Module Type Controller

SRX

PROFIBUS Communication Instruction Manual

RKC® RKC INSTRUMENT INC.

IMS01N10-E3

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

SYMBOLS

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

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

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

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

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

 : This mark indicates where additional information may be located.

⚠ WARNING

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

CAUTION

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

NOTICE

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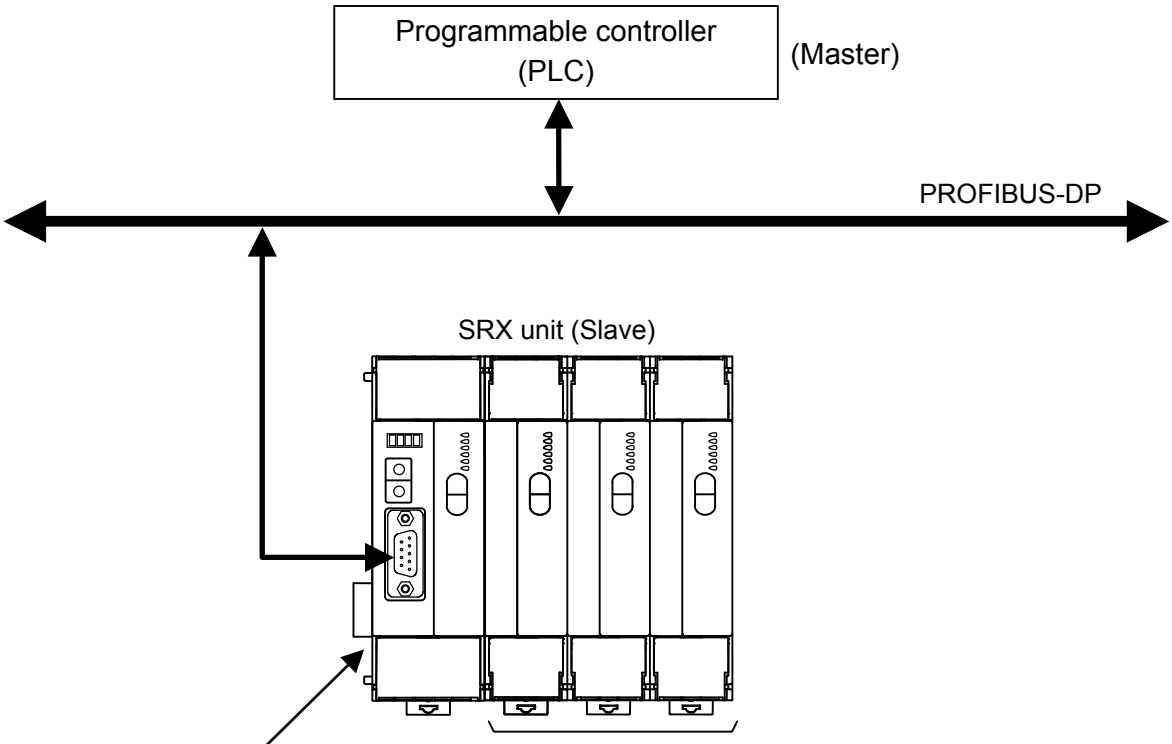
CONTENTS

1. OUTLINE

This manual describes the PROFIBUS specifications, mounting, wiring, setting and data instructions for the Module Type Controller SRX.

The SRX enables communication with the programmable controller (hereafter called the PLC) for PROFIBUS by using X-TIO-G of temperature control module for PROFIBUS.
The X-TIO-G module supports PROFIBUS-DP protocol. This protocol includes master and slave. The PLC is the master and the X-TIO-G module (or the SRX unit including the X-TIO-G module) is the slave.



☞ For specifications, parts description, mounting, and wiring of X-TIO-G module, refer to **Temperature Control Module for PROFIBUS X-TIO-G Instruction Manual (IMS01N09-E□)**.

☞ For PROFIBUS, refer to the home page of PROFIBUS International.
http://www.profibus.com/

2. COMMUNICATION SPECIFICATIONS

■ PROFIBUS communication

Interface: Based on RS-485, EIA standard

Protocol: PROFIBUS-DP (EN50170)
Correspond to both static data request and dynamic data request

- Static data request specification
  The PROFIBUS address of the module with data to be read and written and the communication item number to obtain that data are determined when system configured data is downloaded to the PLC.
  In static data read and write, it is not required to write a sequence program when data assigned.
  Number of communication item:
  16 items max. (Number of read item + Number of write item)
  Communication data: Data of temperature control (TIO) module

  ☞ For details of communication items, refer to **6. LIST OF COMMUNICATION ITEMS (P. 23)**.

- Dynamic data request specification
  The PROFIBUS address of the module with data to be read and written and the communication item number to obtain that data are specified to certain specific registers in the PLC.
  In dynamic data read and write, a sequence program is required when data assigned.
  Communication data: Data of temperature control (TIO) module, digital input (DI) module and digital output (DO) module

  ☞ For details of communication items, refer to **6. LIST OF COMMUNICATION ITEMS (P. 23)**.

Communication speed: 12 Mbps max.
Communication speed is set as follows:
- A master judges the quality situation of a line, and set it automatically.
- Set it with a sequence program of PLC.

Communication data length:
200 bytes max. (For both data read and write)

Selecting response time: 50 ms max.

☞ For the specification of connecting PLC, refer to the instruction manual for the used PLC.

3. WIRING

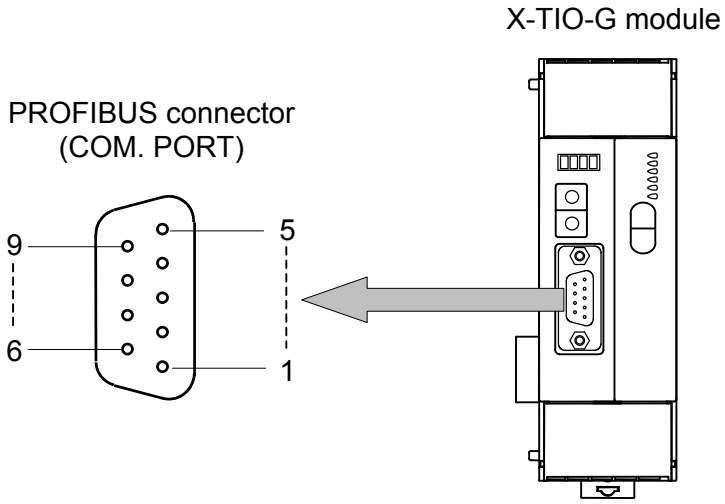
⚠ WARNING

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

3.1 PROFIBUS Connection

The X-TIO-G module has one port (COM.PORT) to be connected to PLC with PROFIBUS. Communication interface is RS-485.

■ Pin layout of connector



☞ For the connectable connector of the PLC, refer to the instruction manual for the used PLC.

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

Pin No.	Signal name	Symbol
1	—	Unused
2	—	Unused
3	Receive data/transmission data (plus)	RxD/TxD-P
4	—	Unused
5	Signal ground	DGND
6	Termination resistor supply voltage (5 V)	VP
7	—	Unused
8	Receive data/transmission data (negative)	RxD/TxD-N
9	—	Unused

■ PROFIBUS cables

Use the PROFIBUS cable which fitted the following requirement.

- Use the shielded twisted pair wire
- Based on EN50170, European standard (Recommend cable type A)

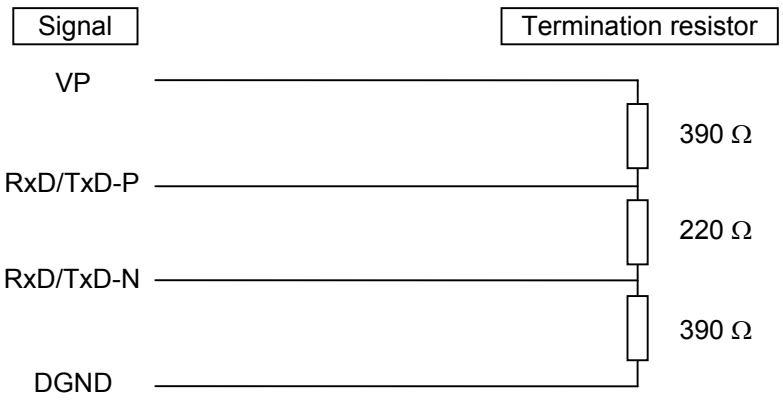
Cable type A specification

Impedance: 135 to 165 Ω
Capacitance: < 30 pF/m
Loop resistance: 110 Ω/km
Core diameter: 0.64 mm
Core cross section: > 0.34 mm^2

Maximum cable length by communication speed (For cable type A)

Communication speed (kbps)	9.6	19.2	93.75	187.5	500	1500	12000
Cable length (m)	1200	1200	1200	1000	400	200	100

- Connect the termination resistor to the end of a bus (Refer to below)



Termination resistor of a bus

The cable must be provided by the customer.
As for the PROFIBUS cable (a connection cable of PLC and X-TIO-G), there is a case prepared by a PLC manufacturer.

The details except the above are connected to a home page of PROFIBUS International, and obtain necessary information.
http://www.profibus.com/

3.2 Module Connection

■ SRX usable modules

The modules which can be connected with the X-TIO-G module is shown in the below.

- Temperature control module [basic type]: X-TIO-A
- Temperature control module [extension type]: X-TIO-B
- Digital input module: X-DI-A, X-DI-B
- Digital output module: X-DO-A, X-DO-B

Up to 29 modules (X-TIO-A, X-TIO-B, X-DI-A, X-DI-B, X-DO-A or X-DO-B) can be connected to one X-TIO-G module.

Be careful of the following when connected to the X-TIO-A module.

- Supply a power supply to either the X-TIO-G or X-TIO-A module.
- When conducting communication (RKC communication or Modbus) using communication terminals, use them on either the X-TIO-G or X-TIO-A module.

4. SETTING

⚠ WARNING

- To prevent electric shock or instrument failure, always turn off the power before setting the switch.
- To prevent electric shock or instrument failure, never touch any section other than those instructed in this manual.

CAUTION

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

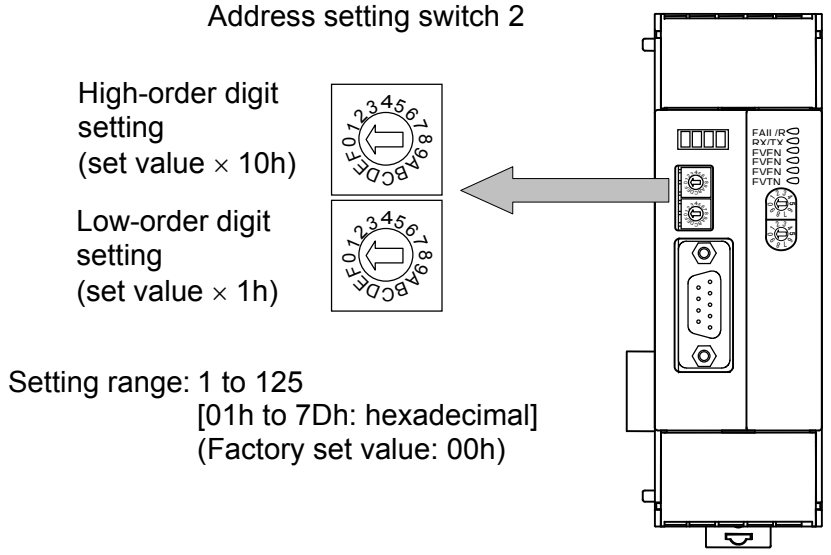
Set the following communication setting before operation.

4.1 Address Setting

■ PROFIBUS address setting

The master communicates with the selected slave by specifying that slave's address number. Each slave must have a unique address number for this data transmission. Set the slave address with the address setting switch prior to operation.
With the "Address setting switch 2" of the front left side of X-TIO-G module, set an address number on the PROFIBUS. For this setting, use a small slotted screwdriver.

No communication with PROFIBUS can be conducted with each factory set value (00h) left as it is. Set it to the same value as the PROFIBUS address set when system configured.

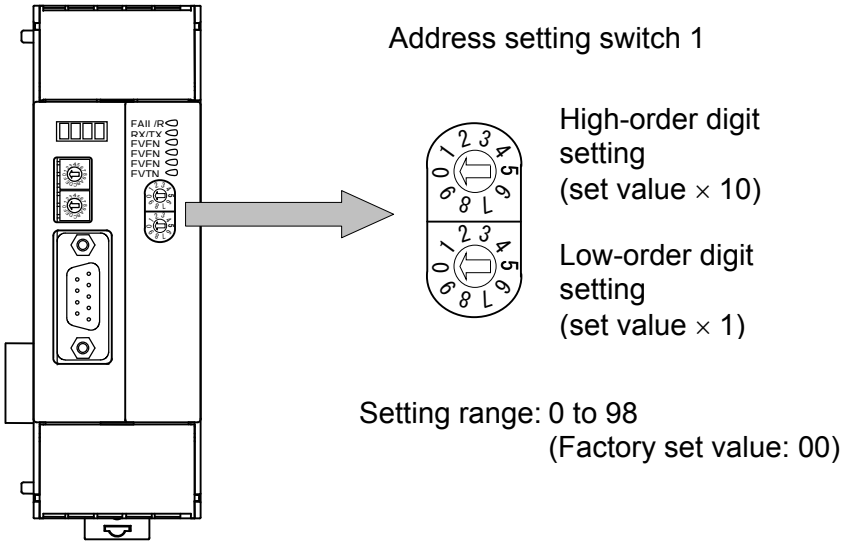


■ Module address setting

In addition to the PROFIBUS address, the module address used to identify each module of the SRX is set to the X-TIO-G module.
Set the module address by the "Address setting switch 1" of front right side of module. For this setting, use a small slotted screwdriver.

Do not set address 99. Otherwise, problems or malfunction may result.

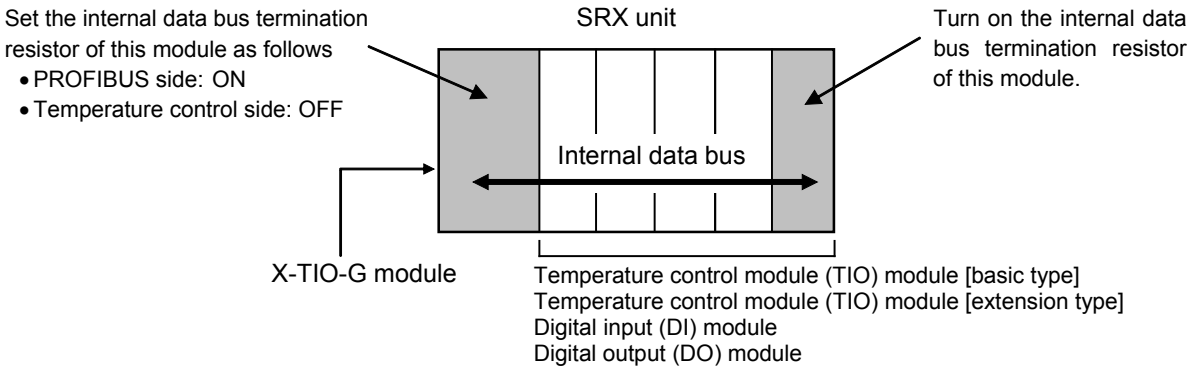
Set the module address such that it is different to the other addresses on the same line. Otherwise, problems or malfunction may result.



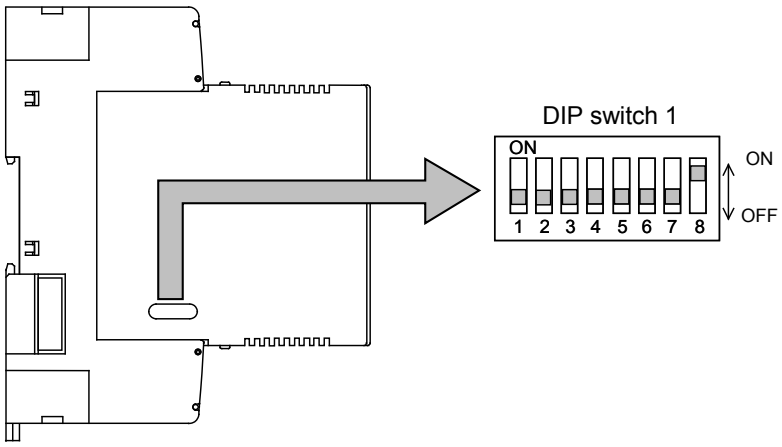
When two or more temperature control modules are connected to the X-TIO-G module to process PROFIBUS static data, temperature control channel No. are assigned in order starting from the smallest module address.

4.2 Internal Data Bus Termination Resistor Setting

It is necessary to set the internal data bus termination resistor to the SRX unit. Turn on the internal data bus termination resistor in module of both ends to the SRX unit.
The X-TIO-G module is divided internally into the PROFIBUS and temperature control sections, in each of which a internal data bus termination resistor can be set.
When the SRX unit is configured as shown in the figure, the internal data bus termination resistor on the PROFIBUS side of the X-TIO-G module is set to ON (No.8 of DIP switch 1: ON) and that on the temperature control side of the same module is set to OFF (No.8 of DIP switch 2: OFF).



■ PROFIBUS side setting of X-TIO-G module



X-TIO-G module left side view (PROFIBUS side)

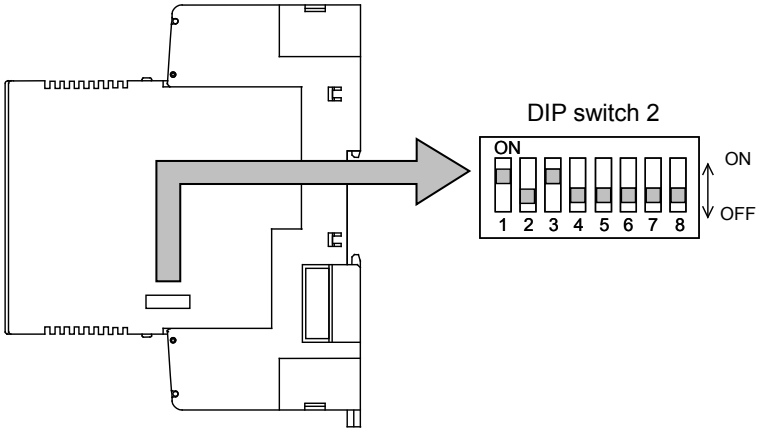
8	Internal data bus termination resistor setting
OFF	Termination resistor OFF
ON	Termination resistor ON

Factory set value: Termination resistor ON

Switch No. 1 to 7: OFF fixed (Do not change this one)

If the X-TIO-G module is used independently, the internal data bus termination resistors on the PROFIBUS and temperature control sides also need to be set to ON (No. 8 of DIP switches 1 and 2: ON).

■ Temperature control side setting of X-TIO-G module



X-TIO-G module right side view (temperature control side)

8	Internal data bus termination resistor setting
OFF	Termination resistor OFF
ON	Termination resistor ON

Factory set value: Termination resistor OFF

Switch No. 1 to 7: OFF fixed (Do not change this one)

Switch No. 1 to 6 are used for the communication setting when the communication terminals are used and are set as follows.

1	2	Communication speed
OFF	OFF	2400 bps
ON	OFF	9600 bps
OFF	ON	19200 bps
ON	ON	38400 bps

← Factory set value

3	4	5	Data bit configuration
OFF	OFF	OFF	Data 7-bit, without parity, Stop 1-bit *
OFF	OFF	ON	Data 7-bit, Even parity, Stop 1-bit *
OFF	ON	ON	Data 7-bit, Odd parity, Stop 1-bit *
ON	OFF	OFF	Data 8-bit, without parity, Stop 1-bit
ON	OFF	ON	Data 8-bit, Even parity, Stop 1-bit
ON	ON	ON	Data 8-bit, Odd parity, Stop 1-bit

← Factory set value

* When the Modbus communication protocol selected, this setting becomes invalid.

6	Protocol selection
OFF	RKC communication
ON	Modbus

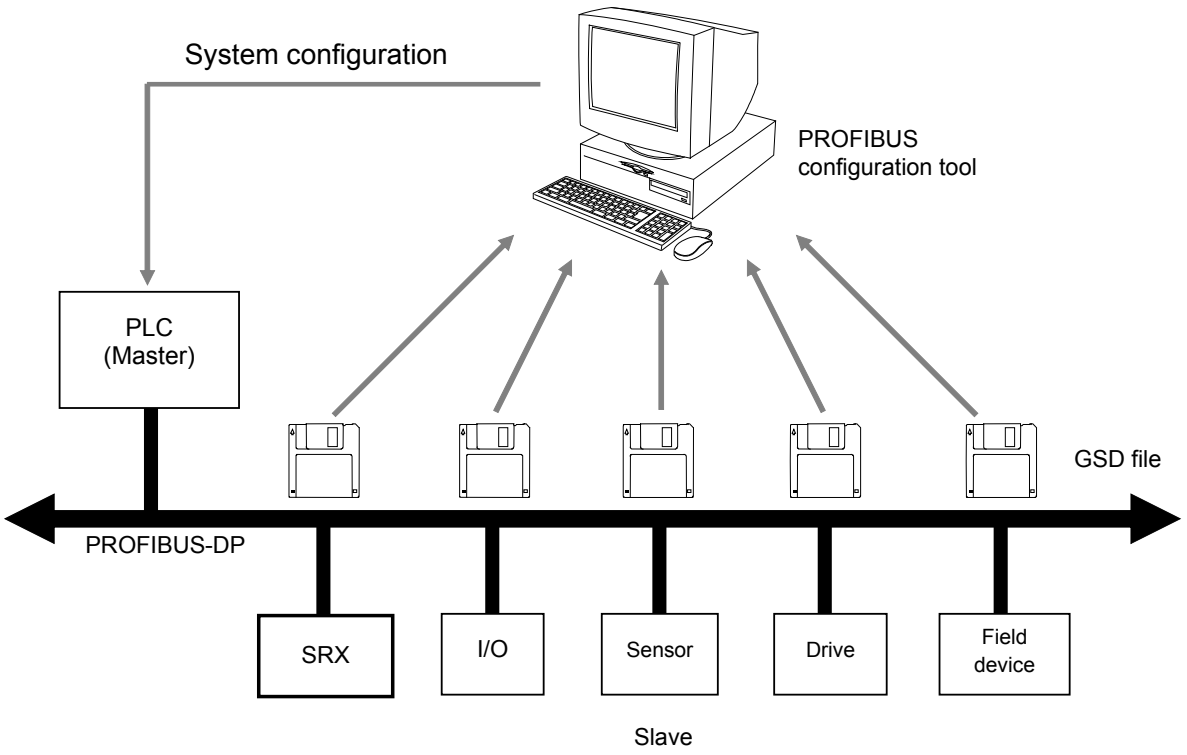
← Factory set value

For communication (RKC communication or Modbus) using communication terminals, refer to **Module Type Controller SRX Communication Instruction Manual (IMS01N01-E□)**.

5. PROFIBUS COMMUNICATION

5.1 PROFIBUS System Configuration

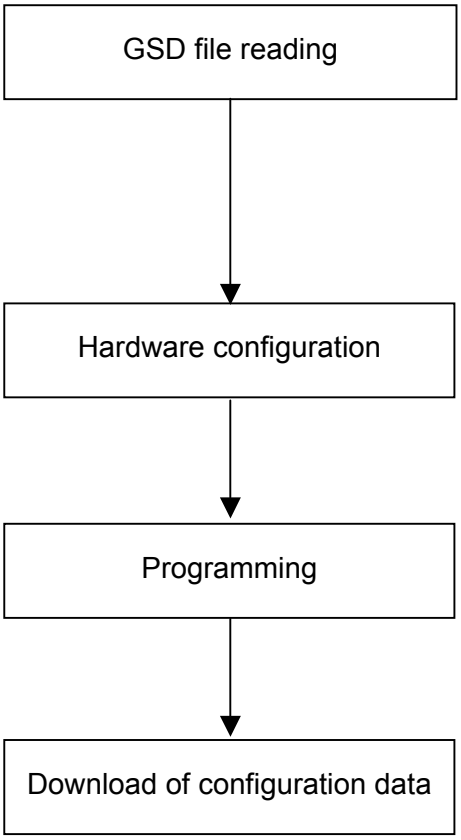
For system configuration with PROFIBUS-DP protocol, have to offer the communication information about each slave for a master in the form of electronic device data seat (GSD file).
A manufacturer of PLC (master) has prepared configuration tool for a system configuration of PROFIBUS. By combining all GSD files of the slaves to be connected, the configuration tool creates a master parameter record containing all pertinent data for the bus system. The configuration of a PROFIBUS system is enabled by downloading these data to a master.



About configuration tool, please ask a manufacturer of a master product.

■ The procedure of system configuration

When a master is PLC, and a slave is SRX (X-TIO-G module), the procedure of system configuration is as follows.



Read a GSD file of SRX on the PC by using a PLC configuration tool.

The GSD file for SRX can be downloaded from the official RKC website: http://www.rkcinst.com/english/download/field_network.htm.

The configuration tool is used to set the PLC and SRX hardware and also the SRX static/dynamic data handled on PROFIBUS.

Create the sequence program that used static/dynamic data of SRX with a configuration tool.

Download the configuration data and sequence program to PLC.

5.2 Data of Static Data Request

Static data are the data which can always be read/write by PLC (a master). Select the items of static data with a configuration tool of PLC.
In addition, as the static data register address is set when system configured, it is not required to create a sequence program for static data assignment.

