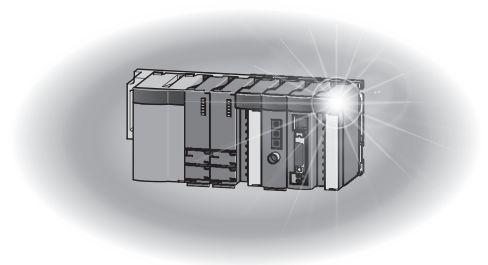


Programmable Controller

MELSEC **Q** series

FL-net (OPCN-2) Interface Module User's Manual

- QJ71FL71-T-F01
- QJ71FL71-B5-F01
- QJ71FL71-B2-F01
- QJ71FL71-T
- QJ71FL71-B5
- QJ71FL71-B2
- GX Configurator-FL (SW0D5C-QFLU-E)



• SAFETY PRECAUTIONS •

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.

The instructions given in this manual are concerned with this product only. For the safety instructions of the programmable controller system, please read the user's manual for the CPU module to use.

In this manual, the safety precautions are ranked as "⚠ 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.

Note that the ⚠ CAUTION level may lead to serious consequence according to the circumstances. Always follow the instructions of both levels because they are important to personal safety.

Please store this manual in a safe place and make it accessible when required. Always forward it to the end user.

[Design Precautions]

WARNING

- Refer to Section 6.2.7 of this manual for information about the operation of each node when the cyclic transmission generates a communication error when using FL-net (OPCN-2). The wrong output or erroneous operation could result in an accident.
- Never write data to the "system area" of the buffer memory for the intelligent function unit buffer memory. In addition, never output (set to on) the "use prohibited" signal during an output signal from the programmable controller CPU to the intelligent function unit. Writing data to the "system area" or output of a "use prohibited" signal could result in the malfunction of the sequence system.

CAUTION

- Do not bundle the control wires and communication cables with the main circuit or power wires, or install them close to each other.
They should be installed at least 100mm(3.94 in.) away from each other.
Failure to do so may generate noise that may cause malfunctions.

[Security Precautions]

WARNING

- To maintain the security (confidentiality, integrity, and availability) of the programmable controller and the system against unauthorized access, denial-of-service (DoS) attacks, computer viruses, and other cyberattacks from external devices via the network, take appropriate measures such as firewalls, virtual private networks (VPNs), and antivirus solutions.

[Installation Precautions]

CAUTION

- Use the programmable controller in the operating environment that meets the general specifications of this manual.
Using the programmable controller in any other operating environments may cause electric shocks, fires or malfunctions, or may damage or degrade the product.
- While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Then, securely mount the module with the fixing hole as a supporting point.
If the module is not installed properly, it may cause the module to malfunction, fail or fall off.
Secure the module with screws especially when it is used in an environment where constant vibrations may occur.
- Be sure to tighten the screws within the specified torque range.
If the screws are loose, it may cause the module to short-circuit, malfunction or fall off.
If the screws are tightened excessively, it may damage the screws and cause the module to short-circuit, malfunction or fall off.
- Before mounting or dismounting the module, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to do so may damage the product.
- Do not directly touch the conducting parts and electronic parts of the module. This may cause the module to malfunction or fail.

[Wiring Precautions]

CAUTION

- When wiring the connectors for external cables connection, crimp or clamp the wires with a tool specified by the manufacture or solder them. An incomplete connection could cause malfunctions.
- Do not connect AUI cables when the programmable controllers on the station where the module is mounted and the FL-net (OPCN-2) system are powered ON.
- Install the connector to the module securely.
- Place the communication and power cables to be connected to the module in a duct or fasten them using a clamp. If not, dangling cables may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunctions due to poor cable contact.
- Always tighten the screws within the specified torque range.
If the screws are loose, shorting or malfunctioning could result. If the screws are too tight, they could break off, fall into the unit and cause shorting or malfunctioning.
- When disconnecting a communication or power cable from the module, do not pull the cable part by hand. When disconnecting a cable with a connector, hold the connector connected to the module by hand and pull it out. When disconnecting a cable connected to a terminal block, loosen the screws on the terminal block first before removing the cable. Failure to do so may cause a malfunction or damage to the module and/or cables.
- Be careful not to let foreign matter such as dust and wire chips get inside the module. They may cause a fire, mechanical breakdown or malfunction.
- The top surface of the module is covered with a protective film to prevent foreign matter such as wire chips from entering the module during wiring work. Do not remove this film until all the wiring work is complete. Before operating the system, be sure to remove the film to release heat.

[Startup and Maintenance Precautions]

CAUTION

- Never disassemble or modify the module. This may cause breakdowns, malfunctions, injuries or fire.
- Before mounting or dismounting the module, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to do so may damage the module or result in malfunctions
- Do not install/remove the module to/from the base unit more than 50 times after the first use of the product. (IEC 61131-2/JIS B 3502 compliant)
Failure to do so may cause malfunction.
- Do not touch the terminals while the power is on. Doing so may cause malfunctions.
- Before cleaning the module or retightening the terminal screws and module fixing screws, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to completely shut off all phases of the external power supply may cause module breakdowns and malfunctions. If the screws are loose, it may cause the module to short-circuit, malfunction or fall off. If the screws are tightened excessively, it may damage the screws and cause the module to short circuit, malfunction or fall off.
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module.
Failure to do so may cause a failure or malfunctions of the module.

[Disposal Precautions]

CAUTION

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

• CONDITIONS OF USE FOR THE PRODUCT •

(1) MELSEC programmable controller ("the PRODUCT") shall be used in conditions;

- i) where any problem, fault or failure occurring in the PRODUCT, if any, shall not lead to any major or serious accident; and
- ii) where the backup and fail-safe function are systematically or automatically provided outside of the PRODUCT for the case of any problem, fault or failure occurring in the PRODUCT.

(2) The PRODUCT has been designed and manufactured for the purpose of being used in general industries.

MITSUBISHI ELECTRIC SHALL HAVE NO RESPONSIBILITY OR LIABILITY (INCLUDING, BUT NOT LIMITED TO ANY AND ALL RESPONSIBILITY OR LIABILITY BASED ON CONTRACT, WARRANTY, TORT, PRODUCT LIABILITY) FOR ANY INJURY OR DEATH TO PERSONS OR LOSS OR DAMAGE TO PROPERTY CAUSED BY the PRODUCT THAT ARE OPERATED OR USED IN APPLICATION NOT INTENDED OR EXCLUDED BY INSTRUCTIONS, PRECAUTIONS, OR WARNING CONTAINED IN MITSUBISHI ELECTRIC USER'S, INSTRUCTION AND/OR SAFETY MANUALS, TECHNICAL BULLETINS AND GUIDELINES FOR the PRODUCT.

("Prohibited Application")

Prohibited Applications include, but not limited to, the use of the PRODUCT in;

- Nuclear Power Plants and any other power plants operated by Power companies, and/or any other cases in which the public could be affected if any problem or fault occurs in the PRODUCT.
- Railway companies or Public service purposes, and/or any other cases in which establishment of a special quality assurance system is required by the Purchaser or End User.
- Aircraft or Aerospace, Medical applications, Train equipment, transport equipment such as Elevator and Escalator, Incineration and Fuel devices, Vehicles, Manned transportation, Equipment for Recreation and Amusement, and Safety devices, handling of Nuclear or Hazardous Materials or Chemicals, Mining and Drilling, and/or other applications where there is a significant risk of injury to the public or property.

Notwithstanding the above restrictions, Mitsubishi Electric may in its sole discretion, authorize use of the PRODUCT in one or more of the Prohibited Applications, provided that the usage of the PRODUCT is limited only for the specific applications agreed to by Mitsubishi Electric and provided further that no special quality assurance or fail-safe, redundant or other safety features which exceed the general specifications of the PRODUCTS are required. For details, please contact the Mitsubishi Electric representative in your region.

(3) Mitsubishi Electric shall have no responsibility or liability for any problems involving programmable controller trouble and system trouble caused by DoS attacks, unauthorized access, computer viruses, and other cyberattacks.

REVISIONS

* The manual number is given on the bottom left of the back cover.

| Print Date | * Manual Number | Revision |
|------------|-------------------|---|
| Aug., 2002 | SH (NA)-080350E-A | First edition |
| Feb., 2003 | SH (NA)-080350E-B | <p>Modifications</p> <p>SAFETY PRECAUTIONS, About Manuals, Section 3.1.1, Section 6.4.4, INDEX</p> |
| Jul., 2003 | SH (NA)-080350E-C | <p>Modifications</p> <p>This Manual's Use and Structure, About the Generic Terms and Abbreviations, Product Composition, Chapter 1, Section 1.2, Section 3.1, 3.1.1, 3.1.2, 3.2.2, 3.2.5, 3.2.6, 3.5, 3.6, Section 4.2, Section 5.1.1, Section 6.3.2, 6.4.3, 6.4.5, 6.4.6, 6.4.7, 6.4.8, 6.4.9, 6.4.10, 6.5, 6.5.3, 6.5.4, Section 7.1, Section 8.4, 8.5.1, 8.5.2, 8.6, Appendix 1, Appendix 4.4, Appendix 7.3, 7.4, Appendix 10, INDEX</p> <p>Chapter/section No. change</p> <p>From Section 5.1.2 to Section 5.1.3</p> <p>Addition</p> <p>Section 5.1.2</p> <p>Model addition</p> <p>QJ71FL71-T-F01, QJ71FL71-B5-F01</p> <p>Model deletion</p> <p>QJ71FL71-F01</p> |
| Jun., 2004 | SH (NA)-080350E-D | <p>Modifications</p> <p>SAFETY PRECAUTIONS, Section 1.2, Section 3.1.1, 3.2.5, 3.5, Section 6.2.7, 6.4.6, 6.4.8, 6.4.10, 6.5, 6.5.4</p> <p>Chapter/section No. change</p> <p>From Appendix 10 to Appendix 11</p> <p>Addition</p> <p>Appendix 10</p> |
| Jan., 2006 | SH (NA)-080350E-E | <p>Modifications</p> <p>SAFETY PRECAUTIONS, Section 1.2, 1.4, Section 3.1.2, 3.2, 3.5, Chapter 4, Section 5.1, Section 6.1.4, 6.2, 6.4, 6.5, Section 8.2</p> <p>Chapter/section No. change</p> <p>From Section 8.6 to Section 8.7, From Appendix 11 to Appendix 12</p> <p>Addition</p> <p>Compliance with the EMC and Low Voltage Directives, Section 8.6, Appendix 11</p> |
| Feb., 2006 | SH (NA)-080350E-F | <p>Modifications</p> <p>Section 3.1.1, 3.2.6, Section 6.4.6, 6.4.8, 6.4.10, 6.5.4</p> |
| Jan., 2008 | SH (NA)-080350E-G | <p>Modifications</p> <p>SAFETY PRECAUTIONS, About the Generic Terms and Abbreviations, Section 1.2, 1.3, Section 3.1.1, 3.1.2, 3.2.2 to 3.2.6, 3.4 to 3.6, Section 4.2, Section 5.1, Section 6.1.2, 6.2.7, 6.2.8, 6.3.2, 6.4.3, 6.4.4, 6.5.2, 6.5.4, Section 8.1, 8.3, 8.4, 8.5.1, 8.6, Appendix 2.3, Appendix 3.8, Appendix 4.3, Appendix 5.1, Appendix 6.1, 6.3, Appendix 7.3, 7.4, Appendix 9, Appendix 12</p> |

* The manual number is given on the bottom left of the back cover.

| Print Date | * Manual Number | Revision |
|------------|-------------------|---|
| May., 2008 | SH (NA)-080350E-H | <p>Change of a term</p> <p>"PLC" was changed to "programmable controller".</p> <p>Modifications</p> <p>SAFETY PRECAUTIONS, Compliance with the EMC and low voltage directives, About the Generic Terms and Abbreviations, Section 2, Section 3.1.1, 3.2.2 to 3.2.6, 3.5, Section 4.2, Section 5.1.1 to 5.1.3, Section 6.1.1, 6.1.3, 6.2.1, 6.2.6 to 6.2.8, 6.3, 6.4.1, 6.4.3, 6.4.5 to 6.4.10, 6.5 Section 7.2, Section 8.3 to 8.5, Appendix 2.2 to 2.5, Appendix 3.1, 3.5, 3.6, 3.8, Appendix 4.1, 4.2, 4.4, 4.6, Appendix 5.1, 5.2, Appendix 6.2, 6.3, Appendix 7, Appendix 9, Appendix 10, Appendix 12</p> |
| Jan., 2009 | SH (NA)-080350E-I | <p>Model addition</p> <p>QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2</p> <p>Modifications</p> <p>The Manual's Use and Structure, About the Generic Terms and Abbreviations, Product Composition, Chapter 1, Section 1.2, Section 3.1.1, 3.1.2, 3.2.2, 3.2.5, 3.2.6, 3.5, 3.6, Section 5.1.1 to 5.1.3, Section 6.2.8, 6.3.2, 6.4.3, 6.5, Section 8.4, 8.7, Appendix 1, Appendix 6.1, Appendix 13</p> <p>Chapter/section No. change</p> <p>Appendix 3 to 12 → Appendix 4 to 13</p> <p>Addition</p> <p>Appendix 2</p> |
| Dec., 2009 | SH (NA)-080350E-J | <p>Modifications</p> <p>Section 1.2, 3.2.5, 6.2.8, 6.3.2, 6.4.10, 6.5.1, 6.5.2, 6.5.3, 6.5.4, 8.4, Appendix 13</p> <p>Addition</p> <p>CONDITIONS OF USE FOR THE PRODUCT</p> |
| Jul., 2012 | SH (NA)-080350E-K | <p>Modifications</p> <p>COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES, About the Generic Terms and Abbreviations, Section 3.1.1, 3.1.2, 3.2.2, 3.5, 6.2.7, 6.4.4, Appendix 6.1, 7.2, 7.3, 13, WARRANTY</p> |
| Aug., 2021 | SH (NA)-080350E-L | <p>Modifications</p> <p>SAFETY PRECAUTIONS, CONDITIONS OF USE FOR THE PRODUCT, ABOUT THE GENERIC TERMS AND ABBREVIATIONS, DISCONTINUED MODELS, Chapter 1, Section 3.1.1, 3.2.2, 3.5, 6.4.3, 6.4.4, Appendix 6.1</p> |

Japanese Manual Version SH-080349-Q

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INTRODUCTION

Thank you for purchasing the Mitsubishi Electric MELSEC-Q series programmable controller. Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the Q series programmable controller you have purchased, so as to ensure correct use. Please forward a copy of this manual to the end user.

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COMPLIANCE WITH EMC AND LOW VOLTAGE DIRECTIVES

(1) Method of ensuring compliance

To ensure that Mitsubishi programmable controllers maintain EMC and Low Voltage Directives when incorporated into other machinery or equipment, certain measures may be necessary. Please refer to one of the following manuals.

- QCPU User's Manual (Hardware Design, Maintenance and Inspection)
- Safety Guidelines

(This manual is included with the CPU module or base unit.)

The CE mark on the side of the programmable controller indicates compliance with EMC and Low Voltage Directives.

(2) Additional measures

To ensure that this product maintains EMC and Low Voltage Directives, please refer to one of the manuals listed under (1).

THE MANUAL'S USE AND STRUCTURE

● How to use this manual

This manual is organized to provide information for specific usage applications for the FL-net module (QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2). Refer to this manual for information on the following topics.

(1) When you want a list of features and utilities . . .

(a) To find out about features and functions

- The features of the FL-net module are provided in Chapter 1.
- The common functions, specifications and other details about FL-net are provided in Chapter 3.

(b) When you want to know about the parts provided and component parts of the network . . .

- The "PRODUCT COMPOSITION" at the front of Chapter 1 provides a list of the parts provided in the package at the time of purchase of the FL-net module.
- Section 3.1.2 provides a description of the system components for the FL-net module. The user is responsible for obtaining the parts and materials required that have not been provided with the FL-net module.

(2) When you want to know the necessary procedures before starting the FL-net module. . .

(a) To find out the start-up procedure

- Section 6.3.1 provides a summary of the procedures required up to operating the FL-net module.

(b) To find out information about connecting to the FL-net (OPCN-2) network system. . .

- Section 3.1.2 provides information about the equipment required for connecting to the FL-net (OPCN-2) network system.
- Chapter 5 provides the connection methods for connecting to the FL-net (OPCN-2) network system, listed by connected type.

(c) To find out the necessary procedures before starting the FL-net module. . .

- There are parameter setting screens from GX Developer for using the FL-net module. Section 6.3.2 provides information about the types of parameter setting screens.

(d) To find out the method for confirming whether or not the FL-net module has failed . . .

- Section 6.3.1(1) provides the self-diagnosis tests for the FL-net module.

(e) To find out the method for confirming whether or not there is an error in the connection with corresponding equipment . . .

- Section 8.2 (3) provides the method for confirming using the "PING" command.

- (3) When you want to know about the types of data communication with detailed explanations. . .
 - (a) To find out about the types of data communications. . .
 - Section 6.2.3 provides information about the types of data communication for the FL-net module.
 - (b) To find out about the location of detailed explanations about each of the communication methods . . .
 - Section 6.2.7 provides information about cyclic transmissions and areas.
 - Section 6.2.8 provides information about message transmissions.
- (4) When you want to know about the program methods for performing communication with the FL-net module. . .
 - The beginning of Section 6.5 provides information about the procedures for creating programs.
 - Section 6.5.4 provides sample programs.
- (5) When you want to know how to perform inspections and maintenance on the FL-net module and how to remove and replace components. . .
 - (a) To find out about inspections and maintenance. . .
 - Section 7.1 provides information about inspection and maintenance of the FL-net module.
 - (b) To find out about the procedure for removing and replacing components. . .
 - Section 7.2 provides the operating procedure when replacing the FL-net module and replacing the CPU.
- (6) When you want to know how to confirm an errors and the methods for responding to them. . .
 - (a) To find the meanings of the error codes . . .
 - Chapter 8 provides the methods for troubleshooting and error confirmation and also provides a description of the error codes and the methods for responding to them.
 - (b) To find the storage locations of the error codes in the FL-net module. . .
 - Chapter 8.5.2 provides information on the storage destination for the error codes for the buffer memory.

● Structure of this manual

(1) Settings from GX Developer

- (a) The FL-net module performs the parameter settings from GX Developer, allowing the sequence program for performing communication with corresponding equipment to be simplified.
- (b) Section 6.3.2 provides a summary of the types of setting screens and the setting items.
- (c) Use Section 6.3.2 to set the relevant parameters and write them to the programmable controller CPU for the FL-net module equipped station.

(2) Explanation of the GX Developer setting screen

In this manual, the intelligent function module switch settings from the GX Developer are explained in the format shown below. (Section 6.3.2 (2))

(2) Intelligent function module switch setting

Shows the GX Developer Intelligent function module switch setting screen.

(a) Switch 1 to switch 4
Sets the IP address of the FL-net module.
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.

1) Switch 1
Sets the first digit of the IP address.
If set to "No setting (Blank)", the default setting is used.
• Default value : 192

POINT

FL-net (OPCN-2) uses Class C IP address.
Setting values can be set within a range from 192 to 223.

2) Switch 2
Sets the second digit of the IP address.
If set to "No setting (Blank)", the default setting is used.
• Default value : 168
• Setting range : 0 to 255

3) Switch 3
Sets the third digit of the IP address.
If set to "No setting (Blank)", the default setting is used.
• Default value : 250
• Setting range : 0 to 255

4) Switch 4
Sets the fourth digit of the IP address. (This is the node number.)
If set to "No setting (Blank)", the default setting is used.
• Default value : 1
• Setting range : 1 to 254

(b) Switch 5
This inputs the operating mode of the FL-net module.
0 : "Off line" (Default, communicate with other nodes)
1 : "Off line" (Disconnects local node)
2 : "Loopback test"
3 : "Hardware test"

(c) Input format
Select the input format for the settings.
• Decimal
• Hexadecimal (default)

Shows the setting contents of each switch.

Shows the setting contents of the input format.

* The page illustrated above is provided for example only and is different from any actual page.

ABOUT THE GENERIC TERMS AND ABBREVIATIONS

Unless otherwise stated, the following generic terms and detailed names are used for explaining the QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2 type FL-net (OPCN-2) interface module.

| Generic terms/Abbreviations | Description of generic terms and abbreviations |
|---------------------------------|---|
| GX Developer | Product name of the software package for the MELSEC programmable controllers. |
| GX Works2 | |
| GX Configurator-FL | Generic product name for SWnD5C-QFLU and SWnD5C-QFLU-A. ("n" means version) "-A" mean "volume license product" respectively. |
| Personal computer | IBM PC/AT or 100 % compatible personal computer. |
| FL-net module | Abbreviation for QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2 type FL-net (OPCN-2) interface module. |
| Ethernet network system | Abbreviation for 10BASE2, 10BASE5, 10BASE-T/100BASE-TX network system. |
| Corresponding equipment | Personal computer, calculator, workstation (WS) or other device connected by FL-net (OPCN-2) for data communication. |
| QCPU | Generic term for Q00JCPU, Q00UJCPU, Q00CPU, Q00UCPU, Q01CPU, Q01UCPU, Q02CPU, Q02HCPU, Q02PHCPU, Q02UCPU, Q03UDCPU, Q03UDVCPU, Q03UDECPU, Q04UDHCPU, Q04UDVCPU, Q04UDPVCPU, Q04UDEHCPU, Q06HCPU, Q06PHCPU, Q06UDHCPU, Q06UDVCPU, Q06UDPVCPU, Q06UDEHCPU, Q10UDHCPU, Q10UDEHCPU, Q12HCPU, Q12PHCPU, Q12PRHCPU, Q13UDHCPU, Q13UDVCPU, Q13UDPVCPU, Q13UDEHCPU, Q20UDHCPU, Q20UDEHCPU, Q25HCPU, Q25PHCPU, Q25PRHCPU, Q26UDHCPU, Q26UDVCPU, Q26UDPVCPU, Q26UDEHCPU, Q50UDEHCPU, Q100UDEHCPU. |
| Basic model QCPU | Generic term for Q00JCPU, Q00CPU, Q01CPU. |
| High Performance model QCPU | Generic term for Q02CPU, Q02HCPU, Q06HCPU, Q12HCPU, Q25HCPU. |
| Process CPU | Generic term for Q02PHCPU, Q06PHCPU, Q12PHCPU, Q25PHCPU. |
| Redundant CPU | Generic term for Q12PRHCPU, Q25PRHCPU. |
| Universal model QCPU | Generic term for Q00UJCPU, Q00UCPU, Q01UCPU, Q02UCPU, Q03UDCPU, Q03UDVCPU, Q03UDECPU, Q04UDHCPU, Q04UDVCPU, Q04UDPVCPU, Q04UDEHCPU, Q06UDHCPU, Q06UDVCPU, Q06UDPVCPU, Q06UDEHCPU, Q10UDHCPU, Q10UDEHCPU, Q13UDHCPU, Q13UDVCPU, Q13UDPVCPU, Q13UDEHCPU, Q20UDHCPU, Q20UDEHCPU, Q26UDHCPU, Q26UDVCPU, Q26UDPVCPU, Q26UDEHCPU, Q50UDEHCPU, Q100UDEHCPU. |
| High-speed Universal model QCPU | Generic term for Q03UDVCPU, Q04UDVCPU, Q06UDVCPU, Q13UDVCPU, Q26UDVCPU. |
| Universal model Process CPU | Generic term for Q04UDPVCPU, Q06UDPVCPU, Q13UDPVCPU, Q26UDPVCPU. |

DISCONTINUED MODELS

The following models are described in this manual, but have no longer been produced.

For the onerous repair term after discontinuation of production, refer to "WARRANTY" in this manual.

| Model | Production discontinuation |
|---|----------------------------|
| QJ71FL71-B5 | November 2015 |
| QJ71FL71-B5-F01 QJ71FL71-B2 QJ71FL71-B2-F01 | February 2017 |

PRODUCT COMPOSITION

This unit is comprised of the following products.

| Model | Product name | Quantity |
|-----------------|--|----------|
| QJ71FL71-T-F01 | QJ71FL71-T-F01 FL-net (OPCN-2) interface module | 1 |
| QJ71FL71-B5-F01 | QJ71FL71-B5-F01 FL-net (OPCN-2) interface module | 1 |
| QJ71FL71-B2-F01 | QJ71FL71-B2-F01 FL-net (OPCN-2) interface module | 1 |
| QJ71FL71-T | QJ71FL71-T FL-net (OPCN-2) interface module | 1 |
| QJ71FL71-B5 | QJ71FL71-B5 FL-net (OPCN-2) interface module | 1 |
| QJ71FL71-B2 | QJ71FL71-B2 FL-net (OPCN-2) interface module | 1 |
| SW0D5C-QFLU-E | GX Configurator-FL Version 1 (Single license product) (CD-ROM) | 1 |
| SW0D5C-QFLU-E-A | GX Configurator-FL Version 1 (Volume license product) (CD-ROM) | 1 |

1 INTRODUCTION

1

This manual applies to the MELSEC-Q Series QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2 type FL-net (OPCN-2) interface modules (hereafter called the FL-net module) and provides information about the specifications, procedures used up to operation, the methods of data communication, inspection, maintenance and troubleshooting.

(1) FL-net (OPCN-2) versions

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

| FL-net (OPCN-2) version | FL-net module | Ethernet standard |
|------------------------------|---------------------|--------------------------|
| FL-net (OPCN-2) Version 2.00 | QJ71FL71-T-F01 (*1) | 10BASE-T (*2)/100BASE-TX |
| | QJ71FL71-B5-F01 | 10BASE5 |
| | QJ71FL71-B2-F01 | 10BASE2 |
| FL-net (OPCN-2) Version 1.00 | QJ71FL71-T | 10BASE-T (*2) |
| | QJ71FL71-B5 | 10BASE5 |
| | QJ71FL71-B2 | 10BASE2 |

*1: Supports Ver.3.01 class 1 (functions equivalent to those of Ver.2).

*2: For a QJ71FL71-T-F01 whose first six digits of serial No. are 211023 or later and for a QJ71FL71-T whose first six digits of serial No. are 211022 or later, replace "10BASE-T" with "10BASE-Te."

(2) Coexistence of FL-net (OPCN-2) Version 2.00 and Version 1.00

Since there is no compatibility between FL-net (OPCN-2) Version 2.00 and FL-net (OPCN-2) Version 1.00, connections and communications are not allowed between these versions.

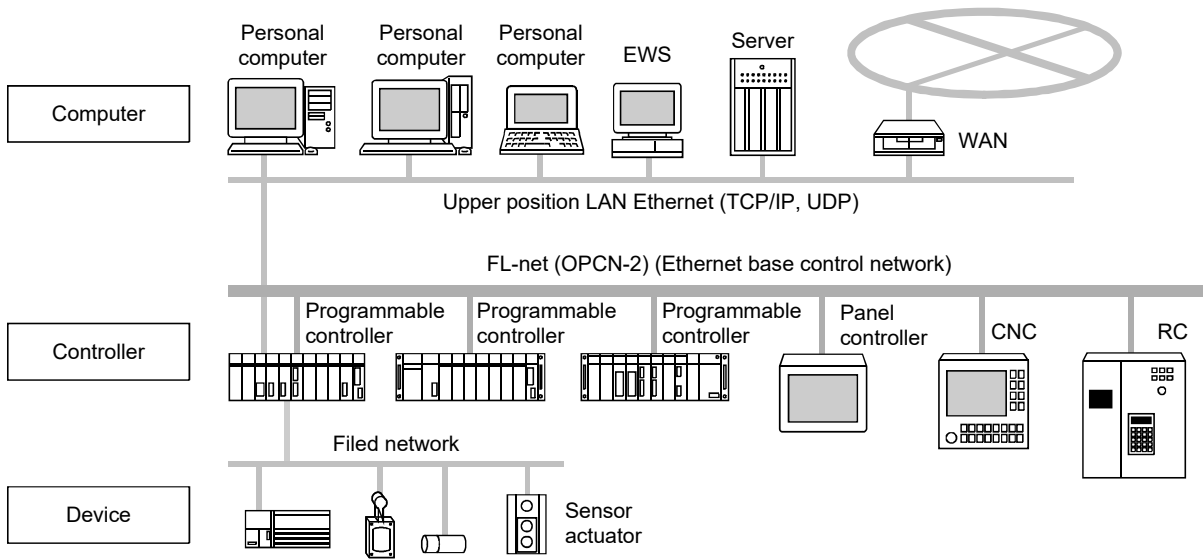
This incompatibility applies to the case of connecting another manufacturer's product.

(3) Reuse of sequence programs and network equipment

Existing sequence programs and network equipment can be used between FL-net (OPCN-2) Version 2.00 and FL-net (OPCN-2) Version 1.00 modules.

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.

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

- (a) 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.
- (b) 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).
- (c) Designed for future speed increases
Anticipates future transmission speed increases 10 Mbps → 100 Mbps → 1 Gbps.
- (d) 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.)
- (e) 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.
- (f) Large-capacity common memory
The common memory is large: 8 k bits + 8 k words.
- (g) 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.

(2) Features of the FL-net module

(a) 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).

If the following conditions, 1) to 4), are met in common memory assignment, double word (32-bit) data consistency is automatically guaranteed.

- 1) The first address of area 1 (bit area) is multiples of 2.
- 2) The size of area 1 (bit area) is multiples of 2.
- 3) The first address of area 2 (word area) is multiples of 2.
- 4) The size of area 2 (word area) is multiples of 2.

(b) The modules available for the cable used

- QJ71FL71-T-F01 - Supports 10BASE-T/100BASE-TX
- QJ71FL71-T - Supports 10BASE-T
- QJ71FL71-B5-F01, QJ71FL71-B5 - Supports 10BASE5
- QJ71FL71-B2-F01, QJ71FL71-B2 - Supports 10BASE2

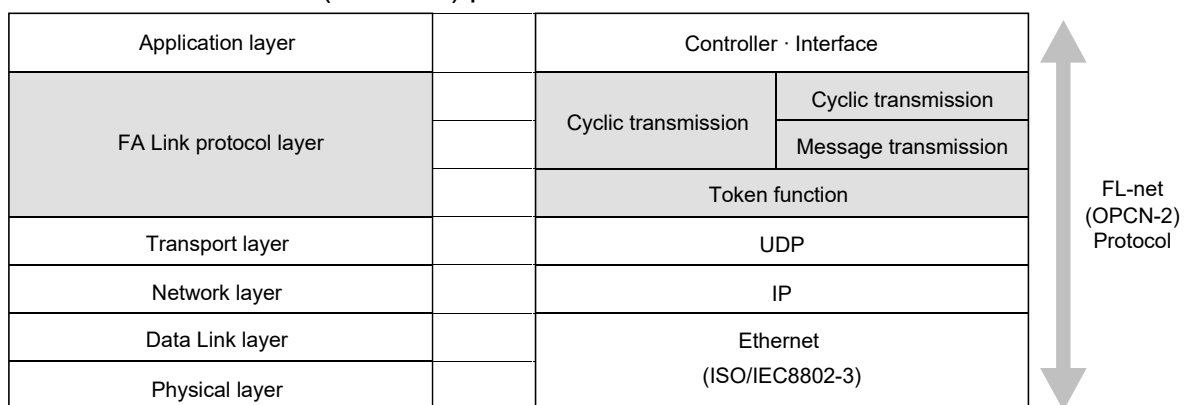
(c) Supports the PING command response function

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

(d) Equipped with self-diagnosis function

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

<Basic structure of FL-net (OPCN-2) protocol>



(e) Easy setting by using GX Configurator-FL

Using GX Configurator-FL, which is separately available, can reduce steps for sequence programs because on-screen configuration is available for the FL-net module.

In addition, it makes checking of the modules' settings and operations easy.

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.

| | 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 high-speed 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. |

(Continued on next page)

(Continued from previous page)

| | Question | Answer |
|----|--|---|
| 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? | <p>The following are some of the standards, characteristics and limitations of Ethernet cable, which is the most commonly used type.</p> <p>Note: Values shown in () indicate that a repeater is used.</p> <p>(1) 10BASE-T/100BASE-TX Twisted pair cable (STP/UTP). The maximum transmission distance per segment is 100 m (500 m). The maximum number of modules that can be connected per segment is 254.</p> <p>(2) 10BASE5 Thick coaxial cable (yellow cable). The maximum transmission distance per segment is 500 m (2500 m). The maximum number of modules that can be connected per segment is 100 (254).</p> <p>(3) 10BASE-FL Optical fiber cable. The maximum transmission distance per segment is 2000 m. The maximum number of modules that can be connected per segment is 254.</p> |
| 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. |
| 11 | What is the best cables to use when constructing a FL-net (OPCN-2) system? | <p>The following are the most commonly used cables.</p> <ul style="list-style-type: none"> • 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. |

1.4 FL-net (OPCN-2) Version Information

The FL-net (OPCN-2) authorization version of the FL-net module can be confirmed with the buffer memory (Address: 9CA_H).

The FL-net (OPCN-2) protocol version of the FL-net module can be checked with the buffer memory (Address: 9C9_H).

(Refer to Section 3.2.6 (2).)

2 SAFETY PRECAUTIONS

The beginning of this manual contains "SAFETY PRECAUTIONS". Read and understand them before using this product.

In addition, before using this product read this manual and all other related manuals introduced in this manual. Always keep safety top priority when using this equipment.

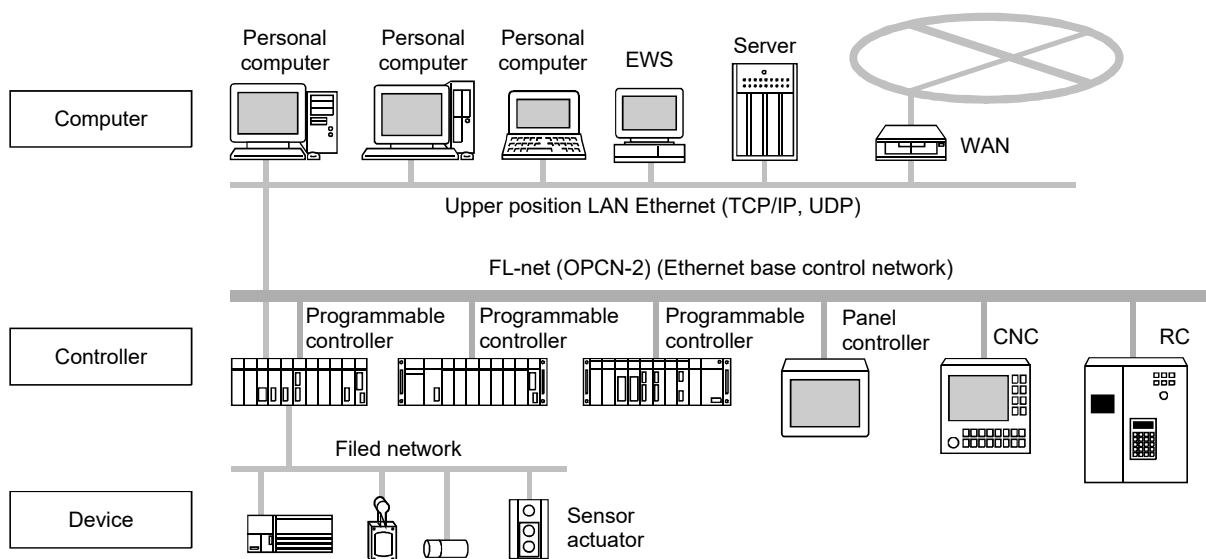
3 FL-net MODULE

3.1 System Configuration

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

(1) 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.)



3

(2) Mixed system

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

(a) Cyclic transmissions

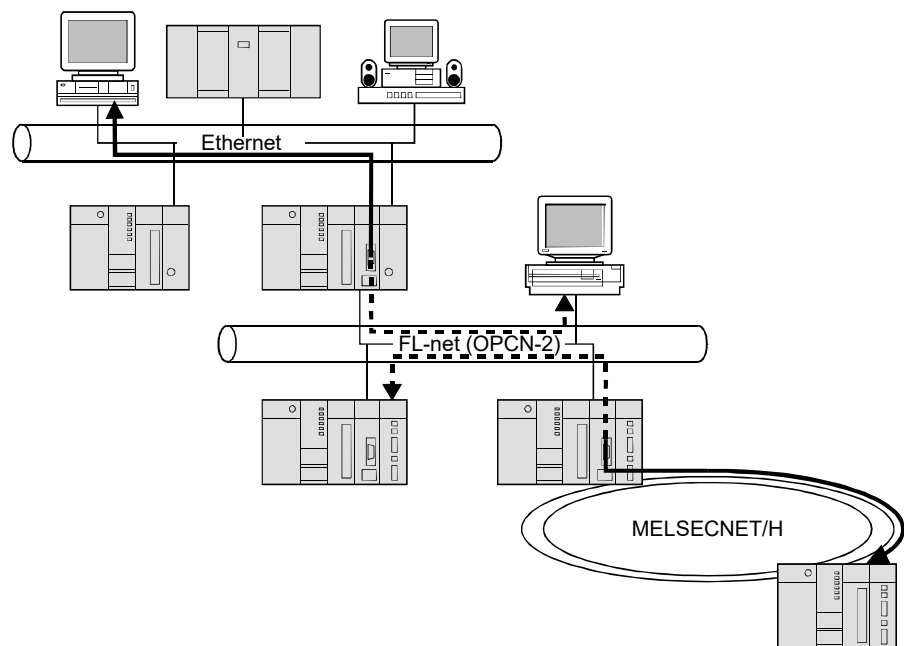
Data transmissions can be performed within FL-net (OPCN-2).

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

(b) 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.



3.1.1 Applicable systems

This section describes the applicable systems.

(1) Applicable modules and base units, and No. of modules

(a) When mounted with a CPU module

For the CPU modules, the number of modules, and base units applicable to the FL-net module, refer to the user's manual for the CPU module used.

Note the following when the FL-net module is used with a CPU module.

- Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient. Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.
- Mount a module within the number of I/O points for the CPU module. If the number of slots is within the available range, the module can be mounted on any slot.

REMARK

When using a C Controller module, refer to the user's manual for the C Controller module.

(b) Mounting to a MELSECNET/H remote I/O station

For the MELSECNET/H remote I/O station, the number of modules, and base units applicable to the FL-net module, refer to the Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O network).

(2) Support of the multiple CPU system

When using the FL-net module in a multiple CPU system, refer to the QCPU User's Manual (Multiple CPU System) first.

(3) Supported software packages

Relation between the system containing the FL-net module and software package is shown in the following table.

GX Developer or GX Works2 is necessary when using the FL-net module.

| | | Software version | | |
|---|---------------------|------------------------|----------------------------|---|
| | | GX Developer | GX Configurator-FL | GX Works2 |
| Q00J/Q00/Q01CPU | Single CPU system | Version 7 or later | Version 1.10L or later | Refer to the GX Works2 Version 1 Operating Manual (Common). |
| | Multiple CPU system | Version 8 or later | | |
| Q02/Q02H/Q06H/ Q12H/Q25HCPU | Single CPU system | Version 4 or later | SW0D5C-QFLU-E 00A or later | |
| | Multiple CPU system | Version 6 or later | | |
| Q02PH/Q06PHCPU | Single CPU system | Version 8.68W or later | Version 1.13P or later | |
| | Multiple CPU system | | | |
| Q12PH/Q25PHCPU | Single CPU system | Version 7.10L or later | | |
| | Multiple CPU system | | | |
| Q12PRH/Q25PRHCPU | Redundant CPU | Version 8.45X or later | Version 1.14Q or later | |
| Q00UJ/Q00U/Q01UCPU | Single CPU system | Version 8.76E or later | Version 1.23Z or later | |
| | Multiple CPU system | | | |
| Q02U/Q03UD/Q04UDH/ Q06UDHCPU | Single CPU system | Version 8.48A or later | | |
| | Multiple CPU system | | | |
| Q10UDH/Q20UDHCPU | Single CPU system | Version 8.76E or later | | |
| | Multiple CPU system | | | |
| Q13UDH/Q26UDHCPU | Single CPU system | Version 8.62Q or later | | |
| | Multiple CPU system | | | |
| Q03UDE/Q04UDEH/ Q06UDEH/Q13UDEH/ Q26UDEHCPU | Single CPU system | Version 8.68W or later | | |
| | Multiple CPU system | | | |
| Q10UDEH/Q20UDEHCPU | Single CPU system | Version 8.76E or later | | |
| | Multiple CPU system | | | |
| CPU modules other than the above | Single CPU system | Cannot be used | Cannot be used | |
| | Multiple CPU system | | | |
| If installed to MELSECNET/H remote I/O station | | Version 6 or later | SW0D5C-QFLU-E 00A or later | |

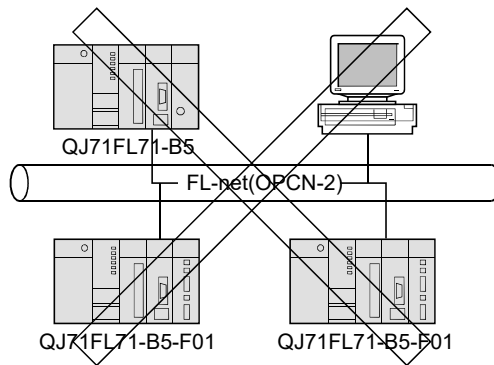
POINT

- (1) Supported system, CPU module, and FL-net module differ according to the version of GX Configurator-FL.
- (2) When using GX Works2, refer to the following:
 - GX Works2 Version 1 Operating Manual (Common)
 - GX Works2 Version 1 Operating Manual (Intelligent Function Module)

(4) Restrictions system configuration

Since the FL-net protocol of the FL-net (OPCN-2) Version 2.00 modules is different from that of the FL-net (OPCN-2) Version 1.00 modules, the following two types of modules cannot communicate each other.

| FL-net(OPCN-2) Version 2.00 module | FL-net(OPCN-2) Version 1.00 module |
|---|--|
| QJ71F71-F01, QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01 Version 2.00 products from other manufacturers | QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2, Version 1.00 products from other manufacturers |

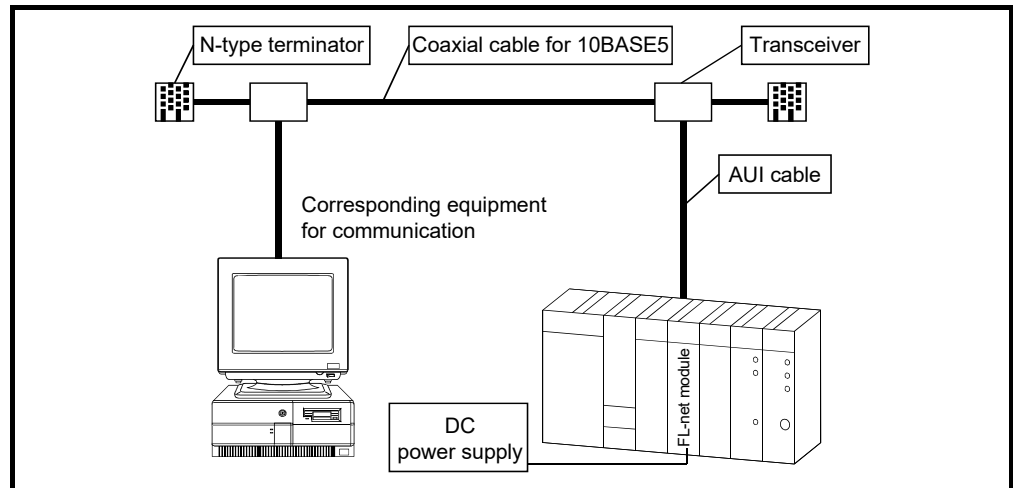


3.1.2 Equipment required when configuring the network

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.

(1) When configuring a network with QJ71FL71-B5(-F01)

(a) When connecting with 10BASE5.



- 1) Makes sure that the coaxial cable for 10BASE5, N-type terminator, transceiver, AUI cable (transceiver cable) all meet Ethernet standards.
- 2) Use a transceiver with an operating SQE TEST (Signal Quality Error Test) or heart beat.
- 3) Use the power supply for the transceiver that satisfies the transceiver and AUI cable specifications.

REMARK

Electrical characteristics of the transceiver

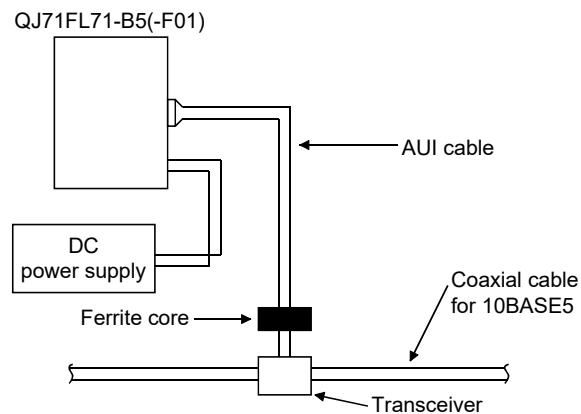
- Input terminal voltage 12 V ^{-6%} to 15 V ^{+5%}
- AUI cable direct resistance 40 Ω / km or less, maximum length: 50 m
- Maximum current consumption: 500 mA or less

In consideration of the above characteristics, the power supply for the transceiver will be 13.28V to 15.75V.

POINT

- (1) Consult a network specialist for information about the required equipment.
- (2) When 10BASE5 is used and countermeasures against noise and high-frequency waves are required for the installation environment of the QJ71FL71-B5(-F01), attaching a ferrite core to the transceiver side of the AUI cable is often effective.

(Ferrite core used in our testing: ZCAT2032-0930 manufactured by TDK Corporation)



(2) When configuring a network with QJ71FL71-T(-F01)

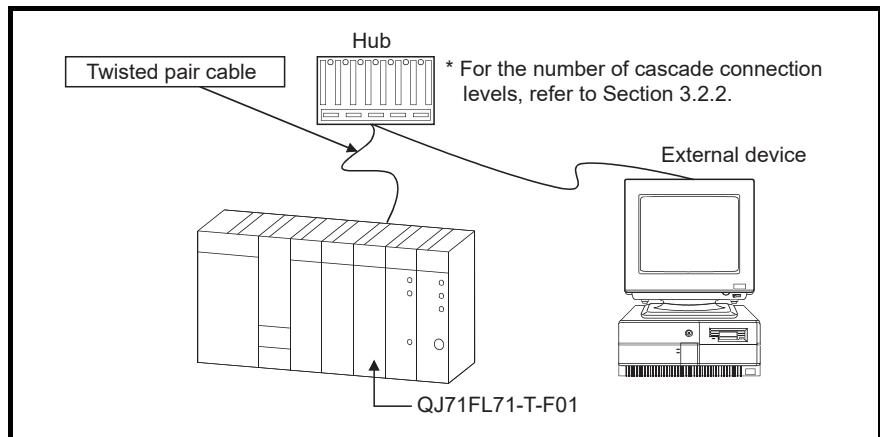
(a) For the QJ71FL71-T-F01

When connecting a QJ71FL71-T-F01 to a network, either a 10BASE-T or 100BASE-TX can be used.

The QJ71FL71-T-F01 detects whether it is 10BASE-T or 100BASE-TX, 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 half-duplex mode on the hub side.

1) Connection using the 100BASE-TX



Use equipment that meets IEEE802.3 100BASE-T specifications.
(Equipment from the HUB and below)

- Shielded twisted pair cable (STP) (straight cable), category 5 or higher*¹
- RJ45 jack.
- Hub for 100 Mbps.

*¹ A crossing cable cannot be used.

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 QJ71FL71-T-F01 side to prevent the effect of high frequency noise when constructing network systems.

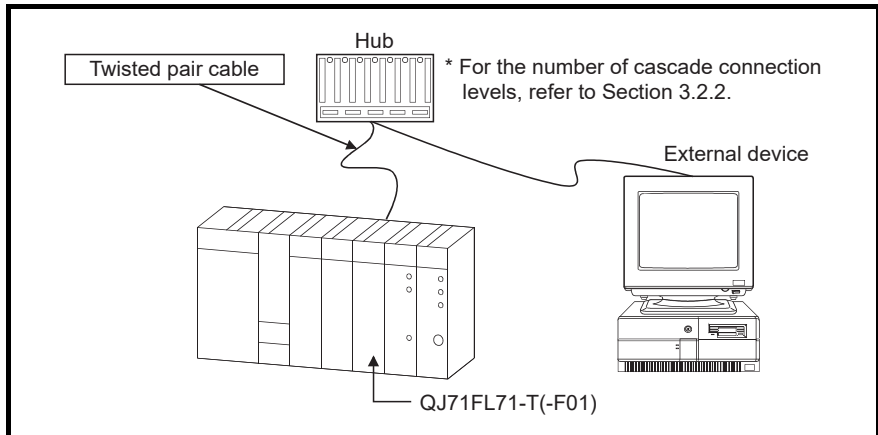
(1) Wiring

- Do not bundle the twisted pair cables with the main circuit and the power wires, and do not install them close to each other.
- Place the twisted pair cables in a duct.

(2) 10 Mbps communication

- Use a data transmission rate of 10 Mbps by changing the hub connected to the QJ71FL71-T-F01 to a 10 Mbps hub.

2) Connection using 10BASE-T



Use equipment that meets IEEE802.3 10BASE-T specifications.
(Equipment from the HUB and below)

- Unshielded twisted pair cable (UTP) (straight cable) or shielded twisted pair cable (STP) (straight cable), category 3 or higher*1
- RJ45 jack
- Hub for 10 Mbps

* 1 A crossing cable cannot be used.

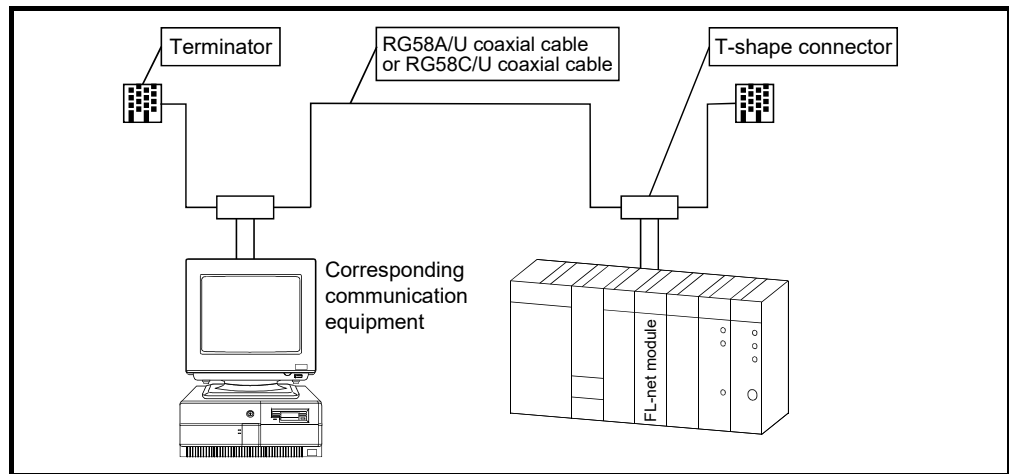
POINT

Consult a network specialist for the equipment required.

- (b) For the QJ71FL71-T
When connecting the QJ71FL71-T to a network, 10BASE-T can be used.
For network equipment, refer to (2) (a) 2).

(3) When configuring a network with QJ71FL71-B2(-F01)

(a) Connection using 10BASE2



- 1) Use devices that meet the standards of IEEE802.3 and 10BASE2.
 - RG58A/U or RG58C/U (coaxial cable 50 Ω)
 - BNC-type Terminator (product equivalent to 221629-4 manufactured by Tyco Electronics AMP K. K.)
 - T-shaped adapter (product equivalent to UG-274/U(15) manufactured by Hirose Electric Co., Ltd.)

POINT

Consult a network specialist for the equipment required.

3.2 Specifications

This section explains the FL-net module performance specifications and transmission specifications.

3.2.1 General specifications

For the general specifications for the FL-net module, refer to the user's manual for the CPU module that is to be used.

3.2.2 Performance specifications

The following are the performance specifications of the FL-net module.

Table 3.1 Performance specifications

| Items | Specifications | | | |
|-----------------------------------|--|--|---|---------------------------------|
| | QJ71FL71-B5-F01/ QJ71FL71-B5 | QJ71FL71-T-F01 | QJ71FL71-T | QJ71FL71-B2-F01/ QJ71FL71-B2 |
| | 10BASE5 | 10BASE-T (*1)/ 100BASE-TX | 10BASE-T (*1) | 10BASE2 |
| Data transmission speed | 10Mbps (Half duplex) | 10Mbps (Half duplex) 100Mbps (Full duplex/Half duplex) | 10Mbps (Half duplex) | 10Mbps (Half duplex) |
| Transmission method | Base band | | | |
| Electric interface | IEEE802.3 standard (CSMA/CD standard) | | | |
| Transmission protocol | UDP/IP FA link protocol | | | |
| Maximum distance between nodes | 2500m | — | — | 925m |
| Maximum segment length | 500m | 100m (length between hub and node) (*2) | | 185m |
| Maximum number of nodes in system | 254 | | | |
| Maximum number of nodes | 100/segment | For 10BASE-T, Maximum 4 bases for Cascade connection (*3) For 100BASE-TX, Maximum 2 bases for Cascade connection (*3) | Maximum 4 bases for Cascade connection (*3) | 30/segment |
| Minimum node interval | 2.5m | — | | 0.5m |
| Cyclic data volume | Maximum (8 k bits + 8 k words)/system Maximum (8 k bits + 8 k words)/node | | | |
| Message data volume | Maximum 1024 bytes | | | |

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| Items | Specifications | | | |
|-----------------------------------|--|--|---------------|---------------------------------|
| | QJ71FL71-B5-F01/ QJ71FL71-B5 | QJ71FL71-T-F01 | QJ71FL71-T | QJ71FL71-B2-F01/ QJ71FL71-B2 |
| | 10BASE5 | 10BASE-T (*1)/ 100BASE-TX | 10BASE-T (*1) | 10BASE2 |
| Link data specifications | Common memory area | Area 1 (bit area): 8 k bits Area 2 (word area): 8 k words | | |
| | Virtual address space and physical memory | — | | |
| | 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 | QJ71FL71-B5-F01, QJ71FL71-T-F01, QJ71FL71-B2-F01: 128 words QJ71FL71-B5, QJ71FL71-T, QJ71FL71-B2: 96 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 | Refer to "Appendix 6.1 (6)". | | |
| | Transmission delay time | Refer to "Appendix 6.1 (7)". | | |
| Number of input/output points | 32 points (I/O assignment: intelligent) | | | |
| 5VDC internal current consumption | 0.50A | 0.50A | 0.60A (*4) | |
| Noise resistance | According to the power supply specifications of the station to which the FL-net module is mounted. | | | |
| Voltage resistance | | | | |
| Insulation resistance | | | | |
| External dimensions | 98 (3.86 in.) (H) × 27.4 (1.08 in.) (W) × 90 (3.54 in.) (D)mm | | | |
| Weight | 0.12kg | 0.11kg | 0.13kg (*4) | |

*1 : For a QJ71FL71-T-F01 whose first six digits of serial No. are 211023 or later and for a QJ71FL71-T whose first six digits of serial No. are 211022 or later, replace "10BASE-T" with "10BASE-Te."

*2 : For maximum segment length (length between hubs), consult the manufacturer of the hub used.

*3 : This number applies when a repeater hub is used.

For the number when a switching hub is used, consult the manufacturer of the switching hub.

*4 : The 5VDC internal current consumption and weight of the product whose first 5 digits of serial No. are 05079 or earlier are as follows:

- 5VDC internal current consumption: 0.70A
- Weight: 0.14kg

3.2.3 FL-net module function list

Table 3.2 shows the function list of the FL-net module.

Table 3.2 FL-net module functions list

| Function | Description | Reference section |
|-------------------------------------|---|-------------------|
| Cyclic transmission | <p>(1) Communication of large data volume The common memory method enables cyclic transmission of data as follows.</p> <ul style="list-style-type: none"> • Area 1 (bit area): 8 k bits (512 words) • Area 2 (word area): 8 k words (8192 words) <p>(Transmitting and receiving up to 8.5 k words/node cyclic data is possible.)</p> <p>(2) 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.</p> <p>(3) High-speed cyclic transmission by 100BASE-TX connection (the QJ71FL71-T-F01 only) By changing the operation mode in the intelligent function module switch setting, high-speed cyclic transmission at 100Mbps is available by 100BASE-TX connection. This function has been certified by JEMA (Japan Electrical Manufacturer's Association), and can be used from the first released products.</p> | 6.2 |
| Message transmission | <p>(1) Transparent message transmission</p> <ul style="list-style-type: none"> • 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. <p>(2) 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.</p> <p>(3) Message return data response It is possible to return the received data as-is whenever a message return command is received.</p> <p>(4) Reading of the network parameters It is possible to read the network parameters for each node (such as vendor name, token monitoring time, etc.).</p> <p>(5) Reading and clearing of log information It is possible to read and clear the communication log information held by each node.</p> <p>(6) Reading of device profile It is possible to read the device profile data held by each node.</p> | 6.2 |
| Self diagnosis function | <p>(1) Hardware test The GX Developer can be used to set the hardware test mode to perform hardware testing of the FL-net module.</p> <p>(2) Self-loopback test The GX Developer 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.</p> | 6.3.1 |
| Ping command response function | <p>(1) Ping command compatibility It is possible to confirm the IP address of the FL-net module by issuing a ping command to your local station FL-net module from a corresponding device (personal computer, etc.) connected to the FL-net (OPCN-2) network.</p> | 8.2(3) |
| Multiple CPU function compatibility | <p>(1) Multiple CPU functions It is possible to control by optional CPU modules, even when multiple card CPU modules are mounted to the same base unit.</p> | - |

(Continued on next page)

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| Function | Description | Reference section |
|---|--|-------------------|
| Parameter setting by GX Configurator-FL | <ul style="list-style-type: none"><li data-bbox="432 405 1281 510">(1) Initial setting Network parameter for common memory assignments, monitoring time and others can be set by GX Configurator-FL.<li data-bbox="432 517 1281 577">(2) Auto refresh setting It is possible to perform cyclic data auto refresh.<li data-bbox="432 584 1281 689">(3) Monitor/test The buffer memory and I/O signals of the FL-net module can be monitored and tested. | 6.4 |

3.2.4 I/O signals for the CPU module

The section explains the input/output signals for the FL-net module.

(1) I/O signal list

The I/O signal assignments shown are based on the case where the start I/O No. of the FL-net module is "0000" (mounted to slot 0 of a main base unit).

Device X denotes an input signal from the FL-net module to the CPU module.

Device Y denotes an output signal from the CPU module to the FL-net module.

Table 3.3 lists the I/O signals used for the CPU module.

Table 3.3 I/O signal list for the CPU module

| Signal direction: CPU module ← FL-net module | | Signal direction: CPU module → FL-net module | |
|--|---|--|---|
| Input No. | Signal name | Output No. | Signal name |
| X00 | Message transmission normal completion signal ON: Normal completion OFF: — | Y00 | Message transmission request ON: Request OFF: — |
| X01 | Message transmission abnormal completion signal ON: Abnormal completion ending OFF: — | Y01 | Use prohibited |
| X02 | Receiving message signal ON: Receiving OFF: No signal received | Y02 | Message receive completion confirmation ON: Request OFF: — |
| X03 to X0F | Use prohibited | Y03 to Y0F | Use prohibited |
| X10 | Network parameter write completion signal ON: Completed OFF: — | Y10 | Network parameter write request ON: Request OFF: — |
| X11 | Network parameter/join node information read completion signal ON: Completed OFF: — | Y11 | Network parameter/join node information read request ON: Request OFF: — |
| X12 | Use prohibited | Y12 | Use prohibited |
| X13 | Device profile read completion signal ON: Completed OFF: — | Y13 | Device profile read request ON: Request OFF: — |
| X14 | Log information clear completion signal ON: Completed OFF: — | Y14 | Log information clear request ON: Request OFF: — |
| X15 | Log information read completion signal ON: Completed OFF: — | Y15 | Log information read request ON: Request OFF: — |
| X16 | Use prohibited | Y16 to Y1F | Use prohibited |
| X17 | Use prohibited | | |
| X18 | Parameter setting status signal ON: Error OFF: Normal | | |
| X19 | Token enter status signal ON: Enter OFF: Leave | | |
| X1A | Use prohibited | | |
| X1B | Use prohibited | | |
| X1C | Module ready ON: Preparation completed OFF: In initialization | | |
| X1D | Use prohibited | | |
| X1E | Use prohibited | | |
| X1F | Watchdog timer error detection signal ON: Detected OFF: Not detected | | |

IMPORTANT
 Do not set any "use-prohibited" signal to ON.
 Doing so may cause malfunctions of the CPU module.

(2) Details of the input/output signal

This section explains the ON/OFF timing, conditions and other items related to the input/output signals shown in Table 3.3

Data in () indicates the corresponding device number in Table 3.3

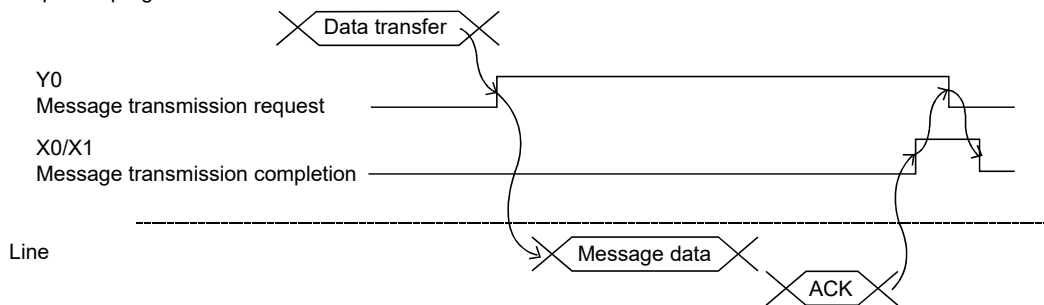
(a) Message transmission normal completion signal/Message transmission abnormal completion signal (X00/X01)

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 the send completion confirmation by the message transmission completion signals (X00/X01), set message transmission request (Y00) to off.

For message transmission, refer to Section 6.5.3 (5).

Sequence program



(b) Receiving message signal (X02)

Message receive completion confirmation (Y02)

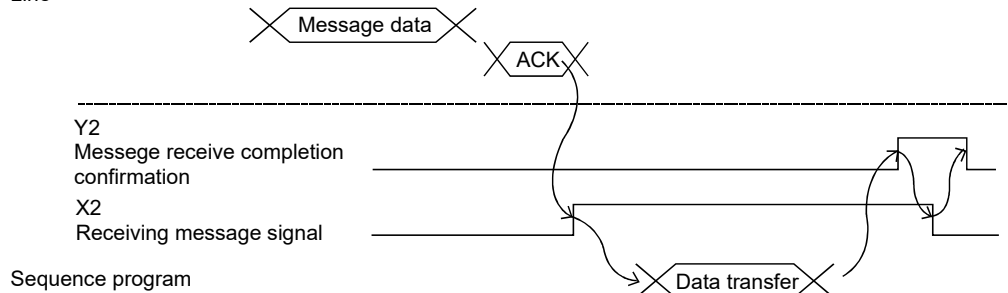
The data from other nodes is set in the message received area of the buffer memory and the receiving message signal (X02) is set to on.

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 message receive, refer to Section 6.5.3 (5).

Line



(c) Network parameter write completion signal (X10)

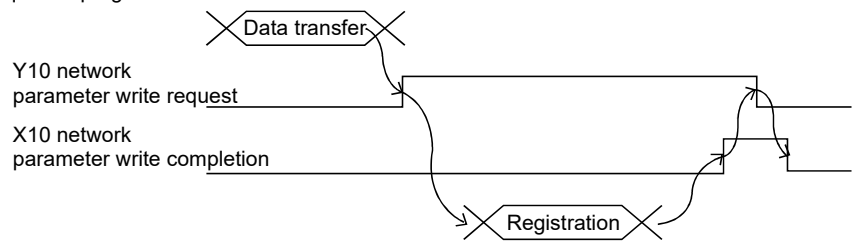
Network parameter write request (Y10)

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 registration of local node network parameters, refer to Section 6.5.1.

Sequence program



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

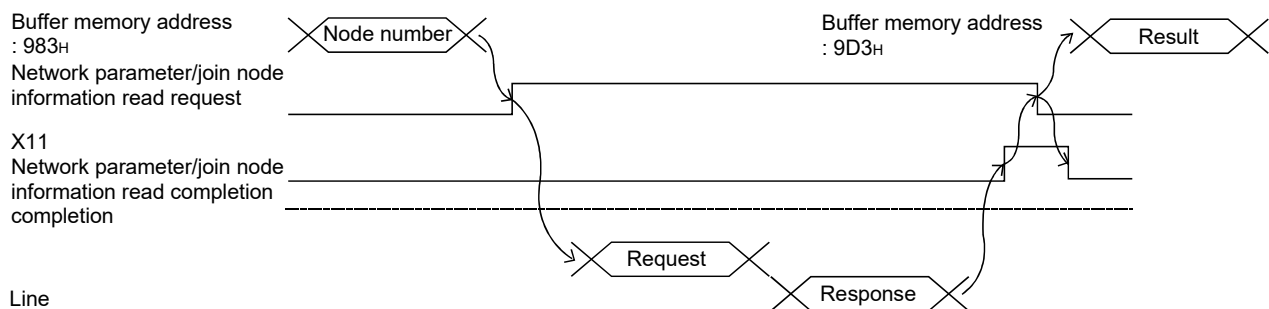
Network parameter/join node information read request (Y11)

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 read, refer to Section 6.5.3 (1).

Sequence program



POINT

The switching of network parameter/join node information reading is distinguished by buffer memory address 983H . . . b15. (Refer to Section 3.2.6.(2))

0: Read network parameter data

1: Read join node data

(e) Device profile read completion signal (X13)

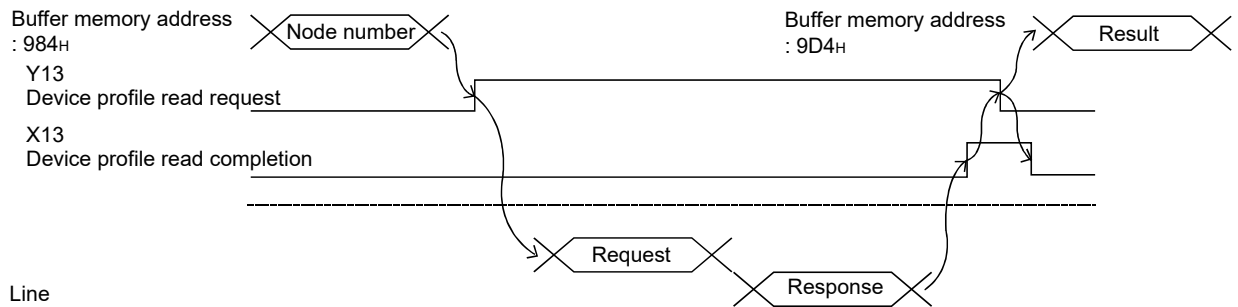
Device profile read request (Y13)

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 Section 6.5.3 (2).

Sequence program



(f) Log information clear completion signal (X14)

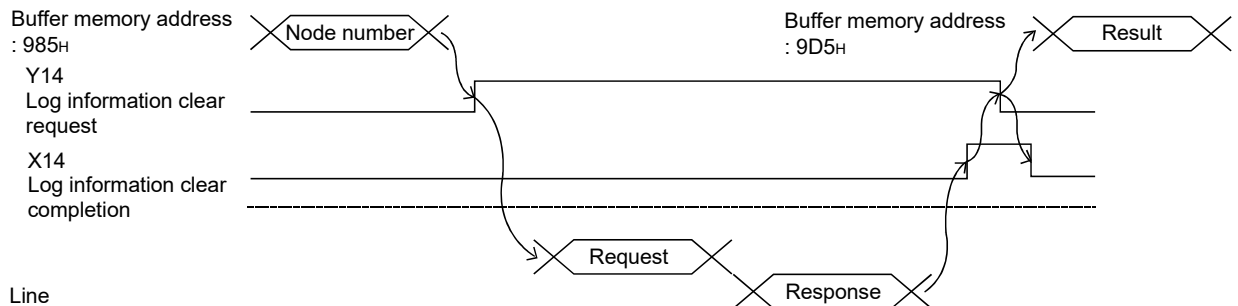
Log information clear request (Y14)

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

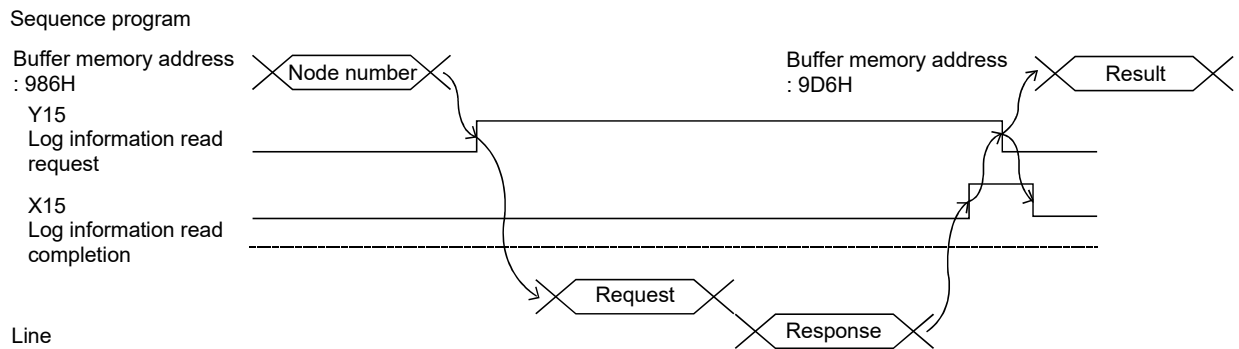
After the completion of the clear has been confirmed by the on of the log information clear completion signal (X14), set the log information clear request (Y14) to off.

