Temperature Controller

FZ110/FZ400/FZ900

Instruction Manual

[PLC Communication]

RKC INSTRUMENT INC.

IMR03A08-E6

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 explanation purpose.
- 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.
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- Windows is a trademark of Microsoft Corporation.
- Modbus is a registered trademark of Schneider Electric.
- The name of each programmable controller (PLC) means the products of each manufacturer.
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Safety Precautions

■ Pictorial Symbols (safety symbols)

Various pictorial symbols are used in this manual to ensure safe use of the product, to protect you and other people from harm, and to prevent damage to property. The symbols are described below.
Be sure you thoroughly understand the meaning of the symbols before reading this manual.

⚠ 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.

⚠ WARNING

- To prevent injury to persons, damage to the instrument and the 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 the instrument and the equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to the instrument and the 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 may 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 plant.)
- 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 to operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- All wiring must be in accordance with local codes and regulations.
- 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 a fuse, circuit breaker, etc.
- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.
- 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 dissipation.
- 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 may occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

For Proper Disposal

When disposing of each part used for this instrument, always follows the procedure for disposing of industrial wastes stipulated by the respective local community.

Symbols

■ Pictorial Symbols (safety symbols)

NOTE : 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.

■ Character Symbols

11-segment character

0	1	2	3	4	5	6	7	8	9	Minus	Period
											

A	B (b)	C	c	D (d)	E	F	G	H	I	J	K
											

L	M	N	n	O (o)	P	Q	R	S	T	t	U
											

u	V	W	X	Y	Z	Degree	／	Prime	✱ (Asterisk)	→
										

7-segment character

0	1	2	3	4	5	6	7	8	9	Minus	Period

A	B (b)	C	c	D (d)	E	F	G	H	I	J	K

L	M	N (n)	O (o)	P	Q	R	S	T	t	U	u

V	W	X	Y	Z	Degree	／	Prime	✱ (Asterisk)

■ Abbreviation symbols

These abbreviations are used in this manual:

Abbreviation symbols	Name	Abbreviation symbols	Name
PV	Measured value	TC (input)	Thermocouple (input)
SV	Set value	RTD (input)	Resistance temperature detector (input)
MV	Manipulated output value	V (input)	Voltage (input)
AT	Autotuning	I (input)	Current (input)
ST	Startup tuning	HBA (1, 2)	Heater break alarm (1, 2)
OUT (1 to 3)	Output (1 to 3)	CT (1, 2)	Current transformer (1, 2)
DI (1 to 6)	Digital input (1 to 6)	LBA	Control loop break alarm
DO (1 to 4)	Digital output (1 to 4)	LBD	LBA deadband
FBR	Feedback resistance		

Document Configuration

There are seven manuals pertaining to this product. Please be sure to read all manuals specific to your application requirements.

The following manuals can be downloaded from the official RKC website:
https://www.rkcinst.co.jp/english/download-center/

Manual	Manual Number	Remarks
FZ110/FZ400/FZ900 Installation Manual	IMR03A01-E☐	This manual is enclosed with instrument. This manual explains the mounting and wiring.
FZ110/FZ400/FZ900 Quick Operation Manual	IMR03A02-E☐	This manual is enclosed with instrument. This manual explains the basic key operation, mode menu, and data setting.
FZ110/FZ400/FZ900 Parameter List	IMR03A03-E☐	This manual is enclosed with instrument. This list is a compilation of the parameter data of each mode.
FZ110/FZ400/FZ900 Instruction Manual [Part 1: Hardware]	IMR03A04-E☐	This manual describes installation, wiring, troubleshooting and product specification.
FZ110/FZ400/FZ900 Instruction Manual [Part 2: Parameters/Functions]	IMR03A05-E☐	Parameters: This manual describes how to switch the operation modes and parameters, the range of parameters, and initialization/automatic conversion associated with the change of settings. Functions: This manual describes how to set up and each function.
FZ110/FZ400/FZ900 Instruction Manual [Host Communication]	IMR03A07-E☐	This manual explains RKC communication protocol (ANSI X3.28-1976) and Modbus relating to communication parameters setting.
FZ110/FZ400/FZ900 Instruction Manual [PLC Communication]	**IMR03A08-E6**	This manual you are reading now. This manual describes how to set up the instrument for communication with a programmable controller (PLC).

Read this manual carefully before operating the instrument. Please place the manual in a convenient location for easy reference.

About This Manual

This manual describes how to connect the instrument to a programmable logic controller (PLC) after it has been installed and how to set up the instrument to transfer the data between the instrument and the PLC.

This manual consists of 8 chapters.
Chapter 7 describes how to make wiring between the instrument and the PLC and how to set up for the data transfer after the installation of the instrument giving an example.
In other chapters, detailed and supplementary explanations are provided.

	What do you want to do?	See the following section for more details
☐	I want to know the features of the PLC communication	1. OUTLINE
☐	I want to know the operation flow to establish PLC communication	1. OUTLINE 7. USAGE EXAMPLE
☐	I want to know the specification of the PLC communication	2. COMMUNICATION SPECIFICATIONS
☐	I want to setting the device address and the communication speed of the instrument	3. COMMUNICATION SETTING 7. USAGE EXAMPLE
☐	I want to check the communication speed and the data bit configuration of the PLC	3. COMMUNICATION SETTING
☐	I want to know how to wiring between the instrument and the PLC	4. CONNECTION TO THE PLC
☐	I want to check the PLC communication environment items	5. PLC COMMUNICATION ENVIRONMENT SETTING
☐	I want to know the communication data transfer method	6. COMMUNICATION DATA
☐	I want to know the communication data processing time	6. COMMUNICATION DATA
☐	I want to know the register address and the communication data range	6. COMMUNICATION DATA
☐	I want to reduce the amount of the communication data for the data transfer.	6. COMMUNICATION DATA
☐	I want to know what actions I should take in case of errors	8. TROUBLESHOOTING

Contents

MEMO

1 OUTLINE

This manual describes the PLC communication.

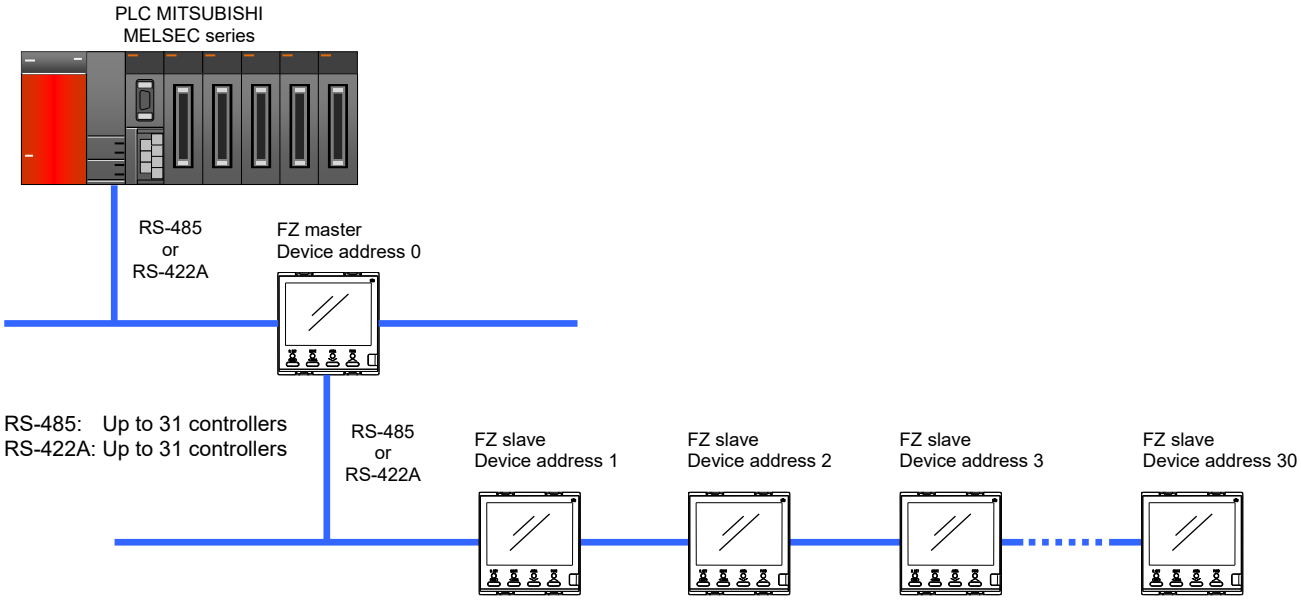
☞ Refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR03A07-E□)** for the Host communication (RKC communication and Modbus).

☞ Refer to **FZ110/FZ400/FZ900 Instruction Manual [Part1: Hardware] (IMR03A04-E□)** for wiring power supply and inputs/outputs.

☞ Refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)** for descriptions of communication data (parameter) and functions.

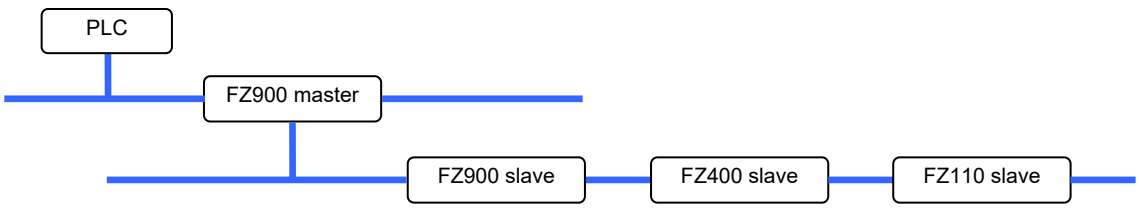
1.1 Features

The PLC communication function is used to exchange the data between a programmable logic controller (hereafter called “PLC”) and a FZ110/400/900 (hereafter called “FZ”) and to set the controller.
Up to 31 controllers can be connected to one PLC.



The interface of FZ110 corresponds to the RS-485.

Different types of the FZ can be used in the same network as shown below.



■ Program free connection to a PLC (MAPMAN function)

Users do not need to develop a program for communication between the PLC and the FZ controller. Users only have to set up the communication data that allows the communication with the PLC to be established.

Data required to establish the communication

Setting of FZ

- Communication protocol, Device address and Communication speed, etc.
  ➔ See "**3. COMMUNICATION SETTING**"
- PLC communication environment items
  ➔ See "**5. PLC COMMUNICATION ENVIRONMENT SETTING**"

Setting of PLC

- Protocol, Station number and Communication rate, etc.
  ➔ See "**3.2 Communication Setting of PLC**" or **PLC instruction manual**

■ PLC communication data map editing is possible

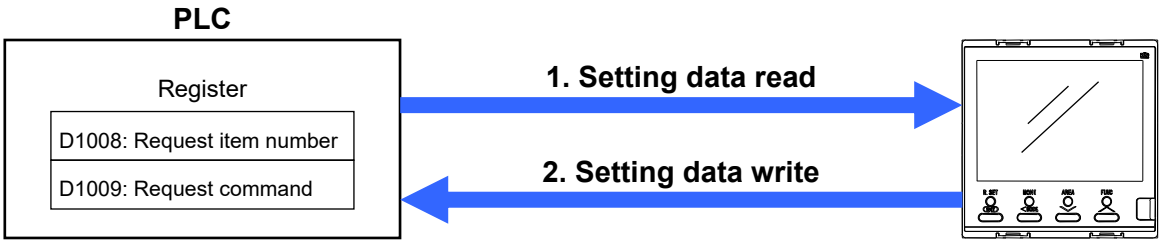
Communication data of a PLC communication data map can be edited by loader communication or host communication. For example, the amount of PLC register space that is used can be reduced by setting unnecessary communication data to "unused."
Editing the PLC communication data map can be set in the PLC communication environment items.

To set the PLC communication environment items, it is recommended to use the loader communication.
This is because the host and the PLC communication share the same communication terminals. When you edit the data map through the host communication, you have to make changes to the communication setup and the wiring to the PLC communication.

To use a loader communication, you will need a USB communication converter COM-K2 (or COM-KG) and loader communication cable (W-BV-05-1500) for the FZ.

■ Execute the data transfer using "Request item number" and "Request command"

The setting data can be transferred by setting values in "Request item number" and "Request command" available in the register of the PLC.



See **6.1.1 Data group (P. 6-3)** for the "Request item number" and "Request command."

■ Communication data type

There are such data as shown below for the communication with the PLC.

- Double word
- Single word

Communication data type can be selected at Input data type (*I ndT*).

For the Input data type, see ■ **Input data type [Engineering mode: Function block No. 21] (P. 3-9).**

1.2 Usable PLC Modules

The FZ can be connected to MITSUBISHI MELSEC series module.

Check the website of Mitsubishi Electric for discontinued PLC modules.

■ Usable PLC modules

MELSEC Q series

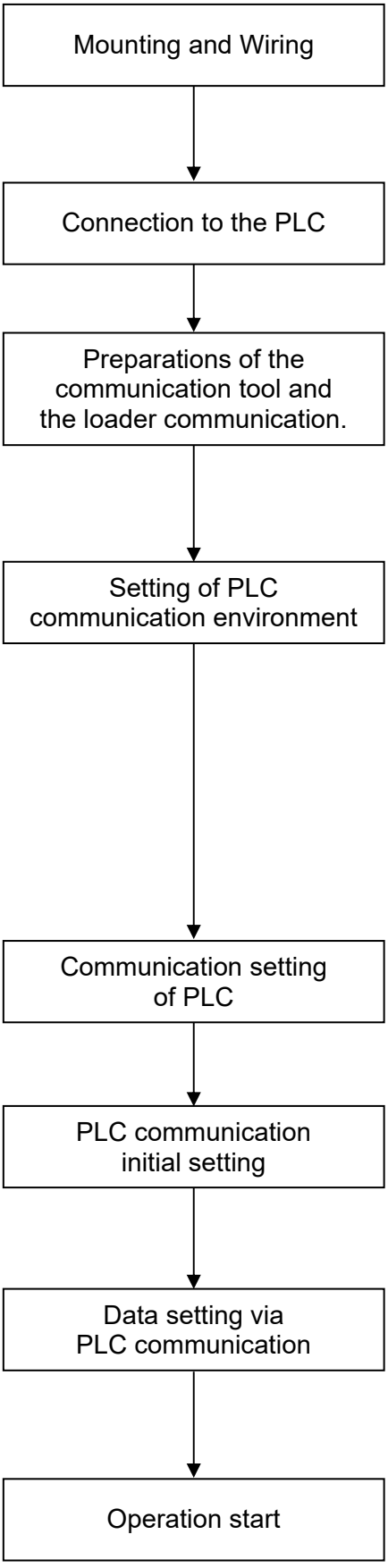
Name	Type
Serial communication modules	● QJ71C24 ● QJ71C24N ● QJ71C24N-R4, etc. The QnA compatible 3C frame (Format 4) can use.

MELSEC iQ-F series

Name	Type
FX5U CPU Module	● FX5U-32MR/ES ● FX5U-64MR/ES ● FX5U-80MR/ES The QnA compatible 3C frame (Format 4) can use.
FX5UC CPU Module	● FX5UC-32MT/D ● FX5UC-64MT/D ● FX5UC-96MT/D The QnA compatible 3C frame (Format 4) can use.
Expansion board for RS-485 communication	● FX5-485-BD
Expansion adapter for RS-485 communication	● FX5-485ADP

1.3 Handling Procedure to Operation

Proceed as follows to establish communication and operate the system.



Install the FZ and wire for input/output and power supply.

☞ Refer to **FZ110/FZ400/FZ900 Instruction Manual [Part1: Hardware] (IMR03A04-E□)**.

Connect PLC to FZ.

☞ See **4. CONNECTION TO THE PLC (P. 4-1).**

To establish PLC communication, the initial setting is required on the FZ controller. You have to arrange for the communication software and the loader communication to do the initial setting.

☞ See **5.1 Preparations of The Loader Communication (P. 5-2)**.

☞ See **7.4 Setting of FZ900 (P. 7-5)**.

Set up the necessary items required for the PLC communication (PLC communication environment items) through the loader communication. PLC communication environment item means the data necessary to be set up to exchange the data between the FZ and the PLC. You have to set up the register type occupied by the data of the FZ and the register address.
You can also configure communication parameters such as Device address, Communication speed, Data bit configuration and so on in the PLC communication environment items.

☞ See **5.2 PLC Communication Environment Items List (P. 5-3)**.

Use the programming tool from the PLC manufacturer to set the protocol, station number, communication rate, etc. of the PLC.

☞ See **3.2 Communication Setting of PLC (P. 3-14)**.

☞ See **7.5 Communication Setting of PLC (P. 7-20)**.

Before changing the FZ data from PLC, always read it into the PLC once.

☞ See **6.1.2 Data transfer procedures (P. 6-16)**.

☞ See **7.6 Initial Setting (P. 7-21)**.

Change the set value of each FZ data from the PLC.

☞ See "**Read out all communication data of PLC setting group to the FZ. (P. 6-5)**."

☞ See **7.7 Data Setting (P. 7-23)**.

MEMO

2 COMMUNICATION SPECIFICATIONS

2.1 PLC Communication

Interface: Based on RS-422A, EIA standard (FZ400/900)
Based on RS-485, EIA standard (FZ110/400/900)

Connection method: RS-422A: 4-wire system, half-duplex multi-drop connection
RS-485: 2-wire system, half-duplex multi-drop connection

Synchronous method: Start-stop synchronous type

Communication speed: 2400 bps
4800 bps
9600 bps
19200 bps
38400 bps
57600 bps

Data bit configuration: Start bit: 1
Data bit: 7 or 8
Parity bit: None, Odd or Even
Stop bit: 1 or 2

Protocol: MELSEC Communication Protocol
QnA compatible 3C frame (Format 4)
[Manufactured by Mitsubishi Electric Corporation.]
Commands used
- 1401: Write to word device in word units
- 0401: Read from word device in word units

Termination resistor: Externally terminal connected (120 Ω 1/2 W)

Xon/Xoff control: None

Maximum connections: RS-422A: Up to 31 controllers
RS-485: Up to 31 controllers
Maximum connection quantity of the FZ to a single PLC

Signal logic: RS-422A, RS-485

Signal voltage	Logic
V (A) − V (B) ≥ 1.5 V	0 (SPACE)
V (A) − V (B) ≤ −1.5 V	1 (MARK)

Transmission distance: RS-422A: 1.2 km
RS-485: 1.2 km
The transmission distance is a theoretically maximum distance of the standard and may depend on the product specification.

☞ Refer to **FZ110/FZ400/FZ900 Instruction Manual [Host communication] (IMR03A07-E□)** for the host communication and loader communication specifications.

2.2 Loader Communication

Protocol: For RKC communication protocol only
(ANSI X3.28-1976 subcategories 2.5 and A4)

Synchronous method: Start/Stop synchronous type

Communication speed: 38400 bps

Data bit configuration: Start bit: 1
Data bit: 8
Parity bit: None
Stop bit: 1
Number of communication data digits: 7 (fixed)

Maximum connections: 1 point

Connection method: Exclusive cable (W-BV-05)

Interval time: 10 ms

When the instrument is powered off, power can be supplied to the instrument from COM-K2 or COM-KG. This function is exclusive for parameter setting, and the instrument functions as follows.

- Control is stopped (Output is off, relay remains open).
- Host communication is stopped.
- The PV/SV monitor shows "LoAd" for the Measured value (PV) display and "----" for the Set value (SV) display. The LCD backlight is partially turned off.

While the instrument is powered by COM-K2 or COM-KG, if power is applied to the instrument, the instrument will be reset and starts for normal operation.

When the instrument is normally powered, the host communication can be used simultaneously.

When the instrument is normally powered, the PLC communication can be used simultaneously.

MEMO

3 COMMUNICATION SETTING

3.1 Communication Setting of FZ

The following communication data of the FZ needs to be set to establish communication to the PLC. Use the front keypad or the loader communication to set.

- Communication protocol
- Device Address
- Communication speed
- Data bit configuration
- Interval time
- Decimal point position *
- Input range low/Input range high *
- Input data type *
- Soak time unit *

* These items are to be set when the communication data type (Double word [signed 32 bit integer]/Single word [signed 16 bit integer]) is changed. The exclusive register allocation of the PLC varies with communication data types. (See **P. 6-30** and **P. 6-37**)
The communication data type can be selected at Input data type. The factory set value of the Input data type depends on the input range code specified at the time of ordering. (See **P. 3-10**)

3.1.1 Contents of the communication data

■ Communication protocol selection [Engineering mode: Function block No. 60]

The table below shows a list of available communication protocols. Select the PLC communication. If two or more FZ are connected to the PLC, set "3: PLC communication" on all of the FZ connected to the PLC.

NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).

If you have ordered your controllers with the preset initial code specifying "(MITSUBISHI MELSEC series special protocol QnA compatible 3C frame [format 4])," your controllers are delivered with this configuration.

Screen number	Symbol	Name	Data range	Factory set value
282	CMPS	Communication protocol	0: RKC communication 1: Modbus (Order of data transfer: upper word to lower word) 2: Modbus (Order of data transfer: lower word to upper word) 3: PLC communication (MITSUBISHI MELSEC series special protocol QnA compatible 3C frame [format 4])	When the communication protocol is specified at the time of order, the specified communication protocol will be the factory preset value. With communication, communication protocol not specified: 0

■ Device Address [Engineering mode: Function block No. 60]

This is a device address of the FZ. Select a device address between 0 and 30 for the PLC communication.
It is recommended to assign continuous values to the device address. Setting noncontinuous device address may need longer time before the FZ master recognizes the total number of connected FZ slaves (device address 1 to 30).

NOTE

- **To set up the parameters in the Engineering mode, the control must be stopped (STOP).**
- **A master FZ with a device address "0" (zero) must exist in the line. (PLC communication)**
- **To avoid problems or malfunction, do not duplicate an address on the same communication line.**

Screen number	Symbol	Name	Data range	Factory set value
283	Add	Device Address	PLC communication: 0 to 30 0: Master 1 to 30: Slave	0
			RKC communication: 0 to 99	0
			Modbus: 1 to 99	1

The device address of the FZ slave must be continuous starting from 1.

■ Communication speed [Engineering mode: Function block No. 60]

Select a communication speed for the data communication between the FZ and the PLC.
The communication speed must be set to the same value for the FZ and the PLC. When two or more FZ are connected, set the same communication speed for all of them.

NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).

Screen number	Symbol	Name	Data range	Factory set value
284	bPS	Communication speed	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	3

■ Data bit configuration [Engineering mode: Function block No. 60]

Set a bit configuration for the data communication with the PLC.
The data bit configuration must be set to the same value for the FZ and the PLC. When two or more FZ are connected, set the same data bit configuration for all of them.

NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).

Screen number	Symbol	Name	Data range	Factory set value
285	bIT	Data bit configuration	0 to 11 See Data bit configuration table	0

Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	None	1
1	8	None	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

Set value	Data bit	Parity bit	Stop bit
6	7	None	1
7	7	None	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

: Not settable for Modbus

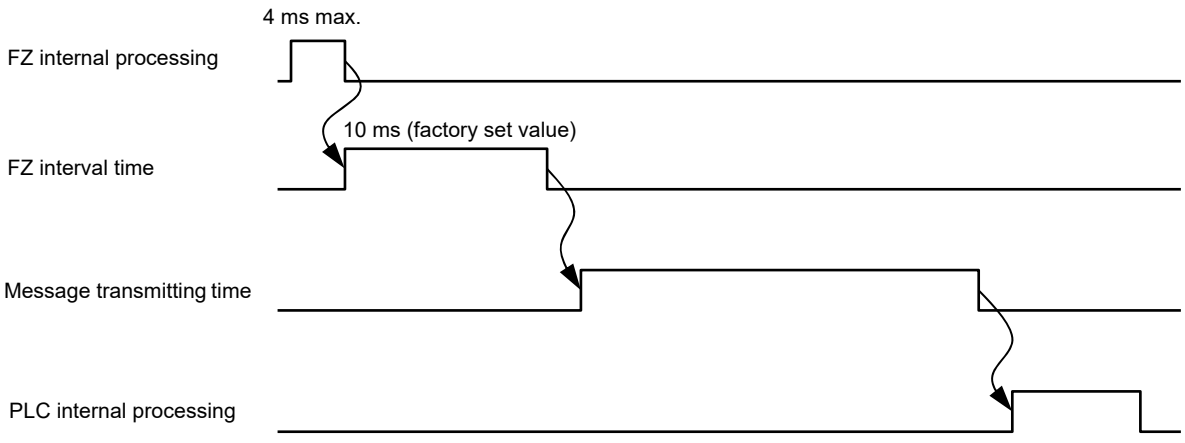
■ Interval time [Engineering mode: Function block No. 60]

Set an interval time which is the latency between the data reception from the PLC and the data transmission from the FZ. The FZ sends the data to the PLC after the elapse of the time (FZ internal processing time + interval time).

NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).

Screen number	Symbol	Name	Data range	Factory set value
286	INT	Interval time	0 to 250 ms	10



■ Decimal point position [Engineering mode: Function block No. 21, No. 22]

When changing the input data type from double word to single word, the input range may need to be changed to cope with the 4-digit display of the measured value. Move the decimal point position to an appropriate position.

☞ For the input range of 4-digit measured value, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

See "■ **Input range table**" of "**5.1 Changing Input**"

NOTE

- **To set up the parameters in the Engineering mode, the control must be stopped (STOP).**
- **Some communication data (parameters) may be initialized or automatically converted when a decimal point position is changed. It is recommended to record settings before changing the decimal point position.**

☞ For the communication data (parameters) that are initialized or automatically converted, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

Engineering mode: Function block No. 21

Screen number	Symbol	Name	Data range	Factory set value
156	I.PGdP	Input 1_Decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: W5Re/W26Re, PR40-20: 0 (fixed) Thermocouples other than those shown above: 0 or 1 RTD input: 0 to 2 Voltage (V)/Current (I) input: In case of Input data type 0: 0 to 4 In case of Input data type 1: 0 to 3 When Control with PV select: Decimal point position setting of Input 1 and Input 2 is compared and the smaller will be used.	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1

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Engineering mode: Function block No. 22

Screen number	Symbol	Name	Data range	Factory set value
168	2.PGdP	Input 2_Decimal point position	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: W5Re/W26Re, PR40-20: 0 (fixed) Thermocouples other than those shown above: 0 or 1 RTD input: 0 to 2 Voltage (V)/Current (I) input: In case of Input data type is 0: 0 to 4 In case of Input data type is 1: 0 to 3	Same as the decimal point position of the input range code specified at the time of order. For V/I inputs: 1

■ Input range high/Input range low [Engineering mode: Function block No. 21, No. 22]

When changing the input data type from double word to single word, the input range may need to be changed to cope with the 4-digit display of the measured value. Adjust the input range narrower as required.

☞ For the input range of 4-digit measured value, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

See "■ **Input range table**" of "**5.1 Changing Input**"

NOTE

- **To set up the parameters in the Engineering mode, the control must be stopped (STOP).**
- **Some communication data (parameters) may be automatically converted when the input range high (or low) is changed. It is recommended to record settings before changing the input range high (or low).**

☞ For the communication data (parameters) that are automatically converted, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

Engineering mode: Function block No. 21

Screen number	Symbol	Name	Data range	Factory set value
157	1.PGSH	Input 1_Input range high	(Input 1_Input range low + 1digit) to Input 1_Maximum value of input range Varies with the setting of the Decimal point position.	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0
158	1.PGSL	Input 1_Input range low	Input 1_Minimum value of input range to (Input 1_Input range high – 1digit) Varies with the setting of the Decimal point position.	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0

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Engineering mode: Function block No. 22

Screen number	Symbol	Name	Data range	Factory set value
169	2.PGSH	Input 2_Input range high	• TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): (Input 2_Input range low + 1digit) to Input 2_Maximum value of input range Varies with the setting of the Decimal point position. • Voltage (V)/Current (I) Inputs (For Remote setting input): (Input 2_Input range low + 1digit) to Input 1_Maximum value of input range Varies with the setting of the Decimal point position.	High limit value of the input range code specified at the time of order. For V/I inputs: 100.0
170	2.PGSL	Input 2_Input range low	• TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): Input 2_Minimum value of input range to (Input 2_Input range high – 1digit) Varies with the setting of the Decimal point position. • Voltage (V)/Current (I) Inputs (For Remote setting input): Input 1_Minimum value of input range to (Input 2_Input range high – 1digit) Varies with the setting of the Decimal point position.	Low limit value of the input range code specified at the time of order. For V/I inputs: 0.0

■ Input data type [Engineering mode: Function block No. 21]

Select a single or a double world for the communication data. Changeable communication data can be found in Monitor group and Setting group.
When changing to a single word system from a double word system, the input range may need to be changed to cope with the 4-digit display of the measured value. If the input data type cannot be changed to "1" (single word) from "0" (double word), select the input range which supports 4-digit display of the measured value.
To set the instrument to a single word system, select "1" (single word). The instrument could be changed to a single word system by setting "2." However, this set value is reserved for RKC communication to handle communication data of our REX-D series instruments. Do not select this set value.

☞ For the input range of 4-digit measured value, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.
See "■ **Input range table**" of "**5.1 Changing Input.**"

NOTE

- **To set up the parameters in the Engineering mode, the control must be stopped (STOP).**
- **Some communication data (parameters) may be automatically converted when the input data type is changed. It is recommended to record settings before changing the input data type.**

☞ For the communication data (parameters) that are automatically converted, refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**.

In case of a dual input type, the input range of both Input 1 and Input 2 must be changed to a 4-digit display, otherwise changing to a single word system from a double word system is not possible.

Screen number	Symbol	Name	Data range	Factory set value
165	I NdT	Input data type	0: Number of measured value digits: 5 Number of RKC communication data digits: 7 Modbus: Double word PLC communication data: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication data digits: 6 Modbus: Single word PLC communication data: Single word 2: Number of measured value digits: 4 Number of RKC communication data digits: 6 Our REX-D series equivalent (Some identifiers are replaced with the REX-D series equivalent identifiers) Modbus data: Single word PLC communication data: Single word When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand. The unit of time depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second	Depends on the input range code specified at the time of order. (See P. 3-10)

• Input range code table

The factory set value of the communication data type depends on the input range code specified at the time of ordering. See the following table to check if the communication data type of your FZ is a double word or a single word.

- When the input range code for a double word has been specified, the factory set value of the Input data type is set to 0 (double word).
- When the input range code for a single word has been specified, the factory set value of the Input data type is set to 1 (single word).

●TC input

Type	Code	Range	Communication data type
K	K01	0 to 200 °C	Single word
	K02	0 to 400 °C	
	K03	0 to 600 °C	
	K04	0 to 800 °C	
	K06	0 to 1200 °C	
	K07	0 to 1372 °C	
	K08	−199.9 to +300.0 °C	
	K09	0.0 to 400.0 °C	
	K10	0.0 to 800.0 °C	
	K14	0 to 300 °C	
	K41	−200 to +1372 °C	
	K42	−200.0 to +1372.0 °C	Double word
	KA1	0 to 800 °F	Single word
	KA2	0 to 1600 °F	
	KA3	0 to 2502 °F	
J	J01	0 to 200 °C	
	J02	0 to 400 °C	
	J03	0 to 600 °C	
	J04	0 to 800 °C	
	J08	0.0 to 400.0 °C	
	J29	−200.0 to +1200.0 °C	Double word
	JA1	0 to 800 °F	Single word
	JA3	0 to 2192 °F	
	JA6	0 to 400 °F	

Type	Code	Range	Communication data type
T	T01	−199.9 to +400.0 °C	Single word
	T02	−199.9 to +100.0 °C	
	T03	−100.0 to +200.0 °C	
	T19	−200.0 to +400.0 °C	Double word
R	R01	0 to 1600 °C	Single word
	R07	−50 to +1768 °C	
	R08	−50.0 to +1768.0 °C	Double word
	R09	0.0 to 1600.0 °C	
S	S06	−50 to +1768 °C	Single word
	S07	−50.0 to +1768.0 °C	Double word
B	B03	0 to 1800 °C	Single word
	B04	0.0 to 1800.0 °C	Double word
E	E01	0 to 800 °C	Single word
	E23	0.0 to 800.0 °C	
N	N02	0 to 1300 °C	Single word
	N05	0.0 to 1300.0 °C	Double word
W5Re/ W26Re	W03	0 to 2300 °C	Single word
PL II	A01	0 to 1300 °C	
	A05	0.0 to 1300.0 °C	Double word
U	U01	−199.9 to +600.0 °C	Single word
L	L04	0.0 to 900.0 °C	
PR40-20	F02	0 to 1800 °C	Double word
	FA2	0 to 3200 °F	

●RTD input

Type	Code	Range	Communication data type
Pt100	D01	−199.9 to +649.0 °C	Single word
	D04	−100.0 to +100.0 °C	
	D05	−100.0 to +200.0 °C	
	D06	0.0 to 50.0 °C	
	D07	0.0 to 100.0 °C	
	D08	0.0 to 200.0 °C	
	D09	0.0 to 300.0 °C	
	D10	0.0 to 500.0 °C	
	D12	−199.9 to +600.0 °C	
	D21	−200.0 to +200.0 °C	Double word

Type	Code	Range	Communication data type
Pt100	D27	0.00 to 50.00 °C	Single word
	D34	−100.00 to +100.00 °C	Double word
	D35	−200.0 to +850.0 °C	
	D48	−100.00 to +850.00 °C	
	DA1	−199.9 to +999.9 °F	Single word
	DA9	0.0 to 500.0 °F	
JPt100	P08	0.0 to 200.0 °C	
	P29	−100.00 to +100.00 °C	Double word
	P30	−200.0 to +640.0 °C	
	P36	−100.00 to +640.00 °C	

●Voltage/Current input

Type	Code	Range	Communication data type
0 to 10 mV DC	101	Programmable range −19999 to +99999 (Factory set value 0.0 to 100.0)	Double word
0 to 100 mV DC	201		
0 to 1 V DC	301		
0 to 5 V DC	401		
0 to 10 V DC	501		

Type	Code	Range	Communication data type
1 to 5 V DC	601	Programmable range −19999 to +99999 (Factory set value 0.0 to 100.0)	Double word
0 to 20 mA DC	701		
4 to 20 mA DC	801		
−10 to +10 V DC	904		
−5 to +5 V DC	905		

■ Soak time unit [Engineering mode: Function block No. 70]

The time unit of the Area soak time of the FZ is set here.
Available time unit may be restricted depending on the Input data type (Double word/Single word), whereas the Input data type may be restricted by the Soak time unit setting.
For example, when the Soak time unit is "2," the Input data type cannot be changed from the double word to the single word. To change the type to the Single word, enter "0" or "1" in the Soak time unit.

NOTE

To set up the parameters in the Engineering mode, the control must be stopped (STOP).

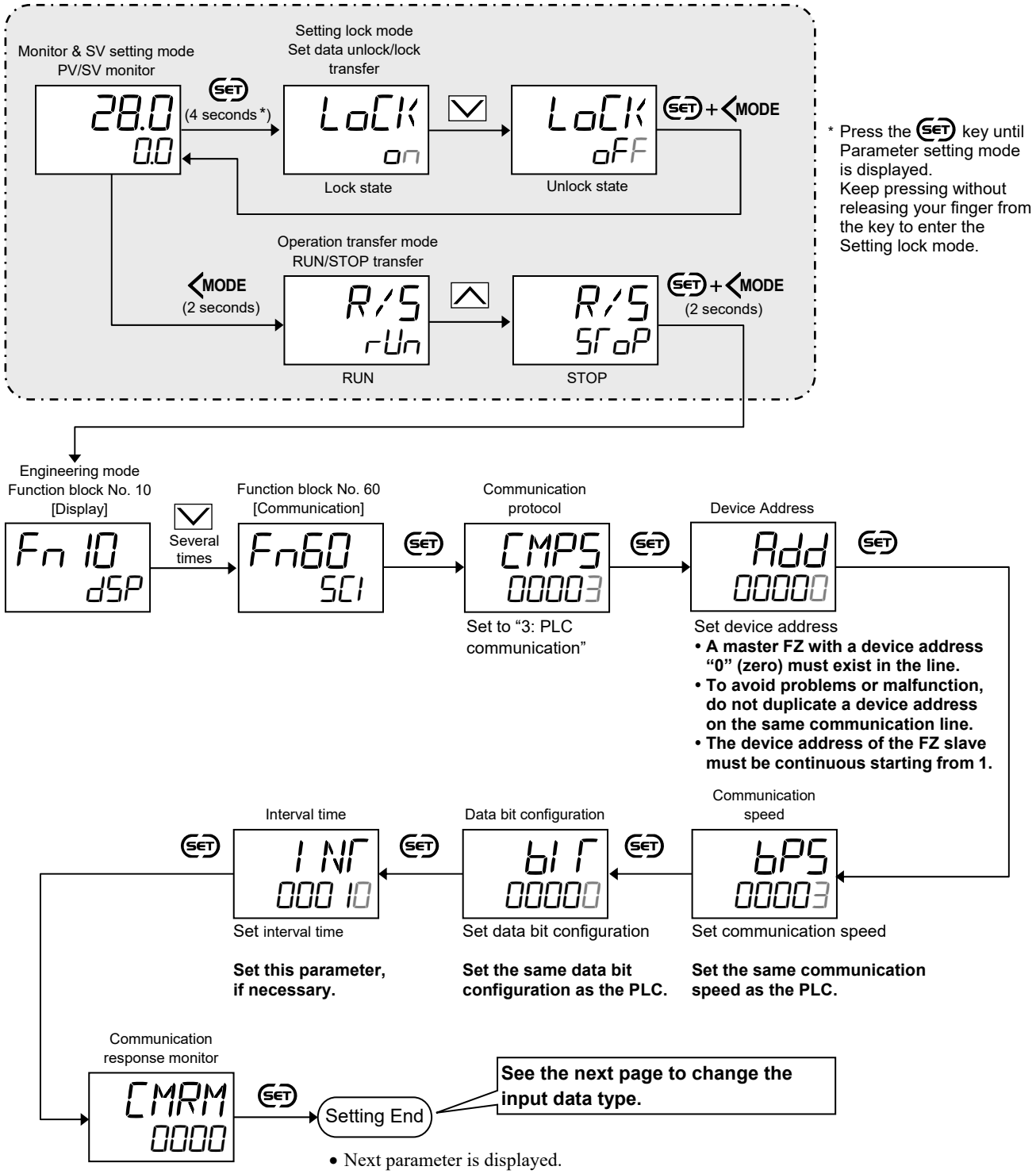
Screen number	Symbol	Name	Data range	Factory set value
299	SrdP	Soak time unit	0: 0 hours 00 minutes to 99 hours 59 minutes 1: 0 minutes 00 seconds to 199 minutes 59 seconds 2: 0 hours 0 minutes 0 seconds to 9 hours 59 minutes 59 seconds In case of Input data type 0: 0 to 2 In case of Input data type 1: 0 or 1	1

3.1.2 Setting via front keys

The communication data on pages **3-2** to **3-4** can be set in Function block No.60 in the Engineering mode.

■ Setting procedure

To enter the Engineering mode



- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

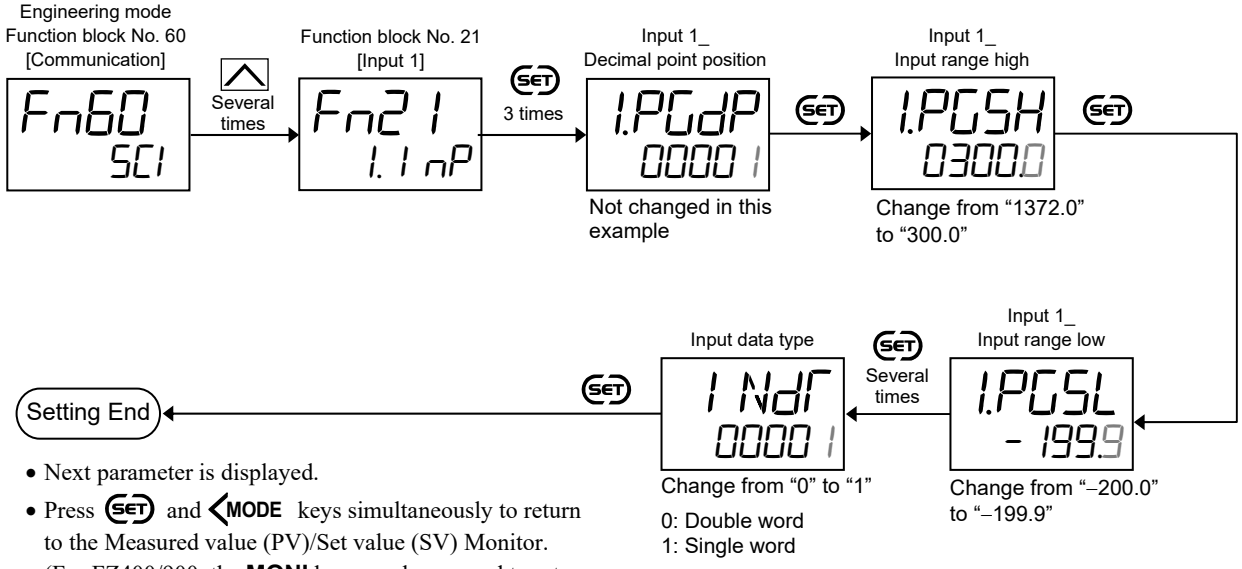
Changing example of Input data type

The Input data type can be set in Function block No.21 in the Engineering mode.

☞ See the previous page to switch the mode to Engineering mode.

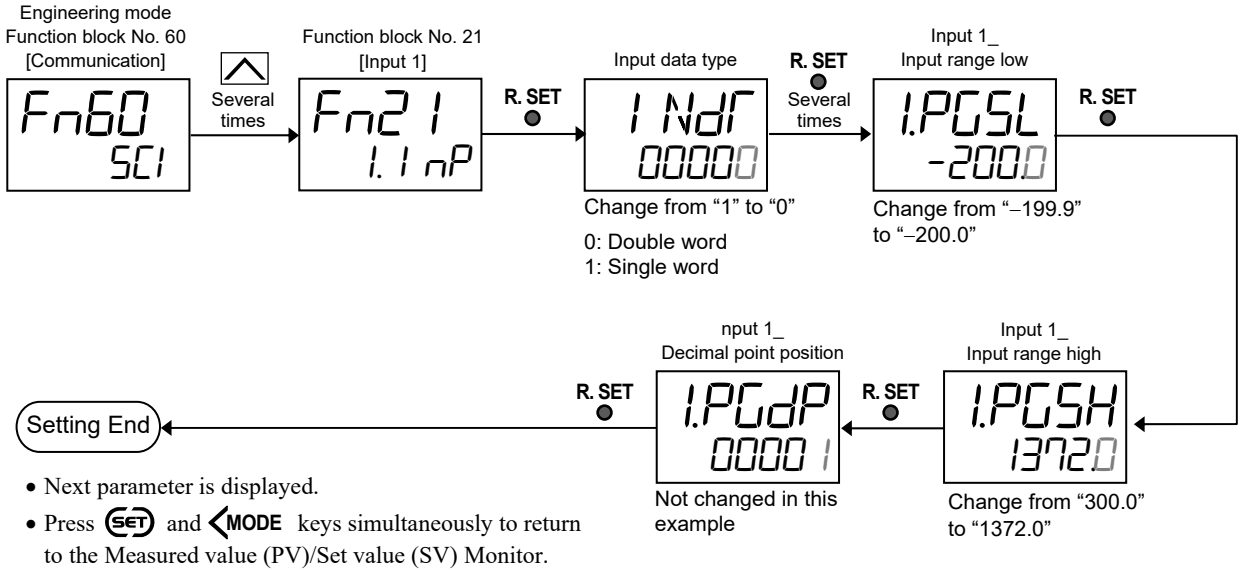
Conditions: Input type: Thermocouple K
Input range: –200.0 to +1372.0 °C (Double word) –199.9 to +300.0 °C (Single word)
Number of input: 1-input specification

• Changing from the Double word to the Single word



- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

• Changing from the Single word to the Double word



- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (For FZ400/900, the **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

3.1.3 Setting by the loader communication

When you try to set the communication parameters (communication protocol, device address, data bit configuration, communication speed, and interval time) via the loader communication, see the following pages.

