



*Ethernet [Modbus/TCP]
Communication Converter*

COM-JL
[For FB100/FB400/FB900]

Instruction Manual

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.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty, expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.
- Various symbols are used on the equipment, and they have the following meaning.

~ : Alternating current

== : Direct current

☐ : Reinforced insulation

⚠ : Safety precaution

This symbol is used where the instruction manual needs to be consulted for the safety of both the operator and the equipment. Carefully read the cautions in this manual before using the instrument.

- Ethernet is a registered trademark of Xerox Corp.
- Modbus is a registered trademark of Schneider Electric.
- Windows and Microsoft Internet Explorer are registered trademark of Microsoft Corporation in the U.S.A. and other countries.
- XPort and DeviceInstaller are trademark of Lantronix Inc.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.

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.

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.

■ 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	LBA	Control loop break alarm
AT	Autotuning	LBD	LBA deadband
OUT	Output		

About This Manual

There are four 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:

http://www.rkcinst.com/english/manual_load.htm.

Manual	Manual Number	Remarks
COM-JL [For FB100/FB400/FB900] Installation Manual	IMR01Y05-E□	This manual is enclosed with instrument. This manual explains the mounting and wiring.
COM-JL [For FB100/FB400/FB900] Quick Instruction Manual	IMR01Y15-E□	This manual is enclosed with instrument. This manual explains the parts description, communication setting, and message format.
COM-JL [For FB100/FB400/FB900] Communication Data List	IMR01Y21-E□	This manual is enclosed with instrument. This list is a compilation of the communication data items.
COM-JL [For FB100/FB400/FB900] Instruction Manual	IMR01Y10-E5	This manual you are reading now. This manual describes mounting, wiring, communication setting, protocol, communication data, troubleshooting and product specification.



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

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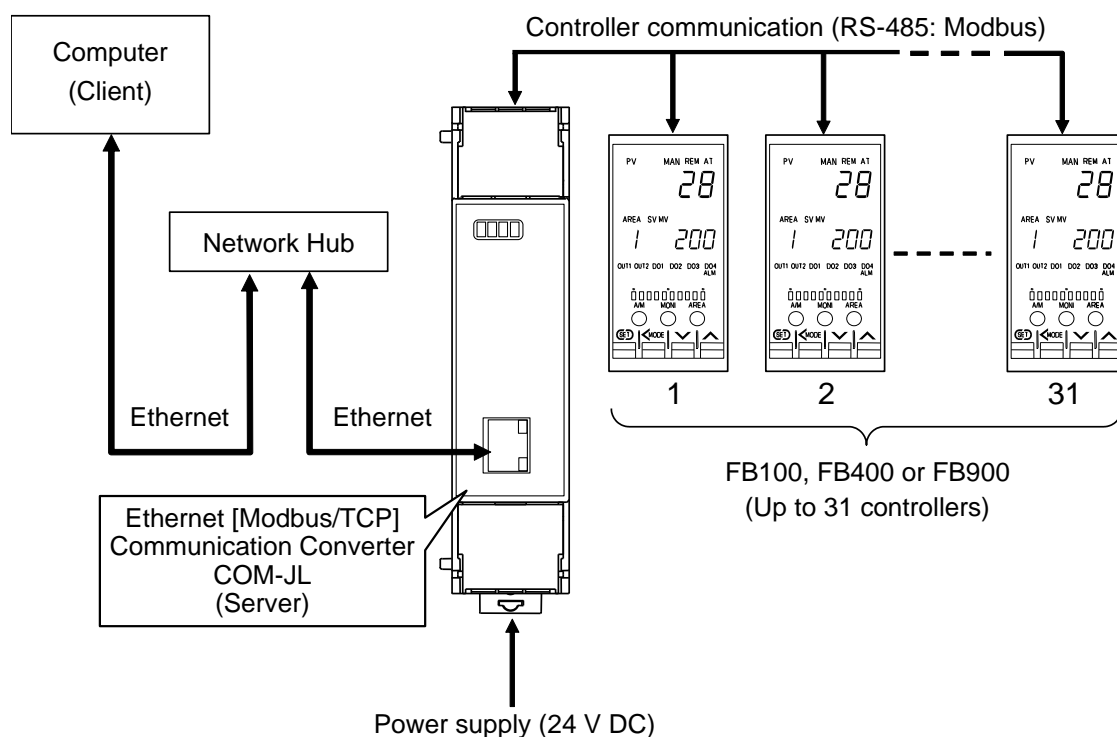
1. OUTLINE

This manual describes the communication specifications, mounting, wiring, setting and data instructions for the Ethernet [Modbus/TCP] Communication Converter COM-JL.

Ethernet [Modbus/TCP] Communication Converter COM-JL (hereafter called COM-JL) is communication converter to connect the RKC temperature controller (FB100/400/900) to Ethernet.

The COM-JL supports Modbus/TCP protocol.

-  Modbus/TCP is an open field network provided with the Modbus protocol on the TCP/IP protocol of Ethernet.
-  The data request side is called Client (such as computer) and the data response (supply) side is called Server (COM-JL).
-  Basically, one Client corresponds to one Server (COM-JL) (i.e. one to one). However, one Client can communicate with two or more Servers depending on the program on the Client side, but two or more Clients cannot communicate with one Server.



1.1 Product Check

Before using this product, check each of the following.

- Model code
- Check that there are no scratches or breakage in external appearance (case, front panel, terminal, etc).
- Check that all of the accessories delivered are complete. (Refer to below)

Accessories	Q'TY	Remarks
<input type="checkbox"/> COM-JL [For FB100/FB400/FB900] Installation Manual (IMR01Y05-E□)	1	Enclosed with instrument
<input type="checkbox"/> COM-JL [For FB100/FB400/FB900] Quick Instruction Manual (IMR01Y15-E□)	1	Enclosed with instrument
<input type="checkbox"/> COM-JL [For FB100/FB400/FB900] Communication Data List (IMR01Y21-E□)	1	Enclosed with instrument
<input type="checkbox"/> COM-JL [For FB100/FB400/FB900] Instruction Manual (IMR01Y10-E5)	1	This manual (sold separately)



If any of the products are missing, damaged, or if your manual is incomplete, please contact RKC sales office or the agent.

1.2 Model Code

Check that the product received is correctly specified by referring to the following model code list:
If the product is not identical to the specifications, please contact RKC sales office or the agent.

COM- JL- 1 * 01
(1) (2)

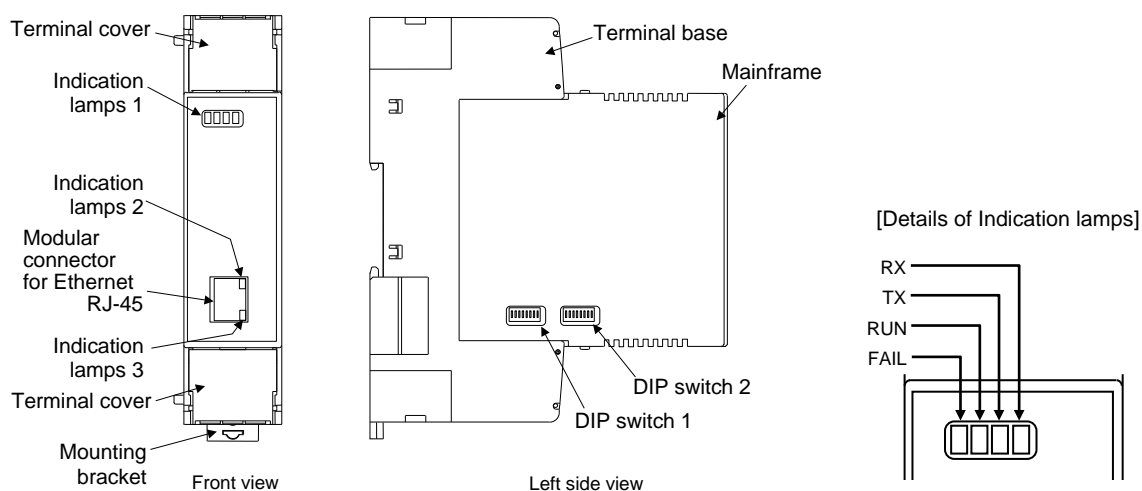
(1) Communication type

1: Modbus/TCP

(2) Corresponding to the RKC controller

01: FB100/400/900

1.3 Parts Description



● Indication lamps 1

FAIL [Red]	<ul style="list-style-type: none"> Instrument normality: Turns off Instrument abnormality: Turns on
RUN [Green]	<ul style="list-style-type: none"> When normal: Turns on Operation error: Flashes slowly Data collection just after the power is turned on: Flashes rapidly
TX [Green]	During data send: Flashes
RX [Green]	During data receive: Flashes

● Indication lamps 2

Link	10BASE-T link: Amber lamp: ON 100BASE-TX link: Green lamp: ON
------	--

● Indication lamps 3

Activity	Half-duplex; activity: Amber lamp: ON Full-duplex; activity: Green lamp: ON
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● Connector

ETHERNET	Modular connector for Ethernet RJ-45
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● Switches

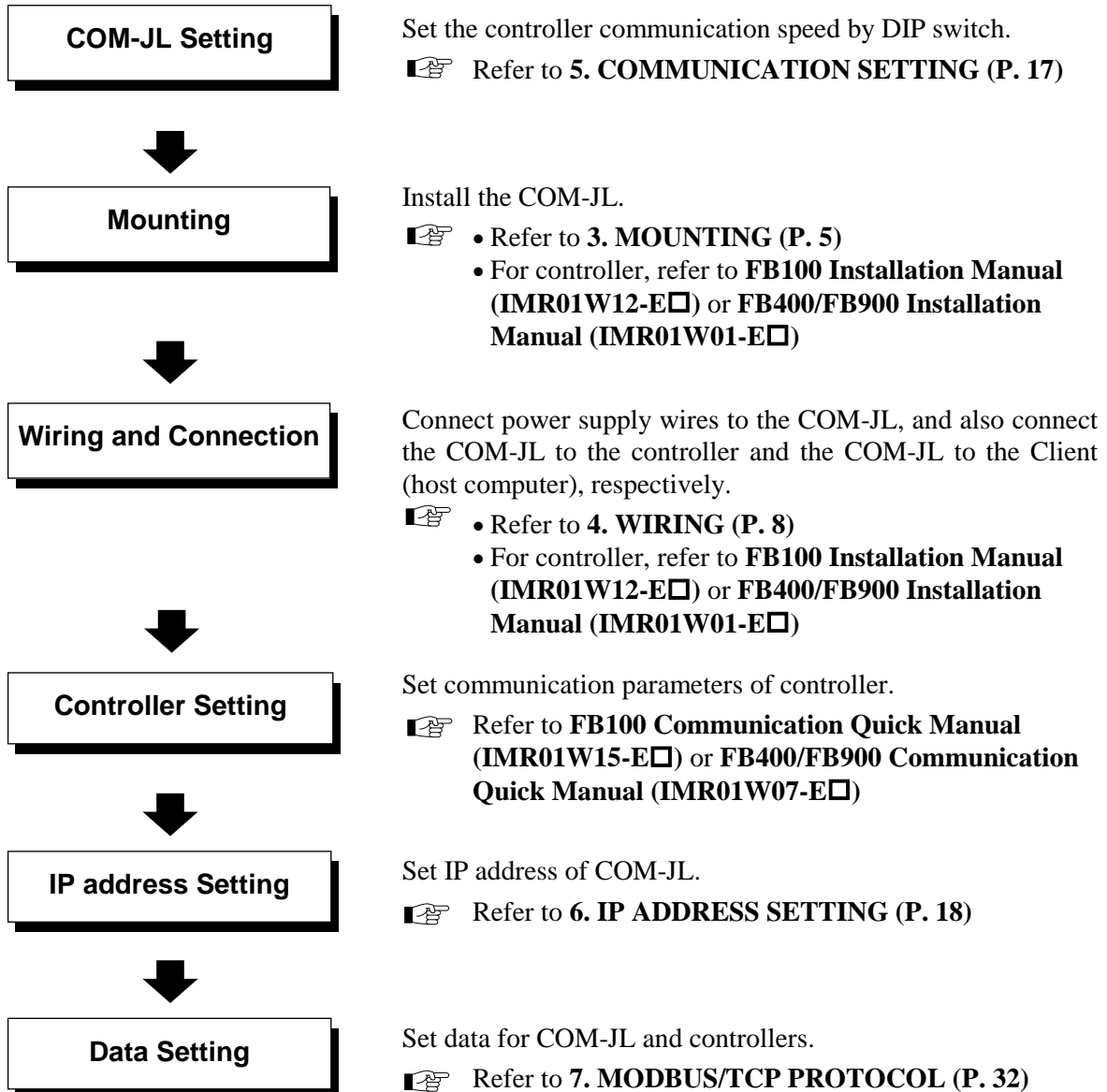
DIP switch 1	Set the communication speed for controller communication
DIP switch 2	Do not change this setting (Use it only in IP address setting by DIP switch)

● Others

Terminal cover	Terminal covers above and below the COM-JL
Mounting bracket	<ul style="list-style-type: none"> Used for the DIN rail mounting When panel mounted, two mounting brackets are required for the upper and lower sides (one required for the upper side: sold separately).
Terminal base	Part of the terminal and base of COM-JL (There is the Termination resistor transfer switch in the inside of terminal base)
Mainframe	Part of the mainframe of COM-JL

2. HANDLING PROCEDURES

Conduct necessary setting before operation according to the procedure described below.



NOTE

To avoid error at operation start-up, COM-JL must be powered on **LAST** (after the controller, PLC, etc.).

3. MOUNTING

This chapter describes installation environment, mounting cautions, dimensions and mounting procedures.



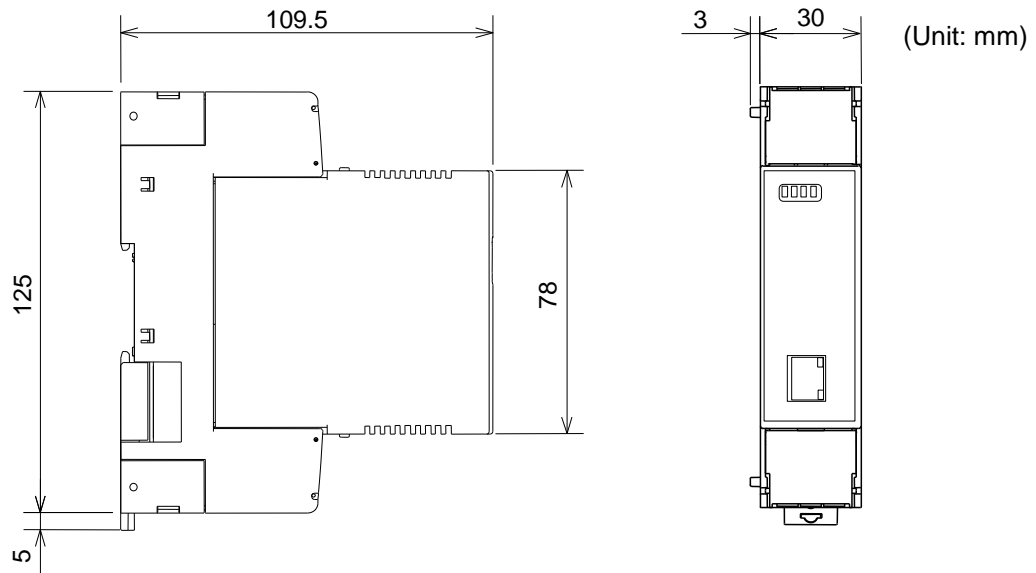
WARNING

To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

3.1 Mounting Cautions

- (1) This instrument is intended to be used under the following environmental conditions. **(IEC 61010-1)**
[OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]
- (2) Use this instrument within the following environment conditions:
 - Allowable ambient temperature: -10 to $+50$ °C
 - Allowable ambient humidity: 5 to 95 %RH
(Absolute humidity: MAX.W.C 29.3 g/m³ dry air at 101.3 kPa)
 - Installation environment conditions: Indoor use
Altitude up to 2000 m
- (3) Avoid the following conditions when selecting the mounting location:
 - Rapid changes in ambient temperature which may cause condensation.
 - Corrosive or inflammable gases.
 - Direct vibration or shock to the mainframe.
 - Water, oil, chemicals, vapor or steam splashes.
 - Excessive dust, salt or iron particles.
 - Excessive induction noise, static electricity, magnetic fields or noise.
 - Direct air flow from an air conditioner.
 - Exposure to direct sunlight.
 - Excessive heat accumulation.
- (4) Mount this instrument in the panel considering the following conditions:
 - Provide adequate ventilation space so that heat does not build up.
 - Ensure at least 50 mm space on top and bottom of the instrument for maintenance and environmental reasons.
 - Do not mount this instrument directly above the equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors).
 - If the ambient temperature rises above 50 °C, cool this instrument with a forced air fan, cooler, etc. Cooled air should not blow directly on this instrument.
 - In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
 - High voltage equipment: Do not mount within the same panel.
 - Power lines: Separate at least 200 mm.
 - For correct functioning mount this instrument in a horizontal position.
- (5) In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.

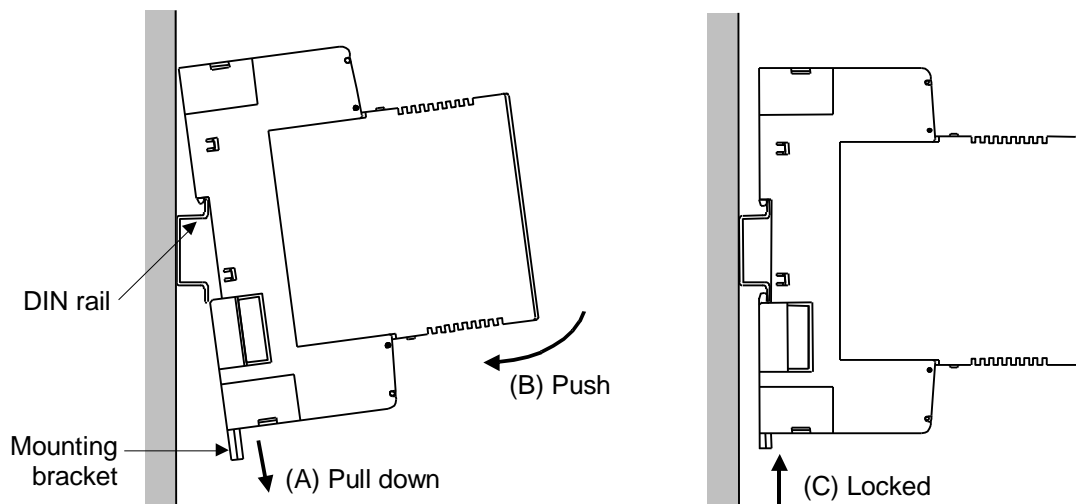
3.2 Dimensions



3.3 DIN Rail Mounting

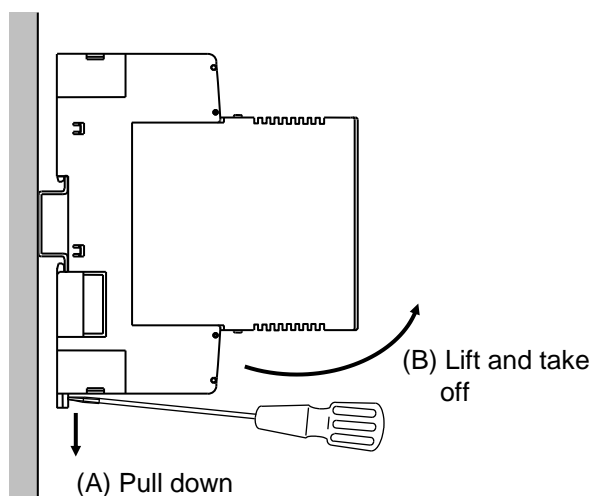
■ Mounting procedures

1. Pull down the mounting bracket at the bottom of the instrument (A). Attach the hooks on the top of the instrument to the DIN rail and push the lower section into place on the DIN rail (B).
2. Slide the mounting bracket up to secure the instrument to the DIN rail (C).



■ Removal procedures

1. Turn the power OFF.
2. Remove the wiring.
3. Pull down a mounting bracket with a blade screwdriver (A). Lift the instrument from bottom, and take it off (B).



3.4 Panel Mounting

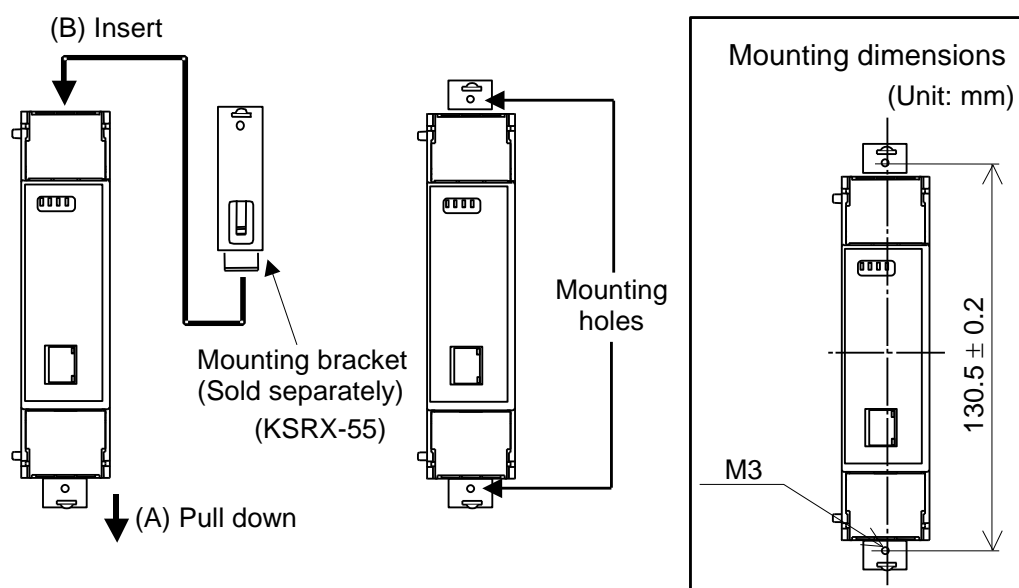
■ Mounting procedures

1. Pull down the mounting bracket (A) until locked and that a mounting hole appears.
2. Prepare one mounting bracket per instrument (B) sold separately (KSRX-55) and then insert it in the rear of the terminal board at top of the instrument until locked but a mounting hole does not disappear.
3. Mount each module directly on the panel with screws which are inserted in the mounting holes of the top and bottom mounting brackets.

