User's
Manual

FN120
Modbus Communication for PLC/RTU

IM 01W03B02-21EN

YOKOGAWA
Yokogawa Electric Corporation

IM 01W03B02-21EN
1st Edition

FN120
Modbus Communication for PLC/RTU

IM 01W03B02-21EN 1st Edition

CONTENTS

Part D Modbus Communication

Part E ISA100 Wireless Gateway Assistant

Part F Operation and Maintenance

Part G Troubleshooting

Part H Specifications

Part I Appendix: STARDOM Engineering

Introduction

This manual (IM 01W03B02-21EN) describes instruction of software function for FN120 Modbus communication for PLC/RTU whose Inter module communication code is “-R1” (hereafter referred to as FN120).

Before you read this document further, read “User’s Manual of FN120 Field Wireless Communication Module” (IM 01W03B02-01EN) and “User’s Manual of LN90 Interface Adapter (IM 01W03L01-01EN) throughly first. These documents describe a instruction of hardware for FN120 and LN90.

The table below lists the related documents including this document.

Title	Document No.
General Specifications FN120 Field Wireless Communication Module	GS 01W03B02-01EN
User’s Manual FN120 Field Wireless Communication Module	IM 01W03B02-01EN
General Specification LN90 Interface Adapter	GS 01W03L01-01EN
User’s Manual LN90 Interface Adapter	IM 01W03L01-01EN
User’s Manual FieldMate Versatile Device Management Wizard	IM 01R01A01-01E
General Specification FCN-RTU Low Power Autonomous Controller Functions	GS 34P02Q02-01E
General Specification FCN Autonomous Controller Functions (FCN-500)	GS 34P02Q03-01E
User’s Manual NPAS POU - Overview	IM 34P02P25-01E

Safety Precautions

Regarding safety precautions of FN120, refer to User's Manual of FN120 (IM 01W03B02-01EN)

Copyright and Trademark Notice

Copyright

Trademark Acknowledgments

- FieldMate, STARDOM and FAST/TOOLS are either trademarks or registered trademarks of Yokogawa.
- Microsoft, Windows, Windows Server and Microsoft .NET Framework are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- All other company and product names mentioned in this User's Manual are trademarks or registered trademarks of their respective companies.
- We do not use ™ or ® mark to indicate those trademarks or registered trademarks in this User's Manual.

Document Conventions

Typographical Convention

The following typographical conventions are used throughout the manual.

Conventions commonly used throughout manuals

Character string to be entered

The characters to be entered are shown in one-byte characters as follows:

Example:

FIC100.SV=50.0

"△" mark

Indicates a space between character strings to be entered.

Example:

AL △ PIC010 △ -SC

Character string enclosed in curly brackets ({ })

Indicates an optional characters that can be omitted.

Example:

PR △ TAG {△. Sheet name}

Conventions used to show key or button operations

Characters enclosed in square brackets ([ ])

Characters enclosed in square brackets show the names of buttons used during the explanation of the software operation.

Example:

To execute the command, click [OK].

Characters enclosed in angle brackets (< >)

Characters enclosed in angle brackets show the title of the screen during the explanation of the software operation.

Characters enclosed in corner brackets ([ ])

Characters enclosed in corner brackets show a tab or an item of the screen during the explanation of the software operation.

Symbols used in the manual

The symbol used in the manual are described in "User's Manual FN120 Field Wireless Communication Module" (IM 01W03B01-01EN).

Drawing Conventions

Some drawings may be partially emphasized, simplified or omitted for the convenience of description.

Some screen image depicted in this document may have different display positions or character types (e.g., upper/lower case). Also note that some of the images contained in this document are display examples.

Information of Revision

Material Name : FN120 Modbus Communication for PLC/RTU
Material Number : IM 01W03B02-21EN

Edition	Date	Page	Revised Item
1st	Aug. 2026	—	New Issue

Part A Outline of Field Wireless System Configuration

FN120, LN90 Interface Adapter (hereafter simply referred to as LN90), field wireless devices and a remote terminal unit (RTU) or a programmable logic controller (PLC) are used to build an industrial wireless network that based on to ISA100.11a, the wireless communication standard for industrial automation specified by the International Society of Automation (ISA). ISA100.11a is approved as an international standards (IEC 62734) by International Electrotechnical Commission (IEC).

A1. Typical system configuration

This chapter describes the typical configuration of field wireless system that can be established using these devices.

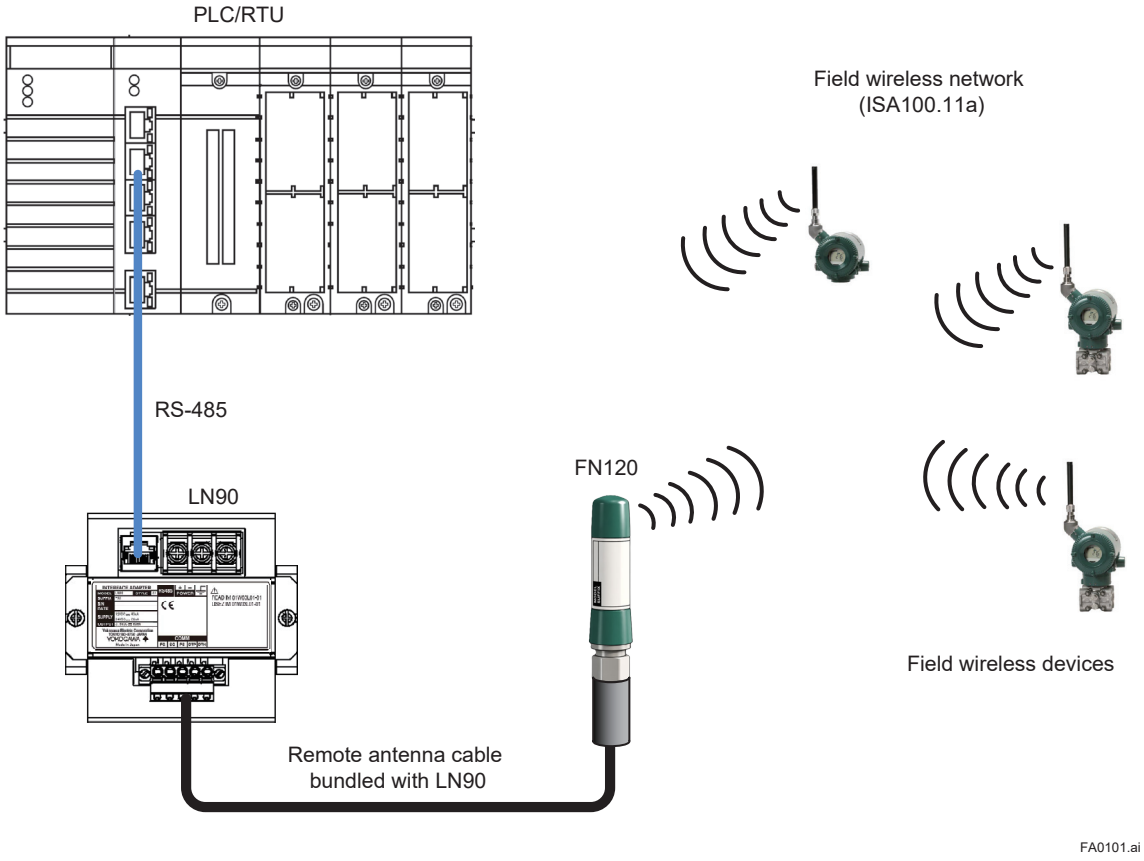


Figure A1-1 System configuration example

This is typical configuration to monitor and record the process data of field wireless devices.

This system consists of field wireless devices, FN120, LN90, and RTU or PLC supporting Modbus/RTU communication. FN120 supports up to 20 field wireless devices.

Part B Product Description

This part outlines the functions and hardware configuration of FN120.

FN120 is a core device in the field wireless network, and it is used for configuration and management of a field wireless network and for data transfer to the host system.

B1. Function Outline of FN120

The following outlines FN120 functions. FN120 has System Manager, Security Manager, and Gateway functions based on ISA100.11a. Also this device has wireless network configuration and management function.

B1.1 System Manager

The System Manager controls the wireless communication of field wireless devices. It establishes a communication path to each field wireless devices, monitors the Join or Leave status and health status of each field wireless device, and notifies the host system of these status. Also, this function determines the communication availability in conjunction with the Security Manager.

B1.2 Security Manager

The Security Manager has a key management and a device authentication functions.

The key management function creates, update and delete keys for communication authentication and encryption. The device authentication function allows only field wireless devices with the correct Join key and other security materials to join to the network.

B1.3 Gateway

FN120 provides the Modbus/RTU slave function for the host system. The host system can get sensor values, device status and so on which are transmitted by field wireless devices, and set field wireless system parameters by writing values to Modbus holding register of FN120. All values are pre-assigned to the Modbus registers, so no Modbus configuration of FN120 is required.

B1.4 Configuration and Management Functions and Others

FN120 is designed to start an operation with minimum-configuration. Typical configuration and management of field wireless system can be executed by the host system through Modbus interface.

For advanced configurations and maintenance, ISA100 Wireless Gateway Assistant is required. The software tool is included in FieldMate.

B2. Installation

Refer to User's Manual of FN120 (IM 01W03B02-01EN) and User's Manual of LN90 (IM 01W03L01-01EN) for details such as hardware installation, power, ground and wiring.

Part C System Construction

This part describes the workflow and content of the engineering in order to construct the field wireless system.

C1. Engineering Procedures

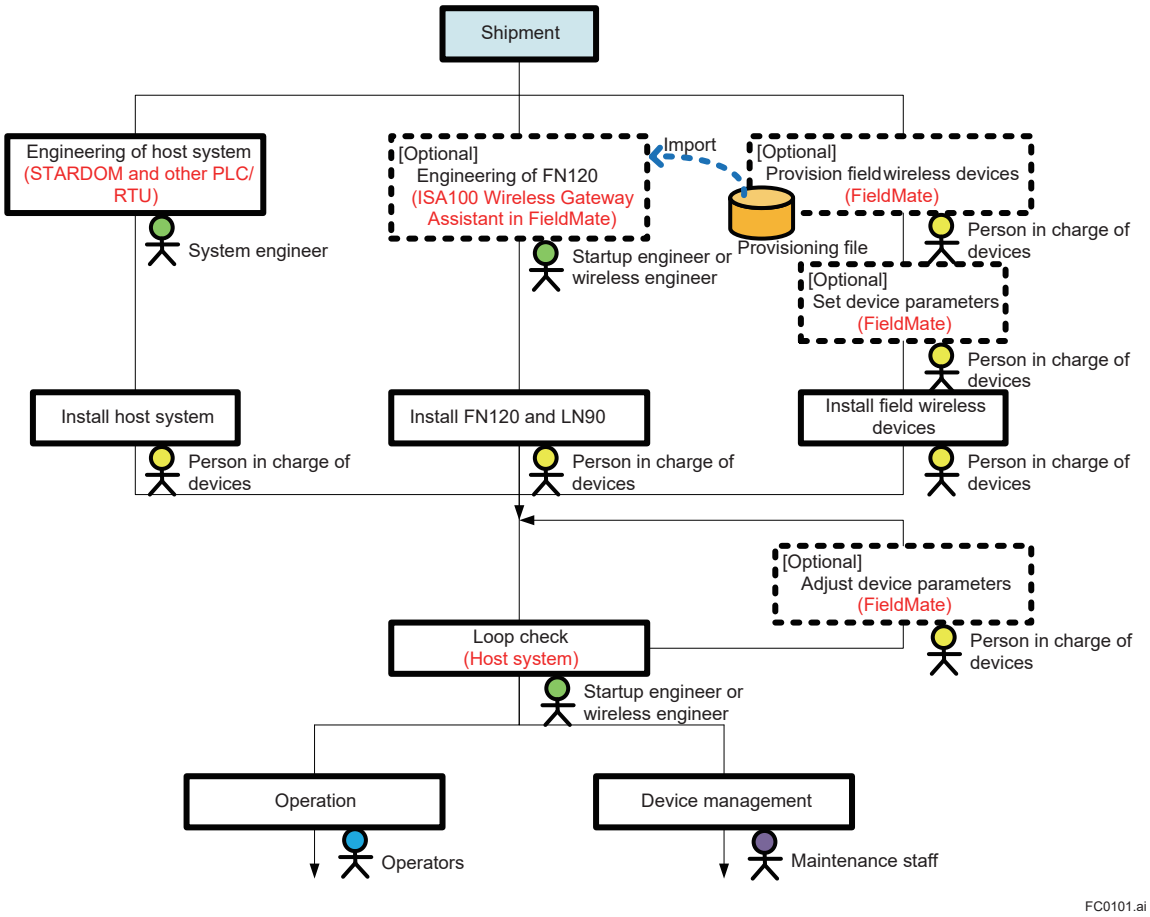


Figure C1-1 Engineering Flow for Wireless System Construction

The explanations in this document are based on the assumption that all engineering in the wireless system construction is executed after the delivery of the components to the customer. When Yokogawa Electric Corporation received an order that include the engineering, the procedure may differ from the flow shown in Figure C1-1.

As shown in Figure C1-1, in order to construct a field wireless system that has been specifically designed according to a customer's request, there are following types of engineering items.

(1) Provisioning field wireless devices (Optional)

(2) Setting and adjusting device parameters (Optional)

(3) Engineering of FN120 (Optional)

(4) Engineering of host system

C1.1 Provisioning field wireless devices (Optional)

A provisioning is a task to set the security and network information necessary for the field wireless devices to join the field wireless network. FN120 supports multiple OOB (provisioning via infrared communication) provisioning methods and customer can choose the suitable method depending on your requirement for security and convenience.

Field wireless devices that are not provisioned or devices for which incorrect information is set cannot join the field wireless network.

IMPORTANT

By specifying the following items as ordering information, Yokogawa's field wireless devices are shipped after performing OOB provisioning "Does not use a provisioning information file" at the factory and the task "Provision field wireless devices" in Figure C1-1 can be skipped. Regarding ordering information, refer to each general specification of field wireless device.

- Device Tag
- Network ID

Parameters set by Provisioning

Provisioning sets the device tag, network ID and join key to the field wireless device:

- Device tag

  A name assigned to the field wireless device for identifying the device. Set a name that is unique on the field wireless network.

- Network ID

  An identifier of the field wireless network to which the field wireless device joins. Set a decimal value from 2 to 65535.

- Join key

  The join key is a 128-bit encryption key used for secure joining of the field wireless device. It is automatically generated by the provisioning.

Provisioning methods supported by FN120

- OOB provisioning "Does not use a provisioning information file"

  This is recommended method, because this method does not require the ISA100 Wireless Gateway Assistant for registering field wireless devices to the FN120.

- OOB provisioning "Uses a provisioning information file"

  This method requires ISA100 Wireless Gateway Assistant to install the provisioning information into FN120.

When performing OOB provisioning, use FieldMate R3.01.00 or later versions.

For details, see Part N ISA100 Device Configuration in the FieldMate User's Manual (IM 01R01A01-01E).

C1.2 Setting and Adjusting of field wireless devices (Optional)

Field wireless devices' parameters such as sensor range, alert, diagnostic configuration and so on can be set or adjust via an infrared communication by using FieldMate before operation. Because FN120 doesn't support field wireless device configuration via field wireless network, an infrared or proprietary interface is required to field wireless devices when changing configuration.

IMPORTANT

By specifying device parameters as ordering information, Yokogawa's field wireless devices are shipped after setting parameters at the factory and the tasks "Set/Adjust field wireless devices" in Figure C1-1 can be skipped. Regarding ordering information, refer to each general specification of field wireless device.

When performing parameter settings/adjustment before installing the device, use FieldMate R2.03.00 or later versions.

C1.3 Engineering of FN120 (Optional)

FN120 is designed to start an operation with minimum-configuration. Network ID, update period of sensor values and device tag of each field wireless device can be configured by a host system through Modbus interface. In this case, the task "Engineering of FN120" in Figure C1-1 can be skipped.

If advanced configuration such as channel blacklist, baud rate of RS-485, importing provisioning file and so on is required, ISA100 Wireless Gateway Assistant should be used. For details, refer to Part E ISA100 Wireless Gateway Assistant.

ISA100 Wireless Gateway Assistant is a part of FieldMate R3.03 or later. Because ISA100 Wireless Gateway Assistant uses Modbus communication, ISA100 Wireless Gateway Assistant can't be used when the host system is connected to FN120.

C1.4 Engineering of host system

This task is the engineering of host system by the system engineer. The task targets system application which reads process data via Modbus/RTU. STARDOM, DAQMASTER and other companies' RTU/PLC can be connected to FN120.

The application of host system should behave as following steps.

1. When FN120 is started, the host system reads configuration information from FN120.
2. If there is difference between received configuration and expected configuration, the host system writes expected values to FN120.
3. After writing parameters, stop it and start to read measurement values from field wireless devices.

Regarding Modbus communication, refer to Part D.

When STARDOM is used as the host system, refer to Part I. Otherwise, see the User's Manual for the relevant host system.

IMPORTANT

When configuration is changed using ISA100 Wireless Gateway Assistant, a host system cannot write configuration to the FN120.
Before connecting the FN120 to a host system, restore the FN120 to its initial configuration using the ISA100 Wireless Gateway Assistant.
The backup files for restoring to the initial settings (FN120_initial.bkup) are included in FieldMate R3.04.06 or later.

C2. Tools for the Engineering

In Figure C1-1 Engineering Flow for Wireless System Construction, the tools described in this User's Manual are shown in parentheses alongside the tasks.

This chapter describes the following tools included in Figure C1-1.

- Engineering tools for PLC/RTU
- ISA100 Wireless Gateway Assistant
- FieldMate

C2.1 Overview of the Tools

Engineering tools for PLC/RTU

This is a separately provided application for setting the parameters of the host system. When STARDOM is used as the host system, refer to Part I. Otherwise, see the User's Manual for the relevant host system.

ISA100 Wireless Gateway Assistant

ISA100 Wireless Gateway Assistant is a part of FieldMate. For advanced confiugration such as importing provisioning file, baud rate of RS-485 or selecting radio channels, this tool is required.

FieldMate

This is a separately provided application for setting the parameters of the field device.

