



MICROSmart

Communication Manual

FC6A Series



SAFETY PRECAUTIONS

- Read the "FC6A Series MICROSmart Communication Manual" to ensure correct operation before starting installation, wiring, operation, maintenance, and inspection of the FC6A Series MICROSmart.
- All FC6A Series MICROSmart modules are manufactured under IDEC's rigorous quality control system, but users must add a backup or failsafe provision to the control system when using the FC6A Series MICROSmart in applications where heavy damage or personal injury may be caused, in case the FC6A Series MICROSmart should fail.
- Care should be taken such that unauthorized access to the FC6A Series MICROSmart does not come from outside network connections. Please note that the Company shall not be liable for any loss, damage or other expenses incurred directly or indirectly by unauthorized access, etc.
- In this manual, safety precautions are categorized in order of importance:



Warning Warning notices are used to emphasize that improper operation may cause severe personal injury or death.

- The FC6A Series MICROSmart is not designed for use in applications requiring a high degree of reliability and safety. The FC6A Series MICROSmart should not be used for such applications.
- When using the FC6A Series MICROSmart in applications (not described above) that require a high degree of reliability in terms of functionality and precision, appropriate measures such as failsafe mechanisms and redundant mechanisms must be taken for the system containing the FC6A Series MICROSmart. The following are specific examples.
 - Emergency stop and interlocking circuits must be configured outside the FC6A Series MICROSmart.
 - If relays or transistors in the FC6A Series MICROSmart output circuits should fail, outputs may remain at on or off state. For output signals which may cause serious accidents, configure monitor circuits outside the FC6A Series MICROSmart.
 - The FC6A Series MICROSmart self-diagnostic function may detect internal circuit or program errors, stop programs, and turn outputs off. Configure circuits so that the system containing the FC6A Series MICROSmart is not jeopardized when outputs turn off.
- Turn off power to the FC6A Series MICROSmart before installation, removal, wiring, maintenance, and inspection of the FC6A Series MICROSmart. Failure to turn power off may cause damage, electrical shocks or fire hazard.
- Special expertise is required to install, wire, program, and operate the FC6A Series MICROSmart. People without such expertise must not use the FC6A Series MICROSmart.
- Install the FC6A Series MICROSmart according to the instructions described in the "FC6A Series MICROSmart User's Manual". Improper installation will result in falling, failure, or malfunction of the FC6A Series MICROSmart.



Caution Caution notices are used where inattention might cause personal injury or damage to equipment.

- The FC6A Series MICROSmart is designed for installation in a cabinet. Do not install the FC6A Series MICROSmart outside a cabinet.
- Install the FC6A Series MICROSmart in environments described in the "FC6A Series MICROSmart User's Manual". If the FC6A Series MICROSmart is used in places where the FC6A Series MICROSmart is subjected to high-temperature, high-humidity, condensation, corrosive gases, excessive vibrations, or excessive shocks, then electrical shocks, fire hazard, or malfunction will result.
- The environment for using the FC6A Series MICROSmart is "Pollution degree 2." Use the FC6A Series MICROSmart in environments of pollution degree 2 (according to IEC 60664-1).
- Prevent the FC6A Series MICROSmart from falling while moving or transporting the FC6A Series MICROSmart, otherwise damage or malfunction of the FC6A Series MICROSmart will result.
- Wiring must use lead sizes that are appropriate for the applied voltage and current. Terminal screws must be tightened with the prescribed tightening torque.
- Prevent metal fragments and pieces of wire from dropping inside the FC6A Series MICROSmart housing. Put a cover on the FC6A Series MICROSmart modules during installation and wiring. Ingress of such fragments and chips may cause fire hazard, damage, or malfunction.
- Use a power supply of the rated value. Use of a wrong power supply may cause fire hazard.
- Use an IEC 60127-approved fuse on the power line outside the FC6A Series MICROSmart. This is required when equipment containing the FC6A Series MICROSmart is destined for Europe.
- Use an IEC 60127-approved fuse on the output circuit. This is required when equipment containing the FC6A Series MICROSmart is destined for Europe.
- Use an EU-approved circuit breaker. This is required when equipment containing the FC6A Series MICROSmart is destined for Europe.
- Make sure of safety before starting and stopping the FC6A Series MICROSmart or when operating the FC6A Series MICROSmart to force outputs on or off. Incorrect operation of the FC6A Series MICROSmart may cause machine damage or accidents.
- Do not connect the ground wire directly to the FC6A Series MICROSmart. Connect a protective ground to the cabinet containing the FC6A Series MICROSmart using an M4 or larger screw. This is required when equipment containing the FC6A Series MICROSmart is destined for Europe.
- Do not disassemble, repair, or modify the FC6A Series MICROSmart modules.
- The FC6A Series MICROSmart contains electronic parts and batteries. When disposing of the FC6A Series MICROSmart, do so in accordance with national and local regulations.

ABOUT THIS MANUAL

This manual describes the powerful communications tools of the FC6A Series MICROSmart.

Chapter 1: General Information

General information about the FC6A Series MICROSmart with communication interfaces.

Chapter 2: Devices

Descriptions of the allocations of devices such as inputs, outputs, internal relays, registers, timers, and counters that are used in the basic and advanced instructions, as well as details about the allocations of special internal relays and special data registers for communication functions.

Chapter 3: Communication Settings

Functions for the FC6A Series MICROSmart communication, how to configure them, and examples of their use.

Chapter 4 through Chapter 8:

Various communication functions such as maintenance communication, user communication, Modbus communication, data link communication and J1939 communication.

Chapter 9: Bluetooth Communication

Description of the Bluetooth communication of the FC6A Series MICROSmart and how you can make the FC6A Series MICROSmart communicate with other devices with the Bluetooth communication.

Chapter 10: FTP Server/Client

Descriptions of the FTP server that enables you to get the files that are saved in the SD memory card inserted in the FC6A Series MICROSmart with an FTP client tool and the FTP client that enables the FC6A Series MICROSmart to transfer the files between the SD memory card and FTP servers.

Chapter 11: PING Instruction

Descriptions of the PING instruction that sends a ping packet to the specified remote host to check if communication is possible at the Internet Protocol (IP) layer.

Chapter 12: Send E-mail Function

Descriptions of the EMAIL instruction that sends preregistered e-mails.

Chapter 13: Web Server

Description of the Web server functions in the FC6A Series MICROSmart.

Chapter 14: Communication Monitor

Description of the communication monitor that enables you to monitor the communication between the FC6A Series MICROSmart and the connected devices.

Chapter 15: MC Protocol Communication

Description of the MC protocol communication functions in the FC6A Series MICROSmart.

Index

Alphabetical listing of key words.

Related Manuals

Refer to the following manuals according to your purpose.

| Manual Name | Description |
|---|--|
| FC6A Series MICROSmart User's Manual | Describes product specifications, installation and wiring instructions, instructions for basic programming operations and special functions, device and instruction lists, and troubleshooting procedures for the FC6A MICROSmart. |
| FC6A Series MICROSmart Communication Manual (this manual) | Describes specifications related to FC6A MICROSmart communication, descriptions of functions, configuration methods, and usage examples. |
| FC6A Series MICROSmart PID Module User's Manual | Describes PID module specifications and functions. |
| Ladder Programming Manual | Describes basic operations for programming with ladders, monitoring methods, device and instruction lists, and details of each instruction. |
| Network User's Manual | Describes how to configure and use specific communication protocols (BACnet/IP communication, EtherNet/IP communication, MQTT communication). |

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Regarding laws and compatible standards

This product adheres to the laws and compatible standards of all countries involved, as shown below.

European laws and standards

This product complies with the following EU directives.

- Low Voltage Directive
- EMC Directive
- RoHS Directive
- RE Directive (FC6A-PC4 only)

To comply with these directives, this product has been designed and evaluated on the basis of the following international and European standard.

- IEC/EN 61131-2: 2007
- EN50581:2012
- EN301 489-1 V2.1.1& EN301 489-17 V2.1.1 (FC6A-PC4 only)

For details on the compatible standards and EU Directives, contact the distributor from which you purchased this product or visit our web site.

North America laws and standards

This product complies with the following standards.

- UL508^{*1}
- UL61010-1^{*1}
- UL61010-2-201^{*1}
- CSA C22.2 No.142^{*1}
- CSA C22.2 No.61010-1^{*1}
- CSA C22.2 No.61010-2-201^{*1}
- ANSI/ISA 12.12.01
- CAN/CSA C22.2 No.213

^{*1} Certain FC6A Series MICROSmart models are not compatible. For details about applicable standards, please contact IDEC Corporation.

Marine standards

This product has been certified by the following classification societies.
(FC6A-C16R1DE, FC6A-C16P1DE and FC6A-C16K1DE are not certified.)

- ABS (American Bureau of Shipping)
- DNV (Det Norske Veritas)
- LR (Lloyd's Register)
- NK (Nippon Kaiji Kyokai)

* This product has not been certified for use on the bridge or deck.

For details on applicable standards and EU directives, please contact the dealer where purchased or check the IDEC website.

IMPORTANT INFORMATION

Under no circumstances shall IDEC Corporation be held liable or responsible for indirect or consequential damages resulting from the use of or the application of IDEC PLC components, individually or in combination with other equipment.

All persons using these components must be willing to accept responsibility for choosing the correct component to suit their application and for choosing an application appropriate for the component, individually or in combination with other equipment.

All diagrams and examples in this manual are for illustrative purposes only. In no way does including these diagrams and examples in this manual constitute a guarantee as to their suitability for any specific application. To test and approve all programs, prior to installation, is the responsibility of the end user.

NAMES AND ABBREVIATIONS USED IN THIS MANUAL

| Item | Description |
|--|---|
| FC6A | Generic term used to refer to CPU module, expansion module, expansion interface module, HMI module, cartridge base module, cartridge. |
| CPU module | Generic term used to refer to All-in-One CPU module, CAN J1939 All-in-One CPU module, Plus CPU module. |
| All-in-One CPU module | Generic term used to refer to FC6A-C****E CPU modules. |
| 16-I/O type | Generic term used to refer to All-in-One CPU modules with a total number of 16 inputs/outputs. (FC6A-C16****) |
| 24-I/O type | Generic term used to refer to All-in-One CPU modules with a total number of 24 inputs/outputs. (FC6A-C24****) |
| CAN J1939 All-in-One CPU module | Generic term used to refer to FC6A-C40***EJ CPU modules. |
| Plus CPU module | Generic term used to refer to FC6A-D****CEE CPU modules. |
| Plus 16-I/O type | Generic term used to refer to Plus CPU modules with a total number of 16 inputs/outputs. (FC6A-D16****) |
| Plus 32-I/O type | Generic term used to refer to Plus CPU modules with a total number of 32 inputs/outputs. (FC6A-D32****) |
| 40-I/O type | Generic term used to refer to CPU modules with a total number of 40 inputs/outputs. (FC6A-C40****) |
| AC power type | Generic term used to refer to CPU modules with AC power supply. (FC6A-C****AE, FC6A-C****AEJ) |
| DC power type | Generic term used to refer to CPU modules with 24VDC power supply or 12VDC power supply. |
| 24V DC power type | Generic term used to refer to CPU modules with 24VDC power supply. (FC6A-C****CE, FC6A-C****CEJ, FC6A-D****CEE) |
| 12V DC power type | Generic term used to refer to CPU modules with 12VDC power supply. (FC6A-C****DE, FC6A-C****DEJ) |
| Relay output type | Generic term used to refer to CPU modules with relay outputs. (FC6A-C**R**E, FC6A-C**R**E*) |
| Transistor output type | Generic term used to refer to CPU modules with transistor sink outputs or transistor protection source outputs. |
| Transistor sink output type | Generic term used to refer to CPU modules with transistor sink outputs. (FC6A-C**K**E, FC6A-C**K**E*, FC6A-D**K*CEE) |
| Transistor protection source output type | Generic term used to refer to CPU modules with transistor protection source outputs. (FC6A-C**P**E, FC6A-C**P**E*, FC6A-D**P*CEE) |
| Expansion module | Generic term used to refer to I/O module, communication module, PID module. |
| I/O module | Generic term used to refer to digital I/O module, analog I/O module. |
| Digital I/O module | Generic term used to refer to digital input module, digital output module, digital mixed I/O module. |
| Digital input module | Generic term used to refer to digital I/O modules with input terminals. (FC6A-N****) |
| Digital output module | Generic term used to refer to digital I/O modules with output terminals. (FC6A-R***, FC6A-T****) |
| Digital mixed I/O module | Generic term used to refer to digital I/O modules with input and output terminals. (FC6A-M****) |
| Analog I/O module | Generic term used to refer to analog input module, analog output module, analog mixed I/O module. |
| Analog input module | Generic term used to refer to analog I/O modules with input terminals. (FC6A-J***, FC6A-J4CN*, FC6A-J4CH**, FC6A-J8CU*) |
| Analog output module | Generic term used to refer to analog I/O modules with output terminals. (FC6A-K****) |
| Analog mixed I/O module | Generic term used to refer to analog I/O modules with input and output terminals. (FC6A-L03CN*, FC6A-L06A*) |
| Communication module | Generic term used to refer to serial communication modules. |
| Serial communication module | Generic term used to refer to FC6A-SIF52, FC6A-SIF524. |
| PID module | Generic term used to refer to FC6A-F2M*, FC6A-F2MR*. |

| Item | Description |
|--|---|
| Expansion interface module | Generic term used to refer to expansion interface module (Expander), expansion interface module (remote master), expansion interface module (remote slave). |
| Expansion interface module (Expander) | Generic term used to refer to FC6A-EXM2, FC6A-EXM24. |
| Expansion interface module (remote master) | FC6A-EXM1M |
| Expansion interface module (remote slave) | Generic term used to refer to FC6A-EXM1S, FC6A-EXM1S4. |
| HMI module | FC6A-PH1 |
| Cartridge base module | FC6A-HPH1 |
| Cartridge | Generic term used to refer to I/O cartridge, communication cartridge. |
| I/O cartridge | Generic term used to refer to digital I/O cartridge, analog I/O cartridge |
| Digital I/O cartridge | Generic term used to refer to I/O cartridges that extend digital inputs or outputs. (FC6A-PN4, FC6A-PT*4) |
| Analog I/O cartridge | Generic term used to refer to I/O cartridges that extend analog inputs or outputs. (FC6A-PJ2A, FC6A-P*2**) |
| Communication cartridge | Generic term used to refer to RS232C communication cartridge, RS485 communication cartridge, Bluetooth communication cartridge. |
| RS232C communication cartridge | FC6A-PC1 |
| RS485 communication cartridge | FC6A-PC3 |
| Bluetooth communication cartridge | FC6A-PC4 |
| WindLDR | This software is used to create ladder programs for the FC6A. |
| USB cable | Generic term used to refer to USB maintenance cable (HG9Z-XCM42), USB Mini-B extension cable (HG9Z-XCE21). |
| User program | It refers to the data that combines function area settings and ladder programs configured by the ladder programming software WindLDR. |
| Function area settings | These are various settings for FC6A. These are the settings to be configured in the Settings tab and the module configuration editor. |
| Ladder program | Generic term used to refer to main program, subroutine program, user-defined macros. |
| Main program | This is a program whose first row is the entry point of the ladder program. The entry point is the starting point where the ladder program is executed. It is created in the Main Program tab of the ladder program editor. |
| Subroutine program | It refers to one of the following programs. <ul style="list-style-type: none"> Programs from the LABEL instruction to the LRET instruction Programs created using WindLDR subroutine function (In the ladder program editor tab, it is indicated by [# Subroutine] (#: subroutine number).) |
| User-defined macros | It is a program created using WindLDR user-defined macro function. (In the ladder program editor tab, it is indicated by [# User-defined macro name] (#: user-defined macro number). |
| Source device | It is a device (the place where data is stored to execute an advanced instruction) on which the operation is performed. |
| Destination device | It is a device that stores the operation result. |
| Timer instruction | Generic term used to refer to TML, TIM, TMH, TMS instruction. |
| Off-delay timer instruction | Generic term used to refer to TML0, TIMO, TMHO, TMSO instruction. |
| Counter instruction | Generic term used to refer to CNT, CDP, CUD instruction. |
| Double-word counter instruction | Generic term used to refer to CNTD, CDPD, CUDD instruction. |
| Shift register instruction | Generic term used to refer to SFR, SFRN instruction. |
| Shot instruction | Generic term used to refer to SOTU, SOTD instruction. |
| Counter compare instruction | Generic term used to refer to CC=, CC>= instruction. |
| Compare instruction | Generic term used to refer to CMP=, CMP<>, CMP<, CMP>, CMP<=, CMP>= instruction. |
| Pulse output instruction | Generic term used to refer to PULS, PWM, RAMP, RAMPL, ARAMP, ABS, JOG instruction. |
| Dual/teaching timer instruction | Generic term used to refer to DTIM, DTML, DTMH, DTMS, TTIM instruction. |

Name of WindLDR

| Name Used in this Manual | WindLDR Operating Procedure |
|-----------------------------|--|
| Function area settings | Configuration tab > Function Area Settings group |
| Monitors | Select Online > Monitor > Start Monitor . |
| PLC status | Select Online > PLC > Status . |
| Communication settings | Select Online > Communication > Set Up . |
| Modbus master request table | On the Configuration tab, in Function Area Settings , click Communication Ports , and in the displayed Function Area Settings dialog box, for Communication Mode under Communication Ports , select Modbus RTU Master or Modbus TCP Client |
| Application button | The button displayed on the left side of the menu bar. Click to display the menu with New , Save , and Save As , recent projects, WindLDR Options , and Exit WindLDR . |

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1: GENERAL INFORMATION

Introduction

This chapter describes an overview of the FC6A, which is equipped with a communication interface.

Description

The FC6A can perform communication using various communication interfaces.

All-in-One CPU Module/J1939 All-in-One CPU Module

Yes: Can be used as a communication port.

No: Cannot be used as a communication port.

—: Not equipped with the CPU module.

| Communication/Function | | Port | | | | | | Cartridge Slot | | | Expansion module | |
|--|--|---------------|----------|-----------------|-----------------|-------------------|----------|----------------|-------|-------|----------------------|----|
| | | Serial Port 1 | USB Port | Ethernet Port 1 | Ethernet Port 2 | HMI-Ethernet Port | CAN Port | 1 | 2 | 3 | Communication module | |
| RS232C Communication/ RS485 Communication | Maintenance Communication | Yes*1 | Yes | Yes | — | Yes*2 | No | Yes*4 | Yes*4 | — | Yes | |
| | User Communication | | No | No | | | | | | | | |
| | Modbus RTU Communication (master/slave) | | | | | | | | | | | |
| | Data Link Communication (master station/slave station) | | | | | | | | | | | |
| Bluetooth Communication | User Communication | No | No | — | — | No | No | No | | | | |
| Ethernet Communication | Maintenance Communication (Server) | | | | | | | | Yes | Yes*2 | | |
| | User Communication (server/client) | | | | | | | | | | No | No |
| | User Communication (UDP) | | | | | | | | | | | |
| | Modbus TCP Communication (server/client) | | | | | | | | No | No | | |
| | MC Protocol Communication (client) | | | | | | | | | | No | No |
| | BACnet/IP Communication | | | | | | | | | | | |
| | EtherNet/IP Communication | | | | | | | | No | | | |
| | MQTT Communication | | | | | | | | | No | | |
| | FTP Server/Client Function | | | | | | | | | | Yes*2 | |
| | Web Server Function | | | | | | | | No | | | |
| | PING Transmission | | | | | | | | | Yes*2 | | |
| | EMAIL Transmission | | | | | | | | | | No | |
| CAN Communication | J1939 Communication | | | | | No | Yes*3 | | | | | |

*1 Only the All-in-One CPU module can perform various types of communication using serial port 1.

*2 The HMI-Ethernet port can be expanded and used for communication by connecting the HMI module to the CPU module.

*3 Only the CAN J1939 All-in-One CPU module can perform J1939 communication using the CAN port.

*4 Communication can be performed by connecting a communication cartridge to the cartridge slot.

1: GENERAL INFORMATION

Plus CPU Module

Yes: Can be used as a communication port.

No: Cannot be used as a communication port.

—: Not equipped with the CPU module.

| Communication/Function | | Port | | | | | | Cartridge Slot | | | Expansion module | | | | | |
|--|--|---------------|----------|-------------------|-----------------|-------------------|----------|-------------------|-------------------|-------------------|----------------------|----|----|----|----|----|
| | | Serial Port 1 | USB Port | Ethernet Port 1 | Ethernet Port 2 | HMI-Ethernet Port | CAN Port | 1 | 2 | 3 | Communication module | | | | | |
| RS232C Communication/ RS485 Communication | Maintenance Communication | — | Yes | Yes | Yes | Yes ^{*1} | — | Yes ^{*2} | Yes ^{*2} | Yes ^{*3} | Yes | | | | | |
| | User Communication | | No | No | No | No | | | | | | | | | | |
| | Modbus RTU Communication (master/slave) | | | | | | | | | | | | | | | |
| | Data Link Communication (master station/slave station) | | | | | | | | | | | | | | | |
| Bluetooth Communication | User Communication | | No | No | No | | | | | | No | No | | | | |
| Ethernet Communication | Maintenance Communication (Server) | | | | | | | Yes | Yes | Yes ^{*1} | | | No | No | No | No |
| | User Communication (server/client) | | | | | | | | | | | | | | | |
| | User Communication (UDP) | | | | | | | | | | | | | | | |
| | Modbus TCP Communication (server/client) | | | | | | | | | No | | | | | | |
| | MC Protocol Communication (client) | | | | | | | | | | | | | | | |
| | BACnet/IP Communication | | | | | | | | No | | | | | | | |
| | EtherNet/IP Communication | | | | | | | No | Yes | | | | | | | |
| | MQTT Communication | | | | | Yes | | No | Yes ^{*1} | | | | | | | |
| | FTP Server/Client Function | | | | | | | | | | | | | | | |
| | Web Server Function | | | | | | | | | | | | | | | |
| | PING Transmission | | | Yes | No | | | | | | | | | | | |
| | EMAIL Transmission | | | Yes ^{*1} | | | | | | | | | | | | |
| CAN Communication | J1939 Communication | | | No | No | No | | | | | | | | | | |

*1 The HMI-Ethernet port can be expanded and used for communication by connecting the HMI module to the CPU module.

*2 Communication can be performed by connecting the cartridge base module to the CPU module and then connecting a communication cartridge to the cartridge slot.

*3 Communication can be performed by connecting the HMI module to the CPU module and then connecting a communication cartridge to the cartridge slot.

Communication Interfaces

An overview and the specifications of the communication interfaces are shown below.

USB Port

Maintenance communication can be performed by using this port to connect to a computer.

| | |
|---|---|
| Communication Type | USB2.0 Full speed, CDC class |
| Communication Functions | Capable of maintenance communication with a PC, program downloads via USB power |
| Connector | USB mini-B |
| Isolation between Internal Circuit | Not isolated |

Serial Port 1

This port can be used to communicate with RS232C/RS485 communication-compatible external devices such as computers, operator interfaces, and printers.

Maintenance communication, user communication, Modbus RTU communication (master/slave), and data link communication (master station/slave station) are possible. Only the All-in-One CPU module is equipped with serial port 1.

| | |
|---|--|
| Communication Type | EIA RS-232C or RS-485 software selectable |
| Maximum Communication Speed | 115,200 bps |
| Communication Functions | Maintenance communication, user communication, Modbus RTU communication (master/slave), data link communication (master station/slave station) |
| Connector | RJ45 |
| Cable | RS232C: Shielded multicore RS485: Shielded twisted-pair |
| Maximum Cable Length | RS-232C: 5 m RS-485 : 200 m |
| Isolation between Internal Circuit | Not isolated |

Serial Communication Module

Serial communication modules can be used by connecting them to the basic expansion side or expansion interface side of the CPU module.

This port can be used to communicate with RS232C/RS485 communication-compatible external devices such as computers, operator interfaces, and printers. Maintenance communication, user communication, Modbus RTU communication (master/slave), and data link communication (master station/slave station) are possible.

| | | |
|---|--|--|
| Type No. | FC6A-SIF52, FC6A-SIF524 | |
| Points | 2 | |
| Electrical Characteristics | EIA RS232C/EIA RS485 ^{*1} | |
| Maximum Communication Speed | 115,200 bps | |
| Communication Functions | Maintenance communication, user communication, Modbus RTU communication (master/slave), data link communication (master station/slave station) | |
| Maximum Cable Length | 15 m (EIA RS232C)/1,200 m (EIA RS485) | |
| Isolation between Internal Circuit | Between Communication Port and Internal Circuit | Photocoupler |
| | Between Ports | Transformer |
| Cable | Recommended Cable | RS-232C: 24 AWG shielded multicore cable RS-485: 24 AWG twisted-pair shielded cable |

*1 Specify the values in the WindLDR **Function Area Settings**. The combination of "Data Bits: 7 bits" and "Parity: None" cannot be set.

RS232C Communication Cartridge and RS485 Communication Cartridge

The RS232C communication cartridge and RS485 communication cartridge can be used by connecting them to the following cartridge slots.

- Cartridge slot 1 and 2 of the All-in-One CPU module/CAN J1939 All-in-One CPU module
- Cartridge slot 1 and 2 of a cartridge base module added to the Plus CPU module
- Cartridge slot 3 of an HMI module added to the Plus CPU module

This port can be used to communicate with RS232C/RS485 communication-compatible external devices such as computers, operator interfaces, and printers. Maintenance communication, user communication, Modbus RTU communication (master/slave), and data link communication (master station/slave station) are possible.

| Type No. | | FC6A-PC1 | FC6A-PC3 |
|------------------------------------|-------------------|--|-------------------------------|
| Electrical Characteristics | | EIA RS232C | EIA RS485 |
| Maximum Communication Speed | | 115,200 bps | 115,200 bps |
| Communication Functions | | Maintenance communication, user communication, Modbus RTU communication (master/slave), data link communication (master station/slave station) | |
| Maximum Cable Length | | 5 m | 200 m |
| Isolation between Internal Circuit | | Not isolated | Not isolated |
| Cable | Recommended Cable | Shielded multicore: 24 AWG | Shielded twisted-pair: 24 AWG |

Bluetooth Communication Cartridge

The Bluetooth communication cartridge can be used by connecting it to the following cartridge slots.

- Cartridge slot 1 and 2 of the All-in-One CPU module/CAN J1939 All-in-One CPU module
- Cartridge slot 1 and 2 of a cartridge base module added to the Plus CPU module
- Cartridge slot 3 of an HMI module added to the Plus CPU module

Using Bluetooth, the FC6A can communicate with external devices that support Bluetooth communication, such as computers, smartphones, and barcode readers. Maintenance communication and user communication are possible.

| Type No. | | FC6A-PC4 |
|----------------------------|--|--|
| Electrical Characteristics | | Bluetooth ver.2.1 + EDR |
| Profile | | SPP (Serial Port Profile) iAP (iPod Accessory Protocol) |
| Communication Functions | | Maintenance communication, user communication |
| Transmission Distance | | 10 m (Class 2) |

Ethernet Port 1 and 2

This port supports the following communications and functions. This port has multiple connections, and each connection can use different communication protocols at the same time. See "Connection Settings" on page 3-19 for details.

Yes: Can be used as a communication port.

No: Cannot be used as a communication port.

—: Not equipped with the CPU module.

| Communication/Function | | All-in-One CPU Module/ J1939 All-in-One CPU Module | | Plus CPU Module | |
|---------------------------|--|---|-----------------|-----------------|-----------------|
| | | Ethernet Port 1 | Ethernet Port 2 | Ethernet Port 1 | Ethernet Port 2 |
| Ethernet Communication | Maintenance Communication (Server) | Yes | — | Yes | Yes |
| | User Communication (server/client) | | | | |
| | User Communication (UDP) | | | | |
| | Modbus TCP Communication (server/client) | | | | |
| | MC Protocol Communication (client) | No | | No | No |
| | BACnet/IP Communication | | | | Yes |
| | EtherNet/IP Communication | | | Yes | No |
| | MQTT Communication | | | | Yes |
| | FTP Server/Client Function | | | | No |
| | Web Server Function | | | | Yes |
| | PING Transmission | Yes | | | No |
| | EMAIL Transmission | No | | | No |

| | |
|------------------------------------|--|
| Communication Type | IEEE 802.3 compliant |
| Communication Speed | 10BASE-T, 100BASE-TX |
| Number of Connections | All-in-One CPU module/CAN J1939 All-in-One CPU module: 8 Plus CPU module: 16 |
| Communication Functions | Maintenance Communication (Server), user communication (server/client), user communication (UDP), Modbus TCP communication (server/client), MC protocol communication (client) |
| Web Server Function | Yes |
| Web Data Storage | FROM |
| Web Data Capacity *1 | 5.0 MB |
| Send E-mail Function | Yes |
| Connector | RJ45 |
| Cable | CAT 5. or higher STP |
| Maximum Cable Length | 100 m |
| Isolation between Internal Circuit | Pulse transformer isolated |

*1 Among the web data capacity, available storage for the user depends on whether to use the system web page and the web page editor.

| | | System Web Page | |
|-----------------|---------|-----------------|---------|
| | | Use | Not Use |
| Web Page Editor | Use | 2.5 MB | 3.0 MB |
| | Not Use | 4.5 MB | 5.0 MB |

1: GENERAL INFORMATION

CAN Port

The CAN J1939 All-in-One CPU module can use this port to perform J1939 communication.

| | |
|---|---|
| Communication Type | CAN bus communication |
| Communication Speed | 250 kbps |
| Communication Functions | J1939 communication |
| Connector | FC6A-PMTE05 |
| Cable | SAE-J1939-11 : Shielded twisted-pair |
| | SAE-J1939-15 : Unshielded twisted-pair |
| Maximum Cable Length | SAE-J1939-11 : 40 m, stub 1 m maximum |
| | SAE-J1939-15 : 40 m, stub 3 m maximum |
| Terminating Resistance | 120 Ω (0.5 W or higher) |
| Isolation between Internal Circuit | Power supply: Transformer isolated |
| | Signal: Galvanic isolation, photocoupler isolated |

HMI-Ethernet Port

The HMI-Ethernet port can only be used when a CPU module and an HMI module are connected.

This port can be used to communicate with Ethernet communication-compatible external devices such as computers and operator interfaces.

This port has eight connections that can be used with Ethernet communication. Each connection can be configured for maintenance communication (server).

This port also supports the web server function and the send E-mail function.

| | |
|---|----------------------------|
| Communication Type | IEEE 802.3 compliant |
| Communication Speed | 10BASE-T, 100BASE-TX |
| Number of Connections | 8 maximum |
| Communication Mode | Maintenance Communication |
| Web Server Function | Yes |
| Web Data Storage | FROM |
| Web Data Capacity *1 | 5.0 MB |
| Send E-mail Function | Yes |
| Connector | RJ45 |
| Cable | CAT 5. or higher STP |
| Maximum Cable Length | 100 m |
| Isolation between Internal Circuit | Pulse transformer isolated |

*1 Among the web data capacity, available storage for the user depends on whether to use the system web page and the web page editor.

| | | System Web Page | |
|-----------------|---------|-----------------|---------|
| | | Use | Not Use |
| Web Page Editor | Use | 2.5 MB | 3.0 MB |
| | Not Use | 4.5 MB | 5.0 MB |



Caution

- When accessing the FC6A over the Internet, adequate security measures for the network to prevent unauthorized access are required. Be sure to consult your network administrator or Internet service provider. IDEC bears no responsibility for damages or problems caused due to security in Ethernet communication.
- Restrict the access to FC6A with IP addresses and ports by using appropriate measures such as the firewall.

List of CPU Modules and Communication Interfaces

The following are the communication interfaces that the CPU modules are equipped with or can be expanded with. For the locations of the communication interfaces in each module, see Chapter 2 "Product Specifications" in the "FC6A Series MICROSmart User's Manual".

| Type No. | USB Port | Serial Port 1 | Communication Module Port 4 to 33 ^{*1} | Communication Cartridge | Ethernet Port 1 | Ethernet Port 2 | CAN Port | HMI-Ethernet Port ^{*4} |
|---------------|----------|---------------|---|-------------------------|-----------------|-----------------|----------|---------------------------------|
| FC6A-C16***E | 1 | 1 | 6 maximum | 1 maximum ^{*2} | 1 | — | — | 1 maximum |
| FC6A-C24***E | | | | 2 maximum ^{*2} | | | — | |
| FC6A-C40***E | | 1 | | | | | | |
| FC6A-C40***EJ | | | — | | | | | |
| FC6A-D****CEE | | — | 30 maximum | 3 maximum ^{*3} | | 1 | — | |

*1 Serial communication modules can be used by connecting them to the basic expansion side or expansion interface side of the CPU module. The communication ports are assigned to port 4, port 5, and so on in order from the ports closest to the CPU module.

*2 The communication cartridges can be used by connecting them to cartridge slots 1 and 2 of the All-in-One CPU module/CAN J1939 All-in-One CPU module.

*3 Communication cartridges can be used by connecting them to cartridge slot 1 and 2 of a cartridge base module connected to the Plus CPU module and cartridge slot 3 of an HMI module connected to the Plus CPU module.

*4 The HMI-Ethernet port is available on the HMI module.

Allocations of the Communication Port Numbers

All-in-One CPU module, CAN J1939 All-in-One CPU module, and Plus CPU module support serial communication with the target device. Serial communication is possible with built-in interface or expanded interface of each CPU module. Interfaces supporting the serial communication are as follows:

| | |
|---------------------------------|--|
| All-in-One CPU module | : Serial port 1, cartridge slots 1 and 2, communication module ports |
| CAN J1939 All-in-One CPU module | : Cartridge slots 1 and 2, communication module ports |
| Plus CPU module | : Cartridge slots 1 to 3, communication module ports |

In order to use each interface as communication port, the communication parameters must be configured according to the communication parameters of the target device. Configure the communication parameters in **Communication Ports** tab in the **Function Area Settings** dialog box. The allocation between each interface and communication port is described below.

For details on each setting, see "Communication Port Settings" on page 3-2.

■ Ports and Cartridge Slots 1 to 3 on the CPU Module and HMI Module

— : Not equipped with the CPU module.

No : Cannot be used as the serial communication ports.

| CPU Module | | Port | | | | | | Cartridge Slot | | |
|---------------------------------|------------------|---------------|----------|-----------------|-----------------|-------------------|----------|----------------|----------------|----------------|
| | | Serial Port 1 | USB Port | Ethernet Port 1 | Ethernet Port 2 | HMI-Ethernet Port | CAN Port | 1 | 2 | 3 |
| All-in-One CPU module | 16-I/O type | Port 1 | No | No | — | No*1 | — | Port 2 *2*5 | — | — |
| | 24-I/O type | | | | | | | | | |
| | 40-I/O type | | | | | | | | | |
| CAN J1939 All-in-One CPU module | — | No | | | No | | No | | Port 3 *2*5 | |
| 40-I/O type | | | | | | | | | | |
| Plus CPU module | Plus 16-I/O type | — | | | No | | No | No | — | Port 1 *3*5 |
| | Plus 32-I/O type | | | | | | | | | |

*1 When the HMI module is connected to the CPU module and HMI-Ethernet port is added.

*2 When a communication cartridge is installed on the cartridge slot.

*3 When the cartridge base module is connected to the CPU module and a communication cartridge is installed on the cartridge slot.

*4 When the HMI module is connected to the CPU module and a communication cartridge is installed on the cartridge slot.

*5 The combination of "Data Bits: 7" and "Parity: None" is not possible.

Note: For the locations of serial port 1 and cartridge slots 1 and 2, and for how to wire serial port 1, communication modules, and communication cartridges, see Chapter 2 "Product Specifications" in the FC6A Series MICROSmart User's Manual.

■ Ports on Communication Modules

| CPU Module | | Communication Module | | | | | |
|---------------------------------|------------------|----------------------|-----------|-----------|-------------|-----|-------------|
| | | 1st | 2nd | 3rd | 4th | ... | 15th |
| All-in-One CPU module | 16-I/O type | Port 4, 5 | Port 6, 7 | Port 8, 9 | *1 | *1 | *1 |
| | 24-I/O type | | | | | | |
| | 40-I/O type | | | | | | |
| CAN J1939 All-in-One CPU module | 40-I/O type | | | | Port 10, 11 | ... | Port 32, 33 |
| Plus CPU module | Plus 16-I/O type | | | | | | |
| | Plus 32-I/O type | | | | | | |

*1 Four or more communication modules cannot be connected to the All-in-One CPU module and CAN J1939 All-in-One CPU module.

Communication Functions Overview

The FC6A supports maintenance communication, user communication, Modbus communication, data link communication, J1939 communication, and BACnet/IP communication.

This section describes an overview of and connection examples for the communication functions.

Maintenance Communication

The maintenance communication of the FC6A enables you to check the operating status and I/O status of the FC6A, monitor and change device values, and download and upload user programs with the PLC programming software WindLDR installed on a computer. For details on maintenance communication, see "Maintenance Communication" on page 4-1.

Supported ports*1

| USB Port | Serial Port 1 | Ethernet Port 1, 2 and HMI-Ethernet Port*2 | Communication Cartridge and Communication Module | CAN Port |
|----------|---------------|--|--|----------|
| Yes | Yes | Yes | Yes | No |

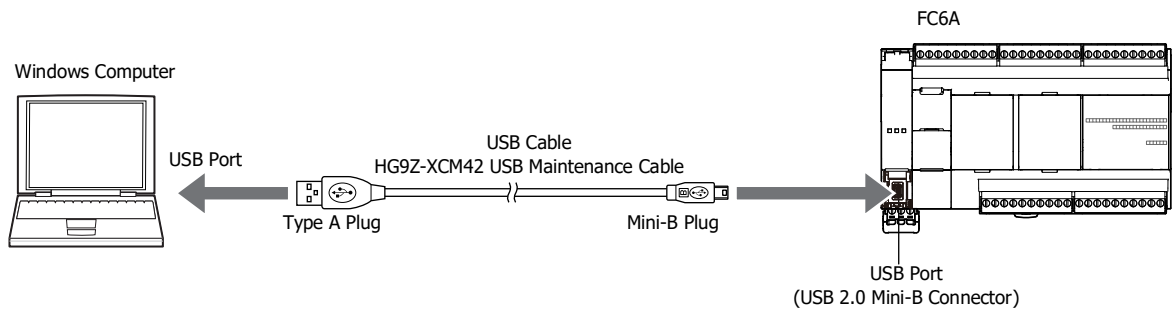
*1 Depending on the port that will be used, there are restrictions on the maintenance communication methods that can be used. For details on the restrictions, see the "Maintenance Communication" on page 4-1.

*2 Only maintenance communication can be used with the HMI-Ethernet port.

Note: When an HMI module is connected, maintenance communication can be performed by using the HMI-Ethernet port. For details, see Chapter 7 "HMI Function" in "FC6A Series MICROSmart User's Manual".

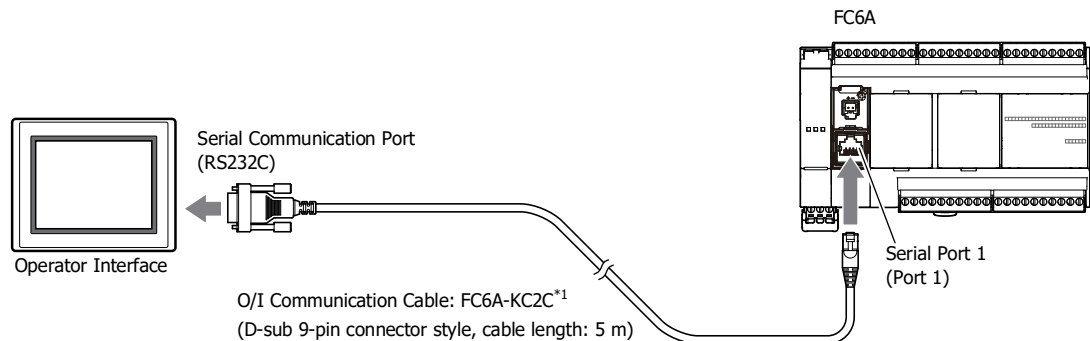
■ 1:1 Maintenance Communication Using USB Port

This example shows a 1:1 maintenance communication system in which a FC6A and a computer are connected with USB. The USB maintenance cable (HG9Z-XCM42) is used.



■ 1:1 Maintenance Communication Example with an IDEC Operator Interface Using Serial Port 1

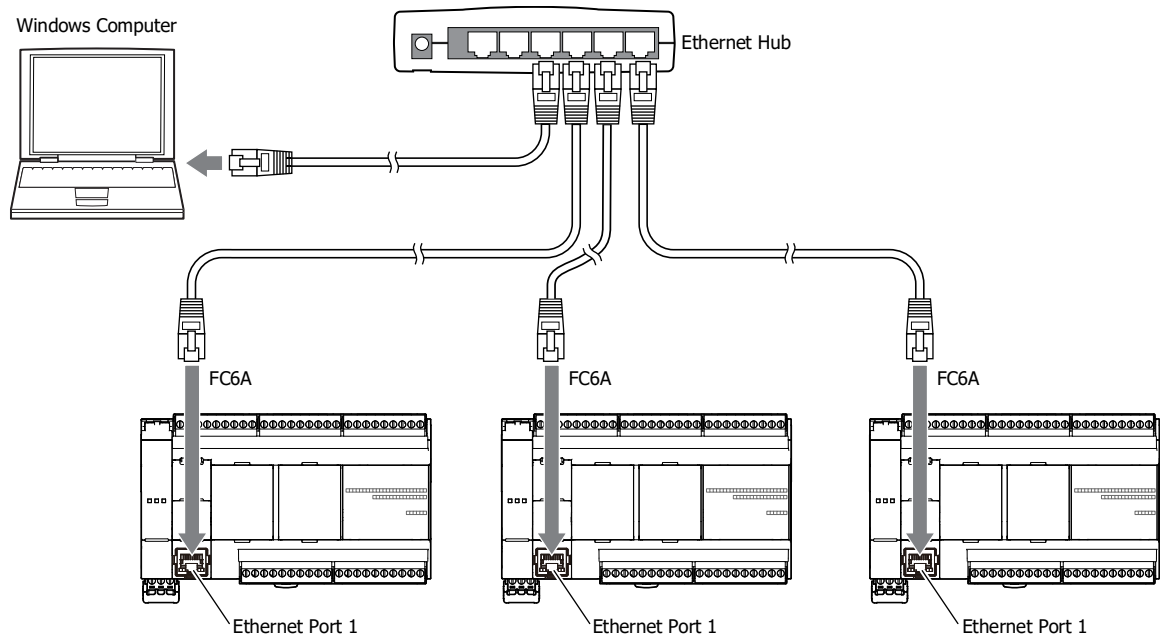
This example shows maintenance communication between the FC6A and an operator interface, as well as monitoring and changing FC6A device values using the operator interface. An IDEC operator interface is connected to serial port 1 of the FC6A.



*1 For details on O/I communication cables, see Appendix "Cables" in the "FC6A Series MICROSmart User's Manual".

■ 1:N Maintenance Communication Using Ethernet Port 1

This example shows a 1:N maintenance communication system in which three FC6A and a computer are connected over Ethernet. The Ethernet cables are connected to the Ethernet port 1 of three FC6A, and those FC6A are connected to the computer via an Ethernet hub.



User Communication

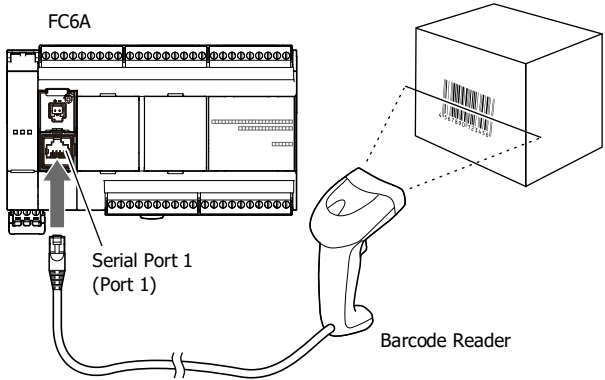
The user communication of the FC6A enables you to control external devices such as computers, printers, and barcode readers. For details on user communication, see "User Communication Instructions" on page 5-1.

Supported ports

| USB Port | Serial Port 1 | Ethernet Port 1 and 2 | Communication Cartridge and Communication Module | CAN Port |
|----------|---------------|-----------------------|--|----------|
| No | Yes | Yes | Yes | No |

■ User Communication Using Serial Port 1

This example shows a system in which a FC6A receives the data read by a barcode reader. A barcode reader is connected to port 1 of the FC6A.



Modbus Communication

The FC6A supports Modbus RTU protocol and can be used as either a Modbus communication master or slave. With Modbus communication, the FC6A can monitor and modify the data of inverters and temperature controllers.

Ethernet ports 1 and 2 also support the Modbus TCP communication protocol. For details on Modbus communication, see "Modbus Communication" on page 6-1.

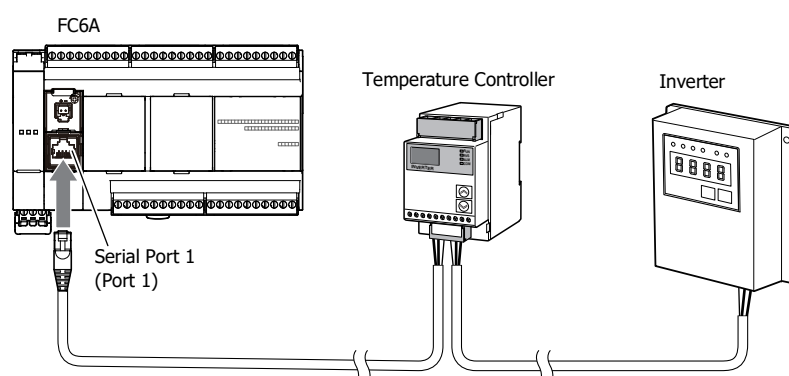
Supported ports

| USB Port | Serial Port 1 | Ethernet Port 1 and 2 | Communication Cartridge ^{*1} and Communication Module | CAN Port |
|----------|---------------|-----------------------|--|----------|
| No | Yes | Yes | Yes | No |

^{*1} Only the RS-232C communication cartridge and RS-485 communication cartridge are supported.

■ Modbus RTU Communication Using Serial Port 1

This example shows a system in which a FC6A is communicating with a temperature controller and an inverter that support Modbus RTU. The A temperature controller is connected to port 1 of the FC6A.



Data Link Communication

The FC6A supports data link communication, and it can share data between CPU modules using serial port 1 and cartridge slots. The FC6A can also share data with FC5A Series and FC4A Series CPU modules. Configure the settings in WindLDR to enable distributed control of a maximum of 31 CPU modules.

For details about the data link communication, see "Data Link Communication" on page 7-1.

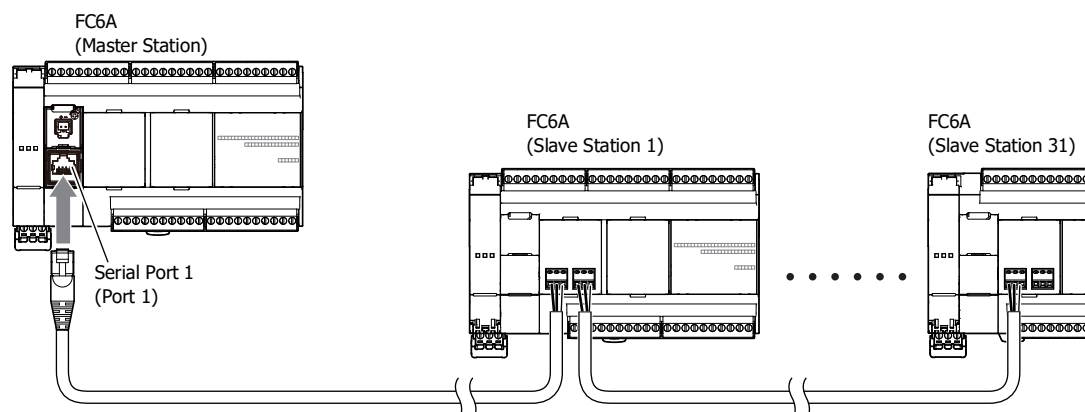
Supported ports

| USB Port | Serial Port 1 | Ethernet Port 1 and 2 | Communication Cartridge ^{*1} and Communication Module | CAN Port |
|----------|---------------|-----------------------|--|----------|
| No | Yes | No | Yes | No |

^{*1} Only the RS-232C communication cartridge and RS-485 communication cartridge are supported.

■ Data Link Communication Using Serial Port 1

This example shows communication between multiple CPU modules with the FC6A as the master station. A slave station CPU module is connected to port 1 of the FC6A.

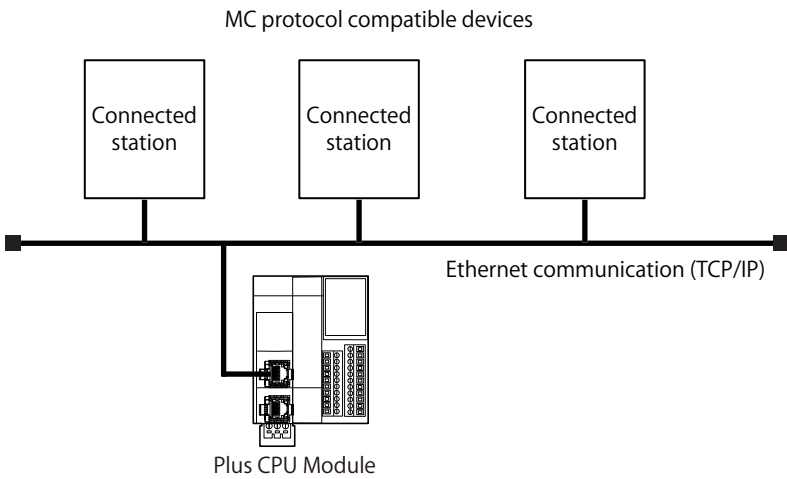


MC Protocol Communication

The Plus CPU module can read and write device values of MC protocol compatible device as client in MC Protocol Communication using Ethernet port 1 or 2. For details, see "MC Protocol Communication" on page 15-1.

Supported ports

| USB Port | Serial Port 1 | Ethernet Port 1 | Ethernet Port 2 | Communication Cartridge and Communication Module | CAN Port |
|----------|---------------|-----------------|-----------------|--|----------|
| No | No | Yes | Yes | No | No |



BACnet/IP Communication

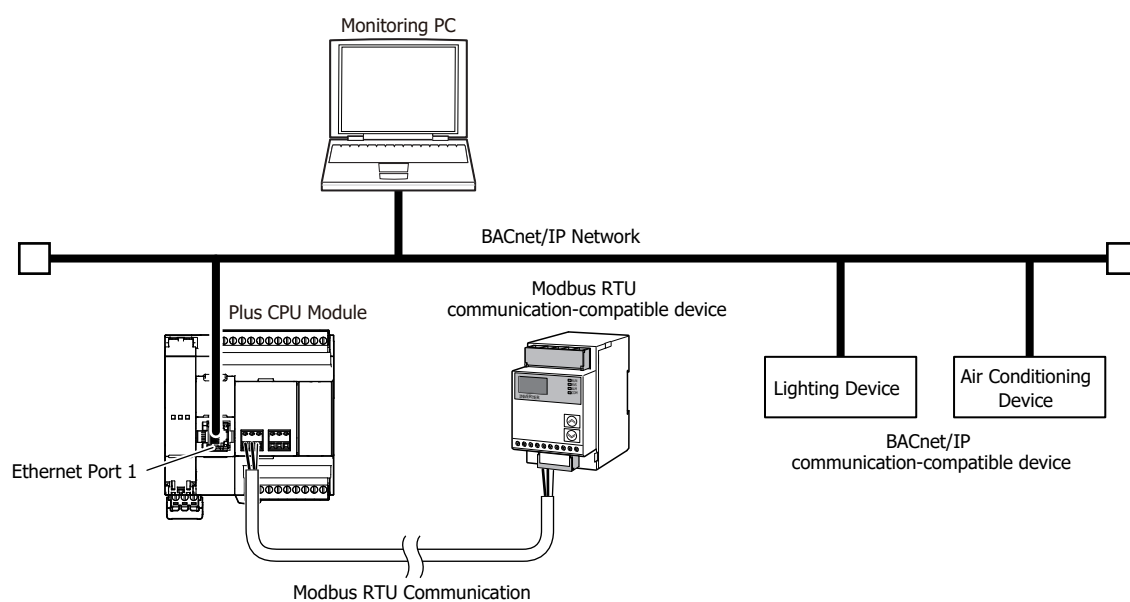
The Plus CPU module can be connected to a BACnet/IP network using Ethernet port 1 and communicate with other BACnet/IP communication-compatible external devices. For details on BACnet/IP communication, see Chapter 1 "BACnet/IP Communication" in the "Network User's Manual".

Supported ports

| USB Port | Serial Port 1 | Ethernet Port 1 | Ethernet Port 2 | Communication Cartridge and Communication Module | CAN Port |
|----------|---------------|-----------------|-----------------|--|----------|
| No | No | Yes | No | No | No |

■ BACnet/IP Communication Using Ethernet Port 1

This example shows the Plus CPU module aggregating information from Modbus RTU communication-compatible devices, communicating with a BACnet/IP communication-compatible device connected to a BACnet/IP network, and making that information publicly available.



EtherNet/IP communication

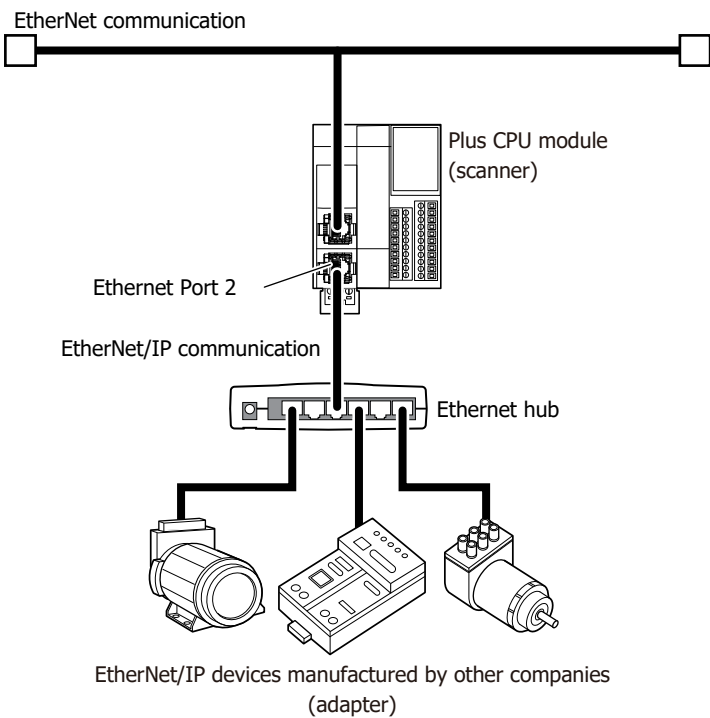
The Plus CPU module can be connected to an existing Ethernet network using Ethernet port 2 and communicate with other EtherNet/IP communication-compatible devices. EtherNet/IP communication uses standard Ethernet technologies, which allows networks to be built that include various Ethernet-compatible devices. For details on EtherNet/IP communication, see Chapter 2 "EtherNet/IP Communication" in the "Network User's Manual".

Supported ports

| USB Port | Serial Port 1 | Ethernet Port 1 | Ethernet Port 2 | Communication Cartridge and Communication Module | CAN Port |
|----------|---------------|-----------------|-----------------|--|----------|
| No | No | No | Yes | No | No |

■ EtherNet/IP Communication Using Ethernet Port 2

This example shows the Plus CPU module communicating with EtherNet/IP communication-compatible devices and controlling those devices.



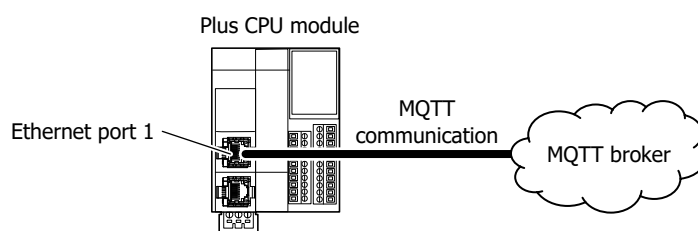
MQTT Communication

The Plus CPU module can communicate with a broker as a client (publisher and subscriber) in MQTT communication using Ethernet port 1. For details on MQTT communication, see Chapter 3 "MQTT Communication" in the "Network User's Manual".

Supported ports

| USB Port | Serial Port 1 | Ethernet Port 1 | Ethernet Port 2 | Communication Cartridge and Communication Module | CAN Port |
|----------|---------------|-----------------|-----------------|--|----------|
| No | No | Yes | No | No | No |

■ MQTT Communication Using Ethernet Port 1



J1939 Communication

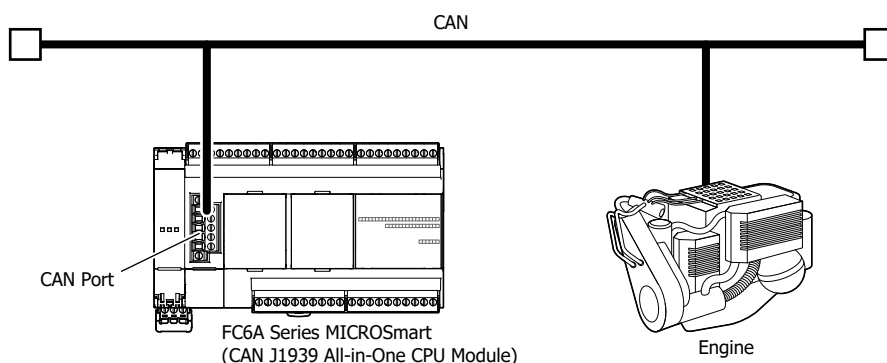
The CAN J1939 All-in-One CPU module can be connected to a J1939 communication network using the CAN port and it can communicate with other J1939 communication-compatible devices. Messages that conform to the SAE J1939 standard can be sent and received. For details on J1939 communication, see "J1939 Communication" on page 8-1.

Supported ports

| USB Port | Serial Port 1 | Ethernet Port 1 and 2 | Communication Cartridge | CAN Port |
|----------|---------------|-----------------------|-------------------------|----------|
| No | No | No | No | Yes |

■ J1939 Communication Using CAN Port

This example shows the FC6A communicating with a J1939-compatible engine. The CAN port of the CAN J1939 All-in-One CPU module is connected to the engine.



2: DEVICES

This chapter provides detailed descriptions of the allocations of devices such as inputs, outputs, internal relays, registers, timers, and counters that are used in the basic and advanced instructions, as well as details about the allocations of special internal relays and special data registers.

Please use this chapter as a reference for the devices.

Note: The programming and operation of FC6A user programs requires specialist knowledge.

Take the time to develop a thorough understanding of the contents and programs in this manual before using the FC6A.

Device Addresses

All-in-One CPU Module/J1939 All-in-One CPU Module

| Device | Symbol | Unit | Range (Points) | | |
|--------------------------------------|--------|----------|--|--|--|
| | | | 16-I/O Type | 24-I/O Type | 40-I/O Type |
| Inputs ^{*1} | I | Bit | I0 - I10 (9 points) | I0 - I15 (14 points) | I0 - I27 (24 points) |
| Expansion Inputs ^{*1} | I | Bit | I30 - I187 (128 points) I190 - I507 ^{*2} (256 points) I630 - I633 ^{*4} (4 points) | I30 - I307 (224 points) I310 - I627 ^{*3} (256 points) I630 - I633 ^{*4} (4 points) | I30 - I307 (224 points) I310 - I627 ^{*3} (256 points) I630 - I637 ^{*4} (8 points) |
| Output ^{*1} | Q | Bit | Q0 - Q6 (7 points) | Q0 - Q11 (10 points) | Q0 - Q17 (16 points) |
| Expansion Outputs ^{*1} | Q | Bit | Q30 - Q187 (128 points) Q190 - Q507 ^{*2} (256 points) Q630 - Q633 ^{*4} (4 points) | Q30 - Q307 (224 points) Q310 - Q627 ^{*3} (256 points) Q630 - Q633 ^{*4} (4 points) | Q30 - Q307 (224 points) Q310 - Q627 ^{*3} (256 points) Q630 - Q637 ^{*4} (8 points) |
| Internal Relay ^{*1} | M | Bit | M0 - M7997 (6,400 points) M10000 - M17497 (6,000 points) | | |
| Special Internal Relay ^{*1} | M | Bit | M8000 - M8317 (256 points) | | |
| Shift Register | R | Bit | R0 - R255 (256 points) | | |
| Timer | T | Bit/Word | T0 - T1023 (1,024 points) | | |
| Counter | C | Bit/Word | C0 - C511 (512 points) | | |
| Data Register | D | Bit/Word | D0000 - D7999 (8,000 points) D10000 to D55999 (46,000 points) | | |
| Special Data Register | D | Bit/Word | D8000 - D8499 (500 points) | | |

*1 The least significant digit of the device address is an octal number (0 to 7).

*2 I190 to I507 and Q190 to Q507 are devices that can only be used when expansion modules are connected at the expansion interface side using the expansion interface module (expander).

*3 I310 to I627 and Q310 to Q627 are devices that can only be used when expansion modules are connected at the expansion interface side using the expansion interface module (expander).

*4 I630 to I637 and Q630 to Q637 are devices that can be used only when I/O cartridges are connected.

2: DEVICES

Plus CPU module

| Device | Symbol | Unit | Range (Points) | |
|--------------------------------------|--------|-------------------------|---|-------------------------|
| | | | Plus 16-I/O Type | Plus 32-I/O Type |
| Inputs ^{*1} | I | Bit | I0 - I7 (8 points) | I0 - I17 (16 points) |
| Expansion Inputs ^{*1} | I | Bit | I30 - I307 (224 points) I310 - I627 ^{*2} (256 points) I630 - I643 ^{*3} (12 points) I1000 - I10597 ^{*4} (2,016 points) | |
| Output ^{*1} | Q | Bit | Q0 - Q7 (8 points) | Q0 - Q17 (16 points) |
| Expansion Outputs ^{*1} | Q | Bit | Q30 - Q307 (224 points) Q310 - Q627 ^{*2} (256 points) Q630 - Q643 ^{*3} (12 points) Q1000 - Q10597 ^{*4} (2,016 points) | |
| Internal Relay ^{*1} | M | Bit | M0 - M7997 (6,400 points) M10000 - M21247 (9,000 points) | |
| Special Internal Relay ^{*1} | M | Bit | M8000 - M9997 (1,600 points) | |
| Shift Register | R | Bit | R0 - R255 (256 points) | |
| Timer | T | Bit/Word | T0 - T1999 (2,000 points) | |
| Counter | C | Bit/Word | C0 - C511 (512 points) | |
| Data Register | D | Bit/Word | D0000 - D7999 (8,000 points) D10000 - D61999 (52,000 points) | |
| Non-retentive Data Register | D | Bit ^{*7} /Word | D70000 - D269999 ^{*5} (200,000 points) | |
| Special Data Register | D | Bit/Word | D8000 - D8899 (900 points) | |
| Index Register ^{*6} | P | 2 words | P0 - P15 (16 points) | |

*1 The least significant digit of the device address is an octal number (0 to 7).

*2 I1310 to I627 and Q310 to Q627 are devices that can only be used when expansion modules are connected at the expansion interface side using the expansion interface module (expander). (Node 0)

*3 I630 to I643 and Q630 to Q643 are devices that can be used only when I/O cartridges are connected.

*4 I1000 to I10597 and Q1000 to Q10597 are devices that can be used only when expansion modules are connected using the expansion interface modules (remote master and slaves) and the expansion interface modules (expander). (Node 1 to 10)

*5 D70000 to D269999 cannot be designated as "Keep." Data register values are kept when you switch the PLC from Stop to Run, but those values are cleared at power up.

*6 The data type that can be used is L (Long) only.

*7 Usable only in scripts executed by the SCRPT instruction and as argument devices used in UMACRO instructions.

■ Inputs (I), Expansion Inputs (I)

Devices that input on/off information from external devices to the FC6A.

■ Outputs (Q), Expansion Outputs (Q)

Devices that output on/off information from the FC6A to external devices.

■ Internal Relays (M)

Bit devices used internally on the FC6A.

■ Special Internal Relays (M)

Bit devices used internally on the FC6A. Special functions are assigned to each bit.

■ Shift Registers (R)

Bit devices that are used with the SFR instruction and the SFRN instruction. The bit sequence of the data is shifted according to pulse input.

■ Timer (T)

Timers used internally in the FC6A. There are three devices: Timer bits (symbol: T, unit: bit), timer preset values (symbol: TP, unit: word), and timer current values (symbol: TC, unit: word).

These can be used as an on-delay timer or an off-delay timer. For details on timers (T), see Chapter 3 "Using Timer or Counter as Source Device" in the "Ladder Programming Manual".

■ Counters (C)

Counters used internally in the FC6A. There are three devices: Counter bits (symbol: C, unit: bit), counter preset values (symbol: CP, unit: word), and counter current values (symbol: CC, unit: word). These can be used as an adding counter or a reversible counter. For details on counters (C), see Chapter 3 "Using Timer or Counter as Source Device" in the "Ladder Programming Manual".

■ Data Registers (D)

Word devices that are used for writing numerical data internally in the FC6A. These can also be used as bit devices.

■ Special Data Registers (D)

Word devices that are used for writing numerical data internally in the FC6A. Special functions are assigned to each data register. These can also be used as bit devices.

Notes:

- Although the device symbol for internal relays (M0000 to M7997, M10000 to M21247) and special internal relays (M8000 to M9997) is the same ("M"), the device characteristics are different. Special functions are assigned to each bit of the special internal relays.
- Although the device symbol for the data registers (D0000 to D7999, D10000 to D61999, D70000 to D269999) and special data registers (D8000 to D8899) is the same ("D"), the device characteristics are different. Special functions are assigned to each special data register.

Special Internal Relay

Special Internal Relay Device Addresses


Warning

Do not write to data in the area marked as reserved in the special internal relays list. Otherwise the system may not operate correctly.

Note: R/W is an abbreviation for read/write.

The notation for the R/W field is as follows.

R/W: The device can be both read from and written to

R: Read-only

W: Write-only

| Device Address | Description | | When Stopped | Power OFF | R/W |
|----------------|--|-------------------------|--------------|------------|-----|
| M8000 | Start Control | | Maintained | Maintained | R/W |
| M8001 | 1-s Clock Reset | | Cleared | Cleared | R/W |
| M8002 | All Outputs OFF | | Cleared | Cleared | R/W |
| M8003 | Carry (Cy) or Borrow (Bw) | | Cleared | Cleared | R/W |
| M8004 | User Program Execution Error | | Cleared | Cleared | R/W |
| M8005 | Communication Error | | Maintained | Cleared | R/W |
| M8006 | Communication Prohibited Flag (When Data Link Master) | | Maintained | Maintained | R/W |
| M8007 | Initialization Flag (When Data Link Master)/Stop Communication Flag (When Data Link Slave) | | Cleared | Cleared | R/W |
| M8010 | Status LED Operation | | Operating | Cleared | R/W |
| M8011 M8012 | — Reserved — | | — | — | — |
| M8013 | Calendar/Clock Data Write/Adjust Error Flag | | Operating | Cleared | R/W |
| M8014 | Calendar/Clock Data Read Error Flag | | Operating | Cleared | R/W |
| M8015 | — Reserved — | | — | — | — |
| M8016 | Calendar Data Write Flag | | Operating | Cleared | R/W |
| M8017 | Clock Data Write Flag | | Operating | Cleared | R/W |
| M8020 | Calendar/Clock Data Write Flag | | Operating | Cleared | R/W |
| M8021 | Clock Data Adjust Flag | | Operating | Cleared | R/W |
| M8022 | User Communication Receive Instruction Cancel Flag (Port 1) | | Cleared | Cleared | R/W |
| M8023 | User Communication Receive Instruction Cancel Flag (Port 2) | | Cleared | Cleared | R/W |
| M8024 | BMOV/WSFT Executing Flag | | Maintained | Maintained | R/W |
| M8025 | Maintain Outputs While Stopped | | Maintained | Cleared | R/W |
| M8026 | User Communication Receive Instruction Cancel Flag (Port 3) | | Cleared | Cleared | R/W |
| M8027 | High-speed Counter (Group 1/I0) | Count Direction Flag | Maintained | Cleared | R/W |
| M8030 | | Comparison Output Reset | Cleared | Cleared | R/W |
| M8031 | | Gate Input | Maintained | Cleared | R/W |
| M8032 | | Reset Input | Maintained | Cleared | R/W |
| M8033 | User Communication Receive Instruction Cancel Flag (Port 4) | | Cleared | Cleared | R/W |
| M8034 | High-speed Counter (Group 3/I3) | Comparison Output Reset | Cleared | Cleared | R/W |
| M8035 | | Gate Input | Maintained | Cleared | R/W |
| M8036 | | Reset Input | Maintained | Cleared | R/W |
| M8037 | — Reserved — | | — | — | — |
| M8040 | High-speed Counter (Group 4/I4) | Comparison Output Reset | Cleared | Cleared | R/W |
| M8041 | | Gate Input | Maintained | Cleared | R/W |
| M8042 | | Reset Input | Maintained | Cleared | R/W |
| M8043 | High-speed Counter (Group 5/I6) | Count Direction Flag | Maintained | Cleared | R/W |
| M8044 | | Comparison Output Reset | Cleared | Cleared | R/W |
| M8045 | | Gate Input | Maintained | Cleared | R/W |
| M8046 | | Reset Input | Maintained | Cleared | R/W |
| M8047 M8050 | — Reserved — | | — | — | — |

| Device Address | Description | When Stopped | Power OFF | R/W |
|----------------|---|-------------------------|------------|-----|
| M8051 | High-speed Counter (Group 2/I1) | Comparison Output Reset | Cleared | R/W |
| M8052 | | Gate Input | Maintained | R/W |
| M8053 | | Reset Input | Maintained | R/W |
| M8054 | | Comparison ON Status | Maintained | R |
| M8055 | | Overflow | Maintained | R |
| M8056 | — Reserved — | | — | — |
| M8057 | High-speed Counter (Group 6/I7) | Comparison Output Reset | Cleared | R/W |
| M8060 | | Gate Input | Maintained | R/W |
| M8061 | | Reset Input | Maintained | R/W |
| M8062 | | Comparison ON Status | Maintained | R |
| M8063 | | Overflow | Maintained | R |
| M8064 to M8067 | — Reserved — | | — | — |
| M8070 | SD Memory Card Mount Status | | Maintained | R |
| M8071 | Accessing SD Memory Card | | Maintained | R |
| M8072 | Unmount SD Memory Card | | Operating | R/W |
| M8073 | Function Switch Status | | Operating | R |
| M8074 | Battery Voltage Measurement Flag | | Operating | R/W |
| M8075 to M8077 | — Reserved — | | — | — |
| M8080 | Data Link Slave 1 Communication Completed Relay (When Data Link Master) | | Operating | R |
| M8081 | Data Link Slave 2 Communication Completed Relay | | Operating | R |
| M8082 | Data Link Slave 3 Communication Completed Relay | | Operating | R |
| M8083 | Data Link Slave 4 Communication Completed Relay | | Operating | R |
| M8084 | Data Link Slave 5 Communication Completed Relay | | Operating | R |
| M8085 | Data Link Slave 6 Communication Completed Relay | | Operating | R |
| M8086 | Data Link Slave 7 Communication Completed Relay | | Operating | R |
| M8087 | Data Link Slave 8 Communication Completed Relay | | Operating | R |
| M8090 | Data Link Slave 9 Communication Completed Relay | | Operating | R |
| M8091 | Data Link Slave 10 Communication Completed Relay | | Operating | R |
| M8092 | Data Link Slave 11 Communication Completed Relay | | Operating | R |
| M8093 | Data Link Slave 12 Communication Completed Relay | | Operating | R |
| M8094 | Data Link Slave 13 Communication Completed Relay | | Operating | R |
| M8095 | Data Link Slave 14 Communication Completed Relay | | Operating | R |
| M8096 | Data Link Slave 15 Communication Completed Relay | | Operating | R |
| M8097 | Data Link Slave 16 Communication Completed Relay | | Operating | R |
| M8100 | Data Link Slave 17 Communication Completed Relay | | Operating | R |
| M8101 | Data Link Slave 18 Communication Completed Relay | | Operating | R |
| M8102 | Data Link Slave 19 Communication Completed Relay | | Operating | R |
| M8103 | Data Link Slave 20 Communication Completed Relay | | Operating | R |
| M8104 | Data Link Slave 21 Communication Completed Relay | | Operating | R |
| M8105 | Data Link Slave 22 Communication Completed Relay | | Operating | R |
| M8106 | Data Link Slave 23 Communication Completed Relay | | Operating | R |
| M8107 | Data Link Slave 24 Communication Completed Relay | | Operating | R |
| M8110 | Data Link Slave 25 Communication Completed Relay | | Operating | R |
| M8111 | Data Link Slave 26 Communication Completed Relay | | Operating | R |
| M8112 | Data Link Slave 27 Communication Completed Relay | | Operating | R |
| M8113 | Data Link Slave 28 Communication Completed Relay | | Operating | R |
| M8114 | Data Link Slave 29 Communication Completed Relay | | Operating | R |
| M8115 | Data Link Slave 30 Communication Completed Relay | | Operating | R |
| M8116 | Data Link Slave 31 Communication Completed Relay | | Operating | R |
| M8117 | Data Link All Slaves Communication Completed Relay | | Operating | R |
| M8120 | Initialize Pulse | | Cleared | R |
| M8121 | 1-s Clock | | Operating | R |
| M8122 | 100-ms Clock | | Operating | R |

2: DEVICES

| Device Address | Description | | When Stopped | Power OFF | R/W |
|----------------|---|--------------------------------|--------------|-----------|-----|
| M8123 | 10-ms Clock | | Operating | Cleared | R |
| M8124 | Timer/Counter Preset Value Changed | | Maintained | Cleared | R |
| M8125 | In-operation Output | | Cleared | Cleared | R |
| M8126 | 1 Scan ON After Run-Time Download Completes | | Cleared | Cleared | R |
| M8127 | — Reserved — | | — | — | — |
| M8130 | High-speed Counter (Group 1/I0) | Reset Status | Maintained | Cleared | R |
| M8131 | | Comparison ON Status | Maintained | Cleared | R |
| M8132 | — Reserved — | | — | — | — |
| M8133 | High-speed Counter (Group 3/I3) | Comparison ON Status | Maintained | Cleared | R |
| M8134 | High-speed Counter (Group 4/I4) | Comparison ON Status | Maintained | Cleared | R |
| M8135 | High-speed Counter (Group 5/I6) | Reset Status | Maintained | Cleared | R |
| M8136 | | Comparison ON Status | Maintained | Cleared | R |
| M8137 | Interrupt Input I0 Status (Group 1/I0) | (ON: Allowed, OFF: Prohibited) | Cleared | Cleared | R |
| M8140 | Interrupt Input I1 Status (Group 2/I1) | | Cleared | Cleared | R |
| M8141 | Interrupt Input I3 Status (Group 3/I3) | | Cleared | Cleared | R |
| M8142 | Interrupt Input I4 Status (Group 4/I4) | | Cleared | Cleared | R |
| M8143 | Interrupt Input I6 Status (Group 5/I6) | | Cleared | Cleared | R |
| M8144 | Timer Interrupt Status | | Cleared | Cleared | R |
| M8145 | User Communication Receive Instruction Cancel Flag (Port 5) | | Cleared | Cleared | R/W |
| M8146 | User Communication Receive Instruction Cancel Flag (Port 6) | | Cleared | Cleared | R/W |
| M8147 | User Communication Receive Instruction Cancel Flag (Port 7) | | Cleared | Cleared | R/W |
| M8150 | Comparison Result 1 | | Maintained | Cleared | R |
| M8151 | Comparison Result 2 | | Maintained | Cleared | R |
| M8152 | Comparison Result 3 | | Maintained | Cleared | R |
| M8153 | Catch Input ON/OFF Status | Group 1/I0 | Maintained | Cleared | R |
| M8154 | | Group 2/I1 | Maintained | Cleared | R |
| M8155 | | Group 3/I3 | Maintained | Cleared | R |
| M8156 | | Group 4/I4 | Maintained | Cleared | R |
| M8157 | | Group 5/I6 | Maintained | Cleared | R |
| M8160 | | Group 6/I7 | Maintained | Cleared | R |
| M8161 | High-speed Counter (Group 1/I0) | Overflow | Maintained | Cleared | R |
| M8162 | | Underflow | Maintained | Cleared | R |
| M8163 | High-speed Counter (Group 5/I6) | Overflow | Maintained | Cleared | R |
| M8164 | | Underflow | Maintained | Cleared | R |
| M8165 | High-speed Counter (Group 3/I3) | Overflow | Maintained | Cleared | R |
| M8166 | High-speed Counter (Group 4/I4) | Overflow | Maintained | Cleared | R |
| M8167 | Interrupt Input I7 Status (Group 6/I7) | (ON: Allowed, OFF: Prohibited) | Maintained | Cleared | R |
| M8170 | User Communication Receive Instruction Cancel Flag (Port 8) | | Cleared | Cleared | R/W |
| M8171 | — Reserved — | | — | — | — |
| M8172 | Transistor Source Output Overcurrent Detection | Group 1 | Operating | Cleared | R |
| M8173 | | Group 2 | Operating | Cleared | R |
| M8174 | | Group 3 | Operating | Cleared | R |
| M8175 | | Group 4 | Operating | Cleared | R |
| M8176 | User Communication Receive Instruction Cancel Flag (Port 9) | | Cleared | Cleared | R/W |
| M8177 to M8183 | — Reserved — | | — | — | — |
| M8184 | Change HMI Module Network Settings Trigger | | Operating | Cleared | R/W |
| M8185 | In Daylight Saving Time Period | | Operating | Cleared | R |
| M8186 | Ethernet Port 1 Executing Auto Ping | | Operating | Cleared | R |
| M8187 | Ethernet Port 1 Auto Ping Stop Flag | | Operating | Cleared | R/W |
| M8190 | Change CPU Module Ethernet Port 1 Network Settings Trigger | | Operating | Cleared | R/W |
| M8191 | SNTP Acquisition Flag | | Operating | Cleared | R/W |

| Device Address | Description | | When Stopped | Power OFF | R/W |
|----------------|---|--------------------------------------|--------------|-----------|-----|
| M8192 | Interrupt Input I0 Edge | On: Rising Edge Off: Falling Edge | Cleared | Cleared | R |
| M8193 | Interrupt Input I3 Edge | | Cleared | Cleared | R |
| M8194 | Interrupt Input I4 Edge | | Cleared | Cleared | R |
| M8195 | Interrupt Input I6 Edge | | Cleared | Cleared | R |
| M8196 | Interrupt Input I7 Edge | | Cleared | Cleared | R |
| M8197 | Interrupt Input I1 Edge | | Cleared | Cleared | R |
| M8200 | User Communication Receive Instruction Cancel Flag | Connection 1 | Cleared | Cleared | R/W |
| M8201 | | Connection 2 | Cleared | Cleared | R/W |
| M8202 | | Connection 3 | Cleared | Cleared | R/W |
| M8203 | | Connection 4 | Cleared | Cleared | R/W |
| M8204 | | Connection 5 | Cleared | Cleared | R/W |
| M8205 | | Connection 6 | Cleared | Cleared | R/W |
| M8206 | | Connection 7 | Cleared | Cleared | R/W |
| M8207 | | Connection 8 | Cleared | Cleared | R/W |
| M8210 | — Reserved — | | — | — | — |
| M8211 | HMI Module Send E-mail Server Settings Initialization | | Operating | Cleared | R/W |
| M8212 | Connection Status (ON: Connected, OFF: Not Connected) | Connection 1 | Operating | Cleared | R |
| M8213 | | Connection 2 | Operating | Cleared | R |
| M8214 | | Connection 3 | Operating | Cleared | R |
| M8215 | | Connection 4 | Operating | Cleared | R |
| M8216 | | Connection 5 | Operating | Cleared | R |
| M8217 | | Connection 6 | Operating | Cleared | R |
| M8220 | | Connection 7 | Operating | Cleared | R |
| M8221 | | Connection 8 | Operating | Cleared | R |
| M8222 | Disconnect User Communication Connection | Connection 1 | Operating | Cleared | R/W |
| M8223 | | Connection 2 | Operating | Cleared | R/W |
| M8224 | | Connection 3 | Operating | Cleared | R/W |
| M8225 | | Connection 4 | Operating | Cleared | R/W |
| M8226 | | Connection 5 | Operating | Cleared | R/W |
| M8227 | | Connection 6 | Operating | Cleared | R/W |
| M8230 | | Connection 7 | Operating | Cleared | R/W |
| M8231 | | Connection 8 | Operating | Cleared | R/W |
| M8232 | HMI Module Connection Information Reference Connection Status | | Operating | Cleared | R |
| M8233 to M8247 | — Reserved — | | — | — | — |
| M8250 | Download from SD Memory Card Execution Flag | | Operating | Cleared | R/W |
| M8251 | Upload to SD Memory Card Execution Flag | | Operating | Cleared | R/W |
| M8252 | Executing SD Memory Card Download | | Operating | Cleared | R |
| M8253 | Executing SD Memory Card Upload | | Operating | Cleared | R |
| M8254 | SD Memory Card Download/Upload Execution Completion Output | | Operating | Cleared | R |
| M8255 | SD Memory Card Download/Upload Execution Error Output | | Operating | Cleared | R |
| M8256 M8257 | — Reserved — | | — | — | — |
| M8260 | Write Recipe Execution Flag | | Operating | Cleared | R/W |
| M8261 | Read Recipe Execution Flag | | Operating | Cleared | R/W |
| M8262 | Executing Write Recipe | | Operating | Cleared | R/W |
| M8263 | Executing Read Recipe | | Operating | Cleared | R/W |
| M8264 | Recipe Channel Execution Completed Output | | Operating | Cleared | R/W |
| M8265 | Recipe Execution Error Output | | Operating | Cleared | R/W |
| M8266 | Recipe Block Execution Completed Output | | Operating | Cleared | R/W |
| M8267 | Read Restriction for Recipe Internal Memory (ROM-Range) | | Operating | Cleared | R |
| M8270 | — Reserved — | | — | — | — |
| M8271 | Download MQTT Basic Settings from SD Memory Card Execution Flag | | Operating | Cleared | R/W |
| M8272 | Download MQTT Basic Settings from SD Memory Card Execution Completed Output | | Operating | Cleared | R |

2: DEVICES

| Device Address | Description | | When Stopped | Power OFF | R/W |
|----------------|---|-------------------|--------------|-----------|-----|
| M8273 | Download MQTT Basic Settings from SD Memory Card Error Output | | Operating | Cleared | R |
| M8274 to M8297 | — Reserved — | | — | — | — |
| M8300 | J1939 Communication Permitted Flag | | Cleared | Cleared | R/W |
| M8301 | J1939 Online Status | | Cleared | Cleared | R |
| M8302 | J1939 Local Station Address Confirmation Status | | Cleared | Cleared | R |
| M8303 | J1939 Communication Error Output | | Cleared | Cleared | R |
| M8304 | J1939 Communication Bus Off Occurrence Output | | Cleared | Cleared | R |
| M8305 to M8310 | — Reserved — | | — | — | — |
| M8311 | ESC+Key Input (Up) | ESC+Key Input (↵) | Cleared | Cleared | R |
| M8312 | ESC+Key Input (Down) | ESC+Key Input (⇩) | Cleared | Cleared | R |
| M8313 | ESC+Key Input (Left) | ESC+Key Input (⇐) | Cleared | Cleared | R |
| M8314 | ESC+Key Input (Right) | ESC+Key Input (⇒) | Cleared | Cleared | R |
| M8315 to M8319 | — Reserved — | | — | — | — |
| M8320 | Initialize Expansion Interface Remote Master/Slave | | Operating | Cleared | R/W |
| M8321 to M8330 | — Reserved — | | — | — | — |
| M8331 | Ethernet Port 2 Executing Auto Ping | | Operating | Cleared | R |
| M8332 | Ethernet Port 2 Auto Ping Stop Flag | | Operating | Cleared | R/W |
| M8333 | Change CPU Module Ethernet Port 2 Network Settings Trigger | | Operating | Cleared | R/W |
| M8334 | User Communication Receive Instruction Cancel Flag | Connection 9 | Cleared | Cleared | R/W |
| M8335 | | Connection 10 | Cleared | Cleared | R/W |
| M8336 | | Connection 11 | Cleared | Cleared | R/W |
| M8337 | | Connection 12 | Cleared | Cleared | R/W |
| M8340 | | Connection 13 | Cleared | Cleared | R/W |
| M8341 | | Connection 14 | Cleared | Cleared | R/W |
| M8342 | | Connection 15 | Cleared | Cleared | R/W |
| M8343 | | Connection 16 | Cleared | Cleared | R/W |
| M8344 | Ethernet Port 1 Send E-mail Server Settings Initialization | | Operating | Cleared | R/W |
| M8345 | Connection Status (ON: Connected, OFF: Not Connected) | Connection 9 | Operating | Cleared | R |
| M8346 | | Connection 10 | Operating | Cleared | R |
| M8347 | | Connection 11 | Operating | Cleared | R |
| M8350 | | Connection 12 | Operating | Cleared | R |
| M8351 | | Connection 13 | Operating | Cleared | R |
| M8352 | | Connection 14 | Operating | Cleared | R |
| M8353 | | Connection 15 | Operating | Cleared | R |
| M8354 | | Connection 16 | Operating | Cleared | R |
| M8355 | Disconnect User Communication Connection | Connection 9 | Operating | Cleared | R/W |
| M8356 | | Connection 10 | Operating | Cleared | R/W |
| M8357 | | Connection 11 | Operating | Cleared | R/W |
| M8360 | | Connection 12 | Operating | Cleared | R/W |
| M8361 | | Connection 13 | Operating | Cleared | R/W |
| M8362 | | Connection 14 | Operating | Cleared | R/W |
| M8363 | | Connection 15 | Operating | Cleared | R/W |
| M8364 | | Connection 16 | Operating | Cleared | R/W |
| M8365 | User Communication Receive Instruction Cancel Flag (Port 10) | | Cleared | Cleared | R/W |
| M8366 | User Communication Receive Instruction Cancel Flag (Port 11) | | Cleared | Cleared | R/W |
| M8367 | User Communication Receive Instruction Cancel Flag (Port 12) | | Cleared | Cleared | R/W |
| M8370 | User Communication Receive Instruction Cancel Flag (Port 13) | | Cleared | Cleared | R/W |
| M8371 | User Communication Receive Instruction Cancel Flag (Port 14) | | Cleared | Cleared | R/W |
| M8372 | User Communication Receive Instruction Cancel Flag (Port 15) | | Cleared | Cleared | R/W |
| M8373 | User Communication Receive Instruction Cancel Flag (Port 16) | | Cleared | Cleared | R/W |
| M8374 | User Communication Receive Instruction Cancel Flag (Port 17) | | Cleared | Cleared | R/W |

| Device Address | Description | When Stopped | Power OFF | R/W |
|----------------|--|----------------------|------------|-----|
| M8375 | User Communication Receive Instruction Cancel Flag (Port 18) | Cleared | Cleared | R/W |
| M8376 | User Communication Receive Instruction Cancel Flag (Port 19) | Cleared | Cleared | R/W |
| M8377 | User Communication Receive Instruction Cancel Flag (Port 20) | Cleared | Cleared | R/W |
| M8380 | User Communication Receive Instruction Cancel Flag (Port 21) | Cleared | Cleared | R/W |
| M8381 | User Communication Receive Instruction Cancel Flag (Port 22) | Cleared | Cleared | R/W |
| M8382 | User Communication Receive Instruction Cancel Flag (Port 23) | Cleared | Cleared | R/W |
| M8383 | User Communication Receive Instruction Cancel Flag (Port 24) | Cleared | Cleared | R/W |
| M8384 | User Communication Receive Instruction Cancel Flag (Port 25) | Cleared | Cleared | R/W |
| M8385 | User Communication Receive Instruction Cancel Flag (Port 26) | Cleared | Cleared | R/W |
| M8386 | User Communication Receive Instruction Cancel Flag (Port 27) | Cleared | Cleared | R/W |
| M8387 | User Communication Receive Instruction Cancel Flag (Port 28) | Cleared | Cleared | R/W |
| M8390 | User Communication Receive Instruction Cancel Flag (Port 29) | Cleared | Cleared | R/W |
| M8391 | User Communication Receive Instruction Cancel Flag (Port 30) | Cleared | Cleared | R/W |
| M8392 | User Communication Receive Instruction Cancel Flag (Port 31) | Cleared | Cleared | R/W |
| M8393 | User Communication Receive Instruction Cancel Flag (Port 32) | Cleared | Cleared | R/W |
| M8394 | User Communication Receive Instruction Cancel Flag (Port 33) | Cleared | Cleared | R/W |
| M8395 to M8400 | — Reserved — | — | — | — |
| M8401 | Download Files for Server Functions from SD Memory Card Execution Flag | Operating | Cleared | R/W |
| M8402 | Download Files for Server Functions from SD Memory Card Execution Completed Output | Operating | Cleared | R |
| M8403 | Download Files for Server Functions from SD Memory Card Error Output | Operating | Cleared | R |
| M8404 | Plus CPU Module Web Server Operation Status | Operating | Cleared | R |
| M8405 to M8447 | — Reserved — | — | — | — |
| M8450 | BACnet Communication Bit | Operating | Cleared | R/W |
| M8451 to M8457 | — Reserved — | — | — | — |
| M8460 | EtherNet/IP Communication Bit | Cleared | Cleared | R/W |
| M8461 to M8597 | — Reserved — | — | — | — |
| M8600 | High-speed Counter (Group 3/I3) | Reset Status | Maintained | R |
| M8601 | | Underflow | Maintained | R |
| M8602 | | Count Direction Flag | Maintained | R |
| M8603 to M8997 | — Reserved — | — | — | — |

Supplementary Descriptions of the Special Internal Relays

■ M8000: Start Control

M8000 controls the run/stop status of the FC6A. The CPU is set to run when M8000 is turned on, and the CPU is set to off when M8000 is turned off. See Chapter 1 "Start/Stop Operation" in the "Ladder Programming Manual". However, the function switch, stop input, and reset input have precedence over start control. M8000 maintains its status when the CPU is powered down. When data to be maintained during a power failure disappears after the CPU has been off for a period longer than the battery backup duration, the CPU restarts operation as selected in Configuration > Run/Stop Control > Run/Stop Selection at Keep Data Error. For details, see Chapter 5 "Run/Stop Selection at Keep Data Error" in the "FC6A Series MICROSmart User's Manual".

■ M8001: 1-s Clock Reset

While M8001 is on, M8121 (1-s clock) is always off.

■ M8002: All Outputs OFF

While M8002 is on, all outputs are off. The self-holding circuit created in the ladder program is also off.

■ M8003: Carry/Borrow

When a carry (Cy) or borrow (Bw) results from executing an addition or subtraction instruction, M8003 is turned on. For details, see Chapter 3 "Carry and Borrow" in the "Ladder Programming Manual".

■ M8004: User Program Execution Error

When an error occurs while executing a user program, M8004 is turned on. For details on user program execution errors, see Chapter 13 "User Program Execution Error" in the "FC6A Series MICROSmart User's Manual".

■ M8005: Communication Error

When an error occurs during data link communication, M8005 is turned on. The state is retained even when the error is cleared.

■ M8006: Communication Prohibited Flag (When Data Link Master)

During data link communication, communication is stopped while M8006 is on.

■ M8007: Initialization Flag (When Data Link Master)/Stop Communication Flag (When Data Link Slave)

When data link master: When this flag is turned on in the run status, the data link is initialized just once to check the connection status. Use this when the slave configured in the data link is powered at a timing slower than the master.

When data link slave : This flag is turned on when communication from the master is interrupted for 10 s or longer. This flag is turned off when communication can be normally received.

■ M8010: Status LED Operation

While M8010 is on, the status LED [STAT] is turned on. While off, the status LED [STAT] is turned off.

■ M8013: Calendar/Clock Data Write/Adjust Error Flag

When the clock writing or clock adjustment processing could not be executed normally, M8013 is turned on. It is turned off when the processing completes normally.

■ M8014: Calendar/Clock Data Read Error Flag

When an error occurs while calendar/clock data is read from the internal clock to the special data registers (D8008 to D8021), M8014 is turned on. It is turned off when reading completes normally.

■ M8016: Calendar Data Write Flag

When M8016 is turned on after writing data to the calendar data (write-only) special data registers (D8015 to D8018), the calendar data (year, month, day, day of the week) is written to the internal clock.

■ M8017: Clock Data Write Flag

When M8017 is turned on after writing data to the clock data (write-only) special data registers (D8019 to D8021), the clock data (hours, minutes, seconds) is written to the internal clock.

■ M8020: Calendar/Clock Data Write Flag

When M8020 is turned on after writing data to the calendar/clock data (write-only) special data registers (D8015 to D8021), the calendar data (year, month, day, day of the week) and the clock data (hours, minutes, seconds) is written to the internal clock.

■ M8021: Clock Data Adjust Flag

When M8021 is turned on, the clock is adjusted with respect to seconds.

- When M8021 is turned on, if the seconds are between 0 and 29, the seconds will be set to 0 and the minutes remain the same.
- When M8021 is turned on, if the seconds are between 30 and 59, the seconds will be set to 0 and 1 will be added to the minutes.

■ M8022: User Communication Receive Instruction Cancel Flag (Port 1)

While M8022 is on, user communication (receive instruction) executing on Port 1 is canceled.

■ M8023: User Communication Receive Instruction Cancel Flag (Port 2)

While M8023 is on, user communication (receive instruction) executing on Port 2 is canceled.

■ M8024: BMOV/WSFT Executing Flag

While the WSFT (word shift) instruction or the BMOV (block move) instruction is executing, M8024 is turned on. When completed, M8024 is turned off.

■ M8025: Maintain Outputs While Stopped

When the FC6A is stopped while running with M8025 turned on, the outputs maintain their runtime status. When set to run again, M8025 is automatically turned off.

■ M8026: User Communication Receive Instruction Cancel Flag (Port 3)

While M8026 is on, user communication (receive instruction) executing on Port 3 is canceled.

■ M8033, M8145 to M8147, M8170, M8176, M8365 to M8394: User Communication Receive Instruction Cancel

Flag (Port 4 to 33)

While these flags are on, user communication (receive instruction) being executed on the corresponding port is canceled.

M8033 = User Communication Receive Instruction Cancel Flag (Port 4)

M8145 = User Communication Receive Instruction Cancel Flag (Port 5)

M8146 = User Communication Receive Instruction Cancel Flag (Port 6)

M8147 = User Communication Receive Instruction Cancel Flag (Port 7)

M8170 = User Communication Receive Instruction Cancel Flag (Port 8)

M8176 = User Communication Receive Instruction Cancel Flag (Port 9)

M8365 = User Communication Receive Instruction Cancel Flag (Port 10)

M8366 = User Communication Receive Instruction Cancel Flag (Port 11)

M8367 = User Communication Receive Instruction Cancel Flag (Port 12)

M8370 = User Communication Receive Instruction Cancel Flag (Port 13)

M8371 = User Communication Receive Instruction Cancel Flag (Port 14)

M8372 = User Communication Receive Instruction Cancel Flag (Port 15)

M8373 = User Communication Receive Instruction Cancel Flag (Port 16)

M8374 = User Communication Receive Instruction Cancel Flag (Port 17)

M8375 = User Communication Receive Instruction Cancel Flag (Port 18)

M8376 = User Communication Receive Instruction Cancel Flag (Port 19)

M8377 = User Communication Receive Instruction Cancel Flag (Port 20)

M8380 = User Communication Receive Instruction Cancel Flag (Port 21)

M8381 = User Communication Receive Instruction Cancel Flag (Port 22)

M8382 = User Communication Receive Instruction Cancel Flag (Port 23)

M8383 = User Communication Receive Instruction Cancel Flag (Port 24)

M8384 = User Communication Receive Instruction Cancel Flag (Port 25)

M8385 = User Communication Receive Instruction Cancel Flag (Port 26)

M8386 = User Communication Receive Instruction Cancel Flag (Port 27)

M8387 = User Communication Receive Instruction Cancel Flag (Port 28)

M8390 = User Communication Receive Instruction Cancel Flag (Port 29)

M8391 = User Communication Receive Instruction Cancel Flag (Port 30)

M8392 = User Communication Receive Instruction Cancel Flag (Port 31)

M8393 = User Communication Receive Instruction Cancel Flag (Port 32)

M8394 = User Communication Receive Instruction Cancel Flag (Port 33)

- **M8027 to M8032, M8034 to M8036, M8040 to M8046, M8051 to M8055, M8057 to M8063, M8130, M8131, M8133 to M8136, M8161 to M8167, M8600 to M8602: Special Internal Relays for High-speed Counter**
Special internal relays used for the high-speed counter. For details, see Chapter 5 "High-Speed Counter" in the "FC6A Series MICROSmart User's Manual".

M8027 to M8032, M8130, M8131, M8161, M8162 = High-speed counter (group 1/I0)

M8034 to M8036, M8133, M8165, M8600 to M8602 = High-speed counter (group 3/I3)

M8040 to M8042, M8134, M8166 = High-speed counter (group 4/I4)

M8043 to M8046, M8135, M8136, M8163, M8164 = High-speed counter (group 5/I6)

M8051 to M8055 = High-speed counter (group 2/I1)

M8057 to M8063 = High-speed counter (group 6/I7)

- **M8070: SD Memory Card Mount Status**

When an SD memory card is inserted in the FC6A and it has been recognized and can be used, M8070 is turned on. M8070 is turned off if no SD memory card has been inserted or if it is not recognized.

- **M8071: Accessing SD Memory Card**

M8071 is turned on while the SD memory card is being accessed. It is turned off when access has finished.

- **M8072: Unmount SD Memory Card**

When M8072 is turned on, access to the SD memory card is stopped. To make an SD memory card accessible that has had access to it stopped, insert the card once again.

- **M8073: Function Switch Status**

This relay indicates the status of the function switch on the front of the CPU module.

M8073 is on when the function switch is 1. M8073 is off when the function switch is 0.

■ M8074: Battery Voltage Measurement Flag

This relay indicates the battery voltage measurement status of the backup battery.

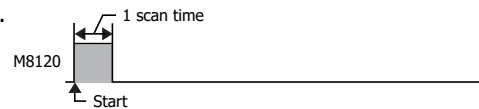
When M8074 is turned on, the battery voltage starts being measured, and it is turned off when the measurement has finished.

■ M8080 to M8117: Data Link Communication Completed Relay

Special internal relays used for data link communication. For details, see "Data Link Communication" on page 7-1.

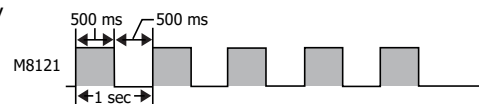
■ M8120: Initialize Pulse

When operation (RUN) starts, M8120 is turned on for a period of one scan.



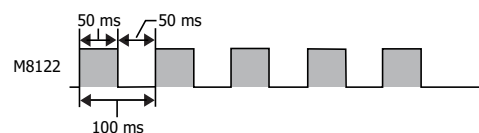
■ M8121: 1-s Clock

While M8001 is off, M8121 generates clock pulses in a 1 s cycle, with a duty ratio of 1:1 (500 ms on and 500 ms off).



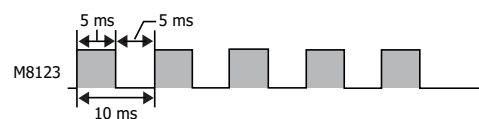
■ M8122: 100-ms Clock

M8122 generates clock pulses in a 100 ms cycle, with a duty ratio of 1:1 (50 ms on and 50 ms off).



■ M8123: 10-ms Clock

M8123 generates clock pulses in a 10 ms cycle, with a duty ratio of 1:1 (5 ms on and 5 ms off).



■ M8124: Timer/Counter Preset Value Changed

When timer or counter preset values are changed, M8124 is turned on. When a user program is transferred or when the changed data is cleared, M8124 is turned off.

■ M8125: In-operation Output

M8125 is on during the run status.

■ M8126: Scan ON After Run-Time Download Completes

When the user program is changed during the run status (run-time download), after the download completes, M8126 is turned on for one scan only when the user program starts operation.

■ M8137 to M8143, M8167: Interrupt Input Status

These relays are turned on when the corresponding user interrupt is allowed. These relays are turned off when the user interrupt is prohibited.

M8137 = Interrupt input I0 status

M8140 = Interrupt input I1 status

M8141 = Interrupt input I3 status

M8142 = Interrupt input I4 status

M8143 = Interrupt input I6 status

M8167 = Interrupt input I7 status

■ M8144: Timer Interrupt Status

When the timer interrupt is allowed, M8144 is turned on. When the timer interrupt is prohibited, M8144 is turned off.

■ M8150 to M8152: Comparison Result

M8150 to M8152 turn on according to the comparison results of the CMP= (Compare=) instruction and the ICMP>= (Interval Compare) instruction.

For details, see Chapter 6 "Special Internal Relays M8150, M8151, and M8152 in ICMP>=" in the "Ladder Programming Manual".

■ M8153 to M8160: Catch Input ON/OFF Status

When the rising or falling input edge of the input contact specified as the catch input is detected during a scan, the input contact status is captured. The detectable edges are once per scan.

M8153 = Group 1/I0 status

M8154 = Group 2/I1 status
 M8155 = Group 3/I3 status
 M8156 = Group 4/I4 status
 M8157 = Group 5/I6 status
 M8160 = Group 6/I7 status

■ **M8172 to M8175: Transistor Source Output Overcurrent Detection**

When overcurrent output occurs in a transistor protection source output on the CPU module, a special internal relay (M8172 to M8175) is turned on. The following special internal relays have been allocated with four outputs set as one group. If overcurrent output occurs in any of the special internal relays, it is turned on.

Even if the overcurrent output has been cleared, these special internal relays are not reset to off. To reset a special internal relay to off, create programming to do so in the ladder program.

M8172 = Group 1 (Q0 to Q3) status
 M8173 = Group 2 (Q4 to Q7) status
 M8174 = Group 3 (Q10 to Q13) status
 M8175 = Group 4 (Q14 to Q17) status

■ **M8184: Change HMI Module Network Settings Trigger**

When M8184 is turned on, the values stored in D8437 to D8456 are set as the HMI module IP address.

The IP address is not set just by changing the values of D8437 to D8456. For details on changing the HMI module network settings, see "Network settings by HMI module special data registers" on page 3-10.

■ **M8185: In Daylight Saving Time Period**

When the daylight saving time function is enabled, M8185 is on during the daylight saving time period. When outside of the daylight saving time period, M8185 is off.

When the daylight saving time function is disabled, M8185 is off.

■ **M8186: Ethernet Port 1 Executing Auto Ping**

M8186 is on when the auto ping on Ethernet port 1 is operating. M8186 is off when auto ping is stopped. For details on auto ping, see "Auto Ping Function" on page 3-28.

■ **M8187: Ethernet Port 1 Auto Ping Stop Flag**

While M8187 is on, the auto ping on Ethernet port 1 is stopped. While M8187 is off, auto ping is executed. At that time, auto ping is executed from the smallest remote host number specified in the remote host list, regardless of the previous end status.

■ **M8190: Change CPU Module Ethernet Port 1 Network Settings Trigger**

When M8190 is turned on, the values stored in D8303 to D8323 are set as the IP Settings/DNS Settings of Ethernet port 1 on the CPU module.

The IP address is not set just by changing the values of D8303 to D8323. For details on changing the IP Settings/DNS Settings of Ethernet port 1 on the CPU module, see "Network settings by special data registers" on page 3-8.

■ **M8191: SNTP Acquisition Flag**

When M8191 is turned on, the time information is acquired from the SNTP server.

■ **M8192 to M8197: Interrupt Input Edge**

These relays turn on when an interrupt occurs with the rising edge of an interrupt input. They turn off when an interrupt occurs with the falling edge of an interrupt input.

M8192 = Interrupt input I0 edge
 M8193 = Interrupt input I3 edge
 M8194 = Interrupt input I4 edge
 M8195 = Interrupt input I6 edge
 M8196 = Interrupt input I7 edge
 M8197 = Interrupt input I1 edge

■ **M8200 to M8207, M8334 to M8343: User Communication Receive Instruction Cancel Flag**

When M8200 to M8207 or M8334 to M8343 are turned on, the user communication receive instruction being executed is stopped.

M8200 = User communication receive instruction being executed on client connection 1
 M8201 = User communication receive instruction being executed on client connection 2
 M8202 = User communication receive instruction being executed on client connection 3
 M8203 = User communication receive instruction being executed on client connection 4
 M8204 = User communication receive instruction being executed on client connection 5

M8205 = User communication receive instruction being executed on client connection 6
M8206 = User communication receive instruction being executed on client connection 7
M8207 = User communication receive instruction being executed on client connection 8
M8334 = User communication receive instruction being executed on client connection 9
M8335 = User communication receive instruction being executed on client connection 10
M8336 = User communication receive instruction being executed on client connection 11
M8337 = User communication receive instruction being executed on client connection 12
M8340 = User communication receive instruction being executed on client connection 13
M8341 = User communication receive instruction being executed on client connection 14
M8342 = User communication receive instruction being executed on client connection 15
M8343 = User communication receive instruction being executed on client connection 16

■ **M8211: HMI Module Send E-mail Server Settings Initialization**

When M8211 is turned on, the settings for the send E-mail server on the HMI-Ethernet port are initialized.

■ **M8212 to M8221, M8345 to M8354: Connection Status**

While connected to a network device via the maintenance communication server, user communication server/client, or Modbus TCP server/client, the connection status is turned on. While not connected to a network device, the connection status is turned off.

M8212 = Connection 1
M8213 = Connection 2
M8214 = Connection 3
M8215 = Connection 4
M8216 = Connection 5
M8217 = Connection 6
M8220 = Connection 7
M8221 = Connection 8
M8345 = Connection 9
M8346 = Connection 10
M8347 = Connection 11
M8350 = Connection 12
M8351 = Connection 13
M8352 = Connection 14
M8353 = Connection 15
M8354 = Connection 16

■ **M8222 to M8231, M8355 to M8364: Disconnect User Communication Connection**

When connected to a remote host via user communication, the corresponding connection is disconnected when M8222 to M8231 is turned on. When these special internal relays are on, the connections cannot be established.

M8222 = Connection 1
M8223 = Connection 2
M8224 = Connection 3
M8225 = Connection 4
M8226 = Connection 5
M8227 = Connection 6
M8230 = Connection 7
M8231 = Connection 8
M8355 = Connection 9
M8356 = Connection 10
M8357 = Connection 11
M8360 = Connection 12
M8361 = Connection 13
M8362 = Connection 14
M8363 = Connection 15
M8364 = Connection 16

These relays are enabled only when a user communication client is used.

■ **M8232: HMI Module Connection Information Reference Connection Status**

M8232 is turned on when there is a connection with the connection number specified by D8429. M8232 is turned off when there is no connection.

■ **M8250: Download from SD Memory Card Execution Flag**

When M8250 is turned on, a ZLD file is downloaded from the SD memory card. The file that will be downloaded is the ZLD file specified in the autoexec.ini file.

■ **M8251: Upload to SD Memory Card Execution Flag**

When M8251 is turned on, a ZLD file is uploaded to the SD memory card.
A ZLD file is created with the file name specified in the autoexec.ini file.

■ **M8252: Executing SD Memory Card Download**

M8252 is turned on when starting execution of the download from the SD memory card, and when the download has completed, it is turned off.

■ **M8253: Executing SD Memory Card Upload**

M8253 is turned on when starting execution of the upload to the SD memory card, and when the upload has completed, it is turned off.

■ **M8254: SD Memory Card Download/Upload Execution Completed Output**

M8254 is turned off when starting execution of the download from the SD memory card or the upload to the SD memory card, and when the download or upload has completed, it is turned on.

■ **M8255: SD Memory Card Download/Upload Execution Error Output**

M8255 is updated when execution of the download from the SD memory card or the upload to the SD memory card has completed. M8255 is turned on when D8255 (Download/Upload Execution Status) is a value other than 0.

■ **M8260: Write Recipe Execution Flag**

When M8260 is turned on from off, write recipe is executed for all channels of the block number specified by D8260 (Recipe Block Number).

■ **M8261: Read Recipe Execution Flag**

When M8261 is turned on from off, read recipe is executed for all channels of the block number specified by D8260 (Recipe Block Number).

■ **M8262: Executing Write Recipe**

M8262 is turned on when the write recipe processing starts, and it is turned off when the processing has completed. M8262 also is turned off when read recipe processing starts.

■ **M8263: Executing Read Recipe**

M8263 is turned on when the read recipe processing starts, and it is turned off when the processing has completed. M8263 also is turned off when write recipe processing starts.

■ **M8264: Recipe Channel Execution Completed Output**

M8264 is turned off when starting to read or write a recipe, and it is turned on when reading or writing a recipe has completed.

■ **M8265: Recipe Execution Error Output**

M8265 is turned on when recipe execution has completed and D8264 (Recipe Execution Status) is a value other than 0. For details on recipes, see Chapter 11 "Recipe Function" in the "FC6A Series MICROSmart User's Manual".

■ **M8266: Recipe Block Execution Completed Output**

M8266 is turned off when starting to read or write a recipe block, and it is turned on when reading or writing a recipe block has completed.

■ **M8267: Read Restriction for Recipe Internal Memory (ROM-Range)**

M8267 is turned on when reading to a recipe block in internal memory (ROM-Range) has completed. When M8267 is on, recipes cannot be read to internal memory (ROM-Range 1) and internal memory (ROM-Range 2). When reading recipes, turn off M8267.

■ **M8271: Download MQTT Basic Settings from SD Memory Card Execution Flag**

When M8271 is turned on, the files for MQTT Basic Settings are downloaded. For details on the files for MQTT Basic Settings, see Chapter 3 "Download the MQTT Basic Settings" in the "Network User's Manual".

■ **M8272: Download MQTT Basic Settings from SD Memory Card Execution Completed Output**

M8272 is turned off when downloading the files for MQTT Basic Settings is started, and it is turned on once the download is finished.

■ **M8273: Download MQTT Basic Settings from SD Memory Card Error Output**

M8273 is turned off when downloading the files for MQTT Basic Settings is started, and it is turned on if an error occurs during the process.

■ M8300 to M8304: J1939 Communication

Special data registers used in J1939 communication. For details, see "J1939 Communication" on page 8-1.

■ M8311 to M8314: Key Input Status

While the ESC button and direction buttons on the HMI module are simultaneously pressed, the corresponding special internal relays are turned on. When the keys are not pressed, the relays are turned off.

M8311 = ESC key + Up (⬆) key

M8312 = ESC key + Down (⬇) key

M8313 = ESC key + Left (⬅) key

M8314 = ESC key + Right (➡) key

■ M8320: Initialize Expansion Interface Remote Master/Slave

When M8320 is turned on, expansion interface remote master and slave modules along with the expansion modules that are connected to the expansion interface remote slave modules are initialized. Once the initialization is finished, M8320 is automatically turned off and the I/O refresh at the expansion interface remote slave modules will resume.

■ M8331: Ethernet Port 2 Executing Auto Ping

M8331 is on when the auto ping on Ethernet port 2 is operating. M8331 is off when auto ping is stopped. For details on auto ping, see "Auto Ping Function" on page 3-28.

■ M8332: Ethernet Port 2 Auto Ping Stop Flag

While M8332 is on, the auto ping on Ethernet port 2 is stopped. While M8332 is off, auto ping is executed. At that time, auto ping is executed from the smallest remote host number specified in the remote host list, regardless of the previous end status.

■ M8333: Change CPU Module Ethernet Port 2 Network Settings Trigger

When M8333 is turned on, the values stored in D8630 to D8650 are set as the IP Settings/DNS Settings of Ethernet port 2 on the CPU module. The IP address is not set just by changing the values of D8630 to D8650. For details on changing the IP Settings/DNS Settings of Ethernet port 2 on the CPU module, see "Network settings by special data registers" on page 3-8.

■ M8344: Ethernet Port 1 Send E-mail Server Settings Initialization

When M8344 is turned on, the settings for the send E-mail server on the Ethernet port 1 are initialized.

■ M8401: Download Files for Server Functions from SD Memory Card Execution Flag

When M8401 is turned on, the files for Server Functions are downloaded. For details on the files for Server Functions, see Chapter 11 "SD Memory Card" in the "FC6A Series MICROSmart User's Manual".

■ M8402: Download Files for Server Functions from SD Memory Card Execution Completed Output

M8402 is turned off when downloading the files for Server Functions is started, and it is turned on once the download is finished.

■ M8403: Download Files for Server Functions from SD Memory Card Error Output

M8403 is turned off when downloading the files for Server Functions is started, and it is turned on if an error occurs during the process.

■ M8404: Plus CPU Module Web Server Operation Status

M8404 turns on when the Plus CPU module web server starts, and it is turned off in the following cases.

- When the Plus CPU module power is turned on
- At the start of downloading the user program
- At the start of downloading system software
- At the start of downloading the files for the Server Functions

Note: Even if D8303 (CPU Module Ethernet Port 1 IP Settings / DNS Settings Switching) is changed, M8404 is not turned off.

■ M8450: BACnet Communication Bit

While M8450 is on, BACnet communication is performed.

■ M8460: EtherNet/IP Communication Bit

This special internal relay enables or disables EtherNet/IP communication.

OFF: Disable EtherNet/IP communication

ON: Enable EtherNet/IP communication

Special Data Register

Special Data Register Device Addresses


Warning

Do not write to data in the area marked as reserved in the special data registers list. Otherwise the system may not operate correctly.

Note: R/W is an abbreviation for read/write.

The notation for the R/W field is as follows.

R/W: The device can be both read from and written to

R: Read-only

W: Write-only

| Device Address | Description | | Update Timing | R/W |
|----------------|---|---|----------------------|-----|
| D8000 | Quantity of Inputs | | When I/O initialized | R |
| D8001 | Quantity of Outputs | | When I/O initialized | R |
| D8002 | CPU Module Type Information | | Power-up | R |
| D8003 D8004 | — Reserved — | | — | - |
| D8005 | General Error Code | | When error occurred | R/W |
| D8006 | User Program Execution Error Code | | When error occurred | R |
| D8007 | — Reserved — | | — | - |
| D8008 | Calendar/Clock Current Data (Read only) | Year | Every 500 ms | R |
| D8009 | | Month | Every 500 ms | R |
| D8010 | | Day | Every 500 ms | R |
| D8011 | | Day of the Week | Every 500 ms | R |
| D8012 | | Hour | Every 500 ms | R |
| D8013 | | Minute | Every 500 ms | R |
| D8014 | | Second | Every 500 ms | R |
| D8015 | Calendar/Clock New Data (Write only) | Year | — | W |
| D8016 | | Month | — | W |
| D8017 | | Day | — | W |
| D8018 | | Day of the Week | — | W |
| D8019 | | Hour | — | W |
| D8020 | | Minute | — | W |
| D8021 | | Second | — | W |
| D8022 | Scan Time Data | Constant Scan Time Preset Value (1 to 1,000 ms) | — | W |
| D8023 | | Scan Time Current Value (ms) | Every scan | R |
| D8024 | | Scan Time Maximum Value (ms) | At occurrence | R |
| D8025 | | Scan Time Minimum Value (ms) | At occurrence | R |
| D8026 | Communication Mode Information (Port 1 to Port 3) | | Every scan | R |
| D8027 D8028 | — Reserved — | | — | - |
| D8029 | System Software Version | | Power-up | R |
| D8030 | Communication Cartridge Information | | Power-up | R |
| D8031 | Optional Device Connection Information | | Power-up | R |
| D8032 | Interrupt Input Jump Destination Label No. (I1) | | — | R/W |
| D8033 | Interrupt Input Jump Destination Label No. (I3) | | — | R/W |
| D8034 | Interrupt Input Jump Destination Label No. (I4) | | — | R/W |
| D8035 | Interrupt Input Jump Destination Label No. (I6) | | — | R/W |
| D8036 | Timer Interrupt Jump Destination Label No. | | — | R/W |
| D8037 | Number of Connected I/O Modules | | When I/O initialized | R |
| D8038 D8039 | — Reserved — | | — | — |
| D8040 | Slave Number (Port 4) | | — | R/W |
| D8041 | Slave Number (Port 5) | | — | R/W |
| D8042 | Slave Number (Port 6) | | — | R/W |
| D8043 | Slave Number (Port 7) | | — | R/W |

2: DEVICES

| Device Address | Description | Update Timing | R/W |
|----------------|---|---------------------|-----|
| D8044 | Slave Number (Port 8) | — | R/W |
| D8045 | Slave Number (Port 9) | — | R/W |
| D8046 to D8051 | — Reserved — | — | — |
| D8052 | J1939 Communication Error Code | Every scan | R/W |
| D8053 to D8055 | — Reserved — | — | — |
| D8056 | Battery Voltage | — | R |
| D8057 | Analog Volume (AI0) | Every scan | R |
| D8058 | Built-in Analog Input (AI1) | Every scan | R |
| D8059 | Analog Input Status AI0 | Every scan | R |
| D8060 | Analog Input Status AI1 | Every scan | R |
| D8061 to D8066 | — Reserved — | — | — |
| D8067 | Backlight ON Time | — | R/W |
| D8068 | — Reserved — | — | — |
| D8069 | Slave 1 Communication Status/Error (When Data Link Master Mode) Slave Communication Status/Error (When Data Link Slave Mode) | When error occurred | R |
| D8070 | Slave 2 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8071 | Slave 3 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8072 | Slave 4 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8073 | Slave 5 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8074 | Slave 6 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8075 | Slave 7 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8076 | Slave 8 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8077 | Slave 9 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8078 | Slave 10 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8079 | Slave 11 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8080 | Slave 12 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8081 | Slave 13 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8082 | Slave 14 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8083 | Slave 15 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8084 | Slave 16 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8085 | Slave 17 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8086 | Slave 18 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8087 | Slave 19 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8088 | Slave 20 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8089 | Slave 21 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8090 | Slave 22 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8091 | Slave 23 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8092 | Slave 24 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8093 | Slave 25 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8094 | Slave 26 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8095 | Slave 27 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8096 | Slave 28 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8097 | Slave 29 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8098 | Slave 30 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8099 | Slave 31 Communication Status/Error (When Data Link Master Mode) | When error occurred | R |
| D8100 | Slave Number (Port 1) | — | R/W |
| D8101 | — Reserved — | — | — |
| D8102 | Slave Number (Port 2) | — | R/W |
| D8103 | Slave Number (Port 3) | — | R/W |
| D8104 | Control Signal Status (Port 1 to 5) | Every scan | R |
| D8105 | RS232C DSR Input Control Signal Option (Port 1 to 5) | Every scan | R/W |
| D8106 | RS232C DTR Output Control Signal Option (Port 1 to 5) | Every scan | R/W |

| Device Address | Description | | Update Timing | R/W |
|----------------|---|-------------------------|--|-----|
| D8107 to D8119 | — Reserved — | | — | — |
| D8120 | HMI Module Information | Type ID/Status | — | R |
| D8121 | | System Software Version | — | R |
| D8122 | Cartridge Slot 1 Information | Type ID/Status | — | R |
| D8123 | | System Software Version | — | R |
| D8124 | Cartridge Slot 2 Information | Type ID/Status | — | R |
| D8125 | | System Software Version | — | R |
| D8126 | Cartridge Slot 3 Information | Type ID/Status | — | R |
| D8127 | | System Software Version | — | R |
| D8128 to D8169 | — Reserved — | | — | — |
| D8170 | Analog I/O Cartridge I/O AI2/AQ2 | | Every scan | R |
| D8171 | Analog I/O Cartridge I/O AI3/AQ3 | | Every scan | R |
| D8172 | Analog I/O Cartridge Status AI2/AQ2 | | Every scan | R |
| D8173 | Analog I/O Cartridge Status AI3/AQ3 | | Every scan | R |
| D8174 | Analog I/O Cartridge I/O AI4/AQ4 | | Every scan | R |
| D8175 | Analog I/O Cartridge I/O AI5/AQ5 | | Every scan | R |
| D8176 | Analog I/O Cartridge Status AI4/AQ4 | | Every scan | R |
| D8177 | Analog I/O Cartridge Status AI5/AQ5 | | Every scan | R |
| D8178 | Analog I/O Cartridge I/O AI6/AQ6 | | Every scan | R |
| D8179 | Analog I/O Cartridge I/O AI7/AQ7 | | Every scan | R |
| D8180 | Analog I/O Cartridge Status AI6/AQ6 | | Every scan | R |
| D8181 | Analog I/O Cartridge Status AI7/AQ7 | | Every scan | R |
| D8182 to D8191 | — Reserved — | | — | — |
| D8192 | High-speed Counter (Group 2/I1) | High Word | Current Value/Frequency Measurement (I1) Current Value | R |
| D8193 | | Low Word | | R |
| D8194 | | High Word | Preset Value | R/W |
| D8195 | | Low Word | | R/W |
| D8196 | | High Word | Reset Value | R/W |
| D8197 | | Low Word | | R/W |
| D8198 | High-speed Counter (Group 6/I7) | High Word | Current Value/Frequency Measurement (I7) Current Value | R |
| D8199 | | Low Word | | R |
| D8200 | | High Word | Preset Value | R/W |
| D8201 | | Low Word | | R/W |
| D8202 | | High Word | Reset Value | R/W |
| D8203 | | Low Word | | R/W |
| D8204 | Control Signal Status (Port 6 to 9) | | Every scan | R |
| D8205 | RS232C DSR Input Control Signal Option (Port 6 to 9) | | Every scan | R/W |
| D8206 | RS232C DTR Output Control Signal Option (Port 6 to 9) | | Every scan | R/W |
| D8207 to D8209 | — Reserved — | | — | — |
| D8210 | High-speed Counter (Group 1/I0) | High Word | Current Value/Frequency Measurement (I0) Current Value | R |
| D8211 | | Low Word | | R |
| D8212 | | High Word | Preset Value | R/W |
| D8213 | | Low Word | | R/W |
| D8214 | Interrupt Input Jump Destination Label No. (I7) | | — | R/W |
| D8215 | Interrupt Input Jump Destination Label No. (I0) | | — | R/W |
| D8216 | High-speed Counter (Group 1/I0) | High Word | Reset Value | R/W |
| D8217 | | Low Word | | R/W |
| D8218 | High-speed Counter (Group 3/I3) | High Word | Current Value/Frequency Measurement (I3) Current Value | R |
| D8219 | | Low Word | | R |
| D8220 | | High Word | Preset Value | R/W |
| D8221 | | Low Word | | R/W |

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| Device Address | Description | | | Update Timing | R/W |
|-------------------|--|-----------|--|-------------------------------------|-----|
| D8222 | High-speed Counter (Group 4/I4) | High Word | Current Value/Frequency Measurement (I4) Current Value | Every scan | R |
| D8223 | | Low Word | | Every scan | R |
| D8224 | | High Word | Preset Value | — | R/W |
| D8225 | | Low Word | | — | R/W |
| D8226 | High-speed Counter (Group 5/I6) | High Word | Current Value/Frequency Measurement (I6) Current Value | Every scan | R |
| D8227 | | Low Word | | Every scan | R |
| D8228 | | High Word | Preset Value | — | R/W |
| D8229 | | Low Word | | — | R/W |
| D8230 D8231 | — Reserved — | | | — | — |
| D8232 | High-speed Counter (Group 5/I6) | High Word | Reset Value | — | R/W |
| D8233 | | Low Word | | — | R/W |
| D8234 | High-speed Counter (Group 3/I3) | High Word | Reset Value | — | R/W |
| D8235 | | Low Word | | — | R/W |
| D8236 | High-speed Counter (Group 4/I4) | High Word | Reset Value | — | R/W |
| D8237 | | Low Word | | — | R/W |
| D8238 | — Reserved — | | | — | — |
| D8239 | Absolute Position Control Status | | | Every scan | R |
| D8240 | Absolute Position Counter 1 | High Word | Absolute Position | Every scan | R |
| D8241 | | Low Word | | Every scan | R |
| D8242 | Absolute Position Counter 2 | High Word | Absolute Position | Every scan | R |
| D8243 | | Low Word | | Every scan | R |
| D8244 | Absolute Position Counter 3 | High Word | Absolute Position | Every scan | R |
| D8245 | | Low Word | | Every scan | R |
| D8246 | Absolute Position Counter 4 | High Word | Absolute Position | Every scan | R |
| D8247 | | Low Word | | Every scan | R |
| D8248 D8249 | — Reserved — | | | — | — |
| D8250 | Read SD Memory Card Capacity | | | Every scan | R |
| D8251 | Read SD Memory Card Free Capacity | | | Every scan | R |
| D8252 D8253 | — Reserved — | | | — | — |
| D8254 | SD Memory Card Download/Upload Execution Information | | | When processing has completed | R |
| D8255 | SD Memory Card Download/Upload Execution Status | | | When processing has completed | R |
| D8256 | Download MQTT Basic Settings from SD Memory Card Execution Information | | | When processing has completed | R |
| D8257 | Download MQTT Basic Settings from SD Memory Card Execution Error Information | | | When processing has completed | R |
| D8258 to D8259 | — Reserved — | | | — | — |
| D8260 | Recipe Block Number | | | — | R/W |
| D8261 | Recipe Execution Block Number | | | When recipe execution has completed | R |
| D8262 | Recipe Execution Channel No. | | | When recipe execution has completed | R |
| D8263 | Recipe Execution Operation | | | When recipe execution has completed | R |
| D8264 | Recipe Execution Status | | | When recipe execution has completed | R |
| D8265 | Recipe Execution Error Information | | | When recipe execution has completed | R |

| Device Address | Description | | Update Timing | R/W |
|-------------------|--|-----------------------|-------------------------------------|-----|
| D8266 | Recipe Internal Memory (ROM-Range 1) Read Count | | When recipe execution has completed | R |
| D8267 | Recipe Internal Memory (ROM-Range 2) Read Count | | When recipe execution has completed | R |
| D8268 | Remote Host Number of Connection 1 (1 to 255) | | — | R/W |
| D8269 | Remote Host Number of Connection 2 (1 to 255) | | — | R/W |
| D8270 | Remote Host Number of Connection 3 (1 to 255) | | — | R/W |
| D8271 | Remote Host Number of Connection 4 (1 to 255) | | — | R/W |
| D8272 | Remote Host Number of Connection 5 (1 to 255) | | — | R/W |
| D8273 | Remote Host Number of Connection 6 (1 to 255) | | — | R/W |
| D8274 | Remote Host Number of Connection 7 (1 to 255) | | — | R/W |
| D8275 | Remote Host Number of Connection 8 (1 to 255) | | — | R/W |
| D8276 D8277 | — Reserved — | | — | — |
| D8278 | Communication Mode Information | Connection 1 to 4 | — | R |
| D8279 | | Connection 5 to 8 | — | R |
| D8280 to D8283 | — Reserved — | | — | — |
| D8284 | Communication Mode Information (HMI Connection) | HMI Connection 1 to 4 | — | R |
| D8285 | | HMI Connection 5 to 8 | — | R |
| D8286 to D8302 | — Reserved — | | — | — |
| D8303 | CPU Module Ethernet Port 1 IP Settings/DNS Settings Switching | | — | R/W |
| D8304 | CPU Module Ethernet Port 1 IP Address (Write-only) | | — | W |
| D8305 | | | — | W |
| D8306 | | | — | W |
| D8307 | | | — | W |
| D8308 | | | — | W |
| D8309 | CPU Module Ethernet Port 1 Subnet Mask (Write-only) | | — | W |
| D8310 | | | — | W |
| D8311 | | | — | W |
| D8312 | | | — | W |
| D8313 | | | — | W |
| D8314 | CPU Module Ethernet Port 1 Default Gateway (Write-only) | | — | W |
| D8315 | | | — | W |
| D8316 | | | — | W |
| D8317 | | | — | W |
| D8318 | | | — | W |
| D8319 | CPU Module Ethernet Port 1 Preferred DNS Server (Write-only) | | — | W |
| D8320 | | | — | W |
| D8321 | | | — | W |
| D8322 | | | — | W |
| D8323 | | | — | W |
| D8324 | CPU Module Ethernet Port 1 MAC Address (Current Value Read-only) | | Every 1 s | R |
| D8325 | | | Every 1 s | R |
| D8326 | | | Every 1 s | R |
| D8327 | | | Every 1 s | R |
| D8328 | | | Every 1 s | R |
| D8329 | | | Every 1 s | R |
| D8330 | | | Every 1 s | R |
| D8331 | CPU Module Ethernet Port 1 IP Address (Current Value Read-only) | | Every 1 s | R |
| D8332 | | | Every 1 s | R |
| D8333 | | | Every 1 s | R |

2: DEVICES

| Device Address | Description | Update Timing | R/W |
|----------------|---|---------------|-----|
| D8334 | CPU Module Ethernet Port 1 Subnet Mask (Current Value Read-only) | Every 1 s | R |
| D8335 | | Every 1 s | R |
| D8336 | | Every 1 s | R |
| D8337 | | Every 1 s | R |
| D8338 | CPU Module Ethernet Port 1 Default Gateway (Current Value Read-only) | Every 1 s | R |
| D8339 | | Every 1 s | R |
| D8340 | | Every 1 s | R |
| D8341 | | Every 1 s | R |
| D8342 | CPU Module Ethernet Port 1 Preferred DNS Server (Current Value Read-only) | Every 1 s | R |
| D8343 | | Every 1 s | R |
| D8344 | | Every 1 s | R |
| D8345 | | Every 1 s | R |
| D8346 | CPU Module Ethernet Port 1 Alternate DNS Server (Current Value Read-only) | Every 1 s | R |
| D8347 | | Every 1 s | R |
| D8348 | | Every 1 s | R |
| D8349 | | Every 1 s | R |
| D8350 | Connection 1 Connected IP Address | Every 1 s | R |
| D8351 | | Every 1 s | R |
| D8352 | | Every 1 s | R |
| D8353 | | Every 1 s | R |
| D8354 | Connection 2 Connected IP Address | Every 1 s | R |
| D8355 | | Every 1 s | R |
| D8356 | | Every 1 s | R |
| D8357 | | Every 1 s | R |
| D8358 | Connection 3 Connected IP Address | Every 1 s | R |
| D8359 | | Every 1 s | R |
| D8360 | | Every 1 s | R |
| D8361 | | Every 1 s | R |
| D8362 | Connection 4 Connected IP Address | Every 1 s | R |
| D8363 | | Every 1 s | R |
| D8364 | | Every 1 s | R |
| D8365 | | Every 1 s | R |
| D8366 | Connection 5 Connected IP Address | Every 1 s | R |
| D8367 | | Every 1 s | R |
| D8368 | | Every 1 s | R |
| D8369 | | Every 1 s | R |
| D8370 | Connection 6 Connected IP Address | Every 1 s | R |
| D8371 | | Every 1 s | R |
| D8372 | | Every 1 s | R |
| D8373 | | Every 1 s | R |
| D8374 | Connection 7 Connected IP Address | Every 1 s | R |
| D8375 | | Every 1 s | R |
| D8376 | | Every 1 s | R |
| D8377 | | Every 1 s | R |
| D8378 | Connection 8 Connected IP Address | Every 1 s | R |
| D8379 | | Every 1 s | R |
| D8380 | | Every 1 s | R |
| D8381 | | Every 1 s | R |
| D8382 | HMI Module MAC Address (Current Value Read-only) | Every 1 s | R |
| D8383 | | Every 1 s | R |
| D8384 | | Every 1 s | R |
| D8385 | | Every 1 s | R |
| D8386 | | Every 1 s | R |
| D8387 | | Every 1 s | R |

| Device Address | Description | | Update Timing | R/W |
|----------------|---|----------------------|---------------|-----|
| D8388 | HMI Module IP Address (Current Value Read-only) | | Every 1 s | R |
| D8389 | | | Every 1 s | R |
| D8390 | | | Every 1 s | R |
| D8391 | | | Every 1 s | R |
| D8392 | HMI Module Subnet Mask (Current Value Read-only) | | Every 1 s | R |
| D8393 | | | Every 1 s | R |
| D8394 | | | Every 1 s | R |
| D8395 | | | Every 1 s | R |
| D8396 | HMI Module Default Gateway (Current Value Read-only) | | Every 1 s | R |
| D8397 | | | Every 1 s | R |
| D8398 | | | Every 1 s | R |
| D8399 | | | Every 1 s | R |
| D8400 | HMI Module Preferred DNS Server (Current Value Read-only) | | Every 1 s | R |
| D8401 | | | Every 1 s | R |
| D8402 | | | Every 1 s | R |
| D8403 | | | Every 1 s | R |
| D8404 | HMI Module Alternate DNS Server (Current Value Read-only) | | Every 1 s | R |
| D8405 | | | Every 1 s | R |
| D8406 | | | Every 1 s | R |
| D8407 | | | Every 1 s | R |
| D8408 to D8412 | — Reserved — | | — | — |
| D8413 | Time Zone Offset | | — | R/W |
| D8414 | SNTP Operation Status | | — | R |
| D8415 | SNTP Access Elapsed Time | | — | R |
| D8416 to D8428 | — Reserved — | | — | — |
| D8429 | HMI Module Connection Information Reference | Connection No. | — | R/W |
| D8430 | | Connected IP Address | Every 1 s | R |
| D8431 | | | Every 1 s | R |
| D8432 | | | Every 1 s | R |
| D8433 | | | Every 1 s | R |
| D8434 | | Connected Port No. | Every 1 s | R |
| D8435 D8436 | — Reserved — | | — | — |
| D8437 | HMI Module IP Address (Write-only) | | — | W |
| D8438 | | | — | W |
| D8439 | | | — | W |
| D8440 | | | — | W |
| D8441 | HMI Module Subnet Mask (Write-only) | | — | W |
| D8442 | | | — | W |
| D8443 | | | — | W |
| D8444 | | | — | W |
| D8445 | HMI Module Default Gateway (Write-only) | | — | W |
| D8446 | | | — | W |
| D8447 | | | — | W |
| D8448 | | | — | W |
| D8449 | HMI Module Preferred DNS Server (Write-only) | | — | W |
| D8450 | | | — | W |
| D8451 | | | — | W |
| D8452 | | | — | W |
| D8453 | HMI Module Alternate DNS Server (Write-only) | | — | W |
| D8454 | | | — | W |
| D8455 | | | — | W |
| D8456 | | | — | W |

2: DEVICES

| Device Address | Description | | Update Timing | R/W |
|----------------|--|--|---------------|-----|
| D8457 | EMAIL Instruction Detailed Error Information (HMI-Ethernet Port) | | — | R |
| D8458 to D8469 | — Reserved — | | — | — |
| D8470 | Expansion Module Slot 1 | Type ID/Status | — | R |
| D8471 | | System Software Version/Position Information | — | R |
| D8472 | Expansion Module Slot 2 | Type ID/Status | — | R |
| D8473 | | System Software Version/Position Information | — | R |
| D8474 | Expansion Module Slot 3 | Type ID/Status | — | R |
| D8475 | | System Software Version/Position Information | — | R |
| D8476 | Expansion Module Slot 4 | Type ID/Status | — | R |
| D8477 | | System Software Version/Position Information | — | R |
| D8478 | Expansion Module Slot 5 | Type ID/Status | — | R |
| D8479 | | System Software Version/Position Information | — | R |
| D8480 | Expansion Module Slot 6 | Type ID/Status | — | R |
| D8481 | | System Software Version/Position Information | — | R |
| D8482 | Expansion Module Slot 7 | Type ID/Status | — | R |
| D8483 | | System Software Version/Position Information | — | R |
| D8484 | Expansion Module Slot 8 | Type ID/Status | — | R |
| D8485 | | System Software Version/Position Information | — | R |
| D8486 | Expansion Module Slot 9 | Type ID/Status | — | R |
| D8487 | | System Software Version/Position Information | — | R |
| D8488 | Expansion Module Slot 10 | Type ID/Status | — | R |
| D8489 | | System Software Version/Position Information | — | R |
| D8490 | Expansion Module Slot 11 | Type ID/Status | — | R |
| D8491 | | System Software Version/Position Information | — | R |
| D8492 | Expansion Module Slot 12 | Type ID/Status | — | R |
| D8493 | | System Software Version/Position Information | — | R |
| D8494 | Expansion Module Slot 13 | Type ID/Status | — | R |
| D8495 | | System Software Version/Position Information | — | R |
| D8496 | Expansion Module Slot 14 | Type ID/Status | — | R |
| D8497 | | System Software Version/Position Information | — | R |
| D8498 | Expansion Module Slot 15 | Type ID/Status | — | R |
| D8499 | | System Software Version/Position Information | — | R |
| D8500 | Expansion Module Slot 16 | Type ID/Status | — | R |
| D8501 | | System Software Version/Position Information | — | R |
| D8502 | Expansion Module Slot 17 | Type ID/Status | — | R |
| D8503 | | System Software Version/Position Information | — | R |
| D8504 | Expansion Module Slot 18 | Type ID/Status | — | R |
| D8505 | | System Software Version/Position Information | — | R |
| D8506 | Expansion Module Slot 19 | Type ID/Status | — | R |
| D8507 | | System Software Version/Position Information | — | R |
| D8508 | Expansion Module Slot 20 | Type ID/Status | — | R |
| D8509 | | System Software Version/Position Information | — | R |
| D8510 | Expansion Module Slot 21 | Type ID/Status | — | R |
| D8511 | | System Software Version/Position Information | — | R |
| D8512 | Expansion Module Slot 22 | Type ID/Status | — | R |
| D8513 | | System Software Version/Position Information | — | R |
| D8514 | Expansion Module Slot 23 | Type ID/Status | — | R |
| D8515 | | System Software Version/Position Information | — | R |
| D8516 | Expansion Module Slot 24 | Type ID/Status | — | R |
| D8517 | | System Software Version/Position Information | — | R |
| D8518 | Expansion Module Slot 25 | Type ID/Status | — | R |
| D8519 | | System Software Version/Position Information | — | R |
| D8520 | Expansion Module Slot 26 | Type ID/Status | — | R |
| D8521 | | System Software Version/Position Information | — | R |

| Device Address | Description | | Update Timing | R/W |
|----------------|---|--|---------------|-----|
| D8522 | Expansion Module Slot 27 Information | Type ID/Status | — | R |
| D8523 | | System Software Version/Position Information | — | R |
| D8524 | Expansion Module Slot 28 Information | Type ID/Status | — | R |
| D8525 | | System Software Version/Position Information | — | R |
| D8526 | Expansion Module Slot 29 Information | Type ID/Status | — | R |
| D8527 | | System Software Version/Position Information | — | R |
| D8528 | Expansion Module Slot 30 Information | Type ID/Status | — | R |
| D8529 | | System Software Version/Position Information | — | R |
| D8530 | Expansion Module Slot 31 Information | Type ID/Status | — | R |
| D8531 | | System Software Version/Position Information | — | R |
| D8532 | Expansion Module Slot 32 Information | Type ID/Status | — | R |
| D8533 | | System Software Version/Position Information | — | R |
| D8534 | Expansion Module Slot 33 Information | Type ID/Status | — | R |
| D8535 | | System Software Version/Position Information | — | R |
| D8536 | Expansion Module Slot 34 Information | Type ID/Status | — | R |
| D8537 | | System Software Version/Position Information | — | R |
| D8538 | Expansion Module Slot 35 Information | Type ID/Status | — | R |
| D8539 | | System Software Version/Position Information | — | R |
| D8530 | Expansion Module Slot 36 Information | Type ID/Status | — | R |
| D8541 | | System Software Version/Position Information | — | R |
| D8542 | Expansion Module Slot 37 Information | Type ID/Status | — | R |
| D8543 | | System Software Version/Position Information | — | R |
| D8544 | Expansion Module Slot 38 Information | Type ID/Status | — | R |
| D8545 | | System Software Version/Position Information | — | R |
| D8546 | Expansion Module Slot 39 Information | Type ID/Status | — | R |
| D8547 | | System Software Version/Position Information | — | R |
| D8548 | Expansion Module Slot 40 Information | Type ID/Status | — | R |
| D8549 | | System Software Version/Position Information | — | R |
| D8550 | Expansion Module Slot 41 Information | Type ID/Status | — | R |
| D8551 | | System Software Version/Position Information | — | R |
| D8552 | Expansion Module Slot 42 Information | Type ID/Status | — | R |
| D8553 | | System Software Version/Position Information | — | R |
| D8554 | Expansion Module Slot 43 Information | Type ID/Status | — | R |
| D8555 | | System Software Version/Position Information | — | R |
| D8556 | Expansion Module Slot 44 Information | Type ID/Status | — | R |
| D8557 | | System Software Version/Position Information | — | R |
| D8558 | Expansion Module Slot 45 Information | Type ID/Status | — | R |
| D8559 | | System Software Version/Position Information | — | R |
| D8560 | Expansion Module Slot 46 Information | Type ID/Status | — | R |
| D8561 | | System Software Version/Position Information | — | R |
| D8562 | Expansion Module Slot 47 Information | Type ID/Status | — | R |
| D8563 | | System Software Version/Position Information | — | R |
| D8564 | Expansion Module Slot 48 Information | Type ID/Status | — | R |
| D8565 | | System Software Version/Position Information | — | R |
| D8566 | Expansion Module Slot 49 Information | Type ID/Status | — | R |
| D8567 | | System Software Version/Position Information | — | R |
| D8568 | Expansion Module Slot 50 Information | Type ID/Status | — | R |
| D8569 | | System Software Version/Position Information | — | R |
| D8570 | Expansion Module Slot 51 Information | Type ID/Status | — | R |
| D8571 | | System Software Version/Position Information | — | R |
| D8572 | Expansion Module Slot 52 Information | Type ID/Status | — | R |
| D8573 | | System Software Version/Position Information | — | R |
| D8574 | Expansion Module Slot 53 Information | Type ID/Status | — | R |
| D8575 | | System Software Version/Position Information | — | R |

2: DEVICES

| Device Address | Description | | Update Timing | R/W |
|----------------|---|--|---------------|-----|
| D8576 | Expansion Module Slot 54 | Type ID/Status | — | R |
| D8577 | | Information | — | R |
| D8578 | Expansion Module Slot 55 | Type ID/Status | — | R |
| D8579 | | Information | — | R |
| D8580 | Expansion Module Slot 56 | Type ID/Status | — | R |
| D8581 | | Information | — | R |
| D8582 | Expansion Module Slot 57 | Type ID/Status | — | R |
| D8583 | | Information | — | R |
| D8584 | Expansion Module Slot 58 | Type ID/Status | — | R |
| D8585 | | Information | — | R |
| D8586 | Expansion Module Slot 59 | Type ID/Status | — | R |
| D8587 | | Information | — | R |
| D8588 | Expansion Module Slot 60 | Type ID/Status | — | R |
| D8589 | | Information | — | R |
| D8590 | Expansion Module Slot 61 | Type ID/Status | — | R |
| D8591 | | Information | — | R |
| D8592 | Expansion Module Slot 62 | Type ID/Status | — | R |
| D8593 | | Information | — | R |
| D8594 | Expansion Module Slot 63 | Type ID/Status | — | R |
| D8595 | | Information | — | R |
| D8596 | Expansion Interface Remote Master Module Slot Information | Type ID/Status | — | R |
| D8597 | | System Software Version/ Number of Connected Expansion Interface Remote Slave Modules | — | R |
| D8598 | Expansion Interface Remote Slave Module (Node 1) Slot Information | Type ID/Status | — | R |
| D8599 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8600 | Expansion Interface Remote Slave Module (Node 2) Slot Information | Type ID/Status | — | R |
| D8601 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8602 | Expansion Interface Remote Slave Module (Node 3) Slot Information | Type ID/Status | — | R |
| D8603 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8604 | Expansion Interface Remote Slave Module (Node 4) Slot Information | Type ID/Status | — | R |
| D8605 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8606 | Expansion Interface Remote Slave Module (Node 5) Slot Information | Type ID/Status | — | R |
| D8607 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8608 | Expansion Interface Remote Slave Module (Node 6) Slot Information | Type ID/Status | — | R |
| D8609 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8610 | Expansion Interface Remote Slave Module (Node 7) Slot Information | Type ID/Status | — | R |
| D8611 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8612 | Expansion Interface Remote Slave Module (Node 8) Slot Information | Type ID/Status | — | R |
| D8613 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8614 | Expansion Interface Remote Slave Module (Node 9) Slot Information | Type ID/Status | — | R |
| D8615 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8616 | Expansion Interface Remote Slave Module (Node 10) Slot Information | Type ID/Status | — | R |
| D8617 | | System Software Version/ Expansion Module Connection Information | — | R |
| D8618 | Refresh Time of Expansion Interface Remote Master/Slave Modules Current Value | | Every scan | R |
| D8619 | Refresh Time of Expansion Interface Remote Master/Slave Modules Maximum Value | | Every scan | R |

| Device Address | Description | Update Timing | R/W |
|----------------|---|---------------|-----|
| D8620 to D8629 | — Reserved — | — | — |
| D8630 | CPU Module Ethernet Port 2 IP Settings/DNS Settings Switching | — | R/W |
| D8631 | CPU Module Ethernet Port 2 IP Address (Write-only) | — | W |
| D8632 | | — | W |
| D8633 | | — | W |
| D8634 | | — | W |
| D8635 | CPU Module Ethernet Port 2 Subnet Mask (Write-only) | — | W |
| D8636 | | — | W |
| D8637 | | — | W |
| D8638 | | — | W |
| D8639 | CPU Module Ethernet Port 2 Default Gateway (Write-only) | — | W |
| D8640 | | — | W |
| D8641 | | — | W |
| D8642 | | — | W |
| D8643 | CPU Module Ethernet Port 2 Preferred DNS Server (Write-only) | — | W |
| D8644 | | — | W |
| D8645 | | — | W |
| D8646 | | — | W |
| D8647 | CPU Module Ethernet Port 2 Alternate DNS Server (Write-only) | — | W |
| D8648 | | — | W |
| D8649 | | — | W |
| D8650 | | — | W |
| D8651 | CPU Module Ethernet Port 2 MAC Address (Current Value Read-only) | Every 1 s | R |
| D8652 | | Every 1 s | R |
| D8653 | | Every 1 s | R |
| D8654 | | Every 1 s | R |
| D8655 | | Every 1 s | R |
| D8656 | | Every 1 s | R |
| D8657 | CPU Module Ethernet Port 2 IP Address (Current Value Read-only) | Every 1 s | R |
| D8658 | | Every 1 s | R |
| D8659 | | Every 1 s | R |
| D8660 | | Every 1 s | R |
| D8661 | CPU Module Ethernet Port 2 Subnet Mask (Current Value Read-only) | Every 1 s | R |
| D8662 | | Every 1 s | R |
| D8663 | | Every 1 s | R |
| D8664 | | Every 1 s | R |
| D8665 | CPU Module Ethernet Port 2 Default Gateway (Current Value Read-only) | Every 1 s | R |
| D8666 | | Every 1 s | R |
| D8667 | | Every 1 s | R |
| D8668 | | Every 1 s | R |
| D8669 | CPU Module Ethernet Port 2 Preferred DNS Server (Current Value Read-only) | Every 1 s | R |
| D8670 | | Every 1 s | R |
| D8671 | | Every 1 s | R |
| D8672 | | Every 1 s | R |
| D8673 | CPU Module Ethernet Port 2 Alternate DNS Server (Current Value Read-only) | Every 1 s | R |
| D8674 | | Every 1 s | R |
| D8675 | | Every 1 s | R |
| D8676 | | Every 1 s | R |
| D8677 | Connection 9 Connected IP Address | Every 1 s | R |
| D8678 | | Every 1 s | R |
| D8679 | | Every 1 s | R |
| D8680 | | Every 1 s | R |

2: DEVICES

| Device Address | Description | Update Timing | R/W |
|----------------|---|---------------|-----|
| D8681 | Connection 10 Connected IP Address | Every 1 s | R |
| D8682 | | Every 1 s | R |
| D8683 | | Every 1 s | R |
| D8684 | | Every 1 s | R |
| D8685 | Connection 11 Connected IP Address | Every 1 s | R |
| D8686 | | Every 1 s | R |
| D8687 | | Every 1 s | R |
| D8688 | | Every 1 s | R |
| D8689 | Connection 12 Connected IP Address | Every 1 s | R |
| D8690 | | Every 1 s | R |
| D8691 | | Every 1 s | R |
| D8692 | | Every 1 s | R |
| D8693 | Connection 13 Connected IP Address | Every 1 s | R |
| D8694 | | Every 1 s | R |
| D8695 | | Every 1 s | R |
| D8696 | | Every 1 s | R |
| D8697 | Connection 14 Connected IP Address | Every 1 s | R |
| D8698 | | Every 1 s | R |
| D8699 | | Every 1 s | R |
| D8700 | | Every 1 s | R |
| D8701 | Connection 15 Connected IP Address | Every 1 s | R |
| D8702 | | Every 1 s | R |
| D8703 | | Every 1 s | R |
| D8704 | | Every 1 s | R |
| D8705 | Connection 16 Connected IP Address | Every 1 s | R |
| D8706 | | Every 1 s | R |
| D8707 | | Every 1 s | R |
| D8708 | | Every 1 s | R |
| D8709 to D8716 | — Reserved — | — | — |
| D8717 | Control Signal Status (Port 10 to 13) | Every scan | R |
| D8718 | RS232C DSR Input Control Signal Option (Port 10 to 13) | Every scan | R/W |
| D8719 | RS232C DTR Output Control Signal Option (Port 10 to 13) | Every scan | R/W |
| D8720 | Control Signal Status (Port 14 to 17) | Every scan | R |
| D8721 | RS232C DSR Input Control Signal Option (Port 14 to 17) | Every scan | R/W |
| D8722 | RS232C DTR Output Control Signal Option (Port 14 to 17) | Every scan | R/W |
| D8723 | Control Signal Status (Port 18 to 21) | Every scan | R |
| D8724 | RS232C DSR Input Control Signal Option (Port 18 to 21) | Every scan | R/W |
| D8725 | RS232C DTR Output Control Signal Option (Port 18 to 21) | Every scan | R/W |
| D8726 | Control Signal Status (Port 22 to 25) | Every scan | R |
| D8727 | RS232C DSR Input Control Signal Option (Port 22 to 25) | Every scan | R/W |
| D8728 | RS232C DTR Output Control Signal Option (Port 22 to 25) | Every scan | R/W |
| D8729 | Control Signal Status (Port 26 to 29) | Every scan | R |
| D8730 | RS232C DSR Input Control Signal Option (Port 26 to 29) | Every scan | R/W |
| D8731 | RS232C DTR Output Control Signal Option (Port 26 to 29) | Every scan | R/W |
| D8732 | Control Signal Status (Port 30 to 33) | Every scan | R |
| D8733 | RS232C DSR Input Control Signal Option (Port 30 to 33) | Every scan | R/W |
| D8734 | RS232C DTR Output Control Signal Option (Port 30 to 33) | Every scan | R/W |
| D8735 | Slave Number (Port 10) | — | R/W |
| D8736 | Slave Number (Port 11) | — | R/W |
| D8737 | Slave Number (Port 12) | — | R/W |
| D8738 | Slave Number (Port 13) | — | R/W |
| D8739 | Slave Number (Port 14) | — | R/W |
| D8740 | Slave Number (Port 15) | — | R/W |
| D8741 | Slave Number (Port 16) | — | R/W |

| Device Address | Description | Update Timing | R/W |
|----------------|--|-------------------------------|-----|
| D8742 | Slave Number (Port 17) | — | R/W |
| D8743 | Slave Number (Port 18) | — | R/W |
| D8744 | Slave Number (Port 19) | — | R/W |
| D8745 | Slave Number (Port 20) | — | R/W |
| D8746 | Slave Number (Port 21) | — | R/W |
| D8747 | Slave Number (Port 22) | — | R/W |
| D8748 | Slave Number (Port 23) | — | R/W |
| D8749 | Slave Number (Port 24) | — | R/W |
| D8750 | Slave Number (Port 25) | — | R/W |
| D8751 | Slave Number (Port 26) | — | R/W |
| D8752 | Slave Number (Port 27) | — | R/W |
| D8753 | Slave Number (Port 28) | — | R/W |
| D8754 | Slave Number (Port 29) | — | R/W |
| D8755 | Slave Number (Port 30) | — | R/W |
| D8756 | Slave Number (Port 31) | — | R/W |
| D8757 | Slave Number (Port 32) | — | R/W |
| D8758 | Slave Number (Port 33) | — | R/W |
| D8759 | EMAIL Instruction Detailed Error Information (Ethernet Port 1) | — | R |
| D8760 | Communication Mode Information | Connection 9 to 12 | R |
| D8761 | | Connection 13 to 16 | R |
| D8762 to D8773 | — Reserved — | — | — |
| D8774 | Remote Host Number of Connection 9 (1 to 255) | — | R/W |
| D8775 | Remote Host Number of Connection 10 (1 to 255) | — | R/W |
| D8776 | Remote Host Number of Connection 11 (1 to 255) | — | R/W |
| D8777 | Remote Host Number of Connection 12 (1 to 255) | — | R/W |
| D8778 | Remote Host Number of Connection 13 (1 to 255) | — | R/W |
| D8779 | Remote Host Number of Connection 14 (1 to 255) | — | R/W |
| D8780 | Remote Host Number of Connection 15 (1 to 255) | — | R/W |
| D8781 | Remote Host Number of Connection 16 (1 to 255) | — | R/W |
| D8782 | BACnet Operation Status | — | R |
| D8783 | BACnet Error Information | — | R |
| D8784 to D8789 | — Reserved — | — | — |
| D8790 | EtherNet/IP Operation Status | — | R |
| D8791 | EtherNet/IP Error Information | — | R |
| D8792 to D8819 | — Reserved — | — | — |
| D8820 | Download Files for Sever Functions from SD Memory Card Execution Information | When processing has completed | R |
| D8821 | Download Files for Sever Functions from SD Memory Card Execution Error Information | When processing has completed | R |
| D8822 | Web Server Current Number of Connections (Plus CPU Module) | Every 1 s | R |
| D8823 to D8899 | — Reserved — | — | — |

Supplementary Descriptions of the Special Data Registers

■ D8000: Quantity of Inputs

The number of FC6A inputs is written to this register.