Recommended tightening torque: 0.3 N·m (3 kgf·cm)



The customer needs to provide the M3 size screws. Select the screw length that matches the mounting panel.



4. WIRING

This chapter describes wiring cautions, terminal configuration and connections.

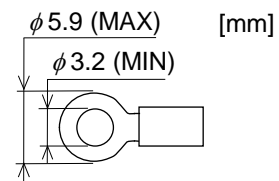
4.1 Wiring Cautions

WARNING

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

- To avoid noise induction, keep communication signal wire away from instrument power line, load lines and power lines of other electric equipment.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
 - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
 - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
 - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply input, supply power from a “SELV” circuit defined as IEC 60950-1.
- A suitable power supply should be considered in end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).

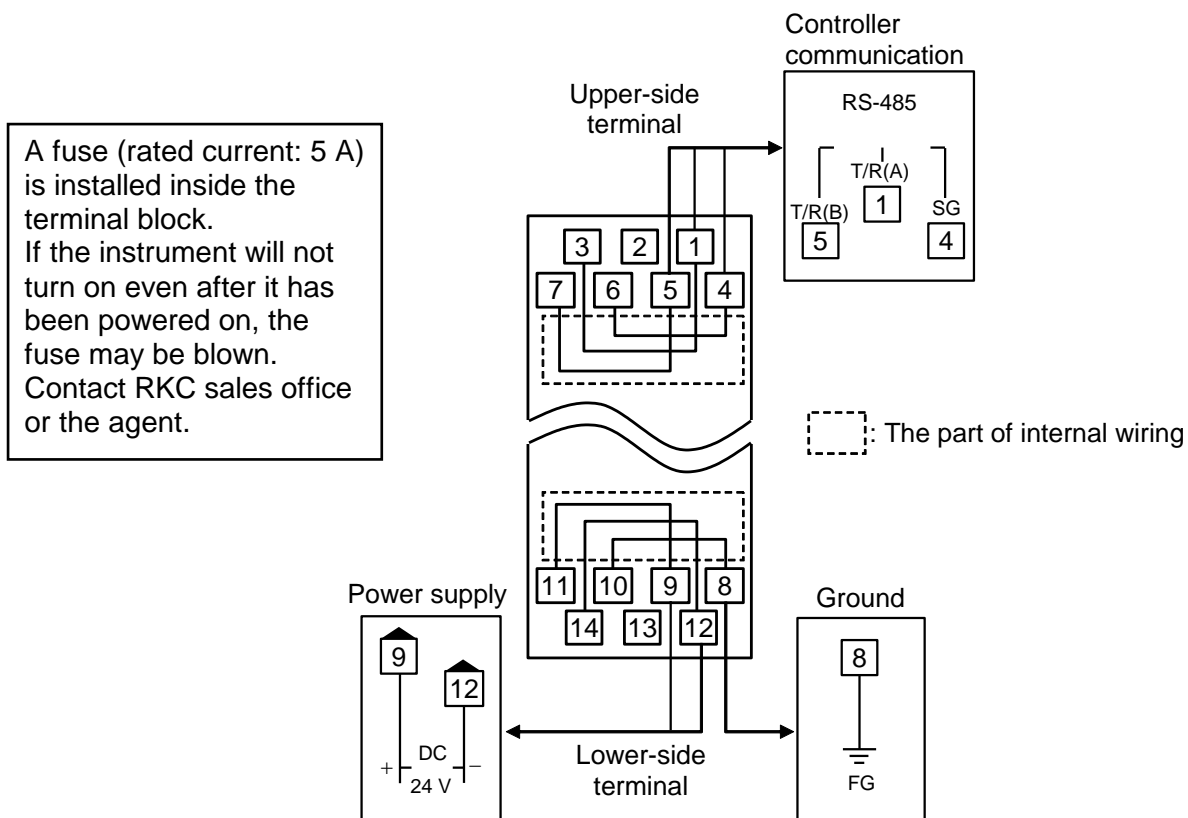
- Use the solderless terminal appropriate to the screw size.
Screw size: M3 × 6 (with 5.8 × 5.8 square washer)
Recommended tightening torque:
0.4 N·m (4 kgf·cm)
Specified dimension: Refer to Fig. at right






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

4.2 Terminal Configuration

The terminal layout is as follows.

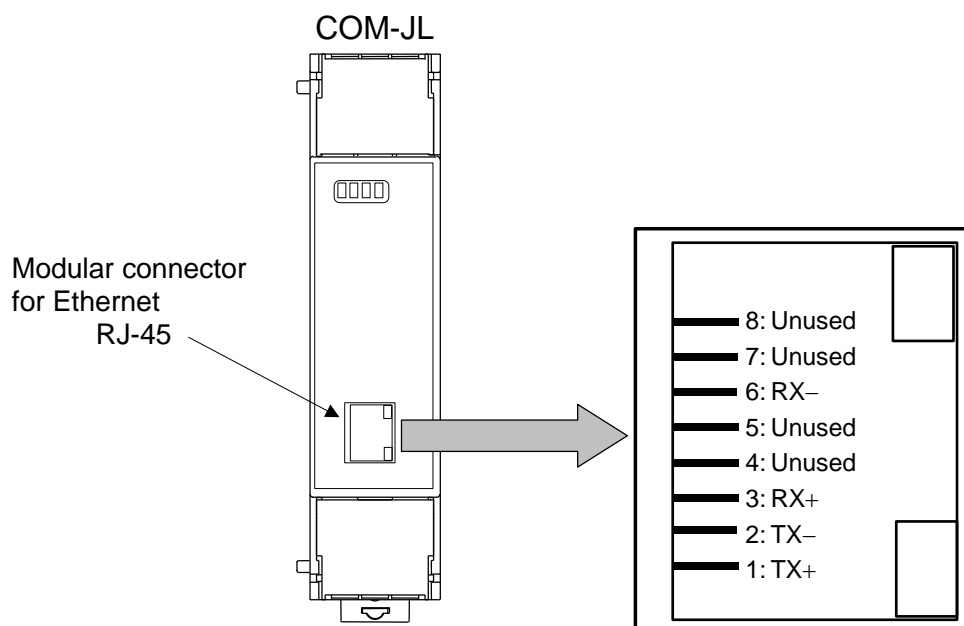


-  As controller communication terminal Nos. 1, 4 and 5 are internally connected to terminal Nos. 3, 6 and 7, any terminals can be used.
-  As ground and power supply terminal Nos. 8, 9 and 12 are internally connected to terminal Nos. 10, 11 and 14, any terminals can be used.
-  Terminal No. 2 and No. 13 is not used.

4.3 Connection to Ethernet

Connect COM-JL to Ethernet.

■ Pin layout of connector



■ Connector pin number and signal details

Pin No.	Signal name	Symbol
1	Send data +	TX+
2	Send data -	TX-
3	Receive data +	RX+
4	Unused	—
5	Unused	—
6	Receive data -	RX-
7	Unused	—
8	Unused	—



The cable must be provided by the customer.

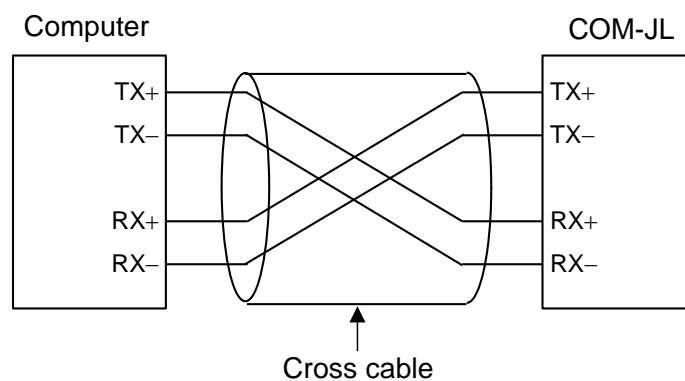
Used cable: The cable is based on the 10BASE-T or the 100BASE-TX standard of Ethernet.

Used connector: RJ-45 type

■ Wiring example

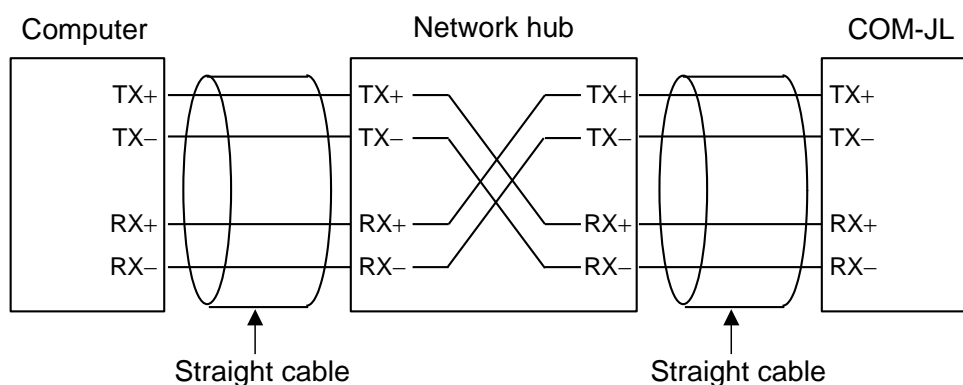
● When directly connected to Client

Use a cross cable when directly connected to the Client (such as computer).



● When use network hub

Use straight cables when connected to the network hub.



Cross cables may be used depending on the connecting device used. Therefore, follow the instructions for the respective device.

4.4 Connection to the Controllers

Conduct wiring between the COM-JL and controller (FB100/400/900) as shown in the following.



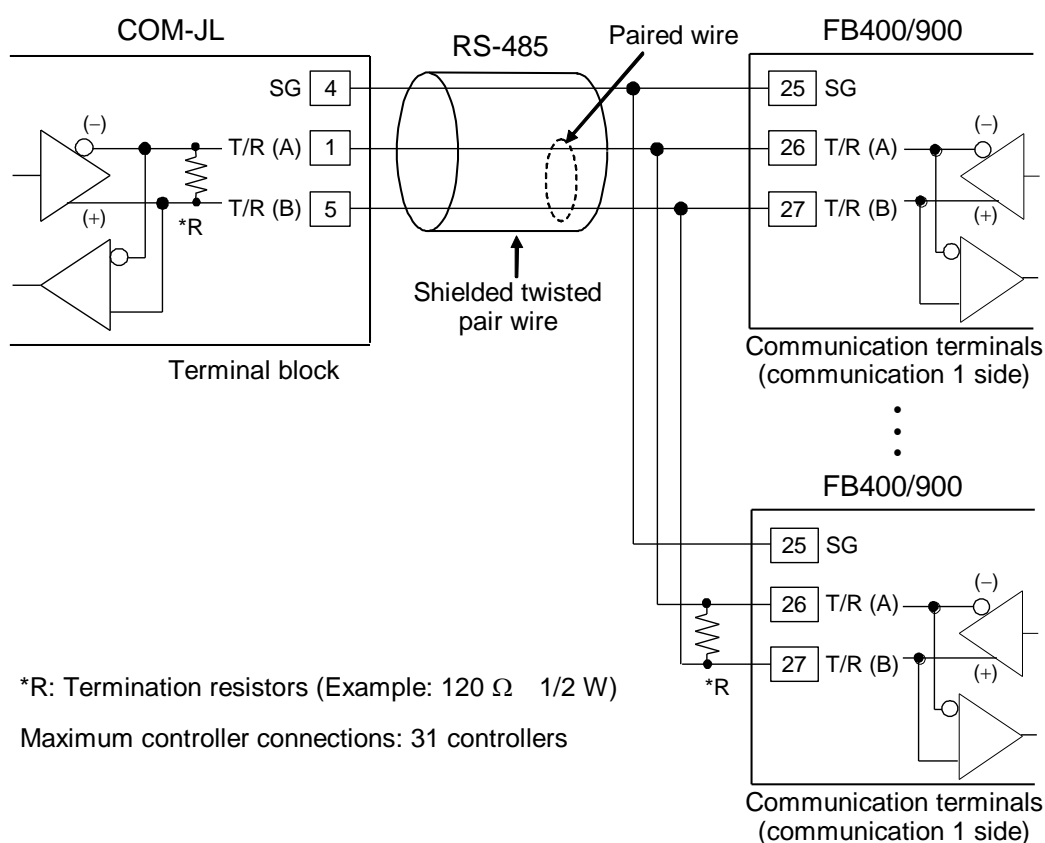
NOTE

When conducting wiring to the FB100/400/900, always conduct wiring to the Communication 1 terminal.

■ FB400/900 communication terminal number and signal details

Terminal No.		Signal name	Symbol
FB100	FB400/900		
13	25	Signal ground	SG
14	26	Send/receive data	T/R (A)
15	27	Send/receive data	T/R (B)

■ Wiring example [FB400/900] (Connections are similar for the FB100)



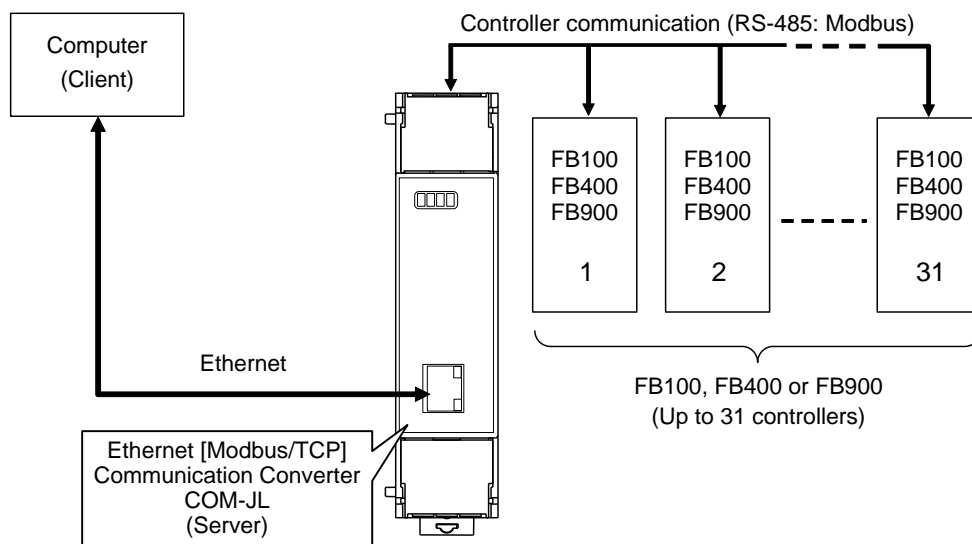
The cable must be provided by the customer.



The termination resistor existing within the COM-JL can be connected or disconnected by the switch. (Factory set value: Termination resistor connected)
[Refer to **4.6 Installation of Termination Resistor (P. 15)**]

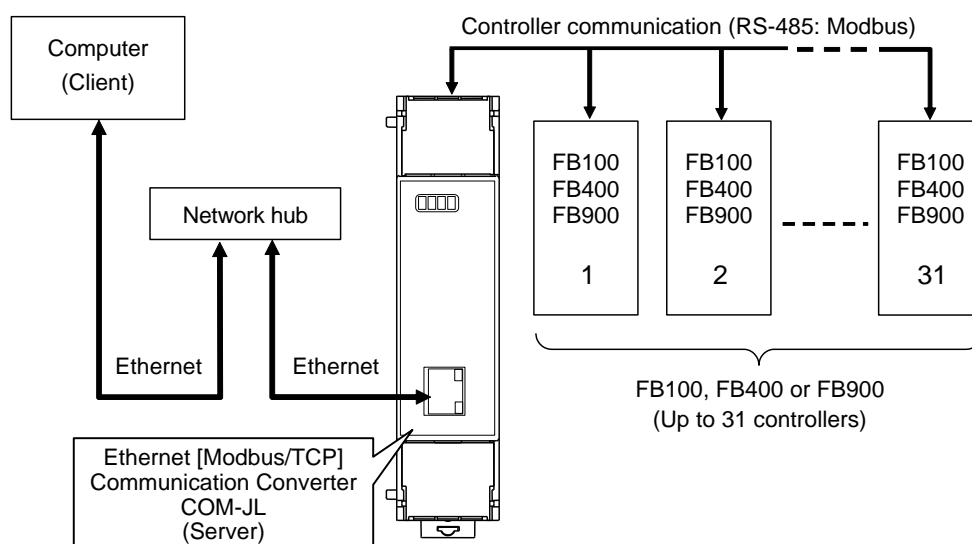
4.5 System Configuration Example

■ When directly connected to Client



Up to 31 controllers (FB100/400/900) can be connected to one COM-JL.

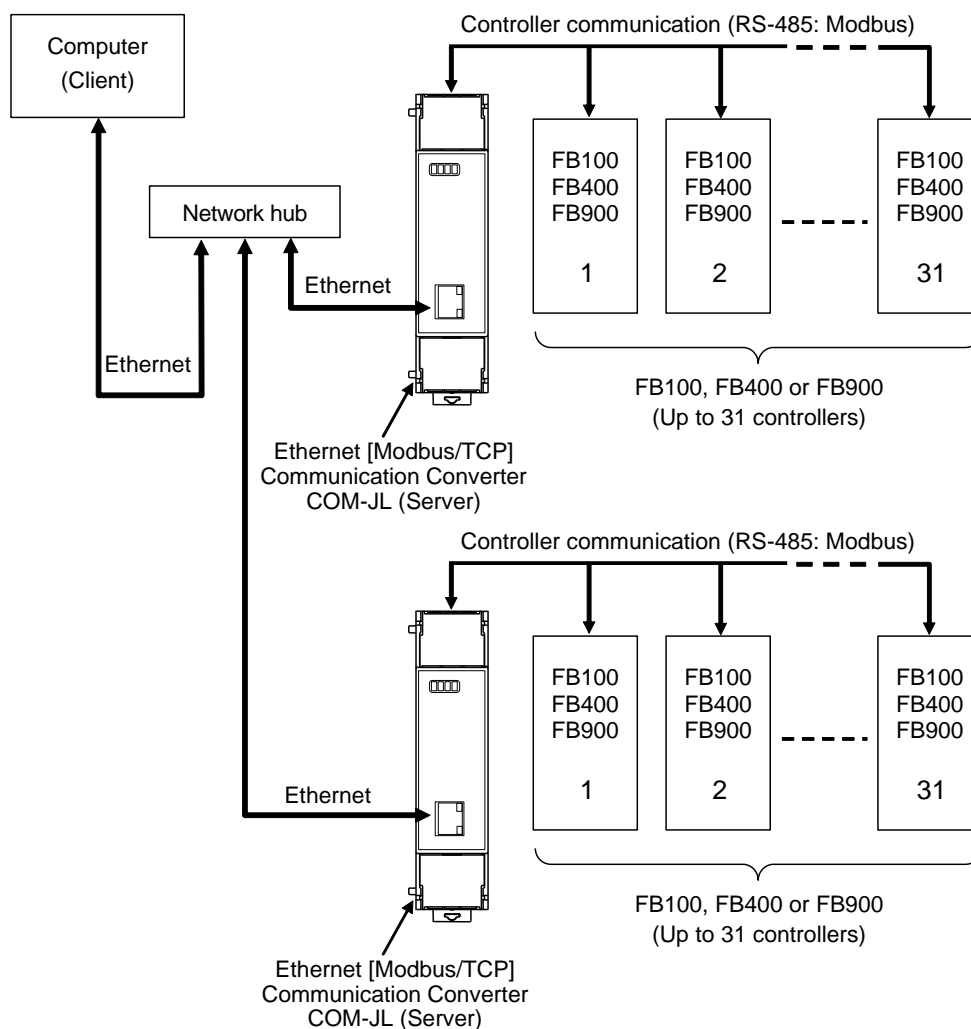
■ When use network hub



Up to 31 controllers (FB100/400/900) can be connected to one COM-JL.



Basically, one Client corresponds to one Server (COM-JL) (i.e. one to one). However, one Client can communicate with two or more Servers depending on the program on the Client side, but two or more Clients cannot communicate with one Server.

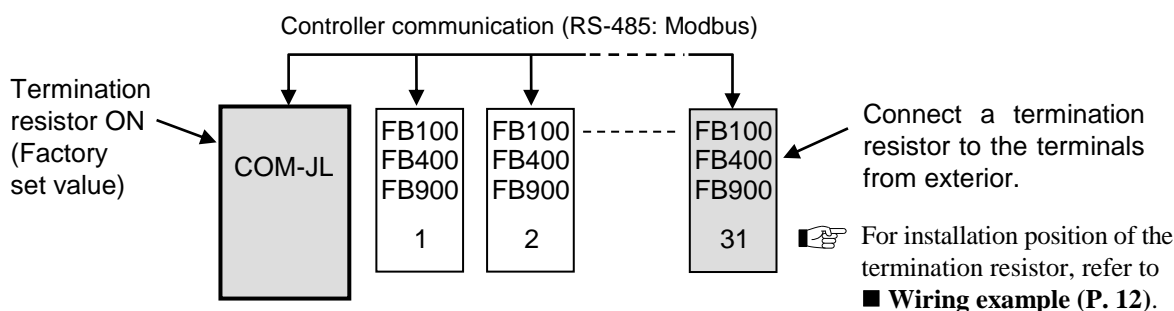


4.6 Installation of Termination Resistor

Procedure for setting a termination resistor to Controller communication (RS-485) and its setting position are described in the following.

■ Termination resistor setting position

If the COM-JL is connected to the extreme end of the communication line, install one termination resistor each to the COM-JL and the controller located most distantly from the COM-JL.

