FL-net (OPCN-2) Interface Module

Model

ER-1FL2-T User's Manual (Detailed Edition)

ER-1FL2-T

MELSEC Approved

SAFETY PRECAUTIONS

(Read these precautions before using this product.)
Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.
The precautions given in this manual are concerned with this product only. For the safety precautions of the programmable controller system, refer to the MELSEC iQ-R Module Configuration Manual.
If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
In this manual, the safety precautions are classified into two levels: "⚠WARNING" and "⚠CAUTION".

⚠ **WARNING**	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ **CAUTION**	Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under "⚠CAUTION" may lead to serious consequences.
Observe the precautions of both levels because they are important for personal and system safety.
Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

⚠WARNING

- For the operating status of each node at a communication failure of cyclic transmission in the FL-net (OPCN-2), refer to ☞Page 142 Cyclic transmission and area in this manual.
  Incorrect output or malfunction due to a communication failure may result in an accident.
- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller. Failure to do so may result in an accident due to an incorrect output or malfunction.
  (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
  (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
    - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
    - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
  (3) All outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller.
  For a fail-safe circuit example, refer to "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.

[Design Precautions]

⚠WARNING

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.
- If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Incorrect output or malfunction due to a communication failure may result in an accident.
- To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures.

[Design Precautions]

⚠CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.
- Do not power off the programmable controller or reset the CPU module while the settings are being written. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so also may cause malfunction or failure of the module.

[Installation Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

⚠CAUTION

- Use the programmable controller in an environment that meets the general specifications in the Safety Guidelines included with the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect interconnection may cause malfunction, failure, or drop of the module.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- Do not directly touch any conductive parts and electronic components of the module. Doing so can cause malfunction or failure of the module.

[Wiring Precautions]

⚠WARNING

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Wiring Precautions]

⚠CAUTION

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
- Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module. Poor contact may cause malfunction.

[Wiring Precautions]

⚠CAUTION

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100mm or more between them. Failure to do so may result in malfunction due to noise.
- Place the cable in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cable or malfunction due to poor contact.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
- When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in the user's manual for the module used. If not, normal data transmission is not guaranteed.

[Startup and Maintenance Precautions]

⚠WARNING

- Do not touch any connectors while power is on. Doing so can cause electric shock or malfunction.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the module fixing screws. Failure to do so may result in electric shock.
- When changing data and operating status, and modifying program of the running programmable controller, ensure the safety before operation.

[Startup and Maintenance Precautions]

⚠CAUTION

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Turn off the programmable controller and shut off the external power supply (all phases) used in the FL-net (OPCN-2) system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.
- After the first use of the product, do not mount/remove the module to/from the base unit more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit may cause malfunction.
- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.

[Operating Precautions]

⚠CAUTION

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
- Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM undefined. The values need to be set in the buffer memory and written to the flash ROM again. Doing so can cause malfunction or failure of the module.

[Disposal Precautions]

⚠CAUTION

- When disposing of this product, treat it as industrial waste.

[Transportation Precautions]

⚠CAUTION

- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

CONDITIONS OF USE FOR THE PRODUCT

(1) This Mitsubishi Electric Engineering Company Limited (hereinafter referred to as “MEE”) product shall be used in applications that will not lead to a major accident even in the unlikely event any failure or defect should occur in the product in which this Mitsubishi product is incorporated, and shall be systematically provided with external backup and fail-safe functions that operate in the event of any failure or defect.

(2) This MEE product has been designed and manufactured as a general purpose product for general industry applications and the like. Thus, the product shall be excluded from use in special equipment, system, and other applications such as those listed below. If used in such applications, Mitsubishi shall not bear any responsibility whatsoever for the quality, performance,
and safety of the Mitsubishi product (including but not limited to non-performance of main obligation, defect liability, quality assurance liability, tort liability, and product liability):

- Applications in which the public could be greatly affected such as the applications of the nuclear and other power plants operated by the respective power companies
- Applications in which a special quality assurance system is required,
  such as the applications of railway companies or government or other public offices
- Use in aircraft, medical applications, railway applications, incineration and fuel devices,
  passenger vehicles, manned transport devices, equipment for recreation and amusement,
  and safety devices, in which human life or assets could be greatly affected

Note that such an application of the Mitsubishi product may be permitted as determined by Mitsubishi if the user accepts that the application is to be limited and a special quality is not to be required
(a quality that exceeds the general specifications). For details, please consult with Mitsubishi.

INTRODUCTION

Thank you for purchasing the FL-net interface module manufactured by Mitsubishi Electric Engineering Company, Ltd.

This manual describes the procedures, system configuration, wiring, programming, and troubleshooting of the relevant products listed below.

Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the programmable controller to handle the product correctly.
When applying the program and circuit examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.
Please make sure that the end users read this manual.

Relevant products

ER-1FL2-T

MEMO

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RELEVANT MANUALS

The manuals related to this product include the following.
Please consult the sales representative, local Mitsubishi representative, or dealer handling Mitsubishi products if necessary.

This manual does not include information on the module function blocks.
For details, refer to the Function Block Reference for the module used.

Products by Mitsubishi Electric Engineering

Manual name [manual number]	Description	Available form
FL-net(OPCN-2) Interface module ER-1FL2-T User's manual (Hardware Edition) [50CM-D180275]	Specifications, installation, and wiring of FL-net modules	Print book PDF
FL-net(OPCN-2) Interface module ER-1FL2-T User's manual (Detailed Edition) [50CM-D180277] (this manual)	Specifications, procedures before operation, system configuration, wiring, communication examples function, parameter settings, programming, troubleshooting, I/O signals, and buffer memory of FL-net modules	Print book PDF
FL-net (OPCN-2) Interface module ER-1FL2-T FB Library reference manual [50CM-D180282]	Function blocks of FL-net modules	PDF

Products by Mitsubishi Electric

Manual name [manual number]	Description	Available form
MELSEC iQ-R Module Configuration Manual [SH-081262ENG]	Common descriptions of the hardware configuration of all programmable controller modules manufactured by Mitsubishi.	Print book e-Manual PDF
MELSEC iQ-R CPU Module User's Manual (Startup) [SH-081263ENG]	Specifications, a function list, and procedures before operation of each programmable controller module manufactured by Mitsubishi.	Print book e-Manual PDF
MELSEC iQ-R CPU Module User's Manual (Application) [SH-081264ENG]	Function details, parameter settings, error codes, special relay areas, and special register areas of each programmable controller module manufactured by Mitsubishi.	Print book e-Manual PDF
MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks) [SH-081266ENG]	Instructions for the CPU module, intelligent function module dedicated instructions, standard function/standard function blocks of programmable controllers manufactured by Mitsubishi	e-Manual PDF
MELSEC iQ-R Programming Manual (Program Design) [SH-081265ENG]	Program specifications, such as ladder programs, ST programs, FBD/LD programs, and SFC programs and labels	Print book e-Manual PDF
GX Works3 Operating Manual [SH-081215ENG]	System configurations, parameter settings, and operation methods for the online function in GX Works3, which is the engineering tool manufactured by Mitsubishi.	Print book e-Manual PDF

MEMO

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
Buffer memory	Memory in an intelligent function module for storing data such as setting values and monitored values. When integrated into the CPU module, this memory refers to a memory for storing data such as setting values and monitored values of the Ethernet function, and data used for data communication of the multiple CPU system function.
Communication module	A generic term for communication boards and communication modules for FL-net communications among FA devices
Control CPU	A CPU module that controls connected I/O modules and intelligent function modules. The multiple CPU system allows the user to assign this control to any CPU module on a module-bymodule basis.
Control system	A system that takes control and performs network communications in a redundant system
Corresponding equipment	Personal computer, workstation (WS) or other device connected by FL-net (OPCN-2) for data communication.
CPU module	A generic term for the MELSEC iQ-R series CPU modules manufactured by Mitsubishi
Cyclic transmission	A function to perform data communications between the stations in the same network by using link devices in the FL-net module
Data link	A generic term for cyclic transmission and transient transmission
Dedicated instruction	An instruction for using the functions of a module
Device	A device (X, Y, M, D, or others) in a CPU module
Ethernet network system	Abbreviation for 10BASE-T/100BASE-TX network system.
External device	A generic term for the personal computer and other Ethernet-equipped modules connected over Ethernet for data communications
FA device	An FA system component device connected to FL-net
FL-net module	Abbreviation for ER-1FL2-T type FL-net (OPCN-2) interface module.
Global label	A label that is valid for all the program data when multiple program data are created in the project. There are two types of global label: a module specific label (module label), which is generated automatically by GX Works3, and an optional label, which can be created for any specified device.
GX Works3	A generic term for MELSOFT GX Works3, which is an engineering tool manufactured by Mitsubishi
Intelligent function module	A module that has functions other than input and output, such as an A/D converter module and D/A converter module
iQ Works2	A product which integrates engineering tools manufactured by Mitsubishi. It contains GX Works3, MT Works2, GT Works3, RT ToolBox2 mini, and FR Configurator2.
Label	A label that represents a device in a given character string
Link device	A device in a module on CC-Link IE
Link register (LW)	Word data send from each station on CC-Link IE Controller Network
Link relay (LB)	Bit data send from each station on CC-Link IE Controller Network
Link special register (SW)	Word data that indicates the operating status and data link status of a module on CC-Link IE
Link special relay (SB)	Bit data that indicates the operating status and data link status of a module on CC-Link IE
Module label	A label that represents one of memory areas (I/O signals and buffer memory areas) specific to each module in a given character string. For the module used, GX Works3 automatically generates this label, which can be used as a global label.
Network	In FL-net, a generic term for local area network (LAN) of data link level compliant with IEEE802.3
Network device	A generic term for FL-net communication devices such as communication cables, transceivers, and hubs compliant with IEEE802.3
Node	An FA device connected to FL-net. It is identified by the node number within the range of 1 to 254.
Personal computer	A personal computer in which Windows® is installed
Programmable controller CPU	A generic term for the R00CPU, R01CPU, R02CPU, R04CPU, R04ENCPU, R08CPU, R08ENCPU, R16CPU, R16ENCPU, R32CPU, R32ENCPU, R120CPU, and R120ENCPU manufactured by Mitsubishi

Term	Description
QJ71FL71-T QJ71FL71-B5 QJ71FL71-B2 QJ71FL71-T-F01 QJ71FL71-B5-F01 QJ71FL71-B2-F01	A generic term for the MELSEC Q series FL-net (OPCN-2) interface modules manufactured by Mitsubishi
Redundant function module	Another term for the R6RFM This module is used with the Process CPU (redundant mode) as a pair and configures a redundant system.
Redundant system	A system consisting of two systems that have same configuration (CPU module, power supply module, network module, and other modules). Even after an error occurs in one of the two system, the other system takes over the control of the entire system. For details, refer to "Redundant system" of the following manual. MELSEC iQ-R Module Configuration Manual
Remote head module	The abbreviation for the RJ72GF15-T2 CC-Link IE Field Network remote head module manufactured by Mitsubishi
Repeater hub	A generic term for concentrators with the function to electrically regenerate and repeat the transmission signal flowing in the cable
RnENCPU	A generic term for the R04ENCPU, R08ENCPU, R16ENCPU, R32ENCPU, and R120ENCPU manufactured by Mitsubishi
Process CPU	A generic term for the R08PCPU, R16PCPU, R32PCPU, and R120PCPU manufactured by Mitsubishi
Process CPU (redundant mode)	A Process CPU operating in redundant mode. A redundant system is configured with this CPU module. Process control FBs and the online module change function can be executed even in this mode.
Safety CPU	A generic term for the R08SFCPU, R16SFCPU, R32SFCPU, and R120SFCPU manufactured by Mitsubishi
Subnet mask	A number used to logically divide one network into multiple subnetworks and manage them easily. The following Ethernet network systems can be configured: • A small-scale Ethernet network system in which multiple network devices are connected • A medium- or large-scale network system in which multiple small-scale network systems are connected via routers or other network communication devices
Standby system	A backup system in a redundant system
Switching hub	A generic term for concentrators with the bridge function. A received packet is temporarily stored in the buffer, and then regenerated and repeated.
Tracking cable	An optical fiber cable used to connect two redundant function modules in a redundant system
Transient transmission	A function of communication with another node, which is used when requested by a dedicated instruction or the engineering tool

Product Portfolio

The following indicates the product portfolio of this product.

Model	Product name	Quantity
ER-1FL2-T	Module	1
	User's manual (Hardware Edition)	1
	Usage precautions (Chinese)	1

1 INTRODUCTION

This manual describes the specifications, procedures before operation, data communication methods, maintenance and inspection, and troubleshooting of FL-net modules.

FL-net (OPCN-2) versions

The FL-net module supports the following FL-net (OPCN-2) versions.

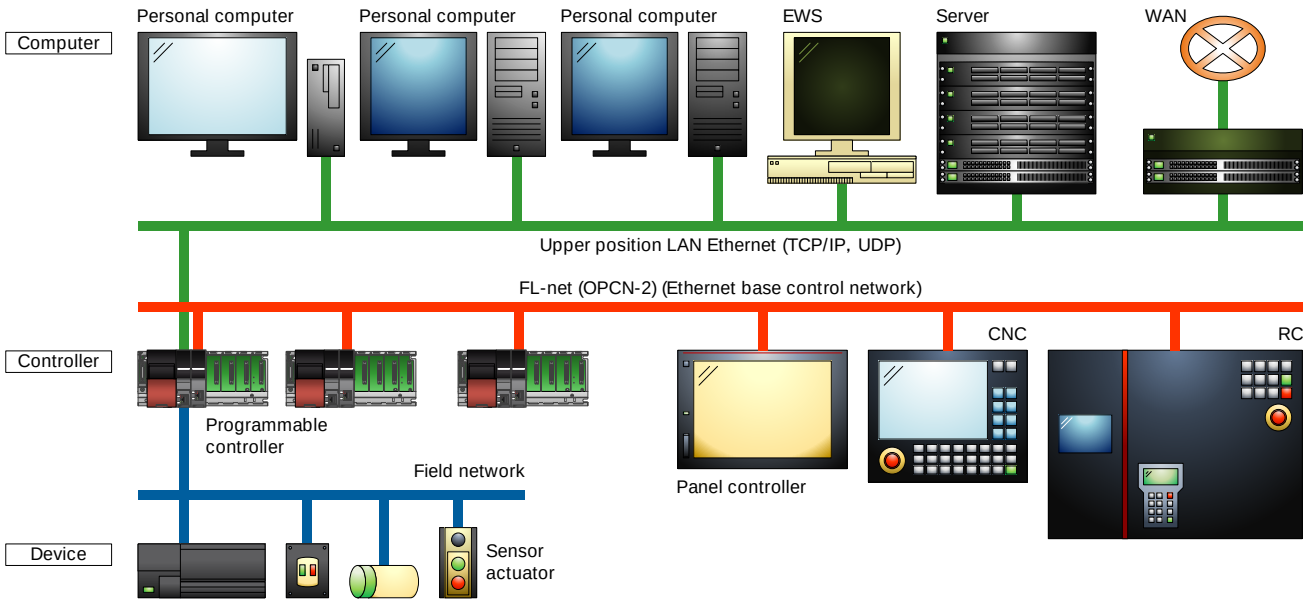
FL-net (OPCN-2) version	Ethernet standard
FL-net(OPCN-2) Version 3	10BASE-T/100BASE-TX

Coexistence of FL-net (OPCN-2) Version 3 and Version 1.00

Since there is no compatibility between FL-net (OPCN-2) Version 3 and FL-net (OPCN-2) Version 1.00, connections and communications are not allowed between these versions.
This incompatibility applies to the case of connecting another manufacturer's product.

1.1 What is the FL-net (OPCN-2)?

FA-net (OPCN-2) (the generic term for a network featuring FA link protocol) is standardized by the Japan FA Open Systems Promotion Group (JOP) of the Manufacturing Science and Technology Center, a group affiliated with the Ministry of Economy, Trade and Industry (the former Ministry of International Trade and Industry.)
The FA link protocol is intended for the FL-net to be used for data exchange between various control modules in manufacture systems such as programmable controller, robot controller (RC) and numerical control module (NC), and personal computers for control.



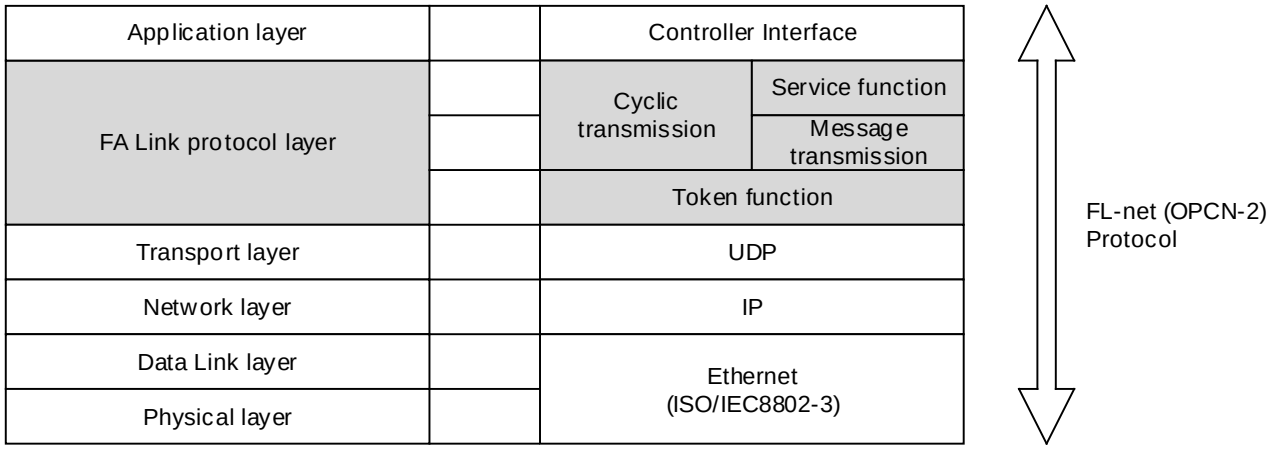
1.2 Features of the FL-net (OPCN-2)

The FL-net (OPCN-2) has the following features.

Overall features of the FL-net (OPCN-2)

■Realizes multi-vendor support

The FL-net (OPCN-2) can be interconnected to controllers, programmable controllers and other devices for manufacturers' programmable controllers or numerically controlled devices (CNC) and other devices that are very different and provide control and monitoring.



■Complies to standard specifications

It can use components commonly used for office automation equipment using Ethernet network equipment (such as transceivers, hubs, cables and LAN cards for Personal computer).

■Designed for future speed increases

Anticipates future transmission speed increases 10 Mbps 100 Mbps 1Gbps.

■For large-scale networks

Up to 254 modules of equipment (nodes) can be connected.
(Of the 254 modules, 249 can be used for control. The remaining five modules are assigned for failure diagnosis.)

■Two types of communication functions to match the application

Supports both types of communication functions: cyclic transmission which is a common memory function that allows each node to normally share the same data and message communication function in which only the required data is acquired when needed.

■Large-capacity common memory

The common memory is large: 8 k bits + 8 k words.

■Masterless method provides high reliability

Because there is no master and because the participation and release of each node does not affect communication of remote nodes, any node can freely turn the power supply on and off or perform maintenance.

Features of the FL-net module

■Data consistency

In area 2 (word area), double word (32-bit) data consistency (the separation prevention (*1)) is guaranteed.

*1 The separation prevention
The separation prevention is the data that has the meaning in a 2-word (32-bits) for current value for the positioning module and it uses the timing of cyclic transmission to prevent the new data and old data from being separated in 1-word units (16-bits).

Point

If the following conditions, are met in common memory assignment, double word (32-bit) data consistency is automatically guaranteed.

- The start address of area 1 (bit area) is multiples of 2.
- The size of area 1 (bit area) is multiples of 2.
- The start address of area 2 (word area) is multiples of 2.
- The size of area 2 (word area) is multiples of 2.

■Supports the PING command response function

When there is a PING command from a corresponding node, the FL-net module responds to the PING command.

■Equipped with self-diagnosis function

The FL-net module can perform Hardware test and self-return test.

■Simple setting in GX Works3

With the module parameters of GX Works3, the sequence program can be reduced since the settings of FL-net modules can be configured on the screen.
In addition, it makes checking of the modules' settings and operations easy.

■The sequence program for the MELSEC Q series FL-net (OPCN-1) interface module can be used.

The resources of the program created for MELSEC Q series FL-net modules manufactured by Mitsubishi, can be used as it is.

■Module function blocks

The module function blocks which can be used in GX Works3 simplify programming.

■Profiles

The profiles which can be used in GX Works3 simplify the start-up, operation, and maintenance of the FL-net module devices.

1.3 Frequently Asked Questions about the FL-net (OPCN-2)

The following are some of questions commonly asked about FL-net module (OPCN-2).
Please use them for your reference.

No.	Question	Answer
1	What is Ethernet?	Ethernet is a specification for defining the types of cables that is used in a Local Area Network (LAN). With Ethernet, data can be transferred among computers at a communication speed of 10 Mbps to 100 Mbps. Currently, the Ethernet most used for office applications is the 100 Mbps twisted pair cable (UTP). Ethernet uses the software protocol that is sent out by many multi-vendors to make communication possible.
2	What is FL-net (OPCN-2)?	FL-net (OPCN-2) is a network that connects FA controllers, such as programmable controllers or numerical control devices (CNC) and performs highspeed interactive exchanging of control data among these controllers. The cables and other components are the same as those used in Ethernet systems.
3	What is the difference between FL-net (OPCN-2) and Ethernet?	Ethernet connects host computers, personal computer and other types of controllers and is used for giving production instructions, collecting various production data and control applications. In addition, FL-net (OPCN-2) is used for making connections among controllers and using it for the high-speed exchange of controller data. When there is one controller module and when the FL-net (OPCN-2) is mounted on both the Ethernet for the host and for among the controllers, use extreme care not to mis-connect the cables.
4	How do you use the FL-net (OPCN-2)?	The FL-net module is mounted to FA controllers such as programmable controllers or numerical control devices (CNC) and by simply performing the link allocation settings for the station number (node number) and common memory (link register) in the same way as a "CPU link module" on a conventional computer, the cyclic sending and receiving of data among the controllers can be performed. Accordingly, no special communication program is required for the programmable controller or other control devices. Moreover, no special communication program is required for reading and rewriting programmable controller memory or communication parameter data from the personal computer. It should be noted that each controller will need a program if data transmission is performed using message transmission interactively among the controllers.
5	What is protocol? Specifically, what protocol does FL-net (OPCN-2) support?	Protocol consists of the rules necessary for communicating. FL-net (OPCN-2) supports UDP/IP and uses the dedicated "FA Link Protocol" for FL-net (OPCN-2) for positioning on the upper layer.
6	Can FL-net (OPCN-2) be connected to a conventional personal computer?	The FL-net module mounted to FA controllers such as programmable controllers and numerical control devices (CNC) have intelligent modules that have processors in the boards. Ethernet cards are referred to as "dumb boards", which means that they use a non-intelligent format so their use will depend on the performance of the personal computer and how it is used. Generally speaking, the use of the intelligent type FL-net (OPCN-2) board is recommended.
7	What is topology?	Network topology indicates the layout of the wiring. Generally speaking, there are three main layouts: star (tree), bus and ring. It is probably easier to think of these as logical arrangements rather than the physical layout of the cables. The 10BASE-T/100BASE-TX used on FL-net (OPCN-2) is star topology. 10BASE5 is bus topology.
8	What is the relationship between the type of network cable and the length and number of modules that can be connected?	The following are some of the standards, characteristics and limitations of Ethernet cable, which is the most commonly used type. 10BASE-T/100BASE-TX: Twisted pair cable (STP/UTP). The maximum transmission distance per segment is 100m (500m *1). The maximum number of modules that can be connected per segment is 254.
9	Are special Ethernet specifications required for systems using FL-net (OPCN-2)?	No. When constructing a FL-net (OPCN-2) system, uses Ethernet specifications (IEEE802.3 standards). There are no special specifications.
10	How is connection with FL-net (OPCN-2) made?	Different types of Ethernet media can be interconnected to Ethernet cable by using devices such as repeaters and media conversion adapters. These products are sold by a most vendors.

No.	Question	Answer
11	What is the best cables to use when constructing a FL-net (OPCN-2) system?	The following are the most commonly used cables. ・Trunk lines : 10BASE5 (Thick coaxial cable, yellow cable) ・Inside control panels and for office applications: 10BASE-T/100BASE-TX (Twisted pair cable, STP/UTP category 5 or more) ・Locations with high-voltage power supplies or other types of electric noise: 10BASE-FL (optical fiber cable)
12	How do you set the IP address for FL-net (OPCN-2)?	The FL-net (OPCN-2) IP address is network address: 192.168.250.Host number (node number): 1 to 254 is standard. Note that node numbers 250 to 254 are reserved for maintenance use.
13	What is the compatibility and interconnectability of FL-net (OPCN-2) compatible equipment?	There is a certification organization for FL-net (OPCN-2) that performs compatibility and interconnectability testing. Equipment that pass these tests are issued a certificate to show that they are FL-net (OPCN-2) compatible equipment.

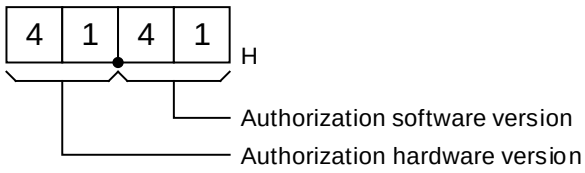
*1 Values shown in ( ) indicate that a repeater is used.

1.4 FL-net (OPCN-2) Version Information

Authorization version

The FL-net (OPCN-2) authorization version of the FL-net module can be confirmed with the buffer memory.
(Address: 2506)
(☞Page 191 Local node information area "FL-net (OPCN-2)→CPU")

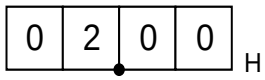
Ex. The software and hardware versions are “A”.



Protocol version

The FL-net (OPCN-2) protocol version of the FL-net module can be checked with the buffer memory (Address: 2505).
(☞Page 191 Local node information area "FL-net (OPCN-2)→CPU")

Ex. The version is 2.00.



2 FUNCTION LIST

This section describes the functions of the FL-net module.

Function		Description
Cyclic transmission ☞Page 142 Cyclic transmission and area	Communication of large data volume	The common memory method enables cyclic transmission of data as follows. • Area 1 (bit area): 8 k bits (512 words) • Area 2 (word area): 8 k words (8192 words) Transmitting and receiving up to 8. 5 k words/node cyclic data is possible.
	Guaranteed refresh cycle time	Since the permissible refresh cycle time is dynamically determined, message transmission (transient transmission) can be controlled with the refresh cycle time guaranteed.
	High-speed cyclic transmission by 100BASE-TX connection	By changing the operation mode in the intelligent function module switch setting, high-speed cyclic transmission at 100Mbps is available by 100BASE-TX connection. ☞Page 59 Switch setting This function has been certified by JEMA (Japan Electrical Manufacturer's Association), and can be used from the first released products.
Message transmission ☞Page 151 Message transmission	Reading and writing of data in word blocks.	By using the virtual memory access method, it is possible to read and write the virtual address space data assigned by each manufacturer in word units.
	Reading of the network parameters	It is possible to read the network parameters for each node. (such as vendor name, token monitoring time, etc.)
	Reading of device profile	It is possible to read the device profile data held by each node.
	Reading and clearing of log information	It is possible to read and clear the communication log information held by each node.
	Message return data response	It is possible to return the received data as-is whenever a message return command is received.
	Transparent message transmission	• Message data (up to 1024 bytes) for the message area of a specified node can be sent and received. • Possible to send and receive transaction codes other than those used by the system.
Self diagnosis function ☞Page 132 Self-diagnosis test	Self-loopback test	The GX Works3 can be used to set the loopback test mode to perform tests of the send/receive functions of FL-net module and the status of the lines.
	Hardware test	The GX Works3 can be used to set the hardware test mode to perform hardware testing of the FL-net module.
Ping command response function ☞Page 116 Ping command response function		It is possible to confirm the IP address of the FL-net module by issuing a ping command to your local node FL-net module from a corresponding device (personal computer, etc.) connected to the FL-net (OPCN-2) network.
Multiple CPU function compatibility		It is possible to control by optional CPU modules, even when multiple card CPU modules are mounted to the same base unit.
Parameter setting by GX Works3 ☞Page 58 Module Parameter	Switch setting	Sets the IP address and operation mode of the FL-net module.
	Basic setting	Sets the items of the local node network parameter area which require the basic setting.
	Auto refresh setting	Sets the status data bit area and status data word area in the buffer memory of the FL-net module to be refreshed.
Event list ☞Page 128 Event list		Displays event information such as a network error.

MEMO

3 PROCEDURES BEFORE OPERATION

This chapter describes the procedures before operation.

1. Network construction

Configure the system and set the parameters which are required for start-up.

- Wiring (☞Page 46 INSTALLATION AND WIRING)
- Parameter setting (☞Page 56 PARAMETER SETTINGS)

2. Communication check using the PING command

Confirm that communications can be performed successfully by using the PING command response function.
For details, refer to the following.
☞Page 116 Ping command response function

3. Programming

Create a program. For details, refer to the following.
☞Page 72 COMMUNICATION EXAMPLES

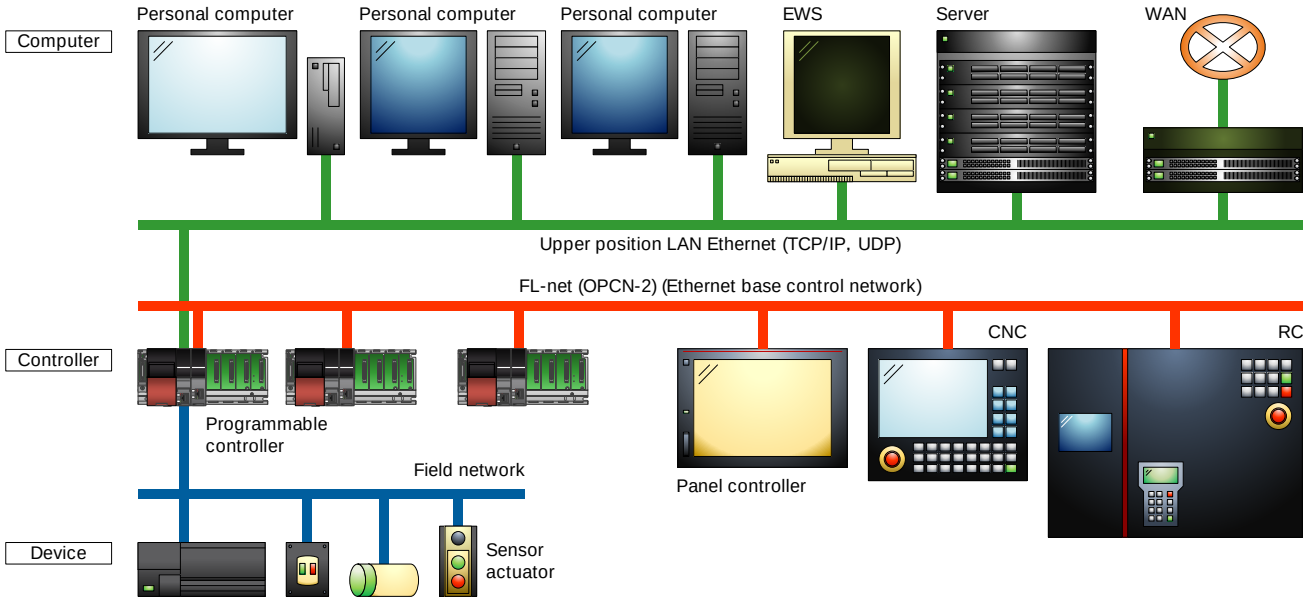
MEMO

4 SYSTEM CONFIGURATION

This section introduces the system configuration possible using FL-net module combinations.

Basic system

The FL-net module can communicate with FL-net (OPCN-2) compatible personal computer and equipment.
(Use dedicated FL-net (OPCN-2) wiring for the Ethernet wiring.)



Restriction

Use dedicated FL-net (OPCN-2) wiring for the Ethernet wiring.

Mixed system

The following is the type of communication possible with mixed systems.

■Cyclic transmissions

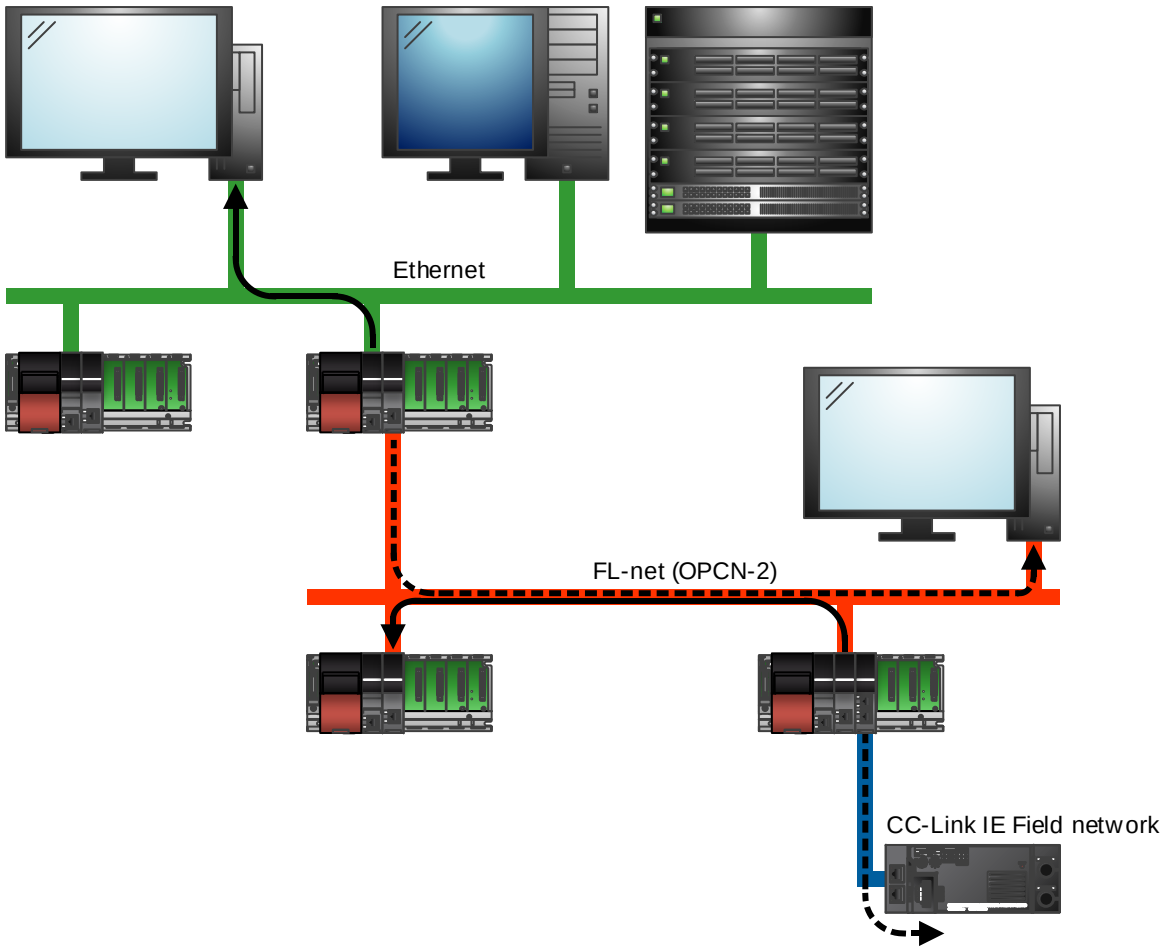
Data transmissions can be performed within FL-net (OPCN-2).

Communication with other networks can be performed by interchanging the CPU module and using a sequence program.

■Message transmissions (transient transmission)

Data transmissions can be performed within FL-net (OPCN-2).

Communication with other networks can be performed by interchanging the CPU module and using a sequence program.



4.1 System Configuration Specifications

This section describes the overview of the system configuration.

CPU module

The following shows the CPU module which the FL-net module can be used with.

CPU type	CPU model	Application
Programmable controller CPU	R00CPU	○
	R01CPU	○
	R02CPU	○
	R04CPU	○
	R08CPU	○
	R16CPU	○
	R32CPU	○
	R120CPU	○
Process CPU *2*5	R08PCPU	○
	R16PCPU	○
	R32PCPU	○
	R120PCPU	○
RnENCPU *3	R04ENCPU	○
	R08ENCPU	○
	R16ENCPU	○
	R32ENCPU	○
	R120ENCPU	○
Safety CPU	R08SFCPU	○ *1
	R16SFCPU	○ *1
	R32SFCPU	○ *1
	R120SFCPU	○ *1
C Controller module *4	R12CCPU-V	○
Motion CPU	R16MTCPU	×
	R32MTCPU	×
	R64MTCPU	×
NCCPU	R16NCCPU	×
Remote head module	RJ72GF15-T2	○ *5

*1 Some functions are not supported.
For details on the unsupported functions, refer to the following.
MELSEC iQ-R CPU Module User's Manual (Startup)
MELSEC iQ-R CPU Module User's Manual (Application)

*2 This module is not available in for the process CPU (redundant mode) manufactured by Mitsubishi.

*3 This module is not available in the extended temperature range redundant power extension base unit (R68RB-HT).

*4 There are restrictions on the following functions in the FL-net module controlled by C Controller modules.
- The word block read/write request messages using the message transmission function cannot be received.
- The auto refresh function cannot be used.

*5 There are restrictions when this module is used as a slave station in the redundant system.
For details, refer to the following.
Page 254 When using the FL-net module in a redundant system

Multiple CPU Systems

When using the FL-net module in a multiple CPU system, refer to the “MELSEC iQ-R Module Configuration Manual” first.

MELSEC iQ-R Module Configuration Manual

Restriction

In a multiple CPU system to which an FL-net module is mounted, only the control CPU for the FL-net module can use the FL-net module functions.

Point

When using an FL-net module in the multiple CPU system, set the control CPU which controls the FL-net module in GX Works3.

For setting methods of the multiple CPU system, refer to the following.

Page 57 System parameter

MELSEC iQ-R CPU Module User's Manual (Application)

4.2 Applicable Software

The following software is available for this module and the system of MELSEC iQ-R series manufactured by Mitsubishi.

Manual of each software

Item	Function and application
iQ Works Version 2	A package software integrated the various software such as a programmable controller, motion controller, and GOT
GX Works3 Version 1.030G or later	A software for a system design, programming, debug, and maintenance of a programmable controller

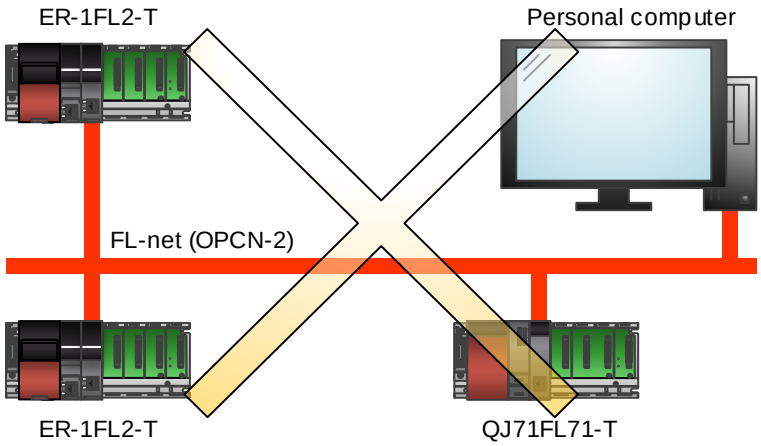
There are restrictions on the functions depending on the GX Works3 version. The following shows the combinations of each version and function.

Function	GX Works3	Reference
Module label	Version 1.030G or later *1	Page 164 Module label
Intelligent Function Module Monitor	Version 1.040S or later	Page 70 INTELLIGENT FUNCTION MODULE M
Module FB (Function Block)	Version 1.036N or later	FL-net (OPCN-2) Interface module ER-1FL2-T FB Library reference manual

*1 Refer to the following for details.
MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks)

4.3 Restrictions system configuration

Since the FL-net protocol of FL-net (OPCN-2) Version 3 modules is different from that of FL-net (OPCN-2) Version 1.00 modules, the following two types of modules cannot communicate each other.



FL-net (OPCN-2) Version 3 module	FL-net (OPCN-2) Version 1.00 module
• ER-1FL2-T (this module) • QJ71FL71-T-F01 manufactured by Mitsubishi • Version 2.00 products from other manufacturers • Version 3 products from other manufacturers	• QJ71FL71-T manufactured by Mitsubishi • Version 1.00 products from other manufacturers

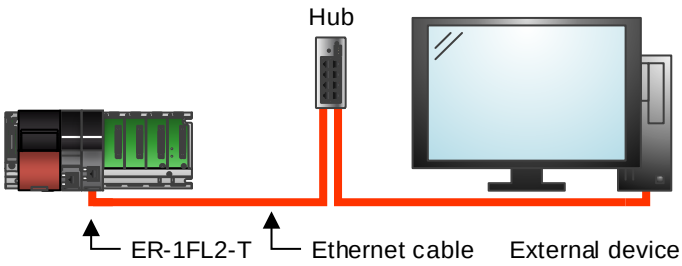
4.4 Equipment required when configuring the network

The following introduces the component equipment of the network.
Since installing the network requires the utmost of safety, always have the work done by trained specialists.
When connecting a ER-1FL2-T to a network, either a 100BASE-TX or 10BASE-T can be used.
The ER-1FL2-T detects whether it is 100BASE-TX or 10BASE-T, and the full-duplex or half-duplex transmission mode according to the hub. For connection to the hub without the auto detection function, set the halfduplex mode on the hub side.

Connection using the 100BASE-TX

Use equipment that meets IEEE802.3 100BASE-T specifications.
(Devices to be connected with a hub, including the hub)

- Shielded twisted pair cable (STP), category 5 or higher.
- RJ45 jack.
- Hub for 100 Mbps.



Point

Consult a network specialist for information about the required equipment.
During the high-speed communication (100 Mbps) via 100BASE-TX connection, a communication error may occur due to the effect of high frequency noise from devices other than programmable controllers in a given installation environment.
The following are countermeasures on the ER-1FL2-T side to prevent the effect of high frequency noise when constructing network systems.

■Wiring

- Do not bundle the twisted pair cables with the main circuit and the power wires, and do not install them close to each other. Keep a distance of 100mm or more between them.
- Place the twisted pair cables in a duct.

■Changing to 10 Mbps transmission

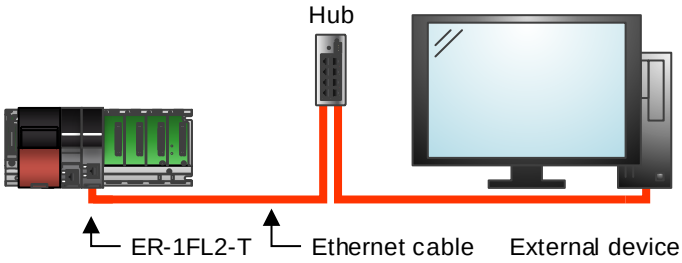
- Use a data transmission rate of 10 Mbps by changing the hub connected to the ER-1FL2-T to a 10 Mbps hub.

Connection using 10BASE-T

Use equipment that meets IEEE802.3 10BASE-T specifications.

(Devices to be connected with a hub, including the hub)

- Unshielded twisted pair cable (UTP) or shielded twisted pair cable (STP), category 3 or higher
- RJ45 jack
- Hub for 10 Mbps



4.5 Preparation of GX Works3

This section explains preparation for using FL-net module with GX Works3.
In order to use FL-net module with GX Works3, installation of module profile, module label, module FB is necessary.

Point

For installers, please consult the sales representative, local Mitsubishi representative, or dealer handling Mitsubishi products.

Install procedures

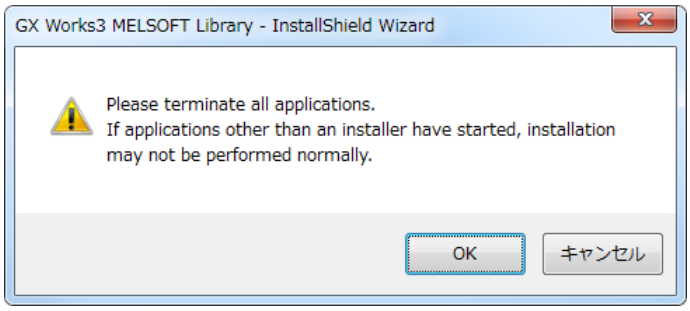
This part describes the procedures used to install the module profile, module label, and module FB to a computer.

Point

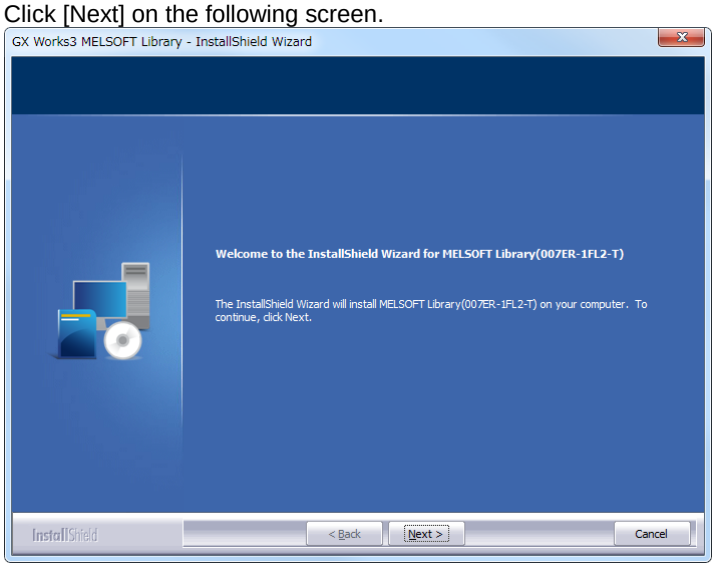
■Verify the following before installation
・Log in to the computer as an Administrator.
・Before installation, terminate all softwares that are being operated on Microsoft Windows® Operating System. If installing in a state where other software is running, the product may not operate correctly.
■Installation
The following screenshots are an example of the screens displayed when installing on Windows® 7.
The displayed screenshots may differ depending on the settings of the computer being used.

1. If GX Works 3 is running, exit GX Works 3.
[Project]⇒[Exit]

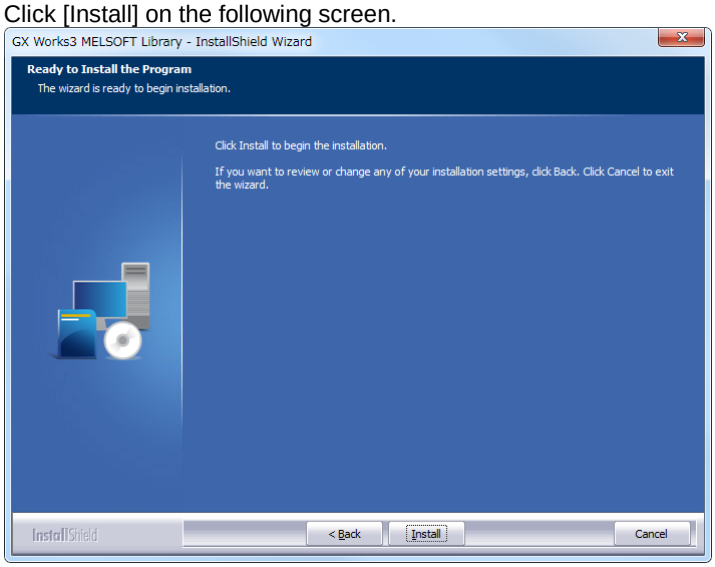
2. Execute the installer (“setup.exe”), and clink [OK] on the screen below.



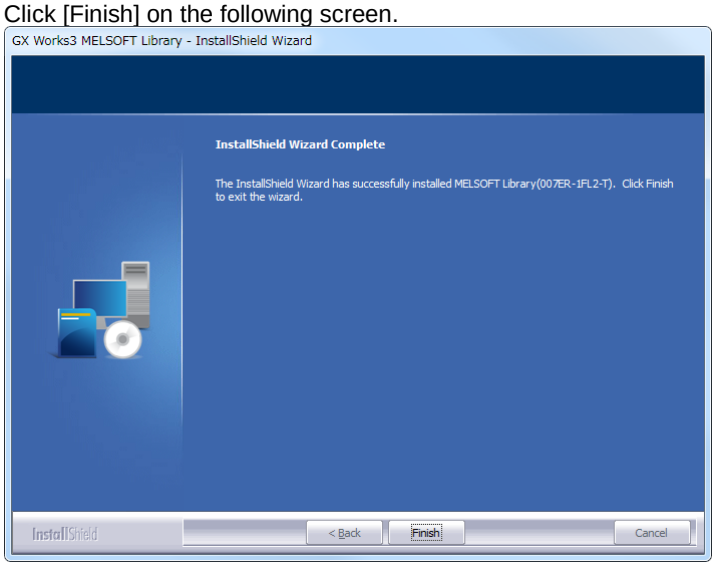
3. Click [Next] on the following screen.



4. Click [Install] on the following screen.

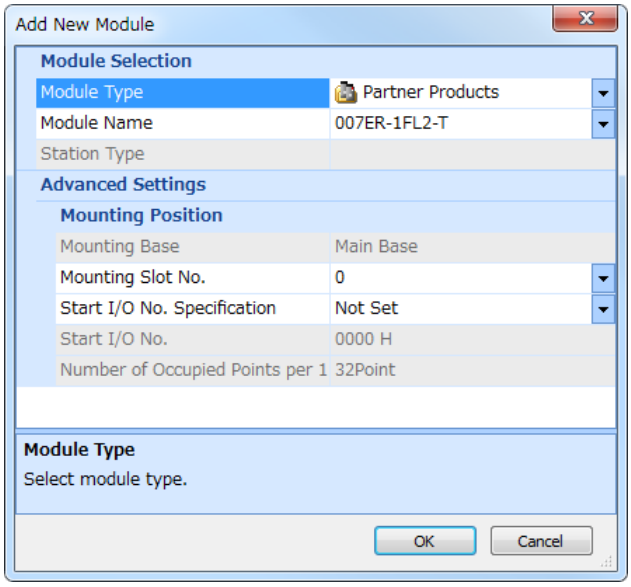


5. Click [Finish] on the following screen.



6. Start GX Works3 and confirm that you can select 007ER-1FL2-T in [Add New Module].
″007ER-1FL2-T″ is displayed on this module on GX Works3.

[Navigation window]⇒[Parameter]⇒[Module information]⇒Right-click⇒[Add New Module]



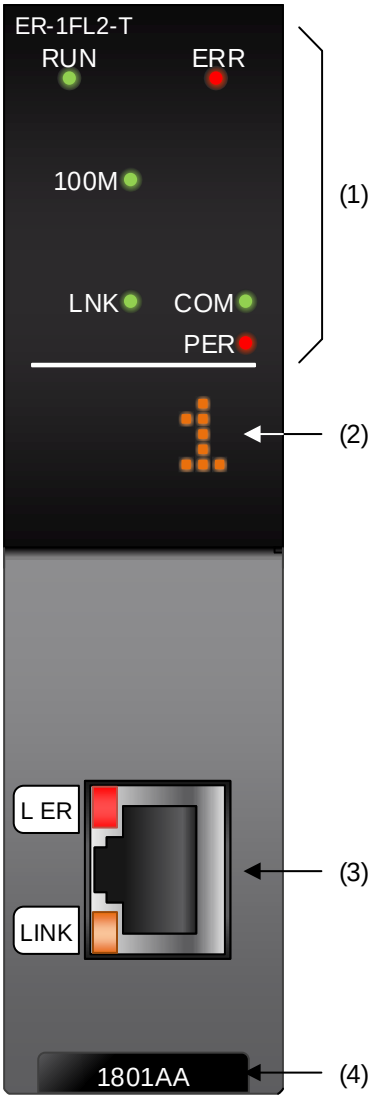
Point

- For how to use GX Works3, refer to the following.
  GX Works3 Operating Manual
- For how to use module label, refer to the following.
  MELSEC iQ-R Programming Manual (Program Design)
- For how to use module FB, refer to the following.
  FL-net (OPCN-2) Interface module ER-1FL2-T FB Library reference manual

MEMO

5 PART NAMES

This section describes the names of each part of the ER-1FL2-T.



No.	Name	Description
(1)	Operation status indicator LED	Displays the operating status of the module. (☞ Page 42 Operation indication LED, FL-net port LED)
(2)	Dot matrix LED	Displays the node number set for the module and the result of the self-diagnosis test. (☞ Page 43 Dot matrix LED indication)
(3)	FL-net port	A Connector for FL-net connection. Connect an Ethernet cable. For wiring methods and wiring precautions, refer to the following. (☞ Page 46 INSTALLATION AND WIRING) Displays the operating status of FL-net network. (☞ Page 42 Operation indication LED, FL-net port LED)
(4)	Serial number marking	Displays the serial number (6 digits) of the module.

Operation indication LED, FL-net port LED

This section describes the operating status LEDs and FL-net port LEDs.

LED name	Description
RUN LED	Displays the operation status of the module. On: Normal operation Off: Error
ERR LED	Displays the error status of the module. On: Error Off: Normal operation
PER LED	Displays network parameter setting status. On: Setting error (*1) Off: Setting normal
100M LED	Displays the transmission speed. On: 100Mbps Off: 10Mbps/Unconnected
LNK LED	Displays the token participation status. On: Token passing status Off: No token passing
COM LED	Displays the send/reception status. On: Sending or receiving data Off: Not sending or receiving data
L ER LED	Displays the connection error status of the FL-net port. On: Communication error Off: Normal operation
LINK LED	Displays the link status of the FL-net port. On: Link-up has occurred (100Mbps) Off: Link-down has occurred, or the transmission speed is 10 Mbps

*1 These LEDs turn on when settings (mode, node number) are out of range, or a fatal error is detected.

Dot matrix LED indication

Indicates the node number set in the module and the self-diagnostics test result.

■Node number indication

The following table lists the node number indicated on the dot matrix LED.

Status	Display
In online mode	Displays the current node number of FL-net. Node number not set: "__ __ __" Normal station: 1 to 254
In offline mode	Displays "__ __ __" in offline mode.
At major error	Undefined

■Self-diagnosis test indication

The status and result of the self-diagnostic test are displayed.

Test status	Display
Test in progress	The dot matrix LED displays "UCT".
Normal completion	The dot matrix LED displays "OK".
Abnormal end	The ERR LED turns on and the dot matrix LED indicates "ERR" and error number alternately at intervals of 1 second. 1: Self-loopback test completes abnormally *1 2: Hardware test completes abnormally *1

*1 Please consult your local Mitsubishi representative.

6 SPECIFICATIONS

6.1 General Specifications

Item	Specifications					
Operating ambient temperature	0 to 55℃ (When an extended temperature range base unit is not used)					
	0 to 60℃ *3 (When an extended temperature range base unit is used)					
Storage ambient temperature	-25 to 75℃					
Operating ambient humidity	5 to 95%RH, non-condensing					
Storage ambient humidity	5 to 95%RH, non-condensing					
Vibration resistance	Compliant with JIS B 3502 and IEC 61131-2	-	Frequency	Constant acceleration	Half amplitude	Sweep count
		Under intermittent vibration	5 to 8.4Hz	-	3.5mm	10 times each in X, Y, and Z directions
			8.4 to 150Hz	9.8m/s^2	-	
		Under continuous vibration	5 to 8.4Hz	-	1.75mm	-
			8.4 to 150Hz	4.9m/s^2	-	
Shock resistance	Compliant with JIS B 3502 and IEC 61131-2 (147m/s^2, 3 times each in X, Y, and Z bidirections)					
Operating atmosphere	No corrosive gases, flammable gases, less conductive dust					
Operating altitude *1	0 to 2000m					
Installation location	Inside a control panel					
Pollution degree *2	2 or less					
Equipment class	Class III					

*1 Do not use or store the programmable controller under pressure higher than the atmospheric pressure of altitude 0m. Doing so may cause malfunction.

*2 This index indicates the degree to which conductive material is generated in terms of the environment in which the equipment is used. Pollution degree 2 is when only non-conductive pollution occurs. A temporary conductivity caused by condensing must be expected occasionally.

*3 All modules mounted on the extended temperature range base unit offer the same performance as that for an operating ambient temperature of 0 to 55℃, and can be used in an operating ambient temperature of 0 to 60℃.

6.2 Performance Specifications

Item			Specifications
Transmission specifications	Data transmission speed		10BASE-T/100BASE-TX
	Communication mode	Half-duplex	Half-duplex
		Full-duplex/half-duplex	Full-duplex/half-duplex
	Transmission method		Base band
	Electric interface		IEEE802.3 standard (CSMA/CD standard)
	Transmission protocol		UDP/IP FA link protocol
	Maximum segment length		100m (length between hub and node) *1
	Maximum number of nodes in system		254
	Maximum number of cascade connections		10BASE-T: maximum four stages *2 100BASE-TX: maximum two stages *2
	Cyclic data volume		Maximum (8 k bits + 8 k words)/system Maximum (8 k bits + 8 k words)/node
	Message data volume		Maximum 1024bytes
Link data specifications	Common memory area		Area 1 (bit area): 8 k bits Area 2 (word area): 8 k words
	Error log memory area		512 words
	Status memory area		Bit area: 2 k bits Word area: 2 k words
	Local node network parameter setting area		128 words
	Other node network parameter setting area		2048 words
	Network parameter acquisition area		512 words
	Device profile memory area		512 words
	Message area (Transient area)		Maximum 1024 bytes×2 (1 for each of transmit and receive)
Transmission specifications	Message transmission		500 ms or less (1:1 Arrival time of one-way message)
	Token start time		New participation: Start time = 3000 + (Minimum node number/8 remaining)×4 + 1200ms Halfway participation: Participation time = Refresh cycle×3 +local node number×4ms
	Refresh time		☞Page 223 Refresh processing time
	Transmission delay time		☞Page 226 Transmission delay time
Number of occupied I/O points			32 points
Internal current consumption (5VDC) *3			0.54A
External dimensions	Height		106mm (Base unit mounting side: 98mm)
	Width		27.8mm
	Depth		110mm
Weight			0.17kg

*1 The maximum segment length of the Ethernet cable is 100m. However, the length may be shorter depending on the operating environment of the cable. For details, contact your cable manufacturer.

*2 This applies when a repeater hub is used. For the number of levels that can be constructed when using a switching hub, consult the manufacturer of the switching hub used.

*3 The power supply must conform to the UL 508 voltage and current limit circuit (LVLC) or must use a power supply conforming to the SELV (Safety Extra-Low Voltage) and LIM (Limited Energy Circuit) circuit.

7 INSTALLATION AND WIRING

7.1 Installation Environment

Install a programmable controller according to the installation environment shown in the general specifications.
(☞Page 44 General Specifications)
FL-net module is intended for indoor use only.

Do not install the programmable controller to the following place.

- Ambient temperature is outside the range of 0 to 55℃ *1.
- Ambient humidity is outside the range of 5 to 95%RH.
- Condensation occurs because of rapid temperature change.
- Corrosive gas or combustible gas exists.
- Conductive powder such as dust and iron powder, oil mist, salinity, or organic solvent is filled.
- Programmable controller is exposed to direct sunlight.
- Strong electric field or strong magnetic field is generated.
- Programmable controller is subject to vibration and shock.

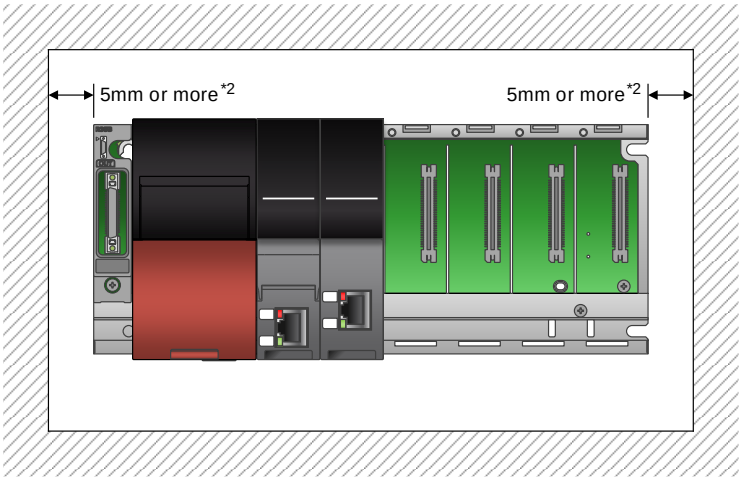
*1 When an extended temperature range base unit is used, each module can be used in the environment of 0 to 60℃.

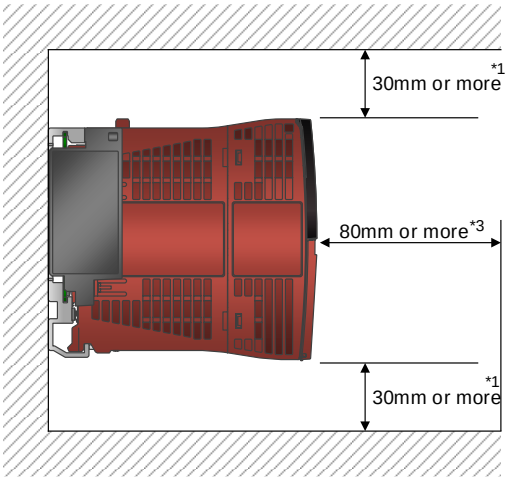
7.2 Installation Position

For details on mounting and installation of this module, refer to the MELSEC iQ-R Module Configuration Manual.
When installing this module and a programmable controller in a control panel, fully consider its operability, maintainability, and environmental resistance.
FL-net module is intended for indoor use only.

Installation position for programmable controller

To improve the airflow and change a module easily, provide clearance between the module top/bottom and structures/parts as shown below.





A shaded area shows the ceiling of a control panel, wiring duct, or parts.

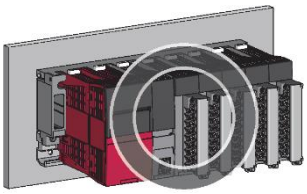
*1 Provide clearance of 30mm or more when the height of a wiring duct is 50mm or less.
In other cases, provide clearance of 40mm or more.

*2 Provide clearance of 20mm or more when an extension cable is connected/removed without removing a power supply module.

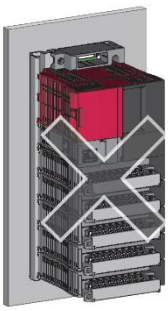
*3 Provide clearance of 20mm or more for a power supply module, and 80mm or more for a module using a connector for external devices.

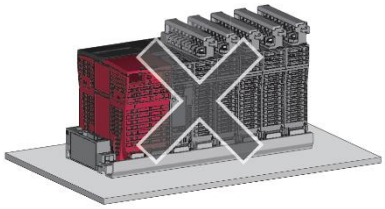
Installation direction for programmable controller

• To improve the airflow for heat dispassion, install a programmable controller in the following direction.



• Do not install the programmable controller in the following direction.





Installation surface

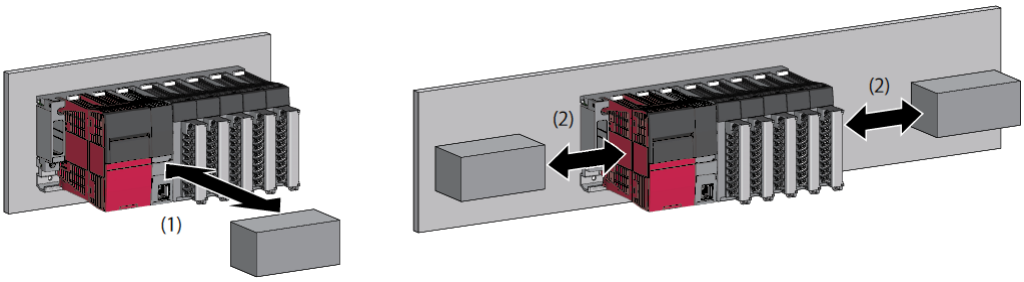
Install a base unit on a flat surface.
If the installation surface is uneven, excessive force is applied to the printed-circuit board, which may cause malfunction.

Installation of programmable controller with other devices

To avoid the close installation of a programmable controller and vibration sources such as an electromagnetic contactor and no fuse breaker, install them in a different control panel or at a distance.

Clearance between a programmable controller and other devices

Provide the following clearance between the programmable controller and other devices such as a contactor and relay to avoid influence from the radiated noise and heat.

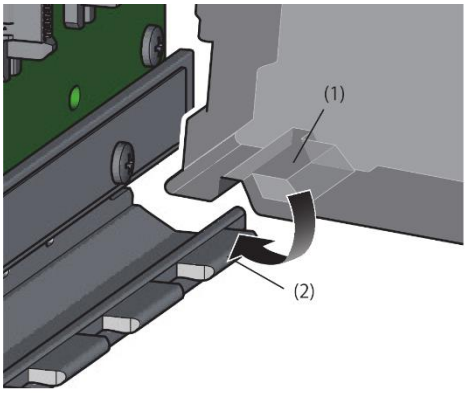


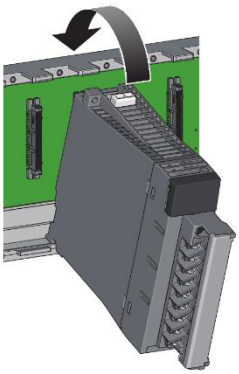
(1) A device in front of a programmable controller: 100mm or more
(2) A device on the right and left of a programmable controller: 50mm or more

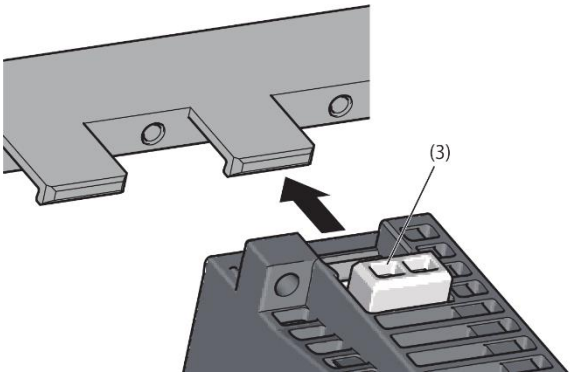
7.3 Mounting/Removing a Module

This section describes the procedure of mounting/removing a module on/from a base unit.
Turn off a system when mounting/removing the module.

Mounting procedure







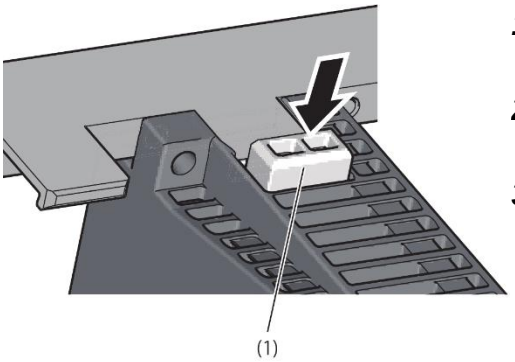
1. When a cap is attached to the module connector of the base unit, remove it.
2. Place the concave part (1) of a module onto the guide (2) of the base unit.
3. Push in the module until the module fixing hook (3) snaps into place.
4. Check that the module fixing hook (3) hangs the base unit and the module is mounted on the base unit securely.

Point

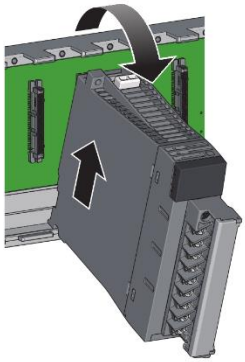
When using the programmable controller in an environment of frequent vibration or impact, secure the module to the base unit using screws.

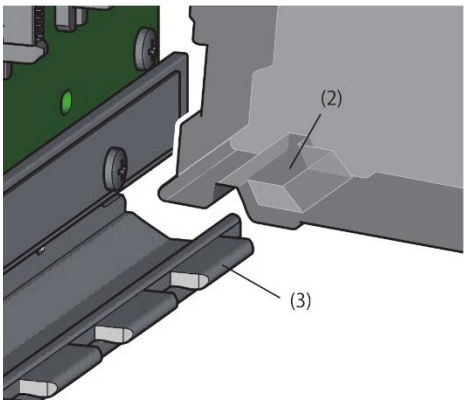
- Module fixing screw: M3×12 (commercial product)

Removal procedure



1. Support the module with both hands and securely press the module fixing hook (1) with your finger.
2. Pull the module straight supporting it at its bottom while pressing the module fixing hook (1).
3. While lifting the module, remove the concave part (2) from the guide (3) of the base unit.





Point

・When module fixing screws are used, remove the screws first and module from the base unit.
Failure to do so may damage the module.
・The module surface temperature may be high immediately after power-off.
When the module is removed, pay attention to the burn injury.

Handling precautions

This section explains the precautions for the FL-net module itself.

・The case for the FL-net module is plastic. Do not drop it or expose it to strong impact.
・Tighten the screws such as module fixing screws within the following ranges.

Screw location	Tightening torque range
Module fixing screw (M3)	0.36 to 0.48N・m

7.4 Wiring

This section explains the methods of connecting the FL-net module to the network.

Connection method

This section explains the methods for connecting the FL-net module to a 10BASE-T/100BASE-TX network.

1. Connect the Ethernet cable to the hub.
2. Connect the Ethernet cable to the FL-net module.

Point

・100BASE-TX/100BASE-TX and full-duplex/half-duplex communication mode are determined in accordance with the hub by the FL-net module. For connection to a hub that does not have the auto negotiation function, set the half-duplex mode on the hub side.

・For equipment required for 10BASE-T/100BASE-TX connection and a system configuration example, refer to the following.

(☞Page 35 Equipment required when configuring the network)

Wiring methods

This section describes the wiring when Ethernet is used.

Connecting the cable

1. Push the Ethernet cable connector into the FL-net module until it clicks. Pay attention to the connector's direction.
2. Lightly pull it to check that it is securely connected.
3. Confirm that the LINK LED of the port connected with the Ethernet cable turns on when the transmission speed is 100 Mbps. *1 *2

*1 The LINK LED of the port does not turn on when the transmission speed is 10 Mbps.

*2 The time between the cable connection and the LINK LED turning on may vary. The LINK LED usually turns on in a few seconds. Note, however, that the time may be extended further if the link-up processing is repeated depending on the status of the device on the line.

Disconnecting the cable

1. Press the latch down and unplug the Ethernet cable.

Precautions

- Place the Ethernet cable in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact.
- Do not touch the core of the cable-side or module-side connector, and protect it from dirt or dust. If oil from your hand, dirt or dust is attached to the core, it can increase transmission loss, arising a problem in data link.
- Check that the Ethernet cable is not disconnected or not shorted and there is no problem with the connector connection.
- Do not use Ethernet cables with broken latches. Doing so may cause the cable to unplug or malfunction.
- Hold the connector part when connecting and disconnecting the Ethernet cable. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- The maximum segment length of the Ethernet cable is 100m. However, the length may be shorter depending on the operating environment of the cable. For details, contact your cable manufacturer.
- The bend radius of the Ethernet cable is limited. For details, check the specifications of the Ethernet cable to be used.

Wiring products

The following describes the devices used for Ethernet.

Point

An Ethernet-equipped module determines whether to use 10BASE-T/100BASE-TX and the full-duplex/half-duplex communication mode based on the hub.
For connection to the hub with no automatic negotiation function, set the communication mode on the hub side to meet the mode of the FL-net module.

Ethernet cable

Use Ethernet cable that meets the following standards.

Communication speed	Ethernet cable	Type
10Mbps	Category 3 or higher, straight cable (shielded, STP)	10BASE-T
	Category 3 or higher, straight cable (UTP)	
	Category 3 or higher, crossing cable (shielded, STP)	
	Category 3 or higher, crossing cable (UTP)	
100Mbps	Category 5 or higher, straight cable (shielded, STP)	100BASE-TX
	Category 5 or higher, crossing cable (shielded, STP)	

Point

A communication error may occur due to high-frequency noise from devices other than a programmable controller in a given connection environment. The following describes countermeasures to be taken on the FL-net module side to avoid high-frequency noise influence.

■Wiring

- Do not bundle the cable with the main circuit or power cable or do not place it near those lines.
- Place the cable in a duct.
- When using a UTP cable, use STP cables.

Hubs

Use hubs that support the transmission speed of communication when using hub in the Ethernet.

8 MAINTENANCE AND INSPECTION

FL-net modules require no inspections other than check for the loose connection of cables.

For other inspections, check the inspection items described in the MELSEC iQ-R Module Configuration Manual to properly use a programmable controller system manufactured by Mitsubishi in optimal condition at all times.
MELSEC iQ-R Module Configuration Manual

Point

Before performing the following operations, read and understand "SAFETY PRECAUTIONS" during operation. Always keep safety top priority during operation.

Operating procedure when changing the FL-net module

When changing the FL-net module, follow the steps below.

1. Turn the power for the station to which the FL-net module is mounted to OFF.
2. Remove the network cable and FL-net module.
3. Follow the procedures before operation to start the FL-net module.
(☞Page 28 PROCEDURES BEFORE OPERATION)

Procedure when changing the CPU module

When changing the CPU module, follow the steps below.

1. Use GX Works3 to write and save settings related to the FL-net module (I/O tables, IP addresses) and sequence program. *1
2. Replace the CPU module.
MELSEC iQ-R Module Configuration Manual
3. Write the settings for the FL-net module and sequence program that were saved in GX Works3 to the CPU module.

*1 This procedure is not limited to replacing the CPU module. It is recommended that the parameters should be recorded and saved whenever there have been changes or settings made that are related to the FL-net module.

MEMO

9 PARAMETER SETTINGS

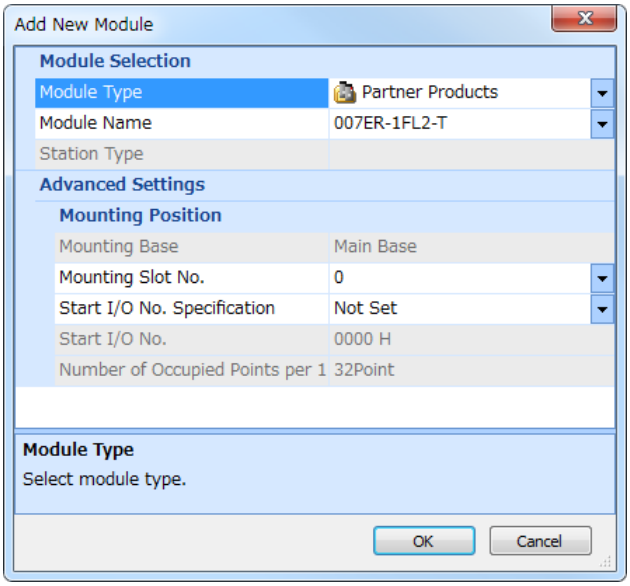
This chapter describes the parameter settings required for communications between the FL-net module and external devices.

Point

For how to use GX Works3, refer to the following.

GX Works3 Operating Manual

9.1 Setting Parameters



1. Add the ER-1FL2-T in GX Works3.
   [Navigation window]⇒[Parameter]⇒[Module Information]⇒Right-click⇒[Add New Module]
2. Set the system parameter if necessary.
   [Navigation window]⇒[Parameter]⇒[System parameter]
3. The module parameter setting which consists of Switch setting, Basic setting, and Auto refresh setting can be selected from the tree on the following window.
   [Navigation window]⇒[Parameter]⇒ER-1FL2-T⇒[Module Parameter]
4. After setting parameters, click the [Check] button.
5. Write the settings to the CPU module using GX Works3.
   [Online]⇒[Write to PLC]
6. The settings are reflected by resetting the CPU module or powering off and on the system.