For the log information clear, refer to Section 6.5.3 (4).

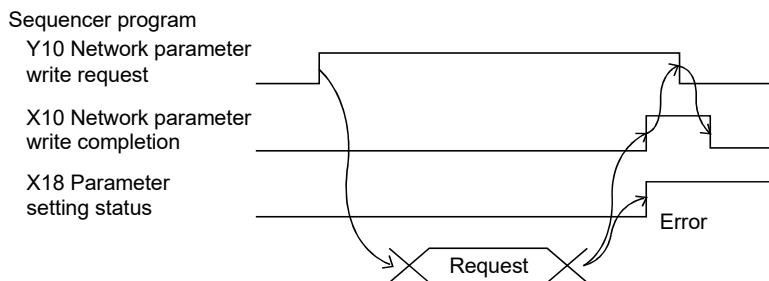
Sequence program



- (g) 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 Section 6.5.3 (3).

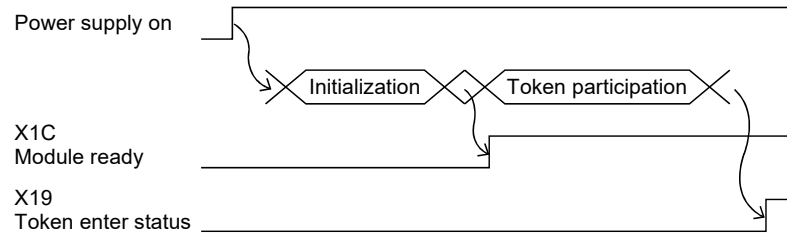


- (h) Parameter setting status signal (X18)
 When the writing of the network parameter has been completed and a network parameter setting error is issued, the parameter setting status signal (X18) is set to on.
 For registration of local node network parameters, refer to Section 6.5.1.



(i) Token enter status signal (X19)

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

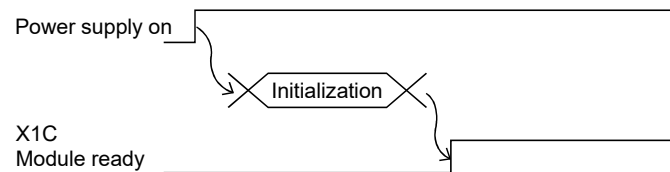


(j) Module ready (X1C)

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

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

If module ready (X1C) does not come on, use the intelligent function module switch settings from GX Developer (Refer to Section 6.3.2) to adjust. If the intelligent function module switch settings are normal, the FL-net module will proceed to its self-diagnostic test. (Refer to Section 6.3.1 (1).)



3.2.5 Buffer memory

This section introduces the CPU module in the FL-net module and buffer memory used for handling its data.

(1) Applications of the buffer memory

The buffer memory is comprised of an area for use by the user and a system area as shown below.

(a) Area for use by user

- 1) This is the area other than the system area shown below.
- 2) It has the following areas: area for setting the various parameters for initialization processing or data communication, area for data communication and an area for storing data about the communication status or communication errors.
- 3) For reading from and writing to the area for use by user, refer to the corresponding section.

(b) System area

The is the area used by the FL-net module.

| |
|------------------|
| Important |
|------------------|

| |
|--|
| Never write data to the "System Area" of the buffer memory for the FL-net module. If any data are written to the "System Area", the programmable controller system will malfunction. |
|--|

(2) Buffer memory assignment

The buffer memory is comprised of 1 address 16 bits.

The following is the overall structure of the buffer memory.

<Bit structure diagram>

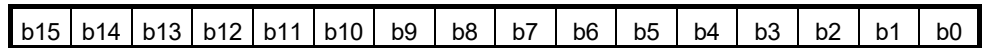


Table 3.4 shows the buffer memory list.

Table 3.4 Buffer memory list

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

(3) Details of buffer memory

This section explains the details of the buffer memory.

- (a) Local node network parameter area (Address: 0 to 7FH)
Set network parameters of the local node.

POINT

(1) The IP address of the FL-net module is set in GX Developer's intelligent function module switch setting. (Refer to Section 6.3.2 (2).)

(2) For the local node network parameter setting other than the above, refer to the following:

- When using the initial setting of GX Configurator-FL: Section 6.4.8
- When setting on the sequence program: Section 6.5.1

| | |
|----------|------------------------------------|
| 0 to 4H | Node name (Equipment name) |
| 5 to 6H | IP address |
| 7H | System area |
| 8H | Area 1 first address |
| 9H | Area 1 size |
| AH | Area 2 first address |
| BH | Area 2 size |
| CH | Token monitoring time out time |
| DH | Minimum permissible frame interval |
| EH | Message data unit selection |
| F to 7FH | System area |

[1] Node name (Equipment name)

Sets node name (Equipment name)

- Setting range : Optional data
- Default : No setting

[2] IP address

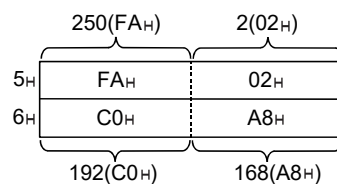
Sets the IP address (32 bit) of the FL-net module.

- Setting range : 0 · · · GX Developer's intelligent function module switch setting (*1) is valid
: Other than 0 · · · Sets 32 bit logic address (*2)
- Default: Intelligent function module switch setting or "192.168.250.1"

*1: Refer to Section 6.3.2.(2) for details about intelligent function module switch setting.

*2: Set the IP address as shown below.

When the IP address is "192.168.250.2"



POINT

There will be double intelligent function module switch settings in relation to the IP address, but the value that has been set in the network parameter area will become the enabled IP address for the FL-net module.

[3] Area 1 first address

The first address of the local node common memory area 1 (bit area) is set in this area.

- Setting range: 0 to 1FFH ··· Set an offset value of the cyclic data area (Area 1) (Address: 1C00 to 1DFFH) in the buffer memory.
- Default : No setting

[4] 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)
(Set "2H" when specifying the size for 32 bits.)
- Default : No setting

[5] Area 2 first address

The first address of the local node common memory area 2 (word area) is set in this area.

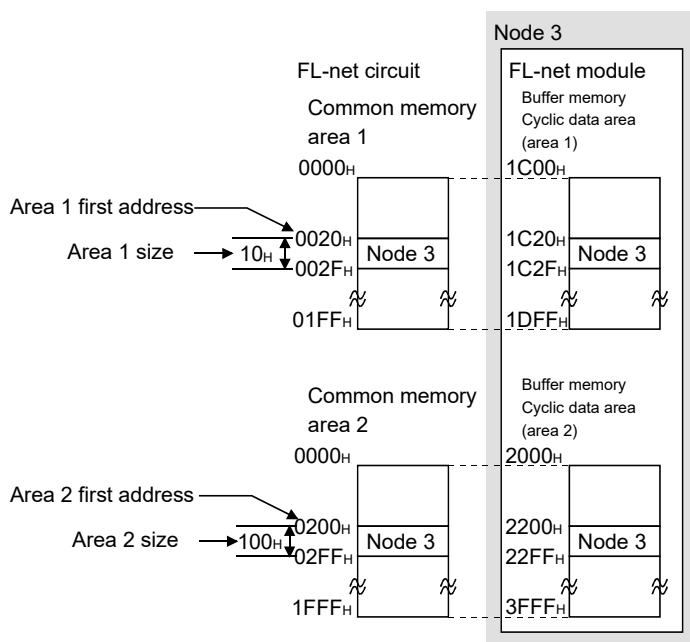
- Setting range: 0 to 1FFFH ··· Set an offset value of the cyclic data area (Area 2) (Address: 2000 to 3FFFH) in the buffer memory.
- Default : No setting

[6] 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

(Example) 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)



- (b) Other node network parameter area (address: 80 to 87FH)
Stores network parameters of the other nodes joining the network.

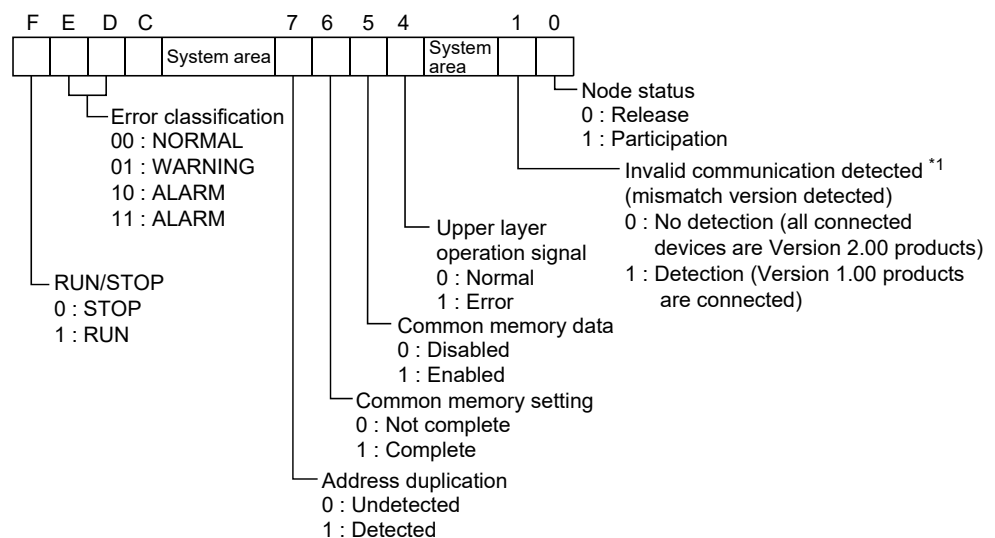
| | | |
|-------------|--|-----------------------------------|
| 80H | Area 1 first address | Node number 1 area (8 words) |
| 81H | Area 1 size | |
| 82H | Area 2 first address | |
| 83H | Area 2 size | |
| 84H | Token monitoring time out time | |
| 85H | Minimum permissible frame interval | |
| 86H | Refresh cycle permissible time / RCT setting value | |
| 87H | Upper layer - link status | |
| 88 to 8FH | Same as node number 1 area | Node number 2 area (8 words) |
| to | to | |
| 868 to 86FH | Same as node number 1 area | Node number 254 area (8 words) |
| 870 to 87FH | System area | |

POINT

The following settings have the same data format as the settings shown in "(a) Local node network parameter area (3) to (8): "Area 1 first address", " Area 1 size", "Area 2 first address", " Area 2 size", "Token monitoring time out time" and "Minimum permissible frame interval".

- [1] Refresh cycle permissible time / RCT setting value
Stores the refresh cycle permissible time (value of 120 % of 1 cycle).

- [2] Upper layer - link status
Stores the status of the upper layer (CPU module) and link status.



*1: For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2, this is the system area.

(c) Status data area (Address: 900 to 117FH)

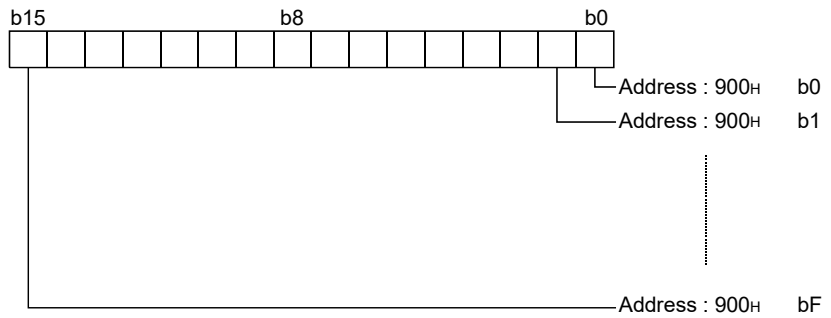
Refer to Section 3.2.6 for details about the status data.

1) Status bit area (Address: 0900 to 097FH)

Stores the status data bit data.

| | | |
|-------------|--|-----------------------|
| 900 to 902H | 900 ··· b0 to 902 ··· bF CPU module → FL-net module | Write area (48 bits) |
| 903 to 97FH | 903 ··· b3 to 97F ··· bF CPU module ← FL-net module | Read area (2000 bits) |

<Structure diagram>

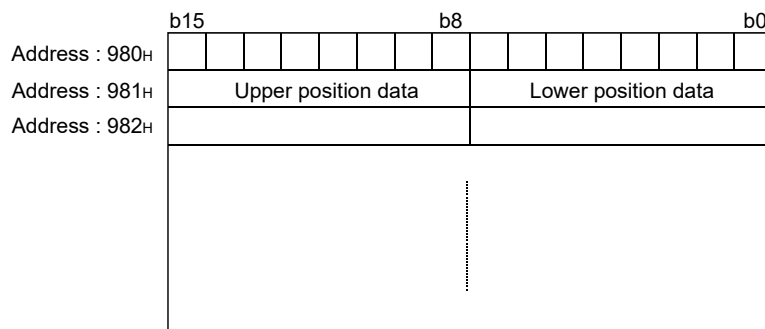


2) Status word area (Address: 0980 to 117FH)

Stores the status data word data.

| | | |
|--------------|---|------------------------|
| 980 to 9AFH | 980 to 9AF CPU module → FL-net module | Write area (48 words) |
| 9B0 to 117FH | 9B0 to 117F CPU module ← FL-net module | Read area (2000 words) |

<Structure diagram>



(d) Network parameter/join node information acquisition area (Address: 1200 to 13FFH)

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 the message transmission, the network parameter/join node information read, refer to Section 6.5.3 (1).

| |
|---|
| POINT |
| Switching of network parameter/join node information is determined by buffer memory address 983H · · · b15. (See Section 3.2.6 (2)) |
| 0: Network parameter data reading |
| 1: Join node data reading |

| | | Network parameter | Join node |
|---------------|--|-------------------|-----------|
| 1200 to 1204H | Node name (Equipment name) | ○ | ○ |
| 1205 to 1209H | Vendor name | ○ | ○ |
| 120A to 120EH | Manufacturer model | ○ | ○ |
| 120FH | Area 1 first address | ○ | ○ |
| 1210H | Area 1 size | ○ | ○ |
| 1211H | Area 2 first address | ○ | ○ |
| 1212H | Area 2 size | ○ | ○ |
| 1213H | Token monitoring time out time | ○ | ○ |
| 1214H | Minimum permissible frame interval | ○ | ○ |
| 1215H | Link status | ○ | ○ |
| 1216H | Protocol version | ○ | — |
| 1217H | Upper layer status | ○ | ○ |
| 1218H | Refresh cycle permissible time / RCT setting value | ○ | ○ |
| 1219H | Current value of refresh cycle | ○ | — |
| 121AH | Maximum value of refresh cycle | ○ | — |
| 121BH | Minimum value of refresh cycle | ○ | — |
| 121C to 13FFH | System area | — | — |

○ : Stored — : Not stored

[1] Node name (Equipment name)

Stores the node name (equipment name) of the node to be the target.

[2] Vendor name

Stores the vendor name of the node to be the target in ASCII characters.
(Example) Mitsubishi Electric: MELCO

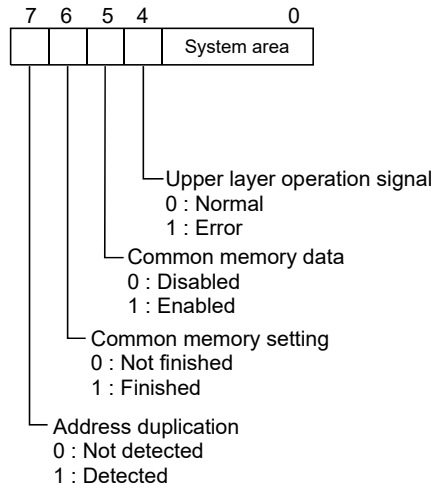
[3] Manufacturer model

Stores the manufacturer model of the node to be the target in ASCII characters.

- QJ71FL71-T-F01 : "QJFLT-F01"
- QJ71FL71-B5-F01 : "QJFLB5-F01"
- QJ71FL71-B2-F01 : "QJFLB2-F01"
- QJ71FL71-T: "QJ71FL71T "
- QJ71FL71-B5: "QJ71FL71B5"
- QJ71FL71-B2: "QJ71FL71B2"

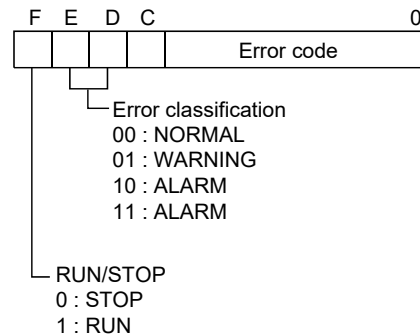
[4] Area 1 first address, Area 1 size, Area 2 first address, Area 2 size, Token monitoring time out time and Minimum permissible frame interval
Stores each of the settings for the node to be the target.

[5] Link status
Stores the network status of the node to be the target.



[6] Protocol version
Stores the protocol version for FL-net (OPCN-2).
• Protocol version: 0080H fixed

[7] Upper layer status
Stores the status of the upper layer (CPU module) of the node to be the target.



[8] Refresh cycle permissible time / RCT setting value
Stores the refresh cycle permissible time (value of 120 % of 1 cycle).

[9] Refresh cycle current value, maximum value and minimum value
Stores the measured value for one cycle of the node to be the target.

(e) Device profile acquisition area (Address: 1400 to 15FFH)

After execution of message transmission, the device profile read, this area stores the device profile data of the target node.

For the message transmission, the device profile read, refer to Section 6.5.3 (2).

Refer to "Appendix 10 – 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) | 2 | 2003 |
| | | | | [INTEGER], 1, (01-12) | 1 | 7 |
| | | | | [INTEGER], 1, (01-31) | 1 | 1 |
| | Device category | 10 | "DVCATEGORY" | PrintableString | 3 | "PLC" |
| Vendor name | 6 | "VENDOR" | PrintableString | 10 | "MELCO" | |
| Device model name | 7 | "DVMODEL" | PrintableString | 10 | "QJFLT-F01" (*1) "QJFLB5-F01" (*2) "QJFLB2-F01" (*3) "QJ71FL71T" (*4) "QJ71FL71B5" (*5) "QJ71FL71B2" (*6) | |

*1: QJ71FL71-T-F01

*2: QJ71FL71-B5-F01

*3: QJ71FL71-B2-F01

*4: QJ71FL71-T

*5: QJ71FL71-B5

*6: QJ71FL71-B2

- (f) Log information acquisition area (Address: 1600 to 17FFH)
 After execution of message transmission, the log information read, this area stores the log information of the target node.
 For the message transmission, the log information read, refer to Section 6.5.3 (3).

| | | |
|---------------|----------------------|-------------|
| 1600 to 1617H | Send and receive | (24 words) |
| 1618 to 162FH | Frame types | (24 words) |
| 1630 to 1647H | Cyclic transmission | (24 words) |
| 1648 to 165FH | Message transmission | (24 words) |
| 1660 to 1677H | ACK related | (24 words) |
| 1678 to 168FH | Token related | (24 words) |
| 1690 to 16A7H | Status 1 | (24 words) |
| 16A8 to 16BFH | Status 2 | (24 words) |
| 16C0 to 17FFH | System area | (320 words) |

- 1) Send and receive (Address: 1600 to 1617H)
 Stores log information related to send and receive.

| | |
|---------------|----------------------------------|
| 1600 to 1601H | Totaling socket send count |
| 1602 to 1603H | Totaling socket send error count |
| 1604 to 1605H | Ethernet send error count |
| 1606 to 160BH | System area |
| 160C to 160DH | Total receive count |
| 160E to 160FH | Total receive error count |
| 1610 to 1611H | Ethernet receive error count |
| 1612 to 1617H | System area |

- [1] Totaling socket send count
Stores the accumulated count of sending to transmission line.
- [2] Totaling socket send error count
Stores the accumulated count of send errors detected at the transmission line.
- [3] Ethernet send error count
Stores the accumulated count of send errors detected at the data link and physical layer.
- [4] Total receive count
Stores the accumulated count of receive signals to the transmission line.
- [5] Total receive error count
Stores the accumulated count of receive errors detected at the transmission line.
- [6] Ethernet receive error count
Stores the accumulated count of receive errors detected at the data link and physical layer.

2) Frame type (Address: 1618 to 162FH)

Stores the log information related to the frame types.

| | |
|---------------|-----------------------------------|
| 1618 to 1619H | Token send count |
| 161A to 161BH | Cyclic frame send count |
| 161C to 161DH | 1 : 1 message frame send count |
| 161E to 161FH | 1 : n message send count |
| 1620 to 1623H | System area |
| 1624 to 1625H | Token receive count |
| 1626 to 1627H | Cyclic frame receive count |
| 1628 to 1629H | 1 : 1 message frame receive count |
| 162A to 162BH | 1 : n message receive count |
| 162C to 162FH | System area |

[1] Token send count

Stores the accumulated count of tokens sent (token + cyclic).

[2] Cyclic frame send count

Stores the accumulated count of cyclic frames sent.

[3] 1 : 1 message frame send count

Stores the accumulated count of 1:1 message frames sent.

[4] 1 : n message send count

Stores the accumulated count of 1:n (broadcast) message frames sent.

[5] Token receive count

Stores the accumulated count of local node address tokens (token + cyclic) received.

[6] Cyclic frame receive count

Stores the accumulated count of cyclic frames received.

[7] 1 : 1 message frame receive count

Stores the accumulated count of local node address 1:1 message frames received.

[8] 1 : n message frame receive count

Stores the accumulated count of 1:n (broadcast) message frames received.

3) Cyclic transmission (Address: 1630 to 1647H)

Stores log information related to cyclic transmission.

| | |
|---------------|----------------------------------|
| 1630 to 1631H | Cyclic frame receive error count |
| 1632 to 1633H | Cyclic address size error count |
| 1634 to 1635H | Cyclic CBN error count |
| 1636 to 1637H | Cyclic TBN error count |
| 1638 to 1639H | Cyclic BSIZE error count |
| 163A to 1647H | System area |

[1] Cyclic frame receive error count

Stores the accumulated count of cyclic frame receive error detections.

[2] Cyclic address size error count

Stores the accumulated count of address size error detections in the cyclic frame.

[3] Cyclic CBN error count

Stores the accumulated count of CBN (block number) error detections in the cyclic frame.

[4] Cyclic TBN error count

Stores the accumulated count of TBN (number of total blocks) error detections in the cyclic frame.

[5] Cyclic BSIZE error count

Stores the accumulated count of BSIZE (data size including frame header) error detections in the cyclic frame.

4) Message transmission (Address:1648 to 165FH)

Stores log information related to message transmission.

| | |
|---------------|---|
| 1648 to 1649H | Message transmission resend count |
| 164A to 164BH | Message transmission resend over count |
| 164C to 1655H | System area |
| 1656 to 1657H | Message transmission receive error count |
| 1658 to 1659H | Message transmission communication number error count |
| 165A to 165BH | Message transmission resend recognition count |
| 165C to 165FH | System area |

[1] Message transmission resend count

Stores the accumulated count of resends in the message frame.

[2] Message transmission resend over count

Stores the accumulated count of resend over in the message frame.

[3] Message transmission receive error count

Stores the accumulated count of receive error detections in the message frame.

[4] Message transmission communication number error count

Stores the accumulated count of communication number error detections in the message frame.

[5] Message transmission resend recognition count

Stores the accumulated count of resend recognition in the message frame.

5) ACK related (Address: 1660 to 1677H)

Stores log information related to ACK.

| | |
|---------------|-----------------------------------|
| 1660 to 1661H | ACK error count |
| 1662 to 1663H | Serial number version error count |
| 1664 to 1665H | Serial number error count |
| 1666 to 1667H | Node number error count |
| 1668 to 1669H | TCD error count |
| 166A to 1677H | System area |

[1] ACK error count

Stores the accumulated count of ACK header error detections.

[2] Serial number version error count

Stores the accumulated count of serial number version error detections (mis-match detection).

[3] Serial number error count

Stores the accumulated count of serial number error detections (non-continuous detection).

[4] Node number error count

Stores the accumulated count of node number error detections.

[5] TCD error count

Stores the accumulated count of TCD (transaction code) error detections

6) Token related (Address : 1678 to 168FH)

Stores log information related to token.

| | |
|---------------|--------------------------------------|
| 1678 to 1679H | Token multiplexing recognition count |
| 167A to 167BH | Token destruction count |
| 167C to 167DH | Token resend count |
| 167E to 1683H | System area |
| 1684 to 1685H | Token holding time out count |
| 1686 to 1687H | Token monitoring time out count |
| 1688 to 168FH | System area |

[1] Token multiplexing recognition count

Stores the accumulated count of optional node address (including local node address) tokens detected while the token is being held.

[2] 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.

[3] Token resend count

Stores the accumulated count of token resends.

[4] 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).

[5] Token monitoring time out count

Stores the accumulated count time out detections for token monitoring time out time.

7) Status 1 (Address:1690 to 16A7H)

Store log information related to status 1.

| | |
|---------------|--------------------------|
| 1690 to 1691H | Total operating time |
| 1692 to 1693H | Frame wait status count |
| 1694 to 1695H | Enter count |
| 1696 to 1697H | Self-release count |
| 1698 to 1699H | Release-by-skip count |
| 169A to 169BH | Other node release count |
| 169C to 16A7H | System area |

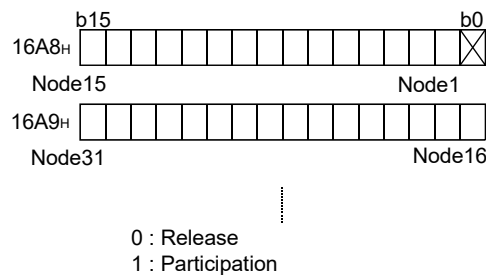
- [1] Total operating time
Stores the total operating time. (Unit: ms)
- [2] Frame wait status count
Stores the accumulated count that frame wait status has become.
- [3] Join count
Stores the accumulated count of local node joining.
- [4] Self-release count
Stores the accumulated count of self release (when token holding time for local node up is generated 3 consecutive times).
- [5] Release-by-skip count
Stores the accumulated count of release by skip (local node address token is pulled out 3 consecutive times).
- [6] Other node release count
Stores the accumulated count of detections of other node releases.

8) Status 2 (Address:16A8 to 16BFH)

Stores log information related to status 2.

| | |
|---------------|-------------------------|
| 16A8 to 16B7H | Participation node list |
| 16B9 to 16B8H | System area |

- [1] Participation node list
Stores the token participation status at other node tokens in bit units.



(g) Cyclic data area

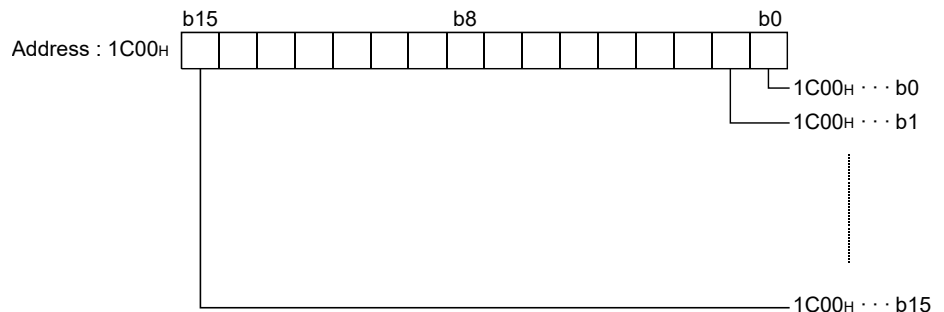
The cyclic data area consists of area 1 (bit area) and area 2 (word area).

| |
|---|
| 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: <ul style="list-style-type: none"> • Transfer by the auto refresh setting of GX Configurator-FL: Section 6.4.9 • Transfer using sequence program: Section 6.5.2 |

- 1) Area 1 (Address: 1C00 to 1DFFH)
 Set bit cyclic data of the local node.
 Stores bit cyclic data of the other nodes.

1C00 to 1DFFH Read/write area (8192 bits)

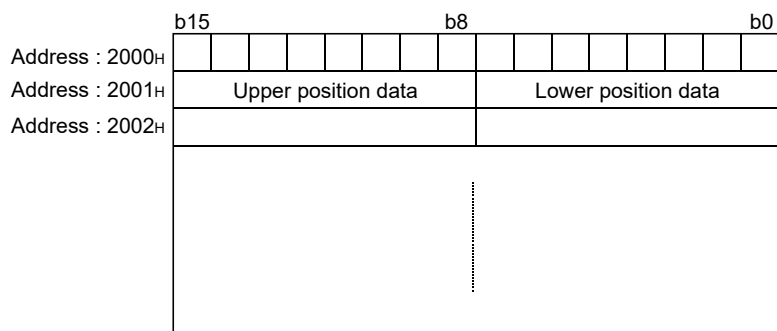
<Structure diagram>



- 2) Area 2 (Address: 2000 to 3FFFH)
 Set word cyclic data of the local node.
 Stores word cyclic data of the other nodes.

2000 to 3FFFH Read/write area (8192 words)

<Structure diagram>



| |
|--|
| POINT |
| <ol style="list-style-type: none"> (1) The area allocated in the send area of the local node is the "write area" and the rest is the "read area". (2) 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 : 0080~0087FH). (Refer to Sectoin 3.2.5(3)(b)) |

(h) Message data area

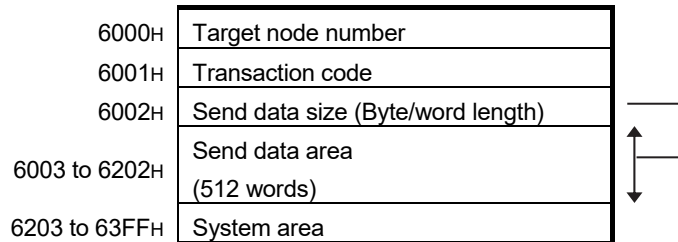
The message data area sets and stores the data related to transparent type message transmissions.

For the transparent type message transmission, refer to Section 6.5.3 (5).

The message data area has a send area and a receive area.

1) Send area (Address: 6000 to 63FFH)

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



[1] Target node number

- 0 : Use prohibited
- 1 to 254 : Target node number
- 255 : All stations (Global)
- 256 and more : Use prohibited

[2] Transaction code

Sets the transaction code.

Refer to Section 6.2.8. (4) for details about the transaction code.

[3] Send data size

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.

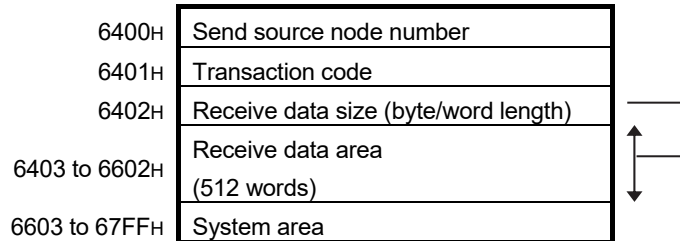
- Word unit: 0 to 512
- Byte unit: 0 to 1024

[4] Send data area

Sets the size of the message data to be sent (up to 512 words or 1024 bytes).

2) Receive area (Address: 6400 to 67FFH)

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



[1] 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)

[2] Transaction code

Stores the transaction codes for received message data.
Refer to Section 6.2.8. (4) for details about the transaction code.

[3] Receive data size

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

[4] Receive data area

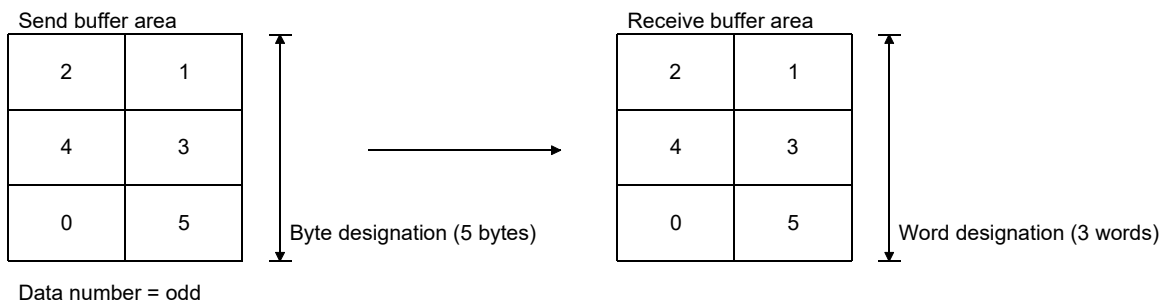
Stores the size of the message data received (up to 512 words or 1024 bytes).

REMARK

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.



3.2.6 Status data details

This section explains the details about status data.
 Status data stores the following data.

1) Status bit

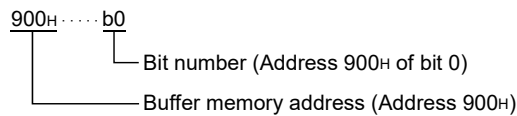
- a) Specified information area "CPU → FL-net (OPCN-2)"
- b) Local node information area "FL-net (OPCN-2) → CPU"

2) Status word

- a) Specified information area "CPU → FL-net (OPCN-2)"
- b) Message information area "CPU → FL-net (OPCN-2)"
- c) Local node information area "FL-net (OPCN-2) → CPU"
- d) Other node information area "FL-net (OPCN-2) → CPU"
- e) Log information area "FL-net (OPCN-2) → CPU"
- f) Message information area "FL-net (OPCN-2) → CPU"

(1) Status bit details

This section explains the status data bit area.
 The notation method for the buffer memory address is shown below.
 (Buffer memory address indication)



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

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

| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|-----------------------|---|----------------|----------|
| | | | On line | Off line |
| 900H ··· b9 | Log information clear | Indicates clearing of log information in buffer memory (Address:A80H to B38H) (*1) 0: No clear instruction 1: Clear instruction | ○ | — |

○ : Valid — : Invalid

*1: Clear is executed during on status.

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

| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|--|---|----------------|----------|
| | | | On line | Off line |
| 904H ··· b3 | Operation data | Indicates node switch of module. 0: On 1: Other than On | ○ | — |
| 904H ··· 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) | ○ | ○ |
| 904H ··· b7 | Module type | Indicates module type * ¹ 0: QJ71FL71-T-F01 (10BASE-T/100BASE-TX), QJ71FL71-B5-F01 (10BASE5), QJ71FL71-T (10BASE-T), QJ71FL71-B5 (10BASE5) 1: QJ71FL71-B2-F01 (10BASE2), QJ71FL71-B2 (10BASE2) | ○ | ○ |
| 904H ··· b8 | Local node communication status | Indicates local node communication (token participation) status. 0: Normal 1: Error | ○ | — |
| 904H ··· bA | Local node CPU status 1 | Indicates local node Qn(H) CPU self-diagnosis result. 0: Normal 1: Warning | ○ | — |
| 904H ··· bB | Local node CPU status 2 | Indicates local node Qn(H) CPU self-diagnosis result. 0: Normal 1: Alarm | ○ | — |
| 905H ··· b0 | Node initialization status | Indicates the initialization completion status of the FL-net module. 0: Completed 1: Not completed | ○ | — |
| 905H ··· b1 | Network parameter setting status | Indicates network parameter setting status from Qn(H) CPU. 0: Setting complete 1: Setting not complete | ○ | — |
| 905H ··· b2 | Network parameter data | Indicates receive network parameter data. 0: Normal 1: Setting error | ○ | — |
| 905H ··· 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 | ○ | — |
| 905H ··· b9 | Token monitoring time out error status | Indicates token transmission monitoring time out error status. 0: Normal 1: Token monitoring time out error | ○ | — |
| 905H ··· bA | Node number multiplexing detection status | Indicates whether or not local node number duplicates other node number. 0: Normal 1: Duplicate node number detected | ○ | — |
| 905H ··· 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 | ○ | — |
| 905H ··· 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 | ○ | — |
| 905H ··· bD | Invalid communication detected status | Indicates the local node communication status during data linking participation. (QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01 only) 0: Communication valid (the same frame received) 1: Communication invalid (different frame received) | ○ | — |
| 90BH ··· bF | Message transmission data | Indicates whether a message transmission error is present or not. 0: No error 1: Error occurred | ○ | — |

○ : Valid — : Invalid

*1: When making module recognition in a sequence program, etc., use the 9C7H data.

(2) Status word details

This section explains the status data word range.

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

| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|---|--|----------------|----------|
| | | | On line | Off line |
| 983H | 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 | ○ | — |
| 984H | Other node number setting for device profile | Indicates node number if reading device profile for other node. 1 to 254: Node number | ○ | — |
| 985H | Other node number setting (1) for log information | Indicates to node number if clearing log information for other node. 1 to 254: Node number | ○ | — |
| 986H | Other node number setting (2) for log information | Indicates to node number if clearing log information for other node. 1 to 254: Node number | ○ | — |

○ : Valid — : Invalid

*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.

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

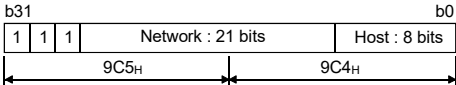
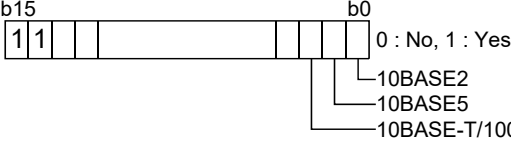
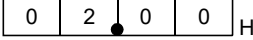
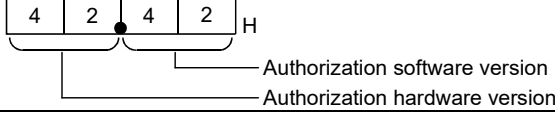
| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|-------------------------------------|--|----------------|----------|
| | | | On line | Off line |
| 9A0H | Response message classification | Indicates the message classification (status) of message transmission using message send area. 00H: Normal message response or request message. 01H: Error message response 02H: Not supported (*1) | ○ | — |
| 9A1H | 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 | ○ | — |
| 9A2H to 9A3H | Virtual address space first address | Indicates the first address (32 bits) when using virtual address space in the transmission of message used for message send area. Range: 0H to FFFFFFFFH | ○ | — |

○ : Valid — : Invalid

*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.

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

| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|---|--|----------------|----------|
| | | | On line | Off line |
| 9C2H | Node number | Indicates the node number of the FL-net module. 1 to 249: Node number | ○ | ○ |
| 9C3H | 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) (The QJ71FL71-T-F01 only) Other: Setting error | ○ | ○ |
| 9C4H to 9C5H | IP address | Indicates FL-net module address status.  | ○ | ○ |
| 9C6H | Intelligent function module switch setting status | Indicates setting status of switches. 0: Normal 1 to: Error code | ○ | ○ |
| 9C7H | Module recognition | Indicates whether the local node module has an Ethernet interface. (100BASE-TX is available for the QJ71FL71-T-F01 only.)  | ○ | ○ |
| 9C8H | 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) (The QJ71FL71-T-F01, QJ71FL71-B5-F01 and QJ71FL71-B2-F01 only) FE: Initializing FFF: Resetting | ○ | — |
| 9C9H | FL-net (OPCN-2) protocol version | Indicates FL-net (OPCN-2) protocol version. Example: The version is 2.00.  | ○ | ○ |
| 9CAH | FL-net (OPCN-2) authorization version | Indicates FL-net (OPCN-2) authorization version. Example: The version is 2.00.  | ○ | ○ |
| 9CBH | Local node CPU status | Indicates results of local node CPU self diagnosis. 0: Normal 1 to: Error code | ○ | — |

○ : Valid — : Invalid
(Continued on next page)

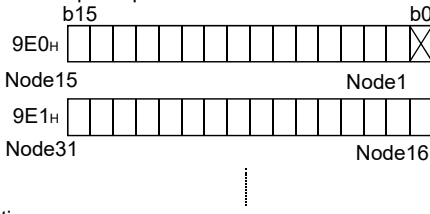
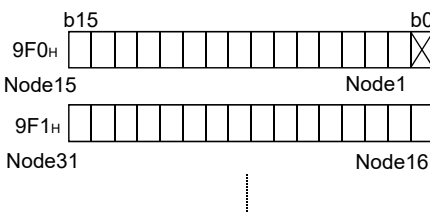
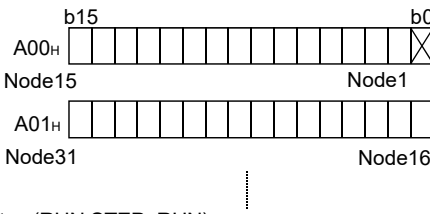
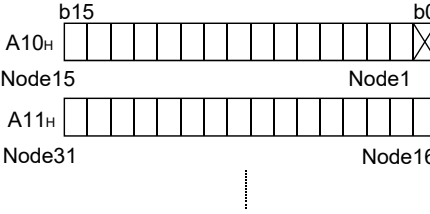
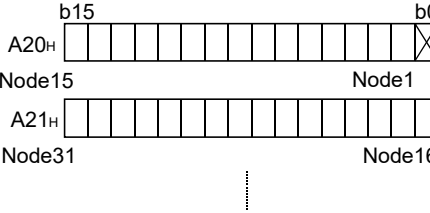
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| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|--|---|----------------|----------|
| | | | On line | Off line |
| 9D0H | Maximum communication node number | Indicates the maximum node number of node normally communicating (token participation). | ○ | — |
| 9D2H | Network parameter setting status | Indicates the network parameter setting contents status. 0: Normal 1 to: Error code | ○ | — |
| 9D3H | Network parameter read results | Indicates network parameter read results. 0: Normal 1 to: Error code | ○ | — |
| 9D4H | Device profile read results | Indicates device profile read results. 0: Normal 1 to: Error code | ○ | — |
| 9D5H | Log information clear results | Indicates log information a clear results. 0: Normal 1 to: Error code | ○ | — |
| 9D6H | Log information read results | Indicates log information read results. 0: Normal 1 to: Error code | ○ | — |
| 9D7H | Transparent message send results | Indicates transparent message send results. 0: Normal 1 to: Error code | ○ | — |
| 9D8H | 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) | ○ | — |
| 9D9H | 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) | ○ | — |
| 9DAH | Refresh cycle permissible time / RCT setting value | Indicates refresh cycle time of 120% of value. (Unit: ms) | ○ | — |
| 9DBH | Network parameter data | Stores the network parameter data. (Network parameter setting status: Enabled when 905H · · · b1 is off (0)) Setting conditions 0 : Sequence program 1 : GX Configurator-FL Setting data 1 : Common memory setting - Yes 0 : Common memory setting - No | ○ | — |
| 9DCH | Message unit data | Stores the unit of the data handled by the message area. 1: Word unit 2: Byte unit | ○ | — |
| 9DDH | Current value refresh cycle time | Indicates refresh cycle time during data link (cyclic transmission) execution. (Unit: ms) | ○ | — |
| 9DEH | Maximum value refresh cycle time | Indicates maximum refresh cycle time during data link (cyclic transmission) execution. (Unit: ms) | ○ | — |
| 9DFH | Minimum value refresh cycle time | Indicates minimum refresh cycle time during data link (cyclic transmission) execution. (Unit: ms) | ○ | — |

○ : Valid — : Invalid

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

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

| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|--|---|----------------|----------|
| | | | On line | Off line |
| 9E0H to 9EFH | Participation node list | Indicates the token participation status at the other node in bits.  0: Participation 1: Release | ○ | — |
| 9F0H to 9FFH | Other node network parameter setting status | Indicates the network parameter setting status at the other node in bits. (*1)  0: Setting 1: No setting | ○ | — |
| A00H to A0FH | Other node CPU execution status | Indicates the execution status of Qn (H) CPU, etc., at the other node. (*1)  0: RUN status (RUN, STEP_RUN) 1: STOP status (STOP, PAUSE) | ○ | — |
| A10H to A1FH | Other node CPU operation status (Low level error) *2 | Indicates the results of self-diagnosis of Qn (H) CPU, etc., at the other node. (*1)  0: Normal 1: Warning | ○ | — |
| A20H to A2FH | Other node CPU operation status (Medium, high level errors) *3 | Indicates the results of self-diagnosis of Qn (H) CPU, etc., at the other node. (*1)  0: Normal 1: Alarm | ○ | — |

○ : Valid — : Invalid

*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.

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

| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|-----------------------------------|--|----------------|----------|
| | | | On line | Off line |
| A80H to A81H | Totalling socket sending count | Indicates the accumulated count of sending to transmission line. | ○ | — |
| A82H to A83H | Totalling socket send error count | Indicates the accumulated count of send errors detected at the transmission line. | ○ | — |
| A84H to A85H | Ethernet send error count | Indicates the accumulated count of send errors detected at the data link and physical layer. | ○ | — |
| A8CH to A8DH | Total receive count | Indicates the accumulated count of receive signals to the transmission line. | ○ | — |
| A8EH to A8FH | Total receive error count | Indicates the accumulated count of receive errors detected at the transmission line. | ○ | — |
| A90H to A91H | Ethernet receive error count | Indicates the accumulated count of receive errors detected at the data link and physical layer. | ○ | — |
| A98H to A99H | Token send count | Indicates the accumulated count of tokens sent (token + cyclic). | ○ | — |
| A9AH to A9BH | Cyclic frame send count | Indicates the accumulated count of cyclic frames sent. | ○ | — |
| A9CH to A9DH | 1:1 message frame send count | Indicates the accumulated count of 1:1 message frames sent. | ○ | — |
| A9EH to A9FH | 1:n message frame send count | Indicates the accumulated count of 1:n (broadcast) message frames sent. | ○ | — |
| AA4H to AA5H | Token receive count | Indicates the accumulated count of local node address tokens (token + cyclic) received. | ○ | — |
| AA6H to AA7H | Cyclic frame receive count | Indicates the accumulated count of cyclic frames received. | ○ | — |
| AA8H to AA9H | 1:1 message frame receive count | Indicates the accumulated count of local node address 1:1 message frames received. | ○ | — |
| AAAH to AABH | 1:n message frame receive count | Indicates the accumulated count of 1:n (broadcast) message frames received. | ○ | — |
| AB0H to AB1H | Cyclic frame receive error count | Indicates the accumulated count of cyclic frame receive error detection. | ○ | — |
| AB2H to AB3H | Cyclic address size error count | Indicates the accumulated count of address size error detection in the cyclic frame. | ○ | — |
| AB4H to AB5H | Cyclic CBN error count | Indicates the accumulated count of CBN (block number) error detection in the cyclic frame. | ○ | — |
| AB6H to AB7H | Cyclic TBN error count | Indicates the accumulated count of TBN (number of total blocks) error detection in the cyclic frame. | ○ | — |
| AB8H to AB9H | Cyclic BSIZE error count | Indicates the accumulated count of BSIZE (data size including frame header) error detection in the cyclic frame. | ○ | — |

○ : Valid — : Invalid

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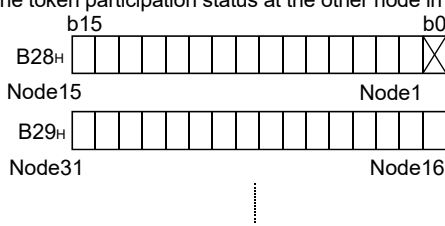
| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|---|---|----------------|----------|
| | | | On line | Off line |
| AC8H to AC9H | Message transmission resend count | Indicates the accumulated count of resends in the message frame. | ○ | — |
| ACAH to ACBH | Message transmission resend over count | Indicates the accumulated count of resend over in the message frame. | ○ | — |
| AD6H to AD7H | Message transmission receive error count | Indicates the accumulated count of receive error detections in the message frame. | ○ | — |
| AD8H to AD9H | Message transmission communication number error count | Indicates the accumulated count of communication number error detections in the message frame. | ○ | — |
| ADAH to ADBH | Message transmission resend recognition count | Indicates the accumulated count of resend recognition in the message frame. | ○ | — |
| AE0H to AE1H | ACK error count | Indicates the accumulated count of ACK header error detections. | ○ | — |
| AE2H to AE3H | Serial number version error count | Indicates the accumulated count of serial number version (* ¹) error detections (mis-match detection). | ○ | — |
| AE4H to AE5H | Serial number error count | Indicates the accumulated count of serial number (* ¹) error detections (non-continuous detection). | ○ | — |
| AE6H to AE7H | Node number error count | Indicates the accumulated count of node number error detections. | ○ | — |
| AE8H to AE9H | TCD error count | Indicates the accumulated count of TCD (transaction code) error detections. | ○ | — |
| AF8H to AF9H | Token multiplexing recognition count | Indicates the accumulated count of optional node address (including local node address) tokens detected while the token is being held. | ○ | — |
| AFAH to AFBH | 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. | ○ | — |
| AFCH to AFDH | Token resend count | Indicates the accumulated count of token resends. | ○ | — |
| B04H to B05H | 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). | ○ | — |
| B06H to B07H | Token monitoring time out count | Indicates the accumulated count time out detections for token monitoring time out time. | ○ | — |
| B10H to B11H | Total operating time | Indicates the total operating time. (Unit: ms) | ○ | — |
| B12H to B13H | Frame wait status count | Indicates the accumulated count that frame wait status has become. | ○ | — |
| B14H to B15H | Participation count | Indicates the accumulated count of local node participaiton. | ○ | — |
| B16H to B17H | Self-release count | Indicates the accumulated count of self release (when token holding time for local node up is generated 3 consecutive times). | ○ | — |

○: Valid —: Invalid

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

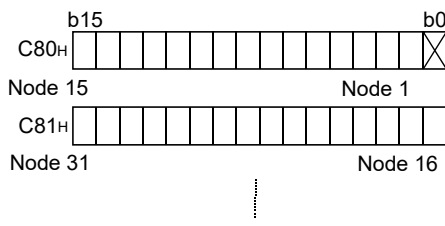
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| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|--------------------------|---|----------------|----------|
| | | | On line | Off line |
| B18H to B19H | Release-by-skip count | Indicates the accumulated count of release by skip (local node address token is pulled out 3 consecutive times). | ○ | — |
| B1AH to B1BH | Other node release count | Indicates the accumulated count of detections of other node releases. | ○ | — |
| B28H to B37H | Participation node list | Indicates the token participation status at the other node in bits.  0: Release 1: Participation | ○ | — |
| B7AH to B7BH | Auto negotiation count | <ul style="list-style-type: none"> For the QJ71FL71-T-F01 Indicates the number of auto negotiations occurred. For other than the QJ71FL71-T-F01 Fixed to 0. | ○ | — |

○ : Valid — : Invalid

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

| Buffer memory address | Name | Description | Operating mode | |
|-----------------------|---|---|----------------|----------|
| | | | On line | Off line |
| C00H | 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) | ○ | — |
| C01H | 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 | ○ | — |
| C02H to C03H | Virtual address space first address | Stores the first address (32 bits) when using virtual address space in the transmission of message used for message send area. Range: 0H to FFFFFFFFH | ○ | — |
| C80H to C8FH | Other node token mode (version mismatch) status | Indicates the valid/invalid status of the participation request from other node in bits. (QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01 only)  0: Communication valid (the same frame received) 1: Communication invalid (different frame received) * Valid when the local node communication status (904H ··· b8) is off. | ○ | — |

○ : Valid — : Invalid

*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.

3.3 Multiple CPU Systems

This section introduces the multiple CPU systems.
 When using FL-net module with a multiple CPU system, the QCPU (i.e. control CPU) controlling the FL-net module is set by GX Developer.

POINT
 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.

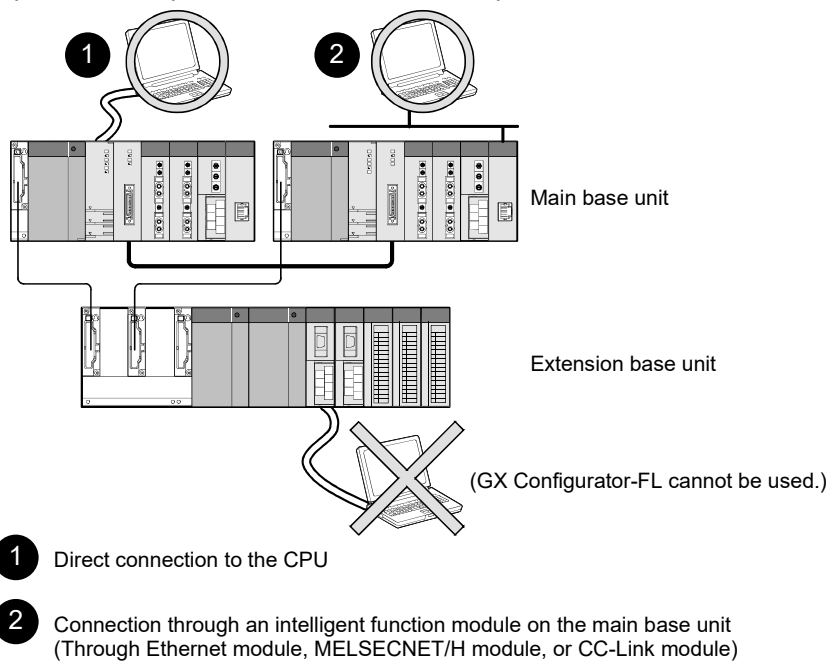
REMARK

For information about the procedure for setting multiple CPU systems, refer to Section 6.3.2 "Setting the GX Developer" and the QCPU User's Manual (Multiple CPU System).

3.4 For Use with Q12PRH/Q25PRH CPU

(1) GX Configurator-FL connection

GX Configurator-FL cannot be used when accessing the Q12PRH/Q25PRH CPU via an intelligent function module on an extension base unit from GX Developer.
 Connect a personal computer with a communication path indicated below.



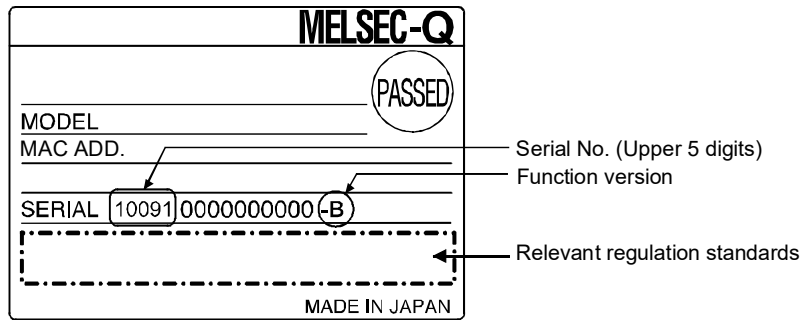
3.5 How to Check the Function Version and Software Version

(1) Checking the function version

The serial No. and function version of the FL-net modules can be confirmed on the rating plate, the front of the module and GX Developer's system monitor.

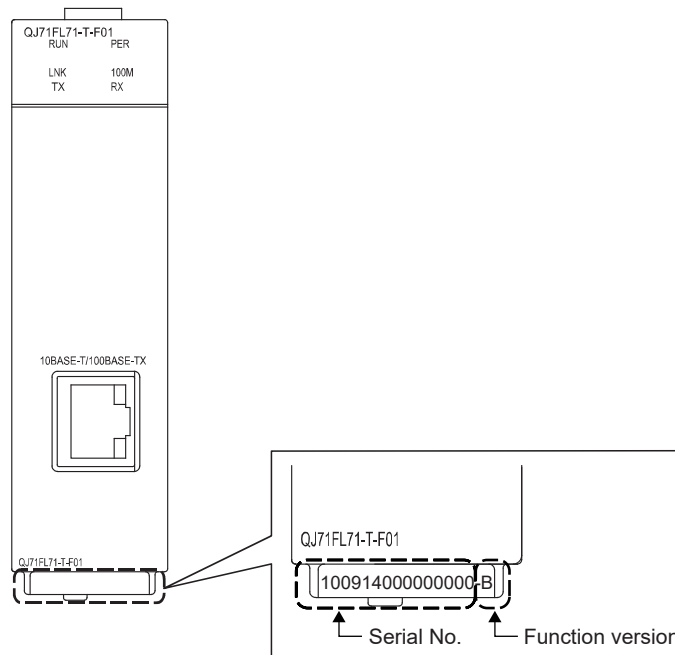
(a) Confirming the serial number on the rating plate

The rating plate is situated on the side face of the FL-net modules.



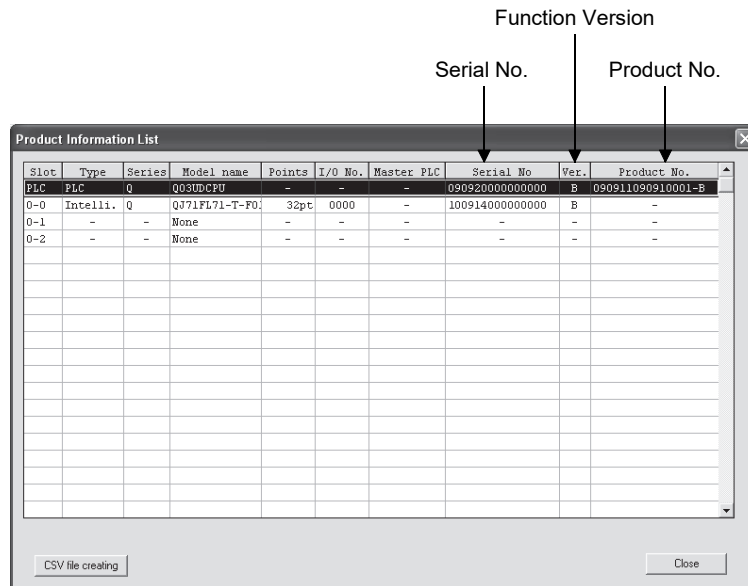
(b) Checking on the front of the module

The serial No. on the rating plate is also indicated on the front of the module (lower part).



- (c) Confirming the serial number on the system monitor (Product Information List)

To display the screen for checking the serial number and function version, select [Diagnostics] → [System Monitor] and click the **Product Inf. List** button in GX Developer.

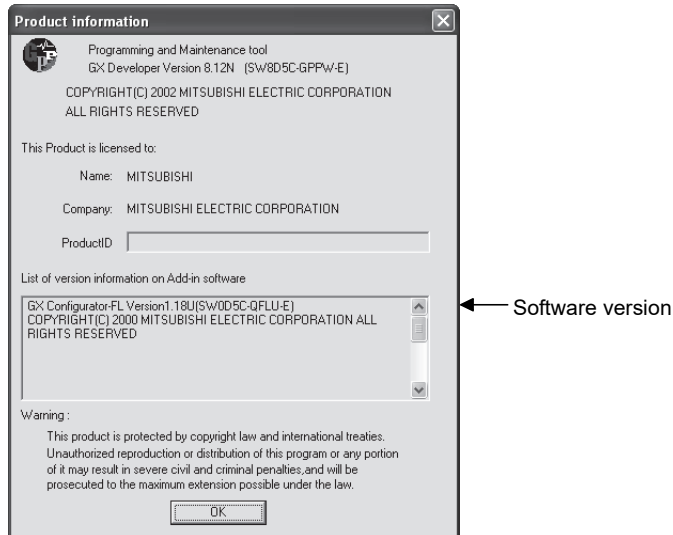


- 1) Production number display
 Since the FL-net modules does not support the production number display, "-" is displayed.

| |
|--|
| POINT |
| <p>The serial No. displayed in the Product Information List of GX Developer may be different from the one on the rating plate and the front of the module.</p> <ul style="list-style-type: none"> • The serial No. on the rating plate and the front of the module indicates the management information on the product. • The serial No. in the product information List of GX Developer indicates the functional information on the product, which is updated when a new function is added. |

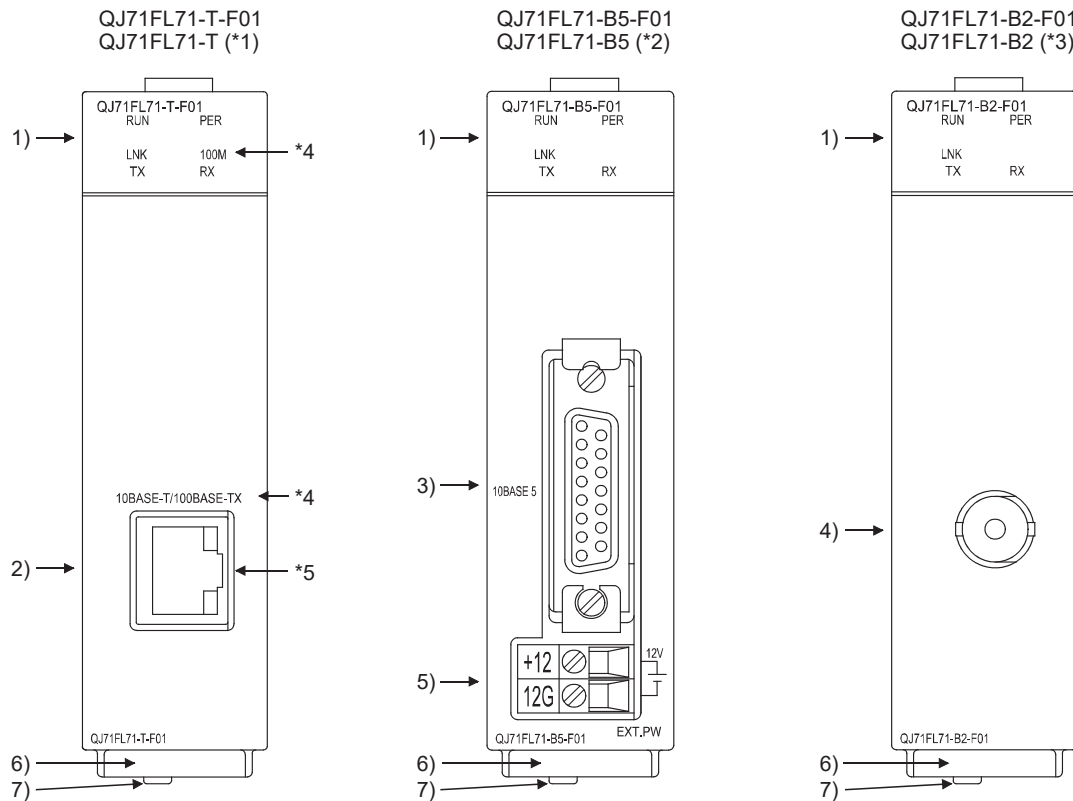
(2) Checking the software version of GX Configurator-FL

The software version of GX Configurator-FL can be checked in the "Product information" dialog box, which can be opened from "Help" in GX Developer.



3.6 Functions and Names of Parts of FL-net Module

The following introduces the functions and names of parts of the FL-net module.



- *1: The appearance of the QJ71FL71-T is the same as that of the QJ71FL71-T-F01, except the model name part and silkscreen print.
- *2: The appearance of the QJ71FL71-B5 is the same as that of the QJ71FL71-B5-F01, except the model name part.
- *3: The appearance of the QJ71FL71-B2 is the same as that of the QJ71FL71-B2-F01, except the model name part.
- *4: The silkscreen print of 100M and 100BASE-TX is for the QJ71FL71-T-F01 only. These silkscreen 100M and 100BASE-TX are printed when the first 5 digits of the serial No. is 10011 or later. When the serial No. (first 5 digits) is earlier than 10011, the following are printed on the module. Although the silkscreen print is different, the LED indications and connector functionality are the same.

| Present silkscreen print | Former silkscreen print |
|--------------------------|-------------------------|
| 100M LED | No print |
| 10BASE-T/100BASE-TX | 10BASE-T |

Since the high-speed cyclic transmission function (100Mbps) by 100BASE-TX connection has been certified by Japan Electrical Manufacture's Association (JEMA), it can be used from the first released products. (The QJ71FL71-T-F01 only)

| | Name | Description |
|----|--|---|
| 1) | LED indicator | Refer to (1) LED indications. |
| 2) | 10BASE-T/100BASE-TX connector (RJ45) (*5) (*6) | Connector for connecting FL-net module to 10BASE-T/100BASE-TX. (The FL-net module detects the 10BASE-T or 100BASE-TX according to the hub.) |
| 3) | 10BASE5 connector | Connector for connecting FL-net module to 10BASE5. (For connecting 10BASE5 AUI cable (transceiver cable)) |
| 4) | 10BASE2 connector | Connector for connecting FL-net module to 10BASE2. (For connecting 10BASE2 coaxial cable) |
| 5) | External power supply terminal | Terminal for supplying power to the transceiver in the connection for 10BASE5. (13.28 V to 15.75 V) |
| 6) | Serial No. display | Label indicating the serial No. of the FL-net module |
| 7) | Lever for mounting module | Guide for correctly mounting FL-net module to base unit. |

*5: The LED on the connector will not light up.

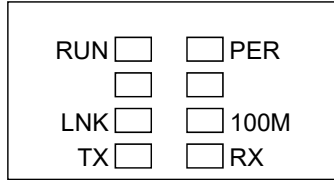
The orientation of the connector is different (rotated) depending on the serial No.

*6: 100BASE-TX is supported by the QJ71FL71-T-F01 only.

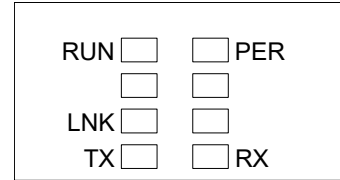
(1) LED indications

1) LED indicators

The QJ71FL71-T-F01



Other than the QJ71FL71-T-F01



| LED Name | Indication | LED on | LED off |
|-----------------|---------------------------------|----------------------|--------------------|
| RUN (Green) | Normal operation | Normal | Error (*1) |
| LNK (Green) | Token passing indicator | Token passing status | No token passing |
| TX (Green) | Data send status indicator | Sending data | Not sending data |
| PER (Red) | Network parameter setting | Setting error (*2) | Setting normal |
| 100M (Green) | Transmission speed | 100Mbps | 10Mbps/Unconnected |
| RX (Green) | Data receiving status indicator | Receiving data | Not receiving data |

*1 : [RUN]LED turns off under the following conditions.

- Hardware error
- Watchdog timer error

*2 : [PER]LED turns on when:

- Setting value is out of the range. (e.g. mode, node number, or assignment)
- A critical error is detected.

4 MOUNTING THE FL-net MODULE

This chapter explains the precautions during the mounting and installation of the FL-net module and introduces information about the installation environment.

4.1 Mounting and Installation

Refer to the user's manual for the programmable controller CPU module being used for details about the mounting and installation of the FL-net module.

4.2 Precautions when Handling

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

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

| Screw location | Tightening torque range |
|--|-------------------------|
| External power supply terminal screw (M2.5 screw) (* ¹) | 0.40 N•m |
| Module fixing screw (Normally not required) (M3 screw) (* ²) | 0.36 to 0.48 N•m |

*1 : External supply power input terminal to be used to supply power to the transceiver for connection to 10BASE5.

*2 : The module can be easily fixed onto the base unit using the hook at the top of the module.

However, it is recommended to secure the module with the module fixing screw if the module is subject to significant vibration.



WARNING

- Never touch the terminals or connectors while the power is on. Electrical shock or malfunctioning could result.
- Before cleaning the module or retightening the terminal screws and module fixing screws, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to completely shut off all phases of the external power supply may cause module breakdowns and malfunctions. If the screws are loose, it may cause the module to short-circuit, malfunction or fall off. If the screws are tightened excessively, it may damage the screws and cause the module to short circuit, malfunction or fall off.
- Always use the utmost care when performing control operations (especially when changing the data, program or operating status conditions) when the programmable controller is in operation.

 CAUTION

- While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Then, securely mount the module with the fixing hole as a supporting point.
If the module is not installed properly, it may cause the module to malfunction, fail or fall off.
Secure the module with screws especially when it is used in an environment where constant vibrations may occur.
- Never allow foreign material, such as metal particles or small pieces of wire, to enter the module. It could cause malfunctioning, damage or fire.
- Never disassemble or modify the module. This may cause breakdowns, malfunctions, injuries or fire.
- Before mounting or dismantling the module, shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases. Failure to do so may damage the product.
- Always tighten the screws to within the specified torque range.
If the screws are loose, shorting or malfunctioning could result. If the screws are too tight, they could break off, fall into the module and cause shorting or malfunctioning.
- Never directly touch the electrical parts or any conductive component of the module. It could cause shorting or malfunctioning of the module.
- Dispose of this product as industrial waste.

4.3 Installation Environment

Avoid the following environments for the programmable controller.

- An environment in which the ambient temperature exceeds a range of 0 to 55 °C.
- An environment in which the relative humidity exceeds a range of 5 to 95 % RH.
- An environment in which rapid temperature fluctuations could cause condensation.
- An environment in which there is corrosive or flammable gas.
- An environment in which there is a high concentration of dust, metal particles or other such conductive particles, oil mist, salt, or organic solvents.
- An environment that is exposed to direct sunlight.
- An environment in which strong electric or magnet fields are generated.
- An environment that is exposed to direct vibration or impact.

 CAUTION

- Use the programmable controller in the operating environment that meets the general specifications of this manual.
Using the programmable controller in any other operating environments may cause electric shocks, fires or malfunctions, or may damage or degrade the product.

5 WIRING THE FL-net MODULE

This chapter explains the methods for connecting the FL-net module to a 10BASE5, 10BASE-T/100BASE-TX or 10BASE2 network.

5.1 Communication Cable Connections

The following are the precautions to be followed when connecting the FL-net module to a network. Always read and understand the procedures and precautions before starting the operations. Keep safety a priority at all times.

- (1) The installation of 10BASE5, 10BASE-T/100BASE-TX or 10BASE2 networks requires strict adherence to safety precautions. Consult a specialist when connecting cable terminals or installing trunk line cables, etc.
- (2) The cables used must meet the specifications shown in Section 3.1.2.
- (3) Coaxial cable has a limited permissible bending radius. Accordingly, if the coaxial cable is to be bent during routing, a space greater than its permissible bending radius is required. The permissible bending radius of the coaxial cable being used is provided by the manufacturer of the cable.



