Cat. No. W309-E1-11

SYSMAC
CS1W-CLK23
CS1W-CLK21-V1
CJ1W-CLK23
CJ1W-CLK21-V1
C200HW-CLK21
CVM1-CLK21
CQM1H-CLK21
(CS1W-RPT01/02/03 Repeater Units)

Controller Link Units

OPERATION MANUAL

OMRON

CS1W-CLK23
CS1W-CLK21-V1
CJ1W-CLK23
CJ1W-CLK21-V1
C200HW-CLK21
CVM1-CLK21
CQM1H-CLK21
(CS1W-RPT01/02/03 Repeater Units)

Controller Link Units

Operation Manual

Revised May 2008

Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

⚠DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage.

⚠WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.

⚠Caution Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

The abbreviation “PLC” means Programmable Controller. “PC” is used, however, in some Programming Device displays to mean Programmable Controller.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1,2,3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

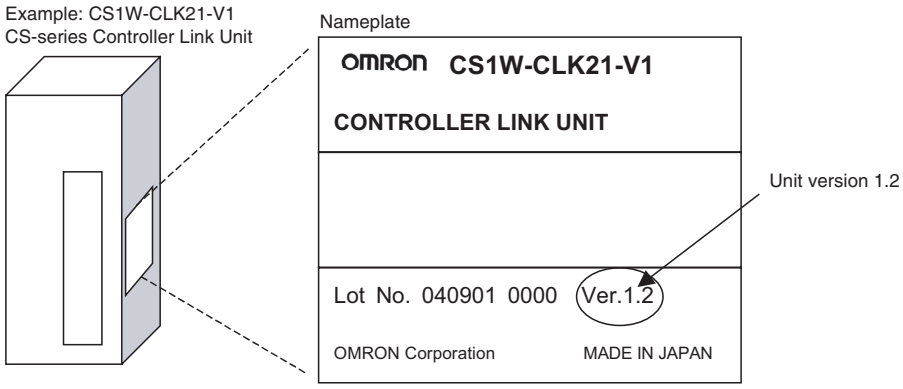
Unit Versions of CS/CJ-series Controller Link Units

Unit Versions

A “unit version” has been introduced to manage CS/CJ-series Controller Link Units according to differences in functionality accompanying upgrades.

Unit Version Notation on Products

The unit version code is provided on the nameplate of the CS/CJ-series Controller Link Units for which unit versions are being managed. This system applies to Controller Link Units with unit version 1.2 or later.

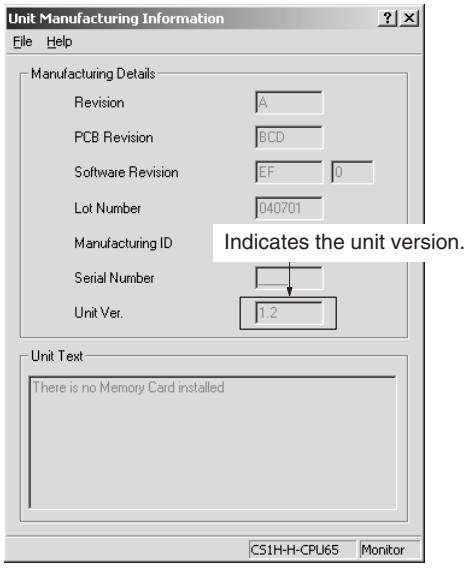


Confirming Unit Versions with Support Software

CX-Programmer version 5.0 or higher can be used to confirm the unit version in the *Unit Manufacturing Information*.

1,2,3... 1. 1. In the I/O Table Window, right-click on the Controller Link Unit, and then select ***Unit Manufacturing Information***.

2. The following Unit Manufacturing Information Dialog Box will be displayed.



Example: In this Unit Manufacturing Information Dialog Box, unit version 1.2 is displayed. Use this dialog box to confirm the unit version of the Controller Link Unit that is connected online.

Using the Unit Version Labels

Unit version labels are provided with the product. These labels can be attached to the front of previous Controller Link Units to differentiate between Controller Link Units of different unit versions.

Unit Version Notation

The unit versions are indicated in this manual as follows:

Notation in product nameplate	Notation in this manual	Remarks
Ver.1.2 or later after the lot number	CS/CJ-series Controller Link Units with unit version 1.2 or later	Information for which no particular version is specified applies to all unit versions.
Blank after the lot number	Pre-Ver. 1.2 CS/CJ-series Controller Link Units	

Function Support by Unit Version

Functions	Unit version 2.0	Unit version 1.2	Earlier version (Pre-Ver. 1.2)
	CS1W-CLK23 CJ1W-CLK23	CS1W-CLK21-V1 CJ1W-CLK21-V1	CS1W-CLK21-V1 CJ1W-CLK21-V1
Maximum number of data link words (data link area for sending/receiving that is created for a single node in a single CPU Unit)	20,000 max. (See note 1.)		12,000 max.
Number of send words per node (total of area 1 and area 2)	4,000 words max. (See note 2.)	1,000 words max.	
Data Link Area	The same area can be allocated for both Area 1 and Area 2.		The same area cannot be allocated for both Area 1 and Area 2.
Maximum number of Units connected to a single CPU Unit	8 Units		4 Units

Note (1) Use the CX-Net in CX-Programmer version 5.0 or later to set a data link area in which the number of send and receive words exceeds 12,000 words, or to set data link tables that allocate the same area for Area 1 and Area 2.

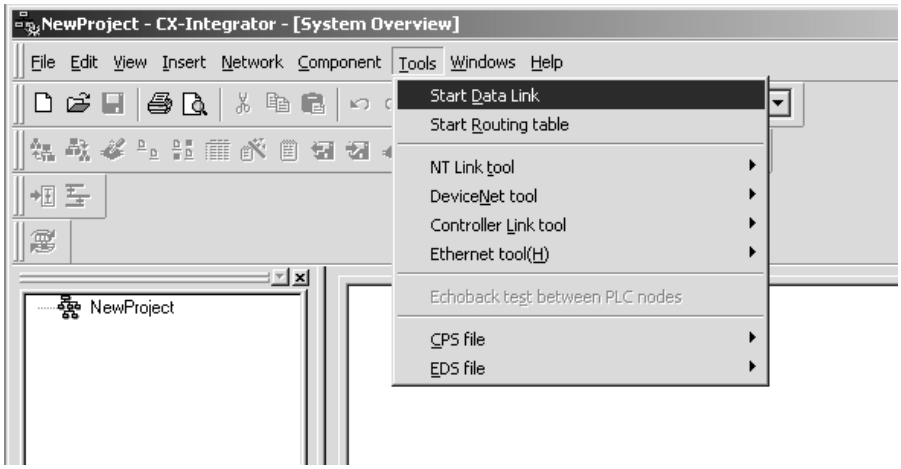
(2) Use the CX-Integrator Data Link Setting Tool version 3.2.1.1 or later to set data link tables with more than 1,000 send words per node. For information on checking the version number, refer to *Checking the CX-Integrator Data Link Setting Tool Version* on page viii.

Unit Versions and Manufacturing Dates/Lot Numbers

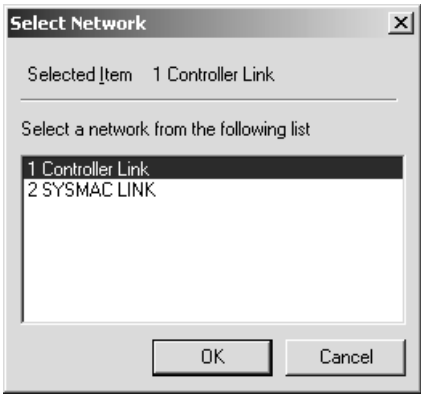
Model	Until August 2004	From September 2004	From September 2007
CS1W-CLK21-V1	Pre-Ver. 1.2	Unit version 1.2 (Lot No. 040901 and later)	
CJ1W-CLK21-V1			
CS1W-CLK23	---	---	Unit version 2.0
CJ1W-CLK23			

Checking the CX-Integrator Data Link Setting Tool Version

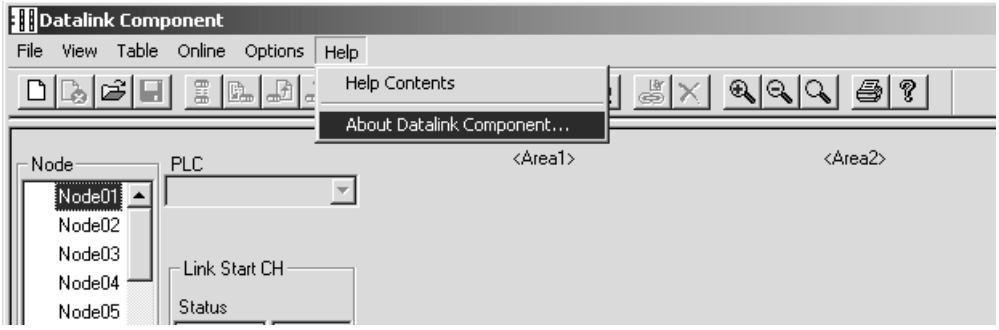
1. Start the CX-Integrator and select ***Tool - Start Data Link***.



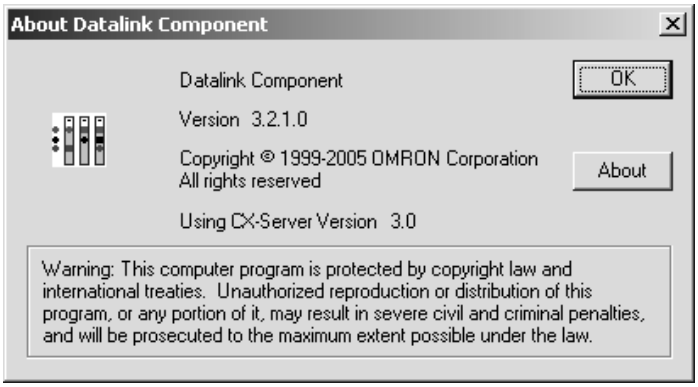
2. In the Select Network Dialog Box, select *1 Controller Link* and click the **OK** Button.



3. The Data Link Table Setting Tool (Data Link Component) will start. Select ***Help - About Datalink Component...***.



4. The Version Dialog Box will be displayed. Check the Data Link Component version number.



If CX-One version 2.0 or later Support Software is being used with an older version of the Data Link Component, use the CX-One automatic update function to upgrade to the latest version.

TABLE OF CONTENTS

PRECAUTIONS xxi

1 Intended Audience xxii
2 General Precautions xxii
3 Safety Precautions xxii
4 Operating Environment Precautions xxiii
5 Applications Precautions xxiv
6 Conformance to EC Directives xxvi

SECTION 1
Features and System Configuration 1

1-1 Overview 2
1-2 Specifications and Configurations 12
1-3 Selection of Communications Functions 27
1-4 Basic Procedures 27
1-5 Application Precautions 29

SECTION 2
Basic Procedures 33

2-1 Data Links Procedures 34
2-2 Message Service Procedure 42

SECTION 3
Installation and Wiring 45

3-1 Component Names and Functions 46
3-2 Unit Installation 60
3-3 Wiring 68
3-4 Constructing Networks with Repeater Units 80

SECTION 4
Preparations for Communications 87

4-1 CS-series Controller Link Units 88
4-2 CJ-series Controller Link Units 91
4-3 C200HX/HG/HE Controller Link Units 95
4-4 CVM1 and CV-series Controller Link Units 99
4-5 CQM1H-series Controller Link Units 102
4-6 Repeater Units 104

SECTION 5
Data Links 107

5-1 What Are Data Links? 108
5-2 Setting Data Links 115
5-3 Starting and Stopping Data Links 155
5-4 Checking Data Link Status 158

TABLE OF CONTENTS

SECTION 6
Message Service. 167

6-1 Introduction 168
6-2 Selecting Communications Instructions 189
6-3 Using the Message Service 192
6-4 FINS Commands and Responses 202
6-5 Commands and Responses for Controller Link Units 204
6-6 Commands and Responses for C200HX/HG/HE and CQM1H-series PLCs 215
6-7 Response Codes 228

SECTION 7
Network Interconnections 237

7-1 What is Network Interconnection? 238
7-2 Remote Programming and Monitoring 240
7-3 Routing Tables 243
7-4 Setting Routing Tables 244

SECTION 8
Communications Timing 251

8-1 Communications Mechanism 252
8-2 Communications Cycle Time 255
8-3 Data Link I/O Response Time 257
8-4 Message Delay Times 264

SECTION 9
Troubleshooting and Maintenance 273

9-1 Troubleshooting Using Indicators 274
9-2 Status Area and Troubleshooting 290
9-3 Error Log 310
9-4 Troubleshooting Error Messages in CX-Net Data Link Table Check 318
9-5 Cleaning and Inspection 320
9-6 Handling Precautions 321

SECTION 10
Adding Nodes and Editing Active Data Link Tables. 329

10-1 Adding Nodes Using a Repeater Unit 330
10-2 Changing the Data Link Tables with Active Data Links 334

Appendices

A Standard Models 341
B Memory Areas 345
C Using the Relay Terminal Block 363

TABLE OF CONTENTS

Index **367**

Revision History **373**

About this Manual:

This manual describes the installation, setup, and operation of the CS1W-CLK23, CS1W-CLK21-V1, CJ1W-CLK23, CJ1W-CLK21-V1, C200HW-CLK21,CVM1-CLK21, and CQM1H-CLK21 Controller Link Units for C200HX/HG/HE, CS/CJ-series, CVM1, CQM1H-series, and CV-series PLCs, and includes the sections described below. The Controller Link Units are used to connect these PLCs to a Controller Link Network. Information is also provided in this manual on CS1W-RPT01/02/03 Repeater Units. The following three manuals are directly related to application of the Controller Link Network.

Name	Contents	Cat. No. (suffixes omitted)
CS1W-CLK23, CS1W-CLK21-V1, CJ1W-CLK23, CJ1W-CLK21-V1, C200HW-CLK21,CVM1-CLK21, CQM1H-CLK21 Controller Link Units (Wired and Optical) Operation Manual (this manual)	Installation, setup, and operating procedures for the Optical and Wired Controller Link Units. Controller Link Units are used to connect C200HX/HG/HE, CV-series, and CS1-series PCs to a Controller Link Network.	W309
3G8F7-CLK13-E, 3G8F7-CLK12-EV1, 3G8F7-CLK53-E, 3G8F7-CLK52-EV1, 3G8F7-CLK23-E, 3G8F7-CLK21-EV1 Controller Link Support Boards for PCI Bus Operation Manual	Operating procedures for Controller Link Support Boards for PCI bus connections. Controller Link Support Boards are used to connect IBM PC/ATs or compatibles to a Controller Link Network.	W383
3G8F7-CLK13-E, 3G8F7-CLK12-EV1, 3G8F7-CLK53-E, 3G8F7-CLK52-EV1, 3G8F7-CLK23-E, 3G8F7-CLK21-EV1 Controller Link Support Boards for PCI Bus Installation Guide	Installation and setup procedures for Controller Link Support Boards for PCI bus connections. Controller Link Support Boards are used to connect IBM PC/ATs or compatibles to a Controller Link Network.	W467
3G8F5-CLK11-E, 3G8F5-CLK21-E Controller Link Support Boards for ISA Bus Operation Manual	Installation, setup, and operating procedures for Controller Link Support Boards for ISA bus connections. Controller Link Support Boards are used to connect IBM PC/ATs or compatibles to a Controller Link Network.	W307
CS1W-CLK13, CS1W-CLK12-V1, CVM1-CLK12, CS1W-CLK53, CS1W-CLK52-V1, CVM1-CLK52 Optical Ring Controller Link Units Operation Manual	Installation, setup, and operating procedures for the Optical Ring Controller Link Units. Controller Link Units are used to connect C200HX/HG/HE CV-series, and CS1-series PCs to a Controller Link Network.	W370
C200HW-ZW3AT2-E-V2 Controller Link Support Software Operation Manual	Installation and operating procedures for the Controller Link Support Software. The Controller Link Support Software enables manually set data links and other procedures for a Controller Link Network.	W369

Depending on the system, you may also need the CX-Programmer, or a Programming Console. Refer to the body of this manual for details. Please read this manual and related manuals carefully and be sure you understand the information provided before attempting to install and operate a Controller Link Unit.

Precautions provides general precautions for using the Controller Link Unit and related devices.

Section 1 provides basic information on Controller Link Networks, and will give the reader an overview of what Controller Link Networks can do and how best to use them.

Section 2 describes the basic procedures to use the Controller Link Unit. The settings necessary for using each of the functions are also explained briefly. For more details, refer to the following sections on individual functions.

Section 3 describes how to install a Controller Link Unit and how to wire the Controller Link Network. Details are also provided on installation, wiring, and basic operating procedures of Repeater Units, including information on using them to construct networks.

Section 4 describes the settings required for starting communications. These basic settings are required for both data links function and the message service. Carry out the settings described here before turning on power to the Controller Link Unit.

Section 5 describes how to use data links in a Controller Link Network. Refer to *SECTION 2 Basic Procedures* for an outline of data link application.

Section 6 explains how to use the message service provided by a Controller Link Unit. It also explains the FINS commands and responses supported by Controller Link Units and those supported by C200HX/HG/HE, CS/CJ-series, CVM1 and CV-series PLCs.

Section 7 describes the method used to connect multiple networks through CS/CJ-series, CVM1, and CV-series PLCs. The section also describes remote programming and monitoring with Programming Devices.

Section 8 explains details on Controller Link Network communications. Refer to this section for network communications that require accurate communications timing.

Section 9 provides information on troubleshooting errors that occur during Controller Link Unit operation, as well as daily inspection, cleaning, and other maintenance procedures.

Section 10 provides information on functions that can be performed without turning OFF the PLC power to the existing network, such as adding nodes to the Controller Link Network using a Repeater Unit and changing data link tables while the data links are active.

Appendix A provides a list of standard OMRON products related to Controller Link Networks.

Appendix B provides easy reference to the words in PLC memory areas used by Controller Link Networks.

Appendix C provides information on how to use the CJ1W-TB101 Wired Controller Link Unit Relay Terminal Block, including details on connection and replacement.

⚠ **WARNING**	Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.

Read and Understand this Manual

Please read and understand this manual before using the product. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall the responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the products.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this manual.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCTS ARE PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

PERFORMANCE DATA

Performance data given in this manual is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

ERRORS AND OMISSIONS

The information in this manual has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

PRECAUTIONS

This section provides general precautions for using the Controller Link Unit and related devices.

The information contained in this section is important for the safe and reliable application of the Controller Link Unit. You must read this section and understand the information contained before attempting to set up or operate a Controller Link Unit.

1 Intended Audience xxii
2 General Precautions xxii
3 Safety Precautions xxii
4 Operating Environment Precautions xxiii
5 Applications Precautions xxiv
6 Conformance to EC Directives xxvi

1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.

2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.

Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.

Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating OMRON PLCs and related devices. Be sure to read this manual before attempting to use the software and keep this manual close at hand for reference during operation.

⚠WARNING It is extremely important that a PLC and all PLC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PLC System to the above mentioned applications.

3 Safety Precautions

⚠WARNING Do not attempt to take any Unit apart while the power is being supplied. Doing so may result in electric shock.

⚠WARNING Do not touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock.

⚠WARNING Provide safety measures in external circuits (i.e., not in the Programmable Controller), including the following items, to ensure safety in the system if an abnormality occurs due to malfunction of the PLC or another external factor affecting the PLC operation. Not doing so may result in serious accidents.

- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.
- Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.

- The PLC will turn OFF all outputs when its self-diagnosis function detects any error or when a severe failure alarm (FALS) instruction is executed. As a countermeasure for such errors, external safety measures must be provided to ensure safety in the system.
- The PLC outputs may remain ON or OFF due to deposition or burning of the output relays or destruction of the output transistors. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.
- When the 24-VDC output (service power supply to the PLC) is overloaded or short-circuited, the voltage may drop and result in the outputs being turned OFF. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.

⚠ **Caution** Execute online edit only after confirming that no adverse effects will be caused by extending the cycle time. Otherwise, the input signals may not be readable.

⚠ **Caution** Confirm safety at the destination node before transferring a program to another node or changing contents of the I/O memory area. Doing either of these without confirming safety may result in injury.

4 Operating Environment Precautions

⚠ **Caution** Do not operate the control system in the following locations:

- Locations subject to direct sunlight.
- Locations subject to temperatures or humidity outside the range specified in the specifications.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

⚠ **Caution** Take appropriate and sufficient countermeasures when installing systems in the following locations:

- Locations subject to static electricity or other forms of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radioactivity.
- Locations close to power supplies.

⚠ **Caution** The operating environment of the PLC System can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the PLC System. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

5 Applications Precautions

Observe the following precautions when using the Controller Link Unit.

⚠ WARNING Failure to abide by the following precautions could lead to serious or possibly fatal injury. Always heed these precautions.

- Always ground the system to 100 Ω or less when installing the system to protect against electrical shock.
- Always turn OFF the power supply or the backup power supply to the PLC or the computer before attempting any of the following. Performing any of the following with the power supply turned ON may lead to electrical shock:
  - Installing or removing the Controller Link Unit.
  - Assembling the Units.
  - Setting DIP or rotary switches.
  - Connecting or disconnecting any cables or wiring.
  - Connecting or disconnecting any terminal block.

⚠ Caution Failure to abide by the following precautions could lead to faulty operation or the PLC or the system or could damage the PLC or PLC Units. Always heed these precautions.

- Always use the power supply voltages specified in the operation manuals. An incorrect voltage may result in malfunction or burning.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.
- Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.
- Separate the line ground terminal (LG) from the functional ground terminal (GR) on the Power Supply Unit before performing withstand voltage tests or insulation resistance tests. Not doing so may result in burning.
- Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or electric shock.
- Install the Units properly as specified in the operation manuals. Improper installation of the Units may result in malfunction.
- Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Leave the label attached to the Unit when wiring. Removing the label may result in malfunction if foreign matter enters the Unit.
- Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.
- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.

- Double-check all wiring and switch settings before turning ON the power supply. Incorrect wiring may result in burning.
- Wire all connections correctly.
- Mount Units only after checking terminal blocks completely.
- Be sure that the Bus Connection Units and other items with locking devices are properly locked into place. Improper locking may result in malfunction.
- Use special packing box when transporting the Controller Link Unit. Handle the product carefully so that no excessive vibration or impact is applied to the product during transportation.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in an unexpected operation.
- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
    - Changing the operating mode of the PLC. (including the setting of the startup operating mode)
    - Force-setting/force-resetting any bit in memory.
    - Changing the present value of any word or any set value in memory.
- Inappropriate settings in data link tables or routing tables can cause unexpected system operation. Always check table settings before starting operation, and always test the settings in trial operation before starting or stopping the data links in actual operation.
- CPU Bus Units will be automatically restarted when routing tables are transferred from a Programming Device to the CPU Unit. Resetting is required to use the new tables. Confirm that restarting the CPU Bus Units will not adversely affect system operation before transferring routing tables.
- Observe the following precautions when wiring the communications cables.
    - Separate the cables from the power lines or high-tension lines.
    - Do not bend the cables.
    - Do not pull on the cables.
    - Do not place heavy objects on top of the cables.
    - Route cables inside conduits.
- Before touching the Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up.

6 Conformance to EC Directives

The Controller Link Units conform to EMC and Low Voltage Directives as follows:

EMC Directives

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards (see the following note). Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer.

EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

Note Applicable EMS (Electro-Magnetic Susceptibility) and EMI (Electro-Magnetic Interference) standards in the EMC (Electro-Magnetic Compatibility) standards are as follows:

	EMS	EMI
CQM1H-CLK21 C200HW-CLK21	EN61131-2	EN61000-6-4
CVM1-CLK21 CS1W-CLK23 CS1W-CLK21(-V1)		
CJ1W-CLK23 CJ1W-CLK21(-V1)	EN61000-6-2	

Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 VAC and 75 to 1,500 VDC meet the required safety standards for the PLC (EN61131-2).

The Controller Link Units that comply with EC Directives (CVM1-CLK21, C200HW-CLK21, CS1W-CLK21(-V1), CS1W-CLK23, CJ1W-CLK21(-V1), CJ1W-CLK23, and CQM1H-CLK21) must be installed as follows:

1,2,3...

1. The Controller Link Units are designed for installation inside control panels. All Controller Link Units must be installed within control panels.
2. Use reinforced insulation or double insulation for the DC power supplies used for the communications power supply and I/O power supplies.
3. The Controller Link Units that comply with EC Directives also conform to the Common Emission Standard (EN61000-6-4). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions. You must therefore confirm that the overall machine or equipment complies with EC Directives.

SECTION 1
Features and System Configuration

This section provides basic information on Controller Link Networks, and will give the reader an overview of what Controller Link Networks can do and how best to use them.

1-1 Overview 2
1-1-1 What Is the Controller Link? 2
1-1-2 Features 8
1-2 Specifications and Configurations 12
1-2-1 System Configuration 12
1-2-2 General Specifications 14
1-2-3 Communications Specifications 15
1-2-4 Controller Link Unit Models and PLCs 18
1-2-5 Devices for Connection 21
1-2-6 Programming Devices 23
1-3 Selection of Communications Functions 27
1-4 Basic Procedures 27
1-5 Application Precautions 29

1-1 Overview

1-1-1 What Is the Controller Link?

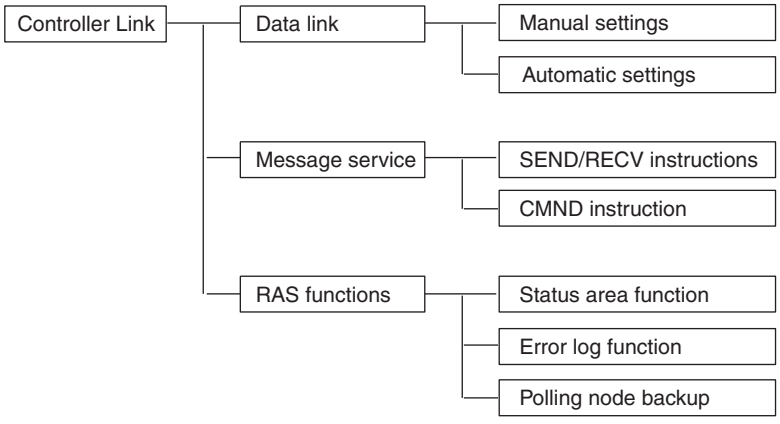
The Controller Link is an FA network that can send and receive large data packets flexibly and easily among the OMRON C200HX/HG/HE Programmable Controllers (PLCs), CS-series PLCs, CJ-series PLCs, CVM1 PLCs, CV-series PLCs, CQM1H-series PLCs, and IBM PC/AT or compatible computers.

The Controller Link supports data links that enable data sharing and a message service that enables sending and receiving data when required. Data link areas can be freely set to create a flexible data link system and effectively use data areas.

High-volume data transmissions are possible at high speed and so a wide range of networks, from low-level systems to high, can be easily created.

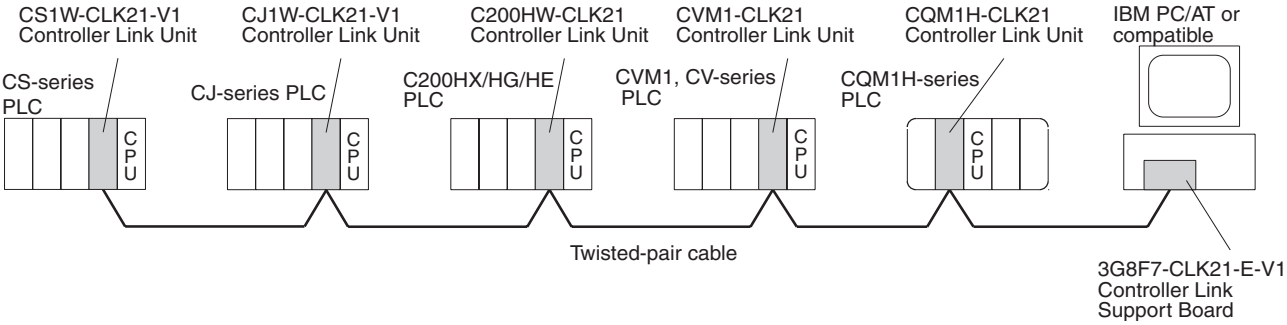
There are two types of networks: networks connected with shielded twisted-pair cable and networks connected with optical fiber cable. Using a Repeater Unit in networks connected with twisted-pair cable makes it possible to use a variety of different wiring configurations, such as T-branch wiring, long-distance wiring, and partial conversion to optical fiber. (Refer to the *CS1W-CLK12, CVM1-CLK12 Optical Ring Controller Link Units Operation Manual* (W370) for detail on optical fiber connections.)

The functions of a Controller Link Network are illustrated below.



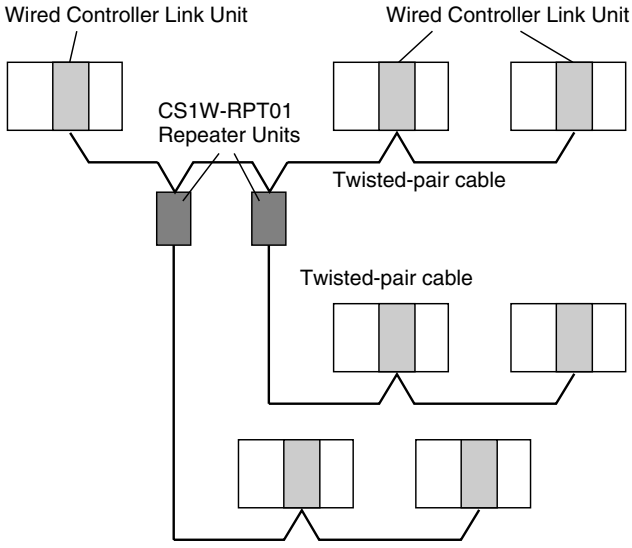
Wired System (Twisted-pair Cable)

CS-series, CJ-series, C200HX/HG/HE, CVM1, CV-series, and CQM1H-series PLCs

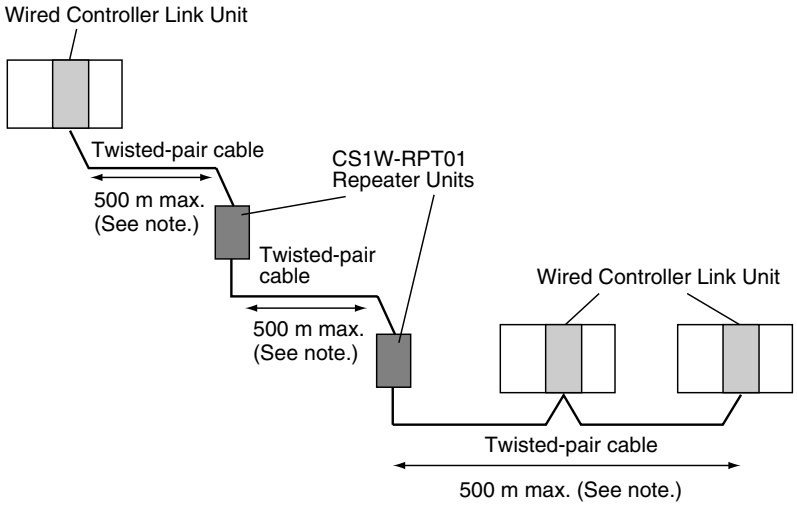


Connecting Repeater Units Using Twisted-pair Cable (Wired Units)

T-Branch Wiring

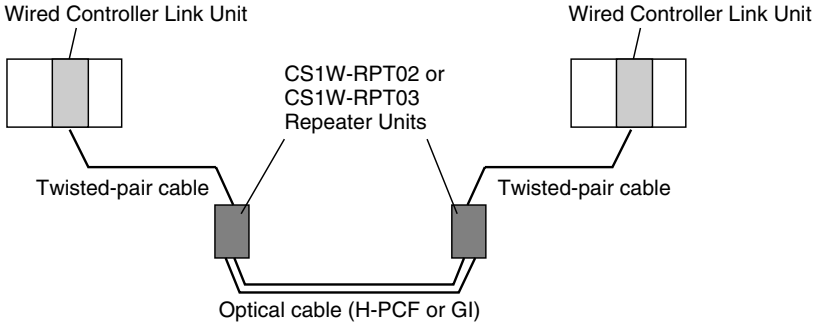


Long-distance Wiring



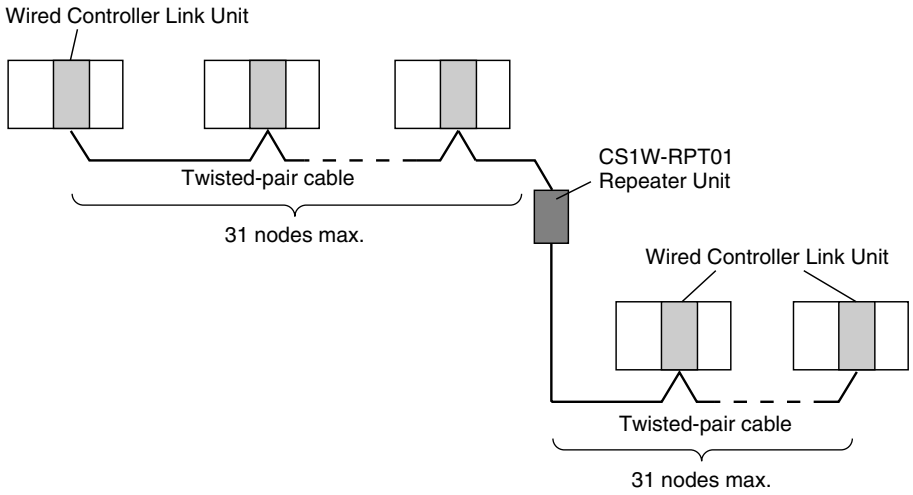
Note: At 2 Mbit/s

Converting Part of the Transmission Line to Optical Fiber



Two Repeater Units of the same model must be used when part of the transmission line uses optical fiber.

Maximum 62-node Configuration



The following Controller Link Units/Support Boards must be used to construct a network with more than 32 nodes:

CS1W-CLK23
CS1W-CLK21-V1
CJ1W-CLK23
CJ1W-CLK21-V1
3G8F7-CLK23
3G8F7-CLK21-V1

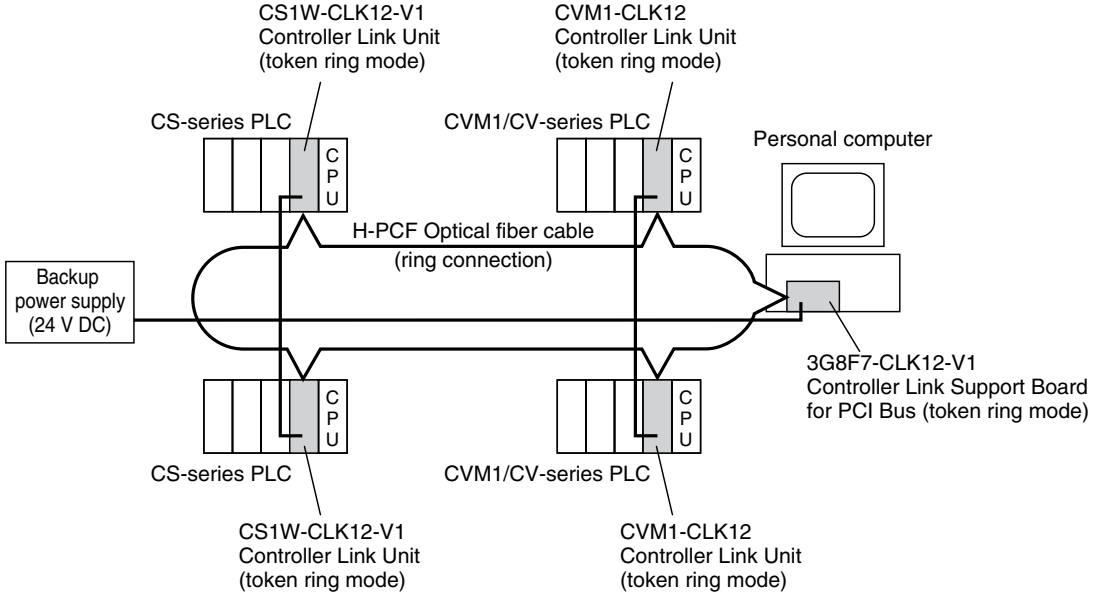
Note

1. The network will not operate correctly unless all nodes within the network use the above Units/Boards.
2. Only node addresses 1 through 32 can be used on networks for which 62 nodes have not been enabled.

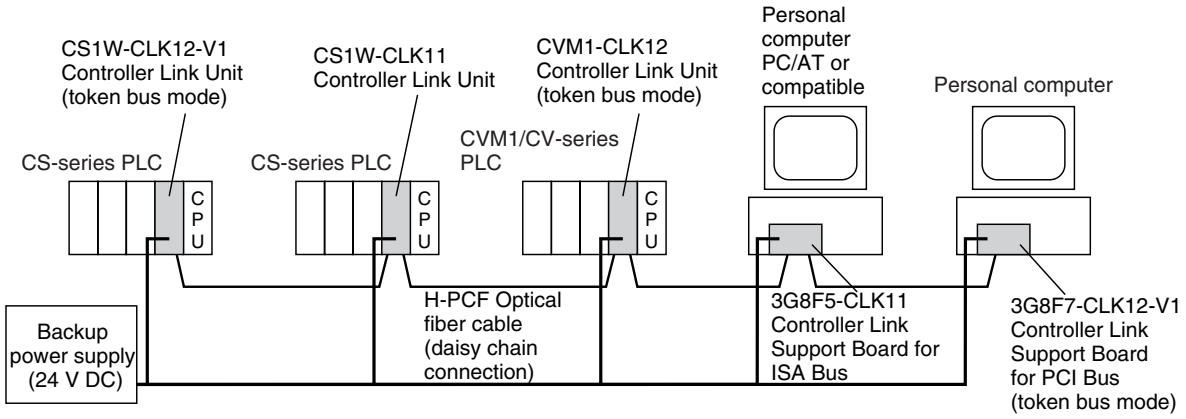
Connecting Repeater Units Using H-PCF Optical Fiber Cable

CS-series and CVM1/CV-series PLCs only.

Token Ring Mode



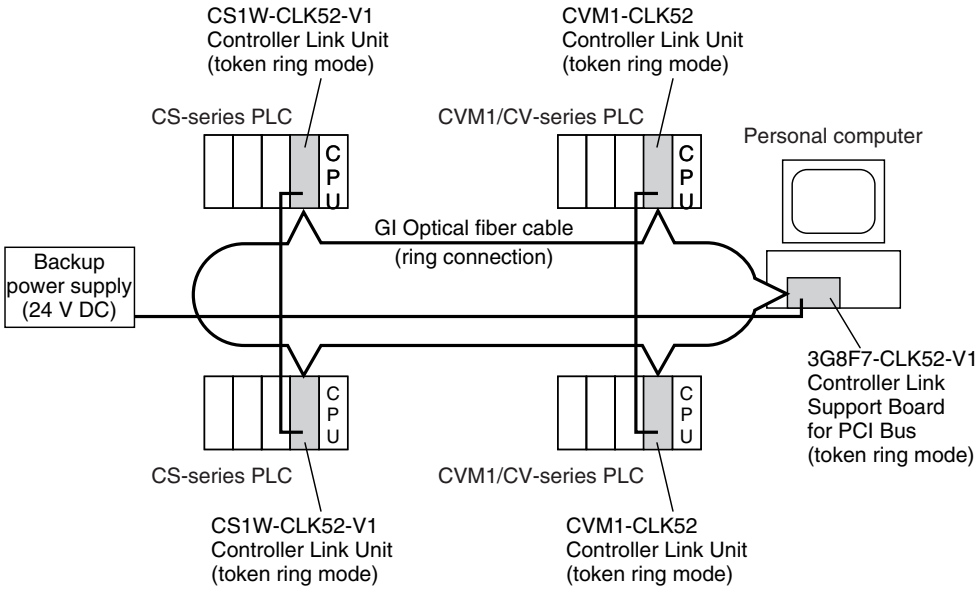
Token Bus Mode



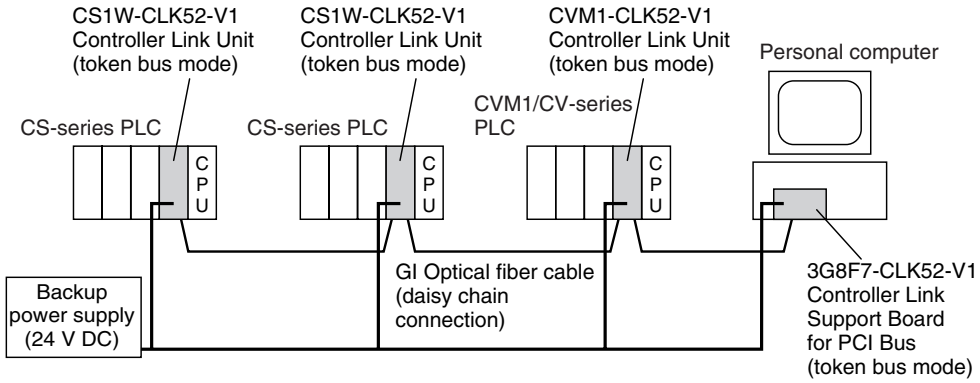
Connecting Repeater Units Using GI Optical Fiber Cable

CS-series and CVM1/CV-series PLCs only.

Token Ring Mode



Token Bus Mode

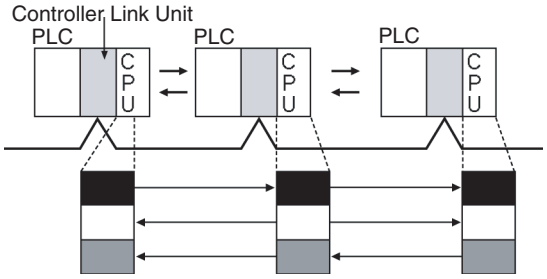


Data Links

Data links allow the constant sharing of data in predetermined data areas between nodes, between PLCs, or between a PLC and an IBM PC/AT or compatible computer on the network. Data links do not require the use of communications programs on the PLC (CPU Unit) or IBM PC/AT or compatible computer. Data written in the send area of the local node will be automatically sent to the receive area of other nodes.

The I/O area (CIO area), link area (LR area), DM Area area (DM area), and extended DM Area area (EM area) can be freely set in the send or receive area. (The area used for sending or receiving data using the data link function is called "data link area.")

The data link area can be set automatically or manually.



Constant data exchange (sharing)

Automatic Setting

Used for simple data link processing. Data link can be performed by simply setting parameters in the DM area of the PLC.

Send data size per node is the same for all nodes. All nodes participating in the data link share the same data.

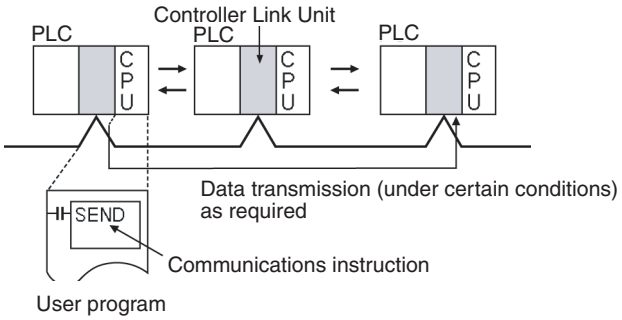
Manual Setting

Used for flexible data link processing depending on each system.

Using the Controller Link Support Software, individual data link tables can be set for each node and the data link area can be freely allocated for each node. Send data size per node can be freely set. It is also possible to set nodes for only send or receive data. With the Controller Link Unit, the data link can be set to receive only a part of the data link area of other nodes.

Message Service

This function controls data transmission with particular nodes, reading or writing of status data, changing of operation modes, etc., by executing communications instructions on a program. The communications instructions include SEND/RECV instructions for data transmission and CMND instructions for issuing various commands.



SEND/RECV

The SEND or RECV instruction sends or receives data in an area of a particular node.

The SEND instruction sends data from an area of the local node and writes to an area in the designated node.

The RECV instruction requests the designated node to send area data and writes the data to the local node.

CMND

The CMND instruction issues a command to read or write data of other nodes, control, or read error logs. With the Controller LInk Unit, OMRON's command protocol called "FINS commands" is used.

Note Since the C200HX/HG/HE PLCs do not support the CMND instructions, arbitrary commands cannot be issued.

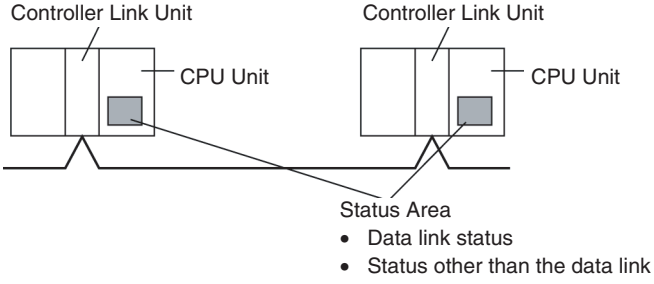
RAS

RAS performs real-time monitoring of the network status. If an error occurs in the network, RAS records and displays the time and contents of the error.

Status Area

Data Link Status Area
When the data link function is used, the data link status is reflected in the data link status area of the PLC.

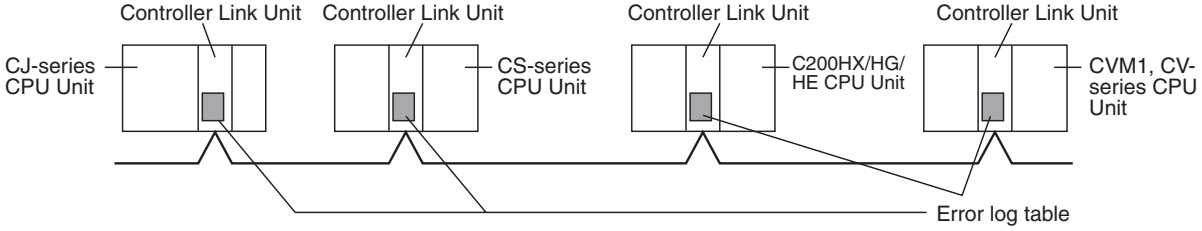
Network Status Area Other than the Data Link:
The network status such as the state of node participation is reflected in the status area of the PLC.



Error Log

The error log function records contents (codes) and times of errors that occur in the network into the RAM or EEPROM, up to the maximum of 64 (see note) errors.

The recorded errors can be read using the Controller Link Support Software or the message service function.



Note The number of error log records depends on the model. For details, refer to *9-3 Error Log*.

1-1-2 Features

The Controller Link Network has the following features to meet the various requirements of FA sites.

Data Links

Flexible and efficient data links can be created for large capacities of data as listed below.

Item	Specifications
Number of send words per node	CS1W-CLK23, CJ1W-CLK23, and 3G8F7-CLK23-E: 4,000 words max. Other Units: 1,000 words max.
Number of send and receive words per node	C200HX/HE/HG, CVM1, CV-series, and CQM1H-series PLCs: 8,000 max. CS/CJ-series PLCs: Pre-Ver. 1.2: 12,000 words max. Unit Ver. 1.2 or later: 20,000 words max. IBM PC/AT or compatible: 32,000 max. (PCI)

Data links can be automatically set, or they can be set by the user to freely change the sizes of the data areas used. A data link can also be created so that one node receives only part of the data sent from another node. This function enables users to receive only the required data, thereby increasing data link efficiency.

Data link tables for which the number of send and receive words exceeds 12,000 words, or for which the number of send words per node exceeds 1,000, can be set using CX-Net in CX-Programmer Ver. 5.0 or higher.

Message Service

The message service can send and receive up to 2,012 bytes of data (including the FINS header), allowing high volumes of data to be sent and received without having to split it up.

Twisted-pair Cable or Optical Fiber Cable Connection

The Controller Link Units can be connected to the network using either shielded twisted-pair cables or optical fiber cables. Select the system that suits your application.

Features of Twisted-pair Cable

Twisted-pair cable is easy to connect and maintain. The cable can be processed much more easily than coaxial or optical cable, thereby reducing the cost of tools and assembly time.

Connections are made to a terminal block on the Controller Link Unit and to a special connector on the Controller Link Support Board for easy system assembly and modification.

The network is equipped with the required terminating resistance built into the Units allowing the terminating resistance to be easily set at both ends of the network using a simple switch.

Features of Optical Fiber Cable

Optical Fiber Cable has superior noise resistance, so this system can provide highly reliable communications even in very noisy conditions.

The communications distance can be up to 20 km total (1 km max. between nodes) if H-PCF cable is used and up to 30 km total (2 km max. between nodes) if GI cable is used, which allows long-distance or large-scale networks.

Once the Optical Fiber Cable has been fitted with special connectors, the cables can be easily connected or disconnected.

Compatible with Different Node Configurations

The following Controller Link Units are available for communications between different models. It must be noted, however, that the wired system and optical system cannot exist in one Controller Link Network.

Wired System

- Controller Link Unit for CS/CJ-series Programmable Controllers
- Controller Link Unit for C200HX/HG/HE Programmable Controllers
- Controller Link Unit for CVM1 and CV-series Programmable Controllers
- Controller Link Unit for CQM1H-series Programmable Controllers
- Controller Link Support Board for IBM PC/ATs or compatibles (PCI bus)

Flexible Inter-network Connections

The Controller Link Network can connect to other networks (Ethernet, SYSMAC NET, SYSMAC LINK, and another Controller Link network) via CVM1, CV-series, CS-series, or CJ-series PLCs. By installing a Communications Unit for the Ethernet, SYSMAC NET or SYSMAC LINK on the same CS/CJ-series or CV-series PLC as a Controller Link Unit, a message service can be created with nodes in interconnected networks through the CVM1 or CV-series PLC. Up to eight network levels are possible.

Note CS/CJ-series PLC cannot be connected directly to SYSMAC NET networks and CJ-series PLC cannot be connected directly to SYSMAC LINK networks

The programming and monitoring of other PLCs on the network can be conducted from Programming Devices connected to the PLC's CPU Unit. Internetwork connections are possible in this case also and can cover up to eight network levels.

Use a CS/CJ-series CPU Unit with unit version 2.0 or later and CX-Programmer Ver. 4.0 or higher to enable internetwork connections for up to eight networks.

Improved Error Handling

An error log enables quick handling of errors by recording the time the error occurred and error details. The current Controller Link Unit and Support Board status are also available, as are the data link and network status.

When an error occurs in the polling node that controls the Controller Link Network, another node automatically becomes the polling node. This prevents an error at a single node from influencing other nodes on the network, achieving a highly reliable system.

Using Repeater Units for T-Branches, Network Extensions, Network Expansions, Converting Network Sections to Optical Fiber, and Device Modularization

T-Branches enable greater wiring freedom during layout, restructuring, and expansion of networks.

Wire-to-Wire Repeater Units enable Controller Link T-Branches. T-Branches provide the following advantages:

- Cabling can conform to the layout of equipment.
- It is possible to add nodes by adding or inserting Repeater Units at branch points of an existing wired Controller Link system.

- If Repeater Units are installed at likely future branch points in the network in advance, new nodes can be added by simply connecting them to these Repeater Units.

The total length of wired networks can be extended.

At a baud rate of 2 Mbps, conventional wired networks can be up to 500 m long. By using two Repeater Units, this can be extended to a maximum of 1.5 km.

The maximum number of nodes can be extended to 62 for wired networks.

By combining version-1 Controller Link Units/Support Boards and a Repeater Unit, it is possible to construct networks containing up to 62 nodes.

Improved noise resistance through the use of optical cabling.

By installing two Wire-to-Optical Repeater Units, optical cabling can be used for sections of the network that are the source of noise.

Devices can be modularized.

- Devices can be modularized according to Repeater Units, making wiring easier when adding, removing, or modifying devices.
- When starting up devices, components can be added to the network and debugged as they are completed.

Features and Functions of Version-1 Models

The following features and functions apply to the CS1W-CLK21-V1 and CJ1W-CLK21-V1 Controller Link Units and the 3G8F7-CLK21-V1 Controller Link Support Board only.

Up to 62 nodes can be connected.

Overview

When a CS1W-RPT01 Repeater Unit is used, the maximum number of nodes that can be used in the network increases to 62. (The previous limit was 32.)

Method

Use Repeater Units and turn ON bit 11 (Wired Network 62 Node Enable Bit) in the DM Parameter Area software switch D30000 + 100 × Unit No. of all nodes to enable a maximum of 62 nodes.

Restrictions

The maximum 62 nodes cannot be achieved if version-1 models and pre-version-1 models are used together in the same network.

Automatic data link creation is possible with 1:N allocations.

Overview

It is possible to perform unequal 1:N allocations of data between nodes with automatic data link creation. This makes it easy to perform data links that formerly required the user to manually edit data link parameters.

The following four automatic data link creation patterns can be used:

- Equality layout (the previous pattern)
- 1:N allocation, common type
- 1:N allocation, 1 to 1 type
- 1:N allocation, chain type

Method

Allocation addresses and sizes are all specified using the Automatic Data Link Creation Parameters (D30000 × Unit No. + 12 to 20) in the DM Parameter Area. These values can be set using the CX-Net in the CX-Programmer version 3.2 or higher.

Objective

This function is effective in applications that collect data from slave PLCs into a master PLC.

Restrictions

Automatic data link creation with 1:N allocations cannot be performed if version-1 models and pre-version-1 models are used together in the same network.

Change manually created data link tables during data link operation.

Overview

It is possible to modify a manually created data link table while data links are running.

Note This is possible only with manually created data link tables. Any attempt to change automatically created data link tables when data links are running will fail with an error message saying that the tables cannot be edited during data link operation will be displayed.

Method

This function can be set using the CX-Integrator.

Objectives

- In systems that operate non-stop and cannot be turned OFF, this function makes it possible to change the data link table to accommodate the addition of new nodes and to transfer data link tables without having to stop manually set data link communications.
- If this function is combined with the use of Repeater Units to add network nodes, it becomes possible to construct systems of greater flexibility.

Operation

When a node is being modified online, this function temporarily stops refreshing of data link data until modifications have been completed.

Nodes will participate in data links after changes to the data link table have been completed.

Overview of CS1W-CLK23 and CJ1W- CLK23 Features and Functions

The CS1W-CLK23 and CJ1W-CLK23 are upwardly compatible with the CS1W-CLK21-V1 and CJ1W-CLK21-V1, respectively.

The following link functions have been added to the features and functions of the CS1W-CLK21-V1 and CJ1W-CLK21-V1.

All other functions and performance are the same as for the CS1W-CLK21-V1 and CJ1W-CLK21-V1.

Model	CS1W-CLK21-V1 CJ1W-CLK21-V1	CS1W-CLK23 CJ1W-CLK23
Number of send words per node (total of area 1 and area 2)	1,000 words max.	4,000 words max.
Number of error log records	39 max.	64 max.

When configuring a system using data links in which the number of send words per node exceeds 1,000 words, all Controller Link Units and Support Boards must be the CS1W-CLK23, CJ1W-CLK23 or 3G8F7-CLK23-E.

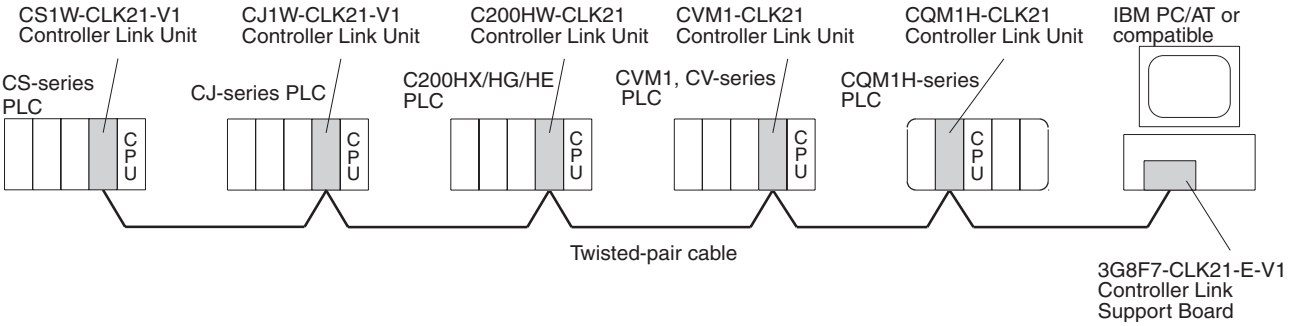
When using other Controller Link Units together in the same network, use a maximum of 1,000 send words per node.

1-2 Specifications and Configurations

1-2-1 System Configuration

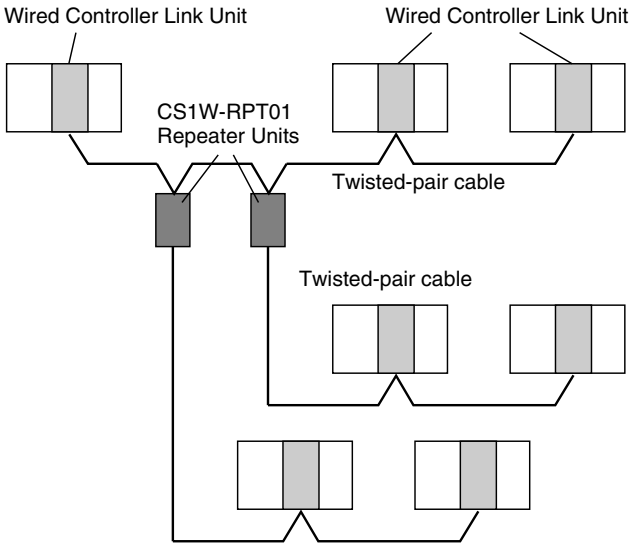
Wired Systems

Wired systems can be used to connect CS/CJ-series PLCs, C200HX/HG/HE PLCs, CVM1 PLCs, CV-series PLCs, and IBM PC/AT or compatible computers.

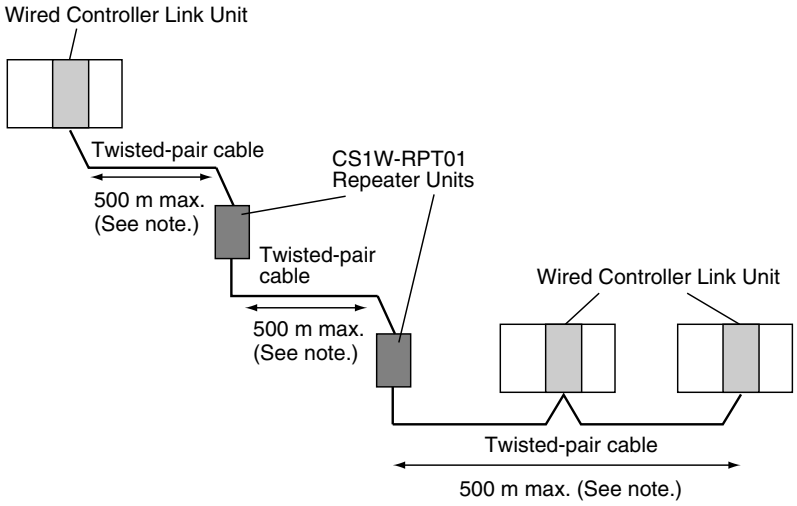


Connecting Repeater Units Using Twisted-pair Cable in Wired Systems

T-Branch Wiring

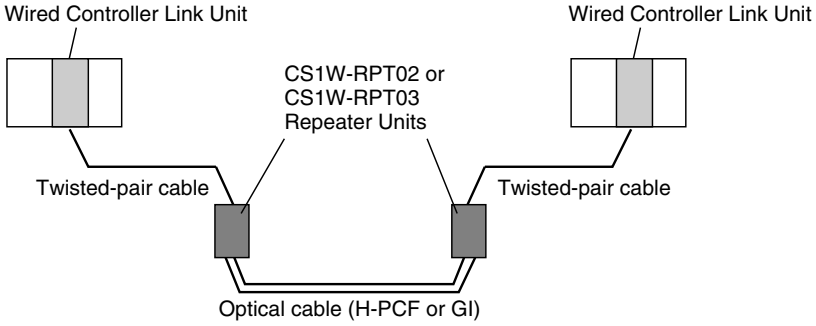


Long-distance Wiring



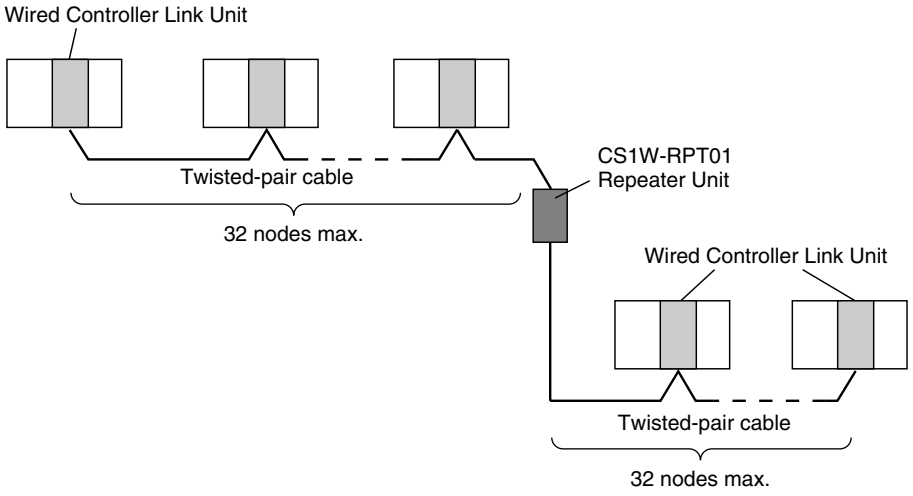
Note: At 2 Mbit/s

Converting Part of the Transmission Line to Optical Fiber



Two Repeater Units of the same model must be used when part of the transmission line uses optical fiber.

Maximum Configuration of 62 Nodes



The following Controller Link Units/Support Boards must be used to construct a network with more than 32 nodes:

CS1W-CLK23
CS1W-CLK21-V1
CJ1W-CLK23
CJ1W-CLK21-V1
3G8F7-CLK23-E
3G8F7-CLK21-E-V1

1. The network will not operate correctly unless all nodes within the network use the above Units/Boards.
2. Only node addresses 1 through 32 can be used on networks for which 62 nodes have not been enabled.

1-2-2 General Specifications

General specifications are the same for the C200HX/HG/HE, CS-series, CJ-series, CVM1, CV-series, and CQM1H-series PLCs.

1-2-3 Communications Specifications

Wired System

Items	Specifications	
Communications method	N:N token bus	
Code	Manchester code	
Modulation	Baseband code	
Synchronization	Flag synchronization (conforms to HDLC frames)	
Transmission path form	Multi-drop bus	
Baud rate and maximum transmission distance	The maximum transmission distance varies with the baud rate as follows: 2 Mbps: 500 m 1 Mbps: 800 m 500 Kbps: 1 km	
Media	Specified shielded twisted-pair cable Number of signal lines: 2, shield line: 1	
Node connection method	PLC: Connected to a terminal block IBM PC/AT or compatible: Connected via a special connector (included)	
Maximum number of nodes	32 or 62 nodes (See note 1.)	
Communications functions	Data links and message service	
Number of data link words	Transmission area per node	CS/CJ Series CS1W-CLK23, CJ1W-CLK23: 4,000 words max. CS1W-CLK-21-V1, CJ1W-CLK21-V1: 1,000 words max. C200HX/HG/HE, CVM1/CV, CQM1H: 1,000 words max. Personal computer 3G8F7-CLK23: 4,000 words max. 3G8F7-CLK21-V1, 3G8F5-CLK21-E: 1,000 words max.
	Data link area (send/receive words) per node	CS/CJ Series CS1W-CLK21-V1, CJ1W-CLK21-V1: 20,000 words max. (unit Ver. 1.2 or later) 12,000 words max. (pre-Ver. 1.2) CS1W-CLK23, CJ1W-CLK23: 20,000 words max. C200HX/HG/HE, CVM1/CV, CQM1H: 8,000 words max. Personal computer: 32,000 or 62,000 words max. (See note 2.)
	Number of data link words in one network (total transmission)	32,000 words (64,000 bytes) or 62,000 words max. (See note 2.)
Data link areas	Bit-access areas (IR, AR, LR, CIO), DM Area (DM), and extended DM Area (EM)	
Message length	2,012 bytes max. (including the header)	
RAS functions	Polling node backup function Self-diagnosis function (hardware checking at startup) Echoback test and broadcast test (using the FINS command) Watchdog timer Error log function	
Error control	Manchester code check CRC check (CCITT $X^{16} + X^{12} + X^5 + 1$)	

Note 1. At least one Repeater Unit is required to construct networks that uses a node address higher than 32. The following Controller Link Units/Support Boards must also be used, and the Wired Network 62 Node Enable Bit of the DM Parameter Area software switch of all nodes must be turned ON (62 nodes max.).

CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, 3G8F7-CLK21-V1, and 3G8F7-CLK23-E

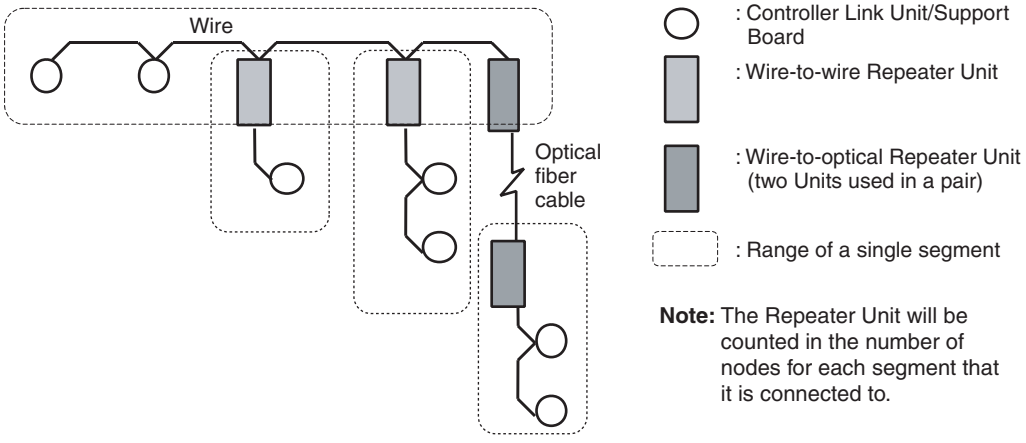
2. Using 62,000 data link words is possible with a configuration containing 62 nodes.

Communications Specifications when Using the CS1W-RPT01 Repeater Unit in a Wired Network

Item	Within 1 segment (See note 1.)	Entire network
Transmission path form	Multi-drop	Tree type (Connection of segments with Repeaters)
Baud rate and maximum transmission distance (See note 2.)	2 Mbps: 500 m 1 Mbps: 800 m 500 Kbps: 1 km	2 Mbps: 1.5 km 1 Mbps: 2.4 km 500 Kbps: 3.0 km
Maximum number of nodes	Total number of Controller Link Units + Repeater Units: 32 nodes (See note 5.)	Controller Link Units/Support Boards (See note 3.): 62 nodes
Maximum number of Repeater stages (See note 4.)	---	2 stages

Note

1. Specifications within a segment are identical to the specifications of a Wired Controller Link Network.
2. Maximum transmission distance: Total length of cables in the longest path connecting any two nodes.
3. A maximum of 62 nodes is possible only when using CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, 3G8F7-CLK21-V, and 3G8F7-CLK23-E Units.
4. Maximum number of Repeater stages: The maximum number of Repeater Units that can be inserted into the path connecting any two nodes. For wire-to-optical connection, two Repeater Units make up a single set, which is counted as a single Repeater stage.
5. The Repeater Units each have a unique node address. Up to 32 Units, consisting of Controller Link Units and Repeater Units, can be connected within a single segment.



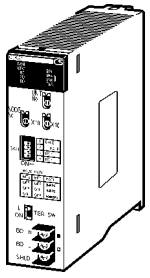
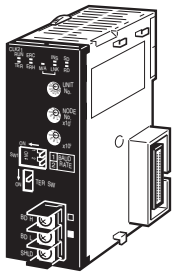
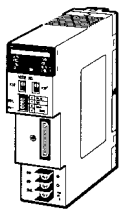
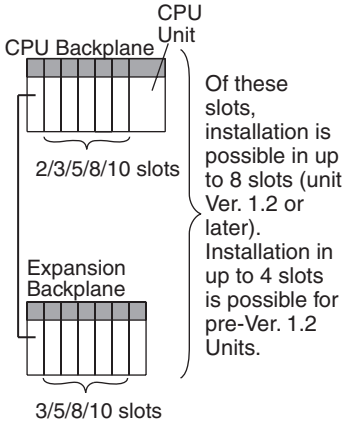
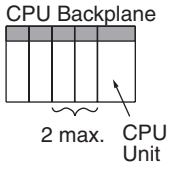
Specifications of Optical Fiber Cables Used with Wire-to-Optical Connections

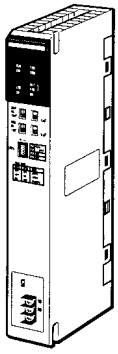
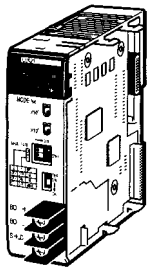
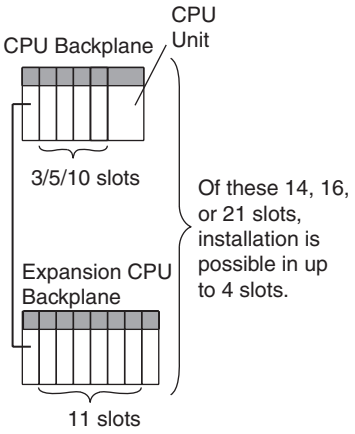
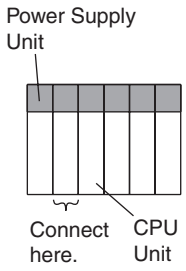
Item	H-PCF type	GI type
Optical fiber cable	H-PCF 200/230 μm two-core cable	GI 50/125 μm two-core cable or GI 62.5/125 μm two-core cable
Maximum transmission distance (See note 2.)	Adhesion-polished: 1 km Crimp cut: 800 m	50/125 μm: 1 km 62.5/125 μm: 2 km

1-2-4 Controller Link Unit Models and PLCs

Wired System

There are five Controller Link Units: One for CVM1 and CV-series PLCs, one each for CS-series and CJ-series PLCs, one for the C200HX/HG/HE PLC, and one for CQM1H-series PLCs.

Item	Specifications		
Model	CS1W-CLK23 CS1W-CLK21-V1	CJ1W-CLK23 CJ1W-CLK21-V1	C200HW-CLK21
External appearance			
Installation devices	None required.	None required.	C200HW-COM01/04 Communications Board and C200HW-CE001/002/012 Bus Connection Unit
PLC	CS-series PLCs	CJ-series PLCs	C200HX/HG/HE PLCs (Except C200HE-CPU11(-Z))
Max No. of Units per PLC	8 maximum for unit Ver. 1.2 or later and 4 maximum for pre-Ver. 1.2 Units. 	8 maximum for unit Ver. 1.2 or later and 4 maximum for pre-Ver. 1.2 Units on CPU or Expansion Rack	2 maximum 
Installation site	Install onto a CPU Backplane or CS-series Expansion Backplane (Classified as a CPU Bus Unit.)	Install onto a CPU Rack or Expansion Rack (Classified as a CPU Bus Unit.)	Install onto a CPU Backplane. (Classified as a Special I/O Unit for communications.)
Storage location for network parameters	CPU Bus Unit Area (in the CPU Unit parameter area)		Controller Link Unit
Storage location for routing tables	CPU Unit parameter area		DM 6450 to DM 6499 in CPU Unit
Weight	220 g	110 g	400 g
Current consumption	330 mA	350 mA	300 mA

Item	Specifications	
Model	CVM1-CLK21	CQM1H-CLK21
External appearance		
Installation devices	None required.	None required.
PLC	CVM1 and CV-series PLCs	CQM1H-CPU51/61
Max No. of Units per PLC	4 maximum 	1 maximum 
Installation site	Install onto a CPU Backplane or Expansion CPU Backplane (Classified as a CPU Bus Unit.)	Connected as a Communications Unit between Power Supply Unit and CPU Unit.
Storage location for network parameters	CPU Bus Unit Area (in the CPU Unit parameter area)	Controller Link Unit
Storage location for routing tables	CPU Unit parameter area	DM 6450 to DM 6499 in CPU Unit
Weight	550 g	200 g
Current consumption	300 mA	290 mA

Note A Controller Link Support Board can be installed into an IBM PC/AT or compatible computer to connect the computer to the network. Refer to the *Controller Link Support Boards Operation Manual* (W307) for details.

Functions Supported by CS/CJ-series Controller Link Units

Item \ Model	CS1W-CLK23 CJ1W-CLK23	CS1W-CLK21-V1 CJ1W-CLK21-V1	
		Ver. 1.2	Pre-Ver. 1.2
Maximum number of send/receive data link words (data link areas for sending/receiving that are created for a single node in a single CPU Unit)	20,000 words max.		12,000 words max.
Number of send words per node (total of area 1 and area 2)	4,000 words max. (optional setting only)	1,000 words max.	
Data Link Area	Area 1 and Area 2 can be allocated in the same area.		Area 1 and Area 2 cannot be allocated in the same area.
Maximum number of Units connected to a single CPU Unit	8 Units		4 Units
Automatic data link setting	Select from equality layout or 1:N allocations (common type, 1:1 type, chain type)		
Changing data link allocations during active data links	Supported. (Data link tables can be changed during active data links.)		
Maximum number of nodes that can be connected	62 Units (See note 1.).		
Mixed use	Supported (See note 2.)		

Note

1. A maximum of 32 nodes can be set without using a Repeater Unit (CS1W-RPT0□).
2. A network can contain both new and old models. In that case, the system must be configured using the specifications for the old models. The number of data link send and receive words, however, can be set separately for old and new models with up to the maximum number of words set for each.

Use the CX-Net in CX-Programmer version 5.0 or higher to set a data link area in which the number of send and receive words exceeds 12,000 words. CX-Integrator version 3.2 or higher can be used to change data link allocations while manually set data links are active.

Up to eight CS/CJ-series Controller Link Units with unit version 1.2 or later can be connected to a single CPU Unit. When connecting multiple Controller Link Units to the CPU Unit, consider the current consumption of the CPU Unit and each CPU Bus Unit before selecting the Power Supply Unit. For details on Controller Link Unit current consumption, refer to *Controller Link Unit Models and PLCs* on page 18. For details on current consumption of each Unit, refer to the operation manual of the PLC that is being used.

The following table provides an example of current consumption.

Example: Using the C200HW-PA204 Power Supply Unit supplying a maximum current of 4.6 A (5 V) and maximum power of 30 W.

Name	Model	Current consumption per Unit (A)	Number of Units	Current consumption (A)
CPU Backplane (8 slots)	CS1W-BC083	0.11 A	1	0.11 A
CPU Unit	CS1H-CPU67H	0.82 A	1	0.82 A
Controller Link Unit (Optical)	CS1W-CLK21-V1	0.33 A	8	2.64 A
Total				3.57 (power consumption: 17.85 W)

1-2-5 Devices for Connection

To set up a Controller Link Network, the following devices are needed in addition to a Controller Link Unit and a PLC.

Communications Cables

The following shielded twisted-pair cables are recommended for Wired Controller Link Network connections.

Model	Manufacturer	Remarks
Li2Y-FCY2 x 0.56 qmm	Kromberg & Schubert, Komtec Department	German company
1 x 2 x AWG – 20PE + Tr.CUSN + PVC	Draka Cables Industrial	Spanish company
#9207	Belden	USA company
ESVC 0.5 x 2 C-1362	Bando Densen Co.	Japanese company
ESNC 0.5 x 2 C-99-087B	Nihon Electric Wire & Cable Co.	Japanese company
ESPC 1P x 0.5 mm^2	Nagaoka Electric Wire Co., Ltd.	Japanese company

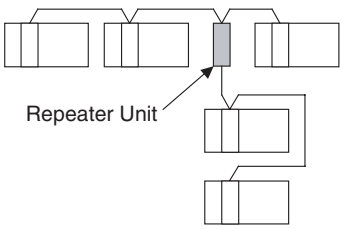
Note Use the special connector provided with the Board to connect the Controller Link Support Board to the network.

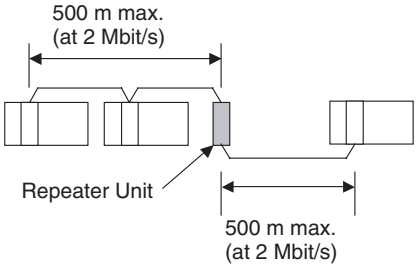
Repeater Units (when Required)

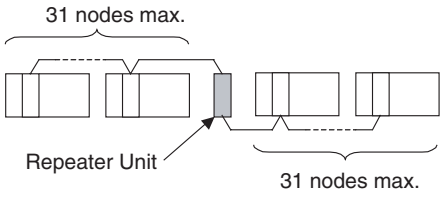
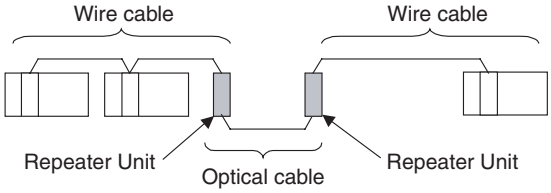
The following Repeater Units can be used to facilitate the use of T-Branch wiring, long-distance wiring, and the addition or removal of nodes.

Three types of Repeater Unit are available for use with different transmission line types (i.e., connection methods).

Item	Specifications		
Model	CS1W-RPT01	CS1W-RPT02	CS1W-RPT03
External appearance			
Supported Units/ Boards	All Controller Link Units/Boards for wired networks. **Note** To construct a network that can contain up to 62 nodes, it is necessary to use CS1W-CLK23, CS1W-CLK21-V1, CJ1W-CLK23, CJ1W-CLK21-V1, 3G8F7-CLK23-E, and 3G8F7-CLK21-EV1 models, which support 62 nodes.		
Transmission line	Twisted-pair cable	H-PCF cable (optical two-core cable)	GI cable (optical two-core cable; 62.5/125 μm, 50/125 μm)

<table>
<tr><th>Item</th><th colspan="3">Specifications</th></tr>
<tr><td>Transmission line format</td><td>Multi-drop
Tree</td><td>1:1 type</td><td>1:1 type</td></tr>
<tr><td></td><td colspan="3">T-Branch Wiring


Long-distance Wiring


62-node Configuration

</td><td colspan="2">Partial Conversion to Optical

</td></tr>
<tr><td>Installation</td><td colspan="3">Units are not mounted on the PLC, but are attached to DIN Track or screw-mounted.</td></tr>
<tr><td>Weight</td><td>126 g</td><td>113 g (excluding mounting bracket)</td><td>116 g (excluding mounting bracket)</td></tr>
<tr><td>Current consumption</td><td>24 V DC at 60 mA max.</td><td>24 V DC at 60 mA max.</td><td>24 V DC at 70 mA max.</td></tr>
<tr><td>Power supply voltage</td><td colspan="3">24 V DC</td></tr>
<tr><td>Allowable power supply voltage range</td><td colspan="3">20.4 to 26.4 V DC (24 V DC –15 to 10%)</td></tr>
<tr><td>Inrush current</td><td colspan="3">2.5 A max. at 24 V DC (5 ms after startup)</td></tr>
<tr><td>Power terminal block</td><td colspan="3">One connector to connect to the power terminal block is provided.</td></tr>
</table>

Note

1. Repeater Units do not use a node address.
2. See *Connection Procedure* for an explanation of how Repeater Units are used.
3. The following Power Supply Unit is recommended: OMRON S82K Series

Relay Terminal Blocks

The following Relay Terminal Block can be used to make maintenance easier by facilitating replacement of the Controller Link Unit after system operation has begun.

Name	Model	Remarks
Relay Terminal Block for Wired Controller Link Units	CJ1W-TB101	Cannot be used on the nodes on the ends of the network

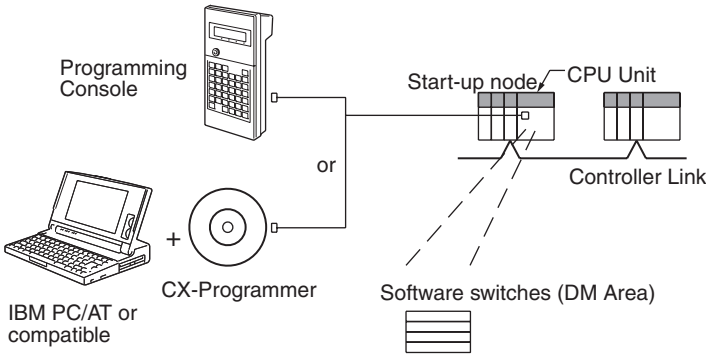
Note Normally, the communications cable must be disconnected from a Wired Controller Link Unit to replace it. Doing this, however, will interrupt communications on the network, requiring that all node be turned OFF to ensure safety before replacing a Unit. With the above Relay Terminal Block, a Controller Link Unit can be replaced by turning OFF only the specific Unit being replaced, i.e., without turning OFF any other Units. The communications cables are left connected to the Relay Terminal Block and only the Relay Terminal Block is removed from the Controller Link Unit. (The built-in terminating resistance connected at the Units at the end of the network prevents using the Relay Terminal Block on the end Units.) Refer to *Appendix C Using the Relay Terminal Block* for details on using the Terminal Relay Block.

1-2-6 Programming Devices

A Programming Device for the PLC, the Controller Link Support Software, or CX-Programmer are needed to use a Controller Link Network.

Programming Device for the PLC

One of the following Programming Devices is necessary when using the automatically setting data links or the message service.



The following operations are possible.

- Selecting manual or automatic setting for data links.
- Setting the data link mode to “automatic” (software switch setting).
- Starting/stopping data links (Start Bit: ON/OFF)
- Programming for the message service.
- Reading (monitoring) the network status.

Programming Device	External appearance	Model	Applicable PLCs
CX-Programmer (for PLC)		WS02-CXPC□-E-V□	CS/CJ-series, C200HX/HG/HE, CVM1-series, and CQM1H-series PLCs
Programming Console		CQM1-PRO01-E C200H-PRO27-E	C200HX/HG/HE, C200H/C200HS, CQM1, and CQM1H-series PLCs
		CVM1-PRS21-EV1	CVM1 and CV-series PLCs

Note 1. Use the CX-Net in CX-Programmer version 5.0 or higher to set data link send and receive areas that exceed 12,000 words, and to set data link tables that allocate the same area for Area 1 and Area 2.

2. Use the CX-Integrator Data Link Setting Tool version 3.2.1.1 or later to set data link tables with more than 1,000 send words per node.
   For information on checking the version number, refer to *Checking the CX-Integrator Data Link Setting Tool Version* on page viii.
3. For automatic data link creation with 1:N allocations or when changing data link tables while the data link is active (CS1W-CLK23/CLK21-V1 and CJ1W-CLK23/CLK21-V1), use the CX-Net in CX-Programmer version 3.2 or higher.

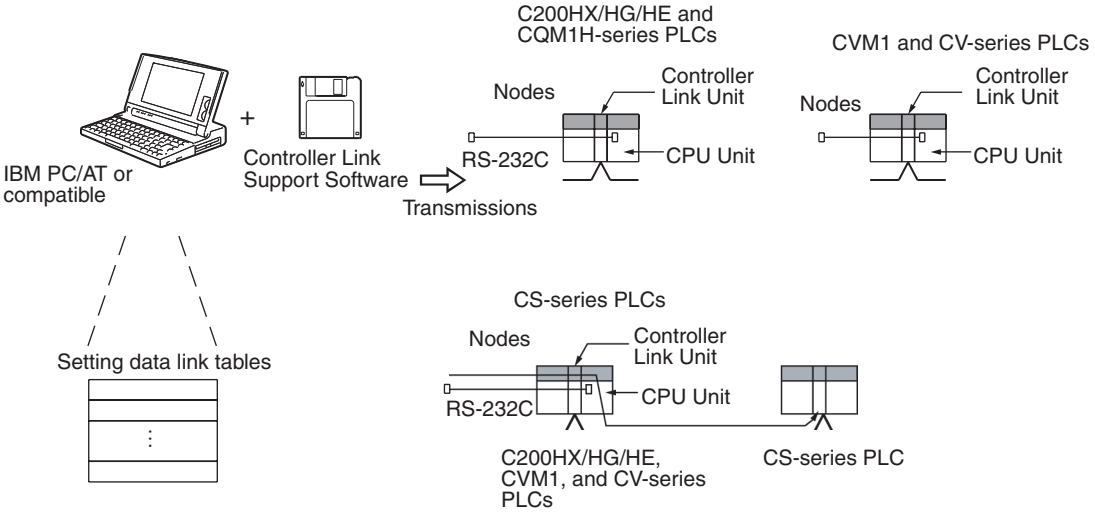
Controller Link Support Software (Version 2.00)

The Controller Link Support Software can be used to manually set data links, to set Controller Link parameters, and to monitor the Controller Link Network. The Controller Link Support Software is run on a personal computer connected to a C200HX/HG/HE, CVM1, or CV-series PLC or a personal computer in which a Controller Link Support Board has been mounted.

- Setting the data link mode to “manual” (creating and storing data link tables).
- Starting/stopping data links.
- Reading (monitoring) network status.
- Reading error logs.
- Setting routing tables.
- Testing the Network.
- Changing network parameters.
- Reading the network connection configuration data and status (in token-ring mode only).

Using an Independent Computer

A computer that is not part of the Network can be used to control the Controller Link Network.

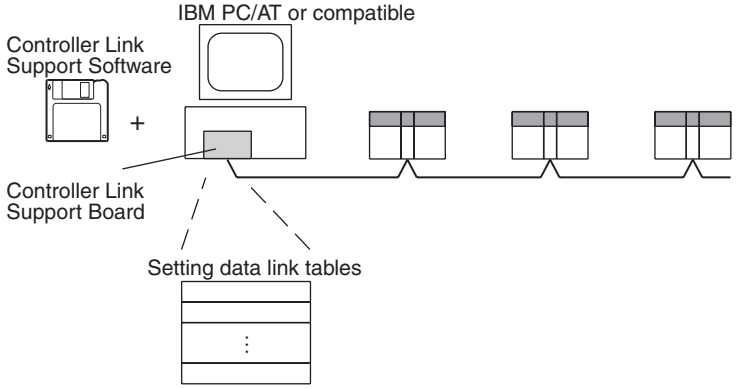


Note

1. The Controller Link Support Software cannot be connected to a CS/CJ-series PLC. It is possible to monitor and set a Controller Link Unit on a CS/CJ-series via the network by connecting the computer running the Controller Link Support Software to a C200HX/HG/HE, CVM1, CV-series, or CQM1H-series PLC.
2. The Controller Link Support Software can be used as a part of the SYSMAC Support Software.

Using a Computer Node

A computer that is a node on the Network can also be used to control the Controller Link Network.

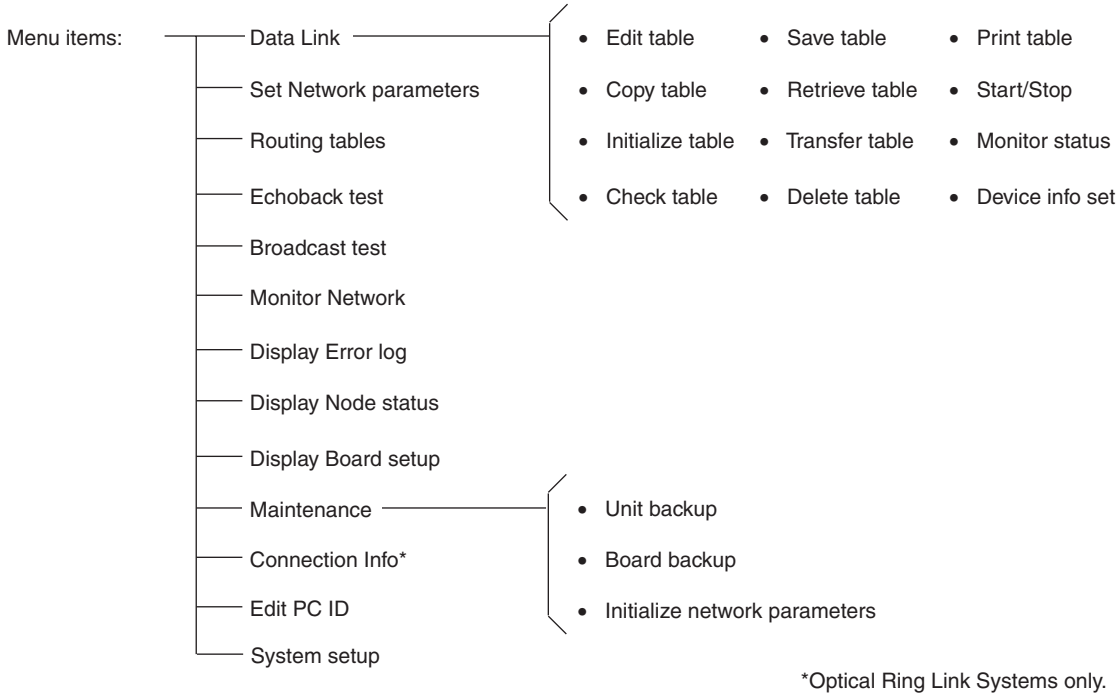


Software		External appearance	Model	Applicable PLCs	Remarks
Controller Link Support Software	Purchased separately		C200HW-ZW3AT2-EV2	CS/CJ, C200HX/HG/HE, CVM1, CV-series, or CQM1H-series PLC	For IBM PC/AT or compatible
	Provided with Controller Link Support Board		3G8F5-CLK21-EV2		For Controller Link Support Board (included with the Board) (Wired systems)
			3G8F5-CLK11-E		For IBM PC/AT or compatible (included with the Board) (Optical systems)

Note Use Controller Link Support Software version 1.1 for an ISA Controller Link Support Board.

The Controller Link Support Software can also be used with the Controller Link Support Board.

Controller Link Support Software Menu Overview



Note

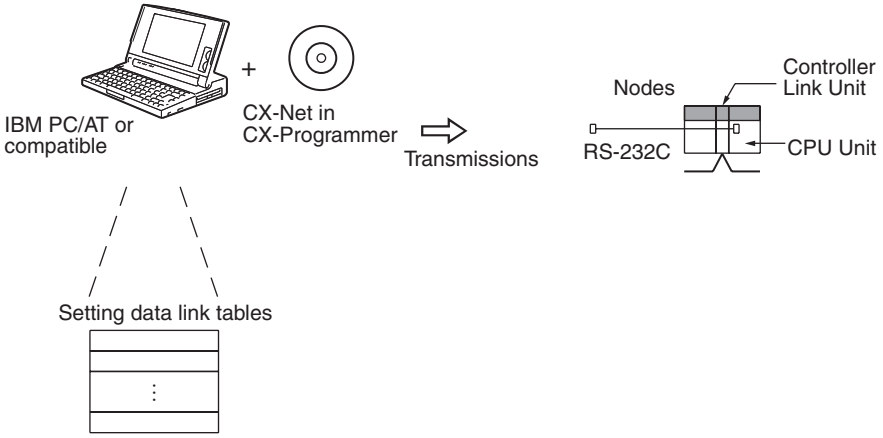
1. Refer to the *Controller Link Support Software Operation Manual* (W308) for detailed operating procedures.
2. Use the CX-Net in CX-Programmer version 5.0 or higher to set data link areas in which the number of send and receive words exceeds 12,000, or to set data link tables that allocate the same area for Area 1 and Area 2. Controller Link Support Software cannot be used for these settings.
3. For automatic data link creation with 1:N allocations or when changing data link tables while the data link is active (CS1W-CLK21-V1 and CJ1W-CLK21-V1), use the CX-Net in CX-Programmer version 3.2 or higher. Controller LInk Support Software cannot be used to perform these functions.

CX-Programmer

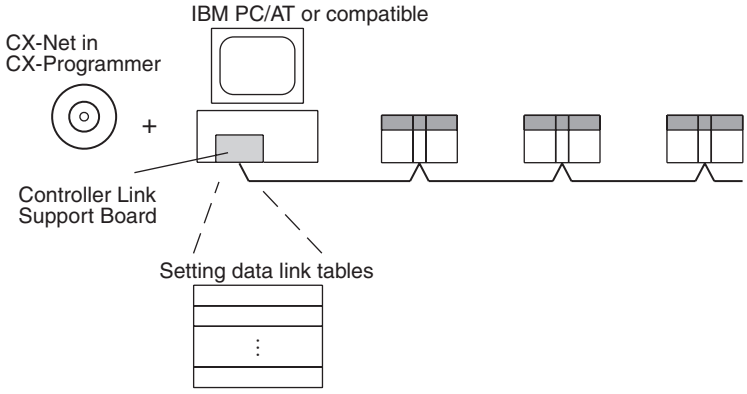
The CX-Net operations within the CX-Programmer is required when using user-set data links, or when setting or monitoring detailed settings of the Controller Link Unit. This software can be used with a CS/CJ-series PLC and is ideal for the following applications.

- Setting the data link mode to “manual” (creating and storing data link tables).
- Starting/stopping data links.
- Reading (monitoring) network status.
- Reading error logs.
- Setting routing tables.
- Testing the Network.
- Changing network parameters.

When Operating on Personal Computer as Peripheral Software



When Operating on Personal Computer Connected as a Node



Software	External appearance	Model	Applicable PLCs
CX-Programmer		WS02-CXPC□-E-V□	CS/CJ-series, C200HX/HG/HE, CVM1, CV-series, and CQM1H-series PLCs

1-3 Selection of Communications Functions

Select the data link function if alarm or status data (in bits) must be constantly shared between PLCs or between a PLC and an IBM PC/AT or compatible computer or if the present value or set value data (in words) must be constantly shared between PLCs or between a PLC and an IBM PC/AT or compatible computer.

Select the message service function (SEND/RECV instructions or CMND instructions) if data (in words) must be sent (or received) from one PLC to other PLCs in other nodes or from one PLC to IBM PC/AT or compatible computers.

1-4 Basic Procedures

Preparations **C200HX/HG/HE and CQM1H-series PLCs**

1,2,3... 1. Perform mounting and wiring.

- Mount to the PLC.

- Connect the communications cables.

2. Set the node address on the front rotary switches.
   - 01 to 32
3. Set the baud rate and operating level on the front DIP switch.
   - 2 M, 1 M, or 500 Kbps
   - Operating level 0 or operating level 1 (C200HX/HG/HE PLCs only)
4. Set the terminating resistance on the sliding switch.
   - ON or OFF (Only the end nodes are set to ON.)
5. Connect power to all nodes.
6. Connect the Programming Device to the PLC.
7. Create I/O tables (not necessary for C200HX/HG/HE and CQM1H-series PLCs and not necessary for CJ-series PLCs unless user-created I/O tables have been specified).
8. Register routing tables as required.

CVM1, CV-series, and CS/CJ-series PLCs

1,2,3...

1. Perform mounting and wiring.
   - Mount to the PLC.
   - Connect the communications cables.
2. Set the Unit number on the front rotary switches.
   - 00 to 15 (0 to F: CS/CJ-series display is in hexadecimal)
3. Set the node address on the front rotary switches.
   - 01 to 32 (01 to 62) (See note a.)
4. Set the baud rate and operating level on the front DIP switch.
   - 2 M, 1 M, or 500 Kbps (wired systems only)
5. Set the terminating resistance on the front slide switch.
   - ON or OFF (Only the terminal node is set to ON.)
6. Connect power to all nodes.
7. Connect the Programming Device to the PLC.
8. Create I/O tables (not necessary for C200HX/HG/HE and CQM1H-series PLCs and not necessary for CJ-series PLCs unless user-created I/O tables have been specified).
9. Set the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches. (See note b.)
   - ON (62 nodes max.) or OFF (32 nodes max.)
10. Register routing tables.

Note a) Setting 62 nodes is possible only with the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23. The Wired Network 62 Node Enable Bit in the DM Parameter Area software switches must be set.

b) This setting is valid only with the CS1W-CLK21-V1, CS1W-CLK23, CS1W-CLK21-V1, and CS1W-CLK23. Reset the power to the PLC after setting.

Data Link Procedure

Set the data link mode in the data link parameters in the DM area of the startup node to either automatic or manual data link creation using the Programming Device.

Manually Setting Data Links

1,2,3... 1. Register data link tables for all nodes using the Controller Link Support Software or CX-Programmer.

2. Start the data links either using the Controller Link Support Software, CX-Programmer, or by turning ON the Start Bit from the Programming Device.

Automatically Setting Data Links

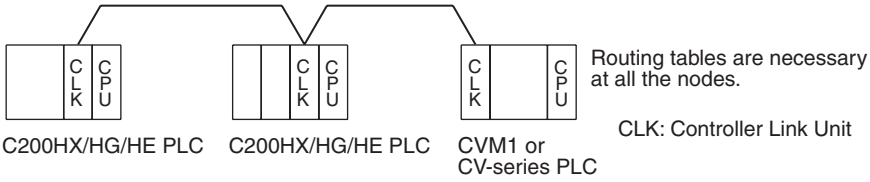
1,2,3... 1. Set the DM area of the startup node using the Programming Device.

2. Start the data links by turning ON the Start Bit from the Programming Device.

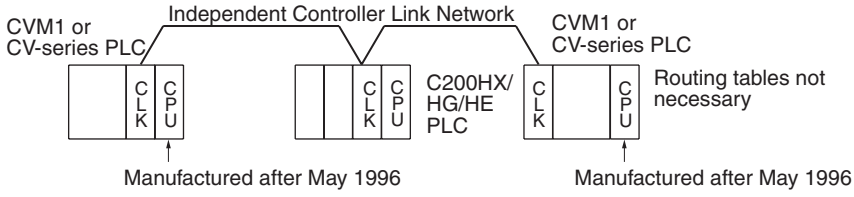
Message Service Procedure Execute communications instructions in the program.

1-5 Application Precautions

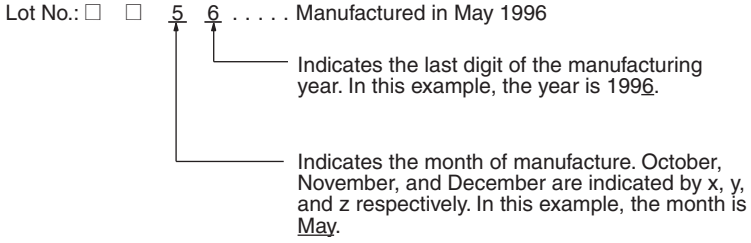
- Turn ON the terminating resistance switch only for the nodes at both ends of the network and turn OFF the switch for all other nodes.
- Turn OFF the power of all the nodes on the network before connecting or disconnecting a cable.
- Use the specified cable only.
- Set the same baud rate for all nodes on the same network.
- Be sure to set routing tables for CVM1 and CV-series PLCs. When a CVM1 or CV-series PLC is connected to the network, set routing tables at all the nodes.



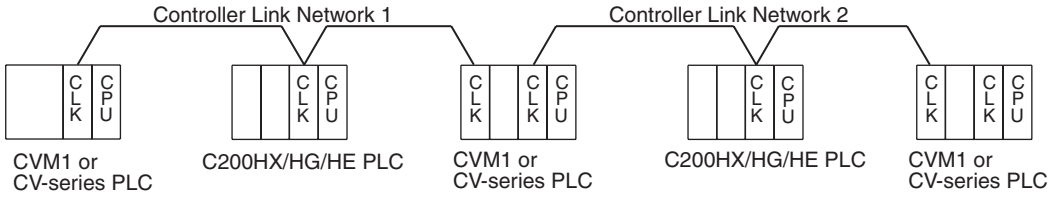
Note Routing tables are not required if all of the CVM1 and CV-series CPU Units if the Controller Link Network were manufactured on or after May 1996.



Note The manufacturing date can be determined from the four-digit lot number on the side of the CPU Unit.



- Set routing tables at all the nodes in all the networks when multiple networks are connected.



Routing tables are necessary at all the nodes regardless.

- When using the SEND/RECV or CMND instructions on a PLC for which routing tables have been set, be sure to specify the network addresses that are set in the routing tables.
- When using manually set data links, delete the data link tables from all nodes not participating in the data links.
- Do not transfer (write) routing tables when data links are active (i.e., started). CPU Bus Units and Communications Units are reset when routing tables are transferred.
- Do not restart or reset the polling node while data links are active.
- The following table shows the status of the data link refresh areas when a node registered in the data link table generates a communications error.

Communications error type	Data link areas
A node separates from the network while a data link is running.	Data received immediately prior to the error continues to be refreshed in the data link areas of the relevant nodes.
A node does not join the network after the data links start.	Zero (0) data continues to be refreshed in the data link areas of the relevant nodes.

- When CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units are used with other models in the same network, set the node addresses of all nodes to between 1 and 32. It is not possible to construct a network that uses a node address higher than 32 in a network that includes pre-version-1 models.
  Turn OFF the Wired Network 62 Node Enable Bit (bit 11 of D30000 + 100 × Unit No.) in the DM Parameter Area software switch of all CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units to restrict the network to 32 nodes max. If a different value is specified, the network will be incorrectly configured.
- To construct a network that uses a node address higher than 32, it is necessary for all nodes to be CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 Units.
  In addition, the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches of all nodes must turned ON to enable 62 nodes maximum. If a different value is specified, the network will not be correctly configured.
- The Wired Network 62 Node Enable Bit in the DM Parameter Area software switches of CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units is read when the Unit is restarted.
- When using automatic data link creation with 1:N allocation, all nodes must be CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 Controller Link Units. Other models cannot participate in data links that employ 1:N allocations.

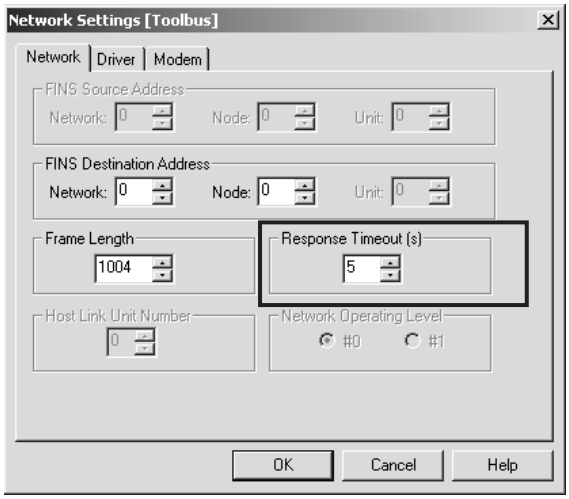
- Communicate between the CPU Unit and Communications Units by executing the SEND(090), RECV(098), and CMND(490) instructions for the internal logic ports (8 ports max.). Up to eight Controller Link Units can be connected to a single CPU Unit with unit version 1.2 or later. Perform exclusive control of the ports using the ladder program when using the SEND(090), RECV(098), and CMND(490) instructions to perform message servicing on multiple networks (Units).
- Up to 20,000 data link send and receive words can be allocated per node (Unit) when using unit version 1.2 or later. Data of 20,000 words is divided and refreshed across three CPU Unit cycles. Make sure that the response time has been considered in the system design. (Data is synchronous for each node when data is refreshed in the CPU Unit, in the same way as for earlier versions. If the number of data link words is 12,000 words or less, the response with earlier unit versions (pre-Ver. 1.2) is exactly the same.)
- For details on Controller Link Unit current consumption, refer to *Controller Link Unit Models and PLCs* on page 18. For details on current consumption of each Unit, refer to the operation manual of the PLC that is being used. For an example of calculating current consumption, refer to page 20.
- The CS1W-CLK23, CJ1W-CLK23, and 3G8F7-CLK23-E support up to 4,000 send words per node, but no more than 1,000 send words per node can be set if any other model of Controller Link Unit or Support Board is used in the same network.
- If the total number of data link words is increased, the PLC cycle time and the communications cycle time will be increased. In that case, observe the following precautions.
  - Check to make sure that it will not cause problems if performance in responses to external devices is reduced.
  - In message communications, extending the communications cycle time may result in timeout errors waiting for responses.
    In that case, lengthen the response monitor time as described below.

    SEND, RECV, and CMND instructions:

    Response monitor time setting area for local node control data.
    For details, refer to *6-1 Introduction*.

    PLC Programming Devices:

    PLC Programming Device *Response Timeout* setting
    For details on settings, refer to the operation manual for the PLC Programming Device that is being used.



Example: CX-Programmer Response Timeout Setting

SECTION 2
Basic Procedures

This section describes the basic procedures to use the Controller Link Unit. The settings necessary for using each of the functions are also explained briefly. For more details, refer to the following sections on individual functions.

2-1 Data Links Procedures 34
2-1-1 Manually Setting Data Links 34
2-1-2 Automatically Setting Data Links 36
2-2 Message Service Procedure 42

2-1 Data Links Procedures

2-1-1 Manually Setting Data Links

When the data link mode is set for manual data link table creation, the data link tables can be input using the Controller Link Support Software or CX-Programmer. Use the following procedure.

1,2,3... 1. Install and wire the Units.

Contents	Method	Nodes	Page
a. Mount the Units to the PLCs.	---	All nodes	61
b. Wire the Network.	---	All nodes	68

2. Prepare for communications.

Contents	Method	Nodes	Page
a. Set the unit number.	Use the front rotary switches.	CS/CJ-series, CVM1, and CV-series PLCs only	100
b. Set the node address.	Use the front rotary switches.	All nodes	96,100
c. Set the baud rate.	Use the DIP switch.	All nodes	97, 101
d. Set the operating level.	Use the DIP switch.	C200HX/HG/HE PLCs only	97
e. Set the terminal resistance	Use the front switch for CVM1, CV-series, CS/CJ-series, and CQM1H-series PLCs or the bottom switch for C200HX/HG/HE PLCs.	All nodes End nodes on the network: ON All other nodes: OFF	98, 101

3. Turn ON the power to the PLC.

Contents	Method	Nodes	Page
Turn ON the power to the PLC.	---	All nodes	---

4. Connect the Programming Device.

Contents	Method	Nodes	Page
Connect the Programming Console or Controller Link Support Software.	Use the special connection cable.	CS/CJ-series, CVM1, and CV-series PLCs	23

5. Create I/O tables.

Contents	Method	Nodes	Page
Input the I/O tables.	Use the Support Software or Programming Console.	CS/CJ-series, CVM1, and CV-series PLCs only	---

6. Set the data link mode.

Contents	Method	Nodes	Page
Enable 62 nodes for a wired network.	Use Support Software for the PLC or the Programming Console.	All nodes Note: This setting must be made to construct a network that uses a node address higher than 32 (See note a.)	80
Set data link mode to manual.	Use Support Software for the PLC or the Programming Console. (See note b.)	Data link startup node only The node that is used to start the data links is called the startup node. It is necessary to decide beforehand which node will be the startup node.	115
Set the data link status storage format. (CS/CJ Series only)	Use Support Software for the PLC or the Programming Console.	Data link startup node only (See note c.)	162

Note a) When using fewer than 33 nodes, make sure that the Wired Network 62 Node Enable Bit if the DM Parameter Area software switch is turned OFF to restrict the network to 32 nodes maximum. To construct a network that uses a node address higher than 32, all nodes must use the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23.

b) Only node addresses 1 through 32 can be used on networks for which 62 nodes have not been enabled.

c) Be sure that the data link mode in the data link parameters in the DM Area is set to 00 when using manually set data links.

d) When using the 8-bit storage format, make sure that the relevant locations in the DM Parameter Area are set to 0. The storage format used by all models other than CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 is fixed at 8-bit, regardless of the setting.

7. Register the data link tables by making the following settings for each node.

Contents		Method	Nodes	Page
First data link status word		Use the Controller Link Support Software or CX-Programmer.	All nodes within the network Delete from the data link tables all nodes that are not in a data link.	117
Data link nodes				
Area 1	First data link status words			
	Numbers of data link words			
	Data link offsets			
Area 2	First data link status words			
	Numbers of data link words			
	Data link offsets			

Note Offsets are used to control where data is placed within the receive area.

8. Start the data links.

Contents	Method	Nodes	Page
Start the data links.	Switch the Data link Start/Stop Bit (listed below) from OFF to ON using either the Programming Device, the user program, the Controller Link Support Software or CX-Programmer.	Data link startup node (The Start Bit can be turned ON in more then one node to make sure the data links start even when the startup node is down.)	155

Note a) Data link Start/Stop Bit (N= unit number):

CS/CJ Series:	Word 0 of DM30000 + 100 × N
C200HX/HG/HE:	AR 0700 (operating level #0), AR 0704 (operating level #1)
CVM1/CV Series:	Word 0 of DM 2000 + 100 × N
CQM1H Series:	AR 0700

b) The data links will not start if there is an error in the data link tables in the startup node.

9. Stop the data links.

Contents	Method	Nodes	Page
Stop the data links.	Switch the Data link Start/Stop Bit (listed below) from OFF to ON using either the Programming Device, the user program, the Controller Link Support Software or CX-Programmer.	Any node that is active in the data link	155

Note Data link Start/Stop Bit (N= unit number):

CS/CJ Series:	Word 0 of DM30000 + 100 × N
C200HX/HG/HE:	AR 0700 (operating level #0), AR 0704 (operating level #1)
CVM1/CV Series:	Word 0 of DM 2000 + 100 × N
CQM1H Series:	AR 0700

2-1-2 Automatically Setting Data Links

Data link tables can be automatically created by setting the data link mode to automatic data link table creation. Use the following procedure.

1,2,3... 1. Install and wire the Units.

Contents	Method	Nodes	Page
a. Mount the Units to the PLCs.	---	All nodes	61
b. Wire the Network.	---	All nodes	68

2. Prepare for communications.

Contents	Method	Nodes	Page
a. Set the unit number.	Use the front rotary switches.	CS/CJ-series, CVM1, and CV-series PLCs only	100
b. Set the node address.	Use the front rotary switches.	All nodes	97, 101
c. Set the baud rate.	Use the DIP switch.	All nodes	97, 101
d. Set the operating level.	Use the DIP switch.	C200HX/HG/HE PLCs only	97
e. Set the terminal resistance	Use the front switch for CVM1, CV-series, CS/CJ-series, and CQM1H-series PLCs or the bottom switch for C200HX/HG/HE PLCs.	All nodes End nodes on the network: ON All other nodes: OFF	98, 101

3. Turn ON the power to the PLC.

Contents	Method	Nodes	Page
Turn ON the power to the PLC.	---	All nodes	---

4. Connect the Programming Device.

Contents	Method	Nodes	Page
Connect the Programming Console or Controller Link Support Software.	Use the special connection cable.	CS/CJ-series, CVM1, and CV-series PLCs only	23

5. Create I/O tables.

Contents	Method	Nodes	Page
Create the I/O tables.	Use the Support Software or Programming Console.	CS/CJ-series, CVM1, and CV-series PLCs only	---

6. Set the data link mode.

Contents	Method	Nodes	Page
Enable 62 nodes for a wired network.	Use Support Software for the PLC or the Programming Console.	All nodes Note: This setting must be made to construct a network that uses a node address higher than 32 (See note a.)	80
Set data link mode to manual.	Use Support Software for the PLC or the Programming Console. (See note b.)	Data link startup node only The node that is used to start the data links is called the startup node. It is necessary to decide beforehand which node will be the startup node.	115
Set the data link status storage format. (CS/CJ Series only)	Use Support Software for the PLC or the Programming Console.	Data link startup node only (See note c.)	162

Note a) When using fewer than 33 nodes, make sure that the Wired Network 62 Node Enable Bit if the DM Parameter Area software switch is turned OFF to restrict the network to 32 nodes maximum. To construct a network containing more than 32 nodes, all nodes must use the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23.

b) Be sure that the data link mode in the data link parameters in the DM Area is set to 00 when using manually set data links.

c) When using the 8-bit storage format, make sure that the relevant locations in the DM Parameter Area are set to 0. The storage format used by all models other than CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 is fixed at 8-bit, regardless of the setting.

7. Set the parameters for automatic data link creation.

   • Equality layout: Previous automatic creation method (Compatible with CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, C200HW-CLK21, CVM1-CLK21, and CQM1H-CLK21)

Contents		Method	Nodes	Page
a. Set the data link mode to automatic.		Use the Support Software or Programming Console.	Data link startup node only The node that is used to start the data link is called the startup node. It is necessary to decide beforehand which node will be the startup node.	115
Area 1	b. Set the area		Data link startup node only Only when Area 1 is used	132
	c. Set the data link start word			
	d. Set the number of data link words			
Area 2	e. Set the area		Data link startup node only Only when Area 2 is used	
	f. Set the data link start word			
	g. Set the number of data link words			
h. Set the first data link status word			Data link startup node only (This setting may be omitted.)	
i. Set the nodes to participate in the data links.			Data link startup node only	

- 1:N allocation (Compatible with CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23)

  Common Type

Contents		Method	Nodes	Page
a. Set the data link mode to automatic.		Use Support Software for the PLC including Programming Console (see note).	Data link startup node only The node that is used to start the data link is called the startup node. It is necessary to decide beforehand which node will be the startup node.	115
b. 1:N setting			Data link startup node only	136
Area 1	c. Set the area		Data link startup node only Only when Area 1 is used	
	d. Set the data link start word			
	e. Set the number of send words per master node			
	f. Set the number of send words per slave node			
Area 2	g. Set the area		Data link startup node only Only when Area 2 is used	
	h. Set the data link start word			
	i. Set the number of send words per master node			
	j. Set the number of send words per slave node			
k. Set the first data link status word			Data link startup node only	
l. Set the nodes to participate in the data links.			Data link startup node only	

Note For automatic data link creation with 1:N allocations, use the CX-Net in CX-Programmer version 3.2 or higher.

1 to 1 Type

Contents	Method	Nodes	Page
a. Set the data link mode to automatic.	Use Support Software for the PLC including Programming Console (see note).	Data link startup node only The node that is used to start the data link is called the startup node. It is necessary to decide beforehand which node will be the startup node.	115
b. 1:N creation		Data link startup node only	140
c. Set the area			
d. Set the data link start word			
e. Set the number of common send words per master node			
f. Se the number of individual send words per master node			
g. Set the number of send words per slave node			
h. Set the first data link status word			
i. Set the nodes to participate in the data links.			

Note For automatic data link creation with 1:N allocation, use CX-Net in CX-Programmer version 3.2 or higher.

Chain Type

Contents	Method	Nodes	Page
a. Set the data link mode to automatic.	Use Support Software for the PLC including Programming Console (see note).	Data link startup node only The node that is used to start the data link is called the startup node. It is necessary to decide beforehand which node will be the startup node.	115
b. 1:N creation		Data link startup node only	143
c. Set the area			
d. Set the data link start word			
e. Set the number of common send words per master node			
f. Set the number of send and receive words per node			
g. Set the first data link status word			
h. Set the nodes to participate in the data links.			

Note For automatic data link creation with 1:N allocations, use the CX-Net in CX-Programmer version 3.2 or higher.

8. Start the data links.

Contents	Method	Nodes	Page
Start the data links.	Switch the Data link Start/Stop Bit (listed below) from OFF to ON using either the Programming Device, or the user program.	Data link startup node (The Start Bit can be turned ON in more then one node to make sure the data links start even when the startup node is down.)	155

Note Data link Start/Stop Bit (N= unit number):

CS/CJ Series: Word 0 of DM30000 + 100 × N
C200HX/HG/HE: AR 0700 (operating level #0), AR 0704 (operating level #1)
CVM1/CV Series: Word 0 of DM 2000 + 100 × N
CQM1H Series: AR 0700

9. Stop the data links.

Contents	Method	Nodes	Page
Stop the data links.	Switch the Data link Start/Stop Bit (listed below) from OFF to ON using either the Programming Device, or the user program.	Any node that is active in the data link	155

Note Data link Start/Stop Bit (N= unit number):

CS/CJ Series: Word 0 of DM30000 + 100 × N

C200HX/HG/HE:	AR 0700 (operating level #0), AR 0704 (operating level #1)
CVM1/CV Series:	Word 0 of DM 2000 + 100 × N
CQM1H Series:	AR 0700

Note The data links will not start if there is an error in the data link tables in the startup node. Data links can be started and stopped using the Controller Link Support Software.