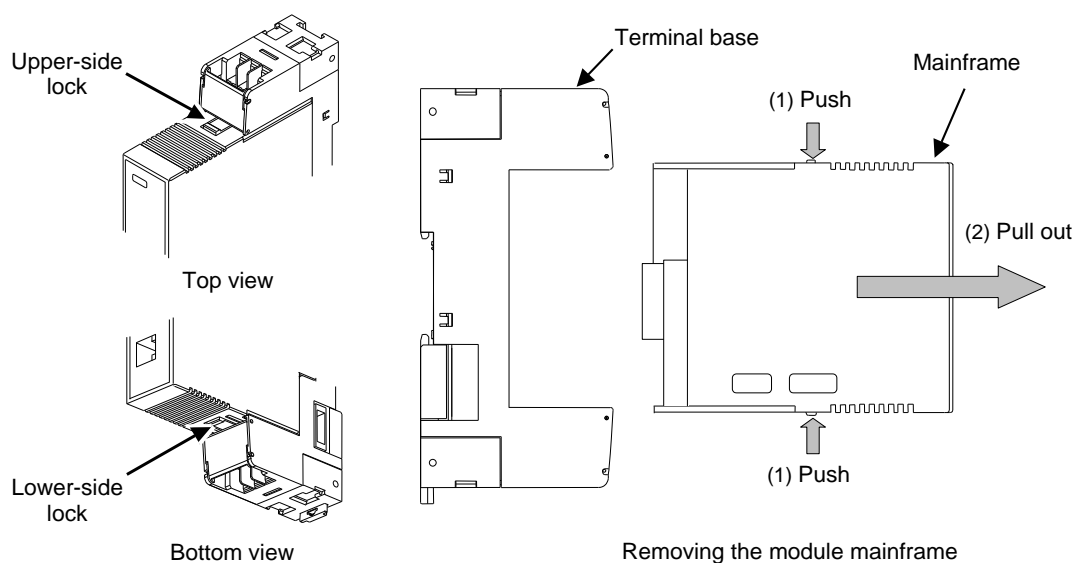


■ Setting procedure of termination resistor (COM-JL)

As the COM-JL is internally provided with a selector switch for choosing the ON/OFF of a termination resistor, it is not required to externally install the termination resistor.

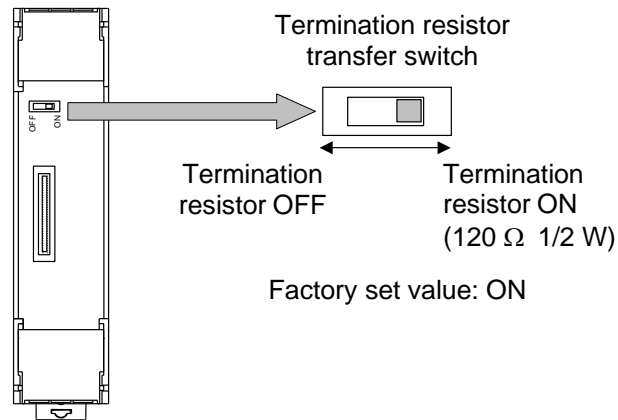
(Factory set value: Termination resistor connected)

1. Turn off the power supply of the COM-JL.
Do not separate the mainframe from terminal base with the power turned on. If so, instrument failure may result.
2. Pull out the mainframe itself toward you while pushing the locks at its top and bottom (1), and then separate it from the terminal base (2).



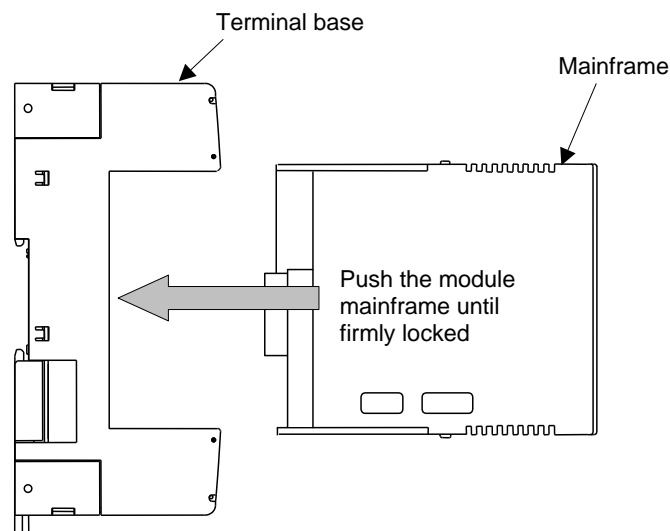
3. Turn on the Termination resistor transfer switch in the terminal base.

The COM-JL is shipped from the factory with the selector switch set to “ON: Termination resistor connected.”



A terminal base of the state which removed module mainframe

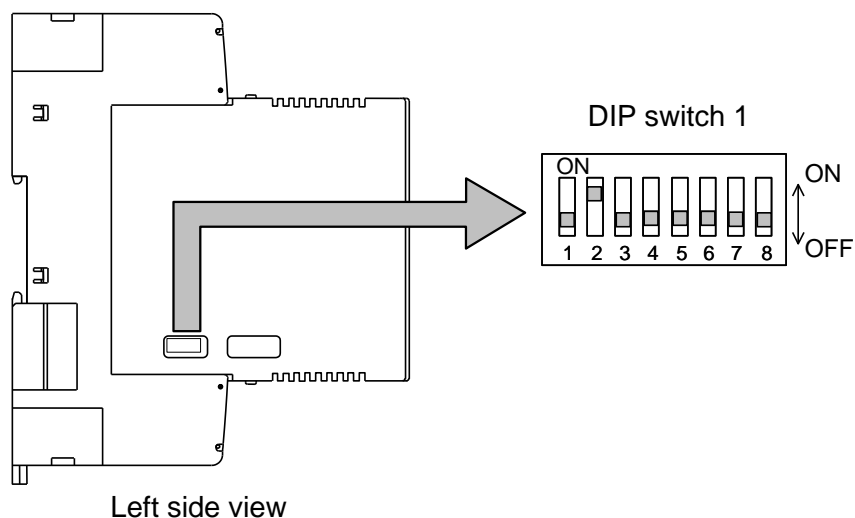
4. Push the mainframe thus separated in the terminal base until firmly locked.



Mounting the module mainframe

5. COMMUNICATION SETTING

The speed of communication with the controller (FB100/400/900) is set by the dip switch at the left side of the COM-JL.



1	2	Controller communication speed
OFF	OFF	38400 bps
ON	OFF	9600 bps
OFF	ON	19200 bps
ON	ON	38400 bps

Factory set value: 19200 bps

3	4	5	6	7	8	
OFF	OFF	OFF	OFF	OFF	OFF	Fixed (Do not change the factory set value)



Another controller communication setting

Data bit configuration: Data 8-bit, Without parity bit, Stop 1-bit



Do not change the setting of DIP switch 2.

(Use it only in IP address setting by DIP switch)

6. IP ADDRESS SETTING

Set an IP address of a COM-JL.

Four types of IP address setting are available: Setting by Web browser, Setting by Telnet, Setting by DeviceInstaller and Setting by DIP switch.



NOTE

Confirm the IP address number to the network administrator of the network (LAN) to which the COM-JL is connected.



If the IP address has been changed from the factory set value (192.168.1.1) and you do not know the current address, set the IP address using DeviceInstaller or the DIP switches.

6.1 Setting by the Web Browser

It is possible to set the IP address by using the Web browser (such as Internet Explorer).

■ Preparations before setting

When setting the IP address by Web browser, it is necessary to coincide the 1st to 3rd bytes and masking range of the IP address of the Client (computer) which starts Web browser with those of the IP address of the COM-JL.

1. Connect the COM-JL and Client, and then turn on the power.



For wiring procedure, refer to **4. WIRING (P. 8)**.

2. Change the IP address of the Client.

The IP address of the COM-JL is set to a factory set value of “192.168.1.1.” As it is necessary to coincide the 1st to 3rd byte values of this IP address with those of the IP address of the Client.

Setting value: 192.168.1. ☐ (☐: Any value in the range of 0 to 255, but other than 1)

3. Change the subnet mask of the Client.

As the subnet mask of the COM-JL is “255.255.255.0,” also change the subnet mask of the Client.

Setting value: 255.255.255.0



After the IP address of the Server is set, return the present IP address of the Client to the original address or change to the address meeting the network to be connected.




It is possible to set the IP address of the COM-JL using the Client already connected to the network. **However, as the IP address of the Client is changed, that Client is disconnected from the network so far connected.**

In addition, when setting the IP address by this method, confirm to the network administrator whether or not no problem arises.

■ Setting example

An example of setting the IP address of the COM-JL to “192.168.1.3” is shown in the following.

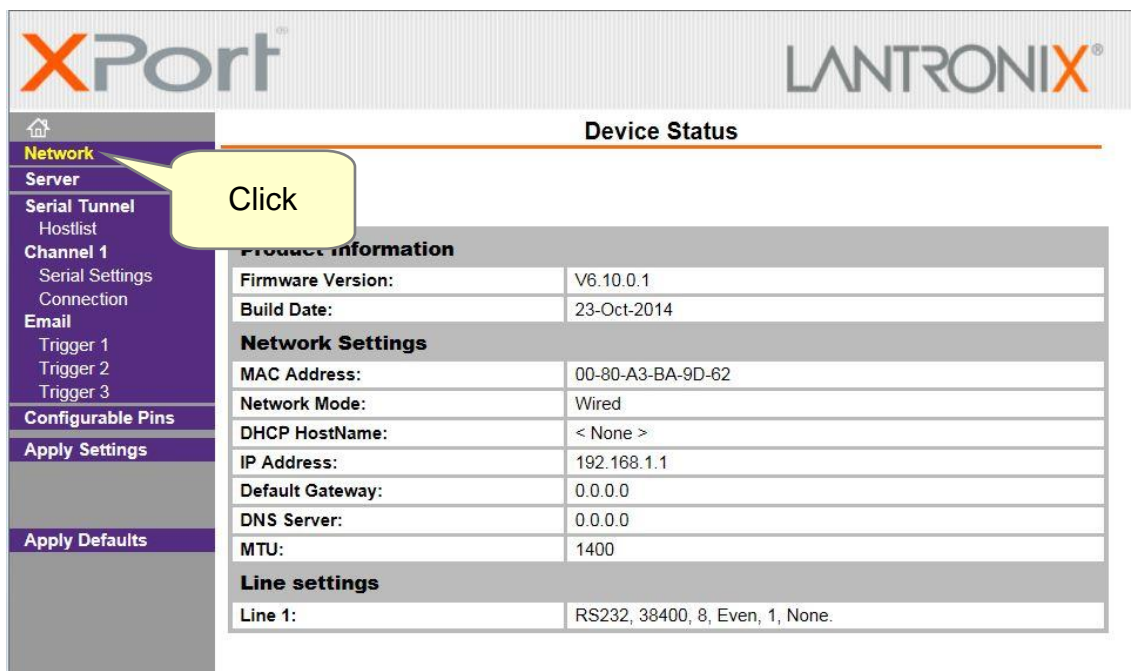
 Screens and operations used in the following explanation are just examples and dependent on the version of the “XPort” installed on the product.

For details of setting the XPort, please visit the website of Lantronix.

1. Start the Web browser; enter the present IP address “192.168.1.1” into the address bar and then press the Enter key.



2. **Web Manager** is started and the first screen (Device Status) is displayed. Click **Network** in the main menu on the left of the screen.



Product Information	
Firmware Version:	V6.10.0.1
Build Date:	23-Oct-2014

Network Settings	
MAC Address:	00-80-A3-BA-9D-62
Network Mode:	Wired
DHCP HostName:	< None >
IP Address:	192.168.1.1
Default Gateway:	0.0.0.0
DNS Server:	0.0.0.0
MTU:	1400

Line settings	
Line 1:	RS232, 38400, 8, Even, 1, None.

NOTE

Do not click any keys except those specified. Device failure and other problems may occur.

- Display the Network Settings screen.

Set IP Address to “192.168.1.3” and click OK.

Network Settings

Network Mode: **Wired Only**

IP Configuration

☐ Obtain IP address automatically

Auto Configuration Methods

BOOTP: ☒ Enable ☐ Disable

DHCP: ☒ Enable ☐ Disable

AutoIP: ☒ Enable ☐ Disable

DHCP Host Name:

☒ Use the following IP configuration:

IP Address:

Subnet Mask:

Default Gateway:

DNS Server:

Set 192.168.1.3

☒ Use the following IP configuration:

IP Address:

Subnet Mask:

Default Gateway:

DNS Server:

NOTE

Do not change any items other than the IP Address. If so, device failure or error may result.

- Clicking the **Apply Settings** button on the Menu display updates the setting to display the following message.

Apply Settings

Click

Configurable Pins

Apply Settings

Network Connectivity settings have been modified.

Please point the browser to the new IP address with the correct HTTP Server Port in order to continue using the web based configuration manager.

- Enter the new IP address “192.168.1.3” into the address bar as instructed by message and then press the Enter key. Thus, a new IP address setting screen appears to end the setting.

<http://192.168.1.3/>


6.2 Setting by Telnet

Set the IP address by the software Telnet attached to Windows.

■ Preparations before setting

When setting the IP address by Telnet, it is necessary to coincide the 1st to 3rd bytes and masking range of the IP address of the Client (computer) which starts Telnet with those of the IP address of the COM-JL.

1. Connect the COM-JL and Client, and then turn on the power.

 For wiring procedure, refer to **4. WIRING (P. 8)**.

2. Change the IP address of the Client.

The IP address of the COM-JL is set to a factory set value of “192.168.1.1.” As it is necessary to coincide the 1st to 3rd byte values of this IP address with those of the IP address of the Client.

Setting value: 192.168.1. (: Any value in the range of 0 to 255, but other than 1)

3. Change the subnet mask of the Client.

As the subnet mask of the COM-JL is “255.255.255.0,” also change the subnet mask of the Client.

Setting value: 255.255.255.0



After the IP address of the Server is set, return the present IP address of the Client to the original address or change to the address meeting the network to be connected.



It is possible to set the IP address of the COM-JL using the Client already connected to the network. **However, as the IP address of the Client is changed, that Client is disconnected from the network so far connected.**

In addition, when setting the IP address by this method, confirm to the network administrator whether or not no problem arises.

■ Setting example

An example of setting the IP address of the COM-JL to “192.168.1.3” is shown in the following.



Screens used in the following explanation are just examples and dependent on the version of the “Telnet.”



Telnet may be disabled by default on Windows.

To activate Telnet on windows, proceed as follows.

Click [Control Panel], [Programs], [Turn Windows features on or off] and check “Telnet client” in the list.

1. Display the MS-DOS prompt (command prompt); enter the following command and then press the Enter key. (Description below is example when Windows is C drive.)

```
C:\>telnet 192.168.1.1 9999
```

2. Device information on the module (COM-JL) whose IP address is “192.168.1.1” is displayed. Finally, as the message “Press Enter for Setup Mode” is displayed, press the Enter key to go into Setup Mode.

```
MAC address 0080A3BA9D62
Software version V6.10.0.1 (141023) XPTEXE
```

```
Press Enter for Setup Mode
```



If the timing of pressing the Enter key is late, the message “Connection with Host was cut off” is displayed and thus the client is disconnected from the COM-JL. Therefore if the message “Press Enter for Setup Mode” is displayed, immediately press the Enter key. If disconnected, try again from “1. .”

3. If entered into Setup Mode, the present Ethernet information is displayed. Finally, eight choices are displayed as “Change Setup:.” Therefore enter “0” after “Your choice ?” and then press the Enter key.

```
*** basic parameters
Hardware: Ethernet TPI
IP addr 192.168.1.1, no gateway set
DNS Server not set
DHCP FQDN option: Disabled

*** Security
SNMP is                enabled
SNMP Community Name: public
Telnet Setup is         enabled
TFTP Download is        enabled
Port 77FEh is           enabled
77FEh Access Mode is Read & Write
Web Server is           enabled
Web Setup is            enabled
ECHO is                 disabled
Enhanced Password is    disabled
Port 77F0h is           enabled
```

Continued on the next page.

Continued from the previous page.

(snip)

- Trigger 1
Serial trigger input: disabled
Channel: 1
Match: 00,00
Triger input1: X
Triger input2: X
Triger input3: X
Message:
Priority: L
Min. notification interval: 1 s
Re-notification interval : 0 s

- Trigger 2
Serial trigger input: disabled
Channel: 1
Match: 00,00
Triger input1: X
Triger input2: X
Triger input3: X
Message:
Priority: L
Min. notification interval: 1 s
Re-notification interval : 0 s

- Trigger 3
Serial trigger input: disabled
Channel: 1
Match: 00,00
Triger input1: X
Triger input2: X
Triger input3: X
Message:
Priority: L
Min. notification interval: 1 s
Re-notification interval : 0 s

Change Setup:
0 Server
1 Channel 1
3 E-mail
5 Expert
6 Security
7 Defaults
8 Exit without save
9 Save and exit

Your choice ? 0

Enter "0" (Server), and press the Enter key.

4. Selecting “0: Server” makes ready to set the IP address.

Enter the IP address one byte by one byte.

As the following display appears, enter “192” into the first byte and then press the Enter key.

```
IP Address : (192) 192
```

Next, enter “168” into the second byte and then press the Enter key.

```
IP Address : (192) 192.(168) 168
```

Enter “1” into the third byte and then press the Enter key.

```
IP Address : (192) 192.(168) 168.(001) 1
```

Enter “3” into the fourth byte and then press the Enter key.

```
IP Address : (192) 192.(168) 168.(001) 1.(001) 3
```

5. After the IP address is entered, the following display appears. Therefore press the Enter key to proceed to the next.

```
IP Address : (192) 192.(168) 168.(001) 1.(001) 3
Set Gateway IP Address (N) ?
```

In addition, as one line is displayed, press the Enter key to proceed to the next.

```
IP Address : (192) 192.(168) 168.(001) 1.(001) 3
Set Gateway IP Address (N) ?
Netmask: Number of Bits for Host Part (0=default) (0)
```

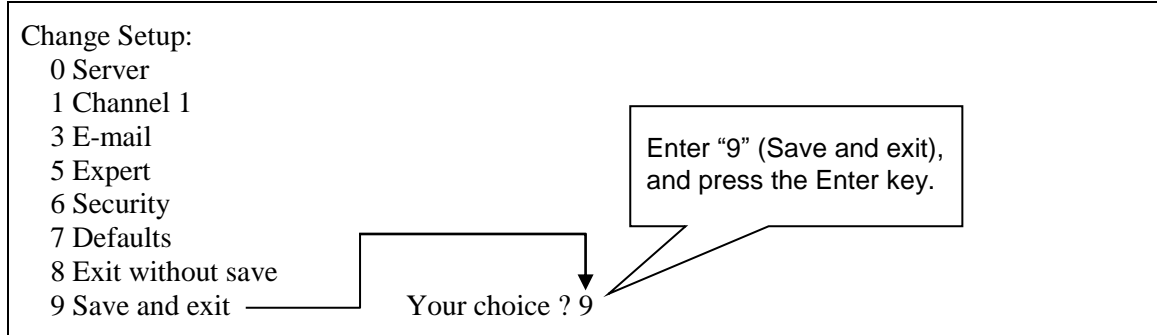
Further, as more one line is displayed, press the Enter key to proceed to the next.

```
IP Address : (192) 192.(168) 168.(001) 1.(001) 3
Set Gateway IP Address (N) ?
Netmask: Number of Bits for Host Part (0=default) (0)
Set DNS Server IP addr (N) ?
```

Further, as more one line is displayed, press the Enter key to proceed to the next.

```
IP Address : (192) 192.(168) 168.(001) 1.(001) 3
Set Gateway IP Address (N) ?
Netmask: Number of Bits for Host Part (0=default) (0)
Set DNS Server IP addr (N) ?
Change telnet/Web Manager password (N) ?
```

6. As “Change Setup:” is displayed again, enter “9” after “Your choice ?” and then press the Enter key.



7. “Parameters stored ...” is displayed and thus the setting is finished.





6.3 Setting by DeviceInstaller

Use the special tool DeviceInstaller to configure IP address and TCP port settings.


DeviceInstaller can be downloaded from the Web site of Lantronix Inc..

For the detailed setting procedures, see the documentation attached to the DeviceInstaller.

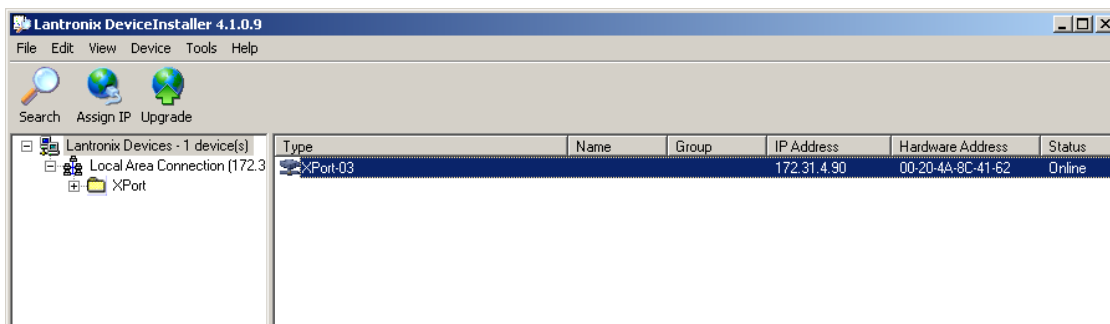
-  Before DeviceInstaller can be used, Microsoft's “.NET Framework” must be installed.
“.NET Framework” can be downloaded from Microsoft's Web site.
-  Screens used in the following explanation are just examples and dependent on the version of the “DeviceInstaller.”

■ Setting outline

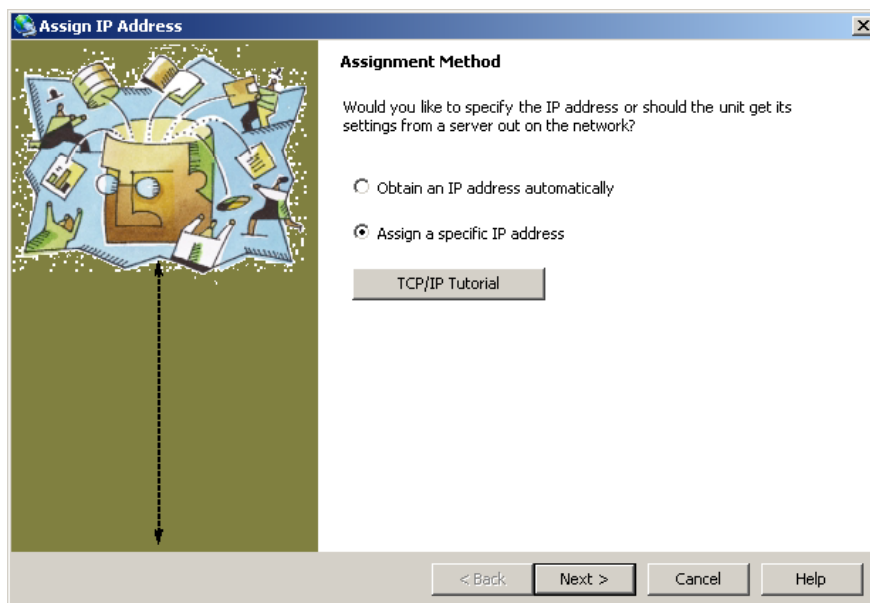
1. Connect the COM-JL and Client, and then turn on the power.