CAUTION

- When routing AUI cable (transceiver cable)/coaxial cable, never bundle them with or position them near other cables, especially main circuit cables and power cables. Always provide at 100 mm or more between them. Positioning the cables too close to each other could cause the module to malfunction from the electrical noise.
- Make sure that the power supply for the sequencer for the station where the unit is mounted and the power supply for the FL-net (OPCN-2) system are off before making AUI cable connections.
- Make sure to place the communication and power cables to be connected to the module in a duct or fasten them using a clamp. If the cables are not placed in a duct or fastened with a clamp, their positions may become unstable and may move, or they may be pulled inadvertently. This may damage the module and the cables or cause the module to malfunction because of faulty cable connections.
- When disconnecting the communication and power cables from the module, do not pull the cables by hand. When disconnecting a cable with a connector, hold the connector to the module by hand and pull it out to remove the cable. When disconnecting a cable connected to a terminal block, loosen the screws on the terminal block first before removing the cable. If a cable is pulled while being connected to the module, it may cause the module to malfunction or damage the module and cables.

5.1.1 Connecting to QJ71FL71-B5(-F01)

This section explains the methods of connecting the QJ71FL71-B5(-F01) to the network.

(1) Connecting to 10BASE5 network

This section introduces the methods for connecting the FL-net module to a 10BASE5 network. (Target module of explanation : QJ71FL71-B5(-F01))

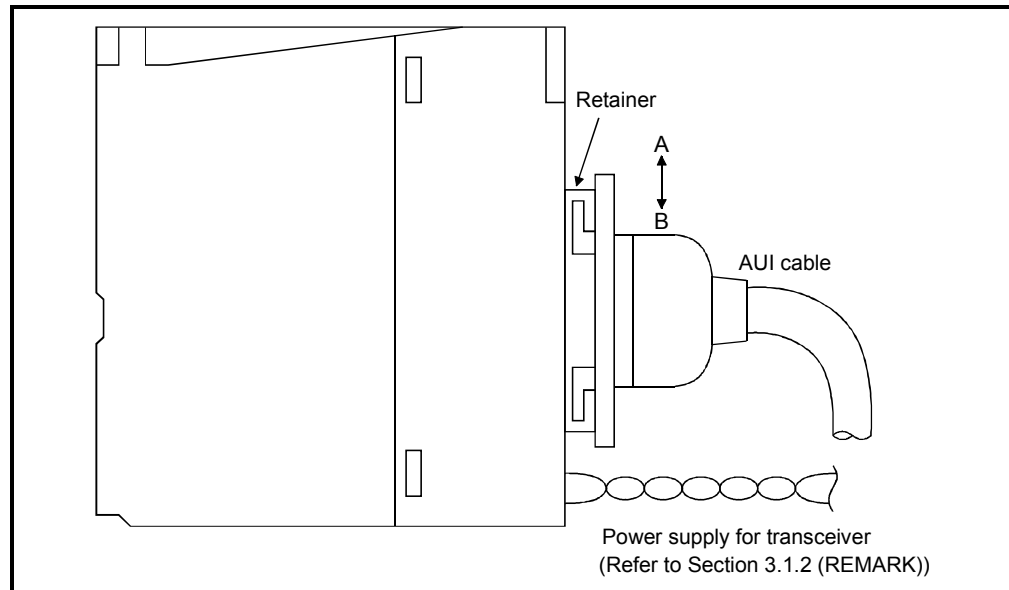


Fig. 5.1 Diagram of AUI cable connection

<Operating procedure>

- (Step 1) Slide the retainer in the direction of B shown in Fig. 5.1
- (Step 2) Insert the AUI connector all the way.
- (Step 3) Slide the retainer in the direction of A shown in Fig. 5.1
- (Step 4) Check that the AUI cable is locked.
- (Step 5) Turn on the power supply for transceiver (*1).

*1 : Use a transceiver that is equipped with a function generally called as SQE TEST or heartbeat (a signal that is used for checking normal transceiver operation after transmission).

**CAUTION**

- Make sure that the power supply for the sequencer for the station where the unit is mounted and the power supply for the FL-net (OPCN-2) system are off before making AUI cable connections.

POINT

- (1) When connecting to the network using 10BASE5 and countermeasures against noise and high-frequency waves are required for the installation environment of the FL-net module, attaching a ferrite core to the transceiver side of the AUI cable is often effective.
Refer to the Point provided in Section 3.1.2.
- (2) Refer to Section 3.1.2 (1) for the example of device and system configuration which is required to connect to the 10BASE5.

5.1.2 Connecting to QJ71FL71-T(-F01)

This section explains the methods of connecting the QJ71FL71-T(-F01) module to the network.

(1) Connecting to 10BASE-T/100BASE-TX network (The QJ71FL71-T supports 10BASE-T only.)

This section explains the methods for connecting the FL-net module to a 10BASE-T/100BASE-TX network. (Target module of explanation : QJ71FL71-T(-F01))

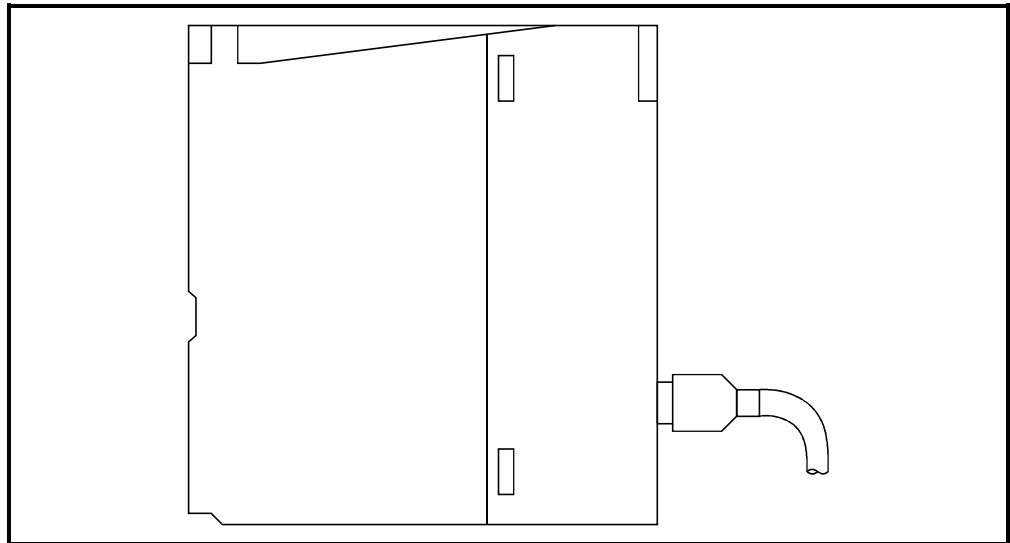


Fig. 5.2 Diagram of 10BASE-T/100BASE-TX cable connection

<Operating procedure>

- (Step 1) Connect the twisted pair cable to the hub.
- (Step 2) Connect the twisted pair cable to the FL-net module.

| POINT |
|--|
| <p>(1) The QJ71FL71-T-F01 detects whether it is 10BASE-T or 100BASE-TX, and the full-duplex or half-duplex transmission mode according to the hub. For connection to a hub that does not have the auto negotiation function, set the half-duplex mode on the hub side.</p> <p>(2) Refer to Section 3.1.2 (2) for equipment required for 10BASE-T/100BASE-TX connection and a system configuration example.</p> |

5.1.3 Connecting to QJ71FL71-B2(-F01)

This section introduces the methods of connecting the QJ71FL71-B2(-F01).

(1) Connecting to 10BASE2 network

This section explains the methods for connecting the FL-net module to a 10BASE2. (Target module of explanation : QJ71FL71-B2(-F01))

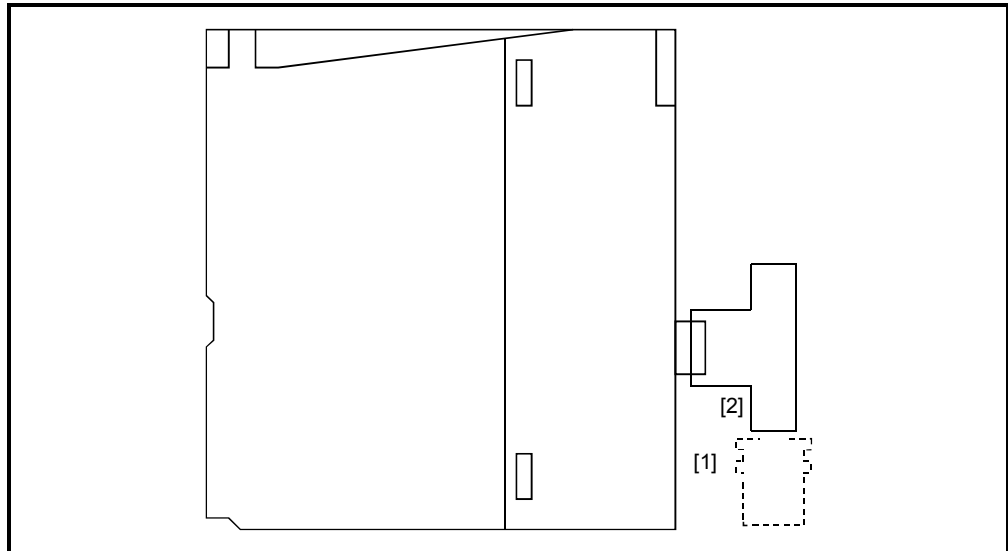


Fig. 5.3 Diagram of 10BASE2 cable connection

<Operating procedure>

- (Step 1) As shown in Fig. 5.3, align the grooves (1) and tab (2) and push in.
- (Step 2) While pushing the connector in, turn the connector to the right until it locks.
- (Step 3) Confirm that the connector has been locked.

POINT

Refer to Section 3.1.2 (3) for the example of device and system configuration which is required to connect to the 10BASE2.

REMARK

Connecting the connector for the coaxial cable
 The following explains the methods for connecting the cable and BNC connector (the connector plug used for coaxial cable).

(1) Configuration of BNC connector and coaxial cable

The configuration of the BNC connector and coaxial cable is shown in Fig. 5.4.

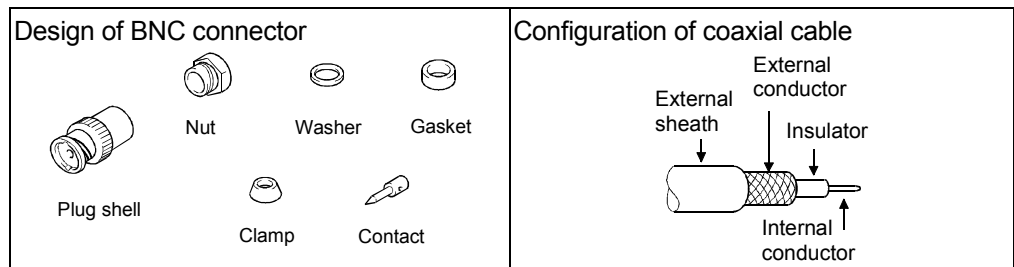
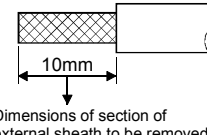
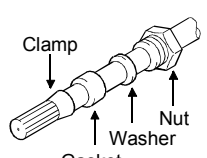
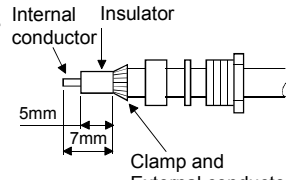
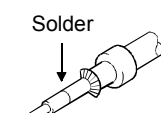
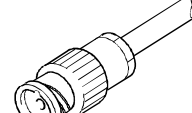


Fig. 5.4 Configuration of BNC connector and coaxial cable

(2) Connecting BNC connector and coaxial cable

The method for connecting BNC connector and coaxial cable is shown below.

- (a) Remove the external sheath for the coaxial cable as shown in the illustration on the right. Use care not to damage the external conductor.
 
- (b) Place the nut, washer, gasket and clamp on the coaxial cable as shown in the illustration on the right and expose the outer conductor.
 
- (c) Cut the external conductor, insulator and internal conductor to the dimensions shown in the illustration on the right. Note that the external conductor is cut to the same dimension as the tapered section of the clamp and connect the clamp.
 
- (d) Solder the contact to the internal conductor.
 
- (e) Push the contact assembly created in (d) into the plug shell and tighten the nut.
 

POINT

Pay attention to the following precautions when soldering the internal conductor and contact.

- (1) Use care to prevent the solder from building up on the soldered section.
- (2) Use care to prevent a gap from forming between the cable insulator and the contact. Also use care to prevent them from digging into each other.
- (3) Perform the soldering quickly to prevent deformation of the insulator.

6 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.

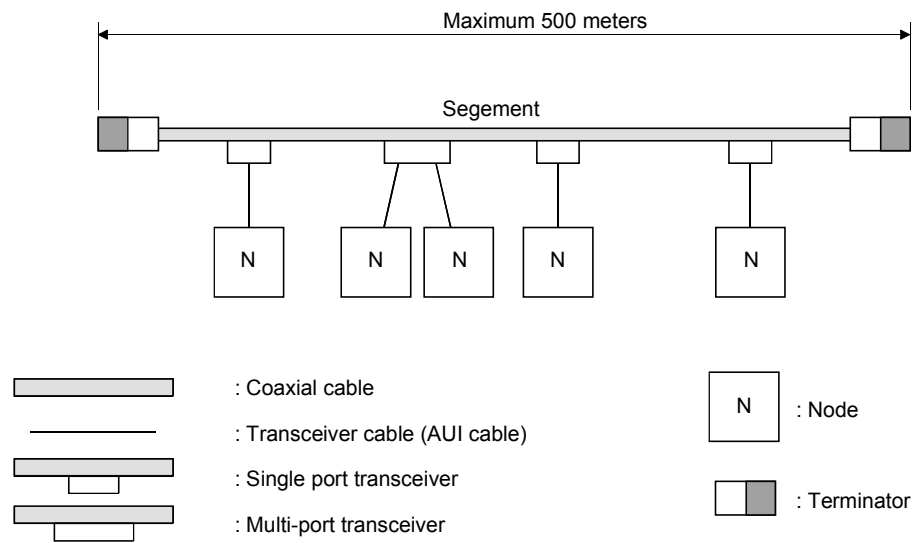
6.1 About Ethernet

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

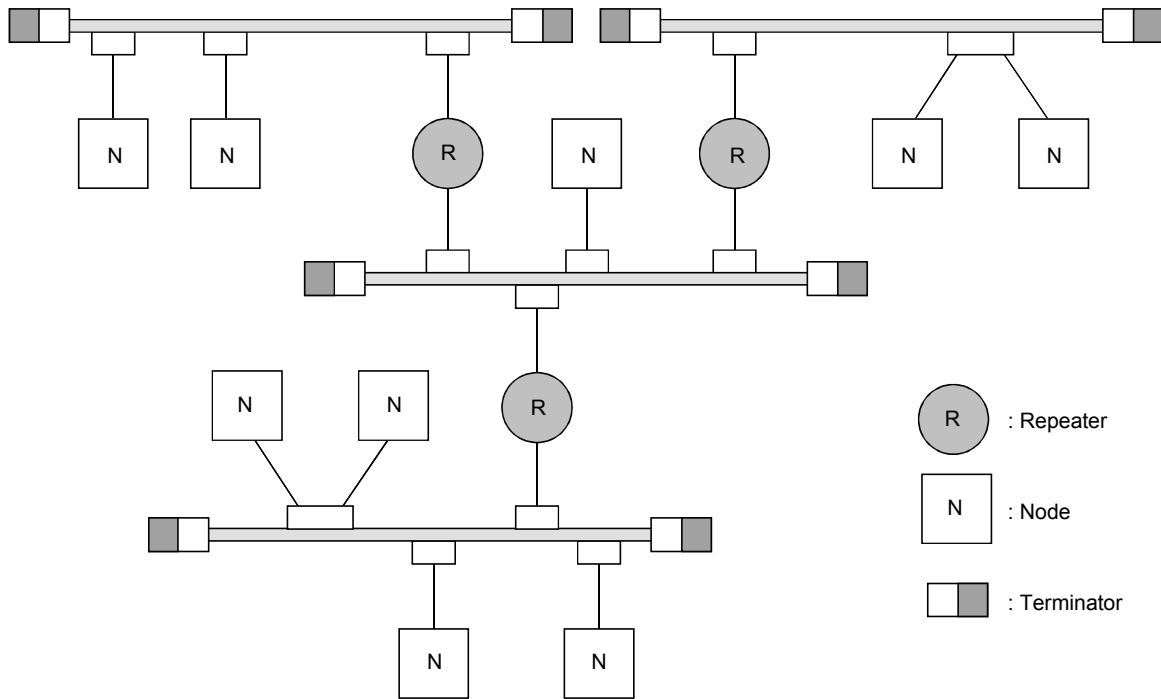
6.1.1 10BASE5 system

As shown below, the basic structure is comprised of a coaxial cable up to 500 meters long to which the nodes are attached. The nodes are connected to the coaxial cable by a transceiver cable (AUI cable) and transceiver. There are two types of transceivers: the single port transceiver to which only one transceiver cable (AUI cable) can be attached and the multi-port transceiver to which multiple cables can be attached.

This basic design is called a segment. Each segment can have up to 100 nodes.



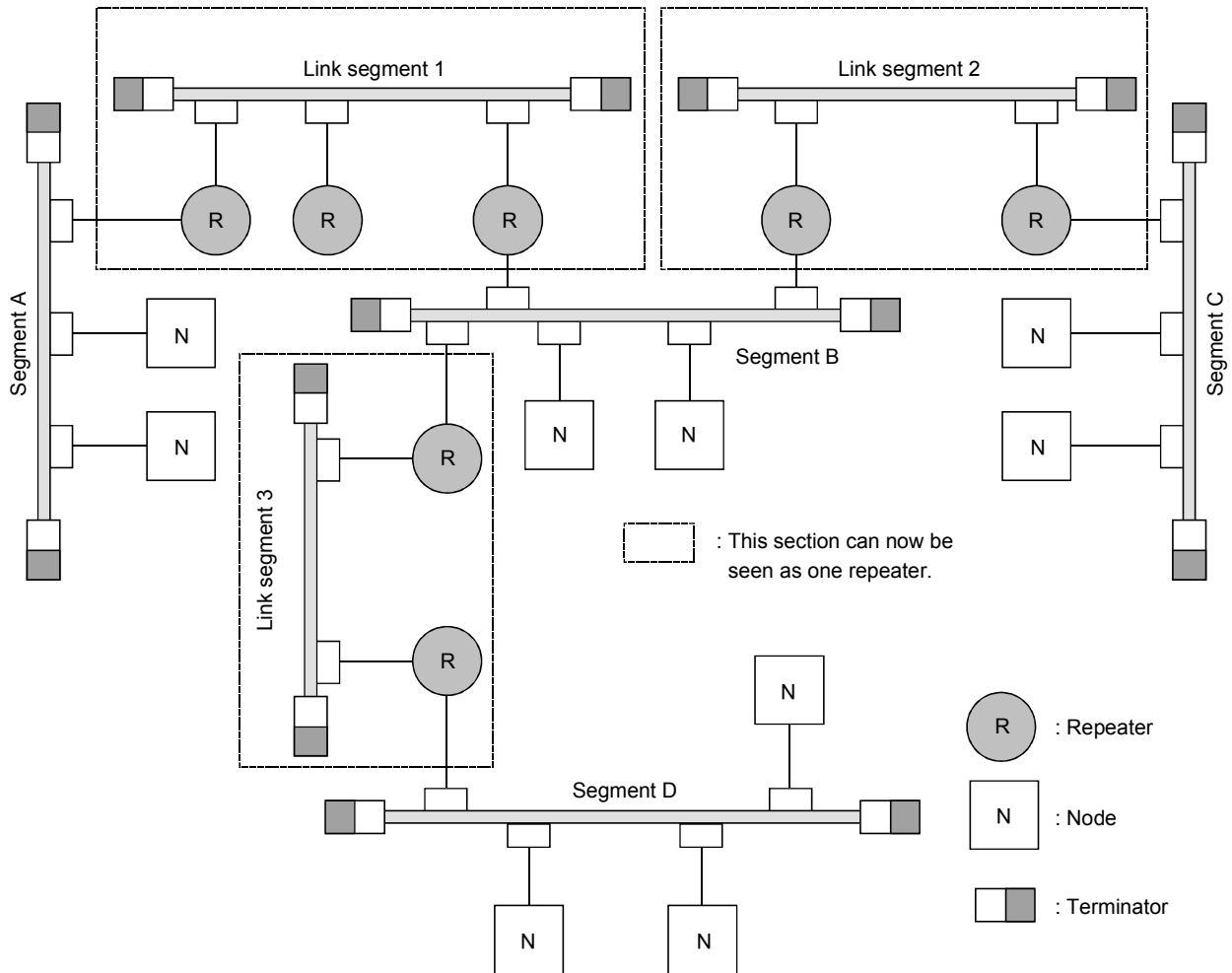
When the distance between nodes exceeds 500 meters, a repeater can be used to increase the number of segments as shown in the illustration below. The system shown in the illustration below has a maximum distance of less than 1500 meters and is arranged so that there will be two repeaters or less between any two nodes.

**POINT**

- (1) The repeater is connected to the coaxial cable via a transceiver and transceiver cable.
- (2) A repeater can be mounted to a transceiver at any position along a coaxial cable segment.
- (3) Mounting interval for a transceiver should be an integral multiple of 2.5 meters.

In the example in the illustration below, the maximum distance between nodes is 2,500 meters. In order to increase the transmission distance, a link cable (the maximum is 500 meters for coaxial cable) with repeaters installed at both ends is used. This is called a linked segment.

Note that there are no nodes connected to the link segment. Instead of a node, the link segment with repeaters at both ends, shown in the dotted line boxes in the illustration below, can be counted as one repeater and thereby reduce the limit for the total number of repeaters between any given node segment.



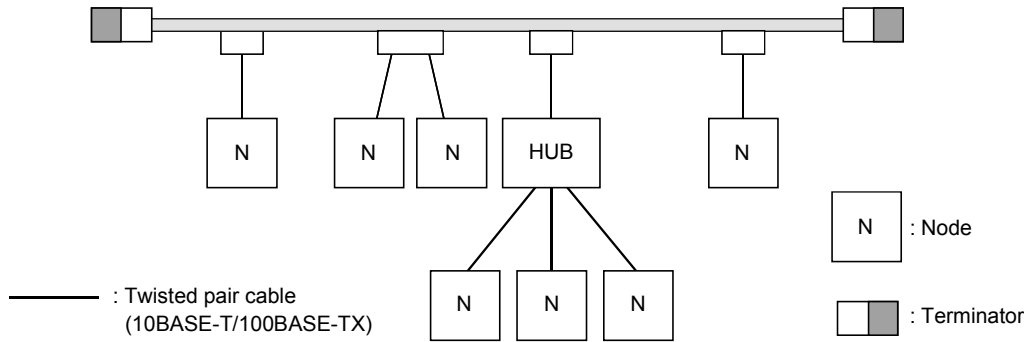
- | POINT |
|--|
| (1) The maximum length of a link segment is 500 meters. |
| (2) Do not connect nodes within a link segment. |
| (3) The link segment with repeaters at both ends, within area indicated by the dotted line boxes in the illustration, can be viewed as one repeater. |
| (4) Use two or less repeaters within any given node segment. |
| (5) Set only one segment for connecting two or more repeaters. |

The following shows the general specifications for configuring an Ethernet system.

| Item | Specification |
|---|--|
| Maximum segment length | 500 m |
| Maximum number of transceivers that can be mounted within on segment | 100 units |
| Maximum distance between nodes | 2500 m or less |
| Maximum number of nodes per system | 254 nodes |
| Maximum length of transceiver cable (AUI cable) | 50 m |
| Cable length between transceiver and repeater | 2 m or less (recommended) |
| Maximum number of repeaters that can be used within a node segment system | 2 repeaters (Note that a link segment with a repeater at each end is seen as one repeater) |

6.1.2 10BASE-T/100BASE-TX system

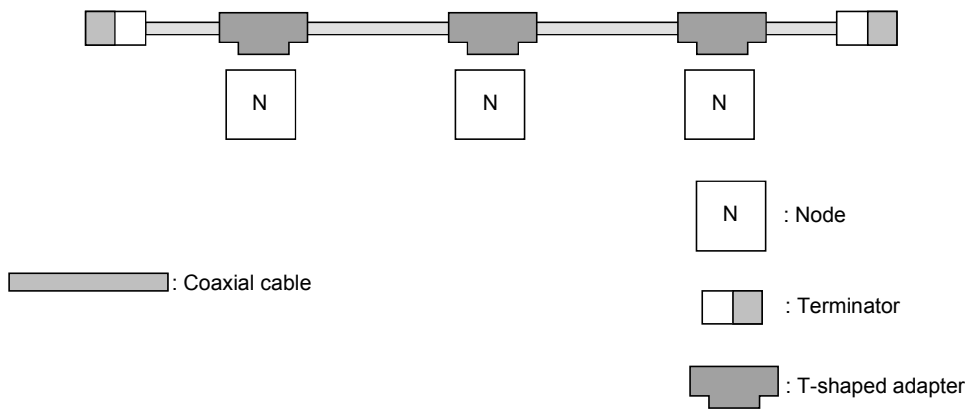
If a HUB is used to connect the transceiver cable to the transceiver, multiple nodes can be connected to the hub. Use a twisted pair cable (10BASE-T/100BASE-TX) to connect the nodes to the HUB.



In addition, if the distance between nodes is short, the twisted pair cable can be connected to the HUB without passing through a coaxial cable or transceiver.

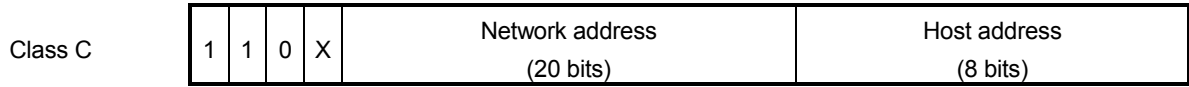
6.1.3 10BASE2 system

A T-shaped branch connector is mounted to the BNC connector on each node and coaxial cables are connected at both ends.

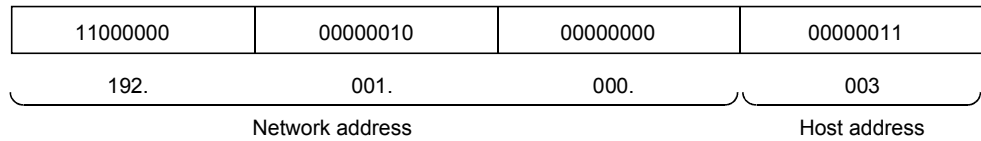


6.1.4 Ethernet IP address

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 |
| (1) 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. ***, ***, *** |
| (2) The following is the address default value for FL-net module. Default value: 192.168.250.1 |
| (3) The IP address of the FL-net module is set in the intelligent function module switch setting of GX Developer. (Refer to Section 6.3.2.) |

6.2 FL-net (OPCN-2)

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

6.2.1 Summary of FL-net (OPCN-2)

(1) Concept of FL-net (OPCN-2)

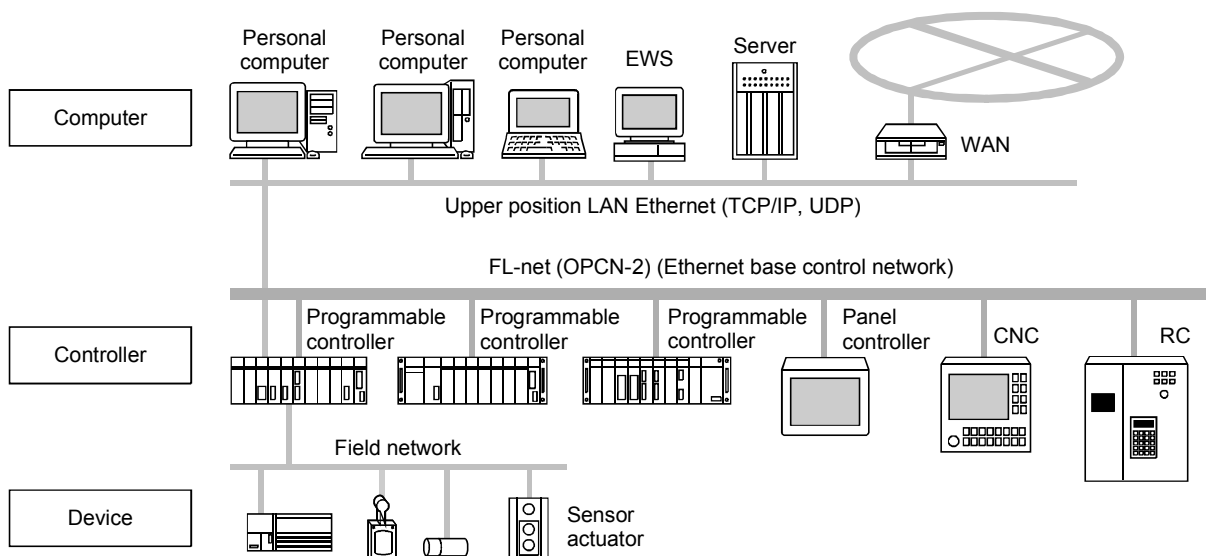
FL-net (OPCN-2) is an Ethernet-based FA control network.

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.

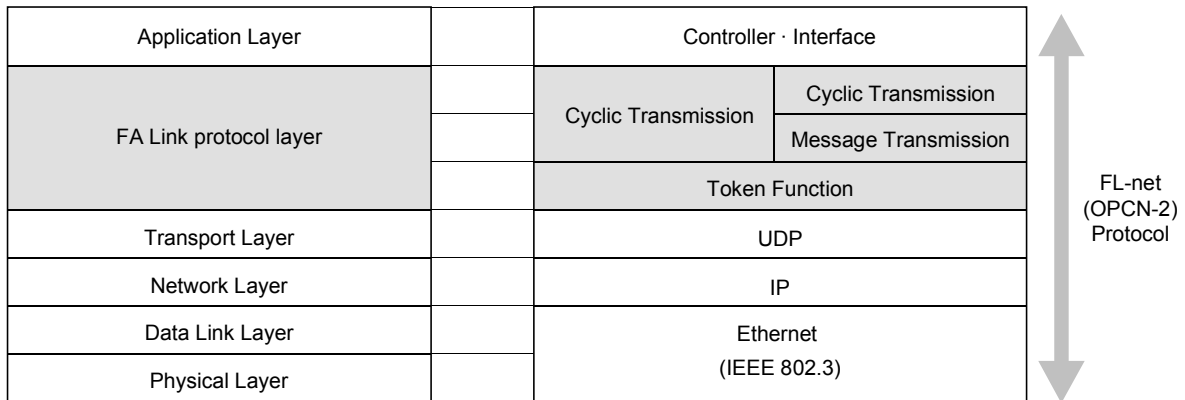
- (a) It uses Ethernet as the communication medium (physical level, data link) among FA controllers.
- (b) It uses the UDP/IP propagated on the Ethernet as the basic method for sending data.
- (c) It manages/controls (collision avoidance) communication medium access for each node on the network to guarantee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



(2) FL-net (OPCN-2) protocol

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



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

(3) 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).

- (a) Transmission control using "masterless token" system avoids collision.
- (b) Refresh cycle time can be specified since the system circulates a token in a fixed time.
- (c) The token is transmitted together with a cyclic data.
- (d) The node with a smallest node number among those who join the network at start-up time shall start to send the token.
- (e) If no token is transmitted for a specified time, next node in the token circulation ring shall send a new token.
- (f) The masterless token system (characterized by the above two items) will keep the network from stopping in case of failure of some nodes.
- (g) 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).

(4) 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).

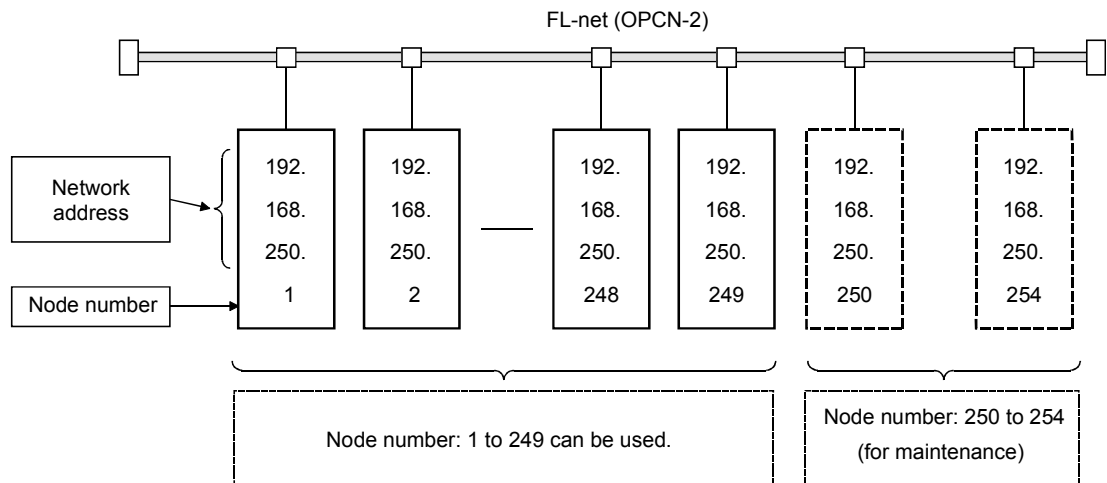
| | | |
|----------------------------|-----------------|-------------------------------|
| FL-net (OPCN-2) IP address | Network address | Host address (Node number) |
| | 192.168.250 | n (n : 1 to 254) |

6.2.2 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.

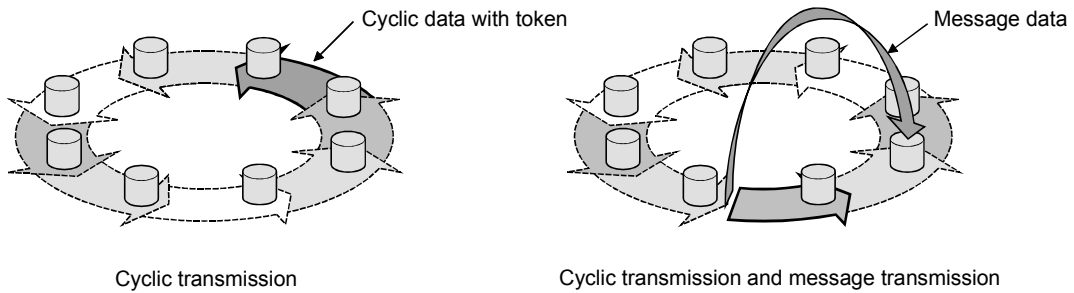
The maximum number of modules that can be connected is 254.

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



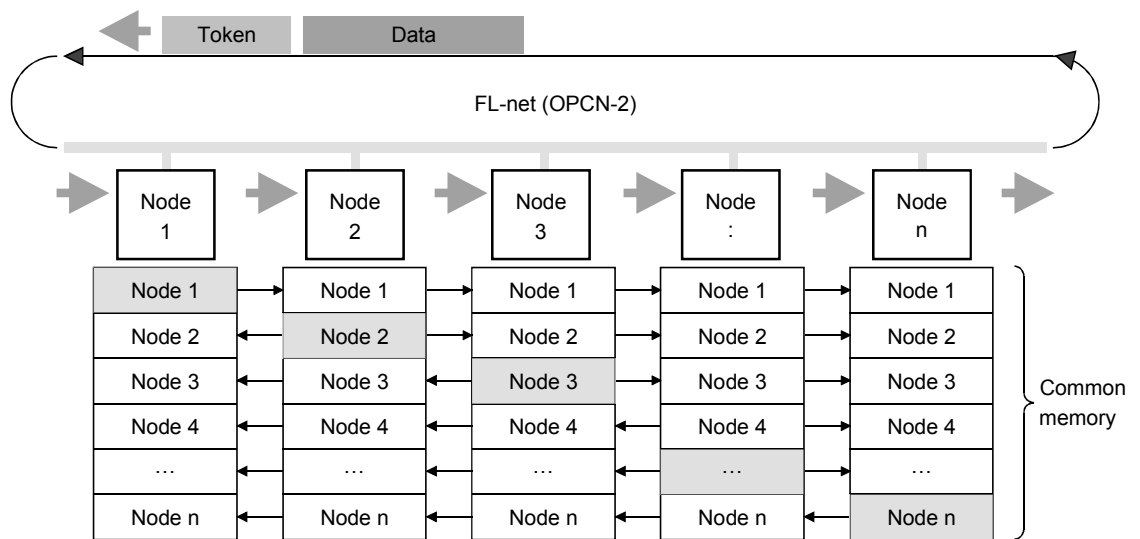
6.2.3 Data communication type

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.



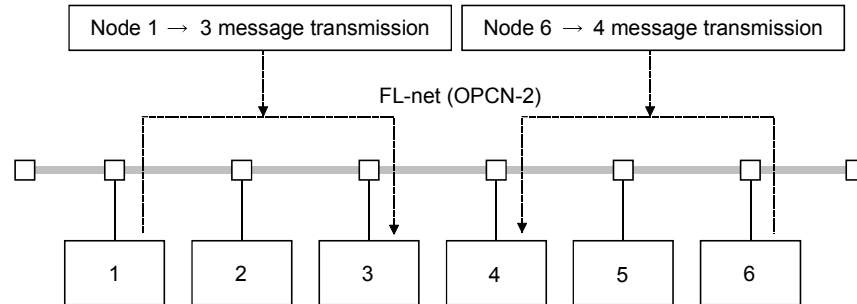
(1) Cyclic transmission

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



(2) Message transmission

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

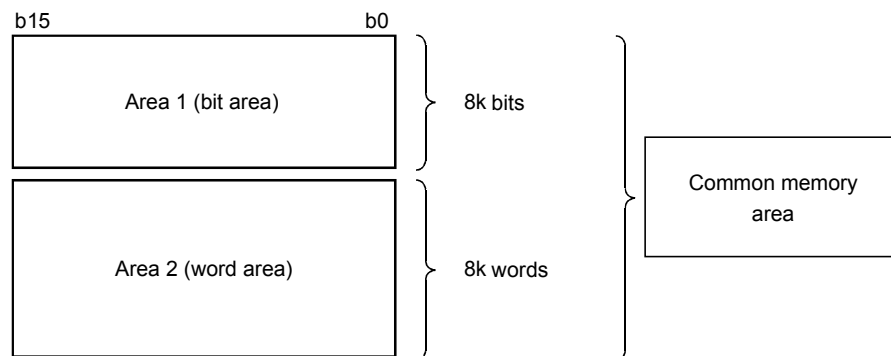


6.2.4 Transmission data volume

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

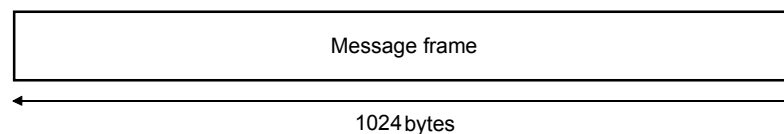
(1) Cyclic transmissions

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.



(2) Message transmission

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



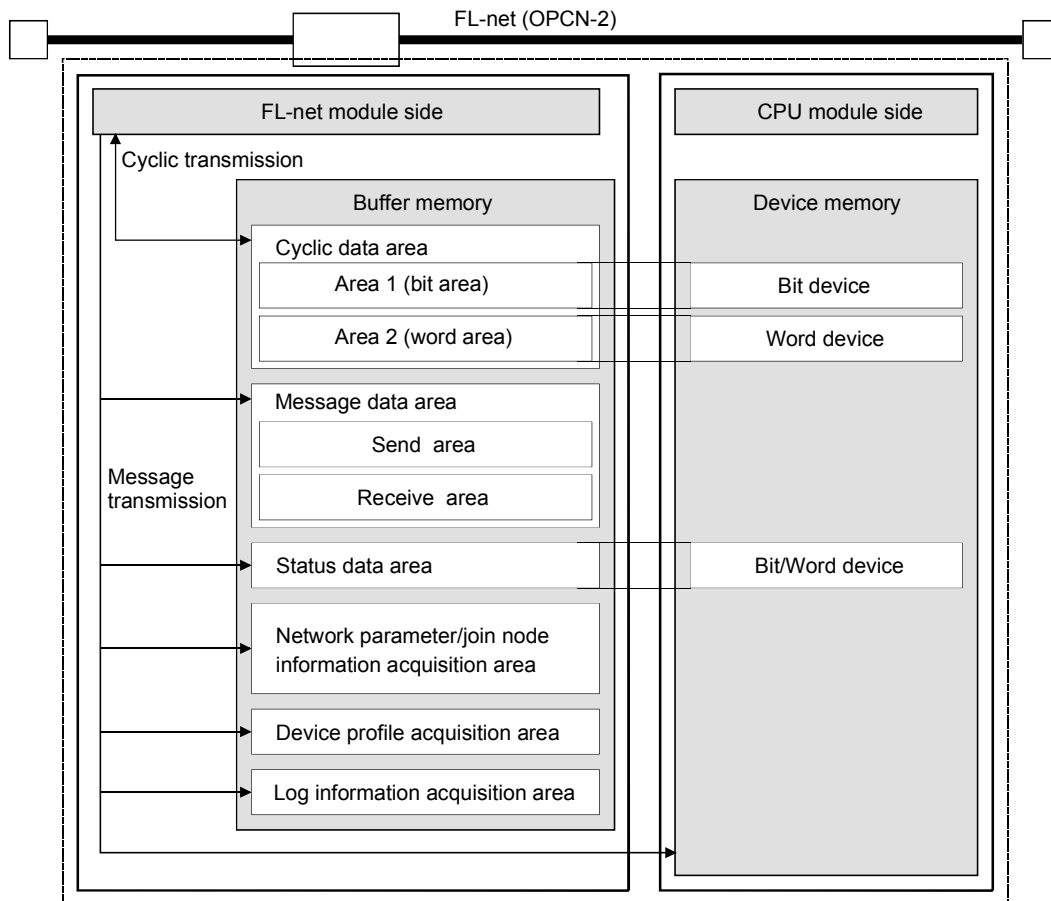
6.2.5 Transfer cycles

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.

6.2.6 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.



6.2.7 Cyclic transmission and area

(1) Summary of cyclic transmission

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

- (a) It realizes the common memory function.
- (b) The node sends when it is holding the token.
- (c) Nodes participating in the network are recognized as entities performing cyclic transmission.
- (d) When the token is being held, all cyclic data to be sent is sent.

1) 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.

2) Token frame

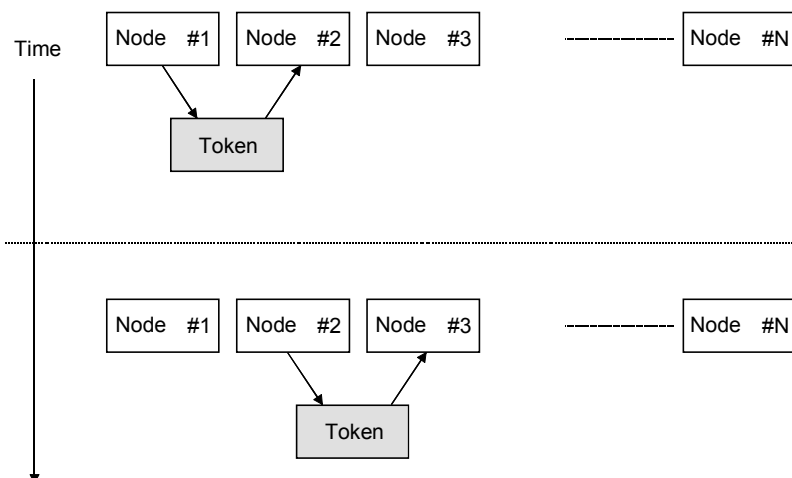
The frame that includes the token (token frame) has a token address node number and a token dispatch node number. When the node matches the token address node number of the token frame received, it becomes the token holding node.

3) Token sequence

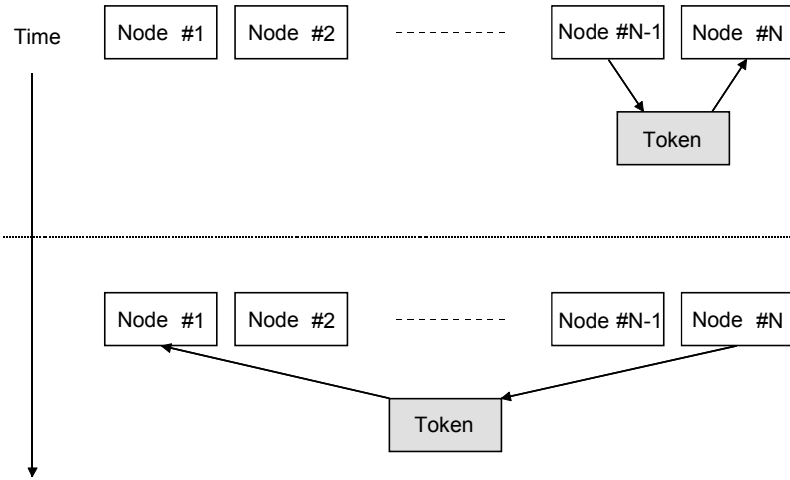
The sequence of the token rotation is determined by the node number. Rotation is performed in ascending order among the nodes that are registered in the participating node control table. The highest node number passes the token to the lowest node number.

- (e) 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>

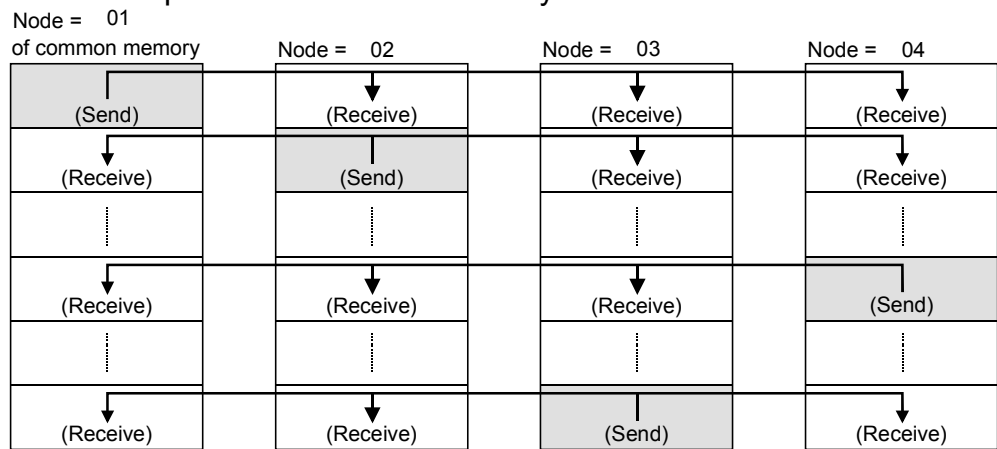


(2) Common memory

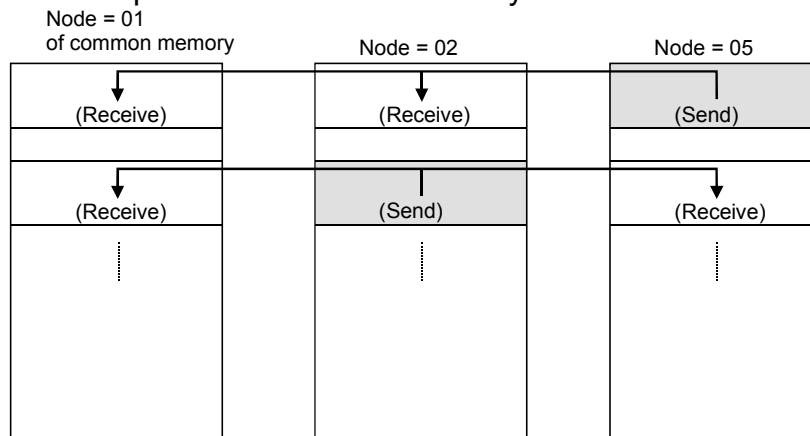
The following introduces the concepts for the common memory.

- (a) The common memory interface provides nodes with a service that can be regarded as a memory shared among them.
- (b) Two area types (Area 1 (bit area) and Area 2 (word area)) may be assigned for a node.
- (c) Multiple frames may be used if the transmitting area size of a node exceeds the transmission size of one frame, that is, 1024 bytes.
- (d) The common memory will not update itself with receiving data until all frames from a node are successfully received in case of the item (c). Thus time coherency of data from a node will be guaranteed.
- (e) Communication unit of each node shall provide fixed area of 8k bits + 8k words = 8.5 k words as the common memory.
- (f) Both Area 1 (bit area) and Area 2(word area) can be set at any size within the maximum.
- (g) 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>



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

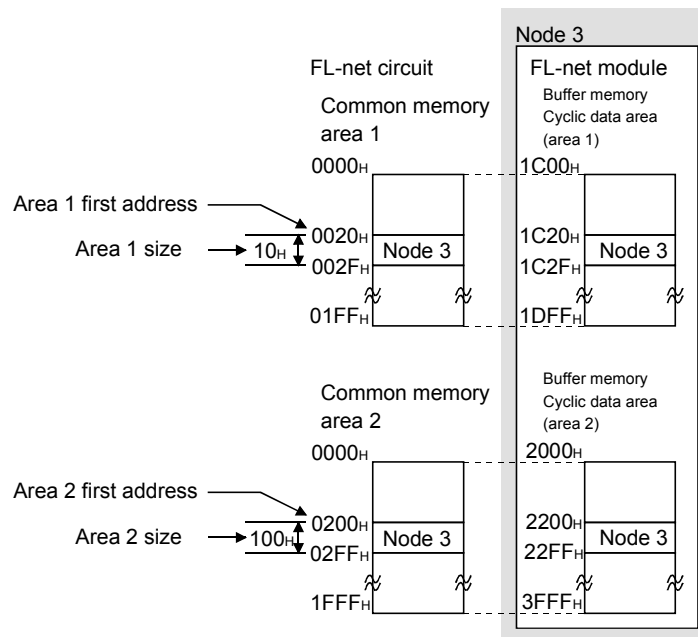
A node shall be assigned two data areas, area 1 (bit area) and area 2 (word area), as the transmitting areas in its common memory.

Set transmission areas by the first 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.

(Example) 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)



(4) Common memory assignment

(a) Common memory assignment of the local node

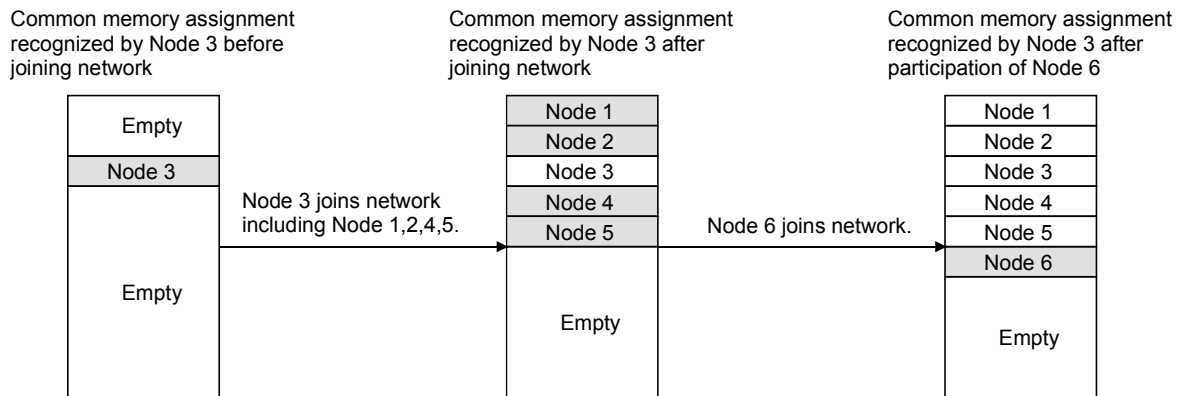
Each node assigns only the common memory area (for the node to store send data) of its own node to the local node network parameter area.

POINT

- (1) For the information on how to set the local node network parameter area, refer to the following:
 - When using the initial setting of GX Configurator-FL: Section 6.4.8
 - When setting on the sequence program: Section 6.5.1
- (2) 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.)

(b) 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.



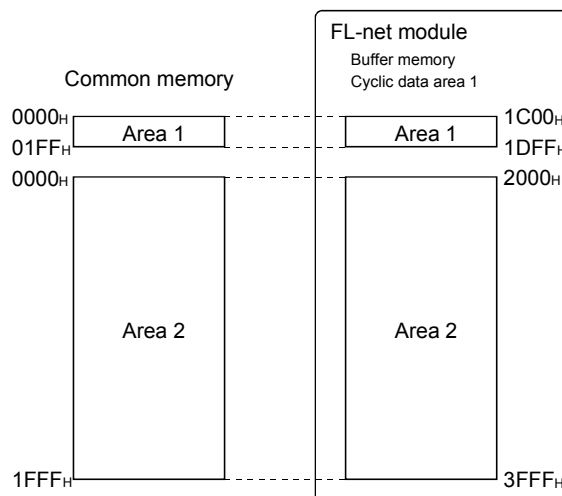
POINT
 Common memory assignment of the other nodes can be confirmed in the other node network parameter area (Address: 0080 to 087FH) in the buffer memory. (Refer to Section 3.2.5 (3) (b).)

- (c) 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. (No error will be detected on the other nodes currently participating in the network.)

(5) 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: 1C00H to 1DFFH) and (Area 2) (Address: 2000H to 3FFFH) accordingly.



(6) 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 either of the following methods.

| Transfer method | Description | Reference |
|--------------------------------|--|---------------|
| Using the auto refresh setting | In the auto refresh setting of GX Configurator-FL, specify No. of data transferred and an offset value from the first address of the cyclic data area. No sequence program for transfer is needed. | Section 6.4.9 |
| 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[]). | Section 6.5.2 |

POINT

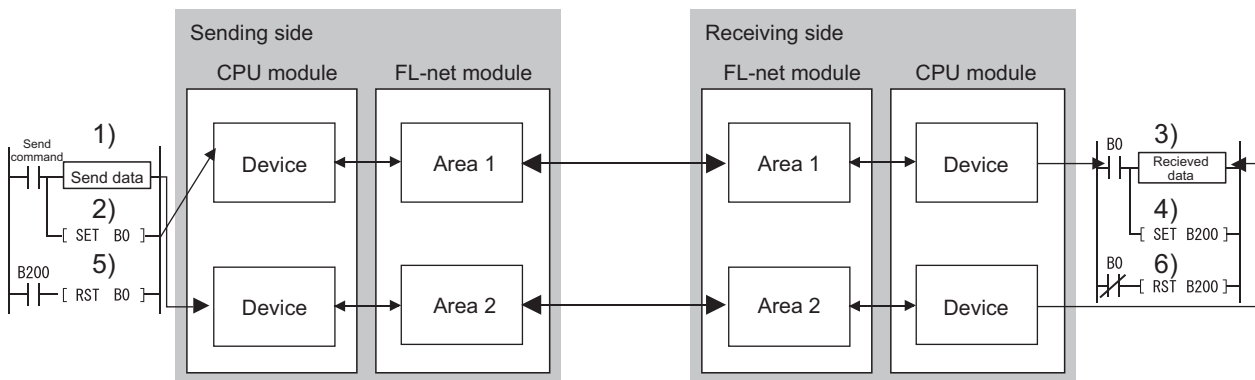
Write the data to be transferred to other station from host station into the "write area" which is the sending range of the local node. Do not write any data into the "read area" which is receiving range from other node. When data is unintentionally written, the system may incur a risk of malfunction after the writing. Read area can be confirmed in other node network parameter area in buffer memory (address: 0080~0087FH). (Refer to Section 3.2.5(3)(b)).

(7) Guaranteed data consistency

(a) 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.

- 1) 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.
 1. The first address of area 1 (bit area) is multiples of 2.
 2. The size of area 1 (bit area) is multiples of 2.
 3. The first address of area 2 (word area) is multiples of 2.
 4. The size of area 2 (word area) is multiples of 2.
- 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.



(Sending side)

1. 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).

(Receiving side)

3. 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).

(Sending side)

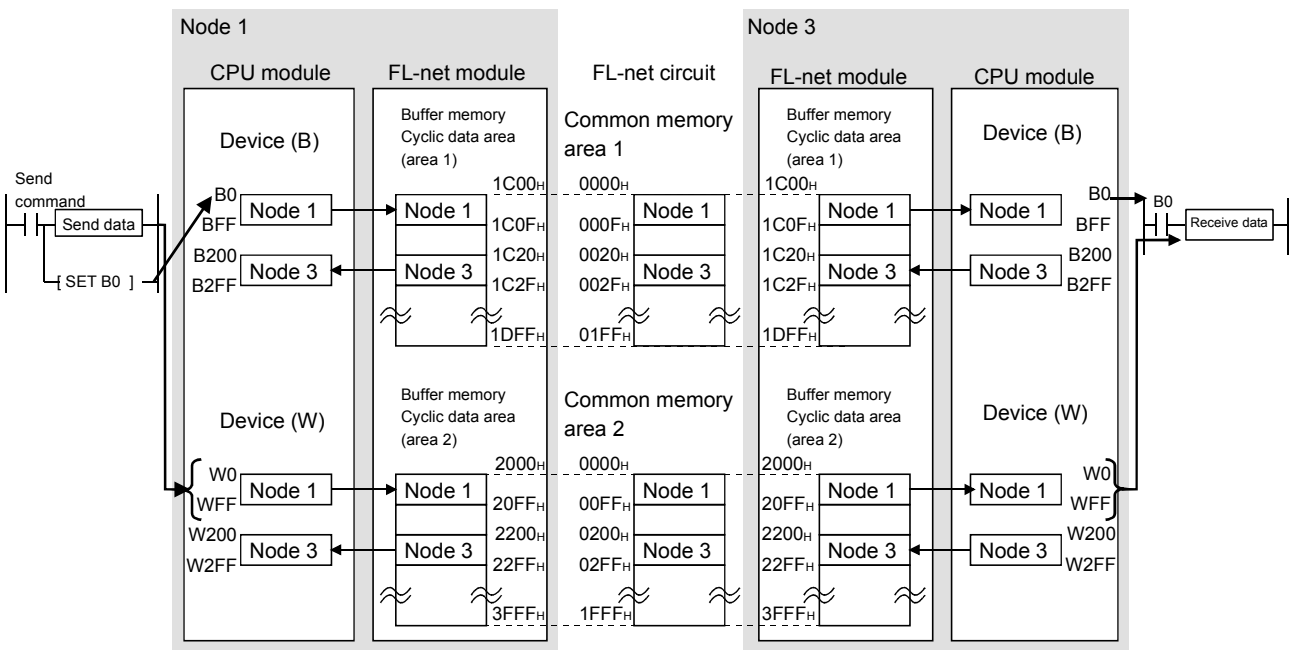
5. After checking that the reading of received data is completed at receiving side, turn off the bit of area 1 (bit area).

(Receiving side)

6. 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.

(b) Handshake program example

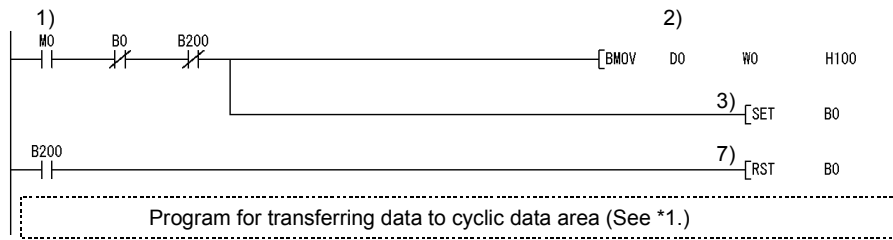
The example below shows how to guarantee data consistency in area 2 (word area) for each node when data larger than double word (32-bit) is written/read.



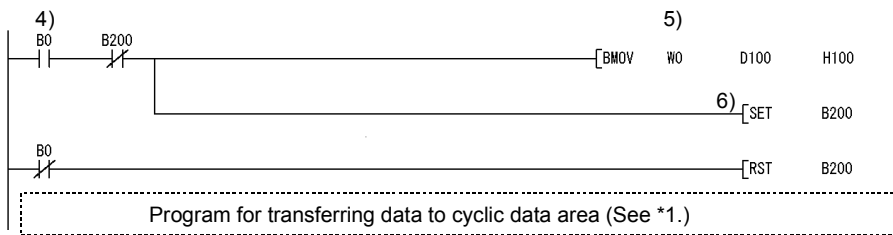
The following is an example program in which W0 to WFF data of node 1 are sent to W0 to WFF of node 3, as shown above.

Upon completion of transmit data storage, B0 is set to ON, resulting in a handshake.

Sending station (Node 1)



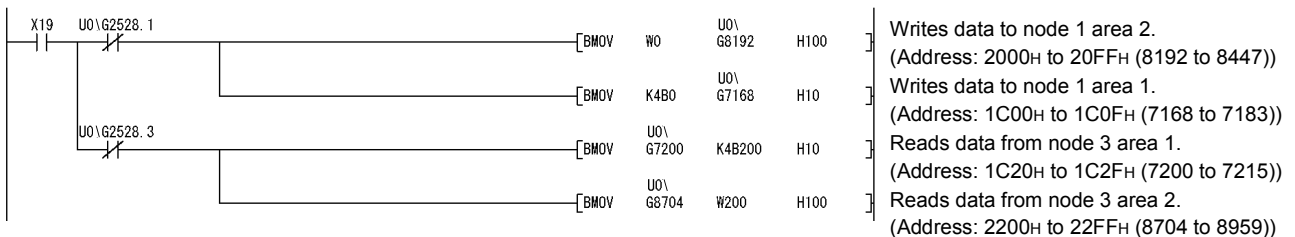
Receiving station (Node 3)



- 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 station 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.

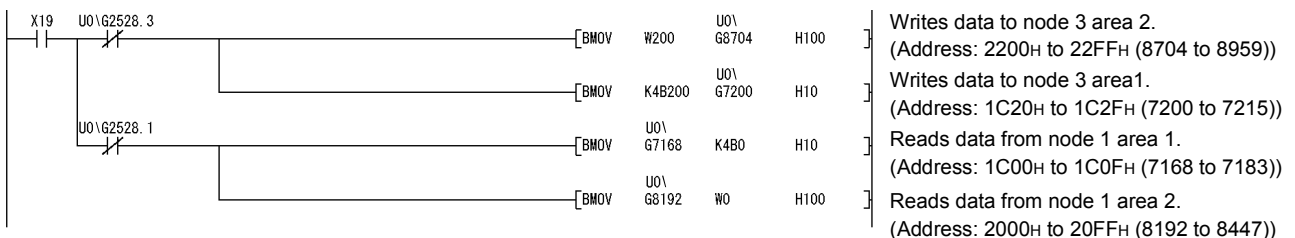
*1 If the auto refresh is not set up (Refer to Section 6.4.9.), transfer CPU module data to the cyclic data area of the FL-net module, using the following sequence program.

Sending station (Node 1)



Writes data to node 1 area 2.
(Address: 2000H to 20FFH (8192 to 8447))
Writes data to node 1 area 1.
(Address: 1C00H to 1C0FH (7168 to 7183))
Reads data from node 3 area 1.
(Address: 1C20H to 1C2FH (7200 to 7215))
Reads data from node 3 area 2.
(Address: 2200H to 22FFH (8704 to 8959))

Receiving station (Node 3)



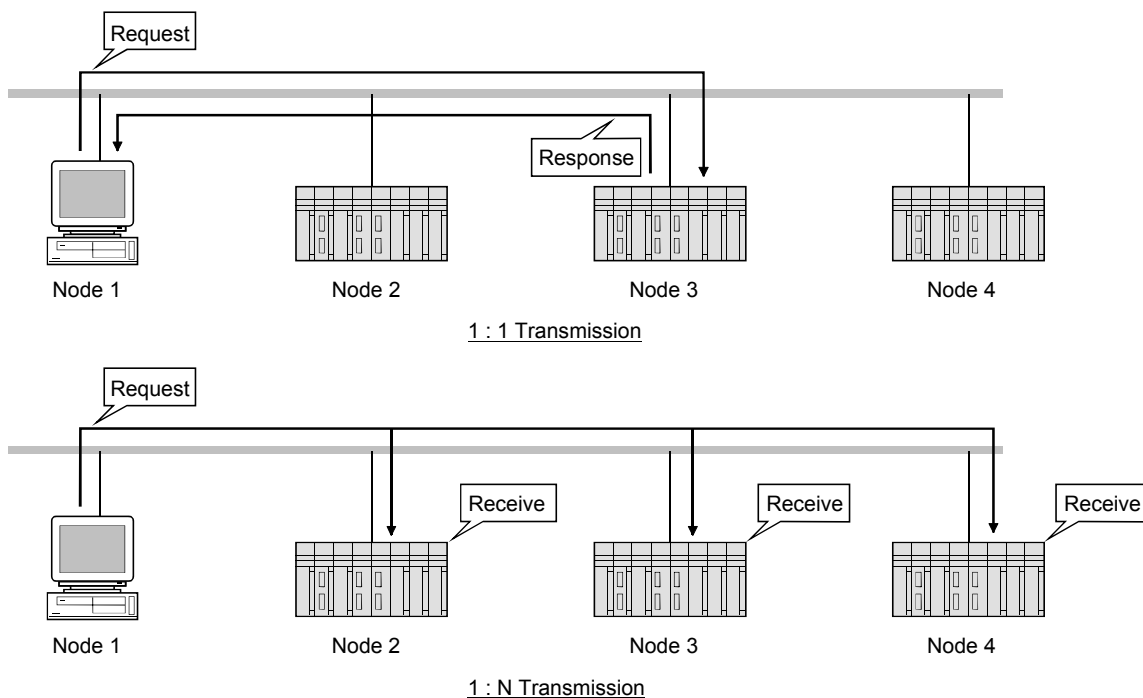
Writes data to node 3 area 2.
(Address: 2200H to 22FFH (8704 to 8959))
Writes data to node 3 area1.
(Address: 1C20H to 1C2FH (7200 to 7215))
Reads data from node 1 area 1.
(Address: 1C00H to 1C0FH (7168 to 7183))
Reads data from node 1 area 2.
(Address: 2000H to 20FFH (8192 to 8447))

6.2.8 Message transmission

(1) Summary of message transmission

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

- (a) When a node receives a token, it sends up to one (message) frame before transmitting cyclic frames.
- (b) Data volume that can be transmitted in a frame is equal to or less than 1024 bytes. (excluding the header).
- (c) Algorithm is provided so as not to exceed permissible refresh cycle time for cyclic transmission.
- (d) Both 1 : 1 transmission to a specific destination node and 1 : n broadcast transmission to all nodes are provided.
- (e) Delivery acknowledgement function is provided to confirm successful delivery of data to the destination node on the 1 : 1 message transmission.
- (f) 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).



(2) Support message list

| No. | Message | 1 : 1 | 1 : n | Server function (* ¹) | Client function (* ²) | Reference |
|-----|----------------------------------|-------|-------|-----------------------------------|-----------------------------------|------------------|
| 1 | Byte block read | ○ | × | × | ○* ³ | Section 6.5.3(6) |
| 2 | Byte block write | ○ | × | × | ○* ³ | |
| 3 | Word block read | ○ | × | ○ | ○* ³ | |
| 4 | Word block write | ○ | × | ○ | ○* ³ | |
| 5 | Network parameter read | ○ | × | ○ | ○ | Section 6.5.3(1) |
| 6 | Network parameter write | ○ | × | × | ○* ³ | Section 6.5.3(6) |
| 7 | Operate/stop command | ○ | × | × | ○* ³ | |
| 8 | Device profile read | ○ | × | ○ | ○ | Section 6.5.3(2) |
| 9 | Log information read | ○ | × | ○ | ○ | Section 6.5.3(3) |
| 10 | Log information clear | ○ | ○ | ○ | ○ | Section 6.5.3(4) |
| 11 | Message return | ○ | × | ○ | ○* ³ | Section 6.5.3(6) |
| 12 | Transparent message transmission | ○ | ○ | ○ | ○ | Section 6.5.3(5) |

○: Enable ×: Disable

*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. Refer to Section 6.5.3 (5)(6) for the sending method for transparent type message transmission. Also, refer to the external device manual for transaction code.

(3) 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 * ¹ | 0000H to EA5FH | Transparent type message transmission (User-defined) * ¹ |
| 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 | FDEC _H | Byte block data write (request) |
| 65005 | FDED _H | Word block data read (request) |
| 65006 | FDEE _H | Word block data write (request) |
| 65007 | FDEF _H | Network parameter read (request) |
| 65008 | FDF0 _H | Network parameter write (request) |
| 65009 | FDF1 _H | Stop command (request) |
| 65010 | FDF2 _H | Operate command (request) |
| 65011 | FDF3 _H | Read profile (request) |
| 65012 | FDF4 _H | Trigger header |
| 65013 | FDF5 _H | Log read (request) |
| 65014 | FDF6 _H | Log clear (request) |
| 65015 | FDF7 _H | For message return test (request) |
| 65016 to 65202 | FDF8 _H to FEB2 _H | Reserved |
| 65203 | FEB3 _H | Byte block data read (response) |
| 65204 | FEB4 _H | Byte block data write (response) |
| 65205 | FEB5 _H | Word block data read (response) |
| 65206 | FEB6 _H | Word block data write (response) |
| 65207 | FEB7 _H | Network parameter read (response) |
| 65208 | FEB8 _H | Network parameter write (response) |
| 65209 | FEB9 _H | Stop command (response) |
| 65210 | FEBA _H | Operate command (response) |
| 65211 | FEBB _H | Read profile (response) |
| 65212 | FEBC _H | Reserved |
| 65213 | FEBD _H | Log read (response) |
| 65214 | FEBE _H | Log clear (response) |
| 65215 | FEBF _H | For message return test (response) |
| 65216 to 65399 | FEC0 _H to FF77 _H | Reserved |
| 65400 to 65535 | FF78 _H to FFFF _H | Reserved |

*1: For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2, the codes are as follows:

| Transaction code | | Application |
|------------------|----------------|--|
| Decimal | Hexadecimal | |
| 0 to 59599 | 0000H to E8CFH | Transparent type message transmission (User-defined) |
| 59600 to 59999 | E8D0H to EA5FH | Reserved |

| |
|--|
| POINT |
| A response transaction code is a "request transaction code + 200". |

(4) Virtual address space and physical address

When a virtual address space is specified by word block read/write for a Q series FL-net module, an access can be made to the CPU module and MELSECNET/H remote I/O station devices on the target node.