Point

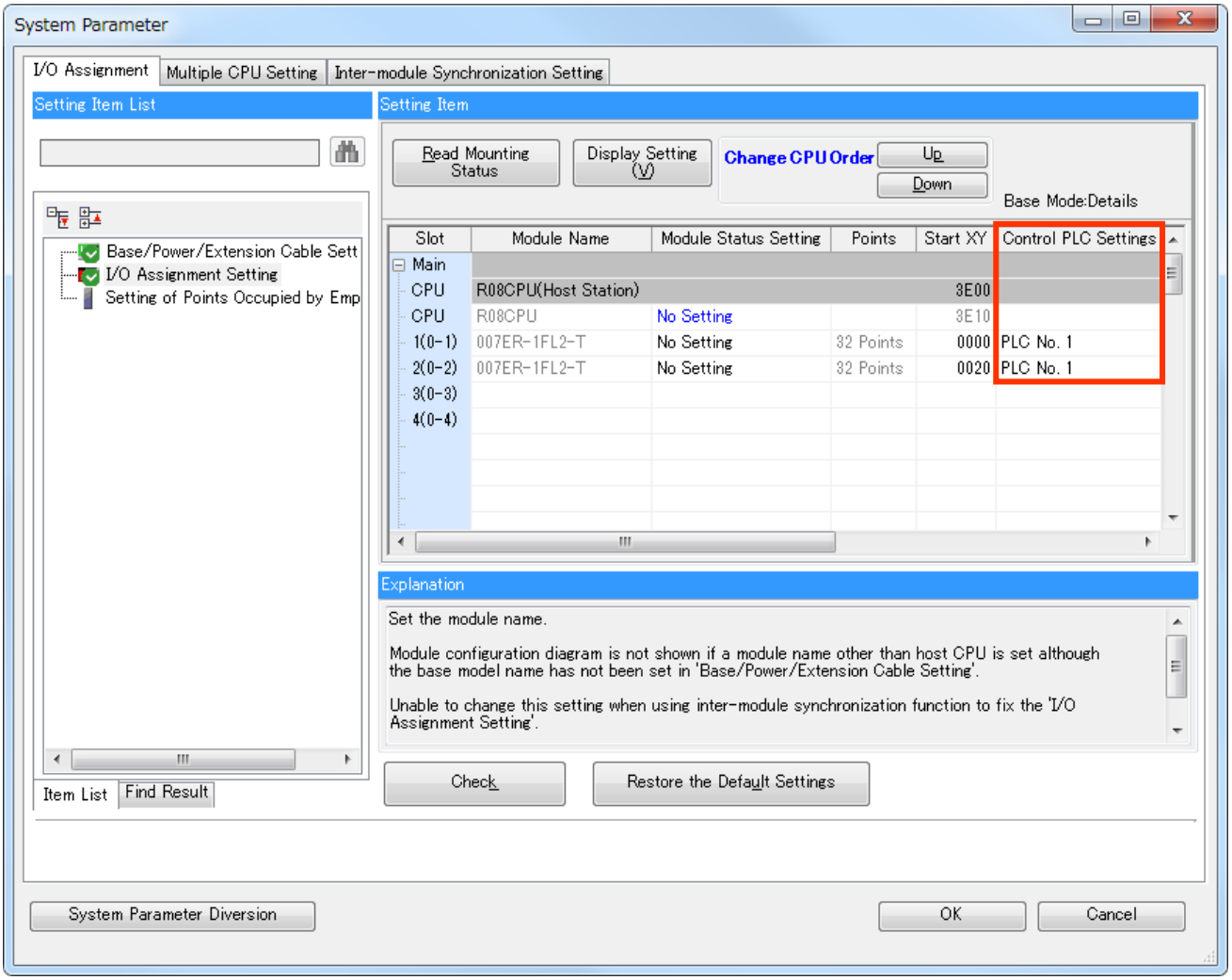
For the multiple CPU system, the control CPU of the FL-net module required to be set in the system parameter.

Page 57 System parameter

9.2 System parameter

For the multiple CPU system, set the control CPU of the FL-net module in I/O assignment setting.

[Navigation window]⇒[Parameter]⇒[System Parameter]⇒[I/O Assignment]



Point

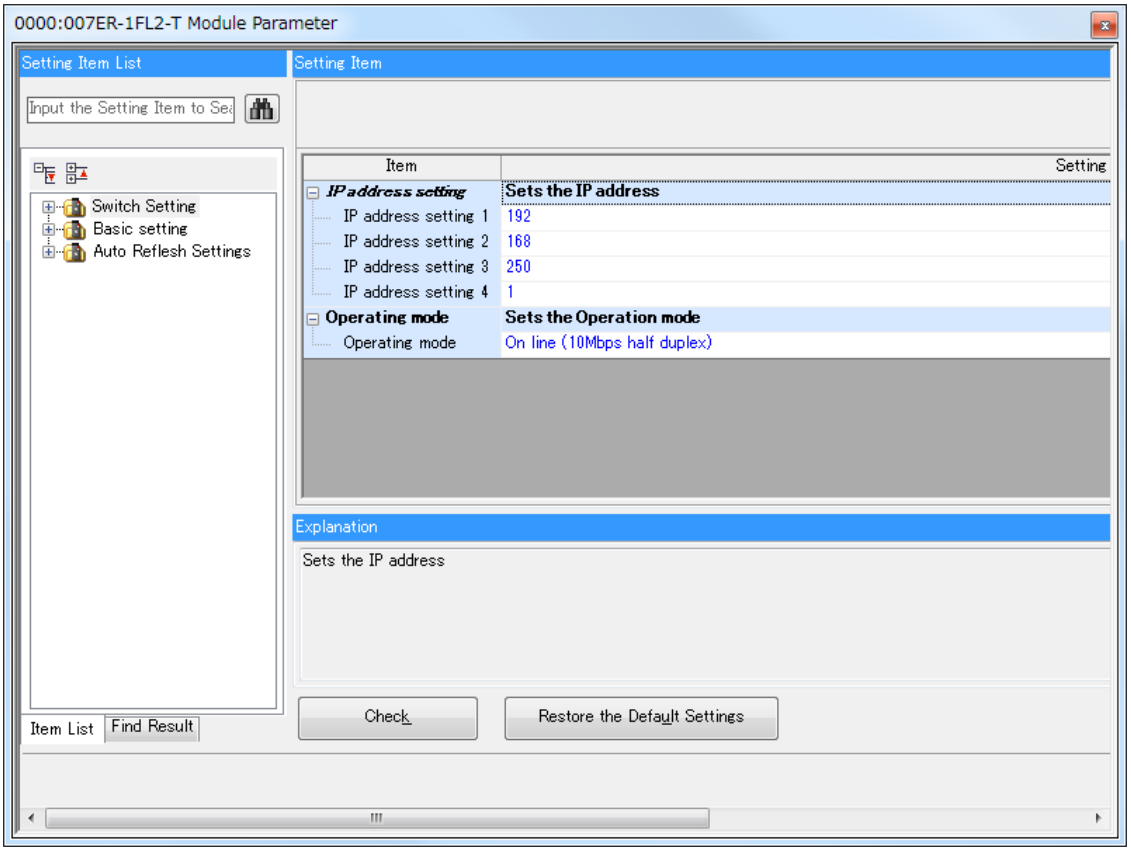
For the multiple CPU system, refer to the following.

MELSEC iQ-R CPU Module User's Manual (Application)

9.3 Module Parameter

Set Switch setting, Basic setting, and Auto refresh setting.

[Navigation window]⇒[Parameter]⇒ER-1FL2-T⇒[Module Parameter]



Setting items	Description	Reference
Switch setting	• Sets the IP address and operation mode of the FL-net module. • The data set in the switch setting is registered to the CPU module parameter and automatically written to the FL-net module after the reset clear of the CPU module.	Page 59 Switch setting
Basic setting	• Sets the items of the local node network parameter area which require the basic setting. • The data set in the basic setting is registered to the CPU module parameter and automatically written to the FL-net module when the CPU module turns to the RUN state.	Page 60 Basic setting
Auto refresh setting	• Sets the following areas for automatic refresh: status data bit area for the buffer memory of the FL-net module, and status data word area. • The buffer memory of the FL-net module that has been set by automatic refresh will automatically read and write to the designated device automatically when the END instruction for the CPU module is executed.	Page 61 Auto refresh setting

Point

The basic setting items can be set in both the module parameter and sequence program.
When the status of the CPU module changed from STOP to RUN state, the basic setting value of the module parameter is written to the FL-net module at first, and overwritten by the basic setting value set in the sequence program.

Switch setting

Switch setting is used to set the IP address and operation mode of the FL-net module.

Setting items		Description	Reference
IP address settings	IP address settings 1	Sets the IP address of the FL-net module. The standard IP address of the FL-net (OPCN-2) is as follows. Network address: 192.168.250. Host number (node number: 1 to 254) *1 Consult with the network manager (the person who plans the network or manages the IP addresses) about the IP address and set so that is no duplication with remote nodes.	192 to 223 (Default: 192)
	IP address settings 2		0 to 255 (Default: 168)
	IP address settings 3		0 to 255 (Default: 250)
	IP address settings 4		1 to 254 (Default: 1)
Operating mode *2	On line (10Mbps half duplex)	Communicates with other nodes. (Default)	-
	Off line	Disconnects its own node from the network.	-
	Loopback test	Hardware including the send/receive circuit of the FL-net module is checked. RAM or ROM is not checked.	-
	Hardware test	Tests the RAM and ROM.	-
	On line (Auto negotiation)	Communicates with other nodes. Mode to be selected when using 100Mbps.	-

*1 Node numbers: 250 to 254 are reserved for maintenance tools.

*2 Module ready (X1C) turns off when "Off line / Loopback test / Hardware test" is set for operation mode.

Point

Set "Operation mode settings" according to the communication speed.

- 10Mbps: Online
- 100Mbps: Online (Auto negotiation)

Basic setting

The local node network parameter area is set.

Setting items			Description	Setting range
Basic parameter	Node name (equipment name)		Sets node name (Equipment name)	Up to 10 characters (10 bytes)
	Cyclic data area 1	Start address	Sets the start address of the data area 1 of the local node.	0 to 1FFH (*1)
		Size	Sets the size of the data area 1 of the local node. The size of the data area 1 is set in increments of one word (16 bits).	0 to 512 (*2)
	Cyclic data area 2	Start address	Sets the start address of the data area 2 of the local node.	0 to 1FFFH (*3)
		Size	Sets the size of the data area 2 of the local node. The size of the data area 2 is se in increments of one word (16 bits).	0 to 8192 (*4)
	Token Watch Time Out Time		Sets the monitoring time from the local node address token receive signal to the next node token transfer. If the token is held by another node, it monitors the time up to the release of the token by the node holding the token.	1 to 255 (1 to 255ms)
	Minimum Permissible Frame interval		Sets the time from local node address token receive signal to the number of frames until local node sends. In addition, it can also be used for message sending or frame interval time for frame division. Enter the value in increments of 100 us.	0 to 50 (0 to 5ms)
	Message Data Unit Select		Sets the unit for when message data is handled. 0: Word unit 1: Byte unit	0, 1

*1 The setting range of the start address is changed depending on the size setting.
For size: 0, start address: 0000H to 01FFH
For size: 1, start address: 0000H to 01FFH
For size: 2, start address: 0000H to 01FEH
For size: 3, start address: 0000H to 01FDH
For size: 512, start address: 0000H only

*2 The setting range of the size is changed depending on the start address.
For start address: 0000H, size: 0 to 512 words
For start address: 0001H, size: 0 to 511 words
For start address: 0002H, size: 0 to 510 words
For start address: 01FFH, size: 0 to 1 word

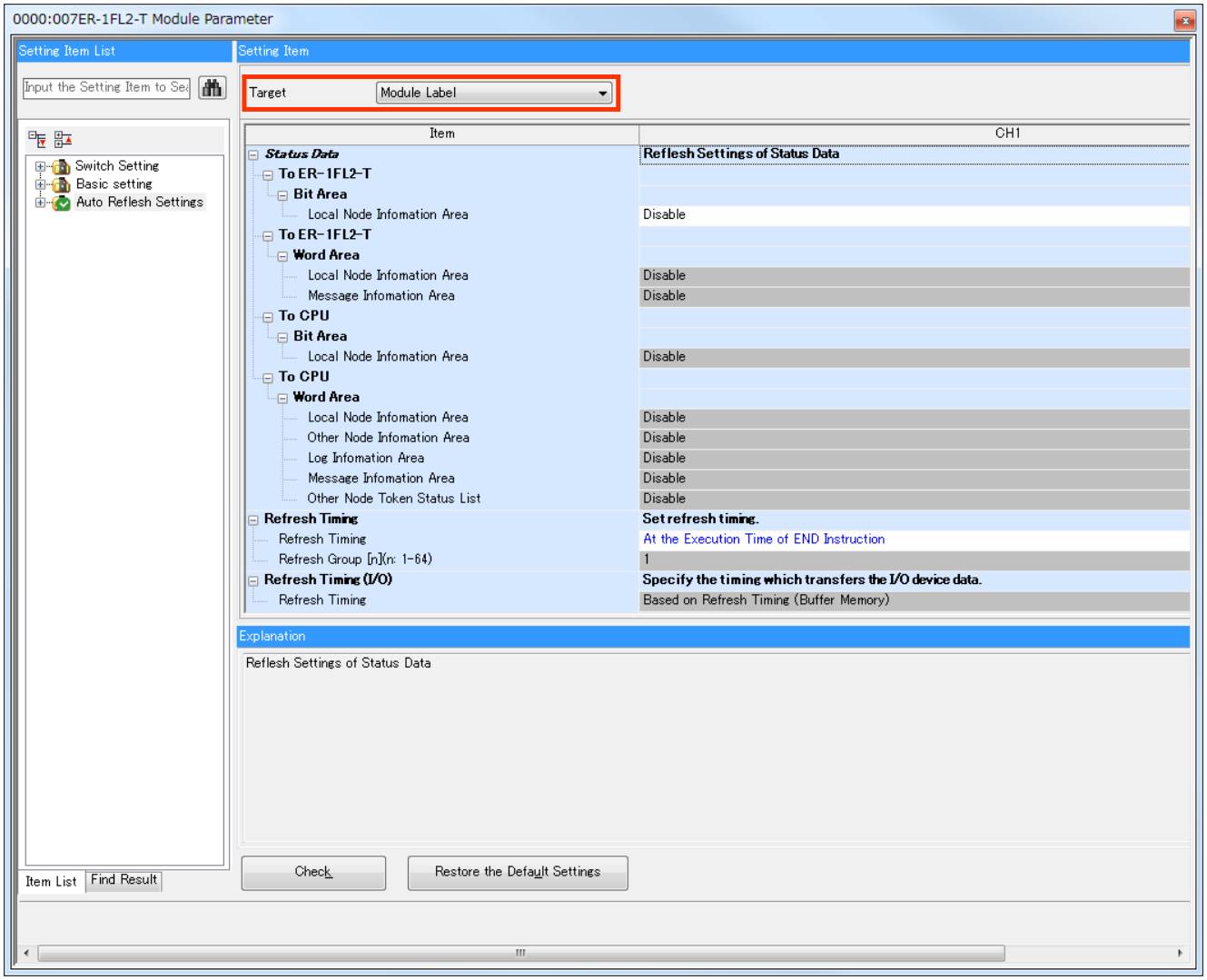
*3 The setting range of the start address is changed depending on the size setting.
For size: 0, start address: 0000H to 1FFFH
For size: 1, start address: 0000H to 1FFFH
For size: 2, start address: 0000H to 1FFEH
For size: 3, start address: 0000H to 1FFDH
For size: 8192, start address: 0000H only

*4 The setting range of the size is changed depending on the start address.
For start address: 0000H, size: 0 to 8192 words
For start address: 0001H, size: 0 to 8191 words
For start address: 0002H, size: 0 to 8190 words
For start address: 1FFFH, size: 0 to 1 word

Auto refresh setting

Auto refresh setting is used for the automatic transfer between the buffer memory data of the FL-net module and the CPU module device.
This setting enables automatic transfer between the status data areas of the FL-net module buffer memory and the CPU module device.

The setting item can be changed by selecting one of the following items as Target.



Setting items	Description
Module label	This module does not support this item. Do not select this item.
Refresh Data Register (RD)	Select this item to perform auto refresh for the Refresh Data register (RD).
Device	Select this item to perform auto refresh for a specified device area.

Module label

This module does not support this item. Do not select this item.

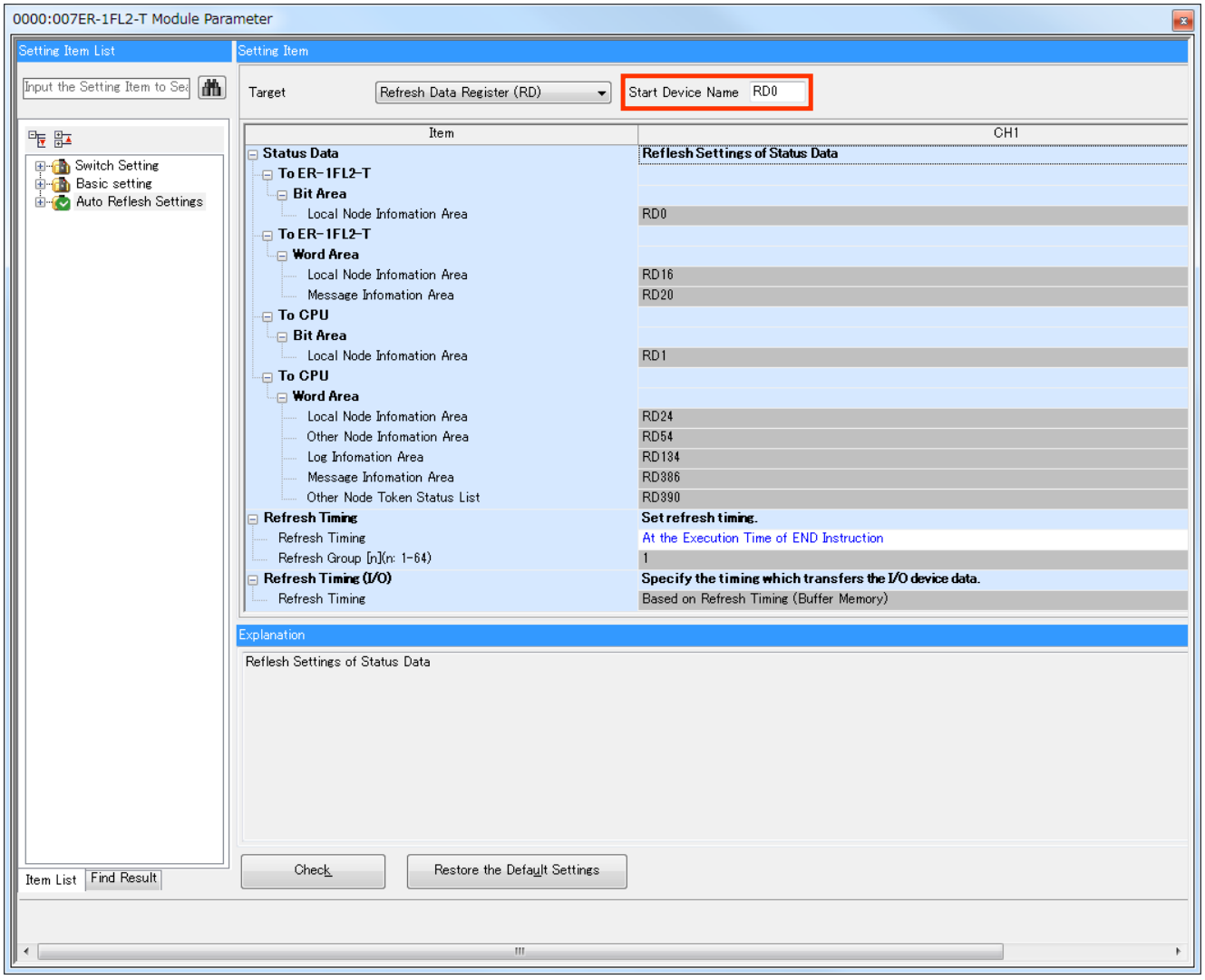
Refresh data register (RD)

Select this item to perform Auto refresh for a refresh data register (RD).
Specifying the Top Device Name of the Target assigns the refresh target of each item sequentially.

Setting items	Description	Setting range
Top Device Name	Set the start device of the refresh target.	*1

*1 The setting range differs according to the CPU module used.

Ex. Specifying RD0 for the Top Device Name



■Status data

Setting items			Description	Setting range
Transfer to intelligent function module	Bit area	Specified information area	Specify the storage source of the status data to be transferred from the CPU module to the intelligent function module.	*1 *2
	Word area	Specified information area		*1 *2
		Message information area		*1 *2
Transfer to the CPU module	Bit area	Local node information area	Specify the storage source of the status data to be transferred from the intelligent function module to the CPU module.	*1 *2
	Word area	Local node information area		*1 *2
		Other node information area		*1 *2
		Log information area		*1 *2
		Message information area		*1 *2

*1 It is set at once when the start address is set.

*2 The setting range differs according to the CPU module used.

■Refresh timing

Setting items		Description	Setting range
Refresh timing	Specified information area	Set the refresh timing. At the Execution Time of END Instruction: To perform a refresh when the END instruction is executed. At the Execution Time of Specified Program: To perform a refresh when the specified program is executed.	-
Group [n] (n: 1-64)	Specified information area	Specify the program group to perform a refresh when the specified program is executed.	1 to 64

■Refresh timing (I/O)

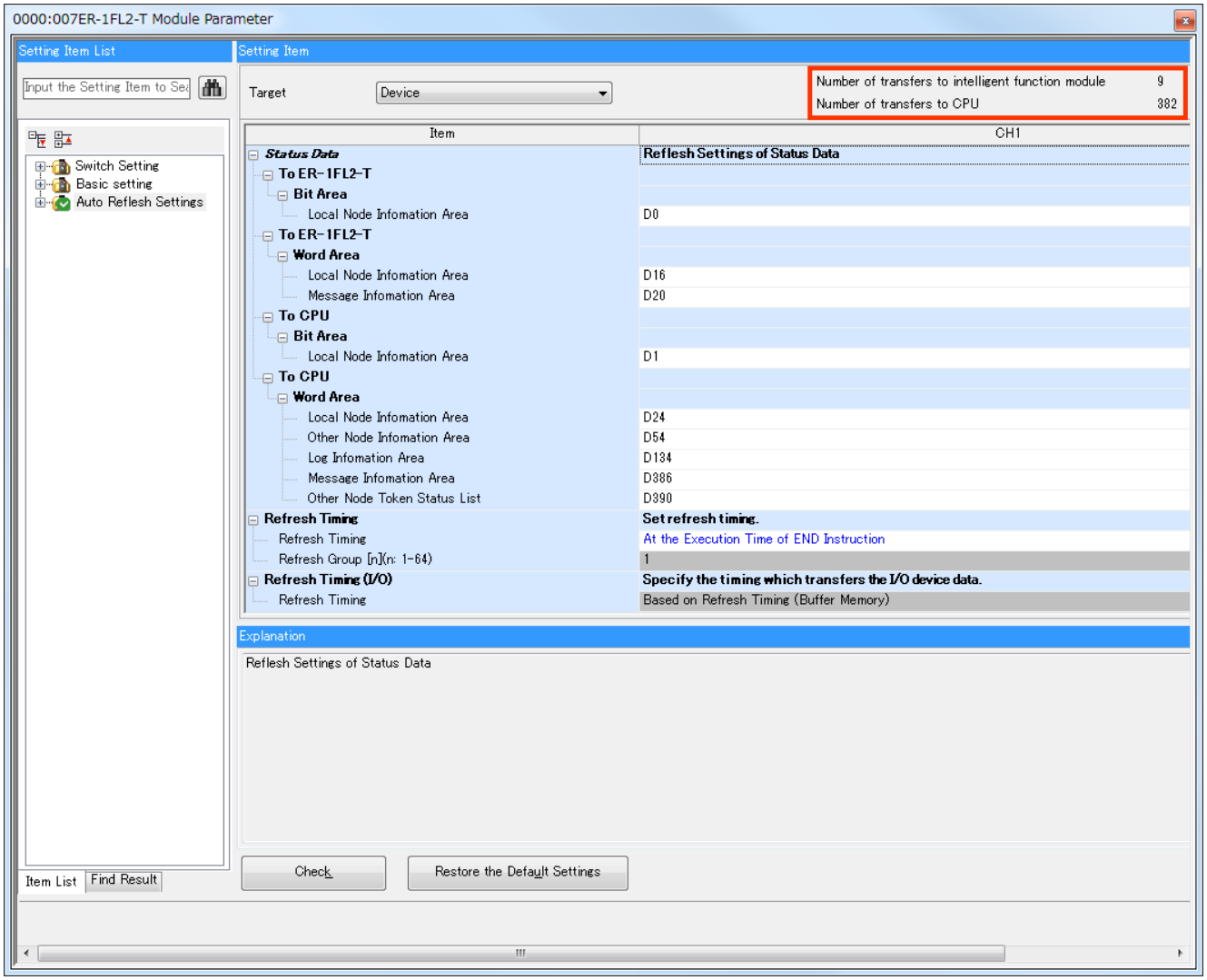
Setting items	Description	Setting range
Refresh timing	Specify the timing to transfer the data of I/O devices. This item is fixed to "Based on Refresh Timing (Buffer Memory)".	-

Device

Select this item to perform Auto refresh for a specified device. The refresh target of each item can be specified individually.

Setting items	Description
The number of transfers to the intelligent function module	Displays the number of transfers from the CPU module to the FL-net module.
The number of transfers to the CPU module	Displays the number of transfers from the FL-net module to the CPU module.

Ex. Specifying the start address sequentially from D0.



■Status data

Setting items			Description	The number of refresh points (word)	Setting range
Transfer to intelligent function module	Bit area	Specified Information Area	Specify the storage source of the status data to be transferred from the CPU module to the intelligent function module.	1	*1 *2
	Word area	Specified Information Area		4	*1 *2
		Message Information Area		4	*1 *2
Transfer to the CPU module	Bit area	Local node Information Area	Specify the storage source of the status data to be transferred from the intelligent function module to the CPU module.	2	*1 *2
	Word area	Local node Information Area		30	*1 *2
		Other node Information Area		80	*1 *2
		Log Information Area		252	*1 *2
		Message Information Area		20	*1 *2
		Other Node Token Status List		16	*1 *2

*1 The setting range differs according to the CPU module used.

*2 Set the setting range to avoid the overlap of refresh areas.

■Refresh timing

Setting items		Description	Setting range
Refresh timing	Specified information area	Set the refresh timing. At the Execution Time of END Instruction: To perform a refresh when the END instruction is executed. At the Execution Time of Specified Program: To perform a refresh when the specified program is executed.	-
Group [n] (n: 1-64)	Specified information area	Specify the program group to perform a refresh when the specified program is executed.	1 to 64

■Refresh timing (I/)

Setting items	Description	Setting range
Refresh timing	Specify the timing to transfer the data of I/O devices. This item is fixed to "Based on Refresh Timing (Buffer Memory)".	-

Setting procedure

1. The Status data, Refresh timing, and Refresh timing (I/O) are included in Auto refresh setting.
   Select one of the settings from the tree on the following window.

   [Navigation window]⇒[Parameter]⇒ER-1FL2-T⇒[Module parameter]⇒[Auto refresh setting]

2. Open the Status data window to enter the setting value for each item

   [Module parameter]⇒[Auto refresh setting]⇒[Status data]

3. Set the Refresh timing to "At the Execution Time of END Instruction" or "At the Execution Time of Specified Program".
   When the "At the Execution Time of Specified Program" is set, double-click "Group[n](n:1-64)" and set 1 to 64.

4. Open the Refresh timing (I/O) window to enter the setting value for each item.

   [Module parameter]⇒[Auto refresh setting]⇒[Refresh timing (I/O)]

5. Click the item to be changed and enter the setting value.
   When using the text box, double-click the item to be changed and enter the setting value.

Point

When refresh is enabled, the value of the refresh target is enabled at the refresh timing set in GX Works3.
At this time, the buffer memory is overwritten by the value of the refresh destination.
To change the buffer memory value of the refresh target, create a program that changes the values of module labels and devices of the refresh target.

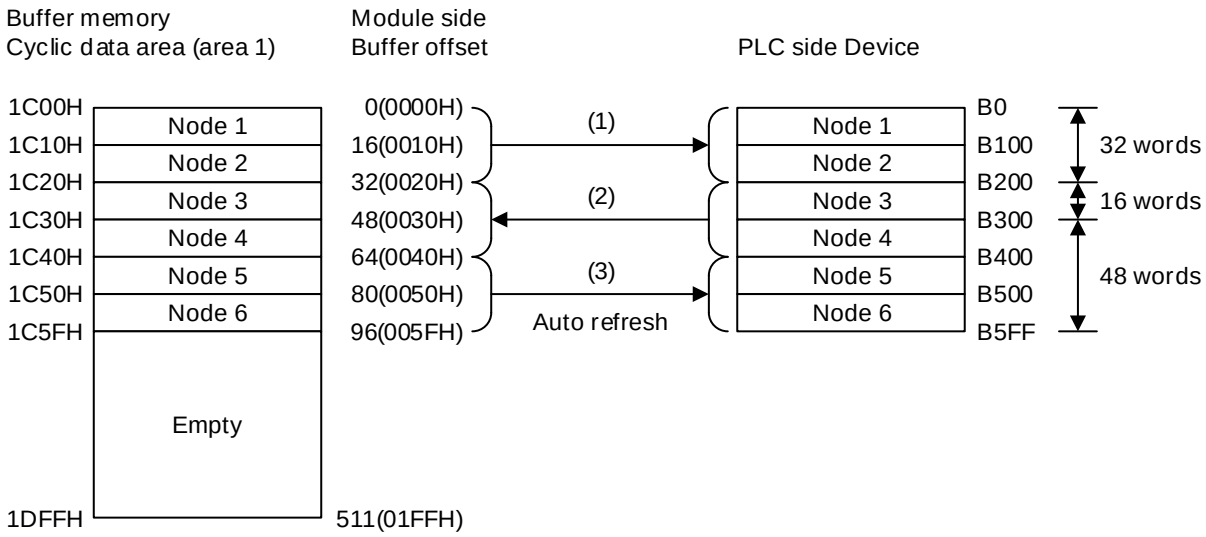
6. After setting parameters, click the [Apply] button.
7. Write the settings to the CPU module using GX Works3.
   [Online]⇒[Write to PLC]
8. The settings are reflected by resetting the CPU module or powering off and on the system.

Point

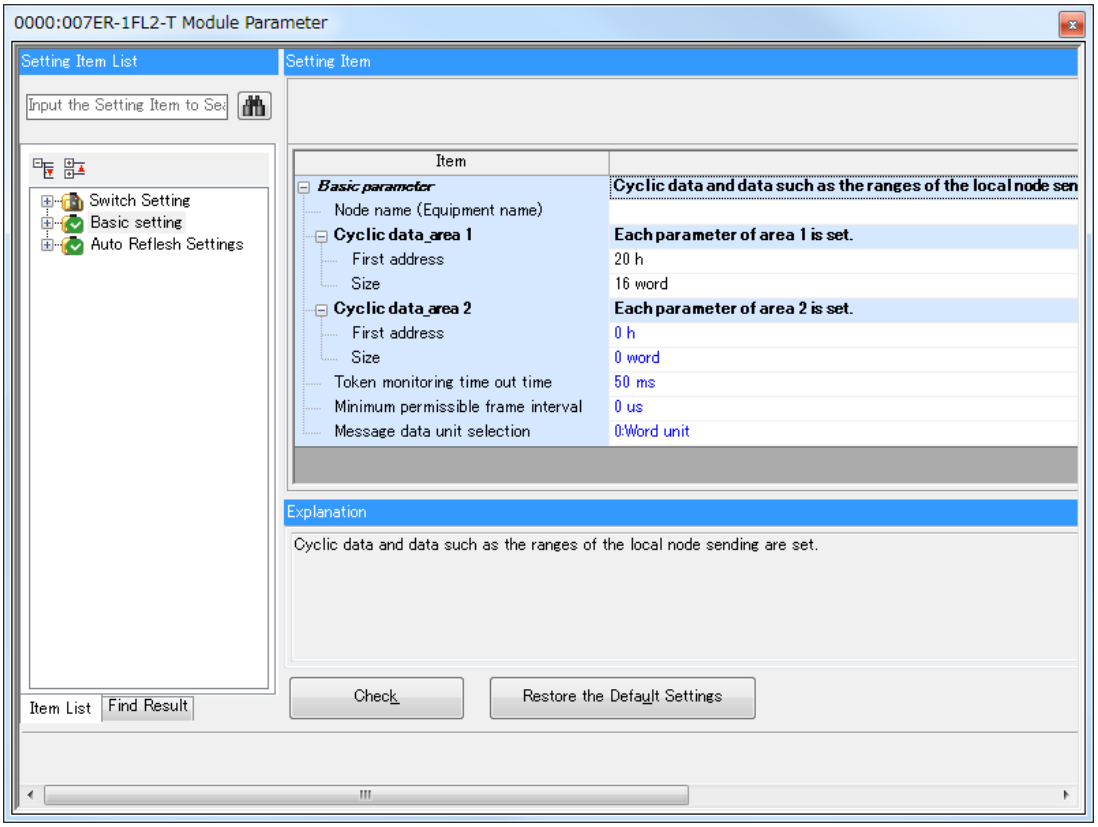
Refresh settings are stored in the module parameter. It cannot be changed in the sequence program.
However, the process equivalent to the auto refresh can be added in the sequence program.

Setting example

The following shows a setting example of the cyclic data area (area 1) when the local node is node 3.



■Basic setting

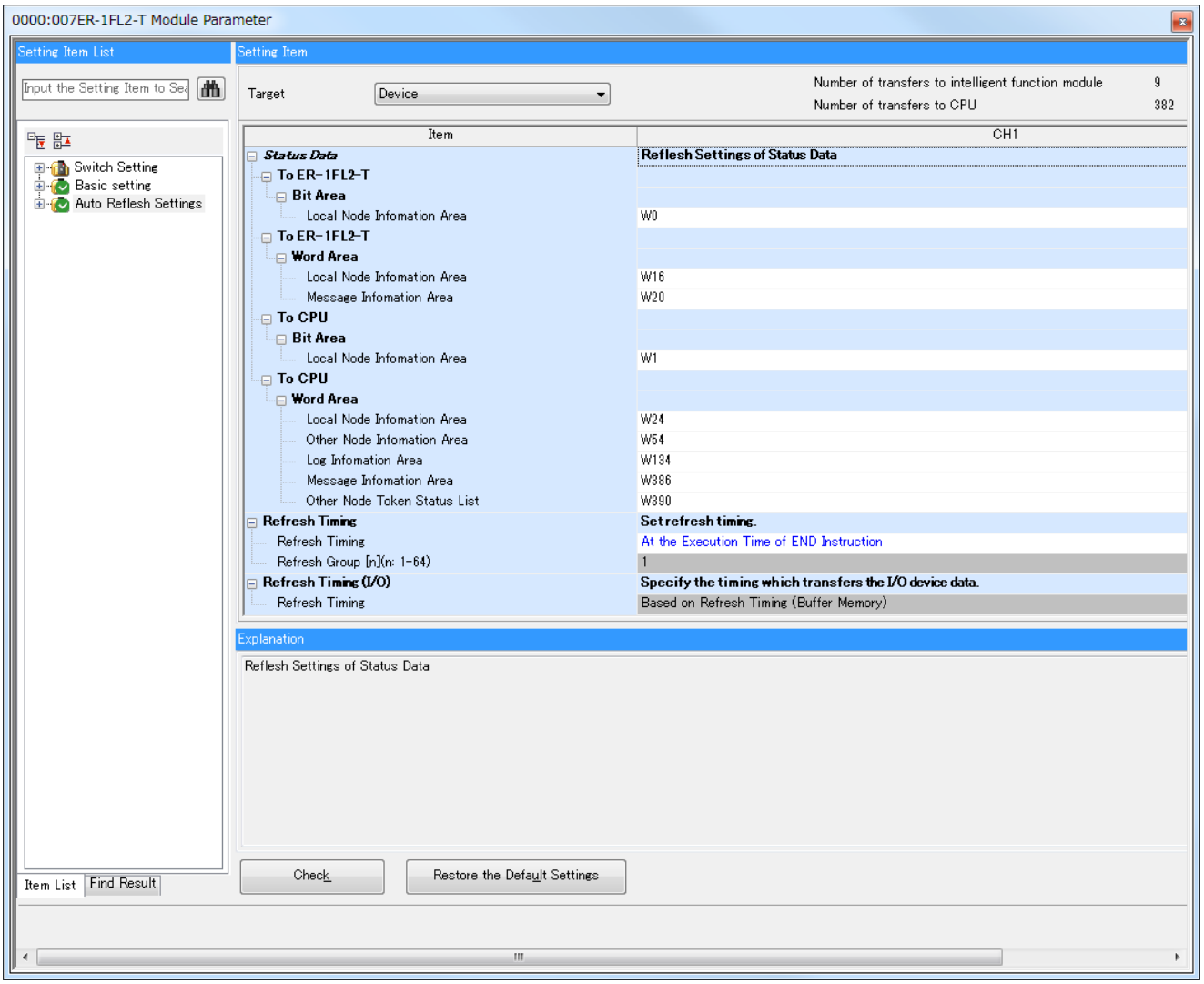


Setting items			Setting value
Basic parameter	Node name (equipment name)		(Blank)
	Cyclic data area 1	Start address	20H
		Size	16word
	Cyclic data area 2	Start address	0H
		Size	0word
	Token Watch Time Out Time		50ms
	Minimum Permissible Frame interval		0 μs
	Message Data Unit Select		0: Word unit

■Auto refresh setting

The following shows a setting example for when the refresh target device is individually set in the following condition.

- CPU module to FL-net module: From W0
- FL-net module to CPU module: From W1
- Refresh condition: At the Execution Time of END Instruction



Setting item				Setting value *1 *2
Target				Device
Status data	Transfer to intelligent function module	Bit Area	Specified Information Area	W0
		Word Area	Specified Information Area	W16
			Message Information Area	W20
	Transfer to the CPU	Bit Area	Local node Information Area	W1
		Word Area	Local node Information Area	W24
			Other node Information Area	W54
			Log Information Area	W134
			Message Information Area	W386
			Other Node Token Status List	W390
Refresh timing	Refresh timing		Specified information Area	Specified Information Area
	Group [n] (n: 1-64)		Specified information Area	1
Refresh timing (I/O)				Based on Refresh Timing (Buffer Memory)

*1 The setting range differs according to the CPU module used.

*2 Set the setting range to avoid the overlap of refresh areas.

10 INTELLIGENT FUNCTION MODULE MONITOR

The I/O signals and the buffer memory can be checked and monitored using the Intelligent Function Module Monitor function of GX Works3.

10.1 Monitor signal list

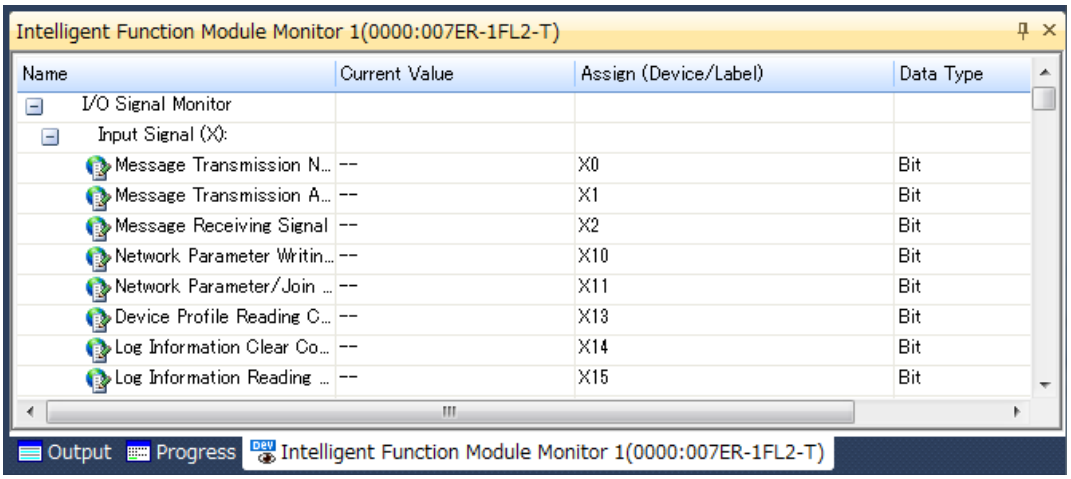
The following signals are supported.

- I/O signals
- Node information
- Network parameter
- Status of other nodes

10.2 Setting procedure

This section describes the setting procedure for the Intelligent Function Module Monitor.

How to use



1. Register the FL-net module to be monitored to the Intelligent Function Module Monitor window.

☞Page 71 How to register

2. Start watching.

[Online]⇒[Watch]⇒[Start Watching]

"[Watching]" is added on the Watch window title during monitoring.

Point

- For details on how to use the Intelligent Function Module Monitor function, refer to the following manual.
  GX Works3 Operating Manual
- To use the intelligent function module monitor, please use the following version of GX Works 3.
  GX Works3: Version 1.040S or later

How to register

To use the Intelligent Function Module Monitor function, the FL-net module to be monitored must be registered.
There are the following three methods to register the FL-net module by using the Navigation window.

■Register Intelligent function modules by using the shortcut menu on the Navigation window

1. Select an Intelligent function module to be registered in the Intelligent Function Module Monitor window from the Navigation window.
2. Right-click⇒select [Register to Intelligent Function Module Monitor] from the shortcut menu.

■Registering Intelligent function modules by dragging and dropping from the Navigation window

1. Select a module to be registered from the Navigation window.
2. Drag and drop it onto the Intelligent Function Module Monitor window.

■Registering Intelligent function modules by using the shortcut menu from the Intelligent Function Module Monitor window

1. On the Intelligent Function Module Monitor window, right-click and select [Register Module Information] from the shortcut menu.
2. Select the module to be registered in "Module List", and click the [OK] button.
   When a positioning module is selected in "Module List", select the item displayed in "Monitor Item Category List".

11 COMMUNICATION EXAMPLES

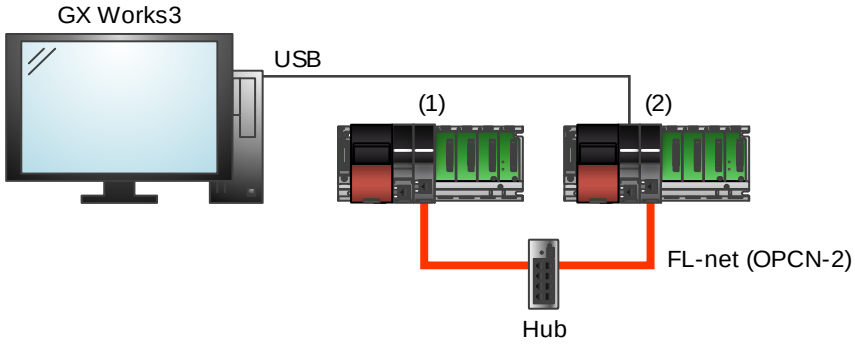
11.1 Communication Examples of FL-net (OPCN-2)

This section describes communication examples using the FL-net module.

System configuration example

The following system configuration is used to describe communication examples using the FL-net module.

System configuration



(1) Node 1 (IP address: 192.168.250.1)

(2) Node 3 (IP address: 192.168.250.3)

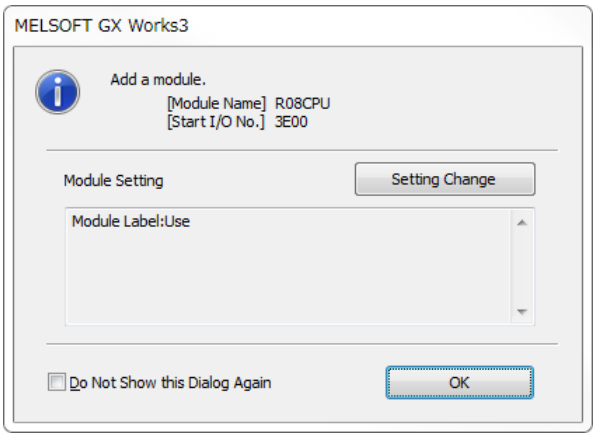
Switch setting

Connect GX Works3 with the sending side CPU module (2)(Node 3) to set parameters.

1. Set the CPU module as follows.

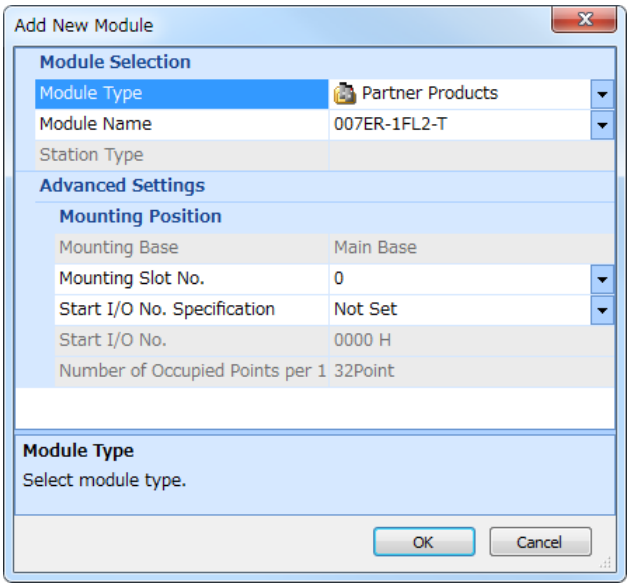
[Project]⇒[New]

2. Click the [OK] button to add the module labels of the CPU module.

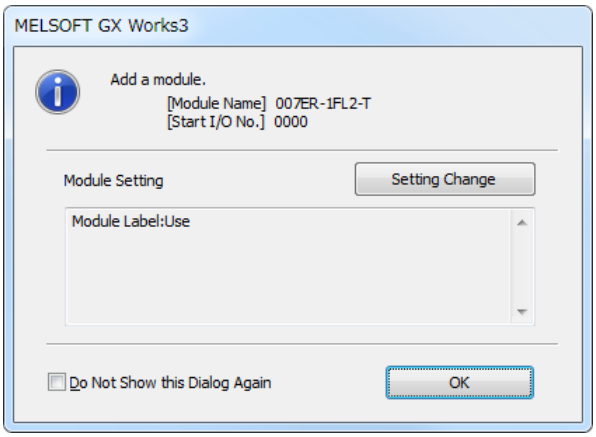


3. Set the ER-1FL2-T as follows.

[Navigation window]⇒[Parameter]⇒[Module information]⇒Right-click⇒[Add New Module]

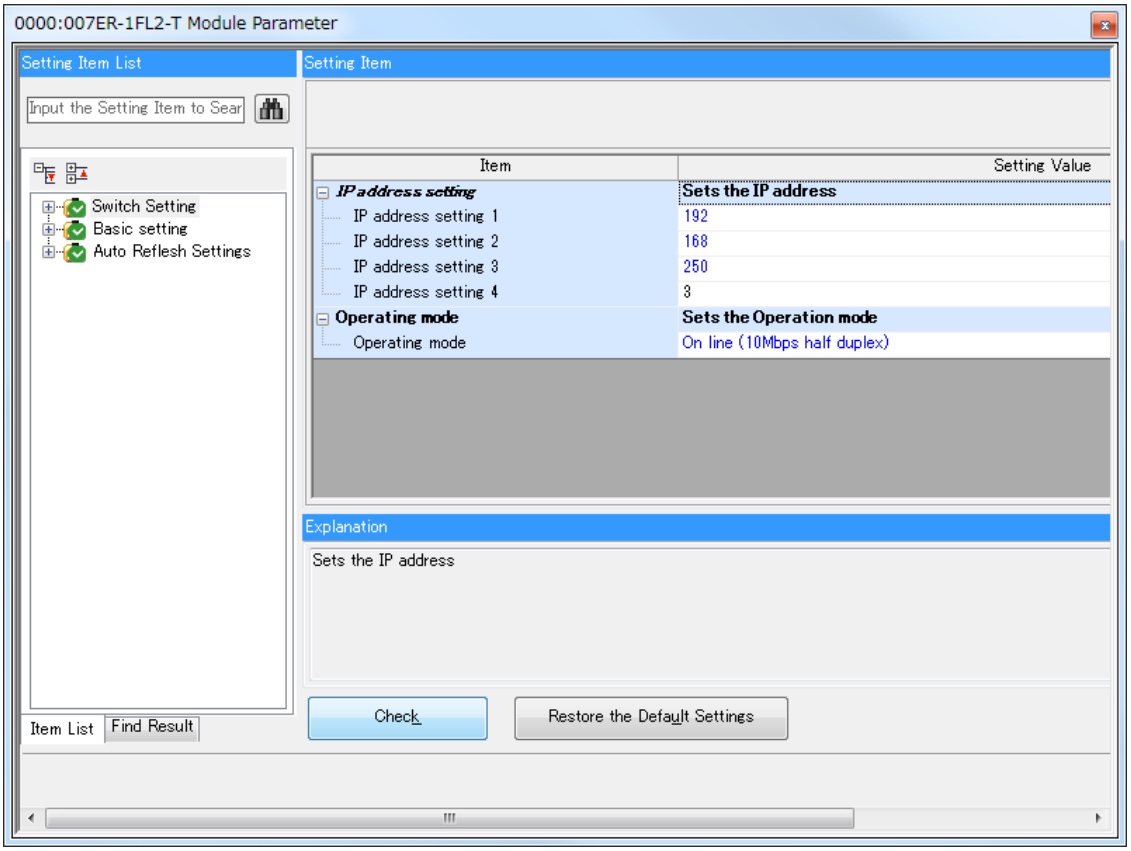


4. Click the [OK] button to add the module labels of the ER-1FL2-T.



5. Set the items in "Switch setting" as follows.

[Navigation window]⇒[Parameter]⇒[Module information]⇒ER-1FL2-T⇒[Module parameter]⇒[Switch setting]



Ex. Example for Node 3 (IP address: 192.168.250.3)

Setting Item		Setting value
IP address settings	IP address settings 1	192
	IP address settings 2	168
	IP address settings 3	250
	IP address settings 4	3
Operating mode settings	Operating mode settings	On line (10Mbps half duplex)

Basic setting

This section describes examples for Basic setting.

Point

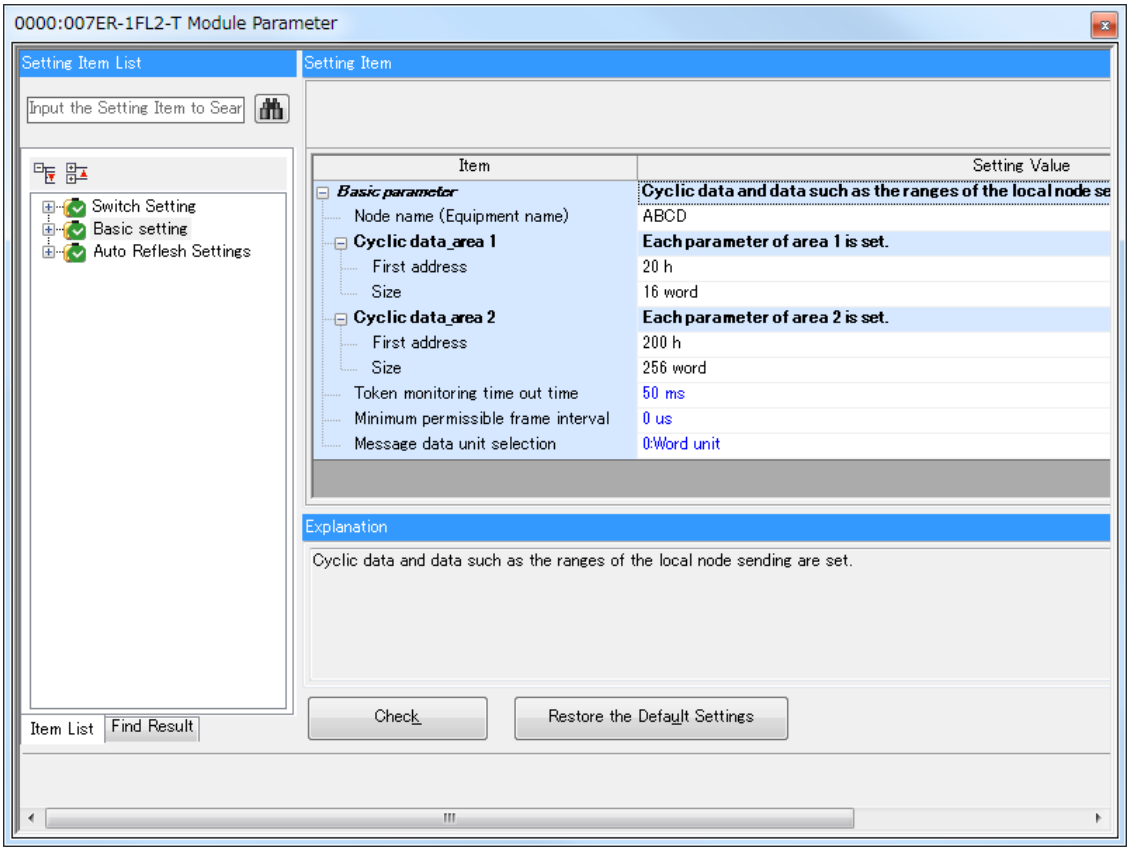
Set the local node network parameter area in Basic setting of the Module parameter.
(☞Page 60 Basic setting)
Basic setting of the Module parameter eliminates the need for the sequence program shown in this section.

Setting in the module parameter

Set "Basic setting" of GX Works3.
This setting eliminates the need for the sequence program for the basic settings.

1. Set the items of "Basic setting" as follows.

[Navigation window]⇒[Parameter]⇒[Module Information]⇒ER-1FL2-T⇒[Module parameter]⇒[Basic setting]



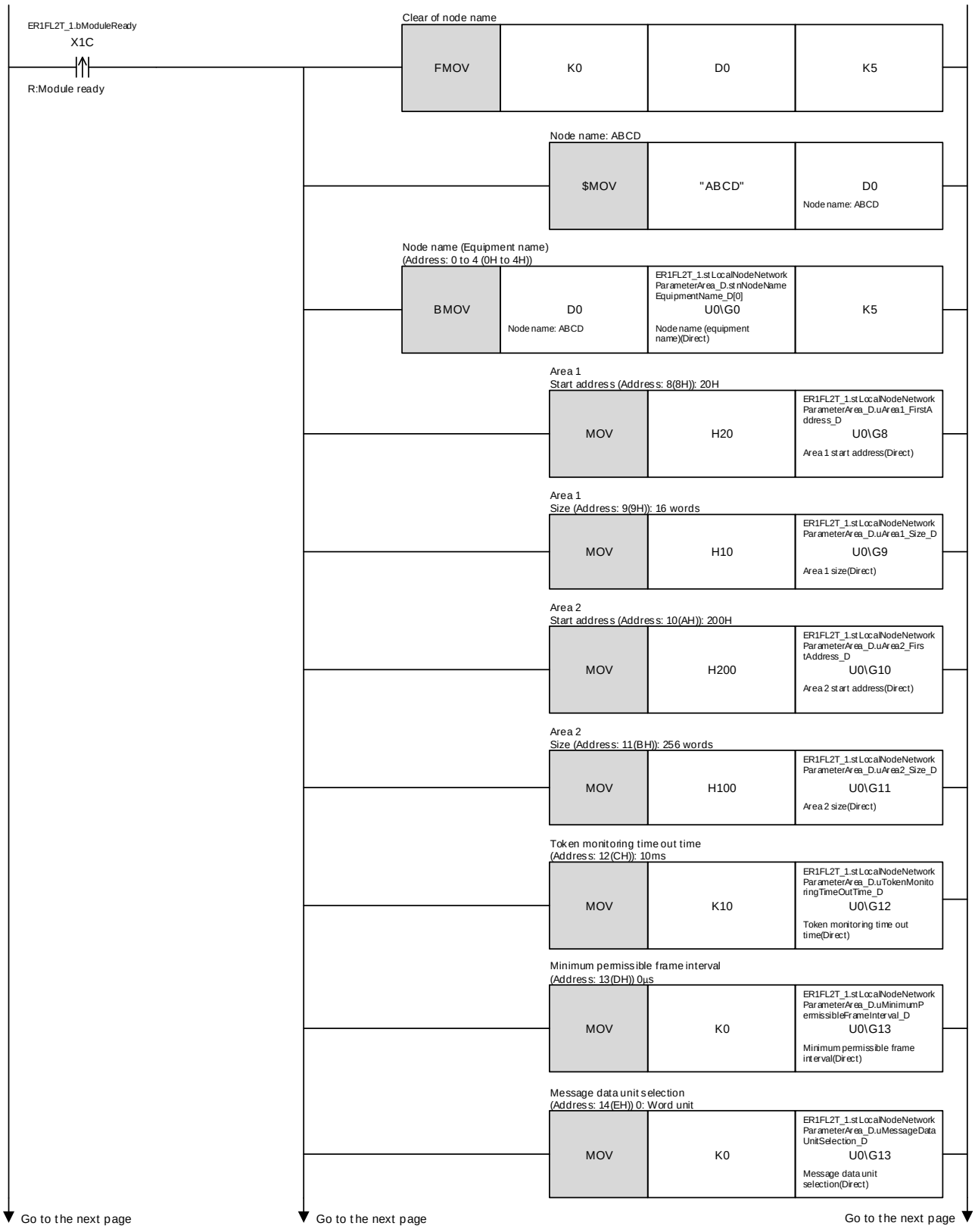
Ex.

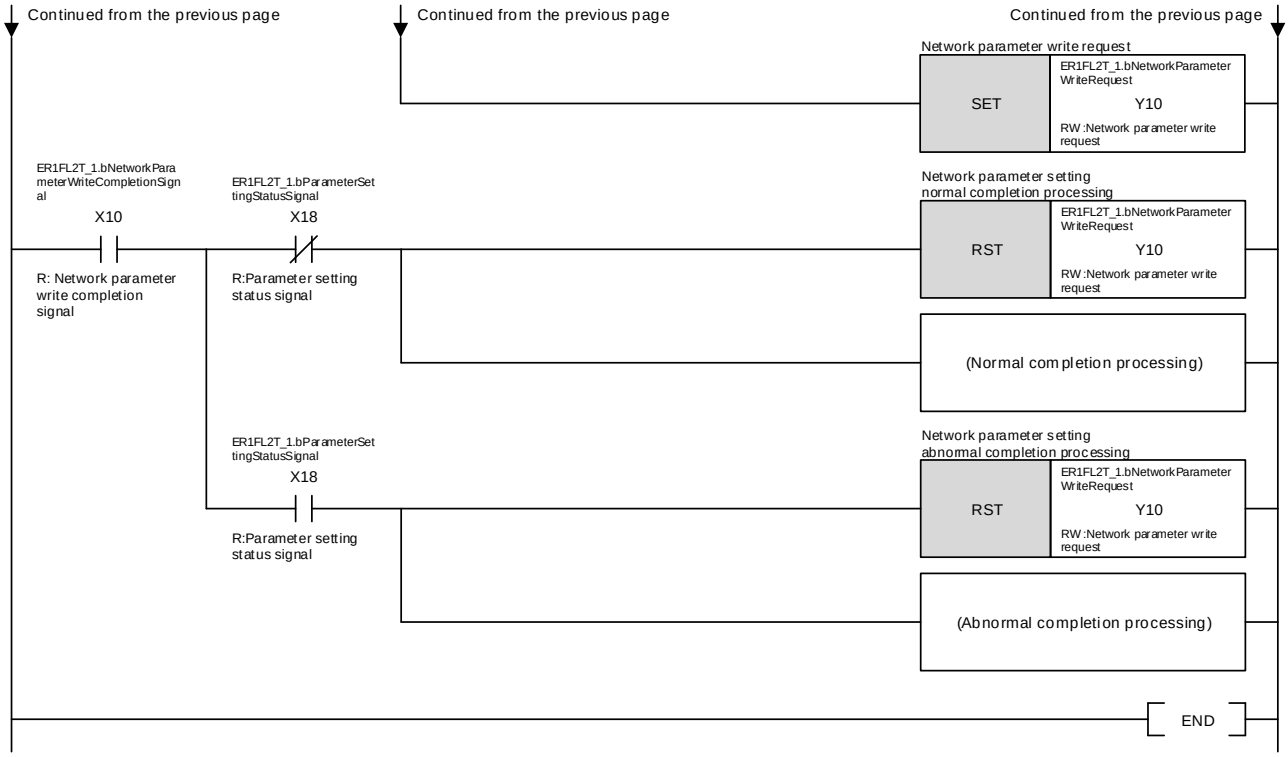
Setting Item		Setting value
Node name (equipment name)		ABCD
Cyclic data area 1	Start address	20H
	Size	16word
Cyclic data area 2	Start address	200H
	Size	256word
Token Watch Time Out Time		50ms
Minimum Permissible Frame interval		0μs
Message Data Unit Select		0: Word unit

Setting in the sequence program

This section describes basic setting in the sequence program.

The local node network parameter area is set.

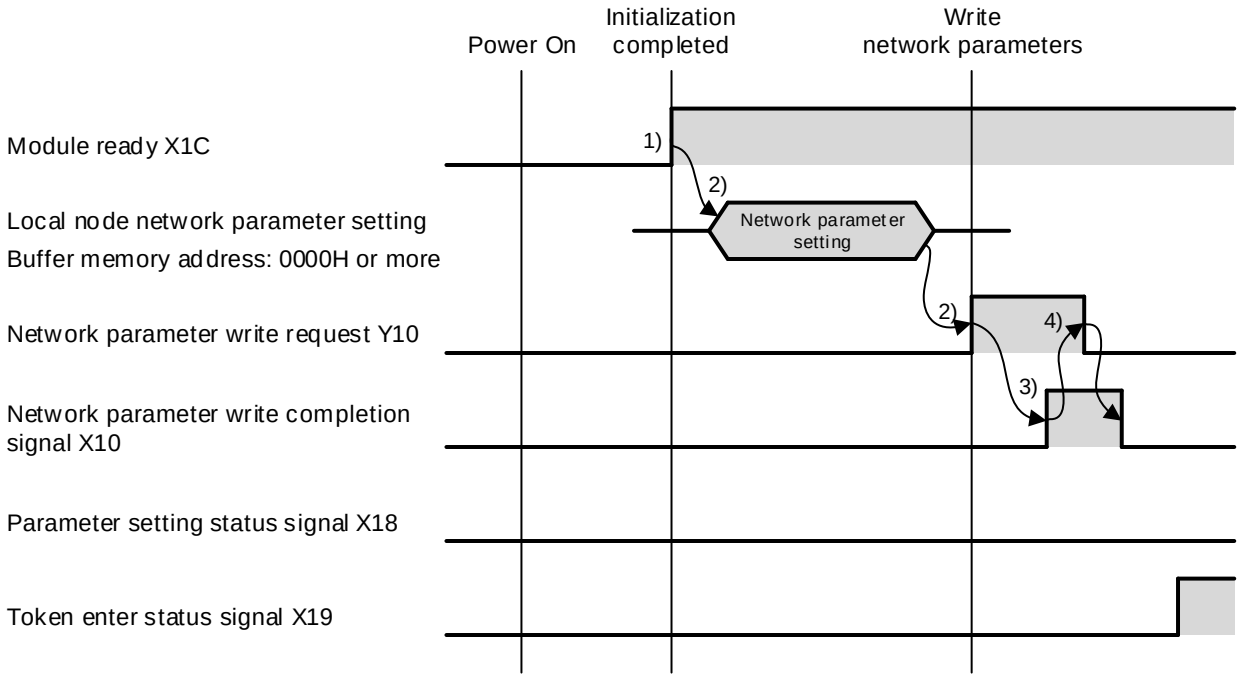



Continued from the previous page
Continued from the previous page
Continued from the previous page
Network parameter write request
SET
ER1FL2T_1.bNetworkParameterWriteRequest
Y10
RW:Network parameter write request
ER1FL2T_1.bNetworkParameterWriteCompletionSignal
X10
R: Network parameter write completion signal
ER1FL2T_1.bParameterSettingStatusSignal
X18
R:Parameter setting status signal
Network parameter setting normal completion processing
RST
ER1FL2T_1.bNetworkParameterWriteRequest
Y10
RW:Network parameter write request
(Normal completion processing)
ER1FL2T_1.bParameterSettingStatusSignal
X18
R:Parameter setting status signal
Network parameter setting abnormal completion processing
RST
ER1FL2T_1.bNetworkParameterWriteRequest
Y10
RW:Network parameter write request
(Abnormal completion processing)
END

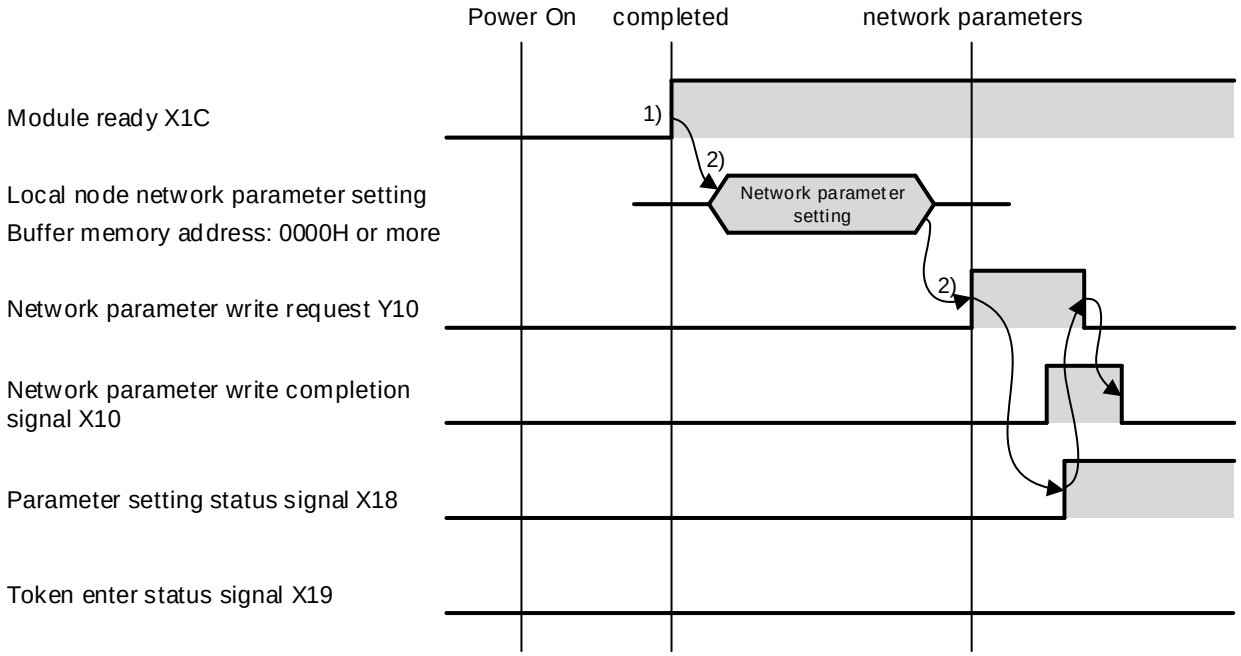
Timing chart

The following shows a timing chart for the basic setting.

■Network parameter setting normal completion



■Network parameter setting abnormal completion



How to check

1. After turning the power on, confirm that the initializing of the FL-net module has completed normally.
At an abnormal completion, review the Switch setting of the module parameter.
(☞Page 59 Switch setting)

Completion status	Device	Device status
Normal completion	Module ready (X1C)	ON
Abnormal completion	Module ready (X1C)	OFF

2. After setting the local node network parameter area data into the buffer memory (Address: 0 or more), turn ON the network parameter write request (Y10).

3. Confirm network parameter write completion.
During error ending, after revising the network parameter by using the error code that is stored in the network parameter setting status, perform the initial processing once again.
(☞Page 124 Confirming errors using error code)

Completion status	Device	Device status	Remarks
Normal completion	Network parameter write completion signal (X10)	ON	The FL-net module is participating in the token. (Token enter status signal (X19): ON)
	Parameter setting status signal (X18)	OFF	
	Network parameter setting status (Buffer memory address: 2514)	0	
Abnormal completion	Network parameter write completion signal (X10)	ON	-
	Parameter setting status signal (X18)	ON *1	
	Network parameter setting status (Buffer memory address: 2514)	Other than 0	

*1 It turns on when an area duplicated with another node is detected.

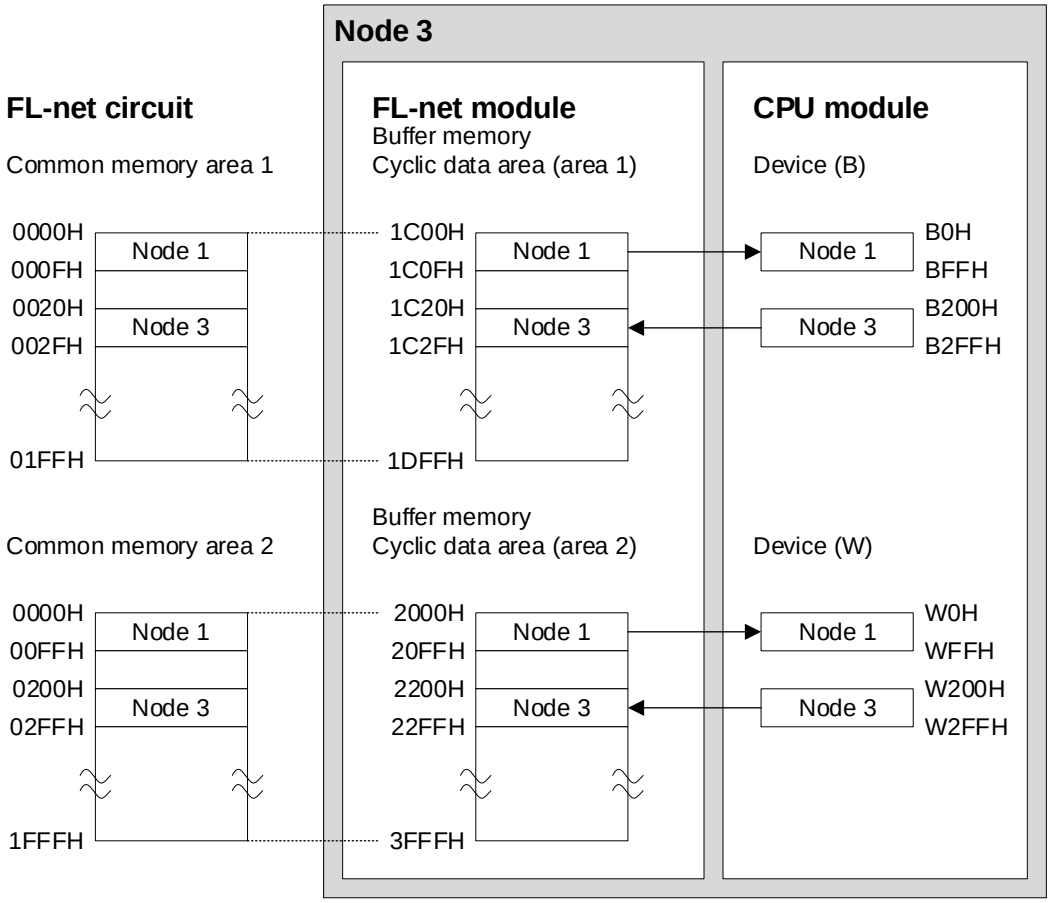
4. After confirming that the network parameter write completion signal (X10) is ON, the network parameter write request (Y10) is set to OFF.

Point

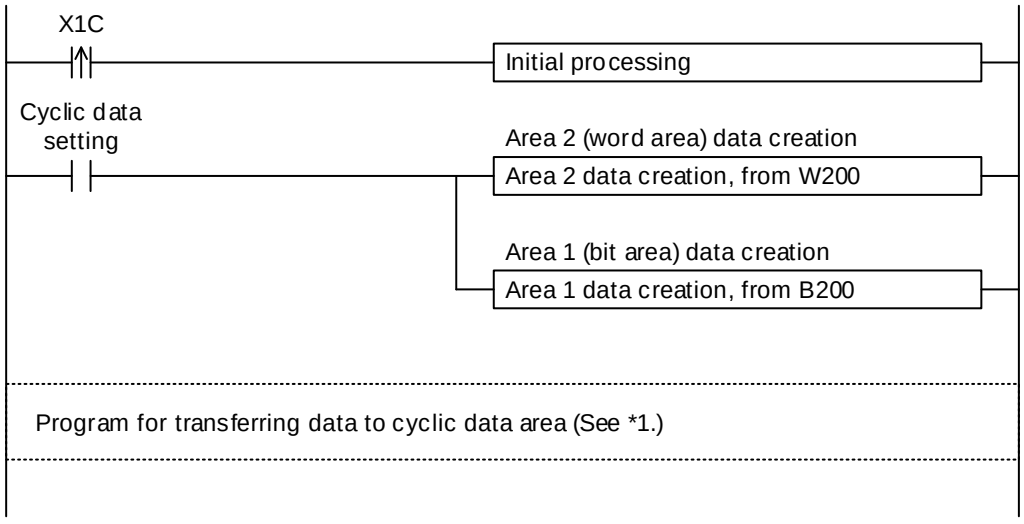
Since the node name is set optionally, there will be no problems if the initial processing is performed without it.

Cyclic transmission

This section explains communication using the cyclic transmission of the FL-net module.
Cyclic transmission is performed at node 3, as shown below.

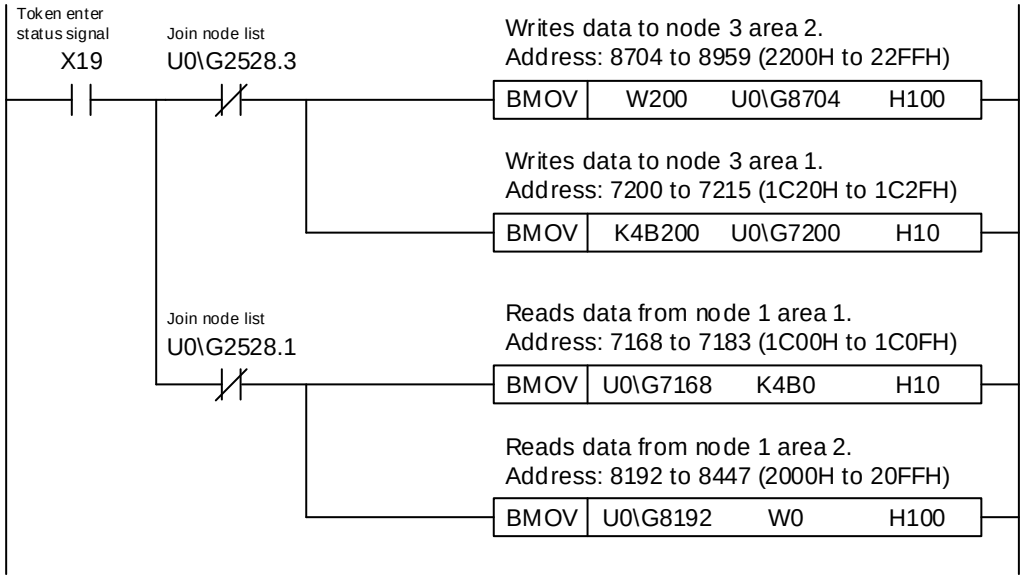


The following shows the program examples for cyclic transmission.



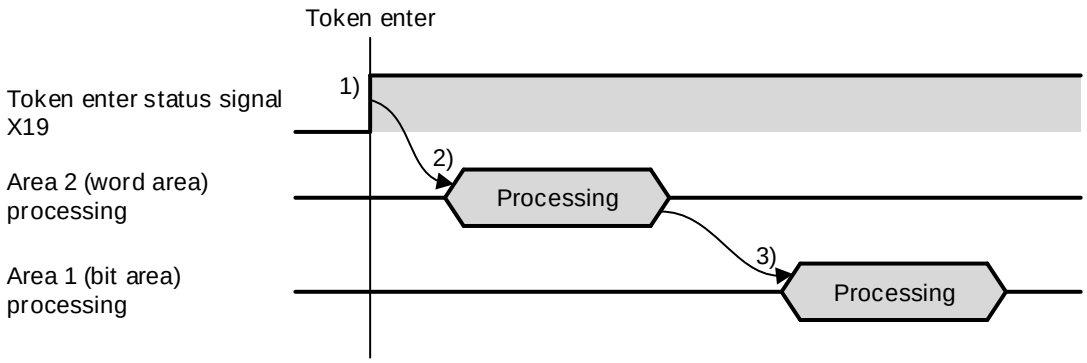
*1 Please transfer the data of the CPU module to the cyclic data area of the FL-net module by using the sequence program on the next page.