 For wiring procedure, refer to **4. WIRING (P. 8)**.


2. Start the DeviceInstaller, and click the “Assign IP” icon.

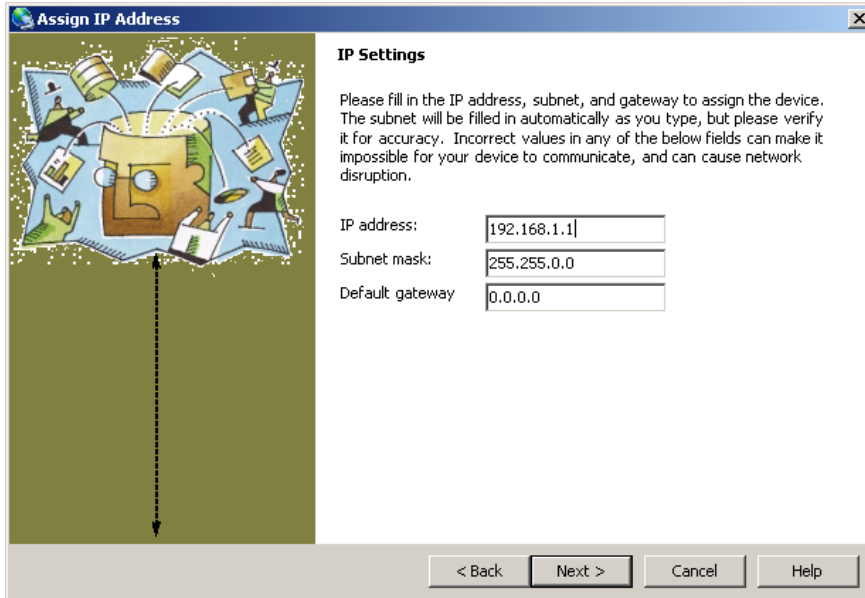


3. Select the “Assign a specific IP address”, and click the Next > button.



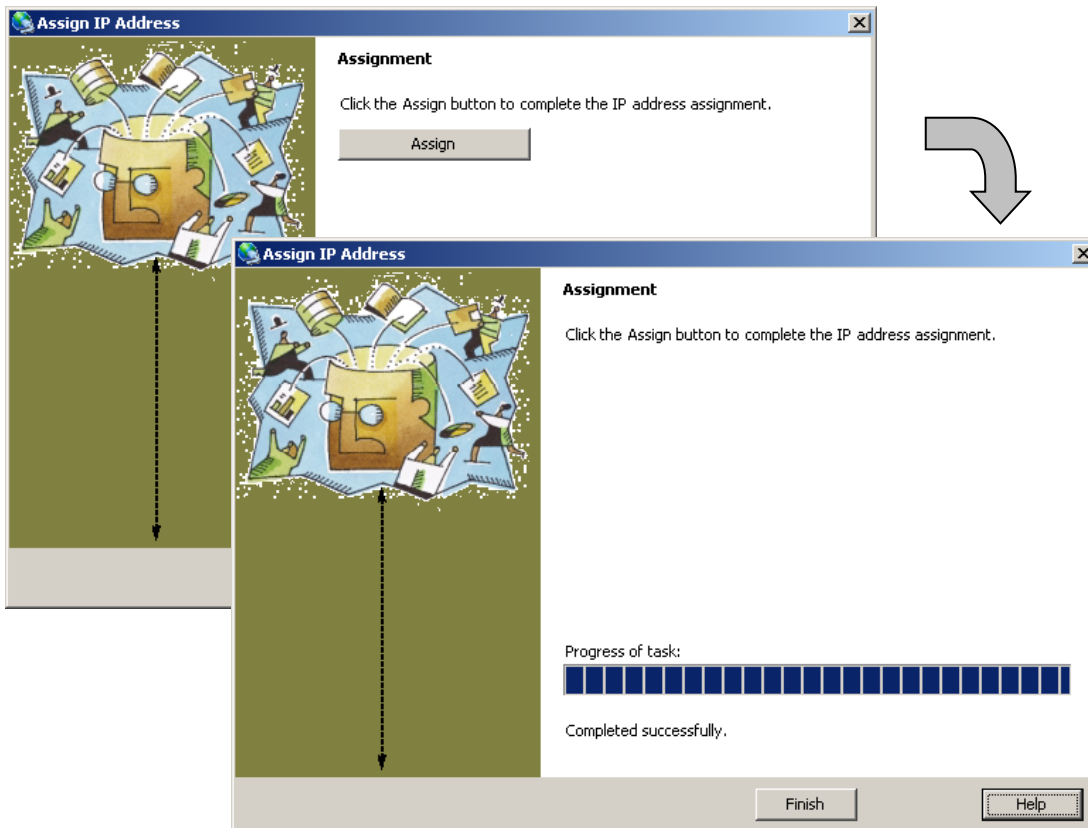
4. Enter the IP address, and click Next > button.

 Check that the subnet mask value is “255.255.255.0”.



The 'Assign IP Address' dialog box is shown. It has a title bar with a globe icon and the text 'Assign IP Address'. On the left is a colorful illustration of a puzzle with a face. On the right, under the heading 'IP Settings', is a paragraph of instructions: 'Please fill in the IP address, subnet, and gateway to assign the device. The subnet will be filled in automatically as you type, but please verify it for accuracy. Incorrect values in any of the below fields can make it impossible for your device to communicate, and can cause network disruption.' Below this are three input fields: 'IP address:' with the value '192.168.1.1', 'Subnet mask:' with the value '255.255.0.0', and 'Default gateway:' with the value '0.0.0.0'. At the bottom are four buttons: '< Back', 'Next >', 'Cancel', and 'Help'.

5. Click the Assign button to set the IP address.

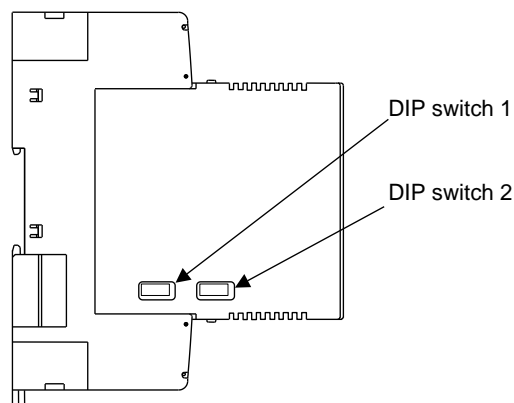


The 'Assign IP Address' dialog box is shown in two states. The top state shows the 'Assignment' step with the instruction 'Click the Assign button to complete the IP address assignment.' and a single 'Assign' button. A large grey arrow points from this state to the bottom state. The bottom state shows the 'Assignment' step with the same instruction, but the 'Assign' button is replaced by a progress bar. The progress bar is labeled 'Progress of task:' and is filled with blue bars. Below the progress bar, it says 'Completed successfully.' At the bottom of the dialog box are two buttons: 'Finish' and 'Help'.

6.4 Setting by the DIP Switch

It is possible to set the IP address by DIP switch with Ethernet not connected.

DIP switches used are DIP switch 1 and DIP switch 2 on the left side of the module.



Left side view of COM-JL



Factory set value of an IP address of a COM-JL is “192.168.1.1.”

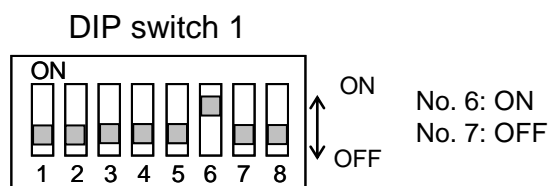
■ Setting example

An example of setting the IP address of the COM-JL to “192.168.1.3” is shown in the following.

1. Setting preparations

Turn on No. 6 and off No. 7 of DIP switch 1 with the power turned off.

It does not matter whether Nos. 1 to 5 and No. 8 of DIP switch 1 is turned on or off.

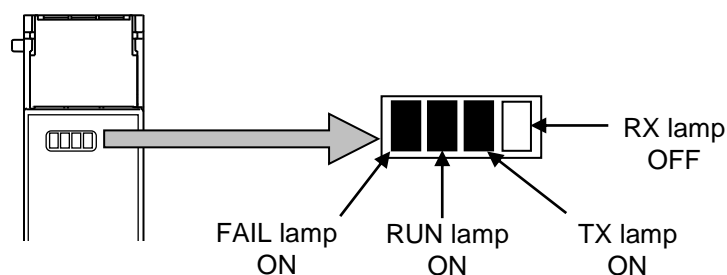


2. Power ON

Turning the power on goes to IP address setup mode. Thus, the FAIL lamp lights.

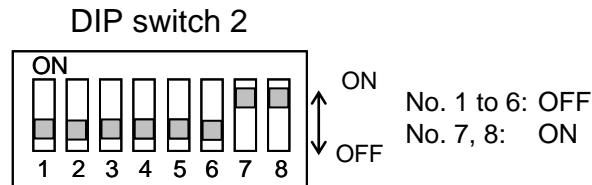
In addition, the first byte (most significant byte) of the IP address is set to the entry wait state.

(RUN lamp: ON, TX lamp: ON, RX lamp: OFF)



3. Input the first byte “192”

Enter the first byte (most significant byte) by DIP switch 2. As the first byte (most significant byte) is entered with “192,” this number corresponds to a binary number of “11000000.” Conduct the following setting with No. 8 of DIP switch 2 set to the most significant bit.

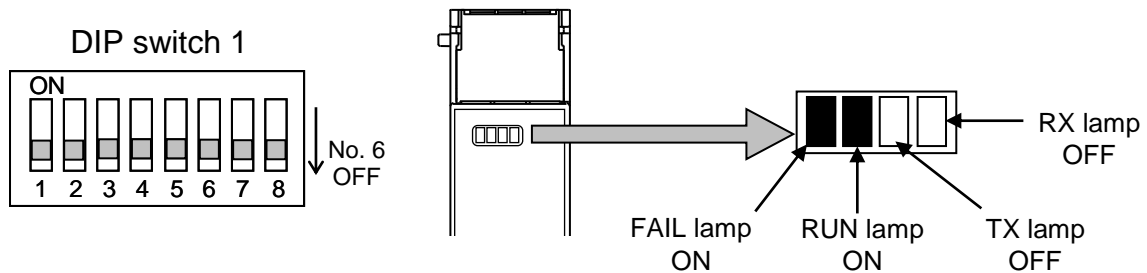


4. Decision of the first byte input

In order to establish the setting of DIP switch 2, turn off No. 6 of DIP switch 1.

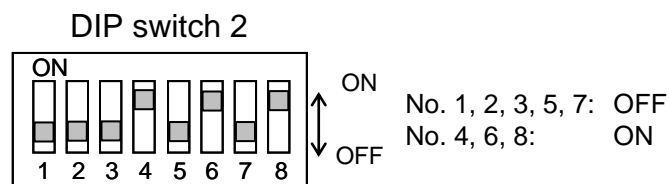
In addition, the second byte of IP address is set to the entry wait state.

(RUN lamp: ON, TX lamp: OFF, RX lamp: OFF)



5. Input the second byte “168”

Enter the second byte by DIP switch 2. As the second byte is entered with “168,” this number corresponds to a binary number of “10101000.” Conduct the following setting with No. 8 of DIP switch 2 set to the most significant bit.

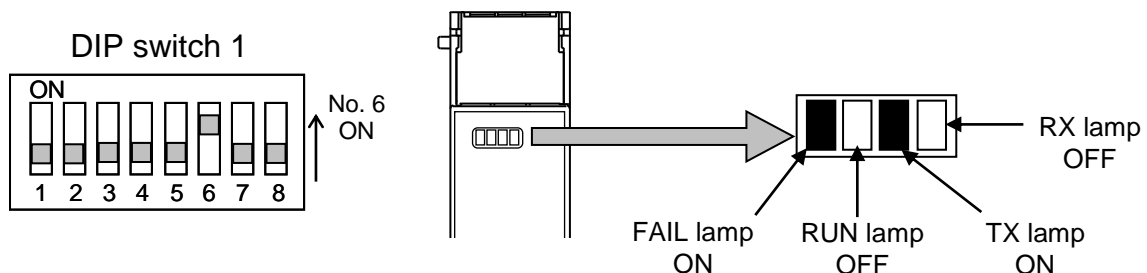


6. Decision of the second byte input

In order to establish the setting of DIP switch 2, turn on No. 6 of DIP switch 1.

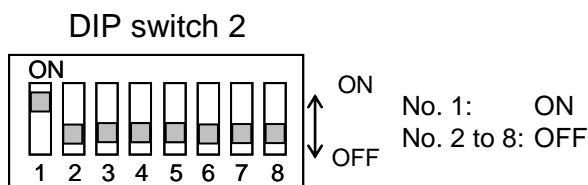
In addition, the third byte of IP address is set to the entry wait state.

(RUN lamp: OFF, TX lamp: ON, RX lamp: OFF)



7. Input the third byte “1”

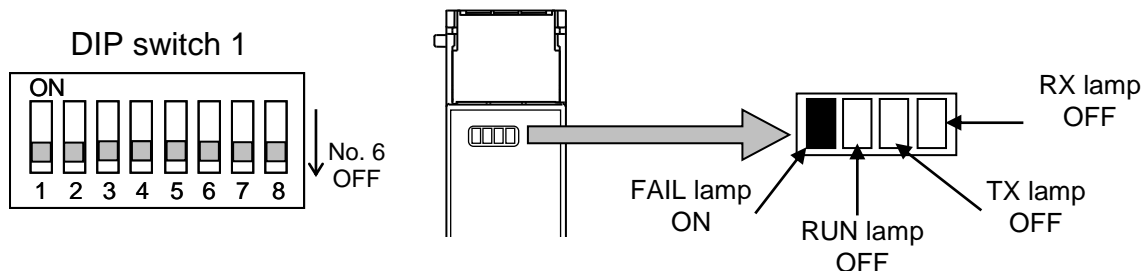
Enter the third byte by DIP switch 2. As the third byte is entered with “1,” this number corresponds to a binary number of “00000001.” Conduct the following setting with No. 8 of DIP switch 2 set to the most significant bit.

**8. Decision of the third byte input**

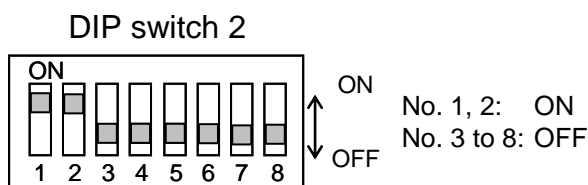
In order to establish the setting of DIP switch 2, turn off No. 6 of DIP switch 1.

In addition, the fourth byte of IP address is set to the entry wait state.

(RUN lamp: OFF, TX lamp: OFF, RX lamp: OFF)

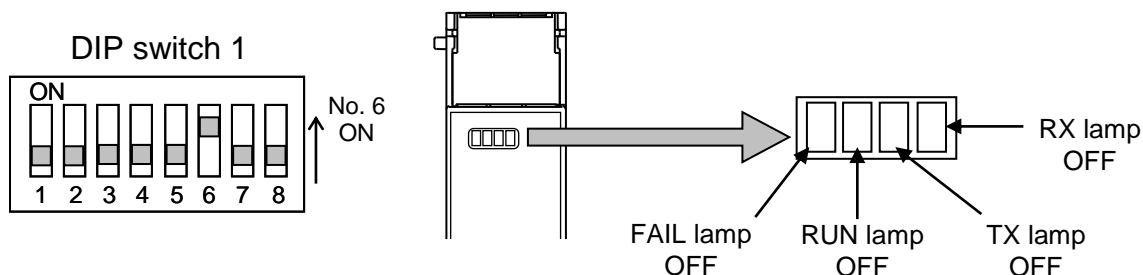
**9. Input the fourth byte “3”**

Enter the fourth byte by DIP switch 2. As the fourth byte is entered with “3,” this number corresponds to a binary number of “00000011.” Conduct the following setting with No. 8 of DIP switch 2 set to the most significant bit.

**10. Decision of the fourth byte input**

In order to establish the setting of DIP switch 2, turn on No. 6 of DIP switch 1. Thus, the IP address setting is finished and the FAIL lamp goes off.

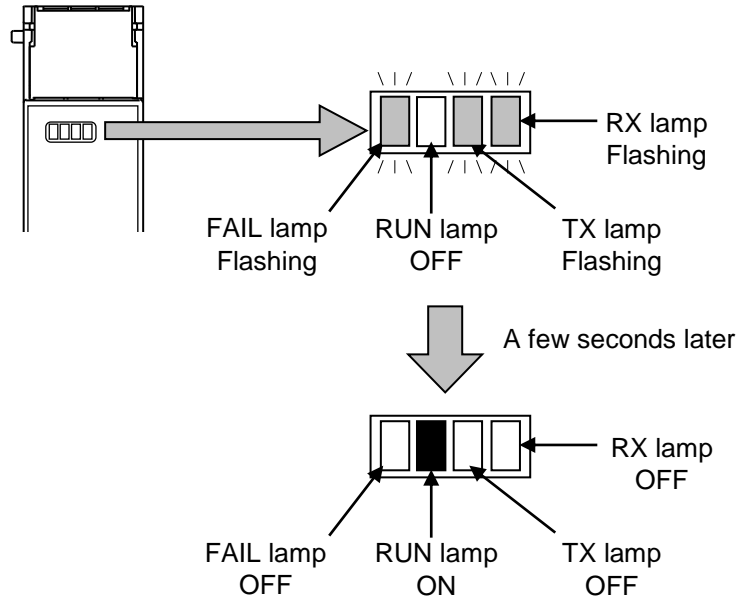
(RUN lamp: OFF, TX lamp: OFF, RX lamp: OFF)



11. Decision of the IP address

After a lapse of a few seconds, the RUN lamp lights and the IP address is established.

The FAIL, TX and RX lamps flash until the IP address is established and they go off after the IP address is established.



12. Power OFF

Turn the power off and also turn off No. 6 of DIP switch 1. In addition, turn off all Nos. of DIP switch 2.

If the power is turned on, operation starts at the IP address thus set.

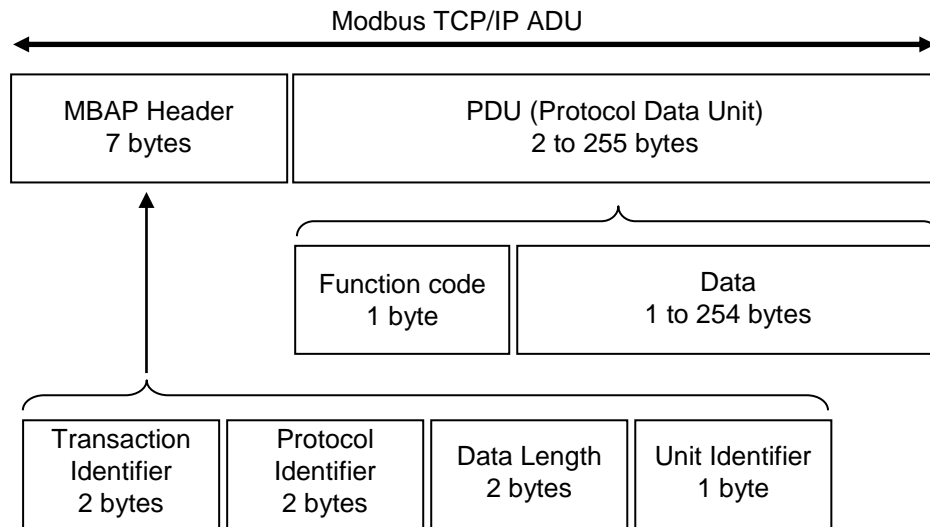
7. MODBUS/TCP PROTOCOL

Modbus/TCP is an open field network provided with the Modbus protocol on the TCP/IP protocol of Ethernet.

The data request side is called Client (such as computer) and the data response (supply) side is called Server (COM-JL).

7.1 Message Configuration

Modbus ADU (Application Data Unit) on TCP/IP is in the following configuration.



■ MBAP Header

MBAP (Modbus Application Protocol) Header contains the following fields: Transaction Identifier, Protocol Identifier, Data Length and Unit Identifier.

Fields	Length	Request (Client)	Response (Server)
Transaction Identifier	2 bytes	Unused However, data corresponding to two bytes is sent According to need, request and the response are used in order to take consistency	Returns data from the Client as is
Protocol Identifier	2 bytes	"0" fixed (Modbus protocol = 0)	Returns data from the Client as is
Data Length	2 bytes	The total number of bytes of Unit Identifier and PDU (256 bytes max.)	The total number of bytes of Unit Identifier and PDU (256 bytes max.)
Unit Identifier	1 byte	Unused However, data corresponding to one byte is sent According to need, request and the response are used in order to take consistency	Returns data from the Client as is

■ PDU

PDU (Protocol Data Unit) consists of two blocks: function codes and data.

Fields	Length	Request (Client)	Response (Server)
Function code	1 byte	03H: Read holding registers 06H: Write single register 08H: Diagnostics (loopback test) 10H: Write multiple registers 17H: Read/Write multiple registers	Normal response Returns data from the Client as is Error response 80H + Function code
Data	1 to 254 bytes	Data meeting the function code	Normal response Data meeting the function code Error response Exception code 01H: Illegal function code 02H: Illegal register address 03H: Illegal data value 04H: Server failure 06H: Server busy

7.2 Function Code

● Function code contents

Function code	Function	Contents
03H	Read holding registers	Measured value, Control output value, Current transformer input value, Event status, etc.
06H	Write single register	Set value, PID constants, Event set value, etc.
08H	Diagnostics (loopback test)	Loopback test
10H	Write multiple registers	Set value, PID constants, Event set value, etc.
17H	Read/Write multiple registers	Measured value, Control output value, Current transformer input value, Event status, Set value, PID constants, Event set value, etc.

● Message (PDU) length of each function [Unit: byte]

Function code	Function	Request message		Response message	
		Min	Max	Min	Max
03H	Read holding registers	5	5	4	252
06H	Write single register	5	5	5	5
08H	Diagnostics (loopback test)	5	5	5	5
10H	Write multiple registers	8	252	5	5
17H	Read/Write multiple registers	12	246	4	238

7.3 Server (COM-JL) Responses

■ Normal response

- In the response message of the read holding registers, the Server (COM-JL) returns the Function code, Number of data items and the Read out data as the response message.
- In the response message of the write single register and diagnostics (loopback test), the Server (COM-JL) returns the same message as the request message.
- In the response message of the write multiple registers, the Server (COM-JL) returns the Function code, the Register address number and the Number of register as the response message.
- In the response message of the read/write multiple registers, the Server (COM-JL) returns the Function code, Number of write data items and the Read out data as the response message.