The total number of inputs for the CPU module and the expansion modules is written to this register.

■ D8001: Quantity of Outputs

The number of FC6A outputs is written to this register.

The total number of outputs for the CPU module and the expansion modules is written to this register.

■ D8002: CPU Module Type Information

CPU module type information is written this register.

- 0 (00h): 16-I/O type
- 1 (01h): 24-I/O type
- 2 (02h): 40-I/O type (All-in-One CPU module)
- 18 (12h): 40-I/O type (CAN J1939 All-in-One CPU module)
- 32 (20h): Plus 16-I/O type
- 33 (21h): Plus 32-I/O type

■ D8005: General Error Code

FC6A general error information is written to this register. When a general error occurs, the bit corresponding to the error occurred turns on. The general error and user program execution error can be cleared by writing "1" to the most significant bit of D8005. For details on general error codes, see Chapter 13 "General Error Codes" in the "FC6A Series MICROSmart User's Manual".

■ D8006: User Program Execution Error Code

FC6Auser program execution error information is written to this register. When a user program execution error occurs, the error code corresponding to the error that occurred is written to this register. For details on user program execution errors, see Chapter 13 "User Program Execution Error" in the "FC6A Series MICROSmart User's Manual".

■ D8008 to D8021: Calendar/Clock Data

D8008 through D8021 are used for reading calendar/clock data from the internal clock and for writing calendar/clock data to the internal clock. For details on the calendar/clock data, see Chapter 5 "Clock Function" in the "FC6A Series MICROSmart User's Manual".

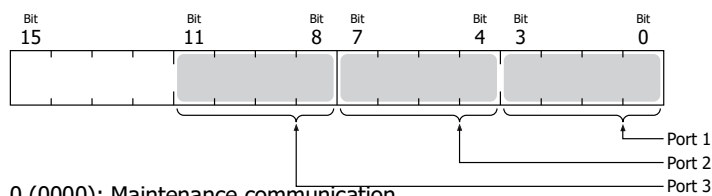
■ D8022 to D8025: Scan Time Data

D8022 through D8025 are special data registers for checking the scan time and configuring the constant scan time. For details on the scan time, see Chapter 5 "Constant Scan Time" in the "FC6A Series MICROSmart User's Manual".

■ D8026: Communication Mode Information (Port 1 to 3)

This register indicates communication mode information for Port 1 to Port 3.

The allocation of communication ports in the device (bit assignment) is as follows.



- 0 (0000): Maintenance communication
- 1 (0001): User communication
- 2 (0010): Modbus RTU master
- 3 (0011): Modbus RTU slave
- 4 (0100): Data link communication

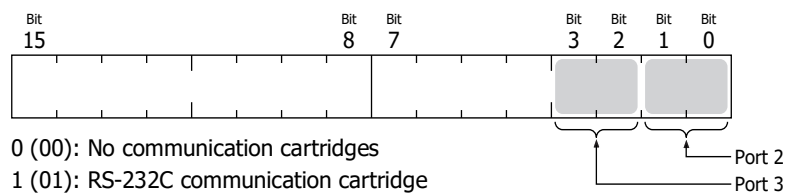
■ D8029: System Software Version

The CPU module system software version number is written to this register.

■ D8030: Communication Cartridge Information

This register indicates information about the communication cartridges in Port 2 and Port 3.

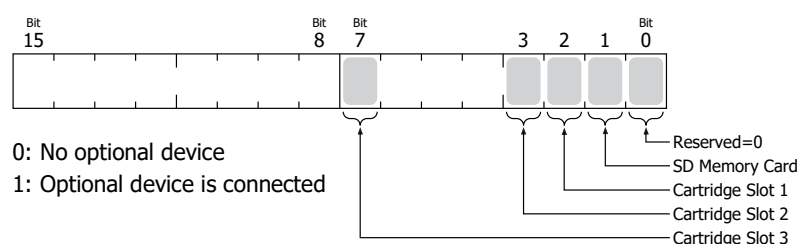
The allocation of communication ports in the device (bit assignment) is as follows.



- 0 (00): No communication cartridges
- 1 (01): RS-232C communication cartridge
- 2 (10): RS-485 communication cartridge
- 3 (11): Bluetooth communication cartridge

■ D8031: Optional Device Connection Information

Optional device connection information is written to this register.
The allocation of bits in the device (bit assignment) is as follows.



■ D8032 to D8035, D8214, D8215: Interrupt Input Jump Destination Label No.

Jump destination label numbers for interrupt inputs are written to these registers. When using interrupt inputs, write the label number that corresponds to the special data register that has been allocated to the interrupt input. For details on interrupt inputs, see Chapter 5 "Interrupt Input" in the "FC6A Series MICROSmart User's Manual".

D8032 = I1

D8033 = I3

D8034 = I4

D8035 = I6

D8214 = I7

D8215 = I0

■ D8036: Timer Interrupt Jump Destination Label No.

The jump destination label number when the timer interrupt occurs is written to this register. When using the timer interrupt, store the corresponding label number.

For details on the timer interrupt, see Chapter 5 "Timer Interrupt" in the "FC6A Series MICROSmart User's Manual".

■ D8037: Number of Connected Expansion Modules

The number of expansion modules connected to the CPU module (I/O modules, PID modules, and communication modules) is written to this register.

■ D8052: J1939 Communication Error Code

When an error occurs in J1939 communication, the error code is written to this register. For details on J1939 communication error codes, see "J1939 Communication Error Code (D8052)" on page 8-6.

■ D8056: Battery Voltage

The measurement result of the backup battery voltage is written to this register in 1 mV units.

0: Measurement error

■ D8057: Analog Volume (AI0)

The analog volume value is converted to a digital value and written to this register. For details, see Chapter 5 "Analog Potentiometer" in the "FC6A Series MICROSmart User's Manual".

■ D8058: Built-in Analog Input (AI1)

The analog input's analog value (0 to 10V DC) is converted to a digital value and written to this register. For details, see Chapter 5 "Analog Voltage Input" in the "FC6A Series MICROSmart User's Manual".

■ D8059: Analog Input Status AI0

The analog volume's analog input status is written to this register. For details, see Chapter 5 "Analog Potentiometer" in the "FC6A Series MICROSmart User's Manual".

■ D8060: Analog Input Status AI1

The analog input's analog input status is written to this register. For details, see Chapter 5 "Analog Voltage Input" in the "FC6A Series MICROSmart User's Manual".

■ D8067: Backlight ON Time

The backlight on time for the HMI module is written to this register. The backlight on time can be set by modifying the value of D8067 in a range between 1 and 65,535 s. When D8067 is 0 s, the backlight is always on. The backlight on time can also be changed with the HMI environment settings. For details, see "Master Station" on page 7-4.

■ D8069 to D8099: Slave (1 to 31) Communication Status/Error

Special data registers used in data link communication. For details, see "Master Station" on page 7-4.

■ D8040 to D8045, D8100, D8102, D8103, D8735 to D8758: Slave Number (Port 1 to 33)

The slave number is written to these registers when the Port 1 to 33 communication mode is maintenance communication, Modbus RTU slave, or data link communication. The slave number can be changed by changing the value of the corresponding device in **Function Area Settings**.

D8100 = Port 1 Slave No.
D8102 = Port 2 Slave No.
D8103 = Port 3 Slave No.

D8040 = Port 4 Slave No.
D8041 = Port 5 Slave No.
D8042 = Port 6 Slave No.
D8043 = Port 7 Slave No.
D8044 = Port 8 Slave No.
D8045 = Port 9 Slave No.
D8735 = Port 10 Slave No.
D8736 = Port 11 Slave No.
D8737 = Port 12 Slave No.
D8738 = Port 13 Slave No.
D8739 = Port 14 Slave No.
D8740 = Port 15 Slave No.
D8741 = Port 16 Slave No.

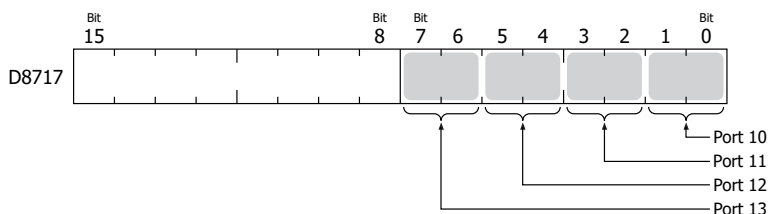
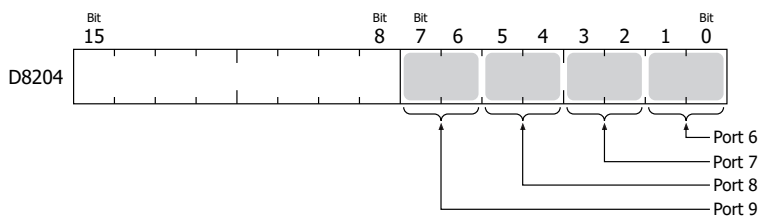
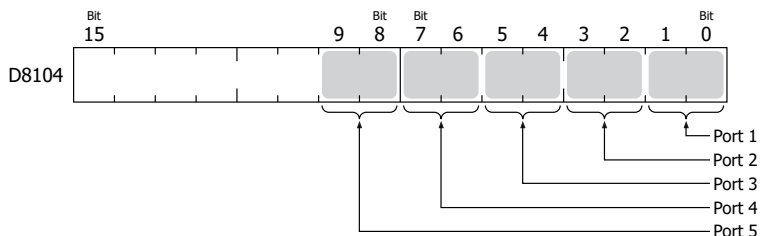
D8742 = Port 17 Slave No.
D8743 = Port 18 Slave No.
D8744 = Port 19 Slave No.
D8745 = Port 20 Slave No.
D8746 = Port 21 Slave No.
D8747 = Port 22 Slave No.
D8748 = Port 23 Slave No.
D8749 = Port 24 Slave No.
D8750 = Port 25 Slave No.
D8751 = Port 26 Slave No.
D8752 = Port 27 Slave No.
D8753 = Port 28 Slave No.
D8754 = Port 29 Slave No.
D8755 = Port 30 Slave No.
D8756 = Port 31 Slave No.
D8757 = Port 32 Slave No.
D8758 = Port 33 Slave No.

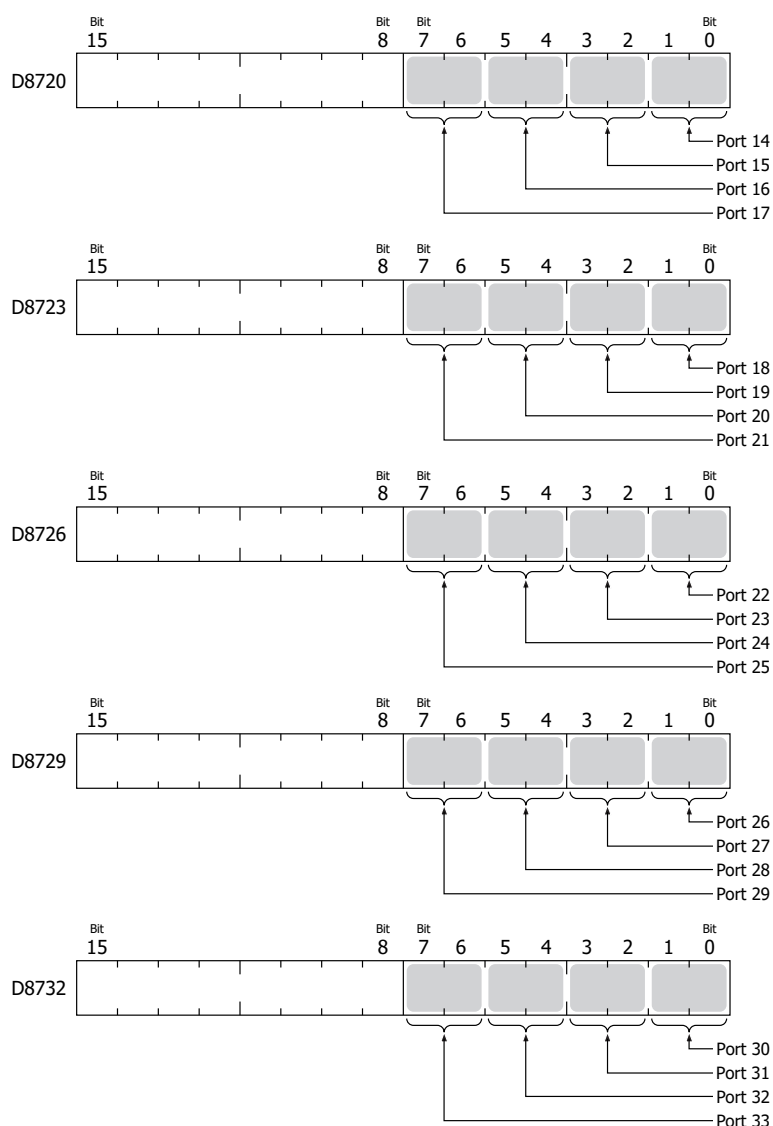
For details on communication modes, see the following in this manual.

- Maintenance communication: "Maintenance Communication" on page 4-1
- Modbus RTU slave: "Modbus Communication" on page 6-1
- Data link communication: "Data Link Communication" on page 7-1

■ D8104, D8204, D8717, D8720, D8723, D8726, D8729, D8732: Control Signal Status (Port 1 to 33)

The signal statuses of the DSR and DTR controls lines are written to this register. This register is updated in END processing when stopped and while running. The allocation of communication ports in the device (bit assignment) is as follows.





0 (00): DTR and DSR are both off.

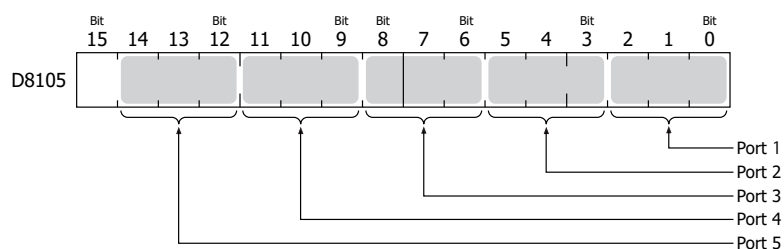
1 (01): DTR is off and DSR is on.

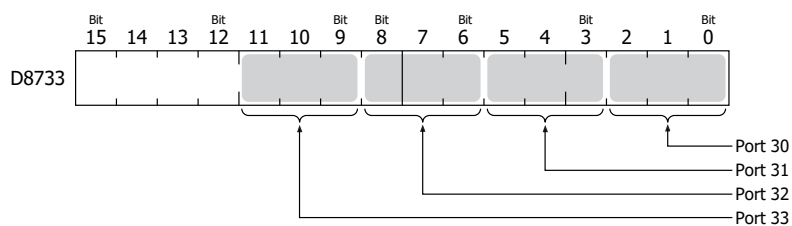
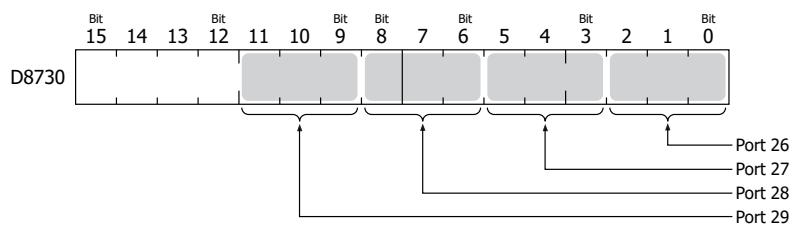
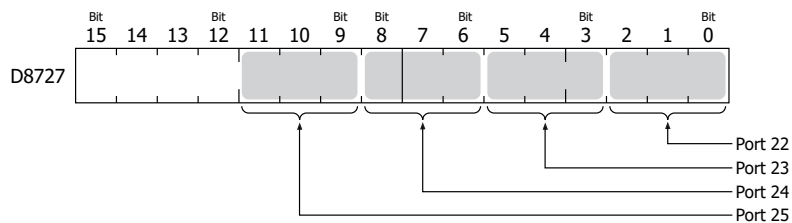
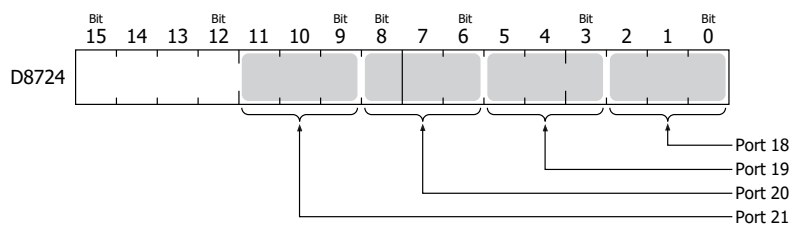
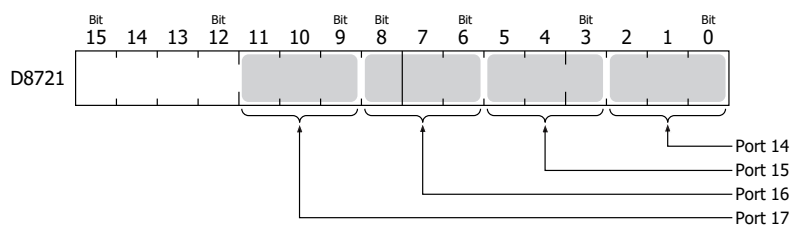
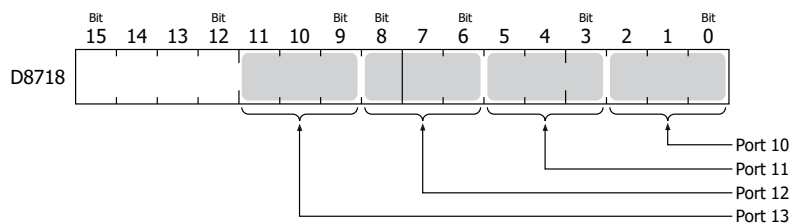
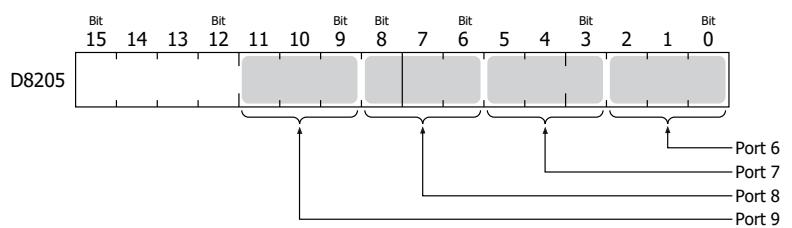
2 (10): DTR is on and DSR is off.

3 (11): DTR and DSR are both on.

■ **D8105, D8205, D8718, D8721, D8724, D8727, D8730, D8733: RS232C DSR Input Control Signal Option (Port 1 to 33)**

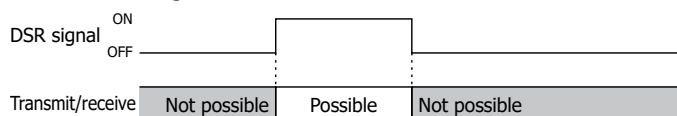
The signal statuses of the DSR and DTR controls lines are written to this register. This register is updated in END processing when stopped and while running. The allocation of communication ports in the device (bit assignment) is as follows.



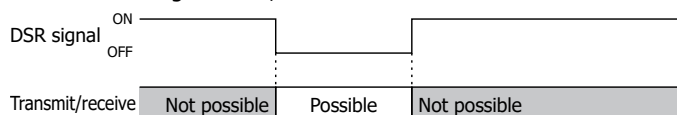


0 (000): The DSR signal status is not used for FC6A transmission control.
Use this status when DSR signal control is not required.

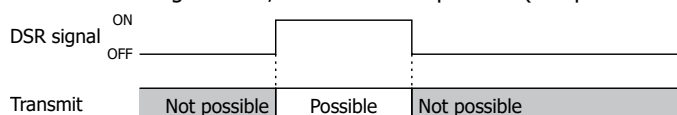
- 1 (001): When the DSR signal is on, the FC6A can transmit and receive.



- 2 (010): When the DSR signal is off, the FC6A can transmit and receive.



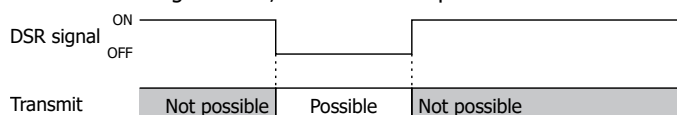
- 3 (011): When the DSR signal is on, transmission is possible (reception is always possible).



This is normally called "busy control" and is used for transmission control for devices with a slow processing speed such as printers.

(As viewed from the connected device, there is a limit on the data that can be input.)

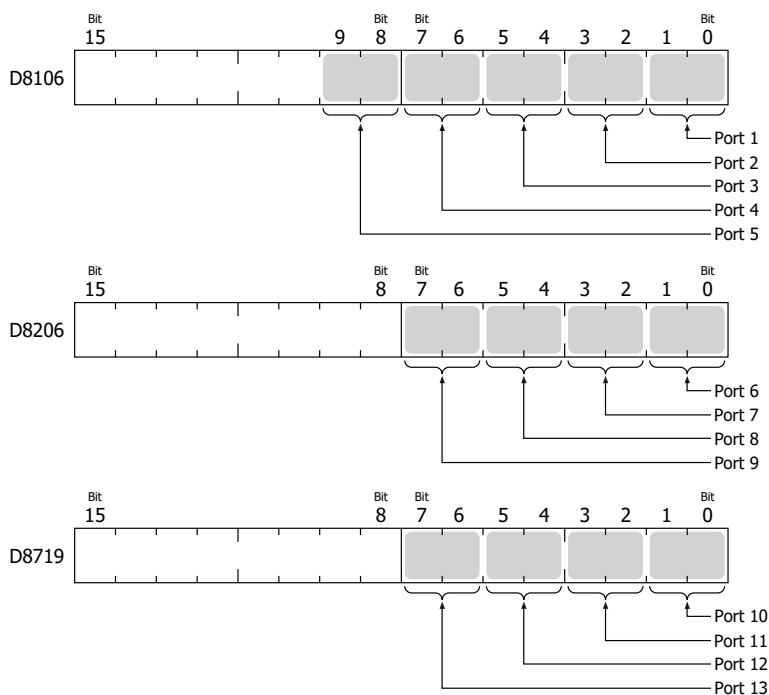
- 4 (100): When the DSR signal is off, transmission is possible.

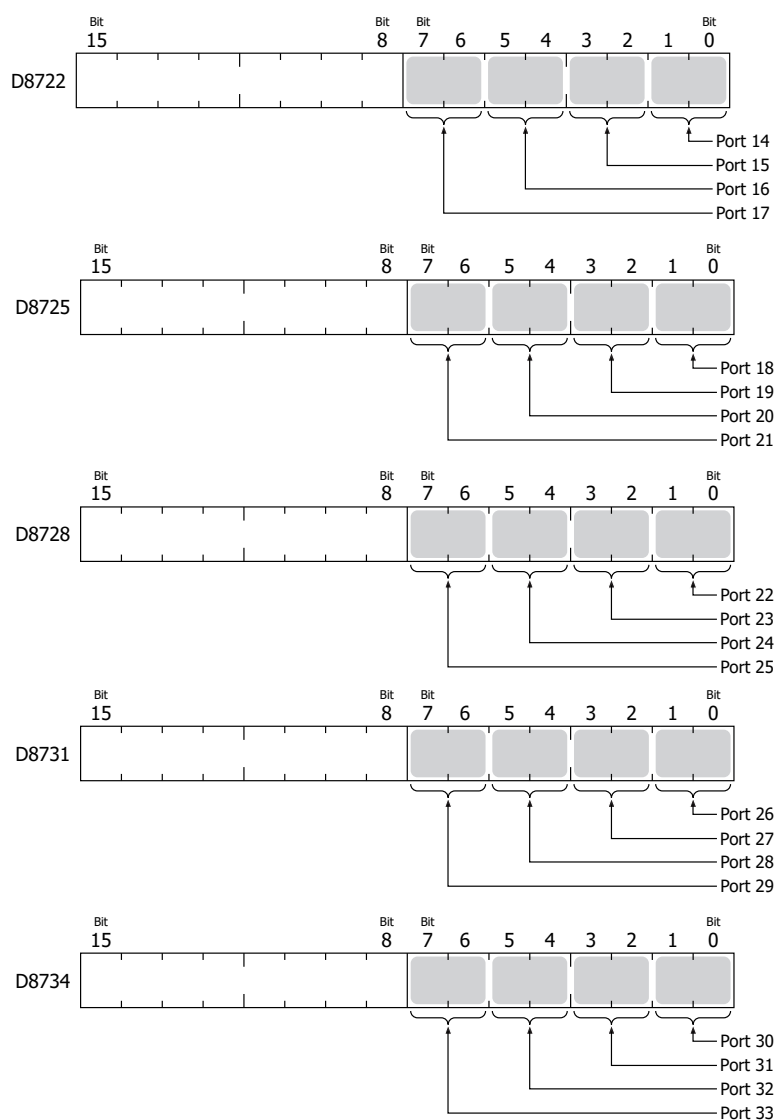


5 or higher: The operation is the same as the setting "000".

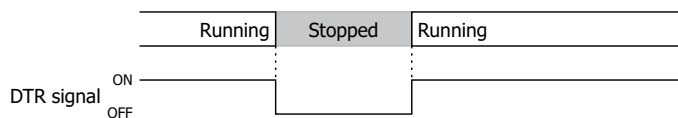
■ D8106, D8206, D8719, D8722, D8725, D8728, D8731, D8734: RS232C DTR Output Control Signal Option (Port 1 to 33)

This register is used when indicating the FC6A control status and the transmit/receive status to the connected device. This control line is an output signal from the FC6A to the connected device. This register is only valid during user communication. The allocation of communication ports in the device (bit assignment) is as follows.

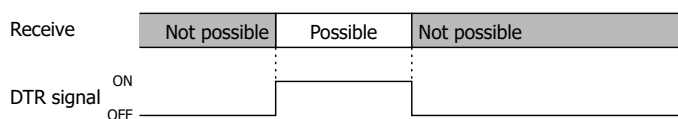




- 0 (00): The signal is on when the FC6A is set to run and off when stopped. While running, the signal is always on regardless of transmitting or receiving data. Set this value when it is necessary to indicate the run status.



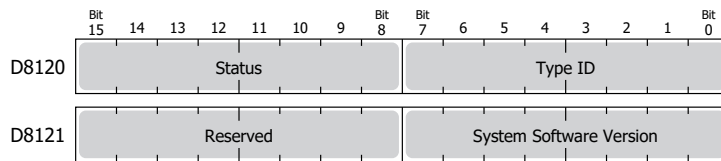
- 1 (01): Always off.
- 2 (10): Set this value when performing flow control for received data. The signal is on when data from the connected device can be received. The signal is off when data cannot be received.



- 3 (11): The operation is the same as the setting "0".

■ D8120, D8121: HMI Module Information

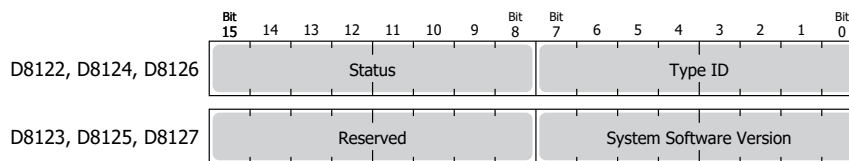
HMI module type information is written to these registers.
The allocation of information (bit assignment) is as follows.



The system software version displays the version of the software written to the device.
For details on the type IDs and statuses, see "List of Type IDs and Status" on page 2-49.

■ D8122 to D8127: Cartridge Slot Information

Cartridge Slot 1 to 3 information is written to these registers.
The allocation of information (bit assignment) is as follows.



D8122, D8123 = Cartridge Slot 1 Information

D8124, D8125 = Cartridge Slot 2 Information

D8126, D8127 = Cartridge Slot 3 Information

For details on the type IDs and statuses, see "List of Type IDs and Status" on page 2-49.

■ D8170, D8171, D8174, D8175, D8178, D8179: Analog I/O Cartridge I/O

Analog I/O values for the analog I/O cartridges are written to these registers.

For the analog input type : The analog values input to the analog I/O cartridge are converted to digital values and written to the registers.

For the analog output type : The digital values stored as digital values are converted to analog values and output from the analog I/O cartridges.

For details, see Chapter 10 "Analog I/O Cartridge" in the "FC6A Series MICROSmart User's Manual".

D8170 = AI2/AQ2

D8171 = AI3/AQ3

D8174 = AI4/AQ4

D8175 = AI5/AQ5

D8178 = AI6/AQ6

D8179 = AI7/AQ7

■ D8172, D8173, D8176, D8177, D8180, D8181: Analog I/O Cartridge Status

The analog status of analog I/O cartridges is written to these registers.

For details, see Chapter 10 "Analog I/O Cartridge" in the "FC6A Series MICROSmart User's Manual".

D8172 = AI2/AQ2

D8173 = AI3/AQ3

D8176 = AI4/AQ4

D8177 = AI5/AQ5

D8180 = AI6/AQ6

D8181 = AI7/AQ7

■ D8192 to D8203, D8210 to D8213, D8216 to D8229, D8232 to D8237: High-speed Counter

These special data registers are used with the high-speed counter function and the frequency measurement function.

For details on high-speed counters, see Chapter 5 "High-Speed Counter" in the "FC6A Series MICROSmart User's Manual".

D8210 to D8213, D8216, D8217 = High-speed counter (group 1/I0)

D8218 to D8221, D8234, D8235 = High-speed counter (group 3/I3)

D8222 to D8225, D8236, D8237 = High-speed counter (group 4/I4)

D8226 to D8229, D8232, D8233 = High-speed counter (group 5/I6)

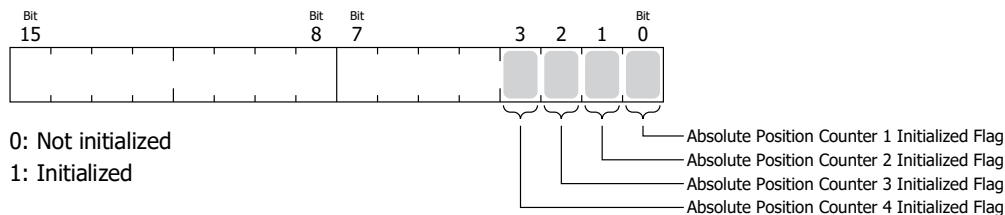
D8192 to D8197 = High-speed counter (group 2/I1)

D8198 to D8203 = High-speed counter (group 6/I7)

■ D8239: Absolute Position Control Status

This register indicates the status of absolute position control.

The allocation of the absolute position counter initialized flags in the device (bit assignment) is as follows. For details on the absolute position control status, see Chapter 18 "ABS (Set Absolute Position)" in the "Ladder Programming Manual".



■ D8240 to D8247: Absolute Position Counter 1 to 4

The absolute position is written to these registers according to pulse output. The absolute position can be initialized with the ABS instruction.

When reversible control is set in the pulse output instructions (RAMP/ARAMP/ZRN/JOG), the absolute position is incremented or decremented according to the output result. For details on absolute position counters, see Chapter 18 "ABS (Set Absolute Position)" in the "Ladder Programming Manual".

D8240, D8241 = Absolute position counter 1

D8242, D8243 = Absolute position counter 2

D8244, D8245 = Absolute position counter 3

D8246, D8247 = Absolute position counter 4

■ D8250: Read SD Memory Card Capacity

This register indicates the capacity of the recognized SD or SDHC (maximum size 32 GB) memory card in megabytes.

It is 0 when no SD memory card has been inserted or if it is not recognized.

■ D8251: Read SD Memory Card Free Capacity

This register indicates the free capacity of the SD memory card in megabytes.

It is 0 when no SD memory card has been inserted or if it is not recognized.

■ D8254: SD Memory Card Download/Upload Execution Information

Information about the SD memory card download/upload that was executed.

For details, see Chapter 11 "SD Memory Card" in the "FC6A Series MICROSmart User's Manual".

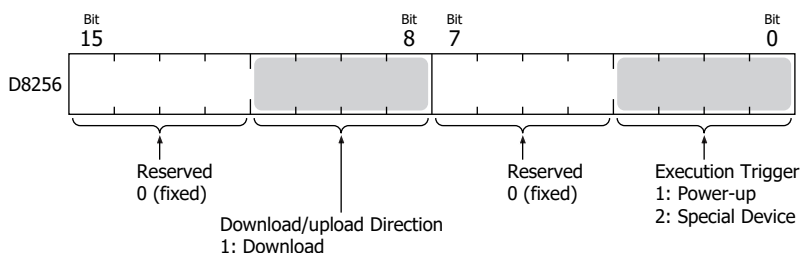
■ D8255: SD Memory Card Download/Upload Execution Status

The status of the SD memory card download/upload that was executed.

For details, see Chapter 11 "SD Memory Card" in the "FC6A Series MICROSmart User's Manual".

■ D8256: Download MQTT Basic Settings from SD Memory Card Execution Information

Information in executing the download of the files for MQTT Basic Settings. The allocation of bits in the device (bit assignment) is as follows.



■ D8257: Download MQTT Basic Settings from SD Memory Card Execution Error Information

Error information in executing the download of the files for MQTT Basic Settings. For details, see Chapter 3 "Special Devices" in the "Network User's Manual".

■ D8260: Recipe Block Number

The recipe block number to read or write using special internal relays.

All channels for the specified block number are applicable.

■ **D8261: Recipe Execution Block Number**

The recipe block number of the recipe that was executed.

This is updated when the recipe block starts, and the status is retained when completed.

■ **D8262: Recipe Execution Channel No.**

The channel number of the recipe that was executed.

This is updated when the channel processing starts, and the status is retained when completed.

■ **D8263: Recipe Execution Operation**

Information about the operation of the recipe that was executed.

For details on recipes, see Chapter 11 "Recipe Function" in the "FC6A Series MICROSmart User's Manual".

■ **D8264: Recipe Execution Status**

The status of the recipe that was executed.

For details on recipes, see Chapter 11 "Recipe Function" in the "FC6A Series MICROSmart User's Manual".

■ **D8265: Recipe Execution Error Information**

Error information about the recipe that was executed.

For details on recipes, see Chapter 11 "Recipe Function" in the "FC6A Series MICROSmart User's Manual".

■ **D8266: Recipe Internal Memory (ROM-Range 1) Read Count**

The number of times device values are read to internal memory (ROM-Range 1) as recipe data is stored in this register in units of 100.

■ **D8267: Recipe Internal Memory (ROM-Range 2) Read Count**

The number of times device values are read to internal memory (ROM-Range 2) as recipe data is stored in this register in units of 100.

■ **D8268 to D8275, D8774 to D8781: Remote Host Number 1 to 255 (connection 1 to 16)**

Special data registers that change the communications device when user communications client is set. For details, see "Switching Remote Host Numbers" on page 5-44.

■ **D8278, D8279, D8760, D8761: Communication Mode Information (Connection 1 to 16)**

D8278 = Indicates the communication mode of connections 1 through 4.

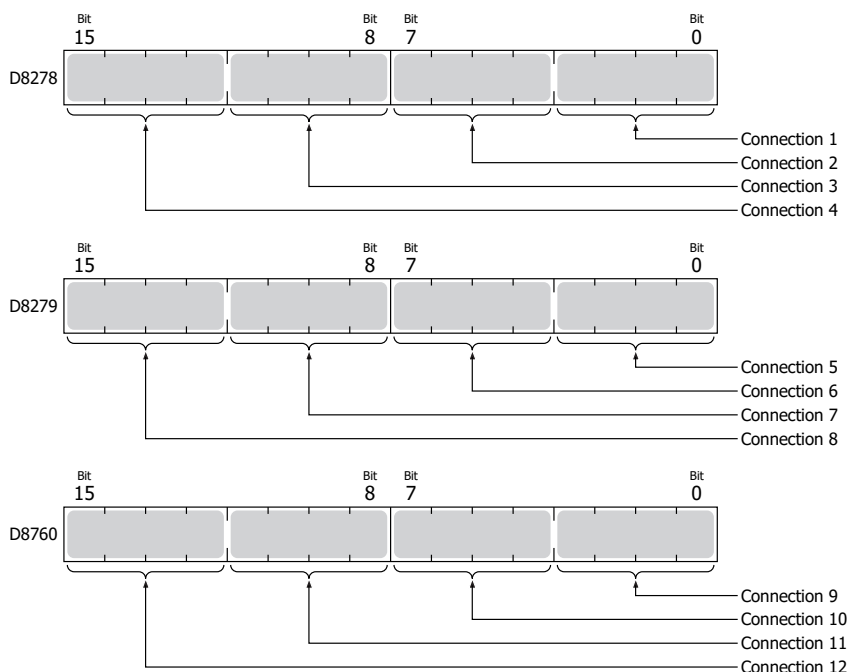
D8279 = Indicates the communication mode of connections 5 through 8.

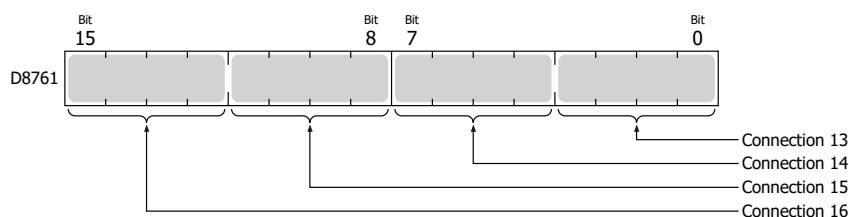
D8760 = Indicates the communication mode of connections 9 through 12.

D8761 = Indicates the communication mode of connections 13 through 16.

The allocation of connections in the device (bit assignment) is as follows.

Connections are allocated in 4-bit units from the lowest digit in ascending order of connection number.





Details for connections (4 bit) are as follow.

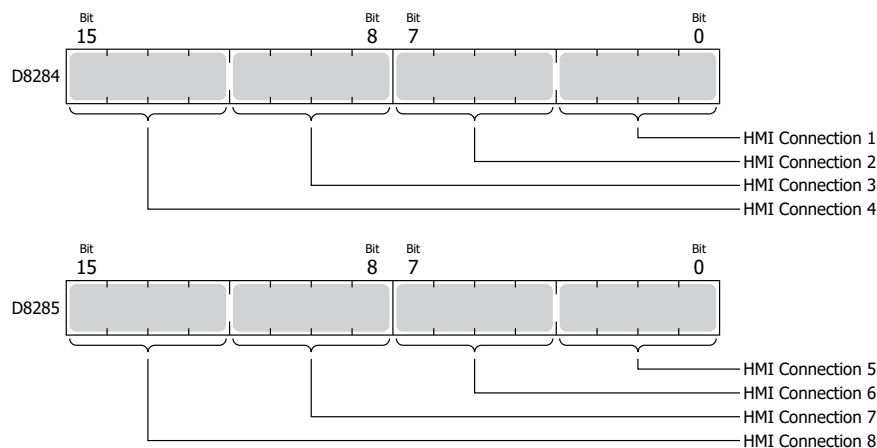
- Client connection (most significant bit = 0)
 - 0000: Unused
 - 0001: User Communication
 - 0010: Modbus TCP client
 - 0011: MC Protocol client
 - 0100: User communication UDP
- Server connection (most significant bit = 1)
 - 1000: Maintenance Communication
 - 1001: User Communication
 - 1010: Modbus TCP server

■ D8284, D8285: Communication Mode Information (HMI Connection) (HMI Connection 1 to 8)

D8284: Indicates the communication mode of HMI connections 1 through 4.

D8285: Indicates the communication mode of HMI connections 5 through 8.

The allocation of connections in the device (bit assignment) is as follows.



- Client connection (most significant bit = 0)
 - 0000: Unused
- Server connection (most significant bit = 1)
 - 1000: Maintenance Communication

■ D8303: CPU Module Ethernet Port 1 IP Settings/DNS Settings Switching

The IP settings/DNS settings for Ethernet Port 1 can be changed by writing one of the setting values in the table on the next page to D8303 and then turning on M8190.

To use this function, enable the following items in **Function Area Settings** of WindLDR.

- All-in-One CPU module/CAN J1939 All-in-One CPU module
 - Enable D8303 (IP Settings / DNS Settings switching) on Network Settings in Function Area Settings**
- Plus CPU module
 - Enable D8303 (IP Settings / DNS Settings switching) on Ethernet Port 1 in Function Area Settings**

The meanings of the setting values are as follows.

| Setting Value | IP Settings/DNS Settings |
|---------------|---|
| 0 | Conform to function area settings. |
| 1 | Enable DHCP. |
| 2 | Conform to special data register (D8304 to D8323) settings. |

■ **D8304 to D8307: CPU Module Ethernet Port 1 IP Address (Write-only)**

These registers are used to write the CPU module's IP address.

IP address: To set as aaa.bbb.ccc.ddd, write the following.

D8304=aaa, D8305=bbb, D8306=ccc, D8307=ddd

■ **D8308 to D8311: CPU Module Ethernet Port 1 Subnet Mask (Write-only)**

These registers are used to write the CPU module's subnet mask.

Subnet mask: For aaa.bbb.ccc.ddd, write the following.

D8308=aaa, D8309=bbb, D8310=ccc, D8311=ddd

■ **D8312 to D8315: CPU Module Ethernet Port 1 Default Gateway (Write-only)**

These registers are used to write the CPU module's default gateway.

Default gateway: For aaa.bbb.ccc.ddd, write the following.

D8312=aaa, D8313=bbb, D8314=ccc, D8315=ddd

■ **D8316 to D8319: CPU Module Ethernet Port 1 Preferred DNS Server (Write-only)**

These registers are used to write the CPU module's preferred DNS server.

Preferred DNS server: For aaa.bbb.ccc.ddd, write the following.

D8316=aaa, D8317=bbb, D8318=ccc, D8319=ddd

■ **D8320 to D8323: CPU Module Ethernet Port 1 Alternate DNS Server (Write-only)**

These registers are used to write the CPU module's alternate DNS server.

Alternate DNS server: For aaa.bbb.ccc.ddd, write the following.

D8320=aaa, D8321=bbb, D8322=ccc, D8323=ddd

■ **D8324 to D8329: CPU Module Ethernet Port 1 MAC Address (Current Value Read-only)**

The CPU module's MAC address is written to the special data registers as follows.

Example: MAC address: AA-BB-CC-DD-EE-FF

D8324=AA, D8325=BB, D8326=CC, D8327=DD, D8328=EE, D8329=FF

■ **D8330 to D8333: CPU Module Ethernet Port 1 IP Address (Current Value Read-only)**

The CPU module's IP address is written to the special data registers as follows.

Example: The CPU module's own IP address aaa.bbb.ccc.ddd

D8330=aaa, D8331=bbb, D8332=ccc, D8333=ddd

■ **D8334 to D8337: CPU Module Ethernet Port 1 Subnet Mask (Current Value Read-only)**

The CPU module's subnet mask value is written to the special data registers as follows.

Example: Subnet mask: aaa.bbb.ccc.ddd

D8334=aaa, D8335=bbb, D8336=ccc, D8337=ddd

■ **D8338 to D8341: CPU Module Ethernet Port 1 Default Gateway (Current Value Read-only)**

The CPU module's default gateway address is written to the special data registers as follows.

Example: Default gateway: aaa.bbb.ccc.ddd

D8338=aaa, D8339=bbb, D8340=ccc, D8341=ddd

■ **D8342 to D8345: CPU Module Ethernet Port 1 Preferred DNS Server (Current Value Read-only)**

The CPU module's preferred DNS server address is written to the special data registers as follows.

Example: Preferred DNS server: aaa.bbb.ccc.ddd

D8342=aaa, D8343=bbb, D8344=ccc, D8345=ddd

■ **D8346 to D8349: CPU Module Ethernet Port 1 Alternate DNS Server (Current Value Read-only)**

The CPU module's alternate DNS server address is written to the special data registers as follows.

Example: Alternate DNS server: aaa.bbb.ccc.ddd

D8346=aaa, D8347=bbb, D8348=ccc, D8349=ddd

■ D8350 to D8381, D8677 to D8708: Connection Connected IP Address

The IP address of the connected device that is being accessed through a connection is written as follows.

Connection 1 Connected IP Address: For aaa.bbb.ccc.ddd

D8350=aaa, D8351=bbb, D8352=ccc, D8353=ddd

Connection 2 Connected IP Address: For aaa.bbb.ccc.ddd

D8354=aaa, D8355=bbb, D8356=ccc, D8357=ddd

Connection 3 Connected IP Address: For aaa.bbb.ccc.ddd

D8358=aaa, D8359=bbb, D8360=ccc, D8361=ddd

Connection 4 Connected IP Address: For aaa.bbb.ccc.ddd

D8362=aaa, D8363=bbb, D8364=ccc, D8365=ddd

Connection 5 Connected IP Address: For aaa.bbb.ccc.ddd

D8366=aaa, D8367=bbb, D8368=ccc, D8369=ddd

Connection 6 Connected IP Address: For aaa.bbb.ccc.ddd

D8370=aaa, D8371=bbb, D8372=ccc, D8373=ddd

Connection 7 Connected IP Address: For aaa.bbb.ccc.ddd

D8374=aaa, D8375=bbb, D8376=ccc, D8377=ddd

Connection 8 Connected IP Address: For aaa.bbb.ccc.ddd

D8378=aaa, D8379=bbb, D8380=ccc, D8381=ddd

Connection 9 Connected IP Address: For aaa.bbb.ccc.ddd

D8677=aaa, D8678=bbb, D8679=ccc, D8680=ddd

Connection 10 Connected IP Address: For aaa.bbb.ccc.ddd

D8681=aaa, D8682=bbb, D8683=ccc, D8684=ddd

Connection 11 Connected IP Address: For aaa.bbb.ccc.ddd

D8685=aaa, D8686=bbb, D8687=ccc, D8688=ddd

Connection 12 Connected IP Address: For aaa.bbb.ccc.ddd

D8689=aaa, D8690=bbb, D8691=ccc, D8692=ddd

Connection 13 Connected IP Address: For aaa.bbb.ccc.ddd

D8693=aaa, D8694=bbb, D8695=ccc, D8696=ddd

Connection 14 Connected IP Address: For aaa.bbb.ccc.ddd

D8697=aaa, D8698=bbb, D8699=ccc, D8700=ddd

Connection 15 Connected IP Address: For aaa.bbb.ccc.ddd

D8701=aaa, D8702=bbb, D8703=ccc, D8704=ddd

Connection 16 Connected IP Address: For aaa.bbb.ccc.ddd

D8705=aaa, D8706=bbb, D8707=ccc, D8708=ddd

■ D8382 to D8387: HMI Module MAC Address (Current Value Read-only)

The MAC address is written to the special data registers as follows.

Example: MAC address: AA-BB-CC-DD-EE-FF

D8382=AA, D8383=BB, D8384=CC, D8385=DD, D8386=EE, D8387=FF

■ D8388 to D8391: HMI Module IP Address (Current Value Read-only)

The HMI module's IP address is written to the special data registers as follows.

Example: HMI module IP address: aaa.bbb.ccc.ddd

D8388=aaa, D8389=bbb, D8390=ccc, D8391=ddd

■ D8392 to D8395: HMI Module Subnet Mask (Current Value Read-only)

The HMI module's subnet mask value is written to the special data registers as follows.

Example: HMI module subnet mask: aaa.bbb.ccc.ddd

D8392=aaa, D8393=bbb, D8394=ccc, D8395=ddd

■ D8396 to D8399: HMI Module Default Gateway (Current Value Read-only)

The HMI module's default gateway address is written to the special data registers as follows.

Example: HMI module default gateway: aaa.bbb.ccc.ddd

D8396=aaa, D8397=bbb, D8398=ccc, D8399=ddd

■ D8400 to D8403: HMI Module Preferred DNS Server (Current Value Read-only)

The HMI module's preferred DNS server address is written to the special data registers as follows.

Example: HMI module preferred DNS server: aaa.bbb.ccc.ddd

D8400=aaa, D8401=bbb, D8402=ccc, D8403=ddd

■ **D8404 to D8407: HMI Module Alternate DNS Server (Current Value Read-only)**

The HMI module's alternate DNS server address is written to the special data registers as follows.

Example: HMI module alternate DNS server: aaa.bbb.ccc.ddd

D8404=aaa, D8405=bbb, D8406=ccc, D8407=ddd

■ **D8413: Time Zone Offset**

The time zone configured in the function area settings can be finely adjusted in 15-minute increments.

For details, see "SNTP Settings" on page 3-16.

■ **D8414: SNTP Operation Status**

The operation status is written to this register when the time information is acquired through operation of M8191 (SNTP Time Acquisition Flag) or when time information acquisition was executed by automatic acquisition.

For details, see "SNTP Settings" on page 3-16.

■ **D8415: SNTP Access Elapsed Time**

The elapsed time in minutes from when the time information was last acquired from the SNTP server.

For details, see "SNTP Settings" on page 3-16.

■ **D8429: HMI Module Connection Information Reference Connection Number**

The connection information for the specified connection number is reflected in D8430 to D8434. When 0 is written, 0 is written to D8430 to D8434. If a connection number that does not exist is specified, 0 is written to D8430 to D8434.

■ **D8430 to D8433: HMI Module Connection Information Reference Connected IP Address**

The IP address of the terminal being accessed through the connection is written to the special data registers as follows.

Example: IP address to read: aaa.bbb.ccc.ddd

D8430=aaa, D8431=bbb, D8432=ccc, D8433=ddd

■ **D8434: HMI Module Connection Information Reference Connected Port No.**

The port number of the terminal being accessed through the connection is written to this register.

■ **D8437 to D8440: HMI Module IP Address (Write-only)**

These registers are used to write the HMI module's IP address.

HMI module IP address: To set as aaa.bbb.ccc.ddd, write the following.

D8437=aaa, D8438=bbb, D8439=ccc, D8440=ddd

■ **D8441 to D8444: HMI Module Subnet Mask (Write-only)**

These registers are used to write the HMI module's subnet mask.

HMI module subnet mask: For aaa.bbb.ccc.ddd, write the following.

D8441=aaa, D8442=bbb, D8443=ccc, D8444=ddd

■ **D8445 to D8448: HMI Module Default Gateway (Write-only)**

These registers are used to write the HMI module's default gateway.

HMI module default gateway: For aaa.bbb.ccc.ddd, write the following.

D8445=aaa, D8446=bbb, D8447=ccc, D8448=ddd

■ **D8449 to D8452: HMI Module Preferred DNS Server (Write-only)**

These registers are used to write the HMI module's preferred DNS server.

HMI module preferred DNS server: For aaa.bbb.ccc.ddd, write the following.

D8449=aaa, D8450=bbb, D8451=ccc, D8452=ddd

■ **D8453 to D8456: HMI Module Alternate DNS Server (Write-only)**

These registers are used to write the HMI module's alternate DNS server.

HMI module alternate DNS server: For aaa.bbb.ccc.ddd, write the following.

D8453=aaa, D8454=bbb, D8455=ccc, D8456=ddd

■ **D8457: EMAIL Instruction Detailed Error Information (HMI-Ethernet Port)**

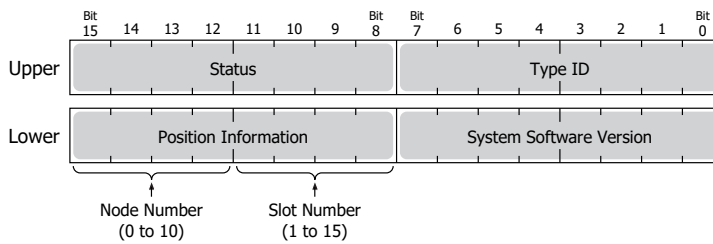
Detailed error information for the EMAIL instruction is written to this register.

For details, see "Confirm the error detail of EMAIL instruction" on page 12-3.

■ D8470 to D8595: Expansion Module Slot Information

Expansion module type information is written to these registers.

The allocation of information (bit assignment) is as follows.



Upper Lower

D8470, D8471 = Expansion Module Slot 1 Information

D8472, D8473 = Expansion Module Slot 2 Information

D8474, D8475 = Expansion Module Slot 3 Information

D8476, D8477 = Expansion Module Slot 4 Information

D8478, D8479 = Expansion Module Slot 5 Information

D8480, D8481 = Expansion Module Slot 6 Information

D8482, D8483 = Expansion Module Slot 7 Information

D8484, D8485 = Expansion Module Slot 8 Information

D8486, D8487 = Expansion Module Slot 9 Information

D8488, D8489 = Expansion Module Slot 10 Information

D8490, D8491 = Expansion Module Slot 11 Information

D8492, D8493 = Expansion Module Slot 12 Information

D8494, D8495 = Expansion Module Slot 13 Information

D8496, D8497 = Expansion Module Slot 14 Information

D8498, D8499 = Expansion Module Slot 15 Information

D8500, D8501 = Expansion Module Slot 16 Information

D8502, D8503 = Expansion Module Slot 17 Information

D8504, D8505 = Expansion Module Slot 18 Information

D8506, D8507 = Expansion Module Slot 19 Information

D8508, D8509 = Expansion Module Slot 20 Information

D8510, D8511 = Expansion Module Slot 21 Information

D8512, D8513 = Expansion Module Slot 22 Information

D8514, D8515 = Expansion Module Slot 23 Information

D8516, D8517 = Expansion Module Slot 24 Information

D8518, D8519 = Expansion Module Slot 25 Information

D8520, D8521 = Expansion Module Slot 26 Information

D8522, D8523 = Expansion Module Slot 27 Information

D8524, D8525 = Expansion Module Slot 28 Information

D8526, D8527 = Expansion Module Slot 29 Information

D8528, D8529 = Expansion Module Slot 30 Information

D8530, D8531 = Expansion Module Slot 31 Information

D8532, D8533 = Expansion Module Slot 32 Information

D8534, D8535 = Expansion Module Slot 33 Information

D8536, D8537 = Expansion Module Slot 34 Information

D8538, D8539 = Expansion Module Slot 35 Information

D8540, D8541 = Expansion Module Slot 36 Information

D8542, D8543 = Expansion Module Slot 37 Information

Upper Lower

D8544, D8545 = Expansion Module Slot 38 Information
 D8546, D8547 = Expansion Module Slot 39 Information
 D8548, D8549 = Expansion Module Slot 40 Information
 D8550, D8551 = Expansion Module Slot 41 Information
 D8552, D8553 = Expansion Module Slot 42 Information
 D8554, D8555 = Expansion Module Slot 43 Information
 D8556, D8557 = Expansion Module Slot 44 Information
 D8558, D8559 = Expansion Module Slot 45 Information
 D8560, D8561 = Expansion Module Slot 46 Information
 D8562, D8563 = Expansion Module Slot 47 Information
 D8564, D8565 = Expansion Module Slot 48 Information
 D8566, D8567 = Expansion Module Slot 49 Information
 D8568, D8569 = Expansion Module Slot 50 Information
 D8570, D8571 = Expansion Module Slot 51 Information
 D8572, D8573 = Expansion Module Slot 52 Information
 D8574, D8575 = Expansion Module Slot 53 Information
 D8576, D8577 = Expansion Module Slot 54 Information
 D8578, D8579 = Expansion Module Slot 55 Information
 D8580, D8581 = Expansion Module Slot 56 Information
 D8582, D8583 = Expansion Module Slot 57 Information
 D8584, D8585 = Expansion Module Slot 58 Information
 D8586, D8587 = Expansion Module Slot 59 Information
 D8588, D8589 = Expansion Module Slot 60 Information
 D8590, D8591 = Expansion Module Slot 61 Information
 D8592, D8593 = Expansion Module Slot 62 Information
 D8594, D8595 = Expansion Module Slot 63 Information

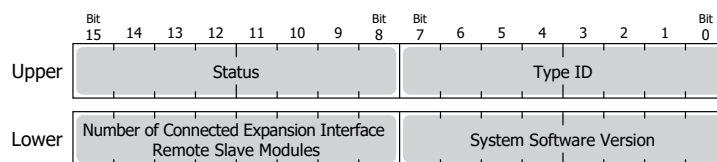
The system software version displays the version of the software written to the device.

For details on the type IDs and statuses, see "List of Type IDs and Status" on page 2-49.

■ D8596, D8597: Expansion Interface Remote Master Module Slot Information

Expansion interface remote master module type information is written to these registers.

The allocation of information (bit assignment) is as follows.



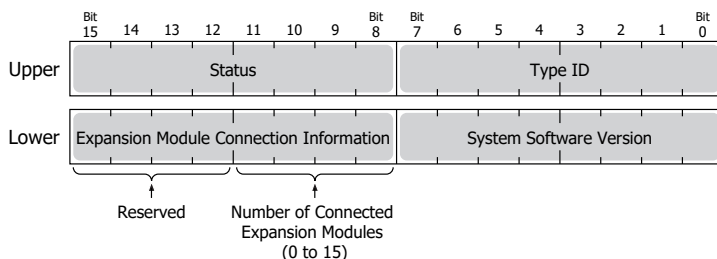
The system software version displays the version of the software written to the device.

For details on the type IDs and statuses, see "List of Type IDs and Status" on page 2-49.

■ D8598 to D8617: Expansion Interface Remote Slave Module Slot Information

Expansion interface remote slave module type information is written to these registers.

The allocation of information (bit assignment) is as follows.



Upper Lower

D8598, D8599 = Expansion Interface Remote Slave Module (Unit 1) Slot Information

D8600, D8601 = Expansion Interface Remote Slave Module (Unit 2) Slot Information

D8602, D8603 = Expansion Interface Remote Slave Module (Unit 3) Slot Information

D8604, D8605 = Expansion Interface Remote Slave Module (Unit 4) Slot Information

D8606, D8607 = Expansion Interface Remote Slave Module (Unit 5) Slot Information

D8608, D8609 = Expansion Interface Remote Slave Module (Unit 6) Slot Information

D8610, D8611 = Expansion Interface Remote Slave Module (Unit 7) Slot Information

D8612, D8613 = Expansion Interface Remote Slave Module (Unit 8) Slot Information

D8614, D8615 = Expansion Interface Remote Slave Module (Unit 9) Slot Information

D8616, D8617 = Expansion Interface Remote Slave Module (Unit 10) Slot Information

The system software version displays the version of the software written to the device.

For details on the type ID and status, see "List of Type IDs and Status" on page 2-49.

■ D8618: Refresh Time of Expansion Interface Remote Master/Slave Modules Current Value

The current value of the I/O refresh time of the expansion modules connected with the expansion interface remote master/slave modules is stored in increments of 1 ms.

■ D8619: Refresh Time of Expansion Interface Remote Master/Slave Modules Maximum Value

The maximum value of the I/O refresh time of the expansion modules connected with the expansion interface remote master/slave modules is stored in increments of 1 ms.

■ D8630: CPU Module Ethernet Port 2 IP Settings/DNS Settings Switching

The IP settings/DNS settings for Ethernet Port 2 can be changed by writing one of the setting values in the following table to D8630 and then turning on M8333.

To use this function, enable **Enable D8630 (IP Settings / DNS Settings switching)** on **Ethernet Port 2** in **Function Area Settings** of WindLDR.

The meanings of the setting values are as follows.

| Setting Value | IP Settings/DNS Settings |
|---------------|---|
| 0 | Conform to function area settings. |
| 1 | Enable DHCP. |
| 2 | Conform to special data register (D8631 to D8650) settings. |

■ D8631 to D8634: CPU Module Ethernet Port 2 IP Address (Write-only)

These registers are used to write the IP address of Ethernet port 2 on the Plus CPU module.

IP address: To set as aaa.bbb.ccc.ddd, write the following.

D8631 = aaa, D8632 = bbb, D8633 = ccc, D8634 = ddd

■ D8635 to D8638: CPU Module Ethernet Port 2 Subnet Mask (Write-only)

These registers are used to write the subnet mask of Ethernet port 2 on the Plus CPU module.

Subnet mask: For aaa.bbb.ccc.ddd, write the following.

D8635 = aaa, D8636 = bbb, D8637 = ccc, D8638 = ddd

■ **D8639 to D8642: CPU Module Ethernet Port 2 Default Gateway (Write-only)**

These registers are used to write the default gateway of Ethernet port 2 on the Plus CPU module.

Default gateway: For aaa.bbb.ccc.ddd, write the following.

D8639 = aaa, D8640 = bbb, D8641 = ccc, D8642 = ddd

■ **D8643 to D8646: CPU Module Ethernet Port 2 Preferred DNS Server (Write-only)**

These registers are used to write the preferred DNS server of Ethernet port 2 on the Plus CPU module.

Preferred DNS server: For aaa.bbb.ccc.ddd, write the following.

D8643 = aaa, D8644 = bbb, D8645 = ccc, D8646 = ddd

■ **D8647 to D8650: CPU Module Ethernet Port 2 Alternate DNS Server (Write-only)**

These registers are used to write the alternate DNS server of Ethernet port 2 on the Plus CPU module.

Alternate DNS server: For aaa.bbb.ccc.ddd, write the following.

D8647 = aaa, D8648 = bbb, D8649 = ccc, D8650 = ddd

■ **D8651 to D8656: CPU Module Ethernet Port 2 MAC Address (Current Value Read-only)**

The MAC address of Ethernet port 2 on the Plus CPU module is written to the special data registers as follows.

Example: MAC address: AA-BB-CC-DD-EE-FF

D8651 = AA, D8652 = BB, D8653 = CC, D8654 = DD, D8655 = EE, D8656 = FF

■ **D8657 to D8660: CPU Module Ethernet Port 2 IP Address (Current Value Read-only)**

The IP address of Ethernet port 2 on the Plus CPU module is written to the special data registers as follows.

Example: The CPU module's own IP address: aaa.bbb.ccc.ddd

D8657 = aaa, D8658 = bbb, D8659 = ccc, D8660 = ddd

■ **D8661 to D8664: CPU Module Ethernet Port 2 Subnet Mask (Current Value Read-only)**

The subnet mask value of Ethernet port 2 on the Plus CPU module is written to the special data registers as follows.

Example: Subnet mask: aaa.bbb.ccc.ddd

D8661 = aaa, D8662 = bbb, D8663 = ccc, D8664 = ddd

■ **D8665 to D8668: CPU Module Ethernet Port 2 Default Gateway (Current Value Read-only)**

The default gateway address of Ethernet port 2 on the Plus CPU module is written to the special data registers as follows.

Example: Default gateway: aaa.bbb.ccc.ddd

D8665 = aaa, D8666 = bbb, D8667 = ccc, D8668 = ddd

■ **D8669 to D8672: CPU Module Ethernet Port 2 Preferred DNS Server (Current Value Read-only)**

The preferred DNS server address of Ethernet port 2 on the Plus CPU module is written to the special data registers as follows.

Example: Preferred DNS server: aaa.bbb.ccc.ddd

D8669 = aaa, D8670 = bbb, D8671 = ccc, D8672 = ddd

■ **D8673 to D8676: CPU Module Ethernet Port 2 Alternate DNS Server (Current Value Read-only)**

The alternate DNS server address of Ethernet port 2 on the Plus CPU module is written to the special data registers as follows.

Example: Alternate DNS server: aaa.bbb.ccc.ddd

D8673 = aaa, D8674 = bbb, D8675 = ccc, D8676 = ddd

■ **D8759: EMAIL Instruction Detailed Error Information (Ethernet Port 1)**

Detailed error information for the EMAIL instruction (Ethernet port 1) is written to this register.

For details, see "Confirm the error detail of EMAIL instruction" on page 12-3.

■ **D8782: BACnet Operation Status**

The operating status of BACnet communication is written to this special data register.

For details, see Chapter 1 "Special Devices" in the "Network User's Manual".

■ **D8783: BACnet Error Information**

Information for the error that last occurred in BACnet communication is written to this special data register.

For details, see Chapter 1 "Special Devices" in the "Network User's Manual".

■ **D8790: EtherNet/IP Operation Status**

The operating status of EtherNet/IP communication is written to this special data register.

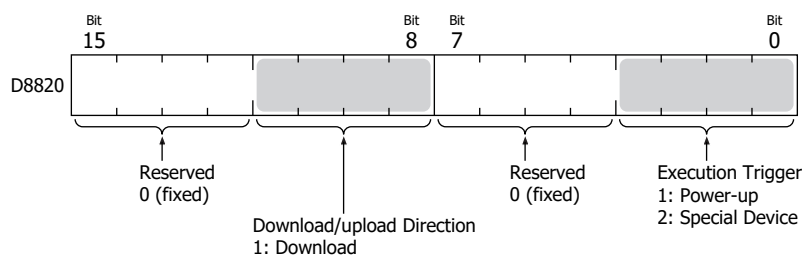
For details, see Chapter 2 "Special Devices" in the "Network User's Manual".

■ D8791: EtherNet/IP Error Information

Information for the error that last occurred in EtherNet/IP communication is written to this special data register. For details, see Chapter 2 "Special Devices" in the "Network User's Manual".

■ D8820: Download Files for Server Functions from SD Memory Card Execution Information

Information in executing the download of the files for Server Functions. The allocation of bits in the device (bit assignment) is as follows.



■ D8821: Download Files for Sever Functions from SD Memory Card Execution Error Information

Error information in executing the download of the files for sever functions. For details, see Chapter 11 "SD Memory Card" in the "FC6A Series MICROSmart User's Manual".

■ D8822: Web Server Current Number of Connections (Plus CPU Module)

The current number of connections for the web server function. D8822 is only supported on Plus CPU module. For details, see Chapter 11 "SD Memory Card" in the "FC6A Series MICROSmart User's Manual".

List of Type IDs and Status

■ Type ID

Expansion module and HMI module

| Type ID | | Type No. |
|-------------|-----------|---|
| Hexadecimal | Binary | |
| 0x00 | 0000 0000 | FC6A-N16B1, FC6A-N16B4, FC6A-N16B3 |
| 0x01 | 0000 0001 | FC6A-R161, FC6A-R164, FC6A-T16K1, FC6A-T16K4, F6A-T16P1, FC6A-T16P4, F6A-T16K3, FCA-T16P3 |
| 0x02 | 0000 0010 | FC6A-N32B3 |
| 0x03 | 0000 0011 | FC6A-T32K3, FC6A-T32P3 |
| 0x04 | 0000 0100 | FC6A-N08B1, FC6A-N08B4, FC6A-N08A11, FC6A-N08A14 |
| 0x05 | 0000 0101 | FC6A-R081, FC6A-R084, FC6A-T08K1, FC6A-T08K4, FC6A-T08P1, FC6A-T08P4 |
| 0x06 | 0000 0110 | FC6A-M08BR1, FC6A-M08BR4 |
| 0x07 | 0000 0111 | FC6A-M24BR1, FC6A-M24BR4 |
| 0x18 | 0001 1000 | FC6A-PH1 |
| 0x19 | 0001 1001 | FC6A-EXM2, FC6A-EXM24 |
| 0x1A | 0001 1010 | FC6A-EXM1S, FC6A-EXM1S4 |
| 0x20 | 0010 0000 | FC6A-J2C1, FC6A-J2C4 |
| 0x21 | 0010 0001 | FC6A-J4A1, FC6A-J4A4 |
| 0x22 | 0010 0010 | FC6A-J8A1, FC6A-J8A4 |
| 0x23 | 0010 0011 | FC6A-K2A1, FC6A-K2A4 |
| 0x24 | 0010 0100 | FC6A-K4A1, FC6A-K4A4 |
| 0x25 | 0010 0101 | FC6A-L06A1, FC6A-L06A4 |
| 0x26 | 0010 0110 | FC6A-L03CN1, FC6A-L03CN4 |
| 0x27 | 0010 0111 | FC6A-J4CN1, FC6A-J4CN4 |
| 0x28 | 0010 1000 | FC6A-J8CU1, FC6A-J8CU4 |
| 0x29 | 0010 1001 | FC6A-F2M1, FC6A-F2M4 |
| 0x2A | 0010 1010 | FC6A-F2MR1, FC6A-F2MR4 |
| 0x2B | 0010 1011 | FC6A-J4CH1Y, FC6A-J4CH4Y |
| 0x2C | 0010 1100 | FC6A-EXM1M |
| 0x2E | 0010 1110 | FC6A-SIF52, FC6A-SIF524 |
| 0xFF | 1111 1111 | Not connected |

Cartridge

| Type ID | | Type No. |
|-------------|-----------|----------------------|
| Hexadecimal | Binary | |
| 0x00 | 0000 0000 | FC6A-PJ2A |
| 0x01 | 0000 0001 | FC6A-PK2AV |
| 0x02 | 0000 0010 | FC6A-PK2AW |
| 0x03 | 0000 0011 | FC6A-PJ2CP |
| 0x06 | 0000 0110 | FC6A-PC1 |
| 0x07 | 0000 0111 | FC6A-PC3 |
| 0x09 | 0000 1001 | FC6A-PTS4, FC6A-PTK4 |
| 0x0A | 0000 1010 | FC6A-PN4 |
| 0x0C | 0000 1100 | FC6A-PC4 |
| 0xFF | 1111 1111 | Not connected |

2: DEVICES

■ Status

| Status | | Description |
|-------------|-----------|--|
| Hexadecimal | Binary | |
| 0x00 | 0000 0000 | Normal |
| 0x81 | 1000 0001 | Communication error (An error has occurred in the communication between the CPU module and an expansion module, HMI module, or cartridge.) |
| 0x82 | 1000 0010 | Unknown device detected (A device other than the FC6A is connected.) |
| 0x83 | 1000 0011 | Device setting error (No device is connected or the connected device is different from that set in the user program.) |
| 0x84 | 1000 0100 | Device writing error (The attempt to set the operation of the device failed.) |
| 0x85 | 1000 0101 | System update error (The system update failed.) |
| 0x86 | 1000 0110 | Expansion interface remote master module communication error (An error is occurring in the communication between the expansion interface remote master and slave modules.) |

3: COMMUNICATION SETTINGS

Introduction

This chapter describes how to configure the settings to use the communication functions of the FC6A and examples of using these functions.

For functions that require advanced setup including the communication ports and network settings, first configure those settings in the **Function Area Settings** dialog box in WindLDR, and then download the user program to the FC6A.

For the way to configure settings related to CAN J1939 communication, see "J1939 Communication" on page 8-1.

Setting List

| Function Name | Overview | Reference | Setup Location |
|---------------------|---|-----------|------------------------|
| Communication ports | Configures the communication function, parameters and the ports to match the communication device. | 3-2 | Function area settings |
| Network settings | Configures information for connecting the FC6A to a network. | 3-6 | |
| Network Management | Configures SNTP settings and the PING instruction timeout time. | 3-16 | |
| Connection settings | Communication mode and parameters for the Ethernet communication can be configured for each connection so that the FC6A can communicate with other network devices over the Ethernet. | 3-19 | |
| Remote host list | The remote host devices on the network that the FC6A communicates with can be registered and managed in the Remote Host List. | 3-26 | Remote host list |
| Auto Ping Function | Configures the auto ping function to monitor the network connection status of remote hosts. | 3-28 | |

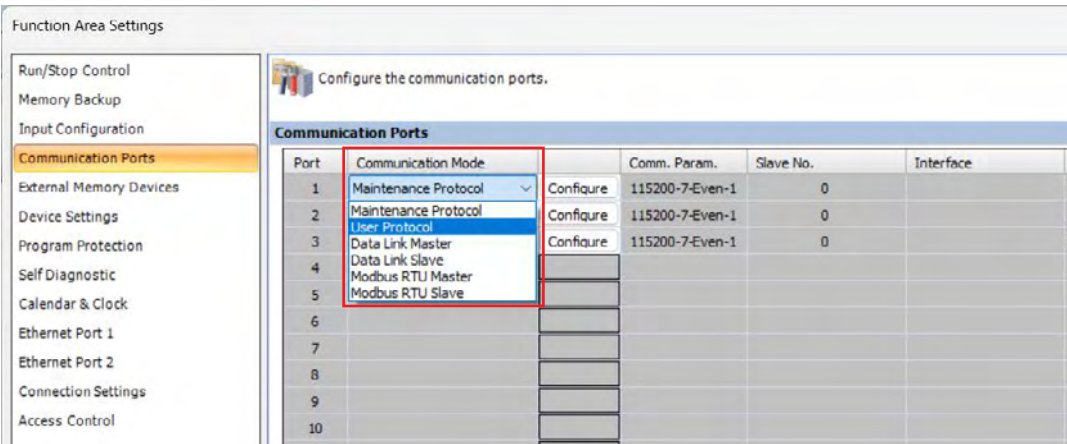
Communication Port Settings

This section describes how to configure the communication ports when using communication port 1 to 33 to communicate with communication devices.

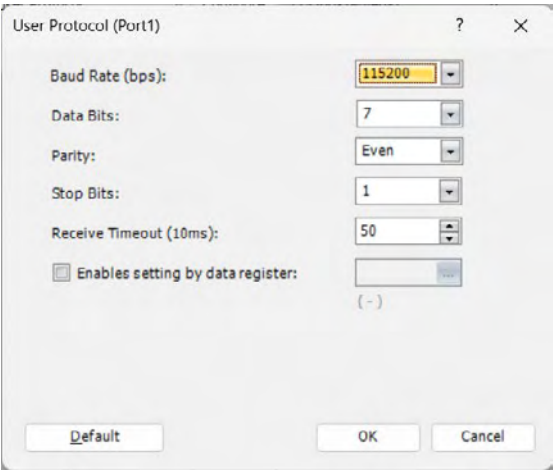
Programming WindLDR

Configure the communication format according to the communication specifications of the device.

- 1. From the WindLDR menu bar, select **Configuration > Communication Ports**.
The **Function Area Settings** dialog box is displayed.
- 2. Click **Communication Mode** for the port to use and select the communication mode to use.
The configuration dialog that corresponds to the communication mode is displayed.



- 3. Change the settings on the configuration dialog according to the communication format for the destination device.
A user communication example is shown below.



Note: When the communication mode is set to "User Protocol", "Modbus RTU Master", or "Modbus RTU Slave", you can change the communication settings using the data register. For details, see "Changing Communication Settings Using Data Registers" on page 3-3.

- 4. Click **OK**.
This concludes configuring the settings.

Changing Communication Settings Using Data Registers

When the communication mode is set to "User Protocol", "Modbus RTU Master", or "Modbus RTU Slave", you can change the communication settings using the data register.

In the **Communication Settings** dialog box for the communication you set in **Communication Mode**, select the **Enable settings by data register** check box and specify the data register. 8 words are used starting from the specified data register.

Example: When "Modbus RTU Master" is set in **Communication Mode**

Communication Settings

Baud Rate (bps): 115200 D0001

Parity: Even D0003

Stop Bit: 1 D0004

Retry Cycle: 1 D0005

Receive Timeout (10ms): 50 D0006

Transmission Wait Time (ms): 0 D0007

☒ Enables setting by data register: D0000 (D0000 - D0007)

OK Cancel

Each item is assigned starting from the specified data register.

Yes: Can be used as a communication mode.

No: Cannot be used as a communication mode.

| Data Register | Item | Description | User Protocol | Modbus RTU Communication | |
|-----------------|--|---|-------------------|--------------------------|-------------------|
| | | | | Master | Slave |
| Start number +0 | Communication Setting Control flags/Status ^{*1} | Bit 0: Write Settings Execution Flag Bit 1: Write Settings Completed Output Bit 2: Read Settings Execution Flag Bit 3: Read Settings Completed Output Bits 4 to 11: Error Status Bits 12 to 15: Reserved | Yes | Yes | Yes |
| Start number +1 | Baud Rate | Write the communication speed with the communication device. 0: 1200 bps 1: 2400 bps 2: 4800 bps 3: 9600 bps 4: 19200 bps 5: 38400 bps 6: 57600 bps 7: 115200 bps | Yes | Yes ^{*2} | Yes ^{*2} |
| Start number +2 | Data Bits | Write the data length for communication with the communication device. 0: 7-bit 1: 8-bit | Yes ^{*3} | No | No |
| Start number +3 | Parity | Write the parity for communication with communication device. 0: None 1: Odd 2: Even | Yes ^{*3} | Yes | Yes |

3: COMMUNICATION SETTINGS

| Data Register | Item | Description | User Protocol | Modbus RTU Communication | |
|-----------------|-----------------------------|---|---------------|--------------------------|-------|
| | | | | Master | Slave |
| Start number +4 | Stop Bit | Write the stop bit for communication with the communication device. 0: 1-bit 1: 2-bit | Yes | Yes | Yes |
| Start number +5 | Retry Cycle | Write the number of times to resend a request if a successful response is not received from the communication device. The retry cycle can be set within the range of 0 to 10. | No | Yes | No |
| Start number +6 | Receive Timeout (10ms) | Write the response waiting time from the communication device. The receive timeout can be set within the range of 0 to 255. | Yes | Yes | No |
| Start number +7 | Transmission Wait Time (ms) | Write the waiting time from receiving a response from the communication device to sending a request. The transmission wait time can be set within the range of 1 to 5000. | No | Yes | No |

*1 The Communication Setting Control flags/Status has the following functions assigned to each bit.

| Bit | Item | | Description | R/W |
|----------|---------------------------------|------------------------------|---|-----|
| 0 | Write Settings Execution Flag | | When this flag is turned on from off, the data register value is written to the communication settings. | R/W |
| 1 | Write Settings Completed Output | | This flag is turned on when writing of communication settings has completed. It turned off when the Write Settings Execution Flag (Bit 0) is turned off. | R |
| 2 | Read Settings Execution Flag | | When this flag is turned on from off, the current communication settings are read and written to the data registers. | R/W |
| 3 | Read Settings Completed Output | | This flag is turned on when the current communication settings are read and writing to the data registers has completed. It turned off when the Read Settings Execution Flag (Bit 2) is turned off. | R |
| 4 | Error Status | Baud Rate Error | An out-of-range value was written. | R |
| 5 | | Data Bits Error | | R |
| 6 | | Parity Error | | R |
| 7 | | Stop Bit Error | | R |
| 8 | | Retry Cycle Error | | R |
| 9 | | Receive Timeout Error | | R |
| 10 | | Transmission Wait Time Error | | R |
| 11 | — Reserved — | | — | — |
| 12 to 15 | — Reserved — | | — | — |

*2 Modbus RTU communication (master/slave) does not support the following baud rates.

1200bps, 2400bps, 4800bps

*3 The communication module and communication cartridge do not support the following settings:

Data Bits: 7-bit, and Parity: None

Start number +1 to start number +7 are data registers for writing the current or setting values of the communication settings.

The data register to which the setting value must be written depends on the communication mode. In the data registers to which the required items are written, write values that are supported by the set communication mode. When you write an unsupported value, an error occurs. For example, when you write 0 (1200 bps) to the Baud Rate (starting number +1) in Modbus RTU communication (master), a Baud Rate error occurs and bit 4 of the starting number +0 turns on.

Change communication settings

1. Write the setting value to the data register (start number +1 to start number +7).
2. Turn the write settings execution flag on from off.
The write settings completed output flag is automatically turned on when writing of communication settings has completed.
When an out-of-range value is written to a setting item, the corresponding bit in the error status turns on.
3. Turn off the write settings execution flag.
The write settings completed output flag is automatically turned off.

Notes:

- Specify the first data register so that it does not exceed the range of the device.
- Immediately after powering on the FC6A, it operates according to the settings configured in the **Communication Settings** dialog box.
When you want to communicate using the data register value immediately after powering on the FC6A, set the corresponding data registers to keep and use the Initialize Pulse (M8120) to set the write settings execution flag. For details on how to keep the data register value, see Chapter 5, "Memory Backup" in the FC6A Series MICROSmart User's Manual.
- The communication setting control flags/status are cleared to 0 immediately after powering on the FC6A, regardless of whether the data register is kept or not.
- If you want to change the communication settings during communication, you must stop the communication, change the communication settings, and then start the communication again.
- Do not turn on the read settings execution flag and write settings execution flag in the same scan. When they are turned on in the same scan, the read process is performed first, so the setting values in the data registers (start number +1 to start number +7) are overwritten.
- When the write settings completed output is off, change the write settings execution flag from off to on.

Network Settings

This section describes the settings for using Ethernet port 1, Ethernet port 2, or the HMI-Ethernet port to connect the FC6A to a network.

Description

The following table presents the Ethernet ports and configuration items that can be configured in the FC6A network settings in order for the FC6A to connect to an Ethernet network.

| FC6A | Ethernet Port | Settings | | | | | | | | |
|-----------------------|-------------------|-------------|--------------|----------------|---------------|-----------------|---------------------|--------------------|--------------|----------------------|
| | | IP Settings | DNS Settings | SNTIP Settings | Ping Settings | E-mail Settings | Web Server Settings | BACnet/IP Settings | FTP Settings | EtherNet/IP Settings |
| All-in-One CPU module | Ethernet port 1 | Yes | Yes | Yes | Yes | — | — | — | — | — |
| Plus CPU module | Ethernet port 1 | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | — |
| | Ethernet port 2 | Yes | Yes | — | Yes | — | — | — | — | Yes |
| HMI module | HMI-Ethernet port | Yes | Yes | — | — | Yes | Yes | — | — | — |

Network Settings

IP Settings

The specification method for the FC6A IP address, subnet mask, and default gateway can be selected as the following three types.

| Specification Method | Description |
|--|--|
| Obtain an IP Address Automatically (DHCP) | The FC6A will automatically acquire the IP address, subnet mask, and default gateway from the DHCP server when the user program download has finished and when the FC6A power is turned on. However, a DHCP server must be present on the network where the FC6A is located. |
| Use Special Data Register to Configure the IP Address | Specify the IP address, subnet mask, and default gateway of Ethernet port 1, Ethernet port 2, and HMI-Ethernet port using the special data registers ^{*1} . These values are set on the FC6A when the FC6A power is turned on and when special internal relay ^{*1} is turned on. |
| Use the Following IP Address | Specify a fixed IP address, subnet mask, and default gateway. The values specified here are reflected in the FC6A when the user program download has finished. |

^{*1} The following special data registers and special internal relays can be used to set the IP settings.
 Ethernet port 1, Ethernet port 2: See "Network settings by special data registers" on page 3-8.
 HMI-Ethernet port: See "Network settings by HMI module special data registers" on page 3-10.

Notes:

- The default Ethernet port 1 settings are: IP address 192.168.1.5, subnet mask 255.255.255.0, default gateway 0.0.0.0.
- The default Ethernet port 2 settings are: IP address 192.168.1.6, subnet mask 255.255.255.0, default gateway 0.0.0.0.
- The IP address, subnet mask, and default gateway for Ethernet port 1 and Ethernet port 2 on the Plus CPU module can be changed using the HMI module or Data File Manager. For details, see the following manuals.
 Using the HMI module: See Chapter 7 "HMI Function" in the "FC6A Series MICROSmart User's Manual".
 Using Data File Manager: See Chapter 2 "Network Search Dialog Box" in the "Data File Manager User's Manual".
- To change the IP address, subnet mask, or default gateway using Data File Manager, you must download a user program with one of the following settings to the Plus CPU module.
 - In the IP settings, select **Use Special Data Register to Configure the IP Address**.
 - Enable IP Settings and DNS Settings Switching function.
 For details about the IP Settings and DNS Settings Switching function, see "IP Settings and DNS Settings Switching" on page 3-13.
- The IP address, subnet mask, and default gateway of the All-in-One CPU module's Ethernet port 1 and HMI-Ethernet port can be changed using the HMI module. For details, see Chapter 7 "HMI Function" in the "FC6A Series MICROSmart User's Manual".

DNS Settings

The specification method for the DNS server addresses can be selected as the following three types.

| Specification Method | Description |
|---|---|
| Obtain DNS Server Address Automatically (DHCP) | The FC6A will automatically acquire the DNS server addresses from the DHCP server when the user program download has finished and when the FC6A power is turned on. However, a DHCP server must be present on the network where the FC6A is located. |
| Use Special Data Registers to Configure the DNS Server Addresses | Specify the preferred DNS server address and the alternate DNS server address of Ethernet port 1, Ethernet port 2, and HMI-Ethernet port using the special data registers ^{*1} . These values are set on the FC6A when the FC6A power is turned on and when special internal relay ^{*1} is turned on. |
| Use the Following DNS Server Addresses | Specify a fixed preferred DNS server address and alternate DNS server address. The values specified here are reflected in the FC6A when the user program download has finished. |

^{*1} The following special data registers and special internal relays can be used to set the IP settings.

Ethernet port 1, Ethernet port 2: See "Network settings by special data registers" on page 3-8.

HMI-Ethernet port: See "Network settings by HMI module special data registers" on page 3-10.

Notes:

- When an IP address cannot be obtained from the preferred DNS server, the alternate DNS server is accessed.
- The DNS server addresses for Ethernet port 1 and Ethernet port 2 on the Plus CPU module can be changed using the HMI module or Data File Manager. For details, see the following manuals.
Using the HMI module: See Chapter 7 "HMI Function" in the "FC6A Series MICROSmart User's Manual".
Using Data File Manager: See Chapter 2 "**Network Search** Dialog Box" in the "Data File Manager User's Manual".
- To change the DNS server address using Data File Manager, you must download a user program with one of the following settings to the Plus CPU module.
 - In the IP settings, select **Use Special Data Register to Configure the IP Address**.
 - Enable IP Settings and DNS Settings Switching function.
 For details about the IP Settings and DNS Settings Switching function, see "IP Settings and DNS Settings Switching" on page 3-13.
- The DNS server address of the All-in-One CPU module's Ethernet port 1 and HMI-Ethernet port can be changed using the HMI module. For details, see Chapter 7 "HMI Function" in the "FC6A Series MICROSmart User's Manual".

3: COMMUNICATION SETTINGS

Network settings by special data registers

When configuring the IP Settings and DNS server addresses using special data registers, values stored in the special data registers are applied as those settings when the power to the FC6A is turned on or when special internal relay M8190 or M3333 is turned on.

Examples:

- When M8190 (Change CPU Module Ethernet Port 1 Network Settings Trigger) is turned on, values stored in D8304 to D8323 are applied as IP settings and DNS server addresses of Ethernet port 1.
- When M8333 (Change CPU Module Ethernet Port 2 Network Settings Trigger) is turned on, values stored in D8631 to D8650 are applied as IP settings and DNS server addresses of Ethernet port 2.

| Special Data Register | Description | Read/Write |
|-----------------------|--|------------|
| D8304-D8307 | Setting value of IP address set for Ethernet port 1. Example: When the IP address is 192.168.0.1 D8304=192, D8305=168, D8306=0, D8307=1 | R/W |
| D8308-D8311 | Setting value of subnet mask set for Ethernet port 1. Example: When the subnet mask is 255.255.255.0 D8308=255, D8309=255, D8310=255, D8311=0 | R/W |
| D8312-D8315 | Setting value of default gateway set for Ethernet port 1. Example: When the default gateway is 192.168.0.24 D8312=192, D8313=168, D8314=0, D8315=24 | R/W |
| D8316-D8319 | Setting value of preferred DNS server address used by Ethernet port 1. Example: When the preferred DNS address is 192.168.0.100 D8316=192, D8317=168, D8318=0, D8319=100 | R/W |
| D8320-D8323 | Setting value of alternate DNS server address used by Ethernet port 1. Example: When the alternate DNS address is 192.168.0.101 D8320=192, D8321=168, D8322=0, D8323=101 | R/W |
| D8631-D8634 | Setting value of IP address set for Ethernet port 2. Example: When the IP address is 192.168.1.1 D8631=192, D8632=168, D8633=1, D8634=1 | R/W |
| D8635-D8638 | Setting value of subnet mask set for Ethernet port 2. Example: When the subnet mask is 255.255.255.0 D8635=255, D8636=255, D8637=255, D8638=0 | R/W |
| D8639-D8642 | Setting value of default gateway set for Ethernet port 2. Example: When the default gateway is 192.168.1.24 D8639=192, D8640=168, D8641=1, D8642=24 | R/W |
| D8643-D8646 | Setting value of preferred DNS server address used by Ethernet port 2. Example: When the preferred DNS address is 192.168.1.100 D8643=192, D8644=168, D8645=1, D8646=100 | R/W |
| D8647-D8650 | Setting value of alternate DNS server address used by Ethernet port 2. Example: When the alternate DNS address is 192.168.1.101 D8647=192, D8648=168, D8649=1, D8650=101 | R/W |

Checking the network settings

The current IP address, subnet mask, default gateway, and DNS server addresses of Ethernet port 1 and Ethernet port 2 of the FC6A can be checked with special data registers.

| Special Data Register | Description | Read/Write |
|-----------------------|--|------------|
| D8330-D8333 | Current value of IP address used by Ethernet port 1. Example: When the IP address is 192.168.0.1 D8330=192, D8331=168, D8332=0, D8333=1 | R |
| D8334-D8337 | Current value of subnet mask used by Ethernet port 1. Example: When the subnet mask is 255.255.255.0 D8334=255, D8335=255, D8336=255, D8337=0 | R |
| D8338-D8341 | Current value of default gateway used by Ethernet port 1. Example: When the default gateway is 192.168.0.24 D8338=192, D8339=168, D8340=0, D8341=24 | R |
| D8342-D8345 | Current value of preferred DNS server address used by Ethernet port 1. Example: When the preferred DNS address is 192.168.0.100 D8342=192, D8343=168, D8344=0, D8345=100 | R |
| D8346-D8349 | Current value of alternate DNS server address used by Ethernet port 1. Example: When the alternate DNS address is 192.168.0.101 D8346=192, D8347=168, D8348=0, D8349=101 | R |
| D8657-D8660 | Current value of IP address used by Ethernet port 2. Example: When the IP address is 192.168.1.1 D8657=192, D8658=168, D8659=1, D8660=1 | R |
| D8661-D8664 | Current value of subnet mask used by Ethernet port 2. Example: When the subnet mask is 255.255.255.0 D8661=255, D8662=255, D8663=255, D8664=0 | R |
| D8665-D8668 | Current value of default gateway used by Ethernet port 2. Example: When the default gateway is 192.168.1.24 D8665=192, D8666=168, D8667=1, D8668=24 | R |
| D8669-D8672 | Current value of preferred DNS server address used by Ethernet port 2. Example: When the preferred DNS address is 192.168.1.100 D8669=192, D8670=168, D8671=1, D8672=100 | R |
| D8673-D8676 | Current value of alternate DNS server address used by Ethernet port 2. Example: When the alternate DNS address is 192.168.1.101 D8673=192, D8674=168, D8675=1, D8676=101 | R |

3: COMMUNICATION SETTINGS

Network settings by HMI module special data registers

When configuring the IP Settings and DNS server addresses using special data registers, values stored in the special data registers are applied as those settings when the power to the FC6A is turned on or when special internal relay M8184 is turned on.

Example:

- When M8184 (Change HMI Module Network Settings Trigger) is turned on, values stored in D8437 to D8456 are applied as IP settings and DNS server addresses of HMI-Ethernet port.

| Special Data Register | Description | Read/Write |
|-----------------------|---|------------|
| D8437-D8440 | The HMI module IP address setting value. Example: When the IP address is 192.168.0.1 D8437=192, D8438=168, D8439=0, D8440=1 | R/W |
| D8441-D8444 | The HMI module subnet mask setting value. Example: When the subnet mask is 255.255.255.0 D8441=255, D8442=255, D8443=255, D8444=0 | R/W |
| D8445-D8448 | The HMI module default gateway setting value. Example: When the default gateway is 192.168.0.24 D8445=192, D8446=168, D8447=0, D8448=24 | R/W |
| D8449-D8452 | The setting value of the preferred DNS server address used by the HMI module. Example: When the preferred DNS address is 192.168.0.100 D8449=192, D8450=168, D8451=0, D8452=100 | R/W |
| D8453-D8456 | The setting value of the alternate DNS server address used by the HMI module. Example: When the alternate DNS address is 192.168.0.101 D8453=192, D8454=168, D8455=0, D8456=101 | R/W |

Checking the HMI module network settings

The current HMI module IP address, subnet mask, default gateway, and DNS server addresses can be checked with special data registers.

| Special Data Register | Description | Read/Write |
|-----------------------|---|------------|
| D8388-D8391 | The HMI module IP address current value. Example: When the IP address is 192.168.0.1 D8388=192, D8389=168, D8390=0, D8391=1 | R |
| D8392-D8395 | The HMI module subnet mask current value. Example: When the subnet mask is 255.255.255.0 D8392=255, D8393=255, D8394=255, D8395=0 | R |
| D8396-D8399 | The HMI module default gateway current value. Example: When the default gateway is 192.168.0.24 D8396=192, D8397=168, D8398=0, D8399=24 | R |
| D8400-D8403 | The current value of the preferred DNS server address used by the HMI module. Example: When the preferred DNS address is 192.168.0.100 D8400=192, D8401=168, D8402=0, D8403=100 | R |
| D8404-D8407 | The current value of the alternate DNS server address used by the HMI module. Example: When the alternate DNS address is 192.168.0.101 D8404=192, D8405=168, D8406=0, D8407=101 | R |

Programming WindLDR

1. On the **Configuration** tab, in the **Function Area Settings** group, click the following item.

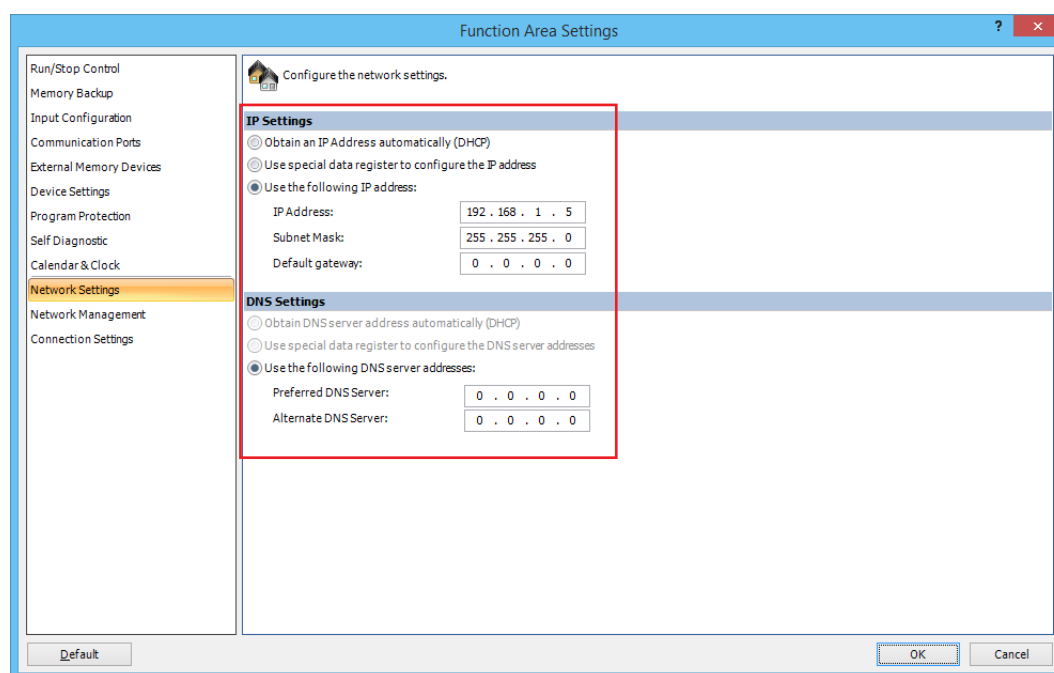
- All-in-One CPU module/CAN J1939 All-in-One CPU module
- **Network Settings**
- Plus CPU module

Ethernet Port 1 to configure Ethernet port 1

Ethernet Port 2 to configure Ethernet port 2

The **Function Area Settings** dialog box appears.

2. Configure **IP Settings** and **DNS Settings**.



3. Click **OK**.

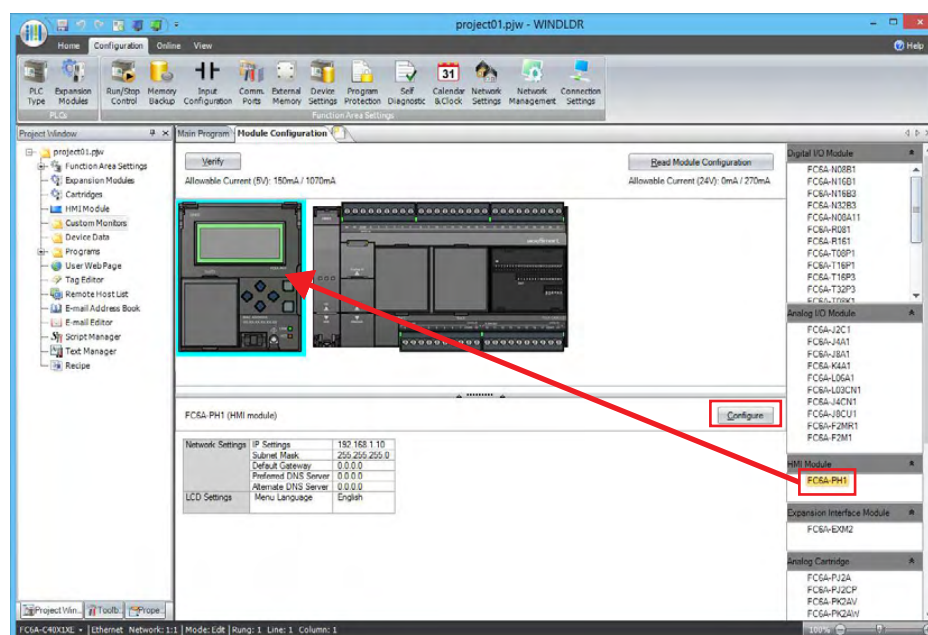
4. Use the Module Configuration Editor to configure the HMI module network settings.

On the **Configuration** tab, in the **PLCs** group, select **Expansion Modules**.

5. Click the inserted HMI module in the module configuration area and click **Configure**.

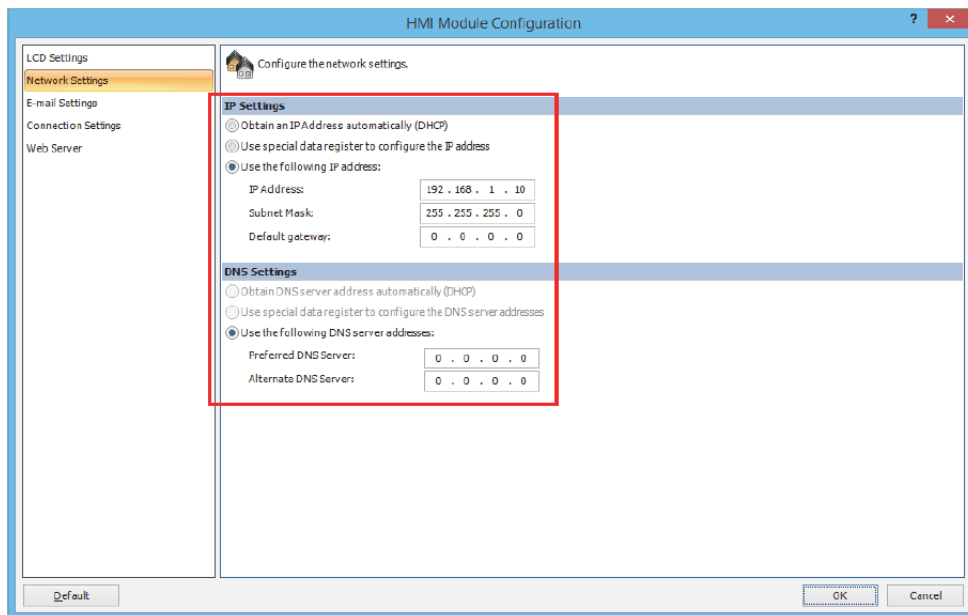
The **HMI Module Configuration** dialog box is displayed.

Note: You can also display the **HMI Module Configuration** dialog box by double-clicking **HMI Module** in the Project Window.



3: COMMUNICATION SETTINGS

6. Click the **Network Settings** tab, and then configure the **IP Settings** and **DNS Settings**.



This concludes configuring the settings.

IP Settings and DNS Settings Switching

The IP settings and DNS settings for Ethernet port 1 and Ethernet port 2 of the CPU module can be switched by using special data registers (D8303 and D8630) and special internal relays (M8190 and M8333). The switching procedure is as follows.

Programming WindLDR

1. On the **Configuration** tab, in the **Function Area Settings** group, click the following item.

- All-in-One CPU module/CAN J1939 All-in-One CPU module

Network Settings

- Plus CPU module

Ethernet Port 1 to configure Ethernet port 1

Ethernet Port 2 to configure Ethernet port 2

The **Function Area Settings** dialog box appears.

2. Configure **IP Settings** and **DNS Settings**.

3. To set Ethernet port 1, select the **Enable D8303 (IP Settings / DNS Settings switching)** check box.

- All-in-One CPU module/CAN J1939 All-in-One CPU module

Function Area Settings

Configure the network settings.

IP Settings

- ☐ Obtain an IP Address automatically (DHCP)
- ☐ Use special data register to configure the IP address
- ☒ Use the following IP address:

| | |
|------------------|---------------------|
| IP Address: | 192 . 168 . 1 . 5 |
| Subnet Mask: | 255 . 255 . 255 . 0 |
| Default gateway: | 0 . 0 . 0 . 0 |

DNS Settings

- ☐ Obtain DNS server address automatically (DHCP)
- ☐ Use special data register to configure the DNS server addresses
- ☒ Use the following DNS server addresses:

| | |
|-----------------------|---------------|
| Preferred DNS Server: | 0 . 0 . 0 . 0 |
| Alternate DNS Server: | 0 . 0 . 0 . 0 |

IP Settings / DNS Settings Option

☒ Enable D8303 (IP Settings / DNS Settings switching)

Default OK Cancel

3: COMMUNICATION SETTINGS

- Plus CPU module

Function Area Settings

Configure the ethernet port 1 settings.

IP Settings

☐ Obtain an IP Address automatically (DHCP)

☐ Use special data register to configure the IP address

☒ Use the following IP address:

IP Address: 192 . 168 . 1 . 5

Subnet Mask: 255 . 255 . 255 . 0

Default gateway: 0 . 0 . 0 . 0

DNS Settings

☐ Obtain DNS server address automatically (DHCP)

☐ Use special data register to configure the DNS server addresses

☒ Use the following DNS server addresses:

Preferred DNS Server: 0 . 0 . 0 . 0

Alternate DNS Server: 0 . 0 . 0 . 0

IP Settings / DNS Settings Option

☒ Enable D8303 (IP Settings / DNS Settings switching)

SNTP Settings

☐ Acquire the current date and time from an SNTP server

SNTP Server:

☐ IP Address: 0 . 0 . 0 . 0

Default

OK Cancel

4. To set Ethernet port 2, select the **Enable D8630 (IP Settings / DNS Settings switching)** check box.

- Plus CPU module

Function Area Settings

Configure the ethernet port 2 settings.

IP Settings

☐ Obtain an IP Address automatically (DHCP)

☐ Use special data register to configure the IP address

☒ Use the following IP address:

IP Address: 192 . 168 . 1 . 6

Subnet Mask: 255 . 255 . 255 . 0

Default gateway: 0 . 0 . 0 . 0

DNS Settings

☐ Obtain DNS server address automatically (DHCP)

☐ Use special data register to configure the DNS server addresses

☒ Use the following DNS server addresses:

Preferred DNS Server: 0 . 0 . 0 . 0

Alternate DNS Server: 0 . 0 . 0 . 0

IP Settings / DNS Settings Option

☒ Enable D8630 (IP Settings / DNS Settings switching)

Ping Settings

Timeout (10 to 30000 msec): 100

Default

OK Cancel

5. Click **OK**.

This concludes configuring the settings.

When the user program is downloaded, the IP settings and DNS settings are switched according to the setting value of D8303 or D8630. The meanings of the setting values of D8303 and D8630 are as follows.

| Values in D8303/D8630 | IP Settings/DNS Settings |
|-----------------------|---|
| 0 | Conform to function area settings. |
| 1 | Enable DHCP. |
| 2 | Conform to special data register (D8304 to D8323 or D8631 to D8650) settings. |

Notes:

- Regardless of the function area settings, the IP settings and DNS settings can be forcibly set using special data registers by setting the value of D8303 or D8630 to 2 (conform to special data register settings), and then switching M8190 or M8333 from off to on or turning the power supply off and then on again.
- Regardless of the function area settings, DHCP can be forcibly set by setting the value of D8303 or D8630 to 1 (enable DHCP), and then switching M8190 or M8333 from off to on or turning the power supply off and then on again.
- To restore the function area settings, set the value of D8303 or D8630 to 0, and then switch M8190 or M8333 from off to on or turn the power supply off and then on again.
- If the IP Settings and DNS Settings Switching function is enabled, when you use Data File Manager to change the IP address, subnet mask, default gateway or DNS server address, 2 is automatically written to D8303 or D8630.

Network Management

SNTP Settings

This section describes the settings to adjust the clock in the FC6A by acquiring the current time (UTC) from an SNTP server on the network.

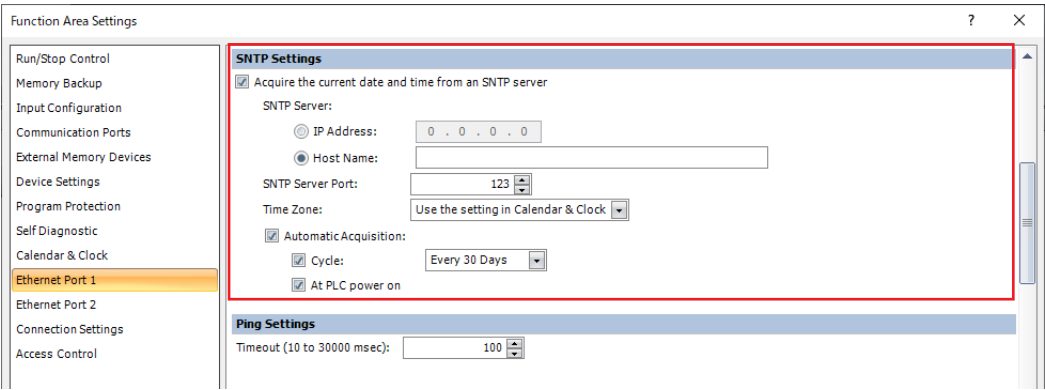
Description

The FC6A acquires the current time (UTC) from an SNTP server on the network automatically or at the set interval and adjusts the internal clock according to the time zone setting. If the daylight savings time setting has been enabled, the current time (UTC) acquired from the SNTP server is corrected for daylight savings time during the daylight savings time period. The time zone can be adjusted and the operation status of the SNTP server can be checked using special data registers.

Programming WindLDR

Configure the SNTP server used to acquire the current time and the acquisition method of the current time.

- 1. On the WindLDR **Configuration** tab, in the **Function Area Settings** group, click the following item.
 - All-in-One CPU module/CAN J1939 All-in-One CPU module
Network Management
 - Plus CPU module
Ethernet Port 1
- 2. Select the **Acquire the current date and time from an SNTP server** check box.



- 3. Configure the SNTP server, time zone, and acquisition method of the current time.

| Item | Setting Value |
|--------------------------|--|
| SNTP Server (IP Address) | Specify the IP address of the SNTP server used to acquire the current time. The format is "xxx.xxx.xxx.xxx". "xxx" stands for a numeric value from 0 to 255. |
| SNTP Server (Host Name) | Specify the host name of the SNTP server used to acquire the current time. The host name can be entered up to 40 single-byte alphanumeric characters. |
| SNTP Server Port | Specify the SNTP server port number (0 to 65535). |
| Time Zone | Select the difference of the regional time zone in regard to the standard time (UTC) acquired from the SNTP server. The time zone can be selected in the range of "Use the setting in Calendar & Clock" ^{*1} or "UTC-12:00" to "UTC+14:00". |

^{*1} The time zone set in the **Calendar & Clock** tab of the **Function Area Settings** dialog box is used. For details, see Chapter 5 "Time Zone" in the "FC6A Series MICROSmart User's Manual".

Note: The time zone can be adjusted in 15 minute increments using special data register D8413. For details, see "Adjusting the time zone (D8413)" on page 3-17.

- 4. To automatically acquire the current time, select the **Automatic Acquisition** check box. When a keep data error occurs and when the user program is downloaded and automatic acquisition is changed from off to on, the current time is automatically acquired from the SNTP server. To periodically acquire the current time at a timing other than the above, select the **Cycle** check box and select the cycle as "Every 10 Minutes", "Every Hour", "Every Day", or "Every 30 Days". To acquire the current time from the SNTP server when the FC6A power is turned on, select the **At PLC power on** check box. When the **Automatic Acquisition** check box is cleared, if special internal relay M8191 is turned from off to on, the current time is acquired from the SNTP server.

5. Click **OK**.

This concludes configuring the settings.

Adjusting the time zone (D8413)

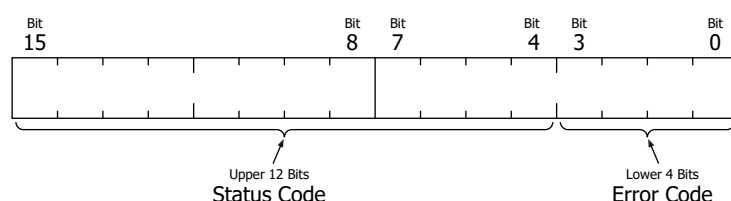
The selected time zone (UTC-12:00 to UTC+14:00) can be adjusted in 15 minute increments with the value of special data register D8413 (time zone offset).

For example, when UTC+09:00 is selected, storing +1 in D8413 advances the time by 15 minutes to make the time zone "UTC+09:15". Storing -2 in D8413 sets the time back by -30 minutes to make the time zone "UTC+08:30".

Checking the operation status (D8414)

The SNTP Operation Status is stored in special data register D8414 (SNTP Operation Status). The operation status indicates the operation status (status code) and the error details (error code).

The operation status (status code) is stored in the upper 12 bits of D8414 and the error details (error code) is stored in the lower 4 bits of D8414.



| Status Code | Operation Status | Status Description |
|--------------------------|---|--|
| 0 (000000000000) | No operation | When there is no access to the SNTP server |
| 32 (000000100000) | Waiting for response | When the SNTP server has been accessed and waiting for the response from the SNTP server |
| 64 (000001000000) | Time information acquisition successful | When the response from the SNTP server was normally received |

| Error Code | Error Details |
|-----------------|---|
| 0 (0000) | Normal |
| 2 (0010) | Timeout error |
| 3 (0011) | The set SNTP server IP address could not be resolved by DNS |
| 9 (1001) | Invalid data was received |

Acquire the current time at an arbitrary timing (M8191)

When special internal relay M8191 (SNTP time acquisition flag) is turned on, the current time is acquired from the SNTP server.

Elapsed time since acquiring the current time (D8415)

The elapsed time (0 to 65,535) in minutes since last acquiring the current time from the SNTP server is stored in special data register D8415 (elapsed time since SNTP access). Since the values that can be stored are between 0 and 65,535, 65,535 minutes / 60 minutes / 24 hours = approximately 45 days, so the maximum value that can be measured is 45 days.

For example, when the date and time that the current time was last acquired from the SNTP server is January 1 at 12:00, if the value of D8415 is checked on January 1 at 15:00, the value stored is "180" because 3 hours = 180 minutes have elapsed.

D8415 is reset to 0 when the current time is successfully acquired, then the elapsed time count starts. If acquiring the current time from the SNTP server was not successful even once, the value of D8415 is not updated.

Ping Settings

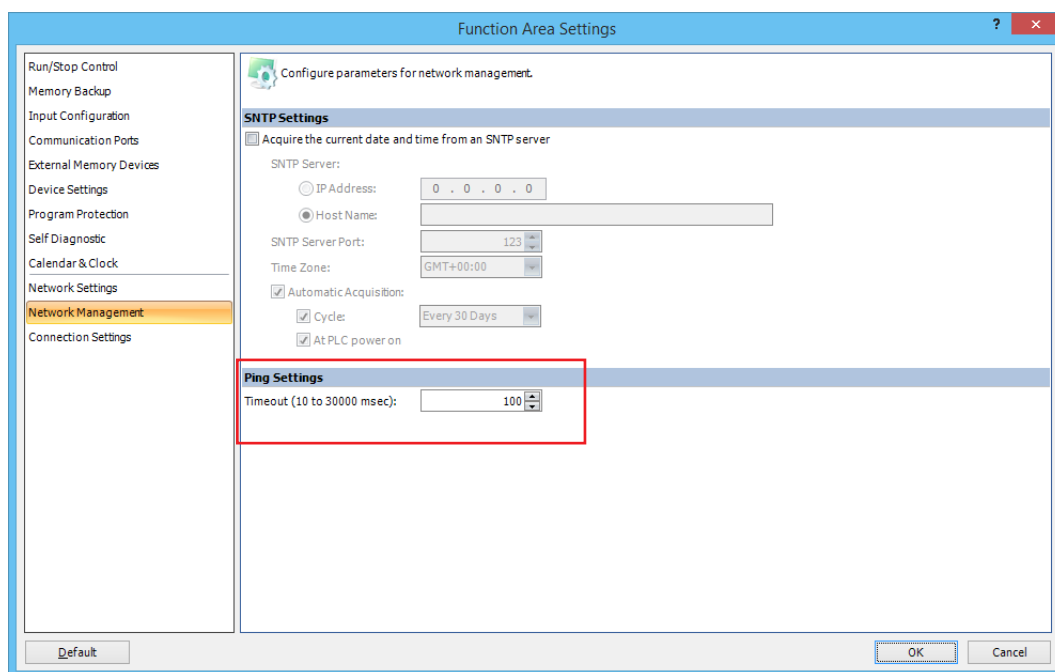
This section describes the ping timeout setting for the PING instruction and when the auto ping function is being executed.

Description

When sending pings with the PING instruction or auto ping function, a ping packet is sent to the specified remote host to check whether or not communication is possible at the IP level. Set the time from when this ping is sent until the timeout occurs.

Programming WindLDR

1. On the **Configuration** tab, in the **Function Area Settings** group, click the following item.
 - All-in-One CPU module/CAN J1939 All-in-One CPU module
Network Management
 - Plus CPU module
Ethernet Port 1 to configure Ethernet port 1
Ethernet Port 2 to configure Ethernet port 2
2. With **Timeout (10 to 30000 msec)**, set the PING instruction timeout between 10 and 30,000 ms. The default is 100 ms.



3. Click **OK**.

This concludes configuring the settings.

Connection Settings

This section describes the settings for client/server communication on TCP/IP communication using Ethernet port 1, Ethernet port 2, or the HMI-Ethernet port of the FC6A.

Applications

The All-in-One CPU module/CAN J1939 All-in-One CPU module allows up to eight connections to be configured on Ethernet port 1. The Plus CPU module can configure up to 16 connections to Ethernet port 1 and Ethernet port 2. Refer to the table below for the communication that can be set for each connection.

When using the HMI module, you can configure up to eight connections to the HMI-Ethernet port. However, only maintenance communication can be set for the connection.

Use the **Function Area Settings** dialog box to set the connections required for communication.

If you use the connection as a server, you can configure filtering by IP address for the connection. Only external devices with a specific IP address can communicate with the FC6A, and you can restrict access from unspecified clients.

Communication Modes Available with the Ethernet Ports

The communication modes supported by each Ethernet port are as follows.

| Communication Mode | All-in-One CPU Module/ CAN J1939 All-in-One CPU module | Plus CPU Module | | HMI Module |
|--|--|-----------------|-----------------|-------------------|
| | Ethernet Port 1 | Ethernet Port 1 | Ethernet Port 2 | HMI-Ethernet Port |
| Maintenance communication server (Default) | Yes | Yes | Yes | Yes |
| User communication server | Yes | Yes | Yes | No |
| User communication client | Yes | Yes | Yes | No |
| User communication (UDP) | No | Yes | Yes | No |
| Modbus TCP server | Yes | Yes | Yes | No |
| Modbus TCP client | Yes | Yes | Yes | No |
| MC Protocol client | No | Yes | Yes | No |
| Unused | Yes | Yes | Yes | Yes |

Number of Connections

| CPU Module | Amount |
|-----------------------|---------------|
| All-in-One CPU module | 8 maximum |
| Plus CPU module | 16 maximum *1 |
| HMI module | 8 maximum |

*1 When using Modbus TCP client, up to 255 communication targets can be registered in one connection setting. Up to 16 connection settings can be set at the same time. Among the communication targets registered in each connection setting, the Plus CPU module can maintain up to 128 connections and communicate with each target one by one. See "Modbus TCP Client" on page 6-23. When using the MC protocol, up to 255 communication targets can be registered in one connection setting, and every time the target is changed, the Plus CPU module disconnect and establish connection.

3: COMMUNICATION SETTINGS

Overview of Communication Modes

The following table presents an overview of the communication modes.

| Communication Mode | Overview | Reference |
|--|---|-----------|
| Maintenance communication server (Default) | This mode allows monitoring and changing devices and user program uploading and downloading from WindLDR. | 4-7 |
| User communication server | This mode enables communication with client devices according to the ETXD (User Communication Transmit over Ethernet) instruction and the ERXD (User Communication Receive over Ethernet) instruction. | 5-48 |
| User communication client | This mode enables communication with server devices according to the ETXD (User Communication Transmit over Ethernet) instruction and the ERXD (User Communication Receive over Ethernet) instruction. | 5-44 |
| User communication (UDP) *1 | This mode enables communication with UDP communication devices according to the ETXD (User Communication Transmit over Ethernet) instruction and the ERXD (User Communication Receive over Ethernet) instruction. | 5-51 |
| Modbus TCP server | When the FC6A is configured as a Modbus TCP server, FC6A data monitoring and modifications can be executed from Modbus TCP client-compatible devices. | 6-28 |
| Modbus TCP client | Modbus TCP server-compatible device data monitoring and modifications can be executed from Modbus TCP clients. | 6-23 |
| MC Protocol client | The Plus CPU module can monitor and change data of the device that supports MC protocol. | 15-2 |
| Unused | The connection is not used. This option stops the internal control processing, which improves the responsiveness of the other connections. | — |

*1 Can be selected for only the Plus CPU module.

Connection Status and Connected IP Address

The connection status of connections with remote hosts can be confirmed with special internal relays M8212 to M8231 and M8345 to M8364. When a connection with a remote host is established, the corresponding special internal relay is turned on. When the connection is disconnected, the corresponding special internal relay is turned off. The IP addresses of the remote hosts can be confirmed with special data registers D8350 to D8381.

Note: R/W is the abbreviation for read/write. When R/W, it can be read and written. When R, it can only be read. When W, it can only be written.

Special Internal Relays

| Device Address | Description | Details | Read/Write |
|----------------|----------------------|---|------------|
| M8212 | Connection 1 Status | While a connection is established with a remote host, the special internal relay will be on. When no connection is established, it will be off. | R |
| M8213 | Connection 2 Status | | |
| M8214 | Connection 3 Status | | |
| M8215 | Connection 4 Status | | |
| M8216 | Connection 5 Status | | |
| M8217 | Connection 6 Status | | |
| M8220 | Connection 7 Status | | |
| M8221 | Connection 8 Status | | |
| M8345*1 | Connection 9 Status | | |
| M8346*1 | Connection 10 Status | | |
| M8347*1 | Connection 11 Status | | |
| M8350*1 | Connection 12 Status | | |
| M8351*1 | Connection 13 Status | | |
| M8352*1 | Connection 14 Status | | |
| M8353*1 | Connection 15 Status | | |
| M8354*1 | Connection 16 Status | | |

| Device Address | Description | Details | Read/Write |
|---------------------|---------------------------------|---|------------|
| M8222 | Connection 1 disconnected flag | <p>When turned on, the connection to the server is forcibly disconnected to stop communication. When turned off, the connection to the server is established and communication is restarted.</p> <p>This flag is only valid in user communication client.</p> | R/W |
| M8223 | Connection 2 disconnected flag | | |
| M8224 | Connection 3 disconnected flag | | |
| M8225 | Connection 4 disconnected flag | | |
| M8226 | Connection 5 disconnected flag | | |
| M8227 | Connection 6 disconnected flag | | |
| M8230 | Connection 7 disconnected flag | | |
| M8231 | Connection 8 disconnected flag | | |
| M8355 ^{*1} | Connection 9 disconnected flag | | |
| M8356 ^{*1} | Connection 10 disconnected flag | | |
| M8357 ^{*1} | Connection 11 disconnected flag | | |
| M8360 ^{*1} | Connection 12 disconnected flag | | |
| M8361 ^{*1} | Connection 13 disconnected flag | | |
| M8362 ^{*1} | Connection 14 disconnected flag | | |
| M8363 ^{*1} | Connection 15 disconnected flag | | |
| M8364 ^{*1} | Connection 16 disconnected flag | | |

*1 Can be used only with the Plus CPU module.

3: COMMUNICATION SETTINGS

Connected IP addresses

| Special Data Register | Description | | Read/Write |
|---------------------------|------------------------------------|---|------------|
| D8350-D8353 | Connection 1 Connected IP Address | When communication has been established between an external device and a connection, the IP address of the connected external device is stored in special data registers as shown below. Example: IP Address: aaa.bbb.ccc.ddd, D8350=aaa, D8351=bbb, D8352=ccc, D8353=ddd | R |
| D8354-D8357 | Connection 2 Connected IP Address | | |
| D8358-D8361 | Connection 3 Connected IP Address | | |
| D8362-D8365 | Connection 4 Connected IP Address | | |
| D8366-D8369 | Connection 5 Connected IP Address | | |
| D8370-D8373 | Connection 6 Connected IP Address | | |
| D8374-D8377 | Connection 7 Connected IP Address | | |
| D8378-D8381 | Connection 8 Connected IP Address | | |
| D8677-D8680 ^{*1} | Connection 9 Connected IP Address | | |
| D8681-D8684 ^{*1} | Connection 10 Connected IP Address | | |
| D8685-D8688 ^{*1} | Connection 11 Connected IP Address | | |
| D8689-D8692 ^{*1} | Connection 12 Connected IP Address | | |
| D8693-D8696 ^{*1} | Connection 13 Connected IP Address | | |
| D8697-D8700 ^{*1} | Connection 14 Connected IP Address | | |
| D8701-D8704 ^{*1} | Connection 15 Connected IP Address | | |
| D8705-D8708 ^{*1} | Connection 16 Connected IP Address | | |

*1 Can be used only with the Plus CPU module.

HMI module connection status information and connected IP address

The connection status for the HMI module connection number specified by D8429 is stored in special internal relays and special data registers.

The status of the connection to an HMI module external device can be checked with special internal relay M8232.

The relay is on when connected to the external device and off when not connected.

The connected IP address can be checked with special data registers D8430 to D8433.

Read specified target connection number

| Special Internal Relays | Description | | Read/Write |
|-------------------------|--|--|------------|
| D8429 | HMI module read target connection number | Reflects the connection information for the specified number to D8430 through D8434 and M8232. When 0 is specified, the target devices are all set to 0. If a connection not that does not exist is specified, the operation is the same as when 0 is specified. | R/W |

Status information

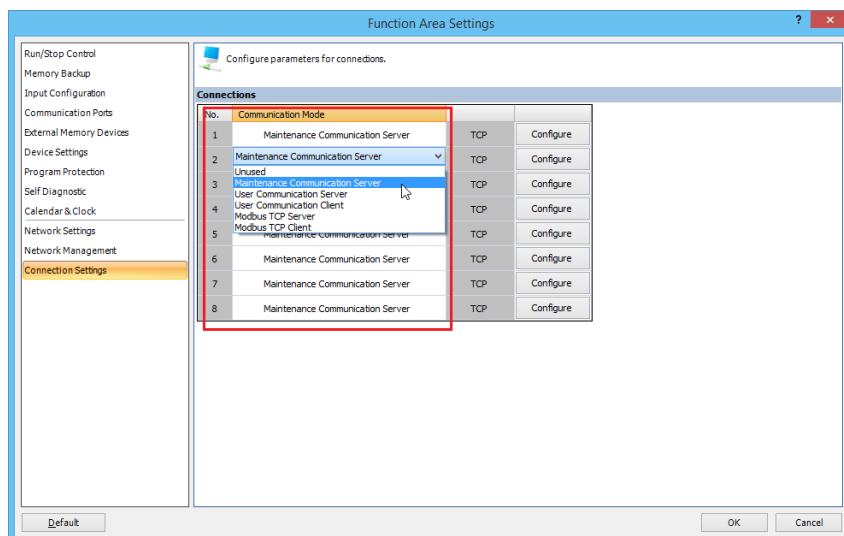
| Special Internal Relays | Description | | Read/Write |
|-------------------------|------------------------------|---|------------|
| M8232 | HMI module connection status | On when the connection specified with D8429 is connected to an external device and off when there is no connection. | R |

Connected IP Address

| Special Internal Relays | Description | | Read/Write |
|-------------------------|-------------------------------------|--|------------|
| D8430-D8433 | HMI connection Connected IP Address | When communication has been established between an external device and the connection specified by D8429, the IP address of the connected external device is stored in special data registers as shown below. Example: IP Address: aaa.bbb.ccc.ddd, D8430=aaa, D8431=bbb, D8432=ccc, D8433=ddd | R |

Programming WindLDR

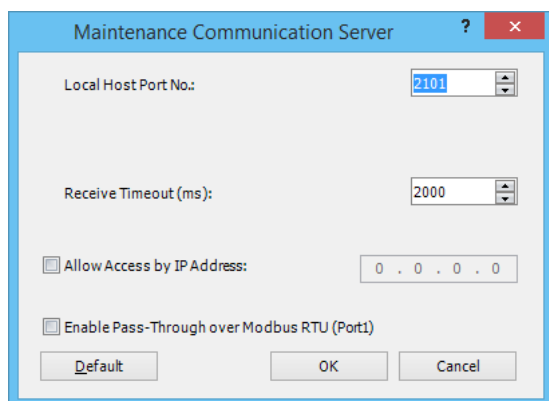
1. From the WindLDR menu bar, select **Configuration > Connection Settings**.
The **Function Area Settings** dialog box is displayed.
2. Click **Communication Mode** for the port to be used and select communication mode of the connection to use.



Configure the communication modes allocated to a maximum of eight connections for the All-in-One CPU module and 16 connections for the Plus CPU module that can be used as client or server. Each connection can be set to a different port number. Set connections that are not used to **Unused**.

A dialog box is displayed according to the communication mode.