Ex. How to refresh data in cyclic areas



Timing chart

The following shows a timing chart for cyclic transmission.



How to check

1. Confirms that the FL-net module token enter status signal (X19) is ON.
2. Data processing for area 2 (word area).
3. Data processing for area 1 (bit area).

Point

- Perform the data processing in the following sequence : area 2 (word area) area 1 (bit area).
- Arrange so that node unit assurance for area 2 (word area) is handshake by bit from area 1 (bit area).

(☞Page 149 Handshake program example)

Message transmission

This section explains communication using the FL-net module message transmission.
Each message transmission described below is described as an example where message transmission is performed at node 3.

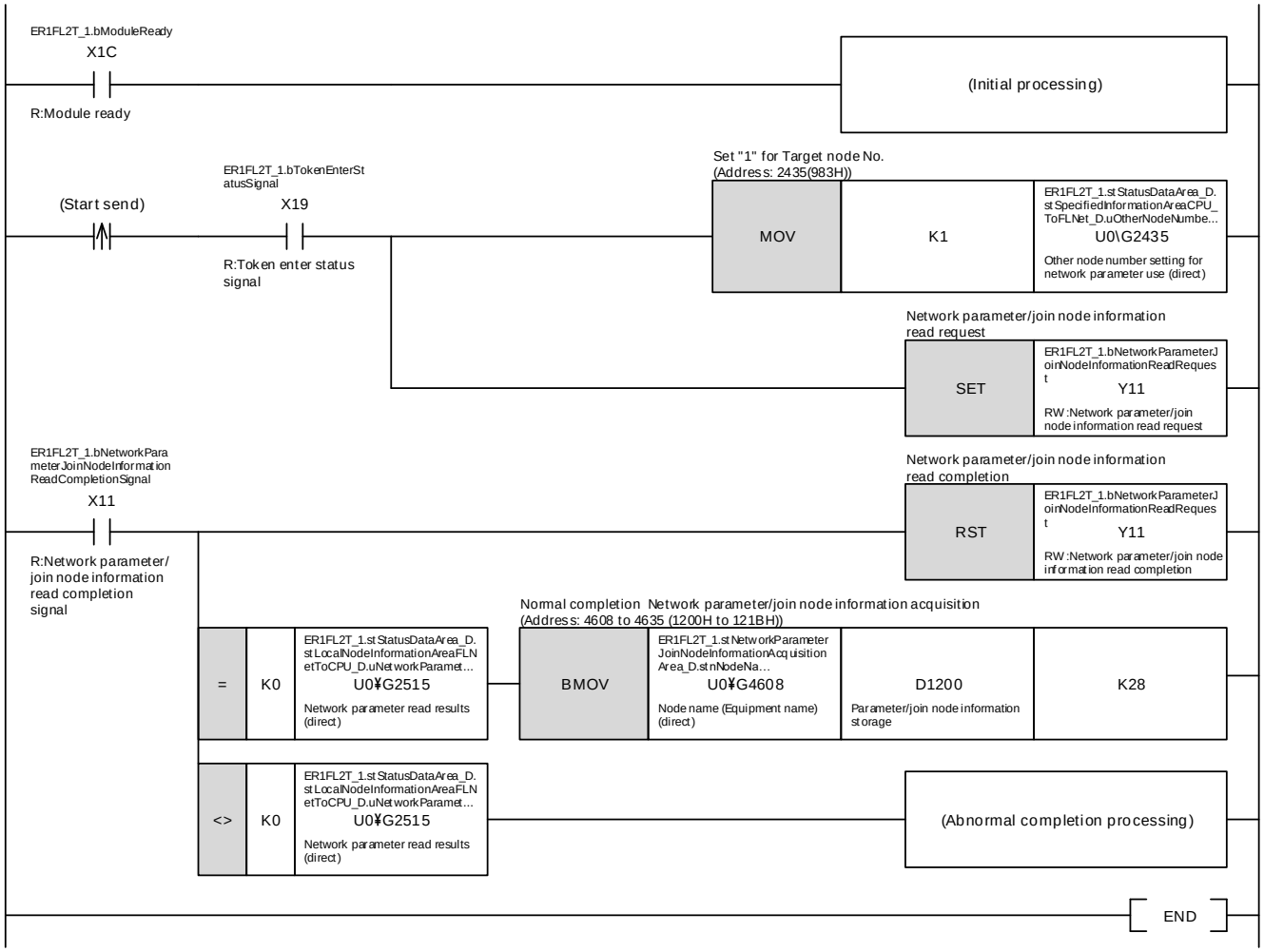
Network parameter/join node information read

The following explains the network parameter/join node information read command.

Point

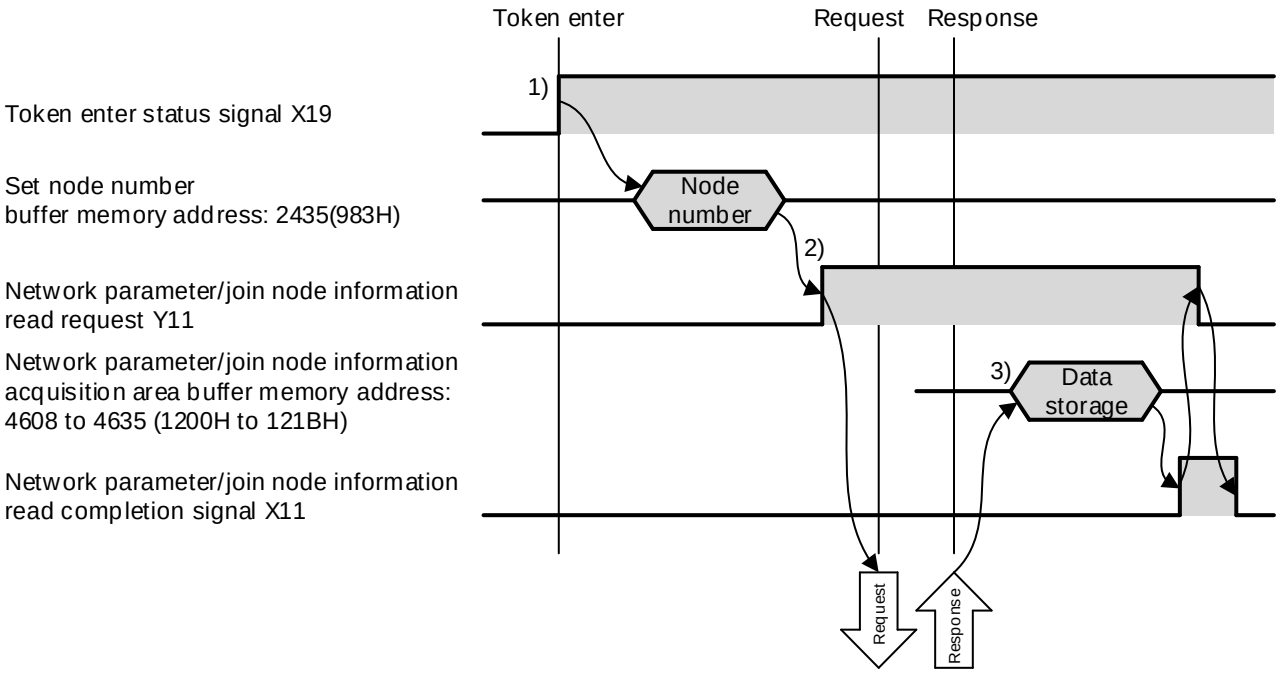
The switching of Network parameter/join node information read is determined by buffer memory address 2435.b15.
(☞Page 190 Specified information area "CPU→FL-net (OPCN-2)")
0: Network parameter information read
1: Join node information read

■Program example



■Timing chart

The following shows a timing chart for Network parameter/join node information read.



■How to check

1. Confirms that the FL-net module token enter status signal (X19) is ON.

2. After setting the target node number to the buffer memory (address: 2435), the network parameter/join node information read request (Y11) is set to ON.
The FL-net module reads the network parameter for the target node.

3. The FL-net module stores the network parameter data for the target node in the buffer memory (address: 4608 to 4635).

4. Confirms network parameter read completion.

Completion status	Signal to be checked	Signal status
Normal completion	Network parameter/join node information read completion signal (X11)	ON
	Network parameter read results (Buffer memory address: 2515)	0
Abnormal completion	Network parameter/join node information read completion signal (X11)	ON
	Network parameter read results (Buffer memory address: 2515)	Other than 0

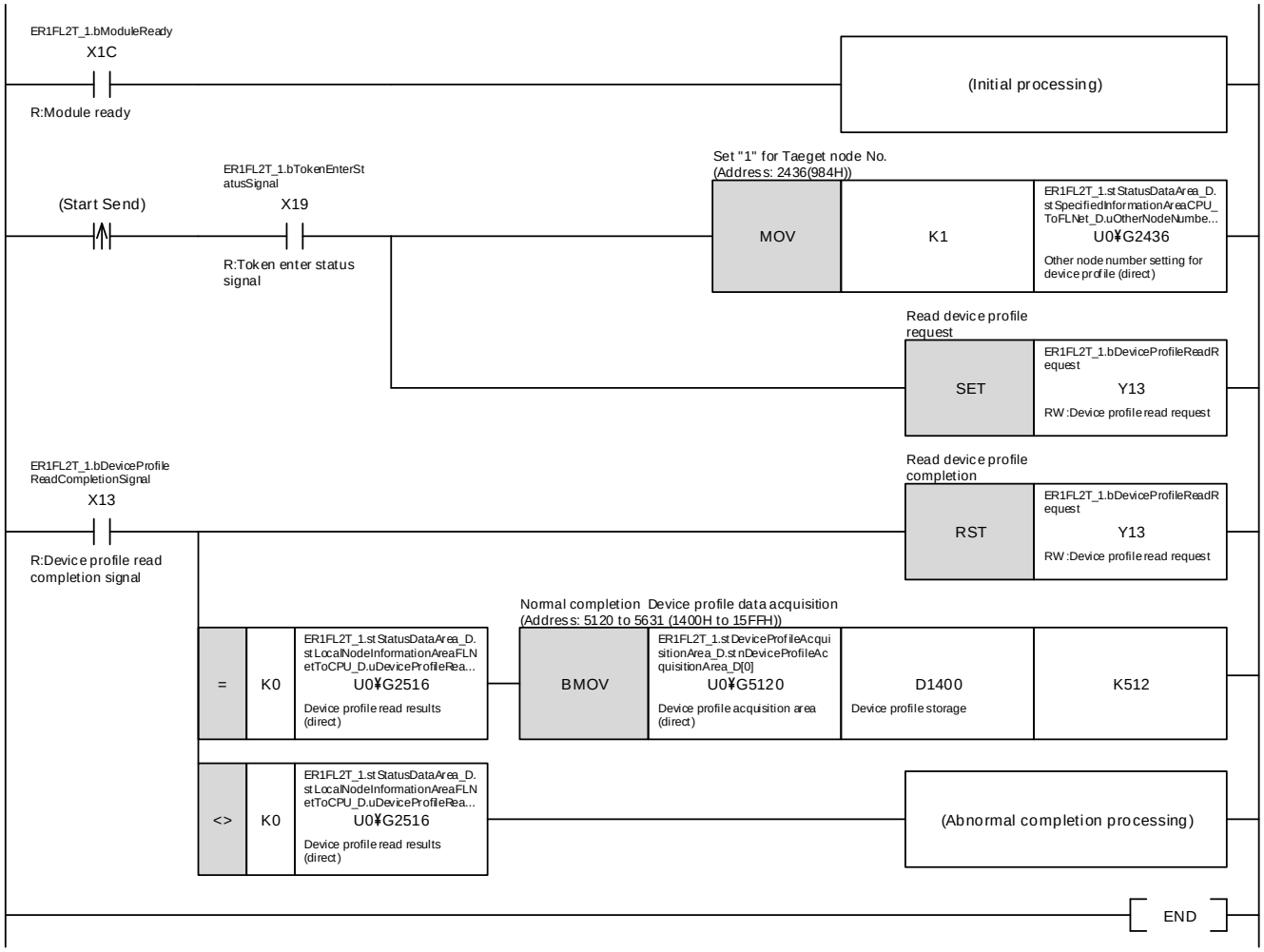
When there is an abnormal completion, after revising the network parameter/program using the error code that is stored in the network parameter read results, execute the network parameter read.
(☞Page 124 Confirming errors using error code)

5. After confirming that the network parameter/join node information read completion signal (X11) is ON, the network parameter/join node information read request (Y11) is set to OFF.

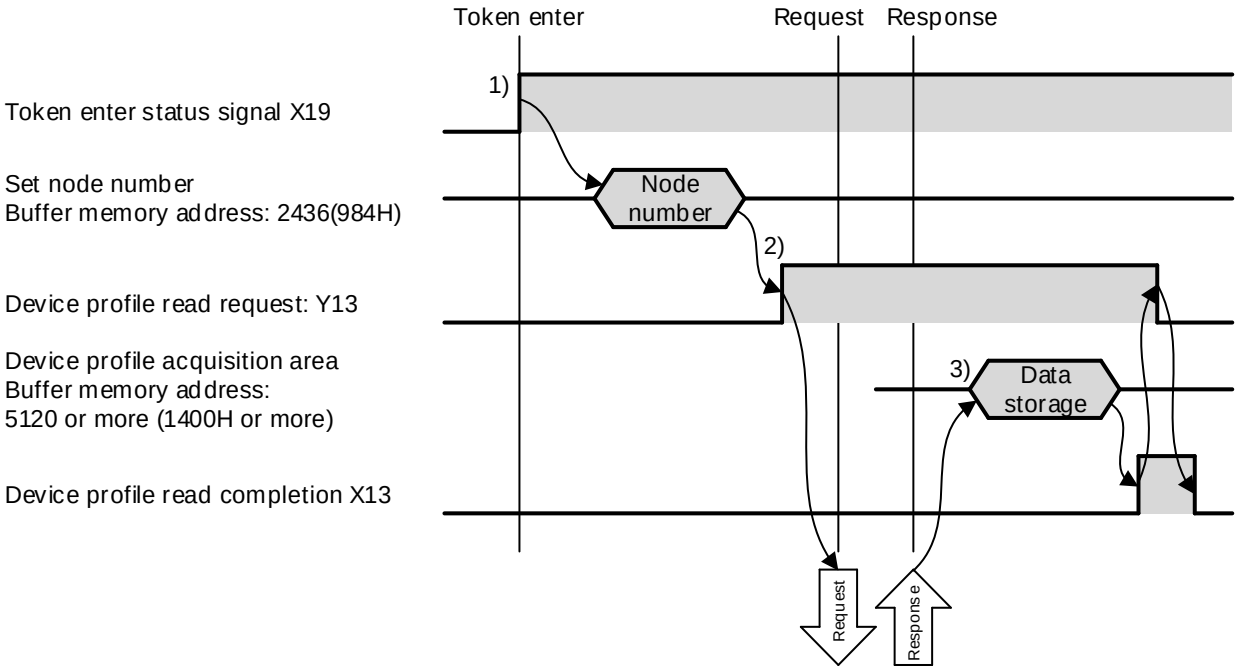
Device profile read

The following explains the device profile read command.

■Program example



■Timing chart



■How to check

1. Confirms that the FL-net module token enter status signal (X19) is ON.

2. After setting the target node number to the buffer memory (address: 2436), the device profile read request (Y13) is set to ON.
The FL-net module reads the parameters for the target node.

3. The FL-net module stores the device profile data for the target node in the buffer memory.
(address : 5120 to 5631)

4. Confirms device profile read completion.

Completion status	Signal to be checked	Signal status
Normal completion	Device profile read completion signal (X13)	ON
	Device profile read results (Buffer memory address: 2516)	0
Abnormal completion	Device profile read completion signal (X13)	ON
	Device profile read results (Buffer memory address: 2516)	Other than 0

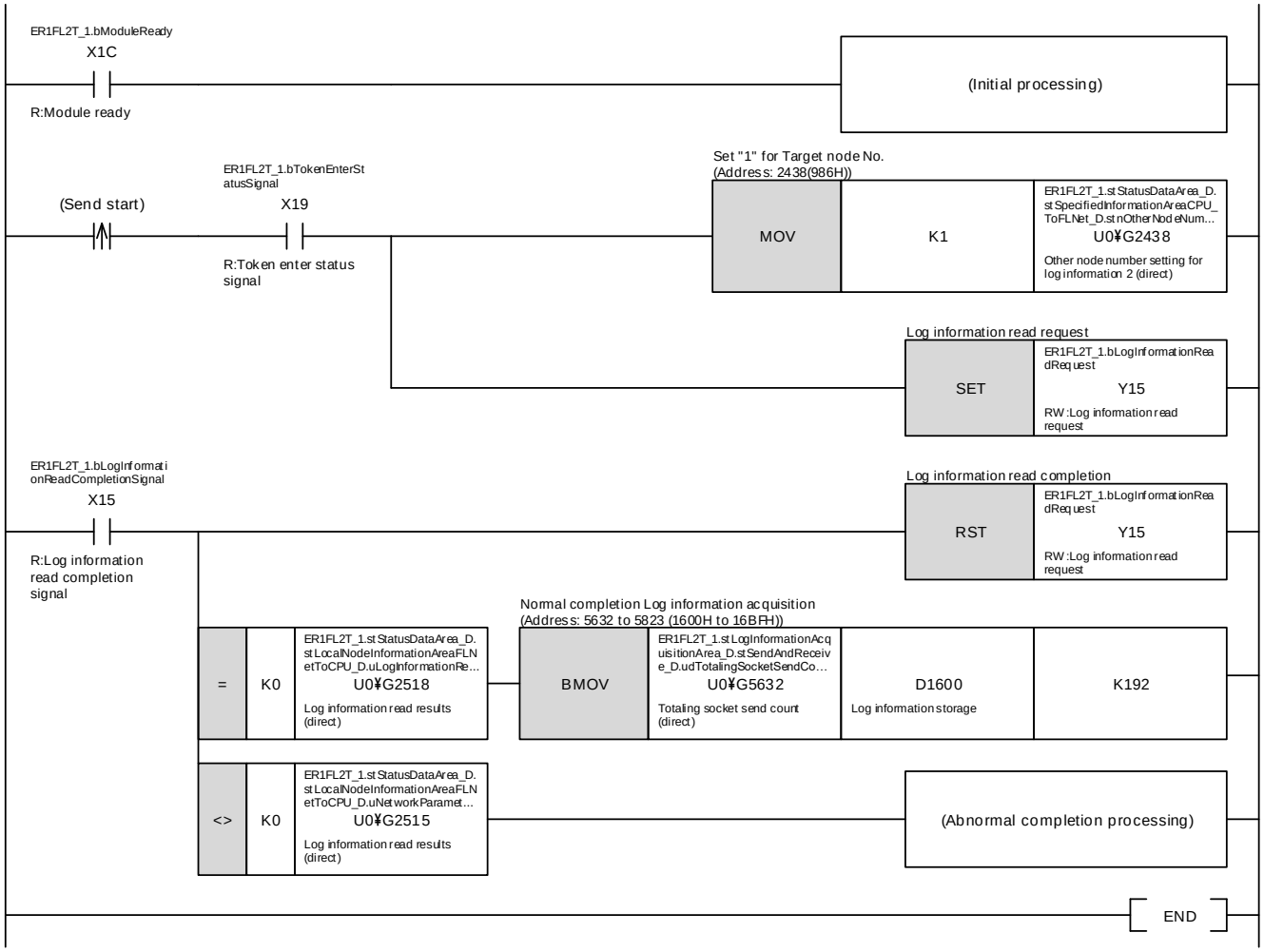
When there is an abnormal completion, after revising the parameter/program using the error codes that are stored in the device profile read results, execute the device profile read command once again.
(☞Page 124 Confirming errors using error code)

5. After confirming that the device profile read completion signal (X13) is ON, the device profile read request (Y13) is set to OFF.

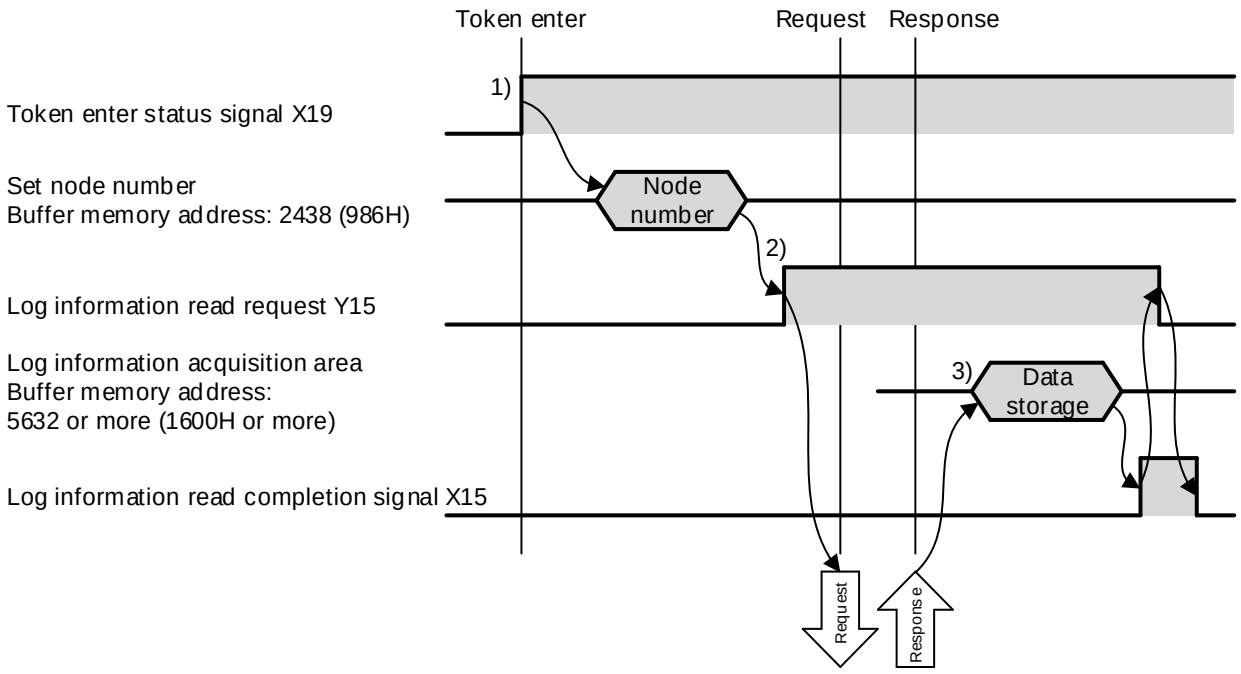
Log information read

The following explains the log information read command.

■Program example



■Timing chart



■How to check

1. Confirms that the FL-net module token enter status signal (X19) is ON.

2. After setting the target node number to the buffer memory (address: 2438), the log information read request (Y15) is set to ON.
The FL-net module reads the parameters for the target node

3. The FL-net module stores the log information for the target node in the buffer memory (address; 5632 to 5823).

4. Confirms log information read completion.

Completion status	Signal to be checked	Signal status
Normal completion	Log information read completion signal (X15)	ON
	Log information read results (Buffer memory address: 2518)	0
Abnormal completion	Log information read completion signal (X15)	ON
	Log information read results (Buffer memory address: 2518)	Other than 0

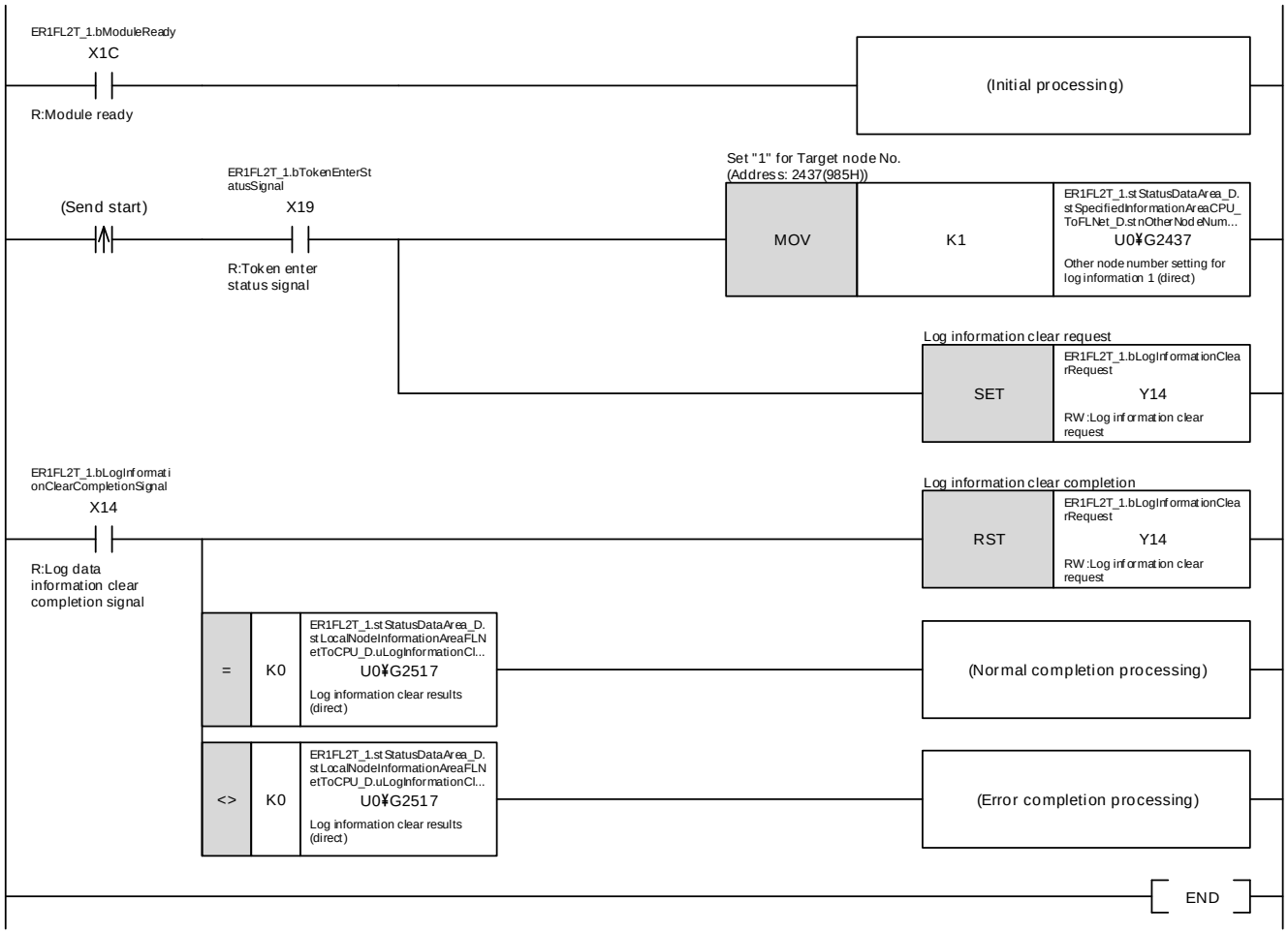
When there is an abnormal completion, after revising the parameter/program using the error codes that are stored in the log information read results, execute the log information read command once again.
(☞Page 124 Confirming errors using error code)

5. After confirming that the log information read completion signal (X15) is ON, the log information read request (Y15) is set to OFF.

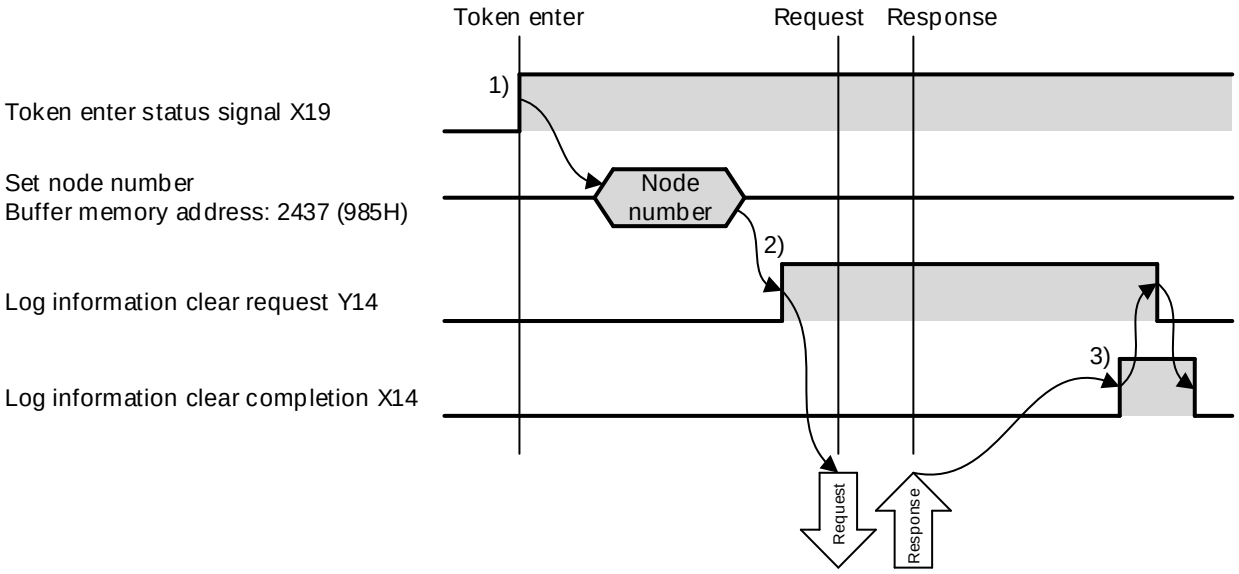
Log information clear

The following explains the log information clear command.

■Program example



■Timing chart



■How to check

1. Confirms that the FL-net module token enter status signal (X19) is ON.

2. After setting the target node number to the buffer memory (address: 2437), the log information clear request (Y14) is set to ON.
The FL-net module performs log information clear for the target node.

3. Confirms log information clear completion.

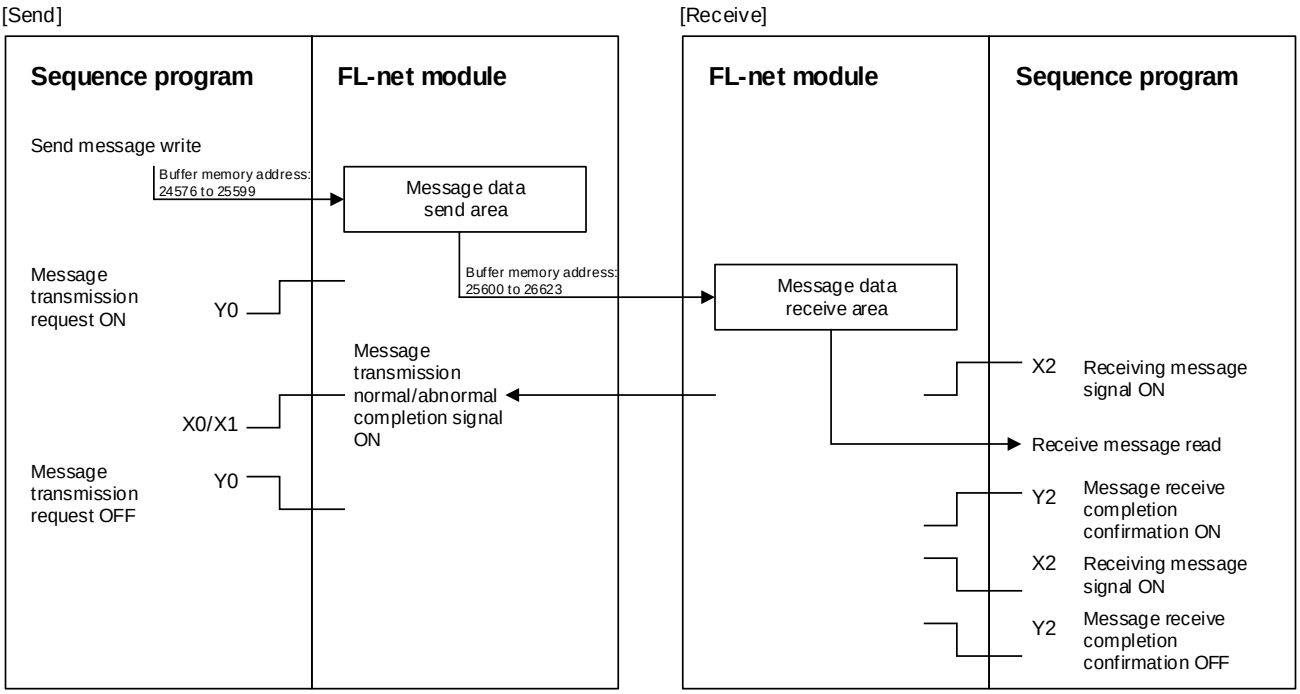
Completion status	Signal to be checked	Signal status
Normal completion	Log information clear completion signal (X14)	ON
	Log information clear results (Buffer memory address: 2517)	0
Abnormal completion	Log information clear completion signal (X14)	ON
	Log information clear results (Buffer memory address: 2517)	Other than 0

When there is an abnormal completion, after revising the parameter/program using the error codes that are stored in the log information clear results, execute the log data clear command once again.
(☞Page 124 Confirming errors using error code)

4. After confirming that the log information clear completion signal (X14) is ON, the log information clear request (Y14) is set to OFF.

Transparent type message (User's arbitrary)

The following explains the send/receive commands for the transparent type message of user's arbitrary.

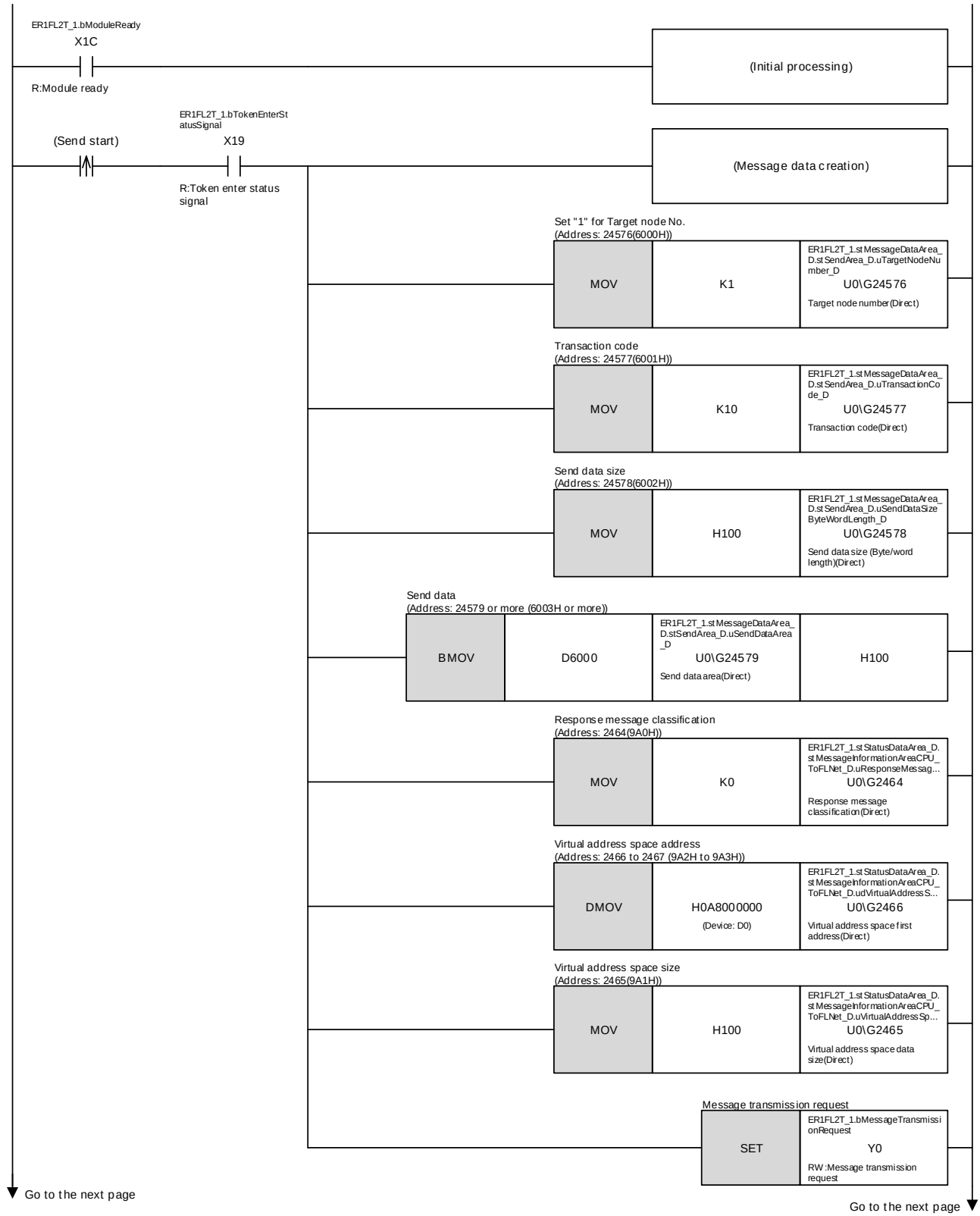


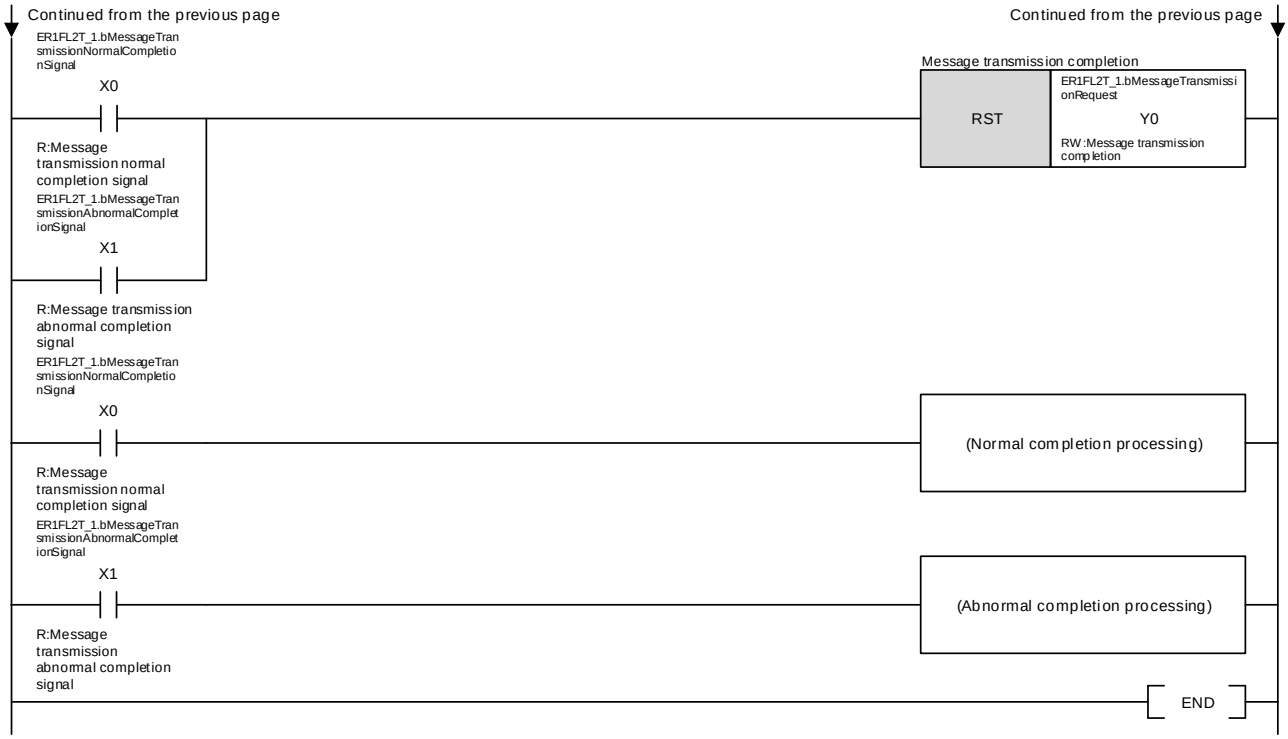
The user's arbitrary transaction code for transparent type messages can be used from 0 to 59999.
(☞Page 153 Transaction code)

Transparent type message (Message send)

The following explains the message transmission command.

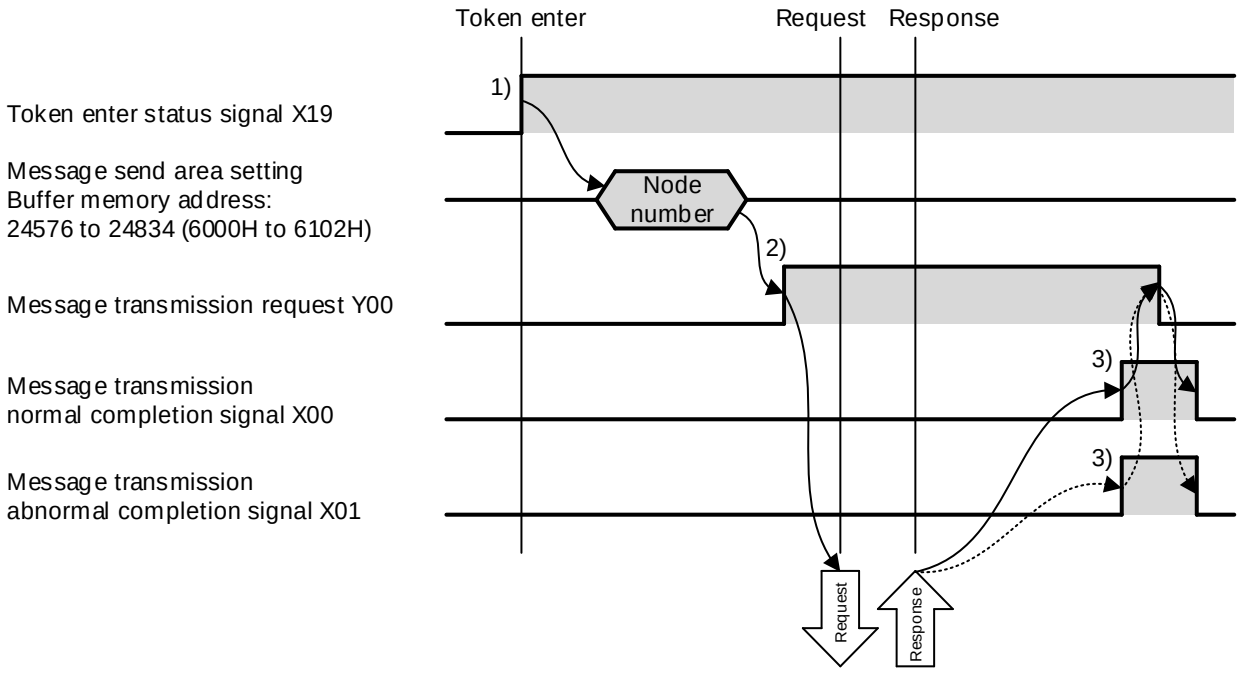
■Program example





■Timing chart

The following shows a timing chart for sending message.



■How to check

1. Confirms that the FL-net module token enter status signal (X19) is ON.

2. After setting the data shown below to the buffer memory (address: 24576 to 24834, 2464 to 2467), message transmission request (Y00) is set to ON.

- Target node number
- Transaction code
- Send data size
- Send data
- Response message classification
- Virtual address space address *1
- Virtual address space size *1

*1 When not using it, it is necessary to specify "0".

3. Confirm the transmission complete of the message.

Completion status	Signal to be checked	Signal status
Normal completion	Message transmission normal completion signal (X00)	ON
	Message transmission abnormal completion signal (X01)	OFF
	Transparent message send result (Buffer memory address: 2519)	0
Abnormal completion	Message transmission normal completion signal (X00)	OFF
	Message transmission abnormal completion signal (X01)	ON
	Transparent message send result (Buffer memory address: 2519)	Other than 0

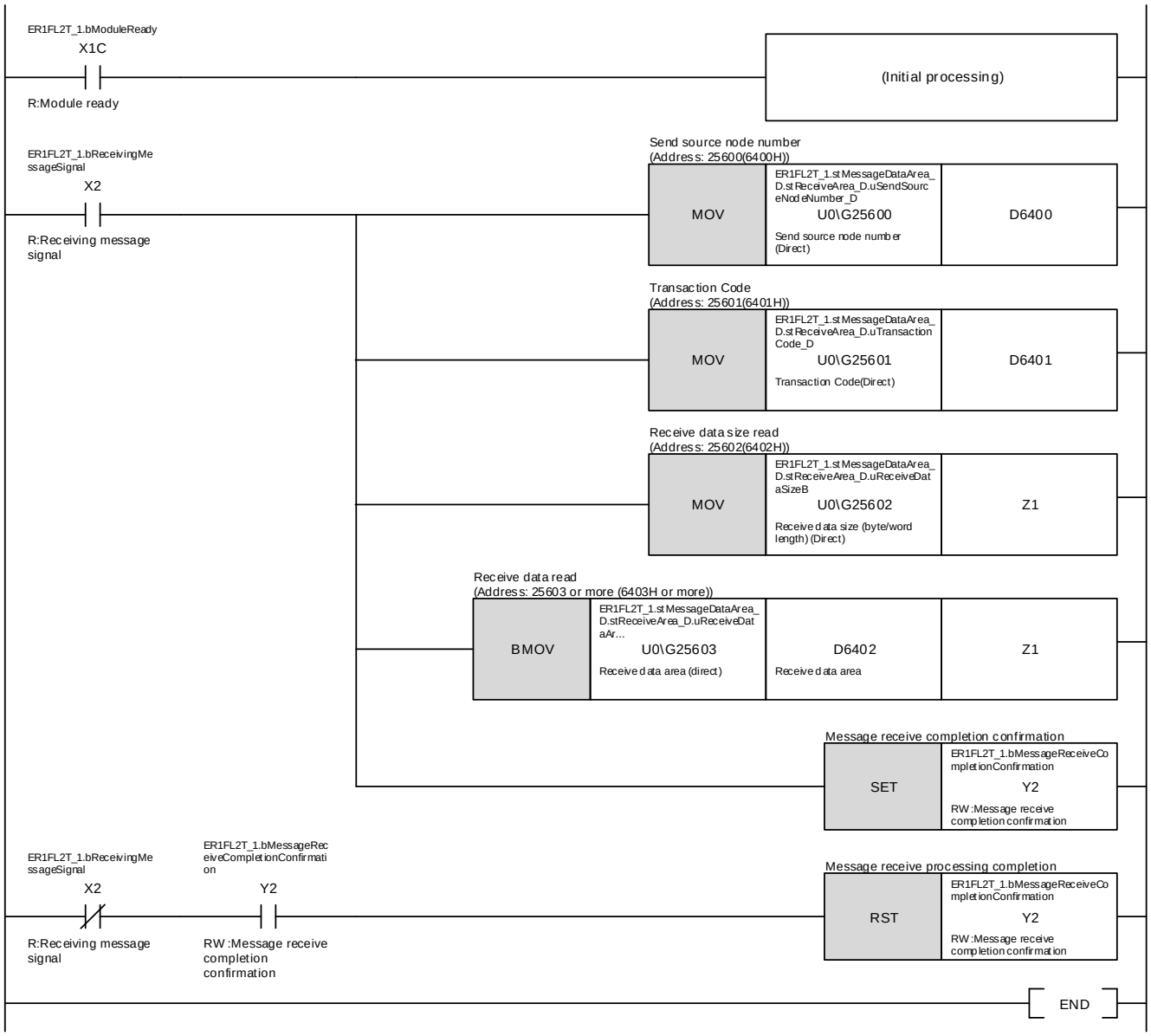
If the transmission has completed abnormally, correct the parameters or program according to the error code stored in the transparent type message transmission result area, and execute the transparent type message transmission. (☞Page 124 Confirming errors using error code)

4. After confirming that the message transmission normal completion signal (X00)/message transmission abnormal completion signal (X01) is ON, the message transmission request (Y00) is set to OFF.

Transparent type message (Message receive)

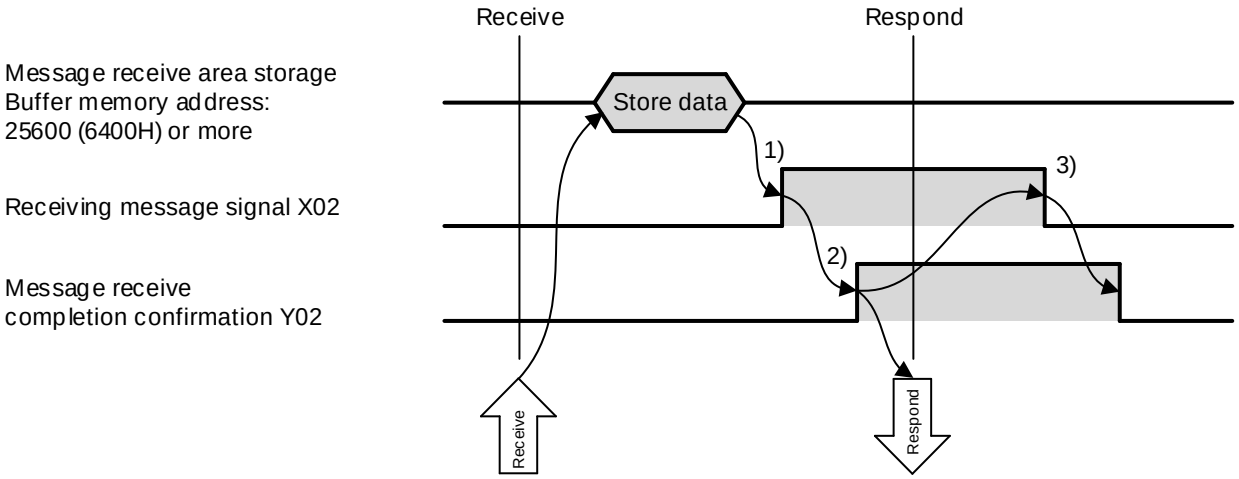
The following explains the message receive command.

■Program example



■Timing chart

The following shows a timing chart for receiving message.



■How to check

1. Once the data receive completion is in the FL-net module buffer memory message data receive area (address: 25600 or more), the receiving message signal (X02) is set to ON.

2. After the message data has been transferred to the device (read), the message receive completion confirmation (Y02) is set to ON.

3. After confirming that the receiving message signal (X02) is OFF, the message receive completion confirmation (Y02) is set to OFF.

Point

When a response is needed for message data receive, create a sequence program for the response.

Other messages (Transparent type messages)

Messages other than the followings enable the client function by the transparent type message transmission.

- Network parameter/join node information read
- Device profile read
- Log information read
- Log information clear
- Transparent type messages (User's arbitrary.)

To realize the client function of each message, a request message transmission program and a response message reception program are required. For the program example, refer to the following.

☞Page 102 Sample program

This section provides the items for which the settings are required for each request message transmission and those for which values are stored at the time of response message reception.

Point

- Completion of each message processing must be recognized by completion of request message transmission and response message reception.
- To control Y0 within the same scan, insert an interlock so that Y0 turns on under the condition that Y0 always turns off.

Byte block read

■Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
2464	Response message classification	0 (Required)
2465	Visual address space data size	Read data size (1 to 1024 bytes) *1
2466 to 2467	Visual address space start address	Visual address space start address *3
24576	Target node number	1 to 254
24577	Transaction code	65003
24578	Send data size (byte/word length)	0 (Required)
24579 to 25090	Send data area (512 words)	0 (Required)

■Items for which values are stored at response message reception

Buffer memory address	Name	Setting value (Decimal)
3072	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
3073	Visual address space data size	Value same as in request message
3074 to 3075	Visual address space start address	Value same as in request message
25600	Send source node number	Value same as in request message
25601	Transaction code	65203
25602	Receive data size (byte/word length)	Read data size (1 to 1024bytes/512words) *2
25603 to 26114	Receive data area (512 words)	Read data

Byte block write

■Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
2464	Response message classification	0 (Required)
2465	Visual address space data size	Write data size (1 to 1024 bytes) *1
2466 to 2467	Visual address space start address	Visual address space start address *3
24576	Target node number	1 to 254
24577	Transaction code	65004
24578	Send data size (byte/word length)	Write data size (1 to 1024 bytes/512 words) *2
24579 to 25090	Send data area (512 words)	Write data

■Items for which values are stored at response message reception

Buffer memory address	Name	Setting value (Decimal)
3072	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
3073	Visual address space data size	Value same as in request message
3074 to 3075	Visual address space start address	Value same as in request message
25600	Send source node number	Value same as in request message
25601	Transaction code	65204
25602	Receive data size (byte/word length)	0
25603 to 26114	Receive data area (512 words)	0

*1 Depends on the transaction code.

*2 For the data size, change the data unit with Message Data Unit Select of the network parameter.

*3 The device of the target node, the CPU module and remote head module, can be accessed by specifying a virtual address. For details, refer to the following.

☞ Page 154 Comparison between the virtual addresses and physical address

Word block read

■Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
2464	Response message classification	0 (Required)
2465	Visual address space data size	Read data size (1 to 512 words) *1
2466 to 2467	Visual address space start address	Visual address space start address *3
24576	Target node number	1 to 254
24577	Transaction code	65005
24578	Send data size (byte/word length)	0 (Required)
24579 to 25090	Send data area (512 words)	0 (Required)

■Items for which values are stored at response message reception

Buffer memory address	Name	Setting value (Decimal)
3072	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
3073	Visual address space data size	Value same as in request message
3074 to 3075	Visual address space start address	Value same as in request message
25600	Send source node number	Value same as in request message
25601	Transaction code	65205
25602	Receive data size (byte/word length)	Read data size (1 to 1024 bytes/512 words) *2
25603 to 26114	Receive data area (512 words)	Read data

Word block write

■Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
2464	Response message classification	0 (Required)
2465	Visual address space data size	Write data size (1 to 512 words) *1
2466 to 2467	Visual address space start address	Visual address space start address *3
24576	Target node number	1 to 254
24577	Transaction code	65006
24578	Send data size (byte/word length)	Write data size (1 to 1024 bytes/512 words) *2
24579 to 25090	Send data area (512 words)	Write data

■Items for which values are stored at response message reception

Buffer memory address	Name	Setting value (Decimal)
3072	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
3073	Visual address space data size	Value same as in request message
3074 to 3075	Visual address space start address	Value same as in request message
25600	Send source node number	Value same as in request message
25601	Transaction code	65206
25602	Receive data size (byte/word length)	0
25603 to 26114	Receive data area (512 words)	0

*1 Depends on the transaction code.

*2 For the data size, change the data unit with Message Data Unit Select of the network parameter.

*3 The device of the target node, the CPU module and remote head module, can be accessed by specifying a virtual address. For details, refer to the following.

☞ Page 154 Comparison between the virtual addresses and physical address

Network parameter write

■Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
2464	Response message classification	0 (Required)
2465	Visual address space data size	0 (Required)
2466 to 2467	Visual address space start address	0 (Required)
24576	Target node number	1 to 254
24577	Transaction code	65008
24578	Send data size (byte/word length)	20bytes/10words *1
24579	Setting parameter flag	1: Set address and size only 2: Set node name only 3: Set address, size and node name
24580	Area 1 start address	0 to 511
24581	Area 1 size	0 to 512
24582	Area 2 start address	0 to 8191
24583	Area 2 size	0 to 8192
24584 to 24588	Node name	Character string (10 bytes or less)

■Items for which values are stored at response message reception

Buffer memory address	Name	Setting value (Decimal)
3072	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
3073	Visual address space data size	0
3074 to 3075	Visual address space start address	0
25600	Send source node number	Value same as in request message
25601	Transaction code	65208
25602	Receive data size (byte/word length)	0
25603 to 26114	Receive data area (512 words)	0

*1 For the data size, change the data unit with Message Data Unit Select of the network parameter.

Operate command

■Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
2464	Response message classification	0 (Required)
2465	Visual address space data size	0 (Required)
2466 to 2467	Visual address space start address	0 (Required)
24576	Target node number	1 to 254
24577	Transaction code	65010
24578	Send data size (byte/word length)	0 (Required)
24579 to 25090	Send data area (512 words)	0 (Required)

■Items for which values are stored at response message reception

Buffer memory address	Name	Setting value (Decimal)
3072	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
3073	Visual address space data size	0
3074 to 3075	Visual address space start address	0
25600	Send source node number	Value same as in request message
25601	Transaction code	65210
25602	Receive data size (byte/word length)	0
25603 to 26114	Receive data area (512 words)	0

Stop command

■Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
2464	Response message classification	0 (Required)
2465	Visual address space data size	0 (Required)
2466 to 2467	Visual address space start address	0 (Required)
24576	Target node number	1 to 254
24577	Transaction code	65009
24578	Send data size (byte/word length)	0 (Required)
24579 to 25090	Send data area (512 words)	0 (Required)

■Items for which values are stored at response message reception

Buffer memory address	Name	Setting value (Decimal)
3072	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
3073	Visual address space data size	0
3074 to 3075	Visual address space start address	0
25600	Send source node number	Value same as in request message
25601	Transaction code	65209
25602	Receive data size (byte/word length)	0
25603 to 26114	Receive data area (512 words)	0

Message return

■Setting items required for request message transmission

Buffer memory address	Name	Setting value (Decimal)
2464	Response message classification	0 (Required)
2465	Visual address space data size	0 (Required)
2466 to 2467	Visual address space start address	0 (Required)
24576	Target node number	1 to 254
24577	Transaction code	65015
24578	Send data size (byte/word length)	Return data size (1 to 1024 bytes/512 words) *1
24579 to 25090	Send data area (512 words)	Return data

■Items for which values are stored at response message reception

Buffer memory address	Name	Setting value (Decimal)
3072	Response message classification	0: Normal response 1: Abnormal response 2: Not supported
3073	Visual address space data size	0
3074 to 3075	Visual address space start address	0
25600	Send source node number	Value same as in request message
25601	Transaction code	65215
25602	Receive data size (byte/word length)	Value same as in request message
25603 to 26114	Receive data area (512 words)	Value same as in request message

*1 For the data size, change the data unit with Message Data Unit Select of the network parameter.

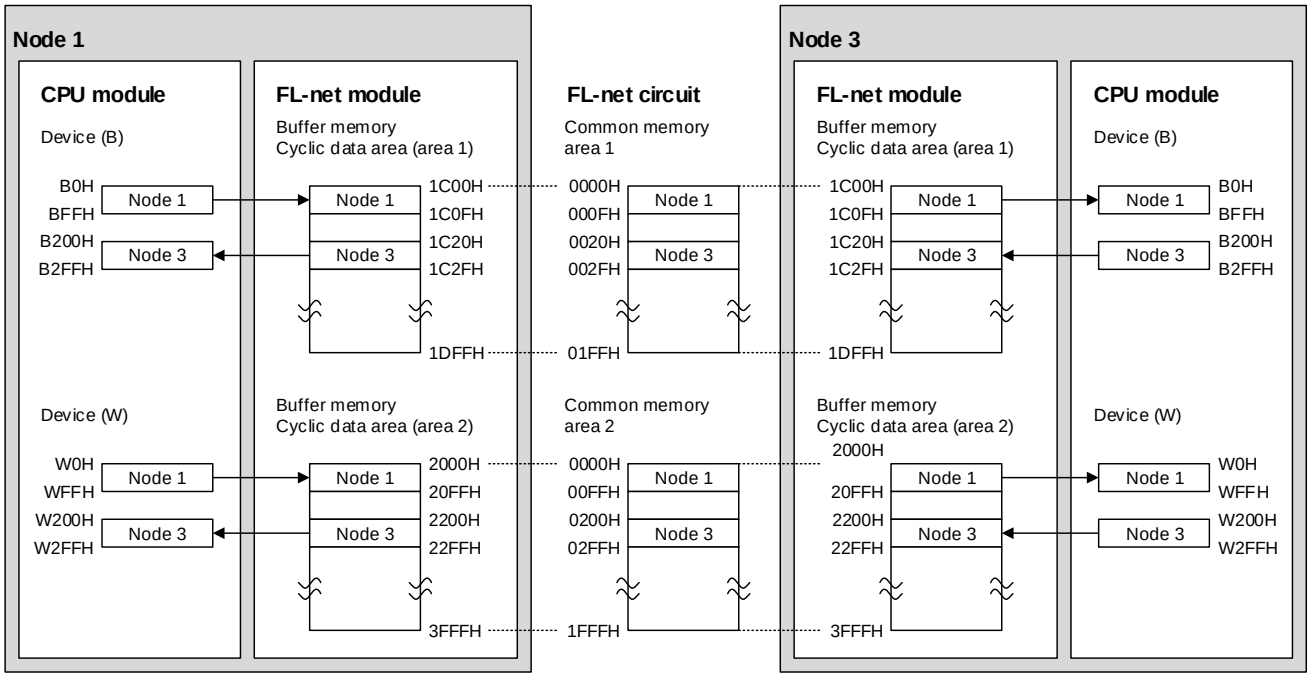
11.2 Sample program

This section describes sample programs for cyclic transmission and transparent type messages transmission.
For the system configuration, refer to ☞Page 72 System configuration example.

Summary

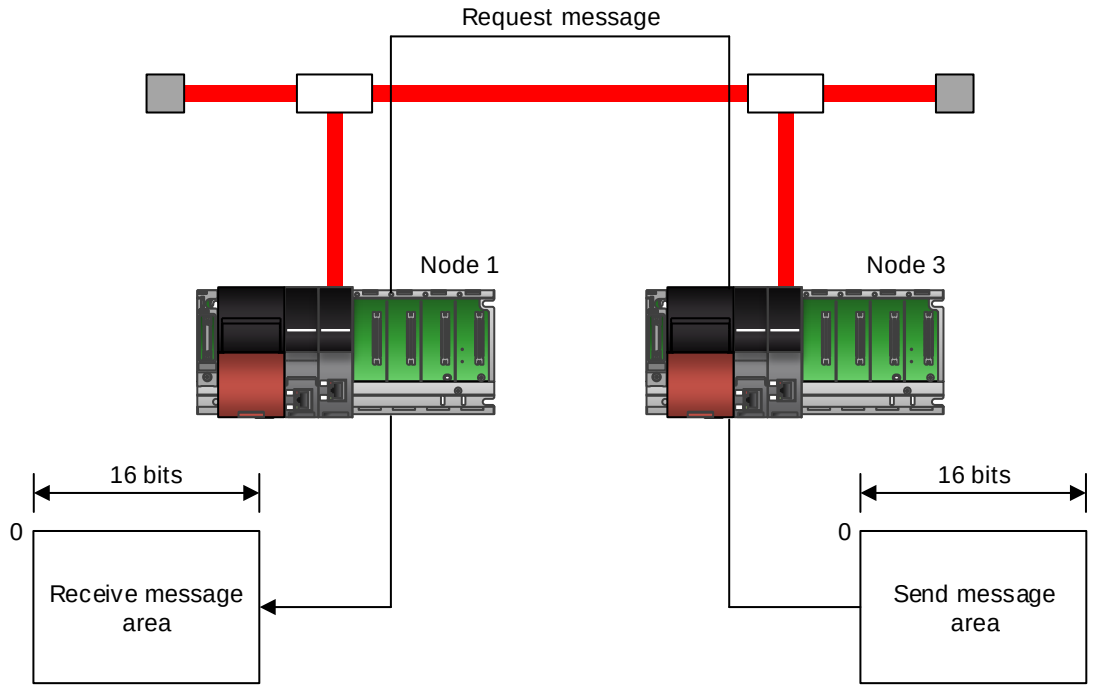
Cyclic transmission

Cyclic transmission program for node 1 ⟷ node 3.
The following shows the flow of data in cyclic transmission of the sample program.



Transparent type message transmission

Transparent type message transmission node 1 ← node 3.



Example form of the cyclic data area assignment sheet

The cyclic data area assignment sheet is provided in this manual. Please utilize the sheet for check of the cyclic data area assignment.

(☞Page 258 Cyclic Data Area Assignment Sheet)

The following is an example for how to fill out the form in the case of this sample program.

Ex. Area 1 (bit area)

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 01FFH)	Buffer memory address 7168 to 7679 (1C00 to 1DFFH)	PLC side device	Buffer offset	PLC side device	
1	0000 to 000FH	7168 to 7183 (1C00 to 1C0FH)	16	0	B0 to BFF	
3	0020 to 002FH	7200 to 7215 (1C20 to 1C2FH)	16	32	B200 to B2FF	Local node

Ex. Area 2 (word area)

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 01FFH)	Buffer memory address 8192 to 16383 (2000 to 3FFFH)	PLC side device	Buffer offset	PLC side device	
1	0000 to 00FFH	8192 to 8447 (2000 to 20FFH)	256	0	W0 to WFF	
3	0200 to 02FFH	8704 to 8959 (2200 to 22FFH)	256	512	W200 to W2FF	Local node

Setting example of the Module parameter

This section describes examples of the Module parameter.

Node 1 side

■Switch setting

For the setting method, refer to ☞Page 59 Switch setting.

Setting Item		Setting value
IP address settings	IP address settings 1	192
	IP address settings 2	168
	IP address settings 3	250
	IP address settings 4	1
Operating mode settings	Operating mode settings	On line (Auto negotiation)

■Basic setting

For the setting method, refer to ☞Page 60 Basic setting.

Setting item			Setting value
Basic parameter	Node name (Equipment name)		Node 1
	Cyclic data area 1	Start address	0H
		Size	16word
	Cyclic data area 2	Start address	0H
		Size	256word
	Token Watch Time Out Time		50ms
	Minimum Permissible Frame interval		0μs
	Message Data Unit Select		0: Word unit

■Auto refresh setting

For the setting method, refer to ☞Page 61 Auto refresh setting.

Point

For automatic refresh setting, only status data is set. When refreshing the cyclic data area, it is necessary to refresh by the sequence program.

☞Page 106 When configuring basic setting and refreshing cyclic area with sequence program

Node 3 side

■Switch setting

For the setting method, refer to ☞Page 59 Switch setting.

Setting Item		Setting value
IP address settings	IP address settings 1	192
	IP address settings 2	168
	IP address settings 3	250
	IP address settings 4	3
Operating mode settings	Operating mode settings	On line (Auto negotiation)

■Basic setting

For the setting method, refer to ☞Page 60 Basic setting.

Setting item			Setting value
Basic parameter	Node name (Equipment name)		Node 3
	Cyclic data area 1	Start address	20H
		Size	16word
	Cyclic data area 2	Start address	200H
		Size	256word
	Token Watch Time Out Time		50ms
	Minimum Permissible Frame interval		0 μs
	Message Data Unit Select		0: Word unit

■Auto refresh setting

For the setting method, refer to ☞Page 61 Auto refresh setting.

Point

For automatic refresh setting, only status data is set. When refreshing the cyclic data area, it is necessary to refresh by the sequence program.

☞Page 106 When configuring basic setting and refreshing cyclic area with sequence program

Program example

When configuring basic setting and refreshing cyclic area with sequence program

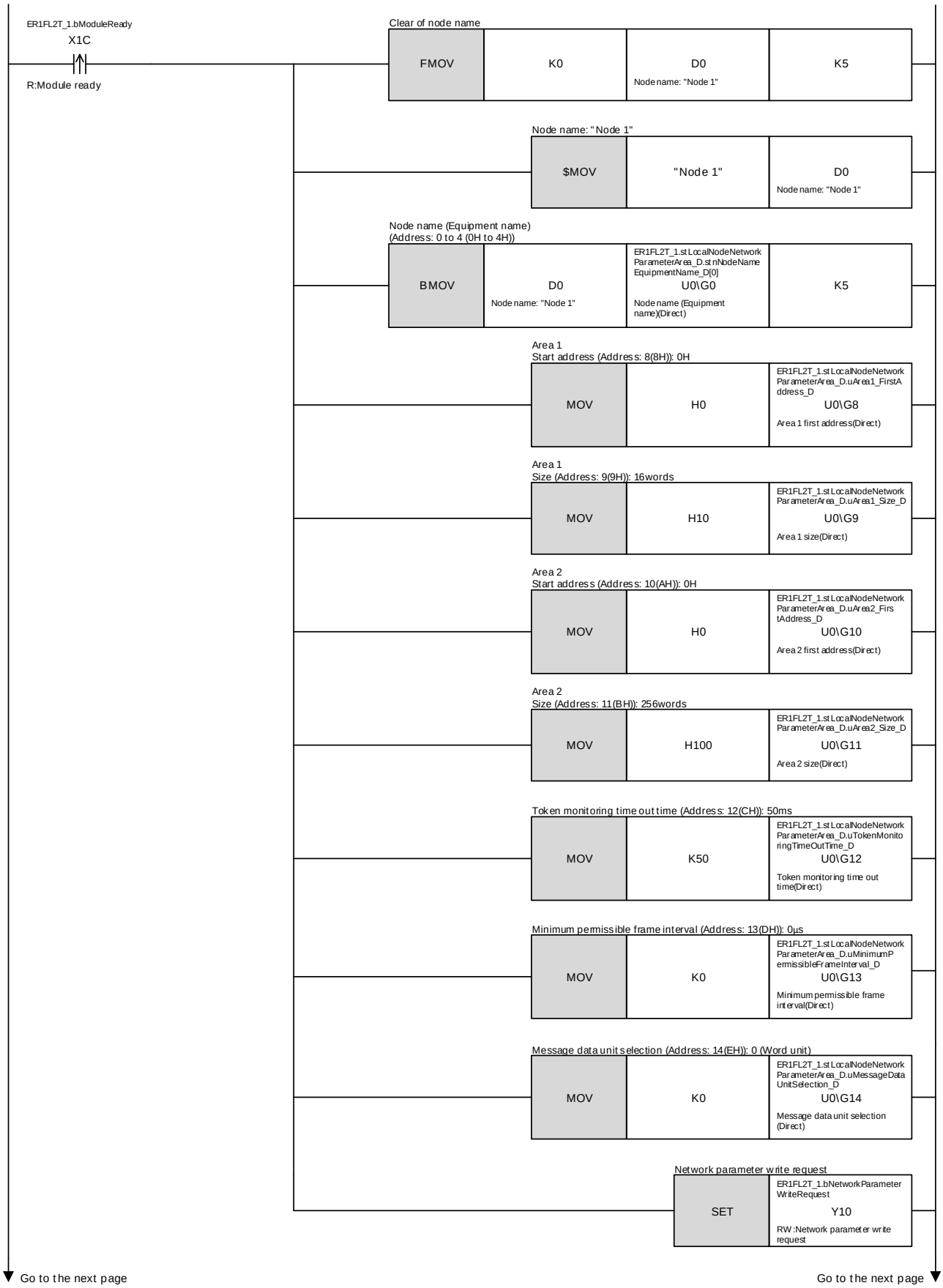
■Node 1 side

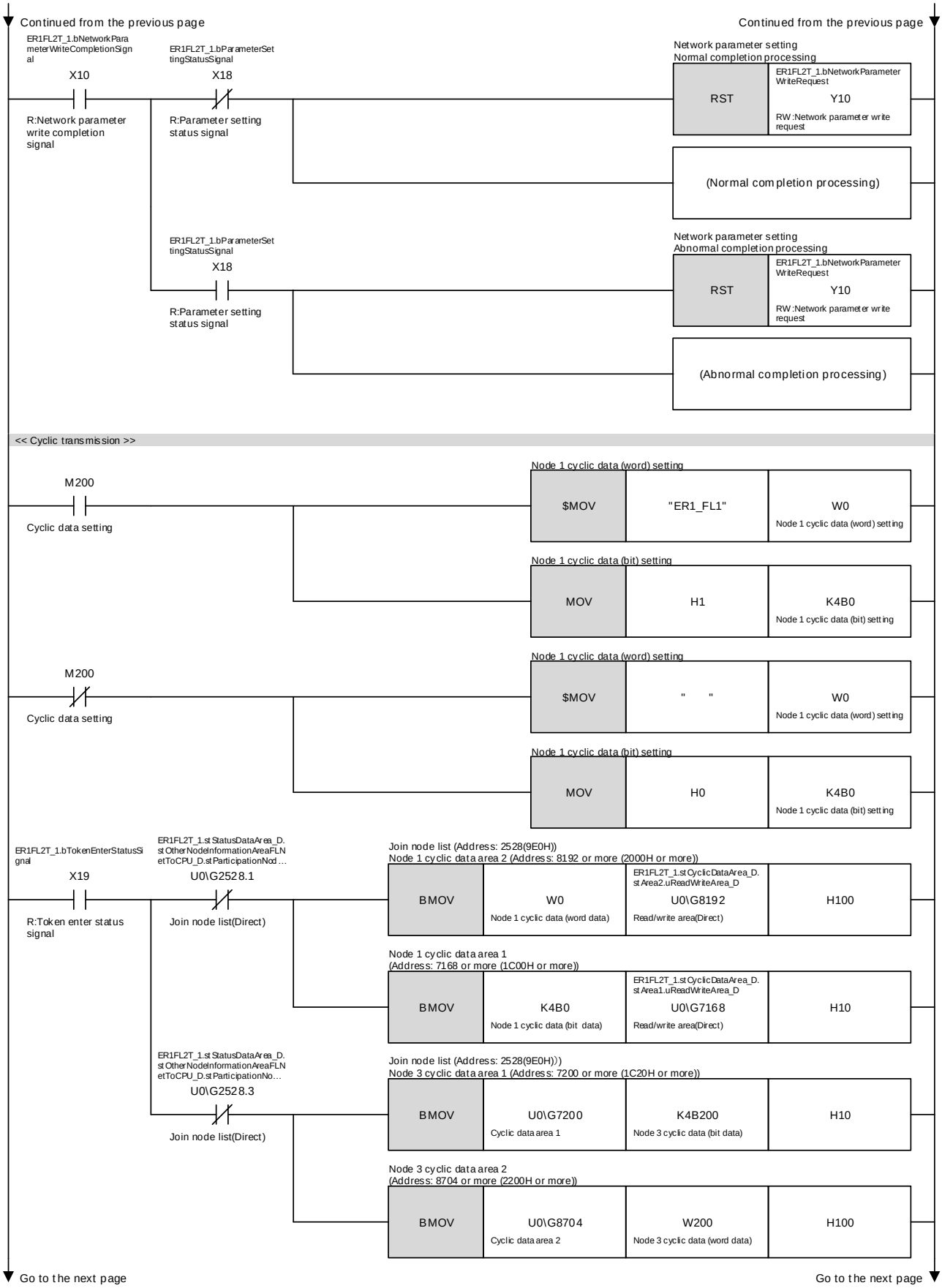
- After confirming that Module ready (X1C) is on and setting the data of the local node network parameter area to the buffer memory (address: from 0), turn on Network parameter write request signal (Y10).
- Turn off Network parameter write request signal (Y10) when Network parameter write completion signal (X10) turns on.
- Turning on Cyclic data setting (M200) sets data to the cyclic data area 1 of the buffer memory and the local node area of the cyclic data area 2.