■ Defective message response

- If the request message from the Client is defective, except for transmission error, the Server (COM-JL) returns the exception response message without any action.
- If the self-diagnostic function of the Server (COM-JL) detects an error, the Server will return an exception response message to all request messages.
- The function code of each exception response message is obtained by adding “80H” to the function code of the request message.

Function code
Exception code

Exception response message

Exception code	Contents	Causes
01H	Illegal function code	An unsupported function code was specified
02H	Illegal register address	When the mismatched register address is specified.
03H	Illegal data value	<ul style="list-style-type: none"> • The number of specified data points was out of the following range during data read or write. Function code 03H: 1 to 125 Function code 10H: 1 to 123 Function code 17H: 1 to 118 • When the data written exceeds the setting range
04H	Server failure	State under which the Server cannot normally respond (An error occurred in the Server)
06H	Server busy	State under which the Server cannot immediately respond (The Server is being initialized)

Exception code priority order

01H > 03H > 02H > 04H > 06H

- Order of a no response in PDU data length error
When Specified PDU data length < Received PDU data length:
01H > No response in PDU data length error > 03H
When Specified PDU data length > Received PDU data length:
No response in PDU data length error > 01H
- Order when reading/writing the register contents
When there is 02H or 03H only for read processing:
01H > 04H > 06H > 03H > 02H
- Order when out of the setting range
For 03H when out of the setting range: 01H > 02H > 04H > 06H > 03H

■ No response

The Server (COM-JL) ignores the request message and does not respond when:

- The IP address does not coincide.
- The Server (COM-JL) is not connected to the network.
- The PDU (Protocol Data Unit) data length is abnormal.
When the PDU data length specified by the request message does not coincide with the number of bytes received as one TCP packet.
COM-JL determines whether or not communication messages correspond to one packet by time-out (approx. 12 ms) between characters.

7.4 Message Format

7.4.1 Read holding registers [03H]

The request message specifies the starting register address number and quantity of register addresses to be read.

The contents of the registers are entered in the response message as data, divided into two parts: the high-order 8 bits and low-order 8 bits, arranged in the order of the register numbers.

Example: The contents of the three registers from 0000H to 0002H are the read out.

Request message [Client]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	} First register address
Function code		03H	
Register address	High	00H	} The setting must be between 1 (0001H) and 125 (007DH).
	Low	00H	
Quantity (Number of words)	High	00H	
	Low	03H	

Normal response message [Server]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	09H	
Unit Identifier		00H	} Number of registers × 2
Function code		03H	
Number of data (byte)		06H	
First register contents	High	00H	
	Low	78H	
Next register contents	High	00H	
	Low	00H	
Next register contents	High	00H	
	Low	14H	

Exception response message [Sever]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	03H	
Unit Identifier		00H	} When the data exceeds the setting range
80H + Function code		83H	
Exception code		03H	

7.4.2 Write single register [06H]

The request message specifies data to be written into the designated register.

Write data items are arranged in the request message in order starting from the smallest register address number. In addition, each register address is assigned in the order of high-order 8 bits and low-order 8 bits, respectively.

Example: When 100 (64H) is written to the register 0580H

Request message [Client]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	} Any data within the range
Function code		06H	
Register address	High	05H	} Any data within the range
	Low	80H	
Write data	High	00H	
	Low	64H	

Normal response message [Server]

Transaction Identifier	High	00H	} Contents will be the same as request message data
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	
Function code		06H	
Register address	High	05H	
	Low	80H	
Write data	High	00H	
	Low	64H	

Exception response message [Sever]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	03H	
Unit Identifier		00H	→ When the data exceeds the setting range
80H + Function code		86H	
Exception code		03H	

7.4.3 Diagnostics (Loopback test) [08H]

The Client's request message will be returned as the response message from the Server.

This function checks the communication system between the Client and Server (COM-JL).

Example: Loopback test

Request message [Client]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	} Test code must be set to 00H
Function code		08H	
Test code	High	00H	
	Low	00H	} Any pertinent data
Data	High	1FH	
	Low	34H	

Normal response message [Server]

Transaction Identifier	High	00H	} Contents will be the same as request message data
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	
Function code		08H	
Test code	High	00H	
	Low	00H	
Data	High	1FH	
	Low	34H	

Exception response message [Sever]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	03H	
Unit Identifier		00H	→ When Server is busy
80H + Function code		88H	
Exception code		06H	

7.4.4 Write multiple registers [10H]

Each data is written to registers in specified quantities starting from the specified register address. Write data items are arranged in the request message in order starting from the smallest register address number. In addition, each register address is assigned in the order of high-order 8 bits and low-order 8 bits, respectively.

Example: When 100 (64H) and 30 (1EH) are written to the register 0580H and 0581H (two in total)

Request message [Client]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	0BH	
Unit Identifier		00H	} First register address
Function code		10H	
Register address	High	05H	} The setting must be between 1 (0001H) and 123 (007BH).
	Low	80H	
Quantity (Number of words)	High	00H	} Number of registers × 2
	Low	02H	
Number of data (byte)		04H	
Data to first register	High	00H	
	Low	64H	
Data to next register	High	00H	
	Low	1EH	

Normal response message [Server]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	06H	
Unit Identifier		00H	} First register address
Function code		10H	
Register address	High	05H	
	Low	80H	
Quantity (Number of words)	High	00H	
	Low	02H	

Exception response message [Sever]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	03H	
Unit Identifier		00H	} When the data exceeds the setting range
80H + Function code		90H	
Exception code		03H	

7.4.5 Read/Write multiple registers [17H]

The contents of consecutive registers in specified quantities are read starting from the specified register address. Each data is written to registers in specified quantities starting from the specified register address.

Example: When data is read from the register 0000H (one in total) and then 100 (64H) and 30 (1EH) are written to the register 0580H and 0581H (two in total)

Request message [Client]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	0FH	
Unit Identifier		00H	} First read register address
Function code		17H	
Read register address	High	00H	} The setting must be between 1 (0001H) and 118 (0076H).
	Low	00H	
Read quantity (Number of words)	High	00H	} First write register address
	Low	01H	
Write register address	High	05H	} The setting must be between 1 (0001H) and 118 (0076H).
	Low	80H	
Write quantity (Number of words)	High	00H	} Number of write registers × 2
	Low	02H	
Number of write data (byte)		04H	} Number of write registers × 2
Written data to first register	High	00H	
	Low	64H	} Number of write registers × 2
Written data to next register	High	00H	
	Low	1EH	

Normal response message [Server]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	05H	
Unit Identifier		00H	} Number of write registers × 2
Function code		17H	
Number of write data (byte)		04H	} Number of write registers × 2
Read register contents	High	00H	
	Low	78H	

Exception response message [Sever]

Transaction Identifier	High	00H	} MBAP Header
	Low	00H	
Protocol Identifier	High	00H	
	Low	00H	
Data Length	High	00H	
	Low	03H	
Unit Identifier		00H	→ When the data exceeds the setting range
80H + Function code		97H	
Exception code		03H	

7.5 Data Configuration

7.5.1 Data scale

The numeric range of data used in this protocol is 0000H to FFFFH. Only the set value within the setting range is effective.



FFFFH represents -1.

■ Data processing with decimal points

The Modbus/TCP protocol does not recognize data with decimal points during communication.

● Data with one decimal place

Current transformer 1 (CT1) input value monitor	Event 3 delay timer
Current transformer 2 (CT2) input value monitor	Event 4 delay timer
Manipulated output value (MV1) monitor [heat-side]	Derivative gain
Manipulated output value (MV2) monitor [cool-side]	Manipulated output value at input error
Holding peak value ambient temperature monitor	Manipulated output value (MV1) at STOP mode [heat-side]
Power feed forward input value monitor	Manipulated output value (MV2) at STOP mode [cool-side]
Manual reset	Output change rate limiter (up) [MV1]
Heater break alarm 1 (HBA1) set value	Output change rate limiter (down) [MV1]
Heater break determination point 1	Output limiter high [MV1]
Heater melting determination point 1	Output limiter low [MV1]
Heater break alarm 2 (HBA2) set value	Output change rate limiter (up) [MV2]
Heater break determination point 2	Output change rate limiter (down) [MV2]
Heater melting determination point 2	Output limiter high [MV2]
PV digital filter	Output limiter low [MV2]
RS digital filter	Output value with AT turned on
Proportional cycle time [heat-side]	Output value with AT turned off
Proportional cycle time [cool-side]	AT differential gap time
Timer 1	Open/Close output neutral zone
Timer 2	Open/Close output differential gap
Timer 3	Integrated output limiter
Timer 4	Automatic temperature rise dead time
Event 1 delay timer	Automatic temperature rise gradient data
Event 2 delay timer	

Example: When Manipulated output value (MV1) monitor [heat-side] is 5.0 %, 5.0 is processed as 50, 50 = 0032H

Manipulated output value (MV1) monitor [heat-side]	High	00H
	Low	32H

● Data with two decimal places

PV low input cut-off	Proportional band adjusting factor [cool-side]
Power feed forward gain	Integral time adjusting factor [cool-side]
Area soak time	Derivative time adjusting factor [cool-side]
Proportional band adjusting factor [heat-side]	ST proportional band adjusting factor
Integral time adjusting factor [heat-side]	ST integral time adjusting factor
Derivative time adjusting factor [heat-side]	ST derivative time adjusting factor

Example: When PV low input cut-off is 0.55 second, 0.55 is processed as 55,
55 = 0037H

PV low input cut-off	High	00H
	Low	37H

● Data with three decimal places

PV ratio
RS ratio
Undershoot suppression factor

Example: When PV ratio is 0.555, 0.555 is processed as 555,
555 = 022BH

PV ratio	High	02H
	Low	2BH

● Data whose decimal point's presence and/or position depends on Integral/Derivative time decimal point position (1300H) selection

The position of the decimal point changes depending on the Integral/Derivative time decimal point position selection type, because this protocol does not recognize data with decimal points during communication.

[Type of decimal points position]

No decimal place, One decimal place

Integral time [heat-side]	Derivative time limiter high [heat-side]
Derivative time [heat-side]	Derivative time limiter low [heat-side]
Integral time [cool-side]	Integral time limiter high [cool-side]
Derivative time [cool-side]	Integral time limiter low [cool-side]
Integral time limiter high [heat-side]	Derivative time limiter high [cool-side]
Integral time limiter low [heat-side]	Derivative time limiter low [cool-side]

Example: When Integral time [heat-side] is 240.0 seconds, 240.0 is processed as 2400,
2400 = 0960H

Integral time [heat-side]	High	09H
	Low	60H

- **Data whose decimal point's presence and/or position depends on Input range and Decimal point position (0A80H) selection**

The position of the decimal point changes depending on the Input range type and the Decimal point position selection type, because this protocol does not recognize data with decimal points during communication.

[Type of decimal points position]

Temperature input: No decimal place, One decimal place, Two decimal places

Voltage/Current input: No decimal place, One decimal place, Two decimal places,
Three decimal places and Four decimal places

Measured value (PV) monitor	Input error determination point high
Set value (SV) monitor	Input error determination point low
Remote setting (RS) input value monitor	Transmission output scale high
Event 1 set value (EV1)	Transmission output scale low
Event 2 set value (EV2)	Event 1 differential gap
Event 3 set value (EV3)	Event 2 differential gap
Event 4 set value (EV4)	Event 3 differential gap
LBA deadband	Event 4 differential gap
Set value (SV)	Start determination point
Proportional band [heat-side]	ON/OFF action differential gap (upper)
Proportional band [cool-side]	ON/OFF action differential gap (lower)
Overlap/Deadband	AT bias
Setting change rate limiter (up)	Proportional band limiter high [heat-side]
Setting change rate limiter (down)	Proportional band limiter low [heat-side]
PV bias	Proportional band limiter high [cool-side]
RS bias	Proportional band limiter low [cool-side]
Manual manipulated output value	Setting limiter high
Input scale high	Setting limiter low
Input scale low	

Example: When Set value (SV) is -20.0°C , -20.0 is processed as -200 ,
 $-200 = 0000\text{H} - 00\text{C8H} = \text{FF}38\text{H}$

Set value (SV)	High	FFH
	Low	38H

● Data with no decimal place

Burnout state monitor	Event 1 hold action
Burnout state monitor of feedback resistance input	Event 1 interlock
Event 1 state monitor	Force ON of Event 1 action
Event 2 state monitor	Event 2 type
Event 3 state monitor	Event 2 hold action
Event 4 state monitor	Event 2 interlock
Heater break alarm 1 (HBA1) state monitor	Force ON of Event 2 action
Heater break alarm 2 (HBA2) state monitor	Event 3 type
Error code	Event 3 hold action
Digital input (DI) state monitor	Event 3 interlock
Output state monitor	Force ON of Event 3 action
Operation mode state monitor	Event 4 type
Memory area soak time monitor	Event 4 hold action
Integrated operating time monitor	Event 4 interlock
Backup memory state monitor	Force ON of Event 4 action
PID/AT transfer	CT1 ratio
Auto/Manual transfer	CT1 assignment
Remote/Local transfer	Heater break alarm 1 (HBA1) type
RUN/STOP transfer	Number of heater break alarm 1 (HBA1) delay times
Memory area transfer	CT2 ratio
Interlock release	CT2 assignment
Control loop break alarm (LBA) time	Heater break alarm 2 (HBA2) type
Control response parameter	Number of heater break alarm 2 (HBA2) delay times
Area soak time	Hot/Cold start
Link area number	External input type
Set lock level	Master channel selection
STOP display	SV tracking
Bar graph display	MV transfer function
Bar graph display resolution	Control action
Direct key 1	Integral/Derivative time decimal point position
Direct key 2	Derivative action
Direct key 3	Action (high) at input error
Direct key type	Action (low) at input error
Input type	Power feed forward selection
Display unit	AT cycles
Decimal point position	Action at feedback resistance (FBR) input error
TC input burnout direction	Feedback adjustment preparation
Square root extraction	Control motor time
Power supply frequency	Valve action at STOP
Sampling cycle	Startup tuning (ST)
Remote setting input type	ST start condition
Digital input (DI) assignment	Automatic temperature rise group
Output assignment	Automatic temperature rise learning
Energized/De-energized	RUN/STOP group
Alarm (ALM) lamp lighting condition 1	Setting change rate limiter unit time
Alarm (ALM) lamp lighting condition 2	Soak time unit
Output status at STOP mode	PV transfer function
Transmission output type	PV flashing display at input error
Event 1 type	

Example: When Integrated operating time monitor is 72 hour,

72 = 0048H

Integrated operating time monitor	High	00H
	Low	48H

7.5.2 Caution for handling communication data

- In this communication, the variables that memory area includes handles different address with for control area and for setting area.
- If data (holding register) exceeding the accessible address range is accessed, an error response message is returned.
- Read data of unused item is a default value.
- Any attempt to write to an unused item is not processed as an error. Data cannot be written into an unused item.
- If data range or address error occurs during data writing, it is not processed as an error. Except the data that error occurred, normal data is written in data register. Therefore, it is necessary to confirm data after the end of setting data.
- Communication data includes data that becomes RO (read only) depending on the specification. No error occurs even if data is written when set to RO. However in this case, no data is written.



For details, refer to **8. COMMUNICATION DATA LIST (P. 51)**.

- COM-JL does not read/write data for Control area Local/External transfer of FB100.

7.5.3 How to use memory area data

Memory area function can store up to 8 individual sets of SVs and parameters. One of the areas is used for control, and the currently selected area is “Control area.”

■ Read and write of memory area data

If any memory area number to perform data read and write is specified by the setting memory area number (2000H to 201EH), data corresponding to the specified memory area number is called up to the register addresses from 2020H to 22BFH. By using these register addresses from 2020H to 22BFH, it becomes possible to read and write data in any memory area.

- Register address to specify memory area: 2000H to 201EH (Setting memory area number)

2000H: Setting memory area number for controller address 1

2001H: Setting memory area number for controller address 2

⋮

201EH: Setting memory area number for controller address 31

(201FH: Unused)

- Register address of memory area data: 2020H to 22BFH

2020H to 203EH: Event 1 set value (203FH: Unused)

2040H to 205EH: Event 2 set value (205FH: Unused)

2060H to 207EH: Event 3 set value (207FH: Unused)

2080H to 209EH: Event 4 set value (209FH: Unused)

20A0H to 20BEH: Control loop break alarm (LBA) time (20BFH: Unused)

20C0H to 20DEH: LBA deadband (20DFH: Unused)

20E0H to 20FEH: Set value (SV) (20FFH: Unused)

2100H to 211EH: Proportional band [heat-side] (211FH: Unused)

2120H to 213EH: Integral time [heat-side] (213FH: Unused)

2140H to 215EH: Derivative time [heat-side] (215FH: Unused)

2160H to 217EH: Control response parameter (217FH: Unused)

2180H to 219EH: Proportional band [cool-side] (219FH: Unused)

21A0H to 21BEH: Integral time [cool-side] (21BFH: Unused)

21C0H to 21DEH: Derivative time [cool-side] (21DFH: Unused)

21E0H to 201FH: Overlap/Deadband (21FFH: Unused)

2200H to 221EH: Manual reset (221FH: Unused)

2220H to 223EH: Setting change rate limiter (up) (223FH: Unused)

2240H to 225EH: Setting change rate limiter (down) (225FH: Unused)

2260H to 227EH: Area soak time (227FH: Unused)

2280H to 229EH: Link area number (229FH: Unused)

22A0H to 22BFH: Unused



Register address of each item corresponds to any controller address from 1 to 31.

■ Control area transfer

Any memory area used for control is specified by the memory area transfer (0480H to 049EH). The area (04C0H to 073FH) now used for control is called “Control area.”

- Register address of memory area transfer: 0480H to 049EH
 - 0480H: Memory area transfer for controller address 1
 - 0481H: Memory area transfer for controller address 2
 - ⋮
 - 049EH: Memory area transfer for controller address 31
 - (049FH: Unused)
- Register address of control area data: 04C0H to 073FH

04C0H to 04DEH: Event 1 set value	(04DFH: Unused)
04E0H to 04FEH: Event 2 set value	(04FFH: Unused)
0500H to 051EH: Event 3 set value	(051FH: Unused)
0520H to 053EH: Event 4 set value	(053FH: Unused)
0540H to 055EH: Control loop break alarm (LBA) time	(055FH: Unused)
0560H to 057EH: LBA deadband	(057FH: Unused)
0580H to 059EH: Set value (SV)	(059FH: Unused)
05A0H to 05BEH: Proportional band [heat-side]	(05BFH: Unused)
05C0H to 05DEH: Integral time [heat-side]	(05DFH: Unused)
05E0H to 05FEH: Derivative time [heat-side]	(05FFH: Unused)
0600H to 061EH: Control response parameter	(061FH: Unused)
0620H to 063EH: Proportional band [cool-side]	(063FH: Unused)
0640H to 065EH: Integral time [cool-side]	(065FH: Unused)
0660H to 067EH: Derivative time [cool-side]	(067FH: Unused)
0680H to 069FH: Overlap/Deadband	(069FH: Unused)
06A0H to 06BEH: Manual reset	(06BFH: Unused)
06C0H to 06DEH: Setting change rate limiter (up)	(06DFH: Unused)
06E0H to 06FEH: Setting change rate limiter (down)	(06FFH: Unused)
0700H to 071EH: Area soak time	(071FH: Unused)
0720H to 073EH: Link area number	(073FH: Unused)



Register address of each item corresponds to any controller address from 1 to 31.

8. COMMUNICATION DATA LIST

8.1 Reference to Communication Data List

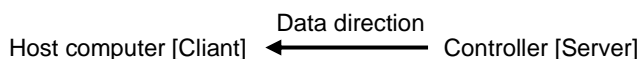
No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
1	Measured value (PV)	0000	0	31	RO	Input scale low to Input scale high	—
2	Current transformer 1 (CT1) input value monitor	0020	32	31	RO	CTL-6-P-N: 0.0 to 30.0A CTL-12-S56-10L-N: 0.0 to 100.0 A	—
3	Current transformer 2 (CT2) input value monitor	0040	64	31	RO		—

(1) **Name:** Communication data name is written.

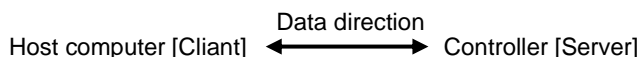
(2) **Register address:** The register start number of each communication item
(Vacant numbers becomes unused.)
HEX: Hexadecimal
DEC: Decimal

(3) **Number of data items:** Number of communication data items is written.
The address in the register address column will be the head address, and the number of data items is indicated in this column.

(4) **Attribute:** A method of how communication data items are read or written when viewed from the host computer is described.
RO: Read only data



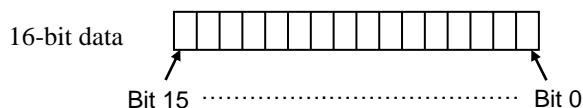
R/W: Read and Write data



(5) **Data range:** The reading range or the writing range of communication data is written.



Bit image of bit data is as follows.



(6) **Factory set value:** The factory set value of communication data is written.



Reading data of unused setting items are factory set values. Unused setting items may not be written. To do so will not cause an error however and data will be rejected.



For the Memory area data, refer to **8.3 Memory area data items (P. 77)**.



For details on the data, refer to **FB100 Instruction Manual (IMR01W16-E□)** or **FB400/FB900 Instruction Manual (IMR01W03-E□)**.

8.2 FB100/400/900 Communication Data Items



For data corresponding to Nos. 76 to 219 (other than No. 204 Startup tuning and No. 210 Automatic temperature rise learning), its attribute becomes RO (Read only data) during RUN (control). When setting data corresponding to Nos. 76 to 219 (other than No. 204 and No. 210), write the data after STOP (control stop) is selected.