☞ **5. PLC PLC COMMUNICATION ENVIRONMENT SETTING (P. 5-1)**

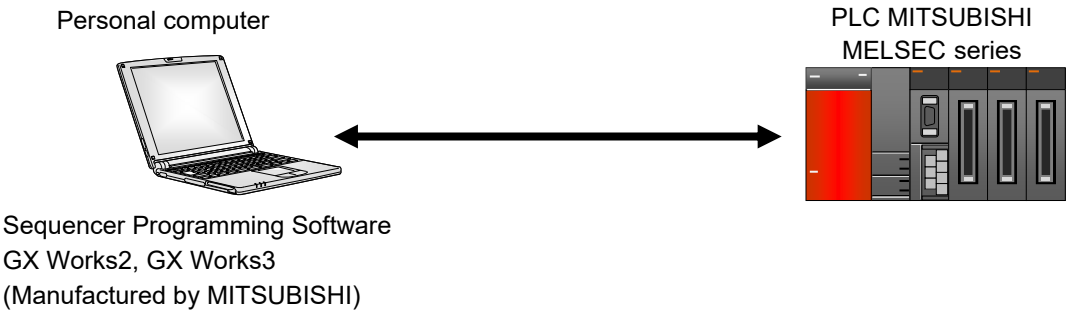
☞ **7.4 Setting of FZ900 (P. 7-5)**

3.2 Communication Setting of PLC

Sets the communication items of PLC side. Set the PLC as follows. (Recommend setting example)

☞ The setting item varies depending on the PLC. The details of the setting procedure for the PLC, see the instruction manual for the PLC being used.

Recommend setting example



Item	Details	
	MELSEC Q series	**MELSEC iQ-F series**
Protocol	MC protocol (Format 4)	MC protocol (Format 4)
Station number	0	0
Communication rate	Set the same as FZ (FZ factory set value: 19200 bps)	Set the same as FZ (FZ factory set value: 19200 bps)
Operation setting	Independent	—
Data bit	8 bits	8 bits
Parity bit	None	None
Stop bit	1 bit	1 bit
Sum check code	Exist	Added
Online Change	Enable	—
Setting modifications	Enable	—
Termination resistor	Connect the termination resistor attached to the PLC	Refer to PLC instruction Manual

CONNECTION TO THE PLC

4

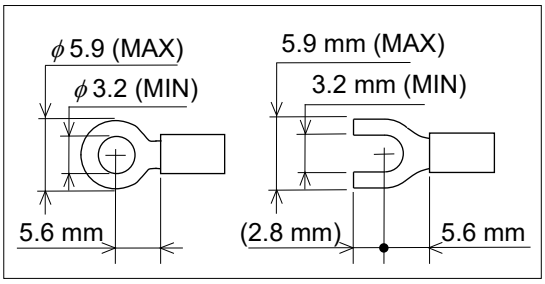
⚠ WARNING

To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

4.1 Wiring Cautions

- To avoid noise induction, keep communication wire away from instrument power line, load lines and power lines of other electric equipment.

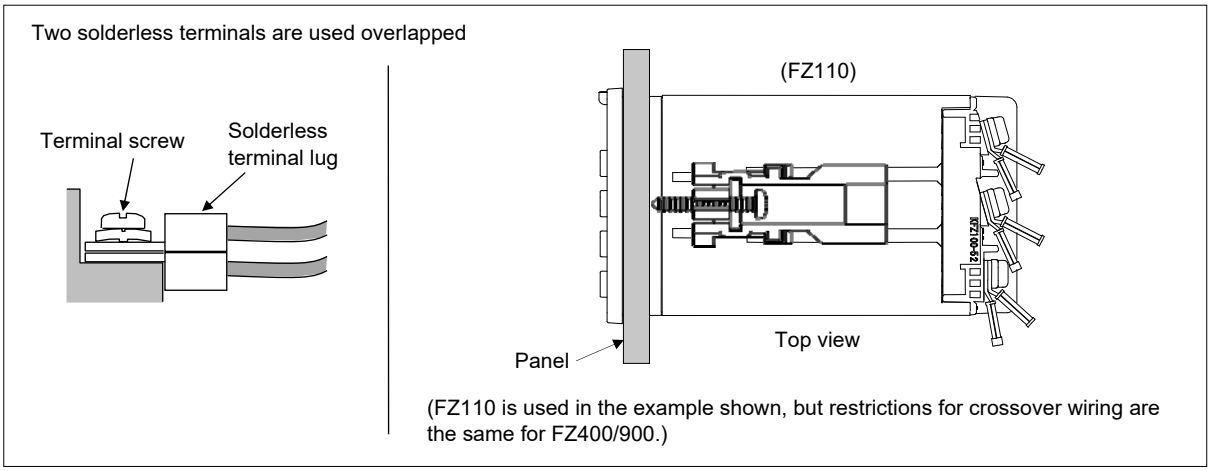
- Use the solderless terminal appropriate to the screw size.
  Screw size: M3×7 (with 5.8×5.8 square washer)
  Recommended tightening torque:
  0.4 N·m [4 kgf·cm]
  Applicable wire: Solid/twisted wire of 0.25 to 1.65 mm^2
  Specified dimension: See Fig. at the right
  Specified solderless terminal:
  Manufactured by J.S.T MFG CO., LTD.
  Circular terminal with isolation V1.25-MS3



☞ For the solderless terminal of PLC, refer to instruction manual of PLC.

- Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.

- Up to two solderless terminal lugs can be connected to one terminal screw. **The requirements of reinforced insulation can be still complied with in this condition.** When actually doing this, place one solderless terminal lug over the other as illustrated below.



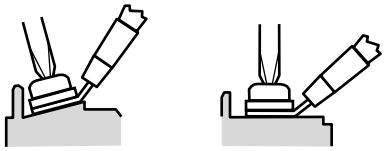
🕮 If solderless terminal lugs other than the recommended dimensions are used, terminal screws may not be tightened. In that case, bend each solderless terminal lug before wiring. If the terminal screw is forcibly tightened, it may be damaged.

🕮 In case of FZ110, if two solderless terminal lugs are connected to one terminal screw, a terminal cover cannot be used.

Continued on the next page.

Continued from the previous page.

When tightening a screw of the instrument, make sure to fit the screwdriver properly into the screw head mounted tilted or flat as shown in the right figure. Tightening the screw with excessive torque may damage the screw thread.



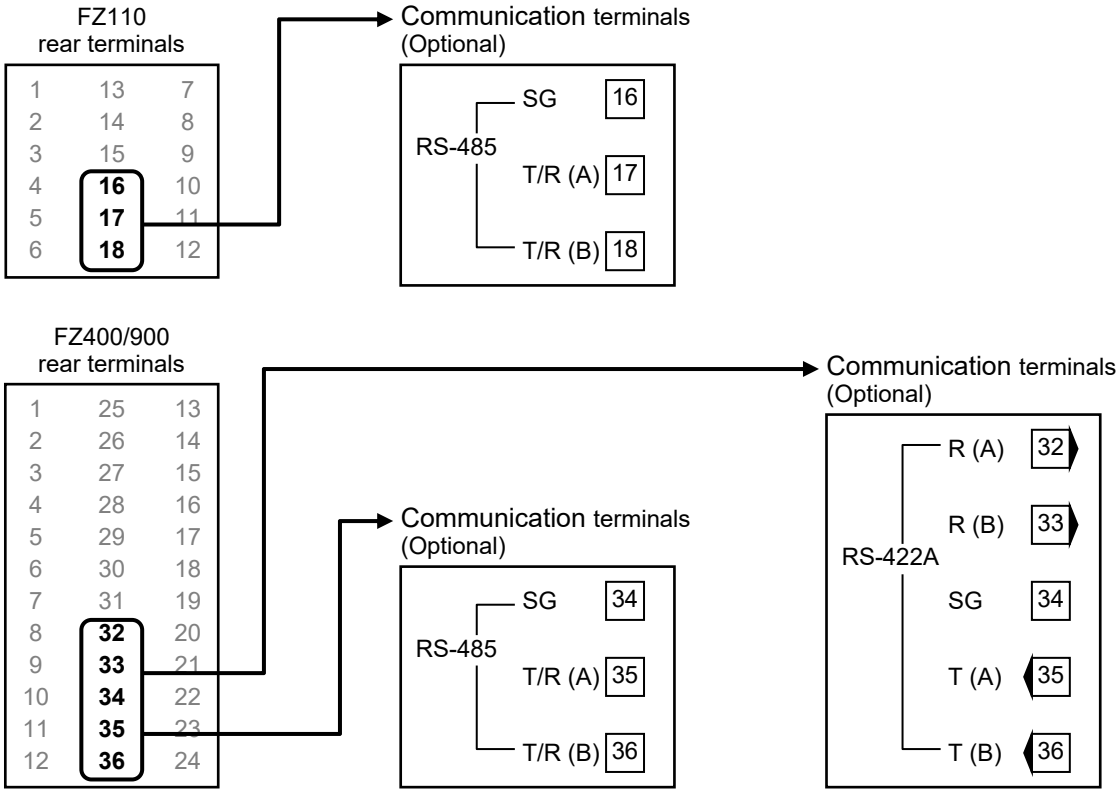
- The symbol of signal polarity A and B may be reversed between the MITSUBISHI MELSEC series and the FZ. Normally signal A of a certain device is connected to signal A of the other device, and so for B to B. However, in this case, signal polarity A should be connected to B and the polarity B to A.
- If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors. Install a termination resistor on the FZ (between communication terminals) at the furthest ends from the PLC.

  ☞ For the termination resistor of PLC, refer to instruction manual of PLC.

4.2 Communication Terminal Number and Signal Details

The FZ uses RS-485 or RS-422A as a communication interface for a connection to the PLC. Below is an explanation about the communication terminals and the signal function when the FZ is linked with a PLC.

■ Terminal configuration



■ Signal details

• RS-485

FZ110 terminal No.	FZ400/900 terminal No.	Symbol	Signal name
16	34	SG	Signal ground
17	35	T/R (A)	Send data/Receive data
18	36	T/R (B)	Send data/Receive data

• RS-422A

FZ400/900 terminal No.	Symbol	Signal name
32	R (A)	Receive data
33	R (B)	Receive data
34	SG	Signal ground
35	T (A)	Send data
36	T (B)	Send data

4.3 Wiring Method

Below is an explanation about how to connect the FZ to the PLC. The connection described in this manual is just an example. When connecting the FZ to an actual PLC, consult the instruction manual of the PLC carefully and make a proper wiring between them.

The communication cable must be provided by the customer.

4.3.1 Connecting through RS-485 (FZ110/400/900)

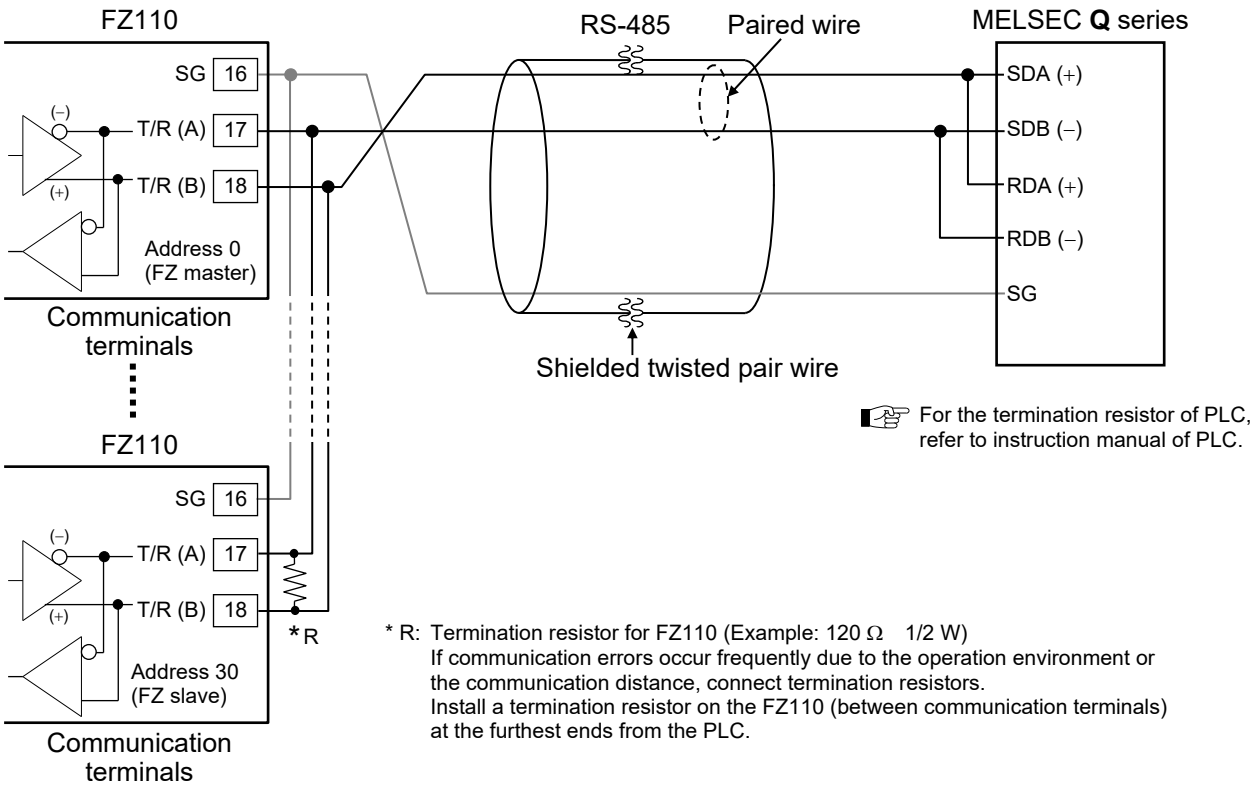
NOTE

The symbol of signal polarity A and B may be reversed between the MITSUBISHI MELSEC series and the FZ. 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.

FZ	
Signal ground	SG
Send data/Receive data (–)	T/R (A)
Send data/Receive data (+)	T/R (B)

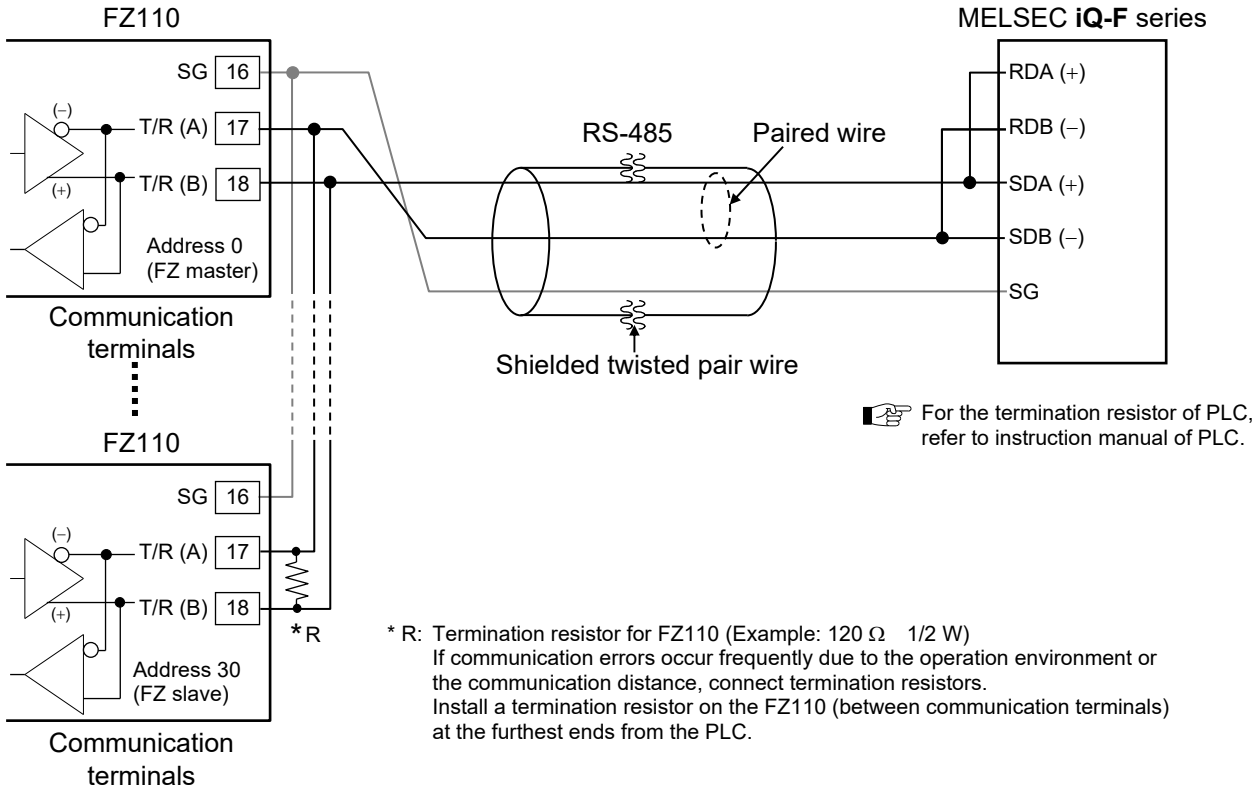
PLC MELSEC series	
SDA	Transmitted data (+)
SDB	Transmitted data (–)
RDA	Received data (+)
RDB	Received data (–)
SG	Signal ground

■ Connection example of FZ110 (RS-485)



* R: Termination resistor for FZ110 (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.
Install a termination resistor on the FZ110 (between communication terminals) at the furthest ends from the PLC.

Maximum connections: Up to 31 FZ110s

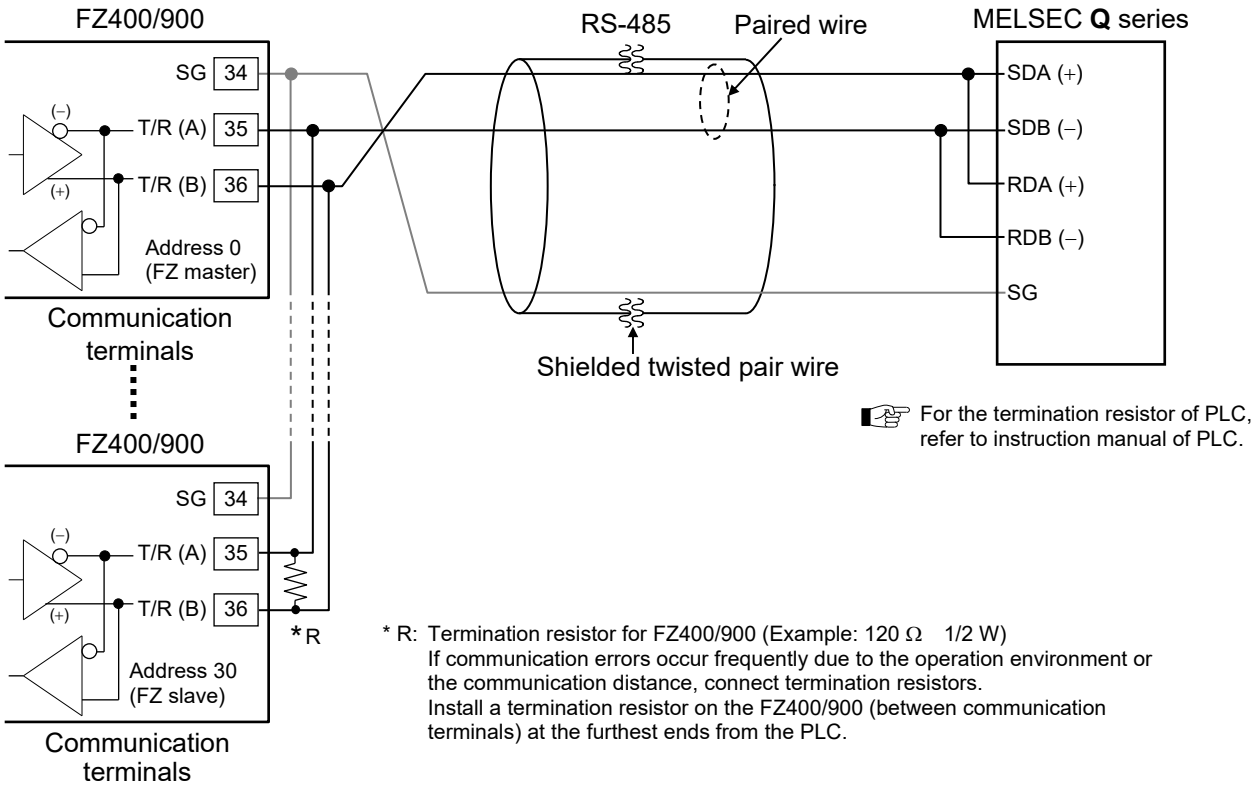


☞ For the termination resistor of PLC, refer to instruction manual of PLC.

* R: Termination resistor for FZ110 (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.
Install a termination resistor on the FZ110 (between communication terminals) at the furthest ends from the PLC.

Maximum connections: Up to 31 FZ110s

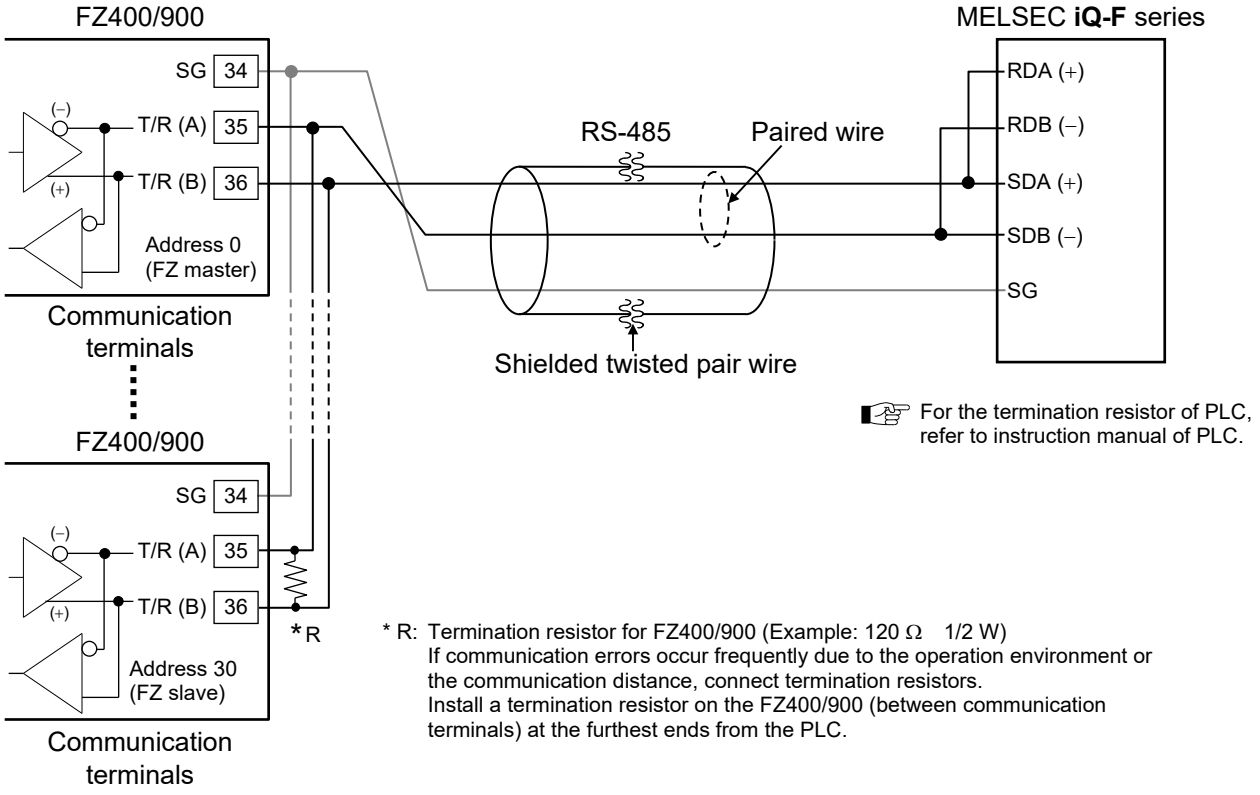
■ Connection example of FZ400/900 (RS-485)



☞ For the termination resistor of PLC, refer to instruction manual of PLC.

* R: Termination resistor for FZ400/900 (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.
Install a termination resistor on the FZ400/900 (between communication terminals) at the furthest ends from the PLC.

Maximum connections: Up to 31 FZ400/900s



* R: Termination resistor for FZ400/900 (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.
Install a termination resistor on the FZ400/900 (between communication terminals) at the furthest ends from the PLC.

Maximum connections: Up to 31 FZ400/900s

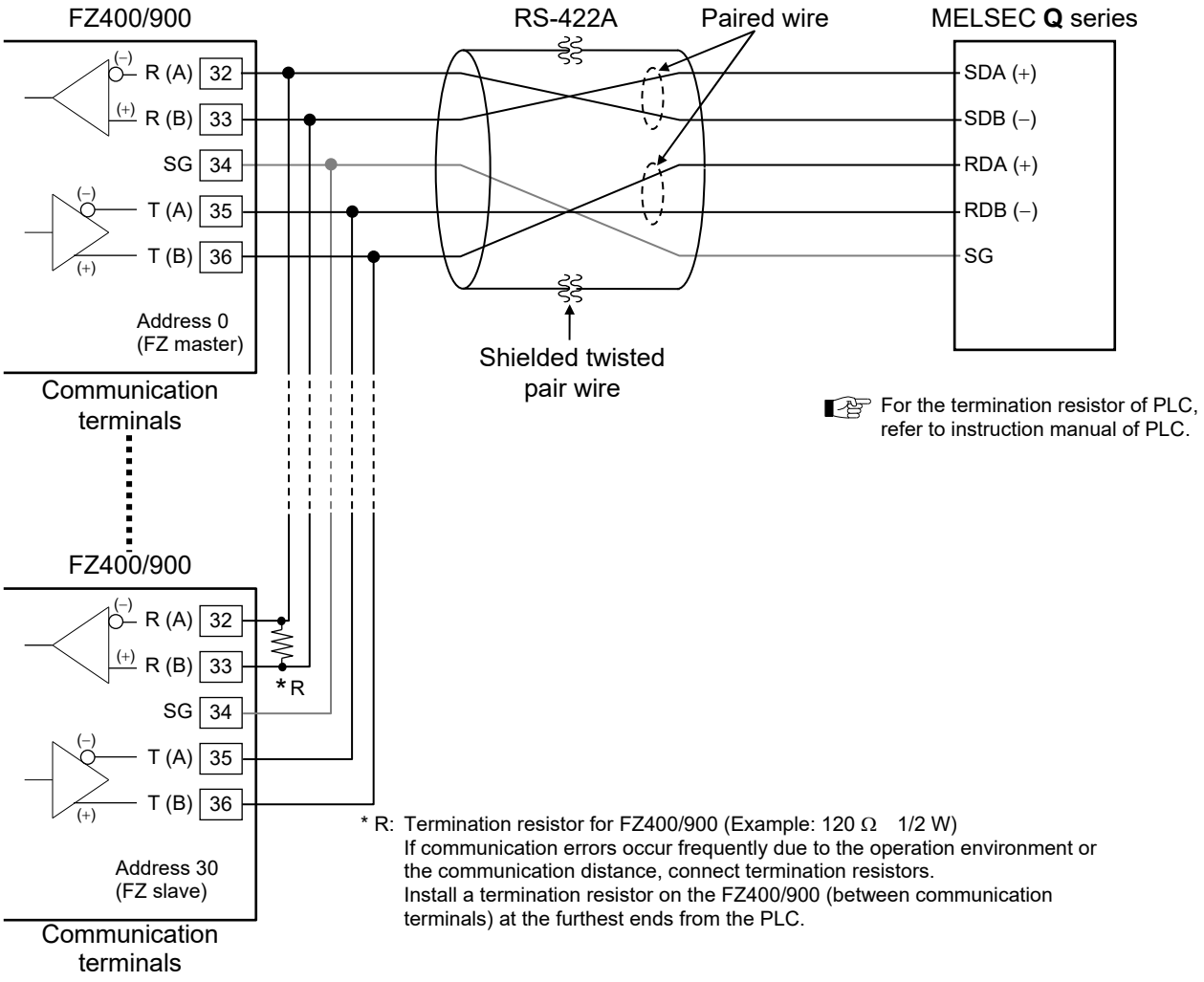
4.3.2 Connecting through RS-422A (FZ400/900)

NOTE

The symbol of signal polarity A and B may be reversed between the MITSUBISHI MELSEC series and the FZ. 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.

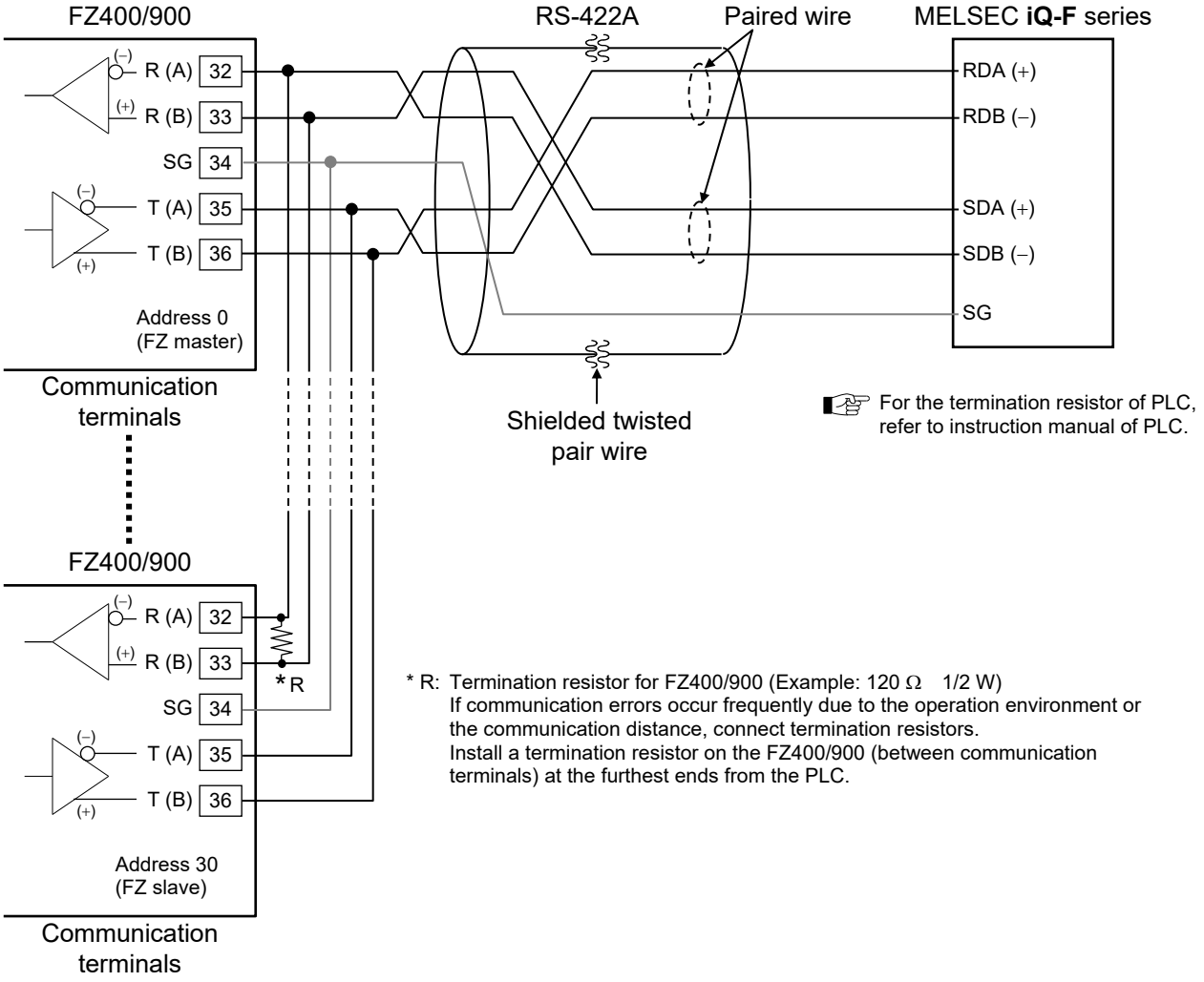
FZ		PLC MELSEC series	
Receive data (–)	R (A)	SDA	Transmitted data (+)
Receive data (+)	R (B)	SDB	Transmitted data (–)
Signal ground	SG	RDA	Received data (+)
Send data (–)	T (A)	RDB	Received data (–)
Send data (+)	T (B)	SG	Signal ground

■ Connection example of FZ400/900 (RS-422A)



* R: Termination resistor for FZ400/900 (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.
Install a termination resistor on the FZ400/900 (between communication terminals) at the furthest ends from the PLC.

Maximum connections: Up to 31 FZ400/900s



* R: Termination resistor for FZ400/900 (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.
Install a termination resistor on the FZ400/900 (between communication terminals) at the furthest ends from the PLC.

Maximum connections: Up to 31 FZ400/900s

MEMO

5 PLC COMMUNICATION ENVIRONMENT SETTING

To perform PLC communication, PLC communication environment settings must be configured in the FZ. The system data settings are made by the loader communication.
(Some communication data can be set via the front keypad of the FZ)

5.1 Preparations of The Loader Communication

■ Communication converter

To perform loader communication, our converter and a communication cable are required.

- USB communication converter COM-K2 or COM-KG (With USB cable)
- Loader communication cable W-BV-05-1500 [COM-K2 or COM-KG optional] *

* W-BV-05-1500 cable can be purchased as an individual part.

■ Communication program

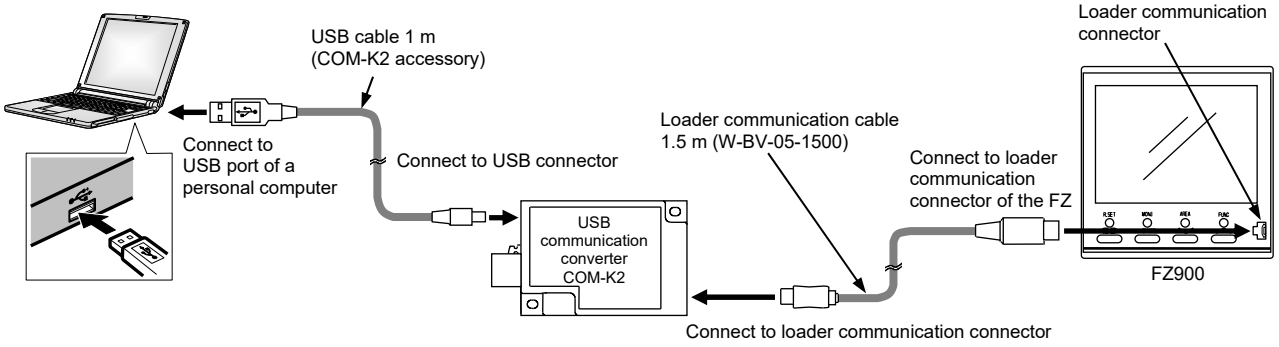
Download our communication tool PROTEM2 from our web.

■ Wiring method

Connect the FZ110/400/900, COM-K2 (or COM-KG), and personal computer using a USB cable and a loader communication cable. Make sure the connectors are oriented correctly when connecting.

NOTE

The Loader port is only for parameter setup. Not used for data logging during operation.



Connection example of loader communication

Communication Tool
PROTEM2
Software operation environment: Consult the manual that you downloaded

Communication port of personal computer
USB port: Based on USB Ver. 2.0

Communication settings on the personal computer
(The following values are all fixed)
Communication speed: 38400 bps
Start bit: 1
Data bit: 8
Parity bit: None
Stop bit: 1

- The device address of the loader communication is fixed at “0.”
- The setting of the device address is disregarded.
- The loader communication corresponds to the RKC communication protocol “Based on ANSI X3.28-1976 subcategories 2.5 and A4.”

When using the loader communication, USB driver for COM-K2 must be installed on the personal computer. The USB driver can be downloaded the official RKC website. Installation of the USB driver is not necessary when the COM-KG is used on Windows 10.

5.2 PLC Communication Environment Items List

The following items are set to the FZ.

5.2.1 Setting items list

NOTE

The following items become valid by turning off the power of the FZ once, and then turning it on again after the settings are changed. These items also become valid* by switching the control to RUN from STOP. The PLC communication is restarted (excluding the PLC communication start time).

* Only the FZ master can enable setting of the modified PLC communication environment items by executing "instrument recognition request command."

All of the following PLC communication environment items can be read and written (R/W).

For the "Communication identifier" and "Modbus register address" of the PLC communication environment items, see **P. 5-14**.

Name	Data range	Factory set value
Station number	0 to 31 Set the PLC station number to the FZ. Set it to the same number as the PLC.	0
PC number	0 to 255 Set the PLC PC number to FZ. (See **P. 5-16**) Set it to the same number as the PLC. When connecting multiple FZ controllers to a PLC, set the same PC number to all of the FZ. When connecting the FZ to the connected station (host station) of the Mitsubishi PLC, there is no need of changing the factory set values.	255
Register type (D, R, W, ZR) * ⊠	0: D register (data register) 1: R register (file register) 2: W register (link register) 3: ZR register (Method of specifying consecutive numbers when 32767 of R register is exceeded.) Set the register types used in PLC communication.	0
Register start number (High-order 4-bit) * ⊠	0 to 15 Set the start number of the register of system data used in PLC communication. Set this if the register address 65535 is exceeded. (For the setting procedure, see **P. 5-19**)	0
Register start number (Low-order 16-bit) * ⊠	0 to 65535 Set the start number of the register of system data used in PLC communication. System data is required to perform PLC communication. The system data occupies twelve PLC registers. (For the setting procedure, see **P. 5-19**)	1000

⊠: Communication data settable via the front keypad. (Parameter of Function block No. 62 of Engineering mode)
For the parameter of function block No. 62, refer to **FZ110/FZ400/PZ900 Parameter List (IMR03A03-E□)** [Enclosed with instrument].

* Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.
If you set a register address larger than a million (1,000,000) to D and R registers, "PLC register Read/Write error" occurs.

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Name	Data range	Factory set value
Monitor item register bias * 🖂	12 to 65535 Set the start number of the register of monitor group communication data. Bias is added to the Register start number in the system data. The factory set value for the register bias is twelve, and thus the register start number of the monitor group starts from D1012. (The Register start number in the system data is factory preset to 1000.) **Equation for calculating:** **Register start number of monitor group =** **Register start number + Monitor item register bias** (See **P. 5-18**)	12
Setting item register bias * 🖂	0 to 65535 Set the start number of the register of setting group communication data. When the Setting item register bias is set to 0 to 11: The set bias value becomes invalid. The Register start number of the Setting group is assigned next to the Monitor group. When the Setting item register bias is set to 12 or more (12 to 65535): Bias is added to the Register start number in the system data. The added value will be the Register start number of Setting group. **Note:** If set to 12 or greater (12 to 65535), take care that overlapping of the communication data of the monitor group and the register address does not occur. **Equation for calculating:** **Register start number of setting group =** **Register start number + Setting item register bias** (See **P. 5-18**)	0
Monitor item selection 1 Monitor item selection 2 Monitor item selection 3	0 to 65535 Select a communication data of the monitor group for data communication between the FZ and the PLC. The selected communication data only performs PLC communication. Convert binary to decimal and configure the setting. (For communication data of the monitor group, see **P. 5-8** and **5-9**)	Monitor item selection 1: 3459 Monitor item selection 2: 16512 Monitor item selection 3: 1024

🖂: Communication data settable via the front keypad. (Parameter of Function block No. 62 of Engineering mode)
For the parameter of function block No. 62, refer to **FZ110/FZ400/PZ900 Parameter List (IMR03A03-E□)** [Enclosed with instrument].

* Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.

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Name	Data range	Factory set value
Setting item selection 1 Setting item selection 2 Setting item selection 3 Setting item selection 4 Setting item selection 5 Setting item selection 6 Setting item selection 7 Setting item selection 8	0 to 65535 Select a communication data of the setting group for data communication between the FZ and the PLC. The selected communication data only performs PLC communication. Convert binary to decimal and configure the setting. (For communication data of the setting group, see **P. 5-10** to **5-13**)	Setting item selection 1: 16480 Setting item selection 2: 7850 Setting item selection 3: 32768 Setting item selection 4: 771 Setting item selection 5: 0 Setting item selection 6: 5 Setting item selection 7: 0 Setting item selection 8: 0
Instrument link recognition time ☒	0 to 255 seconds When connecting two or more FZ controllers, set the time required to recognize the second FZ and thereafter. Set this item to the FZ master (device address 0). When many FZ slaves are connected, setting short for the Instrument link recognition time may cause some of the FZ slaves not to be recognized. Set the Instrument link recognition time longer for such a case.	5
PLC response waiting time ☒	0 to 3000 ms Set the time of waiting for a response from the PLC. (See **P. 5-17**) If communication with a PLC is not properly established, adjust the time longer.	255
PLC communication start time ☒	1 to 255 seconds Time until communication with the PLC starts is set after the power is turned on. The PLC communication start time is the time that writing of the system data starts. Actual communication with the PLC by request command can only take place after the system communication state changes to “1.”	5
Slave register bias ☒	0 to 65535 (0: Slave register bias is invalid) When connecting two or more FZ, a bias is set for the register addresses of each FZ so that no address duplication occurs. To activate the bias, set a value other than zero. **Equation for calculating:** **Slave register start number =** **Register start number + (Device address × Slave register bias)** (See **P. 5-21**)	80

☒: Communication data settable via the front keypad. (Parameter of Function block No. 62 of Engineering mode)
For the parameter of function block No. 62, refer to **FZ110/FZ400/PZ900 Parameter List (IMR03A03-E□)** [Enclosed with instrument].

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Name	Data range	Factory set value
Number of recognizable devices ⊠	0 to 30 Set the quantity of the FZ slaves to be recognized by the FZ master. The recognition processing starts from device address 1. Set the maximum value of the device address of the FZ slaves to be connected. Even if there is any device address that is not used, set the maximum number including such an address. This setting is effective only for the FZ master with a device address of 0.	8
Device address ⊠	PLC communication: 0 to 30 0: Master 1 to 30: Slave This is a device address of the FZ. The FZ master with a device address of 0 must always exist. The device address of the FZ slave must be continuous starting from 1.	0
	RKC communication: 0 to 99	0
	Modbus: 1 to 99	1
Communication speed ⊠	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps Under this parameter, communication speed for data communication with a PLC can be selected. Set the same communication speed for the FZ and the PLC.	3
Data bit configuration ⊠	0 to 11 (See Data bit configuration table) Under this parameter, data bit configuration for data communication with a PLC can be selected. Set the same data bit configuration for the FZ and the PLC.	0
Interval time ⊠	0 to 250 ms Set the transmission waiting time until the data is returned after the receipt of the request from the PLC. The FZ sends the data to the PLC after the elapse of time (FZ internal processing time + interval time).	10

⊠: Communication data settable via the front keypad. (Parameter of Function block No. 60 or No. 62 of Engineering mode)
For the parameter of function block No. 60 or No. 62, refer to **FZ110/FZ400/PZ900 Parameter List (IMR03A03-E□)** [Enclosed with instrument].

Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	None	1
1	8	None	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

Set value	Data bit	Parity bit	Stop bit
6	7	None	1
7	7	None	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

: Not settable for Modbus

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Name	Data range	Factory set value
Input data type ☒	0: Number of measured value digits: 5 Number of RKC communication data digits: 7 Modbus: Double word PLC communication data: Double word (System data: Single word) 1: Number of measured value digits: 4 Number of RKC communication data digits: 6 Modbus: Single word PLC communication data: Single word 2: Number of measured value digits: 4 Number of RKC communication data digits: 6 Our REX-D series equivalent (Some identifiers are replaced with the REX-D series equivalent identifiers) Modbus data: Single word PLC communication data: Single word Select a single or a double word for the communication data. When changing the Input data type from 0 to 1 (or 2) and when the present Input range has 5 digits (example: Input range high: 1372.0), you need to configure the Input range to have 4 digits beforehand. The unit of time depends on the Input data type. In case of Input data type 0 FZ400/900: hour/minute/second, hour/minute, minute/second FZ110: hour/minute, minute/second In case of Input data type 1 hour/minute, minute/second (See **P. 3-9**)	Depends on the input range code specified at the time of order.

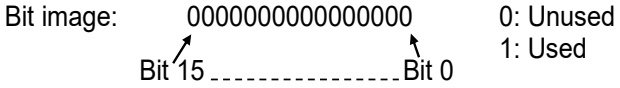
☒: Communication data settable via the front keypad. (Parameter of Function block No. 21 of Engineering mode)
For the parameter of function block No. 21, refer to **FZ110/FZ400/PZ900 Parameter List (IMR03A03-E□)** [Enclosed with instrument].

When changing the input data type, the following communication data may also need to be changed. Make necessary changes to the set value.

Input 1_Decimal point position	■ **Decimal point position** (See **P. 3-5**)
Input 2_Decimal point position	
Input 1_Input range high	■ **Input range low/Input range high** (See **P. 3-7**)
Input 1_Input range low	
Input 2_Input range high	■ **Input range low/Input range high** (See **P. 3-8**)
Input 2_Input range low	
Soak time unit	■ **Soak time unit** (See **P. 3-11**)

● Monitor item selection (Communication data of the monitor group)

Communication data of monitor group is assigned as a bit image in binary numbers. Set decimal-converted values.



The selected communication data is justified upward in the PLC register.

When the input data type is a double word, each communication data occupies two PLC registers.

