Power Supply/CPU Module

H-PCP-J

PLC Communication Instruction Manual

[For MITSUBISHI PLC]

RKC® RKC INSTRUMENT INC. IMS01J03-E2

- Modbus is a registered trademark of Schneider Electric.
- The name of each programmable controller (PLC) means the products of each manufacturer.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.

Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

SYMBOLS

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

 : This mark indicates that all precautions should be taken for safe usage.

 : This mark indicates important information on installation, handling and operating procedures.

 : This mark indicates supplemental information on installation, handling and operating procedures.

 : This mark indicates where additional information may be located.

⚠ WARNING

- To prevent injury to persons, damage to instrument and equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
  The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- Do not connect modular connectors to telephone line.
- When high alarm with hold action/re-hold action is used for Alarm function, alarm does not turn on while hold action is in operation. Take measures to prevent overheating which may occur if the control device fails.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
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CONTENTS

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1. OUTLINE

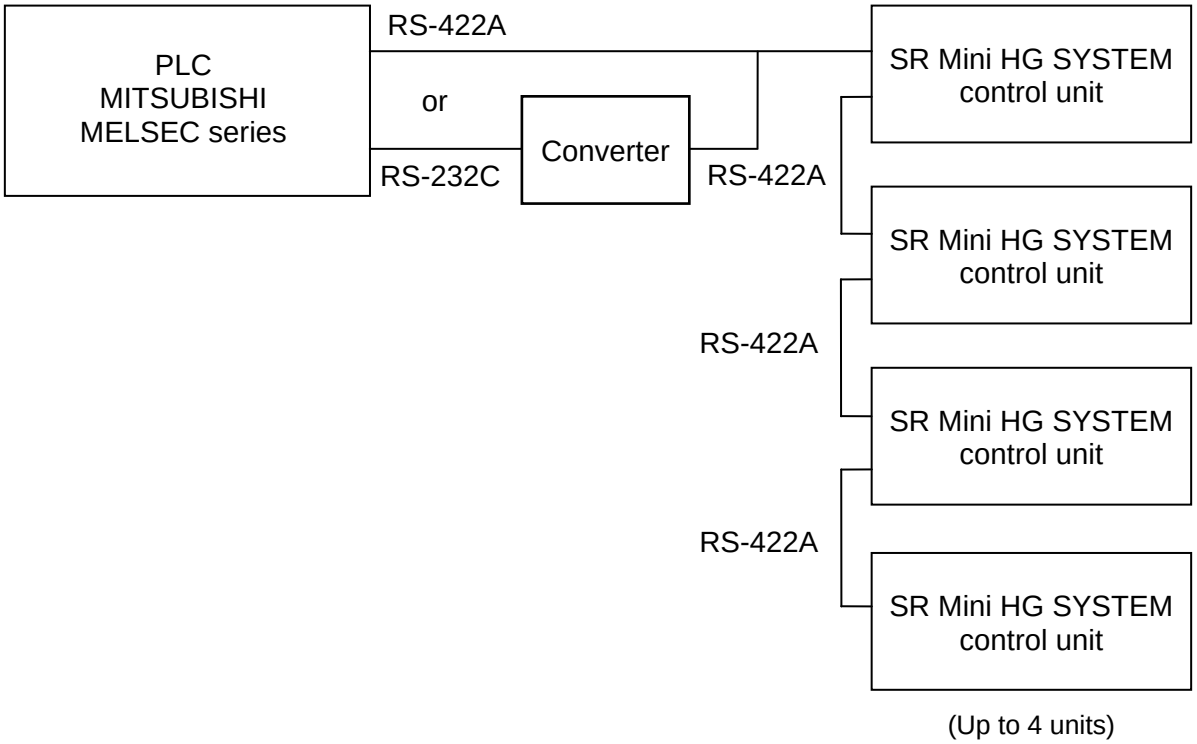
This manual describes the communication function of the SR Mini HG SYSTEM and the MITSUBISHI programmable controller (hereafter called PLC).

This manual is attached when the model code of H-PCP-J module is **H-PCP-J-□□□-D∗ □□-02E**.

For details of the H-PCP-J module, see the **Power Supply/CPU Module H-PCP-J Instruction Manual (IMS01J02-E□)**.

This manual should be used in conjunction with **Hardware Quick Manual (IMS01V01-E□)**.

The SR Mini HG SYSTEM can be connected to the MITSUBISHI MELSEC series computer link module without using any program.
The SR Mini HG SYSTEM occupies the fixed area in the PLC register memory for each unit address.
The control unit for SR Mini HG SYSTEM consists of the H-PCP-J module and temperature control function modules.



In addition, the SR Mini HG SYSTEM can be monitored only current transformer (CT) input.

For the data, see the **8. CURRENT TRANSFORMER (CT) MONITOR (P. 33)**.

■ Usable computer link modules (MITSUBISHI MELSEC series)

Name	Type
Computer link module	AJ71UC24 A1SJ71UC24-R2 A1SJ71UC24-R4 A1SJ71UC24-PRF A1SJ71C24-R2 A1SJ71C24-R4 A1SJ71C24-PRF A1SCPUC24-R2 A2CCPUC24 (PRF) etc. The module which A series common command (type 4) can use.
Serial communication modules	AJ71QC24N A1SJ71QC24N QJ71C24 etc. The module which A series common command (type 4) can use.
Adapter	FX0N-232ADP FX0N-485ADP
Expanded function board	FX2N-232BD FX2N-485BD

■ Usable modules (SR Mini HG SYSTEM)

The following function module data can be used in PLC communication (see "Data map" on page 26). In addition, data on other modules connected (TI, AI, AO, etc.) can be used on one more communication port (RKC communication or Modbus).

Function module	Type
Temperature control module	H-TIO-A H-TIO-B H-TIO-C H-TIO-D H-TIO-E H-TIO-F H-TIO-G H-TIO-H H-TIO-J H-TIO-P H-TIO-R
Position proportioning control module *	H-TIO-K
Speed control module *	H-SIO-A
Cascade control module *	H-CIO-A
Current transformer input module	H-CT-A (Up to 20 points/control unit are available)

* There is restriction on usable data. Only data described in **6.3 Communication Data List (P. 19)** can be used.

☞ For the function modules, see the **Hardware Quick Manual (IMS01V01-E□)** or **Hardware Instruction Manual (IMSRM15-E□)**.

2. COMMUNICATION SPECIFICATIONS

Interface: Based on RS-422A, EIA standard

Connection method: RS-422A: 4-wire system, multi-drop connection

Synchronous method: Start/stop synchronous type

Communication speed: 9600 bps, 19200 bps, 38400 bps
Communication speed can be selected with switch

Data bit configuration:
Start bit: 1
Data bit: 8
Parity bit: Without
Stop bit: 1

Protocol: MITSUBISHI MELSEC series special protocol
Station number 00
Protocol type 4
Checksum provided

Usable command: AnA/AnUCPU common command (AnA/QnA series, Q series)
QR: Word device read for each word
QW: Word device write for each word
ACPU common command (A series, FX series)
WR: Word device read for each word
WW: Word device write for each word
Usable command can be selected with switch

When using the A CPU common command by the MELSEC series, be careful of device access limitations (register range).

Device	ACPU common command	AnA/AnUCPU common command
Data register D	D0000 to D1023	D000000 to D008191
Link register W	W0000 to W03FF	W000000 to W001FFF

For the FX sires, the link register (W) cannot be used.

Maximum connections: 4 control units per communication port of PLC
For the current transformer (CT) monitor function, 16 control units per communication port of PLC

3. CONNECTIONS

⚠ WARNING

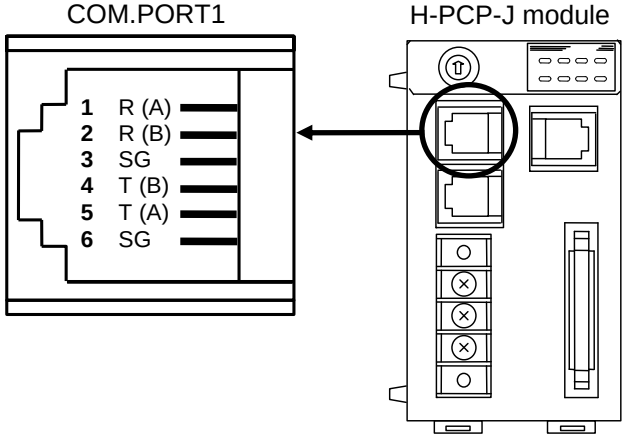
To prevent electric shock or instrument failure, turn off the power before connecting or disconnecting the instrument and peripheral equipment.

CAUTION

- Connect connectors correctly in the right position. If it is forcibly pushed in with pins in the wrong positions, the pins may be bent resulting in instrument failure.
- When connecting or disconnecting the connectors, do not force it too far to right and left or up and down, but move it on the straight. Otherwise, the connector pins may be bent, causing instrument failure.
- When disconnecting a connector, hold it by the connector itself. Disconnecting connectors by yanking on their cables can cause breakdowns.
- To prevent malfunction, never touch the contact section of a connector with bare hands or with hands soiled with oil or the like.
- To prevent malfunction, connect cable connectors securely, then firmly tighten the connector fastening screws.
- To prevent damage to cables, do not bend cables over with excessive force.
- If the instrument is easily affected by noise, use the ferrite core at the both ends of the communication cable (nearest the connector).

■ RS-422A

● Pin layout of modular connector (RS-422A)



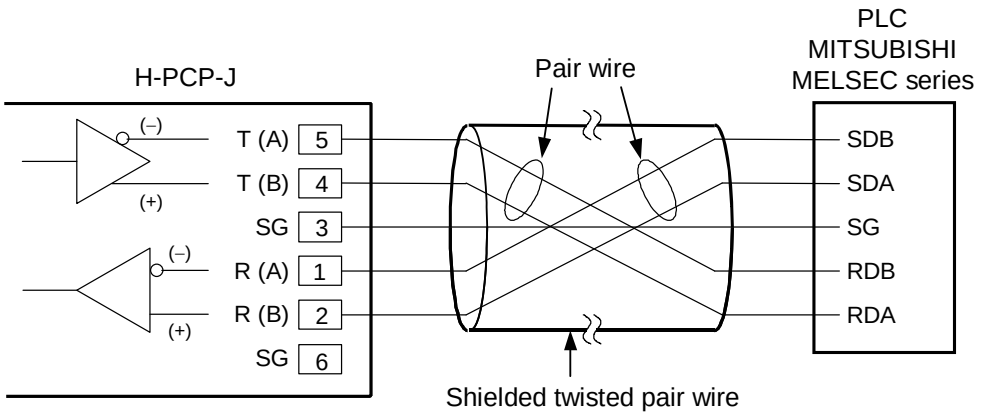
● Connector pin number and signal details (RS-422A)

Pin No.	Signal name	Symbol
1	Receive data	R (A)
2	Receive data	R (B)
3	Signal ground	SG
4	Send data	T (B)
5	Send data	T (A)
6	Signal ground	SG

● Diagram of RS-422A wiring

The signal polarity A and B may be reversed between the computer link unit of the MITSUBISHI MELSEC series and the H-PCP-J module. Normally signal A of a certain device is connected to signal A of the other device, and so for B to B. However, in this case, signal polarity A should be connected to B and the polarity B to A.

Example: Connect the H-PCP-J module T (A) send data terminal to the RDB receive data terminal on the computer link module belonging to the MITSUBISHI MELSEC series

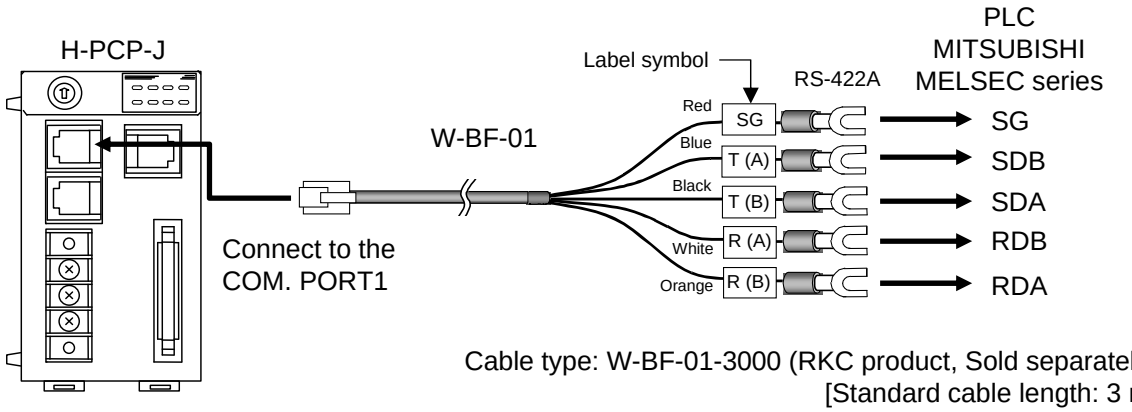


- Connect as instructed on the next page to make wiring using our connection cable W-BF-01.
- The 6-pin type modular connector should be used for the connection to the H-PCP-J module. Recommended model: TM4P-66P (Manufactured by HIROSE ELECTRIC CO., LTD.,)
- Customer is requested to prepare a communication cable fit for the control unit to be connected by the PLC.

● Connection using our cable

Connection cable W-BF-01 * (RKC product) can be used to connect the PLC. If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

* Shields of the cable are connected to SG (No. 6 pin) of the H-PCP-J connector.