Number of communication item of static data request:
16 items max. (Number of read item + Number of write item)

Communication item of static data request: Refer to following "List of communication item names"

- Some item names displayed when system configured may be abbreviated due to limitations on the number of characters used.
- If item names are abbreviated, those not abbreviated are described in the remarks column.
- Each item name affixed with R at its end: Read only
- Each item name affixed with RW or not affixed with R/RW: Read and write

List of communication item names

Communication item name in configuration	Remarks
Measured value: R	Measured value (PV)
Comprehensive event state: R	—
Manipulated output value: R	—
Set value monitor: R	—
Error code: R	—
Current transformer input: R	Current transformer (CT) input value
Burnout state: R	—
Event 1 state: R	—
Event 2 state: R	—
HBA state: R	Hater break alarm (HBA) state
LBA state: R	Control loop break alarm (LBA) state
Operation mode: RW	—
Set value: RW	—
Proportional band: RW	—
Integral time: RW	—
Derivative time: RW	—
Control response parameters: RW	—
PV bias: RW	—
Event 1 set value: RW	—

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Communication item name in configuration	Remarks
Event 2 set value: RW	—
PID/AT transfer: RW	—
Auto/Manual transfer: RW	—
Manual output value: RW	—
Output limiter (high): RW	—
Output limiter (low): RW	—
Proportional cycle time: RW	—
Digital filter: RW	—
HBA set value: RW	Heater break alarm (HBA) set value
Number of HBA delay times: RW	Number of heater break alarm (HBA) delay times
Hot/cold start selection: RW	—
Start determination point: RW	—
Control RUN/STOP transfer: RW	—
Input err. determin. point (H)	Input error determination point (high)
Input err. determin. point (L)	Input error determination point (low)
Action at input error (H): RW	Action at input error (high)
Action at input error (L): RW	Action at input error (low)
Manip. output val. at input err	Manipulated output value at input error
AT differential gap time: RW	—
AT bias: RW	—
Remote/Local transfer: RW	—
Event LED mode setting: RW	—
Digital input setting 1: RW	Digital input setting 1 (RESET)
Digital input setting 2: RW	Digital input setting 2 (RUN)
Digital input setting 3: RW	Digital input setting 3 (FIX)
Digital input setting 4: RW	Digital input setting 4 (MAN)
Digital input setting 5: RW	Digital input setting 5 (HOLD)
Digital input setting 6: RW	Digital input setting 6 (STEP)
Digital input setting 7: RW	Digital input setting 7 (Program pattern selection)
Digital input setting 8: RW	Digital input setting 8 (AT/PID)
Program operation mode sel.: RW	Program operation mode selection
Execution pattern: RW	—
Execution segment: R	—
Segment remaining time: R	—
Num. of program exec. times: R	Number of program execution times

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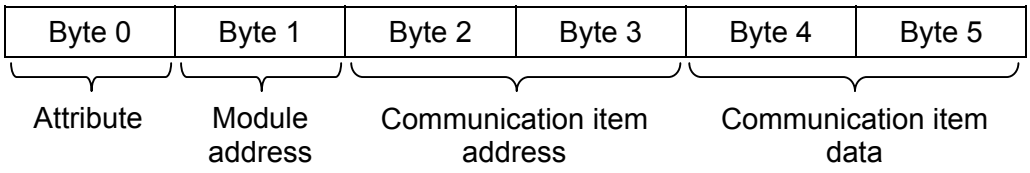
Communication item name in configuration	Remarks
Time signal output state: R	—
Pattern end output state: R	—
End state: R	—
Wait state: R	—
Hold state: RW	—
Step action: RW	—
Program operation start mode:RW	—
LBA use selection: RW	Control loop break alarm (LBA) use selection
LBA time: RW	Control loop break alarm (LBA) time
LBA deadband: RW	Control loop break alarm (LBA) deadband
I/D time decimal point pos.: RW	Integral/Derivative time decimal point position
Input range number: RW	—
Input scale high limit: RW	—
Input scale low limit: RW	—
Input range decimal point pos.	Input range decimal point position
Temperature unit selection: RW	—
Control type selection: RW	—
ON/OFF control diff. gap (U):RW	ON/OFF control differential gap (upper)
ON/OFF control diff. gap (L):RW	ON/OFF control differential gap (lower)
Event 1 differential gap: RW	—
Event 2 differential gap: RW	—
Event 1 type selection: RW	—
Event 2 type selection: RW	—
Event 1 hold action: RW	—
Event 2 hold action: RW	—
Number of event delay times: RW	—
Segment time unit setting: RW	—
Operation mode holding setting	—
Output change rate limiter (U)	Output change rate limiter (up)
Output change rate limiter (D)	Output change rate limiter (down)

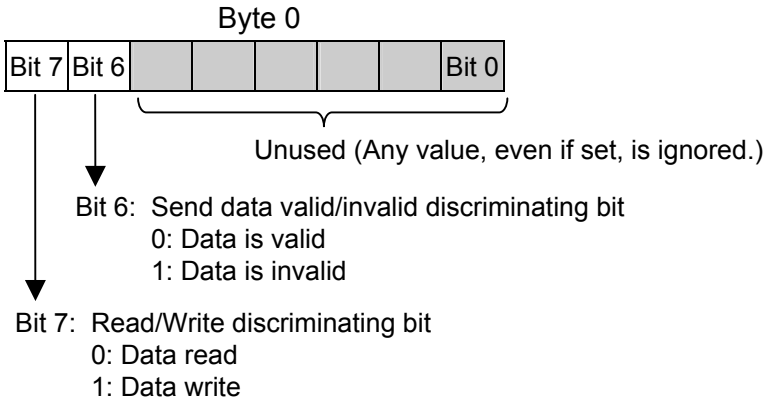
5.3 Data Send/Receive by Dynamic Data Request

Dynamic data is that whose read/write is requested by the sequence program from the PLC (master). The dynamic data request uses 3-word (6-byte) data for both send and receive.
The specifications for each byte are as follows.

■ When send data from PLC to SRX



- **Byte 0: Specify an attribute of data. Only Bit 7 and Bit 6 are used.**



- **Byte 1: Specify an accessing module address of SRX.**

  Data range: 0 to 98

- **Byte 2, Byte 3: The communication item address, to/from which data is written/read is specified.**

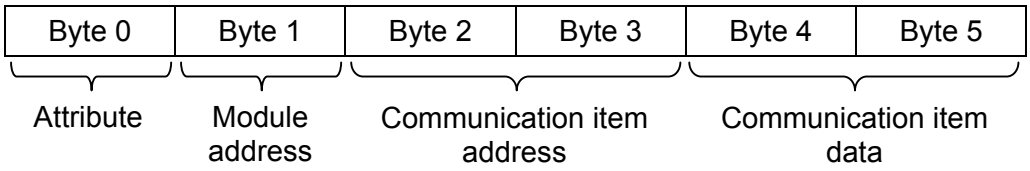
  Data range:
  Temperature control module communication item of CH1: 0000H to 0884H
  communication item of CH2: 1000H to 1884H
  Communication item of digital input (DI)/digital output (DO) module:
  2000H to 2884H

- **Byte 4, Byte 5: Write data of a communication item.**
  - If MSB (Bit 7) in Byte 0 is set to "1: Data write," data in the address specified by Bytes 1, 2, and 3 is written.
  - If MSB (Bit 7) in Byte 0 is set to "0: Data read," data in Byte 4 and Byte 5 will be ignored.

☞ For communication item, refer to **6. LIST OF COMMUNICATION ITEMS (P. 23)**.

■ When PLC received data from SRX

The contents of the following registers are re-written if the X-TIO-G module recognizes the details of data sent to the SRX from the PLC.



- **Byte 0: Echo back of Byte 0 of send data**

  The details of data in Byte 0 sent to the SRX from the PLC are returned.

- **Byte 1: Echo back of Byte 1 of send data**

  The specified SRX module address is returned.
  However, if there is no specified module address, "FFH" is returned.

- **Byte 2, Byte 3: Echo back of Byte 2 and Byte 3 of send data**

  The communication item address, to/from which data is written/read is returned.
  However, if any communication item address out of the data range is specified, "FFFFH" is returned.
  Data range:
  Temperature control module communication item of CH1: 0000H to 0884H
  communication item of CH2: 1000H to 1884H
  Communication item of digital input (DI)/digital output (DO) module:
  2000H to 2884H

- **Byte 4, Byte 5: Data of communication item**

  – For data read, the relevant communication item value is stored.
  – For data write, the current value of relevant communication item is stored.
  If the written data is valid, the written value is returned.
  If the written data is invalid, the present (before data write) value is returned.

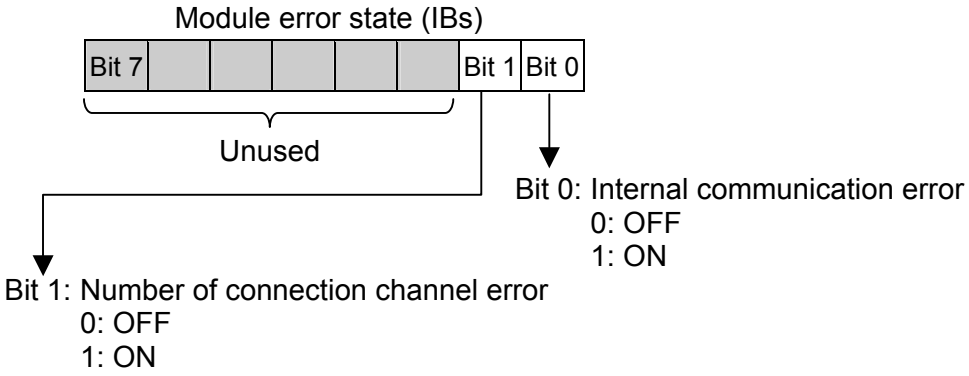
  Even if the written data is valid, the value before data write is returned depending on the period of selecting response time (50 ms max.).

5.4 Registers Assigned to PLC

Set the register area after the GSD file is read to the configuration tool for the PLC.
The dynamic data request, static data request read and static data request write registers are set to the register area.
In addition to the above register area setting, the "Module error state" and "Write permission flags" are set to the first 2 bytes of the read register and to the first 1 byte of the write register, respectively.

■ Module error state (IBs)

The first read only 1-byte register (IBs) consists of bits of module error state.
The respective bit configuration is as follows. (Bit 0 corresponding to LSB and Bit 7, MSB.)



● Internal communication error

An internal communication error occurs when:

- other modules (including the temperature control side of the X-TIO-G module) cannot be recognized within several seconds after the power is turned on,
- initializing information is not received from other modules (including the temperature control side of the X-TIO-G module) within 30 seconds after the power is turned on (In this case, no value can be viewed on PROFIBUS due to not being connected to PROFIBUS.),
- two or more X-TIO-G modules connected,
- an other network module connected,
- the communication buffer overflows as the number of connecting modules within the SRX unit exceeds the maximum number (30 sets including one X-TIO-G module), or
- any modules of versions which are not connectable to the X-TIO-G module are connected.

If an internal communication error occurs, the RUN lamp at the front of X-TIO-G module flashes.

For a version of a module, please contact RKC sales office or the agent.

● Number of connection channel error

An error occurs if the number of channels specified by the PLC configuration tool differs from that of temperature control modules actually connected (including the temperature control side of the X-TIO-G module).

Even if the number of connection channels error occurs, communication of PROFIBUS is possible.
For example, if the number of channels specified by the PLC configuration tool is larger than that of temperature control modules actually connected, data read and write are made from/to channels which do not actually exist. In this case, read data becomes “0” and write data is ignored.

■ Write permission flags (QBw, IBw)

Data may be written by static data request depending on the PLC even if the PLC is not in the RUN state.
In order to prevent this, the X-TIO-G module is provided with the following 1-byte register.

- Write permission flag register (QBw)
- Read register to check that the write permission flag is set (IBw)

Only when the flag value in this one byte corresponds to “0FH” (hexadecimal), data is written to each module of the SRX. If “0FH” is stored in the write permission flag register, “0FH” is also set to the read side.

The operation of writing a hexadecimal value of “0FH” to the write permission flag register (QBw) is necessary for both static and dynamic data requests.

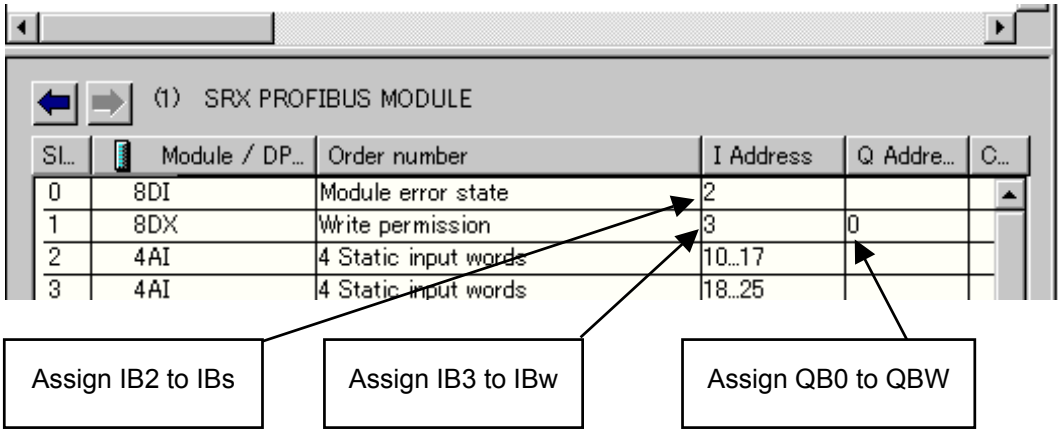
If any value other than “0FH” is stored in the write permission flag register, “00H” is set to the read side.

■ Setting example of "Module error state (IBs)" and "Write permission flags (QBw, IBw)"

This section shows a setting example using STEP7 (programming software) from SIEMENS.

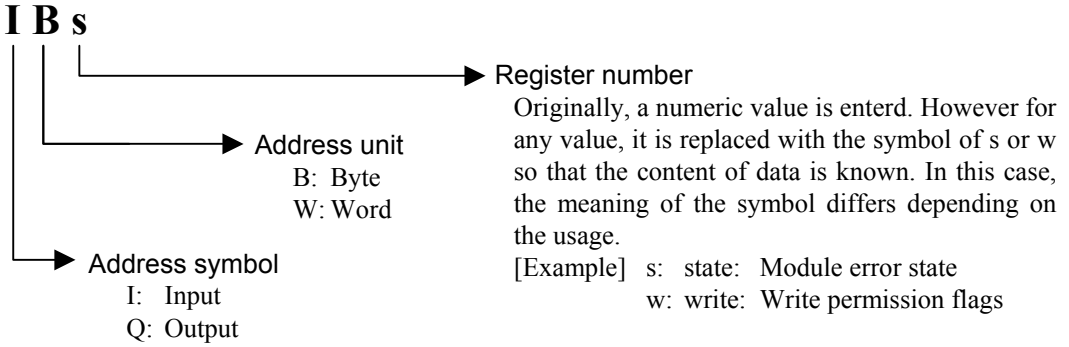
● Setting example of PLC configuration

If the SRX hardware configuration is conducted in STEP7, an address is assigned to the "Module error state (IBs)" and "Write permission flags (QBw and IBw)."
In the following example, IB2 is assigned to "Module error state (IBs)," and QB0 and IB3 are assigned to "Write permission flags [Write permission] (QBw and IBw)."



Display example of STEP 7

Symbols:
The symbols of IBs, QBw and IBw are used for a description of the register. The meaning of these symbols are as follows.



[Relation of word data, byte data and bit data]

For example, the "IW10" word data becomes as follows if expressed in byte and bit.

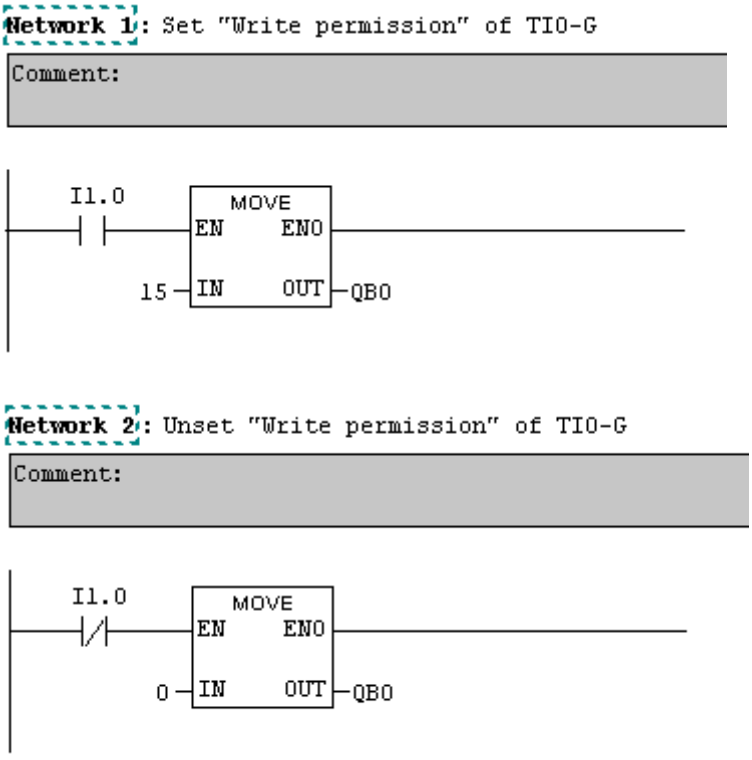
Word data: IW10
Byte data: IB10, IB11
Bit data: I10.0 to I10.7, I11.0 to I11.7
(Bit data is arranged in the order of address symbol, register number and bit number.)

- **Example of sequence program (data written by static data request)**

X-TIO-G module performs data writing for a temperature control module connected to it by writing a hexadecimal number “0FH” (decimal number: 15) to the “write permission flag register (QBw)” of “Write permission flags.”

In the following example, the above operation is performed with a MOVE instruction.

The example on this page is related to the “Setting example of PLC configuration” on a previous page. Therefore, QB0 is assigned to the “write permission flag register (QBw)” in the sequence programming of a PLC.



When I1.0 is ON, a hexadecimal number: 0FH (decimal number: 15) is written to QB0 and a write of static data request is done.

When I1.0 is OFF, a hexadecimal number: 00H (decimal number: 0) is written to QB0 and a write of static data request is stopped.

Example of sequence program

■ Example of data assignment

The registers for static and dynamic data requests are assigned as follows it the following conditions are satisfied.

- Number of temperature control channel: 4 channels
- Number of registers used by dynamic data request: 1
- Number of data items read by static data request: 3 items
  [Measured value (PV), Event 1 state, Set value (SV)]
- Number of data items written by static data request: 1 item [Set value (SV)]

● Assignment of registers read by static data request (4 channels × 3 items = 12 words)

Base address: IWr

Register address	IWr	IWr + 1	IWr + 2	IWr + 3	IWr + 4	IWr + 5	IWr + 6	IWr + 7
Temperature control channel	1	2	3	4	1	2	3	4
Read item	Measured value (PV)	Measured value (PV)	Measured value (PV)	Measured value (PV)	Event 1 state	Event 1 state	Event 1 state	Event 1 state

IWr + 8	IWr + 9	IWr + 10	IWr + 11
1	2	3	4
Set value (SV)	Set value (SV)	Set value (SV)	Set value (SV)

● Assignment of registers written by static data request (4 channels × 1 item = 4 words)

Base address: QWw

Register address	QWw	QWw + 1	QWw + 2	QWw + 3
Temperature control channel	1	2	3	4
Read item	Set value (SV)	Set value (SV)	Set value (SV)	Set value (SV)

● Assignment of registers input by dynamic data request (6 bytes × 1 = 6 bytes)

Base address: IBdr

Register address	IBdr	IBdr + 1	IBdr + 2	IBdr + 3	IBdr + 4	IBdr + 5
Input item	Attribute	Module address	Communication item address		Communication item data	

● Assignment of registers output by dynamic data request (6 bytes × 1 = 6 bytes)

Base address: QBdw

Register address	QBdw	QBdw + 1	QBdw + 2	QBdw + 3	QBdw + 4	QBdw + 5
Output item	Attribute	Module address	Communication item address		Communication item data	

5.5 Processing of Numeric Data Values

Numeric data values used via communication with the PLC and processed by SRX include those with and without decimal points and also those with minus signs.

● For numeric data value without decimal point

If there is no decimal point, the value is processed as it is.
In parameters which only have ON or OFF status, 1 = ON, 0 = OFF.

[Example]

A signal wire for temperature input is disconnected and the burnout state occurs.
→ Read value corresponding to communication item address 0008H (burnout):
1 (Hexadecimal number: 0001H)

● For numeric data value with decimal point

The decimal point is omitted.

[Example 1]

When temperature measured value of SRX is 120.5 °C
→ Read value corresponding to communication item address 0000H (temperature measured value):
1205 (Hexadecimal number: 04B5H)

[Example 2]

When temperature measured value of SRX is 130 °C
→ Read value corresponding to communication item address 0000H (temperature measured value):
130 (Hexadecimal number: 0082H)

● For numeric data value with minus sign

The value is expressed as a 2's complement value which is obtained by subtracting the minus value from the hexadecimal number 10000H.

[Example 1]

When temperature measured value of SRX is −1 °C
→ Read value corresponding to communication item address 0000H (temperature measured value):
Hexadecimal number: FFFFH
(10000H − 1 = FFFFH)

[Example 2]

When temperature measured value of SRX is −2.5 °C
→ Read value corresponding to communication item address 0000H (temperature measured value):
Hexadecimal number: FFE7H
(10000H − 25 = 10000H − 19H = FFE7H)

The original minus value can be found by revising the word value to the INT value on the sequence program side.

6. LIST OF COMMUNICATION ITEMS

6.1 Reference to List of Communication Items

A list of communication items shows data on SRX which can make communication via PROFIBUS.

(1) Communication item address (Hexadecimal) CH1	(1) Communication item address (Hexadecimal) CH2	(2) Name	(3) Attribute	(4) Structure	(5) Data range	(6) Factory set value
0000	1000	Measured value (PV)	RO	C	Input scale low to Input scale high	—
0001	1001	Comprehensive event state	RO	C	0 to 31 (Bit data) Bit 0: Burnout Bit 1: Event 1 state Bit 2: Event 2 state Bit 3: Heater break alarm (HBA) state Bit 4: Control loop break alarm (LBA) state	—
0002	1002	Manipulated output value	RO	C	−5.0 to +105.0 %	—
0003	1003	Set value monitor	RO	C	Input scale low to Input scale high	—
0004		Error code	RO	M	0 to 255 (Bit data) Bit 0: Memory backup error Bit 1: Unused Bit 2: Internal communication error Bit 3: Adjustment data error Bit 4: Input error Bit 5: Current transformer input error Bit 6: Temperature compensation error Bit 7: Unused	

(1) Communication item address:
The communication item address is the address number to specify with configuration tool when carry out read/write of data.

(2) Name: The communication item name is written.

(3) Attribute:
RO: Read only
Slave (SRX) → Master (PLC)
R/W: Read and Write
Slave (SRX) ↔ Master (PLC)

(4) Structure:
C: Data for each channel
L: Data for each level
S: Data for each segment
M: Data for each module
P: Data for each pattern
T: Data for each time signal

(5) Data range: The data range of communication item is written.

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

6.2 Communication Item of TIO Module

6.2.1 Normal setting data items

Communication item address (Hexadecimal)		Name	Attri-bute	Struc-ture	Data range	Factory set value
CH1	CH2					
0000	1000	Measured value (PV)	RO	C	Input scale low to Input scale high (A decimal point position depends on input range decimal point position setting)	—
0001	1001	Comprehensive event state	RO	C	0 to 31 (Bit data) Bit 0: Burnout Bit 1: Event 1 state Bit 2: Event 2 state Bit 3: Heater break alarm (HBA) state Bit 4: Control loop break alarm (LBA) state	—
0002	1002	Manipulated output value	RO	C	–5.0 to +105.0 %	—
0003	1003	Set value monitor	RO	C	Input scale low to Input scale high (A decimal point position depends on input range decimal point position setting)	—
0004		Error code	RO	M	0 to 255 (Bit data) Bit 0: Memory backup error Bit 1: Unused Bit 2: Internal communication error Bit 3: Adjustment data error Bit 4: Input error Bit 5: Current transformer input error Bit 6: Temperature compensation error Bit 7: Unused	—
0005	1005	Unused	—	—	—	—
0006	1006	Current transformer (CT) input value	RO	C	0.0 to 30.0 A or 0.0 to 100.0 A	—
0007	1007	Unused	—	—	—	—
0008	1008	Burnout state	RO	C	0: OFF 1: ON	—
0009	1009	Event 1 state	RO	C	0: OFF 1: ON	—
000A	100A	Event 2 state	RO	C	0: OFF 1: ON	—
000B	100B	Heater break alarm (HBA) state *	RO	C	0: OFF 1: Heater break/Relay welding	—

* Heater break alarm (HBA) cannot judge “heater break” or “relay welding.”