Table 1 Monitor item selection 1

Bit	Communication data (Monitor item)	Factory set value	
		Binary	Decimal
0	Input 1_Measured value (PV)	1	3459
1	Input 1_Set value (SV) monitor	1	
2	Input 2_Measured value (PV)	0	
3	Input 2_Set value (SV) monitor	0	
4	PV select Measured value (PV)	0	
5	Measured value (PV) of differential temperature input	0	
6	Set value (SV) monitor of differential temperature input	0	
7	Input 1_Manipulated output value monitor [heat-side]	1	
8	Input 1_Manipulated output value monitor [cool-side]	1	
9	Input 2_Manipulated output value monitor	0	
10	Current transformer 1 (CT1) input value monitor	1	
11	Current transformer 2 (CT2) input value monitor	1	
12	Memory area soak time monitor	0	
13	Remote setting input value monitor	0	
14	Feedback resistance (FBR) input value	0	
15	Event 1 state monitor	0	

Table 2 Monitor item selection 2

Bit	Communication data (Monitor item)	Factory set value	
		Binary	Decimal
0	Event 2 state monitor	0	16512
1	Event 3 state monitor	0	
2	Event 4 state monitor	0	
3	Heater break alarm 1 (HBA1) state monitor	0	
4	Heater break alarm 2 (HBA2) state monitor	0	
5	Control loop break alarm 1 (LBA1) state monitor	0	
6	Control loop break alarm 2 (LBA2) state monitor	0	
7	Comprehensive event state	1	
8	Input 1_Burnout state monitor	0	
9	Input 2_Burnout state monitor	0	
10	Feedback resistance (FBR) break monitor	0	
11	DI state monitor	0	
12	OUT state monitor	0	
13	DO state monitor	0	
14	Overall operation status	1	
15	Memory area number monitor	0	

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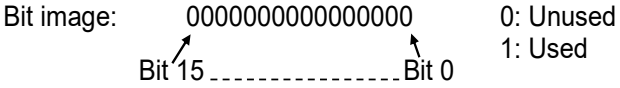
When the input data type is a double word, each communication data occupies two PLC registers.

Table 3 Monitor item selection 3

Bit	Communication data (Monitor item)	Factory set value	
		Binary	Decimal
0	Input 1_PID memory	0	1024
1	Input 2_PID memory	0	
2	Input 1_Peak hold monitor	0	
3	Input 1_Bottom hold monitor	0	
4	Input 2_Peak hold monitor	0	
5	Input 2_Bottom hold monitor	0	
6	Input 1_AT remaining time monitor	0	
7	Input 2_AT remaining time monitor	0	
8	Input 1_AT/ST status monitor	0	
9	Input 2_AT/ST status monitor	0	
10	Error code	1	
11	Integrated operating time	0	
12	Unused	0	
13	Unused	0	
14	Unused	0	
15	Unused	0	

● Setting item selection (Communication data of Setting group)

Communication data of Setting group is assigned as a bit image in binary numbers. Set decimal-converted values.



The selected communication data is justified upward in the PLC register.

When the input data type is a double word, each communication data occupies two PLC registers.

Table 1 Setting item selection 1

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	1	Interlock release	0	16480
1	2	Memory area transfer	0	
2	3	Input 1_Hold reset	0	
3	4	Input 2_Hold reset	0	
4	5	Bottom suppression start signal	0	
5	6	RUN/STOP transfer	1	
6	7	Input 1_Autotuning (AT)	1	
7	8	Input 2_Autotuning (AT)	0	
8	9	Input 1_Startup tuning (ST)	0	
9	10	Input 2_Startup tuning (ST)	0	
10	11	Input 1_Auto/Manual transfer	0	
11	12	Input 2_Auto/Manual transfer	0	
12	13	Remote/Local transfer	0	
13	14	Control area Local/External transfer	0	
14	15	Input 1_Set value (SV)	1	
15	16	Input 2_Set value (SV)	0	

Table 2 Setting item selection 2

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	17	Set value (SV) of differential temperature	0	7850
1	18	Event 1 set value (EV1) Event 1 set value (EV1) [high]	1	
2	19	Event 1 set value (EV1') [low]	0	
3	20	Event 2 set value (EV2) Event 2 set value (EV2) [high]	1	
4	21	Event 2 set value (EV2') [low]	0	
5	22	Event 3 set value (EV3) Event 3 set value (EV3) [high]	1	
6	23	Event 3 set value (EV3') [low]	0	
7	24	Event 4 set value (EV4) Event 4 set value (EV4) [high]	1	
8	25	Event 4 set value (EV4') [low]	0	
9	26	Input 1_Proportional band [heat-side]	1	
10	27	Input 1_Integral time [heat-side]	1	
11	28	Input 1_Derivative time [heat-side]	1	
12	29	Input 1_Control response parameter	1	
13	30	Input 1_Proactive intensity	0	
14	31	Input 1_Manual reset	0	
15	32	Input 1_FF amount	0	

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When the input data type is a double word, each communication data occupies two PLC registers.

Table 3 Setting item selection 3

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	33	Input 1_Output limiter high [heat-side]	0	32768
1	34	Input 1_Output limiter low [heat-side]	0	
2	35	Input 1_Control loop break alarm (LBA) time	0	
3	36	Input 1_LBA deadband (LBD)	0	
4	37	Input 2_Proportional band	0	
5	38	Input 2_Integral time	0	
6	39	Input 2_Derivative time	0	
7	40	Input 2_Control response parameter	0	
8	41	Input 2_Proactive intensity	0	
9	42	Input 2_Manual reset	0	
10	43	Input 2_FF amount	0	
11	44	Input 2_Output limiter high	0	
12	45	Input 2_Output limiter low	0	
13	46	Input 2_Control loop break alarm (LBA) time	0	
14	47	Input 2_LBA deadband (LBD)	0	
15	48	Input 1_Proportional band [cool-side]	1	

Table 4 Setting item selection 4

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	49	Input 1_Integral time [cool-side]	1	771
1	50	Input 1_Derivative time [cool-side]	1	
2	51	Input 1_Overlap/Deadband	0	
3	52	Input 1_Output limiter high [cool-side]	0	
4	53	Input 1_Output limiter low [cool -side]	0	
5	54	Select Trigger type for Memory area transfer	0	
6	55	Area soak time	0	
7	56	Link area number	0	
8	57	Input 1_Setting change rate limiter (up)	1	
9	58	Input 1_Setting change rate limiter (down)	1	
10	59	Input 1_Auto/Manual transfer selection (Area)	0	
11	60	Input 1_Manipulated output value (Area)	0	
12	61	Input 2_Setting change rate limiter (up)	0	
13	62	Input 2_Setting change rate limiter (down)	0	
14	63	Input 2_Auto/Manual transfer selection (Area)	0	
15	64	Input 2_Manipulated output value (Area)	0	

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When the input data type is a double word, each communication data occupies two PLC registers.

Table 5 Setting item selection 5

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	65	Remote/Local transfer selection (Area)	0	0
1	66	Display update cycle	0	
2	67	Input 1_PV bias	0	
3	68	Input 1_PV digital filter	0	
4	69	Input 1_PV ratio	0	
5	70	Input 1_PV low input cut-off	0	
6	71	Input 2_PV bias (RS bias)	0	
7	72	Input 2_PV digital filter (RS digital filter)	0	
8	73	Input 2_PV ratio (RS ratio)	0	
9	74	Input 2_PV low input cut-off	0	
10	75	OUT1 proportional cycle time	0	
11	76	OUT2 proportional cycle time	0	
12	77	OUT3 proportional cycle time	0	
13	78	OUT1 minimum ON/OFF time of proportional cycle	0	
14	79	OUT2 minimum ON/OFF time of proportional cycle	0	
15	80	OUT3 minimum ON/OFF time of proportional cycle	0	

Table 6 Setting item selection 6

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	81	Heater break alarm 1 (HBA1) set value	1	5
1	82	Number of heater break alarm 1 (HBA1) delay times	0	
2	83	Heater break alarm 2 (HBA2) set value	1	
3	84	Number of heater break alarm 2 (HBA2) delay times	0	
4	85	Input 1_Manual manipulated output value	0	
5	86	Input 1_Level PID setting 1	0	
6	87	Input 1_Level PID setting 2	0	
7	88	Input 1_Level PID setting 3	0	
8	89	Input 1_Level PID setting 4	0	
9	90	Input 1_Level PID setting 5	0	
10	91	Input 1_Level PID setting 6	0	
11	92	Input 1_Level PID setting 7	0	
12	93	For system use	0	
13	94	Input 1_ON/OFF action differential gap (upper)	0	
14	95	Input 1_ON/OFF action differential gap (lower)	0	
15	96	Input 2_Manual manipulated output value	0	

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When the input data type is a double word, each communication data occupies two PLC registers.

Table 7 Setting item selection 7

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	97	Input 2_Level PID setting 1	0	
1	98	Input 2_Level PID setting 2	0	
2	99	Input 2_Level PID setting 3	0	
3	100	Input 2_Level PID setting 4	0	
4	101	Input 2_Level PID setting 5	0	
5	102	Input 2_Level PID setting 6	0	
6	103	Input 2_Level PID setting 7	0	
7	104	For system use	0	0
8	105	Input 2_ON/OFF action differential gap (upper)	0	
9	106	Input 2_ON/OFF action differential gap (lower)	0	
10	107	Input 1_AT bias	0	
11	108	Input 2_AT bias	0	
12	109	Open/Close output neutral zone	0	
13	110	Open/Close output differential gap	0	
14	111	FF amount learning	0	
15	112	Input 1_Determination point of external disturbance	0	

Table 8 Setting item selection 8

Bit	Item number	Communication data (Setting item)	Factory set value	
			Binary	Decimal
0	113	Input 2_Determination point of external disturbance	0	
1	114	Cascade_Proportional band (master-side)	0	
2	115	Cascade_Integral time (master-side)	0	
3	116	Cascade_Derivative time (master-side)	0	
4	117	Cascade_Proportional band (slave-side)	0	
5	118	Cascade_Integral time (slave-side)	0	
6	119	Cascade_Derivative time (slave-side)	0	
7	120	Cascade_Digital filter	0	0
8	121	Cascade_Scale high	0	
9	122	Cascade_Scale low	0	
10	123	PV select transfer level	0	
11	124	PV select transfer time	0	
12	125	Unused	0	
13	126	Unused	0	
14	127	Unused	0	
15	128	Unused	0	

● "Communication identifier" and "Modbus register address" of PLC communication environment items

Communication identifier (RKC communication) (R/W: Read and Write)

Name	Identifier	Digits	Attribute
Station number	**QV**	7 or 6	R/W
PC number	**QW**		
Register type (D, R, W, ZR)	**QZ**		
Register start number (High-order 4-bit)	**QS**		
Register start number (Low-order 16-bit)	**QX**		
Monitor item register bias	**R3**		
Setting item register bias	**R4**		
Monitor item selection 1	**R6**		
Monitor item selection 2	**R7**		
Monitor item selection 3	**R9**		
Setting item selection 1	**RE**		
Setting item selection 2	**RF**		
Setting item selection 3	**RG**		
Setting item selection 4	**RH**		
Setting item selection 5	**RI**		
Setting item selection 6	**RJ**		
Setting item selection 7	**RK**		
Setting item selection 8	**RL**		
Instrument link recognition time	**QT**		
PLC response waiting time	**VT**		
PLC communication start time	**R5**		
Slave register bias	**R8**		
Number of recognizable devices	**QU**		
Device address	**IP**		
Communication speed	**IR**		
Data bit configuration	**IQ**		
Interval time	**IT**		

Modbus register address (Double word) (R/W: Read and Write)

Name	Register address				Attribute
	HEX (Hexadecimal)		DEC (Decimal)		
	Low-order	High-order	Low-order	High-order	
Device address	0278	0279	632	633	R/W
Communication speed	027A	027B	634	635	
Data bit configuration	027C	027D	636	637	
Interval time	027E	027F	638	639	
Register type (D, R, W, ZR)	0280	0281	640	641	
Register start number (High-order 4-bit)	0282	0283	642	643	
Register start number (Low-order 16-bit)	0284	0285	644	645	
Monitor item register bias	0286	0287	646	647	
Setting item register bias	0288	0289	648	649	
Instrument link recognition time	028A	028B	650	651	
PLC response waiting time	028C	028D	652	653	
PLC communication start time	028E	028F	654	655	
Slave register bias	0290	0291	656	657	
Number of recognizable devices	0292	0293	658	659	
Station number	0294	0295	660	661	
PC number	0296	0297	662	663	
Monitor item selection 1	0298	0299	664	665	
Monitor item selection 2	029A	029B	666	667	
Monitor item selection 3	029C	029D	668	669	
Setting item selection 1	029E	029F	670	671	
Setting item selection 2	02A0	02A1	672	673	
Setting item selection 3	02A2	02A3	674	675	
Setting item selection 4	02A4	02A5	676	677	
Setting item selection 5	02A6	02A7	678	679	
Setting item selection 6	02A8	02A9	680	681	
Setting item selection 7	02AA	02AB	682	683	
Setting item selection 8	02AC	02AD	684	685	

Modbus register address (Single word) (R/W: Read and Write)

Name	Register address		Attribute
	HEX (Hexadecimal)	DEC (Decimal)	
Device address	213C	8508	R/W
Communication speed	213D	8509	
Data bit configuration	213E	8510	
Interval time	213F	8511	
Register type (D, R, W, ZR)	2140	8512	
Register start number (High-order 4-bit)	2141	8513	
Register start number (Low-order 16-bit)	2142	8514	
Monitor item register bias	2143	8515	
Setting item register bias	2144	8516	
Instrument link recognition time	2145	8517	
PLC response waiting time	2146	8518	
PLC communication start time	2147	8519	
Slave register bias	2148	8520	
Number of recognizable devices	2149	8521	
Station number	214A	8522	
PC number	214B	8523	
Monitor item selection 1	214C	8524	
Monitor item selection 2	214D	8525	
Monitor item selection 3	214E	8526	
Setting item selection 1	214F	8527	
Setting item selection 2	2150	8528	
Setting item selection 3	2151	8529	
Setting item selection 4	2152	8530	
Setting item selection 5	2153	8531	
Setting item selection 6	2154	8532	
Setting item selection 7	2155	8533	
Setting item selection 8	2156	8534	

● Monitor data related to PLC communication

Communication identifier (RKC communication) (RO: Read only)

Name	Identifier	No. of digits	Attribute
PLC communication error code	**ES**	7 or 6	RO
PLC communication instrument recognition flag 1	**QN**		
PLC communication instrument recognition flag 2	**QO**		

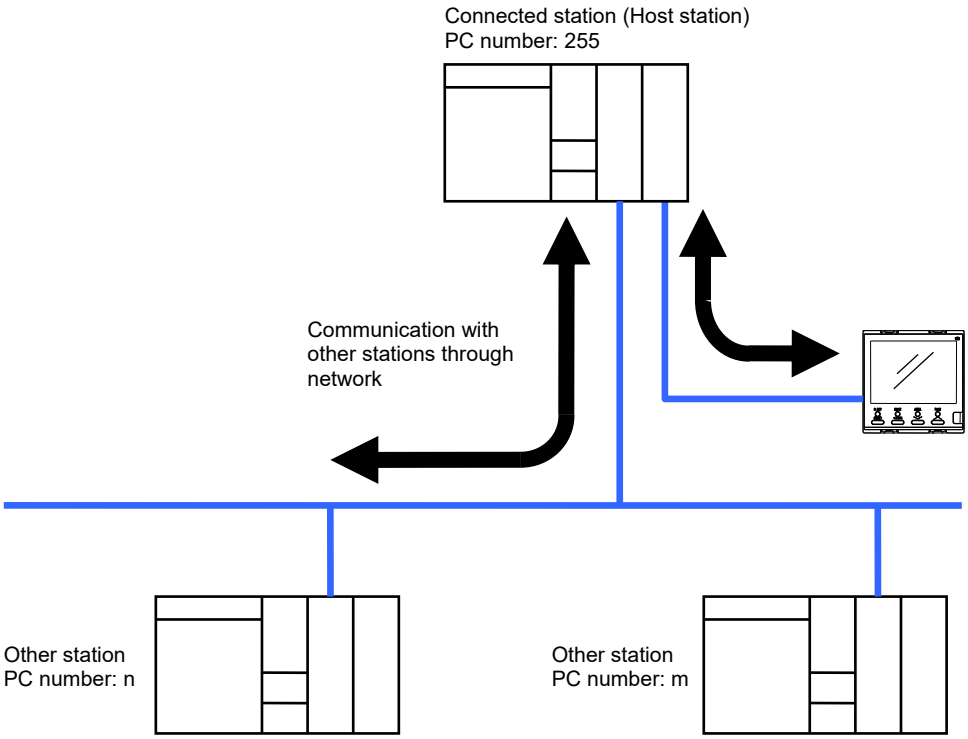
For the data contents, see **P. 6-26** and **P. 6-27**.

5.2.2 Explanation of PLC communication environment setting function

■ PC number

This is a communication data to set a station number of the PLC that communicates with the FZ.
Set the PC number of the connected station (host station) of the PLC, because the connected station (host station) is usually connected to the FZ. (Example: PC number of PLC by Mitsubishi PLC: 255)
In the network where multiple PLCs are connected, to communicate with the other PLC over the network, set the PC number of the target PLC to the FZ.

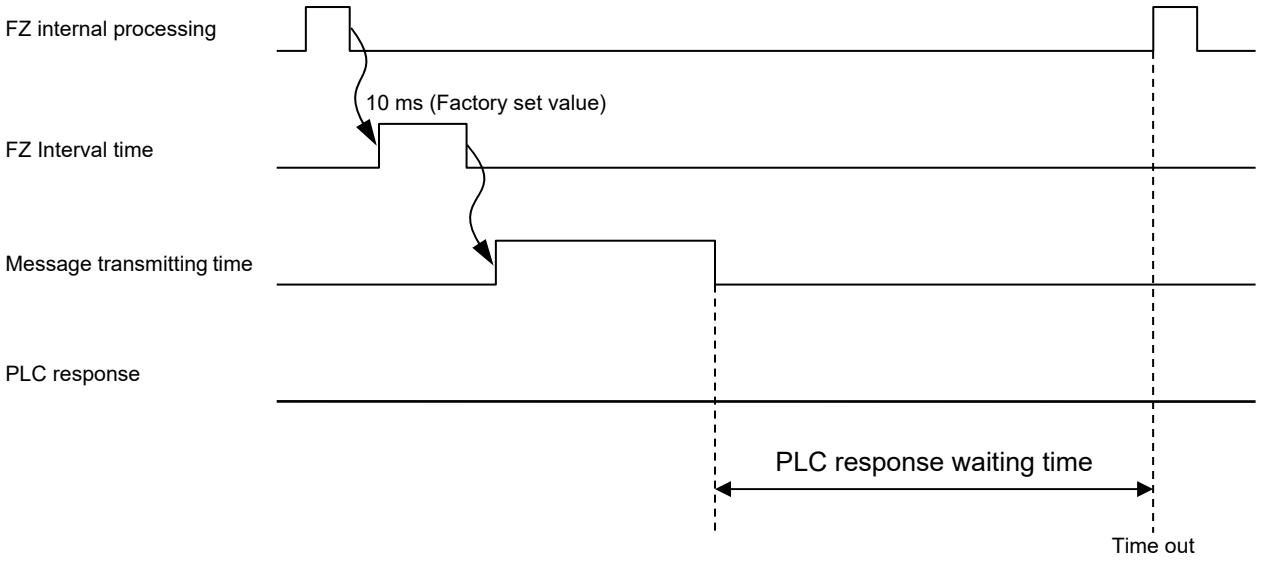
Example: PLC by Mitsubishi Electric



PC number, name, and data range of a PLC and PC number of a connected station (host station) may vary by the PLC. Consult the manual of the PLC for details.

■ PLC response waiting time

The FZ waits for a response for a certain period of time after the data has been sent to the PLC. If there is no response within the preset time, the FZ determines that there was a timeout and sends the next data. This preset time is defined as a PLC response waiting time.



■ Changing the register type

The register type used for PLC communication can be changed. The factory set value is set to D register (data register).

■ Register start number, Monitor item register bias, Setting item register bias

The area to be used in the PLC register address can be set. Data that can be communicated by PLC communication is arranged in the order "system data," "monitor group" and "setting group."

- In "Register start number (High-order 4-bit)" and "Register start number (Low-order 16-bit)," set the start number (start number of system data) of the register used for PLC communication. (factory set value: 1000)
- In "Monitor item register bias," set the start number of the monitor group. The bias will be applied to the register start number (start number of system data). (factory set value: 12)

  Equation for calculating:
  Register start number of monitor group = Register start number + Monitor item register bias

- In "Setting item register bias," set the start number of the setting group.
  If the Setting item register bias set from 0 to 11, the set bias value becomes invalid.
  The setting group register start number will be assigned following the register that has the last number in the monitor group. (factory set value: 0)
  If set to 12 or more (12 to 65535), a bias is added to the start number of the register (start number of system data). If set to 12 or greater, take care that overlapping data of the monitor group and the register address does not occur.

  Equation for calculating (When set to 12 or more):
  Register start number of setting group = Register start number + Setting item register bias

Register address example of PLC communication data (factory set value)

Communication data type	Register address		Contents
	Double word	Single word	
System data	D1000 ⋮ D1011	D1000 ⋮ D1011	Start number [Register start number (Low-order 16-bit)] ⋮ Last number
Communication data of monitor group	D1012 ⋮ D1029	D1012 ⋮ D1020	Start number [Monitor item register bias factory set value: 12] ⋮ Last number
Communication data of setting group	D1030 ⋮ D1065	D1021 ⋮ D1038	Start number [Setting item register bias Factory set value: 0] ⋮ Last number

☞ For register address of PLC communication data, see **6.2 PLC Communication Data Map (P. 6-23)**.

● Setting method of the register start number

When any numbers from 0 to 65535 are set to the register start number:

1. Set the register start number (High-order 4-bit) to 0.

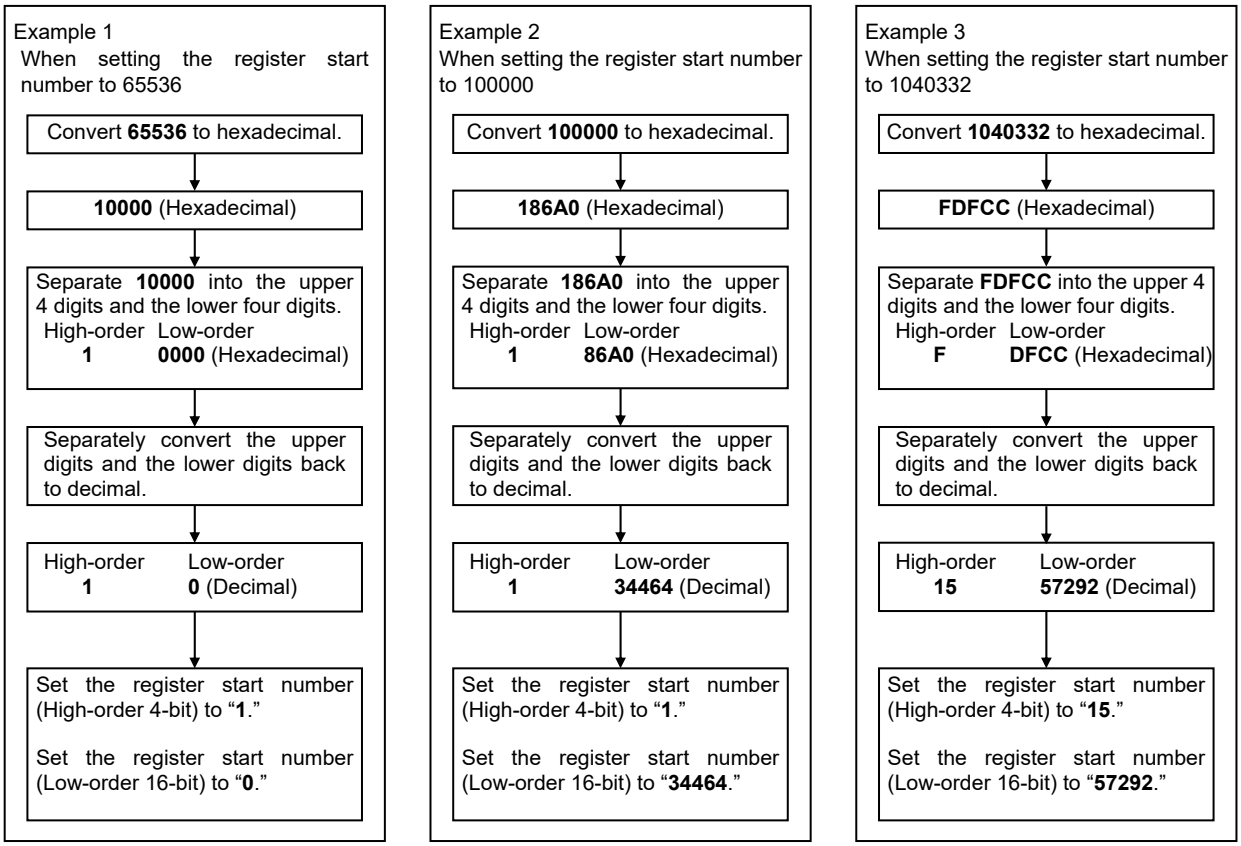
2. In the register start number (low-order 16-bit), set the register address to a value from 0 to 65535.

Example: When setting the register start number to “10188”

Register start number (High-order 4-bit)	Register start number (Low-order16-bit)
Set “0.”	Set “10188.”

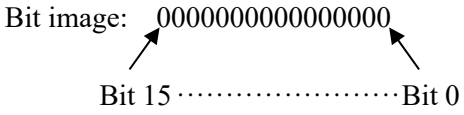
When any numbers from 65536 to 1048575 are set to the register start number:

If set within the range from 65536 to 1048575, the register address must be converted. The converted register address is set in two parts in the register start number (high-order 4-bit) and the register start number (low-order 16-bit). Set the value as shown in the example below.



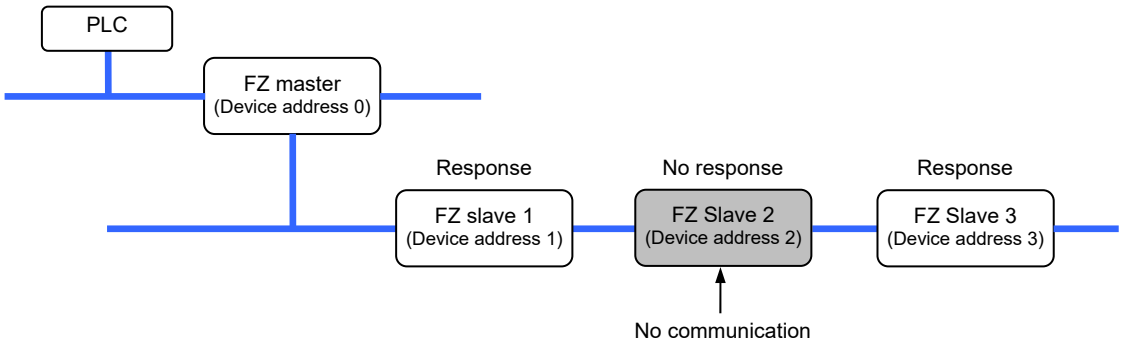
■ Monitor item selection and Setting item selection

This setting is used to shorten the data update period by eliminating unneeded items from the data communicated to the PLC. Only communication data selected using this setting is written to the PLC.
(The amount of the PLC register that is used can also be reduced.)
Monitor item selection or setting item selection state is assigned as a bit image in binary numbers.



■ Instrument link recognition time

This is defined as the time until the FZ master (with a device address of 0) recognizes the connected FZ slaves (with a device address 1 to 30). The timing of recognition processing is when power is supplied or when the Instrument recognition request command is executed.
When the FZ master is powered on, after the elapse of PLC communication start time, the FZ master searches for any FZ slaves within the instrument link recognition time; when the Instrument recognition request command is executed, the FZ master searches for any FZ slaves within the instrument link recognition time after the command has been accepted.
The FZ slaves which have not responded at all to the FZ master within the instrument link recognition time are determined to be nonexistent. After this recognition processing, the FZ master only communicates with the existing FZ slaves.



NOTE

This setting item must be used only on the FZ with a device address of 0.

● To calculate Instrument link recognition time

The times shown are the processing times when the interval time is set to 10 milliseconds (factory set value).

Instrument link recognition time (seconds)
= FZ master processing time + (FZ slave processing time × Number of instrument recognition)

Communication speed	FZ processing time (Per one controller)
19200 bps	0.35 seconds
57600 bps	0.21 seconds

[Example]
The set value of the number of the instrument recognition = 10 and Communication speed = 19200 bps

FZ master processing time + (FZ slave processing time × Number of instrument recognition)
= 0.35 seconds + (0.35 seconds × 10)
= 3.85 seconds

Since the time unit of Instrument link recognition time is one second, the set value is 4 seconds.

■ Slave register bias

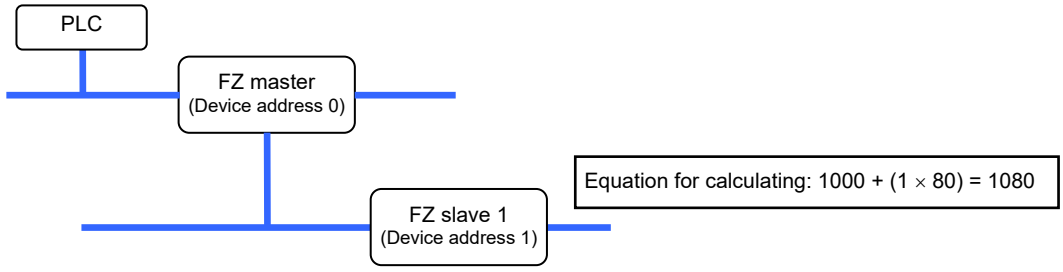
When two or more FZ are connected, a bias can be set to prevent duplication of register addresses.
Setting the slave register bias prevents duplication of register addresses of each FZ by the address setting switch.

Equation for calculating:
Slave register start number = Register start number + (Device address × Slave register bias)

Register address example of PLC communication data (double word)

- Using two FZ
- Register start number of FZ master: 1000 (factory set value)
- Register start number of FZ slave: 1000 (factory set value)
- Slave register bias value of FZ slave: 80 (factory set value)
- Monitor item register bias: 12 (factory set value)
- Setting item register bias: 0 (factory set value)

When the address of FZ slave is set to 1, the data is assigned to the register addresses indicated in the table below.



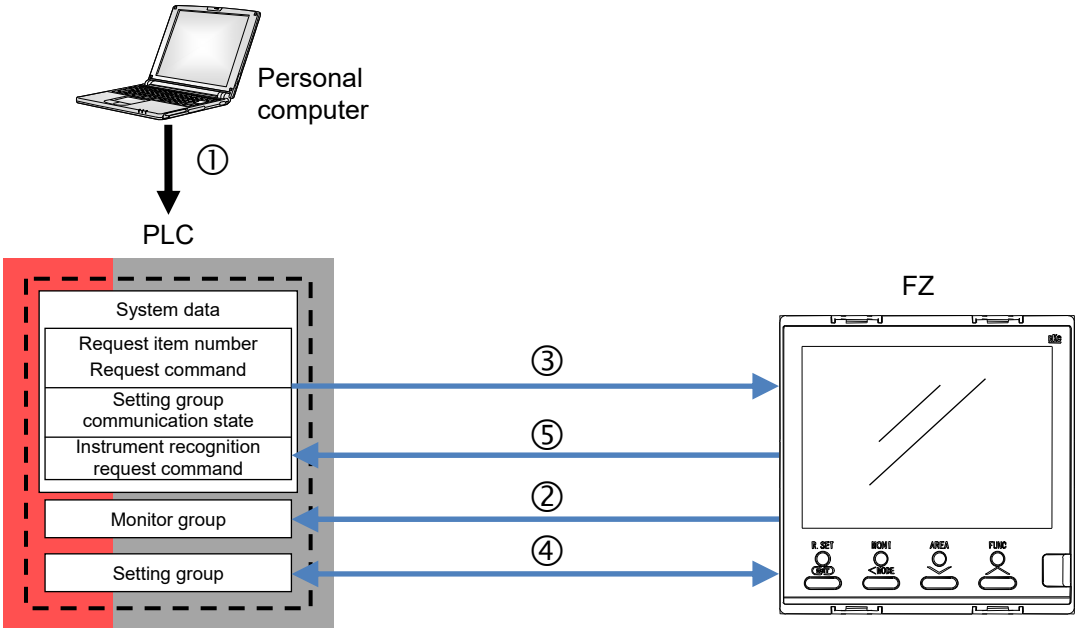
Communication data type	PLC register address	Contents	
System data	D1000 ⋮ D1011	Start number [Register start number (Low-order 16-bit)] Last number	Register numbers in the PLC occupied with the communication data of the FZ master (with a device address of 0).
Communication data of monitor group	D1012 ⋮ D1029	Start number [Monitor item register bias] Last number	
Communication data of setting group	D1030 ⋮ D1079	Start number [Setting item register bias] Last number	
System data	D1080 ⋮ D1091	Start number [Register start number (Low-order 16-bit)] Last number	Register numbers in the PLC occupied with the communication data of the FZ slave (with a device address of 1).
Communication data of monitor group	D1092 ⋮ D1109	Start number [Monitor item register bias] Last number	
Communication data of setting group	D1110 ⋮ D1159	Start number [Setting item register bias] Last number	

MEMO

6 COMMUNICATION DATA

6.1 Data Transfer

The communication data transmitted between the PLC and the FZ is compiled in the PLC communication data map (hereafter, called data map). In the PLC communication data map the communication data is classified into system data, monitor group, and setting group.

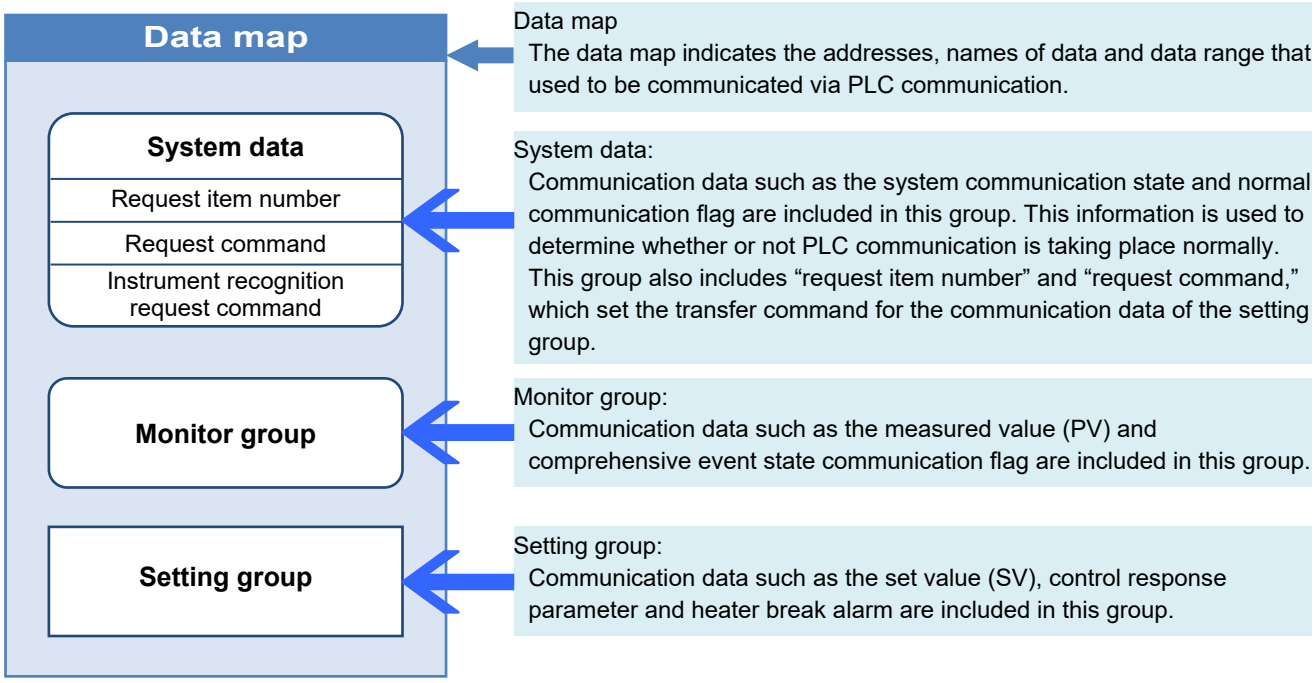


Communication procedures:

① Enter Request item number and Request command into the PLC register.
② Communication data in the Monitor group is constantly written into the PLC.
③ Request item number, Request command, and Instrument recognition request command are read out by the FZ.
④ The FZ implements read or write of the communication data in the Setting group in accordance with the Request item number, Request command, and Instrument recognition request command.
⑤ The FZ writes communication status (such as setting error and setting completed) into the PLC registers.

6.1.1 Data group

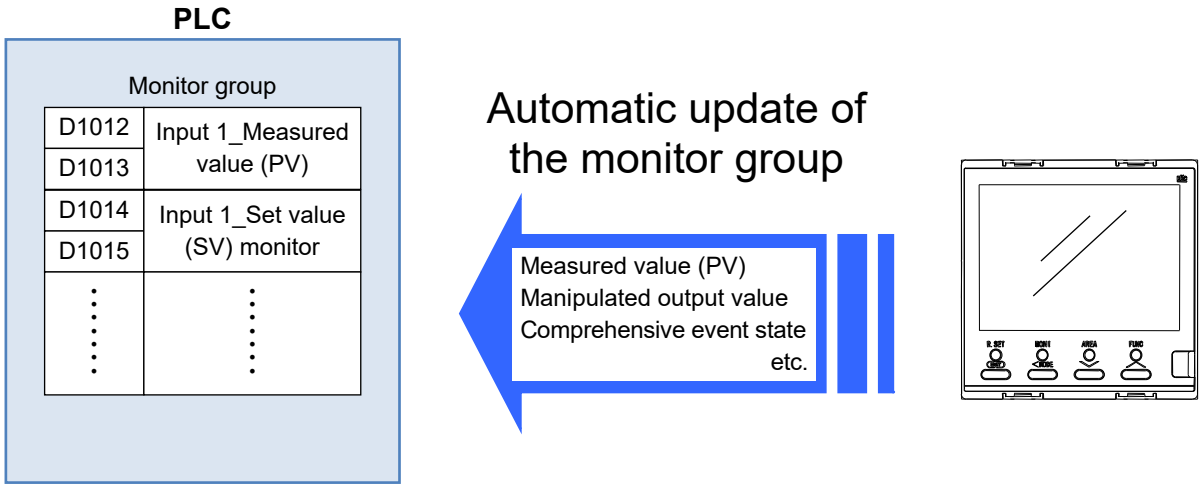
Communication data in the data map is categorized into groups: System data, Monitor group, and Setting group as shown below.



In the following explanation, an operation example is described showing factory preset register address (double word for Input data type).

■ Monitor group (PLC ← FZ)

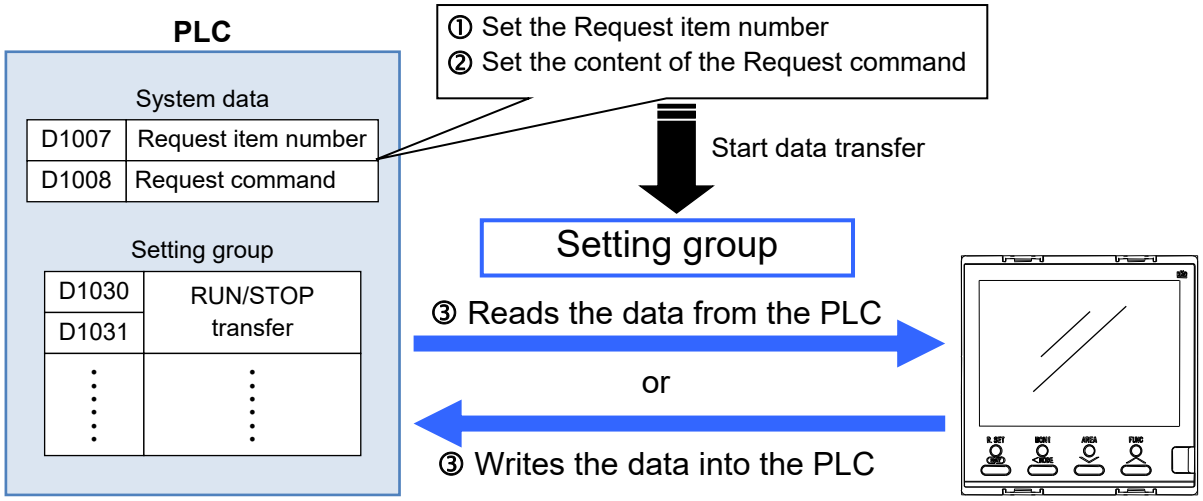
The communication data of the monitor group does not have a request command setting.



For the communication data of monitor group, see **6.2 PLC Communication Data Map (P. 6-23)**.

■ Request item number, and Request command (system data)

Request item number and Request command are commands for transferring the communication data of the setting group. When set values are set into the registers of Request item number register and Request command register in the PLC, communication data in the setting group will be transferred.

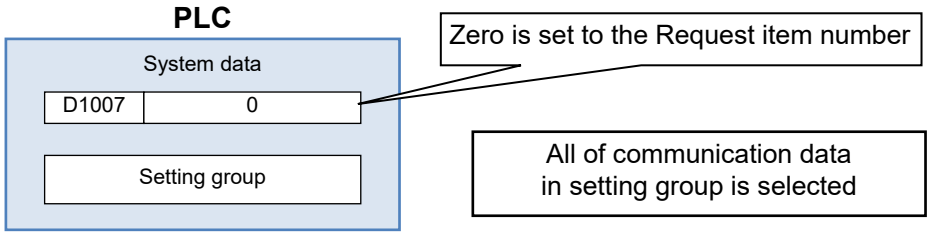


(1) Request item number

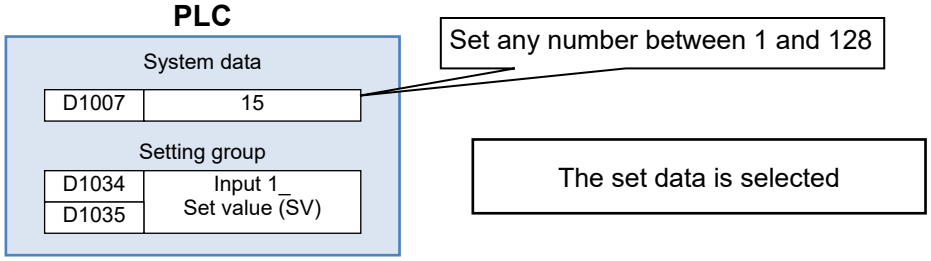
This command sets the communication data of the setting group that is transferred.
Set transfer of all communication data of the setting group, or transfer by one data item.
[Register address: D1007 (factory set value)]

Setting range: 0 or 1 to 128

- When set to 0, all communication data of the setting group is transferred.



- When set to a number from 1 to128 (item number), only the set communication data item is transferred (transfer by one data item).



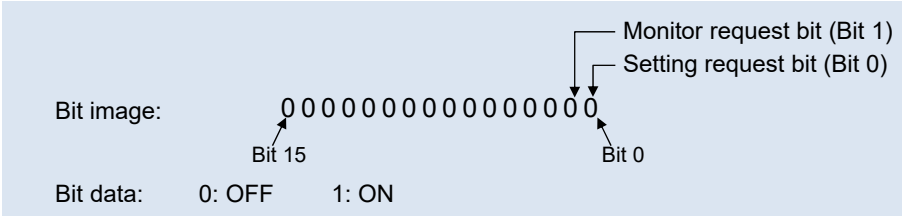
Communication data that has been set to "unused" (binary: 0) in the setting item selection of the PLC communication environment will not be transferred.

When set to a number from 1 to 128 (item number), the value of request item number will not return to 0 even after setting request or monitor request processing is completed.

For item numbers 1 to 128, see **"● Setting item selection (Communication data of Setting group)" (P. 5-10)**.