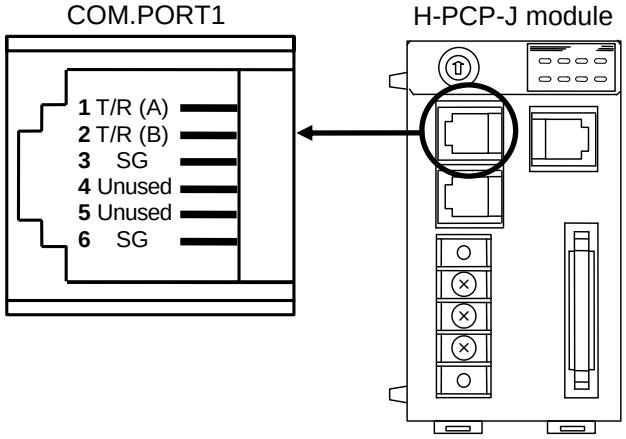
Cable type: W-BF-01-3000 (RKC product, Sold separately)
[Standard cable length: 3 m]

When wiring is to be made with W-BF-01 cable, connect as instructed in the above picture. You do not need to reverse the signal polarity of A and B.
(Just use the label symbol for leadwire identification and ignore the contents.)

☞ The details of the connectable connector for the PLC please also read the instruction manual for the used PLC.

■ RS-485

● Pin layout of modular connector (RS-485)



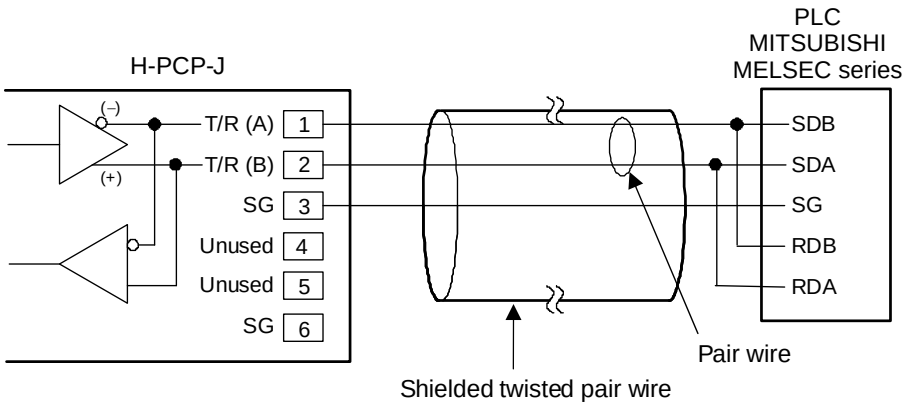
● Connector pin number and signal details (RS-485)

Pin No.	Signal name	Symbol
1	Send/Receive data	T/R (A)
2	Send/Receive data	T/R (B)
3	Signal ground	SG
4	Unused	—
5	Unused	—
6	Signal ground	SG

● Diagram of RS-485 wiring

The signal polarity A and B may be reversed between the computer link unit of the MITSUBISHI MELSEC series and the H-PCP-J module. Normally signal A of a certain device is connected to signal A of the other device, and so for B to B. However, in this case, signal polarity A should be connected to B and the polarity B to A.

Example: Connect the H-PCP-J module T (A) send data terminal to the RDB receive data terminal on the computer link module belonging to the MITSUBISHI MELSEC series



Connect as instructed to the below to make wiring using our connection cable W-BF-01.

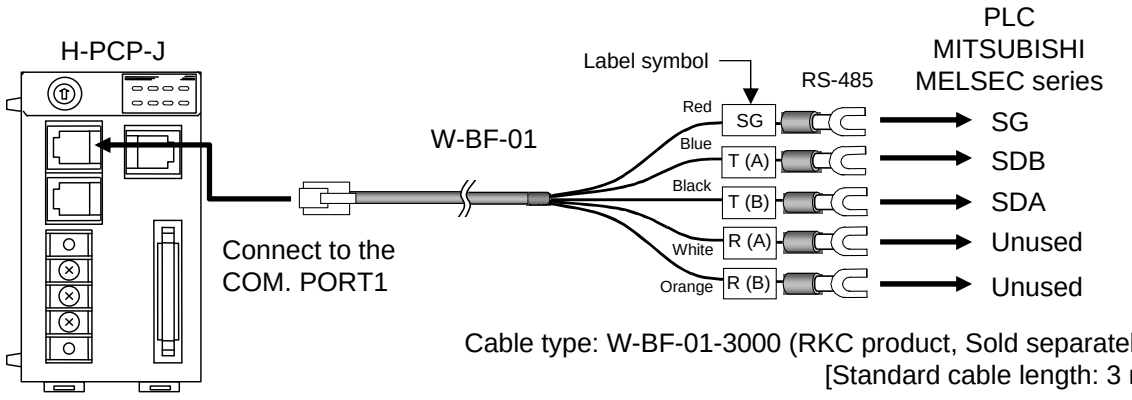
The 6-pin type modular connector should be used for the connection to the H-PCP-J module. Recommended model: TM4P-66P (Manufactured by HIROSE ELECTRIC CO., LTD.,)

Customer is requested to prepare a communication cable fit for the control unit to be connected by the PLC.

● Connection using our cable

Connection cable W-BF-01 * (RKC product) can be used to connect the PLC. If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

* Shields of the cable are connected to SG (No. 6 pin) of the H-PCP-J connector.



Cable type: W-BF-01-3000 (RKC product, Sold separately)
[Standard cable length: 3 m]

When wiring is to be made with W-BF-01 cable, connect as instructed in the above picture.
You do not need to reverse the signal polarity of A and B.
(Just use the label symbol for leadwire identification and ignore the contents.)

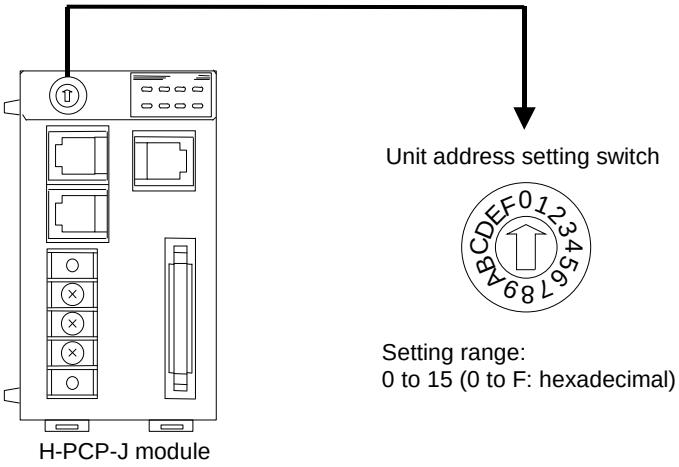
Be sure to insulate the wires that are not used by covering them with insulating tape.

The details of the connectable connector for the PLC please also read the instruction manual for the used PLC.

4. SETTING ON THE H-PCP-J MODULE SIDE

4.1 PLC Register Address Setting

Set the register address of each control unit using the unit address setting switch at the front of the H-PCP-J module. For this setting, use a small blade screwdriver.



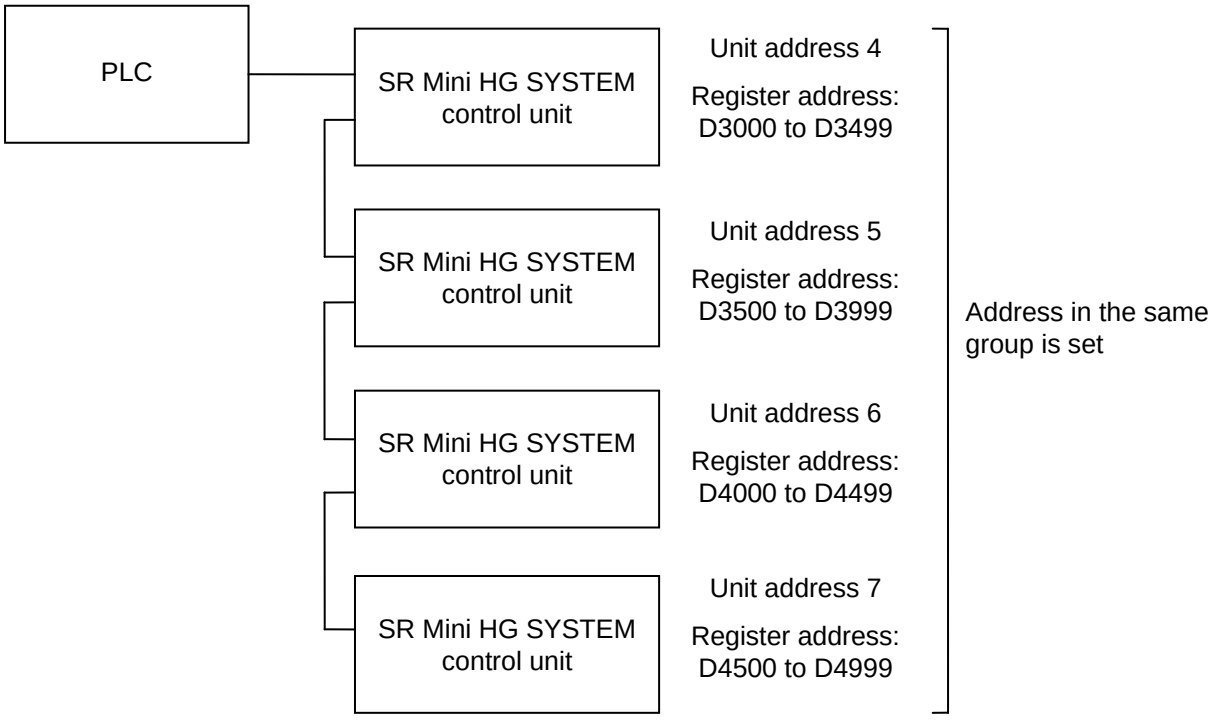
Up to 4 SR Mini HG SYSTEMs can be connected to a PLC communication port. Therefore the register address uses the 4 SR Mini HG SYSTEMs as a group. The SR Mini HG SYSTEMs connected to the same PLC communication port sets the address in the same group.

Set unit address of each group including 0, 4, 8 and C by all means. 0, 4, 8 and C work as a master of communication transfer.

Set unit address within register range of PLC (CPU module) to use.

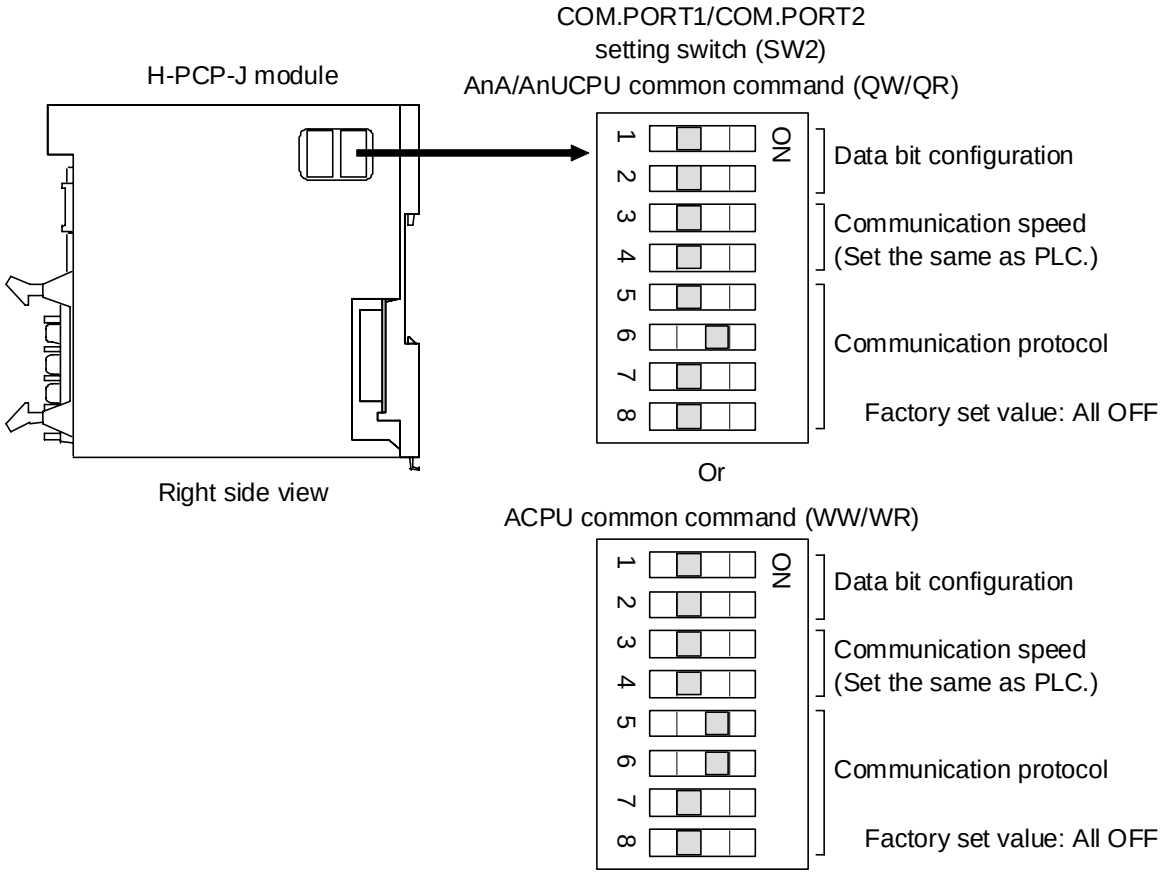
Group	Unit address setting switch	PLC register address
Group 1	**0**	D1000 to D1499
	1	D1500 to D1999
	2	D2000 to D2499
	3	D2500 to D2999
Group 2	**4**	D3000 to D3499
	5	D3500 to D3999
	6	D4000 to D4499
	7	D4500 to D4999
Group 3	**8**	D5000 to D5499
	9	D5500 to D5999
	A	D6000 to D6499
	B	D6500 to D6999
Group 4	**C**	W0000 to W01F3
	D	W0200 to W03F3
	E	D0000 to D0499
	F	D0500 to D0999

Setting example: When group 2 is used



4.2 Protocol Selection and Communication Setting

Match the setting of data bit configuration, communication speed and communication protocol with the PLC communication specification by COM.PORT1/COM.PORT2 setting switch (SW2).
Setting example to recommend is shown in the following.



