000 ms has been set for the averaging time. [] indicates the channel number on which an error occurred. Each number of [0 to 4] does not have any specific meaning but indicates an averaging time setting error. 	Correct the averaging time setting value within 320 to 32000 ms range.
[] [5 to 8]	<ul style="list-style-type: none"> Value other than 1 to 800 times has been set for the number of times of averaging (averaging count). [] indicates the channel number on which an error occurred. Each number of [5 to 8] does not have any specific meaning but indicates an averaging count setting error. 	Correct the averaging count setting value within 1 to 800 times range.

- (1) If more than one error has occurred, the first error code is stored, and the following error codes are not stored.
- (2) To reset the error code, write "0" to buffer address 34 or turn Y12 error code reset flag ON. (See Section 3.4.6.)

6.2 When the RUN LED Flashes or Goes OFF

(1) When the RUN LED flashes

Check Item	Corrective Action
Is the write data error flag ON?	Correct it according to Section 6.5.
Are the TEST terminals open?	Open the TEST terminals after making an error compensation.

(2) When the RUN LED goes OFF

Check Item	Corrective Action
Is the 5 VDC power supply ON?	<ul style="list-style-type: none"> • Make sure the power supply is ON. • Be sure the base and the module are connected.
Is the watchdog timer error signal turned ON?	Correct it according to Section 6.3.
Are the TEST terminals open?	Open the TEST terminals after making an error compensation.

6.3 When the WDT Error Signal is ON

Check Item	Corrective Action
Is the WDT error occurring?	Reset the PC power supply. If the error signal does not go OFF, it indicates faulty hardware. Consult the nearest Mitsubishi representative.

6.4 When the READY Signal is not Turned ON

Check Item	Corrective Action
Is the WDT error signal turned ON?	Correct it according to Section 6.3.
Is there an error in the PC CPU?	Correct it according to the appropriate User's Manual for the CPU module.

6.5 When the Write Data Error Flag is ON

Check Item	Corrective Action
Is a write data error occurring?	<ul style="list-style-type: none"> • See the error code list of Section 6.1 and correct the sequence program. • Confirm the order of the initial setting of Section 5.1 and correct the sequence program.

6.6 When the Disconnection-Detected Signal Is ON

Check Item	Corrective Action
Is any of unused channels set to conversion-enabled?	Set unused channels to conversion-disabled.
Is any channel disconnected?	A68RD3 Connect correctly or replace the Pt100 of the disconnected channel.
	A68RD4 <ul style="list-style-type: none"> • Make continuity between terminals a1 and b8. • Connect correctly or replace the Pt100 of the disconnected channel.

6.7 When a CPU Cannot Read a Detected Temperature Value

Check Item	Corrective Action
Is the channel to be used specified for conversion-enabled?	Set a channel for conversion-enabled.
Is the RUN LED flashing or turned OFF?	Correct it according to Section 6.2.
Is the RUN LED of the CPU module flashing or turned OFF?	Check the error descriptions in the appropriate User's Manual for the CPU module.
Is the ERROR LED of the CPU module flashing or turned OFF?	
Is there a disconnection in Pt100? Or is the Pt100 removed?	Connect Pt100 correctly. Or change it.
Was the error compensation done correctly?	Correct it according to Section 4.4.

6.8 When an Temperature Input Value Does Not Match a Detected Temperature Value

Check Item	Corrective Action
Was the error compensation done correctly?	Correct it according to Section 4.4.
Is the disconnection-detected signal turned ON?	Correct it according to Section 3.3.5.
Is the CPU module in the RUN state?	Set the CPU module to the RUN state.
Is specified Pt100 is used?	Specify a Pt100 to be used.

APPENDIX 1 A0J2CPU Sample Program

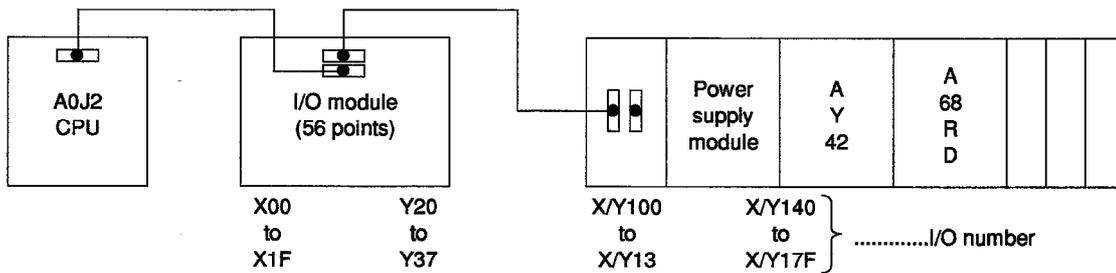
The following explains the programming for use with the A68RD.

