HITACHI

USER'S MANUAL

OPTION

EQ.LINK

(LQE701)

R70 S10V

SVE-1-124 (D)

USER'S MANUAL

OPTION

EQ.LINK

（LQE701）

R70 | S10V

First Edition, January 2004, SVE-1-124(A) (out of print)
Second Edition, September 2008, SVE-1-124(B) (out of print)
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Printed in Japan.

SN<IC> (FL-MW2007, AI10)

SAFETY PRECAUTIONS

- Before installation, operation, maintenance, and/or inspection of this product, be sure to read through carefully this manual and other related manuals. Do not use this product until you are familiar with all the information concerning this product, safety information, and precautions provided in those manuals.
- Keep this manual in a readily accessible place so that users of this product may easily reach it.
- This manual contains information on potential hazards that is intended as a guide for safe use of this product. The potential hazards listed in the manual are divided into four hazard levels of danger, warning, caution, and notice, according to the level of their severity. The following are definitions of the safety labels containing the corresponding signal words DANGER, WARNING, CAUTION, and NOTICE.

⚠ **DANGER**	: This safety label identifies precautions that, if not heeded, will result in death or serious injury.
⚠ **WARNING**	: Identifies precautions that, if not heeded, could result in death or serious injury.
⚠ **CAUTION**	: Identifies precautions that, if not heeded, could result in minor or moderate injury.
NOTICE	: This safety label without a safety alert symbol identifies precautions that, if not heeded, could result in property damage or loss not related to personal injury.

Failure to observe any of the ⚠CAUTION and *NOTICE* statements used in this manual could also lead to a serious consequence, depending on the situation in which this product is used. Therefore, be sure to observe all of those statements without fail.

The following are definitions of the phrases “serious injury,” “minor or moderate injury,” and “property damage or loss not related to personal injury” used in the above definitions of the safety labels.

Serious injury: Is an injury that requires hospitalization for medical treatment, has aftereffects, and/or requires long-term follow-up care. Examples of serious injuries are as follows: vision loss, burn (caused by dry heat or extreme cold), electric-shock injury, broken bone, poisoning, etc.

Minor or moderate injury: Is an injury that does not require either hospitalization for medical treatment or long-term follow-up care. Examples of minor or moderate injuries are as follows: burn, electric-shock injury, etc.

Property damage or loss not related to personal injury: Is a damage to or loss of personal property. Examples of property damages or losses not related to personal injury are as follows: damage to this product or other equipment or their breakdown, loss of useful data, etc.

The safety precautions stated in this manual are based on the general rules of safety applicable to this product. These safety precautions are a necessary complement to the various safety measures included in this product. Although they have been planned carefully, the safety precautions posted on this product and in the manual do not cover every possible hazard. Common sense and caution must be used when operating this product. For safe operation and maintenance of this product, establish your own safety rules and regulations according to your unique needs. A variety of industry standards are available to establish such safety rules and regulations.

The following are the hazard warning statements contained in this manual.

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DANGER

- Switch off the power supply before making connections to the terminal block. Wiring with the power supply switched on may incur electrical shock hazards.
- An electric shock may lead to a death or burn. Noise may cause the system to malfunction. Ground the line ground (LG), frame ground (FG), and shield wire (SHD) terminals.

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WARNING

- If the module emits smoke or foreign odor, immediately switch off the power supply and investigate the problem cause.
- Do not perform any installation, wiring, handling, or internal modification procedures other than stated in this manual. In no event will Hitachi be responsible for personal injury or death or any damage to Hitachi's product or peripheral equipment arising out of the use of such an unauthorized procedure.
- While the power is applied, never touch a terminal strip or connector pin. If you touch a terminal strip or connector pin while the power is applied, you may receive an electric shock.

(Page 3-3)

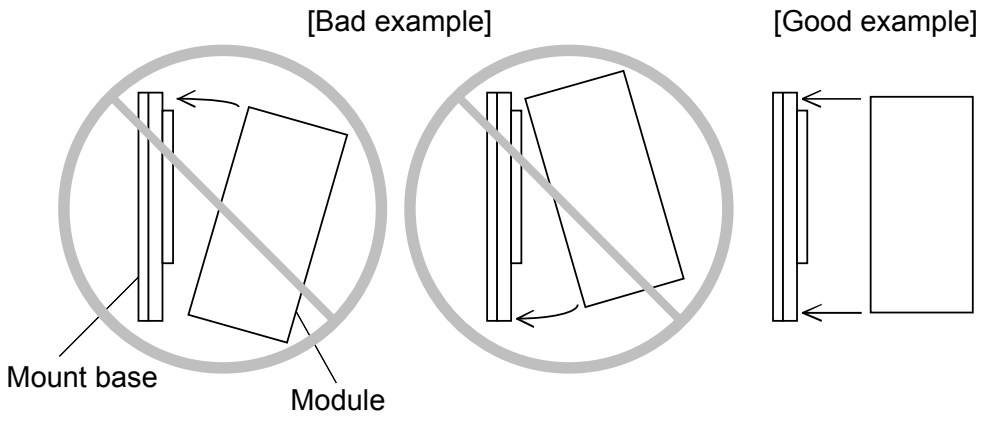
CAUTION

- At installation sites where there is a risk of a water leak, be sure to install the programmable controller in a drip-proof cubicle and use it. Disregarding this rule may result in failure of the product.
- Do not touch any of the modules in the programmable controller when they are in an energized state. Touching any of the modules in an energized state may lead to a discharge of static electricity from your body to the module, resulting in malfunction or breakage of the module. If you have no choice but to touch a module, be sure to discharge the static electricity by touching the metal frame of the cubicle and then touch the module. This is also true when you perform any of the following actions on a module in its non-energized state: 1) setting a switch on the module; 2) connecting or disconnecting the cable from the module; or 3) inserting or removing the connector from the module.

(Page 3-5)

CAUTION

- Dust or other foreign matter might accumulate on the connector, resulting in poor contact. Immediately after the module is unpacked, perform the mounting and wiring procedures.
- To prevent the module from being damaged, observe the following precautions when you mount or demount the module:
  - Before mounting the module to the mount base connector, check that the connector pins are properly aligned and not bent, broken, or soiled with dirt or the like.
  - Ensure that the module is parallel to the mount base vertical surface as shown below when mounting. If you connect a module to or disconnect it from its connector while it is tilted, the connector pins may become damaged.
  - If the mount base is positioned overhead due to the employed enclosure structure, use a stepladder or the like and mount the module squarely. If you mount the module obliquely, the connector may become damaged.



(Page 3-6)

CAUTION

- Observe the installation procedure stated in the manual.
  If the module is improperly installed, it may drop, become defective, or malfunction.
- Do not allow wire cuttings or other foreign matter to enter the module.
  The entry of foreign matter in the module may result in a fire or cause the module to become defective or malfunction.
- Static electricity may damage the module. Before starting the work, discharge all electrostatic charge from your body.
- Properly tighten the screws. If they are inadequately tightened, malfunction, smoke emission, or combustion may occur.

(Page 1-4)

NOTICE

- Do not connect EQ.LINK and FL.NET modules to make a network.
- Do not use the 10BASE-5 transmission. This module does not support the 10BASE-5 connection.
- Mount two EQ.LINK modules to transfer memory data exceeding 17 k words. This configuration can transfer a maximum of 34 k words.
- 4 bytes are assured for data simultaneity only when accessed by Ladder and HI-FLOW. 2 bytes are assured for data simultaneity when accessed by a task (C program).

(Page 1-6)

NOTICE

- If the software supplied by Hitachi is modified for use, Hitachi cannot be responsible for accidents or losses resulting from such modification.
- Hitachi cannot be responsible for reliability if you use software other than supplied from Hitachi.
- Back up files on a daily basis. You might lose the contents of files due, for instance, to a file unit failure, power failure during a file access, or operating error. To provide against such contingencies, back up files according to an appropriate plan.
- Before scrapping the product, ask a professional waste disposal dealer in charge of scrapping work.
- Do not use a transceiver, cellular phone, or similar device near the module because module malfunction or system failure may occur due to noise.
- The contents of the memory may become damaged due, for instance, to a module failure. Be sure to make a backup of important data.
- Before constructing a system, creating a program, or performing a similar procedure, thoroughly read this manual to become familiar with the contained instructions and precautions. If you perform any incorrect procedure, the system may malfunction.
- Store this manual at a predetermined place where it can readily be referred to whenever it is needed.
- If you have any doubt or question about the contents of this manual, contact your local source.
- Hitachi cannot be responsible for accidents or losses resulting from a customer's misuse.
- If an emergency stop circuit, interlock circuit, or similar circuit is to be formulated, it must be positioned external to this module. If you do not observe this precaution, equipment damage or accident may occur when this module becomes defective.

(Page 2-3)

NOTICE

Be sure to turn off the power to the EQ.LINK module before operating the module number setting switch. Operating it in an energized state of the EQ.LINK module will result in malfunction.

(Page 3-6)

NOTICE
Do not disassemble or modify the module. Failure to observe this precaution may result in a fire or cause the module to become defective or malfunction.

(Page 3-7)

NOTICE
● Be sure to shut off power to the system before setting the MODU No. selector switch. When the switch is set while the system is powered on, the system may malfunction. ● Up to two EQ.LINK and FL.NET modules on the mount base. Do not set both modules to MAIN or SUB.

(Page 3-10)

NOTICE
● Electrically insulate the mount base from the enclosure. To assure this, do not remove the insulating sheet from the mount base. ● The LG is a ground terminal for power supply noise. The FG and SHD are ground terminals for the noise in the communication module and other external interface lines. To avoid interference between the ground terminals, separately ground the LG and FG. ● Do not touch the 10BASE-5 connector while the system is powered on. The static electricity on your body may cause the system to malfunction.

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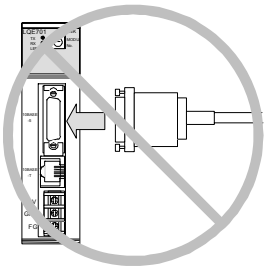
NOTICE

- Do not connect the EQ.LINK module to a router or hub.
- The EQ.LINK module does not support the 10BASE-5 transmission. Do not connect the cable to the 10BASE-5 interface connector.



- Do not touch the 10BASE-5 connector while the system is powered on. The static electricity on your body may cause the system to malfunction.
- For wiring of the SYS SW module, see “USER’S MANUAL OPTION SYS SW (manual number SVE-1-123).”

(Page 5-2)

NOTICE

If Windows® opens a window during the uninstall process to display the question “Remove Shared File?,” click the [No] button to retain shared files.

(Page 5-3)

NOTICE

- You can set parameters of the EQ.LINK system and run the EQ.LINK system only when the LPU is connected to your Windows® personal computer.
- Set parameters of the EQ.LINK modules before connecting them. If the parameters are set while the EQ.LINK modules are interconnected, the EQ.LINK modules may malfunction.

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NOTICE
● Frequent updates of error counts in RAS information may be caused by a system overload, invalid link parameter setting, or cable disconnection. Troubleshoot and repair according to “6 MAINTENANCE.” If the error still persists, the EQ.LINK module may be faulty. Replace the EQ.LINK module. ● If the transmission cycle of the EQ.LINK module becomes greater than the sequence cycle of the LPU, the number of transmission requests skipped is counted. If this value is frequently updated, make the transmission size smaller or the sequence cycle longer.

(Page 6-2)

NOTICE
Static electricity may damage the module. Before starting the work, discharge all electrostatic charge from your body.

WARRANTY AND SERVICING

Unless a special warranty contract has been arranged, the following warranty is applicable to this product.

1. Warranty period and scope
   Warranty period
   The warranty period for this product is for one year after the product has been delivered to the specified delivery site.

   Scope
   If a malfunction should occur during the above warranty period while using this product under normal product specification conditions as described in this manual, please deliver the malfunctioning part of the product to the dealer or Hitachi Engineering & Services Co., Ltd. The malfunctioning part will be replaced or repaired free of charge. If the malfunctioning is shipped, however, the shipment charge and packaging expenses must be paid for by the customer.

   This warranty is not applicable if any of the following are true.

   - The malfunction was caused by handling or use of the product in a manner not specified in the product specifications.
   - The malfunction was caused by a unit other than that which was delivered.
   - The malfunction was caused by modifications or repairs made by a vendor other than the vendor that delivered the unit.
   - The malfunction was caused by a relay or other consumable which has passed the end of its service life.
   - The malfunction was caused by a disaster, natural or otherwise, for which the vendor is not responsible.

   The warranty mentioned here means the warranty for the individual product that is delivered. Therefore, we cannot be held responsible for any losses or lost profits that result from the operation of this product or from malfunctions of this product. This warranty is valid only in Japan and is not transferable.

2. Range of services
   The price of the delivered product does not include on-site servicing fees by engineers. Extra fees will be charged for the following:

   - Instruction for installation and adjustments, and witnessing trial operations.
   - Inspections, maintenance and adjustments.
   - Technical instruction, technical training and training schools.
   - Examinations and repairs after the warranty period is concluded.
   - Even if the warranty is valid, examination of malfunctions that are caused by reasons outside the above warranty scope.

This manual provides information for the following hardware and program product:

<Hardware product>
EQ.LINK (LQE701)

<Program product>
S-7895-41, S10V EQ.LINK SYSTEM, 02-01

Change Record (for SVE-1-124(B)): S10V EQ.LINK SYSTEM, 01-01

Description of added changes	Chapter/Section/ Subsection
Replacing on the module is newly added.	6.1.1

Change Record (for SVE-1-124(C)): S10V EQ.LINK SYSTEM, 02-00

Description of added changes	Chapter/Section/ Subsection
CMU module (of model LQP526) support	5

Change Record (for SVE-1-124(D)): S10V EQ.LINK SYSTEM, 02-01

Description of added changes	Chapter/Section/ Subsection
A procedure for starting up the EQ.LINK system in offline mode is added.	5.1.4
A load command to load the contents of an EQ.LINK parameter file in is added.	5.2.14
A save command to save EQ.LINK parameter settings to a file is added.	5.2.15
A print command to print out the EQ.LINK parameter settings displayed on-screen is added.	5.2.16
A CSV output command to output the EQ.LINK parameter settings displayed on-screen to a file in CSV format is added.	5.2.17

In addition to the above changes, all the unclear descriptions and typographical errors found are also corrected without prior notice.

Revision record

Revision No.	Revision Record (revision details and reason for revision)	Month, Year	Remarks
A	First Edition	January 2004	
B	Replacing on the module is newly added.	September 2008	
C	CMU module (of model LQP526) support	February 2010	
D	Offline functionality is newly added and safety precautions are revised.	January 2011	

PREFACE

Thank you for purchasing the EQ.LINK module, which is an option for use with the R70/S10V.
This manual, named USER'S MANUAL OPTION EQ.LINK, describes how to use the EQ.LINK module. For proper use of the EQ.LINK module, it is requested that you thoroughly read this manual.

The S10V product is available in two types: standard model and environmentally resistant model.
The environmentally resistant model has thicker platings and coatings than those for the standard model.
The model number of the environmentally resistant model is marked by adding the suffix "-Z" to the model number of the standard model.

(Example) Standard model: LQE701
Environmentally resistant model: LQE701-Z

This manual is applicable to both the standard model and environmentally resistant models.
Although the descriptions contained in this manual are based on the standard model, follow the instructions set forth in this manual for proper use of the product even if you use the environmentally resistant model.

<Related Manuals>
- USER'S MANUAL BASIC MODULE (manual number SVE-1-100)
- USER'S MANUAL OPTION SYS SW (manual number SVE-1-123)
- SOFTWARE MANUAL OPERATION S10V LADDER CHART For Windows® (manual number SVE-3-131)
- USER'S MANUAL OPTION CMU (LQP526-Z, LQZ500-Z) (manual number SVE-1-145)

<Trademarks>
- Microsoft® Windows® 2000 operating system and Microsoft® Windows® XP operating system are registered trademarks of Microsoft Corporation in the United States and/or other countries.
- Ethernet® is a registered trademark of Xerox Corp.

<Note for storage capacity calculations>

- Memory capacities and requirements, file sizes and storage requirements, etc. must be calculated according to the formula 2^n. The following examples show the results of such calculations by 2^n (to the right of the equals signs).
  1 KB (kilobyte) = 1,024 bytes
  1 MB (megabyte) = 1,048,576 bytes
  1 GB (gigabyte) = 1,073,741,824 bytes
- As for disk capacities, they must be calculated using the formula 10^n. Listed below are the results of calculating the above example capacities using 10^n in place of 2^n.
  1 KB (kilobyte) = 1,000 bytes
  1 MB (megabyte) = $1{,}000^2$ bytes
  1 GB (gigabyte) = $1{,}000^3$ bytes

<Glossary>

PLC: Abbreviation of Programmable Logic Controller
An industrial electronic apparatus for sequence processing by pre-installed programs
HITACHI S10V series and the like are PLCs.

PCs: Abbreviation of Programmable Controllers
This is a generic name of PLCs such as HITACHI S10V series.

CONTENTS

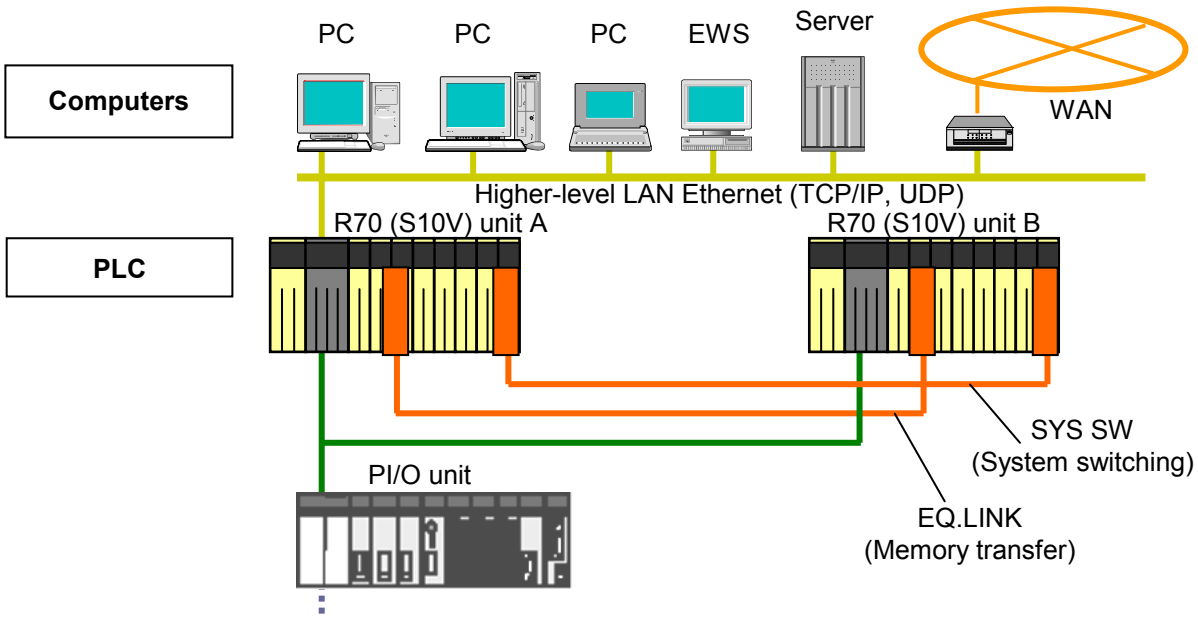
FIGURES

TABLES

1 SPECIFICATIONS

1.1 Use

The EQ.LINK module (Model: LQE701) cooperates with the SYS SW module (Model: LQZ700) to transfer memory data. This module transfers memory data between two R70s (S10Vs) in a duplexed configuration when the SYS SW module switches systems.



1.2 Specifications

Table 1-1 EQ.LINK Module General Specifications

Item	Specifications
Operating ambient temperature	0 to 55°C
Storage ambient temperature	-20 to 75°C
Operating atmosphere	Dust: 0.1 mg/m^3 maximum; free from corrosive gas
Operating ambient humidity	30 to 90% RH (non-condensing)
Storage ambient humidity	10 to 90% RH (non-condensing)
Vibration resistance	JIS C 0040-compliant
Shock resistance	JIS C 0041-compliant

Table 1-2 EQ.LINK Module Functionality and Performance Specifications

Item	Specifications
Module model	LQE701
Maximum number of mountable modules	2 modules per LPU
Transfer speed	10 Mbps
Electrical interface	IEEE802.3-compliant (CSMA/CD-compliant)
Transmission protocol	UDP/IP
Number of connectable units	Up to 2 units per network (interconnection)
Connector	AUI connector (10BASE-5)
	RJ45 connector (10BASE-T)
Module outside dimensions	34 (W) × 130 (H) × 100.2 (D) mm
Mass	240 g
Transfer word count	17 k words maximum (node)
Assurance of simultaneity of transferred data	4 bytes (when accessed by Ladder and HI-FLOW) 2 bytes (when accessed by C programs)
Transfer distance	1.5 km maximum (inter-node)
Cable length	Twisted-pair cable: 100 m maximum

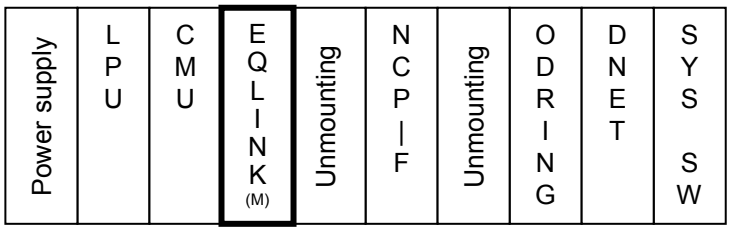
- When two EQ.LINK modules are installed, set their rotary switches respectively to MAIN and SUB.
- To install both EQ.LINK and FL.NET modules, use one EQ.LINK module and one FL.NET module. Set the rotary switch of one of the modules to MAIN and the rotary switch of the other to SUB. For setting of module switches, see "3.4 Setting the Module Number Selector Switch."

NOTICE

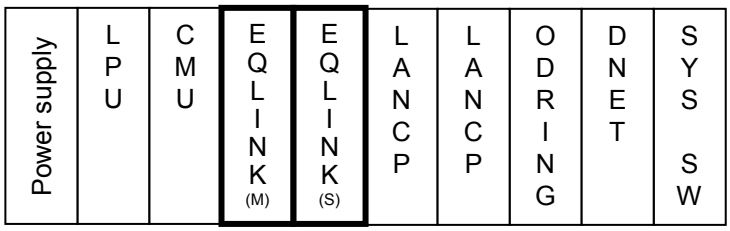
- Do not connect EQ.LINK and FL.NET modules to make a network.
- Do not use the 10BASE-5 transmission. This module does not support the 10BASE-5 connection.
- Mount two EQ.LINK modules to transfer memory data exceeding 17 k words. This configuration can transfer a maximum of 34 k words.
- 4 bytes are assured for data simultaneity only when accessed by Ladder and HI-FLOW. 2 bytes are assured for data simultaneity when accessed by a task (C program).

Examples of mounting modules are shown below.

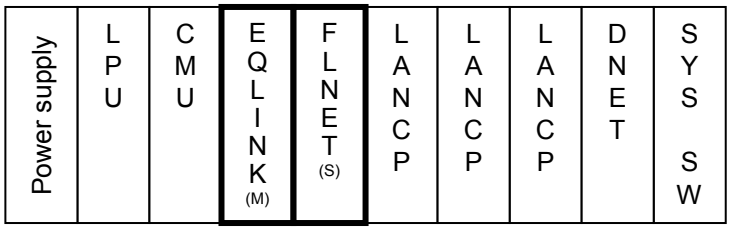
(1) Installation example of one EQ.LINK module



(2) Installation example of two EQ.LINK modules



(3) Installation example of one EQ.LINK module and one FL.NET module



When both EQ.LINK and FL.NET modules are installed, their rotary switches are set respectively to MAIN and SUB, but their MAIN and SUB functions are identical.

1.3 System Software Specifications

1.3.1 System overview

The operating information of the EQ.LINK module must be registered before used. Use the system software (tool) below to register the module information equivalent to a general Windows®-based application.

Table 1-3 Types of System Software (Tools)

Package name	Model	Supply style
EQ.LINK system	S-7895-41	Optional

1.3.2 Required hardware and software

The following hardware and software are required for the use of the EQ.LINK module system software:

- Personal computer main unit having a Pentium 300 MHz or faster CPU
- Display having a resolution of 800 × 600 dots (SVGA) or higher
- Microsoft® Windows® 2000 operating system or Microsoft® Windows® XP operating system
- At least 64 MB of RAM (when Windows® 2000 is used)
  At least 128 MB of RAM (when Windows® XP is used)
- At least 10 MB of free hard disk space
- Cable for connecting the personal computer to the LPU unit

- Users of this product must have an adequate knowledge of the Windows® environment and user interface. This system conforms to the Windows® standard. This manual is prepared for users who are familiar with the basic Windows® operating procedures.
- Disable the suspend function of your personal computer (if it is available). If the suspend function works, the running EQ.LINK system may malfunction.

NOTICE

- If the software supplied by Hitachi is modified for use, Hitachi cannot be responsible for accidents or losses resulting from such modification.
- Hitachi cannot be responsible for reliability if you use software other than supplied from Hitachi.
- Back up files on a daily basis. You might lose the contents of files due, for instance, to a file unit failure, power failure during a file access, or operating error. To provide against such contingencies, back up files according to an appropriate plan.
- Before scrapping the product, ask a professional waste disposal dealer in charge of scrapping work.
- Do not use a transceiver, cellular phone, or similar device near the module because module malfunction or system failure may occur due to noise.
- The contents of the memory may become damaged due, for instance, to a module failure. Be sure to make a backup of important data.
- Before constructing a system, creating a program, or performing a similar procedure, thoroughly read this manual to become familiar with the contained instructions and precautions. If you perform any incorrect procedure, the system may malfunction.
- Store this manual at a predetermined place where it can readily be referred to whenever it is needed.
- If you have any doubt or question about the contents of this manual, contact your local source.
- Hitachi cannot be responsible for accidents or losses resulting from a customer's misuse.
- If an emergency stop circuit, interlock circuit, or similar circuit is to be formulated, it must be positioned external to this module. If you do not observe this precaution, equipment damage or accident may occur when this module becomes defective.