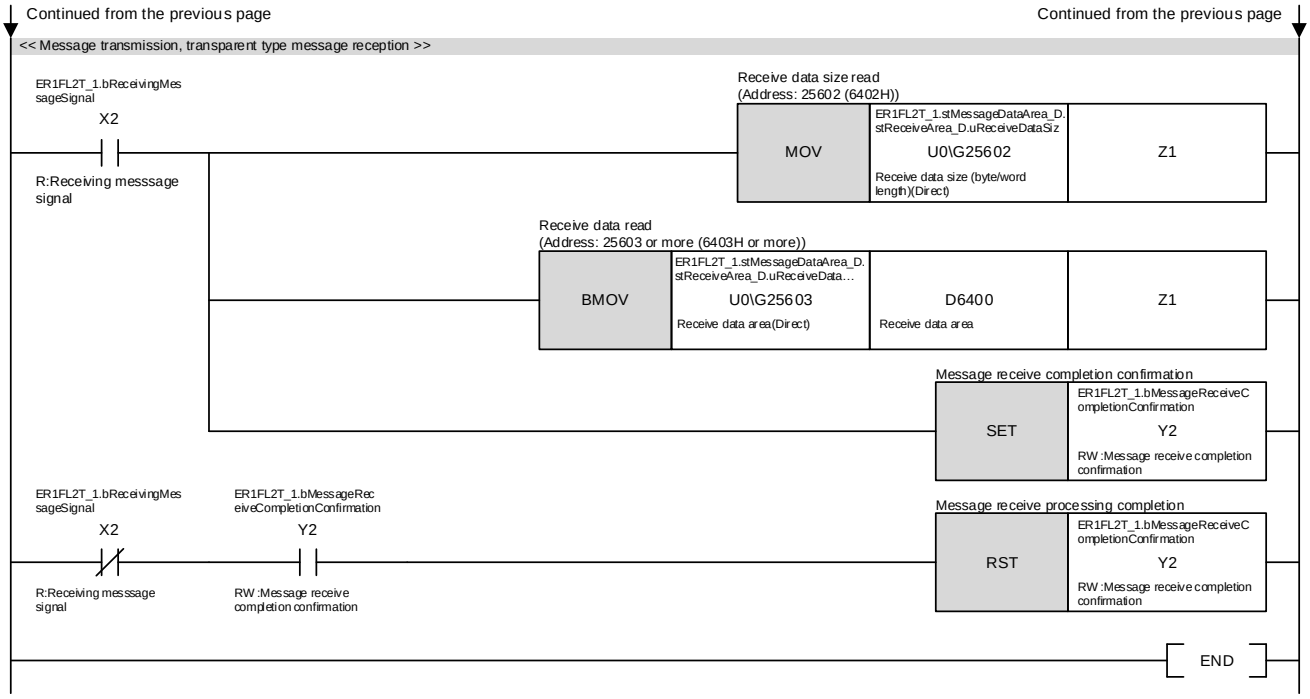
  Turning off Cyclic data setting (M200) clears the local node area.
- When the transparent type message is received, the receive data size is read from the buffer memory.

  The received data equivalent to the read receive data size is read from the buffer memory and transferred to the receive data area (from D6400).
- After the received data has been transferred, turn on Message reception completion confirmation (Y2).

  When Message being received (X2) turns off, turn off Message reception completion confirmation (Y2).


ER1FL2T_1.bModuleReady
X1C
R:Module ready
Clear of node name
FMOV
K0
D0
Node name: "Node 1"
K5
Node name: "Node 1"
$MOV
"Node 1"
D0
Node name: "Node 1"
Node name (Equipment name)
(Address: 0 to 4 (0H to 4H))
BMOV
D0
Node name: "Node 1"
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.stnNodeName EquipmentName_D[0]
U0\G0
Node name (Equipment name)(Direct)
K5
Area 1
Start address (Address: 8(8H)): 0H
MOV
H0
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uArea1_FirstAddress_D
U0\G8
Area 1 first address(Direct)
Area 1
Size (Address: 9(9H)): 16words
MOV
H10
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uArea1_Size_D
U0\G9
Area 1 size(Direct)
Area 2
Start address (Address: 10(AH)): 0H
MOV
H0
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uArea2_FirstAddress_D
U0\G10
Area 2 first address(Direct)
Area 2
Size (Address: 11(BH)): 256words
MOV
H100
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uArea2_Size_D
U0\G11
Area 2 size(Direct)
Token monitoring time out time (Address: 12(CH)): 50ms
MOV
K50
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uTokenMonitoringTimeOutTime_D
U0\G12
Token monitoring time out time(Direct)
Minimum permissible frame interval (Address: 13(DH)): 0µs
MOV
K0
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uMinimumPermissibleFrameInterval_D
U0\G13
Minimum permissible frame interval(Direct)
Message data unit selection (Address: 14(EH)): 0 (Word unit)
MOV
K0
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uMessageDataUnitSelection_D
U0\G14
Message data unit selection (Direct)
Network parameter write request
SET
ER1FL2T_1.bNetworkParameterWriteRequest
Y10
RW:Network parameter write request
Go to the next page
Go to the next page


Continued from the previous page
Continued from the previous page
ER1FL2T_1.bNetworkParameterWriteCompletionSignal
X10
R:Network parameter write completion signal
ER1FL2T_1.bParameterSettingStatusSignal
X18
R:Parameter setting status signal
Network parameter setting
Normal completion processing
RST
ER1FL2T_1.bNetworkParameterWriteRequest
Y10
RW:Network parameter write request
(Normal completion processing)
ER1FL2T_1.bParameterSettingStatusSignal
X18
R:Parameter setting status signal
Network parameter setting
Abnormal completion processing
RST
ER1FL2T_1.bNetworkParameterWriteRequest
Y10
RW:Network parameter write request
(Abnormal completion processing)
<< Cyclic transmission >>
M200
Cyclic data setting
Node 1 cyclic data (word) setting
$MOV
"ER1_FL1"
W0
Node 1 cyclic data (word) setting
Node 1 cyclic data (bit) setting
MOV
H1
K4B0
Node 1 cyclic data (bit) setting
M200
Cyclic data setting
Node 1 cyclic data (word) setting
$MOV
" "
W0
Node 1 cyclic data (word) setting
Node 1 cyclic data (bit) setting
MOV
H0
K4B0
Node 1 cyclic data (bit) setting
ER1FL2T_1.bTokenEnterStatusSignal
X19
R:Token enter status signal
ER1FL2T_1.stStatusDataArea_D.stOtherNodeInformationAreaFLNetToCPU_D.stParticipationNod…
U0\G2528.1
Join node list(Direct)
Join node list (Address: 2528(9E0H))
Node 1 cyclic data area 2 (Address: 8192 or more (2000H or more))
BMOV
W0
Node 1 cyclic data (word data)
ER1FL2T_1.stCyclicDataArea_D.stArea2.uReadWriteArea_D
U0\G8192
Read/write area(Direct)
H100
Node 1 cyclic data area 1
(Address: 7168 or more (1C00H or more))
BMOV
K4B0
Node 1 cyclic data (bit data)
ER1FL2T_1.stCyclicDataArea_D.stArea1.uReadWriteArea_D
U0\G7168
Read/write area(Direct)
H10
ER1FL2T_1.stStatusDataArea_D.stOtherNodeInformationAreaFLNetToCPU_D.stParticipationNo…
U0\G2528.3
Join node list(Direct)
Join node list (Address: 2528(9E0H))
Node 3 cyclic data area 1 (Address: 7200 or more (1C20H or more))
BMOV
U0\G7200
Cyclic data area 1
K4B200
Node 3 cyclic data (bit data)
H10
Node 3 cyclic data area 2
(Address: 8704 or more (2200H or more))
BMOV
U0\G8704
Cyclic data area 2
W200
Node 3 cyclic data (word data)
H100
Go to the next page
Go to the next page


Continued from the previous page
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<< Message transmission, transparent type message reception >>
ER1FL2T_1.bReceivingMessageSignal
X2
R:Receiving messsage signal
Receive data size read
(Address: 25602 (6402H))
MOV
ER1FL2T_1.stMessageDataArea_D.stReceiveArea_D.uReceiveDataSiz
U0\G25602
Receive data size (byte/word length)(Direct)
Z1
Receive data read
(Address: 25603 or more (6403H or more))
BMOV
ER1FL2T_1.stMessageDataArea_D.stReceiveArea_D.uReceiveData...
U0\G25603
Receive data area(Direct)
D6400
Receive data area
Z1
Message receive completion confirmation
SET
ER1FL2T_1.bMessageReceiveCompletionConfirmation
Y2
RW :Message receive completion confirmation
ER1FL2T_1.bReceivingMessageSignal
X2
R:Receiving messsage signal
ER1FL2T_1.bMessageReceiveCompletionConfirmation
Y2
RW :Message receive completion confirmation
Message receive processing completion
RST
ER1FL2T_1.bMessageReceiveCompletionConfirmation
Y2
RW :Message receive completion confirmation
END

■Node 3 side

• After confirming that Module ready (X1C) is on and setting the data of the local node network parameter area to the buffer memory (address: from 0), turn on Network parameter write request signal (Y10).

• Turn off Network parameter write request signal (Y10) when Network parameter write completion signal (Y10) turns on.

• Turning on Cyclic data setting (M200) sets data to the cyclic data area 1 of the buffer memory and the local node area of the cyclic data area 2.

Turning off Cyclic data setting (M200) clears the local node area.

• Turning on Start send (M600) confirms that Token participation status (X19) is on.

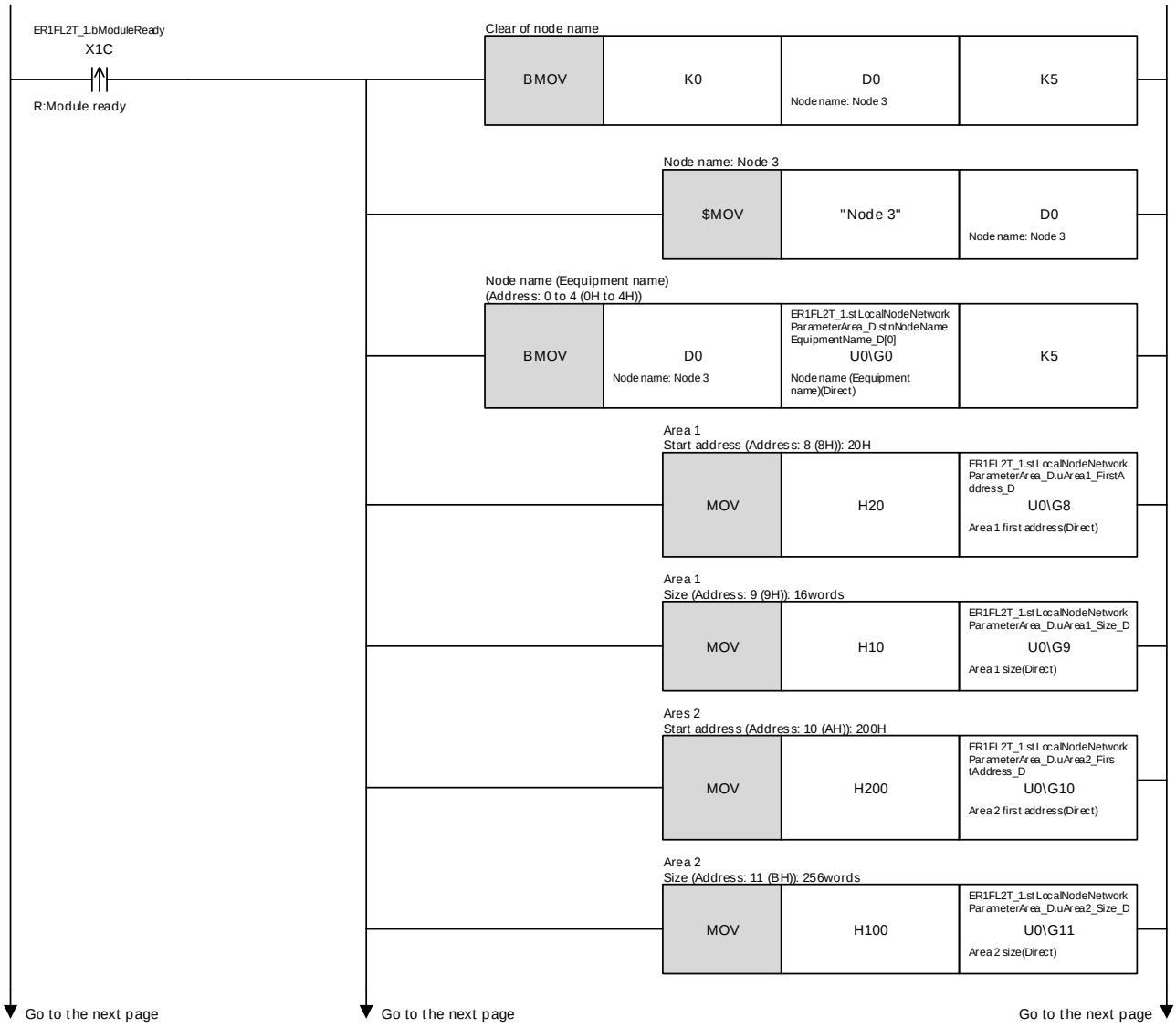
Set the data to be sent to the message send data (from D600).

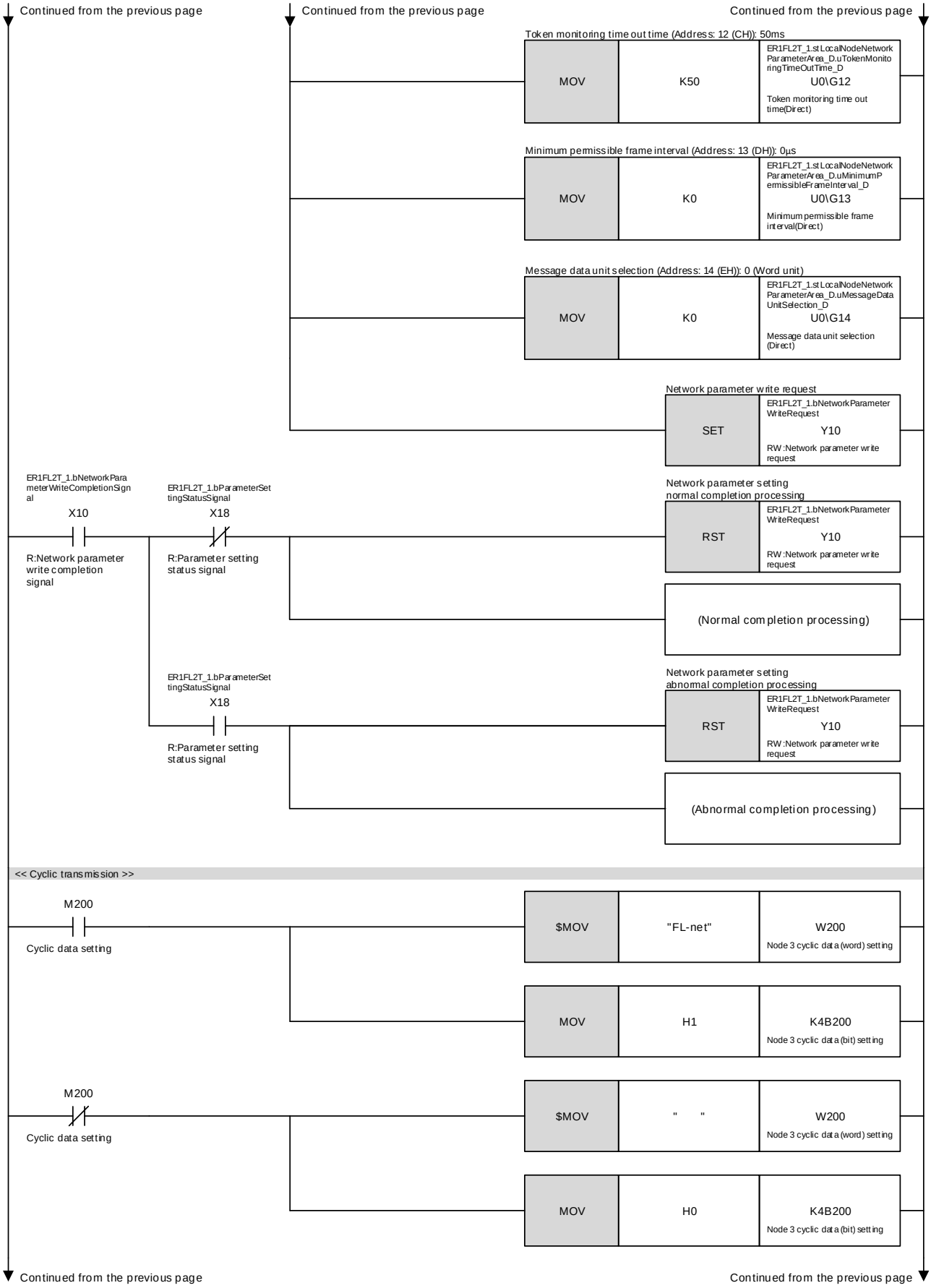
After setting the object node number, transaction code, send data size, and send data in the buffer memory, turn on Message send request (Y0).

• Check the completion of sending the transparent type message with Message send normal completion signal (X0) and Message send error completion signal (X1).

Turn off Message send request (Y0) after Message send normal completion signal (X0) or Message send error completion signal (X1) turns on.

When Message send error completion signal (X1) turns on, the result of sending the transparent type message in the buffer memory is transferred to the transparent type message send result (D600 to D609).




Continued from the previous page
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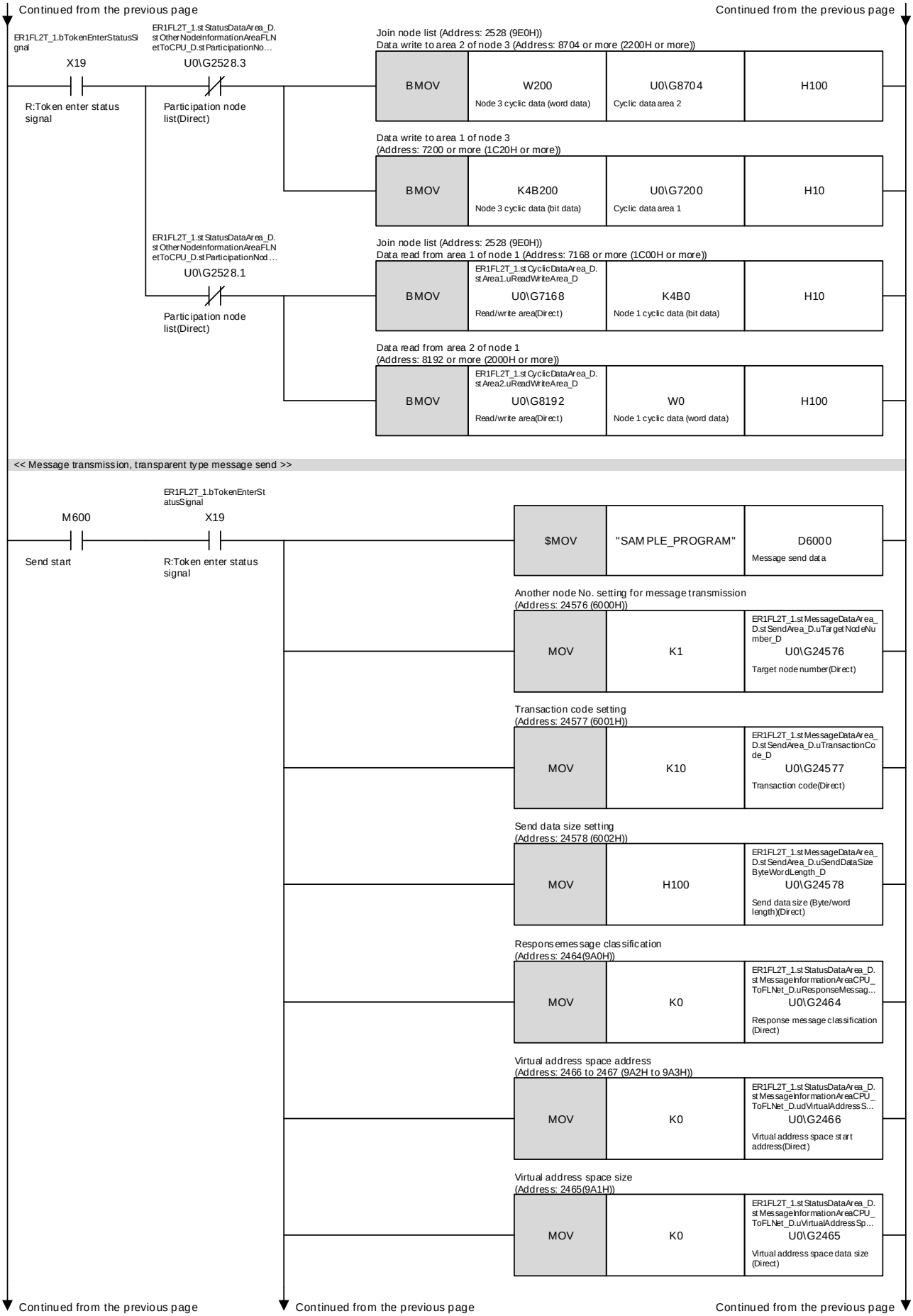
Token monitoring time out time (Address: 12 (CH)): 50ms
MOV
K50
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uTokenMonitoringTimeOutTime_D
U0\G12
Token monitoring time out time(Direct)
Minimum permissible frame interval (Address: 13 (DH)): 0µs
MOV
K0
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uMinimumPermissibleFrameInterval_D
U0\G13
Minimum permissible frame interval(Direct)
Message data unit selection (Address: 14 (EH)): 0 (Word unit)
MOV
K0
ER1FL2T_1.stLocalNodeNetwork ParameterArea_D.uMessageDataUnitSelection_D
U0\G14
Message data unit selection (Direct)
Network parameter write request
SET
ER1FL2T_1.bNetworkParameterWriteRequest
Y10
RW:Network parameter write request
ER1FL2T_1.bNetworkParameterWriteCompletionSignal
X10
R:Network parameter write completion signal
ER1FL2T_1.bParameterSettingStatusSignal
X18
R:Parameter setting status signal
Network parameter setting normal completion processing
RST
ER1FL2T_1.bNetworkParameterWriteRequest
Y10
RW:Network parameter write request
(Normal completion processing)
ER1FL2T_1.bParameterSettingStatusSignal
X18
R:Parameter setting status signal
Network parameter setting abnormal completion processing
RST
ER1FL2T_1.bNetworkParameterWriteRequest
Y10
RW:Network parameter write request
(Abnormal completion processing)
<< Cyclic transmission >>
M200
Cyclic data setting
$MOV
"FL-net"
W200
Node 3 cyclic data (word) setting
MOV
H1
K4B200
Node 3 cyclic data (bit) setting
M200
Cyclic data setting
$MOV
" "
W200
Node 3 cyclic data (word) setting
MOV
H0
K4B200
Node 3 cyclic data (bit) setting
Continued from the previous page
Continued from the previous page


Continued from the previous page
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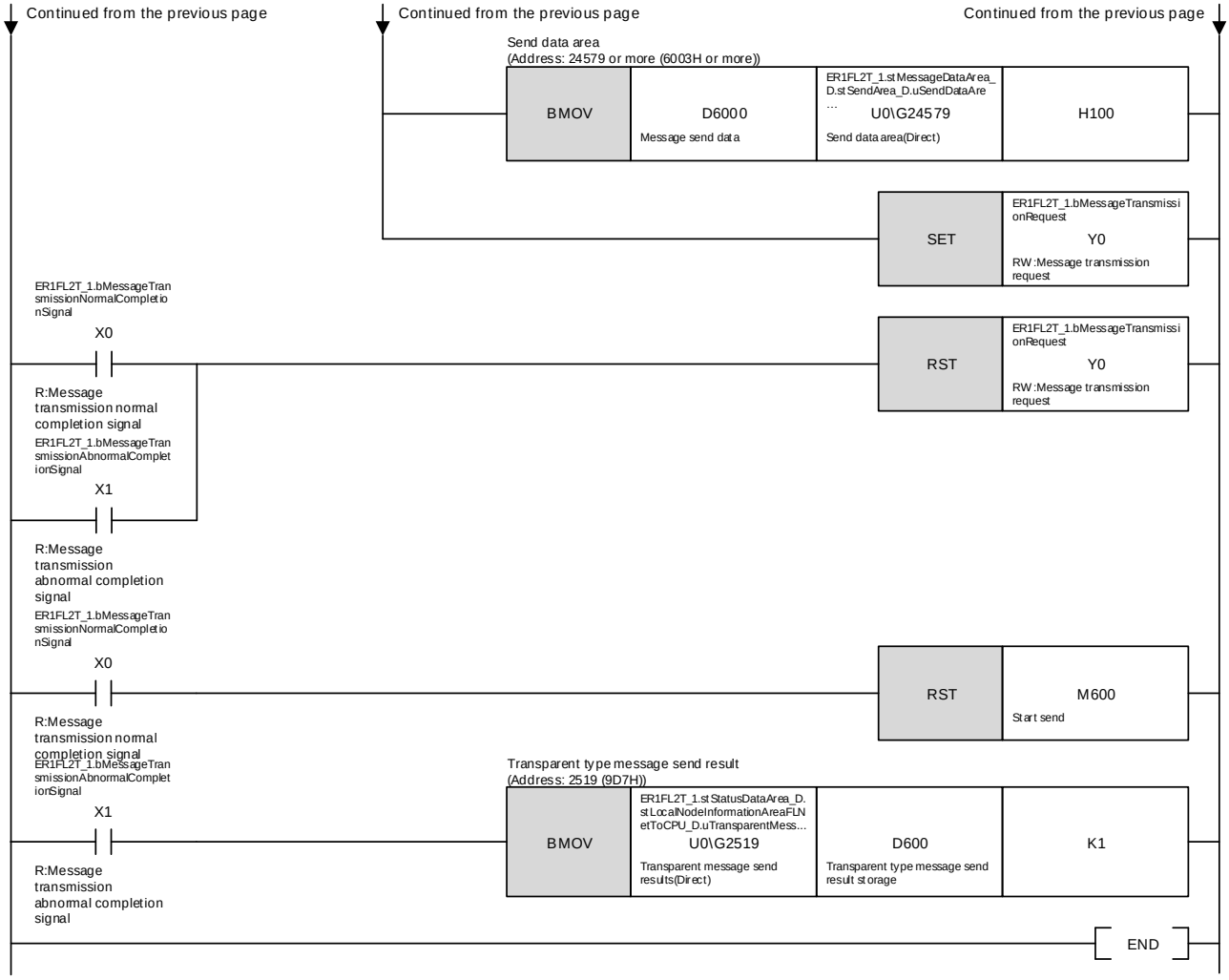
ER1FL2T_1.bTokenEnterStatusSignal
X19
R:Token enter status signal
ER1FL2T_1.stStatusDataArea_D.stOtherNodeInformationAreaFLNetToCPU_D.stParticipationNo...
U0\G2528.3
Participation node list(Direct)
Join node list (Address: 2528 (9E0H))
Data write to area 2 of node 3 (Address: 8704 or more (2200H or more))
BMOV
W200
Node 3 cyclic data (word data)
U0\G8704
Cyclic data area 2
H100
Data write to area 1 of node 3
(Address: 7200 or more (1C20H or more))
BMOV
K4B200
Node 3 cyclic data (bit data)
U0\G7200
Cyclic data area 1
H10
ER1FL2T_1.stStatusDataArea_D.stOtherNodeInformationAreaFLNetToCPU_D.stParticipationNod...
U0\G2528.1
Participation node list(Direct)
Join node list (Address: 2528 (9E0H))
Data read from area 1 of node 1 (Address: 7168 or more (1C00H or more))
BMOV
ER1FL2T_1.stCyclicDataArea_D.stArea1.uReadWriteArea_D
U0\G7168
Read/write area(Direct)
K4B0
Node 1 cyclic data (bit data)
H10
Data read from area 2 of node 1
(Address: 8192 or more (2000H or more))
BMOV
ER1FL2T_1.stCyclicDataArea_D.stArea2.uReadWriteArea_D
U0\G8192
Read/write area(Direct)
W0
Node 1 cyclic data (word data)
H100
<< Message transmission, transparent type message send >>
M600
Send start
ER1FL2T_1.bTokenEnterStatusSignal
X19
R:Token enter status signal
$MOV
"SAMPLE_PROGRAM"
D6000
Message send data
Another node No. setting for message transmission
(Address: 24576 (6000H))
MOV
K1
ER1FL2T_1.stMessageDataArea_D.stSendArea_D.uTargetNodeNumber_D
U0\G24576
Target node number(Direct)
Transaction code setting
(Address: 24577 (6001H))
MOV
K10
ER1FL2T_1.stMessageDataArea_D.stSendArea_D.uTransactionCode_D
U0\G24577
Transaction code(Direct)
Send data size setting
(Address: 24578 (6002H))
MOV
H100
ER1FL2T_1.stMessageDataArea_D.stSendArea_D.uSendDataSizeByteWordLength_D
U0\G24578
Send data size (Byte/word length)(Direct)
Response message classification
(Address: 2464(9A0H))
MOV
K0
ER1FL2T_1.stStatusDataArea_D.stMessageInformationAreaCPU_ToFLNet_D.uResponseMessag...
U0\G2464
Response message classification (Direct)
Virtual address space address
(Address: 2466 to 2467 (9A2H to 9A3H))
MOV
K0
ER1FL2T_1.stStatusDataArea_D.stMessageInformationAreaCPU_ToFLNet_D.udVirtualAddressS...
U0\G2466
Virtual address space start address(Direct)
Virtual address space size
(Address: 2465(9A1H))
MOV
K0
ER1FL2T_1.stStatusDataArea_D.stMessageInformationAreaCPU_ToFLNet_D.uVirtualAddressSp...
U0\G2465
Virtual address space data size (Direct)
Continued from the previous page
Continued from the previous page
Continued from the previous page



Point

To control Y0 within the same scan, insert an interlock so that Y0 turns on under the condition that Y0 always turns off.

12 TROUBLESHOOTING

This section describes the troubleshooting of the FL-module.

12.1 Is It Really an Error?

Inspect the following items first whenever the FL-net module does not operate properly.

No.	Contents
1	Is the module properly mounted?
2	Have the settings from the GX Works3 been properly set for the module?
3	Is the IP address of the network correctly set?
4	Has the common memory area been properly set?
5	Is there any looseness or other abnormalities with the connections for the module?
6	Is Ethernet cable correctly connected?
7	Is the 10BASE-T cable higher than category 3 specifications? Is the 100BASE-TX cable higher than category 5 specifications?
8	Is the power on for the Ethernet hub and repeater?

12.2 Solutions to General Network Problems

This section describes troubleshooting method by symptom.

Communications cannot be performed with the external device

The following table lists how to troubleshoot the problem when the Ethernet-equipped module cannot communicate with the external device.

If the following action does not solve the problem, perform the module communication test and self-diagnosis test (Self-loopback test, Hardware test) to check for hardware failure. (☞Page 132 Self-diagnosis test)

Item to check	Solution
Is the READY LED of the CPU module off?	If the READY LED of the CPU module is off, perform the troubleshooting of the CPU module. MELSEC iQ-R CPU Module User's Manual (Application)
Is the RUN LED of the FL-net module off?	If the RUN LED of the FL-net module is turned off, reset the CPU module. If the RUN LED is still off even after resetting the CPU module, the possible cause is a hardware failure. Replace the FL-net module and restart all the external devices communicated with the own station. *1
Is the Ethernet cable securely connected?	If the Ethernet cable is not securely connected, take following actions. • Securely lock the cable. • Check the wiring.
Does the external device conform to the Ethernet standard?	If the device does not conform to the Ethernet standard, replace it with one conforming to the standard.
Is the external device powered on?	If the external device is not powered on, power it on.
Does any error occur in the external device, hub or other devices?	If an error occurs, refer to the manual for each device and take action.
Was a device on the line (such as an Ethernet-equipped module, external device, and hub) replaced with the one with the same IP address?	If a device was replaced, take any of the following actions. • Wait for update of the ARP cache (waiting time varies depending on the device) • Restart all the devices on the line. *1
Is the IP address of the external device specified correctly?	Execute a PING test to the IP address of the external device. If the existence of the external device cannot be checked, network configuration is incorrect. Consult with the system or network manager.
Is "Operating mode settings" of "Switch setting" set to other than "online"?	Set "Operating mode settings" of "Switch setting" to "Online".
Is the access from the FL-net module blocked by the security setting of the external device?	Correct the security setting (such as firewall) of the external device.

*1 A device on Ethernet has a table of IP addresses and their corresponding MAC address, called "ARP cache". When a device on the line is replaced by the one having the same IP address, the MAC address in the ARP cache is different from that of the replaced device; therefore, communications may not be normally performed. The "ARP cache" is updated by resetting the device or after a while. The time varies depending on the device.

When communication is unsteady

Check and inspect the following items when the communication by the FL-net module is unsteady.

Item to check	Solution
Are there many detected errors in 'Transmission error count'?	If many errors are detected or a error code is stored, there may be a heavy load on the Ethernet line due to data sending and receiving between connected devices. • Taking action such as separating networks or decreasing the number of data sending reduces the load on the Ethernet line. • Consult with the network manager and reduce the load on the Ethernet line.
Has a error code been stored in 'Various local node information' (Un¥G2502 to Un¥G2519)?	
Does each node properly respond to the PING command?	Check the power supply and cables for each node that does not respond.
Does the collision lamp of the network device on the FL-net transmission path turn on frequently?	Check the connections of the cable and connectors. Check the errors with an analyzer.
Are the repeaters four stages (10BASE-T)/two stages (100BASE-TX) or less?	Reevaluate the design.
Is each segment within the specified length?	Reevaluate the design.
Is the power on for the repeaters?	Check the power supply, voltage and if the power supply cable has been pulled out.
Is the network IP address properly set?	Reconfirm the IP address that has been set using support tool and analyzers.
Is the node number for the equipment properly set?	Reconfirm the node number that has been set using support tool and analyzers.
Are the parameters for the equipment properly set?	Reconfirm the equipment that has been set using support tool and analyzers.
Does the [COM] (Send/reception status) LED come on continuously or intermittently?	Reconfirm the settings of the equipment.
Does the [LNK] (Link) LED come on continuously?	Reconfirm the parameter settings of the equipment.

Ping command response function

The following is an example of confirming that initial processing has been completed by issuing a PING command from the corresponding equipment (personal computer, etc.) connected to the FL-net (OPCN-2) network to the own node FL-net module.
To execute the PING command in Windows®, use [Command Prompt] in [Accessories].

¥>ping IP address

Ex. FL-net module IP address: 192.168.250.1

Screen example at normal operation

```
C:\>ping 192.168.250.1◄------ ping command execution

Pinging 192.168.250.1 with 32 bytes of data:
Reply from 192.168.250.1: bytes=32 time<1ms TTL=128
Reply from 192.168.250.1: bytes=32 time<1ms TTL=128
Reply from 192.168.250.1: bytes=32 time<1ms TTL=128
Reply from 192.168.250.1: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.250.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>_
```

Screen example at operation error

```
C:\>ping 192.168.250.1◄------ ping command execution

Pinging 192.168.250.1 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.250.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>_
```

12.3 FL-net (OPCN-2) General Precautions

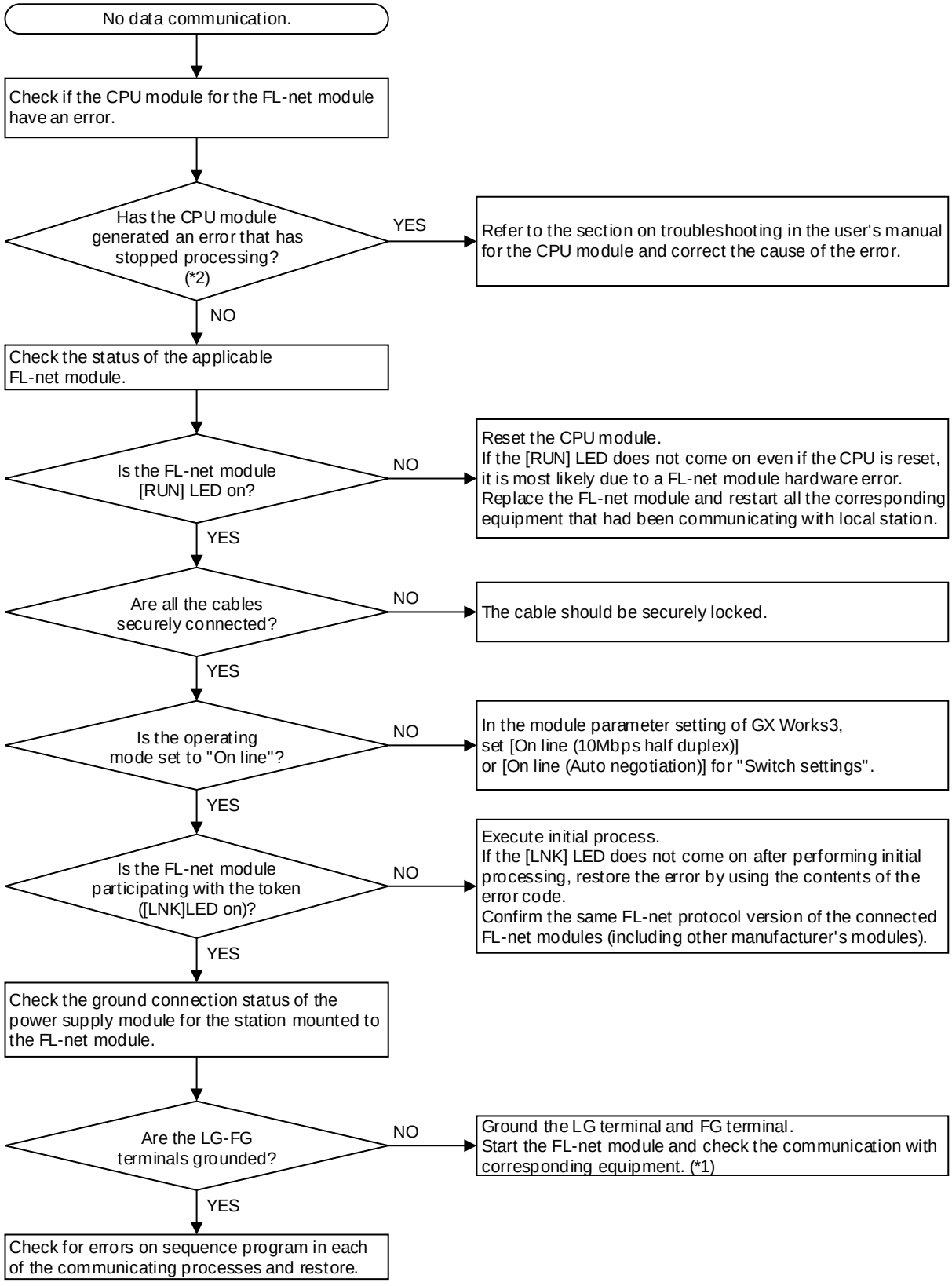
Refer to IEEE802.3 for the specifications relating to the transmission route of the FL-net (OPCN-2).
In addition to these, the following are restrictions and precautions unique to the FL-net (OPCN-2).

<table>
<tr><th>No.</th><th>Contents</th></tr>
<tr><td>1</td><td>Other Ethernet data shall not be handled on communication cables for the FL-net (OPCN-2).</td></tr>
<tr><td>2</td><td>Do not connect FL-net (OPCN-2) to a router.</td></tr>
<tr><td>3</td><td>A switching HUB will not have any effect even if used for FL-net (OPCN-2).</td></tr>
<tr><td>4</td><td>The real-time characteristics of the communication will be dramatically reduced if infrared or other types of wireless media are used.</td></tr>
<tr><td>5</td><td>If a personal computer is used, the performance of the personal computer and its operating system and application software will dramatically change the real-time characteristics.</td></tr>
<tr><td>6</td><td>Use the preset IP address.
There is a need to group network addresses. (Standard network is: 192.168.250) There is the recommended input range for the node number (station number) of the IP address.
A check for duplicate node numbers cannot be performed during the initial settings. Use care during setting as the first duplicate node number error will occur during communication.
<table>
<tr><th>Network address</th><th>Node number *1</th></tr>
<tr><td>192.168.250</td><td>1 to 249</td></tr>
</table>
*1 Node numbers: 250 to 254 are reserved for maintenance tools.</td></tr>
<tr><td>7</td><td>Always provide a proper ground. Be sure to use a heavy gauge ground wire.</td></tr>
<tr><td>8</td><td>Keep the communication cable of the FL-net(OPCN-2) away from noise sources as far as possible.
Avoid routing cables alongside power cords.</td></tr>
<tr><td>9</td><td>When cyclic data communication and message data communication are performed simultaneously, the real-time characteristics will be adversely affected by the volume of the data and other factors.</td></tr>
<tr><td>10</td><td>There is no need to continue and keep the cyclic data communication area (common memory area).</td></tr>
<tr><td>11</td><td>The fixed time communication characteristics of the overall system will be affected by the processing performance of the equipment connected to it. The communication processing speed of all equipment on the network is adjusted to match the communication performance (minimum permissible frame interval) of the slowest equipment. Accordingly, the real-time characteristics of the overall system can be dramatically reduced by connection or addition of one module.</td></tr>
<tr><td>12</td><td>The message data communication header section is big endian but the data section is little endian. However, on system parameter that have a profile read data section, it is big endian. (Big endian indicates the method that initially dispatches the MSB (Most Significant Bit).)</td></tr>
<tr><td>13</td><td>Do not mix devices of different protocol versions or modes in the same network. Otherwise, you cannot access the network.</td></tr>
</table>

12.4 Troubleshooting Flowchart

When data communication is not available

The following is a simple flowchart for troubleshooting when communication cannot be performed with an FL-net module.



*1 When the LG terminal and FG terminal for the power supply module for the station to which the FL-net module is mounted have not been set, the communication line may close because of noise stopping communication with corresponding equipment. Turn off the power supply to the station for the FL-net module and refer to the section on wiring in the user's manual for the CPU module for grounding terminals LG and FG on the power supply module.

*2 If Module configuration error(2009) occurs on CPU module mounted on the base with FL-net module, FL-net module may be in high loaded status due to receiving frames through the network.
Setting "Minimum permissible frame interval" reduces the load caused by FL-net communication.
If any Ethernet device other than FL-net device is connected to FLnet(OPCN-2), remove it from FL-net(OPCN-2).

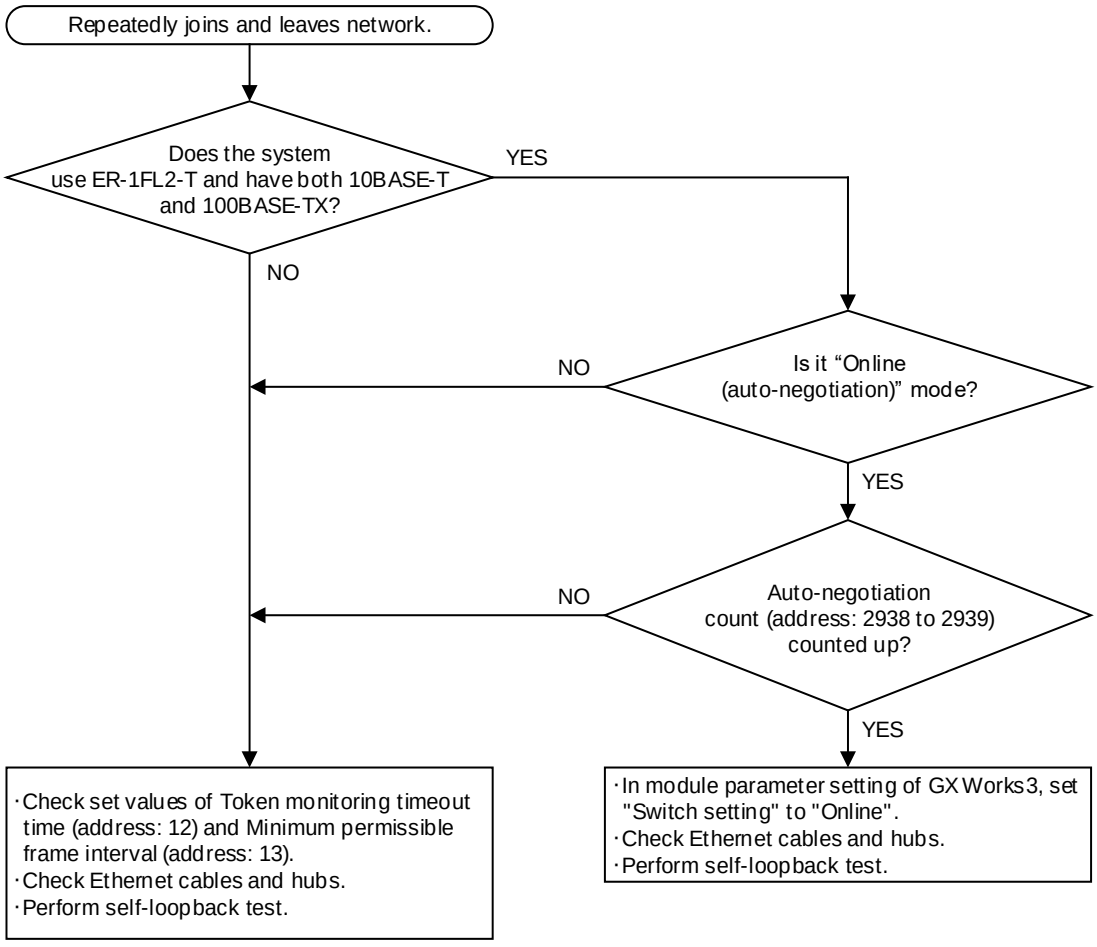
Point

For other errors of the CPU module, refer to the following manual.

MELSEC iQ-R CPU Module User's Manual (Application)

When repeatedly joining and leaving the network

The following is a simple flowchart for troubleshooting in the case that the module is repeatedly joining and leaving the network.



12.5 Errors and Their Solutions

This section explains FL-net module errors and their solutions.
If line errors occur when equipment from different manufacturers are connected, Sort out the causes with a line analyzer or such equipment.

Confirming errors using the LEDs

The following explains how to confirm errors using the LEDs in the front of the FL-net module.
Error status can be determined by status of the RUN LED and the ERR LED.

RUN LED	ERR LED	Error status *1	Description
Off	On	Major error	An error such as hardware failure or memory failure. The module stops operating.
On	On	Minor error	An error such as communication failure. The module continues operating.

*1 When multiple errors occur, the error status is displayed in the order of major, and minor.

Point

If each action does not solve the problem, perform the self-diagnosis test (Self-loopback test, Hardware test) to check for hardware failure. (☞Page 132 Self-diagnosis test)

When an error is found in a hardware test result, perform the test again.
If the error occurs again, a hardware failure may have occurred in the FL-net module.
Please consult your local Mitsubishi representative.

When the 100M LED turns off

When the 100M LED turns off, check the following.

Check item	Action
Are the Ethernet cables used normally?	• Check if the Ethernet cable which conforms the standard is used. • Check if the segment length is set within range. • Check if the Ethernet cables are not disconnected.
Does the cabling condition (bending radius) meet the specifications?	Refer to the manual for the Ethernet cable, and correct the bending radius.
Is the hub used operating normally?	• Check if the hub which conforms the standard is used. • Power off and on the hub.
Is there any source of noise near the module or cables?	Change the location of the module or cables.

When the LNK LED turns off

When the LNK LED turns off, check the following.

Check item	Action
Are the parameter settings correct?	Check the module parameters of the FL-net module. Correct the value for the following setting if it is wrongly set. • Mode • Node number • Common memory start address/size setting
Are the cables properly connected?	• Correct the cable properly. • Check if the Ethernet cables are not disconnected.
	Perform the following tests to check for the status of the cable connection and line. • Ping test

When the COM LED does not turn on

When the COM LED does not turn on, check the following items.

Check item	Action
Is the ERR LED on?	Identify the error cause by using GX Works3.
Are the cables properly connected?	Correct the cable properly.
	Perform the following tests to check for the status of the cable connection and line. • Ping test

When the COM LED turns off at operation

When the COM LED turns off at operation, check the following.

Check item	Action
Is the ERR LED on?	Identify the error cause by using GX Works3.
Are the cables properly connected?	Correct the cable properly.
	Perform the following tests to check for the status of the cable connection and line. • Ping test
Are the parameter settings correct?	Check the module parameters of the Ethernet-equipped module. Correct the value for the following setting if it is wrongly set. • "IP Address" under "Own Node Settings" of "Basic Settings"
Is the program correct?	Check and correct the send program of the external device.

When the PER LED turns on

When the PER LED turns on, check the following.

Check item	Action
Are the parameter settings correct?	Check the module parameters of the FL-net module. Correct the value for the following setting if it is wrongly set. • Mode • Node number • Common memory start address/size setting
Is there any failure in the FL-net module?	The FL-net module may cause an error. Perform the self-diagnosis test (Self-loopback test, Hardware test) to check for hardware failure. (☞Page 132 Self-diagnosis test)

When the L ER LED turns on

When the L ER LED turns on, check the following.

Check item	Action
Are the Ethernet cables used normally?	• Check if the Ethernet cable which conforms the standard is used. • Check if the segment length is set within range.
Does the cabling condition (bending radius) meet the specifications?	Refer to the manual for the Ethernet cable, and correct the bending radius.
Is the hub used operating normally?	• Check if the hub which conforms the standard is used. • Power off and on the hub.
Is there any source of noise near the module or cables?	Change the location of the module or cables.

When the LINK LED turns off

When the LINK LED turns off, check the following.

Check item	Action
Are the Ethernet cables used normally?	• Check if the Ethernet cable which conforms the standard is used. • Check if the segment length is set within range. • Check if the Ethernet cables are not disconnected.
Does the cabling condition (bending radius) meet the specifications?	Refer to the manual for the Ethernet cable, and correct the bending radius.
Is the hub used operating normally?	• Check if the hub which conforms the standard is used. • Power off and on the hub.
Is there any source of noise near the module or cables?	Change the location of the module or cables.

When the indication of the dot matrix LED is abnormal

When the indication of the dot matrix LED is abnormal, check the following items.

Check item	Action
Is the ERROR LED of the CPU module on or flashing?	Identify the error cause by using GX Works3.
Are the parameter settings correct?	Check the module parameters of the FL-net module. Correct the value for the following setting if it is wrongly set. • Mode • Node number • Common memory start address/size setting
Is there any failure in the FL-net module?	The FL-net module may cause an error. Perform the self-diagnosis test (Self-loopback test, Hardware test) to check for hardware failure. (☞Page 132 Self-diagnosis test)

MEMO

Confirming errors using error code

The following introduces the processes the FL-net module uses for communicating data and the error codes and their contents generated during processing requests from the local node CPU.
Error code can be confirmed with the system monitor for the GX Works3. (☞Page 128 How to check)

Error code list

Error code	Contents
0H	Normal
1000H to 3FFFH	FL-net module detection error number
4000H to 4FFFH	CPU module detecting error number

Error codes stored in buffer memory

The following introduces the errors in the processes used by the FL-net module for communicating data and the contents and corrective action for the error codes stored when they have been stored in the buffer memory.
The "Destination storage" in the error code table shows the buffer memory where the applicable error code has been stored.

■Buffer memory storage location

The following shows the name described in the "Storage location" box and corresponding buffer memory area.

Descriptive name	Buffer memory	Buffer memory address
Switch	Switch setting status	2502
Parameter setting	Network parameter setting status	2514
Parameter results	Network parameter read results	2515
Profile results	Device profile read results	2516
Log clear results	Log data clear results	2517
Log data results	Log data read results	2518
Message results	Transparent message transmission results	2519
Receive data area	Start address of receive data area of response message *1	25603

*1 This error code is stored when the message is requested from the ER-1FL2-T.

■Error code details

The error codes whose storage location is not indicated can be checked on the system monitor of the GX Works3.

Error code	Description of error	Corrective action	Destination storage
1800H	Wrong setting value for common memory area 1 start address	Correct setting value for common memory area 1 start address and perform initial process again.	• Parameter setting
1801H	Wrong setting value for common memory area 1 size	Correct setting value for common memory area 1 size and perform initial process again.	• Parameter setting
1802H	Setting value for common memory area 1 start address and size out of permissible range	Correct setting value for common memory area 1 start address and size and perform initial process again.	• Parameter setting
1803H	Wrong setting value for common memory area 2 start address	Correct setting value for common memory area 2 start address and perform initial process again.	• Parameter setting
1804H	Wrong setting value for common memory area 2 size	Correct setting value for common memory area 2 size and perform initial process again.	• Parameter setting
1805H	Setting value for common memory area 2 start address and size out of permissible range	Correct setting value for common memory area 2 start address and size and perform initial process again.	• Parameter setting
1806H	Wrong setting value for token monitoring time out time	Correct setting value for token monitoring time out time and perform initial process again.	• Parameter setting
1807H	Wrong setting value for minimum permissible frame interval	Correct setting value for minimum permissible frame interval and perform initial process again.	• Parameter setting
1808H	Switch setting or basic setting is incorrect.	Correct switch setting or basic setting.	-
1809H	Setting for common memory area overlaps other node setting range	Correct setting value for common memory.	• Parameter setting
180AH	Wrong message data unit Selection	Correct selection for message data unit.	• Parameter setting
1811H	An error is detected in the CPU module	Check the error of the CPU module and take corrective action using the module diagnostics of the GX Works3.	-
1820H	Setting value for target node number out of permissible range	Correct setting value for applicable target node number.	• Parameter results • Profile results • Log clear results • Log data results • Message results
1821H	Target node does not exist	• Correct setting value for applicable target node number • Confirm operation of corresponding equipment	• Parameter results • Profile results • Log clear results • Log data results • Message results
1822H	No response from target node for 10 seconds or more	• Correct setting value for applicable target node number. • Confirm operation of corresponding equipment.	• Parameter results • Profile results • Log clear results • Log data results • Message results
1823H	Error in send data	Correct send data.	• Message results
1824H	FL-net module does not support process indicated in transaction code	Correct transaction code.	• Message results
1825H	No empty capacity in target node buffer	Create space and re-execute.	• Parameter results • Profile results • Log clear results • Log data results • Message results
1826H	Request is broadcast Message	Correct the node number.	• Profile results

Error code	Description of error	Corrective action	Destination storage
1827H	Not joining in token	• Check the status of the programmable controller and wire status. • Re-evaluate the settings for the initial process.	• Parameter results • Profile results • Log clear results • Log data results • Message results
1828H	Transaction code is X/Y handshake specification	Correct the transaction code.	• Message results
1840H	Setting value for virtual address space word length out of permissible range	Re-evaluate the request data.	• Receive data area *1
1841H	Address setting value for virtual address space out of permissible range	Re-evaluate the request data.	• Receive data area *1
1842H	Word block read request data size is not "0"	Re-evaluate the request data.	• Receive data area *1
1843H	Byte length for receive message out of permissible range	Re-evaluate the request data.	• Receive data area *1
1844H	Address setting for receive message range out of permissible range	Re-evaluate the request data.	• Receive data area *1
1845H	Too many processings of message transmission and cannot perform message transmission.	Correct the message transmission execution count.	• Message results
184AH	No response from other node for 10 seconds or more	Re-evaluate the request data.	• Message results
24C0H	An error was detected on the system bus.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the module, base unit, or extension cable. Please consult your local Mitsubishi representative.	-
24C1H			
24C2H			
24C3H			
24C6H			
3000H	Wrong IP address (network address) setting	Correct the IP address.	• Switch
3001H	Wrong IP address(host address) setting	Correct the IP address.	• Switch
3002H	Wrong mode number setting	Correct the mode number.	• Switch
3003H	Wrong IP address (network address) setting	Correct the IP address.	• Parameter setting
3004H	Wrong IP address (host address) setting	Correct the IP address.	• Parameter setting
3010H	Multiple CPU system No.1 to 4 error	Confirm the error code of the PLC No.1 to 4, and remove the factor of the error.	-
3011H	Error occurred in the interface with the multiple CPU system No.1	Confirm the error code of the PLC No.1, and remove the factor of the error.	-
3012H	Error occurred in the interface with the multiple CPU system No.2	Confirm the error code of the PLC No.2, and remove the factor of the error.	-
3013H	Error occurred in the interface with the multiple CPU system No.3	Confirm the error code of the PLC No.3, and remove the factor of the error.	-
3014H	Error occurred in the interface with the multiple CPU system No.4	Confirm the error code of the PLC No.4, and remove the factor of the error.	-
3015H	Error occurred in the interface with the multiple CPU system's control CPU.	Confirm the error code of the control CPU, and remove the factor of the error.	-
3016H	Self-loopback error	Re-evaluate the cable.	-
3017H	An error was detected in the network module.	Please consult your local Mitsubishi representative.	-
3018H	A token transmission monitoring timeout error was detected.	Correct setting value for token monitoring time out time and perform initial process again.	-
3030H	An error was detected in the network module.	Please consult your local Mitsubishi representative.	-
3031H			
3032H			
3033H			
3034H			
3035H			

*1 This error code is stored when the message is requested from the ER-1FL2-T.

Error code	Description of error	Corrective action	Destination storage
3C00H	A hardware failure has been detected.	• Take measures to reduce noise. • Reset the CPU module, and run it again. If the same error code is displayed again, the possible cause is a hardware failure of the module. Please consult your local Mitsubishi representative.	-
3C01H			
3C02H			
3C0FH			
3C10H			
3C13H			
3C2FH	An error was detected in the memory.		
3C3BH	A hardware failure has been detected.		
3E00H	FL-net module's OS error	Replace the FL-net module.	-
3E01H	Network type of the local station is unexpected setting.	Rewrite the module parameter by the GX Works3. If the same error code is displayed again, the possible cause is a hardware failure of the module. Please consult your local Mitsubishi representative.	-
3E02H	Hardware error	Replace the FL-net module.	-
3E11H	Hardware error	Replace the FL-net module.	-
3E20H	Data of message transmission could not be received.	Check that the specified request source of message transmission is operating normally.	-
3E21H	An error was detected in the network module.	Please consult your local Mitsubishi representative.	-
3E22H			
3E23H			
3E24H			
3E25H	Number of message transmission request exceeded the upper limit of simultaneously processable requests.	• Pause the message transmission temporarily, and retry the operation. • Lower the message transmission usage frequency, and then perform again.	-
3E26H	An error was detected in the network module.	Please consult your local Mitsubishi representative.	-
3E27H			
3E28H			
3E29H			
3E2AH			
3E2BH			
3E2CH			
3E2DH			
3E2EH			
4000H to 4FFFH	(Error detected by CPU module)	Refer to the Appendix of the RCPU user's manual and take an appropriate action.	-

12.6 Event list

The following shows the event that occurs in the FL-net module.

Event code	Event type	Description	Cause
00100	System	Link-up *1	Link-up has occurred when the network cable connected to the external device was connected.
00130		Receive frame error	Receive frame error was detected.
00800		Link-down	Link-down has occurred when network cable connected to the external device was disconnected.
00C02		Access abnormal response of another node	• Abnormal response was returned from another node when accessing another station. • Abnormal response was returned to another node when accessed from another node.

*1 Registered twice in the event immediately after power-on or system reset.

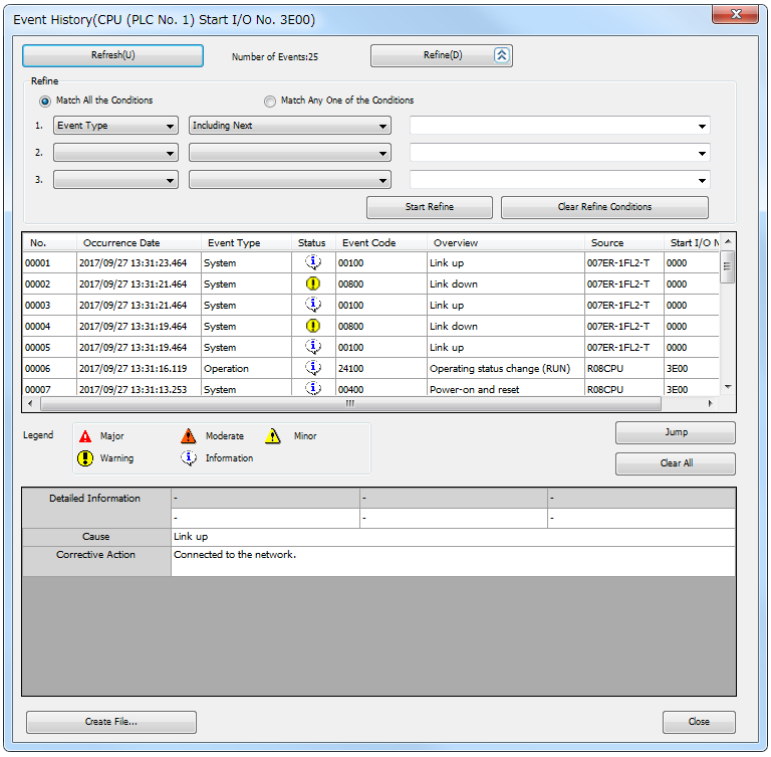
How to check

The event can be checked in the event history of GX Works3.

[Diagnostics]⇒[System Monitor]⇒[Event History]

For details on this function and collected information, refer to the following.

MELSEC iQ-R CPU Module User's Manual (Application)



Point

Use this function for the following purposes:

- To check the error status of all the modules in the system and identify the cause of error occurred in machinery or equipment
- To check when and how the program and parameters of the programmable controller have been changed
- To check for unauthorized access

12.7 Module diagnostics

The following functions can be used with "Module Diagnostics" window of GX Works3.

[Diagnostics]⇒[System Monitor]⇒Double-click ER-1FL2-T to be diagnosed⇒[Module Diagnostics]

List of module diagnostic functions

FUNCTIONS	Applications
Error Information	Displays the details of the errors currently occurring. Click the [Event History] button to check the history of errors that have occurred on the network, errors detected for each module, and operations that have been executed.
Module information list	Displays various status information of the FL-net module

Module diagnostics description

■Error information

Item	Description
Status	Major: An error such as hardware failure or memory failure. The module stops operating. Moderate: An error, such as parameter error, which affect module operation. The module stops operating. Minor: An error such as communication failure. The module continues operating.
Detailed Information	Displays detailed information about each error (maximum of 3 pieces).
Cause	Displays the detailed error causes.
Corrective Action	Displays the actions to eliminate the error causes.

■Module information list

Item		Description
LED information	RUN	Displays the LED status of the FL-net module.
	ERR	
	100M	
	LNK	
	PER	
H/W switch information	NODE NO.	Displays the switch status of the FL-net module.
	MODE	
Individual information	IP address (1st octet)	Displays the IP address set for the selected module.
	IP address (2nd octet)	
	IP address (3rd octet)	
	IP address (4th octet)	
	MAC address (1st octet)	Displays the MAC address set for the selected module.
	MAC address (2nd octet)	
	MAC address (3rd octet)	
	MAC address (4th octet)	
	MAC address (5th octet)	
	MAC address (6th octet)	
	Cyclic data area 1 start address	Displays the setting values of the node of the selected module.
	Cyclic data area 1 size (words)	
	Cyclic data area 2 start address	
	Cyclic data area 2 size (words)	
	Token monitoring time out time (ms)	
	Minimum permissible frame interval (100 μs)	
	Message Data Unit Select	

Item		Description
Individual information	Refresh cycle permissible time / RCT setting value	Displays the refresh cycle permissible time (120% of one cycle) of the selected module.
	Current value of refresh cycle (ms)	Displays the process value in one cycle of the node of the selected module.
	Maximum value of refresh cycle (ms)	
	Minimum value of refresh cycle (ms)	
	Node number	Displays the node number of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Mode switch	Displays the mode switch status of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Intelligent function module switch setting status	Displays the switch setting status of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Local node communication status	Displays the data link (cyclic transmission) status of the local node of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	FL-net (OPCN-2) protocol version (H)	Displays the protocol version of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	FL-net (OPCN-2) protocol version (L)	
	FL-net (OPCN-2) authorization hardware version	Displays the authorization hardware version of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	FL-net (OPCN-2) authorization software version	Displays the authorization software version of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Local node CPU status	Displays the self-diagnosis result of the local node CPU module of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Maximum communication node number	Displays the maximum node number of the node that performs normal communication (token join) of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Network parameter setting status	Displays the network parameter setting status of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Network parameter read results	Displays the read results of the network parameter of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Device profile read results	Displays the device profile read results of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Log information clear results	Displays the log information clear results of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Log information read results	Displays the log information read results of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Transparent message send results	Displays the transparent message send results of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	Network parameter information	Displays the network parameter information of the selected module. ☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"

How to check

1. Open the system monitor of GX Works3.

   [Diagnostics]⇒[System monitor]

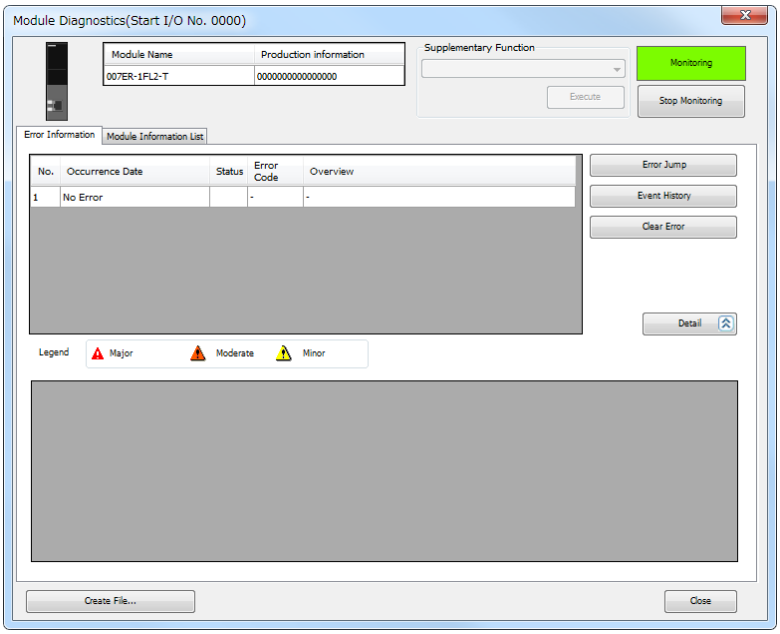
2. Select the module to be diagnosed from the module configuration and double-click one of the cells on the same column.

3. Check the error information of the FL-net module in the Module Diagnostics screen.
   Check the error information of the FL-net module in the [Error Information] tab.
   Various status information of the FL-net module can be checked in [Module Information List] tab.

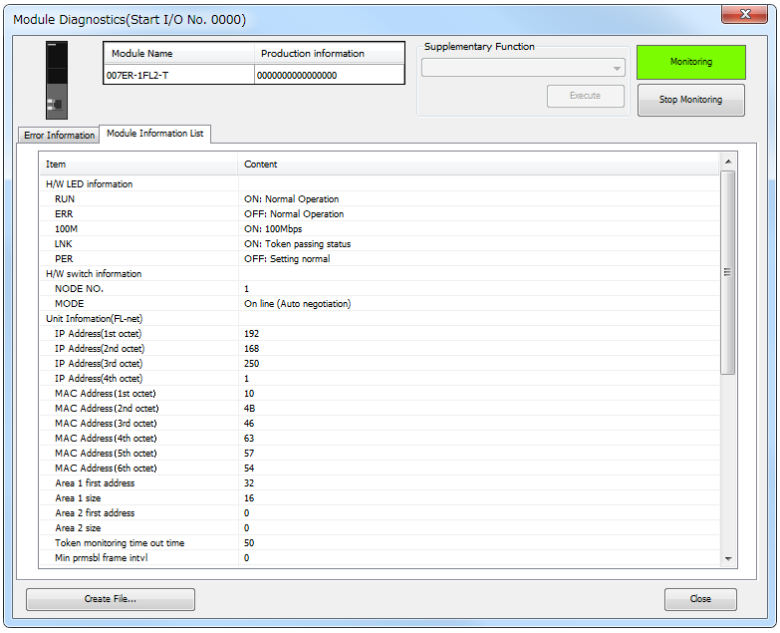
For details on the module diagnostic function, refer to the following manual.

GX Works3 Operating Manual

■Error information



■Module information list



12.8 Self-diagnosis test

This section explains the self-diagnosis test used for checking the send/receive functions and hardware components of the FL-net module.

Self-loopback test

This section explains the self-loopback test for checking the hardware including the send/receive circuits of the FL-net module.
A self-loopback test is one that check whether or not the FL-net module can receive the same message when an local node address transmission is sent and received.
Next, the procedure for the self-loopback test is explained. This test is performed in approximately 5 seconds. The test results are evaluated by using the LED on the front of the FL-net module.

1. Disconnect the FL-net module from the line.
2. Stop the CPU module.
3. Use GX Works3 to change the FL-net module operating mode to "Self-loopback test" and write the parameters to the CPU module.
4. Reset the CPU module.
   On: RUN LED, COM LED
   Off: ERR LED
5. After five (5) seconds, check the status of the LEDs. *1
   Normal completion: The RUN LED turns on. The COM LED and ERR LED turn off.
   Abnormal completion: The RUN LED and ERR LED turn on. The COM LED turns off.
6. Use GX Works3 to change the FL-net module operating mode to "Online" or other test mode.
   (☞Page 59 Switch setting)
7. Connect the FL-net module to the line.
8. Reset the CPU module.

The possible causes of the self-loopback test error are as follows.
・FL-net module hardware error.

*1 For the displayed items of the operation indication LED and dot matrix LED during the self-diagnosis test, refer to the following.
(☞Page 43 Dot matrix LED indication)

Hardware test

This section introduces the RAM and ROM tests for the FL-net module.
The test results are evaluated by using the LED in the front of the FL-net module.

1. Stop the CPU module.
2. Use GX Works3 to change the FL-net module operating mode to "Hardware test" and write the parameters to the CPU module.
3. Reset the CPU module.
   On: RUN LED
   Off: PER LED
4. After five (5) seconds, check the status of the LEDs *1
   Normal completion: The RUN LED turns on. The PER LED turn off
   Abnormal completion: The RUN LED and PER LED turn on.
5. Use GX Works3 to change the FL-net module operating mode to "Online" or other test mode.
   (☞Page 59 Switch setting)
6. Reset the CPU module.

The following are possible causes of errors.

- FL-net module RAM/ROM error.

*1 For the displayed items of the operation indication LED and dot matrix LED during the self-diagnosis test, refer to the following.
(☞Page 43 Dot matrix LED indication)

Point

When an error is found in a hardware test result, perform the test again.
If the error occurs again, a hardware failure may have occurred in the FL-net module.
Please consult your local Mitsubishi representative.

13 USAGE GUIDE

This chapter explains an general summary of FL-net (OPCN-2), the settings required for communication and an introduction of how to use it.

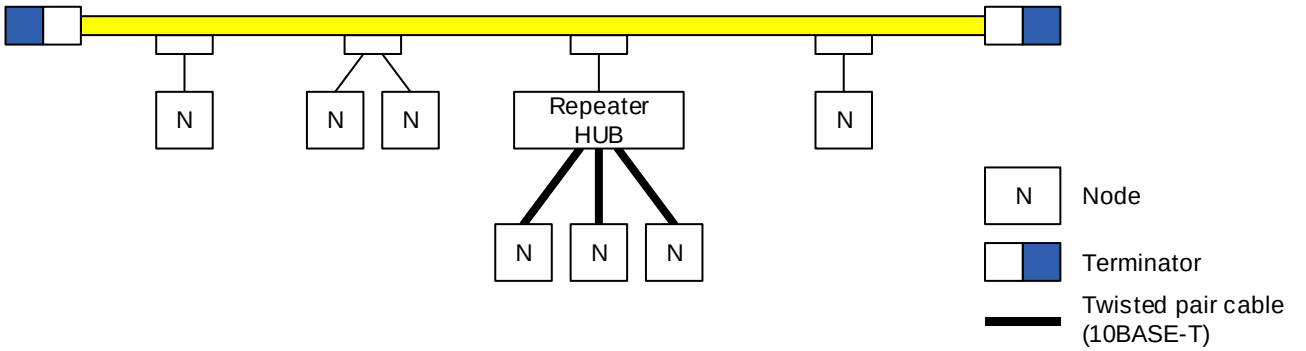
13.1 About Ethernet

FL-net (OPCN-2) uses Ethernet as the communication medium (physical level, data link) among FA controllers.

10BASE-T/100BASE-TX system

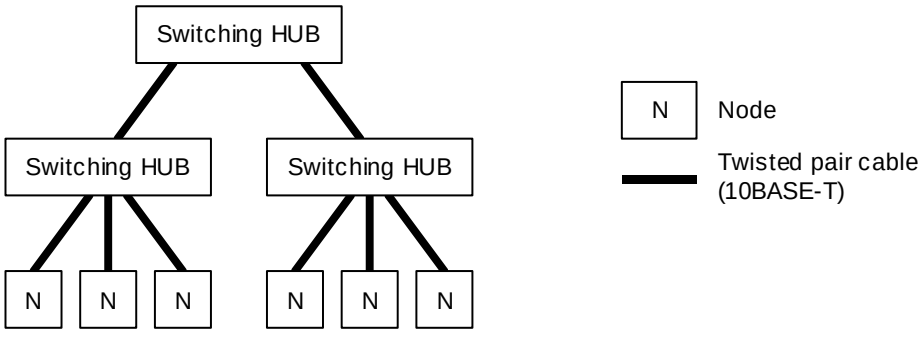
10BASE-T system

If a HUB is used to connect the transceiver cable to the transceiver, multiple nodes can be connected to the hub. When connecting a node to a hub, use a twisted pair cable (10BASE-T). The maximum distance between the node and cable is 100m.



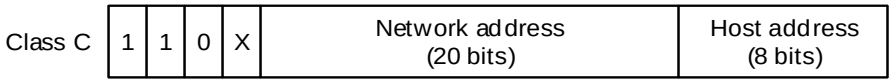
100BASE-TX system

The 100BASE-TX system, generally called Fast Ethernet, communicates at a speed of 100Mbps. In this system, nodes are connected with twisted pair cables through a switching hub. The maximum length of each twisted pair cable is 100m as is the case with the 10BASE-T.
A switching hub functions as a bridge. By connecting segments with the switching hub, the count for cascade connection of the repeater is cleared. Thus, number of connections is not limited unlike in the case of the repeater hub. Note that the switching hub delays longer than the repeater hub.
Some switching hubs support multiple communication speeds such as 100BASE-TX and 10BASE-T. When using this kind of switching hub, devices of 100BASE-TX and 10BASE-T can be mixed in the same system.

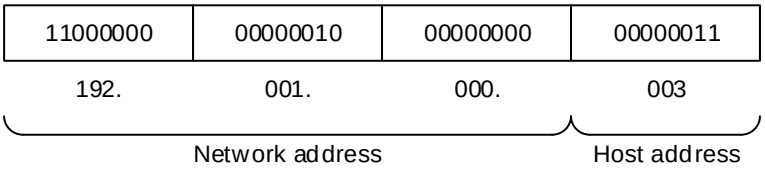


Ethernet IP address

Generally speaking, a 32 bit logical address called an IP address is used in UDP/IP.
The IP address consists of a network address and host address. In the FA field, Class C is the most commonly used.



Note that this address is separated by a period (.) every 8 bits to make it a decimal expression. The following is an example of an address as expressed in Class C.



Point

- A Class C IP address is used for FL-net (OPCN-2). Set the IP address within the following range.
  Setting range: 192 to 223.***.***.***
- The following is the address default value for FL-net module.
  Default value: 192.168.250.1
- Set the IP address of the FL-net module in Switch setting of the module parameter in GX Works3.
  (☞Page 59 Switch setting)

13.2 FL-net (OPCN-2)

The section explains a summary of the FL-net (OPCN-2) and the features of its transmission method.