No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
1	Measured value (PV)	0000	0	31	RO	Input scale low to Input scale high	—
2	Current transformer 1 (CT1) input value monitor	0020	32	31	RO	CTL-6-P-N: 0.0 to 30.0A CTL-12-S56-10L-N: 0.0 to 100.0 A	—
3	Current transformer 2 (CT2) input value monitor	0040	64	31	RO		—
4	Set value (SV) monitor	0060	96	31	RO	Setting limiter low to Setting limiter high	—
5	Remote setting (RS) input value monitor	0080	128	31	RO	Setting limiter low to Setting limiter high	—
6	Burnout state monitor	00A0	160	31	RO	0: OFF 1: ON	—
7	Burnout state monitor of feedback resistance input	00C0	192	31	RO	0: OFF 1: ON	—
8	Event 1 state monitor	00E0	224	31	RO	0: OFF 1: ON	—
9	Event 2 state monitor	0100	256	31	RO		—
10	Event 3 state monitor	0120	288	31	RO		—
11	Event 4 state monitor	0140	320	31	RO		—
12	Heater break alarm 1 (HBA1) state monitor	0160	352	31	RO	0: OFF 1: ON	—
13	Heater break alarm 2 (HBA2) state monitor	0180	384	31	RO		—
14	Manipulated output value (MV1) monitor [heat-side]	01A0	416	31	RO	PID control or Heat/Cool PID control: –5.0 to +105.0 % Position proportioning control with feedback resistance (FBR) input: 0.0 to 100.0 %	—
15	Manipulated output value (MV2) monitor [cool-side]	01C0	448	31	RO	–5.0 to +105.0 %	—

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
16	Error code	01E0	480	31	RO	Bit data Bit 0: Adjustment data error Bit 1: Back-up error Bit 2: A/D conversion error Bit 3 to Bit 4: Unused Bit 5: Custom data error Bit 6: Unused Bit 7: Watchdog timer error Bit 8: Stack overflow Bit 9 to Bit 10: Unused Bit 11: Program error (busy) Bit 12 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 4095]	—
17	Digital input (DI) state monitor	0200	512	31	RO	Bit data Bit 0: DI 1 Bit 4: DI 5 Bit 1: DI 2 Bit 5: DI 6 * Bit 2: DI 3 Bit 6: DI 7 * Bit 3: DI 4 Bit 7 to Bit 15: Unused Data 0: Contact open 1: Contact closed [Decimal number: 0 to 127] * Unused on the FB100.	—
18	Output state monitor	0220	544	31	RO	Bit data Bit 0: OUT1 Bit 3: DO2 Bit 1: OUT2 Bit 4: DO3 * Bit 2: DO1 Bit 5: DO4 * Bit 6 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 63] * Unused on the FB100.	—
19	Operation mode state monitor	0240	576	31	RO	Bit data Bit 0: Control STOP Bit 1: Control RUN Bit 2: Manual mode * Bit 3: Remote mode * Bit 4 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 15] * During operation in Manual mode, the Manual mode of the Operation mode state monitor is set to the "1: ON" state and the Remote mode of the same monitor is set to the "0: OFF" state even if the parameter, Remote/Local transfer is set to "1: Remote mode."	—

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
20	Memory area soak time monitor	0260	608	31	RO	0 to 11999 seconds or 0 to 5999 minutes Data range of Area soak time can be selected on the Soak time unit.	—
21	Integrated operating time monitor	0280	640	31	RO	0 to 19999 hours	—
22	Holding peak value ambient temperature monitor	02A0	672	31	RO	−10.0 to +100.0 °C	—
23	Power feed forward input value monitor ♦	02C0	704	31	RO	0.0 to 160.0 % Display in the percentage of the load voltage (rated value).	—
24	Backup memory state monitor	02E0	736	31	RO	0: The content of the backup memory does not coincide with that of the RAM. 1: The content of the backup memory coincides with that of the RAM.	—
25	Unused	0300	768	32	—	—	—
26	Unused	0320	800	32	—	—	—
27	Unused	0340	832	32	—	—	—
28	Unused	0360	864	32	—	—	—
29	Unused	0380	896	32	—	—	—
30	Unused	03A0	928	32	—	—	—
31	Unused	03C0	960	32	—	—	—
32	Unused	03E0	992	32	—	—	—
33	PID/AT transfer	0400	1024	31	R/W	0: PID control 1: Autotuning (AT) When the Autotuning (AT) is finished, the control will automatically returns to 0: PID control.	0
34	Auto/Manual transfer	0420	1056	31	R/W	0: Auto mode 1: Manual mode	0
35	Remote/Local transfer	0440	1088	31	R/W	0: Local mode 1: Remote mode When performing Remote control by Remote setting input and also performing Cascade control and Ratio setting via Intercontroller communication, transfer to the Remote mode. [FB100] When the Remote setting (RS) input is not provided, this data becomes RO (Read only data).	0
36	RUN/STOP transfer	0460	1120	31	R/W	0: RUN mode (Control start) 1: STOP mode (Control stop)	0

♦ Unused on the FB100.

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
37	Memory area transfer	0480	1152	31	R/W	1 to 8 [FB100] When the Digital input (DI) assignment (No. 95) value is 6 to 12 and Control area Local/External transfer * is External mode, this data becomes RO (Read only data). * Operation of Control area Local/External transfer is only available for FB100.	1
38	Interlock release	04A0	1184	31	R/W	0: Interlock release (execution/state) 1: Interlock An event whose event interlock is set to "1: Used" is set to the event ON state results in "1: Interlocked state." "1" is for monitoring the interlocked state. Under this condition, do not write "1."	0
39	Event 1 set value ★	04C0	1216	31	R/W	Deviation: –Input span to +Input span Process and set value: Input scale low to Input scale high Manipulated output value (MV1 or MV2): –5.0 to +105.0 %	50
40	Event 2 set value ★	04E0	1248	31	R/W	If the Event type corresponds to "0: None," set to RO (Read only data).	50
41	Event 3 set value ★	0500	1280	31	R/W	If Event 4 corresponds to "9: Control loop break alarm (LBA)," the Event 4 set value becomes RO (Read only data).	50
42	Event 4 set value ★	0520	1312	31	R/W	0 to 7200 seconds (0: Unused) If Event 4 is other than "9: Control loop break alarm (LBA)," set to RO (Read only data).	480
43	Control loop break alarm (LBA) time ★	0540	1344	31	R/W	0 to Input span If Event 4 is other than "9: Control loop break alarm (LBA)," set to RO (Read only data).	0
44	LBA deadband ★	0560	1376	31	R/W	Setting limiter low to Setting limiter high	TC/RTD: 0 V/I: 0.0
45	Set value (SV) ★	0580	1408	31	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position selection. Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of Input span (0, 0.0 or 0.00: ON/OFF action)	TC/RTD: 30 V/I: 30.0
46	Proportional band [heat-side] ★	05A0	1440	31	R/W		

★ Data related to multi-memory area function

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
47	Integral time [heat-side] ★	05C0	1472	31	R/W	PID control or Heat/Cool PID control: 0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action) [both heat-side and cool-side] Position proportioning control: 1 to 3600 seconds or 0.1 to 1999.9 seconds Varies with the setting of the Integral/Derivative time decimal point position selection.	240
48	Derivative time [heat-side] ★	05E0	1504	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) Varies with the setting of the Integral/Derivative time decimal point position selection.	60
49	Control response parameter ★	0600	1536	31	R/W	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid.	PID control, Position proportioning control: 0 Heat/Cool PID control: 2
50	Proportional band [cool-side] ★	0620	1568	31	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input span, (Unit: °C [°F]) Varies with the setting of the Decimal point position selection. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of input span If control is other than Heat/Cool PID control, set to RO (Read only data).	TC/RTD: 30 V/I: 30.0
51	Integral time [cool-side] ★	0640	1600	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action) [both heat-side and cool-side] Varies with the setting of the Integral/Derivative time decimal point position selection. If control is other than Heat/Cool PID control, set to RO (Read only data).	240
52	Derivative time [cool-side] ★	0660	1632	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) Varies with the setting of the Integral/Derivative time decimal point position selection. If control is other than Heat/Cool PID control, set to RO (Read only data).	60

★ Data related to multi-memory area function

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
53	Overlap/Deadband ★	0680	1664	31	R/W	TC/RTD inputs: –Input span to +Input span (Unit:°C [°F]) Voltage (V)/Current (I) inputs: –100.0 to +100.0 % of input span Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range. If control is other than Heat/Cool PID control, set to RO (Read only data).	0
54	Manual reset ★	06A0	1696	31	R/W	–100.0 to +100.0 % The offset can be manually eliminated. If the integral function is valid, set to RO (Read only data).	0.0
55	Setting change rate limiter (up) ★	06C0	1728	31	R/W	0 to Input span/unit time * (0: Unused)	0
56	Setting change rate limiter (down) ★	06E0	1760	31	R/W	* Unit time: 60 seconds (factory set value)	0
57	Area soak time ★	0700	1792	31	R/W	0 to 11999 seconds or 0 to 5999 minutes Data range of Area soak time can be selected on the Soak time unit. [FB100] When the Digital input (DI) assignment (No. 95) value is 6 to 12, this data becomes RO (Read only data).	0
58	Link area number ★	0720	1824	31	R/W	0 to 8 (0: No link) [FB100] When the Digital input (DI) assignment (No. 95) value is 6 to 12, this data becomes RO (Read only data).	0
59	Heater break alarm 1 (HBA1) set value	0740	1856	31	R/W	When CT is CTL-6-P-N: 0.0 to 30.0 A (0.0: Not used) When CT is CTL-12-S56-10L-N: 0.0 to 100.0 A (0.0: Not used) If there is no Current transformer 1 (CT1) or CT1 is assigned to “0: None,” set to RO (Read only data).	0.0
60	Heater break determination point 1	0760	1888	31	R/W	0.0 to 100.0 % of HBA1 set value (0.0: Heater break determination is invalid) If there is no Current transformer 1 (CT1) or CT1 is assigned to “0: None,” set to RO (Read only data). If Heater break alarm 1 (HBA1) corresponds to “0: Type A,” set to RO (Read only data).	30.0

★ Data related to multi-memory area function

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
61	Heater melting determination point 1	0780	1920	31	R/W	0.0 to 100.0 % of HBA1 set value (0.0: Heater melting determination is invalid) If there is no Current transformer 1 (CT1) or CT1 is assigned to "0: None," set to RO (Read only data). If Heater break alarm 1 (HBA1) corresponds to "0: Type A," set to RO (Read only data).	30.0
62	Heater break alarm 2 (HBA2) set value	07A0	1952	31	R/W	When CT is CTL-6-P-N: 0.0 to 30.0 A (0.0: Not used) When CT is CTL-12-S56-10L-N: 0.0 to 100.0 A (0.0: Not used) If there is no Current transformer 2 (CT2) or CT2 is assigned to "0: None," set to RO (Read only data).	0.0
63	Heater break determination point 2	07C0	1984	31	R/W	0.0 to 100.0 % of HBA2 set value (0.0: Heater break determination is invalid) If there is no Current transformer 2 (CT2) or CT2 is assigned to "0: None," set to RO (Read only data). If Heater break alarm 2 (HBA2) corresponds to "0: Type A," set to RO (Read only data).	30.0
64	Heater melting determination point 2	07E0	2016	31	R/W	0.0 to 100.0 % of HBA2 set value (0.0: Heater melting determination is invalid) If there is no Current transformer 2 (CT2) or CT2 is assigned to "0: None," set to RO (Read only data). If Heater break alarm 2 (HBA2) corresponds to "0: Type A," set to RO (Read only data).	30.0
65	PV bias	0800	2048	31	R/W	-Input span to +Input span	0
66	PV digital filter	0820	2080	31	R/W	0.0 to 100.0 seconds (0.0: Unused)	0.0
67	PV ratio	0840	2112	31	R/W	0.500 to 1.500	1.000
68	PV low input cut-off	0860	2114	31	R/W	0.00 to 25.00 % of input span If the Input square root extraction corresponds to "0: Unused," set to RO (Read only data).	0.00
69	RS bias Cascade control: Cascade bias Ratio setting: Ratio setting bias	0880	2176	31	R/W	-Input span to +Input span [FB100] When the Remote setting (RS) input is not provided, this data becomes RO (Read only data).	0

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
70	RS digital filter Cascade control: Cascade digital filter Ratio setting: Ratio setting digital filter	08A0	2208	31	R/W	0.0 to 100.0 seconds (0.0: Unused) [FB100] When the Remote setting (RS) input is not provided, this data becomes RO (Read only data).	0.0
71	RS ratio Cascade control: Cascade ratio Ratio setting: Ratio setting ratio	08C0	2240	31	R/W	0.001 to 9.999 [FB100] When the Remote setting (RS) input is not provided, this data becomes RO (Read only data).	1.000
72	Proportional cycle time [heat-side]	08E0	2272	31	R/W	0.1 to 100.0 seconds This item becomes RO (Read only data) for the Voltage/Current output specification.	Relay contact output: 20.0 Voltage pulse output, Triac output and Open collector output: 2.0
73	Proportional cycle time [cool-side]	0900	2304	31	R/W	0.1 to 100.0 seconds If control is other than Heat/Cool PID control, set to RO (Read only data). This item becomes RO (Read only data) for the Voltage/Current output specification.	Relay contact output: 20.0 Voltage pulse output, Triac output and Open collector output: 2.0
74	Manual manipulated output value	0920	2336	31	R/W	PID control: Output limiter low [MV1] to Output limiter high [MV1] Heat/Cool PID control: –Output limiter high [MV2] to +Output limiter high [MV1] (–105.0 to +105.0 %) Position proportioning control with feedback resistance (FBR) input: Output limiter low [MV1] to Output limiter high [MV1]	0.0
75	Set lock level	0940	2368	31	R/W	Bit data Bit 0: Lock only setting items other than SV and Event set value (EV1 to EV4). Bit 1: Lock only Event set value (EV1 to EV4) Bit 2: Lock only Set value (SV) Bit 3 to Bit 15: Unused Data 0: Unlock 1: Lock [Decimal number: 0 to 7]	0
76	STOP display	0960	2400	31	R/W	0: SToP is displayed on the PV display. 1: SToP is displayed on the SV display.	1

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
77	Bar graph display	0980	2432	31	R/W	0: No display 1: Manipulated output value (MV1) or Manipulated output value (MV2) 2: Measured value (PV) 3: Set value (SV) monitor 4: Deviation value 5: CT1 input value 6: CT2 input value	1
78	Bar graph display resolution	09A0	2464	31	R/W	1 to 100 digit/dot Becomes valid when the Bar graph display is "4: Deviation value," "5: CT1 input value" or "6: CT2 input value."	100
79	Direct key 1 [FB100] Direct key selection	09C0	2496	31	R/W	[FB100] 0: Unused 1: Used [FB400/900] 0: Unused 1: A/M transfer key (Type 1, Type 2)	1
80	Direct key 2 ♦	09E0	2528	31	R/W	0: Unused 1: MONI key (For type 1) or R/L transfer key (For type 2)	1
81	Direct key 3 ♦	0A00	2560	31	R/W	0: Unused 1: AREA key (For type 1) or RUN/STOP transfer key (For type 2)	1
82	Direct key type	0A20	2592	31	R/W	[FB100] 1: Auto/Manual transfer 2: Monitor 3: Memory area transfer 4: Remote/Local transfer 5: RUN/STOP transfer [FB400/900] 1: Type 1 2: Type 2	1

♦ Unused on the FB100.

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
83	Input type	0A40	2624	31	R/W	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 10: TC input U 11: TC input L 12: RTD input Pt100 13: RTD input JPt100 14: Current input 0 to 20 mA DC 15: Current input 4 to 20 mA DC 16: Voltage (high) input 0 to 10 V DC 17: Voltage (high) input 0 to 5 V DC 18: Voltage (high) input 1 to 5 V DC 19: Voltage (low) input 0 to 1 V DC 20: Voltage (low) input 0 to 100 mV DC 21: Voltage (low) input 0 to 10 mV DC 24: Voltage (high) input ± 1 V DC 25: Voltage (low) input ± 100 mV DC 26: Voltage (low) input ± 10 mV DC If changed to Voltage (high) input from TC/RTD/Current/Voltage (low) input, select the hardware by the input selector switch (for measurement input) at the side of the instrument. For the selecting procedure, refer to FB100 Instruction Manual (IMR01W16-E□) or FB400/FB900 Instruction Manual (IMR01W03-E□) .	Depend on model code. When not specifying: 0
84	Display unit	0A60	2656	31	R/W	0: °C 1: °F Use to select the temperature unit for thermocouple (TC) and RTD inputs.	0
85	Decimal point position	0A80	2688	31	R/W	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: K, J, E: Only 0 or 1 can be set. T, U, L: Only 1 can be set. Other than the above: Only 0 can be set. RTD input: From 0 to 2 can be set. V/I inputs: From 0 to 4 can be set.	Depends on model code. When not specifying: TC/RTD: 0 V/I: 1

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
86	Input scale high	0AA0	2720	31	R/W	TC/RTD inputs: Input scale low to Maximum value of the selected input range Voltage (V)/Current (I) inputs: –19999 to +19999 (Varies with the setting of the Decimal point position)	TC/RTD: Maximum value of the selected input range V/I: 100.0
87	Input scale low	0AC0	2752	31	R/W	TC/RTD inputs: Minimum value of the selected input range to Input scale high Voltage (V)/Current (I) inputs: –19999 to +19999 (Varies with the setting of the Decimal point position)	TC/RTD: Minimum value of the selected input range V/I: 0.0
88	Input error determination point (high)	0AE0	2784	31	R/W	Input scale low – (5 % of input span) to Input scale high + (5 % of input span)	TC/RTD: Input scale high + (5 % of input span) V/I: 105.0
89	Input error determination point (low)	0B00	2816	31	R/W		TC/RTD: Input scale low – (5 % of input span) V/I: –5.0
90	Burnout direction	0B20	2848	31	R/W	0: Upscale 1: Downscale Valid only when the TC input and Voltage (low) input are selected.	0
91	Square root extraction	0B40	2880	31	R/W	0: Unused 1: Used	0
92	Power supply frequency	0B60	2912	31	R/W	0: 50 Hz 1: 60 Hz If power frequency measurement was made possible with CT input and/or Power feed forward (PFF) input applied, set to RO (Read only data).	0
93	Sampling cycle	0B80	2944	31	R/W	0: 50 ms 1: 100 ms 2: 250 ms	1

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
94	Remote setting input type	0BA0	2976	31	R/W	14: Current input 0 to 20 mA DC 15: Current input 4 to 20 mA DC 16: Voltage (high) input 0 to 10 V DC 17: Voltage (high) input 0 to 5 V DC 18: Voltage (high) input 1 to 5 V DC 19: Voltage (low) input 0 to 1 V DC 20: Voltage (low) input 0 to 100 mV DC 21: Voltage (low) input 0 to 10 mV DC If changed to Voltage (high) input from Current/Voltage (low) input, select the hardware by the input selector switch (for remote setting input) at the side of the instrument. For the selecting procedure, refer to FB100 Instruction Manual (IMR01W16-E□) or FB400/FB900 Instruction Manual (IMR01W03-E□) .	Depends on model code. When not specifying: 15
95	Digital input (DI) assignment	0BC0	3008	31	R/W	[FB100] 1 to 26 [FB400/900] 1 to 8 Refer to Table 1 Digital input (DI) assignment (P. 75) .	Depends on model code. When not specifying: 1
96	Output assignment	0BE0	3040	31	R/W	[FB100] 1 to 15 [FB400/900] 1 to 7 Refer to Table 2 Output assignment (P. 76) .	Depends on model code. When not specifying: FB100: 1 FB400/900: 2
97	Timer 1	0C00	3072	31	R/W	0.0 to 600.0 seconds Customization tool is necessary when the timer function is availed.	0.0
98	Timer 2	0C20	3104	31	R/W		0.0
99	Timer 3	0C40	3136	31	R/W		0.0
100	Timer 4	0C60	3168	31	R/W		0.0
101	Energized/De-energized	0C80	3200	31	R/W	Bit data Bit 0: DO1 Bit 1: DO2 Bit 2: DO3 * Bit 3: DO4 * Bit 4 to Bit 15: Unused Data 0: Energized 1: De-energized [Decimal number: 0 to 15] * Unused on the FB100.	0

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
102	Alarm (ALM) lamp lighting condition 1 ^a	0CA0	3232	31	R/W	Bit data Bit 0: Event 1 Bit 1: Event 2 Bit 2: Event 3 Bit 3: Event 4 Bit 4 to Bit 15: Unused Data 0: ALM lamp is not lit 1: ALM lamp is lit [Decimal number: 0 to 15]	1111 (Bit image)
103	Alarm (ALM) lamp lighting condition 2 ^a	0CC0	3264	31	R/W	Bit data Bit 0: HBA1 Bit 1: HBA2 Bit 2 to Bit 15: Unused Data 0: ALM lamp is not lit 1: ALM lamp is lit [Decimal number: 0 to 3]	11 (Bit image)
104	Output status at STOP mode	0CE0	3296	31	R/W	Bit data Bit 0: Event function Bit 1: Transmission output Bit 2 to Bit 15: Unused Data 0: OFF 1: Action continued	0
105 ⋮ 110	Unused	0D00 ⋮ 0DA0	3328 ⋮ 3488	—	—	—	—
111	Transmission output type	0DC0	3520	31	R/W	0: None 1: Measured value (PV) 2: Set value (SV) monitor 3: Deviation value 4: Manipulated output value (MV1) [heat-side] 5: Manipulated output value (MV2) [cool-side] 6: Set value (SV) 7: Remote setting (RS) input value	1
112	Transmission output scale high	0DE0	3552	31	R/W	When the PV, SV, SV monitor and RS: Input scale low to Input scale high When the MV1 and MV2: -5.0 to +105.0 % When the deviation value: -Input span to +Input span	PV/SV/RS: Input scale high MV1/MV2: 100.0 Deviation: +Input span

^a When two or more items are set to “1: ALM lamp is lit,” if an error occurs in any one of these item, the alarm lamp on the front of the controller (FB100/400/900) lights.