FieldMate provisions and configures field wireless devices via an infrared data communication. Prepare the infrared adapter specified in the FieldMate User's Manual (IM 01R01A01-01E).

For details of operation, see the FieldMate User's Manual (IM 01R01A01-01E).

C3. Starting up the Field Wireless System

This chapter describes how to start up the field wireless system and check the communications quality.

C3.1 Procedure for System Start up

After following the connection instruction in section 4 and 5 of LN90 User's Manual (IM 01W03L01-01EN), start up the field wireless system in the following sequence.

1. Host system
2. LN90; FN120 will be started by powering on LN90
3. Field wireless devices

Power on LN90, and wait approximately 1 minute , then confirm RS-485 communication status on the host system.

Next, start up field wireless devices. The method of starting up the devices depends on a status of devices, if a device is in a deep sleep mode, remove a battery of the device once and plug it back in again. If a device is in a radio silence mode, it will automatically start up and start connecting to the target network within an hour. For detailed instructions on starting up of device, refer to the user's manual of each device.

Check that all field wireless devices have connected on the host system. After confirming that all field wireless devices have connected to the target network, when 3 to 6 hours have elapsed, check data reachability and status of the field wireless devices. If there is any problem with communication quality, reconsider the positions of the field wireless devices and/or antennas and adjust them. For details of how to check statuses of field wireless devices and FN120, see Section C3.2 Wireless Network Management.

C3.2 Wireless Network Management

Check that FN120 is an active and all communication qualities are stable, then the system will be a normal operation.

Since the communication quality is affected by the environment of the communication paths. Even after checking that communications are stable, various causes (installation of structures or machines, arrival of a large vehicle, temporary construction installations, or new installation of wireless networks using the same frequency on a different wireless LAN) may lead to deterioration. To keep a stable field wireless network, requires regular status monitoring and maintenance of the wireless network.

Statuses of field wireless devices and FN120 are mapped on the Modbus register of FN120. For details, refer to D2.

Part D Modbus Communication

This part describes Modbus communication configuration and Modbus register mapping information of FN120. FN120 supports Modbus/RTU and acts as Modbus slave device. When using STARDOM as the host system, skip this chapter and refer to Part I.

D1. Communication Specification

This chapter describes Modbus communication specification of FN120. Set following parameters to the host system to access FN120.

Table C4-1 Modbus communication specifications

Item	Item	Specifications
Serial communication	Protocol	RS-485 2-wire connection, half duplex
	Flow control	NONE
	Baud Rate*1	38.4 kbps
	Data Length	8
	Stop bit*1	1
	Parity*1	NONE
Modbus/RTU	Role	Modbus slave
	Slave Address*1	1
	Response time	Less than 20 ms @ 38.4 kbps
	Number of master device	1 master device
	Supported function code	0x03: Read Holding Registers 0x04: Read Input Registers 0x10: Write Multiple Registers

*1: These parameters can be changed by ISA100 Wireless Gateway Assistant

D2. Modbus Registers

FN120 acts as Modbus slave device and provides the input register and the holding register to the host system. All parameters which FN120 provides are pre-assigned to registers, so there is no configuration for Modbus registers.

This chapter describes the mapping information of Modbus registers.

D2.1 Modbus Holding Register

Table D2-1 shows the mapping information of Modbus holding register.

Table D2-1 Modbus holding register

Addr.	Name	Size [word]	R/W	Description
0	GW_CONFIG	50	R/W	Parameters of FN120 configuration. Refer to D3.1.
50	DEV_CONFIG_ENTRIES	340	R/W	Parameters of field wireless devices. Refer to D3.2.
390	Reserved	60	—	
450	GW_STATUS	9	RO	Status information of FN120. Refer to D3.3.
459	GW_INFO	9	RO	Static information of FN120. Refer to D3.4.
468	Reserved	32	—	
500	DEV_STATUS_ENTRIES	180	RO	Diagnostic information of field wireless devices. Refer to D3.5.
680	Reserved	320	—	
1000	DEV_DIAG_STATUS_ ENTRIES	60	RO	Diagnostic information of field wireless devices. Refer to D3.6.
1060	Reserved	440	—	
1500	AI_PV_ENTRIES	480	RO	AI values from field wireless devices. Refer to D3.7.
1980	Reserved	1020	—	
3000	BI_PV_ENTRIES	320	RO	BI values from field wireless devices. Refer to D3.8.

The host system can change the configuration by writing parameters of GW_CONFIG or DEV_ CONFIG_ENTRIES, but these values will be reset when FN120 turns off as follows.

- When ISA100 Wireless Gateway Assistant is not used, the parameters reset to factory default values.
- Otherwise, the parameters reset to values which are changed by ISA100 Wireless Gateway Assistant.

D2.2 Modbus Input Register

The mapping information of Modbus input register is same as Modbus holding register. All parameters are exact copied from Modbus holding register.

D3. Data Structures

FThis chapter describes data structures which are mapped into Modbus registers of FN120. The byte order of all data which are assigned to Modbus registers of FN120, are “Big Endian” (network byte order). And the unit of the “size” column of each table is “word (2 bytes)”.

D3.1 GW_CONFIG

GW_CONFIG includes the field wireless configuration parameters. GW_CONFIG is mapped from Modbus register address 0. Table D3-1 shows structure of GW_CONFIG.

Table D3-1 Structure of GW_CONFIG

Addr.*1	Name	Type	R/W	Size	Description	Initial value
0	Reserved	—	—	1	Reserved.	0
1	UTC_Time	UINT32	R/W	2	The clock of FN120. The elapsed time since 1970/1/1 0:00:00 in seconds.	0
3	Network_ID*1	UINT16	R/W	1	Network ID. Possible values are 0 and from 2 to 65535. When it is set to 0, radio waves will be stopped.*3	0
4	Reserved	—	—	1	Reserved.	0
5	Default_Pub_ Period*2	INT16	R/W	1	Default publication period for all devices. If Pub_Period of DEVnn_ CONFIG is “-1”, this value is used. Possible values are 2, 4, 8, 16, 30, 60, 120, 300, 600, 1200, 1800, and 3600. *4	60
6	Reserved	—	—	44	Reserved.	0

*1: This address indicates offset from Modbus register address 0.
*2: When the value is changed to different, FN120 will be restarted.
*3: If the network ID is set to a value other than 0, radio waves will be outputted. The radio channels that can be used are regulated by the radio law of each country. If there is a channel restriction by country, please set the channels to be used by ISA 100 Wireless Gateway Assistant. Refer to Part E for details.
*4: To set 1 for publication period, ISA100 Wireless Gateway Assistant should be used. Refer to Part E for details.

D3.2 DEV_CONFIG_ENTRIES

DEV_CONFIG_ENTRIES includes the field wireless device specific configuration. DEV_CONFIG_ENTRIES is mapped from Modbus register address 50. There are 20 DEV_CONFIG entries in DEV_CONFIG_ENTRIES structure. Table D3-2 shows structure of DEV_CONFIG_ENTRIES, and table D3-3 shows structure of DEV_CONFIG.

Table D3-2 Structure of DEV_CONFIG_ENTRIES

Addr.*1	Name	Type	Size	Description
0	Dev01_Config	DEV_CONFIG	17	Field wireless device #01
17	Dev02_Config	DEV_CONFIG	17	Field wireless device #02
34	Dev03_Config	DEV_CONFIG	17	Field wireless device #03
…	…	DEV_CONFIG	…	…
323	Dev20_Config	DEV_CONFIG	17	Field wireless device #20

*1: This address indicates offset from the start address of DEV_CONFIG_ETNRIES. Actual register address is “50 plus these offset”.

Table D3-3 Structure of DEV_CONFIG

Addr.*1	Name	Type	R/W	Size	Description	Initial value
0	Reserved	-	-	1	Reserved	0
1	Pub_Period*2	INT16	R/W	1	Publication Period for each device. Possible values are -1, 2, 4, 8, 16, 30, 60, 120, 300, 600, 1200, 1800, and 3600. *3 When it is set to -1, the value in Default_Pub_Period is applied instead.	-1
2	Reserved	-	-	3	Reserved	0
5	Device_Tag*2	Strings	R/W	9	Max. 16 characters. Uppercase alphabet, numeric, hyphen(-) and underscore(_) are acceptable.	TAGnn*4
14	Reserved	-	-	3	Reserved	0

*1: This address indicates offset from the start address of each DEV_CONFIG shown in table DATA_STATUS_ENTRIES.
*2: When the value is changed to different, corresponding field wireless device will be restarted.
*3: To set 1 for publication period, ISA100 Wireless Gateway Assistant should be used. Refer to Part E for details.
*4: For the part of “nn”, numeric value corresponding to the order of DEV_CONFIG is used. (e.g., TAG01, TAG02 …, TAG20)

D3.3 GW_STATUS

GW_STATUS includes status of FN120. GW_STATUS is mapped from Modbus register address 450. Table D3-4 shows structure of GW_STATUS.

Table D3-4 Structure of GW_STATUS

Addr.*1	Value	Type	R/W	Size	Description
0	Data_status	DATA_STATUS	RO	1	Always 0x0080
1	GW_condition	UINT16	RO	1	0: Normal, 1: Error
2	Reserved	-	RO	1	Reserved
3	GW_status	UINT16	RO	1	0: Ready, 1: Active
4	Reserved	-	RO	2	Reserved
6	Access_Counter	UINT16	RO	1	Access counter of Modbus registers.
7	Reserved	-	RO	2	Reserved

*1: This address indicates offset from the start address of GW_STATUS. Actual register address is “450 plus these offset”.

NOTE

FN120 increments the Access_Counter by receiving Modbus request from the host system. If FN120 is running, the host system gets different value every access.

D3.4 GW_INFO

GW_INFO includes static information such as version number and model number of FN120. GW_INFO is mapped from Modbus register address 459. Table D3-5 shows structure of GW_INFO.

Table D3-5 Structure of GW_INFO

Addr.*1	Name	Type	R/W	Size	Description
0	Data_Status	DATA_STATUS	RO	1	Always 0x0080
1	GW_Model_ID	UINT16	RO	1	Always 0x0065 (means FN120)
2	GW_Version*2	UINT16	RO	1	Gateway version
3	GW_Revision*2	UINT16	RO	1	Upper 2 digits: revision of gateway Lower 2 digits: sub-revision of gateway
4	Reserved	—	RO	5	Reserved

*1: This address indicates offset from the start address of GW_INFO. Actual register address is “459 plus these offset”.
*2: The gateway version is expressed as “GW_Version” dot “GW_Revision.upper 2 digits” dot “GW_Revision.lower 2 digits”.

NOTE

If GW_Model_ID is not 0x0065 (101 in decimal), FN120 is not connected. Other Modbus/RTU supported device may be connected or there may be trouble in RS-485 communication line.

D3.5 DEV_STATUS_ENTRIES

DEV_STATUS_ENTRIES includes status of field wireless devices. DEV_STATUS_ENTRIES is mapped from Modbus register address 500. There are 20 DEV_STATUS entries in DEV_STATUS_ENTRIES structure. Table D3-6 shows structure of DEV_STATUS_ENTRIES, and table D3-7 shows structure of DEV_STATUS.

Table D3-6 Structure of DEV_STATUS_ENTRIES

Addr.*1	Name	Type	Size	Description
0	Dev01_Status	DEV_STATUS	9	Field wireless device #01
9	Dev02_Status	DEV_STATUS	9	Field wireless device #02
18	Dev03_Status	DEV_STATUS	9	Field wireless device #03
…	…	…	…	…
171	Dev20_Status	DEV_STATUS	9	Field wireless device #20

*1: This address indicates offset from the start address of DEV_STATUS_ENTRIES. Actual register address is “500 plus these offset”.

Table D3-7 Structure of DEV_STATUS

Addr.*1	Value	Type	R/W	Size	Description
0	Data_Status	DATA_STATUS	RO	1	Always 0x0080
1	Device_Status	UINT16	RO	1	0: Connected 1: Not connected
2	Battery_Life	INT16	RO	1	0 >: remaining life in days < 0 : remaining life in hours 0x7FFF : External power supply
3	Reserved	-	RO	4	Reserved
7	Data_Reachability	UINT16	RO	1	0: Calculating 1: Poor 2: Fair 3: Average 4: Good 5: Excellent
8	Reserved	UINT16	RO	1	Always 0

*1: This address indicates offset from the start address of each DEV_STATUS shown in table D3-6.

D3.6 DEV_DIAG_STATUS_ENTRIES

DEV_DIAG_STATUS_ENTRIES includes diagnostic status of field wireless devices. DEV_DIAG_STATUS_ENTRIES is mapped from Modbus register address 1000. There are 20 DEV_DIAG_STATUS entries in DEV_DIAG_STATUS_ENTRIES structure. Table D3-8 shows structure of DEV_DIAG_STATUS_ENTRIES, and table D3-9 shows structure of DEV_DIAG_STATUS.

Table D3-8 Structure of DEV_DIAG_STATUS_ENTRIES

Addr.*1	Name	Type	Size	Description
0	Dev01_Diag_Status	DEV_DIAG_STATUS	3	Field wireless device #01
3	Dev02_Diag_Status	DEV_DIAG_STATUS	3	Field wireless device #02
6	Dev03_Diag_Status	DEV_DIAG_STATUS	3	Field wireless device #03
…	…	…	…	…
57	Dev20_Diag_Status	DEV_DIAG_STATUS	3	Field wireless device #20

*1: This address indicates offset from the start address of DEV_DIAG_STATUS_ENTRIES. Actual register address is “1000 plus these offset”.

Table D3-9 Structure of DEV_DIAG_STATUS

Addr.*1	Name	Type	R/W	Size	Description
0	Data_Status	DATA_STATUS	RO	1	Refer to D3.9
1	Diag_Status	UINT32	RO	2	Refer to the user’s manual of each field wireless device.

*1: This address indicates offset from the start address of each DEV_DIAG_STATUS shown in table D3-8.

D3.7 AI_PV_ENTRIES

AI_PV_ENTRIES includes analog measurement values from field wireless devices. FN120 can handle 8 AI channels per one field wireless device. AI_PV_ENTRIES is mapped from Modbus register address 1500. There are 160 AI_PV entries in AI_PV_ENTRIES structure. Table D3-10 shows structure of AI_PV_ENTRIES, and table D3-11 shows structure of AI_PV.

Table D3-10 Structure of AI_PV_ETNRIES

Addr.*1	Name	Type	Size	Description
0	DEV01_AI01.PV	AI_PV	3	AI1 in Field wireless device 1
3	DEV01_AI02.PV	AI_PV	3	AI2 in Field wireless device 1
6	DEV01_AI03.PV	AI_PV	3	AI3 in Field wireless device 1
9	DEV01_AI04.PV	AI_PV	3	AI4 in Field wireless device 1
12	DEV01_AI05.PV	AI_PV	3	AI5 in Field wireless device 1
15	DEV01_AI06.PV	AI_PV	3	AI6 in Field wireless device 1
18	DEV01_AI07.PV	AI_PV	3	AI7 in Field wireless device 1
21	DEV01_AI08.PV	AI_PV	3	AI8 in Field wireless device 1
24	DEV02_AI01.PV	AI_PV	3	AI1 in Field wireless device 2
27	DEV02_AI02.PV	AI_PV	3	AI2 in Field wireless device 2
…	…	…	…	…
456	DEV20_AI01.PV	AI_PV	3	AI1 in Field wireless device 20
459	DEV20_AI02.PV	AI_PV	3	AI2 in Field wireless device 20
462	DEV20_AI03.PV	AI_PV	3	AI3 in Field wireless device 20
465	DEV20_AI04.PV	AI_PV	3	AI4 in Field wireless device 20
468	DEV20_AI05.PV	AI_PV	3	AI5 in Field wireless device 20
471	DEV20_AI06.PV	AI_PV	3	AI6 in Field wireless device 20
474	DEV20_AI07.PV	AI_PV	3	AI7 in Field wireless device 20
477	DEV20_AI08.PV	AI_PV	3	AI8 in Field wireless device 20

*1: This address indicates offset from the start address of AI_PV_ENTRIES. Actual register address is “1500 plus these offset”.

Table D3-11 Structure of AI_PV

Addr.*1	Name	Type	R/W	Size	Description
0	Data_Status	DATA_STATUS	RO	1	Refer to D3.9
1	AI_Value	FLOAT	RO	2	Value of Analog input.

*1: This address indicates offset from the start address of each AI_PV shown in table D3-10

D3.8 BI_PV_ENTRIES

BI_PV_ENTRIES includes binary measurement values from field wireless devices. FN120 can handle 8 BI channels per one field wireless device. BI_PV_ENTRIES is mapped from Modbus register address 3000. There are 160 BI_PV entries in BI_PV_ENTRIES structure. Table D3-12 shows structure of BI_PV_ENTRIES, and table D3-13 shows structure of BI_PV.

Table D3-12 Structure of BI_PV_ETNRIES

Addr.*1	Name	Type	Size	Description
0	DEV01_BI01.PV	BI_PV	2	BI1 in Field wireless device 1
2	DEV01_BI02.PV	BI_PV	2	BI2 in Field wireless device 1
4	DEV01_BI03.PV	BI_PV	2	BI3 in Field wireless device 1
6	DEV01_BI04.PV	BI_PV	2	BI4 in Field wireless device 1
8	DEV01_BI05.PV	BI_PV	2	BI5 in Field wireless device 1
10	DEV01_BI06.PV	BI_PV	2	BI6 in Field wireless device 1
12	DEV01_BI07.PV	BI_PV	2	BI7 in Field wireless device 1
14	DEV01_BI08.PV	BI_PV	2	BI8 in Field wireless device 1
16	DEV02_BI01.PV	BI_PV	2	BI1 in Field wireless device 2
18	DEV02_BI02.PV	BI_PV	2	BI2 in Field wireless device 2
…	…	…	…	…
304	DEV20_BI01.PV	BI_PV	2	BI1 in Field wireless device 20
306	DEV20_BI02.PV	BI_PV	2	BI2 in Field wireless device 20
308	DEV20_BI03.PV	BI_PV	2	BI3 in Field wireless device 20
310	DEV20_BI04.PV	BI_PV	2	BI4 in Field wireless device 20
312	DEV20_BI05.PV	BI_PV	2	BI5 in Field wireless device 20
314	DEV20_BI06.PV	BI_PV	2	BI6 in Field wireless device 20
316	DEV20_BI07.PV	BI_PV	2	BI7 in Field wireless device 20
318	DEV20_BI08.PV	BI_PV	2	BI8 in Field wireless device 20

*1: This address indicates offset from the start address of BI_PV_ENTRIES. Actual register address is “3000 plus these offset”.