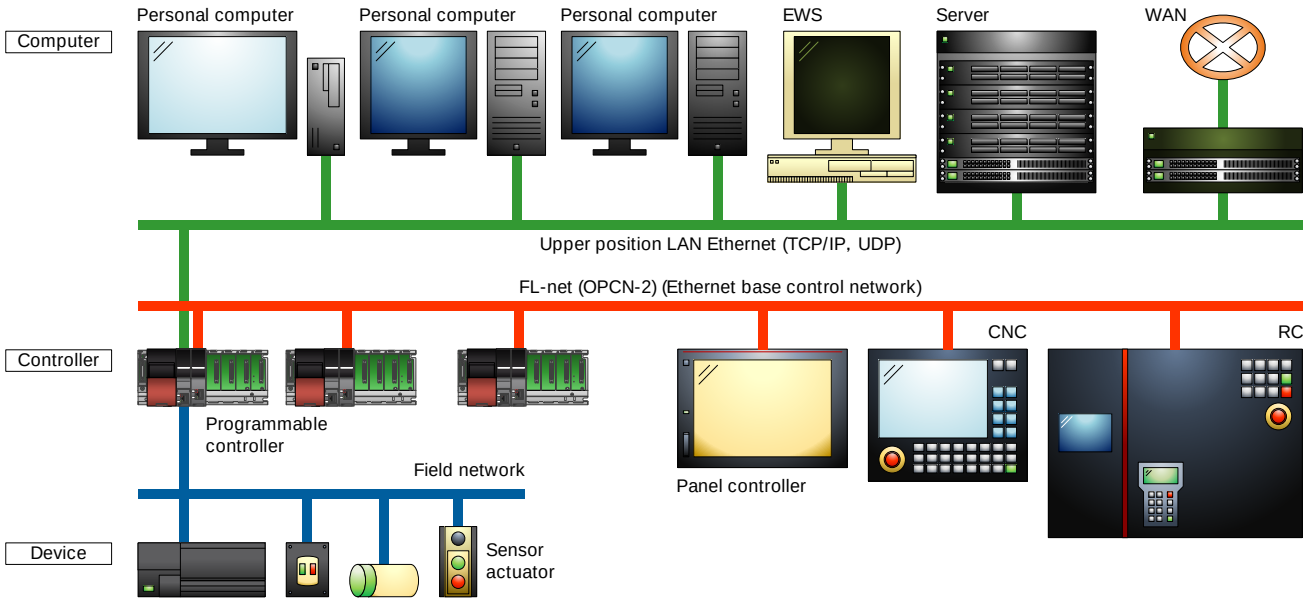
Summary of FL-net (OPCN-2)

Concept of FL-net(OPCN-2)

FL-net (OPCN-2) is an Ethernet-based FA control network.
FL-net (OPCN-2) has both a cyclic transmission function and a message transmission function.
The basic concepts of FL-net (OPCN-2) are as follows.

- It uses Ethernet as the communication medium (physical level, data link) among FA controllers.
- It uses the UDP/IP propagated on the Ethernet as the basic method for sending data.
- It manages/controls (collision avoidance) communication medium access for each node on the network to guarantee transmission within a fixed time.

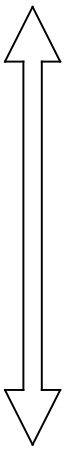
The object of FL-net (OPCN-2) is to be a FA control network for exchanging data among the programmable controllers, robot controllers (RC), numerical control devices (CNC) and other control devices and personal computers found in manufacturing system.



FL-net (OPCN-2) protocol

FL-net (OPCN-2) is comprised of six layers.

<table>
<tr><td>Application layer</td><td></td><td colspan="2">Controller Interface</td></tr>
<tr><td rowspan="3">FA Link protocol layer</td><td></td><td rowspan="2">Cyclic transmission</td><td>Service function</td></tr>
<tr><td></td><td>Message transmission</td></tr>
<tr><td></td><td colspan="2">Token function</td></tr>
<tr><td>Transport layer</td><td></td><td colspan="2">UDP</td></tr>
<tr><td>Network layer</td><td></td><td colspan="2">IP</td></tr>
<tr><td>Data Link layer</td><td></td><td colspan="2" rowspan="2">Ethernet
(ISO/IEC8802-3)</td></tr>
<tr><td>Physical layer</td><td></td></tr>
</table>



FL-net (OPCN-2) Protocol

Point

UDP/IP is used in the transport and network layers and the data link layers and physical layers use Ethernet.

Features of the FL-net (OPCN-2) transmission method

The following shows the features of the "FA link protocol layer" for FL-net (OPCN-2).

- Transmission control using "masterless token" system avoids collision.
- Refresh cycle time can be specified since the system circulates a token in a fixed time.
- The token is transmitted together with a cyclic data.
- The node with a smallest node number among those who join the network at start-up time shall start to send the token.
- If no token is transmitted for a specified time, next node in the token circulation ring shall send a new token.
- The masterless token system (characterized by the above two items) will keep the network from stopping in case of failure of some nodes.
- The protocol provides information management tables (Other node network parameter area) for useful information to refer operation status of other nodes such as operation mode (RUN/STOP) and hardware malfunction (ALARM).

FL-net (OPCN-2) IP address

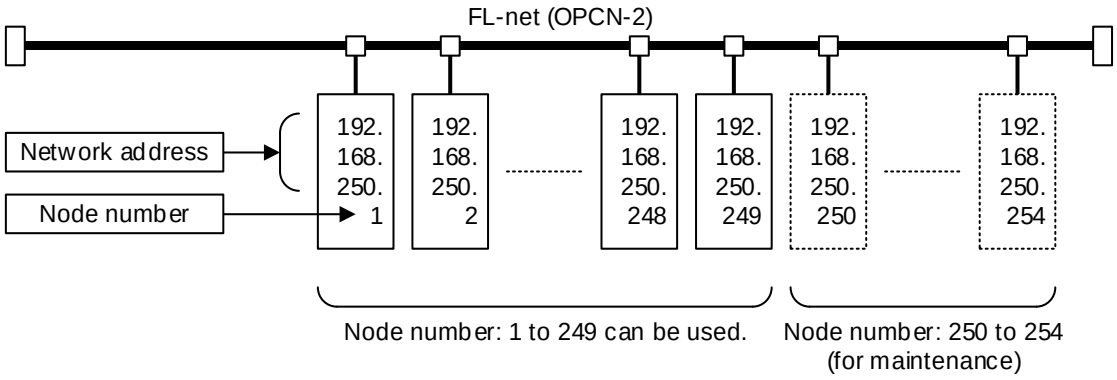
The IP address for each node of FL-net (OPCN-2) uses Class C and must be individually set. An IP address is the "address" that designates a specific node (station) when transmission is performed using IP (internet protocol). Because of this, there is a need to set and manage the IP addresses so that there is no duplication.
Class C IP address is used for FL-net (OPCN-2).

FL-net (OPCN-2) IP address	Network address 192.168.250.	Host address (Node number) n (n: 1 to 254)

Number of modules connected and node numbers

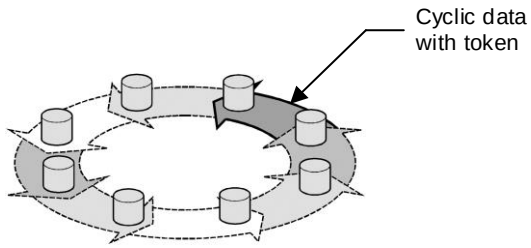
The IP address for each node of FL-net (OPCN-2) uses Class C and must be individually set. Because of this, there is a need to set and manage the IP addresses so that there is no duplication.
The maximum number of modules that can be connected is 254.

- Node number: (1 to 249) For conventional FL-net (OPCN-2) usage
- Node number: (250 to 254) For FL-net (OPCN-2) maintenance
- Node number: (255) Used internally by FL-net (OPCN-2).
  This cannot be used by the user. (It is used for global address broadcasting.)
- Node number: (0) Used internally by FL-net (OPCN-2).
  This cannot be used by the user.

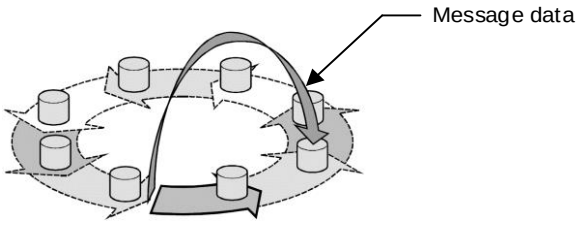


Data communication type

Two types of data communication are supported by FL-net (OPCN-2): cyclic transmission and message transmission. Send timing is controlled by a token. When there is only one token in the network, the station holding the token can send. When there are two or more tokens, the smallest address node number has priority while other are eliminated to continue the network.



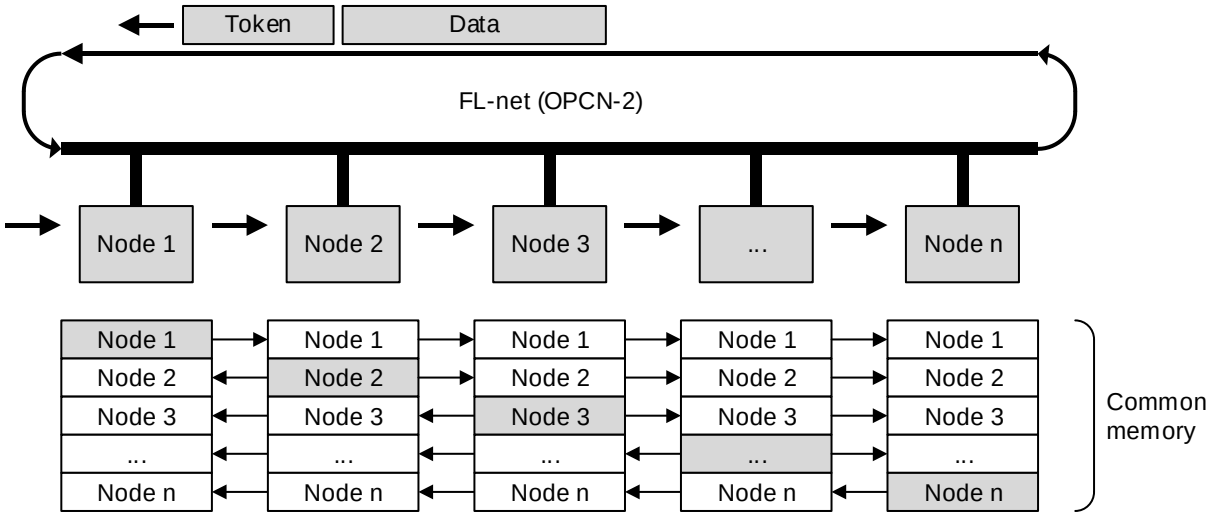
Cyclic transmission



Cyclic transmission and message transmission

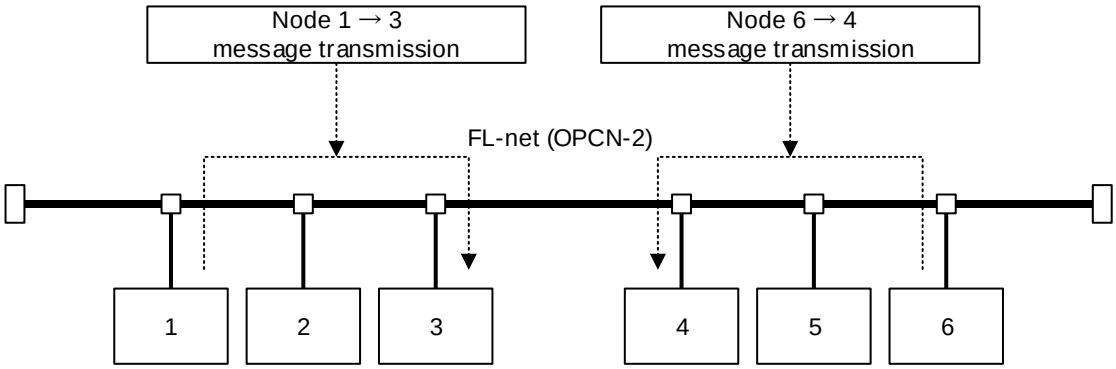
Cyclic transmission

As its name implies, cyclic transmission performs cyclic transmission of the data.
Each node is linked to common memory and data is shared.



Message transmission

Conversely, data is not transmitted on cyclically but communication is performed only to a specified node when there has been a request for transmission.

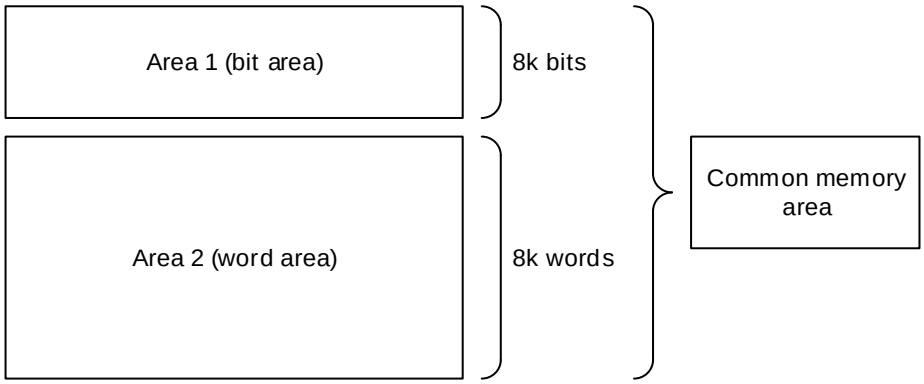


Transmission data volume

This section explains the transmission data volume of cyclic transmissions and message transmissions.

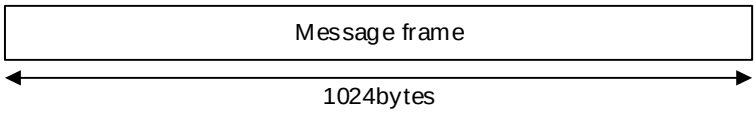
Cyclic transmissions

The overall network has 8 k bits and + 8 k words common memory areas. The maximum usable send data volume for each node is 8.5 k words. Note that one word is two bytes.



Message transmission

The maximum data volume for one message frame is 1024 bytes (not including the header section).

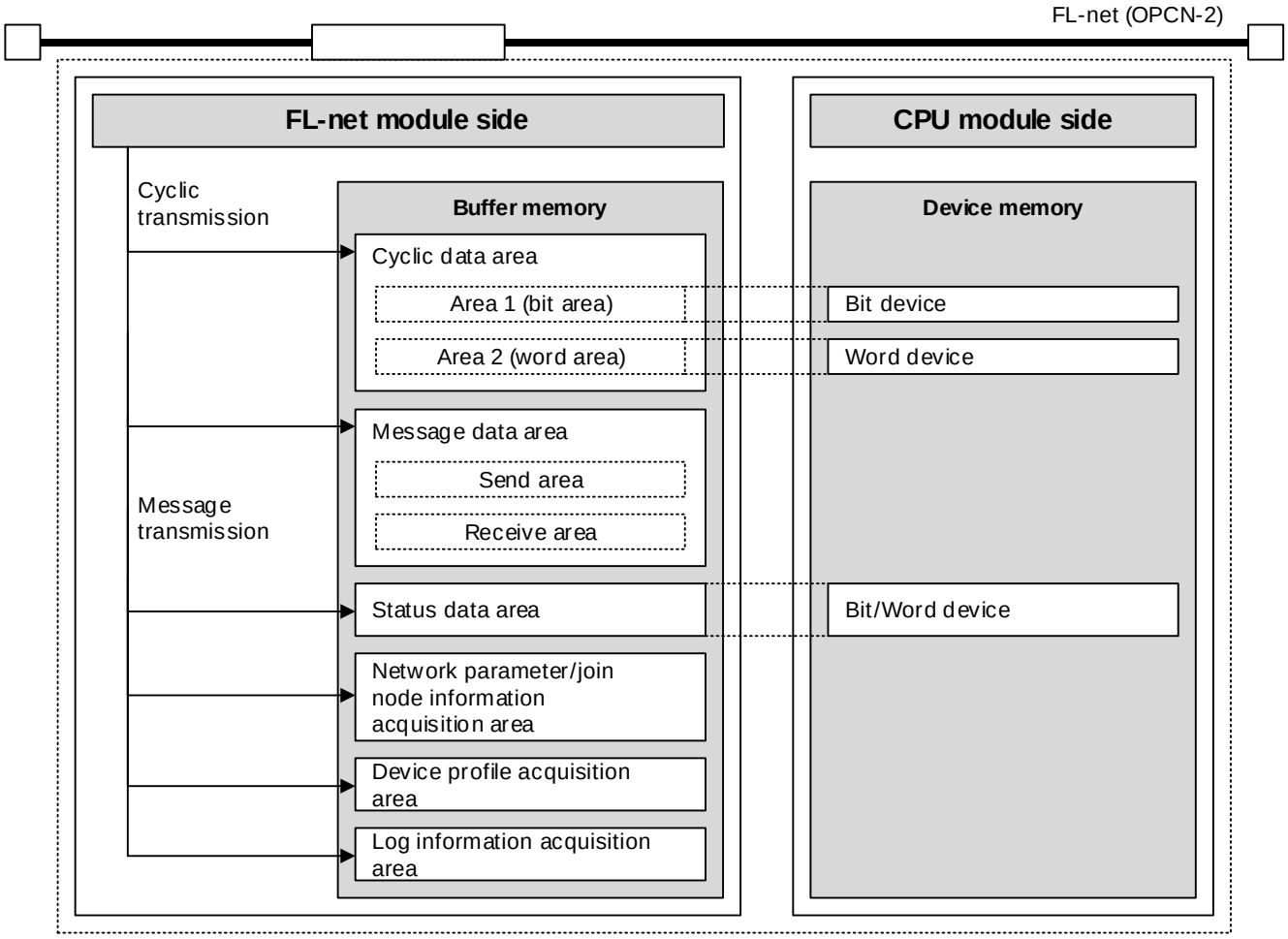


Transfer cycles

In cyclic communication, the common memory is refreshed in nearly fixed cycles. The sending of message communications is controlled so that single message communication will not allow the common memory refresh cycle time to exceed the permissible refresh cycle time. Each node monitors the normal time for message communication frame that flows in the network from the time the token addressed to the local node is received until it is received by the next local node. During this one cycle, when there is not even one message communication frame flowing in the network, the value that is 120% of the refresh cycle permissible time is the permissible refresh cycle time.
The permissible refresh cycle time is actively determined by the monitoring process presented above and the number of nodes subscribing to the network.

Data area and memory

The FL-net module has a memory area corresponding to the path for each type.
Exchange with the CPU module takes place through the buffer memory.



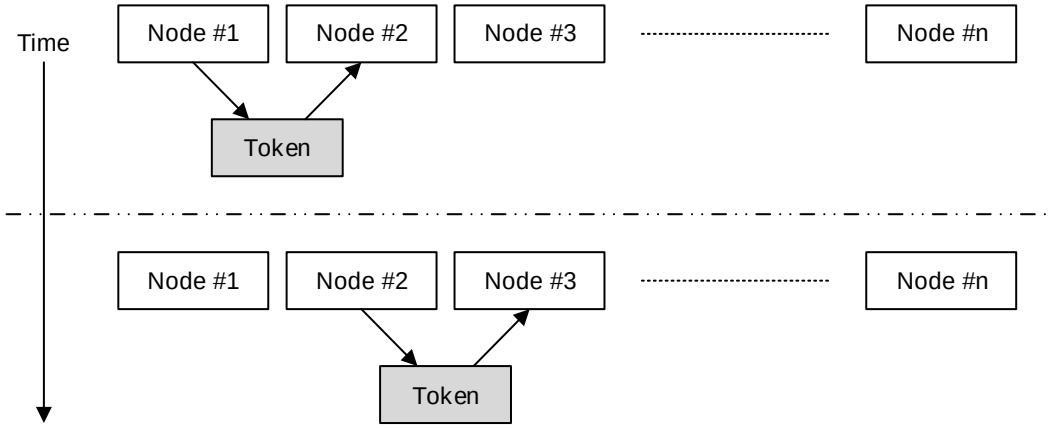
Cyclic transmission and area

Summary of cyclic transmission

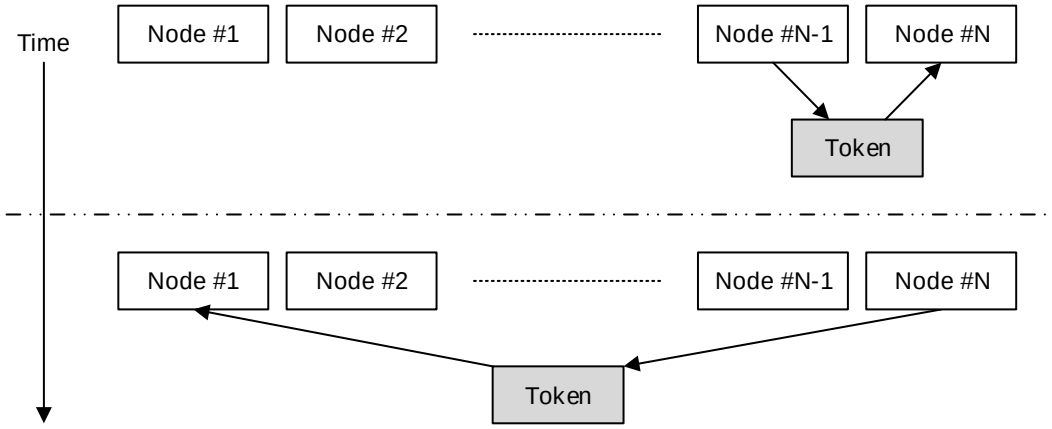
Cyclic transmission is the function that supports the cyclic data exchange generated among nodes.

No.	Description
1	It realizes the common memory function.
2	The node sends when it is holding the token.
3	Nodes participating in the network are recognized as entities performing cyclic transmission.
4	When the token is being held, all cyclic data to be sent is sent. ■Token Basically, there is only one token for the network. When there are two or more tokens, the smallest address node number has priority while others are eliminated. ■Token frame The frame that includes the token (token frame) has a token address node number and a token dispatch node number. When the node matches the token address node number of the token frame received, it becomes the token holding node. ■Token sequence The sequence of the token rotation is determined by the node number. Rotation is performed in ascending order among the nodes that are registered in the participating node control table. The highest node number passes the token to the lowest node number.
5	Data from a node that has separated from the network retains the data before the separation because there has been no communication.

■Token rotation and cyclic transmission 1



■Token rotation and cyclic transmission 2

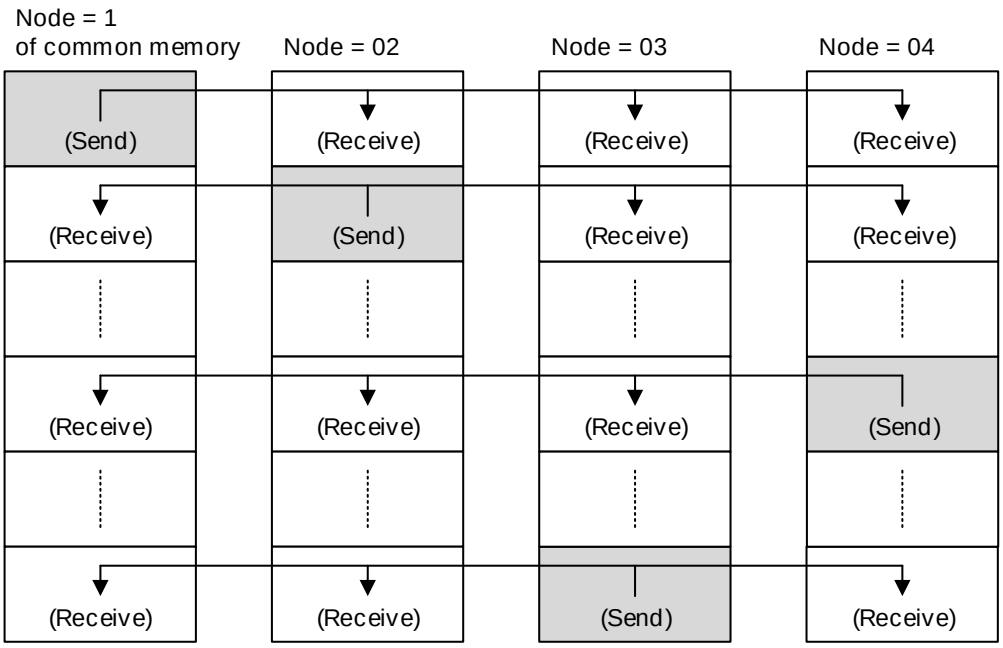


Common memory

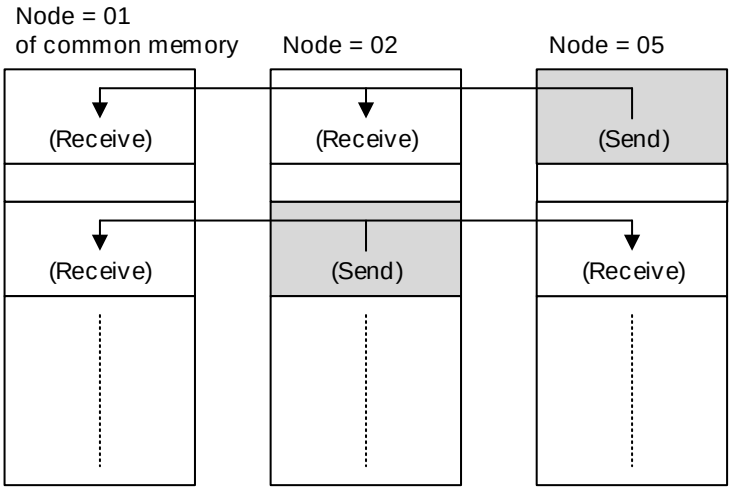
The following intr oduces the concepts for the common memory.

No.	Description
1	The common memory interface provides nodes with a service that can be regarded as a memory shared among them.
2	Two area types (Area 1 (bit area) and Area 2 (word area)) may be assigned for a node.
3	Multiple frames may be used if the transmitting area size of a node exceeds the transmission size of one frame, that is, 1024 bytes.
4	The common memory will not update itself with receiving data until all frames from a node are successfully received in case of the item (3). Thus time coherency of data from a node will be guaranteed.
5	Communication unit of each node shall provide fixed area of 8k bits + 8k words = 8.5 k words as the common memory.
6	Both Area 1 (bit area) and Area 2(word area) can be set at any size within the maximum.
7	Each node cyclically provides a function for sharing the same data with the entire system by broadcasting the data. Each node in FL-net (OPCN-2) reciprocally divides and receives a send area that is not to be duplicated and data exchange is performed. In the operation of the common memory, the send area assigned in a given node becomes the receiving area for another node.

■Example 1 of common area for cyclic transmission



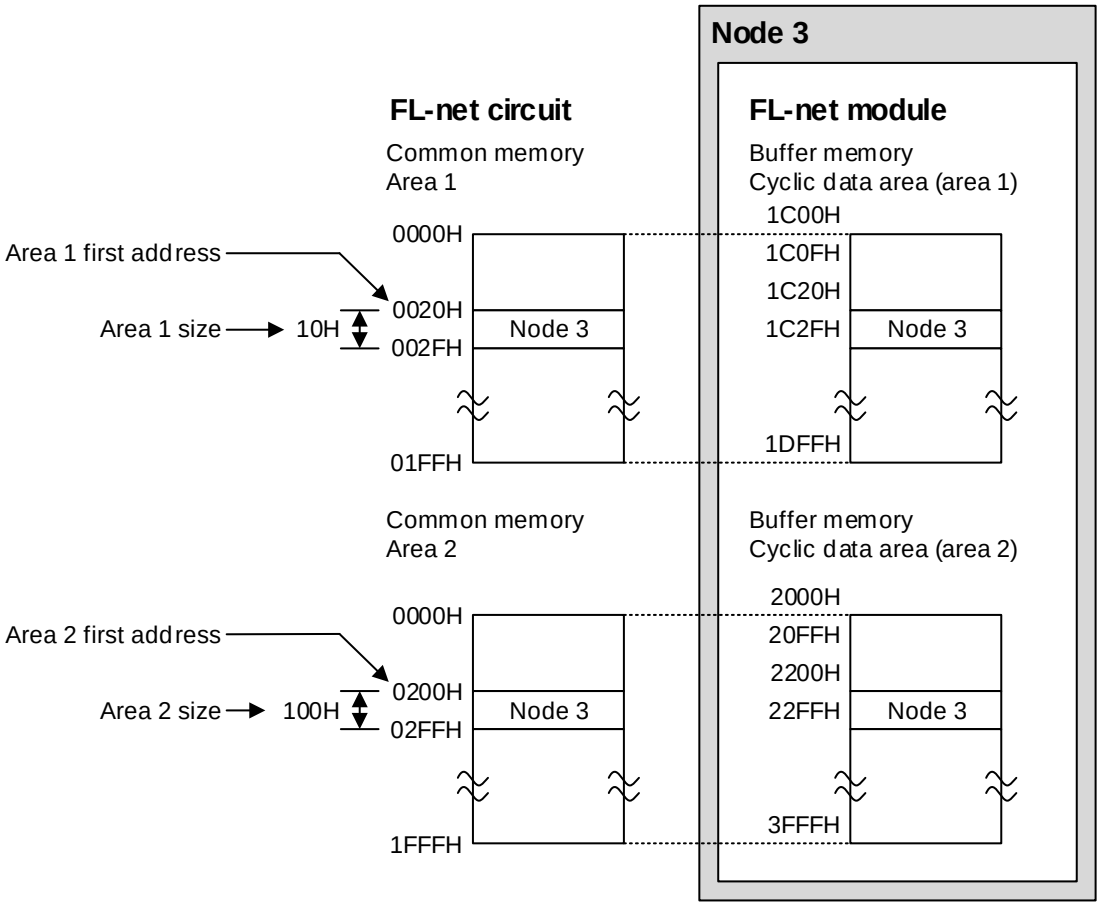
■Example 2 of common area for cyclic transmission



Common memory area 1 (bit area) and 2 (word area)

A node shall be assigned two data areas, area 1 (bit area) and area 2 (word area), as the transmitting areas in its common memory.
Set transmission areas by the start addresses and the sizes of area 1 (bit area) and 2 (word area).
For access between areas 1 (bit area) and 2 (word area), word addresses are used.
Area 1 (bit area) consists of 8 k bits and area 2 (word area) consists of 8 k words.

Ex. Setting example for common memory area 1 (bit area) and area 2 (word area) of the local node
(When the local node is node 3)



Common memory assignment

■Common memory assignment of the local node

Each node assigns only the common memory area (for the node to store send data) of its own node to the local node network parameter area.

Point

For the information on how to set the local node network parameter area, refer to the following:

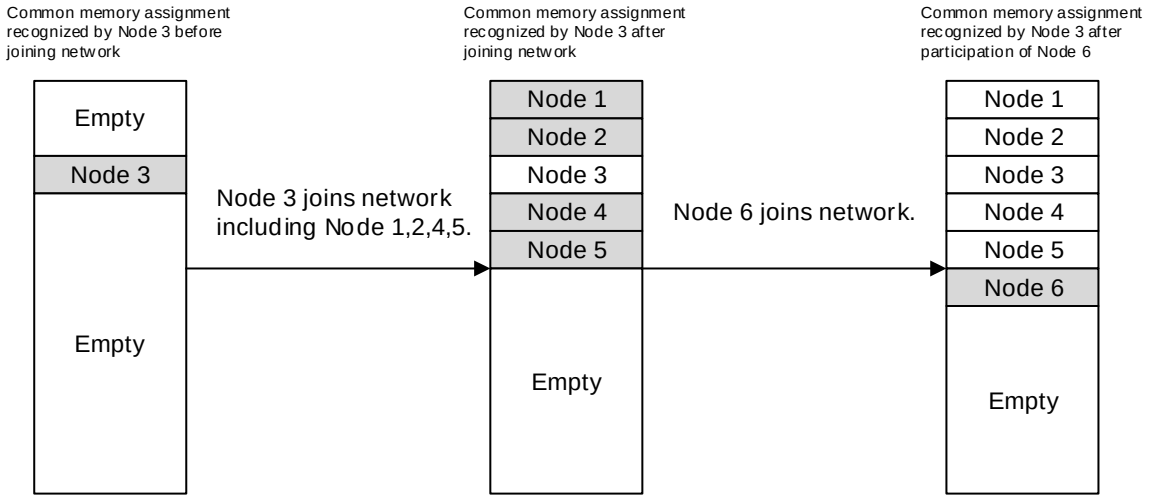
- When setting in module parameter: ☞Page 58 Module Parameter
- When setting in the sequence program: ☞Page 104 Setting example of the Module parameter

The common memory of the local node can be assigned without specific attention to the order of nodes.
Note that overlapping with those of other nodes is not allowed.

■Acquisition timing for common memory assignment of other nodes

A node acquires common memory assignment data of the other nodes participating in the network automatically when the node joins the network.

Also, it automatically acquires common memory assignment data of a new node when the new node joins the network.



Point

Common memory assignment of the other nodes can be confirmed in the other node network parameter area (Address: 128 to 2175) in the buffer memory.

☞Page 172 Buffer memory

■When common memory assignment is overlapped

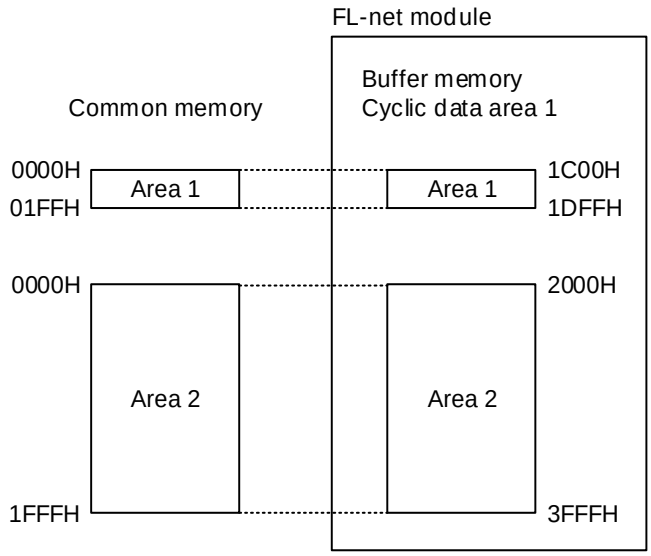
Common memory assignment must not be overlapped among multiple nodes.

Before participation in the network, check the common memory assignment of all nodes currently joining in the network. If any duplication is identified, the local node will detect an error. *1

*1 No error will be detected on the other nodes currently participating in the network.)

Common memory and buffer memory

The common memory represents a virtual memory area and consists of area 1 (bit area) and area 2 (word area).
The FL-net module stores the data of area 1 (bit area) and area 2 (word area) into the cyclic data area (Area 1) (Address: 7168 to 7679) and (Area 2) (Address: 8192 to 16383) accordingly.



Transfer methods between the cyclic data area (Area 1, 2) in the buffer memory and programmable controller CPU devices

Data are transferred between the cyclic data area (Area 1, 2) in the buffer memory and programmable controller CPU devices by following methods.

Transfer method	Description	Reference
Using sequence program	On the sequence program, specify No. of data transferred and the cyclic data area using the intelligent function module device (Un¥G□).	☞Page 106 When configuring basic setting and refreshing cyclic area with sequence program

Point

Write the data to be transferred to other station from host station into the "write area" which is the sending range of the local node. Do not write any data into the "read area" which is receiving range from other node. When data is unintentionally written, the system may incur a risk of malfunction after the writing. Read area can be confirmed in other node network parameter area in buffer memory (address: 128 to 2175).
☞Page 172 Buffer memory

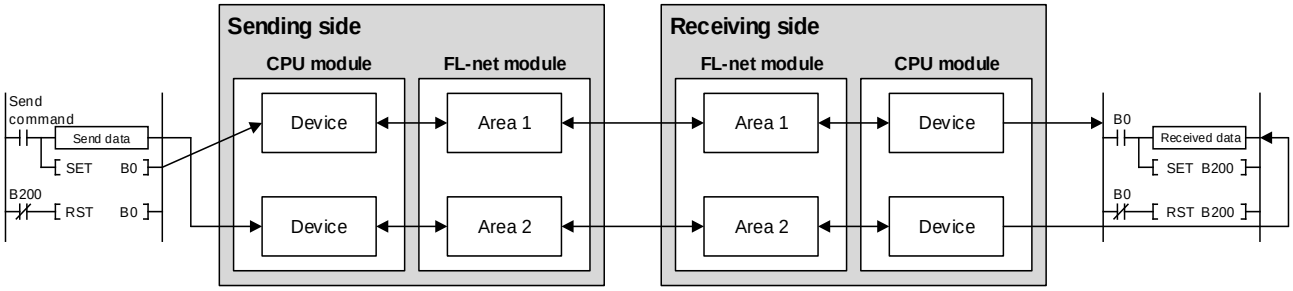
Guaranteed data consistency

■To guarantee data consistency in cyclic data area (area 2)

Although the FL-net module does not operate in synchronization with a CPU module, data consistency in area 2 (word area) is guaranteed by the following procedures.
When data of double word (32-bit) or smaller is written/read If the following conditions are met in common memory assignment, data consistency in area 2 (word area) is automatically guaranteed.

- The start address of area 1 (bit area) is multiples of 2.
- The size of area 1 (bit area) is multiples of 2.
- The start address of area 2 (word area) is multiples of 2.
- The size of area 2 (word area) is multiples of 2.

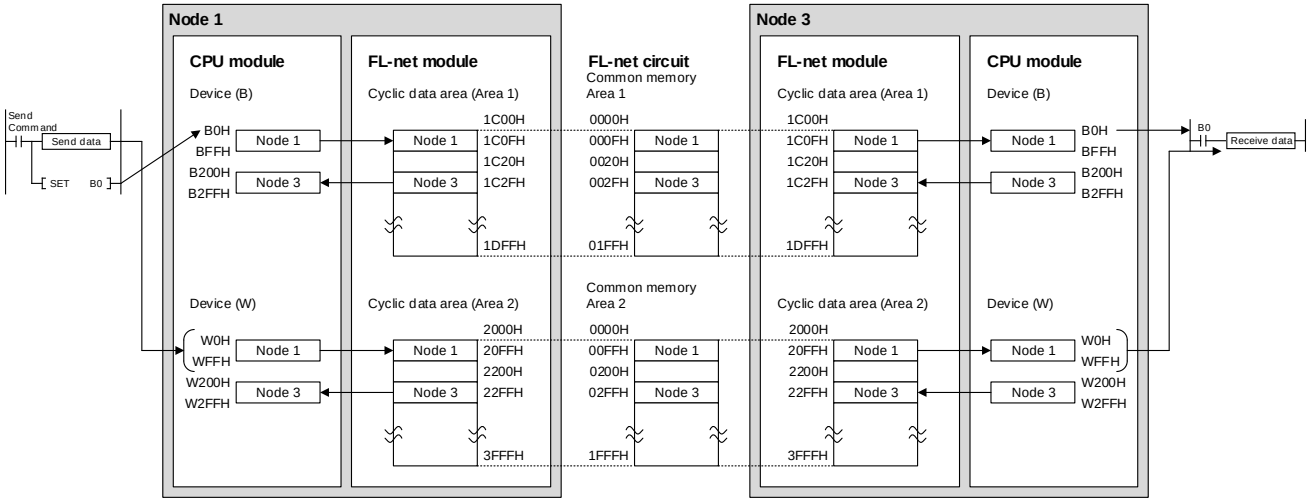
When data larger than double word (32-bit) is written/read Data consistency in area 2 (word area) is guaranteed for each node by the following procedures.



Procedure	Type	Description
1	Sending side	Write send data to area 2 (word area).
2		Turn on the bit of area 1 (bit area). Upon receiving a token, the FL-net module sends data of area 1 (bit area) and then data of area 2 (word area).
3	Receiving side	Because the data are received at area 2 (word area) and then area 1 (bit area) of the FL-net module, read the received data from area 2 when the bit of area 1 is turned on.
4		When reading of received data is completed, turn on the bit of area 1 (bit area).
5	Sending side	After checking that the reading of received data is completed at receiving side, turn off the bit of area 1 (bit area).
6	Receiving side	After checking that the bit of area 1 (bit area) is turned off at sending side, turn off the bit of area 1 (bit area) at receiving side.

■Handshake program example

The example below shows how to guarantee data consistency in area 2 (word area) for each node when data larger than double word (32-bit) is written/read.



The following shows a program example that sends W0 to WFF of node 1 to W0 to WFF of node 3 as shown in the figure above. The program handshakes by turning on B0 when it stores send data, and turning on B200 when it stores receive data.

Sending station (Node 1)

<< Reading data from cyclic area >>

Reads data from node 3 area 1
(Address: 1C20H to 1C2FH (7200 to 7215))

X19 U0¥G2528.3 | BMOV U0¥G7200 K4B200 H10

Reads data from node 3 area 2
(Address: 2200H to 22FFH (8704 to 8959))

BMOV U0¥G8704 W200 H100

1) M0 B0 B200 | 2) BMOV D0 W0 H100

3) SET B0

B200 | 7) RST B0

(Data processing)

<< Writing data to cyclic area >>

Writes data to node 1 area 2
(Address: 2000H to 20FFH (8192 to 8447))

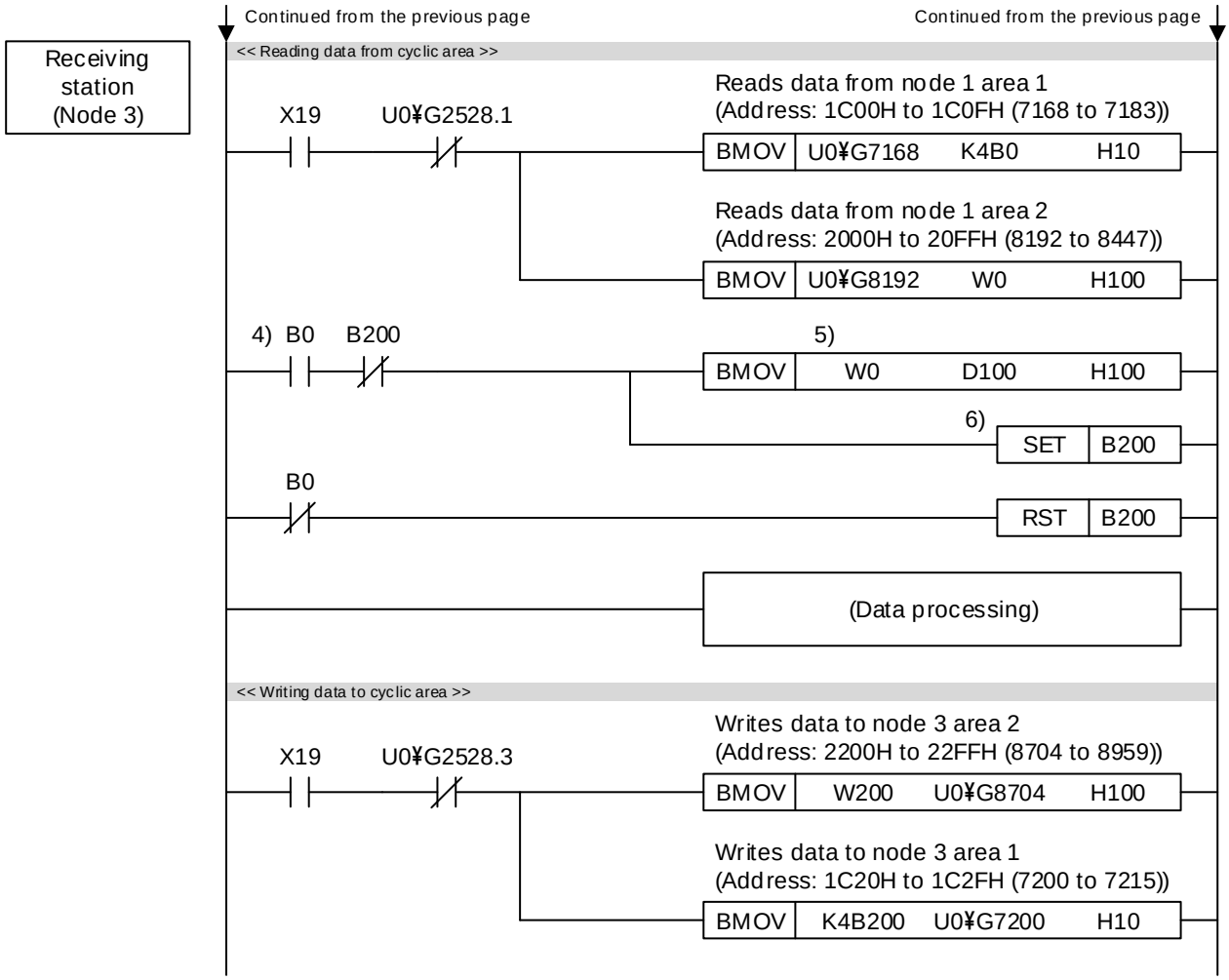
X19 U0¥G2528.1 | BMOV W0 U0¥G8192 H100

Writes data to node 1 area 1
(Address: 1C00H to 1C0FH (7168 to 7183))

BMOV K4B0 U0¥G7168 H10

Go to the next page

Go to the next page



1. Send command (M0) is set to ON.

2. Data in D0 to D255 are stored in W0 to WFF.

3. Upon completion of storing data into W0 to WFF, B0 for handshaking is set to ON.

4. By cyclic transmission, area 2 (word area) data and then area 1 (bit area) data are sent, and B0 of the receiving node is set to ON.

5. Data in W0 to WFF are stored in D100 to D355.

6. Upon completion of storing data into D100 to D355, B200 for handshaking is set to ON.

7. When the data are delivered to the receiving station, B0 is set to OFF.

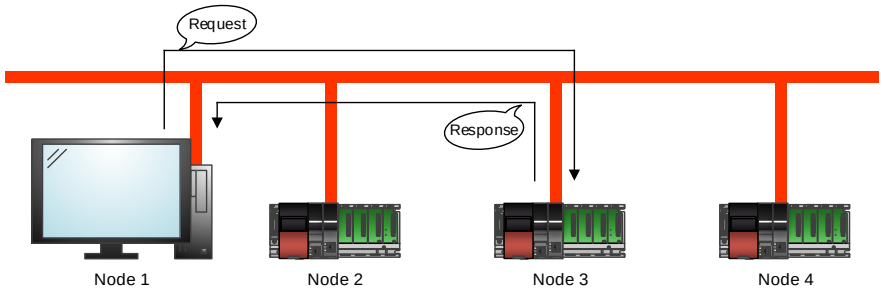
*1 Transfer the data of the CPU module to the cyclic data areas of the FL-net module by using the sequence program.

Message transmission

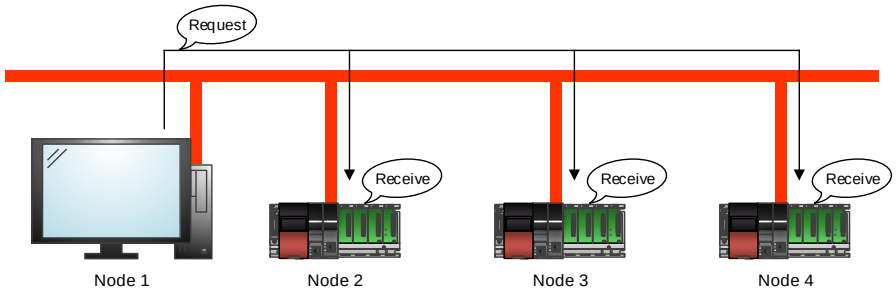
Summary of message transmission

Message transmission is the function supporting the asynchronous data exchange generated among nodes.

- When a node receives a token, it sends up to one (message) frame before transmitting cyclic frames.
- Data volume that can be transmitted in a frame is equal to or less than 1024 bytes. (excluding the header).
- Algorithm is provided so as not to exceed permissible refresh cycle time for cyclic transmission.
- Both 1:1 transmission to a specific destination node and 1:n broadcast transmission to all nodes are provided.
- Delivery acknowledgement function is provided to confirm successful delivery of data to the destination node on the 1:1 message transmission.
- If message transmission is implemented for a node that has been removed from the network, FL-net module detects an error (error code: C322H or C323H).



1:1 Transmission



1:N Transmission

Support message list

No.	Message	1:1	1:n	Server function *1	Client function *2	Reference
1	Byte block read	○	×	×	○ *3	☞Page 97 Byte block read
2	Byte block write	○	×	×	○ *3	☞Page 97 Byte block write
3	Word block read	○	×	○	○ *3	☞Page 98 Word block read
4	Word block write	○	×	○	○ *3	☞Page 98 Word block write
5	Network parameter read	○	×	○	○	☞Page 82 Network parameter/join node information read
6	Network parameter write	○	×	×	○ *3	☞Page 99 Network parameter write
7	Operate/stop command	○	×	×	○ *3	☞Page 100 Operate command ☞Page 100 Stop command
8	Device profile read	○	×	○	○	☞Page 84 Device profile read
9	Log information read	○	×	○	○	☞Page 86 Log information read
10	Log information clear	○	○	○	○	☞Page 88 Log information clear
11	Message return	○	×	○	○ *3	☞Page 101 Message return
12	Transparent message transmission	○	○	○	○	☞Page 90 Transparent type message

*1 Server function: Functions that create a response frame for the request message that has been received and send it.

*2 Client function: Functions that send the response message and receive the response frame.

*3 Realized by the transparent message transmission. For the sending method of transparent type message transmission, refer to the following.
Also, refer to the external device manual for transaction code.

☞Page 90 Transparent type message
☞Page 91 Transparent type message (Message send)
☞Page 94 Transparent type message (Message receive)
☞Page 96 Other messages (Transparent type messages)

Transaction code

In each of the messages, its header has a transaction code for requesting or a transaction code for responding that is used for identifying the message frame.

Transaction code		Application
Decimal	Hexadecimal	
0 to 59999	0000H to EA5FH	Transparent type message transmission
60000 to 64999	EA60H to FDE7H	Reserved
65000	FDE8H	Cyclic header (with token)
65001	FDE9H	Cyclic header (no token)
65002	FDEAH	Join request frame header
65003	FDEBH	Byte block data read (request)
65004	FDECH	Byte block data write (request)
65005	FDEDH	Word block data read (request)
65006	FDEEH	Word block data write (request)
65007	FDEFH	Network parameter read (request)
65008	FDF0H	Network parameter write (request)
65009	FDF1H	Stop command (request)
65010	FDF2H	Operate command (request)
65011	FDF3H	Read profile (request)
65012	FDF4H	Trigger header
65013	FDF5H	Log read (request)
65014	FDF6H	Log clear (request)
65015	FDF7H	For message return test (request)
65016 to 65202	FDF8H to FEB2H	Reserved
65203	FEB3H	Byte block data read (response)
65204	FEB4H	Byte block data write (response)
65205	FEB5H	Word block data read (response)
65206	FEB6H	Word block data write (response)
65207	FEB7H	Network parameter read (response)
65208	FEB8H	Network parameter write (response)
65209	FEB9H	Stop command (response)
65210	FEBAH	Operate command (response)
65211	FEBBH	Read profile (response)
65212	FEBCH	Reserved
65213	FEBDH	Log read (response)
65214	FEBEH	Log clear (response)
65215	FEBFH	For message return test (response)
65216 to 65399	FEC0H to FF77H	Reserved
65400 to 65535	FF78H to FFFFH	Reserved

Point

A response transaction code is a "request transaction code + 200".

Comparison between the virtual addresses and physical address

By specifying the virtual address space for the word block read/write of the FL-net module, the devices of the CPU module and remote head module of the target node can be accessed.
The following table lists the devices and device number range of the accessible CPU module and remote head module.

■Comparison between the virtual addresses and physical address (CPU module)

Category	Device name		Device type		Address classification		Device number range *1	Expression	
			Bit	Word	Physical	Virtual	Programmable controller CPU, RnENCPU, Motion CPU, Process CPU, Safety CPU	Decimal	Hexa-decimal
Internal system	Special relay		○		SM	91	000000 to 003999	○	
	Special register			○	SD	A9	000000 to 003999	○	
Internal user *3	Input relay		○		X	9C	000000 to 002FFF		○
	Output relay		○		Y	9D	000000 to 002FFF		○
	Internal relay		○		M	90	000000000 to 161882111	○	
	Latch relay		○		L	92	000000 to 032767	○	
	Annunciator		○		F	93	000000 to 032767	○	
	Edge relay		○		V	94	000000 to 032767	○	
	Link relay		○		B	A0	000000 to 9A61FFF		○
	Data register			○	D	A8	000000 to 10117631	○	
	Link register			○	W	B4	000000 to 9A61FF		○
	Timer	Contact point	○		TS	C1	000000 to 8993439	○	
		Coil	○		TC	C0			
		Current value		○	TN	C2			
	Accumulated timer	Contact point	○		SS	C7			
		Coil	○		SC	C6			
		Current value		○	SN	C8			
	Counter	Contact point	○		CS	C4	000000 to 8993439	○	
		Coil	○		CC	C3			
		Current value		○	CN	C5			
	Link special relay		○		SB	A1	000000 to 9A61FFF		○
	Link special register			○	SW	B5	000000 to 9A61FF		○
	Step relay		○		S	98	000000 to 016383	○	
	Direct input *4		○		DX	A2	000000 to 0001FF		○
	Direct output *4		○		DY	A3	000000 to 0001FF		○
	Index register			○	Z	CC	000000 to 000020	○	
—	Normal file register			○	R	AF	0 point (It can be changed with the parameter) *2	○	
	Serial number file register			○	ZR	B0	0 point (It can be changed with the parameter) *2		○

*1 This is the maximum number of points for the R120CPU with an extended SRAM cassette (16MB) (NZ2MC-16MBS).
The number of points varies depending on the model of the CPU module used, whether to use an extended SRAM cassette, and the type of its cassette.

*2 The range of file register (R/ZR) is (R/ZR)0 to (file register file size (Unit: word) -1).

*3 When the device number range is changed, up to the changed maximum device number can be accessed. Local devices cannot be accessed.

*4 Input relay, output relay are the same. (For direct access)

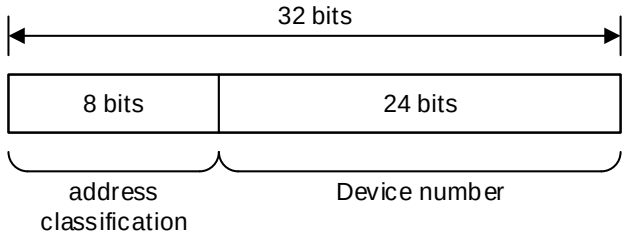
Point

Some device number ranges can be changed from default values in PLC parameter setting for the CPU module. Refer to the manual for the CPU module.

■Comparison between the virtual addresses and physical address (Remote head module)

Device name	Device type		Address classification		Device number range	Expression	
	Bit	Word	Physical	Virtual	RJ72GF15-T2	Decimal	Hexa-decimal
Special relay	○		SM	91	000000 to 004095	○	
Special register		○	SD	A9	000000 to 004095	○	
Input relay	○		X	9C	000000 to 000FFF		○
Output relay	○		Y	9D	000000 to 000FFF		○
Data register		○	D	A8	000000 to 10117631	○	
Link register		○	W	B4	000000 to 001FFF		○
Link special relay	○		SB	A1	000000 to 001FFF		○
Link special register	○		SW	B5	000000 to 001FFF		○

A virtual address is expressed as a 32-bit address as shown below.



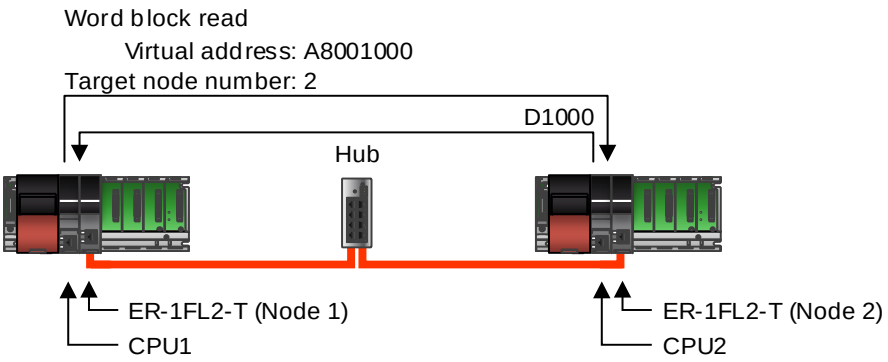
■Comparison between the virtual addresses and physical address (C Controller module)

Device name	Device type		Address classification		Device number range	Expression	
	Bit	Word	Physical	Virtual	R12CCPU-V	Decimal	Hexa-decimal
Special relay	○		SM	91	000000 to 004095	○	
Special register		○	SD	A9	000000 to 004095	○	
Input relay	○		X	9C	000000 to 000FFF		○
Output relay	○		Y	9D	000000 to 000FFF		○
Internal relay	○		M	90	000000 to 61439	○	
Link relay	○		B	A0	000000 to 09FFFF		○
Data register		○	D	A8	000000 to 4184063	○	
Link register		○	W	B4	000000 to 0FFFFF		○

Point

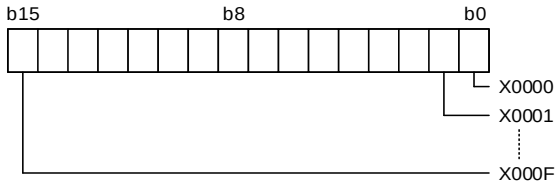
Ex. Accessing D1000 of CPU2 from CPU1 in the following structure

The virtual address corresponding to physical address D is A8 (000000 to 10117631) for the RCPU.
When executing word block read with CPU1, specify "A8001000" as the virtual address and "2" as the target node to read the data in D1000 of CPU2.



Virtual address specification (Word block)

■Device classification: bit

Item	Contents
Area name	Ex. Input relay (X)
Area size	512 words
Access attributes	Read
Comparison with virtual address (Word block)	<table><tr><th>Natural notation (Device name)</th><th>Virtual address</th></tr><tr><td>X0000</td><td>9C000000H</td></tr><tr><td>X0010</td><td>9C000001H</td></tr><tr><td>X0020</td><td>9C000002H</td></tr><tr><td>: :</td><td>: :</td></tr><tr><td>X1FF0</td><td>9C0001FFH</td></tr></table>
Data alignment	Corresponds to 1-word word block at device 16 bit [When set from X0000] 

■Device classification: word

Item	Contents
Area name	Ex. Data register (D)
Area size	12288 words
Access attributes	ReadWrite
Comparison with virtual address (Word block)	<table><tr><th>Natural notation (Device name)</th><th>Virtual address</th></tr><tr><td>D0000</td><td>A8000000H</td></tr><tr><td>D0001</td><td>A8000001H</td></tr><tr><td>D0002</td><td>A8000002H</td></tr><tr><td>: :</td><td>: :</td></tr><tr><td>D12287</td><td>A8002FFFH</td></tr></table>
Data alignment	Device 1 word corresponds to word block 1-word.

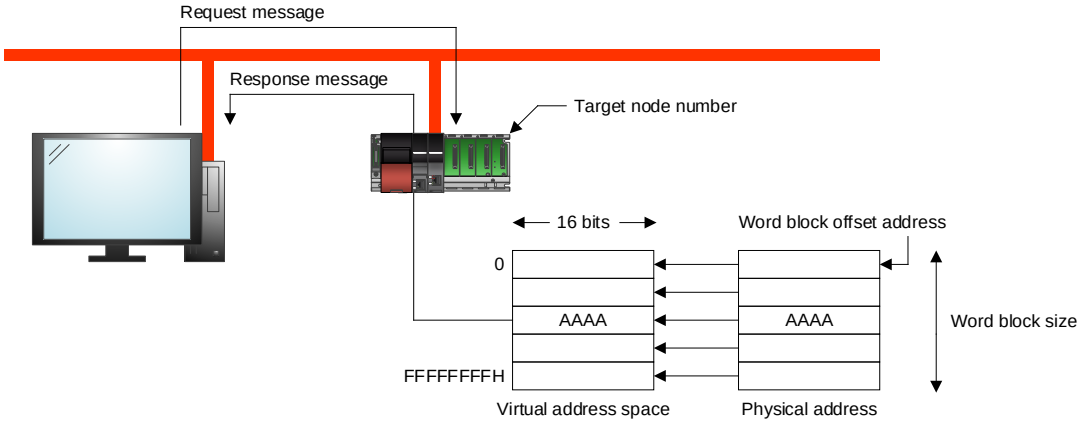
Support message details (Server function)

The server function of the support messages is explained in this section.

■Word block read

This function reads messages in word units (1 address 16 bit units) for the virtual address space (32 bit address space) that the corresponding node holds from the network. The virtual address space of the FL-net module is assigned to each device (physical address) of the CPU module and remote head module. (☞Page 154 Comparison between the virtual addresses and physical address)

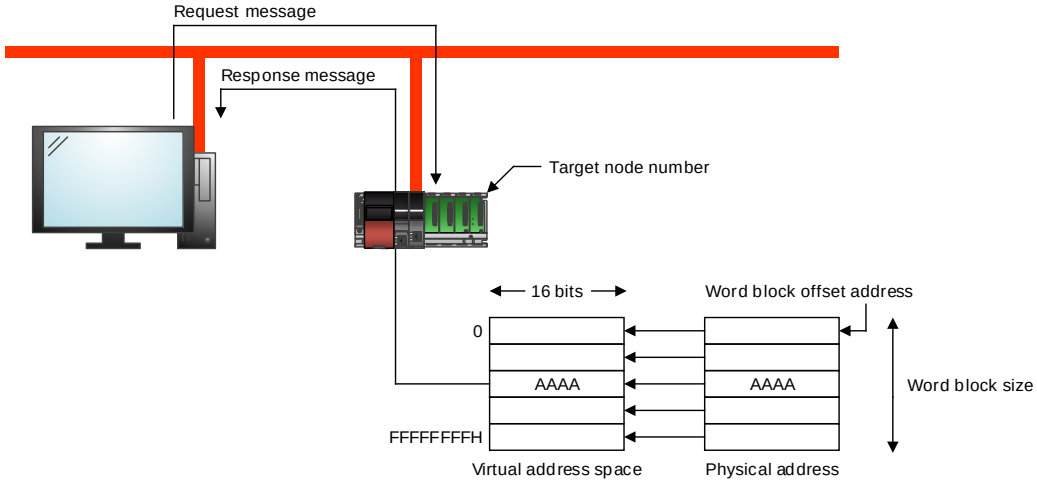
Item	Request	Response
Transaction code	65005	65205
Parameter	• Target node number • Virtual address space data size • Virtual address space start address	-
User data	-	Read data (1024 byte space)



■Word block write

This function writes messages in word units (1 address 16 bit units) for the virtual address space (32 bit address space) that the corresponding node holds from the network. The virtual address space of the FL-net module is assigned to each device (physical address) of the CPU module and remote head module. (☞Page 154 Comparison between the virtual addresses and physical address)

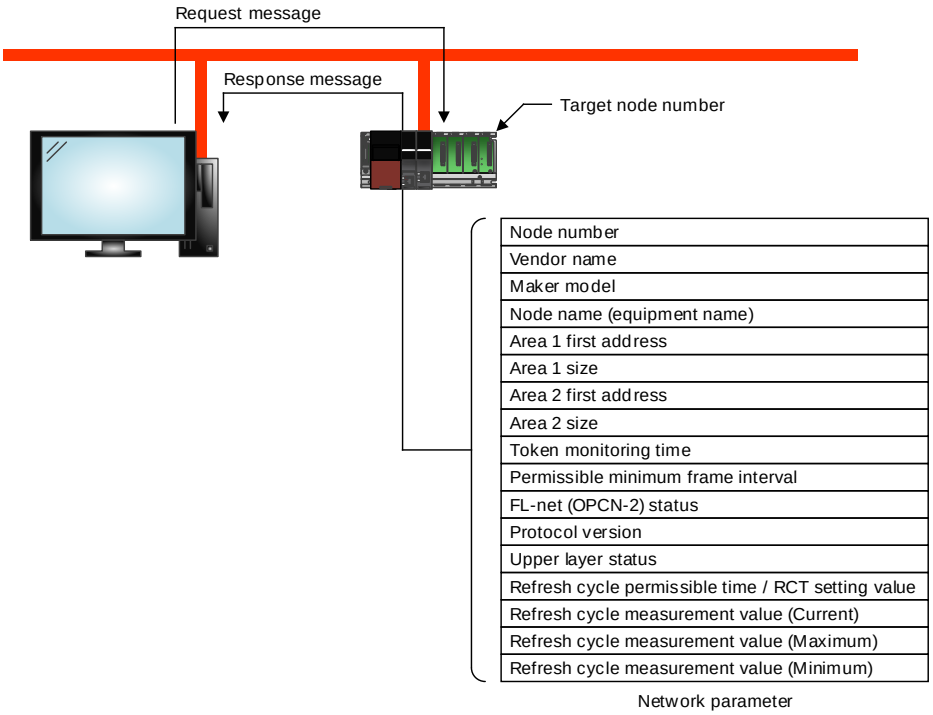
Item	Request	Response
Transaction code	65006	65206
Parameter	• Target node number • Virtual address space data size • Virtual address space start address	-
User data	Write data (1024 byte space)	-



■Read network parameters

This function reads the corresponding node network parameter data from the network.

Item	Request	Response
Transaction code	65007	65207
Parameter	• Target node number	-
User data	-	• Node number • Vender name • Maker model • Node name (equipment name) • Address and size of common memory • Token monitoring time • Permissible refresh cycle time • Refresh cycle measurement time (actual value) • Permissible minimum frame interval • Upper layer status • FL-net (OPCN-2) status • Protocol version



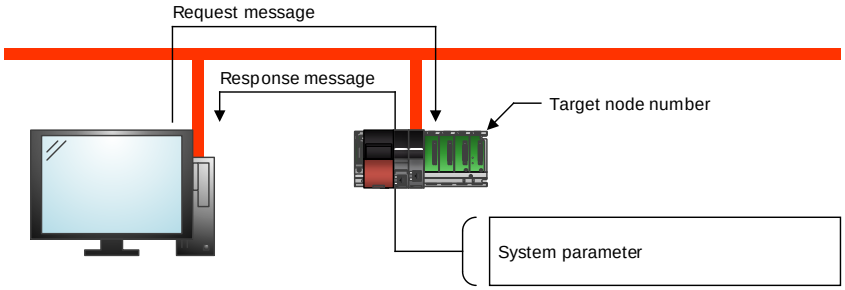
Network parameter

■Device protocol read

This function reads the device profile data that is the data for the corresponding node from the network. The data format for the device profile data is based on ASNI.1 "Abstract Syntax Notation One" conversion rules for transmission encoding as stipulated in ASNI.1 "Basic Encoding Rules (ISO/IEC 8825).

Item	Request	Response
Transaction code	65011	65211
Parameter	• Target node number	-
User data	-	System parameters

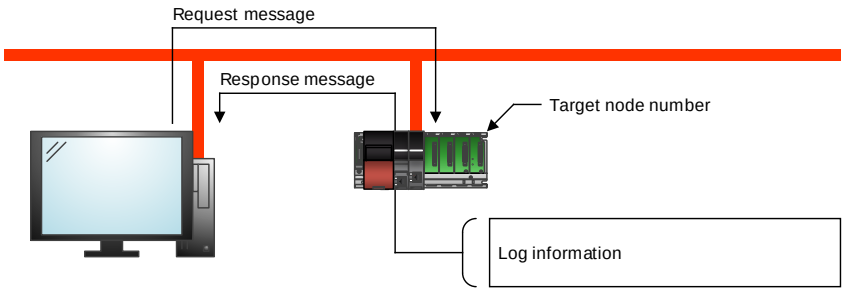
Device profile data	
System parameter	• Common specifications version • Identifier character string • Revision number • Revision data • Device classification • Vendor name • Product number



■Log information read

Message function for reading corresponding node log information from the network.

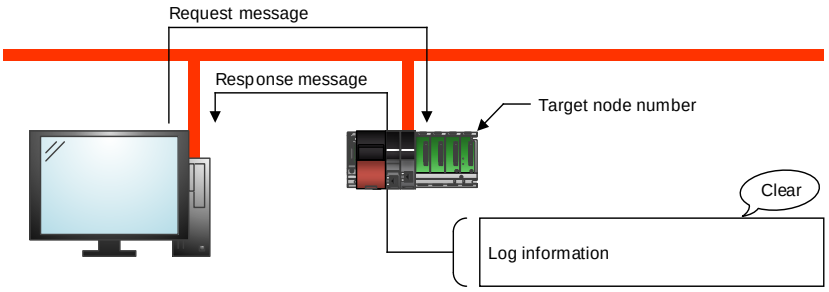
Item	Request	Response
Transaction code	65013	65213
Parameter	• Target node number	-
User data	-	• Send and Receive log • Frame log • Cyclic transmission error log • Message transmission error log • ACK error log • Token error log • Status data • Join node list



■Log information clear

Message function for clearing corresponding node log information from the network.

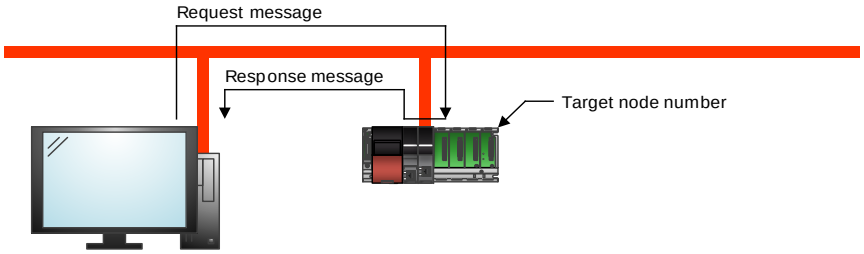
Item	Request	Response
Transaction code	65014	65214
Parameter	• Target node number	-
User data	-	-



■Message return

This function returns the received message. The returning is performed automatically within the FL-net module.

Item	Request	Response
Transaction code	65015	65215
Parameter	• Target node number	-
User data	Test data (1024 bytes)	Test data (1024 bytes)



■Transparent type message transmission

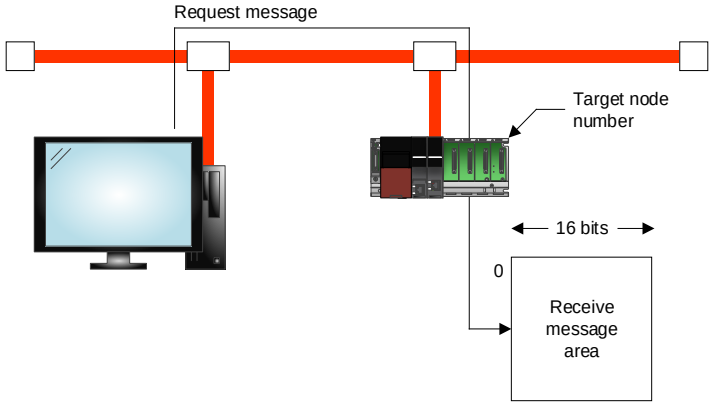
This function writes messages to the corresponding node received message area from the network.
When a response message is required, create it with sequence program since FL-net module does not send it.

Item	Request	Response
Transaction code	• 0 to 59999 65000 to 65535 *1	-
Parameter	• Target node number • Data size (word/byte unit) *2 • Response message classification • Virtual address space • Address • Size (word/byte unit) *3	-
User data	Data (1024 byte space)	-

*1 0 to 65535 are defined in the system.

*2 For the data size, change the data unit with Message Data Unit Select of the network parameter.

*3 Depends on the transaction code.



Point

Since there is no discrimination of transaction codes for the request frame and response frame, user must define them.

APPENDICES

Appendix 1 Module label

The I/O signals and buffer memory of the FL-net module can be set using module label.

Structure of the module label

The module label name is defined with the following structure.
"Instance name"_"Module number"."Label name"
"Instance name"_"Module number"."Label name"_D

Ex.
ER1FL2T.uIO

■Instance name

The following shows the instance name of the ER-1FL2-T.

Model	Instance name
ER-1FL2-T	ER1FL2T

■Module No.

A sequential number starting with "1" for identifying a module from the one with the same instance name.

■Label name

A label name unique to the module.

■_D

This symbol indicates that the module label is for direct access. The label without "_D" is for refresh. The following are the differences between refresh and direct access.

Type	Description	Access timing
Refresh	The values read/written from/to the module labels are reflected to the module at refresh. The execution time of the program can be shortened.	At refresh
Direct access	The values read/written from/to the module labels are reflected to the module immediately. Although the execution time of the program is longer than the one at refresh, the responsiveness is improved.	At writing to or reading from the module label

Appendix 2 I/O Signals

The following table lists the I/O signals of the FL-net module.
For details on the I/O signals, refer to the following.
☞Page 166 Details of input signals

Point

- The I/O signals (X/Y) described below show the case that the start I/O number of the FL-net module is set to "0".
- Do not use the "Use prohibited" signals shown below because the system uses them. If users use (turn off and on) the signals, the functions of the FL-net module cannot be guaranteed.

Appendix 2.1 List of I/O signals

Input Signals

Device No.	Signal name
X00	Message transmission normal completion signal (ON: Normal completion, OFF: -)
X01	Message transmission abnormal completion signal (ON: Abnormal completion ending, OFF: -)
X02	Receiving message signal (ON: Receiving, OFF: No signal received)
X03 to X0F	Use prohibited
X10	Network parameter write completion signal (ON: Completed, OFF: -)
X11	Network parameter/join node information read completion signal (ON: Completed, OFF: -)
X12	Use prohibited
X13	Device profile read completion signal (ON: Completed, OFF: -)
X14	Log information clear completion signal (ON: Completed, OFF: -)
X15	Log information read completion signal (ON: Completed, OFF: -)
X16 to X17	Use prohibited
X18	Parameter setting status signal (ON: Error, OFF: Normal)
X19	Token enter status signal (ON: Enter, OFF: Leave)
X1A to X1B	Use prohibited
X1C	Module ready (ON: Preparation completed, OFF: In initialization)
X1D to X1E	Use prohibited
X1F	Watchdog timer error detection signal (ON: Detected, OFF: No detected)

Output Signals

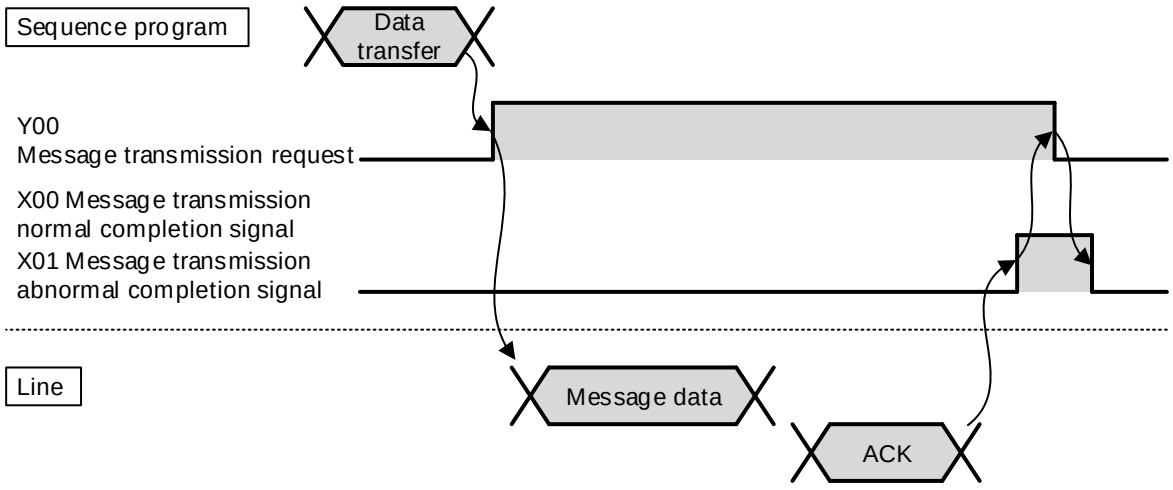
Device No.	Signal name
Y00	Message transmission request (ON: Request, OFF: -)
Y01	Use prohibited
Y02	Message receive completion confirmation (ON: Request, OFF: -)
Y03 to Y0F	Use prohibited
Y10	Network parameter write request (ON: Request, OFF: -)
Y11	Network parameter/join node information read request (ON: Request, OFF: -)
Y12	Use prohibited
Y13	Device profile read request (ON: Request, OFF: -)
Y14	Log information clear request (ON: Request, OFF: -)
Y15	Log information read request (ON: Request, OFF: -)
Y16 to Y1F	Use prohibited

Appendix 2.2 Details of input signals

The following describes the details of the input signals for the FL-net module which are assigned to the CPU module.
The I/O numbers (X/Y) described in Appendix 2 are for the case when the start I/O number of the FL-net module is set to 0.

Message transmission normal completion signal (X00)/Message transmission abnormal completion signal (X01)

Message transmission request (Y00)
The data is sent by setting the data in the message send area of the buffer memory beforehand and setting of the message transmission request (Y00) to ON.
After checking the message transmission completion in Message transmission normal completion signal (X00) and Message transmission abnormal completion signal (X01), turn off Message send request (Y00).
For sending messages, refer to ☞Page 90 Transparent type message.