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Communication item address (Hexadecimal) CH1	CH2	Name	Attribute	Structure	Data range	Factory set value
000C	100C	Control loop break alarm (LBA) state	RO	C	0: OFF 1: ON	—
000D	100D	Unused	—	—	—	—
000E	100E	Unused	—	—	—	—
000F	100F	Operation mode	R/W	C	0: Unused 2: Monitor 2 1: Monitor 1 3: Control	3
0010	1010	Set value (SV)	R/W	C	Input scale low to Input scale high (A decimal point position depends on input range decimal point position setting)	0
0011	1011	Proportional band	R/W	C	TC/RTD input: 0 (0.0) to Input span (Unit: °C [°F]) Voltage (V)/Current (I) input: 0 to 1000 % of input span 0 (0.0): ON/OFF action (A decimal point position depends on input range decimal point position setting)	10.0
0012	1012	Integral time	R/W	C	0.1 to 3600.0 seconds or 0.01 to 360.00 seconds	40.00
0013	1013	Derivative time	R/W	C	0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0.0 (0.00): Derivative action OFF (PI action)	10.00
0014	1014	Control response parameters	R/W	C	0: Slow 2: Fast 1: Medium	0
0015	1015	PV bias	R/W	C	–Input span to +Input span (A decimal point position depends on input range decimal point position setting)	0
0016	1016	Event 1 set value	R/W	C	Deviation high/Deviation low: –Input span to +Input span Deviation high/low, Band: 0 to Input span Process high/Process low: Input scale low to Input scale high (A decimal point position depends on input range decimal point position setting)	0
0017	1017	Event 2 set value	R/W	C		0
0018 ⋮ 001F	1018 ⋮ 101F	Unused	—	—	—	—

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Communication item address (Hexadecimal)		Name	Attri-bute	Struc-ture	Data range	Factory set value
CH1	CH2					
0020	1020	PID/AT transfer	R/W	C	0: PID control operation 1: AT (Autotuning) operation	0
0021	1021	Auto/Manual transfer	R/W	C	0: Auto mode 1: Manual mode	0
0022	1022	Manual output value	R/W	C	–5.0 to +105.0 %	0.0
0023	1023	Output limiter high	R/W	C	Output limiter low to +105.0 %	100.0
0024	1024	Output limiter low	R/W	C	–5.0 % to Output limiter high	0.0
0025	1025	Proportional cycle time	R/W	C	0.2 to 50.0 seconds	Relay contact output: 20.0 Voltage pulse output: 2.0
0026	1026	Unused	—	—	—	—
0027	1027	Digital filter	R/W	C	0.00 to 10.00 seconds 0.00: OFF (Not provided)	0.00
0028	1028	Heater break alarm (HBA) set value	R/W	C	0.0 to 30.0 A or 0.0 to 100.0 A	0.0
0029	1029	Number of heater break alarm (HBA) delay times	R/W	C	1 to 255 times	5
002A	102A	Hot/Cold start selection	R/W	C	0: Hot start 1 2: Cold start 1 1: Hot start 2 3: Cold start 2	0
002B	102B	Start determination point	R/W	C	0 to Input span (A decimal point position depends on input range decimal point position setting)	0.0
002C ⋮ 002F	102C ⋮ 102F	Unused	—	—	—	—
0030		Control RUN/STOP transfer	R/W	M	0: Control STOP 1: Control RUN	0
0031	1031	Input error determination point (high)	R/W	C	Input scale low to Input scale high (A decimal point position depends on input range decimal point position setting)	Input scale high
0032	1032	Input error determination point (low)	R/W	C	Input scale low to Input scale high (A decimal point position depends on input range decimal point position setting)	Input scale low

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Communication item address (Hexadecimal)		Name	Attri-bute	Struc-ture	Data range	Factory set value
CH1	CH2					
0033	1033	Action at input error (high)	R/W	C	0: Normal control 1: Manipulated output value at input error	0
0034	1034	Action at input error (low)	R/W	C	0: Normal control 1: Manipulated output value at input error	0
0035	1035	Manipulated output value at input error	R/W	C	–5.0 to +105.0 %	0.0
0036	1036	AT differential gap time	R/W	C	0.00 to 50.00 seconds	0.10
0037	1037	Unused	—	—	—	—
0038	1038	AT bias	R/W	C	–Input span to +Input span (A decimal point position depends on input range decimal point position setting)	0
0039	1039	Unused	—	—	—	—
003A	103A	Unused	—	—	—	—
003B		Remote/Local transfer	R/W	M	0: Local mode 1: Remote mode	0
003C		Event LED mode setting	R/W	M	1: Mode 1 11: Mode 11 2: Mode 2 12: Mode 12 3: Mode 3 13: Mode 13 10: Mode 10 Except the above: Unused	0 (Unused)
003D	103D	Digital input setting 1 (RESET)	R/W	C	0000 to 9999 Upper two digits (Thousands and hundreds digits): Address of DI module Lower two digits (Tens and units digits): Channel number of DI module 00: No function	0000
003E	103E	Digital input setting 2 (RUN)	R/W	C		0000
003F	103F	Digital input setting 3 (FIX)	R/W	C		0000
0040	1040	Digital input setting 4 (MAN)	R/W	C		0000
0041	1041	Digital input setting 5 (HOLD)	R/W	C		0000
0042	1042	Digital input setting 6 (STEP)	R/W	C		0000
0043	1043	Digital input setting 7 (Program pattern selection)	R/W	C		0000
0044	1044	Digital input setting 8 (AT/PID)	R/W	C		0000

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Communication item address (Hexadecimal) CH1	CH2	Name	Attribute	Structure	Data range	Factory set value
0045 : 0057	1045 : 1057	Unused	—	—	—	—
0058 : 00CF	1058 : 10CF	**Level PID data** **For details, refer to 6.2.2 Level PID data items (P. 28)**	—	—	—	—
00D0 : 0858	10D0 : 1858	**Program control data** **For details, refer to 6.2.3 Program control data items (P. 30)**	—	—	—	—
0859	1859	Control loop break alarm (LBA) use selection	R/W	C	0: Unused 1: Used	0
085A	185A	Control loop break alarm (LBA) time	R/W	C	1 to 7200 seconds	80
085B	185B	LBA deadband (LBD)	R/W	C	0 to Input span (A decimal point position depends on input range decimal point position setting)	0
085C	185C	Integral/Derivative time decimal point position	R/W	C	0: Two decimal places 1: One decimal place	0
085D : 086F	185D : 186F	Unused	—	—	—	—

6.2.2 Level PID data items

The level PID data items are usable for only dynamic data request.

Communication item address (Hexadecimal) CH1	CH2	Name	Attribute	Structure	Data range	Factory set value
0058 : 005F	1058 : 105F	Proportional band	R/W	L	TC/RTD input: 0 (0.0) to Input span (Unit: °C [°F]) Voltage (V)/Current (I) input: 0 to 1000 % of input span 0 (0.0): ON/OFF action (A decimal point position depends on input range decimal point position setting)	10.0

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Communication item address (Hexadecimal) CH1	Communication item address (Hexadecimal) CH2	Name	Attribute	Structure	Data range	Factory set value
0060 : 0067	1060 : 1067	Integral time	R/W	L	0.1 to 3600.0 seconds or 0.01 to 360.00 seconds	40.00
0068 : 006F	1068 : 106F	Derivative time	R/W	L	0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0.0 (0.00): Derivative action OFF (PI action)	10.00
0070 : 0077	1070 : 1077	Control response parameters	R/W	L	0: Slow 1: Medium 2: Fast	0
0078 : 00AF	1078 : 10AF	Unused	—	—	—	—
00B0 : 00B7	10B0 : 10B7	Level PID high limit set value	R/W	L	Level 1: Input scale low to Level 2 PID high limit set value Level 2: Level 1 PID high limit set value to Level 3 PID high limit set value Level 3: Level 2 PID high limit set value to Level 4 PID high limit set value Level 4: Level 3 PID high limit set value to Level 5 PID high limit set value Level 5: Level 4 PID high limit set value to Level 6 PID high limit set value Level 6: Level 5 PID high limit set value to Level 7 PID high limit set value Level 7: Level 6 PID high limit set value to Level 8 PID high limit set value Level 8: Level 7 PID high limit set value to Input scale high (A decimal point position depends on input range decimal point position setting)	Input scale high
00B8 : 00CF	10B8 : 10CF	Unused	—	—	—	—

6.2.3 Program control data items

Communication item address (Hexadecimal)		Name	Attri-bute	Struc-ture	Data range	Factory set value
CH1	CH2					
00D0	10D0	Program operation mode selection	R/W	C	0: RESET 1: RUN (Program control) 2: FIX (Fixed set point control) 3: MAN (Manual control)	2
00D1	10D1	Execution pattern	R/W	C	1 to 16	1
00D2	10D2	Execution segment	RO	C	1 to 16	—
00D3	10D3	Segment remaining time	RO	C	0.00 to 300.00 seconds 0.0 to 3000.0 seconds 0 to 30000 seconds 0 to 30000 minutes	—
00D4	10D4	Number of program execution times	RO	C	0 to 9999 times	—
00D5	10D5	Time signal output state 1	RO	C	0 to 255 (Bit data) Bit 0: Time signal 1 output state Bit 1: Time signal 2 output state Bit 2: Time signal 3 output state Bit 3: Time signal 4 output state Bit 4: Time signal 5 output state Bit 5: Time signal 6 output state Bit 6: Time signal 7 output state Bit 7: Time signal 8 output state	—
00D5	10D5	Time signal output state 2	RO	C	0 to 255 (Bit data) Bit 8: Time signal 9 output state Bit 9: Time signal 10 output state Bit 10: Time signal 11 output state Bit 11: Time signal 12 output state Bit 12: Time signal 13 output state Bit 13: Time signal 14 output state Bit 14: Time signal 15 output state Bit 15: Time signal 16 output state	—
00D6	10D6	Pattern end output state	RO	C	0: Pattern end output OFF 1: Pattern end output ON	—
00D7	10D7	End state	RO	C	0: End state OFF 1: End state ON	—
00D8	10D8	Wait state	RO	C	0: Wait state OFF 1: Wait state ON	—
00D9	10D9	Hold state	R/W	C	0: Hold state OFF 1: Hold state ON	0

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Communication item address (Hexadecimal) CH1	CH2	Name	Attribute	Structure	Data range	Factory set value
00DA	10DA	Step action	R/W	C	0: Not step action 1: Step action execution	0
00DB ⋮ 00EF	10DB ⋮ 10EF	Unused	—	—	—	—
00F0 ⋮ 00FF	10F0 ⋮ 10FF	Setting of the number of program execution times *	R/W	P	1 to 1000 times 1000: Number of infinite times	1
0100 ⋮ 010F	1100 ⋮ 110F	End segment *	R/W	P	1 to 16	16
0110 ⋮ 011F	1110 ⋮ 111F	Link pattern *	R/W	P	0 to 16 0: Not link pattern	0
0120 ⋮ 012F	1120 ⋮ 112F	Pattern end output time *	R/W	P	0.00 to 300.00 seconds 0.0 to 3000.0 seconds 0 to 30000 seconds 0 to 30000 minutes	0.00
0130 ⋮ 013F	1130 ⋮ 113F	Wait zone *	R/W	P	0 to Input span (A decimal point position depends on input range decimal point position setting)	0.0
0140 ⋮ 023F	1140 ⋮ 123F	Segment level *	R/W	S	Input scale low to Input scale high (A decimal point position depends on input range decimal point position setting)	0
0240 ⋮ 033F	1240 ⋮ 133F	Segment time *	R/W	S	0.00 to 300.00 seconds 0.0 to 3000.0 seconds 0 to 30000 seconds 0 to 30000 minutes	0.00
0340 ⋮ 043F	1340 ⋮ 143F	Time signal output number *	R/W	T	0 to 16 0: Not time signal output	0
0440 ⋮ 053F	1440 ⋮ 153F	Time signal ON segment *	R/W	T	1 to 16	1

* These data are usable data only in dynamic data request. Cannot use it for static data request.

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Communication item address (Hexadecimal) CH1	Communication item address (Hexadecimal) CH2	Name	Attribute	Structure	Data range	Factory set value
0540 : 063F	1540 : 163F	Time signal ON time *	R/W	T	0.00 to 300.00 seconds 0.0 to 3000.0 seconds 0 to 30000 seconds 0 to 30000 minutes	0.00
0640 : 073F	1640 : 173F	Time signal OFF segment *	R/W	T	1 to 16	1
0740 : 083F	1740 : 183F	Time signal OFF time *	R/W	T	0.00 to 300.00 seconds 0.0 to 3000.0 seconds 0 to 30000 seconds 0 to 30000 minutes	0.00
0840 : 0857	1840 : 1857	Unused	—	—	—	—
0858	1858	Program operation start mode	R/W	C	0: Zero start 1: PV start 1 2: PV start 2	0

* These data are usable data only in dynamic data request. Cannot use it for static data request.

6.2.4 Initial setting data items

⚠ WARNING

The Initial setting data should be set according to the application before setting any parameter related to operation. Once the Initial setting data is set correctly, no further changes need to be made to data for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Initial setting.

When setting initial setting data items, stop control by normal setting data "Control RUN/STOP transfer."

Even if control is stopped by "Control RUN/STOP transfer" while program control is being performed (RUN state), the program continues running. If it is necessary to stop running the program, set "Program operation mode selection" to RESET.

Communication item address (Hexadecimal)		Name	Attribute	Structure	Data range	Factory set value
CH1	CH2					
0870	1870	Input range number	R/W	C	TC input: 0: K −200 to +1372 °C −328 to +2501 °F 1: J −200 to +1200 °C −328 to +2192 °F 2: R −50 to +1768 °C −58 to +3000 °F 3: S −50 to +1768 °C −58 to +3000 °F 4: B 0 to 1800 °C 32 to 3000 °F 5: E −200 to +1000 °C −328 to +1832 °F 6: N 0 to 1300 °C 32 to 2372 °F 7: T −200 to +400 °C −328 to +752 °F 8: W5Re/W26Re 0 to 2300 °C 32 to 3000 °F 9: PLII 0 to 1390 °C 32 to 2534 °F	Based on model code

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Communication item address (Hexadecimal)		Name	Attribute	Structure	Data range	Factory set value
CH1	CH2					
0870	1870	Input range number	R/W	C	RTD input: 12: Pt100 −200 to +850 °C −328 to +1562 °F 13: JPt100 −200 to +600 °C −328 to +1112 °F Voltage (V)/Current (I) input: 14: 0 to 20 mA DC 15: 4 to 20 mA DC 16: 0 to 10 V DC 17: 0 to 5 V DC 18: 1 to 5 V DC 19: 0 to 1 V DC 20: 0 to 100 mV DC 21: 0 to 10 mV DC	Based on model code
0871	1871	Input scale high	R/W	C	Input scale low to 20000 (A decimal point position depends on input range decimal point position setting)	Based on input range
0872	1872	Input scale low	R/W	C	−20000 to Input scale high (A decimal point position depends on input range decimal point position setting)	Based on input range
0873	1873	Input range decimal point position	R/W	C	TC/RTD input: 0 to 1 Voltage (V)/Current (I) input: 0 to 4 0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	1
0874	1874	Temperature unit selection	R/W	C	0: °C 1: °F	0
0875	1875	Control type selection	R/W	C	0: Direct action 1: Reverse action	1
0876	1876	ON/OFF control differential gap (upper)	R/W	C	0 to Input span (A decimal point position depends on input range decimal point position setting)	TC/RTD: 1.0
0877	1877	ON/OFF control differential gap (lower)	R/W	C		V/I: 0.1 % of input span

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Communication item address (Hexadecimal)		Name	Attri-bute	Struc-ture	Data range	Factory set value
CH1	CH2					
0878	1878	Event 1 differential gap	R/W	C	0 to Input span (A decimal point position depends on input range decimal point position setting)	TC/ RTD: 2.0 V/I: 0.2 % of input span
0879	1879	Event 2 differential gap	R/W	C		
087A	187A	Event 1 type selection	R/W	C	0: Not provided 1: Process high 2: Process low 3: Deviation high 4: Deviation low 5: Deviation high/low 6: Band	0
087B	187B	Event 2 type selection	R/W	C		0
087C	187C	Event 1 hold action	R/W	C	0: Not provided 1: Hold action (2: Unused) 3: Re-hold action	3
087D	187D	Event 2 hold action	R/W	C		3
087E	187E	Number of event delay times	R/W	C	0 to 255 times	0
087F	187F	Unused	—	—	—	—
0880	1880	Segment time unit setting	R/W	C	0: 0.01 second 1: 0.1 second 2: 1 second 3: 1 minute	0
0881		Operation mode holding setting	R/W	M	0: Not hold 1: Hold	1
0882	1882	Output change rate limiter (up)	R/W	C	0.0 to 100.0 %/second 0.0: Limiter OFF	0.0
0883	1883	Output change rate limiter (down)	R/W	C	0.0 to 100.0 %/second 0.0: Limiter OFF	0.0

6.3 Communication Item of DI Module

The communication item of a digital input (DI) module is usable for only dynamic data request.

Communication item address (Hexadecimal)	Name	Attribute	Structure	Data range	Factory set value
2000	Input state of digital input (terminal)	RO	M	0 to 4095 (Bit data) Bit 0: DI channel 1 Bit 1: DI channel 2 Bit 2: DI channel 3 Bit 3: DI channel 4 Bit 4: DI channel 5 Bit 5: DI channel 6 Bit 6: DI channel 7 Bit 7: DI channel 8 Bit 8: DI channel 9 Bit 9: DI channel 10 Bit 10: DI channel 11 Bit 11: DI channel 12 Bit 12 to Bit 15: Unused	—
2001	Input state of digital input (connector) 1	RO	M	0 to 255 (Bit data) Bit 0: DI channel 13 Bit 1: DI channel 14 Bit 2: DI channel 15 Bit 3: DI channel 16 Bit 4: DI channel 17 Bit 5: DI channel 18 Bit 6: DI channel 19 Bit 7: DI channel 20 Bit 8 to Bit 15: Unused	—
2002	Input state of digital input (connector) 2	RO	M	0 to 255 (Bit data) Bit 0: DI channel 21 Bit 1: DI channel 22 Bit 2: DI channel 23 Bit 3: DI channel 24 Bit 4: DI channel 25 Bit 5: DI channel 26 Bit 6: DI channel 27 Bit 7: DI channel 28 Bit 8 to Bit 15: Unused	—
2003 ⋮ 25FF	Unused	—	—	—	—
2600	Error code	RO	M	0 to 1 (Bit data) Bit 0: Backup error Bit 1 to Bit 15: Unused	—
2601 ⋮ 261F	Unused	—	—	—	—

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Communication item address (Hexadecimal)	Name	Attri-bute	Struc-ture	Data range	Factory set value
CH1: 2620 CH2: 2621 CH3: 2622 CH4: 2623 CH5: 2624 CH6: 2625 CH7: 2626 CH8: 2627 CH9: 2628 CH10: 2629 CH11: 262A CH12: 262B	Event LED selection: terminal input (DI channel 1 to 12)	R/W	C	0: Unused 1: EVENT1 lamp 2: EVENT2 lamp 3: EVENT3 lamp 4: EVENT4 lamp	0
262C ⋮ 262F	Unused	—	—	—	—
CH13: 2630 CH14: 2631 CH15: 2632 CH16: 2633 CH17: 2634 CH18: 2635 CH19: 2636 CH20 2637 CH21: 2638 CH22: 2639 CH23: 263A CH24: 263B CH25: 263C CH26: 263D CH27: 263E CH28: 263F	Event LED selection: connector input (DI channel 13 to 28)	R/W	C	0: Unused 1: EVENT1 lamp 2: EVENT2 lamp 3: EVENT3 lamp 4: EVENT4 lamp	0
2640 ⋮ 287F	Unused	—	—	—	—

6.4 Communication Item of DO Module

The communication item of a digital output (DO) module is usable for only dynamic data request.

Communication item address (Hexadecimal)	Name	Attribute	Structure	Data range	Factory set value
2300	Output state of digital output (terminal)	RO	M	0 to 4095 (Bit data) Bit 0: DO channel 1 Bit 1: DO channel 2 Bit 2: DO channel 3 Bit 3: DO channel 4 Bit 4: DO channel 5 Bit 5: DO channel 6 Bit 6: DO channel 7 Bit 7: DO channel 8 Bit 8: DO channel 9 Bit 9: DO channel 10 Bit 10: DO channel 11 Bit 11: DO channel 12 Bit 12 to Bit 15: Unused	—
2301	Output state of digital output (connector) 1	RO	M	0 to 255 (Bit data) Bit 0: DO channel 13 Bit 1: DO channel 14 Bit 2: DO channel 15 Bit 3: DO channel 16 Bit 4: DO channel 17 Bit 5: DO channel 18 Bit 6: DO channel 19 Bit 7: DO channel 20 Bit 8 to Bit 15: Unused	—
2302	Output state of digital output (connector) 2	RO	M	0 to 255 (Bit data) Bit 0: DO channel 21 Bit 1: DO channel 22 Bit 2: DO channel 23 Bit 3: DO channel 24 Bit 4: DO channel 25 Bit 5: DO channel 26 Bit 6: DO channel 27 Bit 7: DO channel 28 Bit 8 to Bit 15: Unused	—
2303 ⋮ 243F	Unused	—	—	—	—

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Communication item address (Hexadecimal)	Name	Attri-bute	Struc-ture	Data range	Factory set value
CH1: 2440 CH2: 2441 CH3: 2442 CH4: 2443 CH5: 2444 CH6: 2445 CH7: 2446 CH8: 2447 CH9: 2448 CH10: 2449 CH11: 244A CH12: 244B	Function selection of DO channel 1 to 12 (terminal)	R/W	C	0000 to 9999 Upper two digits (Thousands and hundreds digits): Address of TIO module or DI module Lower two digits (Tens and units digits): Function number of output signal 00: No function	0
244C ⋮ 244F	Unused	—	—	—	—
CH13: 2450 CH14: 2451 CH15: 2452 CH16: 2453 CH17: 2454 CH18: 2455 CH19: 2456 CH20 2457 CH21: 2458 CH22: 2459 CH23: 245A CH24: 245B CH25: 245C CH26: 245D CH27: 245E CH28: 245F	Function selection of DO channel 13 to 28 (connector)	R/W	C	0000 to 9999 Upper two digits (Thousands and hundreds digits): Address of TIO module or DI module Lower two digits (Tens and units digits): Function number of output signal 00: No function	0
2460 ⋮ 25FF	Unused	—	—	—	—
2600	Error code	RO	M	0 to 1 (Bit data) Bit 0: Backup error Bit 1 to Bit 15: Unused	—
2601 ⋮ 261F	Unused	—	—	—	—

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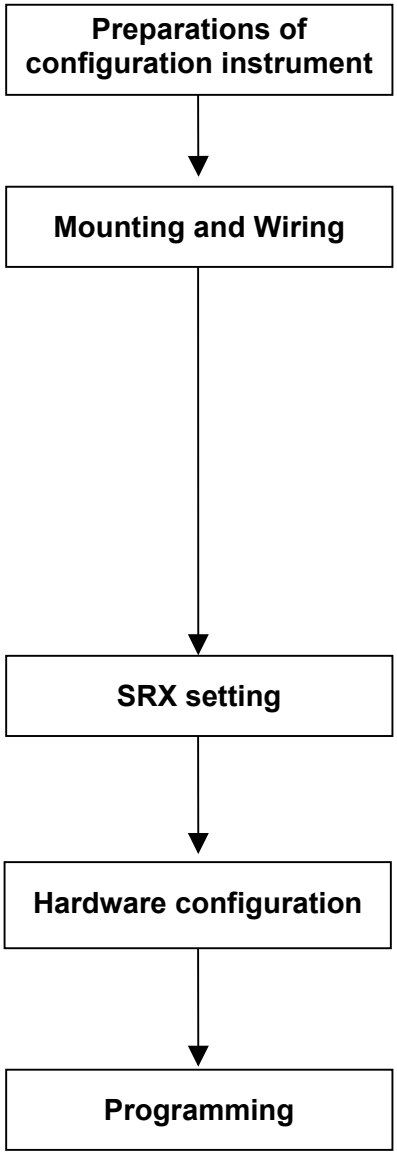
Communication item address (Hexadecimal)	Name	Attri-bute	Struc-ture	Data range	Factory set value
CH1: 2620 CH2: 2621 CH3: 2622 CH4: 2623 CH5: 2624 CH6: 2625 CH7: 2626 CH8: 2627 CH9: 2628 CH10: 2629 CH11: 262A CH12: 262B	Event LED selection: terminal input (DI channel 1 to 12)	R/W	C	0: Unused 1: EVENT1 lamp 2: EVENT2 lamp 3: EVENT3 lamp 4: EVENT4 lamp	0
262C ⋮ 262F	Unused	—	—	—	—
CH13: 2630 CH14: 2631 CH15: 2632 CH16: 2633 CH17: 2634 CH18: 2635 CH19: 2636 CH20: 2637 CH21: 2638 CH22: 2639 CH23: 263A CH24: 263B CH25: 263C CH26: 263D CH27: 263E CH28: 263F	Event LED selection: connector input (DI channel 13 to 28)	R/W	C	0: Unused 1: EVENT1 lamp 2: EVENT2 lamp 3: EVENT3 lamp 4: EVENT4 lamp	0
2640 ⋮ 287F	Unused	—	—	—	—

7. USAGE EXAMPLE

In this Chapter, an example of using PROFIBUS communication when the SRX is connected to a PLC as a master.

7.1 Handling Procedures



☞ Refer to **7.2 System Configuration (P. 42)**.

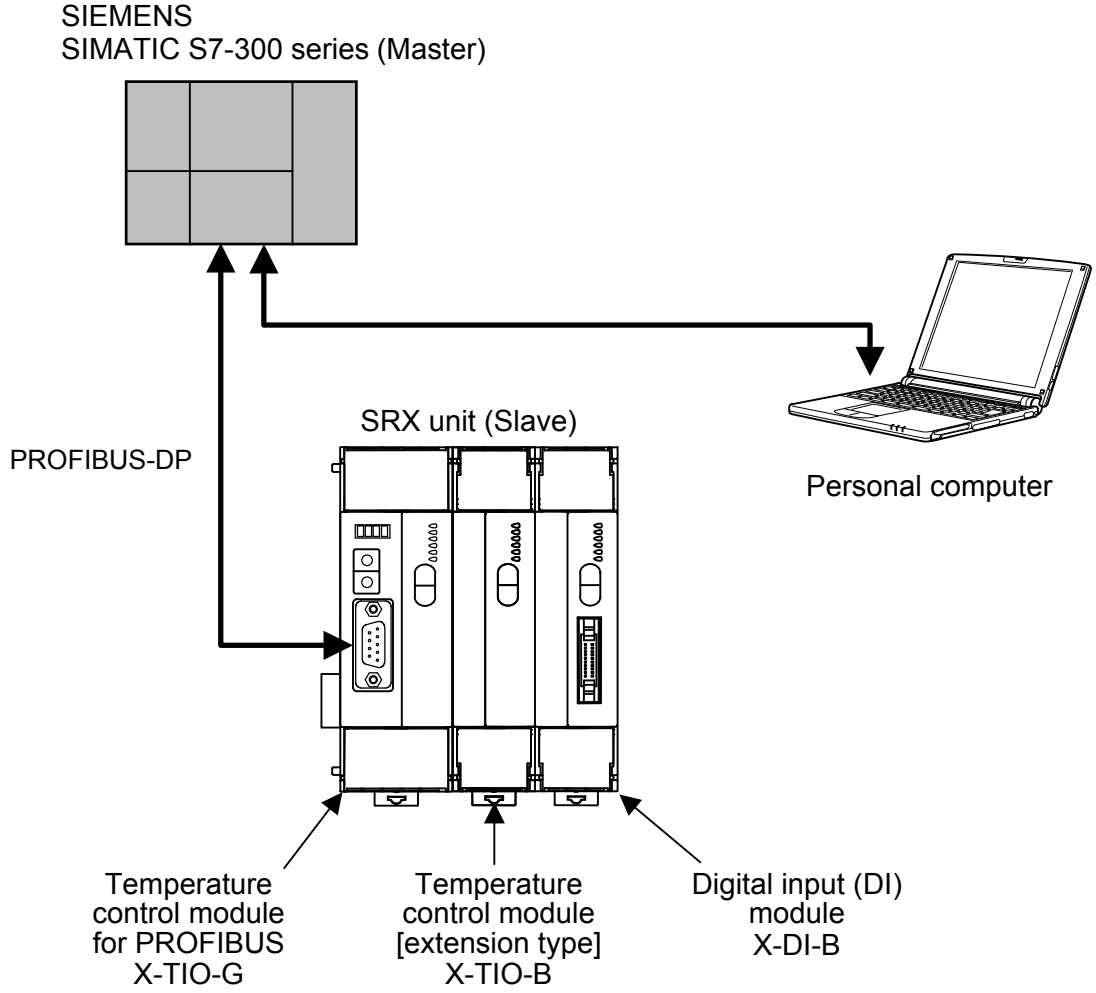
☞
- For mounting and wiring of the SRX, refer to **3. WIRING (P. 4)**, **Temperature Control Module for PROFIBUS X-TIO-G Instruction Manual (IMS01N09-E□)**, **Temperature Control Module [extension type] X-TIO-B Instruction Manual (IMS01N03-E□)**, **Digital Input Module X-DI-A/ X-DI-B Instruction Manual (IMS01N09-E□)** or **Module Type Controller SRX Communication Instruction Manual (IMS01N01-E□)**.
- For mounting and wiring of the PLC, refer to **PLC Instruction Manual**.