Table D3-13 Structure of BI_PV

Addr.*1	Name	Type	R/W	Size	Description
0	Data_Status	DATA_STATUS	RO	1	Refer to D3.9
1	BI_Value	UINT16	RO	1	Value of Binary input.

*1: This address indicates offset from the start address of each BI_PV shown in table D3-12.

D3.9 DATA_STATUS

DATA_STATUS is 2 byte length (= 1 word length in the Modbus register). The upper byte is always 0. The lower byte includes status. DATA_STATUS indicates quality of a data following the data status. The structure of DATA_STATUS is shown as below.

Table D3-14 Structure of DATA_STATUS

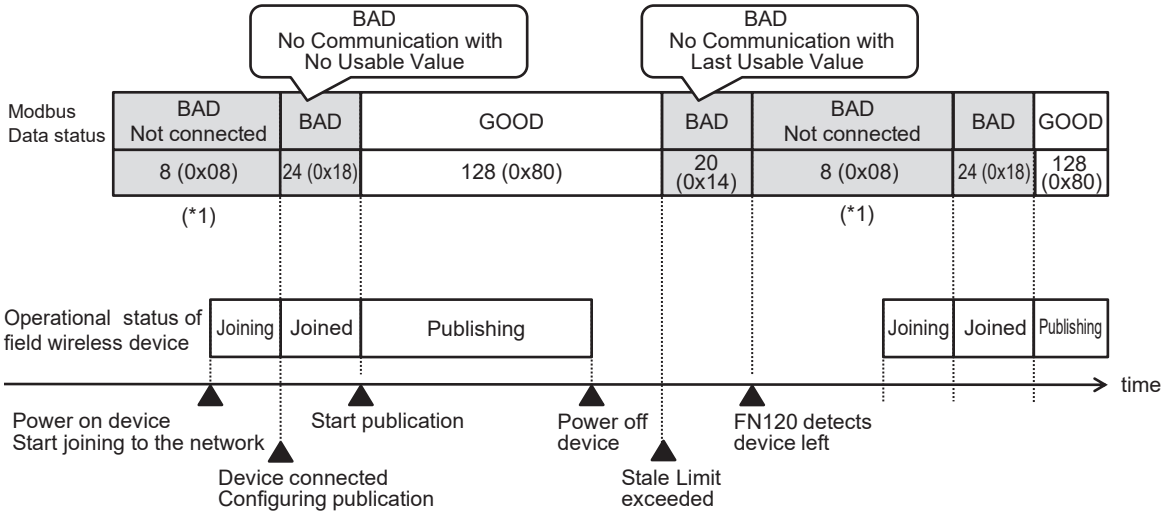
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Upper byte	Always 0 (0x00)							
	Quality		Reserved	Quality dependent sub-status			Limit condition	
Lower byte	0=Bad		This bit shall always be set to zero	0=Non-specific 1=Configuration error 2=Not connected*1 3=Device failure 4=Sensor failure 5=No communication with last usable value*2 6=No communication with no usable value*3 7=Out of service(value is not computed) All other values are reserved			0=Not limited 1=Low limit 2=High limit 3=Constant (both high and low limited)	
	1=Uncertain			0=Non-specific 2=Substituted or manual entry 4=Sensor conversion inaccurate 5=Range limits exceeded All other values are reserved				
	2=Good			0=No special conditions exist All other values are reserved				
	3=Reserved			All values are reserved.				

*1: This value indicates that the field wireless device is not connected to the field wireless network. The error may be caused by engineering mistakes in FN120 or, absence, power off or failure of field wireless device.

*2: This value indicates that the field wireless device is connected to the field wireless network, the data from the field wireless device has been received so far, but the data isn't received now. The error may be caused by network error or failure of field wireless device.

*3: This value indicates that the field wireless device is connected to the field wireless network, but the data from the field wireless device has never been received. The error may be caused by a preparation period of a data publishing which is normally occurs right after starting the field wireless devices or by the engineering mistakes in FN120.

Figure D3-1 shows an example of the relation among value of the data status and an operational status of a field wireless device.



*1: Modbus Data Status may be BAD non-specific (0x00), when the sampling data setting is [Auto]. Refer to E3.7 for detail.

Figure D3-1 Example of the relation between data status and device status (lower byte)

Part E ISA100 Wireless Gateway Assistant

This part describes the flow and work content of the engineering FN120 with ISA100 Wireless Gateway Assistant. Using the ISA100 Wireless Gateway Assistant is not mandatory. The tool can be used for detailed configuration.

E1. Preparation

This chapter describes preparation before using ISA100 Wireless Gateway Assistant. Since both the ISA100 Wireless Gateway Assistant and host system use Modbus communication, they cannot be connected simulataneously. To connect the ISA100 Wireless Gateway Assistant to the FN120, disconnect the cable between the host system and the LN90 in advance.

The ISA100 Wireless Gateway Assistant operates on Windows and is provided as part of FieldMate. An USB-RS485 adapter is required to communicate with FN120.

Figure E1-1 shows a typical configuration for ISA100 Wireless Gateway Assistant.

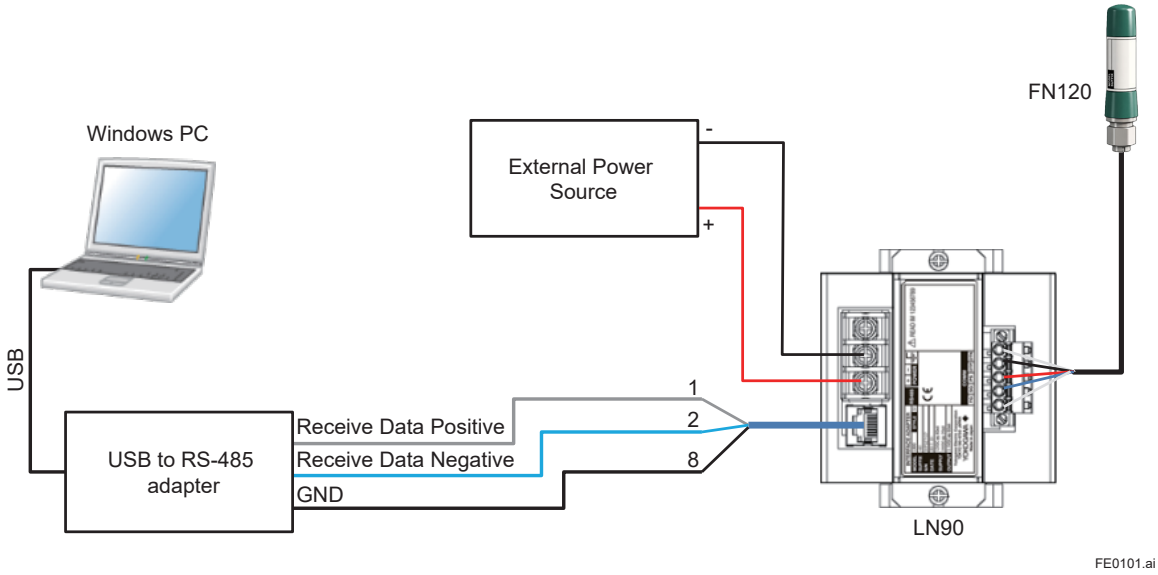


Figure E1-1 Typical configuration for ISA100 Wireless Gateway Assistant

Before launching ISA100 Wireless Gateway Assistant, connect the PC and LN90 using a USB-RS485 adapter. For detail wiring information, refer to LN90 User's Manual (IM 01W03L01-01EN).

The following USB-RS485 adapters have been verified to work properly.

Table E1-1 Verified USB-RS485 adapters

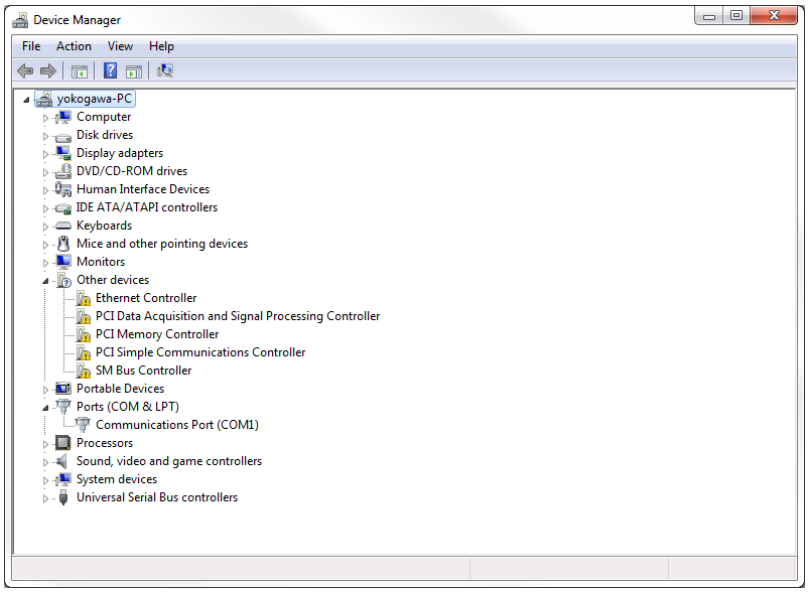
Manufacturer	Model	Remarks
BLACKBOX	SP390A-R2	Device driver: Version: v2.4.16.0 Supported OS : Windows10, 11
MOXA	UPort 1130I	Device driver: Version: v3.2 (Windows 10), v4.2 (Windows 11) Supported OS : Windows10, 11

E2. Launch ISA100 Wireless Gateway Assistant

This chapter describes launching and terminating ISA100 Wireless Gateway Assistant.

Launching ISA100 Wireless Gateway Assistant

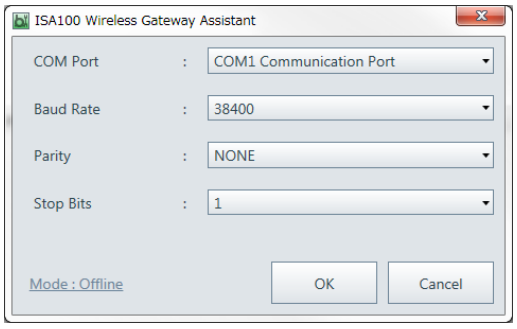
1. Connect the PC and LN90 using a USB-RS485 adapter. Refer to E1 for details.
2. Check the Device Manager to see whether the PC has detected the USB-RS485 adapter. To display the Device manager, select Control Panel on the start menu, select Hardware and Sound, then Device Manager. The window, as shown in Figure E2-1, will appear. When the PC has detected the USB-RS485 adapter, it will appear under COMx port. The letter “x” represents the COM port number. The COM port number assigned to the USB-RS485 adapter is needed at the start of ISA100 Wireless Gateway Assistant. In the example shown in Figure E2-1, the adapter is assigned to COM1.



FE0201.ai

Figure E2-1 Example of Device Manager window

3. After connecting the LN90 to a power source, launch the FieldMate. Once the work memu "Field Wireless Gateways" is selected on FieldMate Start Window or Work Selection Window, ISA100 Wireless Gateway Assistant will be launched. Then the window, as shown in Figure E2-2, will appear.



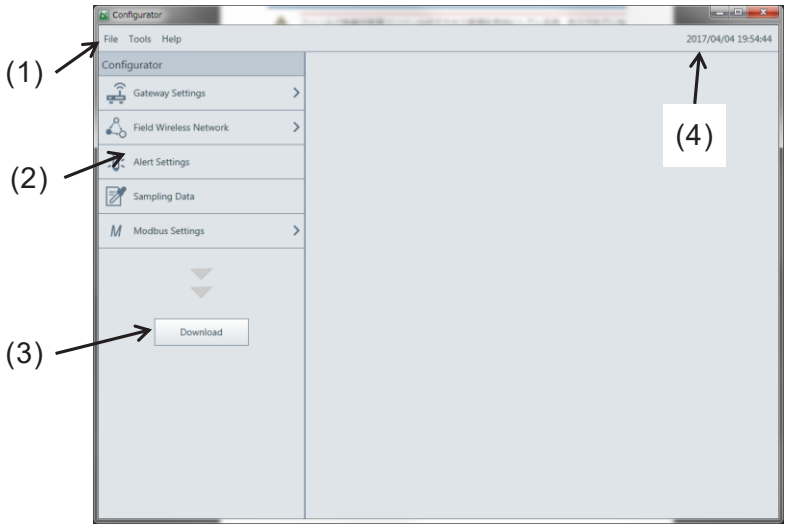
FE0202.ai

Figure E2-2 Serial communication setting dialog

If a serial communication setting of FN120 is changed from defaults, select parameters. Otherwise no need to change anything.

Item	Description	Default
COM Port	Specify the COM port checked in the step 2	—
Baud Rate	Select 9600, 19200, and 38400 bps.	38400
Parity	Select Odd, Even or None.	NONE
Stop Bits	Select 1, or 2 bits.	1
Mode : Offline	This function is for the use of service personnel and is not required for ordinary inspection and management.	—

Click [OK] button, then ISA100 Wireless Gateway Assistant tries to connect to FN120. When the communication is established, following window is shown.



FE0203.ai

Figure E2-3 Main window

No.	Name	Description
(1)	Menu bar	This consists of three menus; File, Tools and Help
(2)	Launcher menu	This is the menu list for configuration of FN120. When the “>” mark is displayed on the right side of the menu, by pressing the menu button displays sub menus under the menu.
(3)	Download button	This is for downloading configuration into FN120.
(4)	Load time	This is timestamp of reading configuration from FN120. When ISA100 Wireless Gateway is started, it reads configuration of FN120 at first.

4. Start operation on the window. Refer to E3 for details.

Terminating ISA100 Wireless Gateway Assistant by selecting

In order to terminate ISA100 Wireless Gateway Assistant, click the [x] button in the top right corner of the window. By clicking the [File] menu in the top left of the window and selecting [Exit] is also available.

E3. Engineering FN120

This chapter describes how to configure FN120.

E3.1 Configuration Items

ISA100 Wireless Gateway Assistant can configure following items.

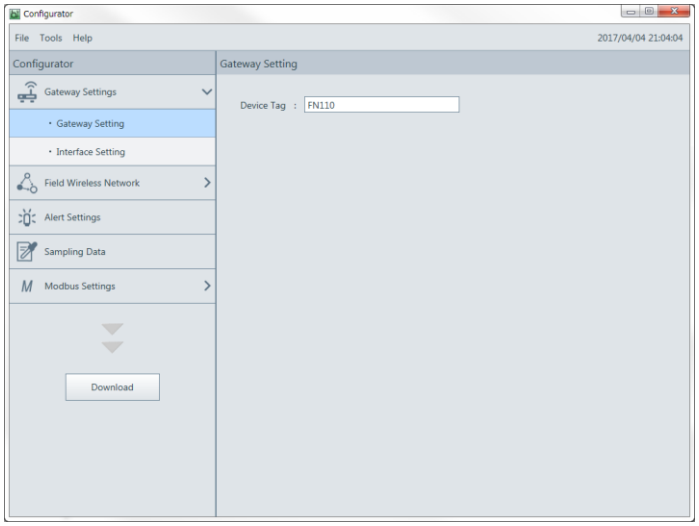
Table E3-1 Configuration Items

Launcher menu	Description
Gateway Settings	—
• Gateway Setting	Setting device tag of FN120
• Interface Setting	Setting serial communication parameters
Field Wireless Network	—
• Network Setting	Setting Network ID, radio frequency and radio transmission control.
• Device Setting	Registering and unregistering field wireless devices
Alert Settings	Not used.
Sampling Data	Setting parameters of publication from field wireless devices, such as update period, item and stale limit.
Modbus Settings	—
• Modbus Setting	Setting Modbus register mapping
• Registers Viewer	Showing Modbus register mapping information

After setting parameters, the configuration will be downloaded to FN120. Refer to E3.10 for details.

E3.2 Gateway Setting

Gateway Settings window allows changing a device tag of FN120. Gateway Setting window is a sub-menu of [Gateway Settings]. Figure E3-1 shows the [Gateway Setting] window.



FE0301.ai

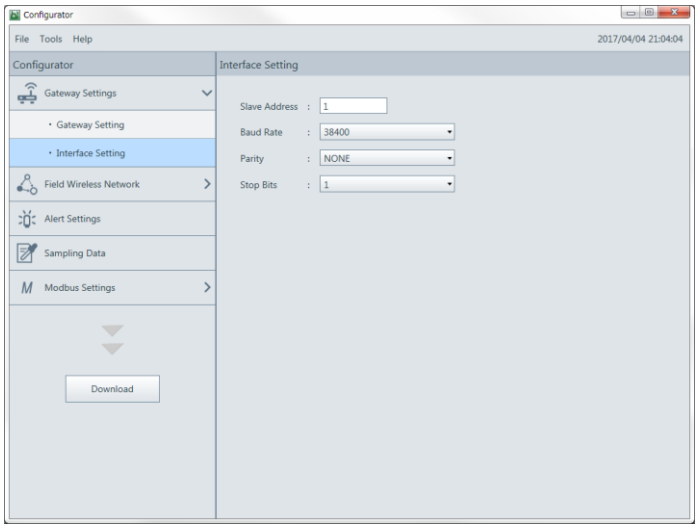
Figure E3-1 Gateway Setting window

The following is item in [Gateway Setting] window

Item	Description	Default
Device Tag	Device Tag of FN120 Max. 16 characters. Uppercase alphabet, numeric, hyphen(-) and underscore(_) are acceptable.	FN120

E3.3 Interface Setting

Interface Setting window allows changing serial communication parameters of FN120. Interface Setting window is a sub-menu of [Gateway Settings]. Figure E3-2 shows the [Interface Setting] window.