- **Data bit configuration**

SW2		Data bit configuration
1	2	
OFF	OFF	Data 8-bit, Non parity, Stop 1-bit

- **Communication speed** Set the same as PLC.

SW2		Communication speed
3	4	
OFF	OFF	9600 bps
ON	OFF	19200 bps
OFF	ON	38400 bps
ON	ON	Don't set this one

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- **Protocol** Select protocol corresponding to PLC.

SW2				Protocol
5	6	7	8	
OFF	ON	OFF	OFF	MITSUBISHI MELSEC series special protocol AnA/AnUCPU common command (QW/QR)
ON	ON	OFF	OFF	MITSUBISHI MELSEC series special protocol ACPU common command (WW/WR)

4.3 PLC Scanning Time Setting

Set the PLC scanning time (time of waiting for a response from the PLC) so as to adapt to the environment used. **The PLC scanning time is set via host communication (RKC communication or Modbus).**

PLC scanning time setting Setting range: 0 to 3000 ms (Factory set value: 10 ms)

[Setting example]
Set PLC scanning time to any value more than twice as long as the maximum scanning time of PLC.

If PLC scanning time is extremely short (When at a factory set value of 10 ms as an example), the SR Mini HG SYSTEM may detect the time-out not conducting normal communication processing.

The maximum scanning time of PLC differs depending on the CPU processing speed, I/O unit configuration and the user program capacity of the PLC.

For the PLC scanning time setting (Identifier ST), see the **Power Supply/CPU Module H-PCP-J Instruction Manual (IMS01J02-E□)**.

5. SETTING ON THE PLC SIDE

Set the PLC as follows. (Recommend setting example)

Item	Description
Protocol	Type 4 protocol mode
Station number	00
Computer link/multi-drop selection	Computer link
Communication rate	Set the same as SR Mini HG SYSTEM
Operation setting	Independent
Data bit	8
Parity bit	Without
Stop bit	1
Sum check code	Provided
Writing during RUN	Allowed
Setting modification	Allowed
Termination resistor	Connect the termination resistor attached to the PLC

☞ The setting item varies depending on the PLC. The details of the setting procedure for the PLC, please also read the instruction manual for the used PLC.

6. COMMUNICATION DATA

6.1 Request Command and Data Transfer

Data transfer between PLC and SR Mini HG SYSTEM are executed by request command.

- **Request command "0: Monitor (PLC ← SR Mini HG SYSTEM)"**
  Command which requests the SR Mini HG SYSTEM to write data such as temperature measured values, etc. (attribute: RO) to the PLC side.
  The SR Mini HG SYSTEM always repeats data writing until "1: Setting" or "2: Set value monitor" is set to the request command.
  The PCP communication status is set to "1: Writing on monitor data" during data transfer.

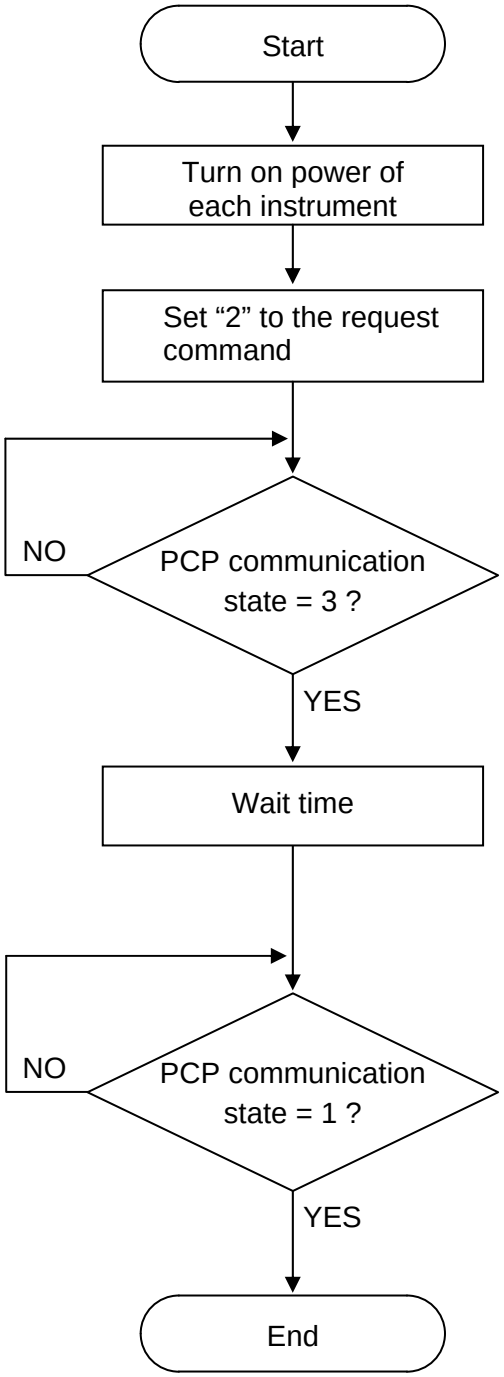
- **Request command "1: Setting (PLC → SR Mini HG SYSTEM)"**
  Command which requests the SR Mini HG SYSTEM to read data such as temperature set values, etc. (attribute: R/W or WO) from the PLC side. Just when "1: Setting" is set to the request command, the SR Mini HG SYSTEM starts reading the data from the PLC side.
  The PCP communication status is set to "2: Reading out setting data" during data transfer. After the data is transferred, the request command and PCP communication status returns to "0: Monitor" and "1: Writing on monitor data," respectively.

- **Request command "2: Set value monitor (PLC ← SR Mini HG SYSTEM)"**
  Command which requests the SR Mini HG SYSTEM to write data such as temperature set values, etc. (attribute: R/W) to the PLC side. Just when "2: Set value monitor" is set to the request command, the SR Mini HG SYSTEM starts writing the data to the PLC side.
  The PCP communication status is set to "3: Writing on setting data" during data transfer. After the data is transferred, the request command and PCP communication status returns to "0: Monitor" and "1: Writing on monitor data," respectively.

■ Data transfer procedures

Change each set value of SR Mini HG SYSTEM from the PLC after the initial settings are made.
If each set value of SR Mini HG SYSTEM is changed from the PLC without setting the initial values, it is re-written to 0 with each set value of the PLC at that time set to 0.

- **Initial Setting (When transmit data of temperature setting values from SR Mini HG SYSTEM to PLC)**



When 2 (Set value monitor) is set to request command, the SR Mini HG SYSTEM starts writing the data items such as temperature set value, etc. (attribute: R/W) to the PLC side.

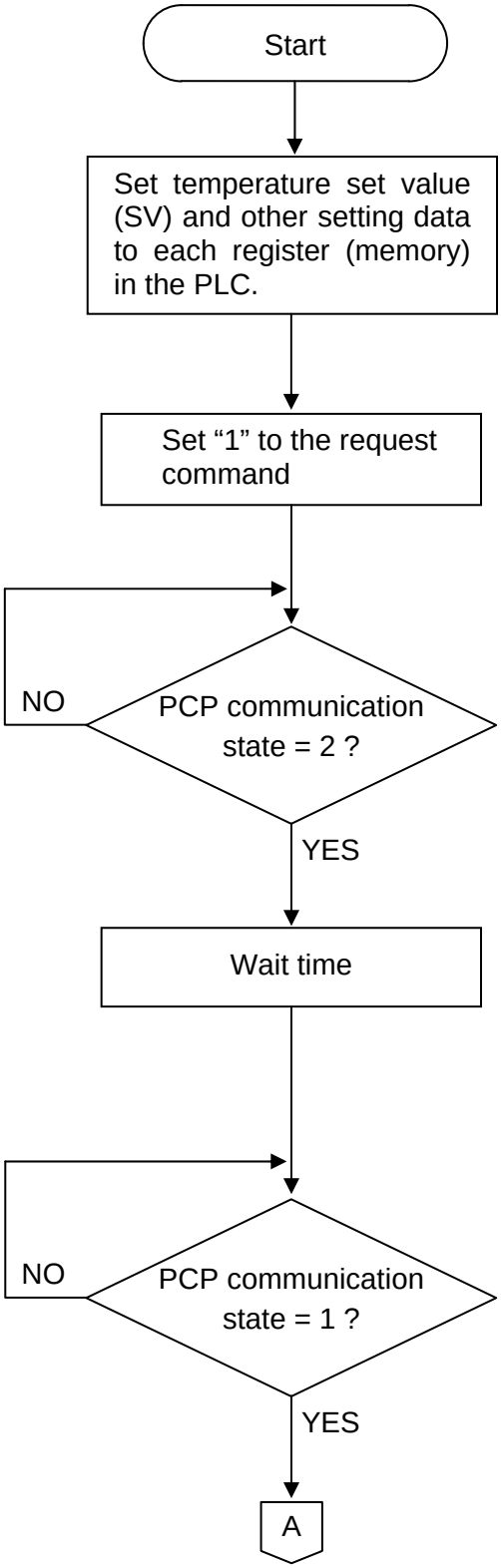
If 3 (Writing on setting data) is set to PCP communication state in the PLC, this indicates that SR Mini HG SYSTEM data items such as temperature set value, etc. (attribute: R/W) are being written into the PLC.

Reserve data write time as wait time. In addition, process data in each item as indefinite during this period.

Waiting time (for 38400 bps):
Approx. 1 second/control unit

If 1 (Writing on monitor data) is set to PCP communication state in the PLC, this indicates that SRV data items such as temperature set value, etc. (attribute: R/W) have been written to start writing SR Mini HG SYSTEM data items such as temperature measured values (PV), etc. (attribute: RO) into the PLC.

- **Data setting (When transmit data of temperature setting values from PLC to SR Mini HG SYSTEM)**



[Data setting]

When 1 (Setting) is set to request command, the SR Mini HG SYSTEM starts reading the temperature set value data set to the register (memory) on the PLC side.

If 2 (Reading out setting data) is set to PCP communication state in the PLC, this indicates that temperature set values data are being read from the PLC.

Reserve data read time as wait time. In addition, process data in each item as indefinite during this period.

Waiting time (for 38400 bps):
Approx. 2 seconds/control unit

If 1 (Writing on monitor data) is set to PCP communication state in the PLC, this indicates that temperature set value data have been read to start writing SR Mini HG SYSTEM data items such as temperature measured values (PV) etc. (attribute: RO) into the PLC.

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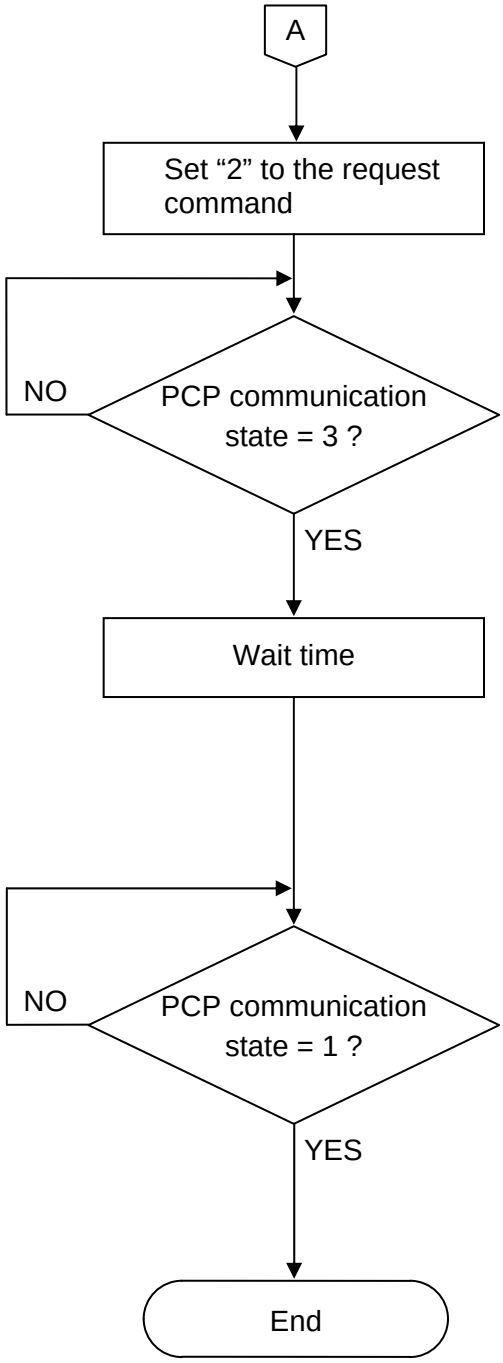

[Confirmation of setting data]

When 2 (Set value monitor) is set to request command, the SR Mini HG SYSTEM starts writing the temperature set value data set to the PLC side.

If 3 (Writing on setting data) is set to PCP communication state in the PLC, this indicates that SR Mini HG SYSTEM temperature set value data are being written into the PLC.

Reserve data write time as wait time. In addition, process data in each item as indefinite during this period.

Waiting time (for 38400 bps):
Approx. 1 second/control unit

If 1 (Writing on monitor data) is set to PCP communication state in the PLC, this indicates that temperature set values have been written to start writing SR Mini HG SYSTEM data items such as temperature measured values (PV), etc. (attribute: RO) into the PLC.

6.2 Data Processing Precautions

- With PLC communication, the maximum number of channels per unit address is 20.
- Read data of unused channel and undefined address is *0*.
- The data type is treated as binary data with a sign and without a decimal point. For this reason, carefully express and set the data. (excluding the TIO status)
  [Example] Heat-side proportional band

  Initial value of internal data: 3.0
  Communication data: 30
- If the data range error occurs during data setting, "Setting error" (bit 8 in the TIO status) is set to ON in the channel where the error occurs. The SR Mini HG SYSTEM continues operation at the present set value without updating the data.

  📖 Any attempt to write to an unused channel is not processed as an error.
- The autotuning (AT) function starts its execution with PID/AT transfer and the request command set to "1: AT operation" and "1: Setting," respectively. After the autotuning function finishes its execution, PID/AT transfer returns to "0: PID control operation" and thus the PID constants are updated.
- When the PLC communication status is selected by selecting the H-PCP-J module DO type (Identifier VU), the digital output (DO) is turned on or off according to the status of communication between the H-PCP-J module and PLC.