☞ Refer to **4. SETTING (P. 6)**, **7.3 Hardware Setting (P. 43)** and **Module Type Controller SRX Communication Instruction Manual (IMS01N01-E□)**.

☞ Refer to **5. PROFIBUS COMMUNICATION (P. 10)**, **7.4 Setting Example of the Programming Software STEP7 (P. 44)** and **Instruction Manual of the Programming Software STEP7**.

☞ Refer to **7.4 Setting Example of the Programming Software STEP7 (P. 44)** and **Instruction Manual of the Programming Software STEP7**.

7.2 System Configuration



■ Use instruments

- **Module type controller SRX**
  - Temperature control module for PROFIBUS: X-TIO-G
  - Temperature control module [extension type]: X-TIO-B
  - Digital input (DI) module: X-DI-B
- **PLC**

  SIMATIC S7-300 series (SIEMENS AG)
  - Power supply module: PS-300 (PS307 2A)
  - CPU module: S7-300 (CPU315-2DP)
  - Digital input module: DI-300 (SM321 DI16)
- **Personal computer**

  Software of the following must be installed in a personal computer.
  - Programming Software STEP7 V5.1 (SIEMENS AG)

☞ For the personal computer to be connected to the PLC, refer to Instruction Manual of PLC and STEP7.

7.3 Hardware Setting

Set each hardware's as the following.

There is not the hardware setting of PLC: SIMATIC S7-300 series (SIEMENS AG).

■ SRX module setting

Set each module of SRX in requirement of the following.

- **X-TIO-G module**
  PROFIBUS address: 01
  Module address: 00
  Internal data bus termination resistor (PROFIBUS side): ON
  Internal data bus termination resistor (temperature control side): OFF

- **X-TIO-B module**
  Module address: 01
  Internal data bus termination resistor: OFF

- **X-DI-B module**
  Module address: 02
  Internal data bus termination resistor: ON

Always set the PROFIBUS address of the X-TIO-G module to any number other than "00." In addition, match the PROFIBUS address with the address set when hardware configured. (Refer to No. 4 on page 50.)

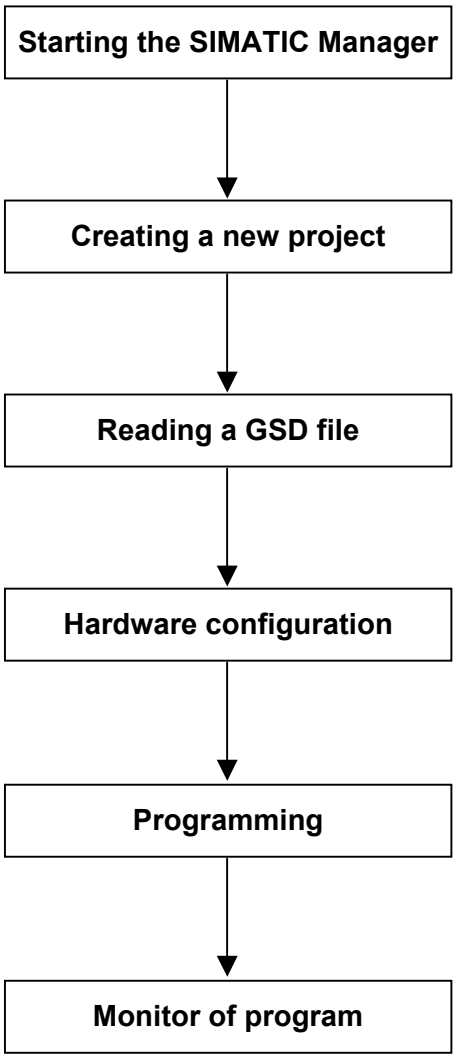
When conducting communication (RKC communication or Modbus) using communication terminals, set the communication speed, data bit configuration and protocol of each module to the same values, respectively.

For setting method, refer to **4. SETTING (P. 6)** and **Module Type Controller SRX Communication Instruction Manual (IMS01N01-E□)**.

7.4 Setting Example of the Programming Software STEP7

7.4.1 Outline

The procedure of using the Programming Software STEP7 V5.1 is as follows.



☞ Refer to **7.4.2 Starting the SIMATIC Manager and creating a new project (P. 45)**.

☞ Refer to **7.4.2 Starting the SIMATIC Manager and creating a new project (P. 45)**.

☞ Refer to **7.4.3 Reading a GSD file (P. 46)**.

☞ Refer to **7.4.4 Hardware configuration (P. 49)**.

☞ Refer to **7.4.5 Programming (P. 59)**.

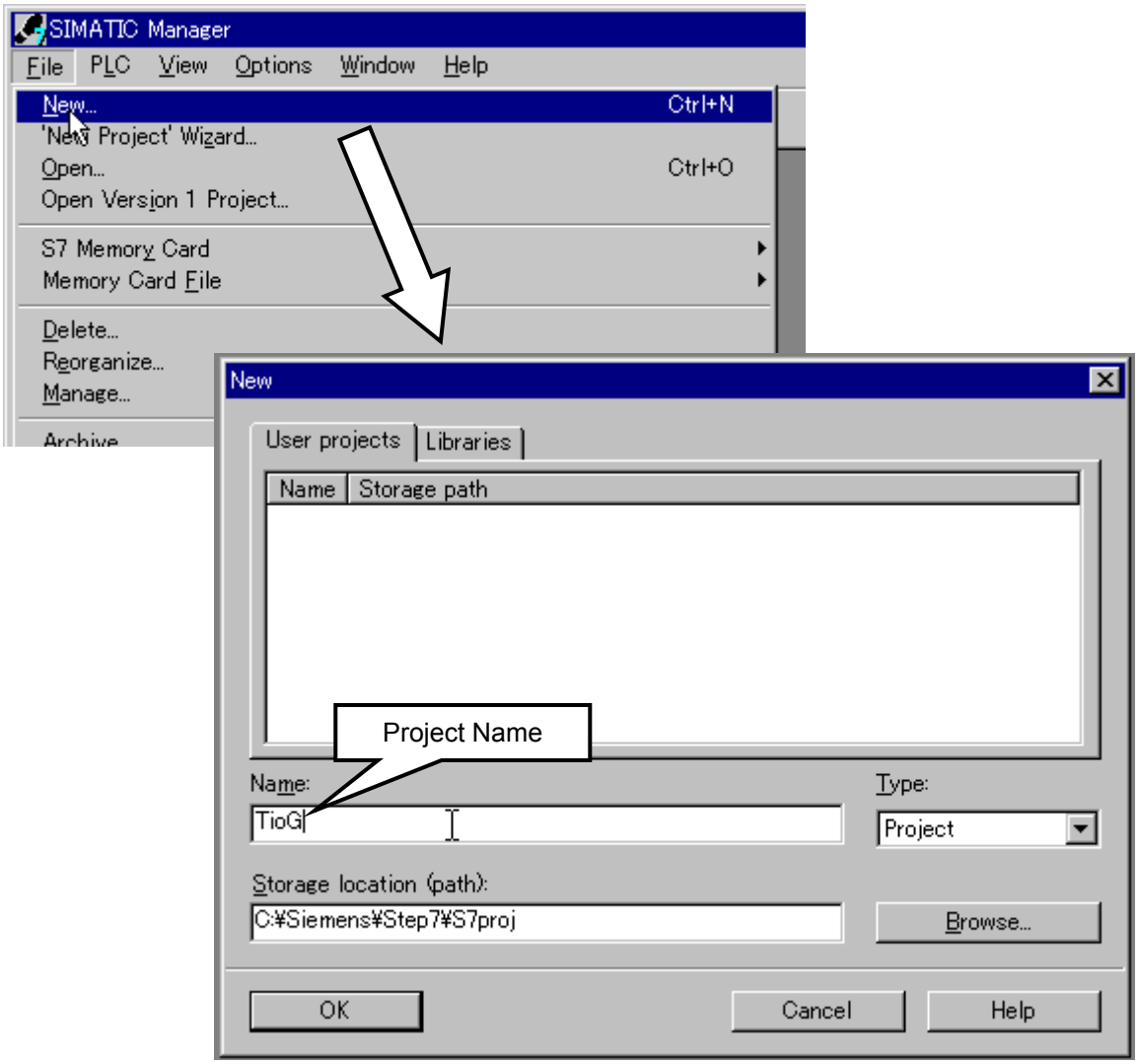
☞ Refer to **7.4.6 Program monitor (P. 71)**.

☞ For details, refer to Instruction Manual of the Programming Software STEP7.

7.4.2 Starting the SIMATIC Manager and creating a new project

1. Start SIMATIC Manager from an icon or start button.

2. Select the menu command **File > New…**, and creating a new project.
The project name is “TioG” (an example).

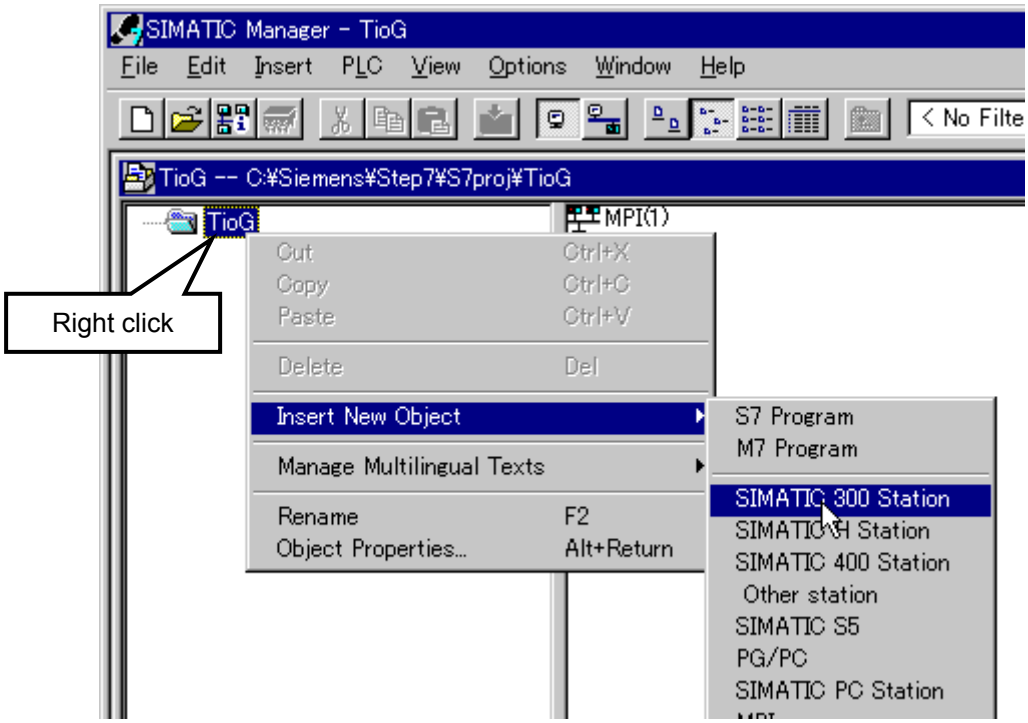


3. Clicking “OK” displays the project.

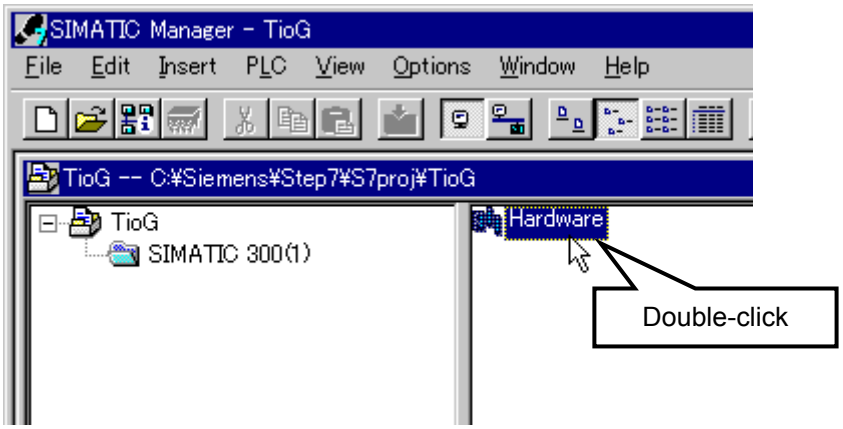
7.4.3 Reading a GSD file

1. The GSD file for SRX can be downloaded from the official RKC website: http://www.rkcinst.com/english/download/field_network.htm.

2. Right clicks a project “TioG” folder, and select the command **Insert new object > SIMATIC 300 Station**. This operation can create the “SIMATIC 300” folder under the “TioG” folder.



3. Clicking the “SIMATIC 300” folder displays “Hardware” on the right side of the window. Therefore, double click it.
Thus, hardware configuration tool “HW Config” starts.



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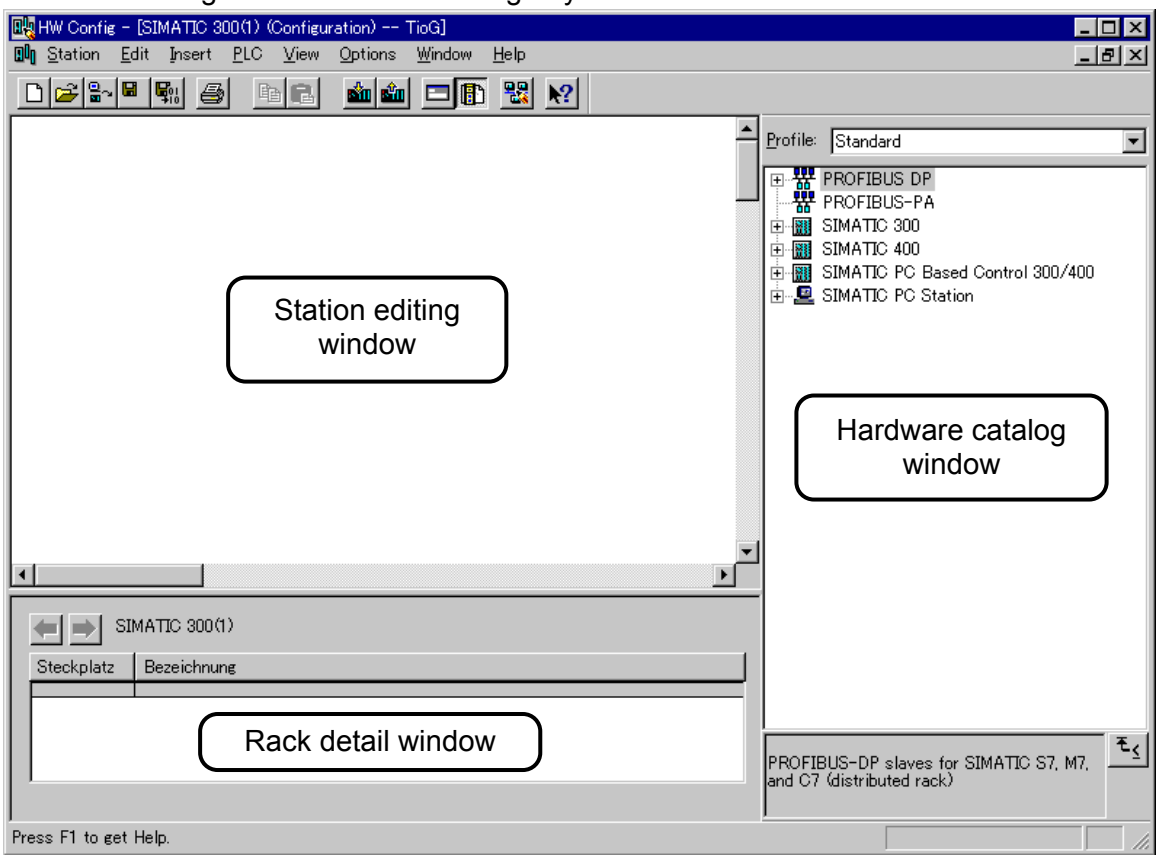
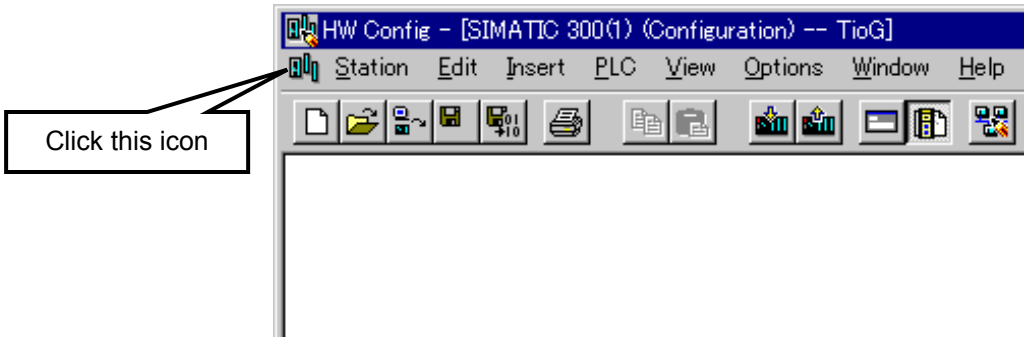
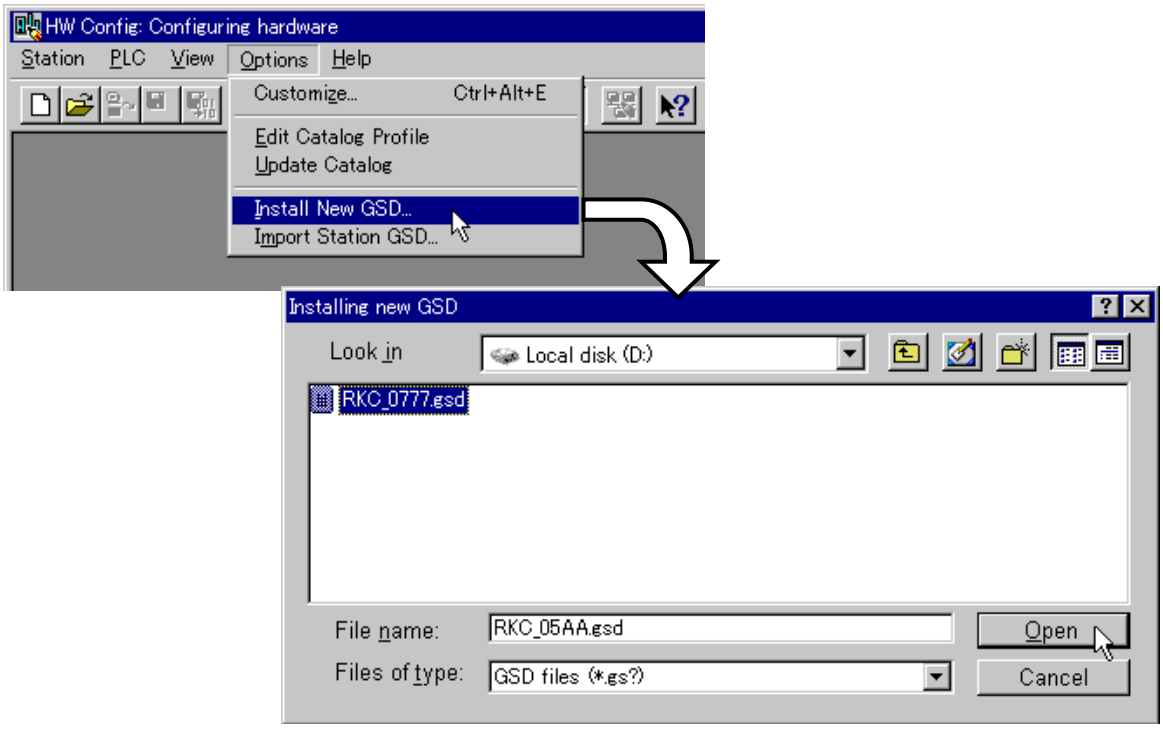
Hardware configuration tool “HW Config” layout



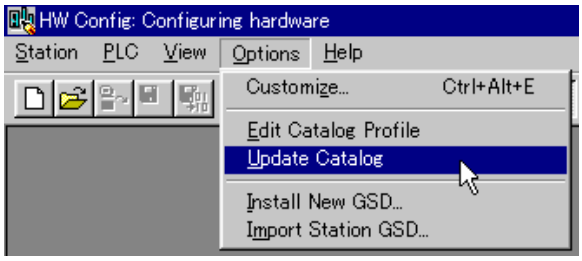
4. In order to read the GSD file, it is necessary to close the “HW Config” station editing and rack detail windows once.
Click the icon on the left side of the menu and then “Close (C).”



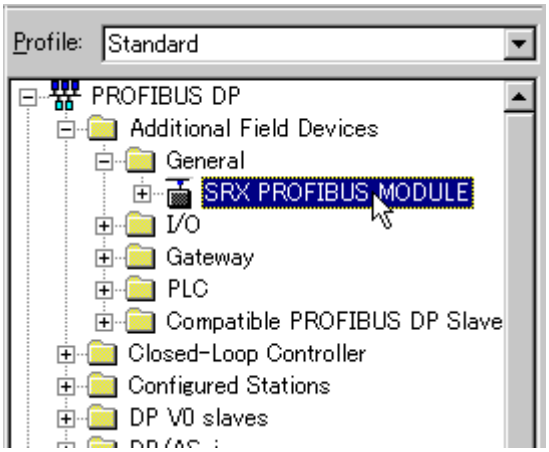
5. Next, select the menu command **Options > Install New GSD…**, and displayed the file selection window. If the folder stored with the GSD file is selected and then "RKC_0777.gsd" is specified, the GSD file is read.



6. The hardware catalogue is updated when select the menu command **Options > Update Catalog**.



7. Check that the X-TIO-G GSD file has been read.
If the selection of **PROFIBUS DP > Additional Field Devices > General** is made in succession on the hardware catalog, GSD hardware information "SRX PROFIBUS MODULE" of X-TIO-G can be checked.