(2) Request command

Request command is a command to transfer the communication data of the setting group selected in the Request item number.
For the request command, both “Setting request bit” and “Monitor request bit” are available.
The Setting request bit and Monitor request bit of the request command are assigned to each bit datum as a binary number.
[Register address: D1008 (Factory set value)]

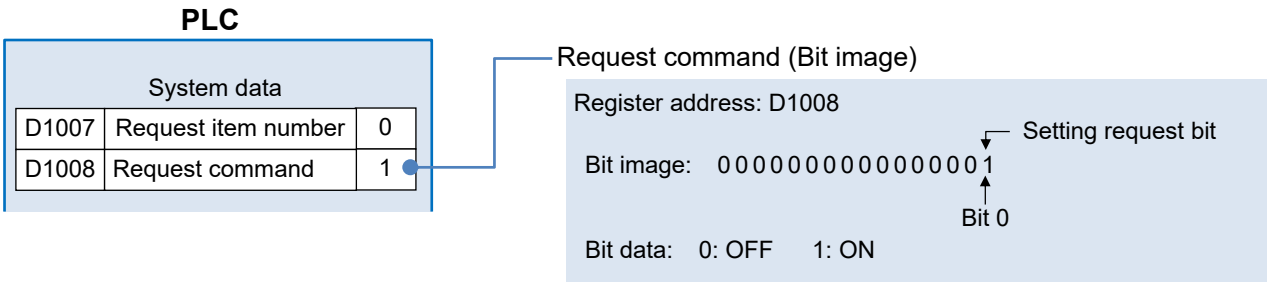


- **Setting request bit (PLC ➔ FZ)**……Set the PLC communication data on to the FZ.

  This command requests that the FZ read the communication data of the setting group on the PLC side.

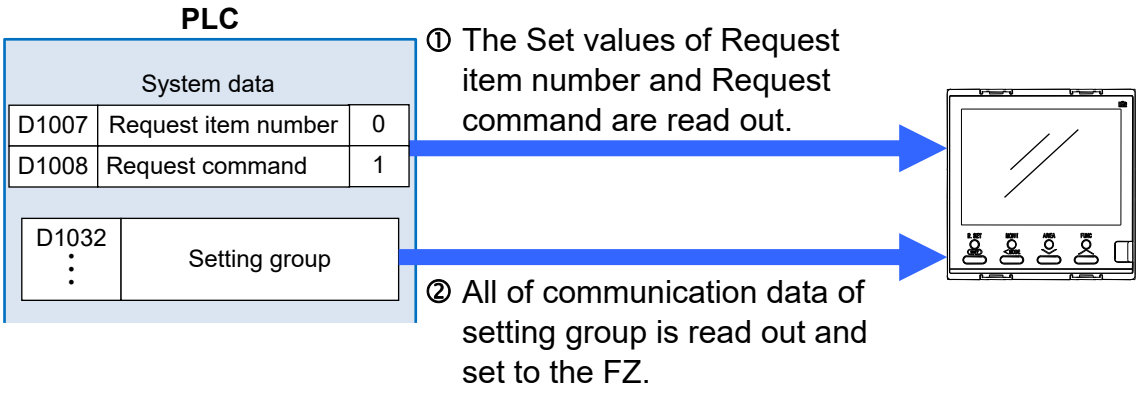
  Processing example: Read out all communication data of PLC setting group to the FZ.

  1. Set “0” to Request item number (D1007) and “1” to Request command (D1008).

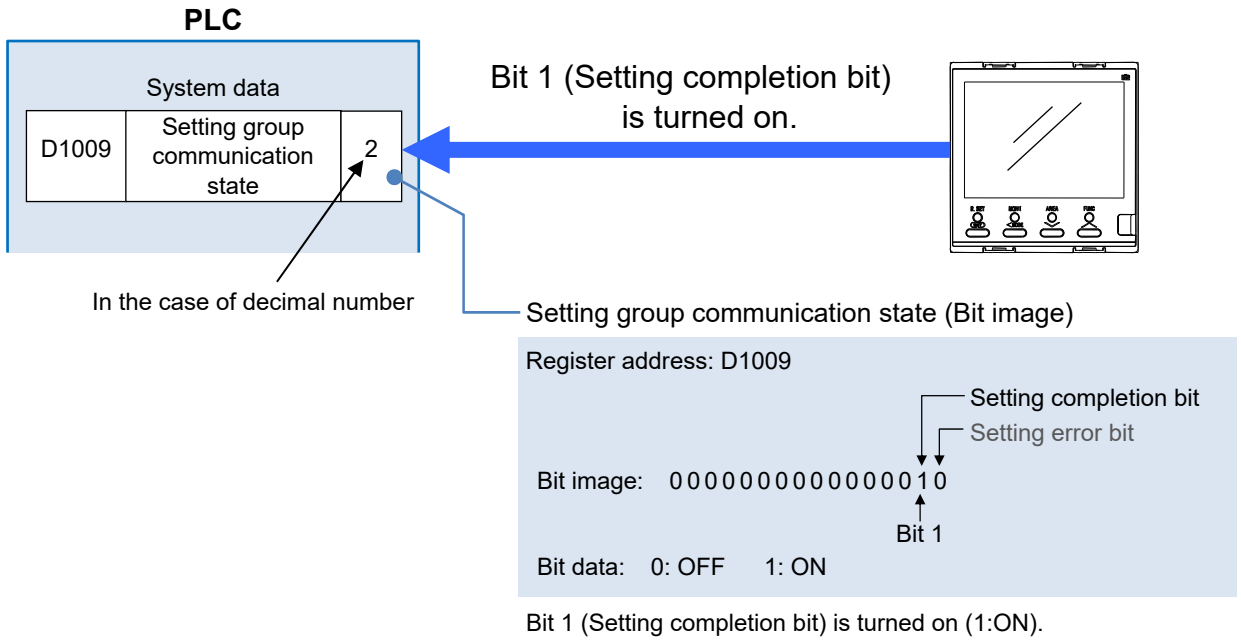


For a bit image, set “1” to the Bit 0 (Setting request bit).

  2. The FZ checks the content set at Request item number and Request command, and reads out the communication data of the setting group from the PLC register.



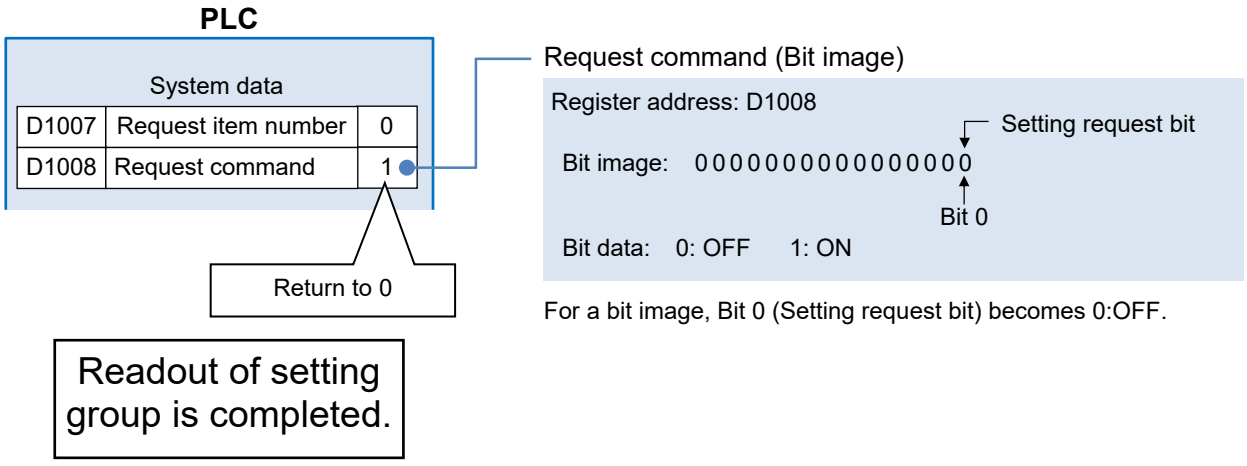
3. When the readout is completed, the FZ writes the communication state of setting group to the Setting completion bit (Bit 1) of the Setting group communication state (D1009).



Bit 1 (Setting completion bit) is turned on (1:ON).

If there is an error in the setting range of the data, the setting error bit (Bit 0) will change to "1." Check and see if there is an error in the values set in the PLC register.

4. The Request command (D1008) will change to "0" to indicate that reading of data from the PLC is finished.

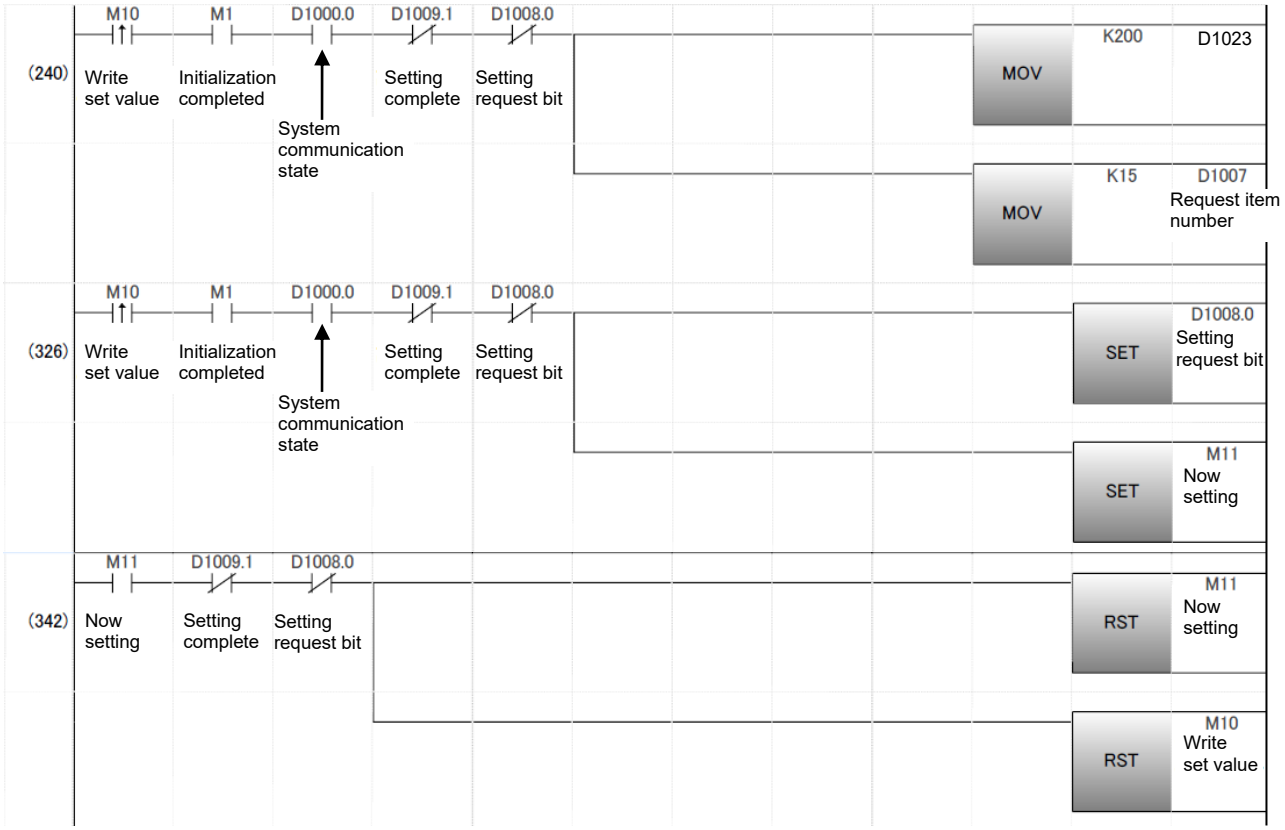


For a bit image, Bit 0 (Setting request bit) becomes 0:OFF.

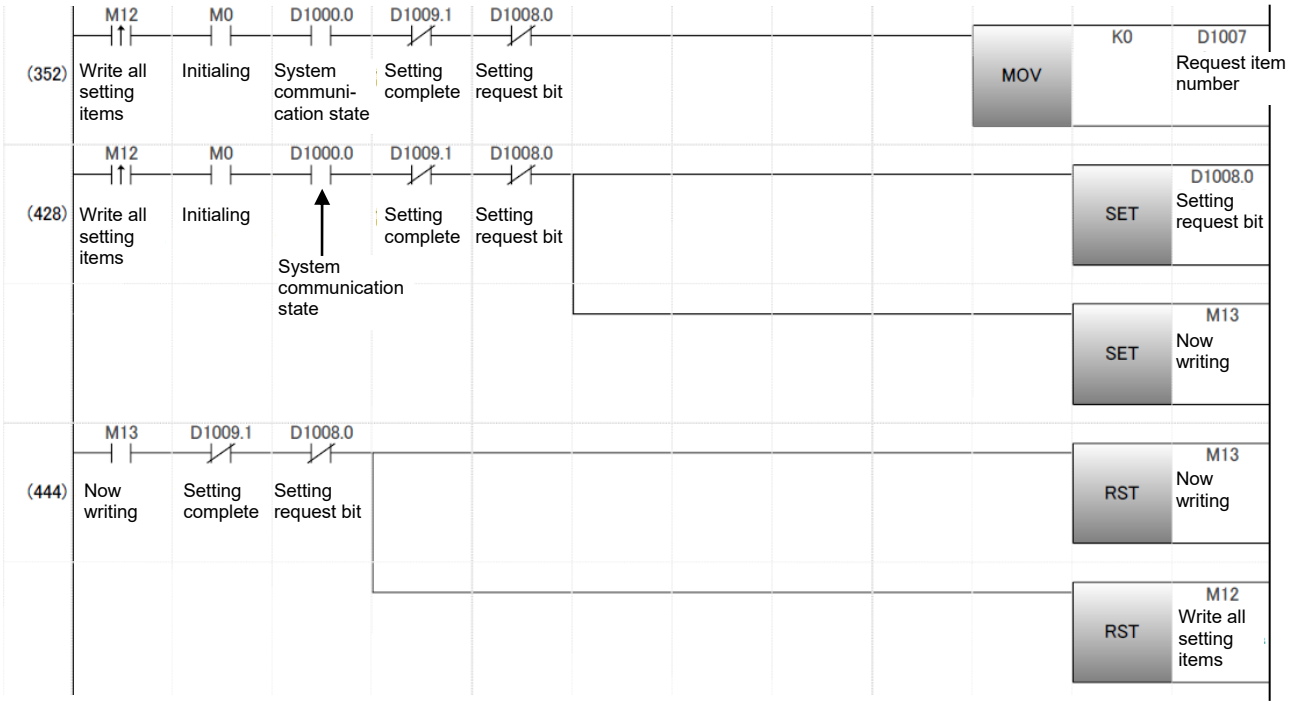
See **P. 6-7** for a programming example.

Program example:

Read out a Input 1_Set value (SV) of PLC to the FZ.



Read out all communication data of PLC setting group to the FZ.



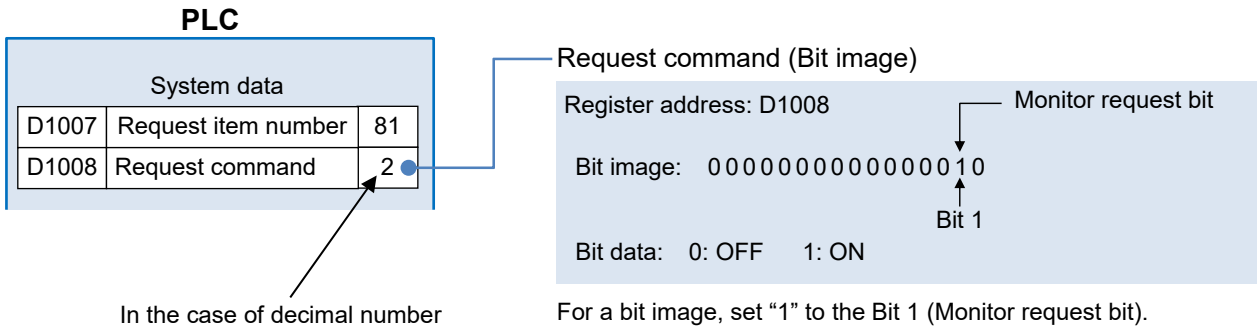
The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

- **Monitor request bit (PLC ← FZ)**……Set the communication data of the FZ to the PLC.

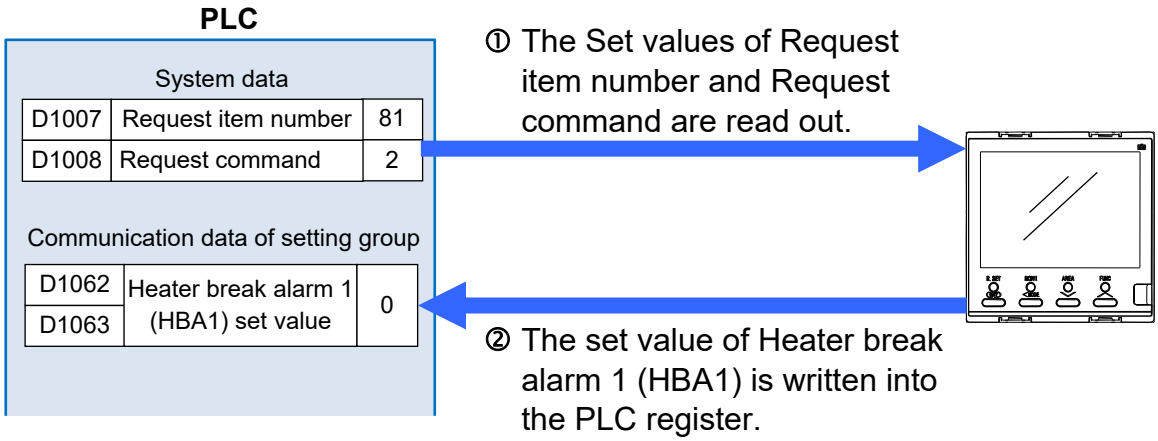
  Monitor request bit is a command to request the communication data of the FZ setting group to be written into the PLC register.

  Processing example: Writing a Set value of Heater break alarm 1 (HBA1) of the FZ into the PLC.

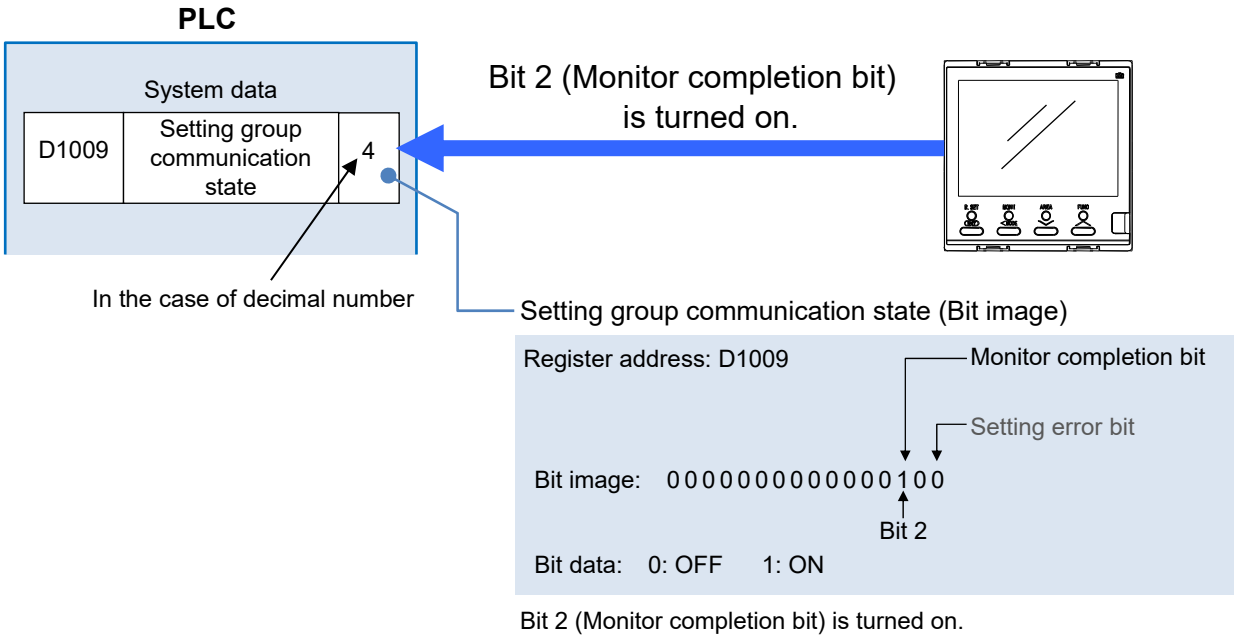
  1. Set “81” to Request item number (D1007) and “2” to Request command (D1008).



  2. The FZ checks the content set at Request item number and Request command and writes the set value of Heater break alarm 1 (HBA1) into the PLC register.

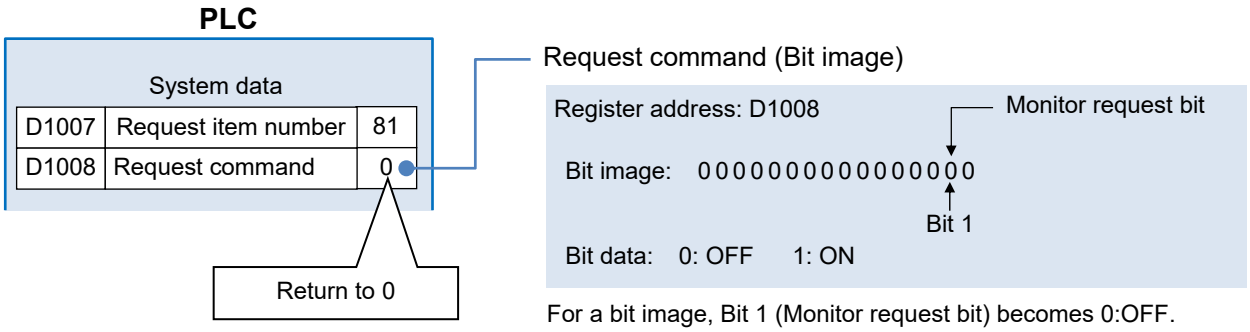


3. When writing is finished, the FZ writes the communication state of the setting group to the Monitor completion bit (Bit 2) of setting group communication state (D1009).



Bit 2 (Monitor completion bit) is turned on.

4. The request command (D1008) will change to "0" to indicate that reading of data from the PLC is finished.

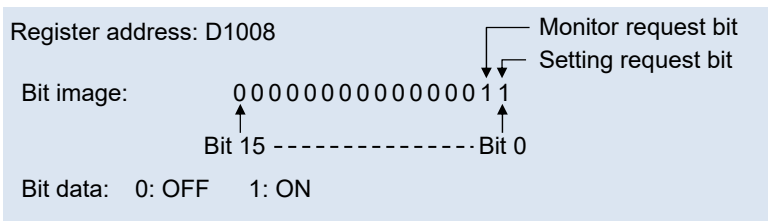


For a bit image, Bit 1 (Monitor request bit) becomes 0:OFF.

Writing the set value of Heater break alarm 1 (HBA1) is completed.

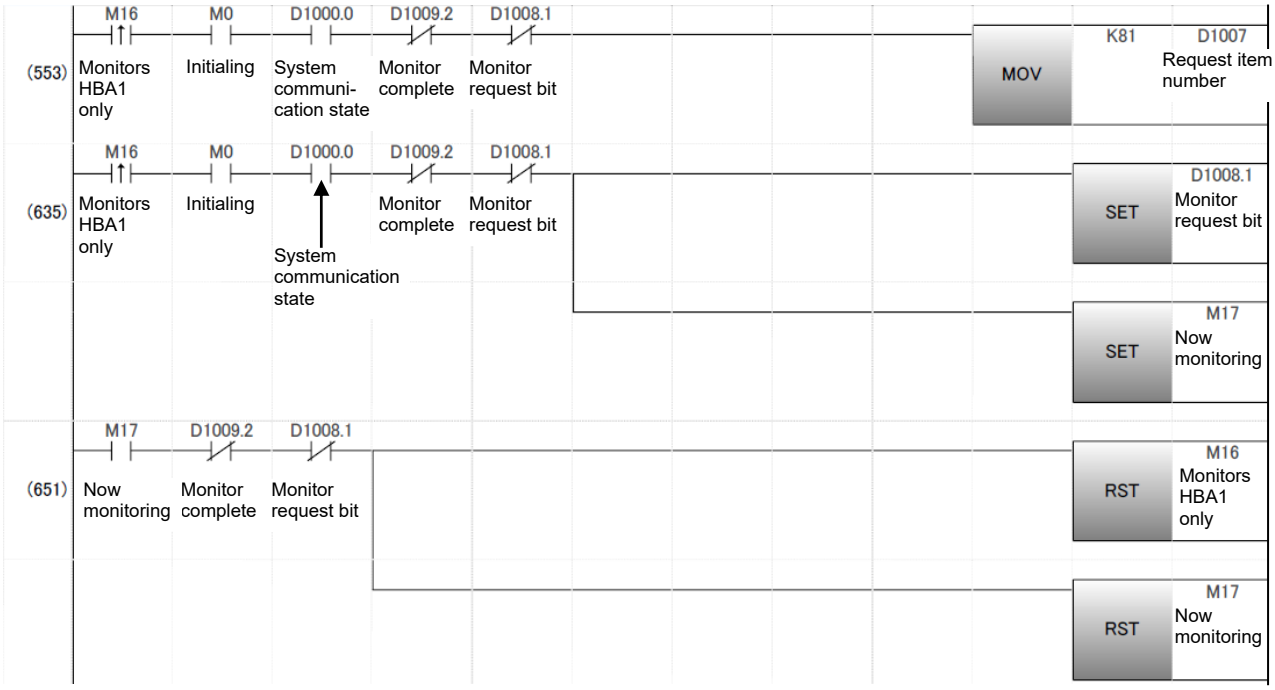
☞ See **P. 6-10** for a programming example.

📖 When setting both the setting request bit (Bit 0) and the monitor request bit (Bit 1) to "1," set the bits simultaneously. If set separately, the bit set later may be disregarded.

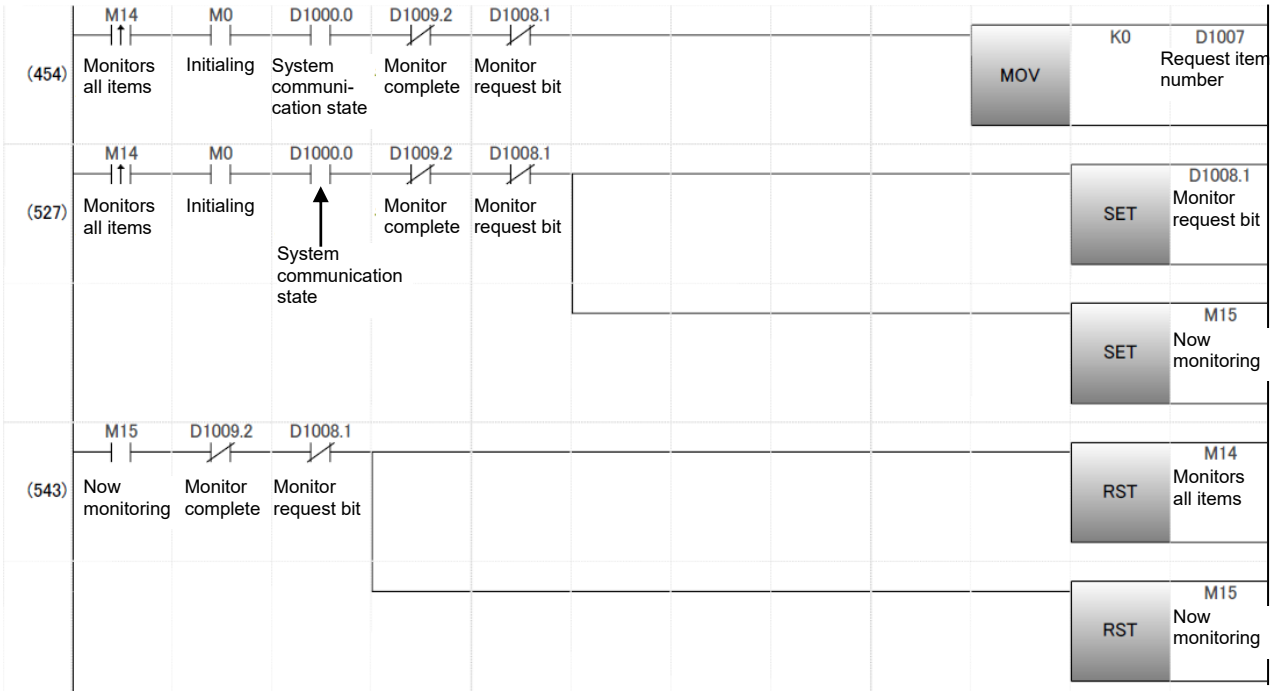


Program example:

Writing a Set value of Heater break alarm 1 (HBA1) of the FZ into the PLC.



Writing an all communication data of FZ setting group to the PLC.



The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

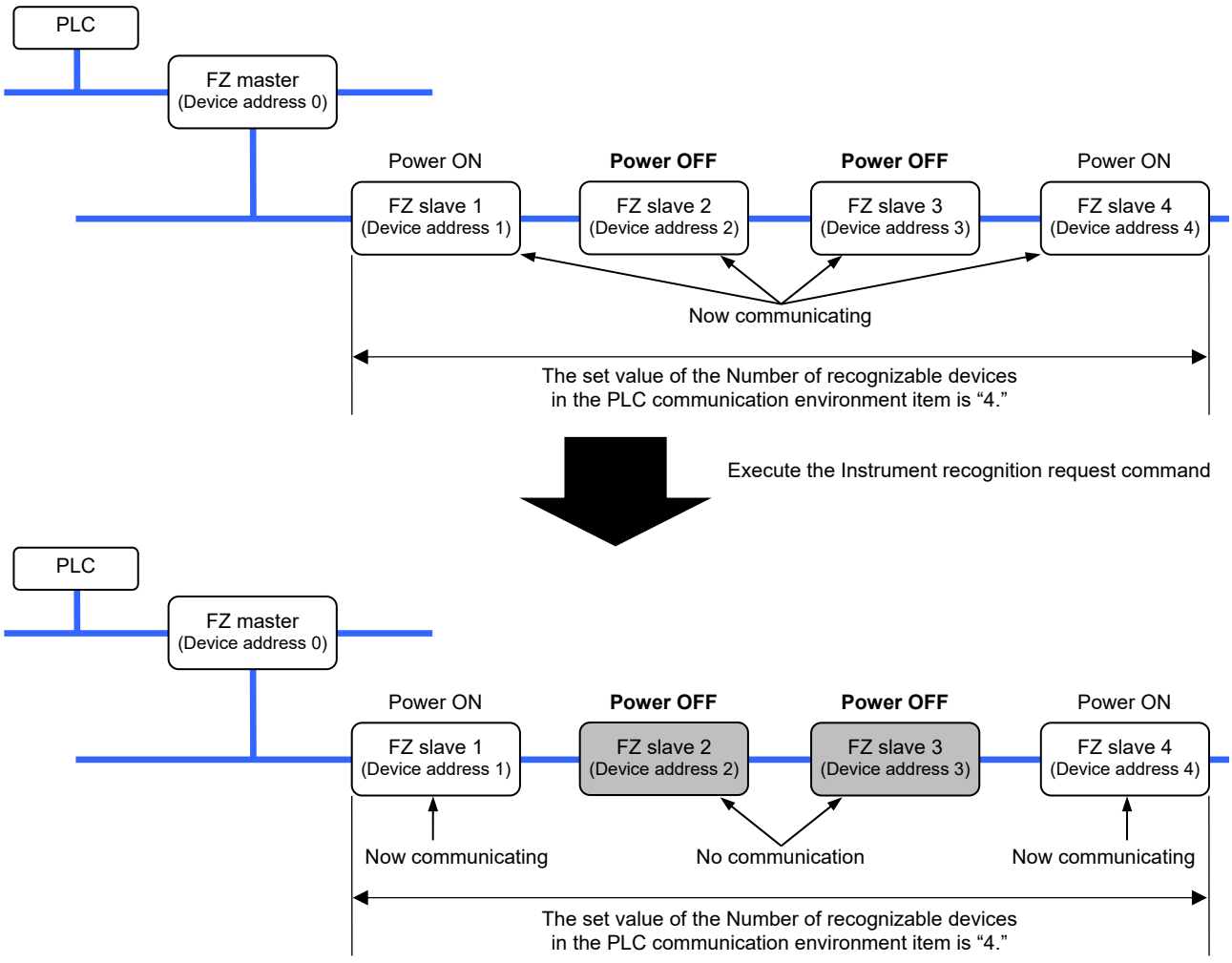
■ Instrument recognition request command (system data)

This is a request command to update the number of the FZ slaves (device address 1 to 30) recognized by the FZ master (device address 0). Recognition processing is conducted for the quantity of the instrument registered in the Number of recognizable devices (maximum value of device address) of the PLC communication environment items.
When some FZ slaves are not required and need to be turned off in a certain work process, perform the Instrument recognition request command to update the number of FZ slaves recognized by the FZ master.
Then the FZ master will not perform the communication request and as a result the communication cycle will be made faster.

Setting range: 0: Waiting for a request
1: Execute instrument recognition processing
(After the recognition, the command state returns to "0")

NOTE

While Recognition processing is being implemented, do not operate the Request command.
The Instrument recognition request command must be used only on the FZ with a device address of 0.



Executing the Instrument recognition request command will not change the set value of Number of recognizable devices in the PLC communication environment items.

Execution example of the Instrument recognition request command:

- When some FZ slaves are turned off depending on the working process

  If any of the FZ slaves recognized by the FZ master is turned off, the FZ master must wait for a reply from the FZ slave until timeout is reached. This may lead to a longer communication cycle.

  In such a case, execute the Instrument recognition request command. The FZ master will not request communication with the FZ slaves which gave no response to the FZ master. This will quicken the communication cycle.

- When there are any FZ slaves which need to be turned on after the FZ master has been turned on

  If the FZ slaves that were off when the FZ master made a recognition processing of the FZ slaves (power-on of the FZ master or execution of the Instrument recognition request command) have been turned on, perform the Instrument recognition request command.

  Communication will be established with the FZ slave which was off in the last recognition process.

When the quantity of the FZ slave has been increased, some FZ slaves may not be recognized if the Instrument link recognition time is set short. Set the Instrument link recognition time longer for such a case. (See **P. 5-5**)

When the quantity of the FZ slave is increased, make sure the Number of recognizable devices is properly set, otherwise, some FZ slaves may not be recognized.

In this case, change the set value of the Number of recognizable devices. (See **P. 5-6**)

Program example:

The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

■ Communication data that works with the Memory area

The memory area data inside the setting group will not be automatically updated by switching the Memory area from the PLC side.
Use either (1) or (2) below to do the update processing.

☞ For the communication data that works with the Memory area, see **6.2 PLC Communication Data Map (P. 6-23)**.

(1) Update the memory area data one after another using Request item number and Request command

After having switched the memory area, write Memory area data one after another into the PLC register using Request item number and Request command.

1. Set the Memory area number to change into the PLC register.

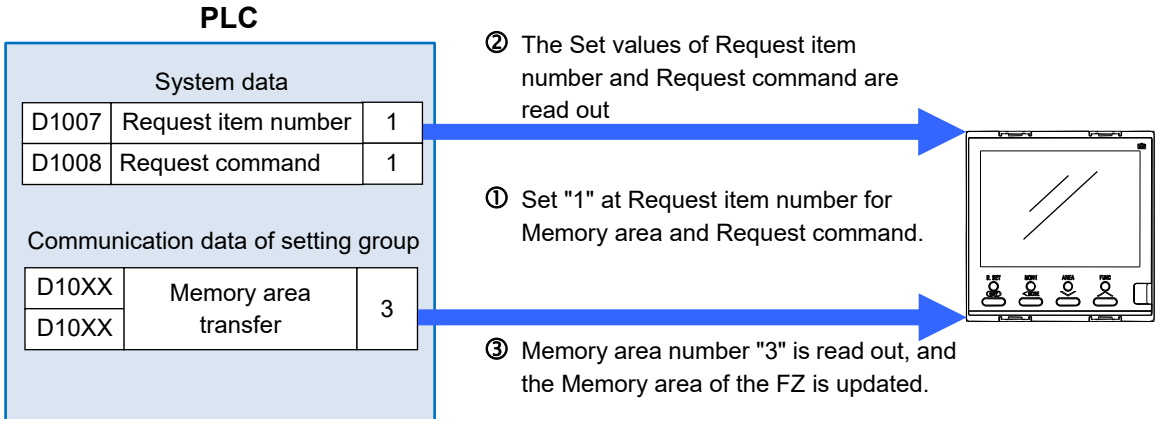
PLC

Communication data of setting group

D10XX	Memory area transfer	3
D10XX		

Example:
Change the Memory area number from 1 to 3.

2. Set commands of Request item number and Request command into the PLC register, then the Memory area of the FZ will be changed.



3. Set Request item number of the Memory area data to be updated into the PLC register.

PLC

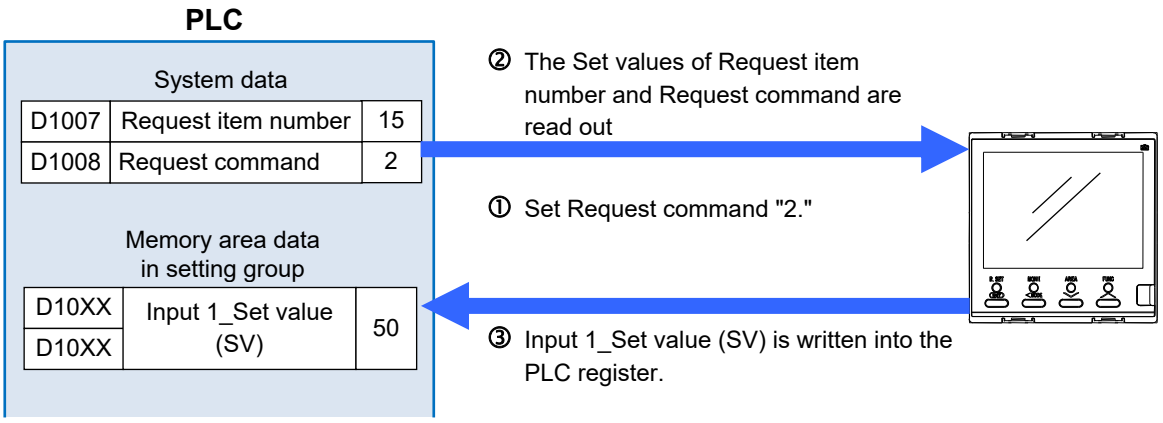
System data

D1007	Request item number	15
D1008	Request command	0

Example: Update the memory area data “Input 1_Set value (SV).”

Set “15” as the Request item number of Input 1_Set value (SV).

4. Set Request command into the PLC register. The Input 1_Set value (SV) of is written into the PLC register.

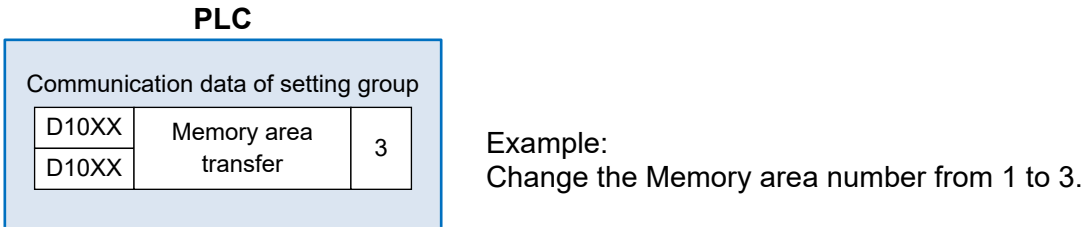


5. Repeat this procedure for all of the Memory area data that needs to be changed.

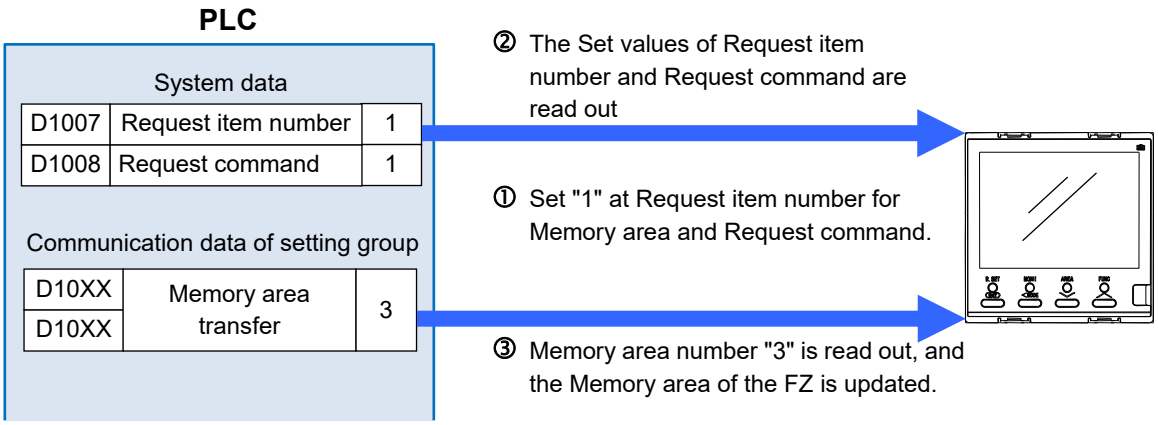
(2) Transfer all of communication data in setting group for update

After having switched the Memory area, write all of the communication data into the PLC register using Request item number and Request command.

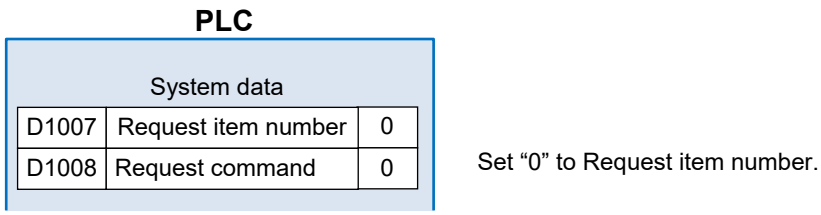
1. Set the Memory area number to change into the PLC register.



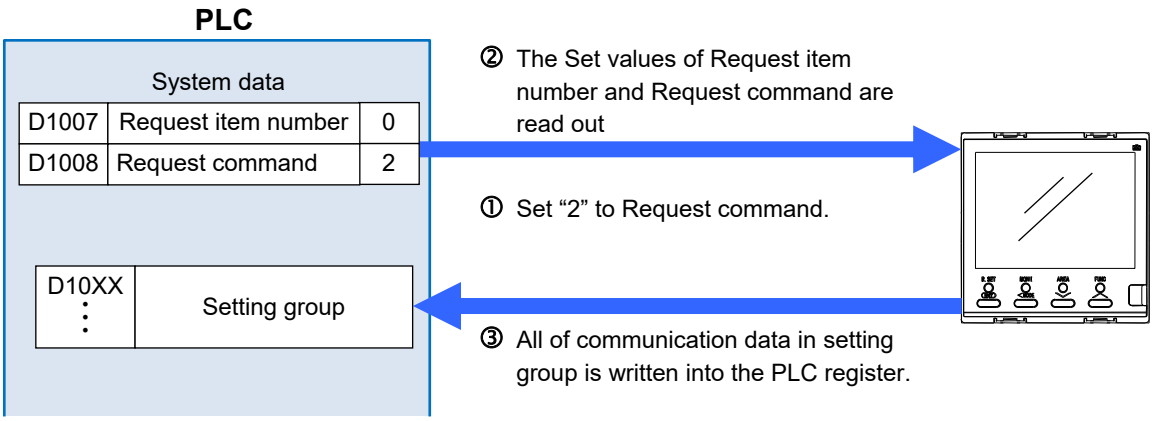
2. Set commands of Request item number and Request command into the PLC register, then the Memory area of the FZ will be changed.



3. Set Request item number into the PLC register to write all of communication data in Setting group into the PLC register.



4. Set Request command into the PLC register. Then, all of communication data in Setting group are written into the PLC register, and Memory area data is updated.