2-2 Message Service Procedure

The following steps outline the basic procedure for using the message service.

1,2,3... 1. Install and wire the Units.

Contents	Remarks	Page
a. Mount the Units to the PLCs.	---	61
b. Wire the Network.	---	68

2. Prepare for communications.

Contents	Remarks	Page
a. Set the unit number.	CS/CJ-series, CVM1, and CV-series PLCs only	100
b. Set the node address.	---	96, 100
c. Set the baud rate.	---	97, 101
d. Set the operating level.	C200HX/HG/HE PLCs only	97
e. Set the terminal resistance.	---	98, 101

3. Turn ON the power to the PLC.

Contents	Remarks	Page
Turn ON the power to the PLC.	---	---

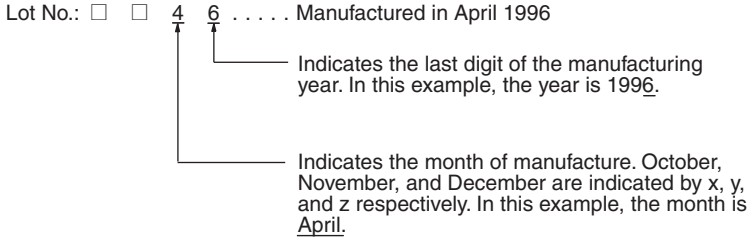
4. Create the I/O tables.

Contents	Remarks	Page
Create the I/O tables.	CS/CJ-series, CVM1, and CV-series PLCs only	---

5. Register routing tables if using inter-network connections.

Contents	Remarks	Page
a. Set the local network table	---	241
b. Set the relay network table	---	

Note Routing tables are required if any of the CVM1 and CV-series CPU Units in the Network has been manufactured on or before April 1996.



6. Set the data link mode.

Contents	Method	Nodes	Page
Enable 62 nodes for a wired network.	Use Support Software for the PLC or a Programming Console.	All nodes This setting must be made when constructing a network that uses a node address higher than 32 (See note.)	80

Note When using fewer than 33 nodes, make sure that the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches is turned OFF to restrict the network to 32 nodes maximum. To construct a network containing more than 32 nodes, all nodes must use the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23.

7. Create the user program.

Contents	Remarks	Page
a. Prepare the send and receive data in memory.	Stored in the memory areas of the source node	168
b. Prepare the control data for the communications instruction.		
c. Check the conditions for executing the SEND/RECV or CMND instruction.	The standard input conditions are the Active Node Flags for the source and destination nodes, and the Port Enabled Flag.	192
d. Execute the SEND/RECV or CMND instruction.	---	
e. Execute other instructions are required for the results of the communications instruction, (e.g., retry or error processing if an error occurs).	The standard input condition is the Port Error Flags. C200HX/HG/HE PLCs have 1 communications port for each operating level. When 2 or more communications instructions are executed at the same time, exclusive control is necessary. CS-series, CJ-series, CVM1, and CV-series PLCs have 8 communications ports. When 9 or more communications instructions are executed at the same time, exclusive control is necessary. CQM1H-series PLCs have only 1 communications port. When 2 or more communications instructions are executed at the same time, exclusive control is necessary.	

SECTION 3
Installation and Wiring

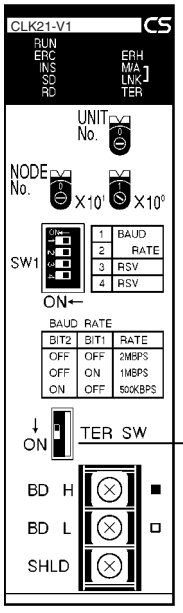
This section describes how to install a Controller Link Unit and how to wire the Controller Link Network.

3-1 Component Names and Functions 46
3-1-1 CS-series Controller Link Units (CS1W-CLK23 and CS1W-CLK21-V1) 46
3-1-2 CJ-series Controller Link Units (CJ1W-CLK23 and CJ1W-CLK21-V1) 48
3-1-3 C200HX/HG/HE Controller Link Unit 51
3-1-4 CVM1 and CV-series Controller Link Unit 53
3-1-5 CQM1H-series Controller Link Unit 55
3-1-6 Wire-to-Wire Repeater Unit 56
3-1-7 Wire-to-Optical (H-PCF) Repeater Unit. 58
3-1-8 Wire-to-Optical (GI) Repeater Unit 59
3-2 Unit Installation. 60
3-2-1 Mounting Controller Link Units. 61
3-2-2 Mounting a Repeater Unit 66
3-3 Wiring 68
3-3-1 Communications Cables 68
3-3-2 Repeater Units 73
3-4 Constructing Networks with Repeater Units. 80
3-4-1 Segments. 81
3-4-2 Number of Repeater Units 82
3-4-3 Terminating Resistance. 84

3-1 Component Names and Functions

This section describes the names and functions of the Controller Link Unit components. This section also describes the operation of the indicators.

3-1-1 CS-series Controller Link Units (CS1W-CLK23 and CS1W-CLK21-V1)



Indicators (Refer to pages 47, 274)
LED indicators that display the Unit and network status.

Unit number switch (Refer to page 88)

One rotary switch. The unit number is set in single-digit hexadecimal for the network to which the PLC is connected.

Node address switches (Refer to page 89)

Two rotary switches. The node address of the Unit on the Controller Link Network is set in 2-digit decimal.

Baud rate switch (Refer to page 90)

A four-pin DIP switch. The following setting is made.
Pins 1, 2: Baud rate
Pins 3, 4: Not used (always OFF)

Terminating resistance switch (Refer to page 91)

A slide switch. Use this switch to set the terminating resistance to ON for nodes at both ends of the Controller Link Network.

Terminal block for the communications cable (Refer to page 68)

Terminals to connect to the Controller Link Network communications cable (twisted-pair cable).

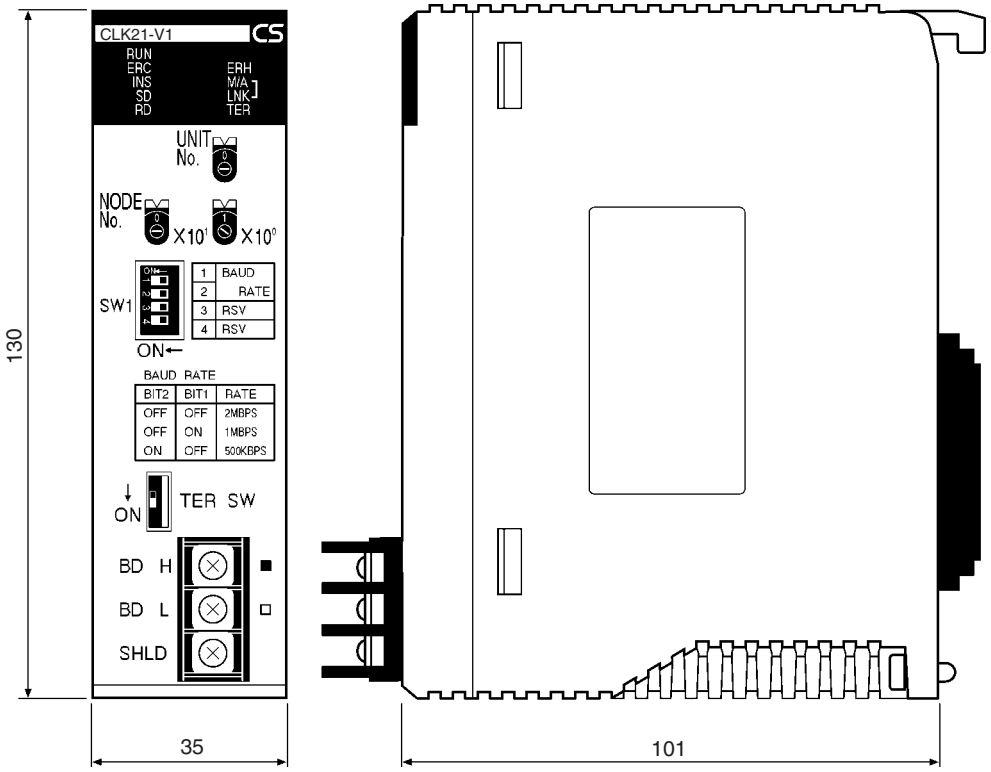
Wired Unit Indicators

Name	Color	Status	Meaning	
RUN (operating)	Green	Lit	Unit operating normally.	
		Not lit	Unit error.	
ERC (communications error)	Red	Lit	Communications error, node address setting error (same address set twice), or hardware error.	
		Not lit	Normal operation	
ERH (PLC error)	Red	Lit	PLC error, PLC interface error, EEPROM error, unit number error, or I/O table not set	
		Not lit	No error.	
INS (network participation)	Yellow	Lit	Unit is participating (inserted) in the network.	
		Not lit	Unit is not participating (inserted) in the network.	
SD (send)	Yellow	Lit	Data transmission.	
		Not lit	No data transmission.	
RD (receive)	Yellow	Lit	Data reception.	
		Not lit	No data reception.	
M/A (data link mode)	Yellow	Lit	Manual (see note)	**Note:** M/A is always not lit when data links are not active in the network.
		Not lit	Automatic	
LNK (data link)	Yellow	Lit	Data links participating.	
		Flashing	Error in data link table.	
		Not lit	Not in a data link or data link inactive.	
TER (terminating resistance)	Yellow	Lit	Terminating resistance switch ON.	
		Not lit	Terminating resistance switch OFF.	

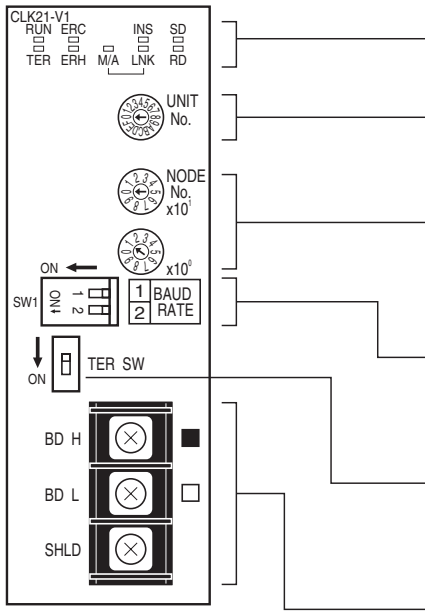
Note Even when the local node does not participate in the data link, the indicator will be lit if there are manually set data links active on the network.

For details refer to *9-1 Troubleshooting Using Indicators*.

Dimensions (Unit: mm)



3-1-2 CJ-series Controller Link Units (CJ1W-CLK23 and CJ1W-CLK21-V1)



Indicators (Refer to pages 47, 274)
LED indicators that display the Unit and network status.

Unit Number Switch (Refer to page 88)
One rotary switch. The unit number is set in single-digit hexadecimal for the network to which the PLC is connected.

Node address switches (Refer to page 89)
Two rotary switches. The node address of the Unit on the Controller Link Network is set in 2-digit hexadecimal.

Baud rate switch (Refer to page 90)
A 2-pin DIP switch used to set the baud rate.

Terminating resistance switch (Refer to page 91)
A slide switch. Use this switch to set the terminating resistance to ON for nodes at both ends of the Controller Link Network.

Terminal block for the communications cable (Refer to page 66)
Terminals to connect the Controller Link Network communications cable (twisted-pair cable).

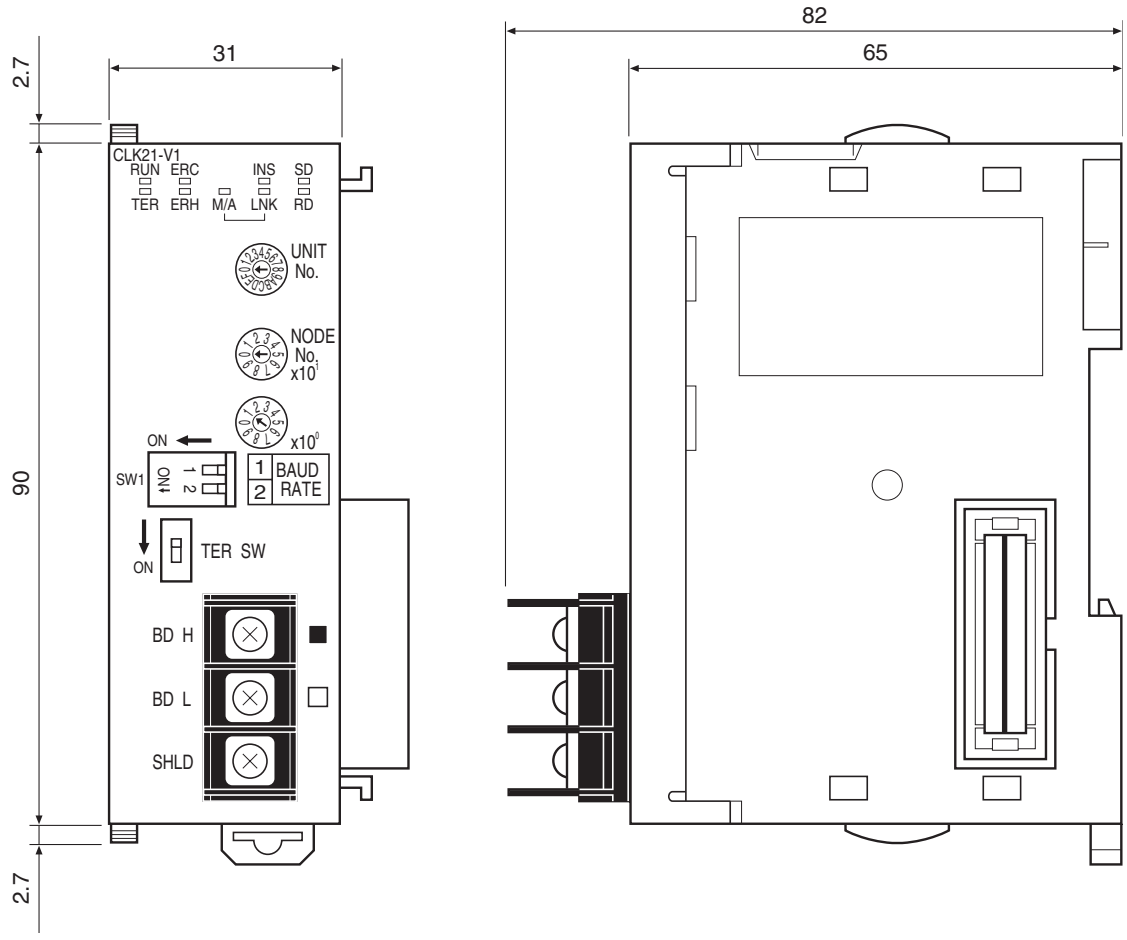
Wired Unit Indicators

Name	Color	Status	Meaning	
RUN (operating)	Green	Lit	Unit operating normally.	
		Not lit	Unit error.	
TER (terminating resistance)	Yellow	Lit	Terminating resistance switch is ON.	
		Not lit	Terminating resistance switch is OFF.	
ERC (communications error)	Red	Lit	Communications error, node address setting error (same address set twice), or hardware error.	
		Not lit	Normal operation	
ERH (PLC error)	Red	Lit	PLC error, PLC interface error, EEPROM error, unit number error, or I/O table not set	
		Not lit	No error.	
INS (network participation)	Yellow	Lit	Unit is participating (inserted) in the network.	
		Not lit	Unit is not participating (inserted) in the network.	
SD (send)	Yellow	Lit	Data transmission.	
		Not lit	No data transmission.	
RD (receive)	Yellow	Lit	Data reception.	
		Not lit	No data reception.	
M/A (data link mode)	Yellow	Lit	Manual (see note)	**Note:** M/A is always not lit when data links are not active in the network.
		Not lit	Automatic	
LNK (data link)	Yellow	Lit	Data links participating.	
		Flashing	Error in data link table.	
		Not lit	Not in a data link or data link inactive.	

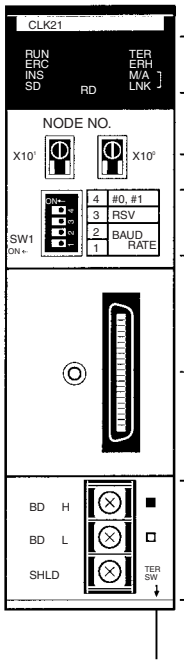
Note Even when the local node does not participate in the data link, the M/A indicator will be lit if there are manually set data links active on the network.

For details, refer to *9-1 Troubleshooting Using Indicators*.

Dimensions (Unit: mm)



3-1-3 C200HX/HG/HE Controller Link Unit



Indicators (Refer to pages 51, 274)

LED indicators that display the Unit and network status.

Node address switches (Refer to page 96)

Two rotary switches. The node address of the Unit on the Controller Link Network is set in 2-digit decimal.

Baud rate and operating level settings (Refer to page 97)

A four-pin DIP switch. The following settings are made.

Pins 1, 2: Baud rate
Pin 3: Not used (leave set to OFF)
Pin 4: Operating level

Bus Connection Unit Connector (Refer to page 61)

Connector used for connection to the CPU Unit.

Terminal block for the communications cable (Refer to page 68)

Terminals to connect to the Controller Link Network communications cable (twisted-pair cable).

Terminating resistance switch (underneath the Unit) (Refer to page 98)

A slide switch. Use this switch to set the terminating resistance to ON for nodes at both ends of the Controller Link Network.

Wired Unit Indicators

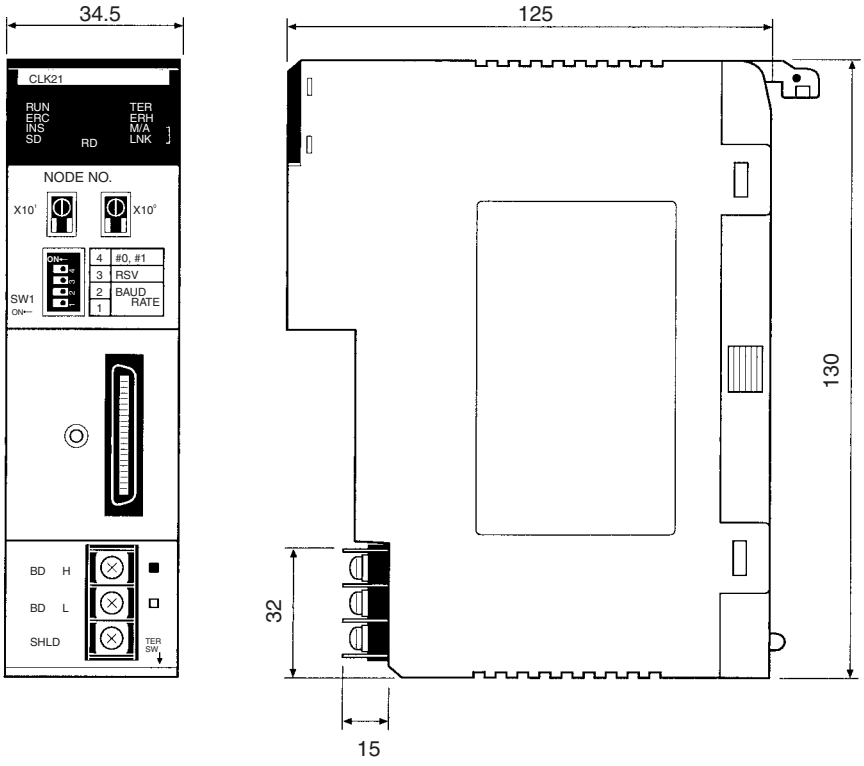
Name	Color	Status	Meaning	
RUN (operating)	Green	Lit	Unit operating normally.	
		Not lit	Unit error.	
TER (terminating resistance)	Yellow	Lit	Terminating resistance switch ON.	
		Not lit	Terminating resistance switch OFF.	
ERC (communications error)	Red	Lit	Communications error, node address setting error (same address set twice), or hardware error.	
		Not lit	Normal operation	
ERH (PLC error)	Red	Lit	PLC error, PLC interface error, EEPROM error, or PLC model setting error.	
		Not lit	No error.	
INS (network participation)	Yellow	Lit	Unit is participating (inserted) in the network.	
		Not lit	Unit is not participating (inserted) in the network.	
M/A (data link mode)	Yellow	Lit	Manual (see note)	**Note:** M/A is always not lit when data links are not active in the network.
		Not lit	Automatic	
LNK (data link)	Yellow	Lit	Data links participating.	
		Flashing	Error in data link table.	
		Not lit	Not in a data link or data link inactive.	
SD (send)	Yellow	Lit	Data transmission.	
		Not lit	No data transmission.	

Name	Color	Status	Meaning
RD (receive)	Yellow	Lit	Data reception.
		Not lit	No data reception.

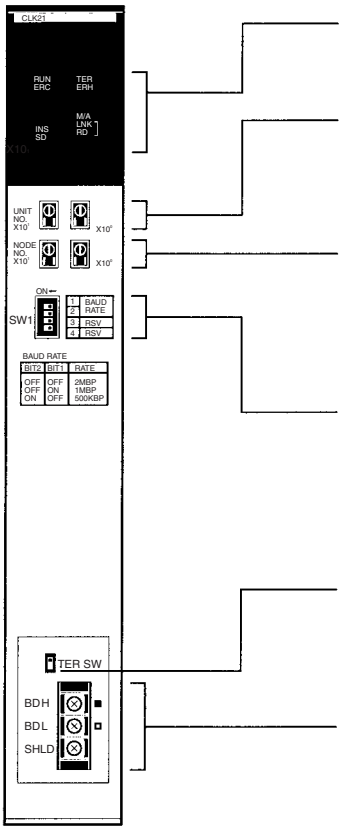
Note Even when the local node does not participate in the data link, the indicator will be lit if there are manually set data links active on the network.

For details refer to *9-1 Troubleshooting Using Indicators*.

Dimensions (Unit: mm)



3-1-4 CVM1 and CV-series Controller Link Unit



Indicators (Refer to pages 53, 285)

LED indicators that display the Unit and network status.

Unit number switches (Refer to page 100)

Two rotary switches. The unit number is set in 2-digit decimal for the Network to which the PLC is connected.

Node address switches (Refer to page 100)

Two rotary switches. The node address of the Unit on the Controller Link Network is set in 2-digit decimal.

Baud rate switch (Refer to page 101)

A four-pin DIP switch. The following setting is made.
Pins 1, 2: Baud rate
Pins 3, 4: Not used (always OFF)

Terminating resistance switch (Refer to page 101)

A slide switch. Use this switch to set the terminating resistance to ON for nodes at both ends of the Controller Link Network.

Terminal block for the communications cable (Refer to page 68)

Terminals to connect to the Controller Link Network communications cable (twisted-pair cable).

Wired Unit Indicators

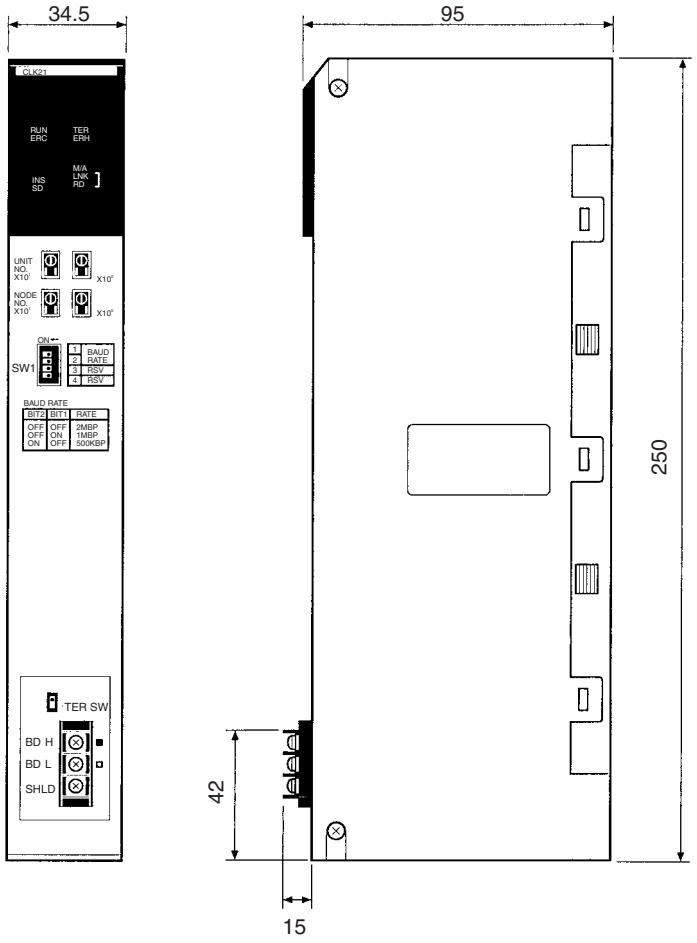
Name	Color	Status	Meaning	
RUN (operating)	Green	Lit	Unit operating normally.	
		Not lit	Unit error.	
TER (terminating resistance)	Yellow	Lit	Terminating resistance switch ON.	
		Not lit	Terminating resistance switch OFF.	
ERC (communications error)	Red	Lit	Communications error, node address setting error (same address set twice), or hardware error.	
		Not lit	Normal operation	
ERH (PLC error)	Red	Lit	PLC error, PLC interface error, EEPROM error, unit number error, or I/O table not set	
		Not lit	No error.	
INS (network participation)	Yellow	Lit	Unit is participating (inserted) in the network.	
		Not lit	Unit is not participating (inserted) in the network.	
M/A (data link mode)	Yellow	Lit	Manual (see note)	**Note:** M/A is always not lit when data links are not active in the network.
		Not lit	Automatic	
LNK (data link)	Yellow	Lit	Data links participating.	
		Flashing	Error in data link table.	
		Not lit	Not in a data link or data link inactive.	

Name	Color	Status	Meaning
SD (send)	Yellow	Lit	Data transmission.
		Not lit	No data transmission.
RD (receive)	Yellow	Lit	Data reception.
		Not lit	No data reception.

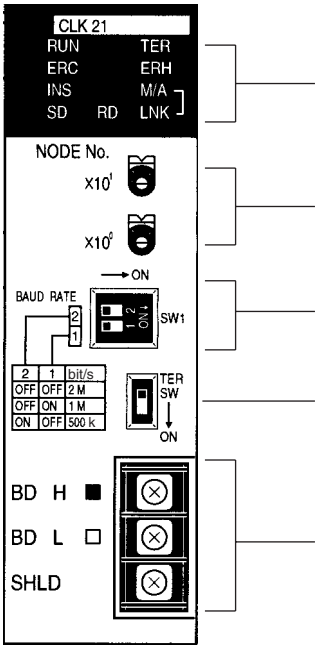
Note Even when the local node does not participate in the data link, the indicator will be lit if there are manually set data links active on the network.

For details refer to *9-1 Troubleshooting Using Indicators*.

Dimensions (Unit: mm)



3-1-5 CQM1H-series Controller Link Unit



Indicators (Refer to pages 55, 274)

LED indicators that display the Unit and network status.

Node address switches (Refer to page 103)

Two rotary switches. The node address of the Unit on the Controller Link Network is set in 2-digit decimal.

Baud rate switch (Refer to page 103)

Terminating resistance switch (Refer to page 104)

A slide switch. Use this switch to set the terminating resistance to ON for the nodes at both ends of the Controller Link Network.

Terminal block for the communications cable (Refer to page 68)

Terminals to connect to the Controller Link Network communications cable (twisted-pair cable).

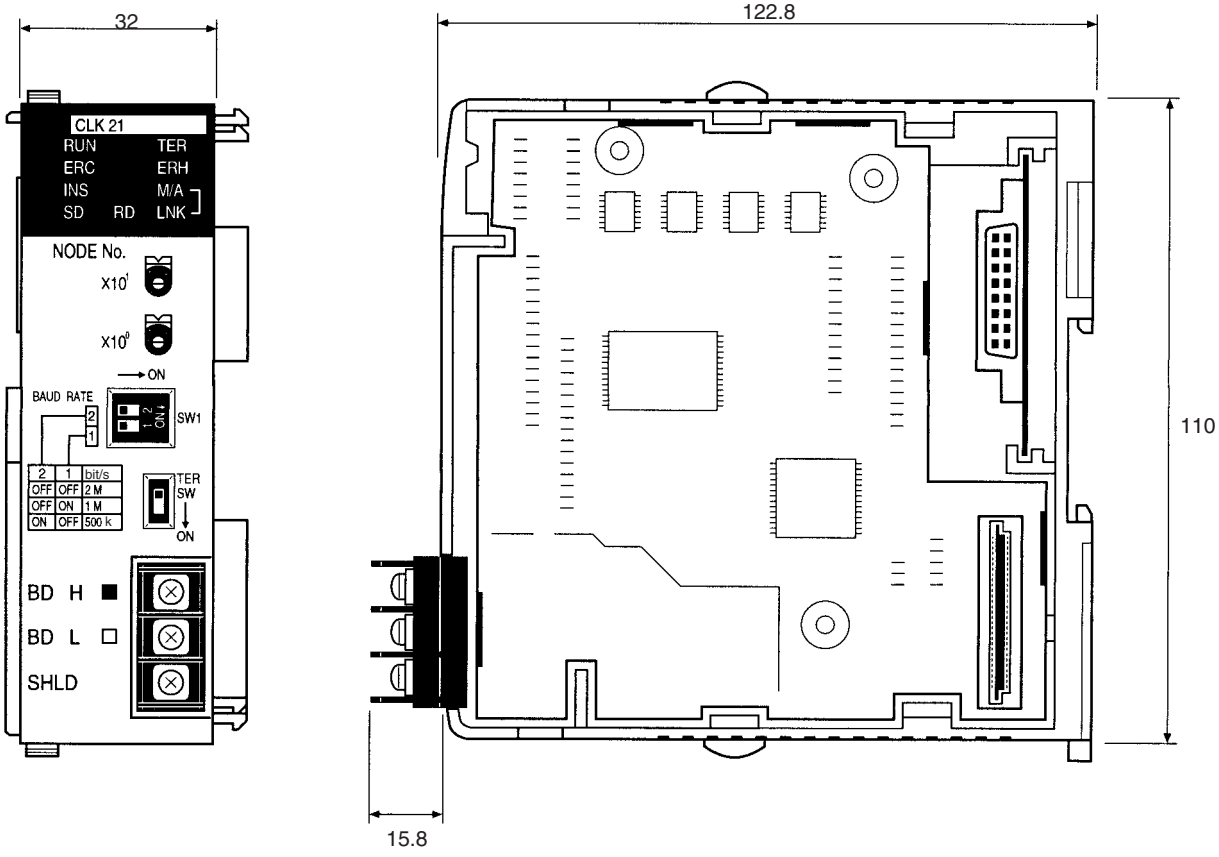
Wired Unit Indicators

Name	Color	Status	Meaning	
RUN (operating)	Green	Lit	Unit operating normally.	
		Not lit	Unit error.	
TER (terminating resistance)	Yellow	Lit	Terminating resistance switch ON.	
		Not lit	Terminating resistance switch OFF.	
ERC (communications error)	Red	Lit	Communications error, node address setting error (same address set twice), or hardware error.	
		Not lit	Normal operation	
ERH (PLC error)	Red	Lit	PLC error, PLC interface error, or EEPROM error	
		Not lit	No error.	
INS (network participation)	Yellow	Lit	Unit is participating (inserted) in the network.	
		Not lit	Unit is not participating (inserted) in the network.	
M/A (data link mode)	Yellow	Lit	Manual (see note)	**Note:** M/A is always not lit when data links are not active in the network.
		Not lit	Automatic	
LNK (data link)	Yellow	Lit	Participating in data links.	
		Flashing	Error in data link tables.	
		Not lit	Not in a data link or data link inactive.	
SD (send)	Yellow	Lit	Data transmission.	
		Not lit	No data transmission.	
RD (receive)	Yellow	Lit	Data reception.	
		Not lit	No data reception.	

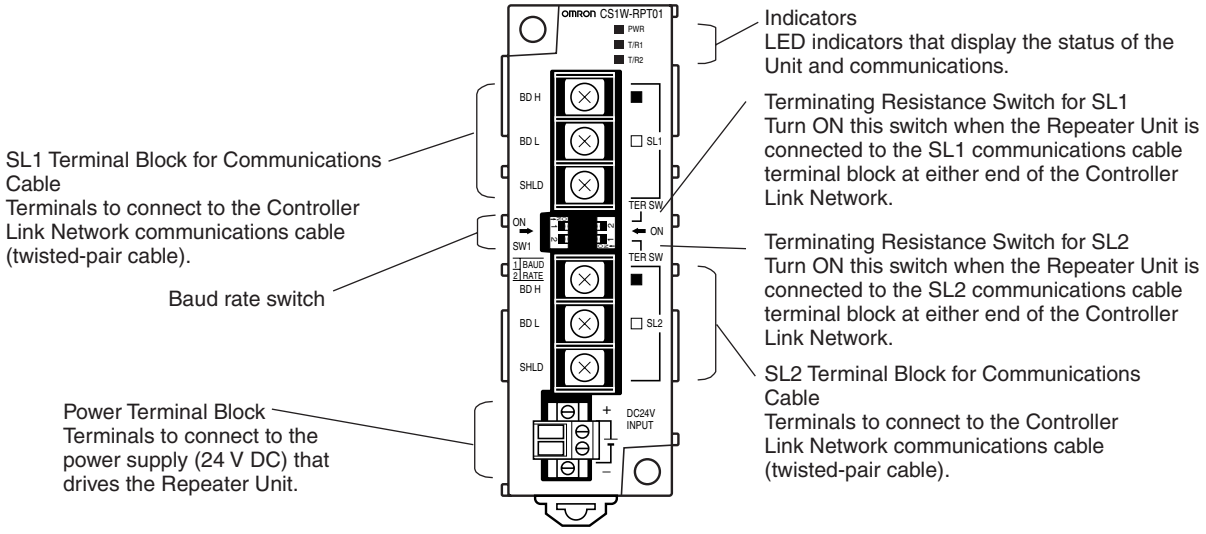
Note Even when the local node does not participate in the data link, the indicator will be lit if there are manually set data links active on the network.

For details refer to *9-1 Troubleshooting Using Indicators*.

Dimensions (Unit: mm)



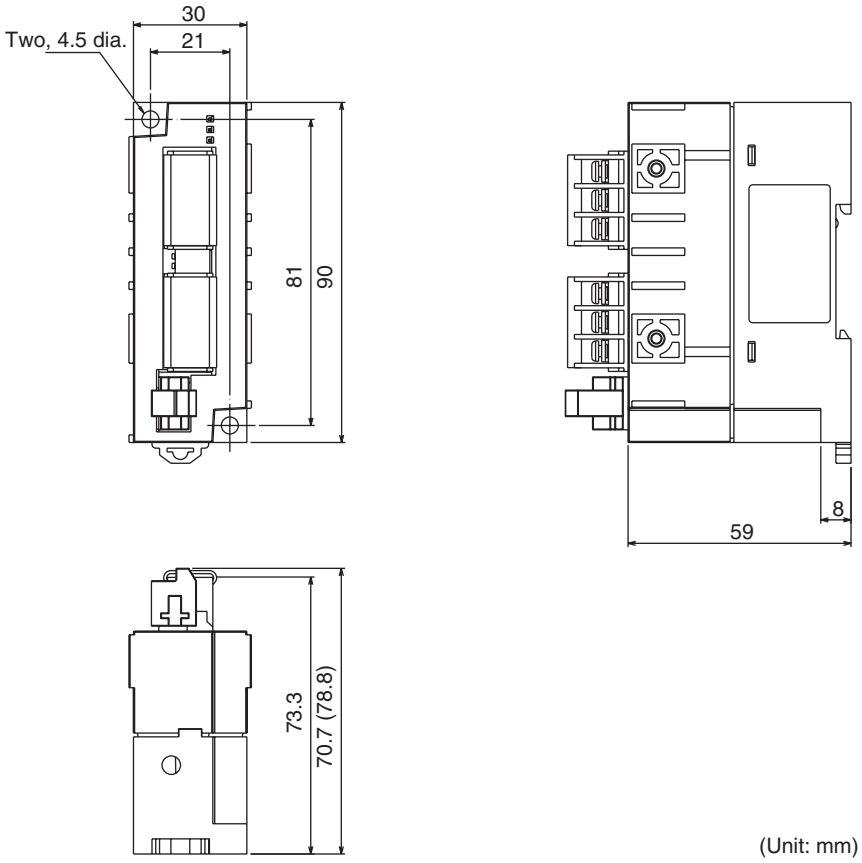
3-1-6 Wire-to-Wire Repeater Unit



Repeater Unit Indicators

Name	Color	Status	Meaning
PWR (Power supply)	Green	Lit	Power supply is ON.
		Not lit	Power supply is OFF.
T/R1 (SL1 communicating)	Yellow	Lit	Transmission signal is being sent or received.
		Not lit	No transmission signal.
TR2 (SL2 2 communicating	Yellow	Lit	Transmission signal is being sent or received.
		Not lit	No transmission signal.

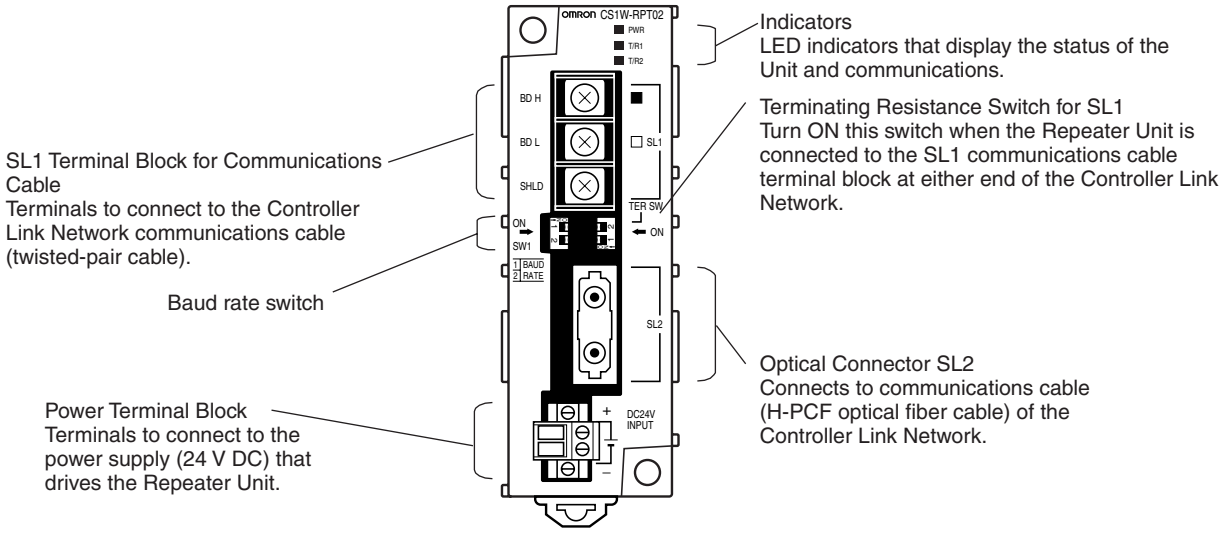
Dimensions (Unit: mm)



(Unit: mm)

Note: The figures in parentheses are the dimensions when the Unit is mounted with the old connector.

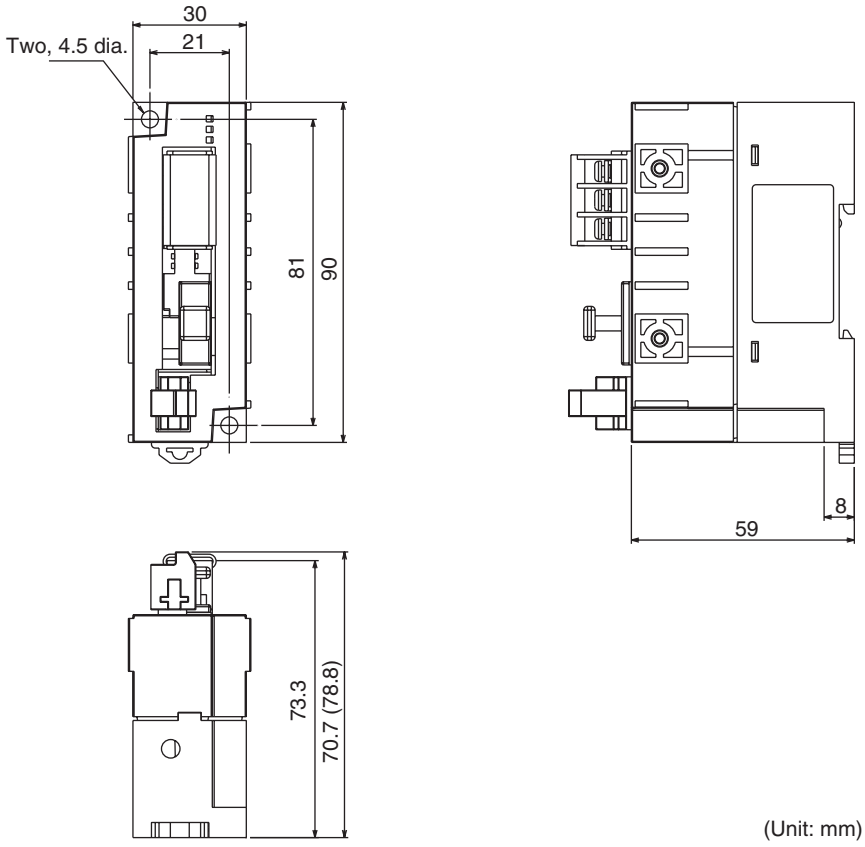
3-1-7 Wire-to-Optical (H-PCF) Repeater Unit



Repeater Unit Indicators

Name	Color	Status	Meaning
PWR (Power supply)	Green	Lit	Power supply is ON.
		Not lit	Power supply is OFF.
T/R1 (SL1 communicating)	Yellow	Lit	Transmission signal is being sent or received.
		Not lit	No transmission signal.
TR2 (SL2 2 communicating)	Yellow	Lit	Transmission signal is being sent or received.
		Not lit	No transmission signal.

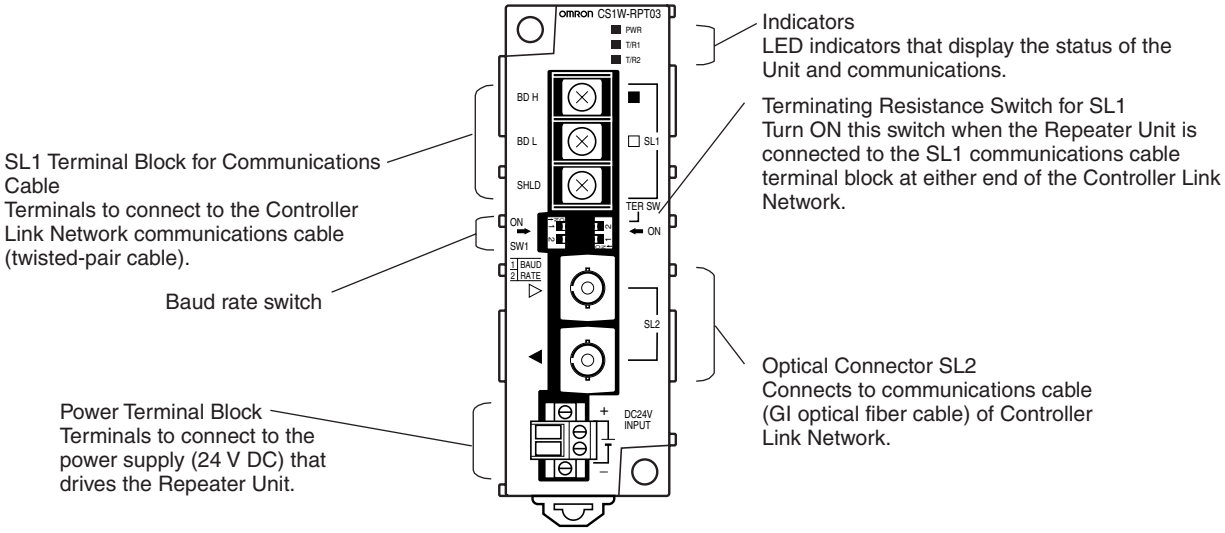
Dimensions (Unit: mm)



(Unit: mm)

Note: The figures in parentheses are the dimensions when the Unit is mounted with the old connector.

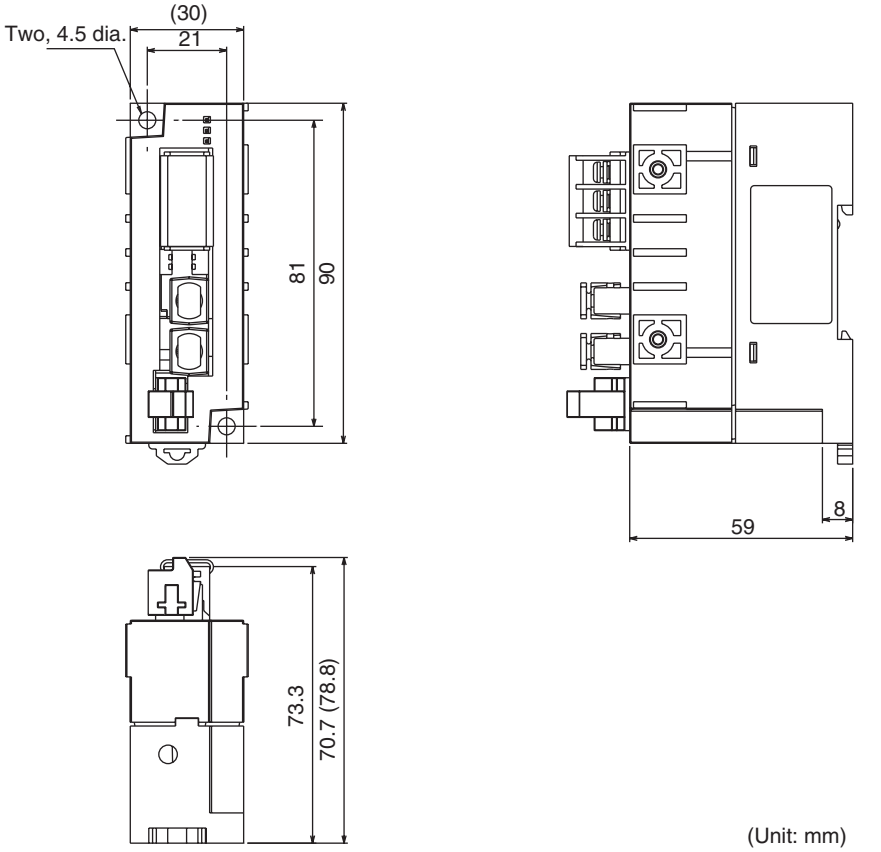
3-1-8 Wire-to-Optical (GI) Repeater Unit



Repeater Unit Indicators

Name	Color	Status	Meaning
PWR (Power supply)	Green	Lit	Power supply is ON.
		Not lit	Power supply is OFF.
T/R1 (SL1 communicating)	Yellow	Lit	Transmission signal is being sent or received.
		Not lit	No transmission signal.
TR2 (SL2 2 communicating)	Yellow	Lit	Transmission signal is being sent or received.
		Not lit	No transmission signal.

Dimensions (Unit: mm)



(Unit: mm)

Note: The figures in parentheses are the dimensions when the Unit is mounted with the old connector.

3-2 Unit Installation

- The Controller Link Unit is mounted onto a CPU Backplane or Expansion CPU Backplane for use. For detailed information on into a PLC installation procedures, refer to the PLC Installation Guide.
- Repeater Units are not mounted to the PLC. They are mounted separately with screws or onto a DIN Track.
- A Repeater Unit is not mounted to a PLC Rack, but rather is mounted to DIN Track or screw-mounted.

Note 1. Always turn off power to the PLC before mounting the Controller Link Unit into the Backplane or connecting the Bus Connection Unit.

2. Be sure that all screws on the Backplane, the Bus Connection Unit, the terminal block, and cables are tightened firmly. If screws work loose, a malfunction may occur as a result of vibration.
3. A label has been placed over the upper surface of the Controller Link Unit to prevent scraps of wire from entering the Unit. Conduct wiring and installation with this label in place. If wire scraps get into the Unit, it will malfunction.
4. Remove the label after wiring and installing the Controller Link Unit to prevent overheating. Overheating will cause the Unit to malfunction.

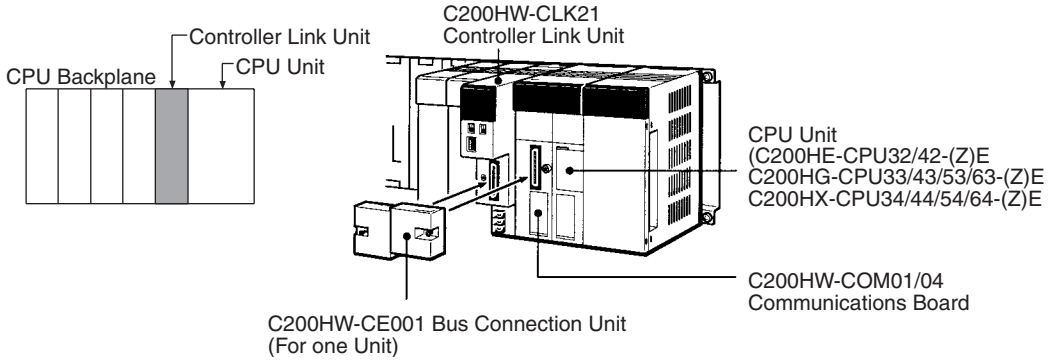
3-2-1 Mounting Controller Link Units

C200HX/HG/HE PLCs

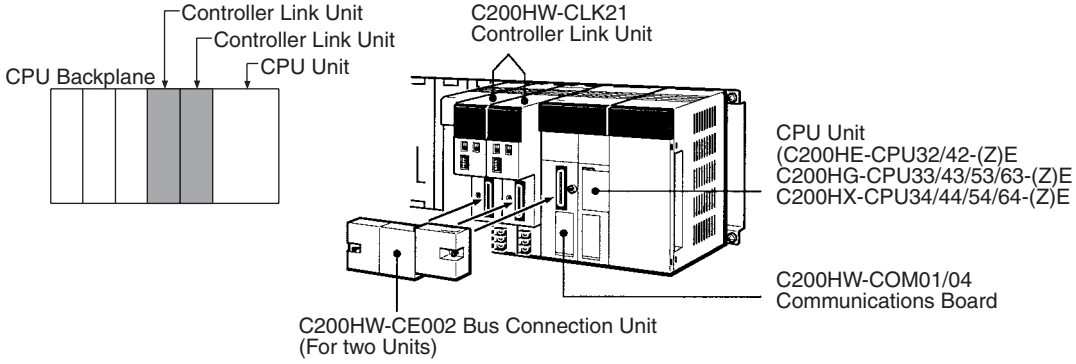
Up to two C200HX/HG/HE Controller Link Units can be mounted on the CPU Rack. Controller Link Units cannot be mounted to an Expansion I/O Rack or a Slave Rack.

Note Tighten the screws on the Backplane to a torque of 1.2 N·m.
Tighten the screws on the Bus Connection Unit to a torque of 0.4 N·m.

Installing One Controller Link Unit
Mount the Unit in the slot on the left of the CPU Unit.

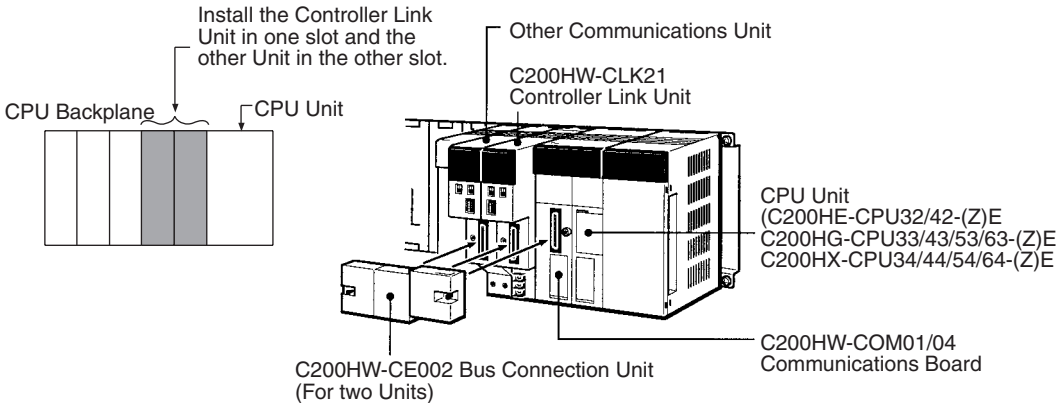


Installing Two Controller Link Units
Mount the Units in the two slots on the left of the CPU Unit.



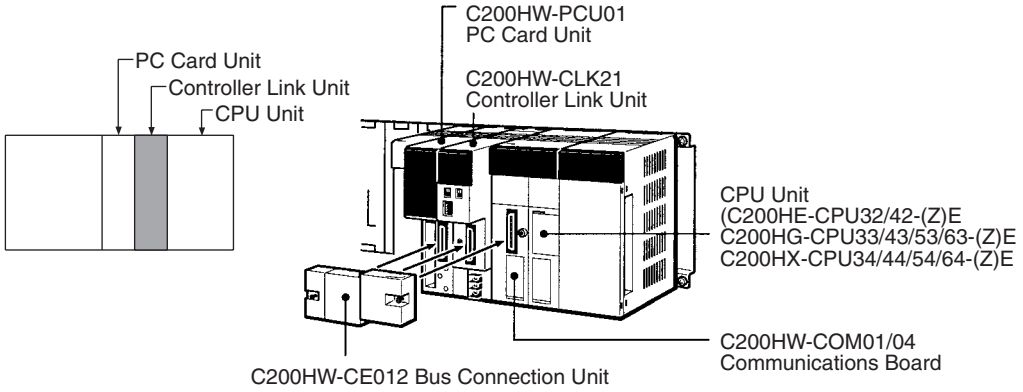
Installing with Another Communications Unit

When installing a Controller Link Unit along with another Communications Unit, such as a SYSMAC LINK Unit or a SYSMAC NET LINK Unit mount both Units in the 2 slots on the left of the CPU Unit.



Installing with a PC Card Unit

When installing a Controller Link Unit along with a PC Card Unit, mount the Controller Link Unit in the first slot on the left of the CPU Unit. Use the C200HW-CE012 Bus Connection Unit.

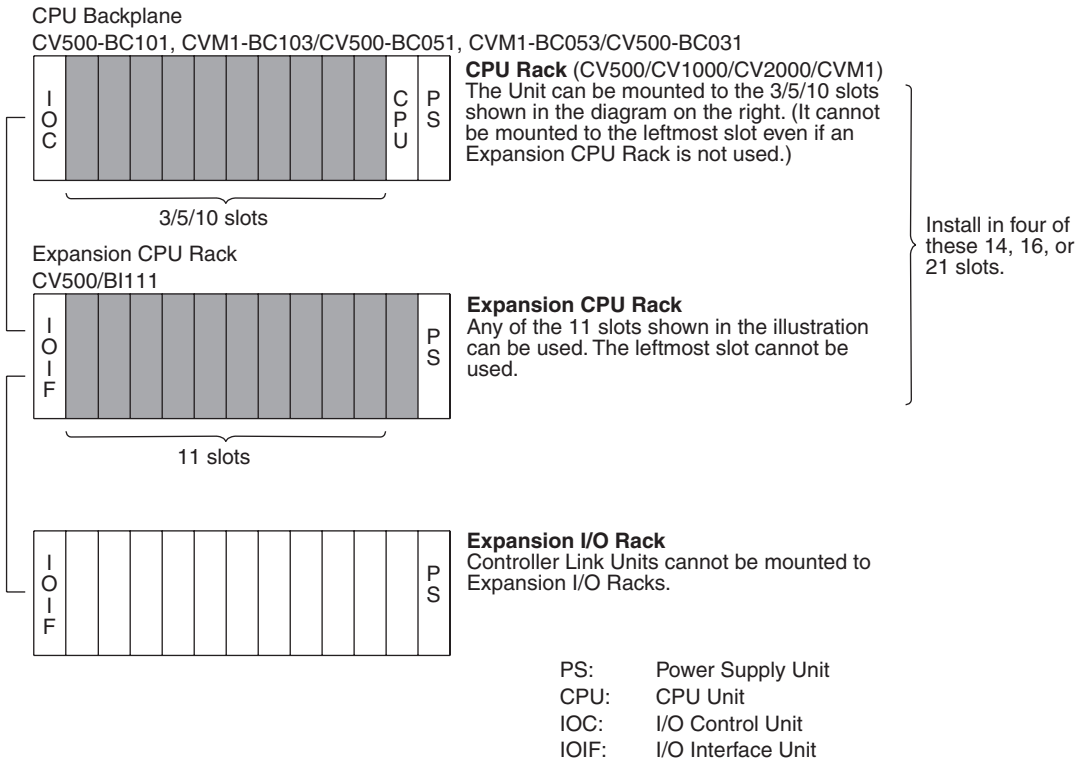


CVM1 and CV-series PLCs

Up to four Controller Link Units for CVM1 and CV-series PLCs can be installed in a CPU Backplane or a Expansion CPU Rack (including both Optical and Wired Units). Controller Link Units cannot be installed on an Expansion I/O Rack, a SYSMAC BUS Slave Rack, or a SYSMAC BUS/2 Slave Rack.

The CVM1 and CV-series Controller Link Unit is classified as a CPU Bus Unit and must be mounted in a CPU bus slot.

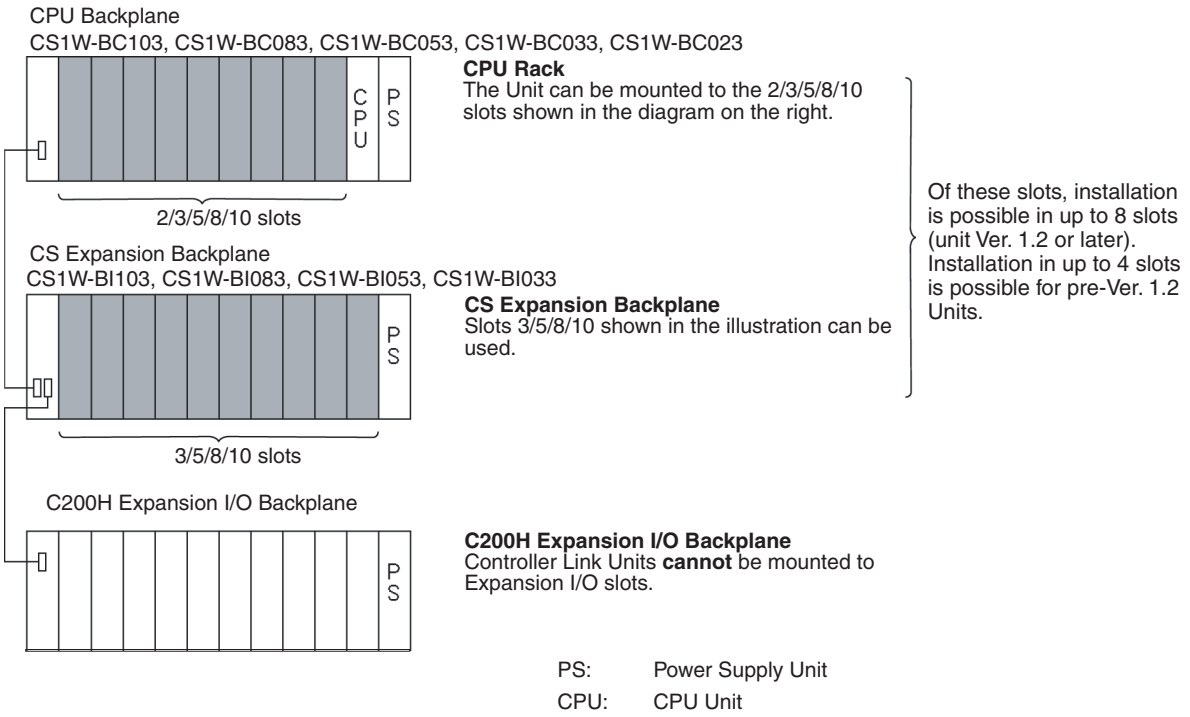
Note Tighten the screws on the Backplane to a torque of 1.2 N·m.
Tighten the fixed screws on the CPU Unit to a torque of 0.9 N·m.



CS-series PLCs

Up to a total of eight Controller Link Units with unit version 1.2 or later (wired, optical, and optical ring) for CS-series PLCs (or up to four pre-Ver. 1.2 Controller Link Units) can be installed in a CPU Backplane or a CS Expansion Rack. Controller Link Units cannot be installed on an C200H Expansion I/O Rack or a SYSMAC BUS Slave Rack.

Note Tighten the screws on the Backplane to a torque of 0.9 N·m.
Tighten the fixed screws on the CPU Unit to a torque of 0.4 N·m.



Note When installing several CS-series CPU Bus Units at the same time, a total of 16 CS-series CPU Bus Units maximum may be installed.

When connecting multiple Controller Link Units to the CPU Unit, consider the current consumption of the CPU Unit and each CPU Bus Unit before selecting the Power Supply Unit. For details on Controller Link Unit current consumption, refer to *Controller Link Unit Models and PLCs* on page 18. For details on current consumption of each Unit, refer to the *SYSMAC CS Series Programmable Controllers Operation Manual* (W339).

The following table provides an example of current consumption

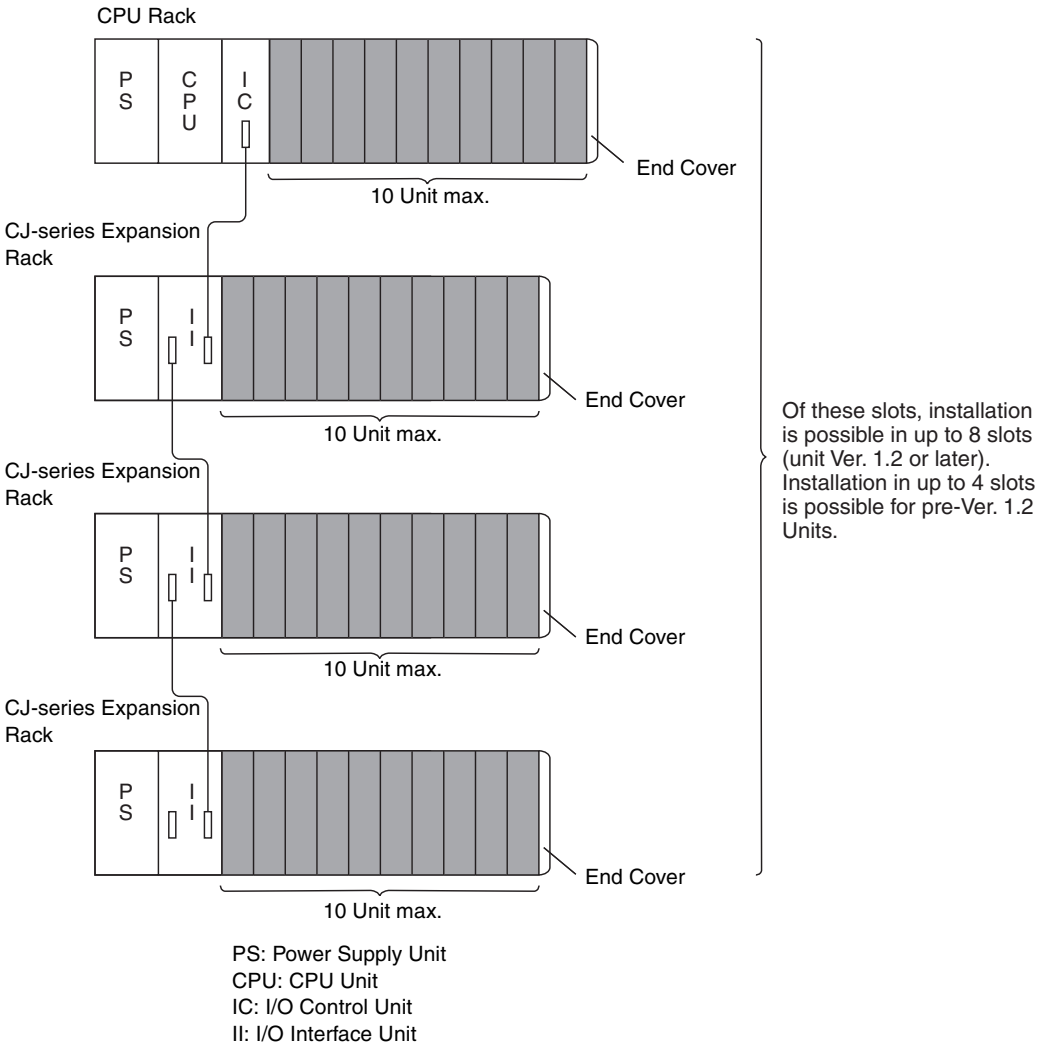
Example: Using the C200HW-PA204 Power Supply Unit supplying a maximum current of 4.6 A (5 V) and maximum power of 30 W.

Name	Model	Current consumption per Unit (A)	Number of Units	Current consumption (A)
CPU Backplane (8 slots)	CS1W-BC083	0.11 A	1	0.11 A
CPU Unit	CS1H-CPU67H	0.82 A	1	0.82 A
Controller Link Unit (Optical)	CS1W-CLK21-V1	0.33 A	8	2.64 A
Total				3.57 (power consumption: 17.85 W)

CJ-series PLCs

A total of up to eight Controller Link Units (unit version 1.2 or later) for CJ-series PLCs can be connected in a CPU Rack or Expansion Rack. (A total of

up to four Pre-Ver. 1.2 models can be connected.) Be sure to secure the Units with the top and bottom sliders.



PS: Power Supply Unit
CPU: CPU Unit
IC: I/O Control Unit
II: I/O Interface Unit

Note When installing several CJ-series CPU Bus Units at the same time, a total of 16 CJ-series CPU Bus Units maximum may be installed.

When connecting multiple Controller Link Units to the CPU Unit, consider the current consumption of the CPU Unit and each CPU Bus Unit before selecting the Power Supply Unit. For details on Controller Link Unit current consumption, refer to *Controller Link Unit Models and PLCs* on page 18. For details on current consumption of each Unit, refer to the *SYSMAC CJ Series Programmable Controllers Operation Manual* (W393).

The following table provides an example of current consumption

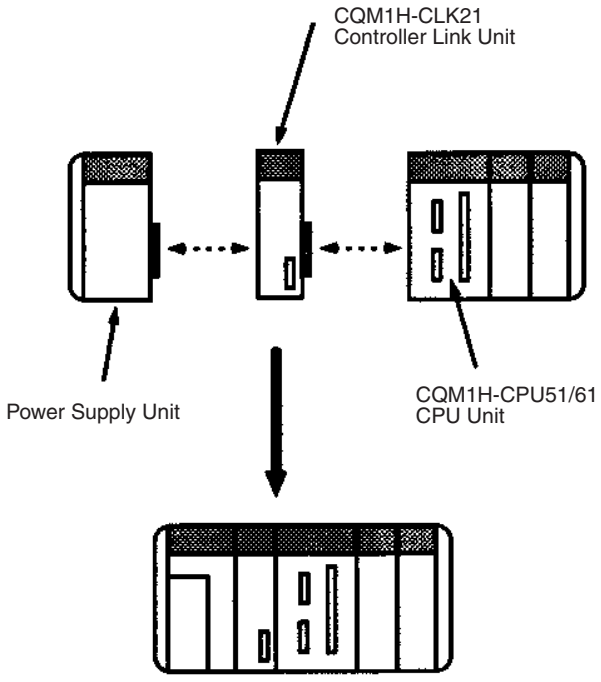
Example: Using the CJ1W-PA205R Power Supply Unit supplying a maximum current of 5.0 A (5 V) and maximum power of 25 W.

Name	Model	Current consumption per Unit (A)	Number of Units	Current consumption (A)
CPU Unit	CJ1W-CPU66H	0.99 A	1	0.99 A
Controller Link Unit (Optical)	CJ1W-CLK21-V1	0.35 A	8	2.8 A
Total				3.79 (power consumption: 18.95 W)

CQM1H-series PLCs

Only one Controller Link Unit can be connected in a CQM1H-series PLC. Connect the Controller Link Unit to the left side of the CPU Unit and then connect the Power Supply Unit to the left of the Controller Link Unit.

After the Units have been connected, secure them with the slide locks on the top and bottom of the Units.



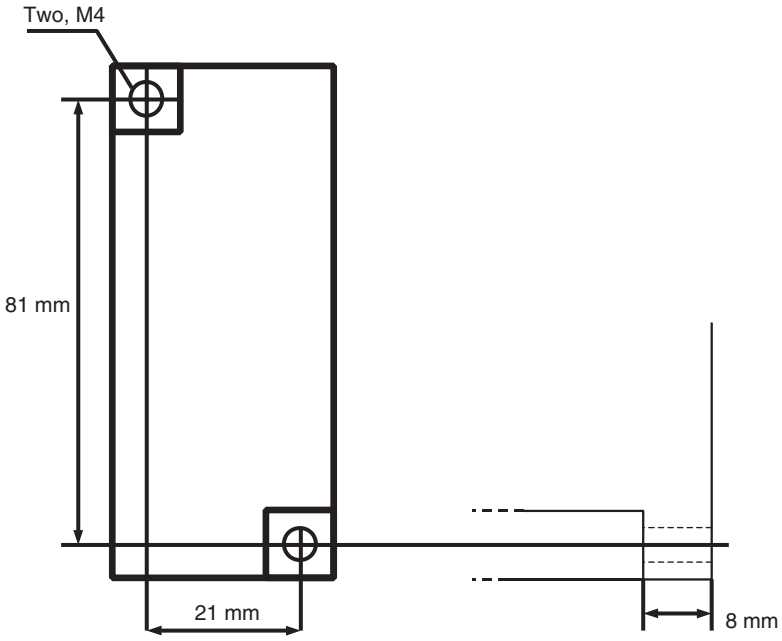
Note The CQM1H-CLK21 Controller Link Unit can be connected only to the CQM1H-CPU51/61 CPU Unit. It cannot be connected to the CQM1H-CPU11/21 CPU Unit.

3-2-2 Mounting a Repeater Unit

Repeater Units can be either mounted on a DIN Track or screw-mounted.

Screw-mounting a Repeater Unit

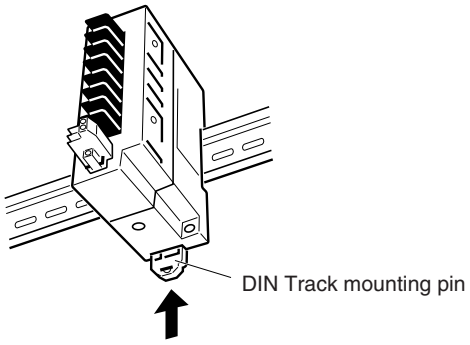
Use M4 × 15 screws to mount the Unit as shown in the following diagram.



Mounting a Repeater Unit on DIN Track

1,2,3...

1. Unlock the DIN Track mounting pins located on the rear of the Repeater Unit.
2. Attach the Repeater Unit by hooking it onto the DIN Track from above (1) and then pressing it into place (2).
3. Lock all DIN Track mounting pins.



4. Secure the Repeater Unit by mounting one End Plate on each side of the Unit. End Plates are attached by hooking first the bottom (1) then the top of the Plate onto the DIN Track and pulling down (2). Use the screw on the each End Plate to fasten it in place.

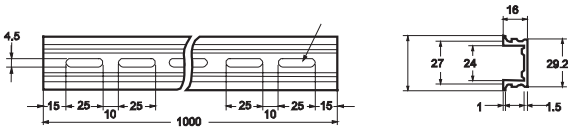
DIN Track

Mount the Repeater Unit to DIN Track. Use at least three screws to attach the DIN Track to the control panel.

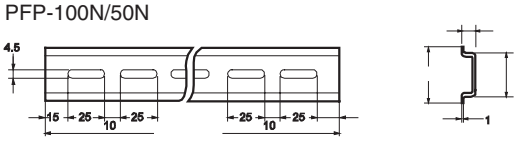
DIN Track: PFP-50N (50 cm), PFP-100N (100 cm), PFP-100N2 (100 cm)

The DIN Track should be attached within the control panel using M4 screws spaced not more than 210 mm (not more than 6 holes) apart. Attach a DIN Track in at least 3 points for the longest DIN Track length. Tightening torque should be 1.2 N·m.

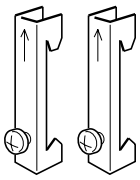
PFP-100N2



PFP-100N/50N



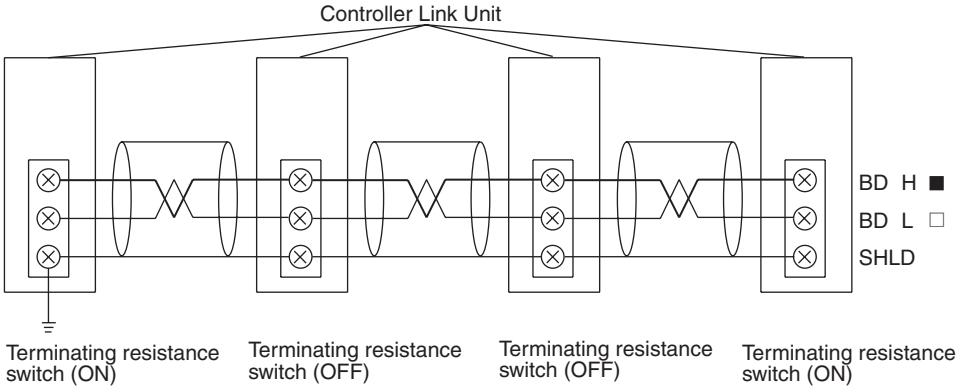
End Plate: PFP-M (2 Plates required per Repeater Unit)



3-3 Wiring

3-3-1 Communications Cables

Using the specified twisted-pair cable, connect all nodes using the multidrop method.



Communications Cables

The following shielded twisted-pair cables should be used for Controller Link Network connections.

Model	Manufacturer
Li2Y-FCY2 x 0.56 qmm	Kromberg & Schubert, Komtec Department
1 x 2 x AWG – 20PE + Tr.CUSN + PVC	Draka Cables Industrial
#9207	Belden
ESVC 0.5 x 2 C	Bando Densen Co.
ESNC0.5X2C-99-087B	Japan Electric Wire & Cable Co.
ESPC 1P x 0.5 mm^2	Nagaoka Electric Wire Co., Ltd.

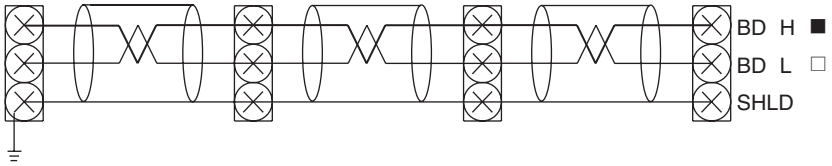
Note

1. Use the specified cable only.
2. Keep communications cables separated from power lines or a high-tension lines to prevent influences from electronic noise.

3. Do not connect the shield cable of the communications cable to a ground that is also being used for power-system devices, such as inverters.
4. Ground the shield line of the communications cable at one end of the network. Do not ground the shield at both ends.
5. Do not run wiring outdoors. If outdoor wiring is necessary, take protective measures against lightning, such as underground wiring or wiring inside pipes.
6. The minimum length of the communications cable between nodes is 1 m. Prepare the communications cables at a length of 1 m or more.
7. Use the multidrop method for connecting nodes. Normal communications will not be possible with T branches.
8. Turn ON the terminating resistance switch at the nodes at both ends of the network to connect terminating resistance. Turn OFF the terminating resistance switch at all other nodes.
9. A label has been placed over the upper surface of the Controller Link Unit to prevent scraps of wire from entering the Unit. Conduct wiring and installation with this label in place. If wire scraps get into the Unit, it will malfunction (C200HW-CLK21, CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, and CQM1H-CLK21 only).
10. Remove the label after wiring to avoid overheating. Overheating will cause the Unit to malfunction (C200HW-CLK21, CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, and CQM1H-CLK21 only).

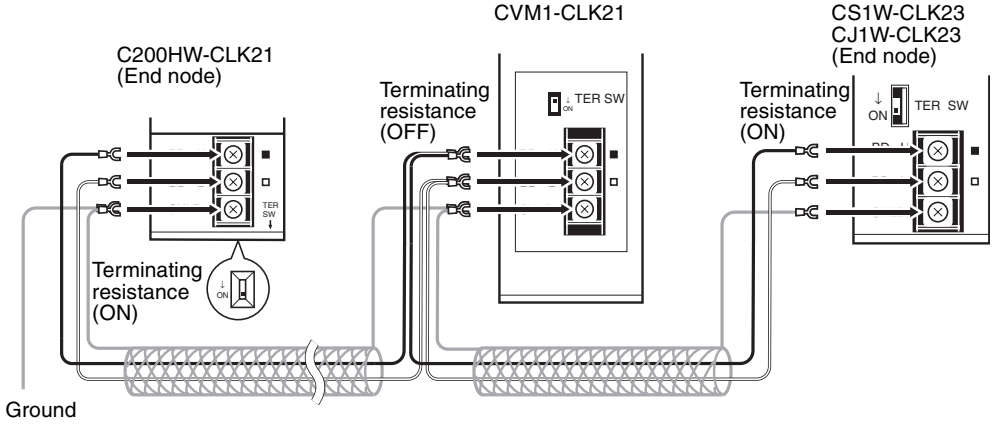
Connecting the Shield Line

Connect both ends of the shield line to the terminal blocks and earth the terminal block at the one end of the network.



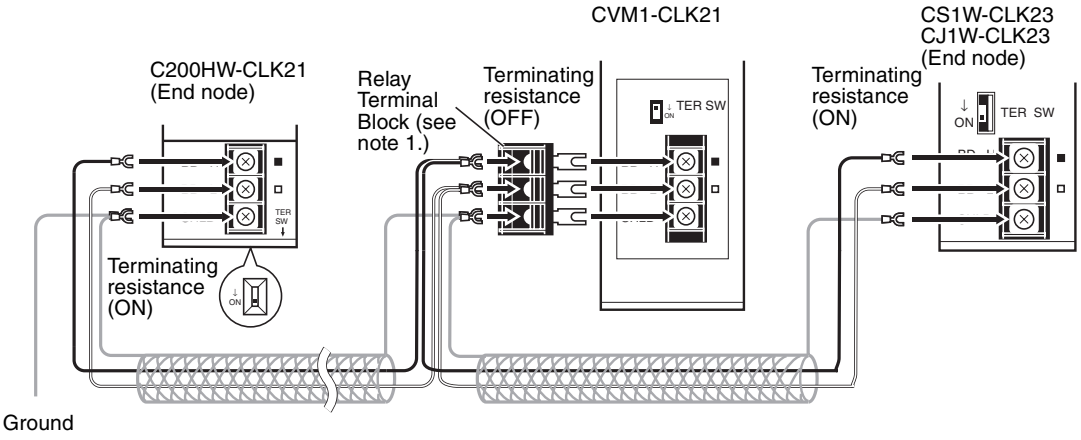
Terminal Block Connections

Not Unit a Relay Terminal Block



Note Use the recommended crimp terminals when connecting the cable's signal lines or shield line to the terminal blocks. Short circuits can damage the Units.

Using a Relay Terminal Block



Note

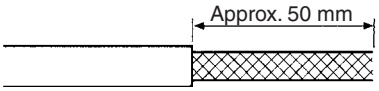
1. Mounting and dismounting during communications is not possible for Relay Terminal Blocks connected to the nodes at the ends of the network (i.e.: the nodes with terminating resistance).
2. Use the recommended crimp terminals when connecting the cable's signal lines or shield line to the terminal blocks. Short circuits can damage the Units.

Connecting the Communications Cables

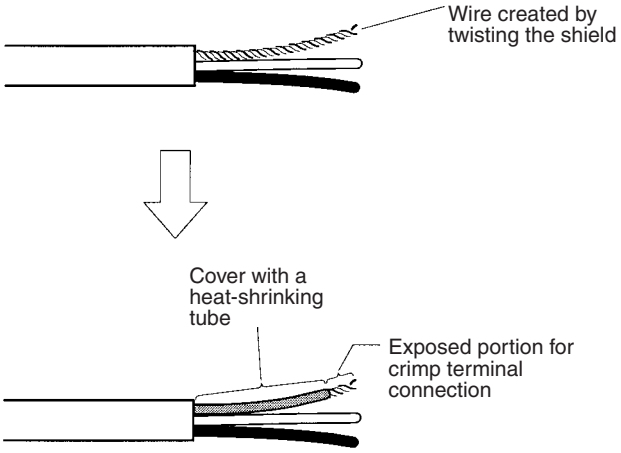
Use crimp terminals when connecting communications cables to a Controller Link Unit. Use the following procedure to connect communications cables to a terminal block.

1,2,3...

1. Peel back the cover of the cable for about 50 mm without scratching the mesh of the shield. Do not peel too much because it may cause a short-circuit.



2. Twist the mesh of the shield to form a line.
3. Leave the tip of the wire created by twisting the shield exposed and cover the remaining section with a heat-shrinking tube.

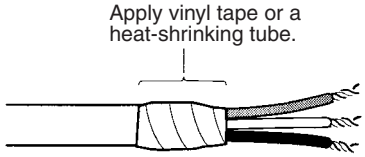


4. Remove enough of the cover from the signal lines to allow the crimp terminals to be connected, taking care not to damage the signal lines. Damage to the signal lines could cause the cable to break.

5. Twist firmly the portion of the signal lines that are exposed.



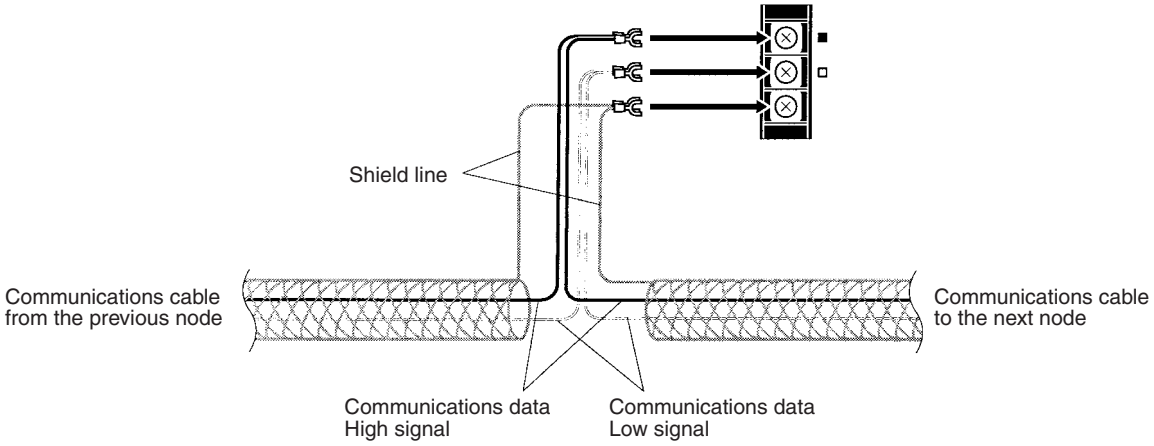
6. Apply vinyl tape or heat-shrinking tube to the end of the cover that was peeled in step 1.



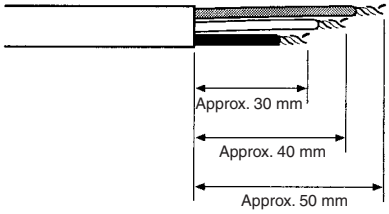
7. Mount the crimp terminal onto the signal lines and the shield line. Use M3 crimp terminals, as illustrated below.

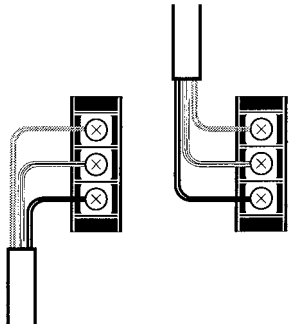


8. Connect the signal lines and the shield line to the terminal block using the markings on the terminal block.

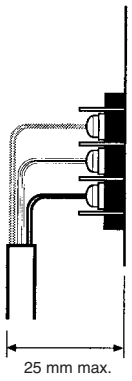


Note a) You can change the length of the signal lines as shown in the following diagrams to make wiring a lot easier.



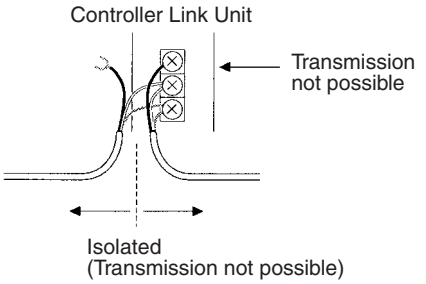


b) The approximate dimension for when the cable has been wired from the terminal block along the front of the Unit is shown in the following diagram.



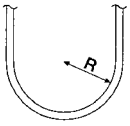
Note

1. Always turn OFF the power to the PLC before connecting the communications cables.
2. Always use a crimp terminal for wiring. If a wire that has only been twisted is connected directly to a terminal block, short circuit, malfunction and product damage will result.
3. Use the recommended crimp terminals.
4. When mounting the crimp terminal, always use the appropriate tools for each crimp terminal and follow the appropriate installation procedures. Contact the crimp terminal manufacturer for details on the appropriate tools and procedures. Failure to use the appropriate tools and procedures could cause cables to break.
5. Measure the length of peeled cable during installation according to the crimp terminal used and make sure that the peeled length is not too long. Cover the compressed section of the crimp terminal and cable with vinyl tape or heat-shrinking tube.
6. Be sure not to confuse the signal lines and shield line connections.
7. Tighten the screws on the terminal block firmly. The correct tightening torque is 0.5 N·m.
8. If a signal line disconnects from the terminal, either the Unit will be unable to communicate with other nodes on the network or that section of the network will be isolated from other nodes. Be sure not to pull on the signal lines.



9. Do not pull on a communication cable.

10. When bending a communications cable, allow 60 mm or more for the bending radius (R).



11. Do not place any object on the communications cable.
12. Supply power only after checking the wiring thoroughly.
13. Connect the terminal block only after checking it thoroughly.
14. Marks are provided on the terminal block for the signal lines. Connect the signal lines according to the marks. The marks correspond to signal lines as listed below.

Mark	Signal name	Line color
■	BDH (communications data high)	Black
□	BDL (communications data low)	White
None	SHLD (shield)	---

3-3-2 Repeater Units

Power Supply Wiring

Repeater Units must be supplied with DC power. The procedure for wiring the power supply is the same for all Repeater Units (CS1W-RPT01/02/03).

Use the following procedure to wire the power supply to Repeater Units.

1,2,3... 1. Attach the following crimp terminal to each of the two power lines.

Crimp terminal: AI Series manufactured by Phoenix Contact



Insert the cable and then crimp the terminal.

The following specialized tool is available for this purpose:
ZA3 manufactured by Phoenix Contact

2. Insert the crimp terminals on the positive and negative power lines into the orange power connectors located near the bottom of the front panel of the Repeater Unit. Insert the positive line in the top and the negative line in the bottom.
3. Use a small, flat-blade screwdriver to fasten the crimp terminals in place.

Note

1. Supply power to the Repeater Unit using a power supply installed specifically for the Repeater Unit. Do not supply power to the Repeater Unit from an I/O power supply, motor power supply, or control power supply.
2. To prevent the power supply from being affected by noise, wire and install the power supply away from power lines and high-voltage lines.
3. Attach special-purpose crimp terminals to the power cables.
4. Do not connect the positive and negative lines to the wrong connectors.
5. The power cable screws should be fastened to a tightening torque of 0.2 N·m.
6. Do not pull on the power cable.
7. Do not bend the power cable past its natural bending radius.

8. Do not place any object on the power cable.
9. Check that connectors are correctly attached before using the Unit.

Power Supply Specifications

The power supply to the Repeater Unit must meet the following specifications.

Item	CS1W-RPT01 Wire-to-Wire Repeater Unit	CS1W-RPT02 Wire-to-Optical (H-PCF) Repeater Unit	CS1W-RPT03 Wire-to-Optical (GI) Repeater Unit
Power supply voltage	24 V DC		
Allowable power supply voltage range	20.4 to 26.4 V DC (24 V DC, –15% to 10%)		
Current consumption	24 V DC at 60 mA max.	24 V DC at 60 mA max.	24 V DC at 70 mA max.
Inrush current	2.5 A max. (24 V DC with rise time 5 ms)		
Power terminal block	One connector to connect to the power terminal block is provided.		

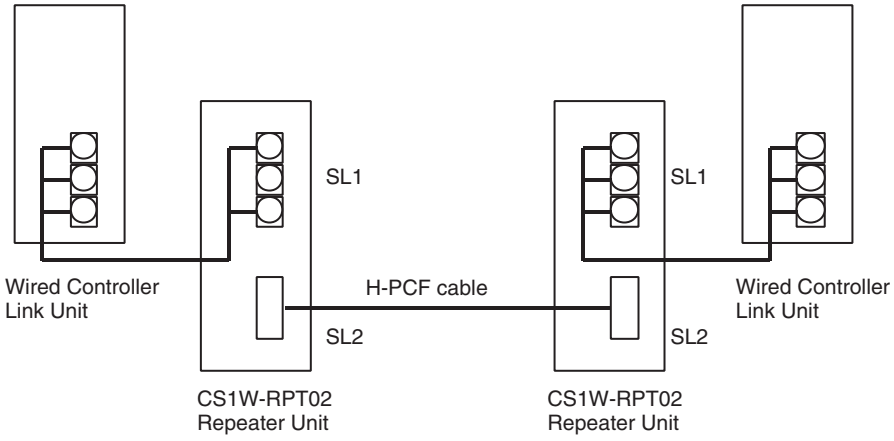
The following Power Supply Unit is recommended:

OMRON S82K Series

Laying Optical Cable (CS1W-RPT02/03 Only)

Optical fiber cable (H-PCF or GI) can be used to create an optical connection in part of a wired network.

CS1W-RPT02 (H-PCF)



Note

1. Always use the specified Optical Fiber Cables.
2. The maximum distance between nodes depends on how the cable is connected. For details, refer to the applicable Optical Fiber Cable (H-PCF) manual.

Connection Procedure

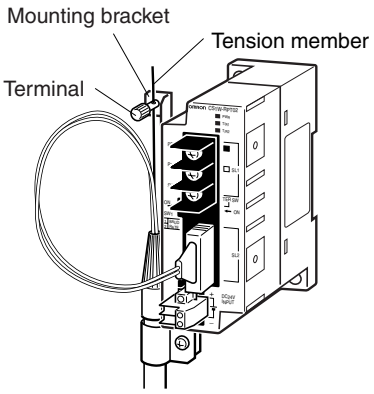
Use the following procedure to connect Optical Fiber Cables to a Unit.

1,2,3...

1. Tighten screws in the mounting brackets so that the through-holes on the terminal are on the top and bottom and then affix hexagonal nuts from the opposite side of the terminal.
2. Insert bushing to the mounting bracket and secure the Unit with screws.
3. Pass the tension member through the through-holes, and tighten the terminal screws to affix the tension member.
4. Affix the cable to the mounting bracket so that it is clamped by the bracket.

5. Move the cable connector so that the loose ends are on the left-hand side, and insert the Unit's optical connector as far as it will reach.

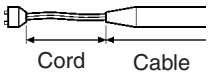
Example: Connections for Duplex Operation of Communications Units



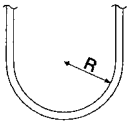
- Insert the connectors completely and always check that the connectors are locked before starting operation.

Even in token-ring mode, the network will be broken and communications may be disrupted if disconnections occur at two or more places. Be sure not to allow connectors to be disconnected during communications.

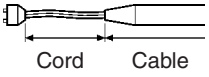
- Do not pull on the Optical Fiber Cable too forcefully.
  The maximum tension that can be applied to the cord is 10 kg and the maximum tension that can be applied to the cable is 50 kg.



- Do not bend the cable too sharply. The minimum radius for bends is 10 cm.



- To prevent the Optical Fiber Cable from being pulled too forcefully, always use the cable securing bracket and provide space below the Unit as shown in the following diagram. Do not exceed the maximum tension for the cord and cable:
  Cord: 0 kg (Do not apply any tension.)
  Cable: 5 kg



- Do not place objects on top of the Optical Fiber Cable. The maximum pressure that can be placed on the cord and cable is as follows:
  Cord: 30 kg/10 cm
  Cable: 50 kg/10 cm
- Inspect the connector before installing it.

Communications Cables

Optical Bus or Optical Ring System (H-PCF Cable)

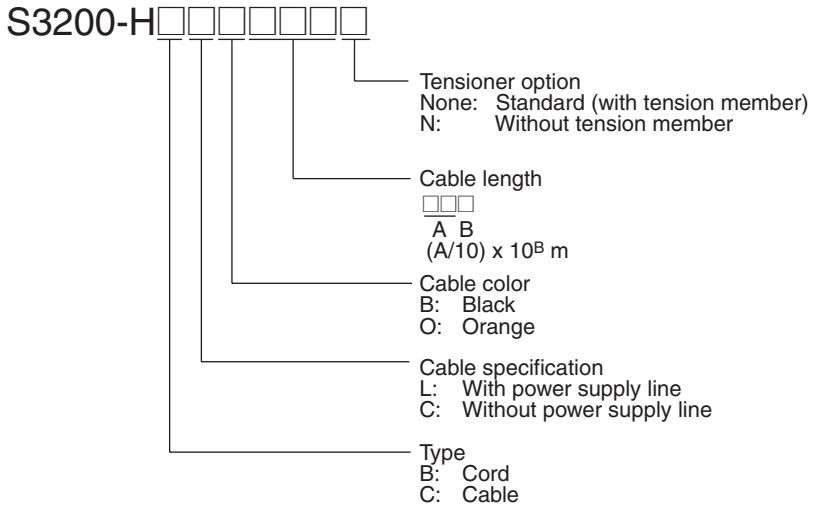
The following devices are required for the Optical Bus or Optical Ring (H-PCF) Controller Link Network. The cable and connectors are the same as those used for Optical SYSMAC LINK Networks.

Optical Fiber Cables (Indoor Use Only)

Use the following Optical Fiber Cables (Hard Plastic-clad Fiber: H-PCF).

Name	Specifications		Model
H-PCF cables	Black	10 m	S3200-HCCB101
		50 m	S3200-HCCB501
		100 m	S3200-HCCB102
		500 m	S3200-HCCB502
		1,000 m	S3200-HCCB103
	Orange	10 m	S3200-HCCO101
		50 m	S3200-HCCO501
		100 m	S3200-HCCO102
		500 m	S3200-HCCO502
		1,000 m	S3200-HCCO103

Note The Optical Fiber Cable model numbers are as follows.



Name	Model	Specifications
Connector	S3200-COCF2071	Use to connect a cable to a node. (Full-lock connector for crimp-cut cable.)
	S3200-COCF2571	Use to connect a cable to a node. (Half-lock connector for crimp-cut cable.)
Inline Adapter	S3200-COIAT2000	Use to connect or extend cables. (Use one adapter for each connection.)

Note

1. Either full-lock or half-lock connectors can be used in a Controller Link Network, but we recommend full-lock connectors to prevent accidental disconnections during operation.
2. The maximum distance between nodes is slightly shorter for connectors with crimp-cut cables compared to connectors assembled with adhesive. Also, the maximum distance is reduced due to extension loss when Inline Adapters are used to extend cables.

Optical Fiber Cables with Connectors (Indoor Use Only)

The following Optical Fiber Cables are available with Connectors already attached.

Specifications	Length	Model
Optical Fiber Cable Connectors: S3200-COCF2071 ⇓ S3200-COCF2071	2 m	S3200-CN201-20-20
	5 m	S3200-CN501-20-20
	10 m	S3200-CN102-20-20
	15 m	S3200-CN152-20-20
	20 m	S3200-CN202-20-20
	Over 20 m	S3200-CN-20-20 (Specify length (m) when ordering.)
Optical Fiber Cable Connectors: S3200-COCF2071 ⇓ S3200-COCF2571	2 m	S3200-CN201-20-25
	5 m	S3200-CN501-20-25
	10 m	S3200-CN102-20-25
	15 m	S3200-CN152-20-25
	20 m	S3200-CN202-20-25
	Over 20 m	S3200-CN-20-25 (Specify length (m) when ordering.)
Optical Fiber Cable Connectors: S3200-COCF2571 ⇓ S3200-COCF2571	2 m	S3200-CN201-25-25
	5 m	S3200-CN501-25-25
	10 m	S3200-CN102-25-25
	15 m	S3200-CN152-25-25
	20 m	S3200-CN202-25-25
	Over 20 m	S3200-CN-25-25 (Specify length (m) when ordering.)

Note

1. Consult a specialist tradesman if cables with outdoor specifications are required.
2. The cables listed above are black and have power supply lines and tension members, although the power supply lines aren't used in the Controller Link Network.
3. All of the cables listed above are attached to the connectors with adhesive.
4. Special training is required to assemble Optical Fiber Cables and connectors with adhesive.

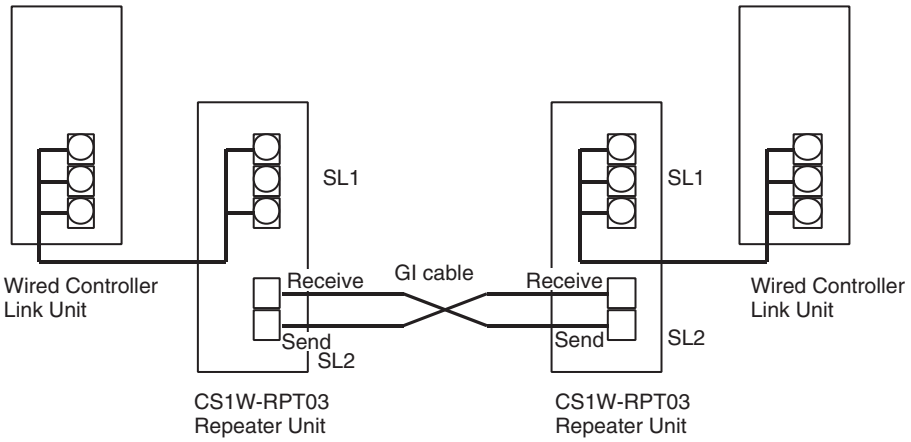
Optical Fiber Cable Accessories

Use the following accessories to assemble and test Optical Fiber Cables.

Name	Model	Specifications	Manufacturer
Optical Fiber Assembly Tool	CAK-0057	Crimp-cut tool for the S3200-COCF2071/2571 Connectors	Sumitomo Electric Industries, Ltd.
Optical Power Tester	CAT-2700	With CAT-2702 Head Unit and adapter for the S3200-COCF2071/2571 Connectors	
Master Fiber Set	CAT-2001H	One meter cable for use with the CAT-2702 Head Unit	

This manual does not provide details on Optical Fiber Cable preparation. For details, refer to the instructions provided with the CAK-0057 or the S3200-CAK1062 Assembly Tool.

CS1W-RPT03 (GI)



Note

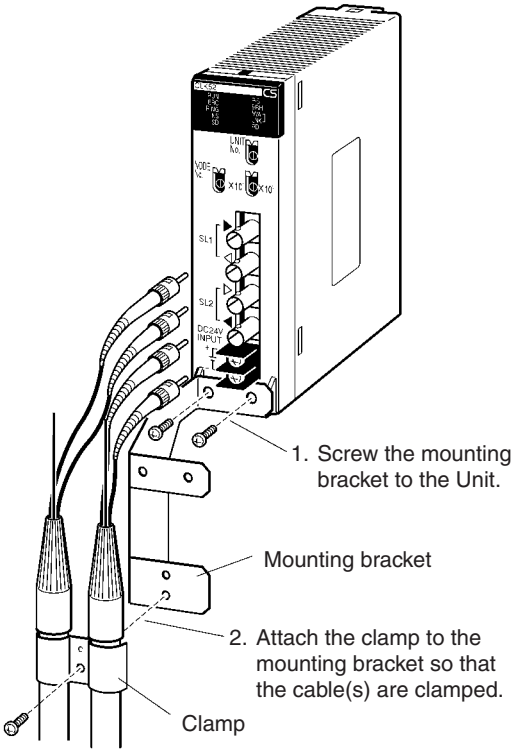
1. Always use the specified Optical Fiber Cables.
2. Although the Optical Fiber Cables can be distinguished by the markings or color, in order to prevent incorrect connection it is recommended that tags are attached to the cables.
3. The maximum distance between nodes depends on the type of GI cable (core diameter) that is being used.
   62.5/125 μm cable: Max. distance between nodes = 2 km
   50/125 μm cable: Max. distance between nodes = 1 km

Connection Procedure

Use the following procedure to connect Optical Fiber Cables to a Unit.

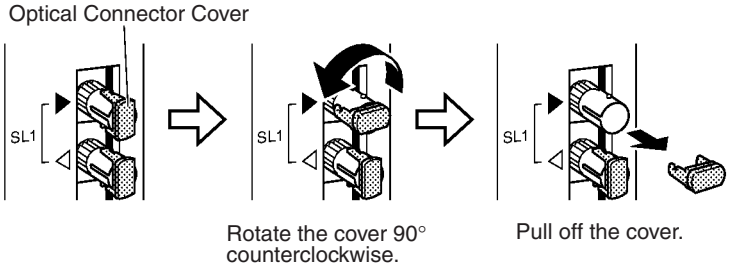
1,2,3...

1. Attach the mounting bracket to the Unit with the provided screws.
2. Attach the clamp to the mounting bracket so that it clamps the cable(s).



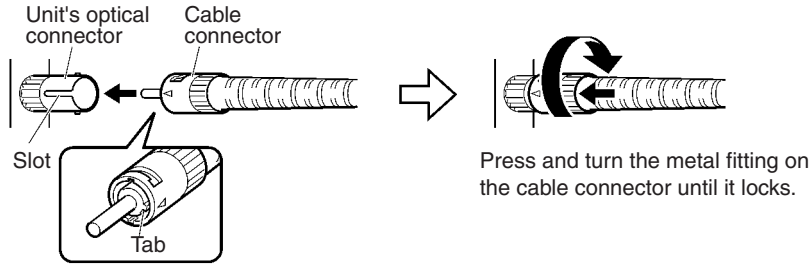
3. Remove the Optical Connector Covers from the Unit's connectors shown in the following diagram if there are covers protecting the connectors.

Remove the covers from the tips of the cables' ST connectors if there are covers protecting the ST connectors.



Note To replace the Optical Connector Cover, just reverse the steps shown in the diagram above.

4. Turn the cable connector so that the tab in the connector faces left and aligns with the slot in the Unit's connector. Insert the cable connector fully into the Unit's optical connector. Press and turn the cable's connector clockwise to lock the connector in place.



Note To remove the connector, just reverse the steps shown in the diagram above. (Press and turn the cable connector's metal fitting counterclockwise to unlock the connector.)

5. After installing the Optical Fiber Cable, fix the tension member of the Optical Fiber Cable.

   Insert the connectors completely and always check that the connectors are locked before starting operation.

When installing Optical Fiber Cables, be sure to stay within the specifications (e.g., tensile strength, bending, lateral pressure) for the cables used.

Optical Fiber Cables

Use Optical Fiber Cables (Graded Index: GI) with the following optical specifications.

50/125 μm AGF Cable

Item	Minimum	Standard	Maximum	Unit	Conditions	
Numerical Aperture (N.A.)	---	0.21	---	---	Theoretical value	
Transmission loss	---	---	3.0 Lf	dB	0.5 km ≤ Lf	λ = 0.8 μm
			3.0 Lf + 0.2		0.2 km ≤ Lf < 0.5 km	T_a = 25°C
			3.0 Lf + 0.4		Lf < 0.2 km	
Connection loss	---	---	1.0		λ = 0.8 μm, one location	
Transmission bandwidth	500	---	---	MHz·km	λ = 0.85 μm (LD)	

Note L_f is fiber length in km, T_a is ambient temperature, and λ is the peak wavelength of the test light source.

62.5/125 μm AGF Cable

Item	Minimum	Standard	Maximum	Unit	Conditions	
Numerical Aperture (N.A.)	---	0.28	---	---	Theoretical value	
Transmission loss	---	---	3.5 Lf	dB	0.5 km ≤ Lf	λ = 0.8 μm
			3.5 Lf + 0.2		0.2 km ≤ Lf < 0.5 km	T_a = 25°C
			3.5 Lf + 0.4		Lf < 0.2 km	
Connection loss	---	---	1.0		λ = 0.8 μm, one location	
Transmission bandwidth	200	---		MHz·km	λ = 0.85 μm (LD)	

Note L_f is fiber length in km, T_a is ambient temperature, and λ is the peak wavelength of the test light source.

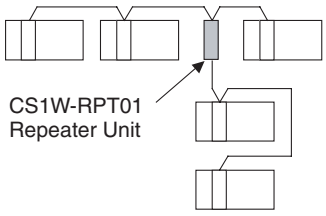
Connectors

ST Connector

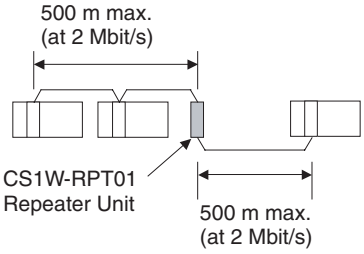
3-4 Constructing Networks with Repeater Units

Repeater Units can be used to construct flexible networks such as those shown below.

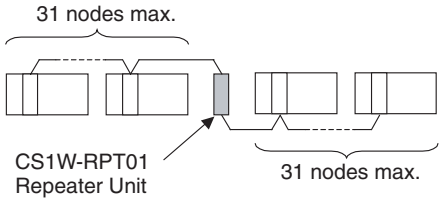
T-Branch Wiring



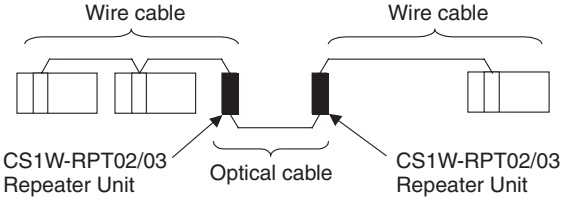
Long-distance Wiring



62-node Configuration



Partial Conversion to Optical Cable



Note

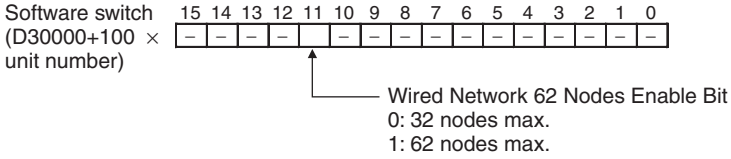
1. Repeater Units must be supplied with 24-V DC power.
2. Wire-to-Optical Repeater Units (CS1W-RPT02 and CS1W-RPT03) are used to convert a section of a wired network to optical fiber. Two Units are always used as a single set.
   Wire-to-Optical Repeater Units cannot be connected to Optical Ring/Optical Controller Link Units or Support Boards. If these types of Controller Link Units or Support Boards are connected by mistake, communications errors will occur throughout the network.
3. Repeater Units have a baud rate switch and a terminating resistance switch. The same baud rate must be set for all nodes on the network.
   In addition, the terminating resistance switch of Units (Controller Link

Units/Support Boards or Repeater Units) at both ends of each network segment created by installing Repeaters must also be turned ON.

To construct a 62-node configuration in a wired network, all network nodes must consist of one of the following models:

CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, 3G8F7-CLK21-V1, 3G8F7-CLK23-E.

The following Wired Network 62 Node Enable Bit in the DM Parameter Area software switch on each node must be turned ON to enable using 62 nodes maximum:

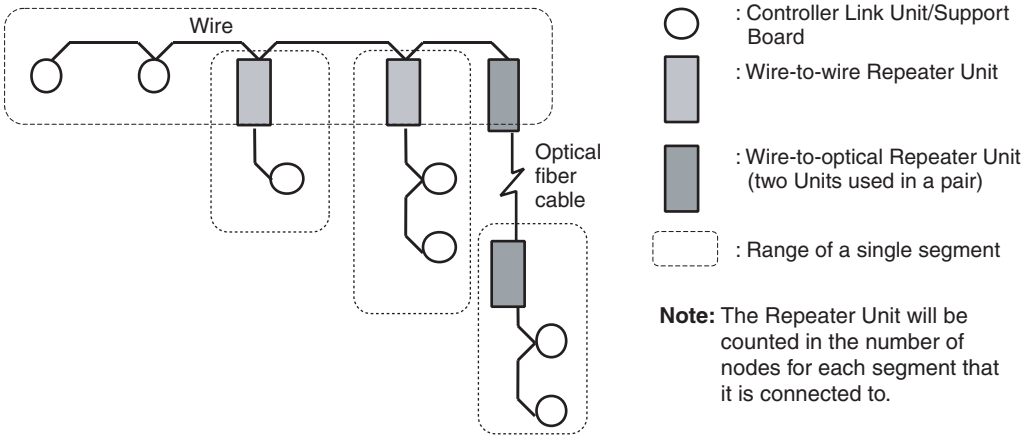


4. Repeater Units can be connected in a network in advance if new nodes are to be added to the network after the system has been constructed. When it becomes necessary to add a node, cabling can be accomplished easily by simply wiring a T-Branch to the Repeater Unit. This method also allows nodes to be added without stopping communications over the existing network.

3-4-1 Segments

Repeater Units divide a wired Controller Link network into segments. Segments are comprised of nodes connected in a multi-drop configuration using wire cables. The specifications of the network within a segment are identical to the wired Controller Link network itself. The specifications within a single segment are shown in the following table.

Item	Specifications within each segment	Remarks
Transmission line type	Multi-drop	---
Baud rate and maximum transmission distance	2 Mbps: 500 m 1 Mbps: 800 m 500 Kbps: 1 km	Because Repeater Units enable up to 2 stages to be connected, the maximum transmission distance of a network (i.e., the total length of the longest path connecting any two nodes) is as follows: 2 Mbps: 1.5 km 1 Mbps: 2.4 km 500 Kbps: 3 km
Maximum number of nodes (Units)	32, including Controller Link Units, Support Boards, and Repeater Units	Repeater Units do not use a node address.



3-4-2 Number of Repeater Units

The number of Repeater Units that can be connected in a Wired Controller Link Network depends on the mode of connection.

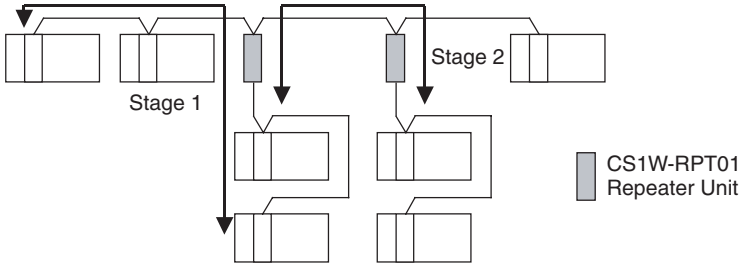
When Repeater Units are used, a maximum of 32 Units, including Controller Link Units/Support Boards and Repeater Units, can be connected within a single segment.

Moreover, if Repeater Units are used for T-Branch wiring, long-distance wiring or partial conversion to optical fiber, up to two repeater stages (see note below) can be connected. Connect Repeater Units so that they do not exceed these ranges.

Note The maximum number of repeater stages refers to the maximum number of Repeater Units that can be inserted into the path connecting any two nodes. In other words, it is necessary to connect Repeater Units so that no more than two Repeater Units (two stages) need to be passed for any node within a network to reach any other node. With Wire-to-Optical Repeater Units, two Units make up a single set, which is counted as a single stage.

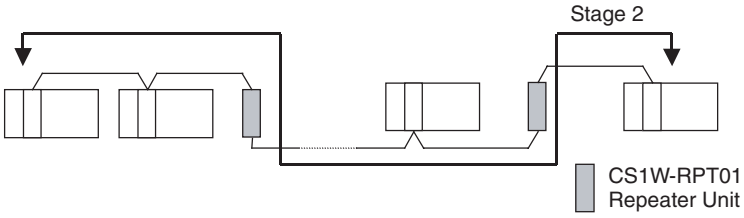
Examples of Correct Repeater Unit Connections

T-Branch Wiring: 2-stage Repeater Unit Connection



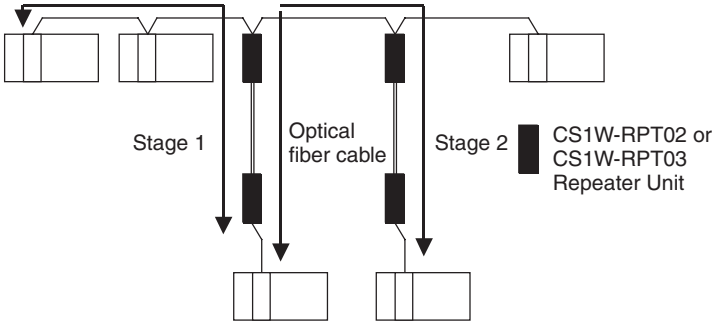
Not more than 2 Repeater Units (2 stages) must be passed for any node to reach any other node

Long-distance Wiring: 2-stage Repeater Unit Connection



Not more than 2 Repeater Units (2 stages) must be passed for any node to reach any other node

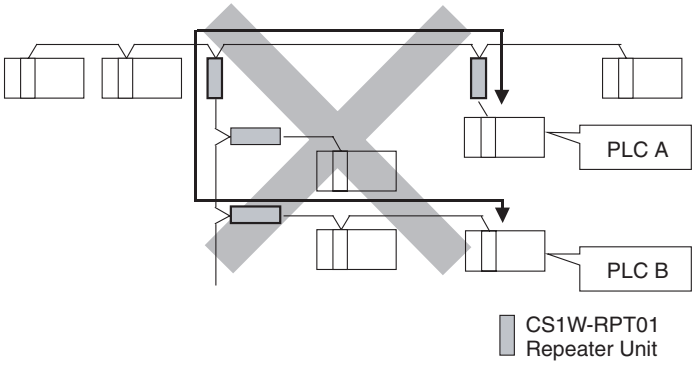
Partial Optical Conversion: 2-stage Repeater Unit Connection



Two Wire-to-Optical Repeater Units make up a single set counted as a single stage. Therefore, not more than 4 Repeater Units (2 stages) must be passed for any node to reach any other node.

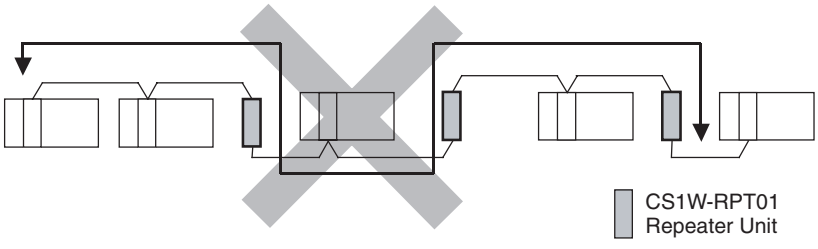
Examples of Incorrect Repeater Unit Connections

More than 2 Stages of Repeater Units



The path from PLC A to PLC B travels via 3 Repeater Units (3 stages). This kind of network is NOT allowed.

More than 2 Stages of Repeater Units



The path from one node to another travels via three Repeater Units (3 stages). This kind of network is NOT allowed.

Note If the Repeater Units are used incorrectly, communications errors may occur, or nodes may not be able to participate in the network.

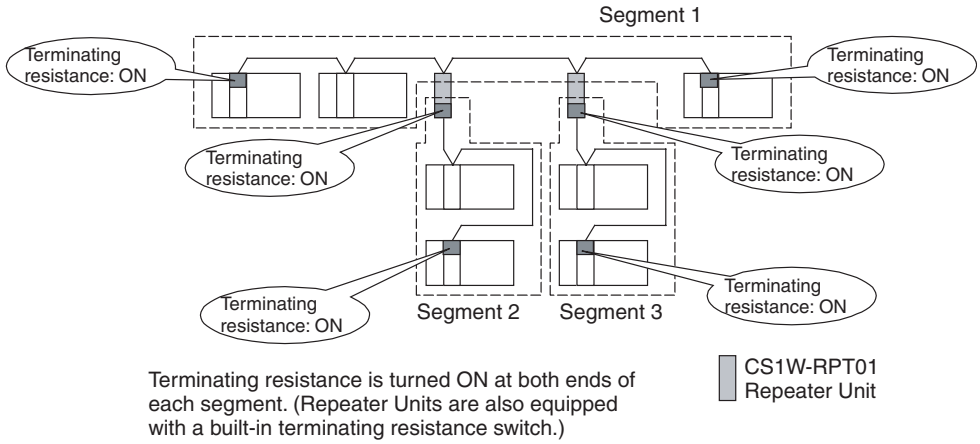
3-4-3 Terminating Resistance

In a Wired Controller Link Network, turn ON the terminating resistance switches only at the nodes at both ends of the network.