2 NAMES AND FUNCTIONS OF EACH PART

2.1 Names and Functions of Each Part

2.1.1 External views

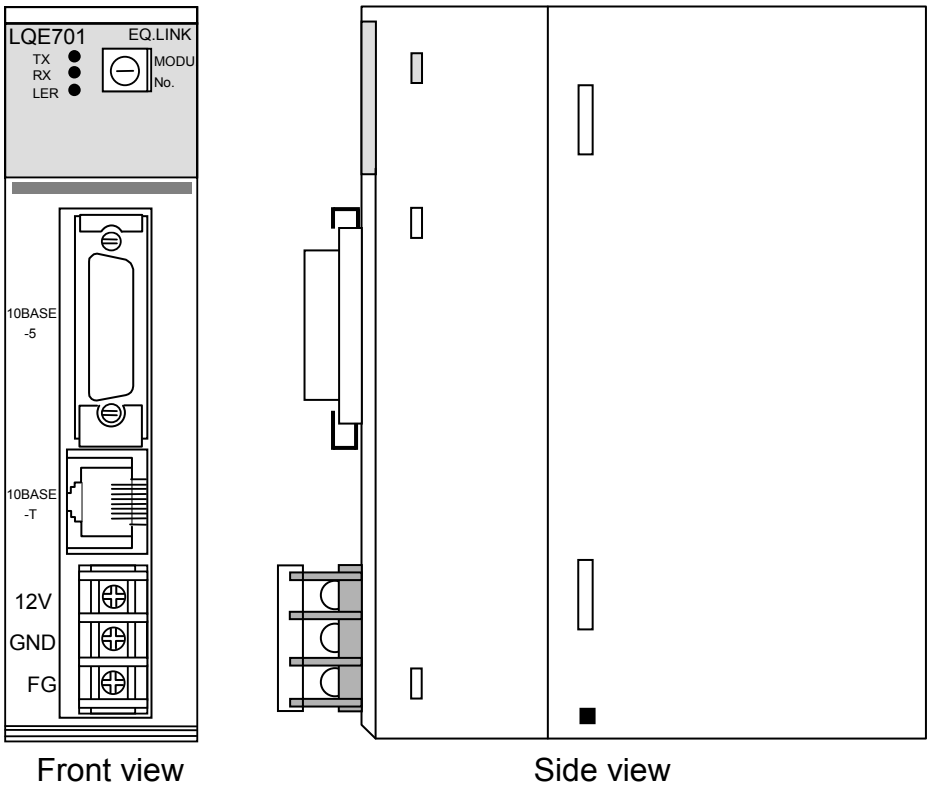


Figure 2-1 EQ.LINK Module External Views

2.1.2 Component names and functions

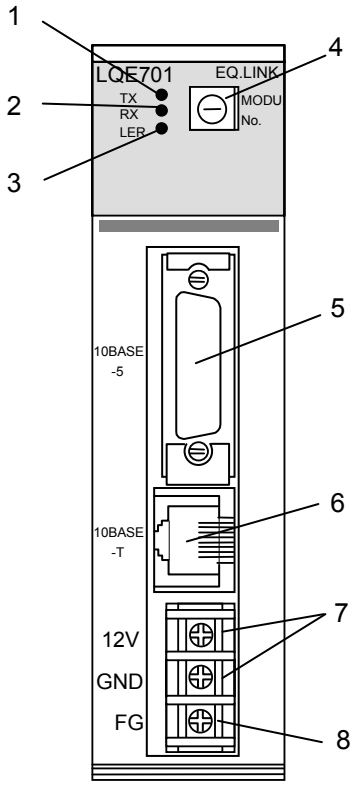


Figure 2-2 EQ.LINK Module Component Names

Table 2-1 EQ.LINK Module Component Names and Functions

No.	Name	Function
1	TX LED	Lights during data transfer.
2	RX LED	Lights when data flows on the transmission line (when a carrier is detected).
3	LER LED	Lights when a hardware error, network disconnection, or network transmission error is detected.
4	Module number setting switch	Specifies the main and sub modules. See "3.4 Setting the Module Number Setting Switch."
5	10BASE-5 connector	Not used
6	10BASE-T connector	Connected to the opponent EQ.LINK system with a cross-cable.
7	Power input terminal	Not used
8	Frame ground	Not used

NOTICE

Be sure to turn off the power to the EQ.LINK module before operating the module number setting switch. Operating it in an energized state of the EQ.LINK module will result in malfunction.

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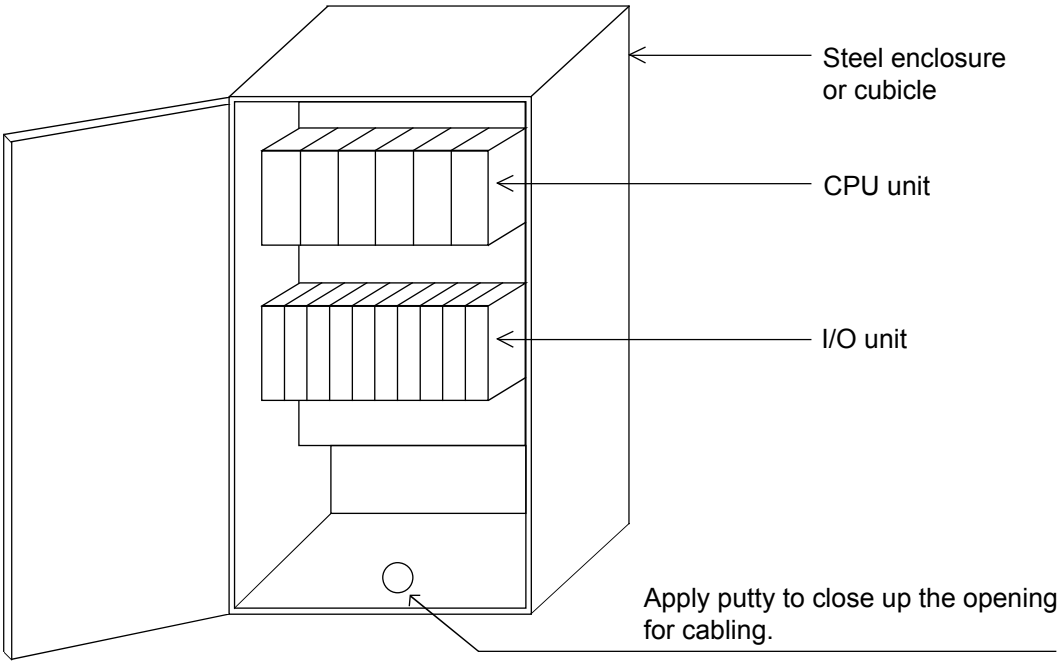
3 MOUNTING AND WIRING

3.1 Precautions for Using PCs

Hitachi's programmable controllers or PCs are a product of application of electronic circuit and processor technologies. The use of the product therefore requires special attention to be given to the following:

(1) The conditions to be met in system construction, such as maximum rated values, operating voltage ranges, heat dissipation characteristics, and mounting conditions, must all be within the warranty coverage stated in this manual. The manufacturer will not be held responsible for any damage that may be caused to the product and/or any physical injury that may be incurred as a result of using the product with conditions outside the warranty coverage.
In addition to the above requirement, fail-safe measures should also be provided in any user system by taking the expected failure rate and failure mode of the product into consideration. This is the case even when the product is used with every condition within the warranty coverage. The purpose of such fail-safe measures is to prevent the user system from suffering physical injuries, fire accidents, and/or other enlarged damages, due to the operation of the product.

(2) None of the PCs supplied to our customers is fireproof, dust-proof, and waterproof. So, please install your PCs in dust-proof and waterproof steel enclosures or cubicles as shown below.



CAUTION

- At installation sites where there is a risk of a water leak, be sure to install the programmable controller in a drip-proof cubicle and use it. Disregarding this rule may result in failure of the product.
- Do not touch any of the modules in the programmable controller when they are in an energized state. Touching any of the modules in an energized state may lead to a discharge of static electricity from your body to the module, resulting in malfunction or breakage of the module. If you have no choice but to touch a module, be sure to discharge the static electricity by touching the metal frame of the cubicle and then touch the module. This is also true when you perform any of the following actions on a module in its non-energized state: 1) setting a switch on the module; 2) connecting or disconnecting the cable from the module; or 3) inserting or removing the connector from the module.

3.2 Mount Base

This module can be mounted in the mount bases shown in Table 3-1.

Table 3-1 Mount Bases Applicable to the EQ.LINK Module

Series	Name	Model	Specifications
R70, S10V	8-slot mount base	HSC-1580	Power supply + CPU + 8 slots (optional, for I/O)
S10V	4-slot mount base	HSC-1540	Power supply + LPU + 4 slots (optional, for I/O)

3.3 Mounting the Module

Mount the SYS SW module on the final option slot (slot 3 or 7) of the mount base. The EQ.LINK module can be mounted on any available slot.

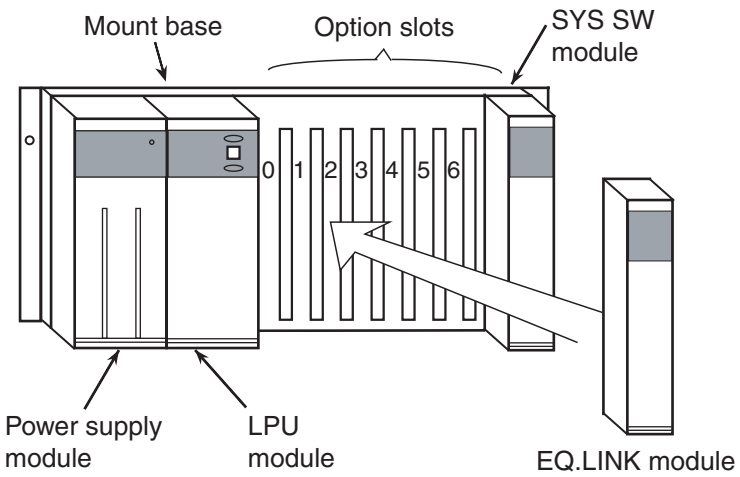


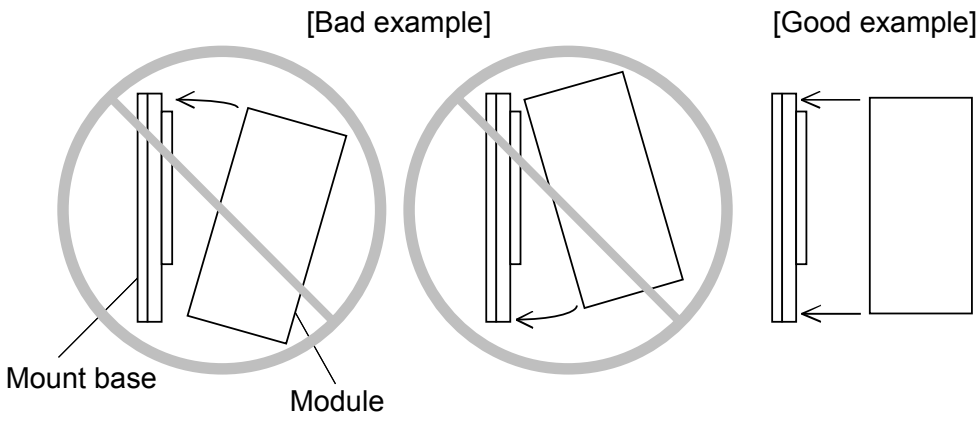
Figure 3-1 Mounting the EQ.LINK Module

⚠ WARNING

- If the module emits smoke or foreign odor, immediately switch off the power supply and investigate the problem cause.
- Do not perform any installation, wiring, handling, or internal modification procedures other than stated in this manual. In no event will Hitachi be responsible for personal injury or death or any damage to Hitachi's product or peripheral equipment arising out of the use of such an unauthorized procedure.
- While the power is applied, never touch a terminal strip or connector pin. If you touch a terminal strip or connector pin while the power is applied, you may receive an electric shock.

⚠ CAUTION

- Dust or other foreign matter might accumulate on the connector, resulting in poor contact. Immediately after the module is unpacked, perform the mounting and wiring procedures.
- To prevent the module from being damaged, observe the following precautions when you mount or demount the module:
  - Before mounting the module to the mount base connector, check that the connector pins are properly aligned and not bent, broken, or soiled with dirt or the like.
  - Ensure that the module is parallel to the mount base vertical surface as shown below when mounting. If you connect a module to or disconnect it from its connector while it is tilted, the connector pins may become damaged.
  - If the mount base is positioned overhead due to the employed enclosure structure, use a stepladder or the like and mount the module squarely. If you mount the module obliquely, the connector may become damaged.



CAUTION

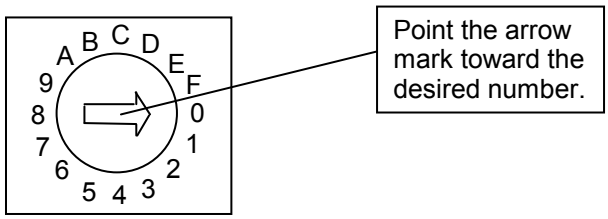
- Observe the installation procedure stated in the manual.
  If the module is improperly installed, it may drop, become defective, or malfunction.
- Do not allow wire cuttings or other foreign matter to enter the module.
  The entry of foreign matter in the module may result in a fire or cause the module to become defective or malfunction.
- Static electricity may damage the module. Before starting the work, discharge all electrostatic charge from your body.
- Properly tighten the screws. If they are inadequately tightened, malfunction, smoke emission, or combustion may occur.

NOTICE

Do not disassemble or modify the module. Failure to observe this precaution may result in a fire or cause the module to become defective or malfunction.

3.4 Setting the Module Number Selector Switch

The module number (MODU No.) selector switch sets a main or sub EQ.LINK module. Set the MODU No. selector switch as follows:



MODU No.		Meaning of setting
Main module	Submodule	
0	1	10BASE-5 communication. (Prohibited)
2	3	10BASE-T communication.
4	5	These module number setting are invalid. When these setting are selected, the system indicates a module switch setting error and does not perform communication or other operations.
6	7	
8	9	
A	B	
C	D	
E	F	

Figure 3-2 Setting the Module Number Selector Switch

The main and sub EQ.LINK modules are functionally the same. When mounting one EQ.LINK module, set it as the main module. When mounting two EQ.LINK modules, set one of the EQ.LINK modules as the main module and the other as the sub module.

NOTICE

- Be sure to shut off power to the system before setting the MODU No. selector switch. When the switch is set while the system is powered on, the system may malfunction.
- Up to two EQ.LINK and FL.NET modules on the mount base. Do not set both modules to MAIN or SUB.

3.5 Applicable Communication Cables

Connect the EQ.LINK module to the opponent module with a 10BASE-T twisted pair cable (cross cable).

Table 3-2 Communication Cable (10BASE-T Twisted-pair Cable) Applicable to the Module

Product name	Model number	Manufacturer
Twisted-pair Cable	HUTP-CAT5 4P	Hitachi Cable, Ltd.

3.6 Ground Wiring

Carry out ground wiring as shown in Figure 3-3 by following these steps:

① Connect the FG terminals of the power supply module, LPU module and optional modules by crossover wiring to the mount base's grounding point, a hexagon nut fitted to the mount base FG terminal (with a wire diameter of 2.0 mm^2 or more).
- Do not connect the grounding wire to the FG terminal of the EQ.LINK module (LQE701).
- For grounding of the other option modules, see their accompanying manuals. (Some option modules have no FG terminal.)

② Wire the mount base FG terminal to the PCs unit grounding point of the enclosure in which the mount base is housed (with a wire diameter of 2.0 mm^2 or more).

③ Perform Class D grounding from the PCs unit grounding point of the enclosure using a wire with a wire diameter of 5.5 mm^2 or more.

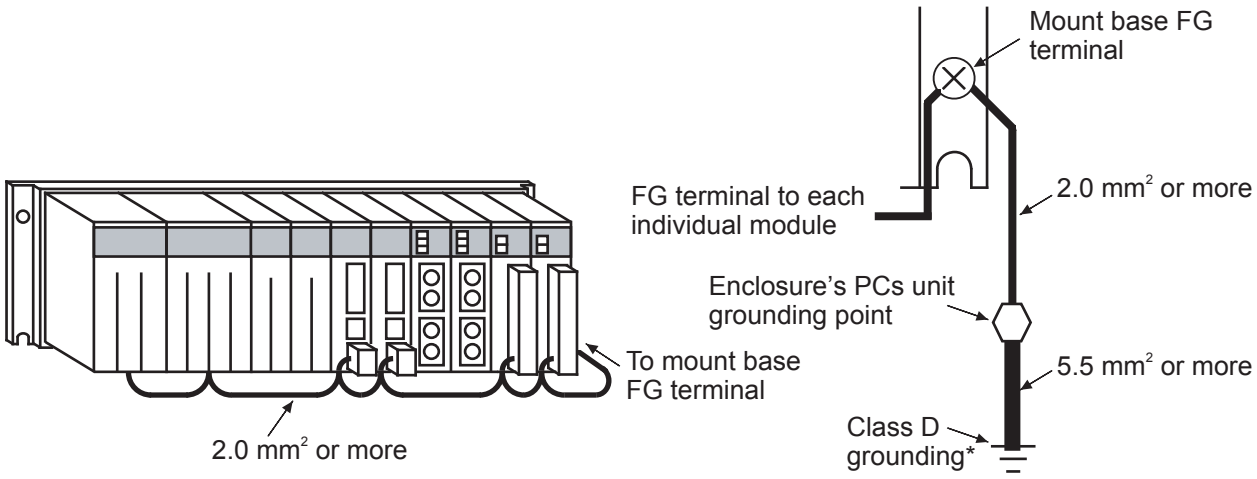


Figure 3-3 Ground Wiring

* Class D grounding is defined in the Technical Standard for Electrical Facilities of Japan. This standard states that the grounding resistance must be 100 ohms or less for equipment operating on 300 VAC or less, and 500 ohms or less for devices that shut down automatically within 0.5 seconds when shorting occurs in low tension lines.

DANGER

- Switch off the power supply before making connections to the terminal block. Wiring with the power supply switched on may incur electrical shock hazards.
- An electric shock may lead to a death or burn. Noise may cause the system to malfunction. Ground the line ground (LG), frame ground (FG), and shield wire (SHD) terminals.

NOTICE

- Electrically insulate the mount base from the enclosure. To assure this, do not remove the insulating sheet from the mount base.
- The LG is a ground terminal for power supply noise. The FG and SHD are ground terminals for the noise in the communication module and other external interface lines. To avoid interference between the ground terminals, separately ground the LG and FG.
- Do not touch the 10BASE-5 connector while the system is powered on. The static electricity on your body may cause the system to malfunction.

3.7 Wiring

Connect the 10BASE-T interface connectors of EQ.LINK modules A and B with the 10BASE-T cable in the one-to-one manner. (For cable types, see "3.5 Applicable Communication Cables.")

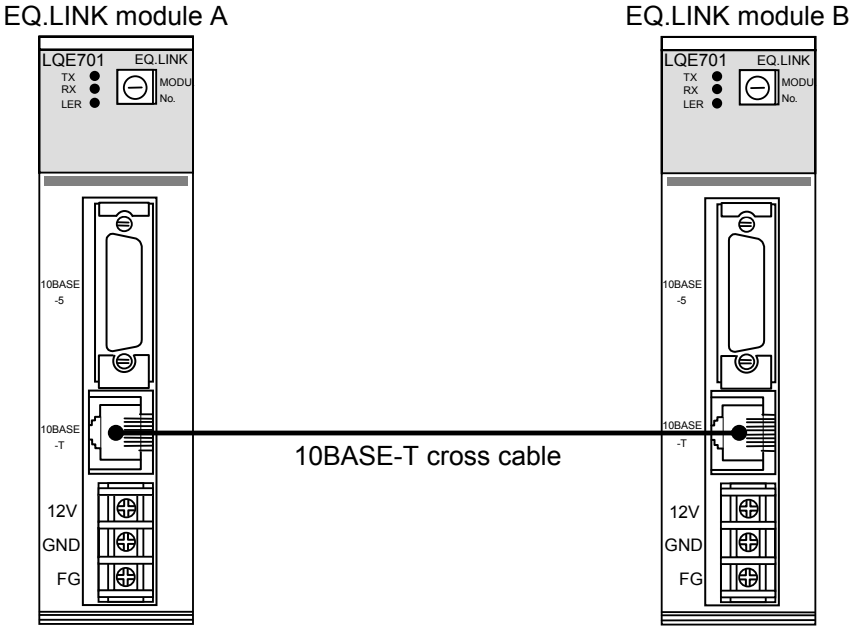
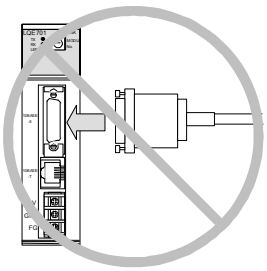


Figure 3-4 Connection of EQ.LINK Modules

NOTICE

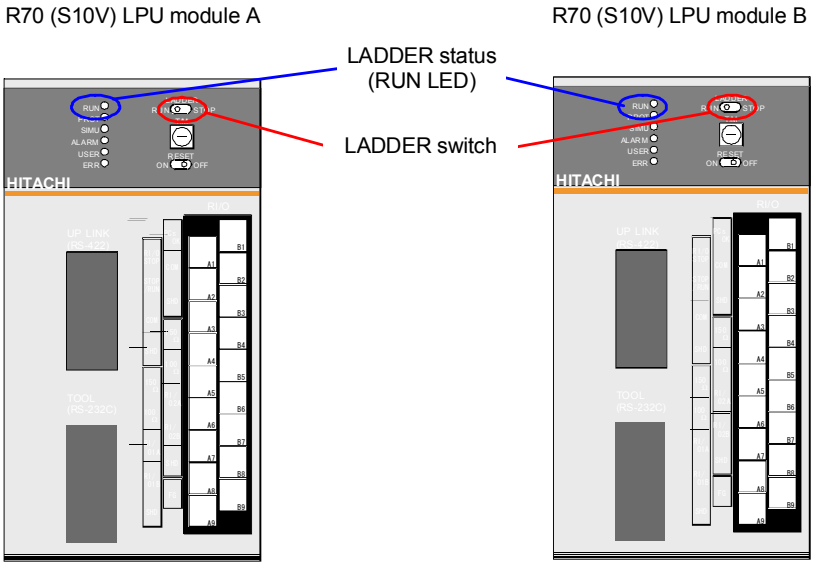
- Do not connect the EQ.LINK module to a router or hub.
- The EQ.LINK module does not support the 10BASE-5 transmission. Do not connect the cable to the 10BASE-5 interface connector.



- Do not touch the 10BASE-5 connector while the system is powered on. The static electricity on your body may cause the system to malfunction.
- For wiring of the SYS SW module, see "USER'S MANUAL OPTION SYS SW (manual number SVE-1-123)."

3.8 LPU Module Setting

Set the LADDER switches of the LPU modules to the RUN position to use the EQ.LINK modules.



MAIN/SUB	LADDER switch	LADDER status
MAIN	RUN	RUN (*)
SUB	RUN	STOP (*)

(*) The SYS SW module automatically determines MAIN and SUB ladder status of the EQ.LINK modules. When the ladder status of the EQ.LINK module is RUN (when the module is MAIN), the RUN indicator of the LPU module lights.

Figure 3-5 LPU Module Setting and Ladder Status

4 OUTLINE OF EQ.LINK

4.1 Outline of EQ.LINK

4.1.1 Outline of EQ.LINK

The EQ.LINK modules work to transfer memory data between two R70 (S10V) units.
The basic function of the EQ.LINK module is to transfer memory data from a main (active) EQ.LINK module to a sub (standby) EQ.LINK module. When the main (active) EQ.LINK module has a problem, the SYS.SW module switches the main and sub EQ.LINK modules. In this case, the memory data of the main EQ.LINK module is transferred to the standby EQ.LINK module which is going to be active.

4.1.2 System configuration

In the duplexed system configuration, the R70 (S10V) LPU units having the modules below are interconnected with the EQ.LINK modules and these EQ.LINK modules are switched by the SYS SW modules to build a duplexed R70 (S10V) system.

Table 4-1 Modules Required to Build a Duplexed R70 (S10V) System

Name of module	Function
SYS SW	The SYS SW modules interconnect between two R70 (S10V) units and automatically switch the main (active) system and the sub (standby) system when the main system has a problem.
EQ.LINK	The EQ.LINK modules interconnect between two R70 (S10V) units and transfer memory data from the main (faulty) system to the sub (normal) system when the SYS SW modules switch the systems.

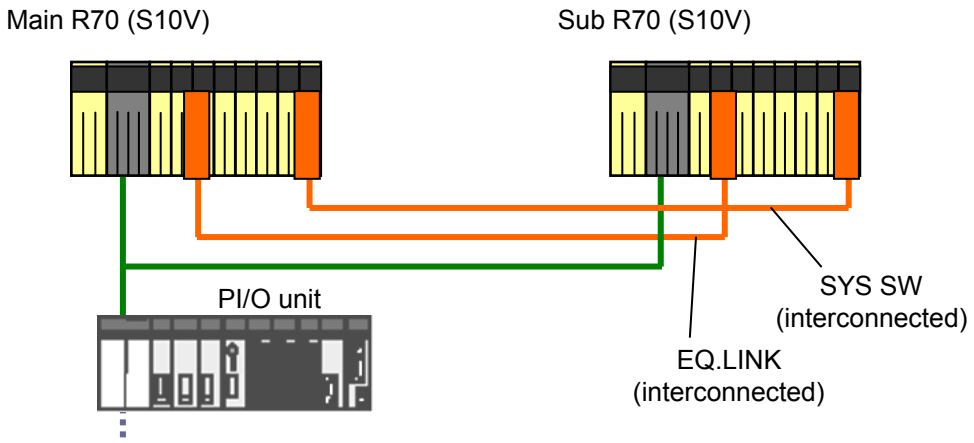


Figure 4-1 Example of a Duplexed R70 (S10V) System

4.1.3 IP address of the EQ.LINK module

An IP address is a number by which the IP (internet protocol) recognizes each node (station) in the IP transmission. Therefore, IP addresses must be unique for setting and management.
The tool automatically assigns an IP address to each EQ.LINK module by assigning a node number to "host number" of a network address. Therefore, the user need not know it.
The IP address below is assigned to the EQ.LINK module when a node number is set.

Table 4-2 IP Address of the EQ.LINK Module

Network address	Node number
192.168.250. "host-number"	1 to 254

4.1.4 EQ.LINK node numbers

An EQ.LINK node number is a unique number to distinguish two interconnected EQ.LINK modules from each other.
Node numbers below can be specified.
Node number 1 to 254: These node numbers are for EQ.LINK modules. Specify a unique node number for each EQ.LINK module.
Node number 255: This node number is internally used by the EQ.LINK module and not available to the user.
Node number 0: This node number is internally used by the EQ.LINK module and not available to the user.