Accessible CPU module and MELSECNET/H remote I/O station devices and their device number ranges are shown below.

(a) Comparison between the virtual addresses and physical address

1) CPU module

| Category | Device name | Device type | | Address classification | | Device number range (Default) | | Expression | | Remark | | |
|-----------------|-----------------------------|-----------------------|------|------------------------|---------|--|-----------------------------------|------------------|--------------|---|---|--|
| | | Bit | Word | Physical | Virtual | High Performance model QCPU/Process CPU/Redundant CPU/Universal model QCPU | Basic model QCPU | Decimal | Hexa-decimal | | | |
| Internal system | Special relay | ○ | | SM | 91 | 000000 to 002047 | 000000 to 001023 | ○ | | — | | |
| | Special register | | ○ | SD | A9 | 000000 to 002047 | 000000 to 001023 | ○ | | — | | |
| Internal user | Input relay | ○ | | X | 9C | 000000 to 001FFF | 000000 to 0007FF | | ○ | If a device number range is changed, up to the maximum device number after the change is accessible. Local devices cannot be accessed. | | |
| | Output relay | ○ | | Y | 9D | 000000 to 001FFF | 000000 to 0007FF | | ○ | | | |
| | Internal relay | ○ | | M | 90 | 000000 to 008191 | 000000 to 008191 | ○ | | | | |
| | Latch relay | ○ | | L | 92 | 000000 to 008191 | 000000 to 002047 | ○ | | | | |
| | Annunciator | ○ | | F | 93 | 000000 to 002047 | 000000 to 001023 | ○ | | | | |
| | Edge relay | ○ | | V | 94 | 000000 to 002047 | 000000 to 001023 | ○ | | | | |
| | Link relay | ○ | | B | A0 | 000000 to 001FFF | 000000 to 0007FF | | ○ | | | |
| | Data register | | ○ | D | A8 | 000000 to 012287 | 000000 to 011135 | ○ | | | | |
| | Link register | | ○ | W | B4 | 000000 to 001FFF | 000000 to 0007FF | | ○ | | | |
| | Timer | Contact point | ○ | | TS | C1 | 000000 to 002047 | 000000 to 000511 | ○ | | | |
| | | Coil | ○ | | TC | C0 | | | | | | |
| | | Current value | | ○ | TN | C2 | | | | | | |
| | Accumulated timer | Contact point | ○ | | SS | C7 | 000000 to 002047 | 000000 to 000511 | ○ | | | |
| | | Coil | ○ | | SC | C6 | | | | | | |
| | | Current value | | ○ | SN | C8 | | | | | | |
| | Counter | Contact point | ○ | | CS | C4 | 000000 to 001023 | 000000 to 000511 | ○ | | | |
| | | Coil | ○ | | CC | C3 | | | | | | |
| | | Current value | | ○ | CN | C5 | | | | | | |
| | | Link special relay | ○ | | SB | A1 | 000000 to 0007FF | 000000 to 0003FF | | | ○ | |
| | | Link special register | | ○ | SW | B5 | 000000 to 0007FF | 000000 to 0003FF | | | ○ | |
| | Step relay | ○ | | S | 98 | 000000 to 008191 | 000000 to 002047 (Not accessible) | ○ | | Basic model QCPU cannot be accessed. | | |
| | Direct input | ○ | | DX | A2 | 000000 to 001FFF | 000000 to 0007FF | | ○ | Input relay, output relay are the same. (For direct access) | | |
| | Direct output | ○ | | DY | A3 | 000000 to 001FFF | 000000 to 0007FF | | ○ | | | |
| | Index register | | ○ | Z | CC | 000000 to 000015 | 000000 to 000009 | ○ | | For the Universal model QCPU, Z16 and greater addresses cannot be specified. | | |
| — | Normal file register | | ○ | R | AF | 000000 to 032767 | 000000 to 032767 | ○ | | — | | |
| | Serial number file register | | ○ | ZR | B0 | 000000 to 0FE7FF | 000000 to 007FFF | | ○ | For the Universal model QCPU, ZR0FE800 and greater addresses cannot be specified. | | |

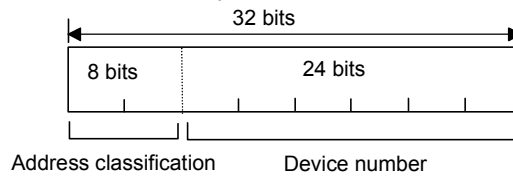
REMARK

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.

2) MELSECNET/H remote I/O station

| Device name | Device type | | Address classification | | Device number range QJ72LP25-25, QJ72LP25G, QJ72LP25GE, QJ72BR15 | Expression | | Remark |
|-----------------------|-----------------------|-----------------------|------------------------|---------|--|-----------------------|-----------------------|------------------------------|
| | Bit | Word | Physical | Virtual | | Decimal | Hexa-decimal | |
| Special relay | <input type="radio"/> | | SM | 91 | 000000 to 002047 | <input type="radio"/> | | — |
| Special register | | <input type="radio"/> | SD | A9 | 000000 to 002047 | <input type="radio"/> | | |
| Input relay | <input type="radio"/> | | X | 9C | 000000 to 001FFF | | <input type="radio"/> | Cannot change the allocation |
| Output relay | <input type="radio"/> | | Y | 9D | 000000 to 001FFF | | <input type="radio"/> | |
| Internal relay | <input type="radio"/> | | M | 90 | 000000 to 008191 | <input type="radio"/> | | |
| Link relay | <input type="radio"/> | | B | A0 | 000000 to 003FFF | | <input type="radio"/> | |
| Data register | | <input type="radio"/> | D | A8 | 000000 to 012287 | <input type="radio"/> | | |
| Link register | | <input type="radio"/> | W | B4 | 000000 to 003FFF | | <input type="radio"/> | |
| Link special relay | <input type="radio"/> | | SB | A1 | 000000 to 0001FF | | <input type="radio"/> | |
| Link special register | | <input type="radio"/> | SW | B5 | 000000 to 0001FF | | <input type="radio"/> | |

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



(b) Virtual address specification (Word block)

1) Device classification: bit

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

2) Device classification : word

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

(5) Support message details (Server function)

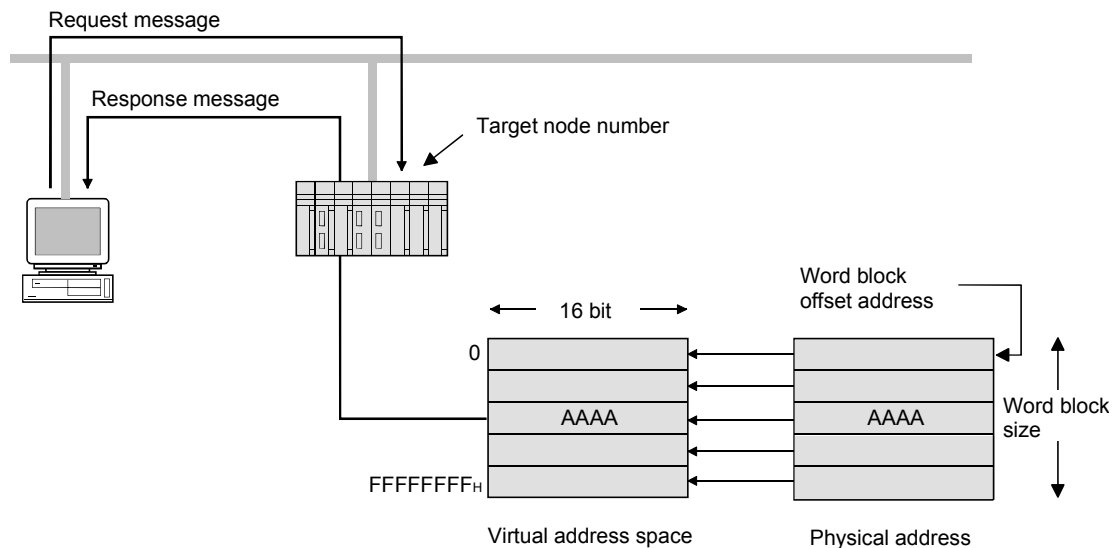
The server function of the support messages is explained in this section.

(a) 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 spaces of the Q series FL-net module are assigned to respective devices (physical addresses) of the CPU module and MELSECNET/H remote I/O station. (Refer to (4).)

| Item | Request | Response |
|------------------|--|-----------------------------|
| Transaction code | 65005 | 65205 |
| Parameter | <ul style="list-style-type: none"> • Target node number • Virtual address space data size • Virtual address space first address | — |
| User data | — | Read data (1024 byte space) |

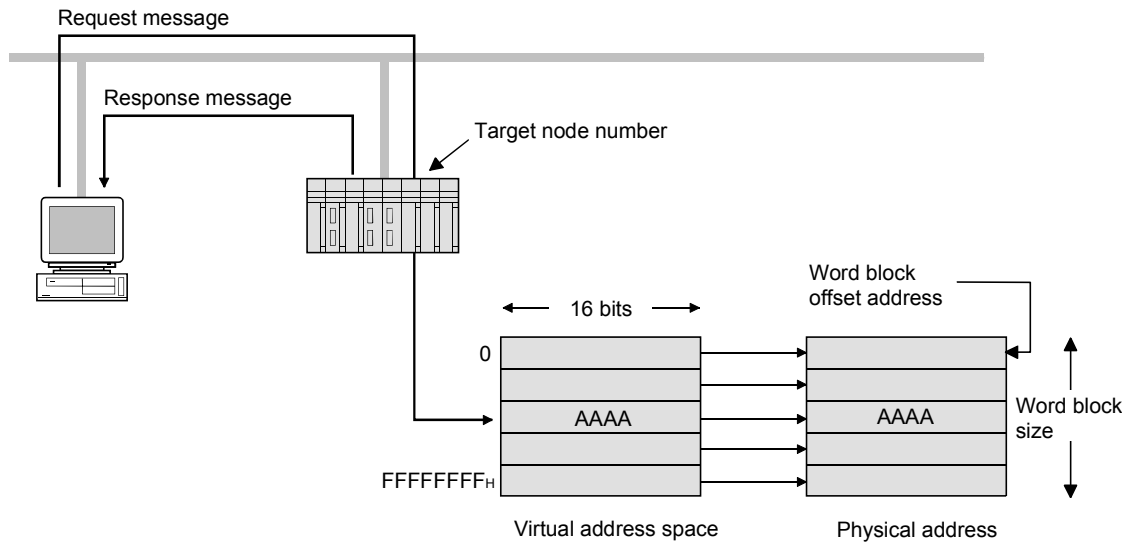


(b) Word block write

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 spaces of the Q series FL-net module are assigned to respective devices (physical addresses) of the CPU module and MELSECNET/H remote I/O station. (Refer to (4).)

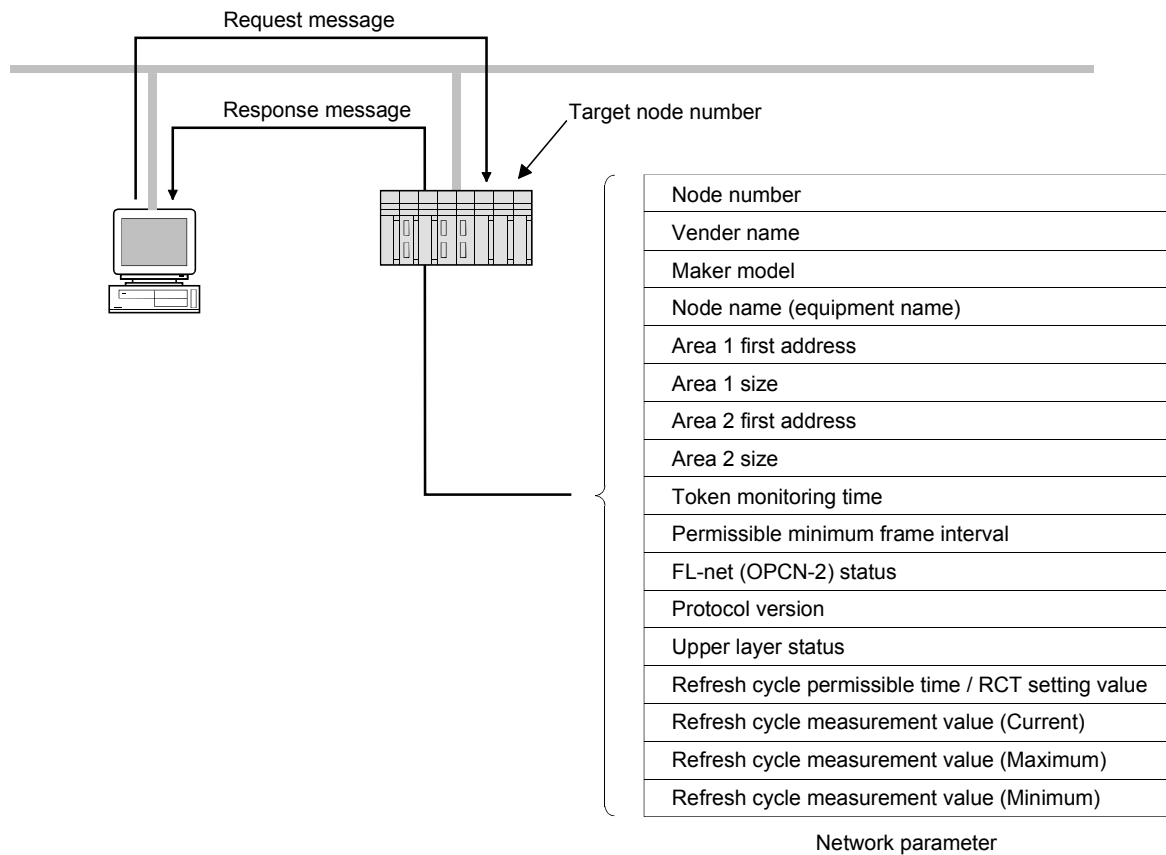
| Item | Request | Response |
|------------------|--|----------|
| Transaction code | 65006 | 65206 |
| Parameter | <ul style="list-style-type: none"> • Target node number • Virtual address space data size • Virtual address space first address | — |
| User data | Write data (1024 byte space) | — |



(c) 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 | — | <ul style="list-style-type: none"> • 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 |



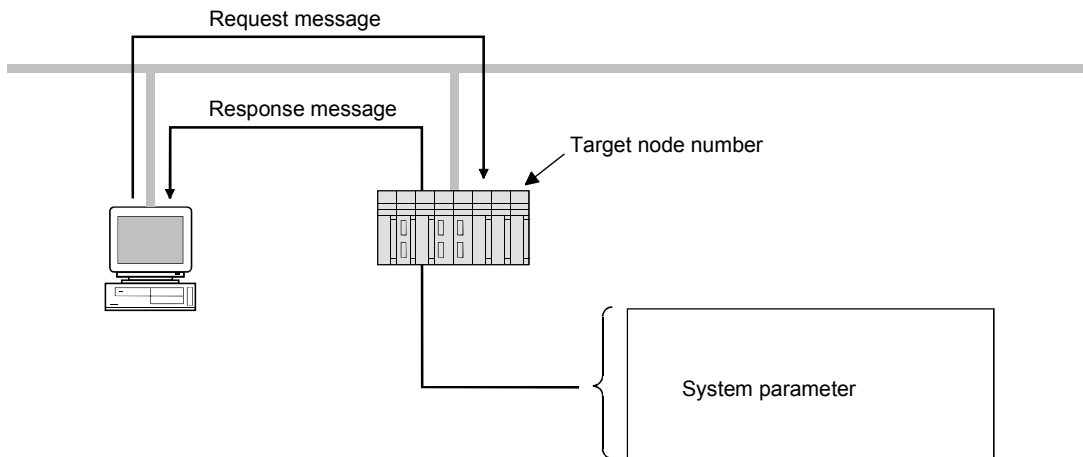
(d) Device protocol read

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>

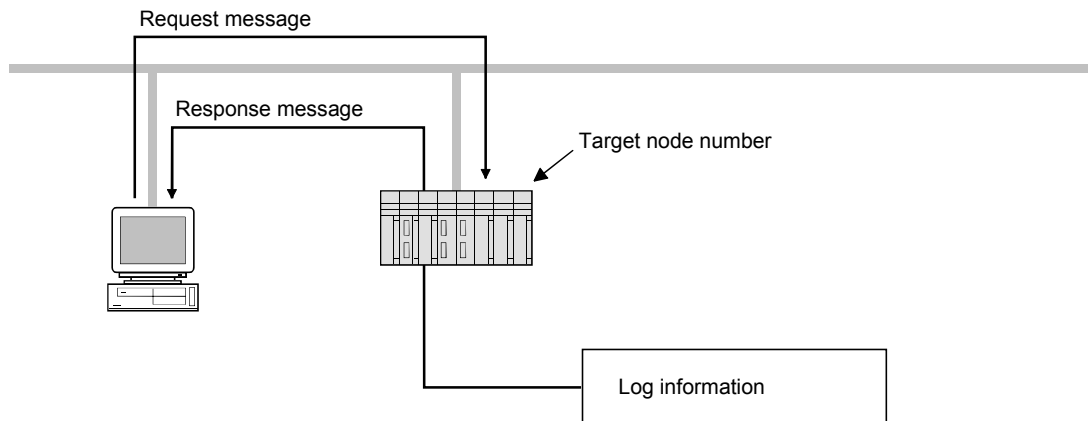
| | |
|------------------|--|
| System parameter | <ul style="list-style-type: none"> • Common specifications version • Identifier character string • Revision number • Revision data • Device classification • Vendor name • Product number |
|------------------|--|



(e) Log information read

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

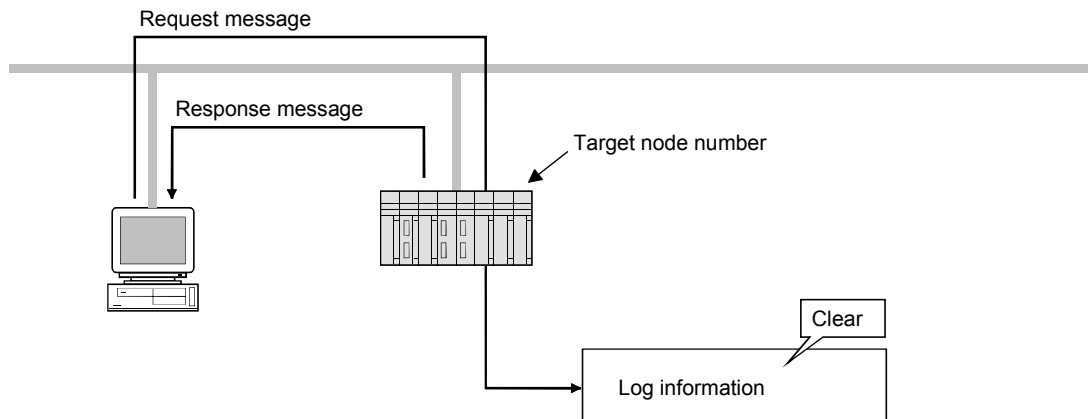
| Item | Request | Response |
|------------------|----------------------|---|
| Transaction code | 65013 | 65213 |
| Parameter | • Target node number | — |
| User data | — | <ul style="list-style-type: none"> • Send and Receive log • Frame log • Cyclic transmission error log • Message transmission error log • ACK error log • Token error log • Status data • Join node list |



(f) 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 | — | — |

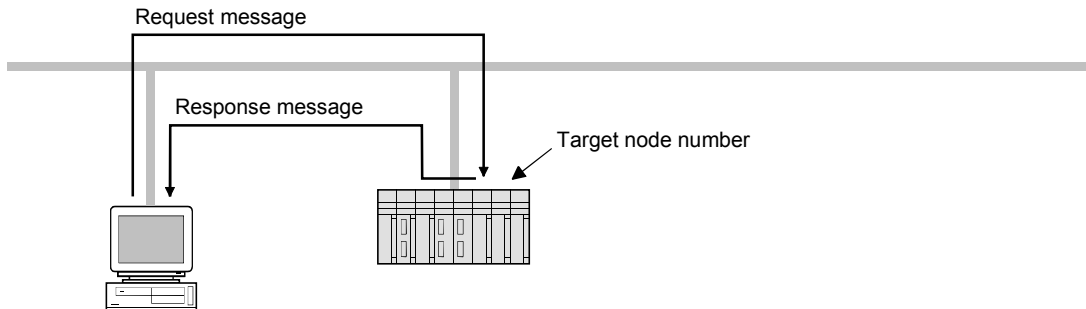


(g) Message return

This function returns the received message.

The returning is performed automatically within the FL-net module.

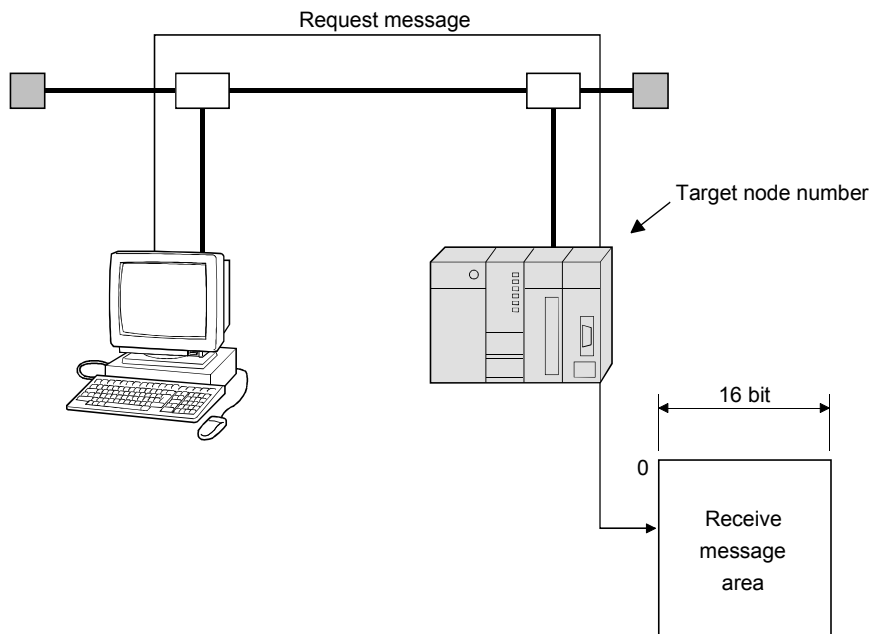
| Item | Request | Response |
|------------------|------------------------|------------------------|
| Transaction code | 65015 | 65215 |
| Parameter | • Target node number | — |
| User data | Test data (1024 bytes) | Test data (1024 bytes) |



(h) 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 | <ul style="list-style-type: none"> • For the QJ71FL71-T-F01, QJ71FL71-B5-F01, and QJ71FL71-B2-F01, 0 to 59999 65000 to 65535 *¹ • For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2, 0 to 59999 65000 to 65535 *¹ (Function version A: 0 to 9999) | — |
| Parameter | <ul style="list-style-type: none"> • Target node number • Data size (word/byte unit) *²*³ • Response message classification • Virtual address space <ul style="list-style-type: none"> • Address • Size (word/byte unit) *⁴ | — |
| User data | Data (1024 byte space) | — |

*1 : Refer to Section 6.2.8 (3) "Transaction codes" for information on codes used by the system.

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

*3 : If the object destination is using Version A, use word units. (Version A is not compatible with byte units.)

*4 : Size depends on transaction code.

| |
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| POINT |
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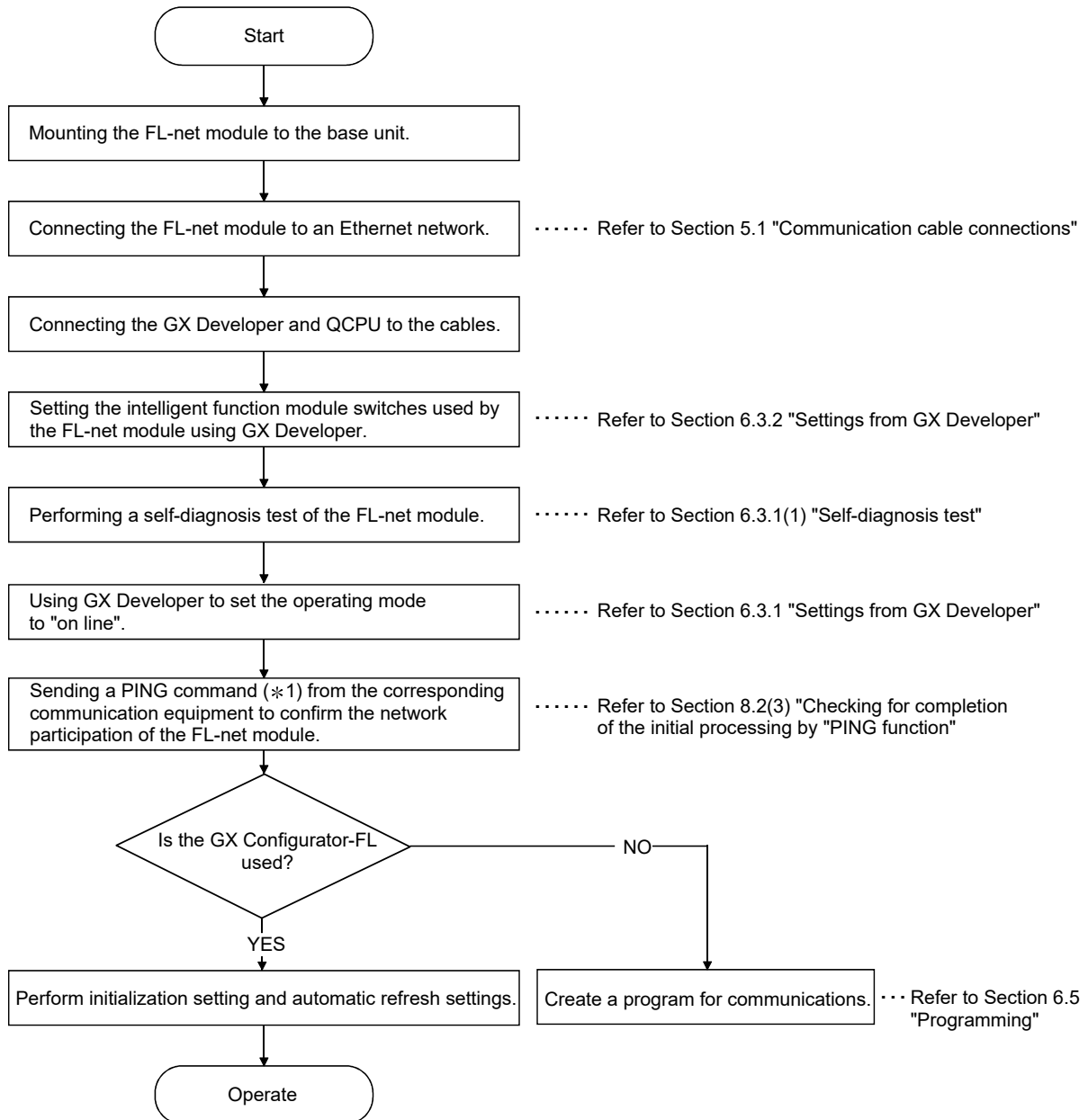
| |
|---|
| <p>Since there is no discrimination of transaction codes for the request frame and response frame, user must define them.</p> |
|---|

6.3 Setting the FL-net Module

This section explains the procedures and setting methods up to the operation of the FL-net module.

6.3.1 Procedures up to operation

The following is a summary of the procedures up to operation.



*1 : Note that the PING command cannot be sent from the FL-net module.

(1) 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.

(a) Self-loopback test

This section explains the self-loopback test for checking the hardware including the send/receive circuits of 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 station address transmission is sent to the line and received via the network.

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.

| Step | Operation | LED Status | | |
|------|--|-------------|-------|-------|
| | | [RUN] | [LNK] | [PER] |
| 1 | Connect the FL-net module to the line. (Refer to Section 5.1) | — | — | — |
| 2 | Stop the CPU module. | — | — | — |
| 3 | Use GX Developer to change the FL-net module operating mode to "2. Loopback test" and write the parameters to the CPU module. (Refer to Section 6.3.2) | — | — | — |
| 4 | Reset the CPU module. | ● | ● | ○ |
| 5 | After five (5) seconds, check the status of the LEDs. | When normal | ● | ○ |
| | | When error | ● | ○ |
| 6 | Use GX Developer to change the FL-net module operating mode to "Online" or other test mode. (Refer to Section 6.3.2) | — | — | — |
| 7 | Reset the CPU module. | — | — | — |

● : On ○ : Off

The following are possible causes of errors.

- FL-net module hardware error.
- FL-net (OPCN-2) line error
- External power supply 12 V DC error (10BASE5 only)

| |
|---|
| POINT |
| There is no hardware-type blockage by the corresponding equipment on line, even when the self-loopback test is performed. When the packets are crowding the line, packet collision may cause the test to take more than five seconds to complete. It such cases, perform this test after stopping the data communication among other equipment. |

(b) Hardware test

This section introduces the RAM and ROM tests for the FL-net module.

The following are the steps for performing the hardware tests.

The test results are evaluated by using the LED in the front of the FL-net module.

| Step | Operation | LED Status | | |
|------|--|-------------|-------|-------|
| | | [RUN] | [LNK] | [PER] |
| 1 | Stop the CPU module. | — | — | — |
| 2 | Use GX Developer to change the FL-net module operating mode to "3. Hardware test" and write the parameters to the CPU module. (Refer to Section 6.3.2) | — | — | — |
| 3 | Reset the CPU module. | ● | ● | ○ |
| 4 | After five (5) seconds, check the status of the LEDs | When normal | ● | ○ |
| | | When error | ● | ○ |
| 5 | Use GX Developer to change the FL-net module operating mode to "Online" or other test mode. (Refer to Section 6.3.2) | — | — | — |
| 6 | Reset the CPU module. | — | — | — |

● : On ○ : Off

The following are possible causes of errors.

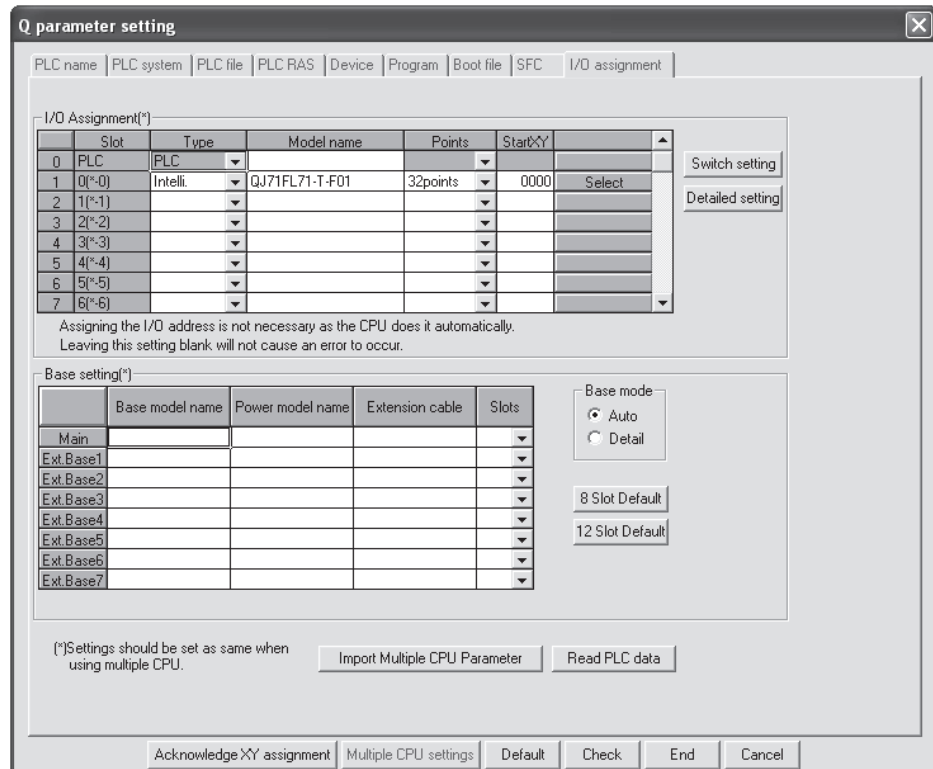
- FL-net module RAM/ROM error.

| |
|--|
| POINT |
| <p>If the results of the hardware test show an error, perform the test again.</p> <p>If a repeat of the test shows that there may be an error with the hardware of the FL-net module, make detailed notes of the problem and then contact your nearest representative.</p> |

6.3.2 Setting the GX Developer

This section explains the settings on GX Developer to operate FL-net module. Refer to the operating manual for the GX Developer for details about the screen displays. For multiple CPU systems, refer to QCPU User's Manual (Multiple CPU System).

(1) I/O assignment



| Item | Contents |
|------------|---|
| Type | Select "Intelli." |
| Model name | Input the model name of the module. |
| Points | Select "32 points" |
| StartXY | Input the start input/output number of the FL-net module. |

(2) Intelligent function module switch setting

Switch setting for I/O and intelligent function module

Input format: DEC.

| | Slot | Type | Model name | Switch 1 | Switch 2 | Switch 3 | Switch 4 | Switch 5 |
|----|----------|----------|----------------|----------|----------|----------|----------|----------|
| 0 | PLC | PLC No.1 | | | | | | |
| 1 | PLC | PLC No.2 | | | | | | |
| 2 | 1(*-1) | Intelli. | QJ71FL71-T-F01 | 192 | 168 | 250 | 1 | 0 |
| 3 | 2(*-2) | Intelli. | QJ71FL71-T-F01 | 192 | 168 | 250 | 2 | 0 |
| 4 | 3(*-3) | | | | | | | |
| 5 | 4(*-4) | | | | | | | |
| 6 | 5(*-5) | | | | | | | |
| 7 | 6(*-6) | | | | | | | |
| 8 | 7(*-7) | | | | | | | |
| 9 | 8(*-8) | | | | | | | |
| 10 | 9(*-9) | | | | | | | |
| 11 | 10(*-10) | | | | | | | |
| 12 | 11(*-11) | | | | | | | |
| 13 | 12(*-12) | | | | | | | |
| 14 | 13(*-13) | | | | | | | |
| 15 | 14(*-14) | | | | | | | |

End Cancel

(a) Switch 1 to switch 4

Sets the IP address of the FL-net module.

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.

1) Switch 1

Set the first digit of the IP address.

If set to "No setting (Blank)", the default setting is used.

- Default value : 192

POINT

FL-net (OPCN-2) uses Class C IP address.

Setting values can be set within a range from 192 to 223.

2) Switch 2

Set the second digit of the IP address.

If set to "No setting (Blank)", the default setting is used.

- Default value : 168
- Setting range : 0 to 255

3) Switch 3

Set the third digit of the IP address.

If set to "No setting (Blank)", the default setting is used.

- Default value : 250
- Setting range : 0 to 255

4) Switch 4

Set the fourth digit of the IP address. (This is the node number.)

If set to "No setting (Blank)", the default setting is used.

- Default value : 1
- Setting range : 1 to 254

(b) Switch 5

Enter the operating mode of the FL-net module.

| Setting value | Items | Description |
|---------------|------------------------------|---|
| 0 | Online (10Mbps, half duplex) | Communicates with other nodes. (Default) |
| 1 | Offline | Disconnects its own node from the network. |
| 2 | Loopback test | Performs a self-diagnostics test. |
| 3 | Hardware test | Tests the RAM and ROM. |
| 4 | Online (Auto negotiation) | Communicates with other nodes. (Mode to be selected when using 100Mbps, the QJ71FL71-T-F01 only) |

(c) Input format

Select the input format for the settings.

- Decimal
- Hexadecimal (default)

REMARK

When connecting to the network, set the operation mode of the FL-net module to "Online" on the Intelligent function module switch setting screen. After writing the settings to programmable controllers and when the CPU is reset, the preparations for the FL-net module is complete.

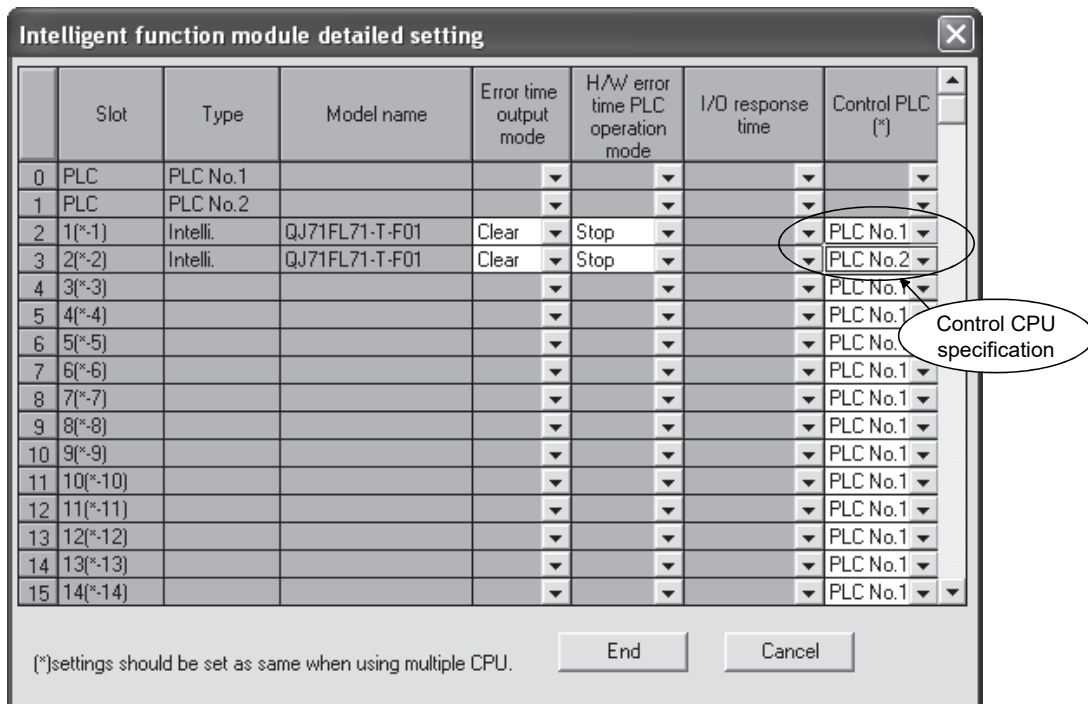
Confirmation that preparations have been completed can be performed by using the module ready (X1C).

ON : Preparations completed

OFF : Intelligent function module switch setting error

If the module ready (X1C) was left off, reset the intelligent function module switches again.

(3) Detailed settings (I/O module, intelligent function module detailed setting screen)



| | Slot | Type | Model name | Error time output mode | H/W error time PLC operation mode | I/O response time | Control PLC (*) |
|----|----------|----------|----------------|------------------------|-----------------------------------|-------------------|-----------------|
| 0 | PLC | PLC No.1 | | ▼ | ▼ | ▼ | ▼ |
| 1 | PLC | PLC No.2 | | ▼ | ▼ | ▼ | ▼ |
| 2 | 1(*-1) | Intelli. | QJ71FL71-T-F01 | Clear | Stop | ▼ | PLC No.1 |
| 3 | 2(*-2) | Intelli. | QJ71FL71-T-F01 | Clear | Stop | ▼ | PLC No.2 |
| 4 | 3(*-3) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 5 | 4(*-4) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 6 | 5(*-5) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 7 | 6(*-6) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 8 | 7(*-7) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 9 | 8(*-8) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 10 | 9(*-9) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 11 | 10(*-10) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 12 | 11(*-11) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 13 | 12(*-12) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 14 | 13(*-13) | | | ▼ | ▼ | ▼ | PLC No.1 |
| 15 | 14(*-14) | | | ▼ | ▼ | ▼ | PLC No.1 |

(*)settings should be set as same when using multiple CPU.

End Cancel

- (a) Error time output mode
Select the output mode during errors.
• Default: "Clear"
- (b) H/W error time PLC operation mode
Select the CPU operating mode during hardware error.
• Default: "Stop"
- (c) Control PLC
Set the control CPU for FL-net module with multiple CPU system.
• Default: "PLC No. 1"

REMARK

For multiple CPU systems, refer to QCPU User's Manual (Multiple CPU System).

6.4 GX Configurator-FL

6.4.1 Functions of GX Configurator-FL

Table 6.1 lists the functions of GX Configurator-FL.

Table 6.1 GX Configurator-FL function list

| Function | Description | Reference section |
|--------------------|---|-------------------|
| Initial settings*1 | (1) Sets items for the local node network parameter area, which require initial settings. (2) The data that has been initially set is registered in the parameters for the CPU module and when the CPU is set to run status, it is automatically written to the FL-net module. | 6.4.8 |
| Auto refresh | (1) Sets the following areas for automatic refresh: status data bit area for the buffer memory of the FL-net module, status data word area and cyclic data area. (2) 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. | 6.4.9 |
| Monitoring/test | (1) Monitoring - test The buffer memory and I/O signals of the FL-net module are monitored or tested. (2) Status data area Monitors the status data area data. (3) Local/other node network parameter data Monitors local/other node network parameter data. | 6.4.10 |

| |
|--------------|
| POINT |
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| |
|-------------------------------------|
| *1) Precaution for initial settings |
|-------------------------------------|

| |
|--|
| <p>If new initial settings are performed at the GX Configurator-FL side on a system which had its initial settings performed by sequence program previously, the initial settings by the GX Configurator-FL will not be enabled.</p> |
|--|

6.4.2 Installing and uninstalling GX Configurator-FL

For how to install or uninstall the utility package, refer to "Method of installing the MELSOFT Series" included in the utility package.

6.4.3 Handling precautions

The following explains the precautions on using the GX Configurator-FL.

(1) For safety

Since GX Configurator-FL is add-in software for GX Developer, read "Safety Precautions" and the basic operating procedures in the GX Developer Operating Manual.

(2) About installation

GX Configurator-FL is add-in software for GX Developer Version 4 or later. Therefore, GX Configurator-FL must be installed on the personal computer that has already GX Developer Version 4 or later installed.

(3) Screen error of Intelligent function module utility

Insufficient system resource may cause the screen to be displayed inappropriately while using the Intelligent function module utility.

If this occurs, close the Intelligent function module utility, GX Developer (program, comments, etc.), and other applications, and then start GX Developer and Intelligent function module utility again.

(4) To start the Intelligent function module utility

(a) In GX Developer, select "QCPU (Q mode)" for PLC series and specify a project.

If any PLC series other than "QCPU (Q mode)" is selected, or if no project is specified, the Intelligent function module utility will not start.

(b) Multiple Intelligent function module utilities can be started.

However, [Open parameters] and [Save parameters] operations under [Intelligent function module parameter] are allowed for one Intelligent function module utility only. Only the [Monitor/test] operation is allowed for the other utilities.

(5) Switching between two or more Intelligent function module utilities

When two or more Intelligent function module utility screens cannot be displayed side by side, select a screen to be displayed on the top of others using the task bar.



(6) Number of parameters that can be set in GX Configurator-FL

When multiple intelligent function modules are mounted, the number of parameter settings must not exceed the following limit.

| When intelligent function modules are installed to: | Maximum number of parameter settings | |
|---|--------------------------------------|----------------------|
| | Initial setting | Auto refresh setting |
| Q00J/Q00/Q01CPU | 512 | 256 |
| Q02/Q02H/Q06H/Q12H/Q25HCPU | 512 | 256 |
| Q02PH/Q06PH/Q12PH/Q25PHCPU | 512 | 256 |
| Q12PRH/Q25PRHCPU | 512 | 256 |
| Q00UJ/Q00U/Q01UCPU | 512 | 256 |
| Q02UCPU | 2048 | 1024 |
| Q03UD/Q04UDH/Q06UDH/Q10UDH/ Q13UDH/Q20UDH/Q26UDH/Q03UDE/ Q04UDEH/Q06UDEH/Q10UDEH/ Q13UDEH/Q20UDEH/Q26UDEHCPU | 4096 | 2048 |
| CPU modules other than the above | Cannot be used | Cannot be used |
| MELSECNET/H remote I/O station | 512 | 256 |

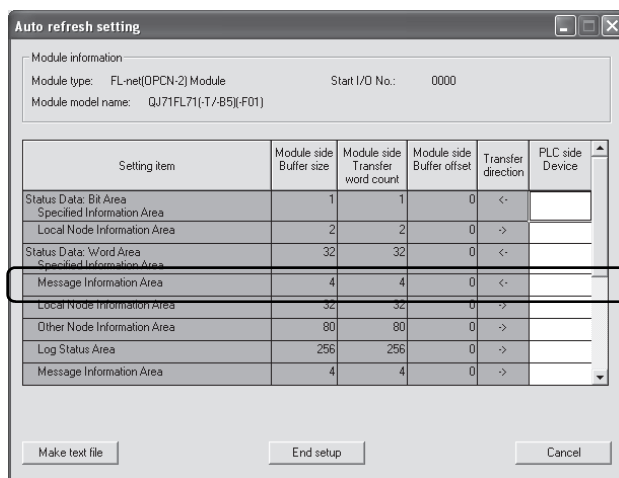
For example, if multiple intelligent function modules are installed to the MELSECNET/H remote I/O station, configure the settings in GX Configurator so that the number of parameter settings for all the intelligent function modules does not exceed the limit of the MELSECNET/H remote I/O station.

Calculate the total number of parameter settings separately for the initial setting and for the auto refresh setting.

The number of parameters that can be set for one module in GX Configurator-FL is as shown below.

| Target Module | Initial setting | Auto refresh setting |
|---------------|-----------------|----------------------|
| FL-net module | 2 (Fixed) | 14 (Max.) |

(Example) Counting the number of parameter settings in the Auto refresh setting



This one row is counted as one setting. Blank rows are not counted. Count up all the setting items on this screen, and add the total to the number of settings for other intelligent function modules to get a grand total.

6.4.4 Operating environment

This section explains the operating environment of the personal computer that runs GX Configurator-FL.

| Item | Description | |
|---------------------------------|--|---------------|
| Installation (Add-in) target *1 | Add-in to GX Developer Version 4 (English version) or later. *2 *4 | |
| Computer | Personal computer compatible with the operating system listed below | |
| CPU | Refer to the following table, "Operating system and performance required for personal computer". | |
| Required memory | | |
| Hard disk space | For installation | 65 MB or more |
| | For operation | 10 MB or more |
| Display | 800 × 600 dots or more resolution *3 | |
| Operating system | Microsoft® Windows® 95 Operating System (English version) Microsoft® Windows® 98 Operating System (English version) Microsoft® Windows® Millennium Edition Operating System (English version) Microsoft® Windows NT® Workstation Operating System Version 4.0 (English version) Microsoft® Windows® 2000 Professional Operating System (English version) Microsoft® Windows® XP Professional Operating System (English version) Microsoft® Windows® XP Home Edition Operating System (English version) Microsoft® Windows Vista® Home Basic Operating System (English version) Microsoft® Windows Vista® Home Premium Operating System (English version) Microsoft® Windows Vista® Business Operating System (English version) Microsoft® Windows Vista® Ultimate Operating System (English version) Microsoft® Windows Vista® Enterprise Operating System (English version) Microsoft® Windows® 7 Starter Operating System (English version) *4 Microsoft® Windows® 7 Home Premium Operating System (English version) *4 Microsoft® Windows® 7 Professional Operating System (English version) *4 Microsoft® Windows® 7 Ultimate Operating System (English version) *4 Microsoft® Windows® 7 Enterprise Operating System (English version) *4 | |

*1: Install GX Configurator-FL in GX Developer Version 4 or higher in the same language.

GX Developer (English version) and GX Configurator-FL (Japanese version) cannot be used in combination, and GX Developer (Japanese version) and GX Configurator-FL (English version) cannot be used in combination.

*2: GX Configurator-FL is not applicable to GX Developer Version 3 or earlier.

*3: Resolution of 1024 X 768 dots or more is recommended for Windows Vista® or Windows® 7.

*4: To use Windows® 7 (32-bit), install GX Configurator-FL Version 1.25AB or later in GX Developer Version 8.91V or later.

To use Windows® 7 (64-bit), install GX Configurator-FL Version 1.25AB or later in GX Developer Version 8.98C or later.

Operating system and performance required for personal computer






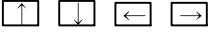
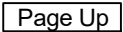
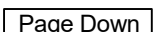

| Operating system | Performance required for personal computer | |
|-----------------------------|--|--|
| | CPU | Memory |
| Windows® 95 | Pentium® 133MHz or more | 32MB or more |
| Windows® 98 | Pentium® 133MHz or more | 32MB or more |
| Windows® Me | Pentium® 150MHz or more | 32MB or more |
| Windows NT® Workstation 4.0 | Pentium® 133MHz or more | 32MB or more |
| Windows® 2000 Professional | Pentium® 133MHz or more | 64MB or more |
| Windows® XP | Pentium® 300MHz or more | 128MB or more |
| Windows Vista® | Pentium® 1GHz or more | 1GB or more |
| Windows® 7 | Pentium® 1GHz or more | 1GB or more (for 32-bit) 2GB or more (for 64-bit) |

| POINT |
|--|
| <ul style="list-style-type: none"> ▪ The following functions cannot be used when the computer is running under Windows XP, Windows Vista, or Windows 7. This product may not perform properly, when these functions are used. <ul style="list-style-type: none"> Activating the application with Windows compatible mode Simplified user switch-over Remote desktop Large font size (Advanced setting of Display Properties) DPI setting other than 100% 64-bit version * 1 Windows XP Mode Windows Touch * 1: Supported by Windows 7. ▪ Use the product as a user having a privilege higher than "USER" for Microsoft® Windows Vista. |

6.4.5 Common GX Configurator-FL operations

(1) Control keys

Special keys that can be used for operation of GX Configurator-FL and their applications are shown in the table below.

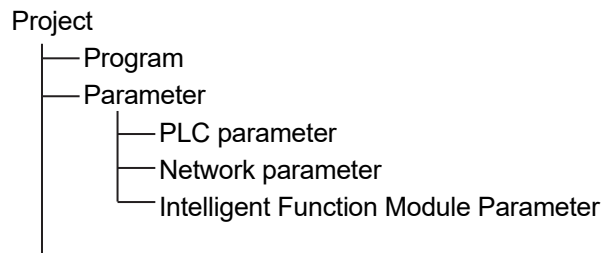
| Key | Application |
|---|---|
|  | Cancels the current entry in a cell. Closes the window. |
|  | Moves between controls in the window. |
|  | Used in combination with the mouse operation to select multiple cells for test execution. |
|  | Deletes the character where the cursor is positioned. When a cell is selected, clears all of the setting contents in the cell. |
|  | Deletes the character where the cursor is positioned. |
|  | Moves the cursor. |
|  | Moves the cursor one page up. |
|  | Moves the cursor one page down. |
|  | Completes the entry in the cell. |

(2) Data created with GX Configurator-FL

The following data or files that are created with GX Configurator-FL can be also handled in GX Developer. Figure 6.1 shows respective data or files are handled in which operation.

<Intelligent function module parameter>

- (a) This represents the data created in Auto refresh setting, and they are stored in an intelligent function module parameter file in a project created by GX Developer.



- (b) Steps 1) to 3) shown in Figure 6.1 are performed as follows:

- 1) From GX Developer, select:
[Project] → [Open project] / [Save] / [Save as]
- 2) On the intelligent function module selection screen of the utility, select:
[Intelligent function module parameter] → [Open parameters] / [Save parameters]
- 3) From GX Developer, select:
[Online] → [Read from PLC] / [Write to PLC] → "Intelligent function module parameters"
Alternatively, from the intelligent function module selection screen of the utility, select:
[Online] → [Read from PLC] / [Write to PLC]

<Text files>

- (a) A text file can be created by clicking the **Make text file** button on the initial setting, Auto refresh setting, or Monitor/Test screen. The text files can be utilized to create user documents.

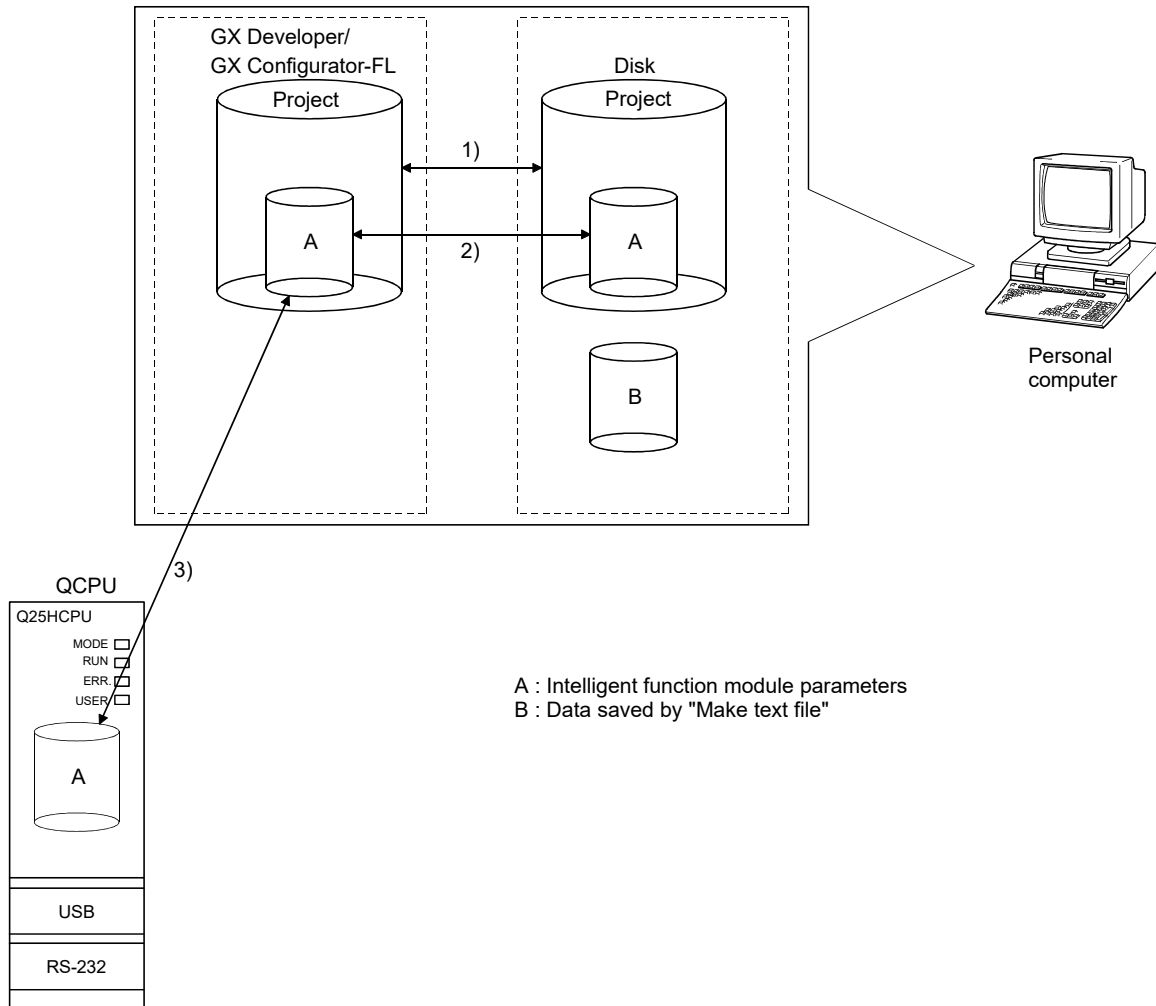
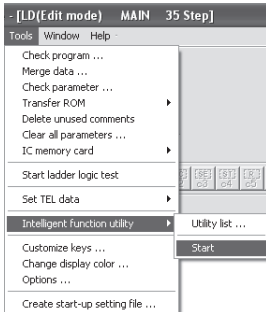


Fig. 6-1 Correlation chart for data created with GX Configurator-FL

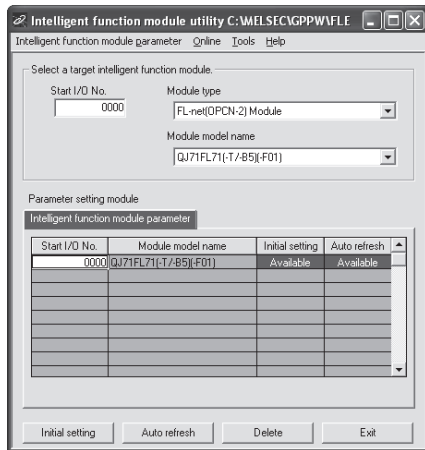
6.4.6 Operation overview

GX Developer screen



[Tool] - [Intelligent function utility] - [Start]

Screen for selecting a target intelligent function module



Refer to Section 6.4.7

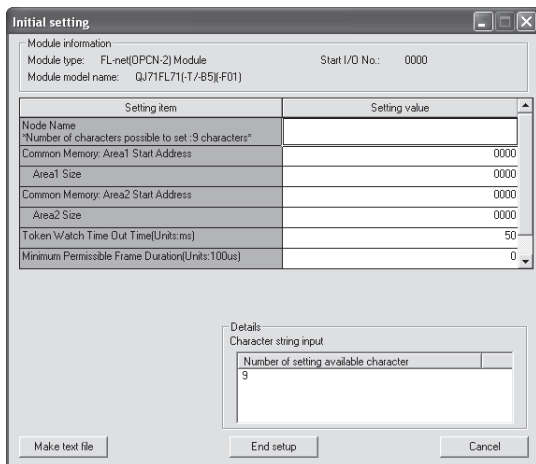
Enter "Start I/O No.", and select "Module type" and "Module model name".

Initial settings

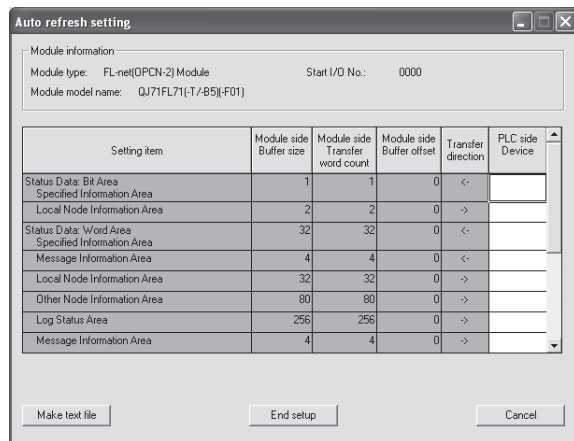
Auto refresh

Initial setting screen

Auto refresh setting screen



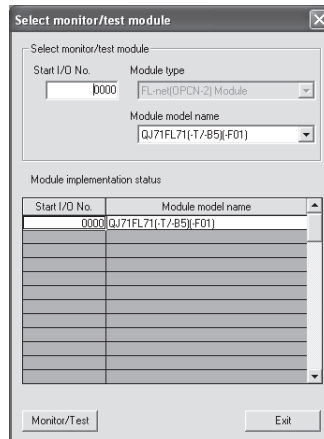
Refer to Section 6.4.8



Refer to Section 6.4.9.

1) [Online] - [Monitor/Test]

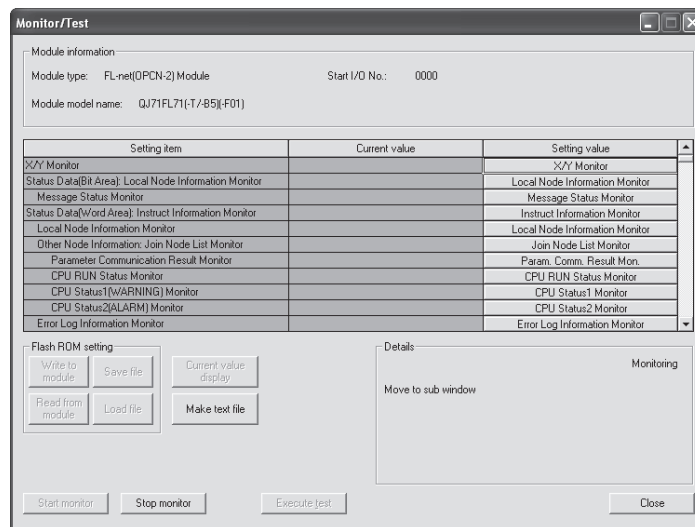
Selecting monitor/test module screen



Select a module to be monitored/tested.

Monitor/Test

Monitor/Test screen



Refer to Section 6.4.10

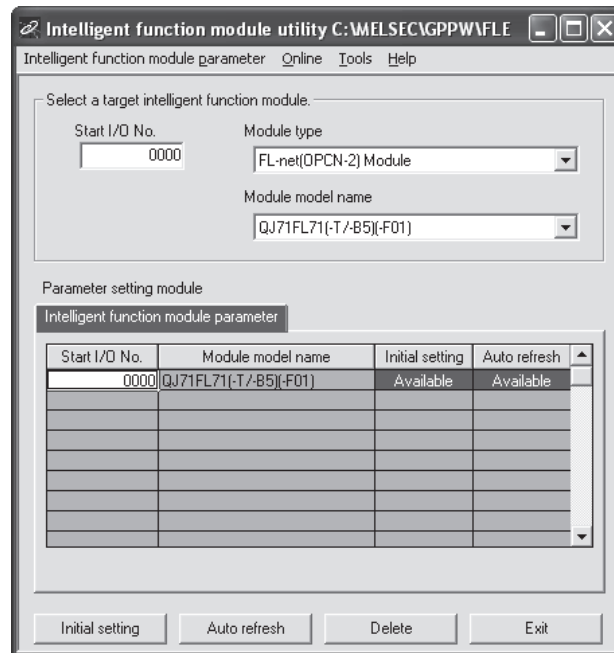
6.4.7 Starting the Intelligent function module utility

[Operating procedure]

Intelligent function module utility is started from GX Developer.

[Tools] → [Intelligent function utility] → [Start]

[Setting screen]



[Explanation of items]

(1) Activation of other screens

Following screens can be displayed from the intelligent function module utility screen.

(a) Initial setting screen

"Start I/O No.*1"→"Module type"→"Module model name"→

(b) Auto refresh setting screen

"Start I/O No.*1"→"Module type"→"Module model name"→

(c) Select monitor/test module screen

[Online] → [Monitor/Test]

*1: Enter the start I/O No. in hexadecimal.

(2) Command buttons

Deletes the initial setting and auto refresh setting of the selected module.

Closes this screen.

(3) Menu bar

(a) File menu

Intelligent function module parameters of the project opened by GX Developer are handled.

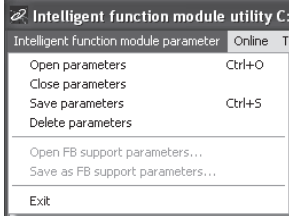
[Open parameters] : Reads a parameter file.

[Close parameters] : Closes the parameter file. If any data are modified, a dialog asking for file saving will appear.

[Save parameters] : Saves the parameter files.

[Delete parameters] : Deletes the parameter file.

[Exit] : Closes this screen.

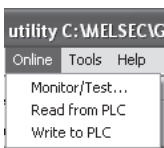


(b) Online menu

[Monitor/Test] : Activates Select monitor/test module screen.

[Read from PLC] : Reads intelligent function module parameters from the CPU module.

[Write to PLC] : Writes intelligent function module parameters to the CPU module.

**POINT**

(1) Saving intelligent function module parameters in a file

Since intelligent function module parameters cannot be saved in a file by the project saving operation of GX Developer, save them on the shown module selection screen.

(2) Reading/writing intelligent function module parameters from/to a programmable controller using GX Developer

(a) Intelligent function module parameters can be read from and written into a programmable controller after having been saved in a file.

(b) Set a target programmable controller CPU in GX Developer:
[Online] → [Transfer setup].

(c) When mounting an FL-net module to a remote I/O station, use [Read from PLC] and [Write to PLC] of GX Developer.

(3) Checking the required utility

While the start I/O is displayed on the Intelligent function module utility setting screen, "*" may be displayed for the model name.

This means that the required utility has not been installed or the utility cannot be started from GX Developer.

Check the required utility, selecting [Tools] - [Intelligent function utility] - [Utility list...] in GX Developer.

6.4.8 Initial setting

[Purpose]

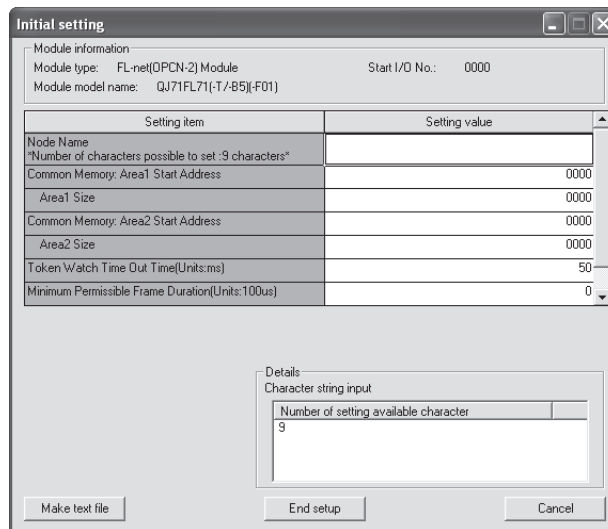
The local node network parameter area is set.
 This setting eliminates the need for creating a sequence program shown in Section 6.5.1.

[Operating procedure]

"Start I/O No.*" → "Module type" → "Module model name" → **Initial setting**

* Enter the start I/O No. in hexadecimal.

[Setting screen]



[Explanation of items]

(1) Setting items

Set data formats and permissible setting values for respective items in Setting value fields, and click the **End setup** button to enter the settings.

| Item | Buffer memory address (Hex.) | Reference section | |
|---|------------------------------|-------------------|----|
| Node Name | 0 to 4H | 3.2.5 (3) | |
| Common Memory | Area 1 Start Address | | 8H |
| | Area 1 Size | | 9H |
| | Area 2 Start Address | | AH |
| | Area 2 Size | | BH |
| Token Watch Time Out Time (Units: ms) | CH | | |
| Minimum Permissible Frame interval (Units: 100us) | DH | | |
| Message Data Unit Select | EH | | |

(2) Introduction of command buttons

| | |
|---|--|
| <input type="button" value="Make text file"/> | Creates a file containing the screen data in text file format. |
| <input type="button" value="End setup"/> | Saves the set data and ends the operation. |
| <input type="button" value="Cancel"/> | Cancels the setting and ends the operation. |

POINT

This initial setting is stored in the intelligent function module parameters.

After being written to the CPU module, the initial settings are enabled by either of the following operation (1) or (2).

- (1) Turn the RUN/STOP switch of the CPU module from STOP → RUN → STOP → RUN.
- (2) After setting the RUN/STOP switch to RUN, turn the power OFF and then ON or reset the CPU module.

When the contents of the initial settings are written by the sequence program, the values of the initial setting parameters are written when the CPU module changes from STOP status to RUN status. Accordingly, program the sequence program so that the initial settings are re-executed.

6.4.9 Auto refresh setting

[Purpose]

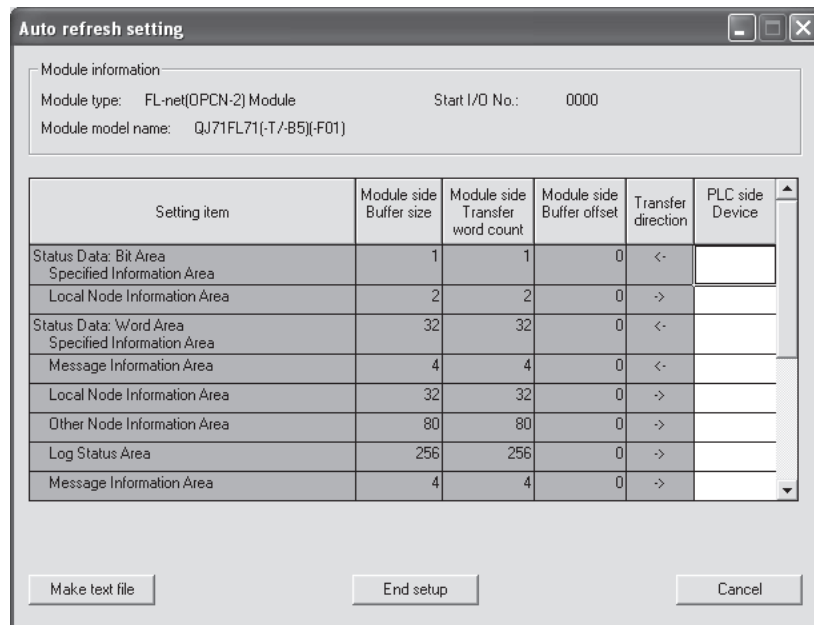
This setting is made for automatic data transfer between the FL-net module buffer memory and the programmable controller CPU devices. By this setting, cyclic data can be automatically transferred between the FL-net module and programmable controller CPU devices.

[Operating procedure]

"Start I/O No.*" → "Module type" → "Module model name" → Auto refresh

* Enter the start I/O No. in hexadecimal.