Receiving message signal (X02)

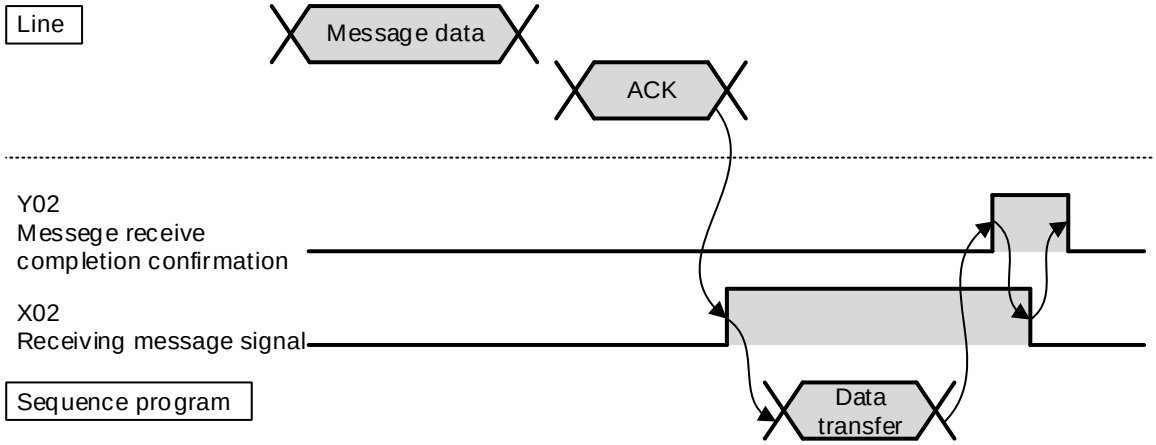
Message receive completion confirmation (Y02)

When data is set from other nodes to the message receiving area of the buffer memory, Receiving message signal (X02) turns on.

After the message data has been transferred to the device (read), set the message receive completion confirmation (Y02) to on.

After confirming that the receiving message signal (X02) is off, set the message receive completion confirmation (Y02) to off.

For receiving messages, refer to ☞Page 90 Transparent type message.



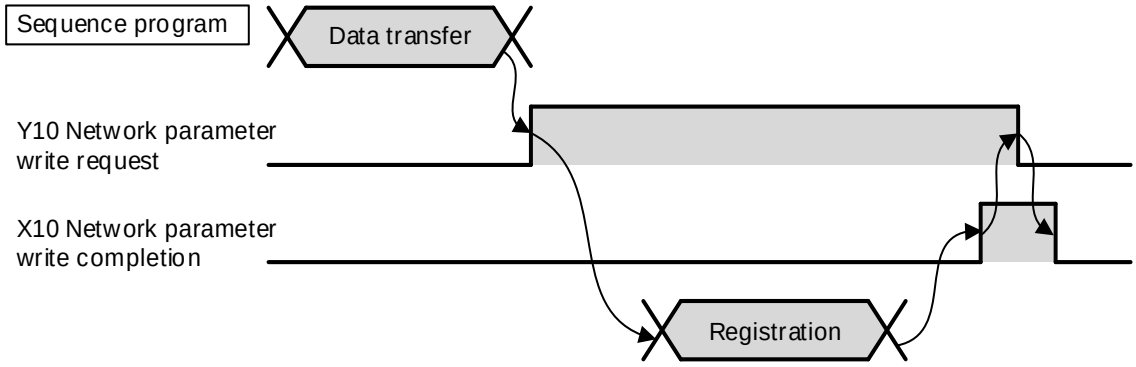
Network parameter write completion signal (X10)

Network parameter write request (Y10)

The data is set in the network parameter area of its local node buffer memory beforehand and the network parameter is registered by setting the network parameter write request (Y10) to on.

After the write completion has been confirmed by the on of the network parameter write completion signal (X10), set the network parameter write request (Y10) to off.

For registering the local node network parameter, refer to ☞Page 75 Basic setting.



A

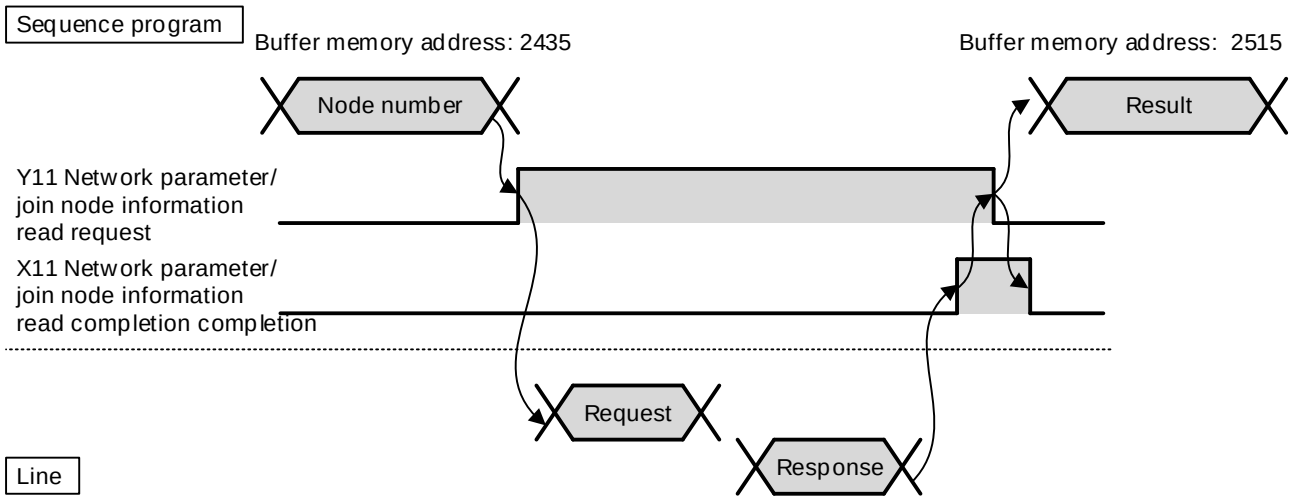
Network parameter/join node information read completion signal (X11)

Network parameter/join node information read request (Y11)

By turning on the network parameter/join node information read request (Y11), data of the target node are read out into the network parameter/join node information acquisition area of the buffer memory.

After the acquisition completion has been confirmed by the on of the network parameter/join node information read completion signal (X11), set the network parameter/join node information read request (Y11) to off.

For the network parameter/join node information read, refer to ☞Page 82 Network parameter/join node information read.



Point

The switching of network parameter/join node information reading is distinguished by buffer memory address 983H.b15 (☞Page 190 Specified information area "CPU→FL-net (OPCN-2)")

0: Read network parameter data

1: Read join node data

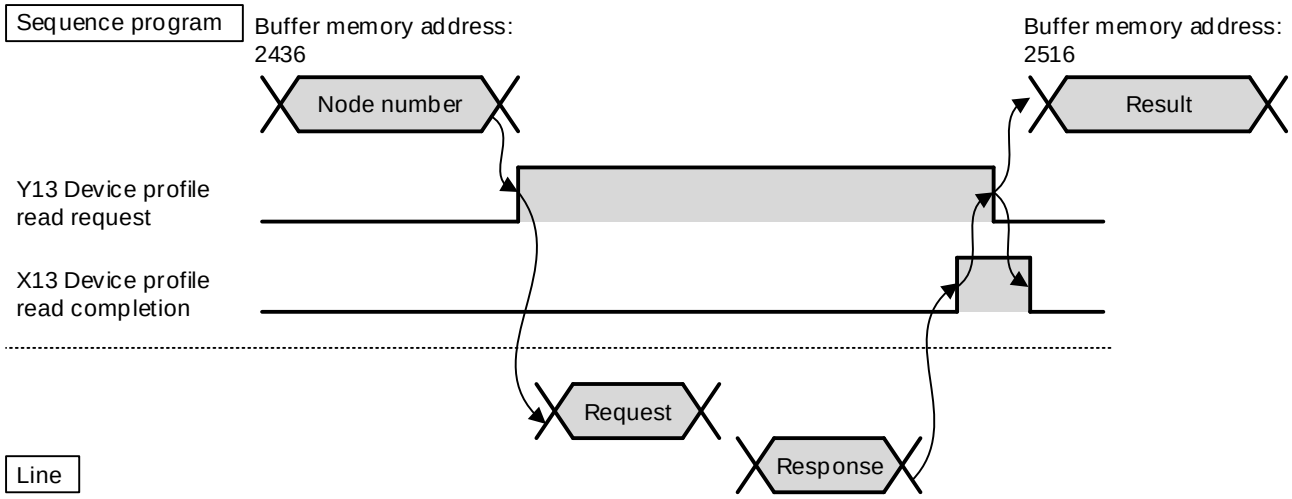
Device profile read completion signal (X13)

Device profile read request (Y13)

By turning on the device profile read request (Y13), the device profile of the target node is read out into the device profile acquisition area of the buffer memory.

After the acquisition completion has been confirmed by the on of the device profile read completion signal (X13), set the device profile read request (Y13) to off.

For the device profile read, refer to ☞Page 84 Device profile read.



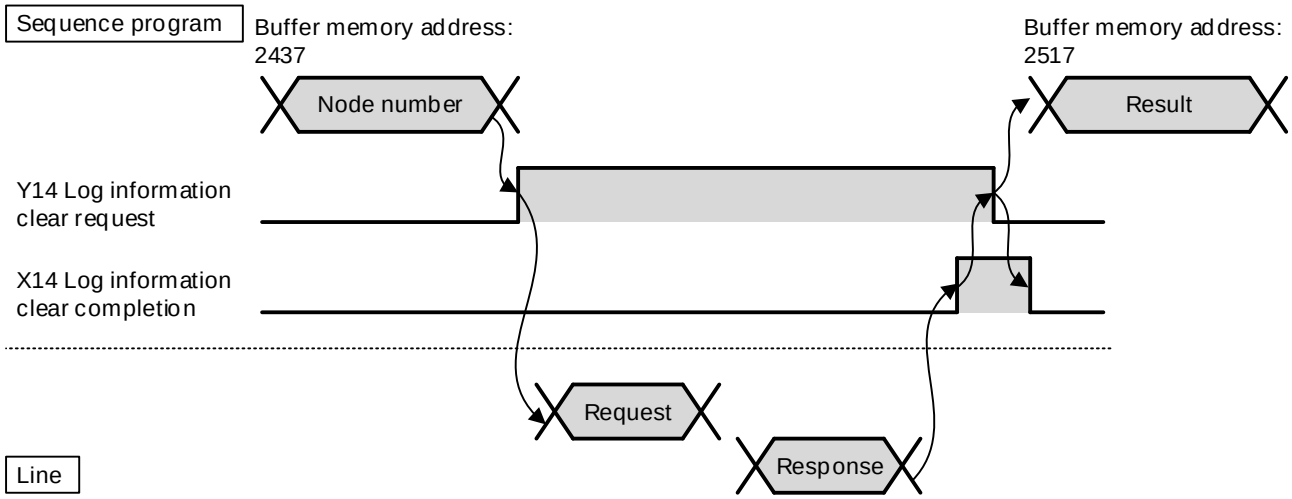
Log information clear completion signal (X14)

Log information clear request (Y14)

By turning on the log information clear request (Y14), the log information of the target node are cleared.

After the completion of the clear has been confirmed by the on of the log information clear completion signal (X14), set the log information clear request (Y14) to off.

For the log information clear, refer to ☞Page 88 Log information clear.



A

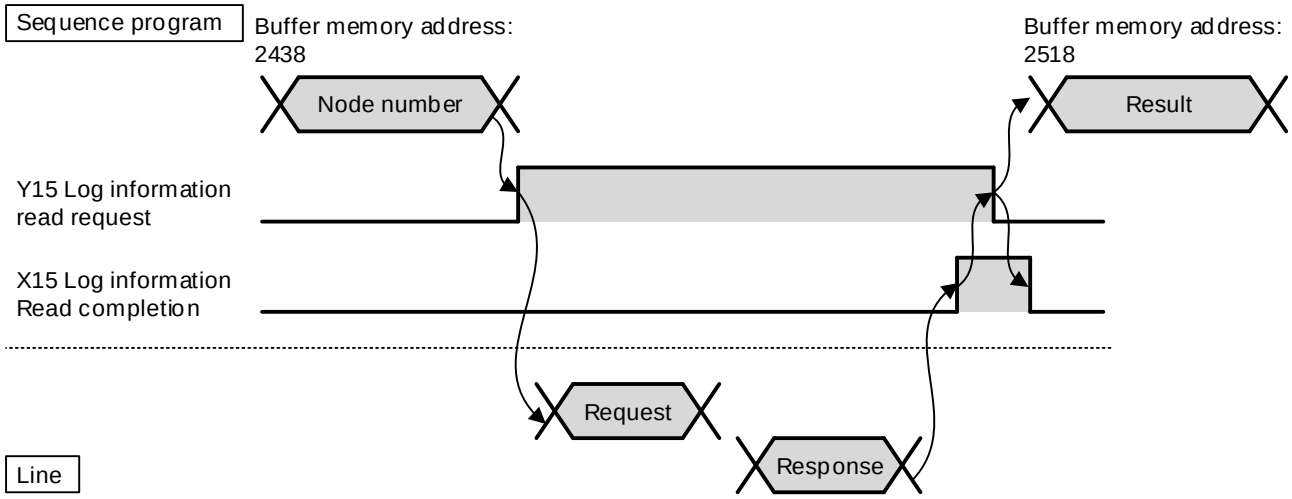
Log information read completion signal (X15)

Log information read request (Y15)

By turning on the log information read request (Y15), the log information of the target node are read out into the log information acquisition area of the buffer memory.

After the completion of the acquisition has been confirmed by the on of the log information read completion signal (X15), set the log information read request (Y15) to off.

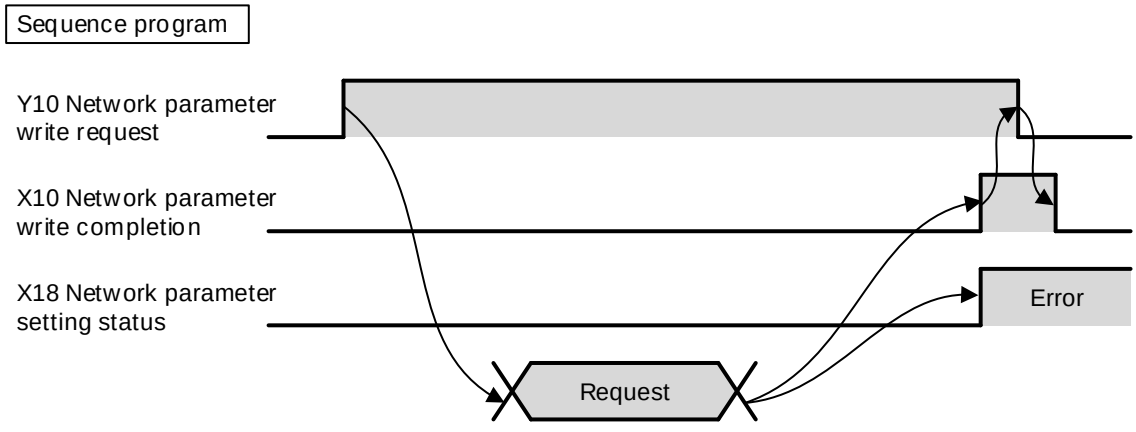
For the log information read, refer to ☞Page 86 Log information read.



Parameter setting status signal (X18)

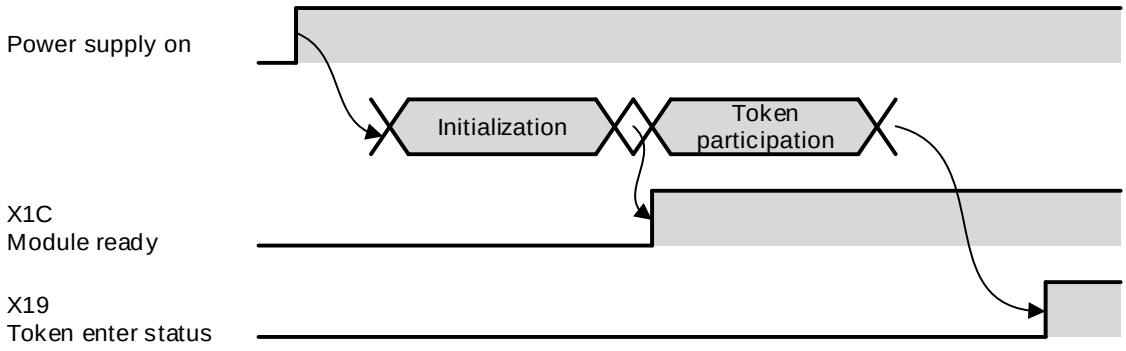
When the writing of the network parameter has been completed and a network parameter setting error is issued, the parameter setting status signal (X18) is set to on. It turns on when an area duplicated with another node is detected.

For registering the local node network parameter, refer to ☞Page 75 Basic setting.



Token enter status signal (X19)

Shows the token participation status to the network. The token enter status signal (X19) is on during token participation.

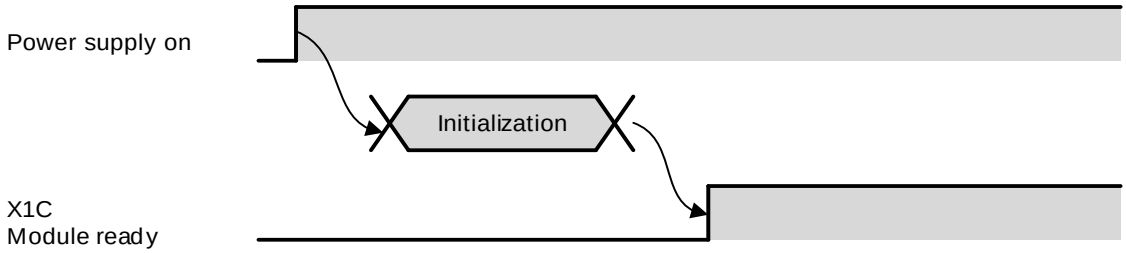


Module ready (X1C)

Shows the results of the initialization of the FL-net module.

If the initialization is normal, module ready (X1C) is set to on.

When Module ready (X1C) does not turn on, review the Switch setting (☞Page 59 Page Switch setting) of GX Works3. If the Switch setting is normal, perform the self-diagnosis test (☞Page 132 Self-diagnosis test) of the FL-net module.



A

Appendix 3 Buffer memory

The following table lists the buffer memory addresses of the FL-net module.
For details on the buffer memory addresses, refer to the following.
☞Page 173 Details of buffer memory addresses

Buffer memory values are reset to default when the CPU module is reset or the system is powered off.

Appendix 3.1 List of buffer memory addresses

Address		Name	Size (word)	Description	Reference
Decimal	Decimal				
0 to 127	0 to 7FH	Local node network parameter area	128	Set network parameters of the local node.	☞173
128 to 2175	80 to 87FH	Other node network parameter area	2048	Stores network parameters of the other nodes joining the network.	☞175
2176 to 2303	880 to 8FFH	System area	128	-	-
2304 to 2431	900 to 97FH	Status data area Bit area: 2 k bits	128	Stores status data bit data.	☞177
2432 to 4479	980 to 117FH	Status data area Word area: 2 k words	2048	Stores status data word data.	☞177
4480 to 4607	1180 to 11FFH	System area	128	-	-
4608 to 5119	1200 to 13FFH	Network parameter /join node information acquisition area	512	After execution of message transmission, the network parameter/join node information read, this area stores the network parameter/join node information of the target node.	☞178
5120 to 5631	1400 to 15FFH	Device profile acquisition area	512	After execution of message transmission, the device profile read, this area stores the device profile data of the target node.	☞180
5632 to 6143	1600 to 17FFH	Log information acquisition area	512	After execution of message transmission, the log information read, this area stores the log information of the target node.	☞181
6144 to 7167	1800 to 1BFFH	System area	1024	-	-
7168 to 7679	1C00 to 1DFFH	Cyclic data area Area1: 8 k bits	512	Set bit cyclic data of the local node. Stores bit cyclic data of the other nodes.	☞184
7680 to 8191	1E00 to 1FFFH	System area	512	-	-
8192 to 16383	2000 to 3FFFH	Cyclic data area Area 2: 8 k words	8192	Set word cyclic data of the local node. Stores word cyclic data of the other nodes.	☞184
16384 to 24575	4000 to 5FFFH	System area	8192	-	-
24576 to 25599	6000 to 63FFH	Message data Send area	1024	Set send data for transparent type message transmission.	☞185
25600 to 26623	6400 to 67FFH	Message data Receiving area	1024	Stores data received by transparent type message transmission.	☞185
26624 to 32767	6800 to 7FFFH	System area	6144	-	-

Buffer memory assignment

The buffer memory is comprised of 1 address 16 bits.
The following is the overall structure of the buffer memory.

b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0

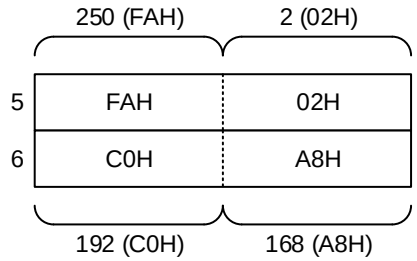
Appendix 3.2 Details of buffer memory addresses Local node network parameter area

Set network parameters of the local node.

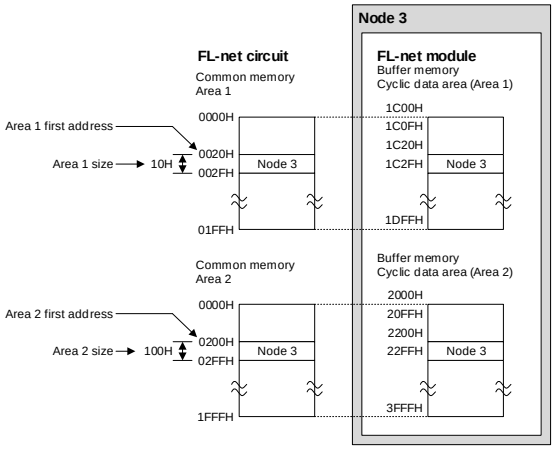
Point

Set the IP address of the FL-net module in Switch setting of GX Works3. (☞Page 59 Switch setting)
For the local node network parameter setting other than the above, refer to the following:

- Basic setting in the module parameter of GX Works3
  ☞Page 60 Basic setting
- Setting with the sequence program
  ☞Page 106 When configuring basic setting and refreshing cyclic area with sequence program

Address (Decimal)	Name	Description
0 to 4	Node name (Equipment name)	Sets node name (Equipment name) Setting range: Optional data Default: No setting
5 to 6	IP address *1	Sets the IP address (32 bit) of the FL-net module. 0: Switch setting of the module parameter in GX Works3 is enabled Other than 0: Sets 32 bit logic address Default: Switch setting or "192.168.250.1" • For the Switch setting, refer to (☞Page 59 Switch setting). • When setting the 32bit logical address, set the IP address as follows. Ex. IP address: 192.168.250.2 
7	System area *2	-
8	Area 1 start address	The start address of the local node common memory area 1 (bit area) is set in this area. Set an offset value of the cyclic data area (Area 1) (Address: 7168 to 7679) in the buffer memory. Setting range: 0 to 1FFH Default: No setting
9	Area 1 size	The size of the local node common memory area 1 (bit area) is set in this area. Set the area 1 size in units of one word (16 bits). Setting range: 0 to 200H (1 word units) Default: No setting Ex. Set "2H" when specifying the size for 32 bits.
10	Area 2 start address	The start address of the local node common memory area 2 (word area) is set in this area. Set an offset value of the cyclic data area (Area 2) (Address: 8192 to 16383) in the buffer memory. Setting range: 0 to 1FFFH Default: No setting

A

Address (Decimal)	Name	Description
11	Area 2 size	The size of the local node common memory area 2 (word area) is set in this area. Setting range: 0 to 2000H (1 word units) Default: No setting Ex. Setting example for common memory area 1 (bit area) and area 2 (word area) of the local node (When the local node is node 3) 
12	Token monitoring time out time	Sets the monitoring time from the local node address token receive signal to the next node token transfer. If the token is held by another node, it monitors the time up to the release of the token by the node holding the token. Setting range: 1 to 255 (1 ms units) Default: 50
13	Minimum permissible frame interval	Sets the time from local node address token receive signal to the number of frames until local node sends. In addition, it can also be used for message sending or frame interval time for frame division. Setting range: 0 to 50(100 μs units) Default: 0
14	Message data unit selection	Sets the unit for when message data is handled. 0: Word unit 1: Byte unit Default: 0
15 to 127	System area *2	-

*1 Although the IP address is also set in the Switch setting, the value set in the local node network parameter area is enabled as the IP address of the FL-net module.

*2 Never write data to the "System Area" of the buffer memory for the FL-net module.
If writing of data is performed to the "System Area", the programmable controller system will malfunction.

Point

Although the module parameter in GX Works3 uses this area as well, when it is mixed with the sequence program, the area operates according to the setting in the sequence program.

Other node network parameter area

Stores network parameters of the other nodes joining the network.

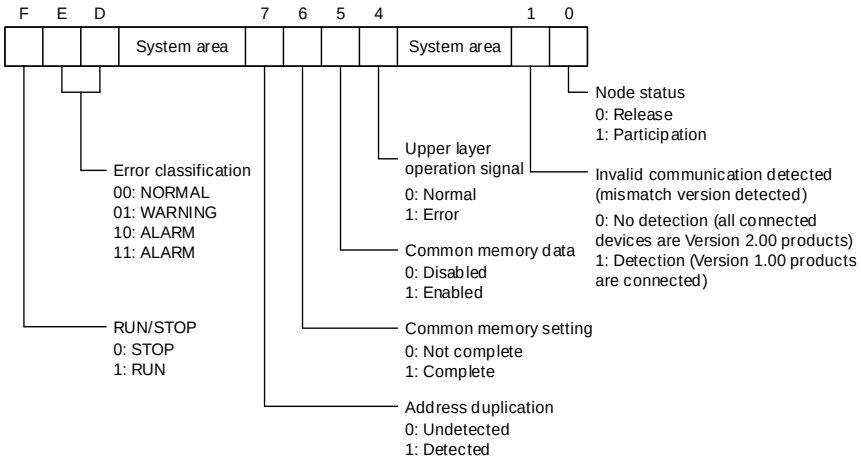
Buffer memory structure

In the other node network parameter area, parameters of nodes 1 to 254 are stored as follows.
The following parameters have the same format as the local node parameter area.

- Area 1 start address
- Area 1 size
- Area 2 start address
- Area 2 size
- Token monitoring time out time
- Minimum permissible frame interval

Address (Decimal)	Name	Description
128	Area 1 start address	Node number 1 area (8 words)
129	Area 1 size	
130	Area 2 start address	
131	Area 2 size	
132	Token monitoring time out time	
133	Minimum permissible frame interval	
134	Refresh cycle permissible time / RCT setting value	
135	Upper layer - link status	
136 to 143	Same as node number 1 area	Node number 2 area (8 words)
(Omitted)	(Omitted)	(Omitted)
2152 to 2159	Same as node number 1 area	Node number 254 area (8 words)
2160 to 2175	System area	-

Details

Address *1 (Decimal)	Name	Description
128	Area 1 start address	The format is the same as the local node network parameter area. (☞Page 173 Local node network parameter area)
129	Area 1 size	
130	Area 2 start address	
131	Area 2 size	
132	Token monitoring time out time	
133	Minimum permissible frame interval	
134	Refresh cycle permissible time / RCT setting value	Stores the refresh cycle per missible time (value of 120 % of 1 cycle).
135	Upper layer - link status	Stores the status of the upper layer (CPU module) and link status. 

*1 The address of the node 1 is shown.
For nodes 2 to 254, follow ☞Page 175 Buffer memory structure to offset.

Status data area

For details on the status data, refer to ☞Page 188 Status data details.

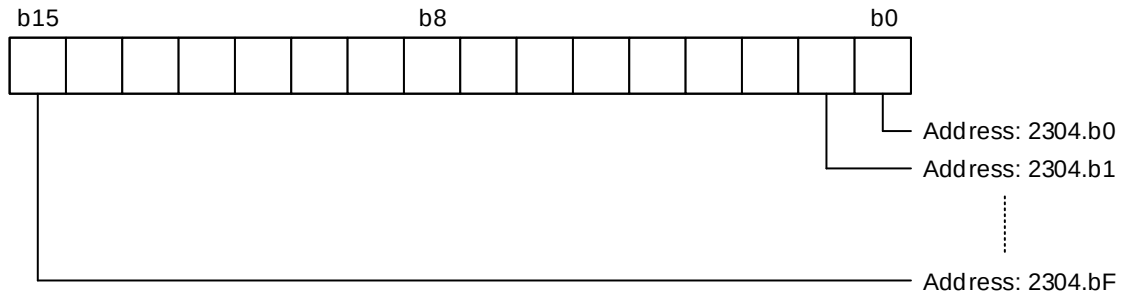
Status bit area

Stores the status data bit data.

■Buffer memory structure

Address		Description	
Decimal	Bit		
2304	2304.b9	CPU module→FL-net module	Write area (1bit)
2308 to 2315	2308.b3 to 2315.bF	CPU module←FL-net module	Read area (125bits)

■Buffer memory configuration



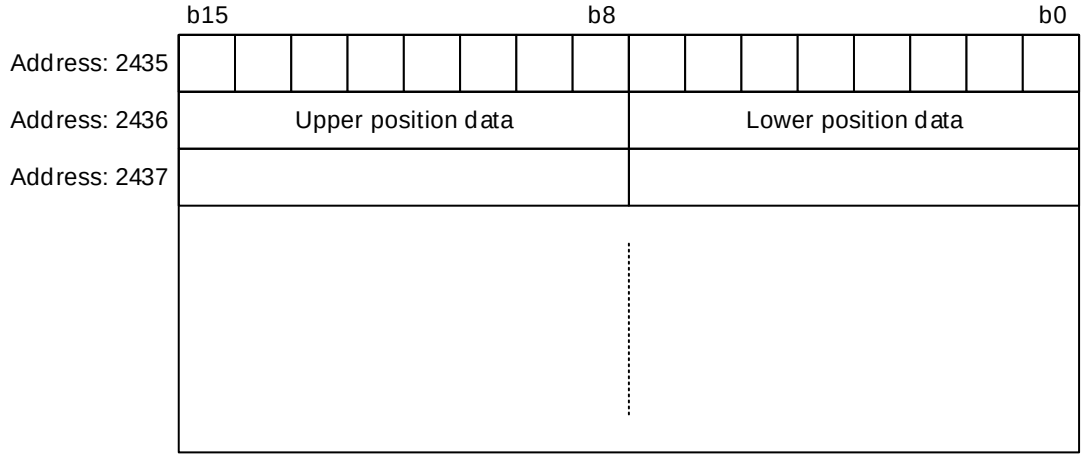
Status word area

Stores the status data word data.

■Buffer memory structure

Address	Description	
Decimal		
2435 to 2467	CPU module→FL-net module	Write area (33words)
2498 to 3215	CPU module←FL-net module	Read area (718words)

■Buffer memory configuration



A

Network parameter/join node information acquisition area

After execution of message transmission, the network parameter/join node information read, this area stores the network parameter/join node information of the target node.
For network parameter/join node information read of message transmission, refer to ☞Page 82 Network parameter/join node information read.

Point

Switching of network parameter/join node information is determined by buffer memory address 2435.b15. (☞Page 190 Specified information area "CPU→FL-net (OPCN-2)")
0: Network parameter data reading
1: Join node data reading

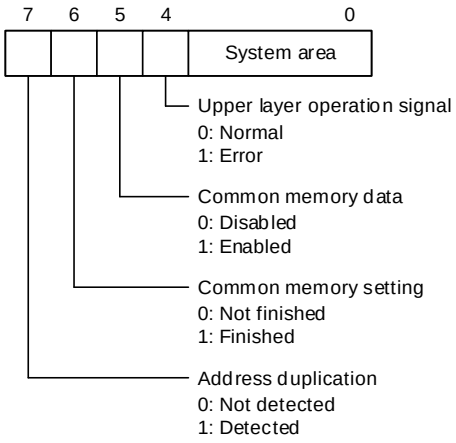
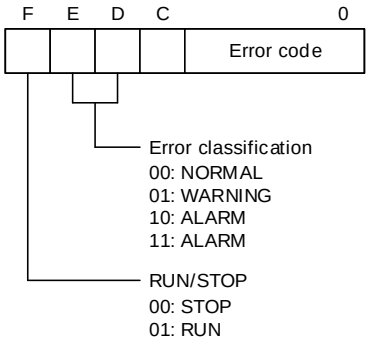
Stored data

The following shows whether the data is stored in the buffer memory when the network parameter or join node information is read.

○: Stored, -: Not stored

Address (Decimal)	Name	Network parameter	Join node
4608 to 4612	Node name (Equipment name)	○	○
4613 to 4617	Vendor name	○	○
4618 to 4622	Manufacturer model	○	○
4623	Area 1 start address	○	○
4624	Area 1 size	○	○
4625	Area 2 start address	○	○
4626	Area 2 size	○	○
4627	Token monitoring time out time	○	○
4628	Minimum permissible frame interval	○	○
4629	Link status	○	○
4630	Protocol version	○	-
4631	Upper layer status	○	○
4632	Refresh cycle permissible time / RCT setting value	○	○
4633	Current value of refresh cycle	○	-
4634	Maximum value of refresh cycle	○	-
4635	Minimum value of refresh cycle	○	-
4636 to 5119	System area	-	-

Details

Address (Decimal)	Name	Description
4608 to 4612	Node name (Equipment name)	Stores the node name (equipment name) of the node to be the target.
4613 to 4617	Vendor name	Stores the vendor name of the node to be the target in ASCII characters. Ex. Mitsubishi Electric Engineering: MEE
4618 to 4622	Manufacturer model	Stores the manufacturer model of the node to be the target in ASCII characters. ER-1FL2-T: "ER-1FL2-T "
4623	Area 1 start address	Stores each of the settings for the node to be the target.
4624	Area 1 size	
4625	Area 2 start address	
4626	Area 2 size	
4627	Token monitoring time out time	
4628	Minimum permissible frame interval	
4629	Link status	Stores the network status of the node to be the target. 
4630	Protocol version	Stores the protocol version for FL-net (OPCN-2).
4631	Upper layer status	Stores the status of the upper layer (CPU module) of the node to be the target. 
4632	Refresh cycle permissible time / RCT setting value	Stores the refresh cycle permissible time (value of 120 % of 1 cycle).
4633	Current value of refresh cycle	Stores the measured value for one cycle of the node to be the target.
4634	Maximum value of refresh cycle	
4635	Minimum value of refresh cycle	
4636 to 5119	System area	-

A

Device profile acquisition area

After execution of message transmission, the device profile is read, and the device profile data of the target node is stored as continuous data at addresses 5120 to 5631 (decimal number).

For the device profile read of the message transmission, refer to ☞Page 84 Device profile read.

For details, refer to ☞Page 247 Profile Supplement.

Parameter name		Name characters		Data type	Parameter contents	
		Length	Characters	[Type]	Length	Characters
SysPara	Device profile common specification version	6	"COMVER"	INTEGER	1	1
	System parameter identification characters	2	"ID"	PrintableString	7	"SYSPARA"
	System parameter revision number	3	"REV"	INTEGER	1	0
	System parameter revision date	7	"REVDATE"	[INTEGER], 2, (0001-9999), [INTEGER], 1, (01-12), [INTEGER], 1, (01-31)	2 1 1	2018 01 1
	Device category	10	"DVCATEGORY"	PrintableString	3	"PLC"
	Vendor name	6	"VENDOR"	PrintableString	10	"MEE "
	Device model name	7	"DVMODEL"	PrintableString	10	″ER-1FL2-T ″

Log information acquisition area

After execution of message transmission, the log information read, this area stores the log information of the target node.
For the log information of the message transmission, refer to ☞Page 86 Log information read.

Buffer memory structure

Address (Decimal)	Name	Size (word)
5632 to 5655	Send and receive	24
5656 to 5679	Frame types	24
5680 to 5703	Cyclic ransmission	24
5704 to 5727	Message transmission	24
5728 to 5751	ACK related	24
5752 to 5775	Token related	24
5776 to 5799	Status 1	24
5800 to 5823	Status 2	24
5824 to 6143	System area	320

Details

■Send and receive

Stores log information related to send and receive.

Address (Decimal)	Name	Description
5632 to 5633	Totaling socket send count	Stores the accumulated count of sending to transmission line.
5634 to 5635	Totaling socket send error count	Stores the accumulated count of send errors detected at the transmission line.
5636 to 5637	Ethernet send error count	Stores the accumulated count of send errors detected at the data link and physical layer.
5638 to 5643	System area	-
5644 to 5645	Total receive count	Stores the accumulated count of receive signals to the transmission line.
5646 to 5647	Total receive error count	Stores the accumulated count of receive errors detected at the transmission line.
5648 to 5649	Ethernet receive error count	Stores the accumulated count of receive errors detected at the data link and physical layer.
5650 to 5655	System area	-

■Frame types

Stores the log information related to the frame types.

Address (Decimal)	Name	Description
5656 to 5657	Token send count	Stores the accumulated count of tokens sent (token + cyclic).
5658 to 5659	Cyclic frame send count	Stores the accumulated count of cyclic frames sent.
5660 to 5661	1:1 message frame send count	Stores the accumulated count of 1:1 message frames sent.
5662 to 5663	1:n message send count	Stores the accumulated count of 1:n (broadcast) message frames sent.
5664 to 5667	System area	-
5668 to 5669	Token receive count	Stores the accumulated count of local node address tokens (token + cyclic) received.
5670 to 5671	Cyclic frame receive count	Stores the accumulated count of cyclic frames received.
5672 to 5673	1:1 message frame receive count	Stores the accumulated count of local node address 1:1 message frames received.
5674 to 5675	1:n message frame receive count	Stores the accumulated count of 1:n (broadcast) message frames received.
5676 to 5679	System area	-

■Cyclic transmission

Stores log information related to cyclic transmission.

Address (Decimal)	Name	Description
5680 to 5681	Cyclic frame receive error count	Stores the accumulated count of cyclic frame receive error detections.
5682 to 5683	Cyclic address size error count	Stores the accumulated count of address size error detections in the cyclic frame.
5684 to 5685	Cyclic CBN error count	Stores the accumulated count of CBN (block number) error detections in the cyclic frame.
5686 to 5687	Cyclic TBN error count	Stores the accumulated count of TBN (number of total blocks) error detections in the cyclic frame.
5688 to 5689	Cyclic BSIZE error count	Stores the accumulated count of BSIZE (data size including frame header) error detections in the cyclic frame.
5690 to 5703	System area	-

■Message transmission

Stores log information related to message transmission.

Address (Decimal)	Name	Description
5704 to 5705	Message transmission resend count	Stores the accumulated count of resends in the message frame.
5706 to 5707	Message transmission resend over count	Stores the accumulated count of resend over in the message frame.
5708 to 5717	System area	-
5718 to 5719	Message transmission receive error count	Stores the accumulated count of receive error detections in the message frame.
5720 to 5721	Message transmission communication number error count	Stores the accumulated count of communication number error detections in the message frame.
5722 to 5723	Message transmission resend recognition count	Stores the accumulated count of resend recognition in the message frame.
5724 to 5727	System area	-

■ACK related

Stores log information related to ACK.

Address (Decimal)	Name	Description
5728 to 5729	ACK error count	Stores the accumulated count of ACK header error detections.
5730 to 5731	Serial number version error count	Stores the accumulated count of serial number version error detections (mis-match detection).
5732 to 5733	Serial number error count	Stores the accumulated count of serial number error detections (non-continuous detection).
5734 to 5735	Node number error count	Stores the accumulated count of node number error detections.
5736 to 5737	TCD error count	Stores the accumulated count of TCD (transaction code) error detections
5738 to 5751	System area	-

■Token related

Stores log information related to token.

Address (Decimal)	Name	Description
5752 to 5753	Token multiplexing recognition count	Stores the accumulated count of optional node address (including local node address) tokens detected while the token is being held.
5754 to 5755	Token destruction count	Stores the accumulated count of node address tokens having a value that is less than that of local node while the token is being held.
5756 to 5757	Token resend count	Stores the accumulated count of token resends.
5758 to 5763	System area	-
5764 to 5765	Token holding time out count	Stores the accumulated count of time out detections for token hold time out time (value that does not exceed the token monitoring time out time).
5766 to 5767	Token monitoring time out count	Stores the accumulated count time out detections for token monitoring time out time.
5768 to 5775	System area	-

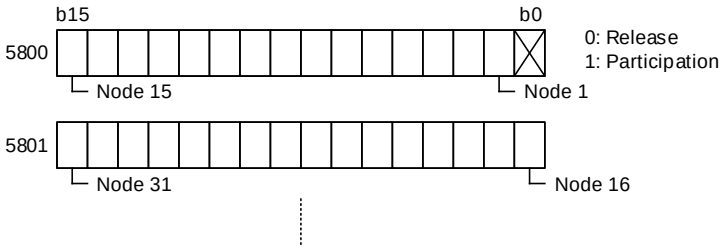
■Status 1

Store log information related to status 1.

Address (Decimal)	Name	Description
5776 to 5777	Total operating time	Stores the total operating time. (Unit: ms)
5778 to 5779	Frame wait status count	Stores the accumulated count that frame wait status has become.
5780 to 5781	Join count	Stores the accumulated count of local node joining.
5782 to 5783	Self-release count	Stores the accumulated count of self release (when token holding time for local node up is generated 3 consecutive times).
5784 to 5785	Release-by-skip count	Stores the accumulated count of release by skip (local node address token is pulled out 3 consecutive times).
5786 to 5787	Other node release count	Stores the accumulated count of detections of other node releases.
5788 to 5799	System area	-

■Status 2

Store log information related to status 2.

Address (Decimal)	Name	Description
5800 to 5815	Participation node list	Stores the token participation status at other node tokens in bit units. 
5816 to 5823	System area	-

A

Cyclic data area

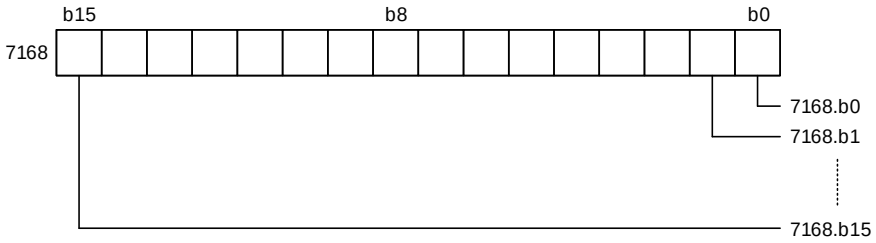
The cyclic data area consists of area 1 (bit area) and area 2 (word area).

Point

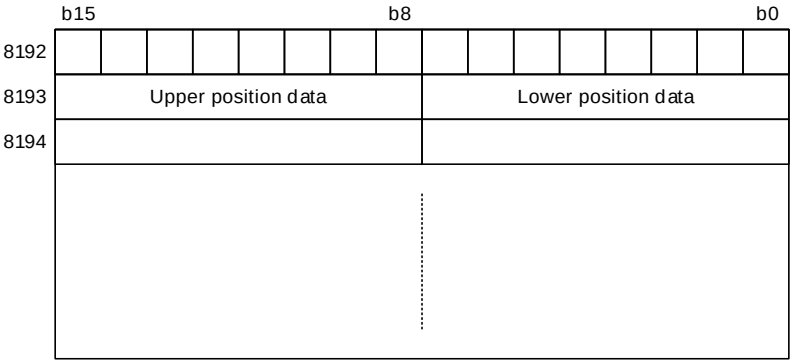
For the information on how to transfer data between the cyclic data area (areas 1, 2) in the buffer memory and programmable controller CPU devices, refer to the following:

- Transmission by the auto refresh setting of the module parameter in GX Works3
(☞Page 61 Auto refresh setting)
- Transmission by the sequence program (☞Page 80 Cyclic transmission)

■Area 1

Address (Decimal)	Name	Description
7168 to 7679	Read/Write area (8192bits)	Set bit cyclic data of the local node. Stores bit cyclic data of the other nodes 

■Area 2

Address (Decimal)	Name	Description
8192 to 16383	Read/Write area (8192words)	Set word cyclic data of the local node. Stores word cyclic data of the other nodes. 

Point

- The area allocated in the send area of the local node is the "write area" and the rest is the "read area".
- Write the data to be transferred to other station from host station into the "write area" which is the sending range of the local node. Do not write any data into the "read area" which is receiving range from other node. When data is written intentionally, the system may malfunction after completing the writing.
- Read area can be confirmed at other node network parameter area in buffer memory.
(address: 128 to 2175)
(☞Page 175 Other node network parameter area)

Message data area

The message data area sets and stores the data related to transparent type message transmissions.
For the transparent type message transmission, refer to ☞Page 82 Message transmission.
The message data area has a send area and a receive area.

■Send area

Data such as the target node number and message data to be transmitted is set in the send area.

Address (Decimal)	Name	Description
24576	Target node number	Set the node number of the target node. 0: Use prohibited 1 to 254: Target node number 255: All stations (Global) 256 and more: Use prohibited
24577	Transaction code	Sets the transaction code. For details on the transaction code, refer to the following. ☞Page 96 Other messages (Transparent type messages)
24578	Send data size (Byte/word length)	Sets the message data size to be sent. The data unit (byte or word) is selected in "Message Data Unit Select" of the network parameter. Word unit: 0 to 512 Byte unit: 0 to 1024
24579 to 25090	Send data area (512words)	Sets the size of the message data to be sent (up to 512 words or 1024 bytes).
25091 to 25599	System area	-

■Receive area

The send source node number, receive message data and other data is stored in the receive area.

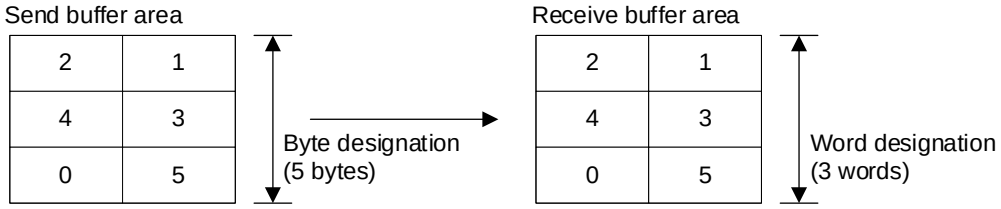
Address (Decimal)	Name	Description
25600	Send source node number	Stores the node number for the node to be the send source. If all stations, arrange so that there is no answer. 1 to 254: Send source node number 255: All stations (Global)
25601	Transaction code	Stores the transaction codes for received message data. For details on the transaction code, refer to the following. ☞Page 96 Other messages (Transparent type messages)
25602	Receive data size (Byte/word length)	Stores the size of the message data that has been received. The data unit (byte or word) is selected in "Message Data Unit Select" of the network parameter. Word unit: 0 to 512 Byte unit: 0 to 1024
25603 to 26114	Receive data area (512words)	Stores the size of the message data received (up to 512 words or 1024 bytes).
26115 to 26623	System area	-

Point

• When the data unit designation for send and receive is different

The follow explains when the send side is in byte units and the receive side is in word units.

When the send data number is an odd number, a zero (0) is stored at the end of the data stored in the receive buffer area.



Data number = odd

MEMO

Appendix 4 Status data details

This section explains the details about status data.

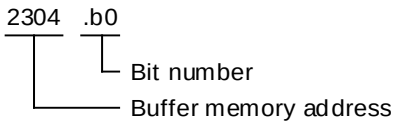
Status data stores the following data.

Type	Reference
Status bit	☞Page 188 Specified information area "CPU→FL-net (OPCN-2)"
	☞Page 189 Local node information area "FL-net (OPCN-2)→CPU"
Status word	☞Page 190 Specified information area "CPU→FL-net (OPCN-2)"
	☞Page 190 Message information area "CPU→FL-net (OPCN-2)"
	☞Page 191 Local node information area "FL-net (OPCN-2)→CPU"
	☞Page 193 Other node information area "FL-net (OPCN-2)→CPU "
	☞Page 195 Log information area "FL-net (OPCN-2)→CPU"
	☞Page 197 Message data area "FL-net (OPCN-2)→CPU"

Appendix 4.1 Status bit

This section explains the status data bit area.

The notation method for the buffer memory address is shown below.



Operation mode shows the valid/invalid for each mode of the online/offline.

Specified information area "CPU→FL-net (OPCN-2)"

○: Valid, -: Invalid

Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2304.b9	Log information clear	Indicates clearing of log information in buffer memory (Address: 2688 to 2872) *1 0: No clear instruction 1: Clear instruction	○	-

*1 Clear is executed during on status.

Local node information area "FL-net (OPCN-2)→CPU"

○: Valid，-: Invalid

Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2308.b3	Operation data	Indicates node switch of module. 0: On 1: Other than On	○	○
2308.b6	Setting data	Indicates node number switch of module. 0: Normal 1: Setting error (node number=0, 256 or more, or mode = other than test, online)	○	○
2308.b7	Module type	Indicates module type. (Fixed to 0) 0: ER-1FL2-T	○	○
2308.b8	Local node communication status	Indicates local node communication (token participation) status. 0: Normal 1: Error	○	-
2308.bA	Local node CPU status 1	Indicates local node iQ-R CPU self-diagnosis result. 0: Normal 1: WARNING	○	-
2308.bB	Local node CPU status 2	Indicates local node iQ-R CPU self-diagnosis result. 0: Normal 1: ALARM	○	-
2309.b0	Node initialization status	Indicates the initialization completion status of the FL-net module. 0: Completed 1: Not completed	○	-
2309.b1	Network parameter setting status	Indicates network parameter setting status from iQ-R CPU. 0: Setting complete 1: Setting not complete	○	-
2309.b2	Network parameter data	Indicates receive network parameter data. 0: Normal 1: Setting error	○	-
2309.b8	Receive signal wait status (waiting for network participation)	Indicates local node receive signal wait status. 0: No receive signal wait 1: Receive signal wait	○	-
2309.b9	Token monitoring time out error status	Indicates token transmission monitoring time out error status. 0: Normal 1: Token monitoring time out error	○	-
2309.bA	Node number multiplexing detection status	Indicates whether or not local node number duplicates other node number. 0: Normal 1: Duplicate node number detected	○	-
2309.bB	Area 1 address multiplexing detection signal	Indicates whether or not local node common memory area 1 (bit area) duplicates other node common memory area. 0: Normal 1: Duplicate address detected	○	-
2309.bC	Area 2 address multiplexing detection signal	Indicates whether or not local node common memory area 2 (word area) duplicates other node common memory area. 0: Normal 1: Duplicate address detected	○	-
2309.bD	Invalid communication detected status	Indicates the local node communication status during data linking participation. 0: Communication valid (the same frame received) 1: Communication invalid (different frame received)	○	-
2315.bF	Message transmission data	Indicates whether a message transmission error is present or not. 0: No error 1: Error occurred	○	-

Appendix 4.2 Status word details

This section explains the status data word range.

Specified information area "CPU→FL-net (OPCN-2)"

○: Valid, -: Invalid

Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2435	Other node number setting for network parameter use	Indicates node number if reading network parameter/join node information for other node. (*1) 1 to 254: Node number ■b15 (Top bit) 0: Network parameter data read 1: join node data read	○	-
2436	Other node number setting for device profile	Indicates node number if reading device profile for other node. 1 to 254: Node number	○	-
2437	Other node number setting (1) for log information	Indicates to node number if clearing log information for other node. 1 to 254: Node number	○	-
2438	Other node number setting (2) for log information	Indicates to node number if clearing log information for other node. 1 to 254: Node number	○	-

*1 The points of difference between network parameter information read and join node information read are as follows.
Network parameter information read: Message issued and acquired by target node and responds.
Join node information read: Responds based on data in cyclic frame.

Message information area "CPU→FL-net (OPCN-2)"

○: Valid, -: Invalid

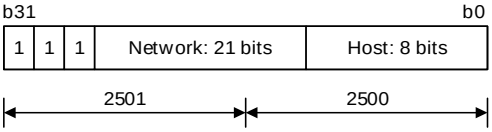
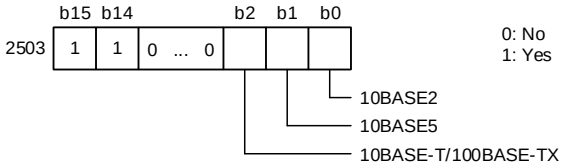
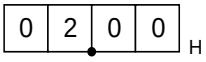
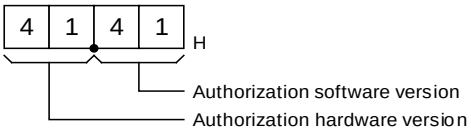
Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2464	Response message classification	Indicates the message classification (status) of message transmission using message send area. 00H: Normal message response or request message. 01H: Error message response 02H: Not supported (*1)	○	-
2465	Virtual address space data size	Indicates data size (*2) when using virtual address space in the transmission of message used for message send area. Range: 0H (Does not use virtual address space), 1H to FFFFH	○	-
2466 to 2467	Virtual address space start address	Indicates the start address (32 bits) when using virtual address space in the transmission of message used for message send area. Range: 0H to FFFFFFFFH	○	-

*1 This is the responding message when own system receives message it does not support.

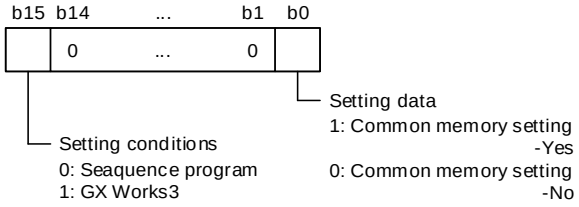
*2 The virtual address space data size is dependent on the transaction code without relation to the message data unit selection made in the network parameter settings.

Local node information area "FL-net (OPCN-2)→CPU"

○: Valid, -: Invalid

Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2498	Node number	Indicates the node number of the FL-net module. 1 to 249: Node number	○	○
2499	Mode switch	Indicates the FL-net module mode switch status. 0: On line (10Mbps, half duplex) 1: Off line 2: Loopback test 3: Hardware test 4: On line (Auto negotiation) Other: Setting error	○	○
2500 to 2501	IP address	Indicates FL-net module address status. 	○	○
2502	Intelligent function module switch setting status	Indicates setting status of switches. 0: Normal 1 to: Error code	○	○
2503	Module recognition	Indicates whether the local node module has an Ethernet interface. 	○	○
2504	Local node communication status	Indicates data link (cyclic transmission) of local node. 0: During data link 3: Disconnecting (Network parameter error detection) 4: Disconnecting (Token monitoring time out) 5: Disconnecting (Node number multiplexing detection) 6: Disconnecting (Receive wait status) 7: Disconnecting (invalid communication detected) FE: Initializing FFF: Resetting	○	○
2505	FL-net (OPCN-2) protocol version	Indicates FL-net (OPCN-2) protocol version. Ex. The version is 2.00 	○	○
2506	FL-net (OPCN-2) authorization version	Indicates FL-net (OPCN-2) authorization version. Ex. When the versions of software and hardware are A 	○	○
2507	Local node CPU status	Indicates results of local node CPU self diagnosis. 0: Normal 1 or more: Error code	○	-
2512	Maximum communication node number	Indicates the maximum node number of node normally communicating (token participation).	○	-

A

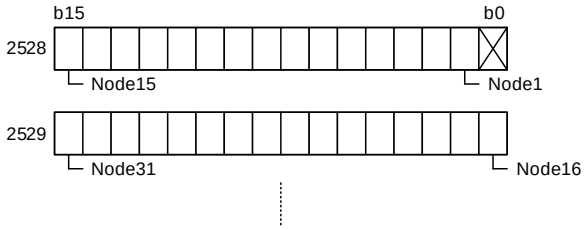
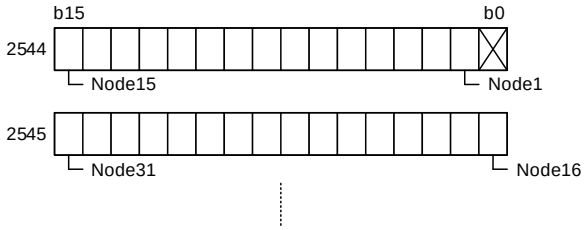
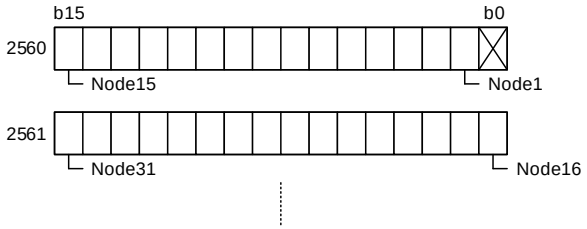
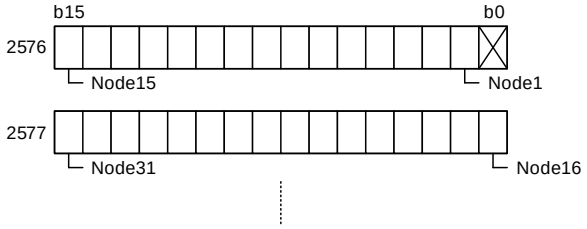
Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2514	Network parameter setting status	Indicates the network parameter setting contents status. 0: Normal 1 or more: Error code	○	-
2515	Network parameter read results	Indicates network parameter read results. 0: Normal 1 or more: Error code	○	-
2516	Device profile read Results	Indicates device profile read results. 0: Normal 1 or more: Error code	○	-
2517	Log information clear results	Indicates log information a clear results. 0: Normal 1 or more: Error code	○	-
2518	Log information read results	Indicates log information read results. 0: Normal 1 or more: Error code	○	-
2519	Transparent message send results	Indicates transparent message send results. 0: Normal 1 or more: Error code	○	-
2520	Token monitoring time	Indicates maximum token monitoring time for each node that has been set by the network parameters. 0: No setting 1 to 255: Setting (Unit: ms)	○	-
2521	Maximum permissible frame interval	Indicates maximum permissible frame intervals for each node that has been set by the network parameters. 0: No setting 1 to 50: Setting (Unit: 100μs)	○	-
2522	Refresh cycle permissible time / RCT setting value	Indicates refresh cycle time of 120% of value. (Unit: ms)	○	-
2523	Network parameter data	Stores the network parameter data. (Network parameter setting status: Enabled when 2309.b1 is off (0)) 	○	-
2524	Message unit data	Stores the unit of the data handled by the message area. 1: Word unit 2: Byte unit	○	-
2525	Current value refresh cycle time	Indicates refresh cycle time during data link (cyclic transmission) execution. (Unit: ms)	○	-
2526	Maximum value refresh cycle time	Indicates maximum refresh cycle time during data link (cyclic transmission) execution. (Unit: ms)	○	-
2527	Minimum value refresh cycle time	Indicates minimum refresh cycle time during data link (cyclic transmission) execution. (Unit: ms)	○	-

Point

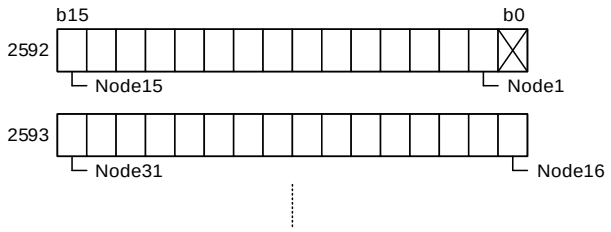
When the error code is in 4000, refer to the error code list for the CPU module.

Other node information area "FL-net (OPCN-2)→CPU "

○: Valid，-: Invalid

Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2528 to 2543	Participation node list	Indicates the token participation status at the other node in bits.  0: Participation 1: Release	○	-
2544 to 2559	Other node network parameter setting status	Indicates the network parameter setting status at the other node in bits. (*1)  0: Setting 1: No setting	○	-
2560 to 2575	Other node CPU execution status	Indicates the execution status of iQ-R CPU, etc., at the other node. (*1)  0: RUN status (RUN, STEP_RUN) 1: STOP status (STOP, PAUSE)	○	-
2576 to 2591	Other node CPU operation status (Low level error) *2	Indicates the results of self-diagnosis of iQ-R CPU, etc., at the other node. (*1)  0: Normal 1: Alarm	○	-

A

Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2592 to 2607	Other node CPU operation status (Medium, high level errors) *3	Indicates the results of self-diagnosis of iQ-R CPU, etc., at the other node. (*1)  0: Normal 1: Alarm	○	-

*1 Participation node only is target.

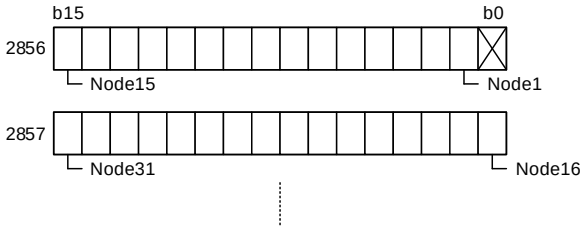
*2 Low level error is a error during which the CPU module continues to operate.

*3 Medium and high level errors are errors which stop the operation of the CPU module.

Log information area "FL-net (OPCN-2)→CPU"

○: Valid，-: Invalid

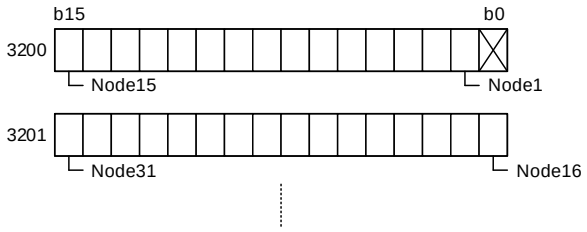
Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2688 to 2689	Totaling socket sending count	Indicates the accumulated count of sending to transmission line.	○	-
2690 to 2691	Totaling socket send error count	Indicates the accumulated count of send errors detected at the transmission line.	○	-
2692 to 2693	Ethernet send error count	Indicates the accumulated count of send errors detected at the data link and physical layer.	○	-
2700 to 2701	Total receive count	Indicates the accumulated count of receive signals to the transmission line.	○	-
2702 to 2703	Total receive error count	Indicates the accumulated count of receive errors detected at the transmission line.	○	-
2704 to 2705	Ethernet receive error count	Indicates the accumulated count of receive errors detected at the data link and physical layer.	○	-
2712 to 2713	Token send count	Indicates the accumulated count of tokens sent (token + cyclic).	○	-
2714 to 2715	Cyclic frame send count	Indicates the accumulated count of cyclic frames sent.	○	-
2716 to 2717	1:1 message frame send count	Indicates the accumulated count of 1:1 message frames sent.	○	-
2718 to 2719	1:n message frame send count	Indicates the accumulated count of 1:n (broadcast) message frames sent.	○	-
2724 to 2725	Token receive count	Indicates the accumulated count of local node address tokens (token + cyclic) received.	○	-
2726 to 2727	Cyclic frame receive count	Indicates the accumulated count of cyclic frames received.	○	-
2728 to 2729	1:1 message frame receive count	Indicates the accumulated count of local node address 1:1 message frames received.	○	-
2730 to 2731	1:n message frame receive count	Indicates the accumulated count of 1:n (broadcast) message frames received.	○	-
2736 to 2737	Cyclic frame receive error count	Indicates the accumulated count of cyclic frame receive error detection.	○	-
2738 to 2739	Cyclic address size error count	Indicates the accumulated count of address size error detection in the cyclic frame.	○	-
2740 to 2741	Cyclic CBN error count	Indicates the accumulated count of CBN (block number) error detection in the cyclic frame.	○	-
2742 to 2743	Cyclic TBN error count	Indicates the accumulated count of TBN (number of total blocks) error detection in the cyclic frame.	○	-
2744 to 2745	Cyclic BSIZE error count	Indicates the accumulated count of BSIZE (data size including frame header) error detection in the cyclic frame.	○	-
2760 to 2761	Message transmission resend count	Indicates the accumulated count of resends in the message frame.	○	-
2762 to 2763	Message transmission resend over count	Indicates the accumulated count of resend over in the message frame.	○	-
2774 to 2775	Message transmission receive error count	Indicates the accumulated count of receive error detections in the message frame.	○	-
2776 to 2777	Message transmission communication number error count	Indicates the accumulated count of communication number error detections in the message frame.	○	-
2778 to 2779	Message transmission resend recognition count	Indicates the accumulated count of resend recognition in the message frame.	○	-
2784 to 2785	ACK error count	Indicates the accumulated count of ACK header error detections.	○	-
2786 to 2787	Serial number version error count	Indicates the accumulated count of serial number version (*1) error detections (mis-match detection).	○	-
2788 to 2789	Serial number error count	Indicates the accumulated count of serial number (*1) error detections (non-continuous detection).	○	-

Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
2790 to 2791	Node number error count	Indicates the accumulated count of node number error detections.	○	-
2792 to 2793	TCD error count	Indicates the accumulated count of TCD (transaction code) error detections.	○	-
2808 to 2809	Token multiplexing recognition count	Indicates the accumulated count of optional node address (including local node address) tokens detected while the token is being held.	○	-
2810 to 2811	Token destruction count	Indicates the accumulated count of node address tokens having a value that is less than that of local node while the token is being held.	○	-
2812 to 2813	Token resend count	Indicates the accumulated count of token resends.	○	-
2820 to 2821	Token holding time out count	Indicates the accumulated count of time out detections for token holding time out time (value that does not exceed the token monitoring time out time).	○	-
2822 to 2823	Token monitoring time out count	Indicates the accumulated count time out detections for token monitoring time out time.	○	-
2832 to 2833	Total operating time	Indicates the total operating time. (Unit: ms)	○	-
2834 to 2835	Frame wait status count	Indicates the accumulated count that frame wait status has become.	○	-
2836 to 2837	Participation count	Indicates the accumulated count of local node participaiton	○	-
2838 to 2839	Self-release count	Indicates the accumulated count of self release (when token holding time for local node up is generated 3 consecutive times).	○	-
2840 to 2841	Release-by-skip count	Indicates the accumulated count of release by skip (local node address token is pulled out 3 consecutive times).	○	-
2842 to 2843	Other node release count	Indicates the accumulated count of detections of other node releases.	○	-
2856 to 2871	Participation node list	Indicates the token participation status at the other node in bits.  0: Release 1: Participation	○	-
2938 to 2939	Auto negotiation count	Indicates the number of auto negotiations occurred.	○	-

*1 This is message transfer frame serial numbers (serial numbers) and its start value. (serial versions)

Message data area "FL-net (OPCN-2)→CPU"

○: Valid, -: Invalid

Address (Decimal)	Name	Description	Operating mode	
			On line	Off line
3072	Response message classification	Stores the message classification (status) of message transmission using message send area. 00H: Normal message response or request message. 01H: Error message response 02H: Not supported (*1)	○	-
3073	Virtual address space data size	Stores data size (*2) when using virtual address space in the transmission of message used for message send area. Range: 0H (Does not use virtual address space) 1H to FFFFH	○	-
3074 to 3075	Virtual address space start address	Stores the start address (32 bits) when using virtual address space in the transmission of message used for message send area. Range: 0H to FFFFFFFFH	○	-
3200 to 3215	Other node token mode (version mismatch) status	Indicates the valid/invalid status of the participation request from other node in bits.  0: Communication valid (the same frame received) 1: Communication invalid (different frame received) * Valid when the local node communication status (904H.b8) is off.	○	-

*1 This is the responding message when own system receives message it does not support.

*2 The virtual address space data size is dependent on the transaction code without relation to the message data unit selection made in the network parameter settings.

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Appendix 5 Checking Serial number and Firmware version

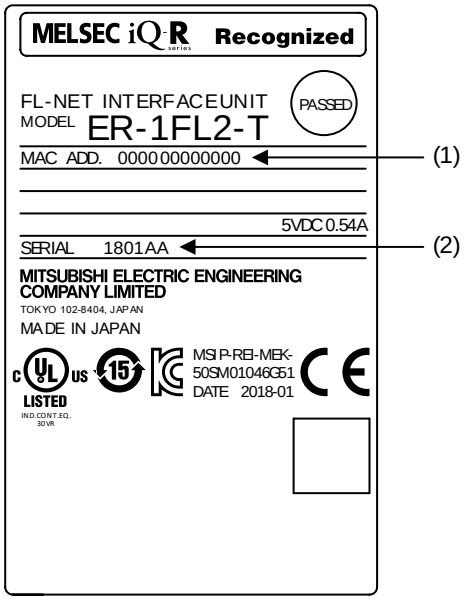
This section describes how to check the serial number and firmware version of a module.

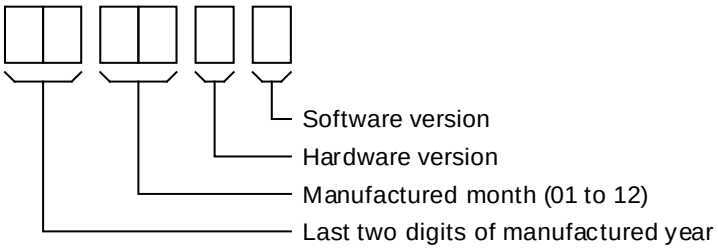
Checking on the module

■Rating plate

The rating plate is located on the side of the module.

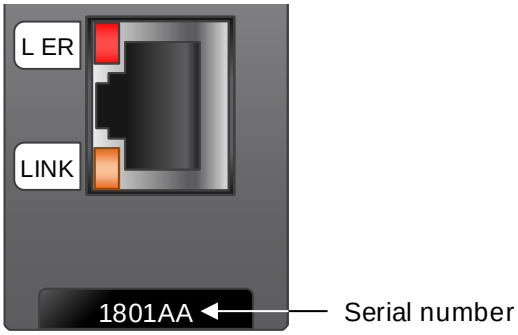
The serial number (6 digits) of the module is shown on the SERIAL field.



No.	Name	Description
(1)	MAC address	Indicates the MAC address of the FL-net module.
(2)	Serial number	Indicates the serial number of this module. The software version and hardware version can be checked with the last two digits of the serial number. 

■Serial number marking

The serial number (6 digits) of the module is printed on the marking on the front (at the bottom) of the module.

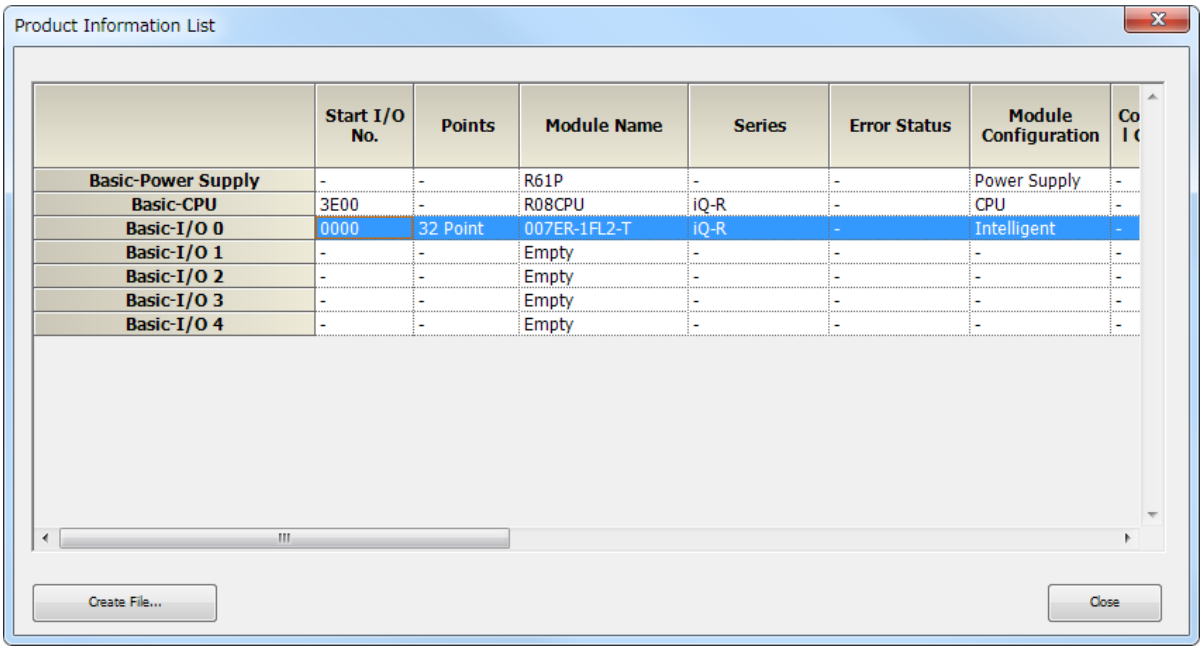


Checking with GX Works3

■Product information list

The firmware version of the module can be checked on the "Product Information List" window

[Diagnostics]⇒[System monitor]⇒[Product Information List] button



Point

- The serial number on the rating plate indicates the product management information.
- The firmware version displayed in the product information list of GX Works3 indicates the function information of the product. The function information is updated when a function is added.

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Appendix 6 EMC and Low Voltage Directives

Appendix 6.1 About programmable controller system manufactured by Mitsubishi

For the compliance with the EMC and Low Voltage Directives of the customer's product by assembling a product manufactured by Mitsubishi into a programmable controller manufactured by Mitsubishi that supports the EMC and Low Voltage Directives, refer to one of the following manuals.

MELSEC iQ-R Module Configuration Manual

Safety Guidelines (This manual is supplied with the base unit manufactured by Mitsubishi.)

For the products compliant with the EMC and Low Voltage Directives of this product, the CE-mark is printed on the rating plate of the product.

• Authorized representative in Europe

The sales representative in EU member states is:

Company: MITSUBISHI ELECTRIC EUROPE B.V.

Address: Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany

Appendix 6.2 About this product

The following measures are necessary for the compliance with the EMC and Low Voltage Directives of this product.

A module is an open-type device and must be placed in a control panel to ensure safety as well as effective shielding of electromagnetic noise from the module.

Measures to comply with the EMC Directive

The EMC Directive sets requirements for emission (conducted and radiated electromagnetic interference emitted by a product) and immunity (the ability of a product not to be influenced by externally generated electromagnetic interference).

This section describes the precautions for machinery constructed with the FL-net modules to comply with the EMC Directive.

These precautions are based on the requirements of the EMC Directive and the harmonized standards. However, they do not guarantee that the entire machinery constructed according to the descriptions complies with the EMC Directive.

The manufacturer of the machinery must determine the testing method for compliance and declare conformity to the EMC Directive.

EMC Directive related standards

■Emission requirements

Standard: EN61131-2: 2007

Test item	Test description	Value specified in standard
CISPR16-2-3 Radiated emission *2	The electromagnetic wave emitted by the product to the external space is measured.	• 30M to 230MHz QP: 40dBμV/m(measured at 10m distance)*1 • 230M to 1000MHz QP: 47dBμV/m(measured at 10m distance)
CISPR16-2-1, CISPR16-1-2 Conducted emission *2	The noise level which the product emits to the power line is measured	• 150k to 500kHz QP: 79dB, Mean：66dB *1 • 500k to 30MHz QP: 73dB, Mean：60dB

*1 QP: Quasi-Peak value, Mean: Average value

*2 Programmable controller is an open-type device and must be placed in a conductive control panel or similar type of enclosure. The tests were conducted with the programmable controller manufactured by Mitsubishi installed in a control panel, applying the maximum rated input voltage of the power supply module.

■Immunity requirements

Standard: EN61131-2: 2007

Test item	Test description	Value specified in standard
EN61000-4-2 Electrostatic discharge immunity *1	An electrostatic discharge is applied to the enclosure of the equipment.	• 8kV Air discharge • 4kV Contact discharge
EN61000-4-3 Radiated, radio-frequency, electromagnetic field immunity *1	An electric field is radiated to the product.	80% AM modulation @1kHz • 80M to 1000MHz: 10V/m • 1.4G to 2.0GHz: 3V/m • 2.0G to 2.7GHz: 1V/m
EN61000-4-4 Fast transient burst immunity *1	Burst noise is applied to power lines and signal lines.	• AC/DC power: 2kV • Communication lines: 1kV
EN61000-4-5 Surge immunity *1	Lightning surge is applied to power lines and signal lines.	• AC power: 2kV CM, 1kV DM • Communication lines: 1kV CM
EN61000-4-6 Conducted RF immunity *1	High-frequency noise is applied to power lines and signal lines.	0.15 to 80MHz, 80% AM modulation @1kHz, 10Vrms
EN61000-4-8 Power-frequency magnetic field immunity *1	The product is immersed in the magnetic field of an induction coil.	50/60Hz, 30A/m
EN61000-4-11 Voltage dips and interruptions immunity *1	Power voltage is momentarily interrupted.	• 0%, 0.5 periods, starting at zerocrossing • 0%, 250/300 periods (50/60Hz) • 40%, 10/12 periods (50/60Hz) • 70%, 25/30 periods (50/60Hz)

*1 Programmable controller is an open-type device and must be placed in a conductive control panel or similar type of enclosure. The tests were conducted with the programmable controller installed in a control panel.