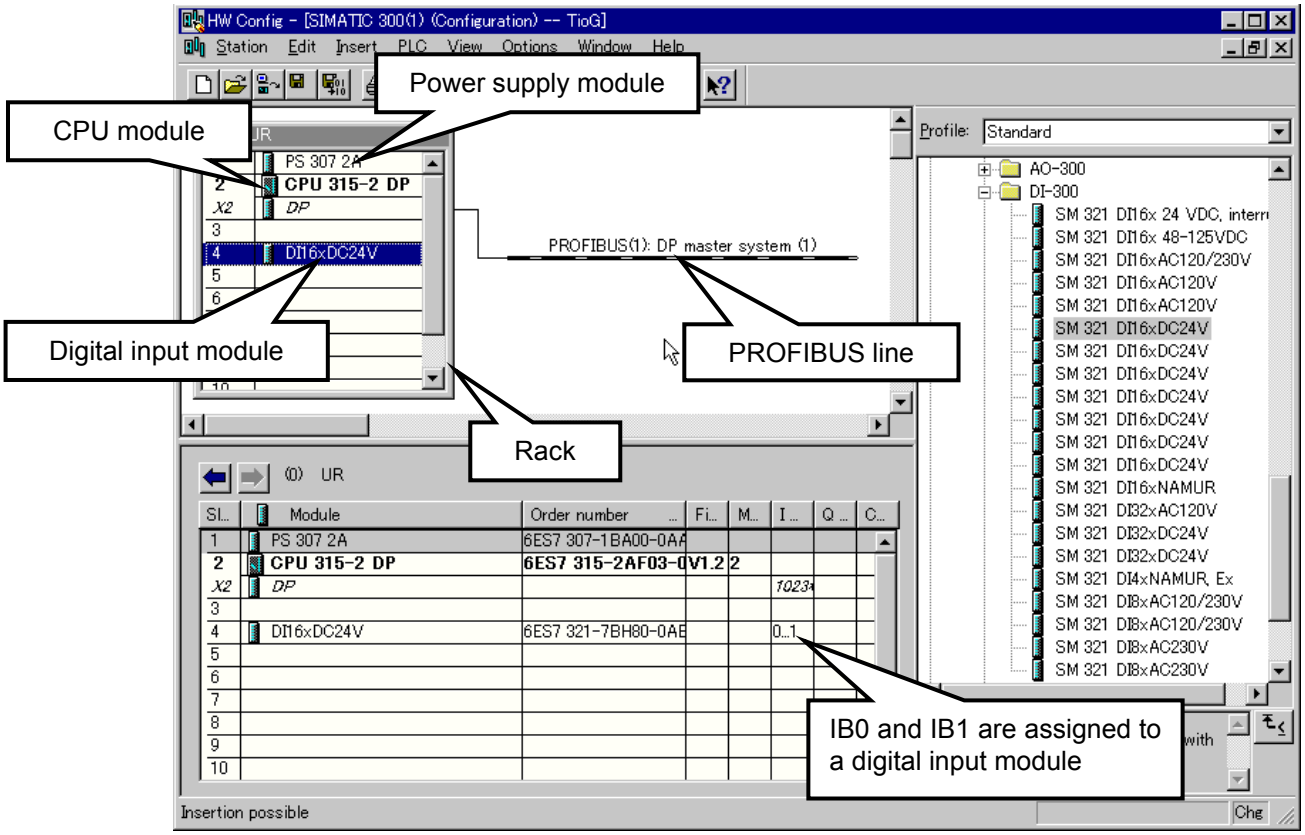
7.4.4 Hardware configuration

■ Hardware assignment

1. After checking that the GSD file was read, minimize "HW Config."
As the screen returns to the main window of the "TioG" project, double click "Hardware" on the right side of the window again to display a screen on which configuration is made in hardware configuration including the SRX. (Same as No.3 in **7.4.3 Reading a GSD file**)

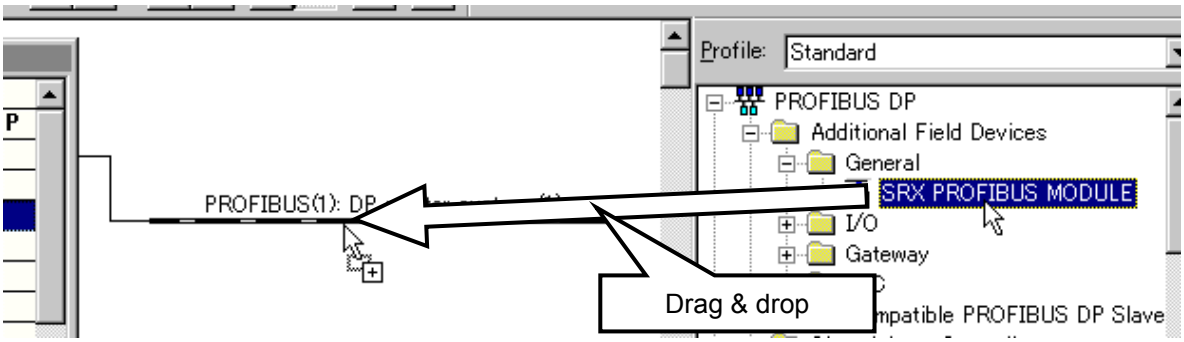
2. A rack is added on the station editing window and the Power supply, CPU and Digital input modules are added on it.
In addition, the CPU module has already been defined as the PROFIBUS master.
Here, the following Power supply, CPU and Digital input modules are specified as an example.
- Power supply module: PS 307A 2A (PS-300)
- CPU module: CPU 315-2 DP (S7-300A)
- Digital input module: SM321 DI16xDC24V (DI-300)

☞ For details of the procedure for adding the rack, and Power supply, CPU and Digital input modules and for defining the PROFIBUS master, refer to the instruction manual for Programming Software STEP7.

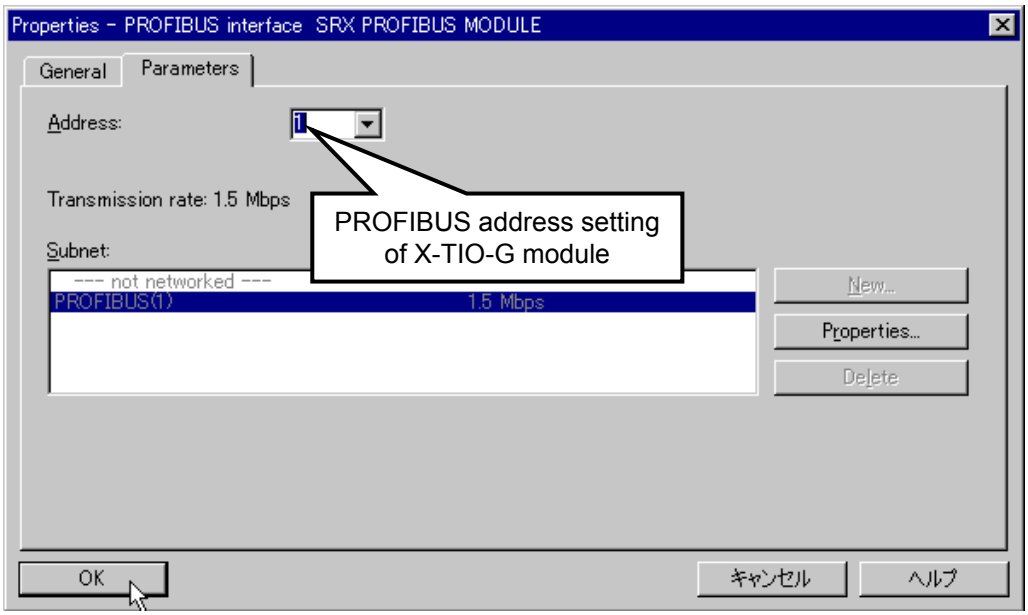


🕮 Just when digital input module is mounted on the rack, IB0 and IB1 are automatically assigned.

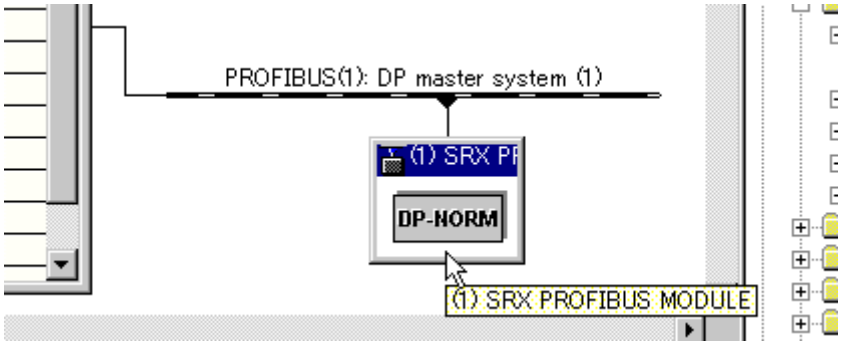
3. Select GSD hardware information "SRX PROFIBUS MODULE" of X-TIO-G read in the previous item from the hardware catalog and then drag and drop it on the PROFIBUS line.



4. As a dialog to set any X-TIO-G module address is displayed, enter the same value as that in the PROFIBUS address specified by the address setting switch of X-TIO-G module.
PROFIBUS address of X-TIO-G module: 1



5. SRX PROFIBUS MODULE is displayed on the PROFIBUS line.



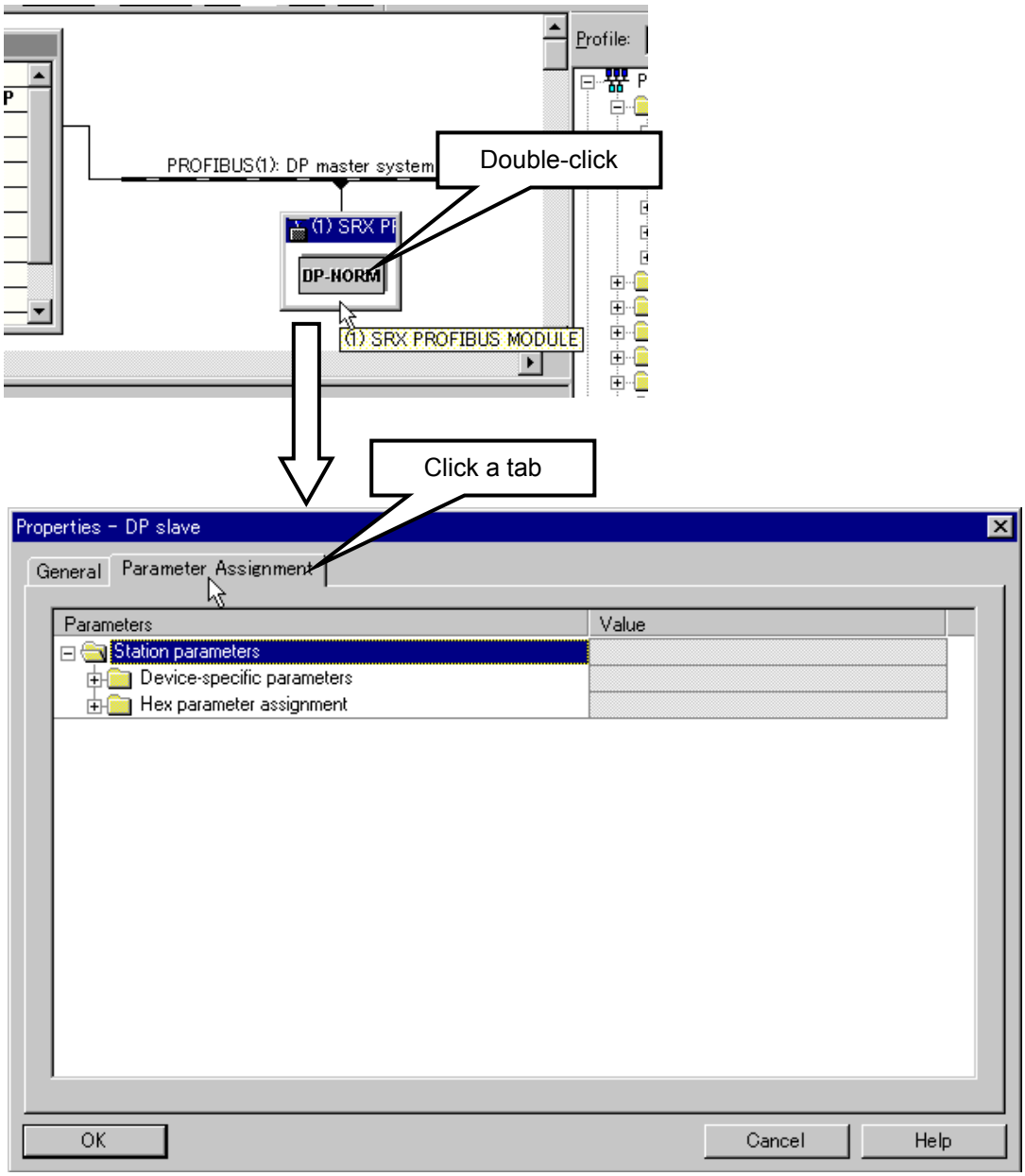
■ Assignment of SRX communication items

Next, SRX PROFIBUS MODULE is configured.
As an example here, conduct the setting so that the following static data can be read/written.

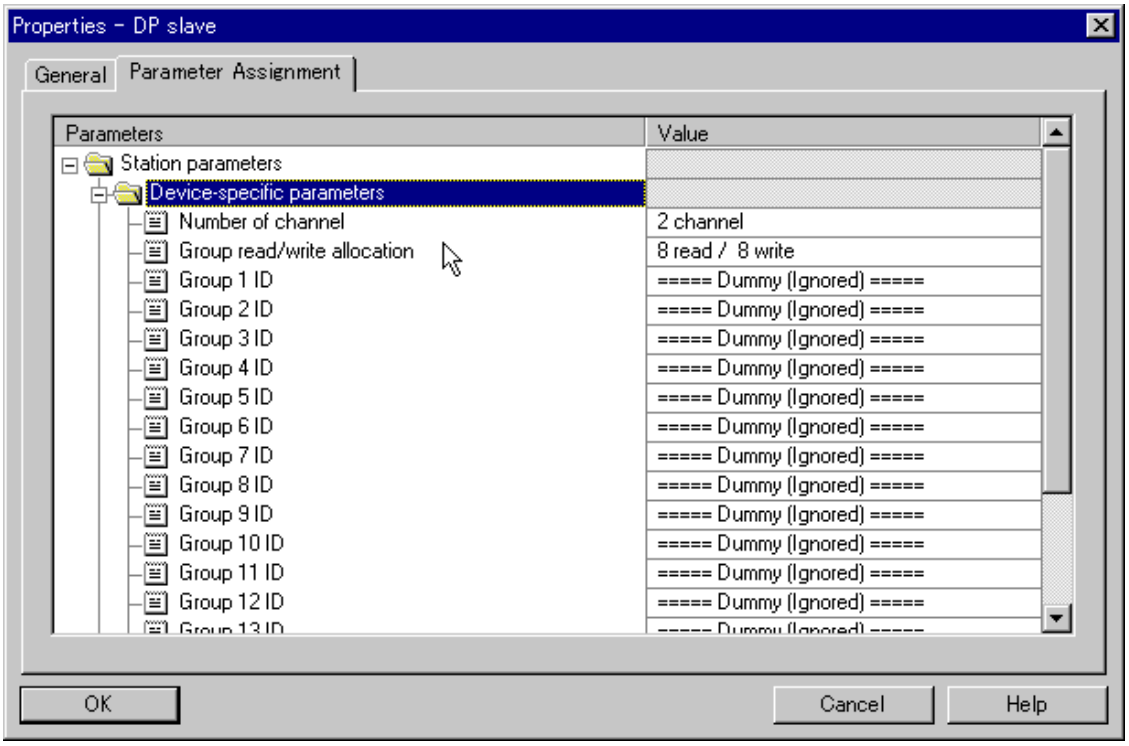
[Read items]
- Measured value (PV)
- Comprehensive event state
- Set value (SV)

[Write item]
- Set value (SV)

1. Double click the SRX PROFIBUS MODULE on the PROFIBUS line, and click the "Parameter Assignment" tab of a displayed "Properties - DP slave" window.



2. If the selection of **Station parameters > Device-specific parameters** is made in this order to unfold the folder, such items as "Number of Channel," "Group read/write allocation" and "Group 1 to 16 ID" appear.



- **Number of Channel**

Specify the number of temperature control channel connected to a X-TIO-G module.
As the X-TIO-G module has two temperature control channels, the minimum number of channels is 2, and as the SRX unit can connect up to 30 sets including one X-TIO-G module, the maximum number of channels is 60.

In this example, as one X-TIO-B module is connected to the X-TIO-G module, select "4 channel."

- **Group read/write allocation**

The read/write attribute of communication items specified by Group 1 to 16 ID is specified.
For example, if 10 read items/6 write items need to be set, select "10 read/6 write."
Group 1 to 16 ID communication items at that time become "Group 1 to 10 ID: Read items" and "Group 11 to 16 ID: Write items."

In this example, as 3 read items/1 write item need to be set, "8 read/8 write" in the initial state is used.

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- **Group 1 to 16 ID**

Select the communication item. "===== Dummy (Ignored) =====" is ignored.

As "8 read/8 write" is set by "Group read/write allocation," Group 1 to 8 become read items and Group 9 to 16, write items.

Set the following to 3 read items.

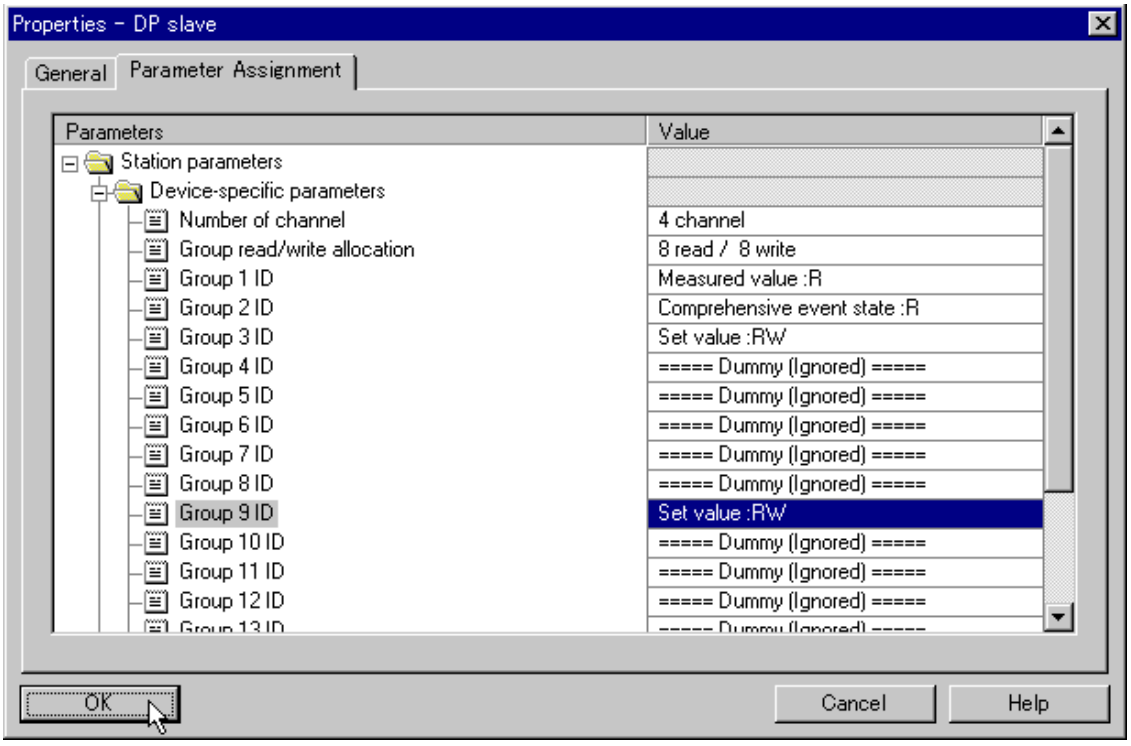
- Group 1 ID: Measured value: R
- Group 2 ID: Comprehensive event state: R
- Group 3 ID: Set value: RW

Set the following to 1 write item.

- Group 9 ID: Set value: RW

Set "===== Dummy (Ignored) =====" to other items.

Set "===== Dummy (Ignored) =====" to empty read and write items.



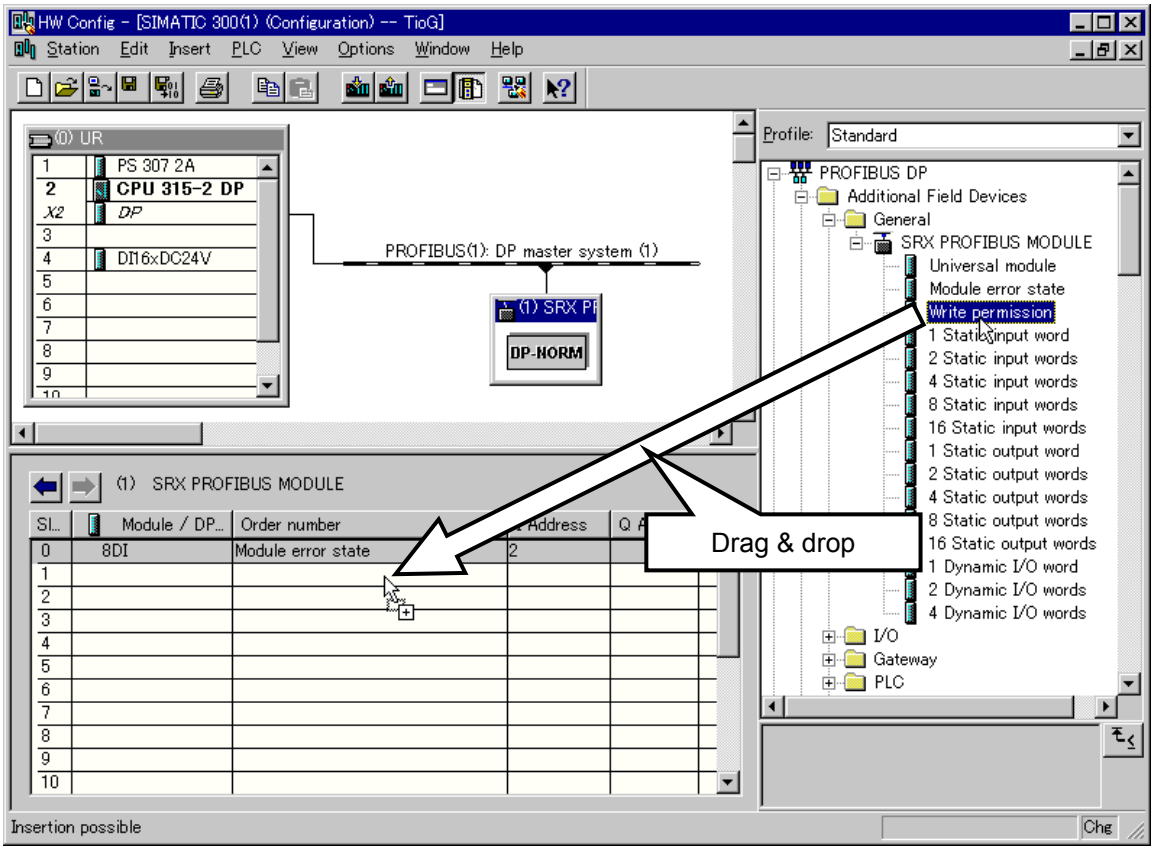
■ PLC register assignment

Assign the read/write items to the PLC register.

1. Open the folder of "SRX PROFIBUS MODULE" of a hardware catalogue.

- Drag "Module error state" in the second line from the top to drop it to the first line in the table on the rack detail window.
- Drag "Write permission" (write permission flag register) in the third line from the top to drop it to the second line in the table on the rack detail window.

Always set "Module error state" and "Write permission" regardless of the contents of communication items. In addition, always set "Module error state" to the first line and "Write permission" to the second line.



2. Assign the registers of static data.
In this example, the read item has 3 items, and the write item has 1 item. In addition, the number of temperature control channel is 4 channels. As the data length of one item corresponds to 1 word in the SRX temperature control channel, the following number of words is required for data read/write.

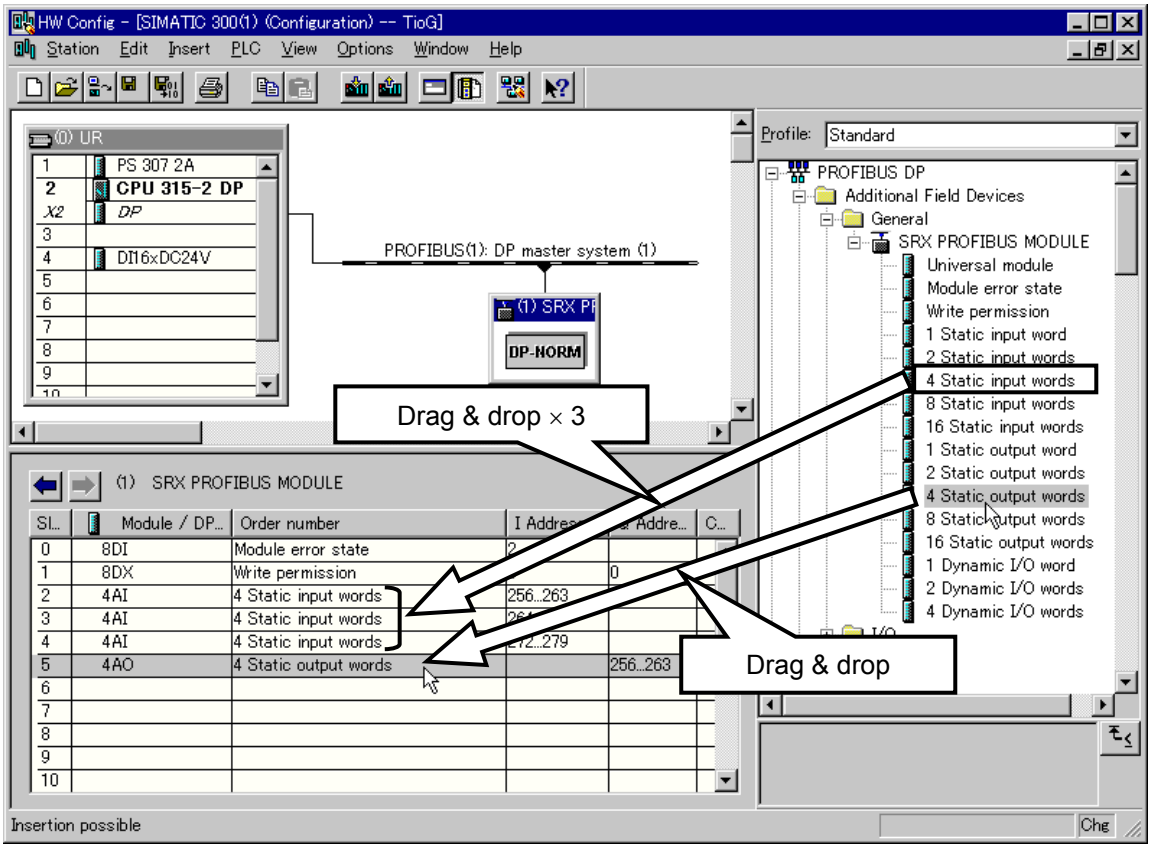
Number of read word: 4 channels × 3 items = 12 words
Number of write word: 4 channels × 1 item = 4 words

Select the number of above word from "SRX PROFIBUS MODULE" of a hardware catalog.

- Drag "4 Static input words" as a read item to drop these 3 items under "Write permission" on the rack detail window.
- Drag "4 Static output words" as a write item to drop that 1 item under "4 Static input words" on the rack detail window.

Always locate "Static input" above "Static output" on the rack detail window.