When Repeater Units are used to divide the network into multiple segments, turn ON the terminating resistance switches of the nodes at both ends of each segment. When a Repeater Unit is connected to the end of a segment, turn ON the built-in terminating resistance switch of the Repeater Unit itself.

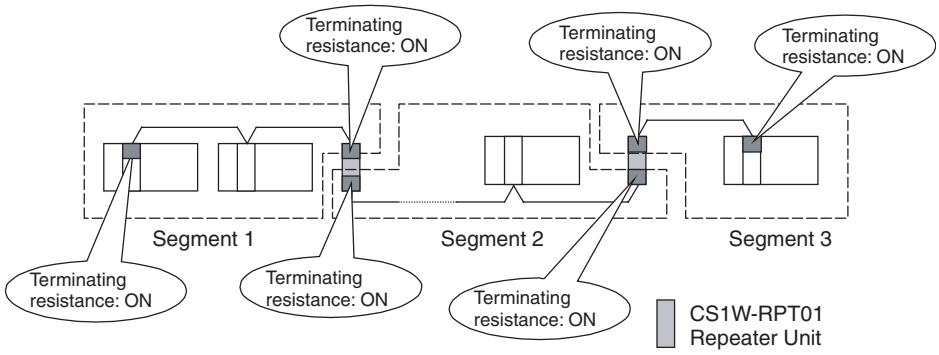
Connection examples are shown below.

T-Branch Wiring

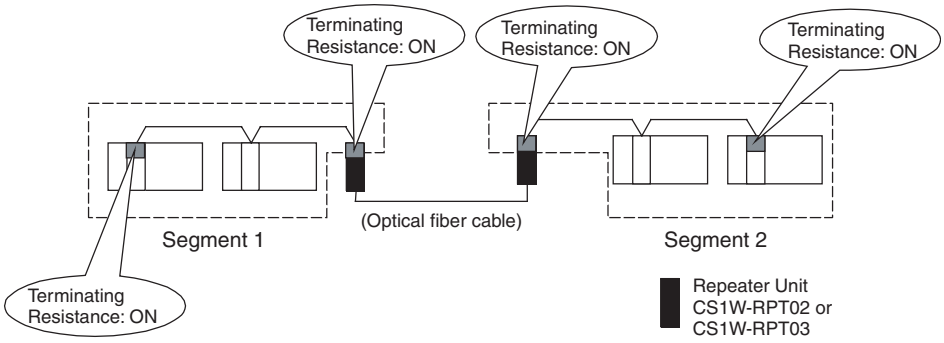


Terminating resistance is turned ON at both ends of each segment. (Repeater Units are also equipped with a built-in terminating resistance switch.)

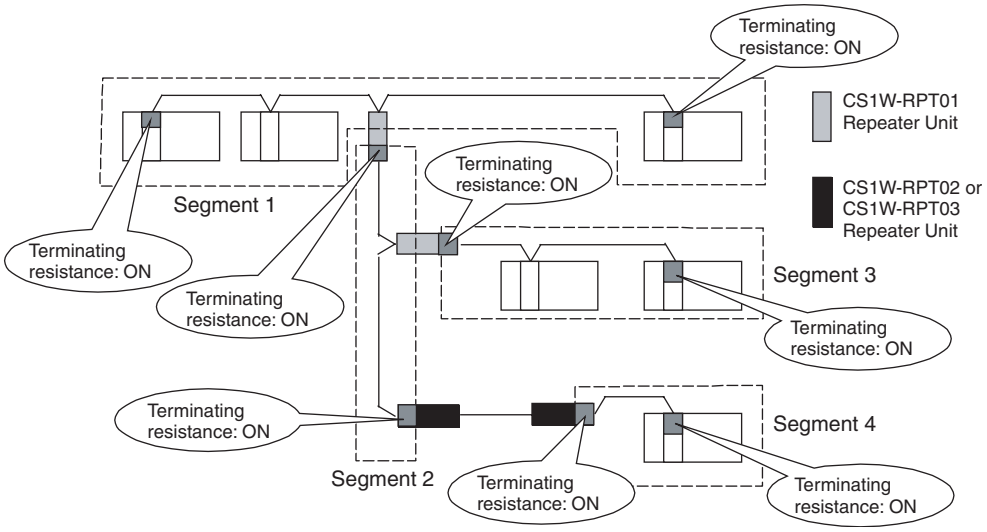
Long-distance Wiring



Partial Conversion to Optical Fiber



Combining T-Branch Wiring (2-stage Repeater) and Partial Optical Fiber



Note When constructing a network using Repeater Units, each segment must satisfy all of the following requirements:

- The total number of Controller Link Units, Support Boards, and Repeater Units within a single segment must not exceed 32.
- The total cable length of a single segment must not exceed the specified value. (500 m at 2 Mbps; 800 m at 1 Mbps; and 1 km at 500 Kbps.)
- The maximum number of repeater stages that can be inserted into the path connecting any two nodes is two.
- The node at each end of a segment (including Repeater Units) must have terminating resistance turned ON.
- The baud rates within each segment must be set to the same value.

SECTION 4
Preparations for Communications

This section describes the settings required for starting communications. These basic settings are required for both data links function and the message service. Carry out the settings described here before turning on power to the Controller Link Unit.

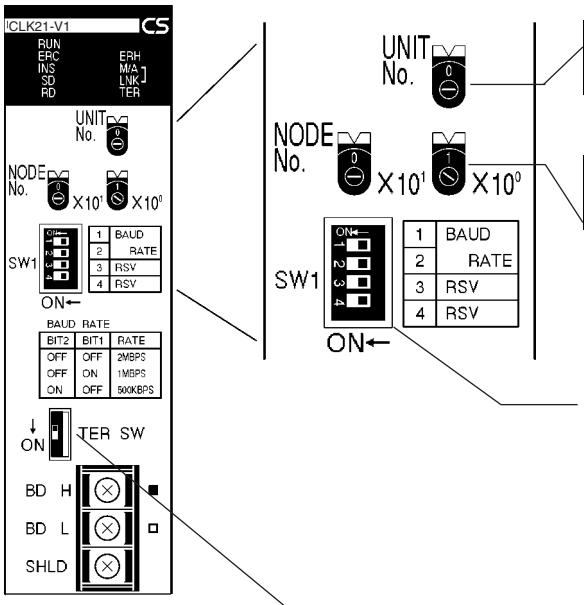
4-1 CS-series Controller Link Units 88
4-1-1 Overview 88
4-1-2 Unit Number 88
4-1-3 Node Addresses 89
4-1-4 Baud Rates 90
4-1-5 Terminating Resistance 91
4-2 CJ-series Controller Link Units 91
4-2-1 Overview 92
4-2-2 Unit Number 92
4-2-3 Node Addresses 93
4-2-4 Baud Rates 94
4-2-5 Terminating Resistance 94
4-3 C200HX/HG/HE Controller Link Units 95
4-3-1 Overview 96
4-3-2 Node Addresses 96
4-3-3 Baud Rates and Operating Levels 97
4-3-4 Terminating Resistance 98
4-4 CVM1 and CV-series Controller Link Units 99
4-4-1 Overview 99
4-4-2 Unit Number 100
4-4-3 Node Addresses 100
4-4-4 Baud Rates 101
4-4-5 Terminating Resistance 101
4-5 CQM1H-series Controller Link Units 102
4-5-1 Overview 102
4-5-2 Node Addresses 103
4-5-3 Baud Rates 103
4-5-4 Terminating Resistance 104
4-6 Repeater Units 104
4-6-1 Wire-to-Wire Repeater Unit 105
4-6-2 Baud Rates 105
4-6-3 Terminating Resistance 106

4-1 CS-series Controller Link Units

The following settings are required for a Controller Link Unit used with a CS-series PLC.

Item	Switch	Page
Unit number	Unit number setting switch	88
Node address	Node address switches	89
Baud rate	Baud rate, pins 1 and 2	90
Terminating resistance	Terminating resistance switch	91

4-1-1 Overview



Unit Number

Setting range	Nodes
01 to F (default is 0)	All nodes in the Network

Node Address

Setting range	Nodes
01 to 32 (default is 01)	All nodes in the Network

Baud Rate

Pins		Baud rate	Maximum transmission distance	Nodes
Pin 1	Pin 2			
OFF	**OFF**	2 Mbps	500 m	Set same rate for all nodes in the Network.
ON	OFF	1 Mbps	800 m	
OFF	ON	500 Kbps	1 km	
ON	ON	Cannot be set.		

Note Factory default setting is in bold.
Always leave pins 3 and 4 OFF.

Terminating Resistance

Front switch	Terminating resistance	Nodes
OFF (factory default)	Not connected	All nodes in the Network
ON	Connected	Turn ON the terminating resistance at the nodes at both ends of the Network and turn it OFF at all other nodes.

4-1-2 Unit Number

Set the unit number for each Unit using the rotary switches on the front of the Unit. The unit number is used to identify a CPU Bus Unit within the PLC. Any unit number can be set between 0 and F in hexadecimal (00 to 15 in decimal)



Note: The factory default settings are shown above.

Item	Specifications
Setting method	Single-digit hexadecimal
Setting range	0 to F (decimal 00 to 15, default is 0)
Node	All nodes in the Network

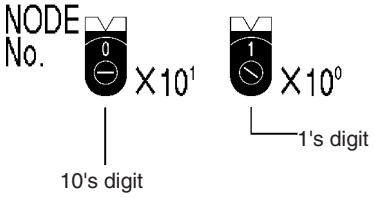
Set the node address using a small flat-blade screwdriver, being careful not to damage the rotary switches.

Note

1. Always turn OFF the PLC's power before setting the unit number.
2. When setting a Unit for the first time or changing the existing setting, create a I/O table in the PLC's CPU Unit.
3. Do not set the same unit number twice within the same PLC. An error will occur if the same unit number is set for two different Unit, and the CPU Unit will not be able to recognize the Units.
4. When the Unit is recognized by the PLC's CPU Unit, "NS" will be shown in the I/O table displayed for the CX-Programmer programming device.
5. The default setting is "0."
6. The unit number determines the words used by the Controller Link Unit in PLC memory.

4-1-3 Node Addresses

Set the node addresses of each Unit on the Network using the rotary switches on the front of the Unit. The node address is used to identify each node in the Network can be set to any number between 01 and 32.



Note: The factory default settings are shown above.

Item	Specifications
Setting method	2-digit decimal
Setting range	01 to 32 (default is 01) (See note 1.)
Node	All nodes in the Network

Set the node address using a small flat-blade screwdriver, being careful not to damage the rotary switches.

Note

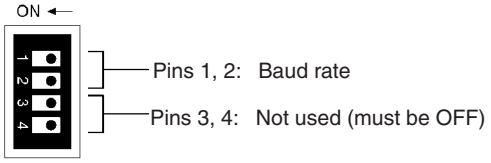
1. When all of the following conditions are satisfied, node addresses can be set between 01 and 62, and the network can contain up to 62 nodes.
   a) All nodes in the Controller Link Network use CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 Units.
   b) The Wired Network 62 Node Enable Bit in the DM Parameter Area software switches (bit 11 of D30000 + 100 × Unit No.) of all nodes is turned ON.
   c) At least one CS1W-RPT01 Repeater Unit is connected and the number of nodes in a single segment does not exceed 31.
2. Always turn OFF the PLC's power before setting the node addresses.
3. Do not set the same node address twice within the same network. An error will occur if the same address is set for two different nodes. The ERC indicator on the front of the Unit will light (Communications Error Flag) and ei-

ther communications will stop, or the INS indicator will not light and you will be unable to participate in the Network.

4. When CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units are used with other models in the same network, set the node addresses of all nodes between 1 and 32. In a network containing pre-version-1 models, it is not possible to construct a network that uses a node address higher than 32.
   Turn ON the Wired Network 62 Node Enable Bit (bit 11 of D30000 + 100 × Unit No.) in the DM Parameter Area software switch of all CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units to restrict the network to 32 nodes maximum. If a different value is specified, the network will be incorrectly configured.
5. To construct a network that uses a node address higher than 32, it is necessary for all nodes to be CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 Units.
   In addition, the Wired Network 62 Node Enable Bit in the DM Parameter Area software switch of all nodes must be turned ON to enable using 62 nodes maximum. If a different value is specified, the network will not be correctly configured.
6. Only node addresses 1 through 32 can be used on networks for which 62 nodes have not been enabled.
7. The Wired Network 62 Node Enable Bit in the DM Parameter Area software switches of CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units is read when the Unit is restarted.
8. The send sequence for the data link areas is determined according to the sequence of node addresses for automatically set data links.
9. Assign node addresses consecutively beginning from 01 whenever possible to minimize Network construction time.

4-1-4 Baud Rates

Set the following pins for the baud rate settings (DIP switch).



Note: The factory default settings are shown above.

Note

1. Always turn OFF the PLC's power before setting the baud rate.
2. Keep pins 3 and 4 set to OFF.

Baud Rate (Pins 1 and 2)

Set the same baud rate for all the nodes on the Network using DIP switch pins 1 and 2 on the front of the Unit. The baud rate is set as shown below.

The maximum transmission distance will also change according to the setting.

Pins		Baud rate	Maximum transmission distance
Pin 1	Pin 2		
OFF	**OFF**	2 Mbps	500 m
ON	OFF	1 Mbps	800 m
OFF	ON	500 Kbps	1 km
ON	ON	Do not set.	

Note The factory default setting is shown in bold.

Note

1. Set the same baud rate for all the nodes on the Network. Normal communication cannot be performed unless the same baud rate is set for all the nodes.
2. The default setting is 2 Mbps, 500 m.

4-1-5 Terminating Resistance

Turn ON the terminating resistance using the switch on the bottom of the Unit for the Units of both ends of the Network. The terminating resistance is required at both ends of a Network to absorb unnecessary signals and reduce noise.

The Controller Link Unit has built-in terminating resistance, which can be connected simply by turning ON the slide switch.



Bottom switch	Terminating resistance
OFF (factory default)	Not connected.
ON	Connected.

Note

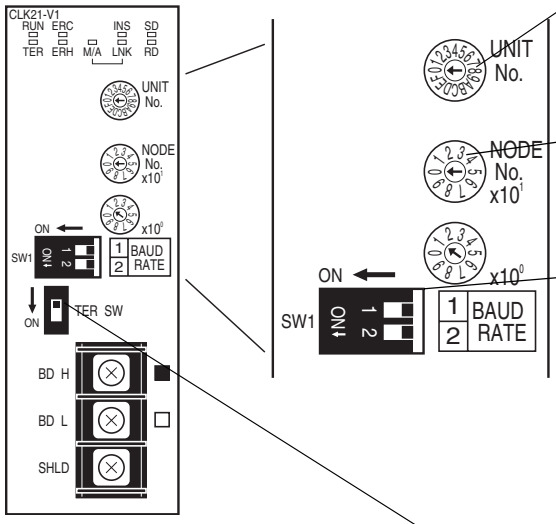
1. Always turn OFF the PLC's power before setting the terminating resistance switch.
2. Turn ON the switch to connect terminating resistance at the nodes at both ends of the Network and turn OFF the switch at all other nodes. Normal communication cannot be performed in the Network unless all the nodes are set properly.
3. The TER LED indicator will light when the terminating resistance switch is set to ON.
4. The default setting is OFF (not connected).

4-2 CJ-series Controller Link Units

The following settings are required for a Controller Link Unit used with a CJ-series PLC.

Item	Switch	Page
Unit number	Unit number setting switch	92
Node address	Node address switches	93
Baud rate	Baud rate, pins 1 and 2	94
Terminating resistance	Terminating resistance switch	94

4-2-1 Overview



Unit Number

Setting range	Nodes
01 to F (default is 0)	All nodes in the Network

Node Address

Setting range	Nodes
01 to 32 (default is 01)	All nodes in the Network

Baud Rate

Pins		Baud rate	Maximum transmission distance	Nodes
Pin 1	Pin 2			
OFF	**OFF**	2 Mbps	500 m	Set same rate for all nodes in the Network.
ON	OFF	1 Mbps	800 m	
OFF	ON	500 Kbps	1 km	
ON	ON	Cannot be set.		

Note Factory default setting is in bold.

Terminating Resistance

Front switch	Terminating resistance	Nodes
OFF (factory default)	Not connected	All nodes in the Network Turn ON the terminating resistance at the nodes at both ends of the Network and turn it OFF at all other nodes.
ON	Connected	

4-2-2 Unit Number

Set the unit number for each Unit using the rotary switches on the front of the Unit. The unit number is used to identify a CPU Bus Unit within the PLC. Any unit number can be set between 0 and F in hexadecimal (00 to 15 in decimal).



Note: The factory default settings are shown.

Item	Specifications
Setting method	Single-digit hexadecimal
Setting range	0 to F (decimal 00 to 15, default is 0)
Node	All nodes in the Network

Set the node address using a small flat-blade screwdriver, being careful not to damage the rotary switches.

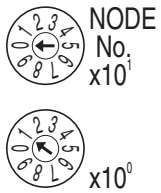
Note

1. Always turn OFF the PLC's power before setting the unit number.
2. When setting a Unit for the first time or changing the existing setting, create a I/O table in the PLC's CPU Unit.
3. Do not set the same unit number twice within the same PLC. An error will occur if the same unit number is set for two different Unit, and the CPU Unit will not be able to recognize the Units.
4. When the Unit is recognized by the PLC's CPU Unit, "NS" will be shown in the I/O table displayed for the CX-Programmer programming device.

5. The default setting is “0.”
6. The unit number determines the words used by the Controller Link Unit in PLC memory.

4-2-3 Node Addresses

Set the node addresses of each Unit on the Network using the rotary switches on the front of the Unit. The node address is used to identify each node in the Network can be set to any number between 01 and 32.



Note: The factory default settings are shown.

Item	Specifications
Setting method	2-digit decimal
Setting range	01 to 32 (default is 01) (See note 1.)
Node	All nodes in the Network

Set the node address using a small flat-blade screwdriver, being careful not to damage the rotary switches.

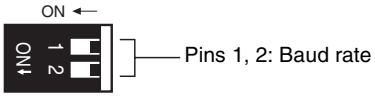
Note

1. When all of the following conditions are satisfied, node addresses can be set between 01 and 62, and the network can contain up to 62 nodes.
   a) All nodes in the Controller Link network use CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 Units.
   b) The Wired Network 62 Node Enable Bit in the DM Parameter Area software switches (bit 11 of D30000 + 100 × Unit No.) of all nodes is turned ON.
   c) At least one CS1W-RPT01 Repeater Unit is connected and the number of nodes in a single segment does not exceed 31.
2. Always turn OFF the PLC’s power before setting the node addresses.
3. Do not set the same node address twice within the same Network. An error will occur if the same address is set for two different nodes. The ERC indicator on the front of the Unit will light (Communications Error Flag) and either communications will stop, or the INS indicator will not light and you will be unable to participate in the Network.
4. When CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units are used with other models in the same Network, set the node addresses of all nodes between 1 and 32. In a network containing pre-version-1 models, it is not possible to construct a network that uses a node address higher than 32.
   Turn ON the Wired Network 62 Node Enable Bit (bit 11 of D30000 + 100 × Unit No.) in the DM Parameter Area software switch of all CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units to restrict the network to 32 nodes maximum. If a different value is specified, the network will be incorrectly configured.
5. To construct a network that uses a node address higher than 32, it is necessary for all nodes to be CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 Units.
   In addition, the Wired Network 62 Node Enable Bit of the DM Parameter Area software switch of all nodes must be turned ON to enable 62 nodes maximum. If a different value is specified, the network will not be correctly configured.

6. Only node addresses 1 through 32 can be used on networks for which 62 nodes have not been enabled.
7. The Wired Network 62 Node Enable Bit in the DM Parameter Area software switches of CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units is read when the Unit is restarted.
8. The send sequence for the data link areas is determined according to the sequence of node addresses for automatically set data links.
9. Assign node addresses consecutively beginning from 01 whenever possible to minimize Network construction time.

4-2-4 Baud Rates

Set the following pins for the baud rate settings (DIP switch).



Note: The factory default settings are shown.

Note Always turn OFF the PLC's power before setting the baud rate.

Baud Rate (Pins 1 and 2)

Set the same baud rate for all the nodes on the Network using DIP switch pins 1 and 2 on the front of the Unit. The baud rate is set as shown below.

The maximum transmission distance will also change according to the setting.

Pins		Baud rate	Maximum transmission distance
Pin 1	Pin 2		
OFF	**OFF**	2 Mbps	500 m
ON	OFF	1 Mbps	800 m
OFF	ON	500 Kbps	1 km
ON	ON	Do not set.	

Note The factory default setting is shown in bold.

Note

1. Set the same baud rate for all the nodes on the Network. Normal communication cannot be performed unless the same baud rate is set for all the nodes.
2. The default setting is 2 Mbps, 500 m.

4-2-5 Terminating Resistance

Turn ON the terminating resistance using the switch on the bottom of the Unit for the Units of both ends of the Network. The terminating resistance is required at both ends of a Network to absorb unnecessary signals and reduce noise.

The Controller Link Unit has built-in terminating resistance, which can be connected simply by turning ON the slide switch.



Bottom switch	Terminating resistance
OFF (factory default)	Not connected.
ON	Connected.

Note

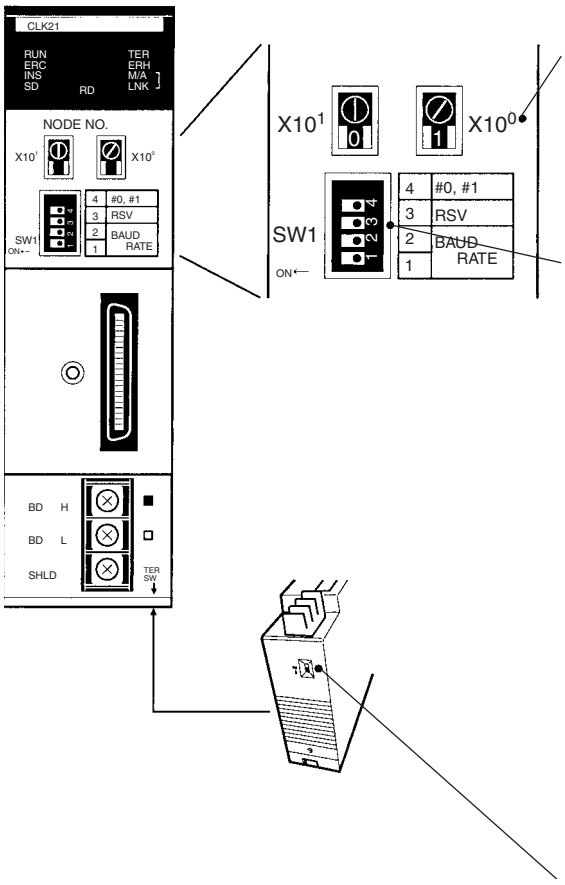
1. Always turn OFF the PLC's power before setting the terminating resistance switch.
2. Turn ON the switch to connect terminating resistance at the nodes at both ends of the Network and turn OFF the switch at all other nodes. Normal communication cannot be performed in the Network unless all the nodes are set properly.
3. The TER LED indicator will light when the terminating resistance switch is set to ON.
4. The default setting is OFF (not connected).

4-3 C200HX/HG/HE Controller Link Units

The following settings are required for a Controller Link Unit used with a C200HX/HG/HE PLC.

Item	Switch	Page
Node address	Node address switches	96
Baud rate	Baud rate and operating level switch, pins 1 and 2	97
Operating level	Baud rate and operating level switch, pin 4)	97
Terminating resistance	Terminating resistance switch	98

4-3-1 Overview



Node Address

Setting range	Nodes
01 to 32 (default is 01)	All nodes in the Network

Baud Rate and Operating Level

•Baud Rate

Pins		Baud rate	Maximum transmission distance	Nodes
Pin 1	Pin 2			
OFF	**OFF**	2 Mbps	500 m	Set same rate for all nodes in the Network.
ON	OFF	1 Mbps	800 m	
OFF	ON	500 Kbps	1 km	
ON	ON	Cannot be set.		

Note Factory default setting is in bold.
Always leave pin 3 OFF.

•Operating Level

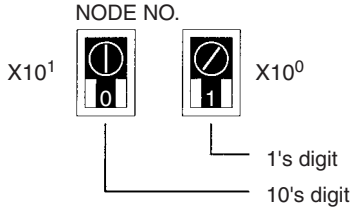
Pin 4	Operating level	Nodes
OFF (factory default)	Level 1	All nodes in the Network Set so that only one Communications Unit is set to the same level in the same PLC.
ON	Level 0	

Terminating Resistance

Bottom switch	Terminating resistance	Nodes
OFF (factory default)	Not connected	All nodes in the Network Turn ON the terminating resistance at the nodes at both ends of the Network and turn it OFF at all other nodes.
ON	Connected	

4-3-2 Node Addresses

Set the node addresses of each Unit on the Network using the rotary switches on the front of the Unit. The node address is used to identify each node in the Network can be set to any number between 01 and 32.



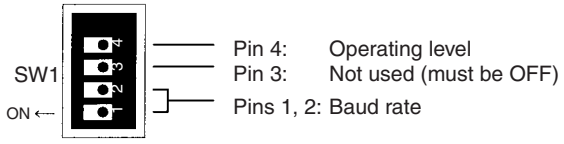
Item	Specifications
Setting method	2-digit decimal
Setting range	01 to 32 (default is 01)
Node	All nodes in the Network

Set the node address using a small flat-blade screwdriver, being careful not to damage the rotary switches.

Note
1. Always turn OFF the PLC's power before setting the node address.
2. Do not set the same node address twice within the same Network. An error will occur if the same address is set for two different nodes. The ERC indicator on the front of the Unit will light and either communications will stop, or the INS indicator will not light and you will be unable to participate in the Network.
3. The send sequence for the data link areas is determined according to the sequence of node addresses for automatically set data links.
4. Assign node addresses consecutively beginning from 01 whenever possible to minimize Network construction time.

4-3-3 Baud Rates and Operating Levels

Set the following pins for the baud rate and operating level settings (DIP switch).



Note: The factory default settings are shown above.

Note
1. Always turn OFF the PLC's power before setting the baud rate or operating level.
2. Keep pin 3 set to OFF. If it is turned ON, internal data may be erased.

Baud Rate (Pins 1 and 2)

Set the same baud rate for all the nodes on the Network using DIP switch pins 1 and 2 on the front of the Unit. The baud rate is set as shown below.
The maximum transmission distance will also change according to the setting.

Pins		Baud rate	Maximum transmission distance
Pin 1	Pin 2		
OFF	**OFF**	2 Mbps	500 m
ON	OFF	1 Mbps	800 m
OFF	ON	500 Kbps	1 km
ON	ON	Do not set.	

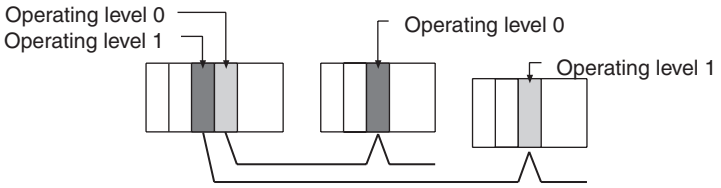
Note The factory default setting is shown in bold.

Note Set the same baud rate for all the nodes on the Network. Normal communication cannot be performed unless the same baud rate is set for all the nodes.

Setting the Operating Level (Pin 4)

With C200HX/HG/HE PLCs, Networks can be constructed by mounting up to two Communications Units, such as Controller Link Units, SYSMAC LINK Units and SYSMAC NET Link Units for the same PLC Each of these Units must run on a different operating level.

Set the Controller Link Unit to operating level 1 or 0 using DIP switch pin 4 on the front of the Unit.



Note It is not necessary to use the same operating level for all nodes in the same Network.

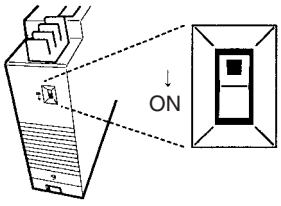
Pin 4	Operating level	Node
OFF (factory default)	Operating level 1	Set all the nodes on the Network to either Operating level.
ON	Operating level 0	

Note
1. Do not use the same operating level for more than one Unit mounted to the same PLC. An error will occur is the same operating level is set twice.
2. Operating levels are used by the CPU Unit to distinguish different Communications Units. Each node can have a different operating level, i.e., it is not necessary to use the same operating level for all nodes in the same Network.

4-3-4 Terminating Resistance

Turn ON the terminating resistance using the switch on the bottom of the Unit for the Units of both ends of the Network. The terminating resistance is required at both ends of a Network to absorb unnecessary signals and reduce noise.

The Controller Link Unit has built-in terminating resistance, which can be connected simply by turning ON the slide switch.



Bottom switch	Terminating resistance
OFF (factory default)	Not connected.
ON	Connected.

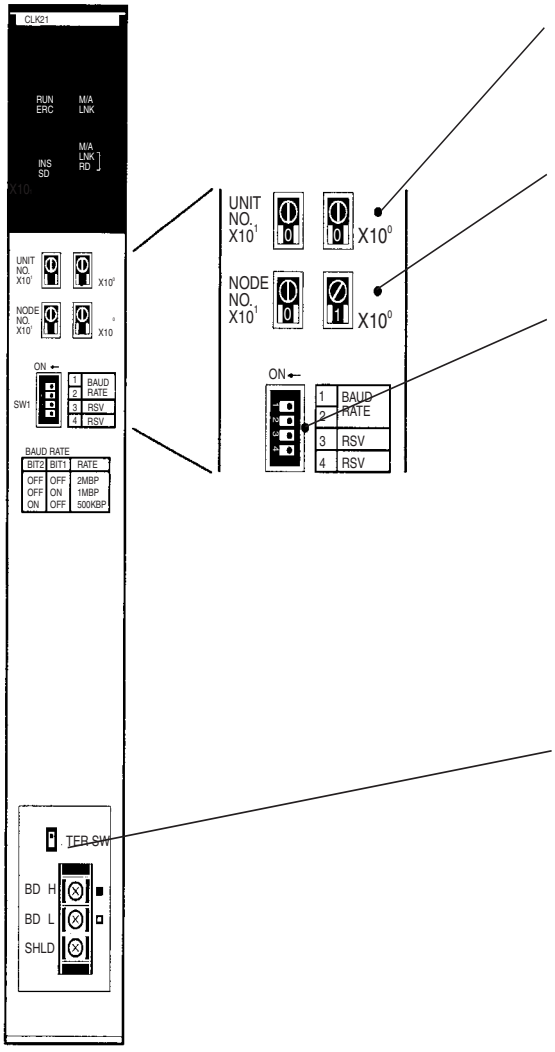
Note
1. Always turn OFF the PLC's power before setting the terminating resistance switch.
2. Turn ON the switch to connect terminating resistance at the nodes at both ends of the Network and turn OFF the switch at all other nodes. Normal communication cannot be performed in the Network unless all the nodes are set properly.
3. The TER LED indicator will light when the terminating resistance switch is set to ON.

4-4 CVM1 and CV-series Controller Link Units

The following settings are required for a Controller Link Unit when used with a CVM1 or CV-series PLC.

Item	Switch	Page
Unit number	Unit number switch	100
Node address	Node address switch	100
Baud rate	Baud rate switch, pins 1 and 2	101
Terminating resistance	Terminating resistance switch	101

4-4-1 Overview



Unit Number

Setting range	Nodes
00 to 15 (default is 00)	All nodes in the Network

Node Addresses

Setting range	Nodes
01 to 32 (default is 01)	All nodes in the Network

Setting Baud Rates

Switch		Baud rate	Maximum transmission distance	Nodes
Pin 1	Pin 2			
OFF	**OFF**	2 Mbps	500 m	Set same rate for all nodes in Network.
ON	OFF	1 Mbps	800 m	
OFF	ON	500 Kbps	1 km	
ON	ON	Do not set.		

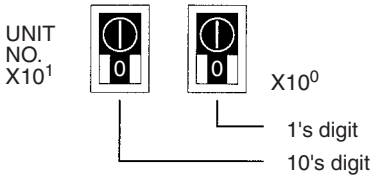
Note The factory default setting is in bold.
Always keep pins 3 and 4 set to OFF.

Terminating Resistance

Bottom switch	Terminating resistance	Nodes
OFF (factory default)	Not connected	All the nodes Turn ON the terminating resistance at the nodes at both ends of the Network and turn it OFF at all other nodes.
ON	Connected	

4-4-2 Unit Number

Set the unit number for each Unit using the rotary switches on the front of the Unit. The unit number is used to identify a CPU Bus Unit within the PLC. Any unit number can be set between 00 and 15.



Item	Specifications
Setting method	2-digit decimal
Setting range	00 to 15 (default is 00)
Node	All nodes in the Network

Set the node address using a small flat-blade screwdriver, being careful not to damage the rotary switches.

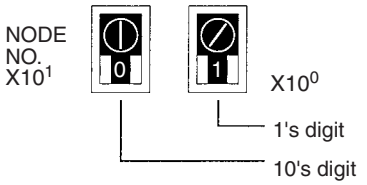
Note

1. Always turn OFF the PLC's power before setting the unit number.
2. When setting a Unit for the first time or changing the existing setting, create a I/O table in the PLC's CPU Unit.
3. Do not set the same unit number twice within the same PLC. An error will occur if the same unit number is set for two different Unit, and the CPU Unit will not be able to recognize the Units.
4. When the Unit is recognized by the PLC's CPU Unit, "NS" will be shown in the I/O table displayed for the CX-Programmer (Windows-based Support Software).
5. The default setting is "0."
6. The unit number determines the words used by the Controller Link Unit in PLC memory.

4-4-3 Node Addresses

Set the node address of each Unit in the Network using the rotary switch on the front of the Unit. The node address is used to identify each node in the Network.

The node address can be set to any value between 01 and 32.



Item	Specifications
Setting method	2-digit decimal
Setting range	01 to 32 (default is 01)
Node	All nodes in the Network

Set the node address using a small flat-blade screwdriver, being careful not to damage the rotary switches.

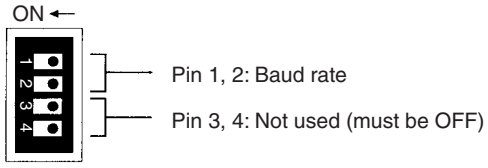
Note

1. Always turn OFF the PLC's power before setting the node address.

2. Do not set the same node address twice within the same Network. An error will occur if the same address is set for two different nodes. The ERC indicator on the front of the Unit will light and either communications will stop, or the INS indicator will not light and you will be unable to participate in the Network.
3. The send sequence for the data link areas is determined according to the sequence of node addresses for automatically set data links.
4. Assign node addresses consecutively beginning from 01 whenever possible to minimize Network construction time.

4-4-4 Baud Rates

Set the following pins for the baud rate setting (DIP switch).



The factory default setting is shown above.

Note
1. Always turn OFF the PLC's power before setting the baud rate.
2. Keep pins 3 and 4 set to OFF. If they are turned ON, internal data may be erased.

Set the same baud rate for all the nodes on the Network using DIP switch pins 1 and 2 on the front of the Unit. The baud rate is set as shown below.

The maximum transmission distance will also change according to the setting.

Switch		Baud rate	Maximum transmission distance
Pin 1	Pin 2		
OFF	**OFF**	2 Mbps	500 m
ON	OFF	1 Mbps	800 m
OFF	ON	500 Kbps	1 km
ON	ON	Do not set.	

Note The factory default setting is shown in bold.

Note Set the same baud rate for all the nodes on the Network. Normal communication cannot be performed unless the same baud rate is set for all the nodes.

4-4-5 Terminating Resistance

Turn ON the terminating resistance using the switch on the bottom of the Unit for the Units of both ends of the Network. The terminating resistance is required at both ends of a Network to absorb unnecessary signals and reduce noise.

The Controller Link Unit has built-in terminating resistance, which can be connected simply by turning ON the slide switch.



Switch at the front	Terminating resistance
OFF (factory default)	Not connected.
ON	connected

Note

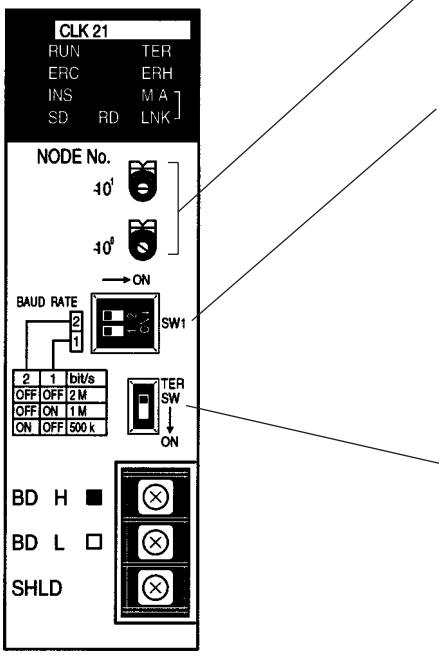
1. Always turn OFF the PLC's power before setting the terminating resistance switch.
2. Turn ON the switch to connect terminating resistance at the nodes at both ends of the Network and turn OFF the switch at all other nodes. Normal communication cannot be performed in the Network unless all the nodes are set properly.
3. The TER indicator will light when the terminating resistance switch is set to ON.

4-5 CQM1H-series Controller Link Units

The following settings are required for a Controller Link Unit when used with a CQM1H-series PLC.

Item	Switch	Page
Node address	Node address switch	103
Baud rate	Baud rate switch, pins 1 and 2	103
Terminating resistance	Terminating resistance switch	104

4-5-1 Overview



Node Addresses

Setting range	Nodes
01 to 32 (default is 01)	All nodes in the Network

Setting Baud Rate

Switch		Baud rate	Maximum transmission distance	Nodes
Pin 1	Pin 2			
OFF	**OFF**	2 Mbps	500 m	Set same rate for all nodes in Network.
ON	OFF	1 Mbps	800 m	
OFF	ON	500 Kbps	1 km	
ON	ON	Do not set.		

Note The factory default setting is in bold.

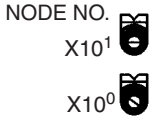
Terminating Resistance

Switch	Terminating resistance	Nodes
OFF (default)	Not connected	All the nodes Turn ON the terminating resistance at the nodes at both ends of the Network and turn it OFF at all other nodes.
ON	Connected	

4-5-2 Node Addresses

Set the node address of each Unit in the Network using the rotary switch on the front of the Unit. The node address is used to identify each node in the Network.

The node address can be set to any value between 01 and 32.



Item	Specifications
Setting method	2-digit decimal
Setting range	01 to 32 (default is 01)
Node	All nodes in the Network

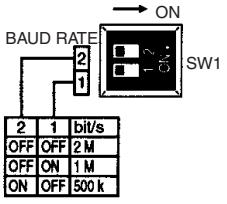
Set the node address using a small flat-blade screwdriver, being careful not to damage the rotary switches.

Note

1. Always turn OFF the PLC's power before setting the node address.
2. Do not set the same node address twice within the same Network. An error will occur if the same address is set for two different nodes. The ERC indicator on the front of the Unit will light and either communications will stop, or the INS indicator will not light and you will be unable to participate in the Network.
3. The send sequence for the data link areas is determined according to the sequence of node addresses for automatically set data links.
4. Assign node addresses consecutively beginning from 01 whenever possible to minimize Network construction time.

4-5-3 Baud Rates

Set the following pins for the baud rate setting (DIP switch).



Note Always turn OFF the PLC's power before setting the baud rate.

Set the same baud rate for all the nodes on the Network using DIP switch pins 1 and 2 on the front of the Unit. The baud rate is set as shown below.

The maximum transmission distance will also change according to the setting.

Switch		Baud rate	Maximum transmission distance
Pin 1	Pin 2		
OFF	**OFF**	2 Mbps	500 m
ON	OFF	1 Mbps	800 m
OFF	ON	500 Kbps	1 km
ON	ON	Do not set.	

Note The factory default setting is shown in bold.

Note Set the same baud rate for all the nodes on the Network. Normal communication cannot be performed unless the same baud rate is set for all the nodes.

4-5-4 Terminating Resistance

Turn ON the terminating resistance using the switch on the bottom of the Unit for the Units of both ends of the Network. The terminating resistance is required at both ends of a Network to absorb unnecessary signals and reduce noise.

The Controller Link Unit has built-in terminating resistance, which can be connected simply by turning ON the slide switch.



(The diagram shows the factory setting.)

Switch at the front	Terminating resistance
OFF (default)	Not connected.
ON	connected

Note

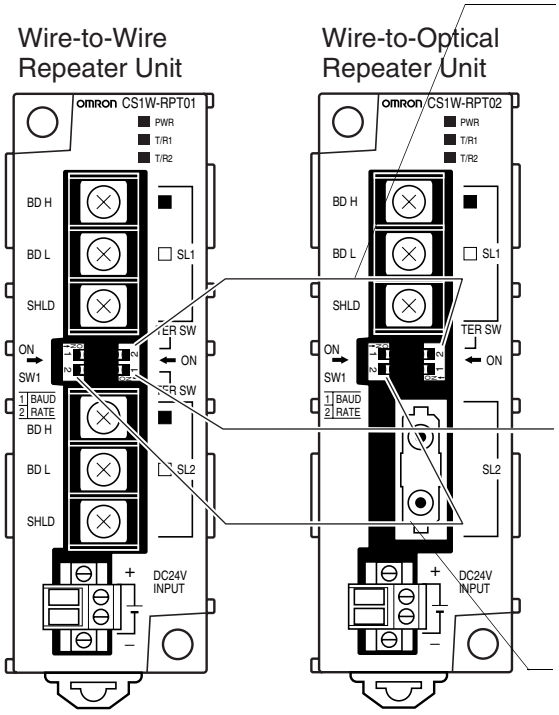
1. Always turn OFF the PLC's power before setting the terminating resistance switch.
2. Turn ON the switch to connect terminating resistance at the nodes at both ends of the Network and turn OFF the switch at all other nodes. Normal communication cannot be performed in the Network unless all the nodes are set properly.
3. The TER indicator will light when the terminating resistance switch is set to ON.
4. The switch is factory-set to OFF (terminating resistance not connected).

4-6 Repeater Units

Repeater Units must be set as shown in the following table before starting communications.

Item	Switch	Page
Baud rate	Baud rate switch, pin 1	105
Terminating resistance	Terminating resistance switch	106

4-6-1 Wire-to-Wire Repeater Unit



Terminating Resistance Switch for SL1

Switch	Terminating resistance	Applicable unit
OFF	Not connected	Turn ON when the Repeater Unit is connected to the end of the Network or a segment.
ON	Connected	

Note The factory default setting is in bold.

Terminating Resistance Switch for SL2

Switch	Terminating resistance	Applicable unit
OFF	Not connected	Turn ON when the Repeater Unit is connected to the end of the Network or a segment.
ON	Connected	

Note The factory default setting is in bold.

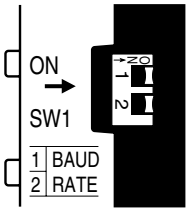
Baud Rate Switch

Switch		Baud rate	Maximum transmission distance	
Pin 1	Pin 2		1 segment	Network
OFF	**OFF**	2 Mbps	500 m	1.5 km
ON	OFF	1 Mbps	800 m	2.4 km
OFF	ON	500 Kbps	1 km	3.0 km
ON	ON	Do not set.		

Note The factory default setting is in bold.

4-6-2 Baud Rates

Set the same baud rates for all nodes on the network using pins 1 and 2 of DIP switch 1 on the front of the Unit.



The baud rate is set as shown below. The maximum transmission distance will change according to the baud rate setting.

Switch		Baud rate	Maximum transmission distance	
Pin 1	Pin 2		1 segment	Network
OFF	OFF	2 Mbps	500 m	1.5 km
ON	OFF	1 Mbps	800 m	2.4 km
OFF	ON	500 Kbps	1 km	3.0 km
ON	ON	Do not set.	---	---

See pages 16 and 81 for details on the maximum transmission distance.

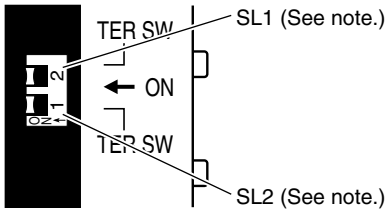
Note
1. Always turn OFF power to the Repeater Unit before setting the baud rate.
2. Set the same baud rate for all nodes on the network.
   Normal communications throughout the entire network will not be performed if the baud rate of even a single node differs from the others.
3. The factory default setting is 2 Mbps.

4-6-3 Terminating Resistance

Turn ON the terminating resistance at the Unit located at each end of the network. The terminating resistance switch is located on the front of the Unit. The terminating resistance is required at both ends of a network, or both ends of a segment, to absorb unnecessary signals and reduce noise.

When a Repeater Unit is located at either end of the Network, turn ON the terminating resistance switch of the Repeater Unit.

Terminating Resistance Switch for Communications Cable Terminal Block SL1 and SL2



Note The numbers 1 and 2 on the switch are in reverse order, so make sure the switch is set correctly.

Switch	Terminating resistance
OFF (default)	Not connected
ON	Connected

Note
1. Always turn OFF power to the Repeater Unit before setting the baud rate.
2. Turn ON the switch at the node located at each end of the network to connect terminating resistance and turn OFF the switches at all other nodes to disconnect terminating resistance. Normal communications throughout the entire network will not be performed if the terminating resistance of even one node differs from the others.
3. The factory default setting is OFF (terminating resistance not connected).

SECTION 5
Data Links

This section describes how to use data links in a Controller Link Network. Refer to *SECTION 2 Basic Procedures* for an outline of data link application.

5-1 What Are Data Links?. 108
5-1-1 Data Link Specifications. 113
5-1-2 Differences between Manual and Automatic Setting 114
5-2 Setting Data Links. 115
5-2-1 Selecting Manual or Automatic Setting 115
5-2-2 Manual Setting 116
5-2-3 Manual Setting Examples. 125
5-2-4 Automatic Setting. 131
5-2-5 Automatic Setting Example 153
5-3 Starting and Stopping Data Links 155
5-3-1 Using a Programming Device or the User Program 156
5-3-2 Using the Controller Link Support Software and CX-Programmer . 157
5-3-3 Using FINS Commands 157
5-4 Checking Data Link Status 158
5-4-1 LED Indicators 158
5-4-2 Data Link Status Area. 158
5-4-3 Data Link Status Area. 163
5-4-4 Checking by Manipulating Bit/Word Status. 163
5-4-5 Error Detection Program Example 164
5-4-6 Programming Examples for Processing Data when Errors Occur . . 164

5-1 What Are Data Links?

Data links automatically exchange data in the preset areas between nodes (PLCs and/or computers) on one network. Data links can be freely created for CS/CJ-series PLCs, C200HX/HG/HE PLCs, CVM1, CV-series PLCs, CQM1H-series PLCs, and IBM PC/AT or compatible computers.

Two data link areas, area 1 and area 2, can be set for each node. Data links can be set in either of the following ways.

Functions supported by CS/CJ-series Controller Link Unit Models

Model / Item	CS1W-CLK23 CJ1W-CLK23	CS1W-CLK21-V1 CJ1W-CLK21-V1	
		Unit version 1.2	Pre-Ver. 1.2
Maximum number of data link words (data link area for sending/receiving that is created for a single node in a single CPU Unit)	20,000 max.		12,000 max.
Maximum number of send words (total for areas 1 and 2)	4,000 max. (for user settings)	1,000 max.	
Data Link Area	The same area cannot be allocated for both Area 1 and Area 2.		The same area can be allocated for both Area 1 and Area 2.

Note

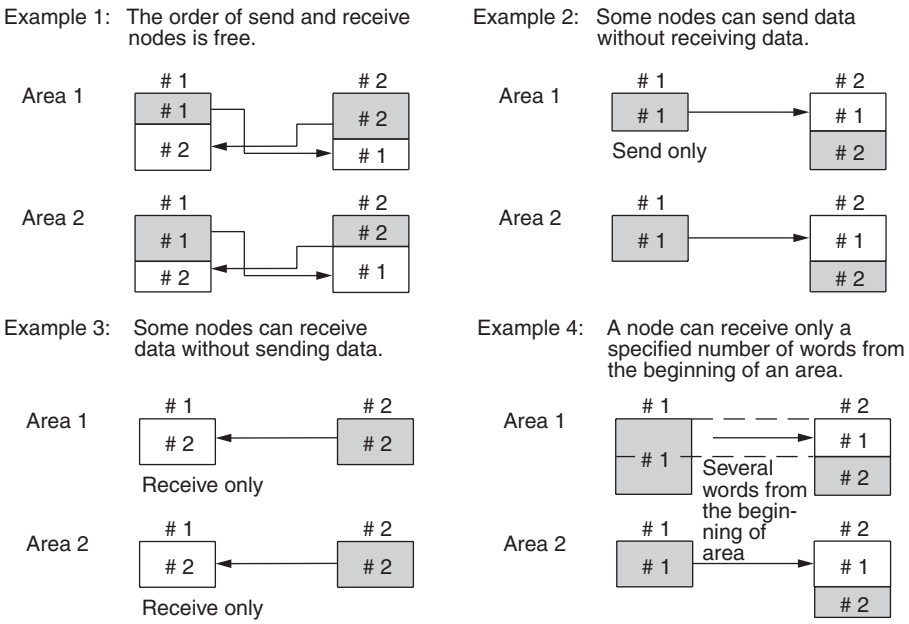
1. Use the CX-Integrator to set a data link area in which the number of send and receive words exceeds 12,000 words, or to set data link tables that allocate the same area for Area 1 and Area 2.
2. Use the CX-Integrator Data Link Setting Tool version 3.2.1.1 or later to set data link tables with more than 1,000 send words per node. For information on checking the version number, refer to *Checking the CX-Integrator Data Link Setting Tool Version* on page viii.

- Data link areas can be manually set by inputting data link tables using Support Software. Data link tables are created to define the data links. These tables enable free allocation of data link areas.
- Data links can be set automatically from a Programming Device. With automatically set data links, all link areas are the same size.

Both automatic setting and manual setting cannot be used together in the same network. The following rules apply to these two methods of setting data links.

- Data links are enabled concurrently for area 1 and area 2.
- Separate settings (data link start words and send area size) are made in area 1 and area 2. The sequences of send and receive words are the same in area 1 and area 2.
- Not all nodes must participate in the data links.

Manually Setting Data Links



Manually set data links are used to create flexible data links that meet the needs of the individual system.

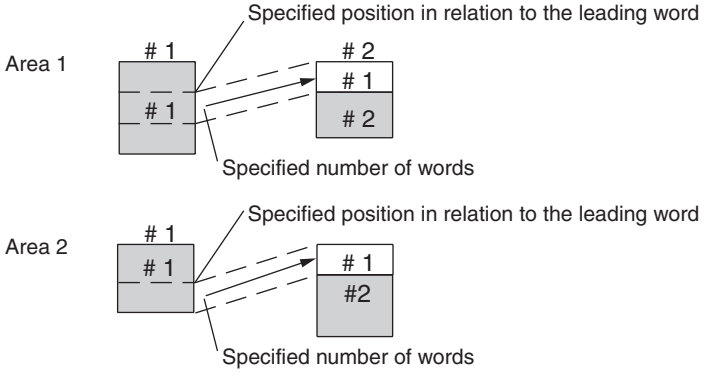
- Data links are set in the Controller Link Unit or Board of each node using the Support Software.
- Area 1 and area 2 can be selected from PLC memory areas, including the DM Area and EM Area.
- A send area and its size can be allocated freely for each node.
- The sequence of receive nodes can be changed.
- Nodes can be set that only send or only receive data.
- Only part of send data can be received and an offset can be used to specify the beginning of the desired part.

Manual Setting Options

The following options can be set when manually setting data links.

Offsets

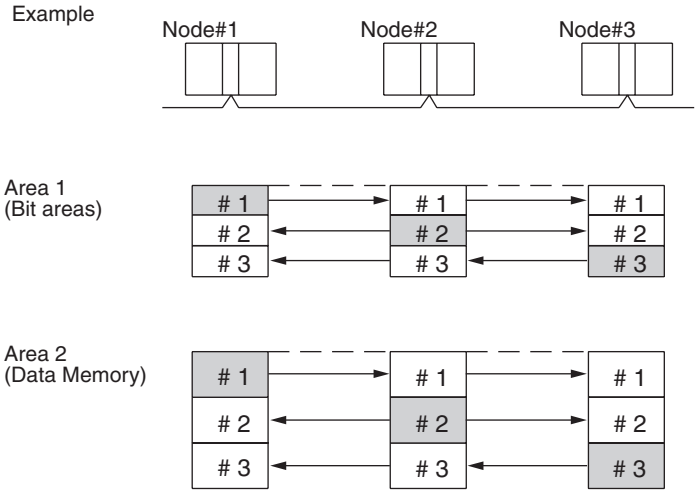
Data of the only the specified number of words can be received starting from the specified word position. The starting word is set as an offset from the beginning of the send data. The following is an example.



Easy Setting

The send data areas of all nodes can be set to the same size (same as for automatic setting described next).

Automatically Setting Data Links with Equality Layout



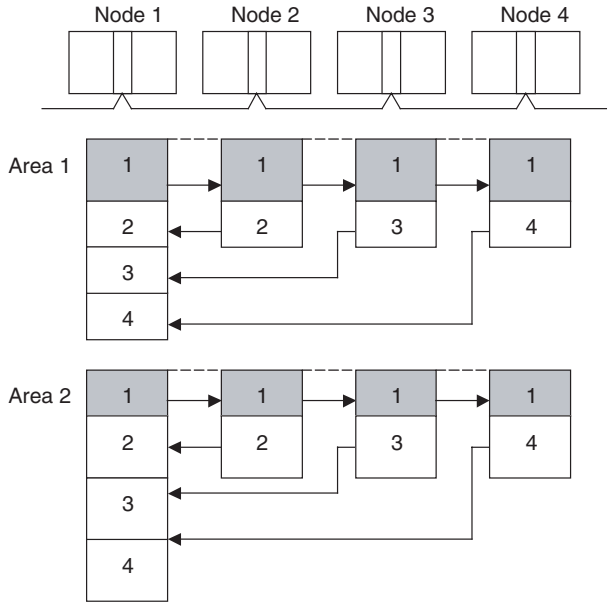
Automatic setting can be used to create simple data links.

- Using a Programming Device (such as a Programming Console), set the automatic data link mode in the DM Parameter Area of the startup node.
- Area 1 can be selected from bit-access areas (i.e., IR, CIO, and LR areas) and area 2 can be selected from DM Area.
- In areas 1 and 2 send areas for each node are of the same size.
- Send nodes are in the same ascending order as node numbers.
- It is not possible to receive only a part of send data.
- All nodes can be specified to either participate or not participate in the data link.
- The data link areas are exactly the same and common to all nodes participating in the data links.

Note The Controller Link Support Software contains a function called "Easy Setting" that can be used within the manual data link mode to register the same data links as automatic setting. The "Easy Setting" can be used first, and then the send size of each node and other settings can be changed as required.

Automatic Setting Data Links with 1:N Allocations

This method is used to simplify setting of 1:N allocation data links between master and slave nodes.



- There are three types of 1:N allocations.
- Programming Devices (including Programming Consoles) are used to set the automatic data link mode in the DM Parameter Area of the PLC used as the startup node.
- Node 1 is the master node.
- Areas 1 and 2 can be selected from bit-access areas or the DM Area.
- The send area sizes of the master and slave nodes are the same for each area.
- Send nodes are in the same ascending order as node numbers.
- All nodes can be specified to either participate or not participate in the data link.
- The data link areas (data link start words) are common to all nodes participating in the data links.

Note

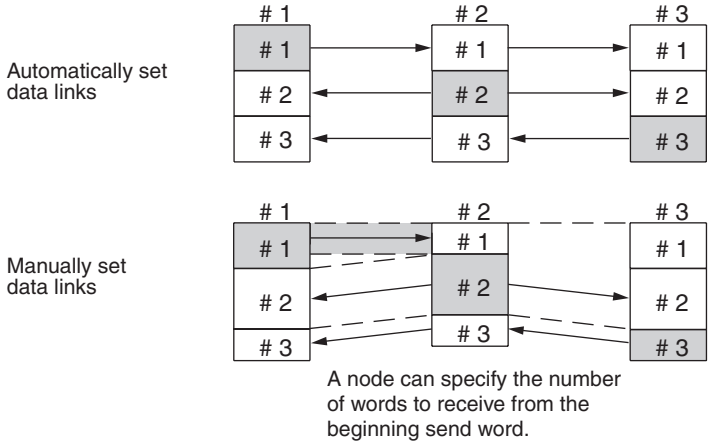
1. Automatic data link creation with 1:N allocations can only be used with the following Controller Link Units and Support Boards:

Type	Model
Wired networks	CS1W-CLK21-V1 and CS1W-CLK23 (for CS Series) CJ1W-CLK21-V1 and CJ1W-CLK23 (for CJ Series) 3G8F7-CLK21-V1 and 3G8F7-CLK23-E (for PCI bus)

2. Controller Link Units and Support Boards other than those listed above cannot participate in 1:N allocation data links. They can, however, join the network if a parameter in the DM Parameter Area is set so that they do not participate in the data links.
3. The Controller Link Support Board (3G8F7-CLK21-V1 and 3G8F7-CLK23-E) can be used in automatic data link creation with 1:N allocations, but it cannot be the startup node. Use a Controller Link Unit (CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23) on the same network as the startup node.
4. For automatic data link creation with 1:N allocations, use the CX-Integrator.

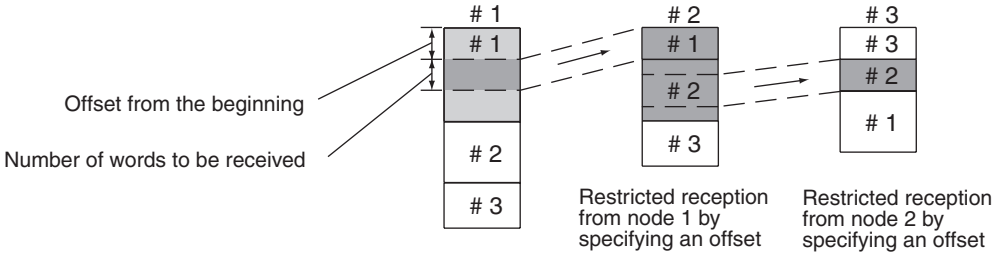
Using Offsets

For automatically set data links, all of the send words transmitted by a node are received by other nodes with no change in size. For manually set data links, the size of a receive area can be restricted by specifying a number of words from the beginning word of the words sent by another node.

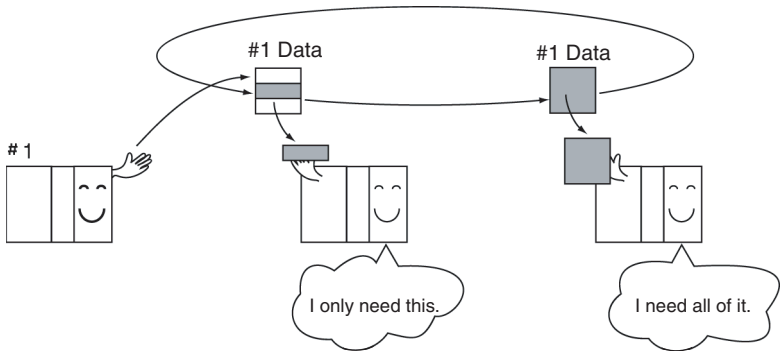


However, the above system does not guarantee that only the desired words will be received and therefore the receive node may receive unnecessary data.

Offsetting enables specification of a more specific range of receive data by indicating both the number of words and the starting word position from the beginning of the area. The offset refers to the starting word position counted from the beginning of the area.

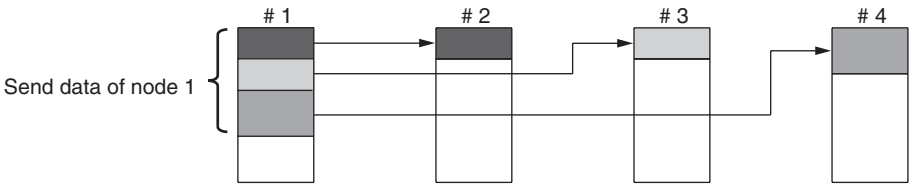


Offsetting Image



Application Example of Using Offsets

In the following example, the send data from node 1 is split into three parts and each part is received by a different node, i.e., each of the other nodes receives only part of the send data from node 1. This enables effective use of data link memory areas without wasting space. In this way, a type of message service (i.e., specific data to a specific node) can be achieved through data links.



Note The following table shows the status of the data link refresh area when a node registered in the data link table generates a communications error.

Communications error type	Data link area
A node separates from the network while a data link is running.	Data received immediately prior to the error continues to be refreshed in the data link areas of the relevant nodes.
A node does not join the network after the data links start.	Zero (0) data continues to be refreshed in the data link areas of the relevant nodes.

5-1-1 Data Link Specifications

Item	Description	
No. of data link nodes	32 max., 2 min.	
Number of data link words	Number of send words per node	CS/CJ Series CS1W-CLK23, CJ1W-CLK23: 4,000 max. CS1W-CLK21-V1, CJ1W-CLK21-V1: 1,000 max. C200HX/HG/HE, CVM1/CV, CQM1H: 1,000 max. Personal computer 38F7-CLK23: 4,000 max. 3G8F7-CLK21-V1, 3G8F5-CLK21-E: 1,000 max.
	Number of send/receive words per node	CS/CJ Series CS1W-CLK23, CJ1W-CLK23: 20,000 max. CS1W-CLK21-V1, CJ1W-CLK21-V1: 20,000 max. (unit Ver. 1.2 or later) 12,000 max. (pre-Ver. 1.2) C200HX/HG/HE, CVM1/CV, CQM1H: 8,000 max. Personal computer: 32,000 or 62,000 max. (See note.)
Allocation of data link areas	Manual setting	Area 1, 2: Bit-access area (IR, CIO, and LR Areas) DM Area (DM and EM Areas) Unit Ver. 1.2 or later: Area 1 and Area 2 can be set in the same memory area. Pre-Ver. 1.2: Area 1 and Area 2 cannot be set in the same memory area.
	Automatic setting equality layout	Area 1: IR, CIO, or LR Area Area 2: DM Area (DM and EM Areas)
	Automatic setting 1:N allocations	Area 1, 2: Bit-access area (IR, CIO, and LR Areas) DM Area (DM and EM Areas)

Note For 62-node configuration

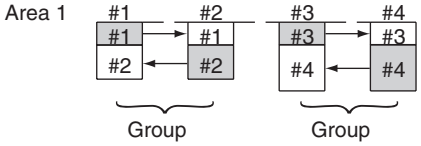
5-1-2 Differences between Manual and Automatic Setting

Item	Manual setting	Automatic setting
Determination of nodes to be in a data link	Determined by setting data link tables.	Determined by the data link parameters set in the data link startup node (the node used to start the data links).
Data link settings	Set in data link tables that are set in the nodes to participate in data links.	Determined by the data link parameters set in the data link startup node (the node used to start the data links).
Data link areas 1 and 2	In each node, area 1 and area 2 are selected from bit-access areas (IR, CIO, and LR Areas) and DM Area (DM and EM Areas). However, areas 1 and 2 cannot be set in the same memory area.	Area 1 is selected from bit-access areas (IR, CIO, and LR Areas) and area 2 is selected from DM Area (DM and EM Areas).
Refresh starting word	Can be set freely in each node. (See note a))	Can be set freely. (See note a))
Data link status area	Selected from bit-access areas (IR, CIO, and LR Areas) and DM Area (DM and EM Areas) in each node.	Selected from bit-access areas (IR or CIO Areas).
Refresh sequence	Can be set in each node freely.	Node addresses are in ascending order.
Data reception	It is possible to set in each node whether the entire data or a part of the data sent from another node is received. It is also possible to not receive the data sent from a specific node. (See note b))	The entire data sent from each node that is participating in the data link is received.
Data transmission	The send sizes can be set freely in each node. It is also possible for certain node not to send data. (See note b))	In area 1 and area 2, data send sizes are the same in each node.

Note a) The following are true for computer nodes (i.e., computers with a Controller Link Support Board mounted).

- The data link starting position is fixed.
- Because areas such as bit-access areas and the DM Area are not supported, areas must be made available on the computer for linking.
- Automatically set data links cannot be started from the Controller Link Support Board.
- The Controller Link Support Board can participate in automatically set data links.

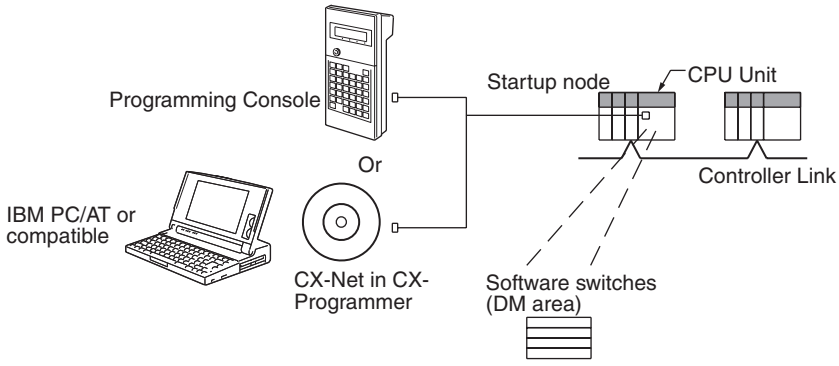
b) If data links are manually set, send/receive area can be selected in each node, allowing send/receive groups to be created within the network in area 1 and area 2, as shown below.



5-2 Setting Data Links

5-2-1 Selecting Manual or Automatic Setting

Specify either the manual or automatic data link mode in the following DM Parameter Area of the PLC's CPU Unit of the startup node, using a PLC Programming Device.



CS/CJ-series Startup Nodes

N: DM 30000 + 100 x Unit number of Controller Link Unit

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word N	–	–	0	0	–	0	0	0	–				0	0	0	–

0: Always 0.
–: Other setting

Data link mode
000: Manual setting
001: Automatic setting, equality layout
101: Automatic setting, 1:N allocation

C200HX/HG/HE Startup Nodes

N: Level 0 = DM 6400
Level 1 = DM 6420

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word N	–	–	0	–	0	0	0	0	0	0			0	0	0	0

0: Always 0.
–: Other settings

Data link mode
00: Manual setting
01: Automatic setting

CVM1 and CV-series Startup Nodes

N: DM 2000 + 100 x unit number of Controller Link Unit

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word N	–	–	0	0	0	0	0	0	0	0			0	0	0	–

0: Always 0.
–: Other setting

Data link mode
00: Manual setting
01: Automatic setting

CQM1H-series Startup Nodes

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DM 6400	–	–	0	–	0	0	0	0	0	0			0	0	0	0

0: Always 0.
–: Other setting

Data link mode
00: Manual setting
01: Automatic setting

Note

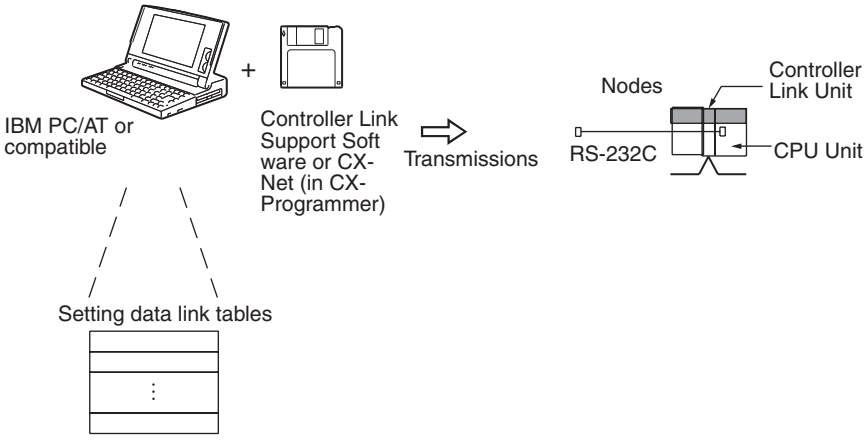
1. Be sure to set the bit in the DM Area's (CPU Bus Unit Area's) software switches (DM30000 + 100 × unit number) described as "always set to 0" to 0. Not doing so may result in the data link not starting properly.
2. The default data link mode is for manual setting (00), but check the setting from the Programming Device.
3. A data link mode can be set in a data link startup node only. The data link mode setting is determined by the data link mode of the startup node even if the data link mode settings of the nodes participating in the data links are different from the settings in the startup node.
4. In manual setting, a data link table must be set in the data link startup node and in automatic setting, automatic data link setting parameters must be set in the data link startup node. Data links will not be started unless the settings are correct.
5. Always check whether the data link settings for all startup nodes in the corresponding network are correct to prevent starting up using with incorrect data link modes and parameters. Make sure that both automatic setting and manual setting modes are not used together in the same network and that automatic settings with different parameters are not used.

5-2-2 Manual Setting

Transfer the data link tables that were created on the Controller Link Support Software or CX-Net (in CX-Programmer) to the Controller Link Unit or the Controller Link Support Board (for IBM PC/AT or compatible computers).

The data link tables are transferred from a computer running the Controller Link Support Software. The computer can either be a node in the network or a computer attached as a Programming Device.

Transferring from a Programming Device

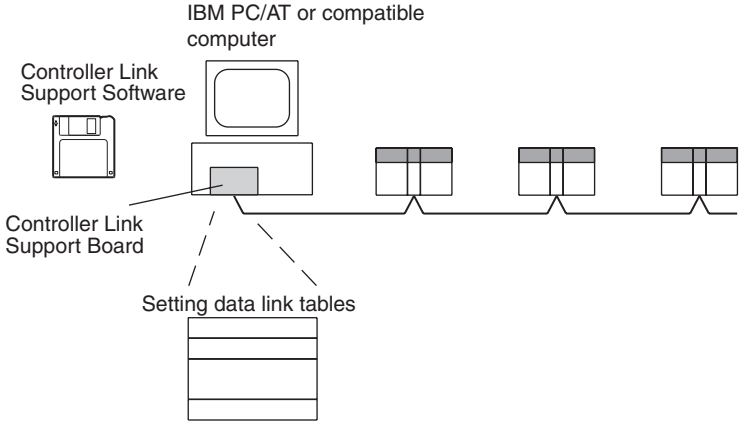


Note

1. When transferring data link tables to a CS/CJ-series PLC, turn OFF pin 1 of the DIP switch on the CPU Unit. Otherwise, data link tables cannot be written normally.
2. When transferring the data link tables to a CVM1 or CV-series PLC, set the System Protect Keyswitch on the CPU Unit to "NORMAL." Otherwise, data link tables cannot be written normally.
3. Use the CX-Net in CX-Programmer version 1.20 or higher for CQM1H Controller Link Units. The Controller Link Support Software can also be used. (Refer to the *Controller Link Support Software Operation Manual* (W308) for details.)

4. When using the Controller Link Support Software to set a CJ-series Controller Link Unit, use one of the following methods to set the type of PLC.
   - Set the type of PLC to “Others.”
   - Add the following information to the device information setting file (CLKTYPE.TXT) in the Controller Link Support Software to add the CJ-series PLC and then set the CJ-series PLC.
     CJ1G-CPU44: Same settings as the CS1G-CPU44-E
     CJ1G-CPU45: Same settings as the CS1G-CPU45-E
     For details on editing device information setting files, refer to the *Controller Link Support Software Operation Manual* (W308).

Transferring from a Computer Node



A data link table is created for each node using the Controller Link Support Software. The data link tables contain all the settings required to create the data links.

Note

1. The following three methods can be used to start data links. (See page 155.)
   - Using a software switch
   - Using the Controller Link Support Software or CX-Net (in CX-Programmer)
   - Using an FINS command
2. To create data link tables using the Controller Link Support Software, the network must have been constructed correctly. Set routing tables at each node as required. See *Applications Precautions* on page xxiv for details.

Data Link Table Specifications

CS/CJ-series PLCs

Setting item	Setting range
PLC model	Set the model of the PLC’s CPU Unit.
Nodes	1 to 32 Set the address of the refresh nodes. It cannot be set to a parameter exceeding the “maximum node address” of the network parameter.

Setting item		Setting range
First data link status word		Set the first word to store data link status. An area of 16 words is used. CIO Area: CIO 001 to CIO 6128 (*1) LR Area: LR 00 to LR 184 (*2) DM Area: DM 0000 to DM 32752 EM Area: Banks 00 to 12, EM 0000 to EM 32752 *1: When IR 000 is specified or when the default setting (——) is left unchanged, the default first status word will be used. Refer to *5-4 Checking Data Link Status* for details. *2: When a word between LR 000 and LR 184 is specified, the data link area will be allocated between CIO 1000 and CIO 1184.
Area 1	Data link start word	CIO Area: CIO 000 to CIO 6143 LR Area: LR 00 to LR 199 (*) DM Area: DM 0000 to DM 32767 EM Area: Banks 00 to 12, EM 0000 to EM 32767 Unit Ver. 1.2 or later: The same memory areas can be set for both Area 1 and Area 2. *: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between CIO 1000 and CIO 1199.
	Number of words	Remote nodes: 0 to the number of source words Set the number of words to be received. Local node: CS1W-CLK23, CJ1W-CLK23: 0 to 4,000 CS1W-CLK21-V1, CJ1W-CLK21-V1: 0 to 1,000 Set the number of words to be transmitted. The total number of words in area 1 and area 2 in each node must not exceed 4,000 for the CS1W-CLK23 or CJ1W-CLK23, and must not exceed 1,000 for the CS1W-CLK21-V1 or CJ1W-CLK21-V1. The numbers of words in both area 1 and area 2 in each node must not be set to 0.
	Offset	Remote nodes: 0 to one less than number of source words Set the offset for the data to be received. Local node: Cannot be set. This setting is not required if an offset is not used.

Setting item		Setting range
Area 2	Data link start word	CIO Area: CIO 000 to CIO 6143 LR Area: LR 00 to LR 199 (*) DM Area: DM 0000 to DM 32767 EM Area: Banks 00 to 15, EM 0000 to EM 32767 (EM must be installed) Unit Ver. 1.2 or later: The same memory areas can be set for both Area 1 and Area 2. *: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between CIO 1000 and CIO 1199.
	Number of words	Remote nodes: 0 to the number of source words Set the number of words to be received. 0 to 4,000 (CS1W-CLK23, CJ1W-CLK23) Local node: CS1W-CLK23, CJ1W-CLK23: 0 to 4,000 CS1W-CLK21-V1, CJ1W-CLK21-V1: 0 to 1,000 Set the number of words to be transmitted. The total number of words in area 1 and area 2 in each node must not exceed 4,000 for the CS1W-CLK23 or CJ1W-CLK23, and must not exceed 1,000 for the CS1W-CLK21-V1 or CJ1W-CLK21-V1. The numbers of words in both area 1 and area 2 in each node must not be set to 0.
	Offset	Remote nodes: 0 to one less than number of source words Set the offset for the data to be received. Local node: Cannot be set. This setting is not required if an offset is not used.

Note a) The total number of words in data link send and receive areas must not exceed 20,000 per node when using Controller Link Units with unit Ver. 1.2 or later, or 12,000 words per node if using pre-Ver. 1.2 Controller Link Units.

b) The following values must be satisfied for each node for the data link area 1 and area 2 so that the final word in the data link does not go beyond the last word in the PLC memory area.

(Data link start word – 1) + (Total number of send/receive words in area 1 or area 2)

≤ 6143 (CIO Area)
199 (LR Area)
32767 (DM Area, EM Area)

c) Refer to the *Controller Link Support Boards Operation Manual* (W307) for information on the Controller Link Support Board.

d) If CX-Net detects an error during the data link table check, troubleshoot the error referring to *9-4 Troubleshooting Error Messages in CX-Net Data Link Table Check.*

C200HX/HG/HE PLCs

Setting item	Setting range
PLC model	Set the model of the PLC's CPU Unit.
Nodes	1 to 32 Set the address of the refresh nodes. It cannot be set to a parameter exceeding the "maximum node address" of the network parameter.

Setting item		Setting range
First data link status word		Set the first word to store data link status. An area of 16 words is used. IR Area: IR 001 to IR 220, IR 300 to IR 496 (*) LR Area: LR 00 to LR 48 DM Area: DM 0000 to DM 5984 EM Area: Banks 00 to 15, EM 0000 to EM 6128 (EM must be installed) *: When IR 000 is specified or when the default setting (——) is left unchanged, the default first status word will be used. Refer to *5-4 Checking Data Link Status* for details.
Area 1	Data link start word	IR Area: IR 000 to IR 235, IR 300 to IR 511 LR Area: LR 00 to LR 63 DM Area: DM 0000 to DM 5999 EM Area: Banks 00 to 15, EM 0000 to EM 6143 (EM must be installed) The same area cannot be set for both area 1 and area 2. Set different areas.
	Number of words	Remote nodes: 0 to the number of source words Set the number of words to be received. Local node: 0 to 1,000 Set the number of words to be transmitted. The total number of words in area 1 and area 2 in each node must not exceed 1,000. The numbers of words in both area 1 and area 2 in each node must not be set to 0.
	Offset	Remote nodes: 0 to one less than number of source words Set the offset for the data to be received. Local node: Cannot be set. This setting is not required if an offset is not used.
Area 2	Data link start word	IR Area: IR 000 to IR 235, IR 300 to IR 511 LR Area: LR 00 to LR 63 DM Area: DM 0000 to DM 5999 EM Area: Banks 00 to 15, EM 0000 to EM 6143 (EM must be installed) The same area cannot be set for both area 1 and area 2. Set different areas.
	Number of words	Remote nodes: 0 to the number of source words Set the number of words to be received. Local node: 0 to 1,000 Set the number of words to be transmitted. The total number of words in area 1 and area 2 in each node must not exceed 1,000. The numbers of words in both area 1 and area 2 in each node must not be set to 0.
	Offset	Remote nodes: 0 to one less than number of source words Set the offset for the data to be received. Local node: Cannot be set. This setting is not required if an offset is not used.

Note a) The total number of words in data link send and receive areas must not exceed 8,000 per node.

b) The following values must be satisfied for each node for the data link area 1 and area 2 so that the final word in the data link does not go beyond the last word in the PLC memory area.

(Data link start word – 1) + Total number of send/receive words in area ≤235 (First word IR 000 to IR 235)
511 (First word IR 300 to IR 511)
63 (LR Area)
5999 (DM Area)
6143 (EM Area)

c) Refer to the *Controller Link Support Boards Operation Manual* (W307) for information on the Controller Link Support Board.

d) If CX-Net detects an error during the data link table check, troubleshoot the error referring to *9-4 Troubleshooting Error Messages in CX-Net Data Link Table Check.*

CVM1 and CV-series PLCs

Setting item		Setting range
PLC model		Set the model of the PLC's CPU Unit.
Nodes		1 to 32 Set the address of the refresh nodes. It cannot be set to a parameter exceeding the "maximum node address" of the network parameter.
First data link status word		Set the first word to store data link status. An area of 16 words is used. CIO Area: CIO 0001 to CIO 2540 (*1) LR Area: LR 000 to LR 184 (*2) DM Area: DM 0000 to DM 8176 (CV500/CVM1-CPU01-EV□) DM 0000 to DM 24560 (Other CPU Units) EM Area: Banks 00 to 07, EM 0000 to EM 32750 (EM must be installed) *1: When CIO 000 is specified or when the default setting (– – – – –) is left unchanged, the default first status word will be used. Refer to *5-4 Checking Data Link Status* for details. *2: When a word between LR 000 and LR 184 is specified, the data link area will be allocated between CIO 1000 and CIO 1184.
Area 1	Data link start word	CIO Area: CIO 0000 to CIO 2555 LR Area: LR 000 to LR 199 (*) DM Area: DM 0000 to DM 8191 (CV500/CVM1-CPU01-EV□) DM 0000 to DM 24575 (Other CPU Units) EM Area: Banks 00 to 07, EM 0000 to EM 32765 (EM must be installed) The same area cannot be set for both area 1 and area 2. Set different areas. *: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between CIO 1000 and CIO 1199.
	Number of words	Remote nodes: 0 to the number of source words Set the number of words to be received. Local node: 0 to 1,000 Set the number of words to be transmitted. The total number of words in area 1 and area 2 in each node must not exceed 1,000. The numbers of words in both area 1 and area 2 in each node must not be set to 0.
	Offset	Remote nodes: 0 to one less than number of source words Set the offset for the data to be received. Local node: Cannot be set. This setting is not required if an offset is not used.

Setting item		Setting range
Area 2	Data link start word	CIO Area: CIO 0000 to CIO 2555 LR Area: LR 000 to LR 199 (*) DM Area: DM 0000 to DM 8191 (CV500/CVM1-CPU01-EV□) DM 0000 to DM 24575 (Other CPU Units) EM Area: Banks 00 to 07, EM 0000 to EM 32765 (EM must be installed) The same area cannot be set for both area 1 and area 2. Set different areas. *: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between CIO 1000 and CIO 1199.
	Number of words	Remote nodes: 0 to the number of source words Set the number of words to be received. Local node: 0 to 1,000 Set the number of words to be transmitted. The total number of words in area 1 and area 2 in each node must not exceed 1,000. The numbers of words in both area 1 and area 2 in each node must not be set to 0.
	Offset	Remote nodes: 0 to one less than number of source words Set the offset for the data to be received. Local node: Cannot be set. This setting is not required if an offset is not used.

Note a) The total number of words in data link send and receive areas must not exceed 8,000 per node.

b) The following values must be satisfied for each node for the data link area 1 and area 2 so that the final word in the data link does not go beyond the last word in the PLC memory area.

(Data link start word – 1) + Total number of send/receive words in area ≤2555 (CIO Area)
199 (LR Area)
8191 (DM Area for CV500/CVM1-CPU01-EV□)
24575 (DM Area for other CPU Units)
32765 (EM Area)

c) Refer to the *Controller Link Support Boards Operation Manual* (W307) for information on the Controller Link Support Board.

d) If CX-Net detects an error during the data link table check, troubleshoot the error referring to *9-4 Troubleshooting Error Messages in CX-Net Data Link Table Check.*

CQM1H-series PLCs

Setting item	Setting range
PLC model	Set the model of the PLC's CPU Unit.
Nodes	1 to 32 Set the address of the refresh nodes. It cannot be set to a parameter exceeding the "maximum node address" of the network parameters.

Setting item		Setting range
First data link status word		Set the first word to store data link status. An area of 16 words is used. IR Area: IR 001 to IR 232 LR Area: LR 00 to LR 48 DM Area: DM 0000 to DM 5984 EM Area: EM 0000 to EM 6128 (EM must be installed) When IR 000 is specified or when the default setting (———) is left unchanged, the default first status word will be used. Refer to *5-4 Checking Data Link Status* for details.
Area 1	Data link start word	IR Area: IR 000 to IR 247 LR Area: LR 00 to LR 63 DM Area: DM 0000 to DM 5999 EM Area: EM 0000 to EM 6143 (EM must be installed) The same memory area cannot be set for both area 1 and area 2. Set different memory areas.
	Number of words	Remote nodes: 0 to the number of source words Set the number of words to be received. Local node: 0 to 1,000 Set the number of words to be transmitted. The total number of words in area 1 and area 2 in each node must not exceed 1,000. The numbers of words in both area 1 and area 2 in each node must not be set to 0.
	Offset	Remote nodes: 0 to one less than number of source words Set the offset for the data to be received. Local node: Cannot be set. This setting is not required if an offset is not used.
Area 2	Data link start word	IR Area: IR 000 to IR 247 LR Area: LR 00 to LR 63 DM Area: DM 0000 to DM 5999 EM Area: EM 0000 to EM 6143 (EM must be installed) The same memory area cannot be set for both area 1 and area 2. Set different memory areas.
	Number of words	Remote nodes: 0 to the number of source words Set the number of words to be received. Local node: 0 to 1,000 Set the number of words to be transmitted. The total number of words in area 1 and area 2 in each node must not exceed 1,000. The numbers of words in both area 1 and area 2 in each node must not be set to 0.
	Offset	Remote nodes: 0 to one less than number of source words Set the offset for the data to be received. Local node: Cannot be set. This setting is not required if an offset is not used.

Note a) The total number of words in data link send and receive areas must not exceed 8,000 per node.

b) The following values must be satisfied for each node for the data link area 1 and area 2 so that the final word in the data link does not go beyond the last word in the PLC memory area.

(Data link start word – 1) + Total number of send/receive words in area ≤247 (IR Area)
63 (LR Area)
5999 (DM Area)
6143 (EM Area)

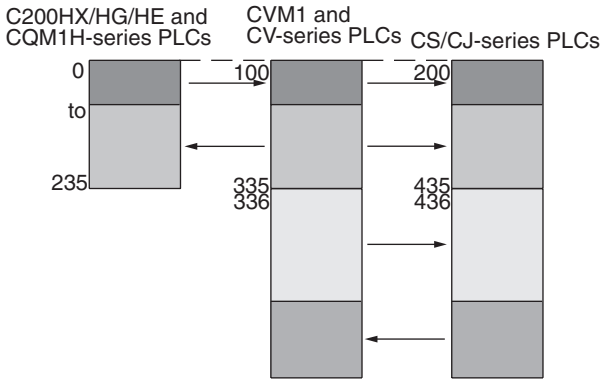
c) Refer to the *Controller Link Support Boards Operation Manual* (W307) for information on the Controller Link Support Board.

d) If CX-Net detects an error during the data link table check, troubleshoot the error referring to *9-4 Troubleshooting Error Messages in CX-Net Data Link Table Check.*

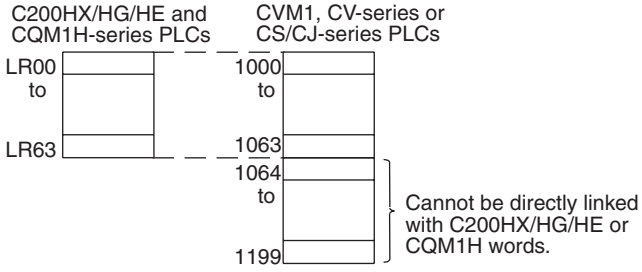
Precautions

C200HX/HG/HE, CS/CJ-series, CVM1, CV-series, and CQM1H-series PLCs have different-sized memory areas. When data links are manually set, provided the PLCs are set so as not to receive data in the areas indicated in the following diagram, the data link setting area is not limited by the small area size of the PLC.

Example:



If the LR Area in the C200HX/HG/HE or CQM1H Series is manually set for a data link with a CVM1, CV-series or CS/CJ-series PLC, the LR words will be linked to CIO 1000 to CIO 1063 in the CVM1, CV-series or CS/CJ-series PLC. CIO 1064 to CIO 1199 cannot be linked with C200HX/HG/HE or CQM1H-series PLCs in this way.

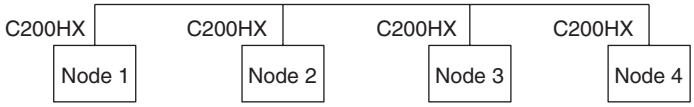


5-2-3 Manual Setting Examples

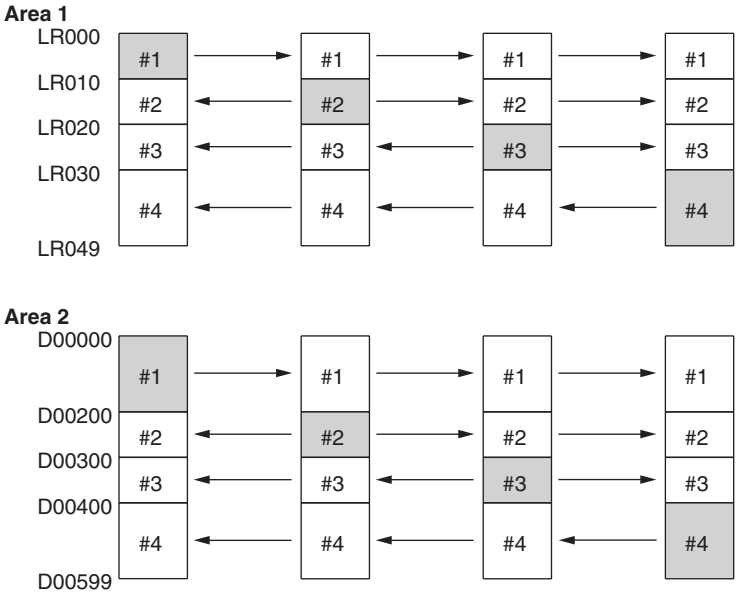
This section shows examples of manually creating data link tables on the Controller Link Support Software. Sample files containing the data link tables are provided on the installation disk for the Software.

SAMPLE1.CLK: Same Allocation to All Nodes

Data Link Area Structure



Data Link Areas



Device Information Settings

Device Info set | DataLink table

Node	Model name	Node	Model name
01	C200HX	17	
02	C200HX	18	
03	C200HX	19	
04	C200HX	20	
05		21	
06		22	

Data Link Tables

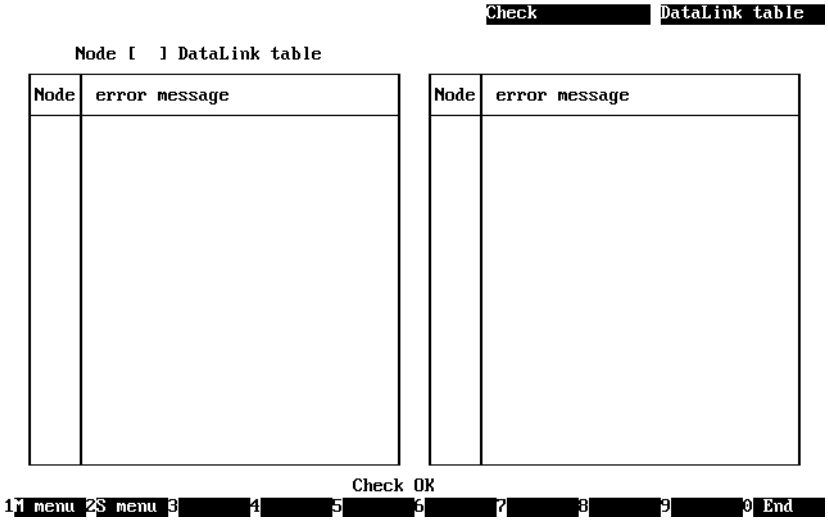
Edit | DataLink table

Node[01] PCtype[C200HX] Num of Nd [4] Status Word[--------]

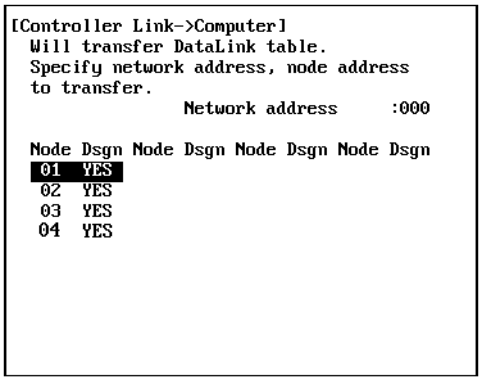
Node	<Area1> Link Start Word[L00000] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[D00000] Link Wd	Num Wd	Source Wd
01	L00000	10	Send Area	D00000	200	Send Area
02	L00010	10	L00010	D00200	100	D00200
03	L00020	10	L00020	D00300	100	D00300
04	L00030	20	L00030	D00400	200	D00400

Set exactly the same table for nodes 2, 3, and 4. To do this, the copy function can be used to copy the data link table for node 1 to nodes 2, 3, and 4.

Checking the Data Link Tables



Transferring the Data Link Tables



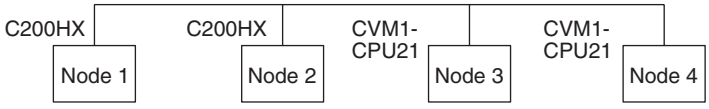
Saving the Data Link Tables



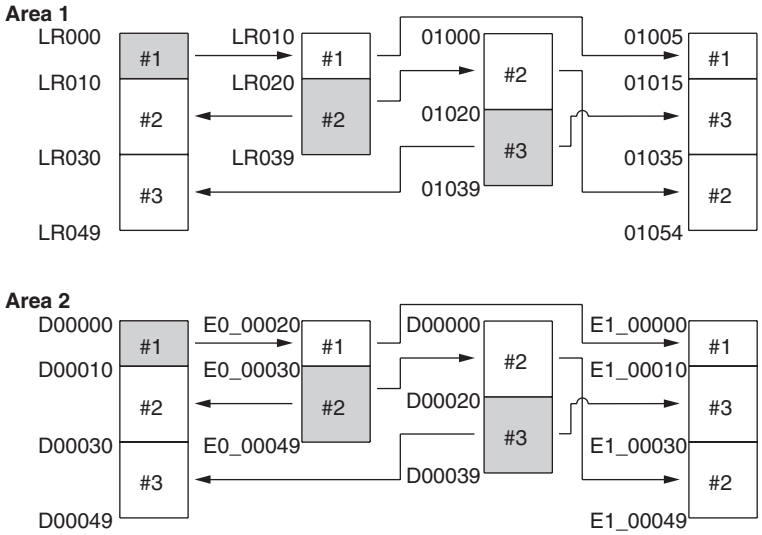
SAMPLE2.CLK: Different Allocations to Each Node

Data links can be created so that one node does not receive from all other nodes or so that some nodes do not send or receive any data at all. In the following example, node 2 does not receive data from node 3 and node 3 does not receive data from node 1. Node 4 does not send any add; it only receives data from other nodes.

Data Link Area Structure



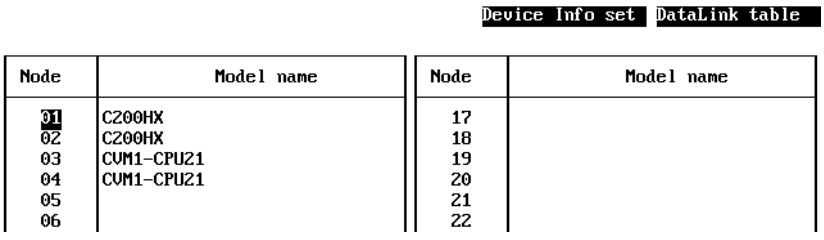
Data Link Areas



Only nodes in which a data link table has been created can participate in the data links.

In the data link table, the node sequence can be changed freely; however, the data link areas must be created consecutively.

Device Information Setting



Data Link Tables

Edit DataLink table

Node[01] PCtype[C200HX] Num of Nd [3] Status Word[--------]

Node	<Area1> Link Start Word[L00000] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[D00000] Link Wd	Num Wd	Source Wd
01	L00000	10	Send Area	D00000	10	Send Area
02	L00010	20	L00020	D00010	20	E0_00030
03	L00030	20	01020	D00030	20	D00020

Edit DataLink table

Node[02] PCtype[C200HX] Num of Nd [2] Status Word[--------]

Node	<Area1> Link Start Word[L00010] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[E0_00020] Link Wd	Num Wd	Source Wd
01	L00010	10	L00000	E0_00020	10	D00000
02	L00020	20	Send Area	E0_00030	20	Send Area

Edit DataLink table

Node[03] PCtype[CVM1-CPU21] Num of Nd [2] Status Word[--------]

Node	<Area1> Link Start Word[01000] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[D00000] Link Wd	Num Wd	Source Wd
02	01000	20	L00020	D00000	20	E0_00030
03	01020	20	Send Area	D00020	20	Send Area

Edit DataLink table

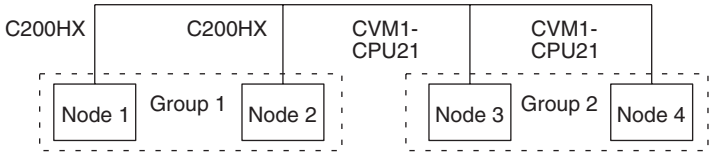
Node[04] PCtype[CVM1-CPU21] Num of Nd [3] Status Word[--------]

Node	<Area1> Link Start Word[01005] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[E1_00000] Link Wd	Num Wd	Source Wd
01	01005	10	L00000	E1_00000	10	D00000
03	01015	20	01020	E1_00010	20	D00020
02	01035	20	L00020	E1_00030	20	E0_00030

SAMPLE3.CLK: Creating Data Link Groups within a Network

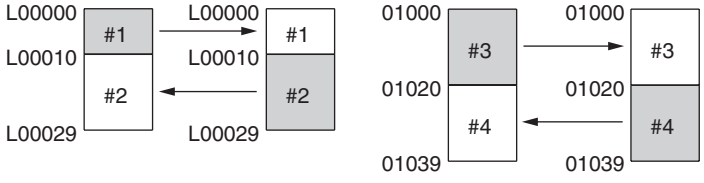
A data links consisting of multiple groups within a single network can be created by setting data link tables. Send and receive areas are created for only the nodes in each group, as shown below.

Data Link Area Structure



Data Link Areas

Area 1



Area 2



Device Information Setting

Device Info set | DataLink table

Node	Model name	Node	Model name
01	C200HX	17	
02	C200HX	18	
03	CVM1-CPU21	19	
04	CVM1-CPU21	20	
05		21	
06		22	

Data Link Tables

Edit | DataLink table

Node[01] PCtype[C200HX] Num of Nd [2] Status Word[--------]

Node	<Area1> Link Start Word[L00000] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[D00000] Link Wd	Num Wd	Source Wd
01	L00000	10	Send Area	D00000	100	Send Area
02	L00010	20	L00010	D00100	200	D01100

Edit | DataLink table

Node[02] PCtype[C200HX] Num of Nd [2] Status Word[--------]

Node	<Area1> Link Start Word[L00000] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[D01000] Link Wd	Num Wd	Source Wd
01	L00000	10	L00000	D01000	100	D00000
02	L00010	20	Send Area	D01100	200	Send Area

Edit | DataLink table

Node[03] PCtype[CVM1-CPU21] Num of Nd [2] Status Word[--------]

Node	<Area1> Link Start Word[01000] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[E0_00000] Link Wd	Num Wd	Source Wd
03	01000	20	Send Area	E0_00000	300	Send Area
04	01020	20	01020	E0_00300	300	E1_00300

Edit | DataLink table

Node[04] PCtype[CVM1-CPU21] Num of Nd [2] Status Word[--------]

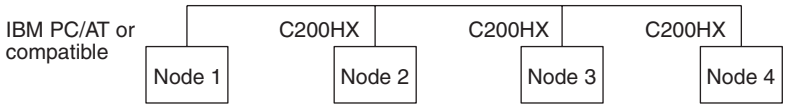
Node	<Area1> Link Start Word[01000] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[E1_00000] Link Wd	Num Wd	Source Wd
03	01000	20	01000	E1_00000	300	E0_00000
04	01020	20	Send Area	E1_00300	300	Send Area

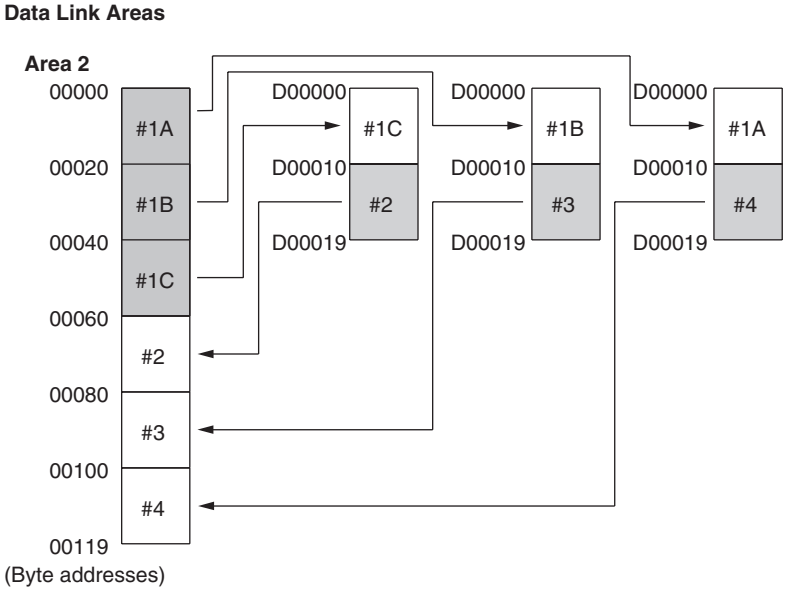
SAMPLE4.CLK: Receiving Only Part of Send Data and Offsets

Only area 2 is used in this example.

Note A Controller Link Support Board is used in this example. The Support Board does not have memory areas. The area settings are ignored and byte addresses are used. Refer to the *Controller Link Support Boards Operation Manual* (W307) for details on using a Controller Link Support Board.

Data Link Area Structure





Device Information Setting

Device Info set DataLink table

Node	Model name	Node	Model name
01	CLK Board	17	
02	C200HX	18	
03	C200HX	19	
04	C200HX	20	
05		21	
06		22	

Data Link Tables

Edit DataLink table

Node[01] PCtype[CLK Board] Num of Nd [4] Status Word[--------]

Node	<Area1> Link Start Word[00000] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[D00000] Link Wd	Num Wd	Source Wd
01	00000	0	Send Area	D00000	30	Send Area
02	00000	0	00000	D00030	10	D00010
03	00000	0	00000	D00040	10	D00010
04	00000	0	00000	D00050	10	D00010

Edit DataLink table

Node[02] PCtype[C200HX] Num of Nd [2] Status Word[--------]

Node	<Area1> Link Start Word[00000] Link Wd	Num Wd	Source Wd	Offset	<Area2> Link Start Word[D00000] Link Wd	Num Wd	Source Wd	Offset
01	00000	0	00000	0	D00000	10	D00020	20
02	00000	0	Send Area	---	D00010	10	Send Area	---

Edit DataLink table

Node[03] PCtype[C200HX] Num of Nd [2] Status Word[--------]

Node	<Area1> Link Start Word[00000] Link Wd	Num Wd	Source Wd	Offset	<Area2> Link Start Word[D00000] Link Wd	Num Wd	Source Wd	Offset
01	00000	0	00000	0	D00000	10	D00010	10
03	00000	0	Send Area	---	D00010	10	Send Area	---

Edit DataLink table

Node[04] PCtype[C200HX] Num of Nd [2] Status Word[--------]

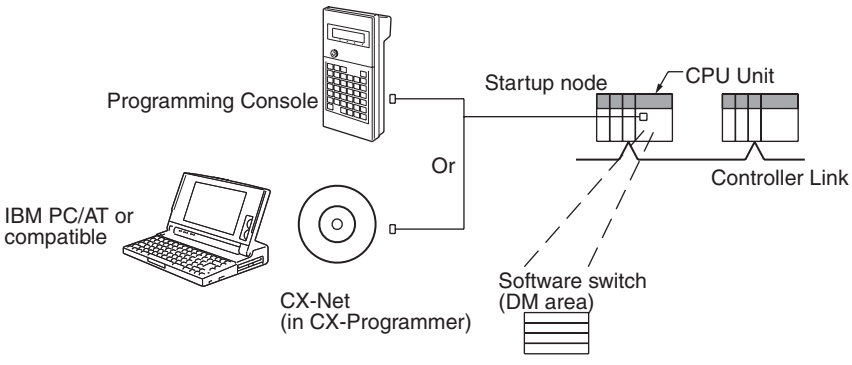
Node	<Area1> Link Start Word[00000] Link Wd	Num Wd	Source Wd	<Area2> Link Start Word[D00000] Link Wd	Num Wd	Source Wd
01	00000	0	00000	D00000	10	D00000
04	00000	0	Send Area	D00010	10	Send Area

5-2-4 Automatic Setting

Data links can be automatically created by setting values in the DM Parameter Area of the PLC's CPU Unit of the startup node. The settings are made using a Programming Console or the CX-Net in the CX-Programmer.

The startup node is the node from which the data links are activated. When automatically setting data links, data link operation is based on the values set in the startup node.

Note Automatic setting appears as "Select All" on the Controller Link Support Software message screens.

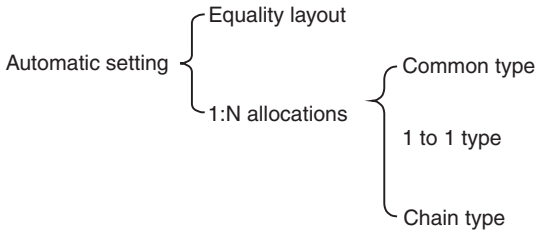


Note Data links can be started using one of the following (See p 155.)

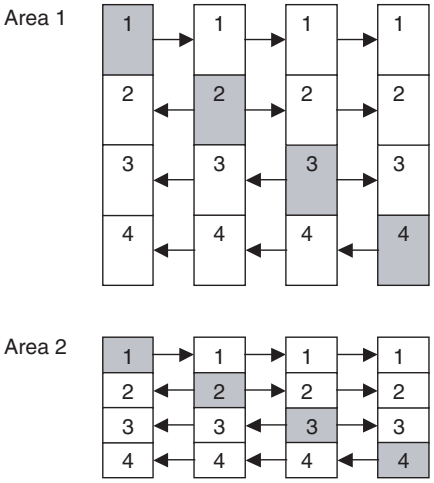
- Using a software switch
- Using Controller Link Support Software or CX-Net (in CX-Programmer)
- Using FINS commands.

CS/CJ-series Startup Node

Automatic setting for the CS/CJ Series can be performed using either equality layout (previous method), where each node is allocated the same link area size, or 1:N allocations, which allows individually set exchange of data between the master node and slave nodes. There are 3 types of 1:N allocations, which use different allocation methods.



Automatic Setting, Equality Layout

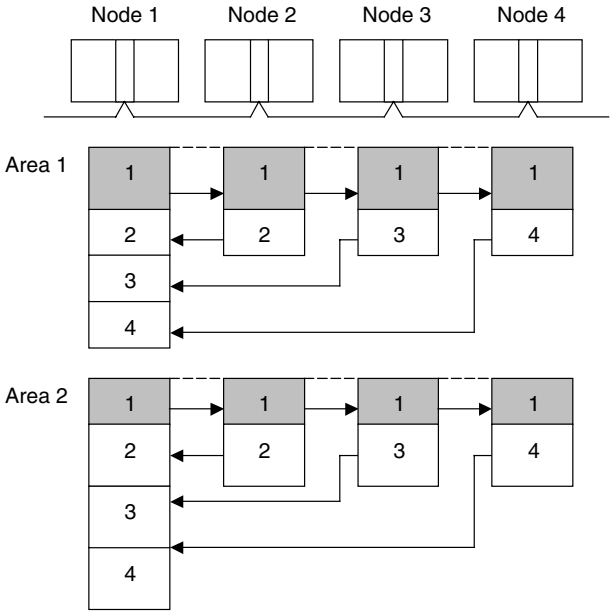


Features of Equality Layout:

- The send areas for each node are of the same size.
- Area 1 can be selected from bit-access areas (i.e., CIO and LR Areas) and area 2 can be selected from DM Area.
- Data link area allocation is performed in ascending order of node address.
- Each node can be specified to either participate or not participate in the data links.
- The data link areas are the same for all nodes participating in the data links.

Automatic Setting, 1:N Allocations

This method is used to simplify the establishment of 1:N allocation data links between master and slave nodes.



- There are three types of 1:N allocations.
- Programming Devices (including Programming Consoles) are used to set the automatic data link mode in the DM Parameter Area of the PLC used as the startup node.
- Node 1 is the master node.
- Area 1 can be set in the bit-access areas and area 2 can be set in the DM Area.
- The send area sizes of the master and slave nodes are the same for each area.
- Send nodes are in the same ascending order as node numbers.
- All nodes can be specified to either participate or not participate in the data link.
- The data link areas (data link start words) are common to all nodes participating in the data links.

Note

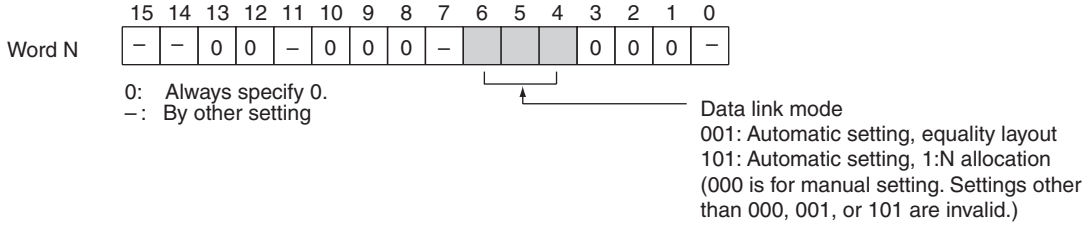
1. Automatic data link creation with 1:N allocations can only be used with the following Controller Link Units and Support Boards:

Type	Model
Wired networks	CS1W-CLK21-V1 and CS1W-CLK23 (for CS Series) CJ1W-CLK21-V1 and CJ1W-CLK23 (for CJ Series) 3G8F7-CLK21-V1 and 3G8F7-CLK23-E (for PCI bus)

2. Controller Link Units and Support Boards other than those listed above cannot participate in 1:N allocation data links. They can, however, join the network if a parameter in the DM Parameter Area is set so that they do not participate in the data links.
3. For automatic data link creation with 1:N allocations, use the CX-Net in CX-Programmer version 3.2 or higher.

Set the following parameter in the DM Parameter Area of the PLC at the startup node.

N: DM 30000 + 100 × Controller Link Unit number



Automatic Setting, Equality Layout

	15 – 8	7 – 0
N+1	Start word for area 1 (BCD)	
N+2	Area for area 1	00
N+3	Send size per node for area 1 (BCD)	
N+4	Rightmost 4 digits of start word for area 2 (DM area) (BCD)	
N+5	Area for area 2	Leftmost digit of start word for area 2 (BCD)
N+6	Send size per node for area 2 (BCD)	
N+7	First word to store link status (BCD)	

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
N+8	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
N+9	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
N+10	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
N+11	---	---	62	61	60	59	58	57	56	55	54	53	52	51	50	49

← Nodes to participate in the data links

The numbers indicate node numbers.
The status that is set determines whether the node will participate in the data links.
Participate: ON
Not participate: OFF

BCD: Set the value as binary-coded decimal.

Setting Range for Automatic Setting, Equality Layout

Item	Setting range
Data link mode	Specify automatic (01).
Start word for area 1	Set the word address in BCD. CIO Area: CIO 000 to CIO 6143 LR Area: LR 00 to 199 (*) *: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between CIO 1000 and CIO 1199.
Area for area 1	Set the area for area 1 in BCD. CIO Area: 80 LR Area: 86 Area 1 not used: 00
Send size per node for area 1	Set the number of words in BCD between 0 and 1,000. The total number of send words for area 1 and area 2 must not exceed 1,000. When area 1 is not used, set to 0.
Start word for area 2	Set the word address in BCD. DM Area: DM 0000 to DM 32767 EM Area: Banks 00 to 12, EM 0000 to EM 32767

Item	Setting range
Area for area 2	Set the area for area 2 in BCD. DM Area: 82 EM Area: Banks 00 to 07: 90 to 97 Banks 08 to 12: A8 to AC Area 2 not used: 00
Send size per node for area 2	Set the number of words in BCD between 0 and 1,000. The total number of send words of area 1 and area 2 must not exceed 1,000. When area 2 is not used, set to 0.
First word to store link status	Set in BCD the first word used for storing data link status. An area of 16 words is used for storing status. 0 (*), IR 000 to IR 6128 Status is stored in the IR or CIO Area only. *: When 0 is set, the status is saved in IR 1500 + unit number x 25 (+ 7 to + 22).
Nodes to participate in the data links	Turn ON the bits corresponding to the nodes participating in the data links. The data link will not start unless the startup node itself is set as a participating node. The data link will not start if the node is set to a parameter exceeding the maximum node address of the network parameter.

Note a) The total number of words in data link send and receive areas must not exceed 20,000 per node when using Controller Link Units with unit Ver. 1.2 or later, or 12,000 words per node if using pre-Ver. 1.2 Controller Link Units.

b) The following values must be satisfied for each node for the data link area 1 and area 2 so that the final word in the data link does not go beyond the last word in the PLC memory area.

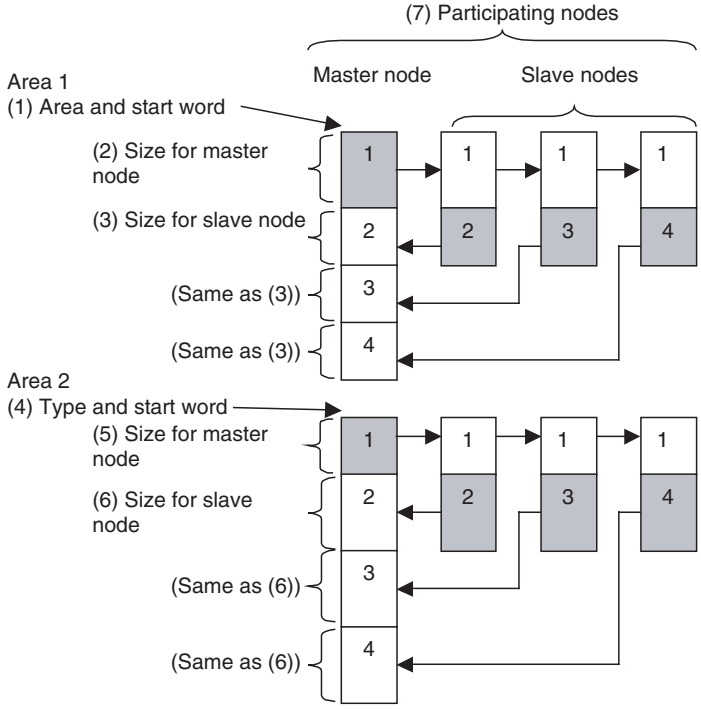
(Data link start word – 1) + Total number of send/receive words in area $\leq$ 6143 (CIO Area)
199 (LR Area)
32767 (DM Area, EM Area)

c) When using area 1 only, set the data link start word, type, and the number of send words of area 2 to 0.

d) When using area 2 only, set the data link start word, type, and the number of send words of area 1 to 0.

e) The startup node must be set as a participating node of the data links. If not, the data links will not start.

1:N Allocation, Common Type



Features of Common Type 1:N Allocation

- Data communications are 1:1 between the master node and slave nodes.
- All slave nodes receive the data sent by the master node.
- The master node receives all data sent by the slaves. The reception size for the master node is thus the node send data size times the number of slave nodes.
- Slaves do not send or receive data with other slaves.
- Area 1 is selected from the bit-access areas (e.g., CIO Area) and area 2 is selected from word-access areas (e.g., DM Area).
- Data link areas are allocated in ascending order of node addresses.
- Data link participation can be specified for each node.

Address N: D30000 + (100 × Controller Link Unit number)

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word N	---	---	0	0	---	0	0	0	---	1	0	1	0	0	0	---

When bits 6, 5 and 4 are set to 1, 0, and 1 respectively, automatic setting with 1:N allocations is specified.

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
N+12	1:N allocation type (**Set value 0001 = Common type**)																---
N+13	Start word for area 1 (bit-access area, BCD)																(1)
N+14	Area for area 1								00								
N+15	Area 1 send size (number of words) for master node (BCD)																(2)
N+16	Area 1 send size (number of words) for slave nodes (BCD)																(3)
N+17	Rightmost 4 digits of start word for area 2 (DM Area) (BCD)																(4)
N+18	Area for area 2								Leftmost digit of start word for area 2 (BCD)								
N+19	Area 2 send size (number of words) for master node (BCD)																(5)
N+20	Area 2 send size (number of words) for slave nodes (BCD)																(6)
N+21	First word to store data link status (bit-access area) (BCD)																---
N+22	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	(7)
N+23	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	
N+24	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	
N+25	---	---	62	61	60	59	58	57	56	55	54	53	52	51	50	49	

Words N+22 through N+25 register nodes that will participate in the data links. The numbers shown in the table are the node addresses. The bit status for each node address indicates whether the node is to participate in the data links.