FE0302.ai

Figure E3-2 Interface Setting window

The following are items in [Interface Setting] window

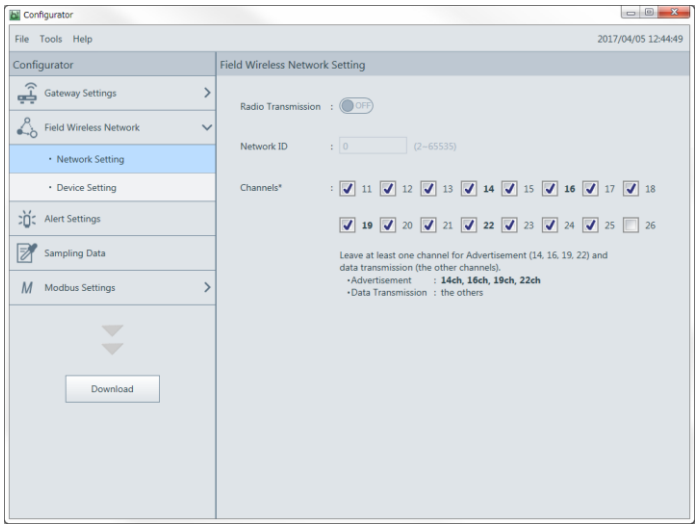
Item	Description	Default
Slave Address	Specify the slave address of Modbus/RTU for FN120 in a range of 1 to 127.	1
Baud Rate	Select 9600, 19200, and 38400 bps..	38400
Parity	Select Odd, Even or None.	NONE
Stop Bits	Select 1, or 2 bits.	1

IMPORTANT

When parameters of [Interface Setting] were changed, these parameters will be applied to FN120 after downloading configuration. And these parameters are required to start ISA100 Wireless Gateway Assistant next time.

E3.4 Network Setting

Network Setting window allows changing Network ID and radio configuration. Network Setting window is a sub-menu of [Field Wireless Network]. Figure E3-3 shows the [Network Setting] window.



FE0303.ai

Figure E3-3 Network Setting window

The following are items in [Network Setting] window

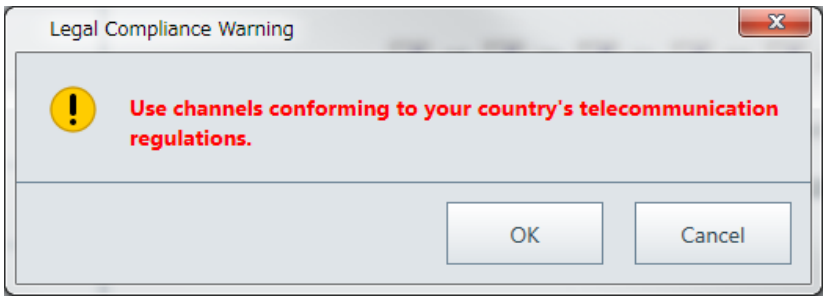
Item	Description	Default
Radio Transmission	Set ON / OFF for the radio transmission of FN120. When the radio transmission is turned ON, Network ID can be set.	OFF
Network ID	When the radio transmission is turned OFF, Network ID is 0. When radio transmission is turned ON, Specify Network ID in a range of 2 to 65535.	0
Channels	Select channels to be used in the field wireless system.	11-25ch are ON

■ Radio Transmission toggle switch

The [Radio Transmission] toggle switch controls outputting radio wave. Table E3-2 shows behavior of the switch on each state.

Table E3-2 Behavior of Radio Transmission toggle switch

State		Description
OFF		FN120 is stopping radio transmission. When the switch is clicked, a dialog as shown in Figure E3-4 appears asking users to confirm that the specified channels comply with local radio regulation. When the [OK] button in the dialog is clicked, [Network ID] field can be configurable. And the radio transmission will be started after downloading configuration.
ON		FN120 is transmitting radio wave with specified channels. When the switch is clicked, [Network ID] field becomes 0. And the radio transmission will be stopped after downloading configuration.



FE0304.ai

Figure E3-4 Confirmation dialog.

Channels

Usable wireless channels are regulated by national radio standards. With field wireless, 16 channels between 11 and 26 can be used. However, the default setting is FCC (US), which removes channel 26 because it cannot be used. The 15 channels between channel 11 and 25 that are permitted in most countries are selected. If there is a wireless channel that is not used because of additional national channel restrictions or the effects of interference with wireless LAN and other wireless transmissions cannot be tolerated, clear the check box of that channel. At least one channel for each “Advertisement” and “Data Transmission” should be selected.

Channels for Advertisement

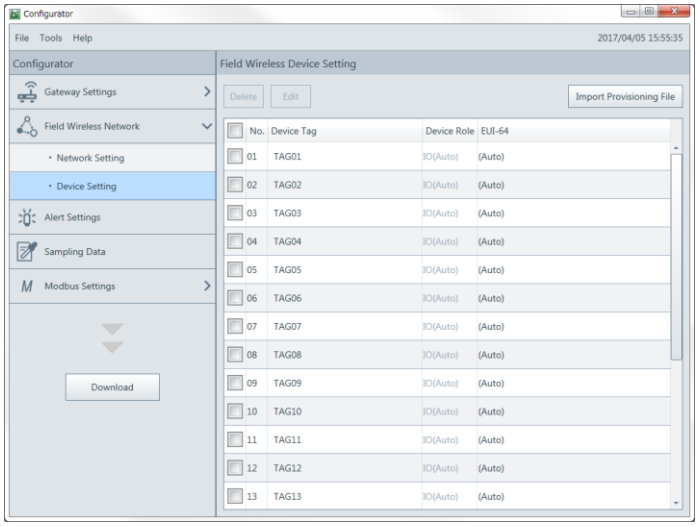
This is set the channels for advertisement message transmission. 14, 16, 19 and 22 channels are used by default.

Channels for Data Transmission

This is set the channels for data transmission. 11, 12, 13, 15, 17, 18, 20, 21, 23, 24 and 25 channels are used by default.

E3.5 Device Setting

Device Setting window allows managing field wireless devices. Device Setting window is a sub-menu of [Field Wireless Network]. Figure E3-5 shows the [Device Setting] window.



FE0305.ai

Figure E3-5 Device Setting window

The following are items in [Device Setting] window

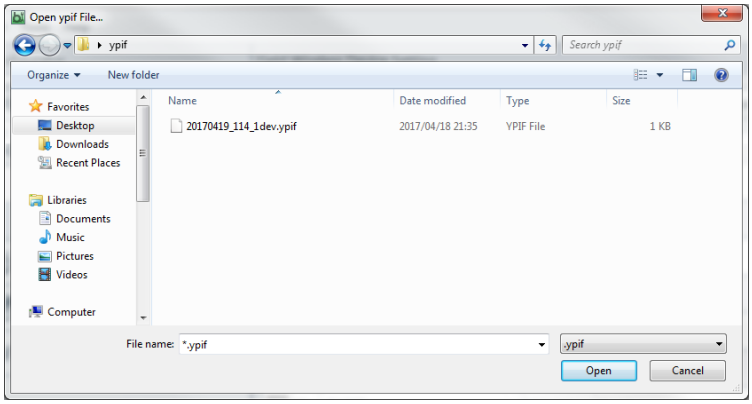
Item		Description	Default
Buttons	Delete	Deleting selected field wireless devices from the list. Select field wireless devices by turning on the check box and click [Delete] button, then selected devices will be deleted from the list; [Device Tag] becomes blank and other items become default value.	—
	Edit	Editing selected field wireless device. Select one field wireless device by turning on the check box and click [Edit] button, then [Field Device Setting] dialog as shown in Figure E3-6 is displayed. The same dialog is also appeared by double-clicking the line of the list.	—
	Import Provisioning File	Registering field wireless devices by importing the provisioning file. If there are field wireless devices provisioned by using OOB provisioning “Uses a provisioning information file”, registering these devices by importing the file is required.	—
Device list	No. column	This is the identification number of the field wireless device registered in FN120.	01 to 20
	Device Tag column	This is a device tag of the field wireless device registered in FN120.	TAGnn “nn” is numeric character in range 01 to 20.
	Device Role column	This is the role of field wireless devices. [Device Role] can’t be changed in FN120 engineering. [Device Role] is always “IO(Auto)”.	IO(Auto)
	EUI-64 column	64bit Extended Unique Identifier. If the device is imported from the provisioning file, EUI-64 is shown in this field. Otherwise, this column becomes “(Auto)”.	(Auto)

Registering field wireless devices provisioned by OOB provisioning “Does not use a provisioning information file”

If field wireless devices to be registered are provisioned with device tag “TAG01 to TAG20”, any configuration doesn’t need to change. The devices should be provisioned by OOB provisioning “Does not use a provisioning information file” or should be ordered with specifying both of Network ID and Tag Name. Otherwise change the Device Tag in [Field Device Settings] window to specified device tag in the provisioning process.

Registering field wireless devices with importing a provisioning file

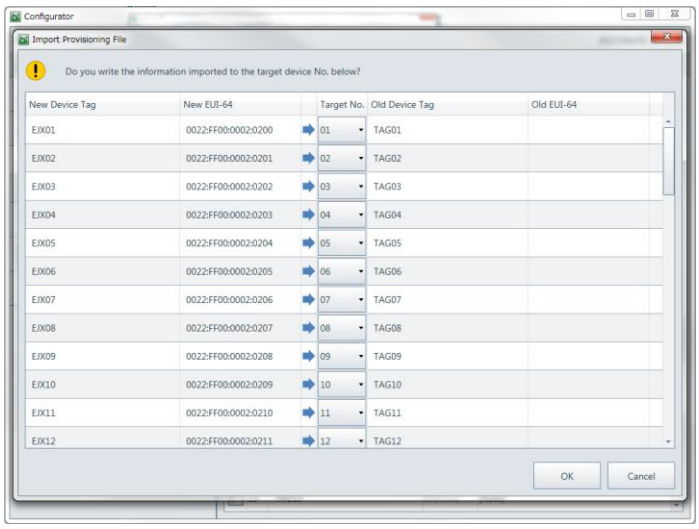
If field wireless devices are provisioned by OOB provisioning “Uses a provisioning information file”, click [Import Provisioning File] button to register devices.



FE0306.ai

Figure E3-6 Open ypif File dialog

Select the provisioning file, the window shown in Figure E3-7 appears.



FE0307.ai

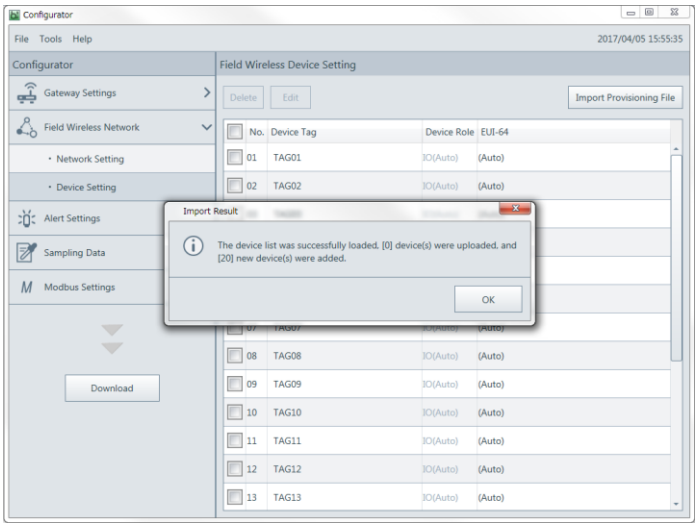
Figure E3-7 Import Provisioning File window (adding new devices)

The following are items in [Import Provisioning File] window

Item	Description
New Device Tag	Pair of device tag and EUI-64 of the new field wireless device to be registered. These parameters are imported from the provisioning information file.
New EUI-64	
Target No.	Select a number of the target field wireless device to be replaced with the new field wireless device. The numbers of devices which are already registered from the provisioning information file and of which device tag and EUI-64 are different from the new device's, are not listed in the drop-down menu. When the device tag or EUI-64 matches*1, the device in the provisioning information is able to be overwritten to the corresponding number. Otherwise in order to replace registered device, delete existing device at first.
Old Device Tag *	Pair of device tag and EUI-64 of the field wireless device to be replaced. The device is selected by [Target No.] drop-down menu.
Old EUI-64 *	

*1: If matched, an asterisk mark is appeared in [Old Device Tag] or [Old EUI-64] columns.

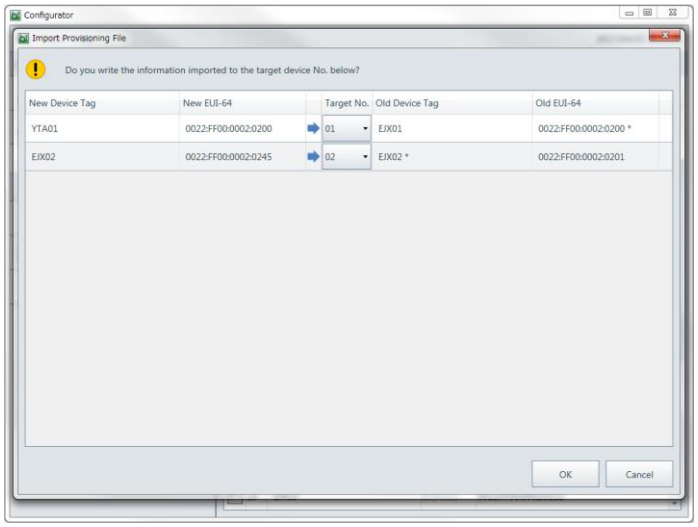
When [OK] button is clicked, the new devices are added and [Import Result] dialog appears as shown in Figure E3-8.



FE0308.ai

Figure E3-8 Import Result dialog (adding new devices)

If the field wireless devices tag already contains information of registered devices when the provisioning file information is imported, a window shown in Figure E3-9 appears instead of Figure E3-7.

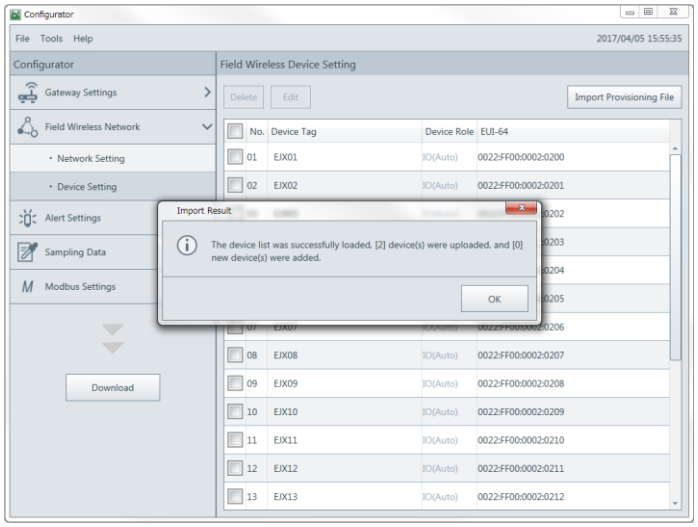


FE0309.ai

Figure E3-9 Import Provisioning File window (updating existing information)

When device tag or EUI-64 included in the provisioning file is already registered, the [Older Devices Tag] or [Older EUI-64] columns displays with an asterisk mark. In this example, the window indicates that 2 devices included in the provisioning file have already been registered and [Target No.] of each entry is selected.

When the [OK] button is clicked, the registration information of devices is updated.



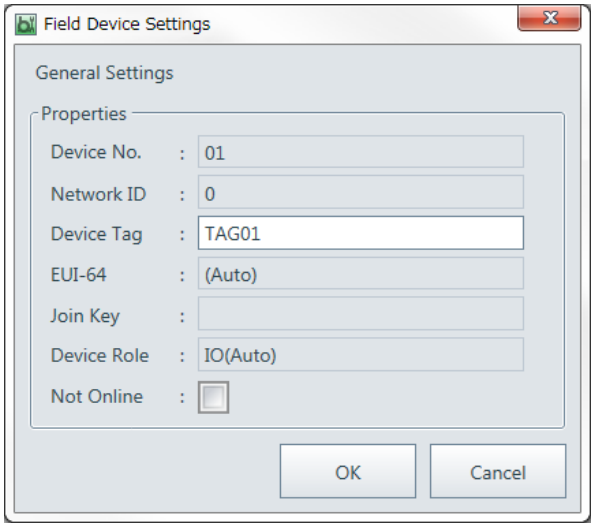
FE0310.ai

Figure E3-10 Import Result dialog (updating existing information)

After the information has been imported to the device list, the dialog shown in Figure E3-10 appears. Click the [OK] button to close this window. This dialog indicates that 2 field wireless devices were updated in this example.

Editing field wireless device

Select one field wireless device and click [Edit] button, then [Field Device Setting] dialog as shown in Figure E3-11 is displayed.



FE0311.ai

Figure E3-11 Field Device Setting dialog

The following are items in [Field Device Setting] window

Item	Description	Default
Device No.	This is an identification number of field wireless devices registered in FN120.	01 to 20
Network ID	The ID of the field wireless network. The value is copied from [Network Setting] window.	0
Device Tag	This is a device tag of the field wireless device.	TAGnn “nn” is numeric character in range 01 to 20.
EUI-64	64bit Extended Unique Identifier. If the provisioning file is imported, EUI-64 is copied from the file. Otherwise “(Auto)” is shown in the field.	(Auto)
Join Key	This field is always blank. Customer doesn’t need to care about this field. The key is generated automatically in the provisioning process. This key is used for device authentication when field wireless device is connecting the field wireless network.	Blank
Device Role	This field is always “IO (Auto)”	IO(Auto)
Not Online	Select whether to prevent the relevant device from joining (check box selected)	Check box cleared (Join)

Deleting field wireless device

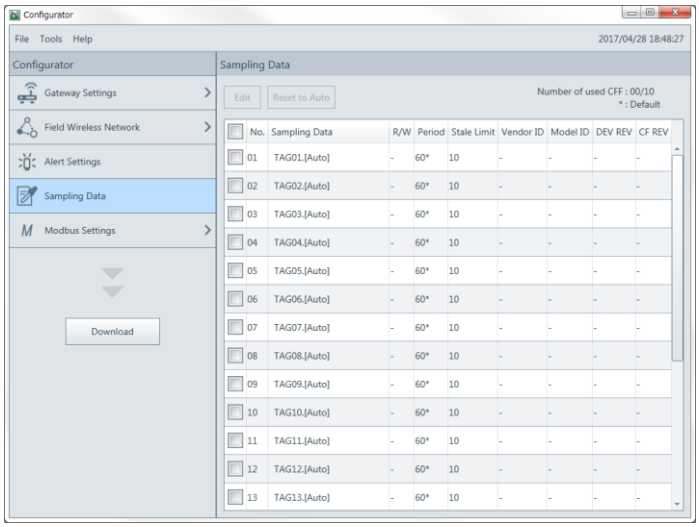
Turn on the check box of field wireless devices to be deleted in the list and click [Delete] button. After downloading configuration to FN120, the devices will be left from the field wireless network when the devices are connected.