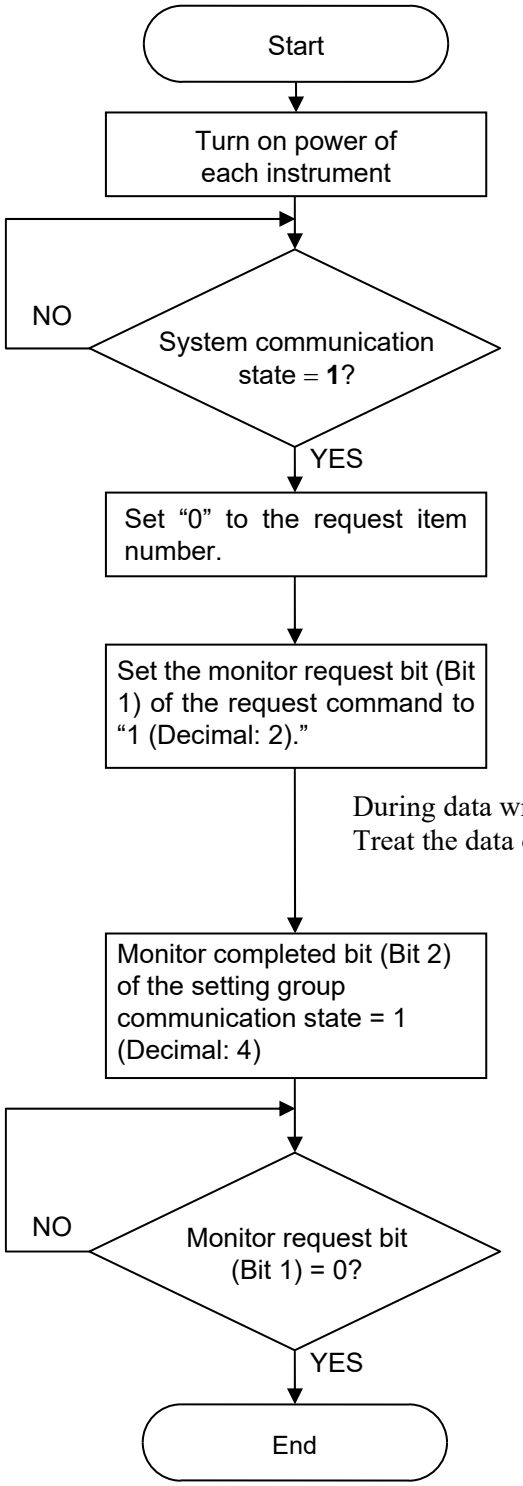


6.1.2 Data transfer procedures

NOTE

Change each set value of the FZ from the PLC after the initial settings are made. If each set value of the FZ 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



Turn on the power of the FZ, and the PLC. When the PLC communication start time (factory setting: 5 seconds) elapses, writing of the system data begins.

After the system data is written, the FZ begins writing the communication data of the monitor group to the PLC. When monitor group writing starts, "system communication state" changes to "**1**."
When the system communication condition becomes "**1**," PLC communication can be performed.

Because all communication data of the setting group is written to the PLC, the request item number of the PLC register is set to "**0**."

When the monitor request bit (Bit 1) of request command of the PLC register is set to "**1** (Decimal: **2**),"
the FZ begins writing the setting group to the PLC.

During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the FZ writes the communication state of the setting group to the monitor completed bit (Bit 2) of the setting group communication state of the PLC.

If the monitor request bit (Bit 1) of the request command of the PLC register is "**0**," this indicates that writing of data to the PLC is finished.

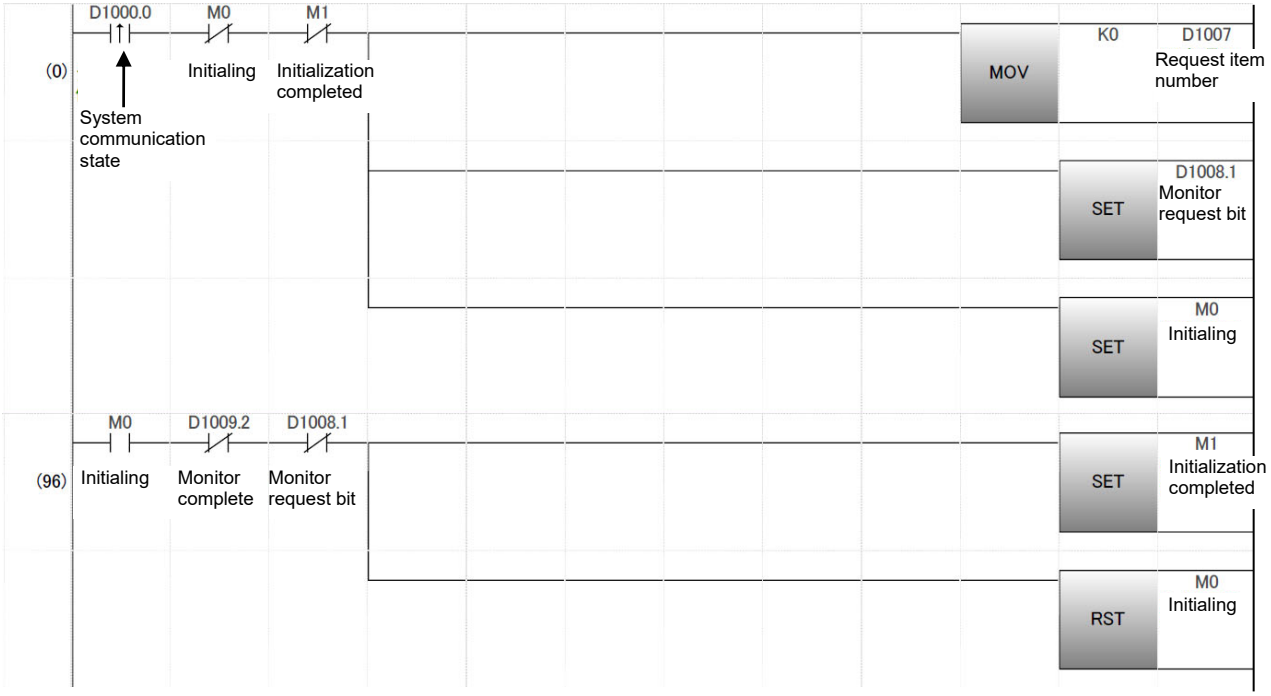
NOTE

When multiple FZ are connected, write the communication data of all FZ to the PLC.

☞ See **P. 6-17** for a programming example.

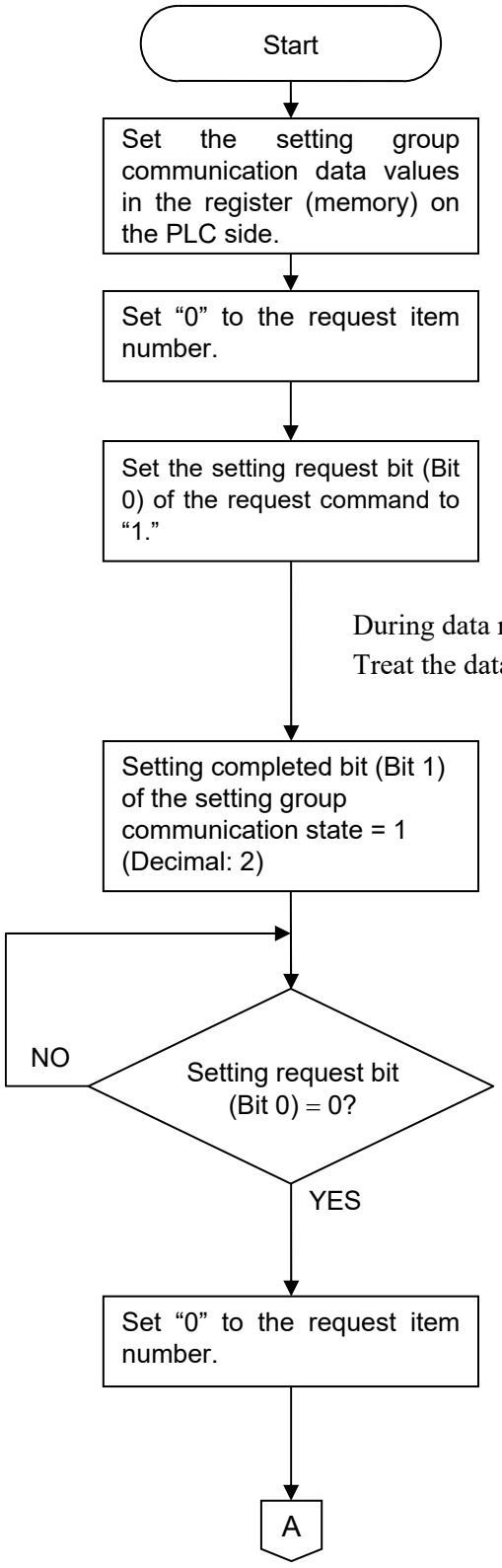
Program example:

Initial setting



The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

■ When the setting group communication data is transferred from PLC to the FZ.



[Data setting]
Set "0" to the request item number of PLC register.

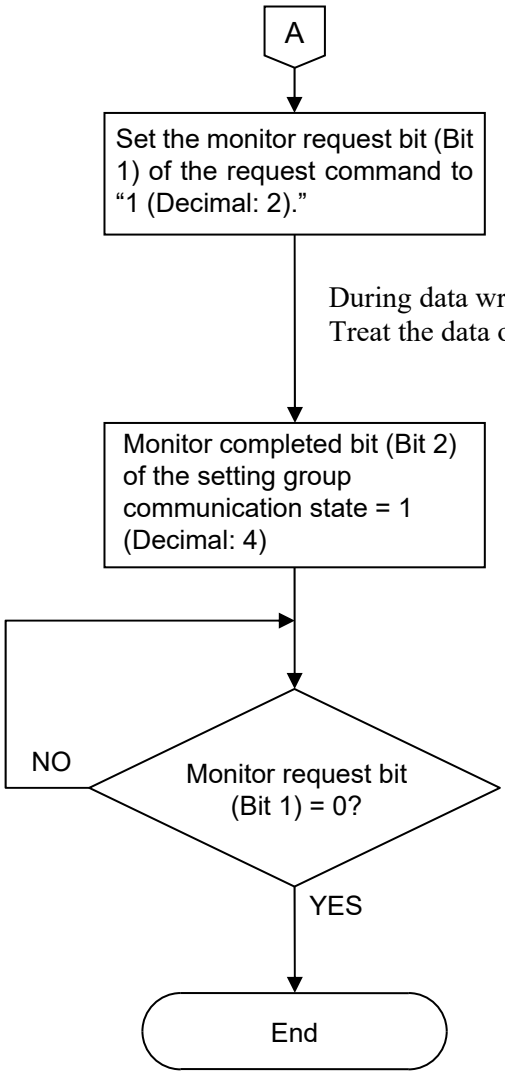
When the setting request bit (Bit 0) of request command of the PLC register is set to "**1**," the FZ begins reading the data set in the PLC register (memory).

During data read:
Treat the data of all items as inconsistent during the data read.

When reading of the data ends, the FZ writes the setting group communication state to the setting completed bit (Bit 1) of PLC setting group communication state.

If the setting request bit (Bit 0) of the request command of the PLC register is "**0**," this indicates that reading of data from the PLC is finished.

[Confirmation of setting data]
The request item number of the PLC register is set to "**0**" for verification of the data read from the PCL by the FZ.



When the monitor request bit (Bit 1) of request command of the PLC register is set to "**1** (Decimal: **2**),"the FZ begins writing the setting group data to the PLC.

During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the FZ writes the communication state of the setting group to the monitor completed bit (Bit 2) of the setting group communication state of the PLC.

If the monitor request bit (Bit 1) of the request command of the PLC register is "**0**," this indicates that writing of data to the PLC is finished.

☞ See **P. 6-7** for a programming example.

6.1.3 Data processing precautions

(1) Automatic update of communication data
Some of the PLC data in the communication data of the setting group will be automatically updated.
To activate the automatic update, "Monitor request" must be performed at least once, after starting the PLC communication.

Communication data automatically updated

Group	Item number	Communication data (Setting items)
Setting item selection 1	1	Interlock release
	3	Input 1_Hold reset
	4	Input 2_Hold reset
	5	Bottom suppression start signal
	7	Input 1_Autotuning (AT)
	8	Input 2_Autotuning (AT)
	9	Input 1_Startup tuning (ST)
	10	Input 2_Startup tuning (ST)
	13	Remote/Local transfer
Setting item selection 2	26	Input 1_Proportional band [heat-side]
	27	Input 1_Integral time [heat-side]
	28	Input 1_Derivative time [heat-side]
	32	Input 1_FF amount
Setting item selection 3	35	Input 1_Control loop break alarm (LBA) time
	37	Input 2_Proportional band
	38	Input 2_Integral time
	39	Input 2_Derivative time
	43	Input 2_FF amount
	46	Input 2_Control loop break alarm (LBA) time
	48	Input 1_Proportional band [cool-side]
Setting item selection 4	49	Input 1_Integral time [cool-side]
	50	Input 1_Derivative time [cool-side]
Setting item selection 7	111	FF amount learning
Setting item selection 8	114	Cascade_Proportional band (master-side)
	115	Cascade_Integral time (master-side)
	116	Cascade_Derivative time (master-side)
	117	Cascade_Proportional band (slave-side)
	118	Cascade_Integral time (slave-side)
	119	Cascade_Derivative time (slave-side)

(2) Communication data that works with Memory area will not be automatically updated even if the Memory area has been changed. Check the Memory area number after switching, and read out the communication data using the Request command.

☞ For the communication data that works with the Memory area, see **6.2 PLC Communication Data Map (P. 6-23)**.

Continued on the next page.

Continued from the previous page.

(3) 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.

[Example] Setting of Input 1_Proportional band
Initial value of internal data: 3.0
Communication data: 30

(4) Invalid or disabled items
Concerning the items made invalid or disabled because of the following conditions, the actions in the case of Setting request or Monitor request are shown below.

Condition:

- Items made invalid on the FZ side
- Items disabled in Setting item selection 1 through 8

Actions taken by Setting request or Monitor request:

Request command	FZ operation
Setting request bit (FZ←PLC)	The data from the PLC is ignored and is not read into the FZ. The setting error bit is not turned on either.
Monitor request bit (FZ→PLC)	The FZ writes “0” into the PLC register.

6.1.4 Processing time of communication data

The processing times for communication data monitor and setting are shown below (This is just an example).

The times shown are the processing times when the interval time is set to 10 milliseconds (factory set value).

■ Communication data processing time of monitor group

Communication speed	Number of communication data items	Monitor processing time [Unit: seconds]					
		When there are 31 FZ		When there are 9 FZ		When there are one FZ	
		Double word	Single word	Double word	Single word	Double word	Single word
19200 bps	1	12.2	12.1	3.6	3.4	0.2	0.2
	9 *	13.5	12.6	3.8	3.7	0.3	0.2
	48	19.2	15.3	5.8	4.4	0.6	0.3
57600 bps	1	7.4	7.4	2.3	2.0	0.1	0.1
	9 *	7.7	7.5	2.3	2.0	0.2	0.1
	48	10.3	8.3	3.0	2.6	0.2	0.2

* Factory set value

■ Communication data processing time of setting group

Reading PLC communication data (setting request bit)

Communication speed	Number of communication data items	Setting processing time when there is one FZ [Unit: ms]	
		Double word	Single word
19200 bps	1	110	110
	18 *	170	140
	128	760	440
57600 bps	1	70	70
	18 *	90	80
	128	320	210

* Factory set value

Writing PLC communication data (monitor request bit)

Communication speed	Number of communication data items	Set value monitor processing time when there is one FZ [Unit: ms]	
		Double word	Single word
19200 bps	1	110	110
	18 *	170	140
	128	730	440
57600 bps	1	70	70
	18 *	80	80
	128	310	210

* Factory set value

6.2 PLC Communication Data Map

The data map summarizes communication data name, register addresses, and data range which enable PLC communication.

6.2.1 Reference to data map

(1) (2) (3) (4) (5)

No.	Name	Register address	Attri-bute	Data range	Factory set value
System data					
1	System communication state [1]	D1000	RO	Bit data Bit 0: Data collection condition Bit 1 to Bit 15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0, 1]	—

(1) Name: Name of communication data
For setting group communication data, the item number is indicated.

(2) Register address: A register address of communication data in PLC communication
(A register address of MITSUBISHI MELSEC series)
Register addresses in this manual are those assigned when the PLC communication environment setting is set as follows. (factory set values)

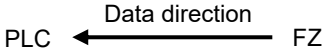
- Register type: 0 (D register)
- Register start number (High-order 4-bit): 0
- Register start number (Low-order 16-bit): 1000
- Monitor item register bias: 12
- Setting item register bias: 0
- Monitor item selection 1: 3459
- Monitor item selection 2: 16512
- Monitor item selection 3: 1024
- Setting item selection 1: 16480
- Setting item selection 2: 7850
- Setting item selection 3: 32768
- Setting item selection 4: 771
- Setting item selection 5: 0
- Setting item selection 6: 5
- Setting item selection 7: 0
- Setting item selection 8: 0

Assignment of register addresses varies depending on the communication data of the PLC communication environment indicated below.

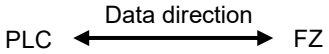
- Register type
- Register start number (High-order 4-bit)
- Register start number (Low-order 16-bit)
- Monitor item register bias
- Setting item register bias
- Monitor item selection 1 to 3
- Setting item selection 1 to 8
- Slave register bias
- Input data type

For PLC communication environment setting, see **5.2 PLC Communication Environment Items List (P. 5-3)**.

(3) Attribute: RO: Read only data



R/W: Read and Write data



(4) Data range: Read or write range of communication data

(5) Factory set value: Factory set value of communication data

When there is one FZ, the number of communication data is 39 (factory set value). When the maximum of 31 FZ are connected to the PLC communication port, the number of communication data is 1209.
When there is one FZ, the total number of communication data is 188. When the maximum of 31 FZ are connected to the PLC communication port, the total number of communication data is 5828.

The data map classifications of the communication data are shown below. (factory set value)
System data is a single word and occupies one register address of the PLC.
Monitor group and Setting group are either double word * or single word.
(It depends on the input range specified at the time of order.)

* Occupies two PLC register addresses.
In the data transfer of double word, data is sent from the lower word.

System data	D1000 [system communication state] to D1011 [Internal processing]
Monitor group	Double word: D1012 [Input 1_Measured value (PV)] to D1029 [Error code] Single word: D1012 [Input 1_Measured value (PV)] to D1020 [Error code]
Setting group	Double word: D1030 [RUN/STOP transfer] to D1065 [Heater break alarm 2 (HBA2) set value] Single word: D1021 [RUN/STOP transfer] to D1038 [Heater break alarm 2 (HBA2) set value]

The indicated communication data of the PLC communication data map are the communication data of factory set value. The number of communication data of factory set value is limited by monitor item selection and setting item selection.

Some communication data may be invalid or disabled depending on the type and the specification of the FZ. Check the following manual for detailed information of communication data that may be invalid or disabled.

☞ **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)**

6.2.2 Data map list (Factory setting)

■ Common items (System data) to Double word and Single word

No.	Name	Register address	Attri-bute	Data range	Factory set value
System data					
1	System communication state [1]	D1000	RO	Bit data Bit 0: Data collection condition Bit 1 to Bit 15: Unused Data 0: Before data collection is completed 1: Data collection is completed [Decimal number: 0, 1]	—
2	Communication flag [2]	D1001	RO	0/1 transfer (For communication checking) "0" and "1" are repeated for each communication period.	—
3	—	D1002	RO	Internal processing Do not use the register address	—
4	—	D1003	RO	Internal processing Do not use the register address	—

[1] When system communication state becomes "1," PLC communication can be performed.

Data collection condition is assigned as a bit image in binary numbers.

Bit image: 0000000000000000
Bit 15 ---------- Bit 0

[2] The FZ writes alternating zeros and ones (0→1→0) to this area each communication period. By periodically monitoring this area in the PLC program, it can be determined whether or not the FZ has stopped communicating.

Programming example for determination of a communication error:

Determination of an error when the Communication flag has not been updated for 30 seconds.

The sample program is intended solely for purposes of example and the operation is not guaranteed. When you create a program using the sample program, check the operation of the program and use it on your own responsibility.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
System data					
5	PLC communication error code *	D1004	RO	Bit data Bit 0: PLC register read/write error Bit 1: Slave communication timeout Bit 2: Unused Bit 3: Unused Bit 4: Master communication timeout Bit 5 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 31]	—

* PLC communication error occurrence condition differ between the FZ master and the FZ slave.

		FZ master		FZ slave	
		PLC register	Loader communication	PLC register	Loader communication
Bit 0: PLC register read/write error	Error occurred on the FZ master	Bit 0: ON	Bit 0: ON	—	—
	Error occurred on the FZ slave	—	—	Bit 0: ON	Bit 0: ON
Bit 1: Slave communication timeout occurred		Bit 1: ON	Bit 1: ON	Value not updated [1]	Bit 1: ON
Bit 4: Master communication timeout occurred		Value not updated [1]	Bit 4: ON	—	—

[1] Because a timeout error already occurred on the instrument (master or slave), writing to the PLC register will not be implemented.

Bit 0:PLC register read/write error

[FZ master]

An error is recognized when read/write is not available and error response has been received five times in series.

[FZ slave]

An error is recognized when read/write is not available and error response has been received five times in series.

Bit 1:Slave communication timeout

[FZ master]

- A timeout is detected when the PLC response waiting time has been exceeded after the FZ slave sent the request message. (The FZ slave is monitored)
- A timeout is detected when the FZ slave, to which Access right [2] is given, remains non responding and the preset PLC response waiting time has elapsed.

[FZ slave]

- A timeout is detected when the PLC response waiting time has been exceeded after the FZ slave sent the request message.
- If Access right [2] is not transferred from the FZ master within 10 minutes after the last response of the FZ slave, the error is recognized.

Bit 4:Master communication timeout

[FZ master]

A timeout is detected when the PLC response waiting time has been exceeded after the FZ master sent the request message.

[FZ slave]

Timeout is not detected.

[2] Access right

The PLC and the FZ perform 1:1 communication. When multiple FZs are connected, communication to the PLC is switched from one device to the other. This condition under which communication can be established is defined as Access right. The Access right is given to the FZ slaves (and the FZ master itself) by the FZ master in the order of the device address.

Each error state is assigned as a bit image in binary numbers

Bit image: 0000000000000000

Bit 15 ---------- Bit 0

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No.	Name	Register address	Attribute	Data range	Factory set value
System data					
6	PLC communication instrument recognition flag 1 *	D1005	RO	Bit data Bit 0: FZ 1 Bit 1: FZ 2 Bit 2: FZ 3 Bit 3: FZ 4 Bit 4: FZ 5 Bit 5: FZ 6 Bit 6: FZ 7 Bit 7: FZ 8 Bit 8: FZ 9 Bit 9: FZ 10 Bit 10: FZ 11 Bit 11: FZ 12 Bit 12: FZ 13 Bit 13: FZ 14 Bit 14: FZ 15 Bit 15: FZ 16 Data 0: No instrument exists 1: Instrument exists [Decimal number: 0 to 65535]	—
7	PLC communication instrument recognition flag 2 *	D1006	RO	Bit data Bit 0: FZ 17 Bit 1: FZ 18 Bit 2: FZ 19 Bit 3: FZ 20 Bit 4: FZ 21 Bit 5: FZ 22 Bit 6: FZ 23 Bit 7: FZ 24 Bit 8: FZ 25 Bit 9: FZ 26 Bit 10: FZ 27 Bit 11: FZ 28 Bit 12: FZ 29 Bit 13: FZ 30 Bit 14: FZ 31 Bit 15: Unused Data 0: No instrument exists 1: Instrument exists [Decimal number: 0 to 16383]	—

* The connection state of the FZ slaves is displayed. FZ slaves (device address 1 to 30) can only recognize itself. Only the FZ master (device address 0) can recognize the whole system.

The state of the PLC communication instrument recognition flag is assigned to each bit in the binary number.

Bit image: 0000000000000000
Bit 15 ---------- Bit 0

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No.	Name	Register address	Attri-bute	Data range	Factory set value
System data					
8	Request item number [1]	D1007	R/W	0, 1 to 128 0: Transfer all communication data of the setting group. 1 to 128: Transfer only the communication data of the selected item number.	—
9	Request command [2]	D1008	R/W	Bit data Bit 0: Setting request bit Bit 1: Monitor request bit Data 0: OFF 1: ON [Decimal number: 0 to 3]	0
10	Setting group communication state [3]	D1009	R/W	Bit data Bit 0: Setting error bit Bit 1: Setting completed bit Bit 2: Monitor completed bit Data 0: OFF 1: ON [Decimal number: 0 to 7]	—

[1] Request item number

This command sets the communication data of the setting group that is transferred. Set transfer of all communication data of the setting group, or transfer by one data item.

Communication data that has been set to "unused" (binary: 0) in the setting item selection of the PLC communication environment will not be transferred.

[2] Request command

Bit 0: Setting request bit

This command requests that the FZ read the communication data of the setting group on the PLC side.

Bit 1: Monitor request bit

This command requests that the FZ write the communication data of the setting group on the PLC side.

The setting request bit and monitor request bit is assigned as a bit image in binary numbers.

Bit image: 0000000000000000
Bit 15 ---------- Bit 0

[3] This is the communication state of setting group.

Bit 0: Setting error bit

Turns ON when the PLC data and FZ data do not agree due to a setting range error or other error. Also turns ON when data cannot be set.

When setting error is "1" (ON), it will return to "0" (OFF) the next time data is set normally.

Bit 1: Setting completed bit

When there is a request by setting request bit for a PLC setting data read, this will turn ON when the PLC data read is finished.

At the next communication period with the setting request bit set to 0, the setting completed bit turns OFF.

Bit 2: Monitor completed bit

When there is a request by monitor request bit for a FZ setting data write, this will turn ON when the FZ setting data write is finished.

At the next communication period with the monitor request bit set to 0, the monitor completed bit turns OFF.

The setting error bit, setting completed bit, and monitor completed bit is assigned as a bit image in binary numbers.

Bit image: 0000000000000000
Bit 15 ---------- Bit 0

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No.	Name	Register address	Attri-bute	Data range	Factory set value
System data					
11	Instrument recognition request command	D1010	R/W	Bit data Bit 0: Instrument recognition request Bit 1 to Bit 15: Unused Data 0: Wait for a request 1: Execute instrument recognition processing (After the recognition, the command state returns to "0") This setting is effective only for the FZ master with a device address of 0.	—
12	—	D1011	RO	Internal processing Do not use the register address	—

■ Double word items (Monitor group and Setting group)

No.	Name	Register address	Attri-bute	Data range	Factory set value
Monitor group (Monitor item selection 1)					
13	Input 1_Measured value (PV)	D1012 D1013	RO	Input 1_Input range low – (Input 1_5 % or more of input span) to Input 1_Input range high + (Input 1_5 % or more of input span) Varies with the setting of the Decimal point position.	—
14	Input 1_Set value (SV) monitor	D1014 D1015	RO	Input 1_Setting limiter low to Input 1_Setting limiter high Varies with the setting of the Decimal point position.	—
15	Input 1_Manipulated output value monitor [heat-side]	D1016 D1017	RO	–5.0 to +105.0 %	—
16	Input 1_Manipulated output value monitor [cool-side]	D1018 D1019	RO	–5.0 to +105.0 %	—
17	Current transformer 1 (CT1) input value monitor	D1020 D1021	RO	0.0 to 100.0 A	—
18	Current transformer 2 (CT2) input value monitor	D1022 D1023	RO	0.0 to 100.0 A	—
Monitor group (Monitor item selection 2)					
19	Comprehensive event state	D1024 D1025	RO	0 to 4095 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Heater break alarm 1 (HBA1) +32: Heater break alarm 2 (HBA2) +64: Control loop break alarm 1 (LBA1) +128: Control loop break alarm 2 (LBA2) +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low When multiple items are applicable, they are summed up.	—
20	Overall operation status	D1026 D1027	RO	0 to 511 0: OFF +1: STOP state +2: Input 1_Manual mode state +4: Input 2_Manual mode state +8: Remote mode state (Cascade control state, Differential temperature control state, Input 2 state of Control with PV select) +16: Input 1_Autotuning (AT) state +32: Input 2_Autotuning (AT) state +64: Set value of Input 1 is now changing +128: Set value of Input 2 is now changing +256: Communication monitoring result When multiple items are applicable, they are summed up.	—

: Shows the communication data of FZ400/900.

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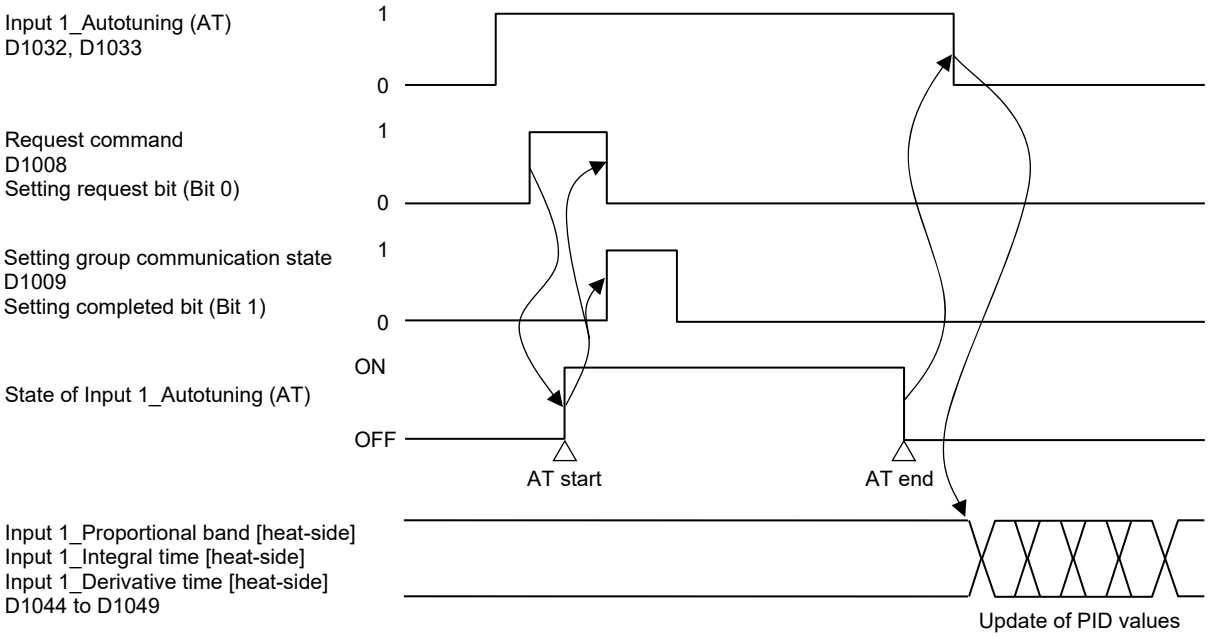
No.	Name	Register address	Attri-bute	Data range	Factory set value
Monitor group (Monitor item selection 3)					
21	Error code	D1028 D1029	RO	0 to 71 0: Normal +1: Adjustment data error +2: Data back-up error +4: A/D conversion error (Temperature compensation error included) +64: Display units error When multiple items are applicable, they are summed up.	—
Setting group (Setting item selection 1)					
22	RUN/STOP transfer Item number: 6	D1030 D1031	R/W	0: RUN (Control start) 1: STOP (Control stop)	0
23	Input 1_Autotuning (AT) Item number: 7	D1032 D1033	R/W	0: PID control 1: Start Autotuning When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the corresponding data in the PLC will be also automatically updated. (See a Time chart)	0
24	Input 1_Set value (SV) ★ Item number: 15	D1034 D1035	R/W	Input 1_Setting limiter low to Input 1_Setting limiter high Varies with the setting of the Decimal point position.	0

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

Time chart



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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 2)					
25	Event 1 set value (EV1) Event 1 set value (EV1) [high] ★ Item number: 18	D1036 D1037	R/W	Deviation • When assigned to Input 1 or Differential temperature input –(Input 1_Input span) to +(Input 1_Input span) • When assigned to Input 2 –(Input 2_Input span) to +(Input 2_Input span) • When Control with PV select is selected –(PV select input span) to +(PV select input span) Varies with the setting of the Decimal point position. Input value or Set value • When assigned to Input 1 Input 1_Input range low to Input 1_Input range high • When assigned to Input 2 Input 2_Input range low to Input 2_Input range high • When assigned to Differential temperature input –(Input 1_Input span) to +(Input 1_Input span) • When Control with PV select is selected PV select input range low to PV select input range high Varies with the setting of the Decimal point position. Manipulated output value –5.0 to +105.0 %	For Deviation, Input value and Set value TC/RTD inputs: 10.0 V/I inputs: 5 % of input span For Manipulated output value 50.0
26	Event 2 set value (EV2) Event 2 set value (EV2) [high] ★ Item number: 20	D1038 D1039	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 2)					
27	Event 3 set value (EV3) Event 3 set value (EV3) [high] ★ Item number: 22	D1040 D1041	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
28	Event 4 set value (EV4) Event 4 set value (EV4) [high] ★ Item number: 24	D1042 D1043	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
29	Input 1_Proportional band [heat-side] ★ Item number: 26	D1044 D1045	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.0 to 1000.0 % of PV select input span) 0 (0.0, 0.00): ON/OFF action In the following cases, Input 1_Proportional band [heat-side] of the PLC will be automatically updated. • The Input 1_Autotuning (AT) of the FZ has changed to zero from one. • When Input 1_Startup tuning (ST) of the FZ has been normally completed	TC/RTD inputs: 30.0 V/I inputs: 3.0

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 2)					
30	Input 1_Integral time [heat-side] ★ Item number: 27	D1046 D1047	R/W	PID control or Heat/Cool PID control: 0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Position proportioning PID control: 1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds Varies with the setting of the Integral/ Derivative time decimal point position. In the following cases, Input 1_Integral time [heat-side] of the PLC will be automatically updated. • The Input 1_Autotuning (AT) of the FZ has changed to zero from one. • When Input 1_Startup tuning (ST) of the FZ has been normally completed	240
31	Input 1_Derivative time [heat-side] ★ Item number: 28	D1048 D1049	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/ Derivative time decimal point position. In the following cases, Input 1_Derivative time [heat-side] of the PLC will be automatically updated. • The Input 1_Autotuning (AT) of the FZ has changed to zero from one. • When Input 1_Startup tuning (ST) of the FZ has been normally completed	PID control or Heat/Cool PID control: 60 Position proportioning PID control: 0
32	Input 1_Control response parameter ★ Item number: 29	D1050 D1051	R/W	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid	PID control or Position proportioning PID control: 0 Heat/Cool PID control: 2

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attribute	Data range	Factory set value
Setting group (Setting item selection 3)					
33	Input 1_Proportional band [cool-side] ★ Item number: 48	D1052 D1053	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span (When Control with PV select: 0.1 to 1000.0 % of PV select input span) When the Input 1_Autotuning (AT) in the FZ has been changed to "0" from "1," Input 1_Proportional band [cool-side] of the PLC will be automatically updated.	TC/RTD inputs: 30 V/I inputs: 3.0
Setting group (Setting item selection 4)					
34	Input 1_Integral time [cool-side] ★ Item number: 49	D1054 D1055	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Varies with the setting of the Integral/ Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to "0" from "1," Input 1_Integral time [cool-side] of the PLC will be automatically updated.	240
35	Input 1_Derivative time [cool-side] ★ Item number: 50	D1056 D1057	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/ Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to "0" from "1," Input 1_Derivative time [cool-side] of the PLC will be automatically updated.	60

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 4)					
36	Input 1_Setting change rate limiter (up) ★ Item number: 57	D1058 D1059	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function Varies with the setting of the Decimal point position.	0
37	Input 1_Setting change rate limiter (down) ★ Item number: 58	D1060 D1061	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function Varies with the setting of the Decimal point position.	0
Setting group (Setting item selection 6)					
38	Heater break alarm 1 (HBA1) set value Item number: 81	D1062 D1063	R/W	0.0 to 100.0 A 0.0: HBA function OFF	0.0
39	Heater break alarm 2 (HBA2) set value Item number: 83	D1064 D1065	R/W	0.0 to 100.0 A 0.0: HBA function OFF	0.0

: Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

■ Single word items (Monitor group and Setting group)

☞ See **P. 6-30** to **6-36** for the data range and the factory set value.

No.	Name	Register address
Monitor group (Monitor item selection 1)		
13	Input 1_Measured value (PV)	D1012
14	Input 1_Set value (SV) monitor	D1013
15	Input 1_Manipulated output value monitor [heat-side]	D1014
16	Input 1_Manipulated output value monitor [cool-side]	D1015
17	Current transformer 1 (CT1) input value monitor	D1016
18	Current transformer 2 (CT2) input value monitor	D1017
Monitor group (Monitor item selection 2)		
19	Comprehensive event state	D1018
20	Overall operation status	D1019
Monitor group (Monitor item selection 3)		
21	Error code	D1020
Setting group (Setting item selection 1)		
22	RUN/STOP transfer Item number: 6	D1021
23	Input 1_Autotuning (AT) Item number: 7	D1022
24	Input 1_Set value (SV) ★ Item number: 15	D1023
Setting group (Setting item selection 2)		
25	Event 1 set value (EV1) Event 1 set value (EV1) [high] ★ Item number: 18	D1024
26	Event 2 set value (EV2) Event 2 set value (EV2) [high] ★ Item number: 20	D1025
27	Event 3 set value (EV3) Event 3 set value (EV3) [high] ★ Item number: 22	D1026
28	Event 4 set value (EV4) Event 4 set value (EV4) [high] ★ Item number: 24	D1027
29	Input 1_Proportional band [heat-side] ★ Item number: 26	D1028
30	Input 1_Integral time [heat-side] ★ Item number: 27	D1029
31	Input 1_Derivative time [heat-side] ★ Item number: 28	D1030
32	Input 1_Control response parameter ★ Item number: 29	D1031
Setting group (Setting item selection 3)		
33	Input 1_Proportional band [cool-side] ★ Item number: 48	D1032
Setting group (Setting item selection 4)		
34	Input 1_Integral time [cool-side] ★ Item number: 49	D1033
35	Input 1_Derivative time [cool-side] ★ Item number: 50	D1034
36	Input 1_Setting change rate limiter (up) ★ Item number: 57	D1035
37	Input 1_Setting change rate limiter (down) ★ Item number: 58	D1036
Setting group (Setting item selection 6)		
38	Heater break alarm 1 (HBA1) set value Item number: 81	D1037
39	Heater break alarm 2 (HBA2) set value Item number: 83	D1038

: Shows the communication data of FZ400/900.

★ Data for Memory area:
This is the data of the Control area selected by the Memory area transfer.

6.2.3 Communication data set to “unused” at the factory

These are communication data items that are set to “unused” when the product is shipped from the factory. The “use” or “unused” setting is configured in monitor item selection or setting item selection.

☞ For the setting procedures, see **6.3 Example of PLC Communication Data Map Editing (P. 6-61)**.
To configure the settings, reverse the procedure used to reduce communication data.

No.	Name	Register address	Attri-bute	Data range	Factory set value
Monitor group (Monitor item selection 1)					
1	Input 2_Measured value (PV)	—	RO	Input 2_Input range low – (Input 2_5 % or more of input span) to Input 2_Input range high + (Input 2_5 % or more of input span) Varies with the setting of the Decimal point position.	—
2	Input 2_Set value (SV) monitor	—	RO	Input 2_Setting limiter low to Input 2_Setting limiter high Varies with the setting of the Decimal point position.	—
3	PV select Measured value (PV)	—	RO	When controlling with Input 1: Input 1_Input range low – (Input 1_5 % or more of input span) to Input 1_Input range high + (Input 1_5 % or more of input span) When controlling with Input 2: Input 2_Input range low – (Input 2_5 % or more of input span) to Input 2_Input range high + (Input 2_5 % or more of input span) Varies with the setting of the Decimal point position.	—
4	Measured value (PV) of differential temperature input	—	RO	In case of Input data type 0: 19999 to 99999 In case of Input data type 1: 1999 to 9999 Varies with the setting of the Decimal point position.	—
5	Set value (SV) monitor of differential temperature input	—	RO	–(Input 1_Input span) to +(Input 1_Input span) Varies with the setting of the Decimal point position.	—
6	Input 2_Manipulated output value monitor	—	RO	–5.0 to +105.0 %	—

: Shows the communication data of FZ400/900.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Monitor group (Monitor item selection 1)					
7	Memory area soak time monitor	—	RO	In case of Input data type 0: 0 to 35999 seconds * 0 to 11999 seconds 0 to 5999 minutes * Monitoring is available only on FZ400/900. In case of Input data type 1: 0 to 11999 seconds 0 to 5999 minutes Data range of Memory area soak time monitor can be selected on the Soak time unit (P. 3-11).	—
8	Remote setting input value monitor	—	RO	Input 1_Setting limiter low to Input 1_Setting limiter high Varies with the setting of the Decimal point position.	—
9	Feedback resistance (FBR) input value	—	RO	0.0 to 100.0 %	—
10	Event 1 state monitor	—	RO	0: OFF 1: ON	—
Monitor group (Monitor item selection 2)					
11	Event 2 state monitor	—	RO	0: OFF 1: ON	—
12	Event 3 state monitor	—	RO	0: OFF 1: ON	—
13	Event 4 state monitor	—	RO	0: OFF 1: ON	—
14	Heater break alarm 1 (HBA1) state monitor	—	RO	0: OFF 1: ON	—
15	Heater break alarm 2 (HBA2) state monitor	—	RO	0: OFF 1: ON	—
16	Control loop break alarm 1 (LBA1) state monitor	—	RO	0: OFF 1: ON	—
17	Control loop break alarm 2 (LBA2) state monitor	—	RO	0: OFF 1: ON	—
18	Input 1_Burnout state monitor	—	RO	0: OFF 1: ON	—
19	Input 2_Burnout state monitor	—	RO	0: OFF 1: ON	—
20	Feedback resistance (FBR) break monitor	—	RO	0: OFF 1: ON	—

: Shows the communication data of FZ400/900.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Monitor group (Monitor item selection 2)					
21	DI state monitor	—	RO	0 to 63 0: Open +1: DI1 Closed +2: DI2 Closed +4: DI3 Closed +8: DI4 Closed +16: DI5 Closed +32: DI6 Closed When multiple items are applicable, they are summed up.	—
22	OUT state monitor	—	RO	0 to 7 0: OFF +1: OUT1 ON +2: OUT2 ON +4: OUT3 ON When multiple items are applicable, they are summed up.	—
23	DO state monitor	—	RO	0 to 15 0: OFF +1: DO1 ON +2: DO2 ON +4: DO3 ON +8: DO4 ON When multiple items are applicable, they are summed up.	—
24	Memory area number monitor	—	RO	1 to 16	—
Monitor group (Monitor item selection 3)					
25	Input 1_PID memory	—	RO	Switching by Memory area number: 1 to 16 Switching by Set value (SV): 1 to 8 Switching by Measured value (PV): 1 to 8	—
26	Input 2_PID memory	—	RO	Switching by Memory area number: 1 to 16 Switching by Set value (SV): 1 to 8 Switching by Measured value (PV): 1 to 8	—
27	Input 1_Peak hold monitor	—	RO	Input 1_Input range low − (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	—

: Shows the communication data of FZ400/900.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Monitor group (Monitor item selection 3)					
28	Input 1_Bottom hold monitor	—	RO	Input 1_Input range low – (Input 1_5 % of input span) to Input 1_Input range high + (Input 1_5 % of input span) Varies with the setting of the Decimal point position.	—
29	Input 2_Peak hold monitor	—	RO	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_ Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—
30	Input 2_Bottom hold monitor	—	RO	Input 2_Input range low – (Input 2_5 % of input span) to Input 2_Input range high + (Input 2_5 % of input span) Varies with the setting of the Decimal point position.	—
31	Input 1_AT remaining time monitor	—	RO	0 to 2880 minutes	—
32	Input 2_AT remaining time monitor	—	RO	0 to 2880 minutes	—
33	Input 1_AT/ST status monitor	—	RO	–4 to +2 0: AT/ST complete +1: AT running now +2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—
34	Input 2_AT/ST status monitor	—	RO	–4 to +2 0: AT/ST complete +1: AT running now +2: ST running now –1: Aborted. Setting changed. –2: Aborted. Abnormal input. –3: Aborted. Timeout. –4: Aborted. Abnormal calculated values.	—
35	Integrated operating time	—	RO	0 to 65535 hours	—

: Shows the communication data of FZ400/900.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 1)					
36	Interlock release Item number: 1	—	R/W	0: Interlock release 1: Interlock state "1: Interlock state" is for monitoring the interlocked state. Do not write "1." When the Interlock release of the FZ has changed to "1" from "0," the data in the PLC will be also automatically updated to "1."	0
37	Memory area transfer Item number: 2	—	R/W	1 to 16 When the DI1 function selection is set to "Memory area transfer (Without area set signal)" and when "External mode" is selected with the Control area Local/External transfer, the data is RO (Read only).	1
38	Input 1_Hold reset Item number: 3	—	R/W	0: Hold 1: Reset When the Input 1_Hold reset of the FZ has changed to "0" from "1," the data in the PLC will be also automatically updated to "0."	0
39	Input 2_Hold reset Item number: 4	—	R/W	0: Hold 1: Reset When the Input 2_Hold reset of the FZ has changed to "0" from "1," the data in the PLC will be also automatically updated to "0."	0
40	Bottom suppression start signal Item number: 5	—	R/W	0 to 3 0: No forced ON +1: Input 1_Bottom suppression action_ Forced ON +2: Input 2_Bottom suppression action_ Forced ON When the Bottom suppression start signal has been switched, the data in the PLC will be also automatically updated.	0
41	Input 2_Autotuning (AT) Item number: 8	—	R/W	0: PID control 1: Start Autotuning When the Input 2_Autotuning (AT) in the FZ has been changed to "0" from "1," the corresponding data in the PLC will be also automatically updated.	0
42	Input 1_Startup tuning (ST) Item number: 9	—	R/W	0: ST unused 1: Execute once * 2: Execute always * When the ST is finished, the control will automatically return to "0." When the Input 1_Startup tuning (ST) signal has been changed to "0" from a value other than zero, the data in the PLC will be also automatically updated.	0