Communication error	PLC communication status (H-PCP-J module DO)	Operation mode
When the communication is error after the power ON immediately	OFF	"1: Monitor"
When the communication is error during operation	OFF	Same as mode before the communication error

If communication between the H-PCP-J module and PLC is ready, the PLC communication status (H-PCP-J module DO) is turned on to enable operation to continue.

☞ The H-PCP-J module DO type selection (Identifier VU) is set by host communication. For the host communication, see the **Power Supply/CPU Module H-PCP-J Instruction Manual (IMS01J02-E□)**.

- Some communication data may become invalid depending on the module selection or the configuration of the SR Mini HG System control unit.
  If any one of the conditions listed below occurs and data items written are within the setting range, read data becomes *0*. Under these conditions, no error response message will occur.
  – When heat/cool control, manual output value and auto/manual transfer are invalid.
  – When heat control, cool-side manipulated output, cool-side proportional band and overlap/deadband are invalid.
  – When ON/OFF control, cool-side manipulated output, heat-side and cool-side proportional band, integral time, derivative time and overlap/deadband are invalid.
  – When the H-CT-A module is not provided, current transformer input measured value and heater break alarm set value are invalid.

6.3 Communication Data List

- Name
  ◆: Item stored in the memory area.
  [ ]: The functional module name that data becomes valid is written.
- Attributes
  RO: At the time of request command "0: Monitor," SR Mini HG SYSTEM writes in data. (SR Mini HG SYSTEM → PLC)
  R/W: At the time of request command "1: Setting," SR Mini HG SYSTEM read out data. At the time of request command "2: Set value monitor," SR Mini HG SYSTEM writes in data. (SR Mini HG SYSTEM ↔ PLC)
  WO: At the time of request command "1: Setting," SR Mini HG SYSTEM read out data. (SR Mini HG SYSTEM ← PLC)
- Structure
  C: Data for each channel U: Data for each unit address

Name	Attribute	Structure	Data range	Factory set value
Temperature set value (SV) ◆ [H-TIO-□, H-CIO-A]	R/W	C	TC/RTD input: Within input range (Within setting limiter) Current/voltage input: Within display scale range (Within setting limiter)	0 The position of the decimal point differs depending on the input range.
Motor speed set value ◆ [H-SIO-A]			Within display scale range (Within setting limiter)	
Alarm 1 set value ◆ [H-TIO-□, H-CIO-A, H-SIO-A]	R/W	C	TC/RTD input: Within input range or span range Current/voltage input, H-SIO-A: Within display scale range or span range	See Factory set value table of Alarm 1/ Alarm 2 set value *
Alarm 2 set value ◆ [H-TIO-□, H-CIO-A, H-SIO-A]	R/W	C		

* Factory set value table of Alarm 1/Alarm 2 set value

Input type	Alarm type	Alarm 1 set value	Alarm 2 set value
TC/RTD input	Process high alarm	Input range (high limit)	Input range (high limit)
	Process low alarm	Input range (low limit)	Input range (low limit)
	Deviation high alarm, Deviation high/low alarm, Band alarm	50 °C [1]	50 °C [1]
	Deviation low alarm	–50 °C [1]	–50 °C [1]
	No alarm function	Input range (high limit)	Input range (low limit)
Current/voltage input H-SIO-A	Process high alarm	100 (100.0) %	100 (100.0) %
	Process low alarm	0 (0.0) %	0 (0.0) %
	Deviation high alarm, Deviation high/low alarm, Band alarm	50 (50.0) %	50 (50.0) %
	Deviation low alarm	–50 (–50.0) %	–50 (–50.0) %
	No alarm function	100 (100.0) %	100 (100.0) %

[1] The position of the decimal point differs depending on the input range.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Heater break alarm set value [H-CT-A]	R/W	C	0.0 to 100.0 A or 0.0 to 30.0 A For the current transformer (CT) input of the H-CT-A module. Allocates the channels for H-TIO-☐ module to the input channels of H-CT-A module by CT channel setting. For the CT channel setting, see the **Power Supply/CPU Module H-PCP-J Instruction Manual (IMS01J02-E☐)**.	0.0
Operation mode transfer [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0: Unused If set to "Unused," no control, monitor or alarm monitor is performed. 1: Monitor If set to "Monitor," only the monitor is performed. No control or alarm monitor is performed. 2: Alarm If set to "Alarm," monitor or alarm monitor is performed. No control is performed. 3: Normal Selected to normal mode to perform control, monitor or alarm monitor.	3
Auto/Manual transfer [H-TIO-☐, H-CIO-A]	R/W	C	0: Auto 1: Manual Setting will be invalid in ON/OFF control and heat/cool control.	0
Manual output value [H-TIO-☐, H-CIO-A]	R/W	C	−5.0 to +105.0 % Setting will be invalid in ON/OFF control and heat/cool control.	0.0
Overlap/deadband ◆ [H-TIO-☐, H-CIO-A]	R/W	C	−10.0 to +10.0 % of span	0.0
Heat-side proportional band ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0.1 to 1000.0 % of span	H-TIO-☐, H-CIO-A: 3.0 H-SIO-A: 300.0
Cool-side proportional band ◆ [H-TIO-☐, H-CIO-A]	R/W	C	0.1 to 1000.0 % of span	3.0

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Integral time ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	1 to 3600 seconds	H-TIO-☐, H-CIO-A: 240 H-SIO-A: 2
Derivative time ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0 to 3600 seconds (0: PI action)	H-TIO-☐, H-CIO-A: 60 H-SIO-A: 0
PID/AT transfer * [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0: PID control operation 1: AT (Autotuning) operation The autotuning (AT) function starts its execution with PID/AT transfer and the request command set to "1: AT operation" and "1: Setting," respectively. After the autotuning function finishes its execution, PID/AT transfer returns to "0: PID control operation."	0

* Autotuning (AT) is the function which automatically measures, calculates and sets the optimum PID constants according to the set temperature.

Caution for using the Autotuning (AT)
When a temperature change (UP and/or Down) is 1C or less per minute during Autotuning, Autotuning may be cancelled before calculating PID values. In that case, adjust the PID values manually. It is possible to happen when the set value is around the ambient temperature or is close to the maximum temperature achieved by the load.

The following is the conditions necessary to carry out autotuning and the conditions which will cause the autotuning to stop.

Conditions necessary for autotuning:

The autotuning should be executed after satisfying all of the following conditions:

- Operation mode conditions:
  – Auto/Manual transfer → Auto mode
  – PID/AT transfer → PID control mode
  – Control RUN/STOP transfer → Control RUN mode
- The measured value (PV) is without input error range [Input error determination point (high) > Measured value (PV) > Input error determination point (low)].
- The output limiter high limit should be more than 0.1 % and the output limiter low limit should be less than 99.9 %.
- When operation mode is set to "Normal (Can be controlled)."

When the autotuning is finished, the display of each channel automatically returns to "0: PID control operation."

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Conditions which will cause the autotuning to stop:

- When the temperature set value (SV) is changed.
- When the memory area is changed.
- When the PV bias value is changed.
- When the AT bias value is changed.
- When transfer to Manual mode using the Auto/Manual transfer.
- When the measured value (PV) goes to input error range [Measured value (PV) ≥ Input error determination point (high) or Input error determination point (low) ≥ Measured value (PV)].
- When the power is cut off.
- When FAIL occurs in the module whose channel is under the autotuning. Otherwise, when FAIL occurs in the H-PCP-J module.
- When transfer to the PID control mode by the PID/AT transfer.
- When operation mode is set to “Unused,” “Monitor” or “Alarm.”
- When the Control RUN/STOP function is changed to the “Control STOP” function.

When the above-mentioned conditions to stop the autotuning occurs, the autotuning is immediately stopped and switch over to the PID control mode. The PID constants return to the values at the start of the autotuning.

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Temperature measured value (PV) [H-TIO-☐, H-CIO-A]	RO	C	TC/RTD input: Within input range Current/voltage input: Within display scale range	—
Motor speed measured value [H-SIO-A]			Within display scale range	—
Heat-side manipulated output value [H-TIO-☐, H-CIO-A]	RO	C	−0.5 to +105.0 %	—
Cool-side manipulated output value [H-TIO-☐, H-CIO-A]	RO	C	−0.5 to +105.0 %	—
Current transformer input measured value [H-CT-A]	RO	C	0.0 to 100.0 A or 0.0 to 30.0 A Current transformer (CT) input measured value of the H-CT-A module. Allocates the channels for H-TIO-☐ module to the input channels of H-CT-A module by CT channel setting. For the CT channel setting, see the **Power Supply/CPU Module H-PCP-J Instruction Manual (IMS01J02-E☐)**.	—
TIO status [H-TIO-☐, H-CIO-A, H-SIO-A]	RO	C	Each operation status is assigned as a bit image in binary numbers. Bit data bit 0: Heat-side manipulated output status bit 1: Unused bit 2: Alarm 1 status bit 3: Alarm 2 status bit 4: Burnout status bit 5: Heater break alarm status bit 6: Control loop break alarm (LBA) status bit 7: Temperature rise completion status bit 8: Setting error bit 9 to 15: Unused Data 0: OFF 1: ON bit 15 ····· bit 0 Bit image: 0000000000000000 [Decimal number: 0 to 509]	—
Set value monitor [H-TIO-☐, H-CIO-A, H-SIO-A]	RO	C	TC/RTD input: Within input range Current/voltage input, H-SIO-A: Within display scale range	—

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Name	Attri-bute	Struc-ture	Data range	Factory set value
Request command [H-PCP-J]	R/W	U	0: Monitor Command which requests the SR Mini HG SYSTEM to write data such as temperature measured values, etc. (attribute: RO) to the PLC side. The SR Mini HG SYSTEM always repeats data writing until "1: Setting" or "2: Set value monitor" is set to the request command. The PCP communication status is set to "1: Writing on monitor data" during data transfer. 1: Setting Command which requests the SR Mini HG SYSTEM to read data such as temperature set values, etc. (attribute: R/W or WO) from the PLC side. Just when "1: Setting" is set to the request command, the SR Mini HG SYSTEM starts reading the data from the PLC side. The PCP communication status is set to "2: Reading out setting data" during data transfer. After the data is transferred, the request command and PCP communication status returns to "0: Monitor" and "1: Writing on monitor data," respectively. 2: Set value monitor Command which requests the SR Mini HG SYSTEM to write data such as temperature set values, etc. (attribute: R/W) to the PLC side. Just when "2: Set value monitor" is set to the request command, the SR Mini HG SYSTEM starts writing the data to the PLC side. The PCP communication status is set to "3: Writing on setting data" during data transfer. After the data is transferred, the request command and PCP communication status returns to "0: Monitor" and "1: Writing on monitor data," respectively.	0
PCP communication status [H-PCP-J]	RO	U	1: Writing on monitor data During monitor data of attribute RO is written to PLC 2: Reading out setting data During setting data of attribute R/W or WO is read from PLC 3: Writing on setting data During setting data of attribute R/W is written to PLC	—

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Name	Attri-bute	Struc-ture	Data range	Factory set value
PCP normal communication flag [H-PCP-J]	RO	U	The numbers 0 and then 1 are repeated in every communication period. The SR Mini HG SYSTEM rewrites 0 and 1 in this area alternately like 0 → 1 → 0 in every communication period. It is possible to determine whether or not the SR Mini HG SYSTEM makes communication by monitoring this area periodically using the PLC program.	—
Memory area number [H-TIO-☐, H-CIO-A, H-SIO-A]	WO	U	1 to 8 Data reading is always made from the PLC regardless of the request command. Any numeric value other than 1 to 8 becomes invalid. Changing the memory area automatically writes each set value to the PLC.	—
Control RUN/STOP transfer * [H-PCP-J]	WO	U	0: Control STOP 1: Control RUN	—
PV bias [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	–5.00 to +5.00 % of span ZK-1103 specification: –Input span to +Input span	0.00 ZK-1103: 0 [a]
Setting change rate limiter ◆ [H-TIO-☐, H-CIO-A, H-SIO-A]	R/W	C	0.0 to 100.0 % of span/minute	0.0

* **When the control RUN/STOP holding setting is set to "Not hold" or "Hold":**

The control RUN/STOP transfer setting is always read from the PLC regardless of the request command. Any numeric value other than *0* and *1* becomes invalid.

When the control RUN/STOP holding setting is set to "Start-up from control RUN status":

As the control RUN/STOP transfer setting is always set to "1: Control RUN," any value set to the control RUN/STOP transfer becomes invalid.

☞ The Control RUN/STOP holding (Identifier X1) is set by host communication. For the host communication, see the **Power Supply/CPU Module H-PCP-J Instruction Manual (IMS01J02-E☐)**.

[a] Unit (°C, °F, etc.) and decimal point position (No decimal place, One decimal place, Two decimal places or Three decimal places) depends on input range type.

7. DATA MAP

7.1 Reference to Data Map

This data map summarizes the data (data register, link register) addresses, channels and names that can be used with PLC. For details on each data range, see the **6.3 Communication Data List (P. 19)**.