POINTS
(1) When the A0J2 is connected to an extension base, 64 inputs and outputs are allocated to each slot of the extension base. (2) When an A68RD is loaded to an extension base, only the first 32 points can be used.

1.1 Program to Read a Detected Temperature Values

Time average processing of 500 ms is done in channel 1 using an old JIS-type Pt100. The detected temperature value is read after conversion completion. A program for reading the write data error code and resetting the error code is included.

[System configuration]



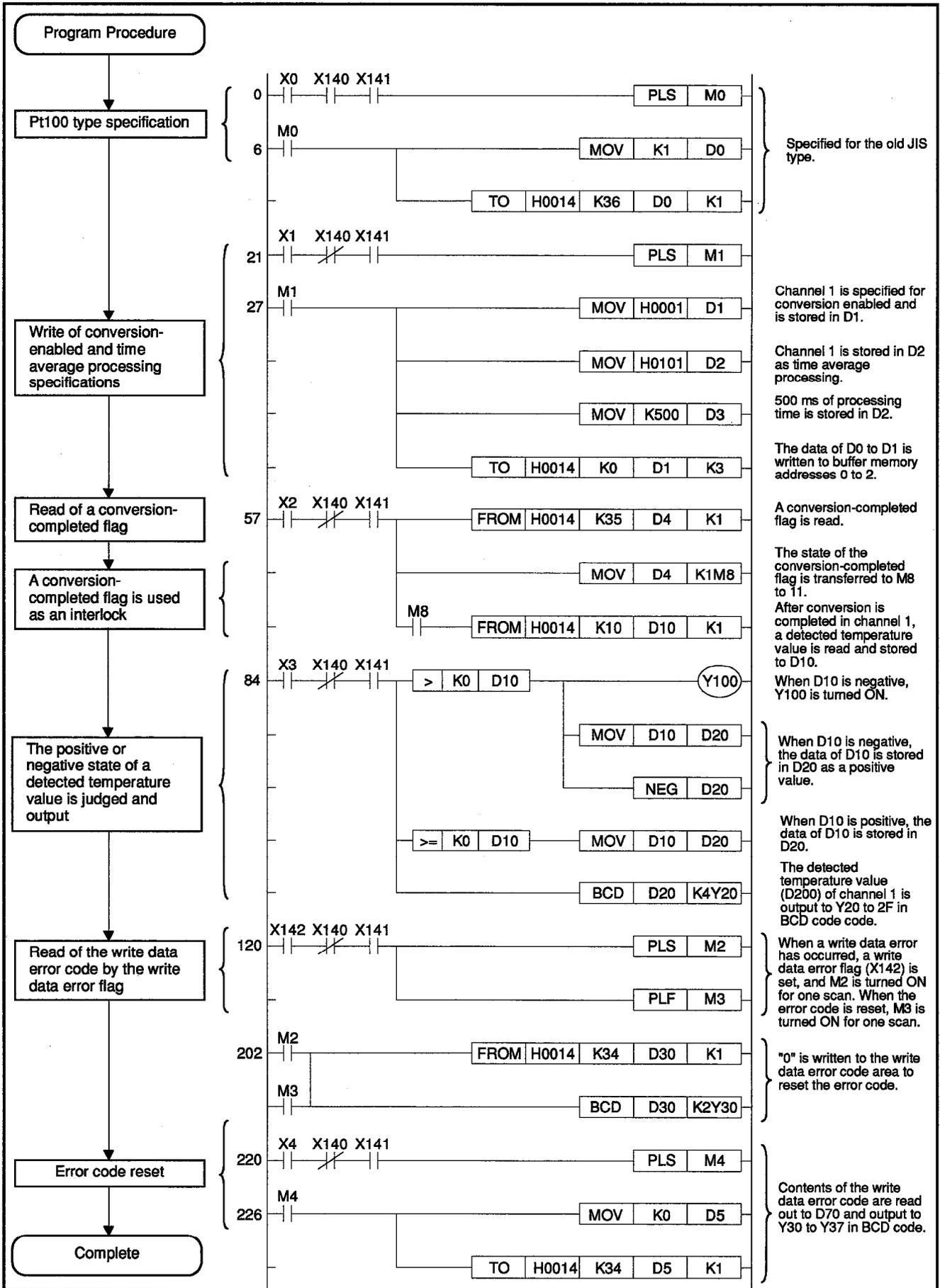
[Specifications]