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
113	Transmission output scale low	0E00	3584	31	R/W	When the PV, SV, SV monitor and RS: Input scale low to Input scale high When the MV1 and MV2: –5.0 to +105.0 % When the deviation value: –Input span to +Input span	PV/SV/RS: Input scale low MV1/MV2: 0.0 Deviation: –Input span
114	Event 1 type	0E20	3616	31	R/W	0: None 1: Deviation high ¹ 2: Deviation low ¹ 3: Deviation high/low ¹ 4: Band ¹ 5: Process high ¹ 6: Process low ¹ 7: SV high 8: SV low 9: Unused 10: MV1 high [heat-side] ^{1, 2} 11: MV1 low [heat-side] ^{1, 2} 12: MV2 high [cool-side] ¹ 13: MV2 low [cool-side] ¹ ¹ Event hold action is available. ² If there is Feedback resistance (FBR) input in Position proportioning control, set to the Feedback resistance (FBR) input value.	Depends on model code. When not specifying: 0
115	Event 1 hold action	0E40	3648	31	R/W	0: OFF 1: Hold action ON (when power turned on; when transferred from STOP to RUN) 2: Re-hold action ON (when power turned on; when transferred from STOP to RUN; SV changed)	Depends on model code. When not specifying: 0
116	Event 1 interlock	0E60	3680	31	R/W	0: Unused 1: Used	0
117	Event 1 differential gap	0E80	3712	31	R/W	① Deviation, process or set value: 0 to Input span (Unit: °C [°F]) ② MV: 0.0 to 110.0 %	① TC/RTD: 2 V/I: 0.2 ② 0.2
118	Event 1 delay timer	0EA0	3744	31	R/W	0.0 to 600.0 seconds	0.0

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
119	Force ON of Event 1 action	0EC0	3776	31	R/W	Bit data Bit 0: Event output turned on at input error occurrence Bit 1: Event output turned on in Manual mode Bit 2: Event output turned on during the Autotuning (AT) function is being executed Bit 3: Event output turned on during the Setting change rate limiter is being operated Bit 4 to Bit 15: Unused Data 0: Invalid 1: Valid [Decimal number: 0 to 15]	0
120	Event 2 type	0EE0	3808	31	R/W	Same as Event 1 type	
121	Event 2 hold action	0F00	3840	31	R/W	Same as Event 1 hold action	
122	Event 2 interlock	0F20	3872	31	R/W	Same as Event 1 interlock	
123	Event 2 differential gap	0F40	3904	31	R/W	Same as Event 1 differential gap	
124	Event 2 delay timer	0F60	3936	31	R/W	Same as Event 1 delay timer	
125	Force ON of Event 2 action	0F80	3968	31	R/W	Same as Force ON of Event 1 action	
126	Event 3 type	0FA0	4000	31	R/W	Same as Event 1 type	
127	Event 3 hold action	0FC0	4032	31	R/W	Same as Event 1 hold action	
128	Event 3 interlock	0FE0	4064	31	R/W	Same as Event 1 interlock	
129	Event 3 differential gap	1000	4096	31	R/W	Same as Event 1 differential gap	
130	Event 3 delay timer	1020	4128	31	R/W	Same as Event 1 delay timer	
131	Force ON of Event 3 action	1040	4160	31	R/W	Same as Force ON of Event 1 action	

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
132	Event 4 type	1060	4192	31	R/W	0: None 1: Deviation high ¹ 2: Deviation low ¹ 3: Deviation high/low ¹ 4: Band ¹ 5: Process high ¹ 6: Process low ¹ 7: SV high 8: SV low 9: Control loop break alarm (LBA) 10: MV1 high [heat-side] ^{1, 2} 11: MV1 low [heat-side] ^{1, 2} 12: MV2 high [cool-side] ¹ 13: MV2 low [cool-side] ¹ ¹ Event hold action is available. ² If there is Feedback resistance (FBR) input in Position proportioning control, set to the Feedback resistance (FBR) input value.	Depends on model code. When not specifying: 0
133	Event 4 hold action	1080	4224	31	R/W	Same as Event 1 hold action	
134	Event 4 interlock	10A0	4256	31	R/W	Same as Event 1 interlock	
135	Event 4 differential gap	10C0	4288	31	R/W	① Deviation, process or set value: 0 to Input span (Unit: °C [°F]) ② MV: 0.0 to 110.0 % Becomes invalid when the Event 4 type corresponds to “9: Control loop break alarm (LBA).”	① TC/RTD: 2 V/I: 0.2 ② 0.2
136	Event 4 delay timer	10E0	4320	31	R/W	Same as Event 1 delay timer	
137	Force ON of Event 4 action	1100	4352	31	R/W	Same as Force ON of Event 1 action	
138	CT1 ratio	1120	4384	31	R/W	0 to 9999	CTL-6-P-N: 800 CTL-12-S56 -10L-N: 1000
139	CT1 assignment	1140	4416	31	R/W	0: None 1: OUT1 2: OUT2 3: DO1 4: DO2 5: DO3 * 6: DO4 * * Unused on the FB100.	1
140	Heater break alarm 1 (HBA1) type	1160	4448	31	R/W	0: Heater break alarm 1 (HBA1) type A (Time-proportional control output) 1: Heater break alarm 1 (HBA1) type B (Continuous control output and Time-proportional control output)	1

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
141	Number of Heater break alarm 1 (HBA1) delay times	1180	4480	31	R/W	0 to 255 times	5
142	CT2 ratio	11A0	4512	31	R/W	0 to 9999	CTL-6-P-N: 800 CTL-12-S56-10L-N: 1000
143	CT2 assignment	11C0	4544	31	R/W	0: None 1: OUT1 2: OUT2 3: DO1 4: DO2 5: DO3 * 6: DO4 * * Unused on the FB100.	0
144	Heater break alarm 2 (HBA2) type	11E0	4576	31	R/W	0: Heater break alarm 2 (HBA2) type A (Time-proportional control output) 1: Heater break alarm 2 (HBA2) type B (Continuous control output and Time-proportional control output)	1
145	Number of Heater break alarm 2 (HBA2) delay times	1200	4608	31	R/W	0 to 255 times	5
146	Hot/Cold start	1220	4640	31	R/W	0: Hot start 1 1: Hot start 2 2: Cold start 3: Stop start	0
147	Start determination point	1240	4672	31	R/W	0 to Input span (The unit is the same as input value.) (0: Action depending on the Hot/Cold start selection)	3 % of input span
148	External input type	1260	4704	31	R/W	0: Remote setting input (Remote control) 1: Intercontroller communication Cascade control 2: Intercontroller communication Ratio setting When performing Cascade control or Ratio setting, set the master controller to 0 (Remote control). Set slave controllers to 1 (Cascade control) or 2 (Ratio setting).	0
149	Master channel selection	1280	4736	31	R/W	0 to 31 If the External input type corresponds to "1: Cascade control" or "2: Ratio setting," the setting becomes valid.	0
150	SV tracking	12A0	4768	31	R/W	0: Unused 1: Used	1

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
151	MV transfer function [Action taken when changed to Manual mode from Auto mode]	12C0	4800	31	R/W	0: MV1 or MV2 in Auto mode is used. 1: When selected by Digital input (DI): MV1 or MV2 in previous Manual mode is used. When selected by front key: MV1 or MV2 in Auto mode is used. 2: MV1 or MV2 in previous Manual mode is used.	0
152	Control action	12E0	4832	31	R/W	0: Brilliant II PID control (direct action) 1: Brilliant II PID control (reverse action) 2: Brilliant II Heat/Cool PID control [water cooling] 3: Brilliant II Heat/Cool PID control [air cooling] 4: Brilliant II Heat/Cool PID control [Cooling gain linear type] 5: Position proportioning control	Depends on model code. When not specifying: 1
153	Integral/Derivative time decimal point position	1300	4864	31	R/W	0: 1 second setting (No decimal place) 1: 0.1 seconds setting (One decimal place)	0
154	Derivative action	1320	4896	31	R/W	0: Measured value derivative 1: Deviation derivative	0
155	Undershoot suppression factor	1340	4928	31	R/W	0.000 to 1.000	Water cooling: 0.100 Air cooling: 0.250 Cooling gain linear type: 1.000
156	Derivative gain	1360	4960	31	R/W	0.1 to 10.0	6.0
157	ON/OFF action differential gap (upper)	1380	4992	31	R/W	TC/RTD inputs: 0 to Input span (Unit: °C [°F])	TC/RTD: 1 V/I: 0.1
158	ON/OFF action differential gap (lower)	13A0	5024	31	R/W	Voltage (V)/Current (I) inputs: 0.0 to 100.0 % of input span	TC/RTD: 1 V/I: 0.1
159	Action (high) at input error	13C0	5056	31	R/W	0: Normal control 1: Manipulated output value at input error	0
160	Action (low) at input error	13E0	5088	31	R/W		0

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
161	Manipulated output value at input error	1400	5120	31	R/W	–105.0 to +105.0 % Actual output values become those restricted by the output limiter. Position proportioning control: If there is no Feedback resistance (FBR) input or the Feedback resistance (FBR) input is disconnected, an action taken when abnormal is in accordance with the value action setting during STOP.	0.0
162	Manipulated output value (MV1) at STOP mode [heat-side]	1420	5152	31	R/W	–5.0 to +105.0 % Position proportioning control: Only when there is Feedback resistance (FBR) input and no Feedback resistance (FBR) input is disconnected, the Manipulated output value (MV1) during STOP is output.	–5.0
163	Manipulated output value (MV2) at STOP mode [cool-side]	1440	5184	31	R/W		–5.0
164	Output change rate limiter (up) [MV1]	1460	5216	31	R/W	0.0 to 100.0 %/seconds (0.0: OFF)	0.0
165	Output change rate limiter (down) [MV1]	1480	5248	31	R/W	Becomes invalid when in position proportioning control.	0.0
166	Output limiter high [MV1]	14A0	5280	31	R/W	Output limiter low [MV1] to 105.0 % Position proportioning control: Becomes valid only when there is Feedback resistance (FBR) input and it does not break.	105.0
167	Output limiter low [MV1]	14C0	5312	31	R/W	–5.0 % to Output limiter high [MV1] Position proportioning control: Becomes valid only when there is Feedback resistance (FBR) input and it does not break.	–5.0
168	Output change rate limiter (up) [MV2]	14E0	5344	31	R/W	0.0 to 100.0 %/seconds (0.0: OFF)	0.0
169	Output change rate limiter (down) [MV2]	1500	5376	31	R/W	Becomes invalid when in Position proportioning control.	0.0
170	Output limiter high [MV2]	1520	5408	31	R/W	Output limiter low [MV2] to 105.0 %	105.0
171	Output limiter low [MV2]	1540	5440	31	R/W	–5.0 % to Output limiter high [MV2]	–5.0
172	Power feed forward selection ♦	1560	5472	31	R/W	0: Unused 1: Used	1
173	Power feed forward gain ♦	1580	5504	31	R/W	0.01 to 5.00	1.00
174	AT bias	15A0	5536	31	R/W	–Input span to +Input span	0

♦ Unused on the FB100.

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
175	AT cycles	15C0	5568	31	R/W	0: 1.5 cycles 1: 2.0 cycles 2: 2.5 cycles 3: 3.0 cycles	1
176	Output value with AT turned on	15E0	5600	31	R/W	Output value with AT turned off to 105.0 % Actual output values become those restricted by the output limiter. Position proportioning control: Becomes valid only when there is Feedback resistance (FBR) input and it does not break (high limit of Feedback resistance input at AT).	105.0
177	Output value with AT turned off	1600	5632	31	R/W	−105.0 % to Output value with AT turned on Actual output values become those restricted by the output limiter. Position proportioning control: Becomes valid only when there is Feedback resistance (FBR) input and it does not break (low limit of Feedback resistance input at AT).	−105.0
178	AT differential gap time	1620	5664	31	R/W	0.0 to 50.0 seconds	10.0
179	Proportional band adjusting factor [heat-side]	1640	5696	31	R/W	0.01 to 10.00 times	1.00
180	Integral time adjusting factor [heat-side]	1660	5728	31	R/W		1.00
181	Derivative time adjusting factor [heat-side]	1680	5760	31	R/W		1.00
182	Proportional band adjusting factor [cool-side]	16A0	5792	31	R/W		1.00
183	Integral time adjusting factor [cool-side]	16C0	5824	31	R/W		1.00
184	Derivative time adjusting factor [cool-side]	16E0	5856	31	R/W		1.00
185	Proportional band limiter high [heat-side]	1700	5888	31	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position selection.	TC/RTD: Input span V/I: 1000.0
186	Proportional band limiter low [heat-side]	1720	5920	31	R/W	Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of input span	TC/RTD: 0 V/I: 0.0
187	Integral time limiter high [heat-side]	1740	5952	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds	3600
188	Integral time limiter low [heat-side]	1760	5984	31	R/W	Varies with the setting of the Integral/Derivative time decimal point position selection.	0

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
189	Derivative time limiter high [heat-side]	1780	6016	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds	3600
190	Derivative time limiter low [heat-side]	17A0	6048	31	R/W	Varies with the setting of the Integral/Derivative time decimal point position selection.	0
191	Proportional band limiter high [cool-side]	17C0	6080	31	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position selection.	TC/RTD: Input span V/I: 1000.0
192	Proportional band limiter low [cool-side]	17E0	6112	31	R/W	Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of input span	TC/RTD: 1 V/I: 0.1
193	Integral time limiter high [cool-side]	1800	6144	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds	3600
194	Integral time limiter low [cool-side]	1820	6176	31	R/W	Varies with the setting of the Integral/Derivative time decimal point position selection.	0
195	Derivative time limiter high [cool-side]	1840	6208	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds	3600
196	Derivative time limiter low [cool-side]	1860	6240	31	R/W	Varies with the setting of the Integral/Derivative time decimal point position selection.	0
197	Open/Close output neutral zone	1880	6272	31	R/W	0.1 to 10.0 % of output	2.0
198	Open/Close output differential gap	18A0	6304	31	R/W	0.1 to 5.0 % of output	1.0
199	Action at Feedback resistance (FBR) input break	18C0	6336	31	R/W	0: Action depending on the valve action at STOP 1: Control action continued	0
200	Feedback adjustment	18E0	6368	31	R/W	0: Adjustment end 1: During adjustment on the open-side 2: During adjustment on the close-side	—
201	Control motor time	1900	6400	31	R/W	5 to 1000 seconds	10
202	Integrated output limiter	1920	6432	31	R/W	0.0 to 200.0 % of control motor time (0.0: OFF) Becomes invalid when there is Feedback resistance (FBR) input.	150.0
203	Valve action at STOP	1940	6464	31	R/W	0: Close-side output OFF, Open-side output OFF 1: Close-side output ON, Open-side output OFF 2: Close-side output OFF, Open-side output ON Becomes valid when there is no Feedback resistance (FBR) input or the Feedback resistance (FBR) input is disconnected.	0

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
204	Startup tuning (ST)	1960	6496	31	R/W	0: ST unused 1: Execute once * 2: Execute always * When the Startup tuning is finished, the setting will automatically returns to "0: ST unused." The Startup tuning (ST) function is activated according to the ST start condition selected. If control is other than Position proportioning control, set to RO (Read only data).	0
205	ST proportional band adjusting factor	1980	6528	31	R/W	0.01 to 10.00 times	1.00
206	ST integral time adjusting factor	19A0	6560	31	R/W		1.00
207	ST derivative time adjusting factor	19C0	6592	31	R/W		1.00
208	ST start condition	19E0	6624	31	R/W	0: Activate the Startup tuning (ST) function when the power is turned on; when transferred from STOP to RUN; or when the Set value (SV) is changed. 1: Activate the Startup tuning (ST) function when the power is turned on; or when transferred from STOP to RUN. 2: Activate the Startup tuning (ST) function when the Set value (SV) is changed.	0
209	Automatic temperature rise group	1A00	6656	31	R/W	0 to 16 (0: Automatic temperature rise function OFF)	0
210	Automatic temperature rise learning	1A20	6688	31	R/W	0: Unused 1: Learning * * When the Automatic temperature rise learning is finished, the setting will automatically returns to "0: Unused." If the Automatic temperature rise group corresponds to "0: Automatic temperature rise function OFF," set to RO (Read only data).	1
211	Automatic temperature rise dead time	1A40	6720	31	R/W	0.1 to 1999.9 seconds	10.0
212	Automatic temperature rise gradient data	1A60	6752	31	R/W	0.1 to Input span/minutes	1.0
213	RUN/STOP group	1A80	6784	31	R/W	0 to 16 (0: Group RUN/STOP function OFF)	0
214	Setting change rate limiter unit time	1AA0	6816	31	R/W	1 to 3600 seconds	60

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
215	Soak time unit	1AC0	6848	31	R/W	0: 0 to 5999 minutes 1: 0 to 11999 seconds Set the data range of Memory area soak time monitor and Area soak time.	1
216	Setting limiter high	1AE0	6880	31	R/W	Setting limiter low to Input scale high	Input scale high
217	Setting limiter low	1B00	6912	31	R/W	Input scale low to Setting limiter high	Input scale low
218	PV transfer function	1B20	6944	31	R/W	0: Unused 1: Used	0
219	PV flashing display at input error	1B40	6976	31	R/W	Bit data Bit 0: Input error Bit 1 to Bit 15: Unused Data 0: Flashing display 1: Non-flashing display [Decimal number: 0 to 1]	0
220	Unused	1B60	7008	32	—	—	—
221	Unused	1B80	7040	32	—	—	—
222	Unused	1BA0	7072	32	—	—	—
223	Unused	1BC0	7104	32	—	—	—
224	Unused	1BE0	7136	32	—	—	—

Table 1: Digital input (DI) assignment

[FB100]

Set value	DI 1	DI 2	DI 3	DI 4	DI 5
1	Unused	Unused	Unused	Unused	Unused
2	Memory area number selection (1 to 8)			Memory area set	RUN/STOP
3	Memory area number selection (1 to 8)			Memory area set	Unused
4	Memory area number selection (1 to 8)			Memory area set	AUTO/MAN
5	Memory area number selection (1 to 8)			Memory area set	Interlock release
6	Memory area number selection (1 to 8)			RUN/STOP	Unused
7	Memory area number selection (1 to 8)			RUN/STOP	AUTO/MAN
8	Memory area number selection (1 to 8)			RUN/STOP	Interlock release
9	Memory area number selection (1 to 8)			Unused	AUTO/MAN
10	Memory area number selection (1 to 8)			Unused	Interlock release
11	Memory area number selection (1 to 8)			AUTO/MAN	Interlock release
12	Memory area number selection (1 to 8)				
13	RUN/STOP	REM/LOC *	AUTO/MAN		
14	RUN/STOP	REM/LOC *	Interlock release		
15	RUN/STOP	AUTO/MAN	Interlock release		
16	REM/LOC *	AUTO/MAN	Interlock release		
17	RUN/STOP	REM/LOC *			
18	RUN/STOP	AUTO/MAN			
19	RUN/STOP	Interlock release			
20	REM/LOC *	AUTO/MAN			
21	REM/LOC *	Interlock release			
22	AUTO/MAN	Interlock release			
23	RUN/STOP				
24	REM/LOC *				
25	AUTO/MAN				
26	Interlock release				

RUN/STOP: RUN/STOP transfer

AUTO/MAN: Auto/Manual transfer

REM/LOC: Remote/Local transfer

* When the optional function A, C or D is selected, the remote/local transfer is invalid.

[FB400/900]

Set value	DI 1	DI 2	DI 3	DI 4	DI 5	DI 6	DI 7
1	Memory area number selection (1 to 8)			Memory area set	Unused		
2					RUN/STOP	REM/LOC	AUTO/MAN
3					RUN/STOP	REM/LOC	Interlock release
4					RUN/STOP	AUTO/MAN	Interlock release
5					REM/LOC	AUTO/MAN	Interlock release
6					RUN/STOP	Unused	Interlock release
7					REM/LOC	Unused	Interlock release
8					AUTO/MAN	Unused	Interlock release

RUN/STOP: RUN/STOP transfer

AUTO/MAN: Auto/Manual transfer

REM/LOC: Remote/Local transfer

Table 2: Output assignment

[FB100]

Set value	Output 1 (OUT1)	Output 2 (OUT2)	Digital output 1 (DO1)	Digital output 2 (DO2)
1	Control output 1	Control output 2	Event 1 (EV1)	Event 2 (EV2)
2	Control output 1	Control output 2	Event 1 (EV1)	Event 4 (EV4)
3	Control output 1	Control output 2	Event 1 (EV1)	HBA
4	Control output 1	Control output 2	Event 1 (EV1)	FAIL (De-energized)
5	Control output 1	Control output 2	Event 4 (EV4)	HBA
6	Control output 1	Control output 2	Event 4 (EV4)	FAIL (De-energized)
7	Control output 1	Control output 2	HBA	FAIL (De-energized)
8	Control output 1	HBA	Event 1 (EV1)	Event 2 (EV2)
9	Control output 1	HBA	Event 1 (EV1)	Event 4 (EV4)
10	Control output 1	HBA	Event 1 (EV1)	FAIL (De-energized)
11	Control output 1	HBA	Event 4 (EV4)	FAIL (De-energized)
12	Control output 1	FAIL (De-energized)	Event 1 (EV1)	Event 2 (EV2)
13	Control output 1	FAIL (De-energized)	Event 1 (EV1)	Event 4 (EV4)
14	Control output 1	Event 1 (EV1)	Event 2 (EV2)	Event 3 (EV3)
15	Control output 1	Event 4 (EV4)	Event 1 (EV1)	Event 2 (EV2)

HBA: Heater break alarm (HBA) output

- For Position proportioning control, Output 1 (OUT1) is open-side output and Output 2 (OUT2) is close-side output, regardless of the above selection.
- When Current transformer (CT) input is two-point input, Heater break alarm (HBA) output is *OR* output.
- Energized or De-energized can be selected for the digital outputs (DO1 to DO4). [Factory set value: Energized] However, with the exception of FAIL (de-energized, fixed).
- When using for Heat/Cool control, select one of set values 1 to 7.
- Invalid for a non-existing output/event function.

[FB400/900]

Set value	Output 1 (OUT1)	Output 2 (OUT2)	Digital output 1 (DO1)	Digital output 2 (DO2)	Digital output 3 (DO3)	Digital output 4 (DO4)
1	Control output 1	Control output 2	Event 1 (EV1)	Event 2 (EV2)	Event 3 (EV3)	Event 4 (EV4)
2	Control output 1	Control output 2	Event 1 (EV1)	Event 2 (EV2)	Event 3 (EV3)	HBA1 HBA2
3	Control output 1	Control output 2	Event 1 (EV1)	Event 2 (EV2)	HBA1 HBA2	FAIL (De-energized)
4	Control output 1	Control output 2	Event 1 (EV1)	HBA1 HBA2	Event 3 (EV3)	Event 4 (EV4)
5	Control output 1	HBA1 HBA2	Event 1 (EV1)	Event 2 (EV2)	Event 3 (EV3)	Event 4 (EV4)
6	Control output 1	HBA1 HBA2	Event 1 (EV1)	Event 2 (EV2)	Event 3 (EV3)	FAIL (De-energized)
7	Control output 1	FAIL (De-energized)	Event 1 (EV1)	Event 2 (EV2)	Event 3 (EV3)	Event 4 (EV4)

HBA1: Heater break alarm 1 (HBA1) output

HBA2: Heater break alarm 2 (HBA2) output

- When Current transformer (CT) input is two-point input, Heater break alarm (HBA) output is *OR* output.
- Energized or De-energized can be selected for the digital outputs (DO1 to DO4). [Factory set value: Energized] However, with the exception of FAIL (de-energized, fixed).
- Invalid for a non-existing output/event function.