Participate: ON
Not participate: OFF

Note When using automatic data link creation with 1:N allocations, set DM Parameter Areas words N+2 to N+11 (which were previously used for automatic setting with equality layout) to 0.

Setting Range for Automatic Setting, 1:N Allocations, Common Type

Item	Setting range
Data link mode	Specify automatic data link creation with 1:N allocations.
1:N allocation	Specify *Common type*.
Start word for area 1	Set the word address in BCD. CIO Area: 0000 to 6143 LR Area: LR 000 to LR 199 (CIO 1000 to CIO 1199) (See note.) DM Area: DM 00000 to DM 32767 EM Area: Banks 0 to 12: EM 00000 to EM 32767 Note: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between words CIO 1000 and CIO 1199 in the CIO Area.
Area for area 1	Set the area for data link area 1 as a hexadecimal number. CIO Area: 80 hex LR Area: 86 hex DM Area: 82 hex EM Area Banks 0 to 7: 90 to 97 hex Banks 8 to 12: A8 to AC hex When area 1 is not used: 00 hex

Item	Setting range
Send size (number of words) for master node for area 1	Set the number of words in BCD between 0 and 1,000. The total number of send words for master node of area 1 and area 2 must not exceed 1,000. Set to 0 when area 1 is not to be used or when the master node will transmit no data.
Send size (number of words) for slave nodes for area 1	Set the number of words in BCD between 0 and 1,000. The total number of send words per slave node of area 1 and area 2 must not exceed 1,000. Set to 0 when area 1 is not to be used or when the slave node will transmit no data.
Start word for area 2	Set the word address in BCD. CIO Area: 0000 to 6143 LR Area: LR 000 to LR 199 (CIO 1000 to CIO 1199) (See note.) DM Area: DM 00000 to DM 32767 EM Area: Banks 0 to 12: EM 00000 to EM 32767 Note: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between words CIO 1000 and CIO 1199 in the CIO Area.
Area for area 2	Set the area type of area 2 as a hexadecimal number. IR Area: 80 Hex LR Area: 86 Hex DM Area: 82 Hex EM Area Banks 0 to 7: 90 to 97 Hex Banks 8 to 12: A8 to AC Hex When area 2 is not used: 00 Hex
Send size (number of words) for master node for area 2	Set the number of words in BCD between 0 and 1,000. The total number of send words per master node of area 1 and area 2 must not exceed 1,000. Set to 0 when area 2 is not to be used, or when the master node will transmit no data.
Send size (number of words) for slave nodes for area 2	Set the number of words in BCD between 0 and 1,000. The total number of send words per slave node of area 1 and area 2 must not exceed 1,000. Set to 0 when area 2 is not to be used, or when the slave node will transmit no data.
First word to store data link status	Set in BCD the first word used for storing data link status. When automatic setup is used, status can be stored in the IR or CIO Area only. The number of words used to store status depends on the data link status storage format specification as below. 0 (*) 1 to 6128 (32 nodes max., 8-bit format: 16 words used) *: When 0 is set, the status is saved in IR 1500 + unit number x 25 (+ 7 to + 22).
Nodes to participate in the data links	Turn ON the bits corresponding to the nodes participating in the data links. The data links will not start unless the startup node itself is set as a participating node.

Note

1. Node 1 is the master node. Node 1 must be registered as a participating node.
2. The startup node (the node that sets the above DM Area parameters and starts the data links) must be set as a participating node of the data links. If not, the data links will not start.

3. When using area 2 only, set the area for area 1 and the number of send words for area 1 to 0.
4. When using area 1 only, set the area for area 2 and the number of send words for area 2 to 0.
5. The total number of words in data link send and receive areas must not exceed 20,000 per node when using Controller Link Units with unit Ver. 1.2 or later, or 12,000 words per node if using pre-Ver. 1.2 Controller Link Units. The total number of words in data link send and receive areas of a master node must satisfy the following values. The number of master node words is greatest when 1:N allocation is used, so the value can be estimated from the number of master node words.

   Total number of words in data link send and receive areas of master node = Send size for master node for area 1 + Send size for slave nodes for area 1 × Number of slave nodes participating in data links + Send size for master node for area 2 + Send size for slave nodes for area 1 × Number of slave nodes participating in data links
6. The following values must be satisfied to ensure that data link areas 1 and area 2 are fully contained within the specified area.
   - For area 1:

     (Area 1 start word − 1) + (Total of send and receive sizes for master node for area 1 (See note.))
     ≤ 6143 (when using the IR or CIO Area)
     ≤ 199 (when using the LR Area)

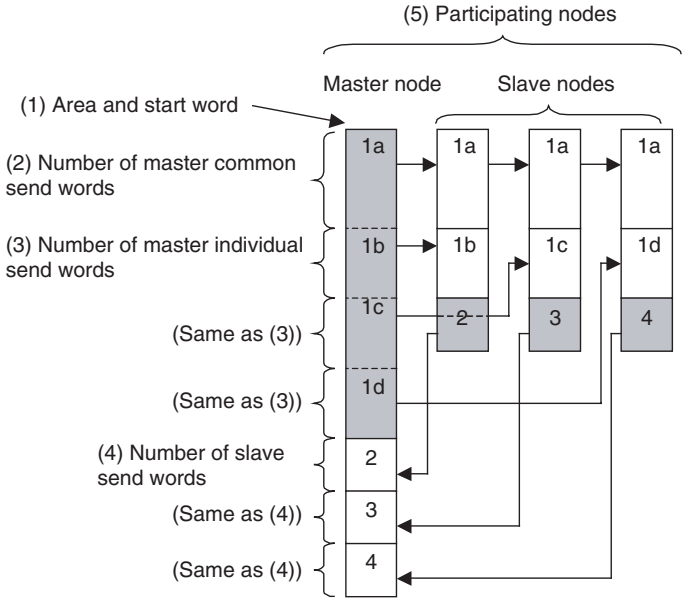
   Note (Total of send and receive sizes for master node for area 1 = Send size for master node for area 1 + Send size for slave nodes for area 1 × Number of slave nodes participating in data links

   - For area 2:

     (Area 2 start word − 1) + (Total of send and receive sizes for master node for area 2 (See note.))
     ≤ 32767 (when using DM or EM Area)

   Note (Total of send and receive sizes for master node for area 2 = Send size for master node for area 2 + Send size for slave nodes for area 2 × Number of slave nodes participating in data links
7. If a node that does not actually exist (e.g., a node that is scheduled to be added in the future) is registered as a node that will participate in the data links, a data link area for that node will be allocated in the master node, and the send and receive areas will be refreshed with 0 data.
8. Automatic data link creation with 1:N allocations can be performed only with CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, 3G8F7-CLK21-V1, and 3G8F7-CLK23-E Controller Link Units. If any other model is used, the LNK indicator will flash and it will not be possible to automatic create 1:N allocations.
9. If automatic data link creation with 1:N allocations is to be set up using CX-Net operations in the CX-Programmer, use CX-Programmer version 3.2 or higher. Setup cannot be performed using CX-Programmer version 3.1 or lower.
10. The startup node (the node that sets the above DM Area Parameters and starts the data links) can be set as either a master node or a slave node.

1:N Allocations, 1 to 1 Type



Features of 1 to 1 Type 1:N Allocation

- Data communications are 1:1 between the master node and slave nodes.
- All slave nodes receive part of the data sent by the master node. In addition, each slave node receives unique data from the master node (see a to d in figure).
- The master node receives all data sent by the slaves. The data sizes are fixed for all nodes.
- Slaves do not send or receive data with other slaves.
- One area is selected from the bit-access areas (e.g., CIO Area) or word-access areas (e.g., DM Area).
- Data link areas are allocated in ascending order of node addresses.
- Data link participation can be specified for each node.

Address N: D30000 + (100 × Controller Link Unit number)

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word N	---	---	0	0	---	0	0	0	---	1	0	1	0	0	0	---

When bits 6, 5 and 4 are set to 1, 0 and 1 respectively, automatic setting with 1:N allocations is specified.

	15							8	7							0	
N+12	1:N allocation type setting (**Set value 0002 = 1 to 1 type**)																---
N+13	Rightmost 4 digits of start word (BCD)																(1)
N+14	Area								Leftmost digit of area start word (BCD)								
N+15	Number of common send words for master node (BCD)																(2)
N+16	Number of individual send words for master node (BCD)																(3)
N+17	Number of send words for slave nodes (BCD)																(4)
N+18	0000 (Reserved)																---
N+19	0000 (Reserved)																---
N+20	0000 (Reserved)																---
N+21	First word to store data link status (bit-access area) (BCD)																---
N+22	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	(5)
N+23	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	
N+24	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	
N+25	---	---	62	61	60	59	58	57	56	55	54	53	52	51	50	49	

Words N+22 through N+25 register nodes that will participate in the data links. The numbers in the table are the node addresses. The bit status given for each node address indicates whether the node is to participate in the data links.

Participate: ON
Not participate: OFF

Note

1. Leave the reserved words set to 0 (N+18 to N+20).
2. When using automatic data link creation with 1:N allocations, set DM Parameter Area words N+2 to N+11 (which were previously used for automatic setting with equality layout) to 0.

Setting Ranges for Automatic Creation with 1:N allocations, 1 to 1 Type

Item	Setting range
Data link mode	Specify automatic data link creation with 1:N allocations.
1:N allocation	Specify *1 to 1 type*.
Area start word	Set the word address in BCD. IR or CIO Area: 0 to 6143 LR Area: LR 000 to LR 199 (1000 to 1199) (See note.) DM Area: D00000 to D32767 EM Area: Banks 0 to 12 E00000 to E32767 Note: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between words 1000 and 1199 in the IR or CIO Area.
Area type	Set the area type of area 1 as a hexadecimal number. IR Area: 80 Hex LR Area: 86 Hex DM Area: 82 Hex EM Area Banks 0 to 7: 90 to 97 Hex Banks 8 to 12: A8 to AC Hex

Item	Setting range
Number of common send words per master node	Set the number of words in BCD between 0 and 1,000. The number of common send words per master node added to the number of individual send words per master node multiplied by the number of slave nodes participating in the data links must not exceed 1,000. Set to 0 if common data is not to be sent from a master node to a slave node.
Number of individual send words per master node	Set the number of words in BCD between 0 and 1,000. The number of common send words per master node added to the number of individual send words per master node multiplied by the number of slave nodes participating in the data links must not exceed 1,000. Set to 0 if individual data is not to be sent from a master node to a slave node.
Send size (number of words) for slave node	Set the number of words in BCD between 0 and 1,000. Set to 0 if the slave node will transmit no data.
First data link status word	Set in BCD the first word used for storing data link status. When automatic setup is used, status can be stored in the IR or CIO Area only. The number of words used to store status depends on the data link status storage format specification as below. 0 (*) 1 to 6128 (32 nodes max., 8-bit format: 16 words used) *: When 0 is set, the status is saved in IR 1500 + unit number x 25 (+ 7 to + 22).
Nodes to participate in the data links	Set to ON (1) the bits corresponding to the nodes participating in the data links. The data link will not start unless the startup node itself is set as a participating node.

Note

1. Node 1 becomes the master node. Node 1 must be registered as a participating node.
2. Only one area can be specified when using the 1 to 1 type of 1:N allocation.
3. The startup node (the node that sets the above DM parameter and starts the data link) must be set as a participating node of the data link. If not, the data links will not start.
4. The total number of words in data link send and receive areas must not exceed 20,000 per node when using Controller Link Units with unit Ver. 1.2 or later, or 12,000 words per node if using pre-Ver. 1.2 Controller Link Units. The total number of words in data link send and receive areas of a master node must satisfy the following values. Since the number of master node words is greatest when 1:N allocation is used, the value can be estimated from the number of master node words.

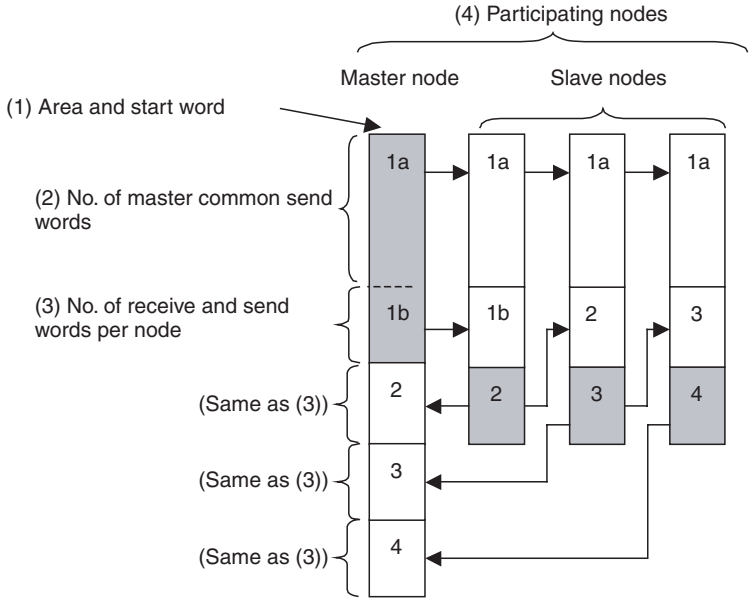
   Total number of words in data link send and receive areas of master node =
   Number of common send words in master node +
   Number of individual send words in master node × Number of slave nodes participating in data links +
   Number of send words in slave node × Number of slave nodes participating in data links
5. The following values must be satisfied to ensure that the data link area is fully contained within the specified area.

(Area start word − 1) + (Total number of send and receive words of master node *)
≤ 6143 (when using the IR or CIO Area)
199 (when using LR Area)
32767 (when using DM or EM Area)

* Total number of send and receive words in master node =
Number of common send words in master node +
Number of individual send words in master node × Number of slave nodes participating in data links +
Number of send words in slave node × Number of slave nodes participating in data links

6. If a node that does not actually exist (e.g., a node that is scheduled to be added in the future) is registered as a node that will participate in the data links, a data link area for that node will be allocated in the master node, and the send/receive area will be refreshed with “0” data.
7. Automatic data link creation with 1:N allocation can only be performed with CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, 3G8F7-CLK21-V1, and 3G8F7-CLK23-E Controller Link Units. If any other model is used, the LNK LED will flash and it will not be possible to participate in the automatic creation with 1:N allocation.
8. If automatic data link creation with 1:N allocation is to be set up using CX-Net operations in the CX-Programmer, use CX-Programmer Version 3.2 or higher. Setup cannot be performed using CX-Programmer Version 3.2 or lower.
9. The startup node (the node that sets the above DM parameter and starts the data link) can be set at either a master node or a slave node.

1:N Allocation, Chain Type



Features of Chain Type 1:N Allocation

- Data communications are 1:1 between the master node and slave nodes.
- All slave nodes receive part of the data sent by the master node. (1a in figure).
- The master node receives all data sent by the slaves. The data sizes are fixed for all nodes.

- Each slave nodes receives data from the previous node and then sends data to the next node. Data is thus passed in ascending order of the nodes participating in the data link.
- One area is selected from the bit-access areas (e.g., CIO Area) or word-access areas (e.g., DM Area).
- Data link areas are allocated in ascending order of node addresses.
- Data link participation can be specified for each node.

Address N: D30000 + (100 × Controller Link Unit number)

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word N	---	---	0	0	---	0	0	0	---	1	0	1	0	0	0	---

When bits 6, 5 and 4 are set to 1, 0 and 1 respectively, automatic setting with 1:N allocation is specified.

	15 to 8	7 to 0	
N+12	1:N allocation type setting (**Set value 0003=Delivery type**)		---
N+13	Rightmost 4 digits of area start word (BCD)		(1)
N+14	Area	Leftmost digit of area start word (BCD)	
N+15	Number of master common send words (BCD)		(2)
N+16	Number of receive and send words per node (BCD)		(3)
N+17	0000 (Reserved area)		---
N+18	0000 (Reserved area)		---
N+19	0000 (Reserved area)		---
N+20	0000 (Reserved area)		---
N+21	First word to store data link status (bit-access area) (BCD)		---

	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	
N+22	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	(4)
N+23	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	
N+24	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	
N+25	---	---	62	61	60	59	58	57	56	55	54	53	52	51	50	49	

Words N+22 through N+25 register nodes that will participate in the data links. The numbers in the table are the node addresses. The bit status given for each node address indicates whether the node is to participate in the data links.

Participate: ON
Not participate: OFF

Note

1. Set 0 as the values of the reserved areas (N+17 to N+20).
2. When using automatic data link creation with 1:N allocation, set DM Parameter Areas N+2 to N+11 (which were previously used for automatic setting with equality layout) to 0.

Setting Range for Automatic Creation with 1:N Allocation, Chain Type

Item	Setting range
Data link mode	Specify automatic data link creation with 1:N allocations.
1:N allocation	Specify *Chain Type*.

Item	Setting range
Area start word	Set the word address in BCD. IR or CIO Area: 0 to 6143 LR Area: LR 000 to LR 199 (1000 to 1199) (*) DM Area: DM 0 to 32767 EM Area: Banks 0 to 12 EM 0 to 32767 *: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between words 1000 and 1199 in the IR or CIO Area.
Area	Set the area type of area 1 as a hexadecimal number. IR Area: 80 Hex LR Area: 86 Hex DM Area: 82 Hex EM Area Banks 0 to 7: 90 to 97 Hex Banks 8 to 12: A8 to AC Hex
Number of master common send words	Set the number of words in BCD between 0 and 1,000. The number of common send words per master node added to the number of delivery send words per node must not exceed 1,000. Set to 0 if common data is not to be sent from a master node to a slave node.
No. of receive and send words per node	Set the number of words in BCD between 0 and 1,000. The number of common send words per master node added to the number of delivery send words per node must not exceed 1,000. Set to 0 if delivery data is not to be sent.
First word to store data link status	Set in BCD the first word used for storing data link status. When automatic setup is used, status can be stored in the IR or CIO Area only. The number of words used to store status depends on the data link status storage format specification as below. 0 (*) 1 to 6128 (32 nodes max., 8-bit format: 16 words used) *: When 0 is set, the status is saved in IR 1500 + unit number x 25 (+ 7 to + 22).
Nodes to participate in the data links	Set to ON (1) the bits corresponding to the nodes participating in the data links. The data link will not start unless the startup node itself is set as a participating node.

Note

1. Node 1 becomes the master node. Node 1 must be registered as a participating node.
2. Only one area can be specified when using the chain type of 1:N allocation.
3. The startup node (the node that sets the above DM parameter and starts the data link) must be set as a participating node of the data link. If not, the data links will not start.
4. The total number of words in data link send and receive areas must not exceed 20,000 per node when using Controller Link Units with unit Ver. 1.2 or later, or 12,000 words per node if using pre-Ver. 1.2 Controller Link Units. The total number of words in data link send and receive areas of a master node must satisfy the following values. Since the number of master node words is greatest when 1:N allocation is used, the value can be estimated from the number of master node words.

Total number of words in data link send and receive areas of master node =
Number of common send words in master node +
Number of individual send words in each node × Number of nodes participating in data links (including both master nodes and slave nodes)

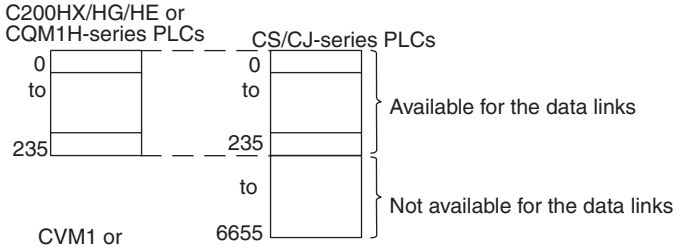
5. The following values must be satisfied to ensure that the data link area is fully contained within the specified area.

   (Area start word − 1) + (Total number of send and receive words of master node *)
   ≤ 6143 (when using the IR or CIO Area)
   199 (when using LR Area)
   32767 (when using DM or EM Area)

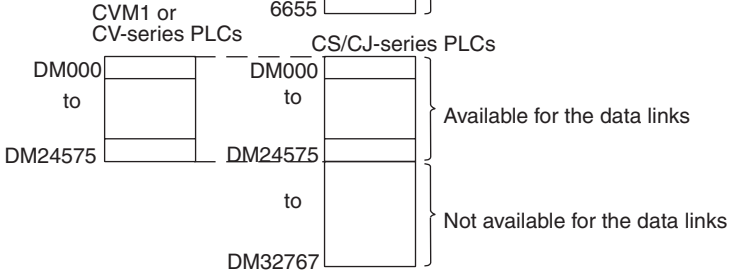
   * Total number of send and receive words in master node =
   Number of common send words in master node +
   Number of delivery send words in master node × Number of nodes participating in data links (including both master nodes and slave nodes)

6. If a node that does not actually exist (e.g., a node that is scheduled to be added in the future) is registered as a node that will participate in the data links, a data link area for that node will be allocated in the master node, and the send/receive area will be refreshed with "0" data.
7. Automatic data link creation with 1:N allocation can only be performed with CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, 3G8F7-CLK21-V1, and 3G8F7-CLK23-E Controller Link Units. If any other model is used, the LNK LED will flash and it will not be possible to participate in the automatic creation with 1:N allocation.
8. If automatic data link creation with 1:N allocation is to be set up using CX-Net operations in the CX-Programmer, use CX-Programmer Version 3.2 or higher. Setup cannot be performed using CX-Programmer Version 3.2 or lower.
9. The startup node (the node that sets the above DM parameter and starts the data link) can be set at either a master node or a slave node.
10. When data links are automatically created for networks containing C200HX/HG/HE PLCs, CS/CJ-series PLCs, CVM1, CV-series, and CQM1H-series PLCs, the linkable area is restricted to the area of the CVM1, CV-series, C200HX/HG/HE, or CQM1H-series PLC because it is smaller than that of CS/CJ-series PLCs.

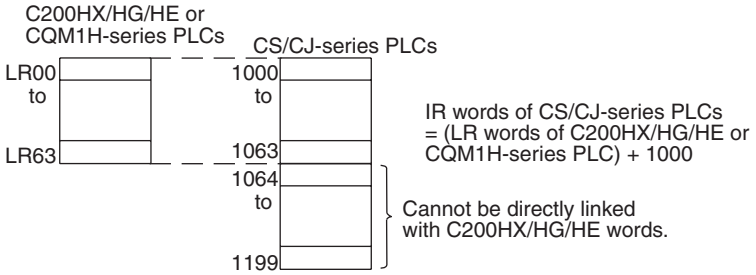
Example: IR/CIO Area



Example: DM Area



11. If the LR Area in the C200HX/HG/HE or CQM1H-series PLC is automatically set for a data link with a CVM1, CV-series PLC or CS/CJ-series PLC, the LR words will be linked to CIO 1000 to CIO 1063 in the CVM1, CV-series or CS/CJ-series PLC. CIO 1064 to CIO 1199 cannot be linked with C200HX/HG/HE or CQM1H-series PLCs in this way.



C200HX/HG/HE Startup Node

Set the following DM Parameter Area of the PLC of the startup node.

N: Level 0 = DM 6400
Level 1 = DM 6420

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word N	–	–	0	–	0	0	0	0	0	0			0	0	0	0

0: Always specify 0.
–: By other setting

Data link mode
Set to 01 for automatic setting.
(00 is for manual setting. Other values are invalid.)

	15 8	7 0
N+1	Area 1 data link start word (BCD)	
N+2	Area 1 type	00
N+3	Number of send words per node of area 1 (BCD)	
N+4	Rightmost 4 digits of data link start word of area 2 (DM area) (BCD)	
N+5	Area 2 type	Leftmost digit of data link start word of area 2 (BCD)
N+6	Number of send words per node of area 2 (BCD)	
N+7	First data link status word (BCD)	

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
N+8	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
N+9	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

BCD: Set the value as binary-coded decimal.

← Nodes to participate in the data links

The numbers indicate node numbers.
The value assigned indicates whether the node is to participate in the data links.
Participate: 1
Not participate: 0

Settings

Item	Setting range
Data link mode	Specify automatic (01).
Area 1 data link start word	Set the word address in BCD. IR Area: IR 000 to IR 235, IR 300 to IR 511 LR Area: LR 00 to 63
Area 1 type	Set the area for area 1 in BCD. IR Area: 80 LR Area: 86 Area 1 not used: 00

Item	Setting range
Send size (number of words) for node of area 1	Set the number of words in BCD between 0 and 1,000. The total number of send words for area 1 and area 2 must not exceed 1,000. When area 1 is not used, set to 0.
Area 2 data link start word	Set the word address in BCD. DM Area: DM 0000 to DM 5999 EM Area: Banks 00 to 15, EM 0000 to EM 6143
Area 2 type	Set the area type for area 2 in BCD. DM Area: 82 EM Area: Banks 00 to 07: 90 to 97 Banks 08 to 15: A8 to AF Area 2 not used: 00
Send size (number of words) for node of area 2	Set the number of words in BCD between 0 and 1,000. The total number of send words of area 1 and area 2 must not exceed 1,000. When area 2 is not used, set to 0.
First data link status word	Set in BCD the first word used for storing data link status. An area of 16 words is used for storing status. 0 (*), IR 001 to IR 220, IR 300 to IR 496 Status is stored in the IR or CIO Area only. *: When 0 is set, status of nodes 1 to 6 is stored in CIO 239 to CIO 241 for level 0 and in CIO 243 to CIO 245 for level 1.
Nodes to participate in the data links	Set to ON (1) the bits corresponding to the nodes participating in the data links. The data link will not start unless the startup node itself is set as a participating node. The data link will not start if the node is set to a parameter exceeding the “maximum node address” of the network parameter.

Note a) The total number of words in data link send and receive areas must not exceed 8,000 per node.

b) The following values must be satisfied for each node for the data link area 1 and area 2 so that the final word in the data link does not go beyond the last word in the PLC memory area.

(Data link start word – 1) + Total number of send/receive words in area ≤ 235 (First word IR 000 to IR 235)
511 (First word IR 300 to IR 511)
63 (LR Area)
5999 (DM Area)
6143 (EM Area)

c) When using area 1 only, set the data link start word, type, and the number of send words of area 2 to 0.

d) When using area 2 only, set the data link start word, type, and the number of send words of area 1 to 0.

e) The startup node must be set as a participating node of the data links. If not, the data links will not start.

CVM1 or CV-series Startup Node

Set the following DM Parameter Area of the PLC of the startup node.

N: DM 2000 + 100 × (Unit number of Controller Link Unit)

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word N	–	–	0	0	0	0	0	0	0	0			0	0	0	–

0: Always 0.
–: Other settings

Data link mode
Set to 01 for automatic setting.
(00 is for manual setting. Other values are invalid.)

	15	8	7	0
N+1	Area 1 data link start word (BCD)			
N+2	Area 1 type			
N+3	Number of send words per node of area 1 (BCD)			
N+4	Rightmost 4 digits of data link start word of area 2 (BCD)			
N+5	Area 2 type	Leftmost digit of data link start word of area 2 (BCD)		
N+6	Number of send words per node of area 2 (BCD)			
N+7	First data link status word (BCD)			

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
N+8	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
N+9	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

BCD: Set the value as binary-coded decimal.

← Nodes to participate in the data links

The numbers indicate node numbers.
The value assigned indicates whether the node is to participate in the data links.
Participate: 1
Not participate: 0

Settings

Item	Setting range
Data link mode	Specify automatic (01).
Area 1 data link start word	Set the word address in BCD. CIO Area: CIO 0000 to CIO 2555 LR Area: LR 000 to LR 199 (*) *: When a word between LR 000 and LR 199 is specified, the data link area will be allocated between CIO 1000 and CIO 1199.
Area 1 type	Set the area for area 1 in BCD. CIO Area: 80 LR Area: 86 Area 1 not used: 00
Send size (number of words) for node of area 1	Set the number of words in BCD between 0 and 1,000. The total number of send words of area 1 and area 2 must not exceed 1,000. When area 1 is not used, set to 0.
Area 2 data link start word	Set the word address in BCD. DM Area: DM 0000 to DM 8191 (CV500/CVM1-CPU01) DM 0000 to DM 24575 (Other CPU Units) EM Area: Banks 00 to 07, EM 0000 to EM 32765 (EM must be installed)
Area 2 type	Set the area for area 2 in BCD. DM Area: 82 EM Area: Banks 00 to 07: 90 to 97 Area 2 not used: 00

Item	Setting range
Send size (number of words) for node of area 2	Set the number of words in BCD between 0 and 1,000. The total number of send words of area 1 and area 2 must not exceed 1,000. When area 2 is not used, set to 0.
First data link status word	Set in BCD the first word used for storing data link status. An area of 16 words is used for storing status. 0 (*) or CIO 0001 to CIO 2540 Status is stored in the CIO area only. *: When 0 is set, the status is saved in CIO 1500 + unit number x 25 (+ 7 to + 22).
Nodes participating in the data links	Set to ON (1) the bits corresponding to the nodes participating in the data links. The data link will not start unless the startup node itself is set as participating node. The data link will not start if the node is set to a parameter exceeding the “maximum node address” of the network parameter.

Note **a)** The total number of words in data link send and receive areas must not exceed 8,000 per node.

b) The following values must be satisfied for each node for the data link area 1 and area 2 so that the final word in the data link does not go beyond the last word in the PLC memory area.

(Data link start word – 1) + Total number of send/receive words in area ≤ 2555 (CIO Area)
199 (LR Area)
8191 (DM Area for CV500/CVM1-CPU01)
24575 (DM Area for other CPU Units)
32765 (EM Area)

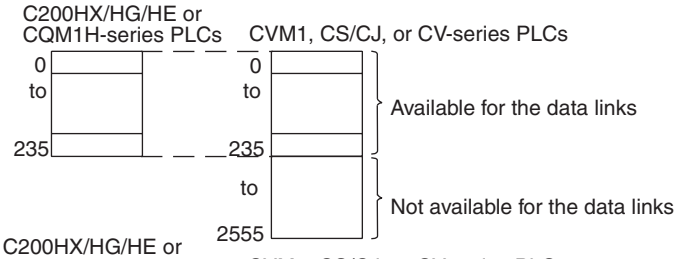
c) When using area 1 only, set the data link start word, type, and the number of send words of area 2 to 0.

d) When using area 2 only, set the data link start word, type, and the number of send words of area 1 to 0.

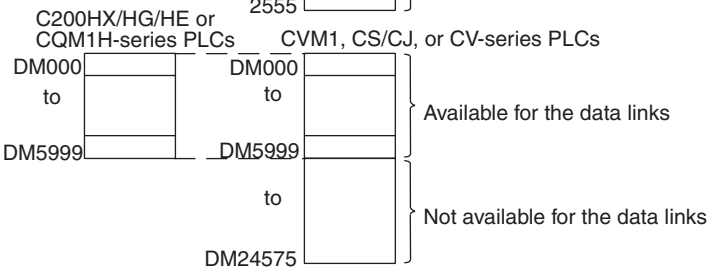
e) The startup node must be registered as a participating node of the data links. If not, the data links will not start.

Note 1. When data links are automatically created for networks containing C200HX/HG/HE, CS/CJ-series, CVM1, CV-series, and CQM1H-series PLCs, the linkable area is restricted to the area of the C200HX/HG/HE or CQM1H-series PLC because it is smaller than that of CVM1, CV-series or CS/CJ-series PLCs.

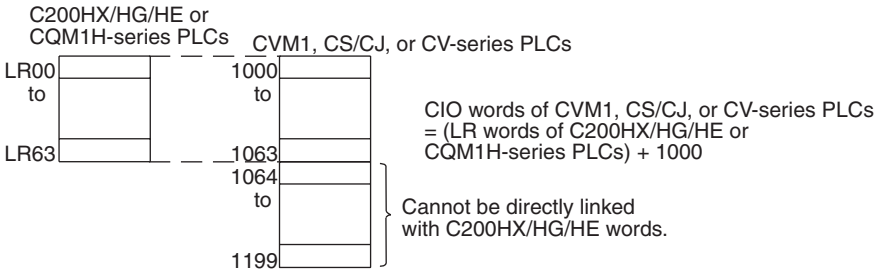
Example: IR/CIO Area



Example: DM Area

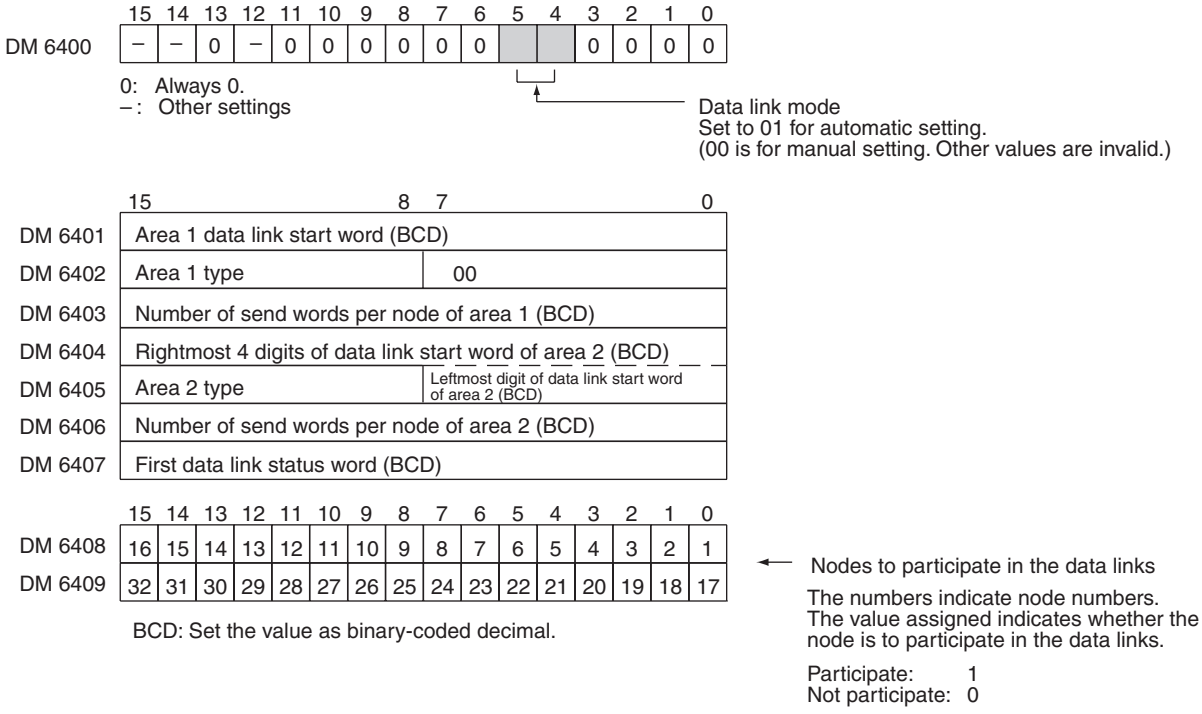


2. If the LR Area in a C200HX/HG/HE or CQM1H-series PLC is manually set for a data link with a CVM1, CV-series, or CS/CJ-series PLC, the LR words will be linked to CIO 1000 to CIO 1063 in the CVM1, CV-series or CS/CJ-series PLC. CIO 1064 to CIO 1199 cannot be linked with C200HX/HG/HE or CQM1H-series PLCs in this way.



CQM1H-series Startup Node

Set the following DM Parameter Area of the PLC of the startup node.



Settings

Item	Setting range
Data link mode	Specify automatic (01).
Area 1 data link start word	Set the word address in BCD. IR Area: IR 0000 to IR 247 LR Area: LR 00 to LR 63
Area 1 type	Set the area for area 1 in BCD. IR Area: 80 LR Area: 86 Area 1 not used: 00
Send size (number of words) for node of area 1	Set the number of words in BCD between 0 and 1,000. The total number of send words of area 1 and area 2 must not exceed 1,000. When area 1 is not used, set to 0.
Area 2 data link start word	Set the word address in BCD. DM Area: DM 0000 to DM 5999 EM Area: EM 0000 to EM 6143 (EM must be installed)
Area 2 type	Set the area for area 2 in BCD. DM Area: 82 EM Area: 90 Area 2 not used: 00
Send size (number of words) for node of area 2	Set the number of words in BCD between 0 and 1,000. The total number of send words of area 1 and area 2 must not exceed 1,000. When area 2 is not used, set to 0.

Item	Setting range
First data link status word	Set in BCD the first word used for storing data link status. An area of 16 words is used for storing status. 0 (*) or IR 001 to IR 232 Status is stored in the IR or CIO Area only. *: When 0 is set, the status for nodes 1 to 6 is stored in IR 91 to IR 93.
Nodes participating in the data links	Set to ON (1) the bits corresponding to the nodes participating in the data links. The data link will not start unless the startup node itself is set as participating node. The data link will not start if the node is set to a parameter exceeding the “maximum node address” of the network parameter.

Note a) The total number of words in data link send and receive areas must not exceed 8,000 per node.

b) The following values must be satisfied for each node for the data link area 1 and area 2 so that the final word in the data link does not go beyond the last word in the PLC memory area.

(Data link start word – 1) + Total number of send/receive words in area ≤ 247 (IR Area)
63 (LR Area)
5999 (DM Area)
6143(EM Area)

c) When using area 1 only, set the data link start word, type, and the number of send words of area 2 to 0.

d) When using area 2 only, set the data link start word, type, and the number of send words of area 1 to 0.

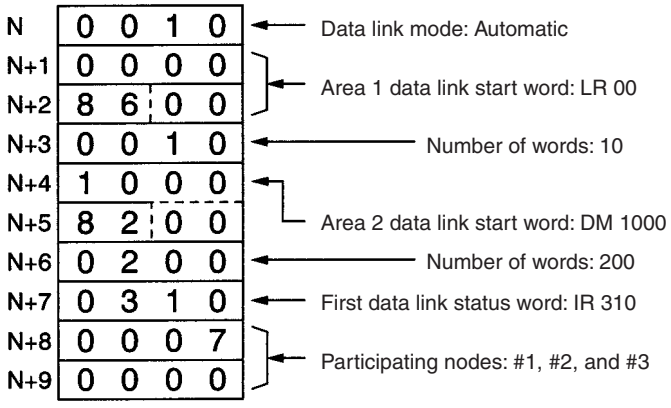
e) The startup node must be registered as a participating node of the data links. If not, the data links will not start.

5-2-5 Automatic Setting Example

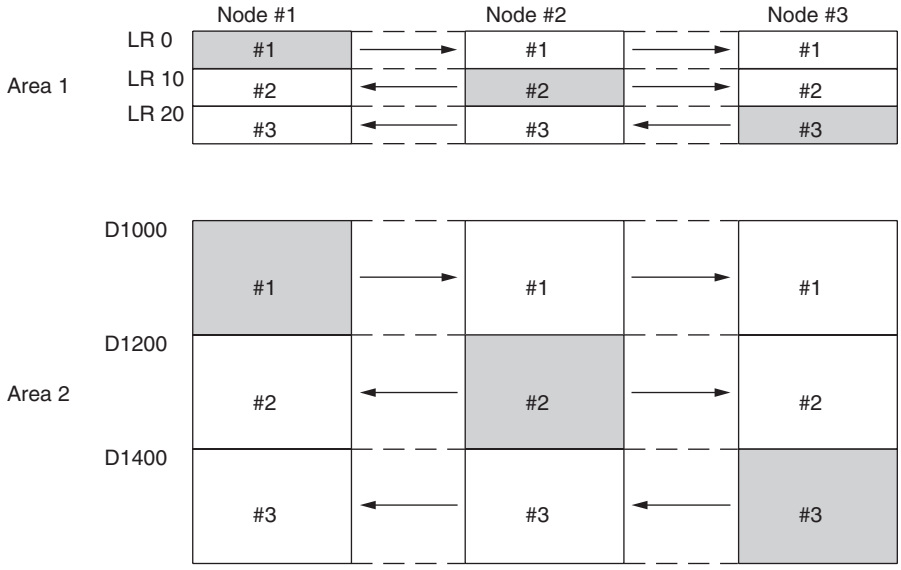
This section shows an example of DM Parameter Area settings and the data link areas that are created as a result.

DM Parameter Area Settings for Equality Layout

Set the parameters in the startup node as follows:



Data Link Areas Created



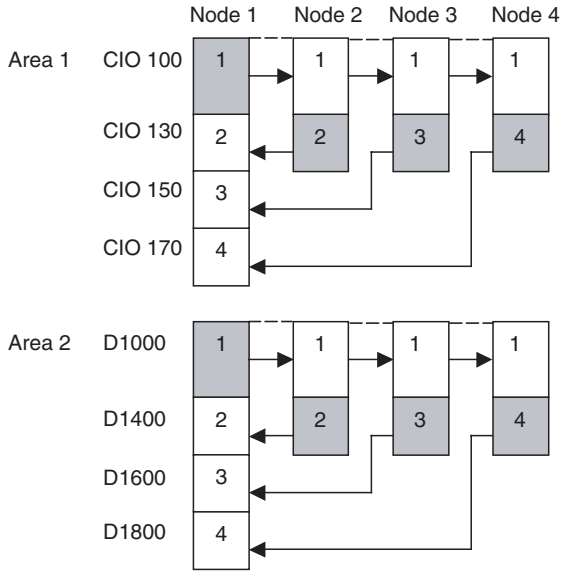
DM Parameter Setting Example for 1:N Allocation, Common Type

When automatic data link creation with common type1:N allocations is used, the DM Parameter Area of the startup node is set as follows:

Word	Setting	
N	0050	← Data link mode: Automatic 1:N allocation
N+1 to N+11	0000	← "0" because equality layout allocations are not used.
N+12	0001	← Common type
N+13	0100	← Area for area 1: CIO Area
N+14	80 | 00	Start word: 100
N+15	0030	← Area 1 send size for master node: 30
N+16	0020	← Area 1 send size for slave nodes: 20
N+17	1000	← Area for area 2: DM Area
N+18	82 | 00	Start word: D1000
N+19	0400	← Area 2 send size for master node: 400 words
N+20	0200	← Area 2 send size for slave nodes: 200 words
N+21	0000	← Data link status stored in default area (*)
N+22	000F	← Data link participating nodes: #1, #2, #3, and #4
N+23	0000	
N+24	0000	
N+25	0000	

*: The default area for storing data link status is the Special I/O Unit Area (CIO 1500 + (25 × Controller Link Unit number) +7 to +22).

Data Link Areas



Note
1. Node 1 is the master node.
2. The startup node (the node that sets the above DM parameter and starts the data link) can be set at either a master node or a slave node.

5-3 Starting and Stopping Data Links

Data link must be started after data link areas have been created. Use any of the methods described below for the startup node to start and stop data links. (The procedure for stopping data links is performed on participating nodes.) These methods are the same for both manually and automatically set data links.

Note The data link mode (manual setting or automatic setting) and data link method are determined according to the data link setting in the startup node. In the startup node, set a data link table in the case of manual setting and data link automatic setting parameters in the case of automatic setting. If the settings are incorrect, the data link will not start.

⚠ **Caution** Check the following items before starting data links. If incorrect data link tables or parameters are set, injury may result due to unexpected operation of the system. Even if the correct data link tables and parameters have been set, do not start or stop data links before verifying that there will be no adverse influence on the system.

•Manually Set Data Links

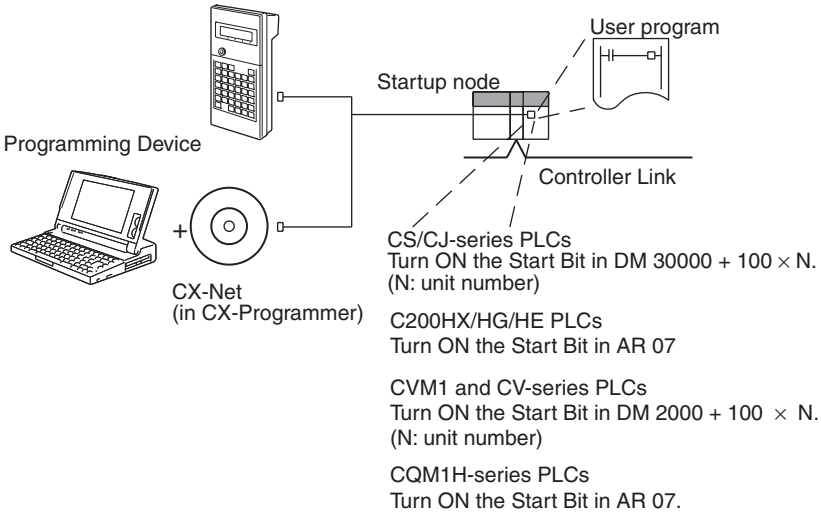
Check the data link tables in each node participating in the data link to see that they are correct.
Be sure that data link tables are deleted from nodes that are not participating in the data links.

•Automatically Set Data Links

Be sure that the correct DM parameters have been set in the data link startup node.

5-3-1 Using a Programming Device or the User Program

Set the software switch (AR or DM Start Bit) in the PLC to ON using a Programming Device or from the user program.

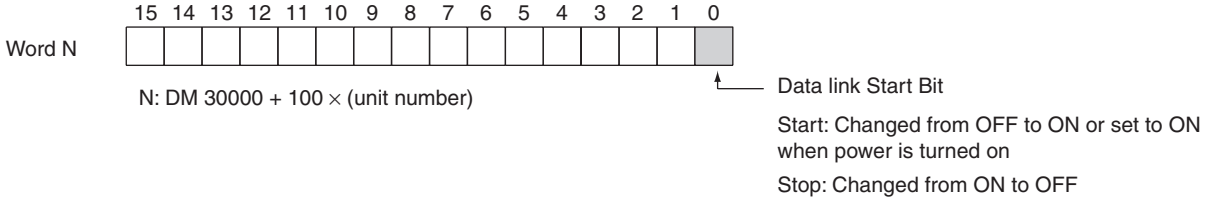


The data links will start when the Start Bit changes from OFF to ON or is already ON when power is turned on. The data links will stop when the Start Bit changes from ON to OFF.

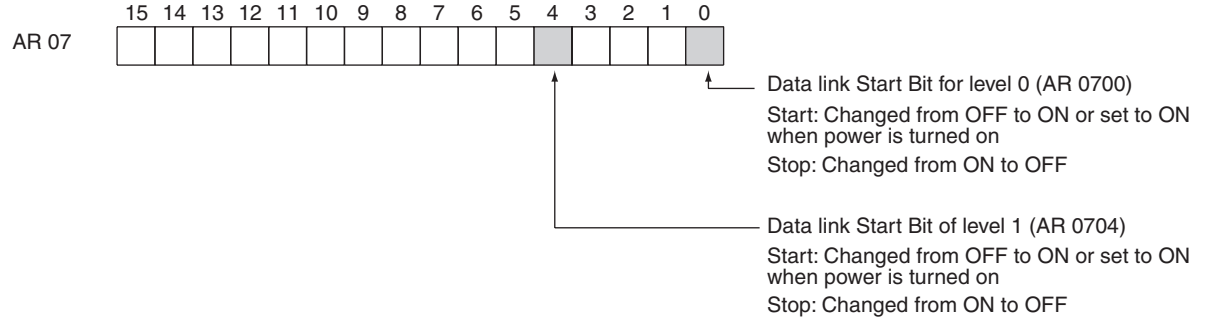
Note The data in the AR and DM Areas is retained when power is turned off. Therefore, by setting in the AR and DM Areas can be made in advance to start data links as soon as power is turned on.

It is recommended to set the Start Bit to ON in multiple nodes that are participating in the data link so that the data links will start even if the startup node is down. The same data link settings must be set in these nodes for automatically set data links.

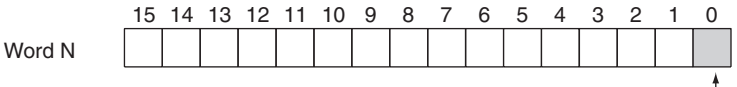
CS/CJ-series Start Bit



C200HX/HG/HE Start Bit



CVM1 and CV-series Start Bit

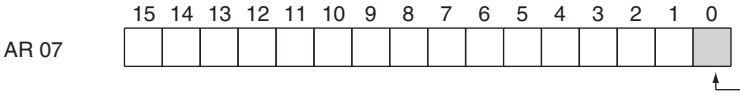


Data link Start Bit

Start: Changed from OFF to ON or set to ON when power is turned on

Stop: Changed from ON to OFF

CQM1H-series Start Bit



Data link Start Bit

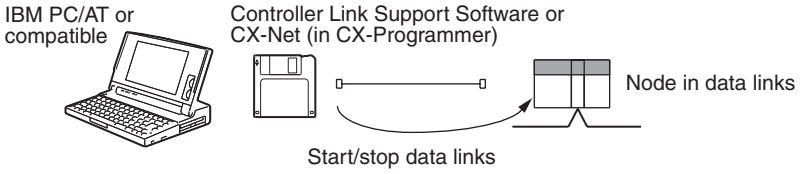
Start: Changed from OFF to ON or set to ON when power is turned on

Stop: Changed from ON to OFF

5-3-2 Using the Controller Link Support Software and CX-Programmer

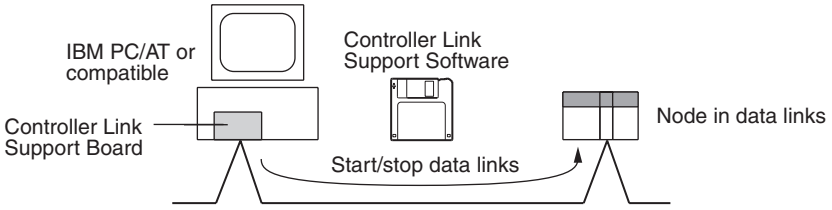
Data links can be started or stopped using commands on the Data Link Menu of the Controller Link Support Software. The node for which starting and stopping is being specified must participate in the data links.

Using a Programming Device Connected to PLC Node



Note The Controller Link Support Software cannot be connected to a CS-series PLC. Use the CX-Net (in CX-Programmer).

Using a Computer Node

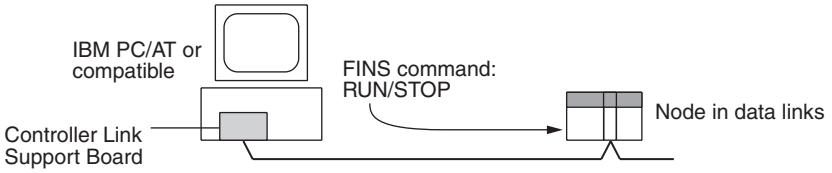


Data links can be started or stopped from the Controller Link Support Board on the local node.

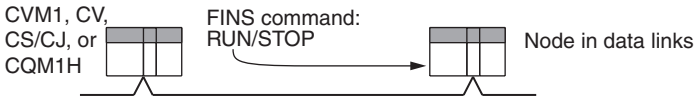
5-3-3 Using FINS Commands

Data links can be started and stopped by sending the RUN and STOP FINS commands from a node on the Controller Link to a node that is in the data links.

Issuing the FINS Command from a Computer Node



Issuing the FINS Command from CVM1, CV-series, CS/CJ-series, and CQM1H-series PLCs



Data links can be stopped by sending the FINS command "STOP." The node to which the FINS command is issued must be participating in the data link.

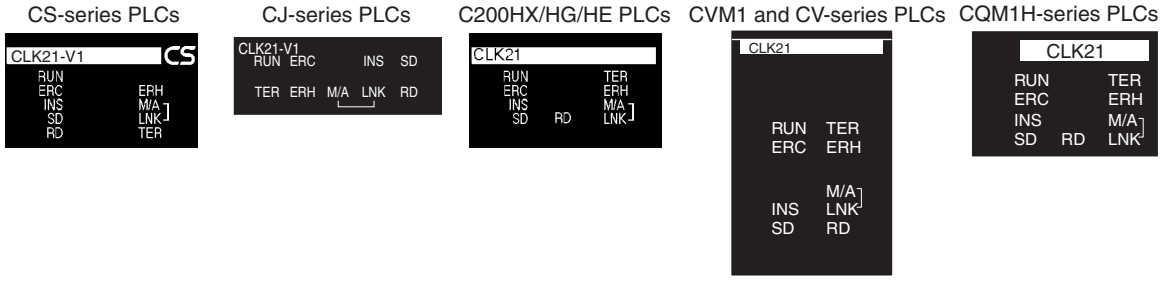
5-4 Checking Data Link Status

There are two methods for checking the status of active data links:

- Check the LED indicators on the front of the Units.
- Check the data link status area.

5-4-1 LED Indicators

Check the LINK and M/A indicators on the front of the unit.



Make sure that the LNK indicator is ON at nodes participating in the active data links.

Name	Color	Status	Contents	
LNK (data link)	Yellow	ON	Participating in data links.	
		Flashing	Data link table setting error	
		OFF	Not in data links or data links are inactive.	
M/A (data link mode)	Yellow	ON	Manual	**Note:** This indicator will always be OFF when the data links are not active.
		OFF	Automatic	

The LNK indicator will be lit at all node participating in the data links as long as operation is normal. The data link mode (manual/automatic) can be checked using the M/A indicator. See *9-1 Troubleshooting Using Indicators* for details.

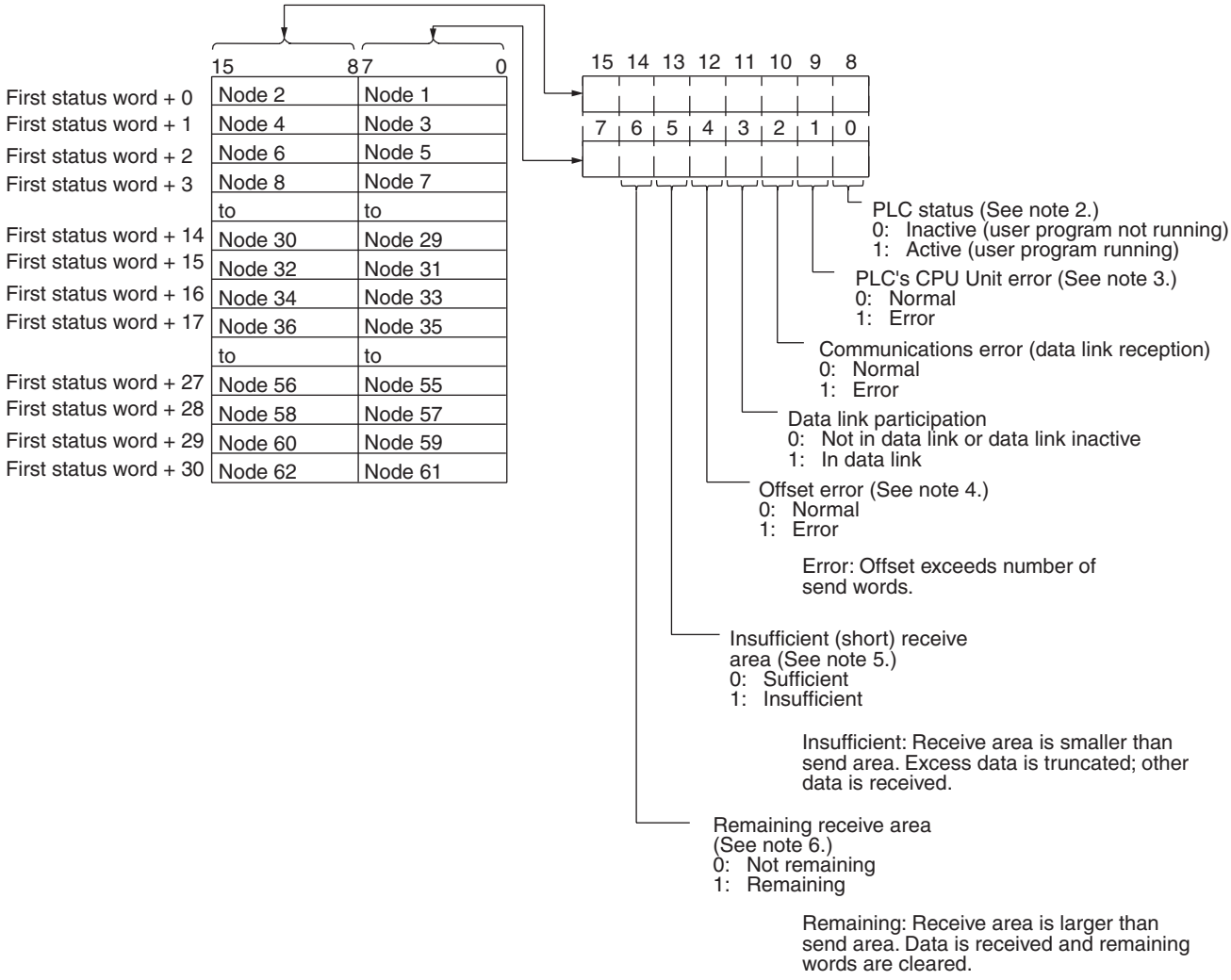
5-4-2 Data Link Status Area

The data link status area can be used to check for errors when data link does not operate normally even though no abnormality has been detected by the PLC's CPU Unit or the Controller Link Unit. The data link status area contains the data link status information shown below.

The number of words used for data link status and the information that is reflected depends on the setting (8-bit or 4-bit format) for the data link status storage format specification in the DM Parameters Area, as shown in the following diagram.

See *9-2 Status Area and Troubleshooting* for troubleshooting procedures and see *Data Link Status Storage Format (CS/CJ Series Only)* for details on setting the data link status storage format in the DM Parameters Area when using CS- and CJ-series PLCs.

When 8-bit Format is Specified (i.e., when using a C200HX/HG/HE, CVM1, CV-series, or CQM1H-series PLC or when using a CS/CJ-series PLC with the data link status storage format specification in the DM Parameter Area set to 8-bit format)
(See note 1.)

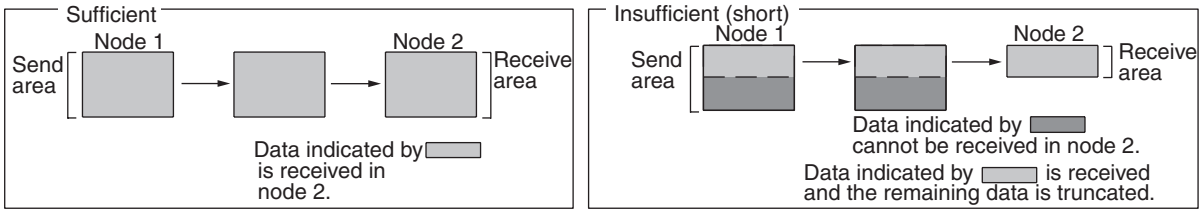


Note

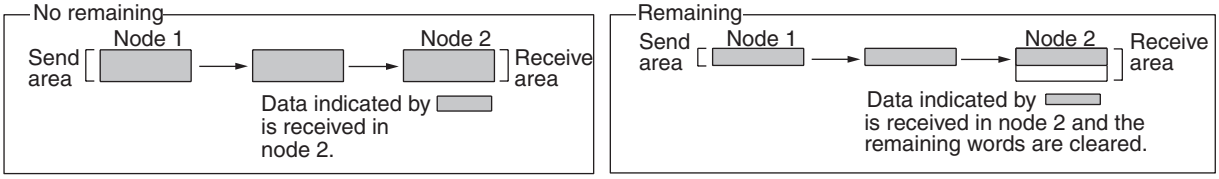
1. When the default setting is used for the data link status storage destination, 16 words are determined within the status area according to the unit number setting. When the 8-bit format is specified, therefore, the data that is reflected will be limited to node addresses 1 to 32.

   When data link status is required for node addresses 33 or larger, do not use the default setting, i.e., specify the first word of the status storage area. If this is done when an 8-bit format is specified, 31 words will be used as the status storage area.
2. Always 1 for the Controller Link Support Board.
3. Always 0 for the Controller Link Support Board.
4. Even if an offset error occurs, the data link will operate and the node will participate in the data links. In the node where the offset error occurred, however, all receive area words will be cleared to 0.

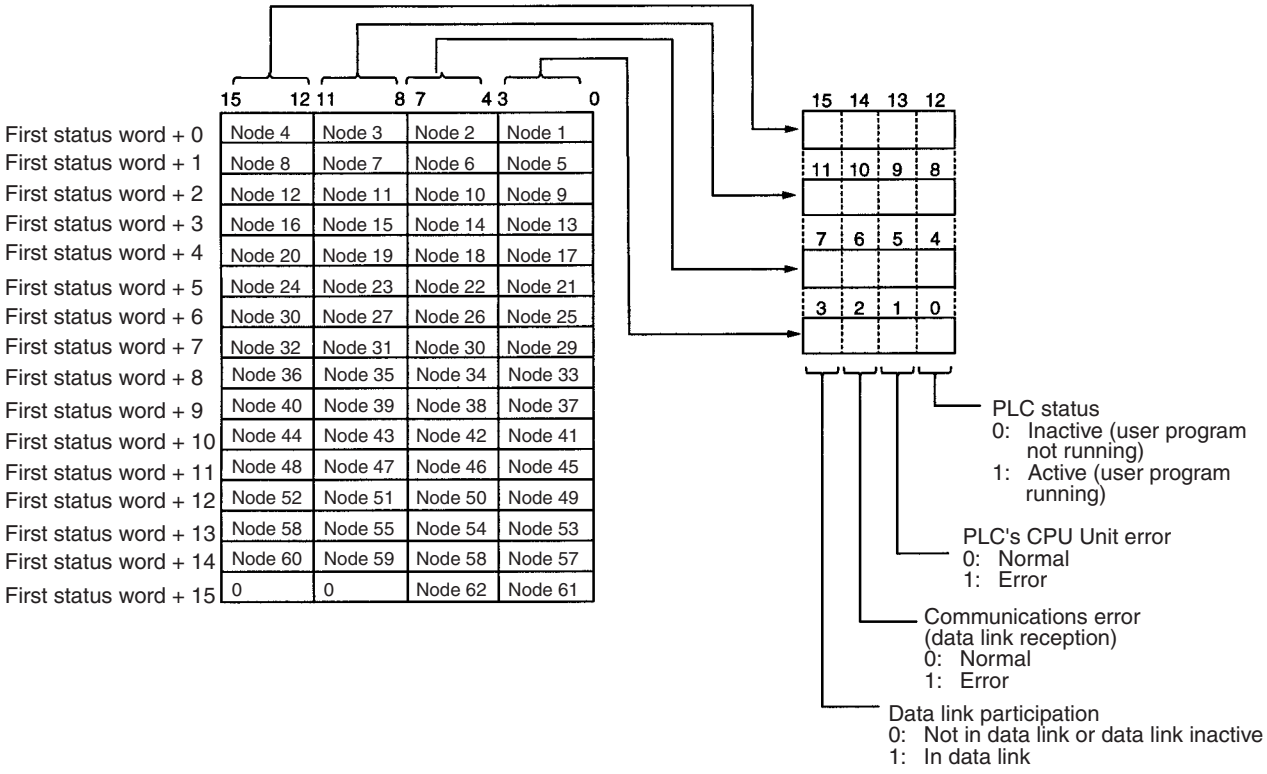
5. The following shows an example of an insufficient (short) receive area.



6. The following shows an example of a remaining receive area.



When 4-bit Format is Specified (i.e., when using a CS/CJ-series PLC with the data link status storage format specification in the DM Parameter Area set to 4-bit format)



Note

1. A communications error will occur in a node that is not participating in the network.
2. When a communications error occurs, previous status is retained for other nodes status.
3. Only the PLC status and the PLC's CPU Unit error status are refreshed for nodes that are participating in the network, but not participating in the data links.
4. When the data link status area is set in the IR, CIO, or LR Area, the data link status will be instantaneously set to 0 when the mode of the PLC's CPU Unit is changed.

5. With CS/CJ-series PLCs, the status of the words from first status word + 16 to first status word + 30 when 8-bit format is specified and the status of the words from first status word + 8 to first status word + 15 (i.e., the status of nodes 33 to 62) is reflected when the Wired Network 62 Node Enable Bit in the DM Parameter Area is turned ON.

The flags in the data link status operate as follows:

Name	Function
Data link participation	The corresponding flag will turn ON if the node has never participated in the data link normally. The flag will not turn OFF once it has turned ON even if the node is no longer participating in the data links.
Communications error	The corresponding flag will turn ON if continuous data link data cannot be received from the node, e.g., due to a cable break. The flag will turn OFF again if normal data is received.
PLC's CPU Unit error	The corresponding flag will turn ON if the CPU Unit has a fatal error, non-fatal error, or watchdog timer error. The flag will turn OFF again if the node returns to normal. The status of this flag is based on data sent from the node and will not turn ON if data cannot received, e.g., due to a Communications Error. Make sure that the Communications Error Flag is OFF before checking this flag.
PLC status	The corresponding flag will turn ON if the user program is being executed in the CPU Unit. It will turn OFF is the user program is not being executed. The status of this flag is based on data sent from the node and will not turn ON if data cannot received, e.g., due to a Communications Error. Make sure that the Communications Error Flag is OFF before checking this flag.

The Data Link Participation Flag and the PLC Status Flag can be used to see if the system has started normally. These flags, however, cannot be used to detect communications errors. Use the Communications Error Flag and PLC's CPU Unit Error Flag to detect errors.

If the Local Node Data Link Participation Flag is OFF, the previous status will be maintained as the data link status and may not be correct. Make sure that the Local Node Data Link Participation Flag is ON before checking data link status.

Note The following Local Node Data Link Participation Flags are available.

CS/CJ-series, CVM1, CV-series PLCs:
Bit 15 in 1500 + 25 × unit number + 6
C200HX/HG/HE PLCs: SR 25205
CQM1H-series PLCs: IR 9015

The data link status storage area is set as follows:

Data link mode	PLC and operating level	First data link status word	Setting range	Default status
Automatic	CS/CJ-series PLC	Specify in DM 30000 + 100 × N + 7	Either 8, 16, or 31 words between CIO 001 and CIO 6640	CIO 1500 + 25 × N + 7 to 22
	C200HX/HG/HE Level 0	Specify in DM 6407	16 words between IR 001 and IR 220 or IR 300 to IR 496	IR 239 to IR 241 (See note b.)
	C200HX/HG/HE Level 1	Specify in DM 6427		IR 243 to IR 245 (See note b.)
	CVM1 or CV-series PLC	Specify in DM 2000 + 100 × N + 7	16 words between CIO 000 and CIO 2540	CIO 1500 + 25 × N + 7 to 22
	CQM1H-series PLC	Specify in DM 6407	16 words between IR 000 and IR 232	IR 91 to IR 93 (See note b.)
Manual	CS/CJ-series PLC	Specify in the data link tables	Either 8, 16, or 31 words in the following ranges CIO: 1 to 6640 LR: 0 to 184 DM: 0 to 32752 EM: 0 to 32752	CIO 1500 + 25 × N + 7 to 22
	C200HX/HG/HE Level 0		16 words in the following ranges IR: 1 to 220 IR: 300 496 LR: 0 to 48 DM: 0 to 5984 EM: 0 to 6128	IR 239 to IR 241 (See note b.)
	C200HX/HG/HE Level 1			IR 243 to IR 245 (See note b.)
	CVM1 or CV-series PLC		16 words in the following ranges CIO: 1 to 2540 LR: 0 to 184 DM: 0 to 24560 EM: 0 to 32750	CIO 1500 + 25 × N + 7 to 22
	CQM1H-series PLC		16 words in the following ranges IR: 1 to 232 LR: 0 to 48 DM: 0 to 5984 EM: 0 to 6128	IR 91 to IR 93 (See note b.)

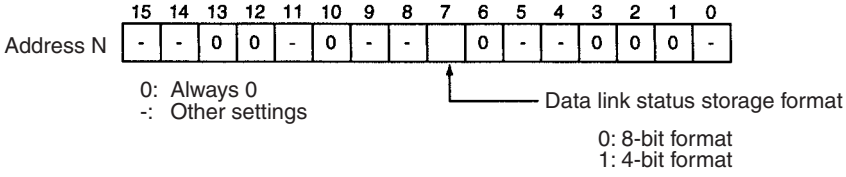
Note a) N: Unit number

b) Only status for nodes 1 to 6 are saved.

Data Link Status Storage Format (CS/CJ Series Only)

The setting for the data link status storage format when using CS- or CJ-series PLCs is shown below. The setting is made using the software switch in bit 7 of the DM Parameters Area. The address of the software switch is as follows:

DM 30000 + 100 x unit number



The user setting and automatic setting for the data link status storage format are the same.

Note The data link storage format setting is enabled with the data link startup node setting. Therefore, if multiple nodes are set as startup nodes, ensure that they all have the same settings. If there are different settings, the format setting will depend on the startup node.

5-4-3 Data Link Status Area

The numbers of words used to store the data link status information are shown in the following table. These numbers apply to both manual and automatic settings.

Model	DM Parameter Area		No. of words used	No. of status nodes
	Wired network 62-node specification	Data link status storage format specification		
CS/CJ Series	62 nodes max.	8-bit format	31 (See note 1.)	For 62 nodes
		4-bit format	16	For 62 nodes
	32 nodes max.	8-bit format	16	For 32 nodes
		4-bit format	8	For 32 nodes
C200HX/HG/HE	No setting	No setting	16	For 32 nodes
CVM1/CV series	32 nodes max.	8-bit format fixed		
CQM1H series				

Note

1. The default words area used when the CIO or IR Area is specified with 0 specified as the first word to store data link status. The default setting for the CS/CJ-series Controller Link Units is 16 words in the Special I/O Unit Area (1500 + (25 × Controller Link Unit number) +7 to +22). For this reason, if using a 62-node wired network is specified in the DM Parameter Area and the data link status storage format is set to the 8-bit format, the resulting data link status will be limited to nodes 1 to 32.
   If data link status information is required for more than 32 nodes, do not set the storage start word to its default setting, but set another area as the data link status storage area instead.
2. The setting for the data link status storage format specification in the DM Parameter Area is valid in the data link startup node. Only the CS/CJ-series Controller Link Units support the 4-bit format for the data link status storage format specification. Even if a data link is initiated from a CS/CJ-series Controller Link Unit using the 4-bit data link status format, other Controller Link Unit models on the same network (i.e., the C200HX/HG/HE, CVM1/CV, or CQM1H) will save the data link status in 8-bit format.
   Use the 8-bit format if it is desirable to standardize the data link status format of each node in a system containing other models.

5-4-4 Checking by Manipulating Bit/Word Status

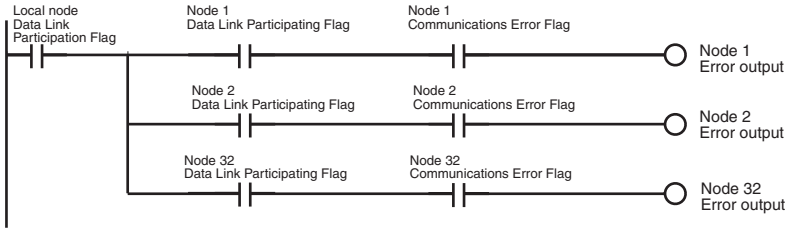
After you have confirmed that the data link function is operating normally, check to see whether or not the data link is operating as intended, i.e., check to see if the desired bits/words data is being transferred to the intended words at other nodes.

Although the data link function itself may be operating correctly, the data link areas may have been input incorrectly.

Change the contents of a bit or word in a data link send area using a Programming Device or the user program and check whether the change is reflected in data link areas of other nodes as intended.

Note Do not restart the polling node of the Controller Link Network while data links are active. Otherwise, the data links may stop.

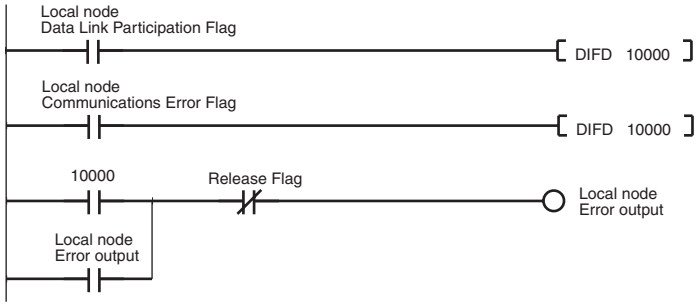
5-4-5 Error Detection Program Example



When the source node's data link is participating, the AND condition of the data link status for each node can be taken using the Data Link Participation Flag and the Communications Error Flag, and the error output.

The following example shows an error output program for cases where the local node data link stops.

The local node's Communications Error Flag (in the data link status area) will be turned ON if the local node is isolated from the network while the data link is active. In this case, the data link remains active, so the node's Data Link Participation Flag will remain ON even though the node is isolated from the network.

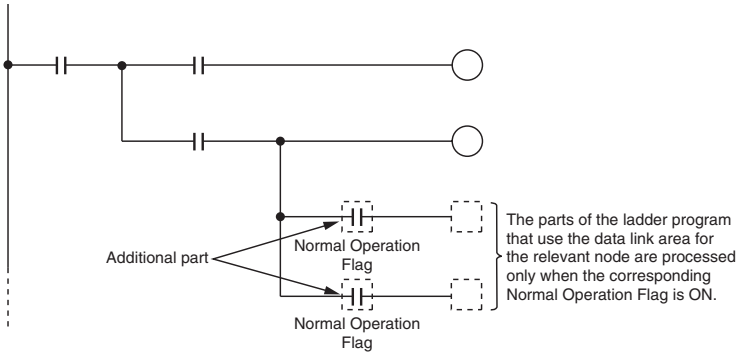


5-4-6 Programming Examples for Processing Data when Errors Occur

If a communications error occurs in a data link and valid data link data cannot be received, the previous data is stored in the data link area. To stop processing using the data link data when an error occurs, refer to the following program example.

Processing Data Only when Data Links Are Operating Normally

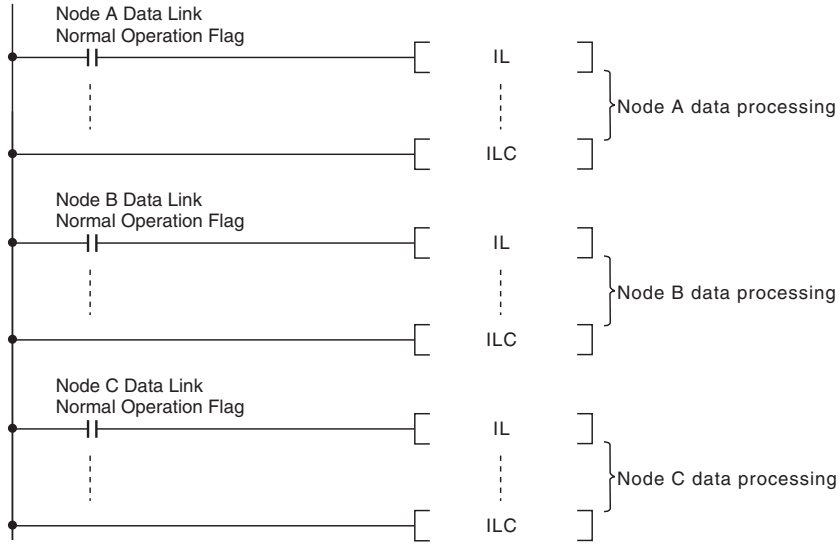
Perform processing only when the data links are operating normally by including an AND condition for the Data Link Normal Operation Flag in the part of the program that handles data link data for each node. This is an example of programming locks in the appropriate places.



"Data Link Normal Operating Flags" can be created using the programming described in *5-4-5 Error Detection Program Example*.

Processing Data Only when Operation Is Normal Using the IL-ILC and JMP-JME Instructions

Perform processing only when operation is normal by creating a program based on program blocks that process data for each node with the IL-ILC and JMP-JME programs.



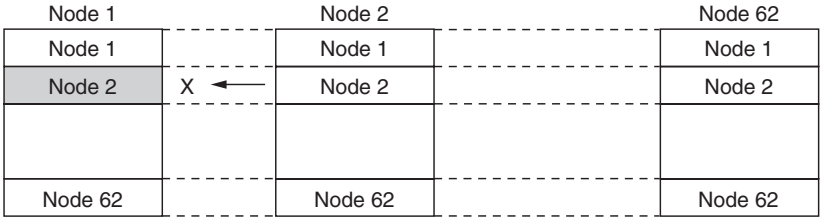
"Data Link Normal Operating Flags" can be created using the programming described in *5-4-5 Error Detection Program Example*.

Writing 0000 in the Data Link Area when Errors Occur

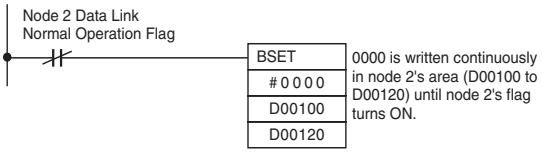
When data links are not operating normally, write 0000 to the data link area of the node with the error to stop other data being received.

As an example, the following example shows how to write 0000 in the data link area of node 2 (D00100 to D00120) using the BSET (block set) instruction when an error occurs at node 2.

■ **Data Link Example: Communications Error at Node 2**



■ **Example of Programming for Node 1 to Handle Communications Errors at Node 2**



Insert the above programming at the start of the program.

"Data Link Normal Operating Flags" can be created using the programming described in *5-4-5 Error Detection Program Example*.

Note 1. If an error occurs and 0000 is written to the Data Link Area occurs for an unstable transmission path (i.e., one that repeatedly alternates between communications errors and normal operation), the normal data will be fre-

quently cleared to 0000. Data processing methods that will not process data or arithmetic operations when errors occur are recommended (such as shown in the example for processing data only when data links are operating normally or the example for processing data only when operation is normal using the IL-ILC and JMP-JME instructions).

2. The BSET(071) instruction is used to write 0000 to the corresponding area in which the ladder program is executing, but the value in the data link table will be read if the words are being monitored from Support Software. This enables peripheral servicing (i.e., for Support Software) to be executed after the CPU Unit has performed I/O refreshing (Controller Link Unit data link refresh).
3. With Controller Link data links, if there is an error at the source node, the previous data (i.e., data received immediately before the error) continues to be stored in the data link receive area of the node receiving the data. To clear the data in the receive area to 0 when an error occurs, include the appropriate programming for clearing to 0, with reference to the above example.
4. Refresh processing for the data used in Controller Link data links is performed between the Controller Link Unit and CPU Unit with every cycle and so the above programming must be included at the start of the program. This method (i.e., clearing to 0) can be used with C200HX/HG/HE, CS1, and CS1-H CPU Units as long as the DLNK instruction is not used, and can be used with CVM1/CV CPU Units as long as CPU execution processing is set to synchronous processing. It cannot be used with C200HX/HG/HE or CS1-H CPU Units if the DLNK instruction is used, or with CVM1/CV CPU Units if CPU execution processing is set to asynchronous processing. (This is because when the DLNK instruction is used with CS1-H CPU Units, or when asynchronous processing is set for the CVM1/CV CPU Units, the refreshing of data for data links is not synchronized with the instruction execution cycle.)

SECTION 6
Message Service

This section explains how to use the message service provided by a Controller Link Unit. It also explains the FINS commands and responses supported by Controller Link Units and those supported by C200HX/HG/HE, CS/CJ-series, CVM1 and CV-series PLCs.

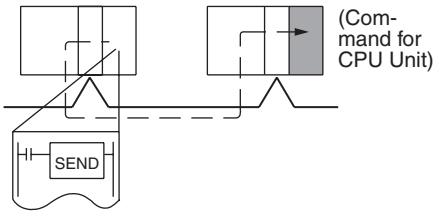
6-1 Introduction . . . 168
6-1-1 SEND and RECV . . . 169
6-1-2 CMND (CVM1, CV-series, CS/CJ-series, and CQM1H-series PLCs Only) . . . 182
6-1-3 Send/Receive Data Areas . . . 187
6-2 Selecting Communications Instructions . . . 189
6-2-1 Message Service Operations . . . 190
6-2-2 Message Service Specifications . . . 191
6-3 Using the Message Service . . . 192
6-4 FINS Commands and Responses . . . 202
6-4-1 FINS Communications Service . . . 202
6-4-2 Sending and Receiving FINS Commands and Responses . . . 202
6-4-3 Applicable Units for FINS Commands . . . 203
6-5 Commands and Responses for Controller Link Units . . . 204
6-5-1 Command Codes . . . 204
6-5-2 DATA LINK START . . . 204
6-5-3 DATA LINK STOP . . . 204
6-5-4 CONTROLLER DATA READ . . . 205
6-5-5 CONTROLLER STATUS READ . . . 206
6-5-6 NETWORK STATUS READ . . . 208
6-5-7 DATA LINK STATUS READ . . . 210
6-5-8 ECHOBACK TEST . . . 212
6-5-9 BROADCAST TEST RESULTS READ . . . 212
6-5-10 BROADCAST TEST DATA SEND . . . 213
6-5-11 ERROR LOG READ . . . 213
6-5-12 ERROR LOG CLEAR . . . 214
6-6 Commands and Responses for C200HX/HG/HE and CQM1H-series PLCs . . . 215
6-6-1 Command Codes . . . 215
6-6-2 Memory Area Designations . . . 215
6-6-3 MEMORY AREA READ . . . 217
6-6-4 MEMORY AREA WRITE . . . 218
6-6-5 MULTIPLE MEMORY AREA READ . . . 219
6-6-6 PROGRAM AREA READ . . . 219
6-6-7 PROGRAM AREA WRITE . . . 220
6-6-8 RUN . . . 221
6-6-9 STOP . . . 221
6-6-10 CONTROLLER DATA READ . . . 222
6-6-11 CONTROLLER STATUS READ . . . 223
6-6-12 CLOCK READ . . . 224
6-6-13 CLOCK WRITE . . . 224
6-6-14 ERROR CLEAR . . . 225
6-6-15 FORCED SET/RESET . . . 225
6-6-16 FORCED SET/RESET CANCEL . . . 226
6-6-17 MULTIPLE FORCED STATUS READ . . . 227
6-7 Response Codes . . . 228
6-7-1 Configuration . . . 228
6-7-2 Network Relay Errors . . . 229
6-7-3 Response Codes and Troubleshooting . . . 230

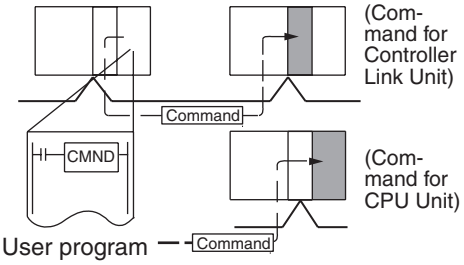
6-1 Introduction

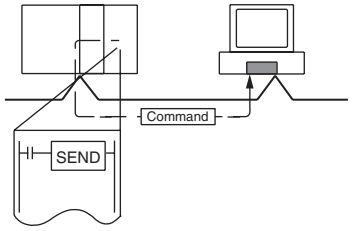
A message service is a command/response system used for data transmission between nodes on a network, i.e., PLC to PLC, PLC to computer, and computer to PLC). The message service can also be used to control operations, such as mode changes. The message service is implemented by sending commands from the user program. The following communications instructions are used:

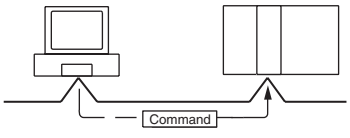
SEND and RECV: Instructions for sending and receiving data.

CMND: An instruction for sending FINS commands. Some FINS commands are supported by Controller Link Units, and other FINS commands supported by the PLC's CPU Unit.

<table>
<tr><th colspan="2">Message service</th><th>SEND/RECV instructions</th><th>CMND instruction (FINS commands)</th></tr>
<tr><td rowspan="3">Source node to destination node</td><td>PLC to PLC</td><td>C200HX/HG/HE, CS/CJ-series, CVM1, CV-series, or CQM1H-series PLC
C200HX/HG/HE, CS/CJ-series, CVM1, CV-series, or CQM1H-series PLC


User program
A program is not required for receiving responses when the PLC executes SEND and RECV.</td><td>CS/CJ-series, CVM1, CV-series, or CQM1H-series PLC (Not supported by the C200HX/HG/HE.)
C200HX/HG/HE, CS/CJ-series, CVM1, CV-series, or CQM1H-series PLC


A program is not required for receiving responses when the PLC executes commands.</td></tr>
<tr><td>PLC to computer</td><td colspan="2">C200HX/HG/HE, CS/CJ-series, CVM1, CV-series, or CQM1H-series PLC
Computer


A program is required for sending and receiving data with the computer.
A program is not required for receiving responses when the PLC executes commands.</td></tr>
<tr><td>Computer to PLC</td><td colspan="2">(The equivalent of SEND/RECV and CMND are sent from the computer program.)
Computer
C200HX/HG/HE, CS/CJ-series, CVM1, CV-series or CQM1H-series PLC


Programming is required to receive responses at the computer.</td></tr>
</table>

Message service	SEND/RECV instructions	CMND instruction (FINS commands)
Source node: Destination node	SEND: 1:1 or 1:N (broadcast) There are no responses for broadcasting.	1:1 or 1:N (broadcast) There are no responses for broadcasting.
	RECV: 1:1	
Data length	1,980 bytes max. (990 words)	1,990 bytes max.

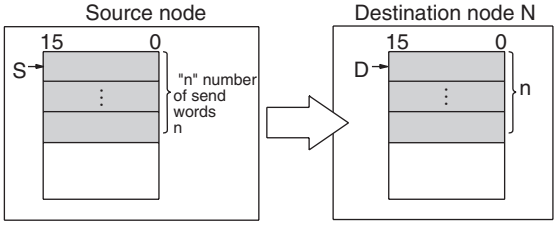
6-1-1 SEND and RECV

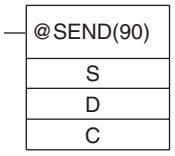
I/O memory data from other nodes can be read or written by simply using the program in the CPU Unit of a C200HX/HG/HE, CS/CJ-series, CVM1, CV-series, or CQM1H-series PLC to execute SEND and RECV.

CS/CJ-series PLCs

SEND

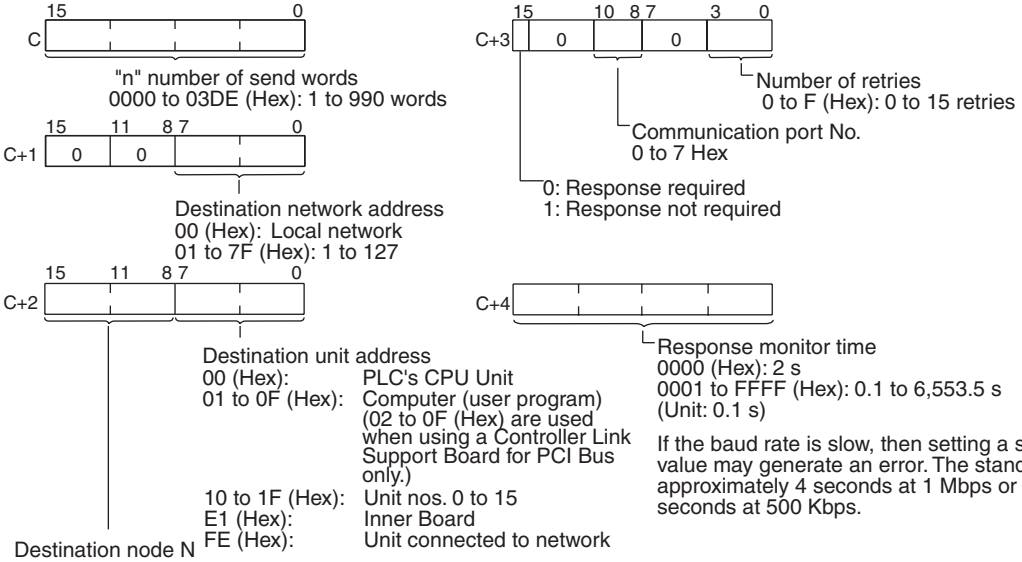
SEND transmits “n” words beginning with S (the beginning word for data transmission at the source node) to “n” words beginning with D (the beginning word for data reception at the destination node, N.)





user setting and the automatic setting

S: Source node beginning send word
D: Destination node beginning receive word
C: Source node first control data word

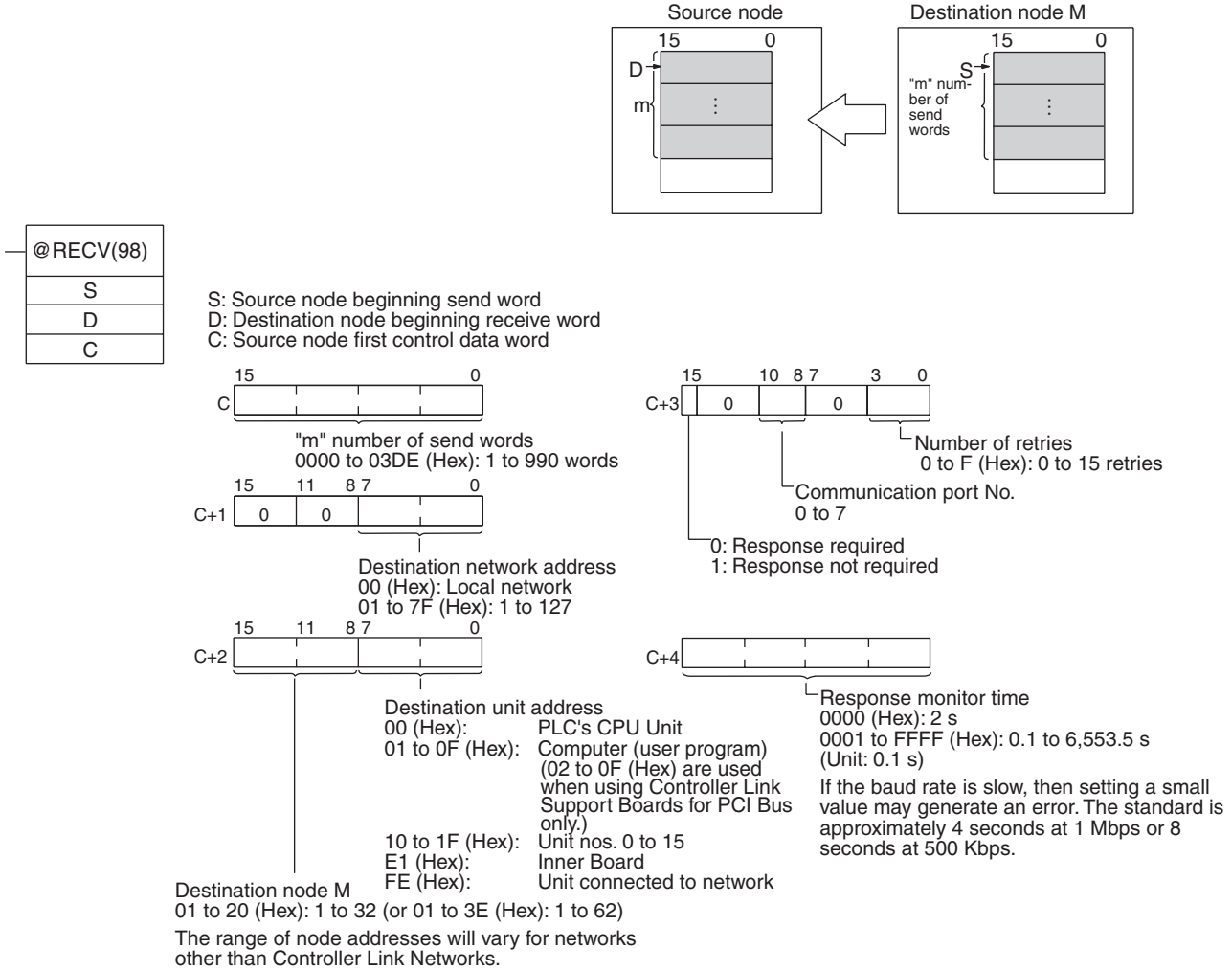


Note 1. When communicating with a CVM1 or CV-series PLC manufactured prior to April 1996 on the local network, the local network address cannot be set to “00.” Set a number other than “00” as the local network address in the routing tables, and then specify that number.

2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than "0" for the number of retries.
3. If the total number of data link words is increased, the communications cycle time will be increased. This may cause timeout errors to occur when waiting for the response. In that case, lengthen the response monitor time (control data word C+4).

RECV

RECV receives "m" words beginning with S (the beginning word for data transmission at the destination node, M) to the words beginning with D (the beginning word for data reception at the source node).



Note

1. When communicating with a CVM1 or CV-series PLC manufactured prior to April 1996 on the local network, the local network address cannot be set to "00." Set a number other than "00" as the local network address in the routing tables, and then specify that number.
2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When

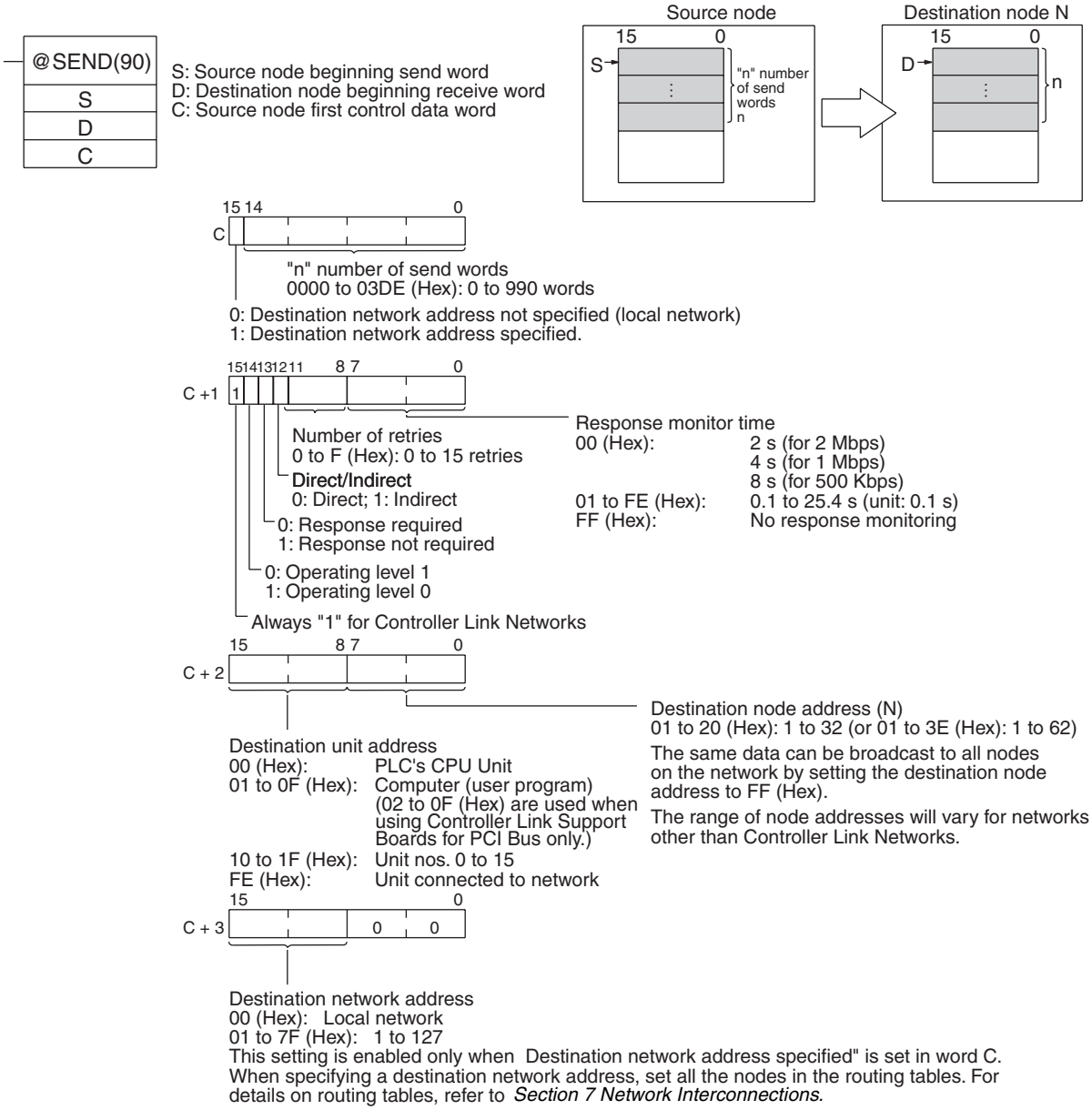
using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than "0" for the number of retries.

3. If the total number of data link words is increased, the communications cycle time will be increased. This may cause timeout errors to occur when waiting for the response. In that case, lengthen the response monitor time (control data word C+4).

C200HX/HG/HE PLCs

SEND

SEND transmits "n" words beginning with S (the beginning source word for data transmission at the source node) to the "n" words beginning with D (the beginning destination word for data reception at destination node N).



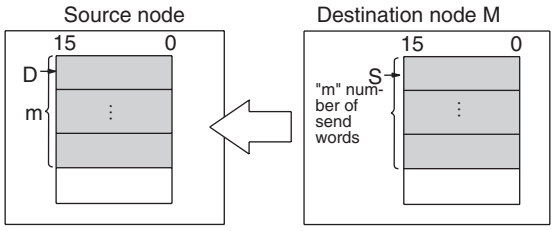
Note 1. When communicating in the same network with a CVM1 or CV-series PLC manufactured prior to April 1996, the local network address cannot be set

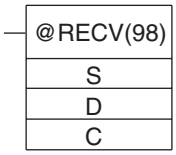
to “00.” Set a number other than “00” as the local network address in the routing tables, and then specify that number.

2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than “0” for the number of retries.

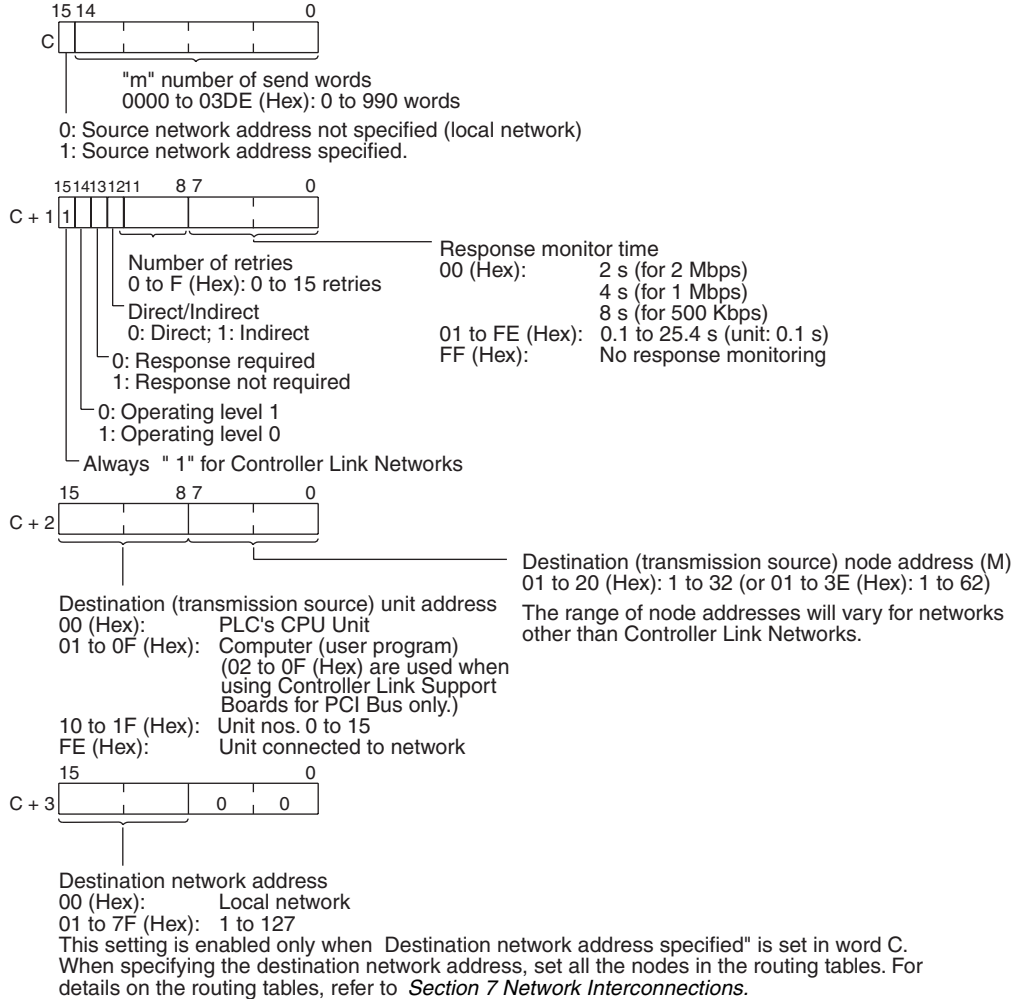
RECV

RECV receives “m” words beginning with S (the beginning word for data transmission at the destination node, M) to the words from D (the beginning word for data reception at the source node) onwards.





S: Destination node beginning send word
D: Source node beginning receive word
C: Source node first control data word



Note

1. When communicating in the same network with a CVM1 or CV-series PLC manufactured prior to April 1996, the local network address cannot be set to “00.” Set a number other than “00” as the local network address in the routing tables, and then specify that number.
2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend pro-

cessing is performed automatically once the number of retries has been set, so be sure to specify a number other than "0" for the number of retries.

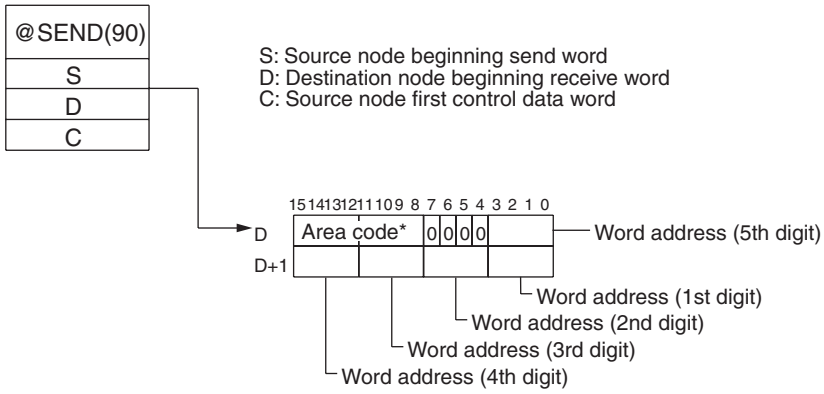
Indirect Designation of Beginning Words

CVM1, CV-series, and CS/CJ-series PLCs have a larger area than C200HX/HG/HE PLCs, so the beginning words for sending and receiving at destination nodes cannot always be directly specified by means of SEND and RECV operands. Moreover, depending on circumstances, it may be desirable to change the beginning word at destination nodes.

In such cases, set the "Direct/Indirect" control data designation to "1" (Indirect), and specify the beginning words for sending and receiving as described below.

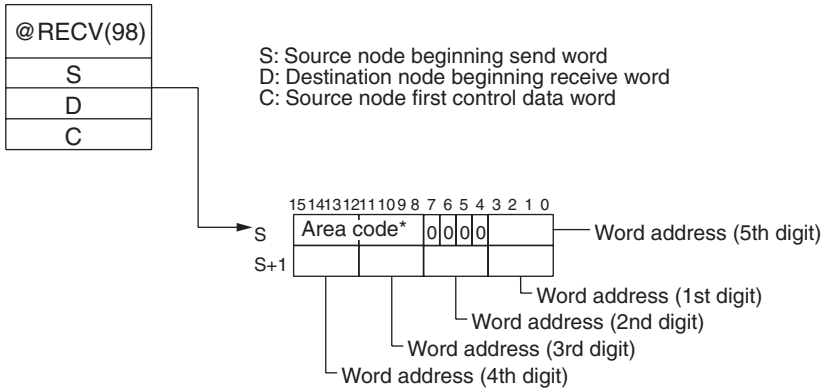
SEND

The beginning receive word is determined by the contents of the destination node's D and D+1 words.



RECV

The beginning send word is determined by the contents of the destination node's S and S+1 words.



Note Specify the area code according to the following table.

Destination node: CS/CJ-series PLC		Destination node: C200HX/HG/HE or CQM1H-series PLC		Destination node: CVM1 or CV-series PLC	
Area	**Code**	**Area**	**Code**	**Area**	**Code**
CIO (IR etc.) (See note 1.)	00	IR (Internal Relay)	00	CIO	00
TIM (Timer) (See note 2.)	03	LR (Link Relay)	06	CPU Bus Link	01
CNT (Counter) (See note 2.)	04	HR (Holding Relay)	07	Auxiliary	02
DM (DM Area)	05	AR (Auxiliary Relay)	08	Timer	03
EM (Expansion DM) Banks 0 to 7 Banks 8 to 13 Current bank	10 to 17 A8 to AC 18	TC (Timer/Counter)	03	Counter	04
		DM (DM Area)	05	DM (DM Area)	05
		EM (Expansion DM) Banks 0 to 7 Banks 8 to 15 Current bank (CQM1H: Bank 0 only)	10 to 17 28 to 2F 18	EM (Expansion DM) Banks 0 to 7 Current bank	10 to 17 18

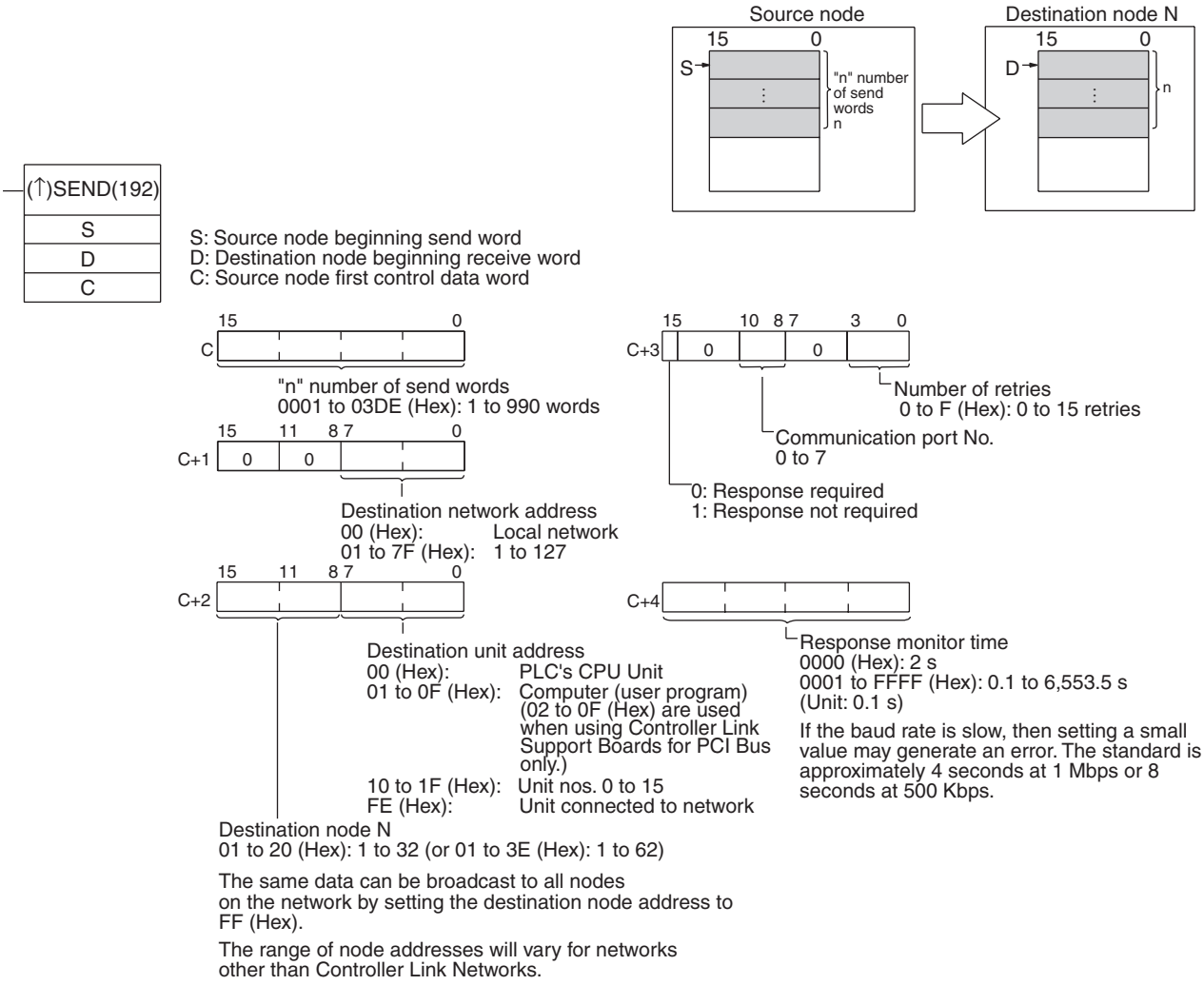
Note 1. Words 0 to 2555 in the IR Area can send and receive data.

2. Timer/counters numbers 0 to 2047 can send and receive data.

CVM1 and CV-series PLCs

SEND

SEND transmits “n” words beginning with S (the beginning word for data transmission at the source node) to “n” words beginning with D (the beginning word for data reception at the destination node, N.)

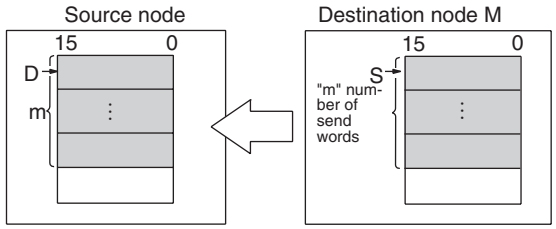


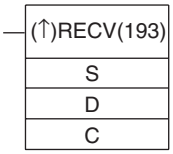
Note

1. When using CVM1 and CV-series PLCs manufactured prior to April 1996, the local network address cannot be set to “00.” Set a number other than “00” as the local network address in the routing tables, and then specify that number.
2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than “0” for the number of retries.

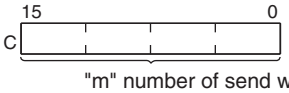
RECV

RECV receives "m" words beginning with S (the beginning word for data transmission at the destination node, M) to the words beginning with D (the beginning word for data reception at the source node).

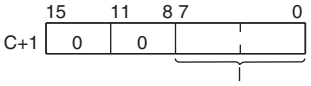




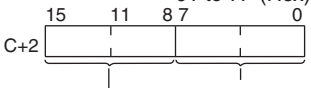
S: Source node beginning send word
D: Destination node beginning receive word
C: Source node first control data word



"m" number of send words
0001 to 03DE (Hex): 1 to 990 words

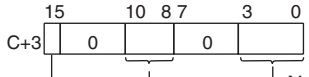


Destination network address
00 (Hex): Local network
01 to 7F (Hex): 1 to 127



Destination unit address
00 (Hex): PLC's CPU Unit
01 to 0F (Hex): Computer (user program) (02 to 0F (Hex) are used when using Controller Link Support Boards for PCI Bus only.)
10 to 1F (Hex): Unit nos. 0 to 15
FE (Hex): Unit connected to network

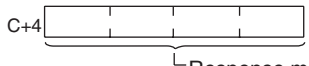
Destination node M
01 to 20 (Hex): 1 to 32 (or 01 to 3E (Hex): 1 to 62)
The range of node addresses will vary for networks other than Controller Link Networks.



Number of retries
0 to F (Hex): 0 to 15 retries

Communication port No.
0 to 7

0: Response required
1: Response not required



Response monitor time
0000 (Hex): 2 s
0001 to FFFF (Hex): 0.1 to 6,553.5 s
(Unit: 0.1 s)

If the baud rate is slow, then setting a small value may generate an error. The standard is approximately 4 seconds at 1 Mbps or 8 seconds at 500 Kbps.

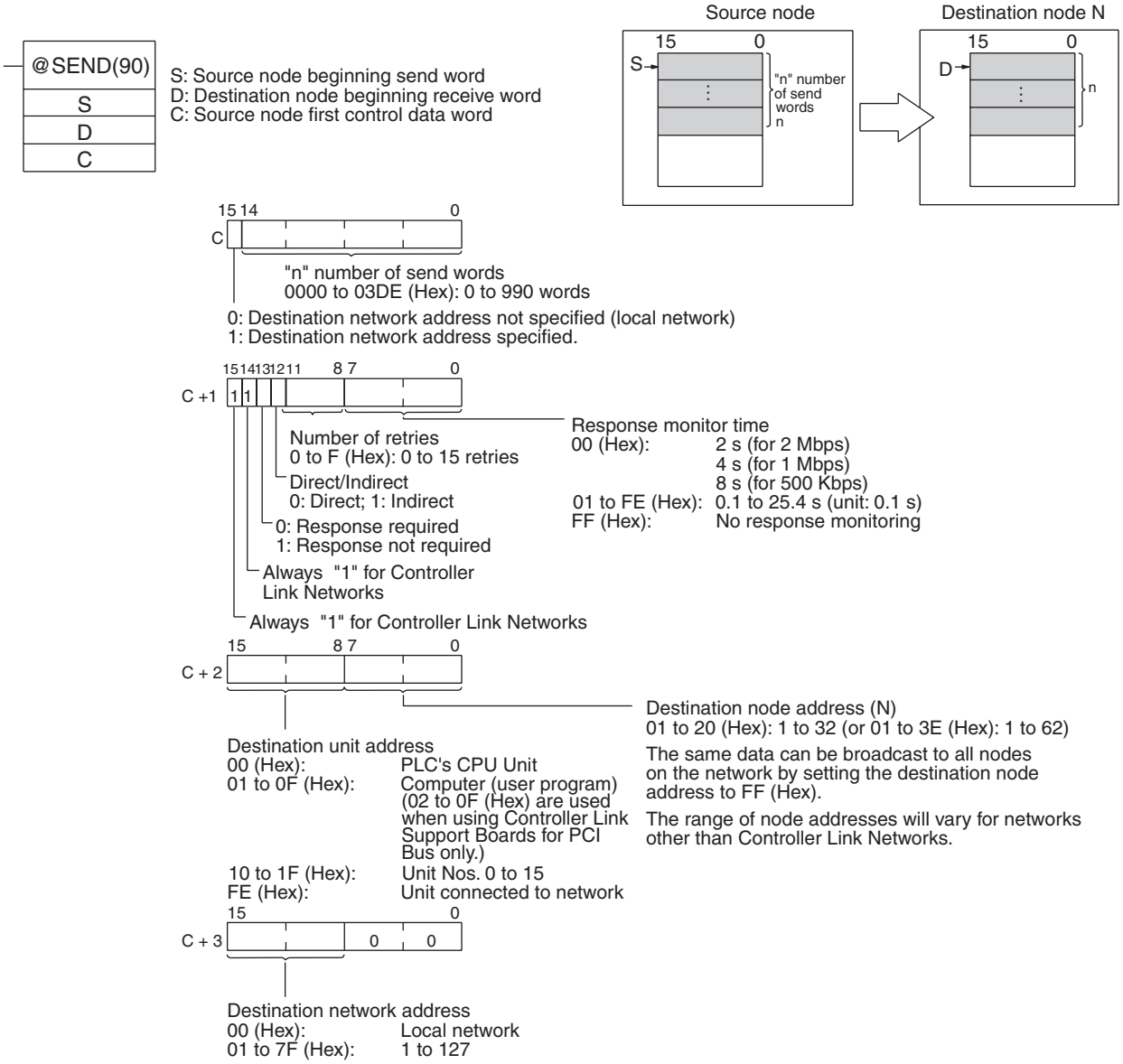
Note

1. When using CVM1 and CV-series PLCs manufactured prior to April 1996, the local network address cannot be set to "00." Set a number other than "00" as the local network address in the routing tables, and then specify that number.
2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than "0" for the number of retries.

CQM1H-series PLCs

SEND

SEND transmits “n” words beginning with S (the beginning word for data transmission at the source node) to “n” words beginning with D (the beginning word for data reception at the destination node, N.)

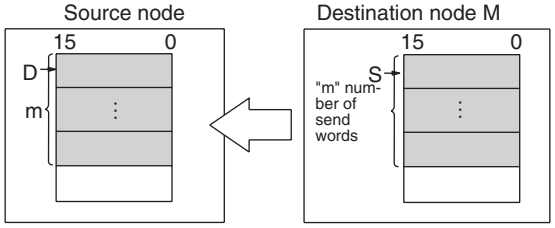


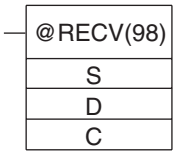
Note

1. When communicating in the same network with CVM1 and CV-series PLCs manufactured prior to April 1996, the local network address cannot be set to “00.” Set a number other than “00” as the local network address in the routing tables, and then specify that number.
2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are executed. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than “0” for the number of retries.