- Initially (as default), the local node has a node number "1" and the remote mode has a node number "2." Be sure to change the node numbers of the EQ.LINK modules before connecting them. Otherwise, a node number error occurs.
- For setting of a node number, see "5.2.3 Setting of link parameters."

4.1.5 Outline of duplexed system operations

(1) When the ladder and RI/O of the R70 (S10V) unit A are active (as a main system), those of the R70 (S10V) unit B are standby (as a sub system).

(2) The EQ.LINK modules A and B always transfer memory data to each other to match data in the specified areas.

(3) When the main R70 (S10V) unit A has a problem (such as a power failure, resetting, ladder stop, or error detected by the LPU) to stop the ladder operation, the SYS SW modules switch the main and sub R70 (S10V) units and the EQ.LINK modules transfer data from the R70 (S10V) unit A to the R70 (S10V) unit B.

(4) When the R70 (S10V) unit B starts the ladder and the RI/O, the R70 (S10V) unit B becomes the main system and continues the processing.

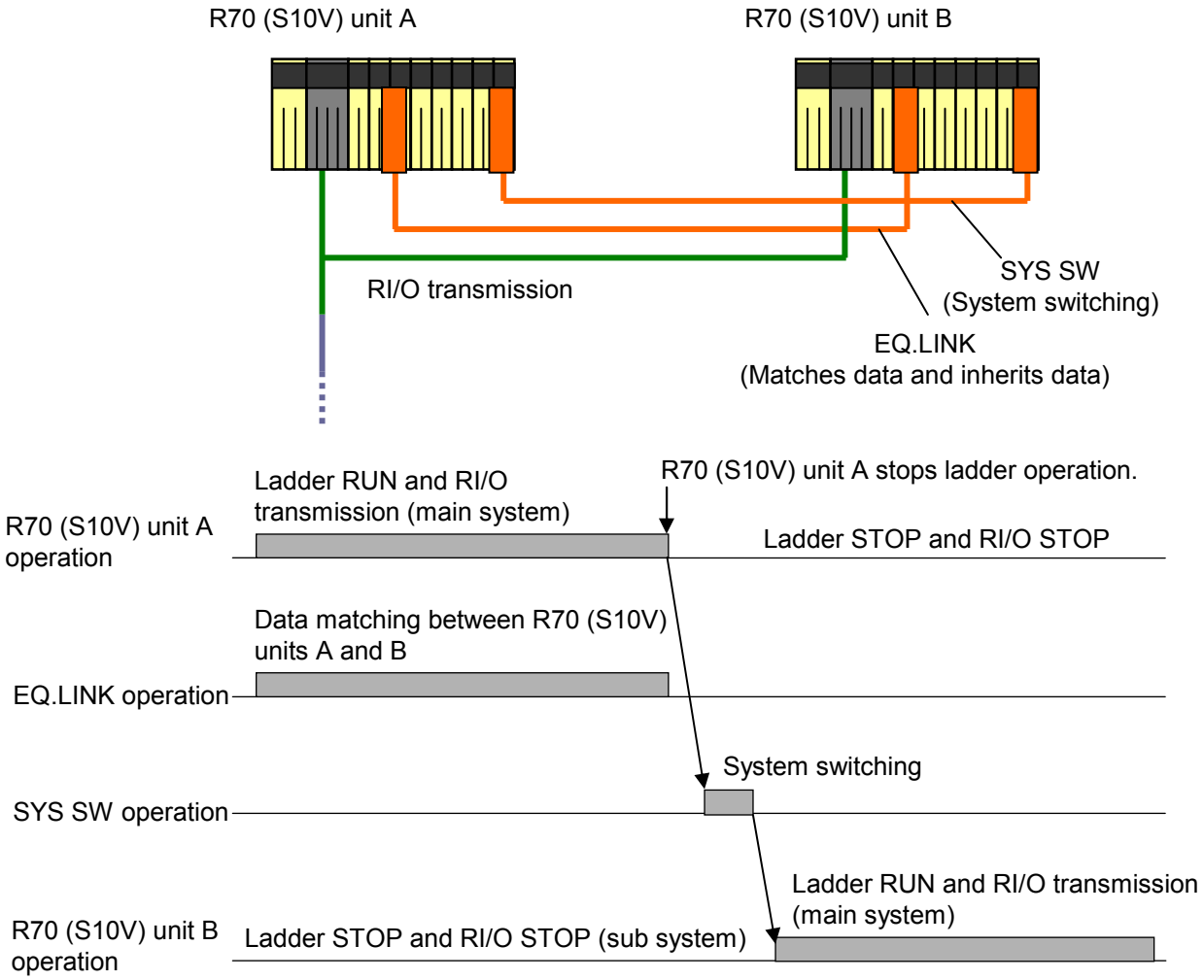


Figure 4-2 Duplexed System Configuration and Operations (Outline)

4.1.6 Transfer areas and cycle

Below are listed the numbers of areas and words that one EQ.LINK module can transfer and cycles of transfer.

- Main-to-sub transferring
  - Number of areas transferred = 40 areas maximum
  - Number of words transferred = 17 k words maximum (without sub-to-main transferring)
  - Transfer cycle = Synchronous to the ladder sequence cycle
- Sub-to-main transferring
  - Number of areas transferred = 1 area
  - Number of words transferred = 1 k words maximum
  - Transfer cycle = Set by "5.2.3 Setting of link parameters."

A total of 17 k words (maximum) can be transferred in both main-to-sub transferring and sub-to-main transferring. A maximum of 1 k words can be transferred in sub-to-main transferring. When the sub-to-main transferring is not required, up to 17 k words can be transferred in main-to-sub transferring.

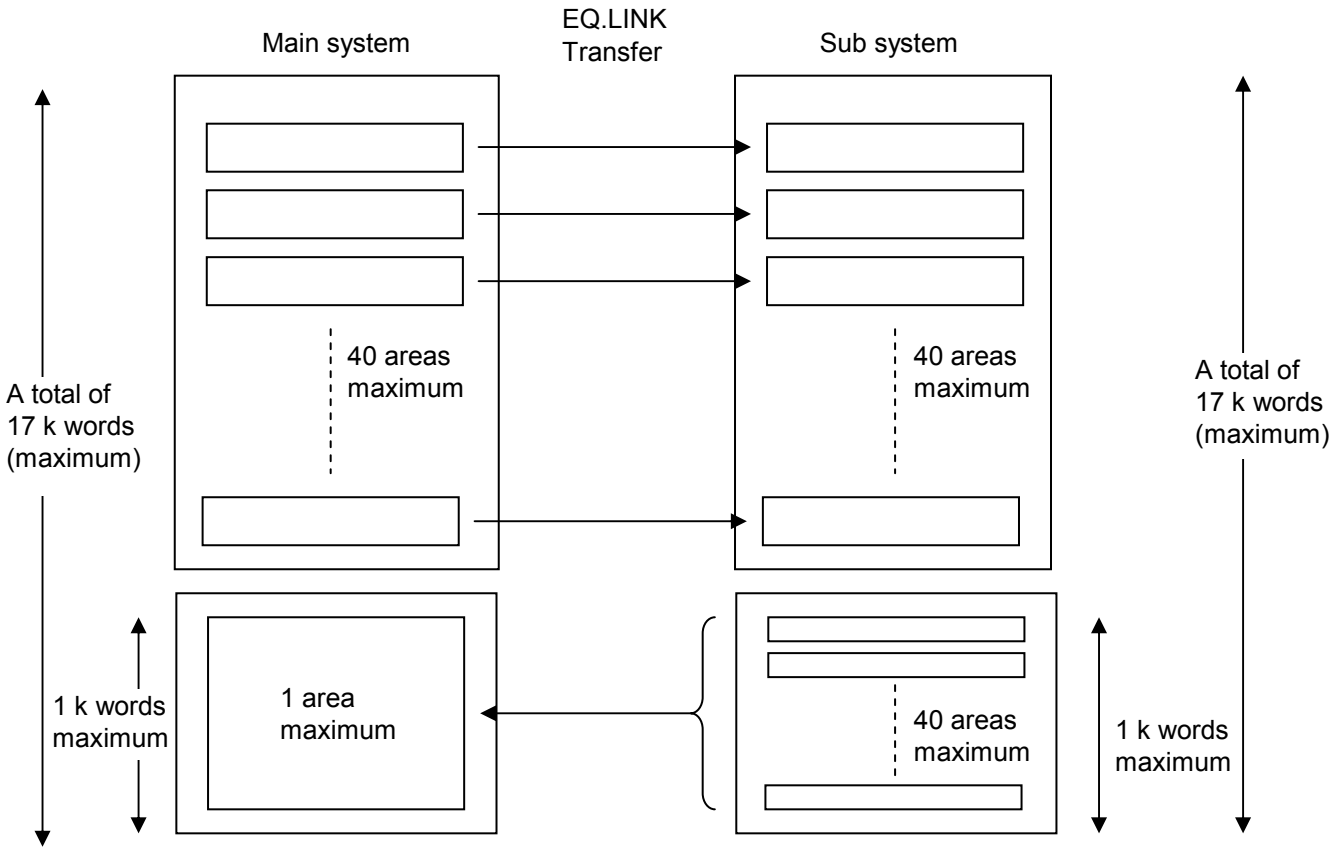


Figure 4-3 Number of Areas Transferred by EQ.LINK

4.1.7 Main-to-sub transferring

- Main system operation

  The main EQ.LINK transfers memory data to the sub EQ.LINK in synchronism with the ladder sequence to assure simultaneity of transferred data.

  ① The LPU copies the content of the selected memory areas onto common memory by the SEQEND processing at each sequence cycle and makes a SEND request to the EQ.LINK.

  ② The EQ.LINK copies the content of common memory onto the internal buffer.

  ③ The EQ.LINK sends the data from the internal buffer to the sub EQ.LINK periodically.

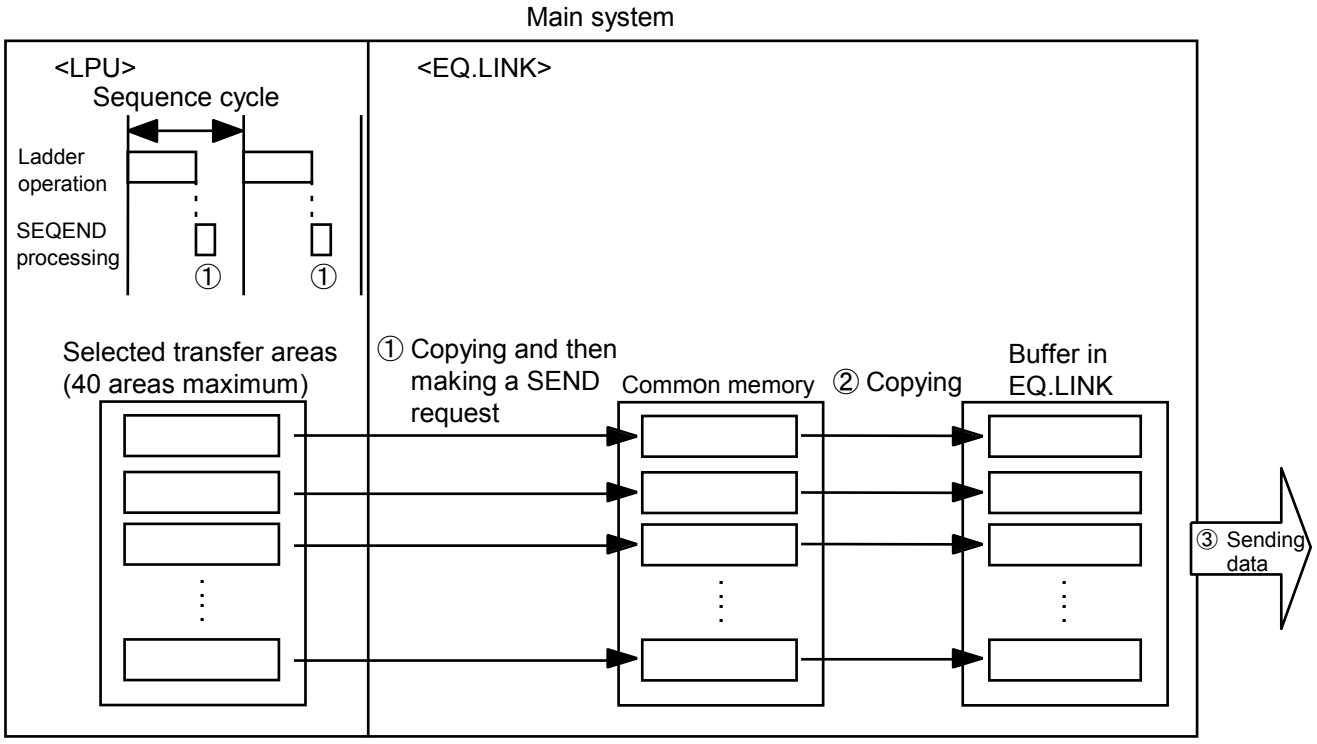


Figure 4-4 Main System Operation

- Sub system operation

  The sub system always stores the latest data sent from the main system in common memory. When the SYS SW switches systems from SUB to MAIN, the EQ.LINK copies data from common memory onto the transfer set area.

  ① The EQ.LINK stores the data (coming from the main system) in the internal buffer.

  ② The EQ.LINK copies the data from the internal buffer onto common memory.

  ③ When the systems are switched, the EQ.LINK copies the content of common memory onto the transfer set area. After copying is completed, the sub system is made to work as the main system and continues the ladder operation.

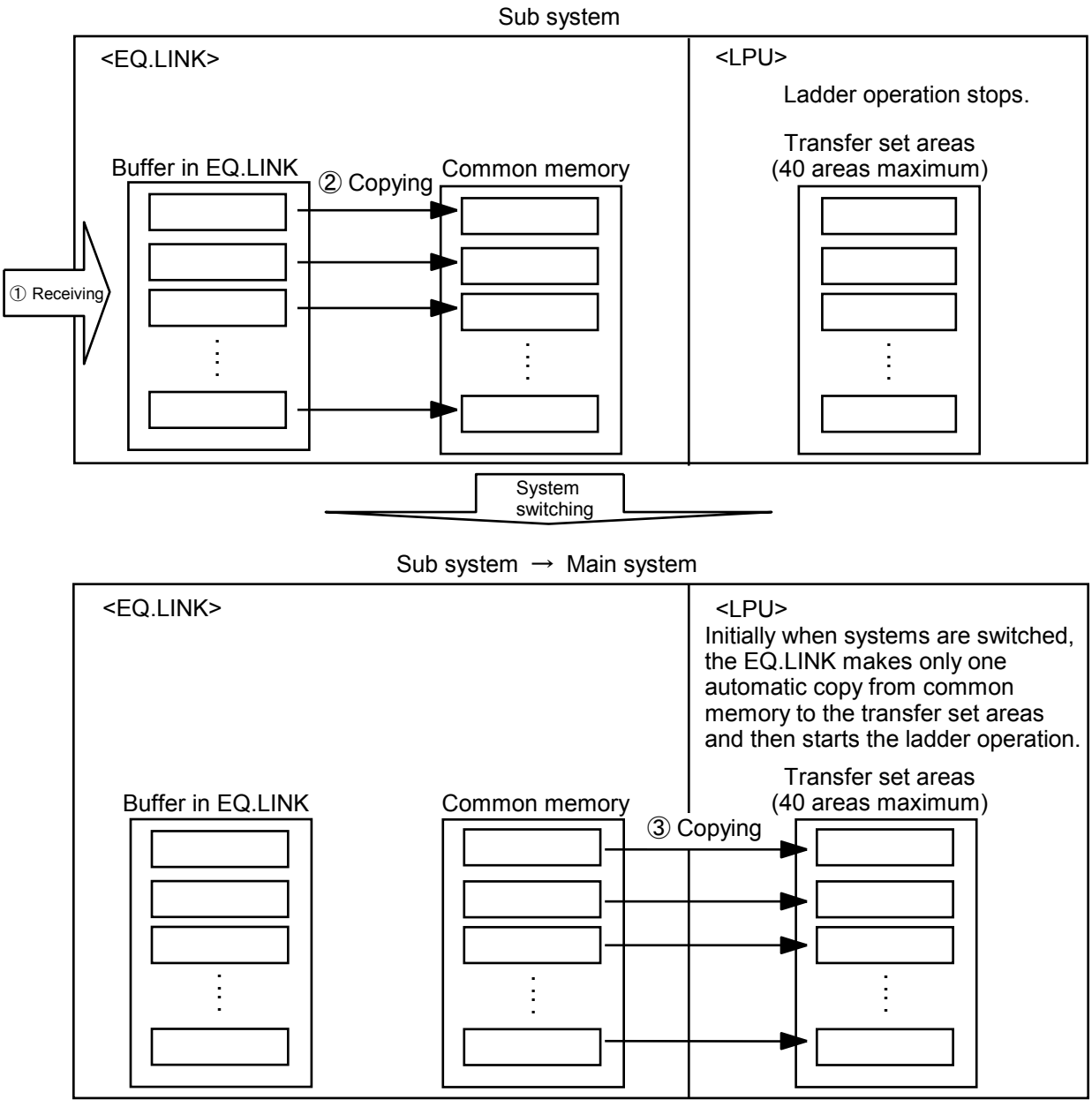


Figure 4-5 Reception by the Sub System

4.1.8 Sub-to-main transferring

- Sub system operation

  The sub system transfers the status of its modules to the main system.

  ① The LPU copies the content of the transfer set areas onto common memory at each data update cycle of the sub system.

  ② The EQ.LINK copies the content of common memory onto the internal buffer.

  ③ The EQ.LINK sends the data from the internal buffer to the main system periodically.

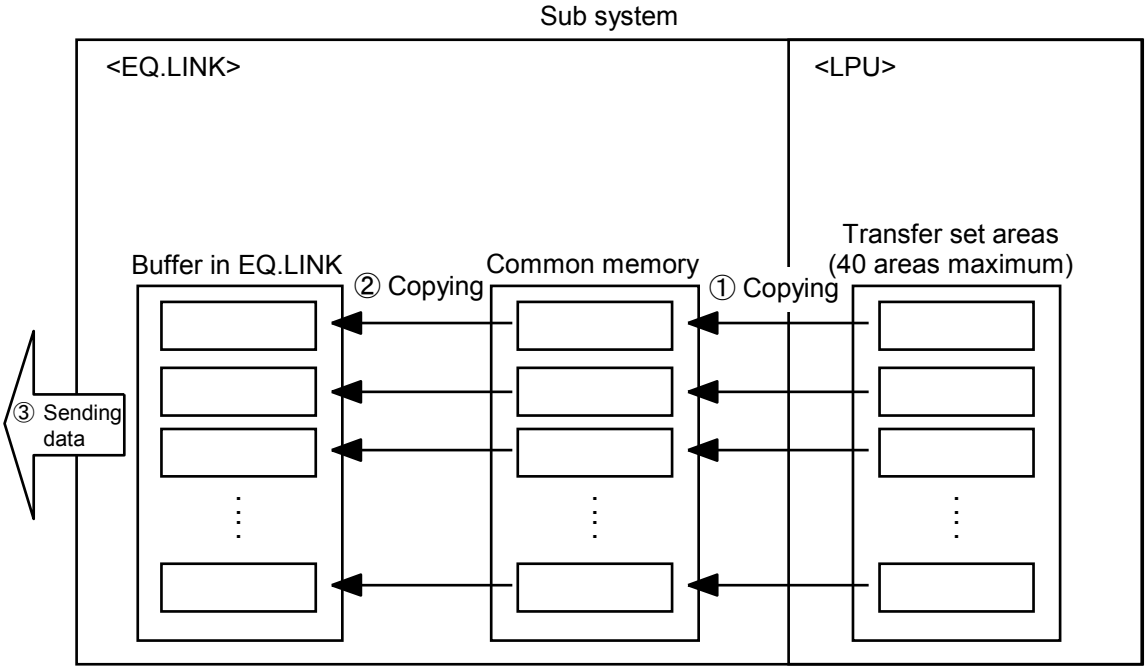


Figure 4-6 Transmission by the Sub System

> The default data update cycle of the sub system is 100 ms. To change the value, see "5.2.3 Setting of link parameters."

- Main system operation

  The main system receives data from the sub system and copies it onto the transfer set area periodically.

  ① The EQ.LINK receives data from the sub system and stores it in the internal buffer.

  ② The EQ.LINK copies data from the internal buffer onto common memory.

  ③ The LPU copies the content of common memory onto a single transfer set area periodically.

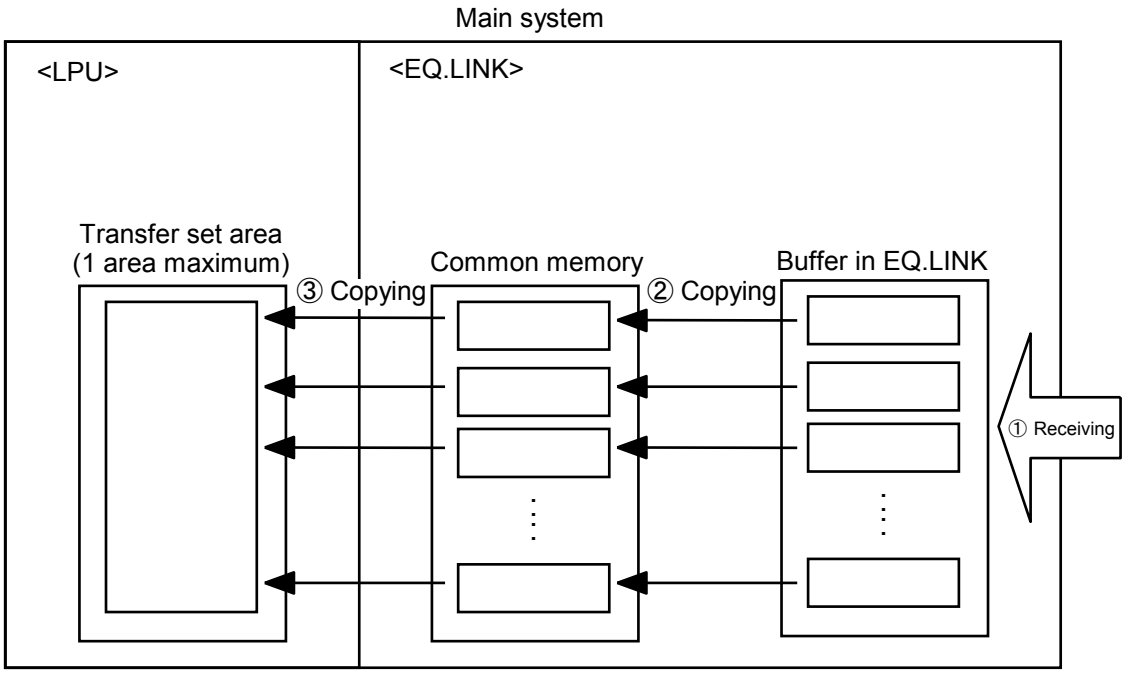


Figure 4-7 Reception by the Main System

4.1.9 Data reception timeout and received data valid flag

If the EQ.LINK module in the sub system does not receive data from the EQ.LINK module in the main system for a preset receiving data timeout value, the sub EQ.LINK module does not inherit data from the main system assuming that the received data is invalid when the SYS SW switches the systems. Whether the data is valid (ON) or invalid (OFF) is indicated by the ON/OFF status of the received data valid flag. (See "5.2.3 Setting of link parameters.") The values and meanings of the received data valid flag are as follows:

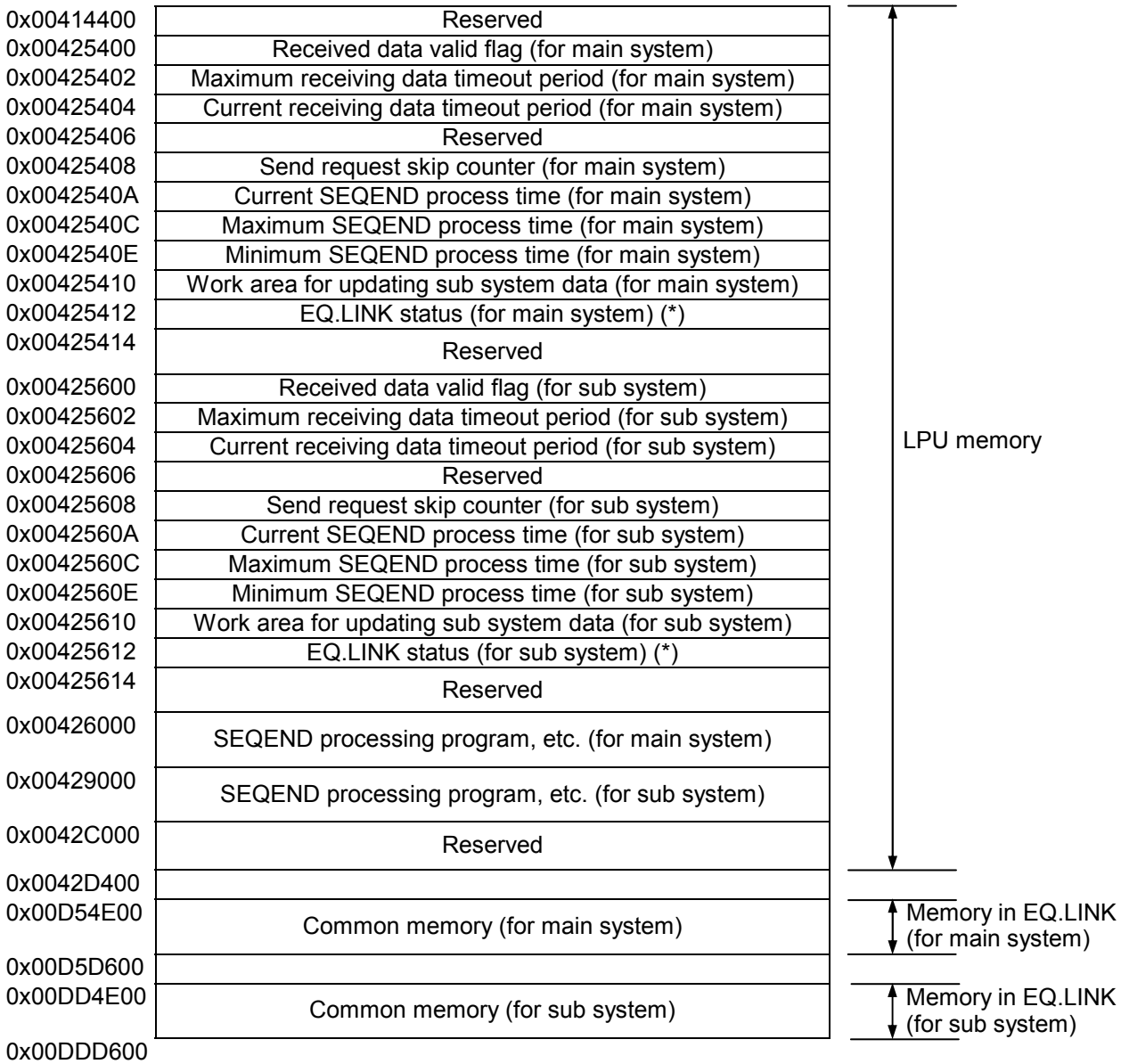
The value of this flag changes under the conditions below.