E3.6 Alert Settings

Alert Settings window is not used for FN120 engineering. Do not change any parameters.

E3.7 Sampling Data

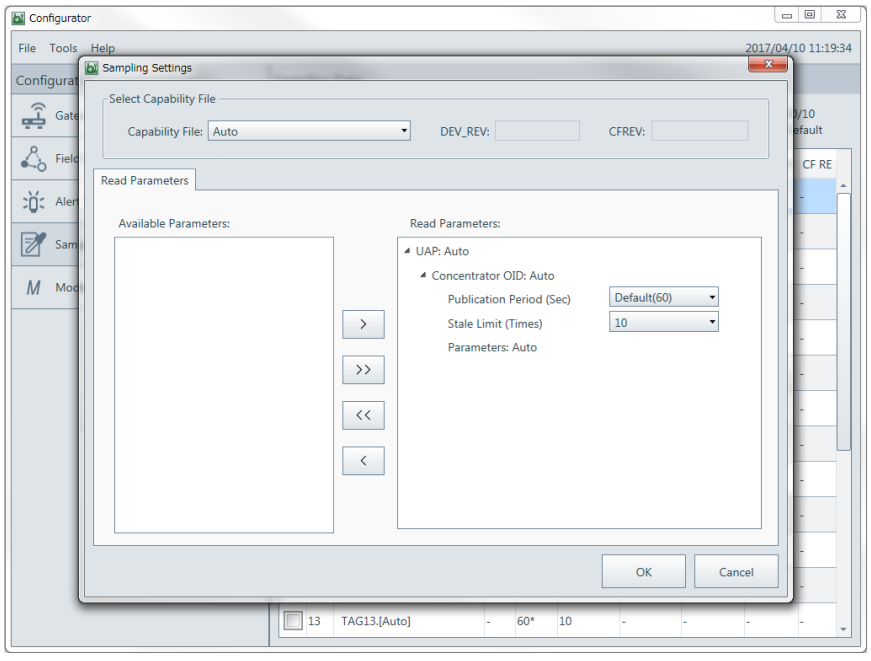
Sampling Data window allows configuring the publication of process values and diagnosis data from field wireless devices to a host system. Figure E3-12 shows the [Sampling Data] window.



FE0312.ai

Figure E3-12 Sampling Data window

In order to change sampling data parameters, select devices to be changed and click [Edit] button. Then Figure E3-13 appears.



FE0313.ai

Figure E3-13 Sampling Settings dialog

The following are items in [Sampling Settings] dialog

Item		Description	Default
Select Capability File	Capability File	Name of CF file associated with the selected devices.	Auto
	DEV_REV	The device revision that CFF corresponds to.	Blank
	CFREV	This is CFF revision.	Blank

There are two sub-windows in [Read Parameters] tab: [Available Parameters] and [Read Parameters].

The following are items in [Read Parameters] tab

Item		Description	Default
Available Parameters sub-window		Available parameters of the selected devices are displayed. When [Capability File] is [Auto], This sub-window is blank.	Blank
Read Registers sub-window	UAP	The TSAP id of UAP of selected device is displayed.	Auto
	Concentrator OID	The object id of a concentrator object of device is displayed.	Auto
	Publication Period (Sec)	Select the update time to periodically publish data from the drop-down box. Selectable values are Default (60), 1, 2, 4, 8, 16, 30, 60, 120, 300, 600, 1200, 1800, 3600. In the case of the default cycle, the setting from the host system takes precedence.	Default(60)
	Stale Limit (Times)	This is the timeout interval when published data does not arrive normally. It is set in multiples of [Publication Period] setting. Select a setting from 1 to 255 from the drop-down box.	10 Times
	Parameters	Set the parameters to transmit with periodically publish data. For [Auto], parameters to be transmitted are set automatically.	Auto

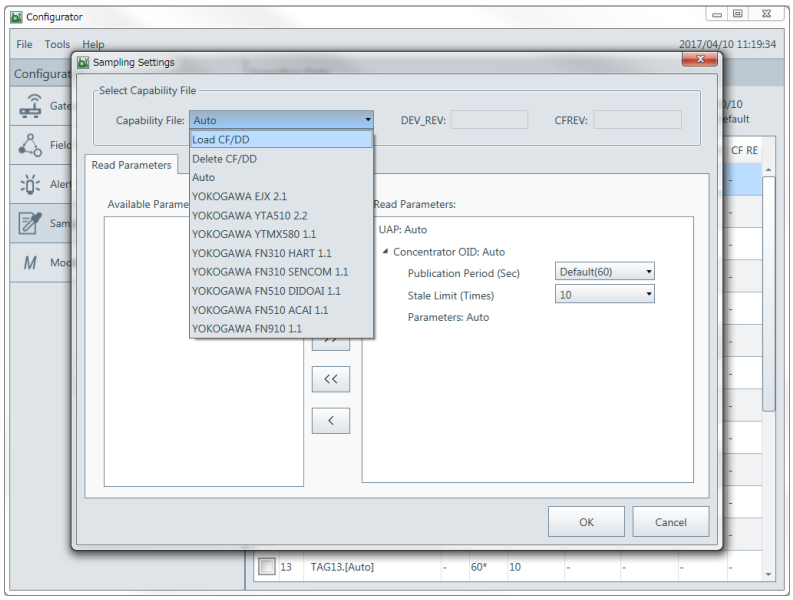
Registering CFF

Capabilities File (CFF) contains the following data: vendor names, model names, revisions, embedded process data (flow rate, temperature, pressure, and other measurement values) and device self-diagnosis information. This information is provided by the device vender. It is necessary to acquire the CF file for the relevant model before registration.

ISA100 Wireless Gateway Assistant has following pre-installed CFFs. Pre-installed CFF can be removed. Up to 100 CFFs including pre-installed CFFs can be registered in ISA100 Wireless Gateway Assistant.

Pre-installed CFF	DEV_REV	CFREV
YOKOGAWA EJX 2.1	2	1
YOKOGAWA YTA510 2.2	2	2
YOKOGAWA YTMX580 1.1	1	1
YOKOGAWA FN310 HART 1.1	1	1
YOKOGAWA FN310 SENCOM 1.1	1	1
YOKOGAWA FN510 DIDOAI 1.1	1	1
YOKOGAWA FN510 ACAI 1.1	1	1
YOKOGAWA FN910 1.1	1	1

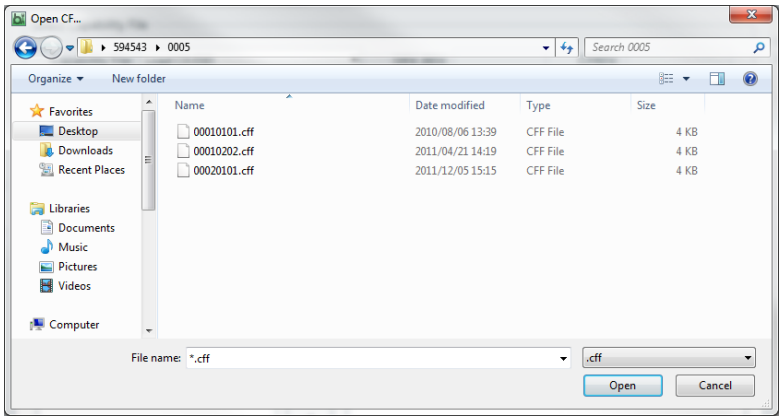
To register new CFF, select [Load CF/DD] on [Capability File] drop-down box.



FE0314.ai

Figure E3-14 Capability File drop-down box

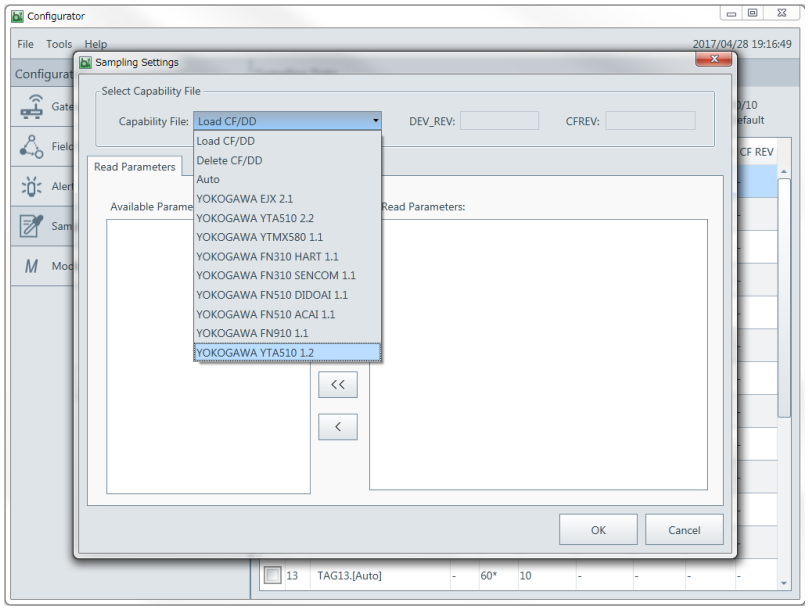
Select the CFF of the model to be registered at the dialog shown in Figure E3-15.



FE0315.ai

Figure E3-15 Open CF dialog

The name of registered CFF appears in the [Capability File] drop-down box.

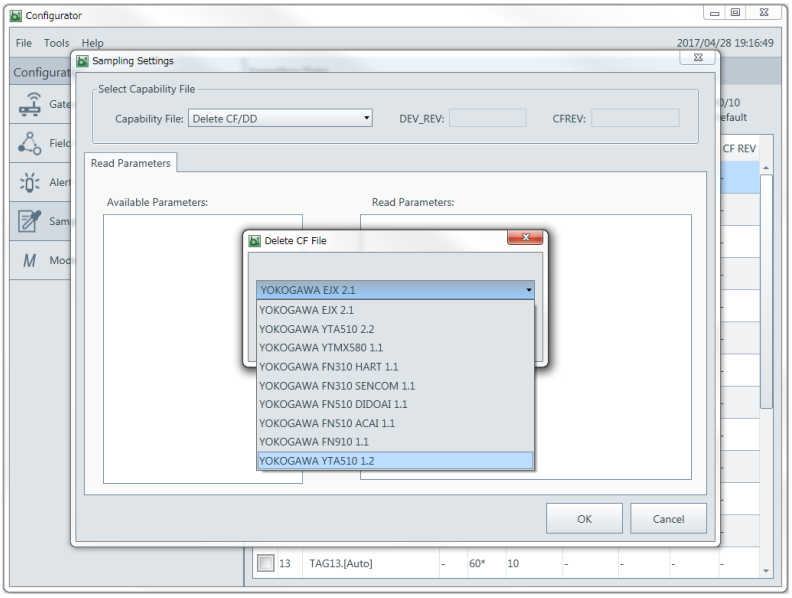


FE0316.ai

Figure E3-16 Capability File drop-down box (after loading CFF)

Unregistering CFF

When [Delete CF/DD] is selected from the CF File drop-down box, the dialog shown in Figure E3-17 appears.



FE0317.ai

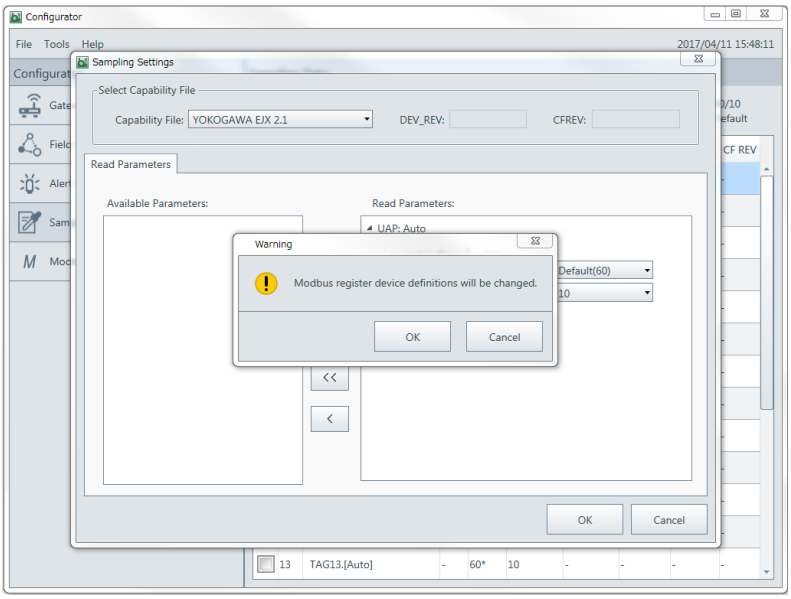
Figure E3-17 Delete CF File dialog

When CFF to be deleted is selected from the drop-down box and the [OK] button is clicked, the registration is deleted.

The sampling data of all field wireless devices using the deleted CFF are changed to [Auto].

Associating CFF to field wireless devices

In order to associate CFF to field wireless devices, select devices to be associated and click [Edit] button in [Sampling Data] window. Multiple devices can be associated at one time. Then the dialog shown in Figure E3-13 appears. When selecting CFF from [Capability File] drop-down box, the dialog shown in Figure E3-18.

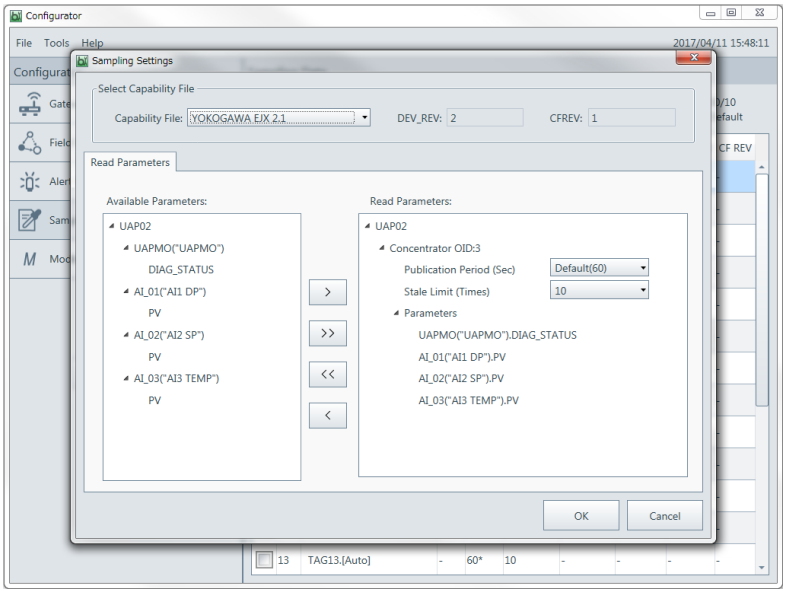


FE0318.ai

Figure E3-18 Device registration warning dialog

When a new association is made, no Modbus Settings are affected.

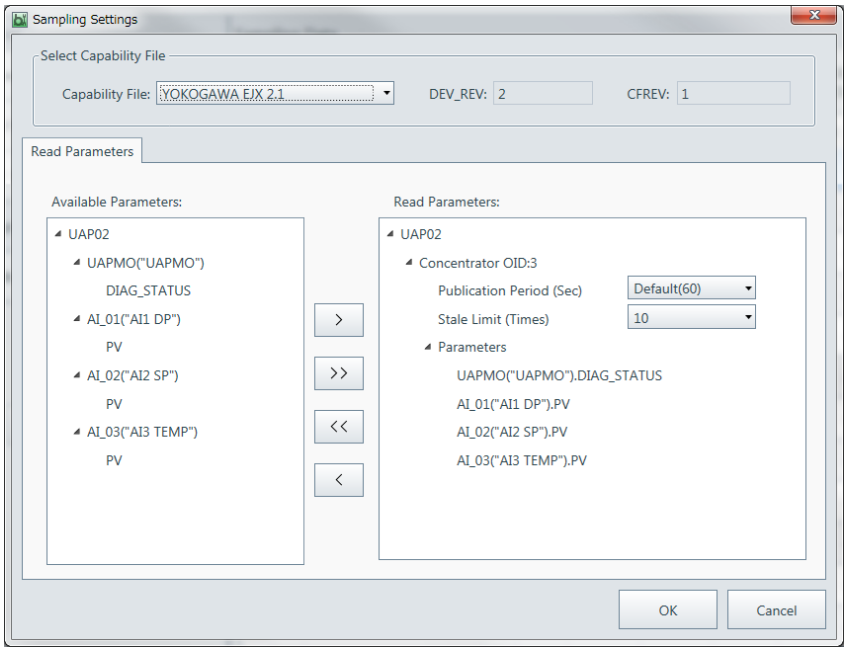
When the [OK] button of the warning dialog is clicked, the parameter information of devices is shown in [Available Parameters] and [Read Parameters] sub-windows.



FE0319.ai

Figure E3-19 Sampling Setting dialog (after specifying CFF to device)

Figure E3-20 is an enlarged image of [Sampling Settings] dialog.

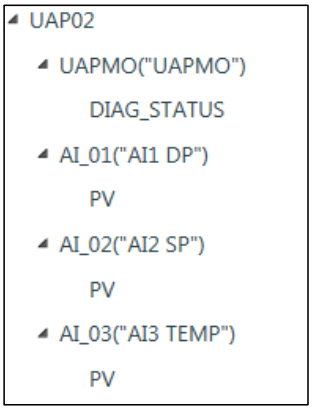


FE0320.ai

Figure E3-20 Sampling Setting dialog

When a new registration is made, all parameters defined in CFF are displayed in [Available Parameters] and [Read Parameters] sub-windows.