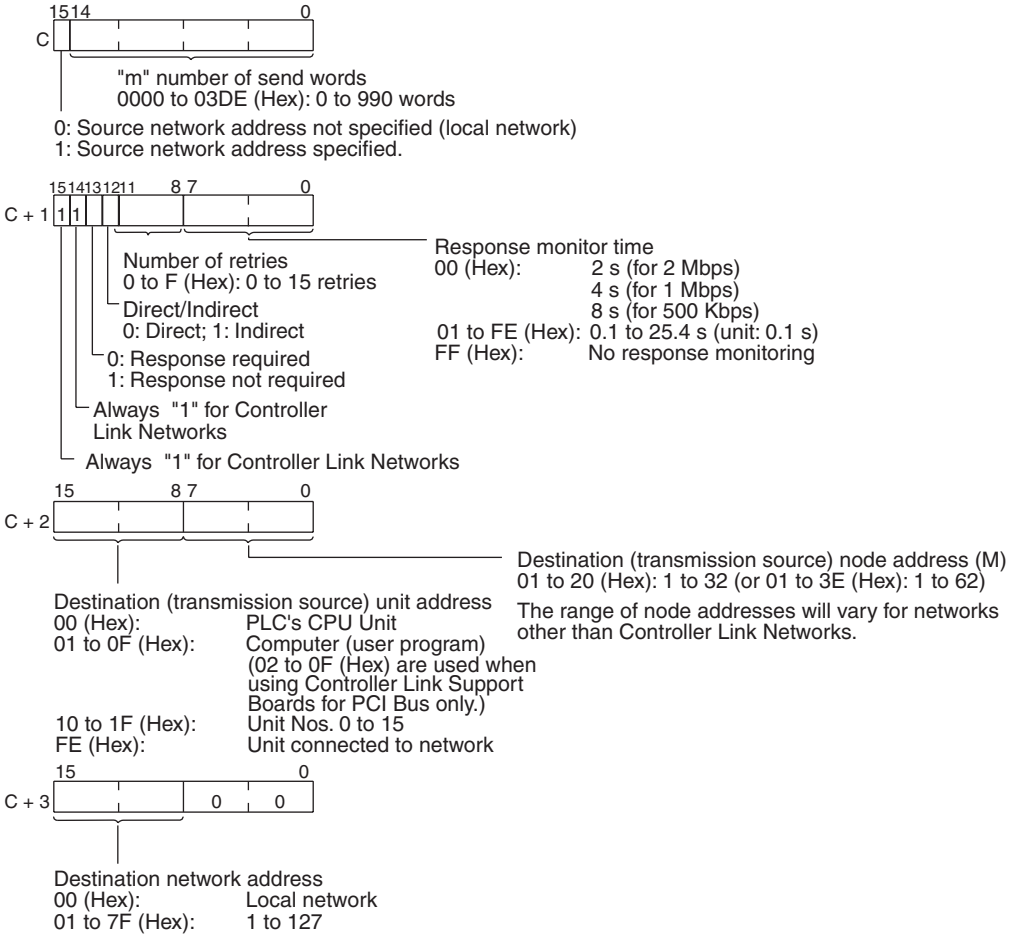
RECV

RECV receives “m” words beginning with S (the beginning word for data transmission at the destination node, M) to the words from D (the beginning word for data reception at the source node) onwards.





S: Destination node beginning send word
D: Source node beginning receive word
C: Source node first control data word



This setting is enabled only when "Destination network address specified" is set in word C. When specifying the destination network address, set all the nodes in the routing tables. For details on the routing tables, refer to *Section 7 Network Interconnections.*

Note

1. When communicating in the same network with CVM1 and CV-series PLCs manufactured prior to April 1996, the local network address cannot be set to “00.” Set a number other than “00” as the local network address in the routing tables, and then specify that number.
2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When

using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than "0" for the number of retries.

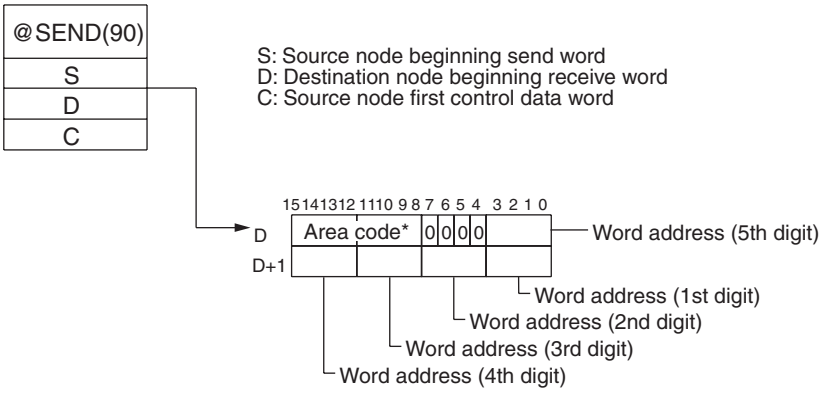
Indirect Designation of Beginning Words

CVM1, CV-series, and CS/CJ-series PLCs have a larger area than CQM1H-series PLCs, so the beginning words for sending and receiving at destination nodes cannot always be directly specified by means of SEND and RECV operands. Moreover, depending on circumstances, it may be desirable to change the beginning word at destination nodes.

In such cases, set the "Direct/Indirect" control data designation to "1" (Indirect), and specify the beginning words for sending and receiving as described below.

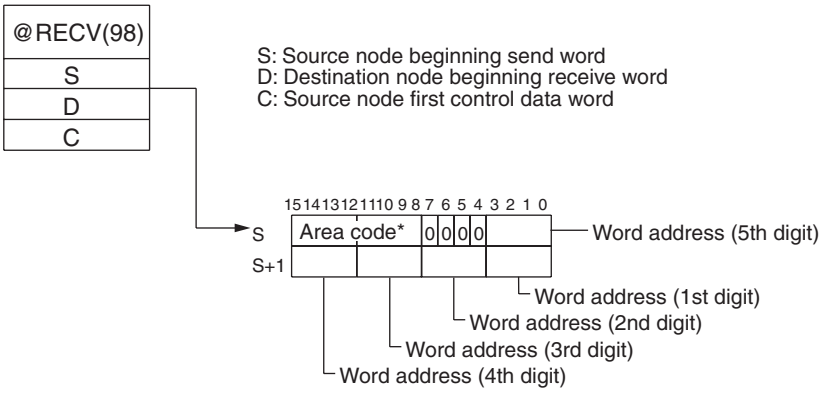
SEND

The beginning receive word is determined by the contents of the destination node's D and D+1 words.



RECV

The beginning send word is determined by the contents of the destination node's S and S+1 words.



Note Specify the area code according to the following table.

Destination node: CS/CJ-series PLC		Destination node: C200HX/HG/HE or CQM1H-series PLC		Destination node: CVM1 or CV-series PLC	
Area	**Code**	**Area**	**Code**	**Area**	**Code**
CIO (IR, etc.) (See note 1.)	00	IR (Internal Relay)	00	CIO	00
TIM (Timer) (See note 2.)	03	LR (Link Relay)	06	CPU Bus Link	01
CNT (Counter) (See note 2.)	04	HR (Holding Relay)	07	Auxiliary	02
DM (DM Area)	05	AR (Auxiliary Relay)	08	Timer	03
EM (Expansion DM) Banks 0 to 7 Banks 8 to 13 Current bank	10 to 17 A8 to AC 18	TC (Timer/Counter)	03	Counter	04
		DM (DM Area)	05	DM (DM Area)	05
		EM (Expansion DM) Banks 0 to 7 Banks 8 to 15 Current bank (CQM1H: Bank 0 only)	10 to 17 28 to 2F 18	EM (Expansion DM) Banks 0 to 7 Current bank	10 to 17 18

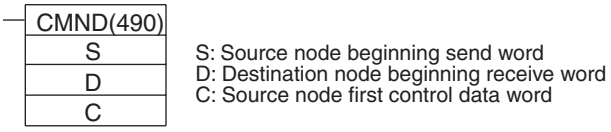
Note
1. Words 0 to 2555 in the IR Area can send and receive data.
2. Timer/counters numbers 0 to 2047 can send and receive data.

6-1-2 CMND (CVM1, CV-series, CS/CJ-series, and CQM1H-series PLCs Only)

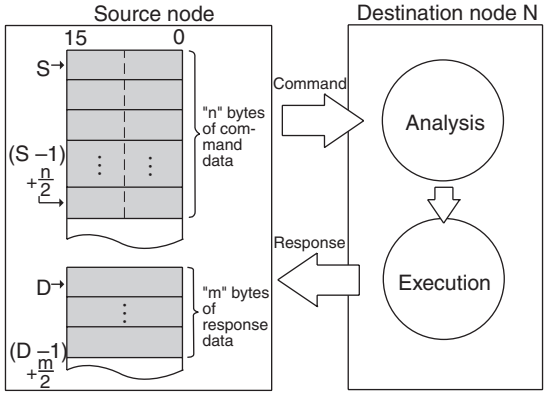
The CMND instruction can be executed in the user program in a CVM1, CV-series, CS/CJ-series, or CQM1H-series PLC to perform operations such as reading and writing memory data from and to other nodes, reading status information, and changing the operating mode.

CS/CJ-series PLCs

CMND sends "n" bytes of command data beginning with S (the beginning send word for storing command data at the source node) to destination node N. In return, "m" bytes of response data are stored at the source node beginning with D (the beginning receive word for storing response data).

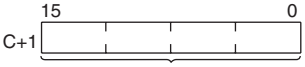


S: Source node beginning send word
D: Destination node beginning receive word
C: Source node first control data word

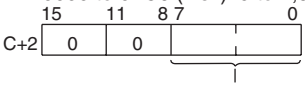




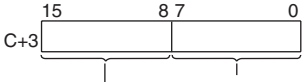
"n" bytes of command data
0000 to 07C6 (Hex): 0 to 1,990 words



"m" bytes of response data
0000 to 07C6 (Hex): 0 to 1,990 words



Destination network address
00 (Hex): Local network
01 to 7F (Hex): 1 to 127

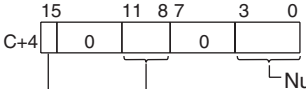


Destination unit address
00 (Hex): PLC's CPU Unit
01 to 0F (Hex): Computer (user program)
(02 to 0F (Hex) are used when using Controller Link Support Boards for PCI Bus only.)
10 to 1F (Hex): Unit nos. 0 to 15
E1 (Hex): Inner Board
FE (Hex): Unit connected to network

Destination node N
00 to 20 (Hex): 0 to 32 (or 00 to 3E (Hex): 0 to 62)

The same data can be broadcast to all nodes on the network by setting the destination node address to FF (Hex).

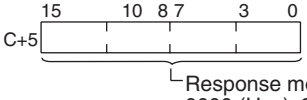
The range of node addresses will vary for networks other than Controller Link Networks.



Number of retries
0 to F (Hex): 0 to 15 retries

Communications port number: 0 to 7 (Hex)

0: Response required
1: Response not required



Response monitor time
0000 (Hex): 2 s
0001 to FFFF (Hex): 0.1 to 6,553.5 s
(Unit: 0.1 s)
If the baud rate is slow, then setting a small value may generate an error. The standard is approximately 4 seconds at 1 Mbps or 8 seconds at 500 Kbps.

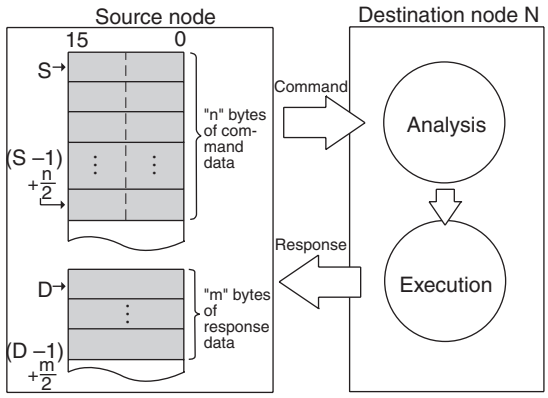
Note 1. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When

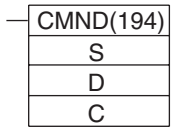
using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than "0" for the number of retries.

2. If the total number of data link words is increased, the communications cycle time will be increased. This may cause timeout errors to occur when waiting for the response. In that case, lengthen the response monitor time (control data word C+5).

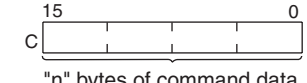
CVM1 and CV-series PLCs

CMND sends "n" bytes of command data beginning with S (the beginning word for storing command data at the source node) to node N. In return, "m" bytes of response data are stored at the source node beginning with D (the beginning word for storing response data).





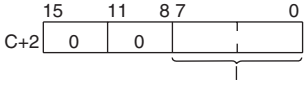
S: Source node beginning send word
D: Destination node beginning receive word
C: Source node first control data word



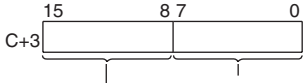
"n" bytes of command data
0000 to 07C6 (Hex): 0 to 1,990 words



"m" bytes of response data
0000 to 07C6 (Hex): 0 to 1,990 words



Destination network address
00 (Hex): Local network
01 to 7F (Hex): 1 to 127



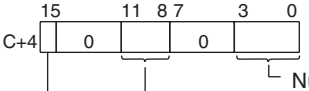
Destination unit address

00 (Hex):	PLC's CPU Unit
01 to 0F (Hex):	Computer (user program) (02 to 0F (Hex) are used when using Controller Link Support Boards for PCI Bus only.)
10 to 1F (Hex):	Unit nos. 0 to 15
FE (Hex):	Unit connected to network

Destination node N
00 to 20 (Hex): 0 to 32 (or 00 to 3E (Hex): 0 to 62)

The same data can be broadcast to all nodes on the network by setting the destination node address to FF (Hex).

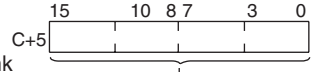
The range of node addresses will vary for networks other than Controller Link Networks.



Number of retries
0 to F (Hex): 0 to 15 retries

Communications port number: 0 to 7 (Hex)

0: Response required
1: Response not required



Response monitor time
0000 (Hex): 2 s
0001 to FFFF (Hex): 0.1 to 6,553.5 s
(Unit: 0.1 s)
If the baud rate is slow, then setting a small value may generate an error. The standard is approximately 4 seconds at 1 Mbps or 8 seconds at 500 kbps.

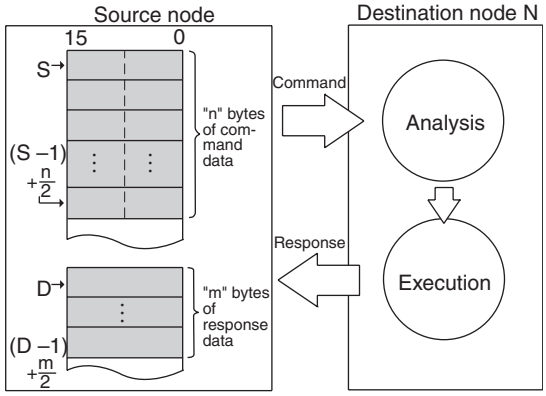
Note

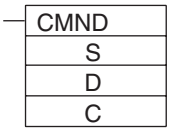
1. When using CVM1 and CV-series PLCs manufactured prior to April 1996, the local network address cannot be set to "00." Set a number other than "00" as the local network address in the routing tables, and then specify that number.
2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When using the message service, it is advisable to prevent this situation from oc-

curring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than "0" for the number of retries.

CQM1H-series PLCs

CMND sends "n" bytes of command data beginning with S (the beginning word for storing command data at the source node) to node N. In return, "m" bytes of response data are stored at the source node beginning with D (the beginning word for storing response data).

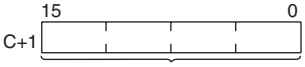




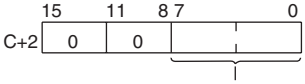
S: Source node beginning send word
D: Destination node beginning receive word
C: Source node first control data word



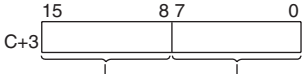
"n" bytes of command data
0000 to 07C6 (Hex): 0 to 1,990 words



"m" bytes of response data
0000 to 07C6 (Hex): 0 to 1,990 words



Destination network address
00 (Hex): Local network
01 to 7F (Hex): 1 to 127

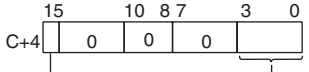


Destination unit address
00 (Hex): PLC's CPU Unit
01 to 0F (Hex): Computer (user program) (02 to 0F (Hex) are used when using Controller Link Support Boards for PCI Bus only.)
10 to 1F (Hex): Unit nos. 0 to 15
FE (Hex): Unit connected to network

Destination node N
00 to 20 (Hex): 0 to 32 (or 00 to 3E (Hex): 0 to 62)

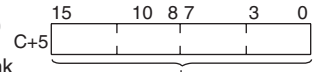
The same data can be broadcast to all nodes on the network by setting the destination node address to FF (Hex).

The range of node addresses will vary for networks other than Controller Link Networks.



Number of retries
0 to F (Hex): 0 to 15 retries

0: Response required
1: Response not required



Response monitor time
0000 (Hex): 2 s at 2 Mbits/s
4 s at 1 Mbit/s
8 s at 500 kbits/s
0001 to FFFF (Hex): 0.1 to 6,553.5 s
(Unit: 0.1 s)

Note 1. When using CVM1 and CV-series PLCs manufactured prior to April 1996, the local network address cannot be set to "00." Set a number other than "00" as the local network address in the routing tables, and then specify that number.

2. With the message service, there is no guarantee that a message to a destination node will reach its destination. It is always possible that the message may be lost in transit due to noise or some other condition. When using the message service, it is advisable to prevent this situation from occurring by performing resend processing at the node where instructions are issued. With the SEND, RECV, and CMND instructions, resend processing is performed automatically once the number of retries has been set, so be sure to specify a number other than "0" for the number of retries.

Example: Commands for CVM1, CV-series and CS/CJ-series PLCs

Type of command		Code	CS/CJ	CVM1/CV
For memory areas (CIO, DM, EM, TC, transition, step, forced ON/OFF)	MEMORY AREA READ	0101	Yes	Yes
	MEMORY AREA WRITE	0102	Yes	Yes
	MEMORY AREA FILL	0103	Yes	Yes
	MULTIPLE MEMORY AREA READ	0104	Yes	Yes
	MEMORY AREA TRANSFER	0105	Yes	Yes
For parameter areas (PLC system setting, I/O table registration, routing table, etc.)	PARAMETER AREA READ	0201	Yes	Yes
	PARAMETER AREA WRITE	0202	Yes	Yes
	PARAMETER AREA CLEAR	0203	Yes	Yes
For program areas (UM)	PROGRAM AREA PROTECT	0304	Yes	Yes
	PROGRAM AREA PROTECT CLEAR	0305	Yes	Yes
	PROGRAM AREA READ	0306	Yes	Yes
	PROGRAM AREA WRITE	0307	Yes	Yes
	PROGRAM AREA CLEAR	0308	Yes	Yes
PLC mode	RUN	0401	Yes	Yes
	STOP	0402	Yes	Yes
PLC model data	CONTROLLER DATA READ	0501	Yes	Yes
	CONNECTION DATA READ	0502	Yes	Yes
PLC status data	CONTROLLER STATUS READ	0601	Yes	Yes
	CYCLE TIME READ	0620	Yes	Yes
PLC internal clock	CLOCK READ	0701	Yes	Yes
	CLOCK WRITE	0702	Yes	Yes
Messages	MESSAGE READ	0920	Yes	Yes
	MESSAGE CLEAR		Yes	Yes
	FAL/FALS READ		Yes	Yes
Access rights	ACCESS RIGHT ACQUIRE	0C01	Yes	Yes
	ACCESS RIGHT FORCED ACQUIRE	0C02	Yes	Yes
	ACCESS RIGHT RELEASE	0C03	Yes	Yes
Error data	ERROR CLEAR	2101	Yes	Yes
	ERROR LOG READ	2102	Yes	Yes
	ERROR LOG CLEAR	2103	Yes	Yes

Type of command		Code	CS/CJ	CVM1/CV
File Memory	FILE NAME READ	2201	Yes	Yes
	SINGLE FILE READ	2202	Yes	Yes
	SINGLE FILE WRITE	2203	Yes	Yes
	MEMORY CARD FORMAT	2204	Yes	Yes
	FILE DELETE	2205	Yes	Yes
	VOLUME LABEL CREATE/ DELETE	2206	No	Yes
	FILE COPY	2207	Yes	Yes
	FILE NAME CHANGE	2208	Yes	Yes
	FILE DATA CHECK	2209	No	Yes
	MEMORY AREA FILE TRANSFER	220A	Yes	Yes
	PARAMETER AREA FILE TRANSFER	220B	Yes	Yes
	PROGRAM AREA FILE TRANSFER	220C	Yes	Yes
Forced set/reset	FORCED SET/RESET	2301	Yes	Yes
	FORCED SET/RESET CANCEL	2302	Yes	Yes

For details on commands for CS/CJ-series PLCs, refer to the *CS/CJ-series Programmable Controllers Instructions Reference Manual* (W340). For details on commands for CVM1 and CV-series PLCs, refer to the *FINS Commands Reference Manual* (W227). For details on commands for C200HX/HG/HE PLCs, refer to *6-6 Commands and Responses for C200HX/HG/HE and CQM1H-series PLCs*. For details on commands for Controller Link Units, refer to *6-5 Commands and Responses for Controller Link Units*.

6-1-3 Send/Receive Data Areas

The data areas that can be used as operands in the SEND and RECV instructions depend on the PLC, as shown in the following tables. Be sure to set the operands so that the end of the data area is not exceeded.

CS/CJ-series PLCs

Area	Range
CIO (IR etc.)	CIO 0000 to CIO 6143
Work Area (WR)	W000 to W511
Holding Area	HR000 to HR511
Auxiliary Area	AR000 to AR959 (See note 1.)
Timer	T0000 to T4095
Counter	C0000 to C4095
DM Area	DM00000 to DM32767
Extended DM Area	EM00000 to EM32767 (See note 2.)

Note
1. Writing is not possible to words A000 through A447 in the Auxiliary Area.
2. A maximum of thirteen banks can be used for Expansion DM. For details on extended DM Area and the number of banks, refer to the operation manual for the PLC model that is being used.

C200HX/HG/HE PLCs

Area	Range
Internal Relay Area 1	IR 000 to IR 235 (See note 1.)
Special Relay Area 1	SR 236 to SR 255 (See note 1.)
Special Relay Area 2	SR 256 to SR 299 (See note 1.)
Internal Relay Area 2	IR 300 to IR 511 (See note 1.)
Link Relay	LR 00 to LR 63
Holding Relay	HR 00 to HR 99
Timer/Counter	T/C 000 to T/C 511
Auxiliary Relay	AR 00 to AR 27
DM Area	DM 0000 to DM 6655
Extended DM Area	EM 0000 to EM 6143 (See note 2.)

Note

1. Words in the Internal Relay Area 1 (IR 000 to IR 235) and Special Relay Area 1 (SR 236 to SR 255) are continuous in memory, and any range of words within these areas can be transferred in a single operation. The same is true for Special Relay Area 2 (SR 256 to SR 299) and Internal Relay Area 2 (IR 300 to IR 511). You cannot, however, transfer data in a range that crosses the boundary between Special Relay Area 1 (SR 236 to SR 255) and Special Relay Area 2 (SR 256 to SR 299).
   SR 253 to SR 255 cannot be written at the source node, even if they are specified by the RECV instruction's beginning receive word at the source node.
2. For details on extended DM Area and the number of banks, refer to the operation manual for the PLC model that is being used.

CVM1 and CV-series PLCs

Area	Range	
	CV500, CVM1-CPU01	CV1000/2000, CVM1-CPU11/21
CIO Area	CIO 0000 to CIO 2555	
CPU Bus Link Area	G000 to G255 (See note 1.)	
Auxiliary Area	A000 to A511 (See note 2.)	
Timer Area	T000 to T511	T000 T1023
Counter Area	C000 to C511	C000 to C1023
DM Area	DM0000 to DM8191	DM0000 to DM24575
Expansion DM Area	---	EM00000 to EM32765 (See note 3.)

Note

1. Writing is not possible to words G000 through G007 in the CPU Bus Link Area.
2. Writing is not possible to words A256 through A511 in the Auxiliary Area.
3. Expansion DM can be used by mounting an Expansion DM Unit to a CV1000/2000 or CVM1-CPU11/21 PLC. A maximum of eight banks can be used, depending on the type of Expansion DM. For details, refer to the CVM1 and CV-series PLC operation manuals.

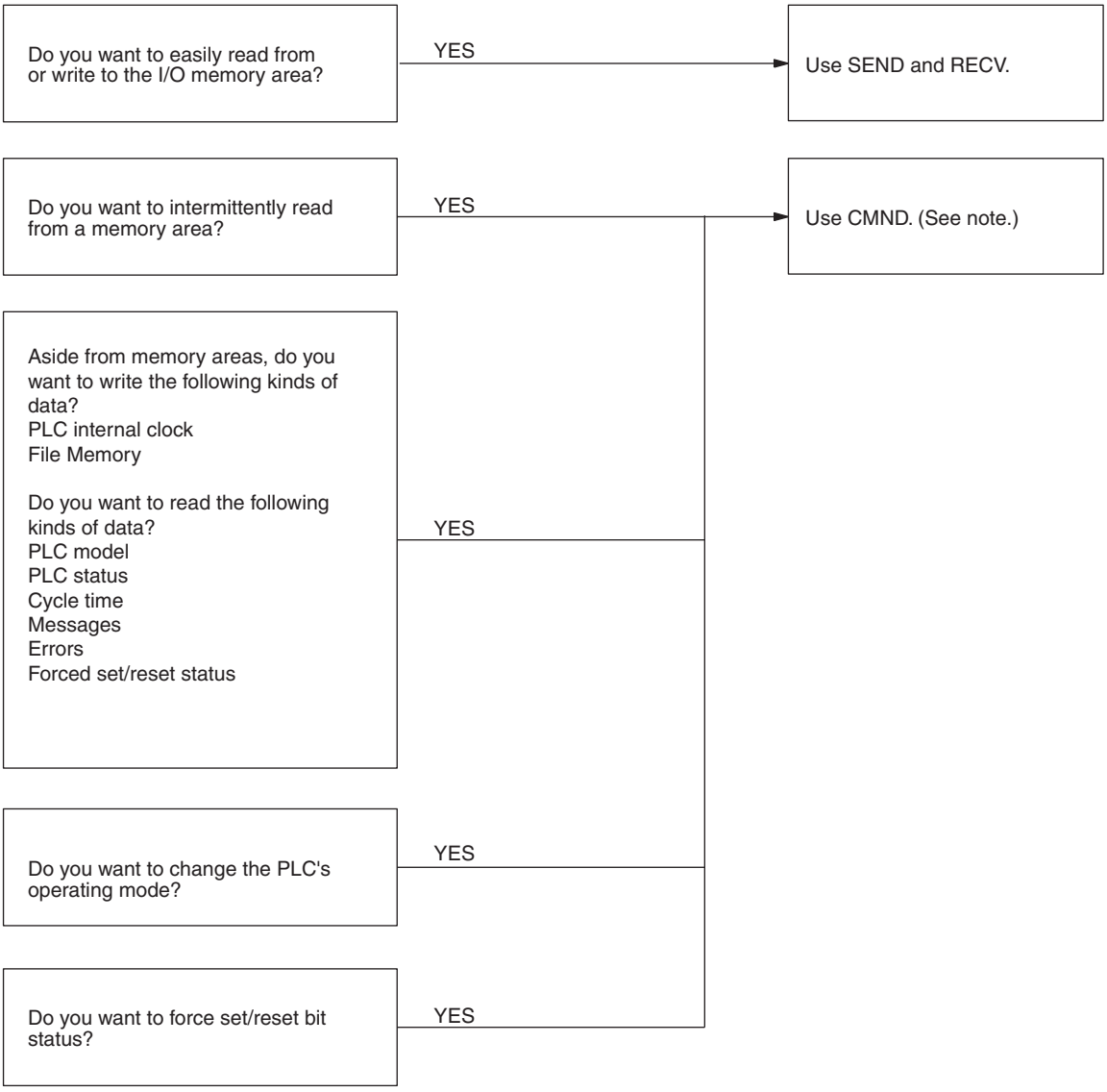
CQM1H-series PLCs

Area	Range
IR/SR Area	IR 000 to SR 255 (See note 1.)
LR Area	LR 00 to LR 63
HR Area	HR 00 to HR 99
Timer/Counter Area	TIM/CNT 000 to TIM/CNT 511
AR Area	AR 00 to AR 27

Area	Range
DM Area	DM 0000 to DM 6655
Extended DM Area	EM 0000 to EM 6143 (See note 2.)

Note
1. SR 253 to SR 255 cannot be written at the source node, even if they are specified by the RECV instruction's beginning receive word at the source node.
2. For details on extended DM Area, refer to the operation manual for the PLC model that is being used.

6-2 Selecting Communications Instructions



Note CMND cannot be used with C200HX/HG/HE PLCs.

6-2-1 Message Service Operations

Instruction	Source node			Destination node			Communications contents	Data length	Broadcasting	Network connections
	C200HX/HG/HE	CQM1H	CS/CJ, CVM1, or CV	C200HX/HG/HE or CQM1H	CS/CJ, CVM1, or CV	Computer				
SEND and RECV	Yes	Yes	Yes	Yes	Yes	Yes (See note 2.)	Read to and write from all I/O memory areas.	990 words max. (1,980 bytes)	SEND only (no response)	Yes (up to three levels including local network), via CS/CJ-series, CVM1, or CV-series PLCs.
CMND (See note 1.)	**No**	Yes	Yes	Yes	Yes	Yes (See note 2.)	**Data read/write:** Read to and write from all I/O memory areas. Read PLC model. Read status data. Read time data. Read and write File Memory data. Read PLC mode. **PLC Control:** Change PLC mode. Forced set/reset Clear PLC errors.	2,012 bytes max.	Yes (no response)	

Note 1. CMND cannot be used with C200HX/HG/HE PLCs.

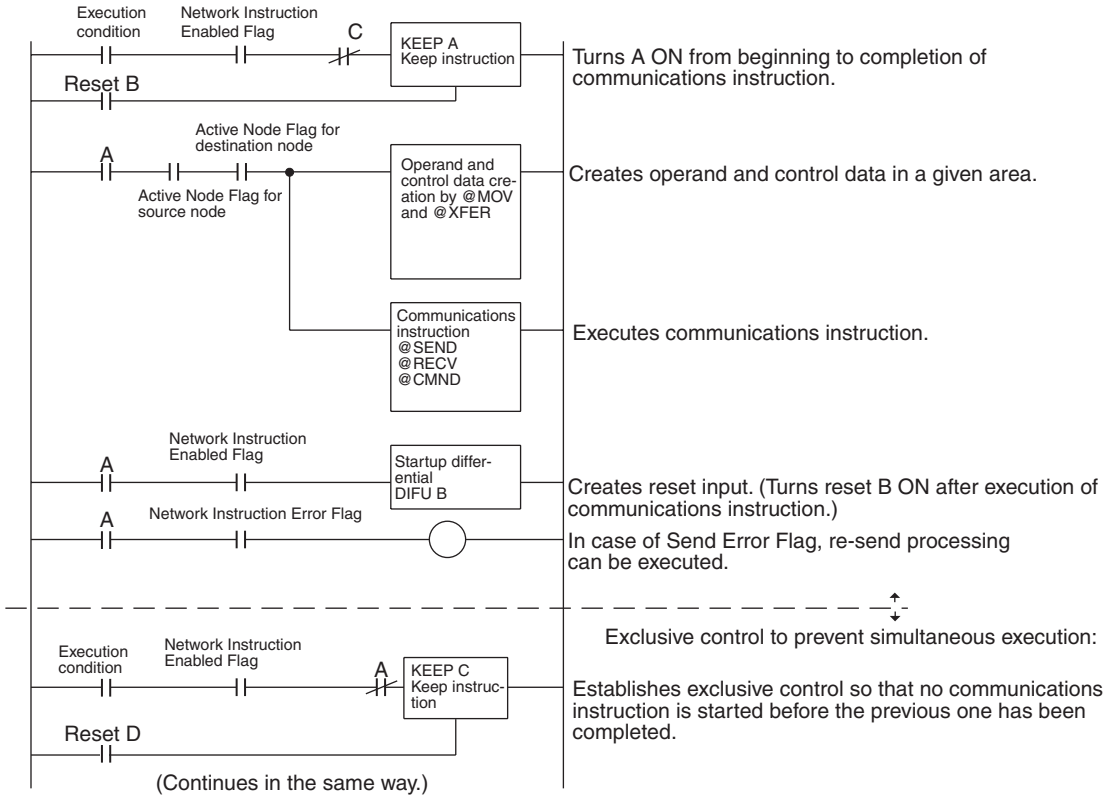
2. If a computer is receiving commands, a program is required at the computer for sending back responses.

6-2-2 Message Service Specifications

Item	Specifications
Transmission format	C200HX/HG/HE PLCs 1:1 SEND or RECV 1:N SEND (broadcast) CS/CJ-series, CVM1,CV-series, or CQM1H-series PLCs 1:1 SEND, RECV, or CMND 1:N SEND or CMND; (broadcast)
Packet length	SEND: 990 words (1,980 bytes) max. RECV: 990 words (1,980 bytes) max. CMND: 1,990 bytes max.
Data content	SEND: Command and response for a request to send data are transferred. RECV: Command and response for a request to receive data are transferred. CMND: A wide range of command/response data can be sent.
Number of simultaneous commands	C200HX/HG/HE PLCs: One at a time for each of 2 operating level. CS/CJ-series, CVM1, and CV-series PLCs: One for each of eight ports (ports 0 to 7). CQM1H-series One
Response monitor time	C200HX/HG/HE or CQM1H-series PLCs 00: Default setting 2 seconds (2 Mbps) 4 seconds (1 Mbps) 8 seconds (500 Kbps) FF: No monitoring 01 to FE: User settings (in increments of 100 ms, 100 to 25,400 ms) CS/CJ-series, CVM1, and CV-series PLCs 0000: Default setting (2 s) 0001 to FFFF: User settings (in increments of 0.1 s, 0.1 to 6553.5 s)
Number of retries	0 to F: 0 to 15

6-3 Using the Message Service

With SEND, RECV, and CMND, the Network Instruction Enabled Flag and Network Instruction Error Flag are generally written into the program as input conditions, as shown below. Only one instruction can be executed at a time for any given communications port. Exclusive control thus must be incorporated to execute two or more instructions per operating level with C200HX/HG/HE PLCs, nine or more instructions with CS/CJ-series, CVM1, and CV-series PLCs (because CVM1 and CV-series PLCs have eight ports), or two or more instructions with CQM1H-series PLCs.



SEND/RECV Flags

CS/CJ-series PLCs

Name	Address		Contents
	Word	Bit	
Network Instruction Enabled Flag	A202	Port number corresponds to bit number, i.e., port 0: bit 00, port 1: bit 01, etc.	0: Execution not enabled (executing) 1: Execution enabled (not executing)
Network Instruction Error Flag	A219	Port number corresponds to bit number plus 8, i.e., port 0: bit 08, port 1: bit 09, etc.	0: Normal end 1: Abnormal end

Note With CS/CJ-series PLCs, ports 0 to 7 are also used for executing the PMCR (Protocol Macro) instruction, therefore these flags are used for the 4 instructions, SEND/RECV/CMND/PMCR. When the PMCR command is being executed, the same port cannot be used for SEND/RECV/CMND instructions.

C200HX/HG/HE PLCs

Name	Operating level	Address	Contents
Network Instruction Enabled Flag	1	SR 25204	0: Execution not possible (already executing) 1: Execution possible (not executing)
	0	SR 25201	
Network Instruction Error Flag	1	SR 25203	0: Normal end 1: Abnormal end
	0	SR 25200	

CVM1, and CV-series PLCs

Name	Address		Contents
	Word	Bit	
Network Instruction Enabled Flag	A502	Port number corresponds to bit number, i.e., port 0: bit 00, port 1: bit 01, etc.	0: Execution not enabled (executing) 1: Execution enabled (not executing)
Network Instruction Error Flag	A502	Port number corresponds to bit number plus 8, i.e., port 0: bit 08, port 1: bit 09, etc.	0: Normal end 1: Abnormal end

CQM1H-series PLCs

Name	Address	Contents
Network Instruction Enabled Flag	AR 0209	0: Execution not possible (already executing) 1: Execution possible (not executing)
Network Instruction Error Flag	AR 0208	0: Normal end 1: Abnormal end

Network Status

The nodes on the network are shown in the following illustrations.

C200HX/HG/HE PLCs

Operating level 0
AR 08
AR 09

Operating level 1
AR 12
AR 13

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of network
1: Part of network

CS/CJ-series, CVM1, and CV-series PLCs

CIO 1500 + 25 × N + 2
CIO 1500 + 25 × N + 3
N: Unit number

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of the network
1: Part of the network

CQM1H-series PLCs

IR 192
IR 193

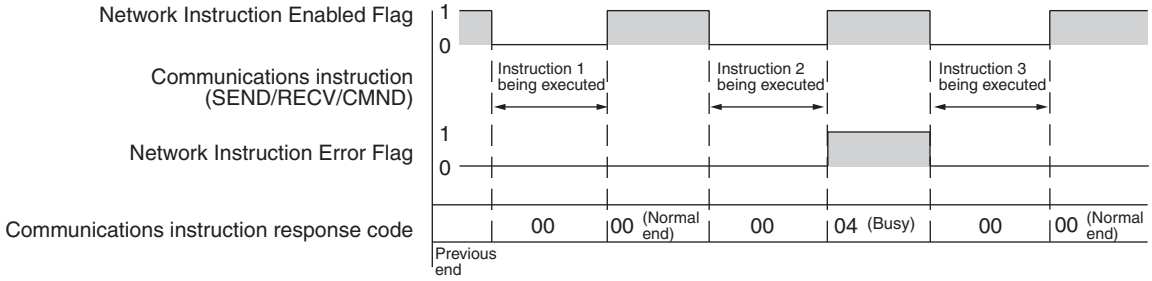
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of network
1: Part of network

SEND/RECV Flag Operations

- The Network Instruction Enabled Flag turns OFF during transmission or reception, and ON after the data transmission or reception has been completed (regardless of whether an error occurs).
- The Network Instruction Error Flag retains its status until the next data transmission or reception.
- Even when there is an abnormal end, the Network Instruction Error Flag turns OFF when the next communications instruction is executed.

Example



Communications Instruction Response Codes

The status after a communications instruction has been executed is reflected in the words shown in the following table. During instruction execution, it becomes “00” or “0000,” and it is reflected here after the execution has been completed.

PLC	Word	Bits	Contents
CS/CJ-series	A203	---	Port 0 response code
	A204	---	Port 1 response code
	A205	---	Port 2 response code
	A206	---	Port 3 response code
	A207	---	Port 4 response code
	A208	---	Port 5 response code
	A209	---	Port 6 response code
	A210	---	Port 7 response code
C200HX/HG/HE	SR 237	08 to 15	Operating level 1 response code
		00 to 07	Operating level 0 response code
CVM1 and CV-series	A503	---	Port 0 response code
	A504	---	Port 1 response code
	A505	---	Port 2 response code
	A506	---	Port 3 response code
	A507	---	Port 4 response code
	A508	---	Port 5 response code
	A509	---	Port 6 response code
	A510	---	Port 7 response code
CQM1H-series	AR 02	00 to 07	Response code

C200HX/HG/HE and CQM1H-series PLC Response Codes

The results of executing SEND and RECV instructions are reflected as shown in the following table.

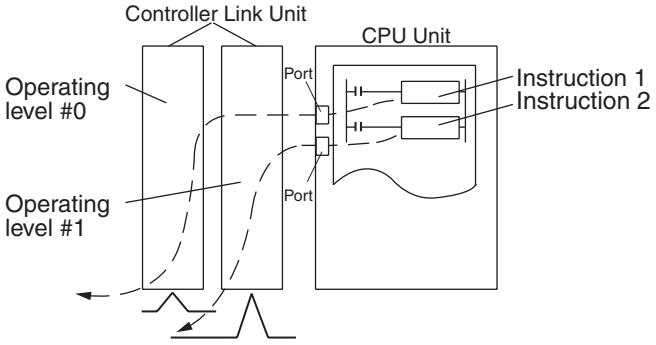
Code	Contents	Meaning
00 (Hex)	Normal end	Data transfer was completed successfully.
01 (Hex)	Parameter error	SEND/RECV instruction operands are not within specified ranges.
02 (Hex)	Transmission impossible	The source node is not in the network or the Unit was reset during execution of the instruction.
03 (Hex)	Destination node error	The destination node is not in the network.
04 (Hex)	Destination node busy error	The destination node is busy and cannot receive the command.
05 (Hex)	Response timeout	A response was not received within the time limit.
06 (Hex)	Response error	The response received from the destination node was incorrect.
07 (Hex)	Communications controller error	An error occurred in the communications controller.
08 (Hex)	Setting error	The destination node address was set incorrectly.
09 (Hex)	CPU Unit error	A CPU Unit error occurred in the PLC of the destination node.
10 (Hex)	Routing error	Command could not be sent because of incorrect routing.
11 (Hex)	Relay error	Command did not reach the destination node because of an error at the relay station.
12 (Hex)	Source node busy error	The source node is busy and cannot send the command.

CS/CJ-series, CVM1, and CV-series Response Codes

The results of executing SEND, RECV, and CMND instructions are reflected as one word (two bytes) of data. Instruction response codes are the same as FINS command response codes. Response code bits 08 to 15 correspond to the first byte of the response code, and response code bits 00 to 07 correspond to the second byte of the response code. For details, refer to *6-7 Response Codes*.

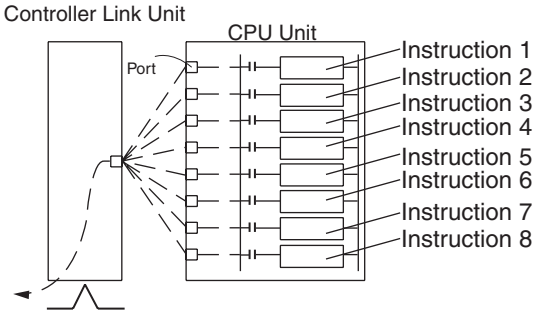
Simultaneous Execution of Communications Instructions

C200HX/HG/HE PLCs



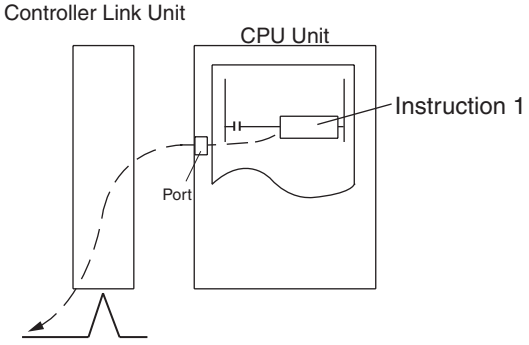
There is only one communications port per operating level, so no more than one communications instruction can be executed per operating level at one time. When both operating levels are used, two instructions can be executed simultaneously.

CS/CJ-series, CVM1, and CV-series PLCs



There are eight communications ports, so eight communications can be executed simultaneously. Only one message is refreshed from the CPU Unit to the Controller Link Unit and one from the Controller Link Unit to the CPU Unit for each CPU Bus Unit service time.

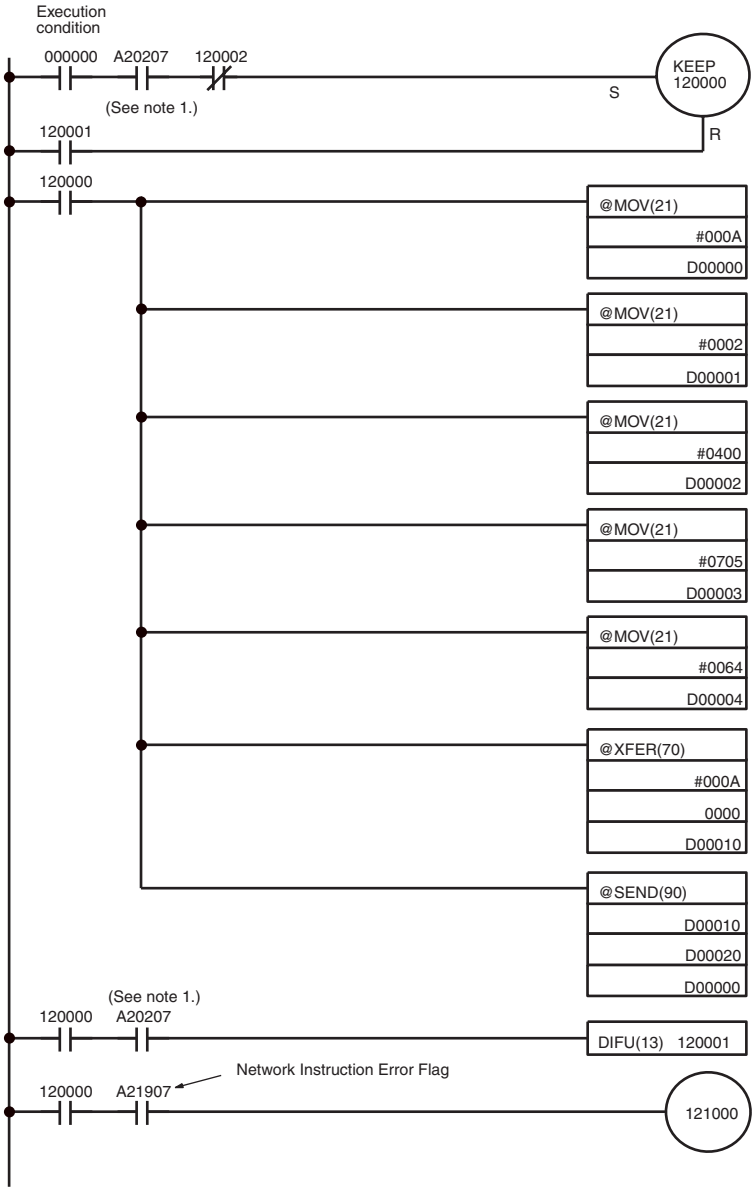
CQM1H-series PLCs



There is only one communications port, so no more than one communications instruction can be executed at one time.

PLC Programming Examples

CS/CJ-series PLCs



The transmission program will run when CIO 000000 turns ON, provided that the Network Instruction Enabled Flag is ON and the RECV instruction has not been executed.

CIO 120000 remains ON while the SEND instruction is being executed, and it turns OFF when instruction execution has been completed.

Control Data Preparation

Word	Content	Meaning
D00000	0 0 0 A	10 send words
D00001	0 0 0 2	Destination network address= 2
D00002	0 4 0 0	Destination node address = 4 Destination Unit address = 0
D00003	0 7 0 5	Response required Port No. 7 used No. of resends = 5
D00004	0 0 6 4	Response monitoring time = 10 s

Transfers the 10 words beginning at CIO 0000 to the 10 words beginning at DM 00010.

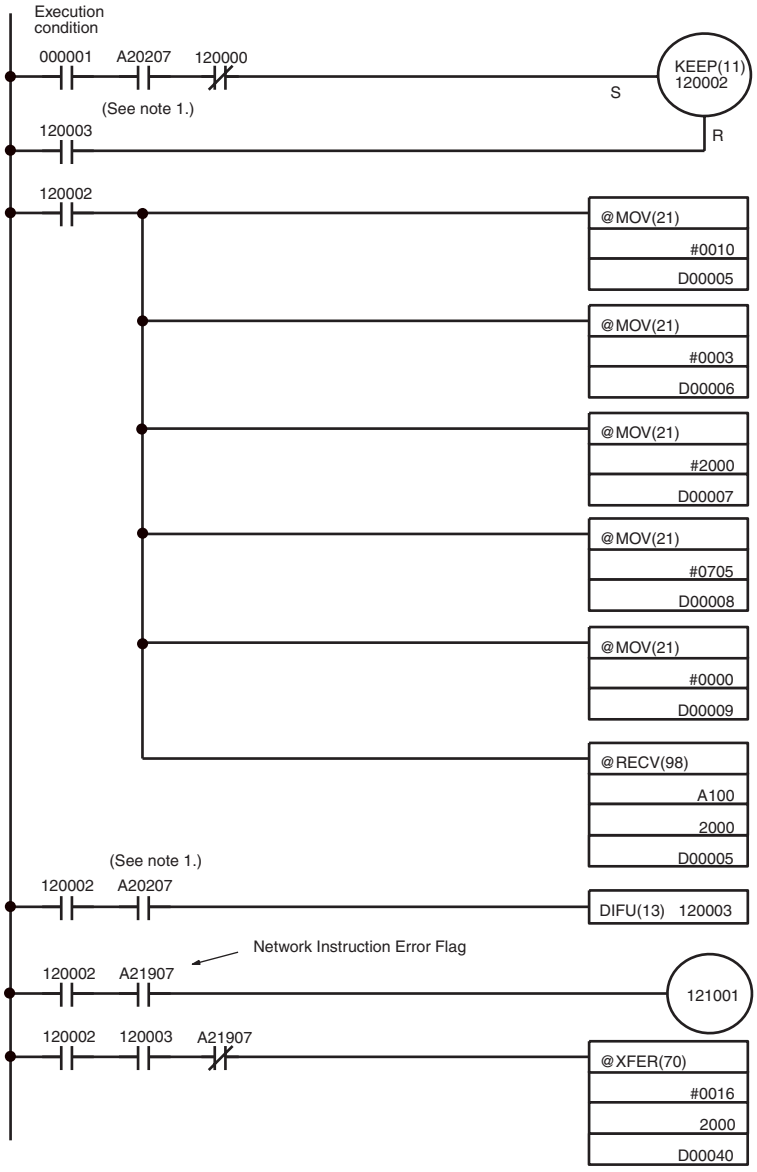
Transfers the 10 words beginning at DM 00010 of the source node to the words beginning with DM 00020 at network address 2, node address 4, and Unit address 0 (PLC).

Creates reset input.

Turns ON to indicate transmission error.

(Continued on the next page)

(Continued from the previous page)



The reception program will run when CIO 00001 turns ON, provided that the Network Instruction Enabled Flag is ON and the SEND instruction has not been executed.

CIO 120002 remains ON while the RECV instruction is being executed, and it turns OFF when instruction execution has been completed.

Control Data Preparation

Word	Content	Meaning
D00005	0 0 10	16 send words
D00006	0 0 0 3	Destination network address= 3
D00007	2 0 0 0	Destination node address = 32 Destination Unit address = 0
D00008	0 7 0 5	Response required Port No. 7 used No. of resends = 5
D00009	0 0 0 0	Response monitoring time = Default

Transfers the 16 words beginning at A100 of net work address 3, node address 32, and Unit address 0 (PLC) to 2000.

Creates reset input.

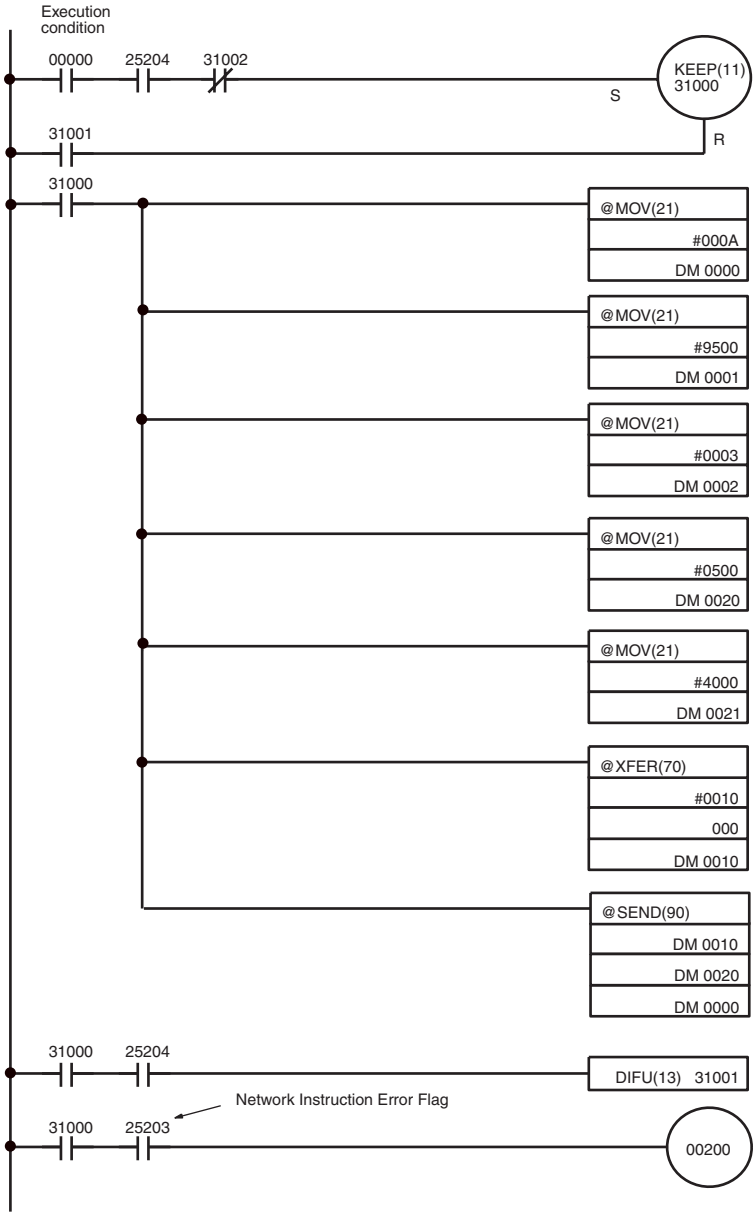
Turns ON to indicate reception error.

Transmitted data (16 words from 2000) moved into words beginning at D00040 for storage.

Note

1. With CS/CJ-series PLCs, the Network Instruction Enabled Flag in A20200 to A20207 corresponding to communications ports will be OFF even when PMCR (PROTOCOL MACRO) is being executed.
2. When using the sample program, make sure that the bits and words used in the sample program are not the same as those in the user program or by Special I/O Units.

C200HX/HG/HE PLCs



The transmission program will run when IR 00000 turns ON, provided that the Network Instruction Enabled Flag is ON and the RECV instruction has not been executed.

IR 31000 remains ON while the SEND instruction is being executed, and it turns OFF when instruction execution has been completed.

Control Data Preparation

DM 0000	00	0A	10 send words*
DM 0001	95	00	Operating level 1**
DM 0002	00	03	Node 3, Unit 0 (a PLC)

* No destination network address specified
** Response required, 5 retries, direct designation, monitoring time: default

Beginning Word for Indirect Receiving by Destination Node

DM 0020	05	00	Beginning word for receiving (by destination node) = DM4000 (05: DM designation)
DM 0021	40	00	

Transfers the 10 words beginning at IR 000 to the 10 words beginning at DM 0010.

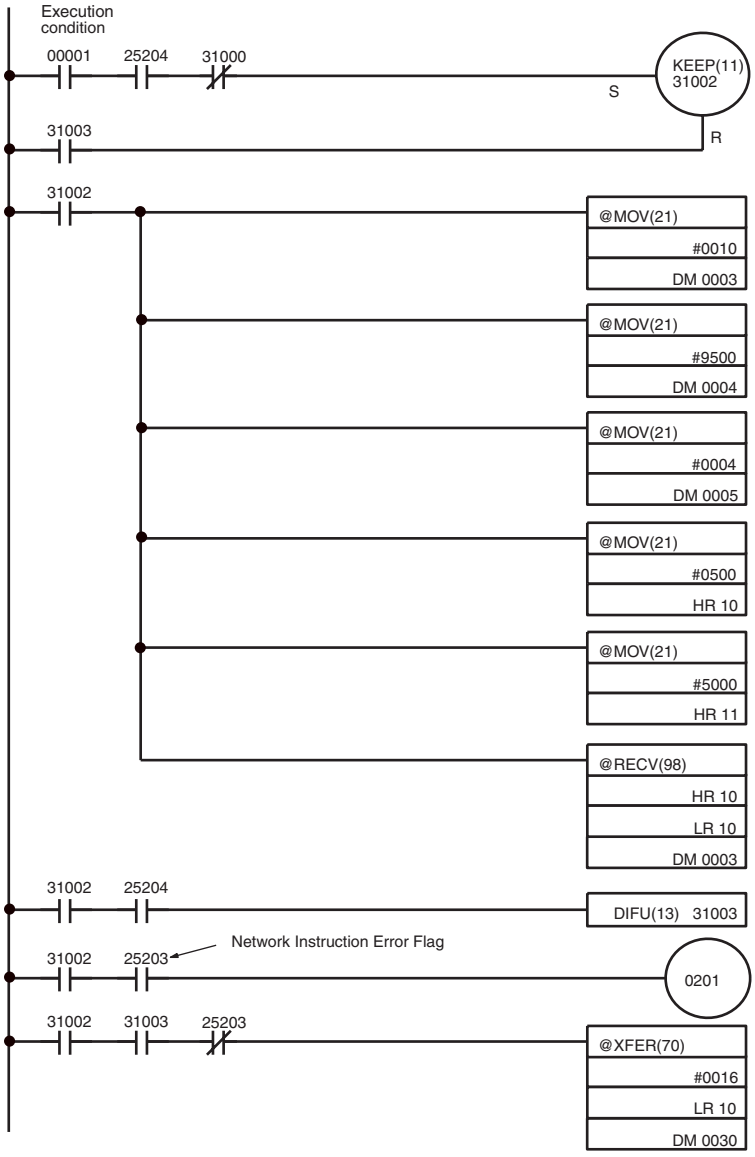
Transfers the 10 words beginning at DM 0010 of the source node to the words beginning with DM 4000 (specified by DM 0020 and DM0021) at node address 3.

Creates reset input.

Turns ON to indicate transmission error.

(Continued on the next page)

(Continued from the previous page)



The reception program will run when IR 000001 turns ON, provided that the Network Instruction Enabled Flag is ON and the SEND instruction has not been executed.

IR 31002 remains ON while the RECV instruction is being executed, and it turns OFF when instruction execution has been completed.

Control Data Preparation

DM 0003	00	10	16 receive words*
DM 0004	95	00	Operating level 1**
DM 0005	00	04	Node 4, Unit 0 (a PLC)

* No destination network address specified
** Response required, 5 retries, direct designation, monitoring time: default

Beginning Word for Indirect Sending by Destination Node

HR 10	05	00	Beginning word for sending (by destination node) = DM5000 (05: DM designation)
HR 11	50	00	

Data for 16 words from DM 5000 (HR10, HR11) of the node address 4 is received in LR 10 and after.

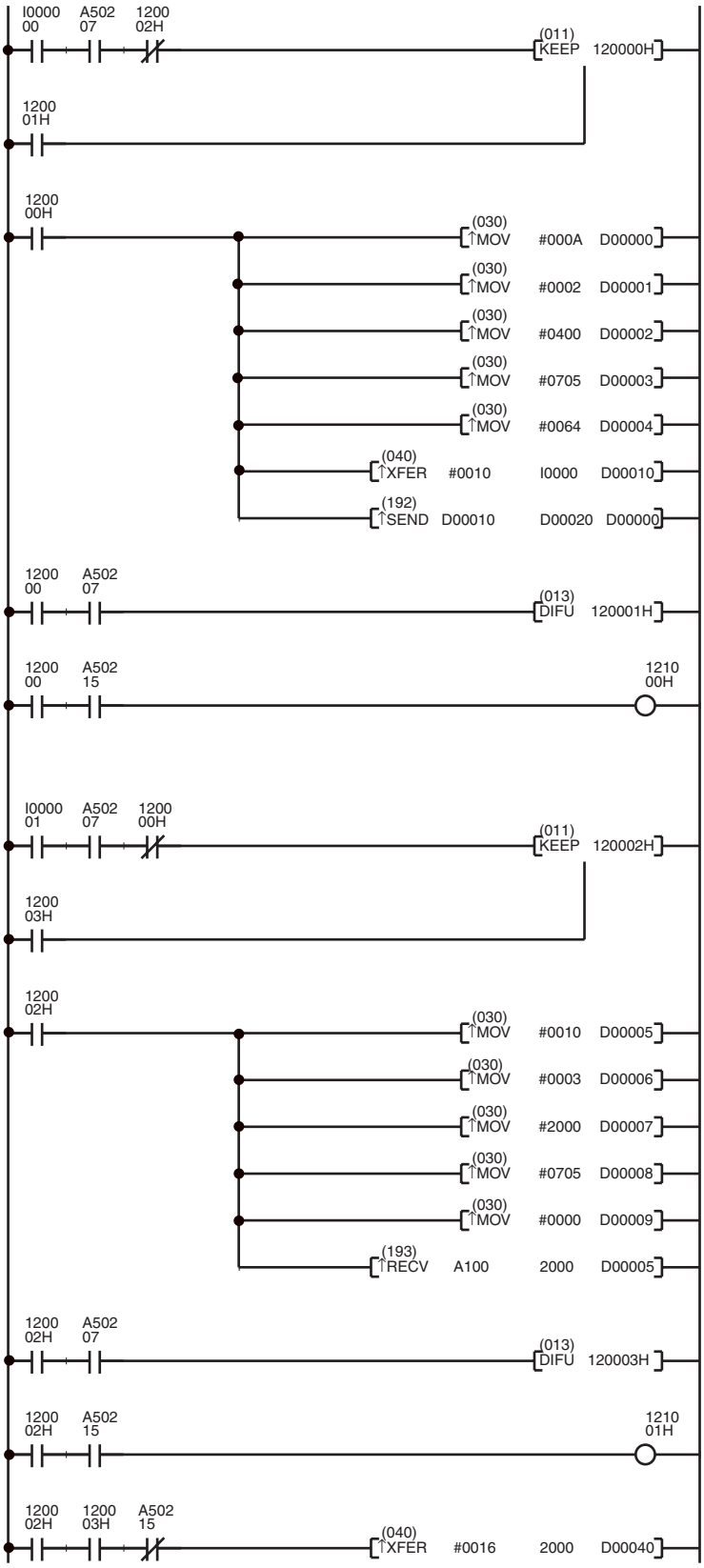
Creates reset input.

Turns ON to indicate reception error.

Transmitted data (16 words from LR 10) moved into words beginning at DM 0030 for storage.

Note When using the sample program, make sure that the bits and words used in the sample program are not the same as those in the user program or by Special I/O Units.

CVM1 and CV-series PLCs



The transmission program will run when I000000 is ON, provided that the Network Instruction Enabled Flag for port 7 is ON and the RECV instruction has not been executed.

CIO 120000H remains ON while the SEND instruction is being executed, and it turns OFF when the execution of the instruction has been completed.

Word	Content	Meaning
D00000	00 0A	No. of send words: 10H
D00001	00 02	Destination network address: 2
D00002	04 00	Destination node address: 4 Destination unit address: 0
D00003	07 05	Response required Communications port no.: 7 Number of retries: 5
D00004	00 64	Response monitor time: 10 s

The 10-word data starting from I0000 is stored in D00010 and following words.

Transfers 10 words of data from the source node (D00010) to the PLC (from D00020 onwards) at network address 2, node no. 4, unit address 0.

Creates reset input.

Transmission error display

The reception program will run when I000001 is ON, provided that the Network Instruction Enabled Flag for port 7 is ON and the SEND instruction has not been executed.

CIO 120002H remains ON while the RECV instruction is being executed, and it turns OFF when the execution of the instruction has been completed.

Word	Content	Meaning
D00005	00 10	Number of receive words: 16H
D00006	00 03	Destination network address: 3
D00007	20 00	Destination node address: 32 Destination Unit address: 0
D00008	07 05	Response required Communications port no.: 7 Number of retries: 5
D00009	00 00	Response monitor time: Default

Transfers 16 words of data (from A100 onwards) from the PLC at network address 3, node no. 32, unit address 0, to words 2000 onwards.

Creates reset input.

Reception error display
Reception data processing
When the data is received without an error, the 16-word data received at CIO 2000 and following words is stored in D00040 and following words on the same PLC.

Note When using the sample program, make sure that the bits and words used in the sample program are not the same as those in the user program or Special I/O Units.

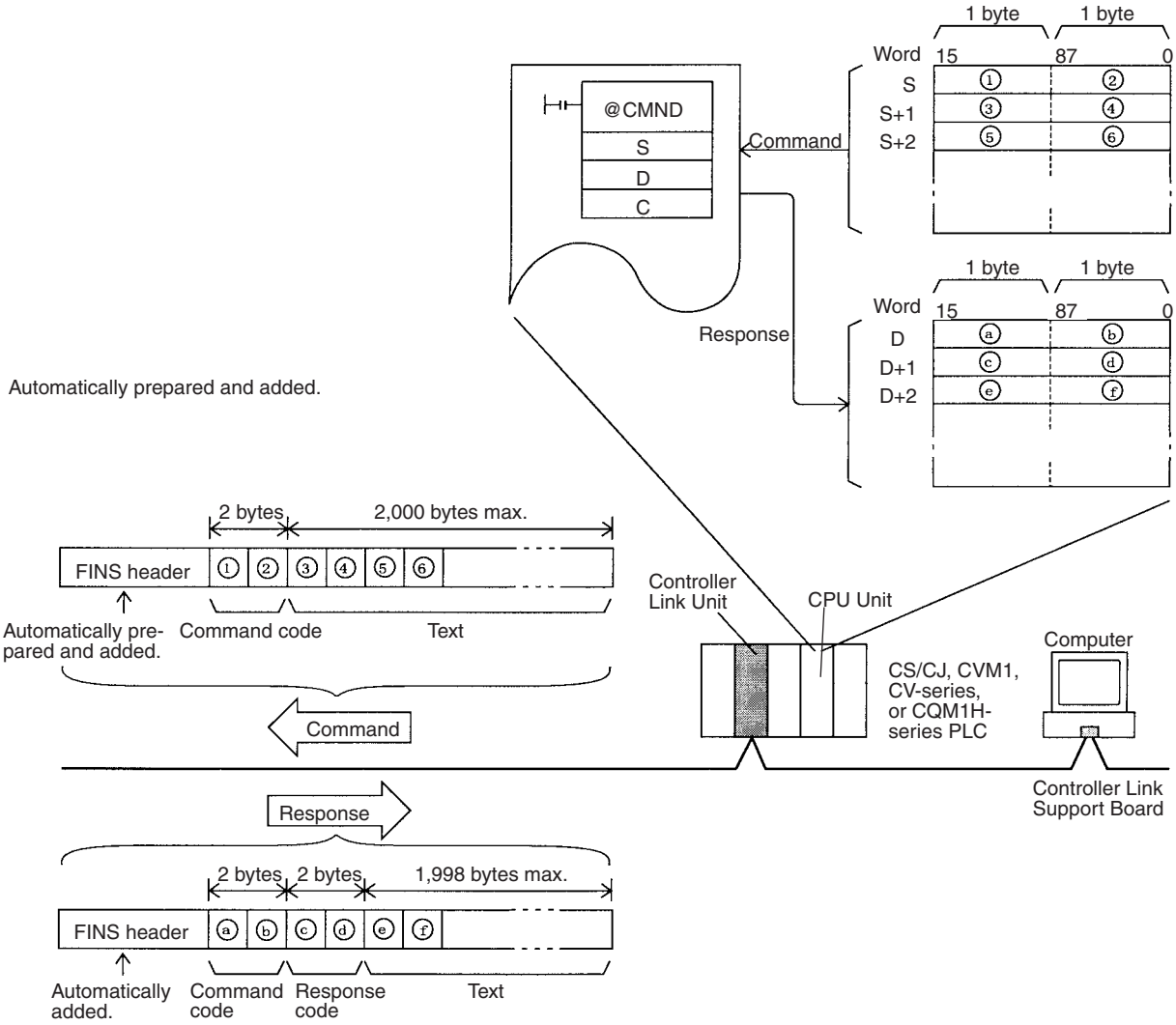
6-4 FINS Commands and Responses

6-4-1 FINS Communications Service

The FINS communications service is a communications protocol developed by OMRON for FA control devices. It can be used for reading from and writing to PLC memory, or for controlling various operations, without having to create a user's program at the PLC. The FINS communications service has its own independent address system which does not rely on the actual network address system, so it can carry out communications in the same way regardless of whether the PLC at the local node is on a Controller Link Network or some other FA network (e.g., SYSMAC NET or SYSMAC LINK). For details on FINS commands, refer to the *FINS Commands Reference Manual* (W227).

6-4-2 Sending and Receiving FINS Commands and Responses

FINS commands can be sent by using the CMND instruction with a CVM1, CV-series, CS/CJ-series, or CQM1H-series PLC. The following diagram shows the data format for sending FINS commands and receiving responses. The data that is sent and received is all hexadecimal unless otherwise noted.



Command Codes

The command code consists of two bytes of data, and indicates the contents of the command. A FINS command must begin with a 2-byte command code, and any parameters must follow the command code.

Response Codes

The response code consists of two bytes of data, and indicates the result of the command execution. The first byte is the MRES (main response code), which indicates the broad classification of the execution result. The second byte is the SRES (sub-response code), which gives the detailed classification.

The following table shows the main response codes and the execution results. For a more detailed listing of response codes, including the sub-response codes, refer to *6-7 Response Codes*.

MRES	Execution result	MRES	Execution result
00	Normal completion	21	Write not possible
01	Local node error	22	Not executable in current mode
02	Destination node error	23	No unit
03	Communications controller error	24	Start/stop not possible
04	Not executable (service not supported)	25	Unit error
05	Routing error	26	Command error
10	Command format error	30	Access error
11	Parameter error	40	Service interrupted by abort
20	Read not possible	---	---

6-4-3 Applicable Units for FINS Commands

The parameters used with FINS commands and responses depend on the Unit to which the command is being sent. The FINS commands and responses addressed to Controller Link Units, to C200HX/HG/HE PLCs, and to CQM1H-series PLCs are explained in this manual. For explanations of FINS commands for other Units, refer to the *FINS Commands Reference Manual* (W227).

C200HX/HG/HE and CQM1H-series PLCs do not directly support FINS commands, but the Controller Link Unit automatically converts the command format so that C200HX/HG/HE and CQM1H-series PLCs can process them. The Unit also converts the response format so that the response can be returned to the source of the command.

When FINS commands are sent via a Host Link System for CVM1, CV-series, or CS/CJ-series PLCs, be sure to use the command format for relaying between networks.

6-5 Commands and Responses for Controller Link Units

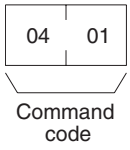
6-5-1 Command Codes

Command code		Data link operation mode		Name	Page
		Active	Inactive		
04	01	Not valid	Valid	DATA LINK START	204
	02	Valid	Not valid	DATA LINK STOP	204
05	01	Valid	Valid	CONTROLLER DATA READ	205
06	01	Valid	Valid	CONTROLLER STATUS READ	206
	02	Valid	Valid	NETWORK STATUS READ	208
	03	Valid	Valid	DATA LINK STATUS READ	210
08	01	Valid	Valid	ECHOBACK TEST	212
	02	Valid	Valid	BROADCAST TEST RESULTS READ	212
	03	Valid	Valid	BROADCAST TEST DATA SEND	213
21	02	Valid	Valid	ERROR LOG READ	213
	03	Valid	Valid	ERROR LOG CLEAR	214

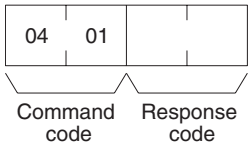
6-5-2 DATA LINK START

Starts the Controller Link Network data links.

Command Block



Response Block



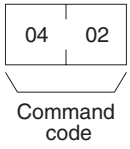
The DATA LINK START command can be received for either automatically or manually set data links. An error will occur if manually set data links are specified and yet data link tables do not exist.

The node that receives this command and starts the data links will become the data link startup node. For automatically set data links, the data links will be executed according to the settings at the startup node.

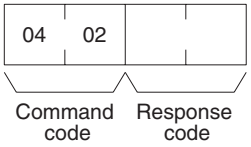
6-5-3 DATA LINK STOP

Stops the Controller Link Network data links.

Command Block



Response Block



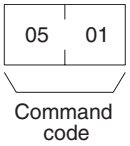
The DATA LINK STOP command can be received only while the data links are active. An error will occur if this command is sent at any other time.

This command can be received by any node that is participating in the data link.

6-5-4 CONTROLLER DATA READ

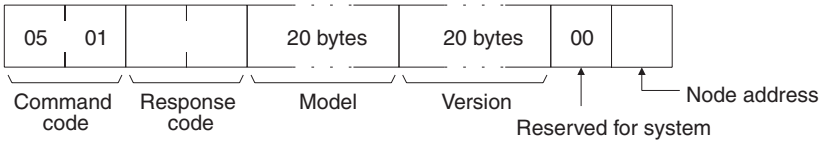
Reads the Controller Link Unit's model, version, and node address data.

Command Block

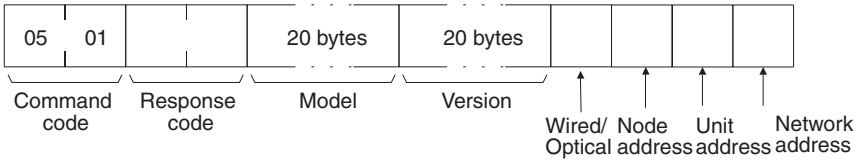


Response Block

For C200HX/HG/HE, CVM1, and CV-series PLCs



For CS/CJ-series and CQM1H-series PLCs



Parameters

Model, Version (response): The Controller Link Unit's model and version are returned as shown below, each 20 characters in ASCII code. If fewer than 20 bytes of data are used, 20 (Hex) (i.e., spaces) will be returned for the remaining bytes. In the version numbers shown below, the spaces are represented by boxes (□).

Model

Example for CJ-series PLC Units:CJ1W-CLK21-V1□□□□□□□□

Version

PLCs other than CJ-series PLCs: V1.00□V1.00□□□□□□□□□

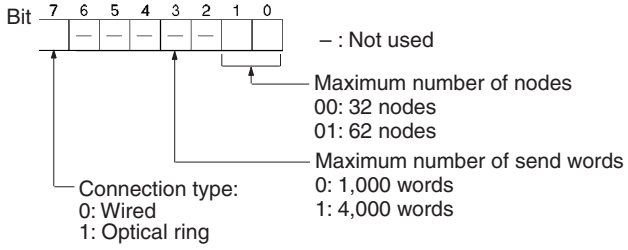
The first version number represents the Communications Controller version number, and the second represents the Unit version number.

CJ-series PLCs: V2.00□V2.00□V2.00□□□

The first version number represents the data link layer Communications Controller version number, the second represents the network layer Communications Controller version number, and the third represents the Unit version number.

Wired/Optical (response)

The connection method for the Controller Link Unit (wired or optical ring). The configuration is as follows:



Node Address (response): The Controller Link Unit's node address is returned between 01 and 3E Hex (1 to 62).

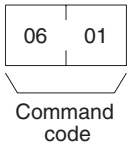
Unit Address (response): The Unit address set for the Controller Link Unit (10 Hex + Unit number), is returned in hexadecimal. Even when there is a Unit number setting error, the Unit address is returned.

Network Address: The Controller Link Unit's network address, as set in the routing table, is returned in hexadecimal. When the routing table has not been set, the address becomes 00 Hex.

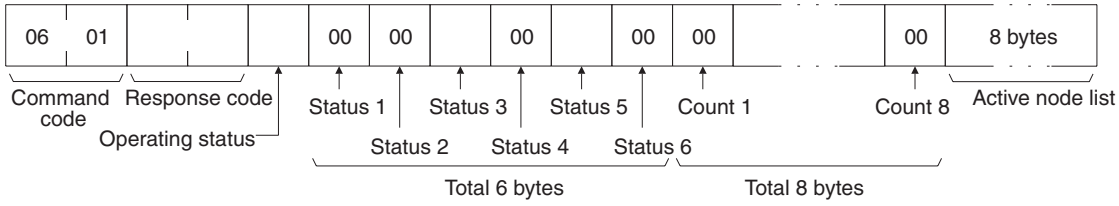
6-5-5 CONTROLLER STATUS READ

Reads the Controller Link Unit's controller status.

Command Block



Response Block



Parameters

Operating status (response): The operating status of the data links as follows:

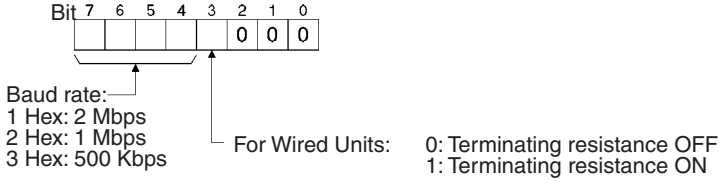
00 (Hex): Data links inactive.

01 (Hex): Data links active.

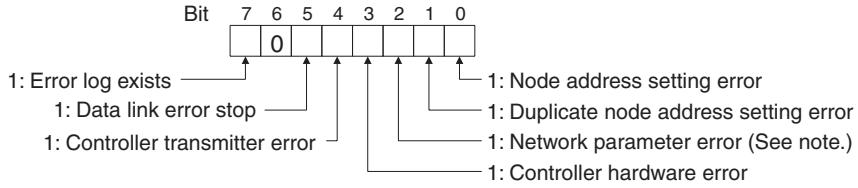
02 (Hex): Local data links not active. (The data links are active in the network, but the local node is not participating.)

Status 1, Status 4, Status 6 (response): Not used by the Controller Link Unit. Always set to 00 (Hex).

Status 2 (response): For C200HX/HG/HE, CVM1, and CV-series Controller Link Units, always set to 00 (Hex). For CS/CJ-series and CQM1H-series PLCs, the Unit's setting status is returning in the following configuration.

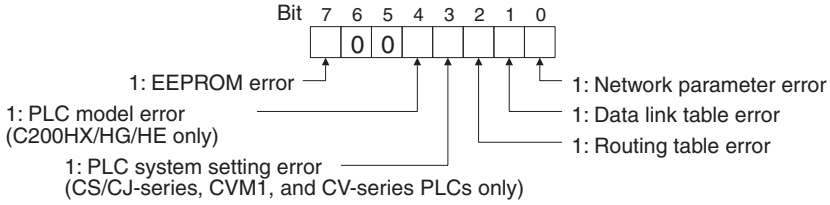


Status 3 (response): Error information. The configuration is as follows:



Note With CS/CJ-series Optical Controller Link Units, this bit will be 1, even if the Unit is mistakenly connected to an Optical SYSMAC LINK Network.

Status 5 (response): Error information related to the Unit and the PLC. The configuration is as follows:



A network parameter error, data link table error, or routing table error occurs if an error is discovered when the parameters and tables are checked at power up.

A PLC system setting errors occurs if the Controller Link Unit is not properly recognized by a CS/CJ-series, CVM1, or CV-series PLC.

A PLC model error occurs if a C200HX/HG/HE Controller Link Unit is mounted to another type of PLC.

Count 1 to Count 8 (response): The total number of times for each of the items listed below is returned as 1 byte of hexadecimal data.

Count 1: Number of CRC errors
Count 2: Number of token re-sends
Count 3: Number of token returns
Count 4: Number of token timeouts
Count 5: Number of polling timeouts
Count 6: Number of controller changes
Count 7: Number of active node changes
Count 8: Reserved for system use.

For the C200HW-CLK21 and CVM1-CLK21, *Count 7: Number of active node changes* is disabled.

For the CS1W-CLK23 and CJ1W-CLK23, *Count 5: Number of polling timeouts* is disabled.

Network participation status (response): The following diagram shows the bits corresponding to node addresses in the Controller Link Network. When a bit is returned as "1," it means that the corresponding node is participating in the network.

Bit	7	6	5	4	3	2	1	0
Byte 1	8	7	6	5	4	3	2	1
Byte 2	16	15	14	13	12	11	10	9
Byte 3	24	23	22	21	20	19	18	17
Byte 4	32	31	30	29	28	27	26	25
Byte 5	40	39	38	37	36	35	34	33
Byte 6	48	47	46	45	44	43	42	41
Byte 7	56	55	54	53	52	51	50	49
Byte 8	–	–	62	61	60	59	58	57

Reserved for system use.

The numbers in the boxes indicate the node addresses. The bit status of a particular node address shows whether or not that node participates in the network.

0: Not part of network
1: Part of network

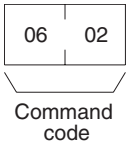
(All boxes marked by "–" are reserved for system use and fixed at "0.")

When CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units are used and the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches is ON, the network participation status of nodes 33 to 62 is returned in bytes 5 through 8. In other models, bytes 5 through 8 are reserved for system use.

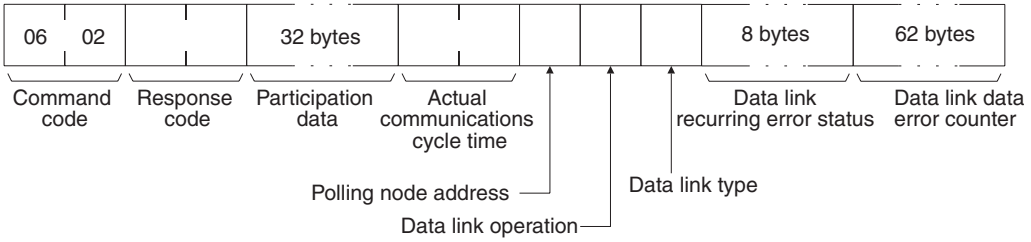
6-5-6 NETWORK STATUS READ

Reads the operating status of the entire Controller Link Network.

Command Block

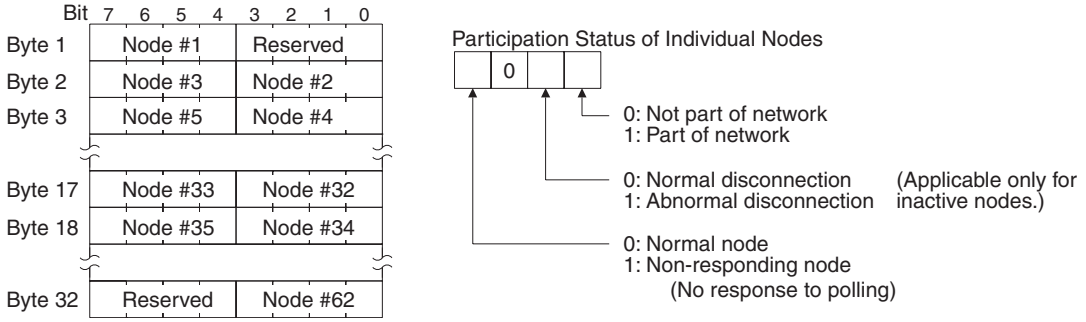


Response Block



Parameters

Participation data (response): This parameter indicates the active status of individual nodes with respect to the network (i.e. their participation in the network). As shown in the following diagram, that status is expressed in four bits corresponding to the node address.

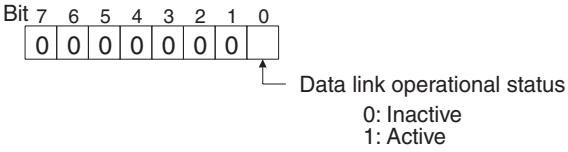


When CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units are used and the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches is ON, the network participation status of nodes 33 to 62 is returned in the upper four bits of bytes 17 through to the lower four bits of byte 32. In other models, the areas corresponding to nodes 33 to 62 are reserved for system use.

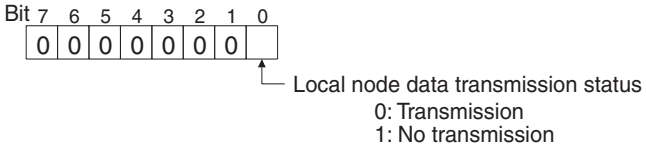
Actual communications cycle time (response): The actual communications cycle time is returned in units of 100 μs in hexadecimal.

Polling node address: The current polling node address is returned in hexadecimal.

Data link operation (response): Indicates the status of data link operation in the network.



Data link type (response): Indicates the data transmission status of the local node's data links. It is configured as shown in the following diagram. This parameter is valid only during data link operation. While data link operation is inactive, the value from the previous operation is retained.



Data link recurring error status (response): Indicates whether an error continues to occur at a node when data link data is received. If an error continues to occur at the same node when the data is received, the bit corresponding to that node turns to "1" (i.e., turns ON). The configuration is shown in the following diagram.

Bit	7	6	5	4	3	2	1	0
Byte 1	8	7	6	5	4	3	2	1
Byte 2	16	15	14	13	12	11	10	9
Byte 3	24	23	22	21	20	19	18	17
Byte 4	32	31	30	29	28	27	26	25
Byte 5	40	39	38	37	36	35	34	33
Byte 6	48	47	46	45	44	43	42	41
Byte 7	56	55	54	53	52	51	50	49
Byte 8	–	–	62	61	60	59	58	57

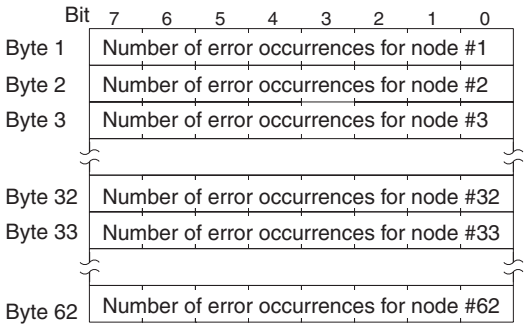
Reserved for system use.

The numbers in the boxes indicate the node addresses. The bit status of a particular node address shows whether or not there is a recurring data link error at that node.

0: No recurring error
1: Recurring error

When CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units are used and the Wired Network 62 Node Enable Bit of the DM Parameter Area software switch is ON, the continuous data link error status of nodes 33 to 62 is returned in bytes 5 through 8. In other models, bytes 5 through 8 are reserved for system use.

Data link data error counter (response): The total number of data link data reception errors occurring at all nodes is returned as a total count from the time the power was turned on. It is expressed, in hexadecimal, as one byte per node. The count can range from 0 to 255 (i.e., 0 to FF in hexadecimal).

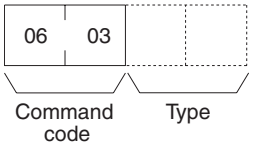


When CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units are used and the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches is ON, the data link error counter of nodes 33 to 62 is returned in bytes 33 through 62. In other models, the areas corresponding to nodes 33 to 62 are reserved for system use.

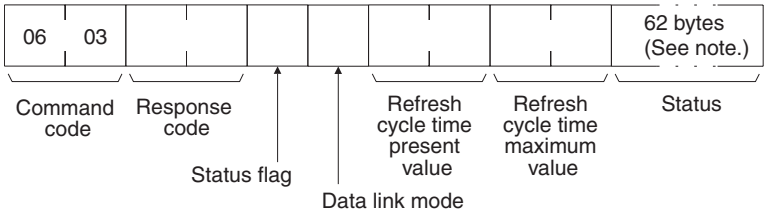
6-5-7 DATA LINK STATUS READ

Reads the data link operational status.

Command Block



Response Block



Note If the type is set to 0000 Hex (or is omitted), only 32 bytes will be returned.

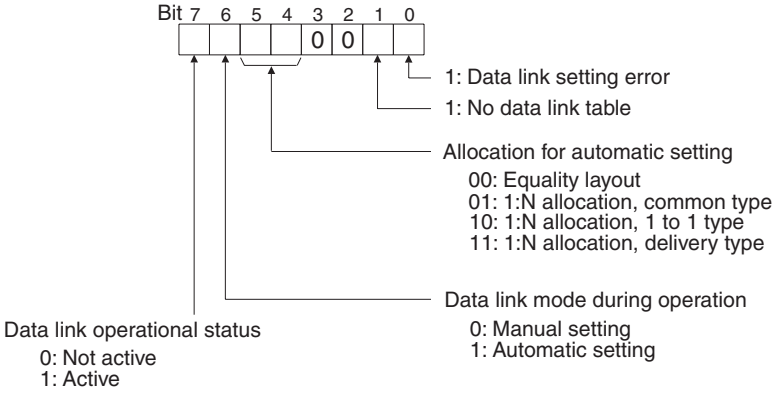
Parameters

Type (Command): The number of nodes reading the data link status is specified as a 2-byte (4-digit) hexadecimal number as follows:

0000 Hex: 32 nodes
0001 Hex: 62 nodes
Default value: 32 nodes

Reading of the data link status for 62 nodes is enabled only when the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches of CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Units is ON.

Status flag (response): The overall data link status is returned in one byte of data, as shown in the following diagram.

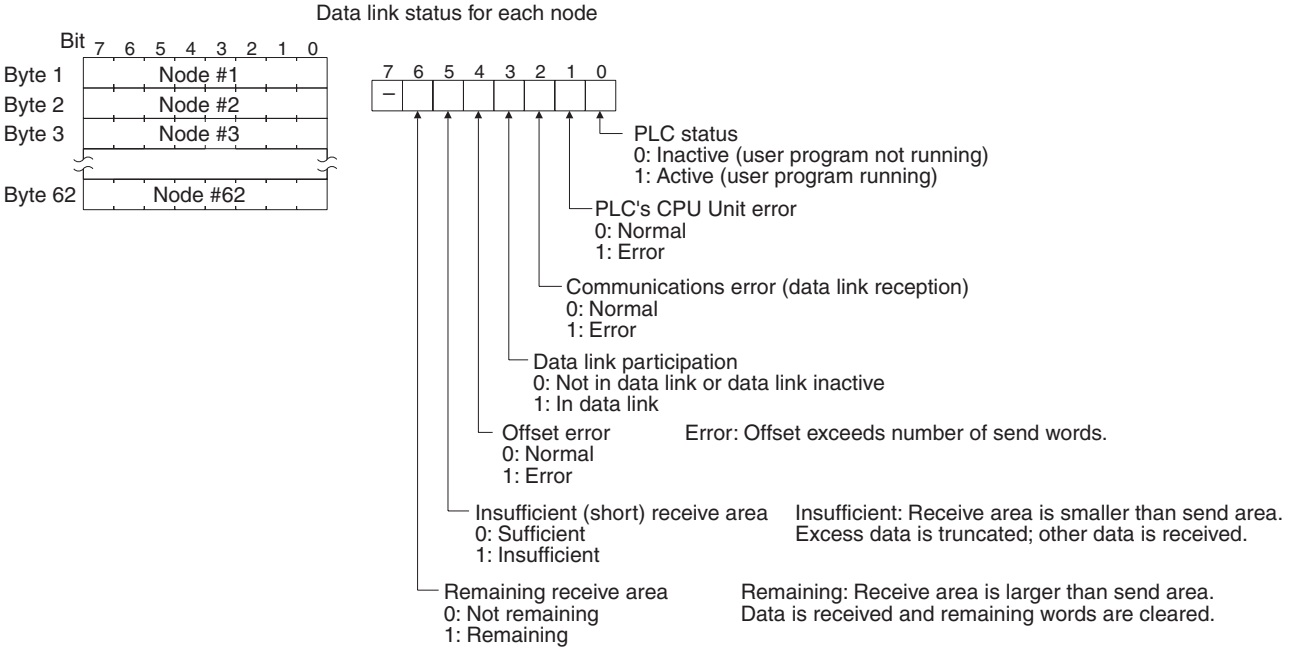


Data link mode (response): The data link mode during operation is returned in one byte of data, as follows:

01 (Hex): Automatic (Equality Layout)
81 (Hex): Automatic (1:N allocation)
03 (Hex): Manual

Refresh cycle time present value, refresh cycle time maximum value (response): The present value and the maximum value of the cycle time for refreshing the data link area are both returned in units of 1 ms, in hexadecimal, within a range of 0000 to 00FF (decimal: 0 to 255).

Status (response): The data link status of each mode is returned as shown in the following diagram. It is the same as the data link status in the PLC. (Refer to page 158.)



Note

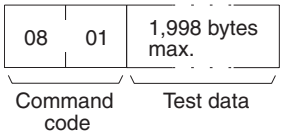
1. If the type is set to 0000 Hex (or is omitted), only the 32 bytes for nodes 1 to 32 will be returned.
2. The data link status is not refreshed while the data links are inactive.
3. Nodes which are not active in the network or participating in the data links will generate communications errors.

4. Any node which is not active in the network retains the status that existed immediately prior to the generation of the communications error.
5. Only the PLC operation status and PLC error status will be refreshed for nodes that are not participating in a data link that is active in the network.

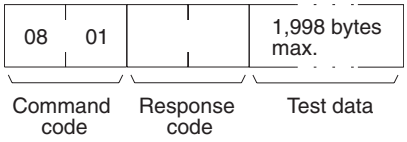
6-5-8 ECHOBACK TEST

Executes an echoback communications test between specified nodes.

Command Block



Response Block



Parameters

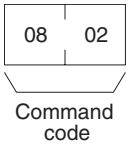
Test data (command, response): For the command, up to 1,998 bytes of data can be specified to be sent to a specified node. For the response, the test data that was sent by the command is returned unchanged.

An error is generated if the data returned by the response is different from the data that was sent by the command.

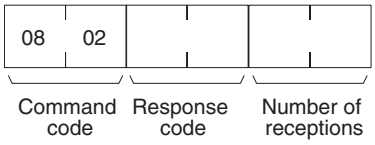
6-5-9 BROADCAST TEST RESULTS READ

Reads for each node the results (number of receptions) of a BROADCAST TEST DATA SEND command that has been sent to all nodes in a specified network. (For details on the BROADCAST TEST RESULTS SEND command, refer to *6-5-10 BROADCAST TEST DATA SEND*.

Command Block



Response Block



Parameters

Number of receptions (response): The number of times that broadcast test data has been received at the command destination node from the time that the last BROADCAST TEST RESULTS READ command was sent until this one was sent is returned.

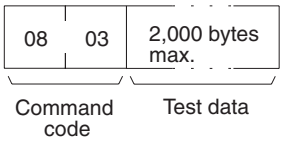
An error will be generated if that number of receptions differs from the number of times that the BROADCAST TEST DATA SEND command was issued during that same period.

The *number of receptions* value being retained at the destination node is cleared when the BROADCAST TEST RESULTS READ command is executed.

6-5-10 BROADCAST TEST DATA SEND

Broadcasts test data to all nodes in a specified network.

Command Block



There is no response to this command.

The control data must be set as follows when this command is issued:

Destination node address: FF (Hex) (for broadcasting the data)

Destination unit address: FE (Hex) (for the Controller Link Unit)

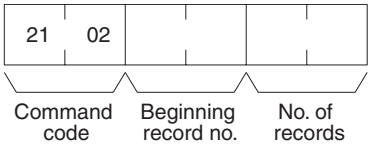
Response required/not required: 1 (response not required)

The transmission and reception status is checked by comparing the number of times this command is issued with the *number of receptions* parameter of the BROADCAST TEST RESULTS READ command. (For details, refer to *6-5-9 BROADCAST TEST RESULTS READ*.)

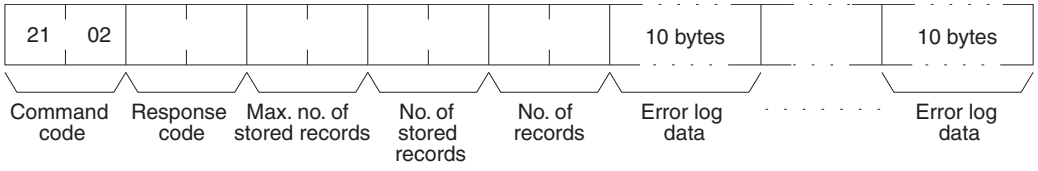
6-5-11 ERROR LOG READ

Reads the PLC's error log.

Command Block



Response Block



Parameters

Beginning record no. (command): Specifies the first record to be read, in two bytes (four digits) in hexadecimal. (The first record number is 0000 in hexadecimal. Designate the record number within the range given in the following table).

No. of records (command and response): Specifies the number of records to be read, within the range given in the following table. The response gives the number of records actually read.

Max. no. of stored records (response): Specifies the maximum number of records that can be recorded.

No. of stored records (response): The number of records that have been recorded by the time the command is executed.

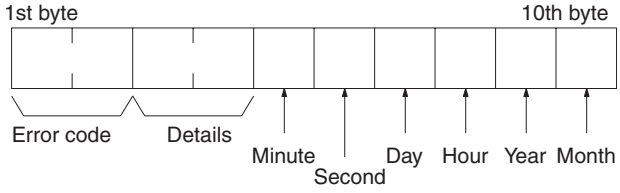
Parameter / Model		CS1W-CLK23 CJ1W-CLK23	CS1W-CLK21(-V1) CJ1W-CLK21(-V1)
Command	Beginning record No.	0000 to 003F hex (Decimal: 0 to 63)	0000 to 0026 hex (Decimal: 0 to 38)
	No. of records	0001 to 0040 hex (Decimal: 1 to 64)	0001 to 0027 hex (Decimal: 1 to 39)

Parameter	Model	CS1W-CLK23 CJ1W-CLK23	CS1W-CLK21(-V1) CJ1W-CLK21(-V1)
Response	Max. no. of stored records	0040 hex, fixed (Decimal: 64) 64 records max.	0027 hex, fixed (Decimal: 39) 39 records max.
	No. of stored records	0001 to 0040 hex (Decimal: 1 to 64)	0001 to 0027 hex (Decimal: 1 to 39)
	No. of records	0001 to 0040 hex (Decimal: 1 to 64)	0001 to 0027 hex (Decimal: 1 to 39)

Error log data (response): The specified error log records are returned in sequence starting from the beginning record number. The total number of bytes required is calculated as follows:

No. of records x 10 bytes

The configuration of each error record is as follows:



Error code, details: These parameters show the contents of errors. For details, refer to *9-3-2 Error Codes.*

Date and time: These parameters show the seconds, minutes, hour (0 to 23), date, month, and year (the rightmost two digits) in BCD specifying the time that the error occurred.

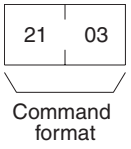
Note

1. If the PLC does not have the specified number of records, all the records that have been stored in the PLC up to the point that the command is executed will be returned.
2. If there is no error log registered, a response code of 1103 (Hex) will be returned.

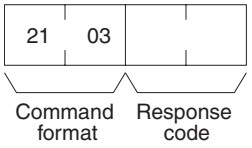
6-5-12 ERROR LOG CLEAR

Clears all error log records and sets the error log pointer to 0.

Command Block



Response Block



6-6 Commands and Responses for C200HX/HG/HE and CQM1H-series PLCs

6-6-1 Command Codes

Command code		PLC mode			Name	Page
		RUN	MONITOR	PROGRAM		
01	01	Valid	Valid	Valid	MEMORY AREA READ	217
	02	Valid	Valid	Valid	MEMORY AREA WRITE	218
	04	Valid	Valid	Valid	MULTIPLE MEMORY AREA READ	219
03	06	Valid	Valid	Valid	PROGRAM AREA READ	219
	07	Not valid	Not valid	Valid	PROGRAM AREA WRITE	220
04	01	Valid	Valid	Valid	RUN	221
	02	Valid	Valid	Valid	STOP	221
05	01	Valid	Valid	Valid	CONTROLLER DATA READ	222
06	01	Valid	Valid	Valid	CONTROLLER STATUS READ	223
07	01	Valid	Valid	Valid	CLOCK READ	224
	02	Not valid	Valid	Valid	CLOCK WRITE	224
21	01	Valid	Valid	Valid	ERROR CLEAR	225
23	01	Not valid	Valid	Valid	FORCED SET/RESET	225
	02	Not valid	Valid	Valid	FORCED SET/RESET CANCEL	226
	0A	Valid	Valid	Valid	MULTIPLE FORCED STATUS READ	227

6-6-2 Memory Area Designations

The following table gives the addresses to use when reading or writing PLC data. The *Data area address* column gives the normal addresses used in the PLC program. The *Address used in communications* column are the addresses used in CV-mode commands and responses. These addresses are combined with the memory area codes to specify PLC memory locations. These addresses are not the same as the actual memory addresses of the data.

The *No. of bytes* column specifies the number of bytes to read or write data for that area. The number of bytes varies for the same area depending on the memory area code. Actual data area sizes vary with the PLC being used. Refer to your PLC's operation manual for specific limits.

Memory area	Data	Data area address	Address used in communications		Memory area code	No. of bytes
			1st and 2nd bytes	3rd byte		
IR Area 1, 2 SR Area 1, 2	Bit status	00000 to 51115	0000 to 01FF	00 to 0F	00	1
	Word contents	000 to 511		00 to 00	80	2
LR Area	Bit status	LR 0000 to LR 6315	03E8 to 0427	00 to 0F	00	1
	Word contents	LR 00 to LR 63		00 to 00	80	2
HR Area	Bit status	HR 0000 to HR 9915	0428 to 048B	00 to 0F	00	1
	Word contents	HR 00 to HR 99		00 to 00	80	2
AR Area	Bit status	AR 0000 to AR 2715	048C to 04A7	00 to 0F	00	1
	Word contents	AR 000 to AR 27		00 to 00	80	2
Timer/ Counter Area	Status	T/C 000 to T/C 511	0000 to 01FF	00 to 00	01	1
	PV				81	2

Memory area	Data	Data area address	Address used in communications		Memory area code	No. of bytes
			1st and 2nd bytes	3rd byte		
DM Area	Word contents	DM 0000 to DM 6655	0000 to 19FF	00 to 00	82	2
Expansion DM	Word contents	EM 0000 to EM 6143	0000 to 17FF	00 to 00	90 to 97, 98, and A8 to AF (See note.)	2

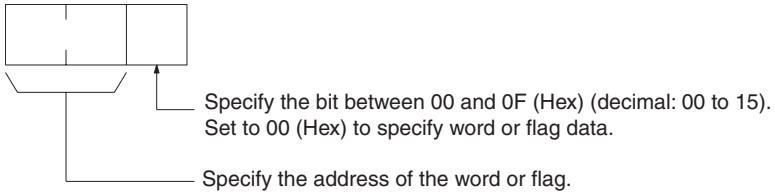
Note The meanings of the memory area codes for the Expansion DM area are shown in the following table. Only the current bank (98) or bank 0 (90) can be specified for CQM1H-series PLCs.

Memory area code	Meaning
90 to 97	Banks 0 to 7
98	Current bank
A8 to AF	Banks 8 to 15

Memory area size varies depending on the PLC model. For details, refer to the operation manual of the specific PLC that is being used.

Word/Bit Addresses

Each word/bit address specifies a specific bit or word.



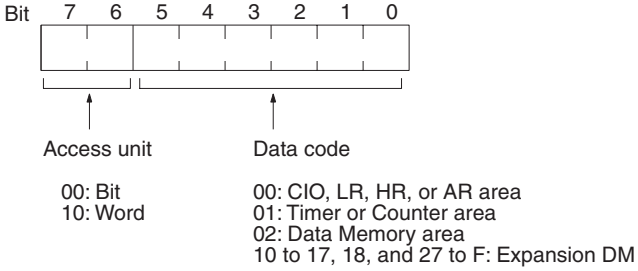
To obtain the corresponding address of the desired word or bit, add the data area word address (hexadecimal) to the first address of the range of addresses used for that data area in communications. For example, the address for word AR 13 is computed as follows:

First address for AR area; 048C (Hex)
048C + 0D (13 in BCD); 0499 (Hex)

The word address for AR 13 would be 04990C (Hex) (the memory area code would specify this as a word) and the address of bit 12 (C Hex) in AR 13 would be 04990C (Hex).

Memory Area Code

The unit of access (bit or word) and the data code are specified as shown in the following illustration.



Number of Bytes/Element

The number of bytes of read or write data per element is as follows depending on the access unit.

1 Byte/element for bit access

2 Bytes/element for word access

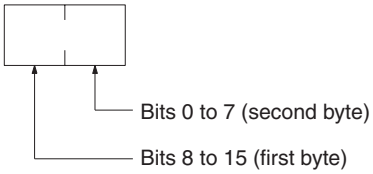
Data Configuration

The configuration of the various types of data that can be read or written is shown below. The number of bytes required for each type of data is also given.

Flag or Bit Status (One Byte)

00: Bit is OFF (0)
01: Bit is ON (1)

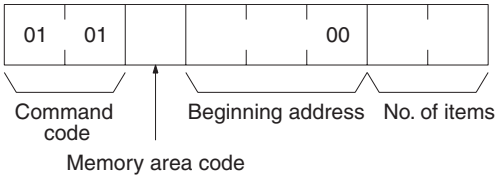
Word Contents or PV (Two Bytes)



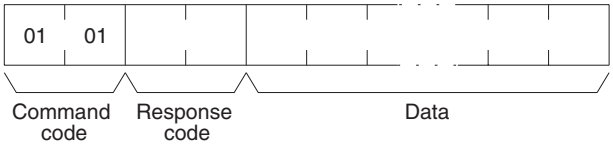
6-6-3 MEMORY AREA READ

Reads the contents of the specified number of consecutive memory area words starting from the specified word. All words must be in the same memory area. (Here, all memory areas with the same memory area code are considered as one area).

Command Block



Response Block



Parameters

Memory area code (command): The data area to read.

Beginning address (command): The address of the first word/bit/flag to read from memory. Specify 00 (Hex) for the 3rd byte.

No. of items (command): The number of items to be read. Specify 0000 to 03E7 (Hex) (0 to 999 decimal). The command can be completed normally even if zero items are specified.

Data (response): The data from the specified words is returned in sequence starting from the beginning address. PVs for timers and counters are returned as BCD. The required number of bytes in total is calculated as follows:

No. of bytes required by each item × No. of items

Memory Areas

The following areas can be read. (Refer to *6-6-2 Memory Area Designations* for PLC word/bit address designations):

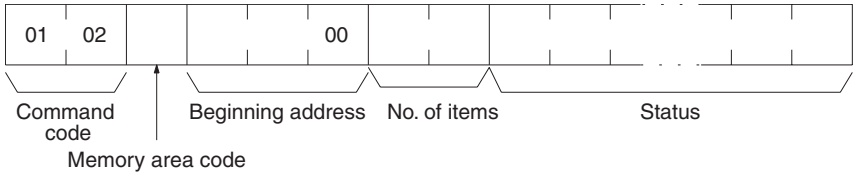
Memory area	Data	Memory area code	No. of bytes
IR, SR, LR, HR, or AR	Word contents	80	2
Timer/Counter	Completion Flag status	01	1
	PV	81	2
DM	Word contents	82	2
Expansion DM	Word contents	90 to 97, 98, and A8 to AF	2

6-6-4 MEMORY AREA WRITE

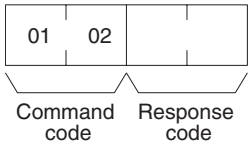
Writes data to the specified number of consecutive words starting from the specified word. All words must be in the same memory area. (Here, all memory areas with the same memory area code are considered as one area).

Note When data is written to the Timer/Counter PV area, the Completion Flags will be turned OFF (0).

Command Block



Response Block



Parameters

Memory area code (command): The data area to write.

Beginning address (command): The first word/value to write. Specify 00 (Hex) for the 3rd byte.

No. of items (command): The number of items to be written. Specify 0000 to 03E5 (Hex) (0 to 997 decimal). The command can be completed normally even if zero items are specified.

Data (command): The data to be written. PVs for timers and counters are written as BCD. The required number of bytes in total is calculated as follows:

2 bytes × No. of items

The following data can be written. (Refer to *6-6-2 Memory Area Designations* for the word/bit address designations):

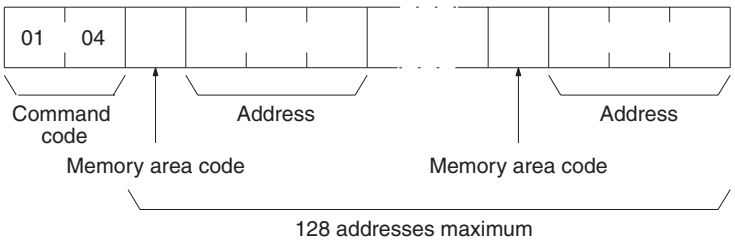
Memory area	Data	Memory area code	No. of bytes
IR, SR, LR, HR, or AR	Word contents	80	2
Timer/Counter	PV	81	2
DM	Word contents	82	2
Expansion DM	Word contents	90 to 97, 98, and A8 to AF	2

6-6-5 MULTIPLE MEMORY AREA READ

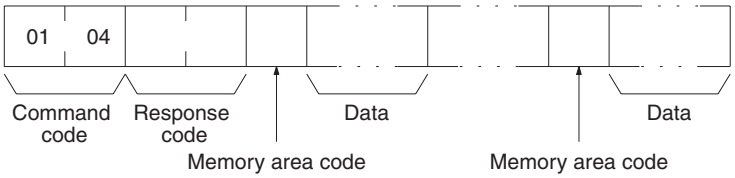
Reads the contents of the specified number of non-consecutive memory area words, starting from the specified word.

Note If there is an error in the command code or an address, no data will be read.

Command Block



Response Block



Parameters

Memory area code (command): The data area to read.

Address (command): The word/bit/flag to read. The content of up to 128 words can be read. If one or more EM Area words is included in the data to be read, the maximum number of words that can be read will be limited to 100.

Data (response): The data in the specified memory area(s) will be returned in sequence starting from the beginning address.

Memory Areas

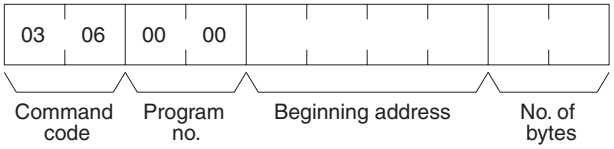
The following data can be written. (Refer *6-6-2 Memory Area Designations* for memory area designations):

Memory area	Data	Memory area code	No. of bytes
IR, SR, LR, HR, or AR	Bit status	00	1
	Word contents	80	2
Timer/Counter	Status	01	1
	PV	81	2
DM	Word contents	82	2
Expansion DM	Word contents	90 to 97, 98, and A8 to AF	2

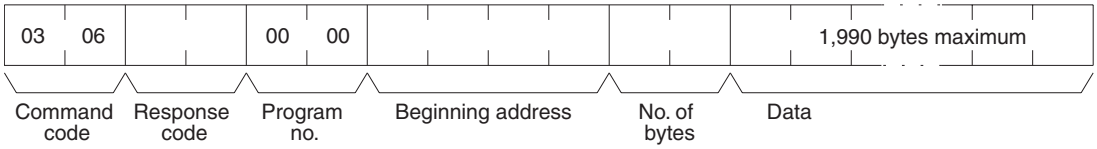
6-6-6 PROGRAM AREA READ

Reads the contents of the specified number of consecutive program area words starting from the specified word. The program is read a machine language (object code). A maximum of 1,990 bytes can be read with each command.

Command Block



Response Block

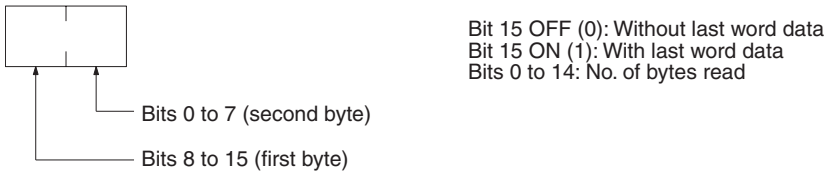


Parameters

Program no. (command and response): Set to 0000 (Hex).

Beginning address (command and response): Set an relative byte address with 00000000 (Hex) as the starting address. The beginning word must be an even number. The address set in the command will be returned in the response.

No. of bytes (command and response): The number of bytes in an even number 07C6 (Hex) (1990 in decimal) or smaller. The number of bytes actually read will be returned in the response. Bit 15 will be ON (1) in the response block when the last word data of the program area is returned.



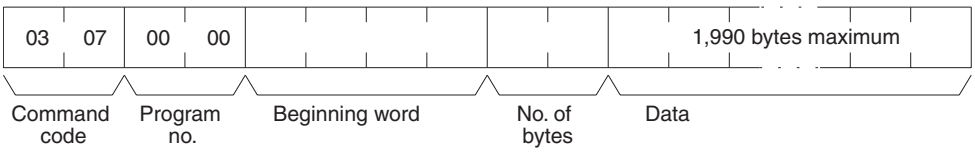
Data (response): The data in the specified program area will be returned in sequence starting from the beginning word.

Note If the designated number of bytes is larger than the program area, the program will be read through the final address and a response code indicating an address range error or response length error will be returned.

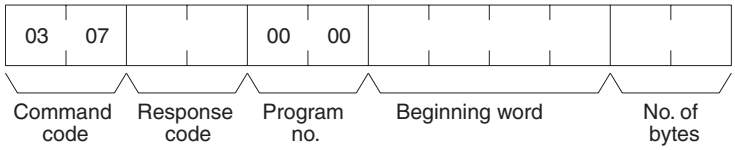
6-6-7 PROGRAM AREA WRITE

Writes data to the specified number of consecutive program area words starting from the specified word. A maximum of 1,990 bytes can be written with each command. To write larger amounts of data, use multiple commands and specify the beginning word and number of words for each. The data is written to the program area at the machine language (object code) level.

Command Block



Response Block



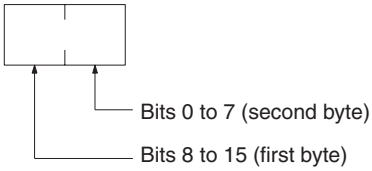
Parameters

Program no. (command and response): Set to 0000 (Hex).

Beginning word (command and response): Set a relative byte address with 00000000 (Hex) as the starting address. The beginning word must be an even number. The address set in the command will be returned in the response.

No. of bytes (command and response): The command specifies the number of bytes of data to write. This must be an even number of 07C6 (Hex) or smaller (1990 or smaller in decimal). The number of bytes actually written will be returned in the response. The leftmost bit (bit 15) is used to indicate the completion of the command. It must be turned ON (1) when writing data to the last address in the program area so that the PLC can generate an index*. To write only an index marker, specify 8000 (Hex) for the number of bytes.

*Generating an index is a process that enables a program to be used by the PLC after it has been written. A program will not run properly if the index has not been generated.

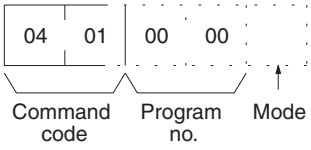


Data (command): The data to be written.

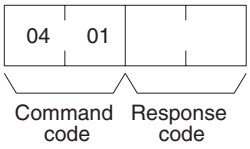
6-6-8 RUN

Changes the PLC to MONITOR or RUN mode, enabling the PLC to execute its program.

Command Block



Response Block



Parameters

Program no. (command and response): Set to 0000 (Hex).

Mode (command): As follows:

02 (Hex): MONITOR mode

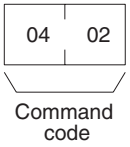
04 (Hex): RUN mode

Note If the mode is not specified, the PLC will go to MONITOR mode.

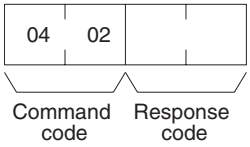
6-6-9 STOP

Changes the PLC to PROGRAM mode, stopping program execution.

Command Block



Response Block

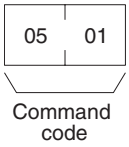


6-6-10 CONTROLLER DATA READ

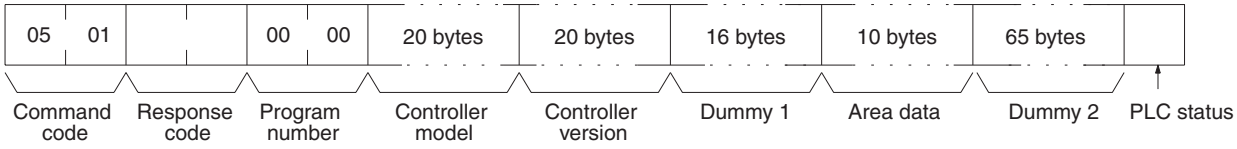
Reads the following data:

- Controller model and version
- Area data
- PLC status

Command Block



Response Block

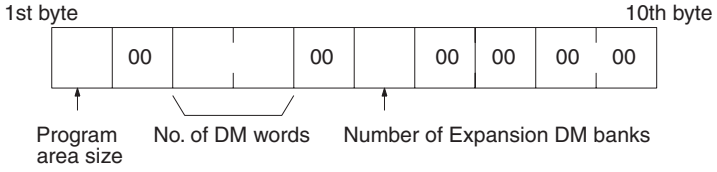


Parameters

Controller model and Controller version (response): Both are returned in ASCII, within 20 bytes (i.e., within 20 ASCII characters). If the model or version information does not require 20 bytes of data, the remainder of the bytes will be filled with spaces (20 hexadecimal).