3. Specify the parameters according to the communication format of the destination device.

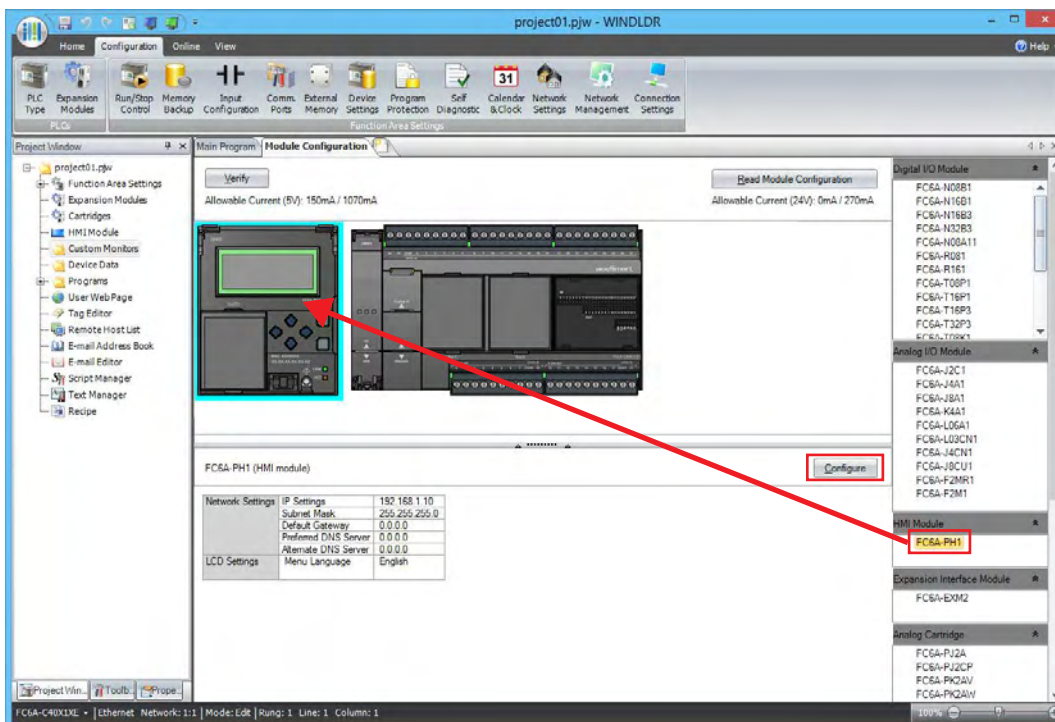


4. Click **OK**.
5. Use the Module Configuration Editor to configure the HMI module network settings.
On the **Configuration** tab, in the **PLCs** group, select **Expansion Modules**.

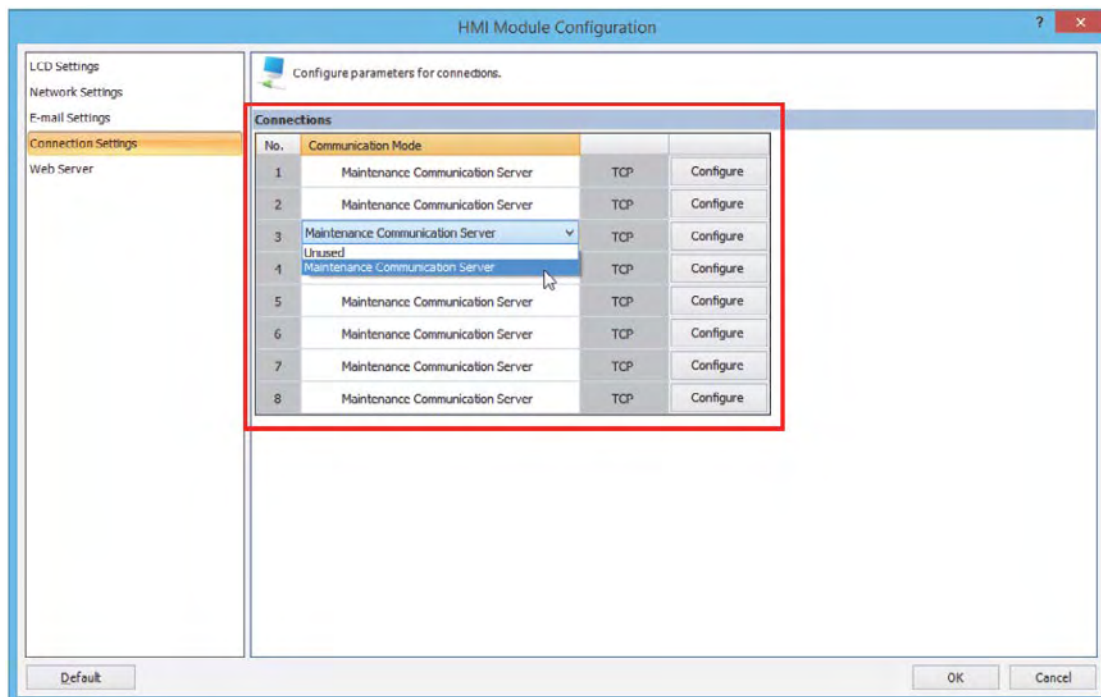
3: COMMUNICATION SETTINGS

- Click the inserted HMI module in the module configuration area and click **Configure**.
The **HMI Module Configuration** dialog box is displayed.

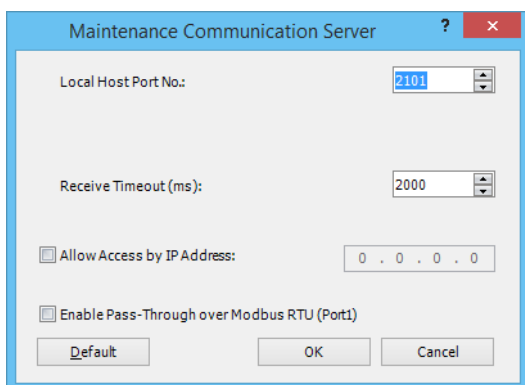
Note: You can also display the **HMI Module Configuration** dialog box by double-clicking **HMI Module** in the Project Window.



- Click **Connection Settings**.
- Click **Communication Mode** for the port to be used and select communication mode of the connection to use.



9. Specify the parameters according to the communication format of the destination device.



10. Click **OK**.

This concludes configuring the settings.

Remote Host List

This chapter describes how to configure a list of network devices (remote hosts) in the network to which the FC6A communicates.

Description

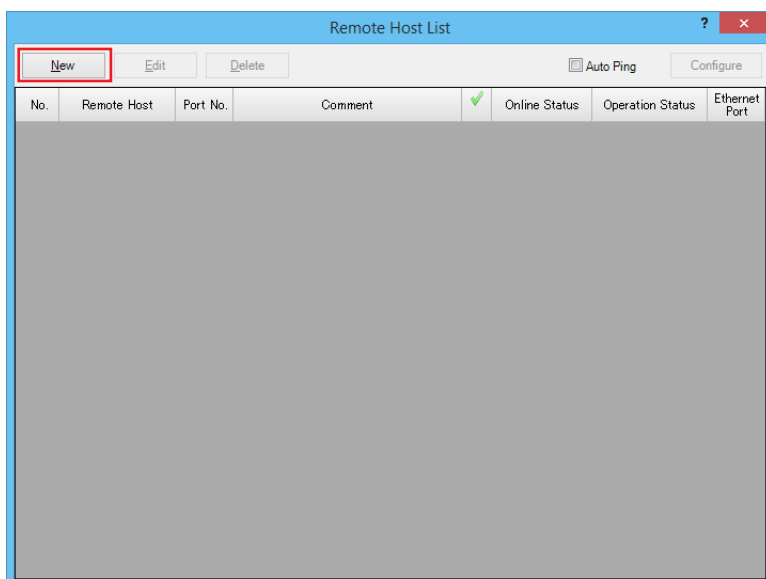
When the FC6A accesses and communicates with other network devices in the network, the remote host device should be specified. The remote host list is required to use the following functions:

- PING Instruction
- ETXD/ERXD Instructions (User communication over Ethernet)
- Modbus TCP Client
- MC Protocol Client

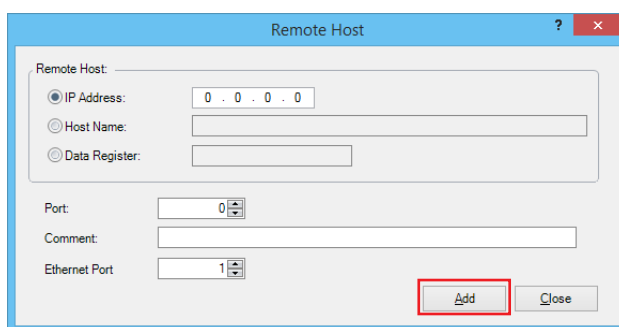
When you register a remote host, a remote host number (1 to 255) is automatically assigned. When using the above functions, set the remote host number as the communication device.

Programming WindLDR

1. Click **Project Window** in the **Work Space** on the **View** tab.
The Project Window is displayed on the left side of the screen.
2. Double-click on the Remote Host List in the **Project Window**.
The **Remote Host List** dialog box appears.
3. Click **New** button.
The **Remote Host List** dialog box appears.



4. Configure the parameters in the **Remote Host** dialog box and then click on **Add** button.



The 'Remote Host' dialog box contains the following fields:

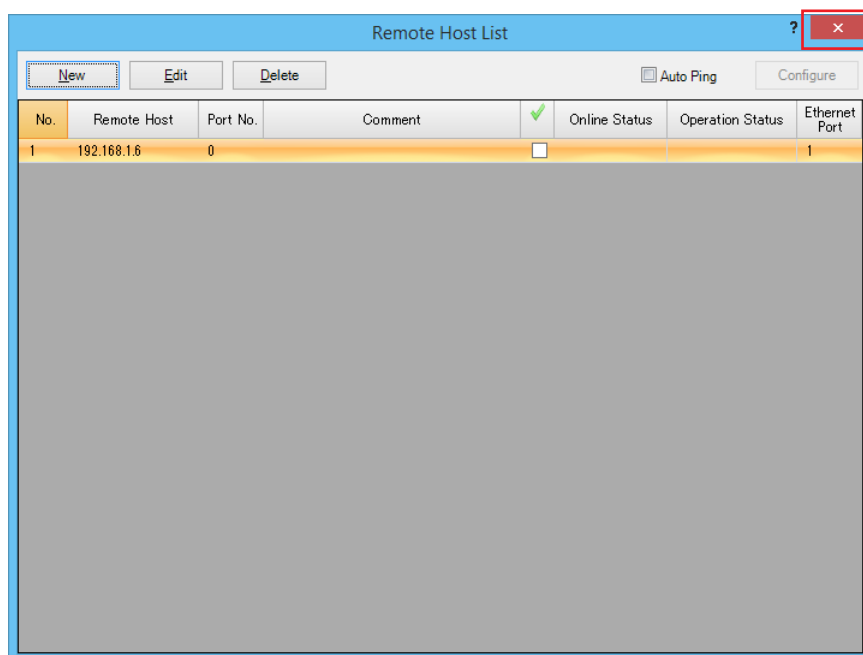
- Remote Host:**
 - ☒ IP Address: 0 . 0 . 0 . 0
 - ☐ Host Name: [Empty text box]
 - ☐ Data Register: [Empty text box]
- Port:** [Spin box with value 0]
- Comment:** [Empty text box]
- Ethernet Port:** [Spin box with value 1]
- Buttons:** Add (highlighted with a red box), Close

The remote host is composed of the following items.

| Item | Setting Value |
|---------------|--|
| IP Address | Specify the remote host with an IP address. The FC6A will communicate by establishing a connection to the set IP address and port number. |
| Host Name | Specifies the remote host as a host name. Up to 40 single-byte alphanumeric characters can be entered. |
| Data Register | Specify the IP address of the remote host as data registers (4 words). |
| Port | Specify the port number of the remote host. This port number is the TCP communication port number. It differs from the numbers of the FC6A USB port and port 1 through port 3. |
| Comment | The comment for the remote host can be assigned. The contents or the length of the comment has no effect on the FC6A operation. |
| Ethernet Port | Select the Ethernet port to communicate with the remote host. |

A new remote host will be added in the Remote Host List dialog box. If you want to add additional remote hosts, repeat the same procedure.

5. To periodically ping the specified remote host, configure auto ping.
For details, see "Auto Ping Function" on page 3-28.
6. After adding remote hosts has been completed, click on **Close** button.



The 'Remote Host List' dialog box shows a table of configured remote hosts. The 'Close' button in the top right corner is highlighted with a red box.

| No. | Remote Host | Port No. | Comment | Online Status | Operation Status | Ethernet Port |
|-----|-------------|----------|---------|--------------------------|------------------|---------------|
| 1 | 192.168.1.6 | 0 | | <input type="checkbox"/> | | 1 |

Buttons: New, Edit, Delete, Auto Ping (checkbox), Configure.

7. If you want to delete an unused remote host, select that remote host in the **Remote Host List** dialog box and click on **Delete** button.

This concludes configuring the settings.

Note: Once a remote host is deleted, the remote host numbers of the following remote hosts are changed. As a result, there is an effect on the operation of the PING instruction, Modbus TCP client, and user communication client that refer to these remote host list numbers.

Auto Ping Function

This section describes the auto ping function that periodically pings the specified remote host.

Function Description

The function to periodically ping the specified remote host is called the auto ping function. This function can be used to check whether or not communication is possible with the specified remote host by sending a packet to that host. The result of the Auto Ping function can be linked with Modbus TCP and MC protocol client request processing. For details see "Modbus TCP Client" on page 6-23. For details see "MC protocol communication via Ethernet Communication" on page 15-2.

The remote host is specified with the remote host list.

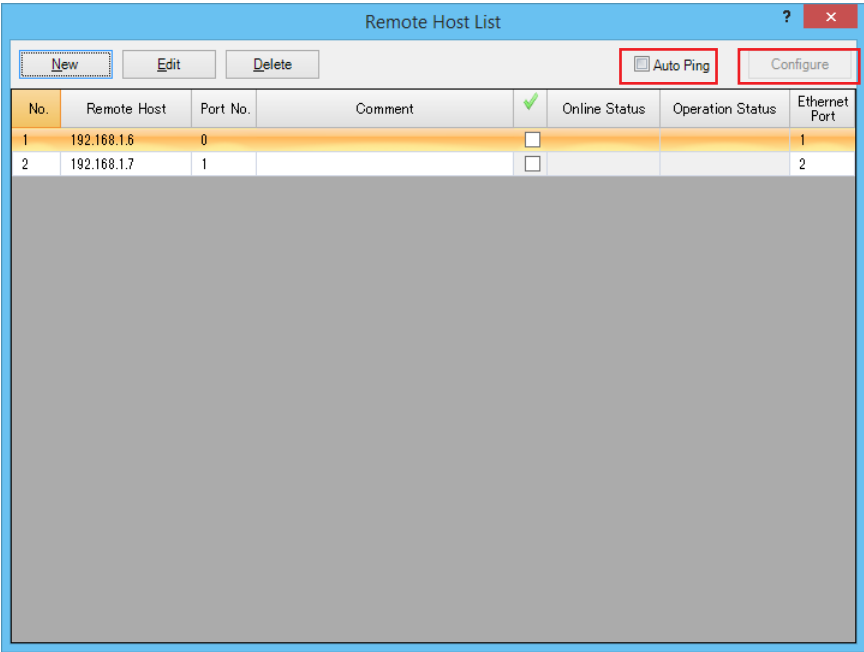
While the FC6A is turned on, once the user program in which the auto ping is enabled is downloaded, the auto ping is started. The CPU pings remote hosts in order from the smallest remote host number. There is no impact from the FC6A run and stop statuses and the ladder program.

On Ethernet port 1, when M8186 (Ethernet port 1 Auto Ping is running) is ON and M8187 (Ethernet port 1 Auto Ping stop flag) is ON, Auto Ping is stopped. When M8187 turns OFF, Auto Ping execution will be executed.

For Ethernet port 2, when M8331 (Ethernet port 2 Auto Ping is running) is ON and M8332 (Ethernet port 2 Auto Ping stop flag) is ON, Auto Ping is stopped. When M8332 turns OFF, Auto Pinging starts. Ethernet port 2 can only be used with Plus CPU modules.

Programming WindLDR

- 1. In the **Remote Host List** dialog box, select the **Auto Ping** check box and click **Configure**. The **Auto Ping Settings** dialog box is displayed.



2. Specify the auto ping function items and click **OK**.

The auto ping function is composed of the following items.

| Item | Setting Value |
|-------------------------------|---|
| Online Status ^{*1} : | Configure the internal relay to store the results of pings sent with the auto ping. Starting with the configured internal relay, the internal relays are automatically assigned in the order of remote host numbers. |
| Operation Status: | Specify the data register that stores the operation status of the pings sent with the auto ping. Starting with the configured data register, the data registers are automatically assigned in the order of remote host numbers. The operation status indicates the operation status (status code) and the error details (error code). The status code is stored in the upper 12 bits and the error code is stored in the lower 4 bits. For the status code details, see "Operation status" on page 3-31. There is no impact on the operation of the PING instruction. |
| Retry: | Specify the retry count (0 to 5 times) of the ping sent with the auto ping function. |
| Ping Interval: | Specify the send interval (0 to 60,000 ms) of the pings sent with the auto ping function in 10 ms increments. |
| Auto Ping Interval: | Specify the interval (100 to 6,000,000 ms) until the next auto ping is executed after the auto ping was executed in 100 ms increments. |

^{*1} **Online status** is automatically turned OFF when the Auto Ping function starts executing. After sending a Ping, **Online status** turns ON when a response is received, and automatically turns OFF when a response cannot be received. When Auto Ping is stopped, the ON / OFF status of **Online status** is retained. The status of the special internal relay and **Online status** used by the Auto Ping function are as follows.

| Ethernet port to communicate with remote host | Status of Online status |
|--|--|
| Ethernet port 1 | When Ethernet port 1 Auto Ping is being executed (M8186 is ON), when the Ethernet port 1 Auto Ping stop flag (M8187) is turned ON from OFF and Auto Ping stops, the previous ON / OFF state is retained. When Auto Ping is stopped (M8186 is OFF), if you change the Ethernet port 1 Auto Ping stop flag (M8187) from ON to OFF, [Online status] is OFF and the OFF status is maintained. |
| Ethernet port 2 (Only Plus CPU module) | When Ethernet port 2 Auto Ping is being executed (M8331 is ON), when the Ethernet port 2 Auto Ping stop flag (M8332) is turned ON from OFF and Auto Ping stops, the previous ON / OFF state is retained. When Auto Ping is stopped (M8331 is OFF), if you change the Ethernet port 2 Auto Ping stop flag (M8332) from ON to OFF, [Online status] is OFF and the OFF status is maintained. |

3: COMMUNICATION SETTINGS

3. In the **Remote Host List** dialog box, select the check box of the remote hosts to ping when auto ping executes.

Remote Host List

NewEditDelete

☒ Auto PingConfigure

| No. | Remote Host | Port No. | Comment | | Online Status | Operation Status | Ethernet Port |
|-----|-------------|----------|---------|-------------------------------------|---------------|------------------|---------------|
| 1 | 192.168.1.6 | 0 | | <input checked="" type="checkbox"/> | M0000 | D0000 | 1 |
| 2 | 192.168.1.7 | 1 | | <input type="checkbox"/> | M0001 | D0001 | 2 |

4. Click **Close**.

This concludes configuring the settings.

Operation status

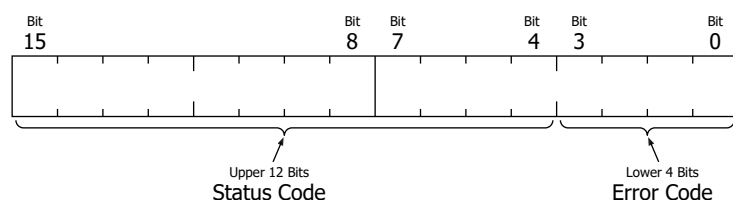
The operation status indicates the operation status (status code) and the error details (error code).

The operation status (status code) is stored in the upper 12 bits of D8414 and the error details (error code) is stored in the lower 4 bits of D8414.

When the value of the operation status data register is divided by 16, the remainder is the error code.

If the value of the operation status data register is 66:

$66 \div 16 = 4$ with a remainder of 2, so the error code is 2.



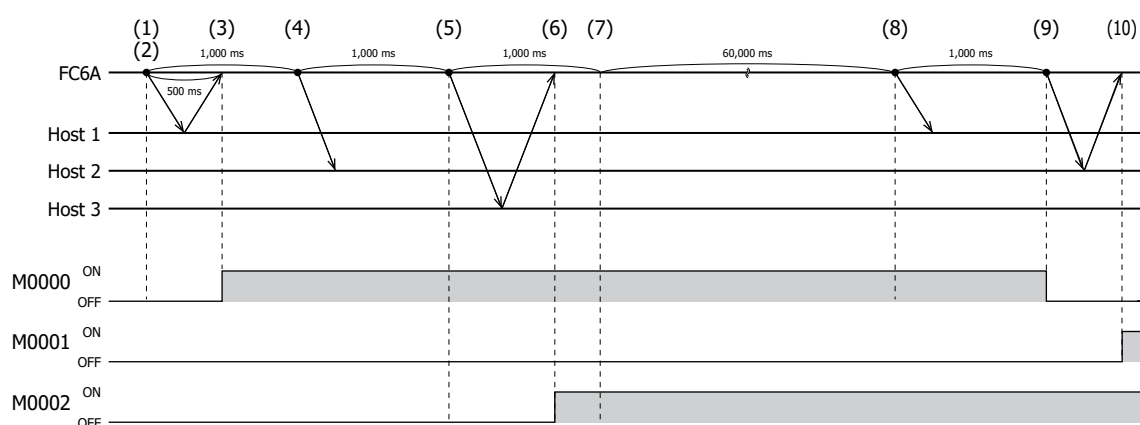
| Status Code | Operation Status |
|--------------------------|---|
| 16 (000000010000) | Status after ping executed and before the packet is sent |
| 32 (000000100000) | Status after packet send processing has completed and waiting for a response from the host |
| 64 (000001000000) | Status where receiving the response for the packet completed normally or a timeout error occurred and the next ping can be executed |

| Error Code | Error Details |
|-----------------|--|
| 0 (0000) | Normal |
| 2 (0010) | Timeout error |
| 3 (0011) | The destination host name could not be resolved by DNS |

Auto ping operation example 1

This example describes the operation when auto ping is executed for three remote hosts under the following conditions.

| Settings | | Setting Details |
|--------------------|--------------------|-----------------|
| Ping settings | Timeout | 1,000 ms |
| | Online Status | M0000 |
| Auto ping settings | Retry | 0 times |
| | Ping Interval | 1,000 ms |
| | Auto Ping Interval | 60,000 ms |

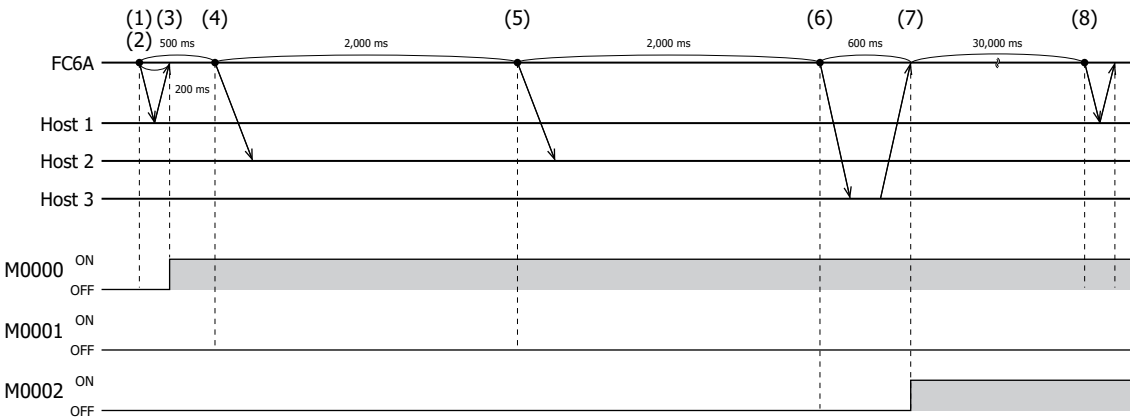


- (1) : Auto ping operation starts
- (2) to (3) : Response from Host 1 within the timeout
- (4) : No response from Host 2 within the timeout
- (5) to (6) : Response from Host 3 within the timeout
- (7) to (8) : Auto Ping Interval
- (8) : No response from Host 1 within the timeout
- (9) to (10) : Response from Host 2 within the timeout

Auto ping operation example 2

This example describes the operation when auto ping is executed for three remote hosts under the following conditions.

| Settings | | Setting Details |
|--------------------|--------------------|-----------------|
| Ping settings | Timeout | 2,000 ms |
| | Online Status | M0000 |
| Auto ping settings | Retry | 1 time |
| | Ping Interval | 500 ms |
| | Auto Ping Interval | 30,000 ms |



- (1) : Auto ping operation starts
- (2) to (3) : Response from Host 1 within the timeout
- (4) to (5) : No response from Host 2 within the timeout, no response even for retries
When the timeout is longer than the ping interval, there is no ping interval wait time.
- (6) : Response from Host 3 was late, but within the timeout
- (7) to (8) : Auto Ping Interval

4: MAINTENANCE COMMUNICATION

Introduction

This chapter describes the FC6A maintenance communication function.

Maintenance communication is a communication protocol dedicated for IDEC programmable controllers. It is used when WindLDR or an IDEC operator interface communicates with the FC6A.

The FC6A supports maintenance communication on each communication port, allowing the optimum communication method to be selected for a variety of system configurations.

Maintenance Communication Functions

When performing maintenance communication with the FC6A, the following functions can be used:

| Function | Description |
|------------------------------|---|
| Download user programs | User programs created in WindLDR can be downloaded to the FC6A. See Chapter 4 "Download Program" in the "FC6A Series MICROSmart User's Manual". |
| Upload user programs | User programs stored in the FC6A can be uploaded to WindLDR. |
| Monitor/change device values | The user program and the device values of the FC6A can be monitored and the device values can be changed using WindLDR. See Chapter 4 "Monitor Operation" in the "FC6A Series MICROSmart User's Manual". |
| Download system software | System software can be downloaded to the FC6A. See Appendix "Upgrade FC6A System Software" in the "FC6A Series MICROSmart User's Manual". |

Note: To use maintenance communication, see Chapter 4 "Start WindLDR" in the "FC6A Series MICROSmart User's Manual" and perform setup.

Communication Ports Used For Maintenance Communication

Supported models, ports, and slots are as follows.

| Port | All-in-One CPU Module | | | CAN J1939 All-in-One CPU Module | Plus CPU Module | |
|---------------------|-----------------------|-------------|-------------|---------------------------------|----------------------|------------------|
| | 16-I/O Type | 24-I/O Type | 40-I/O Type | | Plus 16-I/O Type | Plus 32-I/O Type |
| USB Port | Yes | Yes | Yes | Yes | Yes | Yes |
| Port 1 | Yes | Yes | Yes | — | Yes*2 | Yes*2 |
| Port 2 | Yes*1 | Yes*1 | Yes*1 | Yes*1 | Yes*2 | Yes*2 |
| Port 3 | — | — | Yes*1 | Yes*1 | Yes*3 | Yes*3 |
| Port 4 to 33 | Yes (Port 4 to 9)*4 | | | | Yes (Port 4 to 33)*5 | |
| Ethernet Port 1 | Yes | Yes | Yes | Yes | Yes | Yes |
| Ethernet Port 2 | — | — | — | — | Yes | Yes |
| HMI-Ethernet Port*6 | Yes | Yes | Yes | Yes | Yes | Yes |

*1 When a communication cartridge is connected.

*2 When a cartridge base module and communication cartridge are connected.

*3 When the HMI module and a communication cartridge are connected.

*4 Up to three communication modules can be connected to the All-in-One CPU module and CAN J1939 All-in-One CPU module, expanding the communication ports 4 to 9.

*5 Up to 15 communication modules can be connected to the Plus CPU module, expanding the communication ports 4 to 33.

*6 HMI-Ethernet port can be expanded by connecting the HMI module to the CPU module.

Maintenance communication methods that are supported by the communication ports are as follows.

| Communication Method | | USB Port | Port 1 | Port 2 and Port 3 | Port 4 to 33 | Ethernet Port 1 | Ethernet Port 2 | HMI-Ethernet Port |
|---------------------------|-------------------------------|----------|--------|-------------------|--------------|-----------------|-----------------|-------------------|
| Maintenance Communication | Download system software | Yes | Yes*1 | No | No | Yes | Yes | Yes |
| | Download/upload user programs | Yes | Yes*1 | No | No | Yes | Yes | Yes |
| | Run-time download | Yes | Yes*1 | No | No | Yes | Yes | Yes |
| | Monitor/change device values | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

4: MAINTENANCE COMMUNICATION

*1 Not supported with a communication cartridge.

Maintenance communication functions that are supported by the communication ports and slots are as follows.

All-in-One CPU module/CAN J1939 All-in-One CPU module

| Communication Port | Standard/Expansion | Communication Settings |
|--------------------|-------------------------|--|
| USB Port | Standard | None |
| Port 1 | Standard ^{*1} | Function area settings. See "Maintenance Communication via Port 1" on page 4-4. |
| Port 2 | Expansion ^{*2} | When using a RS232C/RS485 communication cartridge: Function area settings. See "Maintenance Communication via Port 2 to 33" on page 4-12. |
| Port 3 | | When using a Bluetooth communication cartridge: Function area settings. See "Maintenance Communication via Port 1 to 3 (Bluetooth)" on page 4-15. |
| Port 4 to 9 | Expansion ^{*3} | Function area settings. See "Maintenance Communication via Port 2 to 33" on page 4-12. |
| Ethernet Port 1 | Standard | Function area settings. See "Maintenance Communication via Ethernet Port 1 and 2" on page 4-7. |
| Ethernet Port 2 | — | — |
| HMI-Ethernet Port | Standard ^{*4} | Function area settings. See "Maintenance Communication via HMI-Ethernet port" on page 4-16. |

*1 The CAN J1939 All-in-One CPU module does not have port 1.

*2 The ports can be expanded by connecting a communication cartridge to the CPU module.

*3 The ports can be expanded by using a communication module.

*4 The ports can be expanded by using the HMI module.

Plus CPU module

| Communication Port | Standard/Expansion | Communication Settings |
|--------------------|-------------------------|--|
| USB Port | Standard | None |
| Port 1 | Expansion ^{*1} | When using a RS232C/RS485 communication cartridge: Function area settings. See "Maintenance Communication via Port 1" on page 4-4. |
| Port 2 | | When using a Bluetooth communication cartridge: Function area settings. See "Maintenance Communication via Port 1 (Bluetooth)" on page 4-6. |
| Port 3 | Expansion ^{*2} | When using a RS232C/RS485 communication cartridge: Function area settings. See "Maintenance Communication via Port 2 to 33" on page 4-12. |
| Port 4 to 33 | | When using a Bluetooth communication cartridge: Function area settings. See "Maintenance Communication via Port 1 to 3 (Bluetooth)" on page 4-15. |
| Ethernet Port 1 | Standard | Function area settings. See "Maintenance Communication via Port 2 to 33" on page 4-12. |
| Ethernet Port 2 | | Function area settings. See "Maintenance Communication via Ethernet Port 1 and 2" on page 4-7. |
| HMI-Ethernet Port | Expansion ^{*4} | Function area settings. See "Maintenance Communication via HMI-Ethernet port" on page 4-16. |

*1 The ports can be expanded by connecting a communication cartridge to a cartridge base module.

*2 The ports can be expanded by connecting a communication cartridge to the HMI module.

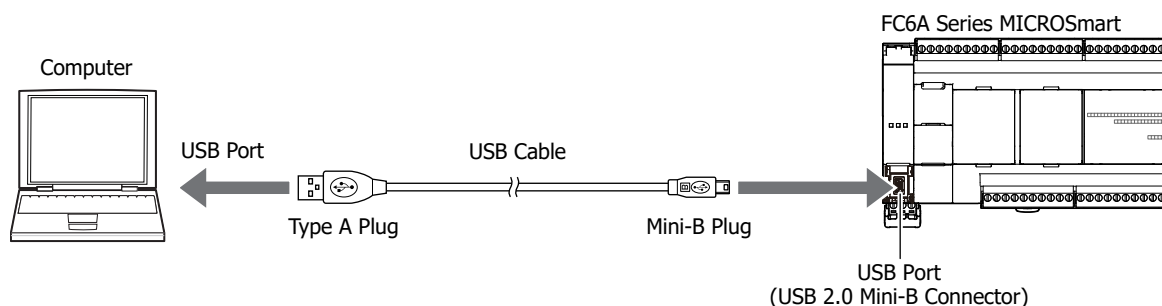
*3 The ports can be expanded by using a communication module.

*4 The ports can be expanded by using the HMI module.

Maintenance Communication via USB Port

Using the USB port, it is possible to connect FC6A to a computer on which WindLDR is installed, and monitor and change device values, download and upload user programs, and download system software. Connect the computer and the FC6A using a USB cable (recommended cable: HG9Z-XCM42).

FC6A USB Port



Maintenance Communication Specifications

| Item | Specifications/Functions |
|-------------------------------------|--|
| Cable | Recommended cable: USB maintenance cable (HG9Z-XCM42) |
| Maintenance communication functions | Monitor/change device values Download/upload user programs Download system software Run-time download |

Detailed Operations for Maintenance Communication Functions

See the following in the "FC6A Series MICROSmart User's Manual".

- Monitor/change device values: Chapter 4 "Monitor Operation"
- Download/upload user programs: Chapter 4 "Download Program"
- Download system software: Appendix "Upgrade FC6A System Software"
- Run-time download: Chapter 5 "Online Edit"

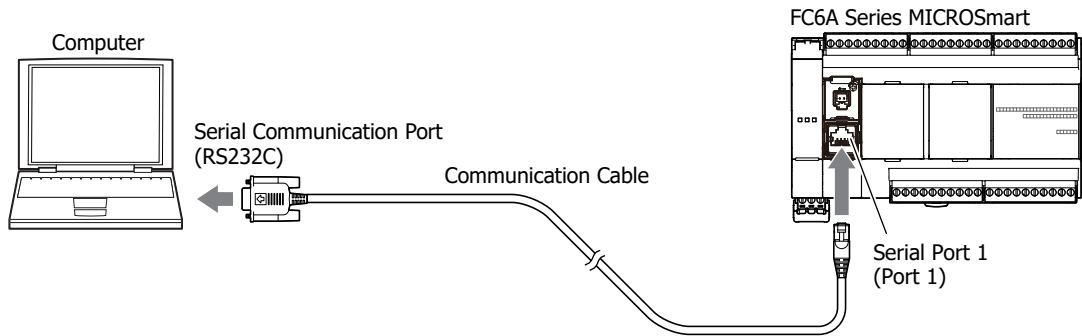
Maintenance Communication via Port 1

Computers in which WindLDR is installed or IDEC operator interfaces can be connected to the FC6A, and monitoring and changing device values, downloading or uploading the user program, and downloading the system software are possible.

Maintenance communication on port 1 is possible by using the serial port 1 of the All-in-One CPU module or using the communication cartridge installed to the cartridge slot 1 of the cartridge base module that is connected to the Plus CPU module.

For details on communication cables, see Appendix "Cables" in the "FC6A Series MICROSmart User's Manual".

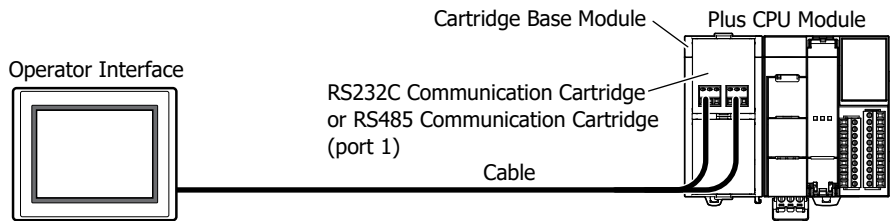
All-in-One CPU Module Port 1



Maintenance Communication Specifications

| Item | Specifications/ Functions |
|-------------------------------------|--|
| Cable | O/I communication cable (FC6A-KC2C) |
| Maintenance communication functions | Monitor/change device values Download/upload user programs Download system software Run-time download |

Plus CPU Module Port 1



Maintenance Communication Specifications

| Item | Specifications/ Functions |
|-------------------------------------|--|
| Cable | RS232C communication cartridge: Shielded multicore cable RS485 communication cartridge: Shielded twisted-pair cable |
| Maintenance communication functions | Monitor/change device values |

Note:

The following functions are not supported by maintenance communication using an RS232C communication cartridge or RS485 communication cartridge.

- Download/upload user programs
- Download system software
- Run-time download

Detailed Operations for Maintenance Communication Functions

See the following in the "FC6A Series MICROSmart User's Manual".

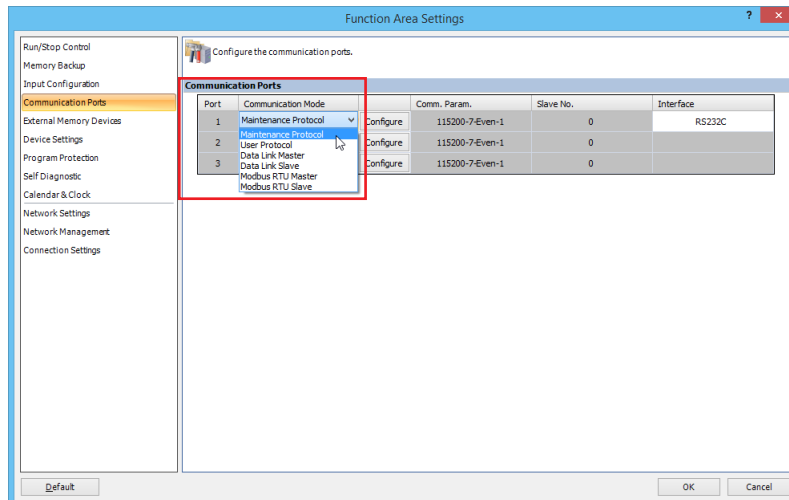
- Monitor/change device values: Chapter 4 "Monitor Operation"

Programming WindLDR

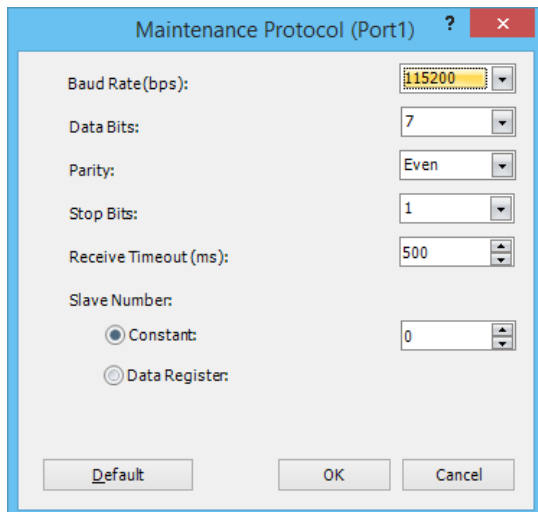
Configure the settings for maintenance communication.

1. From the WindLDR menu bar, select **Configuration > Comm. Ports**.
The **Function Area Settings** dialog box appears.

2. Click **Communication Mode** for port 1 and select **Maintenance Protocol**.
The **Maintenance Protocol (Port1)** dialog box appears.



3. Configure the parameters to match the communication settings of the computer or operator interface.



Baud Rate (bps): 115200 bps (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200)
 Data Bits: 7 (7 or 8)
 Parity: Even (None, Even, Odd)
 Stop Bits: 1 (1 or 2)
 Receive Timeout (ms): 500 (10 to 2550)
 Slave Number: 0 (0 to 31)

Slave number can be specified by either a constant or a data register.

| Type | Details |
|---------------|--|
| Constant | Set within the range of 0 to 31 |
| Data register | Store the slave numbers 0 to 31 in the following special data registers Port 1: D8100 Port 2: D8102 Port 3: D8103 Port 4 to 9 ^{*1} : D8040 to D8045 Port 10 to 33 ^{*1*2} : D8735 to D8758 |

*1 When using a communication module.

*2 Plus CPU module only.

* Values not in parentheses are the default settings.

* Set **Data Bits** to **8** when downloading the system software over port 1.

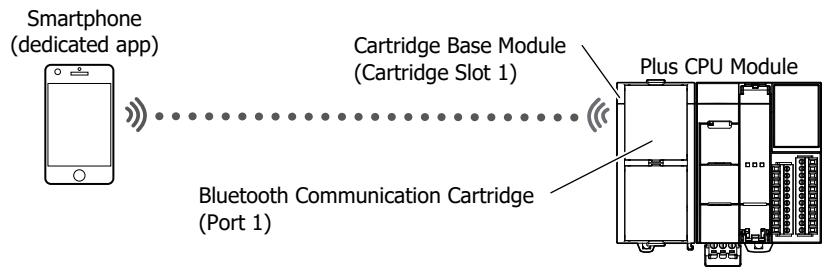
4. Click **OK**.

Configuring the maintenance communication for the expansion communication port is now complete.

Maintenance Communication via Port 1 (Bluetooth)

Connect a Bluetooth communication cartridge to cartridge slot 1 of a cartridge base module added to the Plus CPU module to connect to computers or smartphones equipped with Bluetooth and allow device values to be monitored and changed.

Plus CPU Module Bluetooth



Maintenance Communication Specifications

| Item | Specifications/Functions |
|------------------------------------|---|
| Maintenance Communication Function | Monitor/change device values Download/upload user programs |

Notes:

- The following functions are not supported by maintenance communication using a Bluetooth communication cartridge.
 - Download system software
 - Run-time download
- Bluetooth communication may fail and a download error may occur after a user program is downloaded and Bluetooth communication cartridge settings are changed.

Detailed Operations for Maintenance Communication Functions

See the following in the "FC6A Series MICROSmart User's Manual".

- Monitor/change device values: Chapter 4 "Monitor Operation"

Programming WindLDR

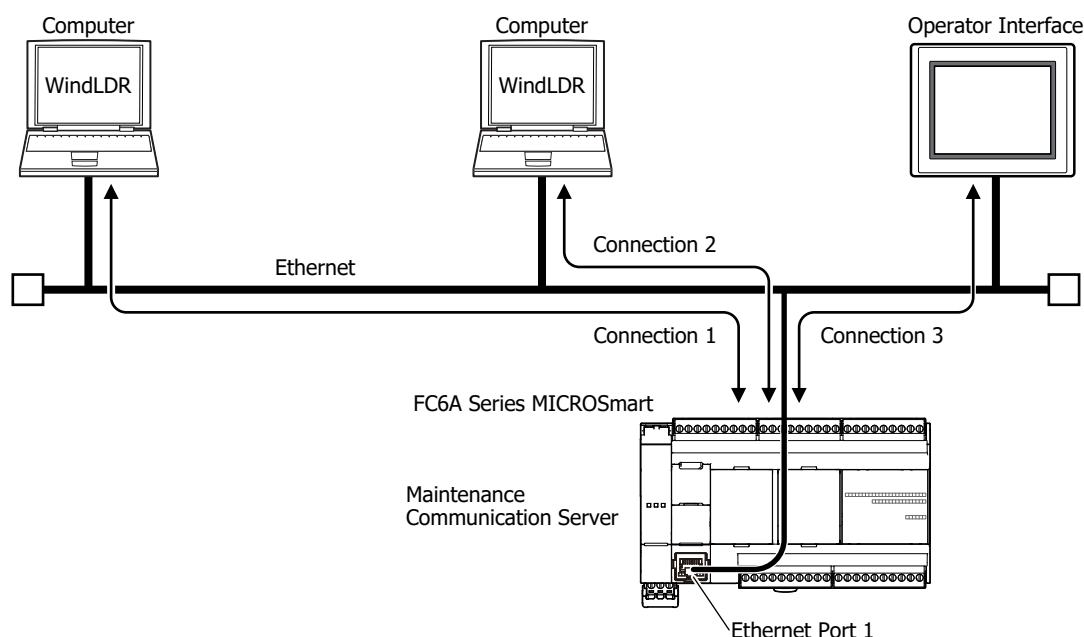
For details, see "Bluetooth Communication" on page 9-1.

Maintenance Communication via Ethernet Port 1 and 2

The FC6A can communicate with network devices such as computers or IDEC operator interfaces using Ethernet port 1 of the All-in-One CPU module/CAN J1939 All-in-One CPU module and Ethernet port 1 and 2 of the Plus CPU module. External devices on the network can monitor or change the device values and download or upload user programs.

The FC6A can use the maintenance communication server and other communications functions simultaneously by assigning a separate communication function, such as a maintenance communication server or Modbus TCP communication, to a maximum of eight connections on the All-in-One CPU module/CAN J1939 All-in-One CPU module and 16 connections on the Plus CPU module.

FC6A Ethernet Port 1 and 2



Maintenance Communication Specifications

| Item | Specifications/Functions |
|-------------------------------------|--|
| Cable | LAN cable (Cat 5. STP) |
| Maintenance communication functions | Monitor/change device values Download/upload user programs Download system software Run-time download |

Detailed Operations for Maintenance Communication Functions

See the following in the "FC6A Series MICROSmart User's Manual".

- Monitor/change device values: Chapter 4 "Monitor Operation"
- Download/upload user programs: Chapter 4 "Download Program"
- Download system software: Appendix "Upgrade FC6A System Software"
- Run-time download: Chapter 5 "Online Edit"

Programming WindLDR

This section describes the procedures to configure the maintenance communication server for the Ethernet port 1 and 2, and to communicate with the FC6A via Ethernet.

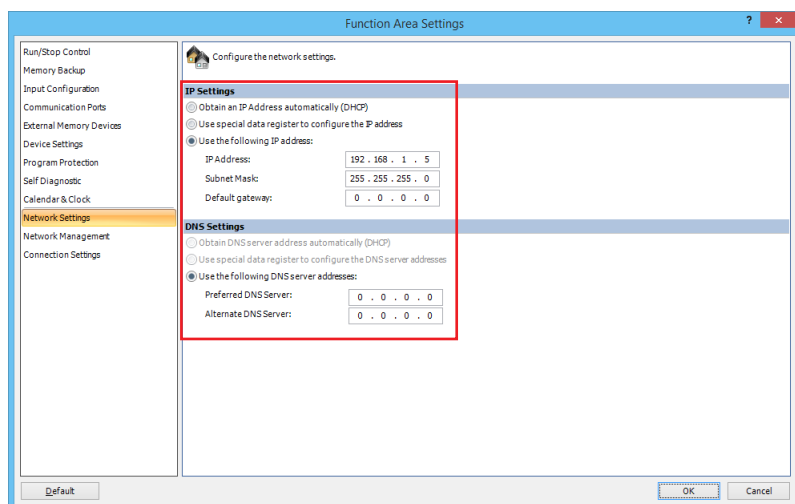
Configure Maintenance Communication Server

1. On the **Configuration** tab, in the **Function Area Settings** group, click the following item.

- All-in-One CPU module/CAN J1939 All-in-One CPU module
Network Settings
- Plus CPU module
Ethernet Port 1 to configure Ethernet port 1
Ethernet Port 2 to configure Ethernet port 2

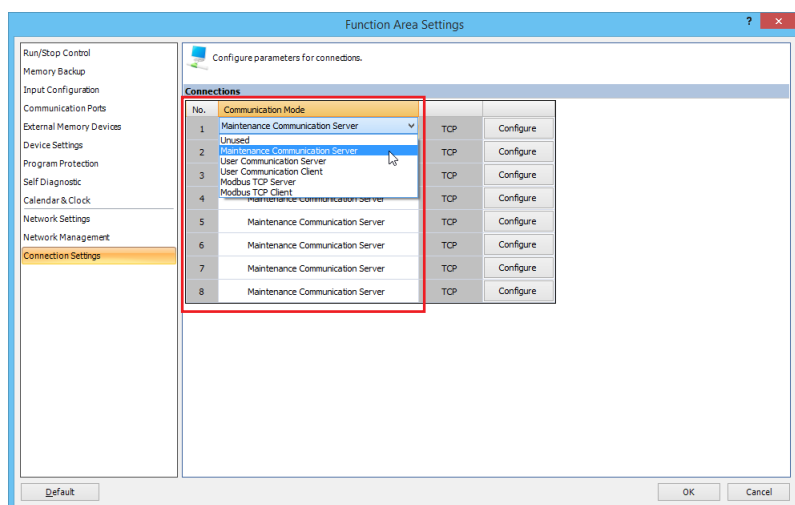
The **Function Area Settings** dialog box appears.

2. Enter the IP address, subnet mask, and default gateway.

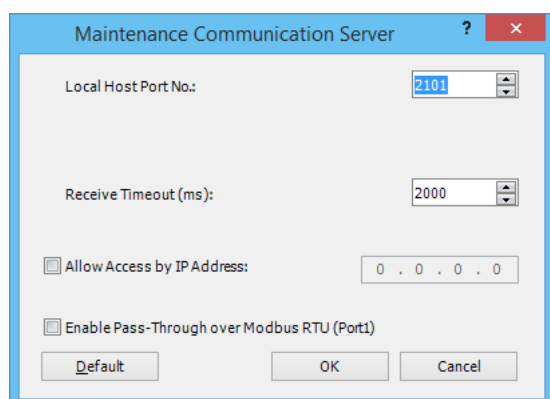


3. Click **Connection Settings**.

4. Click **Communication Mode** for the connection that will be used and select **Maintenance Communication Server**.
The Maintenance Communication Server dialog box appears.



- Set the parameters to match the communication settings of the PC or operator interface.



- Local Host Port No.: 2101 (The port number that the FC6A uses for the maintenance communication server)
- Receive Timeout (ms): 2000 (100 to 25500)
- Allow Access by IP Address: Disabled (Enabling this option makes it possible to prevent access from devices having any IP addresses other than the one entered.)
- Enable Pass-Through over Modbus RTU (Port1):
Port 1 can be used as the pass-through port. In this case, set **Communication Mode** for port 1 to **Modbus RTU Master**. Specify a port number different from the port numbers of the other server connections as the local host port number of the connection used for the pass-through.

Note: The number of clients that can be connected to the FC6A simultaneously is one client per connection. If connections 1 to 8 are all set to the maintenance communication server, eight clients can connect to the FC6A at the same time.

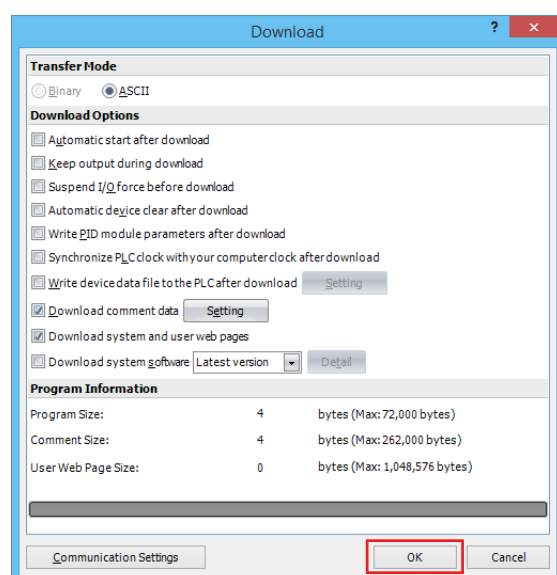
- Click **OK**.

This completes maintenance communications settings.

Download User Program and Confirm IP Addresses via USB Port

Before starting Ethernet communication, configure the function area settings and download the user program to the FC6A via USB.

- Connect the PC and the FC6A using a USB cable.
- From the WindLDR menu bar, select **Online > Transfer > Download**.
The **Download** dialog box appears.
- Click **OK**.
The user program is downloaded to the FC6A.



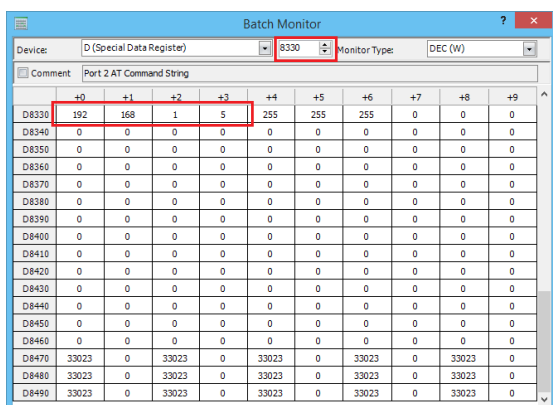
- After the user program has been successfully downloaded, go to Monitor Mode to check the status of the FC6A. Select **Online > Monitor > Monitor** from the WindLDR menu bar.

4: MAINTENANCE COMMUNICATION

11. From the WindLDR menu bar, select **Online > Monitor > Batch**.

The **Batch Monitor** dialog box appears.

12. Confirm that the IP address entered in step 2 is correctly shown in D8330 to D8333.



| | +0 | +1 | +2 | +3 | +4 | +5 | +6 | +7 | +8 | +9 |
|-------|-------|-----|-------|----|-------|-----|-------|----|-------|----|
| D8330 | 192 | 168 | 1 | 5 | 255 | 255 | 255 | 0 | 0 | 0 |
| D8340 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8350 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8360 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8370 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8380 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8390 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8400 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8410 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8420 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8430 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8440 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8450 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8460 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D8470 | 33023 | 0 | 33023 | 0 | 33023 | 0 | 33023 | 0 | 33023 | 0 |
| D8480 | 33023 | 0 | 33023 | 0 | 33023 | 0 | 33023 | 0 | 33023 | 0 |
| D8490 | 33023 | 0 | 33023 | 0 | 33023 | 0 | 33023 | 0 | 33023 | 0 |

This concludes downloading the user program via the USB port and checking the IP address.

Monitor FC6A via the Ethernet Port 1 and 2

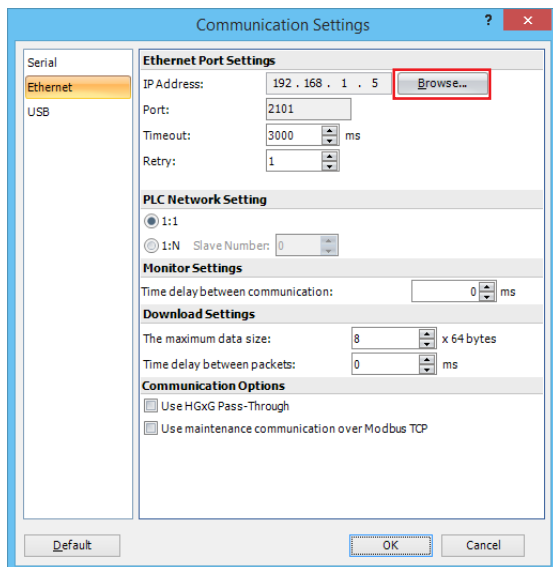
Monitor the FC6A via Ethernet using WindLDR.

13. From the WindLDR menu bar, select **Online > Communication > Set Up**.

The **Communication Settings** dialog box appears.

14. Select the **Ethernet** tab and click **Browse**.

The **IP Address Settings** dialog box appears.



Communication Settings

Serial
Ethernet
USB

Ethernet Port Settings

IP Address: 192.168.1.5 **Browse...**

Port: 2101

Timeout: 3000 ms

Retry: 1

PLC Network Setting

☒ 1:1
☐ 1:N Slave Number: 0

Monitor Settings

Time delay between communication: 0 ms

Download Settings

The maximum data size: 8 x 64 bytes

Time delay between packets: 0 ms

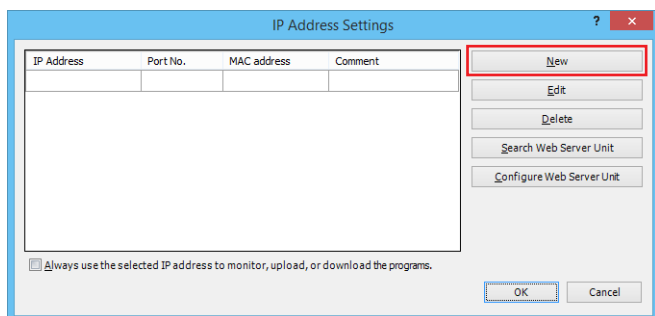
Communication Options

☐ Use HGxG Pass-Through
☐ Use maintenance communication over Modbus TCP

Default OK Cancel

15. Click **New**.

The **Input IP address** dialog box appears.



IP Address Settings

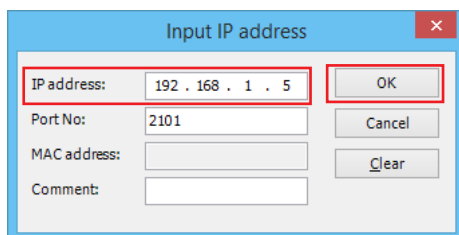
| IP Address | Port No. | MAC address | Comment |
|------------|----------|-------------|---------|
|------------|----------|-------------|---------|

New
Edit
Delete
Search Web Server Unit
Configure Web Server Unit

☐ Always use the selected IP address to monitor, upload, or download the programs.

OK Cancel

16. Enter the IP address entered in step 2 and click **OK**.



The 'Input IP address' dialog box is shown. It has a title bar with a close button. The main area contains four input fields: 'IP address:' with the value '192 . 168 . 1 . 5', 'Port No:' with '2101', 'MAC address:', and 'Comment:'. To the right of the 'IP address' field is an 'OK' button. Below the 'Port No' field is a 'Cancel' button. Below the 'MAC address' field is a 'Clear' button.

17. From the WindLDR menu bar, select **Online > Monitor > Monitor**.
The **IP Address Settings** dialog box appears.

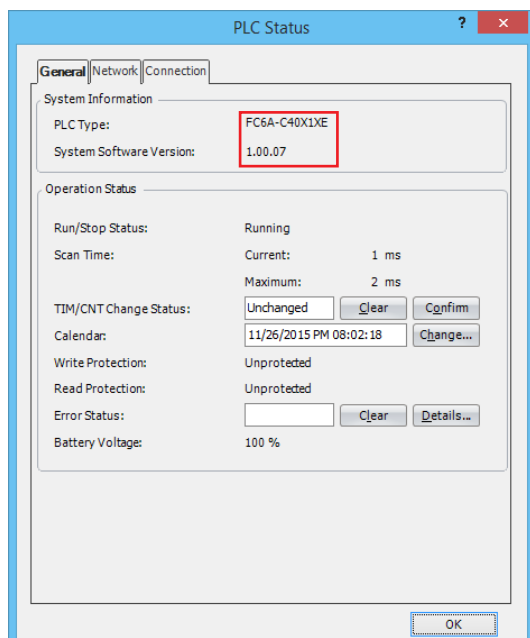
18. Select the IP address you entered and click **OK**.



The 'IP Address Settings' dialog box is shown. It has a title bar with a help button and a close button. The main area contains a table with four columns: 'IP Address', 'Port No.', 'MAC address', and 'Comment'. The first row of the table has the values '192.168.1.5', '2101', and empty cells for 'MAC address' and 'Comment'. To the right of the table are buttons: 'New', 'Edit', 'Delete', 'Search Web Server Unit', and 'Configure Web Server Unit'. At the bottom of the dialog are 'OK' and 'Cancel' buttons. A checkbox at the bottom left is labeled 'Always use the selected IP address to monitor, upload, or download the programs.'

19. From the WindLDR menu bar, select **Online > PLC > Status**.
The **PLC Status** dialog box appears.

20. Check that the FC6A module type and system software version are displayed correctly.



The 'PLC Status' dialog box is shown. It has a title bar with a help button and a close button. The main area contains three tabs: 'General', 'Network', and 'Connection'. The 'General' tab is selected. It contains two sections: 'System Information' and 'Operation Status'. In the 'System Information' section, 'PLC Type:' is 'FC6A-C40X1XE' and 'System Software Version:' is '1.00.07'. In the 'Operation Status' section, 'Run/Stop Status:' is 'Running', 'Scan Time:' shows 'Current: 1 ms' and 'Maximum: 2 ms', 'TIM/CNT Change Status:' is 'Unchanged', 'Calendar:' is '11/26/2015 PM 08:02:18', 'Write Protection:' is 'Unprotected', 'Read Protection:' is 'Unprotected', 'Error Status:' is empty, and 'Battery Voltage:' is '100 %'. At the bottom of the dialog is an 'OK' button.

Configuring the initial Ethernet setup for the maintenance communication server is now complete. You can download and upload user programs and monitor and change device values via Ethernet.

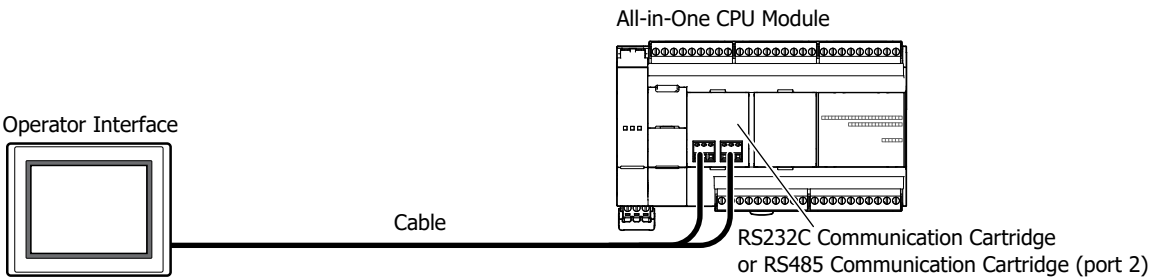
Maintenance Communication via Port 2 to 33

Expand the FC6A in the following manner to allow the FC6A to connect to a computer or operator interface with an RS232C or RS485 port and monitor and change device values.

- Connect an RS232C communication cartridge or RS485 communication cartridge to the cartridge slot of the All-in-One CPU module/CAN J1939 All-in-One CPU module.
- Connect an RS232C communication cartridge or RS485 communication cartridge to cartridge slot 2 of a cartridge base module added to the Plus CPU module.
- Connect an RS232C communication cartridge or RS485 communication cartridge to the cartridge slot of the HMI module added to the Plus CPU module.
- Connect a communication module to the FC6A.

For the communication cable, see Appendix "Cables" in the "FC6A Series MICROSmart User's Manual".

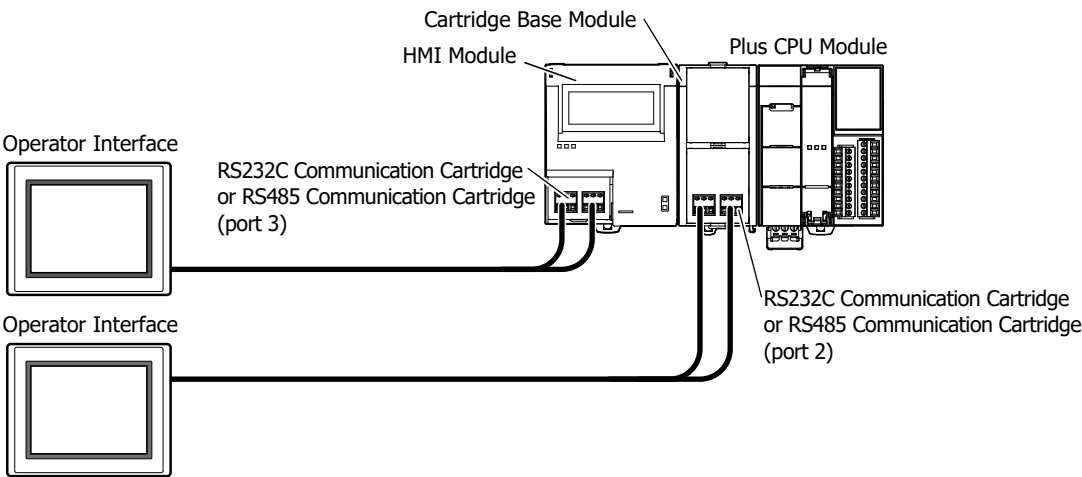
All-in-One CPU Module/CAN J1939 All-in-One CPU Module Port 2 and 3



Maintenance Communication Specifications

| Item | Specifications/Functions |
|------------------------------------|--|
| Cable | RS232C communication cartridge: Shielded multicore cable RS485 communication cartridge: Shielded twisted-pair cable |
| Maintenance Communication Function | Monitor/change device values |

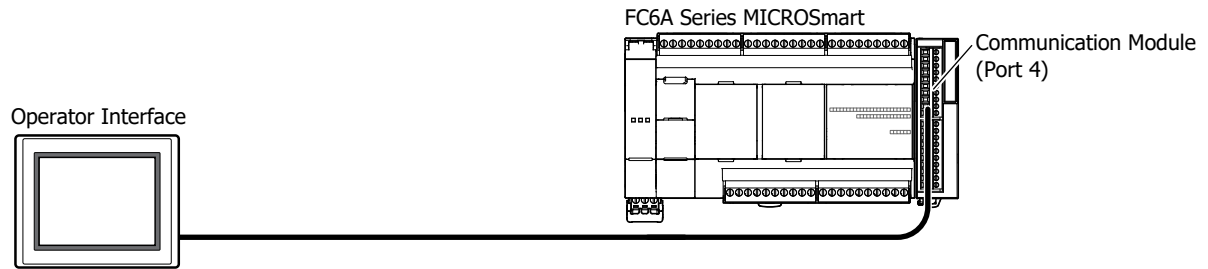
Plus CPU Module Port 2 and 3



Maintenance Communication Specifications

| Item | Specifications/Functions |
|------------------------------------|--|
| Cable | RS232C communication cartridge: Shielded multicore cable RS485 communication cartridge: Shielded twisted-pair cable |
| Maintenance Communication Function | Monitor/change device values |

FC6A Port 4 to 33



The All-in-One CPU module and CAN J1939 All-in-One CPU module can be expanded with up to three communication modules to add ports 4 to 9.

The Plus CPU module can be expanded with up to 15 communication modules to add ports 4 to 33. For details on communication modules, see Chapter 2 "Communication Modules" in the "FC6A Series MICROSmart User's Manual".

Maintenance Communication Specifications

| Item | Specifications/Functions |
|------------------------------------|--|
| Cable | RS232C communication cartridge: Shielded multicore cable RS485 communication cartridge: Shielded twisted-pair cable |
| Maintenance Communication Function | Monitor/change device values |

Detailed Operations for Maintenance Communication Functions

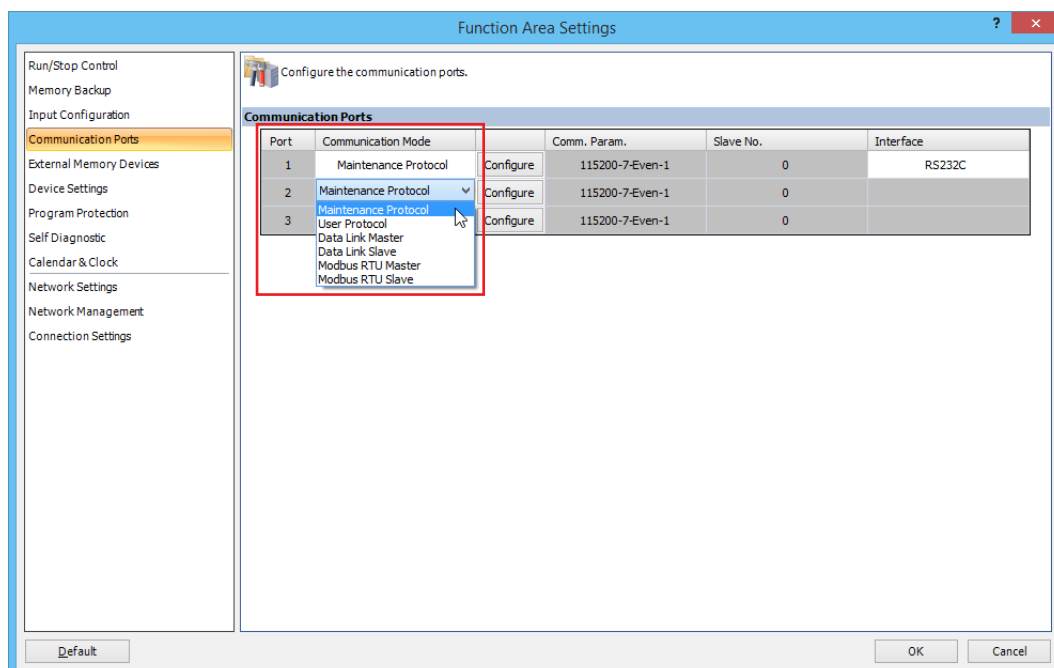
See the following in the "FC6A Series MICROSmart User's Manual".

- Monitor/change device values: Chapter 4 "Monitor Operation"

Programming WindLDR

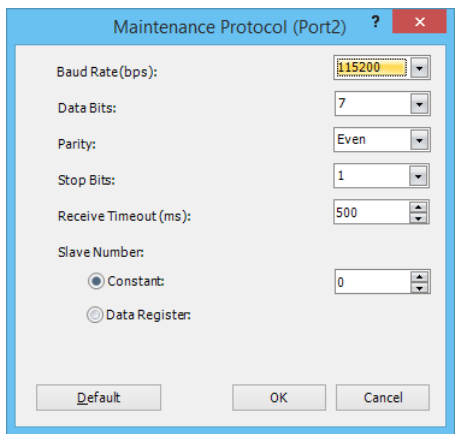
Configure the settings for maintenance communication.

1. On the **Configuration** tab, in the **Function Area Settings** group, click **Comm. Ports**.
The **Function Area Settings** dialog box is displayed.
2. Click **Communication Mode** for port 2 to 33 and select **Maintenance Protocol**.
The **Maintenance Protocol (Port n)** dialog box is displayed.



4: MAINTENANCE COMMUNICATION

3. Set the parameters to match the communication format used by the computer or operator interface.



- Baud Rate (bps) : 115200 bps (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200)
- Data Bits : 7 (7 or 8)
- Parity : Even (None, Even, Odd)
- Stop Bit : 1 (1 or 2)
- Receive Timeout : 500 ms (10 ms to 2550 ms)
- Slave Number : 0 (0 to 31)

Slave numbers are specified by constants or data registers.

| Type | Details |
|---------------|--|
| Constant | Set within the range of 0 to 31 |
| Data Register | Store the slave numbers 0 to 31 in the following special data registers Port 1: D8100 Port 2: D8102 Port 3: D8103 Port 4 to 9*1: D8040 to D8045 Port 10 to 33*1*2: D8735 to D8758 |

*1 When using a communication module.

*2 Plus CPU module only.

* Values not in parentheses are the default settings.

4. Click **OK**.

This concludes configuring the maintenance communications settings.

Maintenance Communication via Port 1 to 3 (Bluetooth)

Computers or smart phones having Bluetooth interface can be connected to the FC6A, and monitoring and changing device values are possible. Bluetooth communication is possible by inserting a Bluetooth communication cartridge on the cartridge slot 1, 2, or 3 (Plus CPU module only).

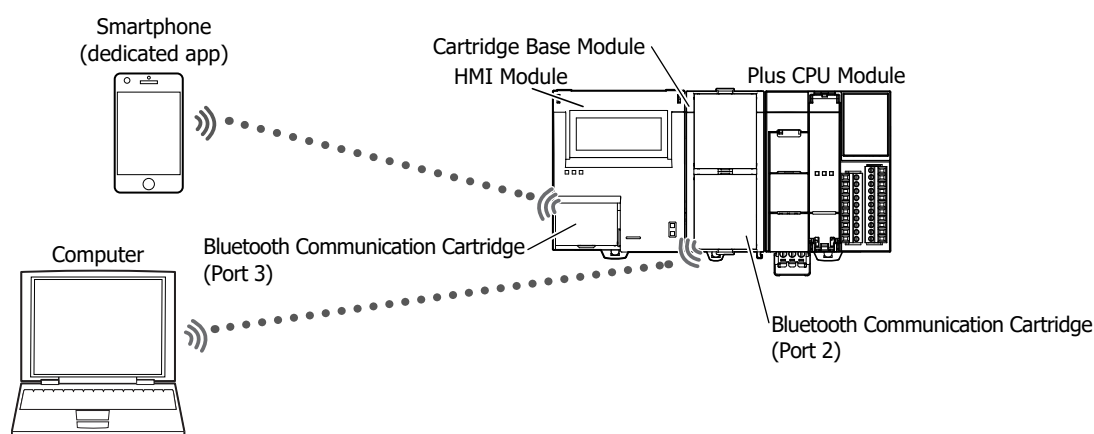
All-in-One CPU Module/CAN J1939 All-in-One CPU Module Bluetooth



Maintenance Communication Specifications

| Item | Specifications/Functions |
|------------------------------------|---|
| Maintenance Communication Function | Monitor/change device values Download/upload user programs |

Plus CPU Module Bluetooth



Maintenance Communication Specifications

| Item | Specifications/Functions |
|------------------------------------|---|
| Maintenance Communication Function | Monitor/change device values Download/upload user programs |

Notes:

- The following functions are not supported by maintenance communication using a Bluetooth communication cartridge.
 - Download system software
 - Run-time download
- Bluetooth communication may fail and a download error may occur after a user program is downloaded and Bluetooth communication cartridge settings are changed.

Detailed Operations for Maintenance Communication Functions

For details, see the following in the "FC6A Series MICROSmart User's Manual".

- Monitor/change device values: Chapter 4 "Monitor Operation"

Programming WindLDR

For details, see "Bluetooth Communication" on page 9-1.

Maintenance Communication via HMI-Ethernet port

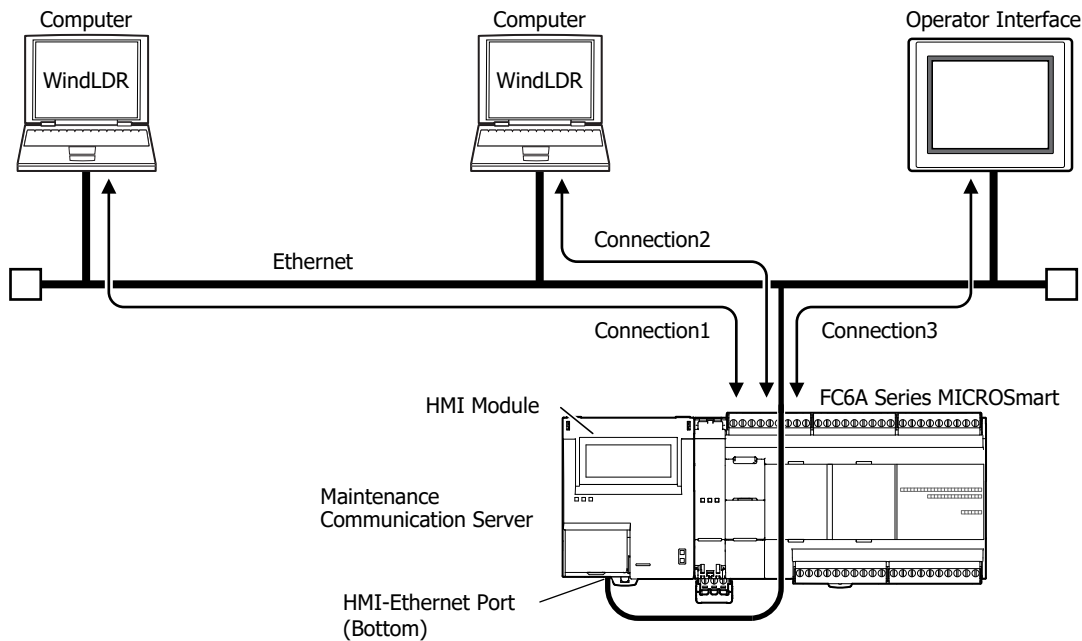
It is possible to use the HMI-Ethernet port of an HMI module connected to the CPU module to perform maintenance communication with network-enabled devices such as computers and operator interfaces.

It is possible to monitor and change FC6A device values from, download user programs from, and upload user programs to an external device connected to the network.

The HMI-Ethernet port can be used to add a maximum of eight connections to the connections of Ethernet port 1 (eight connections maximum), which is standard equipment on the All-in-One CPU module, and the connections of Ethernet port 1 and 2 (16 connections maximum), which are standard equipment on the Plus CPU module.

The maintenance communication server can be assigned to the expanded connections (up to eight) provided by the HMI-Ethernet port.

HMI Module HMI-Ethernet Port 1



Maintenance Communication Specifications

| Item | Specifications/Functions |
|-------------------------------------|--|
| Cable | Ethernet cable (Cat 5. STP) |
| Maintenance communication functions | Monitor/change device values Download/upload user programs Download system software Run-time download |

Detailed Operations for Maintenance Communication Functions

See the following in the "FC6A Series MICROSmart User's Manual".

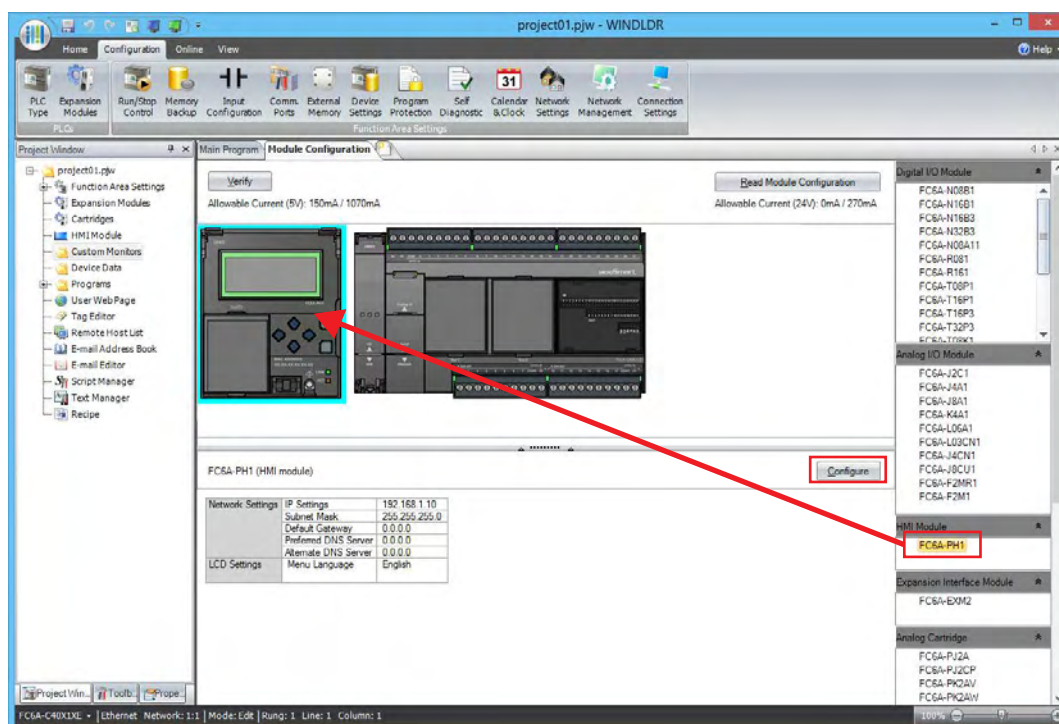
- Monitor/change device values: Chapter 4 "Monitor Operation"
- Download/upload user programs: Chapter 4 "Download Program"
- Download system software: Appendix "Upgrade FC6A System Software"
- Run-time download: Chapter 5 "Online Edit"

Programming WindLDR

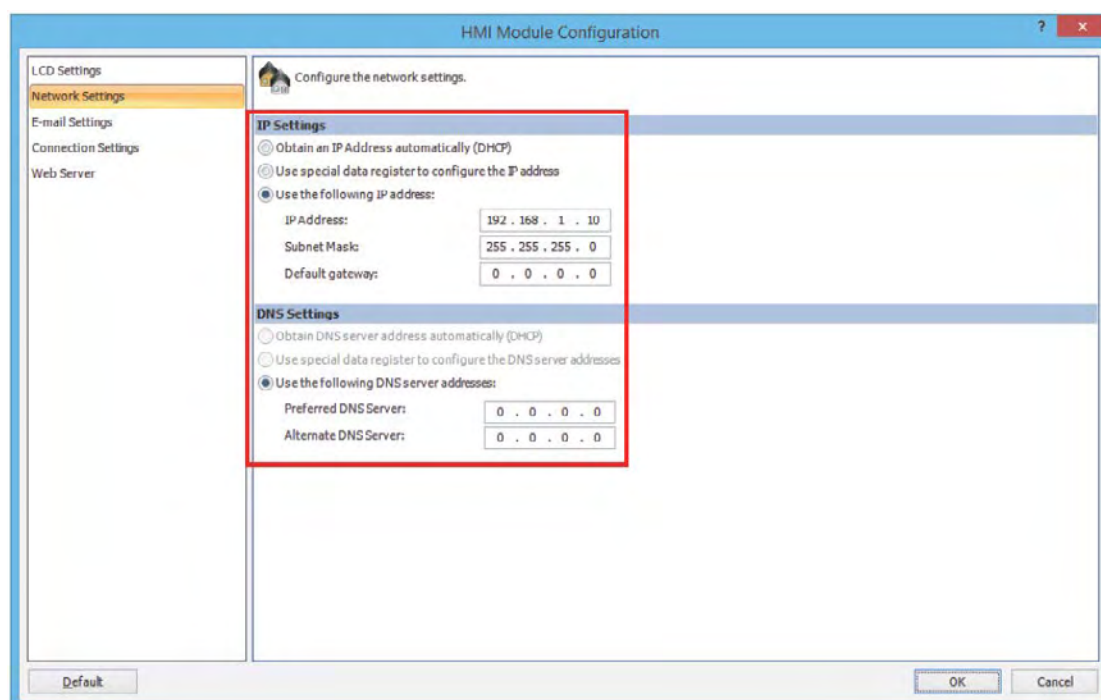
Configure the settings for maintenance communication.

1. Use the Module Configuration Editor to configure the HMI module network settings and connection settings. On the **Configuration** tab, in the **PLCs** group, select **Expansion Modules**.
2. Click the inserted HMI module in the module configuration area and click **Configure**. The **HMI Module Configuration** dialog box is displayed.

Note: You can also display the **HMI Module Configuration** dialog box by double-clicking **HMI Module** in the Project Window.

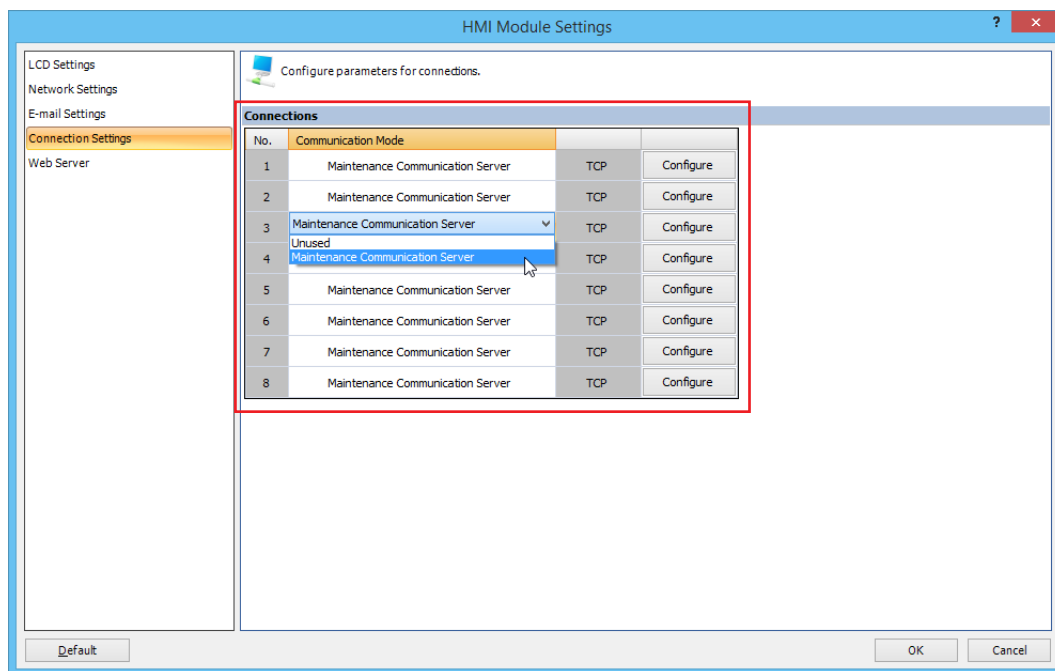


3. Click the **Network Settings** tab, and then configure the **IP Settings** and **DNS Settings**.

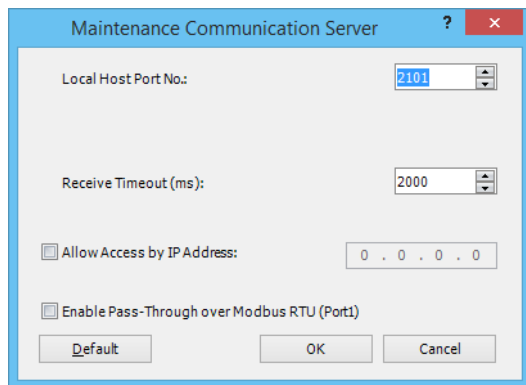


4: MAINTENANCE COMMUNICATION

- Click **Connection Settings**.
- Click **Communication Mode** for the port to be used and select communication mode of the connection to use.



- Set the parameters to match the communication format used by the computer or operator interface.



Local Host Port No. : 2101 (The port number that the FC6A uses for the maintenance communication server)

Receive Timeout (ms) : 2000 (100 to 25500)

Allow Access by IP Address : Disabled (Enabling this option makes it possible to prevent access from devices having any IP addresses other than the one entered.)

Note: The number of clients that can be connected to the FC6A simultaneously is one client per connection. If connections 1 to 8 are all set to the maintenance communication server, eight clients can connect to the FC6A at the same time.

- Click **OK**.

This completes maintenance communications settings.

5: USER COMMUNICATION INSTRUCTIONS

Introduction

This chapter describes user communication to send and receive specific data by converting it to data types for external devices connected to the FC6A.

The user communication instructions are used to execute user communication.

The user communication instructions differ according to the communication interface that will be used.

- When performing user communication with an external device using port 1 to port 33 via serial communication (RS232C/RS485)
When performing user communication with an external device using port 1 to port 3 via serial communication (Bluetooth)
"TXD (Transmit)" on page 5-2
"RXD (Receive)" on page 5-10
- When performing user communication with an external device using Ethernet port 1 and 2 via Ethernet communication
"ETXD (User Communication Transmit over Ethernet)" on page 5-24
"ERXD (User Communication Receive over Ethernet)" on page 5-24

Communication Ports Used in User Communication

Supported models and communication ports are as follows.

| Communication Port | All-in-One CPU Module | | | CAN J1939 All-in-One CPU Module | Plus CPU Module | |
|--------------------|---------------------------------|-------------------|-------------------|---------------------------------|----------------------------------|-------------------|
| | 16-I/O Type | 24-I/O Type | 40-I/O Type | | Plus 16-I/O Type | Plus 32-I/O Type |
| Port 1 | Yes | Yes | Yes | — | Yes ^{*2} | Yes ^{*2} |
| Port 2 | Yes ^{*1} | Yes ^{*1} | Yes ^{*1} | Yes ^{*1} | Yes ^{*2} | Yes ^{*2} |
| Port 3 | — | — | Yes ^{*1} | Yes ^{*1} | Yes ^{*3} | Yes ^{*3} |
| Port 4 to 33 | Yes (Port 4 to 9) ^{*4} | | | | Yes (Port 4 to 33) ^{*5} | |
| Ethernet Port 1 | Yes | Yes | Yes | Yes | Yes | Yes |
| Ethernet Port 2 | — | — | — | — | Yes | Yes |
| HMI-Ethernet Port | — | — | — | — | — | — |

*1 When a communication cartridge is connected.

*2 When a cartridge base module and communication cartridge are connected.

*3 When the HMI module and a communication cartridge are connected.

*4 Up to three communication modules can be connected to the All-in-One CPU module and CAN J1939 All-in-One CPU module, expanding the communication ports 4 to 9.

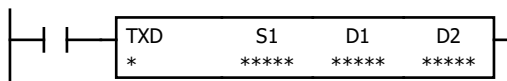
*5 Up to 15 communication modules can be connected to the Plus CPU module, expanding the communication ports 4 to 33.

User Communication Settings

The user communication settings supported by each communication port are as follows.

- Serial communication with an external device connected to port 1 to port 33 (RS232C/RS485)
Serial communication with an external device connected to port 1 to port 3 (Bluetooth)
"User Communication via Serial Communication" on page 5-25
- Ethernet communication with an external device connected by the Ethernet port 1 and 2
"User Communication via Ethernet Communication" on page 5-41

TXD (Transmit)



The transmit data is converted to the set data type and transmitted to the external device using port 1 to 33.

Valid Devices

| Device | Function | I | Q | M | R | T | C | D | P | Constant | Repeat |
|--------------------|----------------------------|---|---|-----------------|---|---|---|-----------------|---|----------|--------|
| S1 (Source 1) | Transmit data | — | — | — | — | — | — | X | — | X | — |
| D1 (Destination 1) | Transmit completion output | — | X | X ^{*1} | — | — | — | — | — | — | — |
| D2 (Destination 2) | Transmit status register | — | — | — | — | — | — | X ^{*2} | — | — | — |

For valid device address ranges, see "Devices" on page 2-1.

*1 Special internal relays cannot be designated as D1.

*2 Special data registers cannot be used.

Transmit data designated by device S1 can be a maximum of 1,536 bytes.

When transmission is complete, an output or internal relay, designated by device D1, is turned on.

Destination 2 occupies two consecutive data registers starting with the device designated by D2. The transmit status data register stores the status of transmission and error code. The next data register stores the byte count of transmitted data. The same data registers cannot be used as transmit status registers for TXD1 through TXD33 instructions and receive status registers for RXD1 through RXD33 instructions.

Notes:

- For details on user communication over serial communication, see "User Communication via Serial Communication" on page 5-25.
- For details on user communication over Bluetooth communication, see "User Communication via Serial Communication (Bluetooth)" on page 5-40.

Precautions for Programming TXD Instruction

- The FC6A has five formatting areas each for executing TXD1 through TXD33 instructions, so five instructions each of TXD1 through TXD33 can be processed at the same time. If inputs to more than five of the same TXD instructions are turned on at the same time, an error code is set to the transmit status data register, designated by device D2, in the excessive TXD instructions that cannot be executed.
- If the input for a TXD instruction turns on while another TXD instruction is executed, the subsequent TXD instruction is executed 2 scan times after the preceding TXD instruction is completed.
- Since TXD instructions are executed in each scan while input is on, a pulse input from a SOTU or SOTD instruction should be used.
- The data register used to store the transmit/receive status and the transmit/receive data byte count must be different for the TXD instruction and the RXD instruction.
- The TXD instruction cannot be used in an interrupt program. If used in an interrupt program, a user program execution error will result and error code 18 will be stored in the user program execution error code (D8006). For details about the user program execution errors, see Chapter 3 "User Program Execution Errors" in the "Ladder Programming Manual".

User Communication Transmit Instruction Dialog Box in WindLDR

Selections and Devices in Transmit Instruction Dialog Box

| | | |
|-----------------|-------------------------|--|
| Type | TXD | Transmit instruction |
| | RXD | Receive instruction |
| Port No. | Port 1 - Port 33 | Transmit user communication from port 1 (TXD1) through port 33 (TXD33) |
| S1 | Source 1 | Enter the data to transmit in this area. Transmit data can be constant values (character or hexadecimal), data registers, or BCC. |
| D1 | Destination 1 | Transmit completion output can be an output or internal relay. |
| D2 | Destination 2 | Transmit status register can be data register. The next data register stores the byte count of transmitted data. |

Transmit Data

Transmit data is designated by source device S1 using constant values or data registers. BCC code can also be calculated automatically and appended to the transmit data. One TXD instruction can transmit a maximum of 1,500 bytes of data.

S1 (Source 1)

| Transmit Data | Conversion Type | Transmit Digits (Bytes) | Repeat | BCC Calculation | Calculation Start Position |
|-------------------------------|---|-------------------------|--------|--|----------------------------|
| Constant (Character) | No conversion | 1 | — | — | — |
| Constant (Hexadecimal) | | | | | |
| Data Register | A: Binary to ASCII B: BCD to ASCII —: No conversion | 1-4 1-5 1-2 | 1-99 | — | — |
| BCC | A: Binary to ASCII —: No conversion | 1-2 | — | X: XOR A: ADD C: Add-2comp M: Modbus ASCII M: Modbus RTU | 1-15 |

Note: Total byte count of the transmit data is shown in S1 of TXD instruction on the ladder diagram of WindLDR.

Designating Constant as S1

When a constant value is designated as source device S1, one-byte data is transmitted without conversion. The valid transmit data value depends on the data bits selected in the Communication Parameters dialog box. These data bits are set in **Configuration > Comm. Ports**, followed by selecting **User Protocol** in Port 1 through Port 33 list box and clicking the **Configure** button. When 7 data bits are selected as default, 00h through 7Fh is transmitted. When 8 data bits are selected, 00h through FFh is transmitted. Constant values are entered in character or hexadecimal notation into the source data.

Constant (Character)

Any character available on the computer keyboard can be entered. One character is counted as one byte.

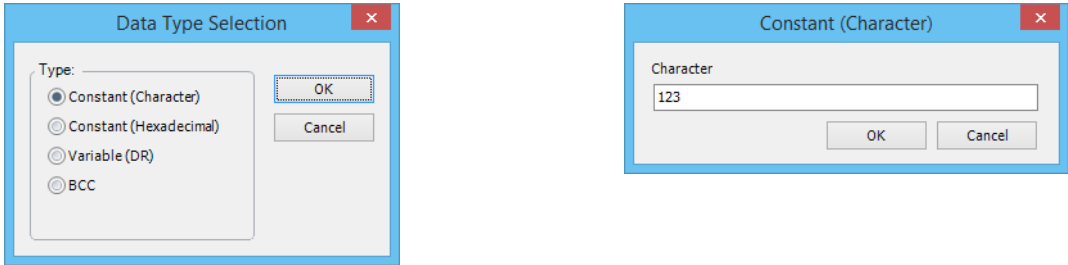
Constant (Hexadecimal)

Use this option to enter the hexadecimal code of any ASCII character. ASCII control codes NUL (00h) through US (1Fh) can also be entered using this option.

Example:

The following example shows two methods to enter 3-byte ASCII data "1" (31h), "2" (32h), "3" (33h).

(1) Constant (Character)



(2) Constant (Hexadecimal)



Designating Data Register as S1

When a data register is designated as source device S1, conversion type and transmit digits must also be assigned. The data stored in the designated data register is converted and the assigned quantity of digits of the resultant data is transmitted. The conversion types that are available are: Binary to ASCII, BCD to ASCII, and no conversion.

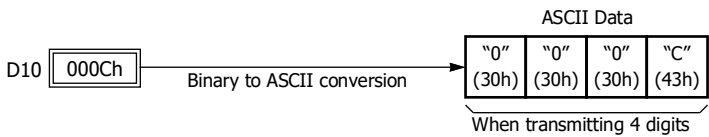
When repeat is designated, data of data registers as many as the repeat cycles are transmitted, starting with the designated data register. Repeat cycles can be up to 99.

Conversion Type

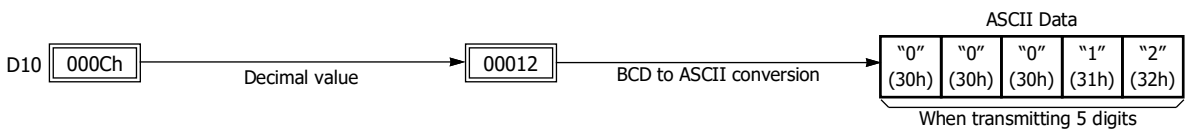
The transmit data is converted according to the designated conversion type as described below:

Example: D10 stores 000Ch (12)

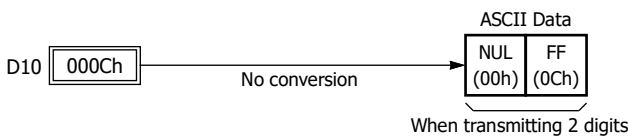
(1) Binary to ASCII conversion



(2) BCD to ASCII conversion



(3) No conversion

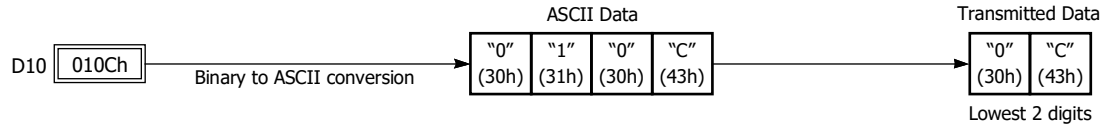


Transmit Digits (Bytes)

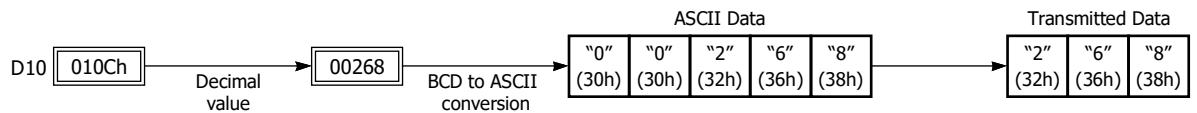
After conversion, the transmit data is taken out in specified digits. Possible digits depend on the selected conversion type.

Example: D10 stores 010Ch (268)

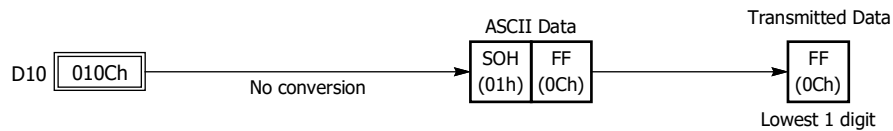
(1) Binary to ASCII conversion, Transmit digits = 2



(2) BCD to ASCII conversion, Transmit digits = 3



(3) No conversion, Transmit digits = 1



Repeat Cycles

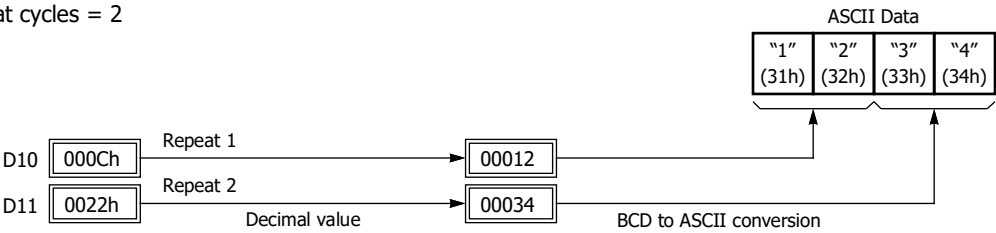
When a data register is assigned to repeat, as many consecutive data registers, as the repeat cycles, are used to transmit data in the same conversion type and transmit digits.

Example:

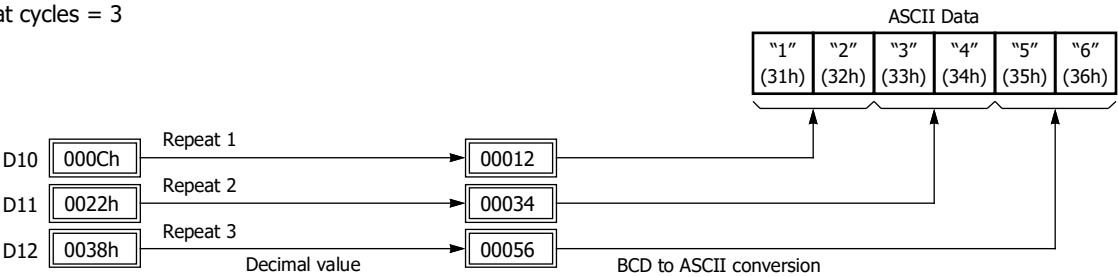
| | | | |
|-----|-------|--------------------|--------------|
| D10 | 000Ch | Data register No.: | D10 |
| D11 | 0022h | Transmit digits: | 2 |
| D12 | 0038h | Conversion type: | BCD to ASCII |

Data from data registers starting with D10 is converted in BCD to ASCII and is transmitted according to the designated repeat cycles.

(1) Repeat cycles = 2

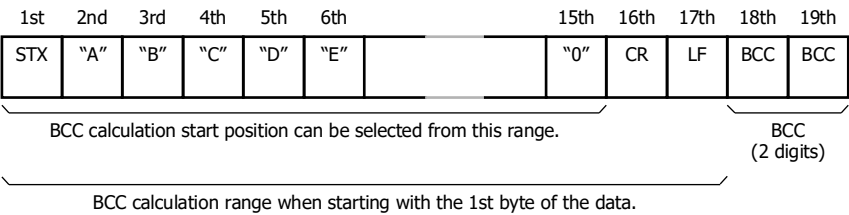


(2) Repeat cycles = 3



BCC (Block Check Character)

Block check characters can be appended to the transmit data. The start position for the BCC calculation can be selected from the first byte through the 15th byte. The BCC can be 1 or 2 digits.

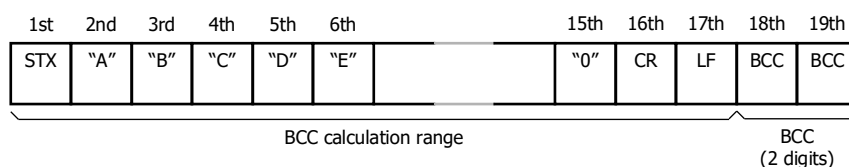


BCC Calculation Start Position

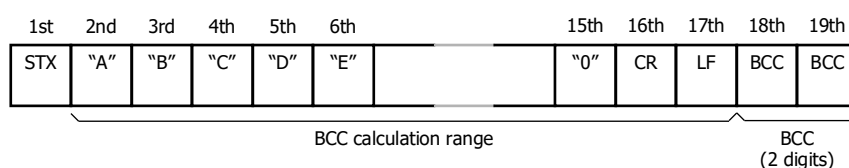
The start position for the BCC calculation can be specified from the first byte through the 15th byte. The BCC is calculated for the range starting at the designated position up to the byte immediately before the BCC of the transmit data.

Example: Transmit data consists of 17 bytes plus 2 BCC digits.

(1) Calculation start position = 1



(2) Calculation start position = 2

**BCC Calculation Formula**

BCC calculation formula can be selected from XOR (exclusive OR), ADD (addition), ADD-2comp, Modbus ASCII, or Modbus RTU.

Example: Conversion results of transmit data consist of 41h, 42h, 43h, and 44h.

| ASCII Data | | | |
|------------|-------|-------|-------|
| "A" | "B" | "C" | "D" |
| (41h) | (42h) | (43h) | (44h) |

(1) BCC calculation formula = XOR

Calculation result = $41h \oplus 42h \oplus 43h \oplus 44h = 04h$

(2) BCC calculation formula = ADD

Calculation result = $41h + 42h + 43h + 44h = 10Ah \rightarrow 0Ah$ (Only the last 1 or 2 digits are used as BCC.)

(3) BCC calculation formula = ADD-2comp

Calculation result = FEh, F6h (2 digits without conversion)

(4) BCC calculation formula = Modbus ASCII

Calculation result = 88 (ASCII)

(5) BCC calculation formula = Modbus RTU

Calculation result = 85h 0Fh (binary)

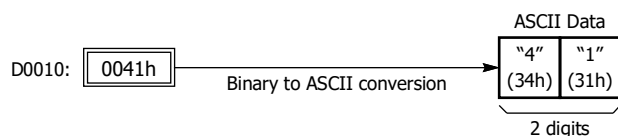
5: USER COMMUNICATION INSTRUCTIONS

Conversion Type

The BCC calculation result is converted or not according to the designated conversion type as described below:

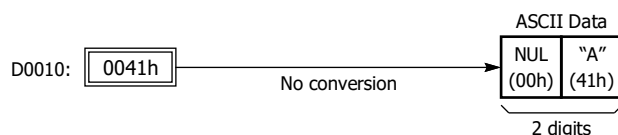
Example: BCC calculation result is 0041h.

(1) Binary to ASCII conversion



Note: On WindLDR, Modbus ASCII is defaulted to binary to ASCII conversion.

(2) No conversion

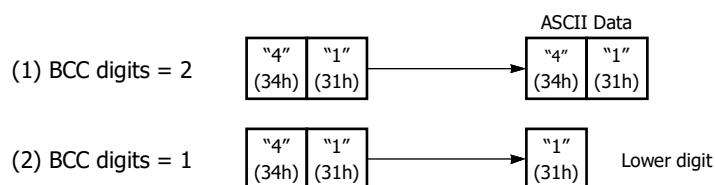


Note: On WindLDR, Modbus RTU is defaulted to no conversion.

BCC Digits (Bytes)

The quantity of digits (bytes) of the BCC code can be selected from 1 or 2.

Example:



Note: On WindLDR, Modbus ASCII and Modbus RTU are defaulted to 2 digits.

D1 (Destination 1)

Set an internal relay or an output for the transmit completion output.

When the start input for a TXD instruction is turned on, preparation for transmission is initiated, followed by data transmission.

When this sequence of operations is complete, the transmit completion output is turned on.

D2 (Destination 2)

Set the data register in which to store the transmit status and the transmit data byte count.

The transmit status is stored in D2+0 and the transmit data byte count is stored in D2+1.

D2+0 (Transmit Status)

| Transmit Status Code | Status | Description |
|----------------------|-------------------------------|--|
| 16 | Preparing transmission | From turning on the start input for a TXD instruction, until the transmit data is stored in the internal transmit buffer |
| 32 | Transmitting data | From enabling data transmission by an END processing, until all data transmission is completed |
| 48 | Data transmission complete | From completing all data transmission, until the END processing is completed for the TXD instruction |
| 64 | Transmit instruction complete | All transmission operation is completed and the next transmission is made possible |

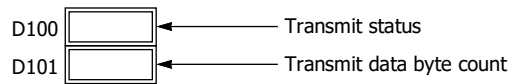
If the transmit status code is other than shown above, a transmit instruction error is suspected. See "User Communication Error" on page 5-53.

D2+1 (Transmit Digits (Bytes))

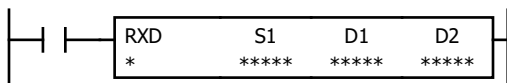
The transmit data byte count is stored in the data register after that set with D2 (D2+1). BCC data is also included in the transmit data byte count.

The data register next to the device designated for transmit status stores the byte count of data transmitted by the TXD instruction. When BCC is included in the transmit data, the byte count of the BCC is also included in the transmit data byte count.

Example: Data register D100 is designated as a device for transmit status.



RXD (Receive)



When input is on, data from an RS232C/RS485 remote terminal received by port 1 through port 33 is converted and stored in data registers according to the receive format assigned by S1.

Valid Devices

| Device | Function | I | Q | M | R | T | C | D | P | Constant | Repeat |
|--------------------|---------------------------|---|---|-----------------|---|---|---|-----------------|---|----------|--------|
| S1 (Source 1) | Receive format | — | — | — | — | — | — | X | — | X | — |
| D1 (Destination 1) | Receive completion output | — | X | X ^{*1} | — | — | — | — | — | — | — |
| D2 (Destination 2) | Receive status | — | — | — | — | — | — | X ^{*2} | — | — | — |

For valid device address ranges, see "Devices" on page 2-1.

*1 Special internal relays cannot be designated as D1.

*2 Special data registers cannot be used.

Receive format designated by device S1 can be a maximum of 1,536 bytes.

When data receive is complete, an output or internal relay, designated by device D1, is turned on.

Destination 2 occupies two consecutive data registers starting with the device designated by D2. The receive status data register stores the status of data receive and error code. The next data register stores the byte count of received data. The same data registers can not be used as transmit status registers for TXD1 through TXD33 instructions and receive status registers for RXD1 through RXD33 instructions.

Notes:

- For details on user communication over serial communication, see "User Communication via Serial Communication" on page 5-25.
- For details on user communication over Bluetooth communication, see "User Communication via Serial Communication (Bluetooth)" on page 5-40.

Precautions for Programming the RXD Instruction

- The FC6A can execute a maximum of five instructions each of RXD1 through RXD33 that have a start delimiter at the same time. If a start delimiter is not programmed in RXD1 through RXD33 instructions, the FC6A can execute only one instruction each of RXD1 through RXD33 at a time. If the start input for a RXD1 through RXD33 instruction is turned on while another RXD1 through RXD33 instruction, without a start delimiter is executed, a user communication error occurs.
- Since RXD instructions are executed in each scan while input is on, a pulse input from a SOTU or SOTD instruction should be used.
- Once the input to the RXD instruction is turned on, the RXD is activated and ready for receiving incoming communication even after the input is turned off. When the RXD completes data receiving, the RXD is deactivated if the input to the RXD is off. Or, if the input is on, the RXD is made ready for receiving another communication. Special internal relays are available to deactivate all RXD instructions waiting for incoming communication. For user communication receive instruction cancel flags, see "User Communication Receive Instruction Cancel Flag" on page 5-23.
- The RXD instruction cannot be used in an interrupt program. If used in an interrupt program, a user program execution error will result and error code 18 will be stored in the user program execution error code (D8006). For details about the user program execution errors, see Chapter 3 "User Program Execution Errors" in the "Ladder Programming Manual".

User Communication Receive Instruction Dialog Box in WindLDR

Selections and Devices in Receive Instruction Dialog Box

| | | |
|----------|------------------|--|
| Type | TXD | Transmit instruction |
| | RXD | Receive instruction |
| Port No. | Port 1 - Port 33 | Receive user communication to port 1 (RXD1) through port 33 (RXD33) |
| S1 | Source 1 | Enter the receive format in this area. The receive format can include a start delimiter, data register to store incoming data, constants, end delimiter, BCC, and skip. |
| D1 | Destination 1 | Receive completion output can be an output or internal relay. |
| D2 | Destination 2 | Receive status register can be data register. The next data register stores the byte count of received data. |

Receive Format

Receive format, designated by source device S1, specifies data registers to store received data, data digits for storing data, data conversion type, and repeat cycles. A start delimiter and an end delimiter can be included in the receive format to discriminate valid incoming communication. When some characters in the received data are not needed, "skip" can be used to ignore a specified number of characters. BCC code can also be appended to the receive format to verify the received data. One RXD instruction can receive 1,500 bytes of data at the maximum.

S1 (Source 1)

| Receive Format | Receive Digits (Bytes) | Conversion Type | Repeat | BCC Calculation | Calculation Start Position | Skip Bytes | Delimiter |
|---------------------------|------------------------|--|--------|---|----------------------------|------------|--------------|
| Data Register | 1-4 1-5 1-2 | A:ASCII to Binary B:ASCII to BCD -:No conversion | 1-99 | — | — | — | Hex ASCII |
| Start Delimiter | — | No conversion | — | — | — | — | |
| End Delimiter | — | No conversion | — | — | — | — | |
| Constant for Verification | — | No conversion | — | — | — | — | |
| BCC | 1-2 | A:Binary to ASCII -:No conversion | — | X:XOR A:ADD C:Add-2comp M:Modbus ASCII M:Modbus RTU | 1-15 | — | |
| Skip | — | — | — | — | — | 1-99 | |

Note: Total byte count of the receive format is shown in S1 of RXD instruction on the ladder diagram of WindLDR.

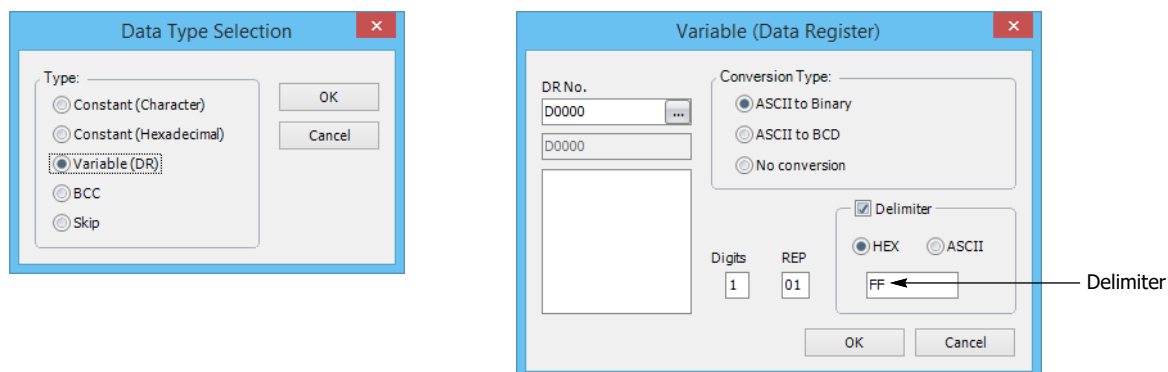
Designating Data Register as S1

When a data register is designated as source device S1, receive digits and conversion type must also be assigned. The received data is divided into blocks of specified receive digits, converted in a specified conversion type, and stored to the designated data registers. Conversion types are available in ASCII to Binary, ASCII to BCD, and no conversion.

When repeat is designated, received data is divided, converted, and stored into as many data registers as the repeat cycles, starting with the designated data register. There can be up to 99 repeat cycles.

5: USER COMMUNICATION INSTRUCTIONS

When a data register is designated as source device S1, a delimiter can be included in the data register designation to end receiving communication.

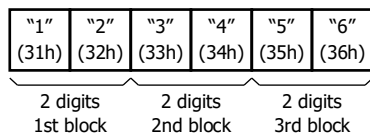


Receive Digits

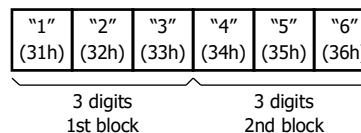
The received data is divided into blocks of specified receive digits before conversion as described below:

Example: Received data of 6 bytes are divided in different receive digits. (Repeat is also designated.)

(1) Receive digits = 2



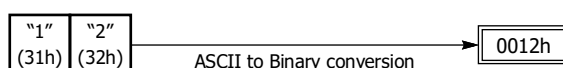
(2) Receive digits = 3

**Conversion Type**

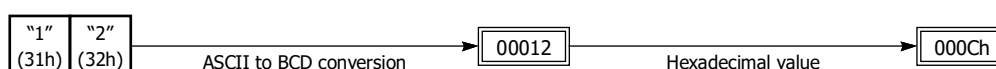
The data block of the specified receive digits is then converted according to the designated conversion type as described below:

Example: Received data has been divided into a 2-digit block.

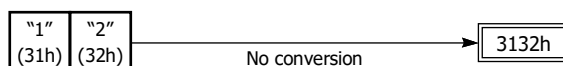
(1) ASCII to Binary conversion



(2) ASCII to BCD conversion



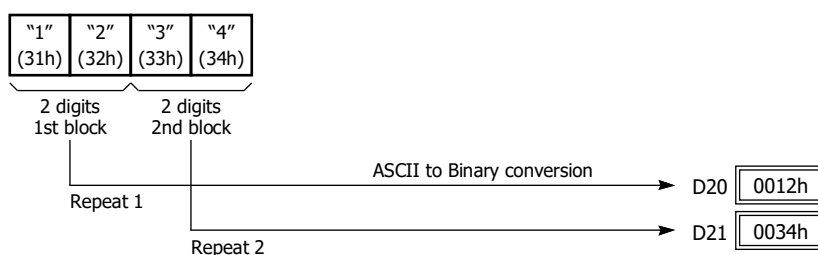
(3) No conversion

**Repeat Cycles**

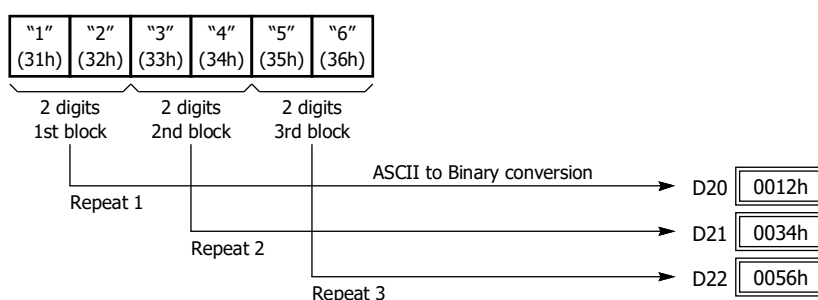
When a data register is assigned to repeat, the received data is divided and converted in the same way as specified, and the converted data is stored to as many consecutive data registers as repeat cycles.

Example: Received data of 6 bytes is divided into 2-digit blocks, converted in ASCII to Binary, and stored to data registers starting at D20.

(1) Repeat cycles = 2



(2) Repeat cycles = 3



Delimiter

A delimiter for the data register in the receive format can be assigned. Using a delimiter, incoming data of variable length can be received and stored to data registers.

| Delimiter | How the incoming data is stored to data registers |
|--------------|--|
| Designated | The incoming data is stored to data registers until all the data specified with receive digits, conversion type, and repeat is processed or the specified delimiter is received. |
| No delimiter | The incoming data is stored to data registers until all the data specified with receive digits, conversion type, and repeat is processed. |

Note: Delimiters for data registers can be used in the receive format of RXD instructions only.

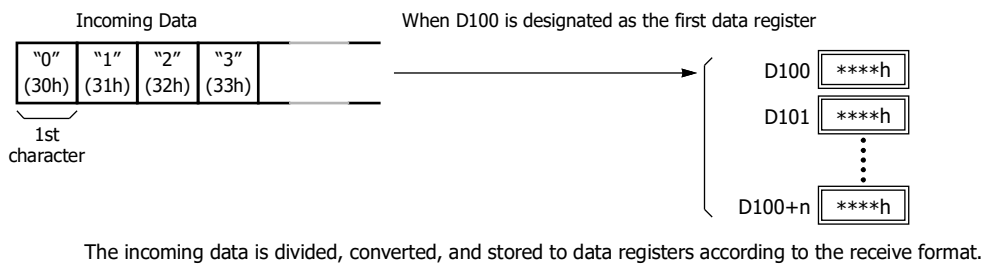
Designating Constant as Start Delimiter

A start delimiter can be programmed at the first byte in the receive format of a RXD instruction; the FC6A will recognize the beginning of valid communication, although a RXD instruction without a start delimiter can also be executed. When a constant value is designated at the first byte of source device S1, the one-byte data serves as a start delimiter to start the processing of the received data.

A maximum of five instructions each of RXD1 through RXD3 with different start delimiters can be executed at the same time. When the first byte of the incoming data matches the start delimiter of a RXD instruction, the received data is processed and stored according to the receive format specified in the RXD instruction. If the first byte of the incoming data does not match the start delimiter of any RXD instruction that is executed, the FC6A discards the incoming data and waits for the next communication. When a RXD instruction without a start delimiter is executed, any incoming data is processed continuously according to the receive format. Only one instruction each of RXD1 through RXD3 without a start delimiter can be executed at a time. If start inputs to two or more RXD instructions without a start delimiter are turned on simultaneously, the one at the smallest address is executed and the corresponding completion output is turned on.

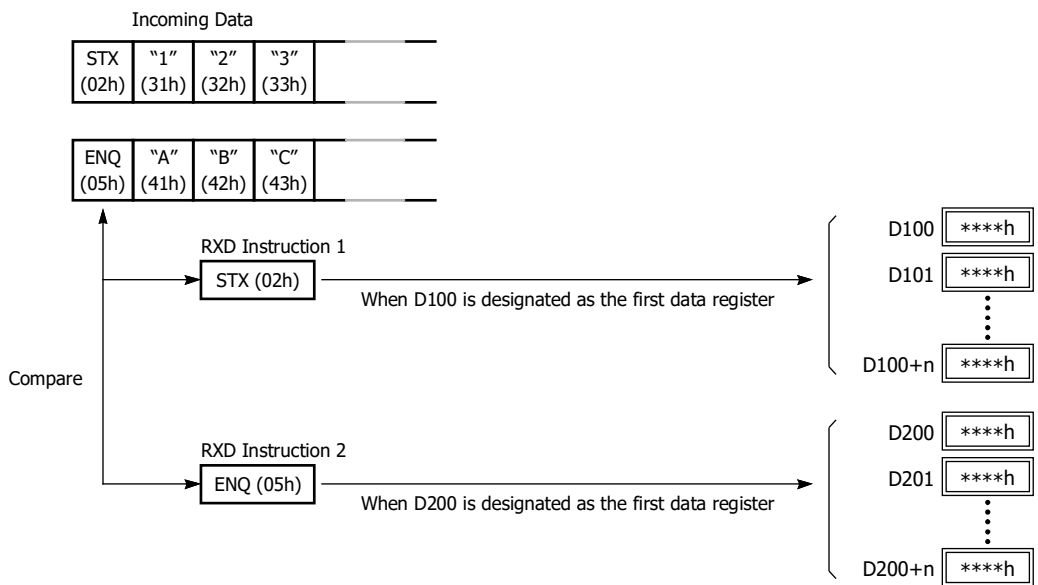
Example:

(1) When a RXD instruction without a start delimiter is executed



The incoming data is divided, converted, and stored to data registers according to the receive format.

(2) When RXD instructions with start delimiters STX (02h) and ENQ (05h) are executed



The incoming data is divided, converted, and stored to data registers according to the receive format. Start delimiters are not stored to data registers.

Multi-byte Start Delimiter

A start delimiter can be programmed at the first bytes in the receive format of a RXD instruction; the FC6A will recognize the beginning of valid communication, although a RXD instruction without a start delimiter can also be executed. A maximum of 5 consecutive constants that are either character or hexadecimal from the first byte of the receive format are considered a multi-byte start delimiter.

If a RXD instruction with a start delimiter is executed and another RXD instruction with the same start delimiter is executed, user communication error code 5 is stored in the data register designated as the receive status of the second RXD instruction. When the error occurs, the second RXD instruction is canceled, and the first RXD instruction executed is kept.

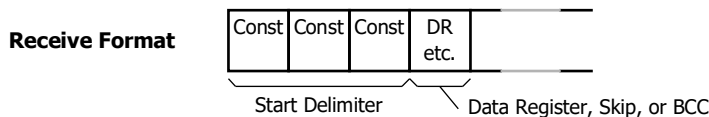
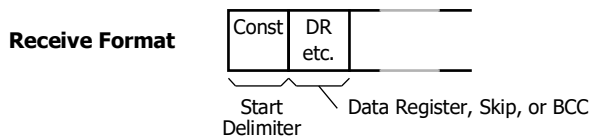
If a multi-byte start delimiter is assigned, and the incoming data does not match the entire multi-byte start delimiter, the FC6A discards the incoming data and waits for the next communication.

When the first one byte is received, a timer is started to monitor the interval between incoming data even when a multi-byte start delimiter is assigned. If data is not received in the period specified for the receive timeout value after receiving one byte of data, a receive timeout error occurs, and user communication error code 11 is stored in the status data register.

Examples: Multi-byte Start Delimiter

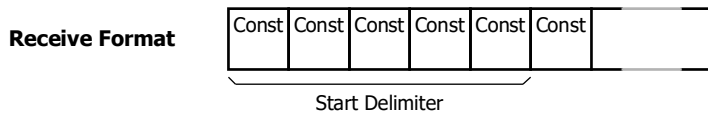
Multi-byte start delimiter is determined in the structure of the Receive Format. The following examples show how multi-byte start delimiter is determined.

- Constants are followed by data register, skip, or BCC



Note: Constants following data register, skip, or BCC are not considered start delimiter even if these are in the first five bytes of the receive format.

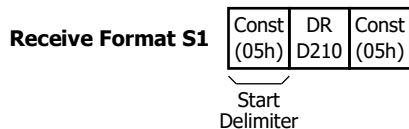
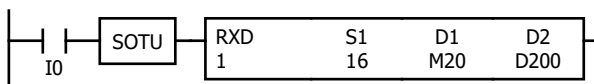
- More than 5 constants are specified from the first byte



Note: Constants that are neither start delimiters or end delimiters are considered constants for verification. See "Constant for Verification" on page 5-18.

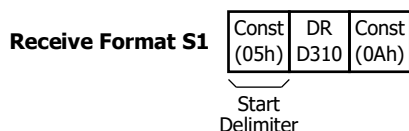
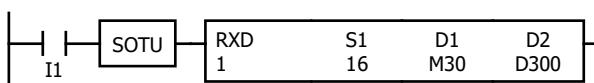
Example: Start Delimiter Duplication Error

When input I0 is turned on, the first RXD instruction is executed and status code 32 is stored in the receive status D200, indicating the RXD instruction is waiting for the incoming data. When input I1 is turned on, another RXD instruction is executed, but since two RXD instructions have the same start delimiter, the second RXD instruction is not executed, and user communication error code 5 is stored in the receive status D300.



Communication port: Port 1
 Receive completion output: M20
 Receive status register: D200
 Receive data byte count: D201

| | |
|------|-----|
| D200 | 32 |
| M20 | OFF |

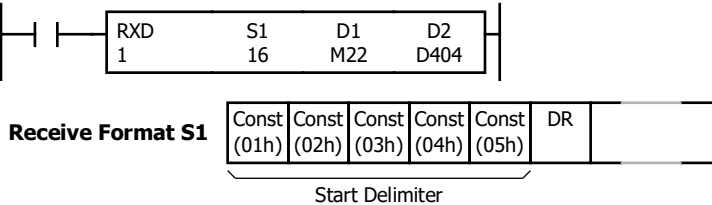
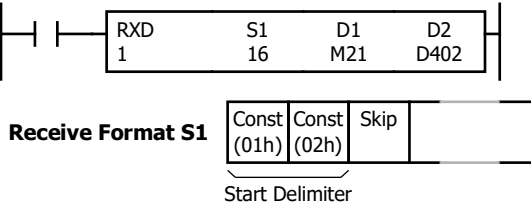
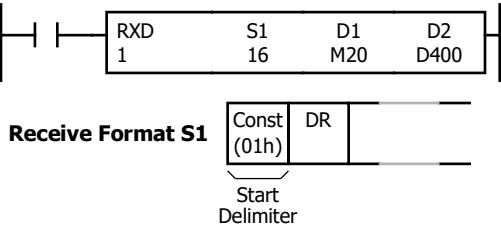


Communication port: Port 1
 Receive completion output: M30
 Receive status register: D300
 Receive data byte count: D301

| | |
|------|-----|
| D300 | 5 |
| M30 | OFF |

5: USER COMMUNICATION INSTRUCTIONS

Note: If you execute two or more RXD instructions with multi-byte start delimiters simultaneously, the start delimiters of those RXD instructions must be unique from the others. When the length of the multi-byte start delimiters of the RXD instructions is different, the length of the shortest one is applied to check the duplicated start delimiters. The start delimiter of any of two RXD instructions in the following RXD instructions are considered the same.

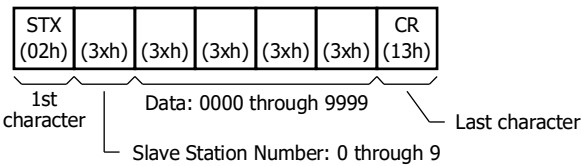


Example: Using Multi-byte Start Delimiter

The following example shows the advantages of using a multi-byte start delimiter rather than a single-byte start delimiter. A RXD instruction processes incoming data from the master station. The incoming data is sent to multiple slave stations 0 through 9, and the local slave station number is 1. Therefore, incoming data from the master station must be received only when the incoming data is sent for the slave station 1.

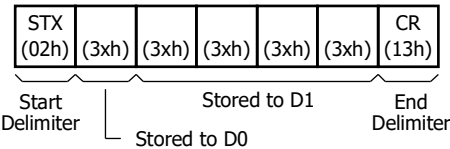
• Incoming data

Incoming data consists of start delimiter STX, a slave station number which can be 0 through 9, data 0000 through 9999, and end delimiter CR.



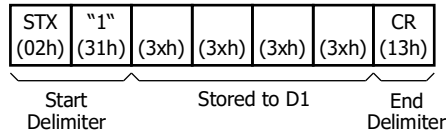
• Single-byte start delimiter

Only the first byte can be the start delimiter. The second byte of the incoming data, which is the slave station number, has to be stored to data register D0, and extra ladder programming is needed to see whether the slave station number of the incoming communication is 1 or not. Only when the slave station number is 1, received data stored in D1 is valid for the local PLC.



- **Multi-byte start delimiter**

First two bytes can be configured as a multi-byte start delimiter. The incoming data is processed according to the receive format only when the first two bytes of the incoming data match the start delimiter. Therefore, only the incoming data sent to slave station 1 is processed. No extra ladder programming is needed to check the slave station number.



Designating Constant as End Delimiter

An end delimiter can be programmed at the end of the receive format of a RXD instruction; the FC6A will recognize the end of valid communication, although RXD instructions without an end delimiter can also be executed.

When a constant value is designated at the end of source device S1, the one-byte data serves as an end delimiter to end the processing of the received data. If data bits are set to 7 bits, the end delimiters will be between 00h and 7Fh. If data bits are set to 8 bits, the end delimiters will be between 00h and FFh. Constant values are entered in character or hexadecimal notation into the source data. When using the same RXD instruction repeatedly in a user program, assign different end delimiters for each RXD instruction.

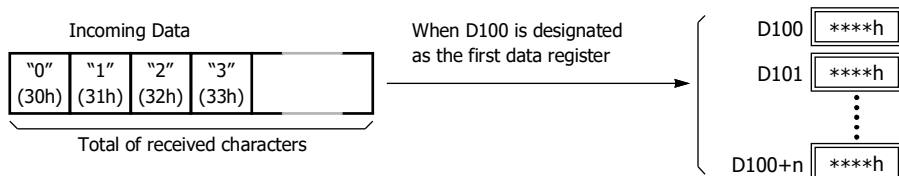
If a character in incoming data matches the end delimiter, the RXD instruction ends receiving data at this point and starts subsequent receive processing as specified. Even if a character matches the end delimiter at a position earlier than expected, the RXD instruction ends receiving data there.

If a BCC code is included in the receive format of a RXD instruction, an end delimiter can be positioned immediately before or after the BCC code. If a data register or skip is designated between the BCC and end delimiter, correct receiving is not ensured.

When a RXD instruction without an end delimiter is executed, data receiving ends when the specified bytes of data in the receive format, such as data registers and skips, have been received. In addition, data receiving also ends when the interval between incoming data characters exceeds the receive timeout value specified in the Communication Parameters dialog box whether the RXD has an end delimiter or not. The character interval timer is started when the first character of incoming communication is received and restarted each time the next character is received. When a character is not received within a predetermined period of time, timeout occurs and the RXD ends data receive operation.

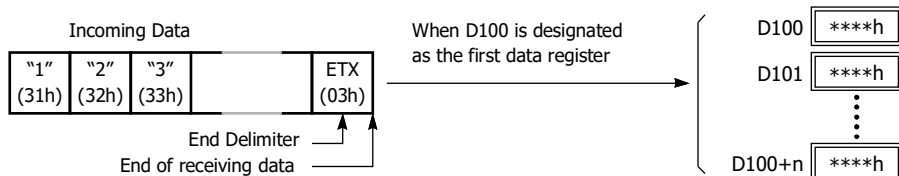
Example:

(1) When a RXD instruction without an end delimiter is executed



The incoming data is divided, converted, and stored to data registers according to the receive format. Receive operation is completed when the total characters programmed in RXD are received.

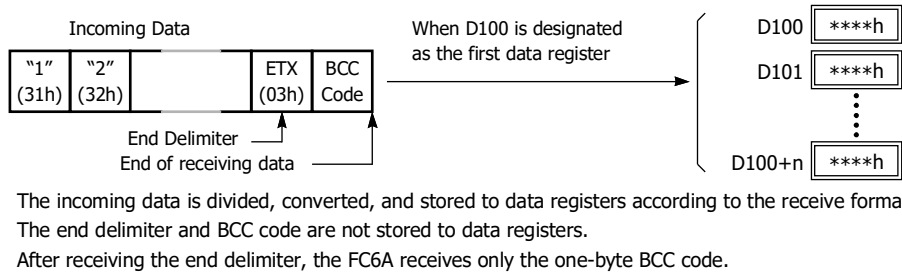
(2) When a RXD instruction with end delimiter ETX (03h) and without BCC is executed



The incoming data is divided, converted, and stored to data registers according to the receive format. The end delimiter is not stored to a data register. Any data arriving after the end delimiter is discarded.

5: USER COMMUNICATION INSTRUCTIONS

(3) When a RXD instruction with end delimiter ETX (03h) and one-byte BCC is executed



Constant for Verification

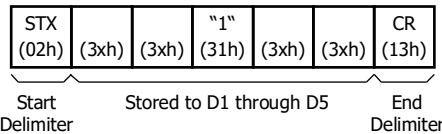
Constants excluding start and end delimiters can be configured in the receive format to verify the incoming data with the constants, which are either characters or hexadecimal values. As many constants can be configured for the verification as required. The verification result is stored in the receive status of the RXD instruction.

Example: Programming Constant for Verification

The following example shows the advantage of using constant for verification. The incoming data contains a constant value "1" in the middle, and that constant value needs to be verified to see whether the incoming data is valid.

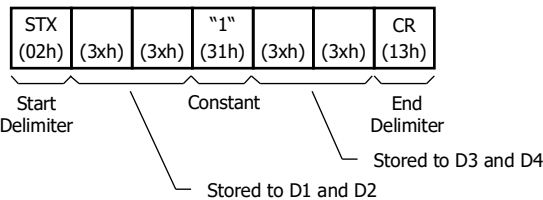
• Using Data Register

The incoming data including the constant value needs to be stored in data registers. When the RXD instruction completes receiving the incoming data, the receive status contains 64, meaning the RXD instruction has completed without errors, even if the constant value is not an expected value. Extra ladder programming is needed to see whether the constant value in the incoming data is correct or not.



• Using Constant for Verification

A constant to verify the constant value in the incoming data is designated in the receive format. If the constant value is not an expected value when the RXD instruction completes receiving the incoming data, the receive status contains 74, meaning the RXD instruction has completed but user communication error code 5 occurred. No extra ladder programming is needed to see whether the constant value in the received data is correct or not.



Note: When configuring constants, which are either characters or hexadecimal values, in the receive format, and the incoming data does not match the constants in the receive format, then a user communication error code is stored in the receive status. The error code contained in the receive status depends on whether the constants are used as a start delimiter or as constants for verification. If used as a start delimiter, user communication error code 7 is stored in the receive status, and the RXD instruction keeps waiting for valid incoming data. On the other hand, if used as constants for verification, the receive status contains 74, and the RXD instruction finishes the execution. To repeat receiving incoming communication, turn on the input for the RXD instruction.

- Start delimiter of incoming data does not match the receive format

| | | | | | | | | |
|----------------|--------------------|-------|----------------|-------|----------------|----------------------------|---|---|
| Incoming Data | Const (02h) | (xxh) | (FFh) | (xxh) | (0Dh) | | | |
| Receive Format | Const (05h) | DR | Const (FFh) | DR | Const (0Dh) | Receive status: | 7 | RXD instruction keeps waiting for valid incoming data, and completes data receiving after receiving valid data including a correct start delimiter. |
| | | | | | | Receive completion output: | 0 | |
| | Start Delimiter | | | | | | | |

- Constant for verification of incoming data does not match the receive format

| | | | | | | | | |
|----------------|----------------|-------|------------------------------|-------|----------------|----------------------------|----|--|
| Incoming Data | (05h) | (xxh) | (0Fh) | (xxh) | (0Dh) | | | |
| Receive Format | Const (05h) | DR | Const (FFh) | DR | Const (0Dh) | Receive status: | 74 | Receive status stores 74 (= 64 + 10) RXD instruction completes data receiving. To repeat receiving incoming communication, turn on the input for the RXD instruction. |
| | | | | | | Receive completion output: | 1 | |
| | | | Constant for Verification | | | | | |

Note: Constants configured in the beginning of receive formats have different functions as shown below:

- More than five constants are configured in the beginning of the receive format

| | | | | | | | | |
|----------------|-----------------------------------|-------|-------|-------|-------|---|--|-------|
| Byte | 1st | 2nd | 3rd | 4th | 5th | 6th | | 200th |
| Receive Format | Const | Const | Const | Const | Const | Const | | Const |
| | Start Delimiter Up to 5th byte | | | | | Constant for Verification 6th byte and after | | |

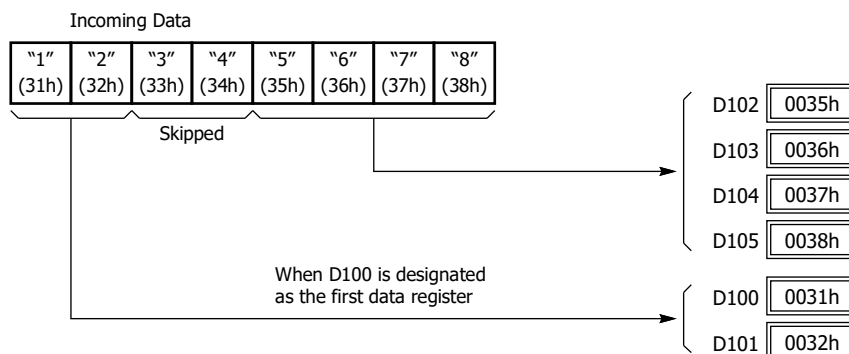
- Other than constants (data register, skip, or BCC) are included in the first five bytes of the receive format

| | | | | | | | | |
|----------------|---|------------|--------------------------------|-------|---|-----|--|-------|
| Byte | 1st | 2nd | 3rd | 4th | 5th | 6th | | 200th |
| Receive Format | Const | DR etc. | Const | Const | Const | | | |
| | Start Delimiter Consecutive first 5 bytes only | | Data register, skip, or BCC | | Constant for Verification Not consecutive in the first 5 bytes | | | |

Skip

When "skip" is designated in the receive format, a specified quantity of digits in the incoming data are skipped and not stored to data registers. A maximum of 99 digits (bytes) of characters can be skipped continuously.

Example: When a RXD instruction with skip for 2 digits starting at the third byte is executed



BCC (Block Check Character)

The FC6A has an automatic BCC calculation function to detect a communication error in incoming data. If a BCC code is designated in the receive format of a RXD instruction, the FC6A calculates a BCC value for a specified starting position through the position immediately preceding the BCC. It then compares the calculation result with the BCC code in the received incoming data. The start position for the BCC calculation can be specified from the first byte through the 15th byte. The BCC can be 1 or 2 digits.

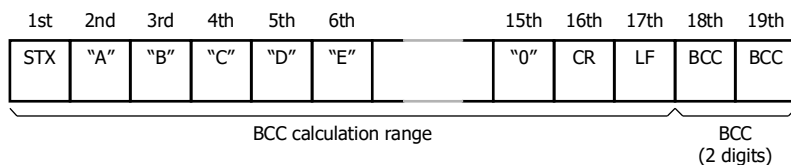
When an end delimiter is not used in the RXD instruction, the BCC code must be positioned at the end of the receive format designated in Source 1 device. When an end delimiter is used, the BCC code must be immediately before or after the end delimiter. The FC6A reads a specified number of BCC digits in the incoming data according to the receive format to calculate and compare the received BCC code with the BCC calculation results.

BCC Calculation Start Position

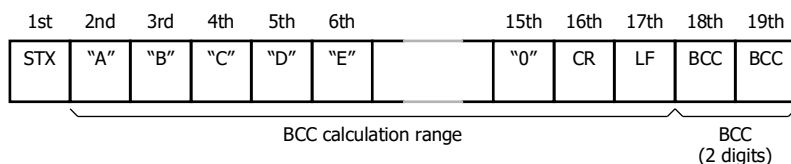
The start position for the BCC calculation can be specified from the first byte through the 15th byte. The BCC is calculated for the range starting at the designated position up to the byte immediately before the BCC of the receive data.

Example: Received data consists of 17 bytes plus 2 BCC digits.

(1) Calculation start position = 1



(2) Calculation start position = 2



BCC Calculation Formula

BCC calculation formula can be selected from XOR (exclusive OR), ADD (addition), ADD-2comp, Modbus ASCII, or Modbus RTU.

Example: Incoming data consists of 41h, 42h, 43h, and 44h.

(1) BCC calculation formula = XOR

$$\text{Calculation result} = 41\text{h} \oplus 42\text{h} \oplus 43\text{h} \oplus 44\text{h} = 04\text{h}$$

(2) BCC calculation formula = ADD

$$\text{Calculation result} = 41\text{h} + 42\text{h} + 43\text{h} + 44\text{h} = 10\text{Ah} \rightarrow 0\text{Ah} \text{ (Only the last 1 or 2 digits are used as BCC.)}$$

(3) BCC calculation formula = ADD-2comp

$$\text{Calculation result} = \text{FEh, F6h (2 digits without conversion)}$$

(4) BCC calculation formula = Modbus ASCII

$$\text{Calculation result} = 88 \text{ (ASCII)}$$

(5) BCC calculation formula = Modbus RTU

$$\text{Calculation result} = 85\text{h } 0\text{Fh (binary)}$$

D1 (Destination 1)

Set an internal relay or an output for the receive completion output.

When the start input for a RXD instruction is turned on, preparation for receiving data is initiated, followed by data conversion and storage. When the data receive operation sequence is complete, the designated output or internal relay is turned on.

Conditions for Completion of Receiving Data

After starting to receive data, the RXD instruction can be completed in three ways depending on the designation of end delimiter and delimiter in the receive format.

| End Delimiter | Delimiter | Conditions for Completion of Receiving Data |
|---------------|-----------------|--|
| With | With or Without | When a specified byte count of data (digits × repeat) has been received or when an end delimiter is received. When a BCC exists immediately after the end delimiter, the BCC is received before ending data receiving. |
| Without | With | After the last constant (including delimiter) designated in the RXD instruction has been received, data receiving is completed when the subsequent byte count of data has been received. |
| Without | Without | When a specified byte count of data (digits × repeat) has been received. |

Note: Whenever a receive timeout has occurred, data receiving stops arbitrarily.