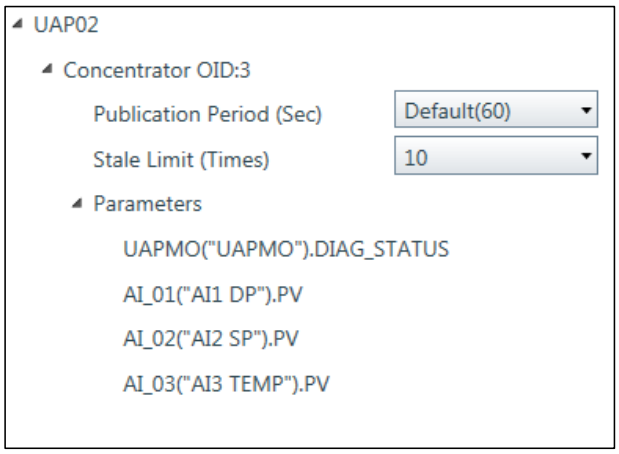
Content of [Available Parameters] sub-window



FE0321.ai

Parameters shown in [Available Parameters] sub-window are available items to be published in the field wireless device. By putting these items into [Read Parameters], the items will be configured as publishing items. In this example, three analog inputs (AI process value) and one device self-diagnosis (DIAG_STATUS) are available for publishing. The string enclosed by double quotes describes the object.

Content of [Read Parameters] sub-window



FE0322.ai

Parameters shown in [Read Parameters] sub-windows will be published from field wireless device after downloading configuration. In this example, three analog inputs (AI process value) and one device self-diagnosis (DIAG_STATUS) will be published

Parameters in [Read Parameters] sub-window can be added and delete using the arrow buttons. To individually add parameters in [Available Parameters] not registered under [Read Parameters], select the relevant parameter ([PV] or [DIAG_STATUS] in the tree), and then click › button. To add all parameters in [Available Parameters], select [UAP], and then click ›› button.

Conversely, to individually delete parameters in [Read Parameter], select the name of the parameter to be deleted, and then click ‹ button. When ‹‹ button is clicked, all parameters in [Read Parameters] are deleted.

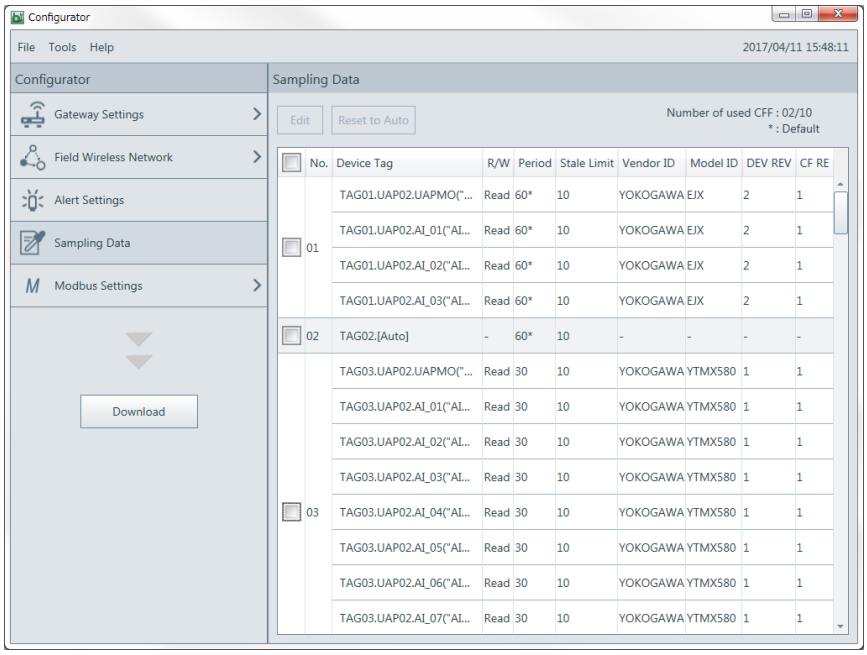
NOTE

- Publication Period
  A publication period refers to a period at which data is transmitted and received between FN120 and the field wireless device. Determine the publication period considering battery power consumption (which varies depending on the publication period) or other factors.
- Stale Limit
  The check process of wireless communication, the operating environment of the system, deterioration of wireless quality, and communication path error and restoration may cause data loss, retransmission of the same data, or variations in the data update time.
  When the state of not-updated-data or lost-data continues for the period specified in Stale Limit, FN120 considers that an error has occurred and notifies the control system of an error. It is recommended to set a value 10 times as large as the publication period. However, determine the value considering the fact that the time from when the state of data-not-updated or data-lost occurs until the determination of an error varies depending on the system environment and user application.

IMPORTANT

For periodic data publication, set an update time in the range that can be used by the field wireless devices.

When the [OK] button is clicked after completing the sampling data settings, the information is added to the tab shown in Figure E3-21.



FE0323.ai

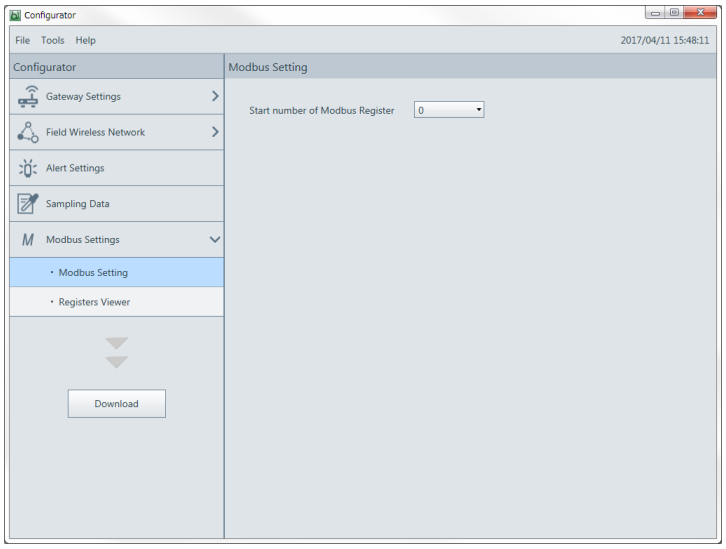
Figure E3-21 Example of registration at Sampling Data window

Editing sampling data

In order to change sampling data parameters, select devices to be changed and click [Edit] button in [Sampling Data] window. Then the dialog shown in Figure E3-13 appears. For the method to change or correct parameters, see “Associating CFF to field wireless devices” in this section.

E3.8 Modbus Setting

Modbus Setting window allows changing a start address of data to be mapped in Modbus registers of FN120. Modbus Setting window is a sub-menu of [Modbus Settings].
Figure E3-22 shows [Modbus Setting] window.



FE0324.ai

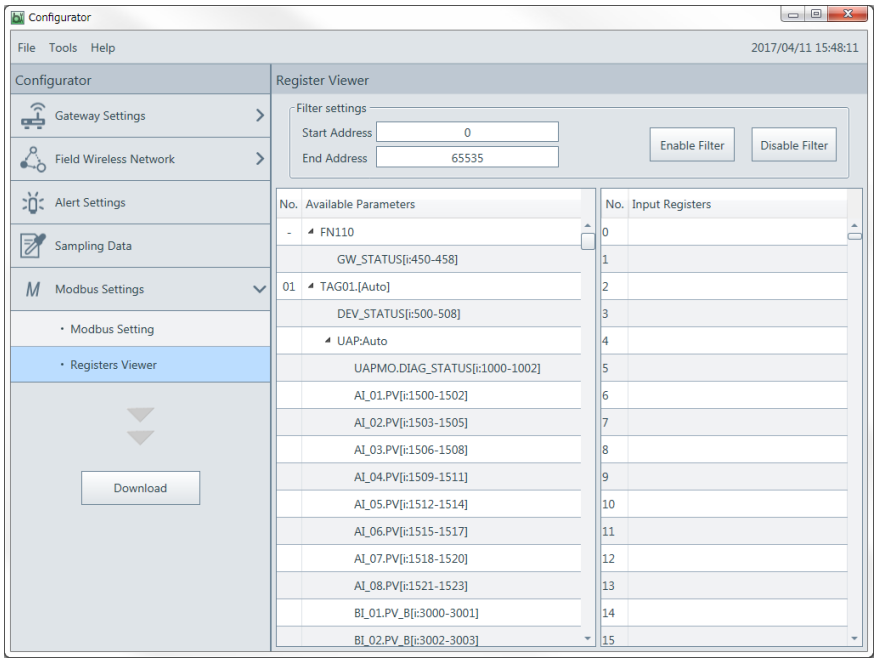
Figure E3-22 Modbus Setting window

The following are items in [Modbus Setting] window

Item	Description	Default
Start number of Modbus Register	Select the start address of data to be mapped in Modbus register from 0, 10000 or 20000.	0

E3.9 Registers Viewer

Register View window shows mapping information of Modbus registers in FN120. Register Viewer window is a sub-menu of [Modbus Settings]. Figure E3-23 shows [Register Viewer] window.



FE0325.ai

Figure E3-23 Register Viewer window

The following are items in [Register Viewer] window.

Item	Description
Start Address	For the display in [Input Register], specify the start number to display.
End Address	For the display in the [Input Register], specify the end number to display.
Enable Filter	Filter and display registers in the range specified by [Start Address], [End Address].
Disable Filer	Disable the filter setting and all register are displayed.

For data construction of each parameter, refer to D3.

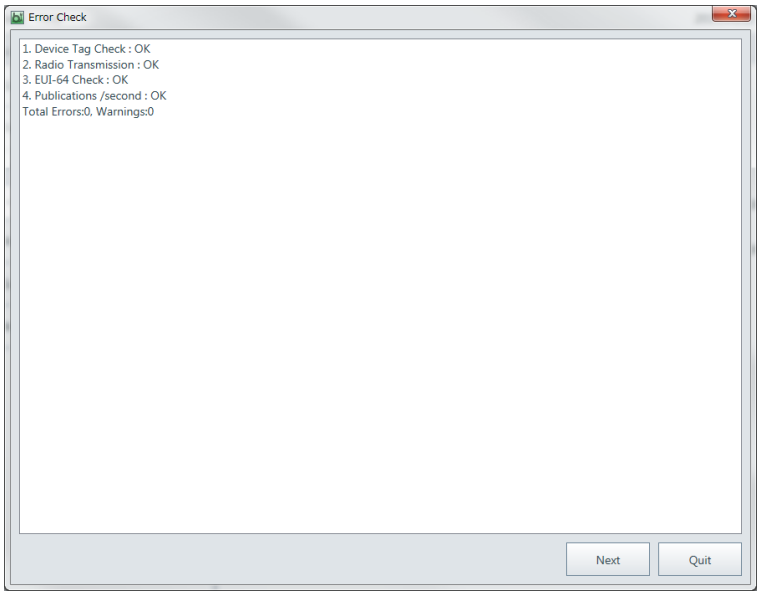
E3.10 Configuration Download

Changes set with ISA100 Wireless Gateway Assistant are applied to FN120 by clicking [Download] button. Please check configuration before downloading that it meets the setting rules.

Error Check

To check the compatibility of the setting information with the setting rules, click [Tools], and then click [Error Check] in the menu bar of ISA100 Wireless Gateway Assistant. Alternatively, click [Download] button.

After the check is complete, the window shown in Figure E3-24 appears. If there are errors or warnings in the results, click the [OK] button. The error check window closes and returns to main window. Correct the relevant items.



FE0326.ai

Figure E3-24 Error Check dialog

Download

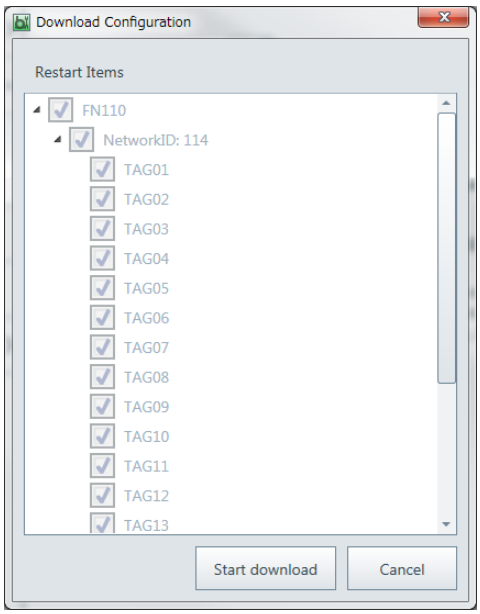
After using ISA100 Wireless Gateway Assistant to configure the field wireless network, download the setting information to FN120.

All information of FN120 and field wireless devices is downloaded, but field wireless devices do not need to be running. The setting information is automatically downloaded from FN120 after field wireless devices connected.

When [Download] button is clicked, checking the compatibility of the setting information with the setting rules is started.

After the check is complete, the results are displayed in Figure E3-24. If there are no errors or warnings in results, click the [Next] button. The error check dialog closes and Figure E3-25 appears.

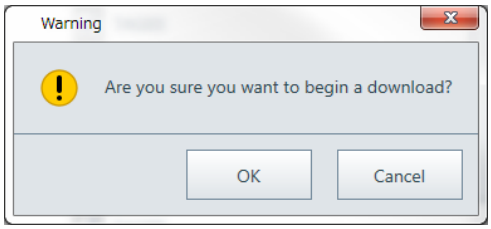
If there are items that require correction, click the [Quit] button. The error check dialog closes and returns to main window. Correct all the relevant items. Next, either perform the error check mentioned later or perform the download procedure again.



FE0327.ai

Figure E3-25 Download Configuration dialog

When [Start Download] button is clicked, the dialog shown in Figure E3-26 appears.

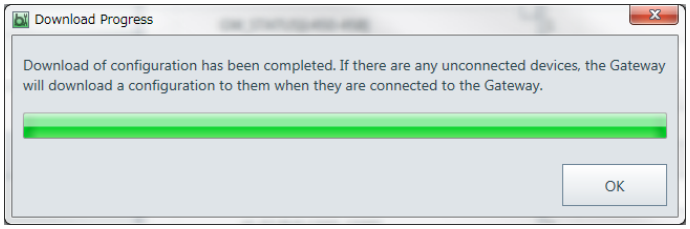


FE0328.ai

Figure E3-26 Start download warning dialog

When the [OK] button is clicked, downloading to FN120.

When the download is complete, the window shown in Figure E3-27 appears.



FE0329.ai

Figure E3-27 Download Progress dialog

E3.11 Other Setting Operation

The menu bar of ISA100 Wireless Gateway Assistant has three items: [File], [Tools], and [Help].

File Menu

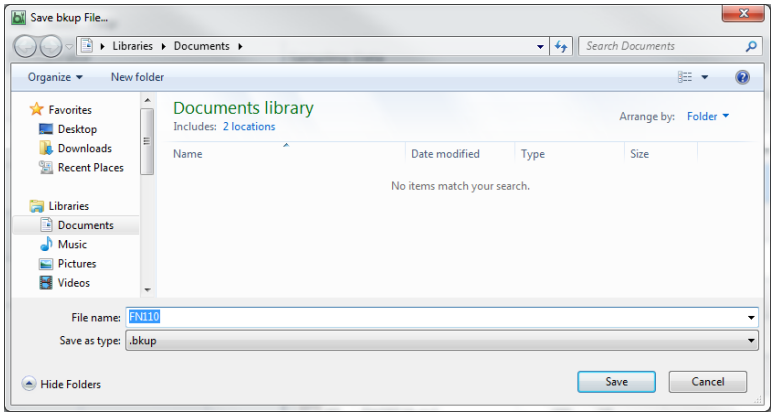
The File menu has the following three items.

[Backup], [Restore] and [Exit].

Backup

This function backs up the field wireless network setting information created by ISA100 Wireless Gateway Assistant to a file.

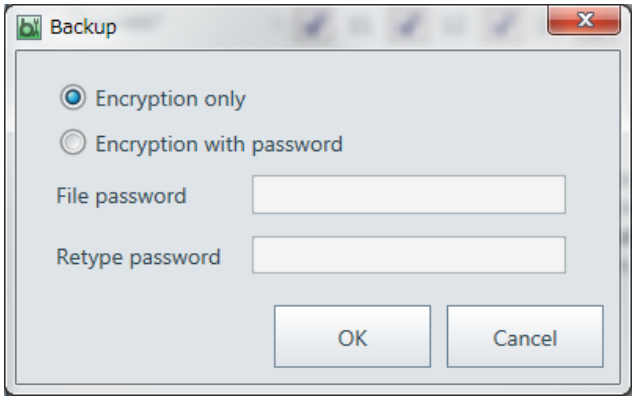
When [File] and then [Backup] are clicked, the dialog shown in Figure E3-28 appears.



FE0330.ai

Figure E3-28 Save bkup file dialog

When the file name and storage location are specified and the [Save] button is clicked, the dialog shown in Figure E3-29 appears.



FE0331.ai

Figure E3-29 Backup dialog

At this dialog, encryption and a password can be added to the backup file.

The default setting is [Encryption only]. When [Encryption with password] is selected, the password fields become available. Enter a password into the File password and the Retype password fields.

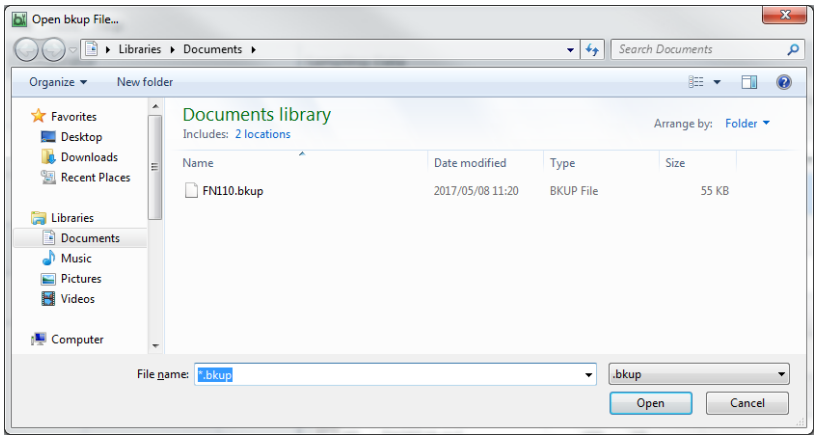
Up to 16 half-byte alphanumeric characters and symbols can be entered.