[Setting screen]



[Explanation of items]

(1) Setting items

| Item | | Buffer memory address (Hex.) | Reference section |
|------------------------|-----------------------------|------------------------------|----------------------------------|
| Status Data: Bit Area | Specified Information Area | 900 _H | 3.2.6 (1)(a) |
| | Local Node Information Area | 904 to 905 _H | 3.2.6 (1)(b) |
| Status Data: Word Area | Specified Information Area | 980 to 99F _H | 3.2.6 (2)(a) |
| | Message Information Area | 9A0 to 9A3 _H | 3.2.6 (2)(b) |
| | Local Node Information Area | 9C0 to 9DF _H | 3.2.6 (2)(c) |
| | Other Node Information Area | 9E0 to A2F _H | 3.2.6 (2)(d) |
| | Log Status Area | A80 to B7F _H | 3.2.6 (2)(e) |
| | Message Information Area | C00 to C03 _H | 3.2.6 (2)(f) |
| Cyclic Data: Area 1 | Local Node Area | 1C00 to 1DFF _H | 3.2.5 (3)(g) This section (4) |
| | Other Node Area | | |
| | Other Node Area | | |
| Cyclic Data: Area 2 | Local Node Area | 2000 to 3FFF _H | This section (4) |
| | Other Node Area | | |
| | Other Node Area | | |

(2) Contents of screen display

(a) Setting method

1) Auto-refresh items

Enter the CPU side device data as the auto refresh target.

For cyclic data, also enter the number of words to be transferred to the PLC side devices and offset values of the buffer memory addresses.

2) Non-auto-refresh items

Leave the "PLC side Device" field blank.

In the "Module side Transfer word count" field, enter 1 or larger value (a dummy value).

(b) Setting items

| Item | Description |
|--|--|
| Module side Buffer size | Displays the buffer memory size for each setting item. |
| Module side Transfer word count (Enter in decimal) | Set the number of data transferred between the module side buffer memory and the CPU side devices in units of words. |
| Module side Buffer offset (Enter in decimal) | Set the transfer destination of the module side buffer memory with an offset value from the start address of each setting item. |
| Transfer direction | Shows the data transfer direction. <input type="checkbox"/> <- : Module side buffer memory ← PLC side device <input type="checkbox"/> -> : Module side buffer memory → PLC side device |
| PLC side Device | Set the start device on the CPU side to which data are transferred. Applicable devices are as follows: • CPU module: X, Y, M, L, B, T, C, ST, D, W, R, ZR • MELSECNET/H remote I/O station: X, Y, M, B, D, W When using bit device X, Y, M, L or B, set a number divisible by 16 points (e.g. X10, Y120, M16). Buffer memory data are stored into an area of 16 points starting from the specified device number. For example, if X10 is set, data are stored in X10 to X1F. |

POINT

If the local node area is set to the first or last in the cyclic data area, other node areas are not divided into two. Since other node areas need to be set in two different parts, enter 1 or larger value for the second other node area field of "Module side Transfer word count" as a dummy value even if it is not required for control.

(3) Command buttons

- Make text file Creates a file containing the screen data in text file format.
- End setup Saves the set data and ends the operation.
- Cancel Cancels the setting and ends the operation.

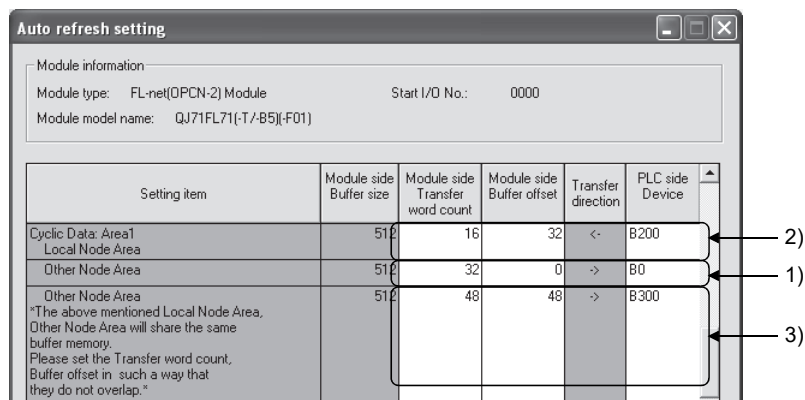
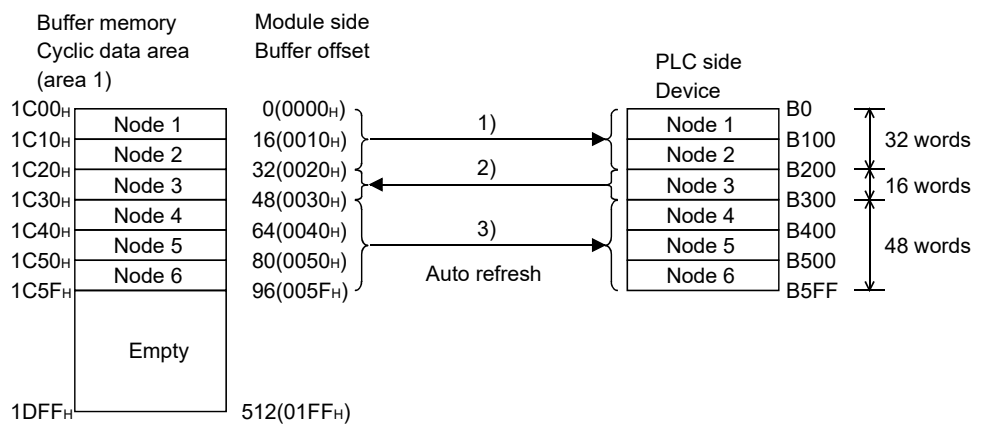
POINT

The auto refresh settings are stored in an intelligent function module parameter file. After writing the intelligent function module parameter to the CPU module, the auto refresh settings are enabled by setting the RUN/STOP switch to STOP → RUN → STOP → RUN or by the resetting of the CPU module.

The auto refresh settings cannot be changed from sequence programs. However, processing equivalent to auto refresh can be added using the FROM/TO instruction in the sequence program.

(4) Cyclic data area setting example

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



6.4.10 Monitoring/Test

[Purpose]

Start buffer memory monitoring/testing, I/O signal monitoring/testing and local/remote node parameter data monitor from this screen.

[Operating procedure]

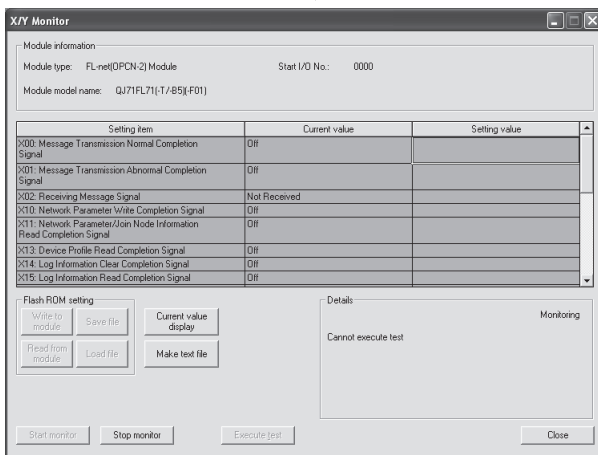
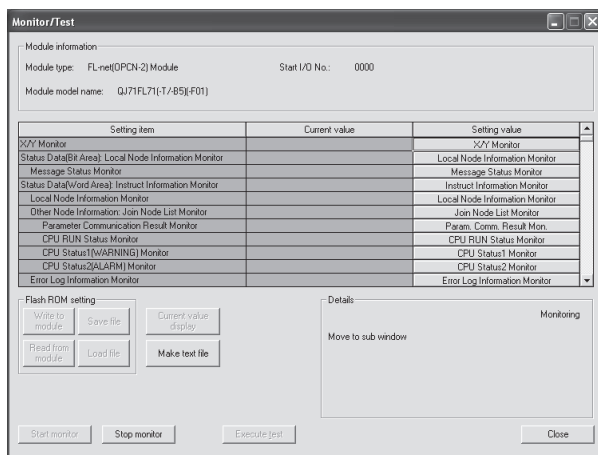
"Select monitor/test module" screen → "Start I/O No.*" → "Module type" → "Module model name" → **Monitor/test**

* Enter the start I/O No. in hexadecimal.

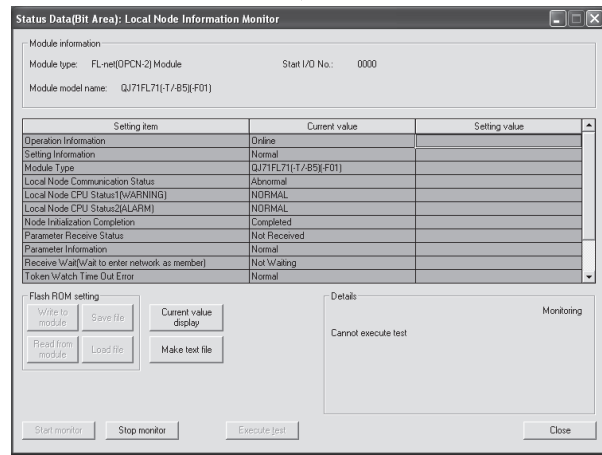
The screen can be started from System monitor of GX Developer Version6 or later.

Refer to the GX Developer Operating Manual for details.

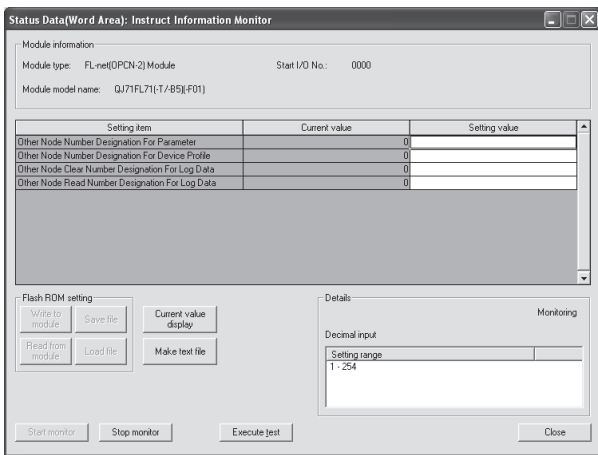
[Setting screen]



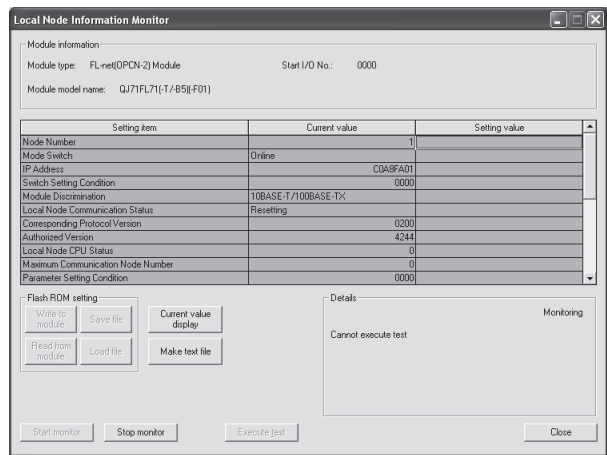
Refer to Section 3.2.4



Refer to Section 3.2.6(1)(b)



Refer to Section 3.2.6(2)(a)



Refer to Section 3.2.6(2)(c)

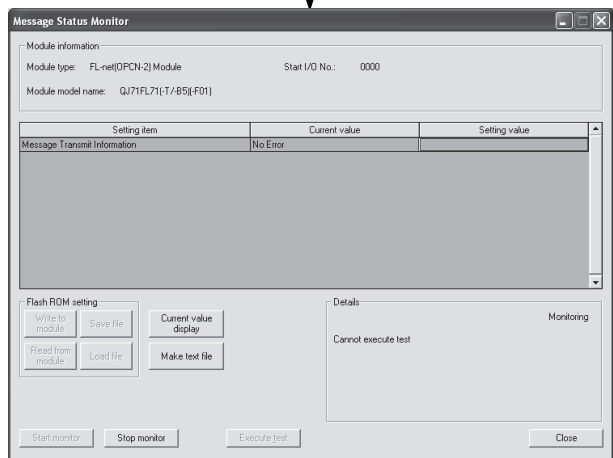
Status data (word area)
Instruct information monitor screen

Status data (word area) local
node information monitor screen

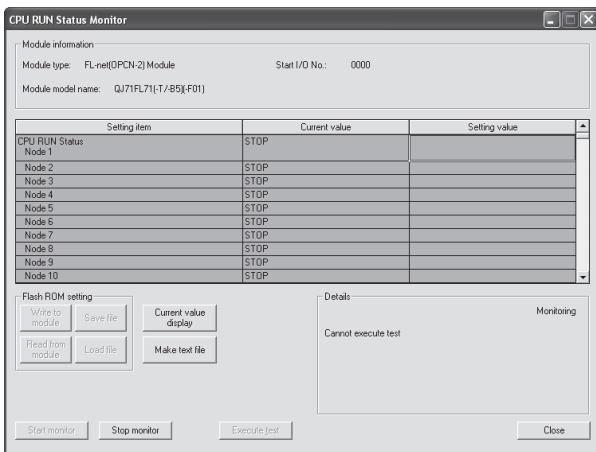
1) ←

→ 2)

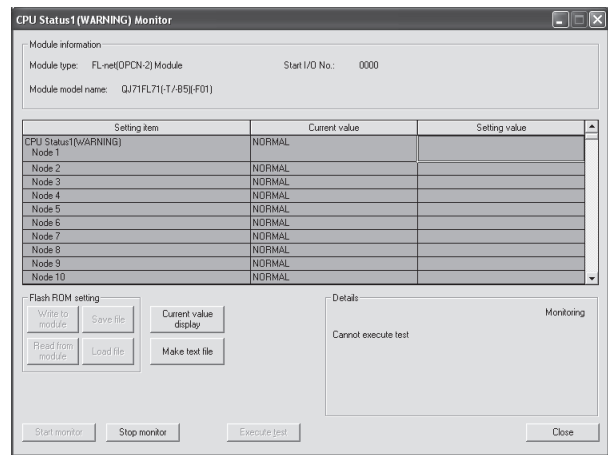
Status data (bit area)
message status monitor area



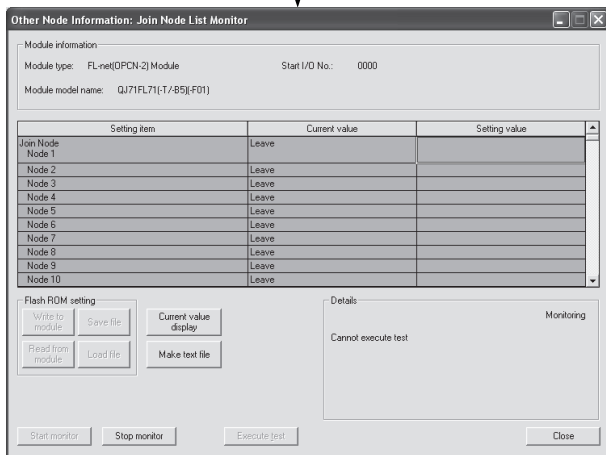
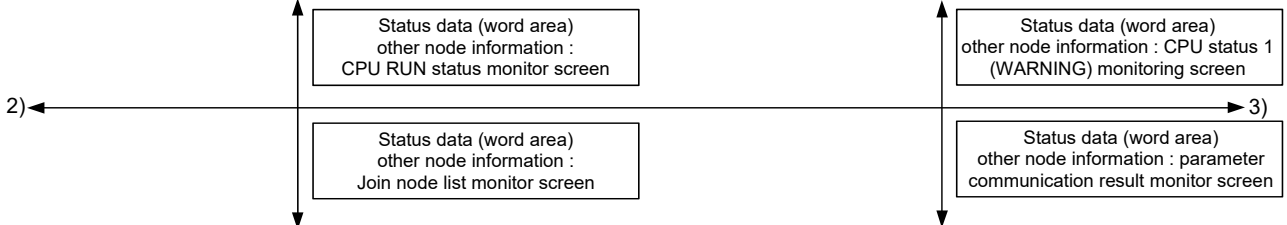
Refer to Section 3.2.6(1)(b)



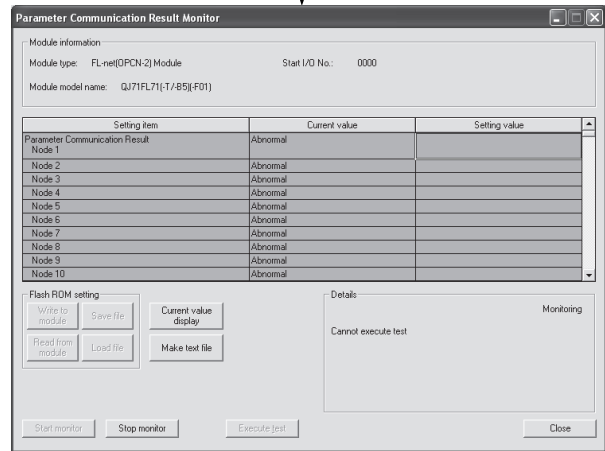
Refer to Section 3.2.6(2)(b)



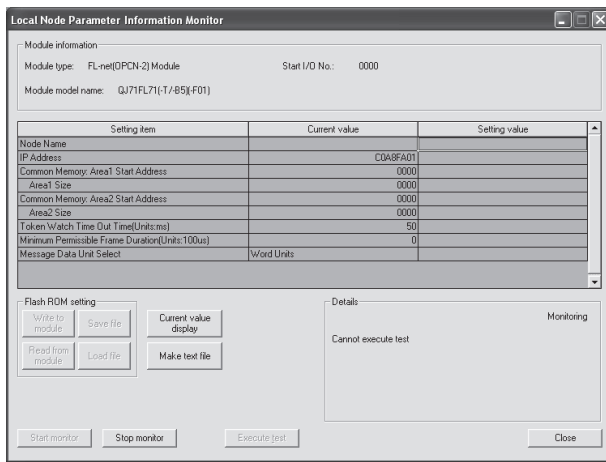
Refer to Section 3.2.6(2)(b)



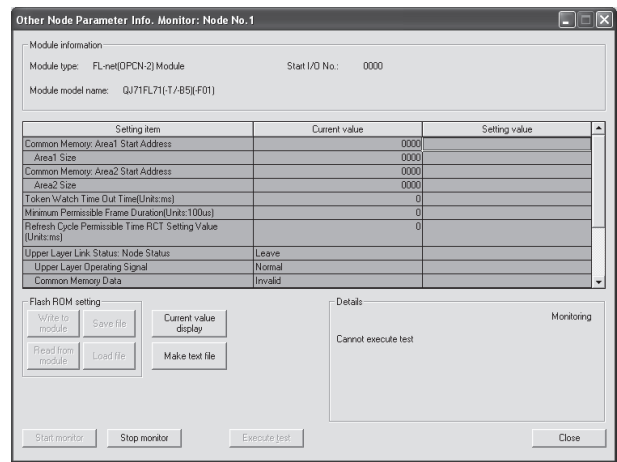
Refer to Section 3.2.6(2)(b)



Refer to Section 3.2.6(2)(b)



Refer to Section 3.2.5(3)(a)



Refer to Section 3.2.5(3)(b)

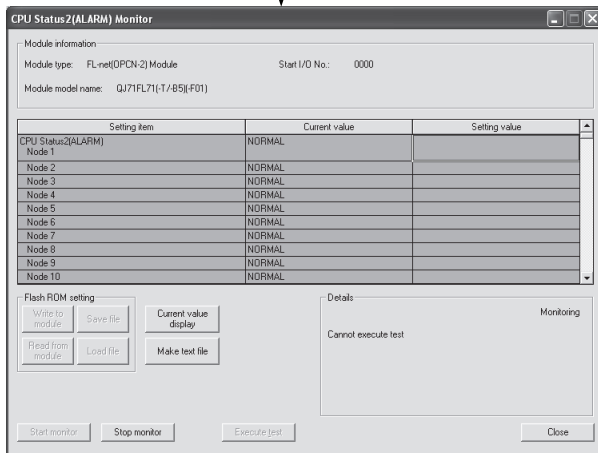
Local node parameter information monitor screen

Other node parameter info. monitor screen

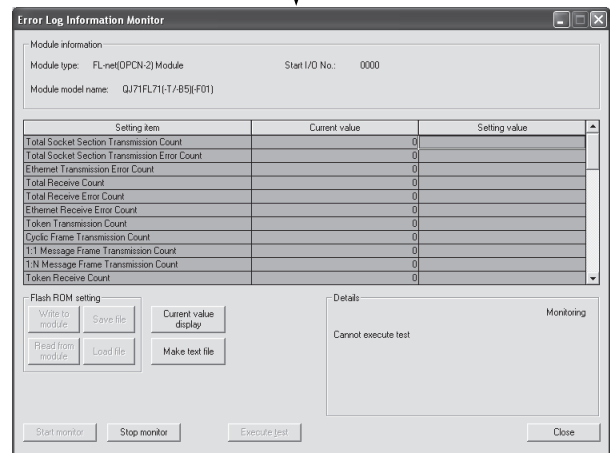
3)

Status data (word area) other node information : CPU status 2 (ALARM) monitor screen

Status data (word area) error log information monitor screen



Refer to Section 3.2.6(2)(d)



Refer to Section 3.2.6(2)(e)

[Explanation of items]

(1) Items

Setting item : Displays I/O signals and buffer memory names.

Current value : Monitors the I/O signal states and present buffer memory values.

Setting value : Input or selection of write data in test operations.

(2) Command buttons

Displays the current value of the item selected. (This is used to check the text that cannot be displayed in the current value field. However, in this utility package, all items can be displayed in the display fields).

Creates a file containing the screen data in text file format.

/

Selects whether or not to monitor current values.

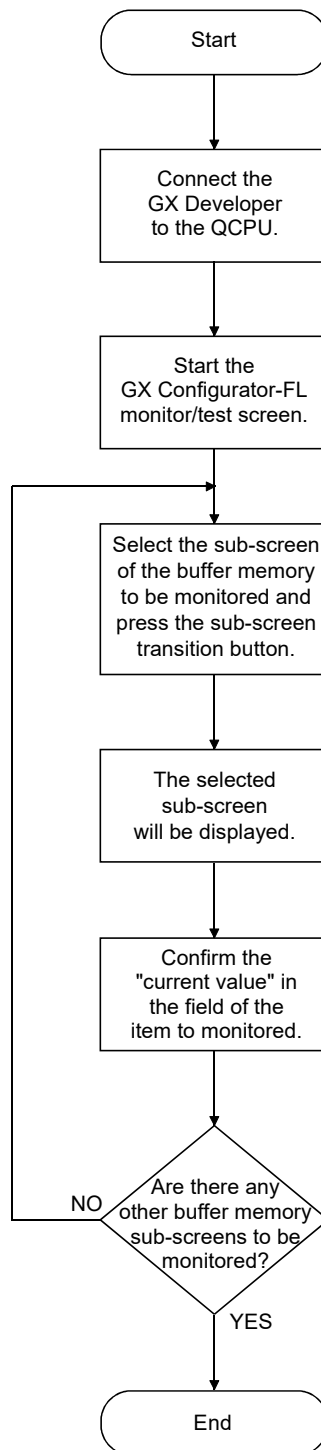
Performs a test on the selected items. To select more than one item, select them while holding down the key.

Closes the screen that is currently open and returns to the previous screen.

POINT

If test selection operations are performed on a setting that has been deleted (blank setting value) using the key, "Finished" will appear but writing is not performed.

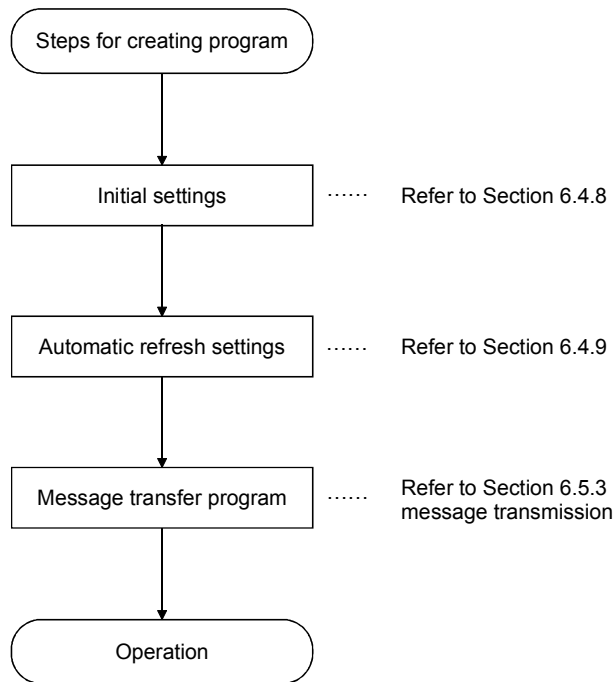
(3) Steps for monitoring the buffer memory



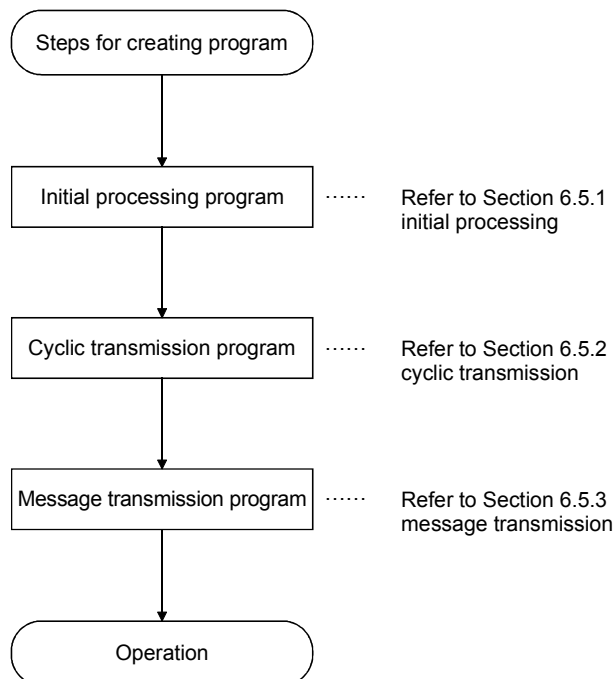
6.5 Programming

This section explains the programming for communicating using the FL-net module. When applying the following program examples to the actual system, make sure to examine the applicability and confirm that it will not cause system control problems.

(1) If using GX Configurator-FL



(2) If not using GX Configurator-FL



POINT

Also refer to Appendix 11 for programming when the FL-net module is mounted on the MELSECNET/H remote I/O station.

REMARK

This item presents the environment for executing the program.

Local node number : Node 03

I/O assignment (Q parameter setting screen)

Classification : Intelligent
 Model name : QJ71FL71-T-F01
 Number of points : 32 points
 First XY : 0 (Occupies X/Y00 to X/Y01F)

Switch setting for I/O and intelligent function module

Switch 1 : 192
 Switch 2 : 168
 Switch 3 : 250
 Switch 4 : 3
 Switch 5 : 0

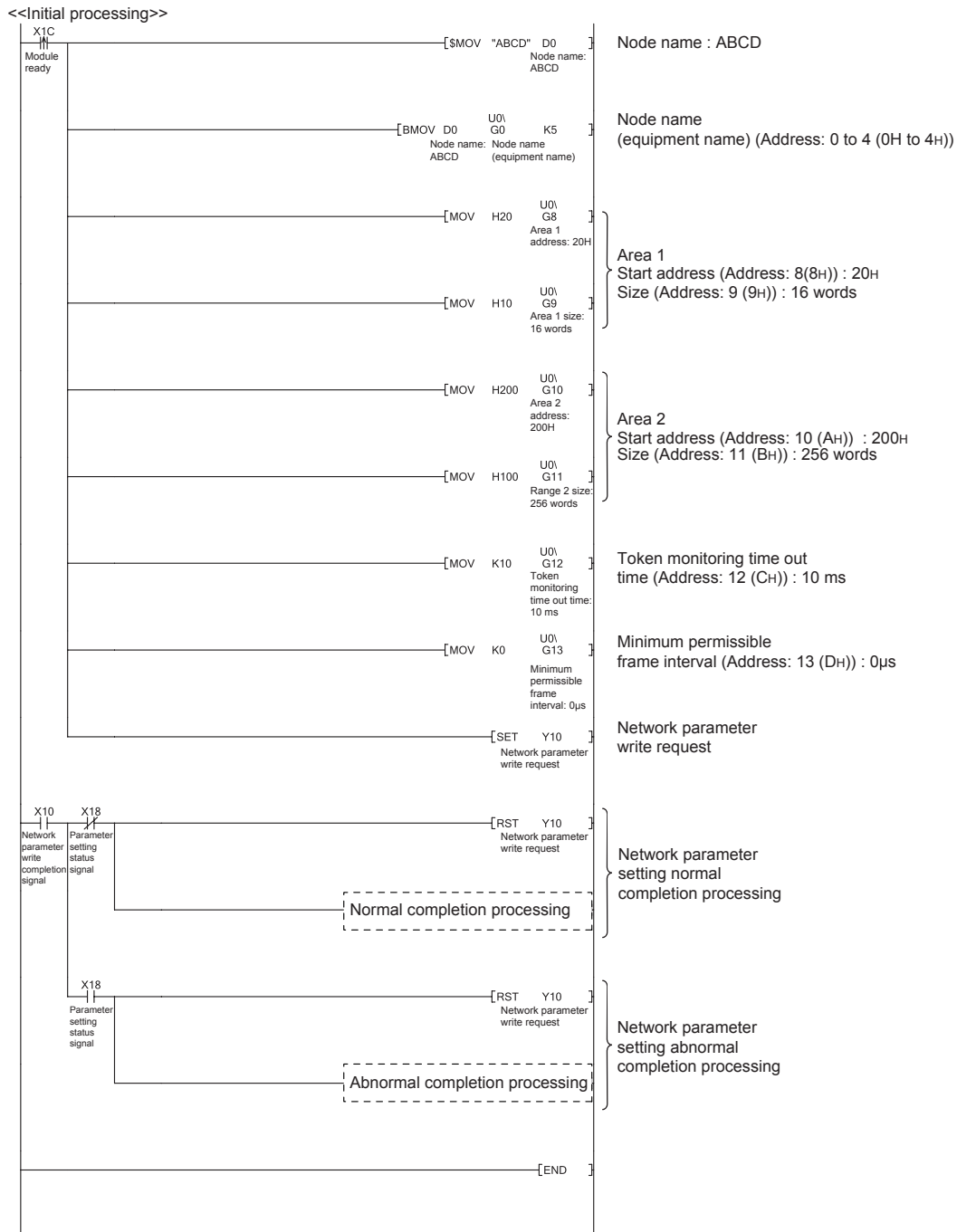
Switch setting for I/O and intelligent function module

Input format: DEC

| | Slot | Type | Model name | Switch 1 | Switch 2 | Switch 3 | Switch 4 | Switch 5 |
|---|-------|----------|------------|----------|----------|----------|----------|----------|
| 0 | PLC | PLC | | | | | | |
| 1 | 0(*0) | Intelli. | | 192 | 168 | 250 | 3 | 0 |
| 2 | 1(*1) | | | | | | | |

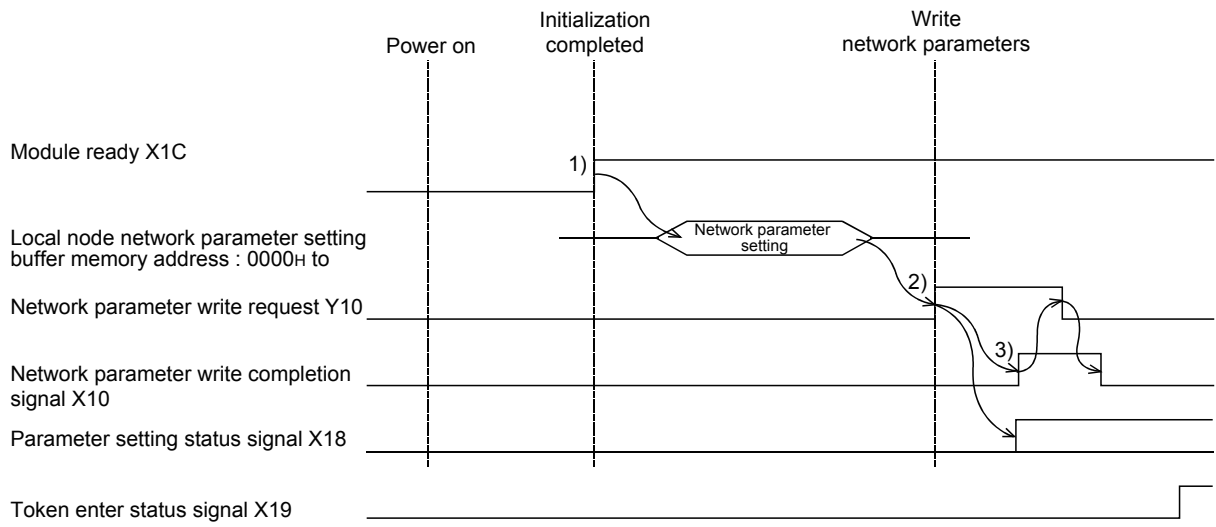
6.5.1 Initial processing

This section explains the initial processing of the FL-net module.
The local node network parameter area is set.



POINT

The local node network parameter area can be set in Initial setting of GX Configurator-FL. (Refer to Section 6.4.8.)
The initial setting on GX Configurator-FL eliminates the need for creating the sequence program shown here.



- 1) After turning the power on, confirm that the initializing of the FL-net module has completed normally.
 - <Normal completion>
 - Module ready (X1C) :ON
 - <Abnormal completion>
 - Module ready (X1C) :OFF

If there is an abnormal completion, the settings for the FL-net module switches have to be reset.
(Refer to Section 6.3.2.(2))
- 2) After setting the local node network parameter area data into the buffer memory (Address: 0000H to ...), turn ON the network parameter write request (Y10).
- 3) Confirm network parameter write completion.
 - <Normal completion>
 - Network parameter write completion signal (X10) : ON
 - Parameter setting status signal (X18) : OFF
 - Network parameter setting status : 0
(Buffer memory address: 9D2H)

The FL-net module is participating in the token.
(Token enter status signal (X19) : ON)
 - <Abnormal completion>
 - Network parameter write completion signal (X10) : ON
 - Parameter setting status signal (X18) : ON
 - Network parameter setting status : Other than 0
(Buffer memory address : 9D2H)

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. Refer to Section 8.5.2 for more information about the error codes.

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

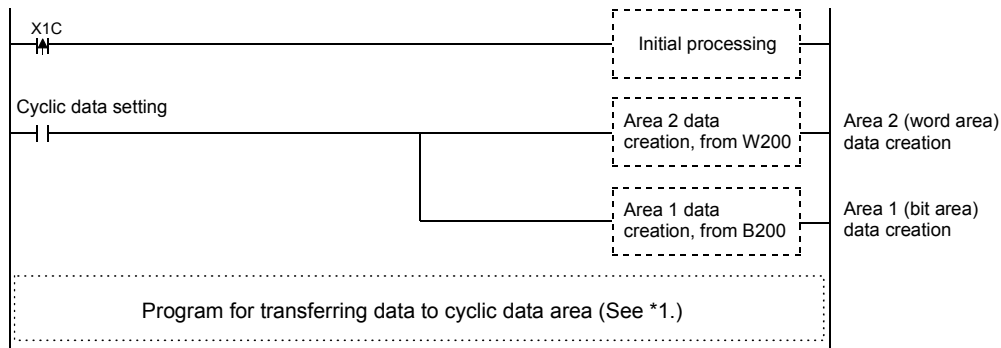
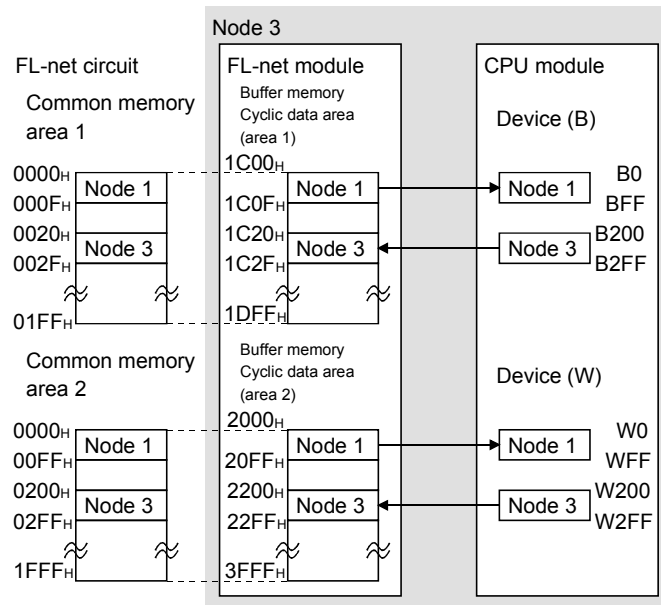
POINT

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

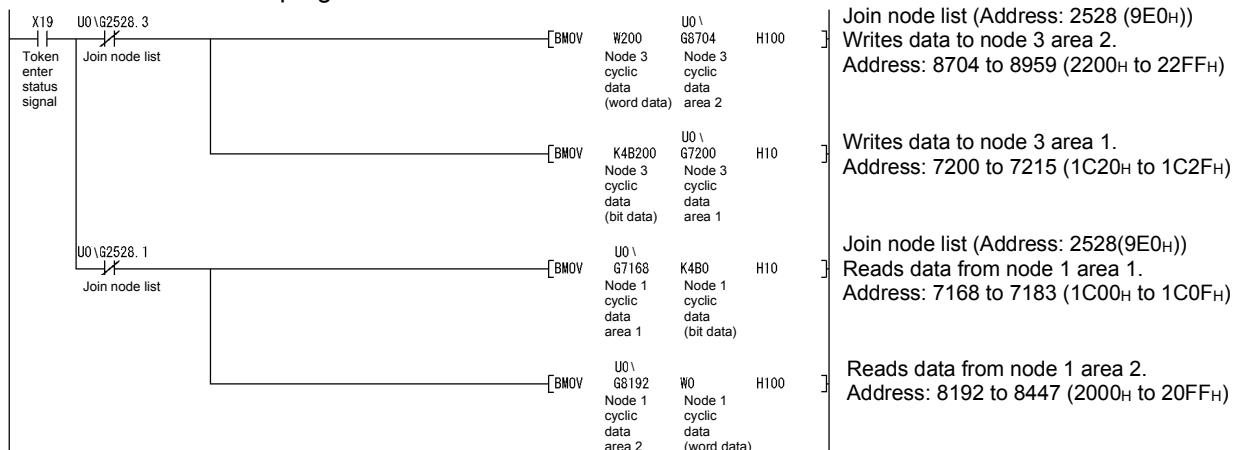
6.5.2 Cyclic transmission

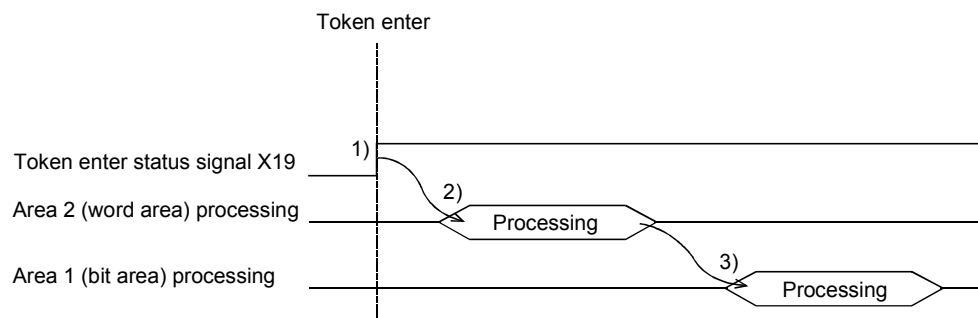
This section explains communication using the cyclic transmission of the FL-net module.

Cyclic transmission is performed at node 3, as shown below.



*1 If no auto refresh settings are configured (Refer to Section 6.4.9.), transfer the CPU module data to the cyclic data area of the FL-net module by the following sequence program.





- 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 |
|--------------|

- | | |
|--------------|---|
| POINT | <p>(1) Perform the data processing in the following sequence : area 2 (word area) → area 1 (bit area).</p> <p>(2) Arrange so that node unit assurance for area 2 (word area) is handshake by bit from area 1 (bit area). For a handshake program example, refer to Section 6.2.7 (7) (c).</p> |
|--------------|---|

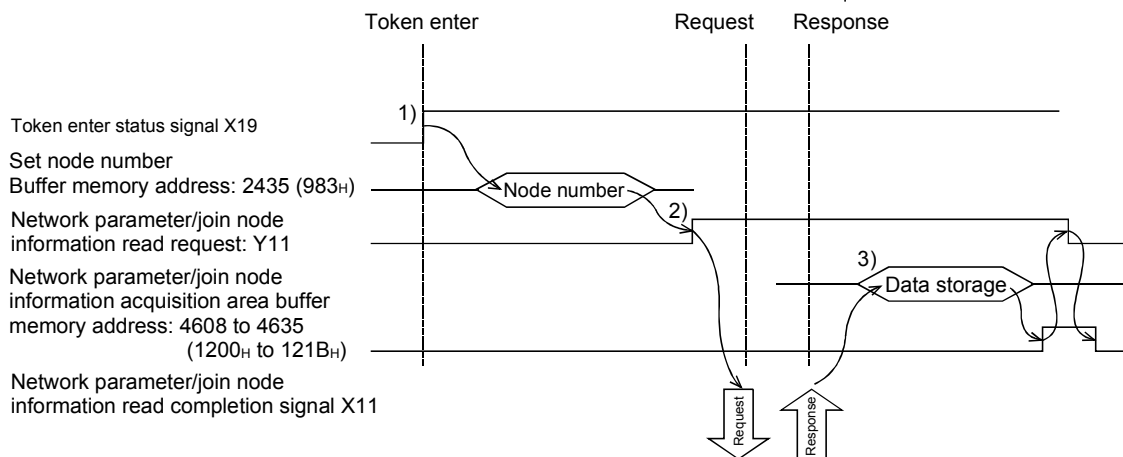
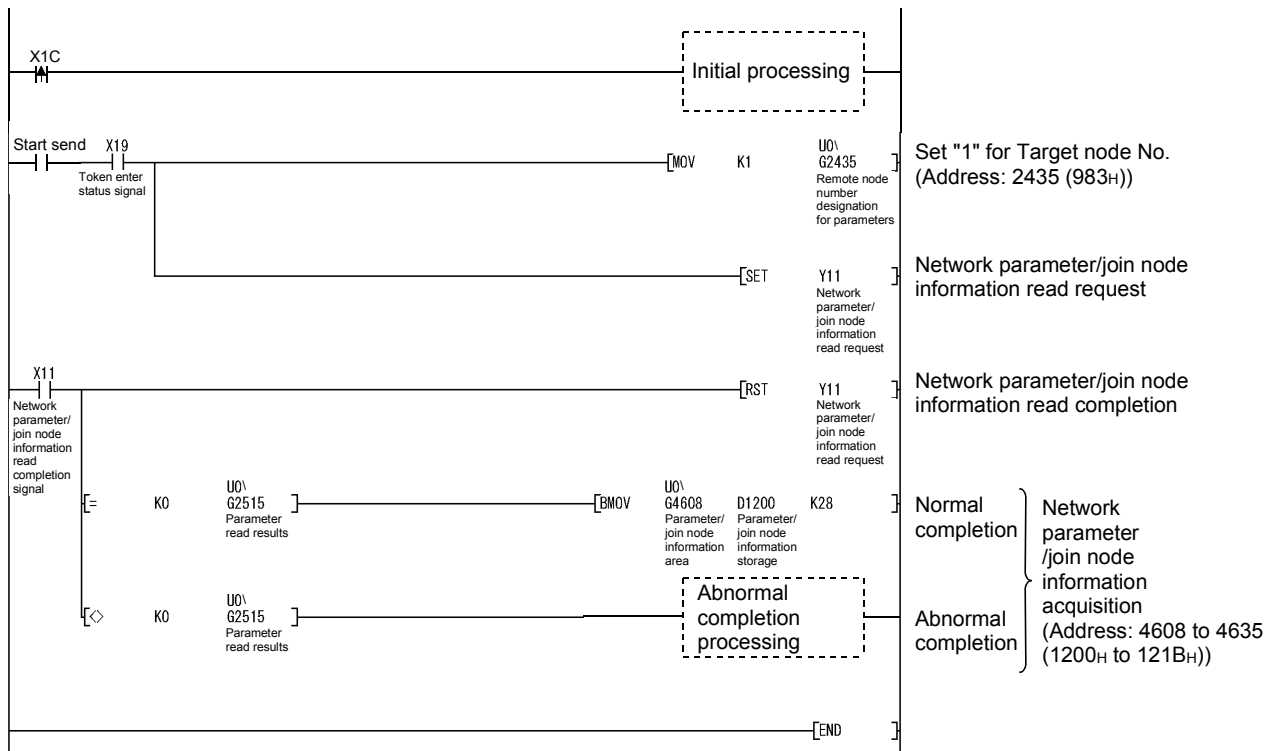
6.5.3 Message transmission

This section explains communication using the FL-net module message transmission.

(1) 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 983H . . . b15. (Refer to Section 3.2.6.(2)) |
| 0 : Network parameter information read |
| 1 : Join node information read |



- 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 : 983_H), 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 : 1200_H to 121B_H).

- 4) Confirms network parameter read completion.

<Normal completion>

- Network parameter/join node information read completion signal (X11) : ON
- Network parameter read results : 0
(Buffer memory address : 9D3_H)

<Abnormal completion>

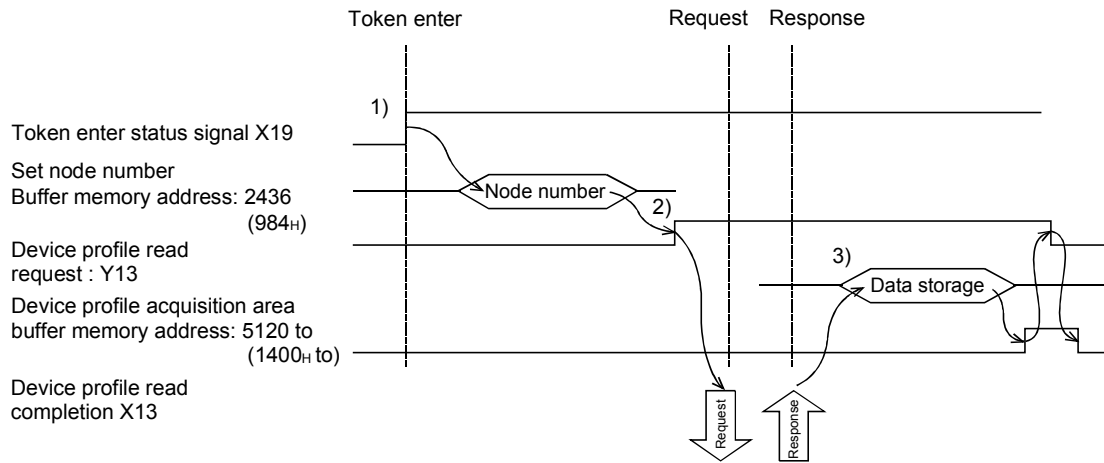
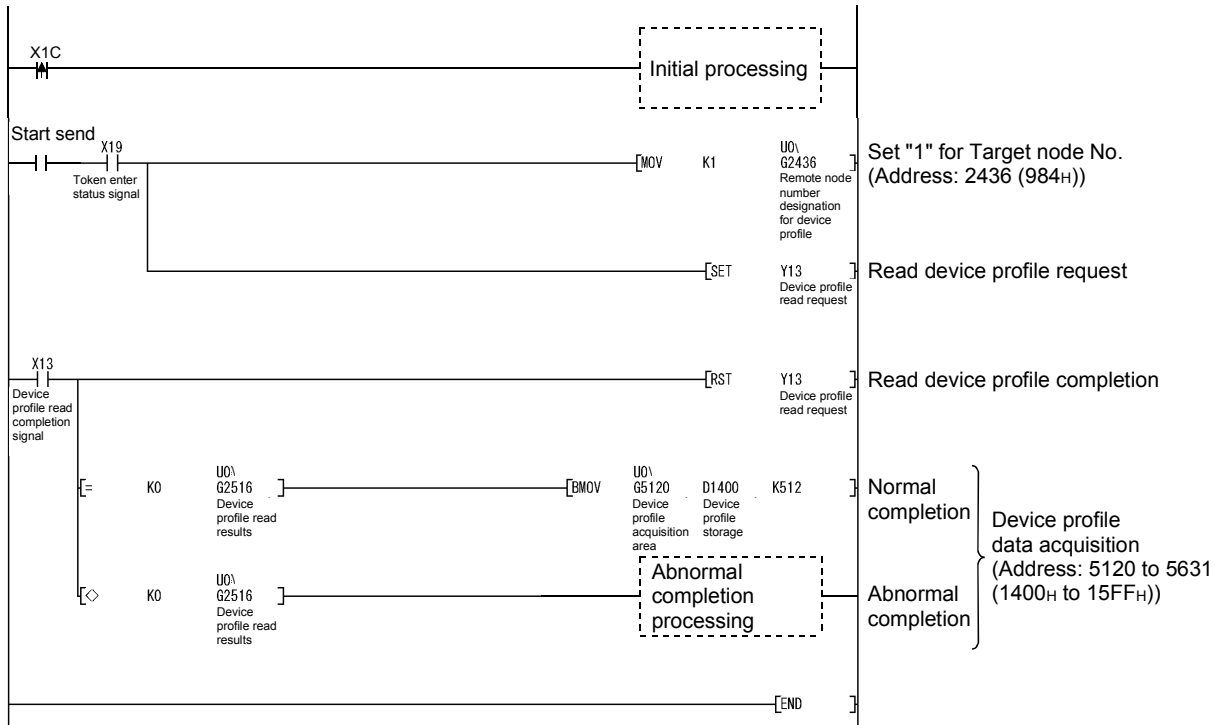
- Network parameter/join node information read completion signal (X11) : ON
- Network parameter read results : Other than 0
(Buffer memory address : 9D3_H)

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 command once again. Refer to Section 8.5.2 for information about error codes.

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.

(2) Device profile read

The following explains the device profile read command.



- 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 : 984_H), 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 : 1400_H to 15FF_H).
- 4) Confirms device profile read completion.

<Normal completion>

- Device profile read completion signal (X13) : ON
- Device profile read results : 0
(Buffer memory address : 9D4_H)

<Abnormal completion>

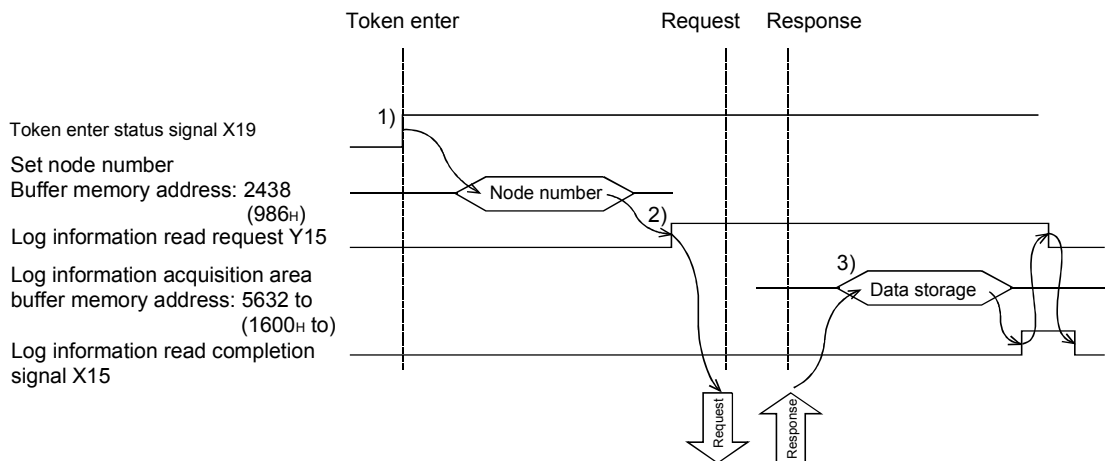
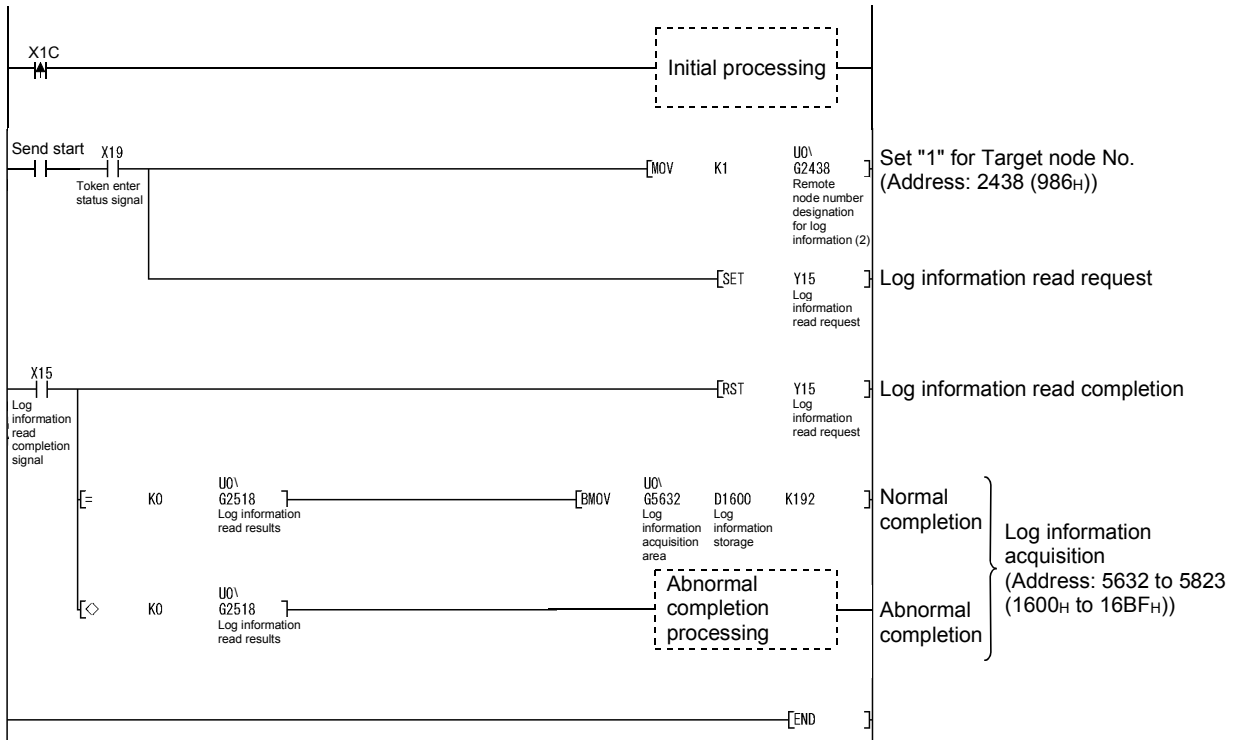
- Device profile read completion signal (X13) : ON
- Device profile read results : Other than 0
(Buffer memory address : 9D4_H)

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. Refer to Section 8.5.2 for information about error codes.

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

(3) Log information read

The following explains the log information read command.



- 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: 986_H), 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; 1600_H to 16BF_H).
- 4) Confirms log information read completion.

<Normal completion>

- Log information read completion signal (X15) : ON
- Log information read results : 0
(Buffer memory address : 9D6_H)

<Abnormal completion>

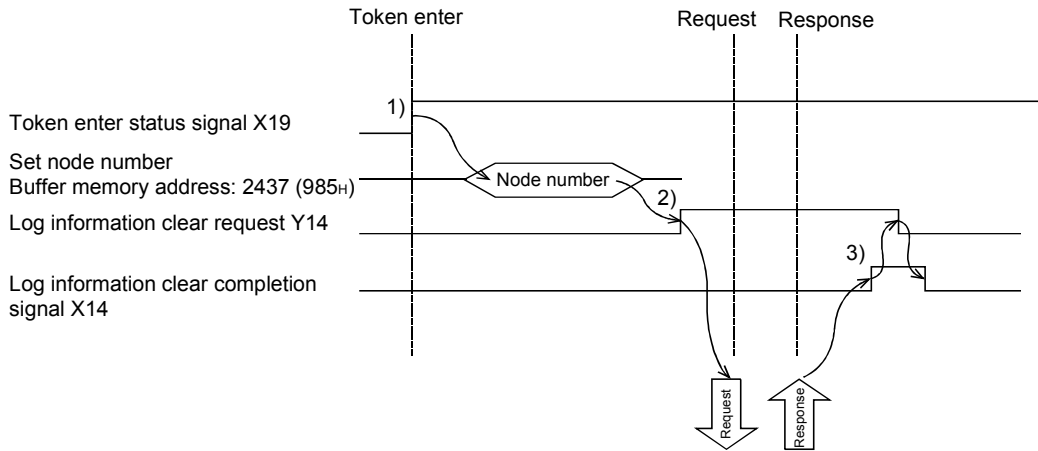
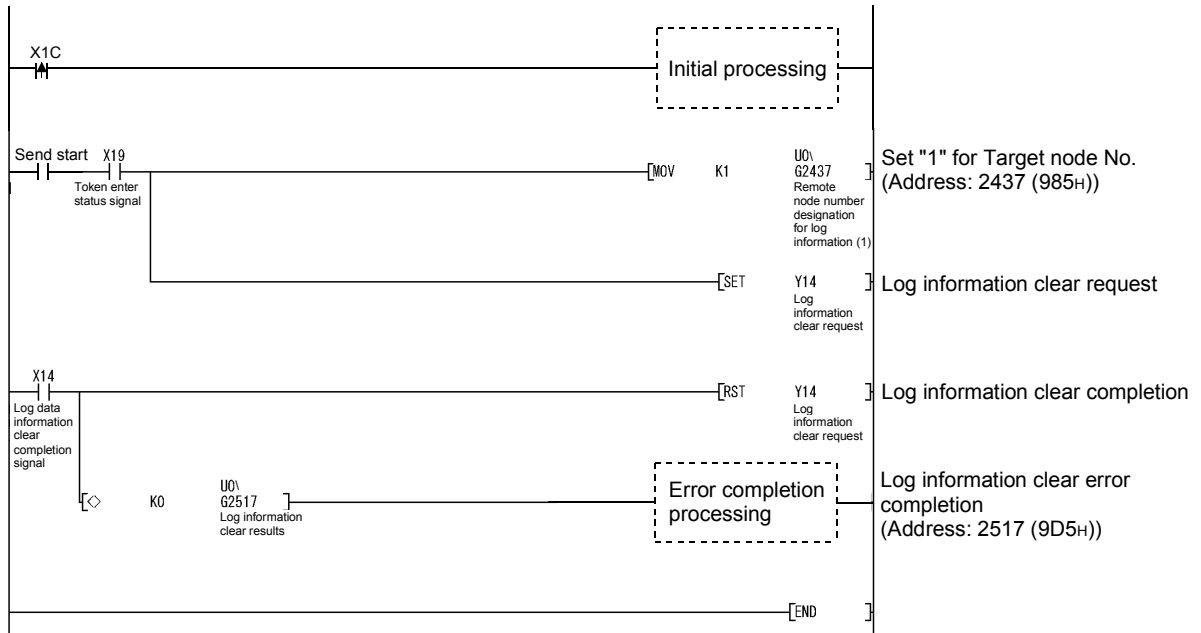
- Log information read completion signal (X15) : ON
- Log information read results : Other than 0
(Buffer memory address : 9D6_H)

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. Refer to Section 8.5.2 for information about error codes.

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

(4) Log information clear

The following explains the log information clear command.



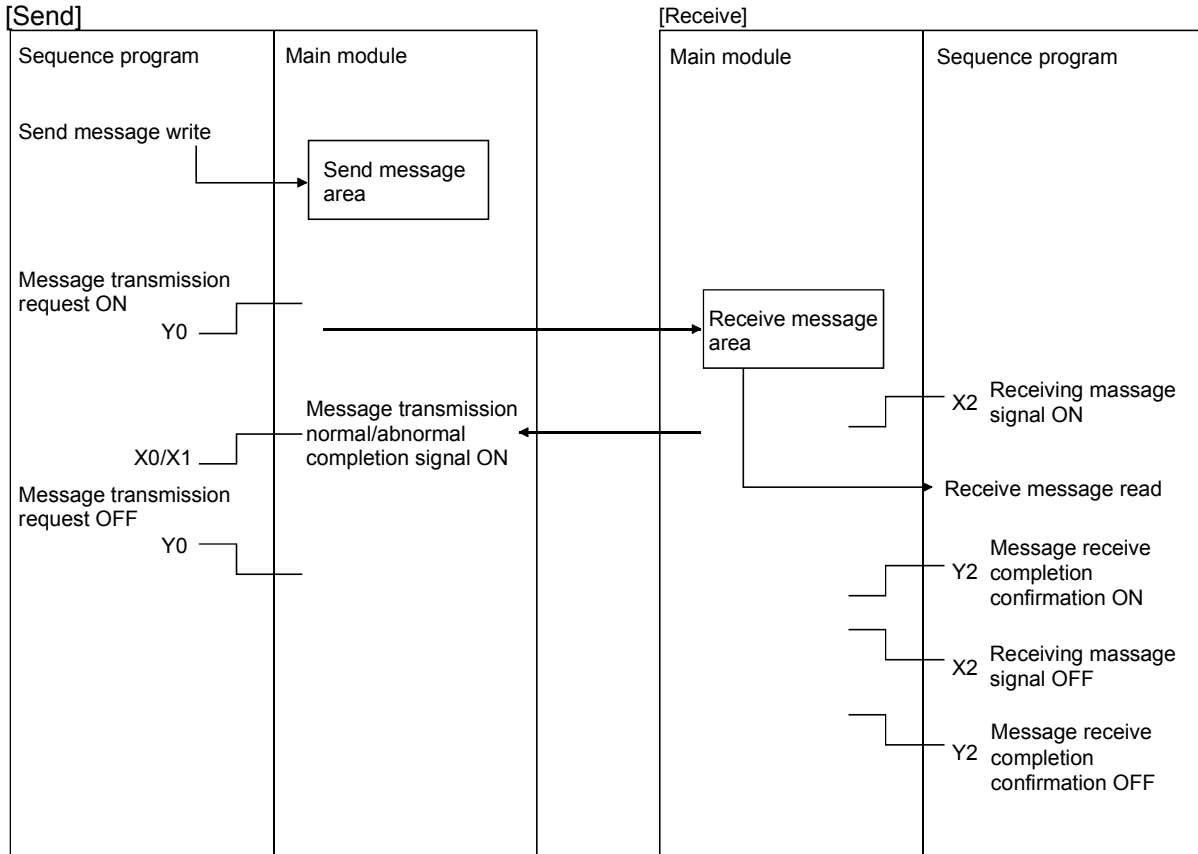
- 1) Confirms that the FL-net module token enter status signal (X19) is ON.
- 2) After setting the target node number to the buffer memory (address: 985_H), the log information clear request (Y14) is set to ON. The FL-net module performs log information clear for the target node.
- 3) Confirms log information clear completion.
 - <Normal completion>
 - Log information clear completion signal : ON (X14)
 - Log information clear results : 0 (Buffer memory address : 9D5_H)
 - <Abnormal completion>
 - Log information clear completion signal : ON (X14)
 - Log information clear results : Other than 0 (Buffer memory address : 9D5_H)

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. Refer to Section 8.5.2 for information about error codes.

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

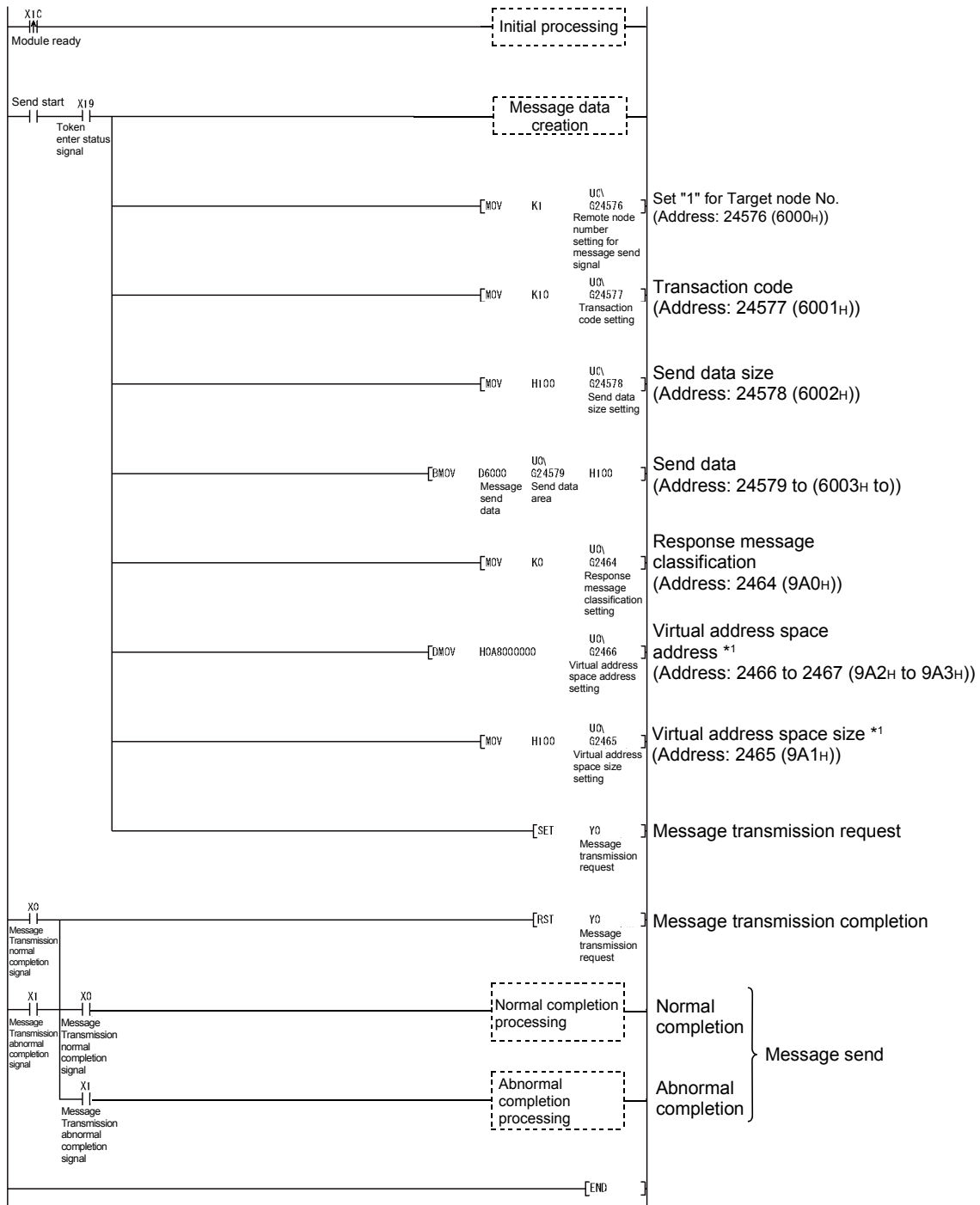
(5) Transparent type message

The following explains the send/receive commands for the transparent type message.

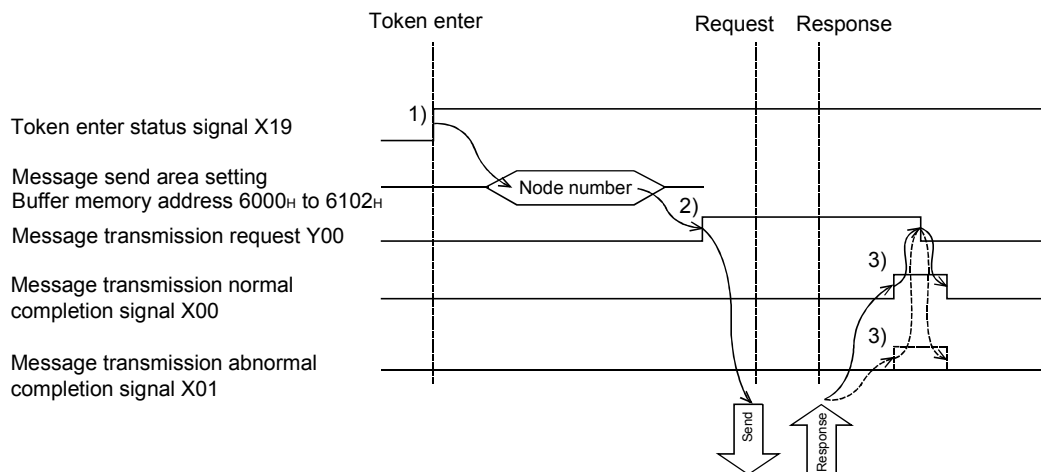


(a) Message send

The following explains the message transmission command.



*1 When the target node is a Q series FL-net module, specify 0H.