- When the sub node receives transfer data from the main node
  - OFF (0) → ON (1)
- When the sub node cannot receive data from the main node within a preset receiving data timeout period
  - ON (1) → OFF (0)

> The default receiving data timeout period is 30 seconds. To change the value, see "5.2.3 Setting of link parameters."

4.1.10 Common memory map

Common memory is on memory of the EQ.LINK module. The EQ.LINK module uses LPU memory of addresses 0x00414400 to 0x0042D3FF as shown below.



(*) The EQ.LINK states are

- Main system: 0x0001
- Sub system: 0x0000
- Error: 0xffff
- Switching: 0xffff

Figure 4-8 Common Memory Map

4.2 System Switching

4.2.1 Outline

The EQ.LINK modules transfer data from the main system to the sub system. When the main system is disabled, the SYS SW modules switch the systems between MAIN and SUB (that is, switches ladder operations). The EQ.LINK modules always monitor the operating status of the LPU units and change the transfer direction when the LPU status changes.

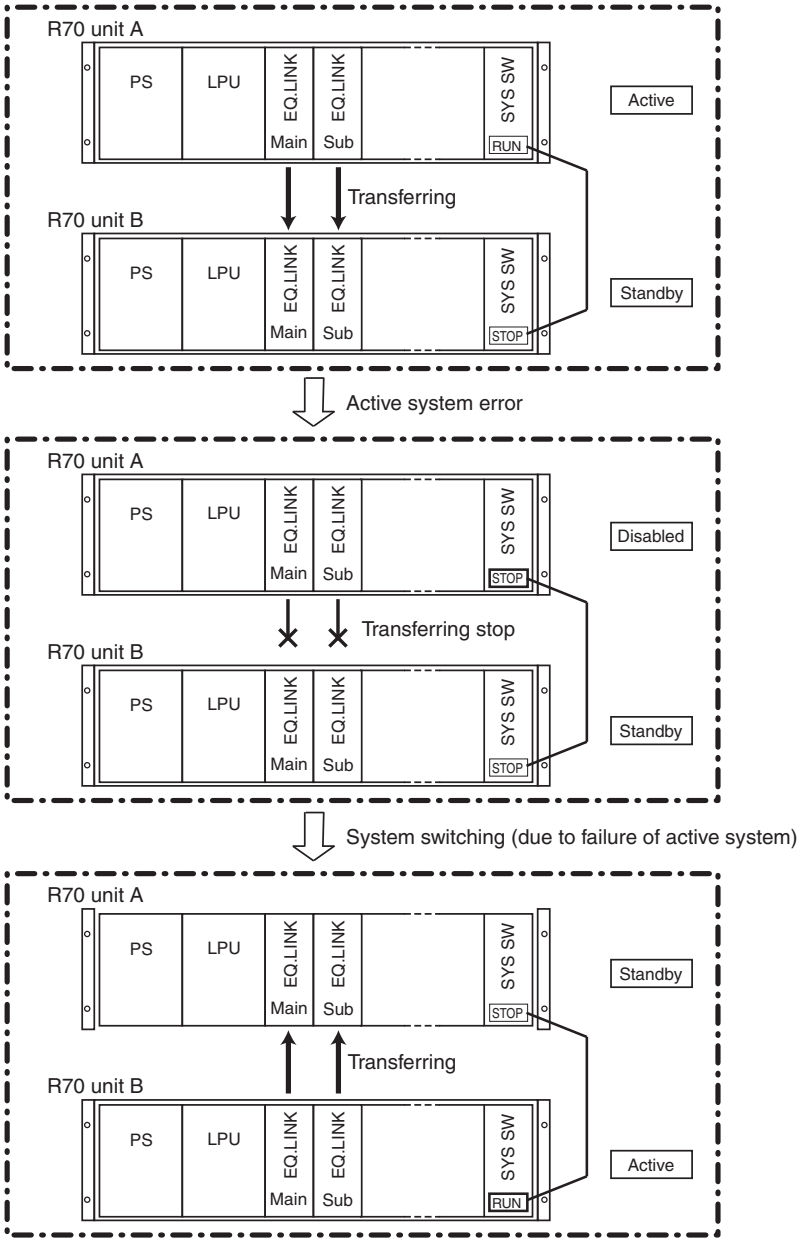


Figure 4-9 Outline of System Switching

4.2.2 System switching status transition

When the main R70 system becomes disabled, the SYS SW modules automatically switch systems between MAIN and SUB. Before restarting the faulty R70 unit, collect error data, remove the error cause, and manually reset the R70 unit if necessary. Unless the R70 unit is reset, the EQ.LINK modules cannot transfer data.

Figure 4-10 shows how the system status changes and how the EQ.LINK modules work when the systems are switched.

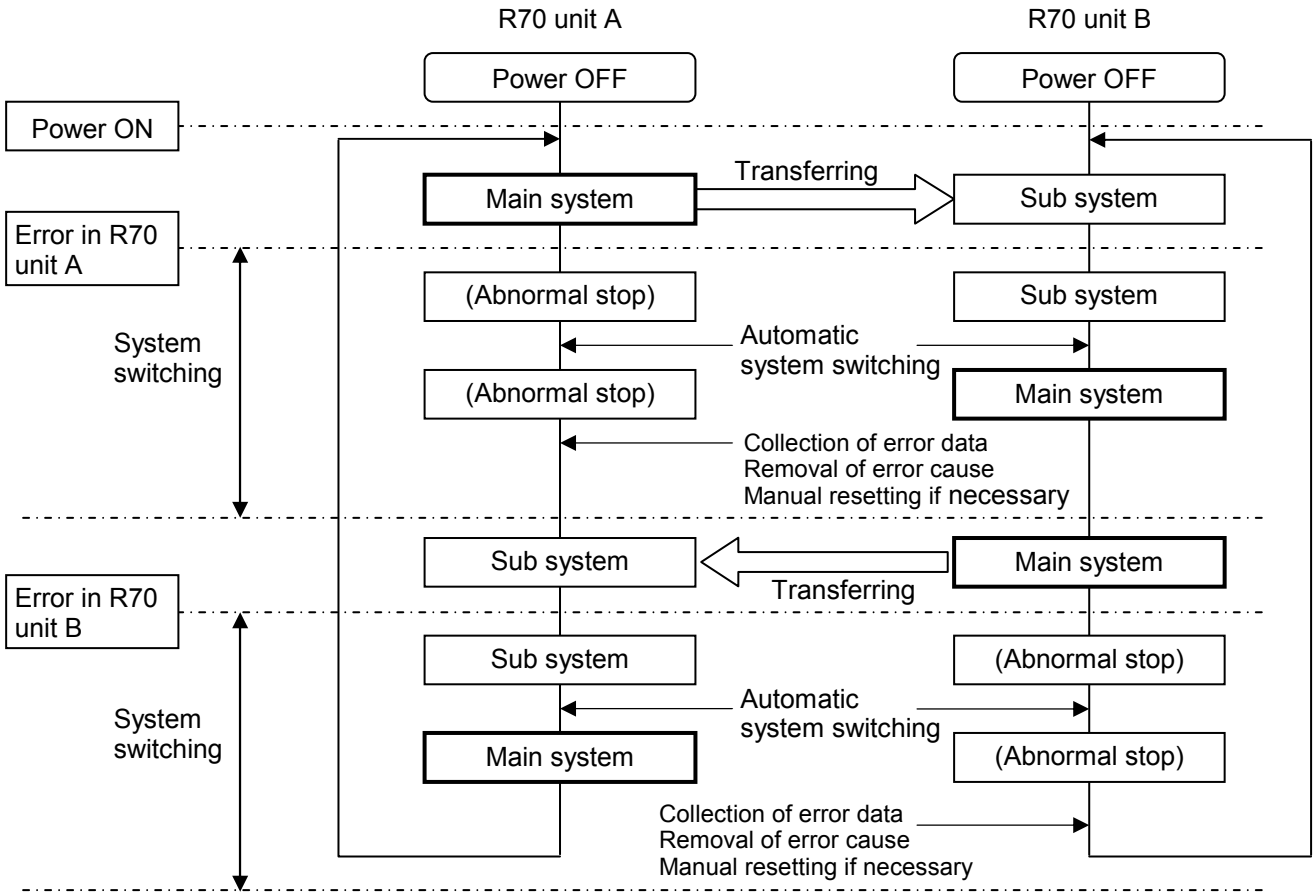


Figure 4-10 System Status Transition in System Switching

For a system (Main or Sub) to which the started R70 unit is set, see "USER'S MANUAL OPTION SYS SW (manual number SVE-1-123)."

4.3 Designing Data Reliability in CPU Configuration Control

4.3.1 Reliability of EQ.LINK transfer data

To assure the reliability of data transferred by the EQ.LINK modules, design the system to satisfy two conditions below.

- Condition 1: Reliability of EQ.LINK transfer data in CPU configuration control

> [SEQEND processing time] + [EQ.LINK transmission time] < [Sequence cycle]

This is explained in detail below. See Figure 4-11.

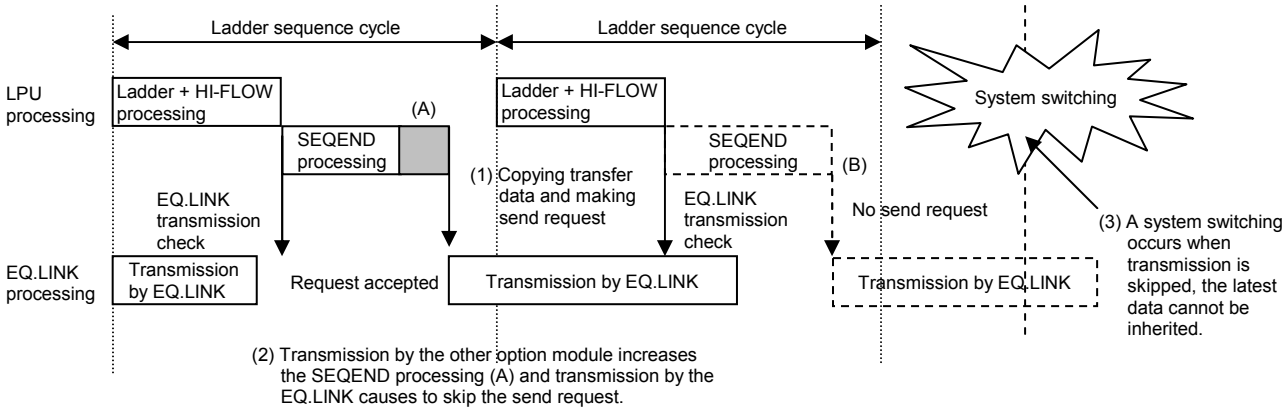


Figure 4-11 Designing Data Reliability in CPU Configuration Control

(1) The main LPU unit executes the ladder and HI-FLOW operations at each sequence cycle, copies the PI/O data (transfer data) onto common memory in the EQ.LINK module, and requests the EQ.LINK module to send out the data. These LPU's data copying and send requesting are termed as SEQEND processing.

(2) When the EQ.LINK module or the other option module has a greater number of transfer words or transmissions or when a task browses PI/O data, the execution of the SEQEND processing is delayed. As the result, when the sum of the SEQEND processing period and the EQ.LINK transmission processing period exceeds the sequence cycle period, neither the SEQEND processing nor data transferring is executed in the next sequence cycle. The data transferring is carried over to the next sequence cycle.

(3) When a system switching occurs in this status, the latest data cannot be inherited. The EQ.LINK module inherits the previous data which was transferred one cycle before. This cannot assure the reliability of data in the duplexed R70 (S10V) configuration. To prevent skipping of the SEQEND processing (send request) and assure data reliability, the sum of the SEQEND processing period and the EQ.LINK transmission processing period must be smaller than the sequence cycle period.

You can check the number of skipped send requests by “RAS information” and “send request skip count” of the EQ.LINK setting tool. (See “5.2.8 RAS information.”)

- Condition 2: Data reliability by holding the sequence cycle

[Ladder running time] + [HI-FLOW running time] + [SEQEND processing time] < [Sequence cycle]

This is explained in detail below. See Figure 4-12.

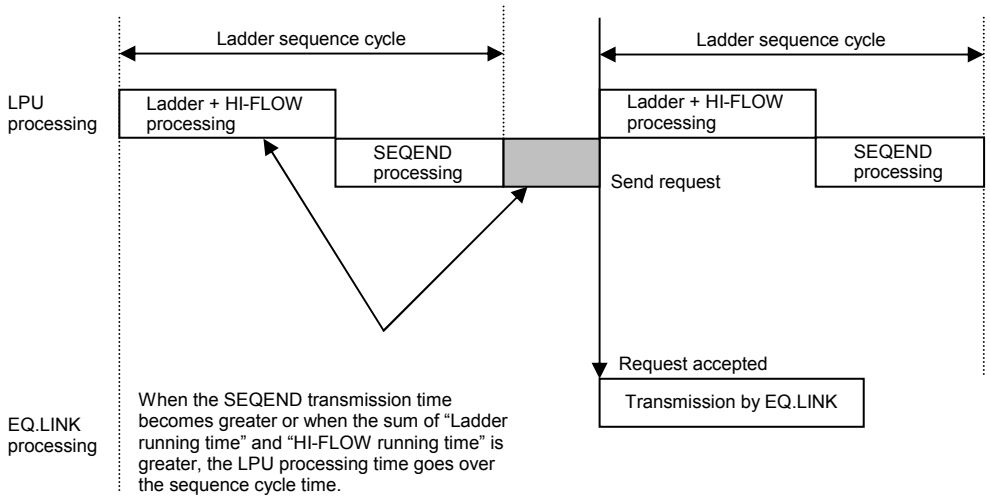


Figure 4-12 Data Reliability by Holding the Sequence Cycle

If the LPU cannot hold the sequence cycle operation, system controlling may be affected. To prevent this, the sum of “Ladder running time,” “HI-FLOW running time,” and “SEQEND processing time” must be smaller than “Sequence cycle.”

4.3.2 Checking the reliability of EQ.LINK transfer data

- Conditional expression 1 (to assure the reliability of EQ.LINK transfer data in the CPU configuration)

[SEQEND processing time] + [EQ.LINK transmission time] < [Sequence cycle] $(0.10 \times (\sqrt{(K_0 \times N_0)} + \sqrt{(K_1 \times N_1)} + \cdots) + 8.83) \times Neq + 10 \quad < \quad Ts$

Ts: Sequence cycle (ms)

Neq: Preset number of transfer words by the EQ.LINK (k words)

N_0, N_1, …: Number of transfer words by each non-EQ.LINK module per 100 ms (k words per 100 ms)

For example, when the system contains D.NET and OD.RING modules besides the EQ.LINK module, "N_0" is the number of words that the D.NET transfers each 100 ms and "N_1" is the number of words the OD.RING transfers each 100 ms.

When the system contains two EQ.LINK modules, they must be calculated separately assuming the other module is a non-EQ.LINK module. In other words, for calculation of the processing time of the EQ.LINK module in the main system, use "Neq" as the preset number of transfer words by the main EQ.LINK and "N_0" as the preset number of transfer words by the sub EQ.LINK. Contrarily, for calculation of the processing time of the EQ.LINK module in the sub system, use "Neq" as the preset number of transfer words by the sub EQ.LINK and "N_0" as the preset number of transfer words by the main EQ.LINK.

Further, the LANCP receives broadcast frames which affect the processing time of the EQ.LINK modules from a network. So, when the system contains the LANCP module, the number of transfer words must contains the number of broadcast frames which flow through the network.

K_0, K_1, …: The transmission processing time of the EQ.LINK module is also dependent upon the types of option modules (in addition to the transfer words N_0, N_1, and so on of the option modules). The influence on calculation of the transmission processing time of the EQ.LINK module can be eliminated by giving weighting coefficients K_0, K_1, and so to respective modules. Table 4-3 lists weighting coefficients of option modules.

Table 4-3 Weighting Coefficients of Option Modules

Option module	Weighting coefficient K
D.NET	1
J.NET/J.NET-INT/IR.LINK	1
ET.NET	2
FL.NET/EQ.LINK	2
OD.RING/SD.LINK	1
CMU	1
NCP-F	1
LANCP	1

- Conditional expression 2 (to assure data reliability by holding the sequence cycle)

[Ladder running time] + [HI-FLOW running time] + [SEQEND processing time] < [Sequence cycle]

$$Tld + Thf + (0.10 \times (\sqrt{}(K_0 \times N_0) + \sqrt{}(K_1 \times N_1) + \cdots) + 2.36) \times Neq \times Nnu < Ts$$

Ts: Sequence cycle (ms)
Tld: Ladder running time (ms)
Thf: HI-FLOW running time (ms)
Neq: Preset number of transfer words of EQ.LINK (k words)
Nnu: Number of EQ.LINK modules
N_0, N_1, …: Number of transfer words by each non-EQ.LINK module per 100 ms (k words per 100 ms)
K_0, K_1, …: Weighting coefficients of option modules

- Example of checking the reliability of transfer data by the EQ.LINK module
  An example is shown below to explain how the reliability of transfer data by the EQ.LINK module is checked.

  <Example of system configuration>
  • Sequence cycle: 200 ms
  • Modules installed and their setting values:
    1 CMU module (Accessing LPU memory from a task-------1 k words/100 ms)
    2 D.NET modules (Transmission cycle of each D.NET------10 ms, 64-word transmission, 64-word reception)

- 1 EQ.LINK module (Preset number of transfer words: 17 k words)
- Ladder running time: 80 ms
- HI-FLOW running time: 20 ms

<Example of checking the reliability of transfer data by the EQ.LINK module in the above configuration>

- Preset number of transfer words
  Neq = 17 k words
- CMU's accesses to LPU memory per 100 ms
  N_0 = 1 k words/100 ms
- Weighting coefficient of 1 CMU
  K_0 = 1
- Number of transfer words of 1 D.NET per 100 ms
  $N_1 = N_2$
  = (64-word transmission + 64-word reception)/10 ms
  = 128 words/10 ms
  = 1,280 words/100 ms
  = 1.25 k words/100 ms
- Weighting coefficient of 1 D.NET
  $K_1 = K_2$
  = 1
- "SEQEND processing time" + "EQ.LINK transmission time"
  $((0.10\times(\sqrt{(K_0\times N_0)}+\sqrt{(K_1\times N_1)}+\sqrt{(K_2\times N_2)})+8.83)\times Neq)+10$
  $= ((0.10\times(\sqrt{(1\times 1)}+\sqrt{(1\times 1.25)}+\sqrt{(1\times 1.25)})+8.83)\times 17)+10$
  = 166 ms
- "Ladder running time" + "HI-FLOW running time" + "SEQEND processing time"
  $Tld+Thf+((0.10\times(\sqrt{(K_0\times N_0)}+\sqrt{(K_1\times N_1)}+\sqrt{(K_2\times N_2)})+2.36)\times Neq\times Nnu)$
  $= 80+20+((0.10\times(\sqrt{(1\times 1)}+\sqrt{(1\times 1.25)}+\sqrt{(1\times 1.25)})+2.36)\times 17\times 1)$
  = 146 ms

From the above, the conditional expressions for the reliability of transfer data by the EQ.LINK module satisfy as shown below and it is apparent that the data reliability is assured when systems are switched in the duplexed configuration.

Conditional expression 1:

"SEQEND processing time" + "EQ.LINK transmission time" (166 ms)
< Sequence cycle (200 ms)

Conditional expression 2:

"Ladder running time" + "HI-FLOW running time" + "SEQEND processing time" (146 ms)
< Sequence cycle (200 ms)

5 OPERATION

5.1 Installing and Starting Up the System

5.1.1 Installing

First check that the correct CD is on hand. The EQ.LINK system runs on the Microsoft® Windows® 2000 operating system and Microsoft® Windows® XP operating system.
To install the EQ.LINK, you must execute the setup program that is stored in the DISK1 folder on the "EQ.LINK system CD."
Double-click "setup.exe" that is stored in the DISK1 folder on the "EQ.LINK system CD." Since no window opens upon completion of installation, attach a shortcut to the desktop as needed.

- The S10V BASIC SYSTEM is required for operating the EQ.LINK system. If it is not installed, you cannot install the EQ.LINK system.
- Before installing the EQ.LINK system, be sure to exit all the currently open Windows®-based programs. Do not forget to exit anti-virus software and other memory-resident programs. If you install the EQ.LINK system without exiting such programs, an error may occur during installation. If such an error occurs, first uninstall the EQ.LINK system as directed in "5.1.2 Uninstalling," exit all the Windows®-based programs, and then install the EQ.LINK system again.

5.1.2 Uninstalling

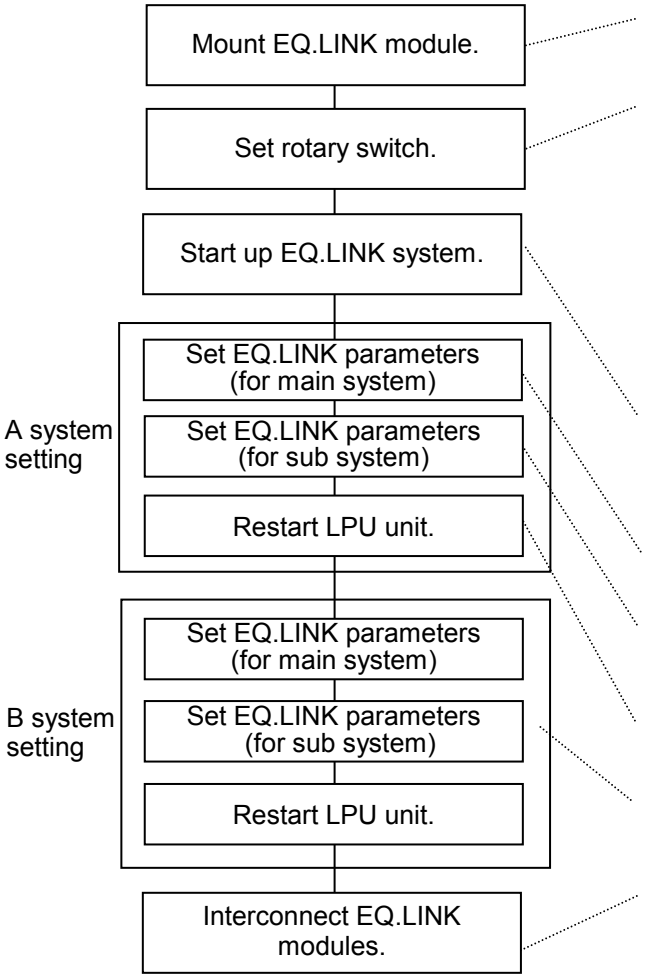
From the Start button, select [Settings] and then click [Control Panel]. When the Control Panel opens, double-click [Add/Remove Programs], select [S10V EQ.LINK SYSTEM] for S10V from the [Install/Uninstall] tab, and then click the Remove button. When the [Confirm File Deletion] window opens, click the Yes button.

NOTICE

If Windows® opens a window during the uninstall process to display the question "Remove Shared File?," click the No button to retain shared files.

5.1.3 Procedure for starting up the EQ.LINK system

A procedure is explained below to start up the EQ.LINK system.



(1) Turn off power to the LPU unit and mount the EQ.LINK module on it.

(2) Set the MODU No. rotary switch of the EQ.LINK module as shown below.

MODU No.	Description
2	Main module
3	Sub module

(3) Connect the LPU to your Windows® personal computer, turn on power, then start up the EQ.LINK system.

(4) Set parameters to make the EQ.LINK module A work as a main system.

(5) Set parameters to make the EQ.LINK module A work as a sub system.

(6) After setting all required parameters, restart the LPU unit A.

(7) Repeat the above steps (4) to (6) on the LPU unit B.

(8) Turn off power to both LPU units A and B and interconnect their EQ.LINK modules.

Each EQ.LINK module requires both a parameter setting for the main system and a parameter setting for the sub system. Therefore, the main system parameter setting of the EQ.LINK module A is equal to the main system parameter setting of the EQ.LINK module B. Similarly, the sub system parameter setting of the EQ.LINK module A is equal to the sub system parameter setting of the EQ.LINK module B.

NOTICE

- You can set parameters of the EQ.LINK system and run the EQ.LINK system only when the LPU is connected to your Windows® personal computer.
- Set parameters of the EQ.LINK modules before connecting them. If the parameters are set while the EQ.LINK modules are interconnected, the EQ.LINK modules may malfunction.

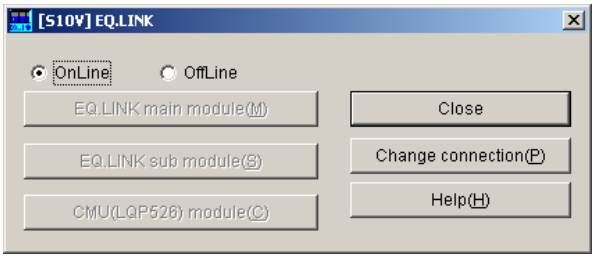
5.1.4 Starting up the EQ.LINK system

To launch the EQ.LINK system, perform one of the operating procedures described below, which are described separately for use in online mode and offline mode.

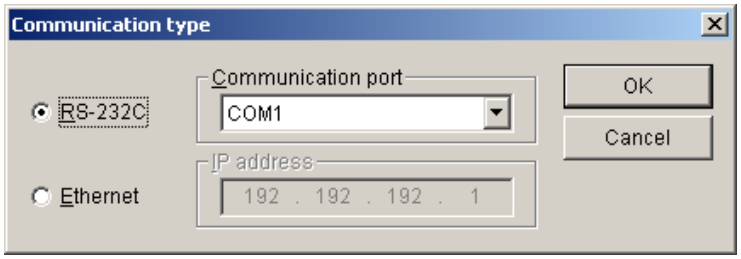
(1) Procedure for use in online mode

① Click the Start button on the desktop screen, point to the [Programs] menu item, and select "S10V EQ.LINK system" in the Programs pull-down menu. Where a shortcut of the [S10V EQ.LINK SYSTEM] has been created on the desktop, double-click this shortcut to start the system.