Ethernet cable

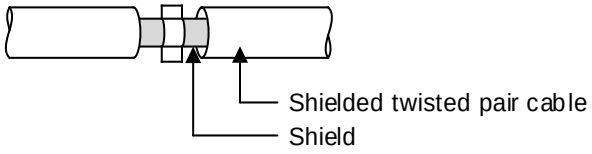
Use a shielded cable for the Ethernet cable to be extended out of the control panel from the module. If a shielded cable is not used or not grounded properly, the noise immunity will not meet the requirement.

■Ethernet cable

The following describes the precautions for the use of the Ethernet cable.

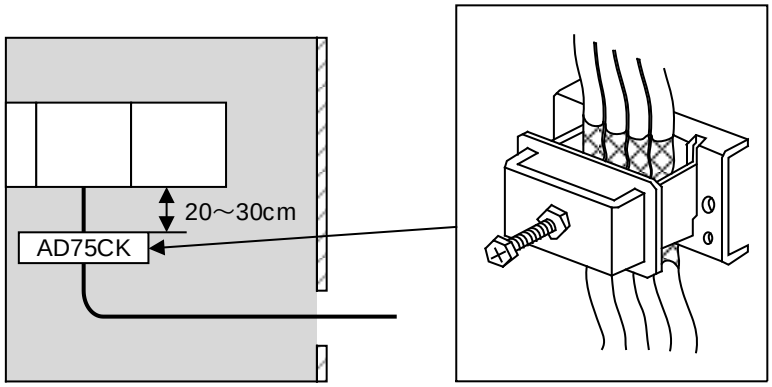
・The Ethernet cable is a shielded cable.

Strip a part of the jacket of the cable as shown below and ground the exposed shield to the largest area.



■Grounding cables with a cable clamp

Use shielded cables for Ethernet cables and ground the shields of the Ethernet cables to the control panel with an AD75CK cable clamp (manufactured by Mitsubishi). Ground the shields within 20 to 30cm from the module.



Measures to comply with the Low Voltage Directive

These FL-net module is not targeted for the Low Voltage Directive compliance because the circuits in this product operates at the 24V DC or less rated voltage.

MEMO

Appendix 7 Replacement from MELSEC-Q

The sequence programs created for the MELSEC-Q series and network devices can be used.

Restriction

The FL-net(OPCN-2)Version 3 and FL-net(OPCN-2)Version 1.00 are not compatible and mixed connection is unavailable.

Devices to be replaced

The following devices manufactured by Mitsubishi can be replaced.

- QJ71FL71-T-F01

Availability

Item	Description *3
Sequence program	Can be used *1
Network devices for when the following modules manufactured by Mitsubishi are used *2 • QJ71FL71-T • QJ71FL71-T-F01	Can be used
Network devices for when the following modules manufactured by Mitsubishi are used *2 • QJ71FL71-B5 • QJ71FL71-B2 • QJ71FL71-B5-F01 • QJ71FL71-B2-F01	Cannot be used

*1 Unit parameters can not be inherited.

*2 The network devices are such as a hub and a cable.

*3 Refer to the following restrictions.

Restriction

The following FL-net(OPCN-2) Version 3 module and FL-net(OPCN-2) Version1.00 module cannot be communicated since the FL-net protocols are different.

■FL-net(OPCN-2) Version 1.00 module

The following devices manufactured by Mitsubishi, or devices with Version 1.00 manufactured by other companies

- QJ71FL71-T
- QJ71FL71-B5
- QJ71FL71-B2

■FL-net(OPCN-2) Version 2 module

The following devices manufactured by Mitsubishi, or devices with Version 2.00 and 3 manufactured by other companies

- QJ71FL71-T-F01
- QJ71FL71-B5-F01
- QJ71FL71-B2-F01

Differences from MELSEC-Q series FL-net modules

Item		MELSEC-Q series FL-net module (manufactured by Mitsubishi) QJ71FL71-T-F01	MELSEC iQ-R compatible ER-1FL2-T (This module)	Differences
FL-net version		Version 2.00	Version 3 class 1	-
LED indication	Send/receive	TX (sending) RX (receiving)	COM (sending/receiving)	Sending and receiving status is indicated by the COM LED.
	Node number	Not supported	Supported	The local node number can be checked.
	RJ45 connecter	Not supported	L ER (connection error status) LINK (link status)	The communication status of FL-net can be checked.
Module function block		Not supported	Supported	The program creating procedure of MELSEC iQ-R-series is applied.
Module label		Not supported	Supported	
Buffer memory		Same excluding model-specific items		The buffer memory structure is the same excluding the following items. ・Manufacturer name ・Model name ・Module identify bit
Support message		Same		-
Transaction code		Same		-
Auto refresh function	Cyclic transmission	Supported	Not supported	The auto refreshing function does not support cyclic transmission areas. Refresh the data in the areas using ladder diagrams or module function blocks. ☞Page 106 Program example 📖 FL-net (OPCN-2) Interface module ER-1FL2-T FB Library reference manual
Error code	FL-net module	C000H to CFFFH	1000H to 3FFFH	The error codes are assigned according to the MELSEC iQ-R-series common system. ☞Page 124 Confirming errors using error code
	CPU module	3E8H to 4FFFH	4000H to 4FFFH	
GX Works3	Error history	Not supported	Supported	Details and measures of errors are displayed.
	Event history	Not supported	Supported	Module communication status including the information of link-up, link-down, and message transmission errors is stored.

Appendix 8 Guide to System Configuration

Appendix 8.1 Overview of Ethernet

Ethernet is a standard for Local Area Network (LAN) used for communication among computers, printers and other such devices. It sets the standards for formatting the data for communication, the cables, connectors and other components.

Ethernet standards are established by IEEE 802.3 Ethernet Working Group of IEEE. Until now, the standards such as 10BASE5, 10BASE2, 10BASE-T, 100BASE-TX, and 100BASE-FX have been established.

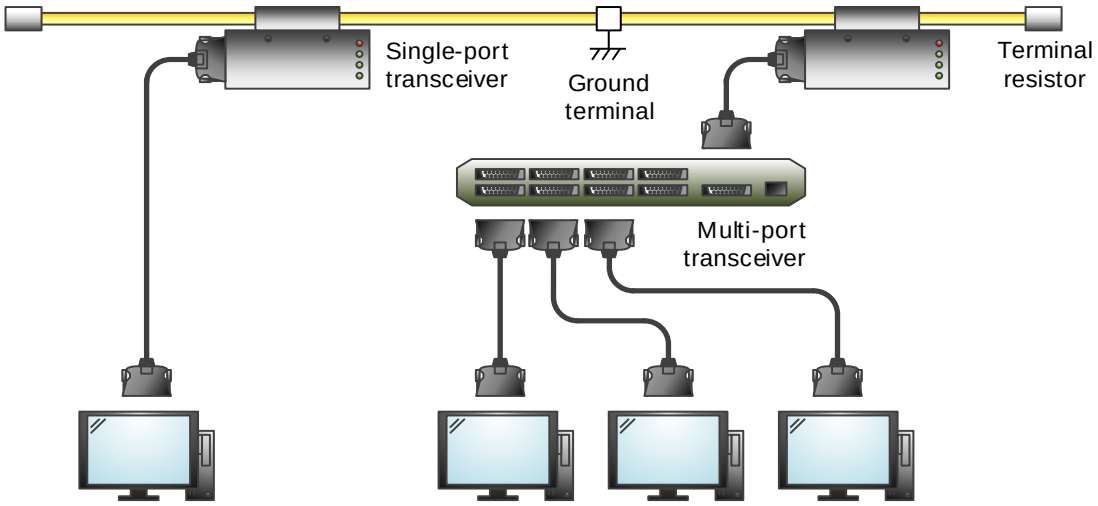
Appendix 8.2 10BASE5 specifications

10BASE5 is a method of connecting an Ethernet system with a coaxial cable that is approximately 10mm in diameter (often called thick cable or yellow cable). The "10" as in 10BASE5 indicates the transmission speed which is 10Mbps. The "BASE" indicates that the transmission method is a base band format. And the "5" indicates that the transmission distance of the main cable is 500m.

A transceiver is connected to the coaxial cable when Personal computer and other such equipment is connected to the system. A transceiver cable, commonly called an AUI cable, is used for the connection between the equipment and the transceiver.

Since the thick cables of the 10BASE5 system make it difficult to layout a network, it is not used in offices very often. It is most commonly used as the main line network for applications requiring transmission over long distances.

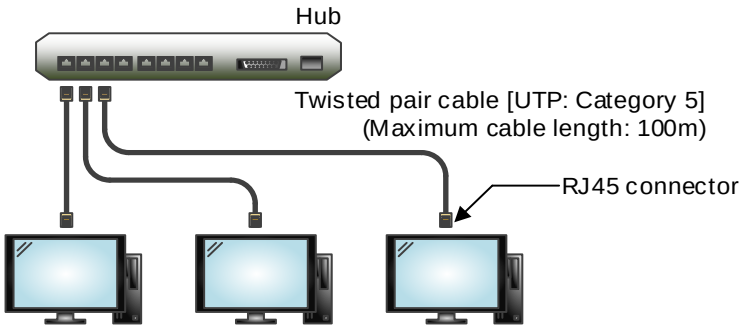
The following shows the example of 10BASE5 configuration.



- If a multi-port transceiver is used, the maximum overall AUI cable length from the coaxial cable to the terminal is 50 m.
- Multi-port transceiver cascade connections can be up to 2 levels.

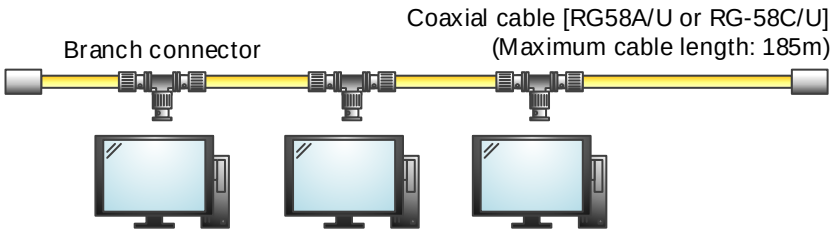
Appendix 8.3 10BASE-T/100BASE-TX specifications

10BASE-T/100BASE-TX is a method of connecting an Ethernet system with twisted pair cables.
The "10" as in 10BASE-T indicates the transmission speed which is 10Mbps. The "BASE" indicates that the transmission method is a base band format. And the "-T" indicates that the twisted pair cable is used as the transmission medium.
10BASE-T/100BASE-TX networks require a hub in a star configuration for connecting personal computer and other such equipment and the equipment cannot be directly connected to each other. The cable from the hub to each piece of equipment can be up to 100m long.
Since the cables of the 10BASE-T/100BASE-TX are thin and relatively easy to route and since each piece of equipment can be connected or disconnected to the network individually, this is a popular network system for office applications.
The following shows the example of 10BASE-T configuration.



Appendix 8.4 10BASE2 specifications

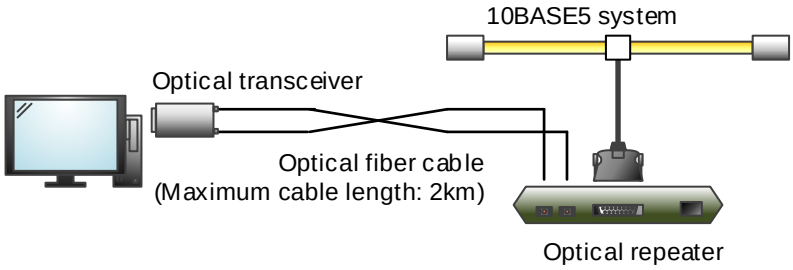
10BASE2 is a method of connecting an Ethernet system with a coaxial cable that is approximately 5mm in diameter (often called the thin cable). The "10" as in 10BASE2 indicates the transmission speed which is 10Mbps. The "BASE" indicates that the transmission method is a base band format. And the "2" indicates that the transmission distance of the main cable is 185m (approximately 200m).
Each personal computer and other equipment are connected with a T-shaped branch connector on the BNC cable. The coaxial cable is connected to both ends of this Tshaped branch connector.
The following shows the example of 10BASE2 configuration.



Appendix 8.5 Other Ethernet specifications

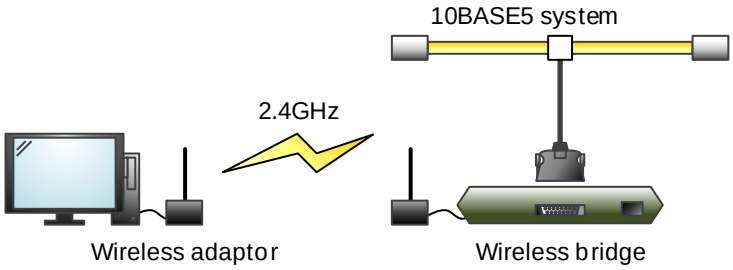
Optical Ethernet

Optical Ethernet uses fiber optics as the medium of transmission. It can transmit data in distance exceeding 500m and is resistant to electrical noise. IEEE802.3 has standardized the optical Ethernet connection method as 10BASE-FP, 10BASE-FB, 10BASE-FL, 100BASE-FX, 1000BASE-LX and 1000BASE-SX.
The following shows the example of optical Ethernet configuration.



Wireless Ethernet

Wireless LAN uses radio waves or infrared rays as the medium of transmission.
It allows portable devices to be connected to a LAN system. The standardization for wireless LAN is planned to process by IEEE wireless LAN working group: IEEE802.11. Wireless LAN has a different MAC layer protocol which necessitates the use of a bridge for interconnection.
The following shows the example of wireless LAN configuration.

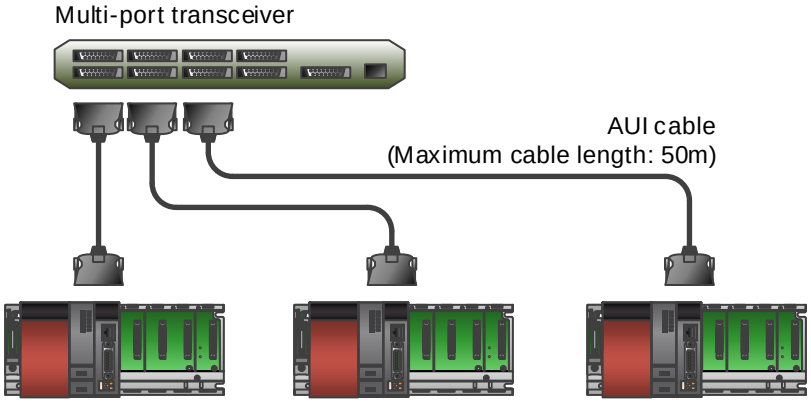


Appendix 9 Examples of System Configuration

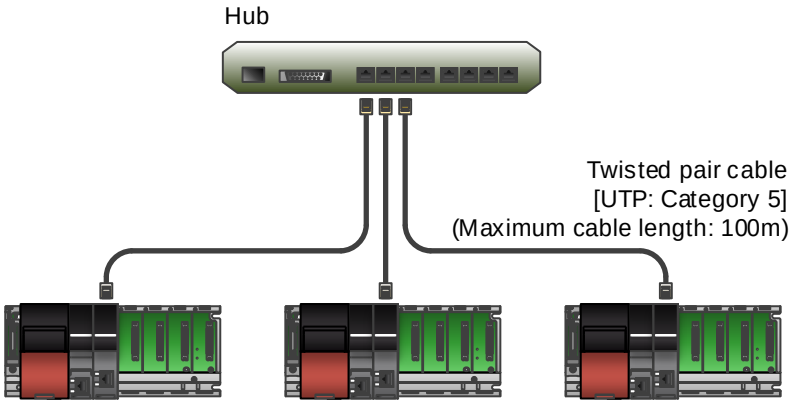
Appendix 9.1 Small-scale configuration

A network system can be configured by connecting equipment to a single multi-port transceiver or a HUB.

When using a multi-port transceiver



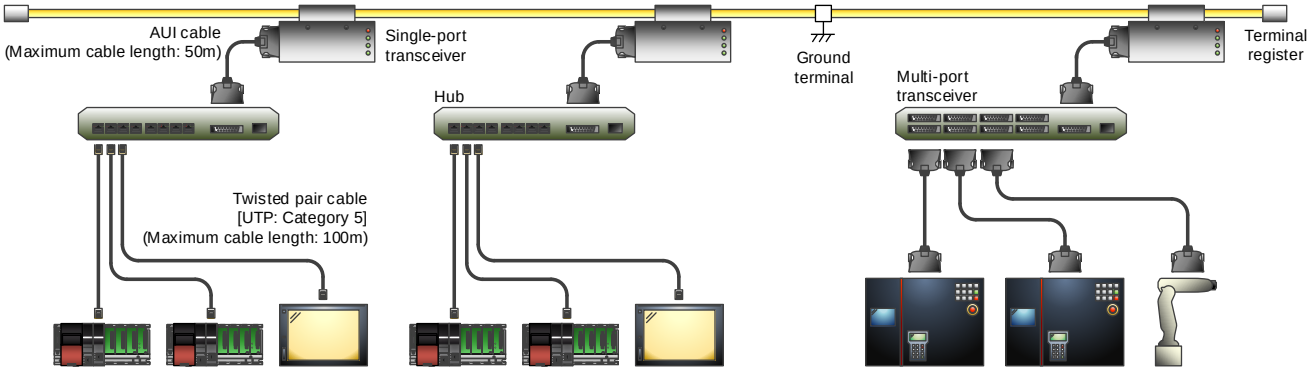
When using a HUB



A

Appendix 9.2 Basic configuration

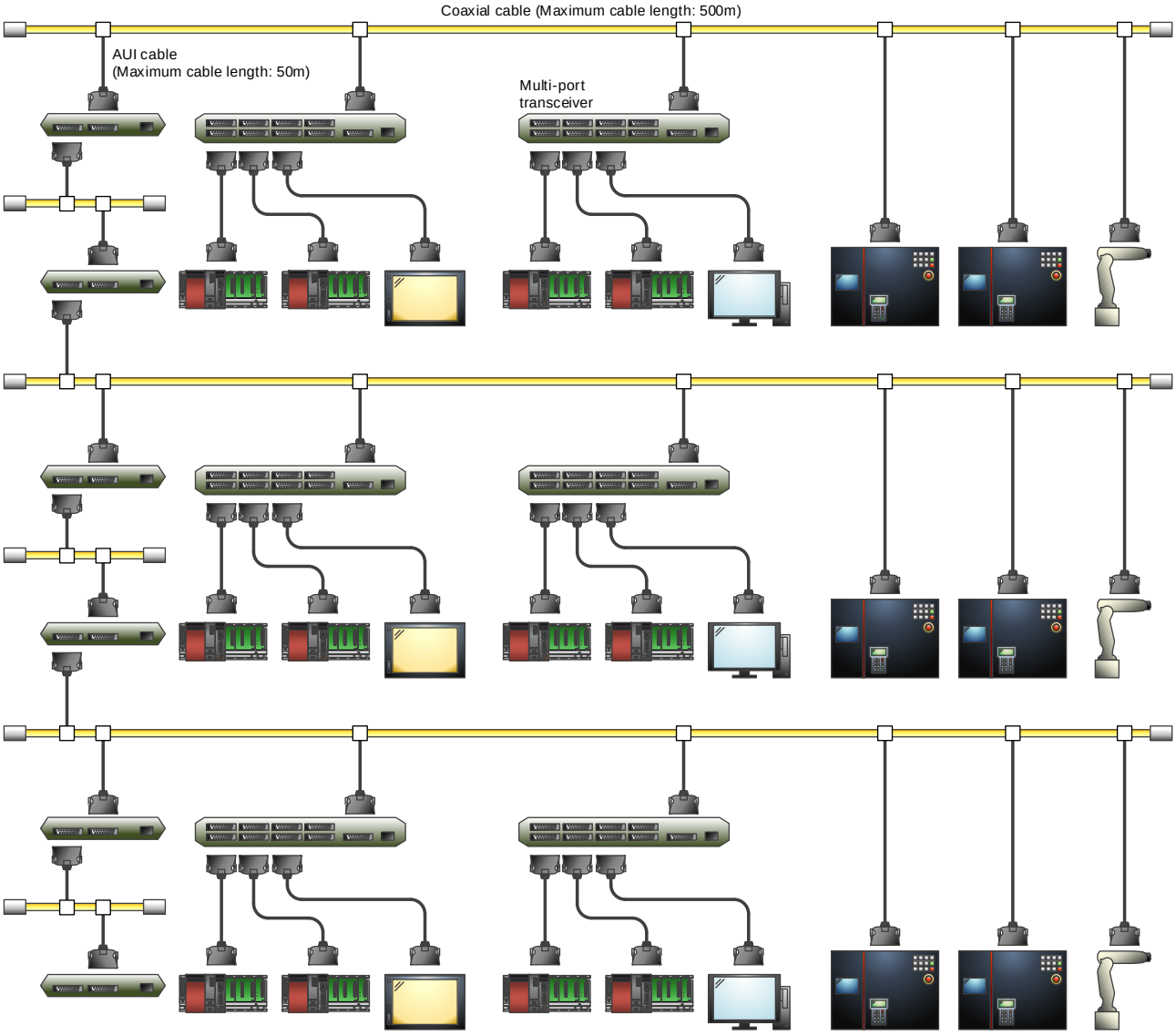
Several multi-port transceivers or HUBs are connected to one coaxial cable so that the network can consist of a large number of equipment.



- Up to a total of four repeaters or HUBs can be installed between any two given terminals.
- If a multi-port transceiver is used, the maximum overall length of the AUI cable from the coaxial cable to the terminal is 50 m.
- Multi-port transceiver cascade connections can be up to 2 levels.

Appendix 9.3 Large-scale configuration

Several 10BASE5 networks sections are connected by repeaters to form a network system that can incorporate several hundred pieces of equipment.

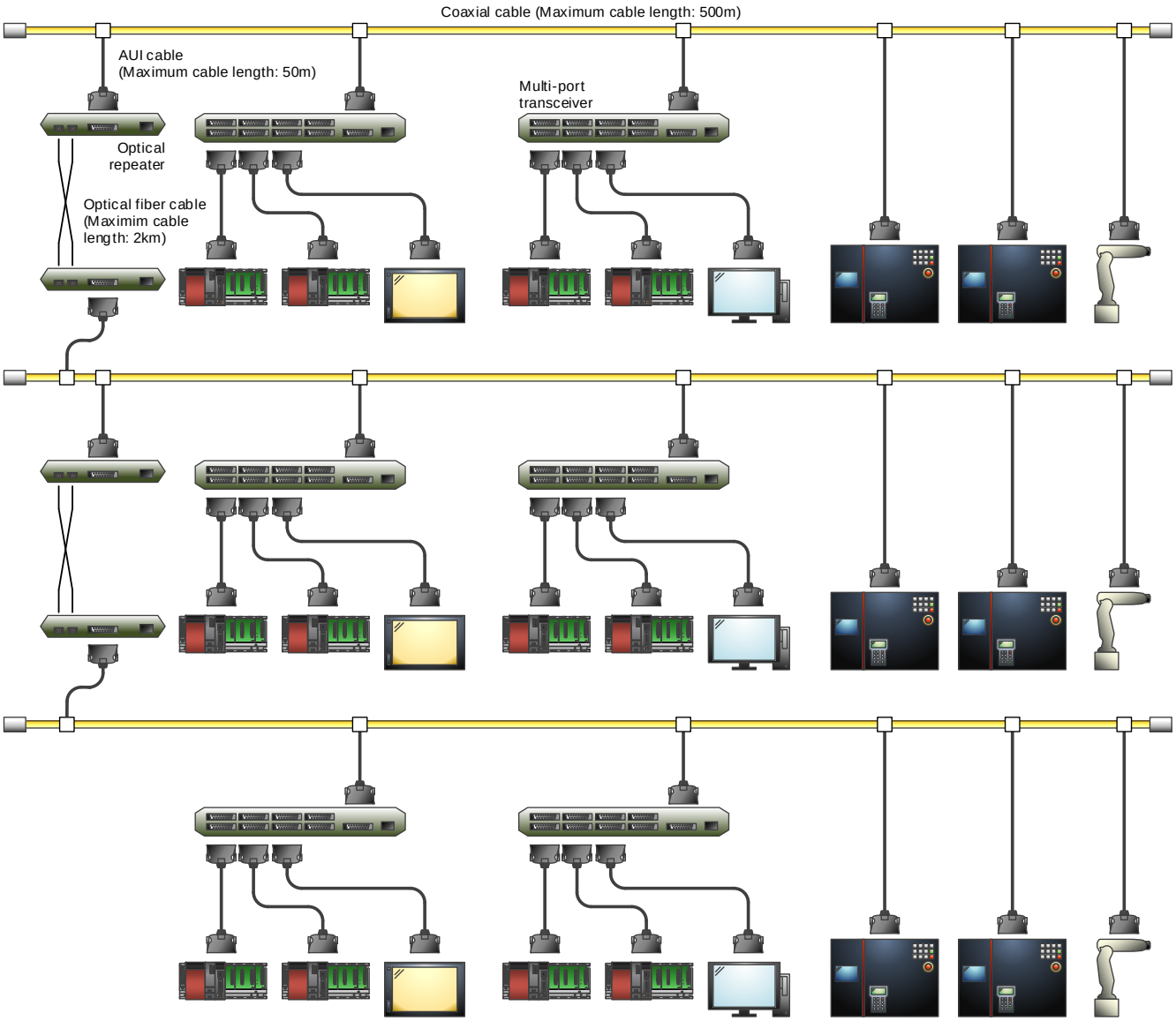


- If a multi-port transceiver is used, the maximum overall length of the AUI cable from the coaxial cable to the terminal is 50 m.
- Multi-port transceiver cascade connections can be up to 2 levels.
- Up to a total of four repeaters or HUBs can be installed between any two given terminals.

A

Appendix 9.4 Long-distance distributed configuration

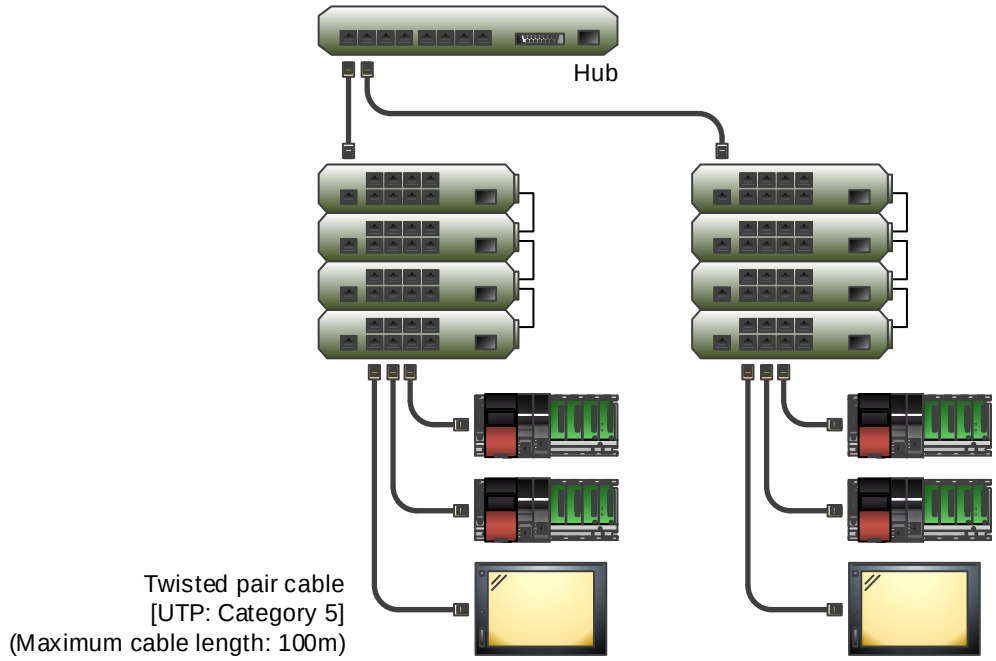
When the distance between the network segments in a large-scale network system exceeds the limitations of the 10BASE5 transmission distance (500 m), the segments of the network can be linked by optical fiber cable that can provide up to 2 km between repeaters.



- If a multi-port transceiver is used, the maximum overall length of the AUI cable from the coaxial cable to the terminal is 50 m.
- Multi-port transceiver cascade connections can be up to 2 levels.
- Up to a total of four repeaters or HUBs can be installed between any two given terminals.

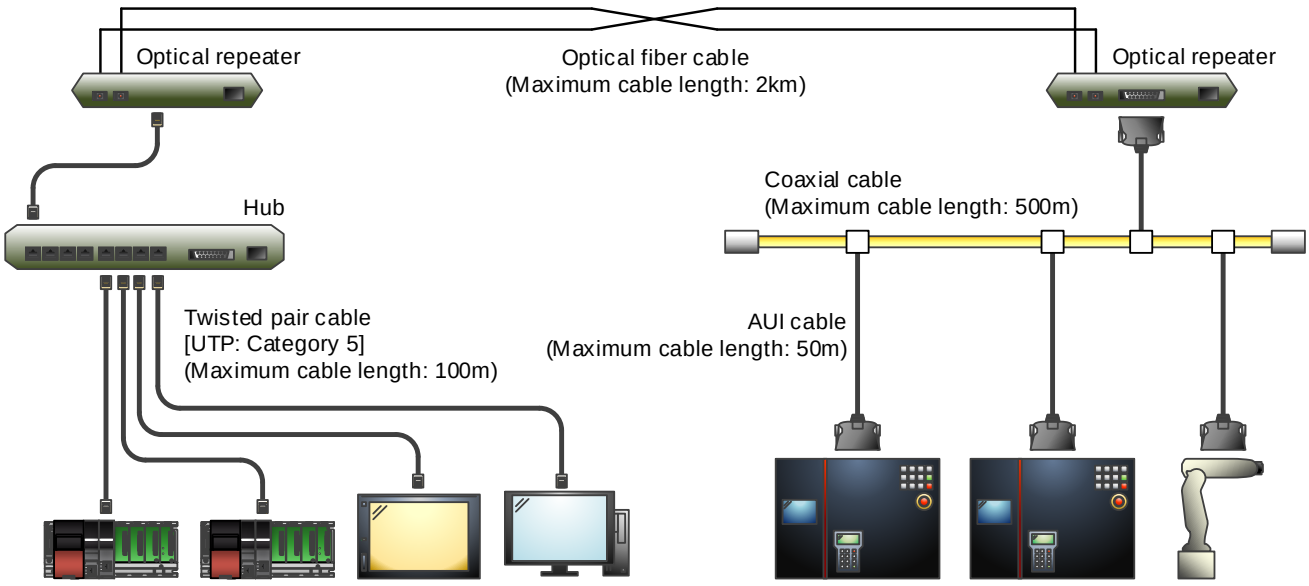
Appendix 9.5 Local centralized configuration

When many pieces of equipment are centralized locally, stackable HUBs can be used when configuring the network system.



Appendix 9.6 Local and long-distance dispersed configuration

This is a basic network system divided into two segments and then connected by optical repeaters. This design is used when the controller is located away from the network or when there are a high voltage power sources or other sources of electrical noise near the network. The linking of the two segments by optical repeater allows them to be far from each other while offering exceptional resistance to electrical noise.



Appendix 9.7 Basic concepts of the FL-net (OPCN-2) system

The FL-net (OPCN-2) is intended to provide real-time communication among controllers such as the programmable controllers, robot controllers and numerical control devices found in manufacturing systems.
FL-net (OPCN-2) is designed for simultaneous broadcast using a token passing mechanism with upon Ethernet UDP/IP protocol in addition, cyclic communication and message communication can be performed.

Appendix 9.8 Differences between conventional Ethernet and FL-net (OPCN-2)

Noise resistance

Since FL-net (OPCN-2) is a network system for the factory automation field, some general-purpose Ethernet equipment can not be used with it. Some equipment with noise resistance characteristics and environmental resistance characteristics are not appropriate for FL-net (OPCN-2) system.

Responsiveness

Since the FL-net (OPCN-2) is required to provide the response performance that gives it the ability for real-time communication for controller applications, it can be connected to FL-net (OPCN-2) compatible controllers or controller equipment alone.

Restrictions

Since the FL-net (OPCN-2) is a cyclic communication method that uses the simultaneous broadcast functions of UDP/IP communication found in 10BASE5 and 10BASE-T/100BASE-TX, the following restrictions apply under its current protocol.

- Currently compatible equipment can only be used with 10Mbps/100Mbps Ethernet LAN.
- It cannot be connected to other general-purpose Ethernet systems.
- It does not support the TCP/IP communication functions.
- A switching HUB can be used but it will be ineffective.
- Some functions may not be executable when a router or other such equipment is used

Appendix 10 Network System Definitions

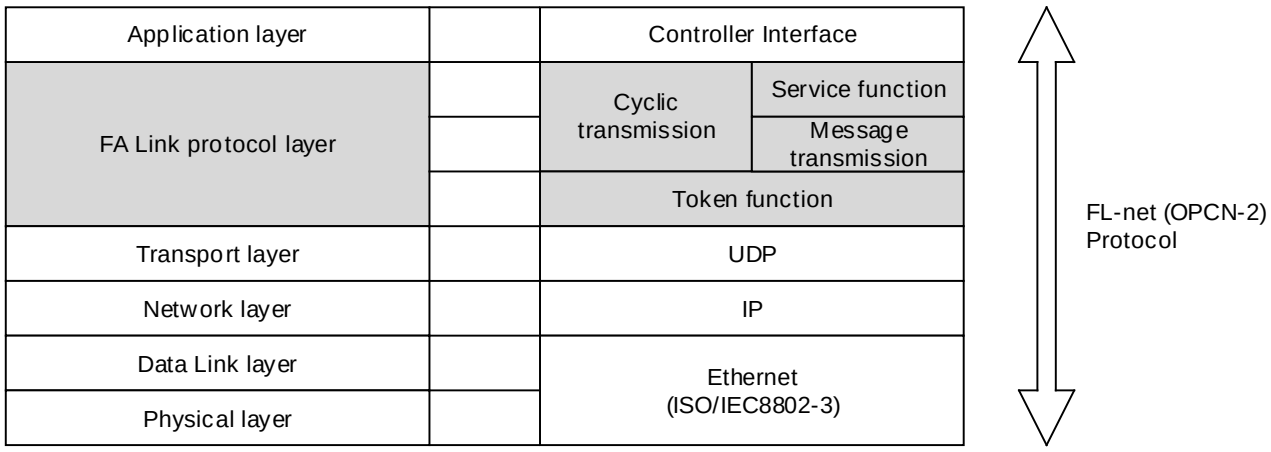
Appendix 10.1 Communication protocol standards

Communication protocol is the rules for one system to exchange data with another system over communication wires. The communication protocol used by FL-net (OPCN-2) conforms to the following standards.

Communication protocol for FL-net (OPCN-2)	Applicable standards
FL-net(OPCN-2)	FA link protocol specifications (Issued by the FA open promotion convention and special committee for FA control networks)
UDP	RFC768
IP,ICMP, etc.	RFC791,792,919,922,950
ARP, etc.	RFC826,894
Ethernet	IEEE802.3

Appendix 10.2 Communication protocol layer structure

Communication protocol has been made into a model based on a layered structure and communication processing is divided and organized into several levels for expression and standardization. FL-net (OPCN-2) is comprised of the six protocol layers shown below.



A

Appendix 10.3 FL-net (OPCN-2) physical layer

When the transmission speed is 10Mbps, there are five types of transmission methods in the physical layer of Ethernet.

- 10BASE5
- 10BASE2
- 10BASE-T
- 10BASE-F
- 10BROAD36 (This method is rarely used.)

Ethernet with the transmission speed of 100Mbps also exists. Among the above methods, FL-net(OPCN-2) adopts 10BASE5 (recommended) and 10BASE2, and 10BASE-T/100BASE-TX.

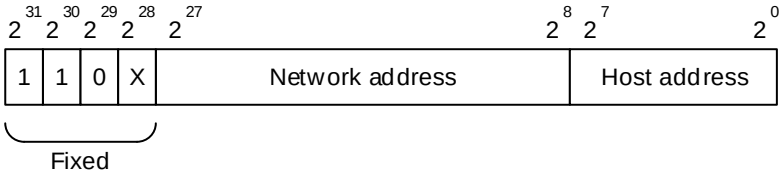
Appendix 10.4 FL-net (OPCN-2) IP address

An address, called an IP address (INET address), is used to identify a specified communication device from among all the communication devices connected to an Ethernet system. Accordingly, a unique IP address must be set for each communication device on the system.
An IP address is comprised of two sections. A section that expresses the network address and a section for the host address. Depending on the size of the network, it can be classified into one of three network classes, Class A, B or C. (Note that there are also Class D and Class E for special purposes.)

Class	Start address octet value	Network address section *1	Host address section *1
Class A	0 to 127	xxx. xxx.xxx.xxx	xxx. xxx.xxx.xxx
Class B	128 to 191	xxx. xxx.xxx.xxx	xxx. xxx.xxx.xxx
Class C	192 to 223	xxx. xxx.xxx.xxx	xxx. xxx.xxx.xxx

*1 The part enclosed by the rectangular is the section corresponding to each of the address sections.

In one network, the IP addresses of the communication devices that are connected to that network will all have the same network address section and the host address section will be a unique value.
The FL-net (OPCN-2) IP address default value is 192.168.250.n (n is the node number: 1 to 254). It is recommended that IP address class C be used and that the lower position host address and the FL-net (OPCN-2) protocol node number be matched.



Appendix 10.5 FL-net (OPCN-2) sub-net mask

The sub-net mask of FL-net (OPCN-2) is fixed at 255.255.255.0. There is no need for users of FL-net (OPCN-2) to change this setting.
This value is the same as segments for the Class C original network address section and host address segments

Appendix 10.6 TCP/IP, UDP/IP communication protocol

TCP, UDP and IP are the main protocols used in Ethernet. IP is positioned in the network layer of the communication protocol and controls the flow of the communication data.
TCP and UDP are positioned in the transport layer and while both use the IP as the network layer, there are big differences in the service. TCP provides reliable service that will not recognize the breaks in data for the upper layer.
On the other hand, since the UDP functions for transmitting the data cluster (data diagram) as is to the top layer from IP, there is no assurance whether or not the data reaches its destination. It leaves the confirmation of reception and resending of data processing to the top layer. UDP provides small overhead transmission service while it is less reliable in comparison to TCP.

FL-net (OPCN-2) uses UDP. This is because the process involved in confirming and resending of questionable TCP data is redundant in the FL-net (OPCN-2). This process is eliminated and instead, high speed data exchange is provided by dividing and composing multiple frames and control of transmission rights through the use of tokens in the top layer of FL-net (OPCN-2) protocol.

Appendix 10.7 FL-net (OPCN-2) port numbers

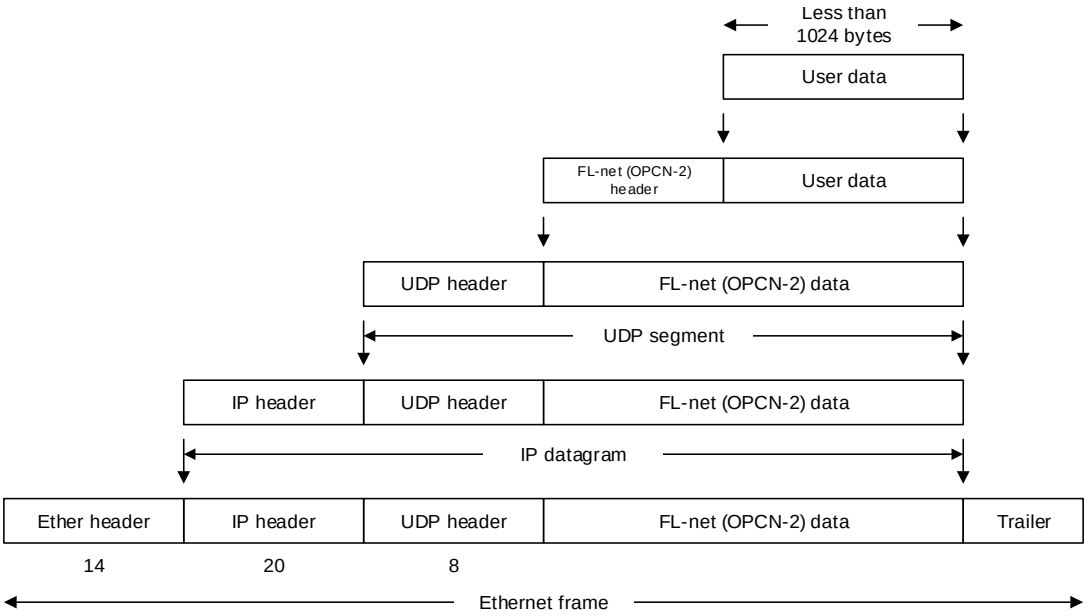
The following port number have been pre-determined for realizing service FL-net (OPCN-2) protocol positioned in the upper transport layer.
There is no need for FL-net (OPCN-2) users to set the parameters for these port numbers.

No.	Name	Port number
1	Port number for cyclic transmission	55000 (Fixed)
2	Port number for message transmission	55001 (Fixed)
3	Port number for participation request frame	55002 (Fixed)
4	Port number for sending	55003 (Fixed)

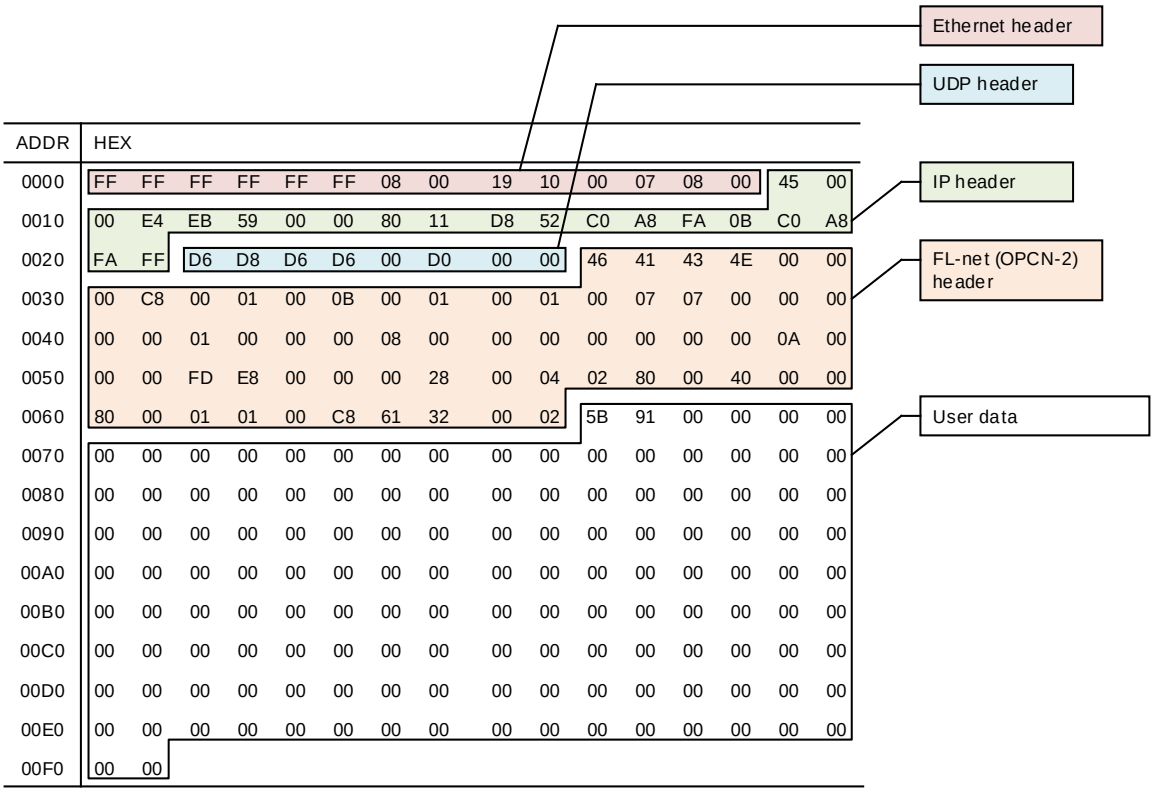
Appendix 10.8 Data format for FL-net (OPCN-2)

■Summary of data format for FL-net (OPCN-2)

The data that is sent by FL-net (OPCN-2) is capsulated in layers of the communication protocol shown below.



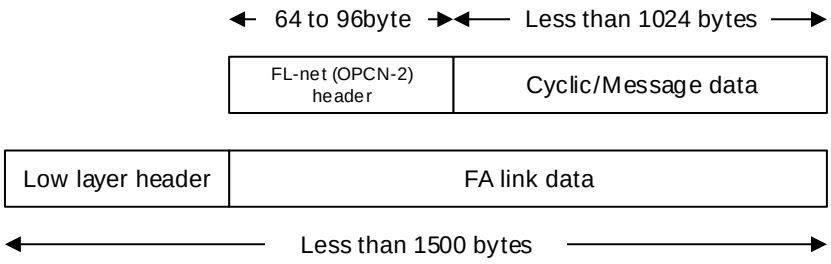
The following shows one frame of FL-net (OPCN-2) data that can be observed on a communication line.
As for example, cyclic data of 128 bytes are transferring.



ADDR	HEX															
0000	FF	FF	FF	FF	FF	FF	08	00	19	10	00	07	08	00	45	00
0010	00	E4	EB	59	00	00	80	11	D8	52	C0	A8	FA	0B	C0	A8
0020	FA	FF	D6	D8	D6	D6	00	D0	00	00	46	41	43	4E	00	00
0030	00	C8	00	01	00	0B	00	01	00	01	00	07	07	00	00	00
0040	00	00	01	00	00	00	08	00	00	00	00	00	00	00	0A	00
0050	00	00	FD	E8	00	00	00	28	00	04	02	80	00	40	00	00
0060	80	00	01	01	00	C8	61	32	00	02	5B	91	00	00	00	00
0070	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0080	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
0090	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00A0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00B0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00C0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00F0	00	00														

■FL-net (OPCN-2) header format

FL-net (OPCN-2) headers can be from 64 to 96 bytes in size. Note that under FL-net (OPCN-2) protocol, FL-net (OPCN-2) headers are attached to the start address of all frames.



Appendix 10.9 FL-net (OPCN-2) transaction code

For details, refer to ☞Page 96 Other messages (Transparent type messages).

Appendix 11 FL-net (OPCN-2) Network Control

Appendix 11.1 FL-net (OPCN-2) token control

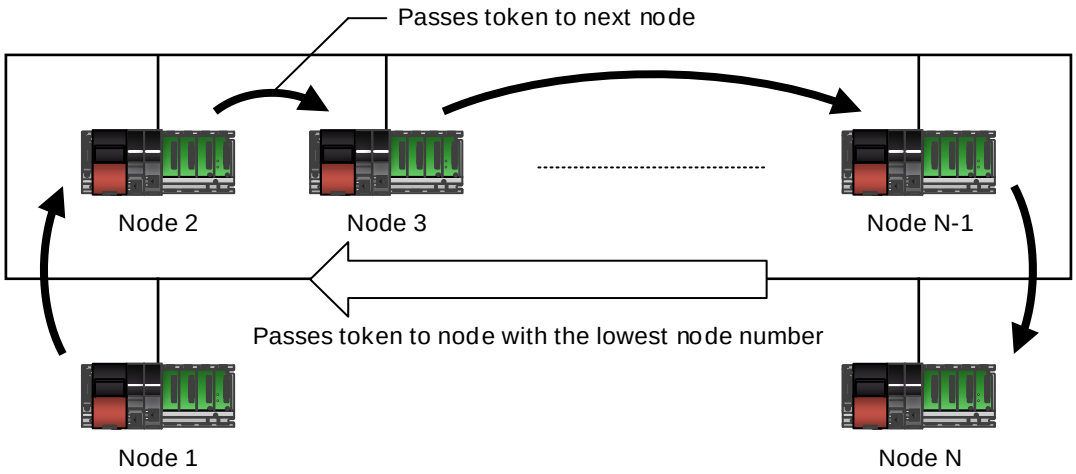
Token

Nodes can transmit only when the nodes are holding a token. Under following two conditions, the nodes can transmit; token reissuing due to expiration of token monitoring time and participation request while node is not in the network.

- In the FL-net (OPCN-2), a single token is circulated among nodes.
- Each node holds a transmission right to the network as long as the node has a token after receiving it.
- The token is circulated among all the nodes participating in the FL-net (OPCN-2)
- The token can be transmitted together with cyclic data.
- The token can also be circulated without any data.
- The token is monitored by the timer of each node. If the token is not sent in the network for specified time, another token will be reissued automatically.
- If there are two tokens in the network, they are unified into one.

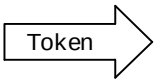
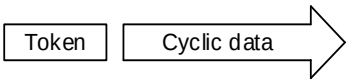
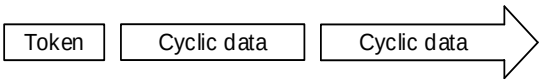
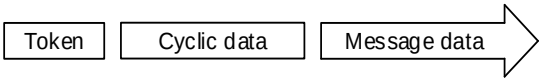
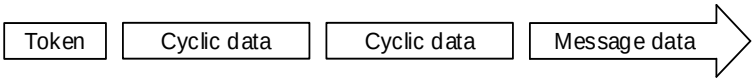
Token flow

Basically, there is only one token for the network. When there are two or more tokens, the smallest address node number has priority while others are eliminated.
The frame that includes the token (token frame) has a token address node number and a token dispatch node number. When the node matches the token address node number of the token frame received, it becomes the token holding node.
The sequence of the token rotation is determined by the node number. Rotation is performed in ascending order among the nodes that are registered in the joining node control table. The highest node number passes the token to the lowest node number.



Token and data

There are the following 6 types of patterns for the data when sending a token.

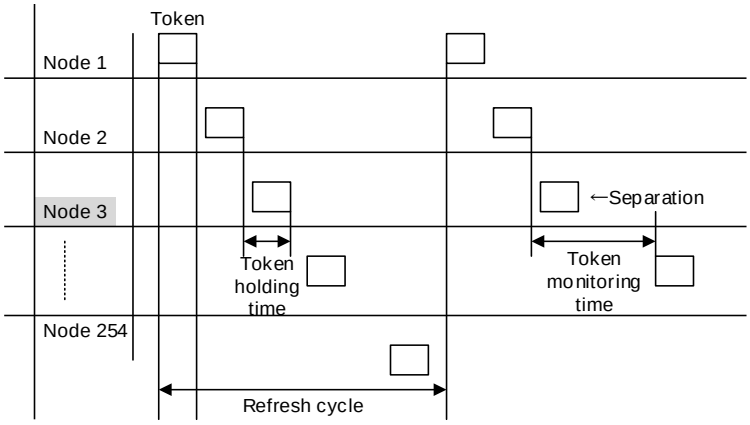
No.	Item	Contents
1	When there is no accompanying data	Only the token is sent. 
2	When there is only cyclic data	The token is sent after the cyclic data has been sent. 
3	When there is only cyclic data and the cyclic data is divided and sent	The token is sent after the cyclic data has been divided and sent. 
4	When there is only message data	The token is sent after the message data has been sent. 
5	When there is cyclic data and message data	The cyclic data and token is sent after the message data has been sent. 
6	When there is cyclic data and message data and the cyclic data is divided and sent	The message data is sent first, then the cyclic data is divided and sent, and the token is sent last. 

Frame interval (Minimum permissible frame interval)

The frame interval is time from when a local node receives the token until it dispatches a frame. The minimum permissible frame interval is the shortest amount of time a node has to wait before dispatching a frame.
With FL-net (OPCN-2), this minimum permissible frame interval is shared by the network. Each node recalculates and updates the largest value for the minimum permissible frame interval when nodes join or leave.

Refresh cycle time

As shown below, the refresh cycle time is the time from when a local node dispatches a token until it is held.



■Refresh cycle time (RC)

Item	Calculation formula
At 100Mbps	RC[ms]=The number of nodes×1.3+total number of cyclic data words(*1)×0.0022 +(total number of frames (*2)-the number of nodes)×the minimum frame interval time setting value (*3)÷10 +(number of separating nodes×token monitoring time (*4))……Add to separation time +(1.3+number of message data words×0.0011)…Add to message transmission time
At 10Mbps	RC[ms]=The number of nodes×1.7+total number of cyclic data words (*1)×0.0032 +(total number of frames (*2)-the number of nodes)×the minimum frame interval time setting value (*3)÷10 +(number of separating nodes×token monitoring time (*4))……Add to separation time +(1.7+number of message data words×0.0016)…Aff to message transmission time

*1 Total number of data words: Total of area 1 (bit area) and area 2 (word area) that have been assigned to each node.

*2 Total number of frames: The total number of frames that have been divided when the size for each node has exceeded 1024 bytes.

*3 Minimum frame interval time setting value: Maximum setting value for all nodes.

*4 Token monitoring time: The token monitoring time that has been set for each node.

■Token hold time

Item	Calculation formula
At 100Mbps	Token holding time[ms]=1.3+(number of local node transmission cyclic data word×0.0022) + {(number of frames-1)×minimum frame interval time setting value÷10}
At 10Mbps	Token holding time[ms]=1.7+(number of local node transmission cyclic data word×0.0032) + {(number of frames-1)×minimum frame interval time setting value÷10}

Point

・The above are the calculations when comprised of this module and will become the sum total of token holding time when mixed with equipment from other manufacturers.

・When the minimum frame interval time is larger than the token holding time, the following will apply:
RC[ms]=total number of frames×minimum frame interval time setting value÷10

・Separation is determined as follows. When each node receives a token frame, it checks the node number. If a token frame is not received from a given node for three times continuously, it is considered separated. Note that this also includes when a node holding a token does not dispatch a token even though the token monitoring time has been exceeded.

Refresh processing time

A refresh processing time [□s] is a constituent of the scan time of the CPU module. For details on the scan time, refer to the following.

MELSEC iQ-R CPU Module User's Manual (Application)

The following shows the refresh processing time [μs] at the refresh setting. *1

Item	Calculation formula
Refresh time[μs]	Refresh time[μs]=Read refresh time (Module→CPU module) +write refresh time (CPU module→FL-net module)

*1 The read refresh time and write refresh time vary depending on the setting of "Target".

■When "Target" is a module label or a refresh data register (RD)

The following shows the read refresh time and write refresh time for when the R□CPU is used.

Item	Refresh time
Read refresh time	80.80μs
Write refresh time	20.48μs

■When "Target" is a specified device

Item	Calculation formula
Read refresh time [μs]	Read refresh time[μs]=Number of read refresh settings×KM1 +Refresh time of the first setting item (A) +Refresh time of the second setting item (A) +・・・ +Refresh time of the "n"th setting item (A) +KM2
Write refresh time [μs]	Write refresh time[μs]=Number of write refresh settings×KM4 +Refresh time of the first setting item (B) +Refresh time of the second setting item (B) +・・・ +Refresh time of the "n"th setting item (B) +KM5

A: KM3×Number of refresh transfer (word)[μs]

B: KM6×Number of refresh transfer (word)[μs]

n: Number of blocks for refresh parameter (*1)

KM1 to KM6: Constant value as shown below

*1 The number of blocks for refresh parameter can be checked in "Auto Refresh Setting Total Counts" of "Module Parameter List" window.

■Constant KN1 to KN4 in the equation

Constant	Item	Constant value
KM1	Module on the main base unit→CPU module	0.98
	Module on the extension base unit→CPU module	0.98
KM2	Module on the main base unit→CPU module	11.6
	Module on the extension base unit→CPU module	11.6
KM3	Module on the main base unit→CPU module	0.05
	Module on the extension base unit→CPU module	0.05
KM4	CPU module→Main base unit	0.58
	CPU module→Extension base unit	0.58
KM5	CPU module→Main base unit	9.10
	CPU module→Extension base unit	9.10
KM6	CPU module→Main base unit	0.01
	CPU module→Extension base unit	0.01

Calculation example

The following is the calculation example when the FL-net module is mounted on the main base unit for the R04CPU and refresh setting is set as shown below.

■Basic setting

For the setting method, refer to ☞Page 60 Basic setting.

Setting item			Setting value
Basic parameter	Node name (equipment name)		Node 1
	Cyclic data area 1	Start address	0H
		Size	16word
	Cyclic data area 2	Start address	0H
		Size	256word
	Token Watch Time Out Time		50ms
	Minimum Permissible Frame interval		0μs
	Message Data Unit Select		0: Word unit

■Auto refresh setting

For the setting method, refer to ☞Page 61 Auto refresh setting.

Setting item				Setting value
Target				Refresh Data Register (RD)
Top Device Name				RD0
Status data	Transfer to intelligent function module	Bit Area	Specified Information Area	RD0 *1
		Word Area	Specified Information Area	RD16 *1
			Message Information Area	RD20 *1
	Transfer to the CPU	Bit Area	Local node Information Area	RD1 *1
		Word Area	Local node Information Area	RD24 *1
			Other node Information Area	RD54 *1
			Log Information Area	RD134 *1
			Message Information Area	RD386 *1
			Other Node Token Status List	RD390 *1
Refresh timing	Refresh timing		Specified information Area	Specified Information Area
	Group [n] (n: 1-64)		Specified information Area	1
Refresh timing (I/O)				Based on Refresh Timing (Buffer Memory)

*1 It is automatically set.

■Refresh processing time of the FL-net module

Item	Calculation formula
Read refresh time[μs]	Read refresh time[μs]=Number of read refresh settings×KM1 +Refresh time of the first setting item (A) +Refresh time of the second setting itemA) +KM2 =Number of read refresh settings×KM1 +KM3×Number of the first refresh transfer data (word) [μs] +KM3×Number of the second refresh transfer data (word) [μs] +KM2 =2×0.98+0.05×32+0.05×4+11.6=15.36μs
Write refresh time[μs]	Write refresh time[μs]=Number of write refresh settings×KM4 +Refresh time of the first setting item (B) +KM5 =Number of write refresh settings×KM4 +KM6×Number of the first refresh transfer data (word) [μs] +KM5 =1×0.58+0.01×20+9.10=9.88μs
Refresh time [μs]	Refresh time[μs]=Read refresh time+Write refresh time =15.36+9.88=25.24[μs]

■During BMOV (FROM/TO)

CPU module	Instruction name	Condition	Processing time(μs)	
			Minimum	Maximum
MELSEC iQ-R CPU	BMOV	(n)=1	1.100	1.300
		(n)=96	2.000	2.200
	FROM	Reading buffer memory, (n)=1	3.700	4.300
		Reading buffer memory, (n)=1000	38.000	55.600
	TO	Writing to buffer memory, (n)=1	2.100	2.700
		Writing to buffer memory, (n)=1000	45.000	65.500

A

Transmission delay time

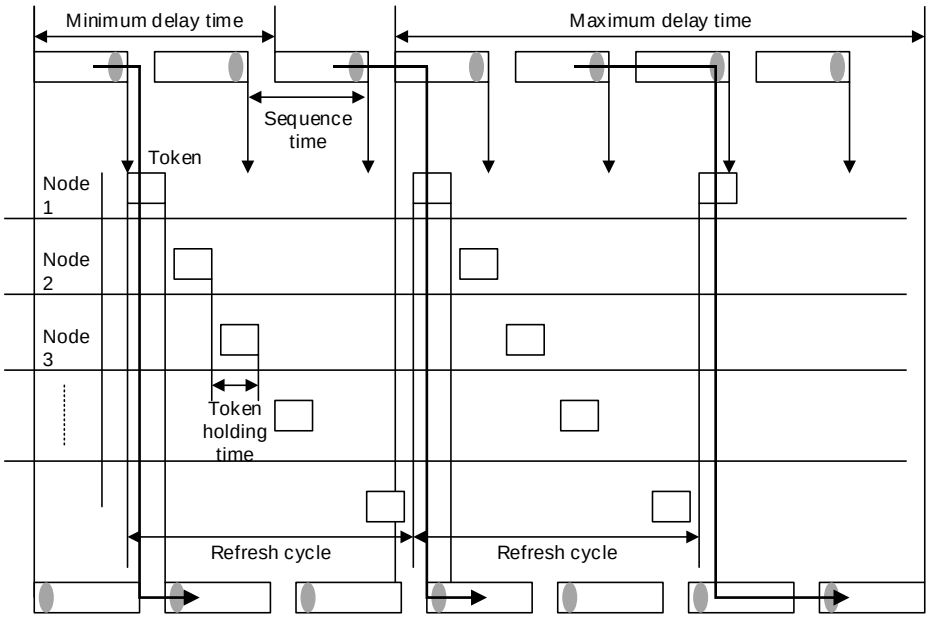
The transmission delay time indicates the delay time until the cyclic data is transmitted from the node.

Item	Calculation formula
Minimum transmission delay time[ms]	Minimum transmission delay time[ms]＝SM1＋token holding time＋SM2
Maximum transmission delay time[ms]	Maximum transmission delay time[ms]＝SM1＋(refresh cycle time (RC)× 4)＋SM2

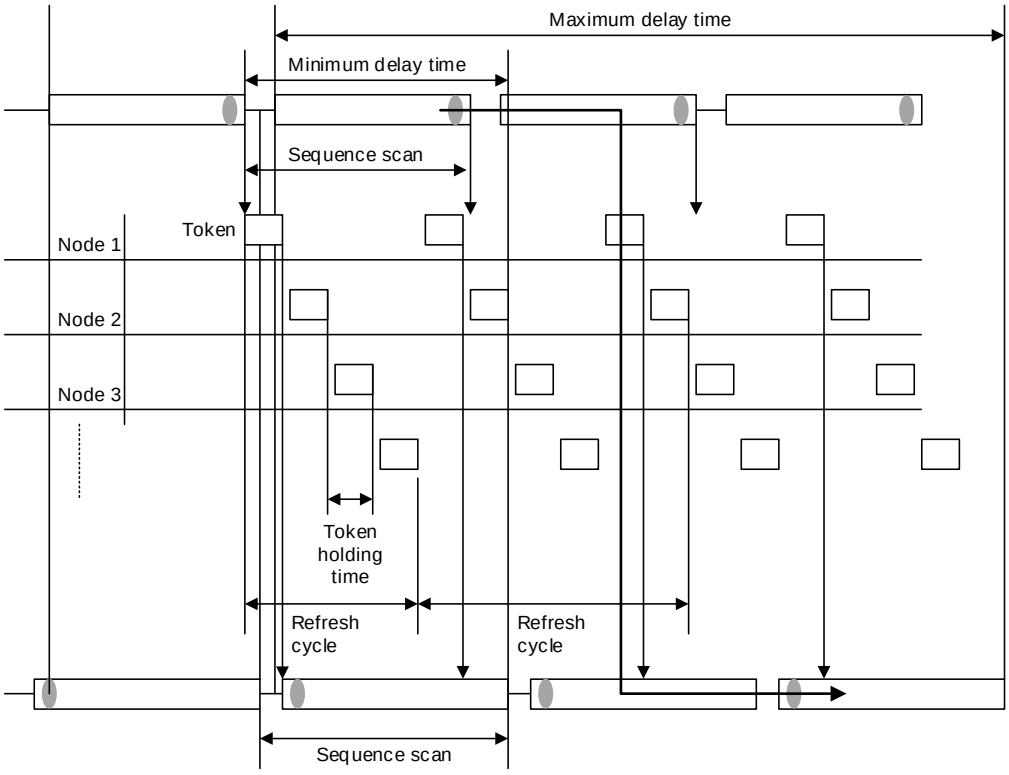
SM1: SM1: Send side sequence scan (including refresh time)

SM2: Receive side sequence scan (including refresh time)

■When refresh cycle > sequence scan



■When refresh cycle < sequence scan



Point

Due to the relationship between the refresh cycle time and sequence scan time, there is a need to also estimate the transmission delay time with the maximum delay time
for "when refresh cycle time < the sequence scan".

Appendix 11.2 FL-net (OPCN-2) enter and release

Subscription to FL-net (OPCN-2)

During start-up, each node monitors the transmission line until each of the token detection times have expired. If the node has not received a token at that time, it determines that the network is starting up and makes a new participation joining with the network. Or, if the node has received the token, it determines that it is in joining mode and performs in-process participating with the network.

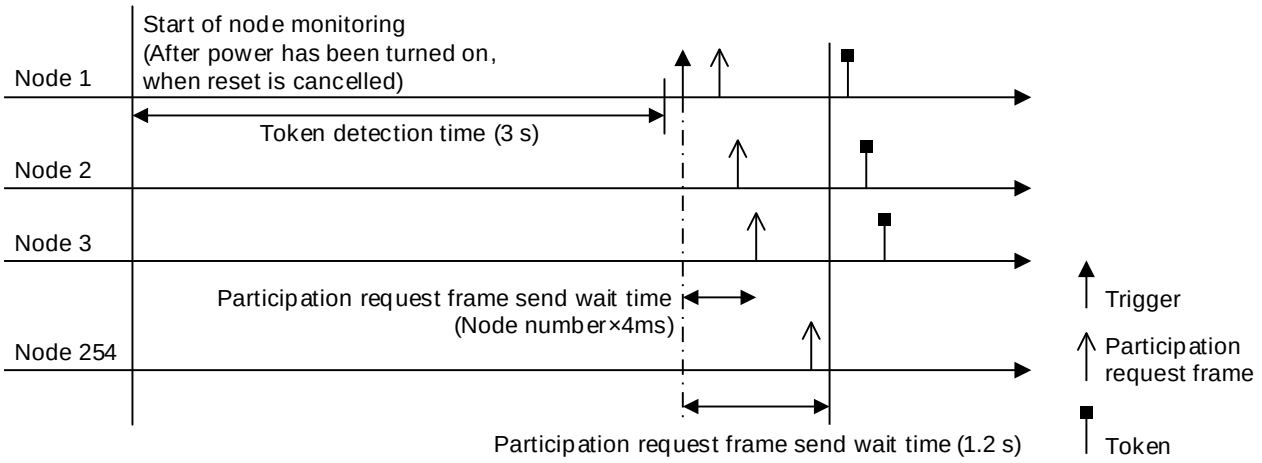
■New participation

If the token has not been received after the token detection time (*1) has expired, preparations are made for sending a trigger, which is sent approximately (node number÷8)×4 ms later. If a trigger is received before one is sent, the trigger is not sent.

During the participation request frame receive wait time (1200 ms) from when the trigger was received, all nodes wait for sending a participation request frame while checking for duplicate node numbers and addresses and updating join node control tables.

After the participation request frame receive wait time (*3) (node number×4 ms) from when the trigger was received has expired, the participation request frame is sent. At this time, nodes that recognized duplicate addresses by the participation request frame of other nodes set area 1 (bit area) and area 2 (word area) of the start address of the common memory and the common memory size to zero (0) and do not send cyclic data.

The nodes that recognized duplicate addresses set the duplicate address flag and reset the common memory data validity notification flag. At the time the participation request frame receive wait time has ended, the node with the smallest node number sends the first token in accordance with the join node control table. All the nodes that recognized node number duplication do not send or receive.



*1 Subscription token detection time:
Time for checking if the network is in operation mode.

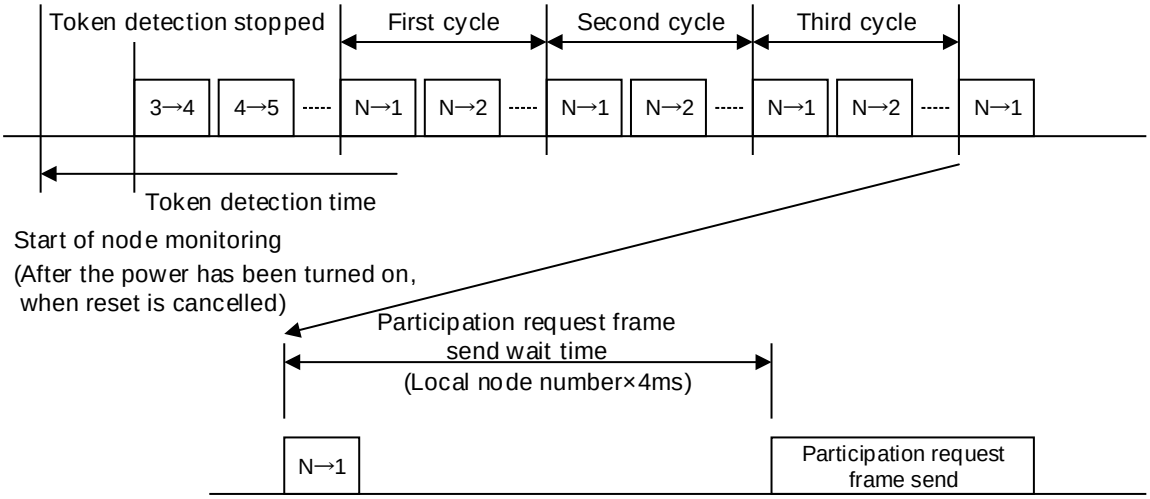
*2 Cycle:
The standard for a cycle is based on the time at which the token addressed to the smallest node number is received.

*3 Participation request frame send wait time:
The dispatching of a participation request node is sent after the (node number×4 ms) has passed so that it does not overlap with another node that is newly participating.

■Participating (halfway participation)

When a token is received within the token detection time (*1) and a previously established link is recognized, there is a wait in the sending of the participation request frame until the token has completed three cycles. (*2)
During this time, the frame that has been received is used for checking for duplicate addresses and updating the join node control table. At this time, nodes that recognized duplicate addresses set area 1 (bit area) and area 2 (word area) of the start address of the common memory and the common memory size to zero (0) and do not send cyclic data.

The nodes that recognized duplicate addresses set the address multiplexing flag and reset the common memory data validity notification flag.
If there is no error with a node number, the node sends the participation request frame after the participation request frame send wait time has expired. (*3) The participation request frame is sent without any relation to the holding of the token.
The nodes that recognized duplicate node numbers do not send participation request frames and do not participate in the network.



*1 Subscription token detection time:
Time for checking if the network is in operation mode.

*2 Cycle:
The standard for a cycle is based on the time at which the token addressed to the smallest node number is received.

*3 Participation request frame send wait time:
The dispatching of a participation request node is sent after the (node number×4 ms) has passed so that it does not overlap with another node that is newly participating.

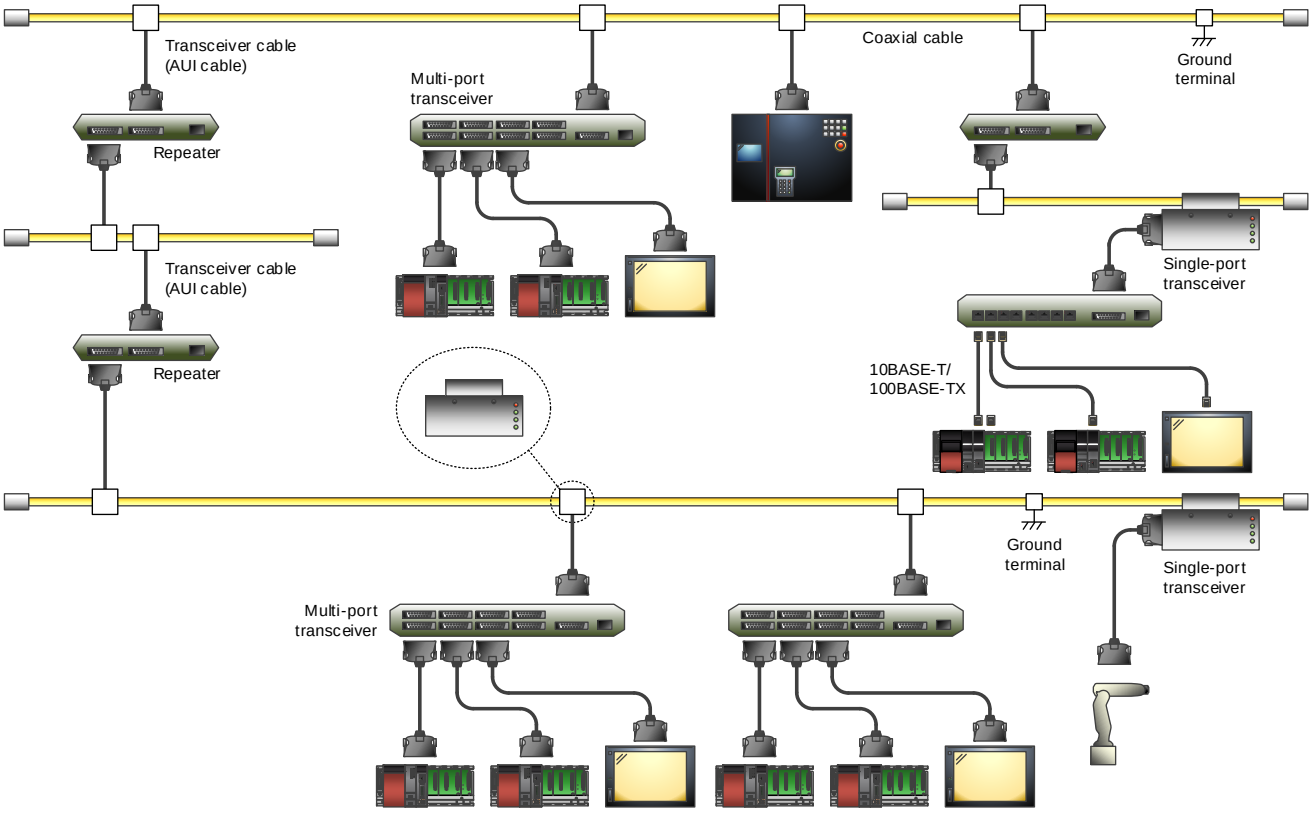
Release from FL-net (OPCN-2)

When each node receives a token frame, it checks the node number. If a token frame is not received from a given node for three cycles continuously, it is considered released. (Note that this also includes when a node holding a token does not dispatch a token even though the token monitoring time has been exceeded.)
When a node is determined to have released from the network as shown above, the data for that node is deleted from the control table.

Appendix 12 Network Components

Appendix 12.1 List of Ethernet components

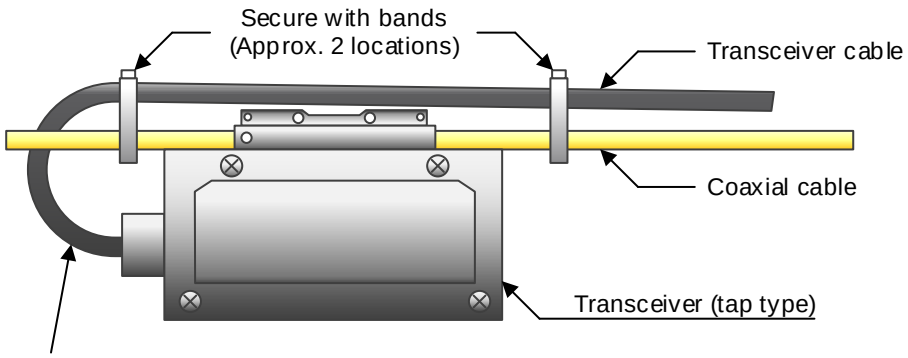
The following shows the components to configure Ethernet. Use the network equipment conforming to the IEEE802.3 standard.