Dummy 1 and Dummy 2 (response): All zeros (Hex) will be returned.

Area data (response): As follows:



Item	Meaning	Unit (Hex)
Program area size	The size of PLC Setup and program area	K words (1K words = 1,024 words; 1 word = 2 bytes))
No. of DM words	Total words in the DM area	Words (1 word = 2 bytes)
Number of Expansion DM banks	Number of banks in the Expansion DM area	Banks

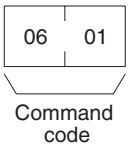
PLC status (response): The status of connected tools is returned:

00 (Hex): No recognized tool connected
80 (Hex): Recognized tool connected

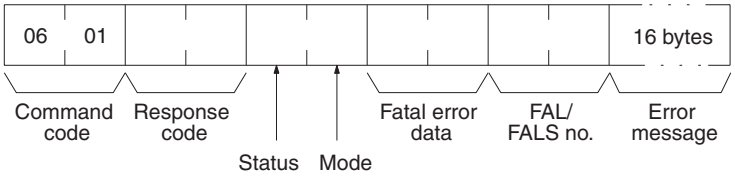
6-6-11 CONTROLLER STATUS READ

Reads the status of the Controller.

Command Block



Response Block



Parameters

Status (response): The operating status of the PLC as follows:

00 (Hex): Stop (program not being executed)

01 (Hex): Run (program being executed)

80 (Hex): CPU Unit on standby

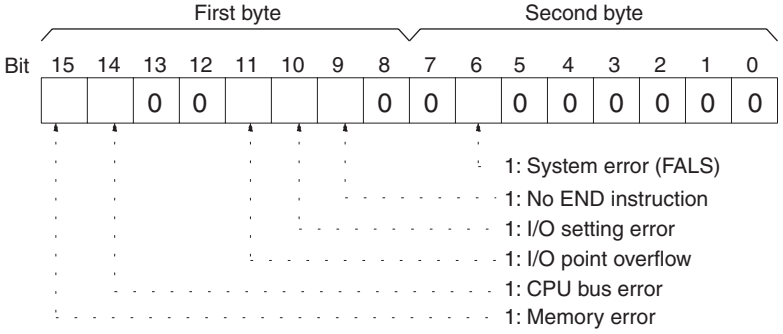
Mode (response): One of the following PLC modes:

00 (Hex): PROGRAM

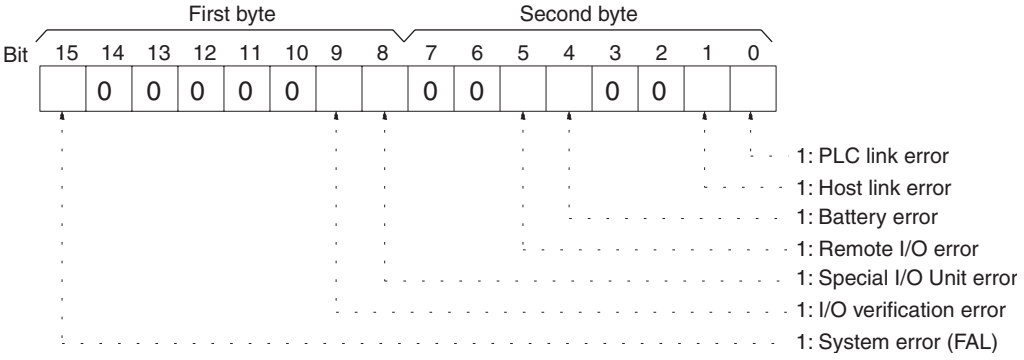
02 (Hex): MONITOR

04 (Hex): RUN

Fatal error data (response): The contents of fatal error information from the PLC. (For details refer to the operation manual of the PLC that is being used.)



Non-fatal error data (response): The contents of non-fatal error information from the PLC. (For details refer to the operation manual of the PLC that is being used.)



FAL/FALS No. (response): The number of the highest priority FAL/FALS error is returned as BCD between 00 and 99 (decimal) to the second byte. The first byte is always 00 (Hex). If no error has occurred, 0000 (Hex) is returned.

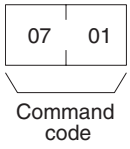
Error message (response): The error message of the present FAL/FALS number is returned as 16 or fewer ASCII characters (16 or fewer bytes). If there is no error, nothing will be returned.

6-6-12 CLOCK READ

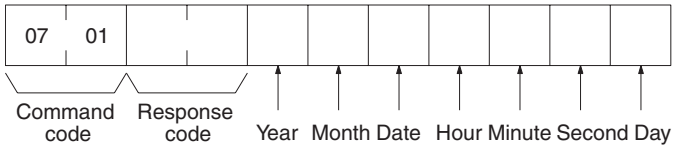
Reads the clock.

With CQM1H-series PLCs, all zeros will be returned if the CPU Unit does not contain a Memory Cassette with a clock.

Command Block



Response Block



Parameters

Year, month, date, hour, minute, second, day (response): Each value is expressed in BCD.

Year: The rightmost two digits of the year.

Hour: 00 to 23.

Day: As follows:

Value	00	01	02	03	04	05	06
Day	Sun	Mon	Tues	Wed	Thur	Fri	Sat

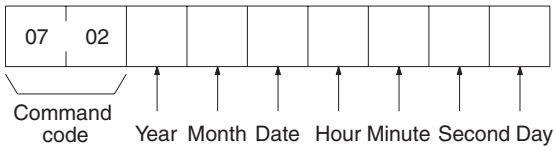
6-6-13 CLOCK WRITE

Sets the clock.

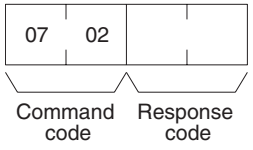
With CQM1H-series PLCs, the time will not be written unless the CPU Unit contains a Memory Cassette with a clock.

Note Be sure to specify all data.

Command Block



Response Block



Parameters

Year, month, date, hour, minute, second, day (command): Each specified value is expressed in BCD.

The ranges for setting these items are shown in the following table.

Parameters	Range
Year	00 to 99 (rightmost 2 digits)
Month	01 to 12
Date	00 to 31
Hour	00 to 23
Minute	00 to 59
Second	00 to 59

Day: As follows:

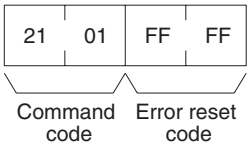
Value	00	01	02	03	04	05	06
Day	Sun	Mon	Tues	Wed	Thur	Fri	Sat

6-6-14 ERROR CLEAR

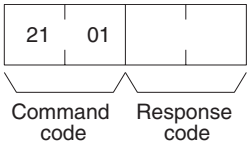
Clears errors from the PLC. A normal response will be returned even if an error has not occurred.

Note The cause of the error must be removed before executing the ERROR CLEAR command or the same error will occur again after the ERROR CLEAR command is executed.

Command Block



Response Block



Parameters

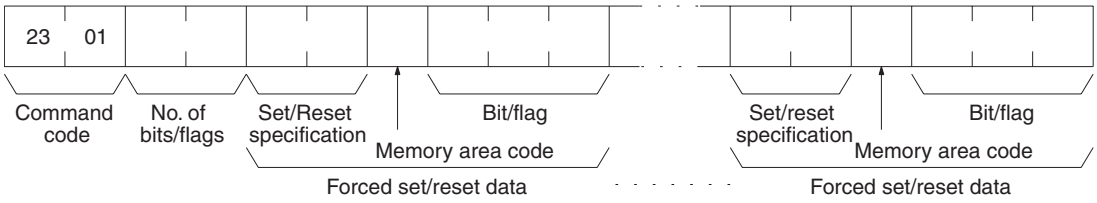
Error reset code (command): Set to FFFF (Hex).

6-6-15 FORCED SET/RESET

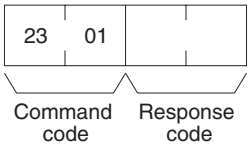
Forcibly sets (ON) or resets (OFF) bits/flags or releases forced set/reset status. Bits/flags that are forced ON or OFF will remain ON or OFF and cannot be written to until the forced status is released.

Note This command cannot be used to release the status of Completion Flags for timers or counters. If forced status is released and the Completion Flag is turned ON, it will be force-set; if forced status is released and the Completion Flag is turned OFF, it will be force-reset.

Command Block



Response Block



Parameters

No. of bits/flags (command): The number of bits/flags to be processed.

Note Multiple bits/flags can be forced set/reset, and the status will be retained until the forced set/reset is cleared.

Set/Reset specification (command): The action to be taken for each bit/flag:

Value	Function
0000 (Hex)	Force-reset (OFF)
0001 (Hex)	Force-set (ON)
8000 (Hex)	Forced status released and bit/flag turned OFF (0).
8001 (Hex)	Forced status released and bit/flag turned ON (1).
FFFF (Hex)	Forced status released.

Note "Forced status" is the ON/OFF status of bits/flags which is forcibly retained as write protected.

Memory area code (command): The memory area of the bit or flag to be controlled.

Bit/Flag (command): The bit or flag to be controlled.

Memory Areas

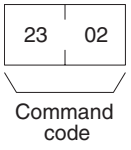
Refer to *6-6-2 Memory Area Designations* for memory area designations.

Memory area	Data	
IR, SR, LR, HR, and AR areas	Bits status	00
Timer/Counter	Completion Flag status	01

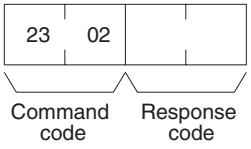
6-6-16 FORCED SET/RESET CANCEL

Cancels the forced status of all bits/flags that have been forced ON or forced OFF. ("Forced status" is the ON/OFF status of bits/flags which has been forcibly retained as write protected.)

Command Block



Response Block



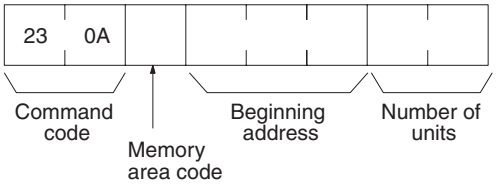
Note The bits (flags) in the following memory areas can be force-set or force-reset.

Memory area	Data
IR, SR, LR, HR, and AR areas	Bit status
Timer/Counter	Completion Flag status

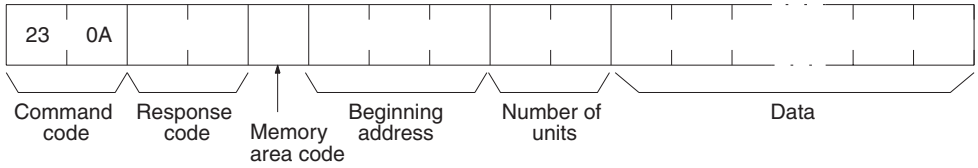
6-6-17 MULTIPLE FORCED STATUS READ

Reads the forced status of the specified range of words or timers/counters.

Command Block



Response Block



Parameters

Memory area code, Beginning address, Number of units (command, response): Specify the memory area code, the beginning address in that area, and the number of words or timers/counters to read. The number of units can be set from 0001 to 0040 (Hex) (1 to 64 in decimal). The total of 64 continuous bits (for 4 words) for the number of bits or words and the total of 64 units (for 32 words) for the timers/counters can be read at one time.

The actual area, beginning address, and number of units read will be returned in the response.

Memory Areas

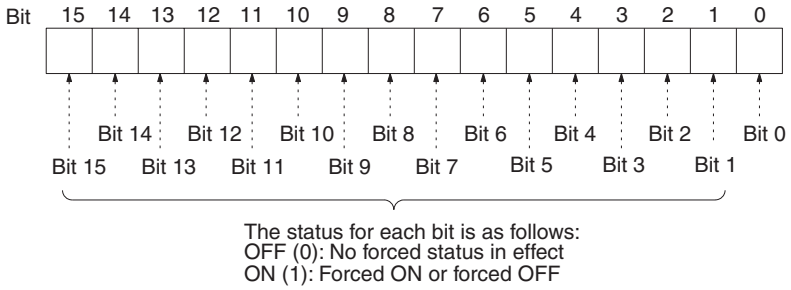
Forced status can be read in the following areas. Refer to *6-6-2 Memory Area Designations* for memory area designations.

Area	Data type	Memory area code	Number of bytes
IR, SR, LR, HR, and AR areas	PV of word	80	2
Timer/counter area	Completion Flag status	01	1

Note Forced status is read by words for the IR, SR, LR, HR, or AR area and by bits/flags for the Timer/Counter area.

Data (response): Forced status is returned beginning from the specified word or timer/counter. The number of bytes returned will be (the number of units) x (the number of bytes/unit).

IR, SR, LR, HR, and AR Areas:



Timers/Counters: Status of the Completion Flag will be returned as follows:

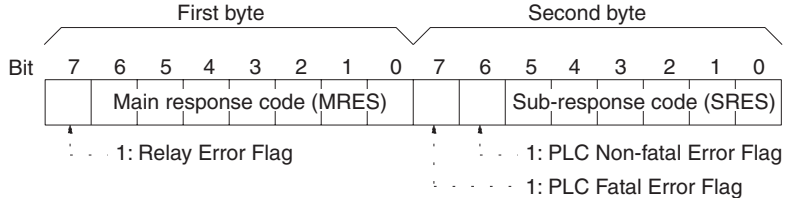
00 (Hex): No forced status in effect
01 (Hex): Forced ON or forced OFF

6-7 Response Codes

This section describes the response codes returned with responses to FINS commands. Response codes can be used to confirm normal completion of command execution or to troubleshoot problems when commands fail. For further troubleshooting information, refer to *SECTION 9 Troubleshooting and Maintenance* of this manual and to the operation manuals for specific Units or Systems.

6-7-1 Configuration

Response codes for FINS commands consist of two bytes that indicate the result of executing a command. The structure of the response codes is shown in the following diagram.



The main response code (MRES) in the first byte classifies the response and the sub-response code (SRES) in the second byte indicates details under the MRES classification.

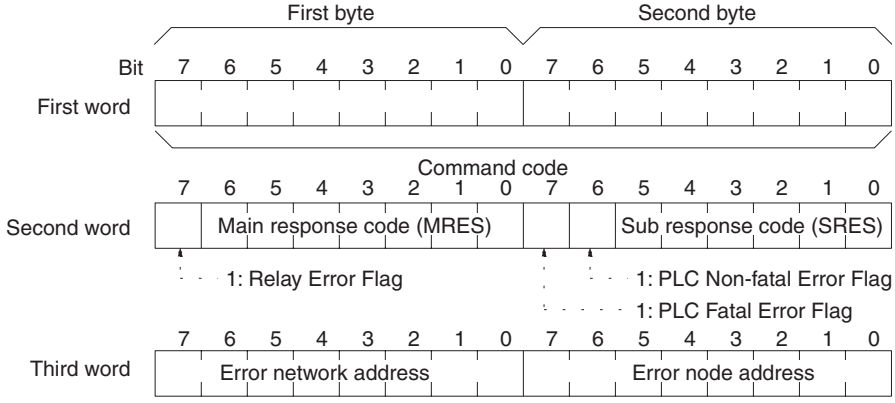
If bit 7 of the first byte is ON, a network relay error has occurred. Refer to *6-7-2 Network Relay Errors* for details on troubleshooting the error.

If bit 6 or 7 of the second byte is ON, an error has occurred in the PLC or computer returning the response. Refer to the operation manual for the device returning the response for details when troubleshooting the error.

6-7-2 Network Relay Errors

A network relay error will occur whenever a command cannot reach the destination. These errors can occur for several reasons: 1) Data was not successfully passed between two Link Units, 2) Data was not passed successfully between a Link Unit and another Unit, such as the PLC's CPU Unit, or 3) The destination of a gateway does not exist. In any case, the Unit that was not able to transfer data will return a response indicating a network relay error.

Bit 7 of the first byte of the response code will be ON if a network relay error has occurred. When this happens, two more bytes of data will follow the response code to indicate the location of the error. This information, along with the response code, should enable you to track the error.



Error network address: 00 to 7F (Hex) (0 to 127 in decimal)
Error node address: Controller Link: 01 to 3E (Hex) (1 to 62 in decimal)
Ethernet: 01 to 7E (Hex) (1 to 126 in decimal)
SYSMAC NET: 01 to 7E (Hex) (1 to 126 in decimal)
SYSMAC LINK: 01 to 3E (Hex) (1 to 62 in decimal)

Relay Errors

A relay error indicates that the command did not reach the Unit to which it was sent. There are several types of situation in which this can occur. Example 1 (below) shows a situation in which a relay error occurs when data cannot be transferred from one Communications Unit to another in an interconnected network. Example 2 shows a similar situation, except that the destination Unit is something other than a Communications Unit. In Example 3, the relay error occurs because either the specified destination node or the next relay node does not exist.

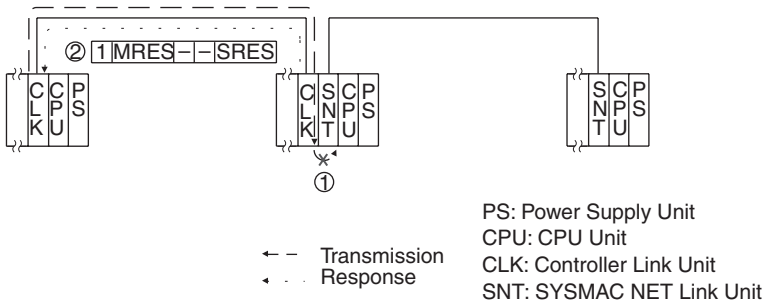
In the three diagrams, the numbers indicate the following:

(1)The transmitted data fails to be received.

(2)The relay error and response code are returned to the command source.

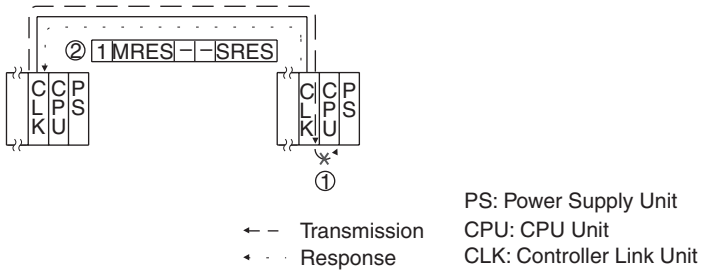
Example 1

In this example, data cannot be transferred between Controller Link Units due to some cause such as a routing table error.



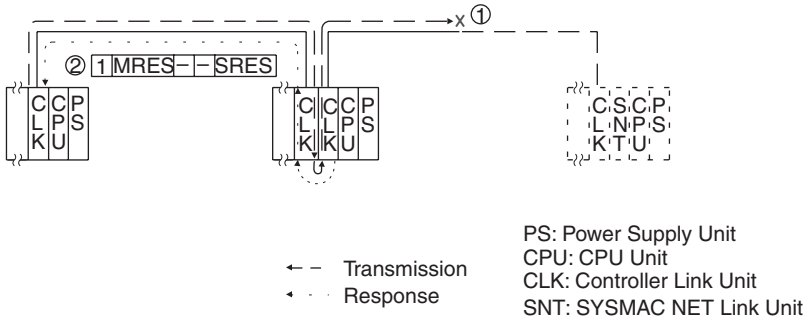
Example 2

In this example, data cannot be transferred between a Controller Link Unit and a CPU Unit.



Example 3

In this example, the specified destination node or the next relay node does not exist.



If an error occurs, check the MRES and SRES codes for the node in question, and correct the problem.

6-7-3 Response Codes and Troubleshooting

The table below lists response codes (main and sub-codes) returned after execution of the FINS commands, the probable cause of errors, and recommended remedies.

Upon receipt of some commands, the destination node will issue a request to another node; the other node is referred to as the third node.

Main code	Sub-code	Probable cause	Remedy
00: Normal completion	00	---	---
	01	Service was interrupted	Check the contents of the destination transmission area of third node.
			Check the data link status.

Main code	Sub-code	Probable cause	Remedy
01: Local node error	01	Local node not part of Network	Add to Network.
	02	Token time-out, node address too large	Set the local node's node address below the maximum node address.
	03	Number of transmit retries exceeded	Check communications with ECHOBACK TEST. If the test fails, check network.
	04	Maximum number of frames exceeded	Either check the execution of events in the network and reduce the number of events occurring in one cycle, or increase the maximum number of frames.
	05	Node address setting error (range)	Correctly set the Controller Link BIOS /N option. Make sure the node address is within specified range and that there are no node addresses that are set twice.
	06	Node address duplication error	Make sure that there are no node addresses that are set twice.
02: Destination node error	01	Destination node not part of Network	Add to Network.
	02	No node with the specified node address	Check the destination node's node address.
	03	Third node not part of Network	Check the third node's node address.
		Broadcasting was specified.	Check the control data and specify only one node as the third node.
	04	Busy error, destination node busy	Increase the number of transmit retry attempts or re-evaluate the system so that the destination node is not so busy receiving data.
	05	Response time-out, message packet was corrupted by noise	Increase the number of transmit retry attempts.
		Response time-out, response watchdog timer interval too short (If a large number of data links is used, the response monitor time will be shorter than the communications cycle time.)	Increase the value for the response watchdog timer interval in the control data.
		Frame lost in transmission	Check the error log and correct the process.
03: Communications controller error	01	Error occurred in the communications controller, ERC indicator is lit	Take corrective action, referring to communications controller errors and remedies table at end of this section.
	02	CPU Unit error occurred in the PLC at the destination node	Clear the error in the CPU Unit (refer to the PLC's operation manuals).
	03	A controller error has prevented a normal response from being returned.	Check network communications status and reset the controller board. If the error still exists, replace the controller board.
	04	Unit address setting error	Make sure the Unit address is within the specified range and that there are no node addresses that are set twice.
04: Not executable	01	An undefined command has been used.	Check the command code and be sure that the Unit supports it.
	02	Cannot process command because the specified unit model or version is wrong.	Check the unit model and version.

Main code	Sub-code	Probable cause	Remedy
05: Routing error	01	Destination node address is not set in the routing table.	Set the destination node address in the routing table.
	02	Routing table isn't registered.	Set the source nodes, destination nodes, and relay nodes in the routing table.
	03	Routing table error	Set the routing table correctly.
	04	The maximum number of relay nodes was exceeded in the command.	Redesign the network or reconsider the routing table to reduce the number of relay nodes in the command. Use a CS/CJ-series CPU Unit with unit Ver. 2.0 or later with CX-Programmer Ver. 4.0 or later to send commands across three or more network levels.
10: Command format error	01	The command is longer than the max. permissible length.	Check the command format of the command and set it correctly.
	02	The command is shorter than min. permissible length.	Check the command format of the command and set it correctly.
	03	The designated number of data items differs from the actual number.	Check the number of items and the data, and make sure that they agree.
	04	An incorrect command format has been used.	Check the command format of the command and set it correctly.
	05	An incorrect header has been used. (The local node's relay table or relay node's local network table is wrong.)	Set the routing table correctly.
11: Parameter error	01	A correct memory area code has not been used or Extended DM Area is not available.	Check the command's memory area code and set the appropriate code.
	02	The access size specified in the command is wrong, or the first address is an odd number.	Set the correct access size for the command.
	03	The first address is in an inaccessible area.	Set a first address that is in an accessible area.
	04	The end of specified word range exceeds the acceptable range.	Check the acceptable limits of the data area and set the word range within the limits.
			Check the data link tables to be sure the limit to link words has not been exceeded.
	06	A non-existent program no. has been specified.	Check the program number and be sure that it is set correctly.
	09	The sizes of data items in the command block are wrong.	Check the command data and be sure that the sixes of the data items are correct.
			Check the data link tables to be sure all nodes in the refresh parameters are in the common link parameters.
	0A	The IOM break function cannot be executed because it is already being executed.	Either abort the current IOM break function processing, or wait until it is completed and execute the command.
			Check the data link tables for node addresses that have been set twice.
	0B	The response block is longer than the max. permissible length.	Check the command format and set the number of items correctly.
	0C	An incorrect parameter code has been specified.	Check the command data and reenter it correctly.
			Check the data link table file for corruption.

Main code	Sub-code	Probable cause	Remedy
20: Read not possible	02	The data is protected.	Execute the instruction again after issuing the PROGRAM AREA PROTECT CLEAR command to the PLC.
		An attempt was made to download a file that is being uploaded.	Check the file name and either interrupt servicing or wait for servicing to complete before re-executing the command.
	03	The registered table does not exist or is incorrect.	Set or reset the registered table.
		Too many files open.	Close open files and re-execute the command.
	04	The corresponding search data does not exist.	---
	05	A non-existing program no. has been specified.	Check the program number and be sure that it is set correctly.
	06	A non-existing file has been specified.	Check whether the correct file name was used.
	07	A verification error has occurred.	Check whether the memory contents are correct and replace if incorrect.
			Check the contents of the file. A read error may have occurred.
21: Write not possible	01	The specified area is read-only or is write-protected.	If the specified area is read-only, the write cannot be performed. If it is write-protected, turn off the write-protect switch and execute the instruction again.
	02	The data is protected.	Execute the instruction again after issuing the PROGRAM AREA PROTECT CLEAR command to the PLC.
		An attempt was made to simultaneously download and upload a file.	Check the file name and either interrupt servicing or wait for servicing to complete before re-executing the command.
		The data link tables cannot be written manual because the Unit is set for automatic generation.	Change the data link mode to manual.
	03	The number of files exceeds the maximum permissible.	Write the file(s) again after erasing unneeded files, or use different disk or Memory Card that has free space.
		Too many files open.	Close open files and re-execute the command.
	05	A non-existing program no. has been specified.	Check the program number and be sure that it is set correctly.
	06	A non-existent file has been specified.	Check the file name and execute again.
	07	The specified file already exists.	Change the name of the file and execute the instruction again.
	08	Data cannot be changed.	---

Main code	Sub-code	Probable cause	Remedy
22: Not executable in current mode	01	The mode is wrong (executing).	Check the operating mode.
		Data links are active.	Check the data link status before execution.
	02	The mode is wrong (inactive).	Check the operating mode.
		Data links are active.	Check the data link status before execution.
	03	The PLC is in the PROGRAM mode.	Check the PLC's mode.
	04	The PLC is in the DEBUG mode.	Check the PLC's mode.
	05	The PLC is in the MONITOR mode.	Check the PLC's mode.
	06	The PLC is in the RUN mode.	Check the PLC's mode.
	07	The specified node is not the control node.	Check which node is the control node.
	08	The mode is wrong and the step cannot be executed.	Check whether the step has active status or not.
23: No Unit	01	A file device does not exist where specified.	Mount the Memory Card or disk
	02	The specified memory does not exist.	Check the specifications of the installed file memory.
	03	No clock exists.	Check the model number.
24: Start/stop not possible	01	The data link tables either have not been created or are incorrect.	Set the data link tables correctly.
25: Unit error	02	Parity/checksum error occurred because of incorrect data.	Transfer correct data into memory.
	03	I/O setting error (The registered I/O configuration differs from the actual.)	Either change the actual configuration to match the registered one, or generate the I/O table again.
	04	Too many I/O points	Redesign the system to remain within permissible limits.
	05	CPU bus error (An error occurred during data transfer between the CPU Unit and a CPU Bus Unit.)	Check the Unit, Service Boards, and cable connections and issue the ERROR CLEAR command.
	06	I/O duplication error (A rack number, unit number, or I/O word allocation has been duplicated.)	Check the system's settings and eliminate any settings that occur twice.
	07	I/O bus error (An error occurred during data transfer between the CPU Unit and an I/O Unit.)	Check the Unit, Service Boards, and cable connections and issue the ERROR CLEAR command.
	09	SYSMAC BUS/2 error (An error occurred during SYSMAC BUS/2 data transfer.)	Check the Unit, Service Boards, and cable connections and issue the ERROR CLEAR command.
	0A	Special I/O Unit error (An error occurred during CPU Bus Unit data transfer.)	Check the Unit, Service Boards, and cable connections and issue the ERROR CLEAR command.
	0D	Duplication in SYSMAC BUS word allocation.	Check and regenerate the I/O table.
	0F	A memory error has occurred in internal memory, in the Memory Card, or in Expansion DM during the error check.	If the error occurred in internal memory or the EM Unit, correct the data in the command an execute it again. If the error occurred in a Memory Card or EM used for file memory, the file data has been corrupted. Execute the MEMORY CARD FORMAT command for the PLC. If the above remedies do not eliminate the error, replace the faulty memory.
	10	Terminator not connected in SYSMAC BUS System.	Connect the terminator correctly.

Main code	Sub-code	Probable cause	Remedy
26: Command error	01	The specified area is not protected. This response code will be returned if an attempt is made to clear protection on an area that is not protected.	The program area is not protected, so it isn't necessary to clear protection.
	02	An incorrect password has been specified.	Specify a password that is registered.
	04	The specified area is protected.	Execute the command again after executing the PROGRAM AREA PROTECT CLEAR command for the PLC.
		To many commands at destination.	The destination has received more than 5 commands. Either interrupt servicing or wait for servicing to complete before re-executing the command.
	05	The service is being executed.	Execute the command again after the service has been completed or aborted.
	06	The service is not being executed.	Execute the service if necessary.
	07	Service cannot be executed from local node because the local node is not part of the data links.	Execute the service from a node that is part of the data links.
		A buffer error has prevented returning a normal response.	Reset the board. If the error persists, replace the board.
	08	Service cannot be executed because necessary settings haven't been made.	Make the necessary settings.
	09	Service cannot be executed because necessary settings haven't been made in the command data.	Check the command format of and make the necessary settings.
	0A	The specified action or transition number has already been registered.	Execute the command again using an action or transition number that hasn't been registered.
	0B	Cannot clear error because the cause of the error still exists.	Eliminate the cause of the error and execute the ERROR CLEAR command.
30: Access right error	01	The access right is held by another node. (Either a Programming Device at the other node is executing an SFC online edit, or the other node is executing an ACCESS RIGHT ACQUIRE or ACCESS RIGHT FORCED ACQUIRE command.)	Execute the command again after the access right has been released. (The command can be executed after the ACCESS RIGHT FORCED ACQUIRE or ACCESS RIGHT RELEASE command is completed. Releasing the access right might affect processes in progress at the node that held the access right.)
40: Abort	01	Command was aborted with ABORT command.	---

SECTION 7
Network Interconnections

This section describes the method used to connect multiple networks through CS/CJ-series, CVM1, and CV-series PLCs. The section also describes remote programming and monitoring with Programming Devices.

7-1 What is Network Interconnection? 238
7-1-1 Interconnecting Controller Link Networks. 238
7-1-2 Interconnecting Different Types of Networks 238
7-2 Remote Programming and Monitoring 240
7-2-1 Local Networks. 240
7-2-2 Remote Controller Link Networks 241
7-2-3 Other Remote Networks 242
7-3 Routing Tables 243
7-4 Setting Routing Tables 244
7-4-1 Routing Table Setting Procedure 245
7-4-2 Editing Local Network Tables 245
7-4-3 Editing Relay Network Tables 246
7-4-4 Saving Routing Tables 246
7-4-5 Connecting to the PLC 247
7-4-6 Routing Table Enable Bit (C200HX/HG/HE and CQM1H-series Only) 247
7-4-7 Transferring Routing Tables 247
7-4-8 Example Routing Table Settings. 248

7-1 What is Network Interconnection?

Network interconnection enables commands and responses for the message service to be sent and received across multiple networks. The four networks listed below can be interconnected to achieve this.

FA Networks

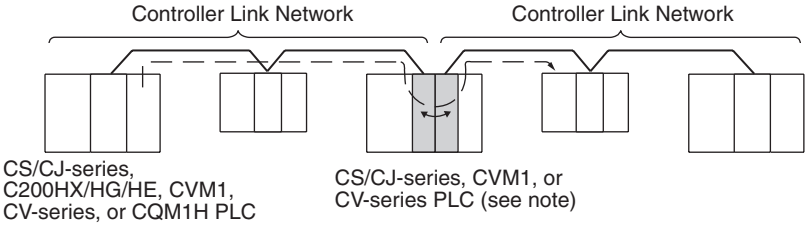
- SYSMAC NET Link Networks
- SYSMAC LINK Networks
- Controller Link Networks

OA Network

- Ethernet Networks

7-1-1 Interconnecting Controller Link Networks

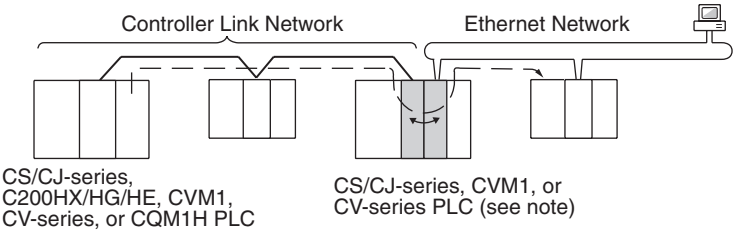
Controller Link Networks can be connected through a CS/CJ-series, CVM1, or CV-series PLC.



Note A data bridge is created between Controller Link Units mounted on the same CS/CJ-series, CVM1, or CV-series PLC.

7-1-2 Interconnecting Different Types of Networks

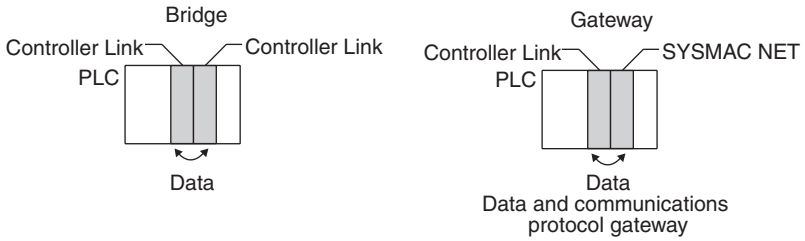
A CS/CJ-series, CVM1, or CV-series PLC can be used to connect a Controller Link Network with an Ethernet, SYSMAC NET, or SYSMAC LINK Network.



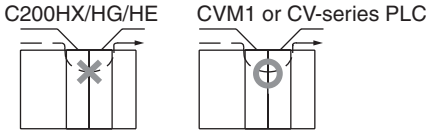
Note A data and communications protocol gateway is created between a Controller Link Unit and an Ethernet, SYSMAC NET, or SYSMAC LINK Unit mounted to the same CS/CJ-series, CVM1, or CV-series PLC.

Note

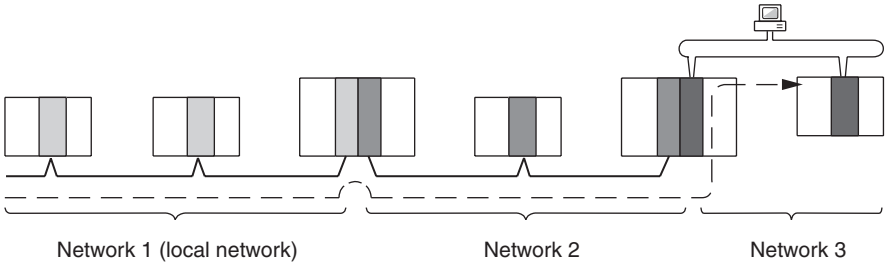
1. A bridge is used between Communications Units to connect the same type of networks.
2. A gateway is used between Communications Units to connect different types of networks.



- Although a C200HX/HG/HE PLC supports multiple (maximum of 2) Communications Units, it cannot function as a data bridge or a data and communications protocol gateway.



- A CQM1H-series PLC supports only one Communications Unit. It cannot function as a data bridge or a data and communications protocol gateway.
- Communications across up to eight networks, including the local network are possible when using a CS/CJ-series CPU Unit with unit version 2.0 or later. The following conditions and restrictions apply.
  - The CPU Unit for all nodes must be a CS/CJ-series CPU Unit with unit version 2.0 or later.
  - Routing tables can be set using the CX-Net in the CX-Programmer version 4.0 or higher.
  - Communications across up to eight networks away are supported by Controller Link and Ethernet networks only.
  - DeviceNet and SYSMAC LINK networks support communications across up to three networks, the same as previous versions.



Although 2,012 bytes of data (including the header) can be sent and received with a Controller Link, the maximum amount of data is limited by any network the data passes through, i.e., the network with the smallest capacity will determine the limit.

If, for example, data passes through a SYSMAC LINK network as shown in the figure on the preceding page, the amount of data sent and received from the Controller Link is limited to 552 bytes (including the header) because the SYSMAC LINK Network can only handle that many bytes.

See the manual for the network you are using in order to determine the maximum amount of data for each network.

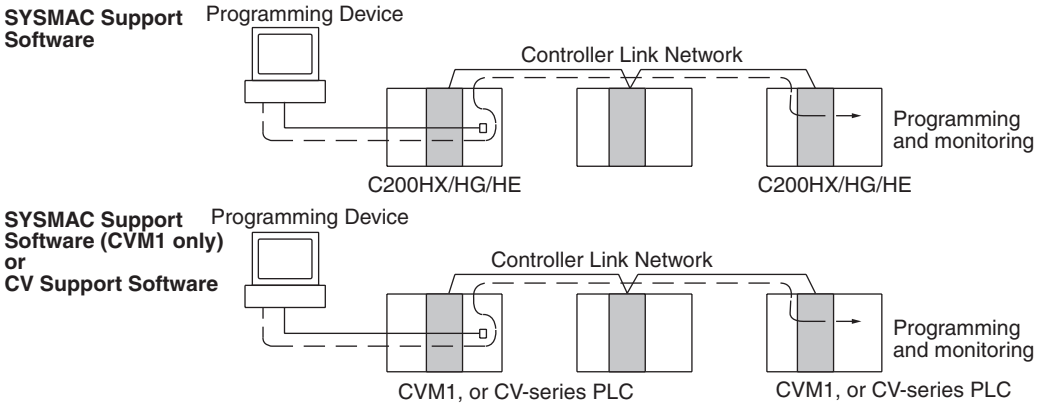
7-2 Remote Programming and Monitoring

A remote PLC can be programmed and monitored across a network from a Programming Device connected to a PLC.

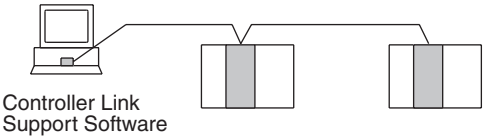
7-2-1 Local Networks

SYSMAC Support Software and CV Support Software

A Programming Device connected to a C200HX/HG/HE, CVM1, or CV-series CPU Unit can program and monitor a C200HX/HG/HE, CVM1, or CV-series PLC on the same network. Programming and monitoring are possible, however, only for the same type of CPU Unit as the one to which the Programming Device is connected. For example, if the Programming Device is connected to a CVM1 or CV-series PLC, you can only program and monitor CVM1 or CV-series PLCs on the network.



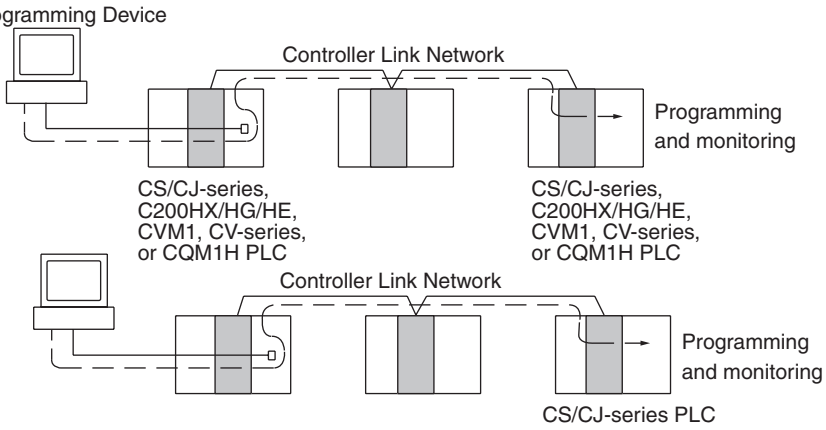
Note A factory automation node computer cannot remotely program or monitor. The node can only monitor Controller Link Network status.



CX-Programmer

A CX-Programmer connected to a CS/CJ-series, C200HX/HG/HE, CVM1, CV-series, or CQM1H CPU Unit can program and monitor a CPU Unit on the same network. Programming and monitoring are possible, including CPU Units that are different to the one to which the Programming Device is connected.

CX-Programmer



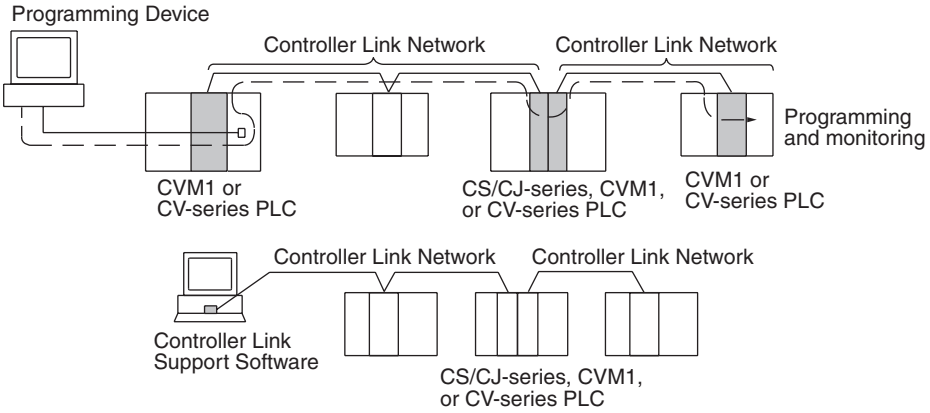
Note Remote programming and monitoring are possible from a factory automation node computer using the CX-Programmer.

7-2-2 Remote Controller Link Networks

SYSMAC Support Software or CV Support Software

A Programming Device connected to a CVM1 or CV-series CPU Unit can program and monitor a CVM1 or CV-series PLC on another Controller Link Network through a CVM1 or CV-series PLC. Other types of PLC cannot be programmed or monitored on remote networks.

SYSMAC Support Software (CVM1 Only) or CV Support Software

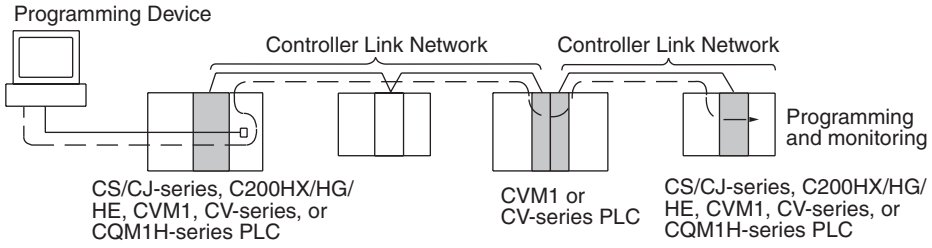


Note Remote programming and monitoring is not possible from computer nodes. Computer nodes can only monitor Controller Link Network status. A Programming Device connected to a C200HX/HG/HE PLC cannot remotely program or monitor a node on a remote network.

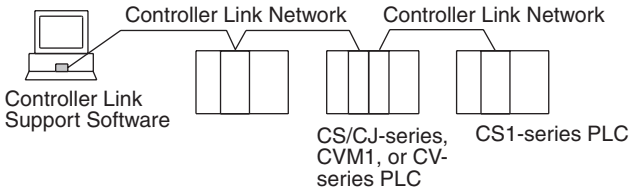
CX-Programmer

A CX-Programmer connected to a CS/CJ-series, C200HX/HG/HE, CVM1, CV-series, or CQM1H-series CPU Unit can program and monitor any other PLC on another Controller Link Network. Other types of PLC, different to the one to which the CX-Programmer is connected can also be programmed or monitored on remote networks.

CX-Programmer



CX-Programmer



Note Remote programming and monitoring is possible from computer nodes.

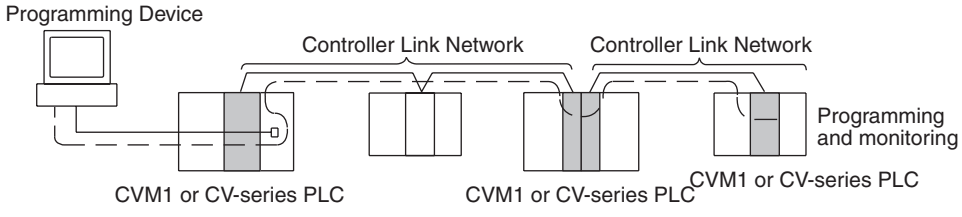
Note
1. Version 1.20 of CX-Programmer must be used for the CQM1H-series Controller Link Unit.
2. Use CX-Programmer version 2.04 or higher for a CJ-series Controller Link Unit.

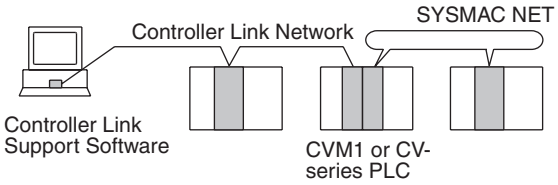
7-2-3 Other Remote Networks

SYSMAC Support Software or CV Support Software

A Programming Device connected to a CVM1 or CV-series CPU Unit can program and monitor a CVM1 or CV-series PLC on a different type of network (SYSMAC NET or SYSMAC LINK) through a CVM1 or CV-series PLC. Other types of PLC cannot be programmed or monitored on remote networks.

SYSMAC Support Software (CVM1 Only) or CV Support Software



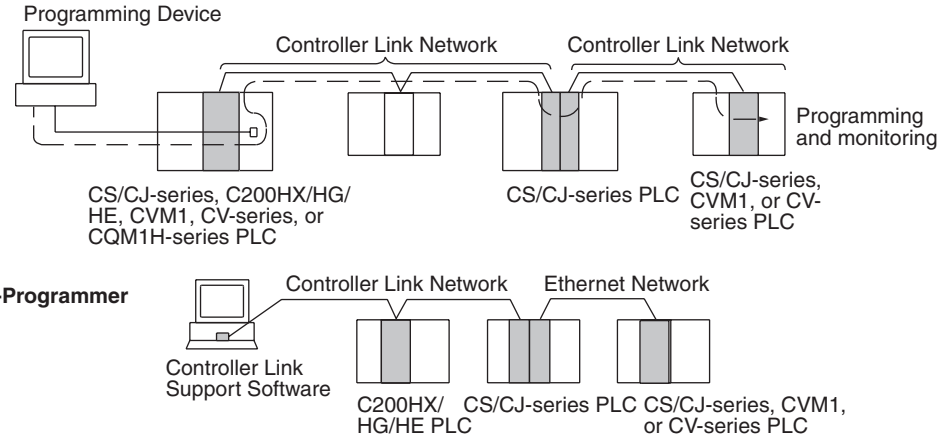


Note Remote programming and monitoring is not possible from computer nodes. Computer nodes can only monitor Controller Link Network status.
A Programming Device connected to a C200HX/HG/HE PLC cannot remotely program or monitor a node on a remote network.

CX-Programmer

A CX-Programmer connected to a CS/CJ-series, C200HX/HG/HE, CVM1, CV-series, or CQM1H-series CPU Unit can program and monitor any other PLC on a different type of network (Ethernet, SYSMAC NET, or SYSMAC LINK) through a CS/CJ-series, CVM1, or CV-series PLC.

CX-Programmer



Note Remote programming and monitoring is possible from computer nodes.

Note
1. Version 1.20 of CX-Programmer must be used for the CQM1H-series Controller Link Unit.
2. Use CX-Programmer version 2.04 or higher for a CJ-series Controller Link Unit.

7-3 Routing Tables

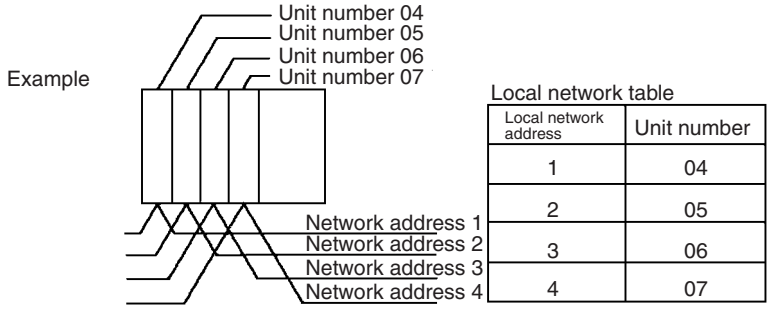
Routing tables that define the communications path from the Controller Link Unit on the local PLC to the network connected to the destination PLC must be created in order to send and receive data across networks. Each CPU Unit implements the message service or remote programming/monitoring to the appropriate Unit according to the routing tables.

Creating Routing Tables

Routing tables consists of a local network table and a relay network table.

Local Network Table

A local network table provides unit numbers and network addresses corresponding to the Units mounted to the PLC.



Local network table

Local network address	Unit number
1	04
2	05
3	06
4	07

Note
1. The unit number is set between 0 and 15 using the rotary switch on the front panel of Controller Link Units for CS/CJ-series, CVM1, and CV-series PLCs, and is the same as the operating level for C200HX/HG/HE PLCs. Set operating level 0 for CQM1H-series Control Link Units.

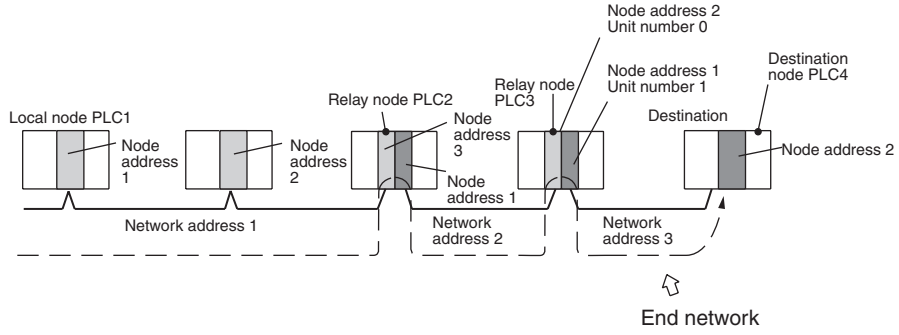
2. The network address is the address of the network connected to the Unit (between 1 and 127). The address is set when the local network table is created.

Relay Network Table

A relay network table provides the node and network addresses corresponding to the initial relay point (first point the data must go to) en route to a target network (end network) not directly connected to the local PLC.

The table traces the route from the relay point to the end network.

The example below shows the routing tables for the route from local node PLC1 (network address 1, node address 1) to PLC4 (network address 3, node address 2).



PLC1 relay network table

End network	Relay network	Relay node
2	1	3
3	1	3

Data first goes to node address 3 at network address 1 to reach network address 3.

PLC2 relay network table

End network	Relay network	Relay node
3	2	2

Data then goes to node address 2 at network address 2 to reach network address 3.

PLC3 local network table

Local network address	Unit number
2	0
3	1

We know from the local network table that the data goes through local unit number 1 to reach network address 3.

Data goes to node address 2 at network address 3, i.e., the local network.

Note

1. The above example shows the routing tables for sending a message from PLC1 to PLC4. Similar routing table entries would have to be added to send a message from PLC4 to PLC1.
2. Refer to *7-4 Setting Routing Tables* for an example of setting routing tables.

7-4 Setting Routing Tables

This section describes routing table settings.

Routing tables are set through the CX-Net (in CX-Programmer), SYSMAC LINK, or Controller Link Support Software. This section describes setting procedures and setting details.

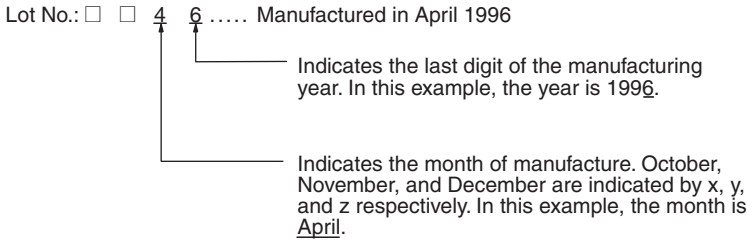
See the operating manual of the Programming Device you are using for the specific setting procedure.

Note

1. Routing tables cannot be set through Programming Consoles.
2. Networks cannot be crossed by a Programming Device without setting routing tables. Routing tables can therefore be set only for nodes connected to the Programming Device and other nodes in the same network. Disconnect and reconnect the Programming Device to each network when setting routing tables in multiple networks.

3. Make sure that the routing tables are properly set at all nodes on the network. If a message is sent to a node without correct routing tables, transmission will not work properly and a response may not be returned.
4. When using a CVM1 or CV-series CPU Unit manufactured prior to April 1996, be sure to register routing tables whether or not the PLC is connecting multiple networks. The date of production can be checked on the lot number as explained below. (The lot number is a four-digit number written on the side panel of the CPU Unit.)

Note Routing tables are required if any of the CVM1 or CV-series CPU Units in the network have been manufactured on or before April 1996.



5. Routing tables are handled differently with C200HX/HG/HE PLCs depending on whether they are used in a Controller Link or SYSMAC NET Network. Be sure to register both Controller Link and SYSMAC NET routing tables when SYSMAC NET Link Units are installed at the same time. See the *SYSMAC NET Link Unit Operation Manual* (W114) for further details.

7-4-1 Routing Table Setting Procedure

The procedure for setting routing tables is described below.

1,2,3...

1. Edit the local network table.
2. Edit the relay network table.
3. Save the routing tables.

Repeat the editing and saving steps for all nodes set with the routing tables.

4. Connect the Programming Device to a PLC.
5. Turn ON the Routing Table Enable Bit for C200HX/HG/HE and CQM1H-series PLCs only.
6. Transfer the routing tables.

7-4-2 Editing Local Network Tables

Use the routing table editing function on the Programming Device to edit the local network table as shown on the screen given below.

[Local Network table]

No.	Loc Netwk	SIOU unit #
1		
2		
3		
4		
5		
6		
7		
8		

No.	Loc Netwk	SIOU unit #
9		
10		
11		
12		
13		
14		
15		
16		

Local network:

Address 1 through 127 for the network connected to the Communications Unit

SIOU Unit No.:
Unit number of the Communications Unit (operating level for C200HX/HG/HE PLCs; always 0 for CQM1H-series Units). (CS/CJ-series, CVM1, or CV-series: 0 to 15, C200HX/HG/HE: 0, 1, CQM1H-series: 0) Set the unit number of all Communications Units (SYSMAC NET Link Units, SYSMAC Link Units and Controller Link Units) as well as the address of network connected to it.

Be sure to set the same address for each network when setting routing tables (local and relay network tables) in multiple PLCs.

7-4-3 Editing Relay Network Tables

Use the routing table editing function on the Programming Device to edit the local network table as shown on the screen given below.

[Relay Network table]

No.	End Netwk	Relay PC ID	Relay Netwk	Relay node
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

No.	End Netwk	Relay PC ID	Relay Netwk	Relay node
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

End network:
Network address of the end network (1 through 127)

Relay network:
Network address of the first relay point on the way to the end network (1 through 127)

Relay node:
Node address of the first relay point on the way to the end network
(SYSMAC NET: 1 through 126, SYSMAC LINK: 1 through 62, and Controller Link: 1 through 32 (1 through 62 when using a CS/CJ-series Unit (CS1W-CLK21-V1 or CJ1W-CLK21-V1) with the Wired Network 62 Node Enable Bit turned ON, or with an optical ring network), Ethernet: 1 through 126)

Set all networks not directly connected to the PLC.

Be sure to set the same address for each network when setting routing tables (local and relay network tables) in multiple PLCs.

Note
1. Do not set the same end network more than once with the C200HX/HG/HE or CQM1H-series PLCs. Routing may fail.
2. The PC ID is any unique name given to a specific node.
   When setting the PC ID, simply input the ID. Network and node addresses will be input for you automatically. See the operation manual for SYSMAC, CV, or Controller Link Support Software for further details.

7-4-4 Saving Routing Tables

After editing local and relay network tables on the Programming Device, save the tables.

Note When setting routing tables in multiple PLCs, edit and save all routing tables and then transfer them together to work more efficiently.

7-4-5 Connecting to the PLC

Connect the Programming Device to a PLC in the network to transfer the routing tables. All PLCs receiving the routing table settings must have power turned ON for the transfer.

Note The Programming Device must be disconnected and then reconnected to a PLC on each network.

7-4-6 Routing Table Enable Bit (C200HX/HG/HE and CQM1H-series Only)

Routing tables are written to DM 6450 through DM 6499 with C200HX/HG/HE and CQM1H-series PLCs. Do not write any other data in these words when using routing tables.

Make sure that bit 12 of the DM word shown below is set at 1 (ON) to allow you to set and use routing tables.

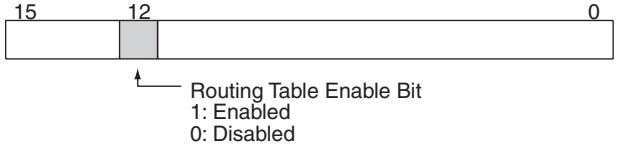
C200HX/HG/HE

Operating level 0: DM 6400

Operating level 1: DM 6420

CQM1H

DM 6400



DM 6450 through DM 6499 can be used as desired if the Routing Table Enable Bit is set at 0 to disabled routing tables.

7-4-7 Transferring Routing Tables

Routing tables saved on a Programming Device can be read from memory and transferred to the PLCs on the network. First load and transfer routing tables to the PLC connected to the Programming Device. This enables networks to be distinguished even when multiple Communications Units are connected, and it enables routing tables to be transferred to other nodes on the network.

Once routing tables are transferred to the PLC connected to the Programming Device as well as all nodes on the same network, disconnect the Programming Device, reconnect it to a PLC on another network, and repeat the procedure.

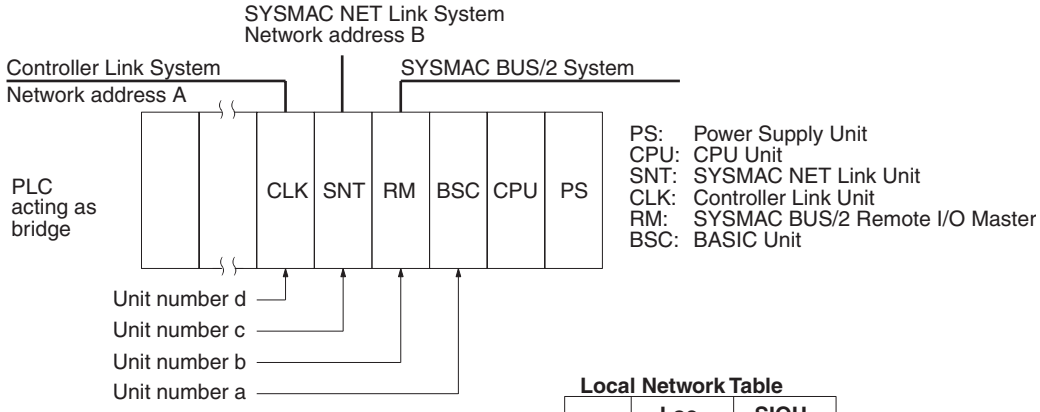
⚠ **Caution** CPU Bus Units are reset when routing tables are transferred from a Programming Device to a PLC to allow set routing tables to be read. Make sure that resetting CPU Bus Units will not cause equipment damage or dangerous system behavior before transferring tables.

7-4-8 Example Routing Table Settings

This section shows examples of routing table settings.

Example 1

The example below shows local network table settings when multiple CPU Bus Units are mounted in a single CVM1 or CV-series PLC.



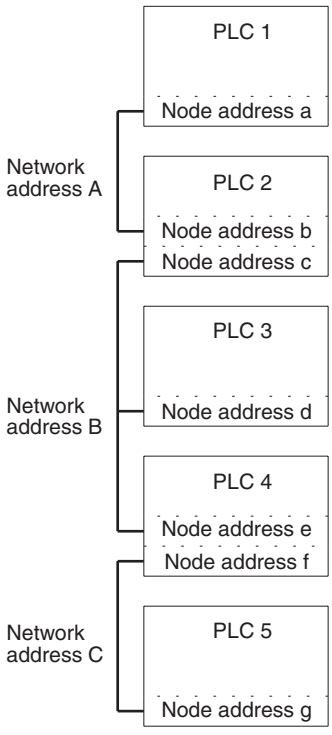
Local Network Table

No.	Loc Netwk	SIOU unit #
1	A	(d)
2	B	(c)

Do not register SYSMAC BUS/2 Master Units and BASIC Units in local network tables because these Units do not connect to networks.

Example 2

The following example show the settings for a relay network table connecting three networks.



Relay Network Tables

No.	End Netwk	PC ID	Relay Netwk	Node
1	B		A	b
2	C		A	b

No.	End Netwk	PC ID	Relay Netwk	Node
1	C		B	e

No.	End Netwk	PC ID	Relay Netwk	Node
1	A		B	c
2	C		B	e

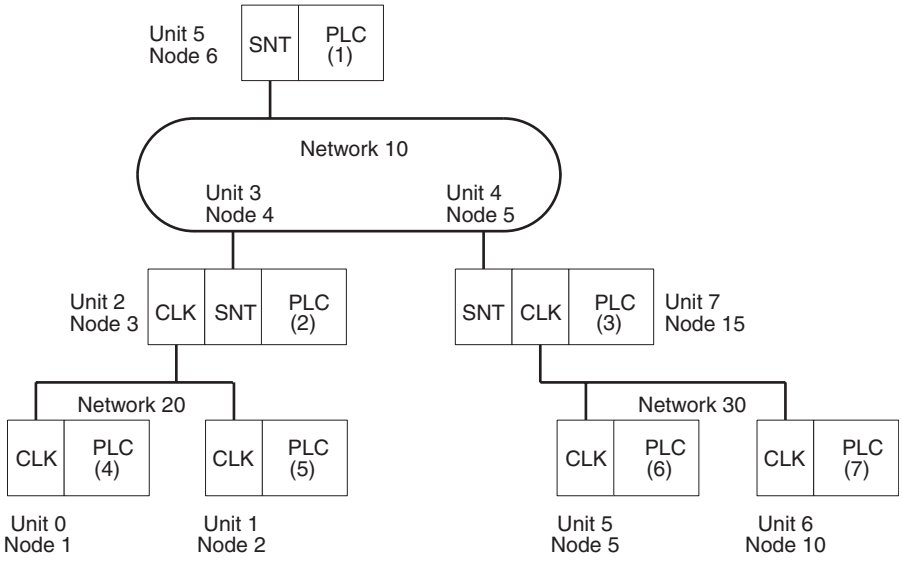
No.	End Netwk	PC ID	Relay Netwk	Node
1	A		B	c

No.	End Netwk	PC ID	Relay Netwk	Node
1	A		C	f
2	B		C	f

On closer examination of the relay network table for PLC#, we see that the relay network is B and the relay node is c when network A is the destination, and that the relay network is B and the relay node is e when network C is the destination.

Example 3

The network structure example in the figure below shows routing tables for all nodes.



Routing Tables on PLC 1

Local Network Table

No.	Loc Netwk	SIOU unit#
1	010	05
2		
3		

Relay Network Table

No.	End Netwk	PC ID	Relay Netwk	Node
1	020		010	004
2	030		010	005
3				

Routing Tables on PLC 2

Local Network Table

No.	Loc Netwk	SIOU unit#
1	010	03
2	020	02
3		

Relay Network Table

No.	End Netwk	PC ID	Relay Netwk	Node
1	030		010	005
2				
3				

Routing Tables on PLC 3

Local Network Table

No.	Loc Netwk	SIOU unit#
1	010	04
2	030	07
3		

Relay Network Table

No.	End Netwk	PC ID	Relay Netwk	Node
1	020		010	004
2				
3				

Routing Tables on PLC 4

Local Network Table

No.	Loc Netwk	SIOU unit#
1	020	00
2		
3		

Relay Network Table

No.	End Netwk	PC ID	Relay Netwk	Node
1	010		020	003
2	030		020	003
3				

Routing Tables on PLC 5

Local Network Table

No.	Loc Netwk	SIOU unit#
1	020	01
2		
3		

Relay Network Table

No.	End Netwk	PC ID	Relay Netwk	Node
1	010		020	003
2	030		020	003
3				

Routing Tables on PLC 6

Local Network Table

No.	Loc Netwk	SIOU unit#
1	030	05
2		
3		

Relay Network Table

No.	End Netwk	PC ID	Relay Netwk	Node
1	010		030	015
2	020		030	015
3				

Routing Tables on PLC 7

Local Network Table

No.	Loc Netwk	SIOU unit#
1	030	06
2		
3		

Relay Network Table

No.	End Netwk	PC ID	Relay Netwk	Node
1	010		030	015
2	020		030	015
3				

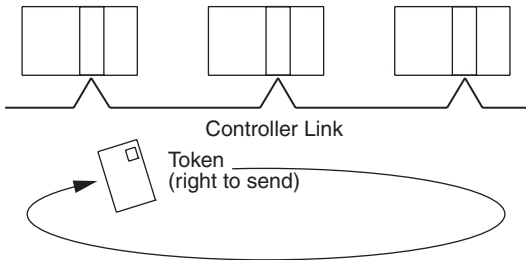
SECTION 8
Communications Timing

This section explains details on Controller Link Network communications. Refer to this section for network communications that require accurate communications timing.

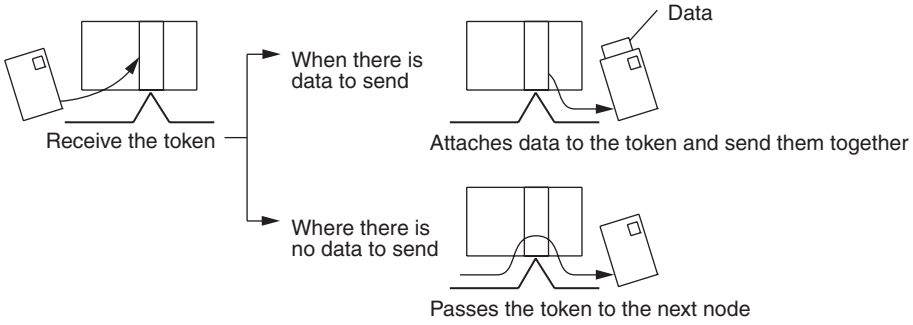
8-1 Communications Mechanism 252
8-1-1 Data Transmissions over the Network 252
8-1-2 Setting the Polling and Polled Nodes 253
8-1-3 Network Parameters 254
8-1-4 Specifying Network Parameters 255
8-2 Communications Cycle Time 255
8-2-1 Active Data Links 255
8-2-2 Inactive Data Links 256
8-3 Data Link I/O Response Time 257
8-3-1 Data Exchange Timing 257
8-3-2 Data Processing Time 258
8-3-3 Calculation Example 259
8-4 Message Delay Times 264
8-4-1 CS/CJ-series, CVM1, and CV-series PLCs 264
8-4-2 C200HX/HG/HE and CQM1H-series PLCs 268

8-1 Communications Mechanism

8-1-1 Data Transmissions over the Network



In a Controller Link Network, token passing is used to control network access. The right to send, called a "token," circulates around the network. A node that receives the token is allowed to send data. If the node has data to send, it will attach the data to the token and send them together. If the node has no data to send, it will pass the token to the next node.



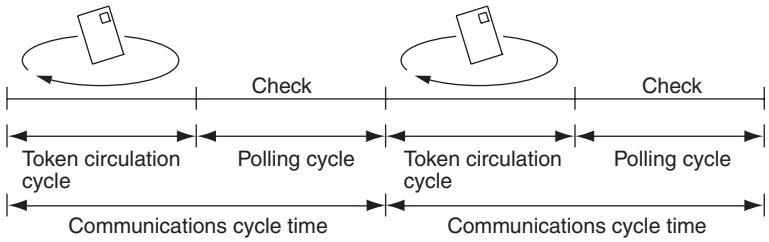
A token can be thought of as a circulating envelope. This envelope is circulated through the network and the person who receives the envelope will put a destination and a memo into the envelope to send his or her message to somebody else. This method is called "token passing." The Controller Link Network is a bus network that uses token passing.

The overall network communications procedure is explained below.

1,2,3...

1. The Unit at the node that manages the network, called the "polling node," transfers the token. The token is circulated through the network in ascending order of node addresses. One cycle in which the token is circulated among all nodes on the network is called a "token circulation cycle."
2. After one token circulation cycle is complete, the polling node checks the network connection status. One cycle in which the connection status of all nodes on the network is checked is called a "polling cycle."
3. After one polling cycle is complete, the polling node transfers the token again.

The procedure is then repeated. In a Controller Link Network, the total time required for a token circulation cycle and a polling cycle is called the "communications cycle time." Communications processing is executed by repeating the communications cycle.



Polling Node

Each Controller Link Network always has a Unit that controls communications within the network. This Unit is called the "polling node." Normally, the node that has the smallest node address in the network is the polling node (see note). All Units at nodes other than the polling node are called "polled nodes" (or polled units). The polling node controls the token, checks the network, and performs other relevant tasks. Should the polling node break down, the node with the next smallest node address is automatically selected as the polling node to prevent the entire network from shutting down.

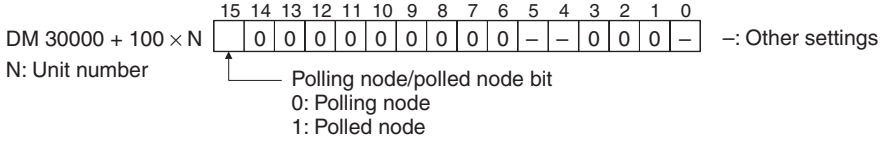
Note The node with the smallest node address is not always the polling node, depending on the Unit start-up sequence, models, settings, and Unit status.

When the polling node breaks down, the next polling node is temporarily disconnected from the network, reconstructs the network, and then reconnects to the network. Polling nodes remain connected to the network.

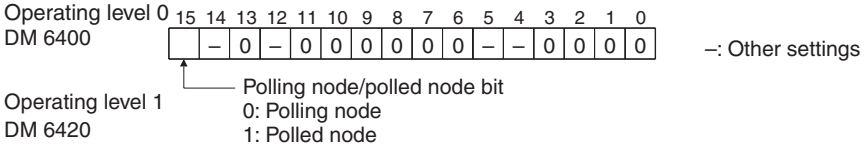
8-1-2 Setting the Polling and Polled Nodes

Use the Programming Device for the PLC to set Units as polling node or polled node in the DM Parameter Area.

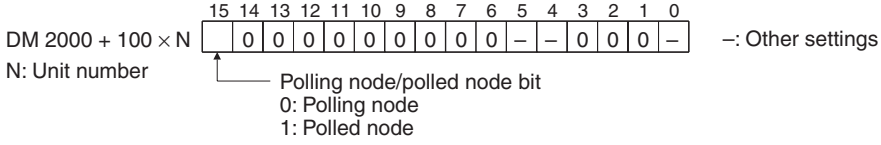
CS/CJ-series Controller Link Units



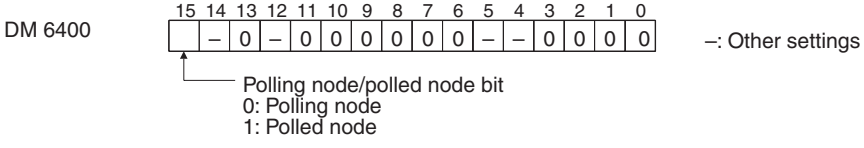
C200HX/HG/HE Controller Link Units



CVM1 and CV-series Controller Link Units



CQM1H-series Controller Link Units



If the node is always to be connected as a polled node when the power is turned on, set it as a polled node. If the node can become a polling node when the power is turned on, set it as a polling node. One of the nodes set as a polling node will serve as the actual polling node. Except for maintenance after Unit replacement (see *9-6 Handling Precautions*), set the Units all nodes as polling nodes (set the polling node/polled node bit to "0").

8-1-3 Network Parameters

Network parameters are also used to control network operations. Network parameters are read from the polling node and distributed to all other nodes when the Controller Link Network is started. In this way, all nodes on the network always have the same network parameter settings. If nodes are connected to the network halfway during network operation, the network parameter settings will also be distributed to these nodes when they are connected. The following three network parameters can be specified.

Maximum Node Address

This parameter specifies the maximum node address of nodes to be checked by the polling node. The default is 32. (See note.) Reducing the setting of this parameter reduces the number of nodes checked by the polling node and can thus avoids unnecessary check operations. However, if the network contains nodes with node addresses greater than the setting of the parameter, these nodes will not be connected to the network.

Note The default maximum node address will be set to 62 when the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches of the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 Unit is ON and the Unit is restarted.

No. of Polled Nodes per Communications Cycle

This parameter specifies the number of nodes to be checked (polled) by the polling node during each polling cycle. The default is 4. Setting this parameter to a high value increases the communications cycle time, but reduces the time required to recognize that nodes have been removed from or added to the network. Reducing the setting of this parameter shortens the communications cycle time but delays a network response when a node is disconnected from or connected to the network.

No. of Event-frames per Communications Cycle

This parameter specifies the maximum number of event frames (communications other than data links, such as message service transmissions) that can be transferred during a communications cycle. Specify a value in units of 128 bytes. The default is 35 ($128 \times 35 = 4{,}480$ bytes).

Increasing the setting of this parameter increases the communications cycle time but allows for more event communications such as the message service. Too small a parameter value restricts event communications, resulting in an error. See *8-2 Communications Cycle Time* (on page 255) for the effects of network parameters on communication cycle times.

8-1-4 Specifying Network Parameters

The network parameters can be specified from the Controller Link Support Software. This section describes only the allowable setting range for each network parameter. Refer to the *Controller Link Support Software Operation Manual* (W308) for setting procedures.

The following table shows the setting range and default for network parameters.

Network parameter	Setting range	Default value
Maximum node address	2 to 32 (See note 1.)	32 (See note 1.)
Number of polled nodes per communications cycle	1 to 31	4
Maximum no. of event-frames per communications cycle	6 to 238	35

The network parameters become valid immediately after being set.

Note

1. The setting range will be 2 to 62 and the default value will be 62 when the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches of the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 Unit is ON and the Unit is restarted.
2. Always stop the data link before changing network parameters.
3. Specify a value for the maximum node address that is equal to or greater than the maximum node address in the Controller Link Network.
4. For the CVM1 and CV-series PLCs, always set the System Protect Key Switch on the CPU Unit to NORMAL. Otherwise, the network parameter settings will not be stored normally.
5. The maximum node address cannot be changed to 32 when the Wired Network 62 Node Enable Bit is ON in the DM Parameter Area software switches of a CS1W-CLK23, CJ1W-CLK23, CS1W-CLK21-V1, or CJ1W-CLK21-V1 Unit with unit version 1.2 or later.

8-2 Communications Cycle Time

This section describes how to calculate the communications cycle time.

8-2-1 Active Data Links

The following equations are used to calculate the communications cycle time when data links are operating.

Wired Systems

Baud rate	Equation
2 Mbps	$10 \times A + 600 \times B + 290 \times C + 320 \times D + 4 \times E + 3{,}290$ (μs)
1 Mbps	$18 \times A + 1{,}150 \times B + 370 \times C + 360 \times D + 8 \times E + 3{,}770$ (μs)
500 Kbps	$34 \times A + 2{,}260 \times B + 530 \times C + 440 \times D + 16 \times E + 4{,}730$ (μs)

Note A: Total number of data link words within the network (total number of words in send areas of all nodes)
B: Number of polled nodes per comm cycle (value specified in the network parameters)
C: Number of nodes connected to the network
D: Number of nodes that send messages during the communications cycle
E: Total number of bytes in messages transmitted during the communications cycle

The number of bytes in each message differs according to the instruction being issued.

Instruction	When sent	When received
SEND	Number of words to be sent × 2 + 18	14
RECV	18	Number of words to be received × 2 + 14
CMND	Number of bytes in command data + 10	Number of bytes in response data

Calculation Example

Communications conditions are as follows:

Transmission medium:	Twisted-pair cable
Baud rate:	2 Mbps
Network parameters:	Defaults
Max node address:	32
Polled nodes per comm cycle:	4
Event-frames per comm cycle:	35
Network configuration:	8 nodes
Total number of data link words:	8,000 words
Nodes that send messages:	2 nodes
Bytes in all messages sent:	2,012 × 2 bytes

In this example, A to E in the equation have the following values.

A: 8,000
B: 4
C: 8
D: 2
E: 4,024

The communications cycle time is thus as follows:

$10 \times 8{,}000 + 600 \times 4 + 290 \times 8 + 320 \times 2 + 4 \times 4{,}024 + 3{,}290 = 104{,}746$ (μs)
$\cong 105$ (ms)

8-2-2 Inactive Data Links

The following equations are used to calculate a communications cycle time when the data link is inactive.

Wired Systems

Baud rate	Equation
2 Mbps	600 × B + 110 × C + 320 × D + 4 × E + 2,290 (μs)
1 Mbps	1,150 × B + 150 × C + 360 × D + 8 × E + 2,690 (μs)
500 Kbps	2,260 × B + 230 × C + 440 × D + 16 × E + 3,490 (μs)

Note B: Number of polled nodes per communications cycle (value specified in the network parameter)
C: Number of nodes connected to network
D: Number of nodes that send messages during the communications cycle
E: Total number of bytes in messages transmitted during the communications cycle

The number of bytes in each message differs according to the instruction being issued.

Instruction	When sent	When received
SEND	Number of words to be sent × 2 + 18	14
RECV	18	Number of words to be received × 2 + 14
CMND	Number of bytes in command data + 10	Number of bytes in response data

Calculation Example

Communications conditions are as follows:

Transmission medium:	Twisted-pair cables
Baud rate:	2 Mbps
Network parameters:	Defaults
Max node address:	32
Polled nodes per comm cycle:	4
Event-frames per comm cycle:	35
Network configuration:	8 nodes
Nodes that send messages:	2 nodes
Bytes in all messages sent:	2,012 × 2 bytes

In this example, B to E in the equation have the following values.

B: 4
C: 8
D: 2
E: 4,024

The communications cycle time is thus as follows:

$600 \times 4 + 110 \times 8 + 320 \times 2 + 4 \times 4{,}024 + 2{,}290 = 22{,}306$ (μs)
$\cong 22$ (ms)

8-3 Data Link I/O Response Time

When accurate communications timing is required, you need to understand data exchange timing and the time required for data transmission and reception via data links. Use the information described in this section as reference information for system construction.

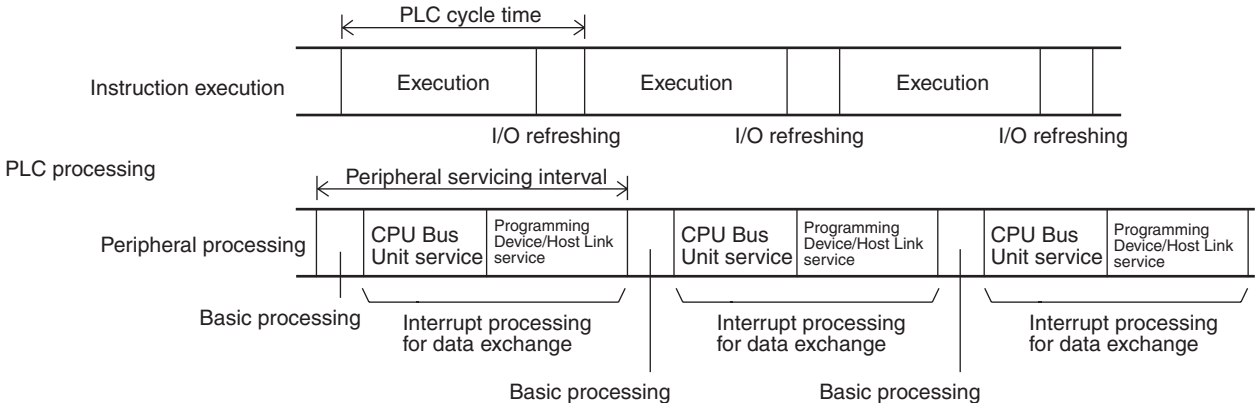
8-3-1 Data Exchange Timing

This section describes data exchange timing for data links between the Controller Link Unit and the PLC's CPU Unit. Data exchange is executed as interrupt processing during CPU Bus Unit or Programming Device/Host Link servicing performed by the CPU Unit. This interrupt processing is executed each time data exchange between the local node and each node connected via a data link is completed.

Data exchange timing differs depending on the CPU Unit model and the CPU Unit the Execute Process (asynchronous or synchronous) specified in PLC Setup, as described below.

CVM1 and CV-series PLCs Under Asynchronous Operation

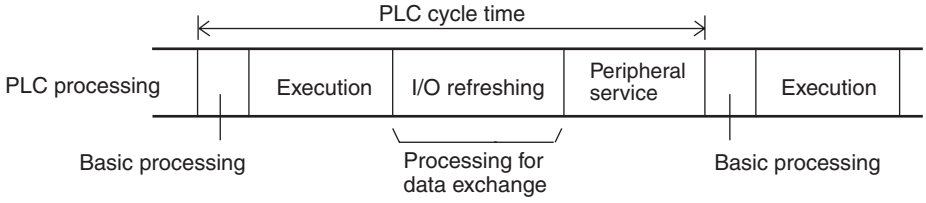
When a CVM1 or CV-series CPU Unit is operating in asynchronous mode, data exchange with the Controller Link Unit is executed as interrupt processing during peripheral processing, regardless of the cycle time of PLC instruction execution. Data exchange timing is as follows:



More than one data exchange can be executed during a PLC cycle, depending on the data exchange timing. If interrupt processing for data exchange is executed, the peripheral servicing interval will be lengthened by the time required for the interrupt processing (see *8-3-2 Data Processing Time* on page 258).

CS/CJ-series PLCs, CVM1 and CV-series PLCs in Synchronous Mode, CQM1H-series PLCs, and C200HX/HG/HE PLCs

When a CS/CJ-series, CQM1H-series, CVM1, or CV-series PLC is operating in synchronous mode, a CQM1H-series, or a C200HX/HG/HE PLC is operating, data exchange with the Controller Link Unit is executed as processing during peripheral processing for the PLC cycle. Data exchange timing is as follows:



If processing for data exchange is executed, the PLC cycle time will be lengthened by the time required for the interrupt processing (see *8-3-2 Data Processing Time* below).

8-3-2 Data Processing Time

The time required to process data exchange (data processing time) can be roughly estimated as shown in the following table.

CPU Unit	Equation estimating data processing time
CS1-H, CJ1-H, CJ1M CPU Unit	0.1 ms + Number of transfer words × 0.7 μs
CS1, CJ1 CPU Unit	1.5 ms + Number of transfer words × 1 μs
CVM1-series CPU Unit	1.7 ms + Number of transfer words × 1 μs

The number of words processed in a single data exchange is shown in the following table for each series of PLC. If the number of data link words exceeds the value shown in the table, data exchange will be executed as several separate processes.

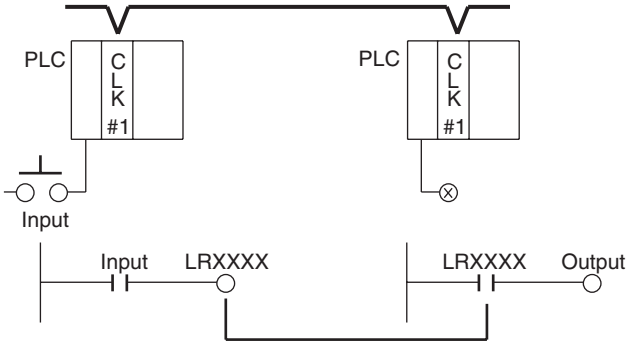
PLCs	Words per data exchange
CS/CJ-series PLCs	Approx. 7,800 words
CVM1 and CV-series PLCs	Approx. 3,700 words
C200HX/HG/HE PLCs	Approx. 4,000 words
CQM1H-series PLCs	Approx. 1,200 words

Note

1. Use the above equations only if only one Controller Link Unit is mounted on the PLC. If other CPU Bus Units are mounted on the PLC, obtain the refresh times for each CPU Bus Unit and add to the above equations.
2. The execution of some items takes precedence over data link area refreshing. For example, data link area refreshing will not take place during execution of the SEND(192), RECV(193), or FAL(006) instruction.

8-3-3 Calculation Example

The data links of the Controller Link Unit require a slight time delay from the time the data link area of one node is changed until this change is reflected in the data link area at another node. This time delay is called the data link I/O response time. The following is a calculation example of the maximum and minimum I/O response times for the system configuration shown below.



CLK: Controller Link Unit

System configuration

Baud rate:	2 Mbps
Maximum node address:	32
Number of polled nodes per comm cycle:	4
Number of event-frames per comm cycle:	35
Nodes in network:	8 nodes
Nodes in data links:	8 nodes
Words sent in area 1:	8 words per node
Words in area 2:	16 words per node

No messages communications are performed.

A single Controller Link Unit is mounted to each CPU Rack.

The data link I/O response time depends on the communications cycle time, input ON delay, output ON delay, and the cycle times of the PLCs involved. The values are detailed below.

Communications Cycles Time

Communications cycle time =
$10 \times (8 + 16) \times 8 + 600 \times 4 + 290 \times 8 + 320 \times 0 + 4 \times 0 + 3{,}290$
$= 9{,}930\ \mu s \cong 9.9$ ms

Input ON Delay

The input ON delay is the time it takes for an input device to turn ON an input to the PLC after receiving an input signal. In this system the input ON delay is 1.5 ms.

Output ON Delay

The output ON delay is the time it takes for an output device to turn ON an output signal after receiving an output from the PLC. In this system the output ON delay is 15 ms.

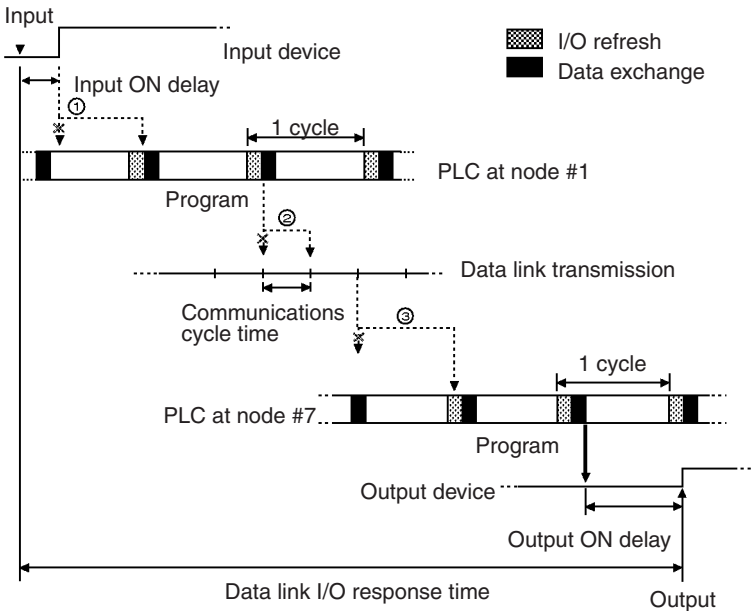
Cycle Times

The cycle time of the PLC at node #1 is 25 ms.

The cycle time of the PLC at node #7 is 10 ms.

CS/CJ-series, CVM1, or CV-series PLC Under Synchronous Operation, C200HX/HG/HE PLC, or CQM1H-series PLC

Maximum Data Link I/O Response Time



There are three points shown in the diagram above where processing is delayed, increasing the data link I/O response time.

1,2,3...

1. The input arrives in the PLC just after I/O refreshing, causing a delay of up to one cycle before the input is read into the PLC.
2. Data exchange occurs just after the PLC at node #1 passes the token, causing a processing delay of up to one communications cycle time until the next token is received. There is a maximum delay of one communications cycle after the token is received.
3. At node #7, data from the previous data exchange is still being transferred, causing a delay of up to one cycle before the input is read into the PLC. (If the cycle time at node #7 is longer than the communications cycle time, the processing will be delayed for two cycles.) Also, if the total number of data link words exceeds the maximum number for a single exchange, the data exchange will be divided up and there may be a delay of one to two additional cycles.

   The maximum number of words that can be exchanged in a single data exchange is approx. 7,800 words for CS/CJ-series PLCs, approx. 3,700 words for CVM1 and CV-series PLCs, approx. 4,000 for C200HX/HG/HE PLCs, and approx. 1,200 words for CQM1H-series PLCs.

The equation for maximum data link I/O response time is as follows:

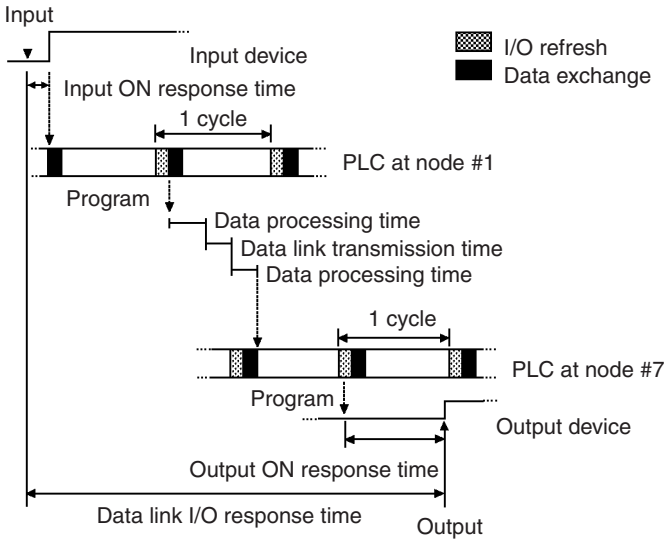
Input ON delay	1.5 ms
Cycle time of PLC at node #1 × 2	25 ms × 2
Communications cycle time × 2	22 ms × 2
PLC cycle time at node #7 × 2 (See note.)	10 ms × 2 (See note.)
Output ON delay	15 ms
Total (data link I/O response time)	130.5 ms

Note The PLC cycle time when data link words exceed 12,000 using a CS/CJ-series Controller Link Unit with unit version 1.2 or later is calculated as follows.

12,000 to 15,600 (approx.) words: × 3
15,600 (approx.) to 20,000 words: × 4
If there is a node with more than 3,850 send words, however, the factors become × 5 and × 6.

Noise may increase I/O delays.

Minimum Data Link I/O Response Time



The minimum data link I/O response time (i.e., the time that will not delay any processing) can be calculated as follows:

Both the input ON response time and output ON response time are considered negligible (0), but the data processing time required for data exchange and the time required for the data transmission itself cannot be ignored, so they are included in the total. The respective values are as follows:

Data processing time:
0.001 × (8 + 16) + 0.1 = 0.124 ≅ 0.1 ms

Data Link transmission time:

The following formula is derived from the transmission speed (2 Mbits/s).

0.008 × Number of data link words (ms)

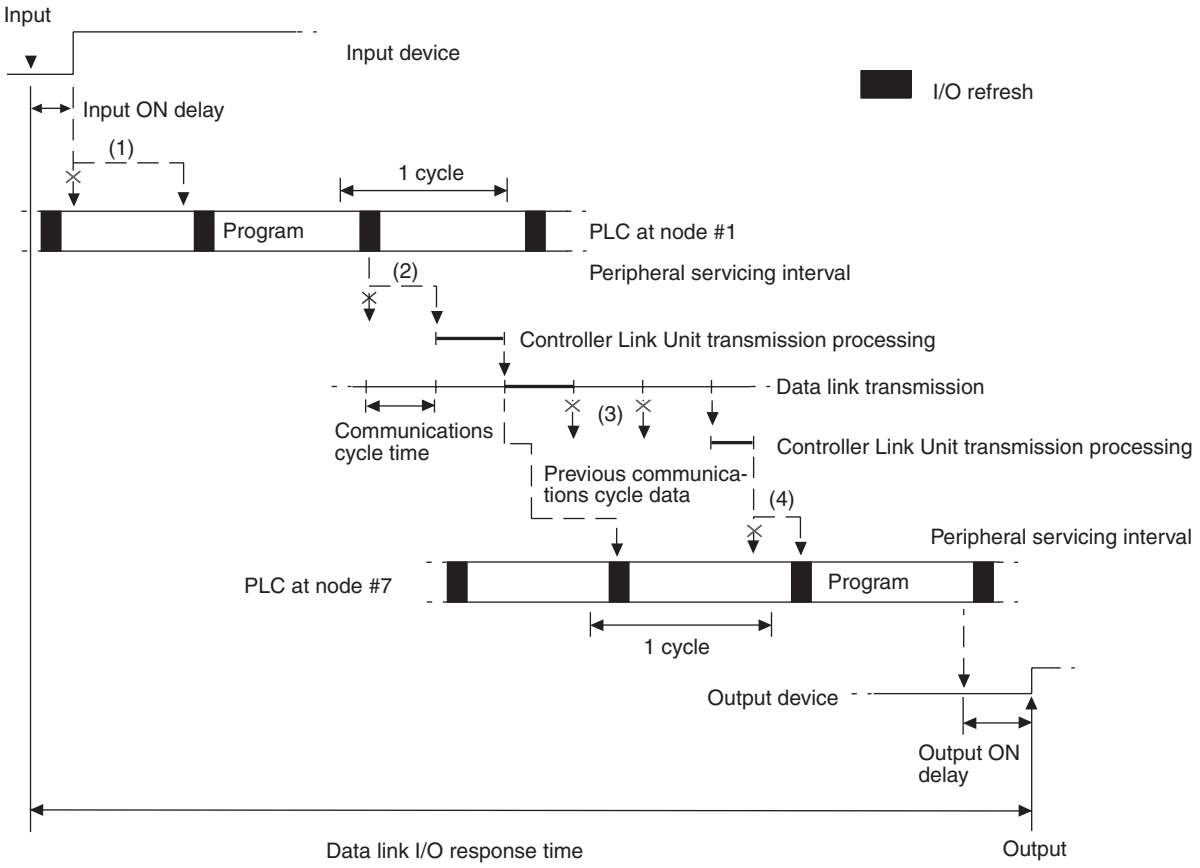
In this case, this gives the following result.
0.008 × (8 + 16) = 0.19 ≅ 0.2 ms

Cycle time of PLC at node #1	25 ms
Data processing time	1.9 ms
Data link transmission time	0.2 ms
Data processing time	0.1 ms
PLC cycle time at node #7	10 ms
Total (data link I/O response time)	37.2 ms

Note Noise may increase I/O delays.

CVM1 and CV-series PLCs Under Asynchronous Operation

Maximum Response Time



There are five points shown in the diagram above where processing is delayed, increasing the data link I/O response time.

1,2,3...

1. The input arrives in the PLC just after I/O refreshing, causing a delay of up to one cycle before the input is read into the PLC.
2. Data exchange occurs just after the PLC at node #1 passes the token that makes it the polling node, causing a delay of up to one communications cycle time before the data is transferred in data link processing.
3. At node #7, data from the previous data exchange is still being transferred, causing a delay of up to one cycle before the input is read into the PLC.
4. The data transferred in data link processing arrives at the PLC at node #7 after data exchange, so the data will not be read into the PLC until the next data exchange, causing a delay of up to one peripheral servicing interval.

   Up to 3,700 words can be transferred in a single data exchange, so a delay of another peripheral servicing interval will occur if more than 3,700 words are being transferred.
5. The data is received after the PLC at node #7 has executed the instruction, causing a delay of up to one cycle time.

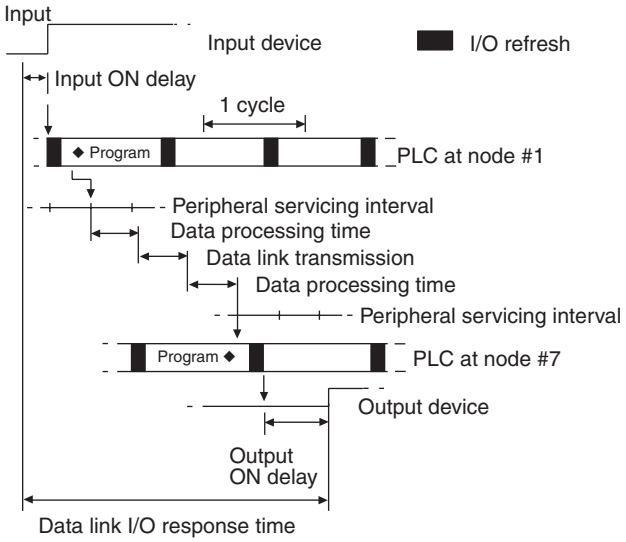
Assume that the peripheral servicing interval of the PLCs at nodes #1 and #7 is 10 ms. The equation for maximum data link I/O response time is as follows:

Input ON delay	1.5 ms
Cycle time of PLC at node #1 × 2	15 ms × 2
Peripheral servicing interval of PLC at node #1	10 ms
Communications cycle time × 3	9.9 ms × 3
Peripheral servicing interval of PLC at node #7 × 2	10 ms × 2
PLC cycle time at node #7 × 2 (See note.)	20 ms × 2 (See note.)
Output ON delay	15 ms
Total (data link I/O response time)	146.2 ms

Note If the total number of data link words is greater than the maximum number of words that can be exchanged per data exchange, the maximum data link I/O response time will be cycle time of PLC at node #7 × 3.

Noise may increase I/O delays.

Minimum Response Time



In this case, the data processing time required for data exchange and the data transmission time are not negligible and need to be included in the calculation. Each time can be determined as follows.

Data Processing Time (see page 258.)

0.0025 × (8 + 16) × 8 + 4.7 = 5.18 ≅ 5.2 ms

Data Transmission Time

Data transmission time varies with the baud rate.

Baud rate	Data transmission time
2 Mbps	Number of data link words × 0.008 ms
1 Mbps	Number of data link words × 0.016 ms
500 Kbps	Number of data link words × 0.032 ms

In this example, the number of data link words is (8 + 16) × 8 = 192, so the data transmission time can be determined as follows:
0.008 × (8 + 16) × 8 = 1.536 ≅ 1.5 ms

Assume that the sum of the instruction execution time and I/O refresh time for the PLCs at nodes #1 and #7 is 1 ms. The equation for minimum data link I/O response time is as follows:

Input ON delay	---
Instruction execution time + I/O refresh time for PLC at node #1	1 ms
Data processing time	5.2 ms
Data link transmission time	1.5 ms
Data processing time	5.2 ms
Instruction execution time + I/O refresh time for PLC at node #7	1 ms
Output ON delay	---
Total (data link I/O response time)	13.9 ms

Noise may increase I/O delays.

8-4 Message Delay Times

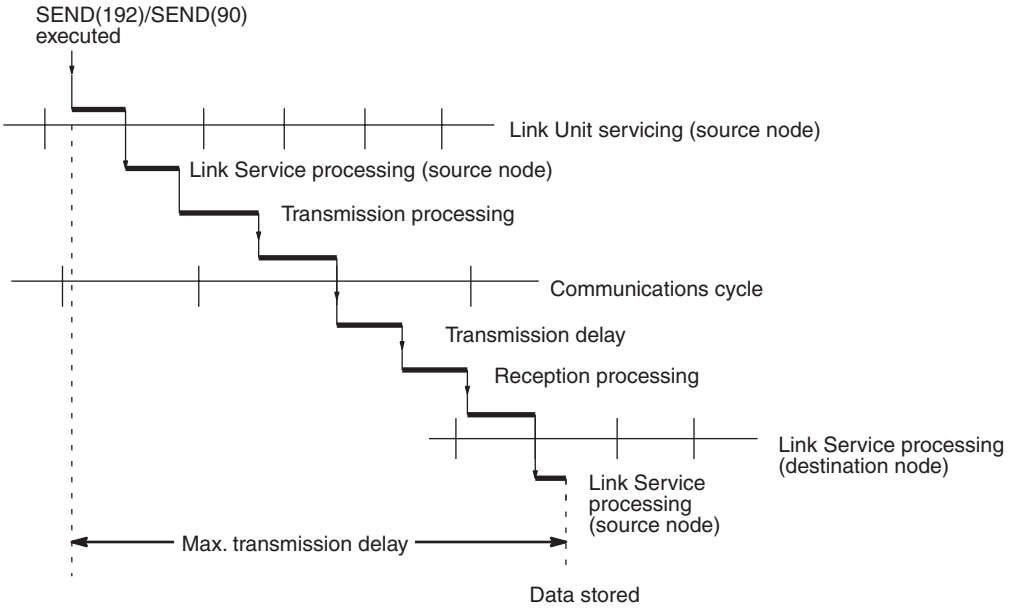
The two charts which follow indicate the sequence of processing which will enable users to calculate the maximum delay time to be expected between the time SEND(192) or RECV(193) is executed and the time the data is stored in the destination or source node's memory area, ready for use by other instructions in the program.

8-4-1 CS/CJ-series, CVM1, and CV-series PLCs

SEND

The following diagram indicates the data flow which will yield the maximum delay time from the time SEND(192)/SEND(90) is executed by the user program to the time the Controller Link Unit stores the data in the destination Unit's memory.

Note Be sure to take into account the time required for data links and program execution, which are not included in the following example.



Max. transmission delay = Link Unit servicing interval (source node) + Link service processing (source node) + Transmission processing + Communications cycle time + Transmission delay + Reception processing + Link Unit servicing interval (destination node) + Link service processing (destination node)

Link Servicing Interval (Source and Destination Nodes)

Link servicing depends on the execution mode of the PLC. The execution modes on the source and destination modes need not be the same.

For synchronous execution, links are serviced once per PLC execution cycle. For asynchronous execution, links are serviced according to the peripheral servicing interval. Refer to the operation manual for the PLC for details. Refer to the *CVM1 and CV-series PLCs Operation Manual: Ladder Diagrams* (W202) or *CS/CJ-series PLCs Instructions Reference Manual* (W340) for details.

Link Service Processing (Source and Destination Nodes)

Link service processing is the same as the PLC's peripheral servicing and is approximately 1 ms for Controller Link Units.

Transmission Processing

Number of words transferred × 0.00075 ms + 2 ms

Communications Cycle Time (with Data Links Inactive)

See *8-2 Communications Cycle Time* (on page 255).

Transmission Delay Time

Transmission delay time varies with the baud rate.

Baud rate	Transmission delay time
2 Mbps	Number of words transferred × 0.008 + 0.112 ms
1 Mbps	Number of words transferred × 0.016 + 0.224 ms
500 Kbps	Number of words transferred × 0.032 + 0.448 ms

Reception Processing

Number of words transferred × 0.00075 + 1.3 ms

Note The I/O response time can increase due to noise or restrictions on the number of frames that can be transmitted while data links are operating.

Example

In this example, the maximum transmission delay is calculated for an instruction sending 256 words of data in a system with 32 nodes. Network specifics are detailed below:

Baud rate:	2 Mbps
Max. node address:	32
Number of nodes:	32
Number of polled nodes per comm cycle:	4
Source node execution:	Synchronous
Destination node execution:	Asynchronous
Number of words:	256
Data link:	Inactive

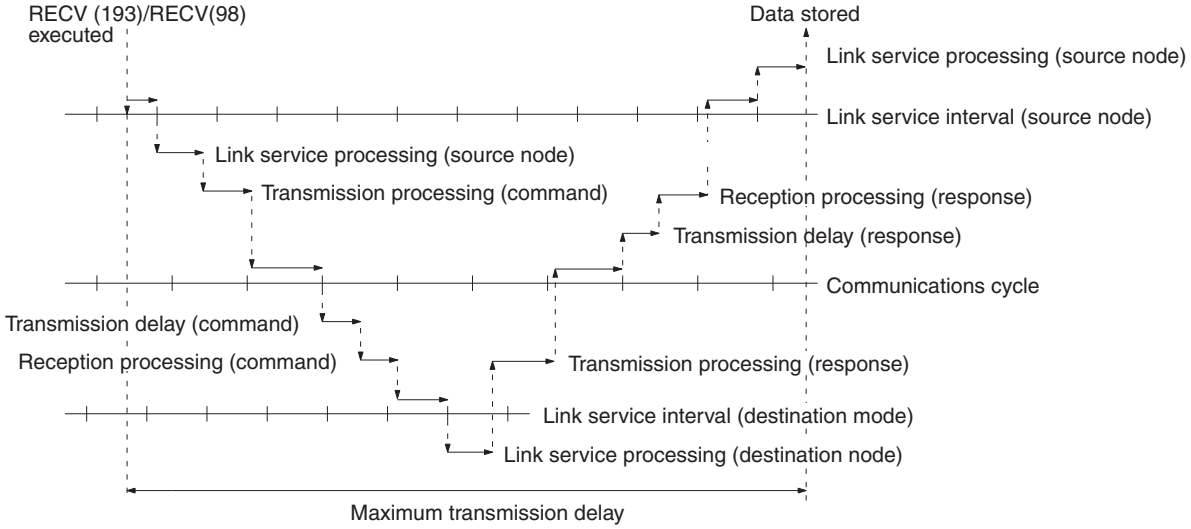
Link servicing interval (source node)	PLC cycle time (source node)
Link service processing (source node)	1 ms
Transmission processing	0.00075 × 256 + 2 = 2.192 ≅ 2.2 ms
Communications cycle time (See note.)	600 × 4 + 110 × 32 + 320 × 0 + 4 × 0 + 2,290 = 8,210 μs ≅ 8.2 ms
Transmission delay	0.008 × 256 + 0.112 = 2.16 ≅ 2.2 ms
Reception processing	0.00075 × 256 + 1.13 = 1.492 ≅ 1.5 ms
Link servicing interval (destination node)	As required by Programming Device
Link service processing (destination node)	1 ms
Total (max. transmission delay)	**PLC cycle time (source node) + Peripheral servicing interval (destination node) + 16.1 ms**

Note This communications cycle time is calculated assuming that there is no node that transmits event frames before the SEND command is sent.

RECV Instruction Maximum Delay Time

The data flow which will yield the maximum transfer interval from the time the RECV(193)/RECV(98) instruction is executed by the user program to the time the Controller Link Unit stores the data in the local Unit's memory area is described below.

Note Be sure to take into account the time required for data links and program execution, which are not included in the following example.



Max. transmission delay = Link servicing interval (source node) + Link service processing (source node) + Transmission processing (command) + Communications cycle + Transmission delay (command) + Reception processing (command) + Link servicing interval (destination node) + Link service processing (destination node) + Transmission processing (response) + Communications cycle + Transmission delay (response) + Reception processing (response) + Link servicing interval (source node) + Link service processing (source node).

Link Servicing Interval (Source and Destination Nodes)

Link servicing depends on the execution mode of the PLC. The execution modes on the source and destination modes need not be the same.

For synchronous execution, links are serviced once per PLC execution cycle. For asynchronous execution, links are serviced according to the peripheral servicing interval. Refer to the *CVM1 and CV-series PLCs Operation Manual: Ladder Diagrams* (W202) for details.

Link Service Processing (Source and Destination Nodes)

Link service processing is the same as the PLC's peripheral servicing and is approximately 1 ms for Controller Link Units.

Transmission Processing

Commands: 2 ms
Responses: Number of words transferred × 0.00075 ms + 2 ms

Communications Cycle Time (with Data Links Inactive

See *8-2 Communications Cycle Time* (on page 255).

Transmission Delay Time

Transmission delay time varies with the baud rate.

Baud rate	Transmission delay time
2 Mbps	Number of words transferred × 0.08 + 0.112 ms
1 Mbps	Number of words transferred × 0.016 + 0.224 ms
500 Kbps	Number of words transferred × 0.032 + 0.448 ms

Note Commands: Transmission delay time is calculated assuming that the number of words to be transferred is zero.
Responses: Transmission delay time is calculated according to the number of words to be transferred.

Reception Processing

Commands: 1.3 ms
Responses: Number of words transferred × 0.00075 ms + 2 ms

The I/O response time can increase due to noise or restrictions on the number of frames that can be transmitted while the data link is operating.

Example

In this example, the maximum transmission delay is calculated for an instruction receiving 256 words of data in a system with 32 nodes. Network specifics are detailed below:

Baud rate:	2 Mbps
Max. node address:	32
Number of nodes:	32
Number of polled nodes per comm cycle:	4
Source node execution:	Synchronous
Destination node execution:	Asynchronous
Number of words:	256
Data link:	Inactive

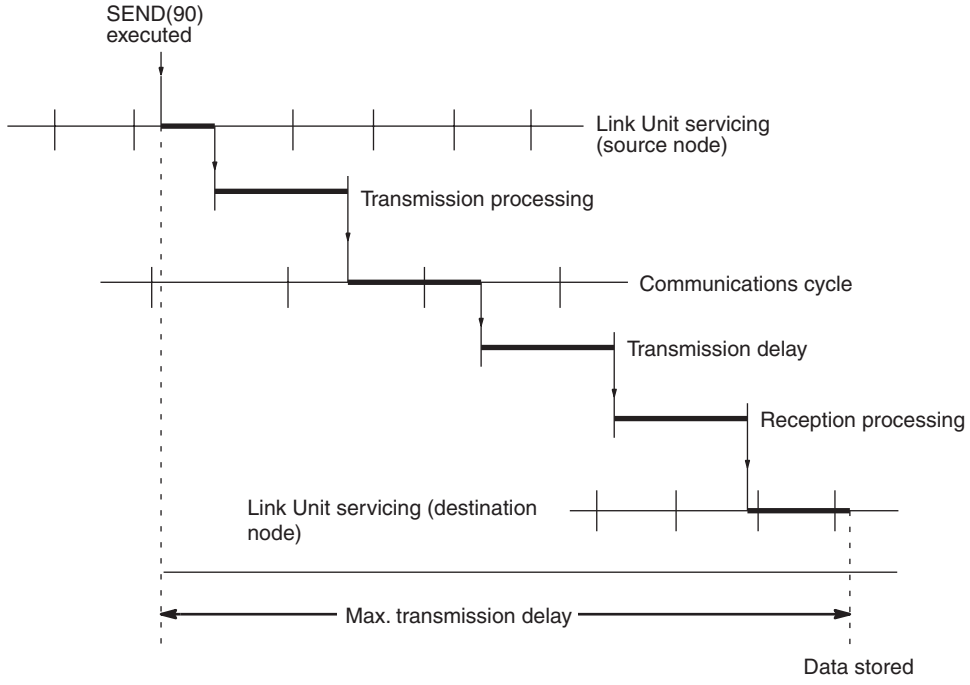
Link Unit servicing (source node) × 2	PLC cycle time (source node) × 2
Link service processing (source node) × 2	1 ms × 2 = 2 ms
Transmission processing (command)	2 ms
Communications cycle × 2 (See note.)	(600 × 4 + 110 × 32 + 320 × 0 + 4 × 0 + 2,290) × 2 = 8,210 μs × 2 ≅ 16.4 ms
Transmission delay (command)	0.112 ≅ 0.1 ms
Reception processing (command)	1.3 ms
Link servicing interval (destination node)	As required by Programming Device (destination node)
Link service processing (destination node)	1 ms
Transmission processing (response)	0.00075 × 256 + 2 = 2.192 ≅ 2.2 ms
Transmission delay (response)	0.008 × 256 + 0.112 = 2.16 ≅ 2.2 ms
Reception processing (response)	0.00075 × 256 + 2 = 2.192 ≅ 2.2 ms
Total (max. transmission delay)	**PLC cycle time (source node) × 2 + Peripheral servicing time (destination node) + 29.4 ms**

Note This communications cycle time is calculated assuming that there is no node that transmits event frames before the RECV command is sent.

8-4-2 C200HX/HG/HE and CQM1H-series PLCs

SEND(90)

The following diagram indicates the data flow which will yield the maximum delay time from the time SEND(90) is executed by the user program to the time the Controller Link Unit stores the data in the destination Unit's memory.



Max. transmission delay = Link Unit servicing interval (source node) + Transmission processing + Communications cycle time + Transmission delay + Reception processing + Link Unit servicing interval (destination node).

Link Servicing Interval (Source and Destination Nodes)

Link service processing is the same as the PLC's peripheral servicing and is approximately 1 ms for Controller Link Units.

Transmission Processing

Responses: Number of words transferred × 0.00125 ms + 3 ms

Communications Cycle Time (with Data Links Inactive)

See *8-2 Communications Cycle Time* (on page 255).

Transmission Delay Time

Transmission delay time varies with the baud rate.

Baud rate	Transmission delay time
2 Mbps	Number of words transferred × 0.08 + 0.112 ms
1 Mbps	Number of words transferred × 0.016 + 0.224 ms
500 Kbps	Number of words transferred × 0.032 + 0.448 ms

Reception Processing

Responses: Number of words transferred × 0.00125 ms + 2.3 ms

Note The I/O response time can increase due to noise or restrictions on the number of frames that can be transmitted while the data link is operating.

Example

In this example, the maximum transmission delay is calculated for an instruction sending 256 words of data in a system with 32 nodes. Network specifics are detailed below:

Baud rate: 2 Mbps
Max. node number: 32
Number of nodes: 32
Number of polled nodes: 4
Number of words: 256
Data link: halted

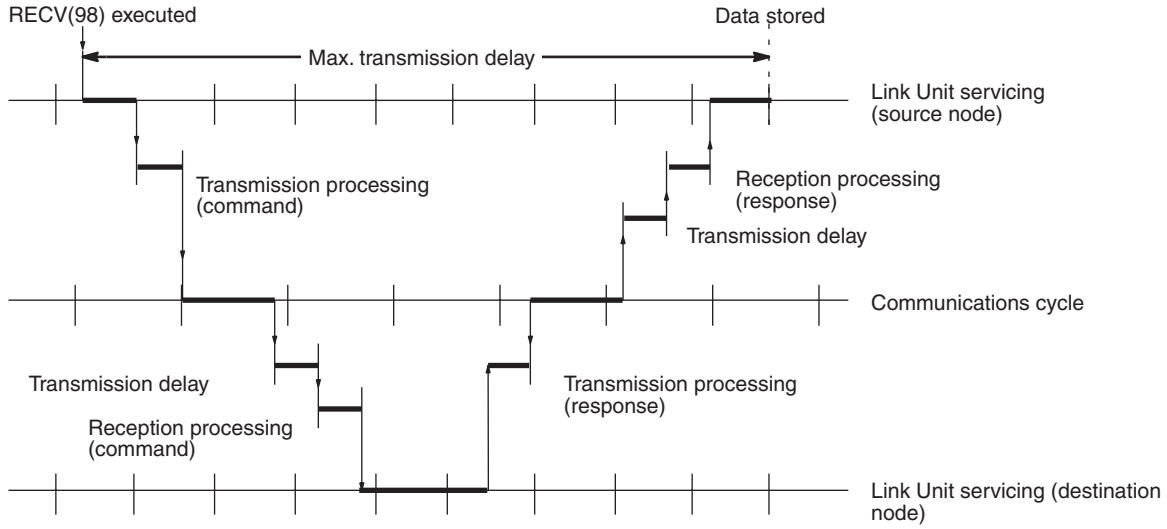
Link Unit servicing (source node)	PLC cycle time (source node)
Transmission processing	0.00125 × 256 + 3 = 3.32 ≅ 3.3 ms
Communications cycle time (See note.)	600 × 4 + 110 × 32 + 320 × 0 + 4 × 0 + 2,290 = 8,210 μs ≅ 8.2 ms
Transmission delay (command)	0.008 × 256 + 0.112 = 2.16 ≅ 2.2 ms
Reception processing	0.00125 × 256 + 2.3 = 2.62 ≅ 2.6 ms
Link servicing interval (destination node)	PLC cycle time (destination node)
Total (max. transmission delay)	**PLC cycle time (source node) × 2 + PLC cycle time (destination node) + Peripheral servicing time (destination node) + 16.3 ms**

Note This communications cycle time is calculated assuming that there is no node that transmits event frames before the SEND command is issued.

RECV(98) Instruction Maximum Delay Time

The following indicates the data flow which will yield the maximum transfer interval from the time the RECV(98) instruction is executed by the user program to the time the Controller Link Unit stores the data in the local Unit's memory area.