(1) Executable command

- (a) Write command for the type specification of a platinum temperature-measuring resistor X0
- (b) Write command of conversion-enabled specification and time average processing and specification X1
- (c) Read command of a conversion-completed flag X2
- (d) Positive/negative judgment command for detected temperature value X3
- (e) Read command for the write data error code X142
(Write data error flag)
- (f) Error code reset command X4

- (2) Output when a detected temperature value is negative..... Y100
- (3) Output of a detected temperature value (4-digit BCD) Y20 to Y2F
- (4) Output of a write data error code (2-digit BCD) Y30 to Y37
- (5) Storage register for the platinum temperature-measuring resistor type specification D0
- (6) Storage register for conversion-enabled channels D1
- (7) Storage register for time average processing specification D2
- (8) Storage register for averaging time D3
- (9) Storage register for the read conversion-completed flag D4
- (10) Storage register for error code reset command D5
- (11) Storage register for a read detected temperature value..... D100
- (12) Storage register for a detected temperature value after positive/negative judgment D200
- (13) Storage register for read write data error code D300

[Sample program]



APPENDIX 2 Comparison of Performance Specifications between A1S62RD3, A1S62RD4, A68RD3 and A68RD4

Table 1 Comparison of Performance Specifications

Item		A68RD3	A1S62RD3	A68RD4	A1S62RD4
Method of measurement		3-wire type		4-wire type	
Connectable temperature-measuring resistor		Pt100 (conforms to 1989 JIS and DIN) JPt100 (1981 JIS)			
Temperature input range	Pt100	-180°C to 600°C (27.08 Ω to 313.59 W)			
	Jpt100	-180°C to 600°C (25.8 Ω to 317.28 W)			
Detected temperature value		16-bit signed binary -1800 to 6000 (value to the first decimal place x 10)			
		32-bit signed binary -180000 to 600000 (value to the third decimal place x 1000)			
Resolution		0.025 °C			
Overall accuracy		±1%			
Conversion speed		40 ms/channel			
Number of temperature input device points		8 channels/module	2 channels/module	8 channels/module	2 channels/module
Number of temperature input device points	Between an input terminal and PC CPU power	Photocoupler insulation			
	Between channels	No insulation			
Number of I/O device points		32			
Connection terminal block		38-point terminal block	20-point terminal block	38-point terminal block	20-point terminal block
Specifying channel to detect temperature		Specify conversion-enabled for each channel			
Disconnection detection		Detected at each channel		Detected at all channels by batch	
5 VDC internal current consumption (A)		0.94	0.54	0.75	0.44