When the [OK] button is clicked, a file of the field wireless network settings is saved.

○ Restore

This function restores saved backup file into ISA100 Wireless Gateway Assistant.

When [File] and then [Restore] are clicked, the dialog shown in Figure E3-30 appears.

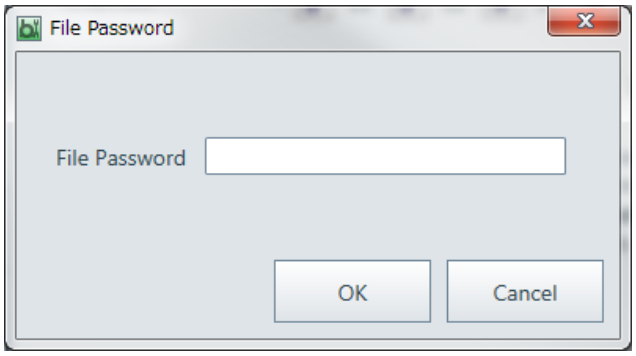


FE0332.ai

Figure E3-30 Open bkup File dialog

Select a file with the extension [.bkup] and then click the [Open] button. The configuration data is imported into ISA100 Wireless Gateway Assistant.

If the backup file has a password, the dialog shown in Figure E3-31 appears when the [Open] button is clicked.



FE0333.ai

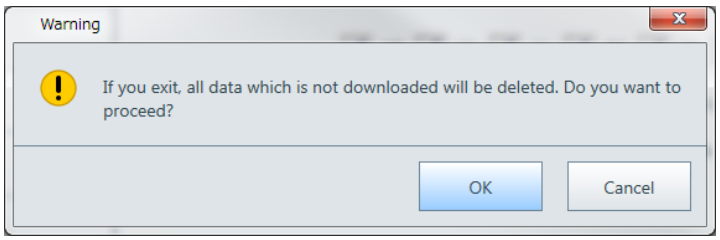
Figure E3-31 File Password dialog

Enter the password specified when the configuration data was backed up, and then click the [OK] button. The configuration data is imported.

○ Exit

When [File] and then [Exit] are clicked, the dialog shown in Figure E3-32 appears.

When is necessary to save the configuration data to a file, back up the settings ahead of time.



FE0334.ai

Figure E3-32 Warning dialog

When the [OK] button is clicked, ISA100 Wireless Gateway Assistant closes.

■ Tools Menu

The Tools menu has the following two items.

[Error Check] and [Download].

○ Error Check

This function checks the compatibility of the setting information with the setting rules. For details, see E3.10.

○ Download

This function downloads field wireless network settings to FN120. For details, see E3.10.

■ Help Menu

The Help menu contains [About] item.

When [Help] and then [About] are clicked, a window shown in Figure E3-33 appears. This dialog shows the application version number.

FE0335.ai

Figure E3-33 About dialog

Part F Operation and Maintenance

This part describes how to carry out check tasks during daily operations of the field wireless system, carry out maintenance when a warning or error occurs, and add and replace components of the field wireless system.

F1. Routine Maintenance

For the field wireless network, it is important to monitor the degree of stability communications after the setup task was completed and the system started normal operations. A wireless communication may become unstable due to the influence of obstacles on radio waves on the communication path. Particular care is required to extend a new building or equipment, temporarily install a metallic structure for construction or maintenance work, or use construction equipment.

F1.1 Routine Maintenance

Operation Status of Field Wireless System

For routine maintenance, monitor the field wireless system status such as GW_STATUS_DEV_STATUS_DEV_DIAG_STATUS, etc through Modbus communication. For routine maintenance, check that the status information of FN120 and the field wireless devices are all normal. For details, see Chapter E4 Modbus communication.

FN120 Maintenance

For FN120 maintenance, check the device installation status as well as the operation status of wireless system components. Check device installation, power supply cable, cable on connection and station condition. If the FN120 becomes dirty or dusty, wipe with a soft cloth moistened with water or mild soap.

IMPORTANT

For details on how to check other components such as field wireless device, see the user's manual of the relevant devices.

F1.2 Handling a Device in the Abnormal Status

Check the status of a device by an abnormal status notification from a host application, and give an emergency treatment for a device of which the status is abnormal. Judge whether there is a problem in the communication path or the power supply, or whether there is a trouble in the device itself or the sensor. Then, take the appropriate action.

For details on how to handle an abnormal device, see the user's manual of the relevant device. Regarding FN120, details are described in this manual.

F1.3 Handling a Device in the Warning Status

If there is a device that are known to be in warning status by an abnormal status notification from a host application or by a daily check, communication may become abnormal when the condition gets worse even if the communication of process value and status is continued.

DEV_STATUS includes the reachability and the remaining battery capacity of the device.

When they will become worse than the threshold value set in the host system, the host system can judge the corresponding device as warning state.

If a warning message appears due to the low remaining battery power level of the field wireless device, replace the battery immediately regardless of the remaining days. For details on the replacement procedure, see the user's manual of the relevant device.

If a warning message appears due to the data reachability, check if a wireless communication error occurs on the communication path. Furthermore, check if a new structure or construction equipment is found on the route or around the device, and if the use of a new wireless communication such as wireless LAN is started at the same frequency band in a nearby area.

Monitor the device for which a warning message of the data reachability is displayed for a while. If there are no symptoms to return to the normal status by itself, adjust the device arrangement, especially the antenna installation position. To adjust the installation position it will return normal.

F2. Adding and Replacing a Device

This chapter describes how to add a component for the extension of the wireless system and replace a defective device.

F2.1 Field Wireless Device

This section describes the procedure for adding and removing a field wireless device. The procedure varies depending on the provisioning method performed to the device.

Adding a new field wireless device

To add a new field wireless device to the wireless network, perform the same procedure as for configuring a field wireless system explained in Part C.

1. If the new device is manufactured by Yokogawa and is ordered with Network ID and Tag Name, provisioning is not needed. Otherwise, perform provisioning by FieldMate. OOB provisioning method to be used is depended on the engineering way. When FN120 wasn't configured by ISA100 Wireless Gateway Assistant, OOB provisioning "Does not use a provisioning information file" should be used.
2. Configure parameters of sensor of the new device, if needed.
3. Install the new device at the site.
4. Register the new device to the host system in order to receive measurement values from the device.
5. When FN120 is configured by ISA100 Wireless Gateway Assistant, add the new device and configure sampling settings. Then download the configuration to FN120.
6. On the host system, check that the new device is connected to the network and that all data from the new device is received.

Replacing a field wireless device

When replacing a device that is judged to be defective by the host system warning function, replace the device with a new one.

1. If the new device is manufactured by Yokogawa and is ordered with Network ID and Tag Name which are same as the replacing device, provisioning is not needed. Otherwise, perform provisioning by FieldMate. OOB provisioning method to be used is depended on the engineering way. When FN120 wasn't configured by ISA100 Wireless Gateway Assistant, OOB provisioning "Does not use a provisioning information file" should be used.
2. Configure parameters of sensor of the new device, if needed.
3. Replace with the new device at the site.
4. When FN120 is configured by ISA100 Wireless Gateway Assistant, add the new device and configure sampling settings. Then download the configuration to FN120.
5. On the host system, check that the new device is connected to the network and that all data from the new device is received.

Part G Troubleshooting

This part briefly describes the troubleshooting procedure when a field wireless system error or warning has occurred in a host system.

The host system refers to a Modbus/RTU-compatible controller, SCADA system, DCS, such as Yokogawa STARDOM, FAST/TOOLS or CENTUM VP, or other device management system.

These systems should be operated using an application, which imports the health status of the process value or status information of each device as Modbus data like the process value, and converts them to the error or warning status in a host system, and displays the conversion result on the window.

G1. Field Wireless System

This chapter describes the troubleshooting flow when a field wireless system error or warning was detected in a host system.

If such an error or warning is explicitly isolated as a problem (input over-range, sensor failure, disconnection, etc.) in the measurement section of the field wireless device using the display of a host system, take appropriate action seeing the troubleshooting section in the user's manual of the relevant device.

When host system has been engineered, it can detect errors referring the device status of each wireless system component (DEV_STATUS), data status (DATA_STATUS), and self-diagnostic status (DEV_DIAG_STATUS) of the field wireless device.

The following shows the troubleshooting flow of the field wireless system.

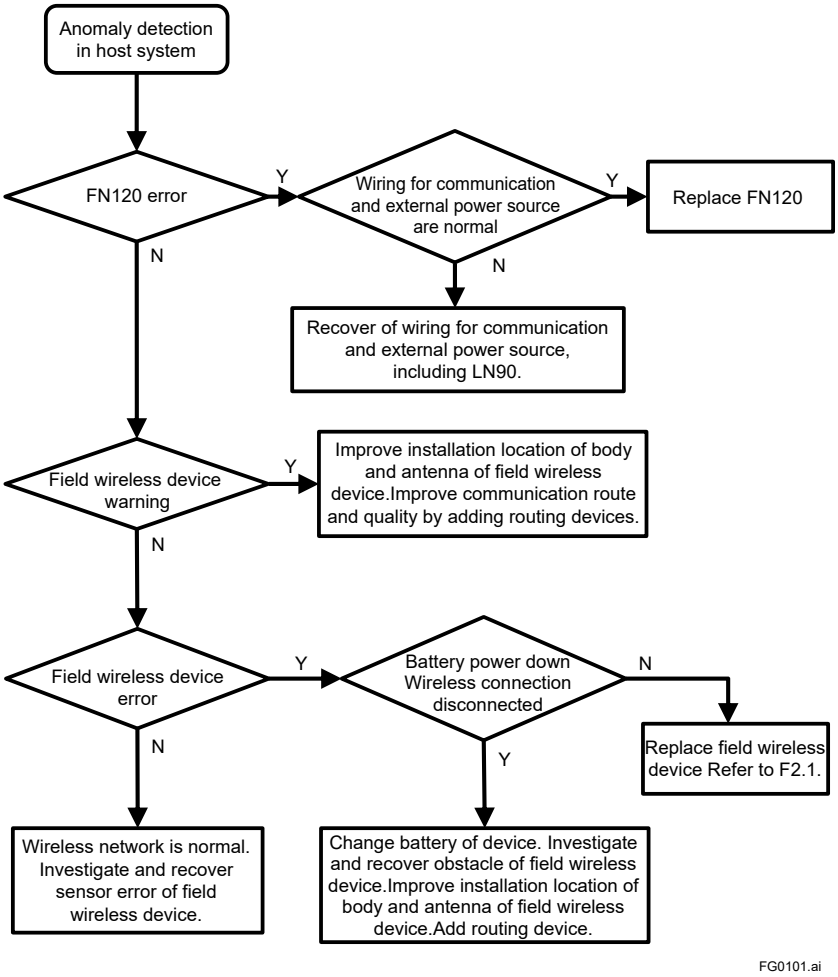


Figure G1-1 Troubleshooting flow of the field wireless system

G2. FN120

FN120 operating status information is notified with the gateway status (GW_STATUS) on the Modbus register. The data structure and the contents of status information are described in D3.3.

G3. Field Wireless Device

The status information concerning wireless function of the device is notified with the device status (DEV_STATUS) on the Modbus register. The data structure and the contents of status information are described in D3.5.

The diagnostic information is notified with the self-diagnostic status (DEV_DIAG_STATUS) on the Modbus register. The data structure of diagnostic information is described in D3.6. The contents are described in the user's manual of the relevant device.

The status of the process data value is notified with the process data status (DATA_STATUS) on the Modbus register. The data structure of status is described in D3.9

Part H Specifications

This part describes only specifications of field wireless network. For other specifications such as hardware, refer to GS 01W03B02-01EN.

H1. Field Wireless Network

Item	Specifications
Protocol	ISA100.11a-2009
Network Topology	Star
Maximum number of field wireless subnets	1 subnet
Maximum number of routing devices	10 devices (at 1 second update) 20 devices (at 2 or more second update)
Publication period	From 1 to 3600 seconds, the following values can be set 1,2,4,8,16,30,60,120,300,600,1200,1800,3600
Maximum number of publication items per field wireless device	UAPMO.DIAG_STATUS 1 item
	8 measurement values of AI or BI

H2. Modbus Communication

Item	Item	Specifications
Serial communication	Protocol	RS-485 2-wire connection, half duplex
	Flow control	NONE
	Baud Rate	9.6, 19.2 or 38.4 kbps
	Data Length	8
	Stop bit	1 or 2
	Parity	NONE, EVEN or ODD
Modbus/RTU	Role	Modbus slave
	Slave Address	1 to 127
	Response time*1	Less than 40 ms @ 19.2 kbps or less Less than 20 ms @ 38.4 kbps
	Number of master device	1 master device
	Supported function code	0x03: Read Holding Registers 0x04: Read Input Register 0x10: Write Multiple Registers

*1: The response time is the time to start sending a response message after receiving end of a request message as shown in Figure H2-1. This time is used for timeout setting of Modbus/RTU in the host system.

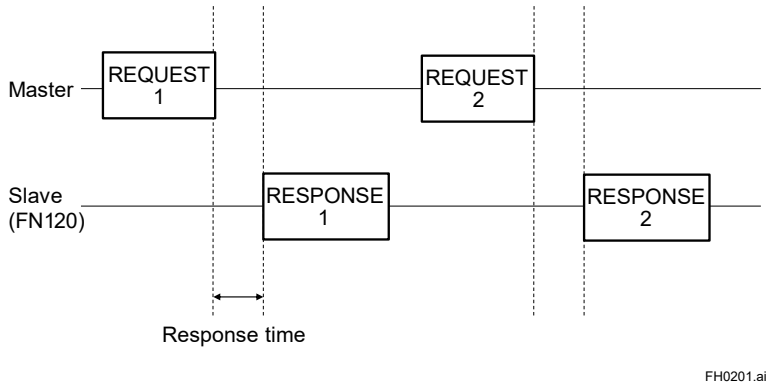


Figure H2-1 Response time of Modbus/RTU

Part I Appendix: STARDOM Engineering

This part describes how to construct a field wireless network connecting with FN120 on the STARDOM system.

On the STARDOM system, following tools can be used to configure for connecting to FN120.

- Resource Configurator

  Resource Configurator is a software application for making basic settings in STARDOM, including:

  - IP address settings
  - I/O module settings
  - Initial communication settings

- Logic Designer

  Logic Designer is a software application for developing control applications (IEC 61131- 3) as tasks for STARDOM. When using FN120, Modbus Communication Portfolio is required.

For detailed information about STARDOM related software, see the General Specifications (GS 34P02Q02-01E or GS 34P02Q03-01E) and the User's Manuals (IM 34P02Q01-01E).

I1. General Configuration

Perform the initial configuration (IP address, RS-485 port settings and so on) by Resource configurator. Refer to User's Manual of STARDOM (IM 34P02Q01-01E)) for details.

I2. Control Application

In STARDOM system, Logic Designer is used to create the control application. The IEC sample program is able to be downloaded from the Yokogawa Customer Portal. It helps creation of control application easier. The IEC sample program requires Logic Designer R4.02.01 or later and Modbus Communication Portfolio.

The sample program can be downloaded by following the steps below.

1. Please sign in to the Yokogawa Customer Portal (https://myportal.yokogawa.com/).
2. Search for “FN120” on the download page and download “FNGW10301.zip”.
3. After extracting “FNGW10301.zip”, the sample program will be available in the following folder.
   <Extracted folder>/FNGW10301/FNGW_R10301.zwt

The IEC sample program is disclosed to allow modification by customers. It has been subjected to simple testing but Yokogawa makes no guarantee whatsoever on its correct execution.

I2.1 RS-485 communication settings

The followings are the initial settings for the RS-485 communication.

Table I2-1 RS-485 communication settings

Item	Setting
Flow control	NONE
Baud Rate	38.4 kbps
Data Length	8
Stop bit	1
Parity	NONE
Slave address of FN120	1

I2.2 Program Organization Unit (POU)

The IEC sample program defines following POU.

Table I2-2 POU of the sample project

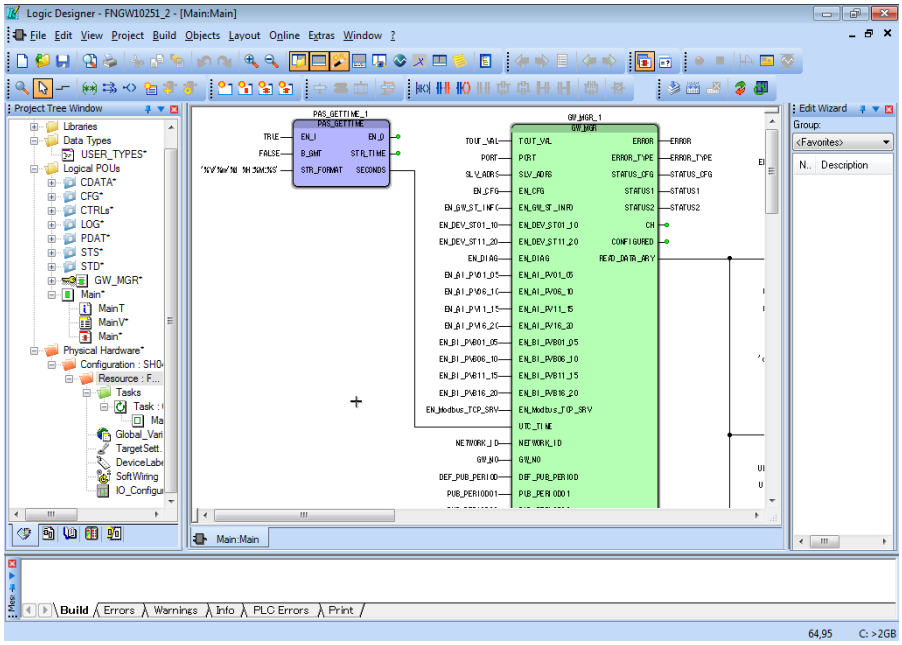
POU Name	Category	Function
GW_MGR	Configuration	Set the network ID
		Set the default publication period
		Set the publication period of each field wireless device
		Set the device tag of each field wireless device
	Monitoring	Get process data
		Get status information
	Modbus TCP Server	Transfer data from FN120 to other system via Modbus TCP
PV_CDATA_S	Create Analog Data Structure	Convert to the CData_REAL Type *1
		Specify an acquisition data
		Set the flag if industrial unit is used.
PVB_ CDATA_S	Create Digital Data Structure	Convert to the CData_BOOL Type *1
		Specify an acquisition data
PAS_GETTIME	Acquisition of the local time	This is the standard POU. See [Help on Standard FB/FU] on Logic Designer.