Note Be sure to take into account the time required for data links and program execution, which are not included in the following example.



Max. transmission delay = Link Unit servicing interval (source node) + Transmission processing (command) + Communications cycle + Transmission delay (command) + Reception processing (command) + Link Unit servicing interval (destination node) + Transmission processing (response) + Communications cycle + Transmission delay (response) + Reception processing (response) + Link Unit servicing interval (source node).

Link Servicing Interval (Source and Destination Nodes)

Link service processing is the same as the PLC's peripheral servicing and is approximately 1 ms for Controller Link Units.

Transmission Processing

Commands: 2 ms
Responses: Number of words transferred × 0.00125 ms + 3 ms

Communications Cycle Time (with Data Links Inactive)

See *8-2 Communications Cycle Time* (on page 255).

Transmission Delay Time

Transmission delay time varies with the baud rate.

Baud rate	Transmission delay time
2 Mbps	Number of words transferred × 0.008 + 0.112 ms
1 Mbps	Number of words transferred × 0.016 + 0.224 ms
500 Kbps	Number of words transferred × 0.032 + 0.448 ms

Note Commands: Transmission delay time is calculated assuming that the number of words to be transferred is zero.
Responses: Transmission delay time is calculated according to the number of words to be transferred.

Reception Processing

Commands: 2.3 ms
Responses: Number of words transferred × 0.00125 ms + 2.3 ms

The I/O response time might increase due to noise or restrictions on the number of frames that can be transmitted while the data link is operating.

Example

In this example, the maximum transmission delay is calculated for an instruction receiving 256 words of data in a system with 32 nodes. Network specifics are detailed below:

Baud rate:	2 Mbps
Max. node number:	32
Number of nodes:	32
Number of polled nodes:	4
Number of words:	256
Data links:	Halted

Link Unit servicing (source node) × 2	PLC cycle time (source node) × 2
Transmission processing (command)	3 ms
Communications cycle time × 2 (See note.)	(600 × 4 + 110 × 32 + 320 × 0 + 4 × 0 + 2,290) × 2 = 8,210 μs × 2 ≅ 16.4 ms
Transmission delay (command)	0.112 ≅ 0.1 ms
Reception processing (command)	2.3 ms
Link Unit servicing (destination node)	PLC cycle time (destination node)
Transmission processing (response)	0.00125 × 256 + 3 = 3.32 ≅ 3.3
Transmission delay (response)	0.008 × 256 + 0.112 = 2.16 ≅ 2.2
Reception processing (response)	0.00125 × 256 + 2.3 = 2.62 ≅ 2.6
Total (max. transmission delay)	**PLC cycle time (source node) × 2 + PLC cycle time (destination node) + Peripheral servicing time (destination node) + 29.9 ms**

Note This communications cycle time is calculated assuming that there is no node that transmits event frames before the SEND command is executed.

SECTION 9
Troubleshooting and Maintenance

This section provides information on troubleshooting errors that occur during Controller Link Unit operation, as well as daily inspection, cleaning, and other maintenance procedures.

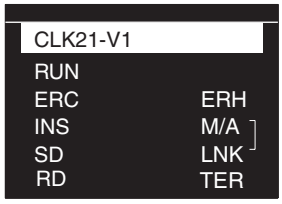
9-1 Troubleshooting Using Indicators 274
9-1-1 CS/CJ-series Controller Link Units 274
9-1-2 C200HX/HG/HE and CQM1H-series Controller Link Units 281
9-1-3 CVM1 and CV-series Controller Link Units 285
9-1-4 Repeater Units 289
9-2 Status Area and Troubleshooting 290
9-2-1 CS/CJ-series Controller Link Units 291
9-2-2 C200HX/HG/HE Controller Link Units 296
9-2-3 CVM1 and CV-series Controller Link Units 302
9-2-4 CQM1H-series Controller Link Units 306
9-3 Error Log 310
9-3-1 Error Log Table 310
9-3-2 Error Codes 311
9-3-3 Reading and Clearing Error Logs 317
9-4 Troubleshooting Error Messages in CX-Net Data Link Table Check 318
9-5 Cleaning and Inspection 320
9-5-1 Cleaning 321
9-5-2 Inspection 321
9-6 Handling Precautions 321
9-6-1 Replacing the Unit 322
9-6-2 Setting the Unit after Replacement 323
9-6-3 Replacing the Unit 325

9-1 Troubleshooting Using Indicators

This section describes the errors indicated by the Controller Link Unit indicators and possible remedies.

9-1-1 CS/CJ-series Controller Link Units

CS-series Unit



CJ-series Unit



RUN: Operating
ERC: Communications error
ERH: PLC error
INS: Network participation
LNK: Data link
M/A: Data link mode
TER: Terminating resistance

Troubleshooting with RUN, ERC, ERH and INS Indicators

The RUN, ERC, ERH, and INS indicators can be used to check whether Controller Link Unit startup and Network participation are operating normally.

Note Be sure to turn off the power to the PLC before performing any of the following.

- Disconnecting the Unit or connectors.
- Securing Units or connectors.
- Setting hardware switches.

Indicators				Probable cause	Probable remedy
RUN	ERC	ERH	INS		
Lit	Not lit	Not lit	Lit	Unit operating normally; Network participation normal.	---
Not lit	Lit	---	---	Node address is set out of range.	Set the node addresses to between 1 and 32.
				Controller Link Unit faulty.	If the ERC indicators still lights when the Unit is mounted on another PLC, replace the Controller Link Unit.
				Wired Network 62 Node Enable Bit is set incorrectly.	Turn ON the Wired Network 62 Node Enable Bit and turn the power supply OFF and ON.

Indicators				Probable cause	Probable remedy
RUN	**ERC**	**ERH**	**INS**		
Not lit	Not lit	Not lit	Not lit	Power is not being supplied correctly to the PLC.	Check the power supply voltage and supply at the recommended voltage.
				The Controller Link Unit has become loose.	Secure the Controller Link Unit firmly.
				The Controller Link Unit is mounted in the wrong position.	Refer to *CS-series PLCs* or *CJ-series PLCs* and mount the Unit correctly.
				The Controller Link Unit is faulty.	If the indicators do not light when the Unit is mounted in another PLC, replace the Controller Link Unit.
Lit	Lit	---	Not lit	The same node address is being used by two different Units.	Reset so that each node address is used only once within the same Network.
				The Unit is connected to a SYSMAC LINK Network (Optical Units only).	Check the Network and reconnect cables correctly.
Lit	---	Lit	---	Routing table setting error	Remake and set the routing table correctly, referring to *7-4 Setting Routing Tables.* When no routing table is being used, delete the routing table.
				The Unit is mounted to a non-compatible PLC.	Refer to *1-2-4 Controller Link Unit Models and PLCs* and reinstall the Unit on the appropriate PLC.
				An error has occurred in the PLC.	Refer to the PLC's operation manual and correct the error. If the error occurs again, replace the PLC.
				EEPROM error	Refer to *9-2 Status Area and Troubleshooting*, correct the data where the error has occurred, and reset the Unit. If the error occurs again, replace the Controller Link Unit.
				Two Units connected to the same PLC have the same unit number.	Reset so that Units connected to the same PLC (including the CPU Expansion Racks), do not have the same unit number.
				Either there is an error in the PLC I/O table or no table has been created.	Create a correct I/O table for the PLC.

Indicators				Probable cause	Probable remedy
RUN	**ERC**	**ERH**	**INS**		
Lit	---	---	Not lit	Terminating resistance is not set correctly. (Wired Unit)	Turn ON the terminating resistance at the nodes at both ends of the Network and turn it OFF at all other nodes.
				Cables are not connected correctly.	Check the cable connections are reconnect correctly.
				The node address is larger than the maximum node address set for the network parameters.	Either reset the maximum node address using the Controller Link Support Software or reset the node address to below the maximum.
				No other nodes exist.	Make sure that 2 or more nodes exist within the Network.
				No nodes have been set as polling nodes.	Refer to *8-1-2 Setting the Polling and Polled Nodes* and set at least one polling node. (Controller Link Units should normally be set as polling nodes.)
				The set baud rate is different to other nodes (Wired Unit).	Refer to Section *SECTION 4 Preparations for Communications* and reset the baud rate.
				The Wired Network 62 Node Enable Bit is ON in some nodes and OFF in other nodes in the network.	When using node address 33 or higher, turn ON the Wired Network 62 Node Enable Bit in all the nodes, then turn the power supply OFF and ON again. When using node address 33 or higher, configure the network so that all nodes are CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, 3G8F7-CLK21-V1, or 3G8F7-CLK23-E. The CS1W-CLK21, CJ1W-CLK21, C200HW-CLK21, CVM1-CLK21, or CQM1H-CLK21 cannot be used.

Troubleshooting with LNK and M/A Indicators

Data Link Cannot be Started

The following table describes the LNK and M/A indicators at the startup node and their use in troubleshooting when a data link cannot be started.

Starting a data link depends on the Controller Link Unit operating normally and participating in the Network. Refer to *Troubleshooting with RUN, ERC, ERH and INS Indicators* earlier in this section and check Unit operation before using the following table.

Indicators		Probable cause	Probable remedy
LNK	M/A		
Lit	---	Data link operating normally.	---
Flashing	---	There is an error in the data link tables.	When the ERH indicator is flashing, remake and set the data link tables.
		When manual setting is used, either data link tables have not been created for the startup node or there is an error in the data link tables.	Refer to *5-2-2 Manual Setting* and set data link tables for the startup node.
		When automatic setting is used, either the data link parameters for the startup node have not been set or there is an error in the data link tables.	Refer to *5-2-4 Automatic Setting* and set the automatic parameters for starting the data links.
		Automatic setting is used with 1:N allocations, but the device does not support this function.	Use a Controller Link Unit that supports automatic data link creation with 1:N allocations. Refer to *Automatic Setting* on page 131 for details.
		When a number exceeding 12,000 was set for the data link send and receive words or the same memory area was set for Area 1 and Area 2 using a CS/CJ-series Controller Link Unit with unit version 1.2 or later that was then replaced with a CS/CJ-series pre-Ver. 1.2 Controller Link Unit.	The number of data link send and receive words cannot exceed 12,000 and the same memory area cannot be set for Area 1 and Area 2 when using a CS/CJ-series pre-Ver. 1.2 Controller Link Unit. Either use a CS/CJ-series Controller Link Unit with unit version 1.2 or later or reset the data link tables.
Not lit	Lit	Manually set data links are already operating on the same Network.	Stop the manually set data links that are operating and restart the data links.
Not lit	Not lit	Automatically set data links are already operating on the same Network.	Stop the automatically set data links that are operating and restart the data links.
		There is an error in the startup node PLC.	Refer to the PLC's operation manual and correct the error. If the error reoccurs, replace the PLC.

Node Cannot Participate in Data Link

The following table describes the LNK and M/A indicators when a node cannot participate in the data links.

Data link participation depends on the Controller Link Unit operating normally and participating in the Network. Refer to *Troubleshooting with RUN, ERC, ERH and INS Indicators* earlier in this section and check Unit operation before using the following table.

Indicators		Probable cause	Probable remedy
LNK	M/A		
Lit	---	Data link operating normally.	---
Flashing	Lit	When manual setting is used, there is an error in the data link table.	Refer to *5-2-2 Manual Setting* and remake the data link table.
Flashing	Not lit	When automatic setting is used, the data link parameters at the startup node are incorrect for the local node (the data link area is out of range for the local node.)	Refer to *5-2-4 Automatic Setting*, reset the parameters for the startup node DM Area so that the local node can participate in the data link, and then restart the data link.
		When automatic setting is used, the local node is not set to participate in the data link at the startup node.	Stop the data link, reset the parameters for the startup node DM Area so that the local node can participate in the data link, and then restart the data link.
		Automatic setting is used with 1:N allocations, but the device does not support this function.	Use a Controller Link Unit that supports automatic data link creation with 1:N allocations. Refer to *Automatic Setting* on page 131 for details.
		When a number exceeding 12,000 was set for the data link send and receive words or the same memory area was set for Area 1 and Area 2 using a CS/CJ-series Controller Link Unit with unit version 1.2 or later that was then replaced with a CS/CJ-series pre-Ver. 1.2 Controller Link Unit.	The number of data link send and receive words cannot exceed 12,000 and the same memory area cannot be set for Area 1 and Area 2 when using a CS/CJ-series pre-Ver. 1.2 Controller Link Unit. Either use a CS/CJ-series Controller Link Unit with unit version 1.2 or later or reset the data link tables.
Not lit	Lit	When manual setting is used, there are no data link tables set for the local node.	Set data link tables for the local node.

Data Link Cannot be Stopped

Stopping the data link depends on the Controller Link Unit operating normally and participating in the Network. Read the above explanations before attempting to stop operation.

Note Stop the data link from the node at which the LNK indicator is lit (indicating active data links). Data links cannot be stopped from nodes which do not have active data links.

Troubleshooting of Other Errors

To configure a network that uses a node address higher than 32, all nodes must be CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, CJ1W-CLK23, 3G8F7-CLK21-V1, or 3G8F7-CLK23-E. The Wired Network 62 Node Enable Bit in the DM Parameters Area must also be turned ON (62 nodes max.) for all nodes. If the nodes are set differently, the network will not be configured correctly. If the settings are incorrect, the following problems will occur.

Configuring a Network with 33 Nodes or More

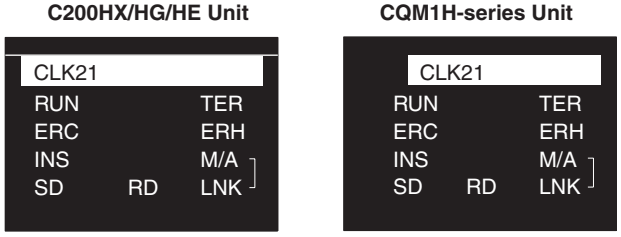
Problem	Status	Cause and remedy
The node is not present in the network. (ERC indicator: ON RUN indicator: OFF INS indicator: OFF)	The ERC indicator is ON in the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 and a node address higher than 32 is set.	The Wired Network 62 Node Enable Bit in the DM Parameters Area is turned OFF. Turn ON the Wired Network 62 Node Enable Bit and then turn the power supply OFF and ON again.
	The ERC indicator is ON in the C200HW-CLK21, CQM1H-CLK21, CVM1-CLK21, CS1W-CLK21, or CJ1W-CLK21, and a node address higher than 32 is set.	The Units that can be used to configure a network that uses a node address higher than 32 are the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 only. Either configure the network using compatible Units and Boards, or split the network into two separate networks.
The node is not present in the network (ERC indicator: OFF RUN indicator: ON INS indicator: OFF)	The INS indicator is ON for some nodes in the same network. Those nodes are C200HW-CLK21, CQM1H-CLK21, CVM1-CLK21, CS1W-CLK21, or CJ1W-CLK21.	
	The INS indicator is ON for some nodes in the same network. Those nodes are CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23.	The Wired Network 62 Node Enable Bit in the DM Parameters Area of the polling node (CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 with INS indicator ON) is OFF. Turn ON the Wired Network 62 Node Enable Bit, then turn the power supply OFF and ON again. The maximum number of nodes set in the network parameters is less than the number of nodes present in the network. Use CX-Net or the Controller Link Support Software to read the network parameters, and check the maximum number of nodes setting. Set the maximum number of nodes to a number that is the same or larger than the number of nodes in the network.
The maximum number of nodes in the network is set to 32.	The polling node is a C200HW-CLK21, CQM1H-CLK21, CVM1-CLK21, CS1W-CLK21, or CJ1W-CLK21.	The Units that can be used to configure a network that uses a node address higher than 32 are the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 only. Either configure the network using compatible Units and Boards, or split the network into two separate networks.
	The polling node is a CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23.	The Wired Network 62 Node Enable Bit in the DM Parameters Area of the polling node (CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 with INS indicator ON) is OFF. Turn ON the Wired Network 62 Node Enable Bit, then turn the power supply OFF and ON again.

Problem	Status	Cause and remedy
The data link status is showing statuses of 32 nodes only.	The data link status storage area is set to default settings, and the data link status storage format specification in the DM Parameters Area is set to the 8-bit format.	The default area for storing data link status is the Special I/O Unit Area. The data for only node addresses 1 to 32 is reflected when the data link status storage format specification is set to 8 bits.
	The polling node is a C200HW-CLK21, CQM1H-CLK21, CVM1-CLK21, CS1W-CLK21, or CJ1W-CLK21.	The Units that can be used to configure a network of a network that uses a node address higher than 32 are the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 only. Either configure the network using compatible Units and Boards, or split the network into two separate networks.
	The polling node is a CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23	The Wired Network 62 Node Enable Bit in the DM Parameters Area of the polling node (CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 with INS indicator ON) is OFF. Turn ON the Wired Network 62 Node Enable Bit, then turn the power supply OFF and ON again.
Error occurs when transferring data link tables.	The data link table being transferred is for a C200HW-CLK21, CQM1H-CLK21, CVM1-CLK21, CS1W-CLK21, or CJ1W-CLK21.	The Units that can be used to configure a network of a network that uses a node address higher than 32 are the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 only. Either configure the network using compatible Units and Boards, or split the network into two separate networks.
The data link status is showing statuses of 32 nodes only.	The polling node is a C200HW-CLK21, CQM1H-CLK21, CVM1-CLK21, CS1W-CLK21, or CJ1W-CLK21.	
	The polling node is a CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23.	The Wired Network 62 Node Enable Bit in the DM Parameters Area of the polling node (CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 with INS indicator ON) is OFF. Turn ON the Wired Network 62 Node Enable Bit, then turn the power supply OFF and ON again.

Configuring a Network with 32 Nodes or Less

Problem	Status	Cause and Remedy
The node is not present in the network. (ERC indicator: ON RUN indicator: OFF INS indicator: OFF)	The node with the ERC indicator ON is set to a node address of 33 or higher.	Reset the node address between 1 and 32, then turn the power OFF and ON again.
The maximum number of nodes in the network is set to 62.	A CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 is present in the network.	The Wired Network 62 Node Enable Bit in the DM Parameters Area of the CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23 is ON. Turn OFF the Wired Network 62 Node Enable Bit, then turn the power supply OFF and ON again.
The data link status is showing statuses for 62 nodes.	The corresponding node is a CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23.	
The network participation status is showing statuses for 62 nodes.		

9-1-2 C200HX/HG/HE and CQM1H-series Controller Link Units



RUN: Operating
ERC: Communications error
INS: Network participation
LNK: Data link
M/A: Data link mode
TER: Terminating resistance set

Troubleshooting with RUN, ERC, ERH and INS Indicators

The RUN, ERC, ERH, and INS indicators can be used to check whether Controller Link Unit startup and Network participation are operating normally.

Note Be sure to turn off the power to the PLC before performing any of the following.

- Disconnecting the Unit or connectors.
- Securing Units or connectors.
- Setting hardware switches.

Indicators				Probable cause	Probable remedy
RUN	ERC	ERH	INS		
Lit	Not lit	Not lit	Lit	Unit operating normally; Network participation normal.	---
Not lit	Lit	---	---	Controller Link Unit faulty.	If the ERC indicators still lights when the Unit is mounted on another PLC, replace the Controller Link Unit.

Indicators				Probable cause	Probable remedy
RUN	**ERC**	**ERH**	**INS**		
Not lit	Not lit	Not lit	Not lit	Power is not being supplied correctly to the PLC.	Check the power supply voltage and supply at the recommended voltage.
				The Controller Link Unit has become loose.	Secure the Controller Link Unit firmly.
				The Bus Connection Unit has become loose.	Tighten the mounting screws on the Bus Connection Unit.
				The Controller Link Unit is mounted in the wrong slot.	Refer to *C200HX/HG/HE PLCs* and *CJ-series PLCs* and mount the Unit correctly.
				The Controller Link Unit is faulty.	If the indicators do not light when the Unit is mounted on another PLC, replace the Controller Link Unit.
Lit	Lit	---	Not lit	The node address is outside the setting range.	Reset the node address to within the 1 to 32 range.
				The same node address is being used by two different Units.	Reset so that each node address is used only once within the same Network.
Lit	---	Lit	---	Routing table setting error or a Routing Table Enable Bit setting error.	Remake and set the routing table correctly, referring to *7-4 Setting Routing Tables.* When no routing table is being used, turn OFF the Routing Table Enable Bit.
				The Unit is mounted to a non-compatible PLC.	Refer to *1-2-4 Controller Link Unit Models and PLCs* and reinstall the Unit on the appropriate PLC.
				An error has occurred in the PLC.	Refer to the PLC's operation manual and correct the error. If the error occurs again, replace the PLC.
				EEPROM error	Refer to *9-2 Status Area and Troubleshooting*, correct the data where the error has occurred, and reset the Unit. If the error occurs again, replace the Controller Link Unit.

Indicators				Probable cause	Probable remedy
RUN	**ERC**	**ERH**	**INS**		
Lit	---	---	Not lit	Terminating resistance is not set correctly.	Turn ON the terminating resistance at the nodes at both ends of the Network and turn it OFF at all other nodes.
				Cables are not connected correctly.	Check the cable connections and reconnect correctly.
				The node address is larger than the maximum node address set for the network parameters.	Either reset the maximum node address using the Controller Link Support Software or reset the node address to below the maximum.
				No other nodes exist.	Ensure that 2 or more nodes exist within the Network.
				No nodes have been set as polling nodes.	Refer to *8-1-2 Setting the Polling and Polled Nodes* and set at least one polling node. (Controller Link Units should normally be set as polling nodes.)
				The same operating level is set more than once for the same PLC.	Reset so that each operating level is used only once.
				The Bus Connection Unit has become loose.	Tighten the mounting screws on the Bus Connection Unit (C200HX/HG/HE PLCs only).
				The set baud rate is different to other nodes.	Refer to *SECTION 4 Preparations for Communications* and set all nodes on the network to the same baud rate.

Troubleshooting with LNK and M/A Indicators

Data Link Cannot be Started

The following table describes the LNK and M/A indicators at the startup node and their use in troubleshooting when a data link cannot be started.

Starting a data link depends on the Controller Link Unit operating normally and participating in the Network. Refer to *Troubleshooting with RUN, ERC, ERH and INS Indicators* earlier in this section and check Unit operation before using the following table.

Indicators		Probable cause	Probable remedy
LNK	**M/A**		
Lit	---	Data link operating normally.	---
Flashing	---	There is an error in the data link tables.	If the ERH indicator is lit, reset the data link tables.
		When manual setting is used, either data link tables have not been created for the startup node or there is an error in the data link tables.	Refer to *5-2-2 Manual Setting* and set data link tables for the startup node.
		When automatic setting is used, either the data link parameters for the startup node have not been set or there is an error in the data link tables.	Refer to *5-2-4 Automatic Setting* and set the automatic parameters for starting the data links.
		Automatic setting is used with 1:N allocations, but the device does not support this function.	Use a Controller Link Unit that supports automatic data link creation with 1:N allocations. Refer to *Automatic Setting* on page 131 for details.
Not lit	Lit	Manually set data links are already operating on the same Network.	Stop the manually set data links that are operating and restart the data links.
Not lit	Not lit	Automatically set data links are already operating on the same Network.	Stop the automatically set data links that are operating and restart the data links.
		There is an error in the startup node PLC.	Refer to the PLC's operation manual and correct the error. If the error reoccurs, replace the PLC.

Node Cannot Participate in Data Link

The following table describes the LNK and M/A indicators when a node cannot participate in the data links.

Data link participation depends on the Controller Link Unit operating normally and participating in the Network. Refer to *Troubleshooting with RUN, ERC, ERH and INS Indicators* earlier in this section and check Unit operation before using the following table.

Indicators		Probable cause	Probable remedy
LNK	M/A		
Lit	---	Data link operating normally.	---
Flashing	Lit	When manual setting is used, there is an error in the data link table.	Refer to *5-2-2 Manual Setting* and remake the data link table.
Flashing	Not lit	When automatic setting is used, the data link parameters at the startup node are incorrect for the local node (the data link area is out of range for the local node.)	Refer to *5-2-4 Automatic Setting*, reset the parameters for the startup node DM Area so that the local node can participate in the data link, and then restart the data link.
		Automatic setting is used with 1:N allocations, but the device does not support this function.	Use a Controller Link Unit that supports automatic data link creation with 1:N allocations. Refer to *Automatic Setting* on page 131 for details.
Not lit	Lit	When manual setting is used, there are no data link tables set for the local node.	Set data link tables for the local node.
Not lit	Not lit	When automatic setting is used, the startup node is not set to participate in the data links.	Stop the data links, remake and set the parameters in the startup node's DM Area, and then restart the data link.

Data Link Cannot be Stopped

Stopping the data link depends on the Controller Link Unit operating normally and participating in the Network. Read the above explanations before attempting to stop operation.

Note Stop the data link from the node at which the LNK indicator is lit (indicating active data links). Data links cannot be stopped from nodes which do not have active data links.

9-1-3 CVM1 and CV-series Controller Link Units



RUN: Operating
ERC: Communications error
INS: Network participation
LNK: Data link
M/A: Data link mode

Troubleshooting with RUN, ERC, ERH and INS Indicators

The RUN, ERC, ERH and INS indicators can be used to check whether Controller Link Unit startup and Network participation are operating normally.

Note Be sure to turn off the power to the PLC before performing any of the following.

- Disconnecting the Unit or connectors.
- Securing Units or connectors.

• Setting hardware switches.

Indicators				Probable cause	Probable remedy
RUN	**ERC**	**ERH**	**INS**		
Lit	Not lit	Not lit	Lit	Unit operating normally; Network participation normal.	---
Not lit	Lit	---	---	Controller Link Unit faulty.	If the ERC indicators still lights when the Unit is mounted on another PLC, replace the Controller Link Unit.
Not lit	Not lit	Not lit	Not lit	Power is not being supplied correctly to the PLC.	Check the power supply voltage and supply at the recommended voltage.
				The Controller Link Unit has become loose.	Secure the Controller Link Unit firmly.
				The Controller Link Unit is mounted in the wrong slot.	Refer to *CVM1 and CV-series PLCs* and mount the Unit correctly.
				The Controller Link Unit is faulty.	If the indicators do not light when the Unit is mounted in another PLC, replace the Controller Link Unit.
Lit	Lit	---	Not lit	The node address is outside the setting range.	Reset the node address to within the 1 to 32 range.
				The same node address is being used by two different Units.	Reset so that each node address is used only once within the same Network.
Lit	---	Lit	---	Routing table setting error or a Routing Table Enable/Disable Bit setting error.	Remake and set the routing table correctly, referring to *7-4 Setting Routing Tables*. When no routing table is being used, set the Routing Table Enable/Disable Bit to OFF.
				The Unit is mounted to a non-compatible PLC.	Refer to *1-2-4 Controller Link Unit Models and PLCs* and reinstall the Unit on the appropriate PLC.
				An error has occurred in the PLC.	Refer to the PLC's operation manual and correct the error. If the error occurs again, replace the PLC.
				EEPROM error	Refer to *9-2 Status Area and Troubleshooting*, correct the data where the error has occurred, and reset the Unit. If the error occurs again, replace the Controller Link Unit.
				The unit number is not set in the range from 0 to 15.	Reset the Unit number to within a range of 0 to 15.
				The same unit number is set more than once for the same PLC.	Reset so that each unit number is set only once within the same PLC (including the Expansion CPU Backplane.)
				I/O tables have not been created for the PLC or they are faulty.	Create I/O tables for the PLC correctly.

Indicators				Probable cause	Probable remedy
RUN	**ERC**	**ERH**	**INS**		
Lit	---	---	Not lit	Terminating resistance is not set correctly.	Turn ON the terminating resistance at the nodes at both ends of the Network and turn it OFF at all other nodes.
				Cables are not connected correctly.	Check the cable connections and reconnect correctly.
				The node address is larger than the maximum node address set for the network parameters.	Either reset the maximum node address using the Controller Link Support Software or reset the node address to below the maximum.
				No other nodes exist.	Make sure that 2 or more nodes exist within the Network.
				No nodes have been set as polling nodes.	Refer to *8-1-2 Setting the Polling and Polled Nodes* and set at least one polling node. (Controller Link Units should normally be set as polling nodes.)
				The set baud rate is different to other nodes (Wired Unit).	Refer to *SECTION 4 Preparations for Communications* and set all nodes on the network to the same baud rate.

Troubleshooting with LNK and M/A Indicators

Data Link Cannot be Started

The following table describes the LNK and M/A indicators at the startup node and their use in troubleshooting when a data link cannot be started.

Starting a data link depends on the Controller Link Unit operating normally and participating in the Network. Refer to *Troubleshooting with RUN, ERC, ERH and INS Indicators* earlier in this section and check Unit operation before using the following table.

Indicators		Probable cause	Probable remedy
LNK	M/A		
Lit	---	Data link operating normally.	---
Flashing	---	There is an error in the data link tables.	When the ERH indicator is flashing, remake and set the data link tables.
		When manual setting is used, either data link tables have not been created for the startup node or there is an error in the data link tables.	Refer to *5-2-2 Manual Setting* and set data link tables for the startup node.
		When automatic setting is used, either the data link parameters for the startup node have not been set or there is an error in the data link tables.	Refer to *5-2-4 Automatic Setting* and set the automatic parameters for starting the data links.
		Automatic setting is used with 1:N allocations, but the device does not support this function.	Use a Controller Link Unit that supports automatic data link creation with 1:N allocations. Refer to *Automatic Setting* on page 131 for details.
Not lit	Lit	Manually set data links are already operating on the same Network.	Stop the manually set data links that are operating and restart the data links.
Not lit	Not lit	Automatically set data links are already operating on the same Network.	Stop the automatically set data links that are operating and restart the data links.
		There is an error in the startup node PLC.	Refer to the PLC's operation manual and correct the error. If the error reoccurs, replace the PLC.

Node Cannot Participate in Data Link

The following table describes the LNK and M/A indicators when a node cannot participate in the data links.

Data link participation depends on the Controller Link Unit operating normally and participating in the Network. Refer to *Troubleshooting with RUN, ERC, ERH and INS Indicators* earlier in this section and check Unit operation before using the following table.

Indicators		Probable cause	Probable remedy
LNK	M/A		
Lit	---	Data link operating normally.	---
Flashing	Lit	When manual setting is used, there is an error in the data link table.	Refer to *5-2-2 Manual Setting* and remake the data link table.
Flashing	Not lit	When automatic setting is used, the data link parameters at the startup node are incorrect for the local node (the data link area is out of range for the local node.)	Refer to *5-2-4 Automatic Setting*, reset the parameters for the startup node DM Area so that the local node can participate in the data link, and then restart the data link.
		Automatic setting is used with 1:N allocations, but the device does not support this function.	Use a Controller Link Unit that supports automatic data link creation with 1:N allocations. Refer to *Automatic Setting* on page 131 for details.
Not lit	Lit	When manual setting is used, there are no data link tables set for the local node.	Set data link tables for the local node.
Not lit	Not lit	When automatic setting is used, the startup node is not set to participate in the data links.	Stop the data links, remake and set the parameters in the startup node's DM Area, and then restart the data link.

Data Link Cannot be Stopped

Stopping the data link depends on the Controller Link Unit operating normally and participating in the Network. Read the above explanations before attempting to stop operation.

Note Stop the data link from the node at which the LNK indicator is lit (indicating active data links). Data links cannot be stopped from nodes which do not have active data links.

9-1-4 Repeater Units



PWR: ON
T/R1: SL1 com
T/R2: SL2 com

Note Be sure to turn OFF the power to the Repeater Unit before disconnecting or reconnecting cables.

Troubleshooting with the PWR Indicator

indicator status	Unit status	Possible error	Probable cause	Probable remedy
Lit	Power is being supplied normally	---	---	---
Not lit	Power supply error	Power supply cables	Cables are loose.	Check the cable connections.
			Cables are broken.	Check whether any of the cables are broken.
			Cable polarity is incorrect.	Check the cable connections.
		Power supply	Power supply voltage or current is wrong.	Check the power supply voltage, and replace the power supply with a Power Supply Unit that will provide a correct supply.
		Repeater Unit	The Repeater Unit is faulty.	Replace the Repeater Unit.

Troubleshooting with the T/R1 and T/R2 Indicators

indicator status	Unit status	Possible error	Probable cause	Probable remedy
Lit or flashing	The Unit is communicating normally.	---	Unit operating normally.	---
Not lit	Communications error (transmission signal error or no signal)	Communications cables	Cables are loose.	Check the cable connections.
			Cables are broken.	Check whether any of the cables are broken.
			Cable polarity is incorrect.	Check the cable connections.
			Noise interference in cables.	Check the wiring environment of the cables.
		Other nodes	The destination node does not exist.	Check the destination Controller Link Unit status (power supply, cable connections).
			The destination node has an error.	Check the destination Controller Link Unit status (baud rate setting, terminating resistance settings, statuses, error log, etc.).
		Repeater Unit	Terminating resistance is set incorrectly.	Check the terminating resistance setting for the network.
			The baud rate setting is incorrect.	Check that the same baud rate is set for all nodes in the same network.
			Noise interference	Check the operating environment of the Unit.
			The Repeater Unit is faulty.	Replace the Repeater Unit.

9-2 Status Area and Troubleshooting

The status of the Unit and the communications status of the Controller Link Unit is recorded in the Status Area of the PLC. The cause of errors can be found by searching the Status Area. The Status Area can be read using a Programming Console, the SYSMAC Support Software, or the Controller Link Support Software.

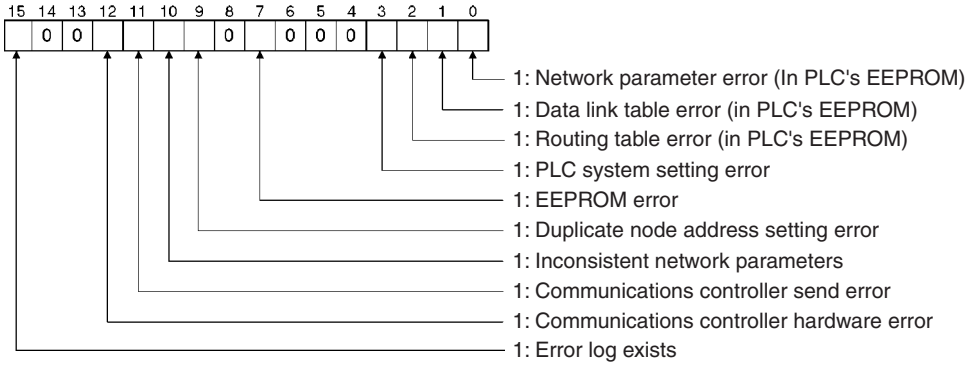
This section explains the contents of the Status Area and tells how to troubleshoot errors recorded there.

9-2-1 CS/CJ-series Controller Link Units

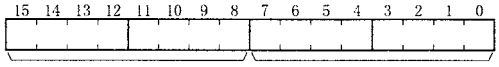
The status of the Unit and Network is indicated in the following manner in the PLC.

Status Area

Error Information:
CIO 1500 + 25 x (Unit No.)



Polling Node Address, Startup Node Address: CIO 1500 + 25 x (Unit No.) + 1



Polling node address Startup node address

Each node address is displayed in 2-digit BCD.

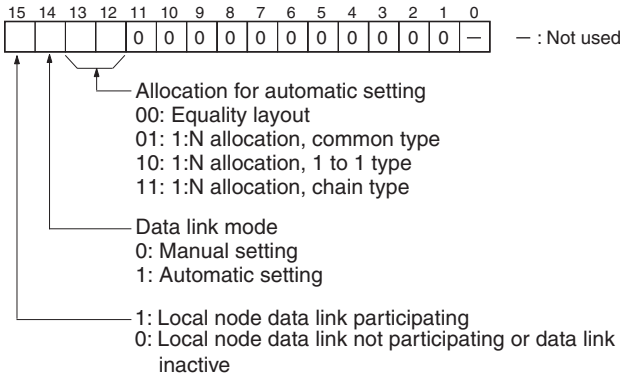
Network Participation Status: CIO 1500 + 25 x (Unit No.) + 2, + 3

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+ 2	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
+ 3	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
+ 4	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
+ 5	–	–	62	61	60	59	58	57	56	55	54	53	52	51	50	49

When CS1W-CLK23 and CJ1W-CLK23 Units are used and the Wired Network 62 Node Enable Bit in the DM Parameter Area software switches is ON, the network participation status of nodes 33 to 62 will be returned in words +4 and +5.

The numbers in the squares are node addresses.
The corresponding node participation status is as follows:
0: Not participating in network
1: Participating in network

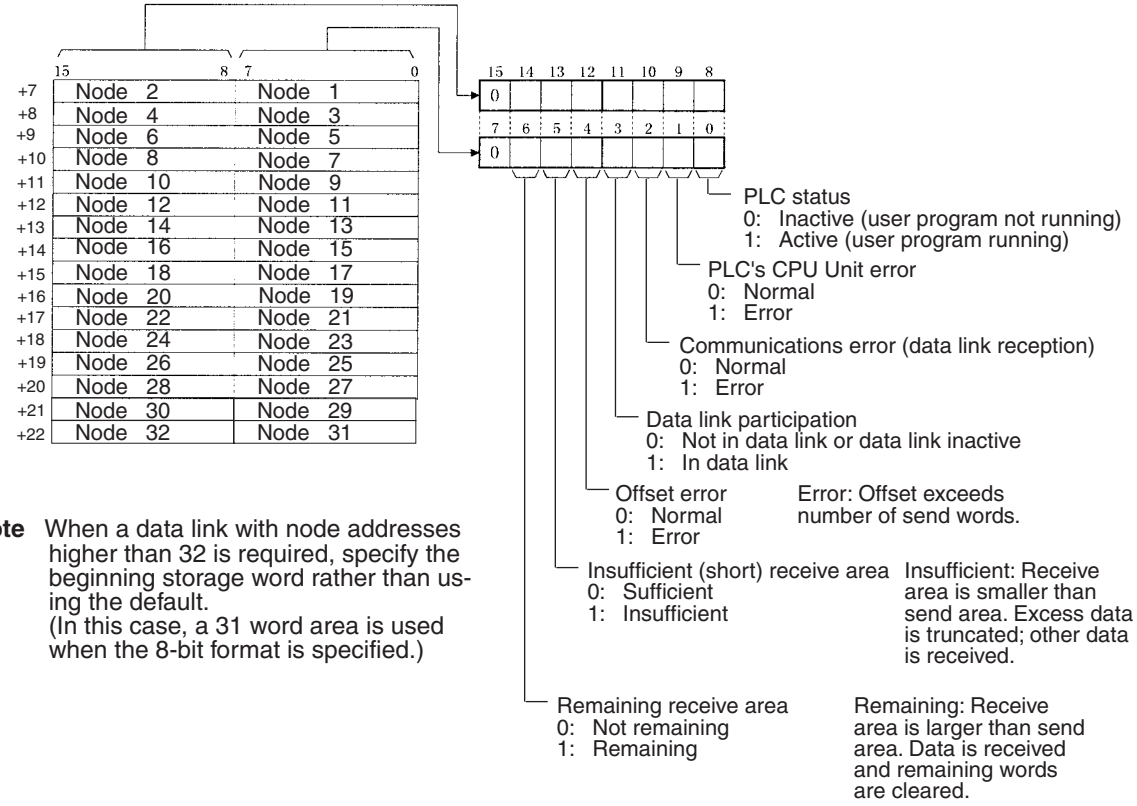
Local Data Link Participation Status: CIO 1500 + 25 x (Unit No.) + 6



Note Data link status is valid only when the local node is participating in the data link. Confirm that the Local Data Link Active Bit is ON before referencing the data link status.
The statuses of bits 12 to 14 are reflected only when using a CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23.

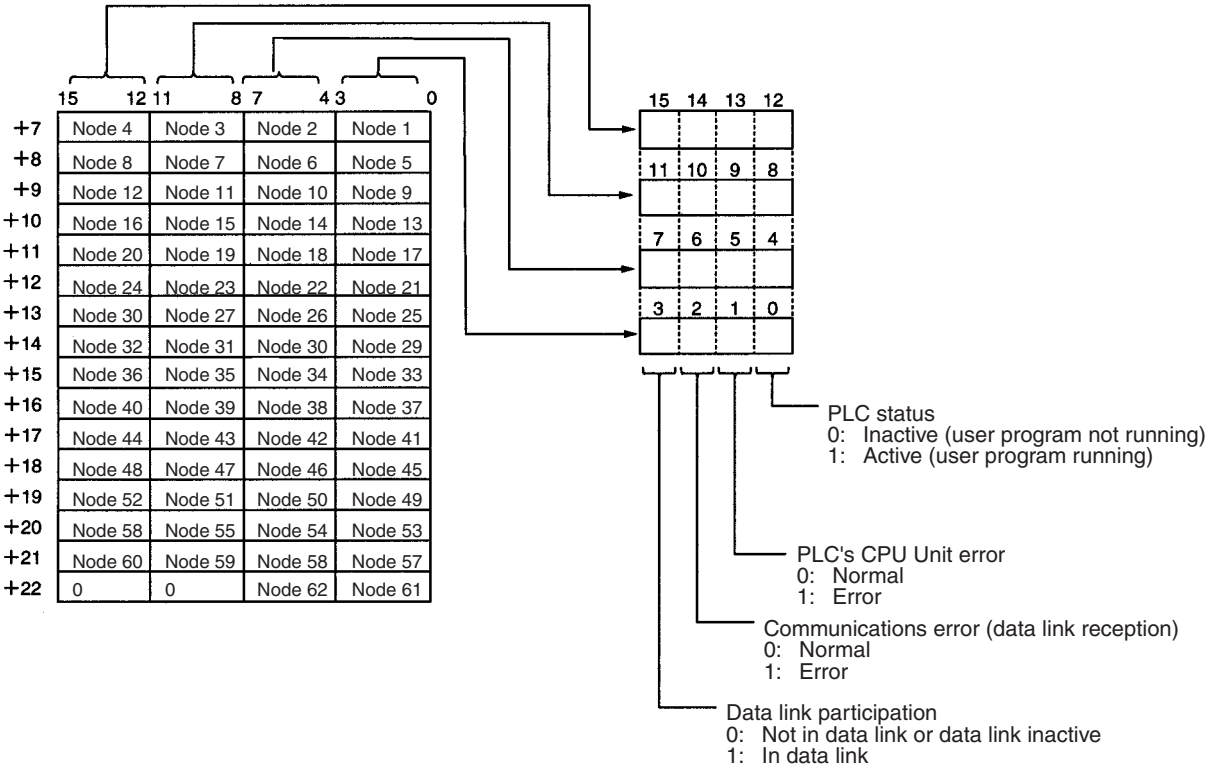
Data Link Status: CIO 1500 + 25 × (Unit No.) + 7 to + 22

8-Bit Format Specified



Note When a data link with node addresses higher than 32 is required, specify the beginning storage word rather than using the default.
(In this case, a 31 word area is used when the 8-bit format is specified.)

4-Bit Format Specified



The data link status can be reflected in 4-bit format only when using a CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, or CJ1W-CLK23. It is reflected in 8-bit format with other models.

When the first data link status word is set to the default (0000) for either the manually set data link tables or automatically set data link tables (In the first data link status word parameter), the data link status is stored in the above area (CIO 1500 + 25 × (Unit No.) (+ 7 to +22)).

When a different area has been set for the first data link status word, the status is stored in the specified area. The status storage format is the same as the one shown in the above diagram.

Note Refer to *5-4 Checking Data Link Status* for details on status flags.

Bit Status and Error Processing

Data Link Status

Bit status	Probable cause	Probable remedy
PLC's CPU Unit error is 1: ON	A fatal PLC error, non-fatal PLC error, or a watchdog timer error has occurred.	Refer to the PLC's operation manual and correct the error. If the error occurs again, replace the PLC.
	The Unit is mounted to a non-compatible PLC.	Refer to *1-2-4 Controller Link Unit Models and PLCs* and mount onto the correct PLC.

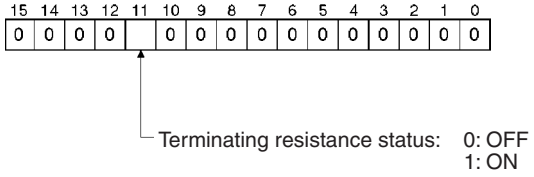
Bit status	Probable cause	Probable remedy
Communications error is 1: ON	The relevant node is not in the Network.	Enter the node in the Network.
	A communications error has occurred as a result of noise.	Conduct an echoback test using the Controller Link Support Software and if this does not correct the error, check the usage environment.
	A communications error has occurred.	Refer to page 285 *Troubleshooting with RUN, ERC, ERH and INS Indicators* and troubleshoot accordingly.
Data link participation is 0: OFF	The relevant node is not part of data links.	Enter the relevant node in data links. If an error occurs, refer to page 289 *Node Cannot Participate in Data Link* and troubleshoot accordingly.
	There are no active data links in the Network.	Activate the data links.
Offset error is 1: ON	The offset is greater than the number of send words at the relevant node.	Check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.
Receive area insufficient (short) is 1: ON	The send area at the relevant node is larger than the receive area and some data cannot be received.	When the intention is not to receive all data, use as is (data that cannot be received will be read and discarded.) When it differs from the intended data link, check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.
Receive area remaining is 1: ON	The send area at the relevant node is smaller than the receive area and some of the area will be unused.	When the intention is to leave some space in the receive area, use as is (the surplus receive area will be cleared to 0.) When it differs from the intended data link, check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.

Other Status

Bit status	Probable cause	Probable remedy
Error log exists (CIO 1500 + 25 × n, bit 15) is 1: ON	Error information on the Controller Link Unit (an error log) has been recorded.	Using the Controller Link Support Software or an FINS command, read the cause of the current error. Alternatively, use past error log records to troubleshoot the problem.
Communications controller send error (CIO 1500 + 25 × n, bit 11) is 1: ON	The Controller Link Unit is faulty.	Replace the Controller Link Unit.
Inconsistent network parameters (CIO 1500 + 25 × n, bit 10) is 1: ON	Indicates that the network parameters recorded in the CPU Bus Unit Area in the CPU Unit differ from the values of the Network in use.	Check the network parameters on the Network in use using the Controller Link Support Software, and reset necessary parameters.
Node address duplicate setting error (CIO 1500 + 25 × n, bit 9) is 1: ON	The same node address has been used more than once.	Reset so that each node address is used only once within the same Network.
EEPROM error (CIO 1500 + 25 × n, bit 7) is 1: ON	An error has occurred while writing data to the EEPROM in the Controller Link Unit.	The EEPROM in the Controller Link Unit is for storing error log data. If the error occurs again, replace the CPU Unit.
PLC system setting error (CIO 1500 + 25 × n, bit 3) is 1: ON	Data is corrupted in the CPU Bus Unit system setup in the CPU Unit.	Check the status of bits 00 to 02 in (CIO 1500 + 25 × n, and correct any problems found. If the error occurs again, replace the CPU Unit.
	The PLC is protected.	Set the PLC's protect switch to OFF.
Routing table error (CIO 1500 + 25 × n, bit 2) is 1: ON	The routing table data in the CPU Unit's Parameter Area is corrupted.	Refer to *7-4 Setting Routing Tables* and reset the routing tables correctly. If the error occurs again, replace the Controller Link Unit.
	There is an error in the routing table setting.	When using a routing table, refer to *7-4 Setting Routing Tables* and reset the routing tables correctly. If no routing tables are being used, delete the tables.
Data link table error (CIO 1500 + 25 × n, bit 1) is 1: ON	The data link table data in the CS/CJ CPU Bus Unit Area is corrupted.	Refer to *5-3 Starting and Stopping Data Links* and reset the data link tables correctly. If the error occurs again, replace the CPU Unit.
	There is an error in the data link table settings.	When using manually set data links, refer to *5-3 Starting and Stopping Data Links* and remake and set the data link tables correctly. When manually set data links are not being used, delete the data link tables.

Bit status	Probable cause	Probable remedy
Network parameter error (CIO 1500 + 25 × n, bit 0) is 1: ON	The network parameter data in the CS/CJ CPU Bus Unit Area is corrupted.	Refer to *8-1-3 Network Parameters* and reset the data correctly. If the error occurs again, replace the CPU Unit.
		Either set the EEPROM Clear Bit in the DM Parameter Area to ON, or use the Initialize network parameters operation on the Maintenance Menu of the Controller Link Support Software to initialize the network parameters and then cycle the power supply.
	There is an error in the network parameter settings, or node address of the local node is larger then the maximum address set within the network parameters.	Refer to *8-1-3 Network Parameters* and reset the network parameters or the node address.

Terminating Resistance Status: CIO 1500 + 25 × (Unit No.) + 24

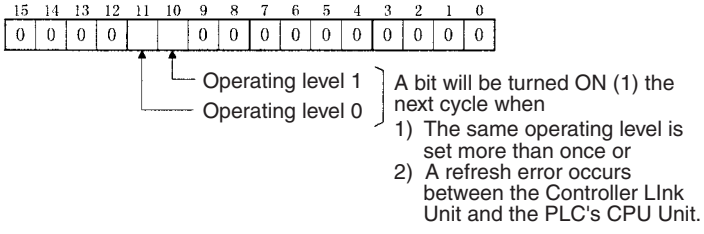


9-2-2 C200HX/HG/HE Controller Link Units

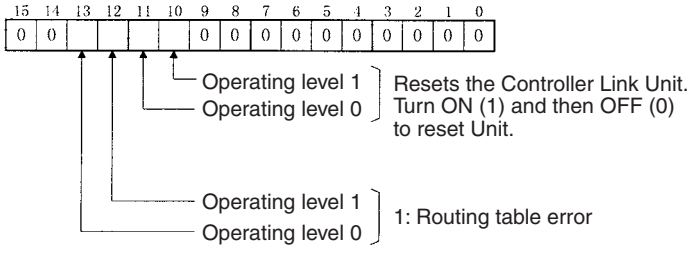
The status of the Unit and Network is indicated in the following manner in the PLC.

Status Area

Duplicate Operating Levels/Refresh Error: AR 00



Routing Table Error/Unit Restart Bits: AR 01



Network Participation Status: AR 08, AR 09, AR 12, AR 13

Operating level 0
AR 08
AR 09

Operating level 1
AR 12
AR 13

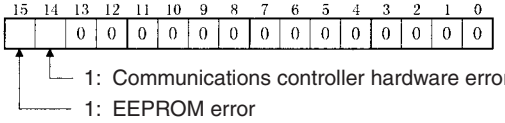
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of network
1: Part of network

Communications Controller Hardware Error, EEPROM Error: AR 11, AR 15

Operating level 0
AR 11

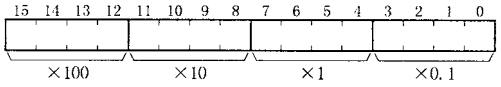
Operating level 1
AR 15



Service Time: AR 16, AR 17

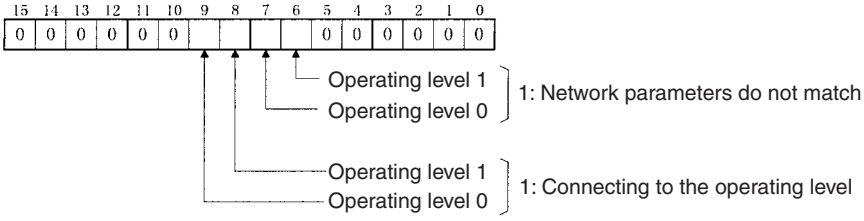
Operating level 0
AR 16

Operating level 1
AR 17



The service time for each PLC cycle is calculated by the PLC and displayed in 0.1-ms units in 4-digit BCD.

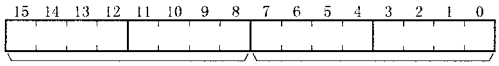
Operating Level Connection Status, Inconsistent Network Parameters: AR 24



Polling Node Address, Startup Node Address: SR 238, SR 242

Operating level 0
SR 238

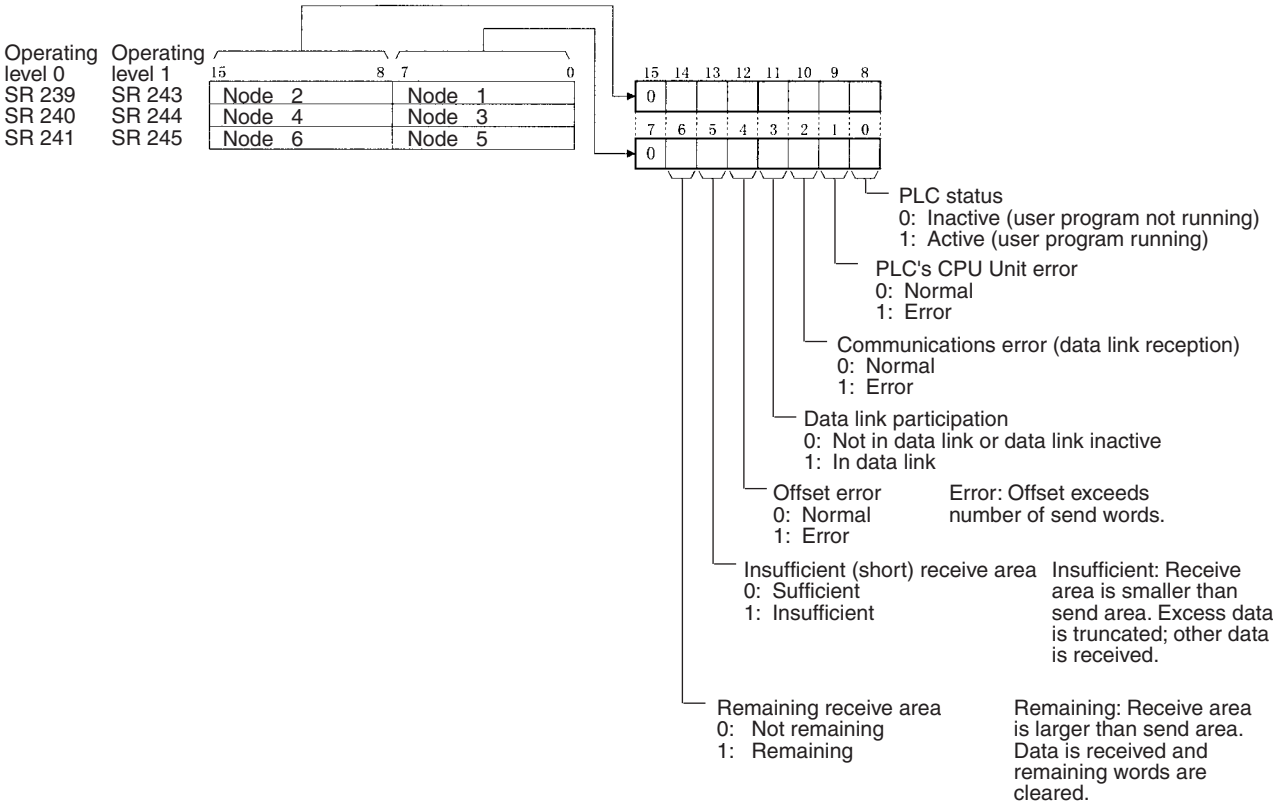
Operating level 1
SR 242



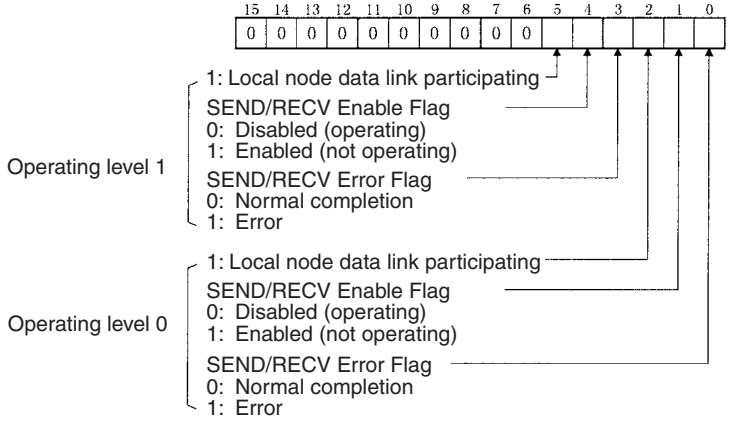
Each node address is displayed in 2-digit BCD.

Data Link Status: SR 239 to SR 241, SR 243 to SR 245

When the data link status stored in the start word for the manual setting data link table or automatic setting data link parameters is not set or is set to 0, the data link status of only node addresses 1 to 6 will be displayed in the following area.

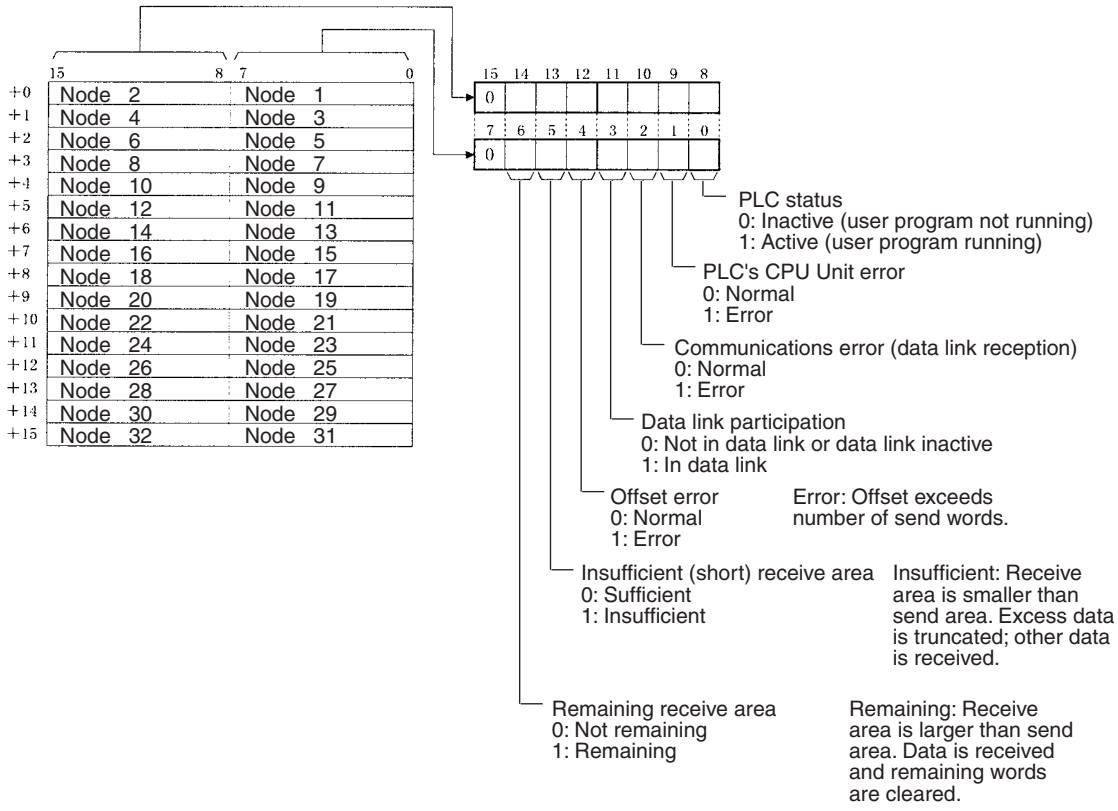


Operating Level Status: SR 252



Note Data link status is valid only when the local node is participating in the data link. Confirm that the local node's data links are active in the operating level status in SR 252 before referencing the data link status.

Data Link Status: First Data Link Status Word + 0 to + 15



Note Refer to *5-4 Checking Data Link Status* for details on status flags.

Troubleshooting with Status Flags

Data Link Status

Bit status	Probable cause	Probable remedy
PLC's CPU Unit error is 1: ON	A fatal PLC error, non-fatal PLC error, or a watchdog timer error has occurred.	Refer to the PLC's operation manual and correct the error. If the error occurs again, replace the PLC.
	The Unit is mounted to a non-compatible PLC.	Refer to *1-2-4 Controller Link Unit Models and PLCs* and mount onto the correct PLC.
Communications error is 1: ON	The relevant node is not in the Network.	Enter the node in the Network.
	A communications error has occurred as a result of noise.	Conduct an echoback test using the Controller Link Support Software and if this does not correct the error, check the usage environment.
	A communications error has occurred.	Refer to page 274 *Troubleshooting with RUN, ERC, ERH and INS Indicators* and troubleshoot accordingly.

Bit status	Probable cause	Probable remedy
Data link participation is 0: OFF	The relevant node is not part of data links.	Enter the relevant node in data links. If an error occurs, refer to page 278 *Node Cannot Participate in Data Link* and troubleshoot accordingly.
	There are no active data links in the Network.	Activate the data links.
Offset error is 1: ON	The offset is greater than the number of send words at the relevant node.	Check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.
Receive area insufficient (short) is 1: ON	The send area at the relevant node is larger than the receive area and some data cannot be received.	When the intention is not to receive all data, use as is (data that cannot be received will be read and discarded.) When it differs from the intended data link, check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.
Receive area remaining is 1: ON	The send area at the relevant node is smaller than the receive area and some of the area will be unused.	When the intention is to leave some space in the receive area, use as is (the remaining receive area will be cleared to 0.) When it differs from the intended data link, check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.

Other Status

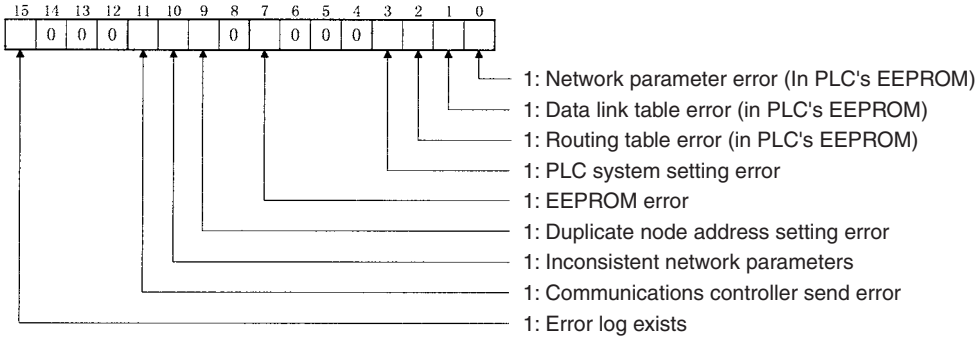
Bit status	Probable cause	Probable remedy
Duplicate Operating Levels/Refresh Error: Operating level 0: AR0011 Operating level 1: AR0010 One of the above flags is 1: ON	The same operating level is set twice within the same PLC.	If two units are required, set them to different operating levels.
	A refresh error has occurred between the PLC and the Unit.	Secure the Controller Link Unit firmly. For C200HX/HG/HE PLCs, tighten the screws on the Bus Connection Unit. If the error occurs even when the Unit is mounted on another PLC, replace the Controller Link Unit.
Routing Table Error/Unit Restart: Operating level 0: AR0113 Operating level 1: AR0112 One of the above flags is 1: ON	The routing table data within the DM Area is corrupted.	Refer to *7-4 Setting Routing Tables* and reset correctly. If the error occurs again, replace the Controller Link Unit.
	There is an error in the routing table setting or a Routing Table Enable Bit (software switch) setting error.	When using routing tables refer to *7-4 Setting Routing Tables* and reset them correctly. When no routing tables are being used, turn OFF the Routing Table Enable Flag.
Communications controller hardware error: Operating level 0: AR1114 Operating level 1: AR1514 One of the above flags is 1: ON	The Controller Link Unit is faulty.	Replace the Controller Link Unit.
EEPROM error: Operating level 0: AR1115 Operating level 1: AR1515 One of the above flags is 1: ON	An error occurred when writing data to EEPROM.	Remake and set the data link table and the network parameters. If the error occurs again, replace the Controller Link Unit.
	The EEPROM data link tables or the network parameters are corrupted.	
	There is an error in the data link or network parameter settings.	
Inconsistent network parameters: Operating level 0: AR2407 Operating level 1: AR2406 One of the above flags is 1: ON	Indicates that the network parameters in the EEPROM of the Controller Link Unit differ from those in the Network.	Check the network parameters on the Network, using the Controller Link Support Software, and reset the necessary parameters.

9-2-3 CVM1 and CV-series Controller Link Units

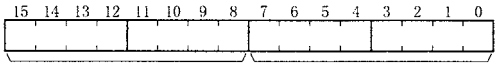
The status of the Unit and Network is indicated in the following manner in the PLC.

Status Area

Error Information: CIO 1500 + 25 × (Unit No.)



Polling Node Address, Startup Node Address: CIO 1500 + 25 × (Unit No.) + 1



Polling node address Startup node address

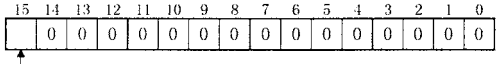
Each node address is displayed in 2-digit BCD.

Network Participation Status: CIO 1500 + 25 × (Unit No.) + 2, + 3

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+ 2	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
+ 3	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of the network
1: Part of the network

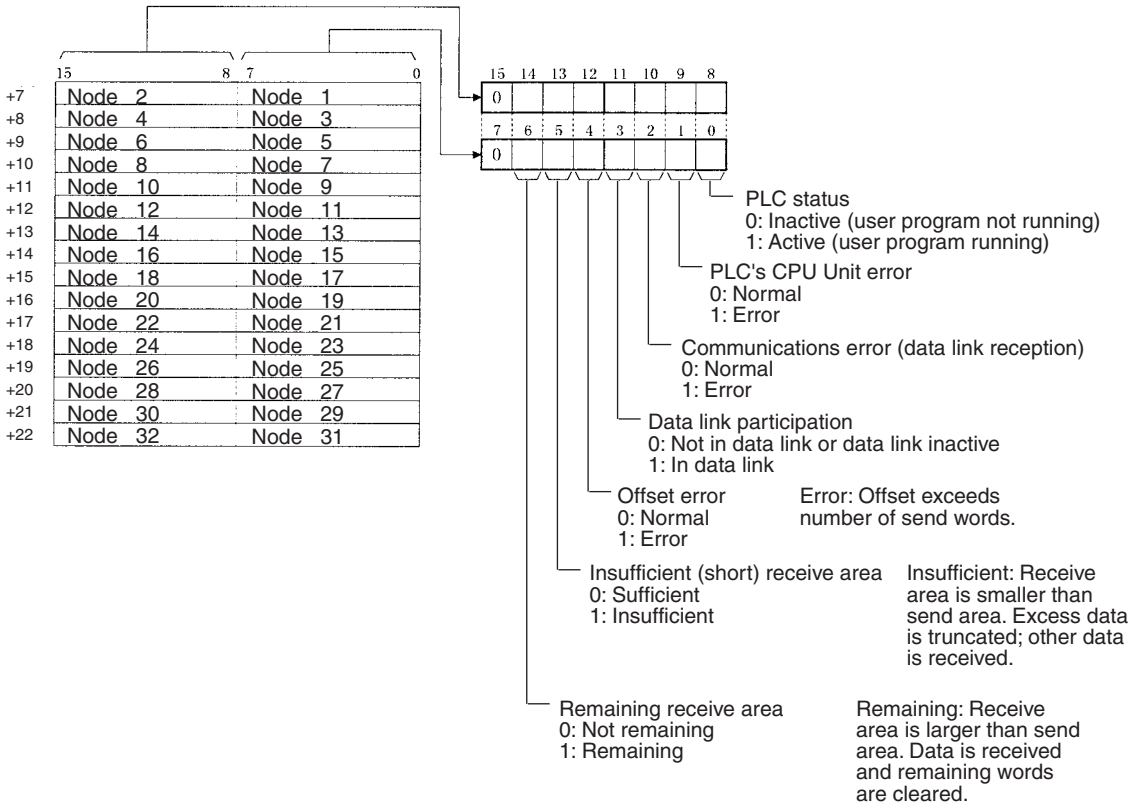
Local Data Link Participation Status: CIO 1500 + 25 × (Unit No.) + 6



1: Local node data link participating
0: Local node data link not participating or data link inactive

Note Data link status is valid only when the local node is participating in the data link. Confirm that the Local Data Link Active Bit is ON before referencing the data link status.

Data Link Status: CIO 1500 + 25 × (Unit No.) + 7 to + 22



When the first data link status word is set to the default (0000) for either the manually set data link tables or automatically set data link tables (In the first data link status word parameter), the data link status is stored in the above area (CIO 1500 + 25 × (Unit No.) (+ 7 to +22)).

When a different area has been set for the first data link status word, the status is stored in the specified area. The status storage format is the same as the one shown in the above diagram.

Note Refer to *5-4 Checking Data Link Status* for details on status flags.

Bit Status and Error Processing

Data Link Status

Bit status	Probable cause	Probable remedy
PLC's CPU Unit error is 1: ON	A fatal PLC error, non-fatal PLC error, or a watchdog timer error has occurred.	Refer to the PLC's operation manual and correct the error. If the error occurs again, replace the PLC.
	The Unit is mounted to a non-compatible PLC.	Refer to *1-2-4 Controller Link Unit Models and PLCs* and mount onto the correct PLC.

Bit status	Probable cause	Probable remedy
Communications error is 1: ON	The relevant node is not in the Network.	Enter the node in the Network.
	A communications error has occurred as a result of noise.	Conduct an echoback test using the Controller Link Support Software and if this does not correct the error, check the usage environment.
	A communications error has occurred.	Refer to page 285 *Troubleshooting with RUN, ERC, ERH and INS Indicators* and troubleshoot accordingly.
Data link participation is 0: OFF	The relevant node is not part of data links.	Enter the relevant node in data links. If an error occurs, refer to page 289 *Node Cannot Participate in Data Link* and troubleshoot accordingly.
	There are no active data links in the Network.	Activate the data links.
Offset error is 1: ON	The offset is greater than the number of send words at the relevant node.	Check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.
Receive area insufficient (short) is 1: ON	The send area at the relevant node is larger than the receive area and some data cannot be received.	When the intention is not to receive all data, use as is (data that cannot be received will be read and discarded.) When it differs from the intended data link, check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.
Receive area remaining is 1: ON	The send area at the relevant node is smaller than the receive area and some of the area will be unused.	When the intention is to leave some space in the receive area, use as is (the surplus receive area will be cleared to 0.) When it differs from the intended data link, check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.

Other Status

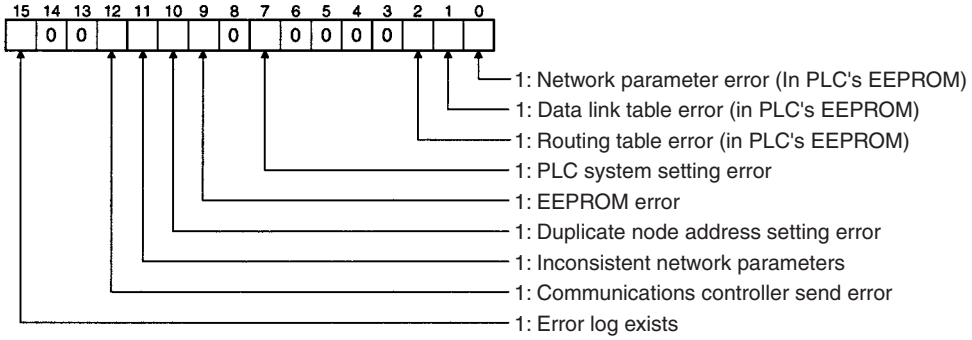
Bit status	Probable cause	Probable remedy
Error log exists (CIO 1500 + 25 × n, bit 15) is 1: ON	Error information on the Controller Link Unit (an error log) has been recorded.	Using the Controller Link Support Software or an FINS command, read the cause of the current error. Alternatively, use past error log records to troubleshoot the problem.
Communications controller send error (CIO 1500 + 25 × n, bit 11) is 1: ON	The Controller Link Unit is faulty.	Replace the Controller Link Unit.
Inconsistent network parameters (CIO 1500 + 25 × n, bit 10) is 1: ON	Indicates that the network parameters recorded in the Controller Link Unit's EEPROM differ from the values of the Network in use.	Check the network parameters on the Network in use using the Controller Link Support Software, and reset necessary parameters.
Node address duplicate setting error (CIO 1500 + 25 × n, bit 9) is 1: ON	The same node address has been used more than once.	Reset so that each node address is used only once within the same Network.
EEPROM error (CIO 1500 + 25 × n, bit 7) is 1: ON	An error has occurred while writing data to the Controller Link Unit's EEPROM.	The EEPROM in the Controller Link Unit is used to store the error log. If this error persists, replace the CPU Unit.
PLC system setting error (CIO 1500 + 25 × n, bit 3) is 1: ON	The system settings for the Controller Link Unit as a CPU Bus Unit in the CPU Unit are corrupted.	Check the status of bits 00 to 02 in (CIO 1500 + 25 × n, and correct any problems found. If the error occurs again, replace the CPU Unit.
	The PLC is protected.	Set the PLC's protect switch to OFF.
Routing table error (CIO 1500 + 25 × n, bit 2) is 1: ON	The routing table data within the CPU Unit's EEPROM is corrupted.	Refer to *7-4 Setting Routing Tables* and reset the routing tables correctly. If the error occurs again, replace the Controller Link Unit.
	There is an error in the routing table setting.	When using a routing table, refer to *7-4 Setting Routing Tables* and reset the routing tables correctly. If no routing tables are being used, delete the tables.
Data link table error (CIO 1500 + 25 × n, bit 1) is 1: ON	The data link table data in the EEPROM of the CPU Unit is corrupted.	Refer to *5-3 Starting and Stopping Data Links* and reset the data link tables correctly. If the error occurs again, replace the CPU Unit.
	There is an error in the data link table settings.	When using manually set data links, refer to *5-3 Starting and Stopping Data Links* and remake and set the data link tables correctly. When manually set data links are not being used, delete the data link tables.

Bit status	Probable cause	Probable remedy
Network parameter error (CIO 1500 + 25 × n, bit 0) is 1: ON	The CPU Unit's EEPROM data link tables or the network parameters are corrupted.	Refer to *8-1-3 Network Parameters* and reset the data correctly. If the error occurs again, replace the CPU Unit.
		Either set the EEPROM Clear Bit in the DM Parameter Area to ON, or use the Initialize network parameters operation on the Maintenance Menu of the Controller Link Support Software to initialize the network parameters and then cycle the power supply.
	There is an error in the network parameter settings, or node address of the local node is larger then the maximum address set within the network parameters.	Refer to *8-1-3 Network Parameters* and reset the network parameters or the node address.

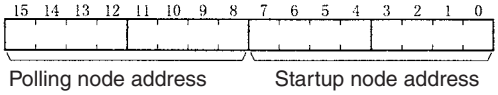
9-2-4 CQM1H-series Controller Link Units

Status Area

Error Information: IR 190

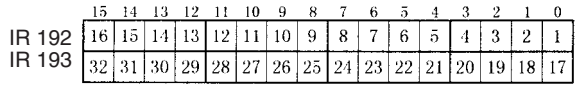


Polling Node Address, Startup Node Address: IR 191



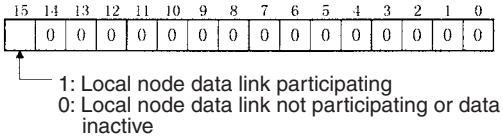
Each node address is displayed in 2-digit BCD.

Network Participation Status: IR 192 and IR 193



The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of the network
1: Part of the network

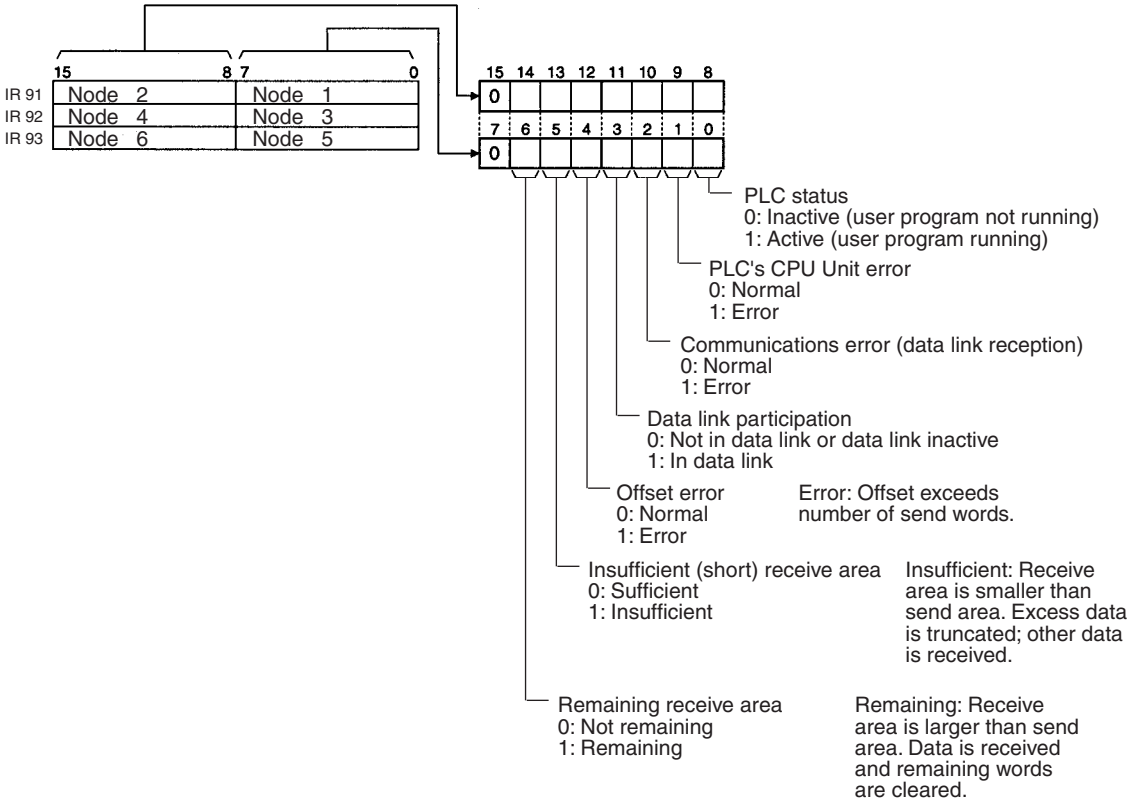
Local Data Link Participation Status: IR 90



Note Data link status is valid only when the local node is participating in the data link. Confirm that the Local Data Link Active Bit is ON before referencing the data link status.

Data Link Status: IR 91 to IR 93

When the first data link status word is not set or is set to the default (0000) for either the manually set data link tables or automatically set data link tables, the data link status is stored in the following words for nodes 1 to 6 only.



Note Refer to *5-4 Checking Data Link Status* for details on status flags.

Bit Status and Error Processing

Data Link Status

Bit status	Probable cause	Probable remedy
PLC's CPU Unit error is 1: ON	A fatal PLC error, non-fatal PLC error, or a watchdog timer error has occurred.	Refer to the PLC's operation manual and correct the error. If the error occurs again, replace the PLC.
	The Unit is mounted to a non-compatible PLC.	Refer to *1-2-4 Controller Link Unit Models and PLCs* and mount onto the correct PLC.

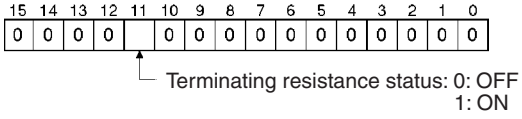
Bit status	Probable cause	Probable remedy
Communications error is 1: ON	The relevant node is not in the Network.	Enter the node in the Network.
	A communications error has occurred as a result of noise.	Conduct an echoback test using the Controller Link Support Software and if this does not correct the error, check the usage environment.
	A communications error has occurred.	Refer to page 285 *Troubleshooting with RUN, ERC, ERH and INS Indicators* and troubleshoot accordingly.
Data link participation is 0: OFF	The relevant node is not part of data links.	Enter the relevant node in data links. If an error occurs, refer to page 289 *Node Cannot Participate in Data Link* and troubleshoot accordingly.
	There are no active data links in the Network.	Activate the data links.
Offset error is 1: ON	The offset is greater than the number of send words at the relevant node.	Check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.
Receive area insufficient (short) is 1: ON	The send area at the relevant node is larger than the receive area and some data cannot be received.	When the intention is not to receive all data, use as is (data that cannot be received will be read and discarded.) When it differs from the intended data link, check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.
Receive area remaining is 1: ON	The send area at the relevant node is smaller than the receive area and some of the area will be unused.	When the intention is to leave some space in the receive area, use as is (the surplus receive area will be cleared to 0.) When it differs from the intended data link, check the number of send words at the relevant node, the number of receive words at the local node and the offset, then reset the data link table correctly.

Other Status

Bit status	Probable cause	Probable remedy
Error log exists (IR 19015) is 1: ON	Error information on the Controller Link Unit (an error log) has been recorded.	Using the Controller Link Support Software or an FINS command, read the cause of the current error. Alternatively, use past error log records to troubleshoot the problem.
Communications controller send error (IR 19011) is 1: ON	The Controller Link Unit is faulty.	Replace the Controller Link Unit.
Inconsistent network parameters (IR 19010) is 1: ON	Indicates that the network parameters recorded in the CPU Unit's EEPROM differ from the values of the Network in use.	Check the network parameters on the Network in use using the Controller Link Support Software, and reset necessary parameters.
Node address duplicate setting error (IR 19009) is 1: ON	The same node address has been used more than once.	Reset so that each node address is used only once within the same Network.
EEPROM error (IR 19007) is 1: ON	An error has occurred while writing data to the CPU Unit's EEPROM.	Check the status of bits IR 19000 to IR 19002 and correct any problems found. If the error occurs again, replace the CPU Unit.
Routing table error (IR 19002) is 1: ON	The routing table data within the CPU Unit's EEPROM is corrupted.	Refer to *7-4 Setting Routing Tables* and reset the routing tables correctly. If the error occurs again, replace the Controller Link Unit.
	There is an error in the routing table setting.	When using a routing table, refer to *7-4 Setting Routing Tables* and reset the routing tables correctly. If no routing tables are being used, delete the tables.
Data link table error (IR 19001) is 1: ON	The data link table data in the EEPROM of the CPU Unit is corrupted.	Refer to *5-3 Starting and Stopping Data Links* and reset the data link tables correctly. If the error occurs again, replace the CPU Unit.
	There is an error in the data link table settings.	When using manually set data links, refer to *5-3 Starting and Stopping Data Links* and remake and set the data link tables correctly. When manually set data links are not being used, delete the data link tables.

Bit status	Probable cause	Probable remedy
Network parameter error (IR 19000) is 1: ON	The CPU Unit's EEPROM data link tables or the network parameters are corrupted.	Refer to *8-1-3 Network Parameters* and reset the data correctly. If the error occurs again, replace the CPU Unit.
		Either set the EEPROM Clear Bit in the DM Parameter Area to ON, or use the Initialize network parameters operation on the Maintenance Menu of the Controller Link Support Software to initialize the network parameters and then cycle the power supply.
	There is an error in the network parameter settings, or node address of the local node is larger then the maximum address set within the network parameters.	Refer to *8-1-3 Network Parameters* and reset the network parameters or the node address.

Terminating Resistance Status: IR 95



9-3 Error Log

The error log records errors that occur in the Controller Link Unit and the time they occur. The error log can be read or cleared by using Programming Devices, such as the Controller Link Support Software, the CX-Net, or Support Software for the CPU Unit (SYSMAC Support Software), or by using the message service (FINS commands for the Controller Link Unit.)

9-3-1 Error Log Table

Errors are recorded in an error log table in the Unit's RAM, with one record for each error and a maximum of 64 or 39 records.

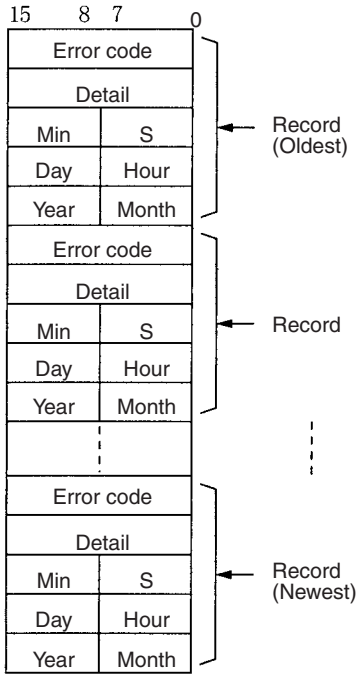
Errors of significance are also recorded in the Unit's EEPROM so that when the power to the Unit is turned OFF or reset, a record of the error will remain. (The error log table in EEPROM automatically reads the Unit's RAM when the power is turned ON again.)

Item	Specification
No. of records	64 records max.: CS1W-CLK23 (See note.) and CJ1W-CLK23 39 records max.: All other Units
Data code	Binary (Times are in BCD)
Length of each record	10 bytes
Configuration of records	Error code: 2 bytes (Refer to page 311) Detail code: 2 bytes (Refer to page 311) Time: 6 bytes (Refer to the following page)
Record order	From the oldest record to the most recent.

Note The maximum number of records that can be stored in EEPROM is 39.

If the number of records exceeds 64 or 39, the oldest record will be deleted and the most recent error recorded.

Error Log Table Configuration



Time Information

The time is recorded in BCD with one byte each for the year (the rightmost two digits), month, day, hour, seconds, and minutes of the time the error occurred.

Note

1. The PLC's time information can be read and used in the Controller Link Unit. When the time cannot be read from the PLC, all error log times will but 0. This can occur for PLC startup errors, Unit No. errors, CPU Unit errors, or PLC model errors. When error logs like these are read from the Controller Link Support Software, they will be dated 0 s, 0 min, 0 hr, 0 day, 0 month, 2000.
2. When replacing the battery for CS/CJ-series PLCs, it will be necessary to switch the power supply ON and reset the internal clock.
   If the internal clock is not reset, time information in the error log will not be recorded correctly.
3. The time information will be all zeros for CQM1H-series PLCs unless a Memory Cassette with a clock is mounted in the CPU Unit. The time information will be all zeros in the year 2000 if it is read from Support Software.

9-3-2 Error Codes

The following table lists the error codes (in 4-digit hexadecimal) and the contents of the errors.

Error code	Contents	Detail code		Correction	Written to EEPROM	Applicable PLC
		1st byte	2nd byte			
0001 Hex	PLC watchdog timer error	00 Hex	00 Hex	Replace PLC's CPU Unit.	Yes	All
0002 Hex	PLC service monitor error	Monitor time (unit: ms)		Check operating environment.	Yes	CV, CS/CJ

Error code	Contents	Detail code		Correction	Written to EEPROM	Applicable PLC
		1st byte	2nd byte			
0003 Hex	PLC shared RAM error	01 Hex: Cyclic 02 Hex: Event 04 Hex: CPU bus link	00 Hex	Check operating environment.	Yes	CV
0004 Hex	CPU Bus Unit ID number error	00 Hex	00 Hex	Check I/O Connecting Cables.	Yes	CV, CS/CJ
0005 Hex	Unit number error	Unit set value	The value recognized by the CPU Unit	Check the Unit number setting. Recreate the I/O table.	Yes	CV
0006 Hex	CPU Unit error	Bit 11:No relevant Unit in I/O table. Bit 12: Hardware test unit number recognized. Bit 13: Incorrect unit number. Bit 14: Duplicated unit number.		Check the Unit number settings. Recreate the I/O table.	Yes	CV, CS/CJ
000D Hex	PLC model error	Not set		Refer to *1-2-4 Controller Link Unit Models and PLCs and PLCs* and check the PLC model.	Yes	C200HX/HG/HE
000E Hex	I/O Bus error	00 Hex	00 Hex	Check the operating environment.	Yes	CS/CJ
000F Hex	PLC initialization error			Check the operating environment.	Yes	CS/CJ
0010 Hex	PLC Setup exceeds capacity			Reduce the number of CPU Bus Units mounted on each CPU Unit by one.	Yes	CS/CJ
0011 Hex	PLC initialization error (Time out)			Check the operating environment.	Yes	CS/CJ
0012 Hex	CPU Unit memory error	01 Hex: Read error 02 Hex: Write error	01 Hex: Data link table 02 Hex: Network parameters 03 Hex: Routing table 04 Hex: PLC Setup Area	Reset the appropriate data.	Yes	CS/CJ
0013 Hex	CPU Unit write-protected			Release the CPU Unit write protect.	Yes	CS/CJ

Error code	Contents	Detail code		Correction	Written to EEPROM	Applicable PLC
		1st byte	2nd byte			
0101 Hex	Transmission failed; local node not in Network	**Command block** Bits 0 to 7: Source node address Bits 8 to 14: Source Network address Bit 15: OFF **Response block** Bits 0 to 7: Destination node address Bits 8 to 14: Destination Network address Bit 15: ON (1st byte: bits 8 to 15; 2nd byte, bits 0 to 7)		Refer to page 274 *Troubleshooting Using Indicators* and place the local node into Network.	No	All
0103 Hex	Transmission failed; retry count exceeded			Using the Controller Link Support Software or FINS commands, run echoback test and check operating environment if errors occur.	No	All
0104 Hex	Transmission failed; maximum number of frames exceeded.			Reduce the number of events per communications cycle or increase the maximum number of network parameter frames.	No	All
0105 Hex	Transmission failed; node address incorrect			Refer to *4-2 CJ-series Controller Link Units* or *4-4 CVM1 and CV-series Controller Link Units* and check node address settings to be sure they are within range and unique.	No	All
0106 Hex	Transmission failed; redundant node address			Correct node addresses so that they are unique within the same Network.	No	All
0107 Hex	Transmission failed; destination node not in Network			Refer to *9-1 Troubleshooting Using Indicators* and place destination node into Network.	No	All
0108 Hex	Transmission failed; specified Unit does not exist			Refer to *4-4 CVM1 and CV-series Controller Link Units* and check unit address and unit number of destination.	No	All

Error code	Contents	Detail code		Correction	Written to EEPROM	Applicable PLC
		1st byte	2nd byte			
0109 Hex	Transmission failed; destination busy	**Command block** Bits 0 to 7: Source node address Bits 8 to 14: Source Network address Bit 15: OFF **Response block** Bits 0 to 7: Destination node address Bits 8 to 14: Destination Network address Bit 15: ON (1st byte: bits 8 to 15; 2nd byte, bits 0 to 7)		Increase number of retries or reconfigure system to distribute load.	No	All
010A Hex	Transmission failed; communications controller error			Conduct an echo-back test and if the effects of noise are considerable, reconsider the operating environment. Restart the Controller Link Unit. If the error occurs again, replace the Unit.	Yes	All
010B Hex	Transmission failed; PLC error			Refer to the PLC operating manual. If the error occurs again, replace the PLC.	No	All
010C Hex	Transmission failed; unit number incorrect			Check unit number settings to be sure they are within range and unique.	No	CV, CS/CJ
010D Hex	Transmission failed; destination address incorrect			Check routing tables.	No	All
010E Hex	Transmission failed; routing tables not registered			Check routing tables	No	All
010F Hex	Transmission failed; routing table error			Check routing tables.	No	All
0110 Hex	Transmission failed; too many relay points			Check routing tables and system configuration. Use a CS/CJ-series CPU Unit with unit version 2.0 or later and CX-Programmer Ver. 4.0 or higher to send commands across three or more network levels.	No	All
0111 Hex	Transmission failed; command packet too long			Be sure to use the FINS command format.	No	All
0112 Hex	Transmission failed; header error.			Be sure to use the correct FINS command format.	No	All
0113 Hex	Transmission failed; I/O setting error			Check I/O table accuracy.	No	CV, CS/CJ
0114 Hex	Transmission failed; CPU bus error			Check Unit and cable connections and clear error.	No	CV, CS/CJ
0115 Hex	Transmission failed; redundant I/O allocations			Check unit numbers for redundancy within the same PLC.	No	CV, CS/CJ
0116 Hex	Transmission failed; CPU Bus Unit error			Check Unit and cable connections and clear error.	No	CV, CS/CJ

Error code	Contents	Detail code		Correction	Written to EEPROM	Applicable PLC
		1st byte	2nd byte			
0117 Hex	Internal buffer full	**Command block** Bits 0 to 7: Source node address Bits 8 to 14: Source Network address Bit 15: OFF **Response block** Bits 0 to 7: Destination node address Bits 8 to 14: Destination Network address Bit 15: ON (1st byte: bits 8 to 15; 2nd byte, bits 0 to 7)		Increase number of retries or reconfigure system to distribute load.	No	All
0118 Hex	Illegal packet discarded			Check for nodes sending illegal packets.	Yes	All
0203 Hex	EEPROM error	01 Hex: Read error 02: Hex: Write error	01 Hex: Data link tables 02 Hex: Network parameters 03 Hex: Routing tables	For CVM1 and CV-series PLCs, check that the PLC is not protected. Remake and set the relevant data. If the error occurs again for the CVM1 and CV-series, replace the CPU Unit and for the C200HX/HG/HE PLCs, replace the Controller Link Unit.	Yes	C200HX/HG/HE, CV, CQM1H
0206 Hex	Number of participating nodes decreased (local node still participating)	Network parameters maximum node address	Number of non-participating nodes	Check network parameters, node participation, cables, and terminating resistance.	No (See note 4.)	All
0207 Hex	Number of participating nodes decreased (local node not participating)				No (See note 4.)	All
0208 Hex	Polling node changed	Address of previous polling node	Address of new polling node	Check previous polling node.	No (See note 4.)	All
0209 Hex	Inconsistent network parameter	00 Hex	Address of polling node	Using the Controller Link Support Software, check network parameters.	Yes	All
020C Hex	Time out with token	00 Hex	Error status (See note.)	Check network parameters, node participation, cables, and terminating resistance.	No	All
0210 Hex	Communications controller send error	00 Hex	Error status (See note.)	Replace the Controller Link Unit.	Yes	All
0211 Hex	Duplicate address error	00 Hex	Local node address	Reset so that each node address is used only once within the same Network.	No (See note 4.)	All
0214 Hex	Node address setting error	Not specified		Check the node address settings and correct them.	Yes	CS/CJ, CQM1H

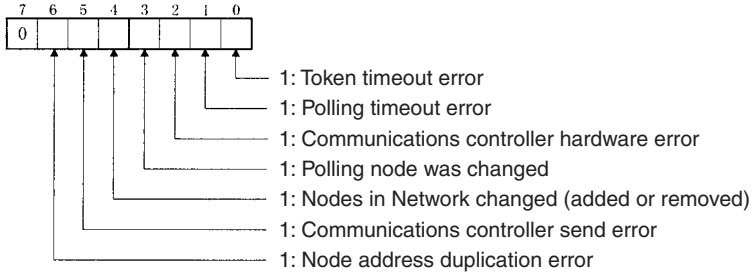
Error code	Contents	Detail code		Correction	Written to EEPROM	Applicable PLC
		1st byte	2nd byte			
0216 Hex	Backup power supply error (Optical Units only)	00 Hex	Backup power supply error distinction: 01 Hex: OFF to ON 02 Hex: ON to OFF	Check the status of the backup power supply and power supply cables.	No	CS/CJ
021A Hex	Set table logic error	00 Hex	01 Hex: Network parameters 02 Hex: Data link tables 03 Hex: Routing tables	Remake and set the appropriate data. Check the unit version.	Yes	All
021B Hex	Hardware error	00 Hex	Error status (See note.)	Replace the Controller Link Unit.	No (See note 4.)	All
021C Hex	Data link error inactive	Not set		Restart the Controller Link Unit.	Yes	All
0220 Hex	Reduced number of participating nodes (separated nodes)	Separated nodes 1 to 16 correspond to bits 0 to 15 (1st byte: bits 8 to 15, 2nd byte: bits 0 to 7)		Check the node parameters, the separated nodes, cables, and terminating resistance settings.	No (See note 4.)	CS/CJ
0221 Hex		Separated nodes 17 to 32 correspond to bits 0 to 15 (1st byte: bits 8 to 15, 2nd byte: bits 0 to 7)				
0222 Hex		Separated nodes 33 to 48 correspond to bits 0 to 15 (1st byte: bits 8 to 15, 2nd byte: bits 0 to 7)				
0223 Hex		Separated nodes 49 to 62 correspond to bits 0 to 13 (1st byte: bits 8 to 15, 2nd byte: bits 0 to 7)				
0230 Hex	Data link stop requested	Start node address	Stop node address	Check the application and Support Software operation if the data link was not intentionally stopped.	Yes	CS/CJ
0300 Hex	Packet discarded	Not set		Conduct an echoback test and find the cause of the error.	No	All
0601 Hex	Unit error	Not set		Check the operating environment.	Yes	All

Note

1. Applicable PLCs: CV = CVM1 and CV-series PLCs, CS/CJ = CS-series and CJ-series PLCs, All = All models of PLC.
2. Errors indicated by error codes 0101 to 0116 are recorded only when the frame was discarded because transmission was impossible.
3. Error code 0230 hex is only recorded for Controller Link Units with unit version 1.2 or later.
4. The data is written to EEPROM for the CS1W-CLK23 and CJ1W-CLK23.

Error Status

The status of each bit indicates that an error has occurred as given in the diagram below.



9-3-3 Reading and Clearing Error Logs

Error logs can be read or cleared using the Controller Link Support Software, the CX-Programmer, PLC Programming Devices, or the message service. The following examples are for the Controller Link Support Software and the message service. When using a PLC Programming Device, refer to the Programming Device's operation manual for details.

Controller Link Support Software

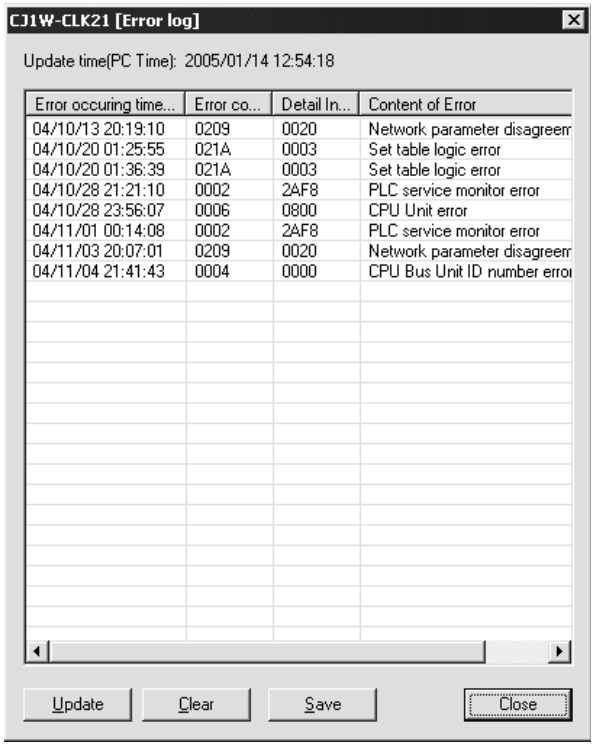
Read or clear the error log using the following procedure.

1,2,3...

1. Display the Main Menu.
2. Select "E: Error log."
3. Designated the node. The error log for the designated node will be displayed.
4. Press the F7 (Clear) Key. The designated node error log will be cleared.

Right-click the target PLC in the Network Configuration Window and select ***Error Log of Communication Unit*** from the pop-up menu.

The Error log Dialog Box will be displayed. In this example, a Controller Link Unit is selected.



The Communications Unit's error log (stored in the Unit's EEPROM) will be displayed, showing each error's *Error occurring time*, *Error code*, *Detail information*, and *Content of Error*.

Message Service

Reading an Error Log

Send the ERROR LOG READ FINS command (command code 2102) to the appropriate node. Refer to *6-5-11 ERROR LOG READ*.

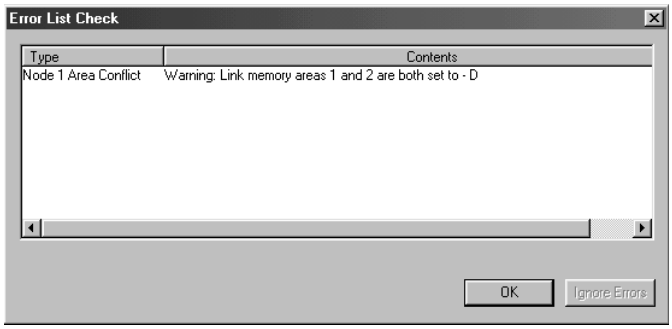
Clearing an Error Log

Send the ERROR LOG CLEAR FINS command (command code 2103) to the appropriate node. Refer to *6-5-12 ERROR LOG CLEAR*.

9-4 Troubleshooting Error Messages in CX-Net Data Link Table Check

This section describes the error messages displayed during data link table checks performed with CX-Net and the required troubleshooting. Perform data link table checks by selecting ***Validate Table*** from the Table Menu in the CX-Net's Datalink Component Screen, or when transferring data link tables (by selecting ***Online - Transfer to PLC***).

Example Display of Error List



Note

(1) If any errors (except for warnings) are detected during the table check performed when transferring data link tables, the data link tables will not be transferred even if the **OK** Button is clicked. Remove the cause of the error and then transfer the data link tables again.

(2) Messages (in the *Contents* field) preceded by "Warning," indicate a warning, not an error that will prevent operation continuing. Check the contents of the message, and confirm that the intended settings and allocations are correct. Click the **OK** Button to transfer the data link tables without any changes.

(3) The following two messages indicate warnings for CS/CJ-series Controller Link Units with unit version 1.2 or later and errors for CS/CJ-series pre-Ver. 1.2 Controller Link Units.
Node XX Node size:
Warning: The total send and receive size of ** exceeds 12000.
Node XX Area Overlap:
Warning: Link memory areas 1 and 2 are both set to – [Area]

Error message		Troubleshooting
Node XX Link area exceeded	Total link area 1 Start Address ** size ** is outside max area size	The size ** of Link Area 1 starting from start address ** exceeds the maximum size for the corresponding area. Check the maximum number of words in the corresponding area of the CPU Unit being used, and either change the start address or reduce the number of data link words.
	Total link area 2 Start Address ** size ** is outside max area size	The size ** of Link Area 2 starting from start address ** exceeds the maximum size for the corresponding area. Either change the start address or reduce the number of data link words.
Node XX Dest	Warning: Size outside bounds of Link from node **. Enter value in range ** to **	The number of receive words at the destination node is smaller than the number of send words at the source node. Change the number of send words or number of receive words if the allocations are not intended. If the allocations are intended, the data link tables can be transmitted without making any changes.
	Invalid [Area] offset. Enter value in range ** to **	The value equal to or higher than the number of send words at node XX is set in the number of offset words for the destination node. If the allocation is not intended, change either the number of send words or the number of receive words. If the allocations are intended, the data link tables can be transmitted without making any changes.
Node XX Dest Overflow	Warning: Overflow occurred	The number of receive words at the destination node is larger than the number of send words at the source node. Change the number of send words or number of receive words if the allocations are not intended. If the allocations are intended, the data link tables can be transmitted without making any changes.
	Warning: Block outside bounds of Link from node **. Enter value in range ** to **	The number of receive words at the destination node is smaller than the number of send words at the source node. Change the number of send words or number of receive words if the allocations are not intended. If the allocations are intended, the data link tables can be transmitted without making any changes.

Error message		Troubleshooting
Node XX Node size	Warning: The total node send and receive size of ** exceeds 12000	The total number of send and receive words exceeds 12,000. Controller Link Units with unit version 1.2 or later are required for data links with 20,000 send and receive words. For pre-Ver. 1.2 Controller Link Units, reduce the number of send and receive words.
	Total Node send size of ** exceeds max 20000	The total number of send and receive words exceeds 20,000. Reduce the number of send and receive words to within the maximum.
	Total Node send size of ** exceeds max 8000	The total number of send and receive words exceeds 8,000. Reduce the number of send and receive words to within the maximum.
	Total Node send size of ** exceeds max 62000	The total number of send and receive words exceeds 62,000. Reduce the number of send and receive words to within the maximum. (The 62,000 maximum can be exceeded by personal computer boards only.)
	Total Node send size is 0	The number of allocated words for node ** in node No. xx is 0. Change the number of words or delete the node.
	Total Node send size of ** exceeds max 1000	The total number of send words for node XX exceeds 1,000. Set the number of send words to 1,000 words or less.
	Total Node send size of ** exceeds max 4000	The total number of send words for node XX exceeds 4,000. Set the number of send words to 4,000 or less, or to 1,000 or less. (More than 1,000 send words can be set for the CS1W-CLK23 and CJ1W-CLK23.)
Node XX Area Overlap Node XX Area Conflict	Warning: Duplicated area exists in Area 1 and status area	The same words have been allocated for both the Data Link Area 1 and status area. If the duplication is not intended, change the settings for either area. If the duplication is intended, the data link tables can be transmitted without making any changes.
	Warning: Duplicated area exists in Area 2 and status area	The same words have been allocated for both the Data Link Area 2 and status area. If the duplication is not intended, change the settings for either area. If the duplication is intended, the data link tables can be transmitted without making any changes.
	Warning: Link memory areas 1 and 2 are both set to - [Area]	The same area has been set for both Data Link Area 1 and 2. The same area can be set if using Controller Link Units with unit Ver. 1.2 or later. If a pre-Ver. 1.2 Controller Link Unit is being used, set a different area each for Area 1 and Area 2. (This message is displayed for CS/CJ-series CPU Units only.)
	Link memory areas 1 and 2 are both set to [Area]	The same area has been set for both Data Link Area 1 and 2. Set a different area each for Area 1 and Area 2. (This message is displayed for CS/CJ-series CPU Units only.)
	Link memory areas 1 and 2 are both set to [Area]	The same address has been set for the Data Link Area and the area in which both Area 1 and Area 2 are set. Reset the addresses so that no duplication occurs. (This message is displayed for CS/CJ-series CPU Units only.)

The XX symbol refers to the corresponding node address. The two asterisks (**) refer to the corresponding area type, address, and number of words.

9-5 Cleaning and Inspection

This section describes cleaning and inspection procedures that are to be performed as daily maintenance.

9-5-1 Cleaning

Conduct the following periodic cleaning to keep the Controller Link Unit in optimum condition.

- Wipe the Unit with a dry, soft cloth daily.
- For stains that cannot be removed with a dry cloth, dip the cloth in medium strength alcohol (2%), wring the cloth tightly, and then wipe down the Unit.
- If glue, vinyl, or tape is left on the Unit for long periods of time, it will stain. Remove these items during cleaning.

⚠ **Caution** Do not use volatile solvents such as benzine or paint thinner, or chemical cloths for cleaning. They will damage the quality of the coating on the Unit.

9-5-2 Inspection

Controller Link Units must be inspected on a regular basis to ensure correct operation. Inspections should be conducted once every 6 to 12 months. If the Unit is subject to extremes in temperature or humidity, inspections should be conducted on a more regular basis.

Tools and Equipment Need for Inspection

The following tools and equipment will be needed to perform inspection and adjustments.

- Assorted flat-blade and Phillips screwdrivers
- Circuit tester or digital voltmeter
- Industrial-grade alcohol and clean cotton cloth
- Synchroscope
- Pen-chart recording oscilloscope
- Thermometer, hygrometer

Inspection Items

Inspect the follow items to see if they deviate from the prescribed standards. If any items do deviate from the standard either adjust so they are within the operating range or adjust the Unit accordingly.

Item	Description	Inspection instrument
Ambient conditions	Temperature: 0° to 55°C	Thermometer
	Humidity: 10% to 90% (no condensation or freezing)	Hygrometer
	Dust-free	Sight
Installation	Units securely attached? Communications cable connectors tight? Communications cabling used for external wiring intact (no breaks)?	Flat-blade screwdriver and sight

9-6 Handling Precautions

The Controller Link Unit is a Network device. If the Unit is damaged, it will effect the entire Network, so always ensure repairs are undertaken immediately. We recommend that you have a spare Controller Link Unit on hand so that repairs may be conducted quickly.

9-6-1 Replacing the Unit

Observe the following precautions when replacing the Unit.

- Always turn OFF the power before replacing the Unit.
- Check that the new Unit is not faulty.
- If you suspect that a poor connection is the cause of a malfunction, clean the connectors using a clean, soft cloth and industrial-grade alcohol. Remove any lint or threads left from the cloth, and remount the Unit.
- When returning a faulty Unit for repairs, always attach a detailed fault report to the Unit and return to you nearest OMRON outlet as listed at the back of this manual.

Note 1. The DM Parameter Area for CS1W-CLK21 and CJ1W-CLK21 Controller Link Units and that for CS1W-CLK21-V1, CS1W-CLK23, CJ1W-CLK21-V1, and CJ1W-CLK23 Controller Link Units differ in the way shown below.

- Differences in Software Switches (D30000 + 100 × Unit No.)

<table>
<tr><th rowspan="2">Bit address</th><th colspan="6">Unit</th></tr>
<tr><th colspan="3">CS1W-CLK21
CJ1W-CLK21</th><th colspan="3">CS1W-CLK21-V1, CS1W-CLK23
CJ1W-CLK21-V1, CJ1W-CLK23</th></tr>
<tr><td>Bit 11</td><td colspan="3">Reserved for system use (fixed at 0)</td><td colspan="3">Used as the Wired Network 62 Node Enable Bit.
0: 32 nodes max.
1: 62 nodes max.</td></tr>
<tr><td rowspan="3">Bit 06</td><td colspan="3" rowspan="3">Reserved for system use (fixed at 0)</td><td colspan="3">Used as one of the bits for specifying the data link mode. Mode set to automatic setting with 1:N allocation when this bit is turned ON.</td></tr>
<tr><td>0</td><td>Manual setting</td><td>0</td><td>Automatic setting - equality layout</td><td>0</td><td>Automatic setting - 1:N allocation</td></tr>
<tr><td>(Bit 05)</td><td>0</td><td>Manual setting</td><td>0</td><td>Automatic setting</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>(Bit 04)</td><td>0</td><td></td><td>1</td><td></td><td>0</td><td></td><td>1</td><td>1</td></tr>
</table>

- Difference in Data Link Automatic Setting Parameters (D3000 + 100 × Unit No. + 12 to 25)

Word address	Unit	
	CS1W-CLK21 CJ1W-CLK21	**CS1W-CLK21-V1, CS1W-CLK23 CJ1W-CLK21-V1, CJ1W-CLK23**
+12 to +25	Reserved for system use (fixed at 0)	Used to make parameter settings for automatic data link creation with 1:N allocation. (Only possible when automatic setting with 1:N allocation is selected by setting software switch bits 04, 05, and 06 to 1, 0, and 1 respectively.)

Because of the differences shown above, if a value other than 0 is set in the above areas of the DM Parameter Area, there is a possibility of malfunction, and particularly in data link operation if the Unit is replaced by one with a different DM Parameter Area. Therefore, before replacing the Unit, check to make sure that 0 is set in all the above areas, and then set the parameters as required after the Unit has been replaced.

2. In order to prevent faulty operation be sure to turn off the power to all nodes before replacing the Unit.

   Relay Terminal Blocks (CJ1W-TB101) can be used on any node but the end nodes to enable replacing the Controller Link Unit with the communications cable connected and turn OFF the power to only the Unit being replaced. Refer to *Appendix C Using the Relay Terminal Block* for details.

3. When replacing the Unit, do not reconnect that node to the Network before carrying out the procedures listed below. In particular, a node with a small address will become the polling node and communicate the initial network

parameter status to other nodes, so there is the chance that network parameters in the entire Network will be damaged.

9-6-2 Setting the Unit after Replacement

After replacing a Controller Link Unit, reset the hardware switches, software switches, and data link tables, and wire it in the same manner as the previous Unit. This section describes settings that require particular care. Refer to the Unit replacement methods later in this section for details on replacing the Unit.

⚠ **Caution** After replacing the CPU Unit, transfer important data, such as DM and HR Area contents, to the new CPU Unit before restarting operation. Depending on the program, accidents can occur as a result of incorrect DM or HR Area contents.

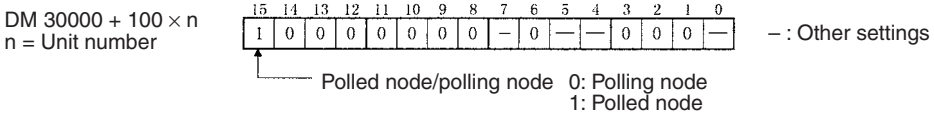
CS/CJ-series, CVM1, and CV-series Controller Link Units store data such as data link tables, network parameters, and routing tables in the CPU Unit. When replacing the CPU Unit, reset these settings using the Controller Link Support Software.

Resetting Network Parameters

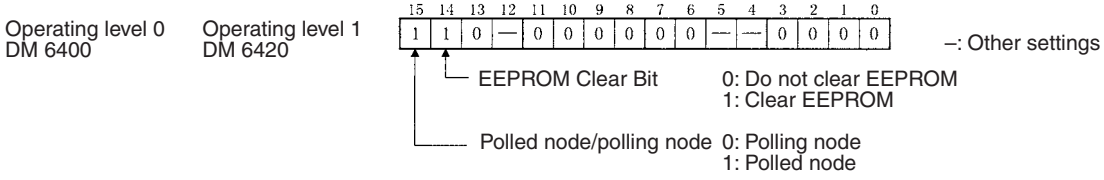
When a C200HX/HG/HE or CQM1H-series Controller Link Unit has been replaced or a CPU Unit has been replaced for a CS/CJ-series, CVM1, or CV-series Controller Link Unit, it is necessary to reset the network parameters, data link tables, and routing tables. This sections describes the resetting procedure for the network parameters. For details on data link table resetting procedures, refer to *5-2 Setting Data Links* and for routing table resetting procedures, refer to *7-4 Setting Routing Tables*.

1,2,3... 1. Network parameters are read from the polling node when the Network is activated and this information is distributed to all nodes in the Network. For this reason, set the polled/polling node setting in the DM Parameter Area for the node replaced to a polled node before reconnecting the Unit to the Network. For C200HX/HG/HE and CQM1H-series Controller Link Units, the EEPROM Clear Bit in the DM Parameter Area will already be set to clear EEPROM (ON or 1).

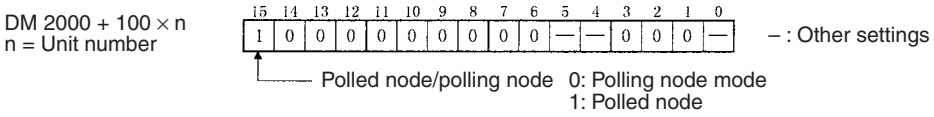
CS/CJ-series Controller Link Units



C200HX/HG/HE Controller Link Units

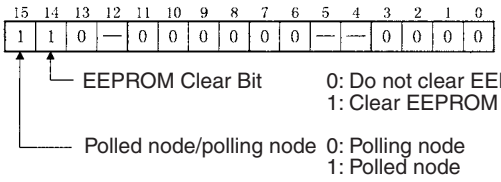


CVM1 and CV-series Controller Link Units



CQM1H-series Controller Link Units

DM 6400



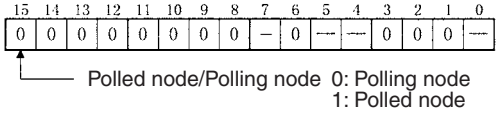
2. Turn the power off once, connect the Controller Link Network and turn the power on again. Check that the Unit is participating in the Network.

   If the INS indicator is lit and the ERC and ERH indicators are off, then the Unit is in the Network.

3. Return the Polled node/polling node setting of the node in which the Unit was replaced to "polling node." For C200HX/HG/HE and CQM1H-series Controller Link Units, the EEPROM Clear bit will already be set to not clear EEPROM.

CS/CJ-series Controller Link Units

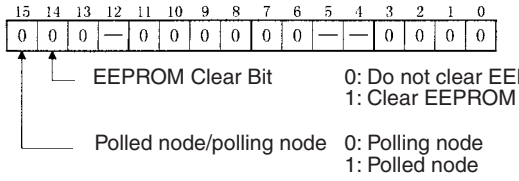
DM 30000 + 100 × n
n = Unit number



C200HX/HG/HE Controller Link Units

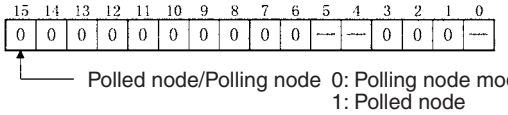
Operating level 0
DM 6400

Operating level 1
DM 6420



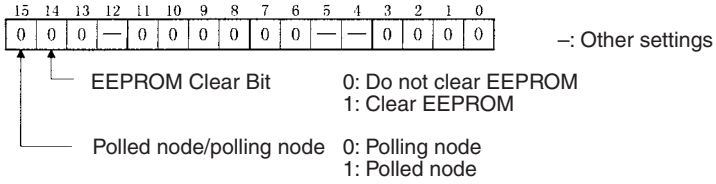
CVM1 and CV-series Controller Link Units

DM 2000 + 100 × n
n = Unit number



CQM1H-series Controller Link Units

DM 6400



4. Restart the Controller Link Unit or turn the power off and then back on again, and then check to see if the Unit is participating in the Network.