APPENDIX 3 Standard Resistance Value of Platinum Temperature-measuring Resistors

3.1 New JIS (DIN)-type Pt100

JIS C1604 – 1989, DIN 43760 – 1980

Unit : Ω

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

3.2 Old JIS-type JPt100

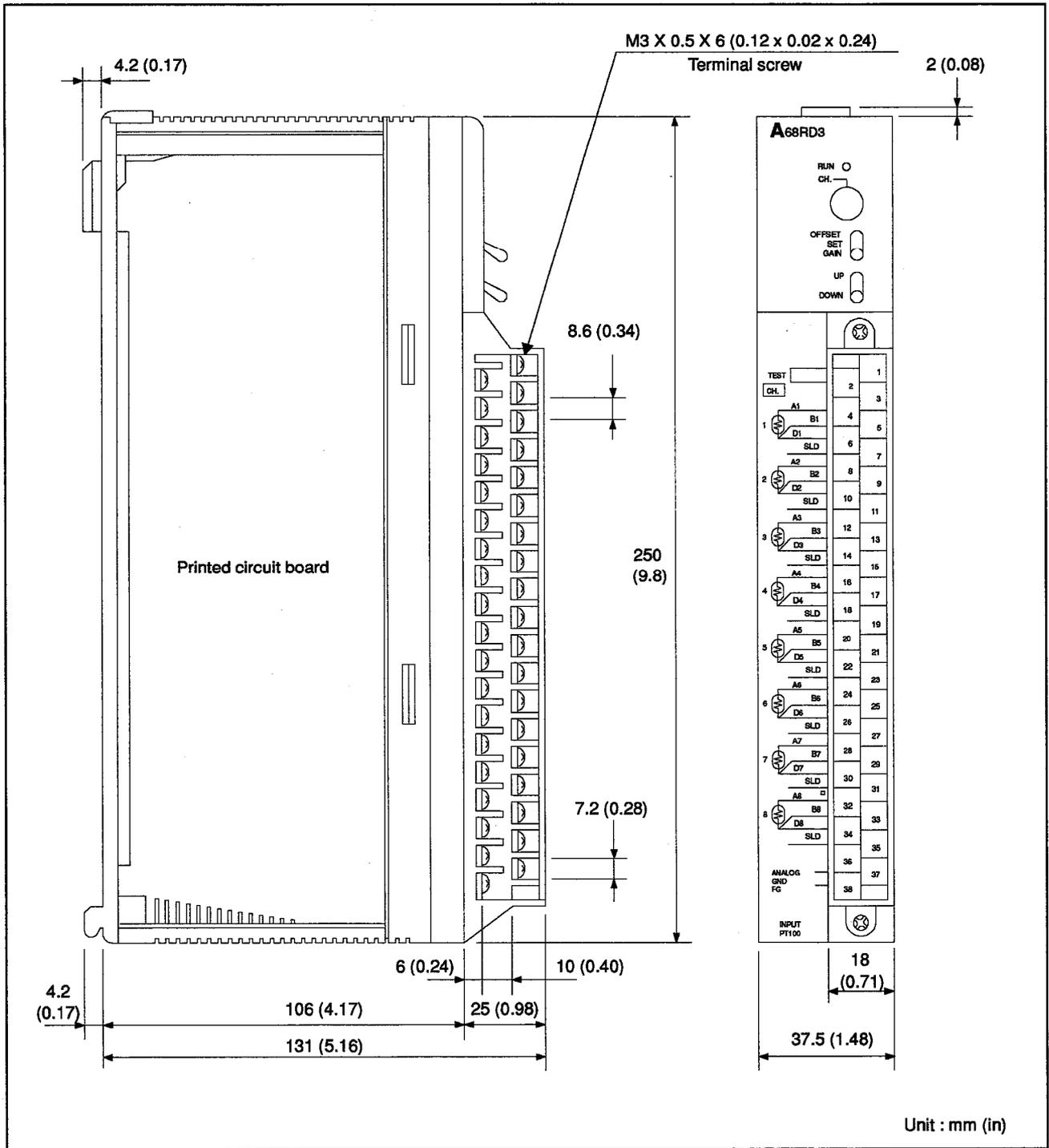
JIS C1604 – 1981

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 4 Outside Dimensions

4.1 A68RD3



Unit : mm (in)

WARRANTY

Please confirm the following product warranty details before starting use.

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 dealer or Mitsubishi Service Company. Note that if repairs are required at a site overseas, on a detached island or remote place, expenses to dispatch an engineer shall be charged for.

[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 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 possible 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 chance loss and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to damages caused by any cause found not to be the responsibility of Mitsubishi, chance losses, lost profits incurred to the user by Failures of Mitsubishi products, damages and secondary damages caused from special reasons regardless of Mitsubishi's expectations, compensation for accidents, and compensation for damages to products other than Mitsubishi products and other duties.

5. Changes in product specifications

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

6. Product application

- (1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
- (2) The Mitsubishi general-purpose programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or National Defense purposes shall be excluded from the programmable logic controller applications.

Note that even with these applications, if the user approves that the application is to be limited and a special quality is not required, application shall be possible.

When considering use in aircraft, medical applications, railways, incineration and fuel devices, manned transport devices, equipment for recreation and amusement, and safety devices, in which human life or assets could be greatly affected and for which a particularly high reliability is required in terms of safety and control system, please consult with Mitsubishi and discuss the required specifications.

Pt100 input module type A68RD3/4

User's Manual

MODEL	A68RD3/4-USERS-E
MODEL CODE	13J670
IB(NA)66308-E(0002)MEE	

 **MITSUBISHI ELECTRIC CORPORATION**

HEAD OFFICE : MITSUBISHI DENKI BLDG MARUNOUCHI TOKYO 100-8310 TELEX : J24532 CABLE MELCO TOKYO
NAGOYA WORKS : 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN

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