(b)

(a) →

(c) →

Unit address 0	Unit address 1	Unit address 2	Unit address 3	Name
D1000 to D1019	D1500 to D1519	D2000 to D2019	D2500 to D2519	Temperature set value (SV) CH1 to CH20
D1020 to D1039	D1520 to D1539	D2020 to D2039	D2520 to D2539	Alarm 1 set value CH1 to CH20

(a) Unit address: Unit address of SR Mini HG SYSTEM

(b) Name: Data names

(c) Address: Data (data register, link register) addresses
Data register (D): Decimal number
Link register (W): Hexadecimal

7.2 Data Map List

■ Unit address 0 to 3 (Group 1)

Unit address 0	Unit address 1	Unit address 2	Unit address 3	Name	
D1000 to D1019	D1500 to D1519	D2000 to D2019	D2500 to D2519	Temperature set value (SV)	CH1 to CH20
D1020 to D1039	D1520 to D1539	D2020 to D2039	D2520 to D2539	Alarm 1 set value	CH1 to CH20
D1040 to D1059	D1540 to D1559	D2040 to D2059	D2540 to D2559	Alarm 2 set value	CH1 to CH20
D1060 to D1079	D1560 to D1579	D2060 to D2079	D2560 to D2579	Heater break alarm set value (H-CT-A module)	CH1 to CH20
D1080 to D1099	D1580 to D1599	D2080 to D2099	D2580 to D2599	Operation mode transfer	CH1 to CH20
D1100 to D1119	D1600 to D1619	D2100 to D2119	D2600 to D2619	Auto/Manual transfer	CH1 to CH20
D1120 to D1139	D1620 to D1639	D2120 to D2139	D2620 to D2639	Manual output value	CH1 to CH20
D1140 to D1159	D1640 to D1659	D2140 to D2159	D2640 to D2659	Overlap/deadband	CH1 to CH20
D1160 to D1179	D1660 to D1679	D2160 to D2179	D2660 to D2679	Heat-side proportional band	CH1 to CH20
D1180 to D1199	D1680 to D1699	D2180 to D2199	D2680 to D2699	Cool-side proportional band	CH1 to CH20
D1200 to D1219	D1700 to D1719	D2200 to D2219	D2700 to D2719	Integral time	CH1 to CH20
D1220 to D1239	D1720 to D1739	D2220 to D2239	D2720 to D2739	Derivative time	CH1 to CH20
D1240 to D1259	D1740 to D1759	D2240 to D2259	D2740 to D2759	PID/AT transfer	CH1 to CH20
D1260 to D1279	D1760 to D1779	D2260 to D2279	D2760 to D2779	Temperature measured value (PV)	CH1 to CH20
D1280 to D1299	D1780 to D1799	D2280 to D2299	D2780 to D2799	Heat-side manipulated output value	CH1 to CH20
D1300 to D1319	D1800 to D1819	D2300 to D2319	D2800 to D2819	Cool-side manipulated output value	CH1 to CH20
D1320 to D1339	D1820 to D1839	D2320 to D2339	D2820 to D2839	Current transformer input measured value (H-CT-A module)	CH1 to CH20
D1340 to D1359	D1840 to D1859	D2340 to D2359	D2840 to D2859	TIO status	CH1 to CH20
D1360 to D1379	D1860 to D1879	D2360 to D2379	D2860 to D2879	Set value monitor	CH1 to CH20
D1380	D1880	D2380	D2880	Request command	
D1381	D1881	D2381	D2881	PCP communication status	
D1382	D1882	D2382	D2882	PCP normal communication flag	

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Unit address 0	Unit address 1	Unit address 2	Unit address 3	Name	
D1383 to D1389	D1883 to D1889	D2383 to D2389	D2883 to D2889	Do not use this address range	
D1390	D1890	D2390	D2890	Memory area number	
D1391	D1891	D2391	D2891	Control RUN/STOP transfer	
D1392 to D1399	D1892 to D1899	D2392 to D2399	D2892 to D2899	Do not use this address range	
D1400 to D1419	D1900 to D1919	D2400 to D2419	D2900 to D2919	PV bias	CH1 to CH20
D1420 to D1439	D1920 to D1939	D2420 to D2439	D2920 to D2939	Setting change rate limiter	CH1 to CH20
D1440 to D1499	D1940 to D1999	D2440 to D2499	D2940 to D2999	Do not use this address range	

■ Unit address 4 to 7 (Group 2)

Unit address 4	Unit address 5	Unit address 6	Unit address 7	Name	
D3000 to D3019	D3500 to D3519	D4000 to D4019	D4500 to D4519	Temperature set value (SV)	CH1 to CH20
D3020 to D3039	D3520 to D3539	D4020 to D4039	D4520 to D4539	Alarm 1 set value	CH1 to CH20
D3040 to D3059	D3540 to D3559	D4040 to D4059	D4540 to D4559	Alarm 2 set value	CH1 to CH20
D3060 to D3079	D3560 to D3579	D4060 to D4079	D4560 to D4579	Heater break alarm set value (H-CT-A module)	CH1 to CH20
D3080 to D3099	D3580 to D3599	D4080 to D4099	D4580 to D4599	Operation mode transfer	CH1 to CH20
D3100 to D3119	D3600 to D3619	D4100 to D4119	D4600 to D4619	Auto/Manual transfer	CH1 to CH20
D3120 to D3139	D3620 to D3639	D4120 to D4139	D4620 to D4639	Manual output value	CH1 to CH20
D3140 to D3159	D3640 to D3659	D4140 to D4159	D4640 to D4659	Overlap/deadband	CH1 to CH20
D3160 to D3179	D3660 to D3679	D4160 to D4179	D4660 to D4679	Heat-side proportional band	CH1 to CH20
D3180 to D3199	D3680 to D3699	D4180 to D4199	D4680 to D4699	Cool-side proportional band	CH1 to CH20
D3200 to D3219	D3700 to D3719	D4200 to D4219	D4700 to D4719	Integral time	CH1 to CH20
D3220 to D3239	D3720 to D3739	D4220 to D4239	D4720 to D4739	Derivative time	CH1 to CH20
D3240 to D3259	D3740 to D3759	D4240 to D4259	D4740 to D4759	PID/AT transfer	CH1 to CH20

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Unit address 4	Unit address 5	Unit address 6	Unit address 7	Name	
D3260 to D3279	D3760 to D3779	D4260 to D4279	D4760 to D4779	Temperature measured value (PV)	CH1 to CH20
D3280 to D3299	D3780 to D3799	D4280 to D4299	D4780 to D4799	Heat-side manipulated output value	CH1 to CH20
D3300 to D3319	D3800 to D3819	D4300 to D4319	D4800 to D4819	Cool-side manipulated output value	CH1 to CH20
D3320 to D3339	D3820 to D3839	D4320 to D4339	D4820 to D4839	Current transformer input measured value (H-CT-A module)	CH1 to CH20
D3340 to D3359	D3840 to D3859	D4340 to D4359	D4840 to D4859	TIO status	CH1 to CH20
D3360 to D3379	D3860 to D3879	D4360 to D4379	D4860 to D4879	Set value monitor	CH1 to CH20
D3380	D3880	D4380	D4880	Request command	
D3381	D3881	D4381	D4881	PCP communication status	
D3382	D3882	D4382	D4882	PCP normal communication flag	
D3383 to D3389	D3883 to D3889	D4383 to D4389	D4883 to D4889	Do not use this address range	
D3390	D3890	D4390	D4890	Memory area number	
D3391	D3891	D4391	D4891	Control RUN/STOP transfer	
D3392 to D3399	D3892 to D3899	D4392 to D4399	D4892 to D4899	Do not use this address range	
D3400 to D3419	D3900 to D3919	D4400 to D4419	D4900 to D4919	PV bias	CH1 to CH20
D3420 to D3439	D3920 to D3939	D4420 to D4439	D4920 to D4939	Setting change rate limiter	CH1 to CH20
D3440 to D3499	D3940 to D3999	D4440 to D4499	D4940 to D4999	Do not use this address range	

■ Unit address 8 to B (Group 3)

Unit address 8	Unit address 9	Unit address A	Unit address B	Name	
D5000 to D5019	D5500 to D5519	D6000 to D6019	D6500 to D6519	Temperature set value (SV)	CH1 to CH20
D5020 to D5039	D5520 to D5539	D6020 to D6039	D6520 to D6539	Alarm 1 set value	CH1 to CH20
D5040 to D5059	D5540 to D5559	D6040 to D6059	D6540 to D6559	Alarm 2 set value	CH1 to CH20
D5060 to D5079	D5560 to D5579	D6060 to D6079	D6560 to D6579	Heater break alarm set value (H-CT-A module)	CH1 to CH20
D5080 to D5099	D5580 to D5599	D6080 to D6099	D6580 to D6599	Operation mode transfer	CH1 to CH20

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Unit address 8	Unit address 9	Unit address A	Unit address B	Name	
D5100 to D5119	D5600 to D5619	D6100 to D6119	D6600 to D6619	Auto/Manual transfer	CH1 to CH20
D5120 to D5139	D5620 to D5639	D6120 to D6139	D6620 to D6639	Manual output value	CH1 to CH20
D5140 to D5159	D5640 to D5659	D6140 to D6159	D6640 to D6659	Overlap/deadband	CH1 to CH20
D5160 to D5179	D5660 to D5679	D6160 to D6179	D6660 to D6679	Heat-side proportional band	CH1 to CH20
D5180 to D5199	D5680 to D5699	D6180 to D6199	D6680 to D6699	Cool-side proportional band	CH1 to CH20
D5200 to D5219	D5700 to D5719	D6200 to D6219	D6700 to D6719	Integral time	CH1 to CH20
D5220 to D5239	D5720 to D5739	D6220 to D6239	D6720 to D6739	Derivative time	CH1 to CH20
D5240 to D5259	D5740 to D5759	D6240 to D6259	D6740 to D6759	PID/AT transfer	CH1 to CH20
D5260 to D5279	D5760 to D5779	D6260 to D6279	D6760 to D6779	Temperature measured value (PV)	CH1 to CH20
D5280 to D5299	D5780 to D5799	D6280 to D6299	D6780 to D6799	Heat-side manipulated output value	CH1 to CH20
D5300 to D5319	D5800 to D5819	D6300 to D6319	D6800 to D6819	Cool-side manipulated output value	CH1 to CH20
D5320 to D5339	D5820 to D5839	D6320 to D6339	D6820 to D6839	Current transformer input measured value (H-CT-A module)	CH1 to CH20
D5340 to D5359	D5840 to D5859	D6340 to D6359	D6840 to D6859	TIO status	CH1 to CH20
D5360 to D5379	D5860 to D5879	D6360 to D6379	D6860 to D6879	Set value monitor	CH1 to CH20
D5380	D5880	D6380	D6880	Request command	
D5381	D5881	D6381	D6881	PCP communication status	
D5382	D5882	D6382	D6882	PCP normal communication flag	
D5383 to D5389	D5883 to D5889	D6383 to D6389	D6883 to D6889	Do not use this address range	
D5390	D5890	D6390	D6890	Memory area number	
D5391	D5891	D6391	D6891	Control RUN/STOP transfer	
D5392 to D5399	D5892 to D5899	D6392 to D6399	D6892 to D6899	Do not use this address range	
D5400 to D5419	D5900 to D5919	D6400 to D6419	D6900 to D6919	PV bias	CH1 to CH20
D5420 to D5439	D5920 to D5939	D6420 to D6439	D6920 to D6939	Setting change rate limiter	CH1 to CH20
D5440 to D5499	D5940 to D5999	D6440 to D6499	D6940 to D6999	Do not use this address range	

■ Unit address C to F (Group 4)

Unit address C *	Unit address D *	Unit address E	Unit address F	Name	
W0000H to W0013H	W0200H to W0213H	D0000 to D0019	D0500 to D0519	Temperature set value (SV)	CH1 to CH20
W0014H to W0027H	W0214H to W0227H	D0020 to D0039	D0520 to D0539	Alarm 1 set value	CH1 to CH20
W0028H to W003BH	W0228H to W023BH	D0040 to D0059	D0540 to D0559	Alarm 2 set value	CH1 to CH20
W003CH to W004FH	W023CH to W024FH	D0060 to D0079	D0560 to D0579	Heater break alarm set value (H-CT-A module)	CH1 to CH20
W0050H to W0063H	W0250H to W0263H	D0080 to D0099	D0580 to D0599	Operation mode transfer	CH1 to CH20
W0064H to W0077H	W0264H to W0277H	D0100 to D0119	D0600 to D0619	Auto/Manual transfer	CH1 to CH20
W0078H to W008BH	W0278H to W028BH	D0120 to D0139	D0620 to D0639	Manual output value	CH1 to CH20
W008CH to W009FH	W028CH to W029FH	D0140 to D0159	D0640 to D0659	Overlap/deadband	CH1 to CH20
W00A0H to W00B3H	W02A0H to W02B3H	D0160 to D0179	D0660 to D0679	Heat-side proportional band	CH1 to CH20
W00B4H to W00C7H	W02B4H to W02C7H	D0180 to D0199	D0680 to D0699	Cool-side proportional band	CH1 to CH20
W00C8H to W00DBH	W02C8H to W02DBH	D0200 to D0219	D0700 to D0719	Integral time	CH1 to CH20
W00DCH to W00EFH	W02DCH to W02EFH	D0220 to D0239	D0720 to D0739	Derivative time	CH1 to CH20
W00F0H to W0103H	W02F0H to W0303H	D0240 to D0259	D0740 to D0759	PID/AT transfer	CH1 to CH20
W0104H to W0117H	W0304H to W0317H	D0260 to D0279	D0760 to D0779	Temperature measured value (PV)	CH1 to CH20
W0118H to W012BH	W0318H to W032BH	D0280 to D0299	D0780 to D0799	Heat-side manipulated output value	CH1 to CH20
W012CH to W013FH	W032CH to W033FH	D0300 to D0319	D0800 to D0819	Cool-side manipulated output value	CH1 to CH20
W0140H to W0153H	W0340H to W0353H	D0320 to D0339	D0820 to D0839	Current transformer input measured value (H-CT-A module)	CH1 to CH20
W0154H to W0167H	W0354H to W0367H	D0340 to D0359	D0840 to D0859	TIO status	CH1 to CH20
W0168H to W017BH	W0368H to W037BH	D0360 to D0379	D0860 to D0879	Set value monitor	CH1 to CH20
W017CH	W037CH	D0380	D0880	Request command	
W017DH	W037DH	D0381	D0881	PCP communication status	
W017EH	W037EH	D0382	D0882	PCP normal communication flag	

* Link register (W) address corresponding to unit address C and D: Hexadecimal

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Unit address C *	Unit address D *	Unit address E	Unit address F	Name	
W017FH to W0185H	W037FH to W0385H	D0383 to D0389	D0883 to D0889	Do not use this address range	
W0186H	W0386H	D0390	D0890	Memory area number	
W0187H	W0387H	D0391	D0891	Control RUN/STOP transfer	
W0188H to W018FH	W0388H to W038FH	D0392 to D0399	D0892 to D0899	Do not use this address range	
W0190H to W01A3H	W0390H to W03A3H	D0400 to D0419	D0900 to D0919	PV bias	CH1 to CH20
W01A4H to W01B7H	W03A4H to W03B7H	D0420 to D0439	D0920 to D0939	Setting change rate limiter	CH1 to CH20
W01B8H to W01F3H	W03B8H to W03F3H	D0440 to D0499	D0940 to D0999	Do not use this address range	

* Link register (W) address corresponding to unit address C and D: Hexadecimal

8. CURRENT TRANSFORMER (CT) MONITOR

Current transformer (CT) monitor function monitors only current transformer input.
Control unit is configured with H-PCP-J module and H-CT-A module to do current transformer (CT) monitor. Data of functional module other than the H-CT-A module cannot be used. In addition, set the communication protocol to "MITSUBISHI MELSEC series special protocol AnA/AnUCPU common command (QW/QR) [Current transformer (CT) monitor]."