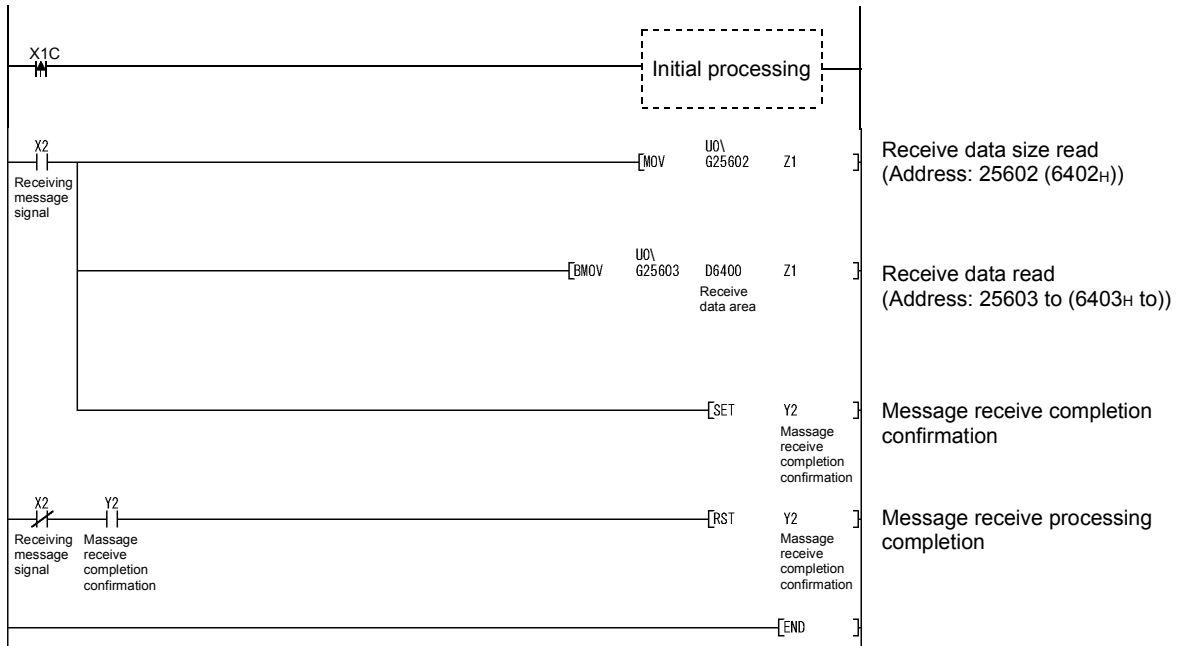
- 1) Confirms that the FL-net module token enter status signal (X19) is ON.
- 2) After setting the data shown below to the buffer memory (address : 6000_H to 6102_H, 9A0_H to 9A3_H), message transmission request (Y00) is set to ON.
 - Target node number
 - Transaction code
 - Send data size
 - Send data
 - Response message classification
 - Virtual address space address
 - Virtual address space size
- 3) Confirm the transmission complete of the message.
 - <Normal completion>
 - Message transmission normal completion signal (X00) : ON
 - Message transmission abnormal completion signal (X01) : OFF
 - Transparent message send result (Buffer memory address : 9D7_H) : 0
 - <Abnormal completion>
 - Message transmission normal completion signal (X00) : OFF
 - Message transmission abnormal completion signal (X01) : ON
 - Transparent message send results (Buffer memory address : 9D7_H) : Other than 0

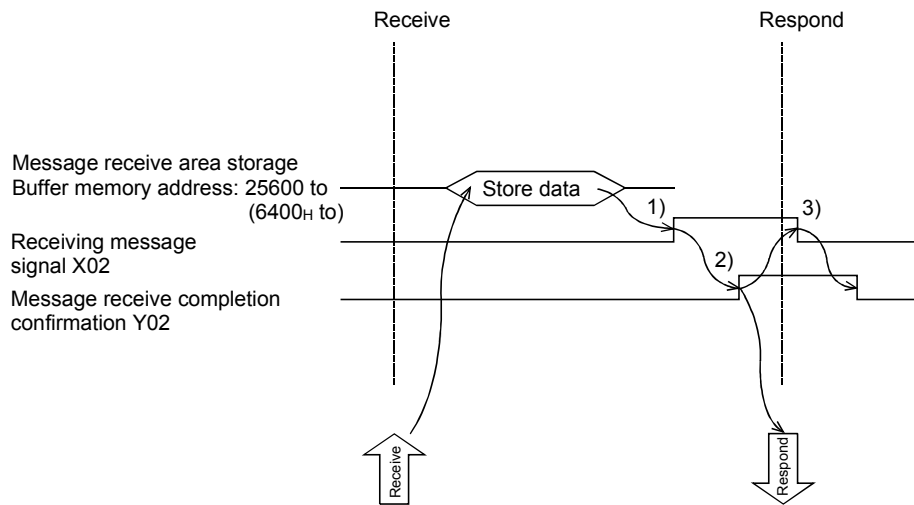
If the transmission has completed abnormally, correct the parameters or program according to the error code stored in the transparent type message transmission result area, and execute the transparent type message transmission. Refer to Section 8.5.2 for information about error codes.

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.

(b) Message receive

The following explains the message receive command.





- 1) Once the data receive completion is in the FL-net module buffer memory message data receive area (address: 6400_H to), 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. |
|---|

(6) Other messages (Transparent type messages)

For messages other than (1) to (5), the transparent type message transmission realizes the client function.

To realize the client function of each message, a request message transmission program and a response message reception program are required.

For program examples, refer to (5).

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. |

(a) Byte block read

1) Setting items required for request message transmission

| Buffer memory address | Name | Setting value (Decimal) |
|-----------------------|------------------------------------|-------------------------------------|
| 9A0H | Response message classification | Not needed (0) |
| 9A1H | Visual address space data size | Read data size (1 to 1024 bytes) |
| 9A2H to 9A3H | Visual address space first address | Visual address space first address |
| 6000H | Target node number | 1 to 254 |
| 6001H | Transaction code | 65003 |
| 6002H | Send data size (byte/word length) | Not needed (0) |
| 6003H to 6202H | Send data area (512 words) | Not needed (0) |

2) Items for which values are stored at response message reception

| Buffer memory address | Name | Stored value (Decimal) |
|-----------------------|--------------------------------------|--|
| C00H | Response message classification | 0: Normal response 1: Abnormal response 2: Not supported |
| C01H | Visual address space data size | Value same as in request message |
| C02H to C03H | Visual address space first address | Value same as in request message |
| 6400H | Send source node number | Value same as in request message |
| 6401H | Transaction code | 65203 |
| 6402H | Receive data size (byte/word length) | Read data size (1 to 1024 bytes/512 words) |
| 6403H to 6602H | Receive data area (512 words) | Read data |

(b) Byte block write

1) Setting items required for request message transmission

| Buffer memory address | Name | Setting value (Decimal) |
|-----------------------|------------------------------------|--|
| 9A0H | Response message classification | Not needed (0) |
| 9A1H | Visual address space data size | Write data size (1 to 1024 bytes) |
| 9A2H to 9A3H | Visual address space first address | Visual address space first address |
| 6000H | Target node number | 1 to 254 |
| 6001H | Transaction code | 65004 |
| 6002H | Send data size (byte/word length) | Write data size (1 to 1024 bytes/512 words) |
| 6003H to 6202H | Send data area (512 words) | Write data |

2) Items for which values are stored at response message reception

| Buffer memory address | Name | Stored value (Decimal) |
|-----------------------|--------------------------------------|--|
| C00H | Response message classification | 0: Normal response 1: Abnormal response 2: Not supported |
| C01H | Visual address space data size | Value same as in request message |
| C02H to C03H | Visual address space first address | Value same as in request message |
| 6400H | Send source node number | Value same as in request message |
| 6401H | Transaction code | 65204 |
| 6402H | Receive data size (byte/word length) | 0 |
| 6403H to 6602H | Receive data area (512 words) | 0 |

(c) Word block read

1) Setting items required for request message transmission

| Buffer memory address | Name | Setting value (Decimal) |
|-----------------------|------------------------------------|------------------------------------|
| 9A0H | Response message classification | Not needed (0) |
| 9A1H | Visual address space data size | Read data size (1 to 512 words) |
| 9A2H to 9A3H | Visual address space first address | Visual address space first address |
| 6000H | Target node number | 1 to 254 |
| 6001H | Transaction code | 65005 |
| 6002H | Send data size (byte/word length) | Not needed (0) |
| 6003H to 6202H | Send data area (512 words) | Not needed (0) |

2) Items for which values are stored at response message reception

| Buffer memory address | Name | Stored value (Decimal) |
|-----------------------|--------------------------------------|--|
| C00H | Response message classification | 0: Normal response 1: Abnormal response 2: Not supported |
| C01H | Visual address space data size | Value same as in request message |
| C02H to C03H | Visual address space first address | Value same as in request message |
| 6400H | Send source node number | Value same as in request message |
| 6401H | Transaction code | 65205 |
| 6402H | Receive data size (byte/word length) | Read data size (1 to 1024 bytes/512 words) |
| 6403H to 6602H | Receive data area (512 words) | Read data |

(d) Word block write

1) Setting items required for request message transmission

| Buffer memory address | Name | Setting value (Decimal) |
|-----------------------|------------------------------------|--|
| 9A0H | Response message classification | Not needed (0) |
| 9A1H | Visual address space data size | Write data size (1 to 512 words) |
| 9A2H to 9A3H | Visual address space first address | Visual address space first address |
| 6000H | Target node number | 1 to 254 |
| 6001H | Transaction code | 65006 |
| 6002H | Send data size (byte/word length) | Write data size (1 to 1024 bytes/512 words) |
| 6003H to 6202H | Send data area (512 words) | Write data |

2) Items for which values are stored at response message reception

| Buffer memory address | Name | Stored value (Decimal) |
|-----------------------|--------------------------------------|--|
| C00H | Response message classification | 0: Normal response 1: Abnormal response 2: Not supported |
| C01H | Visual address space data size | Value same as in request message |
| C02H to C03H | Visual address space first address | Value same as in request message |
| 6400H | Send source node number | Value same as in request message |
| 6401H | Transaction code | 65206 |
| 6402H | Receive data size (byte/word length) | 0 |
| 6403H to 6602H | Receive data area (512 words) | 0 |

(e) Network parameter write

1) Setting items required for request message transmission

| Buffer memory address | Name | Setting value (Decimal) |
|-----------------------|------------------------------------|---|
| 9A0H | Response message classification | Not needed (0) |
| 9A1H | Visual address space data size | Not needed (0) |
| 9A2H to 9A3H | Visual address space first address | Not needed (0) |
| 6000H | Target node number | 1 to 254 |
| 6001H | Transaction code | 65008 |
| 6002H | Send data size (byte/word length) | 20 bytes/10 words |
| 6003H | Setting parameter flag | 1: Set address and size only 2: Set node name only 3: Set address, size and node name |
| 6004H | Area 1 first address | 0 to 511 |
| 6005H | Area 1 size | 0 to 512 |
| 6006H | Area 2 first address | 0 to 8191 |
| 6007H | Area 2 size | 0 to 8192 |
| 6008H to 600CH | Node name | Character string (10 bytes or less) |

2) Items for which values are stored at response message reception

| Buffer memory address | Name | Stored value (Decimal) |
|-----------------------|--------------------------------------|--|
| C00H | Response message classification | 0: Normal response 1: Abnormal response 2: Not supported |
| C01H | Visual address space data size | 0 |
| C02H to C03H | Visual address space first address | 0 |
| 6400H | Send source node number | Value same as in request message |
| 6401H | Transaction code | 65208 |
| 6402H | Receive data size (byte/word length) | 0 |
| 6403H to 6602H | Receive data area (512 words) | 0 |

(f) Operate command

1) Setting items required for request message transmission

| Buffer memory address | Name | Setting value (Decimal) |
|-----------------------|------------------------------------|-------------------------|
| 9A0H | Response message classification | Not needed (0) |
| 9A1H | Visual address space data size | Not needed (0) |
| 9A2H to 9A3H | Visual address space first address | Not needed (0) |
| 6000H | Target node number | 1 to 254 |
| 6001H | Transaction code | 65010 |
| 6002H | Send data size (byte/word length) | Not needed (0) |
| 6003H to 6202H | Send data area (512 words) | Not needed (0) |

2) Items for which values are stored at response message reception

| Buffer memory address | Name | Stored value (Decimal) |
|-----------------------|--------------------------------------|--|
| C00H | Response message classification | 0: Normal response 1: Abnormal response 2: Not supported |
| C01H | Visual address space data size | 0 |
| C02H to C03H | Visual address space first address | 0 |
| 6400H | Send source node number | Value same as in request message |
| 6401H | Transaction code | 65210 |
| 6402H | Receive data size (byte/word length) | 0 |
| 6403H to 6602H | Receive data area (512 words) | 0 |

(g) Stop command

1) Setting items required for request message transmission

| Buffer memory address | Name | Setting value (Decimal) |
|-----------------------|------------------------------------|-------------------------|
| 9A0H | Response message classification | Not needed (0) |
| 9A1H | Visual address space data size | Not needed (0) |
| 9A2H to 9A3H | Visual address space first address | Not needed (0) |
| 6000H | Target node number | 1 to 254 |
| 6001H | Transaction code | 65009 |
| 6002H | Send data size (byte/word length) | Not needed (0) |
| 6003H to 6202H | Send data area (512 words) | Not needed (0) |

2) Items for which values are stored at response message reception

| Buffer memory address | Name | Stored value (Decimal) |
|-----------------------|--------------------------------------|--|
| C00H | Response message classification | 0: Normal response 1: Abnormal response 2: Not supported |
| C01H | Visual address space data size | 0 |
| C02H to C03H | Visual address space first address | 0 |
| 6400H | Send source node number | Value same as in request message |
| 6401H | Transaction code | 65209 |
| 6402H | Receive data size (byte/word length) | 0 |
| 6403H to 6602H | Receive data area (512 words) | 0 |

(h) Message return

1) Setting items required for request message transmission

| Buffer memory address | Name | Setting value (Decimal) |
|-----------------------|------------------------------------|---|
| 9A0H | Response message classification | Not needed (0) |
| 9A1H | Visual address space data size | Not needed (0) |
| 9A2H to 9A3H | Visual address space first address | Not needed (0) |
| 6000H | Target node number | 1 to 254 |
| 6001H | Transaction code | 65015 |
| 6002H | Send data size (byte/word length) | Return data size (1 to 1024 bytes/512 words) |
| 6003H to 6202H | Send data area (512 words) | Return data |

2) Items for which values are stored at response message reception

| Buffer memory address | Name | Stored value (Decimal) |
|-----------------------|--------------------------------------|--|
| C00H | Response message classification | 0: Normal response 1: Abnormal response 2: Not supported |
| C01H | Visual address space data size | 0 |
| C02H to C03H | Visual address space first address | 0 |
| 6400H | Send source node number | Value same as in request message |
| 6401H | Transaction code | 65215 |
| 6402H | Receive data size (byte/word length) | Value same as in request message |
| 6403H to 6602H | Receive data area (512 words) | Value same as in request message |

6.5.4 Sample program

The following sample programs are provided relating to cyclic transmission and transparent type message transmission.

- Programs using GX Configurator-FL
- Programs not using GX Configurator-FL.

(1) Execution environment of program examples

(a) Node 1 side

- 1) FL-net module mounting station CPU : Q25HCPU
- 2) FL-net module input/output number : X/Y000 to X/Y01F
- 3) FL-net module IP address : 192.168.250.1
(Set these in GX Developer's intelligent function module switch setting.
(Refer to Section 6.3.2.))

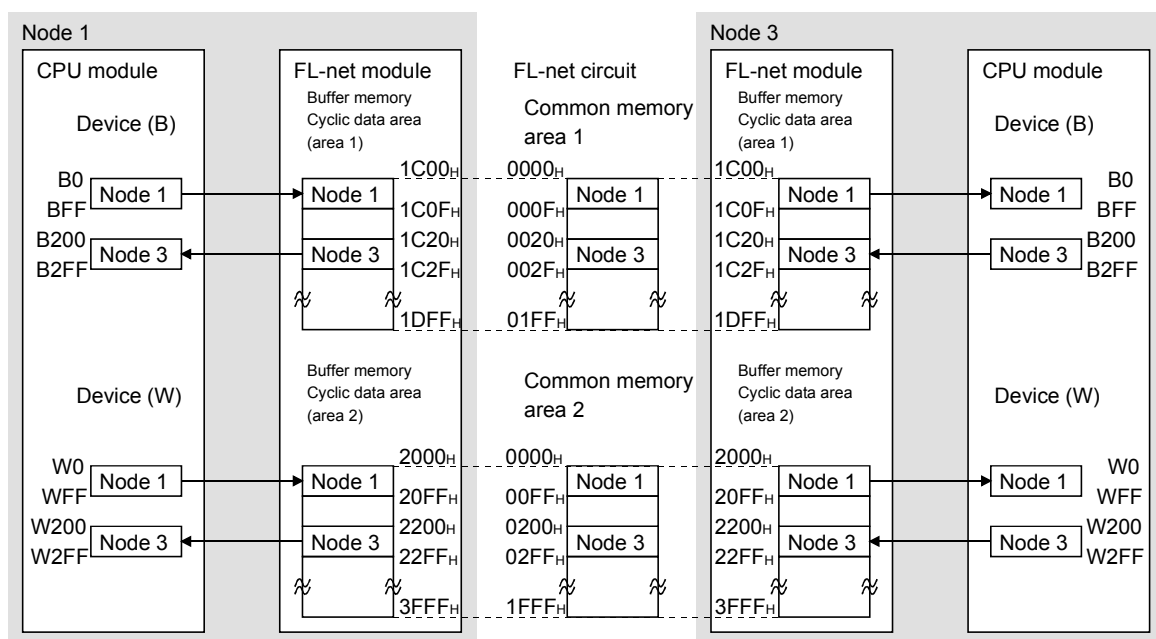
(b) Node 3 side

- 1) FL-net module mounting station CPU : Q06HCPU
- 2) FL-net module input/output number : X/Y000 to X/Y01F
- 3) FL-net module IP address : 192.168.250.3
(Set these in GX Developer's intelligent function module switch setting.
(Refer to Section 6.3.2.))

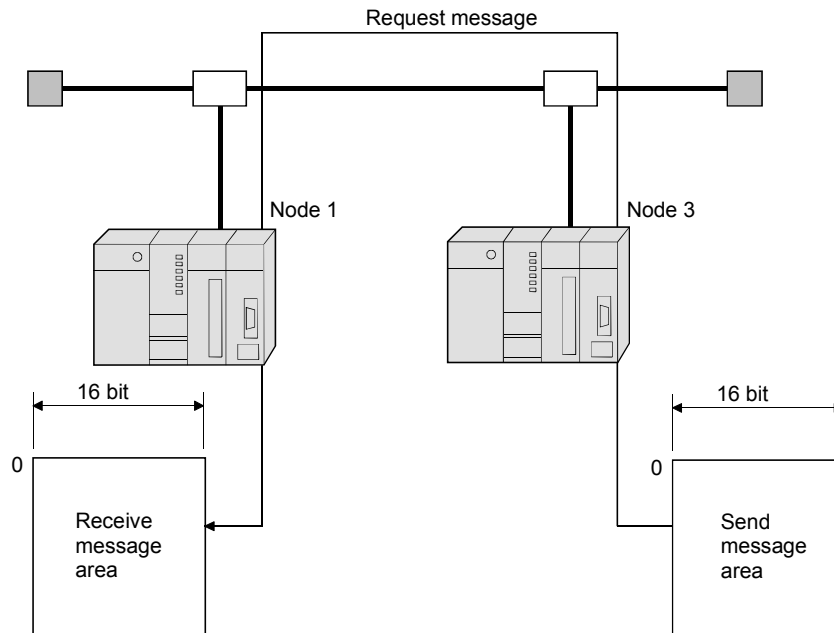
(2) Summary of program

(a) Cyclic transmission

Cyclic transmission program for node 1 ← → node 3.



(b) Transparent type message transmission
 Transparent type message transmission node 1 ← node 3.



REMARK

The cyclic data area assignment sheet is provided in this manual. (Refer to Appendix 11.)
 Please utilize the sheet for check of the cyclic data area assignment.
 The following is an example for how to fill out the form in the case of this sample program.

(1) Area 1 (bit area)

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

(2) Area 2 (word area)

| Node No. | FL-net circuit | FL-net module | | | CPU module | Remark |
|----------|---------------------------------------|---------------------------------------|------------------------|---------------|-----------------|------------|
| | Common memory address (0000 to 1FFFH) | Buffer memory address (2000 to 3FFFH) | Data size (Word units) | Buffer offset | PLC side device | |
| 1 | 0000 to 00FFH | 2000 to 20FFH | 256 | 0 | W0 to WFF | |
| 3 | 0200 to 02FFH | 2200 to 22FFH | 256 | 512 | W200 to W2FF | Local node |

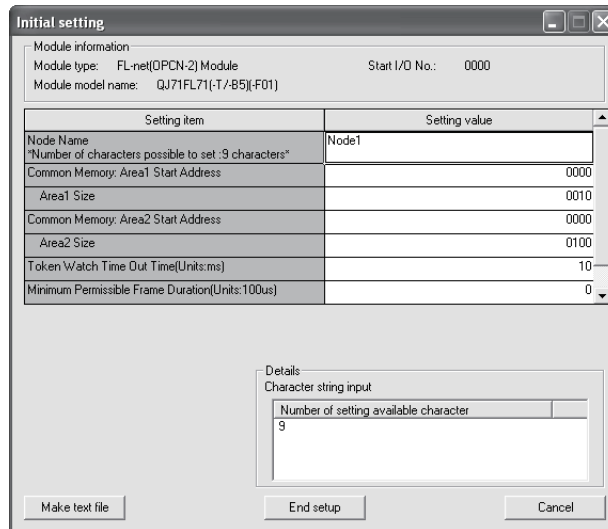
(3) Example of program that used GX Configurator-FL

(a) Node 1

1) GX Configurator-FL operation

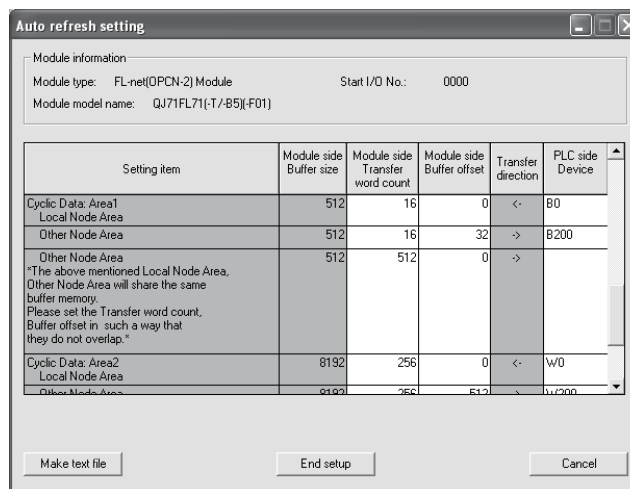
- Initial settings (Refer to Section 6.4.8)

Set as follows: node name to node 1, area 1 first address to 0000H, area 1 size to 10H, area 2 first address to 0000H, area 2 size to 100H.



- Auto refresh setting (Refer to Section 6.4.9)

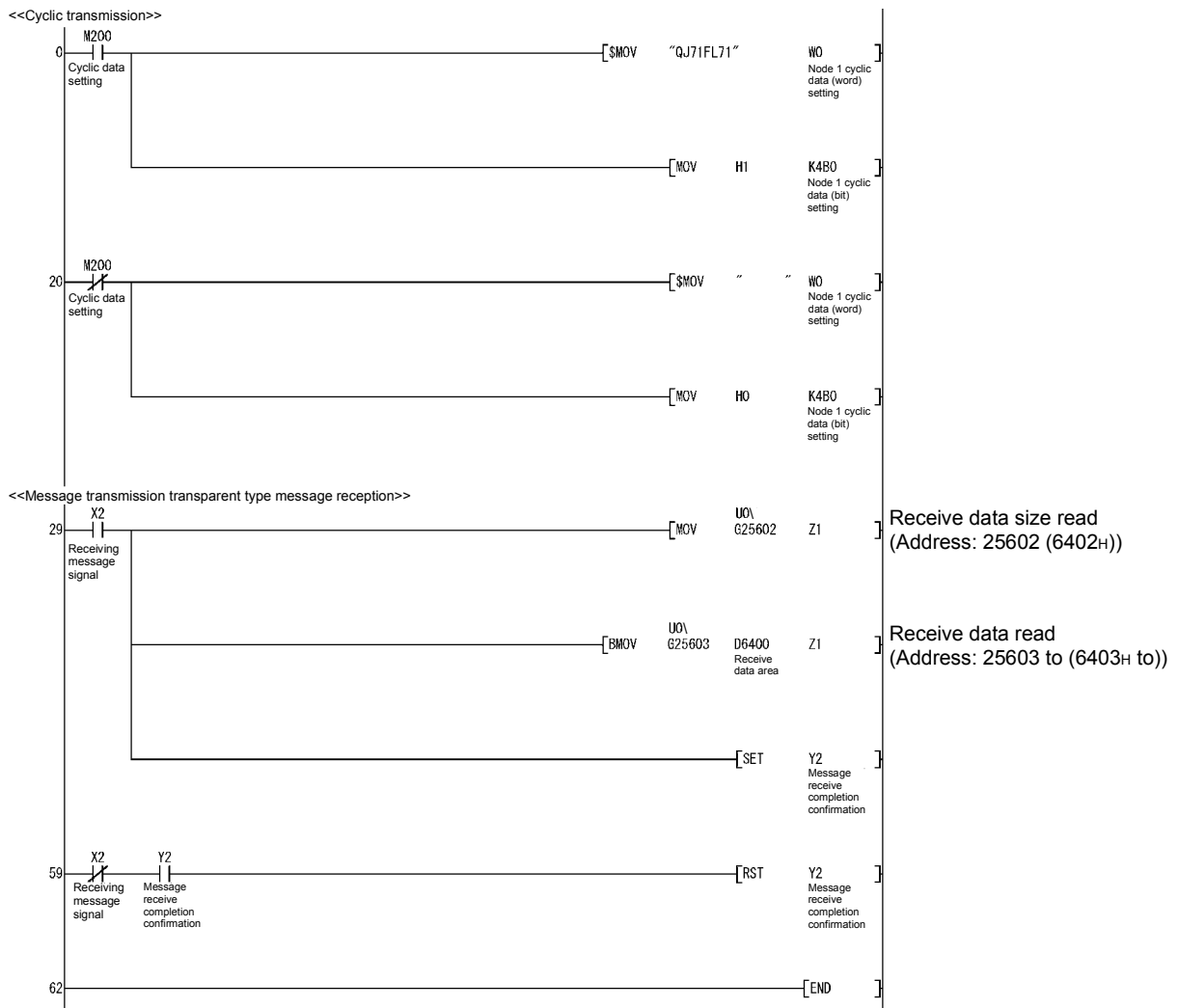
| Setting item | | Module side Transfer word count | Module side Buffer offset | PLC side Device |
|---------------------|-----------------|---------------------------------|---------------------------|-----------------|
| Cyclic Data: Area 1 | Local Node Area | 16 | 0 | B0 |
| | Other Node Area | 16 | 32 | B200 |
| Cyclic Data: Area 2 | Local Node Area | 256 | 0 | W0 |
| | Other Node Area | 256 | 512 | W200 |



- Writing of intelligent function module parameters (Refer to Section 6.4.7)

The intelligent function module parameters are written to the CPU module. Operations are executed on the parameter setting module selection screen.

2) Program example

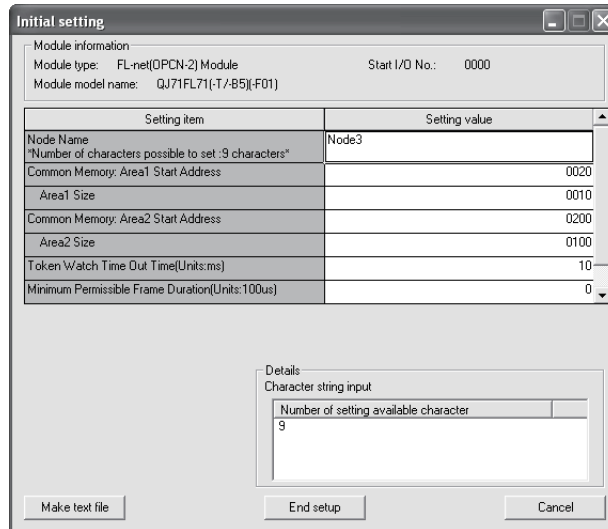


(b) Node 3

1) GX Configurator-FL operations

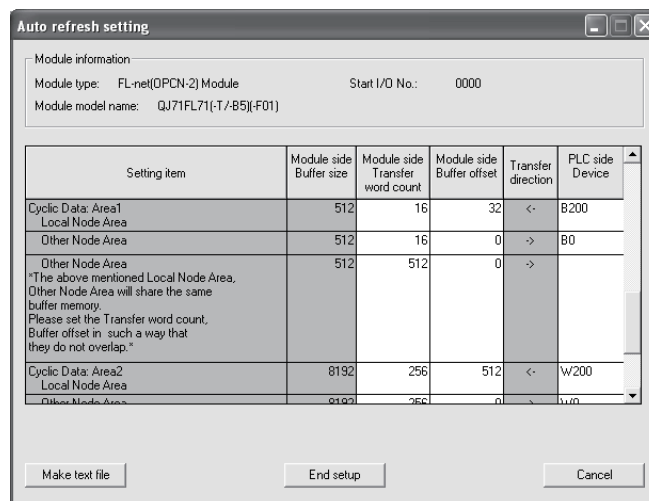
- Initial settings (Refer to Section 6.4.8)

Set as follows: node name to node 3, area 1 first address to 0020H, area 1 size to 10H, area 2 first address to 0200H, area 2 size to 100H.



- Auto refresh setting (Refer to Section 6.4.9)

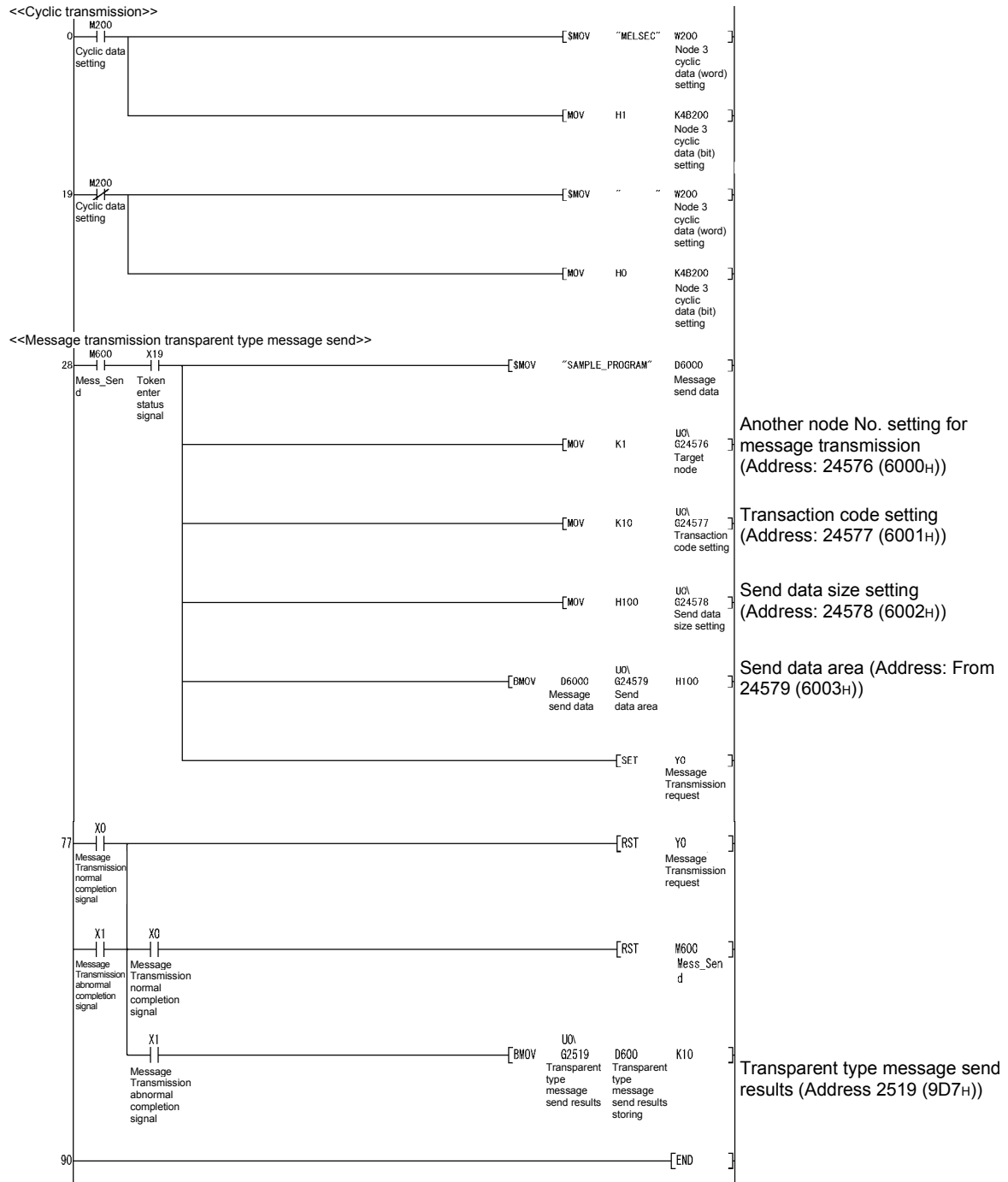
| Setting item | | Module side Transfer word count | Module side Buffer offset | PLC side Device |
|------------------------|-----------------|------------------------------------|------------------------------|-----------------|
| Cyclic Data: Area 1 | Local Node Area | 16 | 32 | B200 |
| | Other Node Area | 16 | 0 | B0 |
| Cyclic Data: Area 2 | Local Node Area | 256 | 512 | W200 |
| | Other Node Area | 256 | 0 | W0 |



- Writing of intelligent function module parameters (Refer to Section 6.4.7)

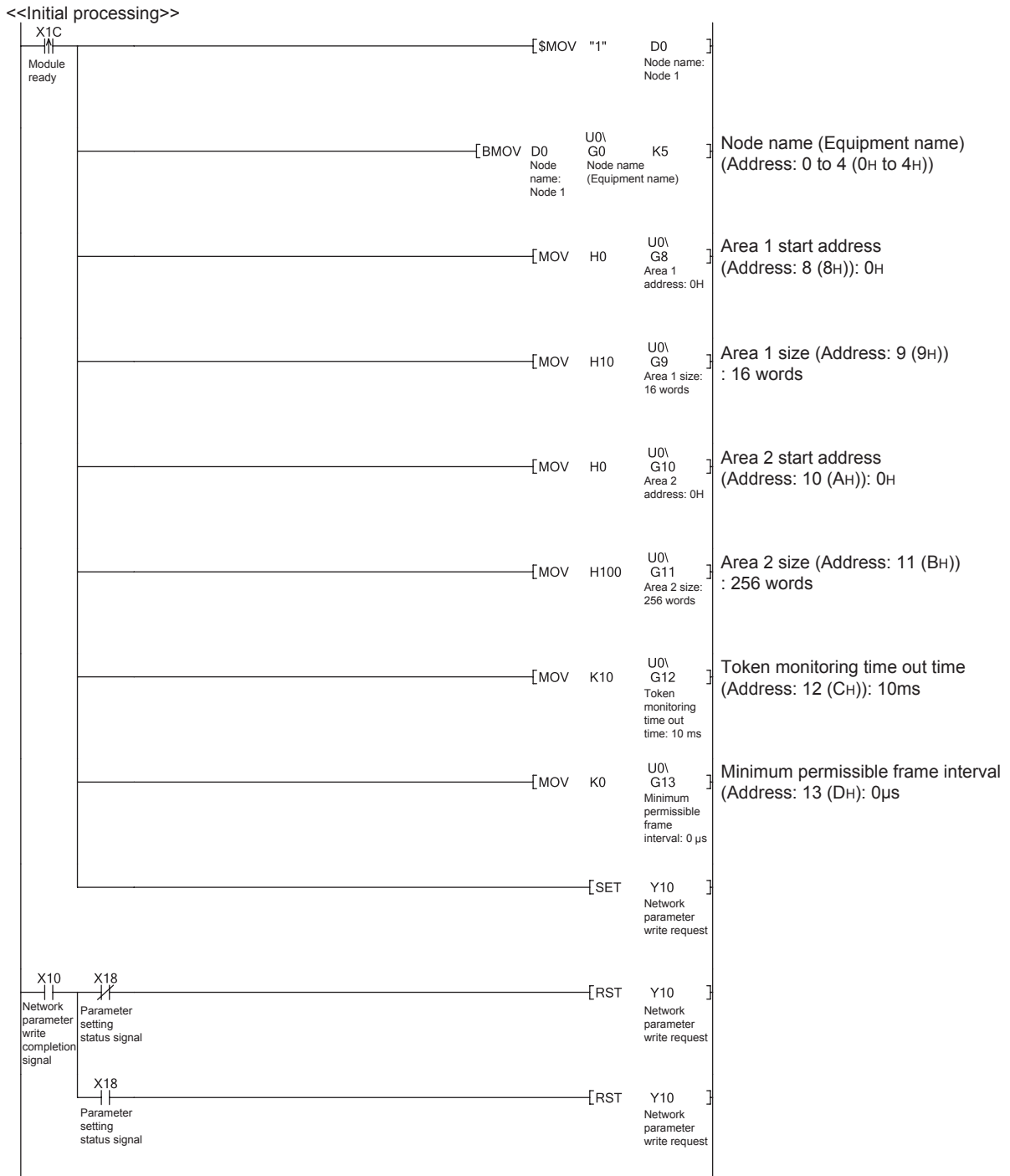
The intelligent function module parameters are written to the CPU module. Operations are executed on the parameter setting module selection screen.

2) Program example

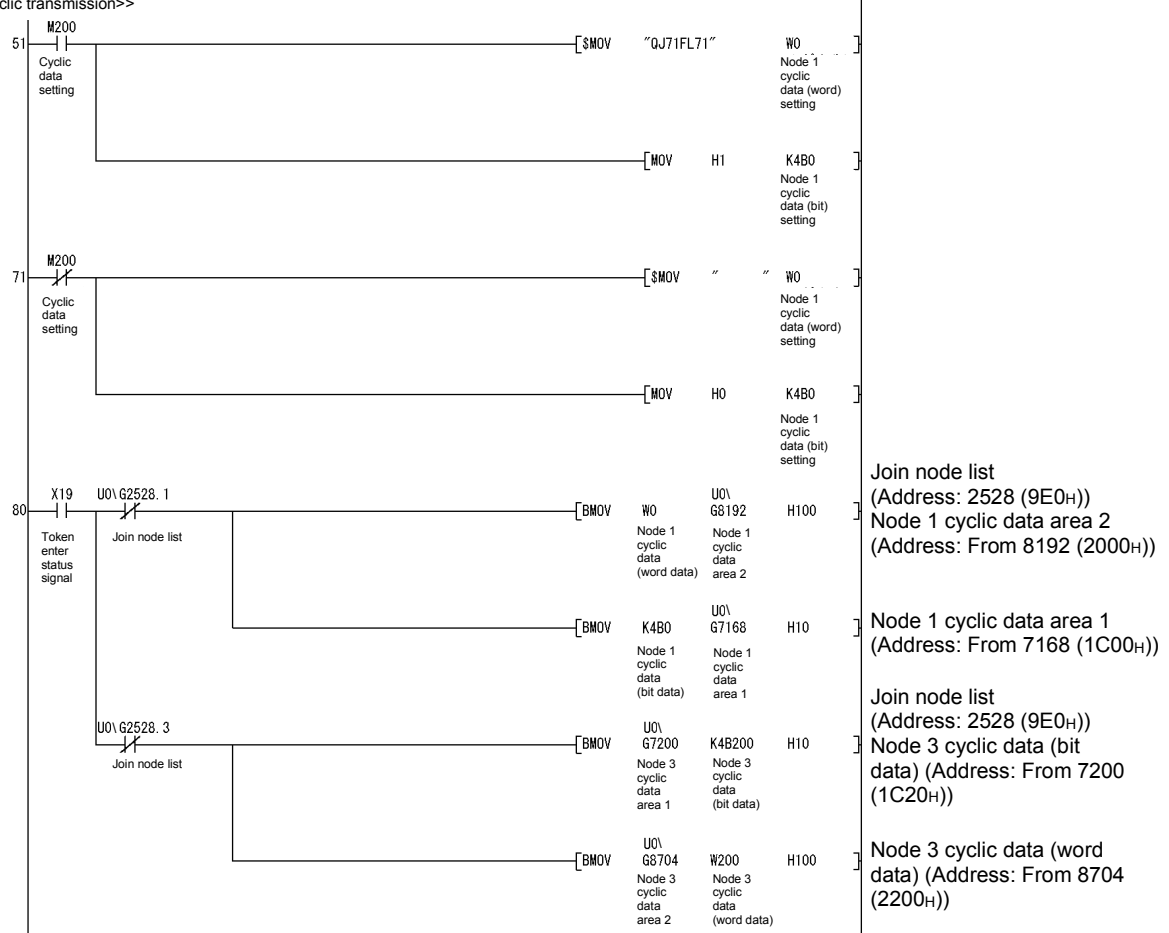


(4) Example of program not using GX Configurator-FL

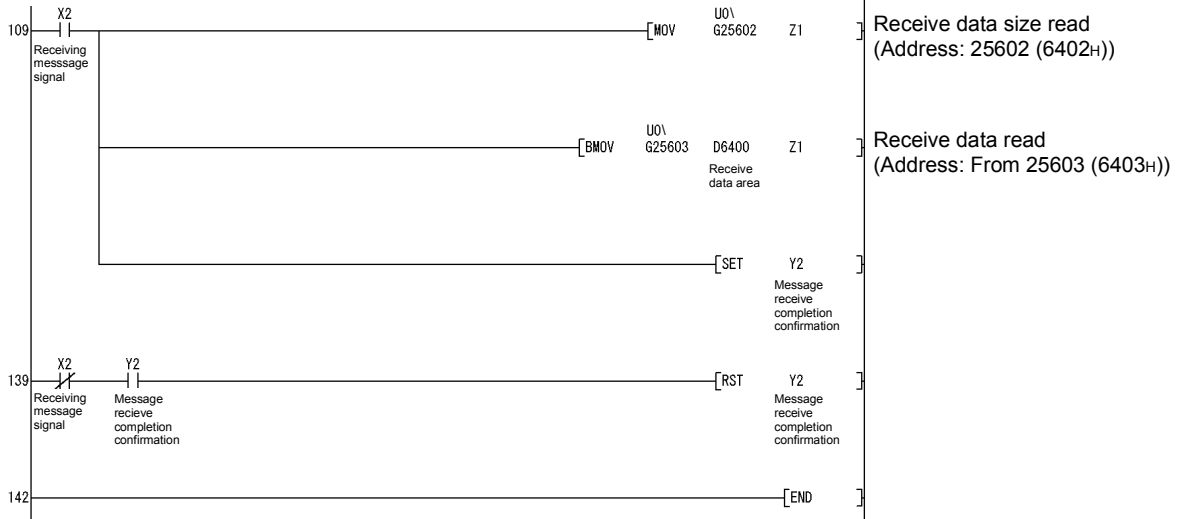
(a) Node 1 side



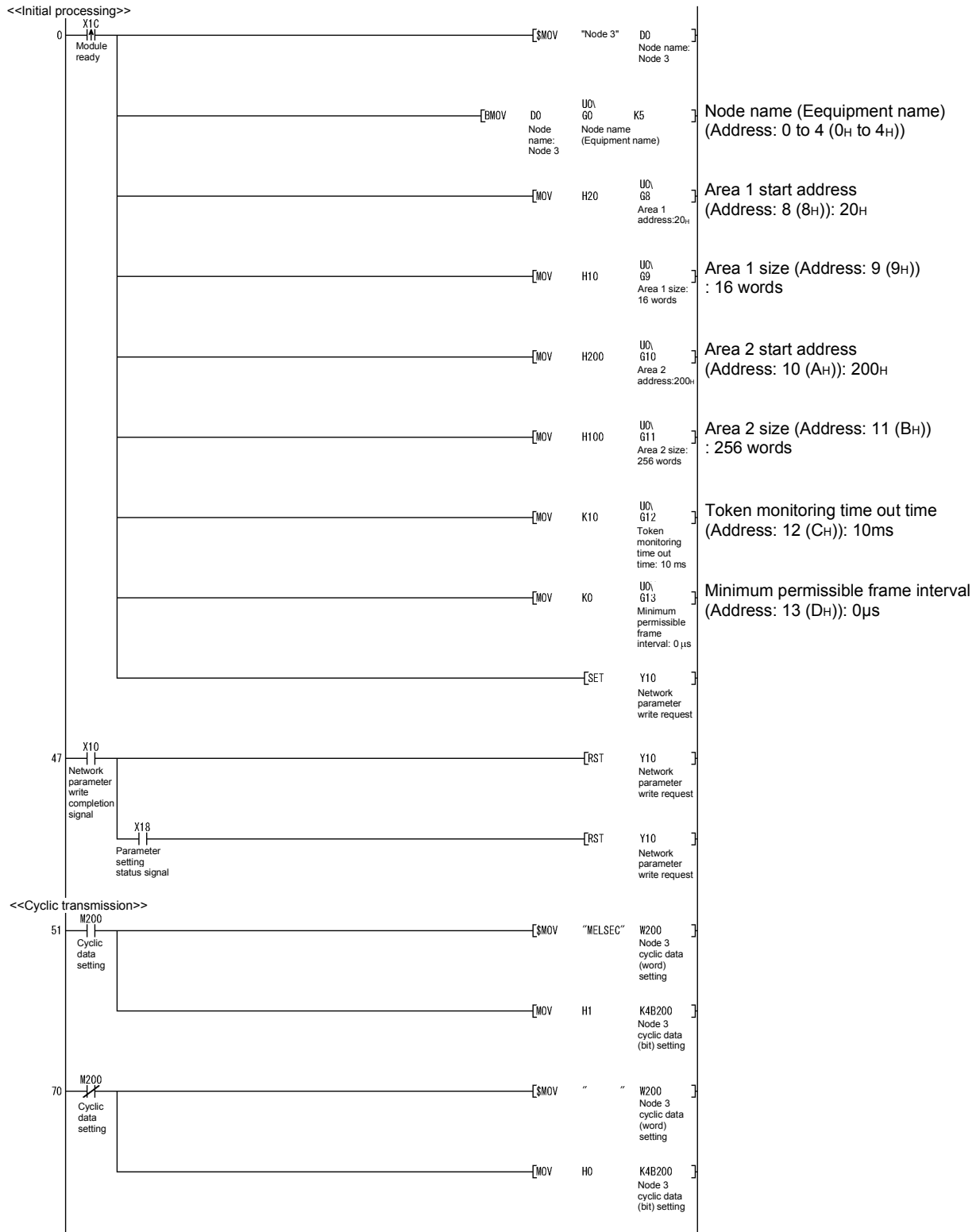
<<Cyclic transmission>>

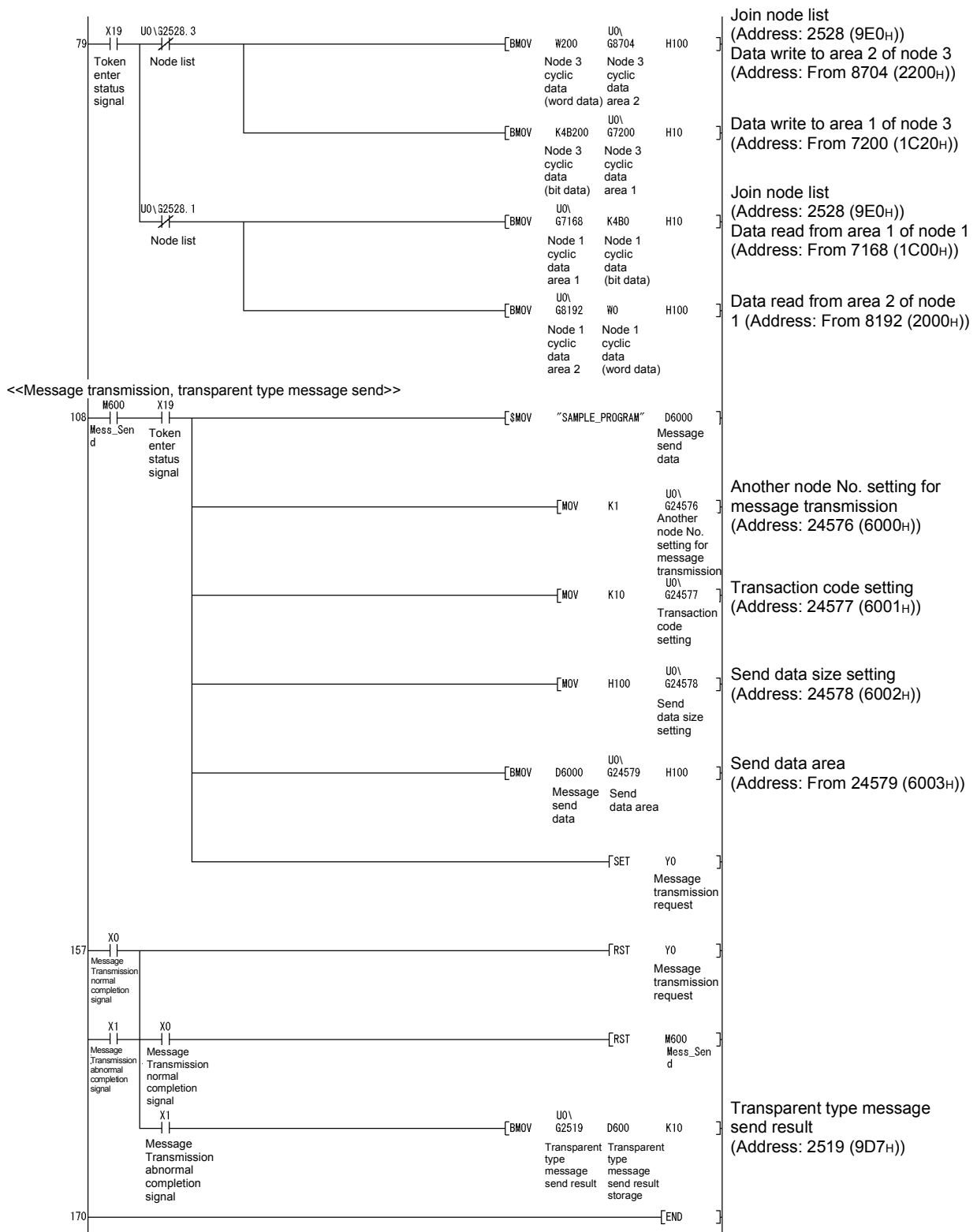


<<Message transmission, transparent type message reception>>



(b) Node 3





7 MAINTENANCE AND INSPECTION

This chapter explains the procedures for maintaining, inspecting and removing the FL-net module.

7.1 Maintenance and Inspection

Other than checking the terminator and cable connections are not loose, there are no specific inspection items for the FL-net module. For the other areas, implement the inspection procedures described in the user's manual for the programmable controller CPU module to maintain the optimum system performance.



WARNING

- Never touch the terminals or connectors while the power is on. Electrical shock or malfunctioning could result.
- Never touch the connectors inside the covered area at the top of the module. Damage or malfunctioning of the module could result.
- Shut off the power supply to the programmable controller and the external power supply to the FL-net (OPCN-2) system in all phases before cleaning or retightening terminal screws or module fixing screws.
If all phases are not turned off, damage or malfunctioning of the module could occur.
If the screws are loose, it could result in a short, malfunction or cause the module to fall off of its mounting. Conversely, if the screws are too tight, the resulting damage to the screw or module could result in a short, malfunction or cause the module to fall off its mounting.
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module.
Failure to do so may cause a failure or malfunctions of the module.



CAUTION

- Never allow foreign material, such as metal particles or small pieces of wire, to enter the module. It could cause malfunctioning, damage or fire.
- Never disassemble or modify the module. It could cause malfunctioning, damage, injury or fire.

7.2 Removing the Module

Before performing the following operations, read and understand Section 4.2 "Safety precautions during operation." Always keep safety top priority during operation. The following is the procedure for removing the FL-net module.

<Operating procedure when changing the FL-net module>

- (Step 1) Turn the power for the station to which the FL-net module is mounted to OFF.
- (Step 2) Remove the network cable and FL-net module.
- (Step 3) Follow the instructions in Section 6.3.1 "Procedures up to operation" and start the FL-net module.

<Procedure when changing the CPU>

- (Step 1) Use GX Developer to write and save settings related to the FL-net module (I/O tables, IP addresses) and sequence program. (*1)
- (Step 2) Replace the CPU module. (Refer to the user's manual for the CPU module.)
- (Step 3) Write the settings for the FL-net module and sequence program that were saved in GX Developer 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.

8 TROUBLESHOOTING

This chapter explains the errors that can occur with the FL-net module and the troubleshooting procedures.

8.1 Is It Really an Error?

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

| | Contents |
|----|--|
| 1 | Is the module properly mounted? |
| 2 | Have the settings from the GX Developer been properly set for the module? |
| 3 | Has the common memory area been properly set? |
| 4 | Is there any looseness or other abnormalities with the connections for the module? |
| 5 | Are the communication cables properly connected? |
| 6 | Is the terminal resistance for the 10BASE5/10BASE2 cable connected? |
| 7 | Is the ground for the 10BASE5/10BASE2 cable connected? |
| 8 | Is a cross cable being used for 10BASE-T/100BASE-TX cable? |
| 9 | Does the cable meet Category 5 specifications? |
| 10 | Is the power on for the Ethernet hub and repeater? |

8.2 Solutions to General Network Problems

(1) When there is no communication

Check and inspect the following items when there is no communication with the FL-net module.

| Location | Item to check | Solution |
|--|--|--|
| Power supply | Is the [Power] LED for the power supply for the programmable controller on? | Check the power supply, voltage and if the power supply cable has been pulled out. |
| | Is the [RUN] LED for the FL-net module on? | Check the power supply, voltage and if the power supply cable has been pulled out. |
| | Is the power supply lamp for the AUI power supply module on? | Check the power supply, voltage and if the power supply cable has been pulled out. |
| | Is the output of the power supply for the AUI power supply module the specified voltage (12V)? | Check the power supply, voltage and if the power supply cable has been pulled out. |
| | Is the power supply lamp for the HUB on? | Check the power supply, voltage and if the power supply cable has been pulled out. |
| | Is the power supply cable for AUI properly connected to the equipment? | Check the power supply, voltage and if the power supply cable has been pulled out. |
| Communication cable and transceiver connection | Are any of the mountings for the transceiver unsteady? | Reinstall. |
| | Is there an error in the equipment used for checking the installation status of the transceiver? | Adjust until normal. If the problem persists, install in a different location. |
| | Is the transceiver properly insulated? | Reinstall. |
| | Is the transceiver properly mounted to the markers of the communication cable? | Reevaluate the installation location. |
| Transceiver cable and transceiver connection | Are any of the mountings for the transceiver cable unsteady? | Reexamine. Tighten as necessary. |
| | Is there an error in the equipment used for checking the installation status of the transceiver? | Follow the procedures in the operating manual for the inspection equipment and check the installation. |
| | Is the transceiver properly locked? | Properly lock. |
| | Do the LEDs for the transceiver indicate normal operation? | Check the power supply, voltage and if the power supply cable has been pulled out. |
| Transceiver cable and equipment connection | Are any of the mountings for the transceiver cable unsteady? | Reexamine. Tighten as necessary. |
| | Do the [TX] (send) and [RX] (receive) LEDs indicate normal operation? | Check the description of the error. |
| | Have the media selection switches (SQE, etc.) been properly set? | Reexamine the settings. |

(2) When communication is unsteady

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

| Location | Item to check | Solution |
|--|--|---|
| Transmission route confirmation | Is one point of the outer conductor of the coaxial cable grounded? | Properly ground. |
| | Is the shield wire of the AUI cable properly grounded? | Ground according to procedure shown in manufacturer's operation manual. |
| | Does each station properly respond to the PING command? | Check the power supply and cables for each station that does not respond. |
| | Does the collision lamp come on frequently? | Check the connections of the cable and connectors. Check the errors with an analyzer. |
| | Are the repeaters four stages or less? | Reevaluate the design. |
| | Is each segment within the specified length? | Reevaluate the design. |
| | Are two terminal registers used at both ends? | Reevaluate the design. |
| | Is the number of equipment connected in a segment within the specified limits? | Reevaluate the design. |
| | Are there three segments or less connecting the equipment? | 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. |
| Confirmation of equipment settings for stations participating in communication | Is the network IP address properly set? | Reconfirm the IP address that has been set using support tool and analyzers. |
| | Is the station number for the equipment properly set? | Reconfirm the station 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 [TX](Send) 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. |

(3) Checking for completion of the initial processing by "PING 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.

```
\> ping IP address
```

The following is an example of a program.

(Example) FL-net module IP address: 192.0.1.254

Normal screen

```
C:\>ping 192.0.1.254   ··· ping command execution

Pinging 192.0.1.254 with 32 bytes of data:

Reply from 192.0.1.254: bytes=32 time=1ms TTL=128
Reply from 192.0.1.254: bytes=32 time<10ms TTL=128
Reply from 192.0.1.254: bytes=32 time<10ms TTL=128
Reply from 192.0.1.254: bytes=32 time<10ms TTL=128

Ping statistics for 192.0.1.254:
    Packets: Sent = 4, Received = 4, Lost = 0 (0 % loss)
Approximate round trip times in milli-seconds:
    Minimum = 0 ms, Maximum = 1ms, Average = 0 ms

C:\>_
```

Error screen

```
C:\>ping 192.0.1.254   ··· ping command execution

Pinging 192.0.1.254 with 32 bytes of data:

Request timed out:
Request timed out:
Request timed out:
Request timed out:

Ping statistics for 192.0.1.254:
    Packets: Sent = 4, Received = 0, Lost = 4 (100 % loss)
Approximate round trip times in milli-seconds:
    Minimum = 0 ms, Maximum = 0 ms, Average = 0 ms

C:\>_
```

8.3 FL-net (OPCN-2) General Precautions

Refer to IEEE802.3 for the specifications relating to the transmission route of the FL-net (OPCN-2).

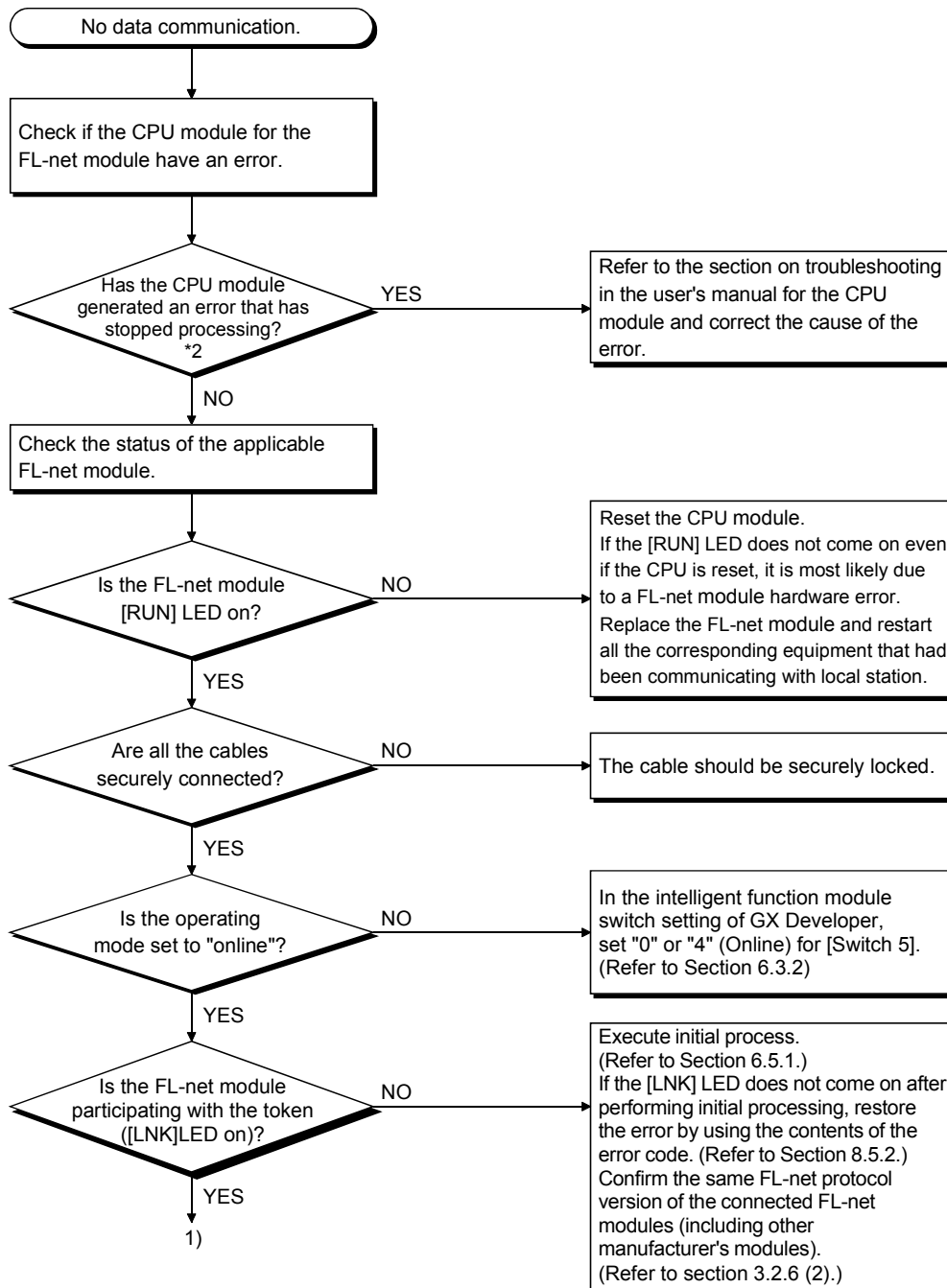
In addition to these, the following are restrictions and precautions unique to the FL-net (OPCN-2).

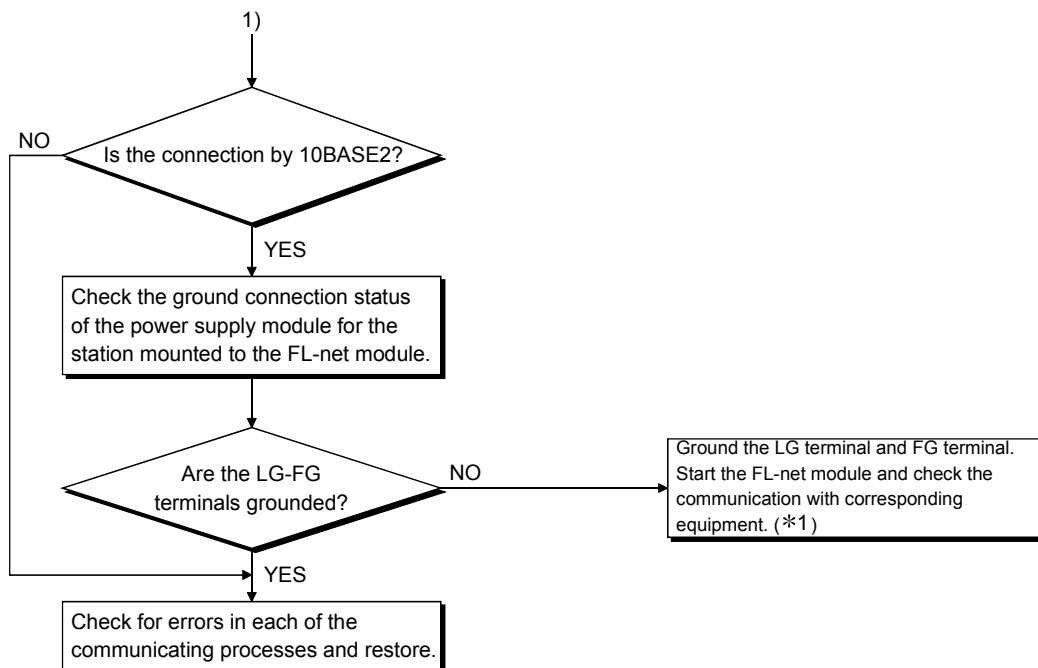
| | Contents | | | | | |
|---|--|--|-----------------|-------------|-------------|----------|
| 1 | Other Ethernet data shall not be handled on communication cables for the FL-net (OPCN-2). | | | | | |
| 2 | Do not connect FL-net (OPCN-2) to a router. | | | | | |
| 3 | A switching HUB will not have any effect even if used for FL-net (OPCN-2). | | | | | |
| 4 | The real-time characteristics of the communication will be dramatically reduced if infrared or other types of wireless media are used. | | | | | |
| 5 | 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. | | | | | |
| 6 | 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. | <table border="1"> <thead> <tr> <th>Network address</th> <th>Node Number</th> </tr> </thead> <tbody> <tr> <td>192.168.250</td> <td>1 to 249</td> </tr> </tbody> </table> | Network address | Node Number | 192.168.250 | 1 to 249 |
| | Network address | Node Number | | | | |
| 192.168.250 | 1 to 249 | | | | | |
| 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. | | | | | | |
| 7 | Always provide a proper ground. Be sure to use a heavy gauge ground wire. | | | | | |
| 8 | Always install FL-net (OPCN-2) away from sources of electrical noise. Avoid routing cables alongside power cords. | | | | | |
| 9 | 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. | | | | | |
| 10 | There is no need to continue and keep the cyclic data communication area (common memory area). | | | | | |
| 11 | If there is SQE switch mounted to the transceiver, follow the operator's manual for proper setting. | | | | | |
| 12 | 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. | | | | | |
| 13 | 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).) | | | | | |

8.4 Troubleshooting Flowchart

(1) When data communication is not available

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



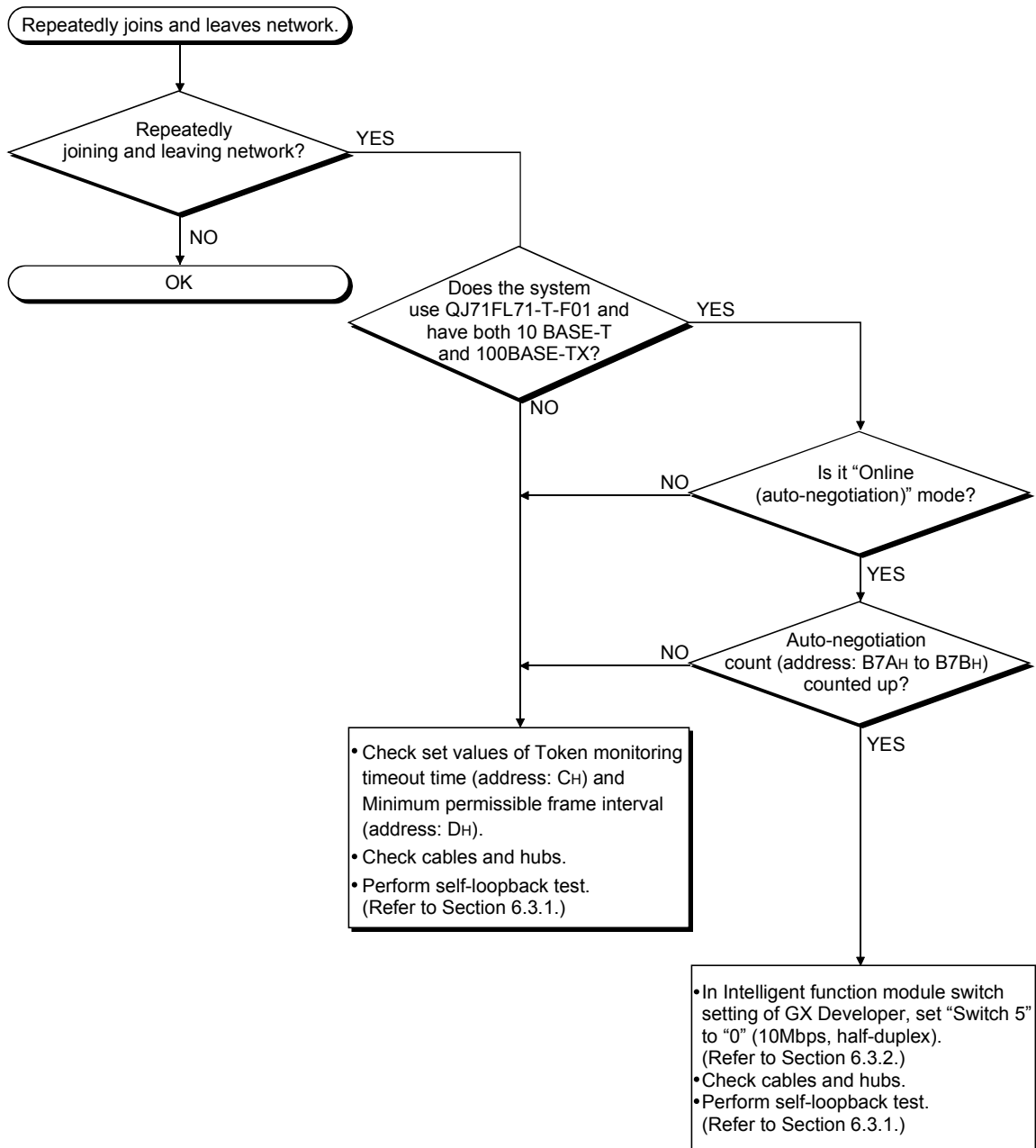


*1 When the LG terminal and FG terminal for the power supply module for the station to which the FL-net module is mounted have not been set, the communication line may close because of noise stopping communication with corresponding equipment. Turn off the power supply to the station for the FL-net module 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 SP.UNIT DOWN(1403) 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).

(2) 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.



8.5 Errors and Their Solutions

This section explains FL-net module errors and their solutions.

REMARK

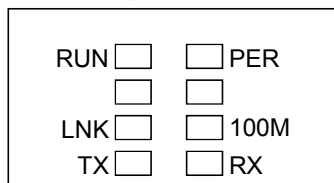
If line errors occur when equipment from different manufacturers are connected, Sort out the causes with a line analyzer or such equipment.