② The [[S10V] EQ.LINK] window as shown below is displayed.
As shown, the three buttons EQ.LINK main module , EQ.LINK sub module , and CMU (LQP526) module are all grayed out and not selectable. This indicates that at this moment no connection is established between the EQ.LINK system and the programmable controller yet.

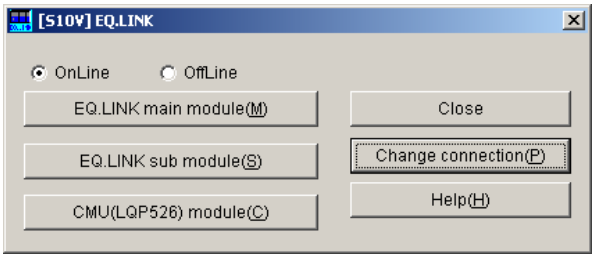


③ Click the Change connection button. The [Communication type] window as shown below will then appear. Specify the desired destination of connection and click the OK button. (For details on the communication type, see "5.2.1 PCs connection change.") If you need not change the existing connection settings, just click the Cancel button.

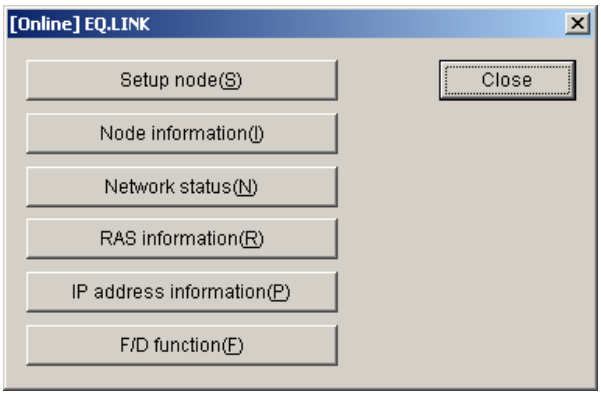


The [Communication type] window then closes and all the three buttons EQ.LINK main module , EQ.LINK sub module , and CMU (LQP526) module become selectable.

④ If you want to set up an EQ.LINK main module, click the EQ.LINK main module button in the window. If you want to set up an EQ.LINK sub-module, click the EQ.LINK sub module button in the same window.



⑤ The [EQ.LINK] window opens. Follow the instructions on the window.



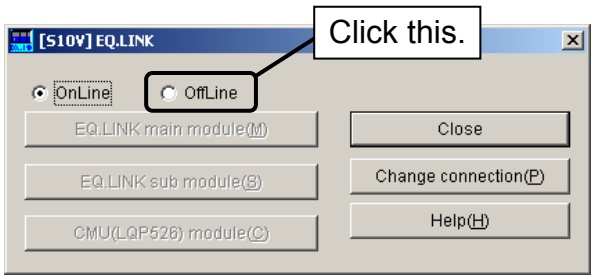
- The CMU (LQP526) module button in the [[S10V] EQ.LINK] window may be clicked only when a model-LQP526 CMU module is mounted on the same mount base as the EQ.LINK module(s).
- When you click the CMU (LQP526) module button in the window, follow the subsequent steps described under "5.4 How to Use the EQ.LINK System" in the User's Manual, Option CMU (LQP526-Z, LQZ500-Z) (manual number SVE-1-145).
- If the CMU module used is of model LQP526, it does not allow direct connection from the PC to its built-in Ethernet® port by cable. The connection must be indirect, via a model-LQE720 ET.NET module. So, be sure to use a model-LQE720 ET.NET module when connecting a model-LQP526 CMU module to the PC.

(2) Procedure for use in offline mode

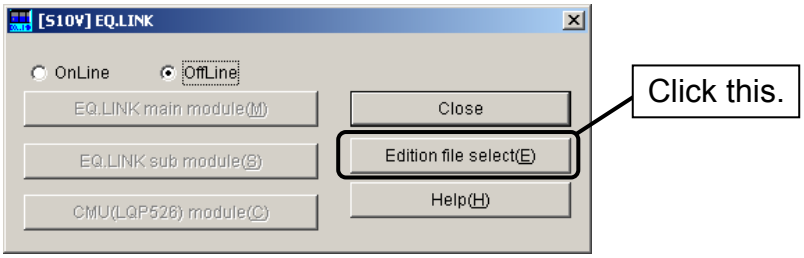
Only EQ.LINK parameter files for EQ.LINK modules can be created and edited in offline mode by performing the procedure described below. You can create one EQ.LINK parameter file for each EQ.LINK module that is intended to be used either as the main module or the submodule. However, you cannot edit both of the parameter files for the main module and submodule simultaneously.

① Click the Start button on the desktop screen, point to the [Programs] menu item, and select "S10V EQ.LINK system" in the Programs pull-down menu. Where a shortcut of the [S10V EQ.LINK SYSTEM] has been created on the desktop, double-click the shortcut to start the system.

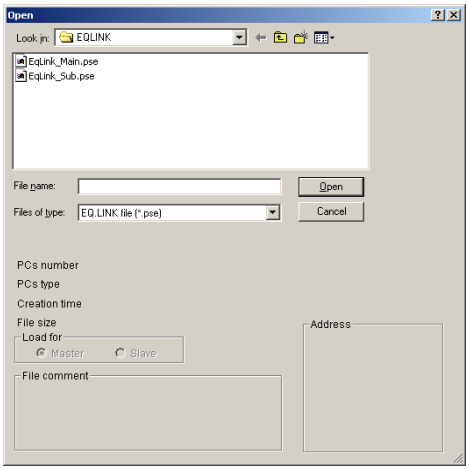
② The [[S10V] EQ.LINK] window as shown below is displayed. Click the [OffLine] radio button in the window.



③ The Change connection button is automatically replaced by the Edition file select button. Click the Edition file select button.

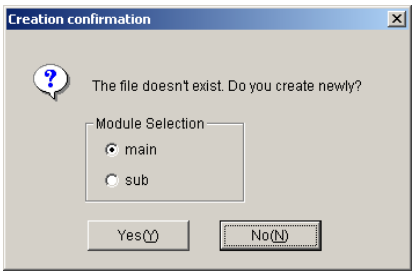


④ The [Open] window as shown below will appear.

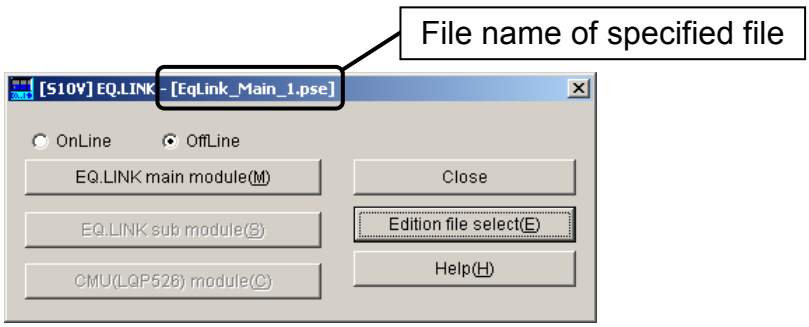


Either select the desired EQ.LINK parameter file you want to edit, or enter the file name of a new EQ.LINK file you want to create. If you enter the file name of a new such file, the [Creation confirmation] dialog box as shown below will appear. In this case, select either the "main" or the "sub" radio button and then click the Yes button. This selection specifies that the EQ.LINK parameter file you are creating is one for a main module or submodule.

If you click the No button instead, the [Open] window becomes active again.

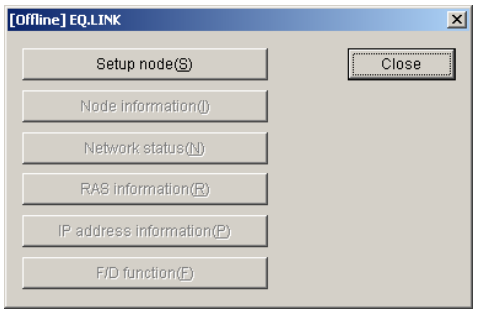


⑤ When the specified file is opened, the [[S10V] EQ.LINK] window becomes active again, with its file name displayed in the title bar. The following is an example of an [[S10V] EQ.LINK] window whose title bar shows the file name of an EQ.LINK parameter file for a main module.



Click the EQ.LINK main module button.

⑥ The [EQ.LINK] window as shown below appears. As shown, in offline mode, only the Setup node and Close buttons are clickable.



Clicking the Setup node button displays the [Setup node] window, which enables you to set link parameters or edit link parameter settings. For details, see "5.2.3 Setting of link parameters."

⑦ The contents of the EQ.LINK parameter file you have edited in offline mode can be written to the EQ.LINK module by using one of the following methods:

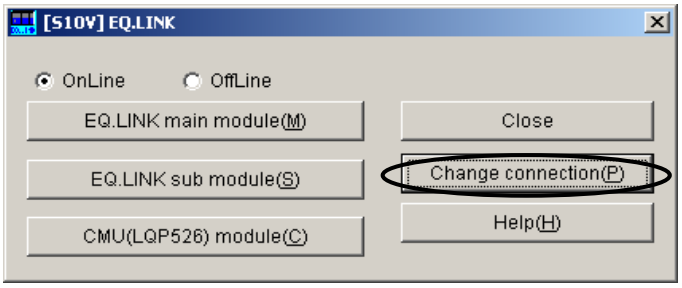
- Open the parameter file from the [Setup node] window in online mode and then write its contents to the module. For details, see "5.2.14 Loading the EQ.LINK parameter settings in from a file."
- Use the Send button in the F/D function's dialog box. For details, see "5.2.12 Send."

5.2 Commands

5.2.1 PCs connection change

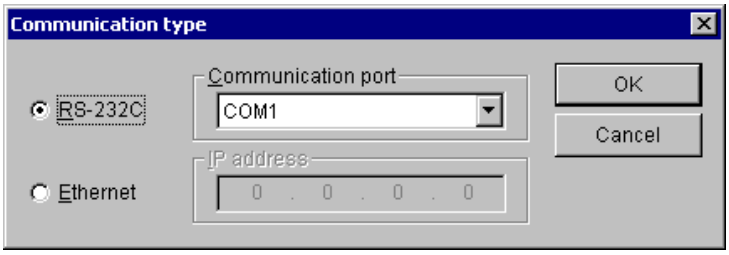
Function: Set the PCs-to-personal computer communication type.
Procedure: The procedure is described below.

① In the [[S10V] EQ.LINK SYSTEM] window, click the Change connecting PCs button.

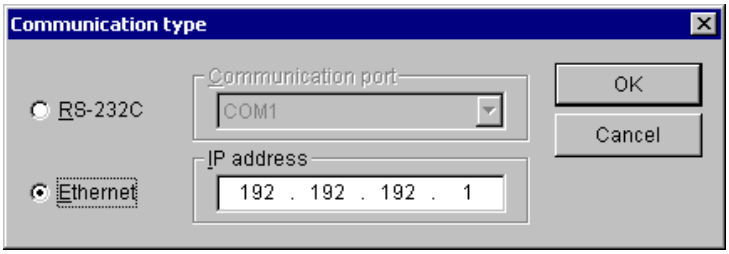


② Select a communication type.

- For RS-232C connection
  Click the radio button of "RS-232C" and select a communication port in the "Communication port" box.



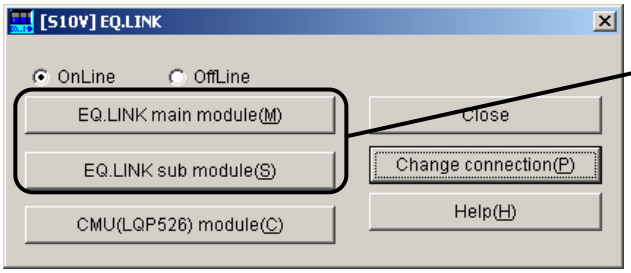
- For Ethernet connection
  Click the radio button of "Ethernet" and enter the IP address of the CMU module in the "IP address" box.



5.2.2 Selecting a module for setting

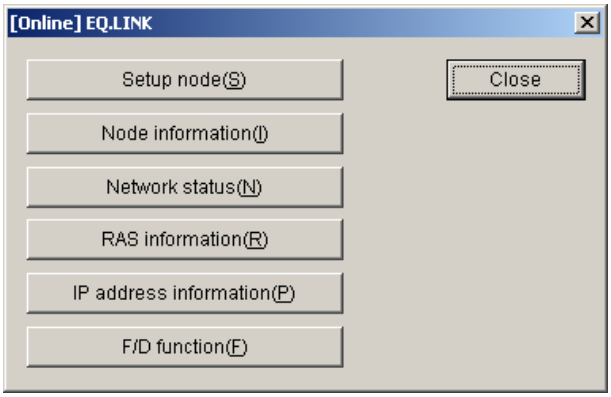
Function: Select a module for setting.
Operation: The procedure is shown below.

① In the [[S10V] EQ.LINK] window displayed, click the EQ.LINK main module button if you want to set up an EQ.LINK main module. If you want to set up an EQ.LINK sub-module, click the EQ.LINK sub module button in the same window.



MODU No.	Description
2	Main module
3	Sub module

② The [EQ.LINK] dialog box opens.

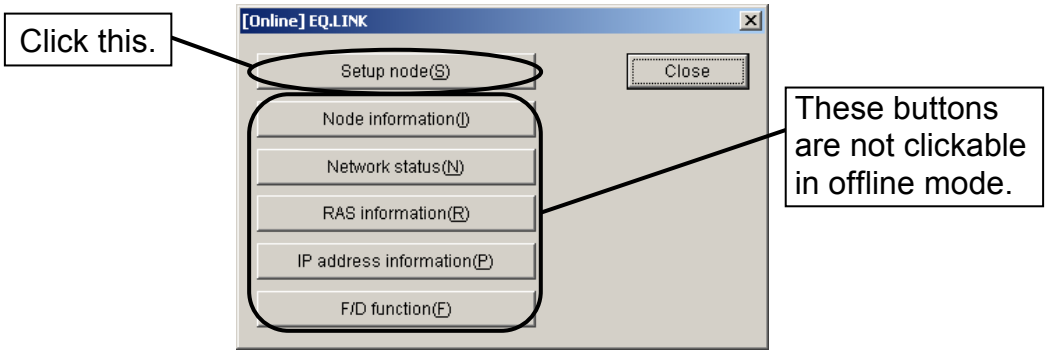


- The CMU (LQP526) module button in the [[S10V] EQ.LINK] window may be clicked only when a model-LQP526 CMU module is mounted on the same mount base as the EQ.LINK module(s).
- When you click the CMU (LQP526) module button in the window, follow the subsequent steps described under "5.4 How to Use the EQ.LINK System" in the User's Manual, Option CMU (LQP526-Z, LQZ500-Z) (manual number SVE-1-145).

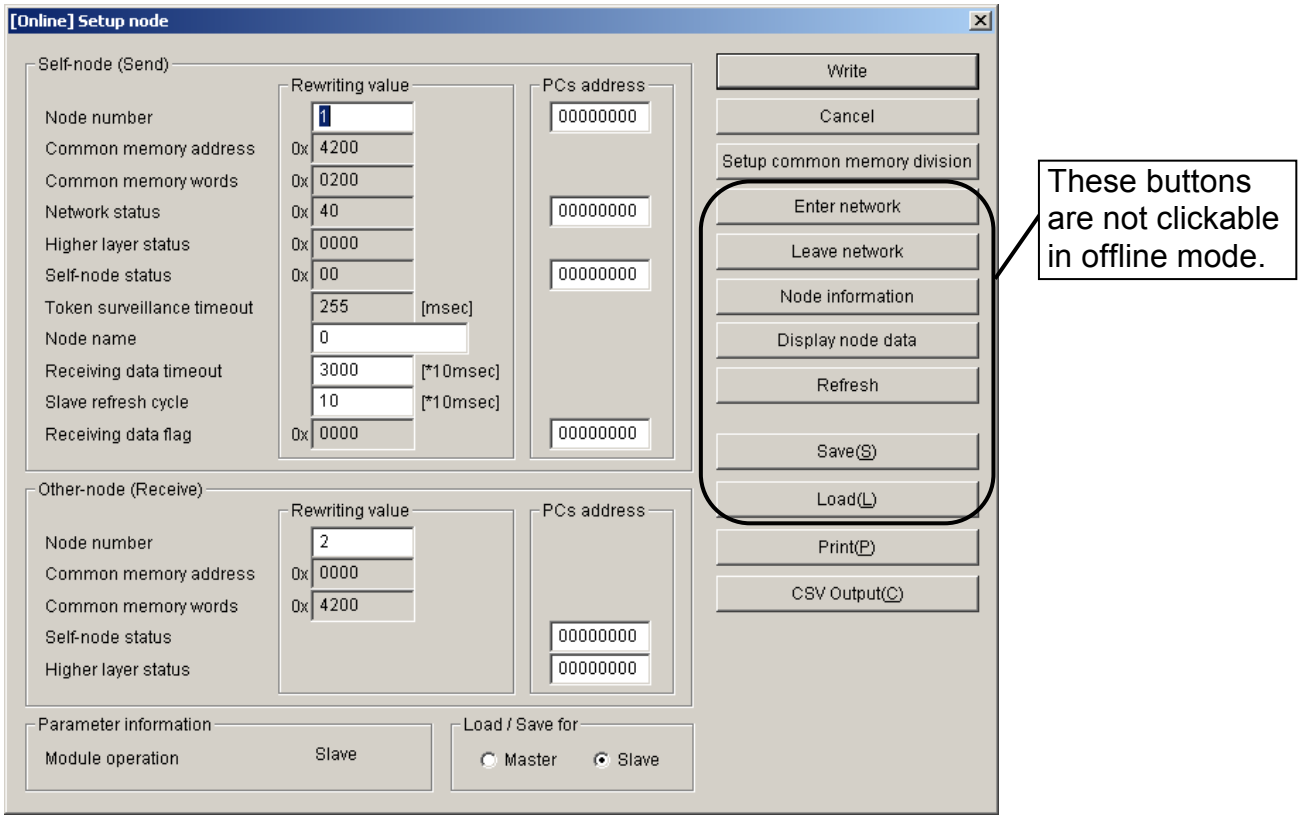
5.2.3 Setting of link parameters

Function: Set the required parameters of the EQ.LINK module and areas in which the user program browses parameter information.
In offline mode, it is a prerequisite that the programmable controller be connected with the PC by cable.
Operation: The procedure is shown below.

① Click the Setup node button on the [EQ.LINK] dialog box.



② Set Self-node (Send) parameters and Other-node (Receive) parameters.
Each EQ.LINK module requires both a parameter setting for the main system and a parameter setting for the sub system. You can select a main or sub system whose parameters you want to set by the [Load/Save for] radio button.



<Specifying Rewriting value>

Enter values in the “Rewriting value” field on the [Setup node] window. This window shows parameters that are required to run the EQ.LINK module (for transferring).

- Node number

  This number is used to identify the remote EQ.LINK module to which the local EQ.LINK module transfer data.

Value available	Default value
1 to 254	Local node: 1 Remote node: 2

  Specify the node number of the remote EQ.LINK (to which the local EQ.LINK module is interconnected) as the remote node number.

- Common memory address

  Top address of common memory which temporarily stores data to be transferred by the EQ.LINK module.

  This box shows the offset value of the No.1 area among common memory areas which are divided by “5.2.4 Setup common memory division.”

- Common memory words

  A total size of data that the EQ.LINK module transfers.

  A total of PCs words of common memory areas which are divided by “5.2.4 Setup common memory division.”

- Network status/Higher layer status/Self-node status

  Flag information indicating the status of communication with a remote node.

  For more information, see “5.2.6 Link parameter information.”

- Token surveillance timeout

  A time period that can hold a token sent to the local node (255 ms fixed).

  The user cannot change this value.

- Node name

  Specify the name of this node.

Value available	Default value
Up to 10 alphanumeric characters	(Blanked)

- Receiving data timeout

  Specify a maximum allowable receiving data timeout period. When data does not come within this period, the received data valid flag is turned off.

Value available	Default value
1 to 60000	3000

(× 10 ms)

  When this period is "0," the received data valid flag is not turned off.

- Slave refresh cycle

  Specify a cycle which updates data to be transferred from the sub system to the main system.

Value available	Default value
1 to 60000	10

(× 10 ms)

  When this period is "0," the transfer data is not updated.

- Receiving data flag

  This flag indicates whether the data received by the sub system is set in PI/O memory when systems are switched. For more information, see "4.1.9 Data reception timeout and received data valid flag."

<Displaying parameter information>

The "Parameter information" of the [Setup node] window displays the operating status of the EQ.LINK module.

- Module operation

  This field shows the operation status of the EQ.LINK module.

  The operation states are as follows:

Indication	Description
Master	The main system is in service.
Slave	The sub system is in service.
Invalid	LPU, CMU error occurred CPU system switching Rewriting parameters

<Specifying PCs allotment>

Specify LPU memory areas to which data is set so that the user program may browse the link parameter information. Table 5-1 lists symbols and addresses available.

Table 5-1 PCs Memory Allocation Range

Register name	Symbol name	Memory address
External input	XW000 to XWFF0	0x414000 to 0x4141FE
External output	YW000 to YWFF0	0x414200 to 0x4143FE
Transfer register	JW000 to JWFF0	0x0E0200 to 0x0E03FE
Receive register	QW000 to QWFF0	0x0E0600 to 0x0E07FE
Global link register	GW000 to GWFF0	0x0E0800 to 0x0E09FE
Internal register	RW000 to RWFF0	0x0E0C00 to 0x0E0DFE
Event register	EW000 to EWFF0	0x0E1C00 to 0x0E1DFE
Internal register	MW000 to MWFF0	0x0E0E00 to 0x0E0FFE
Function data register	DW000 to DWFFF	0x061000 to 0x062FFE
Function work register	FW000 to FWBFF	0x0E2000 to 0x0E37FE
On-delay timer (word)	TW000 to TW1F0	0x0E1300 to 0x0E133E
One-shot timer (word)	UW000 to UW0F0	0x0E1500 to 0x0E151E
Counter (word)	CW000 to CW0F0	0x0E1700 to 0x0E171E
Keep (word)	KW000 to KWFF0	0x0E1000 to 0x0E11FE
System register (word)	SW000 to SWBF0	0x0E1E80 to 0x0E1FFE
Z register (word)	ZW000 to ZW3F0	0x0E1E00 to 0x0E1E7E
Bit register extension	LBW0000 to LBWFFF0	0x412000 to 0x413FFE
Word register extension	LXW0000 to LXW3FFF	0x4A0000 to 0x4A7FFE
Word register extension	LWW0000 to LWW7FFF	0x450000 to 0x46FFFE
Extended internal register	AW000 to AWFF0	0x0E0A00 to 0x0E0BFE
Long word register	BD000 to BD1FE	0x0E3800 to 0x0E3FF8
Extended external input	IW000 to IWFFF	0x0E4000 to 0x0E5FFE
Extended external output	OW000 to OWFFF	0x0E6000 to 0x0E7FFE
T value	TS000 to TS1FF	0x063000 to 0x0633FE
U value	US000 to US0FF	0x063400 to 0x0635FE
C value	CS000 to CS0FF	0x063600 to 0x0637FE
Work register for ladder converter only	LRW0000 to LRW0FF0	0x42FC00 to 0x42FDFE
Work register for ladder converter only	LVW0000 to LVW0FF0	0x42FE00 to 0x42FFFE
Long word work register	LLL0000 to LLL1FFF	0x430000 to 0x437FFC
Floating point work register	LF0000 to LF1FFF	0x438000 to 0x43FFFC
Long word work register	LML0000 to LML1FFF	0x490000 to 0x497FFC
Floating point work register	LG0000 to LG1FFF	0x498000 to 0x49FFFC
Edge contact	VW000 to VWFF0	0x0E1A00 to 0x0E1BFE
T value	TC000 to TC1FF	0x0F0000 to 0x0F03FE
U value	UC000 to UC0FF	0x0F0400 to 0x0F05FE
C value	CC000 to CC0FF	0x0F0600 to 0x0F07FE
On-delay timer (coil)	TLW000 to TLW1F0	0x0E1200 to 0x0E123E
One-shot timer (coil)	ULW000 to ULW0F0	0x0E1400 to 0x0E141E
Counter (coil)	CUW000 to CUW0F0	0x0E1600 to 0x0E161E
Counter (coil)	CDW000 to CDW0F0	0x0E1680 to 0x0E169E
Counter (coil)	CRW000 to CRW0F0	0x0E1780 to 0x0E179E
CDDC area	DDC0000 to DDCC7FF	0x4B2000 to 0x4CAFFE

The symbols and addresses below are available to PCs allocation of the Received Data Valid flag.

Table 5-2 PCs Memory Allocation Range (Received Data Valid Flag)

Register name	Symbol name	Memory address
External input	X000 to XFFF	0x240000 to 0x241FFE
External output	Y000 to YFFF	0x242000 to 0x243FFE
Transfer register	J000 to JFFF	0x0A2000 to 0x0A3FFE
Receive register	Q000 to QFFF	0x0A6000 to 0x0A7FFE
Global link register	G000 to GFFF	0x0A8000 to 0x0A9FFE
Internal register	R000 to RFFF	0x0AC000 to 0x0ADFFE
Internal register	M000 to MFFF	0x0AE000 to 0x0AFFFE
Keep	K000 to KFFF	0x0B0000 to 0x0B1FFE
On-delay timer	T000 to T1FF	0x0B3000 to 0x0B33FE
One-shot timer	U000 to U0FF	0x0B5000 to 0x0B51FE
Up-down counter	C000 to C0FF	0x0B7000 to 0x0B71FE
Nesting coil	N001 to N0FF	0x0B8000 to 0x0B81FE
Nesting coil (word)	NW000 to NW0F0	0x0E1800 to 0x0E181E
Process register	P001 to P080	0x0B9000 to 0x0B90FE
Process register (word)	PW000 to PW080	0x0E1900 to 0x0E19FE
Edge contact	V000 to VFFF	0x0BA000 to 0x0BBFFE
Event register	E000 to EFFF	0x0BC000 to 0x0BDFFE
Z register	Z000 to Z3FF	0x0BE000 to 0x0BE7FE
System register	S000 to SBFF	0x0BE800 to 0x0BFFFE
Extended internal register	LB0000 to LBFFFF	0x220000 to 0x23FFFE
Internal register (for converter only)	LR0000 to LR0FFF	0x3FC000 to 0x3FDFFE
Edge contact register (for converter only)	LV0000 to LV0FFF	0x3FE000 to 0x3FFFFE

When the PCs allotment address is “00000000,” transfer is not done.

③ After setting values and addresses, press the [Write] button. The destination of writing the set values and addresses differs between online mode and offline mode, as described below.