   If the INS indicator is lit and the ERC and ERH indicators are not lit, then the Unit is in the Network.

Note Restart the Unit only when the data links are halted.

Using the above procedure to reset the network parameters of the node that was replaced to the same as the other nodes in the Network.

⚠ **Caution** When a C200HX/HG/HE or CQM1H-series Controller Link Unit has been replaced or a CPU Unit has been replaced for a CS/CJ-series, CVM1, or CV-series Controller Link Unit, do not connect that node to the Network before carrying out the above procedures. In particular, a node with a small address will become the polling node and communicate the initial network parameter status to other nodes, so there is the chance that network parameters in the entire Network will be damaged.

9-6-3 Replacing the Unit

C200HX/HG/HE and CQM1H-series Controller Link Units

Using the Controller Link Support Software

1,2,3...

1. From the Maintenance Menu on the Controller Link Support Software, select "Unit Back-up" and then "Unit –> Computer." The data will be saved as a file in the Unit's EEPROM.

   Data link tables and network parameters are saved in this way.
2. Turn off all nodes in the Controller Link Network.
3. Detach the communications cables and the Bus Connection Unit attached to the Controller Link Unit to be replaced and remove the Unit.
4. Mount the new Controller Link Unit in the PLC and connect the communications cables and the Bus Connection Unit. (Refer to *SECTION 3*)
5. Set the node address, baud rate, operating level (front DIP switch, C200HX/HG/HE only) and the terminating resistance for the new Unit to the same settings as the previous Unit. (Refer to *SECTION 4*.)
6. Turn on only those PLCs for which Units were replaced.
7. From the Maintenance Menu on the Controller Link Support Software, select "Unit Back-up" and then "Computer –> Unit" and the data saved in step 1. will be loaded to the Unit's EEPROM.
8. Cycle the power supply to the PLC where the Unit was replaced.
9. Turn on all other nodes in the Controller Link Network.
10. Using the Controller Link Support Software, read the network parameters and make sure the Network is operating normally.
11. If the data links are not activated automatically, activate the data links from the data link startup node.
12. Check that the data links are operating normally by using the "Data Link Status Monitor" on the Controller Link Support Software.

Not Using the Controller Link Support software

Note When manually set data links are used, the Controller Link Support Software is essential. When the Controller Link Unit being replaced does not have active manually set data links or it has active automatically set data links, the replacement process can be carried out without the Controller Link Support Software. In this case, however, a Programming Device is necessary.

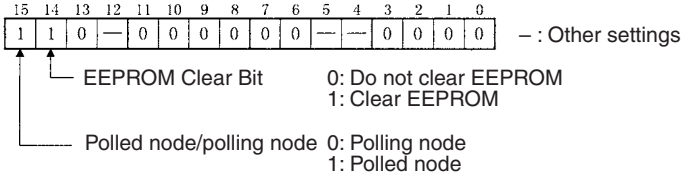
1,2,3...

1. Turn off all nodes in the Controller Link Network.
2. Detach the communications cables and the Bus Connection Unit attached to the Controller Link Unit to be replaced and remove the Unit.
3. Mount the new Controller Link Unit in the PLC and connect the communications cables and the Bus Connection Unit. (Refer to *SECTION 3*.)

4. Set the node address, baud rate, operating level (front DIP switch, C200HX/HG/HE only) and the terminating resistance for the new Unit to the same settings as the previous Unit. (Refer to *SECTION 4*.)
5. Turn ON only those PLC for which Units were replaced.
6. Set the following software switches on the new Controller Link Unit using the Programming Device.
   - Polled node/ polling nodes: ON (polled node)
   - EEPROM Clear But: ON (EEPROM Clear)

C200HX/HG/HE Operating level 0 DM 6400 Operating level 1 DM 6420

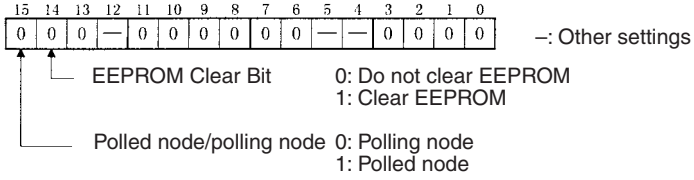
CQM1H Series DM 6400



7. Turn off the power again to PLCs for which the Controller Link Unit has been changed.
8. If the CPU Unit DIP switch pin 5 of the PLC for which the Controller Link Unit has been replaced is ON (automatic transmission), set to OFF (no automatic transmission.)
9. Turn off all nodes in the Controller Link Network.
10. If the Controller Link Support Software can be operated, use it to read the network parameters and make sure the Network is operating normally.
11. If the data links are not activated automatically, activate the data link from the data link startup node.
12. If the Controller Link Support Software can be operated, use it to check that the data links are operating normally by monitoring the data link status.
13. Return the software switches set in step 6. in the new Controller Link Unit to the following settings using the Programming Device.
   - Polled node/polling node: OFF (polling node)
   - EEPROM Clear Bit: OFF (Do not clear EEPROM)

C200HX/HG/HE Operating level 0 DM 6400 Operating level 1 DM 6420

CQM1H Series DM 6400



Check the above if the Controller Link Support Software can be used.

14. If DIP switch pin 5 on the CPU Unit was switched from ON to OFF in set 8., turn the PLC OFF once, return the DIP switch to ON, and turn the power ON again.

CS/CJ-series, CVM1, and CV-series Controller Link Units

Note CS/CJ-series, CVM1, and CV-series Controller Link Unit data is stored in the EEPROM of the CPU Unit. For this reason even if the Controller Link Unit is replaced, on the hardware settings must be made to return all settings to their previous status. If, however, the CPU Unit is replaced, the data link tables and routing tables will need to be reset.

1,2,3...

1. Turn off all nodes in the Controller Link Network.
2. Detach the communications cables attached to the Controller Link Unit to be replaced and remove the Unit.

3. Mount the new Controller Link Unit in the PLC and connect the communications cables. (Refer to *SECTION 3*.)
4. Set the unit number, node address, baud rate, and the terminating resistance for the new Unit to the same settings as the previous Unit. (Refer to *SECTION 4*.)
5. Turn on the power to the PLCs at all nodes in the Controller Link Network other than those for which the Controller Link Unit was replaced.
6. Check that all the other nodes are active and then turn on the power to the PLC with the Controller Link Unit that was replaced.
7. Using the Controller Link Support Software, read the network parameters and make sure the Network is operating normally.
8. If the data links are not activated automatically, start the data links from the data link startup node.
9. Check that the data links are operating normally by monitoring them from the Controller Link Support Software.

SECTION 10
Adding Nodes and Editing Active Data Link Tables

This section describes the methods used to perform functions without turning OFF the PLC power to the existing network, such as adding nodes to the Controller Link Network and changing data link tables while the data links are active.

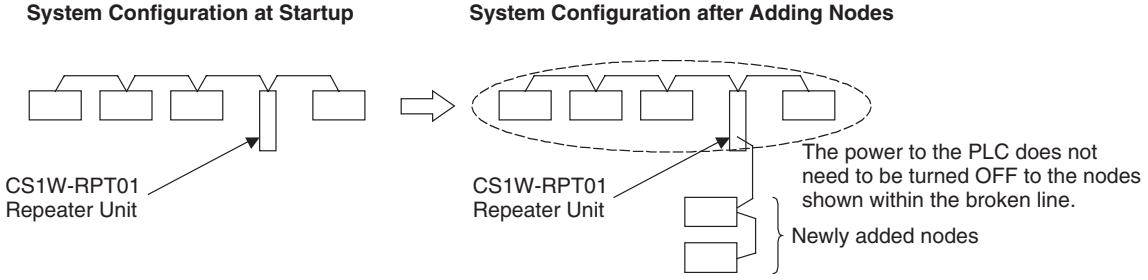
10-1 Adding Nodes Using a Repeater Unit 330
10-1-1 Overview 330
10-1-2 Procedure for Adding Nodes 331
10-1-3 Precautions when Connecting Nodes Using a Repeater Unit 331
10-2 Changing the Data Link Tables with Active Data Links 334
10-2-1 Overview 334
10-2-2 Example of Changing Data Link Table with Active Data Links . . . 334
10-2-3 Operations when Changing Data Link Tables 334
10-2-4 Timing Required to Change Data Link Tables with Active Data Links (Theoretical) 335
10-2-5 Procedure for Changing the Data Link Tables with CX-Programmer 336

10-1 Adding Nodes Using a Repeater Unit

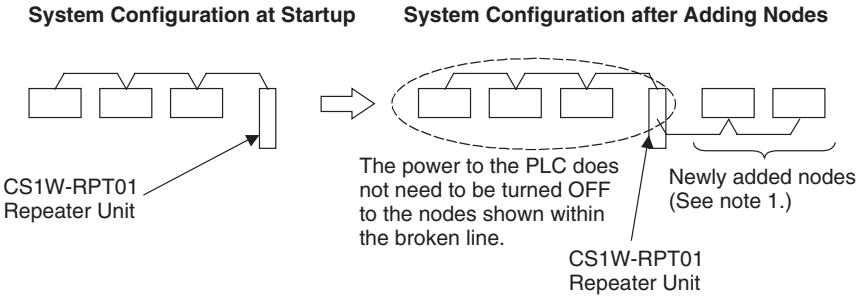
10-1-1 Overview

The CS1W-RPT01 Repeater Unit can be used to add new nodes to the network without turning OFF the power to the existing network.

Example of Adding Nodes Using a T-branch Line



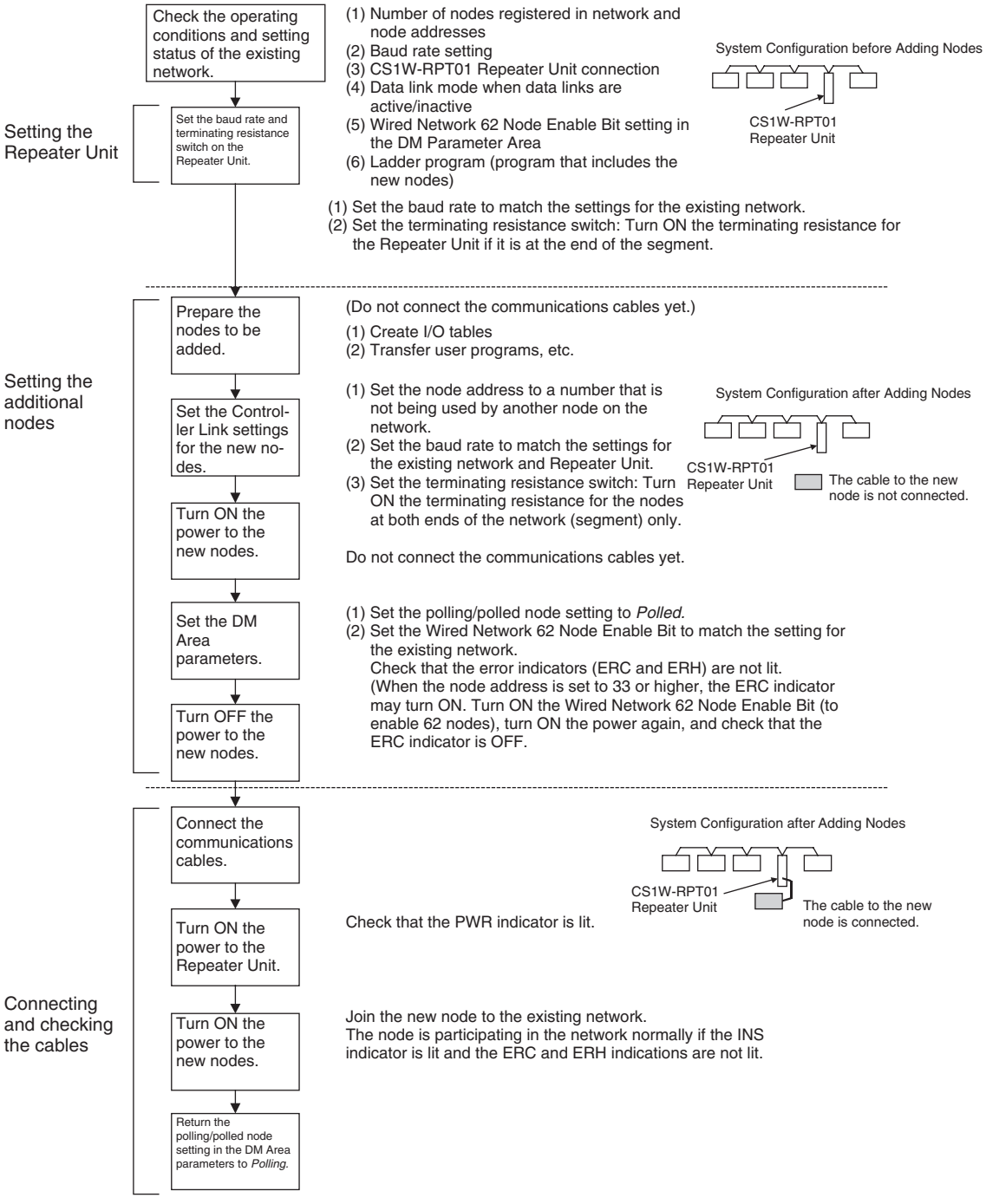
Example of Adding Nodes with a Repeater Unit on One End



Note

1. Connect the communications cable for the existing network and the communications cable for the new nodes to different communications cables terminal blocks (SL1 and SL2) on the Repeater Unit.
2. Connect a CS1W-RPT01 Repeater Unit to the system in advance to enable adding new Controller Link nodes after the system is operating and without turning OFF the power to the existing network.

10-1-2 Procedure for Adding Nodes



10-1-3 Precautions when Connecting Nodes Using a Repeater Unit

When data links are active in the existing network, check the following items before adding nodes to the network. If the inappropriate data link tables or parameters are set, the system may not operate properly.

- If the new node will participate in user-set data links, make sure that the appropriate data link tables are set in the corresponding nodes.
- If the new node will not participate in user-set data links, make sure that the data link tables of the corresponding nodes are deleted.

- If automatic settings are used, make sure that the appropriate DM Area parameters have been set.

Check that the new data transmission that will be performed due to the new nodes has been considered in the user program for the existing network before adding the nodes. If the ladder program is not suitable, the system may not operate properly.

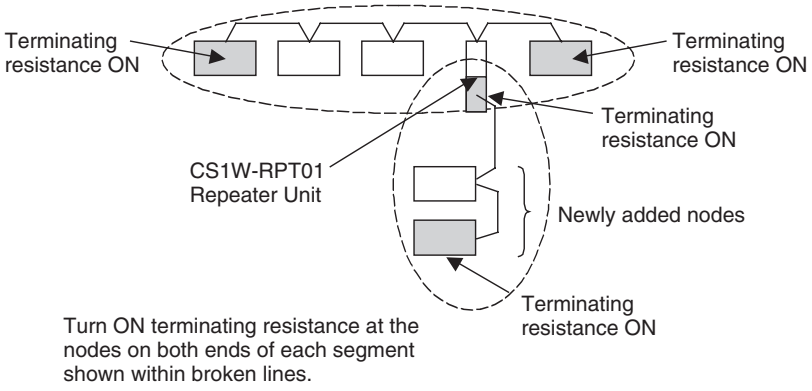
Make sure that the node addresses of the new nodes are not already being used by other nodes in the same network. If the same node address is used by more than one node, a node duplication error will be detected when the node is added, communications will stop, and the node with the same address will not be able to the join the network. Data may also be unexpectedly received from the incorrectly set node. To restore a Controller Link Unit with a duplicated address, reset the node address correctly, then turn ON the power to the corresponding PLCs again, or restart the Controller Link Units.

Always set the baud rate of the new nodes and the Repeater Unit to the same baud rate used for the existing network. If a different baud rate is set when adding a new node, the communications for the whole network including the existing network will be unstable and communications errors will occur.

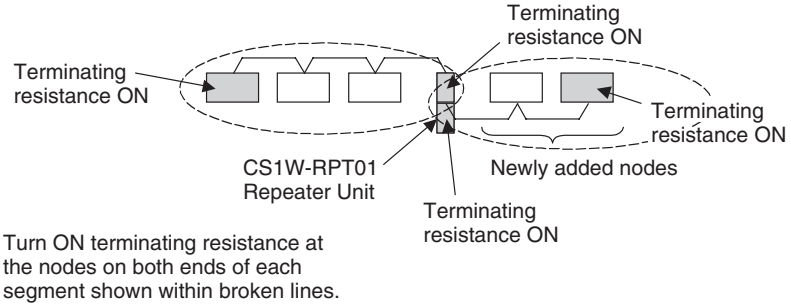
Set the terminating resistance of the new nodes to the Repeater Unit as shown in the following diagram. If terminating resistance is set incorrectly, communications errors may occur.

- Adding Nodes Using T-branch Lines

System Configuration after Adding Nodes



- Adding Nodes with a Repeater Unit at One End



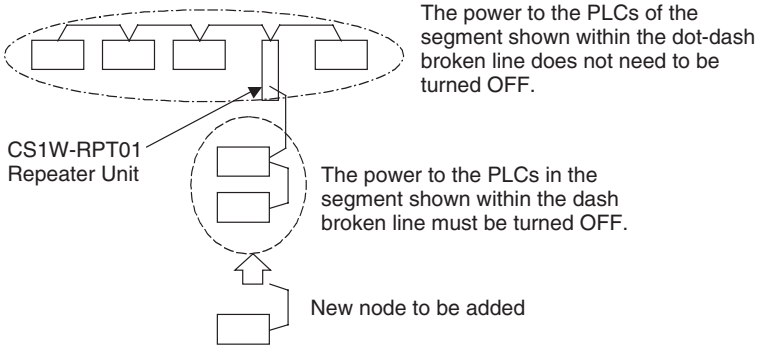
Before connecting the new nodes to the existing network, always set the polling/polled node setting to *Polled*. If the nodes are connected to the existing network with this setting set to *Polling*, the corresponding node may become the polling node for the network, which will affect the network in the following ways. After the new nodes are participating in the network normally, return the polling/polled node setting to polling node.

- When the data link startup switch (software switch in the DM Area parameters) of the new node is OFF, all the data links for the whole network including the existing network will be inactive.
- When the network parameters being used are different from the default values, the network parameters will return to the default values.

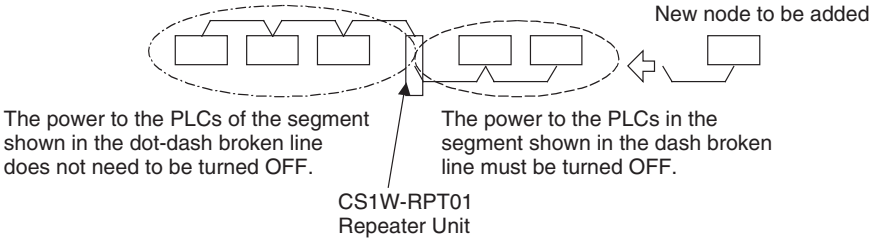
Always set the Wired Network 62 Node Enable Bit in the DM Area parameters of the new node to match the settings of the existing network. If different settings are used, the network may not be configured correctly.

When a new node is to be added to a system that is already wired over a long distance using T-branch lines or Repeater Units, turn OFF the power to the PLCs in the segment where the node is to be added. The power to the PLCs in segments separated by Repeater Units does not need to be turned OFF. The procedure for adding nodes is the same as *10-1-2 Procedure for Adding Nodes*.

Systems with an Existing T-branch Line



Systems Wired with an Existing Repeater Unit



10-2 Changing the Data Link Tables with Active Data Links

10-2-1 Overview

The data link tables can be changed and data link tables can be allocated for newly added nodes while the system's data links are active if the following Controller Link Units and Support Boards are used.

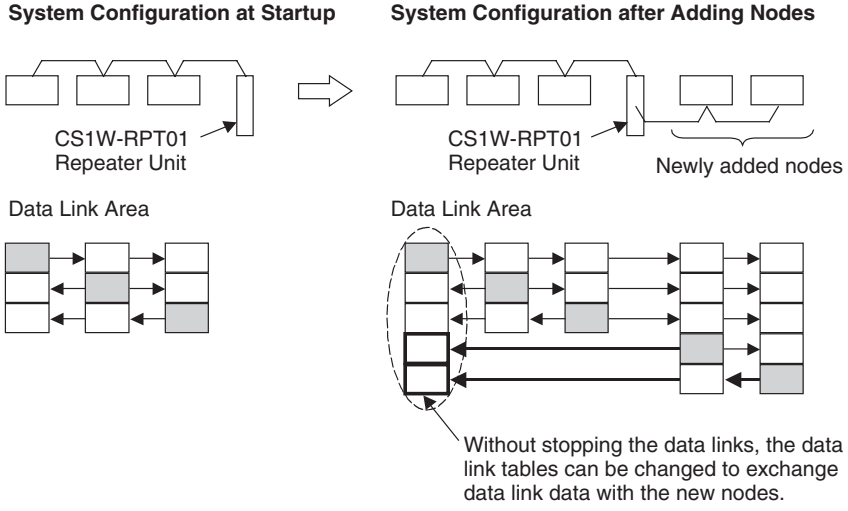
Models that Support Data Link Table Changes during Active Data Links

Model	Remarks
CS1W-CLK21-V1, CS1W-CLK23	Wired Controller Link Unit for CS-series PLCs
CJ1W-CLK21-V1, CJ1W-CLK23	Wired Controller Link Unit for CJ-series PLCs
3G8F7-CLK21-E-V1, 3G8F7-CLK23-E	Wired Controller Link Support Board for PCI Bus

Note

1. When using Controller Link Units and Support Boards that are not listed in the above table, data link tables cannot be changed while data links are active.
2. CX-Programmer version 3.2 must be used to change data link tables with active data links. CX-Programmer version 3.1 or lower versions cannot be used.

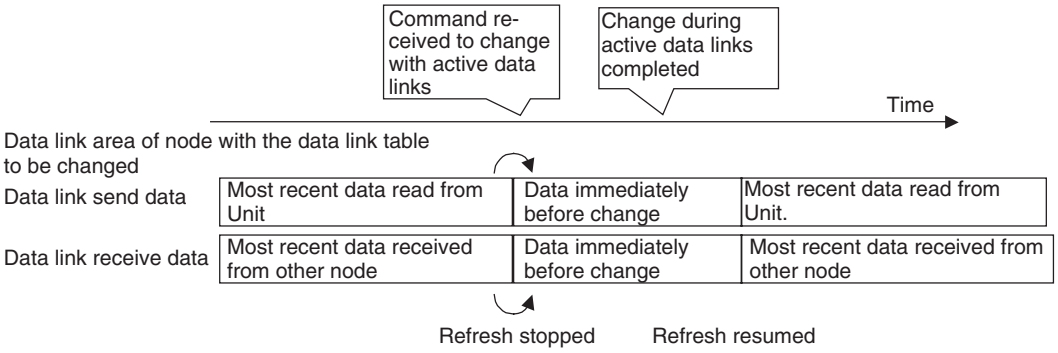
10-2-2 Example of Changing Data Link Table with Active Data Links



10-2-3 Operations when Changing Data Link Tables

The Controller Link Unit/Support Board that receives the command from the CX-Programmer version 3.2 or higher to change a data link table with active data links will temporarily stop refreshing data with the PLC, change to the new data link table (data link refresh allocation) and then resume refreshing data links.

Nodes with data link tables that are changed will send the data from immediately before the tables were changed while PLC data link refreshing is stopped.



Data link communications will continue, so the Communications Error Flag for the data link status will not turn ON in any of the nodes in the network.

Refer to *10-2-4 Timing Required to Change Data Link Tables with Active Data Links (Theoretical)* for details on timing required to change the data link tables.

10-2-4 Timing Required to Change Data Link Tables with Active Data Links (Theoretical)

When changing data link tables with active data links, the data refresh for the corresponding node will stop temporarily. During that time, even if the data in the data link send area in the PLC is refreshed, it will not be sent as data link data to other nodes. Data received from other nodes will also not be shown in the data link receive area of nodes with data link tables that are being changed. The data refresh interrupt timing (maximum theoretical value) is as follows:

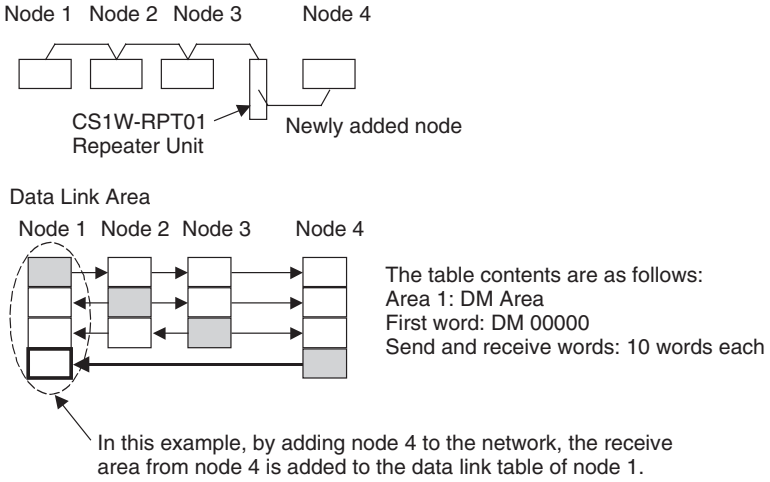
Data link refresh maximum interrupt time = 2 × Unit cycle time of the node with data link table being changed (See note 1.) + 3 × communications cycle time (ms)

Note

1. When CS- or CJ-series PLCs are being used, if the total number of data link send words exceeds 7,800 words, this value is multiplied by 3.
2. Consider the effect of the data link refresh interrupt time on the applications when changing the data link tables. If the maximum interrupt time is not suitable for the user application, transfer the data link table after stopping the data links from a Programming Device as before, and then restart the data links.

10-2-5 Procedure for Changing the Data Link Tables with CX-Programmer

The procedure for changing a data link table with active data links is shown here using CX-Programmer version 3.2 and the following system configuration.



⚠ **Caution** Check that the contents of the data link table to be changed are correct for the corresponding node before changing them. If an incorrect data link table is set, the unexpected operation of the system may result in injury.

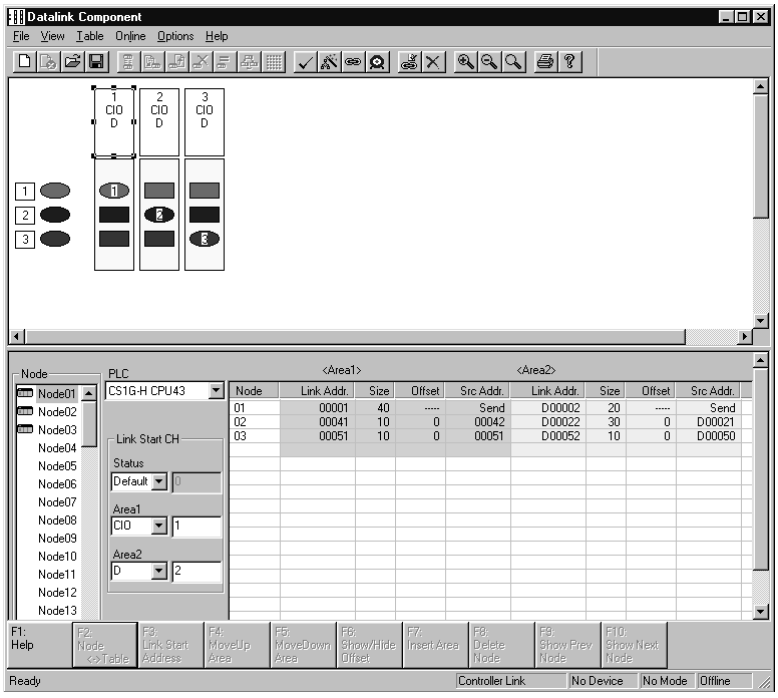
Note

1. Check that the contents of the data link table to be changed will be appropriate for the corresponding node. If the data link table is set with inappropriate data, the Unit may operate abnormally and cause injury.
2. Check that the effects of the data link table to be changed has been considered in the user programs before changing a data link table.
3. CX-Programmer version 3.2 or higher must be used to change a data link table with active data links. CX-Programmer version 3.1 or lower versions cannot be used.

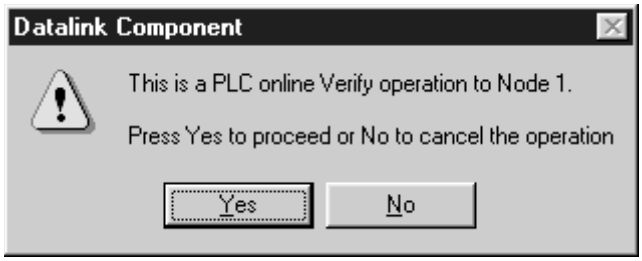
Procedure

1,2,3...

1. Create the new data link table to be transferred to the node whose data link table is to be changed (node 1) offline.
2. Save the created data link table in a file.
3. Connect the personal computer to CX-Net so that it is online.
4. Select ***Data Link*** – ***Setup*** from the Menu.
5. Open the data link table file saved in step 1.



6. Use the mouse to select node 1, whose data link table is to be changed.
7. Select ***Online*** – ***Transfer to PLC while datalink active***.
8. The following message box will be displayed. Click the **Yes** Button.
   If the **Yes** Button is clicked, the current data link table open in CX-Net will be compared with the data link table of the node to be changed.
   If the **No** Button is clicked, the data link tables will not be compared.

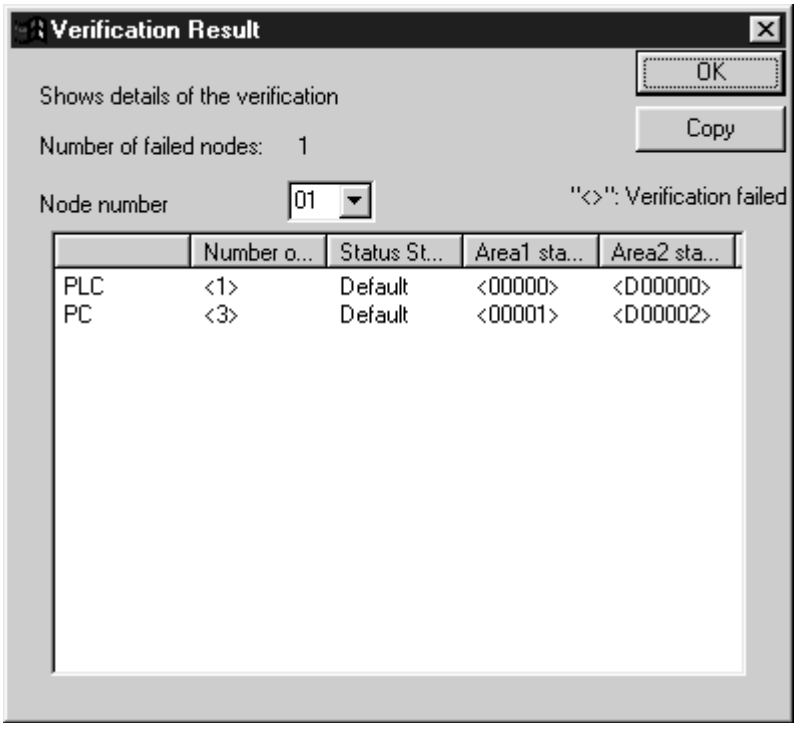


After comparison, is there is any discrepancy, the following message box will be displayed. Click the **OK** Button to check the differences.

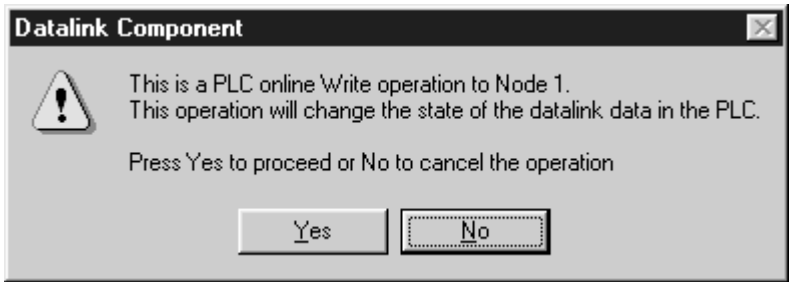


The differences between the data link table open on CX-Net and that of the node to be changed will be displayed.

9. Check that the changes are correct, and click the **OK** Button.



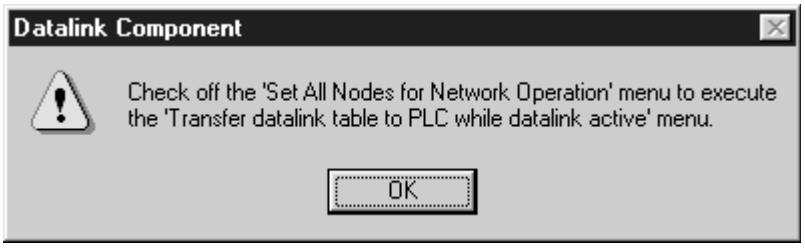
10. The Data Link Table Transfer Confirmation Message Box will be displayed. Click the **Yes** Button to transfer the data link table. The transfer can be cancelled by clicking the **No** Button. (The active data link table will not be changed if the transfer is cancelled.)



11. When the data link table is written correctly, the following message box will be displayed.



Note Transfer data link tables with active data links for one node at a time. When the *Online - Transfer to PLC while datalink active* field is selected, the following message box will be displayed. Deselect the field and execute the command again.


Datalink Component
Check off the 'Set All Nodes for Network Operation' menu to execute the 'Transfer datalink table to PLC while datalink active' menu.
OK

Appendix A
Standard Models

Controller Link Units

Applicable PLC	Model number	Remarks
CS-series PLCs	CS1W-CLK21-V1 CS1W-CLK23	The CS1W-CLK23 and CJ1W-CLK23 have expanded data link functionality (i.e., a maximum of 4,000 send words per node). They are upwardly compatible from the CS1W-CLK21-V1 and CJ1W-CLK21-V1, respectively. See *CPU Units and Programming Devices* in this appendix.
CJ-series PLCs	CJ1W-CLK21-V1 CJ1W-CLK23	
CVM1 and CV-series PLCs	CVM1-CLK21	
C200HX/HG/HE PLC	C200HW -CLK21	
CQM1H-series PLCs	CQM1H -CLK21	

Controller Link Support Board

Applicable computer	Model number	Remarks
IBM PC/AT or compatible for PCI Bus	3G8F7-CLK21-EV1 3G8F7-CLK23-E	The 3G8F7-CLK23-E has expanded data link functionality (i.e., a maximum of 4,000 send words per node) and is upwardly compatible from the 3G8F7-CLK21-EV1. FinsGateway is included.
IBM PC/AT or compatible for ISA Bus	3G8F5-CLK21-E	Controller Link Support Software included.

Controller Link Support Software

Applicable computer	Model number	Remarks
IBM PC/AT or compatible	C200HW-ZW3AT2-EV2	For CS/CJ-series, C200HX/HG/HE, CVM1, and CV-series PLCs

Repeater Units

Model	Remarks
CS1W-RPT01	Wire-to-wire
CS1W-RPT02	Wire-to-optical (H-PCF cable)
CS1W-RPT03	Wire-to-optical (GI cable)

Communications Cables (Twisted-pair Cables)

Model	Manufacturer	Remarks
Li2Y-FCY2 x 0.56 qmm	Kromberg & Schubert, Komtec Department	German company
1 x 2 x AWG – 20PE + Tr.CUSN + PVC	Draka Cables Industrial	Spanish company
#9207	Belden	USA company
ESVC 0.5 x 2 C-1362	Bando Densen Co.	Japanese company
ESNC 0.5 x 2 C-99-087B	Nihon Electric Wire & Cable Co.	Japanese company
ESPC 1P x 0.5 mm^2	Nagaoka Electric Wire Co., Ltd.	Japanese company

Relay Terminal Block

Name	Model number	Remarks
Wired Controller Link Unit Relay Terminal Block	CJ1W-TB101	Cannot be used on the nodes on both ends of the network.

Personal Computer Network Configuration Tools

Applicable computer	Name	Model number	Applicable PLCs
IBM PC/AT or compatible running Windows 98SE, Me, 2000, XP, or NT 4.0	CX-Integrator	CXONE-AL□□C-EV2 CXONE-AL□□D-EV2	CS/CJ-series
IBM PC/AT or compatible running Windows 95 (See note.), 98, NT 4.0, 2000, or XP	CX-Programmer with CX-Net	WS02-CXPC□-EV□ (version 2.1 or higher)	CS/CJ-series, C200HX/HG/HE, CVM1, CV-series, and CQM1H-series PLCs

Note Windows 95 cannot be used when communicating through a Controller Link Support Board (PCI bus) or SYSMAC Link Support Board (PCI bus).

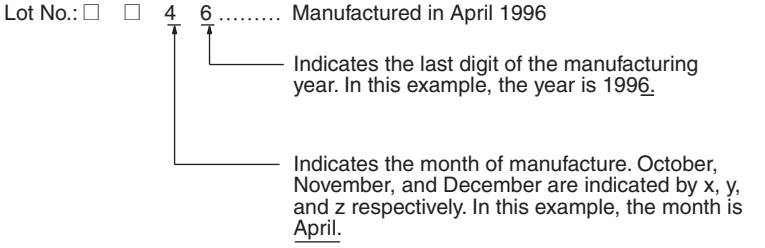
CPU Units and Programming Devices

CPU Units

PLC	Model number	Remarks
CS-series PLCs	CS1H-CPU67-V1 CS1H-CPU66-V1 CS1H-CPU65-V1 CS1H-CPU64-V1 CS1H-CPU63-V1 CS1G-CPU45-V1 CS1G-CPU44-V1 CS1G-CPU43-V1 CS1G-CPU42-V1	Earlier versions of the CPU Units can also be used.
CJ-series PLCs	CS1G-CPU45 CS1G-CPU44	---

PLC	Model number	Remarks
SYSMAC C200HX, C200HG, or C200HE or C200HZ PLCs	C200HE-CPU32/42-(Z)E C200HG-CPU33/43/53/63-(Z)E C200HX-CPU34/44/54/64-(Z)E	---
SYSMAC CV500, CV1000, or CV2000 PLCs (see note 1)	CV500-CPU01-EV1 CV1000-CPU01-EV1 CV2000-CPU01-EV1	Earlier versions of the CPU Units can also be used.
SYSMAC CVM1 PLCs (see note 1)	CVM1-CPU01-EV2 CVM1-CPU11-EV2 CVM1-CPU21-EV2 CVM1D-CPU21-E	Earlier versions of the CPU Units can also be used.
SYSMAC CQM1H-series PLCs	CQM1H-CPU51 CQM1H-CPU61	---

Note Routing tables are required if any of the CVM1 or CV-series CPU Units in the network have been manufactured on or before April 1996. The manufacturing data can be determined from the lot number on the side of the CPU Unit.



Other Products Used with Controller Link Units

Name	Model number	Remarks
Bus Connection Unit	C200HW-CE001	Required to connect a Controller Link Unit to a C200HZ, C200HX, C200HG, or C200HE CPU Unit.
	C200HW-CE002	Required to connect two Controller Link Units, or one Controller Link Unit and one other Communications Unit to a C200HZ, C200HX, C200HG, or C200HE CPU Unit.
	C200HW-CE012	Required to mount both a Controller Link Unit and a PLC Card Unit to a C200HZ, C200HX, C200HG, or C200HE CPU Unit.
Communications Boards	C200HW-COM01 C200HW-COM04	Required to mount a Controller Link Unit to a C200HZ, C200HX, C200HG, or C200HE CPU Unit.

Refer to the operation manual for the relevant PLC for further information on the above products.

Appendix B
Memory Areas

This appendix provides easy reference to the words in PLC memory areas used by Controller Link Networks.

CS/CJ-series PLCs

Auxiliary Area

Word(s)	Bit(s)	Function
A202	00 to 07	Communications Port Enabled (Network Communications Enabled) Flags
A203 to A210	00 to 15	Port #0 to #7 Completion Codes
A219	00 to 07	Port #0 to #7 Execute Error (Network Communications Execute Error) Flags
A302	00 to 15	CS/CJ CPU Bus Unit Initializing Flags
A401	13	Duplicate Number Error Flag (fatal error)
A402	03	CS/CJ CPU Bus Unit Setting Error Flag
	07	CS/CJ CPU Bus Unit Error Flag
A410	00 to 15	CPU Bus Unit Duplicate Number
A417	00 to 15	CS/CJ CPU Bus Unit Error, Unit Number Flags
A427	00 to 15	CS/CJ CPU Bus Unit Setting Error Unit Number
A501	00 to 15	CS/CJ CPU Bus Unit Restart Bits

Network Status Flags

Bits A20200 through A20207 are turned ON to indicate that ports #0 through #7, respectively, are enabled for the SEND(90), RECV(98), CMND(490) and PMCR. Bits A219200 through A219207 are turned ON to indicate that an error has occurred in ports #0 through #7, respectively, during data communications using SEND(90), RECV(98), CMND(490), or PMCR. Refer to page 192.

A203 through A210 contain the completion codes for ports #0 through #7, respectively, following data communications using SEND(90), RECV(98), CMND(490), or PMCR. Refer to page 192.

CS/CJ CPU Bus Unit Initializing Flags

Bits A30200 through A30215 turn ON while the corresponding CS/CJ CPU Bus Units (Units #0 through #15, respectively) are initializing.

CS/CJ CPU Bus Unit Setting Error Flag and Unit Number

Bit A40203 is turned ON when the CS/CJ CPU Bus Units actually installed differ from the Units registered in the I/O table. The unit number of the CS/CJ CPU Bus Unit involved is written to word A427.

Bits A42700 through A42715 correspond to CS/CJ CPU Bus Units #0 through #15, respectively. When a error occurs, the bit corresponding to the unit number of the CS/CJ CPU Bus Unit involved is turned ON.

CS/CJ CPU Bus Unit Error Flag

Bit A40207 is turned ON when a parity error occurs during the transmission of data between the CPU Unit and CS/CJ CPU Bus Units. The unit number of the CS/CJ CPU Bus Unit involved is written to word A417.

CS/CJ CPU Bus Unit Numbers

Bits A41000 through A41015 correspond to CS/CJ CPU Bus Units #0 through #15, respectively. When two CPU Bus Units have the same unit number, the bits corresponding to the unit numbers of the CS/CJ CPU Bus Units involved are turned ON.

CS/CJ CPU Bus Unit Duplication Error Flag

Bit A40113 is turned ON when two CS/CJ CPU Bus Units have been assigned the same unit number. The duplicated unit number is indicated in A410.

CS/CJ CPU Bus Unit Error, Unit Number Flags

When an error occurs in a data exchange between the CPU Unit and an CS/CJ CPU Bus Unit, the CS/CJ CPU Bus Unit Error Flag (A40207) is turned ON and the bit in A417 corresponding to the unit number of the Unit where the error occurred is turned ON.

CS/CJ CPU Bus Unit Restart Bits

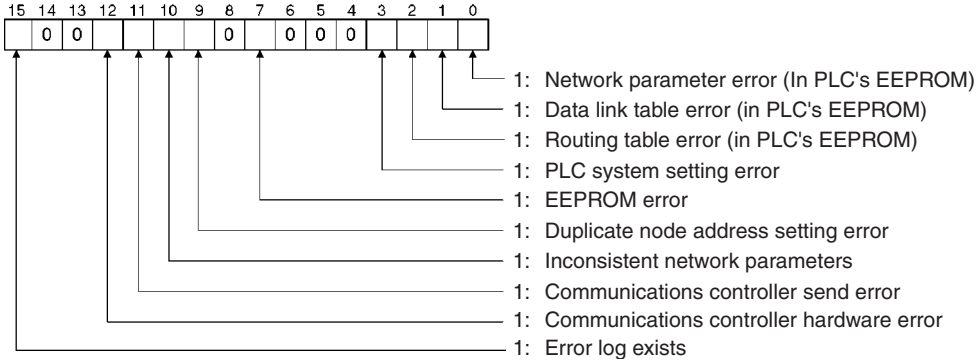
Bits A50100 through A50115 can be turned ON to reset CS/CJ CPU Bus Units number #0 through #15, respectively. The Restart Bits are turned OFF automatically when restarting is completed.

CIO Area: CS/CJ CPU Bus Unit Area

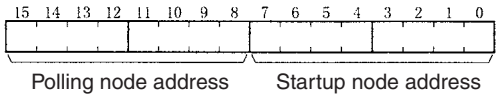
The CS/CJ CPU Bus Unit Area (CIO Area) is allocated to CS/CJ CPU Bus Units according to the unit numbers assigned to them, as shown below. Each Unit is allocated 25 words.

Unit no.	Words	Unit no.	Words
0	1500 to 1524	8	1700 to 1724
1	1525 to 1549	9	1725 to 1749
2	1550 to 1574	10	1750 to 1774
3	1575 to 1599	11	1775 to 1799
4	1600 to 1624	12	1800 to 1824
5	1625 to 1649	13	1825 to 1849
6	1650 to 1674	14	1850 to 1874
7	1675 to 1699	15	1875 to 1899

Error Information: CIO 1500 + 25 × (Unit No.) (See page 302.)



Polling Node Address, Startup Node Address: CIO 1500 + 25 × (Unit No.) + 1 (See page 302.)



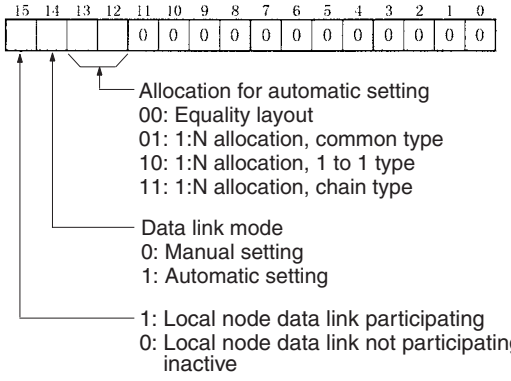
Each node address is displayed in 2-digit BCD.

Network Participation Status: CIO 1500 + 25 × (Unit No.) + 2, + 3 (See pages 193, 302.)

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+ 2	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
+ 3	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
+ 4	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
+ 5	–	–	62	61	60	59	58	57	56	55	54	53	52	51	50	49

The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of the network
1: Part of the network

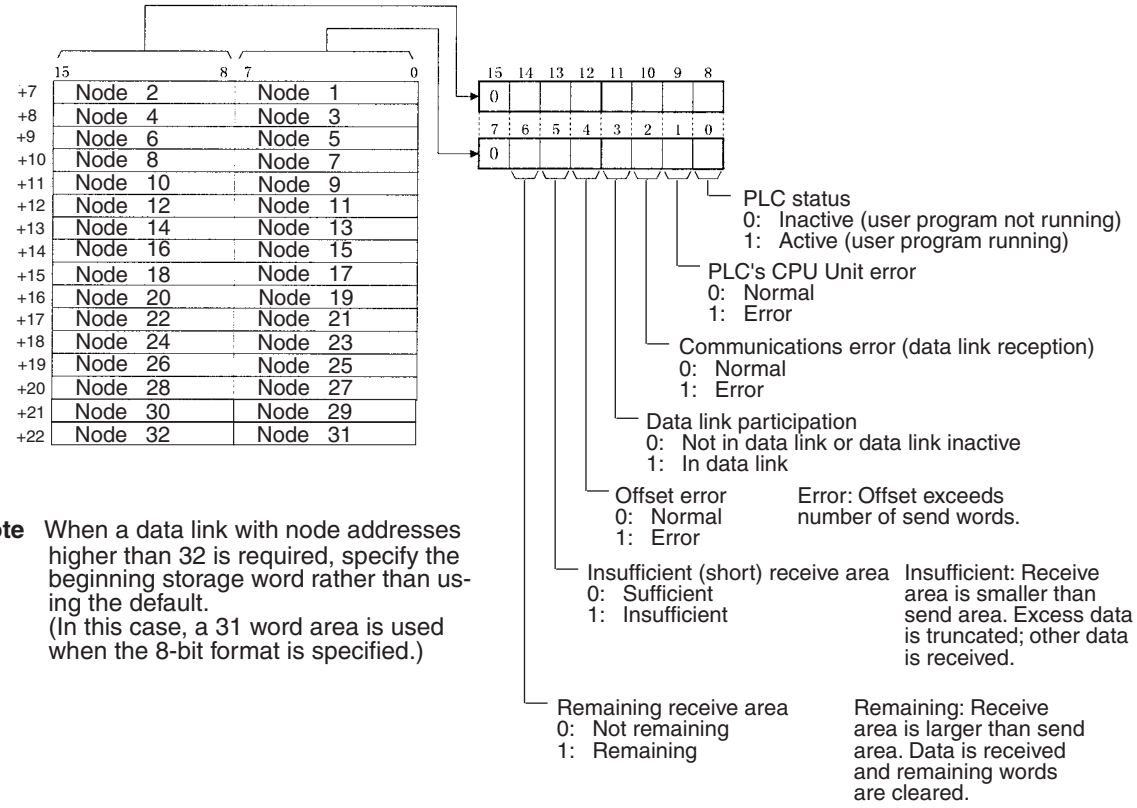
Local Data Link Participation Status: CIO 1500 + 25 × (Unit No.) + 6 (See page 302.)



Data Link Status: CIO 1500 + 25 × (Unit No.) + 7 to + 22 (See pages 158, 303.)

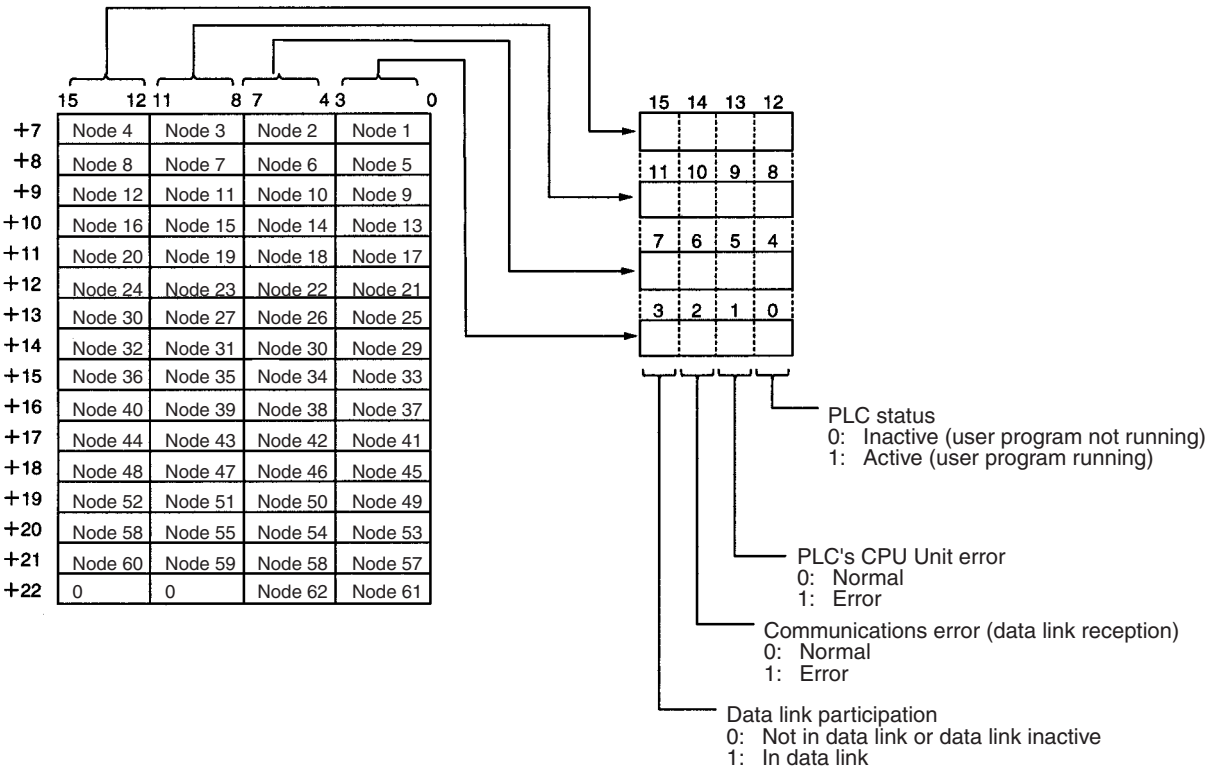
When the first data link status word for manually set data link tables or for automatically set data links is not set or is set to 0, the data link status is stored in the words shown below.

8-Bit Format Specified

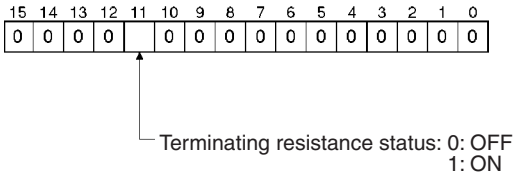


Note When a data link with node addresses higher than 32 is required, specify the beginning storage word rather than using the default.
(In this case, a 31 word area is used when the 8-bit format is specified.)

4-Bit Format Specified



Terminating Resistance Status (CIO 1500 + 25 × (Unit No.) + 24 (See page 303.)

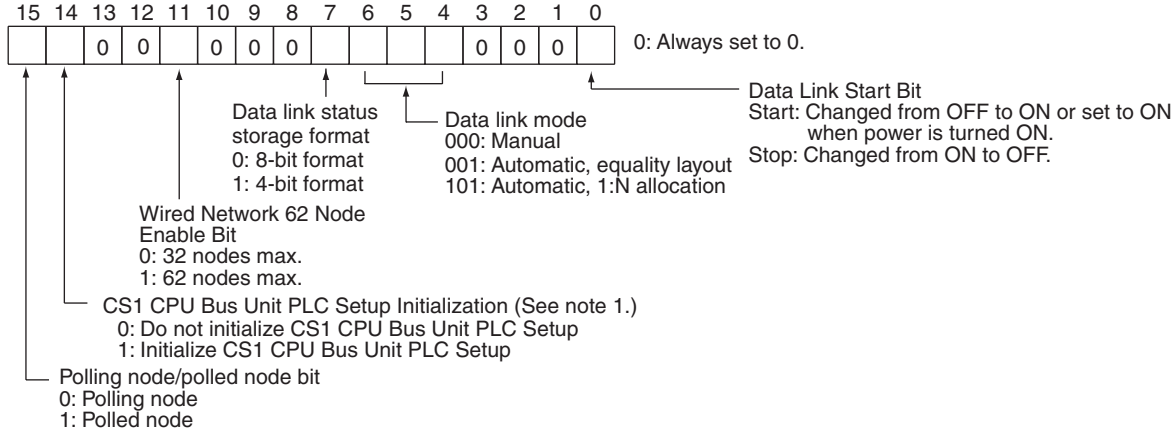


DM Area: CS/CJ CPU Bus Unit Area

The CS/CJ CPU Bus Unit Area (DM Area) is allocated to CS/CJ CPU Bus Units according to the unit numbers assigned to them, as shown below. Each Unit is allocated 100 words, of which 10 words are used. In the Controller Link Unit this area is called the DM Area.

Unit no.	Words	Unit no.	Words
0	DM30000 to DM30009	8	DM30800 to DM30809
1	DM30100 to DM30109	9	DM30900 to DM30909
2	DM30200 to DM30209	10	DM31000 to DM31009
3	DM30300 to DM30309	11	DM31100 to DM31109
4	DM30400 to DM30409	12	DM31200 to DM31209
5	DM30500 to DM30509	13	DM31300 to DM31309
6	DM30600 to DM30609	14	DM31400 to DM31409
7	DM30700 to DM30709	15	DM31500 to DM31509

Software Switches (DM30000 + 100 × Unit No.) (See pages 147, 247, 253, 315.)



Note 1: Initializes the network parameters registered in the CS1 CPU Bus Unit PLC Setup Area on the CPU Unit and clears the data link tables.

2: Be sure to set the bit in the DM Area's (CPU Bus Unit Area's) software switches (D30000 + 100 × unit number) described as "always set to 0" to 0. Not doing so may result in the data link not starting properly. If a data link is started with bit 7 of the software switches set to 1, the data link status will be stored in a format different to the one described in this manual (when using CS-series or CJ-series Controller Link Units).

Parameters for Automatically Setting Data Links with Equality Layout: D30000 + 100 × (Unit No.) + 1 to 9 (See page 147.)

	15 8	7 0
+1	Area 1 data link start word (BCD)	
+2	Area 1 type	00
+3	Number of send words per node of area 1 (BCD)	
+4	Rightmost 4 digits of data link start word of area 2 (DM area) (BCD)	
+5	Area 2 type	Leftmost digit of data link start word of area 2 (BCD)
+6	Number of send words per node of area 2 (BCD)	
+7	First data link status word (BCD)	

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+8	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
+9	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
+10	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
+11	–	–	62	61	60	59	58	57	56	55	54	53	52	51	50	49

← Nodes to participate in the data links
The numbers indicate node numbers.
The value assigned indicates whether the node is to participate in the data links.
Participate: 1
Not participate: 0

BCD: Set the value as binary-coded decimal.

Parameters for Automatic Data Link Creation with 1:N Allocation: D30000 + 100 × (Unit No.) + 12 to 25

Common Type

	15 8	7 0
N+12	1:N allocation type (**Set value 0001 = Common type**)	
N+13	Start word for area 1 (bit-access area, BCD)	
N+14	Area for area 1	00
N+15	Area 1 send size (number of words) for master node (BCD)	
N+16	Area 1 send size (number of words) for slave nodes (BCD)	
N+17	Rightmost 4 digits of start word of area 2 (DM area) (BCD)	
N+18	Area for area 2	Leftmost digit of start word of area 2 (BCD)
N+19	Area 2 send size (number of words) for master node (BCD)	
N+20	Area 2 send size (number of words) for slave nodes (BCD)	
N+21	First word to store data link status (bit-access area) (BCD)	

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
N+22	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
N+23	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
N+24	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
N+25	---	---	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Words N+22 through N+25 register nodes that will participate in the data links. The numbers shown in the table are the node addresses. The bit status for each node address indicates whether the node is to participate in the data links.

Participate: ON
Not participate: OFF

1 to 1 Type

	15							8	7							0
N+12	1:N allocation type setting (**Set value 0002 = 1 to 1 type**)															
N+13	Rightmost 4 digits of start word (BCD)															
N+14	Area								Leftmost digit of area start word (BCD)							
N+15	Number of common send words for master node (BCD)															
N+16	Number of individual send words for master node (BCD)															
N+17	Number of send words for slave nodes (BCD)															
N+18	0000 (Reserved)															
N+19	0000 (Reserved)															
N+20	0000 (Reserved)															
N+21	First word to store data link status (bit-access area) (BCD)															
N+22	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
N+23	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
N+24	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
N+25	---	---	62	61	60	59	58	57	56	55	54	53	52	51	50	49

Words N+22 through N+25 register nodes that will participate in the data links. The numbers shown in the table are the node addresses. The bit status for each node address indicates whether the node is to participate in the data links.

Participate: ON
Not participate: OFF

Chain Type

	15							8	7							0
N+12	1:N allocation type setting (**Set value 0003 = Delivery type**)															
N+13	Rightmost 4 digits of area start word (BCD)															
N+14	Area								Leftmost digit of area start word (BCD)							
N+15	Number of master common send words (BCD)															
N+16	Number of receive and send words per node (BCD)															
N+17	0000 (Reserved area)															
N+18	0000 (Reserved area)															
N+19	0000 (Reserved area)															
N+20	0000 (Reserved area)															
N+21	First word to store data link status (bit-access area) (BCD)															
N+22	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
N+23	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17
N+24	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33
N+25	---	---	62	61	60	59	58	57	56	55	54	53	52	51	50	49

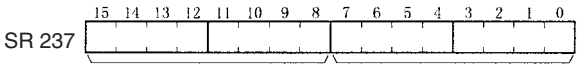
Words N+22 through N+25 register nodes that will participate in the data links. The numbers shown in the table are the node addresses. The bit status for each node address indicates whether the node is to participate in the data links.

Participate: ON
Not participate: OFF

C200HX/HG/HE PLCs

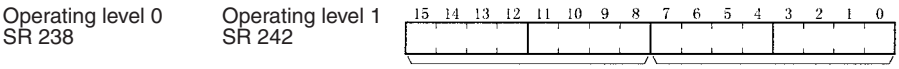
SR Area

Communications Instruction Response Codes: SR 237 (See page 194.)



Each response code is in 2-digit hexadecimal.

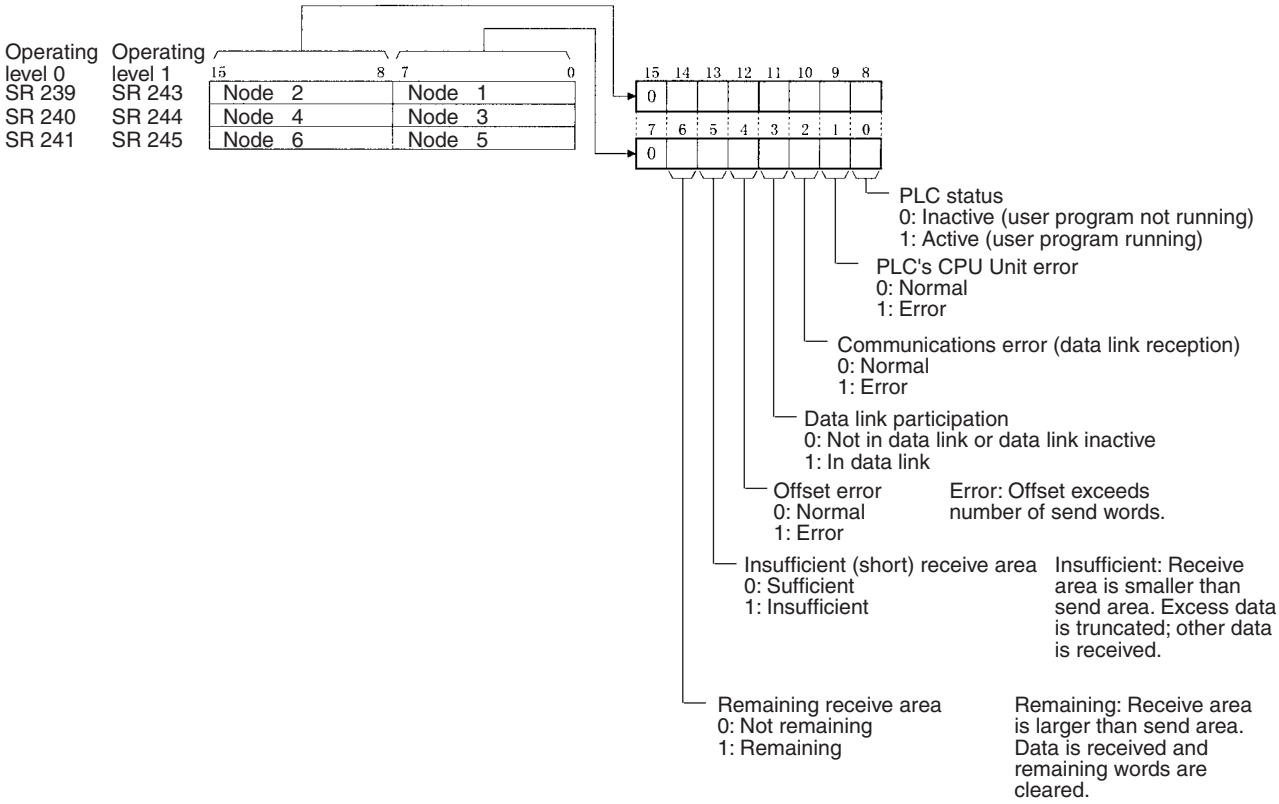
Polling Node Address, Startup Node Address: SR 238, SR 242 (See page 297.)



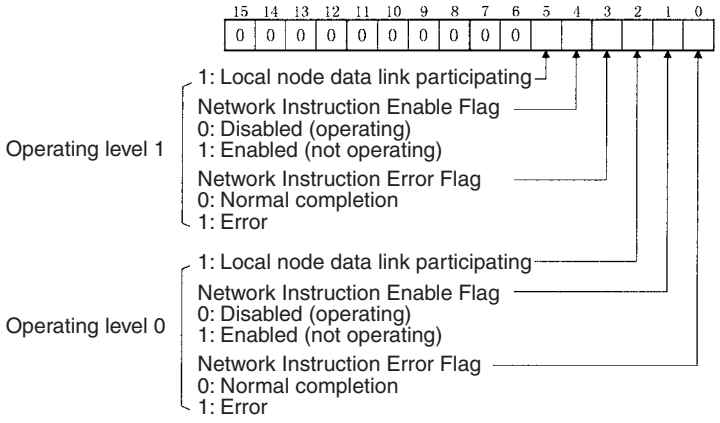
Each node address is in 2-digit BCD.

Data Link Status: SR 239 to SR 241, SR 243 to SR 245 (See pages 158, 297.)

When the first data link status word for manually set data link tables or for automatically set data links is not set or is set to 0, the data link status of only node addresses 1 to 6 will be given in the following area.

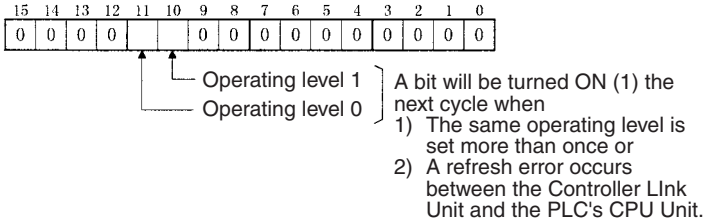


Operating Level Status: SR 252 (See pages 192, 298.)

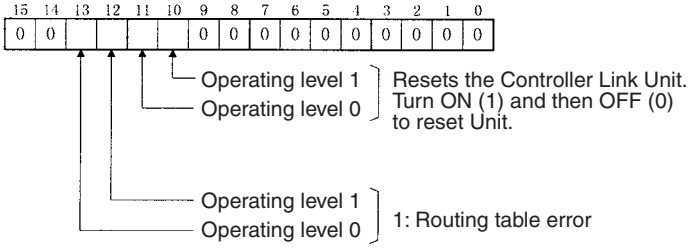


AR Area

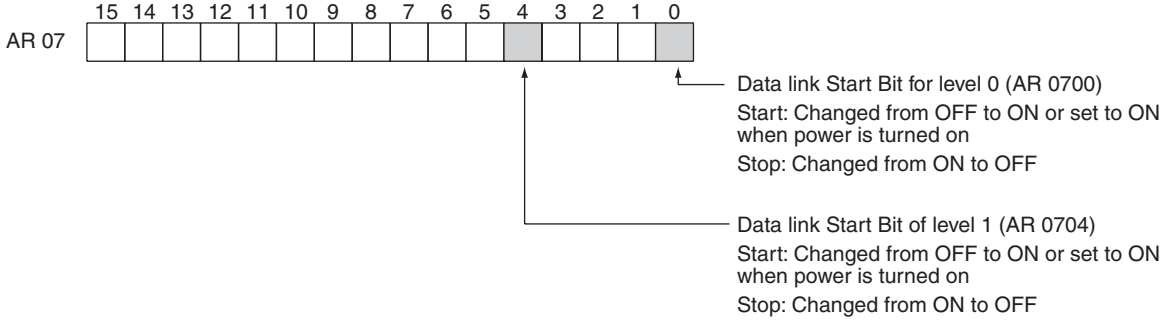
Duplicate Operating Levels/Refresh Error: AR 00 (See page 296.)



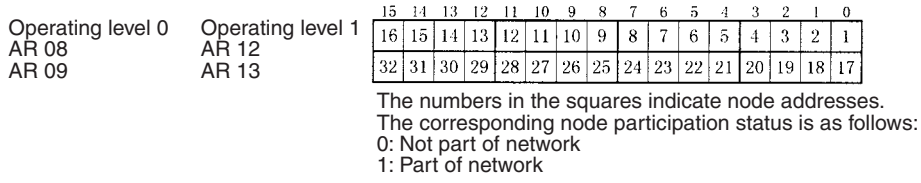
Routing Table Error/Unit Restart Bits: AR 01 (See page 296.)



Data Link Start Bits (See page 156.)



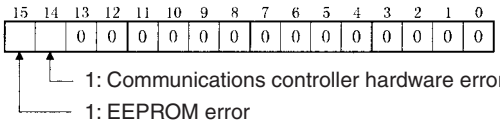
Network Participation Status: AR 08, AR 09, AR 12, AR 13 (See pages 193, 297.)



The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of network
1: Part of network

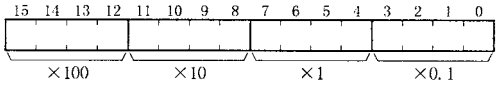
Communications Controller Hardware Error, EEPROM Error: AR 11, AR 15 (See page 297.)

Operating level 0 AR 11 Operating level 1 AR 15



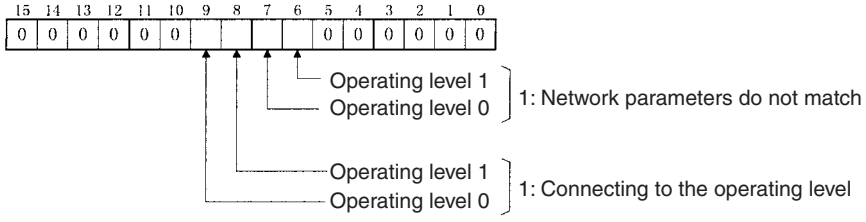
Service Time: AR 16, AR 17 (See page 297.)

Operating level 0 AR 16 Operating level 1 AR 17



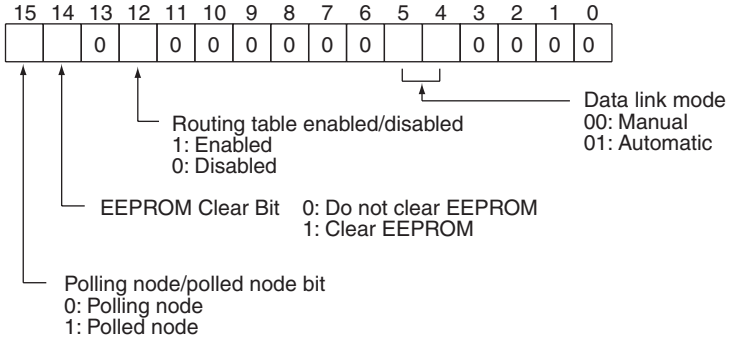
The service time for each PLC cycle is calculated by the PLC and displayed in 0.1-ms units in 4-digit BCD.

Operating Level Connection Status, Inconsistent Network Parameters: AR 24 (See page 297.)



DM Parameter Area

Software Switches: DM 6400 and DM 6420 (See pages 147, 247, 253, 315.)



Parameters for Automatically Setting Data Links: DM 6400 to DM 6409, DM 6420 to DM 6429 (See page 147.)

Level 0	Level 1	15 8 7 0
DM 6401	DM6421	Area 1 data link start word (BCD)
DM 6402	DM6422	Area 1 type / 00
DM 6403	DM6423	Number of send words per node of area 1 (BCD)
DM 6404	DM6424	Rightmost 4 digits of data link start word of area 2 (DM area) (BCD)
DM 6405	DM6425	Area 2 type / Leftmost digit of data link start word of area 2 (BCD)
DM 6406	DM6426	Number of send words per node of area 2 (BCD)
DM 6407	DM6427	First data link status word (BCD)

		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DM 6408	DM6428	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
DM 6409	DM 6429	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

← Nodes to participate in the data links

The numbers indicate node numbers. The value assigned indicates whether the node is to participate in the data links.

Participate: 1
Not participate: 0

BCD: Set the value as binary-coded decimal.

Routing Tables (DM 6450 to DM 6499) (See page 247.)

When the use of routing tables is enabled by the software switch setting, the routing tables are stored in these words. Do not use them for anything else.

CVM1 and CV-series PLCs

Auxiliary Area

Word(s)	Bit(s)	Function
A001	00 to 15	CPU Bus Unit Restart Bits
A015	00 to 15	CPU Bus Service Disable Bits
A302	00 to 15	CPU Bus Unit Initializing Flags
A401	12	CPU Bus Error Flag
A402	03	CPU Bus Unit Setting Error Flag
	07	CPU Bus Unit Error Flag
A405	00 to 15	CPU Bus Unit Error Unit Number
A410	00 to 15	CPU Bus Unit Duplicate Number
A422	00 to 15	CPU Bus Unit Error Unit Number
A427	00 to 15	CPU Bus Unit Setting Error Unit Number
A502	00 to 07	Port #0 to #7 Enabled Flags
	08 to 15	Port #0 to #7 Execute Error Flags
A503 to A510	00 to 15	Port #0 to #7 Completion Codes (See page 194)

CPU Bus Unit Restart Bits

Bits A00100 through A00115 can be turned ON to reset CPU Bus Units number #0 through #15, respectively. The Restart Bits are turned OFF automatically when restarting is completed.

Do not turn these bits ON and OFF in the program; manipulate them from the CVSS.

CPU Bus Service Disable Bits

Bits A01500 through A01515 can be turned ON to stop service to CPU Bus Units numbered #0 through #15, respectively. Turn the appropriate bit OFF again to resume service to the CPU Bus Unit.

CPU Bus Unit Initializing Flags

Bits A30200 through A30215 turn ON while the corresponding CPU Bus Units (Units #0 through #15, respectively) are initializing.

CPU Bus Error and Unit Flags

Bit A40112 is turned ON when an error occurs during the transmission of data between the CPU Unit and CPU Bus Units, or a WDT (watchdog timer) error occurs in a CPU Bus Unit. The unit number of the CPU Bus Unit involved is contained in word A405.

Bits A40500 through A40515 correspond to CPU Bus Units #0 through #15, respectively. When a CPU Bus Error occurs, the bit corresponding to the unit number of the CPU Bus Unit involved is turned ON.

CPU Bus Unit Setting Error Flag and Unit Number

Bit A40203 is turned ON when the CPU Bus Units actually installed differ from the Units registered in the I/O table. The unit number of the CPU Bus Unit involved is written to word A427.

Bits A42700 through A42715 correspond to CPU Bus Units #0 through #15, respectively. When a error occurs, the bit corresponding to the unit number of the CPU Bus Unit involved is turned ON.

CPU Bus Unit Error Flag and Unit Numbers

Bit A40207 is turned ON when a parity error occurs during the transmission of data between the CPU Unit and CPU Bus Units. The unit number of the CPU Bus Unit involved is written to word A422.

Bits A42200 through A42215 correspond to CPU Bus Units #0 through #15, respectively. When a CPU Bus Unit Error occurs, the bit corresponding to the unit number of the CPU Bus Unit involved is turned ON.

CPU Bus Unit Numbers

Bits A41000 through A41015 correspond to CPU Bus Units #0 through #15, respectively. When two CPU Bus Units have the same unit number, the bits corresponding to the unit numbers of the CPU Bus Units involved are turned ON.

Network Status Flags

Bits A50200 through A50207 are turned ON to indicate that ports #0 through #7, respectively, are enabled for the SEND(192), RECV(193), and CMND(194). Bits A50208 through A50215 are turned ON to indicate that an error has occurred in ports #0 through #7, respectively, during data communications using SEND(192), RECV(193), or CMND(194).

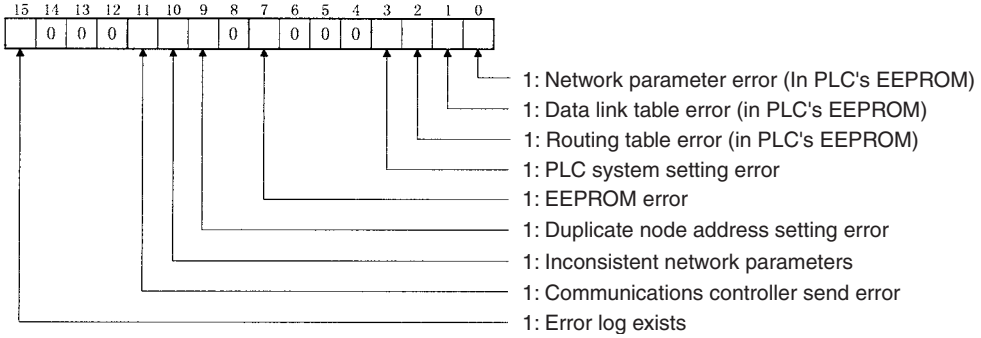
A503 through A510 contain the completion codes for ports #0 through #7, respectively, following data communications using SEND(192), RECV(193), or CMND(194).

CIO Area: CPU Bus Unit Area

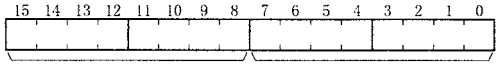
The CPU Bus Unit Area is allocated to CPU Bus Units according to the unit numbers assigned to them, as shown below. Each Unit is allocated 25 words. The Controller Link Units use 22 of the words allocated to them.

Unit no.	Words	Unit no.	Words
0	1500 to 1524	8	1700 to 1724
1	1525 to 1549	9	1725 to 1749
2	1550 to 1574	10	1750 to 1774
3	1575 to 1599	11	1775 to 1799
4	1600 to 1624	12	1800 to 1824
5	1625 to 1649	13	1825 to 1849
6	1650 to 1674	14	1850 to 1874
7	1675 to 1699	15	1875 to 1899

Error Information: CIO 1500 + 25 × (Unit No.) (See page 302.)



Polling Node Address, Startup Node Address: CIO 1500 + 25 × (Unit No.) + 1 (See page 302.)



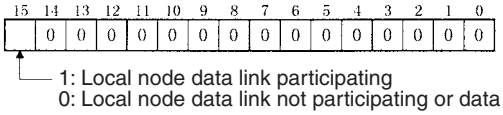
Each node address is displayed in 2-digit BCD.

Network Participation Status: CIO 1500 + 25 × (Unit No.) + 2, + 3 (See pages 193, 302.)

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+ 2	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
+ 3	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

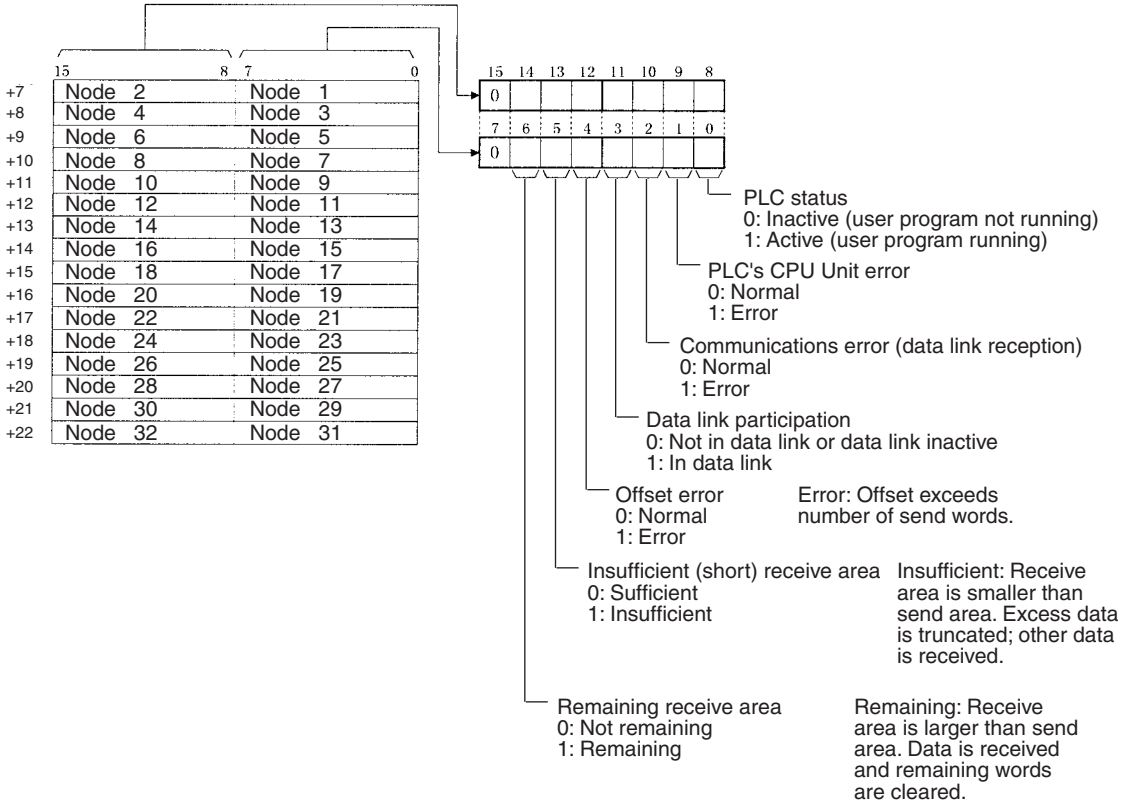
The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of the network
1: Part of the network

Local Data Link Participation Status: CIO 1500 + 25 × (Unit No.) + 6 (See page 302.)



Data Link Status: CIO 1500 + 25 × (Unit No.) + 7 to + 22 (See pages 158, 303.)

When the first data link status word for manually set data link tables or for automatically set data links is not set or is set to 0, the data link status is stored in the words shown below.

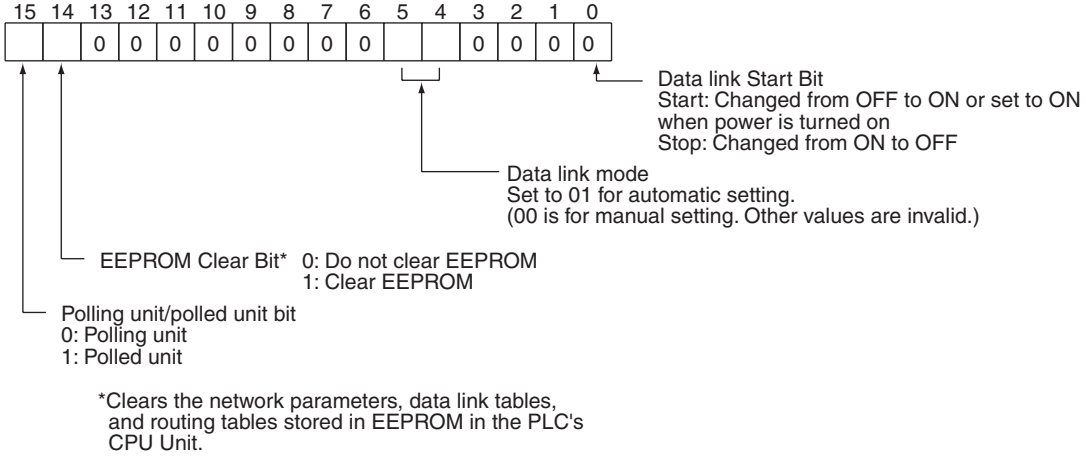


DM Area: CPU Bus Unit Area

The CPU Bus Unit Area (DM Area) is allocated to CPU Bus Units according to the unit numbers assigned to them, as shown below. Each Unit is allocated 100 words, of which 10 words are used. In the Controller Link Unit this area is called the DM Area.

Unit no.	Words	Unit no.	Words
0	DM2000 to DM2009	8	DM2800 to DM2809
1	DM2100 to DM2109	9	DM2900 to DM2909
2	DM2200 to DM2209	10	DM3000 to DM3009
3	DM2300 to DM2309	11	DM3100 to DM3109
4	DM2400 to DM2409	12	DM3200 to DM3209
5	DM2500 to DM2509	13	DM3300 to DM3309
6	DM2600 to DM2609	14	DM3400 to DM3409
7	DM2700 to DM2709	15	DM3500 to DM3509

Software Switches (DM2000 + 100 × Unit No.) (See pages 147, 247, 253, 315.)



Parameters for Automatically Setting Data Links: DM 2000 + 100 × (Unit No.) + 1 to + 9 (See page 149.)

	15 8	7 0
+1	Area 1 data link start word (BCD)	
+2	Area 1 type	
+3	Number of send words per node of area 1 (BCD)	
+4	Rightmost 4 digits of data link start word of area 2 (BCD)	
+5	Area 2 type	Leftmost digit of data link start word of area 2 (BCD)
+6	Number of send words per node of area 2 (BCD)	
+7	First data link status word (BCD)	

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+8	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
+9	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

BCD: Set the value as binary-coded decimal.

← Nodes to participate in the data links

The numbers indicate node numbers.
The value assigned indicates whether the node is to participate in the data links.

Participate: 1
Not participate: 0

CQM1H-series PLCs

AR Area

Word	Bits	Name	Contents
AR 00	11	Communications Unit Error Flag	Turns ON when an error occurs in a Communications Unit.
AR 01	11	Communications Unit Restart Bit	Turn ON this bit to restart the Communications Unit.
AR 02	00 to 07	Response code	Contains the completion code for network instructions (SEND(90), RECV(98), or CMND(—)). (See page 194.)
	08	Network Instruction Error Flag	0: Normal end to SEND(90), RECV(98), or CMND(—). 1: Abnormal end (See page 193.)
	09	Network Instruction Enable Flag	0: SEND(90), RECV(98), or CMND(—) execution not possible (already executing) 1: Execution possible (not executing) (See page 193.)
	15	Communications Unit Connected Flag	Turns ON when a Communications Unit is mounted to the PLC.
AR 03	00 to 15	Communications Unit Servicing Time	Indicates the servicing time for the last cycle in 0.1-ms units (4-digit BCD.)

Data Link Start Bit: AR 07 (See page 115.)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

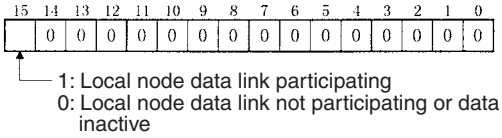
← Data link Start Bit (AR0700)

Start: Changed from OFF to ON or set to ON when power is turned on

Stop: Changed from ON to OFF

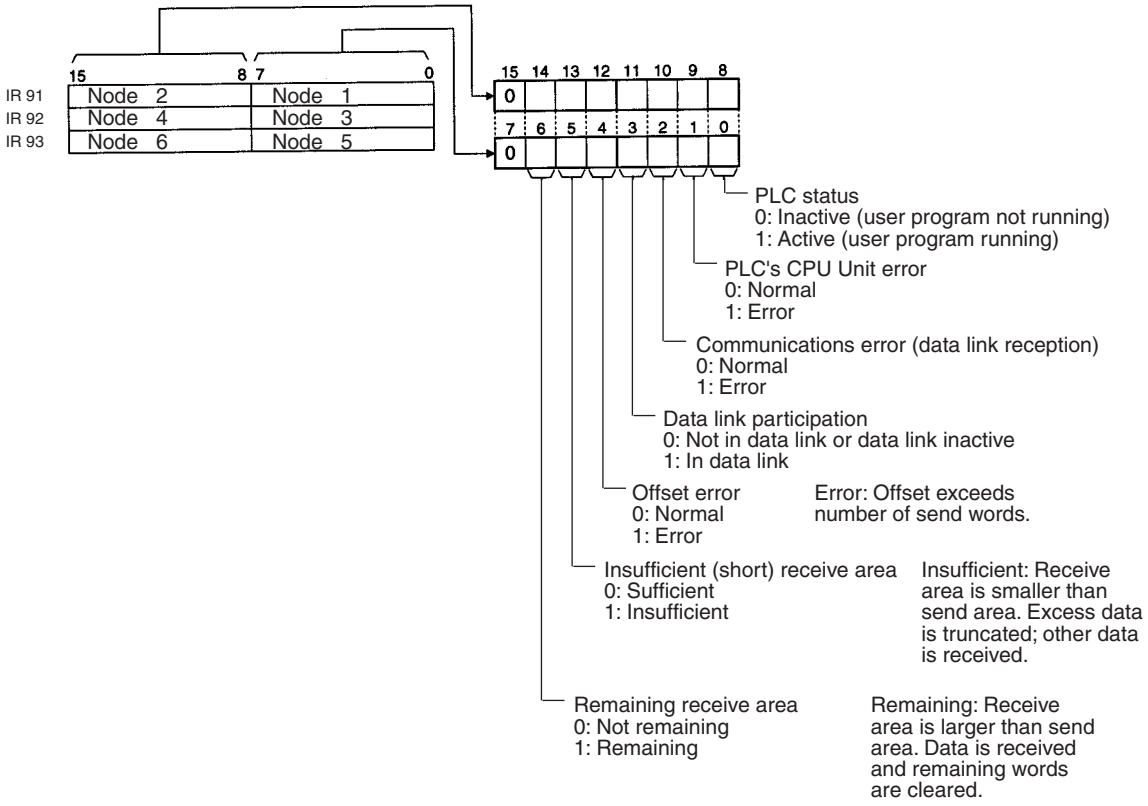
Communications Unit Flags, Control Bits, and Status Information

Local Data Link Participation Status: IR 90 (See page 307.)

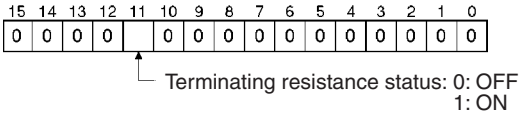


Data Link Status: IR 91 to IR 93 (See pages 158, 307.)

When the first data link status word is not set or is set to the default (0000) for either the manually set data link tables or automatically set data link tables, the data link status is stored in the following words for nodes 1 to 6 only.

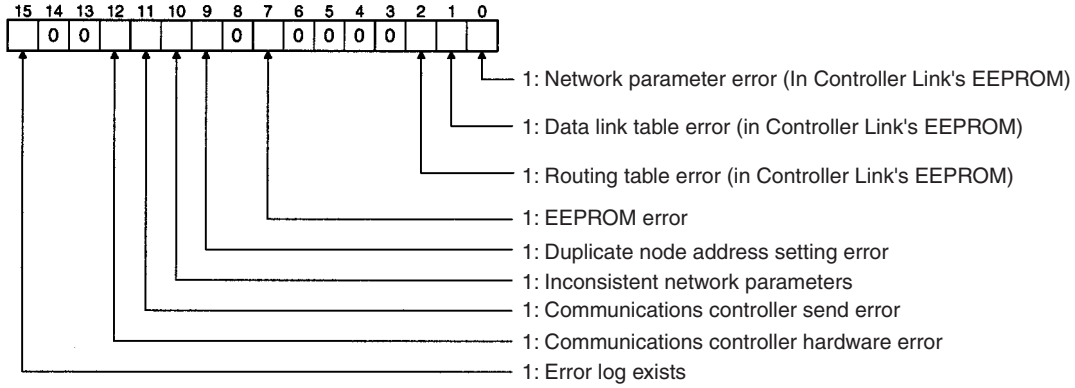


Terminating Resistance Status: IR 95 (See page 310.)

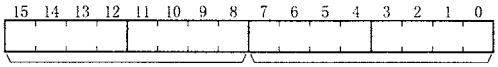


Controller Link Status Information

Error Information: IR 190 (See page 306.)



Polling Node Address, Startup Node Address: IR 191 (See page 306.)



Each node address is displayed in 2-digit BCD.

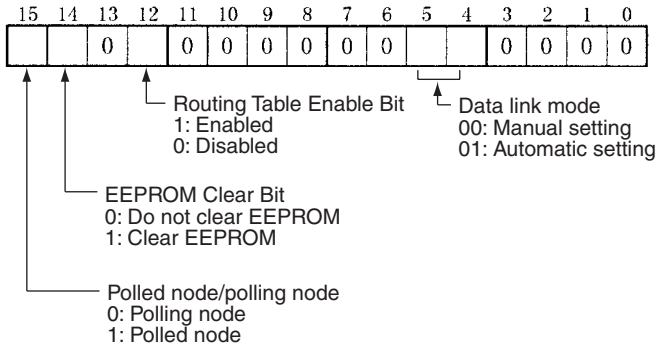
Network Participation Status: IR 192 and IR 193 (See page 306.)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

The numbers in the squares indicate node addresses.
The corresponding node participation status is as follows:
0: Not part of the network
1: Part of the network

PLC Setup Settings in DM Area

Control Bits: DM 6400 (See pages 115, 247, 253, 323.)



Automatic Data Link Parameters: DM 6401 to DM 6409 (See page 152.)

DM 6401	Area 1 data link start word (BCD)	
DM 6402	Area 1 type	00
DM 6403	Number of send words per node of area 1 (BCD)	
DM 6404	Rightmost 4 digits of data link start word of area 2 (BCD)	
DM 6405	Area 2 type	Leftmost digit of data link start word of area 2 (BCD)
DM 6406	Number of send words per node of area 2 (BCD)	
DM 6407	First data link status word (BCD)	

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
DM 6408	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
DM 6409	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17

BCD: Set the value as binary-coded decimal.

← Nodes to participate in the data links

The numbers indicate node numbers.
The value assigned indicates whether the node is to participate in the data links.

Participate: 1
Not participate: 0

Routing Tables: DM 6450 to DM 6499 (See page 243.)

These words are used for the routing tables if the data links are enabled in the software switches. Do not use these words for any other purpose if data links are enabled.

Appendix C
Using the Relay Terminal Block

This appendix describes how to use the CJ1W-TB101 Wired Controller Link Unit Relay Terminal Block. Using a Relay Terminal Block enables replacing a Controller Link Unit while network communications are still in progress.

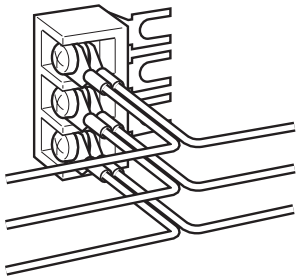
Appearance	Name	Model number	Remarks
	Wired Controller Link Unit Relay Terminal Block	CJ1W-TB101	Cannot be used on the nodes on both ends of the network.

Relay Terminal Blocks (CJ1W-TB101) can be used on any node but the end nodes to enable replacing the Controller Link Unit with the communications cable connected and turn OFF the power to only the Unit being replaced.

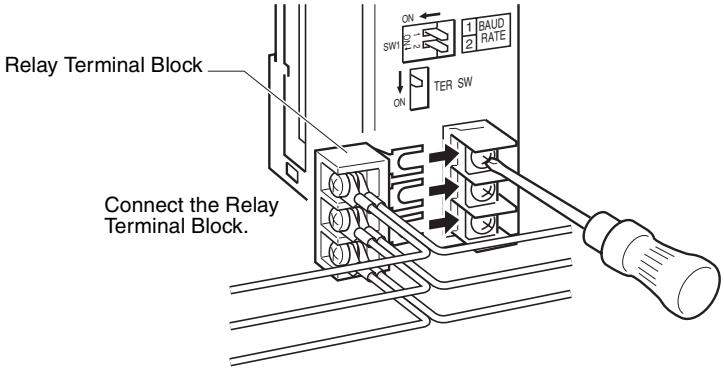
Note The built-in terminating resistance connected at the Units at the end of the network prevents using the Relay Terminal Block on the end Units.

Connecting the Relay Terminal Block to the Communications Terminal Block on the Controller Link Unit

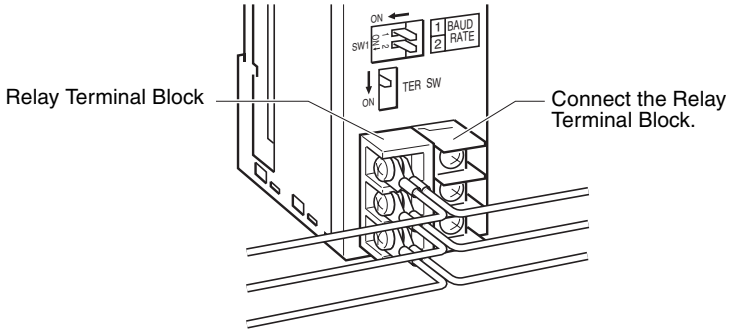
1. Connect the communications cables from the two adjacent nodes together to the terminals on the Relay Terminal Block. The tightening torque for the Relay Terminal Block terminal screws is 0.5 N·m.



2. Remove the terminal block cover from the communications terminal block on the Controller Link Unit and loosen the three screws on the communications terminal block. (If adjacent Units are close enough to interfere with work, remove the three screws.)
3. Confirming that the signal lines and shield lines are aligned properly with the markings on the Controller Link Unit, insert the Relay Terminal Block and tighten the screws on the communications terminal block to secure the Relay Terminal Block. The tightening torque for the three communications terminal block terminal screws is 0.5 N·m.



4. Attach the terminal block cover to the communications terminal block on the Controller Link Unit.



Replacing a Controller Link Unit with a Relay Terminal Block

Use the following procedure to replace a Controller Link Unit with a Relay Terminal Block. The communications cables are left connected to the Relay Terminal Block during the procedure, and only the Relay Terminal Block itself must be disconnected from the Controller Link Unit and then connected to the new Controller Link Unit.

The following procedure describes only steps required for the Relay Terminal Block. Refer to *9-6-1 Replacing the Unit* for details on the replacement operation.

1. Turn OFF the power supply to the PLC with the Unit to be replaced.
2. Remove the communications terminal block cover from the Unit.
3. Loosen the three screws on the communications terminal block. (If adjacent Units are close enough to interfere with work, remove the three screws.)
4. Remove the Relay Terminal Block with the communications cables still attached to it.

⚠ **Caution** Do not allow the metal portions of the Relay Terminal Block or the communications cable crimp terminals to come into contact with any conductive material.

5. Replace the Controller Link Unit. Set the node number, baud rate, operating level, and terminating resistance switches on the new Unit to the same settings as the previous Unit. With the C200HX/HG/HE or CQM1H PLC, turn ON the power to the PLC, download the data that was backed up from the previous Unit to EEPROM in the new Unit, and then turn OFF the power again.
6. Remove the communications terminal block cover from the new Unit.
7. Loosen the three screws on the communications terminal block on the new Unit. (If adjacent Units are close enough to interfere with work, remove the three screws.)
8. Attach the Relay Terminal Block to the new Unit with the communications cables still attached to it, making sure to align the signal lines and shield line with the markings on the Controller Link Unit.
9. Tighten the screws on the communications terminal block to secure the Relay Terminal Block. The tightening torque for the three communications terminal block terminal screws is 0.5 N·m.
10. Attach the terminal block cover to the communications terminal block on the Controller Link Unit.
11. Turn ON the power supply to the new Unit. (The power supply to other nodes should still be ON.)

Note
1. Signal will still be flowing through the communications cables during the replacement procedure if the network is still operating. Use an insulated screwdriver and be very sure that the metal portions of the Relay Terminal Block or the communications cable crimp terminals do not come into contact with any conductive material.
2. Replace the Unit only after confirming that doing so will not affect the system, including the affects of separated nodes or communications errors.
3. Always turn OFF the power supply to all nodes when connecting communications cables to or removing them from the Relay Terminal Unit.

Index

Numerics

1 to 1 type, 10, 132, 141
1:N allocations
  1 to 1 type, 10, 132, 141
  chain type, 10, 132, 143
  common type, 10, 132, 137
4-bit format, 158, 160, 162, 293, 348
8-bit format, 158, 159, 162, 292, 347

A-B

applications precautions, xxiv, 29
AR Area
  reading, 217, 219
  writing, 218
asynchronous operation, 262
automatic setting
  1:N allocations, 10, 132, 133
  setting example, 153
bits
  controlling, 225, 226
Bus Connection Units
  models, 343

C

C200HX/HG/HE PLCs
  installation, 61
  memory areas, 352
  models, 343
  RECV, 172
  RECV delay time, 270
  SEND, 171
  SEND delay time, 268
  SEND/RECV instructions, 171
  synchronous operation, 260
cables, 8
  communications cables, 68
    connecting, 70
  optical, 76
chain type, 10, 132, 143
CJ-series PLCs
  data link tables, 117
  installation, 64
  memory areas, 345
  models, 342
clock
  reading, 224
  setting, 224
CMND instruction
  message service, 168
commands
  FINS commands, 202
commands for C200HX/HG/HE and CQM1H-series PLCs, 215
  CLOCK READ, 224
  CLOCK WRITE, 224
  CONTROLLER DATA READ, 222
  CONTROLLER STATUS READ, 223
  ERROR CLEAR, 225
  FORCED SET/RESET, 225
  FORCED SET/RESET CANCEL, 226
  MEMORY AREA READ, 217
  MEMORY AREA WRITE, 218
  MULTIPLE FORCED STATUS READ, 227
  MULTIPLE MEMORY AREA READ, 219
  PROGRAM AREA READ, 219
  PROGRAM AREA WRITE, 220
commands for Controller Link Units, 204
  BROADCAST TEST DATA SEND, 213
  BROADCAST TEST RESULTS READ, 212
  CONTROLLER DATA READ, 205
  CONTROLLER STATUS READ, 206
  DATA LINK START, 204
  DATA LINK STATUS READ, 210
  DATA LINK STOP, 204
  ECHOBACK TEST, 212
  ERROR LOG CLEAR, 214
  ERROR LOG READ, 213
  NETWORK STATUS READ, 208
commands for CS/CJ-series PLCs, 186
commands for CVM1 and CV-series PLCs, 186
common type, 10, 132, 137
communications
  cables, 21, 76
    models, 342, 363
    optical, 76
  data exchange timing, 257
  data processing time, 258
  instructions, 189
  mechanism, 252
  preparations, 34
  selecting functions, 27
  timing calculation example, 259
Communications Boards
  models, 343
Communications Cables, 21, 76
  models, 342, 363
communications cycle time, 255
  active data links, 255
  definition, 252
  non-active data links, 256
Controller, 53
Controller Link, 2
  network
    connections, 68
    features, 8
    reading operating status, 208
    remote, 241
Controller Link Support Boards
  models, 341
Controller Link Support Software, 24, 26
  models, 341
  stopping and starting data links, 157
Controller Link Units
  C200HX/HG/HE, 51

settings, 95
CJ Series
settings, 91
CJ-series PLCs, 48
CQM1H Series
settings, 102
CQM1H-series PLCs, 55
CS Series
settings, 88
CS-series PLCs, 46
CVM1 and CV Series
settings, 99
CVM1 and CV-series PLCs, 53
models, 18, 341
counters
changing PV, 218
reading Completion Flag status, 217, 219
reading PV, 219
CPU Units
models, 342
CQM1H-series PLCs
CMND, 182
installation, 66
instructions, 178
memory areas, 359
models, 343
RECV, 179
SEND, 178
synchronous operation, 260
CS-series PLCs
data link tables, 117
installation, 63
memory areas, 345
models, 342
CVM1 and CV-series PLCs
asynchronous operation, 262
CMND, 182, 183
commands, 186
installation, 62
memory areas, 355
RECV, 177
RECV delay time, 266
SEND, 176
SEND delay time, 264
SEND/RECV instructions, 176
synchronous operation, 260
CVM1 PLCs
models, 343
CV-series PLCs
models, 343
See also CVM1 and CV-series PLCs
CX-Net, 26, 115
CX-Programmer, 26, 241, 242

D

data areas
See also Memory Areas
data link table
C200HX/HG/HE PLCs, 119
changing during operation, 11, 334
CQM1H-series PLCs, 122
creating manually, 125
CVM1 and CV-series PLCs, 121
specifications, 117
data links, 8
1 to 1 type, 140
automatic setting, 36, 131
1:N, 10, 131, 133
examples, 110
chain type, 143, 144
common type, 136
creating, 28
description, 108
equality layout, 134
error detection, 164
I/O response time, 257
manual setting, 34, 116
examples, 109, 125
from computer node, 117
from Programming Device, 116
modes, 162
procedures, 34
reading data link status, 210
selecting automatic or manual, 115
setting, 115
specifications, 113
starting, 155, 204
status, 158
manipulating bit/word status, 163
storage format, 158, 162, 280, 292, 293, 347, 349
specifying, 159
using data link status area, 158
using indicators, 158
stopping, 155, 204
stopping and starting, 156
dimensions
C200HX/HG/HE Units, 52
CJ-series Units, 50
CQM1H Units, 56
CS-series Units, 48
CVM1 and CV Units, 55
DM Area
reading, 217, 219
writing, 218

E-F

EC Directives, xxvi
EMC Directives, xxvi
error codes, 311
error log, 7, 310
reading and clearing, 317
table, 310
error messages, 224
errors
clearing, 214, 225
error handling, 9

error log, 7
reading, 213
response codes, 230
FAL/FALS No., 224
fatal error data, 223
FINS commands
errors, 230
response codes
errors, 230
sending and receiving, 202
responses, 202
sending and receiving, 202
stopping and starting data links, 157
flags
Network Instruction Enabled Flag, 192, 193
Network Instruction Error Flag, 192, 193
SEND/RECV, 192
SEND/RECV operations, 194
status
troubleshooting, 299
forced status
canceling, 226
controlling, 225
reading, 227

I

I/O tables, 34, 37
indicators
checking data link status, 158
Controller Link Units
C200HX/HG/HE Units, 51
CJ-series Units, 49
CQM1H Units, 55, 57, 58, 60
CS-series Units, 47
CVM1 and CV-series Units, 53
troubleshooting using indicators, 274
inspection
tools and equipment needed, 321
installation, 34, 60
C200HX/HG/HE PLCs, 61
CJ-series PLCs, 64
communications cables, 68, 70
CQM1H-series PLCs, 66
CS-series PLCs, 63
CVM1 and CV-series PLCs, 62
SYSMAC LINK Unit, 62
instructions
CMND, 182
RECV, 169
SEND, 169
IR Area
reading, 217, 219

L-M

Low Voltage Directive, xxvi
maintenance
cleaning, 321
inspection, 321
manual setting
examples, 125
memory areas, 345
designating addresses, 215
reading, 217
reading contents of memory area words, 219
writing, 218
message delay times, 264
message service, 8, 29
operations, 190
procedure, 42
specifications, 191
model numbers
reading PLC model number, 222
models, 18

N

network
interconnecting Controller Link networks, 238
interconnecting other OMRON networks, 238
other remote networks, 242
parameters, 254
specifying, 255
relay errors, 229
remote Controller Link networks, 241
node addresses
setting
C200HX/HG/HE Units, 96
CJ-series Wired Units, 93
CQM1H Units, 103
CS-series Wired Units, 89
CVM1 and CV Units, 100
node configurations, 9
nodes
extending to 62
Enable Bit, 81, 349
nodes, extending to 62, 10, 81
non-fatal error data, 223
number of polled units, 254

O-P

offsets
application example, 112
usage, 112
operating environment precautions, xxiii
Optical Fiber Cables
accessories, 77
optical fiber cables
See also cables
overview, 2
PLC
modes, 223
changing to PROGRAM mode, 221
changing to RUN mode, 221
PLC memory addres. *See also* Memory Areas

reading, 222
reading controller status, 206, 223
receiving routing table settings, 247
status, 222
polling cycle
definition, 252
polling node
setting, 253
precautions
applications, xxiv, 29
general, xxii
handling, 321
operating environment, xxiii
replacing the Unit, 322
safety, xxii
procedures
message service, 29
programming
PLC programming examples, 197
remote, 240
Programming Devices, 23, 241
models, 343
programs
reading, 219
writing, 220

R

RAS functions, 7
RECV, 170
RECV delay time, 266
RECV instruction, 169
C200HX/HG/HE PLCs, 270
CS/CJ-series PLCs, 266
CVM1 and CV-series PLCs, 266
message service, 168
Repeater Units, 9, 12, 66, 73, 80, 104, 332
response codes, 194, 228, 230
C200HX/HG/HE PLCs, 195
C200HXH/HG/HE and CQM1H-series PLCs, 195
CQM1H-series PLCs, 195
CS/CJ-series, CVM1, and CV-series PLCs, 195
routing tables, 243
creating, 243
editing, 245
saving, 246
setting, 244
examples, 248
procedure, 245
transferring, 247

S

safety precautions, xxii
SEND, 169
SEND delay time, 264
SEND instruction, 169
C200HX/HG/HE PLCs, 268
CS/CJ-series PLCs, 264
CVM1 and CV-series PLCs, 264
message service, 168
SEND/RECV instructions, 169
settings
baud rates
C200HX/HG/HE Units, 97
CJ-series Wired Units, 94
CQM1H Units, 103
CS-series Wired Units, 90
CVM1 and CV Units, 101
node addresses
C200HX/HG/HE Units, 96
CJ-series Wired Units, 93
CQM1H Units, 103
CS-series Wired Units, 89
CVM1 and CV Units, 100
operating levels
C200HX/HG/HE Units, 97
CJ-series Wired Units, 94
CS-series Wired Units, 90
polling nodes, 253
settings after replacing Unit, 323
terminating resistance
C200HX/HG/HE Units, 98
CJ-series Wired Units, 94
CQM1H Units, 104
CS-series Wired Units, 91
CVM1 and CV Units, 101
unit numbers
CJ-series Wired Units, 92
CS-series Wired Units, 88
CVM1 and CV Units, 100
specifications
communications, 15
data link, 113
general, 14
message service, 191
standard models, 341
startup procedures, 27
status area, 7
troubleshooting, 290
stopping and starting
data links
using Controller Link Support Software, 157
using FINS commands, 157
synchronous operation, 260
system configuration, 12

T

terminating resistance
setting
C200HX/HG/HE Units, 98
CJ-series Wired Units, 94
CQM1H Units, 104
CS-series Wired Units, 91
CVM1 and CV Units, 101

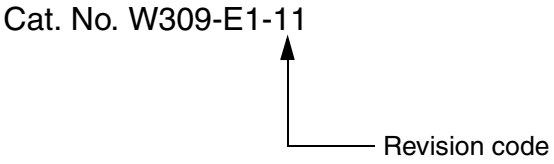
timers
changing PV, 218
reading Completion Flag status, 217, 219
reading PV, 219
troubleshooting, 274
status area, 290
status flags, 299
using indicators, 274

U-W

unit numbers
setting
CJ-series Wired Units, 92
CS-series Wired Units, 88
CVM1 and CV Units, 100
Wired Network 62 Node Enable Bit, 81, 349
wiring
Wired Controller Link Units, 68

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.



The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	February 1997	Original production
2	August 1997	Removed “-HZ” model suffix throughout the manual. **Page 76:** “CMND” corrected to “SEND” in the diagram for the “PC to computer” message service in the table. **Page 88:** “C” bit added to the program example. **Page 145:** Second sentence removed and the equations corrected for *8-3-2 Data Processing Time.*
3	February 1999	CS1W-CLK11 and CS1W-CLK21 Controller Link Units for CS/CJ-series PCs added. “Common memory” corrected to “shared memory” throughout the manual. Addition of new 3G8F5-CLK11-E optical model and optical system information throughout the manual.
4	September 1999	CQM1H-CLK21 Controller Link Units for CQM1H-series PCs added.
5	May 2001	CJ1W-CLK21 Controller Link Units for CJ-series PCs added (including changing “CS1” to “CS” or CS/CJ” according to context). An appendix was added on the Relay Terminal Block. Information on optical systems removed. **Page xiii:** “Connector” changed to “any terminal block.” **Page xiv:** “Connector” removed, “communications connector” changed to “Bus Connection Unit,” and “backup power supply cable” removed. **Page xv:** “CS1W-CLK11” removed. **Page 3:** Graphic altered. **Page 5:** Information added on personal computer boards. **Page 6:** Information on H-PCF and GI cables added. **Pages 6 and 17:** Note changed/added. **Pages 10 and 16:** Information added/changed in table. **Pages 11 and 12:** Information added on wiring. **Page 15:** Note and information following it removed and other changes. **Page 17:** Note added in graphic. **Page 19:** Parenthetic information changed in procedure. **Page 30:** Unit number callout corrected. **Page 45:** Recommended wire added. **Page 54:** Corrected “bottom switch” to “front switch.” **Page 76:** Notes changed. **Page 146:** Corrected version information. **Page 159:** Restriction added on number of read words. **Page 250:** First paragraph in *9-3 Error Log* corrected.

Revision code	Date	Revised content
06	February 2003	"PC" changed to "PLC" throughout the manual. Information related to the CQM1H-CLK21 was added and information related to the CS1W-CLK21 was removed. In addition, the following changes were made. **Page v:** Changes made to information on product references. **Pages 17, 73, 104, 272:** Information on software switches added. **Pages 52, 55:** Changes made to table giving baud rates. **Pages 79, 80:** "-EV□" added to model numbers in several of places. **Page 100:** Parenthetic information added to first paragraph. **Page 107:** Programming examples added. **Pages 137, 141:** Numerical change: 120000 changed to 121000. **Pages 214, 216:** "Scan" changed to "cycle" in several places. **Page 250:** Minor change made to first paragraph.
07	June 2003	Numerous changes were made to add the new functions and features of CS1W-CLK21-V1 and CJ1W-CLK21-V1 Units and the CS1W-PRT01/02/03 Repeater Units.
08	September 2004	Extensive changes were made to the manual mainly to add information on the upgraded functionality of new unit versions, including an overview of the new system of unit version codes.
09	January 2006	"CS1-series" changed to "CS-series" throughout the manual. **Page v:** Information on general precautions notation added and copyright information moved from page vii. **Page xv:** Information on liability and warranty added. **Pages 115, 117, 119, and 120:** "PC" changed to "PLC."

Revision code	Date	Revised content
10	September 2007	Added the CS1W-CLK13, CS1W-CLK23, CJ1W-CLK23, CS1W-CLK53, 3G8F7-CLK13-E, 3G8F7-CLK23-E, and 3G8F7-CLK53-E throughout the manual. **Page vii:** Added note and information on CX-Integrator. **Pages 7, 168, 180:** Added note. **Page 7:** Changed the maximum number of errors to 64. **Page 8:** Changed information in table and paragraph before *Message Service.* **Page 11:** Changed CX-Programmer to CX-Integrator and added section. **Page 14:** Changed specifications for number of data link words and changed notes. **Page 18:** Updated table and notes **Page 19:** Changed note in table. **Page 21:** Changed notes after table. **Page 25:** Removed notes after table. **Page 29:** Added precautions. **Pages 44, 46:** Changed heading. **Page 62:** Removed first sentence from first paragraph after note and changed example. **Page 63:** Changed first paragraph on page and removed first sentence from first paragraph after note. **Page 64:** Changed example, including table. **Page 106:** Updated table and note after table. **Page 108:** Updated note. **Page 109:** Updated note 4. **Page 111:** Changed description of number of data link words. **Page 116:** Changed setting range descriptions for number of words. **Page 129:** Changed second bullet after last note. **Page 202:** Changed information under *Model*. **Page 203:** Added bit description to top figure. **Page 204:** Added information at bottom of page. **Page 210:** Changed descriptions of beginning record number, number of records, and number of stored records, and added table. **Page 228:** Added information to second row of probable cause of error code 02 05. **Page 229:** Added information to remedy of error code 05 04. **Pages 256 to 263:** Updated section. **Page 278:** Changed probable remedy in third row of table. **Page 281:** Changed last paragraph of cause and remedy in fourth row of table. **Page 296:** Changed probable remedy in second row of table. **Page 297:** Changed probable remedy in first, third, and fifth rows of table and probable cause in fifth, sixth, and eighth rows. **Page 298:** Changed probable remedy in fourth row of table. **Page 306:** Changed probable remedy in second row of table. **Page 307:** Changed probable remedy in fifth row of table and probable cause in third, fifth, and sixth rows. **Pages 308 and 310:** Changed probable remedy in fourth row of table. **Page 311:** Changed probable remedy in first and second rows of bottom table. **Page 312:** Changed probable remedy in sixth row of table. **Page 313:** Changed second paragraph, specification for number of records, and information after table. **Pages 318 and 319:** Added references to note 4 (six times) and added note 4. **Page 322:** Added row for *Node XX Node size.* **Page 324:** Changed text after bottom table. **Page 343:** Added remarks to Control Link Unit table and added one row to Controller Link Support Board table. **Page 344:** Changed top table.
11	May 2008	**Pages 21, 22, and 342:** Added row to top table. **Pages 57, 59, and 60:** Changed the dimension with the connector and added note. **Pages 68 and 74:** Added row to table. **Page 71:** Changed information on crimp terminals for step 7.