Data receiving is complete when one of the above three conditions is met. To abort a RXD instruction, use the special internal relay for user communication receive instruction cancel flag. See "User Communication Receive Instruction Cancel Flag" on page 5-23.

Example: A RXD instruction does not have an end delimiter and has a delimiter programmed in the receive format for data registers.

After delimiter FFh has been received, data receiving is completed when subsequent 3 bytes are received.

| Receive Format | DR1 | FFh | BCC | DR2 |
|----------------|---------------------------------|-----|------------------|--------------|
| | 4 bytes max. + delimiter 1 byte | | 1 byte | 2 bytes max. |
| | Delimiter: FFh | | Delimiter: — | |
| | Conversion: ASCII to Binary | | Conversion: None | |
| | Digits: 4 | | Digits: 2 | |
| | Repeat: 1 | | Repeat: 1 | |

D2 (Destination 2)

Set the data register in which to store the receive status and the receive data byte count.

The receive status is stored in D2+0 and the receive data byte count is stored in D2+1.

D2+0 (Receive Status)

The receive status is stored in the data register set with D2. The receive status includes the reception operation status and the error information.

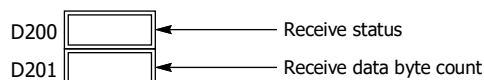
| Receive Status Code | Status | Description |
|---------------------|---|--|
| 16 | Preparing data receive | From turning on the start input for a RXD instruction to read the receive format, until the RXD instruction is enabled by an END processing |
| 32 | Receiving data | From enabling the RXD instruction by an END processing, until incoming data is received |
| 48 | Data receive complete | From receiving incoming data, until the received data is converted and stored in data registers according to the receive format |
| 64 | Receive instruction complete | All data receive operation is completed and the next data receive is made possible |
| 128 | User communication receive instruction cancel flag active | RXD instructions are cancelled by special internal relay for user communication receive instruction cancel flag, such as M8022, M8023, M8026, M8033, M8145 to M8147, M8170, M8176, or M8365 to M8394 |

If the receive status code is other than shown above, a receive instruction error is suspected. See "User Communication Error" on page 5-53.

D2+1 (Receive Digits (Bytes))

The data register next to the device designated for receive status stores the byte count of data received by the RXD instruction. When a start delimiter, end delimiter, and BCC are included in the received data, the byte counts for these codes are also included in the receive data byte count.

Example: Data register D200 is designated as a device for receive status.



User Communication Receive Instruction Cancel Flag

If user communication receive instruction cancel is turned on when the receive pre-processing for the user communication receive instruction has already been completed and data is being received (status code 32), all receive instructions for the corresponding port will be canceled. This is effective for canceling receive instruction execution when waiting a long time to receive data.

To activate a receive instruction that was canceled, turn off the user communication receive instruction cancel flag, and then turn on the receive instruction input conditions again.

User communication receive instruction cancel flags are allocated as follows to each communication port as a special internal relay.

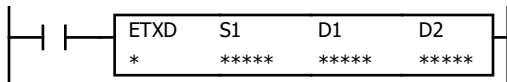
| Device Address | Description | CPU Stopped | Power OFF | R/W |
|----------------|--|-------------|-----------|-----|
| M8022 | User Communication Receive Instruction Cancel Flag (Port 1) | Cleared | Cleared | R/W |
| M8023 | User Communication Receive Instruction Cancel Flag (Port 2) | Cleared | Cleared | R/W |
| M8026 | User Communication Receive Instruction Cancel Flag (Port 3) | Cleared | Cleared | R/W |
| M8033 | User Communication Receive Instruction Cancel Flag (Port 4) ^{*1} | Cleared | Cleared | R/W |
| M8145 | User Communication Receive Instruction Cancel Flag (Port 5) ^{*1} | Cleared | Cleared | R/W |
| M8146 | User Communication Receive Instruction Cancel Flag (Port 6) ^{*1} | Cleared | Cleared | R/W |
| M8147 | User Communication Receive Instruction Cancel Flag (Port 7) ^{*1} | Cleared | Cleared | R/W |
| M8170 | User Communication Receive Instruction Cancel Flag (Port 8) ^{*1} | Cleared | Cleared | R/W |
| M8176 | User Communication Receive Instruction Cancel Flag (Port 9) ^{*1} | Cleared | Cleared | R/W |
| M8365 | User Communication Receive Instruction Cancel Flag (Port 10) ^{*1*2} | Cleared | Cleared | R/W |
| M8366 | User Communication Receive Instruction Cancel Flag (Port 11) ^{*1*2} | Cleared | Cleared | R/W |
| M8367 | User Communication Receive Instruction Cancel Flag (Port 12) ^{*1*2} | Cleared | Cleared | R/W |
| M8370 | User Communication Receive Instruction Cancel Flag (Port 13) ^{*1*2} | Cleared | Cleared | R/W |
| M8371 | User Communication Receive Instruction Cancel Flag (Port 14) ^{*1*2} | Cleared | Cleared | R/W |
| M8372 | User Communication Receive Instruction Cancel Flag (Port 15) ^{*1*2} | Cleared | Cleared | R/W |
| M8373 | User Communication Receive Instruction Cancel Flag (Port 16) ^{*1*2} | Cleared | Cleared | R/W |
| M8374 | User Communication Receive Instruction Cancel Flag (Port 17) ^{*1*2} | Cleared | Cleared | R/W |
| M8375 | User Communication Receive Instruction Cancel Flag (Port 18) ^{*1*2} | Cleared | Cleared | R/W |
| M8376 | User Communication Receive Instruction Cancel Flag (Port 19) ^{*1*2} | Cleared | Cleared | R/W |
| M8377 | User Communication Receive Instruction Cancel Flag (Port 20) ^{*1*2} | Cleared | Cleared | R/W |
| M8380 | User Communication Receive Instruction Cancel Flag (Port 21) ^{*1*2} | Cleared | Cleared | R/W |
| M8381 | User Communication Receive Instruction Cancel Flag (Port 22) ^{*1*2} | Cleared | Cleared | R/W |
| M8382 | User Communication Receive Instruction Cancel Flag (Port 23) ^{*1*2} | Cleared | Cleared | R/W |
| M8383 | User Communication Receive Instruction Cancel Flag (Port 24) ^{*1*2} | Cleared | Cleared | R/W |
| M8384 | User Communication Receive Instruction Cancel Flag (Port 25) ^{*1*2} | Cleared | Cleared | R/W |
| M8385 | User Communication Receive Instruction Cancel Flag (Port 26) ^{*1*2} | Cleared | Cleared | R/W |
| M8386 | User Communication Receive Instruction Cancel Flag (Port 27) ^{*1*2} | Cleared | Cleared | R/W |
| M8387 | User Communication Receive Instruction Cancel Flag (Port 28) ^{*1*2} | Cleared | Cleared | R/W |
| M8390 | User Communication Receive Instruction Cancel Flag (Port 29) ^{*1*2} | Cleared | Cleared | R/W |
| M8391 | User Communication Receive Instruction Cancel Flag (Port 30) ^{*1*2} | Cleared | Cleared | R/W |
| M8392 | User Communication Receive Instruction Cancel Flag (Port 31) ^{*1*2} | Cleared | Cleared | R/W |
| M8393 | User Communication Receive Instruction Cancel Flag (Port 32) ^{*1*2} | Cleared | Cleared | R/W |
| M8394 | User Communication Receive Instruction Cancel Flag (Port 33) ^{*1*2} | Cleared | Cleared | R/W |

*1 When using a communication module.

*2 Plus CPU module only.

Note: "R/W" is the abbreviation for read/write. When R/W, it can be read and written. When R, it can only be read. When W, it can only be written.

ETXD (User Communication Transmit over Ethernet)



The ETXD instruction converts transmission data to the specified data type and sends it to the external device connected over Ethernet port 1 and 2.

When the input is on, the transmission data designated by S1 is transmitted to the device connected with the specified connection.

When transmission is complete, the device designated by D1 is turned on. Transmit status (the transmission status and error code) is stored to the device designated by D2.

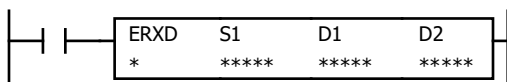
The byte count of transmitted data is stored to D2+1.

Apart from the connection settings, the settings of ETXD and TXD instructions are the same. For details on TXD instruction, see "TXD (Transmit)" on page 5-2.

Note:

- For details on the user communication client and user communication server specifications and for details on user communication over Ethernet, see "User Communication via Ethernet Communication" on page 5-41.
- The ETXD instruction cannot be used in an interrupt program. If used in an interrupt program, a user program execution error will result and error code 18 will be stored in the user program execution error code (D8006). For details about the user program execution errors, see Chapter 3 "User Program Execution Errors" in the "Ladder Programming Manual".

ERXD (User Communication Receive over Ethernet)



The ERXD instruction receives data from an external device connected over Ethernet port 1 and 2, converts the received data in the specified format, and stores the converted data to data registers.

When the input is on, the received data designated by S1 is received from the device connected with the specified connection.

When all data has been received, the device designated by D1 is turned on. Receive status (the receive status and error code) is stored to the device designated by D2.

The byte count of received data is stored to D2+1.

When user communication receive instruction cancel flag (M8200 - M8207 and M8334 - M8343) is turned on while receiving incoming data, the execution of all active receive instructions for the corresponding connection is canceled.

Apart from the connection settings and the allocation of the user communication receive instruction cancel flags, the settings of ERXD and RXD instructions are the same. For details on RXD instruction, see "RXD (Receive)" on page 5-10.

Note:

- For details on the user communication client and user communication server specifications and for details on user communication (UDP), see "User Communication via Ethernet Communication" on page 5-41.
- The ERXD instruction cannot be used in an interrupt program. If used in an interrupt program, a user program execution error will result and error code 18 will be stored in the user program execution error code (D8006). For details about the user program execution errors, see Chapter 3 "User Program Execution Errors" in the "Ladder Programming Manual".

User Communication via Serial Communication

With user communication via serial communication, the FC6A can send and receive data between external devices connected to port 1 to port 33, such as a printer or barcode reader, by using the TXD (user communication transmit) and RXD (user communication receive) instructions.

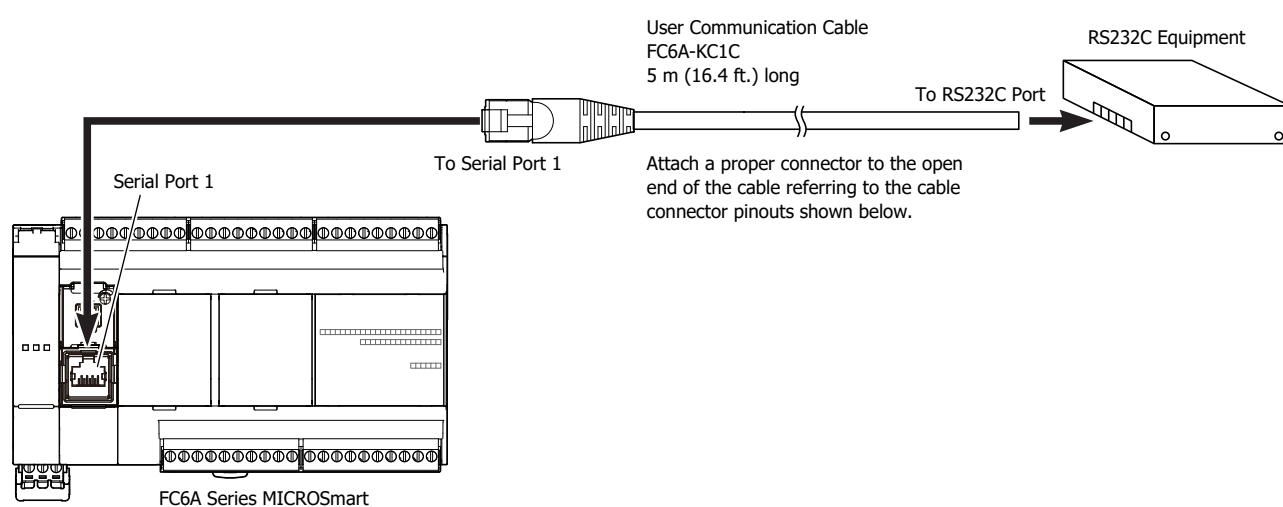
User Communication Overview

By installing a communication cartridge on the FC6A expansion communication port, the FC6A can communicate with two external devices simultaneously.

When using an RS485 communication cartridge, FC6A modules can communicate with a maximum of 31 RS485 devices using the user communication.

User communication transmit and receive instructions can be programmed to match the communication protocol of the equipment to communicate with. Possibility of communication using the user communication mode can be determined referring to the user communication mode specifications described below.

An RS232C equipment is connected to port 1 of the FC6A.



User Communication Mode Specifications

| Type | RS232C User Communication | | RS485 User Communication |
|------------------------------|---|--|--|
| Communication Port | Port 1 to port 33 | | Port 1 to port 33 |
| Maximum Nodes | 1 per port | | 31 maximum |
| Standards | EIA RS232C | | EIA RS485 |
| Baud Rate | 1,200, 2,400, 4,800, 9,600, 19,200, 38,400, 57,600, 115,200 bps (Default: 115,200) | | |
| Data Bits | 7 or 8 bits (Default: 7) | | |
| Parity | Odd, Even, None (Default: Even) | | |
| Stop Bits | 1 or 2 bits (Default: 1) | | |
| Receive Timeout | 10 to 2,540 ms (10 ms increments) or none (Receive timeout is disabled when 2,550 ms is selected.) The receive timeout has an effect when using RXD instructions. | | |
| Communication Method | Start-stop synchronization system | | |
| Maximum Cable Length | FC6A-PC1: 5 m FC6A-SIF52: 15 m | | FC6A-PC3: 200 m FC6A-SIF52: 1,200 m |
| Maximum Transmit Data | 1,500 bytes | | |
| Maximum Receive Data | 1,500 bytes | | |
| BCC Calculation | XOR, ADD, ADD-2comp *, Modbus ASCII *, Modbus RTU * (* For calculation examples, see "BCC Calculation Examples" on page 5-59.) | | |

5: USER COMMUNICATION INSTRUCTIONS

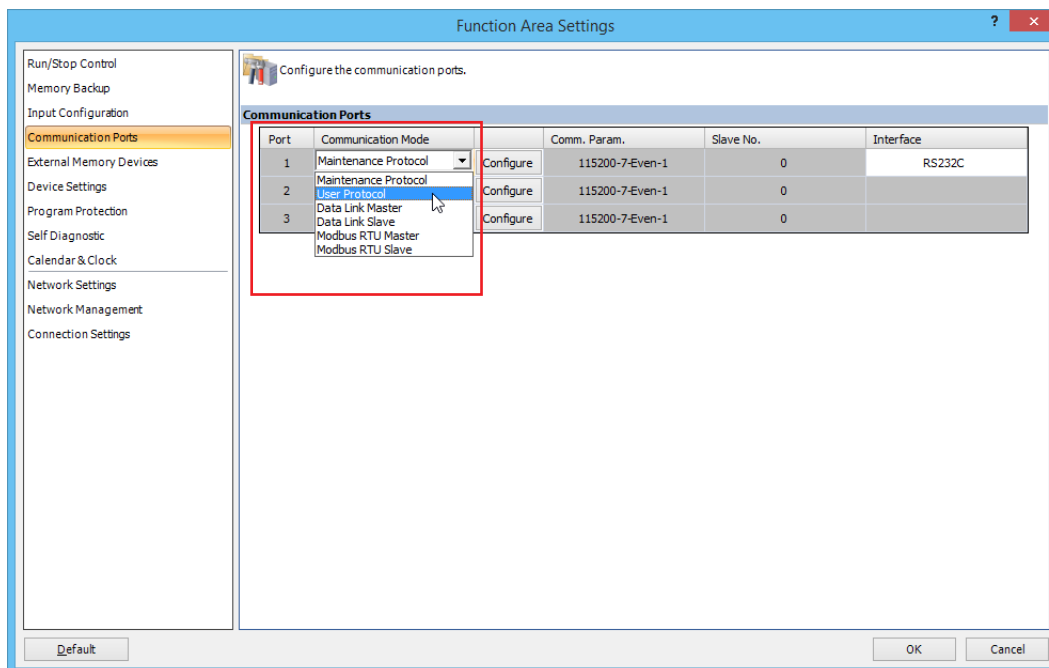
Programming WindLDR

When using the user communication function to communicate with an external RS232C or RS485 device, set the communication parameters for the FC6A to match those of the external device.

Note: Since communication parameters in the Function Area Settings relate to the user program, the user program must be downloaded to the FC6A after changing any of these settings.

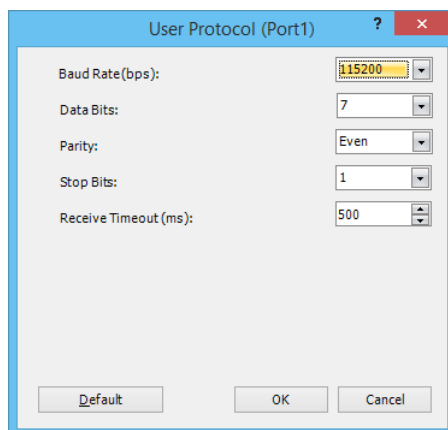
1. From the WindLDR menu bar, select **Configuration > Communication Ports**.

The **Function Area Settings** dialog box for Communication Ports appears.



2. In the Communication Mode pull-down list for **Port 1** to **Port 3**, select **User Protocol**. (Click the **Configure** button when changing previous settings.)

The **User Protocol** dialog box appears.



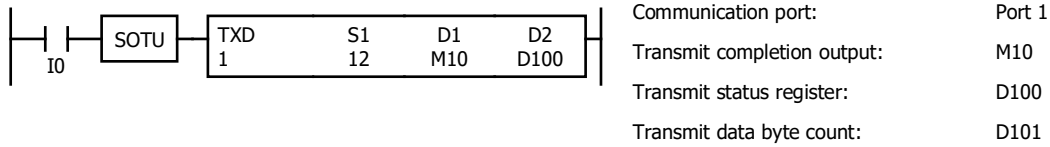
When **2550 ms** is selected in the **Receive Timeout** box, the receive timeout function is disabled.

3. Select communication parameters to the same values for the device to communicate with.
4. Click the **OK** button.

Programming TXD Instruction Using WindLDR

The following example demonstrates how to program a TXD instruction including a start delimiter, BCC, and end delimiter using WindLDR.

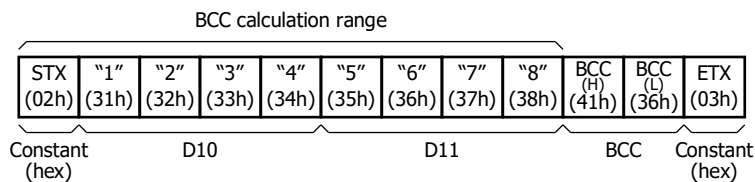
TXD sample program:



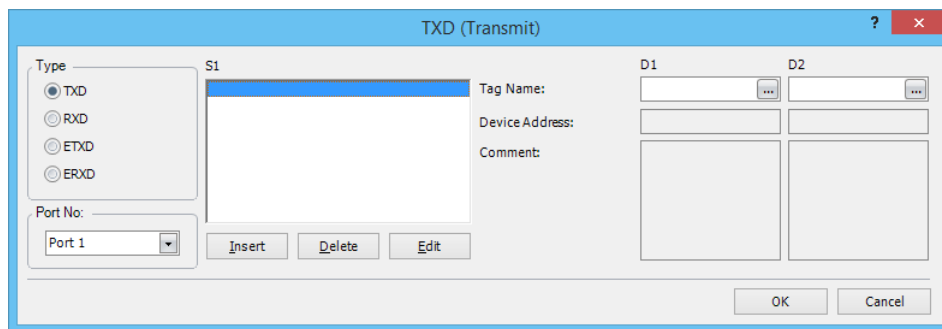
Data register contents:

D10 04D2h = 1234
D11 162Eh = 5678

Transmit data example:

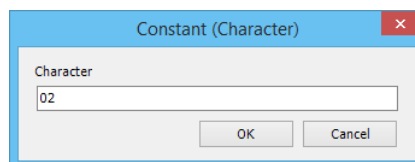
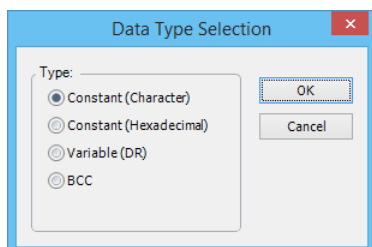


1. Start to program a TXD instruction. Move the cursor where you want to insert the TXD instruction, and type **TXD**. You can also insert the TXD instruction by clicking the User Communication icon in the menu bar and clicking where you want to insert the TXD instruction in the program edit area.
The **TXD (Transmit)** dialog box appears.

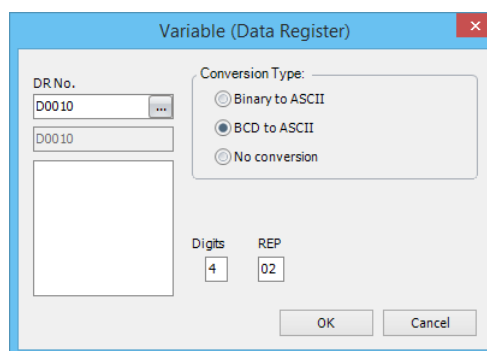
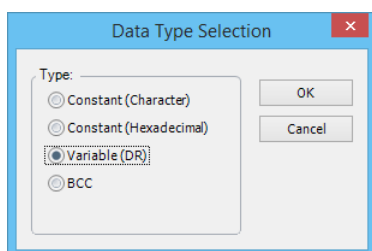


5: USER COMMUNICATION INSTRUCTIONS

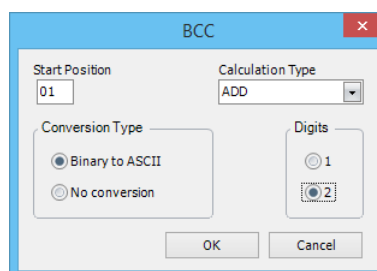
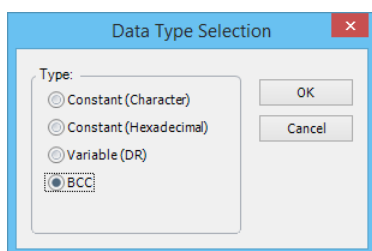
2. Check that **TXD** is selected in the **Type** box and select **Port 1** in the **Port No.** box. Then, click **Insert**. The **Data Type Selection** dialog box appears. You will program source device S1 using this dialog box.
3. Click **Constant (Hexadecimal)** in the **Type** box and click **OK**. Next, in the **Constant (Hexadecimal)** dialog box, type **02** to program the start delimiter STX (02h). When finished, click **OK**.



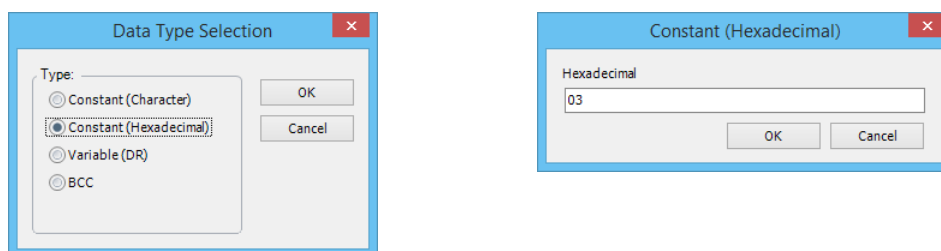
4. Since the **TXD (Transmit)** dialog box reappears, repeat the above procedure. In the **Data Type Selection** dialog box, click **Variable (DR)** and click **OK**. Next, in the **Variable (Data Register)** dialog box, type **D0010** in the **DR No.** box and click **BCD to ASCII** to select the BCD to ASCII conversion. Enter **4** in the **Digits** box (4 digits) and **2** in the **REP** box (2 repeat cycles). When finished, click **OK**.



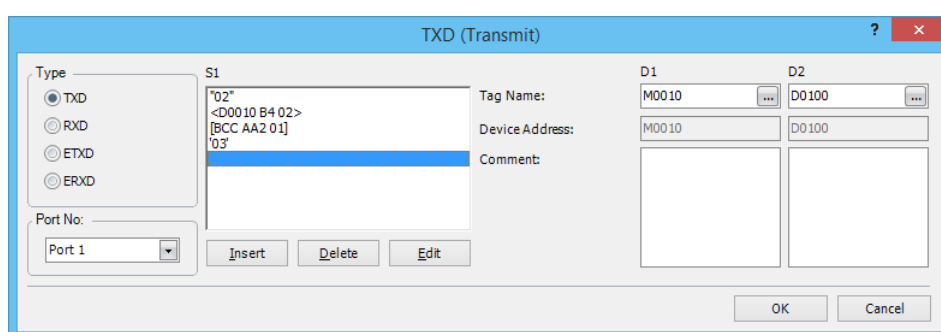
5. Again in the **Data Type Selection** dialog box, click **BCC** and click **OK**. Next, in the **BCC** dialog box, enter **1** in the **Calculation Start Position** box, select **ADD** for the **Calculate Type**, click **Binary to ASCII** for the **Conversion Type**, and click **2** for the **Digits**. When finished, click **OK**.



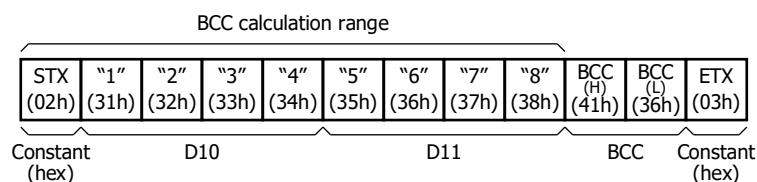
6. Once again in the **Data Type Selection** dialog box, click **Constant (Hexadecimal)** and click **OK**. Next, in the Constant (Hexadecimal) dialog box, type **03** to program the end delimiter ETX (03h). When finished, click **OK**.



7. In the **TXD (Transmit)** dialog box, type **M0010** in the destination D1 box and type **D0100** in the destination D2 box. When finished, click **OK**.



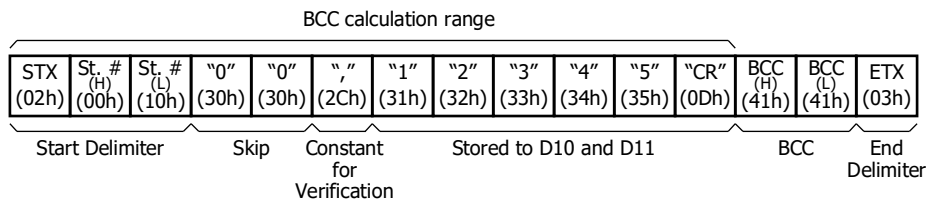
Programming of the TXD1 instruction is complete and the transmit data is specified as follows:



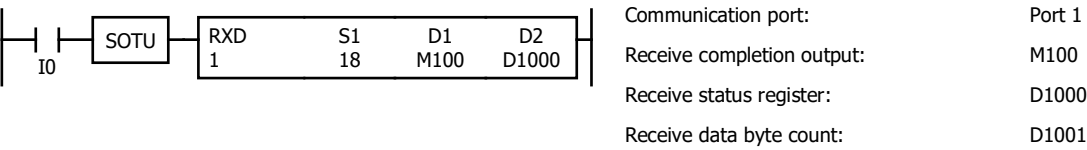
Programming RXD Instruction Using WindLDR

The following example demonstrates how to program an RXD instruction including a start delimiter, skip, constant for verification, BCC, and end delimiter using WindLDR. Converted data is stored to data registers D10 and D11. Internal relay M100 is used as destination D1 for the receive completion output. Data register D1000 is used as destination D2 for the receive status, and data register D1001 is used to store the receive data byte count.

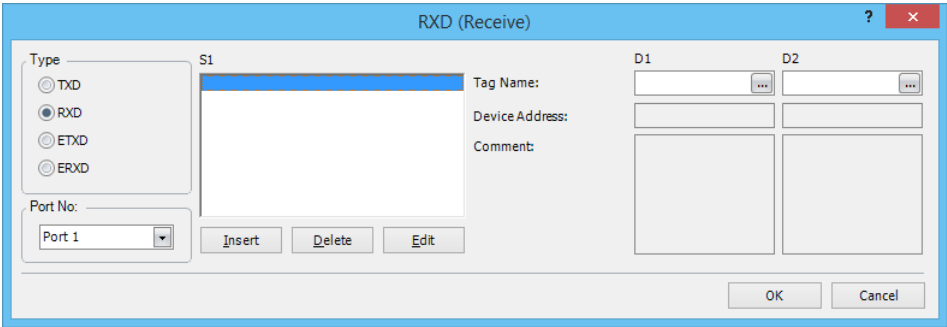
Receive data example:



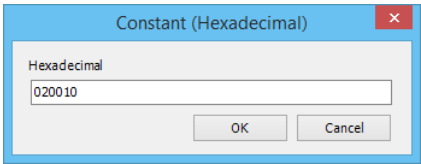
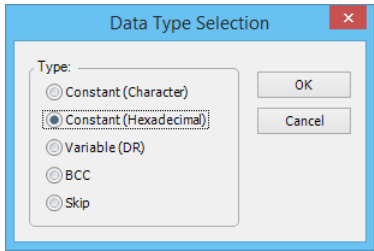
RXD sample program:



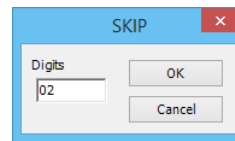
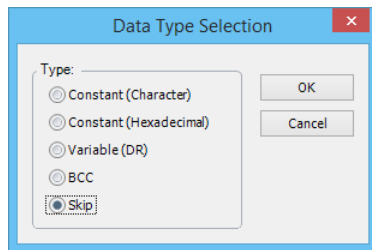
1. Start to program an RXD instruction. Move the cursor where you want to insert the RXD instruction, and type **RXD**. You can also insert the RXD instruction by clicking the User Communication icon in the menu bar and clicking where you want to insert the RXD instruction in the program edit area, then the Transmit dialog box appears. Click **RXD** to change the dialog box to the Receive dialog box.
- The **RXD (Receive)** dialog box appears.



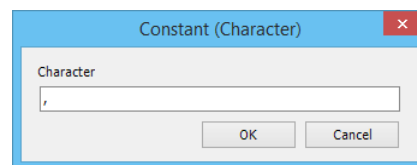
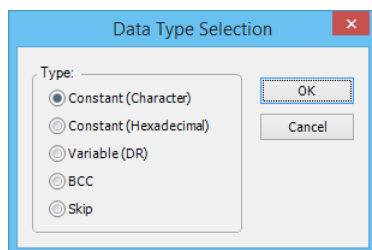
2. Check that **RXD** is selected in the Type box and select **Port 1** in the Port box. Then, click **Insert**. The **Data Type Selection** dialog box appears. You will program source device S1 using this dialog box.
3. Click **Constant (Hexadecimal)** in the Type box and click **OK**. Next, in the **Constant (Hexadecimal)** dialog box, type **020010** to program the start delimiter STX (02h), Station No. H (00h), and Station No. L (10h). When finished, click **OK**.



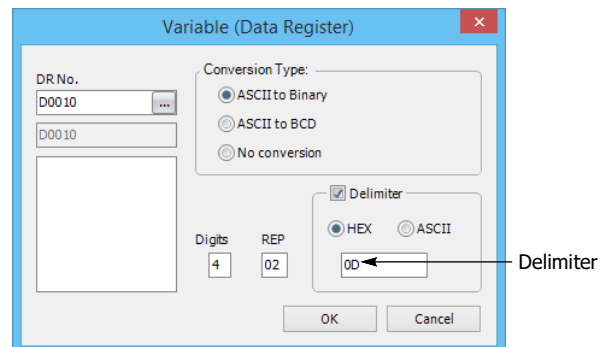
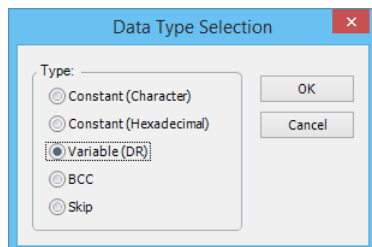
4. Since the **RXD (Receive)** dialog box reappears, repeat the above procedure. In the **Data Type Selection** dialog box, click **Skip** and click **OK**. Next, in the **Skip** dialog box, type **02** in the **Digits** box and click **OK**.



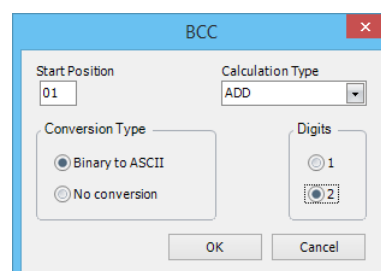
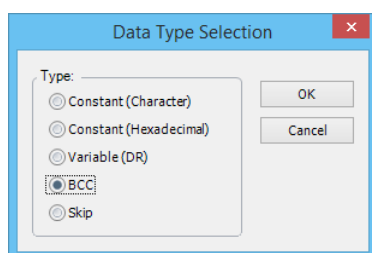
5. Again in the **Data Type Selection** dialog box, click **Constant (Character)** and click **OK**. Next, in the **Constant (Character)** dialog box, type **, (2Ch)** in the **Character** box to program a comma as a constant to verify. When finished, click **OK**.



6. Again in the **Data Type Selection** dialog box, click **Variable (DR)** and click **OK**. Next, in the **Variable (Data Register)** dialog box, type **D10** in the **DR No.** box and click **ASCII to Binary** to select ASCII to binary conversion. Enter **4** in the **Digits** box (4 digits) and **2** in the **REP** box (2 repeat cycles). Click **Variable**, select **HEX**, and type **0D** to designate a delimiter. When finished, click **OK**.

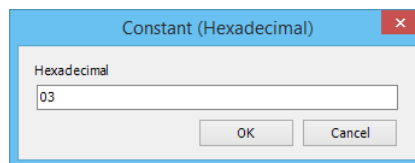
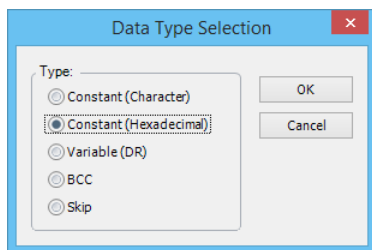


7. Again in the **Data Type Selection** dialog box, click **BCC** and click **OK**. Next, in the **BCC** dialog box, enter **01** in the **Calculation Start Position** box, select **ADD** for the **Calculation Type**, click **Binary to ASCII** for the **Conversion Type**, and click **2** for the **Digits**. When finished, click **OK**.

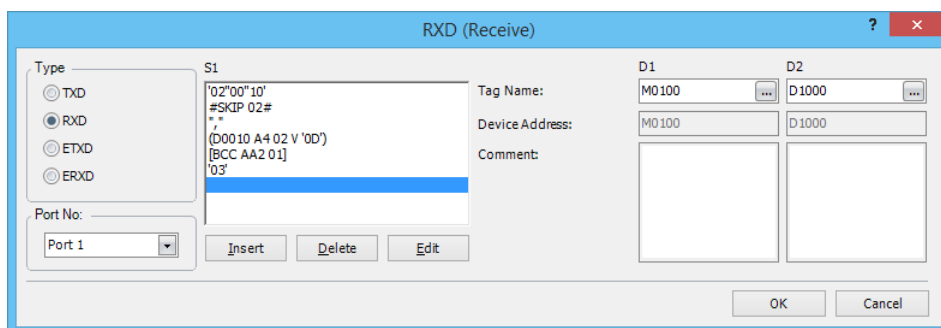


5: USER COMMUNICATION INSTRUCTIONS

8. Once again in the **Data Type Selection** dialog box, click **Constant (Hexadecimal)** and click **OK**. Next, in the **Constant (Hexadecimal)** dialog box, type **03** to program the end delimiter ETX (03h). When finished, click **OK**.



9. In the **RXD (Receive)** dialog box, type **M0100** in the destination **D1** box and type **D1000** in the destination **D2** box. When finished, click **OK**.



Programming of the RXD instruction is complete and the receive data will be stored as follows:

| | | | |
|-------|---|-------|--------|
| D10 | <table border="1"><tr><td>1234h</td></tr></table> | 1234h | = 4660 |
| 1234h | | | |
| D11 | <table border="1"><tr><td>0005h</td></tr></table> | 0005h | = 5 |
| 0005h | | | |

RS232C Line Control Signals

While the FC6A is in user communication mode, special data registers can be used to enable or disable DSR and DTR control signal options for port 1 through port 33.

Line control signals cannot be used with RS485 communication.

The RS-232C communication cartridge (FC6A-PC1) RS signal is an always on output signal.

In the maintenance communication mode, DSR has no effect and DTR remains on.

Special Data Registers for RS232C Line Control Signals

Special data registers D8104 through D8734 are allocated for RS232C line control signals.

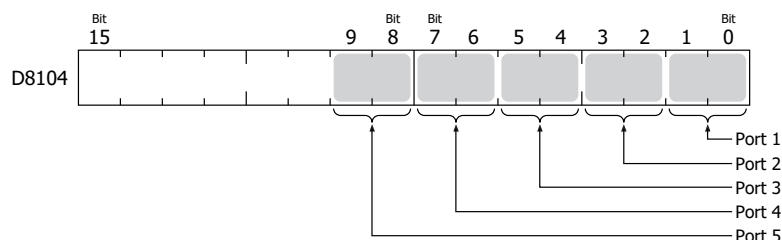
| DR No. | Data Register Function | Data Register Value Updated | R/W |
|--------|---|-----------------------------|-----|
| D8104 | Control signal status (port 1 to port 5) | Every scan | R |
| D8105 | DSR input control signal option (port 1 to port 5) | Every scan | R/W |
| D8106 | DTR output control signal option (port 1 to port 5) | Every scan | R/W |
| D8204 | Control signal status (port 6 to port 9) | Every scan | R |
| D8205 | DSR input control signal option (port 6 to port 9) | Every scan | R/W |
| D8206 | DTR output control signal option (port 6 to port 9) | Every scan | R/W |
| D8717 | Control signal status (port 10 to port 13) | Every scan | R |
| D8718 | DSR input control signal option (port 10 to port 13) | Every scan | R/W |
| D8719 | DTR output control signal option (port 10 to port 13) | Every scan | R/W |
| D8720 | Control signal status (port 14 to port 17) | Every scan | R |
| D8721 | DSR input control signal option (port 14 to port 17) | Every scan | R/W |
| D8722 | DTR output control signal option (port 14 to port 17) | Every scan | R/W |
| D8723 | Control signal status (port 18 to port 21) | Every scan | R |
| D8724 | DSR input control signal option (port 18 to port 21) | Every scan | R/W |
| D8725 | DTR output control signal option (port 18 to port 21) | Every scan | R/W |
| D8726 | Control signal status (port 22 to port 25) | Every scan | R |
| D8727 | DSR input control signal option (port 22 to port 25) | Every scan | R/W |
| D8728 | DTR output control signal option (port 22 to port 25) | Every scan | R/W |
| D8729 | Control signal status (port 26 to port 29) | Every scan | R |
| D8730 | DSR input control signal option (port 26 to port 29) | Every scan | R/W |
| D8731 | DTR output control signal option (port 26 to port 29) | Every scan | R/W |
| D8732 | Control signal status (port 30 to port 33) | Every scan | R |
| D8733 | DSR input control signal option (port 30 to port 33) | Every scan | R/W |
| D8734 | DTR output control signal option (port 30 to port 33) | Every scan | R/W |

Control Signal Status

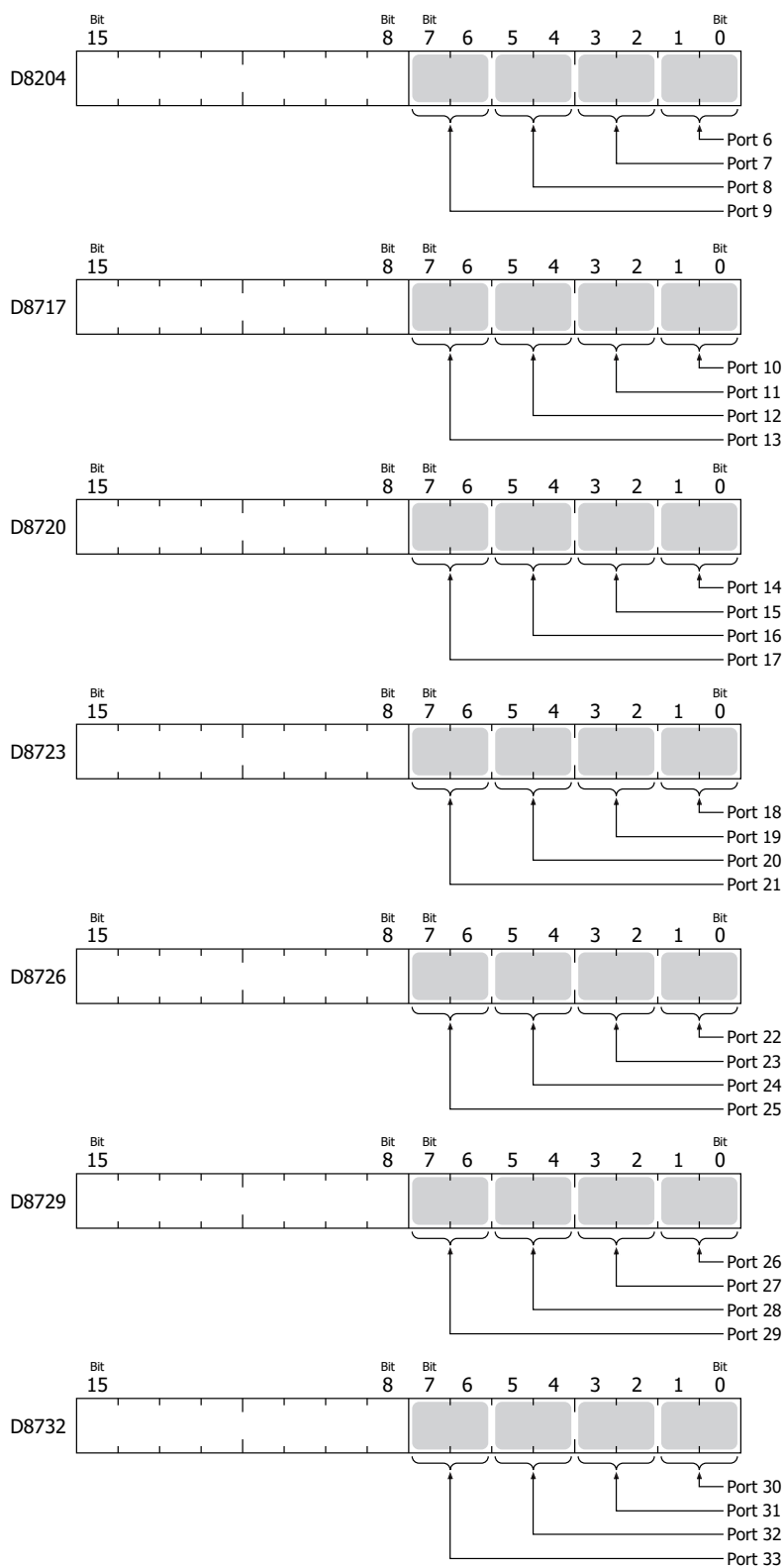
The signal statuses of the control signals (DSR and DTR) are stored in D8104, D8204, D8717, D8720, D8723, D8726, D8729, and D8732.

The statuses of the DSR and DTR signals are stored in the above devices that correspond to the communication port. The values in the devices are updated in END processing when stopped and while running.

The allocation of communication ports in the device (bit assignment) is as follows.



5: USER COMMUNICATION INSTRUCTIONS



| 2-bit Binary Value | DTR | DSR | Description |
|--------------------|-----|-----|--------------------------|
| 00 | OFF | OFF | Both DSR and DTR are off |
| 01 | OFF | ON | DSR is on |
| 10 | ON | OFF | DTR is on |
| 11 | ON | ON | Both DSR and DTR are on |

DSR Control Signal Status in RUN and STOP Modes

| Communication Mode | 3-bit Binary Value | DSR (Input) Status | |
|-------------------------|--------------------|--|------------------------------|
| | | RUN Mode | STOP Mode |
| User Communication Mode | 000 (default) | No effect | No effect (TXD/RXD disabled) |
| | 001 | ON: Enable TXD/RXD OFF: Disable TXD/RXD | No effect (TXD/RXD disabled) |
| | 010 | ON: Disable TXD/RXD OFF: Enable TXD/RXD | No effect (TXD/RXD disabled) |
| | 011 | ON: Enable TXD OFF: Disable TXD | No effect (TXD/RXD disabled) |
| | 100 | ON: Disable TXD OFF: Enable TXD | No effect (TXD/RXD disabled) |
| | ≥ 101 | No effect | No effect (TXD/RXD disabled) |
| Maintenance Mode | — | No effect | No effect |

DTR Control Signal Status in RUN and STOP Modes

| Communication Mode | 2-bit Binary Value | DTR (Output) Status | |
|-------------------------|--------------------|--------------------------------------|-----------|
| | | RUN Mode | STOP Mode |
| User Communication Mode | 00 (default) | ON | OFF |
| | 01 | OFF | OFF |
| | 10 | RXD enabled: ON RXD disabled: OFF | OFF |
| | 11 | ON | OFF |
| Maintenance Mode | — | ON | ON |

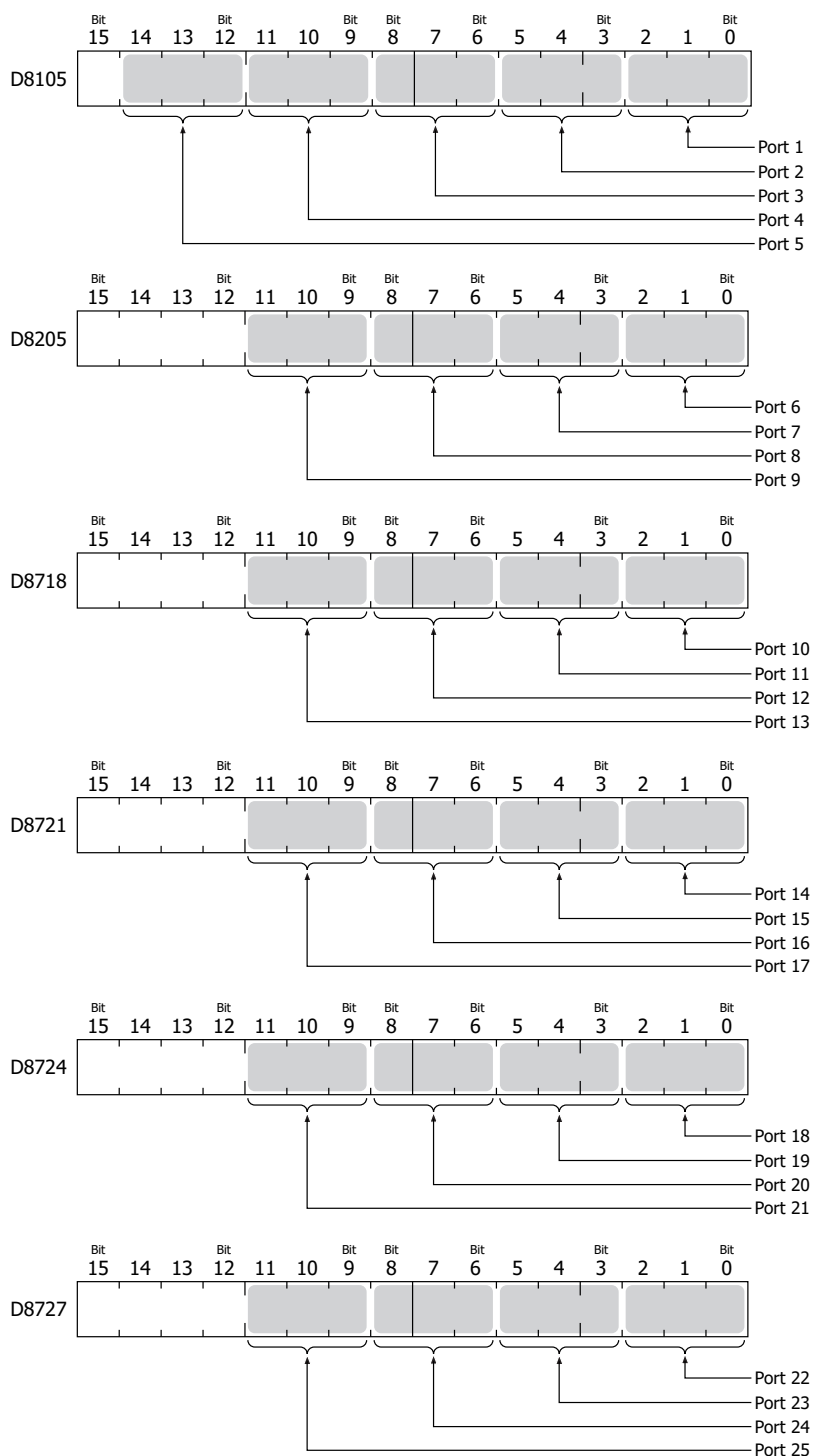
DSR Input Control Signal Option

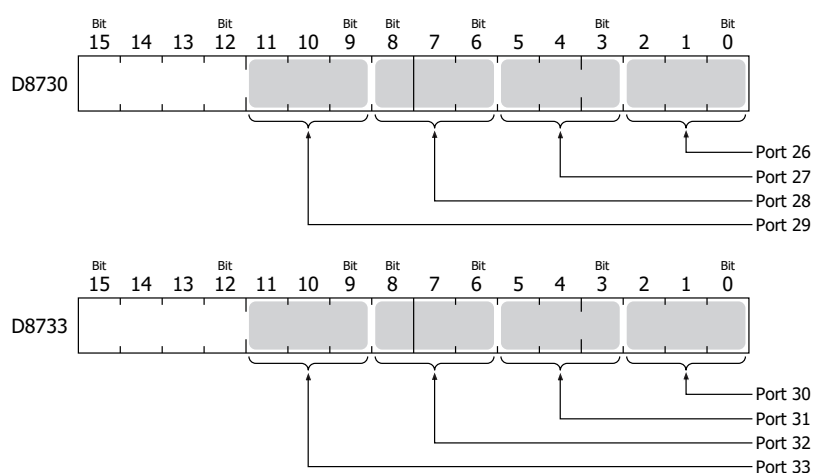
The external device uses the DSR signal to indicate that it is ready to receive data or to tell the FC6A its status, such as if it is transmitting valid data.

The FC6A determines whether or not to transmit and receive data depending on the status of the DSR signal of the external device.

The DSR signal can be controlled by setting values in D8105, D8205, D8718, D8721, D8724, D8727, D8730, and D8733. These registers are only valid during user communication.

The allocation of communication ports in the devices (bit assignment) is as follows.





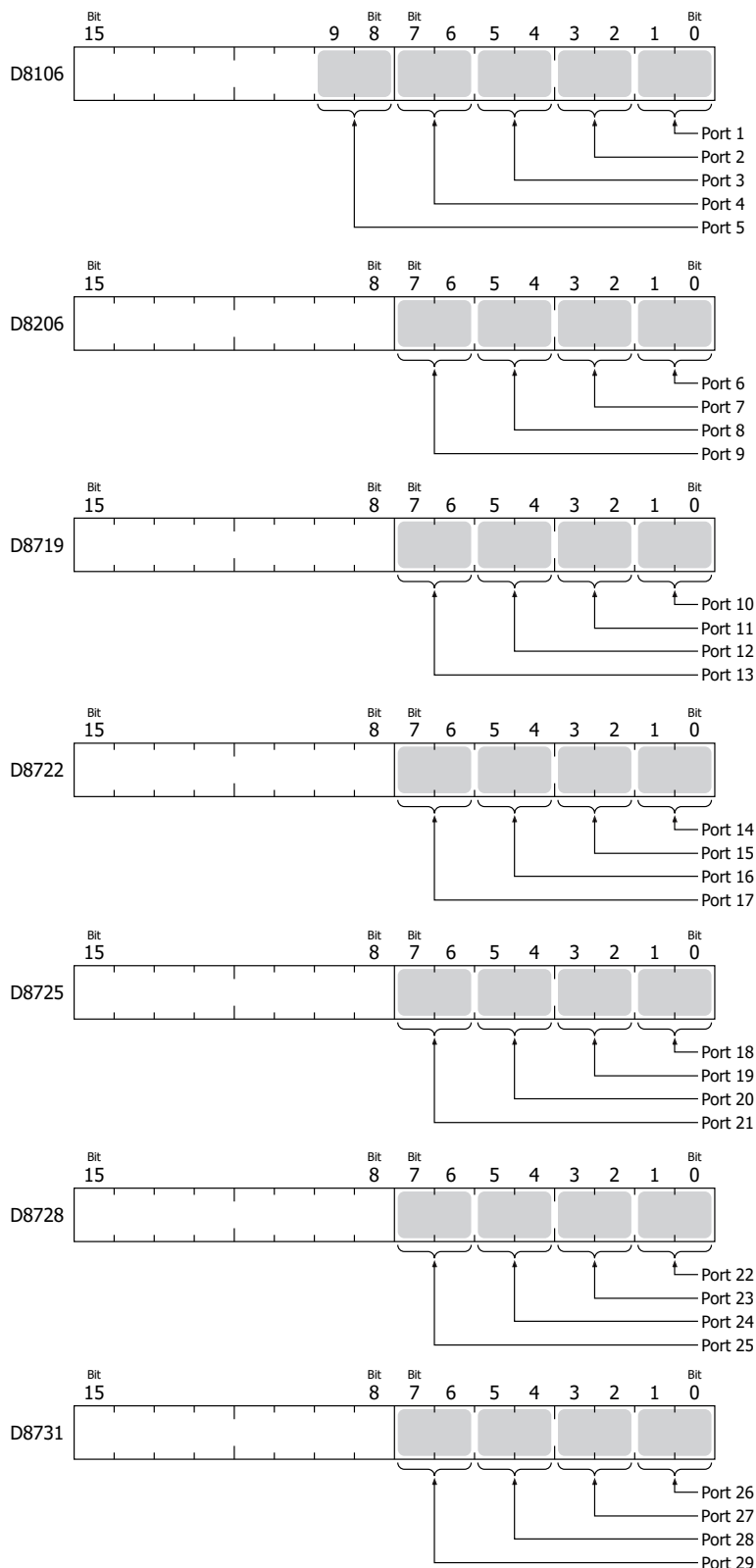
| 3-bit Binary Value | Description |
|--------------------|---|
| 000 | DSR is not used for data flow control. Use this status if DSR signal control is not required. |
| 001 | When DSR is on, the FC6A can transmit and receive data. <div> <div>DSR signal</div> <div>ON OFF</div> <div>Transmit/receive</div> <div>Impossible Possible Impossible</div> </div> |
| 010 | When DSR is off, the FC6A can transmit and receive data. <div> <div>DSR signal</div> <div>ON OFF</div> <div>Transmit/receive</div> <div>Impossible Possible Impossible</div> </div> |
| 011 | When DSR is on, the FC6A can transmit data. This function is usually called "Busy Control" and is used for controlling transmission to a remote terminal with a slow processing speed, such as a printer. When the remote terminal is busy, data input to the remote terminal is restricted. <div> <div>DSR signal</div> <div>ON OFF</div> <div>Transmit</div> <div>Impossible Possible Impossible</div> </div> |
| 100 | When DSR is off, the FC6A can transmit data. <div> <div>DSR signal</div> <div>ON OFF</div> <div>Transmit</div> <div>Impossible Possible Impossible</div> </div> |
| ≥ 101 | The operation is the same as the setting "000". DSR is not used for data flow control. |

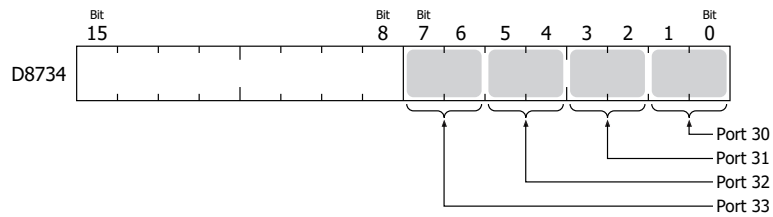
DTR Output Control Signal Option

The FC6A tells the external device of its control status and transmit/receive status using the DTR signal.

The DTR signal can be controlled by setting values in D8106, D8206, D8719, D8722, D8725, D8728, D8731, and D8734. These registers are only valid during user communication.

The allocation of communication ports in the devices (bit assignment) is as follows.





| 2-bit Binary Value | Description | | | | | | | | | | | | |
|--------------------|--|----------|------------|----------|------------|------------|----|----|-----|--|-----|-----|-----|
| 00 | <p>While the FC6A is running, DTR is on whether the FC6A is transmitting or receiving data. While the FC6A is stopped, DTR remains off. Use this option to indicate the FC6A operating status.</p> <table><tr><td>FC6A</td><td>Stopped</td><td>Running</td><td>Stopped</td></tr><tr><td>DTR signal</td><td>ON</td><td>ON</td><td>OFF</td></tr><tr><td></td><td>OFF</td><td>OFF</td><td>OFF</td></tr></table> | FC6A | Stopped | Running | Stopped | DTR signal | ON | ON | OFF | | OFF | OFF | OFF |
| FC6A | Stopped | Running | Stopped | | | | | | | | | | |
| DTR signal | ON | ON | OFF | | | | | | | | | | |
| | OFF | OFF | OFF | | | | | | | | | | |
| 01 | <p>Whether the FC6A is running or stopped, DTR remains off.</p> <table><tr><td>FC6A</td><td>Stopped</td><td>Running</td><td>Stopped</td></tr><tr><td>DTR signal</td><td>ON</td><td>ON</td><td>ON</td></tr><tr><td></td><td>OFF</td><td>OFF</td><td>OFF</td></tr></table> | FC6A | Stopped | Running | Stopped | DTR signal | ON | ON | ON | | OFF | OFF | OFF |
| FC6A | Stopped | Running | Stopped | | | | | | | | | | |
| DTR signal | ON | ON | ON | | | | | | | | | | |
| | OFF | OFF | OFF | | | | | | | | | | |
| 10 | <p>While the FC6A can receive data, DTR is turned on. While the FC6A can not receive data, DTR remains off. Use this option when flow control of receive data is required.</p> <table><tr><td>Receive</td><td>Impossible</td><td>Possible</td><td>Impossible</td></tr><tr><td>DTR signal</td><td>ON</td><td>ON</td><td>OFF</td></tr><tr><td></td><td>OFF</td><td>OFF</td><td>OFF</td></tr></table> | Receive | Impossible | Possible | Impossible | DTR signal | ON | ON | OFF | | OFF | OFF | OFF |
| Receive | Impossible | Possible | Impossible | | | | | | | | | | |
| DTR signal | ON | ON | OFF | | | | | | | | | | |
| | OFF | OFF | OFF | | | | | | | | | | |
| 11 | The operation is the same as the setting "00". | | | | | | | | | | | | |

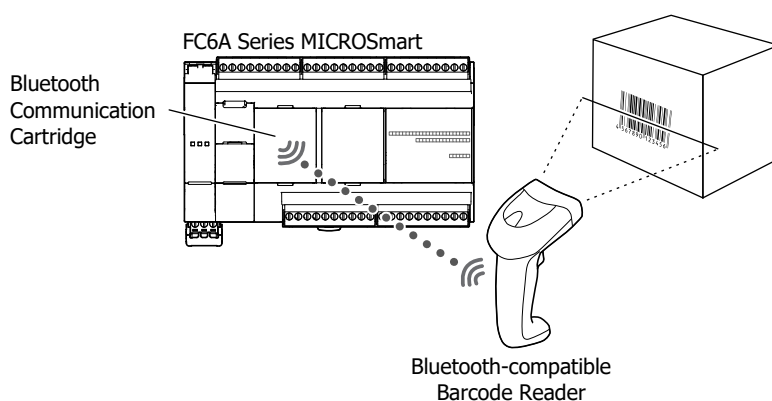
User Communication via Serial Communication (Bluetooth)

Connect a Bluetooth communication cartridge to the cartridge slot of the All-in-One CPU module/CAN J1939 All-in-One CPU module, the cartridge slot of a cartridge base module connected to the Plus CPU module, or the cartridge slot of the HMI module to use user communication over Bluetooth communication.

With user communication over Bluetooth communication, the FC6A can send and receive data between external devices connected over Bluetooth, such as barcode reader, using the TXD (user communication transmit) and RXD (user communication receive) instructions.

Example of Receiving Data Read with a Barcode Reader

Connect the Bluetooth communication cartridge to cartridge slot 1 of the FC6A and communicate with the barcode reader.



For details on communication specifications and WindLDR settings, see "Bluetooth Communication" on page 9-1.

User Communication via Ethernet Communication

This section describes the Ethernet user communication. Ethernet user communication works on TCP/UDP protocol. The FC6A can be used as a user communication client/server. With Ethernet user communication instructions (ETXD and ERXD instructions), the FC6A can exchange the data with devices on the network.

Except for the port number and the allocation of the user communication receive instruction cancel flags, Ethernet user communication instructions (ETXD and ERXD instructions) are identical to TXD and RXD instructions. For details about TXD and RXD instructions, see "TXD (Transmit)" on page 5-2 and "RXD (Receive)" on page 5-10.

Ethernet User Communication Overview

The FC6A can be used as an Ethernet user communication (TCP) client/server. The Plus CPU module can also be used for user communication (UDP). It can be used simultaneously with the maintenance communication server, Modbus TCP server, and Modbus TCP client.

When using the FC6A user communication client, the FC6A can access and communicate with the server devices using the protocol of the server device. A maximum of eight connections for the All-in-One CPU module/CAN J1939 All-in-One CPU module and 16 connections for the Plus CPU module can be allocated to each type of communication.

User communication client functions and configuration are described in "To use the FC6A as a user communication client" on page 5-42. User communication server functions and configuration are described in "User Communication Server" on page 5-48.

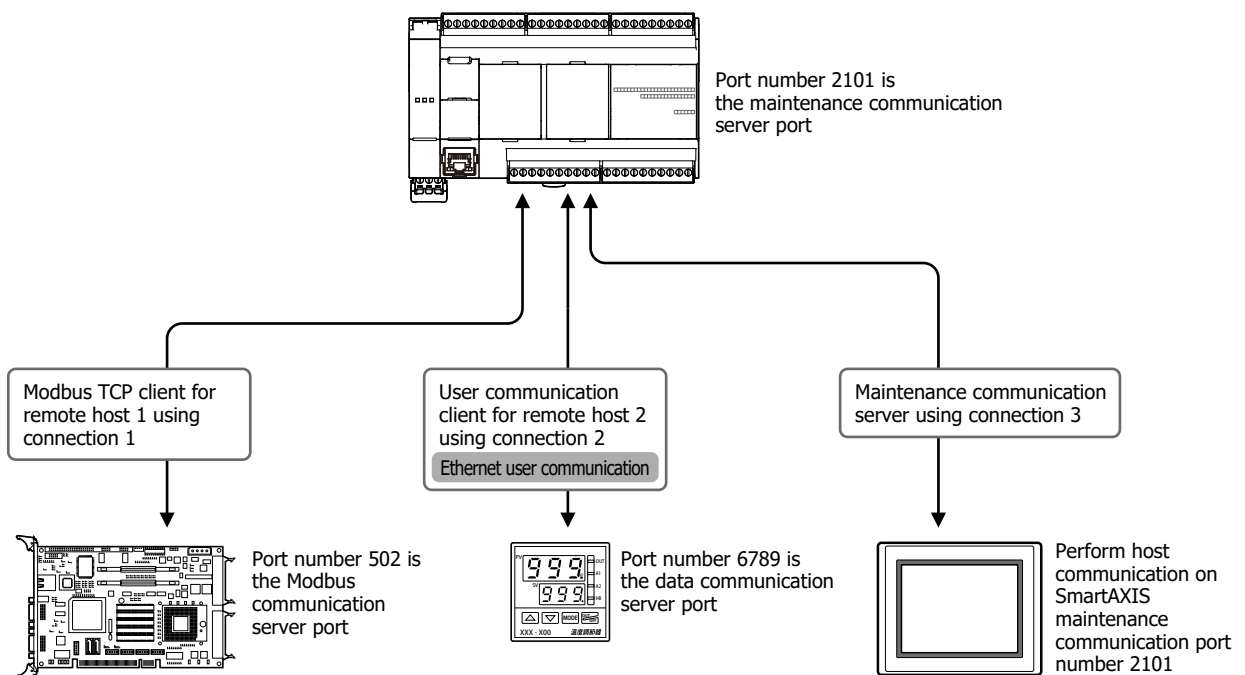
The FC6A supports the TCP/UDP protocol.

The FC6A can send data to and receive data from devices on a network by using the ETXD (User Communication Transmit over Ethernet) instruction and the ERXD (User Communication Receive over Ethernet) instruction.

The FC6A can be used as both an Ethernet user communication client and server.

Each of the eight connections possessed by the FC6A can be allocated to different types of communication. Ethernet user communication can simultaneously use the maintenance communication server, Modbus TCP server, and Modbus TCP client.

Ethernet communication example using three connections



FC6A function area settings connection settings

| Connection | Communication Protocol | Other Settings |
|------------|----------------------------------|----------------------------|
| 1 | Modbus TCP client | Destination: Remote host 1 |
| 2 | User communication client | Destination: Remote host 2 |
| 3 | Maintenance communication server | Port number: 2101 |

Remote host table

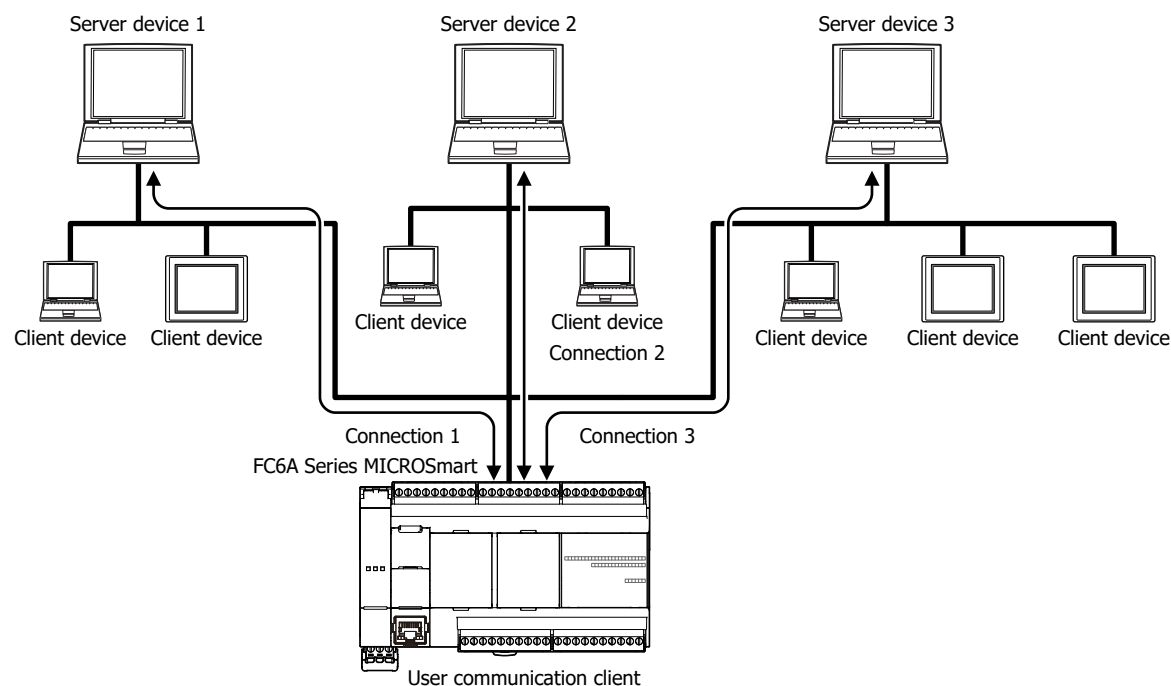
| Remote Host Number | IP Address | Port Number |
|--------------------|--------------|-------------|
| 1 | 192.168.0.12 | 502 |
| 2 | 192.168.0.13 | 6789 |

To use the FC6A as a user communication client

Connect the FC6A to the server device via the network and communicate with the server device using the Ethernet user communication instructions.

A maximum of eight connections for the All-in-One CPU module/CAN J1939 All-in-One CPU module and 16 connections for the Plus CPU module can be allocated to user communication clients, which allows the FC6A to simultaneously connect to and communicate with different server devices.

When three connections are allocated to user communication client

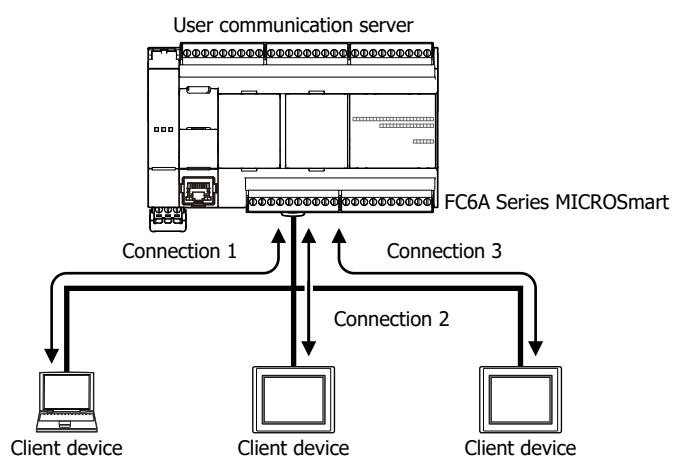


To use the FC6A as a user communication server

The client devices connect to the FC6A and the FC6A communicates with the client devices using Ethernet user communication instructions.

A maximum of eight connections for the All-in-One CPU module/CAN J1939 All-in-One CPU module and 16 connections for the Plus CPU module can be allocated to user communication servers, which enables FC6A to simultaneously connect to and communicate with a maximum of eight different client devices or a maximum of 16 different client devices, respectively.

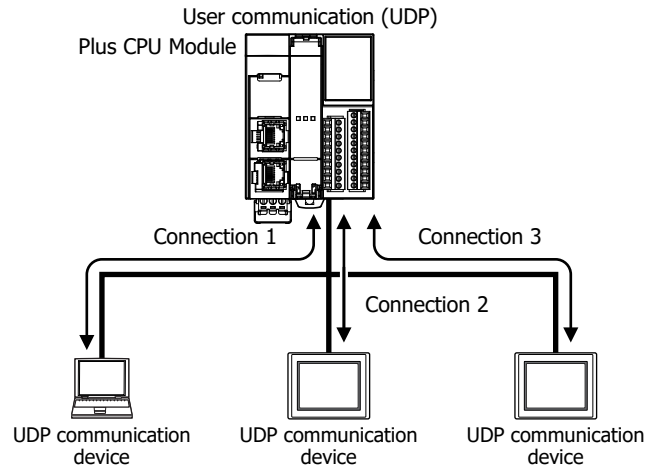
When three connections are allocated to user communication server



To use the FC6A for user communication (UDP)

The Plus CPU module can be connected to a UDP communication device and communicate with that device using the Ethernet user communication instructions.

The Plus CPU module can simultaneously connect to and communicate with a maximum of 16 UDP communication devices by allocating a maximum of 16 connections to user communication (UDP).

When three connections are allocated to user communication (UDP)

5: USER COMMUNICATION INSTRUCTIONS

User Communication Client

When a client connection is configured as the user communication client, the FC6A communicates with the specified server device according to the settings configured in the ETXD and ERXD instructions that are programmed for the client connection. The remote host number and other communication settings can be configured in the Connection Settings tab in the Function Area Settings dialog box.

Specifications (User Communication Client)

| Item | User Communication Client |
|---|---|
| Remote Host Number | 1 to 255 Switch the remote host number with the special data registers (D8268 to D8275 and D8774 to D8781). |
| Establish Connection | <ul style="list-style-type: none">When ETXD/ERXD Instructions are executedWhen the FC6A starts to run^{*1} |
| Disconnect Connection | <ul style="list-style-type: none">When the FC6A is stoppedWhen special internal relays (M8222 to M8231 and M8355 to M8364) are turned on |
| Number of Remote Hosts that the FC6A Can Communicate Simultaneously | One remote host per a user communication client ^{*2} |
| Receive Timeout Time | 100 to 25,500 ms (100 ms increments) ^{*3} |

^{*1} Can be enabled or disabled in **Function Area Settings, Connection Settings**.

^{*2} A maximum of eight connections for the All-in-One CPU module/CAN J1939 All-in-One CPU module and 16 connections for the Plus CPU module can be allocated to user communication clients, which enables FC6A to simultaneously communicate with a maximum of eight server devices or a maximum of 16 server devices, respectively.

^{*3} Numeric values not in parentheses are the default settings.

Switching Remote Host Numbers

When user communication clients have been configured, the communication devices can be changed by using the special data registers (D8268 to D8275 and D8774 to D8781). Specify the remote host number of the communication devices to change to with the special data registers. If a value other than 1 to 255 is specified, the remote host number set in the Function Area Settings will be used.

| Special Data Register | Description |
|-----------------------|--|
| D8268 | Remote Host Number of Connection 1 (1 to 255) |
| D8269 | Remote Host Number of Connection 2 (1 to 255) |
| D8270 | Remote Host Number of Connection 3 (1 to 255) |
| D8271 | Remote Host Number of Connection 4 (1 to 255) |
| D8272 | Remote Host Number of Connection 5 (1 to 255) |
| D8273 | Remote Host Number of Connection 6 (1 to 255) |
| D8274 | Remote Host Number of Connection 7 (1 to 255) |
| D8275 | Remote Host Number of Connection 8 (1 to 255) |
| D8774 ^{*1} | Remote Host Number of Connection 9 (1 to 255) |
| D8775 ^{*1} | Remote Host Number of Connection 10 (1 to 255) |
| D8776 ^{*1} | Remote Host Number of Connection 11 (1 to 255) |
| D8777 ^{*1} | Remote Host Number of Connection 12 (1 to 255) |
| D8778 ^{*1} | Remote Host Number of Connection 13 (1 to 255) |
| D8779 ^{*1} | Remote Host Number of Connection 14 (1 to 255) |
| D8780 ^{*1} | Remote Host Number of Connection 15 (1 to 255) |
| D8781 ^{*1} | Remote Host Number of Connection 16 (1 to 255) |

^{*1} Plus CPU module only.

Establishing/Disconnecting User Communication Client Connections

When user communication clients are configured, connections are established on TCP protocol. The connections are established when ETXD/ERXD instructions are executed or when the FC6A starts running (See above)*¹. Once a connection is established, the connection will be kept open until either the FC6A is stopped or a special internal relay (M8222 to M8231 and M8355 to M8364) allocated to the connection is turned on.

| Special Internal Relay | Description | Operation |
|-----------------------------|--------------------------|---|
| M8222 | Connection 1 Disconnect | When the relay is turned on, the corresponding connection is disconnected. When the relay is on, the connection cannot be established. |
| M8223 | Connection 2 Disconnect | |
| M8224 | Connection 3 Disconnect | |
| M8225 | Connection 4 Disconnect | |
| M8226 | Connection 5 Disconnect | |
| M8227 | Connection 6 Disconnect | |
| M8230 | Connection 7 Disconnect | |
| M8231 | Connection 8 Disconnect | |
| M8355 * ² | Connection 9 Disconnect | |
| M8356 * ² | Connection 10 Disconnect | |
| M8357 * ² | Connection 11 Disconnect | |
| M8360 * ² | Connection 12 Disconnect | |
| M8361 * ² | Connection 13 Disconnect | |
| M8362 * ² | Connection 14 Disconnect | |
| M8363 * ² | Connection 15 Disconnect | |
| M8364 * ² | Connection 16 Disconnect | |

*¹ Can be enabled or disabled in **Function Area Settings, Connection Settings**.

*² Plus CPU module only.

User Communication Receive over Ethernet Instruction (ERXD) Cancel Flag

The allocation of the user communication receive instruction cancel flags for each client connection is shown in the table below. For details about the user communication receive instruction cancel flag, see "User Communication Receive Instruction Cancel Flag" on page 5-23.

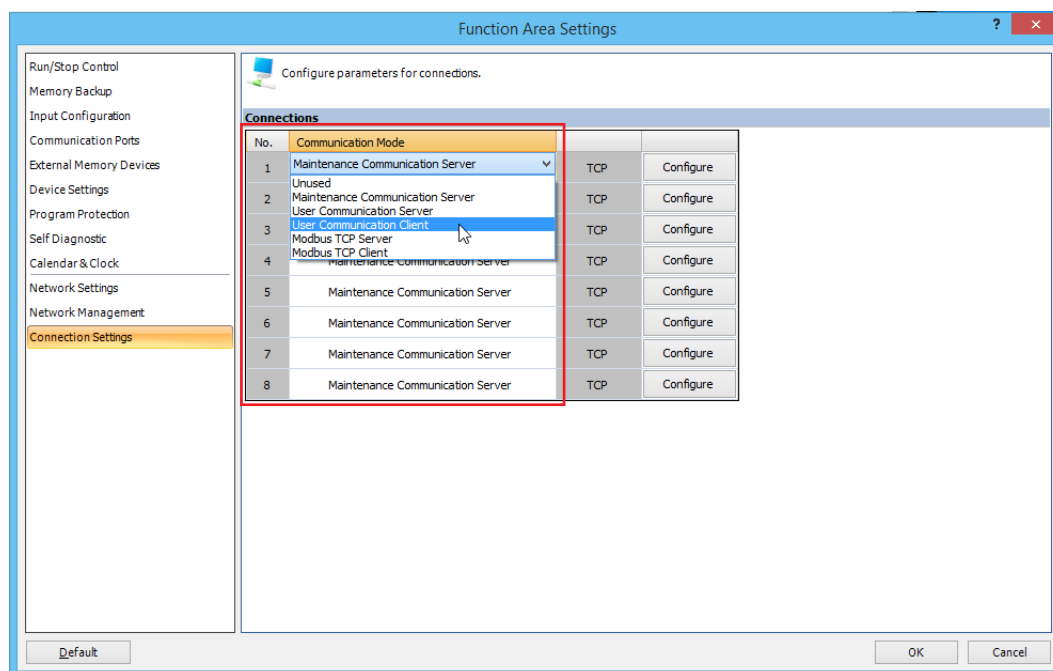
| Special Internal Relay | Description |
|-----------------------------|--|
| M8200 | User Communication Receive Instruction Cancel Flag (Connection 1) |
| M8201 | User Communication Receive Instruction Cancel Flag (Connection 2) |
| M8202 | User Communication Receive Instruction Cancel Flag (Connection 3) |
| M8203 | User Communication Receive Instruction Cancel Flag (Connection 4) |
| M8204 | User Communication Receive Instruction Cancel Flag (Connection 5) |
| M8205 | User Communication Receive Instruction Cancel Flag (Connection 6) |
| M8206 | User Communication Receive Instruction Cancel Flag (Connection 7) |
| M8207 | User Communication Receive Instruction Cancel Flag (Connection 8) |
| M8334 * ¹ | User Communication Receive Instruction Cancel Flag (Connection 9) |
| M8335 * ¹ | User Communication Receive Instruction Cancel Flag (Connection 10) |
| M8336 * ¹ | User Communication Receive Instruction Cancel Flag (Connection 11) |
| M8337 * ¹ | User Communication Receive Instruction Cancel Flag (Connection 12) |
| M8340 * ¹ | User Communication Receive Instruction Cancel Flag (Connection 13) |
| M8341 * ¹ | User Communication Receive Instruction Cancel Flag (Connection 14) |
| M8342 * ¹ | User Communication Receive Instruction Cancel Flag (Connection 15) |
| M8343 * ¹ | User Communication Receive Instruction Cancel Flag (Connection 16) |

*¹ Plus CPU module only.

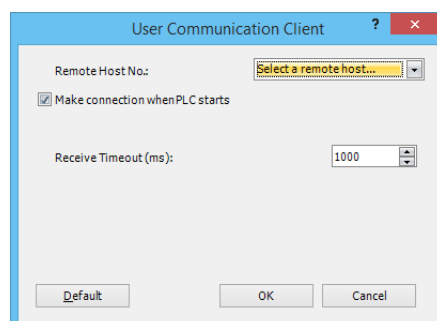
Programming WindLDR (User Communication Client)

To use the user communication client, configure the user client communication settings in the **Function Area Settings** dialog box and then download the user program to the FC6A.

1. Select **Configuration** from the WindLDR menu bar, and then click **Connection Settings**.
The **Function Area settings** dialog box appears.
2. Select the **User Communication Client** as the communication mode for the client connection 1.



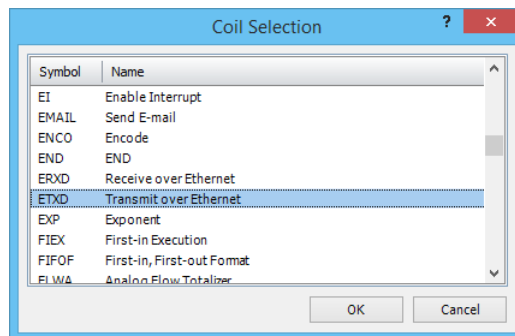
The **User Communication Client** dialog box appears.



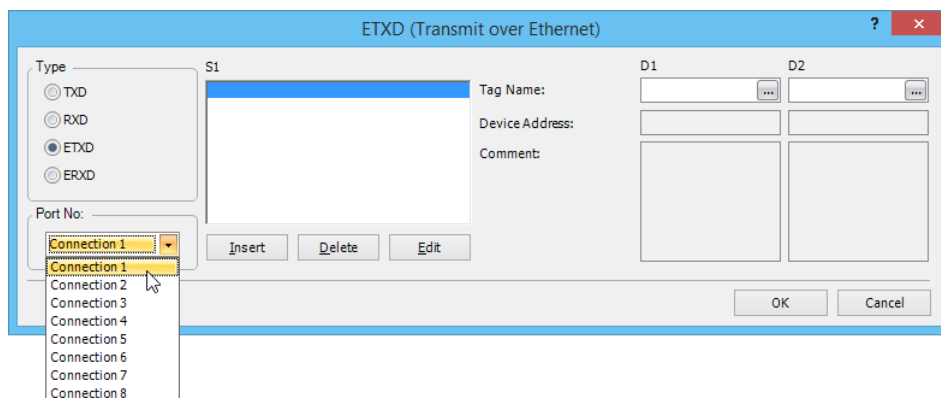
Configure the remote host number and receive timeout. If you want the FC6A to establish the connection when it starts to run, select "Make Connection when PLC starts." Click **OK** button to close the dialog box.

3. Edit the user program.

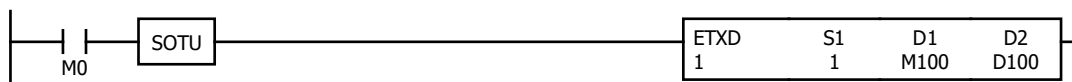
To insert Ethernet user communication instructions to the ladder editor, select the Ethernet user communication instructions (ETXD or ERXD instructions) in the **Coil Selection** dialog box.



The **ETXD (Transmit over Ethernet)** dialog box appears.



Select **ETXD** (Transmit over Ethernet) to transmit data or **ERXD** (Receive over Ethernet) to receive data as the instruction type. Select the client connection from 1 through 8 and designate S1, D1, and D2. Click **OK** button to close the dialog box.



4. Download the user program.

The settings for the user communication client have been finished.

The specifications of Ethernet user communication instructions (ETXD and ERXD instructions) are identical to TXD and RXD instructions. For details about TXD and RXD instructions, see "TXD (Transmit)" on page 5-2 and "RXD (Receive)" on page 5-10.

User Communication Server

When a server connection is configured as the user communication server, a client device can access and communicate with the FC6A. The FC6A communicates with the client device according to the settings configured in the ETXD and ERXD instructions that are programmed for the server connection. The local host number and other communication settings can be configured in the **Connection Settings** tab in the **Function Area Settings** dialog box.

Specifications (User Communication Server)

| Item | User Communication Server |
|---|---|
| Local Host Port Number | 2102 to 2117 (Can be changed between 0 and 65535) |
| Number of Clients That Can Simultaneously Communicate with the FC6A | One client per a user communication server*1 |
| Receive Timeout Time | 100 to 25,500 ms (100 ms increments) |

*1 A maximum of eight connections for the All-in-One CPU module/CAN J1939 All-in-One CPU module and 16 connections for the Plus CPU module can be allocated to user communication servers, which enables a maximum of eight client devices or a maximum of 16 client devices to connect to and communicate with the FC6A, respectively.

User Communication Receive over Ethernet Instruction (ERXD) Cancel Flag

The allocation of the user communication receive instruction cancel flags for each server connection is shown in the table below. For details about the user communication receive instruction cancel flag, see "User Communication Receive Instruction Cancel Flag" on page 5-23.

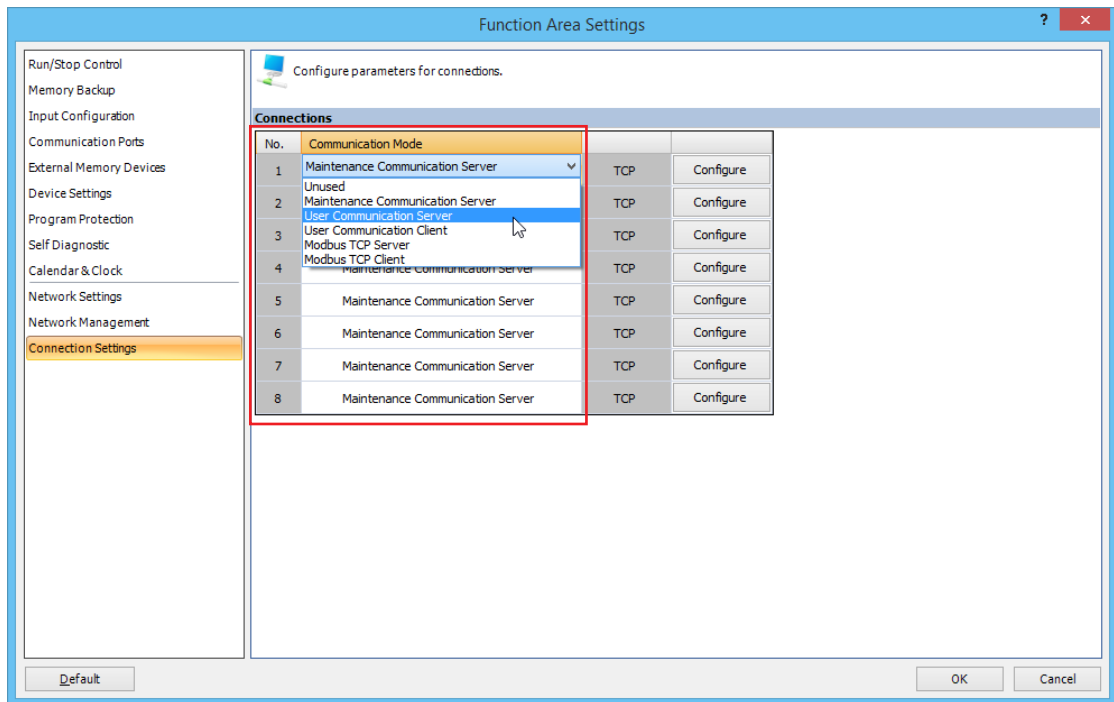
| Device Address | Description |
|-----------------|--|
| M8200 | User Communication Receive Instruction Cancel Flag (Connection 1) |
| M8201 | User Communication Receive Instruction Cancel Flag (Connection 2) |
| M8202 | User Communication Receive Instruction Cancel Flag (Connection 3) |
| M8203 | User Communication Receive Instruction Cancel Flag (Connection 4) |
| M8204 | User Communication Receive Instruction Cancel Flag (Connection 5) |
| M8205 | User Communication Receive Instruction Cancel Flag (Connection 6) |
| M8206 | User Communication Receive Instruction Cancel Flag (Connection 7) |
| M8207 | User Communication Receive Instruction Cancel Flag (Connection 8) |
| M8334 *1 | User Communication Receive Instruction Cancel Flag (Connection 9) |
| M8335 *1 | User Communication Receive Instruction Cancel Flag (Connection 10) |
| M8336 *1 | User Communication Receive Instruction Cancel Flag (Connection 11) |
| M8337 *1 | User Communication Receive Instruction Cancel Flag (Connection 12) |
| M8340 *1 | User Communication Receive Instruction Cancel Flag (Connection 13) |
| M8341 *1 | User Communication Receive Instruction Cancel Flag (Connection 14) |
| M8342 *1 | User Communication Receive Instruction Cancel Flag (Connection 15) |
| M8343 *1 | User Communication Receive Instruction Cancel Flag (Connection 16) |

*1 Plus CPU module only.

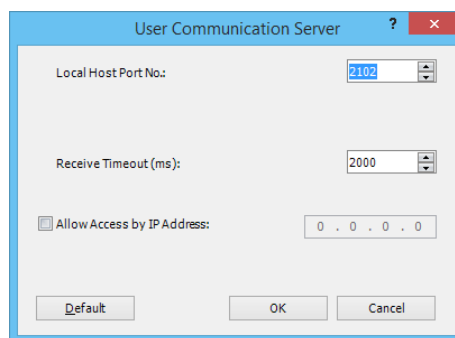
Programming WindLDR (User Communication Server)

To use the user communication server, configure the user communication server settings in the Function Area Settings dialog box and then download the user program to the FC6A.

1. Select **Configuration** from the WindLDR menu bar, and then click **Connection Settings**.
The **Function Area Settings** dialog box appears.
2. Select the **User Communication Server** as the communication mode for the server connection 1.



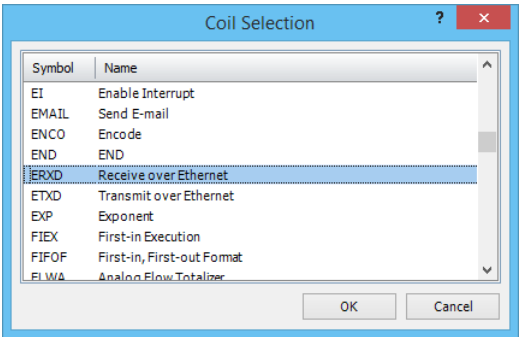
The **User Communication Server** dialog box appears.



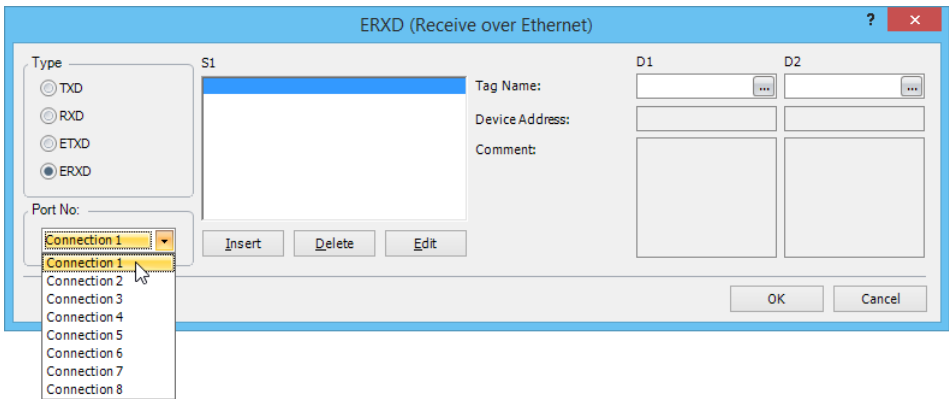
Configure the local host port number and receive timeout. If you want to restrict the access using IP address, configure the allowed IP address.

5: USER COMMUNICATION INSTRUCTIONS

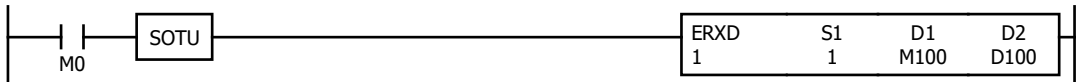
3. Edit the user program.
- To insert Ethernet user communication instructions to the ladder editor, select the Ethernet user communication instructions (ETXD or ERXD instructions) in the **Coil Selection** dialog box.



The **ERXD (Receive over Ethernet)** dialog box appears.



Select **ETXD** (Transmit over Ethernet) to transmit data and **ERXD** (Receive over Ethernet) to receive data as the instruction type. Select the server connection from 1 through 16 and designate S1, D1, and D2. Click **OK** button to close the dialog box.



4. Download the user program.
- The settings for the user communication server have been finished.

The specifications of Ethernet user communication instructions (ETXD and ERXD instructions) are identical to TXD and RXD instructions. For details about TXD and RXD instructions, see "TXD (Transmit)" on page 5-2 and "RXD (Receive)" on page 5-10.

User Communication (UDP)

The Plus CPU module can communicate with UDP communication devices through a user communication server according to the ETXD (User Communication Transmit over Ethernet) and ERXD (User Communication Receive over Ethernet) instructions set to the corresponding connection number.

The port number settings and the communication settings of the user communication server are configured on the **Configuration** tab, in the **Function Area Settings** group, under **Connection Settings**.

Specifications

| Item | User Communication Server |
|----------------------------|----------------------------|
| Remote host number | 1 to 255 |
| Local host port number | 0 to 65535 |
| Allow access by IP address | 0.0.0.0 to 255.255.255.255 |

Allocation of Receive Cancel Flags for ERXD (User Communication Receive over Ethernet) Instructions

The following table shows the allocation of receive cancel flags for each connection.

When preparations for receiving data is finished and the instruction is in Receiving Data state (status code 32), and the corresponding user communication receive instruction cancel flag is turned on, execution of all receive instructions for the corresponding connection will be canceled. This is effective when receiving data is taking too long time and you want to cancel the execution of the receive instruction.

To activate a receive instruction that is canceled, turn off the user communication receive cancel flag, and then turn on the input to the receive instruction again.

User communication receive instruction cancel flags are allocated in special internal relays for each connection as follows.

| Special Internal Relay | Description |
|------------------------|--|
| M8200 | User Communication Receive Instruction Cancel Flag (Connection 1) |
| M8201 | User Communication Receive Instruction Cancel Flag (Connection 2) |
| M8202 | User Communication Receive Instruction Cancel Flag (Connection 3) |
| M8203 | User Communication Receive Instruction Cancel Flag (Connection 4) |
| M8204 | User Communication Receive Instruction Cancel Flag (Connection 5) |
| M8205 | User Communication Receive Instruction Cancel Flag (Connection 6) |
| M8206 | User Communication Receive Instruction Cancel Flag (Connection 7) |
| M8207 | User Communication Receive Instruction Cancel Flag (Connection 8) |
| M8334 | User Communication Receive Instruction Cancel Flag (Connection 9) |
| M8335 | User Communication Receive Instruction Cancel Flag (Connection 10) |
| M8336 | User Communication Receive Instruction Cancel Flag (Connection 11) |
| M8337 | User Communication Receive Instruction Cancel Flag (Connection 12) |
| M8340 | User Communication Receive Instruction Cancel Flag (Connection 13) |
| M8341 | User Communication Receive Instruction Cancel Flag (Connection 14) |
| M8342 | User Communication Receive Instruction Cancel Flag (Connection 15) |
| M8343 | User Communication Receive Instruction Cancel Flag (Connection 16) |

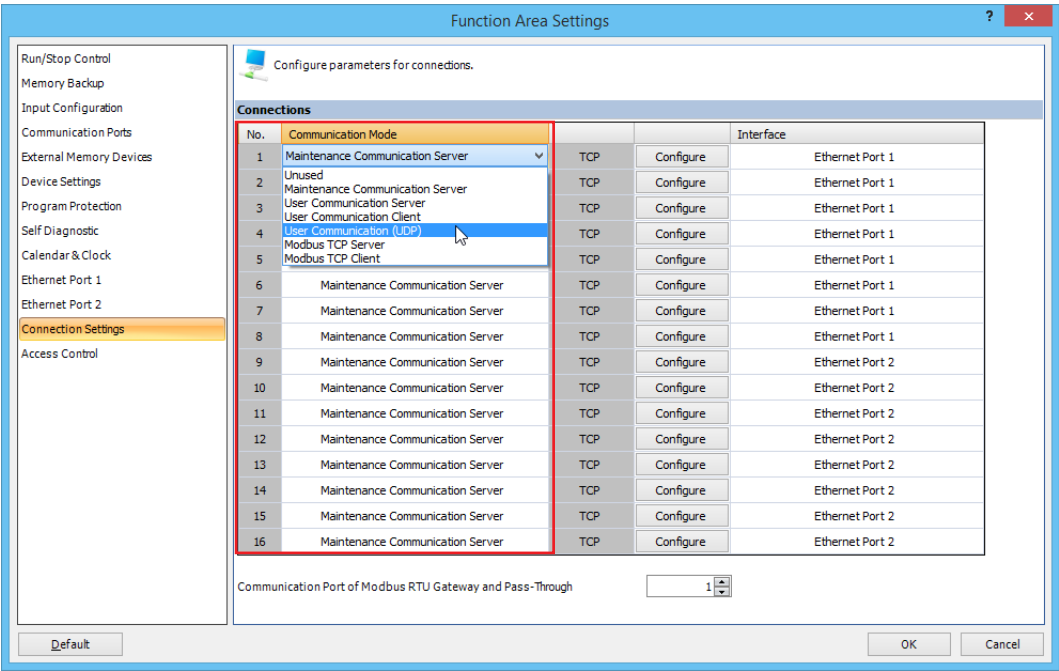
5: USER COMMUNICATION INSTRUCTIONS

Programming WindLDR

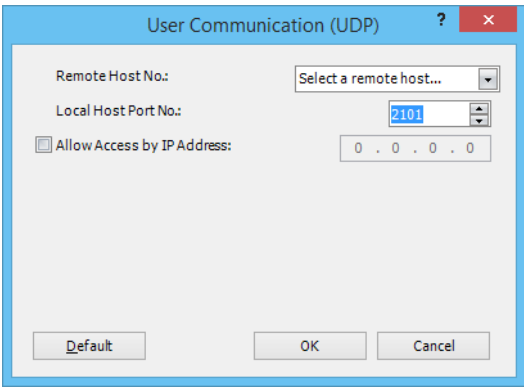
Configure the Plus CPU module for user communication (UDP).

The following example provides a explanation of the procedure to configure user communication (UDP) for connection 1 using WindLDR.

- 1. On the WindLDR **Configuration** tab, in the **Function Area Settings** group, click **Connection Settings**.
The **Function Area Settings** dialog box is displayed.
- 2. Click **Communication Mode** for connection number 1 and select **User Communication (UDP)**.
The **User Communication (UDP)** dialog box is displayed.



- 3. Configure **Remote Host No.** and **Local Host Port No.** To enable access restrictions by IP address, select the **Allow Access by IP Address** check box and configure the IP address to allow.
For details on the remote host number, see "Remote Host List" on page 3-26.



- 4. Click **OK**.

This concludes configuring the settings for user communication (UDP).

Next, create a user program that uses the user communication instructions that correspond to the configured connection, and then download the user program to the Plus CPU module.

User Communication Error

When a user communication error occurs, an error code is stored in the data register designated as a transmit status in the TXD instruction or as a receive status in the RXD instruction. When multiple errors occur, the final error code overwrites all preceding errors and is stored in the status data register.

The status data register also contains transmit/receive status code. To extract a user communication error code from the status data register, divide the value by 16. The remainder is the user communication error code. See "D2 (Destination 2)" on page 5-8 for the Transmit Status and "D2 (Destination 2)" on page 5-22 for the Receive Status.

To correct the error, correct the user program by referring to the error causes described below:

User Communication Error Code

| User Communication Error Code | Error Cause | Transmit/Receive Completion Output |
|-------------------------------|--|---|
| 1 | Start inputs to more than 5 TXD instructions are on simultaneously. | Transmit completion outputs of the first 5 TXD instructions from the top of the ladder diagram are turned on. |
| 2 | Transmission destination busy timeout | The transmit completion output goes on. |
| 3 | Start inputs to more than 5 RXD instructions with a start delimiter are on simultaneously. | Among the first 5 RXD instructions from the top of the ladder diagram, receive completion outputs of RXD instructions go on if the start delimiter matches the first byte of the received data. |
| 4 | While a RXD instruction without a start delimiter is executed, another RXD instruction with or without a start delimiter is executed. | The receive completion output of the RXD instruction at a smaller address goes on. |
| 5 | While a RXD instruction with a start delimiter is executed, another RXD instruction with the same start delimiter is executed. | No effect on the receive completion output. |
| 7 | The first bytes of received data do not match the specified start delimiter. | No effect on the receive completion output. If incoming data with a matching start delimiter is received subsequently, the receive completion output goes on. |
| 8 | When ASCII to binary or ASCII to BCD conversion is specified in the receive format, any code other than 0 to 9 and A to F is received. (These codes are regarded as 0 during conversion.) | The receive completion output goes on. |
| 9 | BCC calculated from the RXD instruction does not match the BCC appended to the received data. | The receive completion output goes on. |
| 10 | Constants including the end delimiter code specified in the RXD instruction do not match the received constants. | The receive completion output goes on. |
| 11 | Receive timeout between characters (After receiving one byte of data, the next byte is not received in the period specified for the receive timeout value.) | The receive completion output goes on. |
| 12 | Overrun error (Before the receive processing is completed, the next data is received.) | The receive completion output goes off. |
| 13 | Framing error (Detection error of start bit or stop bit) | No effect on the completion output. |
| 14 | Parity check error (Error is found in the parity check.) | No effect on the completion output. |
| 15 | A user communication instruction was used even though the port settings or the connection settings were not set to user communication mode. Or, a user communication instruction was used on a port configured for user communication mode when the communication cartridge or communication module was not connected. | No effect on the completion output. |

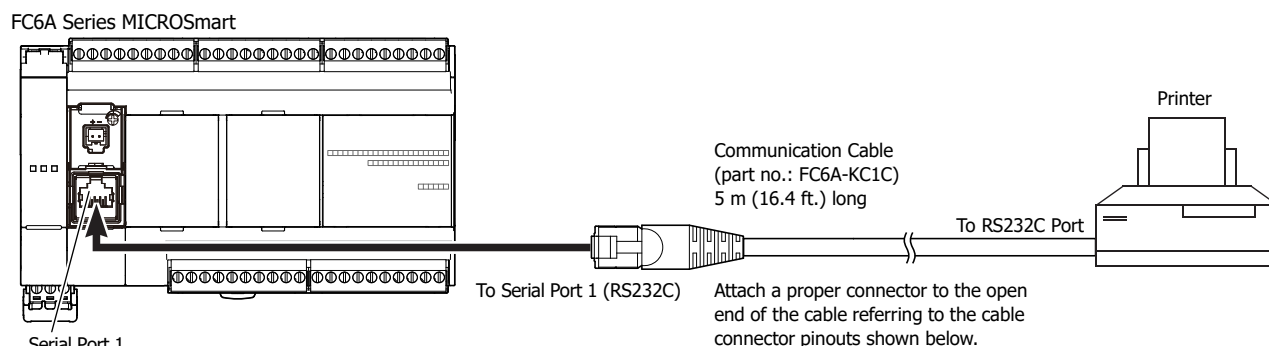
ASCII Character Code Table

| Upper Bit Lower Bit | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|------------------------|-----------------|-----------------|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | N _{UL} | D _{LE} | SP | 0 | @ | P | ` | p | | | | | | | | |
| Decimal | 0 | 16 | 32 | 48 | 64 | 80 | 96 | 112 | 128 | 144 | 160 | 176 | 192 | 208 | 224 | 240 |
| 1 | S _{OH} | D _{C1} | ! | 1 | A | Q | a | q | | | | | | | | |
| Decimal | 1 | 17 | 33 | 49 | 65 | 81 | 97 | 113 | 129 | 145 | 161 | 177 | 193 | 209 | 225 | 241 |
| 2 | S _{TX} | D _{C2} | " | 2 | B | R | b | r | | | | | | | | |
| Decimal | 2 | 18 | 34 | 50 | 66 | 82 | 98 | 114 | 130 | 146 | 162 | 178 | 194 | 210 | 226 | 242 |
| 3 | E _{TX} | D _{C3} | # | 3 | C | S | c | s | | | | | | | | |
| Decimal | 3 | 19 | 35 | 51 | 67 | 83 | 99 | 115 | 131 | 147 | 163 | 179 | 195 | 211 | 227 | 243 |
| 4 | E _{OT} | D _{C4} | \$ | 4 | D | T | d | t | | | | | | | | |
| Decimal | 4 | 20 | 36 | 52 | 68 | 84 | 100 | 116 | 132 | 148 | 164 | 180 | 196 | 212 | 228 | 244 |
| 5 | E _{NQ} | N _{AK} | % | 5 | E | U | e | u | | | | | | | | |
| Decimal | 5 | 21 | 37 | 53 | 69 | 85 | 101 | 117 | 133 | 149 | 165 | 181 | 197 | 213 | 229 | 245 |
| 6 | A _{CK} | S _{YN} | & | 6 | F | V | f | v | | | | | | | | |
| Decimal | 6 | 22 | 38 | 54 | 70 | 86 | 102 | 118 | 134 | 150 | 166 | 182 | 198 | 214 | 230 | 246 |
| 7 | B _{EL} | E _{TB} | ' | 7 | G | W | g | w | | | | | | | | |
| Decimal | 7 | 23 | 39 | 55 | 71 | 87 | 103 | 119 | 135 | 151 | 167 | 183 | 199 | 215 | 231 | 247 |
| 8 | BS | C _{AN} | (| 8 | H | X | h | x | | | | | | | | |
| Decimal | 8 | 24 | 40 | 56 | 72 | 88 | 104 | 120 | 136 | 152 | 168 | 184 | 200 | 216 | 232 | 248 |
| 9 | HT | EM |) | 9 | I | Y | i | y | | | | | | | | |
| Decimal | 9 | 25 | 41 | 57 | 73 | 89 | 105 | 121 | 137 | 153 | 169 | 185 | 201 | 217 | 233 | 249 |
| A | LF | S _{UB} | * | : | J | Z | j | z | | | | | | | | |
| Decimal | 10 | 26 | 42 | 58 | 74 | 90 | 106 | 122 | 138 | 154 | 170 | 186 | 202 | 218 | 234 | 250 |
| B | VT | E _{SC} | + | ; | K | [| k | { | | | | | | | | |
| Decimal | 11 | 27 | 43 | 59 | 75 | 91 | 107 | 123 | 139 | 155 | 171 | 187 | 203 | 219 | 235 | 251 |
| C | FF | FS | , | < | L | \ | l | | | | | | | | | |
| Decimal | 12 | 28 | 44 | 60 | 76 | 92 | 108 | 124 | 140 | 156 | 172 | 188 | 204 | 220 | 236 | 252 |
| D | CR | GS | - | = | M |] | m | } | | | | | | | | |
| Decimal | 13 | 29 | 45 | 61 | 77 | 93 | 109 | 125 | 141 | 157 | 173 | 189 | 205 | 221 | 237 | 253 |
| E | SO | RS | . | > | N | ^ | n | ~ | | | | | | | | |
| Decimal | 14 | 30 | 46 | 62 | 78 | 94 | 110 | 126 | 142 | 158 | 174 | 190 | 206 | 222 | 238 | 254 |
| F | SI | US | / | ? | O | _ | o | | | | | | | | | |
| Decimal | 15 | 31 | 47 | 63 | 79 | 95 | 111 | 127 | 143 | 159 | 175 | 191 | 207 | 223 | 239 | 255 |

Sample Program – User Communication TXD

This example demonstrates a program to send data to a printer using the user communication TXD1 (transmit) instruction.

System Setup



Cable Connection and Pinouts

| Description | Color | Pin | | Pin | Description |
|---------------------|--------------|-------|--|-----|-------------------|
| Shield | — | Cover | | | Shield |
| RXD Receive Data | White/Orange | 1 | | 1 | NC No Connection |
| TXD Transmit Data | Orange | 2 | | 2 | NC No Connection |
| DTR Equipment Ready | White/Green | 3 | | 3 | DATA Receive Data |
| A | Blue | 4 | | 4 | NC No Connection |
| B | White/Blue | 5 | | 5 | SG Signal Ground |
| DSR Data Set Ready | Green | 6 | | 6 | NC No Connection |
| NC No Connection | White/Brown | 7 | | 7 | NC No Connection |
| SG Signal Ground | Brown | 8 | | 8 | BUSY Busy Signal |
| | | | | 9 | NC No Connection |

The name of BUSY terminal differs depending on printers, such as DTR. The function of this terminal is to send a signal to remote equipment whether the printer is ready to print data or not. Since the operation of this signal may differ depending on printers, confirm the operation before connecting the cable.

Caution Do not connect any wiring to the NC (no connection) pins; otherwise, the FC6A and the printer may not work correctly and may be damaged.

Description of Operation

The data of counter C2 and data register D30 are printed every minute. A printout example is shown on the right.

Programming Special Data Register

Special data register D8105 is used to monitor the BUSY signal and to control the transmission of print data.

| Special DR | Value | Description |
|--------------|------------|---|
| D8105 | 3 (011) | While DSR is on (not busy), the FC6A sends data. While DSR is off (busy), the FC6A stops data transmission. If the off duration exceeds a limit (approx. 5 s), a transmission busy timeout error will occur, and the remaining data is not sent. The transmit status data register stores an error code. See "User Communication Error" on page 5-53. |

The FC6A monitors the DSR signal to prevent the receive buffer of the printer from overflowing. For the DSR signal, see "DSR Input Control Signal Option" on page 5-36.

Printout Example

```

--- PRINT TEST ---

11H 00M

CNT2...0050
D030...3854

--- PRINT TEST ---

11H 01M

CNT2...0110
D030...2124

```

Setting User Communication Mode in WindLDR Function Area Settings

Since this example uses the Serial Port 1 (RS232C), select User Protocol for Port 1 in the **Function Area Settings** using WindLDR. See "Programming WindLDR" on page 5-26.

Setting Communication Parameters

Set the communication parameters to match those of the printer. See "Programming WindLDR" on page 5-26. For details of the communication parameters of the printer, see the user's manual for the printer. An example is shown below:

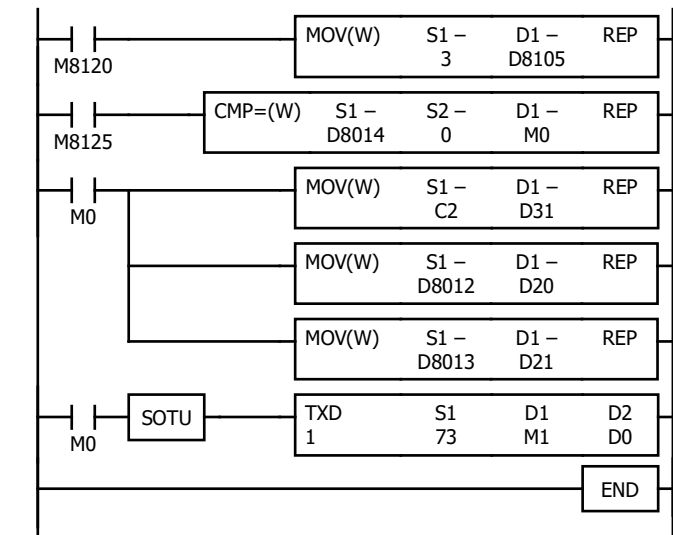
Communication Parameters:

| | |
|---------------|-----------|
| Baud rate: | 9,600 bps |
| Data bits: | 8 |
| Parity check: | None |
| Stop bits: | 1 |

Note: The receive timeout value is used for the RXD instruction in the user communication mode. Since this example uses only the TXD instruction, the receive timeout value has no effect.

Ladder Diagram

The second data stored in special data register D8014 is compared with 0 using the CMP= (compare equal to) instruction. Each time the condition is met, the TXD1 instruction is executed to send the C2 and D30 data to the printer. A counting circuit for counter C2 is omitted from this sample program.



M8120 is the initialize pulse special internal relay.
3 → D8105 to enable the DSR option for busy control.
M8125 is the in-operation output special internal relay.
CMP=(W) compares the D8014 second data with 0.
When the D8014 data equals 0 second, M0 is turned on.
Counter C2 current value is moved to D31.
D8012 hour data is moved to D20.
D8013 minute data is moved to D21.
TXD1 is executed to send 73-byte data through the Serial Port 1 (RS232C) to the printer.

Details of S1 Settings in the Transmit Instruction

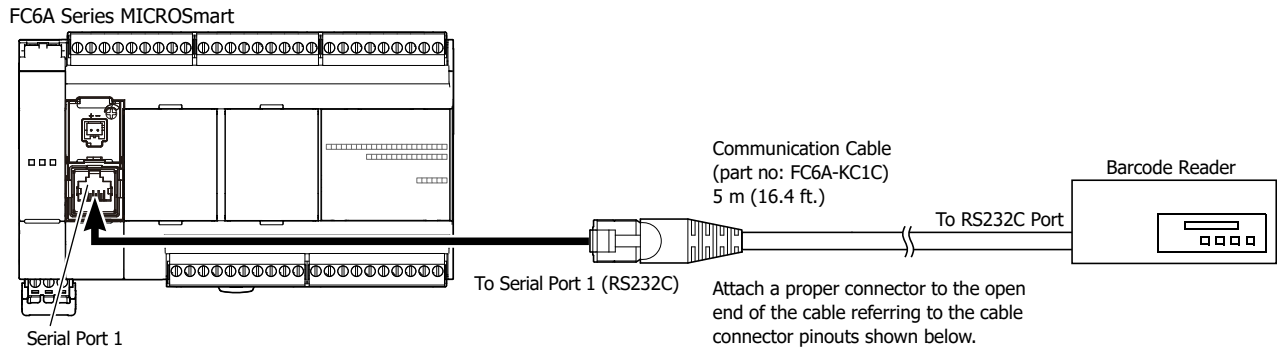
| | | | | | | | | | | | | | |
|---|-----------|-----------|-----------|-----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| SP 20h | SP 20h | SP 20h | - 2Dh | - 2Dh | - 2Dh | SP 20h | P 50h | R 52h | I 49h | N 4Eh | T 54h | SP 20h | T 54h |
| E 45h | S 53h | T 54h | SP 20h | - 2Dh | - 2Dh | - 2Dh | CR 0Dh | LF 0Ah | CR 0Dh | LF 0Ah | SP 20h | SP 20h | SP 20h |
| D20 Conversion: BCD→ASCII Digits: 2 REP: 01 | | | | | | | | | | | | | |
| H 48h | SP 20h | | | | | | | | | | | | |
| D21 Conversion: BCD→ASCII Digits: 2 REP: 01 | | | | | | | | | | | | | |
| M 4Dh | CR 0Dh | LF 0Ah | CR 0Dh | LF 0Ah | | | | | | | | | |
| SP 20h | SP 20h | SP 20h | C 43h | N 4Eh | T 54h | 2 32h | . 2Eh | . 2Eh | . 2Eh | | | | |
| D31 Conversion: BCD→ASCII Digits: 4 REP: 01 | | | | | | | | | | | | | |
| CR 0Dh | LF 0Ah | SP 20h | SP 20h | SP 20h | D 44h | 0 30h | 3 33h | 0 30h | . 2Eh | . 2Eh | . 2Eh | | |
| D30 Conversion: BCD→ASCII Digits: 4 REP: 01 | | | | | | | | | | | | | |
| CR 0Dh | LF 0Ah | CR 0Dh | LF 0Ah | | | | | | | | | | |

D20 hour data is converted from BCD to ASCII, and 2 digits are sent.
D21 minute data is converted from BCD to ASCII, and 2 digits are sent.
D31 counter C2 data is converted from BCD to ASCII, and 4 digits are sent.
D30 data is converted from BCD to ASCII, and 4 digits are sent.

Sample Program – User Communication RXD

This example demonstrates a program to receive data from a barcode reader with an RS232C port using the user communication RXD1 (receive) instruction.

System Setup



RJ45 Connector

| Description | Color | Pin |
|---------------------|--------------|-------|
| Shield | — | Cover |
| RXD Receive Data | White/Orange | 1 |
| TXD Transmit Data | Orange | 2 |
| DTR Equipment Ready | White/Green | 3 |
| A | Blue | 4 |
| B | White/Blue | 5 |
| DSR Data Set Ready | Green | 6 |
| NC No Connection | White/Brown | 7 |
| SG Signal Ground | Brown | 8 |

D-sub 25-pin Connector Pinouts

| Pin | Description |
|-----|--------------------|
| 1 | FG Frame Ground |
| 2 | TXD1 Transmit Data |
| 3 | RXD1 Receive Data |
| 7 | GND Ground |



Caution

Do not connect any wiring to the NC (no connection) pins; otherwise, the FC6A and the barcode reader may not work correctly and may be damaged.

Description of Operation

A barcode reader is used to scan barcodes of 8 numerical digits. The scanned data is sent to the FC6A through the Serial Port 1 (RS232C) and stored to data registers. The upper 8 digits of the data are stored to data register D20 and the lower 8 digits are stored to data register D21.

Setting User Communication Mode in WindLDR Function Area Settings

Since this example uses the Serial Port 1 (RS232C), select User Protocol for Port 1 in the Function Area Settings using WindLDR. See "Programming WindLDR" on page 5-26.

Setting Communication Parameters

Set the communication parameters to match those of the barcode reader. See "Programming WindLDR" on page 5-26. For details of the communication parameters of the barcode reader, see the user's manual for the barcode reader. An example is shown below:

Communication Parameters:

| | |
|---------------|-----------|
| Baud rate: | 9,600 bps |
| Data bits: | 7 |
| Parity check: | Even |
| Stop bits: | 1 |

5: USER COMMUNICATION INSTRUCTIONS

Configuring Barcode Reader

The values shown below are an example of configuring a barcode reader. For actual settings, see the user’s manual for the barcode reader.

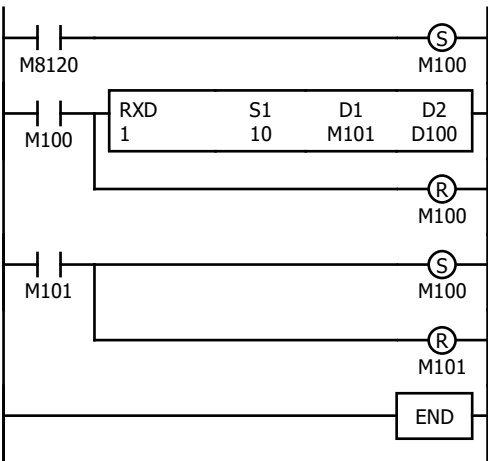
| | | | | |
|------------------------------|------------------------------|-------------------|---------------------|-----|
| Synchronization Mode | Auto | | | |
| Read Mode | Single read or multiple read | | | |
| Communication Parameter | Baud rate: | 9,600 bps | Data bits: | 7 |
| | Parity check: | Even | Stop bit: | 1 |
| Other Communication Settings | Header: | 02h | Terminator: | 03h |
| | Data echo back: | No | BCR data output: | Yes |
| | Output timing: | Output priority 1 | Character suppress: | No |
| | Data output filter: | No | Main serial input: | No |
| | Sub serial: | No | | |
| Comparison Preset Mode | Not used | | | |

Device Addresses

| | |
|-------|---|
| M100 | Input to start receiving barcode data |
| M101 | Receive completion output for barcode data |
| M8120 | Initialize pulse special internal relay |
| D20 | Store barcode data (upper 4 digits) |
| D21 | Store barcode data (lower 4 digits) |
| D100 | Receive status data register for barcode data |
| D101 | Receive data byte count data register |

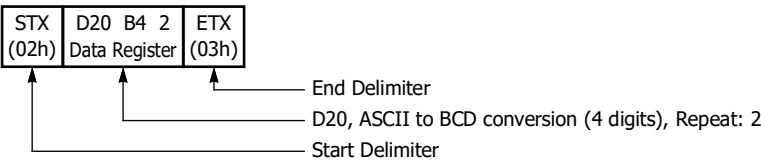
Ladder Diagram

When the FC6A starts operation, the RXD1 instruction is executed to wait for incoming data. When data receive is complete, the data is stored to data registers D20 and D21. The receive completion signal is used to execute the RXD1 instruction to wait for another incoming data.



M8120 is the initialize pulse special internal relay used to set M100.
At the rising edge of M100, RXD1 is executed to be ready for receiving data.
Even after M100 is reset, RXD1 still waits for incoming data.
When data receive is complete, M101 is turned on, then M100 is set to execute RXD1 to receive the next incoming data.

RXD1 Data



BCC Calculation Examples

The FC6A can use three new BCC calculation formulas of ADD-2comp, Modbus ASCII, and Modbus RTU for transmit instructions TXD1, TXD2 and TXD3 and receive instructions RXD1, RXD2 and RXD3. These block check characters are calculated as described below.

ADD-2comp

Add the characters in the range from the BCC calculation start position to the byte immediately before the BCC, then invert the result bit by bit, and add 1.

1. Add the characters in the range from the BCC calculation start position to the byte immediately before the BCC.
2. Invert the result bit by bit, and add 1 (2's complement).
3. Store the result to the BCC position according to the designated conversion type (Binary to ASCII conversion or No conversion) and the designated quantity of BCC digits.

Example: Binary to ASCII conversion, 2 BCC digits

When the result of step 2 is 175h, the BCC will consist of 37h, 35h.

Modbus ASCII — Calculating the LRC (longitudinal redundancy check)

Calculate the BCC using LRC (longitudinal redundancy check) for the range from the BCC calculation start position to the byte immediately before the BCC.

1. Convert the ASCII characters in the range from the BCC calculation start position to the byte immediately before the BCC, in units of two characters, to make 1-byte hexadecimal data. (Example: 37h, 35h → 75h)
2. Add up the results of step 1.
3. Invert the result bit by bit, and add 1 (2's complement).
4. Convert the lowest 1-byte data to ASCII characters. (Example: 75h → 37h, 35h)
5. Store the two digits to the BCC (LRC) position.
If the BCC calculation range consists of an odd number of bytes, the BCC calculation results in an indefinite value. Modbus protocol defines that the BCC calculation range is an even number of bytes.

Modbus RTU — Calculating the CRC-16 (cyclic redundancy checksum)

Calculate the BCC using CRC-16 (cyclic redundancy checksum) for the range from the BCC calculation start position to the byte immediately before the BCC. The generation polynomial is: $X^{16} + X^{15} + X^2 + 1$.

1. Take the exclusive OR (XOR) of FFFFh and the first 1-byte data at the BCC calculation start position.
2. Shift the result by 1 bit to the right. When a carry occurs, take the exclusive OR (XOR) of A001h, then go to step 3.
If not, directly go to step 3.
3. Repeat step 2, shifting 8 times.
4. Take the exclusive OR (XOR) of the result and the next 1-byte data.
5. Repeat step 2 through step 4 up to the byte immediately before the BCC.
6. Swap the higher and lower bytes of the result of step 5, and store the resultant CRC-16 to the BCC (CRC) position. (Example: 1234h → 34h, 12h)

6: MODBUS COMMUNICATION

Introduction

This chapter describes the Modbus communication functions for the FC6A.

Overview

For Modbus communication, the FC6A can be used as a Modbus RTU communication master and slave and Modbus TCP communication client and server to communicate with external devices.

Communication Ports Used in Modbus Communication

Supported models and communication ports are as follows.

| Communication Port | All-in-One CPU Module | | | CAN J1939 All-in-One CPU Module | Plus CPU Module | |
|--------------------|---------------------------------|-------------------|-------------------|---------------------------------|----------------------------------|-------------------|
| | 16-I/O Type | 24-I/O Type | 40-I/O Type | | Plus 16-I/O Type | Plus 32-I/O Type |
| Port 1 | Yes | Yes | Yes | — | Yes ^{*2} | Yes ^{*2} |
| Port 2 | Yes ^{*1} | Yes ^{*1} | Yes ^{*1} | Yes ^{*1} | Yes ^{*2} | Yes ^{*2} |
| Port 3 | — | — | Yes ^{*1} | Yes ^{*1} | Yes ^{*3} | Yes ^{*3} |
| Port 4 to 33 | Yes (Port 4 to 9) ^{*4} | | | | Yes (Port 4 to 33) ^{*5} | |
| Ethernet Port 1 | Yes | Yes | Yes | Yes | Yes | Yes |
| Ethernet Port 2 | — | — | — | — | Yes | Yes |
| HMI-Ethernet Port | — | — | — | — | — | — |

*1 When an RS232C communication cartridge or RS485 communication cartridge is connected.

*2 When a cartridge base module and an RS232C communication cartridge or RS485 communication cartridge are connected.

*3 When the HMI module and an RS232C communication cartridge or RS485 communication cartridge are connected.

*4 Up to three communication modules can be connected to the All-in-One CPU module and CAN J1939 All-in-One CPU module, expanding the communication ports 4 to 9.

*5 Up to 15 communication modules can be connected to the Plus CPU module, expanding the communication ports 4 to 33.

Modbus Communication Settings

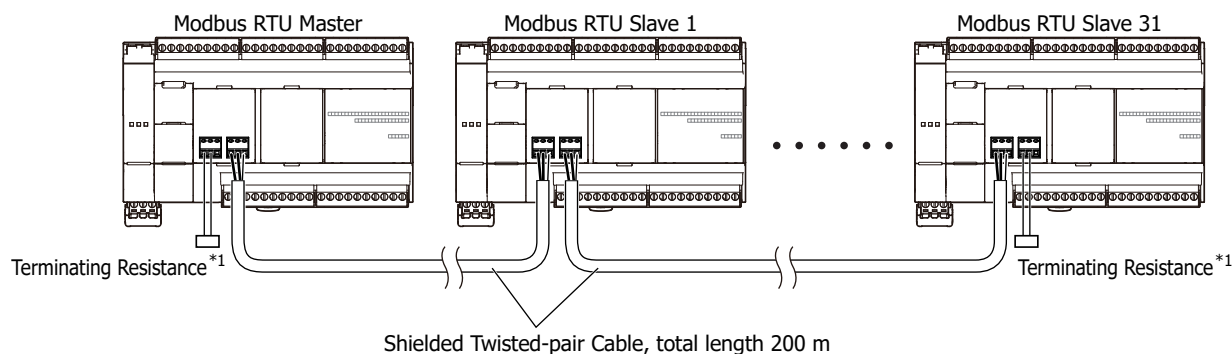
The Modbus communication settings supported by each communication port are as follows.

- Serial communication with an external device connected to port 1 to port 33 (RS232C/RS485)
"Modbus RTU Communication via RS232C/RS485" on page 6-2
- Ethernet communication with an external device connected by the Ethernet port 1 and 2
"Modbus TCP Communication via Ethernet Communication" on page 6-22

Modbus RTU Communication via RS232C/RS485

The FC6A supports the Modbus RTU protocol and can be used as the Modbus RTU master and the Modbus RTU slave. When configured as a Modbus RTU master, the FC6A can monitor and change the data of Modbus RTU slave devices. When the FC6A is configured as a Modbus RTU slave, the device data of the FC6A can be monitored and changed from the Modbus RTU master device.

For the Modbus RTU master function and how to configure it, see "Modbus RTU Master Communication" on page 6-3. For the Modbus RTU slave function and how to configure it, see "Modbus RTU Slave Communication" on page 6-9.



*1 When communication quality is unstable, add terminating resistance matched to the characteristic impedance to both ends. Use resistance with a rating of 1/2 W or higher.

Modbus RTU Master Communication

When configured as a Modbus RTU master, the FC6A sends communication requests to Modbus RTU slaves to read/write data. Each communication request is sent to a Modbus RTU slave according to the configured request table.

Modbus RTU master communication settings and request tables for Modbus RTU slave stations can be programmed using the WindLDR **Function Area Settings**. Communication with slave stations are performed asynchronously with user program execution, and the communication data are processed at the END processing in the order of request numbers specified in the request table. When request execution devices are designated, requests are executed only when the corresponding request execution device is turned on. When request execution devices are not designated, all requests are executed continuously.

Modbus RTU Master Communication Specifications

| Item | Description |
|----------------------------|--|
| Baud Rate (bps) | 9,600, 19,200, 38,400, 57,600, 115,200 |
| Data Bits | 8 bits (fixed) |
| Stop bits | 1, 2 bits |
| Parity | Even, Odd, None |
| Slave Number | 1 to 247 (0: broadcast slave number) *1 |
| Maximum Number of Slaves | RS-232C: 1 RS-485: 31 |
| Maximum Cable Length | Modbus Communication via RS-232C FC6A-PC1: 5 m FC6A-SIF52: 15 m Modbus Communication via RS-485 FC6A-PC3: 200 m FC6A-SIF52: 1,200 m |
| Receive Timeout *2 | 10 to 2,550 ms (in increments of 10 ms) |
| Timeout between Characters | 10 ms |
| Transmission Wait Time | 0 to 5,000 ms (in increments of 1 ms) |
| Retry Cycles | 0 to 10 |

*1 A communication request becomes the broadcast when slave number 0 is specified. The broadcast communication request is received by all Modbus RTU slaves. Modbus RTU slave does not reply to the broadcast communication. Broadcast can be used to write the same data to all Modbus RTU slaves.

*2 Specifies the period of time before receiving a response frame from a slave.

Modbus RTU Master Communication Start and Stop

When request execution devices are designated in the Modbus RTU master request table, internal relays or data register bits as many as the request quantity are allocated to execute Modbus RTU master communication. The internal relays or data register bits are allocated in the order of requests. For example, when internal relay M0 is designated as the request execution device, M0 is allocated to request No. 1, M1 to request No. 2, and so on. To execute a request, turn on the corresponding request execution device.

When communication is completed, the request execution device turns off automatically. When it is required to send requests continuously, keep the corresponding request execution device on using a SET or OUT instruction.

When request execution devices are not designated, all requests programmed in the request table are executed continuously.

Communication Completion and Communication Error

Modbus RTU communication finishes when a read or write process is completed successfully or when a communication error occurs. Communication error occurs when communication failure has repeated more than the designated retry cycles or when the master station does not receive response within the designated receive timeout period. When a communication error occurs, the request is canceled and the next request is processed. When the error status data register is designated, the communication status of each request can be confirmed.

Note: Modbus master processes a maximum of one Modbus request per scan.

6: MODBUS COMMUNICATION

Communication Error Data

When Error Status is configured in the Request Table from the **Function Area Settings**, the error data of each request can be confirmed.

| Use a Single DR for All Communication Requests | Error Data of Each Communication Request |
|--|--|
| Unchecked | Error data, the remote host number (high-order byte) and error code (low-order byte), of each request in the entire request table can be confirmed. Data registers as many as the quantity of requests are reserved for storing error data. When an error occurs for a request, error data is stored to the corresponding data register. |
| Checked | A single data register is shared by all requests. When an error occurs for a request, error data is stored to the data register and the old error data is overwritten. |

| Bit Allocation | |
|---|---|
| Remote Host Number (high-order byte) | 1 to 255 |
| Error Code (low-order byte) | 00h: Normal completion 01h: Function code error (unsupported function code) 02h: Access destination error (address out of range, address+device quantity out of range) 03h: Device quantity error, 1-bit write data error (specified device quantity of 1-bit write is unsupported) 12h: Frame length error (frame length of transmitted request exceeds range) 13h: BCC error (BCC does not match) 14h: Slave number error (received slave number is invalid) 16h: Timeout error (timeout occurs) |

Communication Error Data of Each Request

Error data of each request in the entire request table can be confirmed. To confirm error data of each request, select to use Error Status in the Request Table from the **Function Area Settings** and enter the data register number.

When Use a single DR for all communication requests is not selected, starting with the data register number, data registers as many as the quantity of requests are reserved for storing error data. When an error occurs for a request, an error code is stored to a corresponding data register.

When Use a single DR for all communication requests is selected, the same data register is shared by all requests. When an error occurs for a request, an error code is stored to the data register and the old value is overwritten.

Number of Requests in Modbus RTU Master

The number of requests that can be programmed in a request table is shown in the table below:

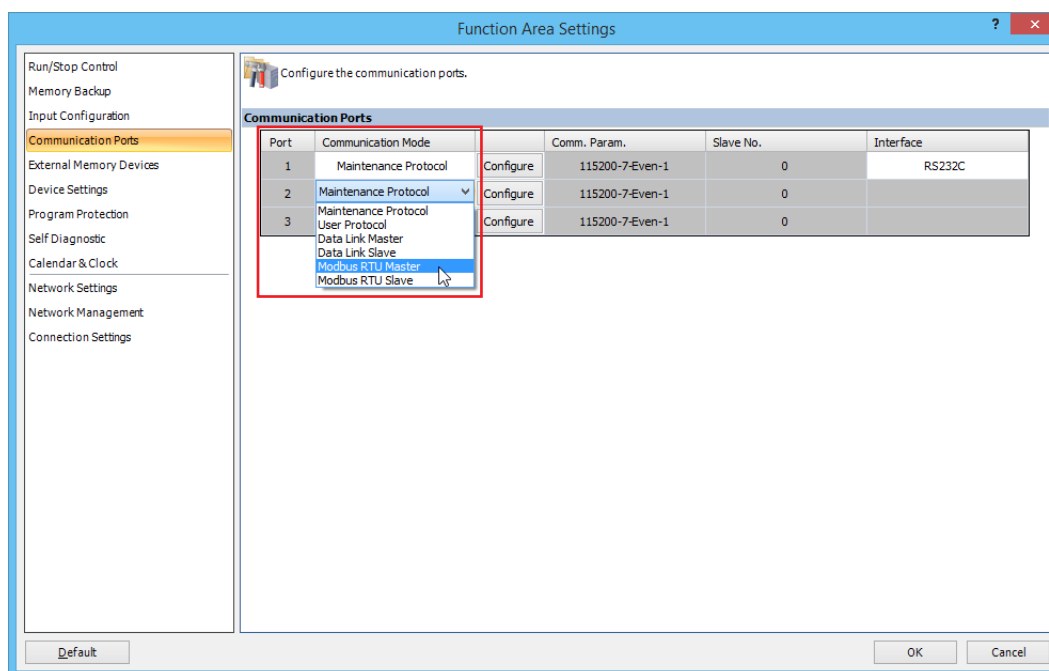
| | |
|-----------------|-------------------|
| Port | Port 1 to Port 33 |
| No. of Requests | 255 |

Note: 8 bytes of the user program area are needed per each request.

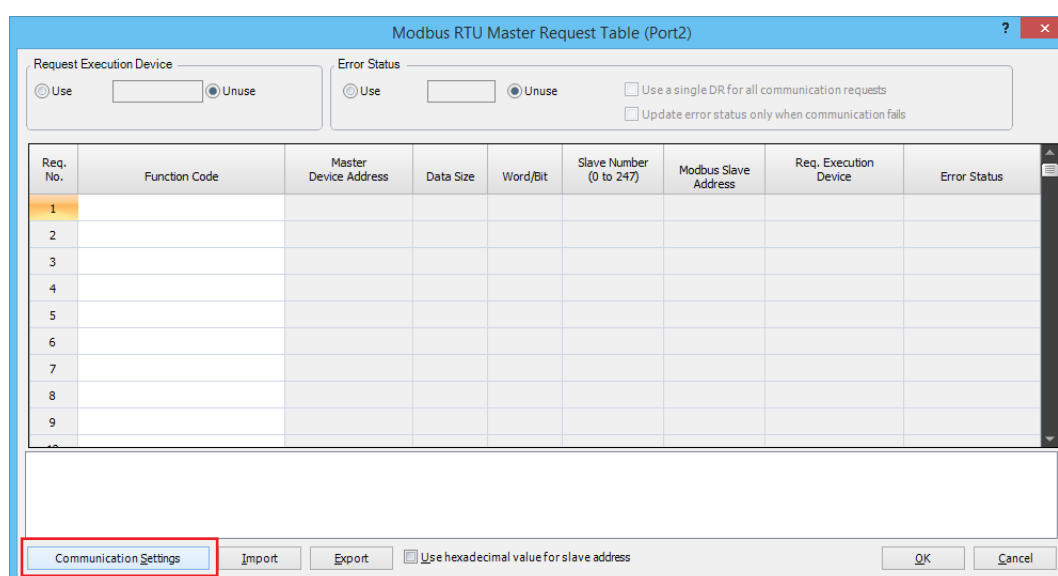
Programming Modbus RTU Master Using WindLDR

Modbus master communication is programmed for Modbus RTU mode using WindLDR. Since these settings relate to the user program, the user program must be downloaded to the FC6A after changing any of these settings.

1. From the WindLDR menu bar, select **Configuration > Communication Ports**.
The **Function Area Settings** dialog box for Communication Ports appears.
2. Click **Communication Mode** for the port to use and select **Modbus RTU Master**.

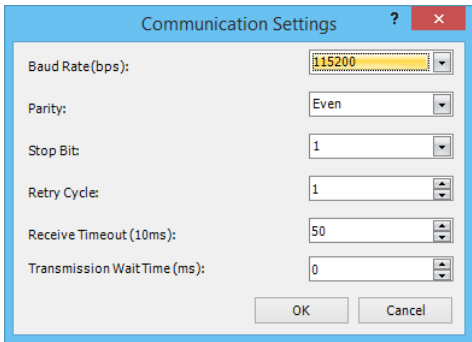


3. Click the **Configure** button for Port 2. The **Modbus RTU Master Request Table** appears.



6: MODBUS COMMUNICATION

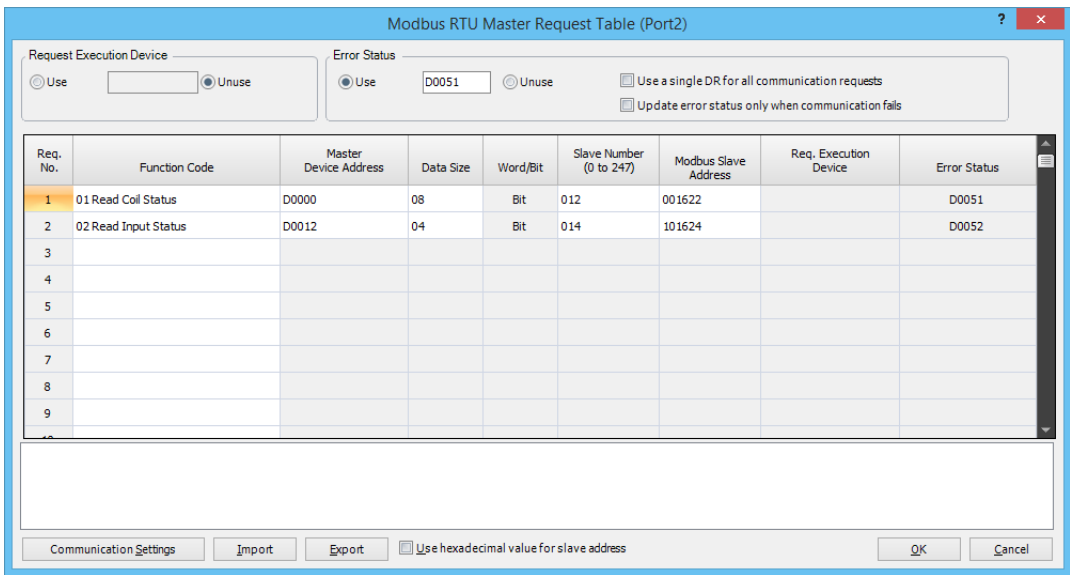
4. Click the **Communication Settings** button. The **Communication Settings** dialog box appears. Change settings, if required.

The dialog box titled "Communication Settings" contains several configuration fields: "Baud Rate(bps)" is a dropdown menu showing "115200"; "Parity" is a dropdown menu showing "Even"; "Stop Bit" is a dropdown menu showing "1"; "Retry Cycle" is a numeric input field showing "1"; "Receive Timeout (10ms)" is a numeric input field showing "50"; and "Transmission Wait Time (ms)" is a numeric input field showing "0". At the bottom are "OK" and "Cancel" buttons.

| | |
|-------------------------------|-----------------------------------|
| Baud Rate (bps) | 9600, 19200, 38400, 57600, 115200 |
| Parity | Even, Odd, None |
| Stop Bits | 1 or 2 |
| Retry Cycle | 0 to 10 |
| Receive Timeout | 1 to 255 (×10 ms) |
| Transmission Wait Time | 0 to 5000 (ms) |

5. Click the **OK** button to return to the Modbus RTU Master Request Table. Designate requests under the **Function Code**. A maximum of 255 requests can be entered in one request table.

Choose to use **Req. Execution Device** and **Error Status** data registers if necessary. When using **Req. Execution Device** and **Error Status** data registers, enter the first number of the devices.

