SYSMAC CVM1/CV Series
CVM1-LK401
PC Link Unit

OPERATION MANUAL

OMRON

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.

⚠ **WARNING**   Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **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. "PC" is also used in "PC Link" to maintain consistency with previous product names.

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.

TABLE OF CONTENTS

TABLE OF CONTENTS

Appendices

About this Manual:

This manual describes the installation and operation of the CVM1-LK401 PC Link Unit and includes the sections described below. This manual also describes the procedures for replacing PC Link Systems for C500, C1000H, and C2000H PLCs using the CVM1-LK401 PC Link Unit, including differences in memory allocations.

Please read this manual carefully and be sure you understand the information provided before attempting to install or operate the PC Link Unit. Be sure to read the precautions provided in the following section.

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

Section 1 describes the capabilities of the PC Link System and provides example system configurations.

Section 2 provides specifications of the PC Link Unit and describes the main components.

Section 3 provides step-by-step procedures to follow when replacing earlier PC Link Units with the C500-LK009-V1 and CVM1-LK401 PC Link Units.

Section 4 explains how to start the PC Link system and verify that links have been established.

Section 5 provides tables to help identify and correct errors in the PC Link system.

The *Appendices* provide ordering information, Link Adapter specifications, information on PC Link I/O response times, and a table of PC Link setting and status memory area allocations.

⚠ **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.

Related Manuals:

Refer to the *CVM1/CV Series Installation Guide* (W195) for information on installing CVM1/CV-series PLCs. Refer to the *CVM1/CV Series Operation Manual: Ladder Diagrams* (W202) for information on programming ladder diagrams. Refer to the *C200H-LK401/C500-LK009-V1 PC Link System Manual* (W135) for information on handling and wiring the C200H-LK401 and C500-LK009-V1 PC Links.

The following table lists the manuals related to the CVM1-LK401 PC Link Unit.

Cat. No	Models	Name	Contents
W434 (this manual)	CVM1-LK401	CVM1-LK401 PC Link Unit Operation Manual	Information on using the CVM1-LK401 PC Link Unit
W135	C200H-LK401 and C500-LK009-V1	C200H-LK401/ C500-LK009-V1 PC Link System Manual	Information on using PC Link Units on C500, C1000H, C2000H, CS-series, C200H, and C200HS PLCs
W195	CVM1, CV500, CV1000, and CV2000	CVM1/CV Series Installation Guide	Specifications, installation methods, and handling methods for CVM1, CV500, CV1000, and CV2000 PLCs
W202	CVM1, CV500, CV1000, and CV2000	CVM1/CV Series Operation Manual: Ladder Diagrams	Ladder programming methods and information on programming instructions for CVM1, CV500, CV1000, and CV2000 PLCs
W194	CV500, CV1000, and CV2000	CVM1/CV Series Operation Manual: SFC	SFC programming methods for CVM1, CV500, CV1000, and CV2000 PLCs
W350	CVM1D	CVM1D Duplex System PLC Installation Guide	Specifications, installation methods, and handling methods for CVM1D PLCs
W351	CVM1D	CVM1D Duplex System Operation Manual	Ladder programming methods and information on programming instructions for CVM1D PLCs
W361	WS02-CXPC1-EV2	CX-Programmer (Ver. 2.1) User's Manual	CX-Programmer operating procedures
W414	WS02-CXPC1-EV3	CX-Programmer (Ver. 3.□) Operation Manual	
W425	WS02-CXPC1-EV4	CX-Programmer (Ver. 4.□) Operation Manual	
W222	CVM1-PRO21-V2	CVM1/CVM1D/CV CVM1-PRS21-V1 Programming Console Operation Manual	Programming Console operating procedures

PRECAUTIONS

This section provides general precautions for using the CVM1-LK401 PC Link Unit.

The information contained in this section is important for the safe and reliable application of the CVM1-LK401 PC Link Unit and the Programmable Controller in general. You must read this section and understand the information contained before attempting to set up or operate a PC Link System.

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 the Unit. Be sure to read this manual before attempting to use the Unit 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 touch any of the terminals or terminal blocks while the power is being supplied. Doing so may result in electric shock.