<In online mode>

The set values are written to the main or sub system selected by the [Load/Save for] radio button.

When writing the setting, the EQ.LINK module automatically breaks away from the network. Therefore, do not try to rewrite the setting while transferring is in progress. After writing is complete, the EQ.LINK module is automatically reconnected to the network.

<In offline mode>

In offline mode, the set values are written to the selected file.

To cancel the setting, press the [Close] button.

- To set a PI/O area to which the EQ.LINK module transfers data, click the [Setup common memory division] button.
- If the EQ.LINK module is disconnected from the network (because of a network error or the like), click the [Enter network] button to connect the EQ.LINK module to the network. To disconnect the EQ.LINK module from the network, click the [Leave network] button (in online mode).
- To monitor the current values, click the [Mode information] button.
- To display the content of common memory in the local and remote node areas, click the [Display node data] button (in online mode).
- To display the latest link parameter information, click the [Refresh] button (in online mode).

- PCs addresses in the [PCs allotment] field and the [Setup common memory division] window must be unique.
- When the local node number is changed for setting, the IP address of the EQ.LINK module is automatically set before the setting is transmitted. In this case, the PCs remote reset message is output for confirmation. Be sure to remote reset. When remote resetting is canceled, the link parameters are not set.

5.2.4 Setup common memory division

Function: Relate the setting of the PI/O areas to which the EQ.LINK module transfers data to offsets of common memory which temporarily stores transfer data.

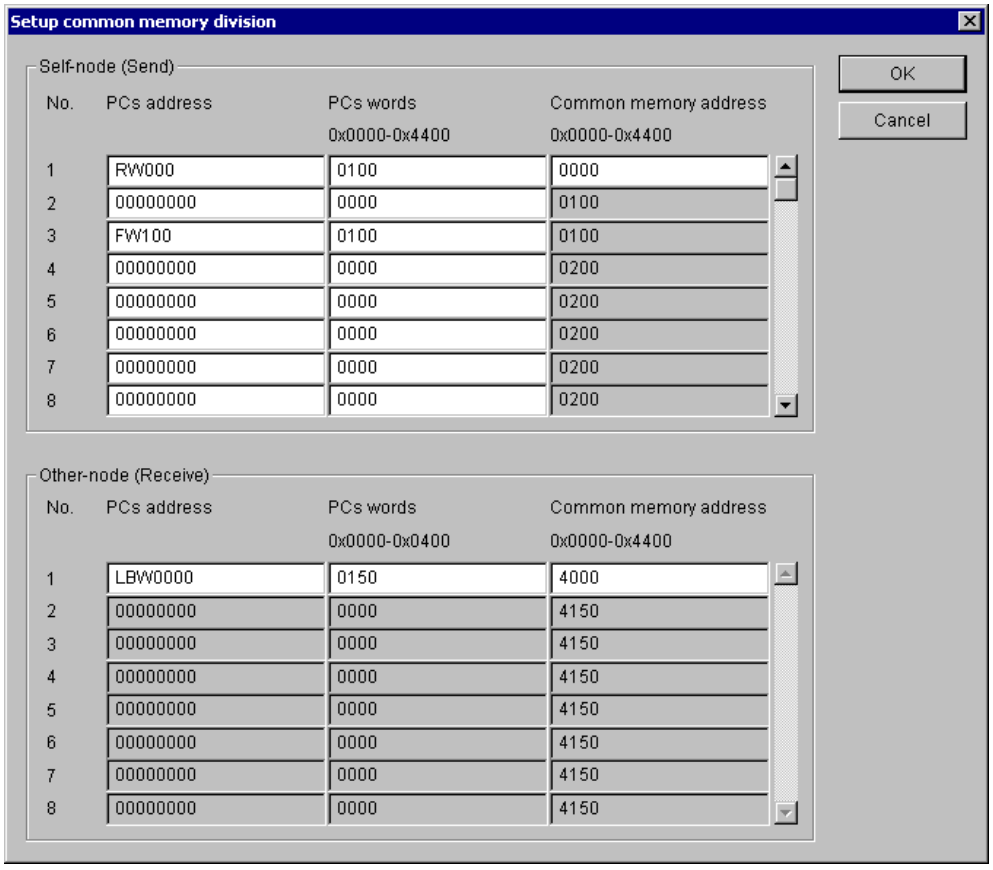
In offline mode, it is a prerequisite that the programmable controller be connected with the PC by cable.

Operation: The procedure is shown below.

① Select Main or Sub for which you want to set parameters by the [Load/Save for] radio button on the [Setup node] window (see subsection 5.2.3).

② Click the Setup common memory division button on the [Setup node] window.

③ Specify areas (local node setting) which store data to be transferred to the remote party and areas (remote node setting) which stores data sent from the remote party.



Items to be specified are as follows:

- No.
  This is a registered number of a PI/O area which is copied and transferred in common memory. Numbers below are available.

	Main system	Sub system
Local node	1 to 40	1 to 40
Remote node	1	1 to 40

- PCs address
  Specify the top address of the PI/O area which is copied and transferred in common memory. The values must be equal to those listed in “Table 5-1 PCs memory” allocation range.
- PCs words
  Specify the size (in words) of the PI/O area which is copied and transferred in common memory. Values below are available.

	Main system	Sub system
Local node	0x0000 to 0x4400	0x0000 to 0x0400
Remote node	0x0000 to 0x0400	0x0000 to 0x4400

- Common memory address
  Specify the address of the area in common memory which stores PI/O data to be stored to the remote party by the EQ.LINK module. Specify the offset (in words) from the top address of common memory for “No.1.” Offset values for “No.2” and later need not be specified because they are automatically calculated according to the specified PCs words. Specify PCs words so that the addresses may not exceed the range below.

Values available	0x0000 to 0x4400

④ When the setting is completed, click the [OK] button. To cancel the setting, click the [Cancel] button.

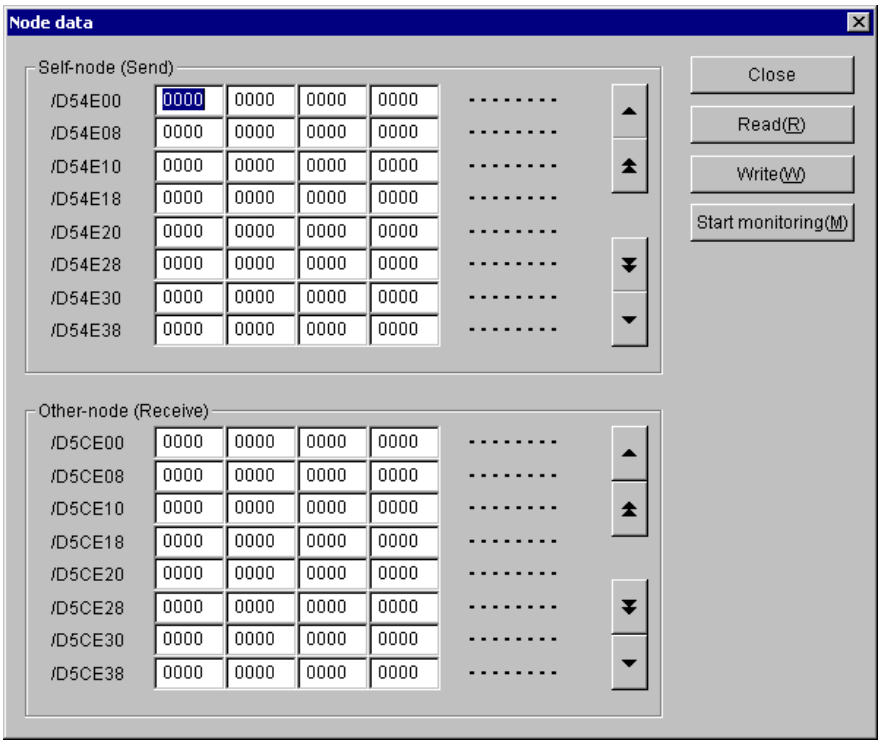
- PCs addresses in the [PCs allotment] field and the [Setup common memory division] window must be unique.
- The setting can be stored by the [Setup node] window. When you click the [Cancel] button on the [Setup node] window, the "Setup common memory division" setting is not stored.

5.2.5 Other nodes display

Function: Display transfer data set in common memory areas of the local and remote nodes.
For using this function, it is a prerequisite that the programmable controller is connected with the PC by cable.
Operation: The procedure is shown below.

① Click the [Display node data] button on the [Setup node] window (see "5.2.3 Setting of link parameters.")

② The [Node data] window is displayed. This window shows data stored in the areas that store data to be transferred to the remote node (local node setting) and in the areas that store data to be received from the remote node (remote node setting).



③ If all the contents of areas cannot be displayed on the current window, click the [▲] [▲▲] and [▼] [▼▼] buttons to shift the display.

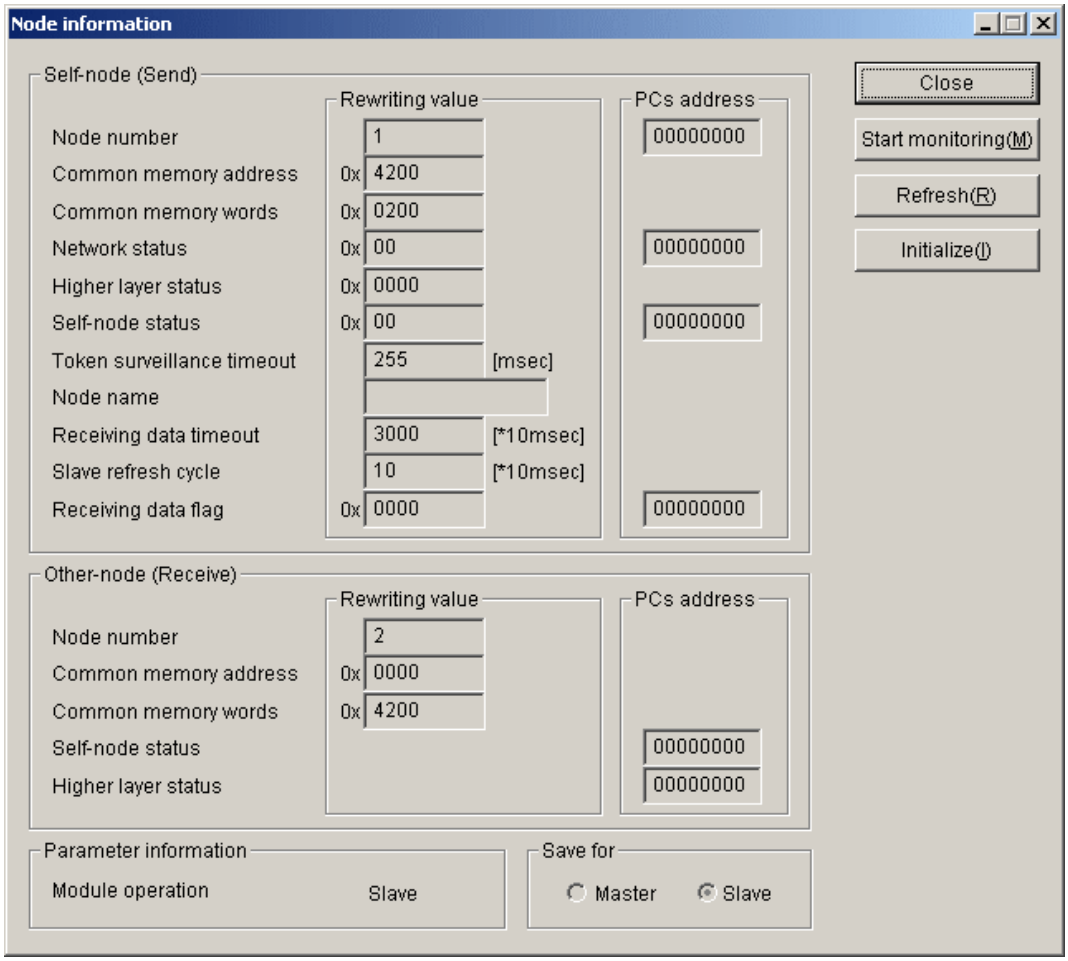
④ To monitor the contents of areas, click the [Start monitoring] button.
After completing the setup, click the [Write] button. To cancel the setup, click the [Close] button.
Other nodes data cannot be written.

5.2.6 Link parameter information (Node information)

Function: Display the setting of parameters required by the EQ.LINK module and the setting of areas that enables the user program to browse parameter information.
For using this function, it is a prerequisite that the programmable controller be connected with the PC by cable.
Operation: The procedure is shown below.

① Click the [Setup node] button on the [EQ.LINK] or [Setup node] window (see "5.2.3 Setting of link parameters.")

② The [Node information] window opens.



③ To monitor the setting of link parameters, click the [Start monitoring] button.
To reset the link parameter information (node information), click the [Initialize] button.
To close the [Node information] window, click the [Close] button.

Below are explained the contents of the network status, high-level status, and local node status flags. For description of the other items, see "5.2.3 Setting of link parameters."

- Network status flag

  The bits of this flag are assigned as shown below.

Network joining
= 0: The local node is not connected to the network.
= 1: The local node is connected to the network

Double common memory setting
= 0: No double common memory setting
= 1: Double common memory setting
Reset the common memory setting of the local node to all zeros and enter the network.

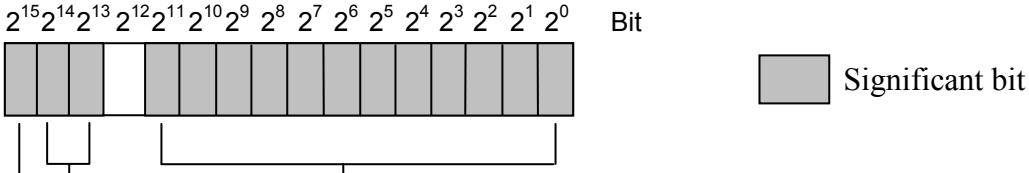
Setting completed
= 0: The common memory setting is not completed (because of an error).
= 1: The common memory setting is completed. (There is no error in the setting.)

Data valid
= 0: The content of common memory is invalid.
= 1: The content of common memory is valid.

High-level error
= 0: The high-level layer is normal.
= 1: The high-level layer is in trouble. For more information, see "High-level status flag."

- High-level status flag

  The bits of this flag are assigned as shown below.



High-level error code (12 bits long)
This field shows the code of an error that the high-level layer has. Error codes below are available to the EQ.LINK module.

Error code	Description
0x000	The high-level layer (S10V) is normal.
0x0FF	The high-level layer (S10V) has a CPU or LPU error.

High-level error status (2 bits long)
Indicates the error status of the high-level layer.

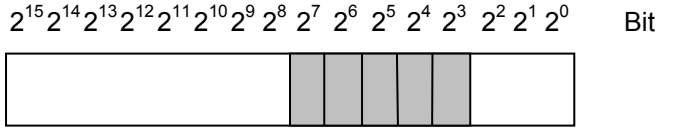
2^{14} bit	2^{13} bit	Description
OFF	OFF	The high-level layer (S10V) is normal.
OFF	ON	The high-level layer (S10V) has an error that allows operation of the system (ALARM status). This status assures the cyclic data and the message data.
ON	OFF	The high-level layer (S10V) has an error that stops operation of the system (WARNING status). This status does not assure the cyclic data and the message data.
ON	ON	

This EQ.LINK module turns on these bits (2^{14} and 2^{13}) when a high-level error occurs.

High-level operation
= 0: The high-level layer (S10V) is not running (STOP).
= 1: The high-level layer (S10V) is running (RUN).

- Local Node Status flags

  The bits of this flag are assigned as shown below.



Token maintenance timeout
= 0: The token maintenance timeout did not occur.
= 1: The token maintenance timeout occurred.

EQ.LINK setting error
= 0: This node (local node) is not connected to the network.
= 1: This node (local node) is connected to the network.

Frame waiting
= 0: This node is entering or already connected to the network.
= 1: Three or more entry requests were made but the remote node is not detected. This node is still trying to enter the network.

Double node number
= 0: No double node number
= 1: The specified node number already exists.

Network entry
= 0: The local node does not enter the network.
= 1: The local node entered the network.

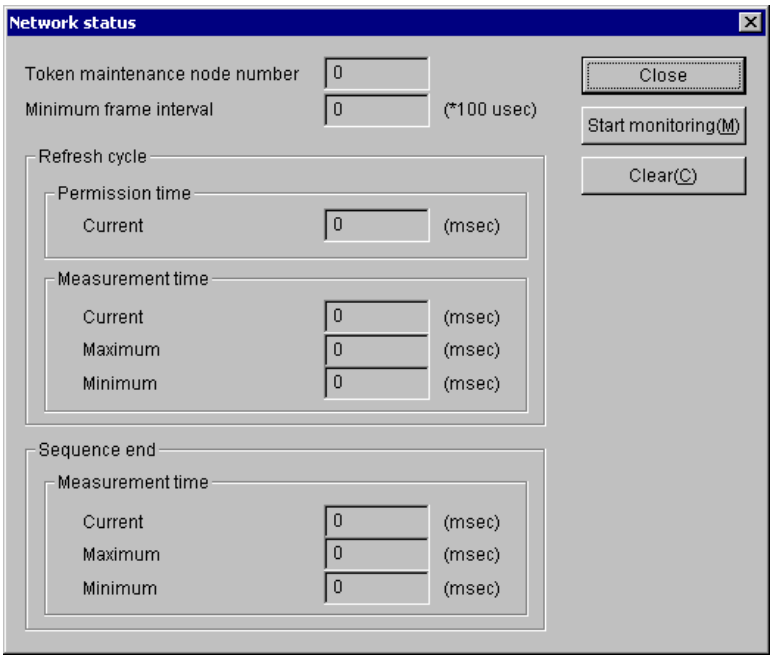
5.2.7 Network status

Function: Display the status when joining the network including the allowable refresh cycle time. For using this function, it is a prerequisite that the programmable controller is connected with the PC by cable.

Operation: The procedure is shown below.

① Click the Network status button on the [EQ.LINK] window.

② The [Network status] window is displayed.



③ Click the Start monitoring button to monitor the network status.
To clear the refresh cycle measurement time and the SEQEND processing measurement time, click the Clear button.
Click the Close button to exit the [Network status] window.
The display items are explained below.

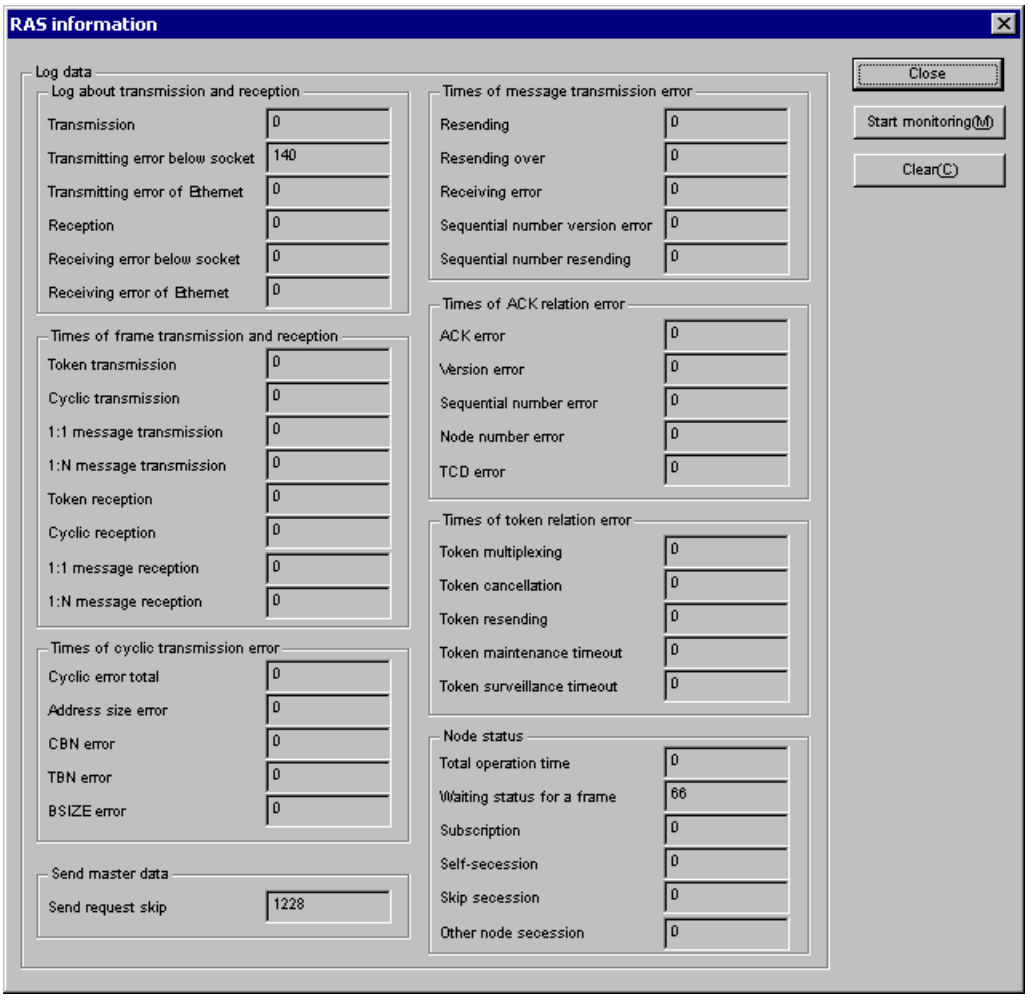
Item displayed		Description
Token maintenance node number		Number of a node that holds the token.
Minimum frame interval		Minimum permissible frame interval on EQ.LINK communication.
Refresh cycle	Permission time	A value obtained by multiplying a time period in which a taken is transferred to and from the EQ.LINK modules by 1.2. When the refresh cycle exceeds this value, "Token surveillance timeout" of RAS information is incremented by one.
	Measurement time	Current measured time period required to reciprocally transfer a token between the EQ.LINK modules, also including the old maximum and minimum measured time periods.
Sequence end	Measurement time	Current measured time period required to copy transfer data (specified by "Setup common memory division") after execution of a ladder program, also including the old maximum and minimum measured time periods.

5.2.8 RAS information

Function: Display the RAS information.
For using this function, it is a prerequisite that the programmable controller be connected with the PC by cable.
Operation: The procedure is shown below.

① Click the Network status button on the [EQ.LINK] window.

② The [RAS information] window is displayed.



③ Click the Start monitoring button to monitor the RAS information.
Click the Clear button to reset all the RAS information to 0.
Click the Close button to exit the [RAS information] window.
The RAS information is all reset to 0 by resetting or turning off and on the power supply.

Below are listed RAS information items to be displayed.

Item displayed		Description
Transmission/ reception log	Number of transmissions	Number of frames requested to send
	Number of transmission errors under socket	Number of transmission errors in the socket section
	Number of transmission errors under Ethernet	Not used
	Number of receptions	Number of frames received from the socket section
	Number of reception errors under socket	Number of reception errors and error frames received by the socket section
	Number of reception errors under Ethernet	Not used
Number of frames transmissions and receptions	Number of token transmissions	Number of token transmissions
	Number of cyclic transmissions	Number of transmissions of cyclic frames without a token
	Number of 1:1 message transmissions	Not used
	Number of 1:N message transmissions	Not used
	Number of token receptions	Number of token receptions
	Number of cyclic receptions	Number of receptions of cyclic frames without a token
	Number of 1:1 message receptions	Not used
	Number of 1:N message receptions	Not used
Number of cyclic transmission errors	Total number of cyclic errors	Number of errors occurred in cyclic transmission and reception
	Address size error	Not used
	CBN error	Number of frame listing errors
	TBN error	Number of frame division errors
	BSIZE error	Number of frame size errors
Number of message transmission errors	Number of retransmissions	Not used
	Number of retransmission timeouts	Not used
	Number of reception errors	Not used
	Number of serial version errors	Not used
	Number of serial retransmissions recognized	Not used
Number of ACK-related errors	Number of ACK errors	Number of ACK-related errors
	Number of version errors	Number of ACK serial versions unmatched
	Number of serial number errors	Number of ACK serial numbers unmatched
	Number of node number errors	Not used
	Number of TCD errors	Not used
Number of token-related errors	Number of multiple tokens recognized	Number of multiple tokens recognized
	Number of tokens discarded	Number of tokens discarded
	Number of tokens re-submitted	Number of tokens re-submitted
	Number of token maintenance timeouts	Number of token maintenance timeouts
	Number of token surveillance timeouts	Number of token surveillance timeouts
Node status	Total run time	Not used
	Number of frame waiting states	Number of frame waiting states when the network finds no remote node
	Number of entries	Number of network entries
	Number of self-disconnections	Number of disconnections when three consecutive token maintenance timeouts occur or when the network finds no remote node
	Number of skip-disconnections	Number of disconnections when a token addresses to the local node is skipped
	Number of remote node disconnections recognized	Number of remote node disconnections from the network
Main system transmission	Number of SEND requests skipped	Number of failures that the LPU cannot make SEND requests for the EQ.LINK module

NOTICE

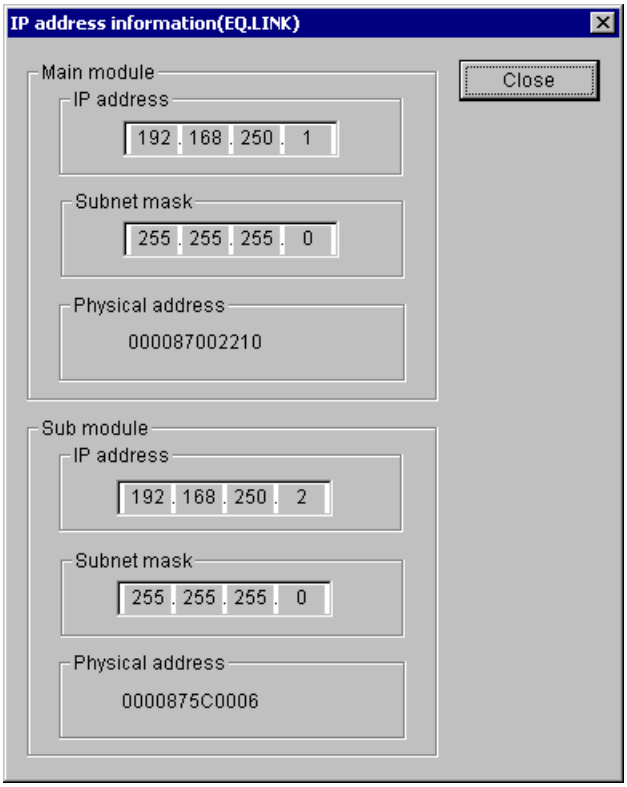
- Frequent updates of error counts in RAS information may be caused by a system overload, invalid link parameter setting, or cable disconnection. Troubleshoot and repair according to “6 MAINTENANCE.” If the error still persists, the EQ.LINK module may be faulty. Replace the EQ.LINK module.
- If the transmission cycle of the EQ.LINK module becomes greater than the sequence cycle of the LPU, the number of transmission requests skipped is counted. If this value is frequently updated, make the transmission size smaller or the sequence cycle longer.