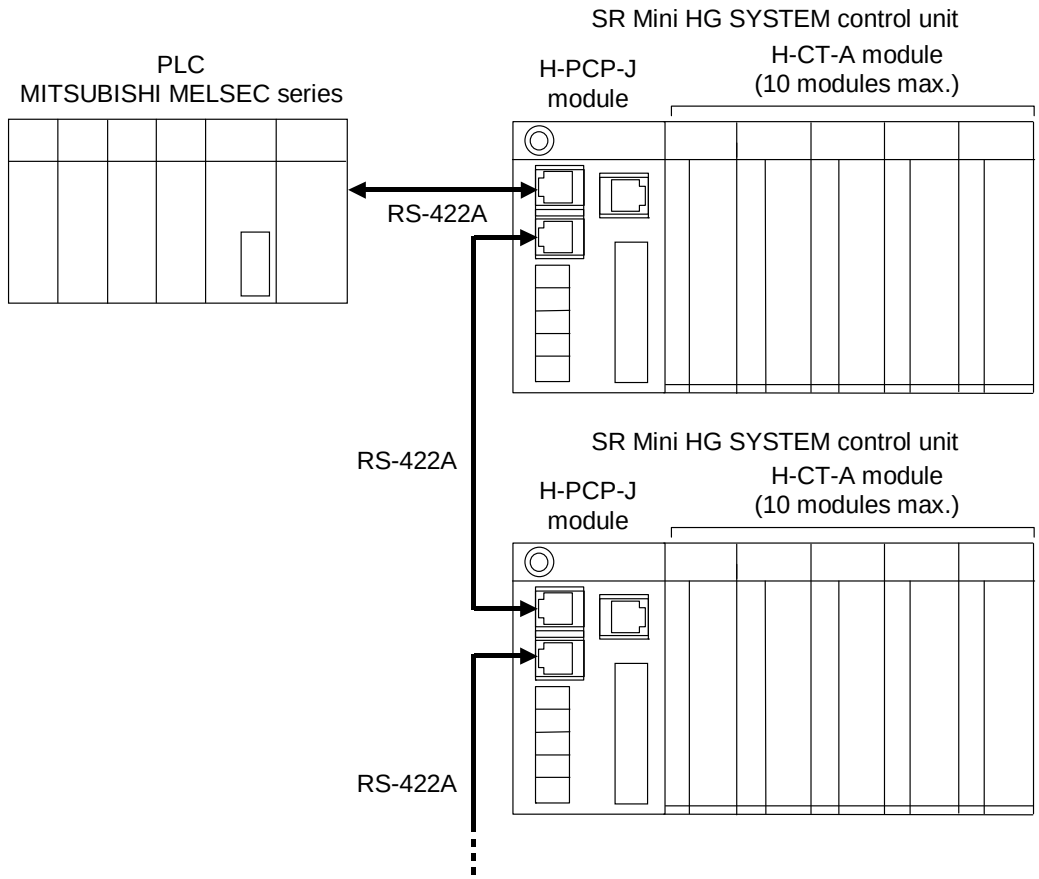
Maximum number of current transformer input points

Maximum 60 points/control unit
Maximum 960 points/communication port of PLC

☞ This section describes the system configuration, switch setting and communication data of current transformer (CT) monitor. For the communication specifications and connections, see the following section.

- For the communication specifications, see the **2. COMMUNICATION SPECIFICATIONS (P. 3)**.
- For the connections, see the **3. CONNECTIONS (P. 4)**.

■ Current transformer (CT) monitor dedicated system configuration



Up to 16 control units per communication port of PLC

Maximum number of H-CT-A modules that can be connected to one control unit:

10 modules/control unit

Maximum number of control units that can be connected to one communication port of PLC:

16 control units/communication port of PLC

- **Usable computer link modules (MITSUBISHI MELSEC series)**

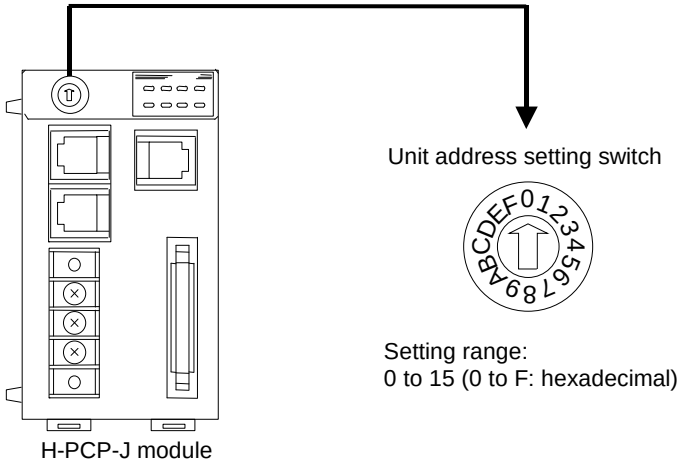
Name	Type
Computer link module	AJ71UC24 A1SJ71UC24-R2 A1SJ71UC24-R4 A1SJ71UC24-PRF A1SJ71C24-R2 A1SJ71C24-R4 A1SJ71C24-PRF A1SCPUC24-R2 A2CCPUC24 (PRF) etc. The module which AnA/AnUCPU common command (type 4) can use.
Serial communication modules	AJ71QC24N A1SJ71QC24N QJ71C24 etc. The module which AnA/AnUCPU common command (type 4) can use.
Adapter	FX0N-232ADP FX0N-485ADP
Expanded function board	FX2N-232BD FX2N-485BD

Be careful of device access limitations (register range). Current transformer (CT) monitor function uses register address D7000 to D7976.

8.1 Setting on The H-PCP-J Module Side

■ PLC register address setting

Set the register address of each control unit using the unit address setting switch at the front of the H-PCP-J module. For this setting, use a small blade screwdriver.



Up to 16 SR Mini HG SYSTEMs can be connected to a PLC communication port.

Set unit address within register range of PLC (CPU module) to use.

Unit address setting switch	PLC register address	Communication item	
0	D7000 to D7059	Unit address 0	Current transformer input measured value CT1 to CT60
	D7961	Unit address 0	PCP normal communication flag
1	D7060 to D7119	Unit address 1	Current transformer input measured value CT1 to CT60
	D7962	Unit address 1	PCP normal communication flag
2	D7120 to D7179	Unit address 2	Current transformer input measured value CT1 to CT60
	D7963	Unit address 2	PCP normal communication flag
3	D7180 to D7239	Unit address 3	Current transformer input measured value CT1 to CT60
	D7964	Unit address 3	PCP normal communication flag
4	D7240 to D7299	Unit address 4	Current transformer input measured value CT1 to CT60
	D7965	Unit address 4	PCP normal communication flag
5	D7300 to D7359	Unit address 5	Current transformer input measured value CT1 to CT60
	D7966	Unit address 5	PCP normal communication flag

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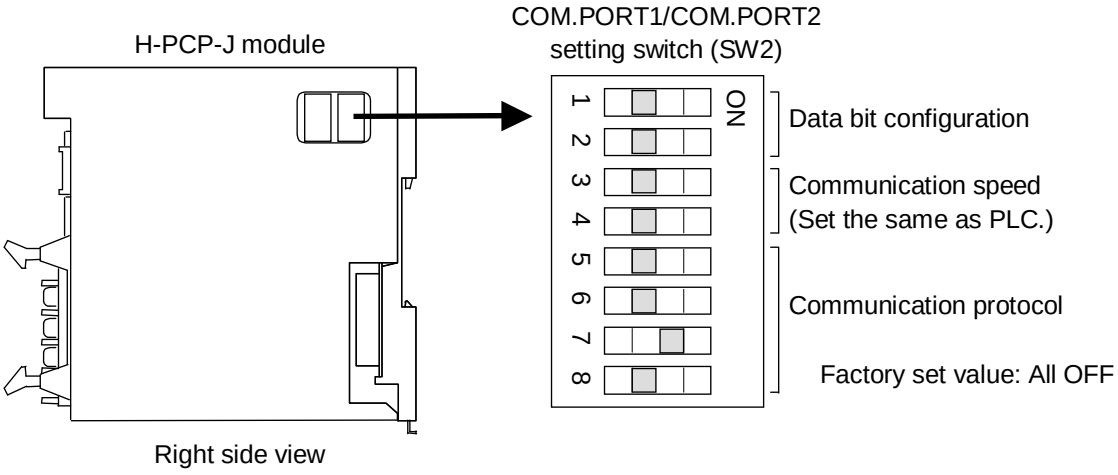
Unit address setting switch	PLC register address	Communication item	
6	D7360 to D7419	Unit address 6	Current transformer input measured value CT1 to CT60
	D7967	Unit address 6	PCP normal communication flag
7	D7420 to D7479	Unit address 7	Current transformer input measured value CT1 to CT60
	D7968	Unit address 7	PCP normal communication flag
8	D7480 to D7539	Unit address 8	Current transformer input measured value CT1 to CT60
	D7969	Unit address 8	PCP normal communication flag
9	D7540 to D7599	Unit address 9	Current transformer input measured value CT1 to CT60
	D7970	Unit address 9	PCP normal communication flag
A	D7600 to D7659	Unit address A	Current transformer input measured value CT1 to CT60
	D7971	Unit address A	PCP normal communication flag
B	D7660 to D7719	Unit address B	Current transformer input measured value CT1 to CT60
	D7972	Unit address B	PCP normal communication flag
C	D7720 to D7779	Unit address C	Current transformer input measured value CT1 to CT60
	D7973	Unit address C	PCP normal communication flag
D	D7780 to D7839	Unit address D	Current transformer input measured value CT1 to CT60
	D7974	Unit address D	PCP normal communication flag
E	D7840 to D7899	Unit address E	Current transformer input measured value CT1 to CT60
	D7975	Unit address E	PCP normal communication flag
F	D7900 to D7959	Unit address F	Current transformer input measured value CT1 to CT60
	D7976	Unit address F	PCP normal communication flag

Register address D7960, D7977 to D7999: Do not use this address range

■ Protocol selection and communication setting

Match the setting of data bit configuration, communication speed and communication protocol with the PLC communication specification by COM.PORT1/COM.PORT2 setting switch (SW2).
Setting example to recommend is shown in the following.



- **Data bit configuration**

SW2		Data bit configuration
1	2	
OFF	OFF	Data 8-bit, Non parity, Stop 1-bit

- **Communication speed** Set the same as PLC.

SW2		Communication speed
3	4	
OFF	OFF	9600 bps
ON	OFF	19200 bps
OFF	ON	38400 bps
ON	ON	Don't set this one

- **Protocol**

SW2				Protocol
5	6	7	8	
OFF	OFF	ON	OFF	MITSUBISHI MELSEC series special protocol AnA/AnUCPU common command (QW/QR) [Current transformer (CT) monitor]

■ PLC scanning time setting

Set the PLC scanning time (time of waiting for a response from the PLC) so as to adapt to the environment used. **The PLC scanning time is set via host communication (RKC communication or Modbus).**

PLC scanning time setting Setting range: 0 to 3000 ms (Factory set value: 10 ms)

[Setting example]
Set PLC scanning time to any value more than twice as long as the maximum scanning time of PLC.

📖 **If PLC scanning time is extremely short (When at a factory set value of 10 ms as an example), the SR Mini HG SYSTEM may detect the time-out not conducting normal communication processing.**

📖 The maximum scanning time of PLC differs depending on the CPU processing speed, I/O unit configuration and the user program capacity of the PLC.

☞ For the PLC scanning time setting (Identifier ST), see the **Power Supply/CPU Module H-PCP-J Instruction Manual (IMS01J02-E□)**.

8.2 Setting on The PLC Side

Set the PLC as follows. (Recommend setting example)

Item	Description
Protocol	Type 4 protocol mode
Station number	00
Computer link/multi-drop selection	Computer link
Communication rate	Set the same as SR Mini HG SYSTEM
Operation setting	Independent
Data bit	8
Parity bit	Without
Stop bit	1
Sum check code	Provided
Writing during RUN	Allowed
Setting modification	Allowed
Termination resistor	Connect the termination resistor attached to the PLC

☞ The setting item varies depending on the PLC. The details of the setting procedure for the PLC, please also read the instruction manual for the used PLC.

8.3 Communication Data List

Attributes
RO: SR Mini HG SYSTEM writes in data. (SR Mini HG SYSTEM → PLC)

If the power is turned on, SR Mini HG SYSTEM always writes data to PLC. As for the setting of request command from PLC, there is not requirement.