8.5.1 Confirming errors using the LEDs

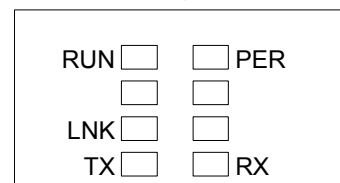
The following explains how to confirm errors using the LEDs in the front of the FL-net module.

The following can be confirmed by using the LEDs in the front of the FL-net module.

The QJ71FL71-T-F01



Other than the QJ71FL71-T-F01



| LED name | Confirmation status | Cause/solution |
|----------|---|---|
| [RUN] | Goes off after power supply for programmable controller is turned on. | 1) Watchdog timer error <ul style="list-style-type: none"> The watchdog timer error detection signal (X1F) is set to on by the self-diagnosis function of the FL-net module when there has been a watchdog timer error (approx. 500 ms). 2) FL-net module mounting defect <ul style="list-style-type: none"> Confirm that there is sufficient power supply capacity (5 V DC). Turn the power off and mount the module. |
| [PER] | Goes on after power supply for programmable controller is turned on. | 1) FL-net module setting error Check the following settings. <ul style="list-style-type: none"> Mode Node number Common memory first address / size setting 2) FL-net module error (* ¹) |
| [TX] | [TX] LED is not flashing during [LNK] LED is on. | 1) [PER] LED on <ul style="list-style-type: none"> Remove the cause of the [PER] LED coming on. 2) Reevaluate the program <ul style="list-style-type: none"> Reexamine the network parameter settings. |

*1: Perform a hardware test to determine whether or not the FL-net module is operating normally.(Refer to Section 6.3.1 (1).)

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| | LED name | Confirmation status | Cause/solution |
|---|----------|---|--|
| 4 | [RX] | [RX] LED is off and cannot receive data | <ol style="list-style-type: none">1) [PER] LED on<ul style="list-style-type: none">• Remove the cause of the [PER] LED coming on.2) Defective cable connection<ul style="list-style-type: none">• Check the cable connections.(*²)3) Local station IP address error<ul style="list-style-type: none">• If no problem was found with the cable connection, reexamine the IP address settings for the FL-net module. |

*2: Perform a loopback test to determine if there is a problem with the cable connections or the Ethernet line.
(Refer to Section 6.3.1.(1))

8.5.2 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 Developer. (Refer to Section 8.6.)

(1) Error code list

| Error code | Contents |
|----------------|--------------------------------------|
| 0H | Normal |
| 3E8H to 4FFFH | CPU module detecting error number |
| C000H to CFFFH | FL-net module detection error number |

(2) 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. The relationship between the descriptive name used for the "destination storage" and the buffer memory area is shown below. (Error codes without the destination storage are error codes to be returned to the corresponding equipment.)

| Descriptive name | Buffer memory | Buffer memory address |
|-------------------|---|-----------------------|
| Switch | Intelligent function module switch setting status | 9C6H |
| Parameter setting | Network parameter setting status | 9D2H |
| Parameter results | Network parameter read results | 9D3H |
| Profile results | Device profile read results | 9D4H |
| Log clear results | Log data clear results | 9D5H |
| Log data results | Log data read results | 9D6H |
| Message results | Transparent message transmission results | 9D7H |

| Error code | Description of error | Corrective action | Destination storage | | | | | | |
|----------------|--|---|---------------------|--------------------|--------------------|-----------------|-------------------|------------------|-----------------|
| | | | Switch | Parameter settings | Parameter settings | Profile results | Log clear results | Log data results | Message results |
| | | | 9C6H | 9D2H | 9D3H | 9D4H | 9D5H | 9D6H | 9D7H |
| 3E8H to 3FFFH | (Error detected by CPU module) | • Refer to the troubleshooting section of the CPU user's manual and take an appropriate action. | | | | | | | |
| 4000H to 4FFFH | (Error detected by CPU module) | • Refer to the Appendix of the QCPU user's manual and take an appropriate action. | | | | | | | |
| C001H | FL-net module's OS error | • Replace the FL-net module. | | | | | | | |
| C003H | Wrong IP address (network address) setting | • Correct the IP address. | ○ | | | | | | |
| C004H | Wrong IP address (host address) setting | • Correct the IP address. | ○ | | | | | | |

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| Error code | Description of error | Corrective action | Storage destination | | | | | | | |
|------------|--|--|---------------------|--------------------|--------------------|-----------------|-------------------|------------------|-----------------|--|
| | | | Switch | Parameter settings | Parameter settings | Profile results | Log clear results | Log data results | Message results | |
| | | | 9C6H | 9D2H | 9D3H | 9D4H | 9D5H | 9D6H | 9D7H | |
| C005H | Wrong mode number setting | • Correct the mode number. | ○ | | | | | | | |
| C021H | Wrong IP address (network address) setting | • Correct the IP address. | | ○ | | | | | | |
| C022H | Wrong IP address (host address) setting | • Correct the IP address. | | ○ | | | | | | |
| C023H | Wrong setting value for common memory area 1 first address | • Correct setting value for common memory area 1 first address and perform initial process again. | | ○ | | | | | | |
| C024H | Wrong setting value for common memory area 1 size | • Correct setting value for common memory area 1 size and perform initial process again. | | ○ | | | | | | |
| C025H | Setting value for common memory area 1 first address and size out of permissible range | • Correct setting value for common memory area 1 first address and size and perform initial process again. | | ○ | | | | | | |
| C026H | Wrong setting value for common memory area 2 first address | • Correct setting value for common memory area 2 first address and perform initial process again. | | ○ | | | | | | |
| C027H | Wrong setting value for common memory area 2 size | • Correct setting value for common memory area 2 size and perform initial process again. | | ○ | | | | | | |
| C028H | Setting value for common memory area 2 first address and size out of permissible range | • Correct setting value for common memory area 2 first address and size and perform initial process again. | | ○ | | | | | | |
| C029H | Wrong setting value for token monitoring time out time | • Correct setting value for token monitoring time out time and perform initial process again. | | ○ | | | | | | |
| C02AH | Wrong setting value for minimum permissible frame interval | • Correct setting value for minimum permissible frame interval and perform initial process again. | | ○ | | | | | | |
| C02CH | Setting for common memory area overlaps other node setting range | • Correct setting value for common memory. | | ○ | | | | | | |
| C02DH | Wrong message data unit selection | • Correct selection for message data unit. | | ○ | | | | | | |
| C104H | 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. | | | | | | | | |
| C105H | 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. | | | | | | | | |
| C106H | 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. | | | | | | | | |

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| Error code | Description of error | Corrective action | Storage destination | | | | | | |
|------------|--|---|---------------------|----------------------------|----------------------------|-------------------------|---------------------------|--------------------------|-------------------------|
| | | | Switch 9C6H | Parameter settings 9D2H | Parameter settings 9D3H | Profile results 9D4H | Log clear results 9D5H | Log data results 9D6H | Message results 9D7H |
| C107H | 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. | | | | | | | |
| C108H | 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. | | | | | | | |
| C112H | 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. | | | | | | | |
| C321H | Setting value for target node number out of permissible range | • Correct setting value for applicable target node number. | | | ○ | ○ | ○ | ○ | ○ |
| C322H | Target node does not exist | • Correct setting value for applicable target node number. • Confirm operation of corresponding equipment. | | | ○ | ○ | ○ | ○ | ○ |
| C323H | No response from target node for 10 seconds or more | • Correct setting value for applicable target node number. • Confirm operation of corresponding equipment. | | | ○ | ○ | ○ | ○ | ○ |
| C324H | Error in send data | • Correct send data. | | | | | | | ○ |
| C325H | FL-net module does not support process indicated in transaction code | • Correct transaction code. | | | | | | | ○ |
| C326H | No empty capacity in target node buffer | • Create space and re-execute. | | | ○ | ○ | ○ | ○ | ○ |
| C327H | Request is broadcast message | • Correct the node number. | | | | ○ | | | |
| C328H | Not joining in token | • Check the status of the programmable controller and wire status. • Re-evaluate the settings for the initial process. | | | ○ | ○ | ○ | ○ | ○ |
| C329H | Transaction code is X/Y handshake specification | • Correct the transaction code. | | | | | | | ○ |
| C421H | Setting value for virtual address space word length out of permissible range | • Re-evaluate the request data. | | | | | | | ○ |
| C422H | Address setting value for virtual address space out of permissible range | • Re-evaluate the request data. | | | | | | | ○ |
| C423H | Word block read request data size is not "0" | • Re-evaluate the request data. | | | | | | | ○ |

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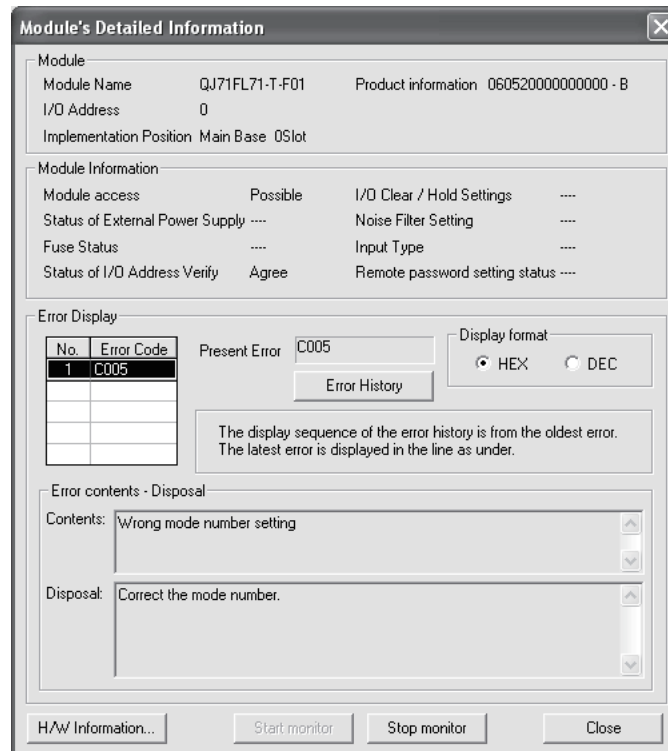
| Error code | Description of error | Corrective action | Storage destination | | | | | | |
|------------|--|--|---------------------|----------------------------|----------------------------|-------------------------|---------------------------|--------------------------|-------------------------|
| | | | Switch 9C6H | Parameter settings 9D2H | Parameter settings 9D3H | Profile results 9D4H | Log clear results 9D5H | Log data results 9D6H | Message results 9D7H |
| C424H | Byte length for receive message out of permissible range | • Re-evaluate the request data. | | | | | | | <input type="radio"/> |
| C425H | Address setting for receive message range out of permissible range | • Re-evaluate the request data. | | | | | | | <input type="radio"/> |
| C42BH | No response from other node for 10 seconds or more | • Re-evaluate the source node for the address. | | | | | | | <input type="radio"/> |
| C501H | Self-loopback error | • Re-evaluate the cable. | | | | | | | |
| C502H | Hardware error | • Replace the FL-net module. | | | | | | | |
| C503H | Hardware error | • Replace the FL-net module. | | | | | | | |

8.6 System Monitor

The FL-net module status can be checked from system monitor.

(1) Startup procedure

GX Developer → [Diagnostics] → [System monitor...] →
Module's Detailed Information



(2) Display details

| Item | Description | |
|-------------------------|------------------------------|--|
| Module | Module Name | Displays the model name of the target module. |
| | I/O Address | Displays the start I/O No. of the target module. |
| | Implementation Position | Displays the slot position in which the module is installed. |
| | Product information | Displays serial No. and function version of the target module. *1 |
| Module Information | Module access | Displays that it is accessible when Module ready (X1C) is ON, or when Watch dog timer error detection signal (X1F) is OFF. |
| | Status of I/O Address Verify | Displays whether the module for which the user has set parameters matches the one installed or not. |
| Error Display | Present Error | Displays an error code of the latest error. (Refer to Section 8.5.2.) |
| | Error Display | Displays the latest 16 error codes stored in the buffer memory (Address: 9C6H, 9D2H to 9D7H). |
| Error contents-Disposal | Contents | For the error code selected at Error Display, displays the error description and its corrective action. *2 |
| | Disposal | |

*1: The suffix of Product information shows the function version of the module.

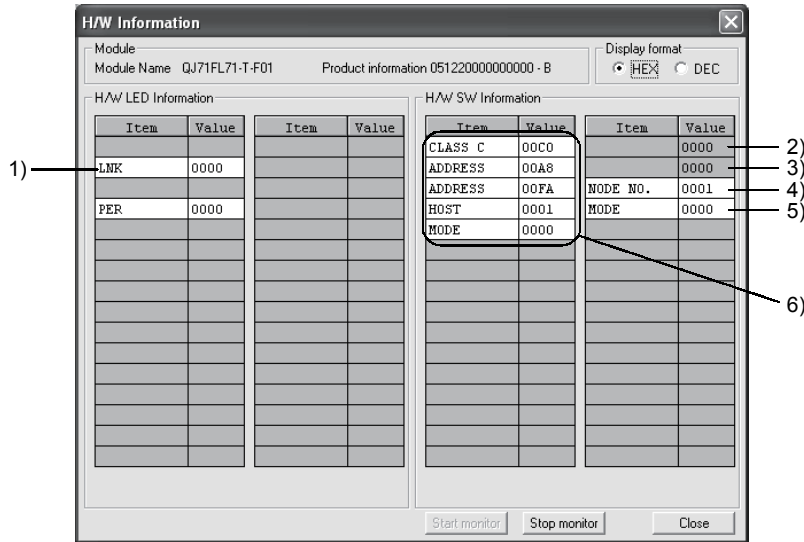
Example: The suffix of "B" means that the module is function version B.

*2: The Error contents-Disposal is displayed in GX Developer Version 8.17T or later.

8.7 H/W Information

Details about FL-net module LED information and switch information can be monitored using H/W information on GX Developer. To display Hardware data, select: Diagnosis → System monitor → Module detailed information and click **H/W Information...**.

The H/W information will be shown on the following screen.



The following items are shown.

- 1) Actual LED information
Displays information about the LED that are on for the FL-net module.
 - LNK 0000: OFF 0001 : ON
 - PER 0000: OFF 0001 : ON
- 2), 3) System information
Displays system information about the FL-net module.
- 4) Node number switch information
Displays the node number (4 digits of IP address) that have been set in FL-net module.
Display range : 1 to 254
- 5) Mode number switch information
Displays the mode number that has been set in the FL-net module.

| Mode number | Contents |
|-------------|---------------------------|
| 0 | Online |
| 1 | Offline |
| 2 | Loopback test |
| 3 | Hardware test |
| 4 | Online (Auto negotiation) |

- 6) Intelligent function module switch setting
Displays the Intelligent function module switch settings that have been set in I/O assignment settings in the parameters for the GX Developer.
 - CLASS C to HOST: IP address settings
 - MODE: Operating mode settings (Refer to 5) in this section.)

APPENDICES

Appendix 1 Transition from QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 to QJ71FL71-T-F01/QJ71FL71-B5-F01/QJ71FL71-B2-F01

The sequence programs and network devices for QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 are compatible with the QJ71FL71-T-F01/ QJ71FL71-B5-F01/QJ71FL71-B2-F01.

However, they cannot be connected together because FL-net (OPCN-2) Version 2.00 is not compatible with FL-net (OPCN-2) Version 1.00.

| Item | Applicability |
|---|--------------------|
| Sequence program | Applicable |
| Network device (transceiver, cable and similar device) | Applicable |
| Connecting both FL-net (OPCN-2) Version 2.00 and FL-net (OPCN-2) Version 1.00 on the same network | N/A * ¹ |

*1: Since the FL-net protocol of FL-net (OPCN-2) Version 2.00 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 2.00 module | FL-net (OPCN-2) Version 1.00 module |
|--|--|
| QJ71FL71-T-F01, QJ71FL71-B5-F01, QJ71FL71-B2-F01, Version 2.00 products from other manufacturers | QJ71FL71-T, QJ71FL71-B5, QJ71FL71-B2, Version 1.00 products from other manufacturers |

Appendix 2 Upgrading the Functions from the QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 to the QJ71FL71-T-F01/QJ71FL71-B5-F01/QJ71FL71-B2-F01

Function version B of the QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 contains functions that are revisions of and additions to the current version (version A).

This section explains a comparison of the module functions, program use and incorporating into the existing system along with these additions and revisions.

Appendix 2.1 Comparison of module functions

This shows the functions that have been added to or changed in version B.

- Transparent message transmission (Refer to 6.2.8.(6) (h) and 6.5.3.(5) (6))
- Parameter settings using the GX Configurator-FL (Refer to Section 6.4)
- Multiple CPU system (Refer to Section 3.3)

Appendix 2.2 Precautions when replacing from function version A to function version B

This section explains using programs created for function version A and incorporating them into previous systems.

(1) Using the program

It is possible to use a program for function version A as is on a function version B.

(2) Incorporating into existing system

It is possible to use a program created for use on function version B as is on the cables for used for function version A.

Appendix 2.3 Precautions when mixing modules with function versions A and B

This section explains the precautions when mixing function version A and function version B.

(1) Transparent-type message transmission

Use word units when performing a transparent-type message transmission from a function version B to a function version A. (Refer to Section 6.2.8.(6) (h) and 6.5.3.(5) (6))

(2) GX Configurator-FL

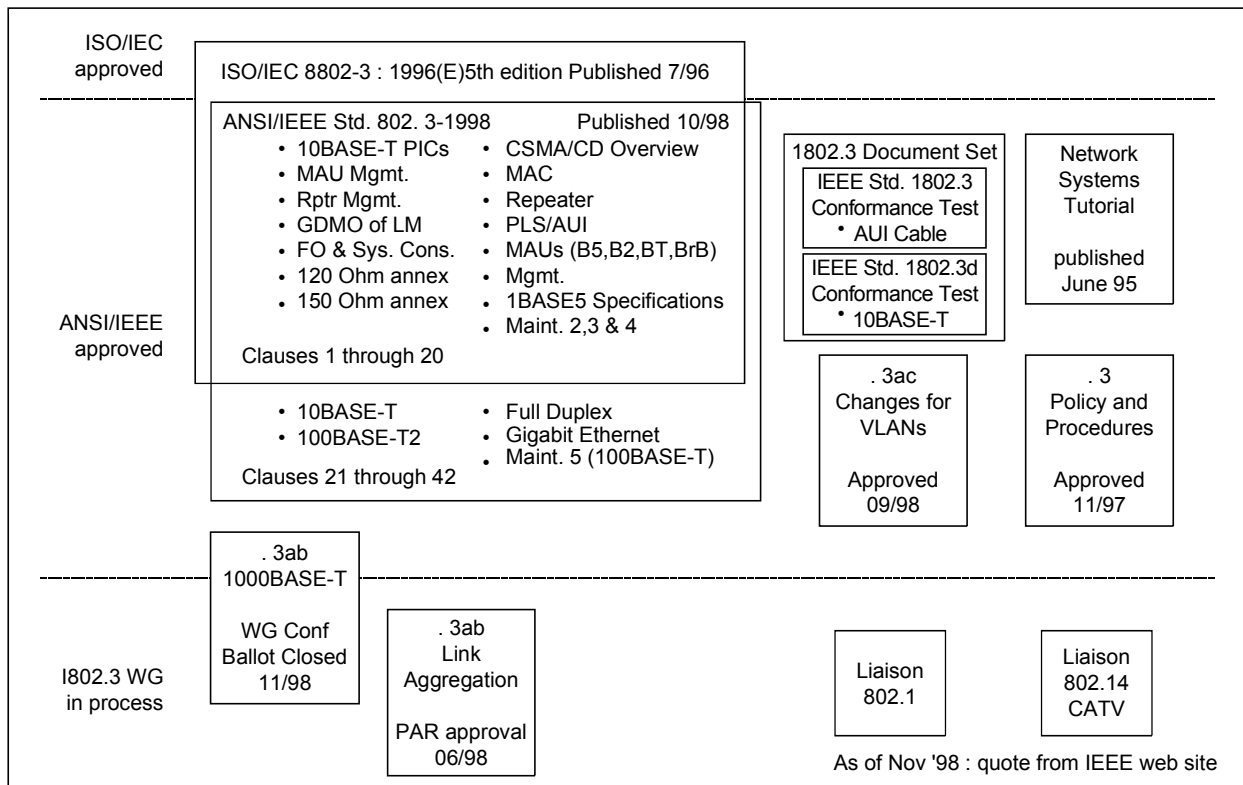
Function version A QJ71FL71-T/QJ71FL71-B5/QJ71FL71-B2 are not compatible with GX Configurator-FL. Use the sequence program to set the parameters.

Appendix 3 Guide to System Configuration

Appendix 3.1 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.

The standard for Ethernet is defined by IEEE Ethernet working group: IEEE802.3, and is the standard that defines formats such as 10BASE5, 10BASE2 and 10BASE-T. At present, there are also researches into standards for new formats such as 100BASE-T. The following shows the trends in standardization of the IEEE802.3 working group.

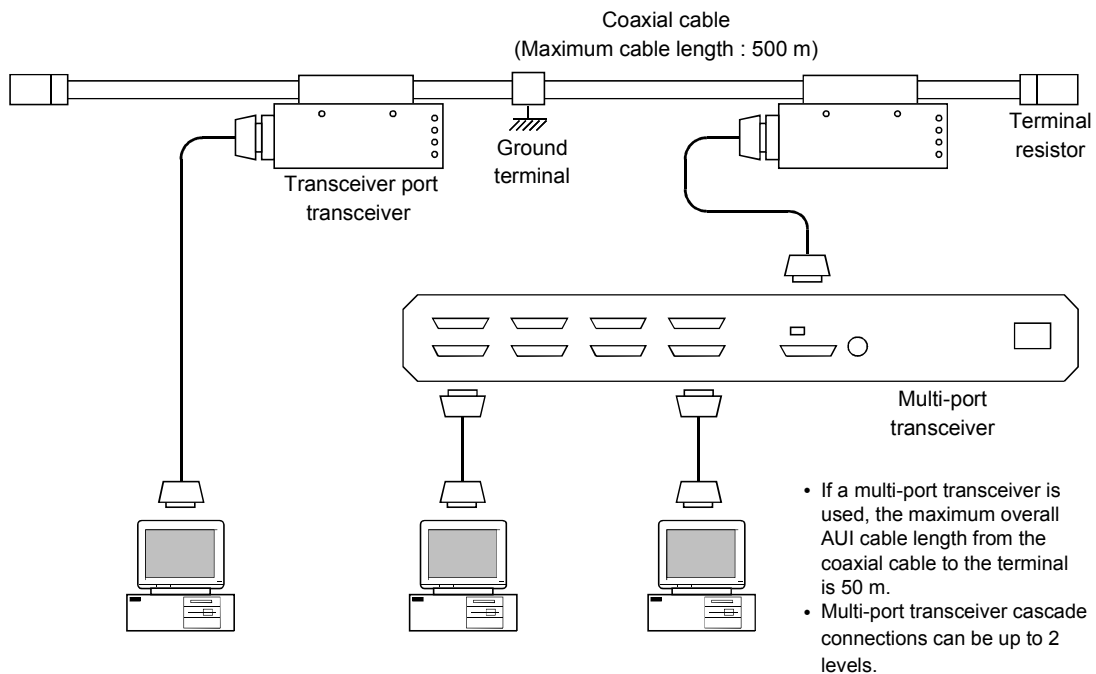


Appendix 3.2 10BASE5 specifications

10BASE5 is a method of connecting an Ethernet system with a coaxial cable that is approximately 10 mm 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 500 m. 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.

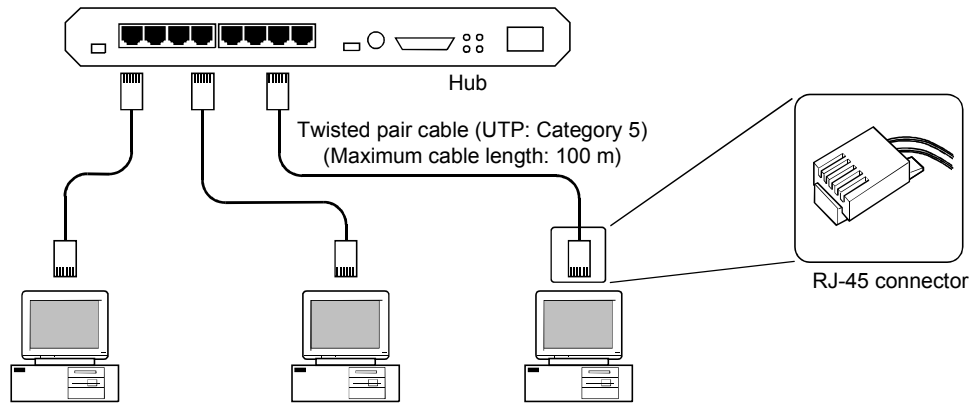
The following shows the example of 10BASE5 configuration.



Appendix 3.3 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 100 m 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.

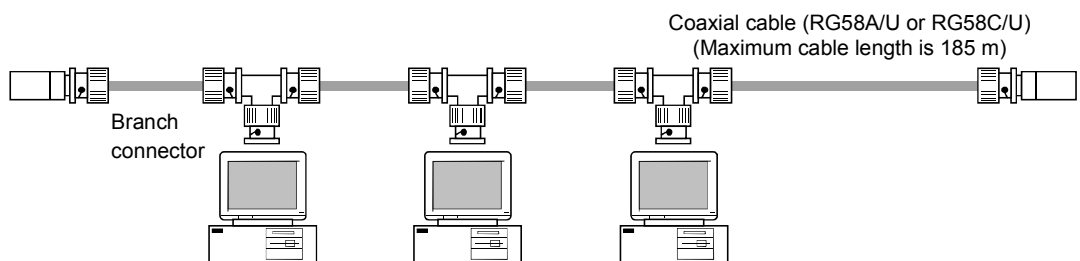
The following shows the example of 10BASE-T configuration.



Appendix 3.4 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 185 m (approximately 200 m). 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 T-shaped branch connector.

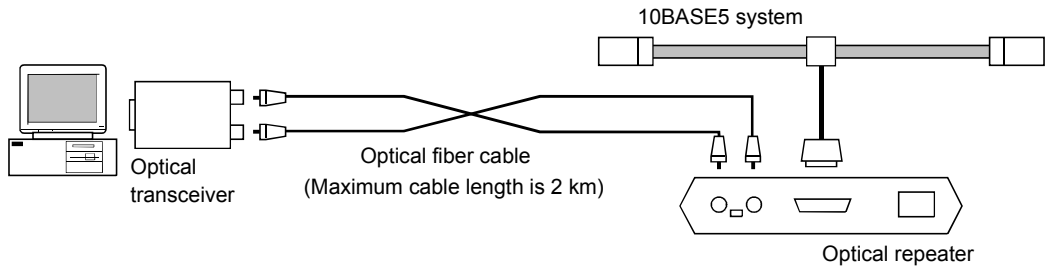
The following shows the example of 10BASE2 configuration.



Appendix 3.5 Other Ethernet specifications

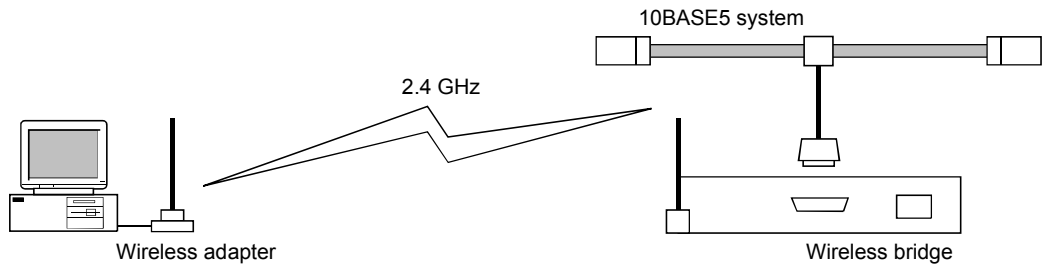
(1) Optical Ethernet

Optical Ethernet uses fiber optics as the medium of transmission. It can transmit data in distance exceeding 500 m 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.



(2) Wireless Ethernet

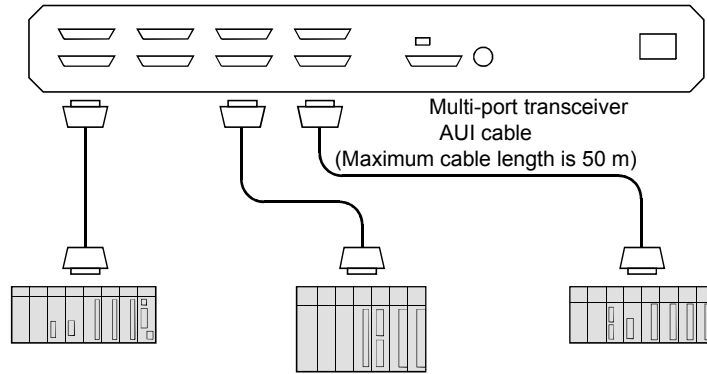
Wireless LAN uses radio waves or infrared rays as the medium of transmission. It allows portable devices to be connected to a LAN system. The standardization for wireless LAN is planned to process by IEEE wireless LAN working group: IEEE802.11. Wireless LAN has a different MAC layer protocol which necessitates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



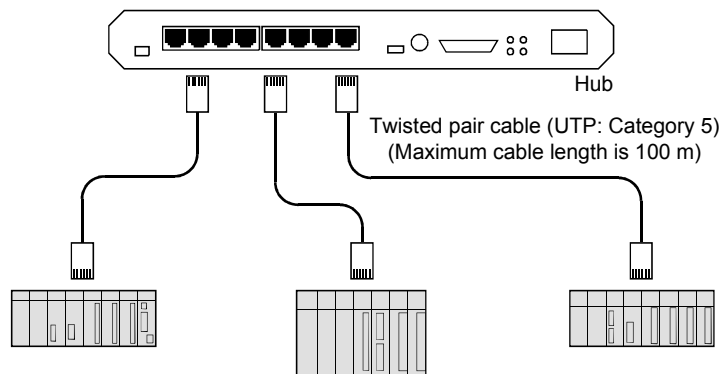
Appendix 4 Examples of System Configuration

Appendix 4.1 Small-scale configuration

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



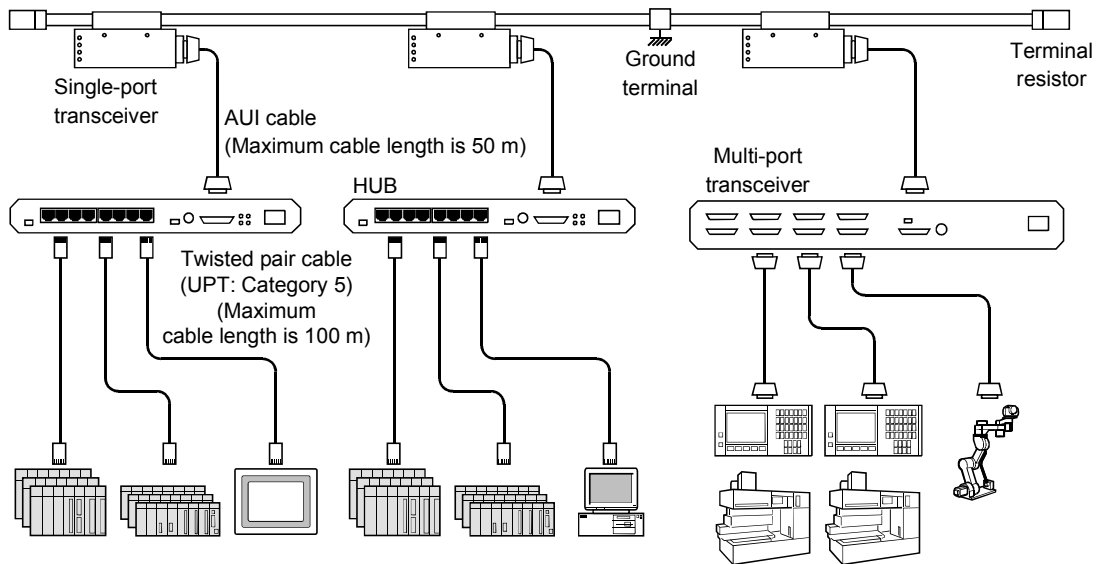
(a) When using a multi-port transceiver.



(b) When using a HUB

Appendix 4.2 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.

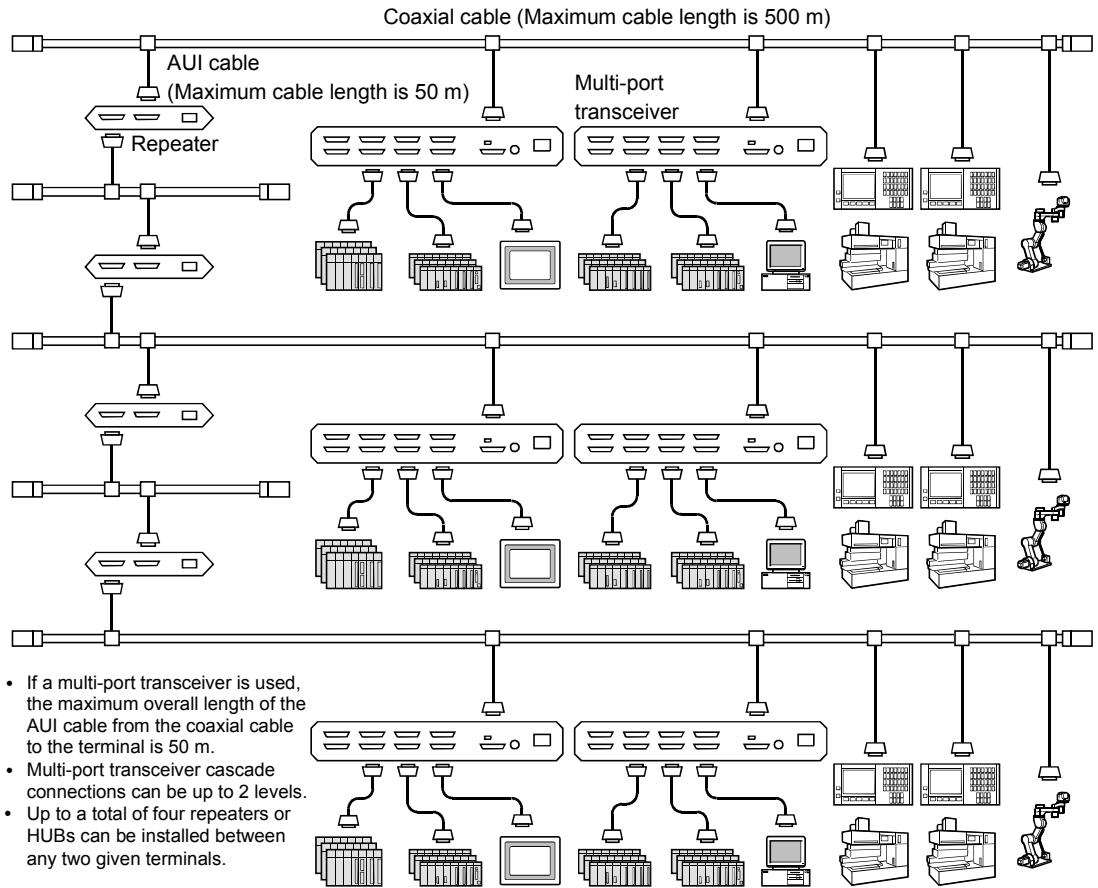


- Up to a total of four repeaters or HUBs can be installed between any two given terminals.

- 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.

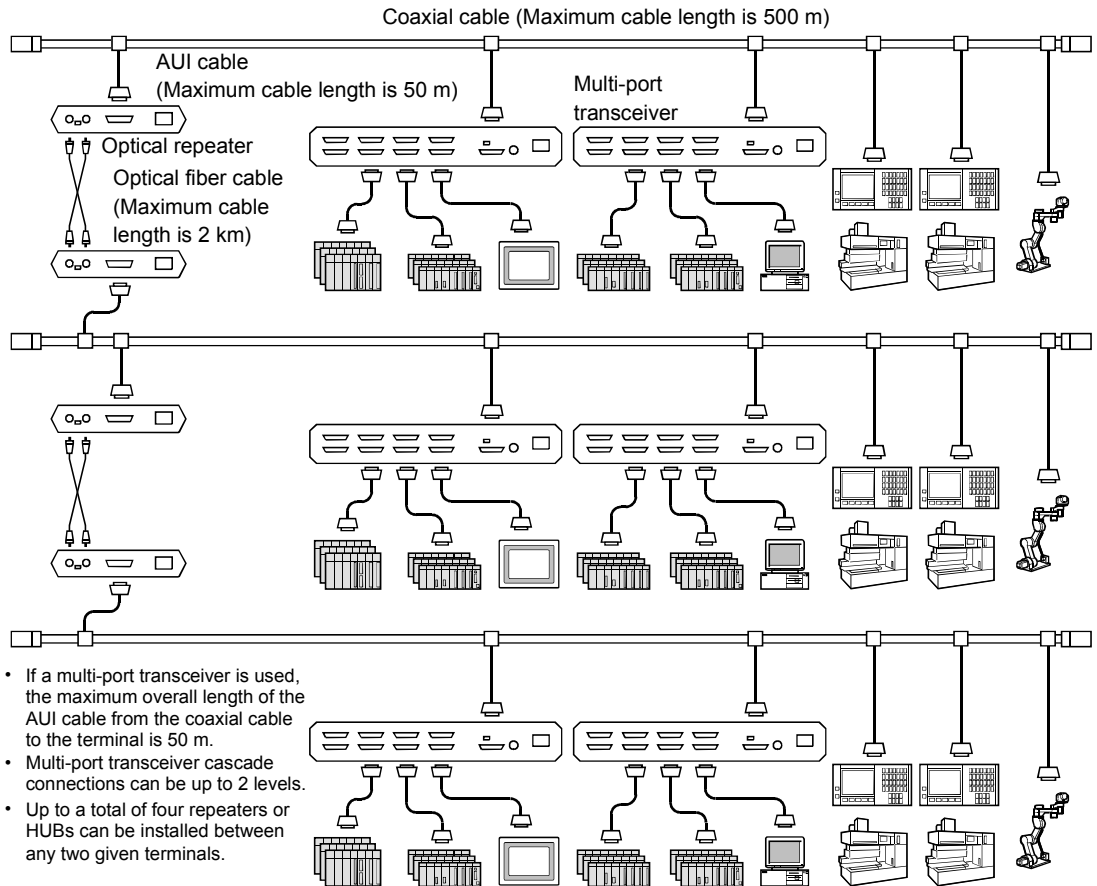
Appendix 4.3 Large-scale configuration

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



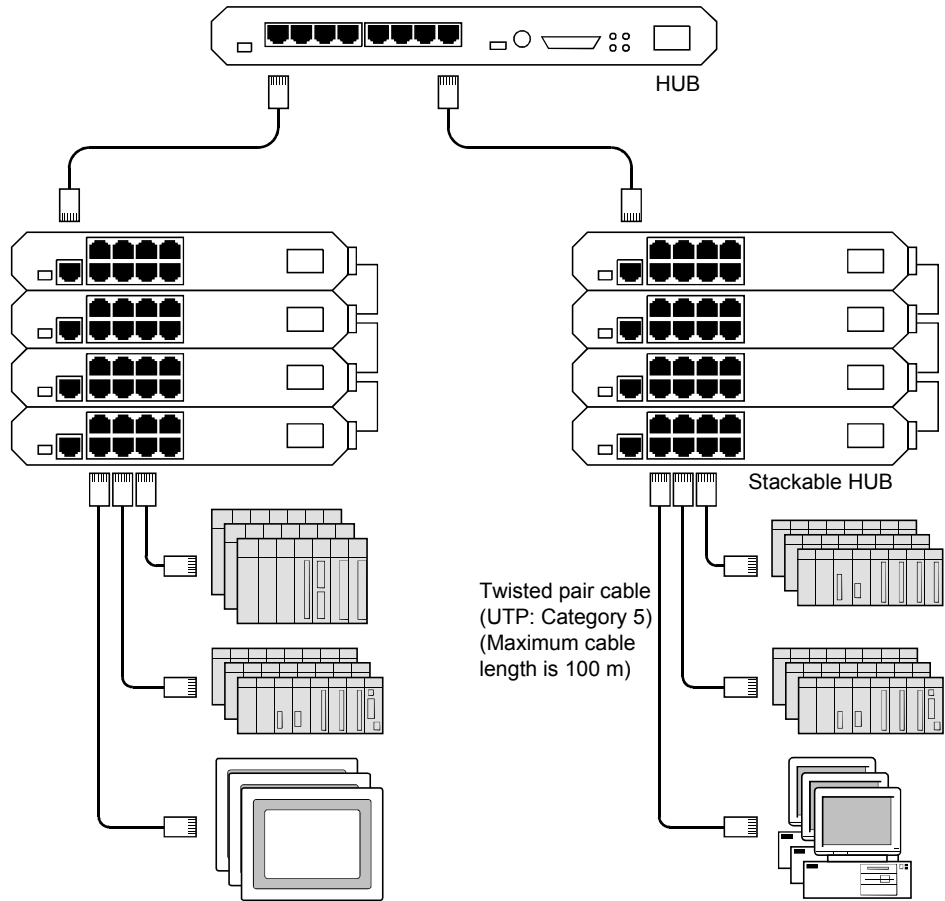
Appendix 4.4 Long-distance distributed configuration

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.



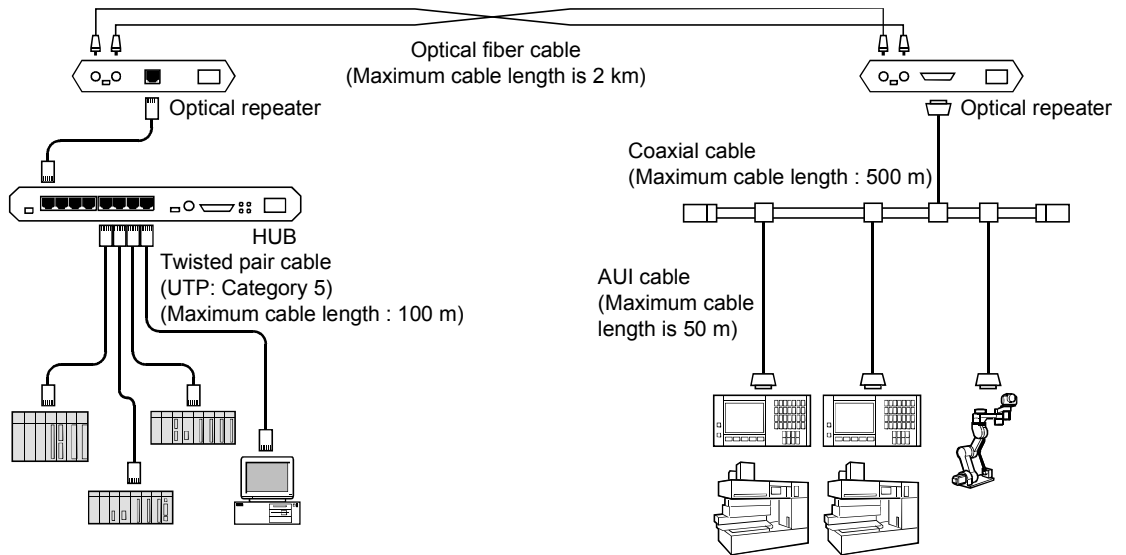
Appendix 4.5 Local centralized configuration

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



Appendix 4.6 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 4.7 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 4.8 Differences between conventional Ethernet and FL-net (OPCN-2)

- (1) 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.
- (2) 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.
- (3) 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.
 - (a) Currently compatible equipment can only be used with 10Mbps/100Mbps Ethernet LAN.
 - (b) It cannot be connected to other general-purpose Ethernet systems.
 - (c) It does not support the TCP/IP communication functions.
 - (d) A switching HUB can be used but it will be ineffective.
 - (e) Some functions may not be executable when a router or other such equipment is used.

Appendix 5 Network System Definitions

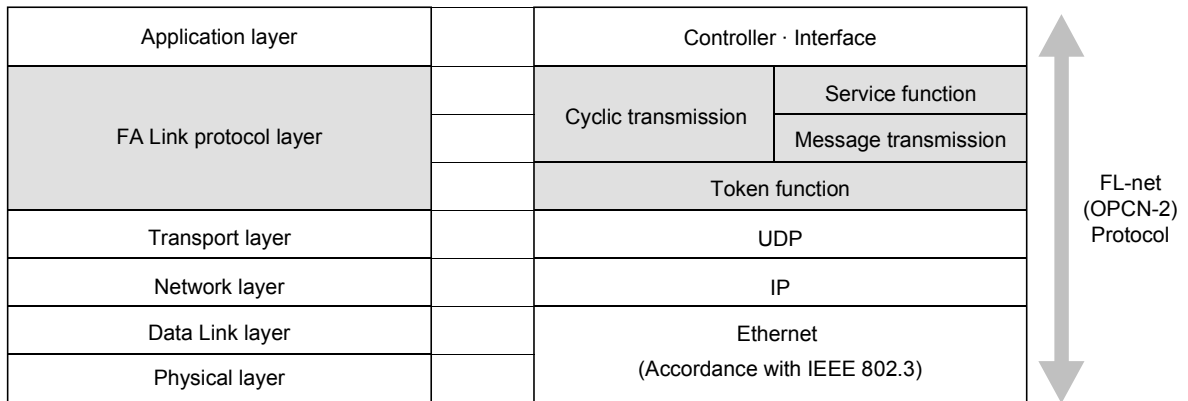
Appendix 5.1 Communication protocol standards

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 5.2 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.



Appendix 5.3 FL-net (OPCN-2) physical layer

When the transmission speed is 10 Mbps, there are 5 types of transmission methods in the physical layer of the Ethernet. These are: 10BASE5, 10BASE2, 10BASE-T, 10BASE-F and 10BROAD36 (although it is not very popular). There is also a 100 Mbps Ethernet. Of these types, 10BASE5 (recommended), 10BASE2 and 10BASE-T/100BASE-TX can be used in FL-net (OPCN-2).

Appendix 5.4 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.)

| | First 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 5.5 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 5.6 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 5.7 FL-net (OPCN-2) port numbers

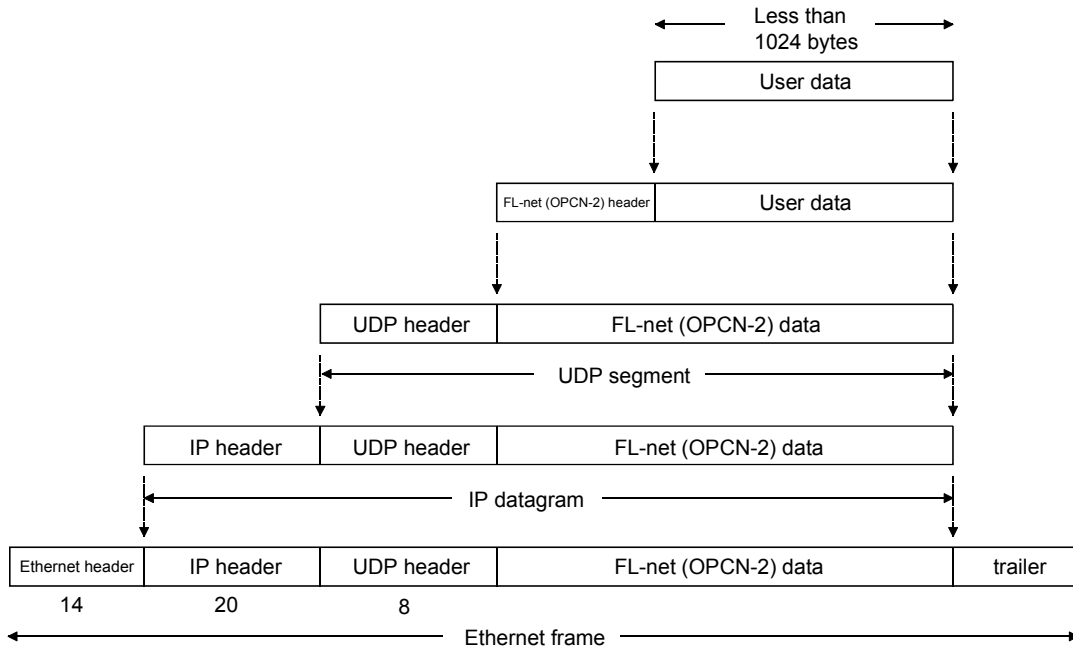
The following port number have been pre-determined for realizing service FL-net (OPCN-2) protocol positioned in the upper transport layer. There is no need for FL-net (OPCN-2) users to set the parameters for these port numbers.

| | 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 5.8 Data format for FL-net (OPCN-2)

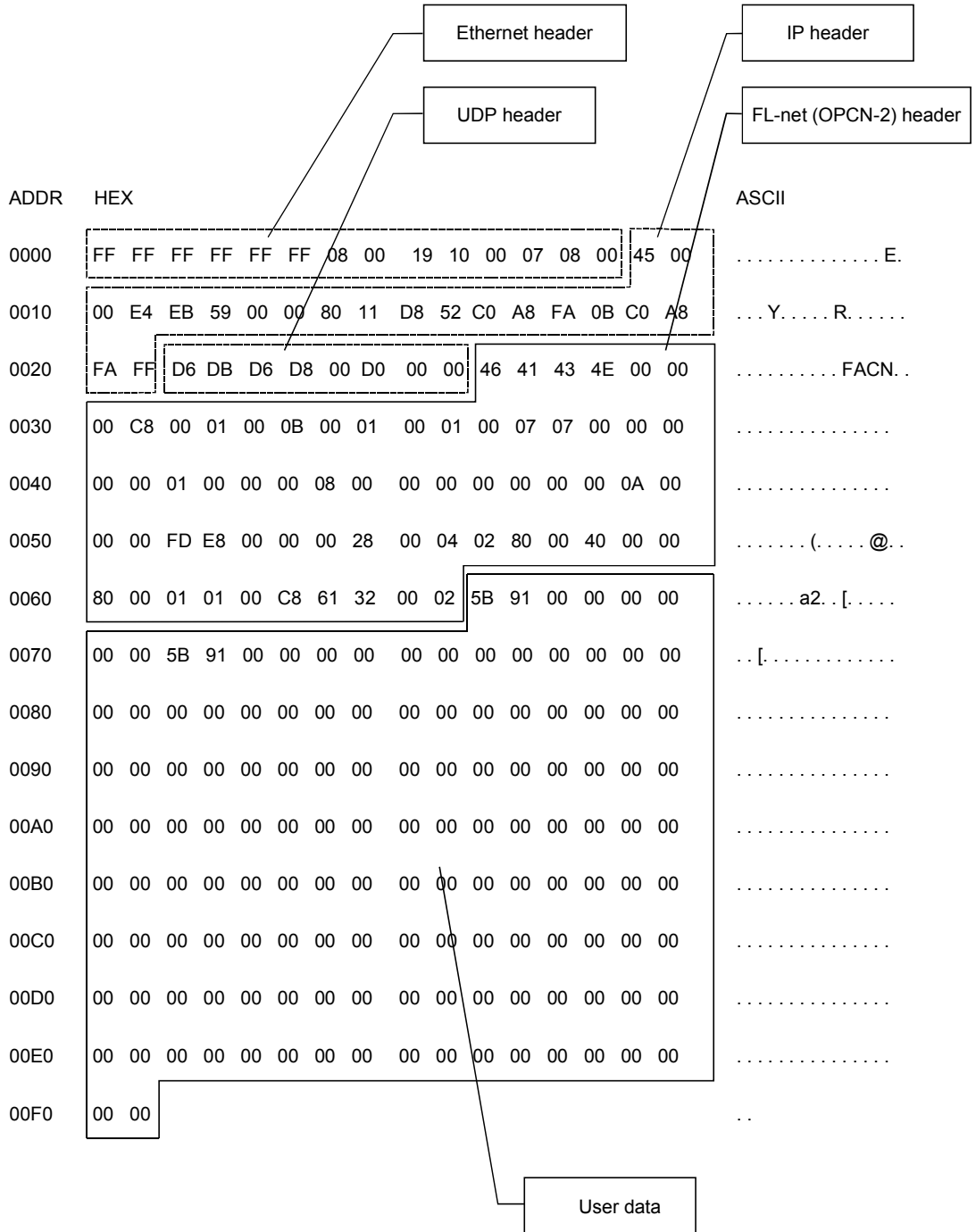
(1) Summary of data format for FL-net (OPCN-2)

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



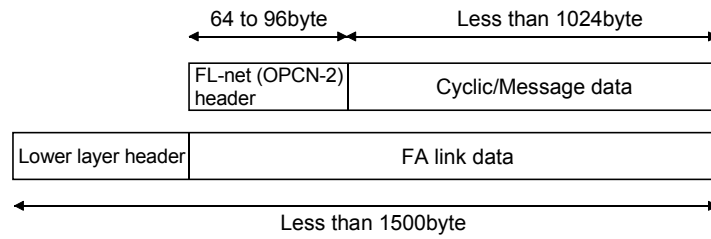
The following shows one frame of FL-net (OPCN-2) data that can be observed on a communication line.

As for example, cyclic data of 128 bytes are transferring.



(2) 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 first address of all frames.



Appendix 5.9 FL-net (OPCN-2) transaction code

Refer to Section 6.2.8.(3), (4) for details.

Appendix 6 FL-net (OPCN-2) Network Control

Appendix 6.1 FL-net (OPCN-2) token control

(1) 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.

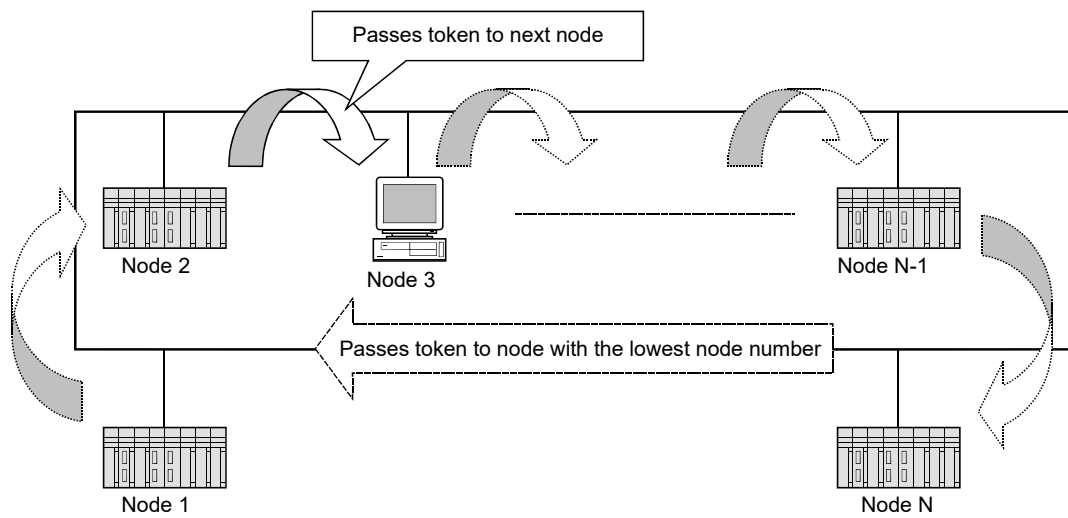
- (a) In the FL-net (OPCN-2), a single token is circulated among nodes.
- (b) Each node holds a transmission right to the network as long as the node has a token after receiving it.
- (c) The token is circulated among all the nodes participating in the FL-net (OPCN-2)
- (d) The token can be transmitted together with cyclic data.
- (e) The token can also be circulated without any data.
- (f) 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.
- (g) If there are two tokens in the network, they are unified into one.

(2) 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.


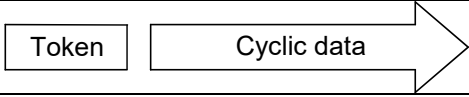
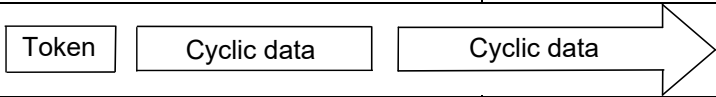
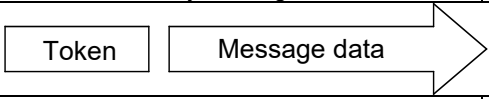
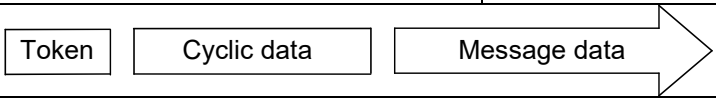
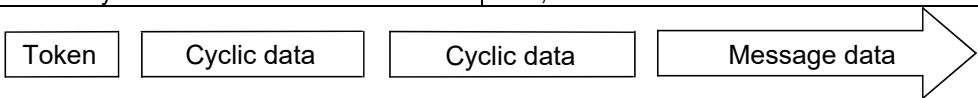
The sequence of the token rotation is determined by the node number. Rotation is performed in ascending order among the nodes that are registered in the joining node control table. The highest node number passes the token to the lowest node number.




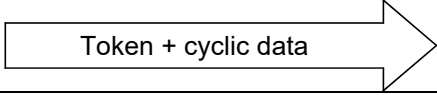
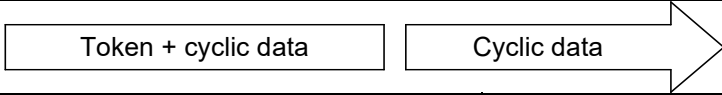
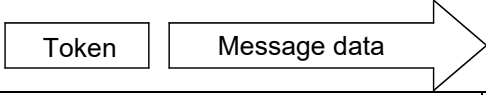
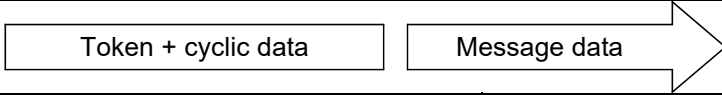
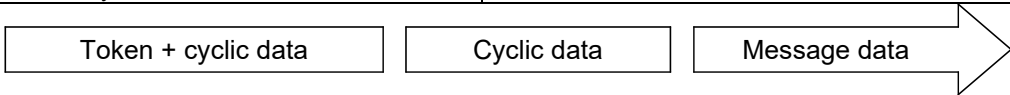
(3) Token and data

There are the following 6 types of patterns for the data when sending a token.

(a) For the QJ71FL71-T-F01, QJ71FL71-B5-F01, and QJ71FL71-B2-F01

| 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. |
| |  | |

(b) For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2

| 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 | Only the cyclic data is sent and the token is attached to the last frame 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 | After the message data has been sent, the token is attached to the cyclic data and sent. |
| |  | |
| 6 | When there is cyclic data and message data and the cyclic data is divided and sent | After the message data has been sent, only the cyclic data is sent and the token is attached to the last frame and sent. |
| |  | |

(4) 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.

(5) 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.

(a) For the QJ71FL71-T-F01, QJ71FL71-B5-F01, and QJ71FL71-B2-F01

1) Refresh cycle time (RC)

• At 100Mbps

$RC [ms] = \text{The number of nodes} \times 1.3 + \text{total number of cyclic data words} (*1) \times 0.0022 + (\text{total number of frames} (*2) - \text{the number of nodes}) \times \text{the minimum frame interval time setting value} (*3) / 10 + (\text{number of separating nodes} \times \text{token monitoring time} (*4)) \dots$

Add to separation time

$+ (1.3 + \text{number of message data words} \times 0.0011) \dots$ Add to message transmission time

• At 10Mbps

$RC [ms] = \text{The number of nodes} \times 1.7 + \text{total number of cyclic data words} (*1) \times 0.0032 + (\text{total number of frames} (*2) - \text{the number of nodes}) \times \text{the minimum frame interval time setting value} (*3) / 10 + (\text{number of releasing nodes} \times \text{token monitoring time} (*4)) \dots$ Add to release time

$+ (1.7 + \text{number of message data words} \times 0.0016) \dots$ add 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.

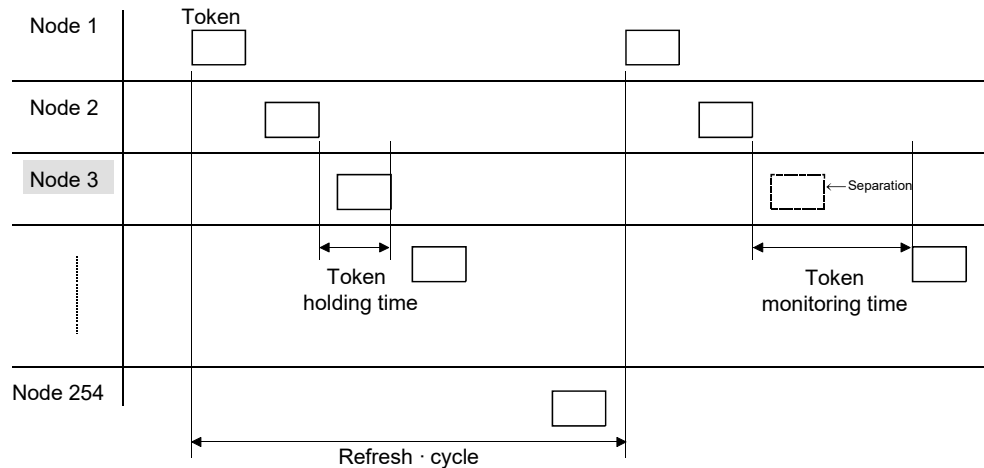
2) Token hold time

- 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

- (1) 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.
- (2) 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.
- (3) 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.

(b) For the QJ71FL71-T, QJ71FL71-B5, and QJ71FL71-B2

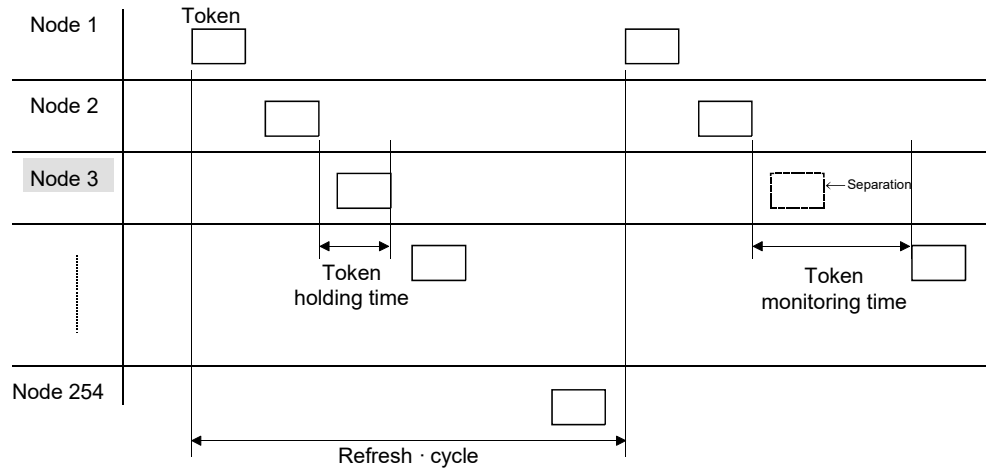
1) Refresh cycle time (RC)

$RC [ms] = \text{Total number of nodes} \times 1.35 + \text{total number of cyclic data words} (*1) \times 0.0032 + (\text{total number of frames} (*2) - \text{the number of nodes}) \times \text{the minimum frame interval time setting value} (*3) / 10 + (\text{number of separating nodes} \times \text{token monitoring time} (*4)) \dots$ Add to separation time
 $+ (1.35 + \text{number of message data words} \times 0.0016) \dots$ add to message transmission time

- *1 : Total number of data words \dots Total of area 1 (bit area) and area 2 (word area) that have been allocated to each node.
- *2 : Total number of frames \dots 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 \dots Maximum setting value for all nodes.
- *4 : Token monitoring time \dots The token monitoring time that has been set for each node.

2) Token hold time

$\text{Token hold time} [ms] = 1.35 + (\text{number of local node transmission cyclic data word} \times 0.0032) + \{(\text{number of frames} - 1) \times \text{minimum frame interval time setting value} / 10\}$



| |
|--|
| POINT |
| <p>(1) The above are the calculations when comprised of this module and will become the sum total of token hold time when mixed with equipment from other manufacturers.</p> <p>(2) When the minimum frame interval time is larger than the token hold time, the following will apply: $RC [ms] = \text{total number of frames} \times \text{minimum frame interval time setting value} / 10$.</p> <p>(3) 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.</p> |

(6) Refresh time

The transmission time between the cyclic data area and device area.

(a) Automatic refresh

Refresh time

$$= \text{Refresh time of the first setting item} \\ + \text{Refresh time of the second setting item} \\ + \dots + \text{Refresh time of the "n"th setting item}$$

| Setting item | Module side Buffer size | Module side Transfer word count | Module side Buffer offset | Transfer direction | PLC side Device |
|-------------------|-------------------------|---------------------------------|---------------------------|--------------------|-----------------|
| Cyclic Data Area1 | 512 | 20 | 0 | <- | D0 |
| Local Node Area | 512 | 32 | 0 | > | D20 |
| Other Node Area | 512 | 32 | 0 | > | D20 |

— First setting item
— Second setting item

⋮

Refresh time for a setting item

- 1) When Module side Transfer word count for a setting item is set to 16 or larger

Refresh time for a setting item

$$= \{KN1 + KN2 \times (\text{Module side transfer word count } 1 * 1)\} \\ + \{KN3 * 3 + KN4 \times (\text{Module side transfer word count } 2 * 2)\} \text{ [ms]}$$

*1 Apply multiples of 16 for Module side transfer word count 1 in the equation.

Example: If Module side Transfer word count is set to 20, apply 16 for Module side transfer word count 1 in the equation.

For Q00J/Q00/Q01/Q02CPU, apply multiples of 4.

*2 Apply the remainder when Module side Transfer word count is divided by 16 for Module side transfer word count 2 in the equation.

Example: If Module side Transfer word count is set to 20, apply 4 for Module side transfer word count 2 in the equation.

For Q00J/Q00/Q01/Q02CPU, apply the remainder when Module side Transfer word count is divided by 4.

*3 When Module side transfer word count 2 is 0, apply 0 for KN3 in the equation.

- 2) When Module side Transfer word count for a setting item is set to smaller than 16

Refresh time for a setting item

$$= KN3 + KN4 \times (\text{Module side Transfer word count}) \text{ [ms]}$$

Constant KN1 to KN4 in the equation

1) When the FL-net module is mounted on the main base unit

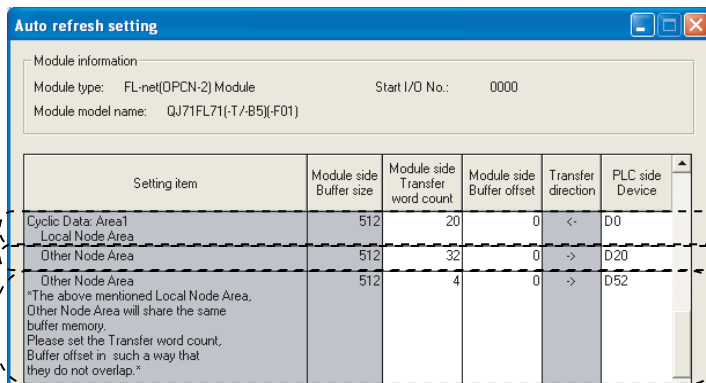
| CPU module | | KN1 | KN2 | KN3 | KN4 |
|-----------------------------|---------------------------------|---------|----------|---------|---------|
| Basic model QCPU | Q00JCPU | 0.168ms | 0.0008ms | 0.115ms | 0.055ms |
| | Q00CPU | 0.134ms | 0.0008ms | 0.091ms | 0.046ms |
| | Q01CPU | 0.128ms | 0.0007ms | 0.085ms | 0.041ms |
| High Performance model QCPU | Q02CPU | 0.043ms | 0.0004ms | 0.053ms | 0.013ms |
| | Other than above | 0.017ms | 0.0003ms | 0.027ms | 0.006ms |
| Process CPU | | | | | |
| Redundant CPU | | | | | |
| Universal model QCPU | Q00UJ/Q00U/Q01UCPU | 0.096ms | 0.0006ms | 0.046ms | 0.008ms |
| | Q02UCPU | 0.096ms | 0.0006ms | 0.023ms | 0.006ms |
| | Q03UD/Q03UDECPU | 0.043ms | 0.0005ms | 0.006ms | 0.005ms |
| | High-speed Universal model QCPU | 0.022ms | 0.0004ms | 0.004ms | 0.005ms |
| | Universal model Process CPU | | | | |
| | Other than above | 0.035ms | 0.0004ms | 0.004ms | 0.005ms |

2) When the FL-net module is mounted on the extension base unit

| CPU module | | KN1 | KN2 | KN3 | KN4 |
|-----------------------------|---------------------------------|---------|----------|---------|---------|
| Basic model QCPU | Q00JCPU | 0.181ms | 0.0015ms | 0.120ms | 0.056ms |
| | Q00CPU | 0.157ms | 0.0015ms | 0.092ms | 0.048ms |
| | Q01CPU | 0.145ms | 0.0014ms | 0.086ms | 0.043ms |
| High Performance model QCPU | Q02CPU | 0.045ms | 0.0009ms | 0.061ms | 0.015ms |
| | Other than above | 0.016ms | 0.0008ms | 0.029ms | 0.008ms |
| Process CPU | | | | | |
| Redundant CPU | | | | | |
| Universal model QCPU | Q00UJ/Q00U/Q01UCPU | 0.104ms | 0.001ms | 0.086ms | 0.009ms |
| | Q02UCPU | 0.104ms | 0.001ms | 0.045ms | 0.007ms |
| | Q03UD/Q03UDECPU | 0.047ms | 0.001ms | 0.007ms | 0.006ms |
| | High-speed Universal model QCPU | 0.022ms | 0.0009ms | 0.005ms | 0.006ms |
| | Universal model Process CPU | | | | |
| | Other than above | 0.037ms | 0.001ms | 0.005ms | 0.006ms |

Calculation example

The following is the calculation example when the FL-net module is mounted on the main base unit for the Q26UDHCPU and auto refresh setting is set as shown below.