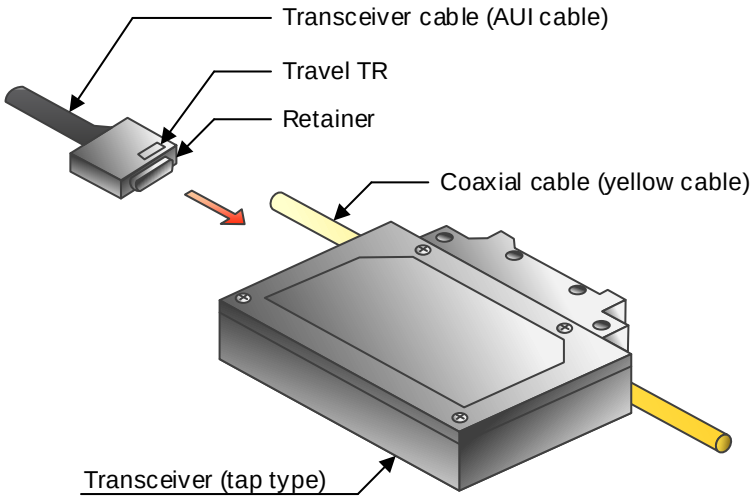
Appendix 12.2 10BASE5 components

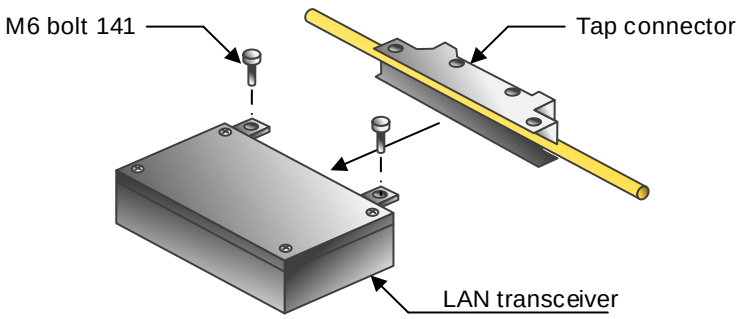
Transceiver

The transceiver is the device that converts the signals flowing through the coaxial cable (yellow cable) into the signals the node requires or vice versa.
When connecting a transceiver to a coaxial cable, there is a need to set them at an integral multiple of 2.5m. Connection is done by following the inscription (jacket mark) on the coaxial cable and installing.
Always turn off the power supply for the node and transceiver when connecting the transceiver to the coaxial cable. Making the connection while the power is on will cause shorting.



Take the bending radius of the transceiver cable into consideration
(the smallest bending radius is 80 mm)





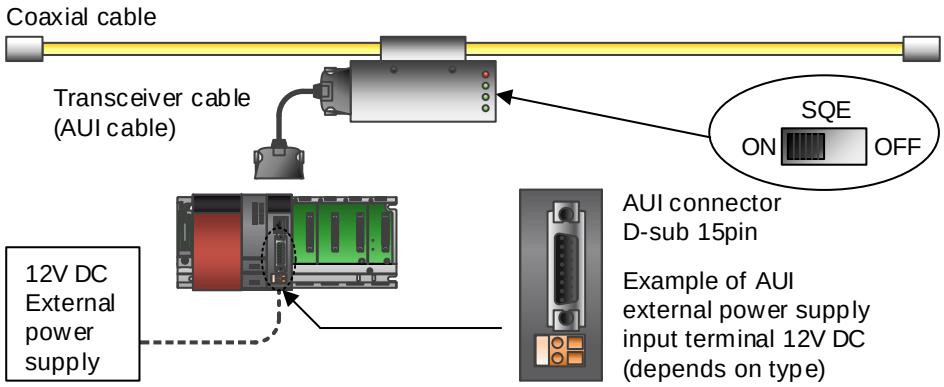
A

■Transceiver (tap type)

To connect a tap-type transceiver, make a hole in the coaxial cable and push in the pin for contacting the center conductor while breaking the insulation jacket on the shielded conductor with the tooth-like tab. Note that special tools are required to connect. The transceiver power supply (12 V DC) is supplied from the node via the transceiver cable. Note that some nodes may require 12 V DC power supply when using a transceiver cable. Check the hardware manual for the node for details.

The following are the m ost common settings for the SQE switch.

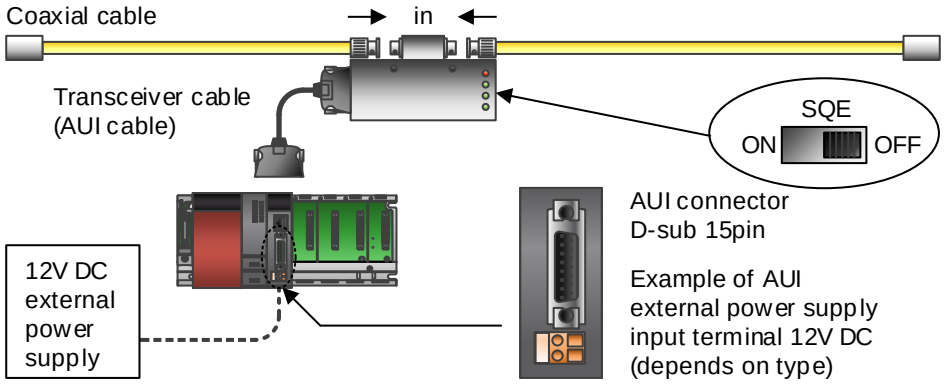
- When connected to node: ON
- When connected to repeater: OFF



■Transceiver (Connector type)

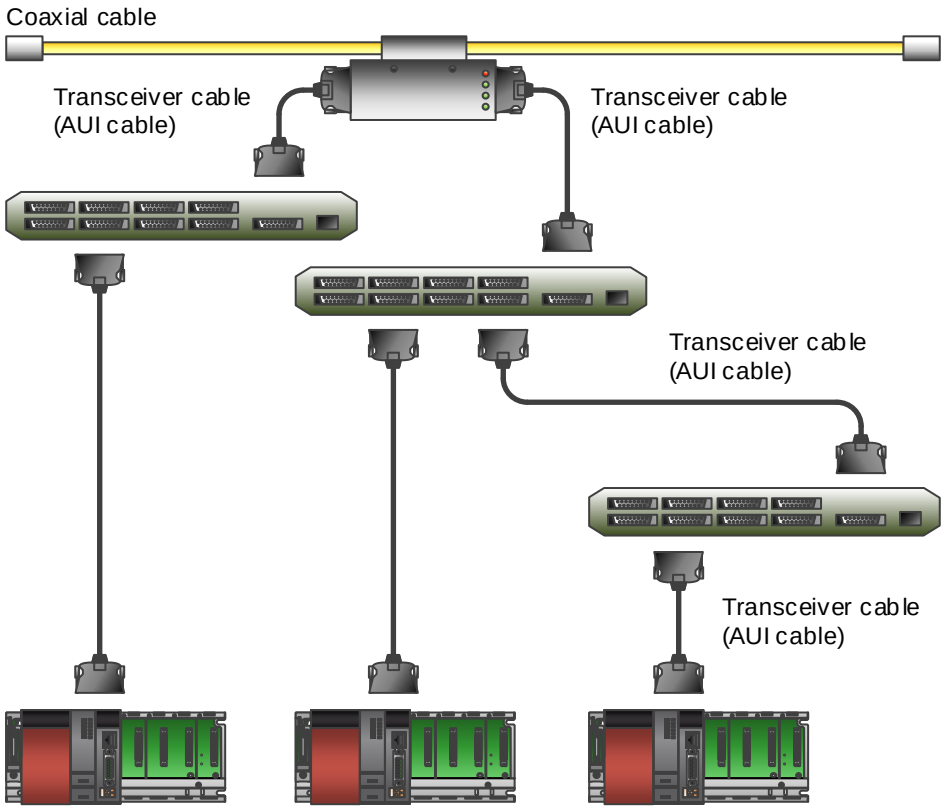
With the connector type transceiver connection, a connector is attached to the coaxial cable and it is connected to the connector on the transceiver.

No special tools are required for installation and the connection can be easily removed. Supply power to the transceiver from nodes via transceiver cable.



■Multi-port transceiver

A multi-port transceiver allows terminals to be connected to the tap type transceiver and the connector type transceiver, which normally would only be capable of having one terminal connected to them. 4-port and 8-port transceivers are the most common. Supply power to the transceiver by connecting the power supply cable.

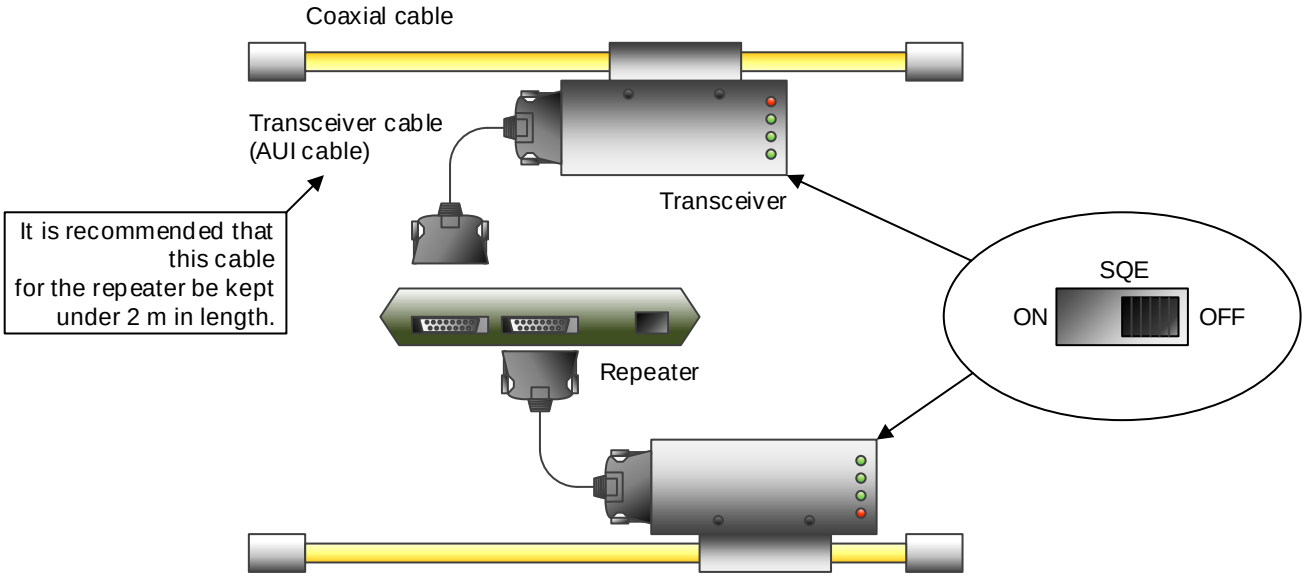


A

■Repeater

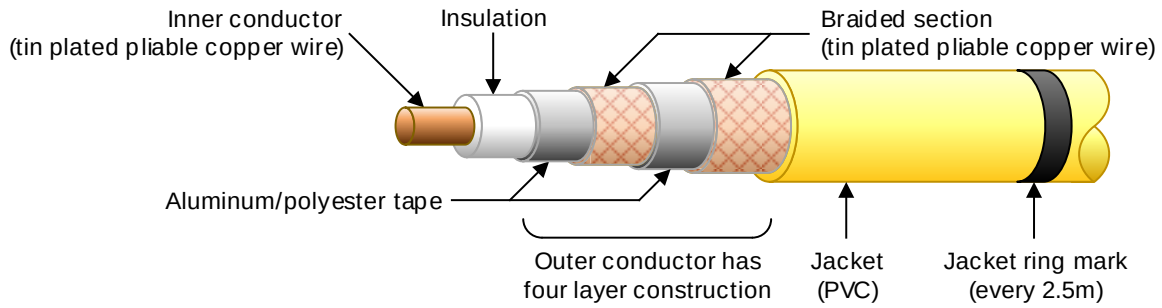
A repeater is a device that relays the transmission signal once again. It is used for interconnecting segments that have different media, extending the length of a media segment, increasing the number of terminals connected and converting cable media. A repeater receives the signal from one of the interconnected segments, adjusts the waveform, amplifies it to a predetermined level and sends (or repeats) it to the other segment connected to the repeater.

While it is possible to connect a transceiver cable of up to 50m to the repeater, it is recommended that the length be less than 2m due to electrical noise and other factors. Check that the SQE switch is off when connecting to the repeater.



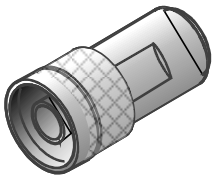
Coaxial cable

The coaxial cable is constructed of an inner conductor and an outer conductor that serves as a shield. Coaxial cable used for Ethernet connection has a 50 ohm impedance and there are coaxial cables (yellow cables) for 10BASE2 RG58A/U and 10BASE5.
The 10BASE2 cable has a maximum length of 185 m and the 10BASE5 cable has a maximum length of 500 m. Always ground a coaxial cable to prevent electrical noise. This should be a one-point Type D ground.



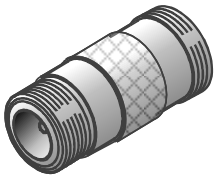
Coaxial cable connector

Coaxial cable connector is commonly called N-type connector. It is the connector used to connect a coaxial cable to a terminator or to connect a coaxial cable to a connector type transceiver.



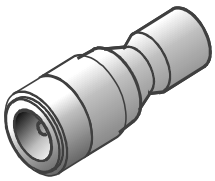
Relay connector

This is the connector used for extending coaxial cable segments. A repeater is used to extend segments while the relay connector is used to extend the cable for the same segment.
Note that if multiple relay connectors are used, they could change the electrical resistance of the coaxial cable. (The use of relay connectors is not recommended.)



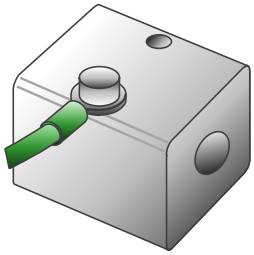
Terminator (Terminal resistor)

Terminators must be connected to devices at both ends of a cable when a bus type configuration is used in order to prevent the signal from being reflected. If the connection at the terminator is not made, the signal is reflected (collides) and shuts the network down. There are two types of terminator, J-type for a tap type transceiver and P-type for a connector type transceiver. Connect terminators at the location indicated by the jacket mark on the coaxial cable.



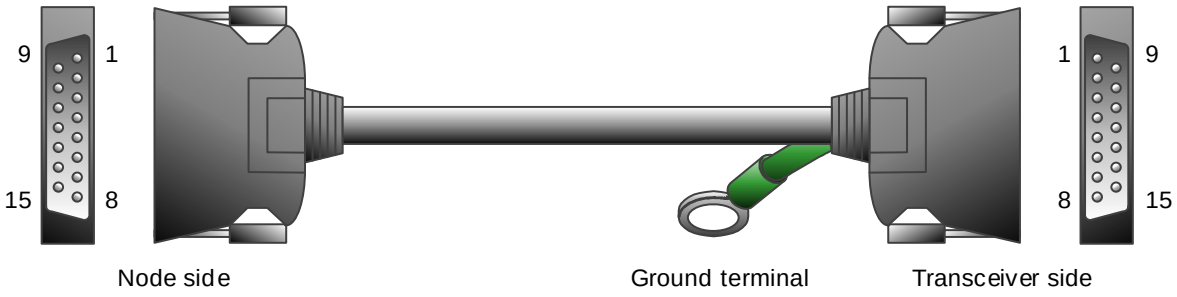
Coaxial cable ground terminal

The coaxial cable ground terminal is a device that prevents transmission data errors due to electrical noise on coaxial cable. Always ground one point of the coaxial cable using a Type D ground.



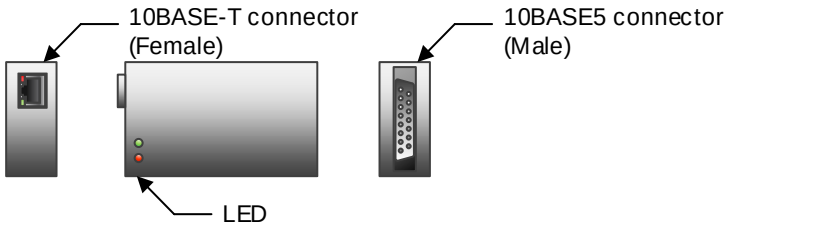
Transceiver cable

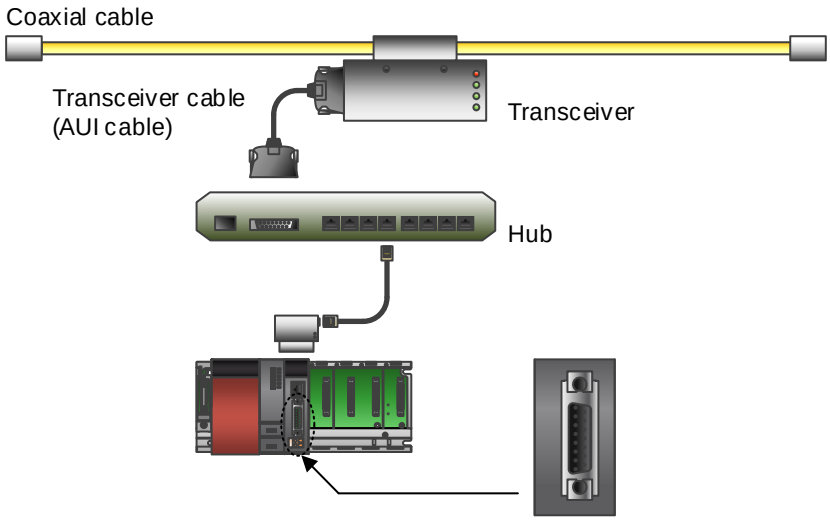
Transceiver cable is used to connect the transceiver and node. Both ends of the transceiver cable have D-sub 15pin AUI connectors. A transceiver cable can be up to 50 m long but it is recommended that the length be kept under 15m in FA applications to reduce the potential for electrical noise. When using a transceiver with a ground terminal, connect it to the ground.



10BASE5/T converter

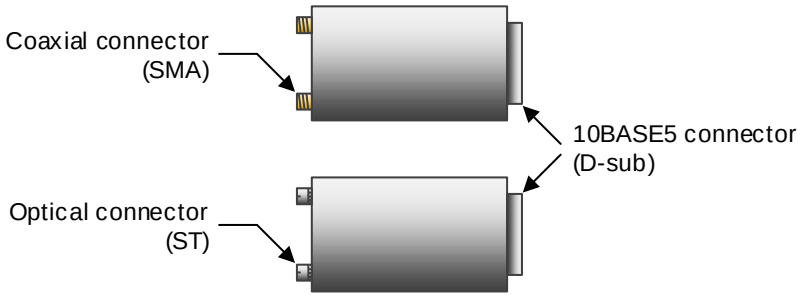
This is the converter for connecting a cable with a 10BASE5 interface to a 10BASE-T.

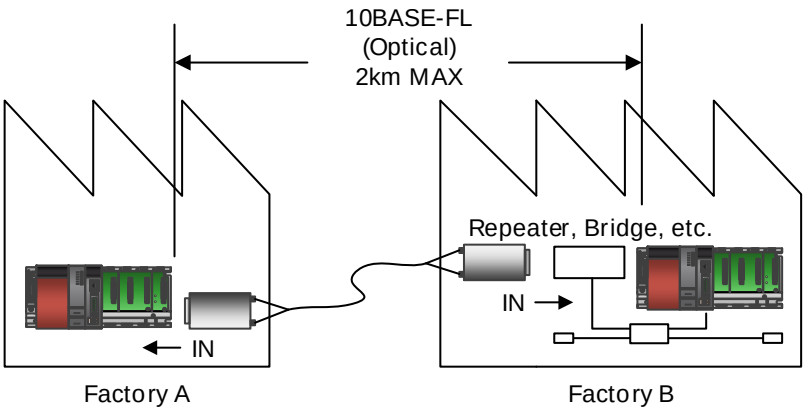




Coaxial cable/optical media converter repeater

Coaxial cable/optical media converter repeater is a device that converts electrical signals on coaxial cable (10BASE5, 10BASE2) to optical signals. Various types include the fiber optic inter repeater link (FOIRL) for connecting repeater segments and 10BASE-FL for connecting to a terminal. Coaxial cable/optical media converter repeater is used for preventing electrical noise, extending cable length and other applications.





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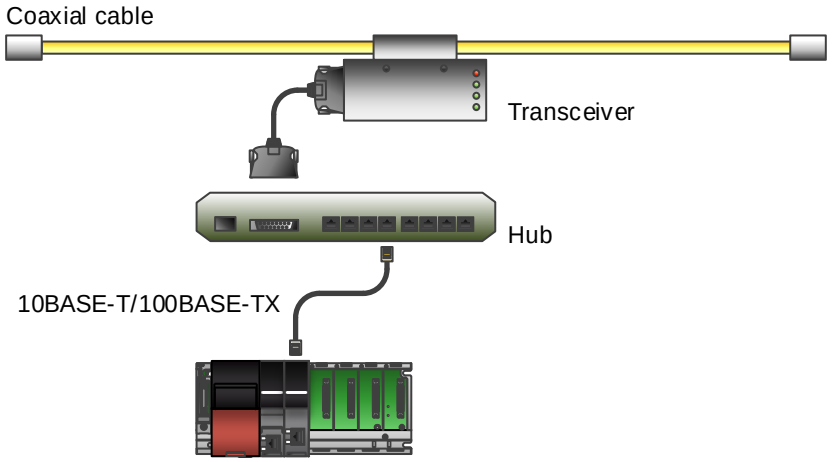
Appendix 12.3 10BASE-T/100BASE-TX components

Hub

Hub is a centralized wiring device with repeater functions capable of accommodating twisted pair cable used by 10BASE-T/100BASE-TX.
There are hubs with 10BASE2 interfaces, cascade type (multi-level connections) interfaces and others.
When a repeater hub is used, up to four hubs (up to two hubs for 100BASE-TX) can be used for cascading. *1
There are also stackable hubs that allow several hubs to be used as one.

＊1 For the number of hubs that can be used when a switching hub is used, consult the manufacturer of the switching hub.

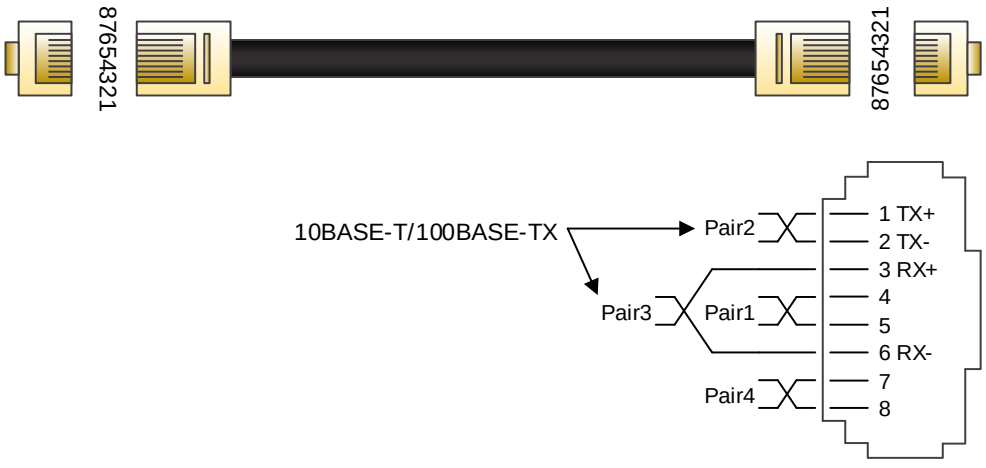


10BASE-T/100BASE-TX cable

This is a twisted pair cable in which the copper wires are matched into pairs, twisted and covered by a protective outer cover. The following are some of the types available.

- Shielded STP cable and unshielded UTP cable
- Cross cable used for making connections directly between nodes and straight cable used for connections through a HUB

Maximum transmission speed in a 10BASE-T/100BASE-TX cable is 10 Mbps/100 Mbps and it can be up to 100 m long. Both ends of the cable have the 8-point modular connector specified by ISO8877. Arrange so that Category 5 compliant components are used on 10BASET/100BASE-TX cable.



10BASE-T/optical media converter repeater

10BASE-T/optical media converter repeater is a device that converts electrical signals on 10BASE-T cable to optical signals. There are fiber optic inter repeater link (FOIRL) for connecting repeater segments, 10BASE-FL for connecting to a terminal and others.
10BASE-T /optical media converter repeater is used for preventing electrical noise, extending cable length and other applications.

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Appendix 12.4 Cable

Since the cable extended out of the control panel contains high-frequency noise component, the cable functions as an antenna and releases the noise when it is outside the control panel.
Use a shielded cable when extending the cable out of the control panel connected to I/O module and intelligent function module. Using the shielded cable is also effective for improving the noise immunity.
The I/O module and intelligent function module of the programmable controller, and a signal line (including a common line) of an extension cable meet the requirement by grounding the shield using the shielded cable.
If a shielded cable is not used or not grounded properly, the noise immunity will not meet the requirement.

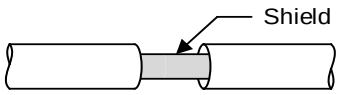
Grounding a shielded cable

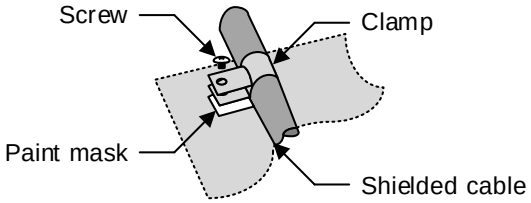
■Grounding location

Ground the shield of a shielded cable close to the module so that the grounded cable will not be affected by electromagnetic induction from ungrounded cables.

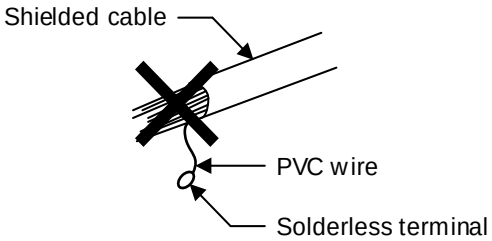
■Grounding area

Ground the exposed shield to a large area on the control panel. A clamp can be used as shown below. In this case, mask off the inner wall surface of the control panel, which comes in contact with the clamp.



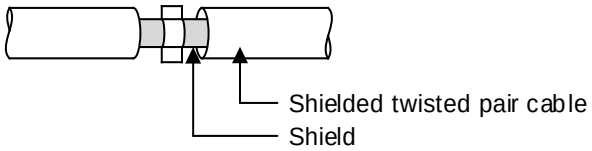


Using the tip of a PVC wire soldered onto a shield of the shielded cable for grounding as shown below will raise the high-frequency impedance, resulting in loss of the shielding effect.



Twisted pair cable for 10BASE-T/100BASE-TX

Use a shielded twisted pair cable for connection to the 10BASE-T or 100BASE-TX connector. Strip a part of the jacket of the shielded twisted pair cable as shown below and ground the exposed shield to the largest area.



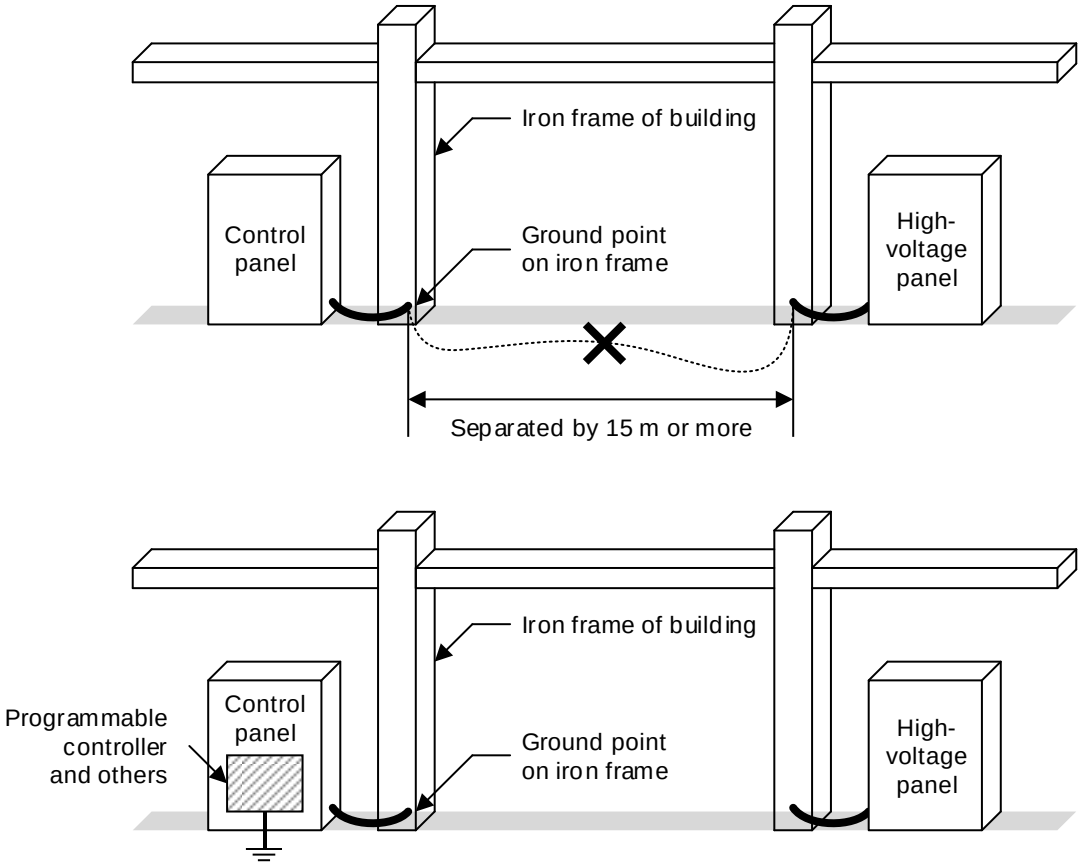
For grounding a shield, refer to ☞Page 240 Grounding a shielded cable.

Appendix 13 Grounding the FL-net (OPCN-2) System

Appendix 13.1 Summary of grounding the FL-net (OPCN-2) system

The following shows the method of grounding the controller control panel for FL-net (OPCN-2) system to iron frames of a building.
Note that certain conditions must be met when grounding a control panel to the iron frames of a building. If those conditions cannot be met, provide a dedicated ground (Type D ground or higher).

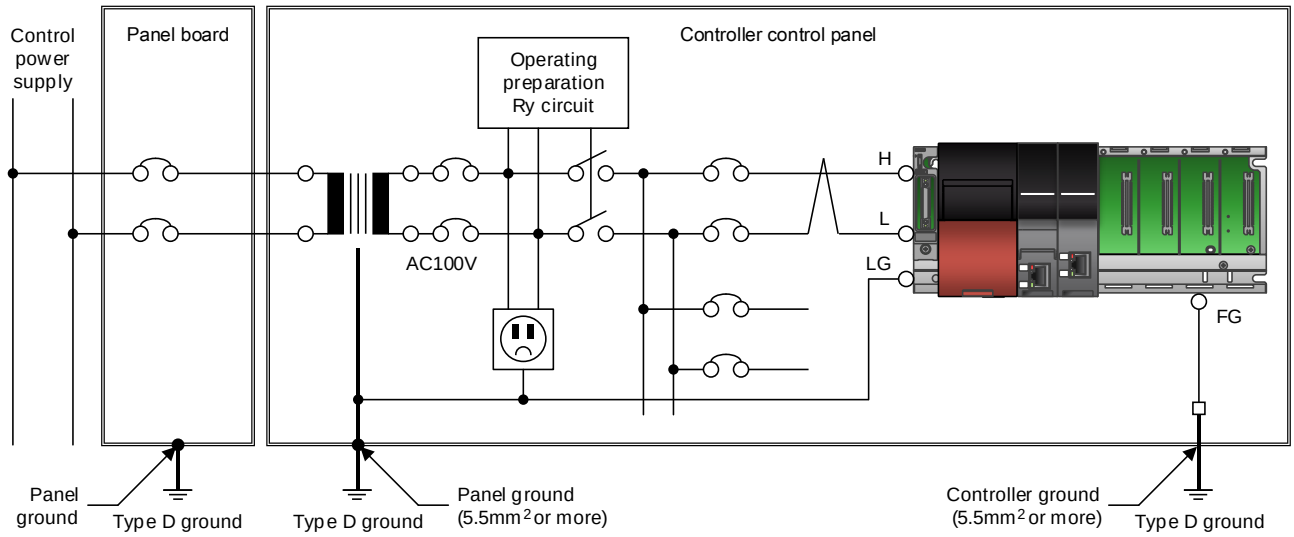
- The frames are welded together.
- There is Type D grounding between the ground and the frames.
- Current from the high-voltage circuit shall not flow into the ground contact point for the control panel.
- The ground point for the control panel and the ground point for the high-voltage panel shall be separated by more than 15m.



Appendix 13.2 Power supply wires and grounding

The following shows the power supply wiring for the FL-net (OPCN-2) system and the grounding as well and provides an example of the power supply wiring for the panel board and controller panel and the grounding.
Follow the information given below when wiring the power supply and grounding.

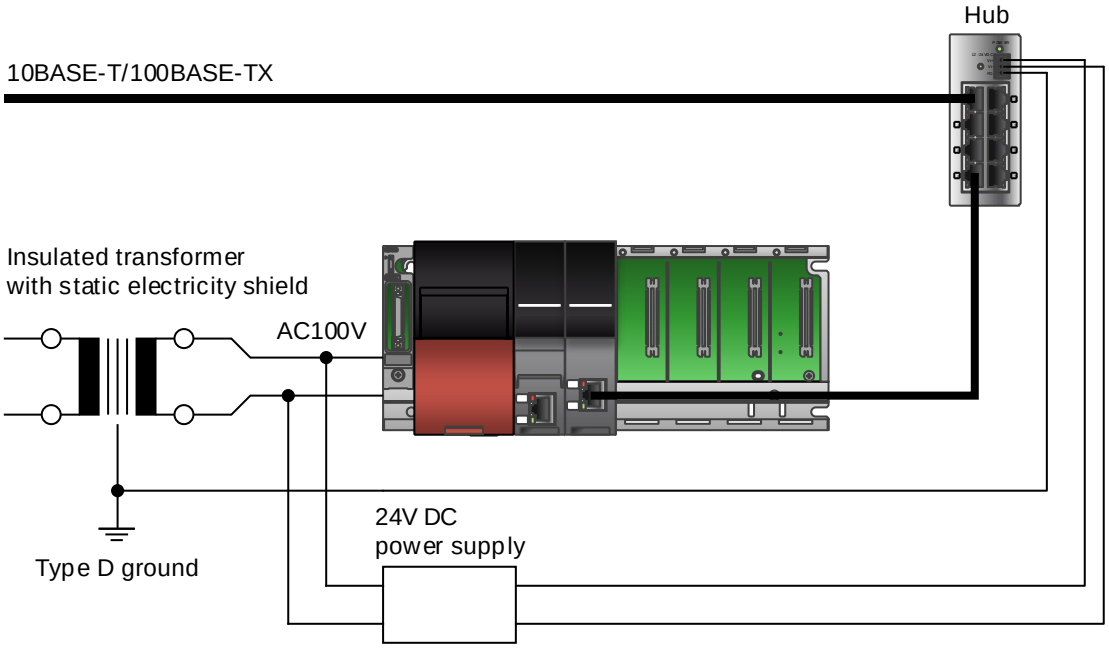
- Isolate the circuit between control power supply and controller power supply by an insulated transformer with a static electricity shield.
- Ground the frame for the control panel and the control board for the controller with a Type D ground.
- Do not connect the frame ground (FG) terminal on the controller to the control panel frame. Use a dedicated ground (Type D or better) for the controller.
- Keep the wiring for the input power supply for the controller as short as possible and wire in a twisted configuration.
- Connect the line ground (LG) terminal for the controller to the shielded terminal on the insulated transformer and ground the frame of the panel.



Appendix 13.3 Power supply wiring and grounding for network equipment in the FL-net (OPCN-2) system

The following shows the power supply wiring and grounding for network equipment in the FL-net (OPCN-2) system. Follow the procedure below for examples of the power supply wiring and grounding.

- The frame ground for the HUB for 10BASE-T/100BASE-TX is connected to the dedicated Type D ground for the controller. Supply power from an insulated transformer with a static electricity shield as is used for the power supply for the controller.
- Do not connect the frame ground (FG) terminal on the controller to the control panel frame. Use a dedicated ground (Type D or better) for the controller.

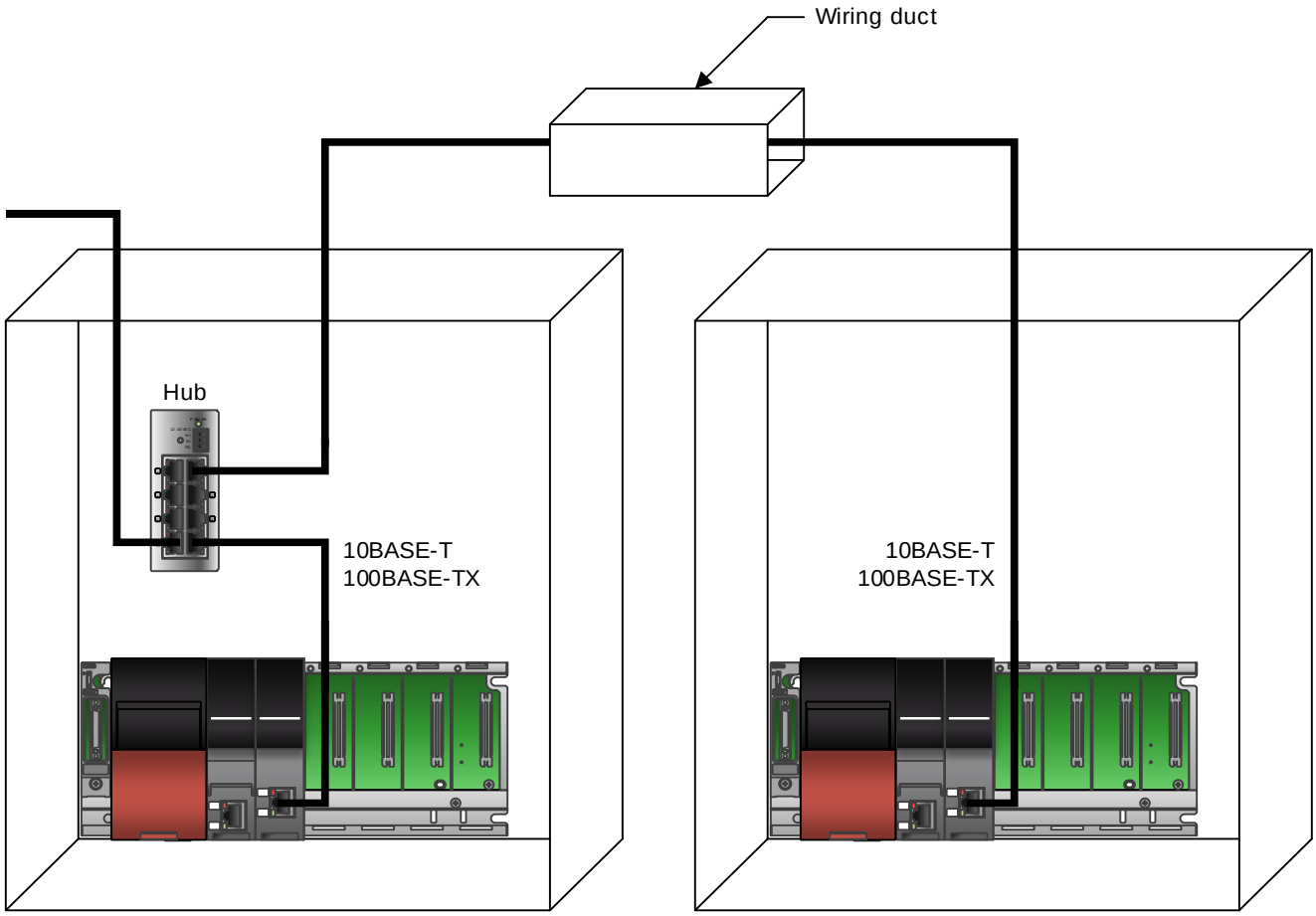


A

Appendix 13.4 Mounting FL-net (OPCN-2) system network components

The following shows examples for mounting the network components (transceiver, HUB, etc.) to the FL-net (OPCN-2) system.

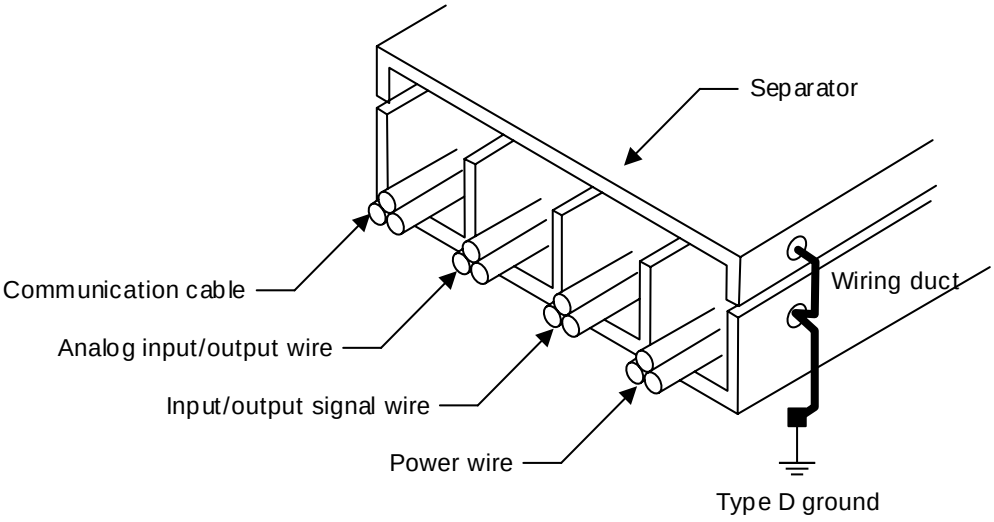
- Follow the procedures below when mounting components.
- Mount the transceiver to a wood insulation board inside a steel mounting box. Be sure that the mounting box has a Type D ground.
- Wire the Ethernet cable to the control panel of the controller by using a wiring duct.
- Use rubber legs or some other type of electric insulation material with the mounting bracket for the HUB. Use a metal U-shaped mounting bracket to connect it to the control panel for the controller. Make sure that the mounting bracket for HUB should be grounded to the control panel for the controller and it has a Type D ground.

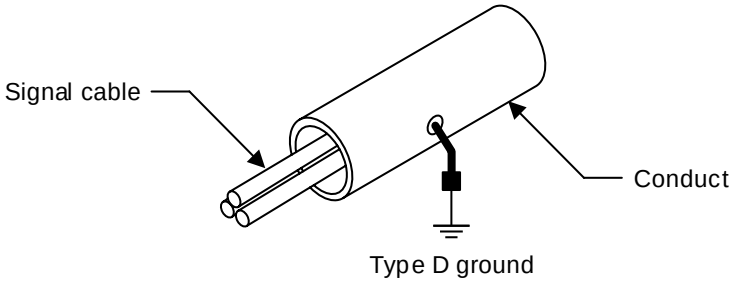


Appendix 13.5 Wiring grounding wiring ducts and conduit

The following shows the grounding of wiring ducts for the FL-net (OPCN-2) system and the wiring and grounding of conduit.
Follow the procedure below for routing the wiring.

- If a wiring duct is used for routing the wires, use separators to separate the power wires and signal wires according to their levels. Make sure that the wiring duct (including the cover and separators) has a Type D ground.
- If conduit is used for routing the wires, prepare separate conduit according to the levels of the power and signal wires. Always use conduit meeting JIS-C-8305 specifications and ground with Type D ground.





A

Appendix 14 FL-net (OPCN-2) Installation Checklist

FL-net (OPCN-2) Installation Checklist

Communication line name: Node No.:

		Inspection date	
	Check item	Inspector Company name	
Cable	Are all connectors securely locked?		
	Are the bend diameter of the cables the established value or greater?		
	Are the connectors protected by jackets, etc.?		
	Have the wires been identified by wire numbers? Are they correct?		
	Are there any heavy objects on the communication cables?		
	Are the communication cables bundled together with other cables, such as the power cables?		
	Is the length of the AUI cable for the repeater less than 2 m? Is the cable for the transceiver less than 50 m?		
	Is the length of the coaxial cable (10BASE5) less than 500 m?		
	Is the coaxial cable properly grounded?		
	Are the shields for the coaxial cable and the transceiver insulated?		
	Are the correct terminal resistor at the ends of the coaxial cable?		
	Is the number of HUBs or repeaters within the specified number?		
	Is the twisted pair cable using a straight cable?		
	Is the twisted pair cable Category 5 and is its length less than 100 m?		
Modules	Is the ground terminal on the equipment properly connected?		
	Is each module tightly secured to its base?		
	Is the base unit tightly secured to the control board?		
	Are the AUI cables securely locked?		
	Is excessive force being applied to any of the cable mountings, such as by a door?		
Hubs, etc.	Is the RJ45 connector securely mounted?		
	Are the AUI cable connectors locked?		
	Are the cables marked with wire numbers?		
	Has the transceiver been properly mounted to the marked location?		
	Has the transceiver SQE switch been properly set according to the equipment specifications?		
	Is the HUB tightly secured?		
	Is the HUB/MAU switch for the hub properly set?		
	Is the specified electrical voltage being supplied to the HUB?		

- Fill in and check this list anytime a modification, change or inspection is made.
- Mark as follows: OK =○, No good =×. For the setting switch column, fill in the rotary switch number. For DIP switches, fill in ON or OFF.

Appendix 15 Profile Supplement

Appendix 15.1 ASN.1 transmission syntax format summary

This section summarizes the portions of this specification manual that is related to ISO/IEC 8825 ASN.1 (Abstract Syntax Notation One) basic coding rules.

Primitive ASN.1 type

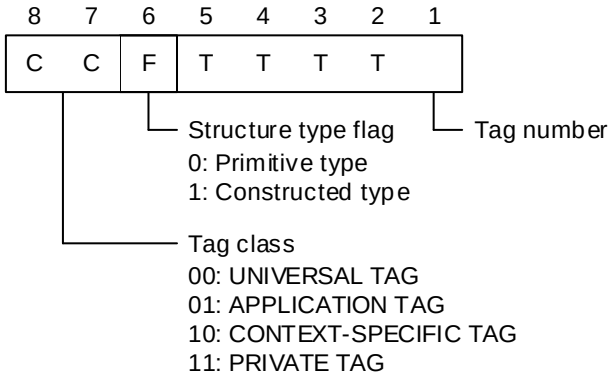
Type	Length	Value

Example of structure type ASN.1 type coding

Type	Length	Value						
		Type	Length	Value	Type	Length	Value	

Type field

■Structured (1 Octet type)



■Tag number (UNIVERSAL TAG)

Tag No. (Hexadecimal)	Type	Tag No. (Hexadecimal)	Type
00	(Reserved)	11	SET & SET OF
01	BOOLEAN	12	NumericString
02	INTEGER	13	PrintableString
03	BIT	STRING	14
04	OCTET	STRING	15
05	NULL	16	IA5String
06	OBJECT	IDENTIFIER	17
07	ObjectDescriptor	18	GeneralizedTime
08	EXTERNAL	19	GraphicString
09	REAL	1A	VisibleString
0A	ENUMERATED	1B	GeneralString
0B to 0F	(Reserved)	1C	CharacterString
10	SEQUENCE & SEQUENCE OF	1D to 1E	(Reserved)

■Each data type and structure type flag

○: Supported, ×: Not supported

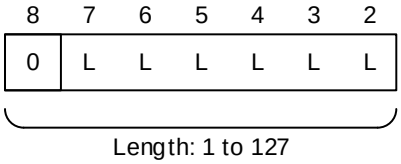
ASN.1 type	Primitive	Constructed
BOOLEAN, INTEGER, OBJECT IDENTIFIER,REAL, ENUMERATED	○	-
BIT STRING	○	○
OCTET STRING, NumericString,etc. structured type	○	○
Null (No value field)	○	-
SEQUENCE, SEQUENCE OF, SET, SET OF	-	○
EXTERNAL	-	○
CHOICE	○	○
ANY	○	○
Tagged type	○	○

■Printable string

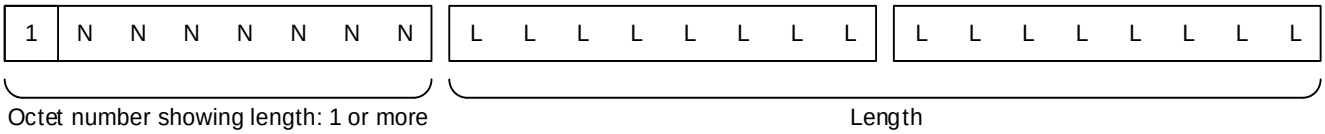
Name	Character	Code (Hexadecimal)
Capital letters	A, B, …, Z	41, 42, …, 5A
Small letters	a, b, …, z	61, 62, …, 7A
Digits	0, 1, …, 9	30, 31, …, 39
Space	(space)	20
Apostrophe	‘	27
Left Parenthesis	(	28
Right Parenthesis	)	29
Plus sign	+	2B
Comma	,	2C
Hyphen	-	2D
Full stop	.	2E
Solidus	/	2F
Colon	：	3A
Equal sign	=	3D
Question mark	?	3F

Length field

■Fixed length short format



■Fixed length long format



■Data transmission sequence

The data transmission is the big endian type in which the data with the highest octet to be sent first.

■Profile reference materials

- Ohgane Hisao, "TCP/IP and OSI Network Management", 1993, Soft Research Center, LTD
- ISO/IEC 8824 Information technology － Open Systems Interconnection - Specification of Abstract Syntax Notation One (ASN.1), 1990 Second edition, (ISO/IEC 8824-1 1995, ISO/IEC 8824-2 1995, ISO/IEC 8824-3 1995, ISO/IEC 8824-4 1995)
- ISO/IEC 8825 Information technology － Open Systems Interconnection - Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1), 1990 Second edition, (ISO/IEC 8825-1 1995, ISO/IEC 8825-2 1996)

Appendix 15.2 Mounting of items that have been read by log data read service

Declaration of mounting/not mounting of the items that have been read by log data read service.

○: Mounting, ×: Not mounting

Item	Description	Status
Send/receive	Totaling socket section send count	○
	Totaling socket section send errors count	○
	Ethernet send error count	○
	Totaling socket receive count	○
	Totaling socket receive error count	○
	Ethernet receive error count	○
Frame types	Token send count	○
	Cyclic frame send count	○
	1:1 message frame send count	○
	1:n message send count	○
	Token receive count	○
	Cyclic frame receive count	○
	1:1 message frame receive count	○
	1:n message receive count	○
Cyclic transmissions	Cyclic transmission/receive count	○
	Cyclic address size error count	○
	Cyclic CBN error count	○
	Cyclic TBN error count	○
	Cyclic BSIZE error count	○
Message transmissions	Message transmission re-send count	○
	Message transmission re-send over count	○
	Message transmission /receive error count	○
	Message transmission serial number count	○
	Message transmission re-send confirmation count	○
ACK related	ACK error count	○
	Serial number version error count	○
	Serial number error count	○
	Node number error count	○
	TCD error count	○
Token related	Token multiplexing recognition count	○
	Token destroyed count	○
	Token reissues count	○
	Token holding time count	○
	Token monitoring time out count	○
Status 1	Total operating time	○
	Frame wait status count	○
	Entry count	○
	Self- release count	○
	Release by skip count	○
	Other node release recognition count	○
Status 2	Participation recognition node list	○

MEMO

Appendix 16 When using a remote head module

When using an FL-net module with a remote head module, consider the following contents when programming.
This section provides the precautions for reading/writing buffer memory data of the Fl-net module using the REMFR/REMTO instruction in programs for initial processing, cyclic transmission, message transmission, etc.
For program of the basic setting processing, cyclic transmission. and message transmission,
refer to ☞Page 72 COMMUNICATION EXAMPLES.

Appendix 16.1 REMFR/REMTO instruction

Instruction timing

Make programming so that the next instruction is executed after completion of the REMFR/REMTO instruction execution.
Several scans are required from when the REMFR/REMTO instruction is executed until read/write of the actual data is completed.
Whether the REMFR/REMTO instruction is completed or not can be checked by the completion device.

Reading/writing 240 words or more

When reading/writing data larger than 240 words, execute the REMFR/REMTO instruction several times.
In that case, make programming to provide a handshake for exclusive processing.
Note that one REMFR/REMTO instruction is executed once (read/write of up to 240 words) for the same module.

Appendix 16.2 REMFR/REMTO instruction and output signal Y

When turning ON/OFF the output signal Y after completion of the read/ write of data by the REMFR/REMTO instruction from/to the FL-net module buffer memory, take into account the following for programming.

When turning ON output signal Y

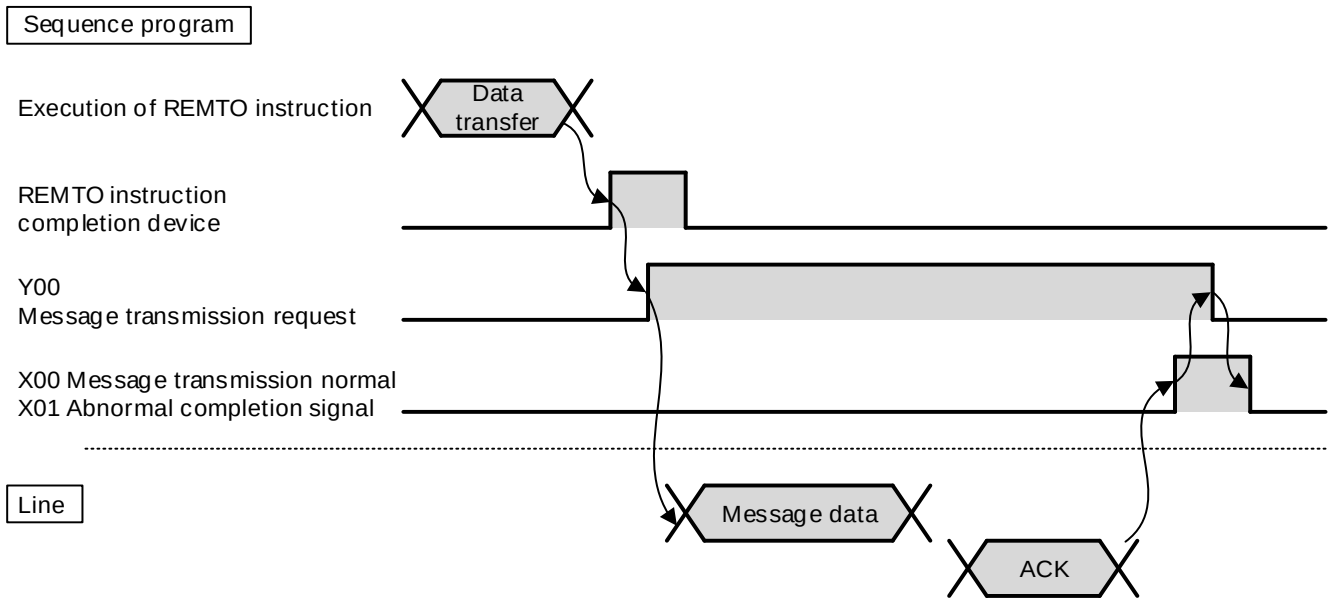
Before turning ON the output signal Y, make sure that the completion device is ON after execution of the REMFR/REMTO instruction.

When turning OFF output signal Y after turning it ON

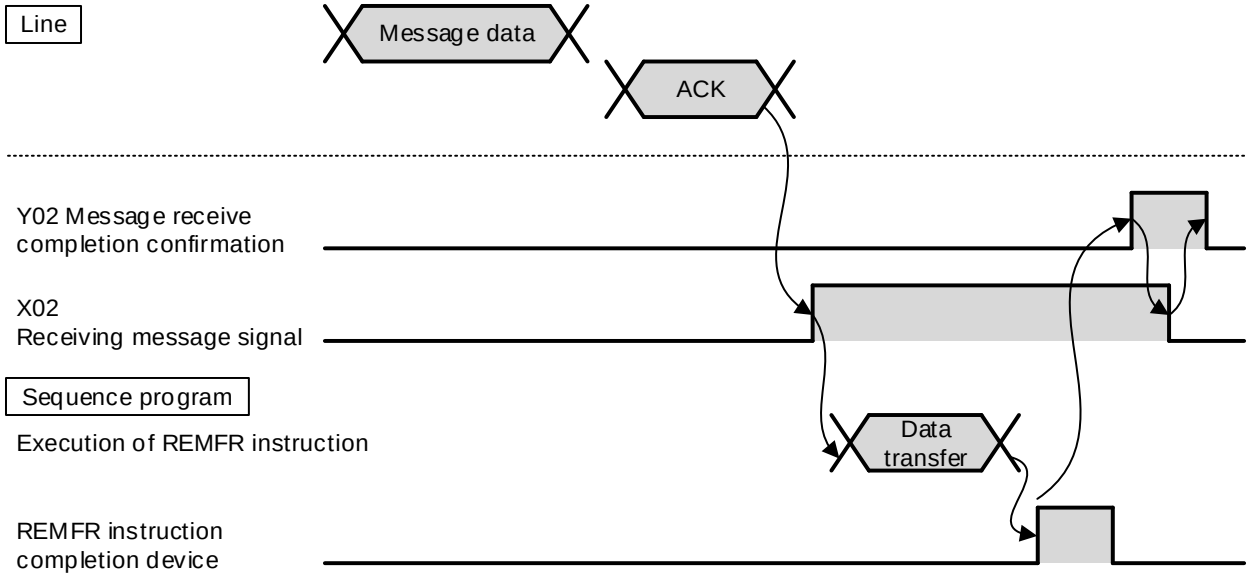
Before turning OFF the output signal Y, make sure that the input signal X corresponding to the output signal Y is ON (X2 is OFF for message reception).
For details on the I/O signals, refer to ☞Page 165 I/O Signals.

Send/receive message example

Ex. Message transmission



Ex. Message reception



Point

For details on REMFR/REMTO instruction, refer to the following manual.

MELSEC iQ-R Programming Manual (Instructions, Standard Functions/Function Blocks)

Appendix 17 When using the FL-net module in a redundant system

The FL-net module can be used on the remote head module (slave station) in a redundant system.
The following restrictions apply when the FL-net interface module is used in the redundant system.
Check the restrictions before making a decision to use the module.

Point

For details of a redundant system, refer to the following.

- MELSEC iQ-R Module Configuration Manual [SH-081262ENG]
- MELSEC iQ-R CC-Link IE Field Network User's Manual (Application) [SH-081259ENG]
- MELSEC iQ-R CC-Link IE Field Network Remote Head Module User's Manual (Application) [SH-081616ENG]

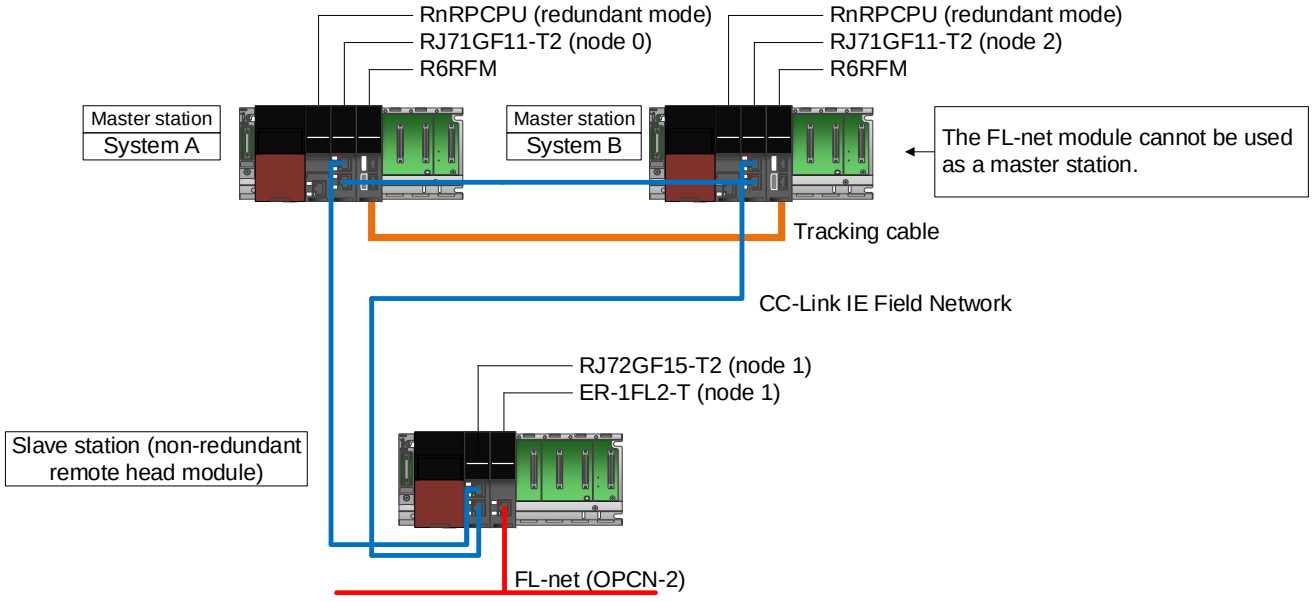
Appendix 17.1 Applicable system

The FL-net module can be used as a slave station in the redundant system.
Note that a redundant configuration is not made for the FL-net module itself.
* Another module with the same IP address (node number) cannot be connected on the same network.

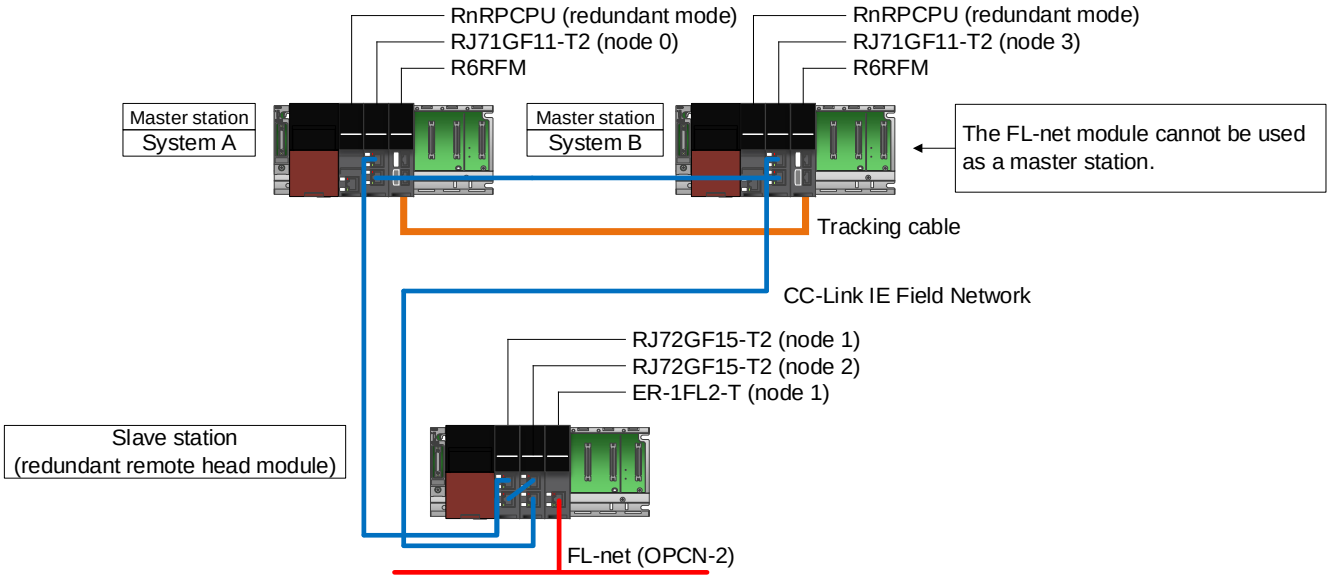
System configuration examples are as shown below.

No.	Condition			Model of the module added in GX Works3	
	Master station	Line	Remote head module	Master module	Remote head module
1	Redundant	Single	Non-redundant	RJ71GF11-T2(MR)	RJ72GF15-T2
2	Redundant	Redundant	Redundant	RJ71GF11-T2(SR)	RJ72GF15-T2(SR)
3	Redundant	Redundant	Redundant	RJ71GF11-T2(LR)	RJ72GF15-T2(LR)

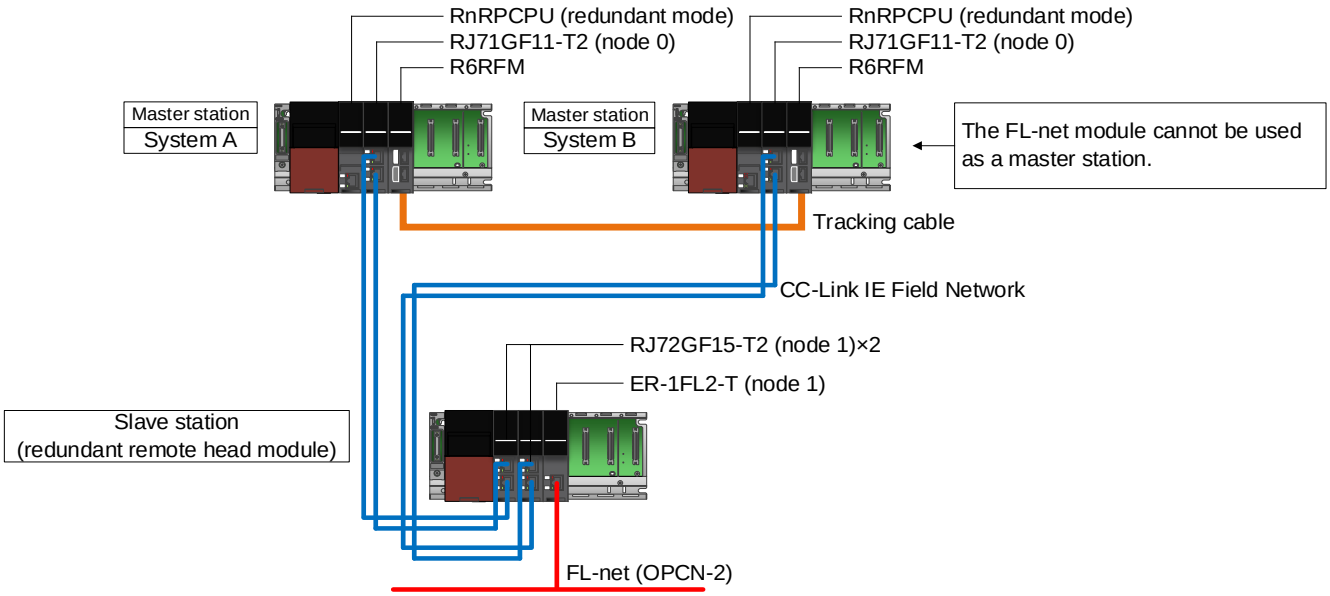
No. 1: Redundant master station, single line, non-redundant remote head module



No. 2: Redundant master station, single line, redundant remote head module



No. 3: Redundant master station, redundant line, redundant remote head module



A

Appendix 17.2 Restrictions on the FL-net module

System disconnection detection

When disconnection is detected for the FL-net system, simultaneous detection of the data link error signal is required for CC-Link IE Field Network.

Ex.

Even through the FL-net network is not disconnected, the token passing status signal (X19) of the FL-net module turns off when CC-Link IE Field Network is disconnected.
By using both the token passing status signal (X19) of the FL-net system and the data link error status of own station (SB0049) of the CC-Link IE Field master module for disconnection detection, the cause of the disconnection can be identified clearly.

Appendix 17.3 Restrictions on a redundant system

The following section describes restrictions on a redundant system.

Restrictions on the product version

A redundant system is supported by products with the following versions or later.

Product	Model name	Version	Remarks
Process CPU	RnPCPU	Version 18 or later	First 2 digits of the serial number: "18" or later
CC-Link IE Field Network master module	RJ71GF11-T2	Version 35 or later	First 2 digits of the serial number: "35" or later
Engineering tool	GX Works3	Version 1.050C or later	Relevant setting items are added only for the specified version.

Module labels and module FBs

Module labels and module FBs are not available for the FL-net module mounted on the slave station.
Specify the device or the buffer memory of the FL-net module directly.

REMTO/REMFR instruction in a redundant system

Due to system switching in a redundant system (master station), an instruction to the module on the remote head module may be suspended.
When the system is switched while an instruction that requires several scans is executed, create a program so that the instruction will be executed again in the control system after switching.
Special instructions such as REMTO or REMFR, which is used to access the buffer memory of the FL-net module mounted on the slave station, are applicable.
Although non-processing or execution of instruction may be continued, execute the applicable instruction again in the new control system.
Otherwise, the completion device will not turn on.

Point

For details of restrictions on system switching in a redundant system or instructions that requires several scans, refer to the following.
MELSEC iQ-R CPU Module User's Manual (Application)
29.2 System Switching→Operation at system switching
30.1 Instructions Not Available in Redundant System

For sample programs to execute instructions again, refer to the following.
MELSEC iQ-R CPU Module User's Manual (Application)
30.1 Instructions Not Available in Redundant System

Programs specific to redundant systems

If users use programs specific to redundant systems, users are required to create the programs.

Ex.
Depending on the monitoring time setting for system switching in the master station, longer time may be required for system switching.
After system switching, the program will be executed again from the step 0 of the CPU in the new control system.
Therefore, based on the premise that system switching occurs, avoid repeating the operation to be executed only once at power-on.

Point

For details of a redundant system, refer to the following.
MELSEC iQ-R CPU Module User's Manual (Application)

Appendix 18 Cyclic Data Area Assignment Sheet

Area1 (bit area)

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 01FFH)	Buffer memory address 7168 to 7679 (1C00 to 1DFFH)	Data size (Word units)	Buffer offset	PLC side device	
□□1						
□□2						
□□3						
□□4						
□□5						
□□6						
□□7						
□□8						
□□9						
□□0						

Ex.

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 01FFH)	Buffer memory address 7168 to 7679 (1C00 to 1DFFH)	Data size (Word units)	Buffer offset	PLC side device	
□□1	0000 to 000FH	7168 to 7183 (1C00 to 1C0FH)	16	0	B0 to BFF	
□□2	0020 to 002FH	7200 to 7215 (1C20 to 1C2FH)	16	32	B200 to B2FF	Local node

Area2 (word area)

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 01FFH)	Buffer memory address 8192 to 16383 (2000 to 3FFFH)	Data size (Word units)	Buffer offset	PLC side device	
□□1						
□□2						
□□3						
□□4						
□□5						
□□6						
□□7						
□□8						
□□9						
□□0						

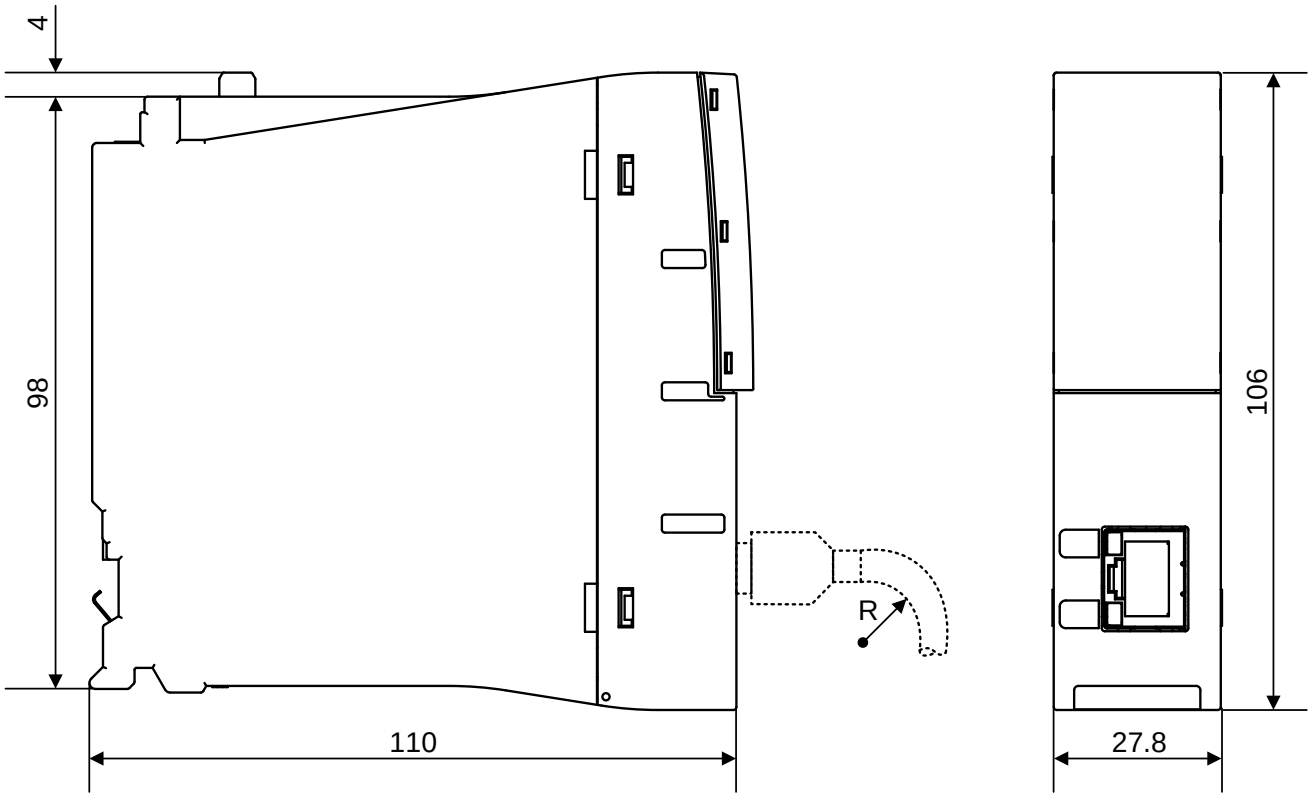
Ex.

Node No.	FL-net circuit	FL-net module			CPU module	Remark
	Common memory address (0000 to 01FFH)	Buffer memory address 8192 to 16383 (2000 to 3FFFH)	Data size (Word units)	Buffer offset	PLC side device	
□□1	0000 to 00FFH	8192 to 8447 (2000 to 20FFH)	256	0	W0 to WFF	
□□2	0200 to 02FFH	8704 to 8959 (2200 to 22FFH)	256	512	W200 to W2FF	Local node

Appendix 19 External Dimensions

The following figure shows the external dimensions of the FL-net module.

ER-1FL2-T



(Unit: mm)

When connecting a Ethernet cable, the bending radius near the connector (reference value: R) must be four times the cable's outside diameter or larger.

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REVISIONS

* The manual number is given on the bottom left of the back cover.

Revision date	*Manual number	Revision
Jan 2018	50CM-D180277-A	First edition
September 2020	50CM-D180277-B	· Error correction · Addition of application to a redundant system

Japanese manual number: 50CM-D180276-B

TRADEMARKS

WARRANTY

Please confirm the following product warranty details prior to product use.

1. Gratis Warranty Terms and Gratis Warranty Range

If any fault or defect (hereinafter referred to as "Failure") attributable to Mitsubishi Electric Engineering Company Limited (hereinafter referred to as "MEE") should occur within the gratis warranty period, MEE shall repair the product free of charge via the distributor from whom you made your purchase.

【Gratis Warranty Period】

The gratis warranty period of this product shall be one (1) year from the date of purchase or delivery to the designated place. Note that after manufacture and shipment from MEE, the maximum distribution period shall be six (6) months, and the gratis warranty period after manufacturing shall be limited to eighteen (18) months.

In addition, the gratis warranty period for repaired products shall not exceed the gratis warranty period established prior to repair.

【Gratis Warranty Range】

The gratis warranty range shall be limited to normal use based on the usage conditions, methods and environment, etc., defined by the terms and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

2. Warranty Period after Discontinuation of Production

(1) MEE shall offer product repair services (fee applied) for seven (7) years after production of the product has been discontinued. Discontinuation of production shall be reported via distributors.

(2) Product supply (including spare parts) is not possible after production has been discontinued.

3. Exclusion of Opportunity Loss and Secondary Loss from Warranty Liability

Regardless of the gratis warranty period, MEE shall not be liable for compensation for damages arising from causes not attributable to MEE, opportunity losses or lost profits incurred by the user due to Failures of MEE products, damages or secondary damages arising from special circumstances, whether foreseen or unforeseen by MEE, compensation for accidents, compensation for damages to products other than MEE products, or compensation for other work carried out by the user.

4. Changes in Product Specifications

The specifications given in the catalogs, manuals and technical documents are subject to change without notice.

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50CM-D180277-B(2009)MEE
MODEL: ER-1FL2-M1E

Published September 2020