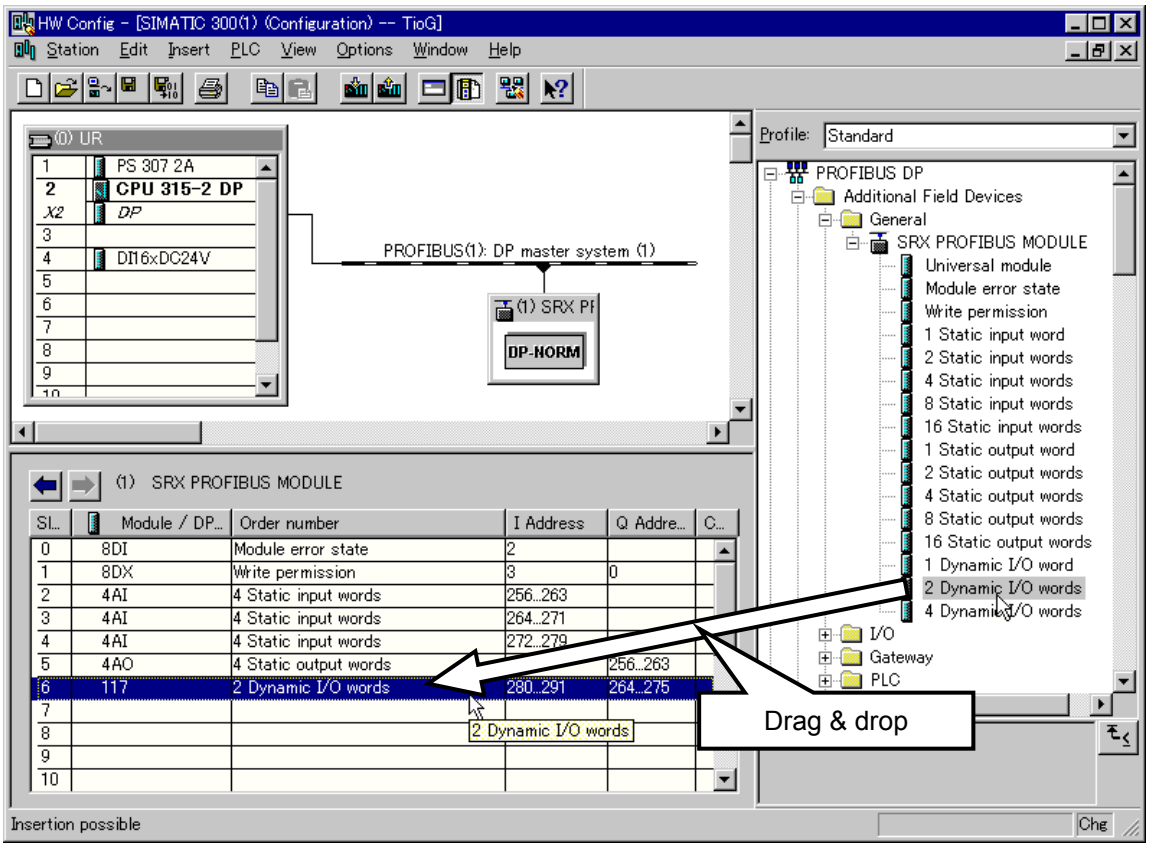
Here, "4 Static input words" × 3 is selected, but "8 Static input words" × 1 and "4 Static input words" × 1 may be selected. Any selection is acceptable if the total number of words is the same as "Number of channels × Number of items."



3. Assign the register of dynamic data.
Data on the X-DI-B module can be read and written by dynamic data request. In addition, a dynamic data request can be made to even data on the temperature control module.
Therefore, in this example one dynamic data area for DI and one spare area: two areas in total are reserved.

- Drag “2 Dynamic I/O words” from among “SRX PROFIBUS MODULE” in the hardware catalog to drop it under “4 Static output words” on the rack detail window.

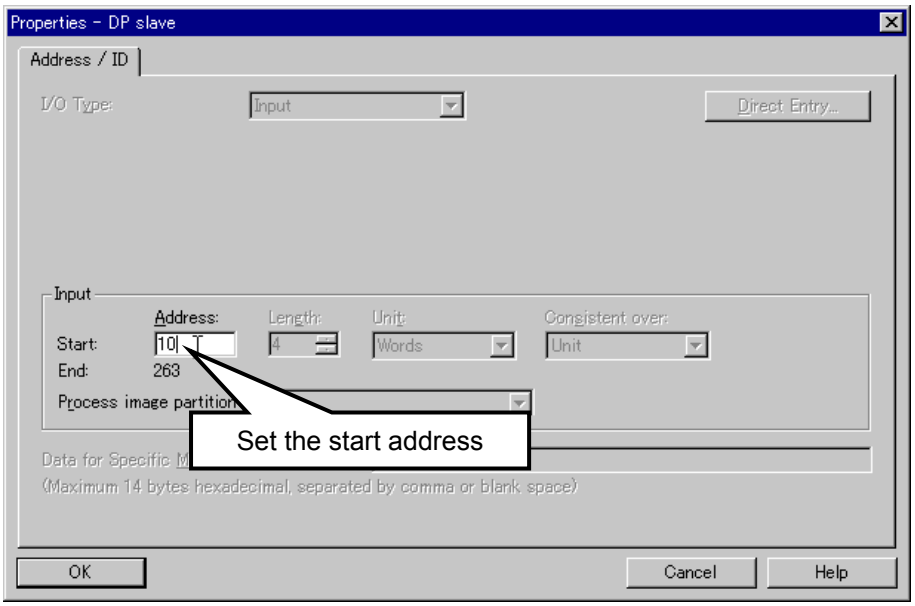
Locate “Dynamic I/O” lower than any other data on the rack detail window.



Order of locating data
Always locate data in the following order on the rack detail window.
”Module error state” → “Write permission” → “Static input” → “Static output” → “Dynamic I/O”

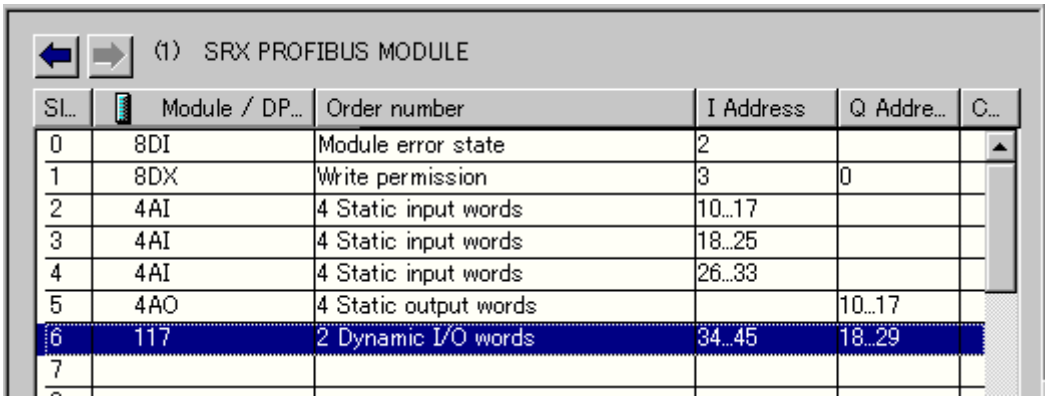
- “Module error state” and “Write permission” are required items.
  (Two or more items cannot be located.)
- “Static input,” “Static output” and “Dynamic I/O” are optional.
  (Two or more items can be located.)

4. Assign the address of the PLC register.
Double-clicking each item on the rack detail window opens the “Properties - DP slave” window.
Set the PLC register address of each item with this window.



Assign each register address in this example as follows.

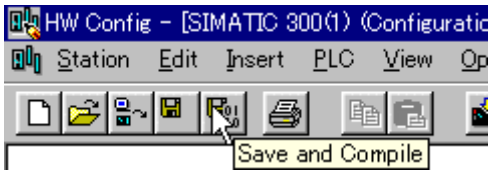
- Module error state: IB2
- Write permission: IB3, QB0
- Measured value (PV) [read]: IW10, IW12, IW14, IW16
- Comprehensive event state [read]: IW18, IW20, IW22, IW24
- Set value (SV) [read]: IW26, IW28, IW30, IW32
- Set value (SV) [write]: QW10, QW12, QW14, QW16
- Dynamic data request for X-DI-B: IB34 to IB39 (Response from SRX)
  QB18 to QB23 (Request for SRX)
- Dynamic data request for the extra: IB40 to IB45 (Response from SRX)
  QB24 to QB29 (Request for SRX)



Sl...	Module / DP...	Order number	I Address	Q Addre...	C...
0	8DI	Module error state	2		
1	8DX	Write permission	3	0	
2	4AI	4 Static input words	10...17		
3	4AI	4 Static input words	18...25		
4	4AI	4 Static input words	26...33		
5	4AO	4 Static output words		10...17	
6	117	2 Dynamic I/O words	34...45	18...29	
7					

IB0 and IB1 are assigned to a digital input module of PLC.
(Refer to the rack detail window of a figure of No. 2 on page 48.)

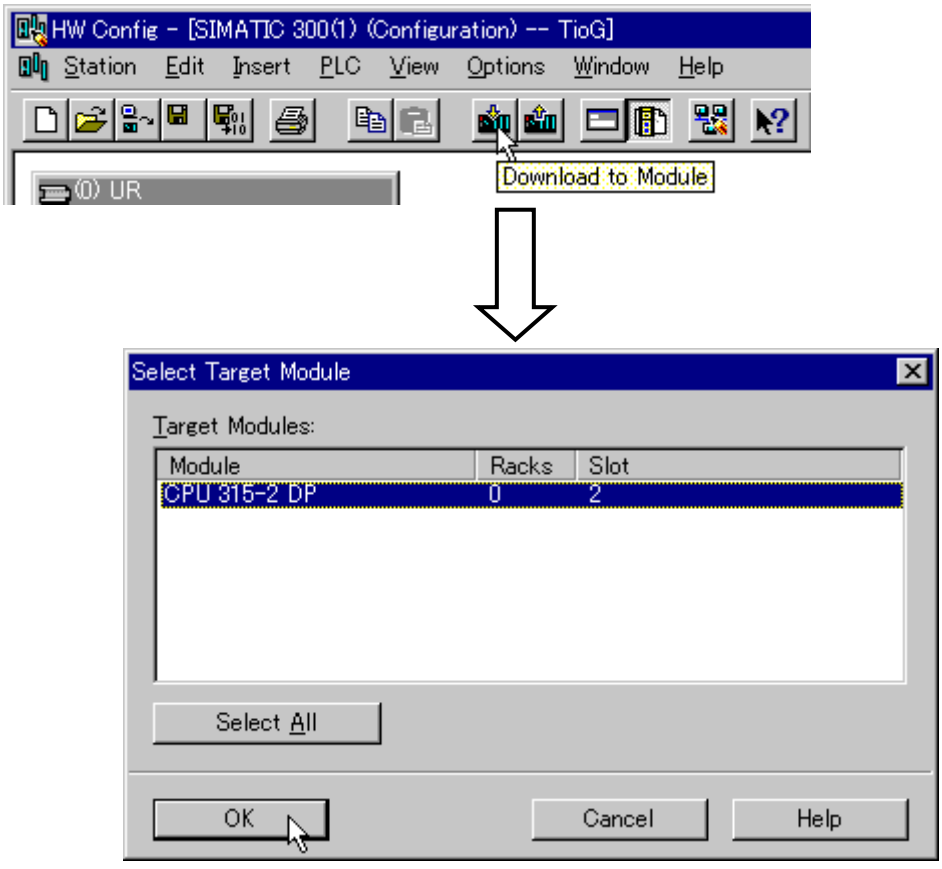
5. Click the “Save and Compile” button on the toolbar to store and compile the configuration.



6. Click the “Download to Module” button of toolbar, and download the data which did hardware configuration to the CPU module.
If communication between personal computer and PLC is normal, “Select Target Module” window opens.

If multi master system is used, first select the CPU module which downloads the hardware configured data, and then click the “OK” button at the lower left.
In this example, as a single master system is used, just click the “OK” button at the lower left.

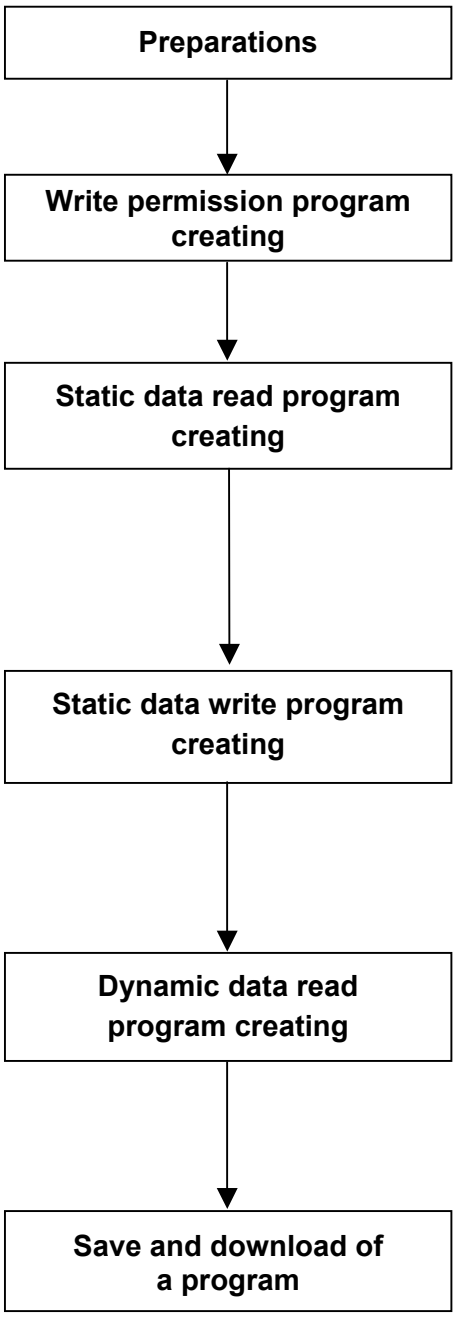
If normally downloaded, the window to inform the operator of the progress opens, and then returns to the window for hardware configuration.



7.4.5 Programming

■ Programming procedures

Creating a program example in the following procedures.



Before creating the program, perform the necessary operation.

☞ Refer to **Preparations (P. 60)**.

Create the write permission program using the write permission flag register.

☞ Refer to **Write permission program (P. 62)**.

Create a program to read static data

[Read items]

- Measured value (PV)
- Comprehensive event state
- Set value (SV)

☞ Refer to **Example of static data read (P. 64)**.

Create a program to write static data

[Write items]

- Set value (SV)

☞ Refer to **Example of static data write (P. 66)**.

Create a program to read dynamic data

[Read items]

- Input state of digital input (terminal)

☞ Refer to **Example of dynamic data read (P. 67)**.

Save the program, and download it to PLC.

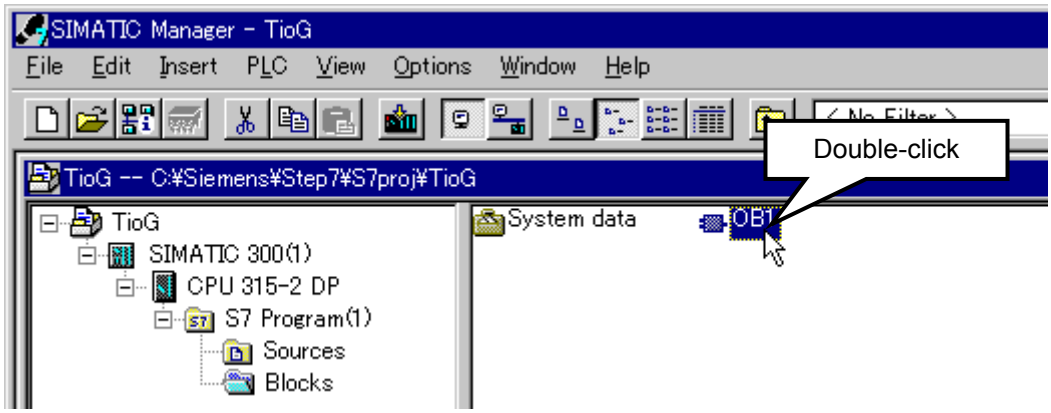
☞ Refer to **Example of dynamic data read (P. 67)**.

📖 This section is explained on the assumption that use language of STEP7 is “English” mode.

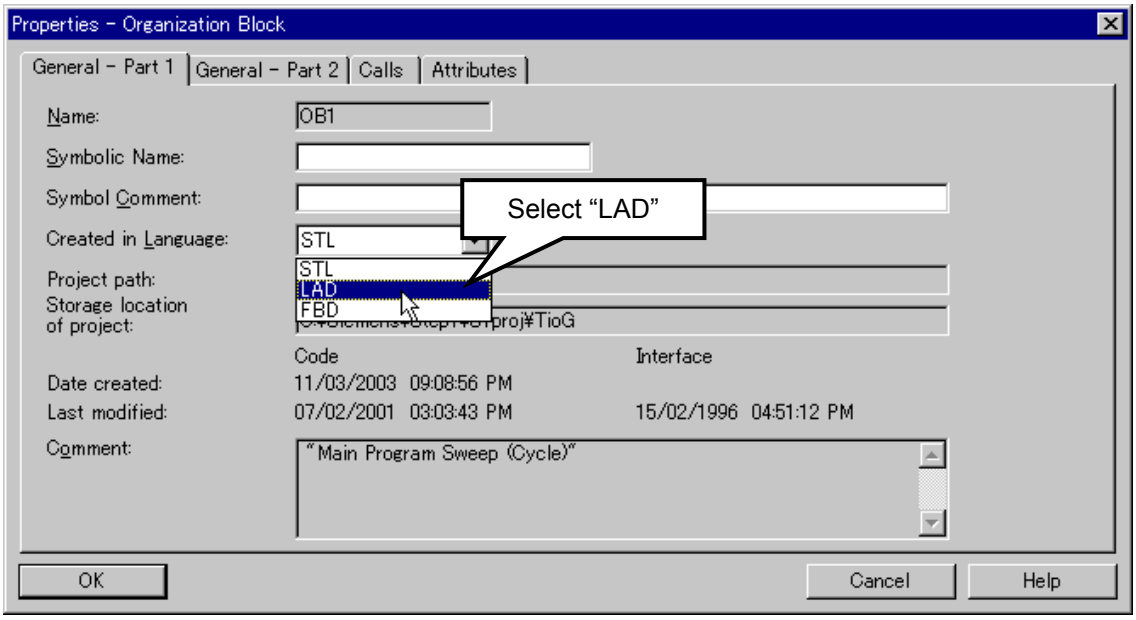
☞ For change method of use language, refer to Instruction Manual of the Programming Software STEP7.

■ Preparations

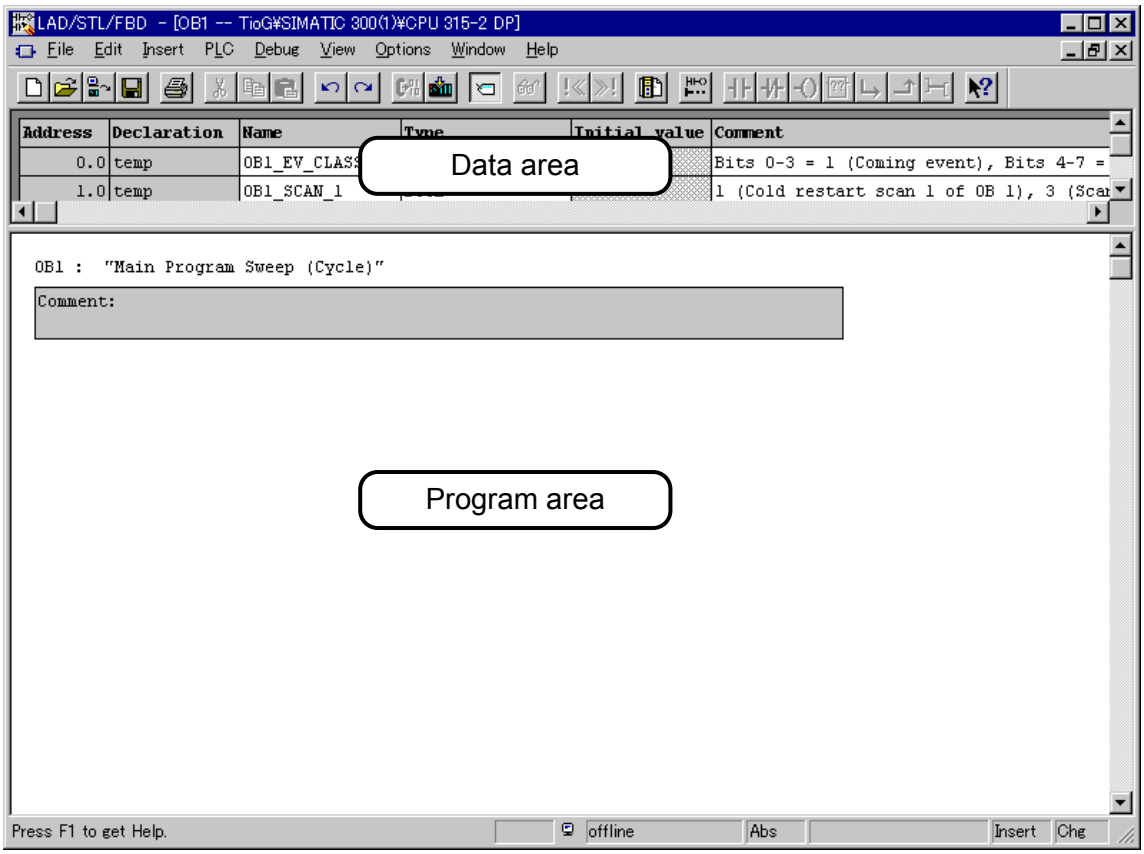
1. Open the project “TioG” folder in the order of **CPU 315-2 DP > S7 Program > Blocks**, and then double click “OB1” displayed on the right side of the window.



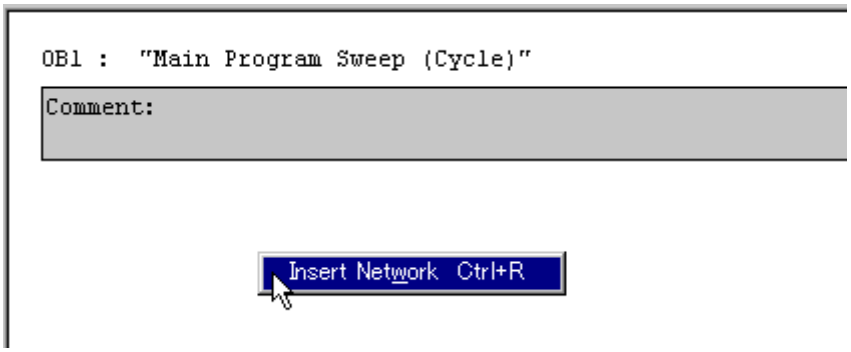
2. A window of “Properties - Organization block” is displayed.
Hereafter, as a sequence program is created by the ladder, change the “Created in Language:” column to “LAD.”



3. A window of “LAD/STL/FBD - [OB1 - TioG¥SIMATIC 300(1)¥CPU 315-2 DP]” is displayed. Creating a ladder program with this window.



4. Click the right on a program area, and select “Insert Network.”



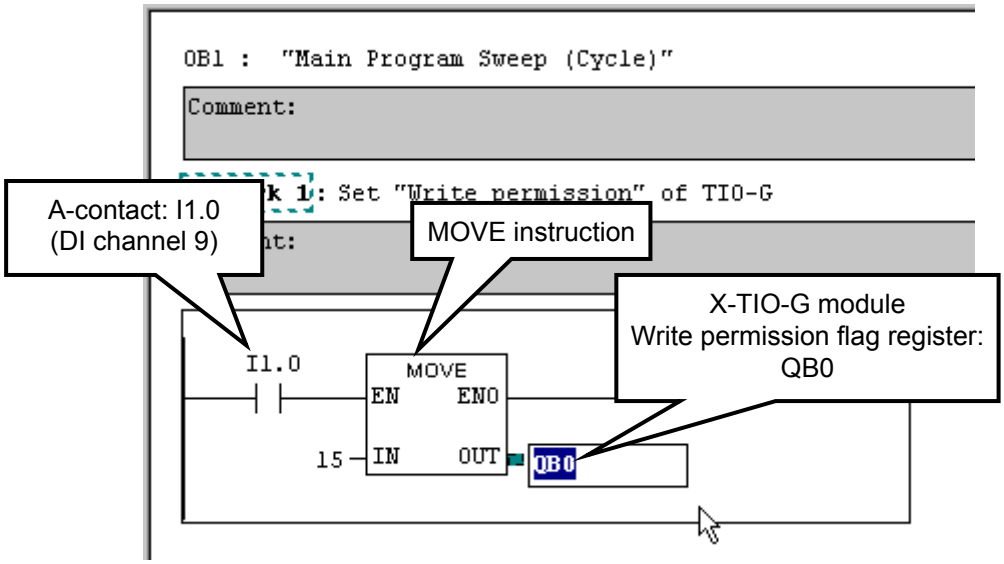
■ Write permission program

The following program is required for requesting both static and dynamic data read/write.

☞ For details of programming, refer to Instruction Manual of the Programming Software STEP7.

1. First, after the PLC digital input module contact is closed, write the "0FH" hexadecimal number ("15" in decimal) to the write permission flag register (Write Permission), and then create a program which validates write permission.
Click the A-contact (Normally Open Contact) button on the tool bar at the upper right of the screen to add the A-contact to the ladder

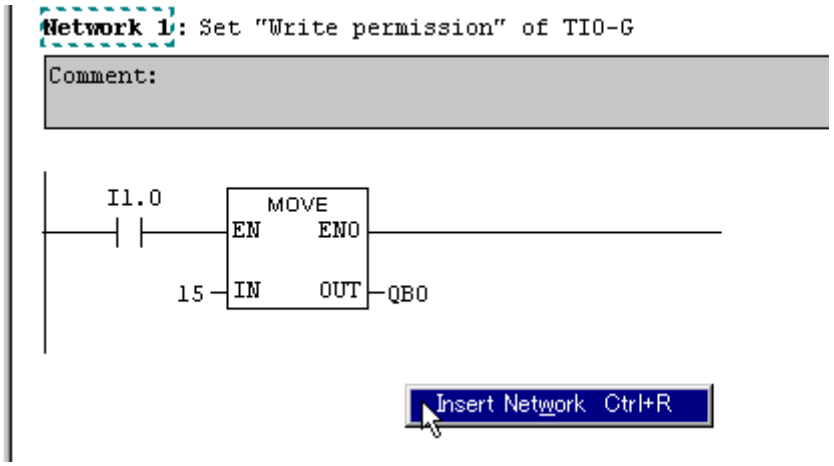
2. Similarly, select Empty Box on the tool bar to add the MOVE instruction to the ladder.
Assign I1.0 (DI channel 9) to A-contact. In addition, specify "15" to IN side and the QB0 Write Permission address of SRX PROFIBUS MODULE to the OUT side of the MOVE instruction, respectively.