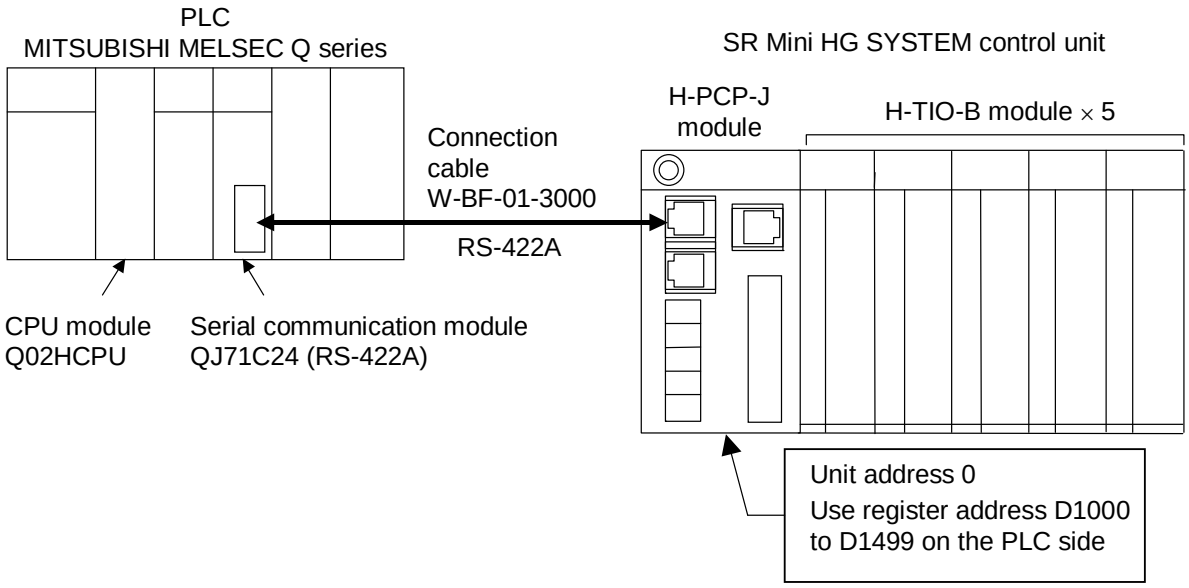
The data type is treated as binary data with a sign and without a decimal point.
[Example] Current transformer input measured value
Initial value of internal data: 12.3
Communication data: 123

Name	Attri-bute	Struc-ture	Data range	Factory set value
Current transformer input measured value	RO	C	0.0 to 100.0 A or 0.0 to 30.0 A Current transformer (CT) input measured value of the H-CT-A module.	—
PCP normal communication flag	RO	U	The numbers 0 and then 1 are repeated. The SR Mini HG SYSTEM rewrites 0 and 1 in this area alternately like 0 → 1 → 0. It is possible to determine whether or not the SR Mini HG SYSTEM makes communication by monitoring this area periodically using the PLC program. When SR Mini HG SYSTEM did not communicate, flag does not change.	—

9. USAGE EXAMPLE

This section describes the procedures for setting the set values after the SR Mini HG SYSTEM is purchased by referring to an example of the following system configuration.

System configuration example:
When connected to a MITSUBISHI MELSEC Q series of PLCs.



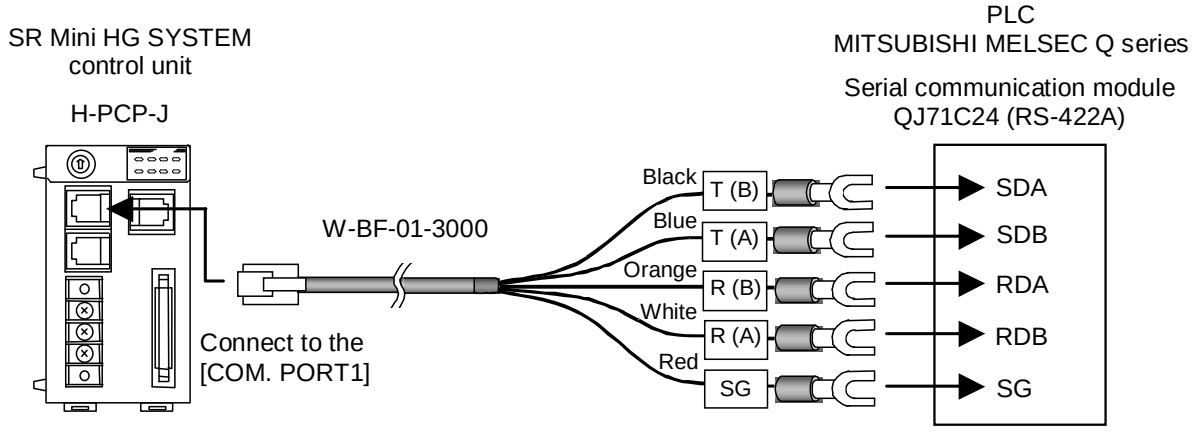
- **MITSUBISHI MELSEC Q series**
  CPU module Q02HCPU 1
  Serial communication module QJ71C24 (RS-422A)..... 1

- **SR Mini HG SYSTEM control unit**
  H-PCP-J module 1
  H-TIO-B module.... 5

- **Connection cable for connecting SR Mini HG SYSTEM control unit and PLC**
  W-BF-01-3000 (RKC product, Sold separately) [Standard cable length: 3 m].....1

9.1 Connecting with PLC

Connect H-PCP-J module and PLC (Serial communication module)
For the connection cable, use the W-BF-01-3000 (RKC product)



Cable type: W-BF-01-3000 (RKC product, Sold separately) [Standard cable length: 3 m]

Shields of the connection cable (W-BF-01-3000) are connected to SG (No. 6 pin) of the H-PCP-J connector.

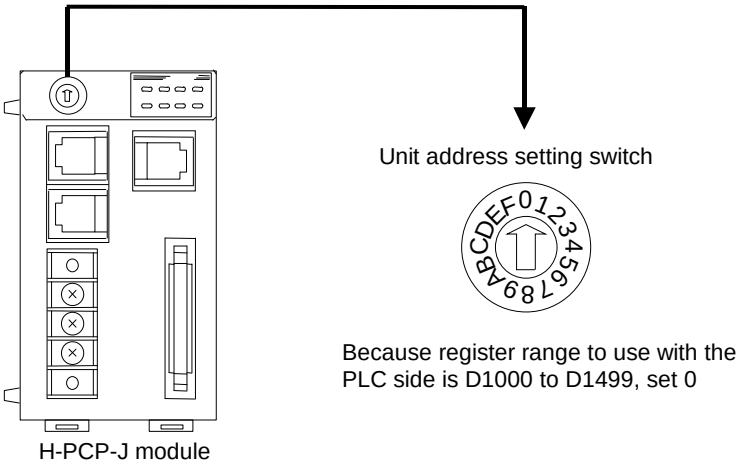
The details of the connectable connector for the PLC, please also read the instruction manual for the used PLC.

When be prepared cable with a customer, see the **3. CONNECTIONS (P. 4)**.

9.2 Setting on The H-PCP-J Module Side

■ Unit address setting switch setting

Set register range to use with the PLC side with unit address setting switch. For this setting, use a small blade screwdriver. Use register address D1000 to D1499 on the PLC side in usage example.



The registers are assigned as follows, if unit address is 0.

PLC register address	Communication item	
D1000 to D1019	Temperature set value (SV)	CH1 to CH20
D1020 to D1039	Alarm 1 set value	CH1 to CH20
D1040 to D1059	Alarm 2 set value	CH1 to CH20
D1060 to D1079	Heater break alarm set value (H-CT-A module)	CH1 to CH20
D1080 to D1099	Operation mode transfer	CH1 to CH20
D1100 to D1119	Auto/Manual transfer	CH1 to CH20
D1120 to D1139	Manual output value	CH1 to CH20
D1140 to D1159	Overlap/deadband	CH1 to CH20
D1160 to D1179	Heat-side proportional band	CH1 to CH20
D1180 to D1199	Cool-side proportional band	CH1 to CH20
D1200 to D1219	Integral time	CH1 to CH20
D1220 to D1239	Derivative time	CH1 to CH20
D1240 to D1259	PID/AT transfer	CH1 to CH20
D1260 to D1279	Temperature measured value (PV)	CH1 to CH20
D1280 to D1299	Heat-side manipulated output value	CH1 to CH20
D1300 to D1319	Cool-side manipulated output value	CH1 to CH20

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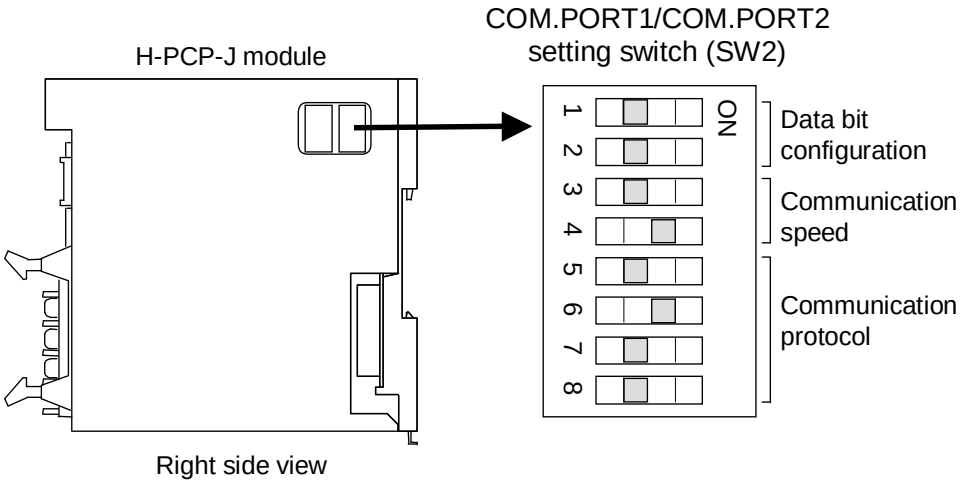
PLC register address	Communication item	
D1320 to D1339	Current transformer input measured value (H-CT-A module)	CH1 to CH20
D1340 to D1359	TIO status	CH1 to CH20
D1360 to D1379	Set value monitor	CH1 to CH20
D1380	Request command	
D1381	PCP communication status	
D1382	PCP normal communication flag	
D1383 to D1389	Do not use this address range	
D1390	Memory area number	
D1391	Control RUN/STOP transfer	
D1392 to D1399	Do not use this address range	
D1400 to D1419	PV bias	CH1 to CH20
D1420 to D1439	Setting change rate limiter	CH1 to CH20
D1440 to D1499	Do not use this address range	

☞ For details on the register address, see the **4.1 PLC Register Address Setting (P. 8)**.

☞ For details on each communication item, see the **6.3 Communication Data List (P. 19)**.

■ Protocol selection and communication setting

Match the setting of data bit configuration, communication speed and communication protocol with the PLC communication specification by COM.PORT1/COM.PORT2 setting switch (SW2).
Set the data bit configuration, communication speed and communication protocol in usage example as follows.



SW2		Setting description
1	OFF	Data bit configuration
2	OFF	Data 8-bit, Non parity, Stop 1-bit
3	OFF	Communication speed
4	ON	38400 bps
5	OFF	Communication protocol
6	ON	MITSUBISHI MELSEC series special protocol
7	OFF	AnA/AnUCPU common command (QW/QR)
8	OFF	

☞ For the details, see the **Power Supply/CPU Module H-PCP-J Instruction Manual (IMS01J02-E□)**.

■ PLC scanning time setting

Set the PLC scanning time (time of waiting for a response from the PLC) so as to adapt to the environment used. **The PLC scanning time is set via host communication (RKC communication or Modbus).**

PLC scanning time setting Setting range: 0 to 3000 ms (Factory set value: 10 ms)

[Setting example]
Set PLC scanning time to any value more than twice as long as the maximum scanning time of PLC.

📖 **If PLC scanning time is extremely short (When at a factory set value of 10 ms as an example), the SR Mini HG SYSTEM may detect the time-out not conducting normal communication processing.**

📖 The maximum scanning time of PLC differs depending on the CPU processing speed, I/O unit configuration and the user program capacity of the PLC.

☞ For the PLC scanning time setting (Identifier ST), see the **Power Supply/CPU Module H-PCP-J Instruction Manual (IMS01J02-E□)**.

9.3 Setting on The PLC Side

Set the Serial communication module of MITSUBISHI MELSEC Q series as follows.

Setting item	Description
Operation setting	Independent
Data bit	8
Parity bit	NO
Even/odd parity	Odd
Stop bit	1
Sum check code	YES

Setting item	Description
Writing during RUN	Allowed
Setting modification	Allowed
Communication rate	38400 bps
Communication protocol	MC protocol, Format 4
Station number	0

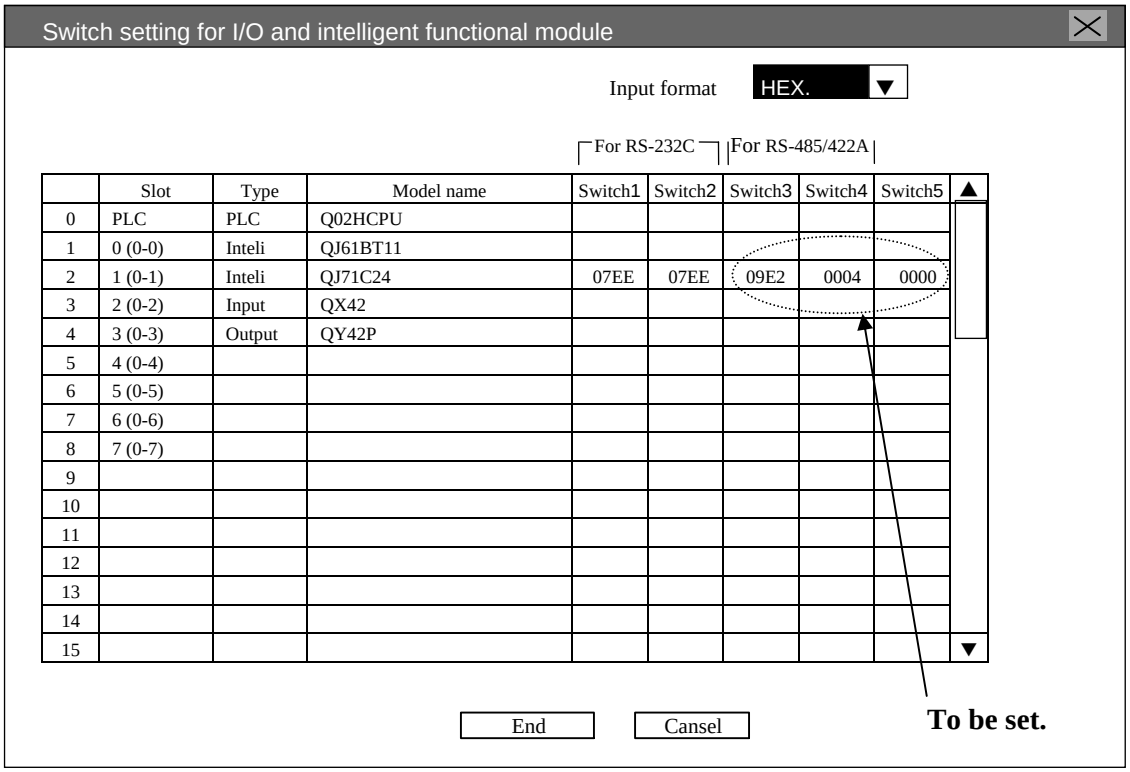
Setting in the serial communication module (QJ71C24) belonging to the MITSUBISHI MELSEC Q series do with the GX Developer of the MITSUBISHI MELSEC PLC programming software (SW□D5C-GPPW-E).
Setting set the following set value with switch setting for I/O and intelligent functional module.