: Shows the communication data of FZ400/900.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 1)					
43	Input 2_Startup tuning (ST) Item number: 10	—	R/W	0: ST unused 1: Execute once * 2: Execute always * When the ST is finished, the control will automatically return to “0.” When the Input 2_Startup tuning (ST) signal has been changed to “0” from a value other than zero, the data in the PLC will be also automatically updated.	0
44	Input 1_Auto/Manual transfer Item number: 11	—	R/W	0: Auto mode 1: Manual mode	0
45	Input 2_Auto/Manual transfer Item number: 12	—	R/W	0: Auto mode 1: Manual mode	0
46	Remote/Local transfer Item number: 13	—	R/W	When Select function for input 2 is: “Remote setting input” 0: Local mode 1: Remote mode When Remote setting input is specified: [FZ110] 0: Local mode 1: Remote mode When Select function for input 2 is: “Cascade control” 0: Single control 1: Cascade control When Select function for input 2 is: “Control with PV select” 0: Input 1 1: Input 2 When “Switching by level” is selected at “Selection of PV select trigger,” the parameter becomes RO (Read only). When Select function for input 2 is: “2-loop control/Differential temperature control” 0: 2-loop control 1: Differential temperature control When the state of Remote/Local transfer of the FZ has been changed, the data in the PLC will be also automatically updated. The values are updated depending on the set values of “Remote/Local transfer selection (Area).”	0

: Shows the communication data of FZ400/900.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 1)					
47	Control area Local/External transfer Item number: 14	—	R/W	0: Local mode 1: External mode	0
48	Input 2_Set value (SV) ★ Item number: 16	—	R/W	Input 2_Setting limiter low to Input 2_Setting limiter high Varies with the setting of the Decimal point position.	0
Setting group (Setting item selection 2)					
49	Set value (SV) of differential temperature input ★ Item number: 17	—	R/W	–(Input 1_Input span) to +(Input 1_Input span) Varies with the setting of the Decimal point position.	0
50	Event 1 set value (EV1') [low] ★ Item number: 19	—	R/W	Deviation • When assigned to Input 1 or Differential temperature input –(Input 1_Input span) to +(Input 1_Input span) • When assigned to Input 2 –(Input 2_Input span) to +(Input 2_Input span) • When Control with PV select is selected at Select function for input 2. –(PV select input span) to +(PV select input span) Varies with the setting of the Decimal point position. Input value or Set value • When assigned to Input 1 Input 1_Input range low to Input 1_Input range high • When assigned to Input 2 Input 2_Input range low to Input 2_Input range high • When assigned to Differential temperature input –(Input 1_Input span) to +(Input 1_Input span) • When Control with PV select is selected at Select function for input 2. PV select input range low to PV select input range high Varies with the setting of the Decimal point position.	TC/RTD inputs: –10 V/I inputs: –5 % of input span

: Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 2)					
51	Event 2 set value (EV2') [low] ★ Item number: 21	—	R/W	Same as Event 1 set value (EV1') [low]	
52	Event 3 set value (EV3') [low] ★ Item number: 23	—	R/W	Same as Event 1 set value (EV1') [low]	
53	Event 4 set value (EV4') [low] ★ Item number: 25	—	R/W	Same as Event 1 set value (EV1') [low]	
54	Input 1_Proactive intensity ★ Item number: 30	—	R/W	0 to 4 0: No function	2
55	Input 1_Manual reset ★ Item number: 31	—	R/W	–100.0 to +100.0 %	0.0
56	Input 1_FF amount ★ Item number: 32	—	R/W	–100.0 to +100.0 % When the Input 1_FF amount of the FZ has changed, the data in the PLC will be also automatically updated.	0.0
Setting group (Setting item selection 3)					
57	Input 1_Output limiter high [heat-side] ★ Item number: 33	—	R/W	Input 1_Output limiter low [heat-side] to 105.0 %	105.0
58	Input 1_Output limiter low [heat-side] ★ Item number: 34	—	R/W	–5.0 % to Input 1_Output limiter high [heat-side]	–5.0 %

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 3)					
59	Input 1_Control loop break alarm (LBA) time ★ Item number: 35	—	R/W	0 to 7200 seconds 0: No function When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Input 1_Control loop break alarm (LBA) time in the PLC will be also automatically updated. When Input 1_Startup tuning (ST) of the FZ has been normally completed, the Input 1_ Control loop break alarm (LBA) time in the PLC will be also automatically updated.	LBA function is specified: 480 LBA function is not specified: 0
60	Input 1_LBA deadband (LBD) ★ Item number: 36	—	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) Varies with the setting of the Decimal point position.	0
61	Input 2_Proportional band ★ Item number: 37	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input 2_Input span 0 (0.0, 0.00): ON/OFF action In the following cases, Input 2_Proportional band of the PLC will be automatically updated. • The Input 2_Autotuning (AT) of the FZ has changed to zero from one. • When Input 2_Startup tuning (ST) of the FZ has been normally completed	TC/RTD inputs: 30.0 V/I inputs: 3.0

: Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 3)					
62	Input 2_Integral time ★ Item number: 38	—	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action Varies with the setting of the Integral/ Derivative time decimal point position. In the following cases, Input 2_Integral time of the PLC will be automatically updated. • The Input 2_Autotuning (AT) of the FZ has changed to zero from one. • When Input 2_Startup tuning (ST) of the FZ has been normally completed	240
63	Input 2_Derivative time ★ Item number: 39	—	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/ Derivative time decimal point position. In the following cases, Input 2_Derivative time of the PLC will be automatically updated. • The Input 2_Autotuning (AT) of the FZ has changed to zero from one. • When Input 2_Startup tuning (ST) of the FZ has been normally completed	60
64	Input 2_Control response parameter ★ Item number: 40	—	R/W	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid	0
65	Input 2_Proactive intensity ★ Item number: 41	—	R/W	0 to 4 0: No function	2
66	Input 2_Manual reset ★ Item number: 42	—	R/W	–100.0 to +100.0 %	0.0
67	Input 2_FF amount ★ Item number: 43	—	R/W	–100.0 to +100.0 % When the Input 2_FF amount of the FZ has changed, the data in the PLC will be also automatically updated.	0.0

: Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 3)					
68	Input 2_Output limiter high ★ Item number: 44	—	R/W	Input 2_Output limiter low to 105.0 %	105.0
69	Input 2_Output limiter low ★ Item number: 45	—	R/W	–5.0 % to Input 2_Output limiter high	–5.0
70	Input 2_Control loop break alarm (LBA) time ★ Item number: 46	—	R/W	0 to 7200 seconds 0: No function When the Input 2_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Input 2_Control loop break alarm (LBA) time in the PLC will be also automatically updated. When Input 2_Startup tuning (ST) of the FZ has been normally completed, the Input 2_ Control loop break alarm (LBA) time in the PLC will be also automatically updated.	LBA function is specified: 480 LBA function is not specified: 0
71	Input 2_LBA deadband (LBD) ★ Item number: 47	—	R/W	0 to Input 2_Input span Varies with the setting of the Decimal point position.	0
Setting group (Setting item selection 4)					
72	Input 1_Overlap/Deadband ★ Item number: 51	—	R/W	TC/RTD inputs: –(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: –(PV select input span) to +(PV select input span)) (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: –100.0 to +100.0 % of Input 1_Input span (When Control with PV select: –100.0 to +100.0 % of PV select input span) Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0

: Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 4)					
73	Input 1_Output limiter high [cool-side] ★ Item number: 52	—	R/W	Input 1_Output limiter low [cool-side] to 105.0 %	105.0
74	Input 1_Output limiter low [cool -side] ★ Item number: 53	—	R/W	–5.0 % to Input 1_Output limiter high [cool-side]	–5.0 %
75	Select Trigger type for Memory area transfer ★ Item number: 54	—	R/W	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge To select two or more functions, sum each value.	0
76	Area soak time ★ Item number: 55	—	R/W	In case of Input data type 0: 0 to 35999 seconds * 0 to 5999 minutes 0 to 11999 seconds * Settable only for FZ400/900 In case of Input data type 1: 0 to 5999 minutes 0 to 11999 seconds Data range of Memory area soak time monitor can be selected on the Soak time unit (P. 3-11).	0 (0 seconds)
77	Link area number ★ Item number: 56	—	R/W	0 to 16 0: No function	0
78	Input 1_Auto/Manual transfer selection (Area) ★ Item number: 59	—	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
79	Input 1_Manipulated output value (Area) ★ Item number: 60	—	R/W	PID control, Position proportioning PID control: –5.0 to +105.0 % Heat/Cool PID control: –105.0 to +105.0 %	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 4)					
80	Input 2_Setting change rate limiter (up) ★ Item number: 61	—	R/W	0 to Input 2_Input span 0: No function Varies with the setting of the Decimal point position.	0
81	Input 2_Setting change rate limiter (down) ★ Item number: 62	—	R/W	0 to Input 2_Input span 0: No function Varies with the setting of the Decimal point position.	0
82	Input 2_Auto/Manual transfer selection (Area) ★ Item number: 63	—	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
83	Input 2_Manipulated output value (Area) ★ Item number: 64	—	R/W	–5.0 to +105.0 %	–5.0
Setting group (Setting item selection 5)					
84	Remote/Local transfer selection (Area) ★ Item number: 65	—	R/W	When Select function for input 2 is: “Remote setting input” 0: Local mode 1: Remote mode When Remote setting input is specified: [FZ110] 0: Local mode 1: Remote mode When Select function for input 2 is: “Cascade control” 0: Single control 1: Cascade control When Select function for input 2 is: “Control with PV select” 0: Input 1 1: Input 2 When Select function for input 2 is: “2-loop control/Differential temperature control” 0: 2-loop control 1: Differential temperature control	0

: Shows the communication data of FZ400/900.

★ Data for Memory area: This is the data of the Control area selected by the Memory area transfer.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 5)					
85	Display update cycle Item number: 66	—	R/W	1: 50 ms 2: 100 ms 3: 150 ms 4: 200 ms 5: 250 ms 6: 300 ms 7: 350 ms 8: 400 ms 9: 450 ms 10: 500 ms Changing the Display update cycle will not affect the updating cycle of the communication.	1
86	Input 1_PV bias Item number: 67	—		–(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: – PV select input span) to +(PV select input span)) Varies with the setting of the Decimal point position.	0
87	Input 1_PV digital filter Item number: 68	—	R/W	0.0 to 100.0 seconds 0.0: Filter OFF	0.0
88	Input 1_PV ratio Item number: 69	—	R/W	0.500 to 1.500	1.000
89	Input 1_PV low input cut-off Item number: 70	—	R/W	0.00 to 25.00 % of Input 1_Input span (When Control with PV select: 0.00 to 25.00 % of PV select input span)	0.00
90	Input 2_PV bias (RS bias) Item number: 71	—	R/W	–(Input 2_Input span) to +(Input 2_Input span) Varies with the setting of the Decimal point position. In the case of FZ400/900, RS bias is selected by selecting “Remote setting input” at Select function for input 2. In the case of FZ110, RS bias is selected by selecting “Remote setting input.”	0

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 5)					
91	Input 2_PV digital filter (RS digital filter) Item number: 72	—	R/W	0.0 to 100.0 seconds 0.0: Filter OFF In the case of FZ400/900, RS digital filter is selected by selecting “Remote setting input” at Select function for input 2. In the case of FZ110, RS digital filter is selected by selecting “Remote setting input.”	0.0
92	Input 2_PV ratio (RS ratio) Item number: 73	—	R/W	Input 2_PV ratio 0.500 to 1.500 RS ratio 0.001 to 9.999 In the case of FZ400/900, RS ratio is selected by selecting “Remote setting input” at Select function for input 2. In the case of FZ110, RS ratio is selected by selecting “Remote setting input.”	1.000
93	Input 2_PV low input cut-off Item number: 74	—	R/W	0.00 to 25.00 % of Input 2_Input span	0.00
94	OUT1 proportional cycle time Item number: 75	—	R/W	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note1
95	OUT2 proportional cycle time Item number: 76	—	R/W	0.1 to 100.0 seconds	Relay contact output: 20.0 Voltage pulse output, Transistor output: Note2
96	OUT3 proportional cycle time Item number: 77	—	R/W	0.1 to 100.0 seconds	Voltage pulse output: Note 3

: Shows the communication data of FZ400/900.

Note 1: In case OUT1 function selection is “Input 1_Control output [cool-side]” and Input 1_Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

Note2: In case OUT2 function selection is “Input 1_Control output [cool-side]” and Input 1_Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

Note3: In case OUT3 function selection is “Input 1_Control output [cool-side]” and Input 1_Control action is “Brilliant II Heat/Cool PID control [air cooling] or [water cooling]”: 20.0
Other cases: 2.0

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 5)					
97	OUT1 minimum ON/OFF time of proportional cycle Item number: 78	—	R/W	0 to 1000 ms	0
98	OUT2 minimum ON/OFF time of proportional cycle Item number: 79	—	R/W	0 to 1000 ms	0
99	OUT3 minimum ON/OFF time of proportional cycle Item number: 80	—	R/W	0 to 1000 ms	0
Setting group (Setting item selection 6)					
100	Number of heater break alarm 1 (HBA1) delay times Item number: 82	—	R/W	0 to 255 times	5
101	Number of heater break alarm 2 (HBA2) delay times Item number: 84	—	R/W	0 to 255 times	5
102	Input 1_Manual manipulated output value Item number: 85	—	R/W	PID control, Position proportioning PID control: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] Heat/Cool PID control *: –(Input 1_Output limiter high [cool-side]) to +(Input 1_Output limiter high [heat-side])	PID control, Position proportioning PID control: –5.0 Heat/Cool PID control: 0.0

: Shows the communication data of FZ400/900.

* In case of Heat/Cool PID control, the data range has such exceptional conditions as shown below.

(1) Input 1_Output limiter high [cool-side] is ≤ 0.0 %
- Input 1_Output limiter low [heat-side] is ≤ 0.0 %: 0.0 % to +(Input 1_Output limiter high [heat-side])
- Input 1_Output limiter low [heat-side] is > 0.0 %: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side]

(2) Input 1_Output limiter high [heat-side] is ≤ 0.0 %
- Input 1_Output limiter low [cool-side] is ≤ 0.0 %: –(Input 1_Output limiter high [cool-side]) to 0.0 %
- Input 1_Output limiter low [cool-side] is > 0.0 %: –(Input 1_Output limiter high [cool-side]) to –(Input 1_Output limiter low [cool-side])

(3) Fixed at 0.0% in the following cases:
Input 1_Output limiter high [cool-side] ≤ 0.0 %, and Input 1_Output limiter high [heat-side] ≤ 0.0 %

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 6)					
103	Input 1_ Level PID setting 1 * Item number: 86	—	R/W	Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) Varies with the setting of the Decimal point position.	Input 1_ Input range high (When Control with PV select: PV select input range high)
104	Input 1_ Level PID setting 2 * Item number: 87	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
105	Input 1_ Level PID setting 3 * Item number: 88	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
106	Input 1_ Level PID setting 4 * Item number: 89	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
107	Input 1_ Level PID setting 5 * Item number: 90	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
108	Input 1_ Level PID setting 6 * Item number: 91	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
109	Input 1_ Level PID setting 7 * Item number: 92	—	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
110	For system use Item number: 93	—	—	Internal processing Do not use the register address	—

*Level PID settings 1 to 7 of Input 1 always maintain the following relation.
(Input 1_Level PID setting 1) ≤ (Input 1_Level PID setting 2) ≤ (Input 1_Level PID setting 3) ≤ (Input 1_Level PID setting 4) ≤ (Input 1_Level PID setting 5) ≤ (Input 1_Level PID setting 6) ≤ (Input 1_Level PID setting 7)

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 6)					
111	Input 1_ON/OFF action differential gap (upper) Item number: 94	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1
112	Input 1_ON/OFF action differential gap (lower) Item number: 95	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span (When Control with PV select: 0.0 to 100.0 % of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1
113	Input 2_Manual manipulated output value Item number: 96	D1122 D1123	R/W	Input 2_Output limiter low to Input 2_Output limiter high	–5.0
Setting group (Setting item selection 7)					
114	Input 2_ Level PID setting 1 * Item number: 97	—	R/W	Input 2_Input range low to Input 2_Input range high Varies with the setting of the Decimal point position.	Input 2_ Input range high
115	Input 2_ Level PID setting 2 * Item number: 98	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
116	Input 2_ Level PID setting 3 * Item number: 99	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1

: Shows the communication data of FZ400/900.

*Level PID settings 1 to 7 of Input 2 always maintain the following relation.
(Input 2_Level PID setting 1) ≤ (Input 2_Level PID setting 2) ≤ (Input 2_Level PID setting 3) ≤ (Input 2_Level PID setting 4) ≤ (Input 2_Level PID setting 5) ≤ (Input 2_Level PID setting 6) ≤ (Input 2_Level PID setting 7)

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 7)					
117	Input 2_ Level PID setting 4 * Item number: 100	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
118	Input 2_ Level PID setting 5 * Item number: 101	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
119	Input 2_ Level PID setting 6 * Item number: 102	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
120	Input 2_ Level PID setting 7 * Item number: 103	—	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
121	For system use Item number: 104	—	—	Internal processing Do not use the register address	—
122	Input 2_ON/OFF action differential gap (upper) Item number: 105	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span	TC/RTD inputs: 1 V/I inputs: 0.1
123	Input 2_ON/OFF action differential gap (lower) Item number: 106	—	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of Input 1_Input span	TC/RTD inputs: 1 V/I inputs: 0.1

: Shows the communication data of FZ400/900.

*Level PID settings 1 to 7 of Input 2 always maintain the following relation.
(Input 2_Level PID setting 1) ≤ (Input 2_Level PID setting 2) ≤ (Input 2_Level PID setting 3) ≤ (Input 2_Level PID setting 4) ≤ (Input 2_Level PID setting 5) ≤ (Input 2_Level PID setting 6) ≤ (Input 2_Level PID setting 7)

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 7)					
124	Input 1_AT bias Item number: 107	—	R/W	–(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: – (PV select input span) to + (PV select input span)) Varies with the setting of the Decimal point position.	0
125	Input 2_AT bias Item number: 108	—	R/W	–(Input 2_Input span) to +(Input 2_Input span) Varies with the setting of the Decimal point position.	0
126	Open/Close output neutral zone Item number: 109	—	R/W	0.1 to 10.0 % of output	2.0
127	Open/Close output differential gap Item number: 110	—	R/W	0.1 to 5.0 % of output	1.0
128	FF amount learning Item number: 111	—	R/W	0 to 3 0: No learning +1: Learn Input 1 +2: Learn Input 2 To select two or more functions, sum each value. When the status of the FF amount learning of the FZ has changed, the learning of the FF amount in the PLC will be also automatically updated.	0
129	Input 1_Determination point of external disturbance Item number: 112	—	R/W	–(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: – (PV select input span) to + (PV select input span)) Varies with the setting of the Decimal point position.	–1

: Shows the communication data of FZ400/900.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 8)					
130	Input 2_Determination point of external disturbance Item number: 113	—	R/W	–(Input 2_Input span) to +(Input 2_Input span) Varies with the setting of the Decimal point position.	–1
131	Cascade_Proportional band (master-side) Item number: 114	—	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 1_Input span When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Proportional band (master-side) in the PLC will be also automatically updated.	TC/RTD inputs: 30 V/I inputs: 3.0
132	Cascade_Integral time (master-side) Item number: 115	—	R/W	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds Varies with the setting of the Integral/ Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Integral time (master-side) in the PLC will be also automatically updated.	240
133	Cascade_Derivative time (master-side) Item number: 116	—	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/ Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Derivative time (master-side) in the PLC will be also automatically updated.	60

: Shows the communication data of FZ400/900.

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No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 8)					
134	Cascade_Proportional band (slave-side) Item number: 117	—	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input 2_Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of Input 2_Input span When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Proportional band (slave-side) in the PLC will be also automatically updated.	TC/RTD inputs: 30 V/I inputs: 3.0
135	Cascade_Integral time (slave-side) Item number: 118	—	R/W	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds Varies with the setting of the Integral/ Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Integral time (slave -side) in the PLC will be also automatically updated.	240
136	Cascade_Derivative time (slave-side) Item number: 119	—	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action Varies with the setting of the Integral/ Derivative time decimal point position. When the Input 1_Autotuning (AT) in the FZ has been changed to “0” from “1,” the Cascade_Derivative time (slave-side) in the PLC will be also automatically updated.	60
137	Cascade_Digital filter Item number: 120	—	R/W	0.0 to 100.0 seconds 0.0: Filter OFF	10.0
138	Cascade_Scale high Item number: 121	—	R/W	Cascade_Scale low to Input 2_Setting limiter high Varies with the setting of the Decimal point position.	Input 2_ Setting limiter high

: Shows the communication data of FZ400/900.

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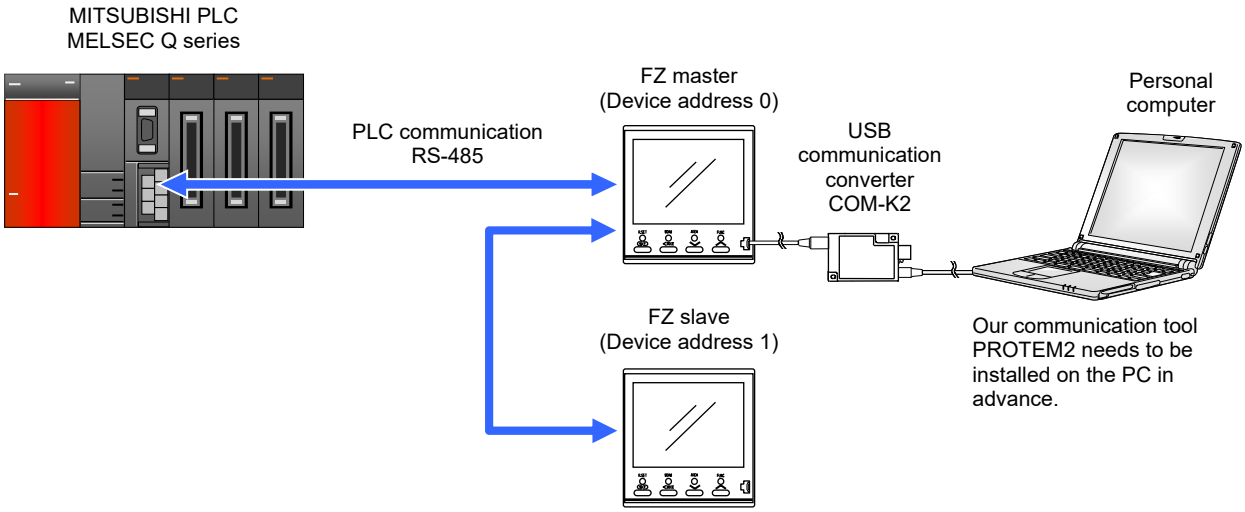
No.	Name	Register address	Attri-bute	Data range	Factory set value
Setting group (Setting item selection 8)					
139	Cascade_Scale low Item number: 122	—	R/W	Input 2_Setting limiter low to Cascade_Scale high Varies with the setting of the Decimal point position.	Input 2_ Setting limiter low
140	PV select transfer level Item number: 123	—	R/W	Input 1_Input range low to Input 1_Input range high Varies with the setting of the Decimal point position.	Input 1_ Input range high
141	PV select transfer time Item number: 124	—	R/W	0.0 to 100.0 seconds	0.0

: Shows the communication data of FZ400/900.

6.3 Example of PLC Communication Data Map Editing

Example: Reducing the number of communication data of FZ master (Device address 0) and changing the register start number of FZ slave (Device address 1). (In case of a double word)

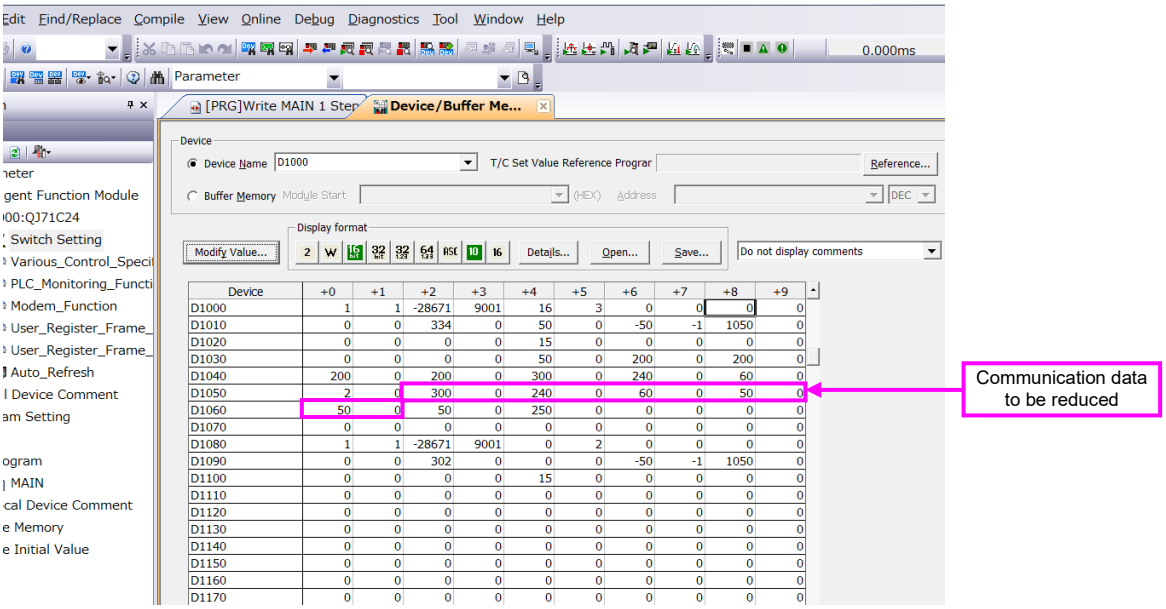


■ Communication data to be reduced

In this example, all of communcation data in Setting item selections 3 and 4 of the FZ master (Device number 0) will be removed.

Group	Item	Name	Register address assigned as a factory set value	
Setting group	Setting item selection 3	Input 1_Proportional band [cool-side]	D1052	D1053
Setting group	Setting item selection 4	Input 1_Integral time [cool-side]	D1054	D1055
Setting group	Setting item selection 4	Input 1_Derivative time [cool-side]	D1056	D1057
Setting group	Setting item selection 4	Input 1_Setting change rate limiter (up)	D1058	D1059
Setting group	Setting item selection 4	Input 1_Setting change rate limiter (down)	D1060	D1061

Display example of GX Works2

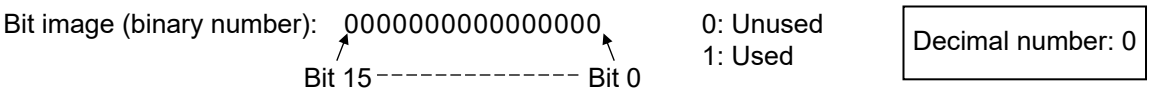


(1) Reducing the communication data of FZ master

Here in this example, the communication data of Setting item selections 3 and 4 of the FZ master will be removed using PROTEM2.

- How to set

1. First, calculate the set values of Setting item selections 3 and 4 in decimal format.
Set "0" (unused) to the communication data to be removed (of Setting item selections 3 and 4) and convert the values from binary to decimal. In this example, all items are set to "0: Unused" and therefore the set value is "0."



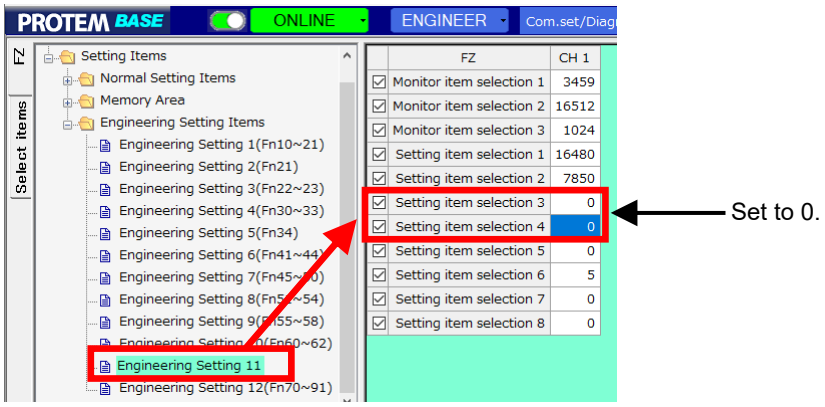
Setting item selection 3

Bit	Item number	Communication data (Setting items)	Factory set value	
			Binary number	Decimal number
0	33	Input 1_Output limiter high [heat-side]	0	
1	34	Input 1_Output limiter low [heat-side]	0	
2	35	Input 1_Control loop break alarm (LBA) time	0	
3	36	Input 1_LBA deadband (LBD)	0	
4	37	Input 2_Proportional band	0	
5	38	Input 2_Integral time	0	
6	39	Input 2_Derivative time	0	
7	40	Input 2_Control response parameter	0	**0**
8	41	Input 2_Proactive intensity	0	
9	42	Input 2_Manual reset	0	
10	43	Input 2_FF amount	0	
11	44	Input 2_Output limiter high	0	
12	45	Input 2_Output limiter low	0	
13	46	Input 2_Control loop break alarm (LBA) time	0	
14	47	Input 2_LBA deadband (LBD)	0	
15	48	Input 1_Proportional band [cool-side]	**0**	

Setting item selection 4

Bit	Item number	Communication data (Setting items)	Factory set value	
			Binary number	Decimal number
0	49	Input 1_Integral time [cool-side]	**0**	
1	50	Input 1_Derivative time [cool-side]	**0**	
2	51	Input 1_Overlap/Deadband	0	
3	52	Input 1_Output limiter high [cool-side]	0	
4	53	Input 1_Output limiter low [cool -side]	0	
5	54	Select Trigger type for Memory area transfer	0	
6	55	Area soak time	0	
7	56	Link area number	0	**0**
8	57	Input 1_Setting change rate limiter (up)	**0**	
9	58	Input 1_Setting change rate limiter (down)	**0**	
10	59	Input 1_Auto/Manual transfer selection (Area)	0	
11	60	Input 1_Manipulated output value (Area)	0	
12	61	Input 2_Setting change rate limiter (up)	0	
13	62	Input 2_Setting change rate limiter (down)	0	
14	63	Input 2_Auto/Manual transfer selection (Area)	0	
15	64	Input 2_Manipulated output value (Area)	0	

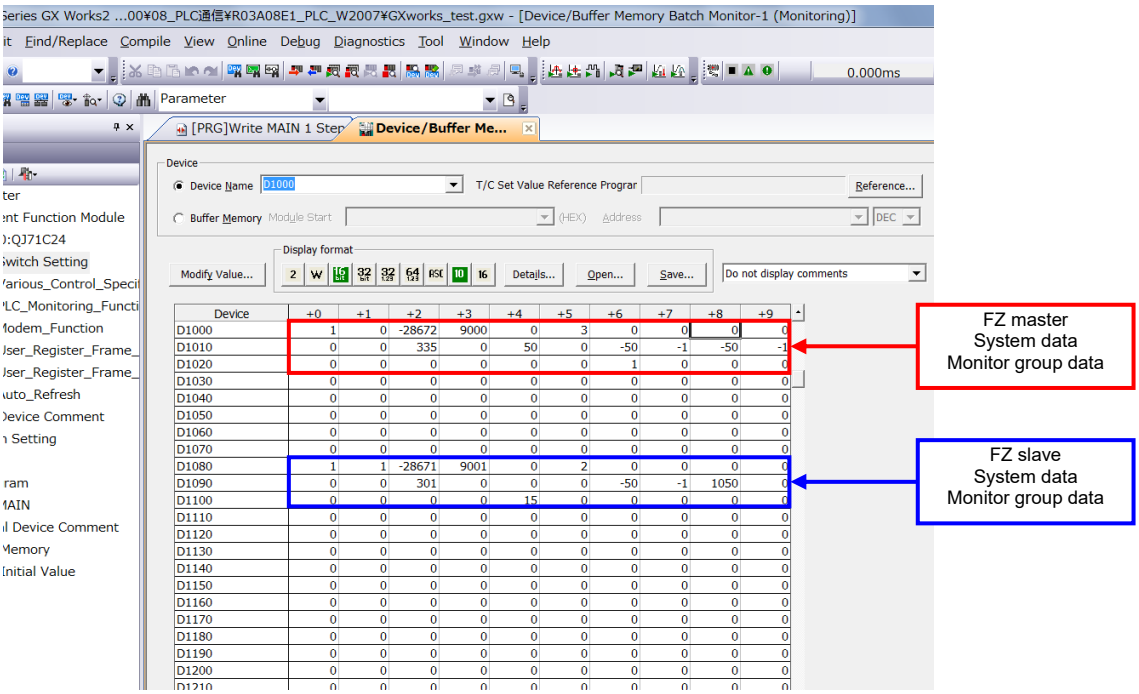
2. Use PROTEM2 to set “0” to Setting item selection 3 and 4 of the FZ master.



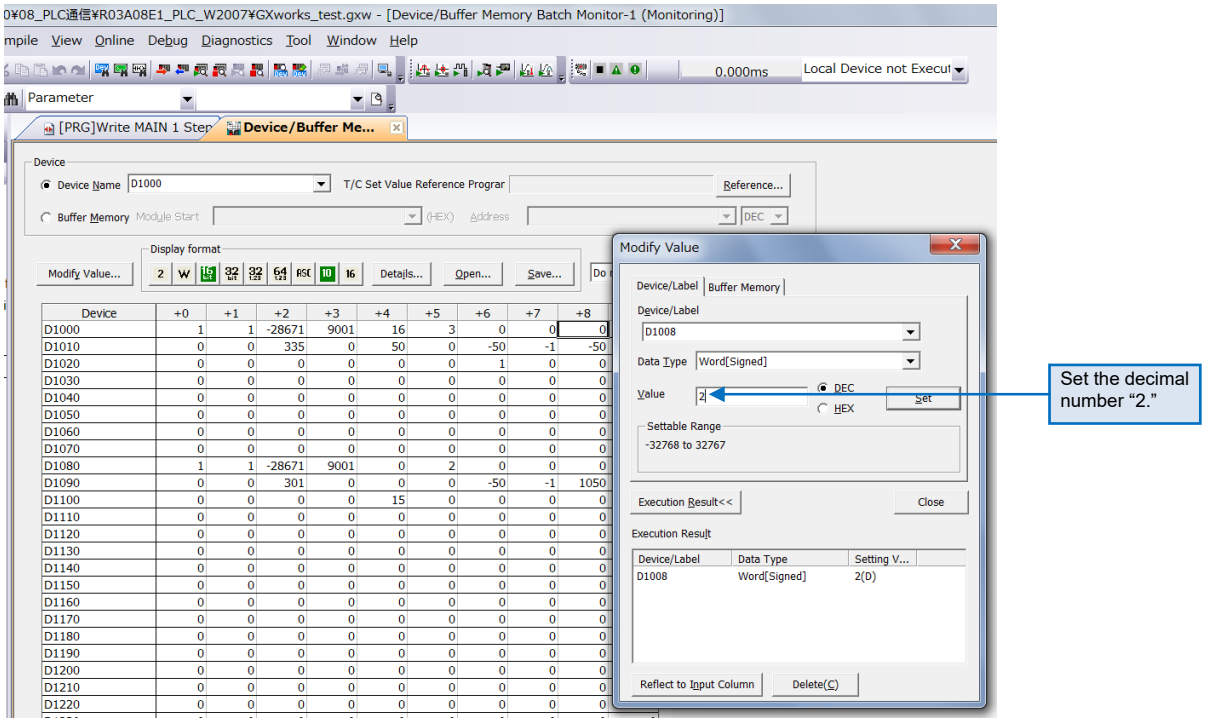
PLC communication environment setting screen of PROTEM2

3. Turn off the power of the FZ master and then turn it back on. When the power is turned on, the new values will take effect.

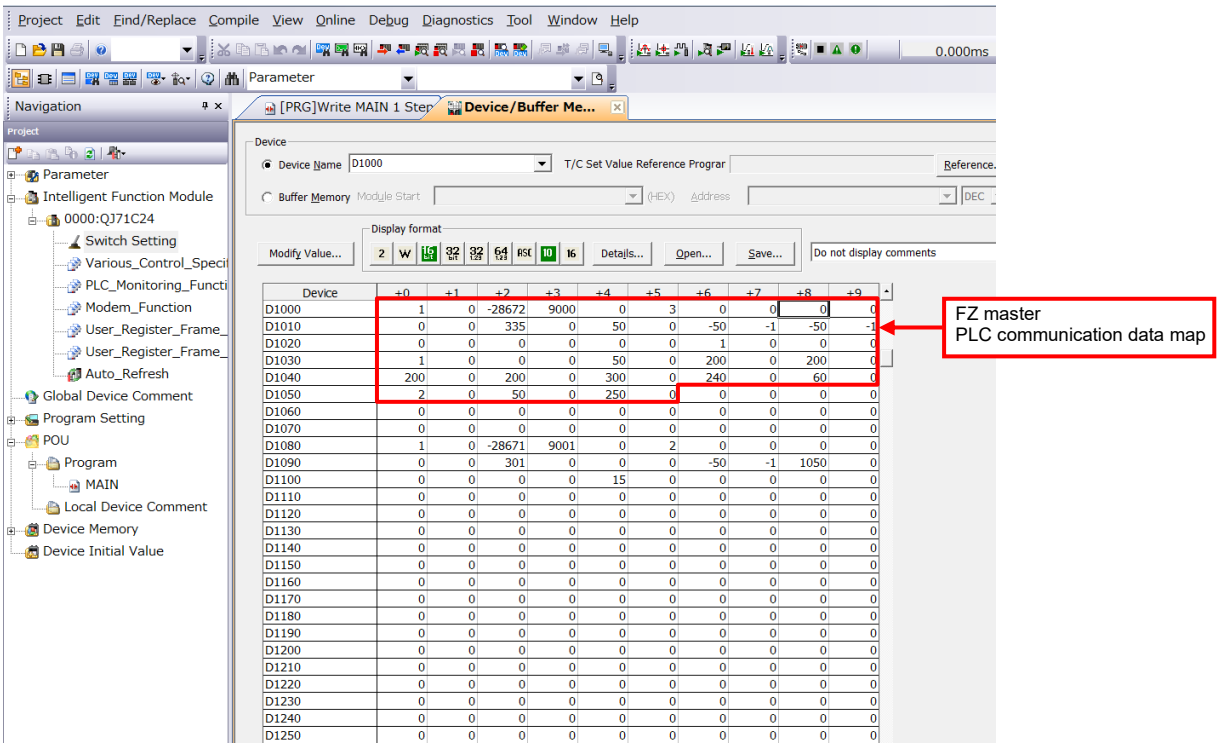
4. Check the edited PLC communication data map with “GX Works2.”
Clear PLC memory by the “GX Works2.”



5. Configure the initial settings. With request item number (D1007) set to "0," set the monitor request bit (Bit 1) of request command (D1008) to "1" (decimal number: 2), and write the setting group communication data of FZ master to the PLC.



6. The PLC communication data map of FZ master has been reduced from D1065 to D1055.



When communication data is added, the position of the added data will be according to the tables of Monitor item selection and Setting item selection on P. 5-8 to 5-13.

[Example]
At the time of shipment, register addresses of setting item selection 1 are assigned as in the following table. When "Input 1_Startup tuning (ST)" on item number 9 is added, change the binary number of item 9 to "1." When item number 9 becomes valid, register address(es) are assigned. Register address(es) will be shifted by the number of the added address(es).

Setting item selection 1

Bit	Item number	Communication data (Setting items)	Factory set value		Register address (Double word)	
			Binary	Decimal		
0	1	Interlock release	0		—	—
1	2	Memory area transfer	0		—	—
2	3	Input 1_Hold reset	0		—	—
3	4	Input 2_Hold reset	0		—	—
4	5	Bottom suppression start signal	0		—	—
5	6	RUN/STOP transfer	1		D1030	D1031
6	7	Input 1_Autotuning (AT)	1		D1032	D1033
7	8	Input 2_Autotuning (AT)	0	16480	—	—
8	9	Input 1_Startup tuning (ST)	0		—	—
9	10	Input 2_Startup tuning (ST)	0		—	—
10	11	Input 1_Auto/Manual transfer	0		—	—
11	12	Input 2_Auto/Manual transfer	0		—	—
12	13	Remote/Local transfer	0		—	—
13	14	Control area Local/External transfer	0		—	—
14	15	Input 1_Set value (SV)	1		D1034	D1035
15	16	Input 2_Set value (SV)	0		—	—

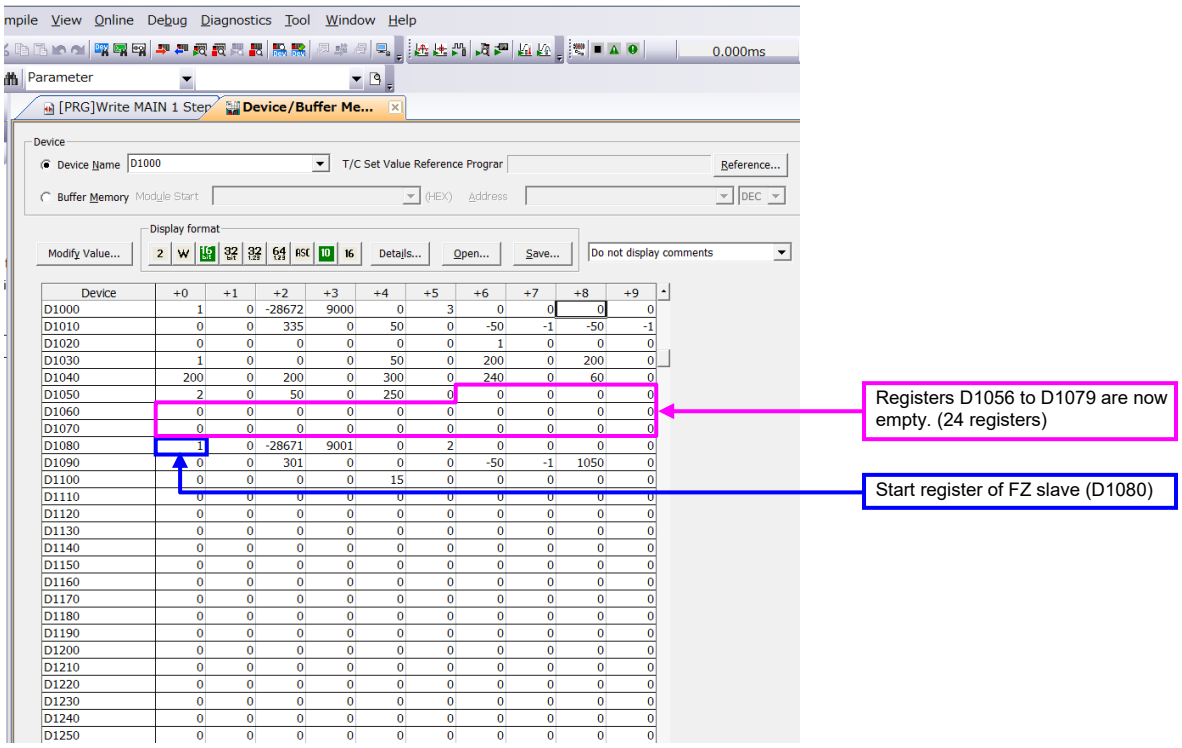
Add

Setting item selection 1

Bit	Item number	Communication data (Setting items)	Factory set value		Register address (Double word)	
			Binary	Decimal		
0	1	Interlock release	0		—	—
1	2	Memory area transfer	0		—	—
2	3	Input 1_Hold reset	0		—	—
3	4	Input 2_Hold reset	0		—	—
4	5	Bottom suppression start signal	0		—	—
5	6	RUN/STOP transfer	1		D1030	D1031
6	7	Input 1_Autotuning (AT)	1		D1032	D1033
7	8	Input 2_Autotuning (AT)	0	16480	—	—
8	9	Input 1_Startup tuning (ST)	1		D1034	D1035
9	10	Input 2_Startup tuning (ST)	0		—	—
10	11	Input 1_Auto/Manual transfer	0		—	—
11	12	Input 2_Auto/Manual transfer	0		—	—
12	13	Remote/Local transfer	0		—	—
13	14	Control area Local/External transfer	0		—	—
14	15	Input 1_Set value (SV)	1		D1036	D1037
15	16	Input 2_Set value (SV)	0		—	—

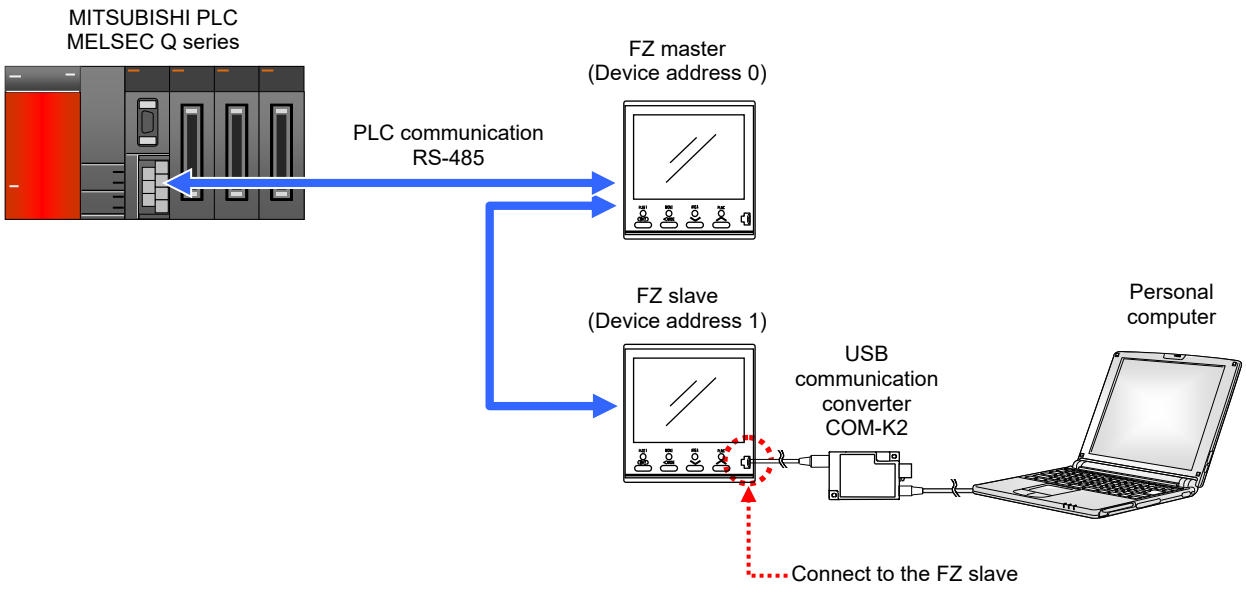
(2) Change the register start number of a FZ slave

Registers D1052 to D1061 (10 registers) are now empty, and thus to fill in the empty registers, the register start number of FZ slave must be changed.
Leave no empty register areas D1066 to D1079 (14 registers) that were not used at the time of shipment.