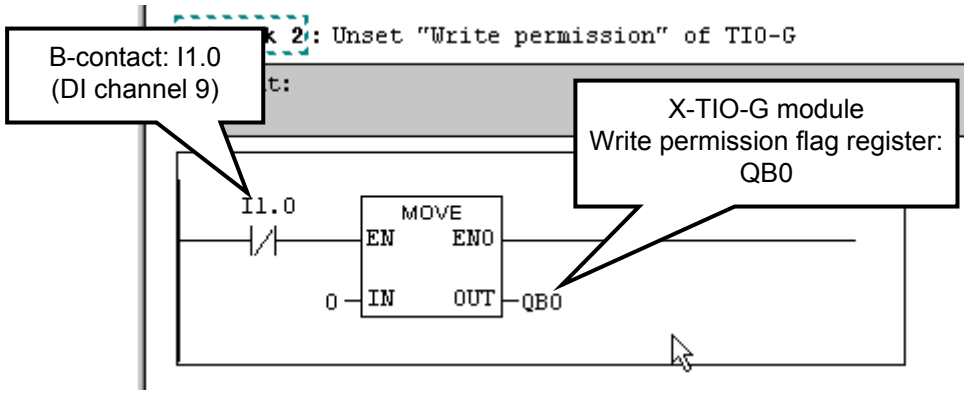
IB0 and IB1 are assigned to a digital input module of PLC.
Bit 0 to Bit 7 (I0.0 to I0.7) of IB0 corresponds to DI channel 1 to 8, and Bit 0 to Bit 7 (I1.0 to I1.7) of IB1 corresponds to DI channel 9 to 16.

☞ An assignment state of each register by this example, refer to **PLC register assignment No. 4 (P. 57)**.

3. Next, after the PLC digital input module contact opens, write the "00H" hexadecimal number ("0" in decimal) to the write permission flag register (Write Permission), and then create a program which invalidates write permission.
Click the right on a program area, and select "Insert Network."



4. Insert the B-contact and a MOVE instruction in ladder.
Assign I1.0 (DI channel 9) to B-contact. In addition, specify "0" to IN side and the QB0 Write Permission address of SRX PROFIBUS MODULE to the OUT side of the MOVE instruction, respectively.

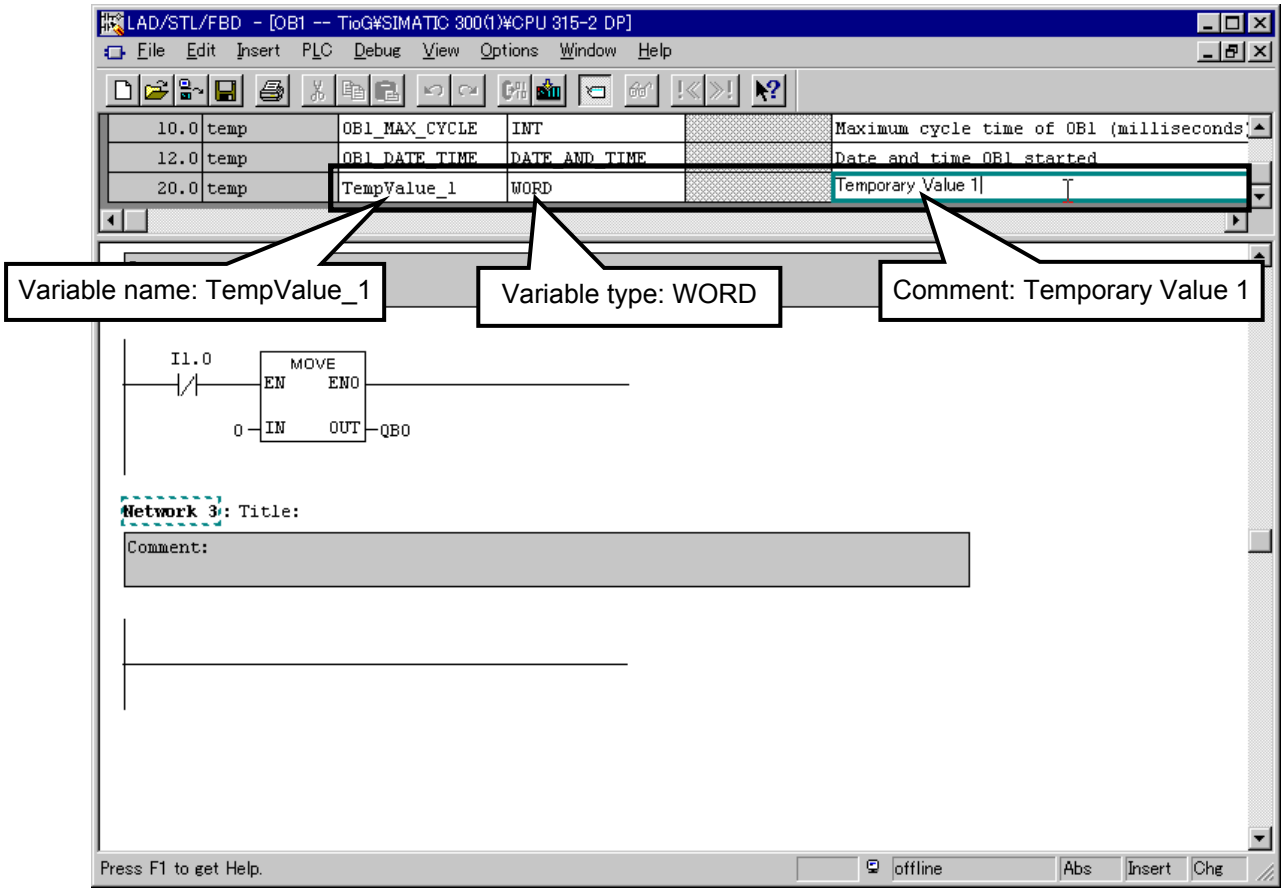


■ Example of static data read

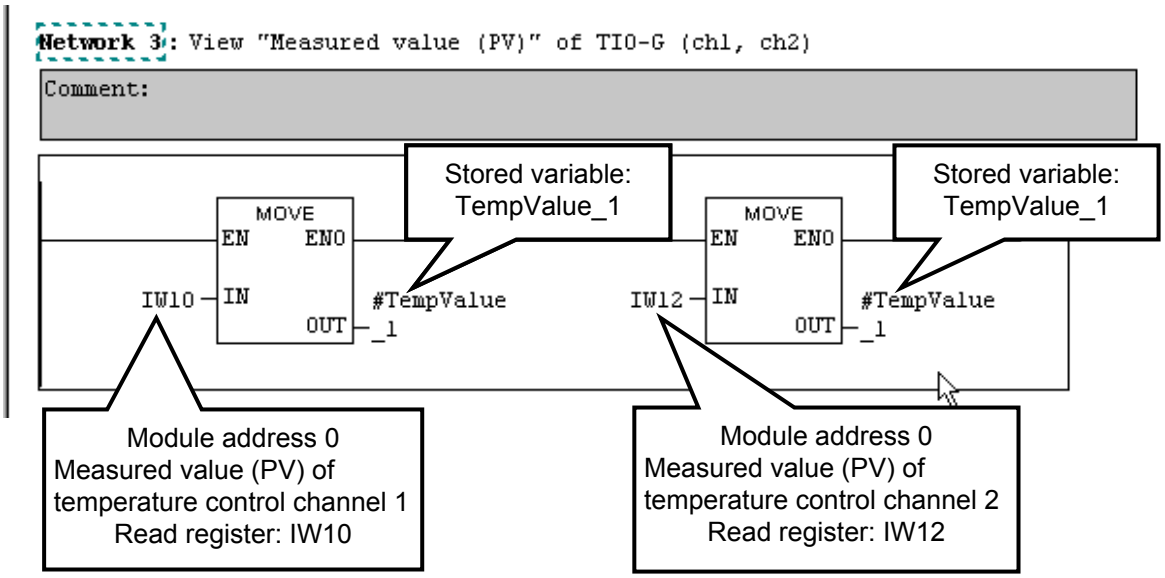
The following is a program example in which a Measured value (PV) of each temperature control channel of SRX is read and then stored into the variable.

☞ For details of programming, refer to Instruction Manual of the Programming Software STEP7.

1. Click the right on a program area, and select “Insert Network,” and create a new ladder program (Network 3).
Before describing the sequence program, define the variable to write the Measured value (PV).
Describe a comment (Example: Temporary Value 1) if necessary with the variable name and type assumed to be “TempValue_1” and “WORD,” respectively.



2. Read the Measured value (PV) of module address 0.
Store the Measured value (PV) of temperature control channel into the "TempValue_1" variable by using the MOVE instruction.
It is so defined when hardware configured that data read registers will be used from "IW10." Thus, Measured values (PV) are stored in the following registers.
Measured value (PV) of temperature control channel 1 of module address 0: IW10
Measured value (PV) of temperature control channel 2 of module address 0: IW12
Therefore, set these PLC register addresses to the IN side and the "TempValue_1" variable to the OUT side of the MOVE instruction, respectively.

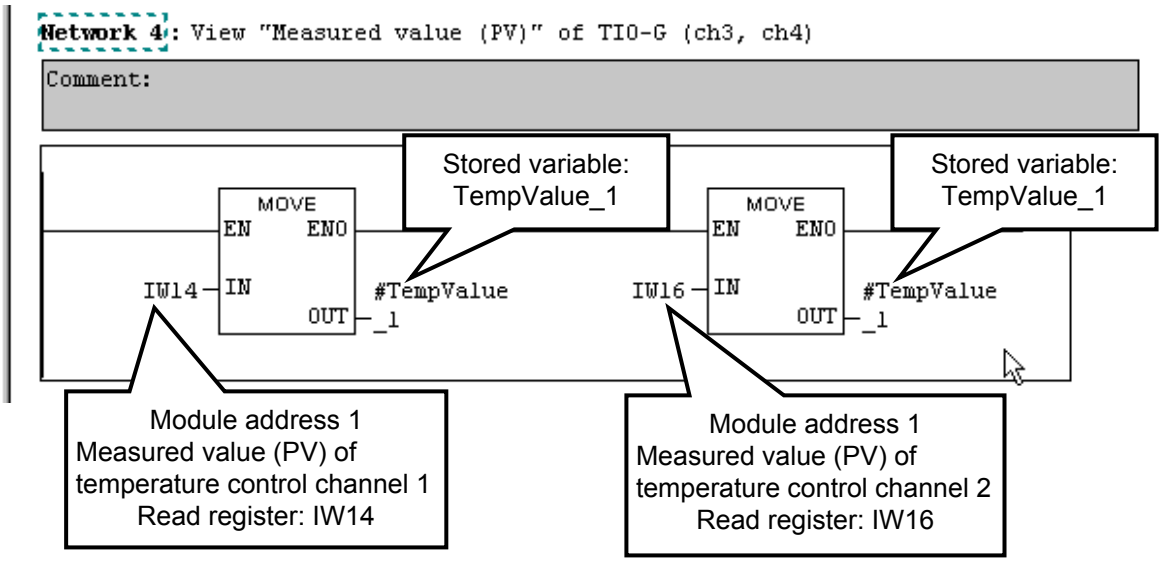


☞ An assignment state of each register by this example, refer to **PLC register assignment No. 4 (P. 57)**.

3. Read the Measured value (PV) of module address 1.

Measured value (PV) of temperature control channel 1 of module address 1: IW14

Measured value (PV) of temperature control channel 2 of module address 1: IW16



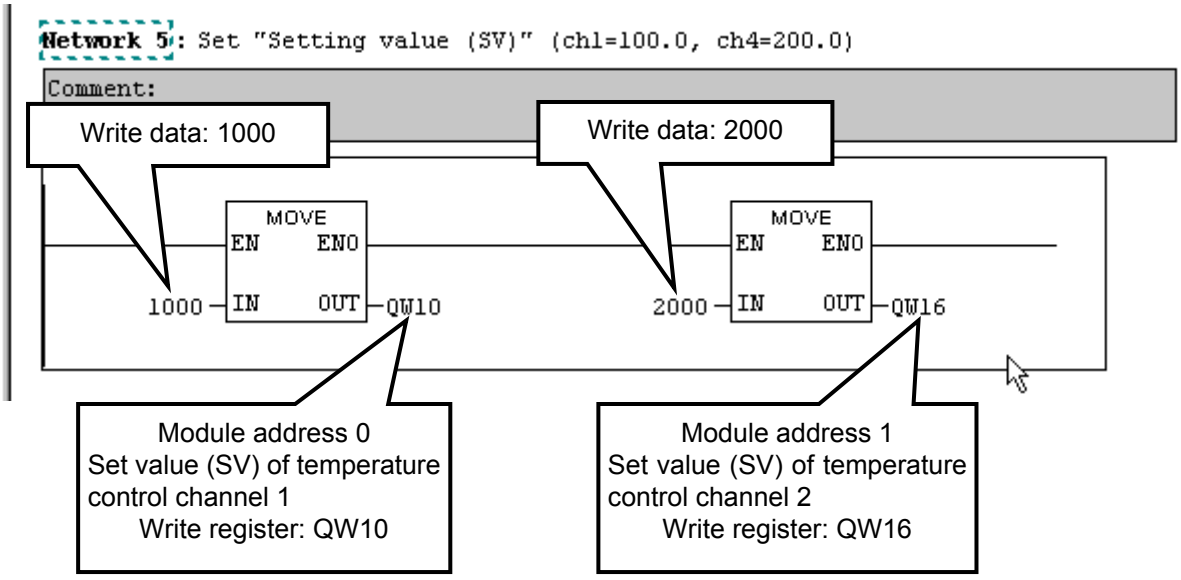
■ Example of static data write

Create a program used to write each Set value (SV) to the respective temperature control channel of the SRX.
Here, write Set value (SV): 100.0 to temperature control channel 1 with module address 0, and Set value (SV): 200.0 to temperature control channel 2 with module address 1.

☞ For details of programming, refer to Instruction Manual of the Programming Software STEP7.

1. Click the right on a program area, and select "Insert Network," and create a new ladder program (Network 5).

2. Write Set value (SV): 100.0 to temperature control channel 1 with module address 0, and Set value (SV): 200.0 to temperature control channel 2 with module address 1 using the MOVE instruction.
It is so defined when hardware configured that data write registers will be used from "QW10." As a result, Set values (SV) are written to the following registers.
Set value (SV) of temperature control channel 1 of module address 0: QW10
Set value (SV) of temperature control channel 2 of module address 1: QW16
Set the "QW10" and "QW16" variables to the OUT side of the MOVE instruction. In addition, as the decimal point of each of "100.0" and "200.0" to be written is omitted, set "1000" and "2000" to the IN side.



☞ An assignment state of each register by this example, refer to **PLC register assignment No. 4 (P. 57)**.

■ Example of dynamic data read

Create a program which requests data to the digital input module X-DI-B of the SRX.
In this case, data access to the X-DI-B module is made by dynamic data request.
A register of dynamic data request is assigned as follows by hardware configuration.

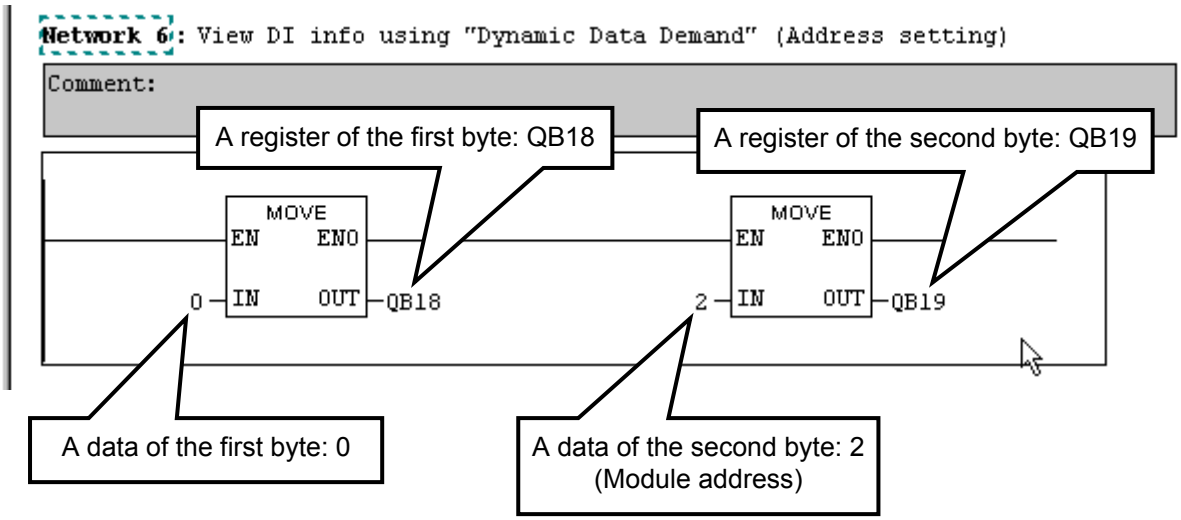
- Dynamic data request for X-DI-B: IB34 to IB39 (Response from SRX)
  QB18 to QB23 (Request for SRX)
- Dynamic data request for the extra: IB40 to IB45 (Response from SRX)
  QB24 to QB29 (Request for SRX)

☞ An assignment state of each register by this example, refer to **PLC register assignment No. 4 (P. 57)**.

☞ For dynamic data request, refer to **5.3 Data Send/Receive by Dynamic Data Request (P. 15)**.

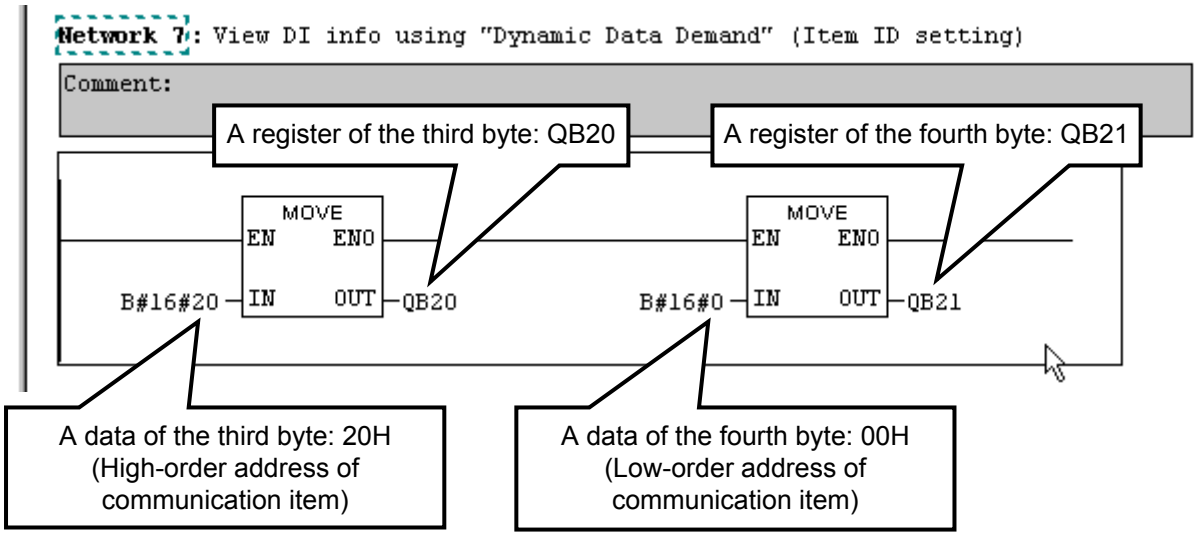
1. Click the right on a program area, and select "Insert Network," and create a new ladder program (Network 6).

2. Use data of 6 bytes in dynamic data request.
As the most significant bit and the succeeding bit in the first byte need to be set to "0," set the first byte to "0." As the module address is entered in the second byte set the X-DI-B module address to "2."
In this example, QB18 is set to the first byte and QB19, to the second byte.
Therefore, it is set so that "0" is stored in QB18 and "2," in QB19 by the MOVE instruction.



3. Click the right on a program area once again, and select “Insert Network,” and create a new ladder program (Network 7).

4. Set the data communication item address which needs to be read from the X-DI-B module to the third and fourth bytes.
Here, as ”Input state of digital input (terminal)” of the X-DI-B module is to be read, this communication address, “2000H” (hexadecimal) is specified to the third byte (QB20) and the fourth byte (QB21) by dividing it into the high order and the low order.
Therefore, it is set so that “20” is stored in QB20 and “00,” in QB21 by the MOVE instruction.



When data read is conducted by dynamic data request, nothing needs to be specified to the fifth byte (QB22) and the sixth byte (QB23).

5. Click the right on a program area once again, and select “Insert Network,” and create a new ladder program (Network 8).

6. Use 6 bytes of IB34 to IB39 in a response from SRX.

The one byte (IB34):

Echo back of QB18

The two byte (IB35):

When there is the module address specified to QB19: Echo back of QB19

When there is no module address specified to QB19: FFH (hexadecimal)

The third byte (IB36) and the fourth byte (IB37):

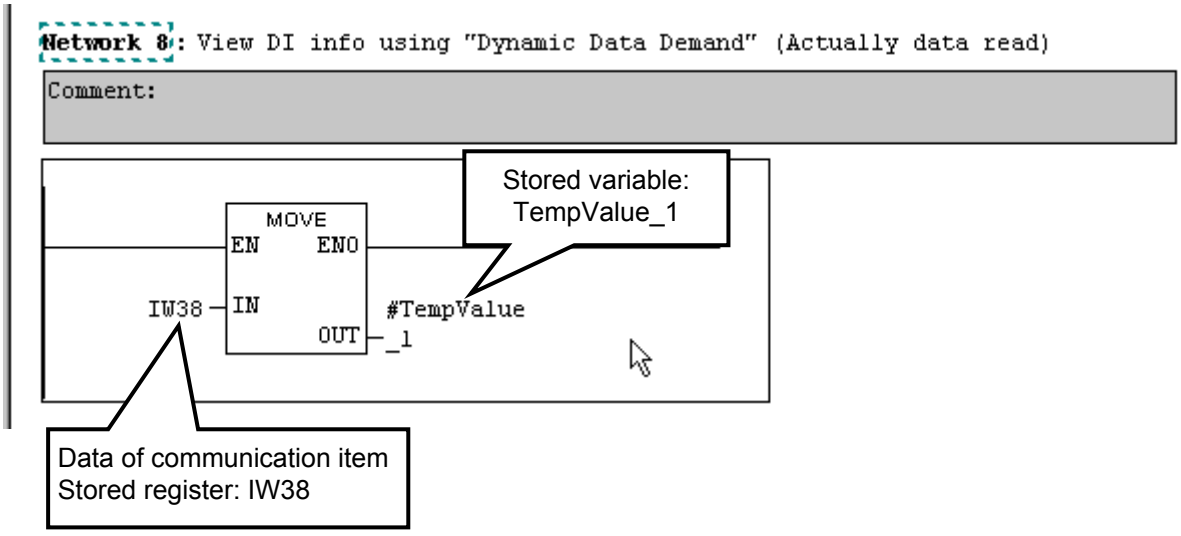
When the communication item address specified to QB20 and QB21 is within the data range:
Echo back of QB20 and QB21

When the communication item address specified to QB20 and QB21 is out of the data range:
FFFFH (hexadecimal)

The fifth byte (IB38) and the sixth byte (IB39):

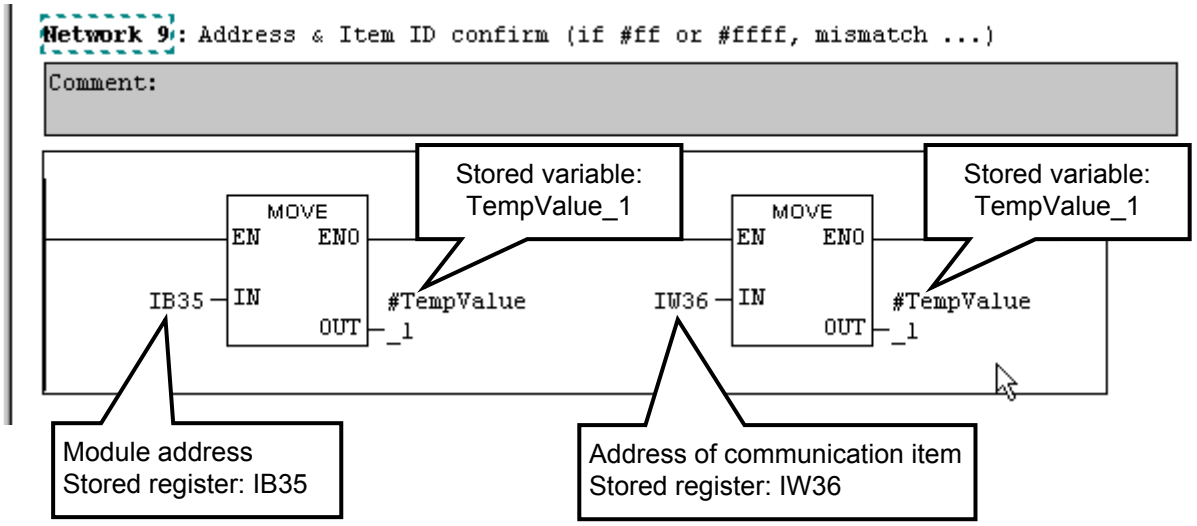
Communication item data specified to QB20 and QB21
(IB38: High-order IB39: Low-order)

As data required here is that in the fifth byte (IB38) and the sixth byte (IB39), communication item data is stored in the "TempValue_1" variable by the MOVE instruction.
If IW38 specified to the IN side, only one MOVE instruction is sufficient.

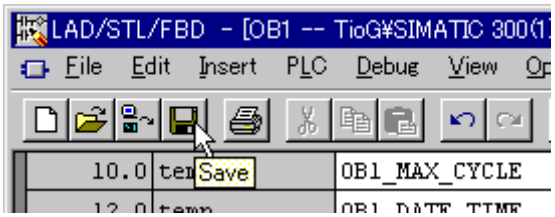


7. Click the right on a program area once again, and select "Insert Network," and create a new ladder program (Network 9).

8. In order to check whether or not the specified module address exists in QB19 or the communication item address specified to QB20 and QB21 is within the data range, the IB35 and IW36 values are checked.
Store each data in variable “TempValue_1” by the MOVE instruction.