Switch 3: **09E2** * Switch 4: **0004** * Switch 5: **0000** * * Hexadecimal

[Setting procedure]

[GX Developer] → [PLC parameters] → [I/O assignment setting] → **Switch setting**

[Setting screen]



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- **Description Switches 1 to 5**

Switch number	Description	
Switch 1	b15 to b8	b7 to b0
	CH1 Communication rate setting	CH1 Transmission setting
Switch 2	CH1 Communication protocol setting	
Switch 3	b15 to b8	b7 to b0
	CH2 Communication rate setting	CH2 Transmission setting
Switch 4	CH2 Communication protocol setting	
Switch 5	Station number setting	

Set the transmission specifications and communication protocol of each interface using the combinations of setting values for each switch with 16-bit binary data.

- **Setting on switch 3 (CH2 Transmission setting)**

Bit	Description	OFF (0)	ON (1)	Setting	Set value
b0	Operation setting *	Independent	Link	0	2
b1	Data bit	7	8	1	
b2	Parity bit	No	Yes	0	
b3	Even/Odd parity	Odd	Even	0	
b4	Stop bit	1	2	0	E
b5	Sum check code	No	Yes	1	
b6	Write during RUN	Prohibited	Allowed	1	
b7	Setting modifications	Prohibited	Allowed	1	

* Must be set to OFF (0) on CH1

- **Setting on switch 3 (CH2 Communication rate setting)**

Communication rate (Unit: bps)	Bit position b15 to b8	Communication rate (Unit: bps)	Bit position b15 to b8
300	00H	14400	06H
600	01H	19200	07H
1200	02H	28800	08H
2400	03H	38400	09H
4800	04H	57600	0AH
9600	05H	115200	0BH

Set 38400 bps on communication rate. (Set value: 09)

- **Setting on switch 4 (CH2 Communication protocol setting)**

Set number	Description	
0H	GX Developer connection	
1H	MC protocol	Format 1
2H		Format 2
3H		Format 3
4H		Format 4
5H		Format 5

Set number	Description
6H	Non procedure protocol
7H	Bidirectional protocol
8H	For linked operation setting
9H to DH	Setting prohibited
EH	ROM/RAM/switch test
FH	Individual station loopback test

Set MC protocol Format 4 on communication protocol setting. (Set value: 04)

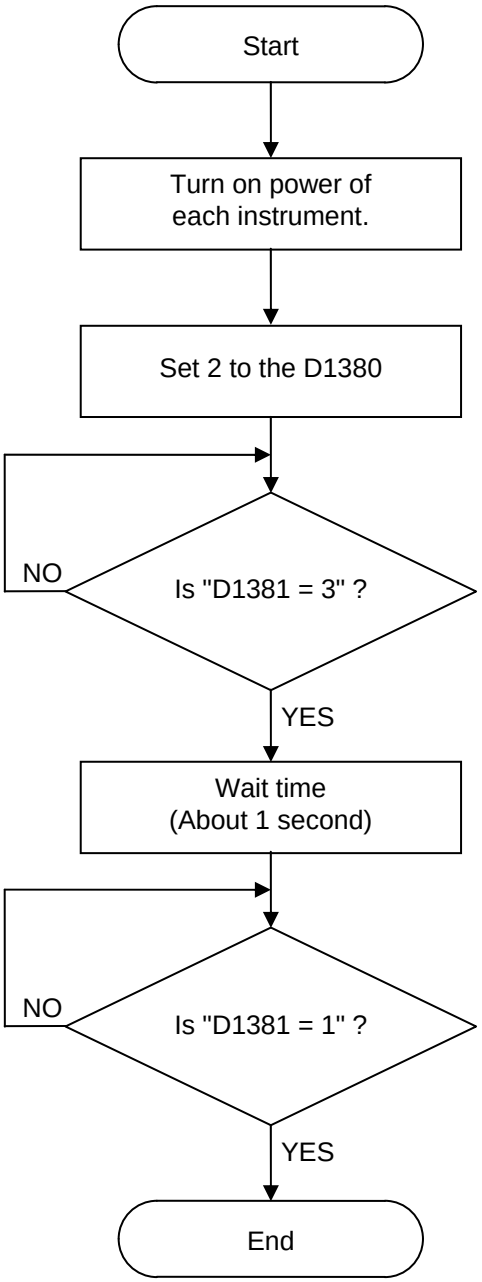
- **Setting on switch 5 (Station number setting)**

This setting is common for both CH1 and CH2 sides.
Set the station number to 0.

☞ The details of the switch setting for the PLC, please also read the instruction manual for the used PLC.

9.4 Initial Setting (Data of SR Mini HG SYSTEM is written into The PLC)

Change each set value of SR Mini HG SYSTEM from the PLC after the following initial settings are made.



When 2 (Set value monitor) is set to D1380 (request command), the SR Mini HG SYSTEM starts writing the data items such as temperature set value, etc. (attribute: R/W) to the PLC side.

If 3 (writing on setting data) is set to D1381 (PCP communication status) in the PLC, this indicates that SR Mini HG SYSTEM data items such as temperature set value, etc. (attribute: R/W) are being written into the PLC.

Spend a wait time of about 1 second/control unit (38400 bps) after being set. In addition, process data in each item as indefinite during this period.

If 1 (writing on monitor data) is set to D1381 (PCP communication status) in the PLC, this indicates that SR Mini HG SYSTEM data items such as temperature set value, etc. (attribute: R/W) have been written to start writing SR Mini HG SYSTEM data items such as temperature measured values (PV), etc. (attribute: RO) into the PLC.

For the request command, see the **6.1 Request Command and Data Transfer (P. 13)**.

9.5 Data Setting

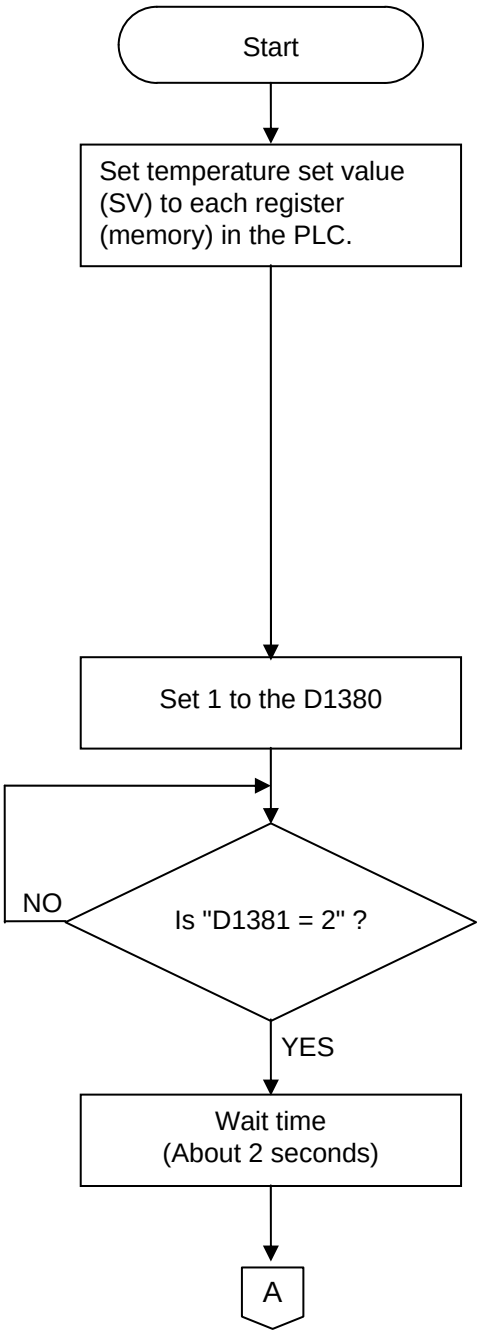
It is assumed that initial setting is finished.

If each set value of SR Mini HG SYSTEM is changed from the PLC without setting the initial values, it is re-written to 0 with each set value of the PLC at that time set to 0.

■ Setting example

When set temperature set value (SV) of SR Mini HG SYSTEM as follows:

Temperature set value (SV)	CH1= 100	CH2=100	CH3=110	CH4=110	CH5=120
	CH6=120	CH7=130	CH8=130	CH9=50	CH10=50



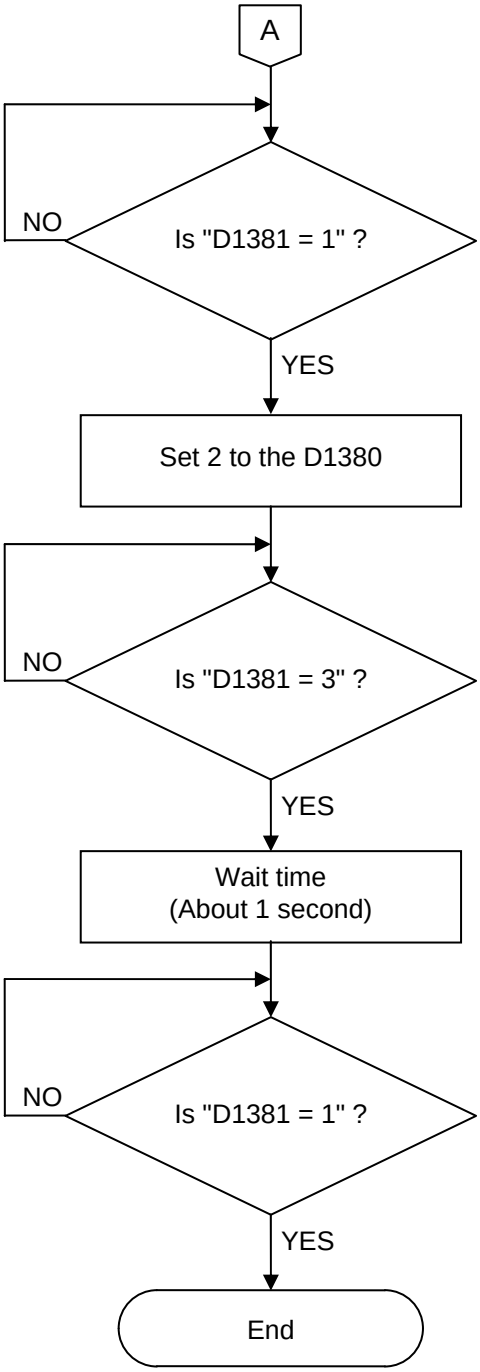
When unit address of SR Mini HG SYSTEM control unit is 0

PLC register address	Communication item	Set value
D1000	Temperature set value (SV) CH1	100
D1001	Temperature set value (SV) CH2	100
D1002	Temperature set value (SV) CH3	110
D1003	Temperature set value (SV) CH4	110
D1004	Temperature set value (SV) CH5	120
D1005	Temperature set value (SV) CH6	120
D1006	Temperature set value (SV) CH7	130
D1007	Temperature set value (SV) CH8	130
D1008	Temperature set value (SV) CH9	50
D1009	Temperature set value (SV) CH10	50

When 1 (Setting) is set to D1380 (request command), the SR Mini HG SYSTEM starts reading the temperature set value data set to the register (memory) on the PLC side.

If 2 (reading out setting data) is set to D1381 (PCP communication status) in the PLC, this indicates that temperature set values data are being read from the PLC.

Spend a wait time of about 2 seconds/control unit (38400 bps) after being set. In addition, process data in each item as indefinite during this period.



If 1 (writing on monitor data) is set to D1381 (PCP communication status) in the PLC, this indicates that temperature set value data have been read to start writing SR Mini HG SYSTEM data items such as temperature measured values (PV) etc. (attribute: RO) into the PLC.

When 2 (Set value monitor) is set to D1380 (request command), the SR Mini HG SYSTEM starts writing the temperature set value data set to the PLC side.

If 3 (writing on setting data) is set to D1381 (PCP communication status) in the PLC, this indicates that SR Mini HG SYSTEM temperature set value data are being written into the PLC.

Spend a wait time of about 1 second/control unit (38400 bps) after being set. In addition, process data in each item as indefinite during this period.

If 1 (writing on monitor data) is set to D1381 (PCP communication status) in the PLC, this indicates that temperature set values have been written to start writing SR Mini HG SYSTEM data items such as temperature measured values (PV), etc. (attribute: RO) into the PLC.

☞ For the request command, see the **6.1 Request Command and Data Transfer (P. 13)**.

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