Device	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
D1000	1	0	-28672	9000	0	3	0	0	0	0
D1010	0	0	335	0	50	0	-50	-1	-50	-1
D1020	0	0	0	0	0	0	1	0	0	0
D1030	1	0	0	0	50	0	200	0	200	0
D1040	200	0	200	0	300	0	240	0	60	0
D1050	2	0	50	0	250	0	0	0	0	0
D1060	0	0	0	0	0	0	0	0	0	0
D1070	0	0	0	0	0	0	0	0	0	0
D1080	1	0	-28671	9001	0	2	0	0	0	0
D1090	0	0	301	0	0	0	-50	-1	1050	0
D1100	0	0	0	0	15	0	0	0	0	0
D1110	0	0	0	0	0	0	0	0	0	0
D1120	0	0	0	0	0	0	0	0	0	0
D1130	0	0	0	0	0	0	0	0	0	0
D1140	0	0	0	0	0	0	0	0	0	0
D1150	0	0	0	0	0	0	0	0	0	0
D1160	0	0	0	0	0	0	0	0	0	0
D1170	0	0	0	0	0	0	0	0	0	0
D1180	0	0	0	0	0	0	0	0	0	0
D1190	0	0	0	0	0	0	0	0	0	0
D1200	0	0	0	0	0	0	0	0	0	0
D1210	0	0	0	0	0	0	0	0	0	0
D1220	0	0	0	0	0	0	0	0	0	0
D1230	0	0	0	0	0	0	0	0	0	0
D1240	0	0	0	0	0	0	0	0	0	0
D1250	0	0	0	0	0	0	0	0	0	0

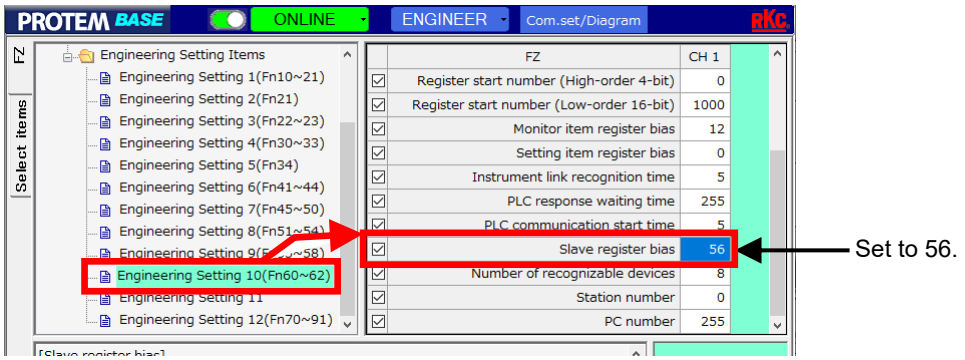
1. Connect a loader communication cable to FZ slave.



2. Set the slave register bias of the FZ slave in the PLC communication environment setting item.

   Slave register bias value = Slave register start number – Master register start number

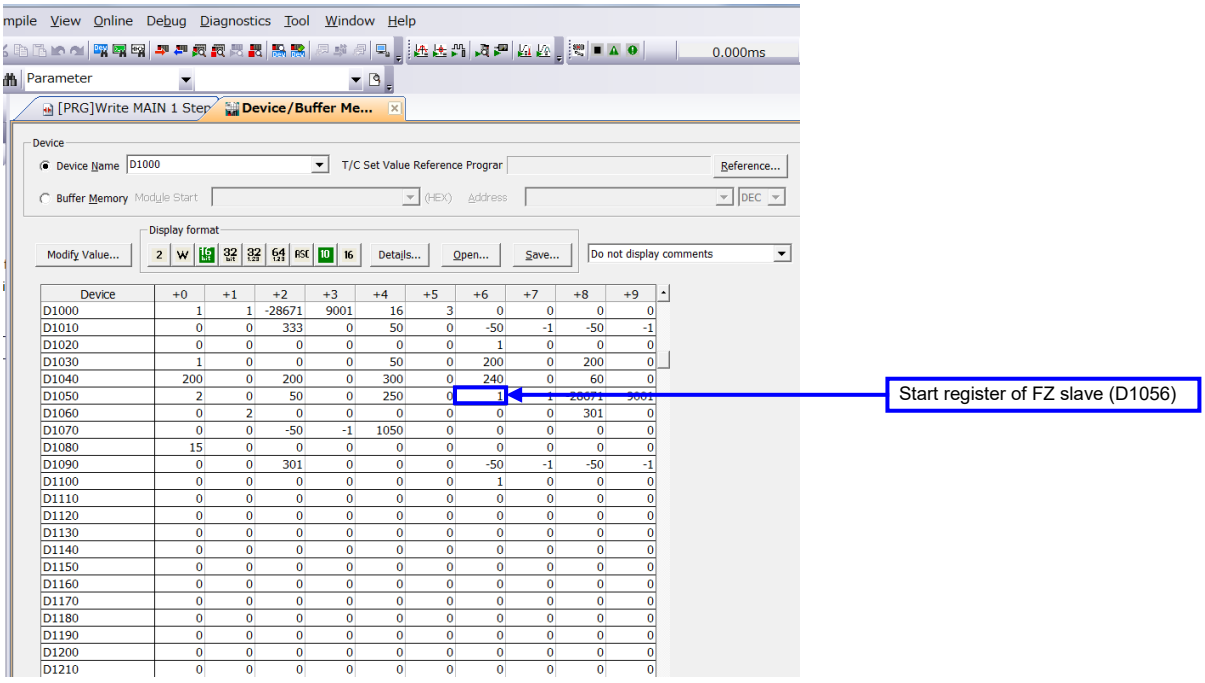
   To change the register start number for the communication data of FZ slave to D1056, set the slave register bias value to "56" (D1056 – D1000 = 56).



PLC communication environment setting screen of PROTEM2

3. Turn off the power of the FZ slaver and then turn it back on. When the power is turned on, the new values will take effect.

4. Check the edited PLC communication data map with "GX Works2."
   The first register for the communication data of FZ slave has been changed from D1080 to D1056.



Device	+0	+1	+2	+3	+4	+5	+6	+7	+8	+9
D1000	1	1	-28671	9001	16	3	0	0	0	0
D1010	0	0	333	0	50	0	-50	-1	-50	-1
D1020	0	0	0	0	0	0	1	0	0	0
D1030	1	0	0	0	50	0	200	0	200	0
D1040	200	0	200	0	300	0	240	0	60	0
D1050	2	0	50	0	250	0	1	1	28671	9001
D1060	0	2	0	0	0	0	0	0	301	0
D1070	0	0	-50	-1	1050	0	0	0	0	0
D1080	15	0	0	0	0	0	0	0	0	0
D1090	0	0	301	0	0	0	-50	-1	-50	-1
D1100	0	0	0	0	0	0	1	0	0	0
D1110	0	0	0	0	0	0	0	0	0	0
D1120	0	0	0	0	0	0	0	0	0	0
D1130	0	0	0	0	0	0	0	0	0	0
D1140	0	0	0	0	0	0	0	0	0	0
D1150	0	0	0	0	0	0	0	0	0	0
D1160	0	0	0	0	0	0	0	0	0	0
D1170	0	0	0	0	0	0	0	0	0	0
D1180	0	0	0	0	0	0	0	0	0	0
D1190	0	0	0	0	0	0	0	0	0	0
D1200	0	0	0	0	0	0	0	0	0	0
D1210	0	0	0	0	0	0	0	0	0	0

MEMO

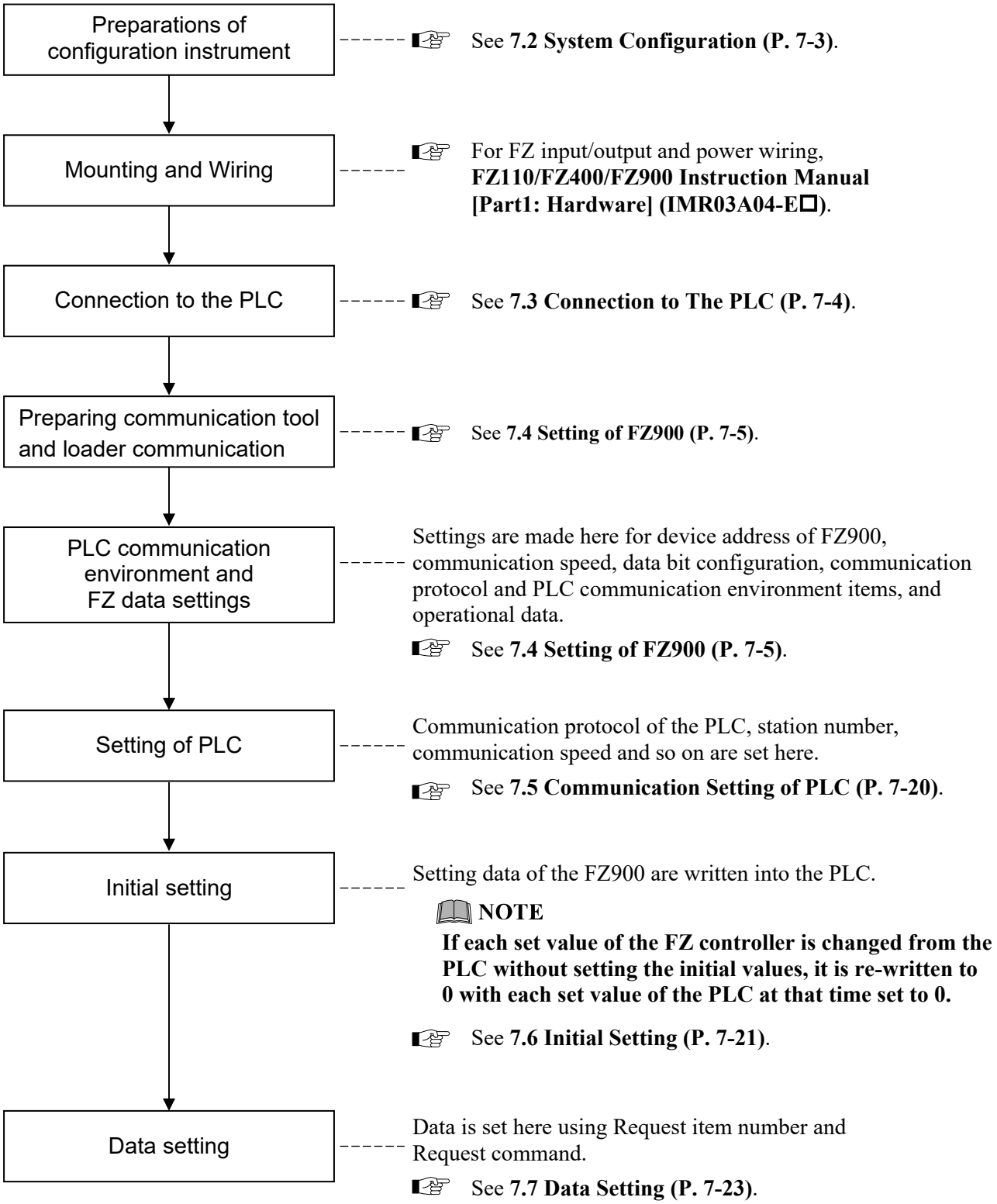
7

USAGE EXAMPLE

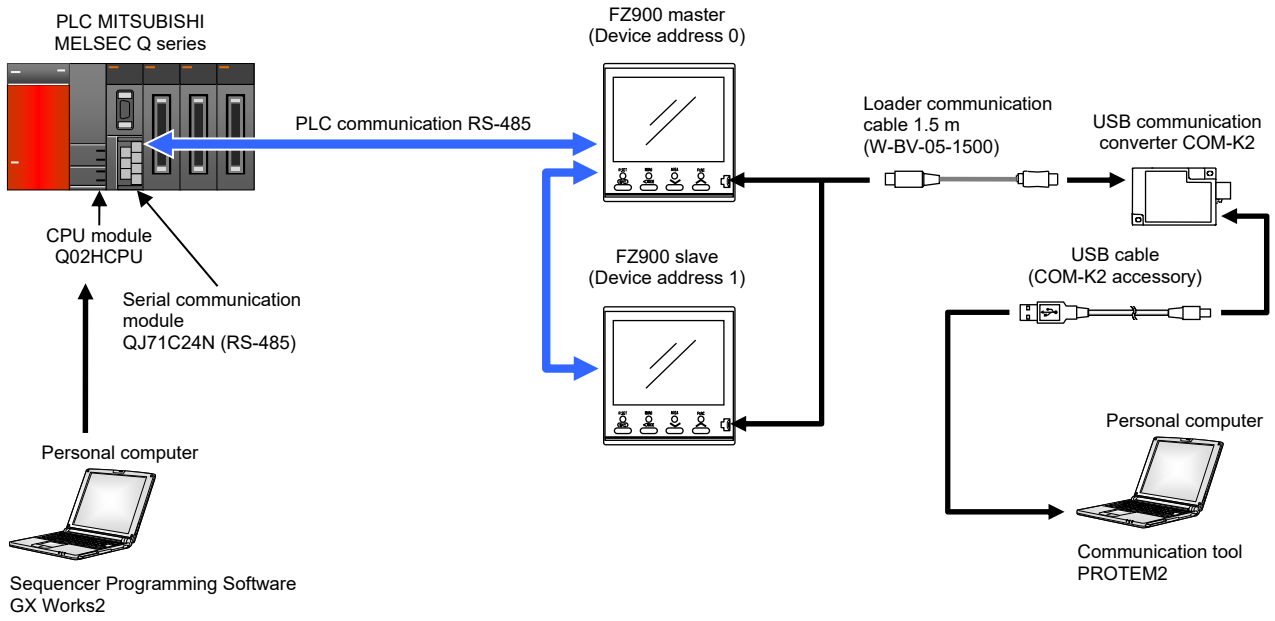
7.1 Handling Procedures

This section explains the data setting procedure when two FZ900 are connected to a MELSEC Q series PLC (Mitsubishi Electric).

Numeric values used in the example are just examples. They are different from the values users may use in their actual application.



7.2 System Configuration



■ Use instruments

- **PLC MITSUBISHI MELSEC Q series**

  CPU unit Q02HCPU: 1
  Serial communication unit QJ71C24N (RS-485): 1
  Power supply, I/O module, etc.

- **FZ900**

  FZ900 (Master instrument: Device address 0): 1
  FZ900 (Slave instrument: Device address 1): 1

- **Communication converter**

  USB communication converter COM-K2 (RKC product): 1
  Loader communication cable W-BV-05 [sold separately]: 1

- **Personal computer:** 1

  Windows 10 (64-bit version).

- **Communication programs**

  Communication tool PROTEM2 (Available for download at our website.)
  Sequencer Programming Software GX Works2 [Manufactured by MITSUBISHI ELECTRIC CO., LTD.,] *

  * Consult the instruction manuals of the PLC for how to use GX Works 2 and how to wire to the PLC.

■ Other condition (FZ900)

Input data type: Double word

7.3 Connection to The PLC

Connect a FZ to PLC (serial communication unit QJ71C24N).

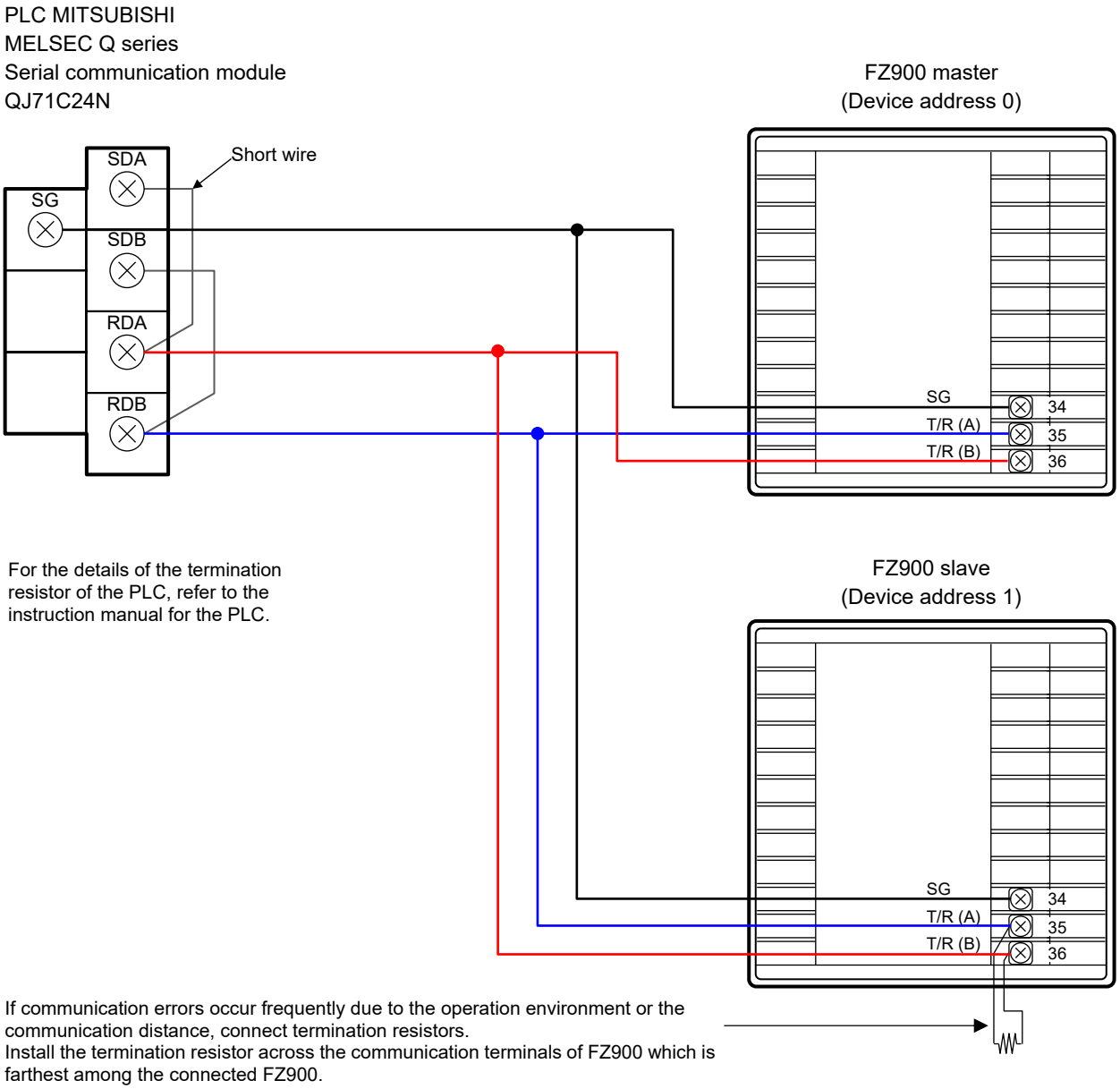
NOTE

Note that the signal polarity symbols (A and B) are opposite to each other between the PLC (MELSEC series) and the FZ series controller. Normally A is connected to A and B to B. However, in this case, A must be connected to B, and B must be connected to A

• FZ900 communication terminal (RS-485)

Terminal No.	Symbol	Signal name
34	SG	Signal ground
35	T/R (A)	Send data/Receive data
36	T/R (B)	Send data/Receive data

■ Wiring example



7.4 Setting of FZ900

First, PLC-communication environment data necessary for communication with a PLC and engineering data and operational data of the FZ900 must be set up. This setting is required on each FZ900.

(1) Installing PROTEM2

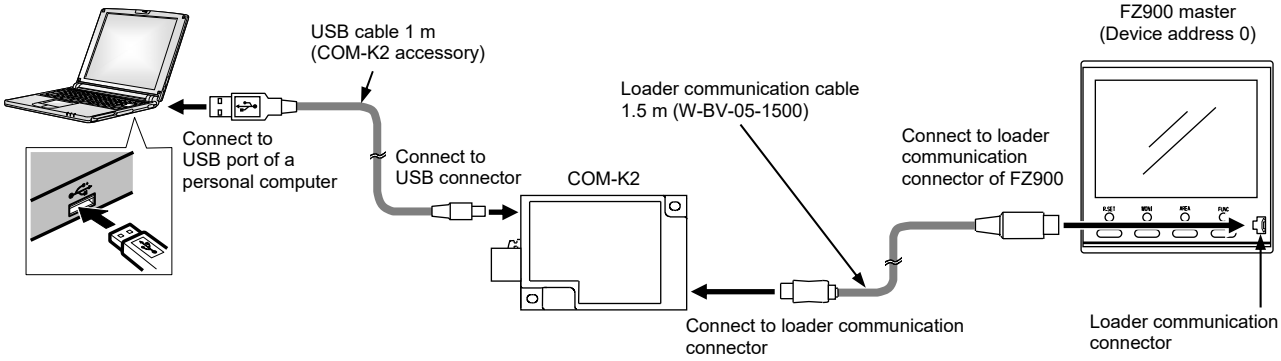
Download PROTEM2 from our website and install it on your personal computer.

(2) Installing COM-K2 driver

If a COM-K2 driver is not yet installed on your personal computer, install the driver now. The driver can be downloaded from the official RKC website.

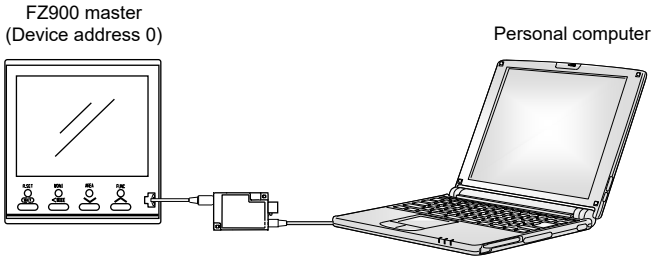
(3) Connection of loader communication

Connect a FZ900 master (device address 0) to converter COM-K2 and personal computer by connection cable.



(4) Configuring the PLC communication environment item and FZ setting data of FZ900 master

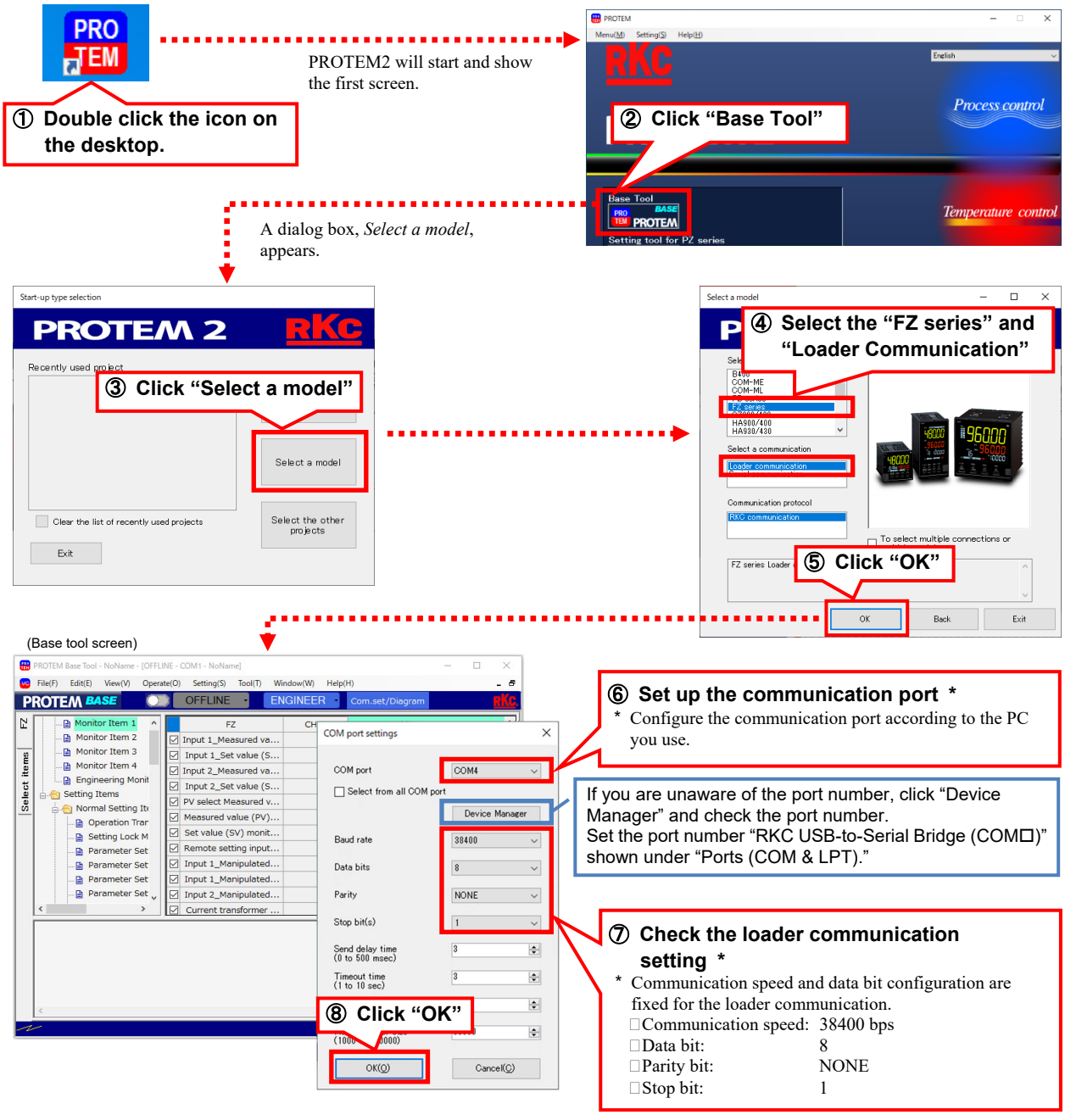
Configure the PLC communication environment and other data of the FZ900 master (device address 0) on your personal computer.



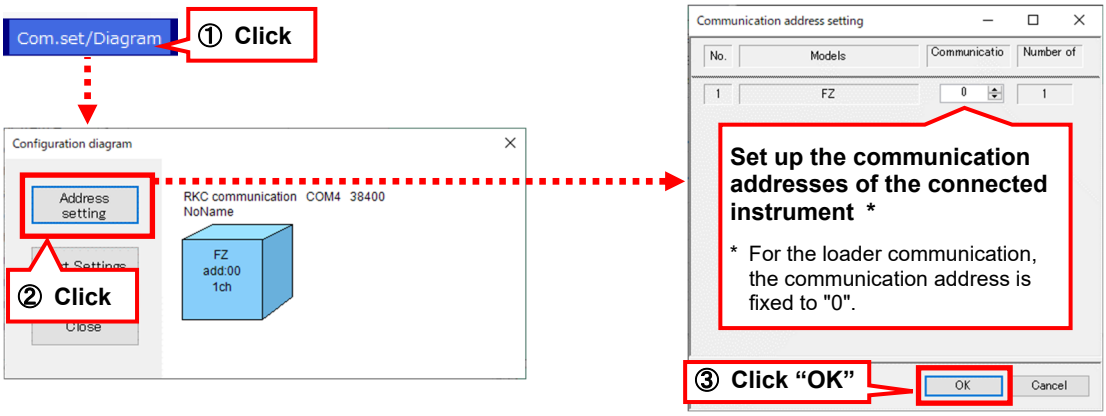
1. Turn on the power of the personal computer

2. Start PROTEM2, and set the communication port.

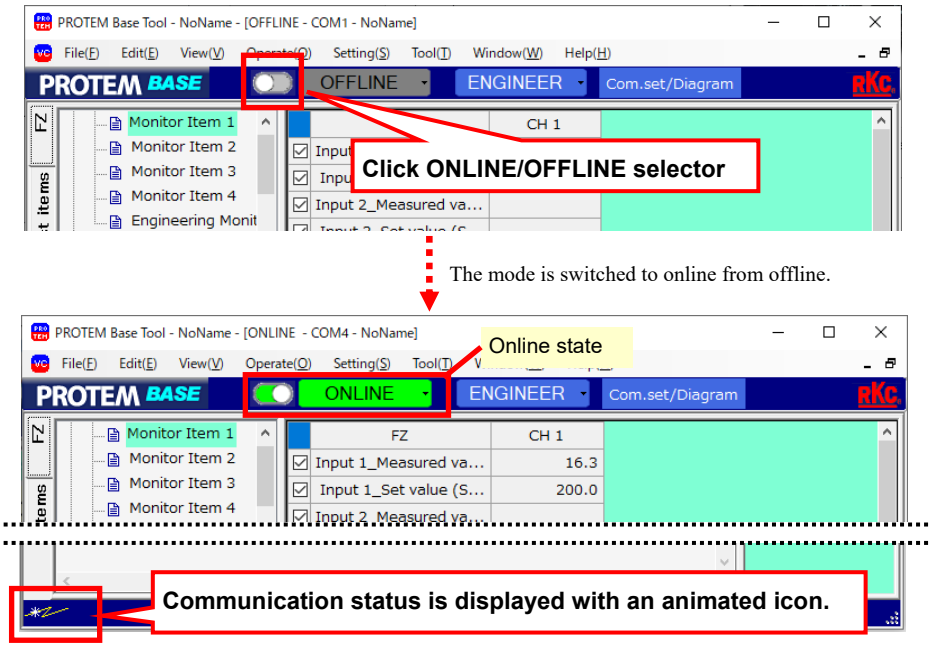
If you use the PROTEM2 for the first time, you have to create a new project and set a communication port.



3. Click “Com.set/Diagram” and check the communication address

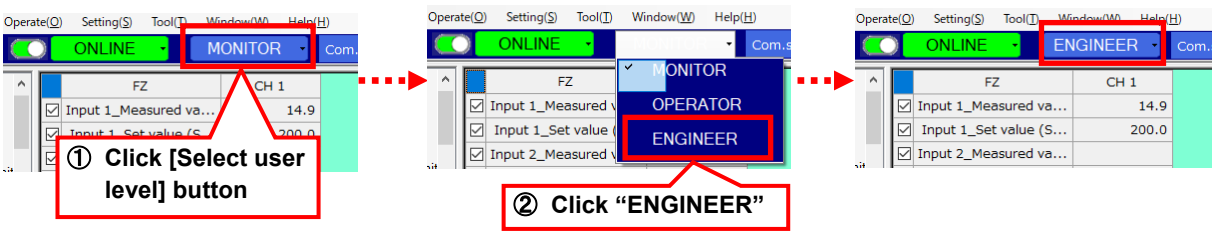


4. Switching to online

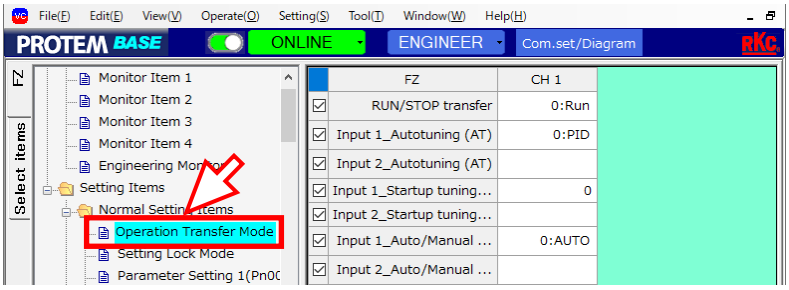


5. Authorize a user to set the Engineering Setting Items.

To allow the user to change the set values, the user level must be switched.

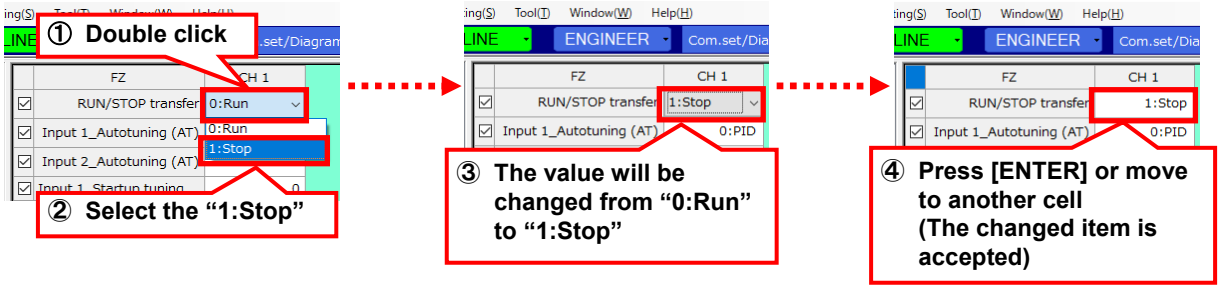


6. Select the “Operation Transfer Mode” in a TreeView

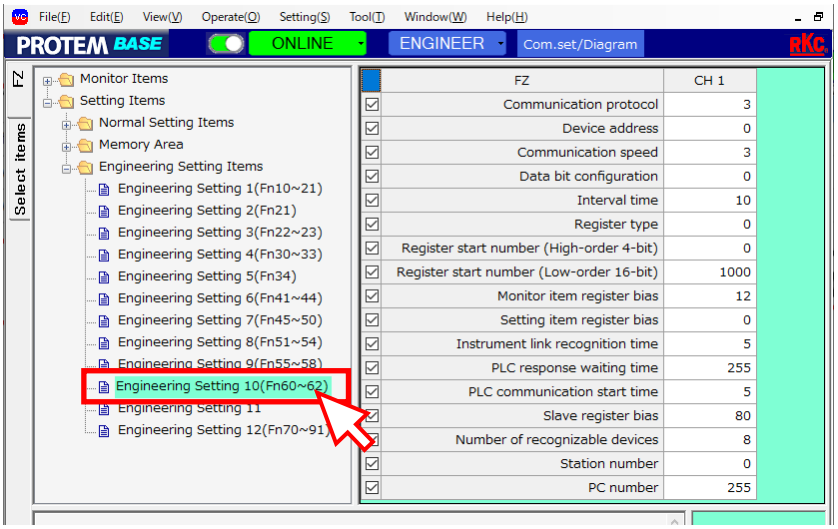


7. Control is stopped

Switch over to “1: Stop” in the RUN/STOP transfer.



8. Select the “Engineer Setting 10(Fn60~62)” in a TreeView



9. Set the communication related items and PLC communication environment items

Set communication related parameters (such as communication speed) and PLC communication environment items at “Engineer Setting 10(Fn60~62).”

Set as follows for the data in “Engineer Setting 10(Fn60~62).” (See **Table 1**.)

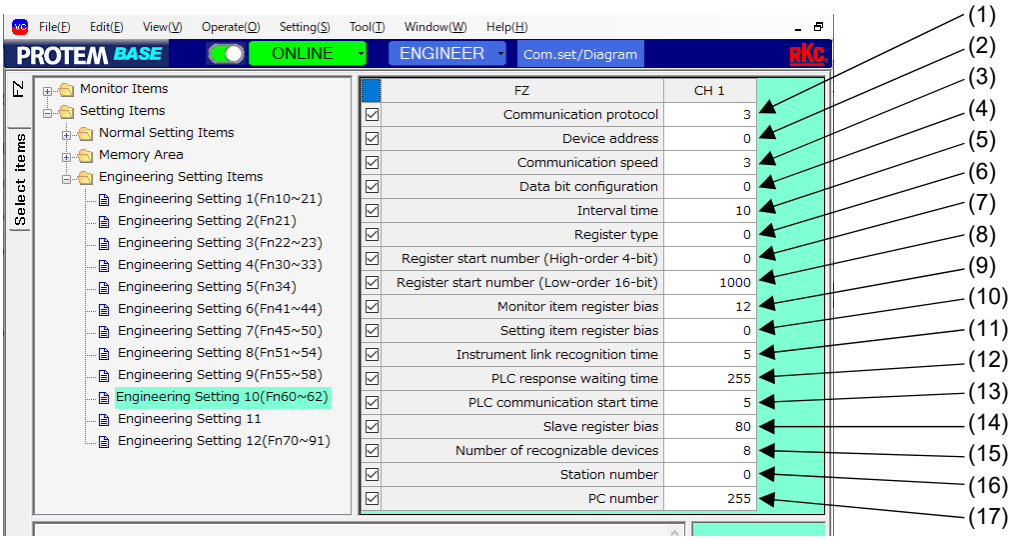


Table 1

Setting items	Set value	
(1) Communication protocol	3	
(2) Device address	0	(Factory set value)
(3) Communication speed	3 (19200 bps)	(Factory set value)
(4) Data bit configuration	0	(Factory set value)
(5) Interval time	10	(Factory set value)
(6) Register type (D, R, W, ZR) [1]	0 (D register)	(Factory set value)
(7) Register start number (High-order 4-bit) [1]	0	(Factory set value)
(8) Register start number (Low-order 16-bit) [1]	1000	(Factory set value)
(9) Monitor item register bias [1]	12	(Factory set value)
(10) Setting item register bias [1]	0	(Factory set value)
(11) Instrument link recognition time	5 seconds	(Factory set value)
(12) PLC response waiting time	255 ms	(Factory set value)
(13) PLC communication start time [2]	5 seconds	(Factory set value)
(14) Slave register bias [1]	80	(Factory set value)
(15) Number of recognizable devices [3]	2	
(16) Station number	0	(Factory set value)
(17) PC number	255	(Factory set value)

These values can be changed to change the starting number of the PLC communication data register.

[1] Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.

[2] The PLC communication start time is the time that writing of the system data starts.
Actual communication with the PLC by request command can only take place after the system communication state (D1000) changes to “1.”

[3] Only the FZ master device (device address 0) can be set up.

☞ For the Register start number, Monitor item register bias and Setting item register bias, see **P. 5-18**.

10. Select the communication data to use.

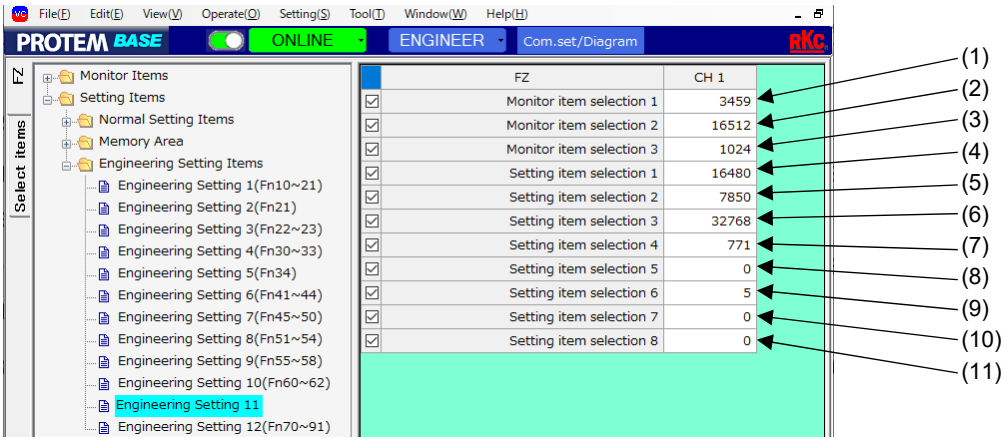
Select the communication data that are sent/received between the PLC and the FZ master (device address 0). Selection of the communication data can be done at “Engineer Setting 11.”

In the following example, the data in the Engineering Setting 11 are used as they are configured at the factory. (See **Table 2**)

☞ To select communication data, see **6.3 Example of PLC Communication Data Map Editing (P. 6-61)**.

☞ For the communication data type and data range, see the following sections:

- **P. 5-8 to P. 5-13 of 5.2.1 Setting items list**
- **6.2 PLC Communication Data Map (P. 6-23)**



Communication data of monitor group is assigned as a bit image in binary numbers.

Bit image: 0000000000000000 (Bit 15 ... Bit 0)

0: Unused
1: Used

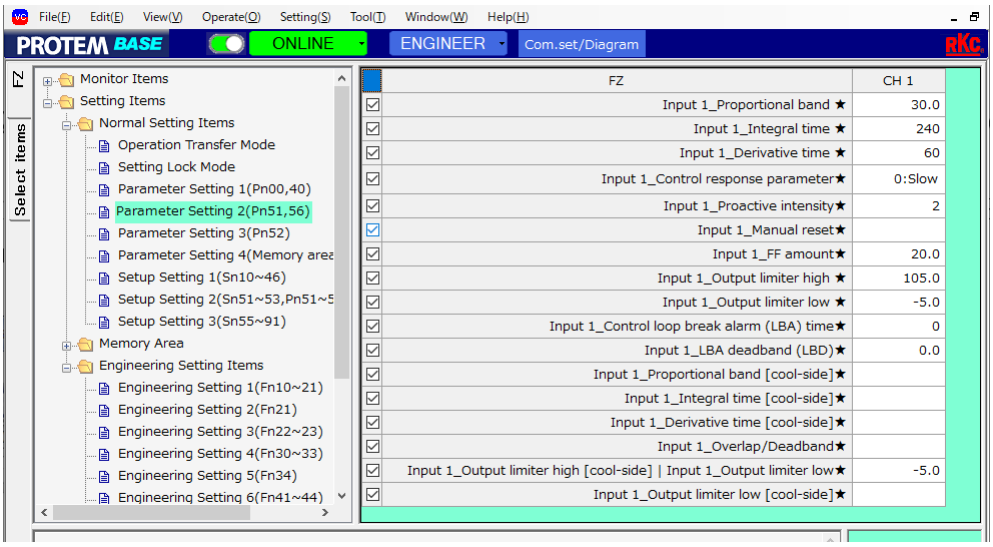
Table 2

Setting item	Set value (factory set value)	
	Bit	Decimal
(1) Monitor item selection 1	0000110110000011	3459
(2) Monitor item selection 2	0100000010000000	16512
(3) Monitor item selection 3	0000010000000000	1024
(4) Setting item selection 1	0100000001100000	16480
(5) Setting item selection 2	0001111010101010	7850
(6) Setting item selection 3	1000000000000000	32768
(7) Setting item selection 4	0000001100000011	771
(8) Setting item selection 5	0000000000000000	0
(9) Setting item selection 6	0000000000000101	5
(10) Setting item selection 7	0000000000000000	0
(11) Setting item selection 8	0000000000000000	0

11. Make other initial setting

Following the setting of the PLC environment items, set up necessary functions and a set value (SV) to operate the FZ900 master (device address 0). This setting can be done using PROTEM2.

☞ Refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)** for non-PLC communication related functions and parameters.