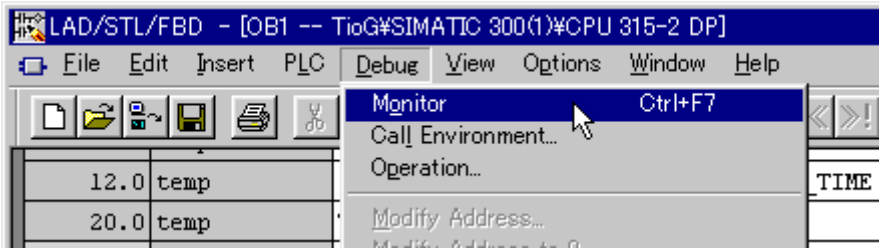
9. Thus, the program has been created.
Click the “Save” button on the toolbar to store and compile the sequence program. And, click the “Download” button of toolbar, and download a program in PLC.



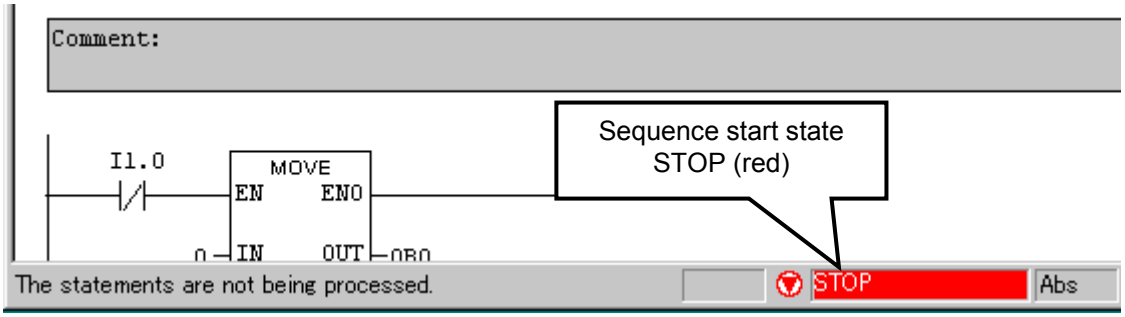
7.4.6 Program monitor

Confirm that a program works normally by a monitor function.

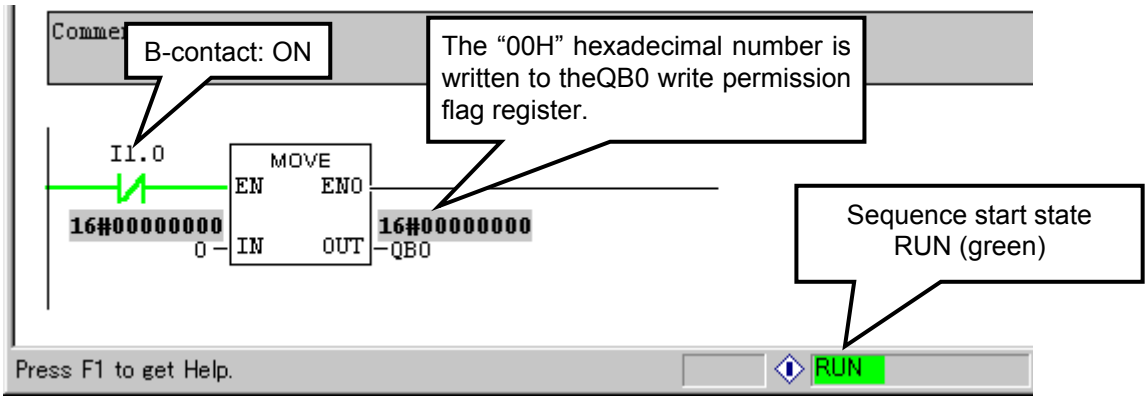
1. Select the menu command **Debug > Monitor**, and change a display to a monitor state.



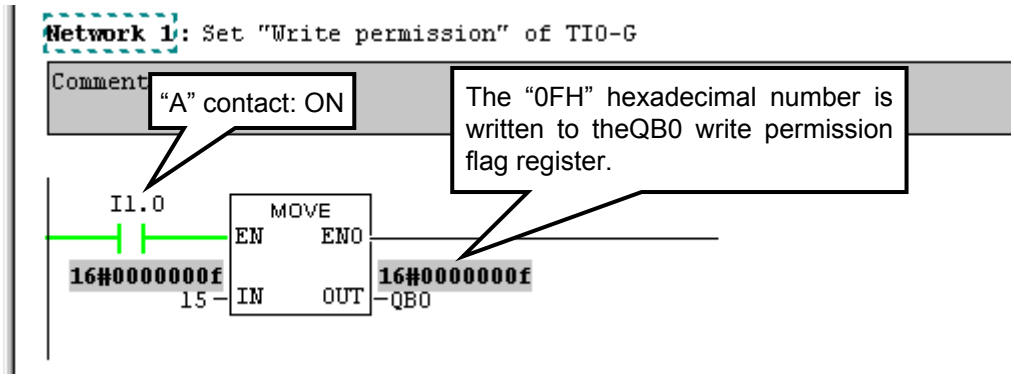
2. The sequence start state of PLC is displayed to bottom of a screen. As the program does not run at this time, “STOP” is displayed in red.



3. Start a sequence program of PLC.
The sequence start state on the lower side of the screen changes to “RUN” in green. In addition, the PLC register variables and contact ON/OFF states within the ladder are displayed.
As the B-contact of I1.0 (DI channel 9) is closed at this time and as a result “0”(hexadecimal number: 00H) is written to the QB0 write permission flag register, data write is not permissible.



4. Close the contact (DI channel 9) of a digital input module of PLC.
As the A-contact of I1.0 is closed and as a result “15” (hexadecimal number: 0FH) is written to the QB0 write permission flag register, data write becomes permissible.



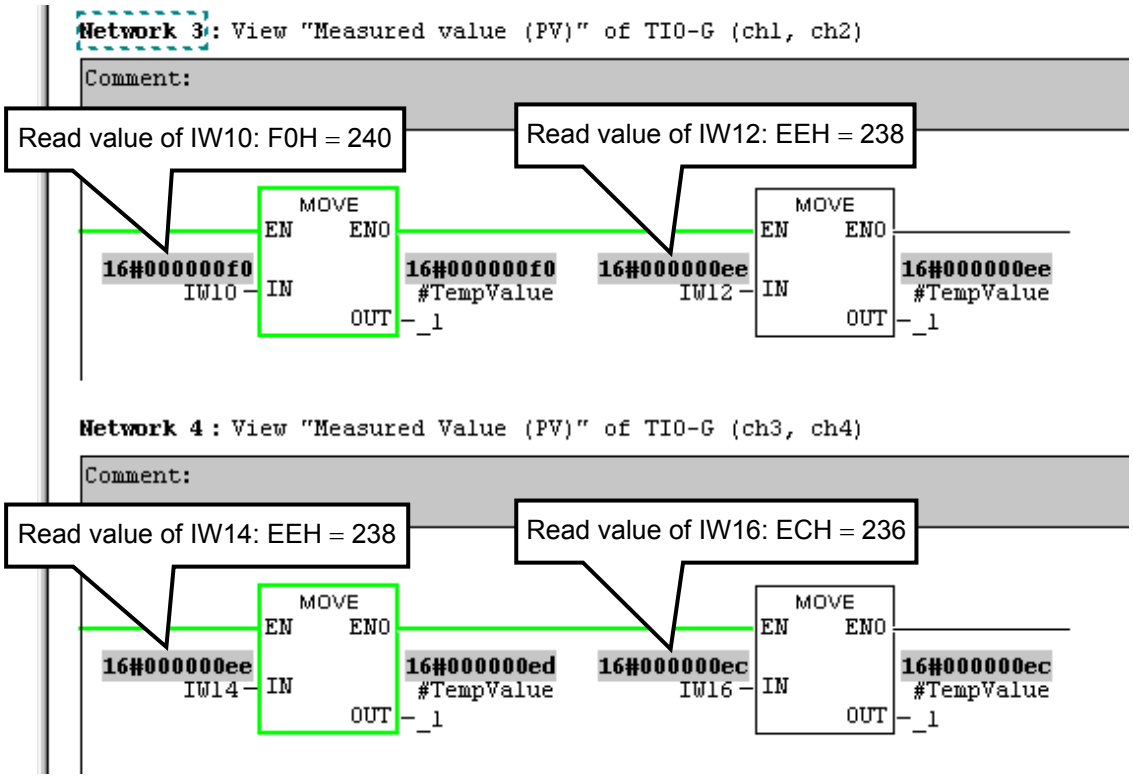
5. Confirm the Measured value (PV) of each temperature control channel.
Scroll the screen to display the ladder (Network 3, 4) in which the Measured value (PV) read program is described.
It can be checked that values are displayed on IW10, IW12, IW14 and IW16.
As the decimal point is positioned in the one decimal place of each Measured value (PV) of the relevant temperature control channel, each displayed value whose decimal point is positioned in the one decimal place becomes the actual Measured value (PV).

IW10 = F0H = 240 = 24.0 °C:
Measured value (PV) of temperature control channel 1 of module address 0

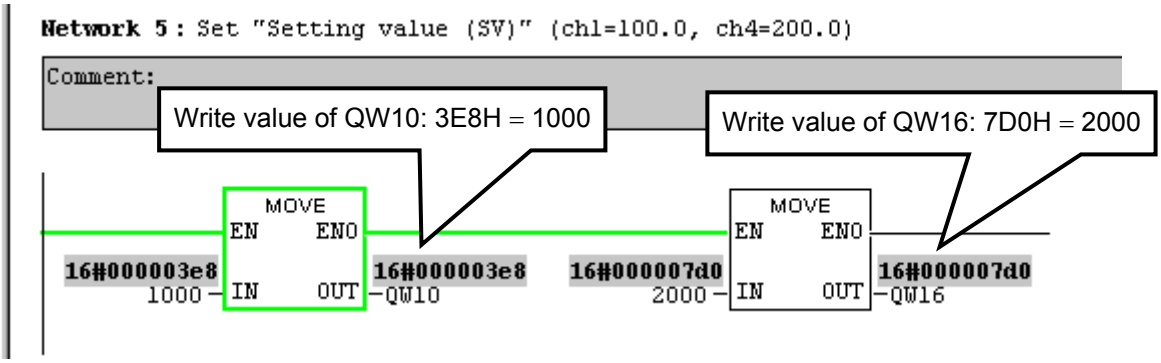
IW12 = EEH = 238 = 23.8 °C:
Measured value (PV) of temperature control channel 2 of module address 0

IW14 = EEH = 238 = 23.8 °C:
Measured value (PV) of temperature control channel 1 of module address 1

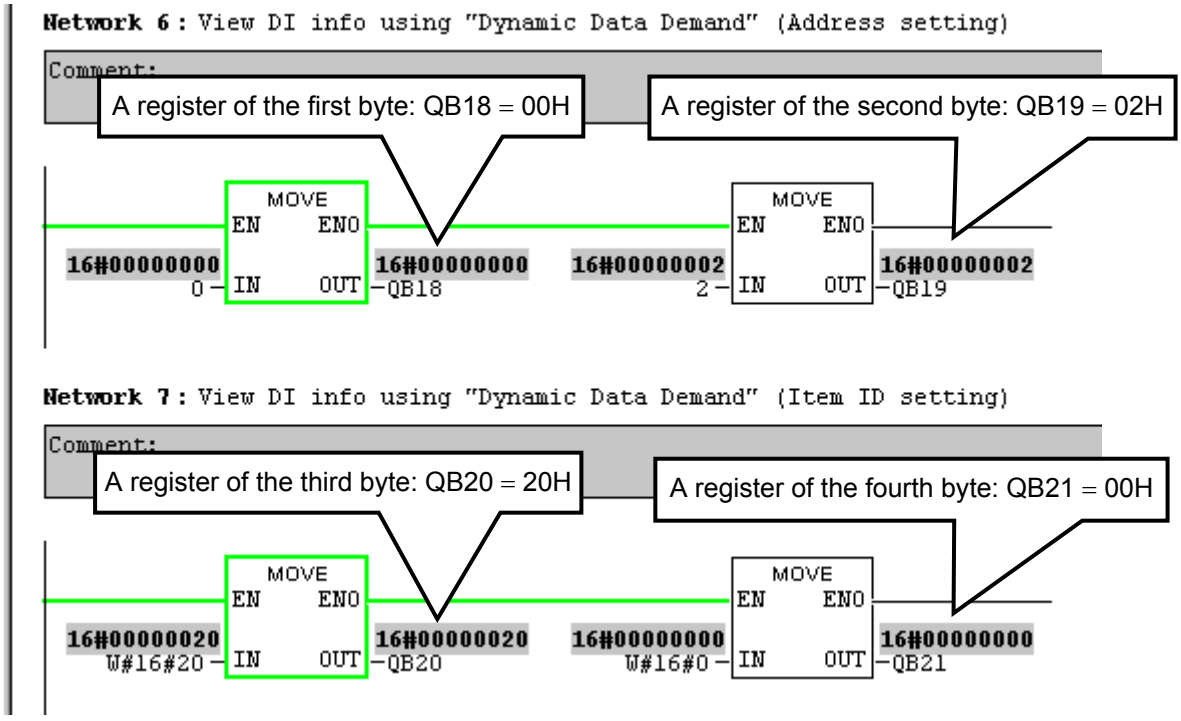
IW16 = ECH = 236 = 23.6 °C:
Measured value (PV) of temperature control channel 2 of module address 1



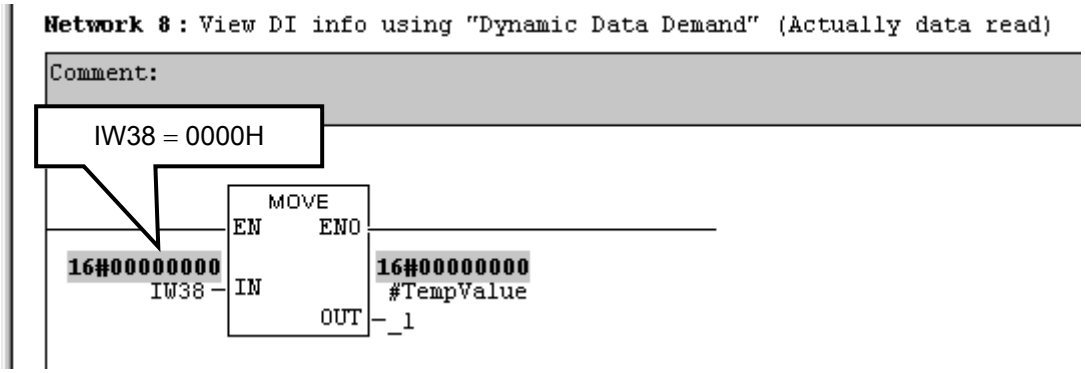
6. Check that the Set value (SV) is set.
Scroll the screen to display the ladder (Network 5) in which the Set value (SV) write program is described.
It can be checked that data is written to QW10 and QW16.
QW10 = 3E8H = 1000
QW16 = 7D0H = 2000



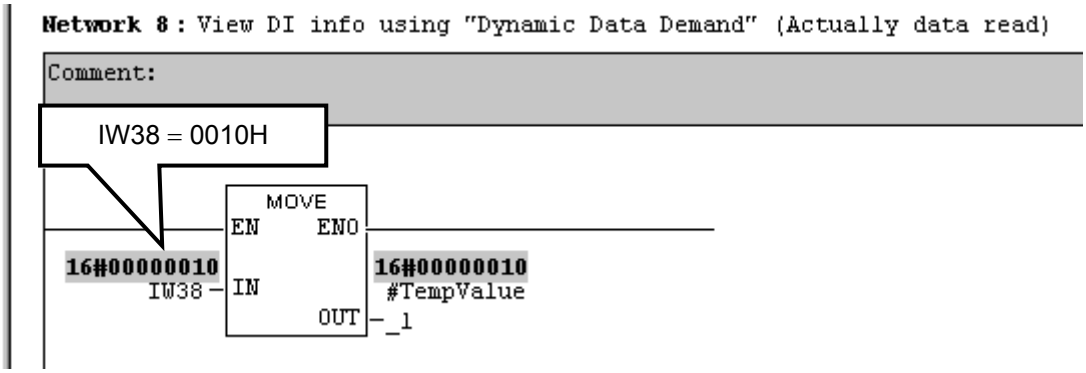
7. Confirm the dynamic data request for the digital input module X-DI-B of SRX.
Scroll the screen to display the ladder (Network 6, 7) in which the dynamic data request program is described.
It can be checked that data is written to QB18, QB19, QB20 and QB21.
QB18 = 00H
QB19 = 02H
QB20 = 20H
QB21 = 00H



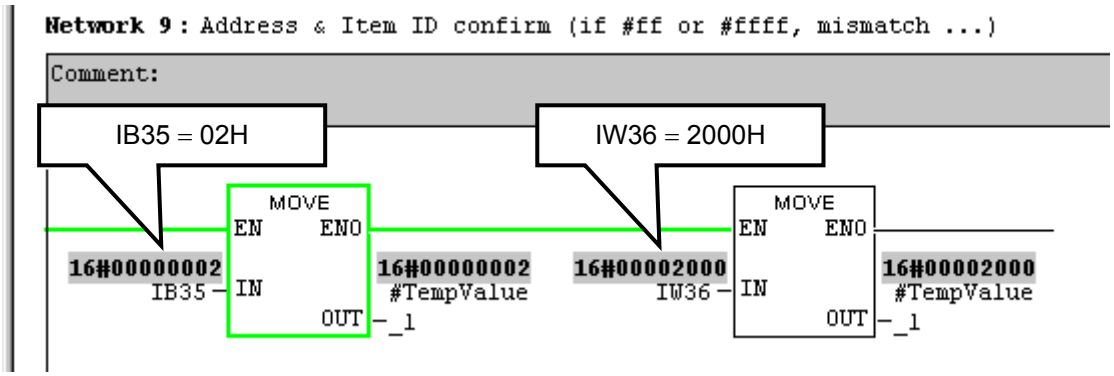
8. Check for “Input state of digital input (terminal)” of the X-DI-B module read by dynamic data request.
IW38 which is a response from the SRX corresponds to “Input state of digital input (terminal)” of the X-DI-B module. If contacts of the X-DI-B module open, IW38 = 0000H is established.



9. Close the contact of DI channel 5 of the X-DI-B module.
Closing the contact of DI channel 5 means that 1 is set to Bit 4 of IW38. As a result, IW38 = 0010H is established.



10. In order to confirm whether or not stored values are for the X-DI-B module, check for IB35 (module address echo back) and IW36 (communication item address echo back) which are responses from the SRX.
As IB35 = 02H and IW36 = 2000H are established, it can be checked that normal communication is conducted.

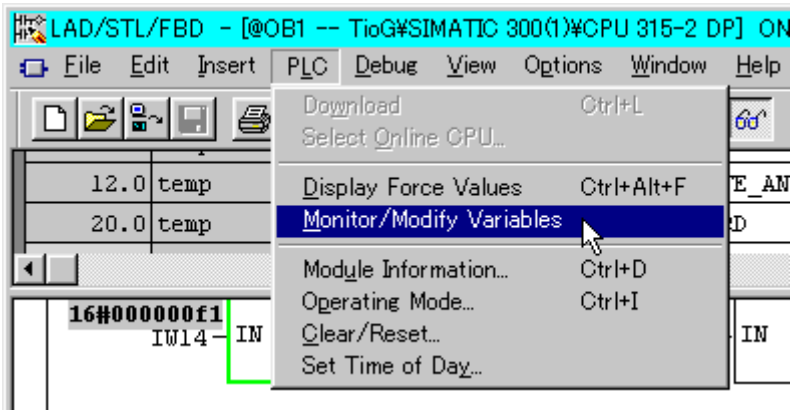


11. Thus, the program monitor has been finished.

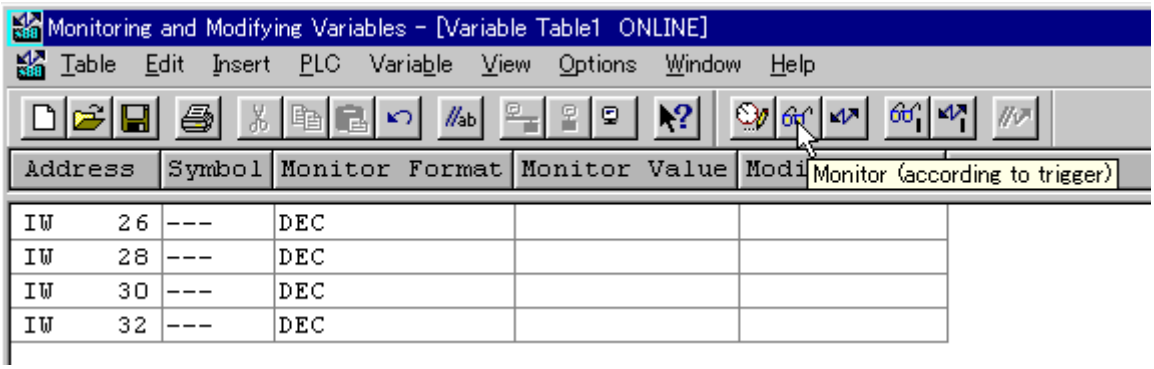
When static data write is checked, use of the PLC tool is better than the ladder.

[Usage of the PLC tool]

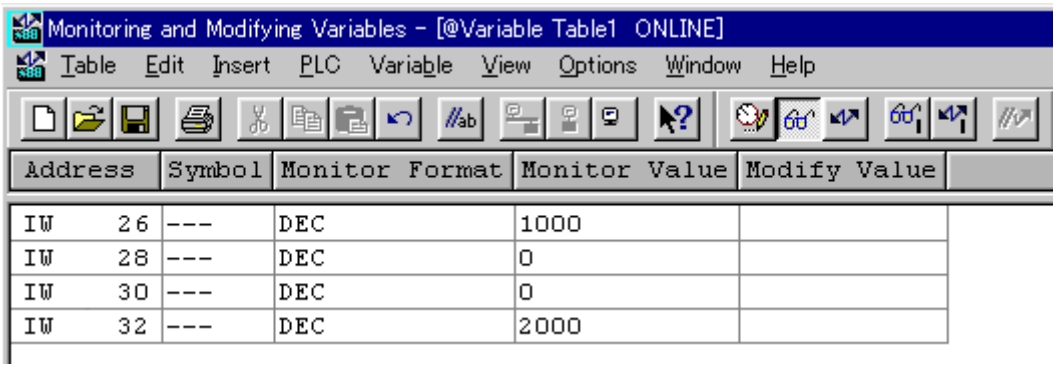
1. Select the menu command **PLC > Monitor/Modify Variables**, and display a window of "Monitor and Modify Variables – [Variable Table 1 ONLINE]."



2. Specify IW26, IW28, IW30 and IW32 assigned to the leftmost “Address” column as Set value (SV) read registers, and then set “DEC” (decimal) to “Monitor Format.”
Click the “Monitor (according to trigger)” of toolbar.



3. Values read are displayed in the “Monitor Value” column.
“1000” and “2000” are read to IW26 and IW32, respectively. Thus, it can be checked that the write value matches the read value.



8. TROUBLESHOOTING

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

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

⚠ WARNING

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

CAUTION

- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
- The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- Do not separate the module mainframe from the terminal base with the power turned on. If so, instrument failure may result.

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

■ X-TIO-G module

Problem	Possible cause	Solution
FAIL/RUN lamp does not light up [Temperature control side]	Power not being supplied	Check external breaker etc.
	Appropriate power supply voltage not being supplied	Check the power supply
	Power supply terminal contact defect	Retighten the terminals
	Power supply section defect	Replace X-TIO-G module
RX/TX lamp does not flash [Temperature control side]	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
	CPU section defect	Replace X-TIO-G module
FAIL/RUN lamp is lit (red): FAIL status [Temperature control side]	CPU section or power section defect	Replace X-TIO-G module
RUN lamp: Turns on RX/TX lamp: Turns off [PROFIBUS side]	No connection, disconnection, breakage or wrong wiring of PROFIBUS cable	Confirm the connection method or condition and connect correctly
	Termination setting of a PROFIBUS connector is wrong	Sets termination setting correctly
RUN lamp: Turns on RX/TX lamp: Turns on ONL lamp: Turns off [PROFIBUS side]	The PROFIBUS address specified when hardware configured does not match that set by the X-TIO-G module	Match both of the PROFIBUS address
	The read/write static data length (number of words) when hardware configured does not match the data length (number of words) set when communication item assigned	Match both of the data length (number of words) (Data length can be calculated by "Number of channels × Number of items")

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Problem	Possible cause	Solution
RUN lamp: Turns on RX/TX lamp: Turns on ONL lamp: Turns off [PROFIBUS side]	The order of specifying data is incorrect at the time of assigning PLC registers when hardware configured, or two or more essential items are specified	Always specify the data in the following order 1. Module error state 2. Write permission 3. Static input 4. Static output 5. Dynamic I/O For the above 3 to 5, two or more items can be specified, but for the above 1 to 2 only one item can be specified
RUN lamp: Flashes [PROFIBUS side]	Internal communication is abnormal • Other modules (including the temperature control side of the X-TIO-G module) cannot be recognized within several seconds after the power is turned on • Initializing information is not received from other modules (including the temperature control side of the X-TIO-G module) within 30 seconds after the power is turned on	Sets termination resistor of internal communication correctly
	Two or more X-TIO-G modules connected	Set the number of net work modules to one within the SRX unit
	Connected an other network module	
	The communication buffer overflows as the number of connecting modules within the SRX unit exceeds the maximum number (30 sets including one X-TIO-G module)	Set the connectable number of modules to the maximum number (30 sets including one X-TIO-G module) or smaller within the SRX unit

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Problem	Possible cause	Solution
RUN lamp: Flashes [PROFIBUS side]	Any modules of versions which are not connectable to the X-TIO-G module are connected	Replace these modules by modules of versions connectable to the X-TIO-G module

☞ For troubleshooting of RKC communication and Modbus, refer to **Module Type Controller SRX Communication Instruction Manual (IMS01N01-E□)**.

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