*1: CData_REAL and CData_BOOL are structures for STARDOM communication and can be accessed from SCADA, such as FAST/TOOLS.

For details of each POU, refer to I3.

I2.3 Summary of Operation

When execute Logic Designer and open the sample project, the window shown in Figure I2-1 appears.



FI0201.ai

Figure I2-1Logic Designer window

Following are an operating summary of the sample project on Logic Designer.

1. Click [Target Setting] in [Project Tree Window]. Set IP address of FCN-RTU in the appeared dialog.
2. Select [Settings] in context menu of [Tasks] – [Task] – [CYCLIC] in [Project Tree Window], and set the update period value. For recommended value, refer to Table I3-2.
3. Click [Main] – [Main] in [Project Tree Window]
4. Set parameters referring to D3.
5. Click [Build] – [Rebuild Project]
6. If there is no compile error, the sample project can be downloaded to FCN-RTU.
7. Connect FCN-RTU to PC on which Logic Designer is running.
8. Select [Online] menu – [Project Control]
9. Select [Download] in [FCX01] dialog
10. Select [Project] - [Download] in [Download] dialog
11. When debugging the project is needed, select [Online] menu – [Debug]

I3. POU Details

I3.1 GW_MGR POU

Figure I3-1 shows GW_MGR POU.

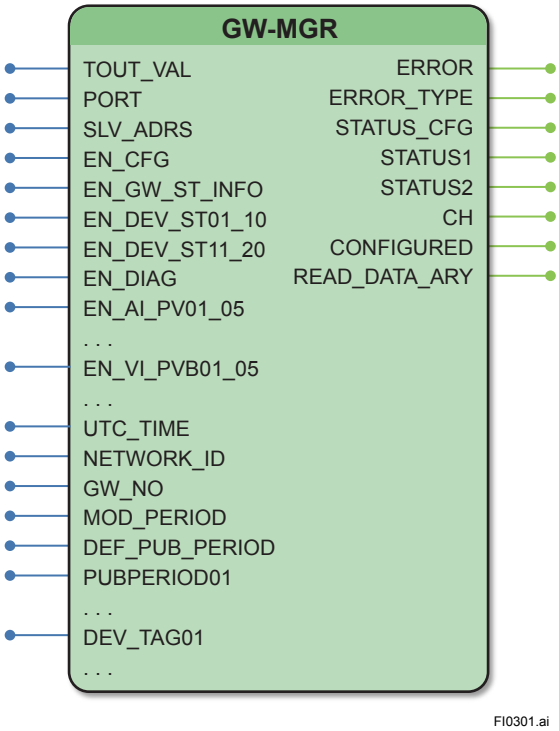


Figure I3-1 GW_MGR POU

Input arguments

Input arguments of GW_MGR POU are followings.

Table I3-1 Input arguments of GW_MGR POU

Argument	Type	Default	Description
TOUT_VAL	REAL	20.0	Same definition as that of SD_CMDBSM_BM_OPEN.
PORT	STRING	COM4	Constant value
SLV_ADRS	UINT	1	Specify the same value as the slave address of FN120.
EN_CFG	BOOL	true	This is a switch that STARDOM writes configuration to FN120.*1 true: write, false: not write
EN_GW_ST_INFO	BOOL	true	This is a switch that STARDOM reads GW_STATUS and GW_INFO from FN120.*2 true: read, false: not read
EN_DEV_ST01_10	BOOL	true	This is a switch that STARDOM reads DEV_STATUS of DEV01 to 10 from FN120.*2 true: read, false: not read
EN_DEV_ST11_20	BOOL	true	This is a switch that STARDOM reads DEV_STATUS of DEV11 to 20 from FN120.*2 true: read, false: not read
EN_DIAG	BOOL	true	This is a switch that STARDOM reads DIAG_STATUS of each device from FN120. true: read, false: not read

Argument	Type	Default	Description
EN_AI_PV01_05	BOOL	true	This is a switch that STARDOM reads PV values of DEV01 to 05 from FN120. true: read, false: not read
EN_AI_PV06_10	BOOL	true	This is a switch that STARDOM reads PV values of DEV06 to 10 from FN120. true: read, false: not read
EN_AI_PV11_15	BOOL	true	This is a switch that STARDOM reads PV values of DEV11 to 15 from FN120. true: read, false: not read
EN_AI_PV16_20	BOOL	true	This is a switch that STARDOM reads PV values of DEV16 to 20 from FN120. true: read, false: not read
EN_BI_PVB01_05	BOOL	true	This is a switch that STARDOM reads PVB values of DEV01 to 05 from FN120. true: read, false: not read
EN_BI_PVB06_10	BOOL	true	This is a switch that STARDOM reads PVB values of DEV06 to 10 from FN120. true: read, false: not read
EN_BI_PVB11_15	BOOL	true	This is a switch that STARDOM reads PVB values of DEV11 to 15 from FN120. true: read, false: not read
EN_BI_PVB16_20	BOOL	true	This is a switch that STARDOM reads PVB values of DEV16 to 20 from FN120. true: read, false: not read
EN_Modbus_TCP_SRV	BOOL	true	This is a switch that STARDOM enables Modbus/TCP server function. Content of Modbus register of FN120 is copied to Modbus register of STARDOM exactly. true: enable, false: disable
UTC_TIME	UDINT		The elapsed time since 1970/1/1 0:00:00 in seconds, which is stored in GW_CONFIG.
NETWORK_ID	UINT	100	Network ID, which is stored in GW_CONFIG.*3*4
GW_NO	UINT	0	Constant.
MOD_PERIOD	UINT	30	Period of access from/to DIAG_STATUS, PV, PV_B through Modbus communication. Range of values is from 1 to 60.*5
DEF_PUB_PERIOD	INT	60	Publication Period for all devices, which is stored in GW_CONFIG.*3*5
PUB_PERIOD01	INT	-1	Publication Period for each device, which is stored in each DEV_CONFIG. When it is set to -1, the value in DEF_PUB_PERIOD is applied instead.*3*5
PUB_PERIOD02	INT	-1	
…	…	…	
PUB_PERIOD20	INT	-1	
DEV_TAG01	STRING	TAG01	Device Tag for each device. This value is stored in each DEV_CONFIG.*3
DEV_TAG02	STRING	TAG02	
…	…	…	
DEV_TAG20	STRING	TAG20	

*1: EN_CFG should be set to false if the settings of FN120 have been changed by ISA100 Wireless Gateway Assistant.
*2: It is read at a minute interval.
*3: Regarding possible input values and error handling, refer to C3.4.3.
*4: If the network ID is set to a value other than 0, radio waves will be outputted according to the radio channel set by ISA 100 Wireless Gateway Assistant. The radio channels that can be used are regulated by the radio law of each country. If there is a channel restriction by country, please set it by ISA 100 Wireless Gateway Assistant.
*5: It is recommended that the settings are changed according to Table C3 4.

IMPORTANT

- Valid values for DEF_PUB_PERIOD and PUB_PERIOD01-20 are 2, 4, 8, 16, 30, 60, 120, 300, 600, 1200, 1800, and 3600. To set the period to 1 second, use ISA100 Wireless Gateway Assistant. At that time, make sure that the value of EN_CFG is set to false.
- Applying changes to the FN120 requires rebuilding and downloading the control application, followed by a cold restart of STARDOM.

Recommended input arguments

Table I3-2 shows a recommended input arguments for stable receiving data from field wireless devices. It assumes that the [Interval] value in [Task Settings] of Logic Designer is 250msec.

Table I3-2 Recommended input arguments

<table>
<tr><th rowspan="2">Item</th><th colspan="8">The shortest update period (second)*1</th></tr>
<tr><th colspan="2">1*2</th><th colspan="2">2</th><th>4</th><th>8</th><th>16</th><th>30 and more</th></tr>
<tr><td>MOD_PERIOD</td><td colspan="2">1</td><td colspan="2">2</td><td>4</td><td>4</td><td>4</td><td>30</td></tr>
<tr><td>EN_CFG</td><td>false</td><td>false</td><td>false</td><td>true</td><td>Any</td><td>Any</td><td>Any</td><td>Any</td></tr>
<tr><td>EN_GW_ST_INFO</td><td>false</td><td>true</td><td>false</td><td>true</td><td>Any</td><td>Any</td><td>Any</td><td>Any</td></tr>
<tr><td>EN_DEV_ST01_10</td><td>false</td><td>true</td><td>false</td><td>true</td><td>Any</td><td>Any</td><td>Any</td><td>Any</td></tr>
<tr><td>EN_DEV_ST11_20</td><td>false</td><td>true</td><td>false</td><td>true</td><td>Any</td><td>Any</td><td>Any</td><td>Any</td></tr>
<tr><td>EN_DIAG</td><td>Any</td><td>true</td><td>Any</td><td>true</td><td>Any</td><td>Any</td><td>Any</td><td>Any</td></tr>
<tr><td>EN_AI_PV01_05</td><td rowspan="4">Any</td><td rowspan="4">Up to two items can be set to true.</td><td rowspan="8">Any</td><td rowspan="8">Up to four items can be set to true.</td><td rowspan="8">Any</td><td rowspan="8">Any</td><td rowspan="8">Any</td><td rowspan="8">Any</td></tr>
<tr><td>EN_BI_PVB01_05</td></tr>
<tr><td>EN_AI_PV06_10</td></tr>
<tr><td>EN_BI_PVB06_10</td></tr>
<tr><td>EN_AI_PV11_15</td><td colspan="2" rowspan="4">false</td></tr>
<tr><td>EN_BI_PVB11_15</td></tr>
<tr><td>EN_AI_PV16_20</td></tr>
<tr><td>EN_BI_PVB16_20</td></tr>
</table>

*1: The minimum value of DEF_PUB_PERIOD and PUB_PERIOD01-20.
*2: When the update period is set to 1, use the ISA100 Wireless Gateway Assistant.

Output arguments

Output arguments of GW_MGR POU are followings.

Table I3-2 Output arguments of GW_MGR POU

Argument	Type	Default	Description
ERROR	BOOL	false	The condition of FN120. true: error false: normal
ERROR_TYPE	WORD	0x0000	It indicates an error type only when the ERROR is true.*1
STATUS_CFG	WORD	0x0000	An error code regarding to the settings.*1
STATUS1	WORD	0x0000	An error code regarding to Modbus Communication POU.*2
STATUS2	WORD	0x0000	An error code regarding to Modbus Communication POU.*2
CH	—	—	Same as the definition of SD_CMDBSM_BM_OPEN.
CONFIGURED	BOOL	true	The configuration status of FN120. true: configured false: configuration in progress
READ_DATA_ARY	WORD ARY	—	All values read from Input Resisters of FN120 are copied in this array. Both addresses are the same.

*1: Error handling is described in C3.4.3.
*2: Please refer to the online help about Modbus Communication POU in Logic Designer.

Error Handling

When GW_MGR POU detects errors, GW_MGR outputs statues to ERROR, ERROR_TYPE, STATUS_CFG, STATUS1 and/or STARTUS2.

Table I3-3 shows a list of ERROR_TYPE code.

Table I3-3 ERROR_TYPE code

Code	Description	Detail status
0x0000	No error	—
0x0010	Configuration error	STATUS_CFG
0x0020	Communication task error	STATUS1*1
0x0101	Write GW_CONFIG error	STATUS1 or 2*1
0x0111	Write DEV_CONFIG01-05 error	STATUS1 or 2*1
0x0112	Write DEV_CONFIG06-10 error	STATUS1 or 2*1
0x0113	Write DEV_CONFIG11-15 error	STATUS1 or 2*1
0x0114	Write DEV_CONFIG16-20 error	STATUS1 or 2*1
0x0201	Read GW_CONFIG error	STATUS1 or 2*1
0x0202	Read DEV_CONFIG01-05 error	STATUS1 or 2*1
0x0203	Read DEV_CONFIG06-10 error	STATUS1 or 2*1
0x0204	Read DEV_CONFIG11-15 error	STATUS1 or 2*1
0x0205	Read DEV_CONFIG16-20 error	STATUS1 or 2*1
0x0211	Read GW_STATUS INFO error	STATUS1 or 2*1
0x0220	Read DIAG_STATUS error	STATUS1 or 2*1
0x0222	Read AI_PV_DEV01_05 error	STATUS1 or 2*1
0x0223	Read AI_PV_DEV06_10 error	STATUS1 or 2*1
0x0224	Read AI_PV_DEV11_15 error	STATUS1 or 2*1
0x0225	Read AI_PVB_DEV16_20 error	STATUS1 or 2*1
0x0226	Read BI_PVB_DEV01_05 error	STATUS1 or 2*1
0x0227	Read BI_PVB_DEV06_10 error	STATUS1 or 2*1
0x0228	Read BI_PVB_DEV11_15 error	STATUS1 or 2*1
0x0229	Read BI_PVB_DEV16_20 error	STATUS1 or 2*1
0x0231	Read DEV_STATUS01-10 error	STATUS1 or 2*1
0x0232	Read DEV_STATUS11-20 error	STATUS1 or 2*1

*1: See the help of Modbus communication POU.

Configuration Errors

When error is occurred in configuration, GW_MGR POU stores detail information of error into STATUS_CFG shown in Table I3-4.

Table I3-4 STATUS_CFG Code

Code	Description	Error item	Error condition
0x0000	No error	—	—
0x0001	Invalid Network ID	NETWORK_ID	A value other than the following is specified. 0, 2-65535
0x0002	Invalid publication period	DEF_PUB_PERIOD	A value other than the following is specified. 1,2,4,8,16,30,60,120,300,600,1200,1800,3600
0x0002	Invalid publication period	PUB_PERIODnn*1	A value other than the following is specified. -1,1,2,4,8,16,30,60,120,300,600,1200,1800,3600
0x0003	Invalid Device Tag	DEV_TAGnn*1	A value other than the following is specified. Word count: 1-16 Character type: half-width capital alphanumeric, hyphen(-), underscore(_)
0x0004	Duplicated Device Tag	DEV_TAGnn*1	Duplicate tag name. The name DEV_TAG01, …, DEV_TAG20 is already used.
0x0005	Invalid GW_NO	GW_NO	The Specified value for GW_NO is Out of range.

*1: "nn" is any value from 01, 20, ..., 19 or 20.

I3.2 PV_CDATA_S POU

Figure I3-2 shows PV_CDATA_S POU.

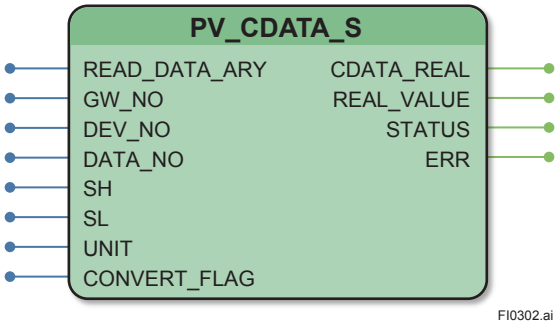


Figure I3-2 PV_CDATA_S POU

Input and output arguments of PV_CDATA_S POU are followings

Table I3-5 Input and output arguments of PV_CDATA_S POU

Argument	Type	Default	Description
READ_DATA_ARY	WORD ARY	—	Read_Data_ARY input
GW_NO	UINT	0	Constant
DEV_NO	UINT	1	Specify a device number from 1 to 20 for output.
DATA_NO	UINT	1	Specify a data number from 1 to 8 for output.
SH	REAL	100.0	Scale High
SL	REAL	0.0	Scale Lo
UNIT	STRING	—	Industrial unit
CONVERT_FLAG	BOOL	false	The output value type of CData_REAL is provided as industrial quantity data, which is a value based on industrial units *1. If the input READ_DATA_ARY is normalized data ranging from 0 to 100%, this flag must be set to True, and the value should be converted to industrial quantity data using SL and SH. If the input data is not normalized, this flag should be set to False.
CDATA_REAL	CData_REAL	—	CDataReal output
REAL_VALUE	REAL	—	Real value output
STATUS	DWORD	—	Status output *2
ERR	BOOL	—	true: has error false: no error

*1: For details on the CData_REAL type, refer to the NPAS POU Manual (Overview) (IM 34P02P25-01E).
*2: When Quality bits in Data Status (Refer to D3.9) is Bad, BAD bit in PAS status in CData_REAL structure is true.

I3.3 PVB_CDATA_S POU

Figure I3-3 shows PVB_CDATA_S POU.

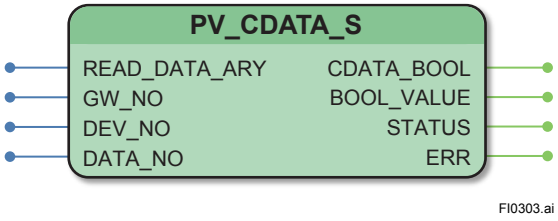


Figure I3-3 PVB_CDATA_S POU

Table I3-6 Input and output arguments of PVB_CDATA_S

Argument	Type	Default	Description
READ_DATA_ARY	WORD ARY	—	Read_Data_ARY input
GW_NO	UINT	0	Constant
DEV_NO	UINT	1	Specify a device number from 1 to 20 for output.
DATA_NO	UINT	1	Specify a data number from 1 to 8 for output.
CDATA_BOOL	CData_BOOL	—	CData_BOOL output. 0 indicates false, and any integer other than 0 indicates true.
BOOL_VALUE	BOOL	—	Bool value output. 0 indicates false, and any integer other than 0 indicates true.
STATUS	DWORD	—	Status output*1
ERR	BOOL	—	True indicates input error.

*1: When Quality bits in Data Status (Refer to D3.9) is Bad, BAD bit in PAS status in CData_Real structure is true.