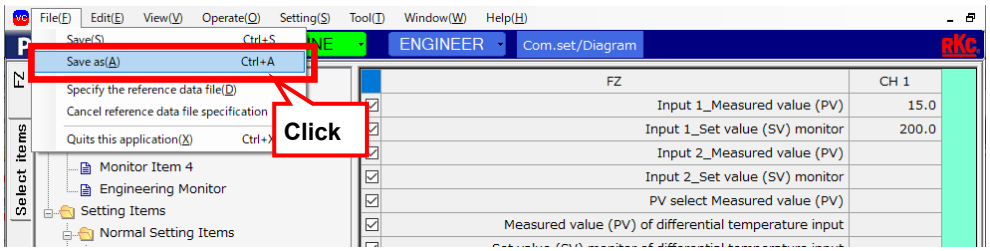
12. Activate the settings

To activate the settings done so far, shut down the FZ900 master (device address 0) once, and reapply power to the instrument. After power up, the modified values become effective.

If the FZ is running on the power from the COM-K2 without turning on the mains supply, remove the loader communication cable once and reconnect it to the FZ. The same effect can be obtained as powering up the FZ.

13. Save the project

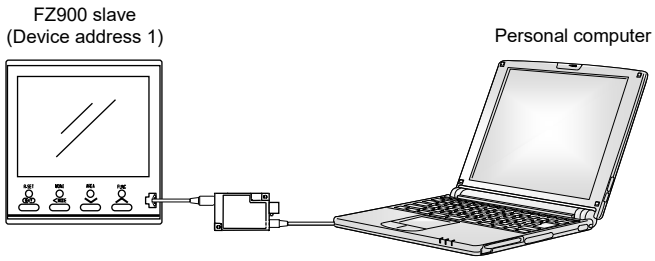
Save the PROTEM2 project used to set the FZ900 master (device address 0). Click “File (F)” and “Save as (A)” to save the project with a project name.



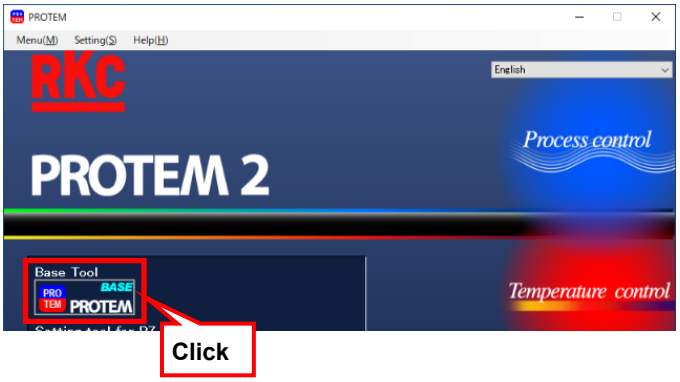
(5) Configuring the PLC communication environment item and FZ setting data of FZ900 slave

Following the setting of the FZ900 master (device address 0), the FZ900 slave (device address 1), set up the personal computer for the PLC communication environment setting and the initial setting.

1. Connect the loader communication cable to FZ900 slave (device address 1)

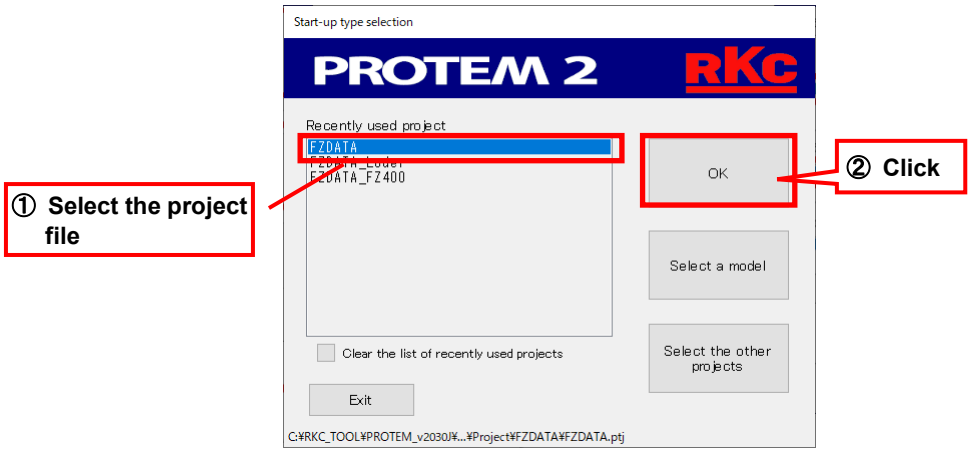


2. Click “Base Tool”



3. Open the project file used for the FZ900 master.

Select a project file to use and click “OK.”



4. Similar to setting the FZ900 master, follow the procedures **4** through **8** to select the Engineering Setting 10(Fn60~62) screen.

5. Set the communication related items and PLC communication environment items of FZ900 slave (device address 1)

Set as follows for the data in “Engineer Setting 10(Fn60~62).” (See **Table 3**.)

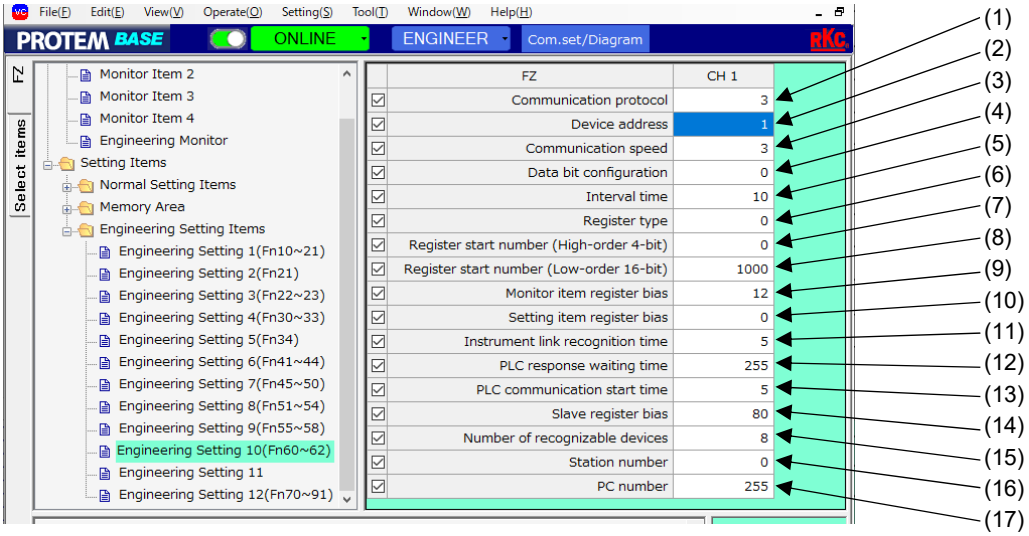


Table 3

Setting items		Set value	
(1)	Communication protocol	3	
(2)	Device address	1	
(3)	Communication speed	3 (19200 bps)	(Factory set value)
(4)	Data bit configuration	0	(Factory set value)
(5)	Interval time	10	(Factory set value)
(6)	Register type (D, R, W, ZR) [1]	0 (D register)	(Factory set value)
(7)	Register start number (High-order 4-bit) [1]	0	(Factory set value)
(8)	Register start number (Low-order 16-bit) [1]	1000	(Factory set value)
(9)	Monitor item register bias [1]	12	(Factory set value)
(10)	Setting item register bias [1]	0	(Factory set value)
(11)	Instrument link recognition time	5 seconds	(Factory set value)
(12)	PLC response waiting time	255 ms	(Factory set value)
(13)	PLC communication start time [2]	5 seconds	(Factory set value)
(14)	Slave register bias [1]	80	(Factory set value)
(15)	Number of recognizable devices [3]	8	(Factory set value)
(16)	Station number	0	(Factory set value)
(17)	PC number	255	(Factory set value)

These values can be changed to change the starting number of the PLC communication data register.

[1] Usable register ranges and types vary depending on used CPU types. For register ranges and types that can actually be used, refer to the PLC instruction manual.

[2] The PLC communication start time is the time that writing of the system data starts.
Actual communication with the PLC by request command can only take place after the system communication state (D1080) changes to “1.”

[3] Only the FZ master device (device address 0) can be set up.

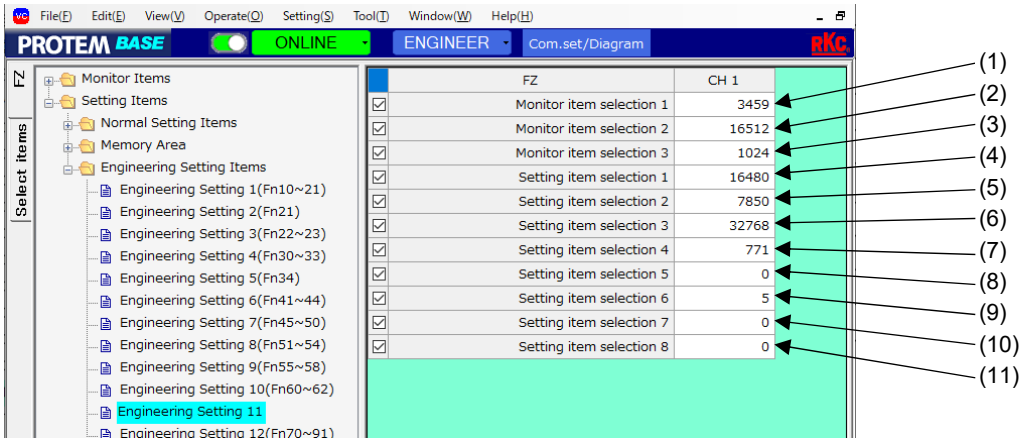
☞ For the Register start number, Monitor item register bias and Setting item register bias, see **P. 5-18**.

6. Select the communication data to use.

Select the communication data that are sent/received between the PLC and the FZ900 slave (device address 1). Selection of the communication data can be done at “Engineer Setting 11.”
In the following example, the data in the Engineering Setting 11 are used as they are configured at the factory. (See **Table 4**)

☞ To select communication data, see **6.3 Example of PLC Communication Data Map Editing (P. 6-61)**.

☞ For the communication data type and data range, see the following sections:
- **P. 5-8 to P. 5-13 of 5.2.1 Setting items list**
- **6.2 PLC Communication Data Map (P. 6-23)**



Communication data of monitor group is assigned as a bit image in binary numbers.

Bit image: 0000000000000000 (Bit 15 ---------- Bit 0)

0: Unused
1: Used

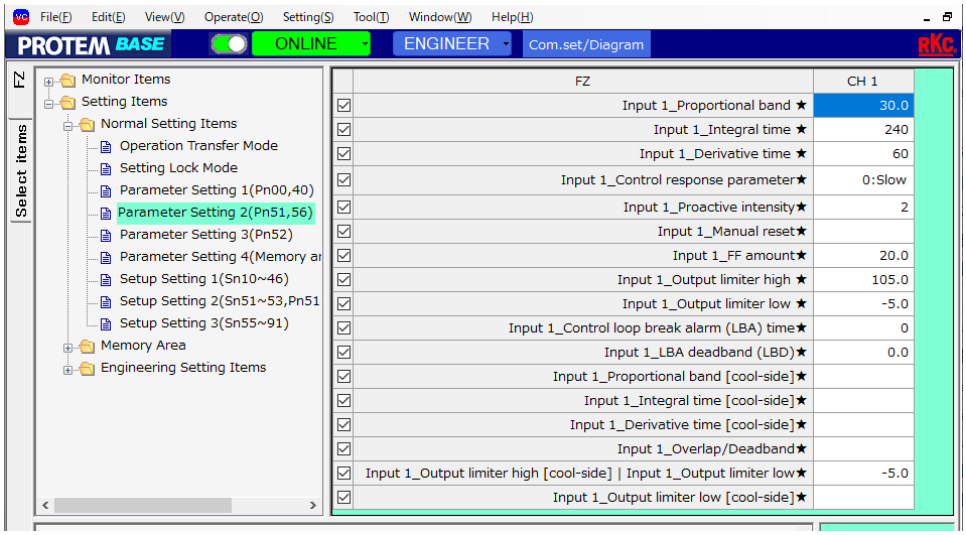
Table 4

Setting item	Set value (factory set value)	
	Bit	Decimal
(1) Monitor item selection 1	0000110110000011	3459
(2) Monitor item selection 2	0100000010000000	16512
(3) Monitor item selection 3	0000010000000000	1024
(4) Setting item selection 1	0100000001100000	16480
(5) Setting item selection 2	0001111010101010	7850
(6) Setting item selection 3	1000000000000000	32768
(7) Setting item selection 4	0000001100000011	771
(8) Setting item selection 5	0000000000000000	0
(9) Setting item selection 6	0000000000000101	5
(10) Setting item selection 7	0000000000000000	0
(11) Setting item selection 8	0000000000000000	0

7. Make other initial setting

Following the setting of the PLC environment items, set up necessary functions and a set value (SV) to operate the FZ900 slave (device address 1). This setting can be done using PROTEM2.

☞ Refer to **FZ110/FZ400/FZ900 Instruction Manual [Part2: Parameters/Functions] (IMR03A05-E□)** for non-PLC communication related functions and parameters.



8. Activate the settings

To activate the settings done so far, shut down the FZ900 slave (device address 1) once, and reapply power to the instrument. After power up, the modified values become effective.

If the FZ is running on the power from the COM-K2 without turning on the mains supply, remove the loader communication cable once and reconnect it to the FZ. The same effect can be obtained as powering up the FZ.

(6) PLC communication register address

In the PLC communication environment, by setting the values shown below for the Register type, Register start number, Monitor item register bias, Setting item register bias, Monitor item selection, Setting item selection, and Slave register bias, the register address of each data item in PLC communication will be as indicated below.

PLC communication environment item	Set value	
	FZ900 master (device address 0)	FZ900 slave (device address 1)
Register type	0 (D register)	0 (D register)
Register start number (Low-order 16-bit)	1000	1000
Monitor item register bias	12	12
Setting item register bias	0	0
Monitor item selection 1	3459	3459
Monitor item selection 2	16512	16512
Monitor item selection 3	1024	1024
Setting item selection 1	16480	16480
Setting item selection 2	7850	7850
Setting item selection 3	32768	32768
Setting item selection 4	771	771
Setting item selection 5	0	0
Setting item selection 6	5	5
Setting item selection 7	0	0
Setting item selection 8	0	0
Slave register bias	80	80

Occupied registers per data of FZ900
- System data (single word): One register per data
- Monitor group data (double word): Two registers per data
- Setting group data (double word): Two registers per data

The communication data selected at Monitor item selection and Setting item selection are assigned to the PLC register shifted to the left to remove blank.

Data map

Register address		Communication data	Data type
D1000	—	System communication state	FZ900 master (device address 0) System data (Single word)
D1001	—	Communication flag	
D1002	—	Internal processing	
D1003	—	Internal processing	
D1004	—	PLC communication error code	
D1005	—	PLC communication instrument recognition flag 1	
D1006	—	PLC communication instrument recognition flag 2	
D1007	—	Request item number	
D1008	—	Request command	
D1009	—	Setting group communication state	
D1010	—	Instrument recognition request command	
D1011	—	Internal processing	

Continued on the next page.

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Data map

Register address		Communication data	Data type
D1012	D1013	Input 1_Measured value (PV)	FZ900 master (device address 0) Monitor item selection 1 data (Double word)
D1014	D1015	Input 1_Set value (SV) monitor	
D1016	D1017	Input 1_Manipulated output value monitor [heat-side]	
D1018	D1019	Input 1_Manipulated output value monitor [cool-side]	
D1020	D1021	Current transformer 1 (CT1) input value monitor	
D1022	D1023	Current transformer 2 (CT2) input value monitor	
D1024	D1025	Comprehensive event state	FZ900 master (device address 0) Monitor item selection 2 data (Double word)
D1026	D1027	Overall operation status	
D1028	D1029	Error code	FZ900 master (device address 0) Monitor item selection 3 data (Double word)
D1030	D1031	RUN/STOP transfer	FZ900 master (device address 0) Setting item selection 1 data (Double word)
D1032	D1033	Input 1_Autotuning (AT)	
D1034	D1035	Input 1_Set value (SV)	
D1036	D1037	Event 1 set value (EV1) Event 1 set value (EV1) [high]	FZ900 master (device address 0) Setting item selection 2 data (Double word)
D1038	D1039	Event 2 set value (EV2) Event 2 set value (EV2) [high]	
D1040	D1041	Event 3 set value (EV3) Event 3 set value (EV3) [high]	
D1042	D1043	Event 4 set value (EV4) Event 4 set value (EV4) [high]	
D1044	D1045	Input 1_Proportional band [heat-side]	
D1046	D1047	Input 1_Integral time [heat-side]	
D1048	D1049	Input 1_Derivative time [heat-side]	
D1050	D1051	Input 1_Control response parameter	
D1052	D1053	Input 1_Proportional band [cool-side]	FZ900 master (device address 0) Setting item selection 3 data (Double word)
D1054	D1055	Input 1_Integral time [cool-side]	FZ900 master (device address 0) Setting item selection 4 data (double word)
D1056	D1057	Input 1_Derivative time [cool-side]	
D1058	D1059	Input 1_Setting change rate limiter (up)	
D1060	D1061	Input 1_Setting change rate limiter (down)	
D1062	D1063	Heater break alarm 1 (HBA1) set value	FZ900 master (device address 0) Setting item selection 6 data (Double word)
D1064	D1065	Heater break alarm 2 (HBA2) set value	
D1066 ⋮ D1078	D1067 ⋮ D1079	Blank registers	—

Continued on the next page.

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Data map

Register address		Communication data	Data type
D1080	—	System communication state	FZ900 slave (device address 1) System data (Single word)
D1081	—	Communication flag	
D1082	—	Internal processing	
D1083	—	Internal processing	
D1084	—	PLC communication error code	
D1085	—	PLC communication instrument recognition flag 1	
D1086	—	PLC communication instrument recognition flag 2	
D1087	—	Request item number	
D1088	—	Request command	
D1089	—	Setting group communication state	
D1090	—	Instrument recognition request command	
D1091	—	Internal processing	
D1092	D1093	Input 1_Measured value (PV)	FZ900 slave (device address 1) Monitor item selection 1 data (Double word)
D1094	D1095	Input 1_Set value (SV) monitor	
D1096	D1097	Input 1_Manipulated output value monitor [heat-side]	
D1098	D1099	Input 1_Manipulated output value monitor [cool-side]	
D1100	D1101	Current transformer 1 (CT1) input value monitor	
D1102	D1103	Current transformer 2 (CT2) input value monitor	
D1104	D1105	Comprehensive event state	FZ900 slave (device address 1) Monitor item selection 2 data (Double word)
D1106	D1107	Overall operation status	
D1108	D1109	Error code	FZ900 slave (device address 1) Monitor item selection 3 data (Double word)
D1110	D1111	RUN/STOP transfer	FZ900 slave (device address 1) Setting item selection 1 data (Double word)
D1112	D1113	Input 1_Autotuning (AT)	
D1114	D1115	Input 1_Set value (SV)	
D1116	D1117	Event 1 set value (EV1) Event 1 set value (EV1) [high]	FZ900 slave (device address 1) Setting item selection 2 data (Double word)
D1118	D1119	Event 2 set value (EV2) Event 2 set value (EV2) [high]	
D1120	D1121	Event 3 set value (EV3) Event 3 set value (EV3) [high]	
D1122	D1123	Event 4 set value (EV4) Event 4 set value (EV4) [high]	
D1124	D1125	Input 1_Proportional band [heat-side]	
D1126	D1127	Input 1_Integral time [heat-side]	
D1128	D1129	Input 1_Derivative time [heat-side]	
D1130	D1131	Input 1_Control response parameter	
D1132	D1133	Input 1_Proportional band [cool-side]	FZ900 slave (device address 1) Setting item selection 3 data (Double word)

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Data map

Register address		Communication data	Data type
1134	1135	Input 1_Integral time [cool-side]	FZ900 slave (device address 1) Setting item selection 4 data (Double word)
1136	1137	Input 1_Derivative time [cool-side]	
1138	1139	Input 1_Setting change rate limiter (up)	
1140	1141	Input 1_Setting change rate limiter (down)	
1142	1143	Heater break alarm 1 (HBA1) set value	FZ900 slave (device address 1) Setting item selection 6 data (Double word)
1144	1145	Heater break alarm 2 (HBA2) set value	

7.5 Communication Setting of PLC

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

Setting item	Description
Operation setting	Independent
Data bit	8
Parity bit	None
Even/odd parity	Odd
Stop bit	1
Sum check code	Exist

Setting item	Description
Online Change	Enable
Setting modifications	Enable
Communication rate setting	19200 bps
Communication protocol setting	MC protocol (Format 4)
Station number setting	0

Setting in the serial communication module (QJ71C24N) belonging to the MITSUBISHI MELSEC Q series do with the GX Works2 of the MITSUBISHI MELSEC PLC programming software. Setting set the following set value with switch setting for intelligent functional module.

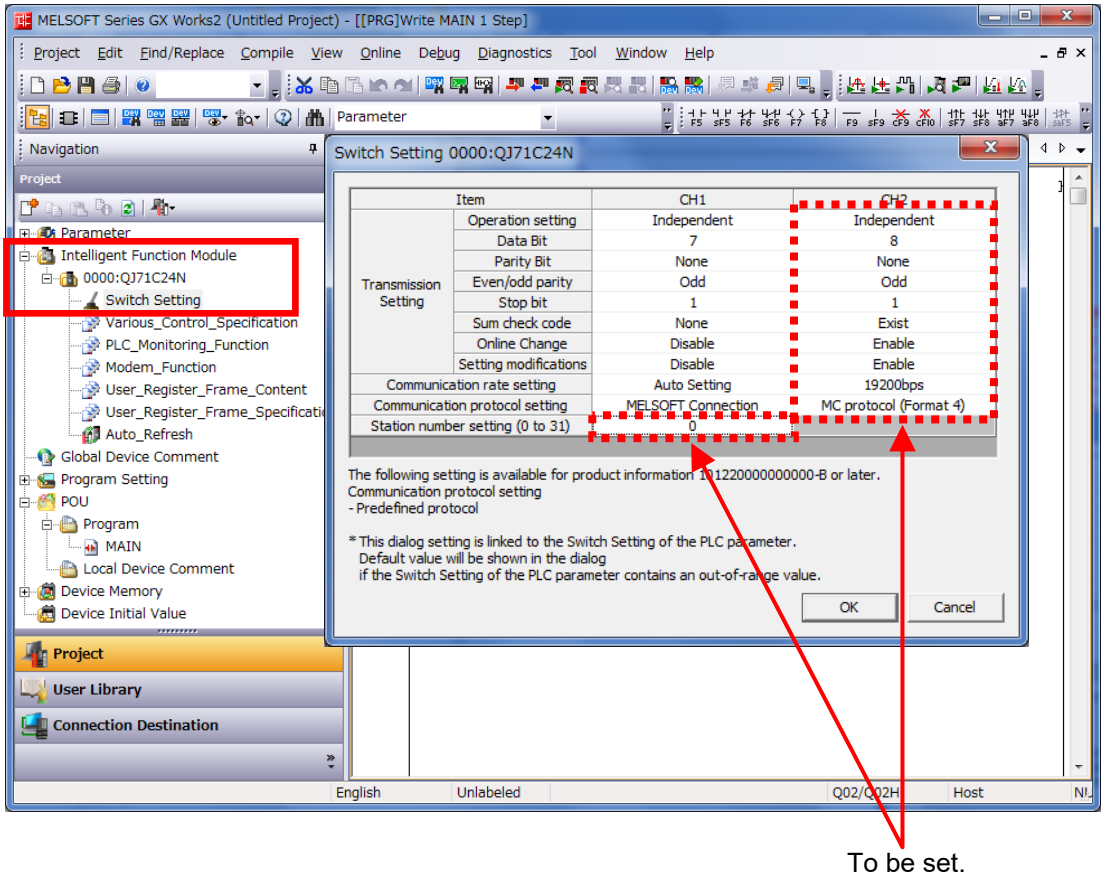
[Setting procedure]

[Intelligent functional module] → [0010: QJ71C24N] → [Switch setting]

[Setting screen]

The screen is a Japanese edition.

<Switch setting of the intelligent function module>



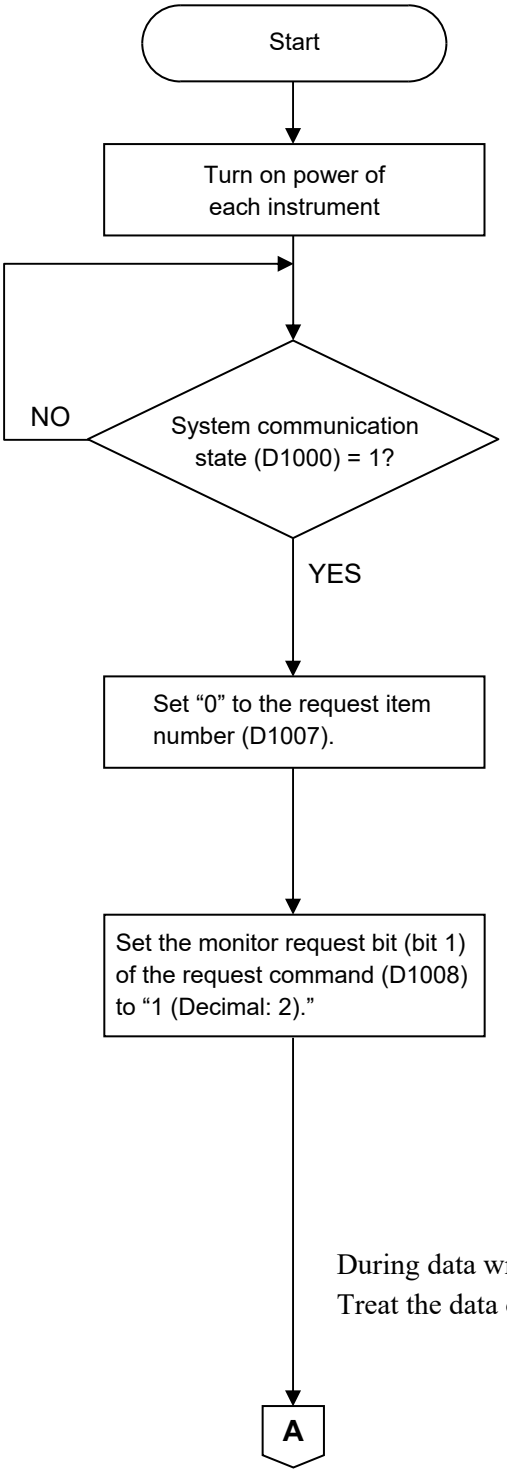
The details of the switch setting for the PLC, refer to the instruction manual for the PLC being used.

7.6 Initial Setting

NOTE

Change each set value of FZ controller from the PLC after the initial settings are made. Configure initial settings for all of the FZ controllers.

■ Initial setting of the FZ900

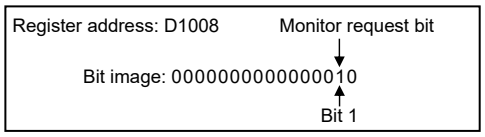


Turn on the power of the FZ controllers, and the PLC.
When the PLC communication start time (factory setting: 5 seconds) elapses, writing of the system data begins.

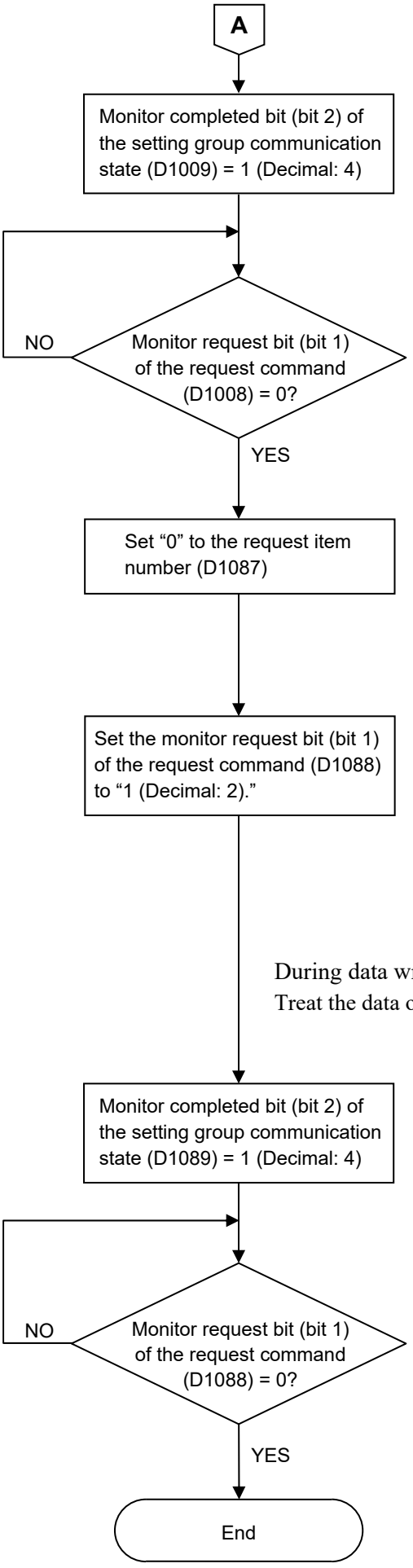
After the system data is written, the FZ controller begins writing the communication data of the monitor group to the PLC. When monitor group writing starts, “system communication state” changes to “1.”
When the system communication condition becomes “1,” PLC communication can be performed.

Data of the FZ900 master (device address 0) is transferred.
Because all communication data of the setting group is written to the PLC, the request item number (D1007) of the PLC register is set to “0.”

When the monitor request bit (bit 1) of request command (D1008) of the PLC register is set to “1 (Decimal: 2),” the FZ master begins writing the communication data of setting group to the PLC.

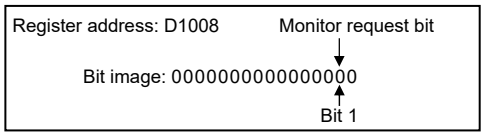


During data write:
Treat the data of all items as inconsistent during the data write.



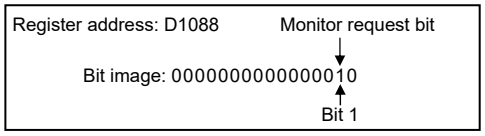
When writing is finished, the FZ master writes the communication state of the setting group to the monitor completed bit (bit 2) of the setting group communication state (D1009) of the PLC.

If the monitor request bit (bit 1) of the request command (D1008) of the PLC register is “0,” this indicates that writing of data to the PLC is finished.



Data of the FZ900 slave (device address 1) is transferred.
Because all communication data of the setting group is written to the PLC, the request item number (D1087) of the PLC register is set to “0.”

When the monitor request bit (bit 1) of request command (D1088) of the PLC register is set to “1 (Decimal: 2),” the FZ slave begins writing the communication data of setting group to the PLC.



During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the FZ slave writes the communication state of the setting group to the monitor completed bit (bit 2) of the setting group communication state (D1089) of the PLC.

If the monitor request bit (bit 1) of the request command (D1088) of the PLC register is “0,” this indicates that writing of data to the PLC is finished.

7.7 Data Setting

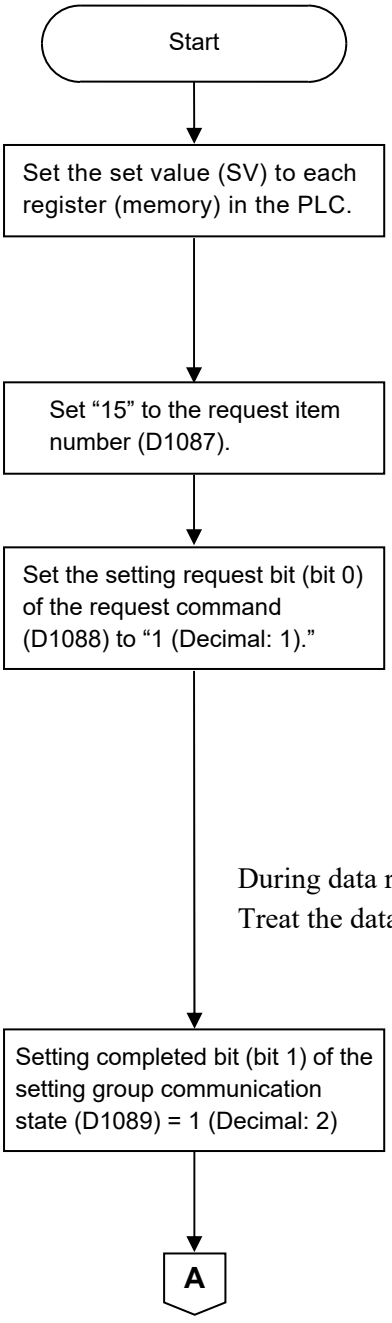
It is assumed that initial setting is finished.

NOTE

If each set value of the FZ controller 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 the Input 1_set value (SV) of FZ900 slave (device address 1) is set to 200 °C

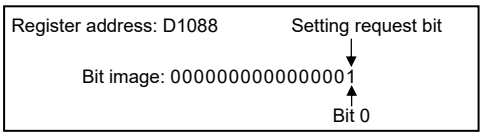


Set "200" as temperature set value to the PLC register D1114*.

* D1114 is the register address to which a set value (SV) of Input 1 is assigned. (See **P. 7-19**)

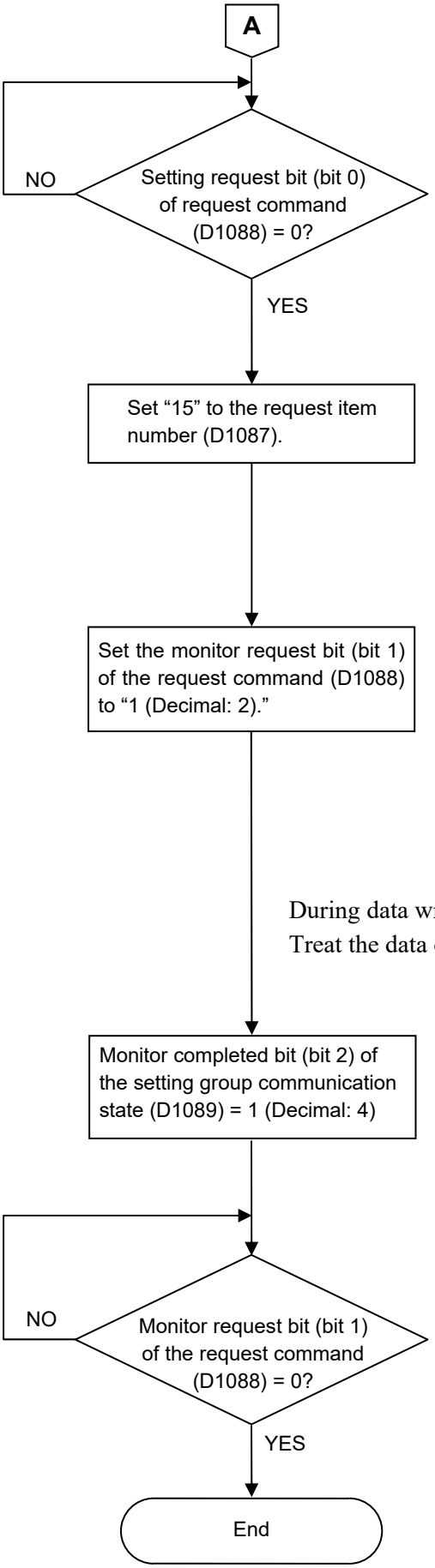
Enter "15" which is the item number of set value (SV) of Input 1 into request item number D1087 of the PLC register.

When setting "1 (1 in decimal)" to the setting request bit (Bit 0) of D1088, request command of the PLC register, FZ900 slave will start reading the data of set value (SV) of input 1 set to the PLC register (memory).

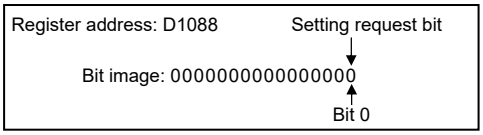


During data read:
Treat the data of all items as inconsistent during the data read.

When readout is completed, FZ900 slave will write the communication state of set value (SV) of Input 1 to the Setting completed bit (Bit 1) of the PLC Setting group communication state D1089.



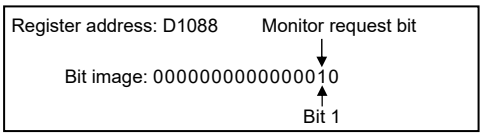
If the setting request bit (bit 0) of the request command (D1088) of the PLC register is "0," this indicates that reading of data from the PLC is finished.



[Confirmation of setting data]]

Set "15" (item number of the Set value (SV) of Input 1) to D1087 (the Request item number of the PLC register) in order to verify the data that the FZ900 slave has read from the PLC.

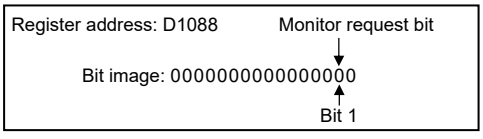
When the monitor request bit (bit 1) of request command (D1088) of the PLC register is set to "1 (Decimal 2)," the FZ slave begins writing the data of Input 1_Set value (SV) to the PLC.



During data write:
Treat the data of all items as inconsistent during the data write.

When writing is finished, the FZ slave writes the communication state of the Input 1_Set value (SV) to the monitor completed bit (bit 2) of the setting group communication state (D1089) of the PLC.

If the monitor request bit (bit 1) of the request command (D1088) of the PLC register is "0," this indicates that writing of data to the PLC is finished.



8

TROUBLE SHOOTING

This section explains probable causes and treatment procedures if any abnormality occurs in the instrument. For any inquiries, please contact RKC sales office or the agent, to confirm the specifications of the product.

If it is necessary to replace a device, always strictly observe the warnings below.

⚠ WARNING

- To prevent electric shock or instrument failure, always turn off the system power before replacing the instrument.
- To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.
- To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.
- To prevent electric shock or instrument failure, do not touch the inside of the instrument.
- All wiring must be performed by authorized personnel with electrical experience in this type of work.

⚠ CAUTION

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.

NOTE

When replacing the FZ with a new one, always use the module with the same model code. If the FZ is replaced, it is necessary to re-set each data item.

■ Solutions for Problems

Problem	Possible cause	Solution
Unable to communicate		
At "Communication response monitor" (CMRM) (P. 8-5) at Fn60 in the Engineering mode of the FZ: Transmission status monitor does not display 0 and 1 alternately.	Communication protocol of the FZ is not set to "PLC communication"	Select "3: PLC communication" at "Communication protocol" at Fn60.
At "Communication response monitor" (CMRM) (P. 8-5) at Fn60 in the Engineering mode of the FZ. • Transmission status monitor displays 0 and 1 alternately. • Reception status monitor does not display 0 and 1 alternately. RD/SD lamps on the PLC side RD lamp: Unlit SD lamp: Unlit	A communication message from the FZ has not reached the PLC. ↓ • Communication cable is wrongly connected. • Communication cable is not connected to the terminal. • Communication cable may be broken.	• Check terminal number and signal function, and properly connect the cable. • Check connection of communication cable. • Replace communication cable. Caution: Polarity of lines A and B of Mitsubishi PLC is just reversed from ours.
At "Communication response monitor" (CMRM) (P. 8-5) at Fn60 in the Engineering mode of the FZ. • Transmission status monitor displays 0 and 1 alternately. • Reception status monitor does not display 0 and 1 alternately. RD/SD lamps on the PLC side RD lamp: Flashing SD lamp: Unlit	A communication message from the FZ has reached the PLC, but the PLC will not reply. ↓ • Wrong communication wiring • Wrong communication setting No sum check in communication setting of the PLC	• Check terminal number and signal function, and properly connect the cable. Caution: Polarity of lines A and B of Mitsubishi PLC is just reversed from ours. • Use sum check in communication setting of the PLC.
At "Communication response monitor" (CMRM) (P. 8-5) at Fn60 in the Engineering mode of the FZ. • Transmission status monitor displays 0 and 1 alternately. • Reception status monitor displays 0 and 1 alternately. RD/SD lamps on the PLC side RD lamp: Flashing SD lamp: Slow flashing	The PLC sends a response to the communication message from the FZ, but the message is not received by the FZ. ↓ • Wrong communication wiring • Wrong communication setting No sum check in communication setting of the PLC	• Check terminal number and signal function, and properly connect the cable. For RS-422A, make sure RA and RB on the FZ side are properly wired. • Use sum check in communication setting of the PLC.
• Data transmission will not end even if "1" is set to the Setting request bit or Monitor request bit of the request command. The Setting request bit or Monitor request bit will not return to "0." • Communication seems to be working properly, but monitor values are not sent to the PLC. • No response	• Communication cable is wrongly connected. • Communication cable is not connected to the terminal. • Communication cable may be broken.	• Check terminal number and signal function, and properly connect the cable. • Check connection of communication cable. • Replace communication cable.
	Communication speed and data bit configuration are different from the PLC.	Check the communication speed and the data bit configuration of the FZ, and set the communication speed and the data bit configuration to be equal to those of the PLC.
	Communication protocol of the FZ is not set to "PLC communication"	Change the communication protocol of the FZ to the PLC communication.
	Wrong setting of PLC communication data	Confirm the PLC communication settings and set them correctly
		Setting of termination resistor in accordance with PLC or the insertion is done
	Setting of PLC becomes write inhibit	Setting of PLC is turned into write enable (Write enable in RUN, shift to monitor mode, etc.)
	Accesses outside the range of memory address of PLC (wrong setting of address)	Confirm the PLC communication environment setting and set them correctly

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Problem	Possible cause	Solution
An error occurs in the PLC communication error code. Bit 0 may be on. A request command was executed, but set values are updated only halfway through.	Writing to the PLC from the FZ fails. ↓ • PLC response waiting time is short. • Register range is out of available range.	• Extend the PLC response waiting time. • Check the setting of the PLC communication environment and set the values correctly.
To detect communication errors, a normal communication flag is used and a watchdog timer is programmed, yet timeout sometimes occurs.	When all of the set values are written into, the update of the normal communication flag may become slower. ↓ • Timeout time is too short. • PLC response waiting time is short.	• Extend the timeout time. • Extend the PLC response waiting time.
When two or more FZ are connected, some of these may not be recognized.	Instrument link recognition time is short	Lengthen Instrument link recognition time * * Set the Instrument link recognition time only for a FZ master (device address 0).
	The "Number of recognizable devices" may be incorrectly set up.	Check the total quantity of the connected instruments and set a correct value.
	• Turned on power to the FZ now connected. • FZ master, FZ slave, and PLC are powered on at different timing.	Conduct the recognition processing using Instrument recognition request command. When two or more FZ are connected and those that had been switched off are turned on again, the recognition processing of the controller must be performed.
When the setting request command of request command is set in "1," setting error is become (Bit 0 of setting group communication state: ON)	Data range error	Read the data once, and try to re-write the data into the controller. Confirm the setting range of set value and set them correctly

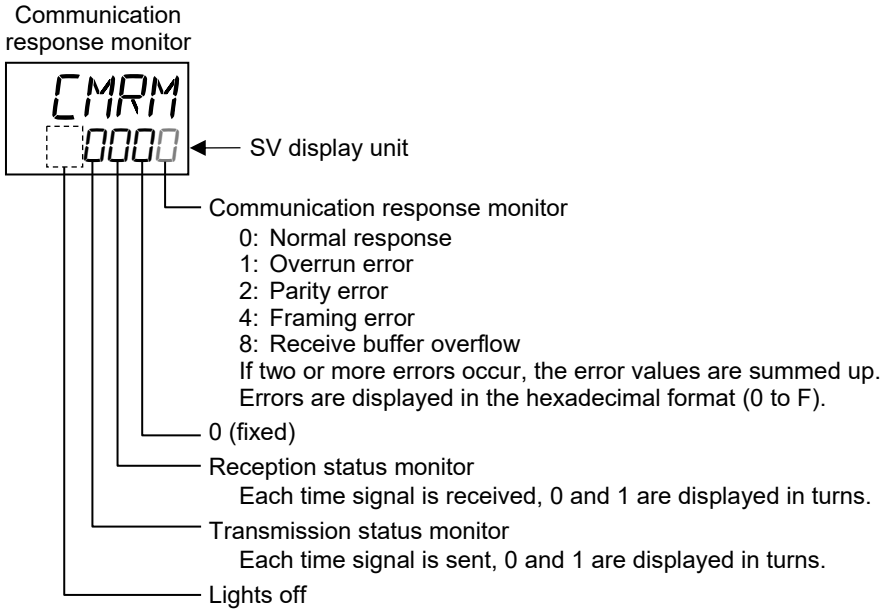
☞ For the communication speed, data bit configuration and communication protocol, see the following sections:

3.1 Communication Setting of FZ (P. 3-2)
5.2 PLC Communication Environment Items List (P. 5-3)

☞ For the PLC communication environment setting, Instrument link recognition time or Number of recognizable devices, see **5.2 PLC Communication Environment Items List (P. 5-3)**.

☞ For more details of the instrument recognition request command, see ■ **Instrument recognition request command (system data) (P. 6-11)**.

Communication response monitor [Engineering mode: Function block No. 60]



☞ For the display method of Communication response monitor, see the **3.1.2 Setting via front keys (P. 3-12)**.

MEMO

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