The dialog box titled "Modbus RTU Master Request Table (Port2)" features two sections at the top: "Request Execution Device" with "Use" and "Unuse" radio buttons, and "Error Status" with "Use" and "Unuse" radio buttons and a text field containing "D0051". There are also checkboxes for "Use a single DR for all communication requests" and "Update error status only when communication fails". Below these is a table with columns: "Req. No.", "Function Code", "Master Device Address", "Data Size", "Word/Bit", "Slave Number (0 to 247)", "Modbus Slave Address", "Req. Execution Device", and "Error Status". The first two rows are populated: Row 1 has "01 Read Coil Status", "D0000", "08", "Bit", "012", "001622", and "D0051"; Row 2 has "02 Read Input Status", "D0012", "04", "Bit", "014", "101624", and "D0052". At the bottom are buttons for "Communication Settings", "Import", "Export", "Use hexadecimal value for slave address", "OK", and "Cancel".

Notes for Editing the Request Table

Request execution devices and error status data registers are allocated in the order of request numbers. When deleting a request or changing the order of requests, the relationship of the request to the request execution devices and error status data register is changed. If the internal relay or data register is used in the user program, the device addresses must be changed accordingly. After completing the changes, download the user program again.

6. When editing of the Master Request Table is complete, click the **OK** button to save changes.
7. Download the user program to the FC6A.
Now, programming for the Modbus master is complete. Details about parameters and valid values are as follows.

Function Code

The Modbus RTU of the FC6A supports eight function codes as listed in the table below. Supported function codes and valid slave addresses vary with each Modbus slave device to communicate with. Configure the function codes according to the specifications of the Modbus slave devices.

| Function Code | Data Size | Slave Address | FC6A as Modbus Slave |
|------------------------------|-----------------|-----------------|---|
| 01 Read Coil Status | 1 to 2,000 bits | 000001 - 065535 | Reads bit device statuses of Q (output), R (shift register), or M (internal relay). |
| 02 Read Input Status | 1 to 2,000 bits | 100001 - 165535 | Reads bit device statuses of I (input), T (timer contact), or C (counter contact). |
| 03 Read Holding Registers | 1 to 125 words | 400001 - 465535 | Reads word device data of D (data register), T (timer preset value), or C (counter preset value). |
| 04 Read Input Registers | 1 to 125 words | 300001 - 365535 | Reads word device data of T (timer current value) or C (counter current value). |
| 05 Force Single Coil | 1 bit | 000001 - 065535 | Changes a bit device status of Q (output), R (shift register), or M (internal relay). |
| 06 Preset Single Register | 1 word | 400001 - 465535 | Changes word device data of D (data register). |
| 15 Force Multiple Coils | 1 to 1,968 bits | 000001 - 065535 | Changes multiple bit device statuses of Q (output), R (shift register), or M (internal relay). |
| 16 Preset Multiple Registers | 1 to 123 words | 400001 - 465535 | Changes multiple word device data of D (data register). |

Master Device Address

When function code 01, 02, 03, or 04 is selected to read data from Modbus slaves, designate the first data register or internal relay number to store the data received from the Modbus slave. When function code 05, 06, 15, or 16 is selected to write data to Modbus slaves, designate the first data register or internal relay number to store the data to write to the Modbus slave. Data registers and internal relays can be designated as the master device address.

Data Size and Word/Bit

Designate the quantity of data to read or write. The valid data size depends on the function code. When function code 01, 02, 05, or 15 is selected, designate the data size in bits. When function code 03, 04, 06, or 16 is selected, designate the data size in words. For valid data sizes, see the table above.

Slave No.

Designate slave numbers 0 through 247. The same slave number can be designated repeatedly for different request numbers which can be 1 through 255. In the Modbus communication, slave number 0 is used for a broadcast slave number. The broadcast can be used to write the same data to all Modbus slaves.

Slave Address

Designate data memory addresses of Modbus slaves. The valid slave address range depends on the function code. For valid slave addresses, see the table above. The allocations of memory addresses vary with each Modbus slave device. Refer to manuals for each Modbus slave device.

Request Execution Device

To use request execution devices, click the radio button for "Use" and designate the first internal relay in the Modbus RTU Master Request Table. Devices used for executing requests are automatically listed in the table. To execute a request, turn on the corresponding request execution device.

Data registers can also be designated as the Request Execution Device. When the first data register is designated as the Request Execution Device, data register bits as many as the number of requests are allocated from the least significant bit of the first data register. Data register bits assigned as the execution relays are automatically listed in the Request Table.

When request execution devices are not designated, all requests programmed in the Request Table are executed continuously.

Error Status Data Register

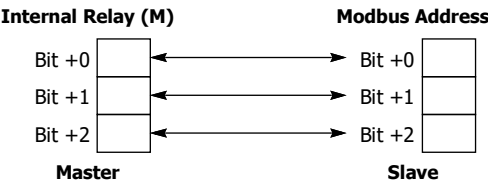
To use error status data registers, click the radio button for "Use" and designate the first data register in the Modbus RTU Master Request Table. Data registers used for storing error statuses are automatically listed in the table. When Use a single DR for all communication requests is selected, the first data register is shared by all requests.

Processing Requests

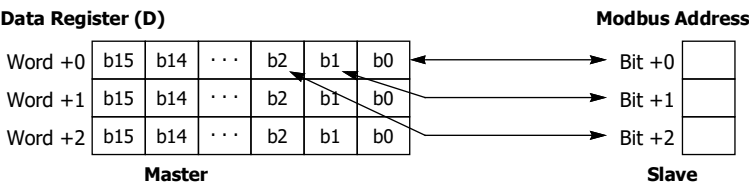
The data for Modbus communication are processed between the master and slaves as shown below.

Bit Data at Slaves (Function Codes 01, 02, 05, and 15)

- Master Device Address: Internal Relay

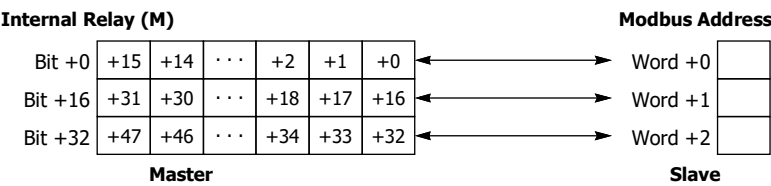


- Master Device Address: Data Register

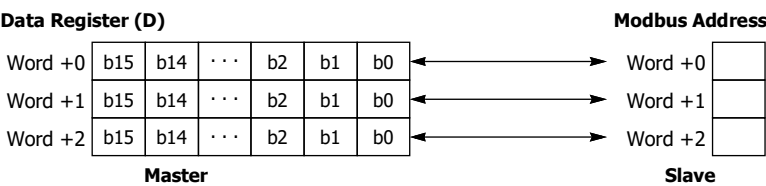


Word Data at Slaves (Function Codes 03, 04, 06, and 16)

- Master Device Address: Internal Relay



- Master Device Address: Data Register



Modbus RTU Slave Communication

Modbus slave communication can be configured by selecting Modbus RTU Slave for Port 1, Port 2 and Port 3 in the WindLDR **Function Area Settings**. When a Modbus RTU slave receives a request from the Modbus RTU master, the Modbus RTU slave reads or writes data according to the request. The request is processed at the END processing of the user program.

Modbus RTU slaves do not reply to the Modbus RTU master for the broadcast requests.

Modbus RTU Slave Communication Specifications

| Item | Description | |
|--|--|---|
| Baud Rate (bps) | 9,600, 19,200, 38,400, 57,600, 115,200 | |
| Data Bits | 8 bits (fixed) | |
| Stop bits | 1, 2 bits | |
| Parity | Odd, even, none | |
| Slave Number | Constant | 1 to 247 |
| | Data register | Set the special data register values between 1 and 247 Port 1: D8100 Port 2: D8102 Port 3: D8103 Port 4 to 9 ^{*2} : D8040 to D8045 Port 10 to 33 ^{*2*3} : D8735 to D8758 |
| Timeout between Characters ^{*1} | 1.5 characters minimum ^{*4} | |
| Timeout between Frames ^{*1} | 3.5 characters minimum ^{*5} | |

^{*1} When timeout occurs, the FC6A discards the received data and waits for the first frame of the next valid communication.

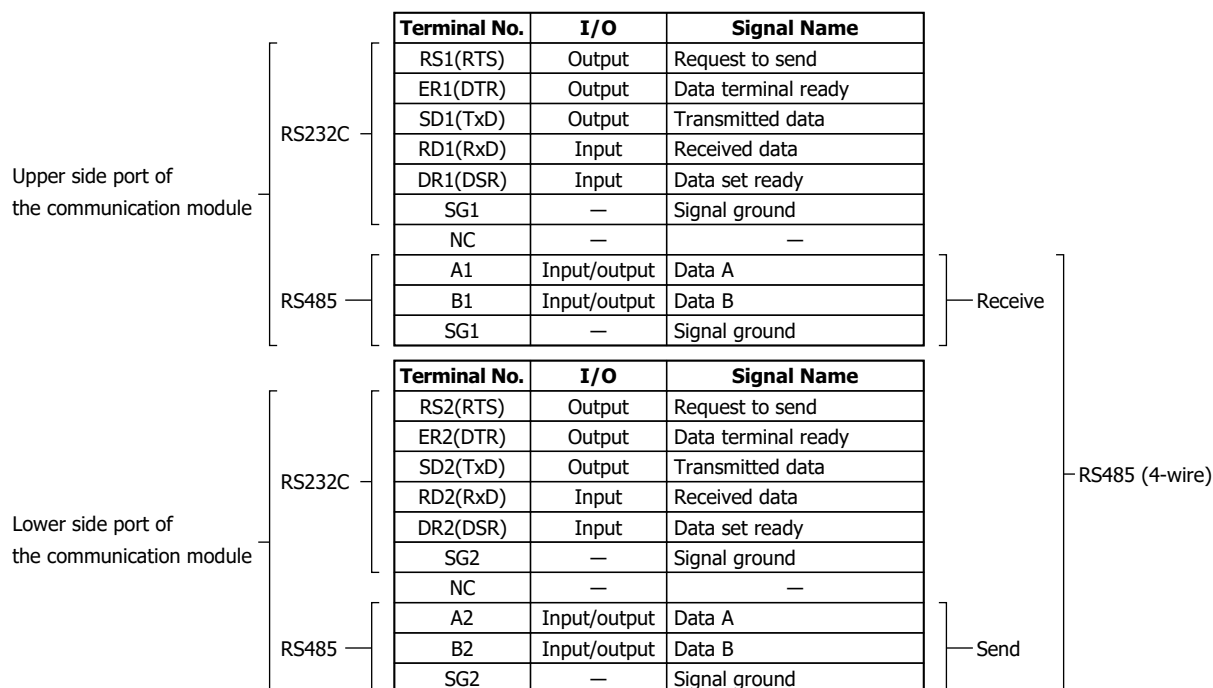
^{*2} When using a communication module.

^{*3} Plus CPU module only.

^{*4} For communication at 19,200 bps or higher, the timeout between characters needs to be a minimum of 0.75 ms.

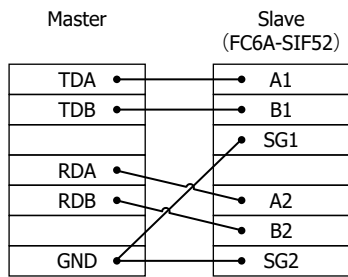
^{*5} For communication at 19,200 bps or higher, the timeout between frames needs to be a minimum of 1.75 ms.

Note: When configuring a communication module in the module configuration editor, you can set "RS485 (4-wire)" as the **Interface** for the **Communication Ports** in the **Function Area Settings**. When "RS485 (4-wire)" is set, two ports of the communication module are used as a single line.



6: MODBUS COMMUNICATION

Wiring example when "RS485 (4-wire)" is set:



Map of Slave Addresses for Modbus RTU Slaves

| Modbus Device Name | Modbus Address Map (Decimal) *1 | Communication Frame Address *2 | FC6A Device *3 | Applicable Function Code |
|--|---------------------------------|--------------------------------|-------------------------------------|--------------------------|
| Coil (000000 and above) | 000001 - 000516 | 0000 - 0203 | Q0 - Q643 | 1, 5, 15 |
| | 000701 - 000956 | 02BC - 03BB | R000 - R255 | |
| | 001001 - 003048 | 03E8 - 0BE7 | M0000 - M2557 | |
| | 003049 - 007400 | 0BE8 - 1CE7 | M2560 - M7997 | |
| | 009001 - 009256 | 2328 - 2427 | M8000 - M8317 | |
| | 009257 - 010600 | 2428 - 2967 | M8320 - M9997 | |
| | 011001 - 017000 | 2AF8 - 4267 | M10000 - M17497 | |
| | 017001 - 020000 | 4268 - 4E1F | M17500 - M21247 | |
| | 030001 - 030480 | 7530 - 770F | Q1000 - Q1597 | |
| | 030481 - 030960 | 7710 - 78EF | Q2000 - Q2597 | |
| | 030961 - 031440 | 78F0 - 7ACF | Q3000 - Q3597 | |
| | 031441 - 031920 | 7AD0 - 7CAF | Q4000 - Q4597 | |
| | 031921 - 032400 | 7CB0 - 7E8F | Q5000 - Q5597 | |
| | 032401 - 032880 | 7E90 - 806F | Q6000 - Q6597 | |
| | 032881 - 033360 | 8070 - 824F | Q7000 - Q7597 | |
| | 033361 - 033840 | 8250 - 842F | Q8000 - Q8597 | |
| | 033841 - 034320 | 8430 - 860F | Q9000 - Q9597 | |
| | 034321 - 034800 | 8610 - 87EF | Q10000 - Q10597 | |
| Input Relay (100000 and above) | 100001 - 100516 | 0000 - 0203 | I0 - I643 | 2 |
| | 101001 - 101256 | 03E8 - 04E7 | T000 - T255 (timer contact) | |
| | 101501 - 101756 | 05DC - 06DB | C000 - C255 (counter contact) | |
| | 102001 - 102768 | 07D0 - 0ACF | T256 - T1023 (timer contact) | |
| | 102769 - 103744 | 0AD0 - 0E9F | T1024 - T1999 (timer contact) | |
| | 104001 - 104256 | 0FA0 - 109F | C256 - C511 (counter contact) | |
| | 130001 - 130480 | 7530 - 770F | I1000 - I1597 | |
| | 130481 - 130960 | 7710 - 78EF | I2000 - I2597 | |
| | 130961 - 131440 | 78F0 - 7ACF | I3000 - I3597 | |
| | 131441 - 131920 | 7AD0 - 7CAF | I4000 - I4597 | |
| | 131921 - 132400 | 7CB0 - 7E8F | I5000 - I5597 | |
| | 132401 - 132880 | 7E90 - 806F | I6000 - I6597 | |
| | 132881 - 133360 | 8070 - 824F | I7000 - I7597 | |
| | 133361 - 133840 | 8250 - 842F | I8000 - I8597 | |
| | 133841 - 134320 | 8430 - 860F | I9000 - I9597 | |
| | 134321 - 134800 | 8610 - 87EF | I10000 - I10597 | |
| Input Register (300000 and above) | 300001 - 300256 | 0000 - 00FF | T000 - T255 (timer current value) | 4 |
| | 300501 - 300756 | 01F4 - 02F3 | C000 - C255 (counter current value) | |
| | 302001 - 302768 | 07D0 - 0ACF | T256 - T1023 (timer current value) | |
| | 302769 - 303744 | 0AD0 - 0E9F | T1024 - T1999 (timer current value) | |
| | 304001 - 304256 | 0FA0 - 109F | C256 - C511 (counter current value) | |
| Holding Register (400000 and above) | 400001 - 408000 | 0000 - 1F3F | D0000 - D7999 | 3,6,16 |
| | 408001 - 408500 | 1F40 - 2133 | D8000 - D8499 | |
| | 408501 - 408900 | 2134 - 22C3 | D8500 - D8899 | |
| | 409001 - 409256 | 2328 - 2427 | T000 - T255 (timer preset value) | 3 |
| | 409501 - 409756 | 251C - 261B | C000 - C255 (counter preset value) | |
| | 410001 - 456000 | 2710 - DABF | D10000 - D55999 | 3,6,16 |
| | 456001 - 462000 | DAC0 - F22F | D56000 - D61999 | |
| | 462001 - 462768 | F230 - F52F | T256 - T1023 (timer preset value) | 3 |
| | 462769 - 463744 | F530 - F8FF | T1024 - T1999 (timer preset value) | |
| | 464001 - 464256 | FA00 - FAFF | C256 - C511 (counter preset value) | |

*1 Addresses generally used for Modbus communication. "Calculating Modbus Addresses for FC6A Devices" on page 6-12 shows the method to calculate slave addresses from FC6A devices.

*2 These 4-digit addresses are used in the communication frame. To calculate the address used in communication frame, extract lower 5 digits of the Modbus address, subtract 1 from the value, and convert the result into hexadecimal.

*3 Access within the device range for the FC6A type used.

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Calculating Modbus Addresses for FC6A Devices

| FC6A Device | Calculating Modbus Address | Calculation Example |
|---|---|--|
| I, Q, M M XXXX X (2): Octal (1): Decimal | $((1) - (4)) \times 8 + (2) + (5)$ Minimum address Offset | Example: M325 $(32 - 0) \times 8 + 5 + 1001 = 1262$ Modbus address: 1262 $1262 - 1 = 1261 = 04ED$ Slave addresses in communication: 04ED |
| R, T, C, D D XXXXX (3): Decimal | $((3) - (4)) + (5)$ Minimum address Offset | Example: D756 $(756 - 0) + 400001 = 400757$ Modbus address: 400757 Extract lower 5 digits → 757 $757 - 1 = 756 = 02F4$ Slave addresses in communication: 02F4 |

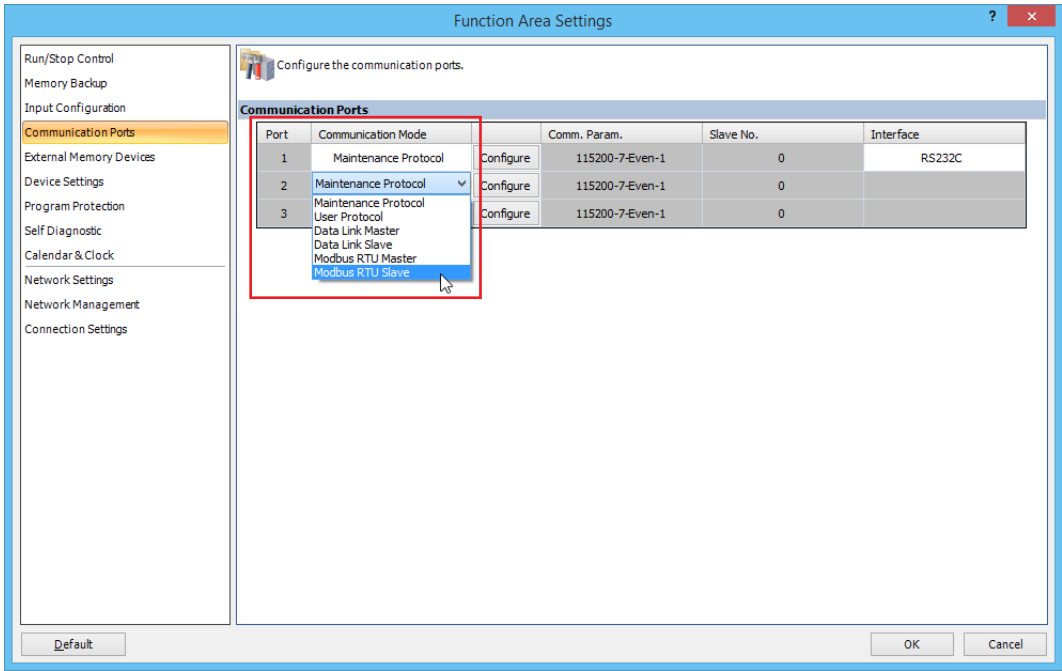
| Modbus Device Name | FC6A Device | Minimum Address (4) | Offset (5) |
|--------------------|-------------------------------------|---------------------|------------|
| Coil | Q0 - Q643 | 0 | 1 |
| | R000 - R255 | 0 | 701 |
| | M0000 - M2557 | 0 | 1001 |
| | M2560 - M7997 | 256 | 3049 |
| | M8000 - M8317 | 800 | 9001 |
| | M8320 - M9997 | 832 | 9257 |
| | M10000 - M17497 | 1000 | 11001 |
| | M17500 - M21247 | 1750 | 17001 |
| | Q1000 - Q1597 | 100 | 30001 |
| | Q2000 - Q2597 | 200 | 30481 |
| | Q3000 - Q3597 | 300 | 30961 |
| | Q4000 - Q4597 | 400 | 31441 |
| | Q5000 - Q5597 | 500 | 31921 |
| | Q6000 - Q6597 | 600 | 32401 |
| | Q7000 - Q7597 | 700 | 32881 |
| | Q8000 - Q8597 | 800 | 33361 |
| | Q9000 - Q9597 | 900 | 33841 |
| | Q10000 - Q10597 | 1000 | 34321 |
| Input Relay | I0 - I643 | 0 | 100001 |
| | T000 - T255 (timer contact) | 0 | 101001 |
| | C000 - C255 (counter contact) | 0 | 101501 |
| | T256 - T1023 (timer contact) | 256 | 102001 |
| | T1024 - T1999 (timer contact) | 1024 | 102769 |
| | C256 - C511 (counter contact) | 256 | 104001 |
| | I1000 - I1597 | 100 | 130001 |
| | I2000 - I2597 | 200 | 130481 |
| | I3000 - I3597 | 300 | 130961 |
| | I4000 - I4597 | 400 | 131441 |
| | I5000 - I5597 | 500 | 131921 |
| | I6000 - I6597 | 600 | 132401 |
| | I7000 - I7597 | 700 | 132881 |
| | I8000 - I8597 | 800 | 133361 |
| | I9000 - I9597 | 900 | 133841 |
| | I10000 - I10597 | 1000 | 134321 |
| Input Register | T000 - T255 (timer current value) | 0 | 300001 |
| | C000 - C255 (counter current value) | 0 | 300501 |
| | T256 - T1023 (timer current value) | 256 | 302001 |
| | T1024 - T1999 (timer current value) | 1024 | 302769 |
| | C256 - C511 (counter current value) | 256 | 304001 |

| Modbus Device Name | FC6A Device | Minimum Address (4) | Offset (5) |
|--------------------|------------------------------------|---------------------|------------|
| Holding Register | D0000 - D7999 | 0 | 400001 |
| | D8000 - D8499 | 8000 | 408001 |
| | D8500 - D8899 | 8500 | 408501 |
| | T000 - T255 (timer preset value) | 0 | 409001 |
| | C000 - C255 (counter preset value) | 0 | 409501 |
| | D10000 - D55999 | 10000 | 410001 |
| | D56000 - D61999 | 56000 | 456001 |
| | T256 - T1023 (timer preset value) | 256 | 462001 |
| | T1024 - T1999 (timer preset value) | 256 | 462769 |
| | C256 - C511 (counter preset value) | 256 | 464001 |

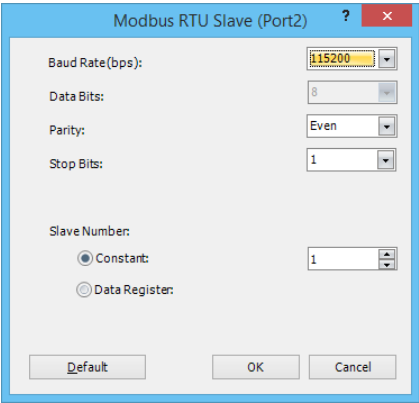
Programming Modbus Slave Using WindLDR

Modbus slave communication is programmed for Modbus RTU mode using WindLDR. Since these settings relate to the user program, the user program must be downloaded to the FC6A after changing any of these settings.

- 1. From the WindLDR menu bar, select **Configuration > Communication Ports**.
The **Function Area Settings** dialog box for Communication Ports appears.
- 2. In the Communication Mode pull-down list for Port, select **Modbus RTU Slave**.



- 3. Click the **Configure** button. The **Modbus RTU Slave** dialog box appears. Change settings, if required.



| | | |
|-----------------|-----------------|---|
| Baud Rate (bps) | 9600 | |
| | 19200 | |
| | 38400 | |
| | 57600 | |
| | 115200 | |
| Data Bits | 8 | |
| Parity | Even, Odd, None | |
| Stop Bits | 1 or 2 | |
| Slave Number | Constant | 1 to 247 |
| | Data register | The value in D8100 (port 1), D8102 (port 2), D8103 (port 3), D8040 to D8045 (port 4 to 9 ^{*1}), or D8735 to D8758 (port 10 to 33 ^{*1*2}) is used. |

*1 When using a communication module.
*2 Plus CPU module only.

- 4. Click the **OK** button to save changes.
- 5. Download the user program to the FC6A.
Now, programming for the Modbus slave is complete. Details about parameters and valid values are as follows.

Communication Protocol

This section describes the communication frame format used for Modbus RTU communication.

Modbus RTU Mode Communication Format

Request from Modbus Master

| | | | | | |
|------------------------|-----------|---------------|------|---------|------------------------|
| Idle 3.5 characters | Slave No. | Function Code | Data | CRC | Idle 3.5 characters |
| | 1 byte | 1 byte | | 2 bytes | |

ACK Reply from Modbus RTU Slave

| | | | | | |
|------------------------|-----------|---------------|------|---------|------------------------|
| Idle 3.5 characters | Slave No. | Function Code | Data | CRC | Idle 3.5 characters |
| | 1 byte | 1 byte | | 2 bytes | |

NAK Reply from Modbus RTU Slave

| | | | | | |
|------------------------|-----------|------------------------|------------|---------|------------------------|
| Idle 3.5 characters | Slave No. | Function Code + 80H | Error Code | CRC | Idle 3.5 characters |
| | 1 byte | 1 byte | 1 byte | 2 bytes | |

Note: Idle means no data flowing on the communication line.

Communication Frame Format

Modbus RTU mode requires a minimum of 3.5-character-long idle time between frames to determine the beginning of a frame. The FC6A Modbus master sends requests at idle intervals of 5 ms, which can be changed in the **Function Area Settings** dialog box.

Slave No.

The FC6A can be assigned slave numbers 1 through 247. In the 1:1 communication using RS232C, the same slave number must be set in the master and the FC6A.

Slave No. 0 is reserved for broadcast slave number and is used to write the same data to all Modbus RTU slaves. In this case, the Modbus RTU slaves do not send a reply to the master.

Modbus RTU Communication NG Reply Error Code

One of the following error codes is stored in NAK reply.

- 01h: Function code error (unsupported function code)
- 02h: Access destination error (address out of range, address+device quantity out of range)
- 03h: Device quantity error, 1-bit write data error

CRC

Modbus RTU mode uses CRC check codes.

• Modbus RTU Mode — Calculating the CRC-16 (cyclic redundancy checksum)

Calculate the BCC using CRC-16 for the range from the slave number to the byte immediately before the BCC. The generation polynomial is: $X^{16} + X^{15} + X^2 + 1$.

1. Take the exclusive OR (XOR) of FFFFh and the first 1-byte data at the slave number.
2. Shift the result by 1 bit to the right. When a carry occurs, take the exclusive OR (XOR) of A001h, then go to step 3. If not, directly go to step 3.
3. Repeat step 2, shifting 8 times.
4. Take the exclusive OR (XOR) of the result and the next 1-byte data.
5. Repeat step 2 through step 4 up to the byte immediately before the BCC.
6. Swap the higher and lower bytes of the result of step 5, and store the resultant CRC-16 to the BCC (CRC) position. (Example: 1234h → 34h, 12h)

Communication Format

This section describes the communication format for each function code from the slave number up to immediately before the check code.

Function Code 01 (Read Coil Status) and Function Code 02 (Read Input Status)

Function code 01 reads bit device statuses of Q (output), R (shift register), or M (internal relay). One through 2,000 consecutive bits can be read out.


Function code 02 reads bit device statuses of I (input), T (timer contact), or C (counter contact). One through 2,000 consecutive bits can be read out.

Communication Frame

Request from Modbus RTU Master

| Slave No. | Function Code | Address | No. of Bits |
|-----------|---------------|---------|-------------|
| xxh | 01h / 02h | xxxxh | xxxxh |

ACK Reply from Modbus RTU Slave

| Slave No. | Function Code | Quantity of Data | First 8 Bits | Second 8 Bits | | Last 8 Bits |
|-----------|---------------|------------------|--------------|---------------|---|-------------|
| xxh | 01h / 02h | xxh | xxh | xxh |  | xxh |

NAK Reply from Modbus RTU Slave

| Slave No. | Function Code | Error Code |
|-----------|---------------|------------|
| xxh | 81h / 82h | xxh |

Communication Example

| | |
|------------------|---|
| Purpose | Read 15 bits starting at output Q10. $Q10 \rightarrow (1 - 0) \times 8 + 0 + 1 = 9$ Modbus address: 9 $9 - 1 = 8 = 8h$ Communication frame address: 0008h |
| Condition | Slave No. 8 Q10 through Q27 binary data: 1234h |

• Modbus RTU Mode

| | |
|--|-----------------------|
| Request from Modbus RTU Master | 08 01 0008 0010 (CRC) |
| ACK Reply from Modbus RTU Slave | 08 01 02 34 12 (CRC) |
| NAK Reply from Modbus RTU Slave | 08 81 xx (CRC) |

Function Code 03 (Read Holding Registers) and Function Code 04 (Read Input Registers)

Function code 03 reads word device data of D (data register), T (timer preset value), or C (counter preset value). 1 through 125 consecutive words can be read out.

Function code 04 reads word device data of T (timer current value) or C (counter current value). 1 through 125 consecutive words can be read out.

Communication Frame**Request from Modbus RTU Master**

| Slave No. | Function Code | Address | No. of Words |
|-----------|---------------|---------|--------------|
| xxh | 03h / 04h | xxxxh | xxxxh |

ACK Reply from Modbus RTU Slave

| Slave No. | Function Code | Quantity of Data | First High Byte | First Low Byte | | Last Low Byte |
|-----------|---------------|------------------|-----------------|----------------|--|---------------|
| xxh | 03h / 04h | xxh | xxh | xxh | | xxh |

NAK Reply from Modbus RTU Slave

| Slave No. | Function Code | Error Code |
|-----------|---------------|------------|
| xxh | 83h / 84h | xxh |

Communication Example

| | |
|------------------|--|
| Purpose | Read 2 words starting at data register D1710. $D1710 \rightarrow (1710 - 0) + 400001 = 401711$ Modbus address: 401711 Extract lower 5 digits $\rightarrow 1711$ $1711 - 1 = 1710 = 6AEh$ Communication frame address: 06AEh |
| Condition | Slave No. 8 D1710 data: 1234h D1711 data: 5678h |

- Modbus RTU Mode**

| | |
|--|----------------------------|
| Request from Modbus RTU Master | 08 03 06AE 0002 (CRC) |
| ACK Reply from Modbus RTU Slave | 08 03 04 12 34 56 78 (CRC) |
| NAK Reply from Modbus RTU Slave | 08 83 xx (CRC) |

Function Code 05 (Force Single Coil)

Function code 05 changes a bit device status of Q (output), R (shift register), or M (internal relay).

Communication Frame

Request from Modbus RTU Master

| Slave No. | Function Code | Address | OFF: 0000h ON: FF00h |
|-----------|---------------|---------|-------------------------|
| xxh | 05h | xxxxh | xxxxh |

ACK Reply from Modbus RTU Slave

| Slave No. | Function Code | Address | OFF: 0000h ON: FF00h |
|-----------|---------------|---------|-------------------------|
| xxh | 05h | xxxxh | xxxxh |

NAK Reply from Modbus RTU Slave

| Slave No. | Function Code | Error Code |
|-----------|---------------|------------|
| xxh | 85h | xxh |

Communication Example

| | |
|------------------|--|
| Purpose | Force internal relay M1320 on. $M1320 \rightarrow (132 - 0) \times 8 + 0 + 1001 = 2057$ Modbus address: 2057 $2057 - 1 = 2056 = 808h$ Communication frame address: 0808h |
| Condition | Slave No. 8 |

• Modbus RTU Mode

| | |
|--|-----------------------|
| Request from Modbus RTU Master | 08 05 0808 FF00 (CRC) |
| ACK Reply from Modbus RTU Slave | 08 05 0808 FF00 (CRC) |
| NAK Reply from Modbus RTU Slave | 08 85 xx (CRC) |

Function Code 06 (Preset Single Register)

Function code 06 changes word device data of D (data register).

Communication Frame**Request from Modbus RTU Master**

| Slave No. | Function Code | Address | New Data |
|-----------|---------------|---------|----------|
| xxh | 06h | xxxxh | xxxxh |

ACK Reply from Modbus RTU Slave

| Slave No. | Function Code | Address | Acknowledge Data |
|-----------|---------------|---------|------------------|
| xxh | 06h | xxxxh | xxxxh |

NAK Reply from Modbus RTU Slave

| Slave No. | Function Code | Error Code |
|-----------|---------------|------------|
| xxh | 86h | xxh |

Communication Example

| | |
|------------------|---|
| Purpose | Write 8000 to data register D1708. $D1708 \rightarrow (1708 - 0) + 400001 = 401709$ Modbus address: 401709 Extract lower 5 digits $\rightarrow 1709$ $1709 - 1 = 1708 = 6ACh$ Communication frame address: 06ACh |
| Condition | Slave No. 8 |

- Modbus RTU Mode**

| | |
|--|-----------------------|
| Request from Modbus RTU Master | 08 06 06AC 1F40 (CRC) |
| ACK Reply from Modbus RTU Slave | 08 06 06AC 1F40 (CRC) |
| NAK Reply from Modbus RTU Slave | 08 86 xx (CRC) |

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Function Code 15 (Force Multiple Coils)

Function code 15 changes bit device statuses of Q (output), R (shift register), or M (internal relay). One through 1,968 consecutive bits can be changed.

Communication Frame

Request from Modbus RTU Master

| Slave No. | Function Code | Address | No. of Bits | Quantity of Data | First 8 Bits | Second 8 Bits | Last 8 Bits |
|-----------|---------------|---------|-------------|------------------|--------------|---------------|-------------|
| xxh | 0Fh | xxxxh | xxxxh | xxh | xxh | xxh | xxh |

ACK Reply from Modbus RTU Slave

| Slave No. | Function Code | Address | No. of Bits |
|-----------|---------------|---------|-------------|
| xxh | 0Fh | xxxxh | xxxxh |

NAK Reply from Modbus RTU Slave

| Slave No. | Function Code | Error Code |
|-----------|---------------|------------|
| xxh | 8Fh | xxh |

Communication Example

| | | | | | | | | |
|-----------|--|---------------|---------------|---------------|---------------|---------------|--------------|---------------|
| Purpose | Write the following bit statuses to internal relays M605 through M624. | | | | | | | |
| | | | | | | M605 (ON) | M606 (ON) | M607 (OFF) |
| | M610 (ON) | M611 (OFF) | M612 (ON) | M613 (ON) | M614 (OFF) | M615 (OFF) | M616 (ON) | M617 (OFF) |
| | M620 (OFF) | M621 (OFF) | M622 (OFF) | M623 (OFF) | M624 (OFF) | | | |
| | M605 (LSB) through M614 (MSB) binary data: 6B | | | | | | | |
| | M615 (LSB) through M624 (MSB) binary data: 02 | | | | | | | |
| | $M605 \rightarrow (60 - 0) \times 8 + 5 + 1001 = 1486$ | | | | | | | |
| | Modbus address: 1486 | | | | | | | |
| | $1486 - 1 = 1485 = 5CDh$ | | | | | | | |
| | Communication frame address: 05CDh | | | | | | | |
| Condition | Slave No. 8 | | | | | | | |

• Modbus RTU Mode

| | |
|--|--------------------------------|
| Request from Modbus RTU Master | 08 0F 05CD 0010 02 6B 02 (CRC) |
| ACK Reply from Modbus RTU Slave | 08 0F 05CD 0010 (CRC) |
| NAK Reply from Modbus RTU Slave | 08 8F xx (CRC) |

Function Code 16 (Preset Multiple Registers)

Function code 16 changes word device data of D (data register). One through 123 consecutive words can be changed.

Communication Frame**Request from Modbus RTU Master**

| Slave No. | Function Code | Address | No. of Words | Quantity of Data | First High Byte | First Low Byte | | Last Low Byte |
|-----------|---------------|---------|--------------|------------------|-----------------|----------------|--|---------------|
| xxh | 10h | xxxxh | xxxxh | xxh | xxh | xxh | | xxh |

ACK Reply from Modbus RTU Slave

| Slave No. | Function Code | Address | No. of Words |
|-----------|---------------|---------|--------------|
| xxh | 10h | xxxxh | xxxxh |

NAK Reply from Modbus RTU Slave

| Slave No. | Function Code | Error Code |
|-----------|---------------|------------|
| xxh | 90h | xxh |

Communication Example

| | |
|------------------|---|
| Purpose | Write the following data to four data registers D1708 through D1711. D1708 D1709 D1710 D1711 (1234h) (5678h) (ABCDh) (EF01h) D1708 → (1708 – 0) + 400001 = 401709 Modbus address: 401709 Extract lower 5 digits → 1709 1709 – 1 = 1708 = 6ACh Communication frame address: 06ACh |
| | |
| Condition | Slave No. 8 |

- Modbus RTU Mode**

| | |
|--|--|
| Request from Modbus RTU Master | 08 10 06AC 0004 08 12 34 56 78 AB CD EF 01 (CRC) |
| ACK Reply from Modbus RTU Slave | 08 10 06AC 0004 (CRC) |
| NAK Reply from Modbus RTU Slave | 08 90 xx (CRC) |

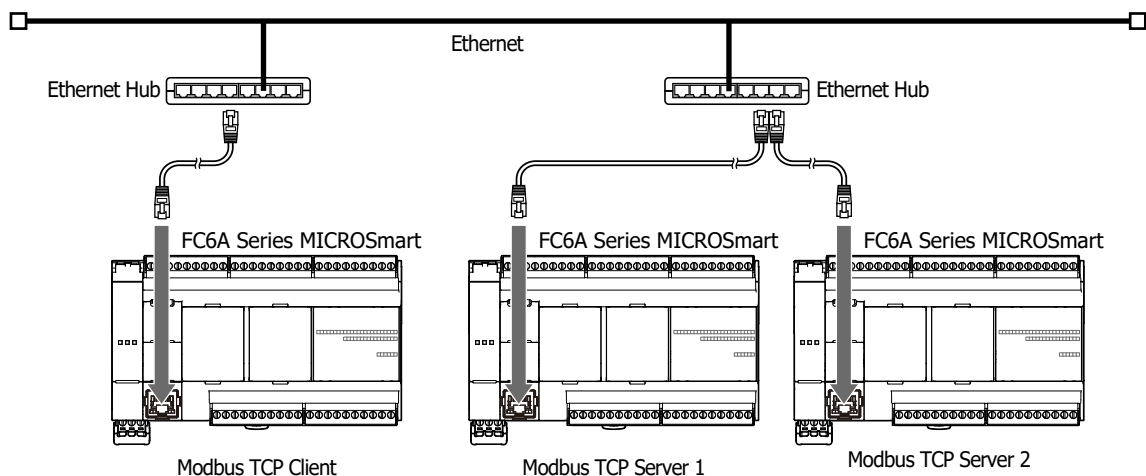
Modbus TCP Communication via Ethernet Communication

The FC6A supports Modbus TCP clients and Modbus TCP servers. Connect the Ethernet port 1 and Ethernet port 2 (Plus CPU module only) on the FC6A to enable the FC6A to communicate with Modbus TCP compliant devices.

When configured as a Modbus TCP client, the FC6A can monitor and change the data memory of the network devices supporting Modbus TCP server. A maximum of eight connections for the All-in-One CPU module/CAN J1939 All-in-One CPU module and 16 connections for the Plus CPU module can be allocated to Modbus TCP clients. Each connection can communicate with multiple Modbus TCP server devices (1 to 255).

When the FC6A is configured as a Modbus TCP server, the device data of the FC6A can be monitored and changed from Modbus TCP client devices. A maximum of eight connections for the All-in-One CPU module/CAN J1939 All-in-One CPU module and 16 connections for the Plus CPU module can be allocated to Modbus TCP servers.

For the Modbus TCP client function and how to configure it, see "Modbus TCP Client" on page 6-23. For the Modbus TCP server function and how to configure it, see "Modbus TCP Server" on page 6-28.



Modbus TCP Client

When configured as a Modbus TCP client, the FC6A sends communication requests to a Modbus TCP server to read/write data. Each communication request is sent to a Modbus Server according to the configured request table.

Modbus TCP client communication settings and request tables for Modbus TCP servers can be configured using the WindLDR **Function Area Settings**. The FC6A communicate with the Modbus TCP servers according to those settings.

Communication with Modbus TCP servers are performed in sync with the user program execution, and the communication data is processed at the END, in the order of request numbers specified in the request table. In Plus CPU module Modbus TCP client communication, the Plus CPU module can perform Modbus TCP communication for the first 128 requests without disconnecting the connection with the Modbus TCP server. For 129 and subsequent requests, the connection with the Modbus TCP server will be connected and disconnected each time Modbus TCP communication is performed.

Modbus TCP Client Specifications

| Parameter | Modbus TCP Client |
|------------------------|--|
| Receive Timeout *1 | 100 to 25,500 ms (in increments of 100 ms) |
| Transmission wait time | 0 to 5,000 ms (0 ms) |

*1 Specifies the period of time before receiving a response frame from a server.

| Request Execution Device | Start/stop |
|--------------------------|--|
| Used | When request execution devices are designated in the Modbus TCP Client request table, internal relays or data register bits (as many as the request quantity) are allocated to execute Modbus TCP Client communication. For example, when internal relay M0 is designated as the request execution device, M0 is allocated to request No. 1, M1 to request No. 2, and so on. To execute a request, turn on the corresponding request execution device. When communication is completed, the request execution device turns off automatically. When it is required to send requests continuously, keep the corresponding request execution device on using a SET or OUT instruction. When request execution devices are not designated, all requests programmed in the request table are executed continuously. |
| Unused | The internal relays or data register bits are allocated in the order of requests. |
| Auto ping linking | Whether or not to send a request from the Modbus TCP client can be controlled with online status on/off via auto ping linking. This eliminates unnecessary timeouts by not sending requests to remote hosts that are not part of the network. For details on auto ping linking, see "Auto Ping Function" on page 3-28. |

The FC6A operation when combining the request execution setting is as follows.

| Request Execution Setting | | Auto Ping Linking | |
|---------------------------|------------|---|--|
| | | Do Not Use | Use |
| Request execution device | Do not use | Always send all requests. | Send the applicable request only when the online status is on, and when it is off, do not send the applicable request. |
| | Use | Send the applicable request only when the communication execution device is on, and when it is off, do not send the applicable request. | Send the applicable request only when the online status and the communication execution device are both on, and do not send the applicable request in all other cases. |

Communication Completion and Communication Error

Modbus communication finishes when a read or write process is completed successfully or when a communication error occurs.

A communication error occurs when communication failure has repeated three times. When a communication error occurs, the request is canceled and the next request is processed. When the error status data register is designated, the communication status of each request can be confirmed.

Communication Error Data

When Error Status is configured in the Request Table from the **Function Area Settings**, the error data of each request can be confirmed.

6: MODBUS COMMUNICATION

| Use a single DR for all communication requests | Error data of each communication request |
|--|--|
| Unchecked | Error data, the remote host number (high-order byte) and error code (low-order byte), of each request in the entire request table can be confirmed. Data registers as many as the quantity of requests are reserved for storing error data. When an error occurs for a request, error data is stored to the corresponding data register. |
| Checked | A single data register is shared by all requests. When an error occurs for a request, error data is stored to the data register and the old error data is overwritten. |

| Bit Allocation | |
|---|---|
| Remote Host Number (high-order byte) | 1 to 255 |
| Error Code (low-order byte) | 00h: Normal completion 01h: Function code error (unsupported function code) 02h: Access destination error (address out of range, address+device quantity out of range) 03h: Device quantity error, 1-bit write data error (specified device quantity of 1-bit write is unsupported) 12h: Frame length error (frame length of transmitted request exceeds range) 13h: BCC error (BCC does not match) 14h: Slave number error (received slave number is invalid) 16h: Timeout error (timeout occurs) |

Keep established connections

When the check box is selected, the Plus CPU module Modbus TCP client communication performs Modbus TCP communication by constantly connecting to the Modbus TCP server (while keeping connections with other remote hosts). The setting is done for each request table. The maximum number of connections that can be kept is 128. When the check box is cleared and the remote host for the next request is different from the remote host for the previous request, the connection is terminated. When they are the same, the connection is kept.

Modbus TCP Communication Request Table

A maximum of 255 requests can be configured in the Modbus TCP Client Request Table.

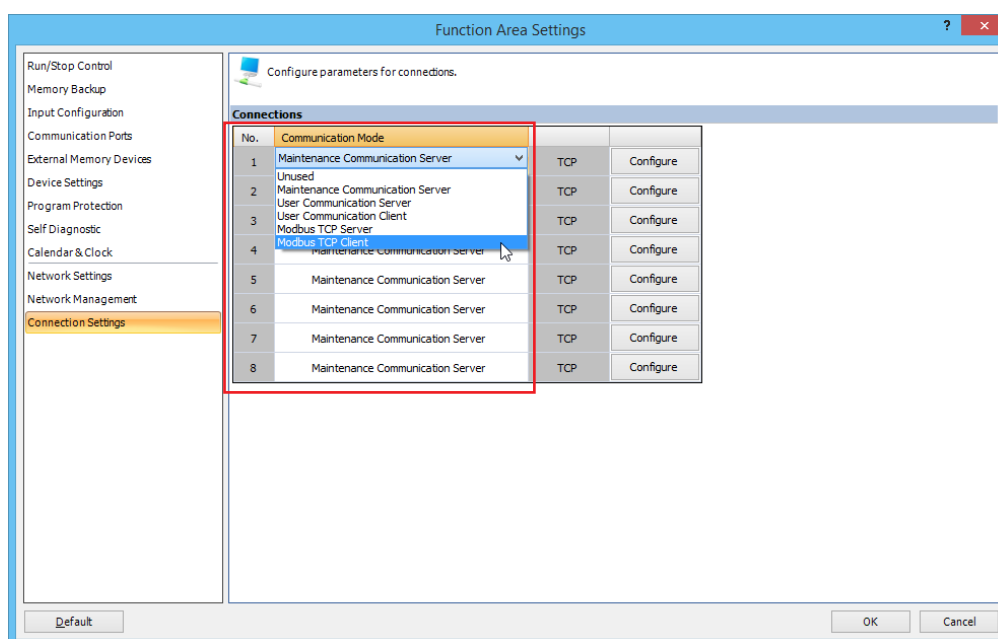
Notes:

- 10 bytes of the user program area are needed per each request.
- Request execution devices and error status data registers are allocated in the order of request numbers. When deleting a request or changing the order of requests, the relationship of the request to the request execution devices and error status data register is changed. If the allocated internal relays or data registers are used in the user program, those device addresses must be updated accordingly.

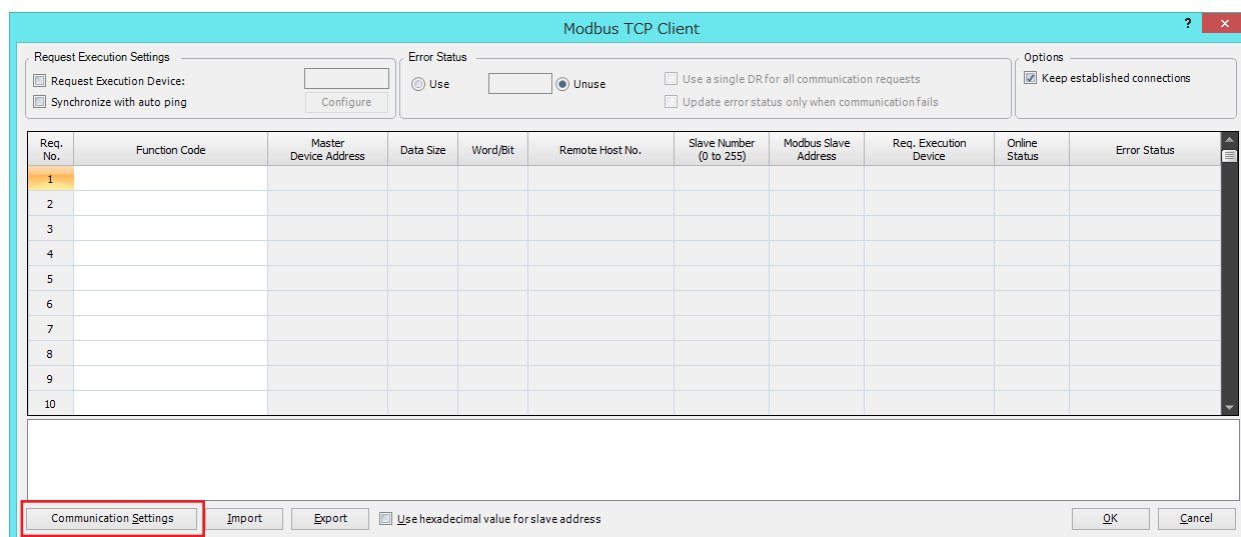
Programming WindLDR (Modbus TCP Client)

In order to use the Modbus TCP client, configure the Modbus TCP client in the **Function Area Settings** dialog box and then download the user program to the FC6A.

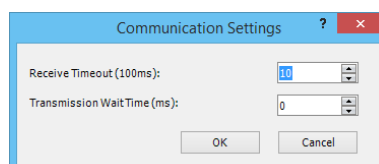
1. From the WindLDR menu bar, select **Configuration > Connection Settings**.
The **Function Area Settings** dialog box appears.
2. Select **Modbus TCP Client** as the communication mode for the connection 1.



The **Modbus TCP Client** dialog box appears.



3. Click on the **Communication Settings** button.
The **Communication Settings** dialog box appears. Configure the receive timeout and the transmission wait time.
Click **OK**.



6: MODBUS COMMUNICATION

4. Configure the requests of the Modbus TCP Client.

A maximum of 255 requests can be entered in one request table. Specify the Modbus TCP servers with the remote host numbers. After all requests are configured, click **OK** button to close the dialog box.

Choose to use **Request Execution Devices** and **Error Status** data registers if necessary. When using **Request Execution Devices** and **Error Status** data registers, enter the first number of the devices.

5. Download the user program to the FC6A.

Programming for the Modbus TCP client is complete. Details about parameters and valid values are as follows.

Function Code

The Modbus TCP of the FC6A supports eight function codes as listed in the table below. Supported function codes and valid slave addresses vary with each Modbus server device to communicate with. Configure the function codes according to the specifications of the Modbus server devices.

| Function Code | Data Size | Slave Address | FC6A as Modbus Slave |
|------------------------------|-----------------|-----------------|---|
| 01 Read Coil Status | 1 to 2,000 bits | 000001 - 065535 | Reads bit device statuses of Q (output), R (shift register), or M (internal relay). |
| 02 Read Input Status | 1 to 2,000 bits | 100001 - 165535 | Reads bit device statuses of I (input), T (timer contact), or C (counter contact). |
| 03 Read Holding Registers | 1 to 125 words | 400001 - 465535 | Reads word device data of D (data register), T (timer preset value), or C (counter preset value). |
| 04 Read Input Registers | 1 to 125 words | 300001 - 365535 | Reads word device data of T (timer current value) or C (counter current value). |
| 05 Force Single Coil | 1 bit | 000001 - 065535 | Changes a bit device status of Q (output), R (shift register), or M (internal relay). |
| 06 Preset Single Register | 1 word | 400001 - 465535 | Changes word device data of D (data register). |
| 15 Force Multiple Coils | 1 to 1,968 bits | 000001 - 065535 | Changes multiple bit device statuses of Q (output), R (shift register), or M (internal relay). |
| 16 Preset Multiple Registers | 1 to 123 words | 400001 - 465535 | Changes multiple word device data of D (data register). |

Master Device Address

When function code 01, 02, 03, or 04 is selected to read data from Modbus servers, designate the first data register or internal relay number to store the data received from the Modbus server. When function code 05, 06, 15, or 16 is selected to write data to Modbus servers, designate the first data register or internal relay number to store the data to write to the Modbus server. Data registers and internal relays can be designated as the master device address.

Data Size and Word/Bit

Designate the quantity of data to read or write. The valid data size depends on the function code. When function code 01, 02, 05, or 15 is selected, designate the data size in bits. When function code 03, 04, 06, or 16 is selected, designate the data size in words. For valid data sizes, see "Function Code" on page 6-26.

Remote Host No.

Designate the remote host number configured in the Remote Host List dialog box. In the Remote Host List dialog box, IP address and port number are configured for each remote host. The default port number of Modbus TCP communication is 502. If the Modbus TCP server uses a different port number, configure that port number in the Remote Host List dialog box.

Slave No.

Designate slave numbers 0 through 255. The same slave number can be designated repeatedly for different request numbers which can be 1 through 255. If the Modbus TCP Server will not reference the slave number, set the slave number to any desired number.

Slave Address

Designate data memory addresses of Modbus servers. The valid slave address range depends on the function code. For valid slave addresses, see the table above. The allocations of memory addresses vary with each Modbus server device. Refer to manuals for each Modbus server device.

Request Execution Device

To use request execution devices, click the radio button for "Use" and designate the first internal relay or data register in the Modbus TCP Client Request Table. Internal relays or data register bits used for executing requests are automatically listed in the table. To execute a request, turn on the corresponding request execution device.

When request execution devices are not designated, all requests programmed in the Request Table are executed continuously.

Error Status Data Register

To use error status data registers, click the radio button for "Use" and designate the first data register in the Modbus TCP Client Request Table. Data registers used for storing error statuses are automatically listed in the table. When **Use a single DR for all communication requests** is selected, the first data register is shared by all requests.

Modbus TCP Server

When the FC6A is configured as the Modbus TCP server, Modbus TCP client devices can read/write data to the FC6A. When the FC6A receives a valid request from a Modbus TCP client device, the data is read or written according to the request received. The communication data received from Modbus TCP clients is processed at the END processing of the user program.

Modbus TCP Server Specifications

| Parameter | Modbus TCP Server |
|--|---|
| Slave Number | Ignored |
| Number of Clients that can Access Simultaneously*1 | All-in-One CPU module/CAN J1939 All-in-One CPU module: 8 (1 client per 1 connection) Plus CPU module: 16 (1 client per 1 connection) |
| Port Number | 502 (can be changed between 0 and 65535) |
| Supported Function Code | 01 Read Coil Status 02 Read Input Status 03 Read Holding Registers 04 Read Input Registers 05 Force Single Coil 06 Preset Single Register 15 Force Multiple coils 16 Preset Multiple Registers |

*1 The number of connections when all eight connections for the All-in-One CPU module/CAN J1939 All-in-One CPU module and 16 connections for the Plus CPU module are set to Modbus TCP server.

Map of Slave Addresses for the Modbus TCP Server

Modbus TCP client can access the Modbus devices (Coil, Input Relay, Input Register, and Holding Register) of Modbus server to read or write the device data (I, Q, M, R, T, C, and D) of FC6A. Refer to the following table to configure the Modbus TCP clients.

| Modbus Device Name | Slave Addresses | Slave Addresses in Communication*1 | FC6A Device*2 | Applicable Function Code |
|----------------------------|-----------------|------------------------------------|-----------------|--------------------------|
| Coil (000000 and above) | 000001 - 000516 | 0000 - 0203 | Q0 - Q643 | 1,5,15 |
| | 000701 - 000956 | 02BC - 03BB | R000 - R255 | |
| | 001001 - 003048 | 03E8 - 0BE7 | M0000 - M2557 | |
| | 003049 - 007400 | 0BE8 - 1CE7 | M2560 - M7997 | |
| | 009001 - 009256 | 2328 - 2427 | M8000 - M8317 | |
| | 009257 - 010600 | 2428 - 2967 | M8320 - M9997 | |
| | 011001 - 017000 | 2AF8 - 4267 | M10000 - M17497 | |
| | 017001 - 020000 | 4268 - 4E1F | M17500 - M21247 | |
| | 030001 - 030480 | 7530 - 770F | Q1000 - Q1597 | |
| | 030481 - 030960 | 7710 - 78EF | Q2000 - Q2597 | |
| | 030961 - 031440 | 78F0 - 7ACF | Q3000 - Q3597 | |
| | 031441 - 031920 | 7AD0 - 7CAF | Q4000 - Q4597 | |
| | 031921 - 032400 | 7CB0 - 7E8F | Q5000 - Q5597 | |
| | 032401 - 032880 | 7E90 - 806F | Q6000 - Q6597 | |
| | 032881 - 033360 | 8070 - 824F | Q7000 - Q7597 | |
| | 033361 - 033840 | 8250 - 842F | Q8000 - Q8597 | |
| | 033841 - 034320 | 8430 - 860F | Q9000 - Q9597 | |
| | 034321 - 034800 | 8610 - 87EF | Q10000 - Q10597 | |

| Modbus Device Name | Slave Addresses | Slave Addresses in Communication ^{*1} | FC6A Device ^{*2} | Applicable Function Code |
|--|-----------------|--|-------------------------------------|--------------------------|
| Input Relay (100000 and above) | 100001 - 100516 | 0000 - 0203 | I0 - I643 | 2 |
| | 101001 - 101256 | 03E8 - 04E7 | T000 - T255 (timer contact) | |
| | 101501 - 101756 | 05DC - 06DB | C000 - C255 (counter contact) | |
| | 102001 - 102768 | 07D0 - 0ACF | T256 - T1023 (timer contact) | |
| | 102769 - 103744 | 0AD0 - 0E9F | T1024 - T1999 (timer contact) | |
| | 104001 - 104256 | 0FA0 - 109F | C256 - C511 (counter contact) | |
| | 130001 - 130480 | 7530 - 770F | I1000 - I1597 | |
| | 130481 - 130960 | 7710 - 78EF | I2000 - I2597 | |
| | 130961 - 131440 | 78F0 - 7ACF | I3000 - I3597 | |
| | 131441 - 131920 | 7AD0 - 7CAF | I4000 - I4597 | |
| | 131921 - 132400 | 7CB0 - 7E8F | I5000 - I5597 | |
| | 132401 - 132880 | 7E90 - 806F | I6000 - I6597 | |
| | 132881 - 133360 | 8070 - 824F | I7000 - I7597 | |
| | 133361 - 133840 | 8250 - 842F | I8000 - I8597 | |
| | 133841 - 134320 | 8430 - 860F | I9000 - I9597 | |
| | 134321 - 134800 | 8610 - 87EF | I10000 - I10597 | |
| Input Register (300000 and above) | 300001 - 300256 | 0000 - 00FF | T000 - T255 (timer current value) | 4 |
| | 300501 - 300756 | 01F4 - 02F3 | C000 - C255 (counter current value) | |
| | 302001 - 302768 | 07D0 - 0ACF | T256 - T1023 (timer current value) | |
| | 302769 - 303744 | 0AD0 - 0E9F | T1024 - T1999 (timer current value) | |
| | 304001 - 304256 | 0FA0 - 109F | C256 - C511 (counter current value) | |
| Holding Register (400000 and above) | 400001 - 408000 | 0000 - 1F3F | D0000 - D7999 | 3,6,16 |
| | 408001 - 408500 | 1F40 - 2133 | D8000 - D8499 | |
| | 408501 - 408900 | 2134 - 22C3 | D8500 - D8899 | |
| | 409001 - 409256 | 2328 - 2427 | T000 - T255 (timer preset value) | 3 |
| | 409501 - 409756 | 251C - 261B | C000 - C255 (counter preset value) | |
| | 410001 - 456000 | 2710 - DABF | D10000 - D55999 | 3,6,16 |
| | 456001 - 462000 | DAC0 - F22F | D56000 - D61999 | |
| | 462001 - 462768 | F230 - F52F | T256 - T1023 (timer preset value) | 3 |
| | 462769 - 463744 | F530 - F8FF | T1024 - T1999 (timer preset value) | |
| | 464001 - 464256 | FA00 - FAFF | C256 - C511 (counter preset value) | |

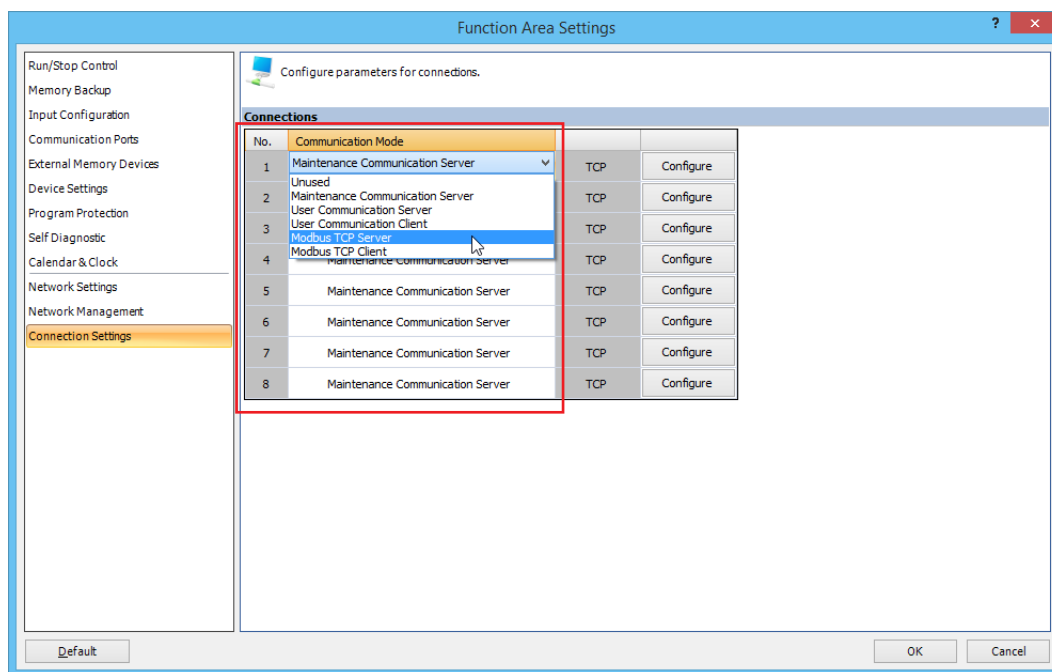
*1 Slave addresses in communication are 4-digit values used in the address portion of the communication frame. Subtract 1 from the lower 5 digits of the slave address and store that value in hexadecimal. For details, see "Modbus RTU Slave Communication" on page 6-9.

*2 Access within the device range for the FC6A type used.

Programming WindLDR (Modbus TCP Server)

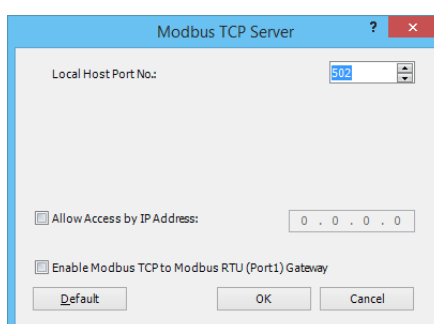
In order to use Modbus TCP server, configure the Modbus TCP server in the **Function Area Settings** dialog box and then download the user program to the FC6A.

1. From the WindLDR menu bar, select **Configuration > Connection Settings**.
The **Function Area Settings** dialog box appears.
2. Select **Modbus TCP Server** as the communication mode for connection 1.



The **Modbus TCP Server** dialog box appears.

3. Configure the parameters and click on **OK** button.



Note: For details about each parameter, see the following page.

4. Download the user program to the FC6A.

Programming for the Modbus TCP server is complete.

Modbus TCP Server Communication Settings

Local Host Port No.

Configure the local host port number between 0 and 65,535. The same local host port number can be used with multiple connection numbers.

If the same port number is used with multiple connections, Modbus TCP clients (as many as the number of the connections) can communicate with FC6A through the same port number.

Allow Access by IP Address

You can set the IP address for a device to permit access. By setting the allowed IP address, only the device with the specified IP address can establish a connection with the FC6A and communicate with the Modbus TCP server. When the same local host port number is configured in multiple connections, all the allowed IP address settings are effective. If a connection in which the allowed IP address is not configured uses the same local host port number, arbitrary access is allowed through the port.

- Example 1) If two connections use the same local port number and an allowed IP address is not configured for both connections, access from a total of two clients with any IP addresses is accepted.
- Example 2) If two connections use the same local port number and 192.168.1.101 and 192.168.1.102 are configured as the allowed IP addresses, access from a total of two clients whose IP addresses are 192.168.1.101 and 192.168.1.102 is accepted.
- Example 3) If connection 1 and 2 use the same local port number, an allowed IP address 192.168.1.101 is configured for connection 1, and the allowed IP address is not configured for connections, access from a total of two clients with any IP addresses is accepted.

Modbus TCP Communication Format

This section describes the communication format used for Modbus TCP client and server communication. Modbus TCP communication format starts with the Modbus TCP header followed by the RTU mode communication format without the idle 3.5 characters at both ends and CRC as shown below.

Modbus TCP Communication Format

| | | | | | | | |
|-------------------------------|-------------|------------------------|-----------|---------------|---------|---------|---------------------|
| Transaction ID | Protocol ID | Message Length (bytes) | Unit ID | Function Code | Data | | |
| 2 bytes | 2 bytes | 2 bytes | 1 byte | 1 byte | N bytes | | |
| Modbus TCP Header | | | | | | | |
| RTU Mode Communication Format | | Idle 3.5 characters | Slave No. | Function Code | Data | CRC | Idle 3.5 characters |
| | | | 1 byte | 1 byte | N bytes | 2 bytes | |

Transaction ID

The Modbus TCP server (slave) returns the request ID sent from the client (master) without any change. When receiving the returned request ID, the client can confirm to which request the response was returned. When confirmation is not required, designate 0 as a transaction ID.

Protocol ID

Designate 0 to identify Modbus TCP protocol.

Message Length

Designate the length of the following message in bytes.

Unit ID

The ID for identifying the device. Store the slave number of the Modbus TCP server. The FC6A Modbus TCP server accepts and processes requests when the unit ID of the received request is not 0. When the unit ID is 0, the received request is processed as broadcast communication and no response is returned to the Modbus TCP client.

Function Code

Designate a function code, such as 01 (read coil status) and 02 (read input status).

Data

Designate required data for each function.

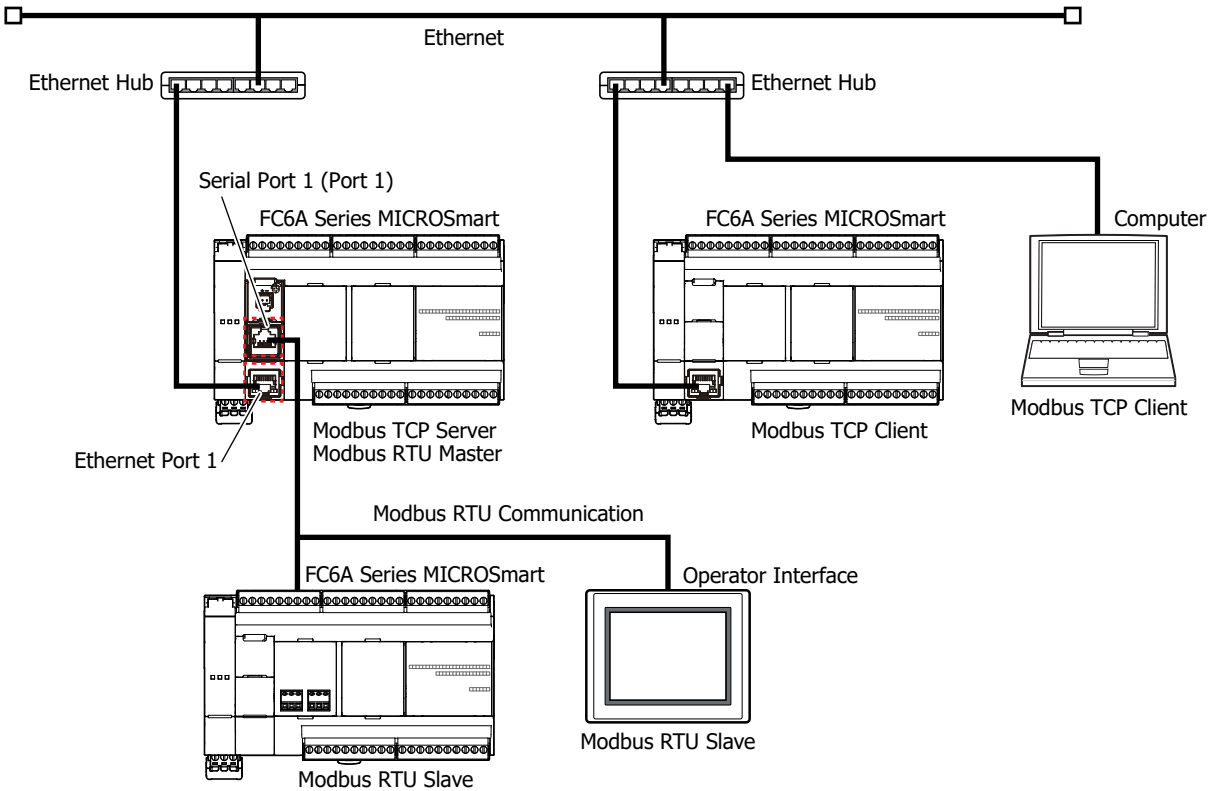
Modbus RTU Pass-Through Function

The Modbus RTU pass-through function allows a Modbus TCP client connected to a Modbus TCP network to access a Modbus RTU slave connected to a Modbus RTU network. Modbus RTU pass-through is supported in the All-in-One CPU module and the Plus CPU module but not supported in CAN J1939 All-in-One CPU module.

For the All-in-One CPU module, this function can read and write device information on a Modbus RTU slave device connected to serial port 1 of the FC6A from the Modbus TCP client device connected to Ethernet port 1.

The Modbus RTU pass-through function is only supported between Ethernet port 1 and the serial port 1 on the FC6A.

For the Plus CPU module, a Modbus RTU slave device connected to port 1 to 33 of the Plus CPU module can be selected and device information can be read and written from the Modbus TCP client device connected to Ethernet port 1 or 2. The Modbus RTU pass-through function is only supported between Ethernet port 1 and 2 and port 1 to 33 on the Plus CPU module.



Modbus TCP Communication Format in the Modbus RTU Pass-Through Function

The Modbus RTU pass-through function deletes the Modbus TCP headers from the Modbus TCP communication frame received by the Modbus TCP server and sends the frames with a CRC added to the "Unit ID", "Function code", and "Description" frames to the Modbus RTU slave specified by the unit ID.

The Modbus TCP communication format in the Modbus RTU pass-through function is as follows.

Modbus TCP Communication Format

| Transaction ID | Protocol ID | Message Length (bytes) | Unit ID | Function Code | Description |
|----------------|-------------|------------------------|---------|---------------|-------------|
| 2 bytes | 2 bytes | 2 bytes | 1 byte | 1 byte | N bytes |

Modbus TCP Header

RTU Mode Communication Format

| | | | | | |
|----------------|-----------|---------------|-------------|---------|----------------|
| "Idle" | Slave No. | Function Code | Description | CRC | "Idle" |
| 3.5 characters | 1 byte | 1 byte | N bytes | 2 bytes | 3.5 characters |

Transaction ID

The Modbus TCP server returns the transaction ID from the client as is. The client can confirm to which request the response was returned. Enter 0 when there is no particular check to perform.

Protocol ID

This number indicates the Modbus TCP protocol and is 0.

Message Length

Represents the length of the message that follows in bytes.

Unit ID

The ID for identifying the device. It stores the slave number of the Modbus RTU slave. The Unit ID and subsequent frames are passed through to the Modbus RTU network.

If 255 is specified for the unit ID, the frames are processed by the Modbus TCP server (local station) and not passed through to the Modbus RTU slave.

Function Code

The function number such as reading or writing.

Description

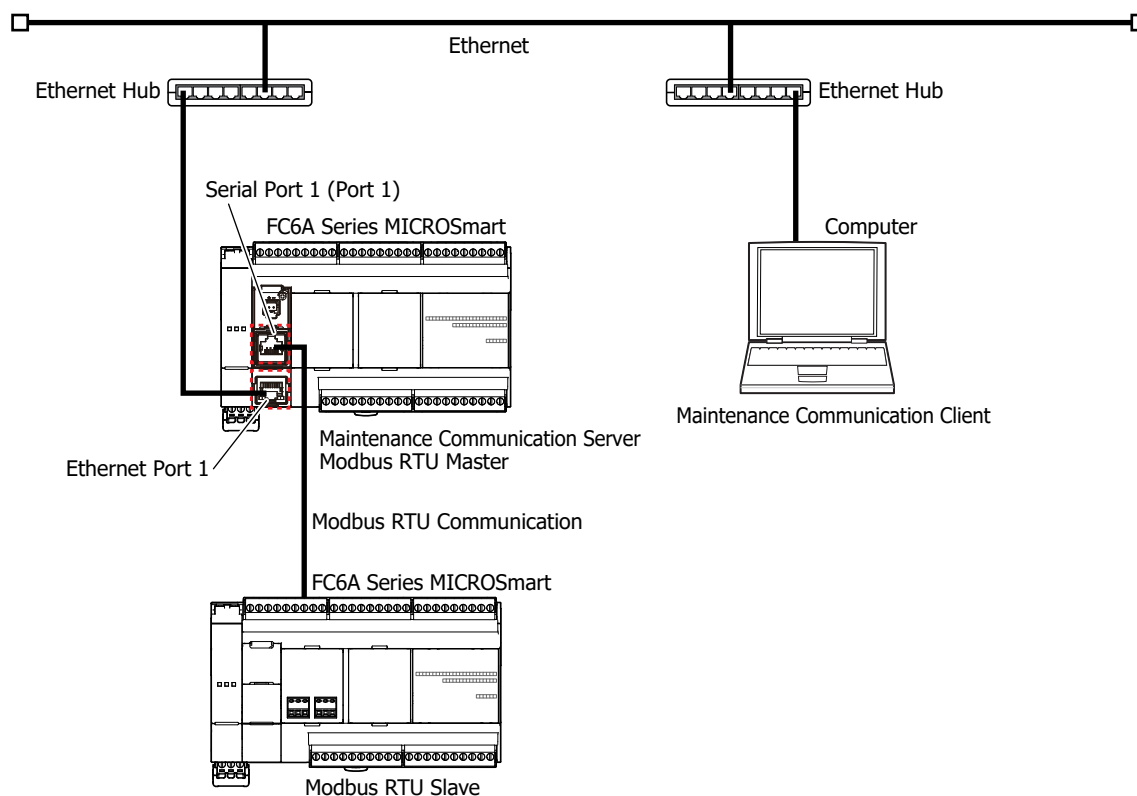
The data required for processing.

Modbus RTU Pass-Through Function Specifications

| | | |
|--|-------------------------------|---|
| Supported Port | Ethernet Communication | All-in-One CPU module: Ethernet port 1 Plus CPU module: Ethernet port 1 and 2 |
| | Serial Communication | All-in-One CPU module: port 1 Plus CPU module: port 1 to 33 |
| Communication Mode | | Modbus TCP server (slave) and Modbus RTU master |
| Enable/disable Settings | | Configure in Function Area Settings . * There is no limit on the number of server connections that can be enabled. * Can be used in combination with pass-through through the maintenance communication server. |
| Specifying the Pass-Through Destination | | Specify the Modbus RTU slave for pass-through with the Modbus TCP communication frame unit ID. When the Modbus RTU pass-through function is enabled Unit ID (0 to 254): Modbus RTU pass-through is performed. Unit ID (255): Processed by the Modbus TCP server. When the Modbus RTU pass-through function is disabled Unit ID (0 to 255): Processed by the Modbus TCP server. |
| Available Number of Bytes for Communication | | 512 bytes * Data (a frame) that exceeds 512 bytes cannot be passed through with the pass-through function. When more than 512 bytes of data are received, that data including the previously received data is discarded. |
| Pass-Through Operation | | When the unit ID (slave station number) is not 255, the FC6A issues a pass-through request to communication port and waits for a response from the Modbus RTU slave. When the unit ID is 255, the FC6A handles the request as communication to the local station and returns a response to the Modbus TCP client. When there are pass-through requests via the ModbusTCP Server, those requests are processed with a higher priority than the communication requests of the ModbusRTU master. |

Modbus RTU Pass-Through Using the Maintenance Communication Server

When the FC6A is set as a maintenance communication server, it can access Modbus RTU slaves connected to a Modbus RTU network. From a maintenance communication client, such as WindLDR or Data File Manager installed in a remote computer, devices of an FC6A set as a Modbus RTU slave can be read and written and project data can be downloaded and uploaded through an FC6A (Modbus RTU Master) connected to Ethernet.

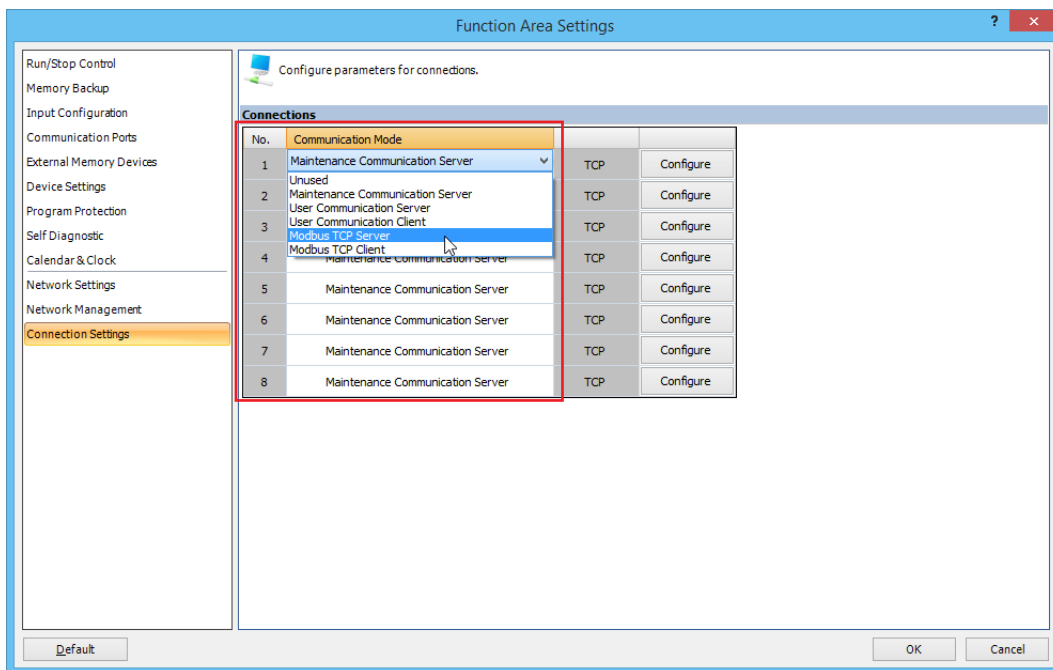


Modbus RTU Pass-Through Function Settings

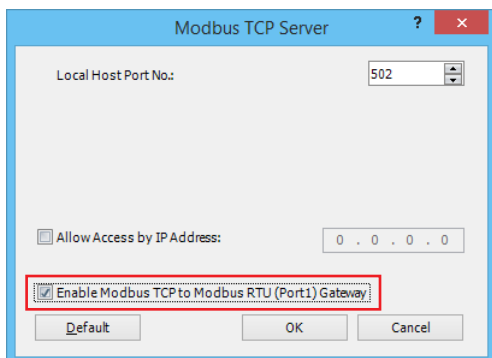
Programming WindLDR

To use the Modbus RTU pass-through function, download a user program to the FC6A configured in **Function Area Settings**. All-in-One CPU module

1. On the WindLDR **Configuration** tab, in the **Function Area Settings** group, click **Connection Settings**. The **Function Area Settings** dialog box is displayed.
2. Click **Communication Mode** for **Port 1** and select **Modbus TCP Server**. The **Modbus TCP Server** dialog box is displayed.

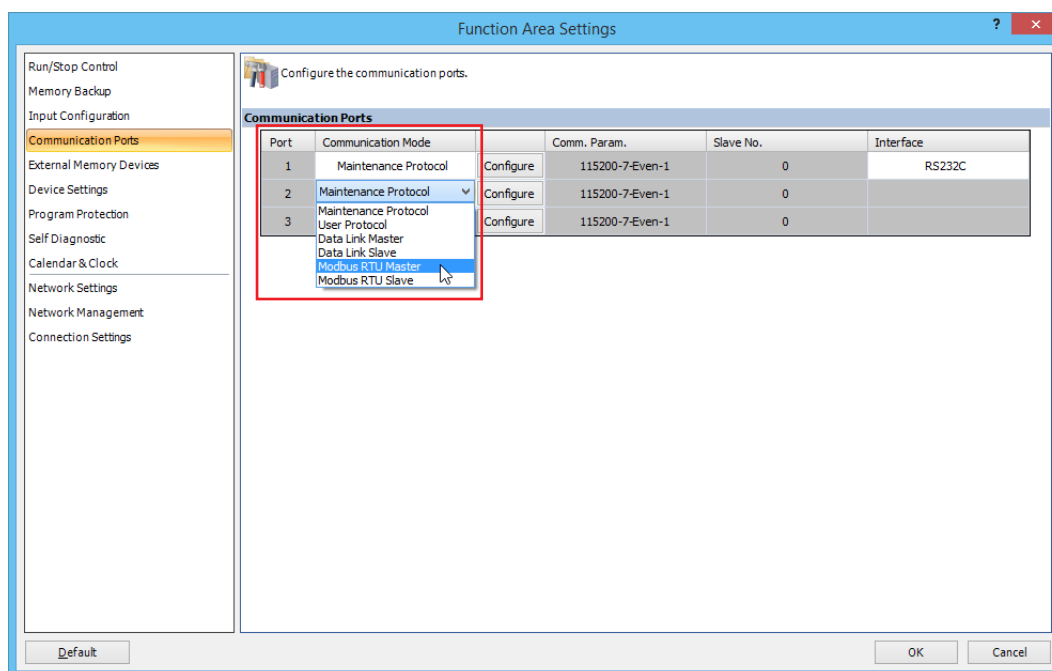


3. Select the **Enable Modbus TCP to Modbus RTU (Port1) Gateway** check box and configure the local host port number and the allow access by IP address. Specify a number that is different from the other server connections for the local host port number of the port that will use the pass-through function.



4. Click **OK**.

5. Click **Communication Mode** for **Port 1** and select **Modbus RTU Master**.
The **Modbus RTU Master Request Table** dialog box is displayed.



6. Configure the **Modbus RTU Master Request Table** dialog box items.
For details, see "Modbus RTU Master Communication" on page 6-3.

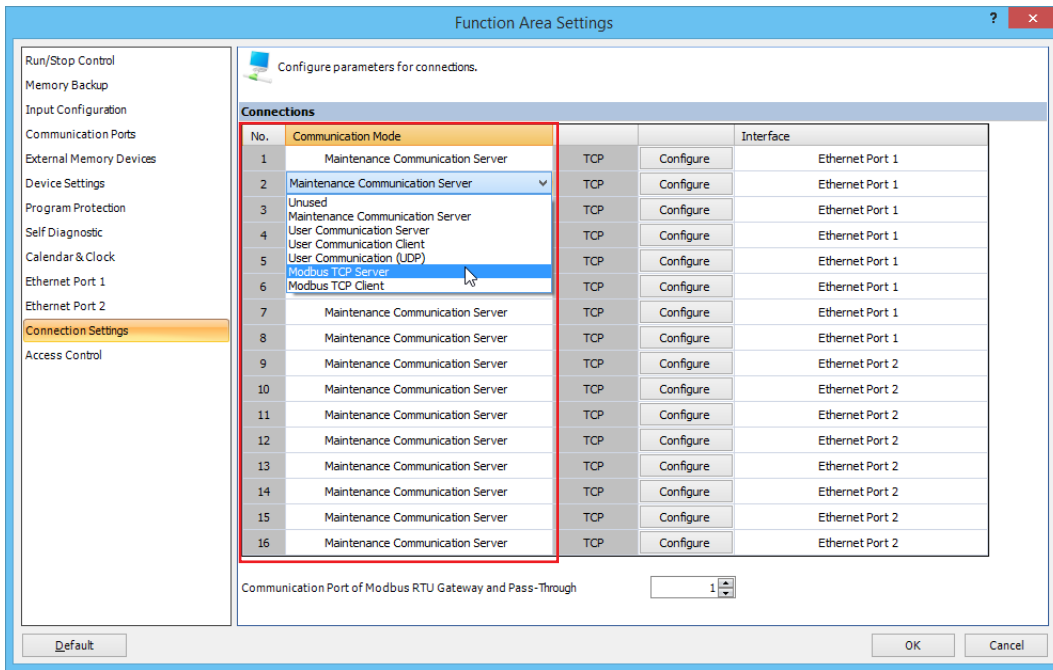
7. Download the user program to the FC6A.

This concludes configuring the settings to use the Modbus RTU pass-through function.

6: MODBUS COMMUNICATION

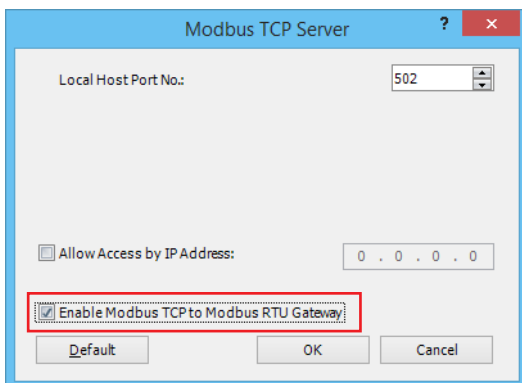
Plus CPU module

1. On the WindLDR **Configuration** tab, in the **Function Area Settings** group, click **Connection Settings**.
The **Function Area Settings** dialog box is displayed.
2. Click **Communication Mode** for the connection number that will be used and select **Modbus TCP Server**.
The **Modbus TCP Server** dialog box is displayed.



Note: For Modbus RTU pass-through using the maintenance communication server, select **Maintenance Communication Server**.
The **Maintenance Communication Server** dialog box is displayed.

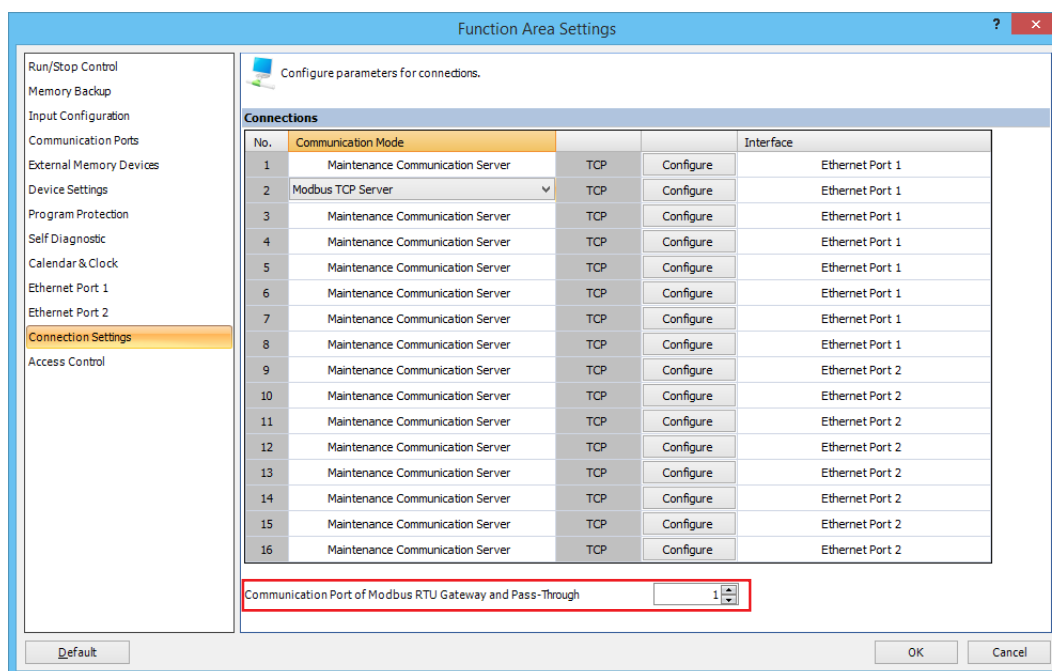
3. Select the **Enable Modbus TCP to Modbus RTU Gateway** check box and configure the local host port number and allow access by IP address.
Set a number that is different from the other server connections for the local host port number of the port that will use the pass-through function.



Note: For the **Maintenance Communication Server** dialog box, select the **Enable Pass-Through over Modbus RTU** check box and configure the local host port number and allow access by IP address.

4. Click **OK**.

5. With **Communication Port of Modbus RTU Gateway and Pass-Through**, set the port number that will be used (1 to 33).



6. Download the user program to the FC6A.

This concludes configuring the settings to use the Modbus RTU pass-through function.

7: DATA LINK COMMUNICATION

Introduction

This chapter describes the data link communication function used to set up a distributed control system.

In data link communication, data can be exchanged between a master station and slave stations by connecting a maximum of 31 slave station FC6A to a master station FC6A. The master station has a total of 13 words worth of data registers for each slave station: 6 words for sending data to the slave station, 6 words for receiving data from the slave station, and 1 word for the communication status/error. Each slave station has a total of 13 words worth of data registers: 6 words for sending data to the master station, 6 words for receiving data from the master station, and 1 word for the communication status/error.

Data link communication proceeds independently of the user program execution, and the data registers for the data link communication are updated at the END processing.

The FC6A data link function is compatible with the data link functions of the FC5A and FC4A.

One CPU module can be either a master station or a slave station. Data link master and slave cannot be used at the same time.

Communication Ports Used in Data Link Communication

Supported models and communication ports are as follows.

| Communication Port | All-in-One CPU Module | | | CAN J1939 All-in-One CPU Module | Plus CPU Module | |
|--------------------|-------------------------------|-------------------|-------------------|---------------------------------|--------------------------------|-------------------|
| | 16-I/O Type | 24-I/O Type | 40-I/O Type | | Plus 16-I/O Type | Plus 32-I/O Type |
| Port 1 | Yes | Yes | Yes | — | Yes ^{*2} | Yes ^{*2} |
| Port 2 | Yes ^{*1} | Yes ^{*1} | Yes ^{*1} | Yes ^{*1} | Yes ^{*2} | Yes ^{*2} |
| Port 3 | — | — | Yes ^{*1} | Yes ^{*1} | Yes ^{*3} | Yes ^{*3} |
| Port 4 to 33 | Yes (3 maximum) ^{*4} | | | | Yes (15 maximum) ^{*5} | |

*1 When an RS232C communication cartridge or RS485 communication cartridge is connected.

*2 When a cartridge base module and an RS232C communication cartridge or RS485 communication cartridge are connected.

*3 When the HMI module and an RS232C communication cartridge or RS485 communication cartridge are connected.

*4 Up to three communication modules can be connected to the All-in-One CPU module and CAN J1939 All-in-One CPU module, expanding the communication ports 4 to 9.

*5 Up to 15 communication modules can be connected to the Plus CPU module, expanding the communication ports 4 to 33.

Data Link Specifications

| Mode | Details |
|-------------------------|--|
| Electric Specifications | Compliance with EIA RS485 |
| Baud Rate | 19,200, 38,400, 57,600 bps |
| Synchronization | Start-stop synchronization |
| | Start bit: 1 |
| | Data bits: 7 |
| | Parity: Even |
| | Stop bit: 1 |
| Communication Cable | Shielded twisted pair cable |
| Maximum Cable Length | 200 m (656 feet) |
| Maximum Slave Stations | 31 slave stations |
| Transmit/Receive Data | Transmit data: 186 words maximum, Receive data: 186 words maximum 0 through 6 words each for transmission and receiving per slave station |

Data Updating

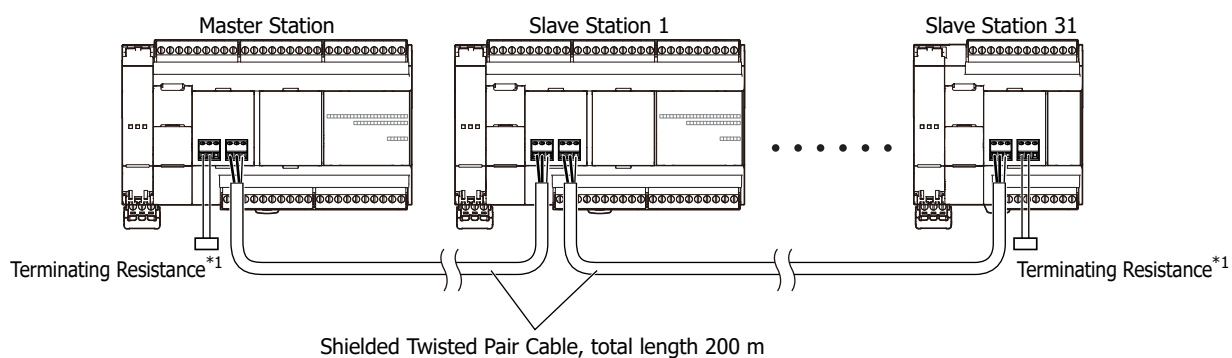
| Mode | Details |
|---------------------------------|---|
| Effect on Scan Time | Communication processing between masters and slaves is not synchronized with the user program, and there is no effect on the scan time. |
| Data Update Timing | Data updating for both masters and slaves is performed in END processing. The update timing can be checked with the communication completed flag. |
| Master-compatible Models | FC6A (FC4A Series MICROSmart/FC5A Series MICROSmart) |
| Slave-compatible Models | FC6A (FC4A Series MICROSmart/FC5A Series MICROSmart) |

The master station sends the appropriate amount of data (in units of words) to the slave stations. The slave stations that received this transmission send an amount of data matching the number of words received to the master station. In this way data is exchanged. The data refresh is performed on the master and slave stations during the END processing. The master station can only exchange data with one slave station during one communication cycle.

If 31 slave stations are connected, the master station requires 31 communication cycles to exchange data with all slave stations. The master station turns on the communication complete relay for only one scan after the completion of the communication cycle with a slave station.

Data Link System Setup

The data link function can be used by setting port 1 of the FC6A to RS-485 or by using a RS-485 communication cartridge in port 2 or port 3.



*1 When communication quality is unstable, add terminating resistance matched to the characteristic impedance to both ends. Use resistance with a rating of 1/2 W or higher.

7: DATA LINK COMMUNICATION

Data Register Allocation for Transmit/Receive Data

The master station has 12 data registers assigned for data communication with each slave station. Each slave station has 12 data registers assigned for data communication with the master station. When data is set in data registers at the master station assigned for data link communication, the data is sent to the corresponding data registers at a slave station. When data is set in data registers at a slave station assigned for data link communication, the data is sent to the corresponding data registers at the master station.

Master Station

| Slave Station Number | Data Register | Transmit/Receive Data | Slave Station Number | Data Register | Transmit/Receive Data |
|----------------------|---------------|----------------------------|----------------------|---------------|----------------------------|
| Slave 1 | D900-D905 | Transmit data to slave 1 | Slave 17 | D1092-D1097 | Transmit data to slave 17 |
| | D906-D911 | Receive data from slave 1 | | D1098-D1103 | Receive data from slave 17 |
| Slave 2 | D912-D917 | Transmit data to slave 2 | Slave 18 | D1104-D1109 | Transmit data to slave 18 |
| | D918-D923 | Receive data from slave 2 | | D1110-D1115 | Receive data from slave 18 |
| Slave 3 | D924-D929 | Transmit data to slave 3 | Slave 19 | D1116-D1121 | Transmit data to slave 19 |
| | D930-D935 | Receive data from slave 3 | | D1122-D1127 | Receive data from slave 19 |
| Slave 4 | D936-D941 | Transmit data to slave 4 | Slave 20 | D1128-D1133 | Transmit data to slave 20 |
| | D942-D947 | Receive data from slave 4 | | D1134-D1139 | Receive data from slave 20 |
| Slave 5 | D948-D953 | Transmit data to slave 5 | Slave 21 | D1140-D1145 | Transmit data to slave 21 |
| | D954-D959 | Receive data from slave 5 | | D1146-D1151 | Receive data from slave 21 |
| Slave 6 | D960-D965 | Transmit data to slave 6 | Slave 22 | D1152-D1157 | Transmit data to slave 22 |
| | D966-D971 | Receive data from slave 6 | | D1158-D1163 | Receive data from slave 22 |
| Slave 7 | D972-D977 | Transmit data to slave 7 | Slave 23 | D1164-D1169 | Transmit data to slave 23 |
| | D978-D983 | Receive data from slave 7 | | D1170-D1175 | Receive data from slave 23 |
| Slave 8 | D984-D989 | Transmit data to slave 8 | Slave 24 | D1176-D1181 | Transmit data to slave 24 |
| | D990-D995 | Receive data from slave 8 | | D1182-D1187 | Receive data from slave 24 |
| Slave 9 | D996-D1001 | Transmit data to slave 9 | Slave 25 | D1188-D1193 | Transmit data to slave 25 |
| | D1002-D1007 | Receive data from slave 9 | | D1194-D1199 | Receive data from slave 25 |
| Slave 10 | D1008-D1013 | Transmit data to slave 10 | Slave 26 | D1200-D1205 | Transmit data to slave 26 |
| | D1014-D1019 | Receive data from slave 10 | | D1206-D1211 | Receive data from slave 26 |
| Slave 11 | D1020-D1025 | Transmit data to slave 11 | Slave 27 | D1212-D1217 | Transmit data to slave 27 |
| | D1026-D1031 | Receive data from slave 11 | | D1218-D1223 | Receive data from slave 27 |
| Slave 12 | D1032-D1037 | Transmit data to slave 12 | Slave 28 | D1224-D1229 | Transmit data to slave 28 |
| | D1038-D1043 | Receive data from slave 12 | | D1230-D1235 | Receive data from slave 28 |
| Slave 13 | D1044-D1049 | Transmit data to slave 13 | Slave 29 | D1236-D1241 | Transmit data to slave 29 |
| | D1050-D1055 | Receive data from slave 13 | | D1242-D1247 | Receive data from slave 29 |
| Slave 14 | D1056-D1061 | Transmit data to slave 14 | Slave 30 | D1248-D1253 | Transmit data to slave 30 |
| | D1062-D1067 | Receive data from slave 14 | | D1254-D1259 | Receive data from slave 30 |
| Slave 15 | D1068-D1073 | Transmit data to slave 15 | Slave 31 | D1260-D1265 | Transmit data to slave 31 |
| | D1074-D1079 | Receive data from slave 15 | | D1266-D1271 | Receive data from slave 31 |
| Slave 16 | D1080-D1085 | Transmit data to slave 16 | — | | |
| | D1086-D1091 | Receive data from slave 16 | | | |

If any slave stations are not connected, master station data registers which are assigned to the vacant slave stations can be used as ordinary data registers.

Slave Station

| Data | Data Register | Transmit/Receive Data |
|--------------------|---------------|----------------------------------|
| Slave Station Data | D900-D905 | Transmit data to master station |
| | D906-D911 | Receive data from master station |

Slave station data registers D912 through D1271 can be used as ordinary data registers.

Special Data Registers for Data Link Communication Error

In addition to data registers assigned for data communication, the master station has 31 special data registers and each slave station has one special data register to store data link communication error codes. If any communication error occurs in the data link system, communication error codes are set to a corresponding data register for link communication error at the master station and to data register D8069 at the slave station. For details of link communication error codes, see below.

If a communication error occurs in the data link communication system, the data is resent two times. If the error still exists after three attempts, then the error code is set to the data registers for data link communication error. Since the error code is not communicated between the master and slave stations, error codes must be cleared individually.

Master Station

| Special Data Register | Data Link Communication Error Data | Special Data Register | Data Link Communication Error Data |
|-----------------------|--------------------------------------|-----------------------|--------------------------------------|
| D8069 | Slave station 1 communication error | D8085 | Slave station 17 communication error |
| D8070 | Slave station 2 communication error | D8086 | Slave station 18 communication error |
| D8071 | Slave station 3 communication error | D8087 | Slave station 19 communication error |
| D8072 | Slave station 4 communication error | D8088 | Slave station 20 communication error |
| D8073 | Slave station 5 communication error | D8089 | Slave station 21 communication error |
| D8074 | Slave station 6 communication error | D8090 | Slave station 22 communication error |
| D8075 | Slave station 7 communication error | D8091 | Slave station 23 communication error |
| D8076 | Slave station 8 communication error | D8092 | Slave station 24 communication error |
| D8077 | Slave station 9 communication error | D8093 | Slave station 25 communication error |
| D8078 | Slave station 10 communication error | D8094 | Slave station 26 communication error |
| D8079 | Slave station 11 communication error | D8095 | Slave station 27 communication error |
| D8080 | Slave station 12 communication error | D8096 | Slave station 28 communication error |
| D8081 | Slave station 13 communication error | D8097 | Slave station 29 communication error |
| D8082 | Slave station 14 communication error | D8098 | Slave station 30 communication error |
| D8083 | Slave station 15 communication error | D8099 | Slave station 31 communication error |
| D8084 | Slave station 16 communication error | — | — |

If any slave stations are not connected, master station data registers which are assigned to the vacant slave stations can be used as ordinary data registers.

Slave Station

| Special Data Register | Data Link Communication Error Data |
|-----------------------|------------------------------------|
| D8069 | Slave station communication error |

Note: Slave station data registers D8070 through D8099 can be used as ordinary data registers.

Data Link Communication Error Code

When an error occurs during the data link, the data is sent again (the operation is retried) up to twice.

If an error occurs on the third attempt to send the data, the error number is set in the data register for the communication status/error of the master station and the corresponding slave station.

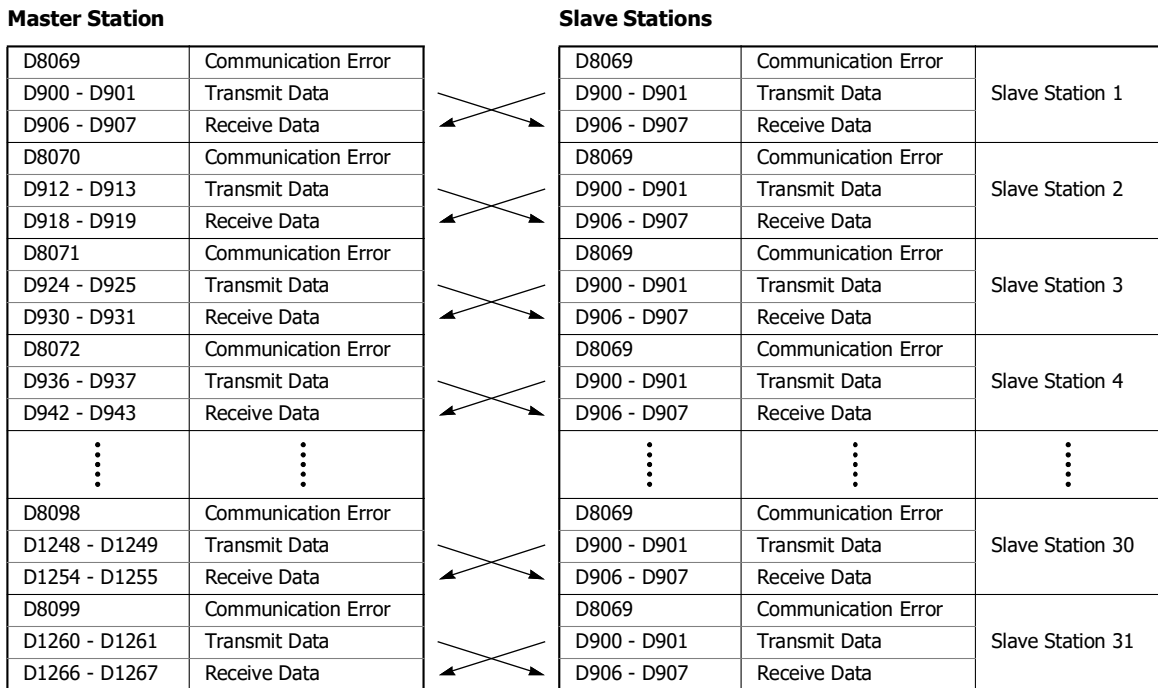
| Error Code | Error Details |
|-----------------|---|
| 1h (1) | Overrun error (data is received when the receive data registers are full) |
| 2h (2) | Framing error (failure to detect start or stop bit) |
| 4h (4) | Parity error (an error was found by the parity check) |
| 8h (8) | Receive timeout (line disconnection) |
| 10h (16) | BCC (block check character) error (disparity with data received up to BCC) |
| 20h (32) | Retry cycle over (error occurred in all 3 trials of communication) |
| 40h (64) | I/O definition quantity error (discrepancy of transmit/receive station number or data quantity) |

When more than one error is detected in the data link system, the total of error codes is indicated. For example, when framing error (error code 2h) and BCC error (error code 10h) are found, error code 12h (18) is stored.

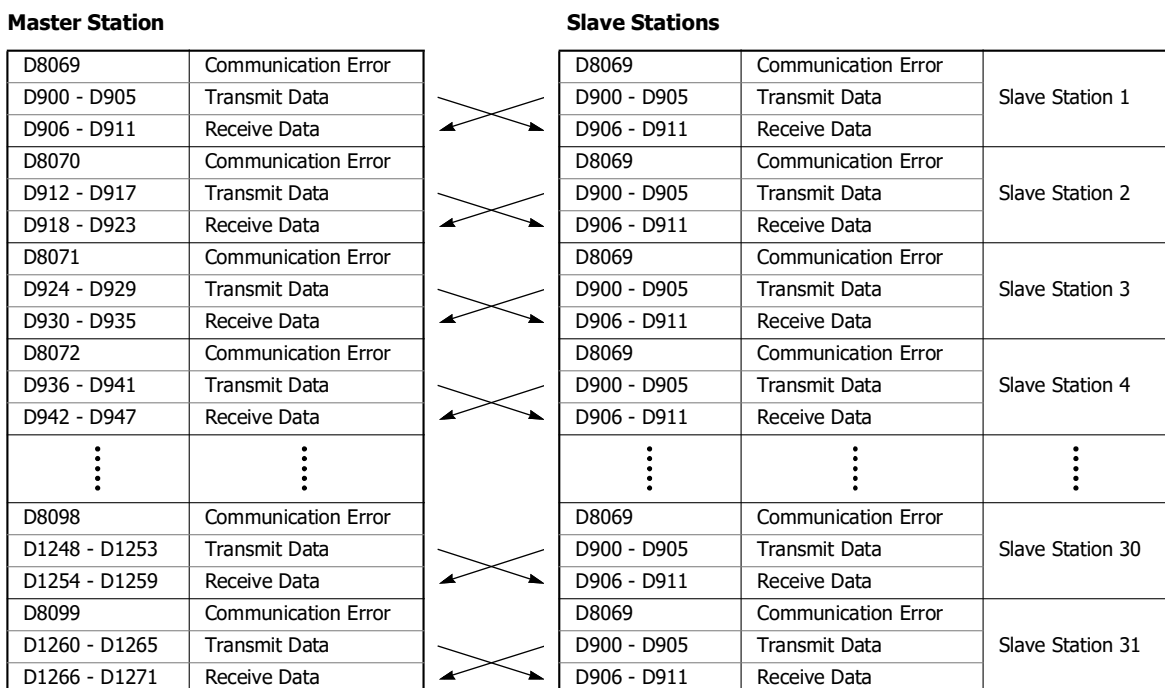
Data Link Communication between Master and Slave Stations

The master station has 6 data registers assigned to transmit data to a slave station and 6 data registers assigned to receive data from a slave station. The quantity of data registers for data link can be selected from 0 through 6 using WindLDR. The following examples illustrate how data is exchanged between the master and slave stations when 2 or 6 data registers are used for data link communication with each of 31 slave stations.

Example 1: Transmit Data 2 Words and Receive Data 2 Words



Example 2: Transmit Data 6 Words and Receive Data 6 Words



Note: When using port 2 or port 3, the communication status and error are stored in the registers configured in **Function Area Settings**.

Special Internal Relays for Data Link Communication

Special internal relays M8005 through M8007 and M8080 through M8117 are assigned for the data link communication.

M8005 Data Link Communication Error

When an error occurs during communication in the data link system, M8005 turns on. The M8005 status is maintained when the error is cleared and remains on until M8005 is reset using WindLDR or until the CPU is turned off. The cause of the data link communication error can be checked using **Online > Monitor > Monitor**, followed by **Online > Status > Error Status: Details**. See "Data Link Communication Error Code" on page 7-5.

When performing communication on port 2 or port 3, this function is disabled.

M8006 Data Link Communication Prohibit Flag (Master Station)

When M8006 at the master station is turned on in the data link system, data link communication is stopped. When M8006 is turned off, data link communication resumes. The M8006 status is maintained when the CPU is turned off and remains on until M8006 is reset using WindLDR.

When M8006 is on at the master station, M8007 is turned on at slave stations in the data link system.

M8007 Data Link Communication Initialize Flag (Master Station)

Data Link Communication Stop Flag (Slave Station)

M8007 has a different function at the master or slave station of the data link communication system.

Master station: Data link communication initialize flag

When M8007 at the master station is turned on during operation, the link configuration is checked to initialize the data link system. When a slave station is powered up after the master station, turn M8007 on to initialize the data link system. After a data link system setup is changed, M8007 must also be turned on to ensure correct communication.

Slave station: Data link communication stop flag

When a slave station does not receive communication data from the master station for 10 seconds or more in the data link system, M8007 turns on. When a slave station does not receive data in 10 seconds after initializing the data link system, M8007 also turns on at the slave station. When the slave station receives correct communication data, M8007 turns off.

M8080-M8116 Slave Station Communication Completion Relay (Master Station)

Special internal relays M8080 through M8116 are used to indicate the completion of data refresh. When data link communication with a slave station is complete, a special internal relay assigned for the slave station is turned on for one scan time at the master station.

| Special Internal Relay | Slave Station Number | Special Internal Relay | Slave Station Number | Special Internal Relay | Slave Station Number |
|------------------------|----------------------|------------------------|----------------------|------------------------|----------------------|
| M8080 | Slave Station 1 | M8092 | Slave Station 11 | M8104 | Slave Station 21 |
| M8081 | Slave Station 2 | M8093 | Slave Station 12 | M8105 | Slave Station 22 |
| M8082 | Slave Station 3 | M8094 | Slave Station 13 | M8106 | Slave Station 23 |
| M8083 | Slave Station 4 | M8095 | Slave Station 14 | M8107 | Slave Station 24 |
| M8084 | Slave Station 5 | M8096 | Slave Station 15 | M8110 | Slave Station 25 |
| M8085 | Slave Station 6 | M8097 | Slave Station 16 | M8111 | Slave Station 26 |
| M8086 | Slave Station 7 | M8100 | Slave Station 17 | M8112 | Slave Station 27 |
| M8087 | Slave Station 8 | M8101 | Slave Station 18 | M8113 | Slave Station 28 |
| M8090 | Slave Station 9 | M8102 | Slave Station 19 | M8114 | Slave Station 29 |
| M8091 | Slave Station 10 | M8103 | Slave Station 20 | M8115 | Slave Station 30 |
| — | — | — | — | M8116 | Slave Station 31 |

M8080 Communication Completion Relay (Slave Station)

When data link communication with a master station is complete, special internal relay M8080 at the slave station is turned on for one scan time.

M8117 All Slave Station Communication Completion Relay

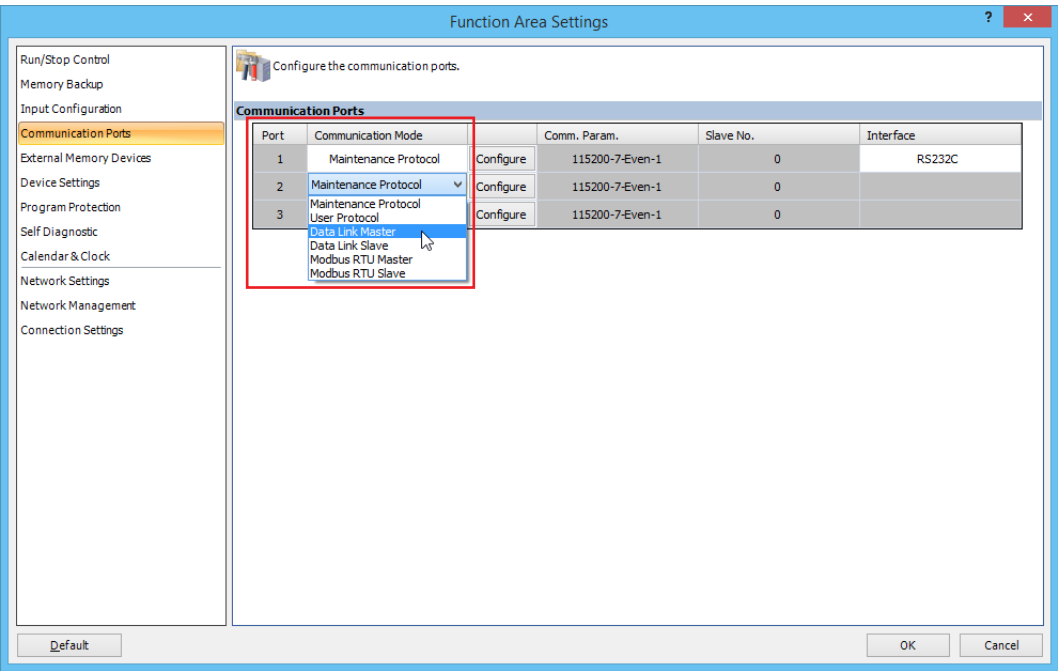
When data link communication with all slave stations is complete, special internal relay M8117 at the master station is turned on for one scan time. M8117 at slave stations does not go on.

Programming WindLDR

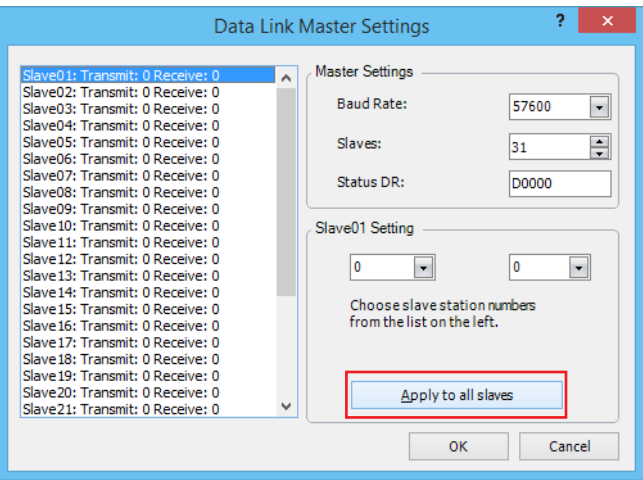
The Communication page in the **Function Area Settings** is used to program the data link master and slave stations. Since these settings relate to the user program, the user program must be downloaded to the CPU module after changing any of these settings.

Data Link Master Station

- 1. From the WindLDR menu bar, select **Configuration > Comm. Ports**.
The **Function Area Settings** dialog box for Communication Ports appears.
- 2. Click **Communication Mode** for the port to use and select **Data Link Master**.
The **Data Link Master Settings** dialog box appears.



- 3. Set the Baud Rate, Slaves, and Status DR under Master Settings.
- 4. Select a slave number from the list, and then set the number of words to transmit/receive.
To make the same settings for all slave stations in the list, click **Apply to all slaves**.



Number of words to transmit: The number of words worth of data to transmit from the master station to the slave stations
Number of words to receive: The number of words worth of data that the master station receives from each slave station

5. Click **OK**.
6. Create the user program.
7. Transfer the user program.

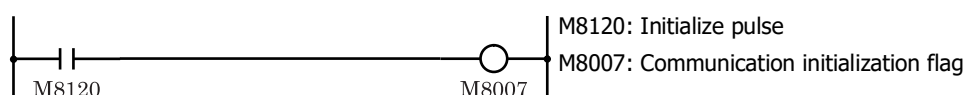
This concludes configuring the settings.

Note: When you use data link communication, you have to turn on the slave stations first before turning on the master station. If you turn on the master station before turning on the slave stations, the master station cannot recognize the slave stations. If the master station cannot recognize the slave stations, you have to initialize the data link. To initialize the data link, click **Initialize Data Link** in WindLDR or turn on special internal relay M8007 in the user program.

1. Select **Online > Monitor > Monitor > Start Monitor**.
WindLDR enters monitor mode.
2. Select **Online > PLC > Initialize > Initialize Data Link**.
The slave stations are recognized by the master station.

If you cannot perform WindLDR maintenance communication, insert the following program into the master station's user program.

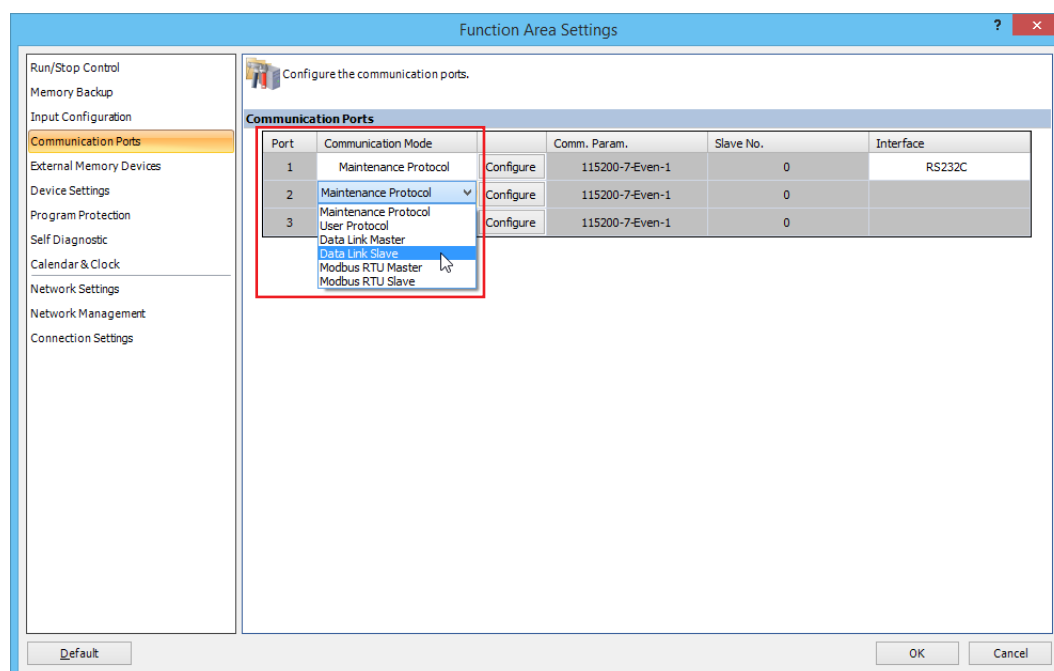
Stop and then run the master station to have it recognize the slave stations.



When operation (RUN) starts, M8007 is turned on for a period of one scan, and the data link is initialized.

Data Link Slave Station

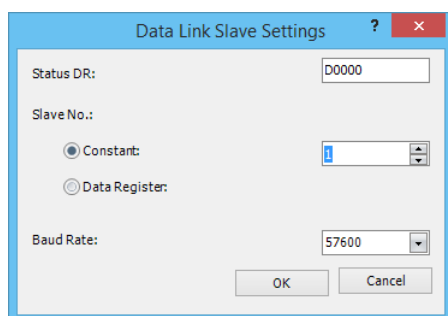
1. From the WindLDR menu bar, select **Configuration > Comm. Ports**.
The **Function Area Settings** dialog box for Communication Ports appears.
2. Click **Communication Mode** for the port to use and select **Data Link Slave**.
The **Data Link Slave Settings** dialog box appears.



7: DATA LINK COMMUNICATION

3. Set the Slave No. and the Baud Rate.

Select **Constant** or **Data Register** under **Slave No.** If you select **Constant**, set the slave No. If you select **Data Register**, write the slave No. into the special data register.



4. Click **OK**.

5. Create the user program.

6. Transfer the user program.

This concludes configuring the settings.

Note: If you select **Data Register** under **Slave No.** in the **Data Link Slave Settings** dialog box, you can change the slave No. of the slave station without downloading the user program by writing the slave No. into the following special data registers.

| Communication Port | Special Data Register |
|-------------------------------|-----------------------|
| Port 1 | D8100 |
| Port 2 | D8102 |
| Port 3 | D8103 |
| Port 4 to 9 ^{*1} | D8040 to D8045 |
| Port 10 to 33 ^{*1*2} | D8735 to D8758 |

*1 When communication modules are connected.

*2 Plus CPU module only.

Note: After making changes, correctly initialize the master station and set the slave stations.

Use one of the following methods to initialize the master station.

(1) Turn off the master station, and then turn it back on.

(2) Set M8007 on the master station.

(3) Select **Online > PLC > Initialize > Initialize Data Link**.

The valid slave No. are 1 to 31. If you specify any other value, the station number set in the **Function Area Settings** will be used.

Data Refresh

In the data link communication, the master station communicates with only one slave station in one communication cycle. When a slave station receives a communication from the master station, the slave station returns data stored in data registers assigned for data link communication. After receiving data from slave stations, the master station stores the data into data registers allocated to each slave station. The process of updating data into data registers is called refresh. When the maximum 31 slave stations are connected, the master station requires 31 communication cycles to communicate with all slave stations.

| Mode | Separate Refresh Mode |
|----------------------------------|---|
| Scan Time | Since the communication between the master station and slave stations proceeds independently of the user program scanning, the scan time is not affected. |
| Data Refresh Timing | At both master and slave stations, received data is refreshed at the END processing. Refresh completion can be confirmed with communication completion special internal relays M8080 through M8117. |
| Applicable Master Station | FC6A (FC4A/FC5A MICROSmart) |
| Applicable Slave Station | FC6A (FC4A/FC5A MICROSmart) |

Both master and slave stations refresh communication data at the END processing. When data refresh is complete, communication completion special internal relays M8080 through M8116 (slave station communication completion relay) go on at the master station for one scan time after the data refresh. At each slave station, special internal relay M8080 (communication completion relay) goes on.

When the master station completes communication with all slave stations, special internal relay M8117 (all slave station communication completion relay) goes on at the master station for one scan time.

Total Refresh Time at Master Station for Communication with All Slave Stations (Trfn)

The master station requires the following time to refresh the transmit and receive data for communication with all slave stations, that is the total of refresh times.

$$[\text{Baud Rate } 19,200 \text{ bps}] \text{ Trfn} = \sum \text{Trf} = \sum \{4.2 \text{ ms} + 2.4 \text{ ms} \times (\text{Transmit Words} + \text{Receive Words}) + 1 \text{ scan time}\}$$

$$[\text{Baud Rate } 38,400 \text{ bps}] \text{ Trfn} = \sum \text{Trf} = \sum \{2.2 \text{ ms} + 1.3 \text{ ms} \times (\text{Transmit Words} + \text{Receive Words}) + 1 \text{ scan time}\}$$

$$[\text{Baud Rate } 57,600 \text{ bps}] \text{ Trfn} = \sum \text{Trf} = \sum \{1.6 \text{ ms} + 0.9 \text{ ms} \times (\text{Transmit Words} + \text{Receive Words}) + 1 \text{ scan time}\}$$

Refresh Time

When data link communication is performed with such parameters as transmit words 6, receive words 6, slave stations 8, and average scan time 20 ms, then the total refresh time Trf8 for communication with all eight slave stations will be:

$$[\text{Baud Rate } 19,200 \text{ bps}] \text{ Trf8} = \{4.2 \text{ ms} + 2.4 \text{ ms} \times (6 + 6) + 20 \text{ ms}\} \times 8 = 424.0 \text{ ms}$$

$$[\text{Baud Rate } 38,400 \text{ bps}] \text{ Trf8} = \{2.2 \text{ ms} + 1.3 \text{ ms} \times (6 + 6) + 20 \text{ ms}\} \times 8 = 302.4 \text{ ms}$$

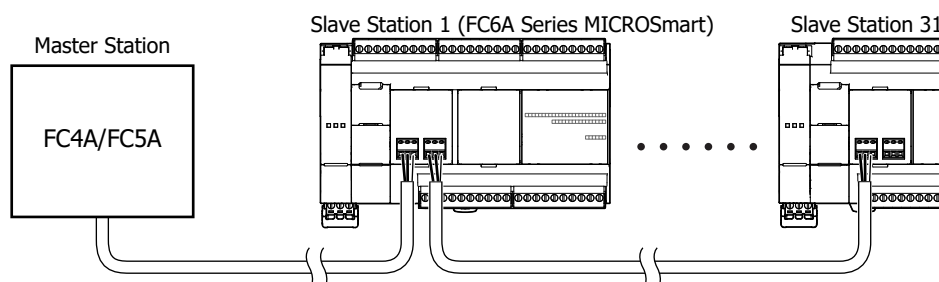
$$[\text{Baud Rate } 57,600 \text{ bps}] \text{ Trf8} = \{1.6 \text{ ms} + 0.9 \text{ ms} \times (6 + 6) + 20 \text{ ms}\} \times 8 = 259.2 \text{ ms}$$

Data Link with Other PLCs

The FC6A can exchange data by communicating with IDEC FC4A and FC5A (data link).

Data Link with FC4A/FC5A

| FC4A/FC5A Settings | Settings |
|--|---|
| Transmit data: 6 words Receive data: 6 words Baud rate: 19,200 or 38,400 bps | Set the data link station slave station to 1 to 31. |



8: J1939 COMMUNICATION

This chapter describes J1939 communication in the CAN J1939 All-in-One CPU module.

The following abbreviations are used in the text to simplify the descriptions.

| Abbreviation | Official Name |
|--------------|---------------------------------|
| CAN | Controller Area Network |
| ECU | Electronic Controller Unit |
| NIECU | Network Interconnection ECU |
| CA | Controller Application |
| PDU | Protocol Data Unit |
| PGN | Parameter Group Number |
| SA | Source Address |
| DA | Destination Address |
| SAE | Society of Automotive Engineers |
| SPN | Suspect Parameter Number |

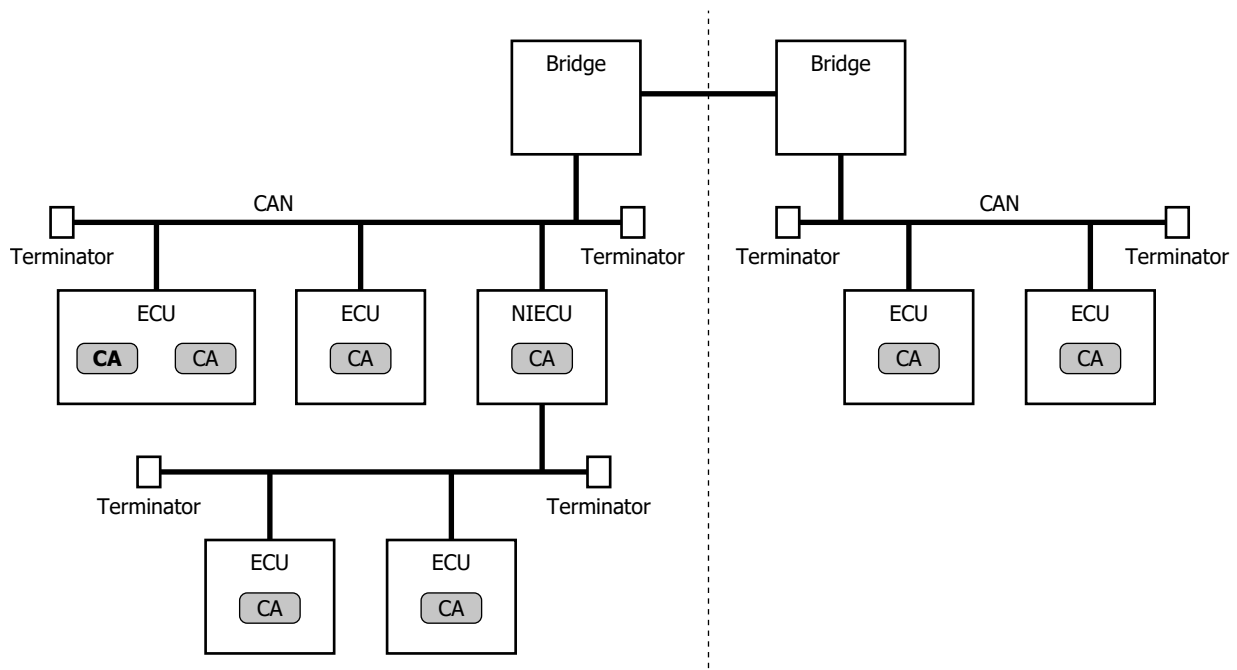
Overview of J1939 Communication over CAN

The CAN J1939 All-in-One CPU module is compatible with CAN communication based on SAE J1939. The CAN J1939 All-in-One CPU module can communicate with other J1939 communication-compatible devices by connecting the CAN port to a J1939 communication network. For details on J1939 communication, refer to the SAE J1939 standard.

SAE J1939 Overview

J1939 Communication Network

A J1939 communication network is composed of ECUs (engine, brake, etc.) and NIECUs (repeaters, routers, etc.), and each ECU has one or more CAs. A CA is assigned an address between 0 and 253 and a unique 64-bit ID (NAME), and messages can be exchanged between CAs using the addresses. If there is an address conflict between CAs, the conflict will be resolved based on the priority indicated in NAME.



8: J1939 COMMUNICATION

Device Address

Addresses are defined between 0 and 255.

However, 254 (null address) is the result of an address conflict and is only used when an address cannot be obtained. 255 (global address) is used when broadcasting messages to all CAs without specifying a specific CA.

| Address | Description | Details |
|----------|--------------------------------|--|
| 0 to 253 | Address range allocated to CAs | For a portion of addresses, the use has been determined according to the type of connected device. For details, refer to the SAE J1939 standard. |
| 254 | Null address | Set as the result of an address conflict when an address between 0 and 253 could not be obtained. |
| 255 | Global address | Used when transmitting a message as a broadcast. |

NAME (64 bits total)

The 64-bit NAME is split into multiple fields. The content for a portion of the fields is already defined in the standard. NAME must be set to a value that is not duplicated by another device on the same J1939 communication network. For details on the definition of each bit, refer to the SAE J1939 standard.

| Field Name | Bit Length | SAE Defined ^{*1} | Item |
|---------------------------|----------------|---------------------------|-------------------------|
| Arbitrary Address Capable | 1 (high order) | — | Dynamic address support |
| Industry Group | 3 | Yes | Industry group |
| Vehicle System Instance | 4 | — | Vehicle system instance |
| Vehicle System | 7 | Yes | Vehicle system |
| Reserved | 1 | Yes | Reserved (fixed as 0) |
| Function | 8 | Yes | Function |
| Function Instance | 5 | — | Function instance |
| ECU Instance | 3 | — | ECU instance |
| Manufacturer Code | 11 | Yes | Manufacturer code |
| Identify Number | 21 (low order) | — | ID number |

^{*1} "Yes" items are defined in the standard. Set those items according to the used network and purpose.

Note: If the network that will be used is not known, set NAME as the maximum value of each field.

The CAN J1939 All-in-One CPU module resolves address conflicts with CAs according to the value of the Arbitrary Address Capable bit.

If the Arbitrary Address Capable bit is 0

The CAN J1939 All-in-One CPU module operates as a fixed address CA. If there is a CA that has the same address as the local address, the CAN J1939 All-in-One CPU module can exchange messages with the set local address if its priority is high.

If the CAN J1939 All-in-One CPU module priority is low, the local address is 254 (null address).

If the Arbitrary Address Capable bit is 1

The CAN J1939 All-in-One CPU module operates as a dynamic address CA. If there are CAs that duplicate the local address, the local address is compared to that of the corresponding CA, and if the CAN J1939 All-in-One CPU module priority is lower, it repeatedly attempts to acquire another address. When the local address has been determined, messages can be exchanged.

If the local address was not determined by the last address, it is set to 254 (null address).

PGN

CAs exchange parameter information such as the engine RPM and the on/off status of switches. These parameters are defined in advance and assigned unique ID numbers (SPNs). The parameters are also grouped according to content, and these parameter groups are assigned unique ID numbers (PGN).

CAs exchange messages for each PGN.

Example: SPNs that make up PGN 1792 General Purpose Valve Pressure^{*1}

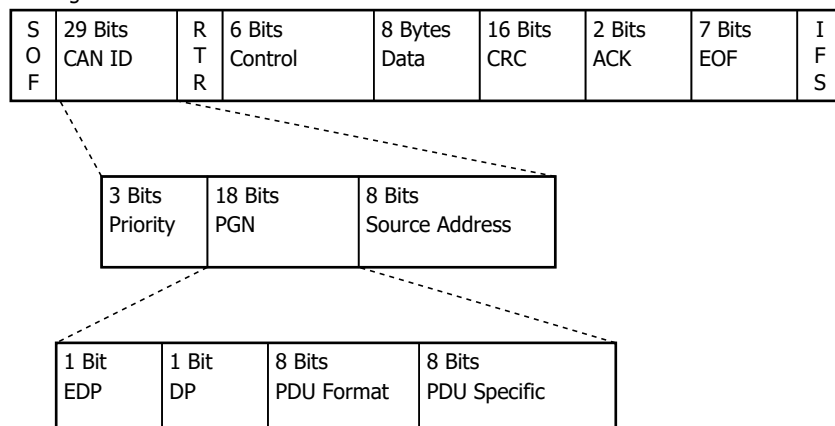
| SPN | Parameter Name | Data Size |
|------|------------------------------------|-----------|
| 4086 | Valve Load Sense Pressure | 2 bytes |
| 4087 | Valve Pilot Pressure | 1 byte |
| 4088 | Valve Assembly Load sense Pressure | 2 bytes |
| 4089 | Valve Assembly Supply Pressure | 2 bytes |

^{*1} From J1939-71

Message

CAs use the data frame in the CAN extended frame format that holds the 29-bit CAN ID to exchange messages. The CAN ID is composed of the priority, PGN, and source address. The PGN is composed of the EDP, DP, PDU Format (PDUF), and PDU Specific (PDUS).

Message



PDU 1 format

When PDUF is 00h to EFh, the PGN is defined in the format called the PDU1 format. The PGN is defined with EDP, DP, and PDUF, and it is handled as a PGN for one-to-one communication. At this time, the destination address is stored in the PDUS. However, when the PDUS is specified as 255 (global address), the PGN is handled as a broadcast PGN, not as one-to-one communication.

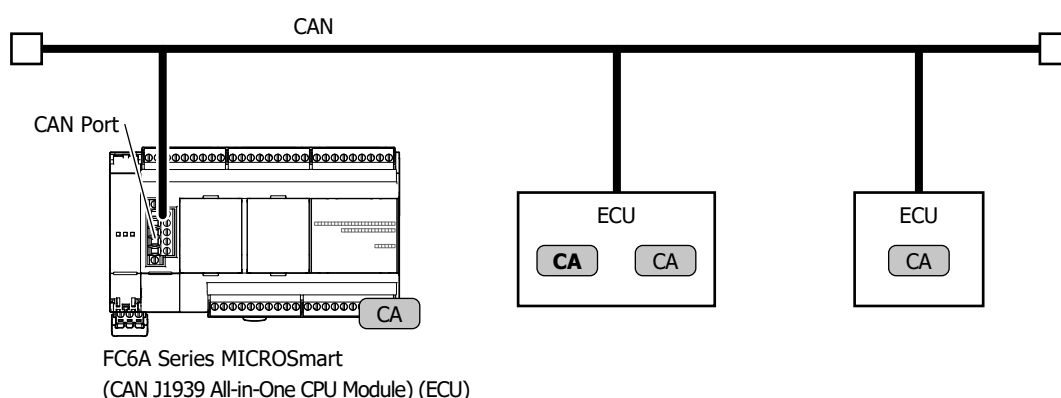
PDU 2 format

When PDUF is F0h to FFh, the PGN is defined in the format called the PDU2 format. The PGN is defined with EDP, DP, PDUF, and PDUS, and it is handled as a PGN for broadcast communication.

Since the data that can be stored in the CAN data frame is a maximum of 8 bytes, when the PGN data is 9 bytes or longer, messages are split into 8-byte packets and exchanged as multi-packet messages.

Overview of J1939 Communication Supported by the All-in-One CPU Module

The CAN J1939 All-in-One CPU module can connect to a J1939 communication network as an ECU that has one CA. It is compatible with the network management function that manages addresses between CAs so address conflicts can be resolved and dynamic addresses can be assigned.



8: J1939 COMMUNICATION

Specifications

| Item | Description | Comments |
|---------------------------------------|---|---|
| Supported SAE J1939 | SAE J1939-11: Physical Layer, 250 K bits/s, Twisted Shielded Pair SAE J1939-15: Reduced Physical Layer, 250 K bits/s, Un-Shielded Twisted Pair SAE J1939-21: Data Link Layer SAE J1939-71: Vehicle Application Layer SAE J1939-73: Application Layer - Diagnostics SAE J1939-75: Application Layer - Generator Sets and Industrial SAE J1939-81: Network Management | |
| Baud Rate | 250 k [bps] / 500 k [bps] | |
| Transmit Methods | Event transmission, cycle transmission | |
| Receive Methods | Receive in ladder END, with cycle monitoring | |
| Maximum Number of Nodes | 128 nodes | The number of CAs that can be managed with address management |
| Maximum Number of Send Message | 100 | |
| Maximum Number of Received Messages | 200 | |
| Maximum Length of Transmitted Message | 252 bytes | |
| Maximum Length of Receive Message | 252 bytes | |
| Network Management | Enabled | Resolves address conflicts, monitors the addresses of neighboring CAs |

Special PGNs Handled by the CAN J1939 All-in-One CPU Module

A portion of PGNs are used internally to control the FC6A. These PGNs cannot be received, even when they are set as receive messages.

PGNs that cannot be set as receive messages

| PGN | Parameter Name | Description |
|---------------|-------------------------------|---|
| 59392 (E800h) | Acknowledgment | Used for responses between CAs. |
| 59904 (EA00h) | Request | Used to request PGN transmission. |
| 60160 (EB00h) | Data Transfer Message | Used to exchange multi-packet messages 9 bytes or longer. |
| 60416 (EC00h) | Connection Management Message | |
| 60928 (EE00h) | Address Claim | Used for address management on the network. |

Communication Control

Checking if J1939 communication is permitted/prohibited and checking the communication status can be performed with special internal relays and special data registers.

Note: R/W stands for read/write and allows reading and writing. R is read-only. W is write-only.

Special Internal Relay Allocations

| Special Internal Relays | Description | Setting Timing | R/W |
|-------------------------|---|----------------|-----|
| M8300 | J1939 Communication Permitted Flag | | R/W |
| M8301 | J1939 Online Status | Every scan | R |
| M8302 | J1939 Local Station Address Confirmation Status | Every scan | R |
| M8303 | J1939 Communication Error Output | Every scan | R |
| M8304 | J1939 Communication Bus Off Occurrence Output | Every scan | R |

J1939 Communication Permitted Flag (M8300)

Controls whether J1939 communication is permitted or prohibited. Turn on M8300 to start J1939 communication after initialization processing has been performed.

OFF: Communication prohibited (default)

ON: Communication permitted

Note: If there is no response from any CAs to a message sent in initialization processing, the transmission will be repeatedly retried and Error Passive (error code 2002) will occur. Turn on M8300 after CAs on the network are able to send and receive data.

J1939 Online Status (M8301)

Indicates the J1939 communication online status. While offline, messages cannot be exchanged because the CAN J1939 All-in-One CPU module is not connected to a J1939 communication network.

OFF: Offline

ON: Online

J1939 Local Station Address Confirmation Status (M8302)

Indicates the local address confirmation status during J1939 communication. This relay turns on when the local address is between 0 and 253. While online, this relay turns off immediately after starting communication and when an address conflict has occurred and the local address is 254 (null address). When M8302 is off, messages cannot be exchanged using the ladder program.

OFF: Local address unconfirmed

ON: Local address confirmed

J1939 Communication Error Output (M8303)

Indicates the status of a J1939 communication error. M8303 turns on when a value other than "0" is stored in D8052 (J1939 Communication Error Code).

OFF: No communication error

ON: Communication error has occurred

J1939 Communication Bus Off Occurrence Output (M8304)

Indicates the bus off status during J1939 communication. Bus off is the status where devices cannot participate in communication on the bus. All transmit and receive operations are prohibited. The CAN J1939 All-in-One CPU module has an internal transmit error counter and receive error counter, and when these counters reach a certain value, the bus off status is set.