First, Module side Transfer word count: 20
 Second, Module side Transfer word count: 32
 Third, Module side Transfer word count: 4

Auto refresh time for the FL-net module

= Refresh time of the first setting item + Refresh time of the second setting item + Refresh time of the third setting item

$$= \{KN1 + KN2 \times (\text{Module side transfer word count 1})\} + \{KN3 + KN4 \times (\text{Module side transfer word count 2})\} \quad \leftarrow \text{First}$$

$$+ \{KN1 + KN2 \times (\text{Module side transfer word count 1})\} + \{KN3 + KN4 \times (\text{Module side transfer word count 2})\} \quad \leftarrow \text{Second}$$

$$+ KN3 + KN4 \times (\text{Module side Transfer word count}) \quad \leftarrow \text{Third}$$

$$= \{0.035 + 0.0004 \times 16\} + \{0.004 + 0.005 \times 4\} + \{0.035 + 0.0004 \times 32\} + \{0\} + \{0.004 + 0.005 \times 4\}$$

$$= 0.1372\text{ms}$$

$$= 138\mu\text{S}$$

(b) During BMOV (FROM/TO)

| CPU module | | 1 point | 1000 points |
|-----------------------------|---------------------------------|-------------------|-------------|
| Basic model QCPU | Q00JCPU | 0.120ms | 0.734ms |
| | Q00CPU | 0.101ms | 0.677ms |
| | Q01CPU | 0.0917ms | 0.642ms |
| High Performance model QCPU | Q02CPU | 0.048ms | 0.489ms |
| | Other than above | 0.025ms | 0.448ms |
| Process CPU | | | |
| Redundant CPU | | | |
| Universal model QCPU | Q00UJ/Q00U/Q01UCPU | 0.075ms | 0.499ms |
| | Q02UCPU | 0.037ms | 0.539ms |
| | Q03UD/Q03UDE CPU | 0.017ms | 0.498ms |
| | High-speed Universal model QCPU | BMOV: 0.0096ms | 0.399ms |
| | Universal model Process CPU | FROM/TO: 0.0079ms | |
| | Other than above | 0.017ms | 0.494ms |

(7) Transmission delay time

The transmission delay time indicates the delay time until the cyclic data is transmitted from the node.

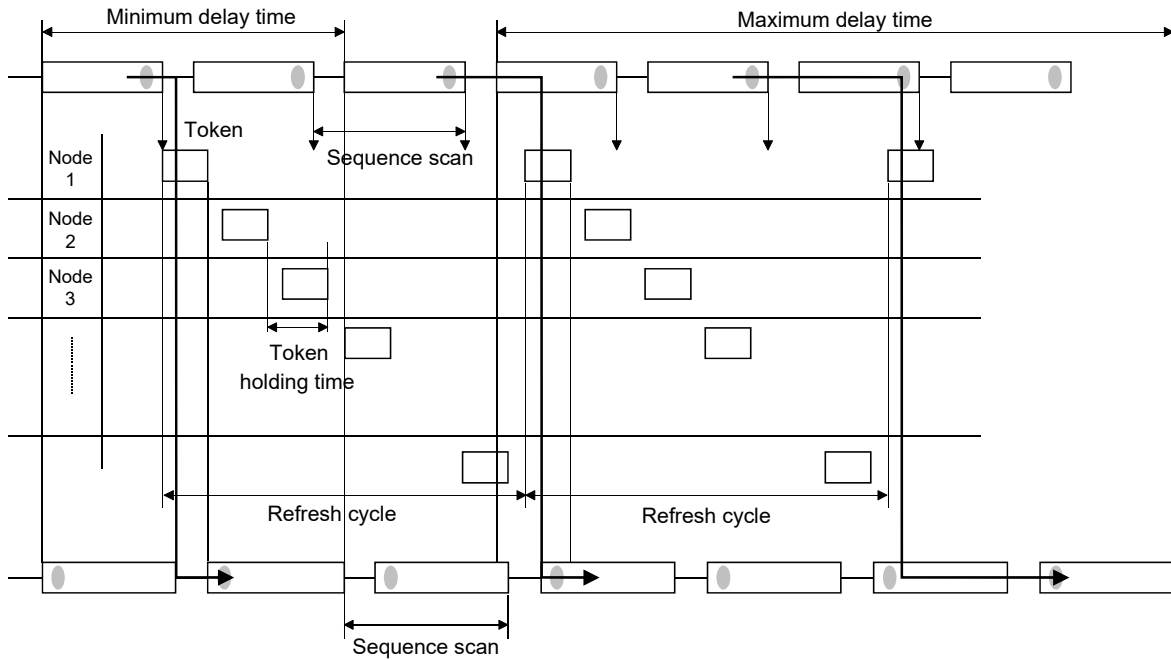
(a) Minimum transmission delay time [ms] = SM1(*5) + token holding time + SM2(*6)

(b) Maximum transmission delay time [ms] = SM1(*5) + (refresh cycle time (RC) × 4) + SM2(*6)

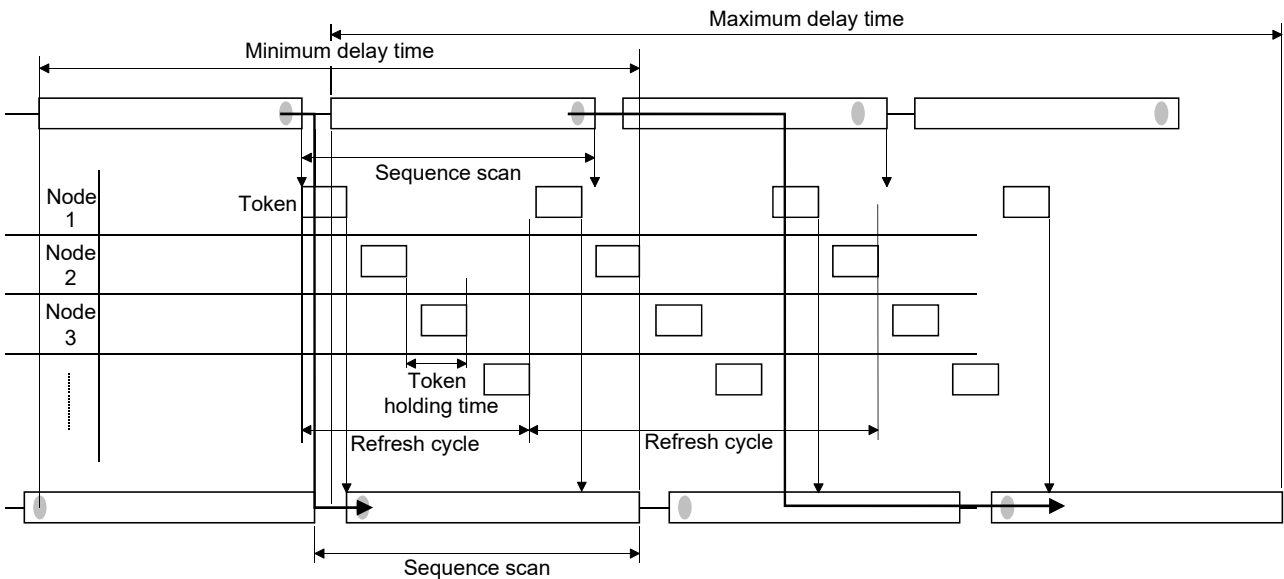
*5: SM1 Send side sequence scan (including refresh time)

*6: SM2 Receive side sequence scan (including refresh time)

1) When refresh cycle > sequence scan



2) 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 6.2 FL-net (OPCN-2) enter and release

(1) Subscription to FL-net (OPCN-2)

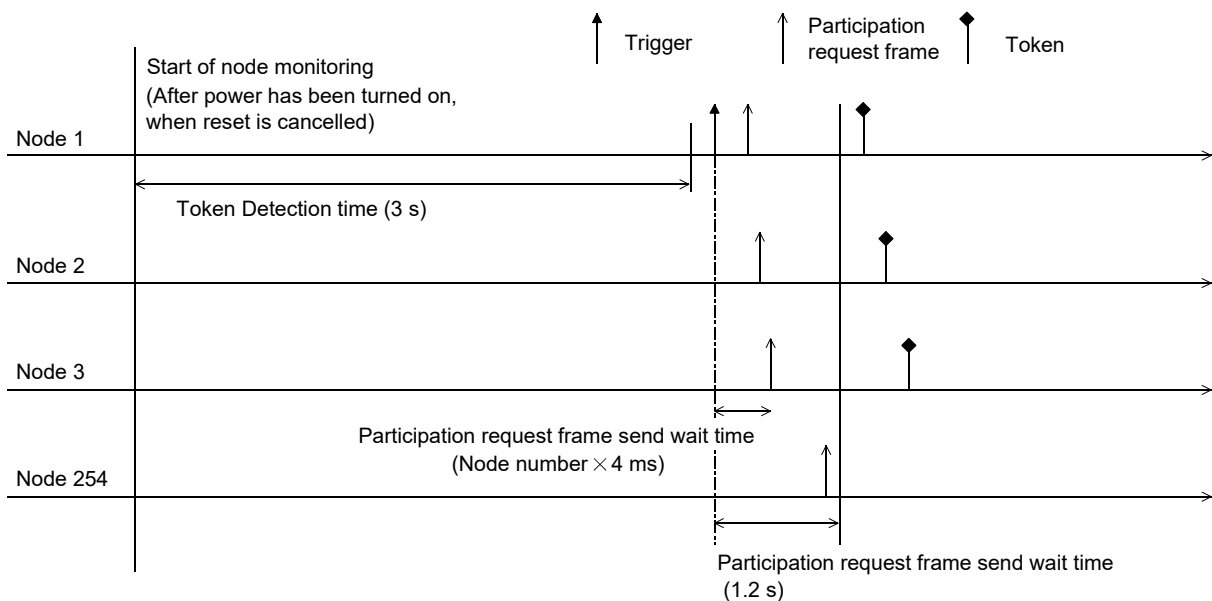
During start-up, each node monitors the transmission line until each of the token detection times have expired. If the node has not received a token at that time, it determines that the network is starting up and makes a new participation joining with the network. Or, if the node has received the token, it determines that it is in joining mode and performs in-process participating with the network.

(a) 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 $(\text{node number}/8) \times 4 \text{ ms}$ 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) $(\text{node number} \times 4 \text{ ms})$ 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 first 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.



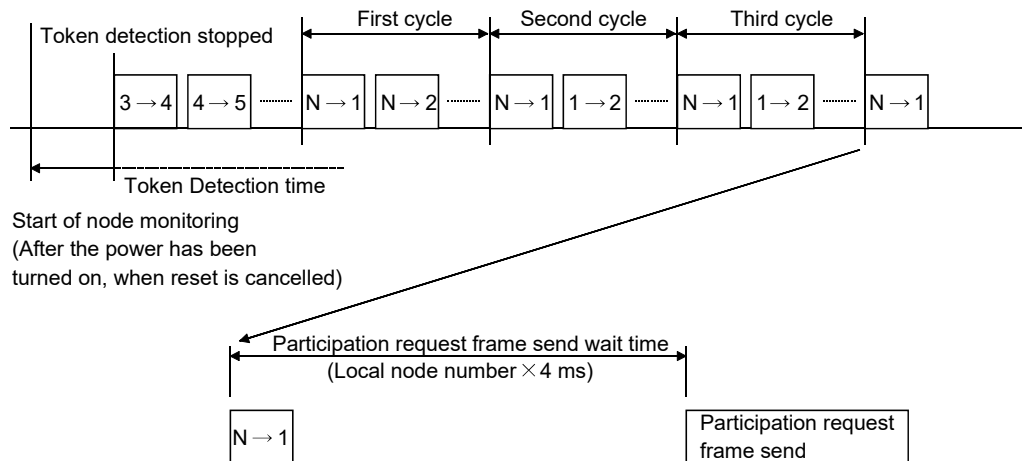
(b) Participating (halfway participation)

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 first 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.



(2) Release from FL-net (OPCN-2)

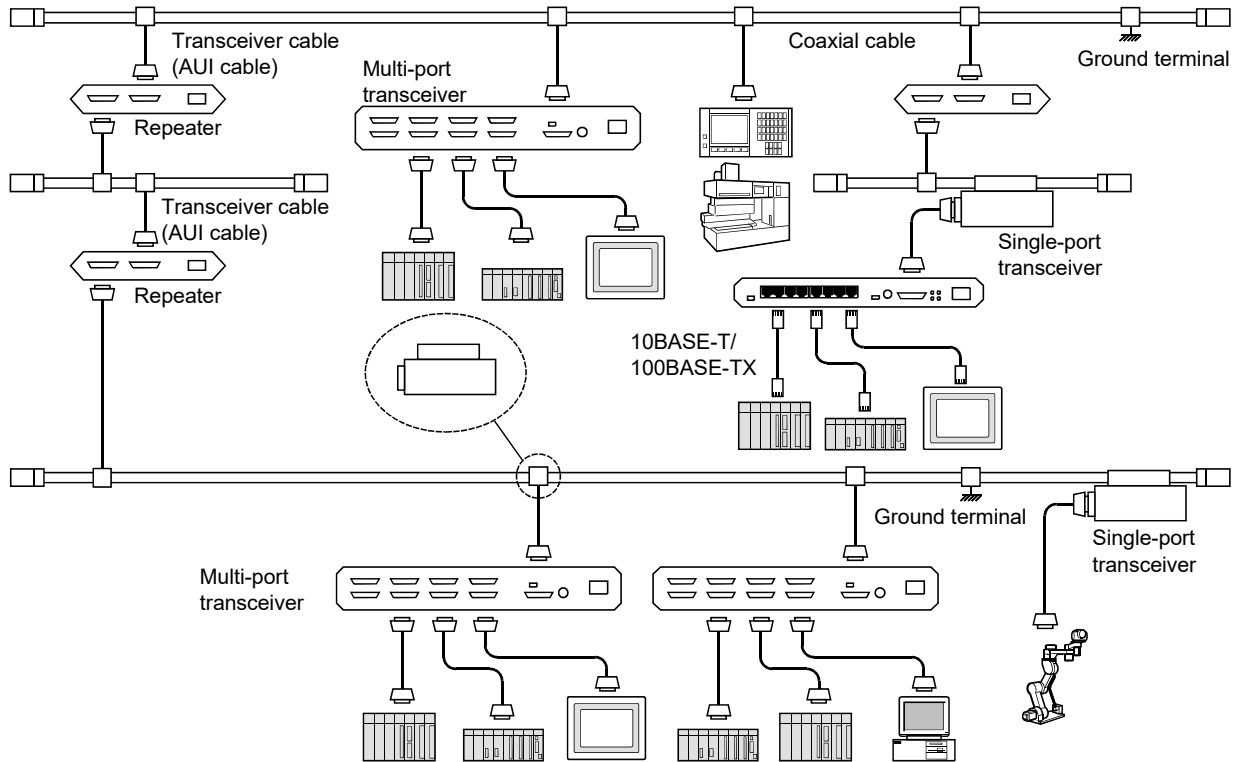
When each node receives a token frame, it checks the node number. If a token frame is not received from a given node for three cycles continuously, it is considered released. (Note that this also includes when a node holding a token does not dispatch a token even though the token monitoring time has 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 7 Network Components

Appendix 7.1 List of Ethernet components

The following shows the components to configure Ethernet. Use the network equipment conforming to the IEEE802.3 standard.



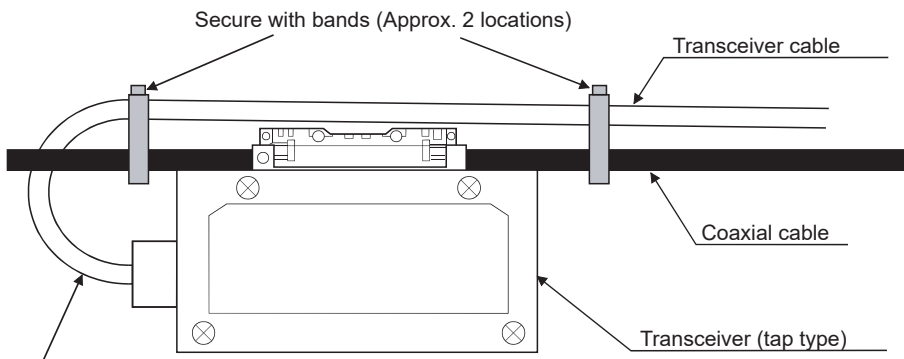
Appendix 7.2 10BASE5 components

(1) Transceiver

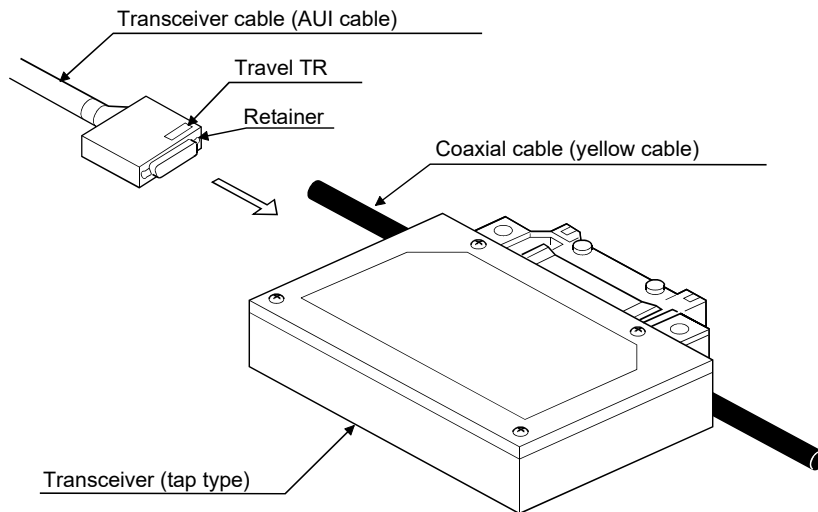
The transceiver is the device that converts the signals flowing through the coaxial cable (yellow cable) into the signals the node requires or vice versa.

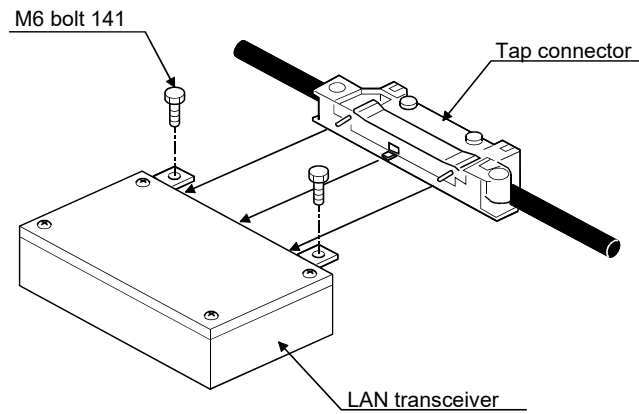
When connecting a transceiver to a coaxial cable, there is a need to set them at an integral multiple of 2.5 m. Connection is done by following the inscription (jacket mark) on the coaxial cable and installing.

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)





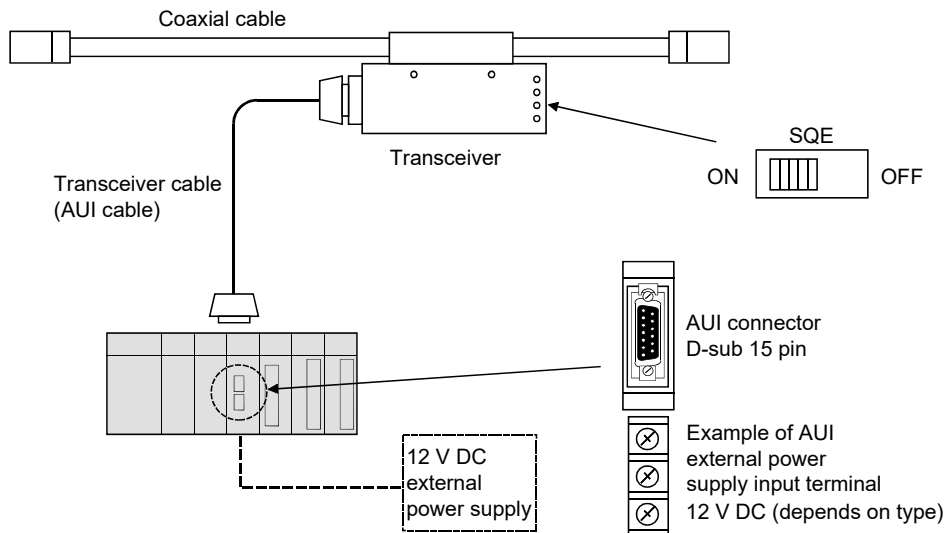
(a) Transceiver (tap type)

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.

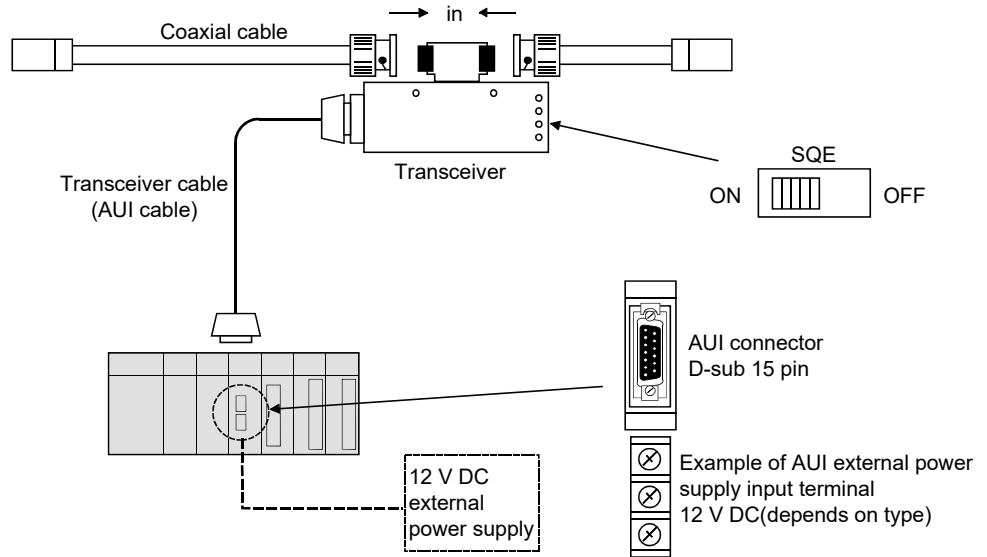
The following are the most common settings for the SQE switch.

- 1) When connected to node : ON
- 2) When connected to repeater: OFF



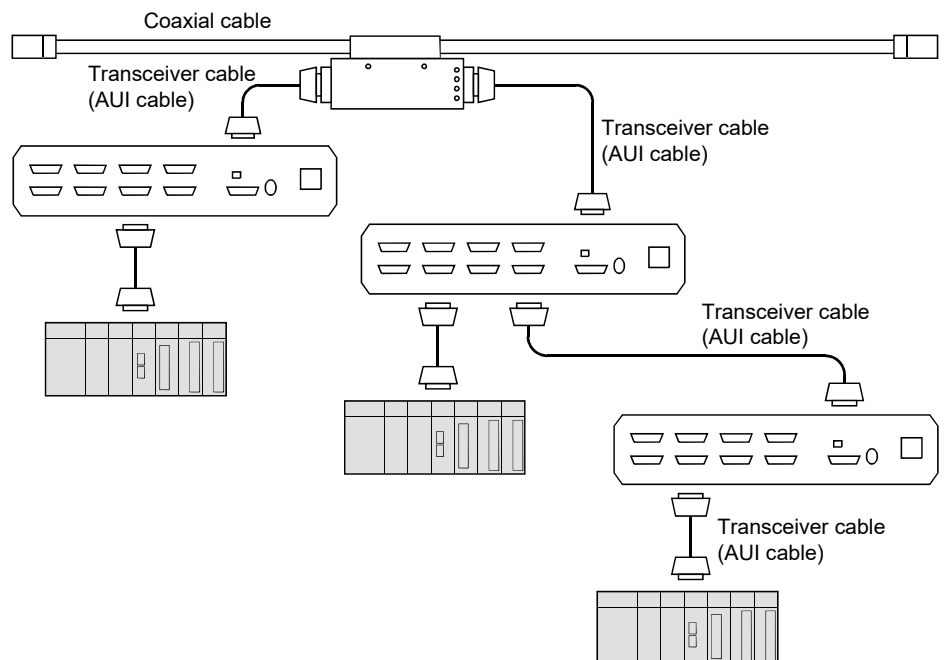
(b) Transceiver (Connector type)

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.



(c) Multi-port transceiver

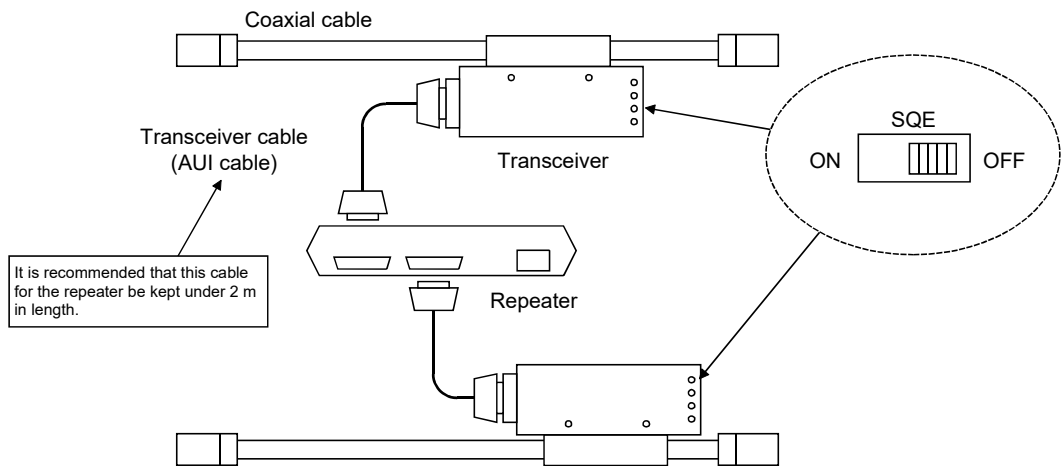
A multi-port transceiver allows terminals to be connected to the tap type transceiver and the connector type transceiver, which normally would only be capable of having one terminal connected to them. 4-port and 8-port transceivers are the most common. Supply power to the transceiver by connecting the power supply cable.



(d) 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.

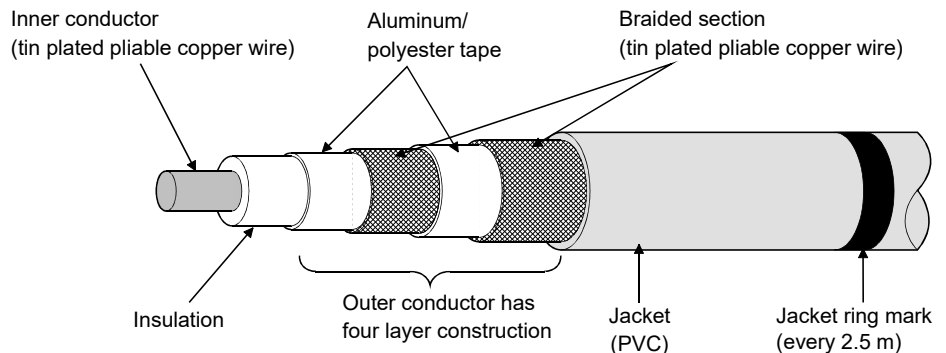
While it is possible to connect a transceiver cable of up to 50 m to the repeater, it is recommended that the length be less than 2 m due to electrical noise and other factors. Check that the SQE switch is off when connecting to the repeater.



(2) Coaxial cable

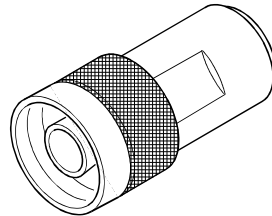
The coaxial cable is constructed of an inner conductor and an outer conductor that serves as a shield. Coaxial cable used for Ethernet connection has a 50 ohm impedance and there are coaxial cables (yellow cables) for 10BASE2 RG58A/U and 10BASE5.

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 one-point grounding with a ground resistance of 100 ohms or less.



(3) Coaxial cable connector

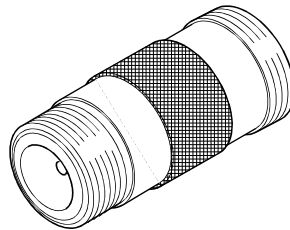
Coaxial cable connector is commonly called N-type connector. It is the connector used to connect a coaxial cable to a terminator or to connect a coaxial cable to a connector type transceiver.



(4) Relay connector

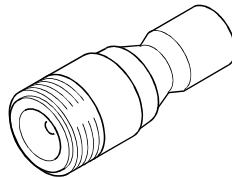
This is the connector used for extending coaxial cable segments. A repeater is used to extend segments while the relay connector is used to extend the cable for the same segment.

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.)



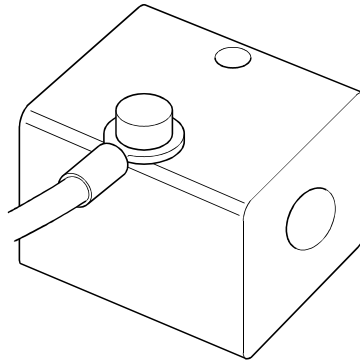
(5) Terminator (Terminal resistor)

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.



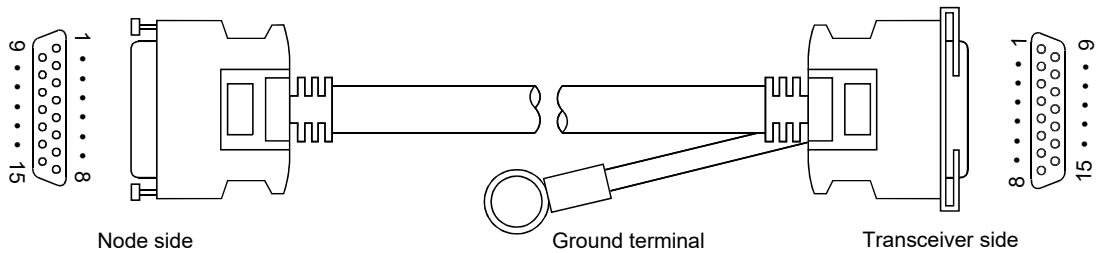
(6) Coaxial cable ground terminal

The coaxial cable ground terminal is a device that prevents transmission data errors due to electrical noise on coaxial cable. Always ground the coaxial cable to one point with a ground resistance of 100 ohms or less.



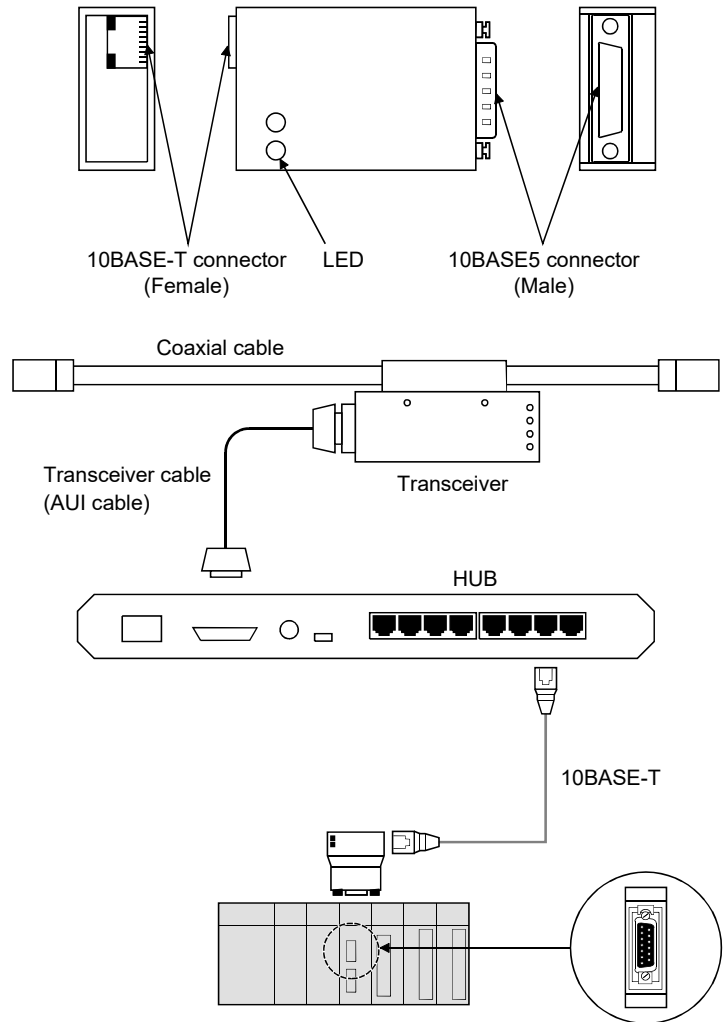
(7) Transceiver cable

Transceiver cable is used to connect the transceiver and node. Both ends of the transceiver cable have D-sub 15 pin AUI connectors. A transceiver cable can be up to 50 m long but it is recommended that the length be kept under 15 m in FA applications to reduce the potential for electrical noise. When using a transceiver with a ground terminal, connect it to the ground.



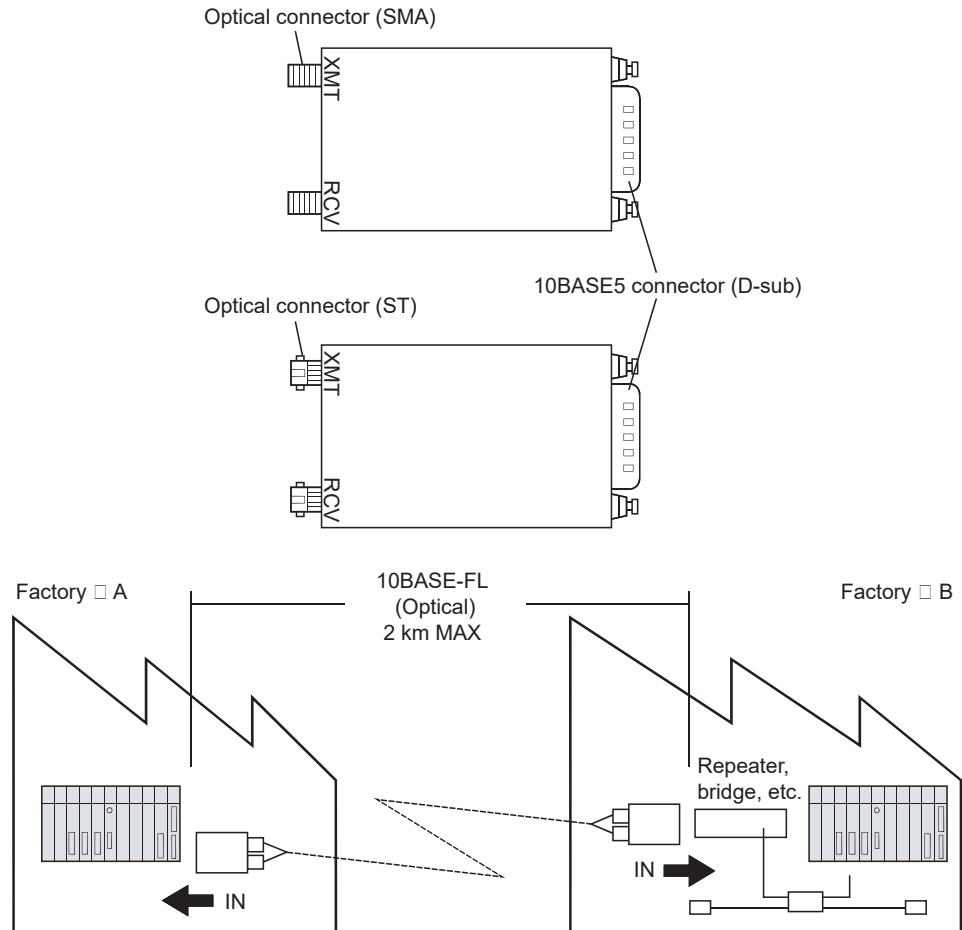
(8) 10BASE5/T converter

This is the converter for connecting a cable with a 10BASE5 interface to a 10BASE-T.



(9) 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.



Appendix 7.3 10BASE-T/100BASE-TX components

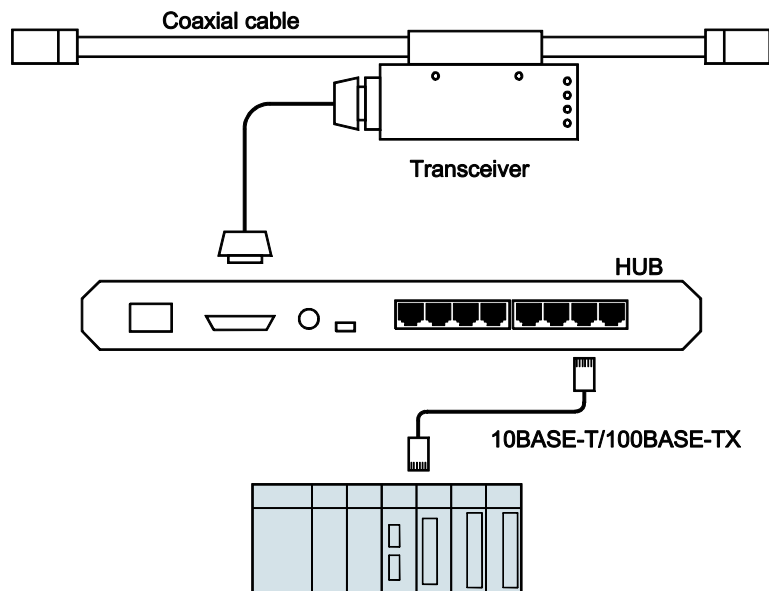
(1) Hub

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.



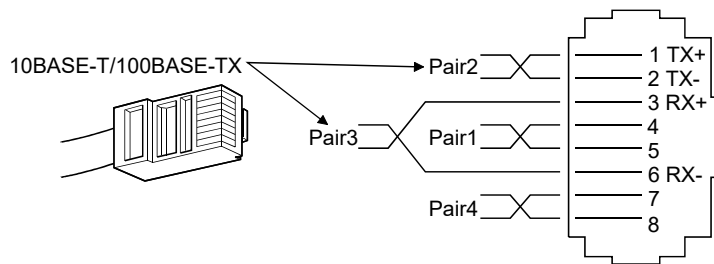
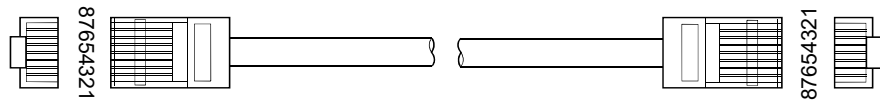
(2) 10BASE-T/100BASE-TX cable

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.

- (a) Shielded STP cable and unshielded UTP cable
- (b) Cross cable used for making connections directly between nodes and straight cable used for connections through a HUB

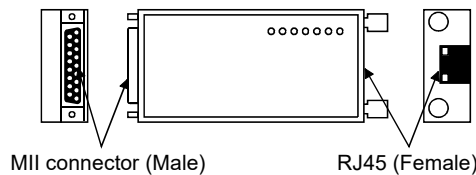
Maximum transmission speed in a 10BASE-T/100BASE-TX cable is 10 Mbps/100 Mbps and it can be up to 100 m long. Both ends of the cable have the 8-point modular connector specified by ISO8877.

Arrange so that Category 5 compliant components are used on 10BASE-T/100BASE-TX cable.



(3) 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.



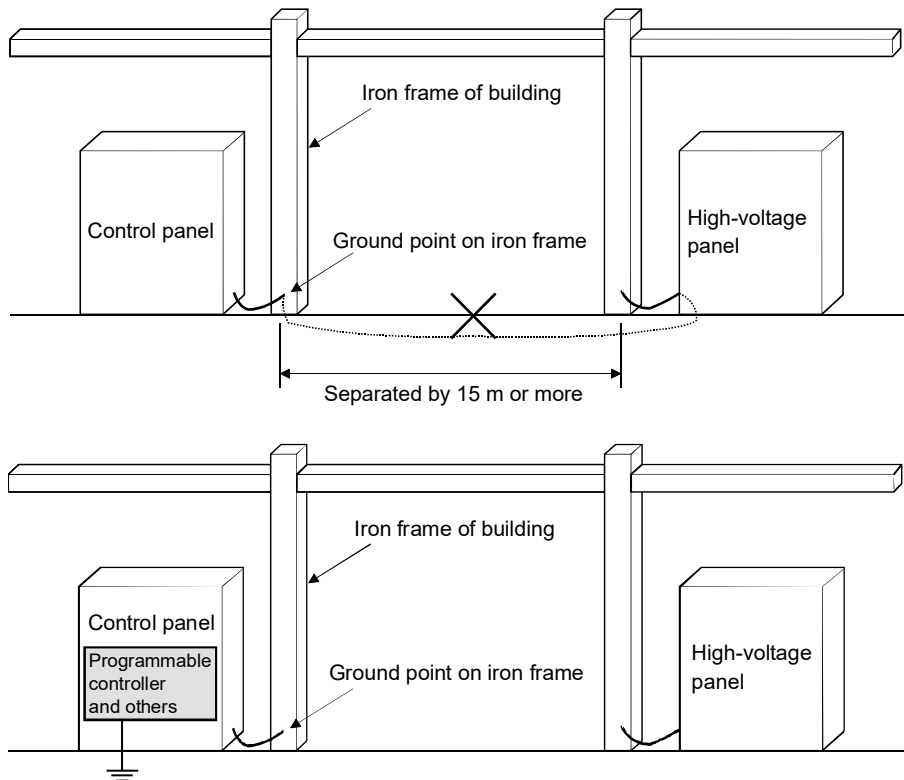
Appendix 8 Grounding the FL-net (OPCN-2) System

Appendix 8.1 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 an independent grounding (with a ground resistance of 100 ohms or less) for the controller.

- (1) The frames are welded together.
- (2) The frames are grounded with a ground resistance of 100 ohms or less.
- (3) Current from the high-voltage circuit shall not flow into the ground contact point for the control panel.
- (4) The ground point for the control panel and the ground point for the high-voltage panel shall be separated by more than 15 m.

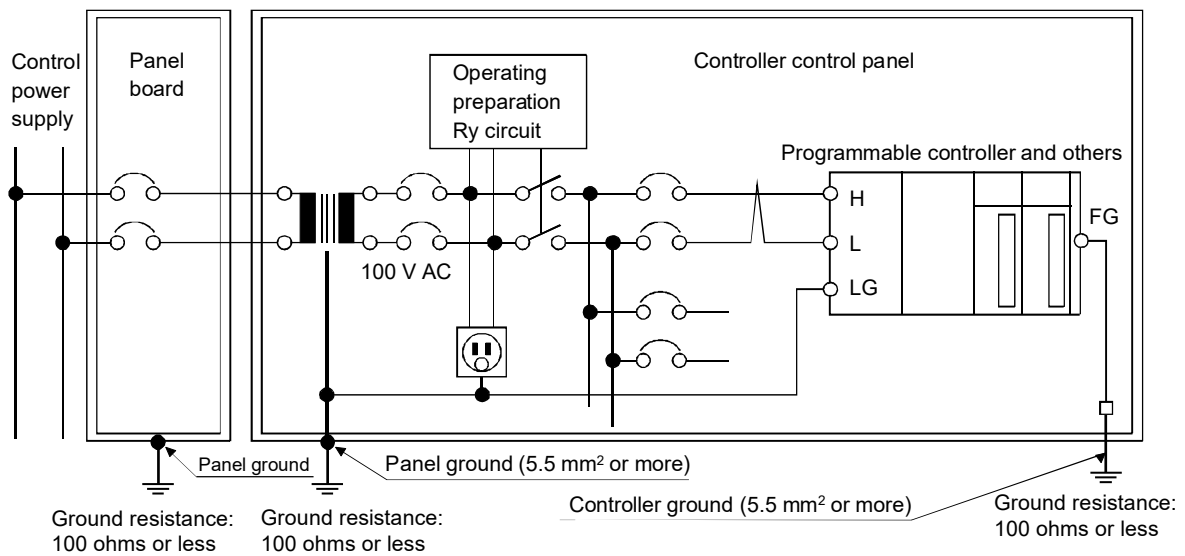


Appendix 8.2 Power supply wires and grounding

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.

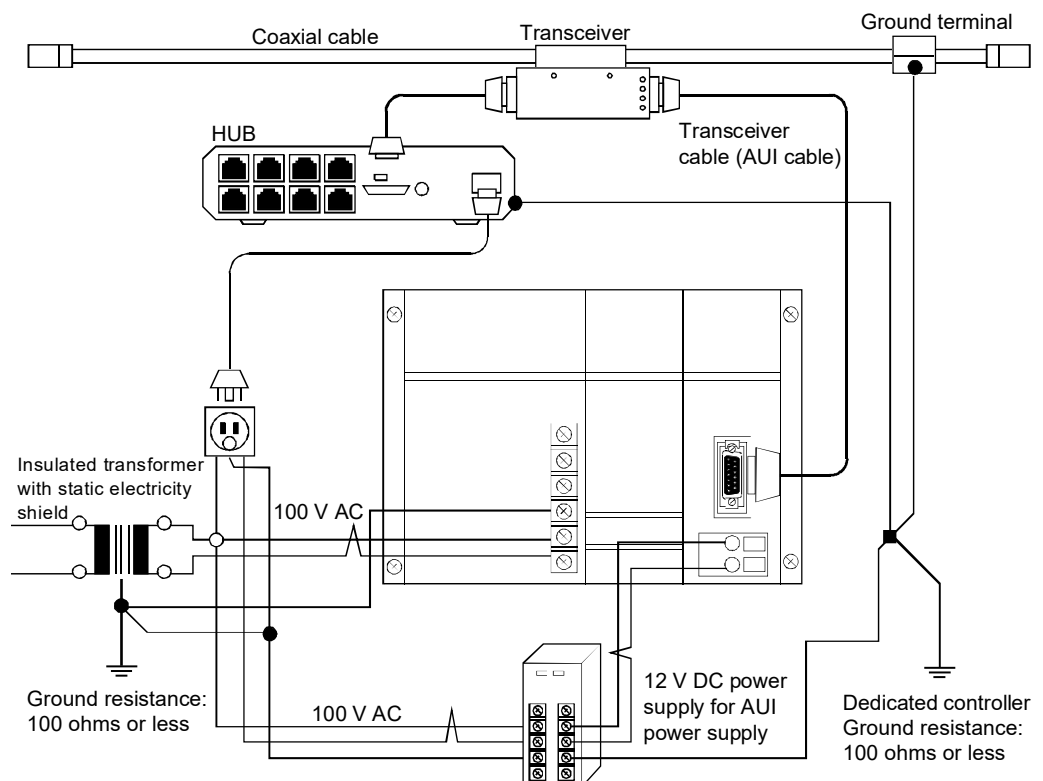
- (1) Isolate the circuit between control power supply and controller power supply by an insulated transformer with a static electricity shield.
- (2) Ground the frame for the control panel and the control board for the controller with a ground resistance of 100 ohms or less.
- (3) Do not connect the frame ground (FG) terminal on the controller to the control panel frame. Provide an independent grounding (with a ground resistance of 100 ohms or less) for the controller.
- (4) Keep the wiring for the input power supply for the controller as short as possible and wire in a twisted configuration.
- (5) 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 8.3 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.

- (1) Connect the ground terminal of a coaxial cable to the independent ground for the controller with a ground resistance of 100 ohms or less.
- (2) Connect the frame ground for the HUB for 10BASE-T/100BASE-TX is connected to the independent ground for the controller with a ground resistance of 100 ohms or less. Supply power from an insulated transformer with a static electricity shield as is used for the power supply for the controller.
- (3) Do not connect the frame ground (FG) terminal on the controller to the control panel frame. Provide an independent grounding (with a ground resistance of 100 ohms or less) for the controller.
- (4) Connect the frame ground (FG) terminal for the FL-net module to the frame ground (FG) terminal on the controller.
- (5) Connect the shielded earth on the transceiver cable (AUI) to the frame ground (FG) on the FL-net module.
- (6) If a direct current power supply (such as 12 V DC) is required by the transceiver (AUI), provide a dedicated stabilize power supply module for the network and connect that direct current output to the terminal for the FL-net module. Provide the 100 V AC input power supply from an insulated transformer with a static electricity shield as is used for the controller.

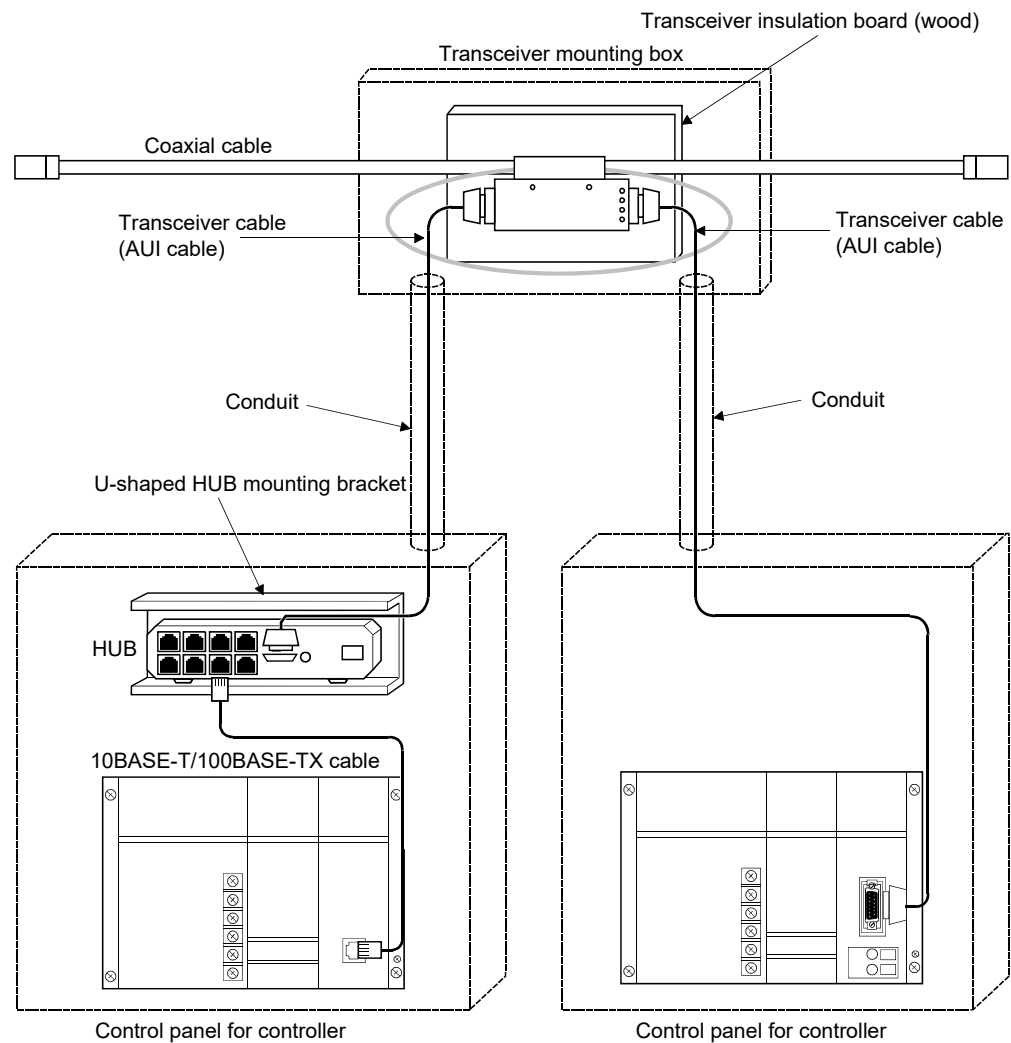


Appendix 8.4 Mounting FL-net (OPCN-2) system network components

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.

- (1) Mount the transceiver to a wood insulation board inside a steel mounting box. Be sure that the mounting box is grounded with a ground resistance of 100 ohms or less.
- (2) Route the transceiver cable through electric conduit to the control panel for the controller. Make sure that the conduit is grounded with a ground resistance of 100 ohms or less.
- (3) 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 the control panel is grounded with a ground resistance of 100 ohms or less.

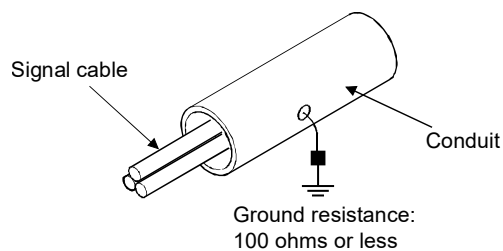
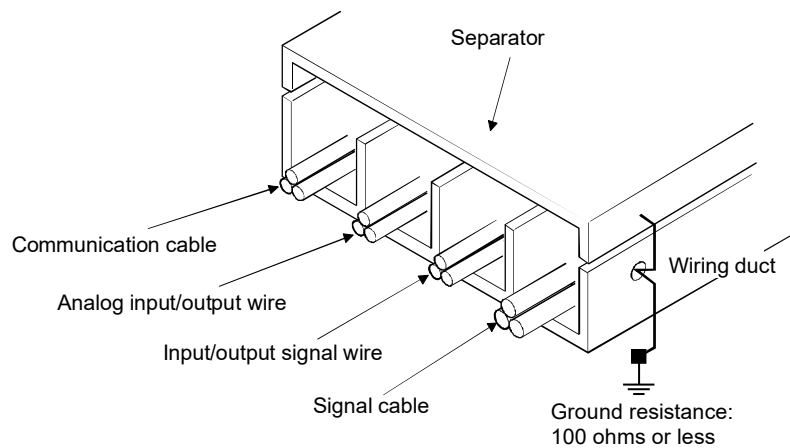


Appendix 8.5 Wiring grounding wiring ducts and conduit

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.

- (1) 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) is grounded with a ground resistance of 100 ohms or less.
- (2) If a conduit is used for routing the wires, prepare separate conduits according to the levels of the power and signal wires. Always use conduits meeting JIS-C-8305 specifications and ground them with a ground resistance of 100 ohms or less.



Appendix 9 FL-net (OPCN-2) Installation Checklist

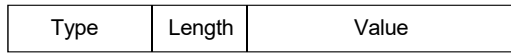
| FL-net (OPCN-2) installation checklist | | | | |
|--|---|-----------------|---------|--|
| Communication line name: | | Node no: | | |
| | | Inspection data | | |
| | | Inspector | Company | |
| Check item | | Name | | |
| Cables | Are all connectors securely locked? | | | |
| | Are the bend diameter 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? | | | |
| Units | 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? | | | | |
| <ul style="list-style-type: none"> • 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 10 Profile Supplement

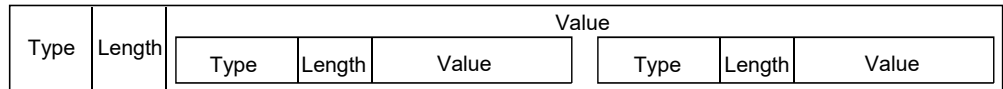
(1) ASN.1 transmission syntax format summary

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.

(a) Primitive ASN.1 type

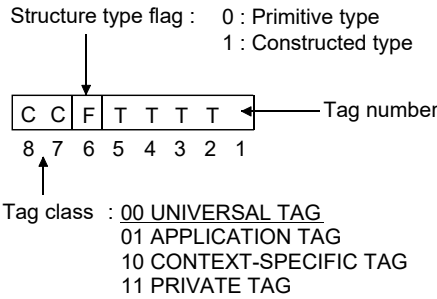


(b) Example of structure type ASN.1 type coding



(c) Type field

1) Structured (1 Octet type)



2) Tag number (UNIVERSAL TAG)

| Tag number (Hexadecimal) | Type | Tag number (Hexadecimal) | Type |
|--------------------------|------------------------|--------------------------|-----------------|
| 00 | (Reserved) | 11 | SET & SET OF |
| 01 | BOOLEAN | 12 | NumericString |
| 02 | INTEGER | 13 | PrintableString |
| 03 | BIT STRING | 14 | TeletexString |
| 04 | OCTET STRING | 15 | VideotexString |
| 05 | NULL | 16 | IA5String |
| 06 | OBJECT IDENTIFIER | 17 | UTCTime |
| 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) |

3) Each data type and structure type flag

| ASN. 1 type | Primitive (*1) | Constructed (*1) |
|---|----------------|------------------|
| 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 | ○ | ○ |

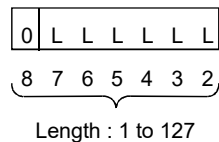
*1 ○ is compatible

4) Printable string

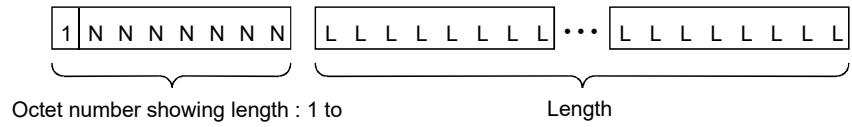
| Name | Character | Code (Hexadecimal) |
|-------------------|--------------|--------------------|
| Capital letters | A, B, ···, Z | 41, 42, ···, 5A |
| Small letters | a, b, ···, z | 61, 62, ···, 7A |
| Digits | 0, 1, ···, 9 | 30, 31, ···, 39 |
| Space | (space) | 20 |
| Apostrophe | ' | 27 |
| Left 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 |

(d) Length field

1) Fixed length short format



2) Fixed length long format



3) Data transmission sequence

The data transmission is the big endian type in which the data with the highest octet to be sent first.

4) 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, (IS/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)

(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 | ○ |

(Continued on next page)

(Continued from previous page)

| Item | Description | Status |
|----------|--------------------------------------|--------|
| 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 | ○ |

Appendix 11 Programming for Use of FL-net Module on MELSECNET/H Remote I/O Station

When using the FL-net module on the MELSECNET/H remote I/O station, take into account the following for 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.

Refer to Section 6.5 for programs for initial processing, cyclic transmission and message transmission.

(1) REMFR/REMTO instruction

- (a) 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.

- (b) When reading/writing data larger than 960 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 960 words) for the same module.

(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.

- (a) When turning ON output signal Y

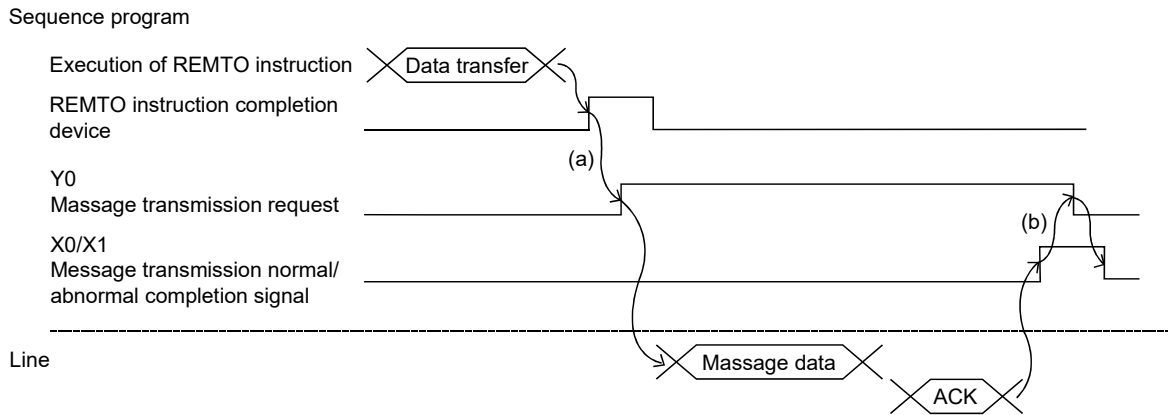
Before turning ON the output signal Y, make sure that the completion device is ON after execution of the REMFR/REMTO instruction.

- (b) When turning OFF output signal Y after turning it ON

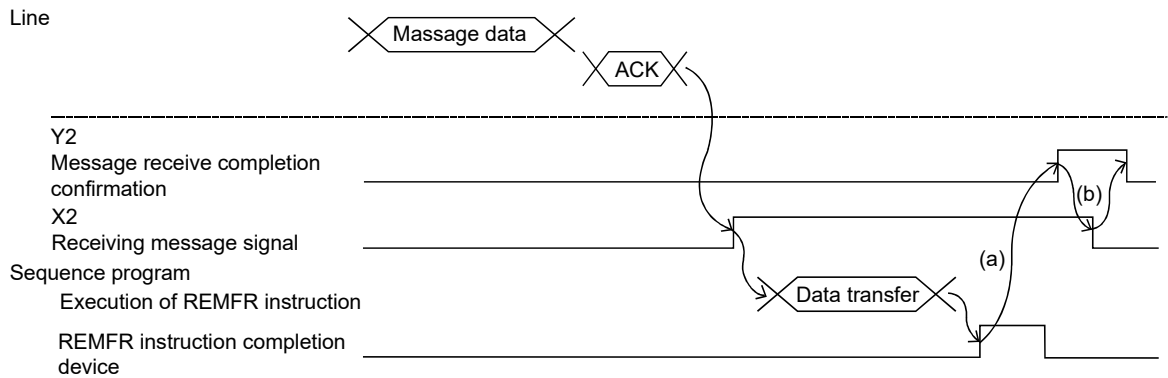
Before turning OFF the output signal Y, make sure that the input signal X corresponding to the output signal Y is ON (X2 is OFF for message reception).

Refer to Section 3.2.4 for details of the I/O signals.

1) Message transmission example



2) Message reception example



POINT

For details of the REMFR/REMTO instruction, refer to "Q Corresponding MELSECNET/H Network System Reference Manual (Remote I/O Network)".

Appendix 12 Cyclic Data Area Assignment Sheet

(1) Area1 (bit area)

| Node No. | FL-net circuit | FL-net module | | | CPU module | Remark | |
|---|---|--|---------------------------|---------------|-----------------|--------------|------------|
| | Common memory address (0000 to 01FFH) | Buffer memory address (1C00 to 1DFFH) | Data size (Word units) | Buffer offset | PLC side device | | |
| <input type="checkbox"/> <input type="checkbox"/> 1 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 2 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 3 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 4 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 5 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 6 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 7 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 8 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 9 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 0 | | | | | | | |
| (example) | <input type="checkbox"/> <input type="checkbox"/> 1 | 0000 to 000FH | 1C00 to 1C0FH | 16 | 0 | B0 to BFF | |
| | <input type="checkbox"/> <input type="checkbox"/> 3 | 0020 to 002FH | 1C20 to 1C2FH | 16 | 32 | B200 to B2FF | Local node |

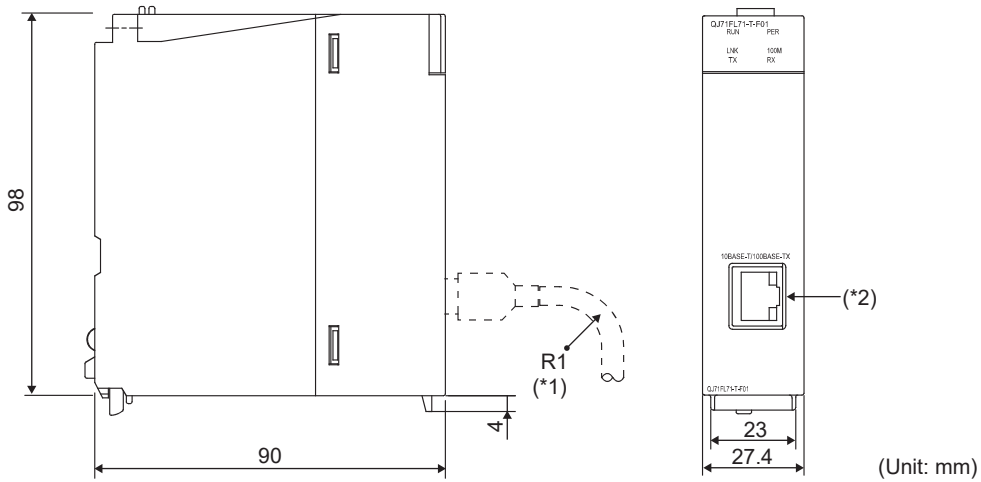
(2) Area2 (word area)

| Node No. | FL-net circuit | FL-net module | | | CPU module | Remark | |
|---|---|--|---------------------------|---------------|-----------------|--------------|------------|
| | Common memory address (0000 to 1FFFH) | Buffer memory address (2000 to 3FFFH) | Data size (Word units) | Buffer offset | PLC side device | | |
| <input type="checkbox"/> <input type="checkbox"/> 1 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 2 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 3 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 4 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 5 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 6 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 7 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 8 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 9 | | | | | | | |
| <input type="checkbox"/> <input type="checkbox"/> 0 | | | | | | | |
| (example) | <input type="checkbox"/> <input type="checkbox"/> 1 | 0000 to 00FFH | 2000 to 20FFH | 256 | 0 | W0 to WFF | |
| | <input type="checkbox"/> <input type="checkbox"/> 3 | 0200 to 02FFH | 2200 to 22FFH | 256 | 512 | W200 to W2FF | Local node |

Appendix 13 External Dimensions

(1) QJ71FL71-T-F01, QJ71FL71-T

The appearance of the QJ71FL71-T is the same as that of the QJ71FL71-T-F01, except the model name part and silkscreen print. (Refer to Section 3.6.)

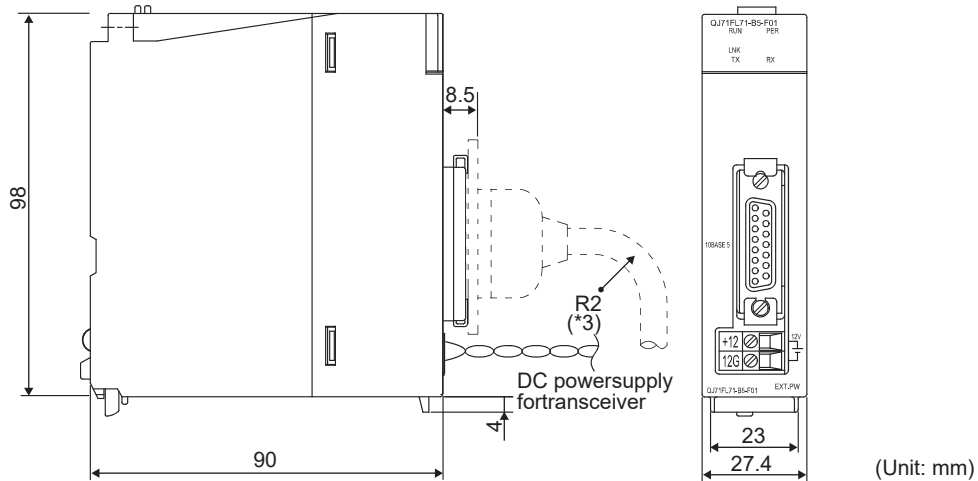


*1 When connecting a twisted pair cable, the bending radius near the connector (reference value: R1) must be four times the cable's outside diameter or larger.

*2 The orientation of the connector is different (rotated) depending on the serial No.

(2) QJ71FL71-B5-F01, QJ71FL71-B5

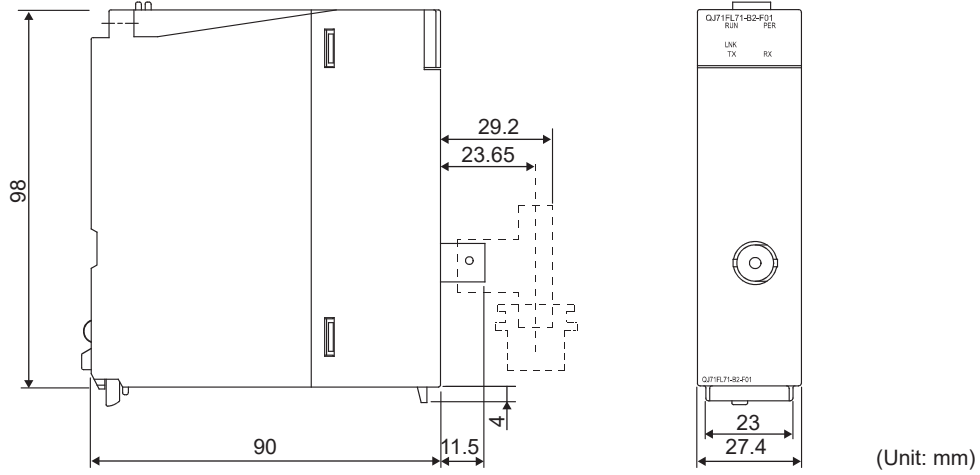
The appearance of the QJ71FL71-B5 is the same as that of the QJ71FL71-B5-F01, except the model name part and silkscreen print. (Refer to Section 3.6.)



*3 When connecting a AUI cable, the bending radius near the connector (reference value: R2) must be four times the cable's outside diameter or larger.

(3) QJ71FL71-B2-F01, QJ71FL71-B2

The appearance of the QJ71FL71-B2 is the same as that of the QJ71FL71-B2-F01, except the model name part and silkscreen print. (Refer to Section 3.6.)



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SH(NA)-080350E-L(2108)KWIX

MODEL: QJFL71-F01-U-SY-E

MODEL CODE: 13JR61

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