5.2.9 IP address information

Function: Display the IP address, subnet mask, and physical address of the EQ.LINK module.
For using this function, it is a prerequisite that the programmable controller be connected with the PC by cable.
Operation: The procedure is shown below.

① Click the IP address information button on the [EQ.LINK] window.

② The [IP address information (EQ.LINK)] window opens.



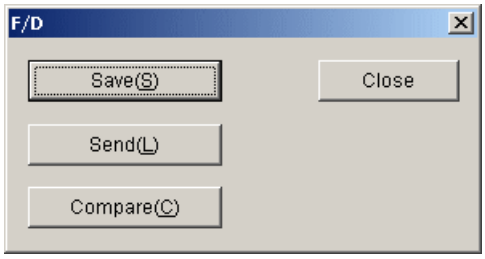
- The IP address is automatically set when the node number of the local node is changed on the [Setup node] window.
- For details of automatically-set IP addresses, see "4.1.3 IP address of the EQ.LINK module."

5.2.10 F/D function

Function: Save and send EQ.LINK system information.
For using this function, it is a prerequisite that the programmable controller be connected with the PC by cable.
Operation: The procedure is shown below.

① Click the F/D function button on the [EQ.LINK] window.

② The [F/D] dialog box opens. Click the Save button to save the system information for the EQ.LINK module, or click the Send button to send that system information to the programmable controller. Then, if you want to send the saved system information to the programmable controller, click the Send button in the same dialog box. If you want to compare the saved system information with the memory contents of the programmable controller, click the Compare button in the same dialog box.



Be sure to use the "F/D" function of the EQ.LINK system to save and send EQ.LINK system information. The other tool cannot save and send the EQ.LINK system information.

5.2.11 Save

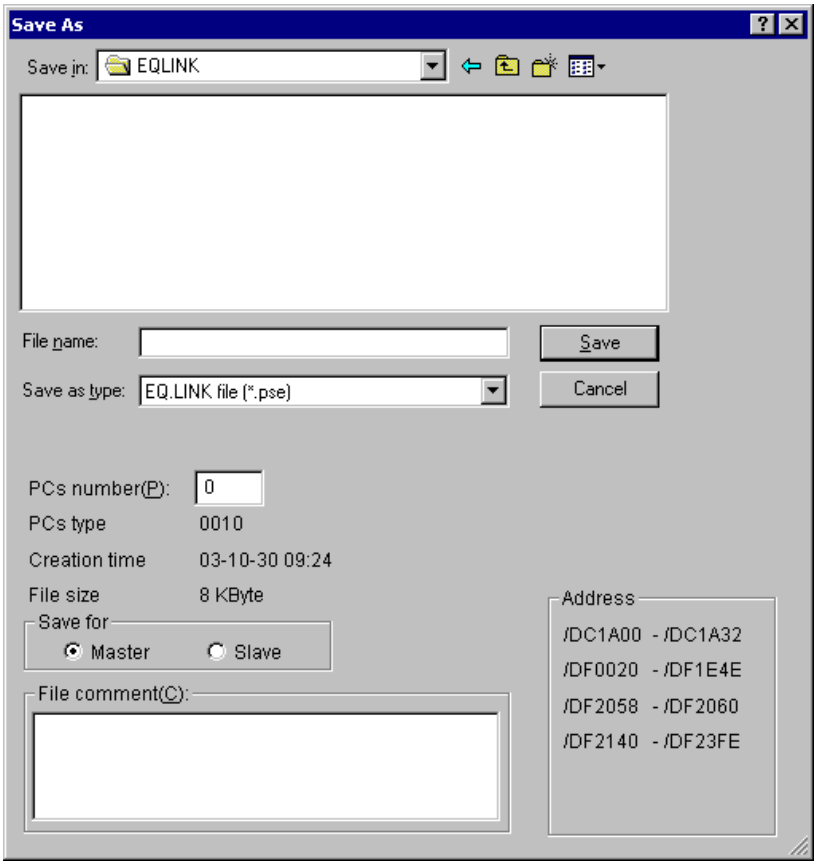
Function: Save the node information (link parameters) set for the EQ.LINK module as a file on your PC.
For using this function, it is a prerequisite that the programmable controller be connected with the PC by cable.
Operation: The procedure is shown below.

① Click the Save button on the [F/D] dialog box.

② The [Save As] dialog box opens.

③ Select parameters for the main system or parameters for the sub system to save and click its radio button in the [Save for] field.

④ Enter the name of the file.



⑤ Then, click the Save button to save the information or click the Cancel button to cancel saving the information.

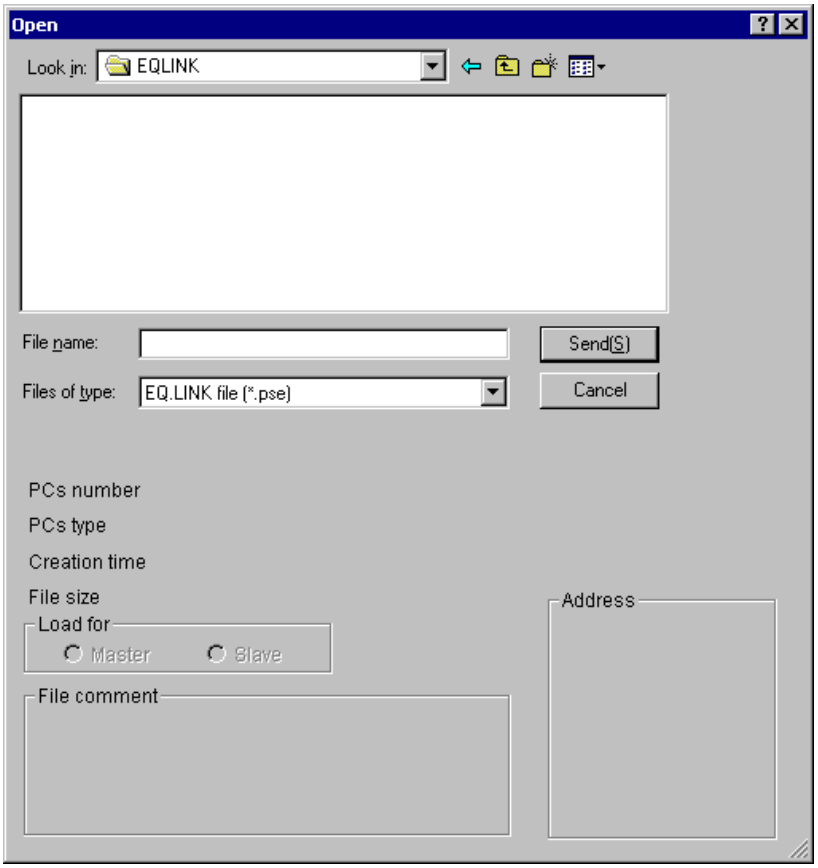
A comment of up to 128 characters can be attached to the saved file.

5.2.12 Send

Function: Send (load) the EQ.LINK system information to PCs.
For using this function, it is a prerequisite that the programmable controller be connected with the PC by cable.
Operation: The procedure is shown below.

① Click the Send button on the [F/D] dialog box.

② The [Open] dialog box opens. Enter the name of a file you want to send. The main or sub system for which the information is dedicated is shown in the "File retention information."



③ Then, click the Send button to send the information or click the Cancel button to cancel sending the information.

- When the local node number is changed in transmission of the PSE file, the IP address of the EQ.LINK module is automatically set. In this case, the "PCs Remote Reset" message is output for confirmation. Be sure to click "Yes" (to remote-reset). When remote resetting is canceled, the file is not sent.
- The PSE file that has been saved by a sub EQ.LINK module cannot be sent to the main EQ.LINK module. (Similarly, the PSE file that has been saved by a main EQ.LINK module cannot be sent to the sub EQ.LINK module.)

5.2.13 Compare

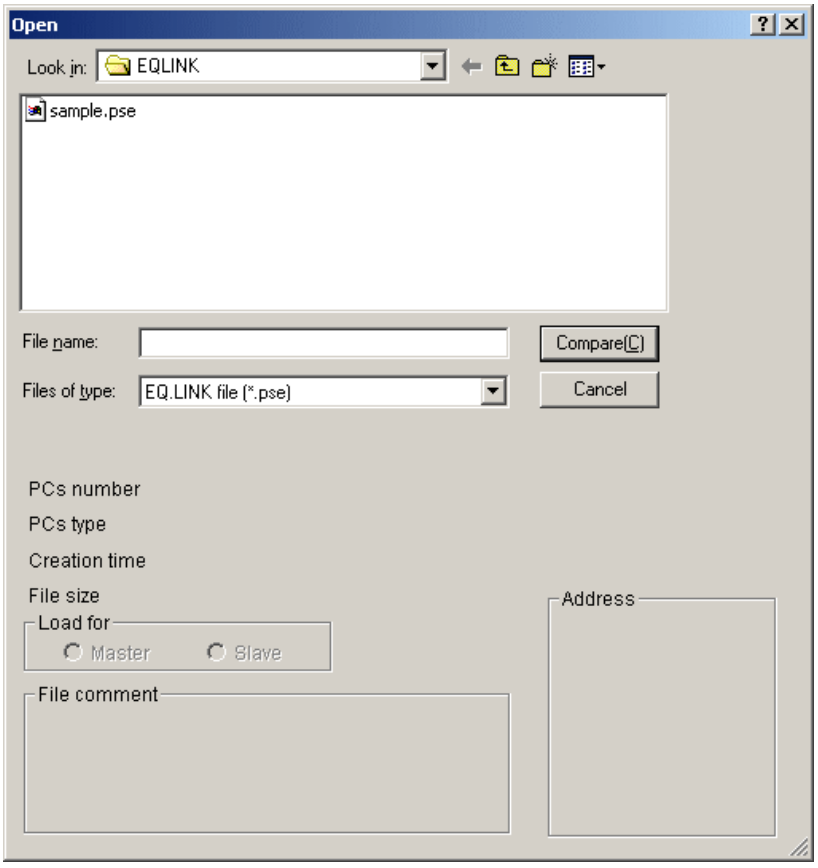
Function: Compare the EQ.LINK system information saved in a file with the memory contents of the programmable controller.

For using this function, it is a prerequisite that the programmable controller be connected with the PC by cable.

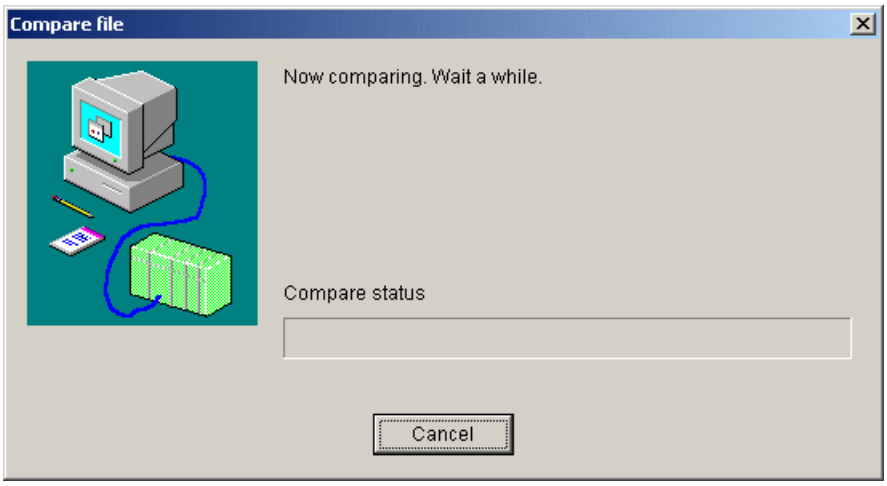
Operation: The procedure is described below.

① On the [F/D] dialog box displayed, click the Compare button.

② The [Open] dialog box opens. Choose the desired file for comparison. Then, the following information on the selected file is displayed: PCs number, PCs type, creation time, file size, file comment, address, and file save info ("Load for"). This information will not be displayed if the file name is entered directly in the "Look in" edit box.

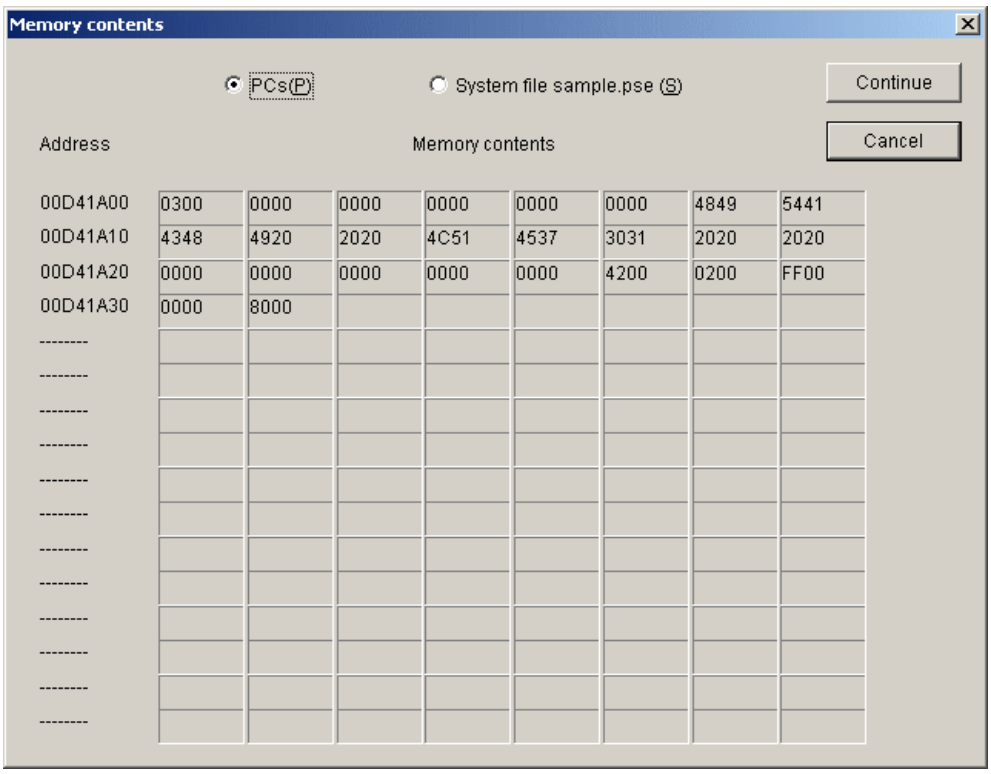


③ Click the Compare button in the dialog box. Then, the [Compare file] dialog box appears and a comparison operation starts.



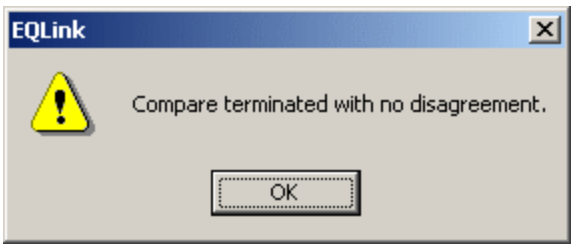
If you click the Cancel button during the comparison operation, the comparison in progress will be stopped with an operation abort message (as shown below) displayed. Clicking the OK button in this message dialog box goes back to the [F/D] dialog box.

④ If a difference is detected between the EQ.LINK system information and the memory contents during the comparison operation, the [Memory contents] window as shown below appears. Locate the difference in the displayed contents and mark it for later action.

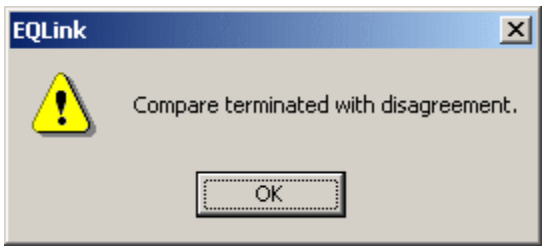


Then, click either the Continue or Cancel button in the window. If you click the Continue button, the EQ.LINK system closes the [Memory contents] window and resumes the comparison process. If another difference is found during the comparison operation, the [Memory contents] window appears again.
If you click the Cancel button, the EQ.LINK system aborts the comparison process and displays an operation abort message as shown below. Clicking the OK button in the message dialog box goes back to the [F/D] window.

⑤ At the end of the comparison process, if no differences are detected between them throughout the comparison process, the [Compare terminated with no disagreement] message shown below is displayed.



If a difference(s) are detected between them, the [Compare terminated with disagreement] message shown below is displayed instead.



The PSE file that has been saved by a sub EQ.LINK module cannot be compared to the main EQ.LINK module. (Similarly, the PSE file that has been saved by a main EQ.LINK module cannot be compared to the sub EQ.LINK module.)

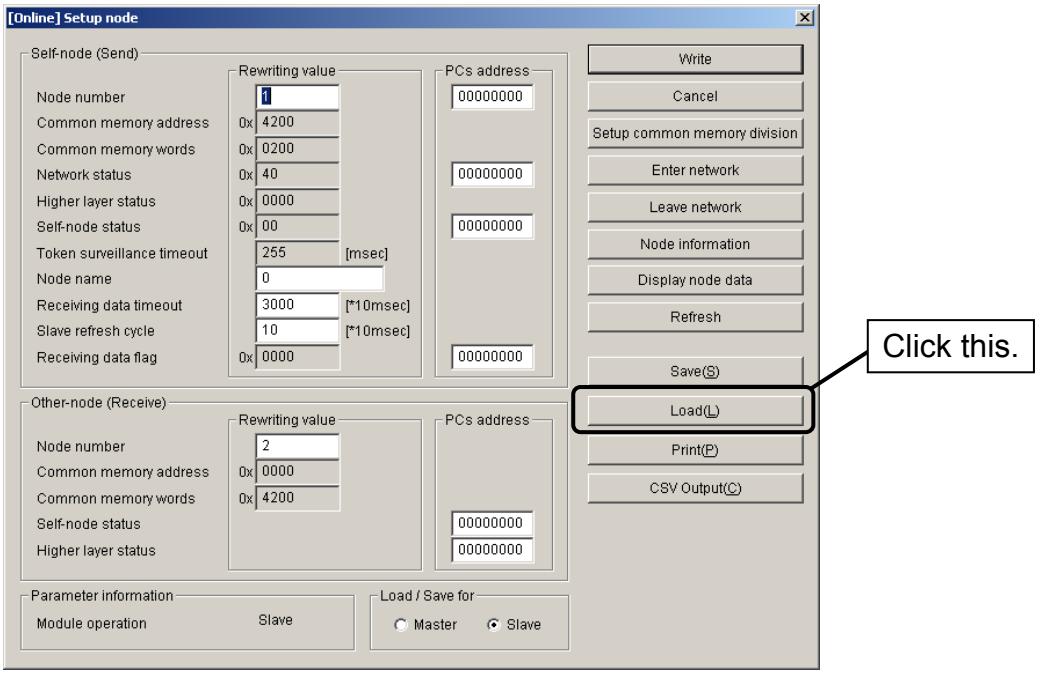
5.2.14 Loading the EQ.LINK parameter settings in from a file (Load)

Function: Load the parameter settings from an existing EQ.LINK parameter file into the [[Online] Setup node] window and subsequently into the [[Online] Setup common memory division] window if requested. (This function is supported by EQ.LINK system Ver-Rev 02-01 or later and is available only in online mode.)

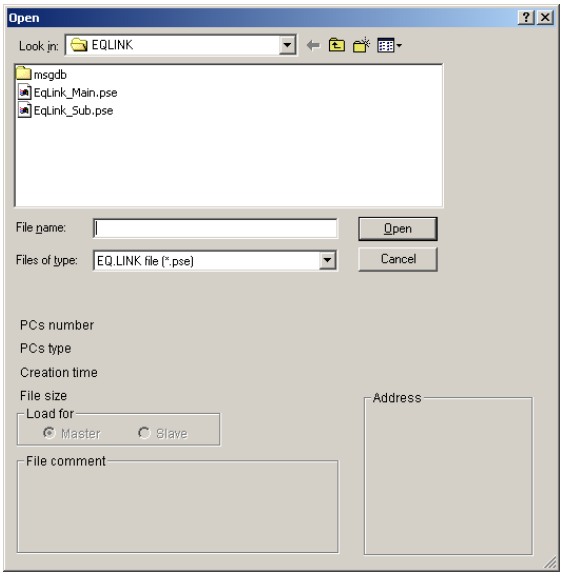
Operation: The procedure is shown below.

① Establish a connection with the programmable controller (see "5.2.1 PCs connection change").

② Display the [[Online] Setup node] window (see "5.2.3 Setting of link parameters") and click the [Load] button:

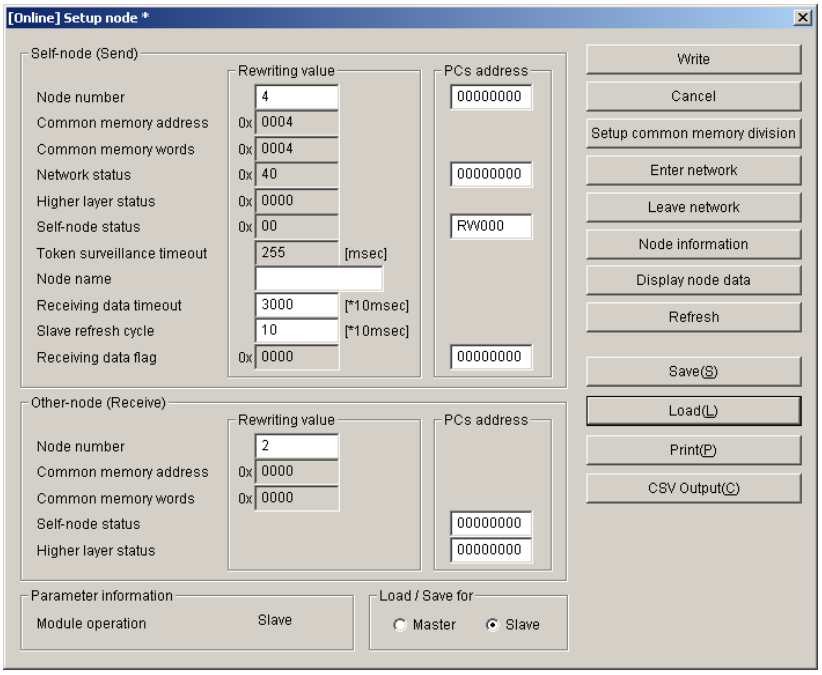


③ The [Open] window as shown below appears.



Select the desired EQ.LINK parameter file and click the Open button.

④ The [Open] window disappears and the selected EQ.LINK parameter file's contents will be loaded into the [[Online] Setup node] window.



When you add a change to the displayed parameters, an asterisk ("*") appears following the title of the [[Online] Setup node] window in the title bar.

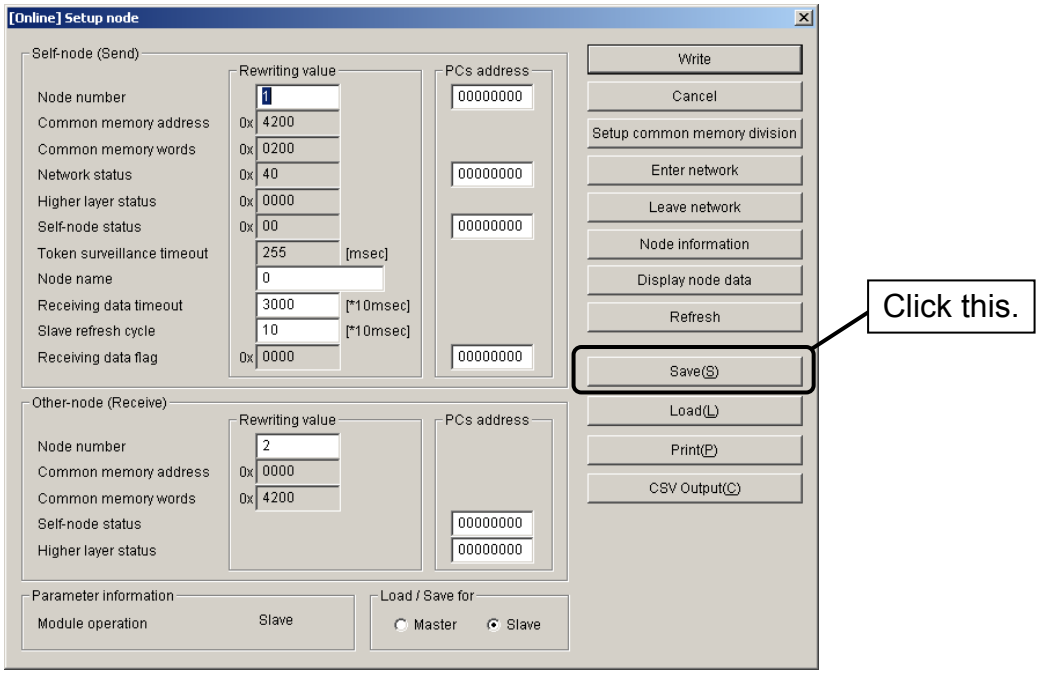
5.2.15 Saving the EQ.LINK parameter settings to a file (Save)

Function: Save the parameter settings displayed on-screen (including the common memory division settings) to a file. (This function is supported by EQ.LINK system Ver-Rev 02-01 or later and is available only in online mode.)

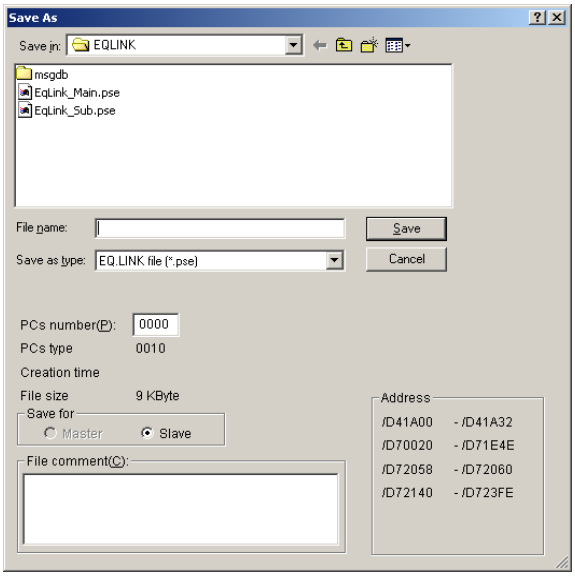
Operation: The procedure is shown below.