When bus off occurs, the CAN J1939 All-in-One CPU module stops communication and goes offline. To restart communication, M8300 must be turned on to go back online. When M8300 is turned on, M8304 is turned off.

OFF: Bus off has not occurred

ON: Bus off has occurred

Special Data Register Allocations

| Special Data Register | Function | Setting Timing | R/W |
|-----------------------|--------------------------------|---------------------|-----|
| D8052 | J1939 Communication Error Code | When error occurred | R/W |

J1939 Communication Error Code (D8052)

This register stores the J1939 communication error code. To initialize this register, write "0".

Details on the J1939 communication error code are as follows.

| Status Code | Description | Details |
|-------------|--|--|
| 0 | Normal | |
| 100 | Multi-packet transmit/receive error | An unexpected BAM frame was received. |
| 101 | Multi-packet transmit/receive error | An unexpected RTS frame was received. |
| 102 | Multi-packet transmit/receive error | An unexpected CTS frame was received. |
| 103 | Multi-packet transmit/receive error | An unexpected EOM frame was received. |
| 104 | Multi-packet transmit/receive error | An unexpected Connection Abort frame was received. |
| 105 | Multi-packet transmit/receive error | An unexpected DT frame was received. |
| 106 | Multi-packet transmit/receive error | The length of the multi-packet transmitted/received message was out of range. |
| 107 | Multi-packet transmit/receive error | Failed to transmit the Connection Abort message. |
| 110 | NACK transmission failure | NACK could not be transmitted for a PGN transmit request. |
| 200 | Internal transmit queue overflow | The limit of messages that can be sent at one time has been exceeded. |
| 201 | Internal receive queue overflow | The limit of messages that can be received at one time has been exceeded.*1 |
| 1000 | Local address unconfirmed | The local address is 254.*2 |
| 1100 | Baud rate error | The baud rate set in the data register is out of range. |
| 2000 | CAN communication initialization error | The CAN controller could not be initialized.*3 |
| 2001 | CAN communication initialization error | The CAN controller could not be reset.*3 |
| 2002 | Error Passive | An error/warning interrupt has occurred, and the CAN controller has entered the Error Passive state.*4 |
| 2003 | Error Active | The CAN controller has entered the Error Active state.*4 |
| 2004 | Data overrun error | The data overrun interrupt occurred.*1 |
| 3000 | Bus off error | Bus off occurred on the CAN.*4 |

*1 Because the bus was a high load, the receiving process could not keep up, and the received message was discarded. Reduce the messages flowing on the bus to lower the load.

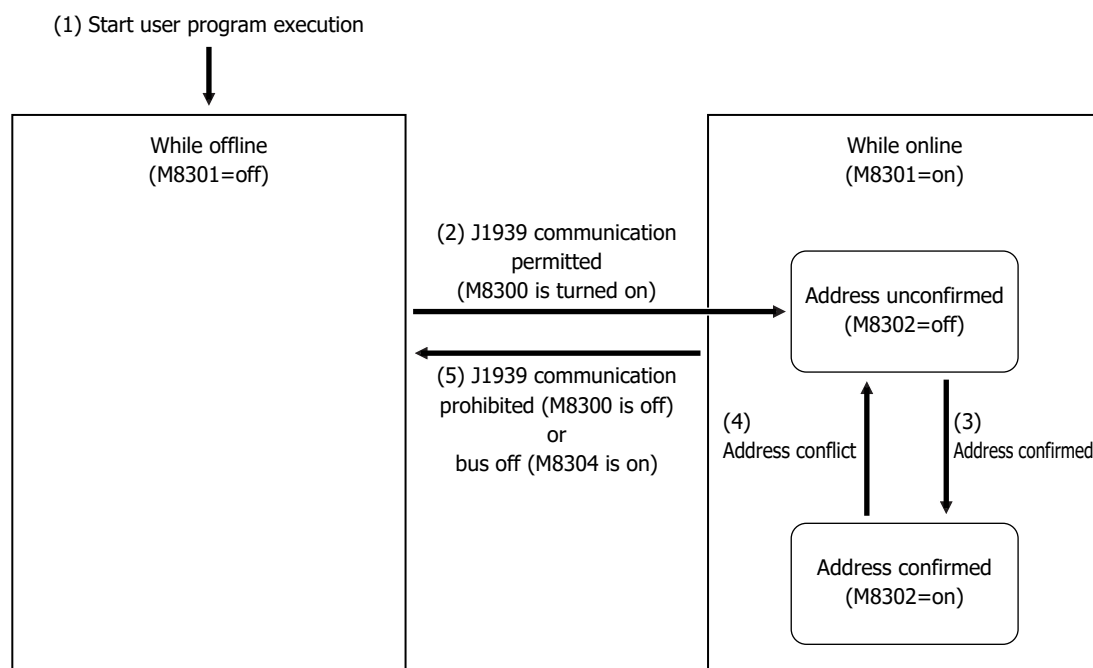
*2 Check if there are any duplicate addresses among the devices connected on the bus. After that, turn off M8300 and confirm that the J1939 communication is offline before starting the J1939 communication again.

*3 Turn off M8300 once and confirm that the J1939 communication is offline before starting the J1939 communication again. When the same error occurs, turn the power of the CAN J1939 All-in-One CPU module off and on again.

*4 There may be a communication failure due to wiring issues or noise. Check the wiring condition and eliminate the cause of the noise.

Communication Control Status Transitions

J1939 communication status and initialization processing transitions are as follows.



(1) The offline status is set immediately after starting execution of the user program.

(2) When M8300 is turned on, the online status is set and initialization processing is performed.

In initialization processing, initialization messages are sent to CAs, duplicate addresses are checked, and conflicts are resolved for those duplicate addresses.

Before confirming the local address in initialization processing, the address is the address unconfirmed status (M8302=off).

(3) When a local address is confirmed between 0 and 253, the status is the address confirmed status (M8302=on).

Messages can be exchanged between the FC6A and CAs. If the local address is 254, the status remains the address unconfirmed status.

(4) When an address conflict occurs and the local address is 254 (null address), the status is the address unconfirmed status.

(5) When M8300 is turned off, communication processing is stopped and the offline status is set.

The offline status is also set when bus off occurs during communication (M8304 is turned on). M8300 remains off at this time.

To set the online status again, turn off M8300 and then turn it on again.

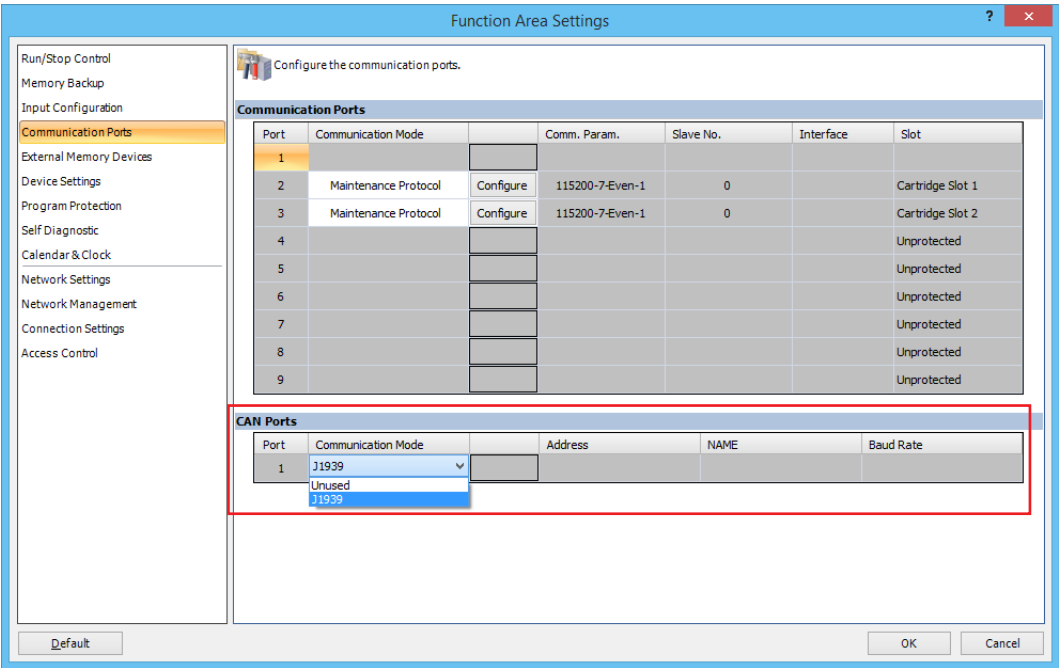
J1939 Communication Settings

This section describes the operation procedure and details about the items related to J1939 communication.

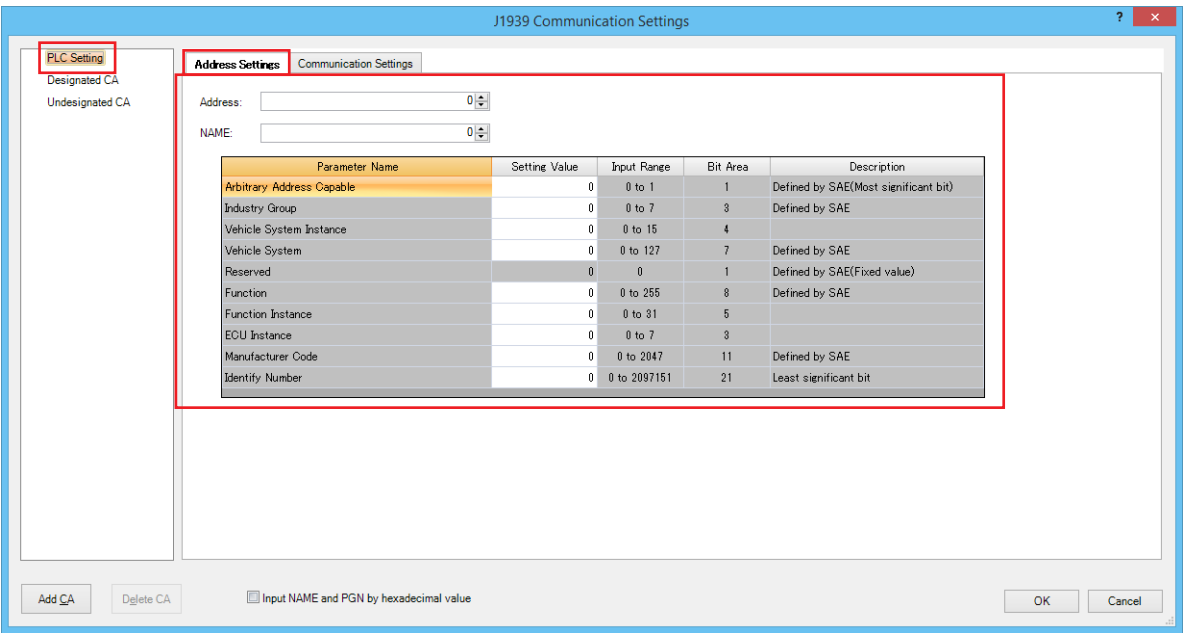
Programming WindLDR

Configure J1939 communication according to the usage environment.

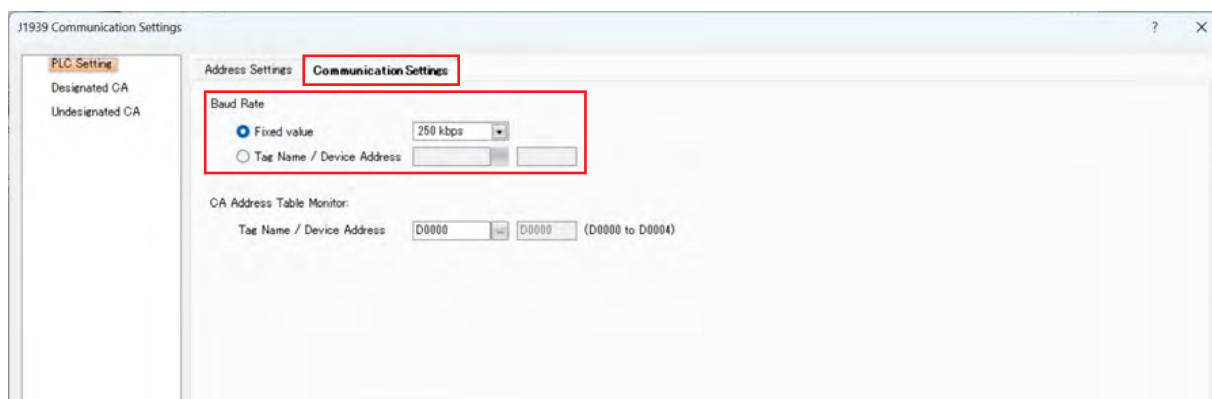
- 1. On the **Configuration** tab, in the **Function Area Settings** group, click **Comm. Port**.
The **Function Area Settings** dialog box is displayed.
- 2. Select **J1939** from the CAN port group communication mode.
The **J1939 Communication Settings** dialog box is displayed.



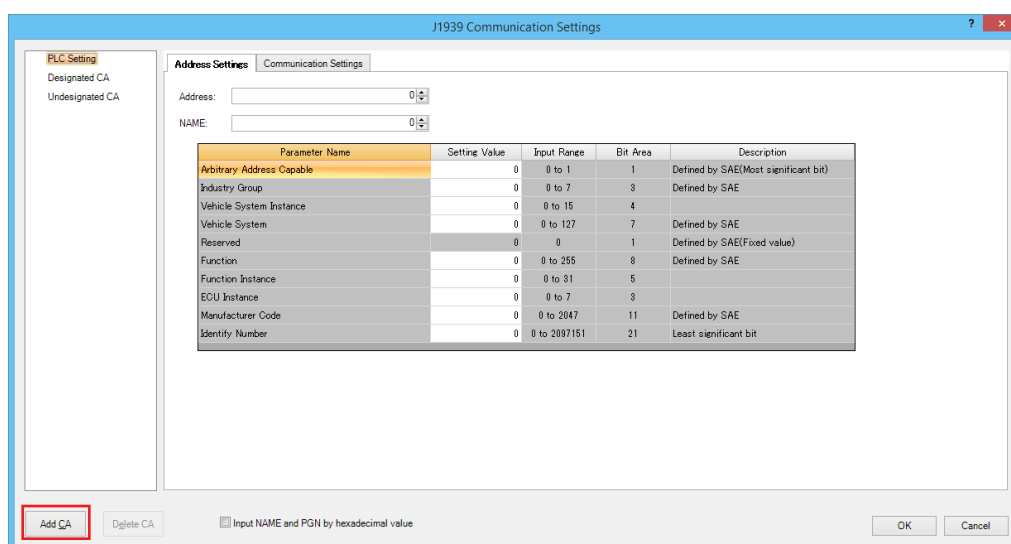
- 3. Under **PLC Setting**, on the **Address Settings** tab, set the local address, device name (NAME), and CA address table.
Set the local address and device name (NAME).



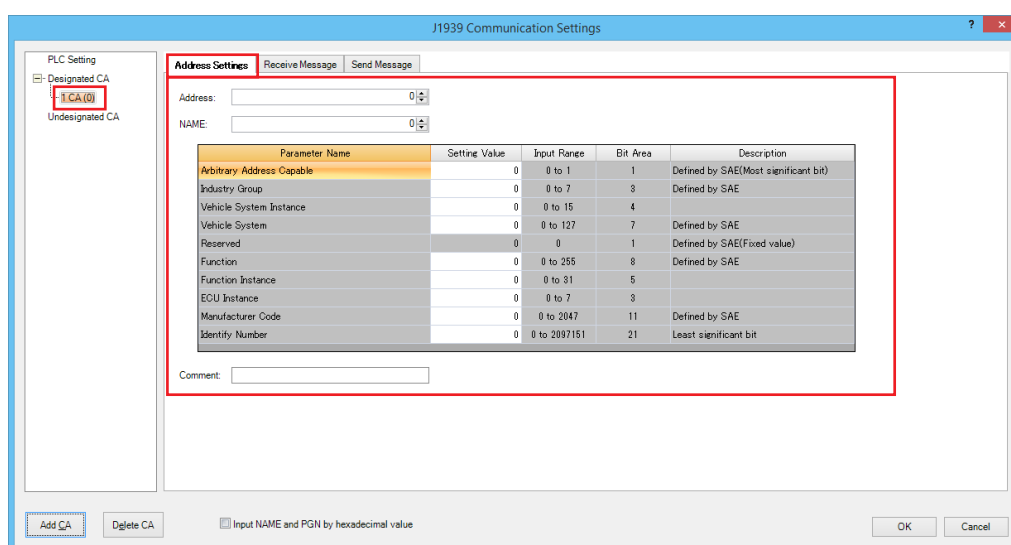
4. Click the **Communication Settings** tab and set the baud rate. Also, configure the device address to store the CA address table.



5. Click **Add CA** to add a node to configure a CA.



6. Click the node that corresponds to the CA to configure and click the **Address Settings** tab. Configure the address and the device name for the CA.



- Click the **Receive Message** tab and first configure the devices that will used with received messages.

J1939 Communication Settings

PLC Setting
Designated CA
Undesignated CA

Address Settings: **Receive Message** Send Message

Device Settings:

| Device | Tag Name | Device Address | Comment |
|--------------------------|----------|----------------|---------|
| S1 (Control Register) | D0000 | D0000 | |
| S2 (Receive REQ Trigger) | M0000 | M0000 | |
| D1 (Receive Alert Flag) | M0100 | M0100 | |

Message Settings:

Add Delete

| No. | PGN | Type | Data Destination | S1 | S2 | D1 | Comment |
|-----|-----|------|------------------|----|----|----|---------|
|-----|-----|------|------------------|----|----|----|---------|

- Click **Add** to add a received message.

J1939 Communication Settings

PLC Setting
Designated CA
Undesignated CA

Address Settings: **Receive Message** Send Message

Device Settings:

| Device | Tag Name | Device Address | Comment |
|--------------------------|----------|----------------|---------|
| S1 (Control Register) | D0000 | D0000 | |
| S2 (Receive REQ Trigger) | M0000 | M0000 | |
| D1 (Receive Alert Flag) | M0100 | M0100 | |

Message Settings:

Add Delete

| No. | PGN | Type | Data Destination | S1 | S2 | D1 | Comment |
|-----|-----|---------|------------------|-------|-------|----|---------|
| 1 | 0 | Polling | D0000 to D0004 | M0000 | M0100 | | |

CAN ID
PGN 0
Type Polling
Max Data Length 8
Receive Cycle Timeout (ms) 0
Data Destination
Address
Comment

- Select any of the cells for the message settings to display the parameters for the messages on the right side. Configure the items.

J1939 Communication Settings

PLC Setting
Designated CA
Undesignated CA

Address Settings: **Receive Message** Send Message

Device Settings:

| Device | Tag Name | Device Address | Comment |
|--------------------------|----------|----------------|---------|
| S1 (Control Register) | D0000 | D0000 | |
| S2 (Receive REQ Trigger) | M0000 | M0000 | |
| D1 (Receive Alert Flag) | M0100 | M0100 | |

Message Settings:

Add Delete

| No. | PGN | Type | Data Destination | S1 | S2 | D1 | Comment |
|-----|-------|---------|------------------|----------------|-------|-------|---------|
| 1 | 61184 | Polling | D0200 to D0203 | D0000 to D0004 | M0000 | M0100 | |

CAN ID
PGN 61184
Type Polling
Max Data Length 8
Receive Cycle Timeout (ms) 0
Data Destination
Address D0200
Comment

PGN
This is used to specify parameter group for message.
The range of value is 0 to 61184 and 61440 to 65535. When value is between 0 to 61184, lower 1 byte has to be 00h.

10. Click the **Send Message** tab and configure it in the same manner as the **Receive Message** tab.

The screenshot shows the 'J1939 Communication Settings' window with the 'Send Message' tab selected. The left sidebar shows 'Designated CA' and 'Undesignated CA'. The main area is divided into 'Device Settings', 'Message Settings', and a right-hand configuration panel.

Device Settings:

| Device | Tag Name | Device Address | Comment |
|------------------------------------|----------|----------------|---------|
| S1 (Control Register) | D0300 | D0300 | |
| S2 (Send Trigger) | M0200 | M0200 | |
| D1 (Reply Permission Flag for REQ) | M0300 | M0300 | |

Message Settings:

Buttons:

| No. | PGN | Type | Data Source | S1 | S2 | D1 | Comment |
|-----|-----|-------|----------------|----------------|-------|-------|---------|
| 1 | 0 | Event | D0400 to D0403 | D0300 to D0304 | M0200 | M0300 | |
| 2 | 0 | Event | D0410 to D0413 | D0305 to D0309 | M0201 | M0301 | |

Right Panel:

- CAN ID: 0
- PGN: 0
- Priority: 6
- Type: Event
- Max Data Length: 8
- Cycle to Send (ms): 1000
- Data Source: D0400
- Address: D0400
- Comment:

Data Source: Configure device address to store data for message. Devices of maximum data length are occupied starting with configured device address. Data register can be configured.

11. Click **Undesignated CA**. Configure the **Receive Message** tab and the **Send Message** tab in the same manner as those under **Designated CA**.

The screenshot shows the 'J1939 Communication Settings' window with the 'Receive Message' tab selected. The left sidebar shows 'Designated CA' and 'Undesignated CA'. The main area is divided into 'Device Settings', 'Message Settings', and a right-hand configuration panel.

Device Settings:

| Device | Tag Name | Device Address | Comment |
|--------------------------|----------|----------------|---------|
| S1 (Control Register) | D1000 | D1000 | |
| S2 (Receive REQ Trigger) | M1000 | M1000 | |
| D1 (Receive Alert Flag) | M1100 | M1100 | |

Message Settings:

Buttons:

| No. | PGN | Type | Data Destination | S1 | S2 | D1 | Comment |
|-----|-------|---------|------------------|----------------|-------|-------|---------|
| 1 | 61443 | Polling | D1200 to D1203 | D1000 to D1004 | M1000 | M1100 | |
| 2 | 61442 | Polling | D1210 to D1213 | D1005 to D1009 | M1001 | M1101 | |
| 3 | 65262 | Polling | D1220 to D1223 | D1010 to D1014 | M1002 | M1102 | |

Right Panel:

- CAN ID: 65262
- PGN: Polling
- Type: Polling
- Max Data Length: 8
- Receive Cycle Timeout (ms): 0
- Data Destination: D1220
- Address: D1220
- Comment:

Data Destination: Configure device address to store data for message. Devices of maximum data length are occupied starting with configured device address. Data register can be configured.

The screenshot shows the 'J1939 Communication Settings' window with the 'Send Message' tab selected. The left sidebar shows 'Designated CA' and 'Undesignated CA'. The main area is divided into 'Device Settings', 'Message Settings', and a right-hand configuration panel.

Device Settings:

| Device | Tag Name | Device Address | Comment |
|------------------------------------|----------|----------------|---------|
| S1 (Control Register) | D1300 | D1300 | |
| S2 (Send Trigger) | M1200 | M1200 | |
| D1 (Reply Permission Flag for REQ) | M1300 | M1300 | |

Message Settings:

Buttons:

| No. | PGN | Type | Data Source | S1 | S2 | D1 | Comment |
|-----|-------|-------|----------------|----------------|-------|-------|---------|
| 1 | 65281 | Event | D1400 to D1403 | D1300 to D1304 | M1200 | M1300 | |
| 2 | 65282 | Event | D1410 to D1413 | D1305 to D1309 | M1201 | M1301 | |
| 3 | 65283 | Event | D1420 to D1423 | D1310 to D1314 | M1202 | M1302 | |

Right Panel:

- CAN ID: 65283
- PGN: 65283
- Priority: 6
- Type: Event
- Max Data Length: 8
- Cycle to Send (ms): 1000
- Data Source: D1420
- Address: D1420
- Comment:

Data Source: Configure device address to store data for message. Devices of maximum data length are occupied starting with configured device address. Data register can be configured.

12. Click OK.

Returns to the **Function Area Settings** dialog box.

This concludes configuring the settings.

J1939 Communication Parameters

This section describes the **J1939 Settings** dialog box parameter settings required to use J1939 communication.

PLC Setting

These settings configure the CAN J1939 All-in-One CPU module local address, local NAME, and CA address table.

■ Address Settings tab

This tab configures the CAN J1939 All-in-One CPU module local address and local NAME.

| Parameter Name | Setting Value | Input Range | Bit Area | Description |
|---------------------------|---------------|--------------|----------|--------------------------------------|
| Arbitrary Address Capable | 0 | 0 to 1 | 1 | Defined by SAE(Most significant bit) |
| Industry Group | 0 | 0 to 7 | 3 | Defined by SAE |
| Vehicle System Instance | 0 | 0 to 15 | 4 | |
| Vehicle System | 0 | 0 to 127 | 7 | Defined by SAE |
| Reserved | 0 | 0 | 1 | Defined by SAE(Fixed value) |
| Function | 0 | 0 to 255 | 8 | Defined by SAE |
| Function Instance | 0 | 0 to 31 | 5 | |
| ECU Instance | 0 | 0 to 7 | 3 | |
| Manufacturer Code | 0 | 0 to 2047 | 11 | Defined by SAE |
| Identify Number | 0 | 0 to 2097151 | 21 | Least significant bit |

(1) Address

Sets the initial value of the CAN J1939 All-in-One CPU module local address between 0 and 253.

When **Input NAME and PGN by hexadecimal value** check box is selected, enter them as hexadecimal values.

Example: When hexadecimal: 01, F0, etc.

When an address conflict occurs with a CA connected to the same network, the local address is reacquired according to the Arbitrary Address Capable bit of the local NAME.

(2) NAME

Sets the CAN J1939 All-in-One CPU module local NAME in 64 bits.

When **Input NAME and PGN by hexadecimal value** check box is selected, enter them as hexadecimal values.

Example: When hexadecimal: 123456789ABCDEF1, 0000FFFFFFFFF0A, etc.

Set this value so that it is not duplicated by other CAs on the same network. For details, see "NAME (64 bits total)" on page 8-2.

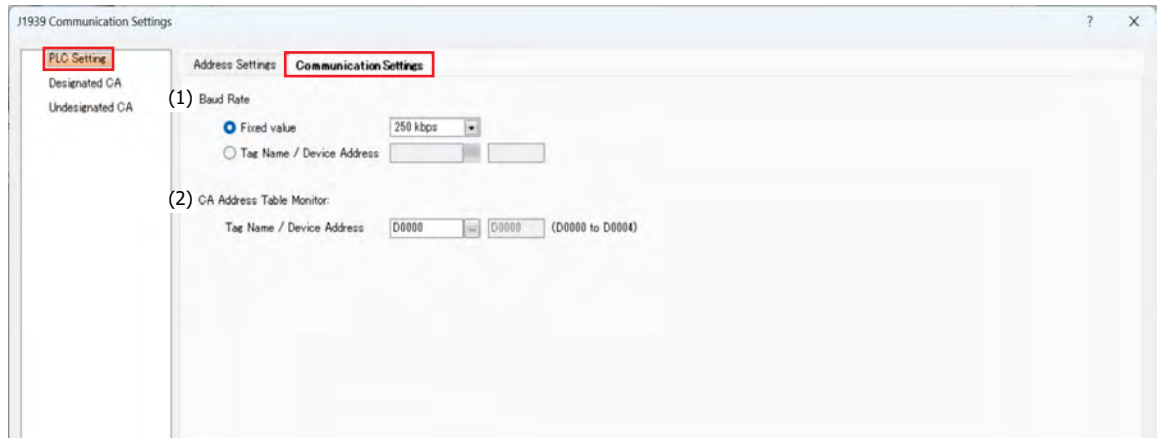
The device name (NAME) is composed of the set values in the device name field list (3). When the device name (NAME) is changed, those changes are reflected under **Setting Value** in the device name field list.

(3) Device name field list

Displays each field of the device name (NAME) (2). When a **Setting Value** is changed, the result is reflected in the device name (NAME).

■ Communication Settings tab

This tab configures the CA address table monitor. The CA address table monitor is the table that manages the CA addresses registered by the CAN J1939 All-in-One CPU module (local) and **Designated CA**.



(1) Baud Rate

Baud rate is specified by a fixed value or device address. For a fixed value, sets 250 kbps or 500 kbps. For a device address, specify the data register to set the baud rate. When M8300 is turned on, communication occurs at the baud rate corresponding to the value in the data register. The values that can be set in the data register are 0 (250 kbps) or 1 (500 kbps). When a value other than these is set and M8300 is turned on, 1100 is written in D8052.

(2) CA Address Table Monitor

Sets the starting address of the data registers that will store the CA address table.
The values set in WindLDR are stored in the CA address table as the initial values, and when the CAN J1939 All-in-One CPU module address changes due to an address conflict, the CA address table is updated with that. When address information is received from a CA, the address of the CA that matches the NAME is updated. The CAN J1939 All-in-One CPU module exchanges messages based on the addresses in the CA address table.

CA Address Table Monitor Definition

| CA | Storage Destination | Function | Setting Details |
|----------------|---------------------|------------------------------|---|
| Local | Starting number+0 | Local NAME | Stores the CAN J1939 All-in-One CPU module NAME. |
| | Starting number+1 | | |
| | Starting number+2 | | |
| | Starting number+3 | | |
| | Starting number+4 | Local address* ¹ | Stores the CAN J1939 All-in-One CPU module address. If the address changes while online, exchanging messages after that is performed based on the new address. |
| CA#1 (5 words) | Starting number+5 | CA#1 NAME* ² | Stores the CA#1 NAME. |
| | Starting number+6 | | |
| | Starting number+7 | | |
| | Starting number+8 | | |
| | Starting number+9 | CA#1 address* ^{2*3} | Stores the CA#1 address. When NAME has been set, the address may change when online. If the address changes while online, exchanging messages after that is performed based on the new address. |
| • | • | • | |
| • | • | • | |
| • | • | • | |

| CA | Storage Destination | Function | Setting Details |
|------------------------------|-----------------------|------------------------------|---|
| CA#N ^{*3} (5 words) | Starting number+5xN | CA#N NAME ^{*2} | Stores the CA#N NAME. |
| | Starting number+5xN+1 | | |
| | Starting number+5xN+2 | | |
| | Starting number+5xN+3 | | |
| | Starting number+5xN+4 | CA#N address ^{*2*3} | Stores the CA#N address. When NAME has been set, the address may change when online. If the address changes while online, exchanging messages after that is performed based on the new address. |

*1 If an address cannot be assigned due to address conflicts with CAs on the network, the address is 254 (null address). In this case, messages cannot be exchanged.

*2 If the address is outside the range of 0 to 253, messages cannot be exchanged with the corresponding CA.

*3 N is 1 to 253.

Example 1: When updated by local address conflict

| CA address table | | | |
|------------------|----------|---------------|---|
| Local NAME | +0 words | 9234....5678h | * Arbitrary Address Capable = 1 → Updated to 128 |
| Local address | +4 words | 30 | |
| CA#1 NAME | +5 words | 1345....6789h | |
| CA#1 address | +9 words | 150 | |
| | | • | |
| | | • | |
| | | • | |

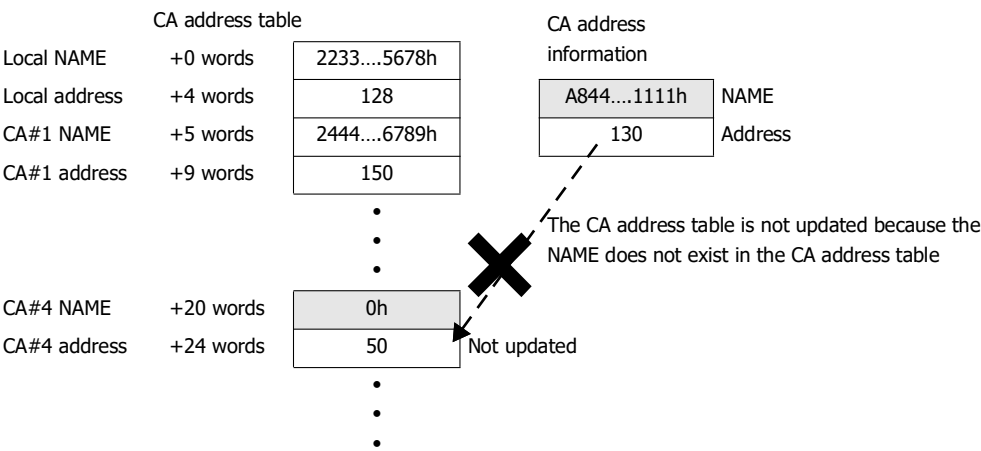
Example 2: When updated by receiving CA address information

| CA address table | | | |
|------------------|-----------|---------------|------------------|
| Local NAME | +0 words | 2233....5678h | |
| Local address | +4 words | 128 | |
| CA#1 NAME | +5 words | 2444....6789h | |
| CA#1 address | +9 words | 150 | |
| | | • | |
| | | • | |
| | | • | |
| CA#4 NAME | +20 words | A844....1111h | → Updated to 130 |
| CA#4 address | +24 words | 50 | |
| | | • | |
| | | • | |
| | | • | |

| CA address information | |
|------------------------|---------|
| A844....1111h | NAME |
| 130 | Address |

Address of CA that matches NAME is updated

Example 3: When CA#4 NAME is set to 0 in Example 2



Designated CA

For each added CA, these settings configure the address and NAME of the CA to exchange messages with and the transmitted and received messages.

■ Address Settings tab

This tab configures the address and NAME of the CA selected on the CA list.

J1939 Communication Settings

PLC Setting
☒ Designated CA
☐ Undesignated CA

Address Settings | Receive Message | Send Message

(1) Address:

(2) NAME:

(3)

| Parameter Name | Setting Value | Input Range | Bit Area | Description |
|---------------------------|---------------|--------------|----------|--------------------------------------|
| Arbitrary Address Capable | 0 | 0 to 1 | 1 | Defined by SAE(Most significant bit) |
| Industry Group | 0 | 0 to 7 | 3 | Defined by SAE |
| Vehicle System Instance | 0 | 0 to 15 | 4 | |
| Vehicle System | 0 | 0 to 127 | 7 | Defined by SAE |
| Reserved | 0 | 0 | 1 | Defined by SAE(Fixed value) |
| Function | 0 | 0 to 255 | 8 | Defined by SAE |
| Function Instance | 0 | 0 to 31 | 5 | |
| ECU Instance | 0 | 0 to 7 | 3 | |
| Manufacturer Code | 0 | 0 to 2047 | 11 | Defined by SAE |
| Identify Number | 0 | 0 to 2097151 | 21 | Least significant bit |

(4) Comment:

Add CA | Delete CA | ☐ Input NAME and PGN by hexadecimal value | OK | Cancel

(1) Address

Sets the address of the CA to exchange messages with from between 0 and 254.

When **Input NAME and PGN by hexadecimal value** check box is selected, enter them as hexadecimal values.

Example: When hexadecimal: 01, F0, etc.

(2) NAME

Sets the CA NAME in 64 bits. If CA NAME is not defined, set it to 0.

When **Input NAME and PGN by hexadecimal value** check box is selected, enter them as hexadecimal values.

Example: When hexadecimal: 123456789ABCDEF1, 0000FFFFFFFFF0A, etc.

The device name (NAME) is composed of the set values in the device name field list (3). When the device name (NAME) is changed, those changes are reflected under **Setting Value** in the device name field list.

(3) Device name field list

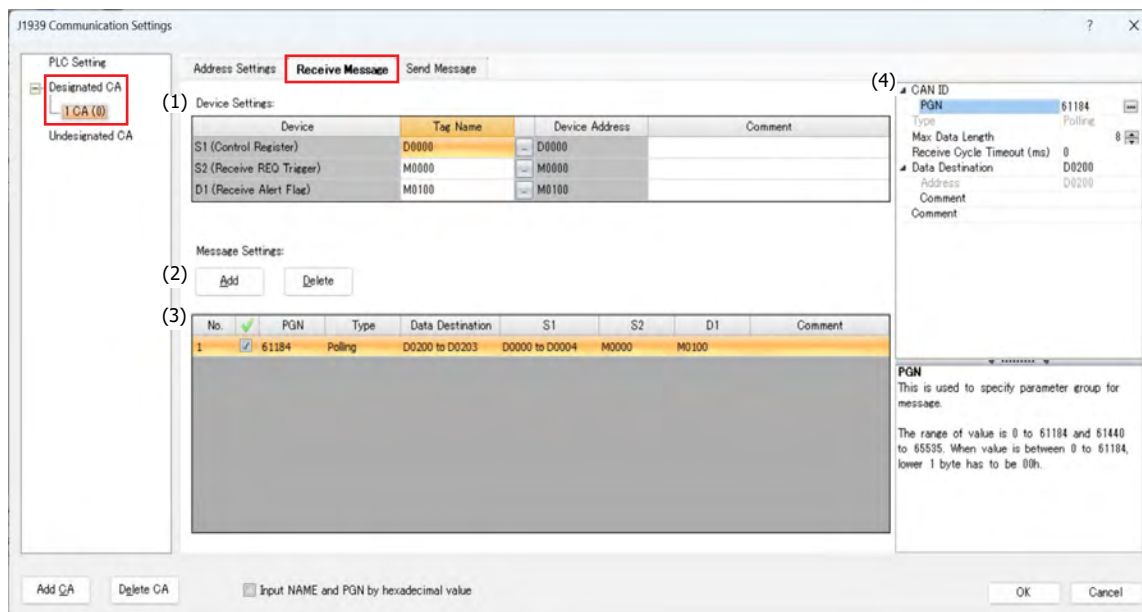
Displays each field of the device name (NAME) (2). When a **Setting Value** is changed, the result is reflected in the device name (NAME).

(4) Comment

Sets a comment for the CA as a maximum of 127 characters. This is reflected in the CA list under **Designated CA**.

■ Receive Message tab

This tab configures the messages that the CAN J1939 All-in-One CPU module receives from the CA selected in the CA list.



(1) Device Settings

Sets the data registers that will be used by the received messages.

| Settings | Description |
|----------------|--|
| Tag Name | Specifies the tag name of the device or the device address. |
| Device Address | Shows the device address that corresponds to the tag name. |
| Comment | Shows the comment for the device address. This item can be edited. |

S1 (Control Register)

Sets the starting address of the data registers that will store the receive results.

| Storage Destination | Item | | Description |
|---------------------|------------------------|-------------------------------|---|
| Starting number+0 | Received data length | | This register stores the length of the received message data. If the message that will be received exceeds 8 bytes, a multi-packet message split into 8-byte packets will be received. After the multi-packet message has finished being received, the split data is combined and stored in the data destination. If the length of the received message data is longer than the maximum data length, the maximum data length is stored and 100 is stored in the receive results status. |
| Starting number+1 | Reserved | | |
| Starting number+2 | Receive results status | | This register stores the receive results. To initialize this register, write "0". For details on the receive results status, see "Receive results status" on page 8-19. |
| Starting number+3 | Receive action flag | | Stores the action flag for receiving. |
| | Bit 0 | Receive buffer overwrite flag | When the internal receive buffer was overwritten by the next message before the message data stored in the receive buffer could be written to the data destination, this register turns on for one scan. |
| | Bits 1 to 15 | Reserved | |
| Starting number+4 | Reserved | | |

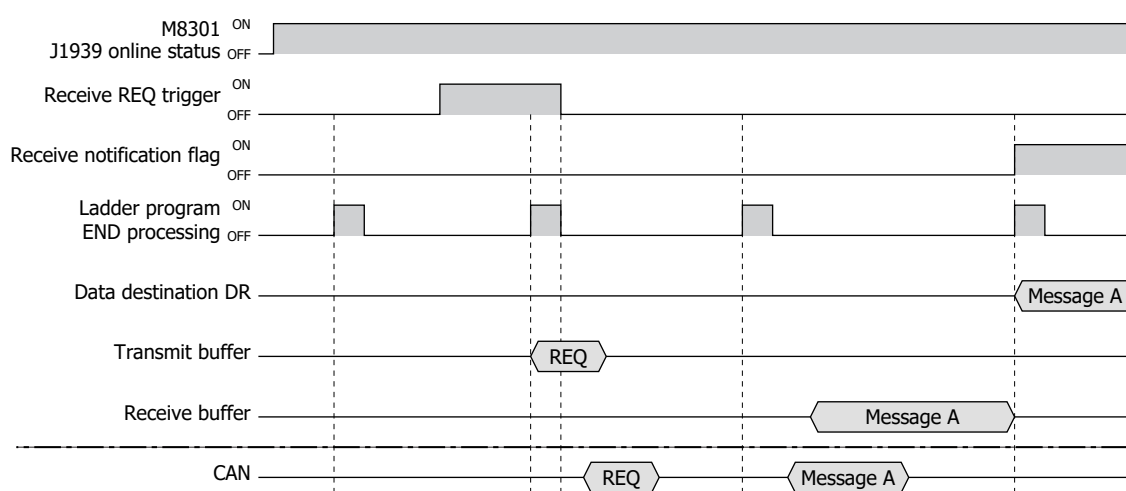
Receive results status

| Status Code | Description | Details |
|-------------|----------------------------|---|
| 0 | Normal | |
| 10 | Receive cycle timeout | The set time for the receive cycle timeout has been exceeded since the previous message was received. |
| 100 | Received data length error | The length of the received message data was longer than the maximum data length. |
| 101 | Received data length error | The received message was 252 bytes or longer. |
| 102 | Multi-packet receive error | A message with a data length of 9 bytes or longer could not be received. |

S2 (Receive REQ Trigger)

This function issues a request to the corresponding CA to transmit a message. When the receive REQ trigger is turned on, PGN 59904 (Request) will be sent to the CA in ladder program END processing.

Receive REQ trigger usage example

**D1 (Receive Alert Flag)**

Sets the flag for notification of a received message. This register is on for one scan when a message is received.

(2) Add button/Delete button

Click **Add** to add a received message to the message list (3).

To delete a message, select the message to delete in the message list, and then click **Delete**.

(3) Message list

Displays the content configured by the message parameter settings (4). The received message can also be enabled or disabled. The message is enabled when the check box is selected and disabled when the check box is cleared.

Notes:

Click the check box column header to perform the following operations.

- If all received message check boxes are on, all of the check boxes are cleared.
- If any received message check boxes are off, all of the check boxes are selected.

(4) Message parameter settings

These settings configure the details of the received message selected in the message list.

CAN ID

PGN: Sets the PGN of the message to receive with 2 bytes.

The range of the PGN that can be set is 0 to 61,184 (0000h to EF00h) (PDU1 format) or 61,440 to 65,535 (F000h to FFFFh) (PDU2 format). Set the low order 1 byte (PDU Specific) that indicates the destination address in PDU1 format to 00h. When setting the PDU2 format, the same PGN cannot be assigned to both Designed CA and Undesigned CA.

Click ... and a PGN can be selected in the displayed PGN Manager. For details, see "PGN Manager" on page 8-32.

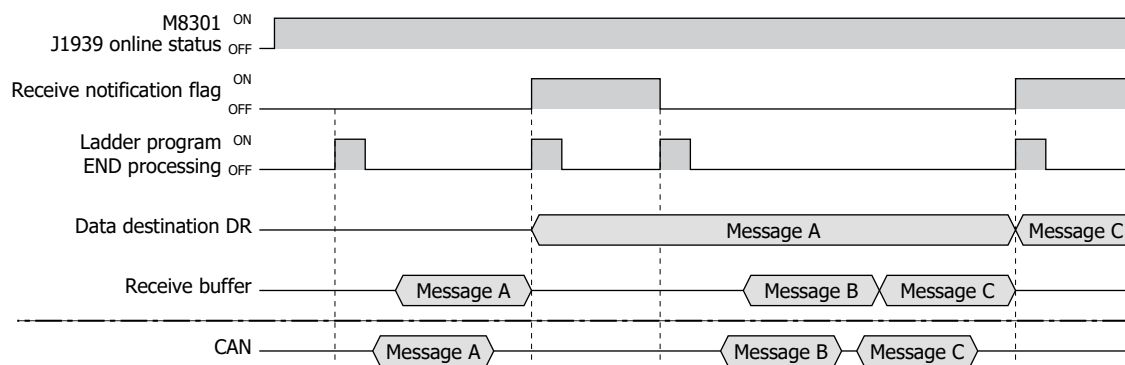
Type

The receive method for messages is fixed as "Polling".

Received messages are temporarily saved to the internal receive buffer, and the contents of the receive buffer are written to the data registers set as the data destination in the ladder program END processing. At this time, the receive notification flag is turned on for only one scan.

If the same PGN message is received from the same CA multiple times during the period from the ladder program END processing until the next END processing, the content of the last received message is written to the data destination.

Polling reception example



Max Data Length

Sets the maximum data length of the PGN to receive. The maximum value that can be set is 252 bytes.

Receive Cycle Timeout (ms)

Sets the time to monitor the receive message cycle that periodically receives messages in 10 ms increments. The range that can be set is 0 to 655,350. If set to 0, the receive cycle is not monitored.

Data Destination

Sets the data registers that will store the received message. The maximum data length is used starting from the set device.

Address: Shows the device address that corresponds to the tag name of the device or the device address.

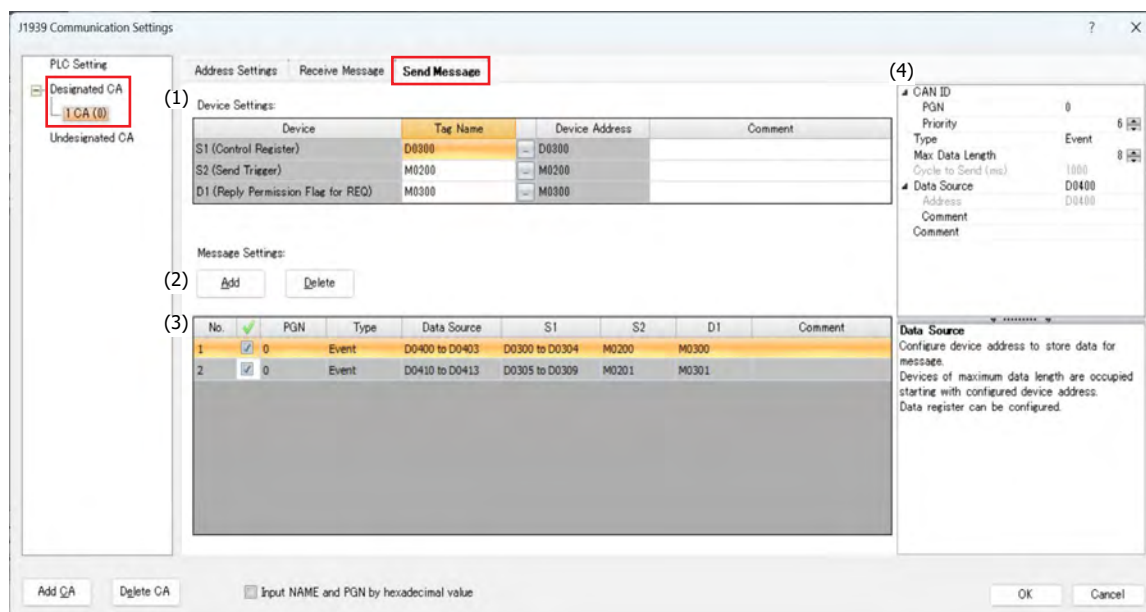
Comment: Shows the comment that corresponds to the tag name of the device or the device address. This item can be edited.

Comment

Sets the comment for the received message. The comment that can be set is a maximum of 127 bytes.

■ Send Message tab

This tab configures the messages that the CAN J1939 All-in-One CPU module transmits to the CA selected in the CA list.



(1) Device Settings

Sets the data registers that will be used by the sent messages.

| Settings | Description |
|----------------|--|
| Tag name | Specifies the tag name of the device or the device address. |
| Device Address | Shows the device address that corresponds to the tag name. |
| Comment | Shows the comment for the device address. This item can be edited. |

S1 (Control Register)

Sets the starting address of the data registers that will store the transmit settings and transmit results.

| Storage Destination | Item | | Description |
|---------------------|-------------------------|-------------------|---|
| Starting number+0 | Transmit data length | | This register stores the length of the message data to transmit. Starting from the data source, data in the length of the transmit data length will be transmitted to the CA. When 0 is stored for the transmit data length, data of the maximum data length will be transmitted to the CA. This cannot be set larger than the maximum data length. If the message that will be transmitted exceeds 8 bytes, the message is split into 8-byte packets and transmitted as a multi-packet message. |
| Starting number+1 | Reserved | | |
| Starting number+2 | Transmit results status | | This register stores the transmit results. To initialize this register, write "0". For details on the transmit results status, see "Transmit results status" on page 8-22. |
| Starting number+3 | Transmit action flag | | Stores the action flag for transmitting. |
| | Bit 0 | REQ received flag | This flag is turned on when a request PGN from a CA was received. This flag is turned off when the corresponding PGN is transmitted. |
| | Bits 1 to 15 | Reserved | |
| Starting number+4 | Reserved | | |

Transmit results status

| Status Code | Description | Details |
|-------------|----------------------------------|---|
| 0 | Normal | |
| 1 | Multi-packet message transmitted | A message with a data length of 9 bytes or longer has finished being transmitted. |
| 10 | Transmit data length error | The length of the transmitted message data was longer than the maximum data length. |
| 20 | Internal transmit queue overflow | The limit on the number of messages that can be queued for transmission has been reached. |
| 100 | Multi-packet transmit error | A message with a data length of 9 bytes or longer could not be transmitted. |
| 200 | Local address unconfirmed | The message could not be transmitted because the local address is unconfirmed. |
| 201 | Destination address unconfirmed | The message could not be transmitted because the destination CA address is unconfirmed. |

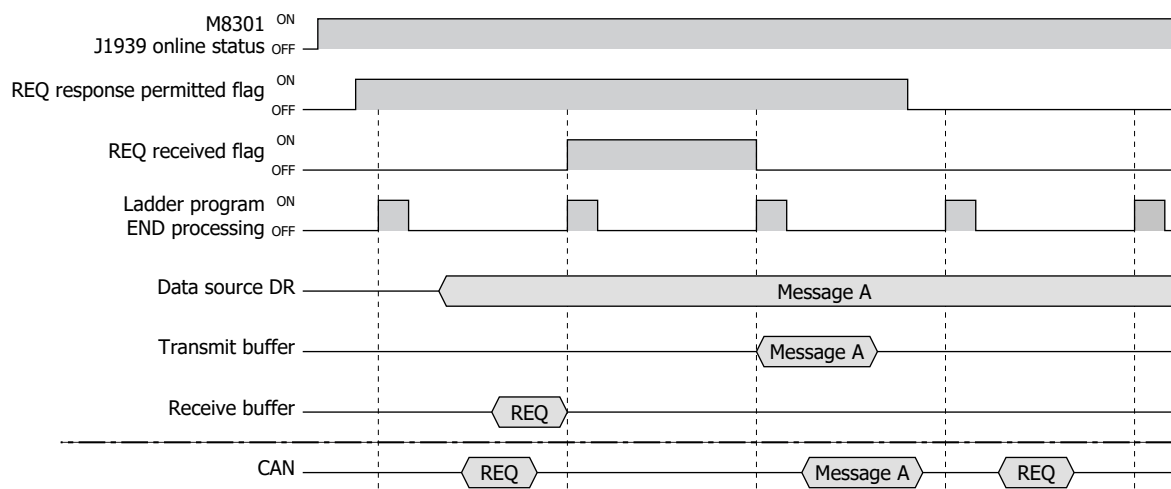
S2 (Send Trigger)

Sets the transmit trigger when "Event transmission" is selected for **Type**. When the transmit trigger is turned on, the message is transmitted in ladder program END processing. After the message is transmitted, the transmit trigger is turned off.

D1 (Reply Permission Flag for REQ)

This function transmits a PGN in response to a transmit request PGN received from the corresponding CA while the REQ response permitted flag is on. When PGN 59904 (Request) is received from a CA, the transmit action flag's REQ received flag is turned on, and in the next END processing a message for the corresponding PGN will be transmitted.

Request response example



(2) Add button/Delete button

Click **Add** to add a transmitted message to the message list (3).

To delete a message, select the message to delete in the message list, and then click **Delete**.

(3) Message list

Displays the content configured by the message parameter settings (4). The send message can also be enabled or disabled.

The message is enabled when the check box is selected and disabled when the check box is cleared.

Note:

Click the check box column header to perform the following operations.

- If all transmitted message check boxes are on, all of the check boxes are cleared.
- If any transmitted message check boxes are off, all of the check boxes are selected.

(4) Message parameter settings

These settings configure the details of the transmitted message selected in the message list.

CAN ID

PGN: Sets the PGN of the message to transmit. The range of the PGN that can be set is 0 to 61,184 (0000h to EF00h) (PDU1 format). Set the low order 1 byte (PDU Specific) that indicates the destination address in PDU1 format to 00h.

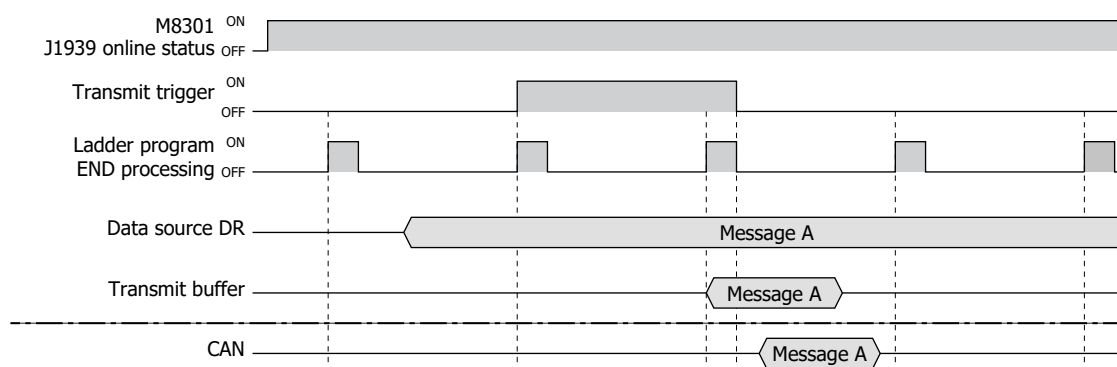
Click ... and a PGN can be selected in the displayed PGN Manager. For details, see "PGN Manager" on page 8-32.

Priority: Sets the priority for the message to transmit between 0 and 7.

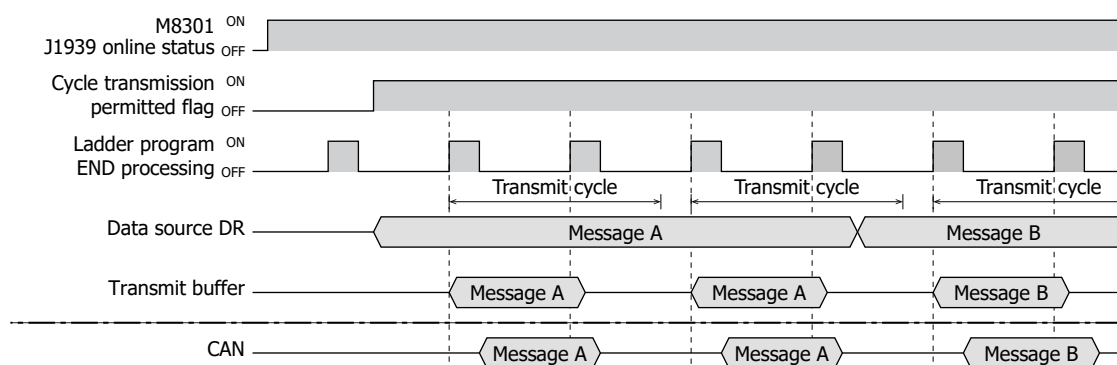
Type

Sets the transmit method for the message. Select as "Event" or "Cycle".

Event: When the transmit trigger is turned on, the transmit data stored in the data source is transmitted in END Processing.

Designated CA event transmission example

Cycle: While the cycle transmission permitted flag is on and when the transmit cycle occurs, the transmit data stored in the data source is transmitted in END processing. The actual transmit cycle is affected by the ladder program scan time.

Designated CA cycle transmission example**Max Data Length**

Sets the maximum data length of the PGN to transmit. The maximum value that can be set is 252 bytes.

Cycle to Send (ms)

Sets the transmit cycle in 10 ms increments when "Cycle transmission" is selected for **Type**. The range of the value that can be set is 10 to 655,350.

Data Source

Sets the data registers that will store the transmitted message. The maximum data length is used starting from the set device. When transmitting a message, the data is first copied from the data source to the internal transmit buffer and then transmitted.

Address: Shows the device address that corresponds to the tag name of the device or the device address.

Comment: Shows the comment that corresponds to the tag name of the device or the device address. This item can be edited.

Comment

Sets the comment for the transmitted message. The comment that can be set is a maximum of 127 bytes.

Undesignated CA

These settings configure messages that are exchanged as broadcasts without specifying specific CAs.

■ Receive Message tab

This tab configures messages that are transmitted from other CAs to the J1939 communication network as broadcasts.

The screenshot shows the 'J1939 Communication Settings' dialog box with the 'Receive Message' tab selected. On the left, under 'PLC Setting', 'Undesignated CA' is highlighted. The main area contains a 'Device Settings' table (1) with columns: Device, Tag Name, Device Address, and Comment. Below it are 'Message Settings' buttons (2) 'Add' and 'Delete'. A table (3) lists messages with columns: No., PGN, Type, Data Destination, S1, S2, D1, and Comment. On the right, a 'Data Destination' panel (4) shows details for CAN ID 65262, including PGN, Type, Max. Data Length, Receive Cycle Timeout (ms), and Data Destination address.

(1) Device Settings

Sets the data registers that will be used by the received messages.

| Settings | Description |
|----------------|--|
| Tag name | Specifies the tag name of the device or the device address. |
| Device address | Shows the device address that corresponds to the tag name. |
| Comment | Shows the comment for the device address. This item can be edited. |

S1 (Control Register)

Sets the starting address of the data registers that will store the receive results.

| Storage Destination | Item | | Description |
|---------------------|------------------------|-------------------------------|---|
| Starting number+0 | Received data length | | This register stores the length of the received message data. If the message that will be received exceeds 8 bytes, a multi-packet message split into 8-byte packets will be received. After the multi-packet message has finished being received, the split data is combined and stored in the data destination. If the length of the received message data is longer than the maximum data length, the maximum data length is stored and 100 is stored in the receive results status. |
| Starting number+1 | Source address | | This register stores the source address of the received message. |
| Starting number+2 | Receive results status | | This register stores the receive results. To initialize this register, write "0". For details on the receive results status, see "Receive results status" on page 8-26. |
| Starting number+3 | Receive action flag | | Stores the action flag for receiving. |
| | Bit 0 | Receive buffer overwrite flag | When the internal receive buffer was overwritten by the next message before the message data stored in the receive buffer could be written to the data destination, this register turns on for one scan. |
| | Bits 1 to 15 | Reserved | |
| Starting number+4 | Reserved | | |

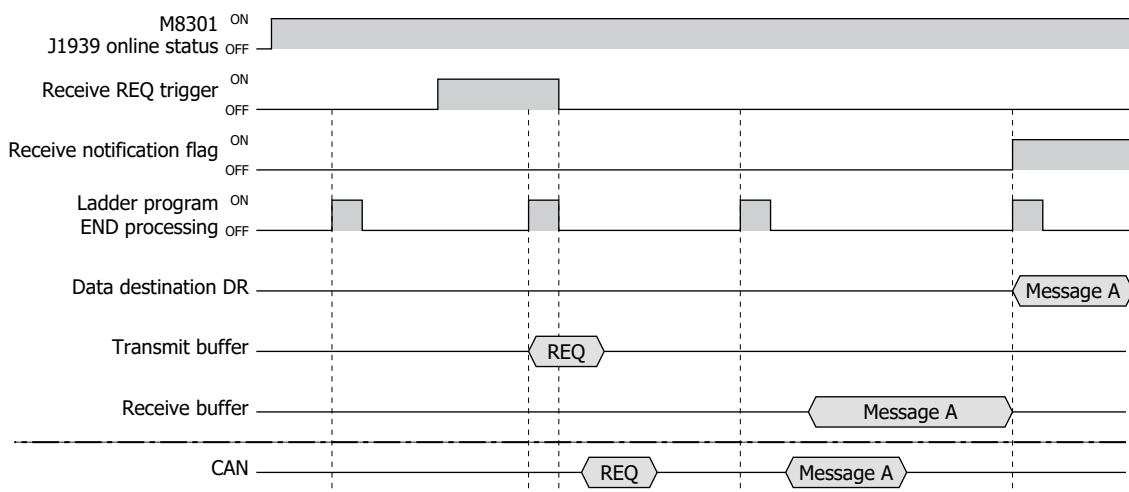
Receive results status

| Status Code | Description | Details |
|-------------|----------------------------|---|
| 0 | Normal | |
| 10 | Receive cycle timeout | The set time for the receive cycle timeout has been exceeded since the previous message was received. |
| 100 | Received data length error | The length of the received message data was longer than the maximum data length. |
| 101 | Received data length error | The received message was 252 bytes or longer. |
| 102 | Multi-packet receive error | A message with a data length of 9 bytes or longer could not be received. |

S2 (Receive REQ Trigger)

This function issues a PGN transmit request as a broadcast to the J1939 communication network. If the receive REQ trigger is turned on, PGN 599034 (Request) is transmitted as a broadcast in ladder program END processing.

Receive REQ trigger usage example



D1 (Receive Alert Flag)

Sets the flag for notification of a received message. This register is on for one scan when a message is received.

(2) Add button/Delete button

Click **Add** to add a received message row to the message list (3).

To delete a message, select the message to delete in the message list, and then click **Delete**.

(3) Message list

Displays the content configured by the message parameter settings (4). The received message can also be enabled or disabled. The message is enabled when the check box is selected and disabled when the check box is cleared.

Notes:

Click the check box column header to perform the following operations.

- If all received message check boxes are on, all of the check boxes are cleared.
- If any received message check boxes are off, all of the check boxes are selected.

(4) Message parameter settings

These settings configure the details of the received message selected in the message list.

CAN ID

PGN: Sets the PGN of the message to receive in 2 bytes. The range of the PGN that can be set is 0 to 61,184 (0000h to EF00h) (PDU1 format) and 61,440 to 65,535 (F000h to FFFFh) (PDU2 format). Set the low order 1 byte (PDU Specific) that indicates the destination address in PDU1 format to 00h.

When the PGN is set in the PDU1 format range, only messages with a destination address of 255 (global address) can be received. When setting the PDU2 format, the same PGN cannot be assigned to both Designed CA and Undesigned CA.

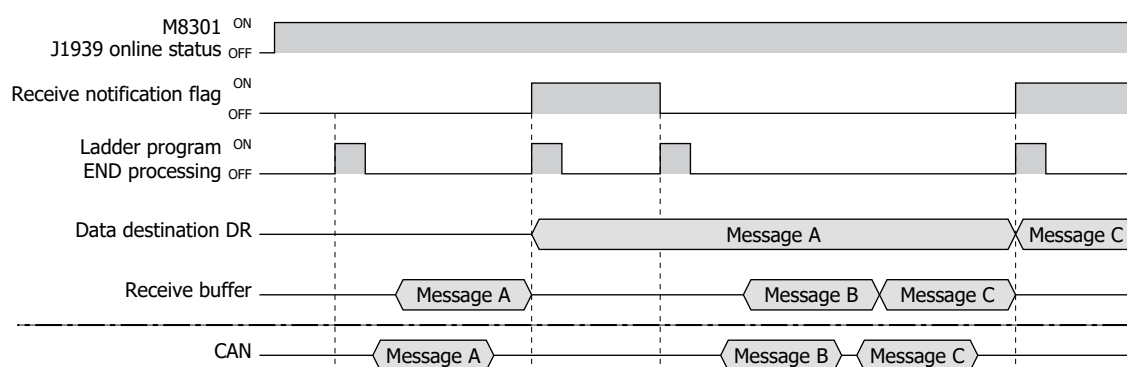
Click ... and a PGN can be selected in the displayed PGN Manager. For details, see "PGN Manager" on page 8-32.

Type

The receive method for messages is fixed as "Polling".

Received messages are temporarily saved to the internal receive buffer, and the contents of the receive buffer are written to the data registers set as the data destination in the ladder program END processing. At this time, the receive notification flag is turned on for only one scan.

If the same PGN message is received from the same CA multiple times during the period from the ladder program END processing until the next END processing, the content of the last received message is written to the data destination.

Polling reception example**Max Data Length**

Sets the maximum data length of the PGN to receive. The maximum value that can be set is 252 bytes.

Receive Cycle Timeout (ms)

Sets the time to monitor the receive message cycle that periodically receives messages in 10 ms increments. The range that can be set is 0 to 655,350. If set to 0, the receive cycle is not monitored.

Data Destination

Sets the data registers that will store the received message. The maximum data length is used starting from the set device.

Address: Shows the device address that corresponds to the tag name of the device or the device address.

Comment: Shows the comment that corresponds to the tag name of the device or the device address. This item can be edited.

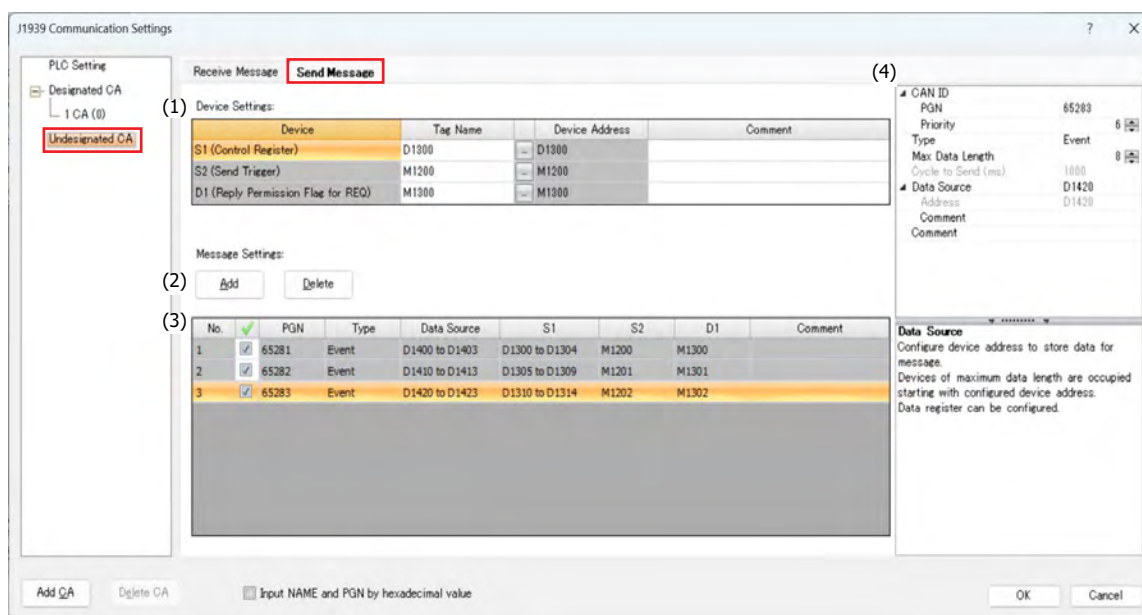
Comment

Sets the comment for the received message. The comment that can be set is a maximum of 127 bytes.

8: J1939 COMMUNICATION

■ Send Message tab

This tab configures messages that the CAN J1939 All-in-One CPU module transmits to the J1939 communication network as broadcasts.



(1) Device Settings

Sets the data registers that will be used by the sent messages.

| Settings | Description |
|----------------|--|
| Tag Name | Specifies the tag name of the device or the device address. |
| Device Address | Shows the device address that corresponds to the tag name. |
| Comment | Shows the comment for the device address. This item can be edited. |

S1 (Control Register)

Sets the starting address of the data registers that will store the transmit settings and transmit results.

| Storage Destination | Item | | Description |
|---------------------|--------------------------------------|-------------------|---|
| Starting number+0 | Transmit data length | | This register stores the length of the message data to transmit. Starting from the data source, data in the length of the transmit data length will be transmitted to the CA. When 0 is stored for the transmit data length, data of the maximum data length will be transmitted to the CA. This cannot be set larger than the maximum data length. If the message that will be transmitted exceeds 8 bytes, the message is split into 8-byte packets and transmitted as a multi-packet message. |
| Starting number+1 | Request response destination address | | Stores the source address of the received request PGN as the PGN response destination address. |
| Starting number+2 | Transmit results status | | This register stores the transmit results. To initialize this register, write "0". For details on the transmit results status, see "Transmit results status" on page 8-29. |
| Starting number+3 | Transmit action flag | | Stores the action flag for transmitting. |
| | Bit 0 | REQ received flag | This flag is turned on when a request PGN from a CA was received. This flag is turned off when the corresponding PGN is transmitted. |
| | Bits 1 to 15 | Reserved | |
| Starting number+4 | Reserved | | |

Transmit results status

| Status Code | Description | Details |
|-------------|----------------------------------|---|
| 0 | Normal | |
| 1 | Multi-packet message transmitted | A message with a data length of 9 bytes or longer has finished being transmitted. |
| 10 | Transmit data length error | The length of the transmitted message data was longer than the maximum data length. |
| 20 | Internal transmit queue overflow | The limit on the number of messages that can be queued for transmission has been reached. |
| 100 | Multi-packet transmit error | A message with a data length of 9 bytes or longer could not be transmitted. |
| 200 | Local address unconfirmed | The message could not be transmitted because the local address is unconfirmed. |
| 201 | Destination address unconfirmed | The message could not be transmitted because the destination CA address is unconfirmed. |

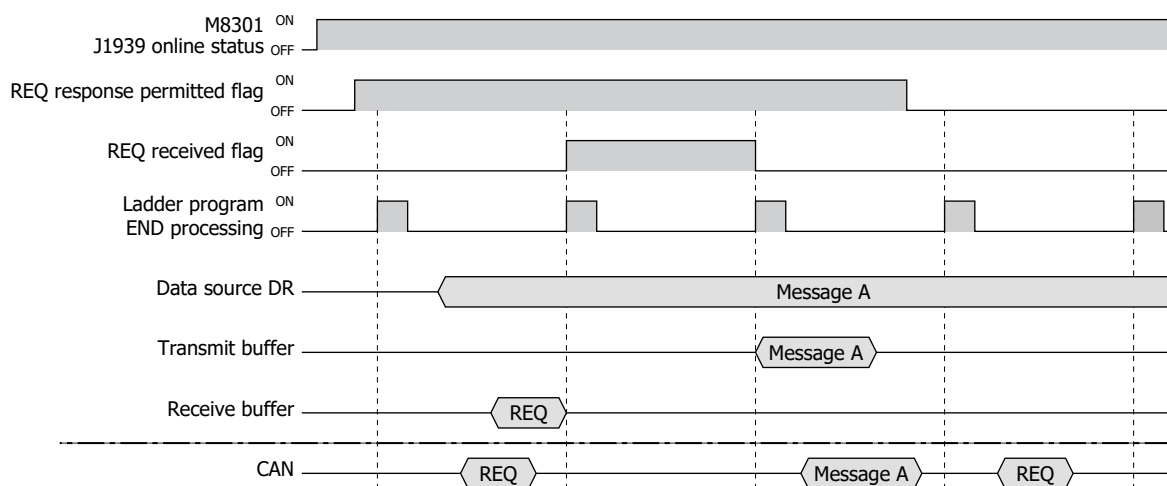
S2 (Send Trigger)

Sets the transmit trigger when "Event transmission" is selected for **Type**. When the transmit trigger is turned on, the message is transmitted in ladder program END processing. After the message is transmitted, the transmit trigger is turned off.

D1 (Reply Permission Flag for REQ)

This function responds to the transmit request in a message transmitted as a broadcast. When PGN 59904 (Request) transmitted as a broadcast is received, if the REQ response permitted flag for the corresponding PGN is on, the PGN 59904 (Request) source address is stored in the request response destination address, and the transmit action flag's REQ received flag is turned on. In the next END processing, the requested PGN message is transmitted to the request response destination address.

Request response example

**(2) Add button/Delete button**

Click **Add** to add a transmitted message to the message list (3).

To delete a message, select the message to delete in the message list, and then click **Delete**.

(3) Message list

Displays the content configured by the message parameter settings (4). The send message can also be enabled or disabled. The message is enabled when the check box is selected and disabled when the check box is cleared.

Notes:

Click the check box column header to perform the following operations.

- If all transmitted message check boxes are on, all of the check boxes are cleared.
- If any transmitted message check boxes are off, all of the check boxes are selected.

(4) Message parameter settings

These settings configure the details of the transmitted message selected in the message list.

CAN ID

PGN: Sets the PGN of the message to transmit. The range of the PGN that can be set is 0 to 61,184 (0000h to EF00h) (PDU1 format) and 61,440 to 65,535 (F000h to FFFFh) (PDU2 format). Set the low order 1 byte (PDU Specific) that indicates the destination address in PDU1 format to 00h. When the PGN is set in the PDU1 format range, it is transmitted as a message with a destination address of 255 (global address).

Click ... and a PGN can be selected in the displayed PGN Manager. For details, see "PGN Manager" on page 8-32.

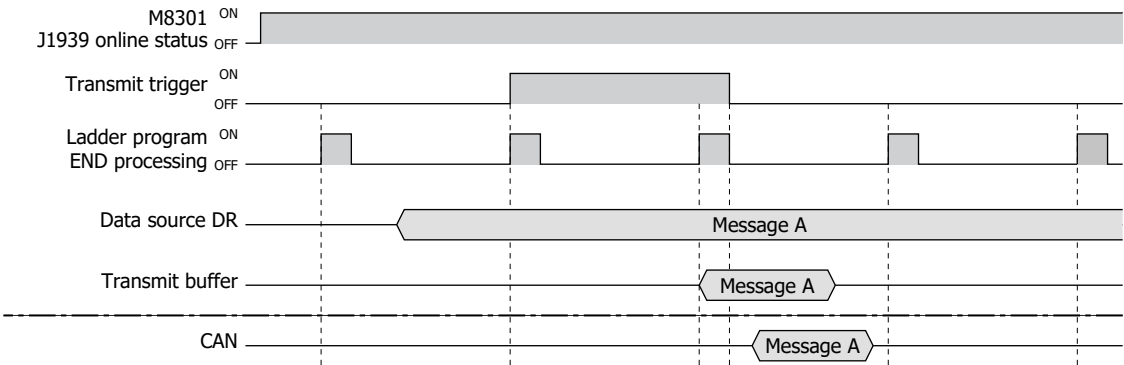
Priority: Sets the priority for the message to transmit between 0 and 7.

Type

Sets the transmit method for the message. Select as "Event" or "Cycle".

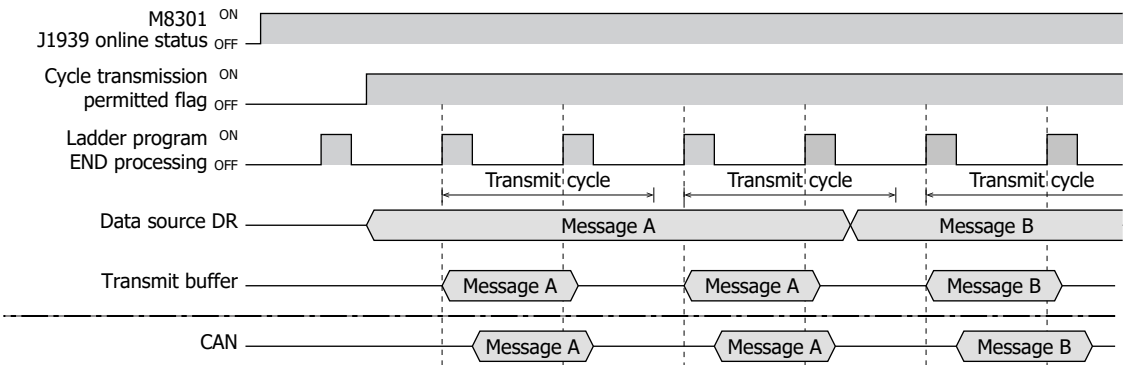
Event: When the transmit trigger is turned on, the transmit data stored in the data source is transmitted in END Processing.

Undesignated CA event transmission example



Cycle: While the cycle transmission permitted flag is on and when the transmit cycle occurs, the transmit data stored in the data source is transmitted in END processing. The actual transmit cycle is affected by the ladder program scan time.

Undesignated CA cycle transmission example



Max Data Length

Sets the maximum data length of the PGN to transmit. The maximum value that can be set is 252 bytes.

Cycle to Send (ms)

Sets the transmit cycle in 10 ms increments when "Cycle transmission" is selected for **Type**. The range of the value that can be set is 10 to 655,350.

Data Source

Sets the data registers that will store the transmitted message. The maximum data length is used starting from the set device. When transmitting a message, the data is first copied from the data source to the internal transmit buffer and then transmitted.

Address: Shows the device address that corresponds to the tag name of the device or the device address.

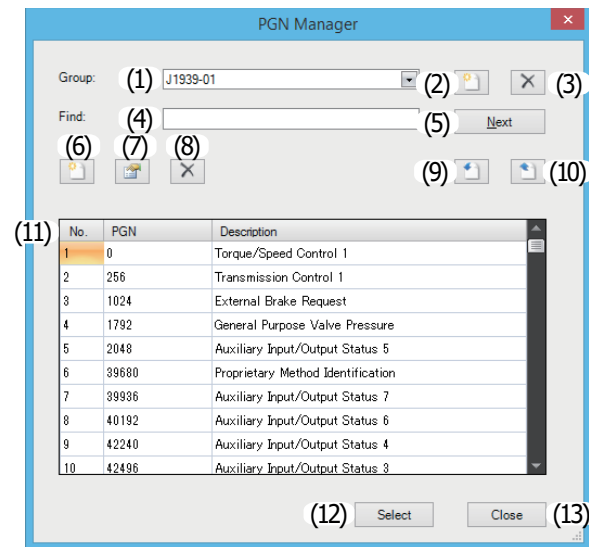
Comment: Shows the comment that corresponds to the tag name of the device or the device address. This item can be edited.

Comment

Sets the comment for the transmitted message. The comment that can be set is a maximum of 127 bytes.

PGN Manager

PGNs for transmitted and received messages are collectively managed with PGN Manager.



(1) Group list

Displays the registered PGN groups.

When the group is changed, the PGNs registered to the selected group are displayed in the PGN list (11).

J1939 has been registered in advance. A maximum of 20 groups including **J1939** can be registered.

(2) Add group button

Adds a group.

Click this button to display PGN Group Editor. Add a new group with PGN Group Editor. For details, see "PGN Group Editor" on page 8-34.

The added group is added to the group list.

(3) Delete group button

Deletes a group.

Select a group from the group list and click this button to delete it.

The default group **J1939** cannot be deleted.

(4) Find

Enter a string to find in the PGN list as a maximum of 128 bytes.

(5) Next

Finds the string entered in **Find** in the PGN list. Enter a string in **Find** and click this button.

(6) Add PGN button

Adds a PGN to the group.

Select the group in the group list where the PGN will be added and click this button to display PGN Editor.

Add a new PGN with PGN Editor. For details, see "PGN Editor" on page 8-34.

The added PGN is added to the PGN list.

(7) Edit PGN button

Edits a PGN.

Select a registered group in the group list that contains the PGN to edit, and then select the PGN to edit in the PGN list. Click this button to display PGN Editor.

Edit the PGN in PGN Editor. For details, see "PGN Editor" on page 8-34.

The content of the PGN selected in the PGN is updated.

(8) Delete PGN button

Deletes a PGN.

Select a registered group in the group list that contains the PGN to delete, and then select the PGN to delete in the PGN list.

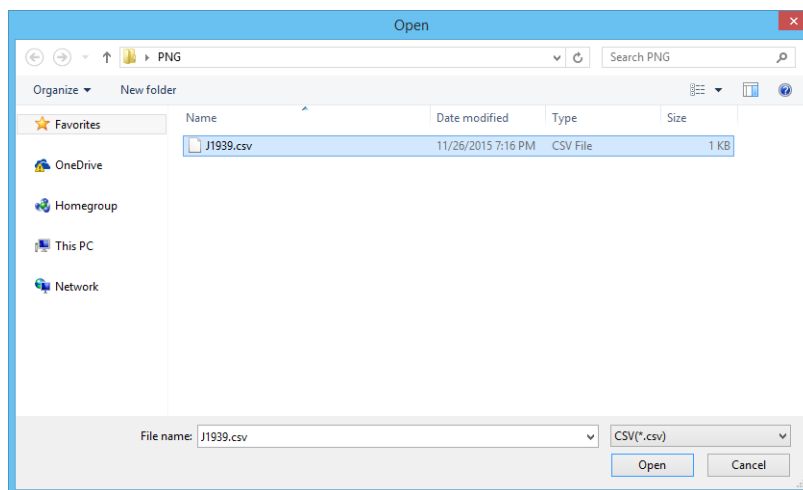
Click this button to delete the PGN.

(9) Import PGNs button

Imports PGNs saved as a CSV file.

Select the group where the PGNs will be imported in the group list. PGNs that are already registered to the selected group are all deleted before the import is executed.

Click this button to display the **Open** dialog box.

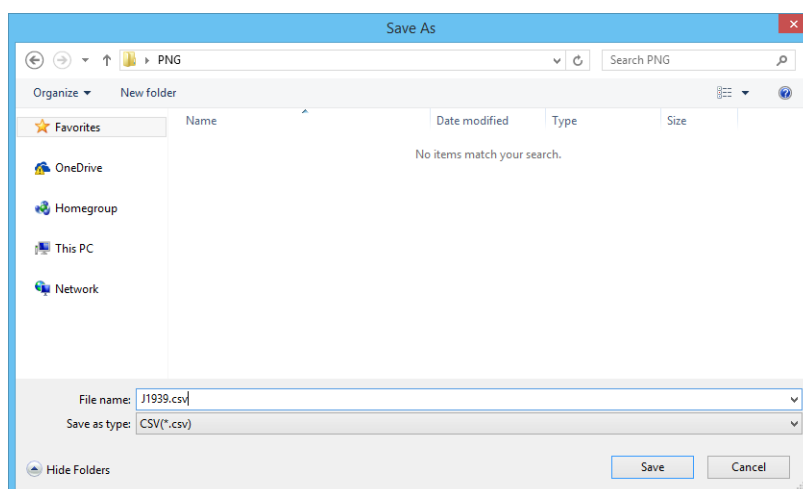


Select the CSV file where the PGNs are saved and click **Open** to import the PGNs in that file to the PGN list for the group selected in the group list.

(10) Export PGNs button

Exports the PGNs registered to the group selected in the group list as a CSV file.

Click this button to display the **Save As** dialog box.



Select the location to save the file, enter a file name, and then click **Save** to save the PGNs registered to the group as a CSV file.

(11) PGN list

Displays the PGNs registered to the group selected in the group list.

No.: Displays the control number for the registered PGN (1 to 65,535).

PGN: Displays the PGN.

Name: Displays the PGN name.

(12) Select button

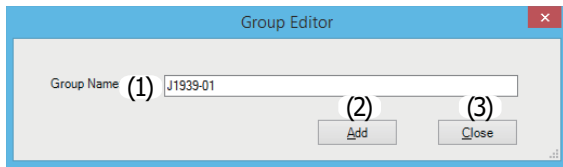
Closes PGN Manager and sets **CAN ID** in the calling message parameter to the PGN selected in the PGN list.

(13) Close button

Closes PGN Manager.

■ PGN Group Editor

Adds a new group.



(1) Group Name

Enter the group name for the group that will be used to register PGNs as a maximum of 64 bytes.

(2) Add button

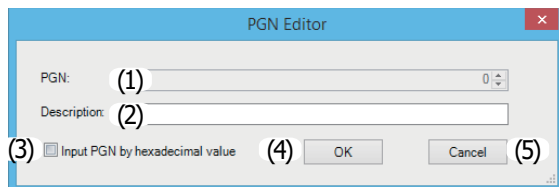
Closes PGN Group Editor and adds the group to the PGN Manager group list.

(3) Close button

Closes PGN Group Editor.

■ PGN Editor

Adds new PGNs and edits existing PGNs.



(1) PGN

Enter the PGN to register as a maximum of 5 characters.

When the **Input PGN by hexadecimal value** check box is cleared, enter this as a decimal value. When the check box is selected, enter this as a hexadecimal value.

Example: When hexadecimal: 0001, FF00, etc.

(2) Description

Enter the name of the PGN to register as a maximum of 128 bytes.

(3) Input PGN by hexadecimal value check box

Specifies the PGN entry format.

When cleared, enter the value as a decimal value. When selected, enter the value as a hexadecimal value.

(4) OK button

Closes PGN Editor and adds the PGN to the PGN Manager group list.

(5) Cancel button

Closes PGN Editor.

9: BLUETOOTH COMMUNICATION

This chapter describes the Bluetooth communication of the FC6A.

Overview

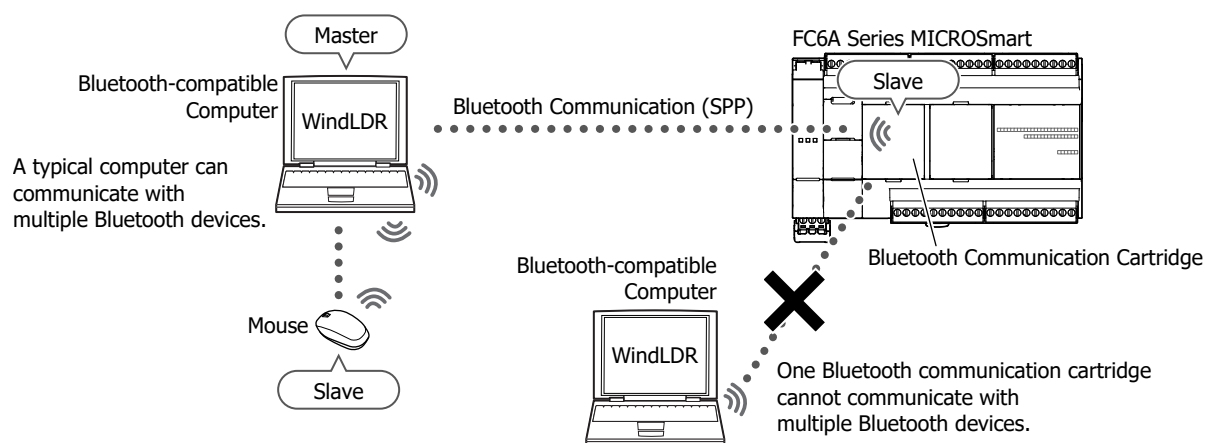
Bluetooth communication can be used by connecting a Bluetooth communication cartridge to the FC6A. Bluetooth communication cartridge can be connected to the three cartridge slots, cartridge slots 1, 2, and 3 (Plus CPU module only). Bluetooth communication cartridges can have the serial communication with Bluetooth devices that support SPP profile.

The FC6A with a connected Bluetooth communication cartridge can connect to a Bluetooth network as a master or slave.

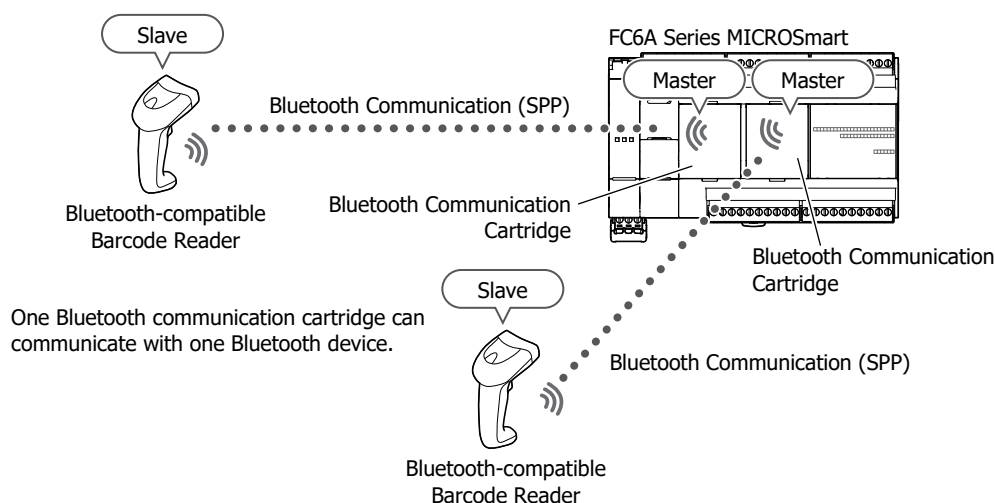
Regardless of whether the FC6A is a master or slave, the FC6A can connect to and communicate with only one Bluetooth device per Bluetooth communication cartridge.

On a Bluetooth network, the source of the connection is called the master and the destination of the connection is called the slave.

Example of Computer and FC6A Connection



Example of FC6A and Bluetooth Device Connection



Wireless Communication Specifications

| Type No. | FC6A-PC4 |
|---------------------------------------|---|
| Bluetooth Standard | Bluetooth ver.2.1 + EDR |
| Profile | SPP (Serial Port Profile) iAP (iPod Accessory Protocol) |
| Frequency Range | 2,402 MHz to 2,480 MHz |
| Wireless Transmission Distance*1 | 10 m (Class 2) |
| Multi-point Function | 8 units |
| Communication Protocol | Maintenance communication protocol, user communication protocol |
| Bluetooth Wireless Approved Regions*2 | Japan, China, USA, Canada, Australia, New Zealand, Europe |

*1 Connection effective range is affected by obstacles (human, metal, wall) and wave signal condition. Make sure to confirm the connection status before actual operation.

*2 Depending on countries or regions, evaluations on the device equipped with FC6A may be necessary.

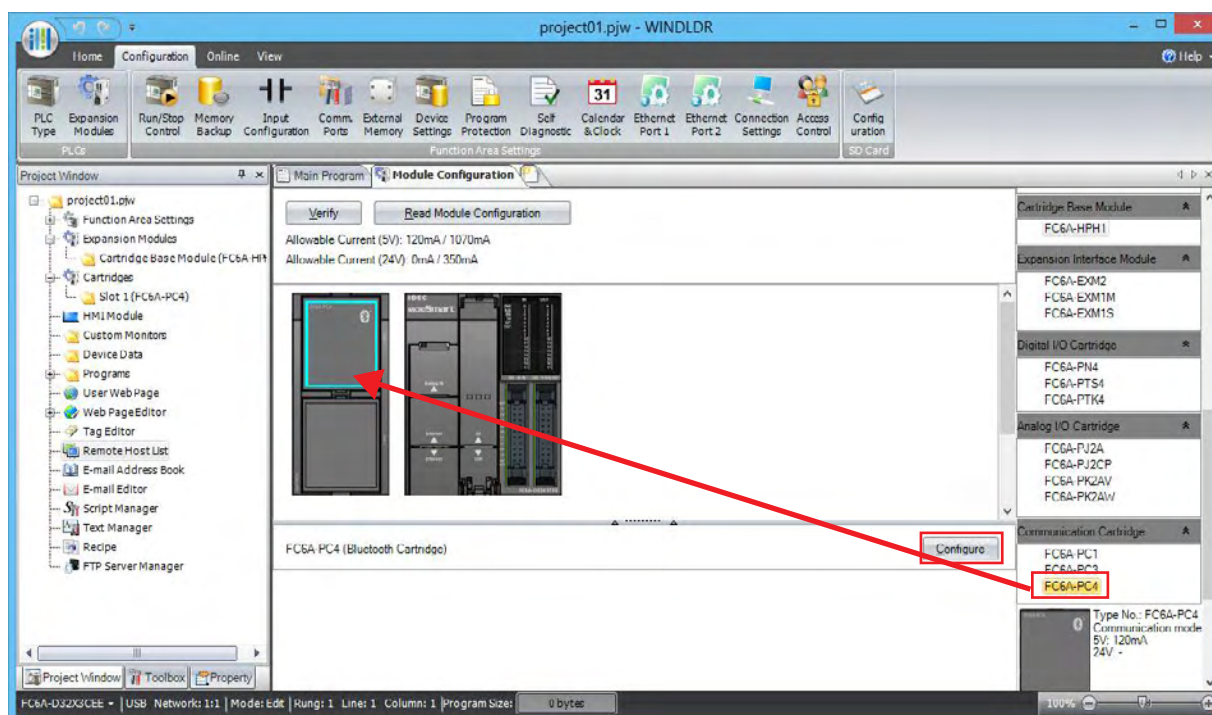
Note: Communication performance (required time) in maintenance communication is as follows.

- User program upload equivalent to 10,000 steps: 2 minutes 40 seconds approx.
- User program download equivalent to 10,000 steps: 2 minutes 30 seconds approx.
- User program upload equivalent to 20,000 steps: 5 minutes 20 seconds approx.
- User program download equivalent to 20,000 steps: 5 minutes approx.
- 100 KB CSV file retrieval: 1 minute 30 seconds approx.
- 200 KB CSV file retrieval: 3 minutes approx.

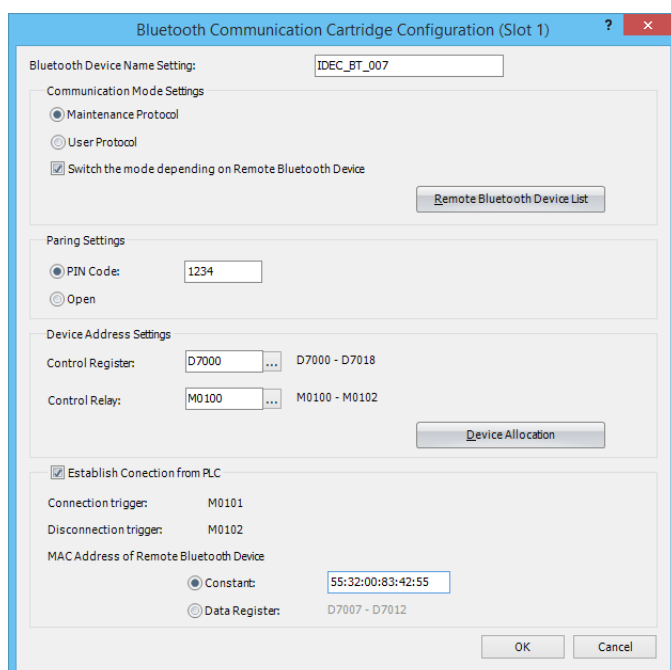
Configuring the Bluetooth Communication Cartridge

Programming WindLDR

1. The Bluetooth communication cartridge is configured with the Module Configuration Editor. On the **Configuration** tab, in the **PLCs** group, select **Expansion Modules**.
2. Click the Bluetooth communication cartridge inserted in the module configuration area and click **Configure**. The **Bluetooth Communication Cartridge Configuration** dialog box is displayed.



3. Configure the Bluetooth communication cartridge settings.



4. Download the user program to the FC6A.
This concludes configuring the Bluetooth communication cartridge.

Bluetooth Communication Cartridge Configuration

(1) Bluetooth Device Name Setting

Set the name that will be displayed on a computer or smartphone when Bluetooth devices in the area are detected from that computer or smartphone.

(2) Communication Mode Settings

Select the communication mode of the FC6A in Bluetooth communication from **Maintenance Protocol** or **User Protocol**. When Switching the mode depending on Remote Bluetooth Device (3) is selected, the communication mode configured in (3) is applied with a higher priority.

(3) Switch the mode depending on Remote Bluetooth Device

Select this check box to switch the communication mode of the FC6A according to the connected Bluetooth device.

For example, use this option to switch to maintenance communication when the FC6A connects to a smart phone and to switch to user communication when the FC6A connects to a barcode reader after it is disconnected from the smart phone.

If this check box is not selected or this check box is selected but no Bluetooth devices are registered in the **Remote Bluetooth Device List** dialog box, the FC6A will operate with the communication mode set by Communication Mode Settings (2).

When Switching the mode depending on Remote Bluetooth Device (3) is configured and FC6A establishes a connection with a Bluetooth device, the FC6A determines the communication mode. Therefore, the FC6A does not receive the SPP data for a few seconds from when the connection is established. SPP communication is possible when the communication mode is changed and the Bluetooth communication cartridge (cartridge slot) status in the control register (6) is changed.

(4) Remote Bluetooth Device List button

MAC address and communication mode for the remote Bluetooth devices to connect for Switching the mode depending on Remote Bluetooth Device (3) can be configured.

Click this button to display the **Remote Bluetooth Device List** dialog box.

The MAC address, communication mode, and comment of each Bluetooth device are displayed in the dialog box. For details, see "Remote Bluetooth Device List" on page 9-6.

(5) Pairing Settings

Select the security when making a Bluetooth connection from the following.

- PIN Code : Requires the input of the configured PIN code when making a connection with the Bluetooth device. The communicated content is encrypted.
This pairing method is typically used with devices up to Bluetooth v2.0.
- Open : The communicated content is not encrypted.
This setting is used to communicate with devices up to Bluetooth v2.0 with no security.

(6) Control Registers

Specify the first data register of the control registers storing MAC addresses of the remote Bluetooth device and the Bluetooth communication cartridge connected to the FC6A. Special data registers cannot be specified.

| Device Address | Item | Description | R/W |
|--------------------|---|---|-----|
| Starting number+0 | Status of Bluetooth communication cartridge (cartridge slot) | Stores the status and communication mode of the Bluetooth communication cartridge. 0: No operation 255: In operation, such as waiting for Bluetooth connection and disconnection 1: Maintenance communication 2: User communication The default setting is 0 (No operation). | R |
| Starting number+1 | MAC address of Bluetooth communication cartridge (cartridge slot) | Stores the MAC address of the Bluetooth communication cartridge connected to the cartridge slot. Example: MAC address: AA-BB-CC-DD-EE-FF Starting number+1=AA, starting number+2=BB, starting number+3=CC, starting number+4=DD, starting number+5=EE, starting number+6=FF | R |
| Starting number+2 | | | |
| Starting number+3 | | | |
| Starting number+4 | | | |
| Starting number+5 | | | |
| Starting number+6 | | | |
| Starting number+7 | MAC address of the remote Bluetooth device with which the Bluetooth communication cartridge makes a connection (cartridge slot) | Store the MAC address of the remote Bluetooth device to connect. Example: MAC address: AA-BB-CC-DD-EE-FF Starting number+1=AA, starting number+2=BB, starting number+3=CC, starting number+4=DD, starting number+5=EE, starting number+6=FF | R/W |
| Starting number+8 | | | |
| Starting number+9 | | | |
| Starting number+10 | | | |
| Starting number+11 | | | |
| Starting number+12 | | | |
| Starting number+13 | —Reserved— | | — |
| Starting number+14 | | | |
| Starting number+15 | | | |
| Starting number+16 | | | |
| Starting number+17 | | | |
| Starting number+18 | | | |

(7) Control Relays

Specify the first internal relay of the control relays storing the Bluetooth communication cartridge (cartridge slot) communication status and connection and disconnection triggers for the Establish Connection (9). Special internal relays cannot be specified.

| Device Address | Item | Description | R/W |
|-------------------|---|---|-----|
| Starting number+0 | Status of Bluetooth communication cartridge (cartridge slot) | 0: Cannot communicate with the remote Bluetooth device 1: Can communicate with the remote Bluetooth device | R |
| Starting number+1 | Connection trigger of Bluetooth communication cartridge (cartridge slot) | 0: Do not process 1: Connect the connection target Bluetooth device | R/W |
| Starting number+2 | Disconnection trigger of Bluetooth communication cartridge (cartridge slot) | 0: Do not process 1: Disconnect the connection target Bluetooth device | R/W |

(8) Device Allocation button

Click this button to display the **Device Allocation** dialog box.

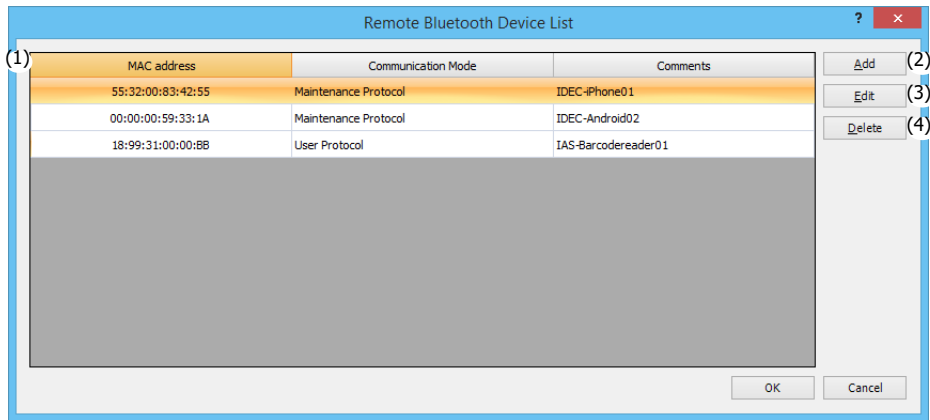
The dialog box displays a table with the Bluetooth communication cartridge settings and corresponding data registers and internal relays. For details, see "Device Allocations" on page 9-7.

(9) Establish Connection from PLC

Select this check box to connect to and disconnect from the remote Bluetooth device when FC6A is the master. When this check box is selected, iOS devices cannot be connected.

- Connection Trigger
- : The device address of the control relay, which is configured in (7), + 1 is displayed as the connection trigger. When this is turned off to on, a connection is made with the remote Bluetooth device configured in **MAC Address of Remote Bluetooth Device**.
- Disconnection Trigger
- : The device address of the control relay, which is configured in (7), + 2 is displayed as the disconnection trigger. When this is turned off to on, a connection with the remote Bluetooth device configured in **MAC Address of Remote Bluetooth Device** is disconnected.
- MAC Address of Remote Bluetooth Device
- : The remote Bluetooth device to connect can be specified with either **Constant** or **Data Register**.
When **Constant** is selected, MAC address configured in the **Bluetooth Communication Cartridge Configuration** dialog box becomes the target to connect.
When **Data Register** is selected, MAC address configured with the first data register +7 to +12 of the control register (6) becomes the target to connect.

Remote Bluetooth Device List



(1) Bluetooth Device List

Displays the MAC address, communication mode, and comment of each Bluetooth device.

(2) Add

Click this button to display the **Remote Bluetooth Device Settings** dialog box. This dialog box is used to enter the MAC address of the connected Bluetooth device, communication mode to switch to at the start of the connection, and comment. A maximum of 20 devices can be registered. For details, see "Remote Bluetooth Device Settings" on page 9-7.

(3) Edit

Select a Bluetooth device in the Bluetooth Device List (1) and click this button to display the **Remote Bluetooth Device Settings** dialog box. This dialog box is used to edit the MAC address of the connected Bluetooth device, communication mode to switch to at the start of the connection, and comment. For details, see "Remote Bluetooth Device Settings" on page 9-7.

(4) Delete

Select a Bluetooth device in the Bluetooth Device List (1) and click this button to delete the Bluetooth device.

Remote Bluetooth Device Settings

Remote Bluetooth Device Setting

MAC address (1) 35:32:00:83:42:55 OK

Communication Mode (2) Maintenance Protoc Cancel

Comments (3) .DEC-iPhone01

(1) MAC address

Set the MAC address of the connected Bluetooth device.

(2) Communication Mode

Select the communication mode to switch to at the start of the connection from **Maintenance Protocol** or **User Protocol**.

(3) Comments

Enter the MAC address of the connected Bluetooth device.

Device Allocations

Device Allocation

Data Register Internal Relay

| Device Address | Description |
|----------------|--|
| D7000 | Bluetooth Cartridge (Slot 1) Status |
| D7001 | Bluetooth Cartridge (Slot 1) MAC Address 1/6 |
| D7002 | Bluetooth Cartridge (Slot 1) MAC Address 2/6 |
| D7003 | Bluetooth Cartridge (Slot 1) MAC Address 3/6 |
| D7004 | Bluetooth Cartridge (Slot 1) MAC Address 4/6 |
| D7005 | Bluetooth Cartridge (Slot 1) MAC Address 5/6 |
| D7006 | Bluetooth Cartridge (Slot 1) MAC Address 6/6 |
| D7007 | Bluetooth Cartridge (Slot 1) Target Device MAC ... |
| D7008 | Bluetooth Cartridge (Slot 1) Target Device MAC ... |
| D7009 | Bluetooth Cartridge (Slot 1) Target Device MAC ... |
| D7010 | Bluetooth Cartridge (Slot 1) Target Device MAC ... |
| D7011 | Bluetooth Cartridge (Slot 1) Target Device MAC ... |
| D7012 | Bluetooth Cartridge (Slot 1) Target Device MAC ... |
| D7013 | Reserved |
| D7014 | Reserved |

Allocate Comments Close

(1) Device Allocations List

Displays a table with the Bluetooth communication cartridge settings, data registers, and internal relays.

(2) Allocate Comments button

Click this button to set the content in the table as the comments of the devices.

Configuring and Communicating with Bluetooth Devices

Maintenance Communication with a Computer

This section describes how to perform maintenance communication with a computer using the Bluetooth communication.

This enables you to have a computer, in which WindLDR is installed, connect with the Bluetooth communication cartridge to monitor and change device values and to upload and download the user program.

The FC6A waits for the connection as the slave and the computer acts as the master to make the connection on the Bluetooth network.



FC6A Settings

- 1. Connect the Bluetooth communication cartridge to the FC6A.
- 2. Configure the Bluetooth communication cartridge with WindLDR.
For details, see "Programming WindLDR" on page 9-3.

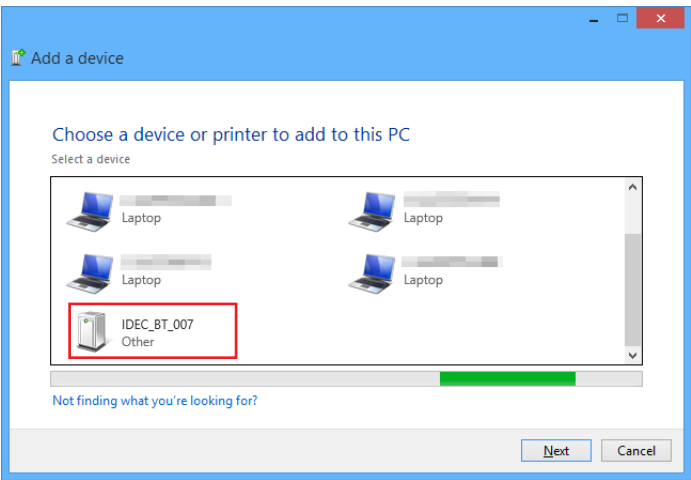
Example: **Bluetooth Communication Cartridge Configuration** dialog box settings

| Settings | | Description |
|-------------------------------|-------------------|---------------------------|
| Bluetooth Device Name Setting | | IDEC_BT_007 |
| Communication Mode | | Maintenance Communication |
| Pairing Setting | | PIN Code "1234" |
| Device Settings | Control Registers | D7000 |
| | Control Relays | M0100 |

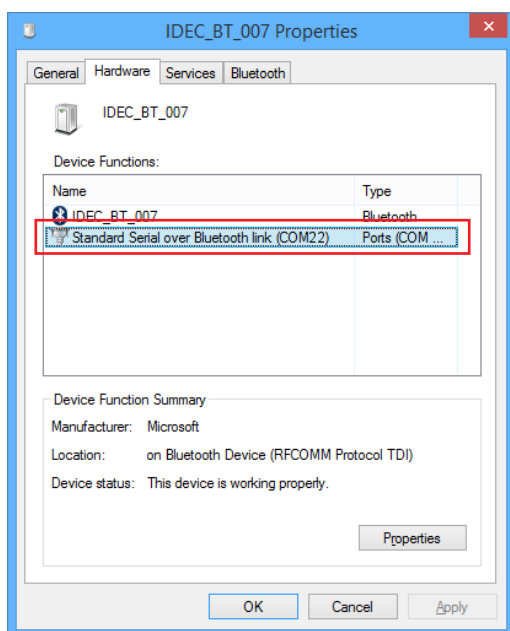
- 3. Download the user program to the FC6A.

Computer Settings

- 1. Search for the name of the Bluetooth communication cartridge with the computer.
The name is set with the **Bluetooth Device Name Setting** in the **Bluetooth Communication Cartridge Configuration** dialog box in WindLDR.
(IDEC_BT_007)

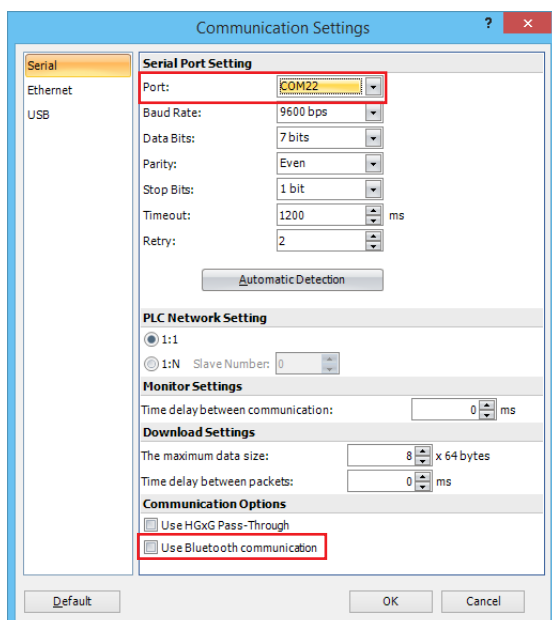


2. Connect to the Bluetooth communication cartridge and create a virtual COM port. When connecting the first time, pairing is necessary and entering the PIN code "1234" is required.



Checking Bluetooth Communication

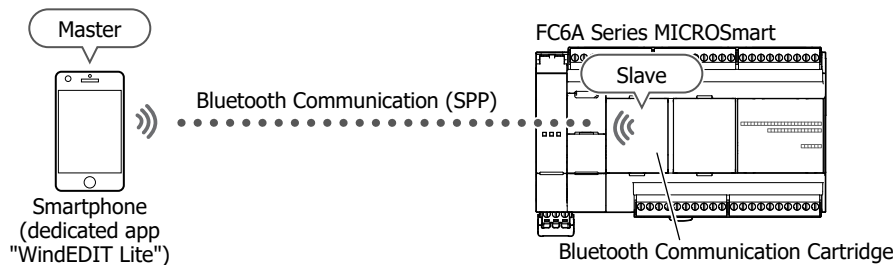
1. Perform the serial communication using the virtual COM port.
Select **Use Bluetooth communication**.



2. Run the monitor in WindLDR.
3. Check the value of the device that indicates the Bluetooth communication status.
Check if the Bluetooth communication cartridge status (M0100) is 1. The Bluetooth communication cartridge (cartridge slot) status is the first internal relay + 0 of the control relays configured in **Device Address Settings** in **Bluetooth Communication Cartridge Configuration** dialog box.

Maintenance Communication with a Smartphone

This section describes how to perform maintenance communication with a smartphone using the Bluetooth communication. This enables you to have a smart phone, in which the dedicated app is installed, connect with the Bluetooth communication cartridge to monitor and change device values and to upload and download the user program. The FC6A waits for the connection as the slave and the smartphone acts as the master to make the connection on the Bluetooth network.



Unspecified access can be prevented by using password authentication to restrict access to the FC6A.

FC6A Settings

- 1. Connect the Bluetooth communication cartridge to the FC6A.
- 2. Configure the Bluetooth communication cartridge with WindLDR.
For details, see "Programming WindLDR" on page 9-3.

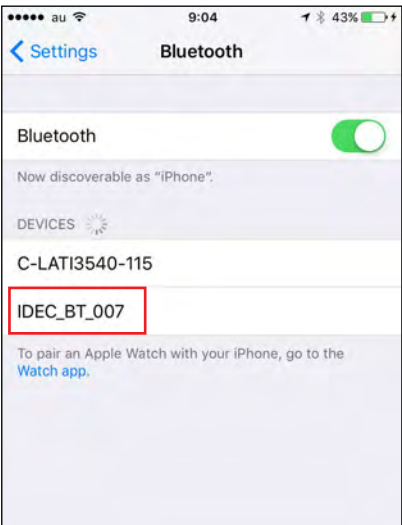
Example: **Bluetooth Communication Cartridge Configuration** dialog box settings

| Settings | | Description |
|-------------------------------|-------------------|---------------------------|
| Bluetooth Device Name Setting | | IDEC_BT_007 |
| Communication Mode | | Maintenance Communication |
| Pairing Setting | | PIN Code "1234" |
| Device Settings | Control Registers | D7000 |
| | Control Relays | M0100 |

- 3. Download the user program to the FC6A.

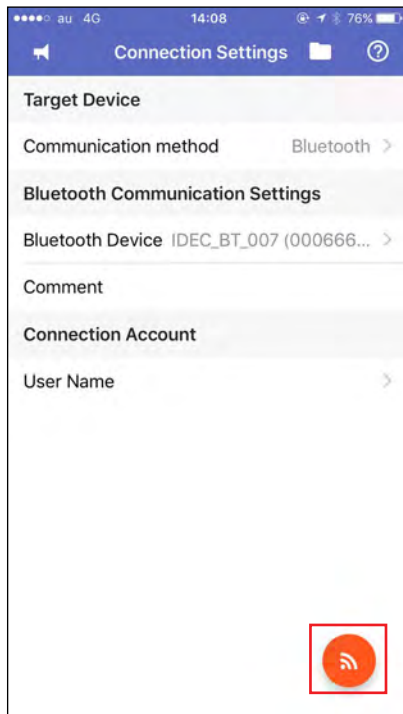
Smartphone Settings

- 1. Search for the name of the Bluetooth communication cartridge with a smart phone.
The name is set with the **Bluetooth Device Name Setting** in the **Bluetooth Communication Cartridge Configuration** dialog box in WindLDR.
(IDEC_BT_007)



Note: The search screen for the Bluetooth communication devices depends on each smart phone to use.

2. Connect to the Bluetooth communication cartridge from the dedicated app.



Checking Bluetooth Communication

1. Check the device value that indicates the Bluetooth communication status with the dedicated app **WindEDIT Lite**.
Check if the Bluetooth communication cartridge status (M0100) is 1. The Bluetooth communication cartridge (cartridge slot) status is the first internal relay + 0 of the control relays configured in **Device Address Settings** in **Bluetooth Communication Cartridge Configuration** dialog box.

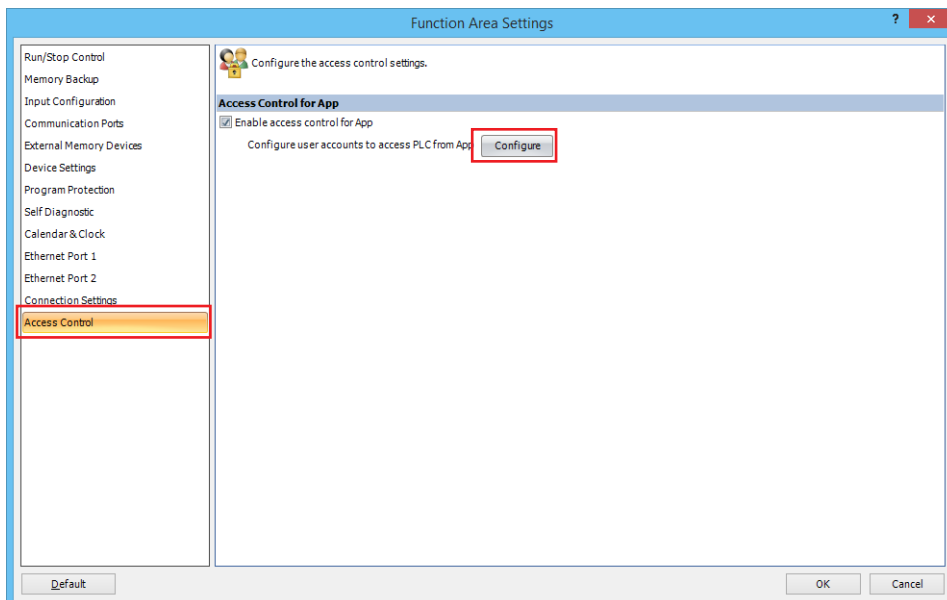
Note: For how to use the dedicated app **WindEDIT Lite**, see the "WindEDIT Lite User's Manual".

User Account Settings

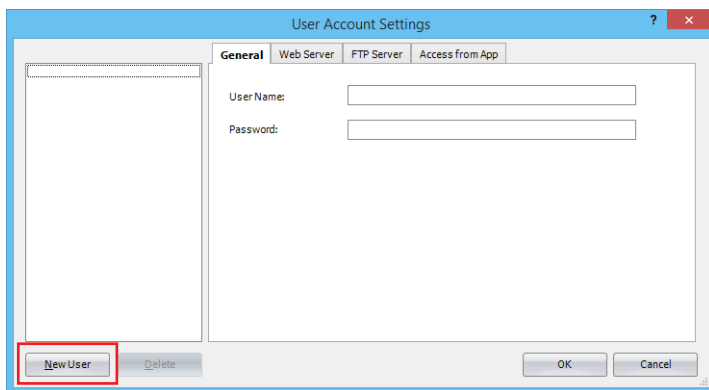
Creating User Accounts

• Operation procedure

1. In the **Function Area Settings** dialog box, under **Access Control**, select the **Enable access control for App** check box.
2. Click **Configure**.
The **User Account Settings** dialog box is displayed.



3. Click **New User**.
A user account is created in the list.



4. On the **General** tab, set **User Name** and **Password**.

The screenshot shows the 'User Account Settings' dialog box with the 'General' tab selected. The 'User Name' field contains 'user1' and the 'Password' field contains '*****'. A red box highlights the 'General' tab and the input fields.

5. Click the **Access from App** tab and select the **Allow access to PLC from App** check box.
6. Under **Permission**, select **Read Only** or **Read/Write**.

The screenshot shows the 'User Account Settings' dialog box with the 'Access from App' tab selected. The 'Allow access to PLC from App' checkbox is checked. Under the 'Permission' section, 'Read/Write' is selected. A red box highlights the 'Access from App' tab and the checkbox.

7. Repeat the steps 2 to 6 and create the required number of user accounts.

Note: If you select a user account on the list, you can edit the settings of the selected user account on the **General** and **Access from App** tabs.

8. Click **OK**.

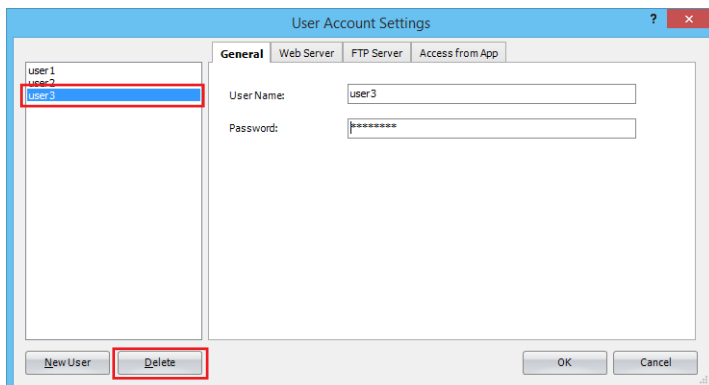
The screenshot shows the 'User Account Settings' dialog box with the 'General' tab selected. The 'User Name' field contains 'user3' and the 'Password' field contains '*****'. The 'OK' button is highlighted with a red box.

This concludes creating user accounts.

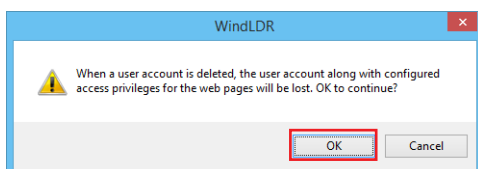
Deleting a Created User Account

• Operation procedure

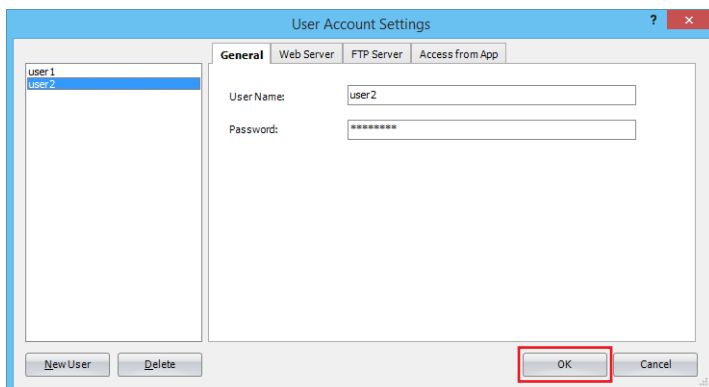
1. Select the user account on the list and click **Delete**.
A confirmation message is displayed.



2. Click **OK**.



3. Click **OK**.



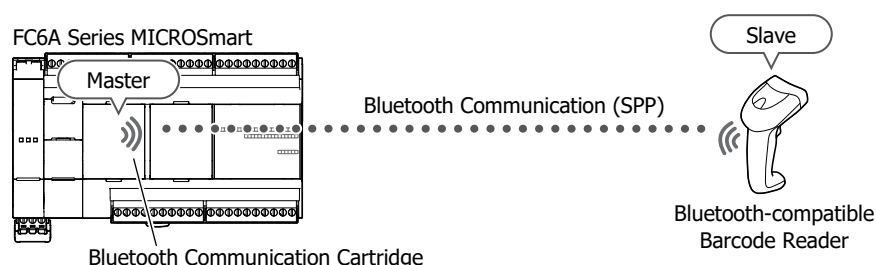
This concludes deleting a user account.

User Communication with a Barcode Reader

This section describes how to perform user communication with a barcode reader using the Bluetooth communication.

The FC6A can connect to a supported barcode reader and perform user communication.

The configuration method depends on the specifications of the barcode reader to use. In the following description, the barcode reader waits for the connection as the slave and the FC6A acts as the master to make the connection on the Bluetooth network.



Note: The recommended barcode reader is IDEC's GBT4400.

FC6A Settings

1. Connect the Bluetooth communication cartridge to the FC6A.
2. Configure the Bluetooth communication cartridge with WindLDR.
For details, see "Programming WindLDR" on page 9-3.

Example: **Bluetooth Communication Cartridge Configuration** dialog box settings

| Settings | | Description |
|-------------------------------|-------------------|------------------------|
| Bluetooth Device Name Setting | | IDEC_BT_007 |
| Communication Mode | | User Communication |
| Pairing Setting | | PIN code "1234" |
| Device Settings | Control Registers | D7000 |
| | Control Relays | M0100 |
| Establish Connection from PLC | | Selected ^{*1} |

^{*1} The MAC address of the barcode reader is required for the connection.

3. Download the user program to the FC6A.

Barcode Reader Settings

1. Set the PIN code on the barcode reader.
Configure the barcode reader by reading the PIN code setup barcode. This will depend on the specifications of the barcode reader. The PIN code is set with the **Pairing Settings** in the **Bluetooth Communication Cartridge Configuration** dialog box in WindLDR.
(1234)
2. Have the barcode reader wait for a connection.
Configure the barcode reader by having it read the setup barcode for the wait for connection. This will depend on the specifications of the barcode reader.

Checking Bluetooth Communication

1. Turn on the connection trigger on the FC6A.
Turn on the Bluetooth communication cartridge connection trigger. The Bluetooth communication cartridge (cartridge slot) connection trigger is the first internal relay + 1 of the control relays configured in **Device Address Settings** in **Bluetooth Communication Cartridge Configuration** dialog box. The status code of 255 is stored in D7000, which is the first control register + 0: Bluetooth communication cartridge status (cartridge slot).
2. Run the monitor in WindLDR.

9: BLUETOOTH COMMUNICATION

3. Check the device value that indicates the Bluetooth communication status.
Check if the Bluetooth communication cartridge status (M0100) is 1. The Bluetooth communication cartridge (cartridge slot) status is the first internal relay + 0 of the control relays configured in **Device Address Settings** in **Bluetooth Communication Cartridge Configuration** dialog box.

10: FTP SERVER/CLIENT

This chapter describes FTP server and client of the Plus CPU module.

FTP Server

The FTP server is available with the Plus CPU module only.

FTP Server Overview

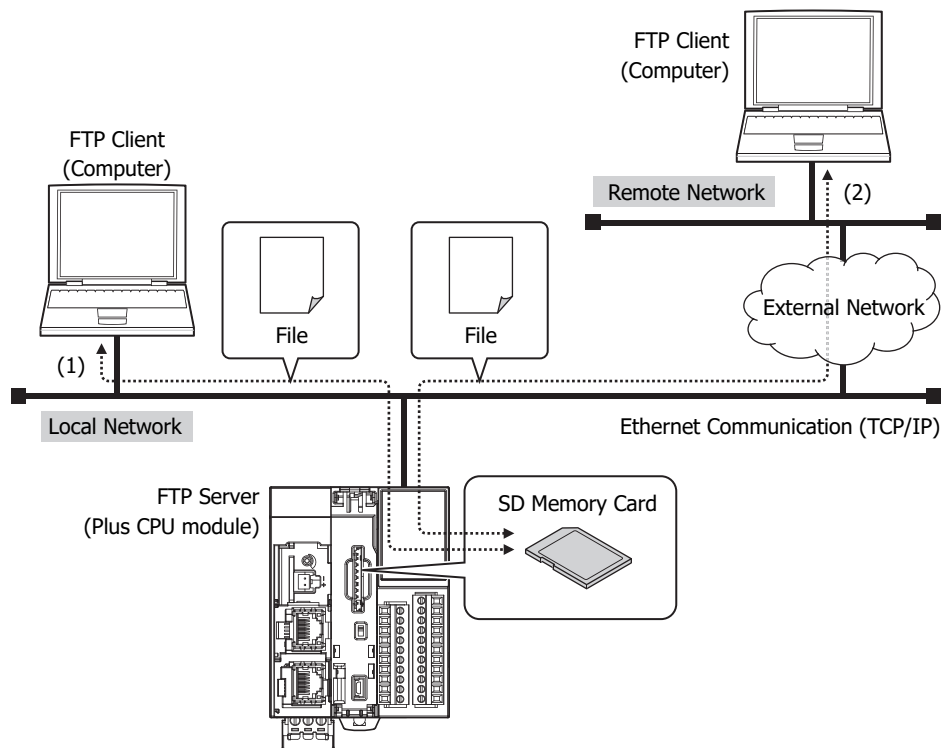
What the FTP Server Can Do

The FTP server enables the Plus CPU module to act as an FTP server to communicate with FTP clients, such as a computer. FTP clients can perform the following actions.

- Read files from the SD memory card inserted into the Plus CPU module.
- Write files to the SD memory card inserted into the Plus CPU module.

Example of System Configuration

The following diagram shows an example of a system configuration for using the FTP server.



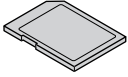
Connect Ethernet port 1 of the Plus CPU module to the network.

- (1) Access the Plus CPU module from an FTP client connected to the network, and read files from or write files to the SD memory card inserted into the Plus CPU module.
- (2) If the network is connected to an external network, configure the gateway and router of the local network for FTP clients connected via a remote network. Access the Plus CPU module from a remote FTP client, and read files from or write files to the SD memory card inserted into the Plus CPU module. Contact the administrator of the network to which the Plus CPU module is connected for information about the configurations for the gateway and router.

Files Handled by the FTP Server

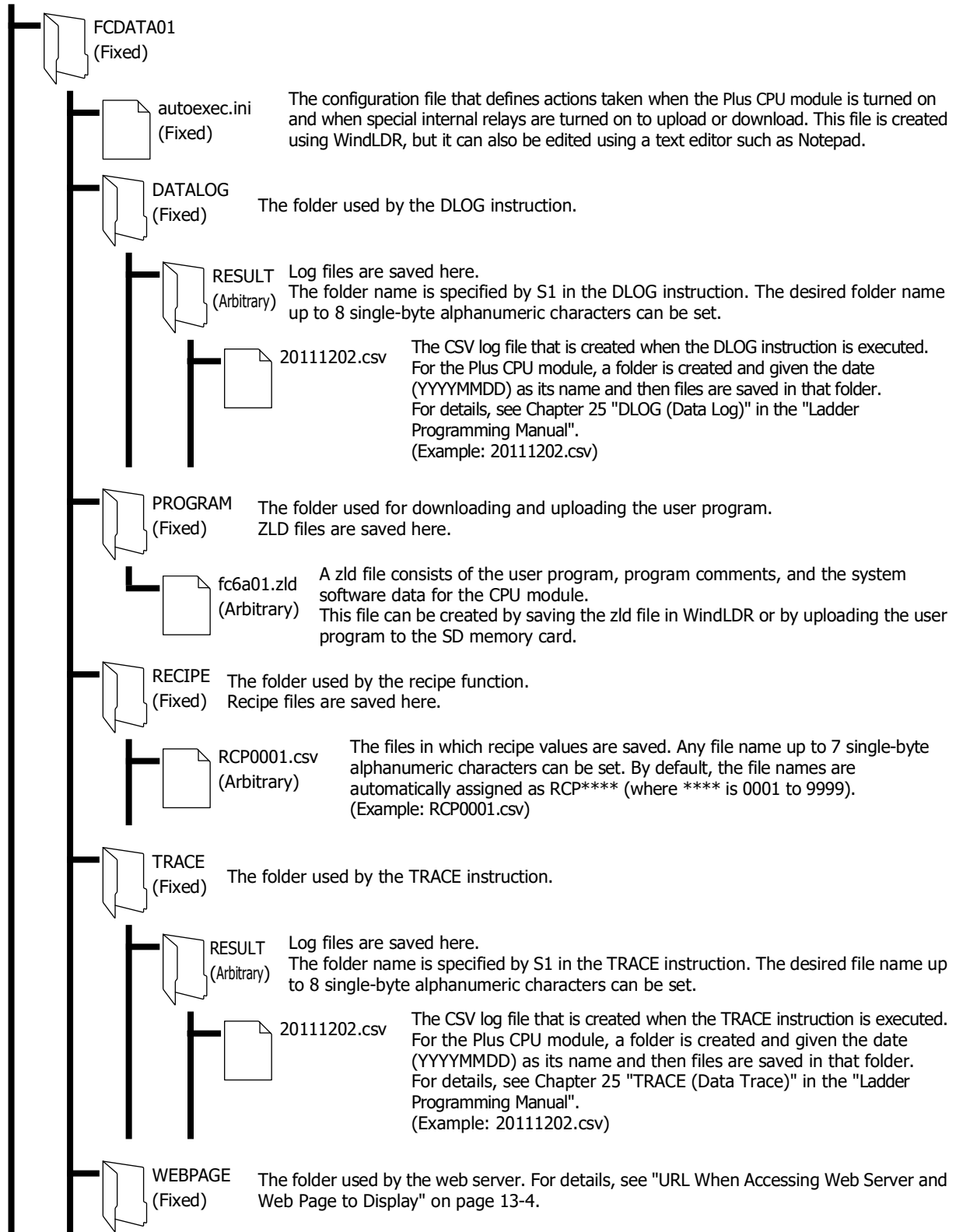
All files on the SD memory card inserted into the Plus CPU module can be accessed with the FTP server. This section shows an example of the folder and file structure of the SD memory card.

SD Memory Card



Arbitrary: File names and folder names that can be specified by the function area settings or instruction parameters.

Fixed: File names and folder names that are fixed by the system.



Supported Commands and Connection Methods

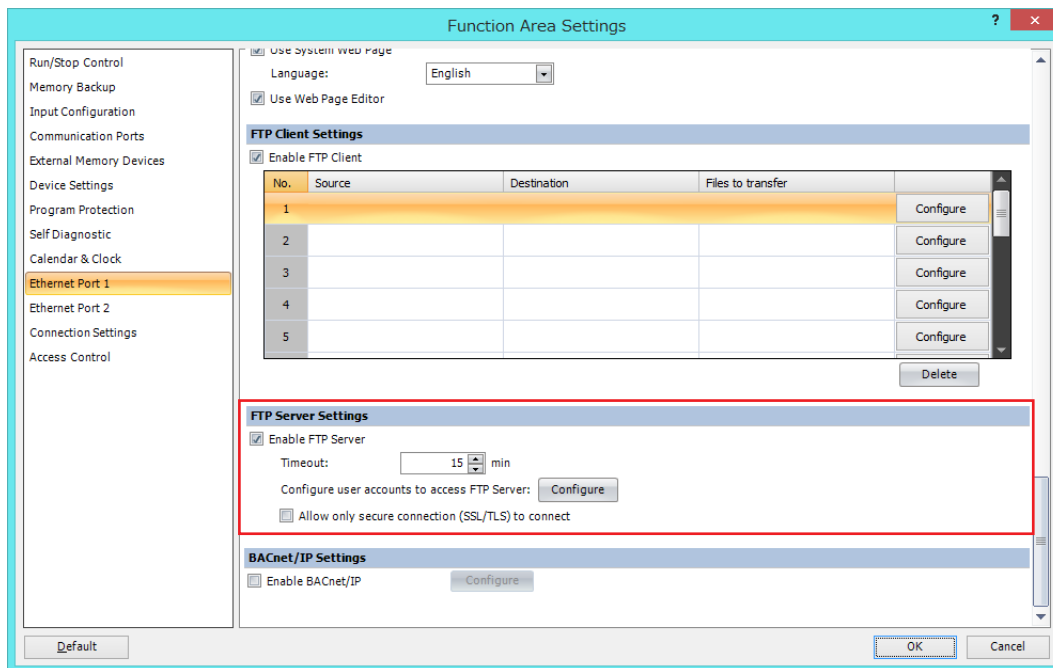
- Commands defined in RFC 959 are supported.
- Active mode and passive mode are supported.
- FTPS (FTP over SSL/TLS) is supported. Explicit mode is supported.
- Only one FTP client connection is allowed at one time.

The recommended FTP client software are as follows.

- FFFTP
- FileZilla
- Core FTP Lite

Programming WindLDR

1. On the **Configuration** tab, in the **Function Area Settings** group, click **Ethernet Port 1**.
2. Under **FTP Server Settings**, select the **Enable FTP Server** check box.
3. Configure the FTP server settings.



4. Download the user program to the Plus CPU module.

This concludes configuring the FTP server settings.

FTP Server Settings

Function Area Settings

Run/Stop Control
Memory Backup
Input Configuration
Communication Ports
External Memory Devices
Device Settings
Program Protection
Self Diagnostic
Calendar & Clock
Ethernet Port 1
Ethernet Port 2
Connection Settings
Access Control

☒ Use System Web Page
Language: English
☒ Use Web Page Editor

FTP Client Settings

☒ Enable FTP Client

| No. | Source | Destination | Files to transfer | |
|-----|--------|-------------|-------------------|-----------|
| 1 | | | | Configure |
| 2 | | | | Configure |
| 3 | | | | Configure |
| 4 | | | | Configure |
| 5 | | | | Configure |

Delete

FTP Server Settings

(1) ☒ Enable FTP Server

(2) Timeout: 15 min

(3) Configure user accounts to access FTP Server:

(4) ☐ Allow only secure connection (SSL/TLS) to connect

BACnet/IP Settings

☐ Enable BACnet/IP

Default OK Cancel

(1) Enable FTP Server

To use the FTP server function, select this check box and set the user account. The files on the SD memory card inserted into the Plus CPU module can be read and written from an FTP client. The port number used for the FTP server is 21.

(2) Timeout

Specify the duration of time to disconnect the FTP client. When an FTP client is logged in to the Plus CPU module and there is no communication between the FTP client and the Plus CPU module for the specified duration of time, the connection is automatically disconnected. (Default: 15 minutes)

(3) Configure user accounts to access FTP Server

Click **Configure** and create user accounts in the **User Account Settings** dialog box. For details, see "User Account Settings" on page 10-5.

(4) Allow only secure connection (SSL/TLS) to connect

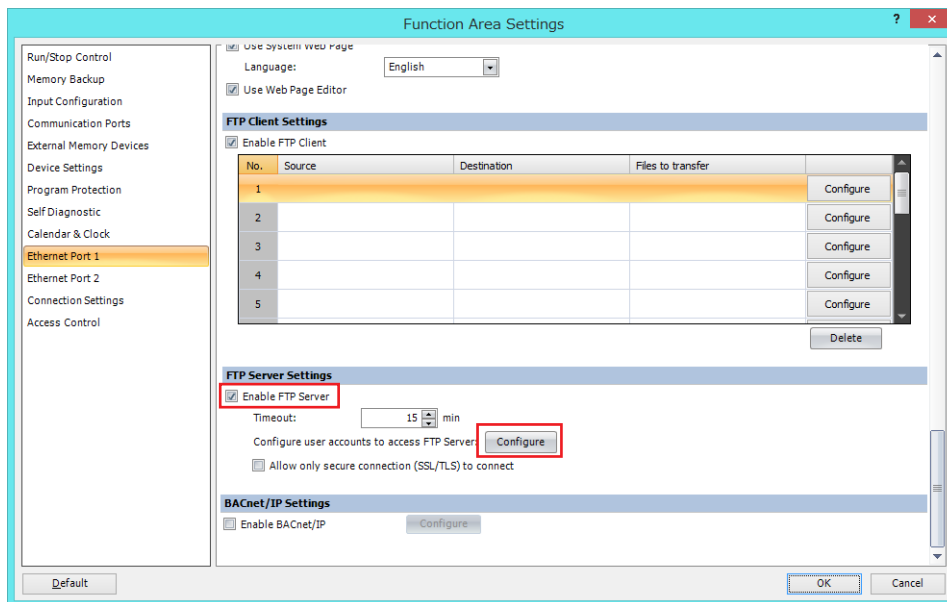
Select this check box to allow logging in to the FTP server over SSL or TLS communication only.

User Account Settings

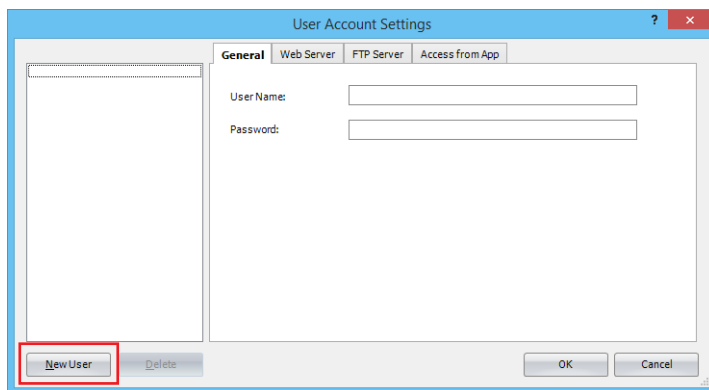
Creating User Accounts

• Operation procedure

1. In the **Function Area Settings** dialog box, under **FTP Server Settings**, select the **Enable FTP Server** check box.
2. Click **Configure**.
The **User Account Settings** dialog box is displayed.

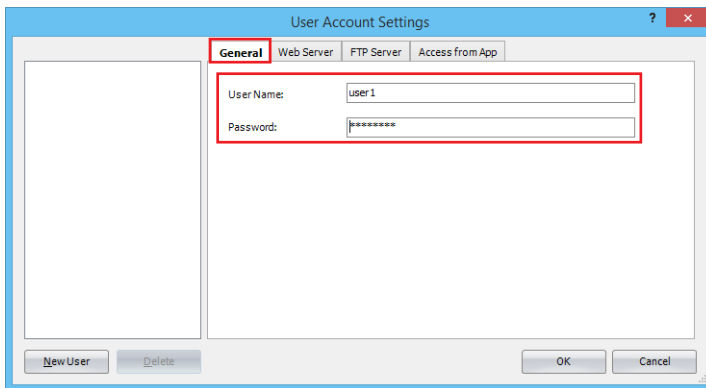


3. Click **New User**.
A user account is created in the list.

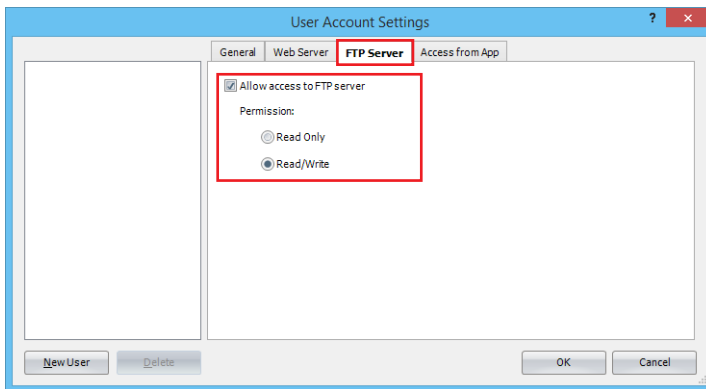


10: FTP SERVER/CLIENT

- On the **General** tab, set **User Name** and **Password**.