8.3 Memory Area Data Items

The register addresses, 2000H to 22BFH are used for checking and changing each set value belonging to the memory area.

No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
1	Setting memory area number	2000	8192	31	R/W	1 to 8 Use to select memory area number.	1
2	Event 1 set value (EV1)	2020	8224	31	R/W	Deviation: –Input span to +Input span	50
3	Event 2 set value (EV2)	2040	8256	31	R/W	Process and set value: Input scale low to Input scale high	50
4	Event 3 set value (EV3)	2060	8288	31	R/W	Manipulated output value (MV1 or MV2): –5.0 to +105.0 %	50
5	Event 4 set value (EV4)	2080	8320	31	R/W	If the Event type corresponds to “0: None,” set to RO (Read only data). If Event 4 corresponds to “9: Control loop break alarm (LBA),” the Event 4 set value becomes RO (Read only data).	50
6	Control loop break alarm (LBA) time	20A0	8352	31	R/W	0 to 7200 seconds (0: Unused) If Event 4 is other than “9: Control loop break alarm (LBA),” set to RO (Read only data).	480
7	LBA deadband	20C0	8384	31	R/W	0 to Input span If Event 4 is other than “9: Control loop break alarm (LBA),” set to RO (Read only data).	0
8	Set value (SV)	20E0	8416	31	R/W	Setting limiter low to Setting limiter high	TC/RTD: 0 V/I: 0.0
9	Proportional band [heat-side]	2100	8448	31	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position selection. Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of input span 0 (0.0, 0.00): ON/OFF action	TC/RTD: 30 V/I: 30.0
10	Integral time [heat-side]	2120	8480	31	R/W	PID control or Heat/Cool PID control: 0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action) [both heat-side and cool-side] Position proportioning control: 1 to 3600 seconds or 0.1 to 1999.9 seconds Varies with the setting of the Integral/Derivative time decimal point position selection.	240

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
11	Derivative time [heat-side]	2140	8512	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) Varies with the setting of the Integral/Derivative time decimal point position selection.	60
12	Control response parameter	2160	8544	31	R/W	0: Slow 1: Medium 2: Fast When the P or PD action is selected, this setting becomes invalid.	PID control, Position proportioning control: 0 Heat/Cool PID control: 2
13	Proportional band [cool-side]	2180	8576	31	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input span (Unit: °C [°F]) Varies with the setting of the Decimal point position selection. Voltage (V)/Current (I) inputs: 0.1 to 1000.0 % of input span If control is other than Heat/Cool PID control, set to RO (Read only data).	TC/RTD: 30 V/I: 30.0
14	Integral time [cool-side]	21A0	8608	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PD action) [both heat-side and cool-side] Varies with the setting of the Integral/Derivative time decimal point position selection. If control is other than Heat/Cool PID control, set to RO (Read only data).	240
15	Derivative time [cool-side]	21C0	8640	31	R/W	0 to 3600 seconds or 0.0 to 1999.9 seconds (0, 0.0: PI action) Varies with the setting of the Integral/Derivative time decimal point position selection. If control is other than Heat/Cool PID control, set to RO (Read only data).	60
16	Overlap/Deadband	21E0	8672	31	R/W	TC/RTD inputs: –Input span to +Input span (Unit: °C [°F]) Voltage (V)/current (I) inputs: –100.0 to +100.0 % of input span Minus (–) setting results in Overlap. However, the overlapping range is within the proportional range. If control is other than Heat/Cool PID control, set to RO (Read only data).	0
17	Manual reset	2200	8704	31	R/W	–100.0 to +100.0 % The offset can be manually eliminated. If the integral function is valid, set to RO (Read only data).	0.0


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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
18	Setting change rate limiter (up)	2220	8736	31	R/W	0 to Input span/unit time * (0: Unused)	0
19	Setting change rate limiter (down)	2240	8768	31	R/W	* Unit time: 60 seconds (factory set value)	0
20	Area soak time	2260	8800	31	R/W	0 to 11999 seconds or 0 to 5999 minutes Data range of Area soak time can be selected on the Soak time unit. [FB100] When the Digital input (DI) assignment (No. 95) value is 6 to 12, this data becomes RO (Read only data).	0
21	Link area number	2280	8832	31	R/W	0 to 8 (0: No link) [FB100] When the Digital input (DI) assignment (No. 95) value is 6 to 12, this data becomes RO (Read only data).	0
22	Unused	22A0	8864	32	—	—	—

8.4 COM-JL Communication Data Items

The register addresses, FA00H (64000) or more are used for checking and changing each set value of the COM-JL.

 : The value of this item should always be set to 0 (FB100/400/900). If changed, malfunction may result.

- ◆ These items become valid by turning off the power of the COM-JL once, and then turning it on again after the settings are changed.
- ♣ This setting (factory set value: 32) causes each address to be shifted by 32 for each communication item in the FB100/400/900 Communication Data and Memory Area Data. **Therefore, exercise sufficient care if you change the setting as the data mappings will also change.**

No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
—	Unused	FA00 ⋮ FA07	64000 ⋮ 64007	—	—	—	—
1	COM-JL error code	FA08	64008	1	RO	Bit data Bit 0: Memory backup error Bit 1: RAM error Bit 2: Controller configuration error Bit 3: Unused Bit 4: Ethernet hardware error Bit 5 to Bit 15: Unused Data 0: OFF 1: ON [Decimal number: 0 to 23]	—
—	Unused	FA09	64009	—	—	—	—
2	Number of connected controller in controller communication	FA0A	64010	1	RO	0 to 31	—
3	Number of connected channel in controller communication	FA0B	64011	1	RO	0 to 128	—
4	Action mode selection ◆	FA0C	64012	1	R/W	Bit data Bit 0: Address setting * 0: Continuous setting 1: Free setting Bit 1 to Bit 15: Unused [Decimal number: 0 to 1]	0
5	Number of connectable controller channels ◆ ♣	FA0D	64013	1	R/W	1 to 128	32

* There are two address settings for the controller (FB100/400/900) connecting to the COM-JL: continuous setting and free setting.

- For the continuous setting (factory set value), consecutive numbers starting from 1 are set to each controller.
- Free settings can be made in the range of 1 to 99.

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
6	Transmission wait time of controller communication	FA0E	64014	1	R/W	0 to 100 ms	0
7	Backup memory state monitor	FA0F	64015	1	RO	0: The content of the backup memory does not coincide with that of the RAM. 1: The content of the backup memory coincides with that of the RAM	—
—	Unused	FA10 ⋮ FA27	64016 ⋮ 64039	—	—	—	—
8	No. 1 Controller type	FA28	64040	1	R/W	0 to 65534 0: FB100/400/900	0
9	No. 2 Controller type	FA29	64041	1	R/W	0 to 65534 0: FB100/400/900	0
10	No. 3 Controller type	FA2A	64042	1	R/W	0 to 65534 0: FB100/400/900	0
11	No. 4 Controller type	FA2B	64043	1	R/W	0 to 65534 0: FB100/400/900	0
12	No. 5 Controller type	FA2C	64044	1	R/W	0 to 65534 0: FB100/400/900	0
13	No. 6 Controller type	FA2D	64045	1	R/W	0 to 65534 0: FB100/400/900	0
14	No. 7 Controller type	FA2E	64046	1	R/W	0 to 65534 0: FB100/400/900	0
15	No. 8 Controller type	FA2F	64047	1	R/W	0 to 65534 0: FB100/400/900	0
16	No. 9 Controller type	FA30	64048	1	R/W	0 to 65534 0: FB100/400/900	0
17	No. 10 Controller type	FA31	64049	1	R/W	0 to 65534 0: FB100/400/900	0
18	No. 11 Controller type	FA32	64050	1	R/W	0 to 65534 0: FB100/400/900	0
19	No. 12 Controller type	FA33	64051	1	R/W	0 to 65534 0: FB100/400/900	0
20	No. 13 Controller type	FA34	64052	1	R/W	0 to 65534 0: FB100/400/900	0
21	No. 14 Controller type	FA35	64053	1	R/W	0 to 65534 0: FB100/400/900	0
22	No. 15 Controller type	FA36	64054	1	R/W	0 to 65534 0: FB100/400/900	0
23	No. 16 Controller type	FA37	64055	1	R/W	0 to 65534 0: FB100/400/900	0

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
24	No. 17 Controller type	FA38	64056	1	R/W	0 to 65534 0: FB100/400/900	0
25	No. 18 Controller type	FA39	64057	1	R/W	0 to 65534 0: FB100/400/900	0
26	No. 19 Controller type	FA3A	64058	1	R/W	0 to 65534 0: FB100/400/900	0
27	No. 20 Controller type	FA3B	64059	1	R/W	0 to 65534 0: FB100/400/900	0
28	No. 21 Controller type	FA3C	64060	1	R/W	0 to 65534 0: FB100/400/900	0
29	No. 22 Controller type	FA3D	64061	1	R/W	0 to 65534 0: FB100/400/900	0
30	No. 23 Controller typ	FA3E	64062	1	R/W	0 to 65534 0: FB100/400/900	0
31	No. 24 Controller type	FA3F	64063	1	R/W	0 to 65534 0: FB100/400/900	0
32	No. 25 Controller type	FA40	64064	1	R/W	0 to 65534 0: FB100/400/900	0
33	No. 26 Controller type	FA41	64065	1	R/W	0 to 65534 0: FB100/400/900	0
34	No. 27 Controller type	FA42	64066	1	R/W	0 to 65534 0: FB100/400/900	0
35	No. 28 Controller type	FA43	64067	1	R/W	0 to 65534 0: FB100/400/900	0
36	No. 29 Controller type	FA44	64068	1	R/W	0 to 65534 0: FB100/400/900	0
37	No. 30 Controller type	FA45	64069	1	R/W	0 to 65534 0: FB100/400/900	0
38	No. 31 Controller type	FA46	64070	1	R/W	0 to 65534 0: FB100/400/900	0
—	Unused	FA47	64071	—	—	—	—
39	No. 1 Controller state	FA48	64072	1	RO	Bit data Bit 0: Presence or absence of controller Bit 1: Presence or absence of abnormal resepomse Bit 2 to Bit 15: Unused Data 0: Absence 1: Presence [Decimal number: 0 to 3]	—
40	No. 2 Controller state	FA49	64073	1	RO		—
41	No. 3 Controller state	FA4A	64074	1	RO		—
42	No. 4 Controller state	FA4B	64075	1	RO		—
43	No. 5 Controller state	FA4C	64076	1	RO		—
44	No. 6 Controller state	FA4D	64077	1	RO		—
45	No. 7 Controller state	FA4E	64078	1	RO		—
46	No. 8 Controller state	FA4F	64079	1	RO		—

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
47	No. 9 Controller state	FA50	64080	1	RO	Bit data Bit 0: Presence or absence of controller Bit 1: Presence or absence of abnormal response Bit 2 to Bit 15: Unused Data 0: Absence 1: Presence [Decimal number: 0 to 3]	—
48	No. 10 Controller state	FA51	64081	1	RO		—
49	No. 11 Controller state	FA52	64082	1	RO		—
50	No. 12 Controller state	FA53	64083	1	RO		—
51	No. 13 Controller state	FA54	64084	1	RO		—
52	No. 14 Controller state	FA55	64085	1	RO		—
53	No. 15 Controller state	FA56	64086	1	RO		—
54	No. 16 Controller state	FA57	64087	1	RO		—
55	No. 17 Controller state	FA58	64088	1	RO		—
56	No. 18 Controller state	FA59	64089	1	RO		—
57	No. 19 Controller state	FA5A	64090	1	RO		—
58	No. 20 Controller state	FA5B	64091	1	RO		—
59	No. 21 Controller state	FA5C	64092	1	RO		—
60	No. 22 Controller state	FA5D	64093	1	RO		—
61	No. 23 Controller state	FA5E	64094	1	RO		—
62	No. 24 Controller state	FA5F	64095	1	RO		—
63	No. 25 Controller state	FA60	64096	1	RO		—
64	No. 26 Controller state	FA61	64097	1	RO		—
65	No. 27 Controller state	FA62	64098	1	RO		—
66	No. 28 Controller state	FA63	64099	1	RO		—
67	No. 29 Controller state	FA64	64100	1	RO		—
68	No. 30 Controller state	FA65	64101	1	RO		—
69	No. 31 Controller state	FA66	64102	1	RO		—
—	Unused	FA67	64103	—	—	—	—

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
70	No. 1 Controller address	FA68	64104	1	R/W	1 to 99 0: There is no connection controller	1
71	No. 2 Controller address	FA69	64105	1	R/W	1 to 99 0: There is no connection controller	2
72	No. 3 Controller address	FA6A	64106	1	R/W	1 to 99 0: There is no connection controller	3
73	No. 4 Controller address	FA6B	64107	1	R/W	1 to 99 0: There is no connection controller	4
74	No. 5 Controller address	FA6C	64108	1	R/W	1 to 99 0: There is no connection controller	5
75	No. 6 Controller address	FA6D	64109	1	R/W	1 to 99 0: There is no connection controller	6
76	No. 7 Controller address	FA6E	64110	1	R/W	1 to 99 0: There is no connection controller	7
77	No. 8 Controller address	FA6F	64111	1	R/W	1 to 99 0: There is no connection controller	8
78	No. 9 Controller address	FA70	64112	1	R/W	1 to 99 0: There is no connection controller	9
79	No. 10 Controller address	FA71	64113	1	R/W	1 to 99 0: There is no connection controller	10
80	No. 11 Controller address	FA72	64114	1	R/W	1 to 99 0: There is no connection controller	11
81	No. 12 Controller address	FA73	64115	1	R/W	1 to 99 0: There is no connection controller	12
82	No. 13 Controller address	FA74	64116	1	R/W	1 to 99 0: There is no connection controller	13
83	No. 14 Controller address	FA75	64117	1	R/W	1 to 99 0: There is no connection controller	14
84	No. 15 Controller address	FA76	64118	1	R/W	1 to 99 0: There is no connection controller	15
85	No. 16 Controller address	FA77	64119	1	R/W	1 to 99 0: There is no connection controller	16
86	No. 17 Controller address	FA78	64120	1	R/W	1 to 99 0: There is no connection controller	17
87	No. 18 Controller address	FA79	64121	1	R/W	1 to 99 0: There is no connection controller	18
88	No. 19 Controller address	FA7A	64122	1	R/W	1 to 99 0: There is no connection controller	19
89	No. 20 Controller address	FA7B	64123	1	R/W	1 to 99 0: There is no connection controller	20
90	No. 21 Controller address	FA7C	64124	1	R/W	1 to 99 0: There is no connection controller	21
91	No. 22 Controller address	FA7D	64125	1	R/W	1 to 99 0: There is no connection controller	22
92	No. 23 Controller address	FA7E	64126	1	R/W	1 to 99 0: There is no connection controller	23

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No.	Name	Register address		Number of data items	Attribute	Data range	Factory set value
		HEX	DEC				
93	No. 24 Controller address	FA7F	64127	1	R/W	1 to 99 0: There is no connection controller	24
94	No. 25 Controller address	FA80	64128	1	R/W	1 to 99 0: There is no connection controller	25
95	No. 26 Controller address	FA81	64129	1	R/W	1 to 99 0: There is no connection controller	26
96	No. 27 Controller address	FA82	64130	1	R/W	1 to 99 0: There is no connection controller	27
97	No. 28 Controller address	FA83	64131	1	R/W	1 to 99 0: There is no connection controller	28
98	No. 29 Controller address	FA84	64132	1	R/W	1 to 99 0: There is no connection controller	29
99	No. 30 Controller address	FA85	64133	1	R/W	1 to 99 0: There is no connection controller	30
100	No. 31 Controller address	FA86	64134	1	R/W	1 to 99 0: There is no connection controller	31
101	Automatic acquisition of controller address *	FA87	64135	1	R/W	0: Do not execute the automatic acquisition 1: Execute the automatic acquisition	0

* The controller address automatic acquisition set “1: Execute the automatic acquisition,” performs the automatic acquisition of the controller address by turning on the power again. Automatically reverts to “0: Do not execute the automatic acquisition” after automatic acquisition ends.

9. TROUBLESHOOTING

This section explains possible 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 the 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

Do not separate the mainframe from the terminal base with the power turned on. If so, instrument failure may result.

NOTE

When replacing the instrument with a new one, always use the instrument with the same model code. If the instrument is replaced, it is necessary to reset each data item.

■ COM-JL

Problem	Possible cause	Solution
RUN lamp does not light up	Power not being supplied	Check external breaker etc.
	Appropriate power supply voltage not being supplied	Check the power supply and supply the normal power
	Power supply terminal contact defect	Retighten the terminals
	Power supply section defect	Replace COM-JL
RUN lamp flashes rapidly	Data collection just after the power is turned on	After data collection, the lamp goes on, if normal
RUN lamp flashes slowly	Memory backup error	Turn on the power again
		Write setting value once again
	Controller configuration error Disconnection of the controller connection	Confirm the controller connection condition and connect correctly
	Input error The IP address was not normally set by DIP switch	Confirm the IP address setting and set this correctly
FAIL lamp is lit	Appropriate power supply voltage not being supplied	Check the power supply and supply the normal power
	Hardware error	Replace COM-JL
Can not recognize the controller	Incorrect sequence of power-on	COM-JL must be powered on last.

■ Communication

Problem	Possible cause	Solution
<ul style="list-style-type: none"> Can not set the IP address The Client and the Server are not in the connected state (the Client cannot recognize the Server) 	The IP address class and subnet mask of the Client do not coincide with those of the Server	Coincide the IP address class and subnet mask of the Client with those of the Server
	The network related software was started before the connection of the Ethernet cable	First connect the Ethernet cable and then start the network related software
No response	Wrong connection, no connection or disconnection of the communication cable	Confirm the connection method or condition and connect correctly
	Breakage, wrong wiring, or imperfect contact of the communication cable	Confirm the wiring or connector and repair or replace the wrong one
	Wrong IP address setting	Confirm the settings and set them correctly
	There is length of query message exceeds set range	
	The number of data points is not twice the specified number of data points at the time of data write	

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Problem	Possible cause	Solution
Error code: 01H	Function code error (Specifying nonexistent function code)	Confirm the function code
Error code: 02H	When the mismatched address is specified	Confirm the address of holding register
Error code: 03H	When the data written exceeds the setting range	Confirm the setting data
	When the number of specified data points was out of a range of 1 to 125 during data read (function code: 03H)	
	When the number of specified data points was out of a range of 1 to 123 during data write (function code: 10H)	
	When the number of specified data points was out of a range of 1 to 118 during data read/write (function code: 17H)	
Error code: 04H	State under which the Server (COM-JL) cannot normally respond [An error occurred in the Server (COM-JL)]	Remove the cause of the error occurring in the Server (COM-JL).
Error code: 06H	State under which the Server (COM-JL) cannot immediately respond [The Server (COM-JL) is being initialized]	Conduct communication again after initialization is finished.

10. SPECIFICATIONS

■ Ethernet communication

Physical layer:	Ethernet 10BASE-T/100BASE-TX automatic recognition
Application layer:	Modbus/TCP
Communication data:	Based on Modbus message format
Connector type:	RJ-45

■ Controller communication

Interface:	Based on RS-485, EIA standard
Protocol:	Modbus-RTU
Synchronous method:	Start/Stop synchronous type
Connection method:	2-wire system, half-duplex multi-drop connection
Communication speed:	9600 bps, 19200 bps, 38400 bps
Data bit configuration:	Start bit: 1 Data bit: 8 Parity bit: Without Stop bit: 1
Maximum connections:	31 controllers (FB100/400/900) per COM-JL [Device address setting: 1 to 99]
Connection method:	Terminals
Termination resistor:	Built-in terminal base of COM-JL [ON/OFF select with switch (120 Ω)]

■ Self-diagnostic function

Hardware error:	Display: FAIL lamp ON
Memory backup error:	Display: RUN lamp flashes Status: 1 is set in bit 0 of COM-JL error code
Configuration error (Can not recognize the controller):	Display: RUN lamp flashes Status: 1 is set in bit 2 of COM-JL error code

■ General specifications

Power supply voltage:	21.6 to 26.4 V DC [Including power supply voltage variation] (Rating 24 V DC)
Current consumption:	110 mA max. (at 24 V DC)
Rush current:	12 A or less
Insulation resistance:	Between communication terminal and grounding: 20 MΩ or more at 500 V DC Between power supply terminal and grounding: 20 MΩ or more at 500 V DC Between power supply terminal and communication terminal: 20 MΩ or more at 500 V DC

Withstand voltage:

Refer to table shown below

Time: 1 min.	Grounding terminal	Power supply terminal
Grounding terminal		
Power supply terminal	600 V AC	
Communication terminal	600 V AC	600 V AC

Power failure:

A power failure of 20 ms or less will not affect the control action.

Memory backup:

Backed up by non-volatile memory
 Number of writing: Approx. 100 times
 Data storage period: Approx. 10 years

Vibration:

Amplitude: < 1.5 mm (5 to 9 Hz)
 Acceleration: < 5 m/s² (9 to 150 Hz)
 Each direction of XYZ axes

Shock:

Height 50 mm or less
 Each direction of XYZ axes (de-energized state)

Allowable ambient temperature:

-10 to +50 °C

Allowable ambient humidity:

5 to 95 %RH
 (Absolute humidity: MAX.W.C 29.3 g/m³ dry air at 101.3 kPa)

Installation environment conditions:

Indoor use
 Altitude up to 2000 m

Operating environments

Avoid the following conditions when selecting the mounting location.

- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Excessive heat accumulation.

Weight:

Approx. 180 g

Dimensions:

30 × 125 × 109.5 mm (W × H × D)

■ Standard**Safety standards:**

UL: UL61010-1
 cUL: CAN/CSA-C22.2 No.61010-1

CE marking:

LVD: EN61010-1
 EMC: EN61326-1

RCM:

EN55011



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