① Establish a connection with the programmable controller (see "5.2.1 PCs connection change").

② Display the [[Online] Setup node] window (see "5.2.3 Setting of link parameters"), select either the "Master" or the "Slave" radio button in the [Load/Save for] box, and then click the Save button.



③ The [Save As] window as shown below opens.



Specify the desired folder and file name in the “Save in” and the “File name” edit box, respectively, and click the Save button.

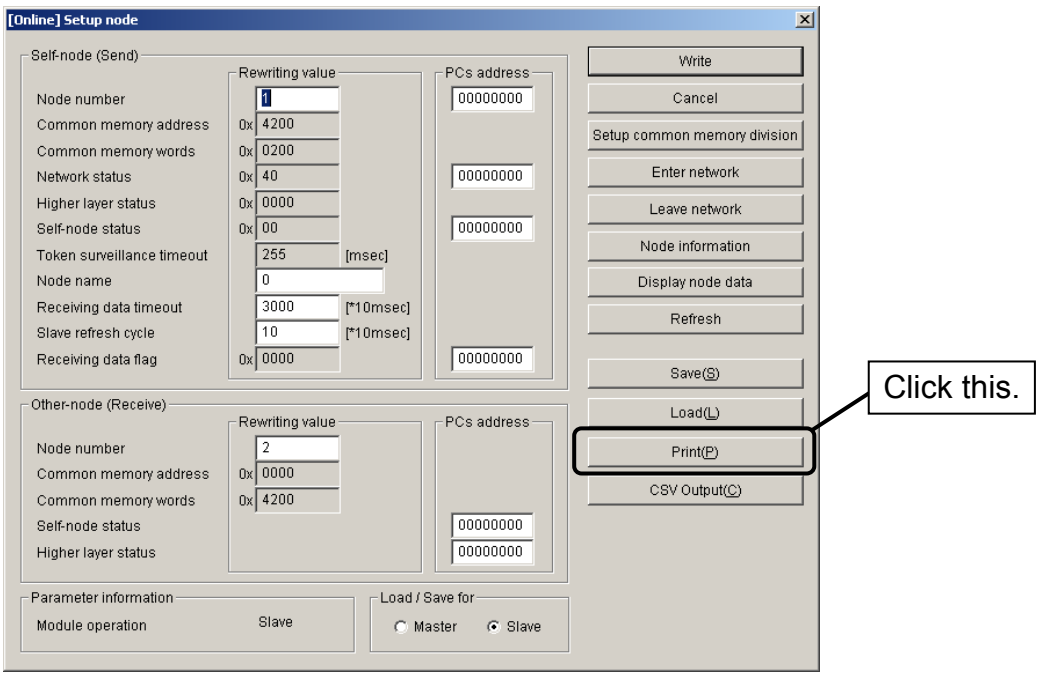
④ The [Save As] window closes and the displayed EQ.LINK parameter settings, including the common memory division settings, will be saved to the specified file.

5.2.16 Printing the EQ.LINK parameter settings displayed on-screen (Print)

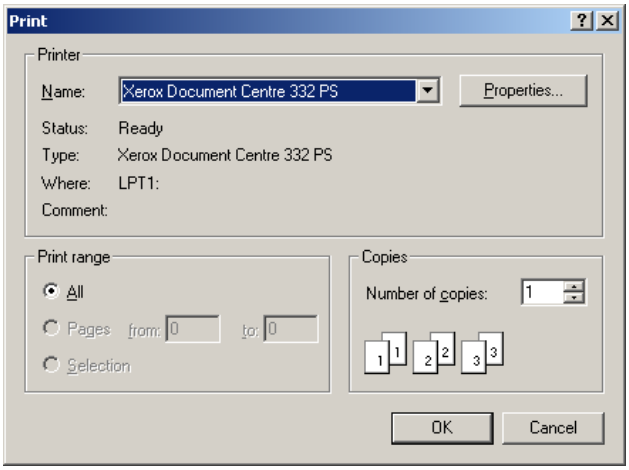
Function: Print out the EQ.LINK parameter settings currently displayed on-screen. (This function is supported by EQ.LINK system Ver-Rev 02-01 or later and is available either in online or offline mode.)

Operation: The procedure is shown below.

① Click the Print button in the [Setup node] window displayed:



② The [Print] dialog box as shown below appears. Specify the desired printer and set properties if necessary. Click the OK button. The displayed EQ.LINK parameter settings will then be printed on the specified printer.

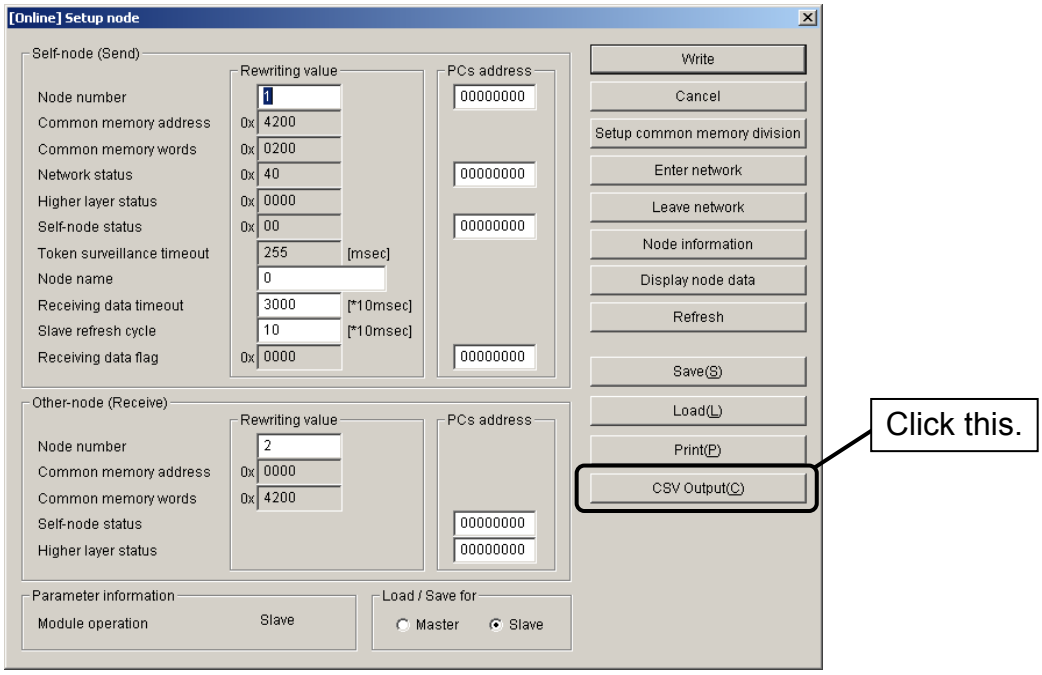


5.2.17 Outputting the EQ.LINK parameter settings displayed on-screen to a file in CSV format (CSV Output)

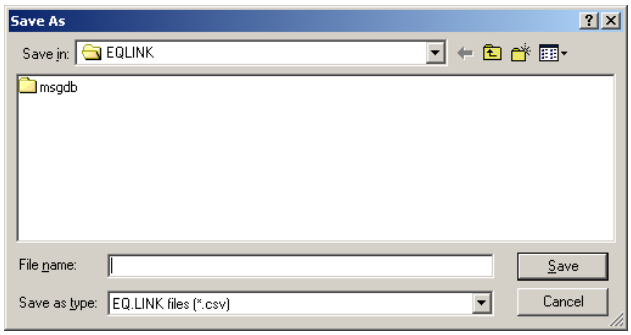
Function: Output the EQ.LINK parameter settings currently displayed on-screen to a file in CSV format. (This function is supported by EQ.LINK system Ver-Rev 02-01 or later and is available either in online or offline mode.)

Operation: The procedure is shown below.

① Click the CSV Output button in the [Setup node] window displayed:



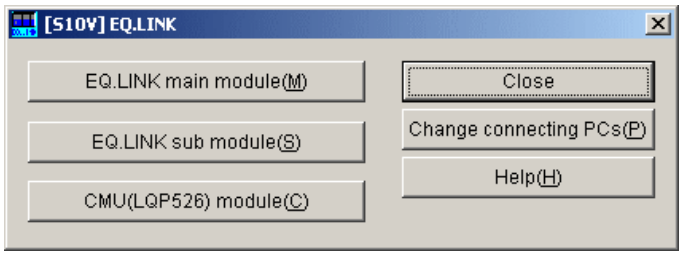
② The [Save As] dialog box as shown below appears. Specify the desired folder and file name in the "Save in" and the "File name" edit box, respectively, and click the Save button.



The [Save As] window closes and the displayed EQ.LINK parameter settings will be saved to the specified file in CSV format.

5.2.18 Shutting down the system

In the [[S10V] EQ.LINK SYSTEM] window, click the [×] or [Close] button.



6 MAINTENANCE

6.1 Maintenance and Inspection

To use the R70 (S10V) in an optimum condition, check the items listed below. Make this check at routine inspection or periodic inspection (twice or more per year).

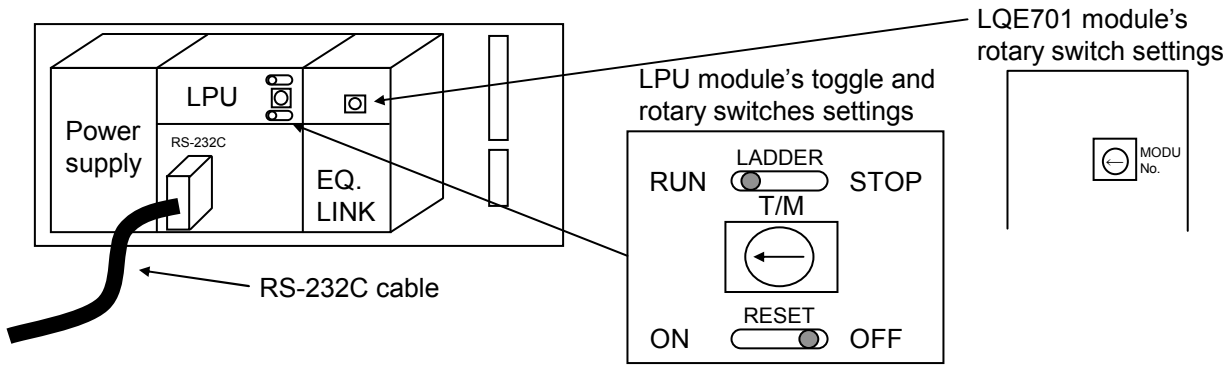
- Module appearance
  Check that no fissure or crack exists in the module case. If the case has such a damage, there is a possibility that the internal circuit may also be damaged, resulting in a system malfunction.
- Indicator's ON status and indication
  From the indicator status, check that no special fault exists.
- Looseness of mounting screws and terminal base screws
  Check that the mounting screws and terminal base screws of the module are not loose. If any of these screws is found to be loose, tighten it. Such a loose screw may result in a system malfunction or a burn-out due to overheating.
- Module replacement
  Hot swapping of modules will lead to hardware or software damage. Be sure to replace a module in a power OFF state.
- Cable sheath condition
  Check that the cable sheath is not abnormal. A peeled sheath may cause a system malfunction or electric shock, or may result in a burn-out due to short circuit.
- Dust sticking condition
  Check if dust and dirt collects on the module. If dust collects on the module, remove it with a vacuum cleaner. Dust on the module may short the internal circuit, resulting in a burn-out.
- Power supply voltage
  Check that neither the internal power supply of the module to it is out of the specified range. If the power supply voltage deviates from the rating, a system malfunction may result.

NOTICE
Static electricity may damage the module. Before starting the work, discharge all electrostatic charge from your body.

6.1.1 Replacing on the module

- What you should get in preparation
  ① Personal computer (with Hitachi's S10V EQ.LINK System installed in it)
  ② RS-232C cable (or 10BASE-T cable if the communication module used is an ET.NET module)
  ③ New EQ.LINK module (LQE701)
  ④ Copies of the parameter values for the module to be replaced. (These copies are prepared for use in cases where the parameters are not accessible for some reason.)
  ⑤ The above-mentioned ET.NET module is an optional module and, if it is mounted in place, may be selected as the type of communication module to be used. For more information, refer to Section 2.1, "Names and Functions of Each Part," and Section 3.3, "Mounting the Module," in the User's Manual, Option ET.NET (LQE520) (manual number SVE-1-103), and the User's Manual, Option ET.NET (LQE720) (manual number SVE-1-128).

- Replacement procedure
  ① Write down, on a piece of paper, the current settings of the rotary switches that are, as shown below, accessible at the front side of the EQ.LINK module to be replaced.
  ② Write down also the current settings of two switches, labeled LADDER (toggle switch) and T/M (rotary switch), respectively, that are, as shown below, accessible at the front side of the LPU module.



  ③ Connect the personal computer and the LPU module together with the RS-232C cable.

④ Start Hitachi's S10V EQ.LINK System and save the set values of all the existing parameters by using its F/D function. When saving the set parameter values, be sure to save those for both the main EQ.LINK module and the EQ.LINK sub-module. (If the existing parameters are not accessible for some reason, use the copies of their set values [item ④] that were obtained in preparation.)

⑤ Set the LPU module's LADDER switch in STOP position and turn off the power supply of the controller unit.

⑥ Remove the connecting cables from the EQ.LINK module to be replaced.

⑦ Replace the existing EQ.LINK module with the new one and set the new EQ.LINK module's rotary switches in the same way as you wrote down in Step ①.

⑧ Turn on the power supply of the controller unit and send to the new EQ.LINK module the set parameter values that you saved in Step ④ using the F/D function. When sending out the saved parameter values, be sure to send out those for both the main EQ.LINK module and the EQ.LINK sub-module.

⑨ By using the F/D function, compare the set parameter values before and after you sent.

⑩ Reset the LPU module by setting the RESET switch in ON position and then in OFF position at its front.

⑪ Turn off the power supply of the controller unit.

⑫ Remove the RS-232C cable from both the personal computer and LPU module, which were connected together in Step ③.

⑬ Connect to the new EQ.LINK module the connecting cables that you removed in Step ⑥.

⑭ Set the LPU module's LADDER and T/M switches in the same way as you wrote down in Step ②.

⑮ Turn on the power supply of the controller unit and check that the new EQ.LINK module is running normally.

6.2 Trouble Detection and Solution

Table 6-1 Check the Following When the Module is Abnormal.

Description
Check that the module is properly installed.
Check that the module switches are properly set.
Check that network IP address setup is properly completed.
Check that the common memory area is properly set.
Check that the module connector connections are tight.
Check that a 10BASE-T straight cable is not used.
Check that the employed 10BASE-T cable complies with the Category 5 specifications.

6.3 Network Problems and Repairing

(1) Network problems and remedies (concerning communication failures)

Table 6-2 Network Problems and Repairing (Concerning Communication Failures)

Problem	Inspection item	Inspection procedure	Remedy
Communication cannot be established.	Power supply	Check whether the device main power lamp is illuminated.	Check for a faulty power supply, disconnected power cable, and improper voltage.

(2) Network problems and remedies (concerning unstable communications)

Table 6-3 Network Problems and Repairing (Concerning Unstable Communications)

Problem	Inspection item	Inspection procedure	Remedy
Communication cannot be established or is unstable.	Transmission path	Check the cable type. Is it OK?	Inter-connect the modules with the 10BASE-T twisted pair cable.
	Setup	Check the node number. Is it OK?	Check the node number by the supported tool and correct it if necessary.
		Check the parameter values. Are they OK?	Check the parameters by the supported tool and correct them if necessary.
		Check the TX (Send) indicator. Is it on or blinking?	Review the parameters.

6.4 Precautions for EQ.LINK Use

For the EQ.LINK transmission path requirements, see the aforementioned section or IEEE 802.3 standard. In addition to such requirements, you must observe the EQ.LINK-specific precautions (see Table 6-4).

Table 6-4 Precautions for EQ.LINK Use

Description
Ensure that no other Ethernet communication data flows along the EQ.LINK communication cable.
Do not connect the EQ.LINK to a router and hub.
The use of infrared, radio, or like medium may substantially decrease the real-time capability of communications.
When you use a personal computer, the real-time capability of communications may substantially change depending on the personal computer capacity and the employed OS and applications.
Make a proper ground wire connection. Ensure that the employed ground cable has a sufficient thickness.
Ensure that the EQ.LINK is positioned at an adequate distance from a noise source. Also, avoid installing the EQ.LINK together with a mains power line or the like.
Cyclic data communication areas (common memory areas) need not contiguously be allocated.

6.5 Error Indications and Countermeasures

6.5.1 Error indications and countermeasures

When detecting any event or error in the EQ.LINK module, click the Error log button on the "BASE SYSTEM" window. The related error code appears on-screen. Find it in the error code table below (see Table 6-5) and follow the repairing instructions there.

Table 6-5 Error Indications and Countermeasures

(1/2)

Error code	Description	Remedy
0x0010	Bus error	Follow the instructions "6.5.2 Collecting error/freeze information" and reset the LPU. If the same error message is output again, the EQ.LINK module may be faulty. Replace the EQ.LINK module.
0x0011	Address error	
0x0012	Invalid instruction	
0x0013	Division by zero	
0x0014	Privileged operation exception	
0x0016	Format error	
0x0017	Spurious interrupt	
0x0018	No-use exception	
0x0019	Parity error	
0x0100	Invalid module switch setting	The setting of the MODU No. switch of the EQ.LINK module is invalid. Set the rotary switch correctly. (See "3.4 Setting the Module Number Selector Switch.")
0x0102	ROM1 sum error	Follow the instructions of "6.5.2 Collecting error/freeze information" and reset the LPU. If the same error message is output again, the EQ.LINK module may be faulty. Replace the EQ.LINK module.
0x0103	ROM1 comparing error	
0x0105	ROM1 comparing error	
0x010B	ROM3 sum error	Invalid parameter values. Check them by "5.2.3 Setting of link parameters" and "5.2.4 Setup common memory division." Then reset or restart the system.
0x0112	Microprogram error	Follow the instructions of "6.5.2 Collecting error/freeze information" and reset the LPU. If the same error message is output again, the EQ.LINK module may be faulty. Replace the EQ.LINK module.
0x0113	Unregistered IP address	Set the parameters. See "5 OPERATIONS."

(2/2)

Error code	Description	Remedy
0x0114	Unregistered MAC address	Follow the instructions of "6.5.2 Collecting error/freeze information" and reset the LPU. If the same error message is output again, the EQ.LINK module may be faulty. Replace the EQ.LINK module.
0x0120	Main module system switching (CPU RUN)	This is a piece of information output when the system starts up or the system switching is made.
0x0121	Sub module system switching (CPU STOP)	
0x0122	Module disconnected from network (CPU Down)	This code is output when the LPU detects a fatal error. See the LPU error log.
0x0200	Not connected to network	The EQ.LINK module has not entered the network (or is now entering the network). See "6.3 Network Problems and Repairing."
0x0201	Double common memory setting	The local and remote nodes have the same common memory areas in the common memory division setting. See "5.2.4 Setup common memory division." Specify different common memory offset values for the local and remote nodes. (This error resets the common memory setting (PCs addresses and PCs words) of the node which has this error into all zeros.)
0x0202	Double node number	The local and remote nodes use the same node number. Specify different node numbers to the local and remote nodes. (See "5.2.3 Setting of link parameters.") (The node which caused this error stops entering the network. Enter the network again by turning on power again or by entering an ENTRY request from the EQ.LINK system.)
0x0203	Module setting error	Invalid setting in the EQ.LINK module. Check the link parameter setting and the common memory division setting of the EQ.LINK module and correct them if necessary. If this error occurs again after correcting the setting, the EQ.LINK module may be faulty. Follow the instructions of "6.5.2 Collecting error/freeze information" and replace the EQ.LINK module.
0x0204	Token maintenance timeout	Three or more consecutive token maintenance timeouts occurred. The EQ.LINK module may be faulty. Follow the instructions of "6.5.2 Collecting error/freeze information" and replace the EQ.LINK module. (The node which caused this error stops entering the network.)

6.5.2 Collecting error/freeze information

Follow the instructions of “Table 6-5 Error Indications and Countermeasures” to collect error/freeze information before resetting the LPU or replacing the EQ.LINK module.

When the main EQ.LINK module has a trouble

① Click the [MCS] button on the “BASE SYSTEM” window, enter “D40400” in the “Top Address” text box and press the [Enter] key.
② Click the [Data Save] button and save the data to a file (named “DataSave1.txt”).
③ Enter “D40480” in the “Top Address” text box and press the [Enter] key.
④ Click the [Data Save] button and save the data to a file (named “DataSave2.txt”).

When the sub EQ.LINK module has a trouble

① Click the [MCS] button on the “BASE SYSTEM” window, enter “DC0400” in the “Top Address” text box and press the [Enter] key.
② Click the [Data Save] button and save the data to a file (named “DataSave3.txt”).
③ Enter “DC0480” in the “Top Address” text box and press the [Enter] key.
④ Click the [Data Save] button and save the data to a file (named “DataSave4.txt”).

Hand these files (DataSave1.txt, DataSave2.txt, DataSave3.txt, and DataSave4.txt) to the person in charge of your local Hitachi distributor or vendor.

Table 6-6 Details of Error Freeze Information Table

Main module	Submodule	2^{31} ——— 2^{16} 2^{15} ——— 2^{0}
/D40400	/DC0400	Error code ———
/D40404	/DC0404	———
/D40410	/DC0410	D0 register
/D40414	/DC0414	D1 register
/D40418	/DC0418	D2 register
/D4041C	/DC041C	D3 register
/D40420	/DC0420	D4 register
/D40424	/DC0424	D5 register
/D40428	/DC0428	D6 register
/D4042C	/DC042C	D7 register
/D40430	/DC0430	A0 register
/D40434	/DC0434	A1 register
/D40438	/DC0438	A2 register
/D4043C	/DC043C	A3 register
/D40440	/DC0440	A4 register
/D40444	/DC0444	A5 register
/D40448	/DC0448	A6 register
/D4044C	/DC044C	A7 register
/D40450	/DC0450	Stack frames (*) (4 words, 6 words, bus error)
/D404FC	/DC04FC	

Code	Error description
0010H	Bus error
0011H	Address error
0012H	Invalid instruction
0013H	Division by 0
0014H	Privilege violation
0016H	Format error
0017H	Spurious interrupt
0018H	Unused exception (CHK, TRAPV, L1010, etc.)
0019H	Parity error
001AH	Power failure notice
0100H	Module number setting switch error
0102H	ROM1 checksum error
0103H	RAM1 compare error
0105H	RAM2 compare error
010BH	ROM3 checksum error
0113H	IP address not registered
0114H	MAC address error

(*) Stack frame detailed descriptions are given on the next page.

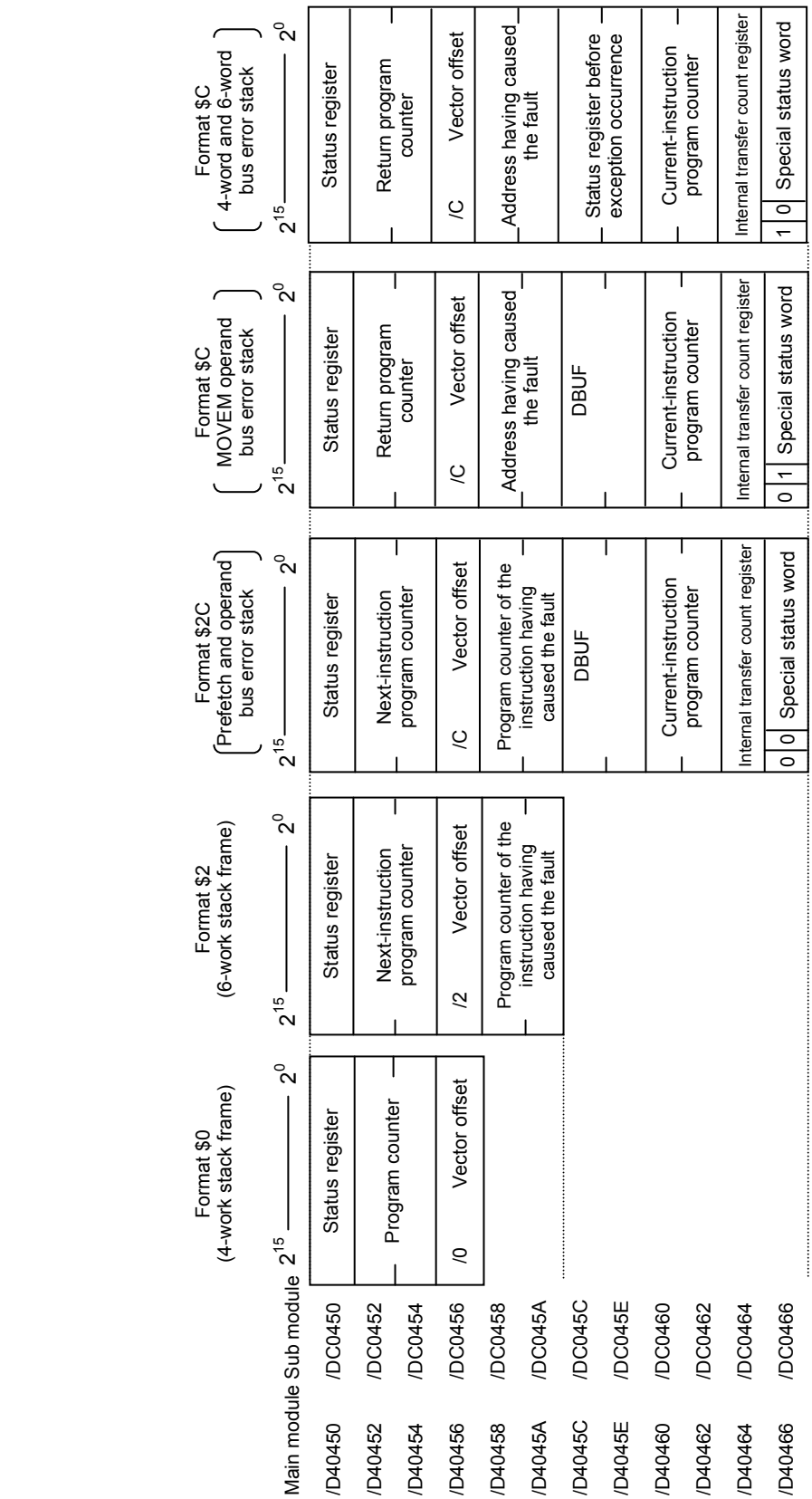


Figure 6-1 Details of Stack Frames in Error Freeze Information Table