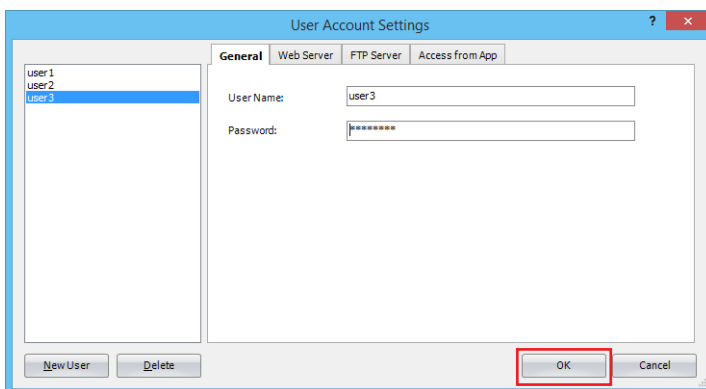
- Click the **FTP Server** tab and select the **Allow access to FTP server** check box.
- Under **Permission**, select **Read Only** or **Read/Write**.



- Repeat the steps 2 to 6 and create the required number of user accounts.

Note: If you select a user account on the list, you can edit the settings of the selected user account on the **General** and **FTP Server** tabs.

- Click **OK**.

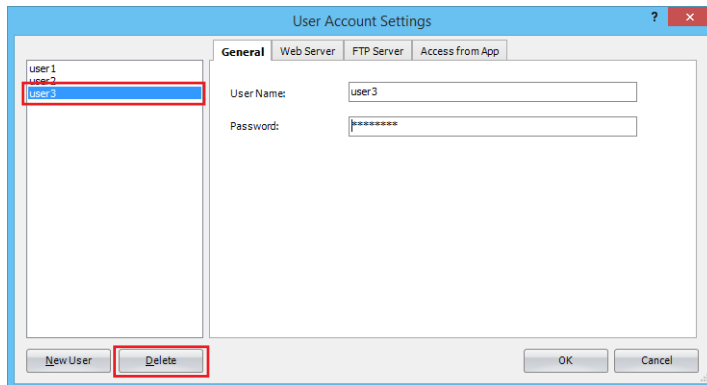


This concludes creating user accounts.

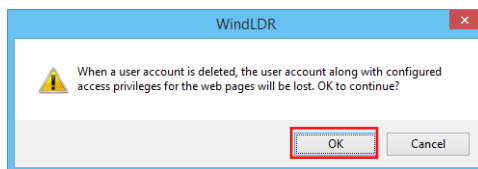
Deleting a Created User Account

• Operation procedure

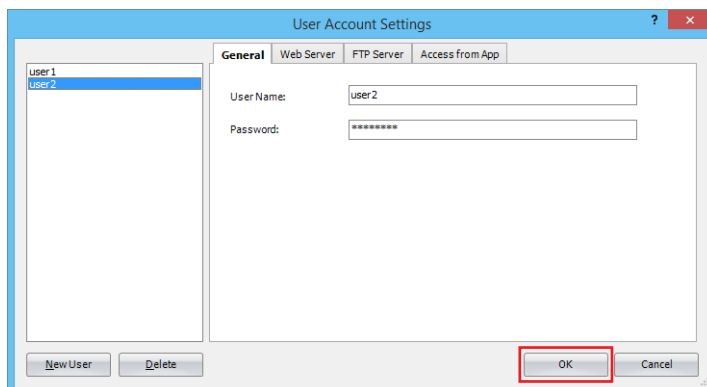
1. Select the user account on the list and click **Delete**.
A confirmation message is displayed.



2. Click **OK**.



3. Click **OK**.



This concludes deleting a user account.

FTP Client

The FTP client is available with the Plus CPU module only.

FTP Client Overview

What the FTP Client Can Do

The FTP client allows the Plus CPU module to act as an FTP client and copy or move files between the SD memory card inserted into the Plus CPU module and an FTP server.

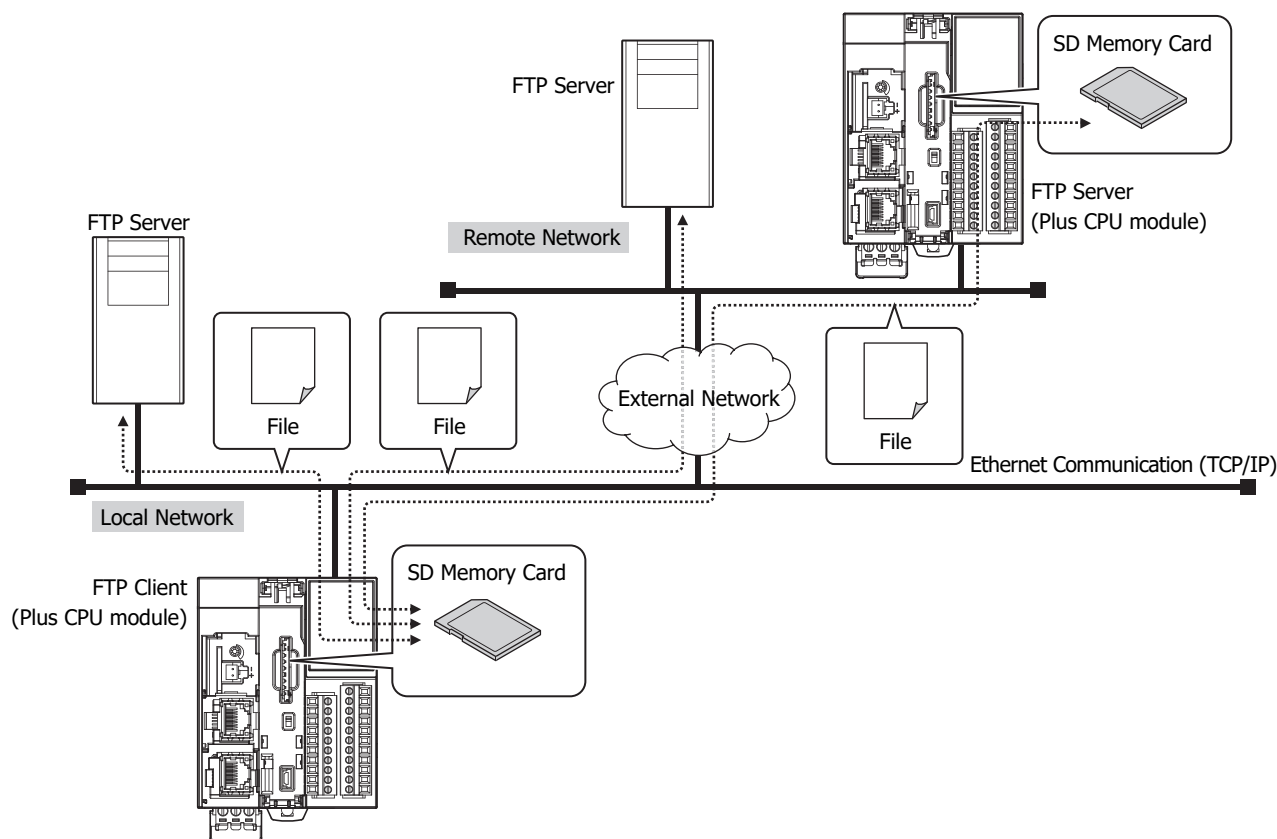
The Plus CPU module can perform the following actions as an FTP client.

- Copy or move files from the SD memory card inserted into the Plus CPU module to an FTP server.
- Copy files from an FTP server to the SD memory card inserted into the Plus CPU module.

Example of System Configuration

The following diagram shows an example of a system configuration for using the FTP client.

Connect Ethernet port 1 of the Plus CPU module to the network.



Configure the Ethernet settings of the Plus CPU module (IP address, subnet mask, and default gateway), and connect it to the local network.

Register the destination FTP server to the Plus CPU module.

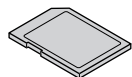
When the operating conditions for the FTP client function (file transfer settings) are satisfied, the following content is executed.

- Copy or move files from the SD memory card inserted into the Plus CPU module to an FTP server.
- Copy files from an FTP server to the SD memory card inserted into the Plus CPU module.

Files Handled by the FTP Client

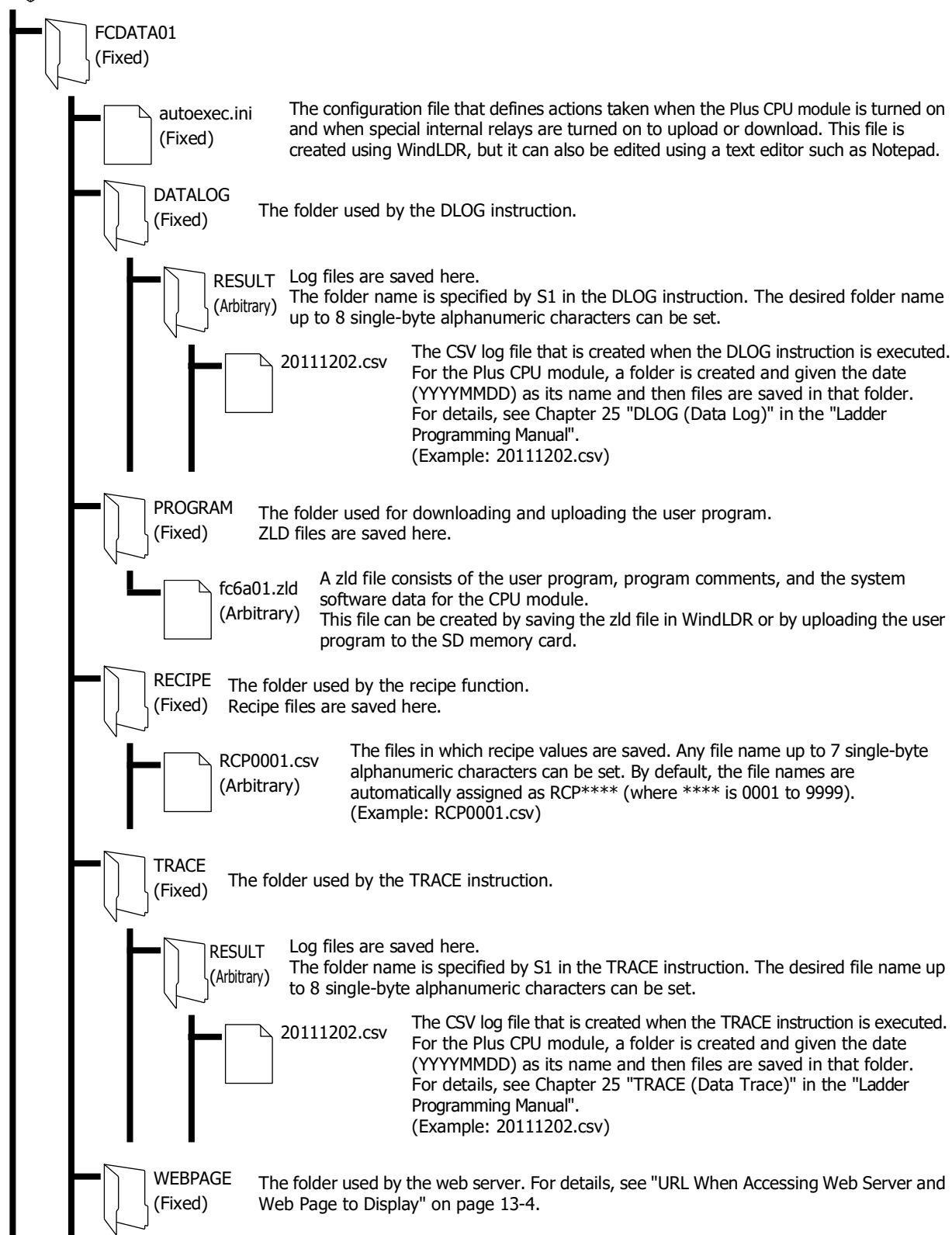
All files on the SD memory card inserted into the Plus CPU module can be accessed with the FTP client. This section shows an example of the folder and file structure of the SD memory card.

SD Memory Card



Arbitrary: File names and folder names that can be specified by the function area settings or instruction parameters.

Fixed: File names and folder names that are fixed by the system.



10: FTP SERVER/CLIENT

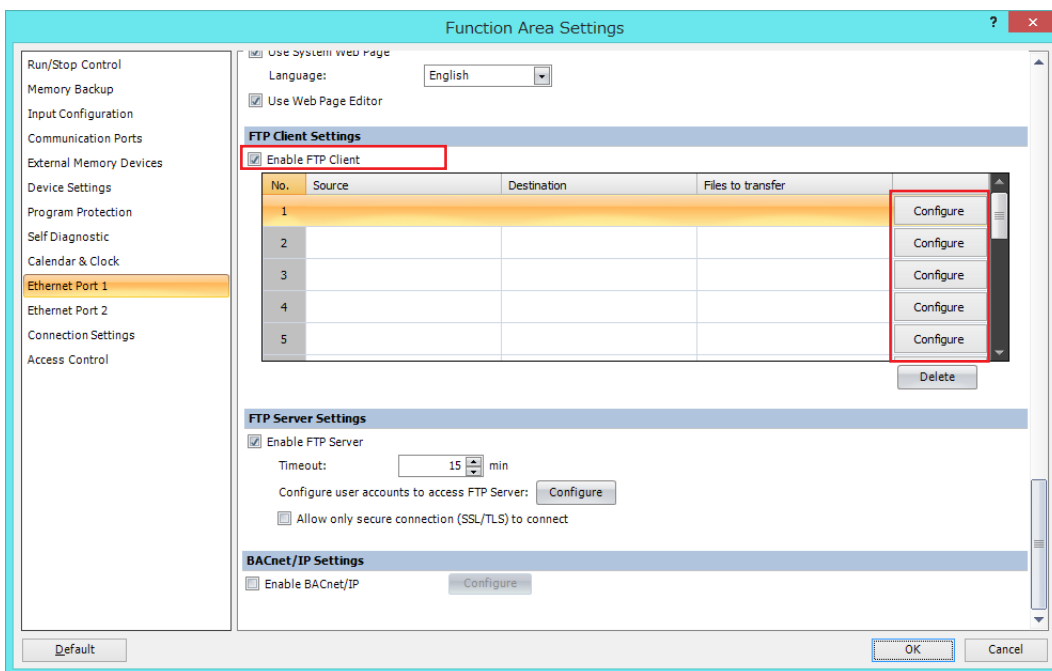
Supported Commands and Connection Methods

- Commands defined in RFC 959 are supported.
- Active mode and passive mode are supported.
- FTPS (FTP over SSL/TLS) is supported.

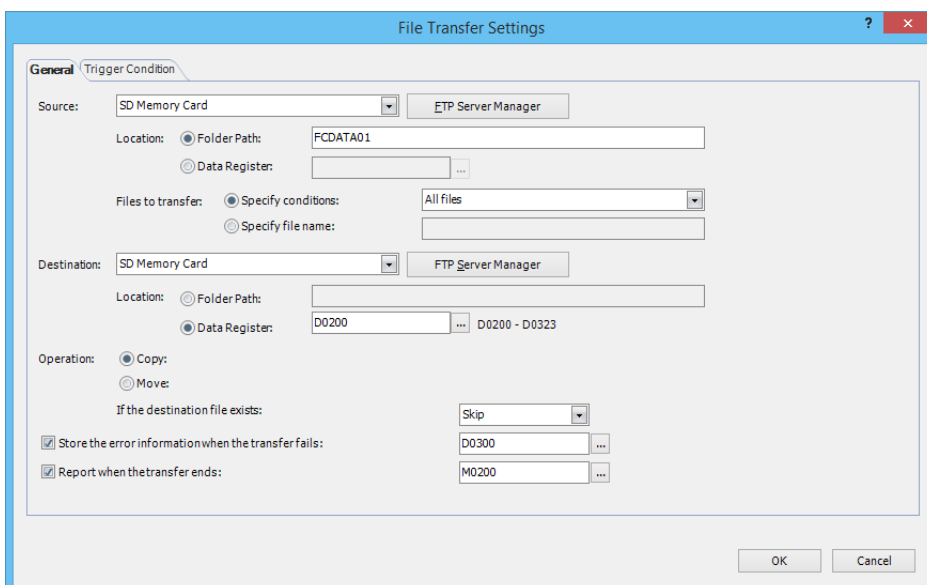
Note: The recommended FTP server software is Microsoft Internet Information Services.

Programming WindLDR

1. On the **Configuration** tab, in the **Function Area Settings** group, click **Ethernet Port 1**.
2. Select the **Enable FTP Client** check box.
3. Click **Configure** for the FTP client to configure on the FTP client registration list.
The **File Transfer Settings** dialog box is displayed.



4. Configure the settings on the **General** and **Trigger Condition** tabs.



5. Click **OK**.
6. Repeat the steps 3 to 5 and create the required number of FTP client settings.
7. Download the user program to the Plus CPU module.

This concludes configuring the FTP client settings.

File Transfer Settings

General tab

(1) Source

Select **SD Memory Card** or **(FTP Server)** where the files that will be copied or moved are saved.
[Number]+[(period)]+[Server name] as set in FTP Server Manager is displayed for (FTP Server).

Example: When [Number] is 1 and [Server name] is TestServer1
"1.TestServer1"

Click **FTP Server Manager** to display the FTP Server Manager. The FTP Server Manager can be used to add and modify FTP servers. For details, see "FTP Server Manager" on page 10-17.

(2) Location

Select the specification method of the location where the files that will be copied or moved are saved.

- | | |
|-----------------------|--|
| Folder Path/File Path | : Specify the folder path or file path of the location where the files that will be copied or moved are saved with a character string. The maximum length of the character string is 247 single-byte alphanumeric characters. Example: To copy or move files in the "DATALOG" folder in the "FCDATA01" folder on the SD memory card FCDATA01\DATALOG |
| Data Register | : Specify a word device for reading the data that will be used as the folder path of the location where the files that will be copied or moved are saved. The values are read in order starting from the specified data register, and the data up to the NULL terminating character (0x00) is handled as the character data of the folder path or file path. |

(3) Files to transfer

Select the specification method of the files that will be copied or moved.

Specify conditions : Specify the files that will be copied or moved with a condition. Select the condition from the following.

All files, Latest file only, Files updated within 24 Hours, Files updated within 7 days

Specify file name : Specify the file that will be copied or moved with a character string. The maximum length of the character string is 247 single-byte alphanumeric characters.

(4) Destination

Select **SD Memory Card** or **(FTP Server)** where the copied or moved files will be saved.

[Number]+[(period)]+[Server name] as set in FTP Server Manager is displayed for (FTP Server).

Example: When [Number] is 1 and [Server name] is TestServer1

"1.TestServer1"

Click **FTP Server Manager** to display the FTP Server Manager. The FTP Server Manager can be used to add and modify FTP servers. For details, see "FTP Server Manager" on page 10-17.

(5) Location

Select the specification method of the destination where the copied or moved files will be saved.

Folder Path : Specify the folder path where the copied or moved files will be saved with a character string. The maximum length of the character string is 247 single-byte alphanumeric characters.

Example: When saving the copied or moved files to the "DATALOG" folder in the "20170423" folder on the FTP server

20170423\DATALOG

Data Register : Specify a word device for reading the data that will be used as the folder path of the location where the copied or moved files will be saved. The values are read in order starting from the specified data register, and the data up to the NULL terminating character (0x00) is handled as the character data of the folder path.

(6) Operation

Select the transfer method of the files from **Copy** or **Move**. Only **Copy** can be selected when **(FTP Server)** is selected as **Source**.

(7) If the destination file exists

Select the processing method when a file with the same name already exists in the transfer destination from **Skip** or **Overwrite**.

Note: The files to be transferred must have file extensions. When a file does not have an extension, it may not be transferred.

(8) Store the error information when the transfer fails

To store the error information in a device address when an error occurs while copying or moving files, select this check box and specify the device address to which the error information will be written. When copying or moving files is started, zero is written to the device address. If an error occurs, one is written to the corresponding bit. The following error information is stored in each bit of the specified device address.

| Bit Position | Error Information | Details | Countermeasure |
|--------------|---------------------------------|---|---|
| 0 | SD memory card access error | <ul style="list-style-type: none"> SD memory card specified as the source or destination is not inserted. SD memory card specified as the source or destination cannot not be accessed. | <ul style="list-style-type: none"> Insert an SD memory card that can be accessed. Mount the SD memory card. |
| 1 | SD memory card read/write error | <ul style="list-style-type: none"> The contents of the folder or file cannot be read from the SD memory card specified as the source or destination. Creating a folder, writing a file, or deleting file cannot be done in the SD memory card specified as the source or the destination. | <ul style="list-style-type: none"> Insert an SD memory card that can be read/written. Insert an SD memory card that has sufficient available capacity. |
| 2 | FTP server connection error | FTP server that is specified as the transfer source or destination cannot be accessed within the time specified as the connection timeout. | <ul style="list-style-type: none"> Confirm that LAN cable is properly connected. Confirm that the network settings of the Plus CPU module are correct. Confirm that the IP address or port number of the FTP server are correct. |

| Bit Position | Error Information | Details | Countermeasure |
|--------------|---------------------------------|---|--|
| 3 | FTP server authentication error | The user name or password is incorrect and the FTP server cannot be accessed. | Confirm that the user name or password is correct. |
| 4 | FTP server command error | An error was returned against the command sent to the FTP server. | Contact administrator of the FTP server. |
| 5 | FTP server transfer error | There is no response from the FTP server within the time specified as the transfer timeout. | Contact administrator of the FTP server. |
| 6 | — Reserved — | — | — |
| 7 | Other errors | Other errors | Contact administrator of the FTP server. |
| 8 to 15 | — Reserved — | — | — |

(9) Report when the transfer ends

To provide a notification when copying or moving files is finished, select this check box and specify the device address to which the notification will be written.

Notes:

- Files cannot be copied or moved from one FTP server to another FTP server.
- Files cannot be copied or moved between SD memory cards inserted into the Plus CPU modules.
- Subfolders cannot be copied or moved.
- The following single-byte characters cannot be used in folder and file paths.
; : * ? " < > |
- When **Data Register** is selected and the folder path limitation is exceeded or invalid characters are used, the folder path is determined as follows:
 - If the folder or file path string exceeds the maximum number of device address points (no NULL), the character string stored from the top device address to the maximum device address becomes the folder path.
 - If the folder path contains a character that cannot be used, the character string up to that invalid character becomes the folder path.

Trigger Condition tab

File Transfer Settings

General **Trigger Condition**

(1) ☒ Device:

Trigger Type: Rising Edge

Device Address: M0300

(2) ☒ Cycle:

Day of the week:

☐ Sunday ☒ Monday ☒ Tuesday ☒ Wednesday ☒ Thursday ☒ Friday ☐ Saturday

(3) Triggerred time (mm:hh):

☒ 09 : 00

☒ 17 : 00

OK Cancel

(1) Device

Select this check box to specify the condition for copying or moving files with a device address.

Select **Rising Edge** or **Falling Edge** and specify the device to act as the condition. Only an internal relay can be used.

(2) Cycle

To specify the condition to copy or move files with days of the week and time, select this check box and the check boxes for the days of the week to execute the file transfer.

(3) Triggerred Time

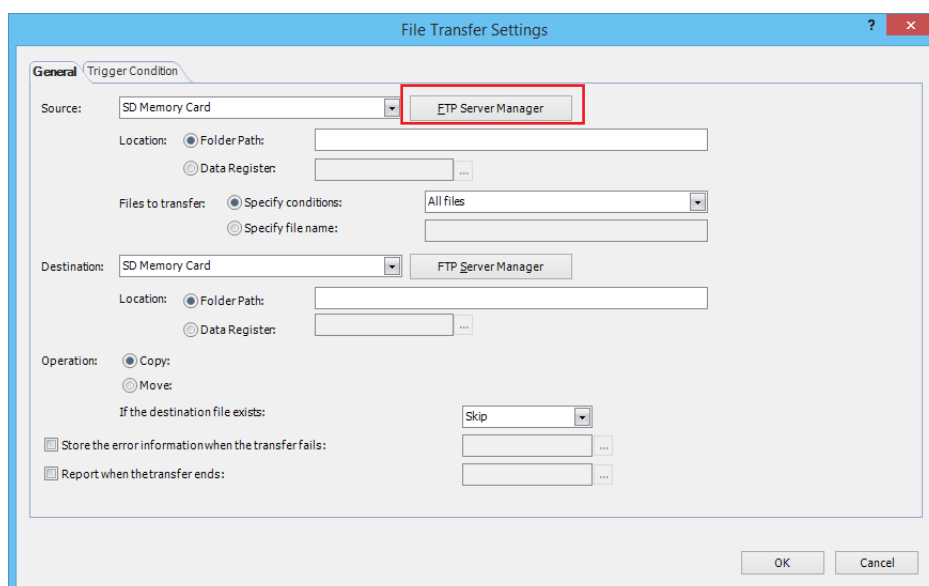
To specify the condition to copy or move files with a time, select this check box and specify the time. Up to two times can be set between 0:00 and 24:00 (24-hour time).

FTP Server Settings

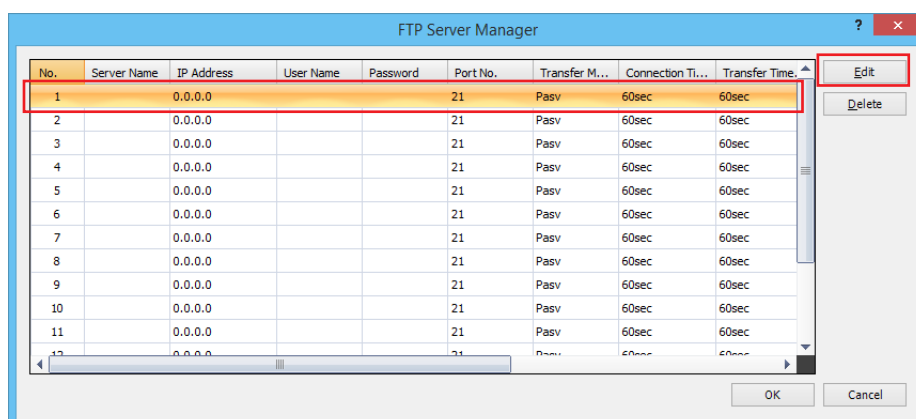
Configure the destination FTP servers.

• Operation procedure

1. In the **File Transfer Settings** dialog box, on the **General** tab, click **FTP Server Manager**.
The FTP Server Manager is displayed.



2. Select the number to use to register the FTP server on the FTP server list and click **Edit**.
The **FTP Server No. n Settings** dialog box for the selected number is displayed (where n: Number in FTP Server Manager).



Note: To delete a registered FTP server, select the FTP server in the FTP server list, and then click **Delete**.

10: FTP SERVER/CLIENT

3. Configure each setting of the FTP server and click **OK**.

FTP Server No.1 Settings

FTP Server Settings:

FTP Server Name:

IP Address: ☒ IP Address: (D0000 - D0020)
☐ Host Name:

User Name: (D0021 - D0041)

Password: (D0042 - D0062)

Port Number: (D0063)

Transfer Mode: ☒ Pasv ☐ Active (D0064)

Connection Timeout: sec (D0065)

Transfer Timeout: sec (D0066)

☒ Use secure connection (SSL/TLS) (D0067)

Advanced Settings:

☒ Specify FTP Server Settings by values of device addresses

Top Device Address: ...

☒ Copy the settings as default value to device address ...

4. Repeat the steps 2 to 3 to register the required number of FTP servers.

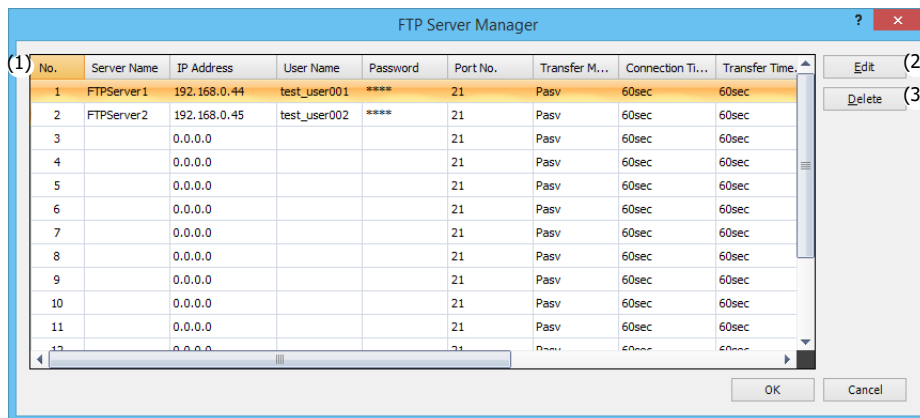
5. Click **OK**.

FTP Server Manager

| No. | Server Name | IP Address | User Name | Password | Port No. | Transfer M... | Connection Ti... | Transfer Time... |
|-----|-------------|--------------|--------------|----------|----------|---------------|------------------|------------------|
| 1 | FTPServer1 | 192.168.0.44 | test_user001 | **** | 21 | Pasv | 60sec | 60sec |
| 2 | FTPServer2 | 192.168.0.45 | test_user002 | **** | 21 | Pasv | 60sec | 60sec |
| 3 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |
| 4 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |
| 5 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |
| 6 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |
| 7 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |
| 8 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |
| 9 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |
| 10 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |
| 11 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |
| 12 | | 0.0.0.0 | | | 21 | Pasv | 60sec | 60sec |

This concludes configuring the FTP server settings.

FTP Server Manager



(1) FTP Server List

FTP server settings corresponding to each number are listed. Double click a cell to display the **FTP Server No. n Settings** dialog box (where n: Number in FTP Server Manager) where the settings can be edited. For details, see "Individual FTP Server Settings" on page 10-18.

| | |
|---|--|
| No. | : Displays the number (1 to 16) used to manage the FTP server settings. |
| Server Name | : Displays the name of the FTP server. |
| IP Address | : Displays the IP address of the FTP server. |
| User Name | : Displays the user name for the FTP server. |
| Password | : Displays the password for the FTP server masked with * (asterisks). |
| Port No. | : Displays the port number of the FTP server. |
| Transfer Mode | : Displays the transfer mode of the FTP server. |
| Connection Timeout | : Displays the time to automatically stop the connection process if there is no response from the FTP server after Trigger Condition set in File Transfer Settings is satisfied and the connection is attempted. |
| Transfer Timeout | : Displays the time to automatically stop the file transfer process if there is no response from the FTP server after Trigger Condition set in File Transfer Settings is satisfied and the data connection is established. |
| Top Device Address | : Displays the Top device address when the FTP server settings are specified with device address values. |
| Copy the settings as default value to device address: | Displays the bit device that acts as the condition to copy the FTP server settings as initial values. |

(2) Edit button

Registers or changes the settings of the selected number.

Select a number in the FTP Server List (1) and click this button to display the **FTP Server No. n Settings** dialog box. The settings of the **FTP Server No. n Settings** dialog box are reflected in the selected number.

For details, see "Individual FTP Server Settings" on page 10-18.

(3) Delete button

Deletes the settings with the number selected in FTP Server List (1).

Individual FTP Server Settings

(1) FTP Server Name

Enter the name of the FTP server. The maximum length of the string is 40 characters.
The default is "FTPServern". (n: FTP Server Manager number)

(2) IP Address

Select the identification method of the FTP server.

IP Address : Enter the IP address of the FTP server.

The format is "xxx.xxx.xxx.xxx". "xxx" stands for a numeric value from 0 to 255.

Host Name : Enter the host name of the FTP server.

The maximum length of the host name is 40 single-byte characters. Only alphanumeric characters and symbols can be used.

(3) User Name

Enter the name of the user account for the FTP server.

The maximum length of the user name is 40 single-byte characters. Only alphanumeric characters and symbols can be used.

(4) Password

Enter the password for the FTP server.

The maximum length of the password is 40 single-byte characters. Only alphanumeric characters and symbols can be used.

(5) Port Number

Specify the port number (0 to 65535) of the FTP server.

(6) Transfer Mode

Select the transfer mode of the FTP server.

Pasv : Establishes the data connection using passive mode.

Active : Establishes the data connection using active mode.

(7) Connection Timeout

Specify the time (10 to 300 seconds) to automatically stop the connection process if there is no response from the FTP server after **Trigger Condition** set in **File Transfer Settings** is satisfied and the connection is attempted.

(8) Transfer Timeout

Specify the time (10 to 300 seconds) to automatically stop the file transfer process if there is no response from the FTP server after **Trigger Condition** set in **File Transfer Settings** is satisfied and the data connection is established.

(9) Use secure connection (SSL/TLS)

Select this check box when SSL or TLS communication is required by the FTP server to use.

(10) Specify FTP Server Settings by values of device addresses

Select this check box to specify the **FTP Server Settings** with device addresses.

Specify the device addresses to use with **Top Device Address**. The settings in the **FTP Server Settings** are allocated to device addresses starting from the address number of the specified device address.

(11) Copy the settings as default value to device address

Select this check box to copy the settings in the **FTP Server Settings** to the device addresses as the initial values.

Specify a device address acting as the condition for copying the settings.

When 1 is written to this device address, the values set in the **FTP Server Settings** are written to the allocated device addresses starting from the address number of the device address set with **Top Device Address**.

Address Allocations When Specifying the FTP Server with Device Address Values

When the **Specify FTP Server Settings by values of device addresses** check box is selected, the settings in the **FTP Server Settings** are allocated to device addresses starting from the address number of the device address set with **Top Device Address**. The details of allocated device addresses are as follows.

| Settings | Address Number | Number of Words | Data Type |
|---|----------------|--------------------|------------------|
| IP Address or Host Name | +0 to +20 | 21 ^{*1*2} | Numeric value |
| User Name | +21 to +41 | 21 ^{*2*3} | Character string |
| Password | +42 to +62 | 21 ^{*2*3} | Character string |
| Port Number | +63 | 1 | Numeric value |
| Transfer Mode (0: Pasv, 1: Active) | +64 | 1 | Numeric value |
| Connection Timeout (second) | +65 | 1 | Numeric value |
| Transfer Timeout (second) | +66 | 1 | Numeric value |
| Use Secure Connection (SSL/TLS) (0: SSL/TLS is used, 1: SSL/TLS is not used) | +67 | 1 | Numeric value |

*1 For an IP address, only the first four words are used, and the remaining 17 words are a reserved region.

*2 The 21st word is handled as the NULL terminating character (0x00), regardless of the value of the data register.

*3 When a character string to use is shorter than 20 words, add the NULL terminating character (0x00) as the end of the character string.

11: SEND PING FUNCTION

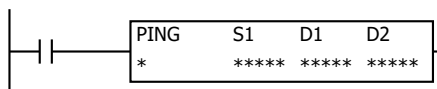
Introduction

This chapter describes the PING instruction that sends a ping packet to the specified remote host to check if communication is possible at the Internet Protocol (IP) layer.

Use the PING instruction to execute the send PING function.

PING (Ping)

The PING instruction sends a ping packet to the specified remote host. For the Plus CPU module, Ethernet port 1 or 2 can be selected.



Operation Details

When the input to the PING instruction is on, the PING instruction sends a ping packet to the remote host specified by S1. Once the FC6A receives the reply from the remote host, the completion output specified by D1 is turned on, and the operation status (operation transition state and error code) is stored in the device specified by D2. D2+1 is reserved for the system.

The PING instruction is executed when the input is on, and it sends a PING request. While that input remains on, the same PING instruction is executed after the ping is sent. To avoid this, use the PING instruction in combination with the SOTU (single output up) instruction or the SOTD (single output down) instruction so that the PING instruction input is on for only one scan. For the SOTU instruction and the SOTD instruction, see Chapter 4 "SOTU and SOTD (Single Output Up and Down)" in the "Ladder Programming Manual".

In order to use the PING instruction, the FC6A remote host list must be created in advance. For details about the remote host list, see "Remote Host List" on page 3-26.

Valid Devices

| | Device | Function | I | Q | M | R | T | C | D | P | Constant | Repeat |
|-----------|---------------|--------------------|---|---|-----------------|---|---|---|---|---|----------|--------|
| S1 | Source 1 | Remote host number | - | - | - | - | - | - | X | - | 1 - 255 | - |
| D1 | Destination 1 | Completion output | - | X | X ^{*1} | - | - | - | - | - | - | - |
| D2 | Destination 2 | Operation status | - | - | - | - | - | - | X | - | - | - |

*1 Special internal relays cannot be used.

Devices in PING Instructions

S1 (Source 1)

Specify the remote host number. A constant or data register can be specified.

D1 (Destination 1)

Specify an internal relay or output as the completion output bit. When the FC6A receives a reply from the remote host, the completion output bit is turned on. The completion output bit is also turned on when there is no reply from the remote host within the specified timeout that is configured in the **Function Area Settings**. For details about the timeout setting, see "Ping Settings" on page 3-18.

D2 (Destination 2)

Specify a data register as the operation status. Destination 2 occupies two consecutive data registers starting with the data register specified by D2. The operation status is stored in D2. D2+1 is reserved for the system. Specify the starting number so that the device range is not exceeded.

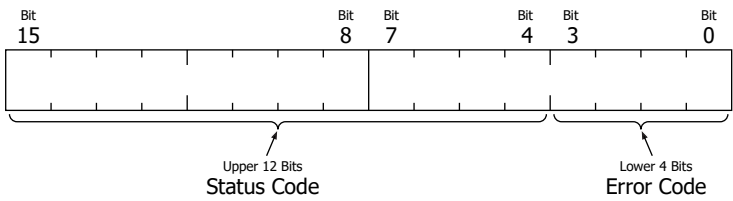
11: SEND PING FUNCTION

Notes:

- When a data register is specified as S1, do not change the data register value while PING instruction is executed.
- The FC6A does not respond to a ping packet that is sent by itself.

The operation status includes the operation transition state (status code) and the error detail (error code). The status code can be obtained by masking the least 4 bits of the operation status. The error code is stored in the least 4 bits of the operation status. When the value of the operation status data register is divided by 16, the remainder is the error code.

If the value of the operation status data register is 66:
 $66 \div 16 = 4$ with a remainder of 2, so the error code is 2.



| Status Code | Operation Transition State | Description |
|-------------------|----------------------------|--|
| 16 (000000010000) | Preparing transmission | The interval from turning on the PING instruction input to when the ping packet is sent to the specified remote host |
| 32 (000000100000) | Waiting for response | From sending the ping packet to the specified remote host, until the response is received |
| 64 (000001000000) | PING instruction complete | The execution of the PING instruction is completed, allowing for the next transmission to be processed |

Note: If the status code is anything other than the codes listed above, an error of PING instruction is suspected.

| Error Code | Error Details | Completion Output |
|------------|--|----------------------------|
| 0 (0000) | Normal | ON (The status code is 64) |
| 1 (0001) | - | - |
| 2 (0010) | Timeout error | ON |
| 3 (0011) | The host name of the target remote host could not be resolved with DNS | ON |
| 4 (0100) | The specified remote host does not exist in the remote host list | ON |
| 5 (0101) | Multiple PING instructions are executed simultaneously | ON |
| 6 (0110) | Parameter error | ON |

12: SEND E-MAIL FUNCTION

Introduction

This chapter describes the EMAIL instruction that sends preregistered e-mails.

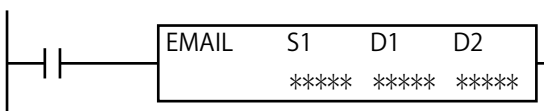
Overview

Ethernet port 1 of the Plus CPU module and the HMI-Ethernet port of the HMI module support the send e-mail function.

Up to 255 types of e-mails can be sent by executing the EMAIL instruction.

EMAIL Instruction (Send E-mail)

The EMAIL instruction sends an e-mail.



Operation Details

When the input is on, e-mail of the e-mail number set by S1 is sent from Ethernet port 1 of the Plus CPU module or the HMI-Ethernet port of the HMI module. Once the FC6A receives a response from the sending e-mail server, the completion output specified by D1 is turned on, and the operation status (operation transition state and error code) is stored in the device specified by D2. D2+1 is reserved for the system.

The EMAIL instruction is executed when the input to the instruction is on. When this input continues to be on, the same EMAIL instruction is executed after the e-mail is sent. To avoid this, use the EMAIL instruction in combination with the SOTU (single output up) instruction or the SOTD (single output down) instruction so that the EMAIL instruction start input is on for only one scan. For the SOTU instruction and the SOTD instruction, see Chapter 4 "SOTU and SOTD (Single Output Up and Down)" in the "Ladder Programming Manual".

To use the EMAIL instruction, you must first configure the mail server settings and create the FC6A e-mails in advance. When using the HMI-Ethernet port of the HMI module, click the HMI module that has been inserted into the module configuration area, click **Configure**, and configure the e-mail settings in the displayed **HMI Module Configuration** dialog box. When using Ethernet port 1 of the Plus CPU module, configure the e-mail settings under **Ethernet Port 1** in the **Function Area Settings**.

Valid Devices

| | Device | Function | I | Q | M | R | T | C | D | P | Constant | Repeat |
|-----------|---------------|-------------------|---|---|-----------------|---|---|---|-----------------|---|----------|--------|
| S1 | Source 1 | E-mail number | - | - | - | - | - | - | X ^{*1} | - | 1 - 255 | - |
| D1 | Destination 1 | Completion output | - | X | X ^{*2} | - | - | - | - | - | - | - |
| D2 | Destination 2 | Operation status | - | - | - | - | - | - | X ^{*1} | - | - | - |

*1 Special data registers cannot be used.

*2 Special internal relays cannot be used.

12: SEND E-MAIL FUNCTION

Devices in EMAIL Instruction

Ethernet Port Number Settings

Configure the settings of the Ethernet port that will be used to send e-mails. Configure Ethernet port 1 of the Plus CPU module or the HMI-Ethernet port of the HMI module.

S1 (Source 1)

Specify the e-mail number. A constant or data register can be specified.

D1 (Destination 1)

Specify an internal relay or output as the completion output bit. When the FC6A receives a reply from the sending e-mail server, the completion output bit is turned on. The completion output bit is also turned on when there is no reply from the sending e-mail server within the timeout.

D2 (Destination 2)

Specify a data register as the operation status. Destination 2 occupies two consecutive data registers starting with the data register specified by D2. The operation status is stored in D2. D2+1 is reserved for the system. Data registers D0000 to D7998, and D10000 to 55998 can be specified. Specify the starting number so that the device range is not exceeded.

Note: When a data register is specified as S1, do not change the data register value while EMAIL instruction is executed.

The operation status includes the operation transition state (status code) and the error detail (error code). The status code can be obtained by masking the least 4 bits of the operation status. The error code is stored in the least 4 bits of the operation status.

When the value of the operation status data register is divided by 16, the remainder is the error code.

If the value of the operation status data register is 66:

$66 \div 16 = 4$ with a remainder of 2, so the error code is 2.

| Status Code | Operation Transition State | Description |
|------------------------------------|----------------------------|--|
| 16 (000000010000) | Preparing transmission | From turning on the start input for an EMAIL instruction, until the e-mail is sent out to the sending e-mail server. |
| 32 (000000100000) | Waiting for response | From sending the e-mail to the sending e-mail server, until the response is received. |
| 64 (000001000000) | EMAIL instruction complete | The execution of the EMAIL instruction is completed, allowing for the next transmission to be processed. |

If the status code is anything other than the codes listed above, an error of EMAIL instruction is suspected.

| Error Code | Error Details | Completion Output |
|------------------|---|----------------------------|
| 0 (0000) | Normal | ON (The status code is 64) |
| 1 (0001) | HMI module connection error <ul style="list-style-type: none">The HMI module is not connectedThe HMI module is not operating correctly | ON |
| 2 (0010) | Timeout error <ul style="list-style-type: none">Port number may be incorrect. | ON |
| 3 (0011) | <ul style="list-style-type: none">The host name of the sending e-mail server could not be resolved with DNS.The sending e-mail server could not be found.The SMTP server does not support the authentication function.Ethernet cable may be disconnected or broken. FC6A may not be connected to the network properly. | ON |
| 4 (0100) | The specified e-mail is not configured. | ON |
| 5 (0101) | Multiple EMAIL instructions are executed simultaneously. | ON |
| 6 (0110) | Parameter error <ul style="list-style-type: none">If Use data registers to configure E-mail settings is enabled, the settings are not stored in data registers. | ON |
| 7 (0111) | Other errors *1 | ON |
| 8 (1000) | Converting a data register value failed *2 | ON |
| 9 (1001) | The size of one log file that will be attached to the e-mail has exceeded the maximum file size configured for the DLOG/TRACE instruction.*3 | ON |
| 10 (1010) | The specified log file that will be attached does not exist.*3 | ON |
| 11 (1011) | The number of attached log files exceeds seven.*4 | ON |

*1 The detail of the error code 7 is stored in special data register D8457 (HMI-Ethernet port) or D8759 (Ethernet port 1).

*2 When converting a data register value fails, ---- is inserted in the e-mail body instead of data register value.

*3 For error code 9 or 10, the corresponding log file will not be attached to the e-mail, and the e-mail will be sent without an attachment.
For the configuration of the maximum log file size, see Chapter 5 "Functions and Settings" in the "FC6A Series MICROSmart User's Manual".

*4 E-mails in which seven files are attached will be sent.

E-mails can be sent to the recipients by the relay of the sending e-mail (SMTP) servers. Even when the value stored in D2 is 64 after the execution of an EMAIL instruction, the recipients of the e-mail may not be able to receive the e-mail if one of the following conditions is met. The FC6A also cannot judge that e-mails cannot be received.

- The SMTP server that relays the e-mails is not functioning normally.
- The e-mail recipient filters the in-coming e-mails by specifying the e-mail address or e-mail domain.

Special Data Registers

Confirm the error detail of EMAIL instruction

When the error code stored in D2 of EMAIL instruction is 7, the response from sending e-mail server can be confirmed with special data register. The allocation of special data registers is given in the following table.

| Ethernet Port Used to Send the E-mail | Special Data Register That Stores the Detailed Error Code of the E-mail |
|--|---|
| HMI-Ethernet port of the HMI module | D8457 |
| Ethernet port 1 of the Plus CPU module | D8759 |

The error code that the sending e-mail servers return could vary with each sending e-mail server. For details about the error code, contact the administrator of the sending e-mail server. An example of the error codes is as follows.

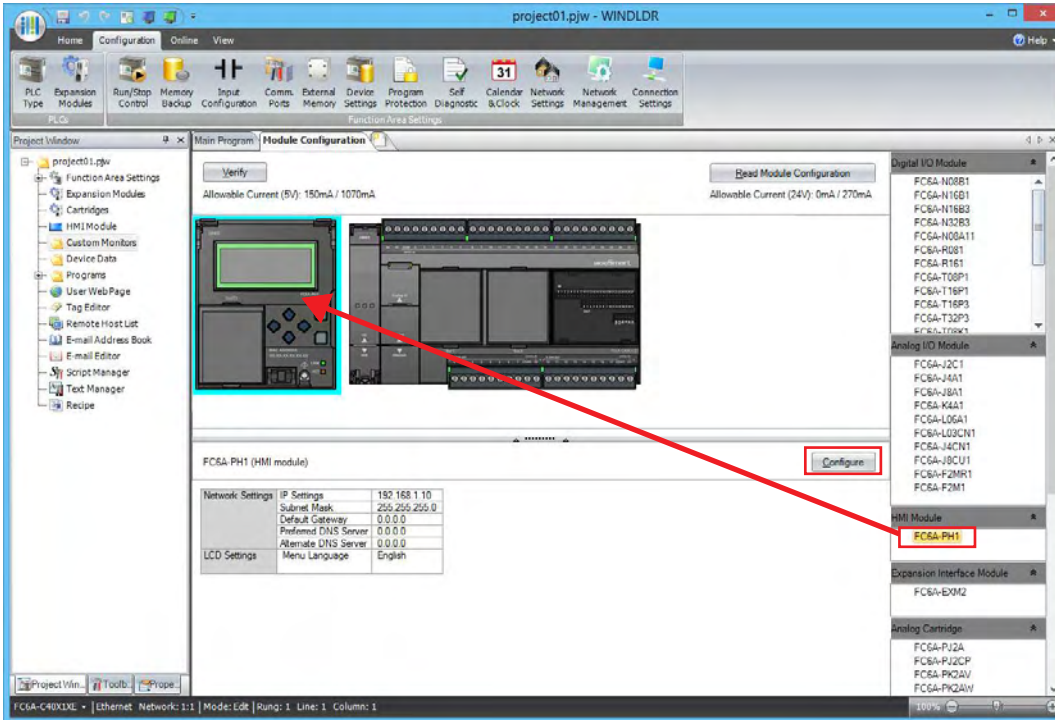
| Error Code | Description | Possible Cause |
|------------|---|--|
| 451 | The requested action is canceled | Sending e-mail server is not working normally |
| 452 | Insufficient system storage | The e-mail server storage is insufficient |
| 500 | Syntax error, unrecognizable command | The command is not recognized by the e-mail server |
| 501 | Parameter or argument syntax error | Invalid command parameter |
| 502 | Command not implemented | The command is not implemented on the e-mail server |
| 504 | Command parameter not implemented | The command parameter is not implemented on the e-mail server |
| 521 | Email not received | Email assumed to be spam |
| 530 | Access denied | The Authentication is required to send e-mail check box is not selected |
| 535 | Authentication error | Account name or password for the authentication is incorrect |
| 550 | The mailbox cannot be used | The command was refused due to the server policy |
| 552 | Allocated capacity has been exceeded | The message is too long |
| 554 | Transaction failure (or a no SMTP server response when starting the connection) | Sending e-mail server is not working normally |

12: SEND E-MAIL FUNCTION

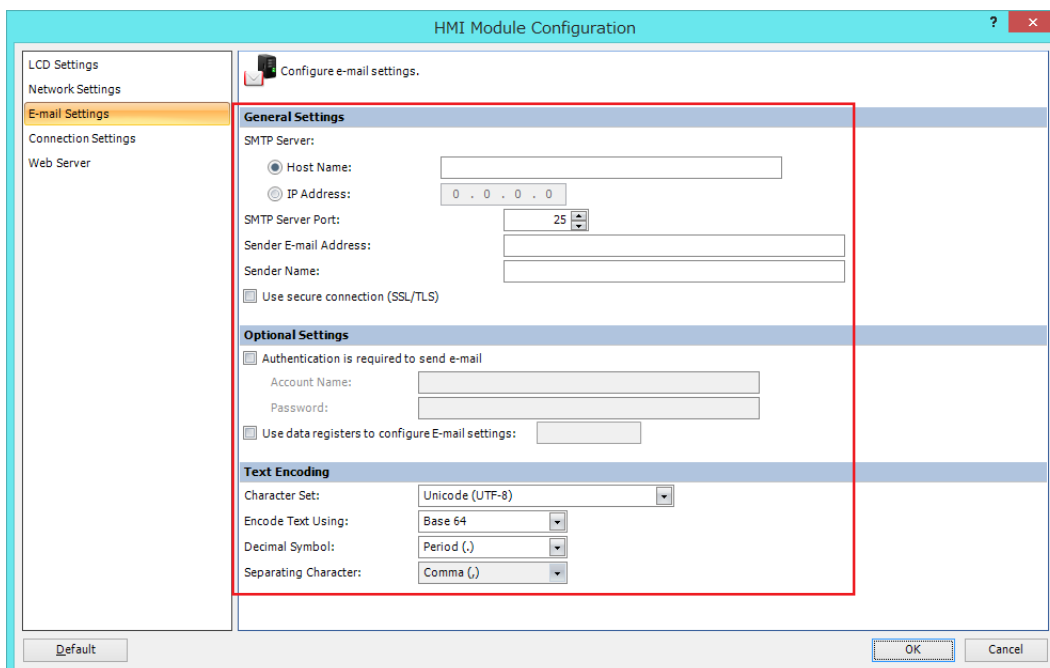
Programming WindLDR

1. Use the Module Configuration Editor to configure the HMI module EMAIL settings.
On the **Configuration** tab, in the **PLCs** group, select **Expansion Modules**.
2. Click the inserted HMI module in the module configuration area and click **Configure**.
The **HMI Module Configuration** dialog box is displayed.

Note: You can also display the **HMI Module Configuration** dialog box by double-clicking **HMI Module** in the Project Window.



3. Click **E-mail Settings**.
4. Configure the settings in General Settings, Optional Settings, and Text Encoding.

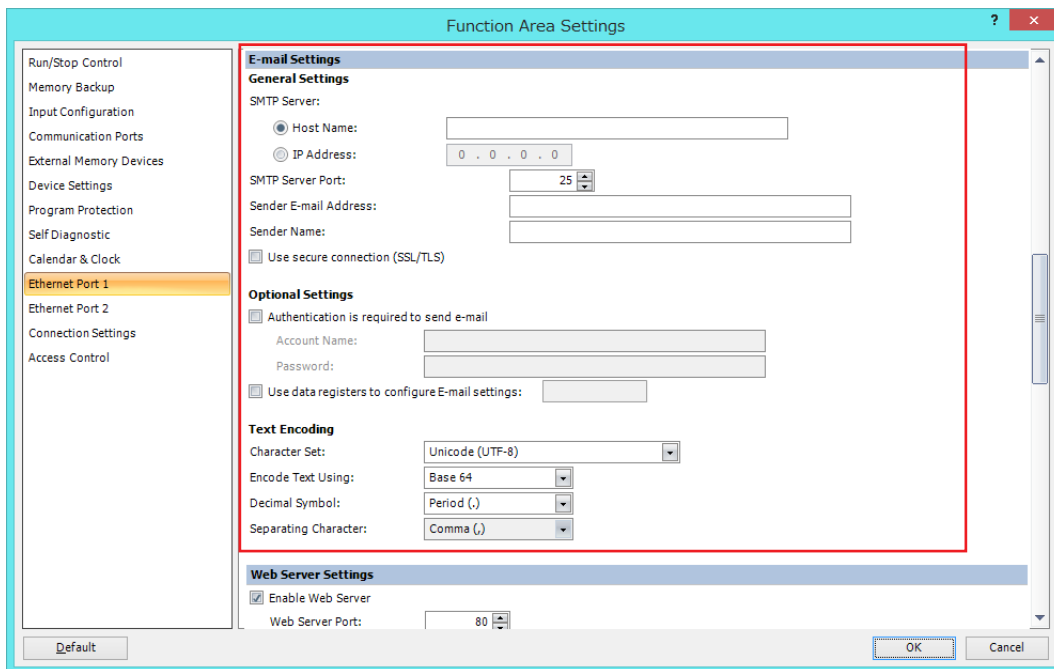


5. Download the user program to the FC6A.

This concludes configuring the e-mail settings.

Ethernet port 1 of the Plus CPU module

1. On the **Configuration** tab, in the **Function Area settings**, select **Ethernet Port 1**.
2. In **E-mail Settings**, configure the settings under General Settings, Optional Settings, and Text Encoding.



3. Download the user program to the Plus CPU module.

This concludes configuring the e-mail settings.

12: SEND E-MAIL FUNCTION

■ General Settings

HMI Module Configuration

Configure e-mail settings.

General Settings

(1) SMTP Server:

Host Name:

IP Address:

(2) SMTP Server Port:

(3) Sender E-mail Address:

(4) Sender Name:

(5) ☐ Use secure connection (SSL/TLS)

Optional Settings

(6) ☒ Authentication is required to send e-mail

(7) Account Name:

(8) Password:

(9) Authentication Method:

(10) ☐ Use data registers to configure E-mail settings:

Text Encoding

(11) Character Set:

(12) Encode Text Using:

(13) Decimal Symbol:

(14) Separating Character:

Default OK Cancel

(1) SMTP Server

Specify the IP address or the host name of the sending e-mail server that is used to send e-mails. A maximum of 40 ASCII characters can be entered.

(2) SMTP Server Port

Specify the port number of the sending e-mail server. Normally, SMTP uses port 25, SMTP-AUTH uses port 587, and SMTPs uses port 465.

(3) Sender E-mail Address

Specify the e-mail address that is included in the sender field of the e-mails to be sent from the FC6A. A maximum of 40 ASCII characters can be entered.

(4) Sender Name

Specify the name that is included in the sender field of the e-mails to be sent from the FC6A. A maximum of 40 ASCII characters can be entered.

(5) Use secure connection (SSL/TLS)

When SSL or TLS communication is required with the sending e-mail server that is used, select this check box.

Notes:

- When specifying the SMTP server with an IP address, 0 in the high order digits of the values is ignored. For example, when the IP address "192.168.1.234" and "192.168.001.234" are considered as the same IP address.
- When specifying the SMTP server with an SMTP server name, the host name of the SMTP server must be resolved using DNS. For DNS and DNS server settings, see "Network Settings" on page 3-6.

Configuration Example: The sender e-mail address and sender name are grouped and shown in the sender field of the e-mail. If the sender e-mail address is test@sample.com and the sender name is Test Mail, the text shown in the sender field will be as follows:

Test Mail <test@sample.com>

■ Optional Settings: SMTP Authentication

Depending on the SMTP server, SMTP-AUTH or SMTPs authentication may be required to send e-mails.

The FC6A supports SMTP-AUTH and SMTPs authentication, so if the SMTP server requires authentication, it can send e-mails using this function.

Contact the administrator of the SMTP server to confirm if it requires authentication.

(6) Authentication is required to send e-mail

Check if the sending e-mail server requires the SMTP authentication with the login method.

(7) Account Name

Specify the account name used for the login authentication. A maximum of 40 ASCII characters can be entered.

(8) Password

Specify the password used for the login authentication. A maximum of 40 ASCII characters can be entered.

(9) Authentication Method

Specify the authentication method used for the login authentication. One of the following five authentication methods can be

| Authentication Method | Description |
|-----------------------|--|
| Automatic | Using CRAM-MD5, DIGEST-MD, LOGIN, and PLAIN authentication methods in that order, the FC6A communicates with the sending e-mail server using the authentication method that successfully connects. |
| CRAM-MD5 | Using CRAM-MD5, the FC6A connects to the sending e-mail server. |
| DIGEST-MD5 | Using DIGEST-MD5, the FC6A connects to the sending e-mail server. |
| LOGIN | Using LOGIN, the FC6A connects to the sending e-mail server. |
| PLAIN | Using PLAIN, the FC6A connects to the sending e-mail server. |

specified.

Note: When "Automatic" is specified as the authentication method, the FC6A may not be able to connect to the sending mail server. In this case, specify the authentication method to be used on the sending mail server.

12: SEND E-MAIL FUNCTION

(10) Use data registers to configure E-mail settings

When the check box for this option is selected, the basic settings and authentication settings can be configured using strings and numeric values stored in data registers. E-mails are sent using the settings stored in 107 words of data registers starting from the specified data register.

For each setting item, the start address and end address as well as details about the setting value are as follows.

| Setting Item | Data Type | Number of Used Words | Start Address of Setting Item | End Address of Setting Item | Setting Value | | |
|---|---------------------------|----------------------|-------------------------------|-----------------------------|---|--------------------------------|-----------------------|
| SMTP Server | String (40 characters) | 21*1 | Starting data register | Starting data register+20 | Specify the IP address or the host name of the sending e-mail server that is used to send e-mails as a string.*2 | | |
| SMTP Server Port | Decimal value | 1 | Starting data register+21 | | Specify the port number of the sending e-mail server that is used to send e-mails as a decimal value. | | |
| Sender E-mail Address | String (40 characters) | 21*1 | Starting data register+22 | Starting data register+42 | Specify the e-mail address that is included in the sender field of the e-mails to be sent from the FC6A as a string.*2 | | |
| Sender Name | String (40 characters) | 21*1 | Starting data register+43 | Starting data register+63 | Specify the name that is included in the sender field of the e-mails to be sent from the FC6A as a string.*2 | | |
| Authentication is required to send e-mail/ Authentication Method | Decimal value | 1 | Starting data register+64 | | Specify whether the authentication is required by the sending e-mail server that is used and the authentication method. | | |
| | | | | | Value | Authentication required or not | Authentication Method |
| | | | | | 0 | Not required | - |
| | | | | | 1 | Required | Automatic |
| | | | | | 3 | | CRAM-MD5 |
| | | | | | 5 | | DIGEST-MD5 |
| | | | | | 7 | | LOGIN |
| | | | | | 9 | | PLAIN |
| Account Name | String | 21*1 | Starting data register+65 | Starting data register+85 | Specify the account name that is used with authentication as a string.*2 | | |
| Password | String | 21*1 | Starting data register+86 | Starting data register+106 | Specify the password that is used with authentication as a string.*2 | | |
| Use secure connection (SSL/TLS) | Decimal value | 1 | Starting data register+107 | | When SSL or TLS communication is required with the sending e-mail server that is used, specify 1. When SSL or TLS communication is not required, specify 0. | | |

^{*1} The string set to "Number of used words - 1" words is valid as the setting value. In order to represent the end of the string, the final word is handled as if 0000h was stored in it, regardless of the actual values in the data registers.

^{*2} If the set string is shorter than "Number of used words - 1", fill the data after the string with 00h.

Configuration Example: The e-mail settings shown below are configured by the data registers.

SMTP Server : smtp.example.com
 SMTP Server Port : 587
 Sender E-mail Address : test@example.com
 Sender Name : Test
 Authentication is required to send e-mail : Checked
 Account Name : test_account
 Password : test_password
 Authentication Method : LOGIN
 Use secure connection (SSL/TLS) : Checked

When D100 is specified as the starting data register, set the values for data registers D100 to D207 as follows.

| Setting Item | Start Address of Setting Item | End Address of Setting Item | Setting Value | | | | | | | | | | |
|--|-------------------------------|-----------------------------|---------------------|---------|---------|-----------|--------------|---------|---------|-----------|--------------|-----------|--------------|
| SMTP Server | D100 | D120 | Data Register | D100 | D101 | D102 | D103 | D104 | D105 | D106 | D107 | D108 | D109 to D120 |
| | | | ASCII | 's' 'm' | 't' 'p' | '.' 'e' | 'x' 'a' | 'm' 'p' | 'l' 'e' | '.' 'c' | 'o' 'm' | '\0' '\0' | '\0' '\0' |
| | | | Value (hexadecimal) | 736Dh | 7470h | 2E65h | 7861h | 6D70h | 6C65h | 2E63h | 6F6Dh | 0000h | 0000h |
| SMTP Server Port | D121 | | Data Register | D121 | | | | | | | | | |
| | | | Value (decimal) | 587 | | | | | | | | | |
| Sender E-mail Address | D122 | D142 | Data Register | D122 | D123 | D124 | D125 | D126 | D127 | D128 | D129 | D130 | D131 to D142 |
| | | | ASCII | 't' 'e' | 's' 't' | '@' 'e' | 'x' 'a' | 'm' 'p' | 'l' 'e' | '.' 'c' | 'o' 'm' | '\0' '\0' | '\0' '\0' |
| | | | Value (hexadecimal) | 7465h | 7374h | 4065h | 7861h | 6D70h | 6C65h | 2E63h | 6F6Dh | 0000h | 0000h |
| Sender Name | D143 | D163 | Data Register | D143 | D144 | D145 | D146 to D163 | | | | | | |
| | | | ASCII | 'T' 'e' | 's' 't' | '\0' '\0' | '\0' '\0' | | | | | | |
| | | | Value (hexadecimal) | 5465h | 7374h | 0000h | 0000h | | | | | | |
| Authentication is required to send e-mail/ Authentication Method | D164 | | Data Register | D164 | | | | | | | | | |
| | | | Value (decimal) | 7 | | | | | | | | | |
| Account Name | D163 | D185 | Data Register | D165 | D166 | D167 | D168 | D169 | D170 | D171 | D172 to D185 | | |
| | | | ASCII | 't' 'e' | 's' 't' | '_' 'a' | 'c' 'c' | 'o' 'u' | 'n' 't' | '\0' '\0' | '\0' '\0' | | |
| | | | Value (hexadecimal) | 7465h | 7374h | 5F61h | 6363h | 6F75h | 6E74h | 0000h | 0000h | | |
| Password | D186 | D206 | Data Register | D186 | D187 | D188 | D189 | D190 | D191 | D192 | D193 to D206 | | |
| | | | ASCII | 't' 'e' | 's' 't' | '_' 'p' | 'a' 's' | 's' 'w' | 'o' 'r' | 'd' '\0' | '\0' '\0' | | |
| | | | Value (hexadecimal) | 7465h | 7374h | 5F70h | 6173h | 7377h | 6F72h | 6400h | 0000h | | |
| Use secure connection (SSL/TLS) | D207 | | Data Register | D207 | | | | | | | | | |
| | | | Value (decimal) | 1 | | | | | | | | | |

Note: Strings by data registers are composed of 1 or more consecutive data registers. 1 word of data is handled as 2 bytes and is used in high-order byte to low-order byte order, and the terminating character is 00h.

Special Data Registers/Special Internal Relays

Initialize sending e-mail server settings

The values set in the **Function Area settings** can be reflected to the corresponding data registers as the initial values by using special internal relay M8211.

Special Internal Relays

| Device Address | Description | Details |
|----------------|---|--|
| M8211 | Initialize HMI module sending e-mail server settings | When this relay is turned on, the values set in the function area settings are set as the initial values in the target data registers. |
| M8344 | Initialize Ethernet port 1 sending e-mail server settings | When this relay is turned on, the values set in the function area settings are set as the initial values in the target data registers. |

Note: Strings can be stored in data registers. Strings start from the specified data register. The end of each string is specified with 00h which is stored in the high-order byte or the low order byte of the value in a data register. 1 word of data is handled as 2 bytes and is used in high-order byte to low-order byte order.

■ Text Encoding

(11) Character Set

The character set for the e-mail subject, body, and attached file can be specified.

ASCII: Specify when e-mail subject and body consist of ASCII characters only.

Japanese (ISO-2022-JP): Specify when e-mail subject and body consist of ASCII and Japanese characters. The character set for the attached file is Shift_JIS.

Chinese (GB2312): Specify when e-mail subject and body consist of Chinese characters.

Western European (ISO-8859-1): Specify when e-mail subject and body consist of western European characters.

Unicode (UTF-8): Specify when using Unicode characters.

In general, any characters can be used using Unicode. Depending on sending e-mail servers that relay the e-mails or the mailer used by the recipients, the e-mails sent out from the FC6A may not reach the recipients or may not be viewed correctly in the mailer.

When ASCII is used, e-mails can be viewed in the same manner in any mailer though only ASCII characters can be used.

Contact the administrator of the sending e-mail server to confirm the supported character sets. Select the appropriate character set for the mailer of the recipients.

(12) Encode Text Using

The encoding format for e-mail body can be specified. Depending on the sending e-mail servers that relay the e-mails, the e-mails in which 8-bit characters are used cannot be sent. In such case, Base64 encoding can be used to convert the 8-bit characters into 7-bit characters.

None: The e-mail body is not encoded.

Base 64: The e-mail body is encoded with Base64 format.

(13) Decimal Symbol

The decimal symbol for the floating-point values can be specified. When the data type of a data register embedded in the e-mail body is float, data register value is converted and shown as a floating-point value in the e-mail body.

Period (.): Period '.' (2Eh) is used.

Comma (,): Comma ',' (2Ch) is used.

(14) Separating Character

The separator for the attached CSV file is automatically determined by the selected **Decimal Symbol**.

| Decimal Symbol | Separator Character |
|------------------|---------------------|
| Period '.' (2Eh) | Comma ',' (2Ch) |
| Comma ',' (2Ch) | Semicolon ';' (3Eh) |

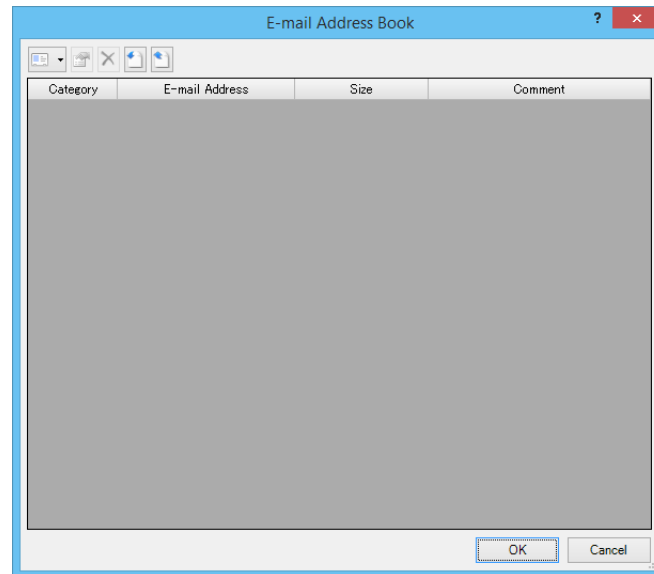
Note: The text encoding settings of HMI-Ethernet port and Ethernet port 1 are the identical. For example, the configured text encoding settings in Email Settings of the HMI Module Configuration dialog box are automatically reflected to the text encoding settings for the Ethernet port 1.

E-mail Address Book

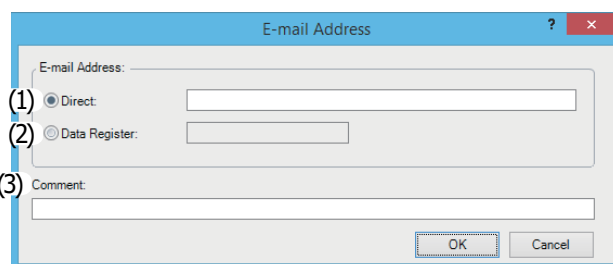
The e-mail addresses and e-mail address groups can be configured in E-mail Address Book dialog box. E-mail addresses can be grouped into an e-mail address group. The e-mail address group can be used to specify a group of e-mail addresses in each e-mail. A maximum of 255 combined e-mail addresses and e-mail address groups can be registered.

Programming WindLDR

1. Double-click on the **E-mail Address Book** in the **Project Window**.
The **E-mail Address Book** dialog box appears.



2. Click the ▼ next to the **New E-mail Address**, and then click **New E-mail Address**. Alternatively, select an existing E-mail address, and then click the **Edit** button.
The **E-mail Address** dialog box appears.
3. Configure the settings.



(1) Direct

Specify the e-mail address to register in the E-mail Address Book dialog box. A maximum of 40 ASCII characters can be entered.

(2) Data Register

Specify the data register to store the e-mail address. When sending an e-mail, the string stored in a maximum of 30 words of data registers starting from the specified data register is used as e-mail address for the E-mail recipients (To and CC). When specifying an e-mail address with a string using data registers, the length of the e-mail address is considered as 60 bytes fixed. When specifying all e-mail addresses with data registers, a maximum of eight e-mail addresses can be set for the E-mail recipients (To and CC).

(3) Comment

The comment for the e-mail address can be assigned. The contents or the length of the comment has no effect on the CPU module operation.

12: SEND E-MAIL FUNCTION

Configuration Example: To send an e-mail to test@example.com by specifying the data register D100, store the values in the data registers as follows.

| Data Register | D100 | D101 | D102 | D103 | D104 | D105 | D106 | D107 | D108 |
|---------------------|---------|---------|---------|---------|---------|---------|---------|---------|-----------|
| ASCII | 't' 'e' | 's' 't' | '@' 'e' | 'x' 'a' | 'm' 'p' | 'l' 'e' | '.' 'c' | 'o' 'm' | '\0' '\0' |
| Value (hexadecimal) | 7465h | 7374h | 4065h | 7861h | 6D70h | 6C65h | 2E63h | 6F6Dh | 0000h |

To send an e-mail to you@example.com by specifying the data register D123, store the values in the data registers as follows.

| Data Register | D123 | D124 | D125 | D126 | D127 | D128 | D129 | D130 |
|---------------------|--------|---------|---------|---------|-----------|---------|---------|----------|
| ASCII | y' 'o' | 'u' '@' | 'e' 'x' | 'a' 'm' | 'p' 'l' ' | 'e' '.' | 'c' 'o' | 'm' '\0' |
| Value (hexadecimal) | 796Fh | 7540h | 6578h | 616Dh | 706Ch | 652Eh | 636Fh | 6D00h |

Notes:

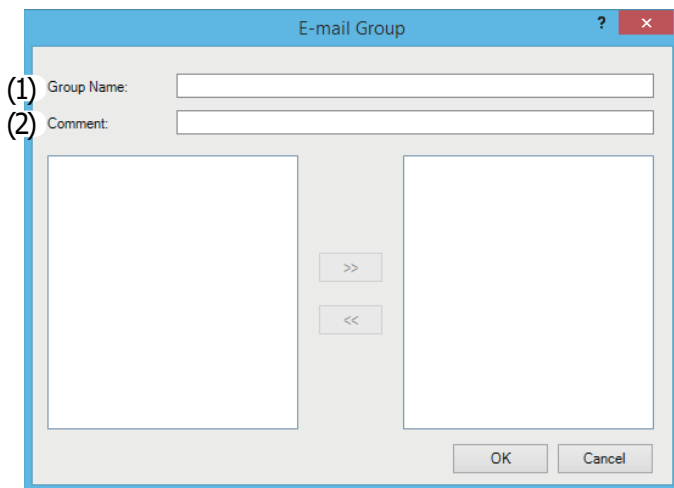
- Strings by data registers are composed of 1 or more consecutive data registers. 1 word of data is handled as 2 bytes and is used in high-order byte to low-order byte order, and the terminating character is 00h.
- If 00h is not included in the 30 words (60 bytes) from the data register specified as the e-mail address, all 60 bytes are used as the e-mail address, and the FC6A operates as if the 61st byte is 00h.

4. Click **OK**.

5. Click the ▼ next to the **New E-mail Address**, and then click **New E-mail Group**. Alternatively, select an existing E-mail address, and then click the **Edit** button.

The **E-mail Group** dialog box appears.

6. Configure the settings.



(1) Group Name

Specify the name of e-mail address group to register in the E-mail Address Book dialog box.

(2) Comment

The comment for the e-mail address group can be assigned. The contents or the length of the comment has no effect on the CPU module operation.

The e-mail addresses that have not been added to the e-mail address group are shown in the list box on the left. The e-mails addresses are listed in the order that they were registered in the E-mail Address Book dialog box. In order to add an e-mail address to the e-mail address group, select the e-mail address to add and click on the >> button. The selected e-mail address is moved to the list box on the right and listed to the bottom of the e-mails.

The e-mail addresses for the e-mail address group are shown on the list box on the right. The e-mail addresses are listed in the order that they were added to the e-mail address group. In order to remove an e-mail address from the e-mail address group, select the e-mail address to remove and click on the << button. The selected e-mail address is moved to the list box on the left and listed to the bottom of the e-mails.

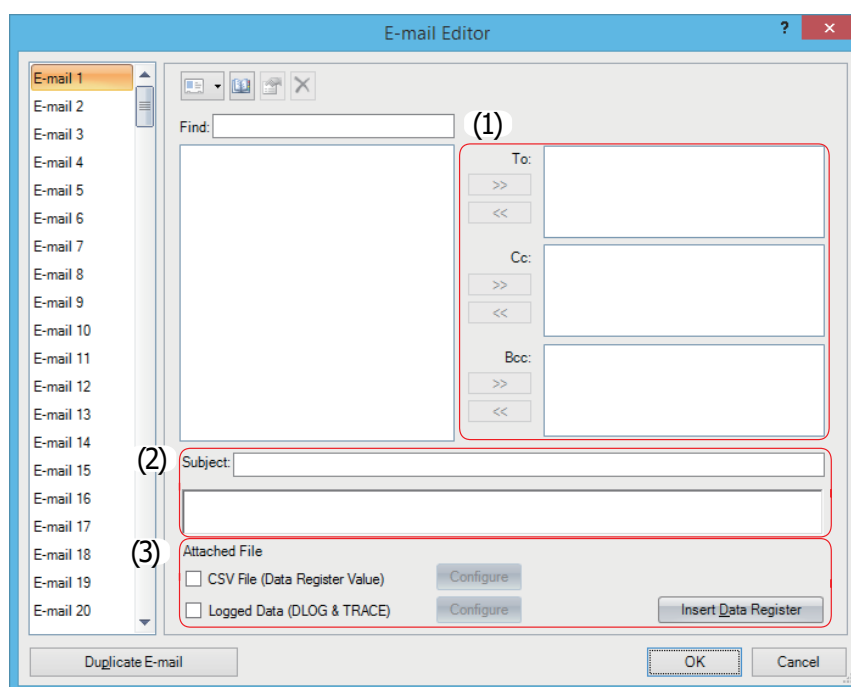
In order to delete unused e-mail addresses or e-mail address groups from the E-mail address book, select the e-mail address or e-mail address group to delete and click Delete button in the E-mail Address Book dialog box. When the deleted e-mail address is used in the e-mail address groups, the deleted e-mail address is removed from all e-mail address groups.

7. Click **OK**.

This concludes configuring the settings.

E-mail Editor

The e-mails can be configured in E-mail Editor dialog box. The following five parameters should be configured for each e-mail.



Settings in E-mail Editor

(1) E-mail recipients (To, Cc, and Bcc)

E-mail address or e-mail group can be specified as the recipients. The maximum size of texts for **To**, **Cc**, or **Bcc** is 512 bytes. Comma (,) is inserted as a separating character between e-mail addresses. For example, the total size of an e-mail group "ccc" containing two e-mail addresses "aa@example.com" (15 bytes including a comma) and "bbb@example.com" (16 bytes including a comma) is 31 bytes. If the size of e-mail addresses is 30 bytes, 16 e-mail addresses can be specified in **To**, **Cc**, and **Bcc** respectively. An e-mail can be sent to 32 e-mail addresses simultaneously.

(2) E-mail subject and body

The maximum size of texts is 256 bytes for **Subject** and 4,096 bytes for **e-mail body**. The e-mail subject and body are composed from the following elements.

- Strings that use **character set** under **E-mail Settings** in the **Function Area settings**
- Numeric value strings of the values of data registers that have been embedded in the body by inserting data registers
- Spaces and newlines

The size of the **e-mail subject** and **body** is the text that is composed of the combination of the above elements.

The result of encoding the composed text according to **Text encoding** under **E-mail Settings** in the **Function Area settings** is sent as the e-mail.

When only single-byte ASCII characters are used, approximately 200 characters can be entered for e-mail subject and 3,500 characters for e-mail body. When multi-byte characters are used, approximately 100 characters can be entered for e-mail subject and 2,000 characters for e-mail body

(3) Attached File

One CSV file can be attached to an e-mail. The attached file can include text and data register values. The file name of the CSV file is fixed as "data.csv". The maximum size of the attached file is 4,096 bytes.

The attached file composed from the following elements.

- Strings that use **character set** under **E-mail settings** in the **Function Area settings**
- Numeric value strings of the values of data registers that have been embedded in the body by inserting data registers
- Spaces, separator characters, and newlines

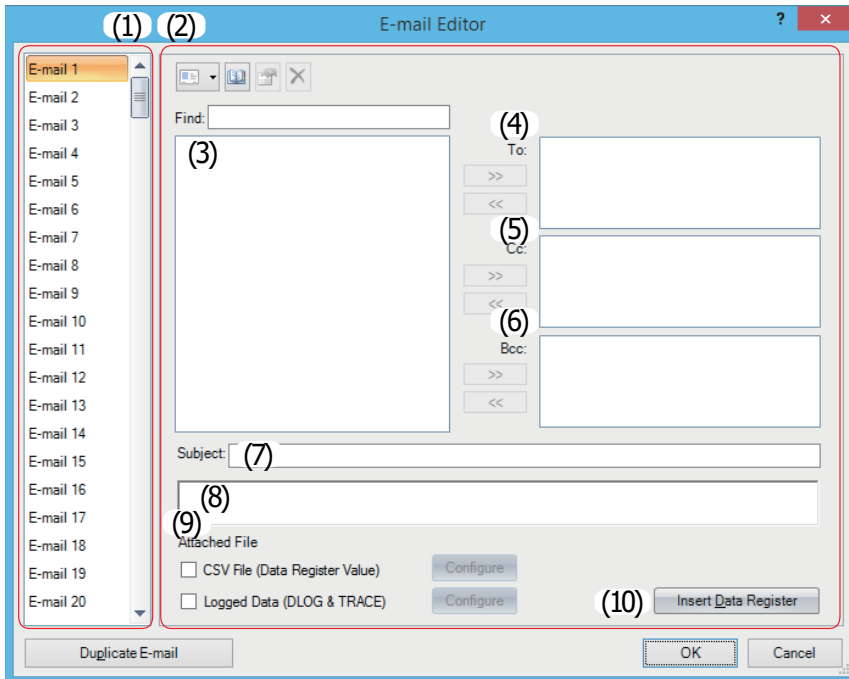
The size of the **attached file** is the text that is composed of the combination of the above elements.

The result of encoding the composed text according to **Text encoding** under **E-mail Settings** in the **Function Area settings** is attached to the e-mail.

When sending e-mails from Ethernet port 1 of the Plus CPU module, log files created with the DLOG and TRACE instructions can be attached to e-mails.

Programming WindLDR

1. Double-click on the **E-mail Editor** in the **Project Window**.
The **E-mail Editor** dialog box appears.
2. Create an e-mail.



(1) E-mail

Displays the registered e-mails.

(2) E-mail content

Displays the content of the selected e-mail.

This area is composed of the following six elements: **To**, **Cc**, **Bcc**, **Subject**, **Body**, **Attached File**.

(3) E-mail addresses

Displays the e-mail addresses registered in the E-mail Address Book.

Select the e-mail address to add to **To**, **Cc**, or **Bcc** and click **>>** on the appropriate side to add that e-mail address to **To**, **Cc**, or **Bcc**.
Of the e-mail addresses in the **To**, **Cc**, or **Bcc** boxes, select the e-mail address to delete and click **<<** on the appropriate side to delete that e-mail address from **To**, **Cc**, or **Bcc**.

(4) To/(5) Cc/(6) Bcc

Specifies the addresses of the e-mail to send.

(7) Subject

Specifies the subject of the e-mail to send.

(8) Body

Specifies the e-mail body.

The e-mail body can be written in multiple lines.

(9) Attached File

Select this check box to attach a file to the e-mail.

CSV File (Data Register Value) : The attached file (CSV file) that includes text and data register values is configured with the Attached File Editor. Click **Edit** to display the Attached File Editor.

The layout and items can be freely configured in a range that fits in the file size limit.

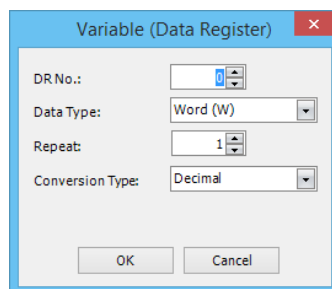
For details, see "Attached File Editor" on page 12-16.

Logged Data (DLOG & TRACE) : For the Plus CPU module, log files created with the DLOG and TRACE instructions can be attached to e-mails. Configure these settings in **Attach Log Data** dialog box. Click **Configure** to display the **Attach Log Data** dialog box.

For details, see "Attach Log Data" on page 12-19.

(10) Insert Data Register

The **Variable (Data Register)** dialog box appears.



The data register values can be embedded in the e-mail body when the FC6A sends e-mails.

| Item | | Description |
|-----------|-------------|--|
| DR Number | | Specify the data register number. |
| Data Type | Word (W) | The 1-word value stored in the specified data register is converted to an unsigned 16 bits value. |
| | Integer (I) | The 1-word value stored in the specified data register is converted to a signed 15 bits value. |
| | Double (D) | The 2-word value stored in the two consecutive data registers starting with the specified data register is converted to an unsigned 32 bits value. |
| | Long (L) | The 2-word value stored in the two consecutive data registers starting with the specified data register is converted to a signed 31 bits value. |
| | Float (F) | The 2-word value stored in the two consecutive data registers starting with the specified data register is converted to a floating-point value according to IEEE754 format. Digits can be specified between 1 and 7. |
| | String (S) | Values in the configured data registers are encoded to a character string with the character set for the text encoding. The length of character string Characters. |

When word (W) or double (D) is selected, the conversion type can be specified. For example, when a data register value is 4660 (1234h), the data register value is converted and embedded in the e-mail body as follows:

Decimal: 4660

Hexadecimal: 1234

When the repeat is configured, the values in the consecutive data registers can be embedded in the e-mail body. A space is inserted between the data register values. For example, when the data register values are (D100) = 1234h, (D101) = 5678h, and (D102) = ABCDh, and the DR number is 100, the data type is Word, the repeat is 3, and the conversion type is hexadecimal, the following text will be embedded in the e-mail body:

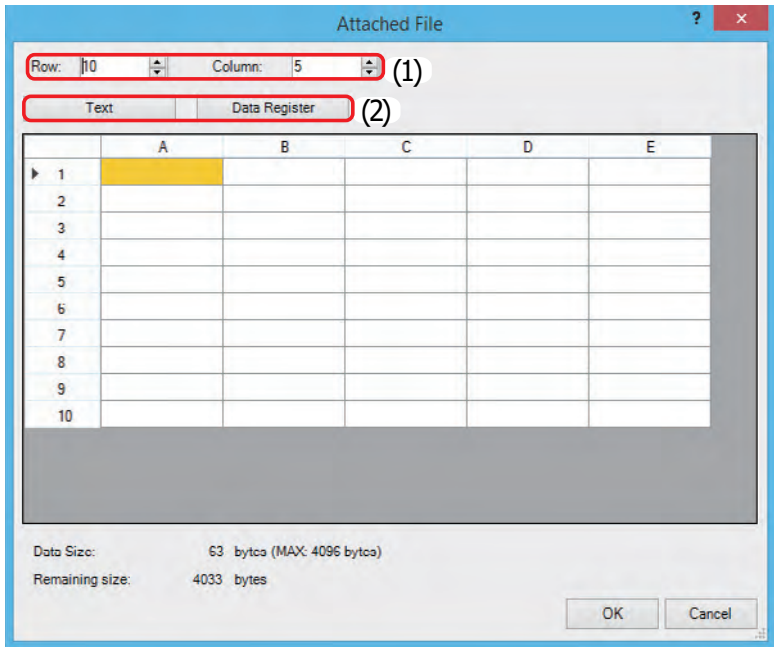
1234 5678 ABCD

The text created in the E-mail Editor is encoded and sent according to the **Encoding method** settings specified on **E-mail Settings** in **Function Area Settings**.

3. Click **OK**.

Attached File Editor

Edit the content of the CSV file attached to the e-mail.
The desired text and data register values can be included in the CSV file. The file name of the CSV file is fixed as "data.csv".



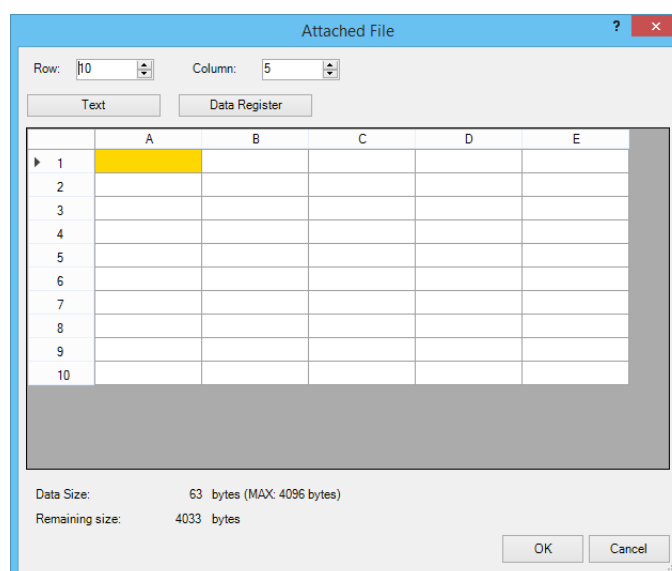
Settings in Attached File Editor

- (1) Row, Column**
The number of rows and columns in the CSV file can be changed. The number of rows and columns can be specified between 1 and 64. When the editing range is shrunk, the setting values outside the editing range are cleared.
- (2) Text, Data Register**
Set the text and data registers displayed in the table to determine the content of the attached file. The file size of the CSV file is a maximum of 4,096 bytes.

Note: The character set, separator, and decimal symbol configured in the Function Area Settings are applied to all attached files. For those settings, see "Programming WindLDR" on page 12-4 in this chapter.

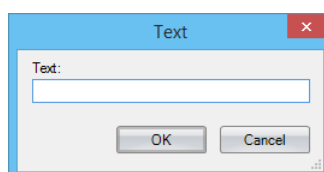
Programming WindLDR

1. Select the **Attached File** check box in the **E-mail Editor** and click **Edit**.
The **Attached File** dialog box appears.
2. Specify **Row** and **Column**.
Set the number of rows and columns in the CSV file to determine the editing range.



The content of the CSV file can be modified at the upper part of the dialog. The current file size and the remaining size that can be used for editing the content are displayed at the bottom of the dialog. You can expand the grid area by changing the size of the dialog. The file size includes separators and line breaks to be contained in the CSV file.

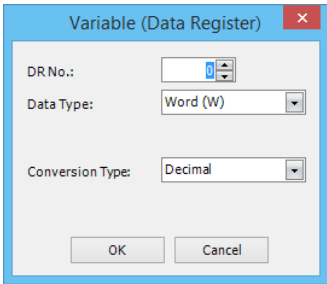
3. Select any cell and click **Text**.
The **Text** dialog box appears.
4. Enter the desired text in the selected cell.
The maximum length of the text that can be specified is 63 bytes.



5. Click **OK**.
You are returned to the **Attached File** dialog box.
6. Select any cell and click **Data Register**.
The **Variable (Data Register)** dialog box appears.

12: SEND E-MAIL FUNCTION

7. Configure the settings.



The value of the data register when the e-mail is sent can be included in the selected cell.

| Item | | Description |
|-----------|-------------|--|
| DR Number | | Specify the data register number. |
| Data Type | Word (W) | The 1-word value stored in the specified data register is converted to an unsigned 16 bits value. |
| | Integer (I) | The 1-word value stored in the specified data register is converted to an unsigned 16 bits value. |
| | Double (D) | The 2-word value stored in the two consecutive data registers starting with the specified data register is converted to an unsigned 32 bits value. |
| | Long (L) | The 2-word value stored in the two consecutive data registers starting with the specified data register is converted to a signed 31 bits value. |
| | Float (F) | The 2-word value stored in the two consecutive data registers starting with the specified data register is converted to a floating-point value according to IEEE754 format. Digits can be specified between 1 and 7. |

When word (W) or double (D) is selected, the conversion type can be specified. For example, when a data register value is 4660 (1234h), the data register value is converted and embedded in the e-mail body as follows:

Decimal: 4660
Hexadecimal: 1234

- 8. Click **OK**.
You are returned to the **Attached File** dialog box.
- 9. Click **OK**.

Attach Log Data

Set the log files that will be attached to the e-mail.

The screenshot shows a dialog box titled "Attach Log Data". It has two radio buttons: "DLOG" (selected) and "TRACE". Below each radio button are two fields: "Folder Name" and "Files to transfer". For "DLOG", the "Folder Name" is "RESULT" and "Files to transfer" is "Latest file only". For "TRACE", the "Folder Name" is empty and "Files to transfer" is "Latest file only". At the bottom are "OK" and "Cancel" buttons.

Settings

(1) Log File Type

Select the log file type to attach.

DLOG and **TRACE**

(2) Folder Name

Specify the folder name of the target folder to which the log files are saved by the DLOG or TRACE instructions. Up to 8 characters can be entered.

(3) Files to transfer

Select the specification method for the log files to attach from the following.

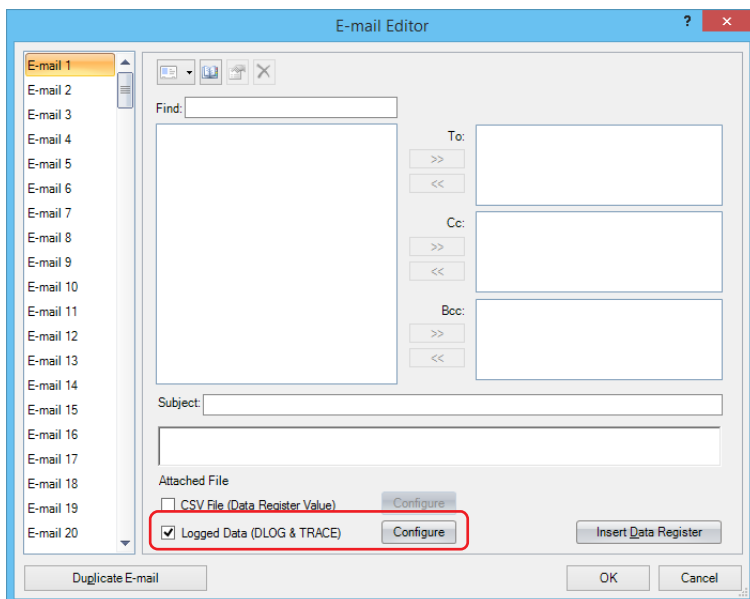
- Files updated within 24 hours
- Files updated within 7 days
- Latest file only

Note: The maximum number of log files that can be attached is seven. If the number of the log files exceeds seven, eighth or later log files are not attached and the error code 11 is stored in D2 of the EMAIL instruction.

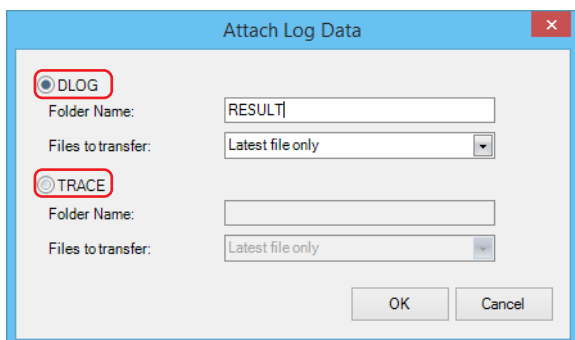
12: SEND E-MAIL FUNCTION

Programming WindLDR

1. In the **E-mail Editor**, select the **Log Data (DLOG & TRACE)** check box and click **Configure**.
The **Attach Log Data** dialog box is displayed.



2. Select the type of the log file to attach to the e-mail from **DLOG** or **TRACE**.



3. With **Folder Name**, specify the folder name of the target folder to which the log files are saved. Up to 8 characters can be entered.
4. With **Files to transfer**, select the specification method for the log files from the following.
 - Files updated within 24 hours
 - Files updated within 7 days
 - Latest file only
5. Click **OK**.

This concludes configuring the settings.

13: WEB SERVER

Introduction

This chapter describes the web server functions in the FC6A.

Overview

The Plus CPU module and HMI module support Web server function.

There are three types of web pages displayed by the web server function.

| Web page | Description |
|-----------------|---|
| System web page | On the system web page, the PLC status of the FC6A can be monitored and device values can be changed. |
| User web page | User web pages can be freely created by users using HTML and JavaScript. |
| Custom web page | Custom web pages can be created using WindLDR web page editor. |

You can use these web pages to build an easy-to-use website for each project.

Web pages can be saved in the internal memory of the Plus CPU module, the SD memory card, or the internal memory of the HMI module. For details, see "URL When Accessing Web Server and Web Page to Display" on page 13-4.

The web server function of the Plus CPU module supports SSL/TLS, which prevents data eavesdropping, falsification, and spoofing by a third party.

Supported Models and Communication Ports

Supported models and communication ports are as follows.

Yes : Can be used as web server.

No : Cannot be used as web server.

— : Not equipped with the CPU module.

| CPU Module | Communication Port | | |
|---------------------------------|--------------------|-----------------|-------------------|
| | Ethernet Port 1 | Ethernet Port 2 | HMI-Ethernet Port |
| All-in-One CPU module | No | — | Yes*2*3 |
| CAN J1939 All-in-One CPU module | | | |
| Plus CPU module | Yes*1 | No | |

*1 SSL/TLS communication is supported.

*2 The HMI-Ethernet port can be expanded and used for communication by connecting the HMI module to the CPU module.

*3 SSL/TLS communication is not supported.

Operating Environment

The recommended operating system and recommended web browser to use when browsing the web pages downloaded to FC6A are as follows.

When SSL/TLS communication is enabled

| Operating System | Web Browser |
|------------------|-----------------------------|
| Windows10 | Google Chrome 90 or later |
| | Mozilla Firefox 88 or later |
| Android | Google Chrome 90 or later |
| iOS | Safari 14 or later |

When SSL/TLS communication is disabled

| Operating System | Web Browser |
|------------------|--------------------------------|
| Windows10 | Google Chrome 47 or later |
| | Mozilla Firefox 42 or later |
| | Microsoft Internet Explorer 11 |
| Android | Google Chrome 47 or later |
| iOS | Safari 8 or later |

Note: You can use the web server function other than the recommended operating system and recommended web browser, but there may be problems with the display or operation of the web page.

Standard Specifications

Save Locations of Web Pages

With the Plus CPU module, you can select the save location when downloading web pages. The All-in-One CPU module can only save web pages in the internal memory of the HMI module.

Yes : Web pages can be saved.

No : Web pages cannot be saved.

| CPU Module | Internal memory of the CPU module | SD memory card inserted into the CPU module | Internal memory of the HMI module |
|---------------------------------|-----------------------------------|---|-----------------------------------|
| All-in-One CPU module | No | No | Yes (5 MB maximum) |
| CAN J1939 All-in-One CPU module | | | |
| Plus CPU module | Yes (5 MB maximum) | Yes (32 GB maximum ^{*1}) | |

^{*1} The maximum size of one file is 4 GB.

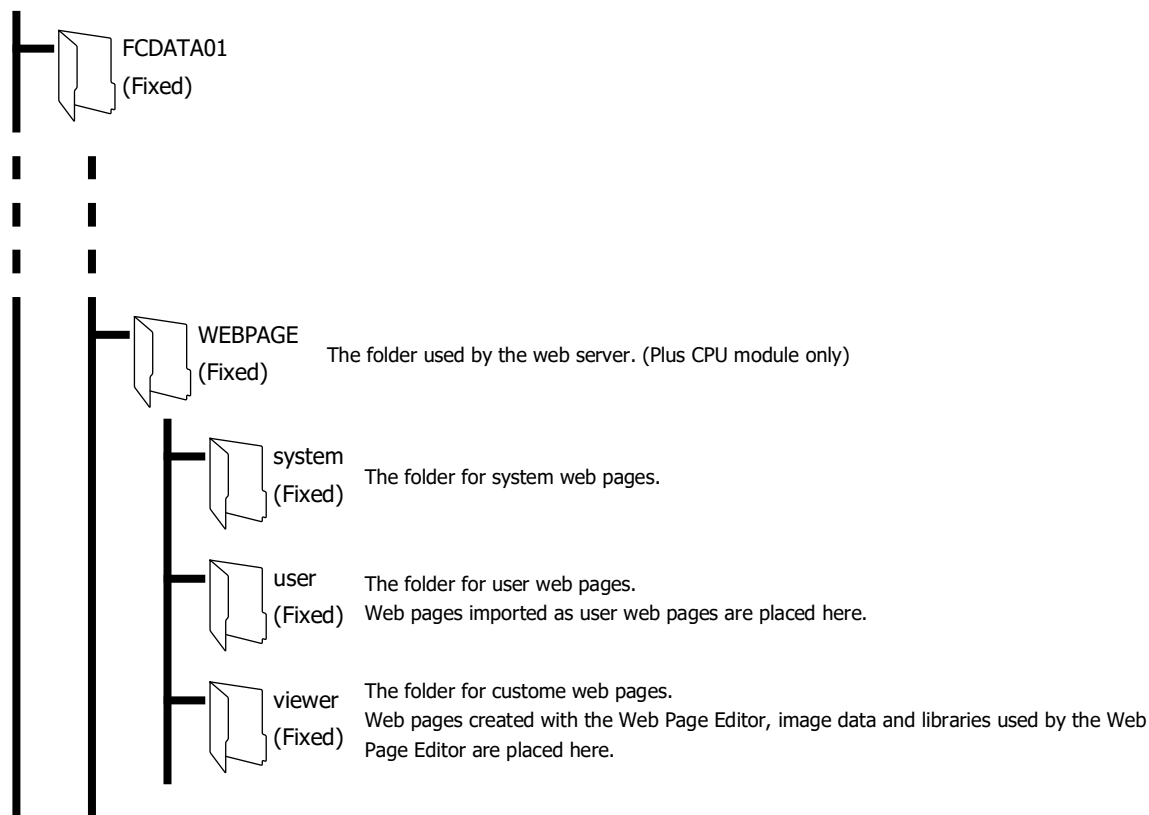
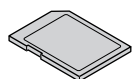
Locations of Web Pages Saved to SD Memory Card

When using the web server function with the Plus CPU module, web pages can be saved to the SD memory card. The following are the locations for saving web pages to SD memory card.

SD Memory Card

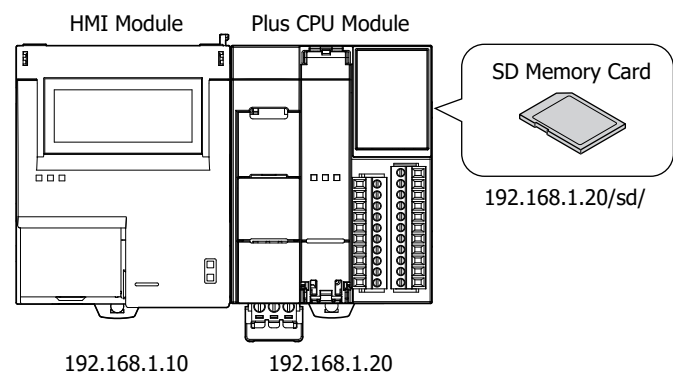
Arbitrary: File names and folder names that can be specified by the function area settings and instruction parameters.

Fixed: File names and folder names that are fixed by the system.



URL When Accessing Web Server and Web Page to Display

When accessing downloaded web pages, the URL to be accessed differs depending on the save location of the web page. For example, when the IP address of the Plus CPU module is 192.168.1.20 and the IP address of the HMI module connected to the Plus CPU module is 192.168.1.10, the URLs to use when accessing the downloaded web pages are as follows.



| Save Location | URL When Accessing Web Pages |
|--|------------------------------|
| Internal memory of the Plus CPU module | http://192.168.1.20/ |
| SD memory card inserted into the Plus CPU module | http://192.168.1.20/sd/ |
| Internal memory of the HMI module | http://192.168.1.10/ |

When the web pages are stored in the internal memory of the Plus CPU module and you access the web server using a web browser, the web page displayed is as follows.

| URL When Accessing Web Server | Displayed Web Page |
|-------------------------------|--|
| http://192.168.1.20 | The web page selected in Redirect Target of Web Server Settings is displayed. When Disable Redirect is selected in Redirect Target , the error occurs. |
| http://192.168.1.20/system/ | The PLC Status page*1 of the system web page is displayed. |
| http://192.168.1.20/user/ | If there is a file called index.html in the user folder, that index.html is displayed. |

*1 For details on the PLC Status page, see "PLC Status" on page 13-29.

Note:

- Even if you access http://192.168.1.20/viewer/, you are not redirected to the custom web page. When you want to display a custom web page, select the custom web page in **Redirect Target** of **Web Server Settings** and access http://192.168.1.20/.
- When you access the web page, you will be asked to enter your user name and password. For details, see "(10) User Settings" on page 13-9.

Number of Connections

When SSL/TLS communication is enabled on the Plus CPU module web server, up to 8 connections can be established.

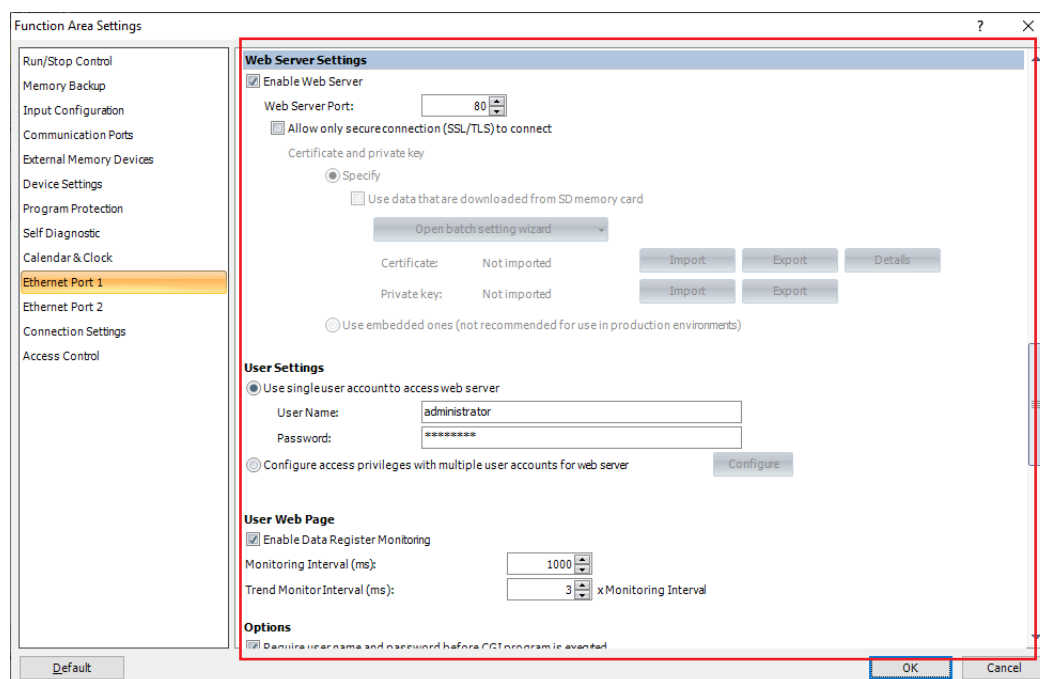
Note: Depending on the configuration of the client connecting to the Plus CPU module web server, the number of connections the client used while connecting to it and viewing web pages varies. The current number of connections can be checked in D8822 (Web Server Current Number of Connections (Plus CPU Module)). For details, see "Special Data Register Device Addresses" on page 2-17.

Plus CPU Module Web Server

This section describes the web server settings when using the web server function in the Plus CPU module.

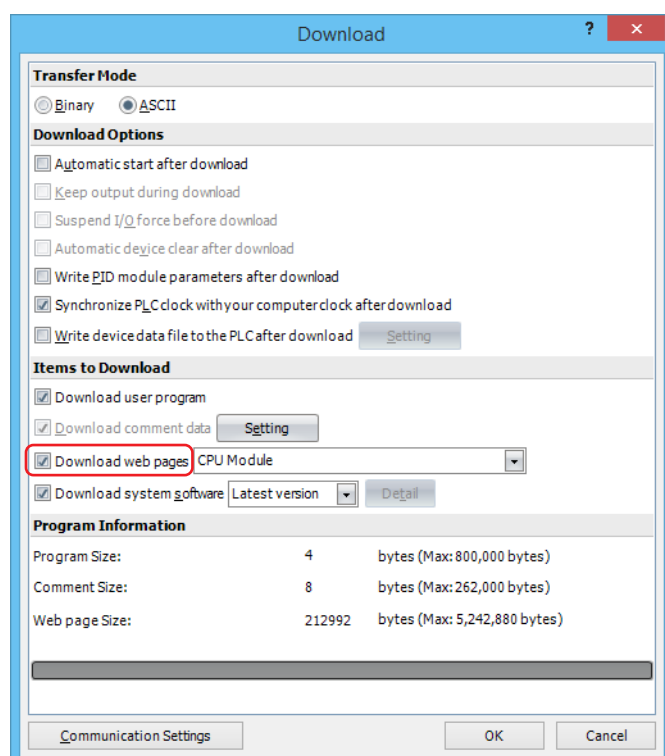
• Operation procedure

1. On the **Configuration** tab, in the **Function Area Settings** group, click **Ethernet Port 1**.
2. Under **Web Server Settings**, configure the web server settings and the settings for the web page and options.



For details on each setting item, see "Web Server Settings" on page 13-7.

3. Download the user program to the Plus CPU module.
From the WindLDR menu bar, select **Online** > **Transfer** > **Download**. The **Download** dialog box appears.
4. Select the **Download web pages** check box.



5. Select the save location of web pages from the following.

| Setting | Description |
|--|---|
| No Download | Web pages is not be downloaded. |
| CPU Module | Downloaded web pages are saved to the internal memory of the Plus CPU module. |
| CPU Module (High-speed and Non-retentive) | Downloaded web pages are saved to the internal memory of the Plus CPU module. When the Plus CPU module is turned off, the downloaded web pages are erased. |
| CPU Module (SD Memory Card) | Downloaded web pages are saved to the SD memory card inserted into the Plus CPU module. |

Note: CPU Module (High-speed and Non-retentive) allows web pages to be downloaded faster than when **CPU Module** is selected, but the downloaded web pages will be deleted when the power to the Plus CPU module is turned off. Select **CPU Module (High-speed and Non-retentive)** when you will repeatedly edit and download web pages, such as to check the operation of created web pages.

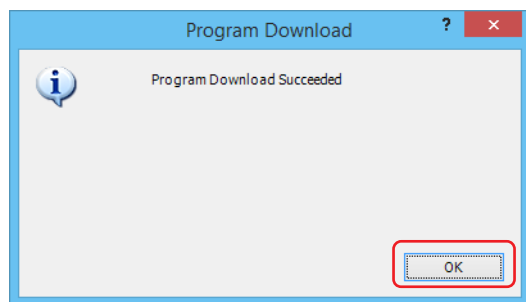
Caution on downloading web pages to SD memory card

When **CPU Module (SD Memory Card)** is selected, download the web pages to the SD memory card with write-protection removed in the Plus CPU module.

6. Click **OK**.

The web pages are downloaded to the selected save location.

When the following message appears, the download has completed successfully.



This concludes configuring the web server settings.

Web Server Settings

On the **Configuration** tab, in the **Function Area Settings** group, click **Ethernet Port 1**, and configure the settings for using the web server function under **Web Server Settings**.

When Use data that are downloaded from SD memory card check box is cleared

The screenshot shows the 'Function Area Settings' window with 'Web Server Settings' selected. The settings are as follows:

- (1) ☒ Enable Web Server
- (2) Web Server Port: 443
- (3) ☒ Allow only secure connection (SSL/TLS) to connect
- (4) Certificate and private key
 - ☒ Specify
- (5) ☐ Use data that are downloaded from SD memory card
- (7) Open batch setting wizard (dropdown menu)
- (8) Certificate: Not imported (Import, Export, Details buttons)
- (9) Private key: Not imported (Import, Export buttons)
- ☒ Use embedded ones (not recommended for use in production environments)

When Use data that are downloaded from SD memory card check box is selected

The screenshot shows the 'Function Area Settings' window with 'Web Server Settings' selected. The settings are as follows:

- ☒ Enable Web Server
- Web Server Port: 443
- ☒ Allow only secure connection (SSL/TLS) to connect
- Certificate and private key
 - ☒ Specify
- ☒ Use data that are downloaded from SD memory card
- (6) Configure SD memory card (button)

(1) Enable Web Server

Select this check box when you want to use the web server function. The check box is selected by default.

(2) Web Server Port

Configure the port number for the web server of the Plus CPU module. Normally, 80 is used for HTTP and 443 is used for HTTP over TLS. Configure the port number in the range of 0 to 65,535. The default port number is 80.

(3) Allow only secure connection (SSL/TLS) to connect

Select this check box to enable SSL/TLS communication. The check box is cleared by default. For restrictions when SSL/TLS communication is enabled, see "Restrictions" on page 13-60.

(4) Certificate and private key

Select the certificate and private key to be used for SSL/TLS communication from the following setting. The default value is "Specify".

| Setting | Description |
|-------------------|---|
| Specify | You can freely specify the certificate and private key you want to use for SSL/TLS communication. |
| Use embedded ones | The self-signed certificate and private key built into the Plus CPU module as standard are used. |

Note: When **Use embedded ones** is selected, if you try to access the Plus CPU module web server by entering "https://..." in the address bar of your web browser, a warning message will be displayed on your web browser. If you ignore this warning message, you can use SSL/TLS communication and access the Plus CPU module web server.

(5) Use data that are downloaded from SD memory card

Configure whether or not to use the SD memory card to write the certificate and private key to the Plus CPU module.

When this check box is selected, (6) is displayed, and (7) to (9) are hidden. When this check box is selected, configure (7) to (9) in the **SD Memory Card Configuration** dialog box. For details on the **SD Memory Card Configuration** dialog box, see Chapter 11 "SD Memory Card" in the "FC6A Series MICROSmart User's Manual".

(6) Configure SD memory card

The **SD Memory Card Configuration** dialog box is opened. Only when **Use data that are downloaded from SD memory card** check box is selected, the **Configure SD memory card** button is displayed. For details on the **SD Memory Card Configuration** dialog box, see Chapter 11 "SD Memory Card" in the "FC6A Series MICROSmart User's Manual".

(7) Open batch setting wizard

The **Batch setting of certificate and private key** wizard is opened and you can create a certificate and private key in a wizard. Follow the displayed procedure to create them.

Note: In this wizard, a certification authority's root certificate is configured and imported into Windows certificate store (Logical system store: "Trusted Root Certification Authorities"). In addition, the certificate and private key to be used in the web server function of the Plus CPU module are configured and imported into the function area settings. For details, see "Batch setting of certificate and private key wizard" on page 13-11.

(8) Certificate

Click **Import** to import the certificate to be used for SSL/TLS communication. Files in pem or der format can be imported. WindLDR converts pem format files to der format. Files in der format that are larger than 2K bytes cannot be imported.

The certificate can be imported when the **Allow only secure connection (SSL/TLS) to connect** check box is selected and **Use data that are downloaded from SD memory card** check box is cleared.

Click **Details** to display the **Certificate Information** dialog box that shows the imported certificate.

Click **Export** to export the imported certificate (der format file).

(9) Private key

Click **Import** to import the private key (encryption method: RSA, key length: up to 2,048 bits) to be used for SSL/TLS communication. WindLDR supports files in the following formats.

- PKCS#1 format pem file or der file
- PKCS#8 format (unencrypted) pem file or der file

The certificate can be imported when the **Allow only secure connection (SSL/TLS) to connect** check box is selected and **Use data that are downloaded from SD memory card** check box is cleared.

Click **Export** to export the imported private key (der format file).

Function Area Settings

Run/Stop Control (10)

Memory Backup

Input Configuration

Communication Ports

External Memory Devices

Device Settings

Program Protection

Self Diagnostic (14)

Calendar & Clock (15)

Ethernet Port 1 (16)

Ethernet Port 2

Connection Settings

Access Control

User Settings

☒ Use single user account to access web server

(11) User Name: administrator

(12) Password: *****

☐ Configure access privileges with multiple user accounts for web server (13) **Configure**

User Web Page

☒ Enable Data Register Monitoring

(15) Monitoring Interval (ms): 1000

(16) Trend Monitor Interval (ms): 3 x Monitoring Interval

Options

(17) ☒ Require user name and password before CGI program is executed

(18) Redirect Target: System Web Top Page

☒ CPU Module

☐ SD Memory Card

(19) ☒ Use System Web Page

(20) Language: English

(21) ☒ Use Web Page Editor

(10) User Settings

Select the number of accounts to create (one or multiple) from the following. The default value is "Use single user account to access web server".

| User Setting | Description |
|--|--|
| Use single user account to access web server | Select to access the web server with a single common user account. |
| Configure access privileges with multiple user accounts for web server | Select to access the web server with multiple user accounts. |

Note: Multiple user accounts are configured in the **User Account Settings** dialog box. For details, see "User Account Settings" on page 13-26.

(11) User Name**(12) Password**

Configure the user name and password. The maximum length of the user name is 40 characters, and the maximum length of the password is 16 characters. Only alphanumeric characters and symbols can be used. These settings are available only when the **Use single user account to access web server** is selected.

| Item | Factory default settings |
|-----------|--------------------------|
| User Name | administrator |
| Password | password |

(13) Configure

You can open the **User Account Settings** dialog box and create user accounts in the displayed **User Account Settings** dialog box. For details, see "User Account Settings" on page 13-26.

(14) Enable Data Register Monitoring

Select this check box in the following situations:

- When using a data register monitor with embedded metacharacters in an HTML page
- When using the graphics library

Only files with html and htm extensions are valid.

(15) Monitoring Interval (ms)

When monitoring, set the interval in ms to send requests from the web browser to the FC6A.

(16) Trend Monitor Interval (ms)

When performing monitoring that uses the trend graph, set the interval in milliseconds to send requests from the web browser to the FC6A as a whole number multiple of the monitoring interval.

(17) Require user name and password before CGI program is executed

Select this check box when you want to require the user name and password before running the CGI program.

This check box is selected as default. For details, see "CGI (Common Gateway Interface)" on page 13-58.

(18) Redirect Target

You can redirect to the web page configured in **Redirect Target**.

| Settings | Description | Redirect Target Setting |
|-------------------------------------|---|-------------------------|
| Disable Redirect | The web page cannot redirect to a web page. | Unnecessary |
| System Web Top Page | The web page can redirect to the top page of the system web pages. | |
| User Web Page and Custom Web Page*1 | The web page can redirect to the configured user web page or custom web page. | Necessary |

*1 Select the folder name or the file name that you imported or saved.

You can select the save location of the web page configured as the redirect target from **CPU Module** or **SD Memory Card**.

| Redirect Destination | Description |
|----------------------|--|
| CPU Module | The web page redirects to the redirect target saved in the internal memory of the Plus CPU module. |
| SD Memory Card | The web page redirects to the redirect target saved in the SD memory card inserted into the Plus CPU module. |

For example, if the IP address of Ethernet port 1 of Plus CPU module is 192.168.1.20, and you select **SD Memory Card** as the **Redirect Target** to download web pages to the SD memory card, the redirect target can be displayed at the following URL.

- <http://192.168.1.20/sd/>

Note: Make sure that the redirect destination configured in **Redirect Target** and the save location when downloading web pages are the same.

(19) Use System Web Page

Select this check box to use the system web pages.

(20) Language

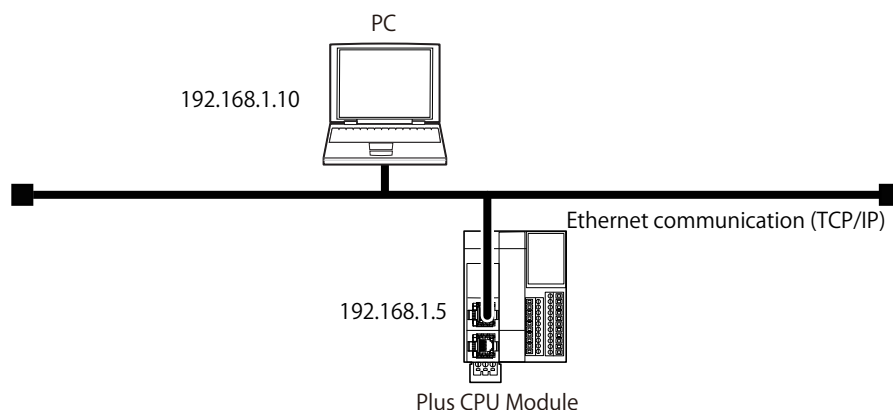
Select the language of the system web pages from Japanese, English, Chinese, German, or Spanish.

(21) Use Web Page Editor

Select this check box to use the Web Page Editor. For details, see "Web Page Editor" on page 13-46.

Batch setting of certificate and private key wizard

In the Plus CPU module, the certificate and private key used for SSL/TLS communication can be configured with the **Batch setting of certificate and private key** wizard. This section describes the procedure to configure the certificate and private key when using the web server function in the following system configuration.

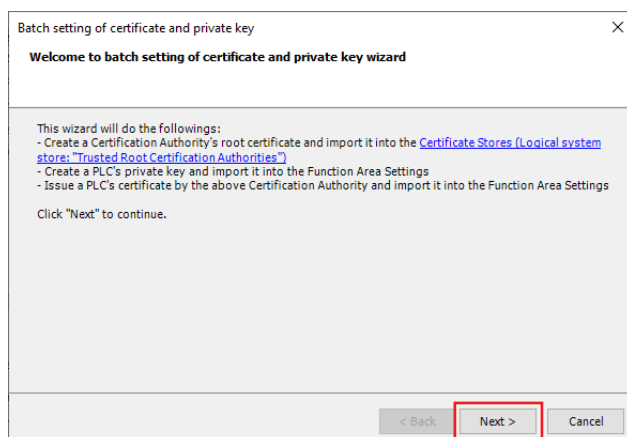


• Operation procedure

1. Click **Open batch setting wizard**.

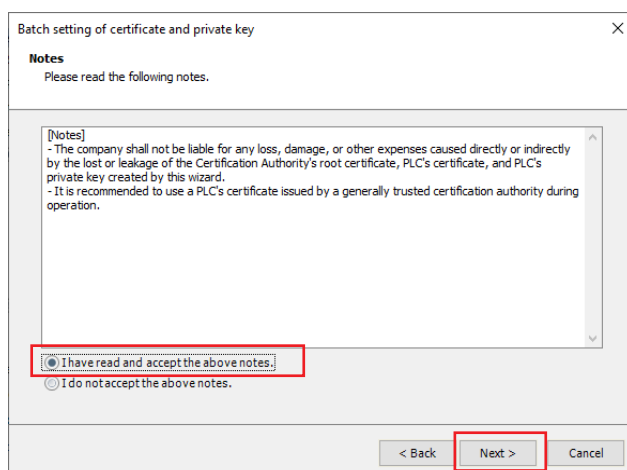
The **Batch setting of certificate and private key** wizard is displayed.

2. Click **Next**.



Note: The certificate store (certmgr.msc) for the user currently logged on to Windows is opened when clicking on the **Certificate Stores (Logical system store: "Trusted Root Certification Authorities")** link.

3. Select **I have read and accept the above note** and then click **Next**.



4. Configure the items you want to configure and click **Next**. If there is no items to configure, click **Next** without configuring those items.

The description of each setting item is as follows.

(1) Create a Certification Authority's root certificate with the following settings

Select this radio button to create a new Certification Authority's root certificate. The check box is selected by default.

(2) Common name

Configure the common name of the Certification Authority's root certificate. The maximum length of the common name is 128 characters. Only alphanumeric characters, the following special characters, and space characters can be used.

' () - . / : ?

Only when **Create a Certification Authority's root certificate with the following settings** is selected, the common name can be configured. MyRootCA is configured as default.

(3) Country

Configure the Certification Authority's location (country). The maximum length of the country is 2 characters. Only alphabet characters (capital characters) can be used.

Only when the **Create a Certification Authority's root certificate with the following settings** and the **Country** check box are selected, the country can be configured.

(4) State or province

Configure the Certification Authority's location (state or province). The maximum length of the state or province is 128 characters. Only alphanumeric characters, the following special characters and space characters can be used.

' () - . / : ?

Only when the **Create a Certification Authority's root certificate with the following settings** and the **State or province** check box are selected, the state or province can be configured.

(5) Locality

Configure the Certification Authority's location (locality). The maximum length of the locality is 128 characters. Only alphanumeric characters, the following special characters and space characters can be used.

' () - . / : ?

Only when the **Create a Certification Authority's root certificate with the following settings** and the **Locality** check box are selected, the locality can be configured.

(6) Organization name

Configure the Certification Authority's organization name. The maximum length of the organization name is 64 characters. Only alphanumeric characters, the following special characters and space characters can be used.

' () - . / : ?

Only when the **Create a Certification Authority's root certificate with the following settings** and the **Organization name** check box are selected, the organization name can be configured.

(7) Organization unit

Configure the Certification Authority's organization unit. The maximum length of the organization unit is 64 characters. Only alphanumeric characters, the following special characters and space characters can be used.

' () - . / : ?

Only when the **Create a Certification Authority's root certificate with the following settings** and the **Organization unit** check box are selected, the organization unit can be configured.

(8) Valid from

Configure the validity period (start date) of the Certification Authority's root certificate. The default value is the date of your PC.

Only when the **Create a Certification Authority's root certificate with the following settings** is selected, the start date can be configured.

(9) Valid to

Configure the validity period (end date) of the Certification Authority's root certificate. The default value is 365 days after your PC date.

Only when the **Create a Certification Authority's root certificate with the following settings** is selected, the end date can be configured.

(10) Reuse Certification Authority's root certificate that is previously created

Select this radio button to reuse the Certification Authority's root certificate that is previously created. Only when the Certification Authority's root certificate that is previously created exists, this radio button can be selected.

Click **Details** to display the **Certificate Information** dialog box, which shows the Certification Authority's root certificate that is previously created.

5. Select 2048 bits or 1024 bits and click Next.

Batch setting of certificate and private key

Set the PLC's private key
Create a PLC's private key with the following settings.

Key length:

☒ 2048 bits (Encryption strength: High, Performance: Low)

☐ 1024 bits (Encryption strength: Low, Performance: High)

Create a PLC's private key with an encryption method RSA, and key length of 2048 bits, which is commonly used for SSL/TLS communications. It is said that the security of encryption using this key length will be ensured until around 2030 (see [NIST Special Publication 800-57 Part 1](#) for details).

< Back **Next >** Cancel

6. Enter the IP address of Ethernet port 1 on the Plus CPU module in the **Common name** and **Subject alternative name**, and click **Next**. When there are other items you want to configure, configure those settings and click **Next**.

The description of each setting item is as follows.

(1) Common name

Configure the domain name or IP address of the PLC. For a domain name, the maximum length of the domain name is 128 characters. Only alphanumeric characters, - (hyphen), and . (period) can be used. For an IP address, the input format is "xxx.xxx.xxx.xxx". Enter a value between 0 and 255 to "xxx".

Note: A wildcard certificate can be created by specifying a domain name starting with "*".

(2) Country

Configure the location (country) of the target to be certified by the Certification Authority. The maximum length of the country is 2 characters. Only alphabet characters (capital characters) can be used. Only when the **Country** check box is selected, the country can be configured.

(3) State or province

Configure the location (state or province) of the target to be certified by the Certification Authority. The maximum length of the state or province is 128 characters. Only alphanumeric characters, the following special characters, and space characters can be used.

' () - . / : ?

Only when the **State or province** check box is selected, the state or province can be configured.

(4) Locality

Configure the location (locality) of the target to be certified by the Certification Authority. The maximum length of the locality is 128 characters. Only alphanumeric characters, the following special characters, and space characters can be used.

' () - . / : ?

Only when the **Locality** check box is selected, the locality can be configured.

(5) Organization name

Configure the name of the organization to be certified by the Certification Authority. The maximum length of the organization name is 64 characters. Only alphanumeric characters, the following special characters, and space characters can be used.

' () - . / : ?

Only when the **Organization name** check box is selected, the organization name can be configured.

(6) Organization unit

Configure the name of the organization unit to be certified by the Certification Authority. The maximum length of the organization unit is 64 characters. Only alphanumeric characters, the following special characters, and space characters can be used.

' () - . / : ?

Only when the **Organization unit** check box is selected, the organization unit can be configured.

(7) Subject alternative name

Configure the domain name or IP address of the PLC. For a domain name, the maximum length of the domain name is 128 characters. Only alphanumeric characters, - (hyphen), and . (period) can be used. For an IP address, the input format is "xxx.xxx.xxx.xxx". Enter a value between 0 and 255 to "xxx". The maximum number of domain names or IP addresses that can be configured is 10.

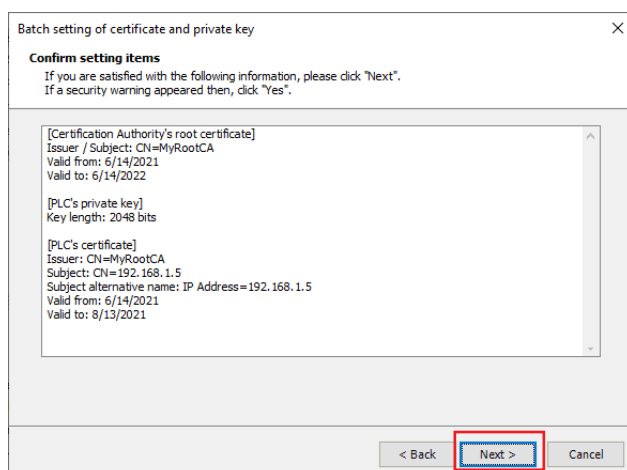
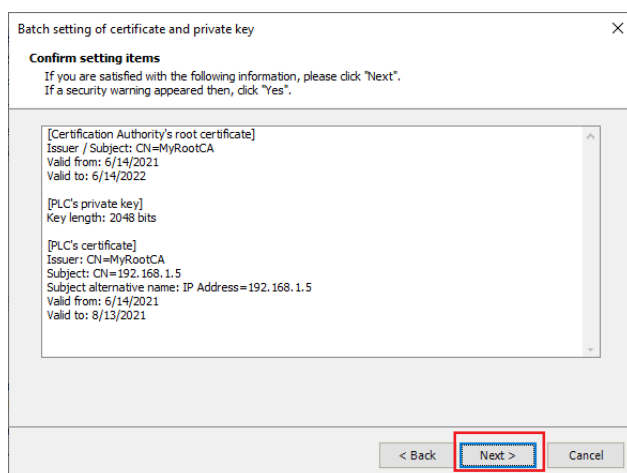
Note: A wildcard certificate can be created by specifying a domain name starting with "*".

(8) Valid from

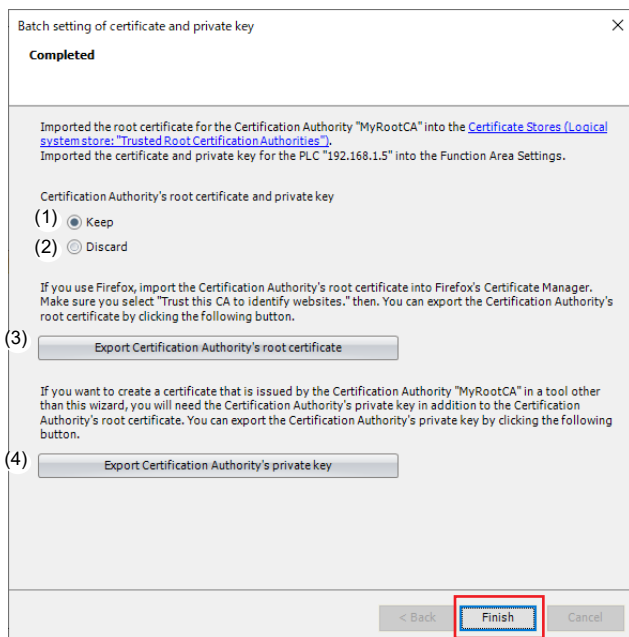
Configure the validity period (start date) of the PLC. The default value is the date of your PC. You cannot configure the date prior than the validity period (start date) of the Certification Authority's root certificate.

(9) Valid to

Configure the validity period (end date) of the PLC. The default value is 60 days after your PC date. You cannot configure the date later than the validity period (end date) of the Certification Authority's root certificate.

7. Confirm the settings and click **Next.****8. Click **Yes**.**

9. Click **Finish**.



The description of the setting item and buttons are as follows.

(1) Keep

Select this radio button to store the root certificate and private key of the Certification Authority in the project. The check box is selected by default.

(2) Discard

Select this radio button to remove the root certificate and private key of the Certification Authority from the project.

(3) Export Certification Authority's root certificate

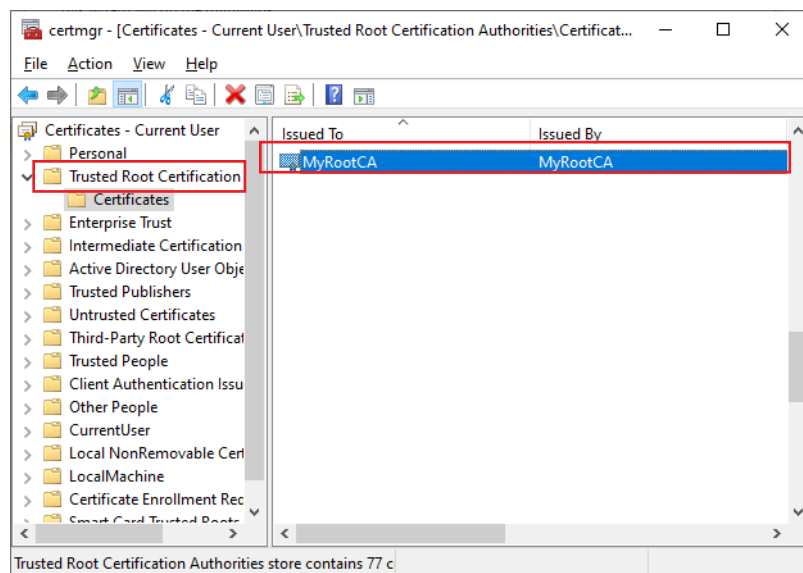
The Certification Authority's root certificate (der file) can be exported.

(4) Export Certification Authority's private key

The Certification Authority's private key (der file) can be exported.

Note:

- The certificate store (certmgr.msc) for the user currently logged on to Windows is opened when clicking on the **Certificate Stores (Logical system store: "Trusted Root Certification Authorities")** link. In the left window of the figure below, you can expand the **Trusted Root Certification Authorities** folder and click **Certificates** to see that MyRootCA (Certification Authority's root certificate) has been added.



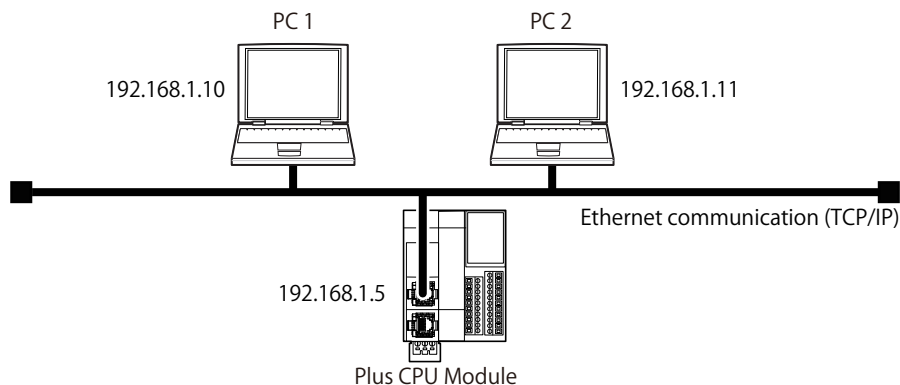
- When you use a web browser to access a web server from a PC that does not have a Certification Authority's root certificate imported into the Certificate Store, a warning is displayed on the web browser. You can hide this warning by clicking **Export Certification Authority's root certificate** to export the Certification Authority's root certificate and import it to your PC. For details, see "Import of the Certification Authority's root certificate" on page 13-18.

This concludes configuring the certificate and private key.

Import of the Certification Authority's root certificate

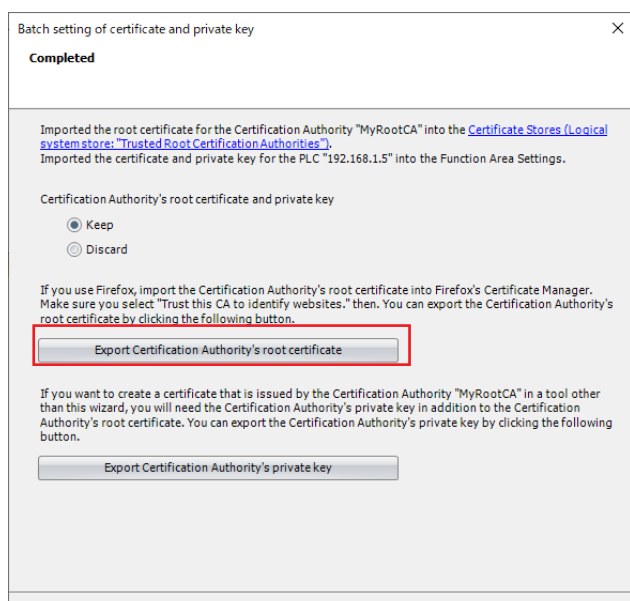
When you use a web browser to access a web server from a PC that does not have a Certification Authority's root certificate imported into the Certificate Store, a warning is displayed on the web browser. You can hide this warning by importing the Certification Authority's root certificate to your PC.

The procedure for configuring the Certification Authority's root certificate on PC 1 shown in the figure below and importing the certificate into the Certificate Store on PC 2 is as follows.



• Operation procedure

1. Perform step 1 to step 8 of "Batch setting of certificate and private key wizard" on page 13-11 on PC 1.
2. Click **Export Certification Authority's root certificate** to save the Certification Authority's root certificate on PC 1.



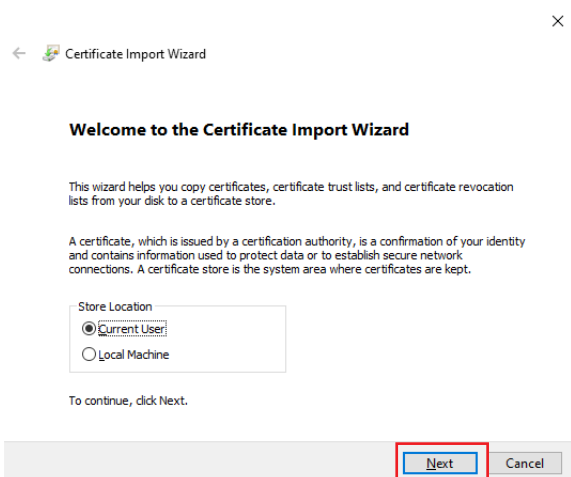
3. Copy the Certification Authority's root certificate saved in step 1 to PC 2.

4. On the Explorer of PC 2, double-click the Certification Authority's root certificate to open its properties, and then click **Install Certificate**.



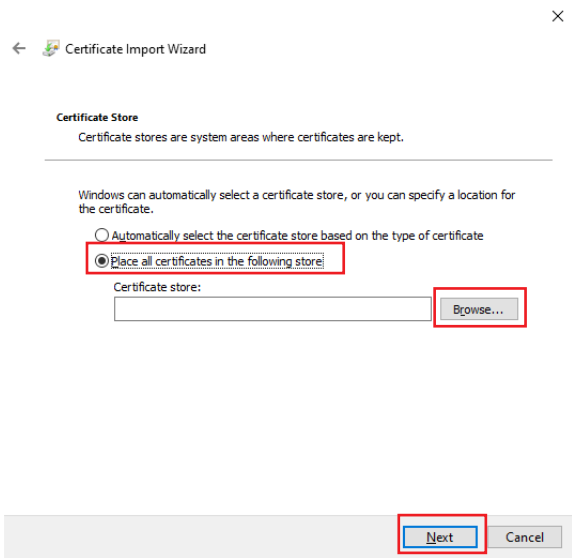
The Certificate Import Wizard is opened.

5. Click **Next**.

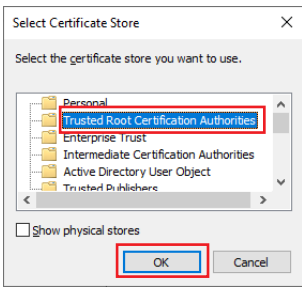


Note: Select **Local Machine** to enable all users of PC 2 to refer to the Certification Authority's root certificate. The Certification Authority's root certificate is imported into the certificate store (certlm.msc) on the local machine. (Administrative privileges are required.)

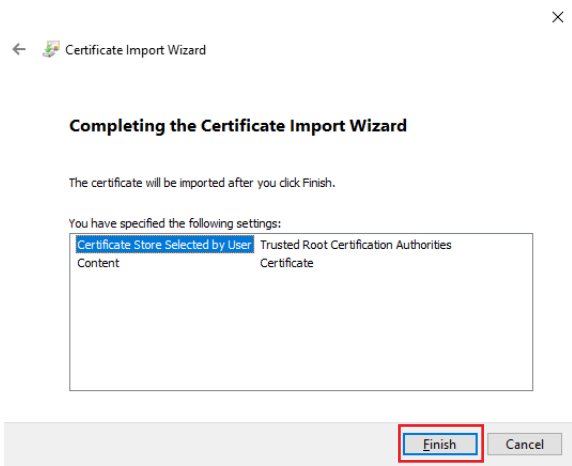
6. Click **Place all certificates in the following store**, and then click **Browse**.

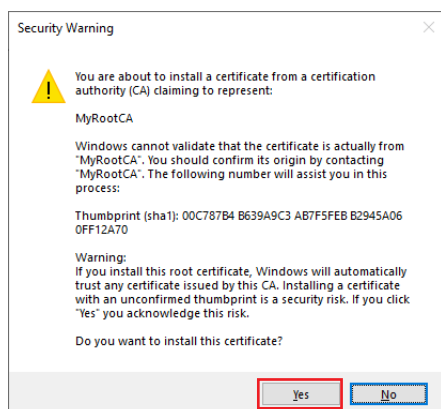
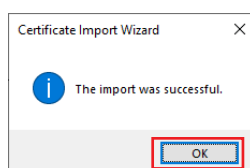


7. Select **Trusted Root Certification Authorities**, and then click **OK**.



8. Click **Finish**.



9. Click Yes.**10. Click OK.**

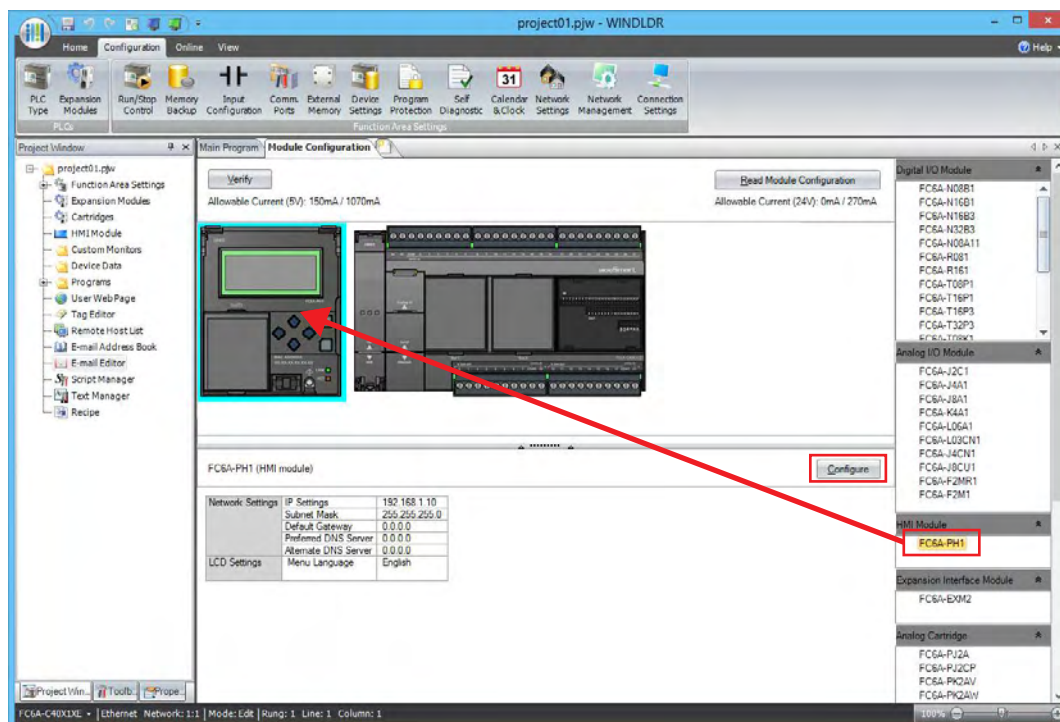
This concludes importing the Certification Authority's root certificate to PC 2.

HMI Module Web Server

This section describes the web server settings when using the web server function on the HMI-Ethernet port of the HMI module.

• Operation procedure

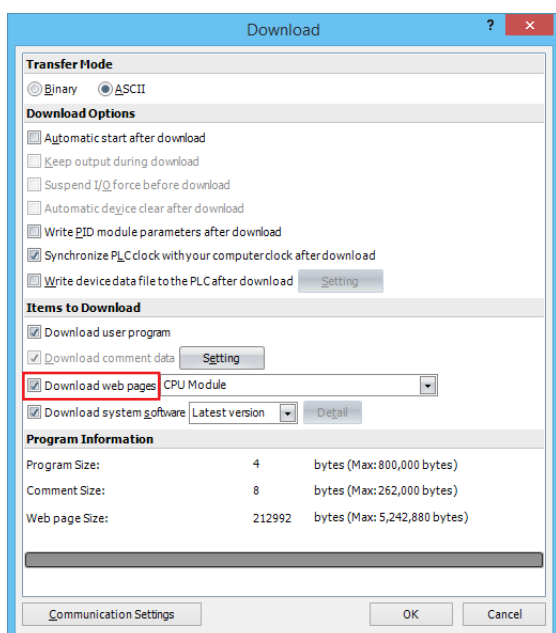
1. Use the Module Configuration Editor to configure the HMI module Web server settings.
On the **Configuration** tab, in the **PLCs** group, select **Expansion Modules**.
2. Right click the inserted HMI module in the module configuration area and click **Configure**.
The **HMI Module Configuration** dialog box is displayed.



Note: The **HMI Module Configuration** dialog box can also be opened in the following way.

- Double-click **HMI Module** in the **Project Window**.
 - Double-click the HMI module in the module configuration area.
3. Click the **Web Server** tab and configure each setting item. For details on each setting, see "Web Server Settings" on page 13-24.
 4. Download the user program to the CPU module.
From the WindLDR menu bar, select **Online** > **Transfer** > **Download**. The **Download** dialog box appears.

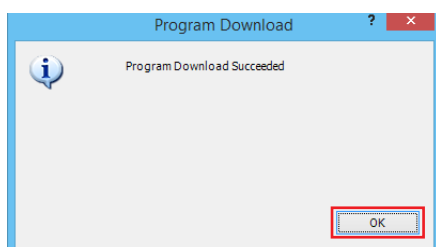
5. Select the **Download web pages** check box.



Note: The web pages are saved only in the internal memory of the HMI module.

6. Click **OK**.

The created web pages are downloaded to the internal memory of the HMI module. When the following message appears, the download has completed successfully.



This concludes configuring the web server settings.

Web Server Settings

Configure the settings for using the web server function in the **Web Server** tab of the **HMI Module Configuration** dialog box.

(1) Enable Web Server

Select this check box when you want to use the Web server function. The check box is selected by default.

(2) Web Server Port

Configure the port number for the web server of the HMI module. Configure the port number in the range of 0 to 65,535. The default port number is 80.

(3) User Settings

Select the number of accounts to create (one or more) from the following. The default value is **Use single user account to access web server**.

| User Setting | Description |
|--|---|
| Use single user account to access web server | Select to access the web server with a single common user account. |
| Configure access privileges with multiple user accounts for web server | Select to use multiple accounts and limit access to the web server. |

Note: Multiple user accounts are configured in the **User Account Settings** dialog box. For details, see "User Account Settings" on page 13-26.

(4) User Name

(5) Password

Configure the user name and password. The maximum length of the user name is 40 characters, and the maximum length of the password is 16 characters. Only alphanumeric characters and symbols can be used. These settings are available only when the **Use single user account to access web server** is selected.

| Item | Factory default settings |
|-----------|--------------------------|
| User Name | administrator |
| Password | password |

(6) Enable Data Register Monitoring

Select this check box in the following situations:

- When using a data register monitor with embedded metacharacters in an HTML page
- When using the graphics library

Only files with html and htm extensions are valid.

(7) Monitoring Interval (ms)

When monitoring, set the interval in ms to send requests from the web browser to the FC6A.

(8) Trend Monitor Interval (ms)

When performing monitoring that uses the trend graph, set the interval in milliseconds to send requests from the web browser to the FC6A as a whole number multiple of the monitoring interval.

(9) Redirect Target

The web page can redirect to the web page configured in **Redirect Target**.

| Settings | Description |
|---|---|
| Disable Redirect | The web page cannot redirect to a web page. |
| System Web Top Page | The web page can redirect to the top page of the system web pages. |
| User Web Page and Custom Web Page* ¹ | The web page can redirect to the configured user web page or custom web page. |

*¹ Select the folder name or the file name that you imported or saved.

For example, if the IP address of HMI-Ethernet port of HMI module is 192.168.1.10, the redirect target can be displayed at the following URL.

- <http://192.168.1.10/>

(10) Use System Web Page

Select this check box to use the system web pages.

(11) Language

Select the language of the system web pages from Japanese, English, Chinese, German, or Spanish.

(12) Use Web Page Editor

Select this check box to use the Web Page Editor. For details, see "Web Page Editor" on page 13-46.

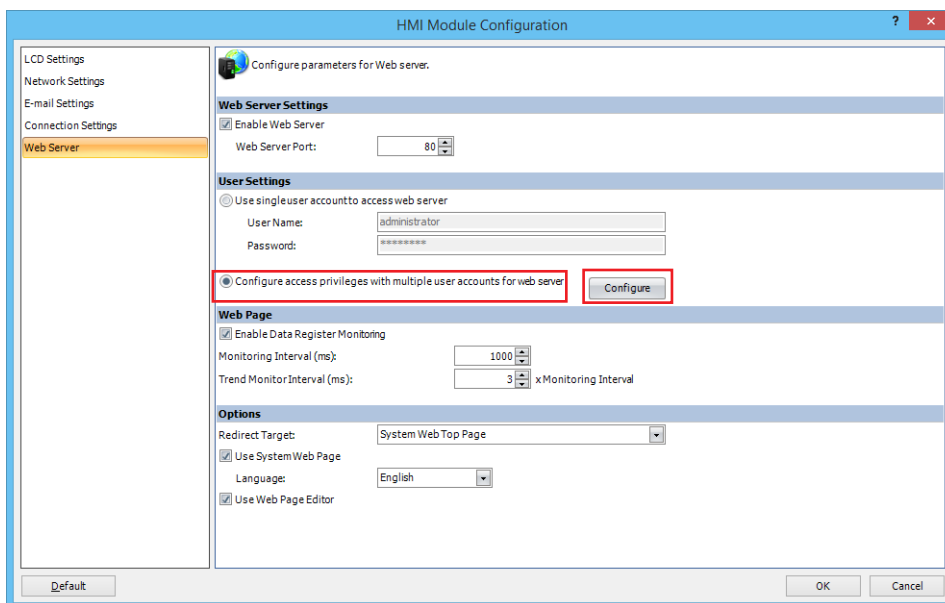
User Account Settings

■Creating Multiple User Accounts

• Operation procedure

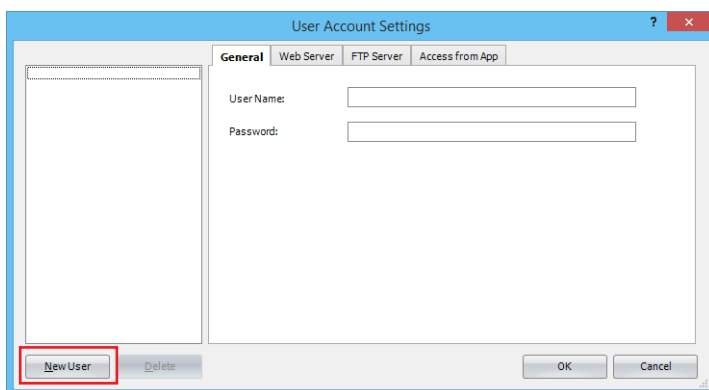
1. In the **Function Area Settings** dialog box, under **Ethernet Port 1** and **Web Server Settings** or in the **HMI Module Configuration** dialog box, on the **Web Server** tab, select **Configure access privileges with multiple user accounts for web server** and click **Configure**.

The **User Account Settings** dialog box is displayed.



2. Click **New User**.

A user account is created in the list.



3. On the **General** tab, set **User Name** and **Password**.

User Account Settings

General Web Server FTP Server Access from App

User Name: user1

Password: *****

New User Delete OK Cancel

4. Click the **Web Server Access Management** tab and select the check boxes of folders and servers where access will be permitted.

User Account Settings

General Web Server Access Management

User 1

| Folder/File | Allow Access |
|-------------------|-------------------------------------|
| /system/ | <input checked="" type="checkbox"/> |
| /user/Folder/ | <input checked="" type="checkbox"/> |
| /user/Folder44/ | <input type="checkbox"/> |
| /user/page1.html | <input checked="" type="checkbox"/> |
| /user/page55.html | <input checked="" type="checkbox"/> |

New User Delete OK Cancel

5. Repeat steps 2 to 4 and create the necessary number of user accounts.

Note: If you select a user account on the list, you can edit the settings of the selected account on the **General** and **Web Server Access Management** tabs.

6. Click **OK**.

User Account Settings

General Web Server FTP Server Access from App

User Name: user3

Password: *****

New User Delete OK Cancel

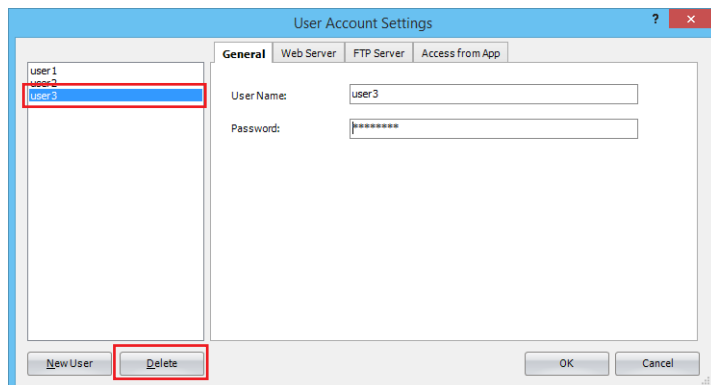
This concludes creating multiple user accounts.

■Deleting a Created User Account

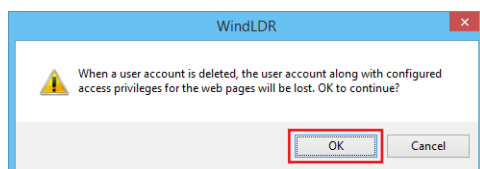
- Operation procedure

1. Select the user account on the list and click **Delete**.

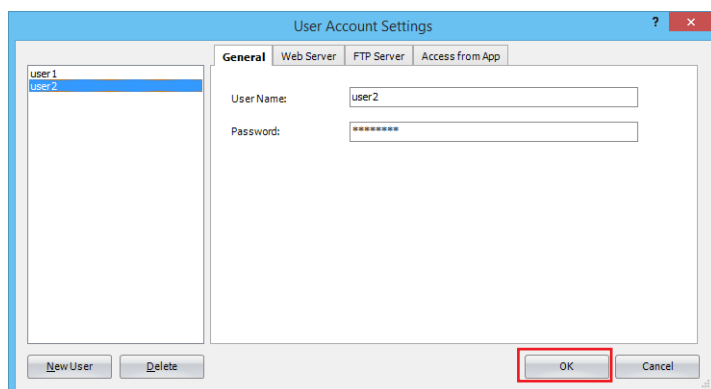
A confirmation message is displayed.



2. Click **OK**.



3. Click **OK**.



This concludes deleting a user account.

System Web Page

The system web pages consist of four web pages (PLC Status, Batch Monitor, Custom Monitor and LCD Monitor page).

PLC Status

In the PLC status page, the FC6A status, such as the system program version or scan time, can be confirmed. You can also run or stop the FC6A using the Run/Stop button.

IDEC PLC Automation and beyond

- PLC Status
- Batch Monitor
- Custom Monitor
- LCD Monitor

MICROSmart System Status

(1) System Information

| Item | Value |
|------------------------|----------|
| PLC Type | FC6A-C40 |
| System Program Version | 1.00 |

(2) Operating Status

| Item | Value |
|---------------------|-------------------------------------|
| Run/Stop Status | <input type="button" value="Stop"/> |
| Scan Time (Current) | 1ms |
| Scan Time (Maximum) | 2ms |
| Battery Voltage | 3182mV |
| General Error Code | 0000 |

(3) Calendar/Clock

| Item | Value |
|-------------------------------|---------------------------|
| Clock (yy/mm/dd/DoW/hh/mm/ss) | 2015/12/02 (Wed) 15:56:58 |

(4) Network Settings

| Item | Value |
|----------------------|-------------------|
| MAC Address | 00-03-bf-f0-16-5f |
| IP Address | 192.168.1.5 |
| Subnet Mask | 255.255.255.0 |
| Default Gateway | 0.0.0.0 |
| Preferred DNS Server | 0.0.0.0 |
| Alternate DNS Server | 0.0.0.0 |

(5) Connection Settings

| Item | Value |
|--|---------|
| Connection1 - Maintenance Communication Server | 0.0.0.0 |
| Connection2 - Maintenance Communication Server | 0.0.0.0 |
| Connection3 - Maintenance Communication Server | 0.0.0.0 |
| Connection4 - Maintenance Communication Server | 0.0.0.0 |
| Connection5 - Maintenance Communication Server | 0.0.0.0 |
| Connection6 - Maintenance Communication Server | 0.0.0.0 |
| Connection7 - Maintenance Communication Server | 0.0.0.0 |
| Connection8 - Maintenance Communication Server | 0.0.0.0 |

For details about web server, see FC6A User's Manual - Communication Volume

The following data can be confirmed on the PLC status page:

(1) System Information

Type number and system program version of the FC6A can be confirmed.

(2) Operating Status

Run/Stop, scan time, and error code can be confirmed. By clicking on the button in the run/stop status, the FC6A can be started or stopped.

(3) Calendar/Clock

The time information obtained with SNTP can be checked here.

(4) Network Settings

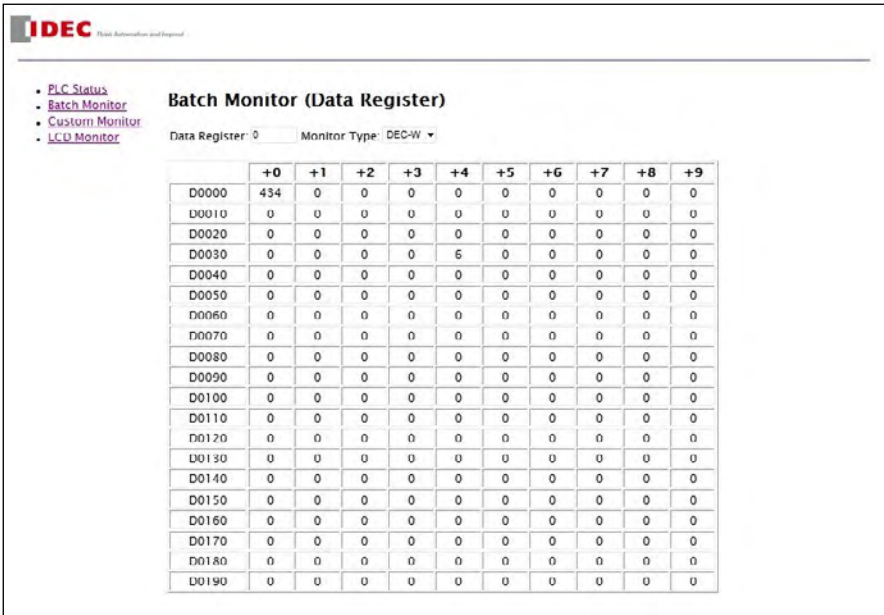
The network settings of the FC6A can be confirmed.

(5) Connection Settings

The IP addresses of the devices with which the FC6A communicates. The IP addresses of the client devices that are accessing the server ports are shown for the **Maintenance Communication Server** and the **Server Connections**. The IP addresses of the remote hosts to which the FC6A communicates are shown for the **Client Connections**. For the Plus CPU module, the IP addresses of the remote hosts on connections 1 to 16 are displayed.

Batch Monitor

In the batch monitor, 200 consecutive data registers can be monitored and controlled with the specified data type. For details on data type, see "Data Type" on page 13-32.



• Operation procedure

- 1. In **Device Number**, specify the device number to monitor.
200 consecutive data registers starting with the specified data register are monitored. The valid device numbers are as follows.
If an invalid value is entered or if the last device of the 200 consecutive data registers is out of the range, the value is corrected to a valid value automatically.

| CPU Module Type | Device Address Range |
|-----------------------|----------------------|
| All-in-One CPU module | 0000 to 7800 |
| | 8000 to 8300 |
| | 10000 to 55800 |
| Plus CPU module | 0000 to 7800 |
| | 8000 to 8700 |
| | 10000 to 61800 |
| | 70000 to 269800 |

- 2. Select the **Monitor Type** to display the data registers in the desired format.
Data register values are shown in the format specified by the monitor type. See the web data type for the available data types.
- 3. Click on a cell in which data register value is shown.
A dialog box to write a data is shown. The entered value is written to the FC6A.

Custom Monitor

In the custom monitor, a maximum of 30 devices and corresponding data types can be specified to monitor and control. For details on data type, see "Data Type" on page 13-32.

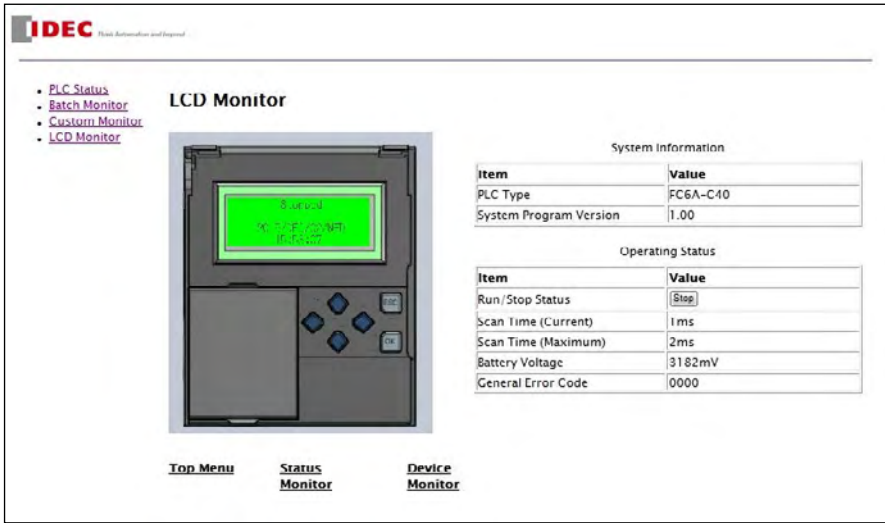
| No. | Device Address | Type | Value |
|-----|----------------|---------|-------|
| 1 | D0000 | DEC-W ▼ | 434 |
| 2 | D0004 | DEC-I ▼ | 6 |
| 3 | | DEC-W ▼ | |
| 4 | | DEC-W ▼ | |
| 5 | | DEC-W ▼ | |
| 6 | | DEC-W ▼ | |
| 7 | | DEC-W ▼ | |
| 8 | | DEC-W ▼ | |
| 9 | | DEC-W ▼ | |
| 10 | | DEC-W ▼ | |
| 11 | | DEC-W ▼ | |
| 12 | | DEC-W ▼ | |
| 13 | | DEC-W ▼ | |
| 14 | | DEC-W ▼ | |
| 15 | | DEC-W ▼ | |
| 16 | | DEC-W ▼ | |
| 17 | | DEC-W ▼ | |
| 18 | | DEC-W ▼ | |
| 19 | | DEC-W ▼ | |
| 20 | | DEC-W ▼ | |
| 21 | | DEC-W ▼ | |
| 22 | | DEC-W ▼ | |
| 23 | | DEC-W ▼ | |
| 24 | | DEC-W ▼ | |
| 25 | | DEC-W ▼ | |
| 26 | | DEC-W ▼ | |
| 27 | | DEC-W ▼ | |
| 28 | | DEC-W ▼ | |
| 29 | | DEC-W ▼ | |
| 30 | | DEC-W ▼ | |

• Operation procedure

1. Enter the device (type and number) in the **Device Address**.
"D" (data register) or "m" (internal relay) can be specified. Specify data device number in decimal, such as D2058 or m0112.
2. Select the **Type** to display the corresponding device in the desired format.
Data registers or internal relays values are shown in the format specified by the monitor type. See the web data type for the available data types.
3. Click the monitored data that is displayed under **Value**.
A dialog box to write a data is shown. The entered value is written to the FC6A.

LCD Monitor

In the LCD monitor, the HMI module screen can be monitored. The HMI module can also be operated by clicking on the displayed buttons and shortcuts. This page can be displayed only when using the HMI-Ethernet port of the HMI module.



• Operation procedure

The monitoring procedure is as follows.

- 1. The menus and messages displayed on the HMI module LCD are displayed on this page.
- 2. Click a button to perform the same operation on the HMI module as when the HMI module's own button is pressed.

Data Type

On the batch monitor page and the custom monitor page, you can configure the type of value to be displayed when displaying the value of the data register or the status of the internal relay, and the type of value to be input to the data register or the internal relay. The following data types can be specified in batch monitor, custom monitor.

| Data Type | Description |
|-----------|---------------------------------|
| DEC-W | Word (Decimal value) |
| DEC-I | Integer (Decimal value) |
| DEC-D | Double Word (Decimal value) |
| DEC-L | Long (Decimal value) |
| DEC-F | Float (Decimal value) |
| HEX-W | Word (Hexadecimal value) |
| HEX-D | Double Word (Hexadecimal value) |
| BIN-B | Binary |

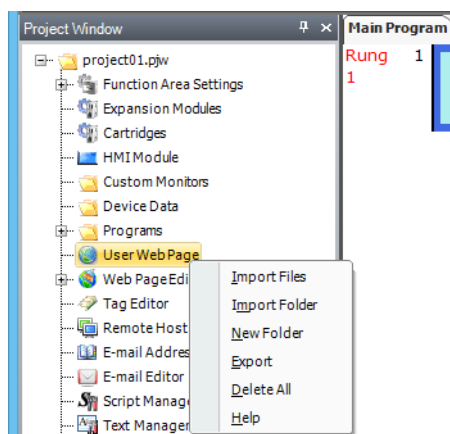
For details on Word, Integer, Double Word, Long and Float, see Chapter 3 "Data Type" in the "Ladder Programming Manual".

User Web Pages

You can create web pages with a high degree of freedom by importing web pages (user web pages) freely created using HTML or JavaScript.

User Web Page Tree Operations

The User Web Page tree can be built by performing the following operations on user web page items on the Project window and files and folders that are registered as web pages.



Creating a Web Page Tree

The web page tree is created on the Project window.

The following procedure describes an example of creating a web page tree with the following structure.

Web page tree structure

page1.html

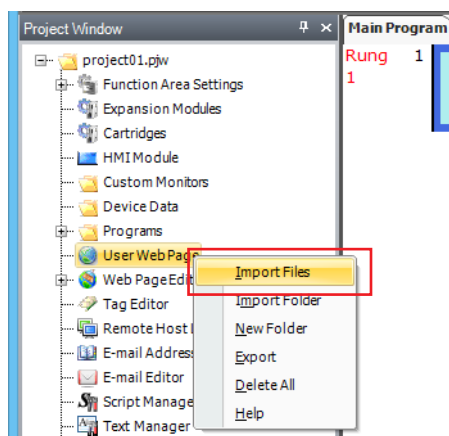
Folder/page2.html

Before this procedure, create "page1.html" and "page2.html" that will be displayed on the FC6A.

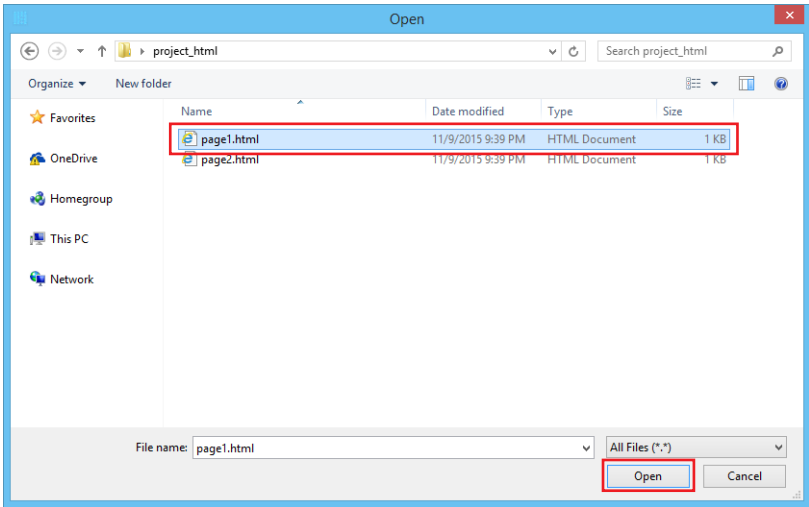
• Operation procedure

1. Right-click **User Web Page** and click **Import Files**.

The **Open** dialog box is displayed.

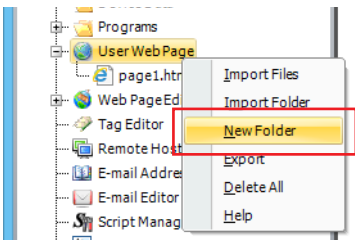


2. Select "page1.html" and click **Open**.



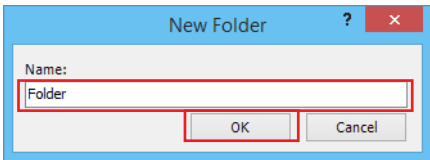
3. Right-click **User Web Page** and click **New Folder**.

The **New Folder** dialog box is displayed.



4. Enter "Folder" as the name of the folder to create and click **OK**.

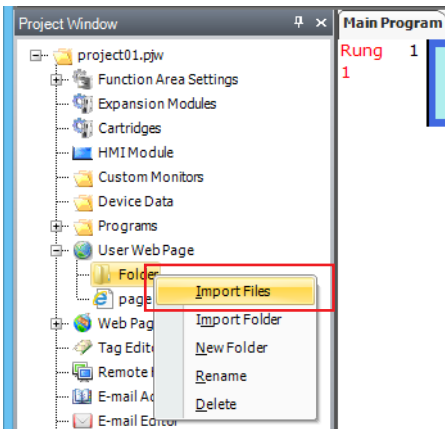
The folder titled "Folder" is created in **User Web Page**.



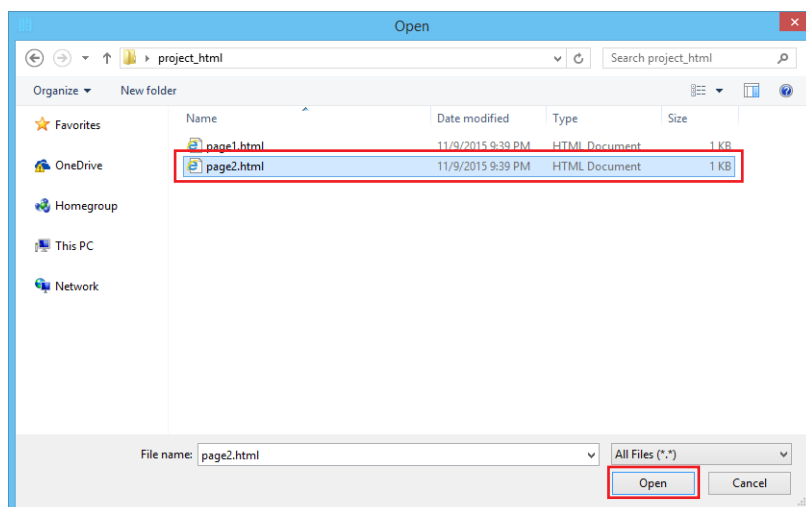
If you want to rename the folder, right click the folder and click **Rename Folder** to change the folder name.

5. Right-click **Folder** created in step 4 and click **Import Files**.

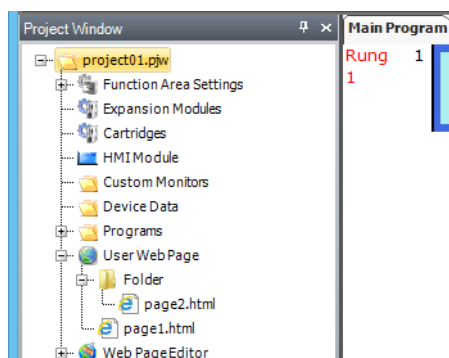
The **Open** dialog box is displayed.



6. Select "page2.html" and click **Open**.



The following is displayed in the Project Window.



Web Page Tree Import

If you already have an HTML file tree to use for building the tree, that entire tree can be imported and added to the user web pages.

In the Project window, right-click **User Web Page** or a folder under **User Web Page** and click **Import Folder**. A dialog box is displayed. Select the folder that contains the web page tree to import, and all of the files under the set folder will be imported.

Web Page Tree Export

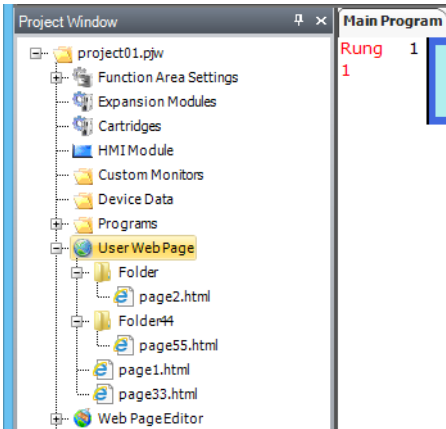
You can rebuild the user web page tree or change files by exporting the user web page data.

In the Project window, right-click **User Web Page** and click **Export**. A dialog box is displayed. Set the folder where the files will be exported, and the user web page data will be exported to that folder.

Deleting User Web Pages

The web page tree is deleted on the Project window.

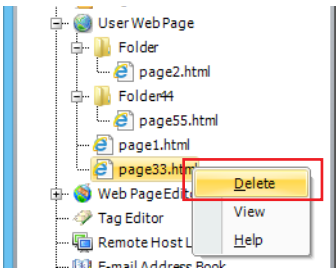
The following procedure describes an example of deleting "page33.html" and "Folder44" from the web page tree.



• Operation procedure

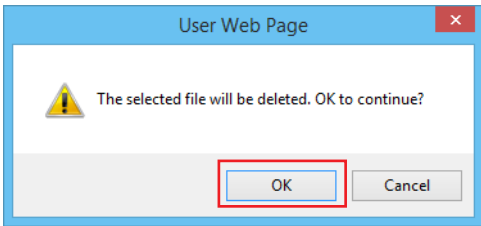
- 1. Right-click "page33.html" and click **Delete**.

A delete confirmation message is displayed.



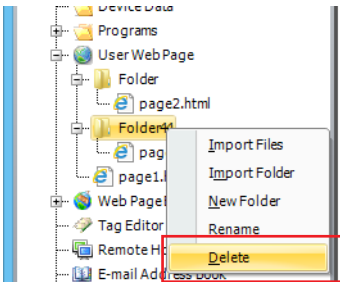
- 2. Click **OK**.

"Page33.html" is deleted.



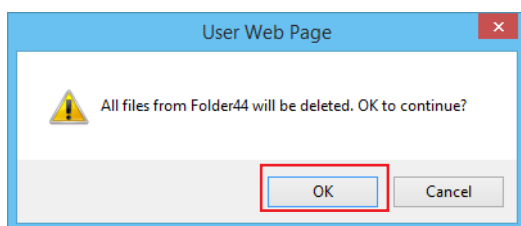
- 3. Right-click "Folder44" and click **Delete**.

A delete confirmation message is displayed.

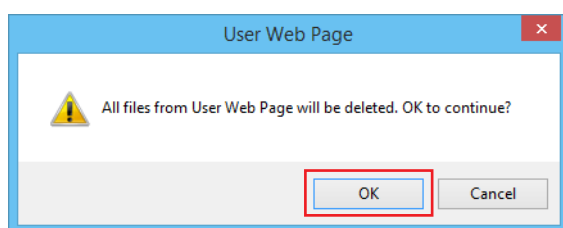


4. Click OK.

All of the files and folders under "Folder44" are deleted.

**Notes:**

- To delete all user web pages, right-click **User Web Page** in the Project window and click **Delete All**. The delete confirmation message is displayed. Click **OK** to delete all registered files and folders.



- Use UTF-8 as the encoding for all htm and html files that will be imported as user web pages. Separately back up all files on the PC that will be imported into WindLDR.
The operation of the web browser may change due to the type and version of the web browser. Fully validate operation using the web browser on the device that will actually be used to access the web server.

Monitor Function

When a user web page contains a string of a specific format (metacharacters), the string is replaced with the value of a data register or the status of an internal relay and displayed. Select the **Enable Data Register Monitoring** check box to use this function, under **Web Server Settings** in the **Ethernet Port 1** of the **Function Area Settings** dialog box or in **Web Server** tab of the **HMI Module Configuration** dialog box.

Note: When converting a program in WindLDR, the following script elements are added in the head elements of the imported htm/html files.

```
<script type="text/javascript" src="/system/lib/jquery.js"></script>
<script type="text/javascript" src="/system/lib/idec.js"></script>
<script type="text/javascript" src="/system/lib/idec_glib.js"></script>
<script type="text/javascript" src="/system/lib/idec_tag_start.js"></script>
```

Metacharacter Format

Data Register Value

{{Read/write type,Device,Device number,Driver number,Network number,Data type,Maximum size}}

| Parameter | Description |
|-----------------|---|
| Read/write type | Set R or W. When R is set, the value is read only. When W is set, the value can also be written. |
| Device | Set the device to monitor. The device that can be set is D (data register). |
| Device number | Set the device number to monitor as a decimal value. |
| Driver number | The driver number. Set to 0. |
| Network number | The network number. Set to 0. |
| Data type | Set the data type*1 |
| Maximum size | When the data type is numeric type, this setting is not required. When the data type is character string type, set the maximum size in bytes to be read or written. The minimum value is 1 and the maximum value is 63. |

*1 Set the data type from the following.

| Type | Data type | Description |
|-----------------------|--------------|---------------------------------|
| Numeric Type | DEC-W | Word (Decimal value) |
| | DEC-I | Integer (Decimal value) |
| | DEC-D | Double Word (Decimal value) |
| | DEC-L | Long (Decimal value) |
| | DEC-F | Float (Decimal value) |
| | HEX-W | Word (Hexadecimal value) |
| | HEX-D | Double Word (Hexadecimal value) |
| | BIN-B | Binary |
| Character String Type | STR_ASCII | ASCII string |
| | STR_HOSTNAME | ASCII string |
| | STR_EMAILADR | ASCII string |
| | STR_PASSWORD | ASCII string |

For details on Word, Integer, Double Word, Long, and Float, see Chapter 3 "Data Type" in the "Ladder Programming Manual".

Note:

- When W (Write) is set in **Read/write type** and you click on the value in the web browser, the write dialog box is displayed, and you can write a value to the device.
- When communication with the Plus CPU module or HMI module is not successful, or when try to get data for a non-existent device number, the metacharacter is replaced with a - (hyphen).

When a data type of character string type is set in **Data type**, reading and writing are processed in word units, in the order of high-order byte and low-order byte.

When reading, the data from the high-order byte of the set device to the terminating character NULL (0x00) are read, or the data from the high-order byte of the set device to the data of the size set in **Maximum size** are read.

When writing, **Maximum size** / 2 words (rounded up to the nearest whole number) from the high-order byte of the set device are written. The end of the input string are filled with the terminator NULL (0x00).

Note:

- When W (Write) is set in **Read/write type** and STR_HOSTNAME is set in **Data type**, the writing process is executed only when the string entered in the write dialog box is in the correct format as a host. The format check is executed at the start of the writing process.
- When W (Write) is set in **Read/write type** and STR_EMAILADR is set in **Data type**, the writing process is executed only when the string entered in the write dialog box is in the correct format as an e-mail address. The format check is executed at the start of the writing process.
- When STR_PASSWORD is set in **Data type**, the value of the data register is displayed in hidden type. The characters used in hidden type vary in a web browser.

Internal relay status

{{Read/write type,Device,Device number,Driver number,Network number,Data type,OFF data,ON data}}

| Parameter | Description |
|-----------------|--|
| Read/write type | Set R or W. When R is set, the value is read only. When W is set, the value can also be written. |
| Device | Set the device to monitor. The device that can be set is m (internal relay). |
| Device number | Set the device number to monitor as a decimal value. |
| Driver number | The driver number. Set to 0. |
| Network number | The network number. Set to 0. |
| Data type | Set the data type ^{*1} |
| OFF data | When BIT_FORM is set in Data type , set the string to be displayed when the set internal relay is off. When BIT is set in Data type , set the image to be displayed when the set internal relay is off. Set the image by file name and set the relative path to the folder where this user web page is located. |
| ON data | When BIT_FORM is set in Data type , set the string to be displayed when the set internal relay is on. When BIT is set in Data type , set the image to be displayed when the set internal relay is on. Set the image by file name and set the relative path to the folder where this user web page is located. |

*1 Set the data type from the following.

| Data type | Description |
|-----------|--|
| BIT_FORM | The status of a bit device is displayed as a string. |
| BIT | The status of a bit device is displayed as an image. |

Note:

- When W (Write) is set in **Read/write type** and BIT_FORM is set in **Data type**, the button for the form is displayed. The on/off status of the internal relay is displayed on the button. You can toggle the internal relay on and off by clicking the button.
- When W (Write) is set in **Read/write type** and BIT is set in **Data type**, you can toggle the internal relay on and off by clicking on the image.
- When communication with the Plus CPU module or HMI module is not successful, or when try to get data for a non-existent device number, the metacharacter is replaced with a - (hyphen).

Example:

| Description example | Description |
|--|--|
| {{R,m,123,0,0,BIT_FORM,BITOFF,BITON}} | When M0123 is off, "BITOFF" is displayed. When M0123 is on, "BITON" is displayed. |
| {{R,m,123,0,0,BIT,img/BIT_IMG_OFF.jpg,img/BIT_IMG_ON.jpg}} | When M0123 is off, the image (BIT_IMG_OFF.jpg) in the img folder is displayed. When M0123 is on, the image (BIT_IMG_ON.jpg) in the img folder is displayed. |

Note: When saving user web pages to the SD memory card, even if a folder above the WEBPAGE folder is set in **OFF data** and **ON data**, the WEBPAGE folder is assumed to be set.

■Cautions on using metacharacters

All strings between "{" and "}" are recognized as metacharacters. Do not put any extra spaces, line feed characters, or strings like HTML tag in this part.

Graph Format

Bar Graph (Vertical)

When the monitor function is enabled and the div tag and parameters are coded on the HTML file, it will be automatically converted to a JavaScript request and the values of the data registers acquired via CGI will be displayed in a vertical bar graph.

To draw a vertical bar graph, first set the id attribute to a string that indicates a unique ID for each graph, set the data-graph attribute to "vbar" that indicates the type of data, and code the parameters in the div tag.

The parameters that can be set are as follows. If the default value of the parameter is acceptable, it does not need to be set.

| | |
|--------------|--|
| device | : The device. Set this to "D" (data register). |
| address | : The device number. Set this as a numeric value. |
| driver | : The driver number. Set this to 0. |
| net_no | : The network number. Set this to 0. |
| format | : The web data type string. |
| width | : The width of the div border in pixels. The default value is 300. |
| height | : The height of the div border in pixels. The default value is 300. |
| line_col | : The line color of the div border. The default value is "#000000". |
| barvgutter | : The vertical space from the div border to the graph in pixels. The default value is 30. |
| barwidth | : The width of the graph in pixels. The default value is 20. |
| gutter | : The space between graphs in pixels when displaying multiple graphs. The default value is 20. |
| type | : The shape of the ends of the graph. Select "square", "round", "sharp", or "soft". The default setting is "square". |
| scalewidth | : The width of the scale in pixels. The default value is 5. |
| labelvgutter | : The vertical space from the graph where the label will be displayed in pixels. The default value is 20. |
| labelhgutter | : The horizontal space from the graph where the label will be displayed in pixels. The default value is 30. |
| bars[] | : An array of parameters that configures each graph. Code the parameters for each array in { } and separate each array element with ",". |

The parameters that can be set as an element of `bars[]` are as follows. If the default value of the parameter is acceptable, it does not need to be set.

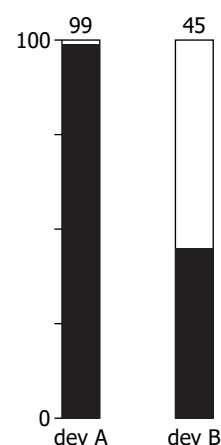
`min_val` : The minimum value of the graph. This parameter is required.
`max_val` : The maximum value of the graph. This parameter is required.
`label` : The label name. The default is a string that combines the device and device number.
`back_col` : The background color of the graph. The default value is "#FFFFFF".
`front_col` : The foreground color of the graph. The default value is a color that differs for each element.
`scale_on` : This parameter sets whether or not the graph has a scale. The default setting is false (no scale).
`scale_lbl_on` : This parameter sets whether or not there is a label for the scale on the graph.
The default setting is false (no label).

When the `div` tag is coded as follows, two vertical bar graphs are displayed using the data in double words D2040 and D2042 (decimal).

```
<div id="div11" data-graph="vbar">
```

```

device:"D", address:2040, driver:0, net_no:0, format:"DEC-D",
width:300, height:300, line_col:"#000000",
barvgutter:30, barwidth:20,
gutter:20, type:"square", scalewidth:5,
bars:[
{
  min_val:0, max_val:100, label:"dev A",
  back_col:"#FFFFFF", front_col:"#0000FF",
  scale_on:true, scale_lbl_on:true
},
{
  min_val:0, max_val:100, label:"dev B",
  back_col:"#FFFFFF", front_col:"#FF0000",
  scale_on:false, scale_lbl_on:false
}
]
</div>
```



Bar Graph (Horizontal)

When the monitor function is enabled and the `div` tag and parameters are coded on the HTML file, it will be automatically converted to a JavaScript request and the values of the data registers acquired via CGI will be displayed in a horizontal bar graph. To draw a horizontal bar graph, first set the `id` attribute to a string that indicates a unique ID for each graph, set the `data-graph` attribute to "hbar" that indicates the type of data, and code the parameters in the `div` tag.

The parameters that can be set are as follows. If the default value of the parameter is acceptable, it does not need to be set.

`device` : The device. Set this to "D" (data register).
`address` : The device number. Set this as a numeric value.
`driver` : The driver number. Set this to 0.
`net_no` : The network number. Set this to 0.
`format` : The web data type string.
`width` : The width of the `div` border in pixels. The default value is 300.
`height` : The height of the `div` border in pixels. The default value is 300.
`line_col` : The line color of the `div` border. The default value is "#000000".
`barhgutter` : The horizontal space from the `div` border to the graph in pixels.
The default value is 30.
`barwidth` : The width of the graph in pixels. The default value is 20.
`gutter` : The space between graphs in pixels when displaying multiple graphs.
The default value is 20.
`type` : The shape of the ends of the graph. Select "square", "round", "sharp", or "soft". The default setting is "square".
`scalewidth` : The width of the scale in pixels. The default value is 5.
`labelgutter` : The vertical space from the graph where the label will be displayed in pixels.
The default value is 20.

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- labelgutter : The horizontal space from the graph where the label will be displayed in pixels.
The default value is 30.
- bars[] : An array of parameters that configures each graph. Code the parameters for each array in { } and separate each array element with ",".

The parameters that can be set as an element of bars[] are as follows. If the default value of the parameter is acceptable, it does not need to be set.

- min_val : The minimum value of the graph. This parameter is required.
- max_val : The maximum value of the graph. This parameter is required.
- label : The label name. The default is a string that combines the device and device number.
- back_col : The background color of the graph. The default value is "#FFFFFF".
- front_col : The foreground color of the graph. The default value is a color that differs for each element.
- scale_on : This parameter sets whether or not the graph has a scale. The default setting is false (no scale).
- scale_lbl_on : This parameter sets whether or not there is a label for the scale on the graph.
The default setting is false (no label).

When the div tag is coded as follows, two horizontal bar graphs are displayed using the data in double words D2040 and D2042 (decimal).

```
<div id="div21" data-graph="hbar">
  device:"D", address:2040, driver:0, net_no:0, format:"DEC-D",
  width:300, height:300, line_col:"#000000",
  barhgutter:30, barwidth:20,
  gutter:20, type:"square", scalewidth:5,
  bars:[
    {
      min_val:0, max_val:100, label:"dev A",
      back_col:"#FFFFFF", front_col:"#0000FF",
      scale_on:true, scale_lbl_on:true
    },
    {
      min_val:0, max_val:100, label:"dev B",
      back_col:"#FFFFFF", front_col:"#FF0000",
      scale_on:false, scale_lbl_on:false
    }
  ]
</div>
```



Trend Graph

When the monitor function is enabled and the div tag and parameters are coded on the HTML file, it will be automatically converted to a JavaScript request, and the values of the data registers acquired via CGI will be displayed in a trend graph.

To draw a trend graph, first set the id attribute to a string that indicates a unique ID for each graph, set the data-graph attribute to "trend" that indicates the type of data, and code the parameters in the div tag.

The parameters that can be set are as follows. If the default value of the parameter is acceptable, it does not need to be set.

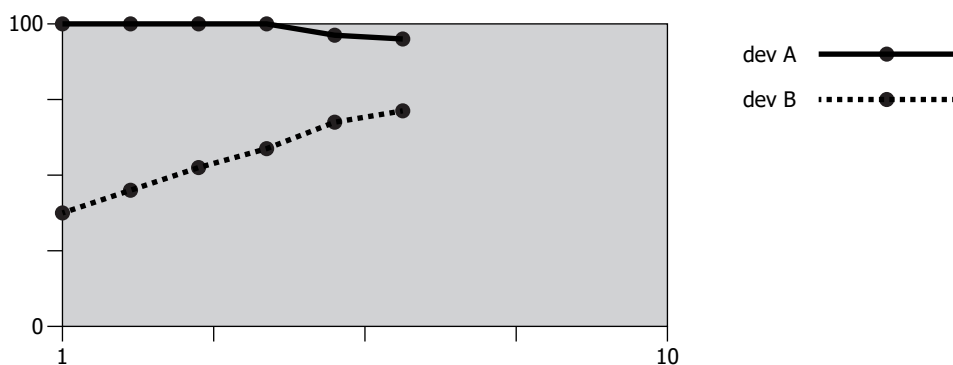
| | |
|--------------------|---|
| device | : The device. Set this to "D" (data register). |
| address | : The device number. Set this as a numeric value. |
| driver | : The driver number. Set this to 0. |
| net_no | : The network number. Set this to 0. |
| format | : The web data type string. |
| width | : The width of the div border in pixels. The default value is 300. |
| height | : The height of the div border in pixels. The default value is 300. |
| line_col | : The line color of the div border. The default value is "#000000". |
| min_val | : The minimum value of the graph. This parameter is required. |
| max_val | : The maximum value of the graph. This parameter is required. |
| plot_num | : This parameter sets the number of plots of data. This parameter is required. |
| scale_col | : The color of the scale. The default value is "#000000". |
| x_val_col | : The color of the X-axis label. The default value is "#000000". |
| y_val_col | : The color of the Y-axis label. The default value is "#000000". |
| g_x | : The position to start drawing the graph border in the horizontal direction in pixels. The default value is 50. |
| g_y | : The position to start drawing the graph border in the vertical direction in pixels. The default value is 30. |
| g_width | : The horizontal width of the graph border in pixels. The default value is 200. |
| g_height | : The vertical of the graph border in pixels. The default value is 100. |
| g_line_col | : The color of the graph border. The default value is the same as line_col. |
| g_line_width | : The thickness of the graph border in pixels. The default value is 1. |
| g_back_col | : The background of the graph border. The default value is "#C0C0C0". |
| mode | : This parameter sets the data that will be truncated when the data exceeds the plot area. Select "one" (only one will be truncated), "half" (half of the entire amount will be truncated), or "all" (all will be truncated). The default setting is "all". |
| legend_gutter | : The width from the graph border to the legend in pixels. The default value is 30. |
| legend_margin_x | : The horizontal margin inside the legend in pixels. The default value is 10. |
| legend_margin_y | : The vertical margin inside the legend in pixels. The default value is 10. |
| legend_line_width | : The length of the line inside the legend in pixels. The default value is 20. |
| legend_line_gutter | : The vertical width in pixels when multiple lines are displayed inside the legend. The default value is 20. |
| legend_line_col | : The color of the lines inside the legend. The default value is the same as line_col. |
| legend_width | : The horizontal width inside the legend in pixels. The default value is 100. |
| line_width | : The initial value for the thickness of lines on the graph in pixels. The default value is 1. |
| marker_on | : The initial setting for whether or not to display markers on the graph. The default value is false (no markers). |
| marker_width | : The initial value for the size of markers on the graph in pixels. The default value is 3. |
| lines[] | : An array of parameters that configures each line. Code the parameters for each array in { } and separate each array element with ",". |

The parameters that can be set as an element of `lines[]` are as follows. If the default value of the parameter is acceptable, it does not need to be set.

| | |
|---------------------------|---|
| <code>label</code> | : The label name. The default is a string that combines the device type and device number. |
| <code>front_col</code> | : The foreground color of the line that can be set for each line. The default value is a color that differs for each element. |
| <code>marker_col</code> | : The marker color of the line. The default value is the same as <code>front_col</code> . |
| <code>line_width</code> | : The thickness of the line in pixels that can be set for each line. This parameter has priority over the initial value of <code>line_width</code> . |
| <code>marker_width</code> | : The size of the marker in pixels that can be set for each line. This parameter has priority over the initial value of <code>marker_width</code> . |

When the `div` tag is coded as follows, the trend graph is displayed with 10 plots and markers using the data in double words D2040 and D2042 (decimal).

```
<div id="div31" data-graph="trend">
  device:"D", address:2040, driver:0, net_no:0, format:"DEC-D",
  width:400, height:300, line_col:"#000000",
  min_val:0, max_val:100, plot_num:10,
  line_width:3, marker_on:true, marker_width:5,
  lines:[
    {
      label:"dev A",
      front_col:"#0000FF"
    },
    {
      label:"dev B",
      front_col:"#FF0000"
    }
  ]
</div>
```



Notes:

Notes on Drawing Graphs

- The string between `<div>` and `</div>` that describes the graph is passed as a JavaScript program parameter. Note that when coding the `div` tag, the content can contain spaces and line breaks for formatting, but it cannot contain comments.
- If a numeric value will not be set as a parameter, enclose it with `""`.
- All parameters must be separated with `,`. Do not put `,` after the last parameter. The `div` tag will not be drawn as a graph if the parameter format is invalid.
- The manner in which the graph is displayed may differ according to the type of web browser.
- There may be a delay in updating the web browser display due to the update frequency and the number of data plots.

JavaScript Functions

When the monitor function is enabled, device data can be read and written using JavaScript functions.

The raw data obtained via CGI can be used and processed in a more complicated manner than that when using metacharacters. See the appendix for details about the CGI interface.

■ Read Device Data Function

`Idec.device_read (device, address, length, driver, net_no)`

device : Sets the device to read as a string.
Currently only D (data register) can be used.

address : Sets the device number to read.

length : Sets the size of the data from the start of address to read.
Set this as a decimal value between 1 and 64.

driver : The driver number. Set this to 0.

net_no : The network number. Set this to 0.

The return value is a hexadecimal numeric value in a string with the format "XXXX". If length is 2 or larger, "_" is inserted between items of data. The return value is "" if there was no response from the server or if the parameters are incorrect.

Note: The function is as follows when D2058 is 49910 (C2F6h) and D2059 is 59768 (E978h).

```
var raw_data = idec.device_read ("D", 2058, 2, 0, 0);
```

The variable `raw_data` will be "C2F6_E978" when the function normally terminates.

■ Write Device Data Function

`idec.device_write (device, address, length, driver, net_no, data)`

device : Sets the device to write as a string. Currently only D (data register) can be used.

address : Sets the device number to write.

length : Sets the size of the data from the start of address to write. Set this as a decimal value between 1 and 64.

driver : The driver number. Set this to 0.

net_no : The network number. Set this to 0.

data : Sets the data to write as a hexadecimal numeric value in a string. If length is 2 or larger, insert "_" between items of data.

The return value is true when the function normally terminates and false in all other cases.

Note: The function is as follows when writing 49910 (C2F6h) to D2058 and 59768 (E978h) to D2059.

```
var status_write = idec.device_write ("D", 2058, 2, 0, 0, "C2F6_E978");
```

The variable `status_write` is true when the function normally terminates.

Custom Web Pages

Using the web page editor of the tools provided with WindLDR, you can easily create web pages (custom web pages) according to your purpose and use. For details on creating custom web pages, see "Web Page Editor" on page 13-46.

Web Page Editor

Web Page Editor is used to create custom web pages that are downloaded to the FC6A.

Custom web pages that have been downloaded to the FC6A can be accessed with a web browser from a PC or other device, and the custom web pages can be displayed according to FC6A device values.

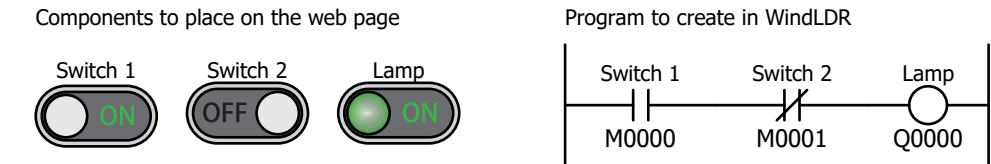
To use Web Page Editor, click the HMI module inserted into the module configuration area, click **Configure**, and in the **HMI Module Configuration** dialog box, select **Use Web Page Editor**.

The behavior of custom web pages according to the device values in FC6A can be checked without downloading the custom web pages to the FC6A by linking the WindLDR simulation function to the created custom web pages.

Creating Custom Web Pages

This section describes the procedure to create custom web pages in Web Page Editor.

A web page will be created that turns on output Q1 when input M0000 is on and input M0001 is off.



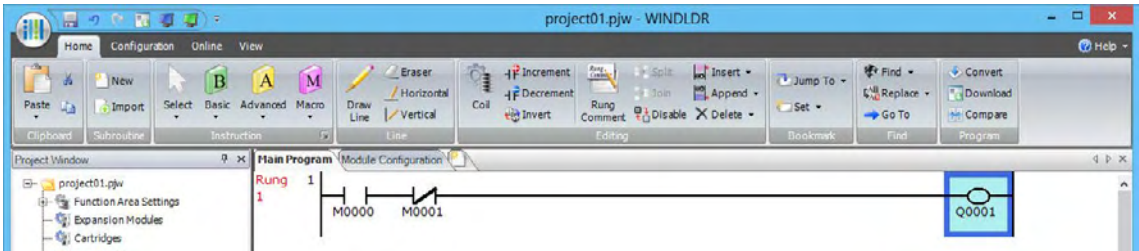
Note:

For details on devices, see "Devices" on page 2-1.

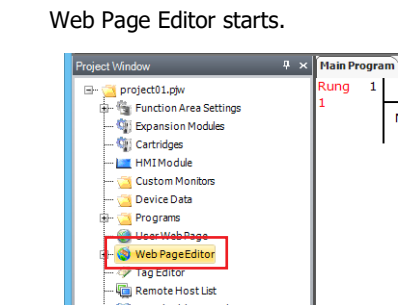
For details on instructions, see the "Ladder Programming Manual".

• Operation procedure

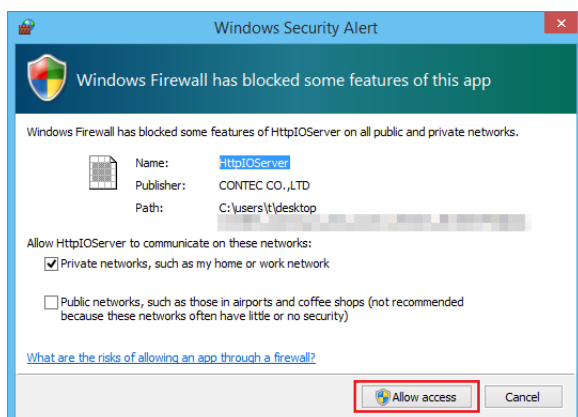
1. Create a program that turns on output Q1 when input M0000 is on and input M0001 is off.
For details, see Chapter 4 "Create Ladder Program" in the "FC6A Series MICROSmart User's Manual".



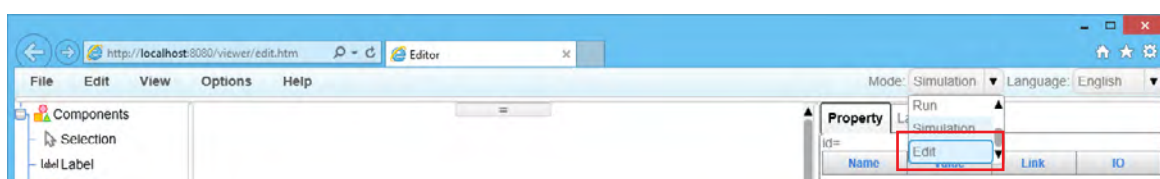
2. Double-click **Web Page Editor** in the Project window.



Note: If the **Windows Security Alert** dialog box is displayed, click **Allow access**.



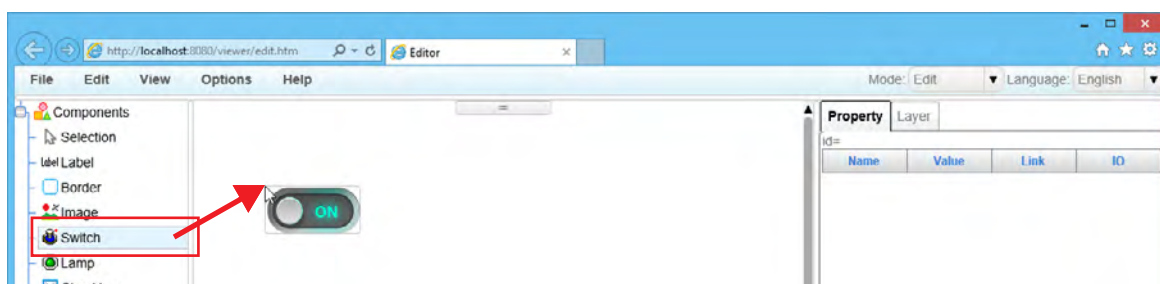
3. For the Web Page Editor **Mode**, click **Edit**.




4. Place Switch 1 on the work area and set it to a normally open contact (M0000).

Select **Switch** in the **Components** list, and drag and drop it on the work area.

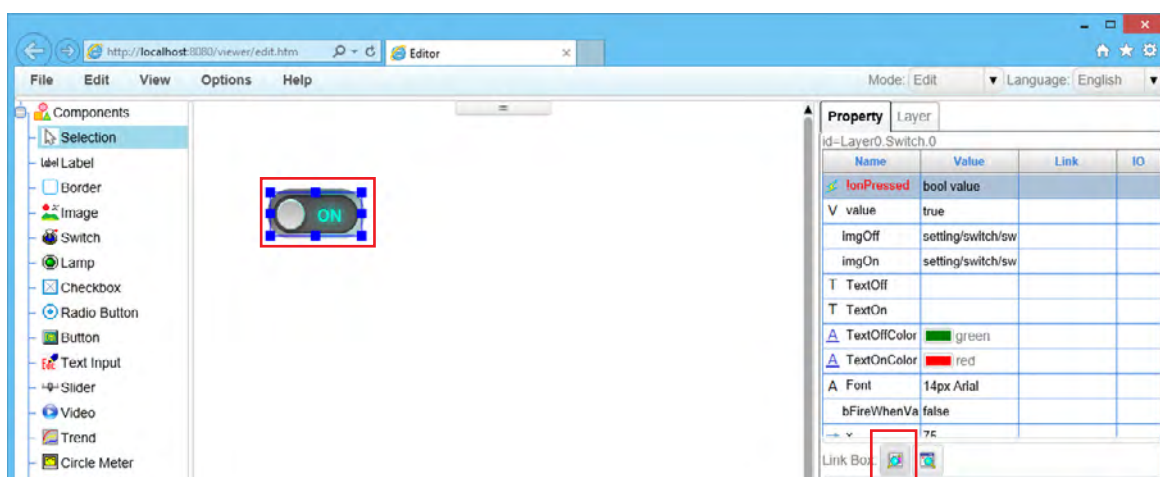
The switch will be placed on the area with the predefined size.



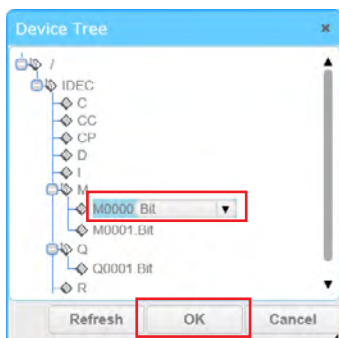
Note: To place a switch on the area with the desired size, click **Switch** in the **Components** list, and then drag the precision select mouse cursor on the work area.

5. Click the switch placed on the work area and on the **Property** tab, for **Link Box**, click .

The **Device Tree** dialog box is displayed.



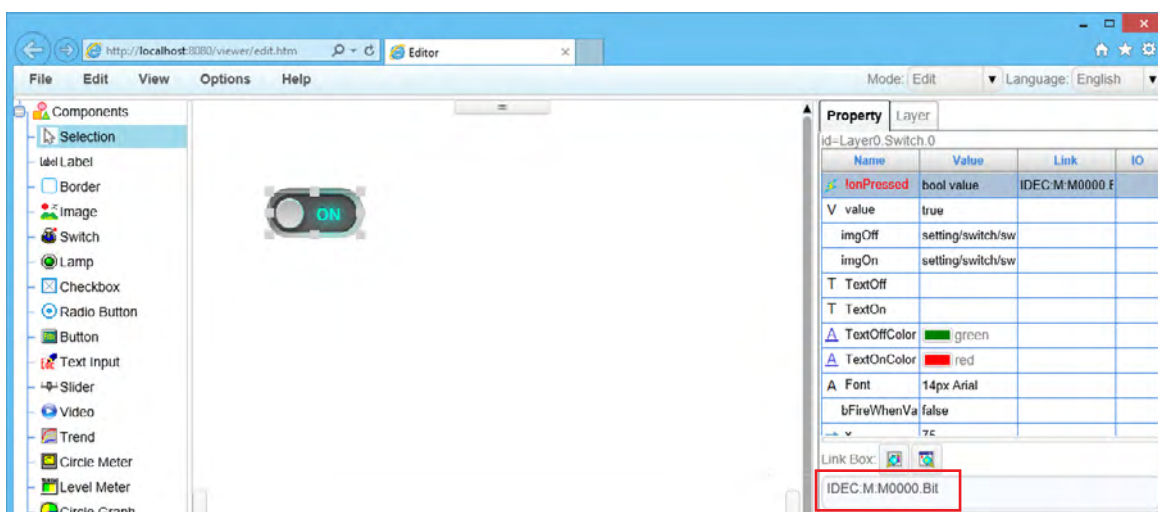
6. Click the device address to set to Switch 1 and click **OK**.



Notes:

- The devices that are used in WindLDR are displayed in the **Device Tree** dialog box.
- If the device address to set is not in the Device Tree, click **Cancel**, and then directly enter the device address in the text box for **Link Box** on the **Property** tab.

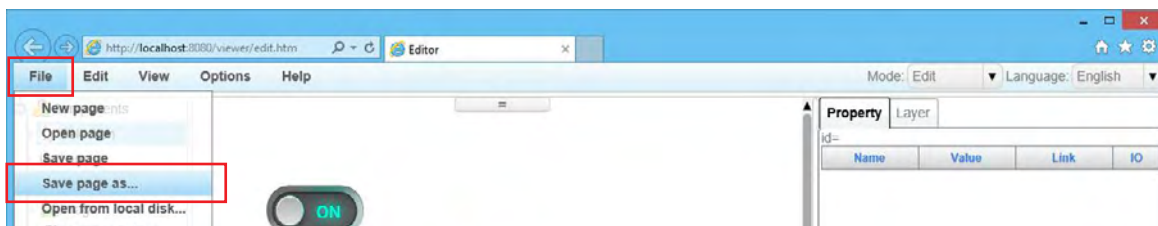
This sets Switch 1 to a normally open contact (M0000).



7. Repeat steps 4 through 6 and set Switch 2 and the lamp.

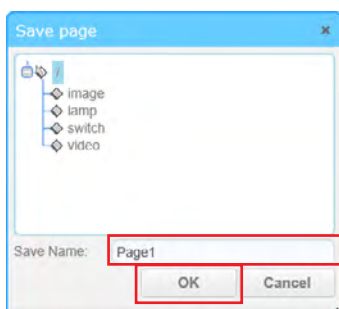
8. On the menu bar, click **File > Save page as**.

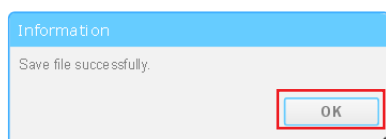
The **Save Page** dialog box is displayed.



9. Enter the file name in **Save Name**, specify the folder to save to, and click **OK**.

A confirmation message is displayed.

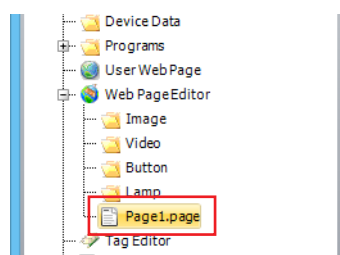


10. Click **OK**.

This concludes creating a custom web page.

Notes:

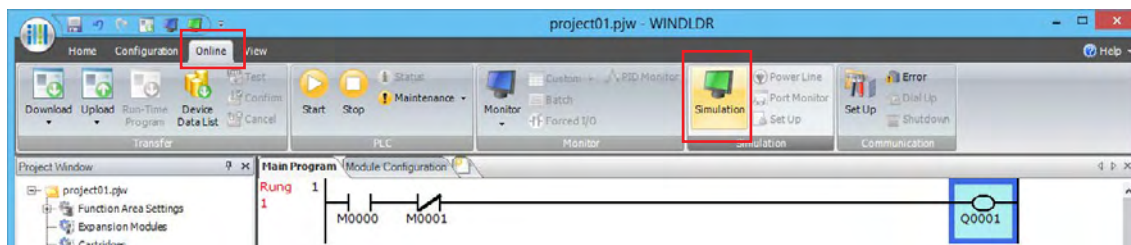
- For details on Web Page Editor, refer to the Web Page Editor help that is displayed by clicking **Help > Help** on the menu bar.
- The created custom web page will be created in Web Page Editor on the Project window. Image files, video files, image files for switches, and image files for lamps that have been imported with custom web pages are displayed in their respective folders on the list. Double-clicking a created custom web page will start Web Page Editor and open that custom web page. The created custom web page can then be edited.

**Checking Operation of Custom Web Pages**

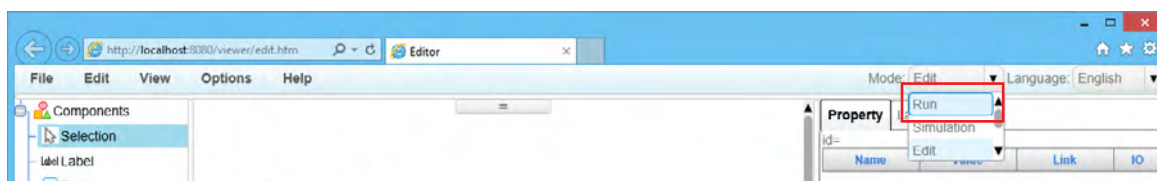
This section describes the procedure to execute operation of the created custom web page in Web Page Editor to check its behavior.

- Operation procedure**

- On the WindLDR **Online** tab, click **Simulation**.



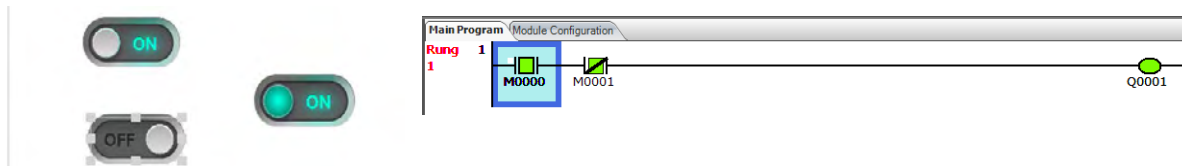
- For the Web Page Editor **Mode**, click **Run**.



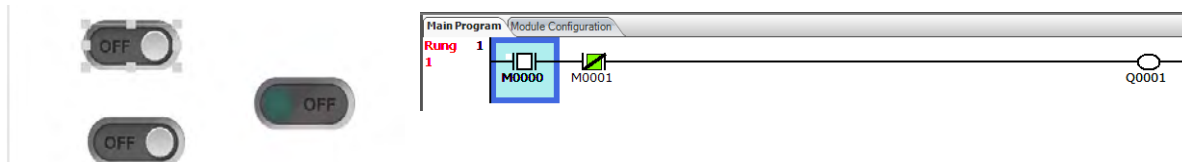
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3. Check the following operation while turning Switch 1 and Switch 2 on and off.

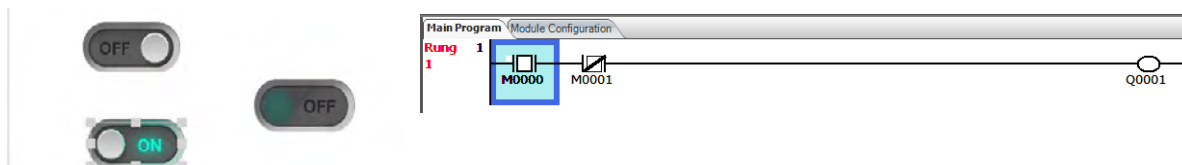
- The lamp turns on when Switch 1 is on and Switch 2 is off



- The lamp turns off when Switch 1 is off



- The lamp turns off when Switch 2 is on



Note: The WindLDR program also turns on and off according to the status of Web Page Editor.

This concludes checking operation of the custom web page.

You can view the custom web page from a web browser if you download the user program in WindLDR to the FC6A after saving the created web page.

For detailed configuration methods, see "HMI Module Web Server" on page 13-22.

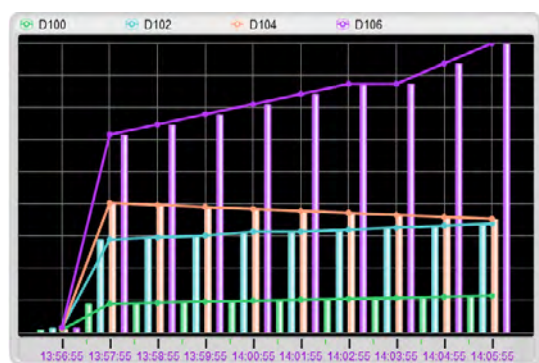
Log Data Integration on Custom Web Pages

Log data can be integrated on custom web pages created with Web Page Editor. The log data that can be integrated is as follows.

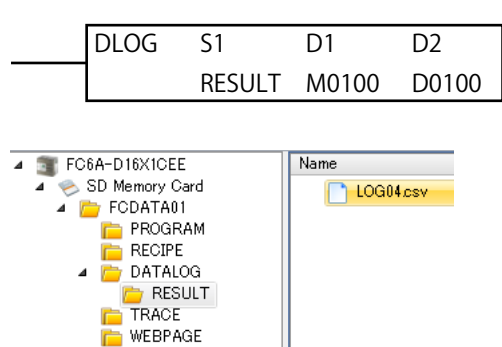
- Log data saved to the SD memory card with the DLOG (Data Log) instruction.

This section describes the operation procedure to reference log data saved to the SD memory card with the DLOG (Data Log) instruction from custom web pages created with Web Page Editor.

Component to place on the web page

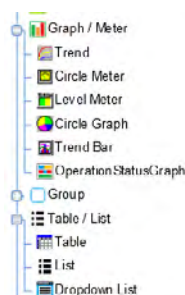


Program to create in WindLDR



Notes:

- For details on the DLOG (Data Log) instruction, see Chapter 25 "DLOG (Data Log)" in the "Ladder Programming Manual".
- Log data integration on custom web pages can be used only with internal memory on the Plus CPU module and the SD memory card inserted into the Plus CPU module. Log data cannot be integrated on custom web pages saved to the internal memory on the HMI module.
- Log data cannot be integrated on custom web pages if the separating character for log data in the CSV file format is set to semicolon (;) in the external memory device settings. For details on the external memory device settings, see Chapter 5 "Functions and Settings" in the "FC6A Series MICROSmart User's Manual".
- Web Page Editor has operation status graph, table, list, and drop-down list components that can be used as components for log data integration on custom web pages. Log data integration can also be set using these components.

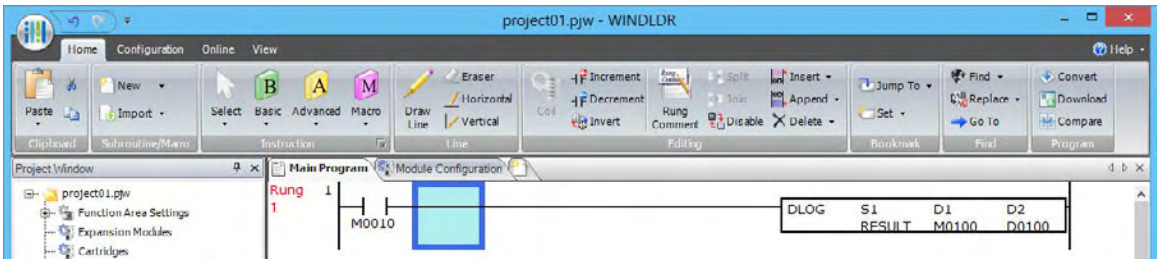


- Log data cannot be integrated on custom web page on Simulation of WindLDR.

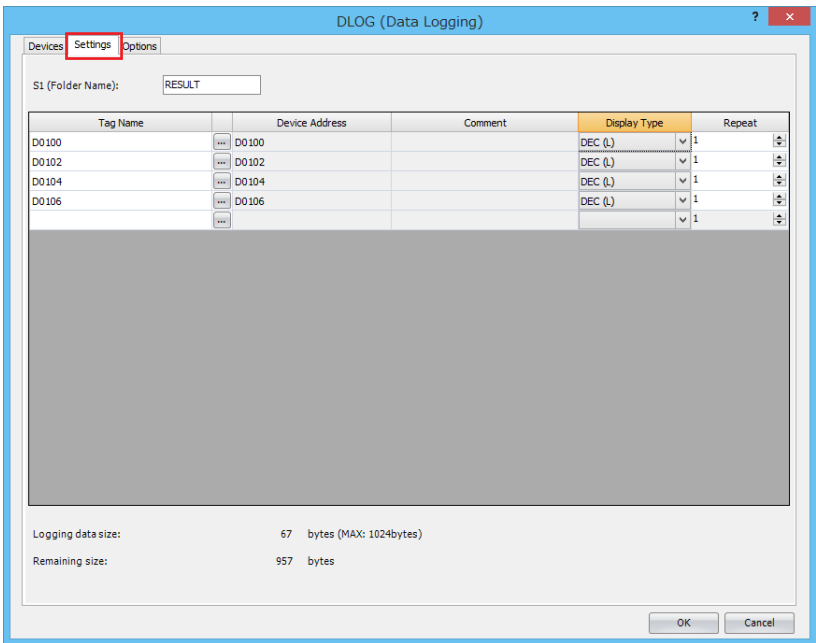
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• Operation procedure

- 1. Insert the DLOG instruction.

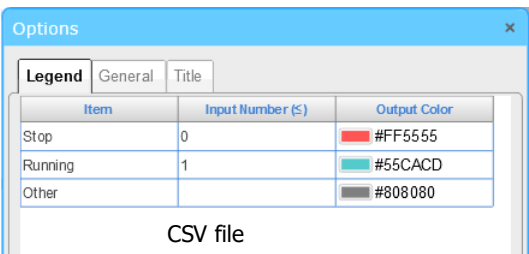
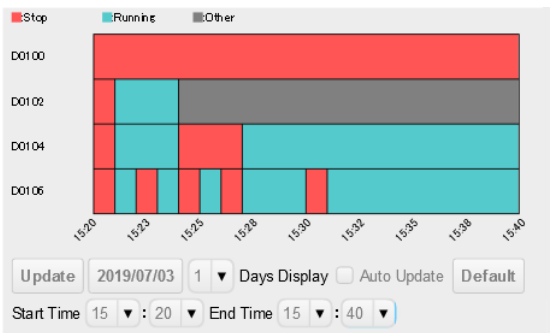


- 2. On the **Settings** tab, set the device addresses of the data to output to CSV file.
The values of the set device addresses are displayed on the components integrated with the log data on the custom web pages.



Note: To use the operation status graph component in the log data integration components on custom web pages, create a ladder program so the values of data output to the CSV file with the DLOG instruction match the input values of the operation status graph.
In this example, the value of the data that was output to the CSV file is output using the operation status graph component with the operation status as 0 ("Stop") and 1 ("Running").

Operation status graph



CSV file

| #_date_time_ | D0100 | D0102 | D0104 | D0106 |
|-------------------|-------|-------|-------|-------|
| 2019/7/3 15:18:01 | 0 | 0 | 0 | 0 |
| 2019/7/3 15:19:01 | 0 | 0 | 0 | 1 |
| 2019/7/3 15:20:01 | 0 | 0 | 0 | 0 |
| 2019/7/3 15:21:01 | 0 | 1 | 1 | 1 |
| 2019/7/3 15:22:01 | 0 | 1 | 1 | 0 |
| 2019/7/3 15:23:01 | 0 | 1 | 1 | 1 |
| 2019/7/3 15:24:01 | 0 | 2 | 0 | 0 |
| 2019/7/3 15:25:01 | 0 | 3 | 0 | 1 |
| 2019/7/3 15:26:01 | 0 | 4 | 0 | 0 |
| 2019/7/3 15:27:01 | 0 | 5 | 1 | 1 |
| 2019/7/3 15:30:15 | 0 | 6 | 1 | 0 |
| 2019/7/3 15:31:15 | 0 | 7 | 1 | 1 |

3. Select **Output only first line of file** in the **Header output**.

Under **Header format**, select **For web page editor** for **Label of date and time column**.

Select the **Store file path of csv file** check box, and specify the starting data register for storing the file path.

Store file path of csv file:

If this check box is selected, the graph will be displayed simply by setting a device address on **Link Box** of the trend bar component.

If this check box is cleared, the graph will not be displayed when the path to the CSV file is not directly specified in the properties of the trend bar component.

Output only first line of file:

If this check box is selected, this header is applied as the header on the X-axis of the trend bar component when the FC6A is changed from STOP to RUN.

If this check box is cleared, the graph will not be displayed on the trend bar component even when the FC6A is changed from STOP to RUN.

Header format:

Label of date and time column:

If **For web page editor** is selected, this header is applied as the the header on the X-axis of the trend bar component.

If **Optional** is selected, the graph will not be displayed on the trend bar component.

Header output: If set to output the header, this header is applied as the header on the X-axis of the trend bar component.

If set to not output the header, the graph will not be displayed on the trend bar component.

There are no **Options** settings required for the trend bar component except the settings described above. For details on the **Options** settings, see Chapter 25 "DLOG (Data Log)" in the "Ladder Programming Manual".

Notes:

- To perform log data integration with Web Page Editor and display a non-ASCII strings, select **Unicode (UTF-8) with BOM** or **Unicode (UTF-8) without BOM** for **Character set**.

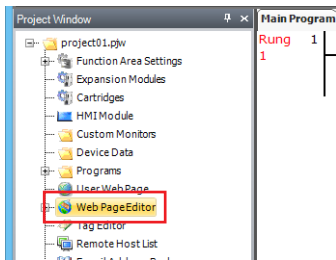
For **Unicode (UTF-8) with BOM**, the BOM values (0xEF 0xBB 0xBF) are output as the first 3 bytes of data.

For **Unicode (UTF-8) without BOM**, if the file is opened in a specific application, the characters may be unreadable because the application does not open the file as **UTF-8** data.

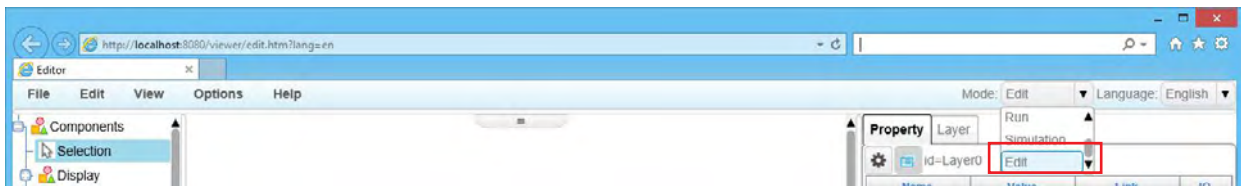
- To use the table, list, and drop-down list components, the content to set under **Common Settings** on the **Options** tab will vary depending on the properties that can be used with each component. For the properties that can be used with each component, refer to the Web Page Editor help that is displayed by clicking **Help > Help** on the menu bar of Web Page Editor.

13: WEB SERVER

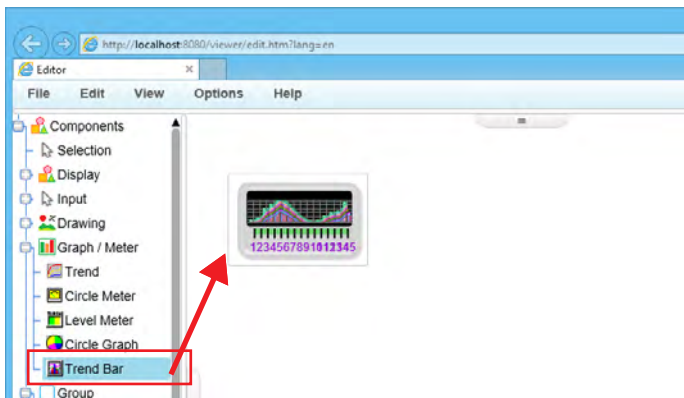
4. Double-click **Web Page Editor** in the Project window.
Web Page Editor starts.



5. For the Web Page Editor **Mode**, click **Edit**.




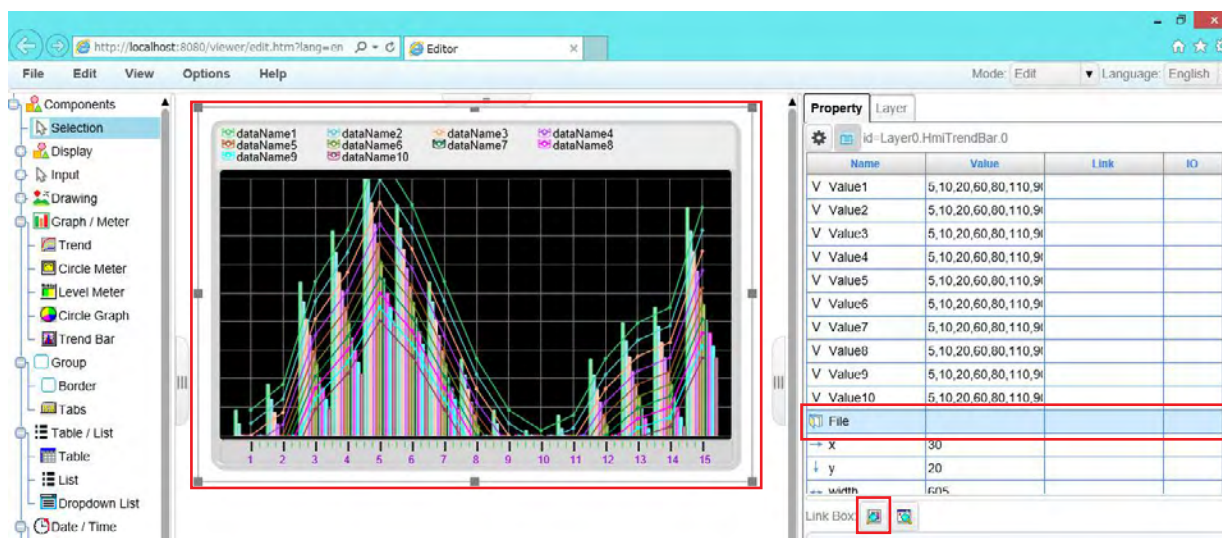
6. Place a trend bar on the work area and set the data register (D0100).
Select **Trend Bar** in the **Components** list, and drag and drop it on the work area.
The trend bar will be placed on the area with the predefined size.



Notes:

- To place a trend bar on the area with the desired size, click **Trend Bar** in the **Components** list, and then drag the precision select mouse cursor on the work area.
- To use the table, list, and drop-down list components, select **Table**, **List**, or **Dropdown List**, and then drag and drop that component to the work area. For details on the table, list, and drop-down list components, refer to the Web Page Editor help that is displayed by clicking **Help** > **Help** on the menu bar.

7. Click the trend bar placed on the work area and on the **Property** tab, click **File**. Next, for **Link Box**, click . The **Device Tree** dialog box is displayed.



8. Click the device address to set to the trend bar and click **OK**.



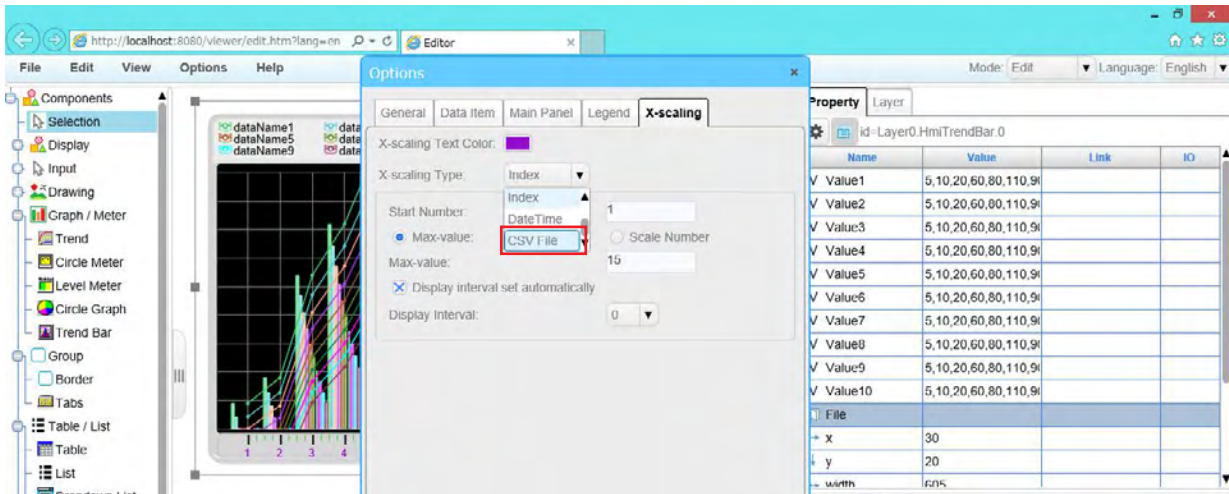
Notes:

- The devices that are used in WindLDR are displayed in the **Device Tree** dialog box.
- If the device address to set is not in the Device Tree, click **Cancel**, and then directly enter the device address in the variable link input area for **Link Box** on the **Property** tab.
- To specify the file path as the file property value, add "<D>\\" to the front of the folder name.
File path format:
<D>\Folder Name\CSV File Name
The DLOG instruction stores the path of the file being updated in the data register specified by **Store file path of csv file**.

9. Double-click the trend bar that has been placed in the area.
The trend bar **Options** dialog box is displayed.

13: WEB SERVER

10. On the **X-scaling** tab, under **X-scaling Type**, select **CSV File**.

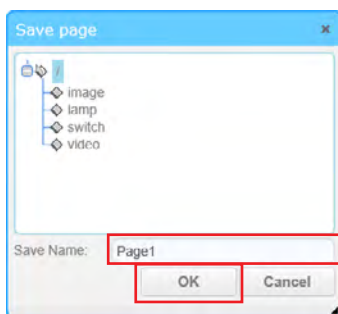


Note: In the **Options** dialog box, on the **General**, **Data Item**, **Main Panel**, and **Legend** tabs, the color, scale, data items, units, tool tips, legend, and other settings of components can be configured.

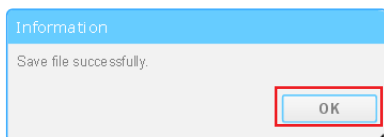
11. On the menu bar, click **File > Save page as**.
The **Save page** dialog box is displayed.



12. Enter the file name in **Save Name**, specify the folder to save to, and click **OK**.
A confirmation message is displayed.

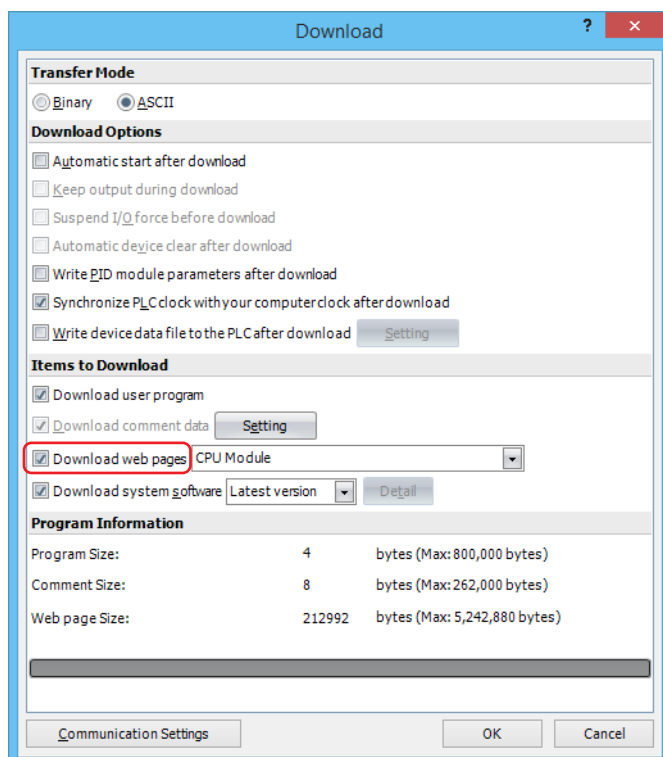


13. Click **OK**.



14. Download the user program to the Plus CPU module.
On the **Online** tab, in the **Transfer** group, click **Download**.
The **Download** dialog box is displayed.

15. Select the **Download web pages** check box.



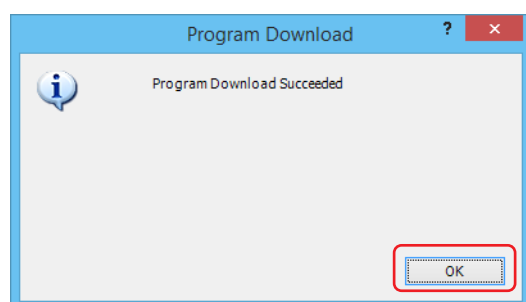
16. Select **CPU Module** or **CPU Module (SD Memory Card)** as the destination for saving the web pages.

Note: Web pages will not be downloaded when no SD memory card is inserted into the Plus CPU module but **CPU Module (SD Memory Card)** is selected.

17. Click **OK**.

The web pages will be downloaded to the selected save location.

When the following message appears, the download has completed successfully. Click **OK**.



18. When the DLOG (Data Log) instruction is executed, a CSV file is saved to the SD memory card. The saved CSV file can be viewed as a graph from the custom web page.

Note: If the size of the CSV file is large, it may take some time until it is displayed on the graph on the web page.

Adjust the maximum size of the CSV file according to the conditions of the communication line.

For the configuration of the maximum log data file size, see Chapter 5 "Functions and Settings" in the "FC6A Series MICROSmart User's Manual".

CGI (Common Gateway Interface)

Plus CPU modules and HMI modules support CGI programs for reading and writing device data. This section describes the CGI formats.

Request Format (Reading Device Data)

Device data can be read from the Web server CPU module with the following format using the GET method.

```
/system/device_read.cgi?device=DEV&address=XXXX&length=XXXX&driver=XX&net_no=XX
```

The CGI parameters are as follows:

| | |
|-------------------------|---|
| /system/device_read.cgi | : CGI file name |
| device | : Specify the device type of the target device using a character. "D" (Data Register) is supported. |
| address | : Specify the device number of the target device in hexadecimal. |
| length | : Specify the number of data registers to read in hexadecimal. The valid range is 1 to 64 (0001h to 0040h). |
| driver | : Reserved for the system. Specify "00". |
| net_no | : Reserved for the system. Specify "00". |

Example: When reading two consecutive data registers from D2058, the format for CGI is as follows:

```
/system/device_read.cgi?device=D&address=080A&length=0002&driver=00&net_no=00
```

Reply Format (Reading Device Data)

The Web server CPU module returns the following reply after receiving above request.

```
Content-type: text/javascript+json; charset=utf-8
{
  "STATUS": "0",
  "DEVICE": "D",
  "ADDRESS": "080A",
  "LENGTH": "0002",
  "DRIVER": "00",
  "NET_NO": "00"
  "DATA": "C2F6_E978"
}
```

STATUS: 0 indicates normal reply. Any other values indicate an error.

DEVICE, ADDRESS, LENGTH, DRIVER, and NET_NO: The parameters in the request are stored.

DATA: Values of the specified devices are stored. When the length is bigger than or equal to 2, " _ " is inserted between device values.

Request Format (Writing Device Data)

Device data can be written to the Web server CPU module with the following format using the POST method.

```
/system/device_write.cgi?device=DEV&address=XXXX&length=XXXX&driver=XX&net_no=XX&data=XXXX
```

The CGI parameters are as follows:

| | |
|--------------------------|--|
| /system/device_write.cgi | : CGI file name |
| device | : Specify the device type of the target device using a character. "D" (Data Register) is supported. |
| address | : Specify the device number of the target device in hexadecimal. |
| length | : Specify the number of data registers to write in hexadecimal. The valid range is 1 to 64 (0001h to 0040h). |
| driver | : Reserved for the system. Specify "00". |
| net_no | : Reserved for the system. Specify "00". |
| data | : Specify the values to write to the target data registers in hexadecimal. |

When the length is bigger than or equal to 2, insert "_" between the values to write to the data registers.

Example: When writing 49910 (C2F6h) to D2058 and 59768(E978h) to D2059, the format for CGI is as follows:

```
/system/device_write.cgi?device=D&address=080A&length=0002&driver=00&net_no=00&data=C2F6_E978
```

Reply Format (Writing Device Data)

The Web server CPU module returns the following reply after receiving above request.

```
Content-type: text/javascript+json; charset=utf-8
{
  "STATUS": "0",
  "DEVICE": "D",
  "ADDRESS": "080A",
  "LENGTH": "0002",
  "DRIVER": "00",
  "NET_NO": "00",
}
```

STATUS: 0 indicates normal reply. Any other values indicate an error.

DEVICE, ADDRESS, LENGTH, DRIVER, and NET_NO: The parameters in the request are stored.

Reading from SD Memory Card (Downloading a file)

When using the web server function with the Plus CPU module, you can download files in the WEBPAGE folder or in the DATALOG folder in the SD memory card to your PC.

When downloading a file in the WEBPAGE folder in the SD memory card, specify the relative path from the WEBPAGE folder in the SD memory card, following the URL (see "URL When Accessing Web Server and Web Page to Display" on page 13-4) when accessing a web page in the SD memory card.

When downloading a file in the DATALOG folder on the SD memory card, add "/viewer/<D>/" to the URL (see "URL When Accessing Web Server and Web Page to Display" on page 13-4) when accessing the web page in the internal memory of the Plus CPU module and specify the relative path from the DATALOG folder in the SD memory card.

Example:

`http://192.168.1.5/sd/viewer/img/picture.png`

The "picture.png" file in the \FCDATA01\WEBPAGE\viewer\img\ folder on the SD memory card is downloaded to your PC.

`http://192.168.1.5/viewer/%3CD%3E/RESULT/LOG04.csv`

The "LOG04.csv" file in the \FCDATA01\DATALOG\RESULT\ folder on the SD memory card is downloaded to your PC.

Note: While downloading a file, the web page stops refreshing for a few seconds.

Restrictions

When SSL/TLS communication is enabled, the following restrictions apply.

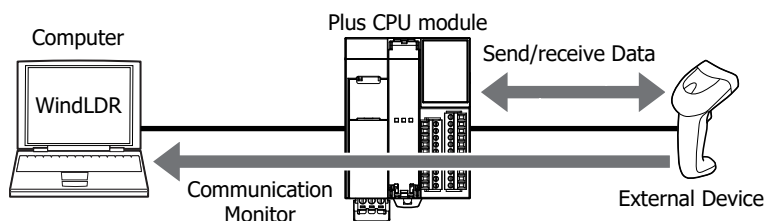
- It takes some time to complete the display of the web page.
- When a web page is being accessed, and another web browser accesses the same web server, the web page stops refreshing for a few seconds.
- When you access the web server on a low-speed line or in a network environment through a proxy, the web page may not be displayed properly because it requires more connections than the maximum number of simultaneous connections of the web server. For custom web pages, reduce the number of components placed on a web page by splitting it into multiple web pages.

14: COMMUNICATION MONITOR

This chapter describes the Communication Monitor.

Overview

The Communication Monitor is a function that monitors the communication data exchanged between the FC6A and an external device in the **Communication Monitor** dialog box of WindLDR. The communication protocols that can be monitored are user communication and Modbus communication. The communication monitor can be used with the Plus CPU module only.



Starting and Stopping the Communication Monitor

This section describes how to start the Communication Monitor and how to start and stop monitoring of an external device.

• Operation procedure

1. On the **Online** tab, in the **Monitor** group, click **Communication Monitor**.

| No. | Protocol | Timestamp | Type | Status(D2) | Length | Data(Binary) | Data(ASCII) |
|-----|----------|-----------|------|------------|--------|--------------|-------------|
|-----|----------|-----------|------|------------|--------|--------------|-------------|

| Ladder line number | Comparison result |
|--------------------|-------------------|
| S1 | Received data |

The external device that will be monitored is specified by the communication interface, port number, and connection number. The communication data that will be monitored is that which the FC6A saves to internal memory from when **Start** is clicked. Click **Stop** or close the **Communication Monitor** dialog box to stop saving the communication data to internal memory. For this reason, you cannot view send and receive data exchanged while the Communication Monitor is not monitoring.

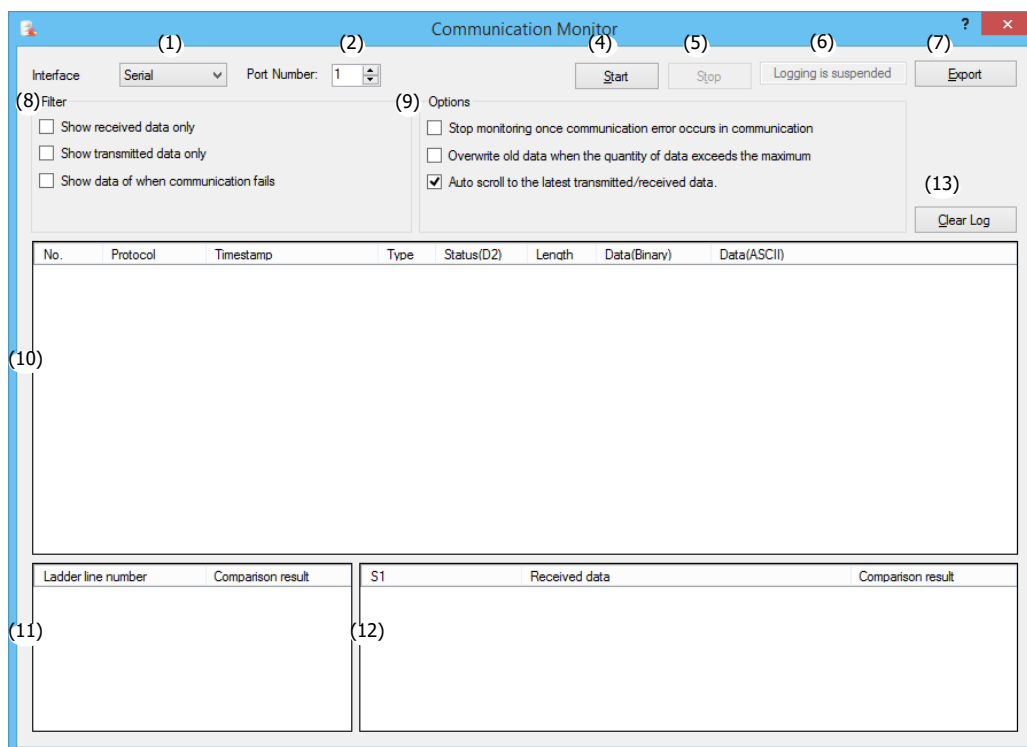
Up to 65,535 items of data can be monitored. The monitor will automatically stop when the maximum amount of data has been reached. To continue monitoring even when the maximum amount of data has been reached, select the **Overwrite old data when the quantity of data exceeds the maximum** check box. Monitoring will continue and the data will be overwritten from the oldest data.

If the communication interval with the monitored external device is faster than the interval used to display and update send and receive data in the Communication Monitor in WindLDR, the FC6A may have insufficient internal memory to temporarily save data. In this case, saving data to internal memory will stop.

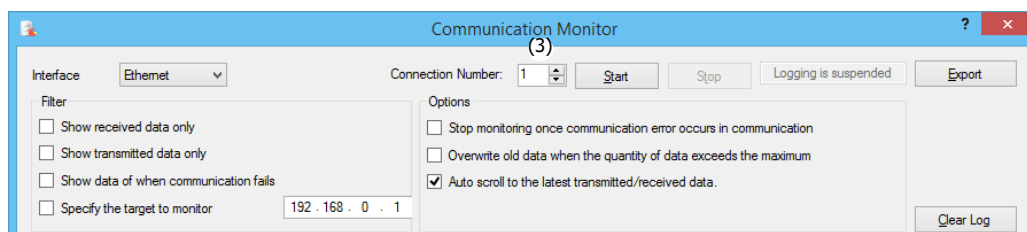
The display on the Communication Monitor after saving data to internal memory has stopped will change to the monitor stopped status after all send and receive data temporarily saved to internal memory has been displayed.

Communication Monitor

Monitoring Serial Communication



Monitoring Ethernet Communication



(1) Interface

Select the communication interface to monitor from **Serial** or **Ethernet**.

(2) Port Number

Set the port of the communication interface to monitor. This can be set only when Interface (1) is **Serial**.

Port: 1 to 33

(3) Connection Number

Sets the connection number to monitor.

This can be set only when Interface (1) is **Ethernet**.

Connection: 1 to 16

(4) Start button

Click this button to start the Communication Monitor. WindLDR will acquire communication data from the PLC at a regular interval.

(5) Stop button

Click this button to stop the Communication Monitor.

Accumulation the communication data at the PLC stops while the Communication Monitor is stopped.

(6) Status Indicator

Displays the status of the Communication Monitor.

(7) Export button

The communication data displayed in Send and Receive Data Display (10) can be exported.

Click this button, enter the file name in the **Save As** dialog box, and click **Save**.

(8) Filter

The items displayed in the Send and Receive Data Display (10) can be filtered. Select the check boxes for the items to display. Multiple filters can be selected.

When the **Specify Send/Receive Device** check box is selected, enter the IP address.

(9) Options

Select the relevant check boxes to operate the communication monitor with the following processing types:

Stop monitoring once communication error occurs in communication:

Stops monitoring when an error occurs.

Overwrite old data when the quantity of data exceeds the maximum:

When the communication data reaches the maximum amount of data (65,535 items), the monitor will continue by deleting old data instead of stopping the monitor.

Auto scroll to the latest transmitted/received data:

The latest send and receive data will be automatically displayed when send and receive data is added.

(10) Send and Receive Data Display

Displays the communication data exchanged between the FC6A and external device. The displayed content is as follows.

- Protocol
- Time stamps (Plus CPU module with system version 1.01 or later)
- Send/receive type
- IP address of target device to send/receive (Ethernet only)
- Status
- Data length
- Data (binary or ASCII)

Note: Time stamps are based on the calendar and clock data of the FC6A when the monitor is started, and they are implemented by adding the time difference from the start of the monitor that is appended to the send and receive data. The purpose of time stamps is to indicate the approximate communication interval of communication data. The time of the time stamps may not match the current time of the computer and it may not be adjusted for daylight savings time.

The calendar/clock display format of the computer is used as the display format of the time stamps.

(11) User Communication Instruction Selection

Displays the list of user communication instructions corresponding to the selected send/receive data in Send and Receive Data Display (10). This is not displayed when the protocol is Modbus.

- | | |
|--------------------|---|
| Ladder line number | : Displays the line number of the user communication instruction (RXD/ERXD/TXD/ETXD) in WindLDR. The relevant user communication instruction is determined by searching for the instruction in WindLDR based on the device address of D2 obtained from the PLC. |
| Comparison result | : Displays the receive result of the user communication receive instructions. (Not displayed for send instructions.) |

(12) Comparison Result Details

Displays details of the comparison result between the actual communication data and the communication format (S1) of the user communication instruction selected in User Communication Instruction Selection (11). In this way, you can check the difference between the format of the user communication receive instruction and the actual received data. However, this is not displayed when the protocol is Modbus.

- | | |
|------------------------|---|
| S1 | : Displays the format of the user communication receive instruction selected in User Communication Instruction Selection (11). <ul style="list-style-type: none"> • Constant (Character) • Constant (Hexadecimal) • Data Register • BCC • Skip (receive data only) |
| Receive Data/Send Data | : Displays the content of the communication data. |
| Comparison Result | : Displays the comparison result. Match: OK Mismatch: NG |

Note: The data received by the FC6A is verified against the format specified by the user communication instruction in WindLDR, and the comparison result with the format is associated with the actual communication data and then displayed. For this reason, the user program opened in WindLDR and the user program in the FC6A must be the same. If the user programs are different, a warning message will be displayed stating that the comparison results cannot be displayed when the **Communication Monitor** dialog box is displayed, and only Send and Receive Data Display (10) will be displayed.

14: COMMUNICATION MONITOR

(13) Clear Log button

Erases the displayed communication data.

15:MC PROTOCOL COMMUNICATION

Introduction

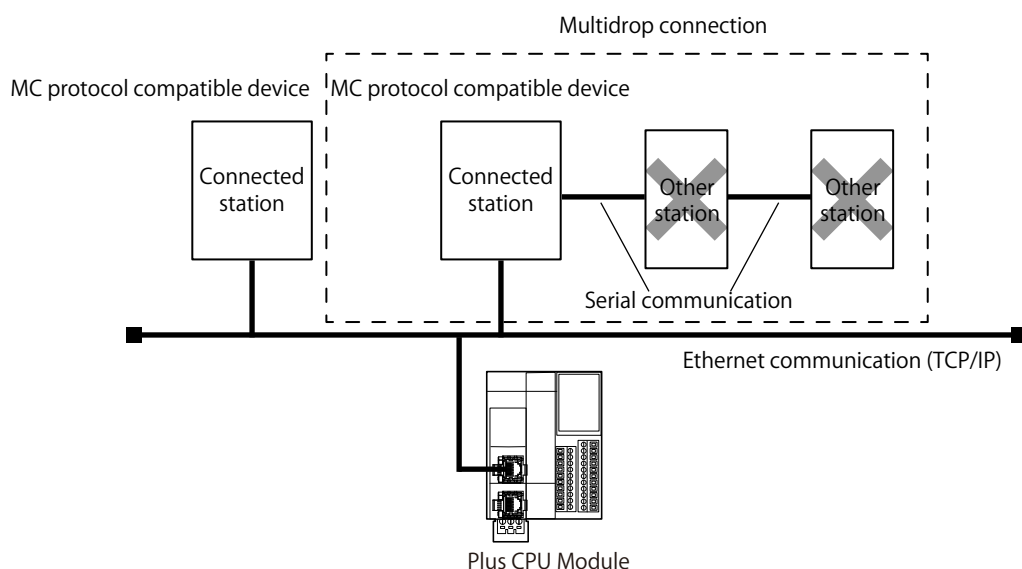
This chapter describes the MC protocol communication for the FC6A.

Overview

MC protocol is an abbreviation for MELSEC communication protocol, and a protocol for communicating with devices that support the MC protocol (hereinafter referred to as MC protocol compatible devices) such as PLC manufactured by Mitsubishi Electric Corporation. As a client of MC protocol communication, the Plus CPU module can read and write device values of MC protocol compatible devices. For details on the MC protocol, see the MELSEC Communication Protocol Reference Manual.

Access Range

The network configuration for MC protocol communication is shown below. The Plus CPU module can communicate with MC protocol compatible devices (connected stations) that support QnA-compatible 3E frame. The Plus CPU module cannot communicate with other MC protocol compatible devices (other stations) connected to the connected station (multidrop connection).



Standard Specifications

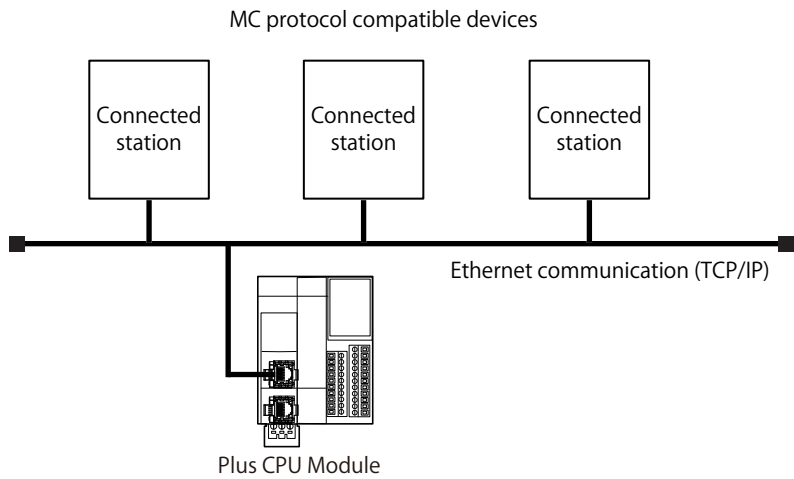
The standard specifications are as follows.

| Module | Plus CPU module |
|-------------------------------------|--|
| Communication Port | Ethernet port 1 and 2 |
| Supported frame | QnA-compatible 3E frame |
| Supported Commands and Sub Commands | Batch read in word units (command: 0401, subcommand: 0000) Batch read in bit units (command: 0401, subcommand: 0001) Batch write in word units (command: 1401, subcommand: 0000) Batch write in bit units (command: 1401, subcommand: 0001) |
| Supported Code | Binary code |
| Number of connections | 16 maximum ^{*1} |

^{*1} You can connect up to 255 servers to a connection.

MC protocol communication via Ethernet Communication

Plus CPU module can be used as MC protocol communication client using Ethernet port 1 or 2, and up to 16 connections can be assigned to MC protocol communication clients. Each connection can communicate with multiple MC protocol compatible devices (1 to 255 devices).



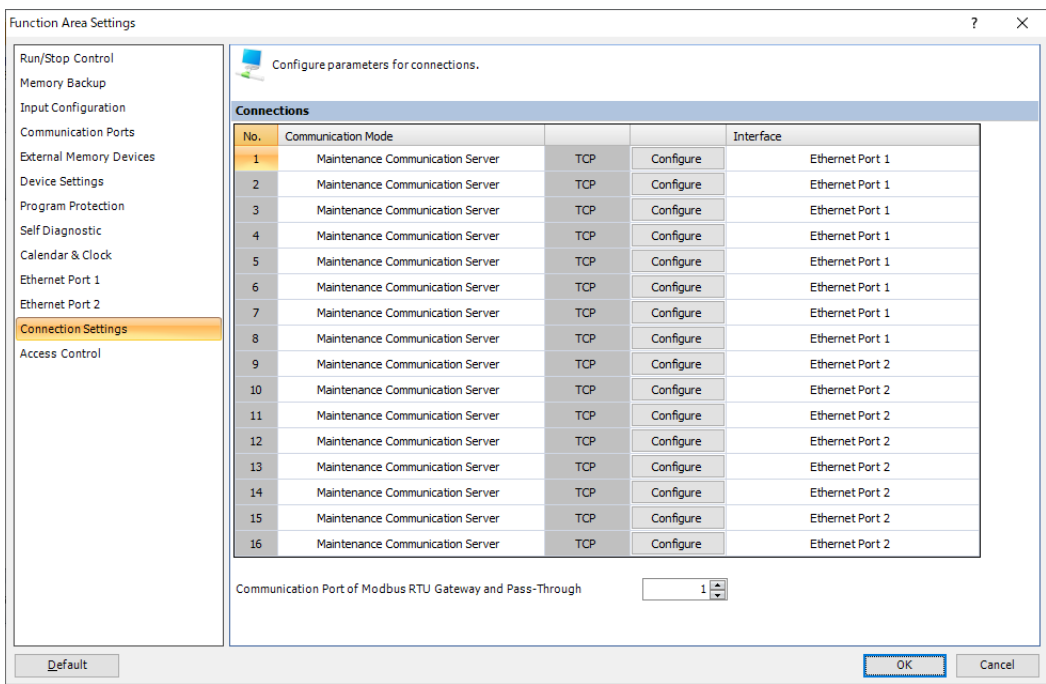
Note: The Plus CPU module can communicate with MC protocol compatible devices that support QnA-compatible 3E frames (binary code).

MC Protocol Communication Settings

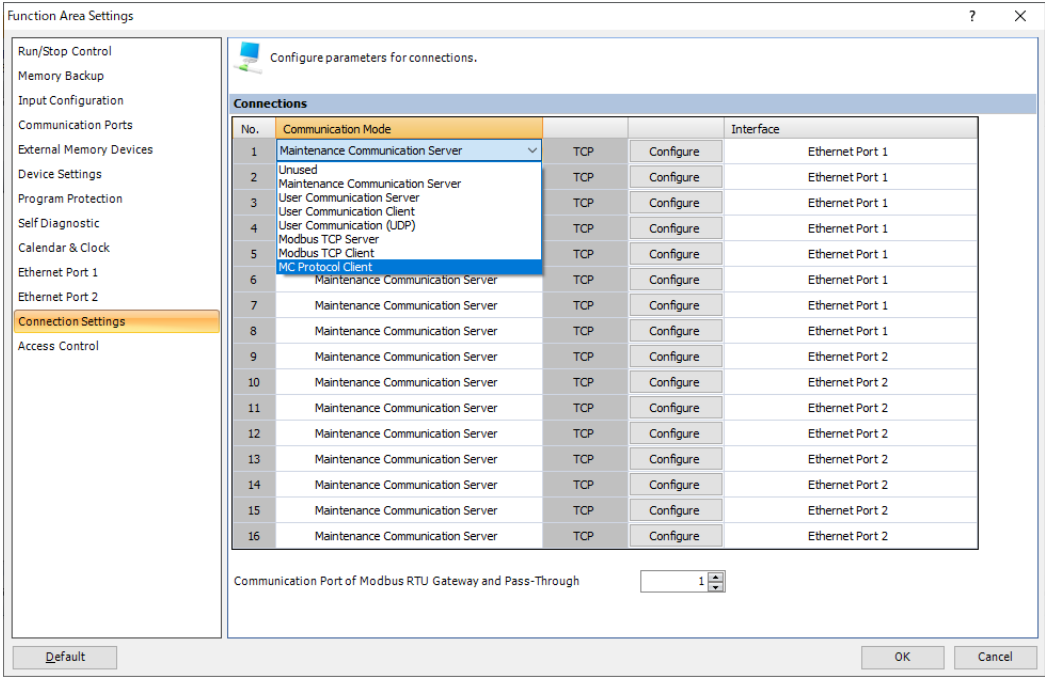
The MC protocol communication settings are configured on the **MC Protocol Client** dialog box. This section describes the **MC Protocol Client** dialog box and its settings.

Procedure to display the MC Protocol Client dialog box

- 1. On the **Configuration** tab, in the **Function Area Settings** group, click **Connection Settings**. The **Function Area Settings** dialog box is displayed.



2. Click **Communication Mode** of the connection number to be used, and select **MC Protocol Client**.



The **MC Protocol Client** dialog box is displayed.

MC Protocol Client Dialog Box

Configure the settings for performing MC protocol communication on **MC Protocol Client** dialog box.

Note: The table in the center of the MC Protocol Client dialog box is called the request table. Each row in the request table is called a request.

(1) Request Execution Device

The execution of the request of the Plus CPU module is controlled by on/off of the request execution device.

When the request execution device changes from off to on, the Plus CPU module sends a request after the time set in "(2) Transmission Wait Time" on page 15-11 has elapsed. After sending the request and receiving the response, the corresponding request execution device is automatically turned off.

If the Plus CPU module cannot receive the response, the Plus CPU module retries after the time set in "(1) Receive Timeout" on page 15-11 has elapsed. After the CPU modules retries twice the corresponding request execution device is automatically turned off. This series of processing is called request execution. When a normal response is received, the execution of the request is successful. If an abnormal response is received, or if the response cannot be received even after the retries, the execution of the request is failed.

The Plus CPU module does not send a request when the request execution device is off.

The request execution device can be configured with an internal relay or data register. Devices are assigned in order of request number to the requests registered in the request table, starting with the configured device. When a data register is configured in the request execution device, the request execution device is assigned in order of request number, starting with the least significant bit of the data register.

| Request Execution Device | Description |
|--------------------------------------|--|
| Unused (The check box is cleared) | The requests registered in the request table are repeatedly executed in order of request number. |
| Used (The check box is selected) | For the requests registered in the request table, the request execution devices are allocated in order of request number, starting with the device set as the request execution device. When you turn on the request execution devices allocated to the requests you want to execute, corresponding requests are executed. |

Precautions for Changing Device Values

Do not change the read device value and write device value until the request execution device is automatically turned off. You may not be able to read or write the device value before the change.

Note: When multiple request execution devices are turned from off to on at the same time, the request with the nearest request number from the request being executed is executed. The request is processed one by one. When execution is completed (successful or failed), the next request is processed.

(2) Synchronize with auto ping

Whether to execute the requests can be controlled with the results of the auto ping. This function is convenient when you want to execute MC protocol communication with multiple remote hosts with minimum delay even when some of those hosts do not respond due to some reasons.

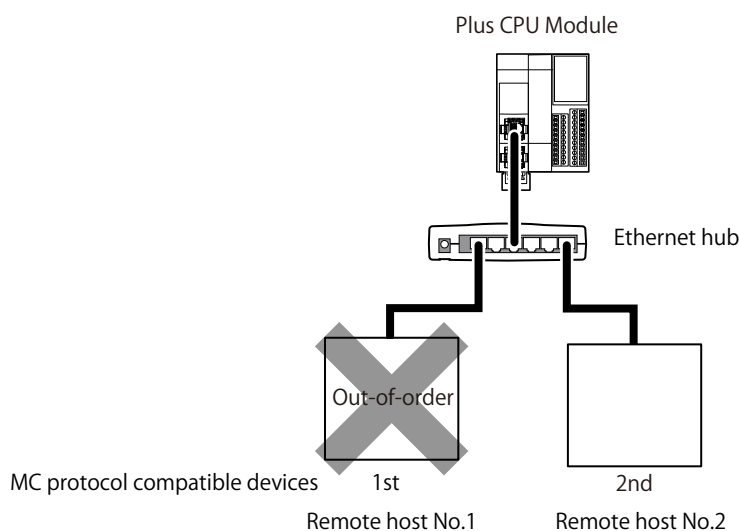
| Synchronize with auto ping | Description |
|---|---|
| Do not synchronize with auto ping (The check box is cleared) | The requests registered in the request table are repeatedly executed in order of request number. |
| Synchronize with auto ping (The check box is selected) | Remote host to which automatic ping is enabled: When the online status (internal relay to store the result of the sent ping) is on, the corresponding request is executed. Remote hosts that are not subject to automatic ping: The corresponding requests are executed regardless of the status of the online status. |

To perform MC protocol communication, register the MC protocol compatible device to communicate with as a remote host in the remote host list. When the Synchronize with auto ping check box is selected, the **Configure** button is displayed. Click **Configure** to display the **Remote Host List** dialog box and register the remote host. For details on the remote host list, see "Remote Host List" on page 3-26.

This section describes the request processing when the synchronization with the auto ping is enabled and disabled.

Example of System Configuration**Setting Details**

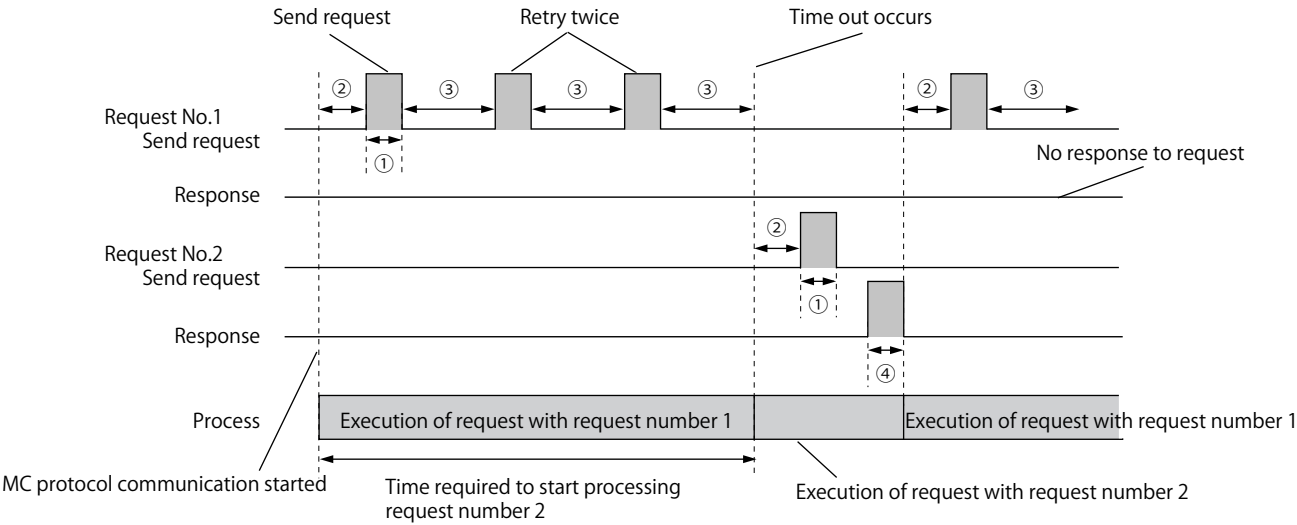
Request Execution Device: Unused

**When the synchronization is enabled (Synchronize with auto ping check box is cleared).**

Requests are executed in order of request number.

| Request Number | Remote Host Number | Execution of Request |
|----------------|--------------------|----------------------|
| 1 | 1 | Execute |
| 2 | 2 | Execute |

Request processing timing chart



- ① Send request
- ② Waiting time for sending a request from the start of execution of the request to sending the request
- ③ After the time set in **Receive Timeout** has elapsed, the request will retry.
- ④ Response

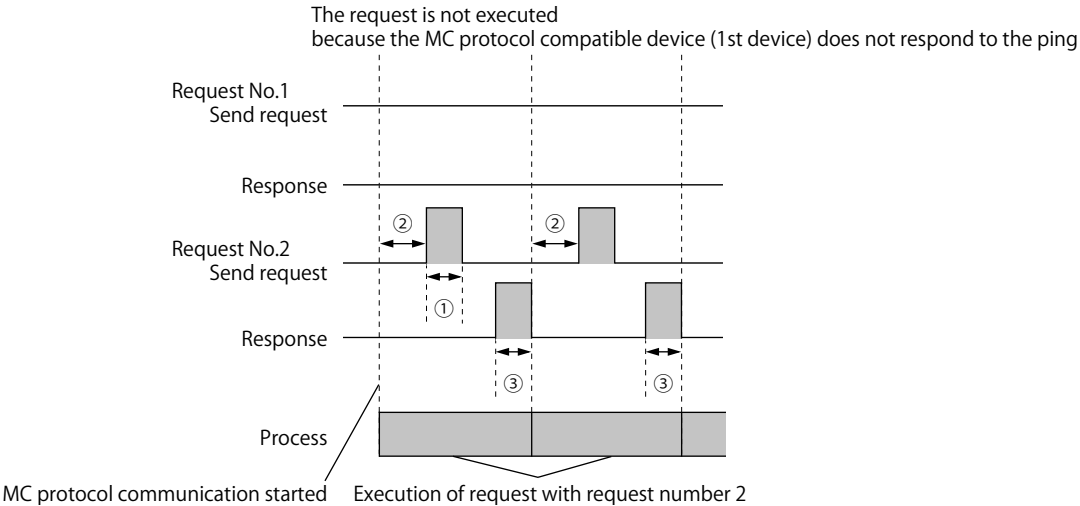
When the synchronization is disabled (Synchronize with auto ping check box is selected)

Requests for the online remote hosts are executed.

| Request Number | Remote Host Number | Online Status ^{*1} | Execution of Request |
|----------------|--------------------|-----------------------------|----------------------|
| 1 | 1 | off | Execute |
| 2 | 2 | on | Execute |

^{*1} The online status is an internal relay that stores the result of the sent ping. For details on the online status, see "(14) Online Status" on page 15-10

Request processing timing chart



- ① Send request
- ② Waiting time for sending a request from the start of execution of the request to sending the request
- ③ Response

Note: This function is effective when you want to execute MC protocol communication with multiple remote hosts with minimum delay even when some of those hosts do not respond due to some reasons. The time required to process a request for a non-responding remote host is three times as long as the time set in **Receive Timeout** in the **Communication Settings** dialog box. See "Auto Ping Function" on page 3-28.

(3) Status

Sets whether to store the error status and end code in the device when the request is executed. If you want to store the error status and end code in the device, select **Use** and set the data register. Two words of data registers are used per request.

Note: When the maximum number (255) of requests is created, the data register is allocated as shown in the table below.

| Device Address | Contents | | R/W |
|---------------------|--------------------------|--------------|-----|
| Starting Number+0 | Status of Request No.1 | Error Status | R |
| Starting Number+1 | | End Code | R |
| Starting Number+2 | Status of Request No.2 | Error Status | R |
| Starting Number+3 | | End Code | R |
| ... | ... | ... | ... |
| Starting Number+508 | Status of Request No.255 | Error Status | R |
| Starting Number+509 | | End Code | R |

Error Status

The remote host number is stored in the upper byte and the error code is stored in the lower byte.

| Error Status (Hexadecimal) | |
|----------------------------|----------------|
| High-order byte | Low-order byte |
| Remote host number | Error code |

Details on the error code are as follows.

| Error Code (Hexadecimal) | Contents | Detail |
|--------------------------|---------------|--|
| 0x04 | Abnormal exit | The End Code of data received from MC protocol compatible device is not 0x0000 (Normal exit) |
| 0x16 | Timeout error | There is no response from the MC protocol compatible device. |

End code

Stores the end code of MC protocol communication. For details on the end code, see the manual of the MC protocol compatible device which the Plus CPU module communicates with.

Note: If an error occurs during MC protocol communication, such as when the Ethernet cable is disconnected or the power of the MC protocol compatible device is turned off, a Timeout error will occur and the error code will be 0x16. At this time, the data read from the MC protocol compatible device right before the error occurs is kept in the device configured in "(8) Client Device" on page 15-8. If you want to clear the data on this device, write 0 to the device.

(4) Use a single DR for all communication requests

When **Use** is selected in **Status**, configure the data register to store the error status and end code.

The details are as follows.

| Use a single DR for all communication requests | Description |
|--|--|
| Unused (The check box is cleared) | Stores the error status and end code for each request. 2 words of data registers are used per request, and the maximum of 510 words are used starting with the data register set in Status . |
| Used (The check box is selected) | Stores the error status and end code of the latest executed request. 2 words of data registers are used, starting with the data register set in Status . |

(5) Update status only when communication fails

When **Update status only when communication fails** check box is selected, the Plus CPU module updates the status (error status and end code) of the request only when the request fails to execute. When this check box is cleared, the Plus CPU module updates the status of the request regardless of whether the request is successful or not.

(6) Request Number

The number of each request (1 to 255).

Note: When using the Request Execution Device or Status, the devices are automatically allocated in order of request number, starting with the configured device. If you delete the requests in the request table or change the order of the requests, the Request Execution Device and Error Status allocation will be updated, which may cause inconsistency with the device used in the user program. If you change the request table, check your user program carefully.

(7) Command

Select the command that the Plus CPU module transmits to the MC protocol compatible devices from the following.

| Command | Description |
|------------------------------|---|
| 04010000 Read in word units | The Plus CPU module reads the word device value for the number of points specified in Points from the device specified in Symbol and Number , and stores it in the devices for the number of points starting with Client Device . |
| 04010001 Read in bit units | The Plus CPU module reads the bit device value for the number of points specified in Points from the device specified in Symbol and Number , and stores it in the devices for the number of points starting with Client Device . |
| 14010000 Write in word units | The Plus CPU module writes the word device value for the number of points specified in Points from Client Device to the word devices for the number of points specified in Points from the device specified in Symbol and Number . |
| 14010001 Write in bit units | The Plus CPU module writes the bit device value for the number of points specified in Points from Client Device to the bit devices for the number of points specified in Points from the device specified in Symbol and Number . |

(8) Client Device

Configure the device of the Plus CPU module. The device types that can be configured differ depending on the **Command** settings. The details are as follows.

| Command | Input (I) | Output (Q) | Internal Relay (M) | Special Internal Relay (M) | Data Register (D) | Special Data Register (D) |
|------------------------------|-----------|------------|--------------------|----------------------------|-------------------|---------------------------|
| 04010000 Read in word units | No | No | No | No | Yes | No |
| 04010001 Read in bit units | No | No | Yes | No | No | No |
| 14010000 Write in word units | Yes | Yes | Yes | No | Yes | No |
| 14010001 Write in bit units | Yes | Yes | Yes | No | No | No |

Note: Configure the **Client Device** within the range of the device.

(9) Points

Configure the number of data to be read or written in the range of 1 to 512.

(10) Remote Host Number (1 to 255)

Configure the IP address and port number of the MC protocol compatible device which the Plus CPU module communicates with.

The table on which you can register and manage target communication devices (remote hosts) on the network is called the remote host list. For details on the remote host list, see "Remote Host List" on page 3-26.

Note: Request execution order and connection intermittent time

The time required to disconnect and establish the connection may change depending on the order in which the requests are executed.

When you execute a request, the Plus CPU module connects to the remote host and sends the request. The connection is maintained until the next request is executed. If the remote host of the next request to be executed and the remote host of the current connection are the same, the request is sent while maintaining the connection. If the remote host is different, the Plus CPU module disconnects the connection, connects to the remote host of the next request to be executed, and sends the request. By executing the requests communicating with the same remote host consecutively, you can save the time required to disconnect and establish the connection.

For example, when the remote host tables ① and ② as shown in the table below are processed without using a request execution device, the remote host table ① can save the time required for disconnecting and establishing the connection.

| Remote Host Table ① | |
|---------------------|--------------------|
| Request Number | Remote Host Number |
| 1 | 1 |
| 2 | 1 |
| 3 | 2 |
| 4 | 2 |



Only when request numbers 1 and 3 are executed, the existing connection is disconnected and a new connection is established.



The time required to disconnect and establish the connection can be saved.

| Remote Host Table ② | |
|---------------------|--------------------|
| Request Number | Remote Host Number |
| 1 | 1 |
| 2 | 2 |
| 3 | 1 |
| 4 | 2 |



Every time a request for each request number is executed, the existing connection is disconnected and the new one is established.



It takes time to disconnect and establish connections.

(11) Server Device Symbol

(12) Server Device Number

Configure the device symbol and device number of the MC protocol compatible device.

Symbol

The devices that can be configured differ depending on the **Command** settings. The details are as follows.

| Command | Input (X) | Output (Y) | Internal Relay (M) | Special Internal Relay (SM) | Data Register (D) | Special Data Register (SD) |
|------------------------------|-----------|------------|--------------------|-----------------------------|-------------------|----------------------------|
| 04010000 Read in word units | Yes | Yes | Yes | Yes | Yes | Yes |
| 04010001 Read in bit units | Yes | Yes | Yes | Yes | No | No |
| 14010000 Write in word units | No | No | No | No | Yes | No |
| 14010001 Write in bit units | Yes | Yes | Yes | No | No | No |

Number

The valid range of the **Server Device Number** differs depending on the **Symbol** setting. The details are as follows.

| Symbol | Number |
|-----------------------------|------------------|
| Input (X) | 0000 to FFFFFF*1 |
| Output (Y) | 0000 to FFFFFF*1 |
| Internal Relay (M) | 0 to 16,777,215 |
| Special Internal Relay (SM) | 0 to 16,777,215 |
| Data Register (D) | 0 to 16,777,215 |
| Special Data Register (SD) | 0 to 16,777,215 |

*1 Configure in hexadecimal.

Note: The **Number** that can be configured depends on each MC protocol compatible device. Check the manual of the MC protocol compatible device, and configure the **Number** so that it does not exceed the range of the device.

(13) Request Execution Device

The request execution device assigned to each request number is displayed.

This is only done if the **Request Execution Device** check box is selected.

Note: If you delete the requests in the request table or change the order of the requests, the Request Execution Device allocation will be updated, which may cause inconsistency with the device used in the user program. If you change the request table, check your user program carefully.

(14) Online Status

When the **Synchronize with auto ping** check box is selected, the internal relay allocated to **Online Status** of each remote host in the **Auto Ping Settings** dialog box is displayed. For details see "Auto Ping Function" on page 3-28.

(15) Error Status

(16) End Code

Data registers that stores the error status and end code assigned to each request number are displayed. It is displayed only when you select **Use** for the **Status**.

Note: If the **Use a single DR for all communication requests** check box is cleared, and you delete the requests in the request table or change the order of the requests, the Error Status and end code allocation will be updated, which may cause inconsistency with the device used in the user program. If you change the request table, check your user program carefully.

(17) Error information display area

If there is an error in the configured settings in the **MC Protocol Client** dialog box, the content of the error will be displayed.

(18) Communication Settings button

Click **Communication Settings** button to open the **Communication Settings** dialog box. For details see "Communication Settings Dialog Box" on page 15-11.

(19) Import button

Import the contents of the request table.

(20) Export button

Export the contents of the request table.

You can edit the contents of the request table in bulk or import it into another WindLDR project.

(21) OK button

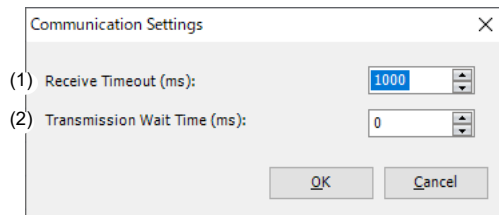
Save your settings and close the **MC Protocol Client** dialog box.

(22) Cancel button

Closes the **MC Protocol Client** dialog box without saving the settings.

Communication Settings Dialog Box

Configure the detailed settings for performing MC protocol communication on this dialog box.

**(1) Receive Timeout**

Specify the wait time for a response to be returned after the Plus CPU module sends data to the MC protocol compatible device. Specify this wait time (300 to 25,500 ms) in 100 ms increments.

(2) Transmission Wait Time

Specify the wait time from completing a request to executing the next request in the range of 0 ms to 5,000 ms.

MC protocol client Operation

Request processing and communication are independent, and each request in the request table is repeatedly executed in END processing in order of the request numbers. The communication between the Plus CPU module and MC protocol compatible device are performed in asynchronous with the user program execution. Whether the request is executed or not depends on the combination of the following settings. The details are as follows.

| Settings | | Synchronize with auto ping | | |
|--------------------------|--------|---|--|---|
| | | Unused | Synchronize with auto ping | |
| | | | Auto Ping transmission target | Auto Ping transmission non-target |
| Request Execution Device | Unused | Requests are executed. | When the online status of a request is on, the request is executed. When it is off, the request is not executed. | Requests are executed. |
| | Use | When the request execution device of a request is on, the request is executed. Otherwise, the requests is not executed. | When both the online status and the request execution device of a request are on, the request is executed. Otherwise, the request is not executed. | When the request execution device of a request is on, the request is executed. Otherwise, the requests is not executed. |

When the execution of a request is completed, the request with the next request number is executed. The request completes with one of the following conditions.

- When **Request Execution Device** is used, the request is completed when the request execution device turned on to execute the request is automatically turned off.
- When **Use** is selected in **Status**, the request is completed when the value of the data register that stores the error status is updated.

When the request is executed successfully (Received a normal response)

The request error code (0x00) and end code (0x0000) are written, and once the time configured in **Transmission Wait Time** has elapsed, the next request is executed. The error code and end code are written only when **Use** is selected in **Status** and the **Update status only when communication fails** check box is cleared.

When the request execution is failed

Values other than 0x0000 are written to the request error code and end code. The error code and end code are written only when **Use** is selected in **Status**. In the following cases, the next request is executed after the time configured in **Transmission Wait Time** has elapsed.

- When an abnormal response is received
- When a response (normal response or abnormal response) cannot be received and all retries fail even after retrying twice.

Notes:

- When the **Request Execution Device** check box is selected, the corresponding request execution device is automatically turned off after executing the request. If you want to send the request all the time, always turn on the corresponding request execution device with an OUT instruction in the user program.
- When an error occurs, the request execution device is automatically turned off after two retries fail.
- If the remote host number (host number 1) set in a request is different from the remote host number (host number 2) set in the request previously executed, the Plus CPU module disconnects the connection with the remote host with the host number 2 and execute the next request. If the host number 1 set in the request is the same as the host number 2 set in the request previously executed, the connection is maintained and the next request is executed.

Used Special Devices

Special devices used in the MC protocol communication are as follows.

Special Data Registers

| Device Address | Function | Description | R/W |
|----------------|---|--|-----|
| D8278 | Communication Mode Information (Connections 1 to 4) | Indicates the communication mode of connections 1 through 4. | R |
| D8279 | Communication Mode Information (Connections 5 to 8) | Indicates the communication mode of connections 5 through 8. | R |
| D8760 | Communication Mode Information (Connections 9 to 12) | Indicates the communication mode of connections 9 through 12. | R |
| D8761 | Communication Mode Information (Connections 13 to 16) | Indicates the communication mode of connections 13 through 16. | R |

For details of the allocation of connections in the device (bit assignment), see "Special Data Register Device Addresses" on page 2-17.

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IDEC CORPORATION

Head Office 6-64, Nishi-Miyahara-2-Chome, Yodogawa-ku, Osaka 532-0004, Japan

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