⚠ **WARNING**   Do not attempt to disassemble, repair, or modify any Units. Any attempt to do so may result in malfunction, fire, or 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.

- 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 deposits on or burning of the output relays, or destruction of the output transistors. As a counter-measure for such problems, external safety measures must be provided to ensure safety in the system.
- When the 24-V DC output (service power supply to the PLC) is over-loaded 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 editing 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 changing or transferring to another node the contents of a program, the PLC Setup, I/O tables, or I/O memory. Changing or transferring any 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 or power lines.

⚠ **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. Make 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   Application Precautions

Observe the following precautions when using the PLC System.

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

- Use the PC Link Unit correctly as specified in this manual.
- Always turn OFF the power supply to the PLC before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
  - Mounting or dismounting Power Supply Units, I/O Units, CPU Units, or any other Units.
  - Assembling the Units.
  - Setting DIP switches or rotary switches.
  - Connecting cables or wiring the system.
  - Connecting or disconnecting the connectors.

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

- Do not mount more than the maximum number of PC Link Units specified in this manual to one PLC. The PLC may malfunction.
- Make sure that only the PC Link Unit model combinations specified in this manual are used. Correct communications may not be possible for some PC Link Unit model combinations.
- Check all switch settings to be sure they agree with the information provided in this manual. Incorrect switch settings may cause malfunctions.
- Attach all protective covers in the locations specified in this manual.
- Make sure that all the Backplane mounting screws, terminal block screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Observe the following precautions when wiring the communications cable.
    - Separate the communications cables from the power lines or high-tension lines.
    - Do not bend the communications cables past their natural bending radius.
    - Do not pull on the communications cables.
    - Do not place objects on top of the communications cables.
    - Always lay communications cable inside ducts.
- Double-check all wiring and switch settings before turning ON the power supply.
- Do not allow wire clipping or scraps to enter the Unit. Be particularly careful during wiring work.
- Make sure that the terminal blocks, Memory Units, expansion cables, and other items with locking devices are properly locked into place. Improper locking may result in malfunction.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in 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.
    - Force-setting/force-resetting any bit in memory.
    - Changing the present value of any word or any set value in memory.
- After replacing a CPU Unit, resume operation only after transferring to the new CPU Unit the contents of the DM Area, HR Area, and other data required for resuming operation. Not doing so may result in an unexpected operation.
- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up. Not doing so may result in malfunction or damage.

6 Conformance to EC Directives

6-1 Applicable Directives

- EMC Directives
- Low Voltage Directive

6-2 Concepts

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 EMC (Electromagnetic Compatibility) standards are as follows:

EMS (Electromagnetic Susceptibility): EN61131-2
EMI (Electromagnetic Interference): EN61000-6-4
(Radiated emission: 10-m regulations)

Low Voltage Directive

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

6-3 Conformance to EC Directives

The CVM1-LK401 PC Link Unit complies with EC Directives. To ensure that the machine or device in which the CVM1-LK401 PC Link Unit is used complies with EC Directives, the PLC must be installed as follows:

1,2,3... 1. The CVM1-LK401 PC Link Unit must be installed within a control panel.
  2. You must use reinforced insulation or double insulation for the DC power supplies used for the communications power supply and I/O power supplies.
  3. The CVM1-LK401 PC Link Unit also meets the common emission standard (EN61000-6-4). When the CVM1-LK401 PC Link Unit is built into equipment, however, the measures necessary to ensure that the standard is met will vary with the overall configuration of the control panel, the other devices connected to the control panel, and other conditions. You must therefore confirm that EC directives are met for the overall machine or device when using the CVM1-LK401 PC Link Unit.

SECTION 1
Introduction

This section describes the capabilities of the PC Link System and provides example system configurations.

1-1   Features of the PC Link System

A PC Link System is a communications system that exchanges I/O data between PLCs independent of programming in the ladder program. The CVM1-LK401 is the PC Link Unit for SYSMAC CVM1/CV-series PLCs.

Exchange Data between PLCs without Programming

Extra programming is not required to communicate through the PC Link System. PLCs with PC Link Units mounted can exchange data through their shared LR Areas.
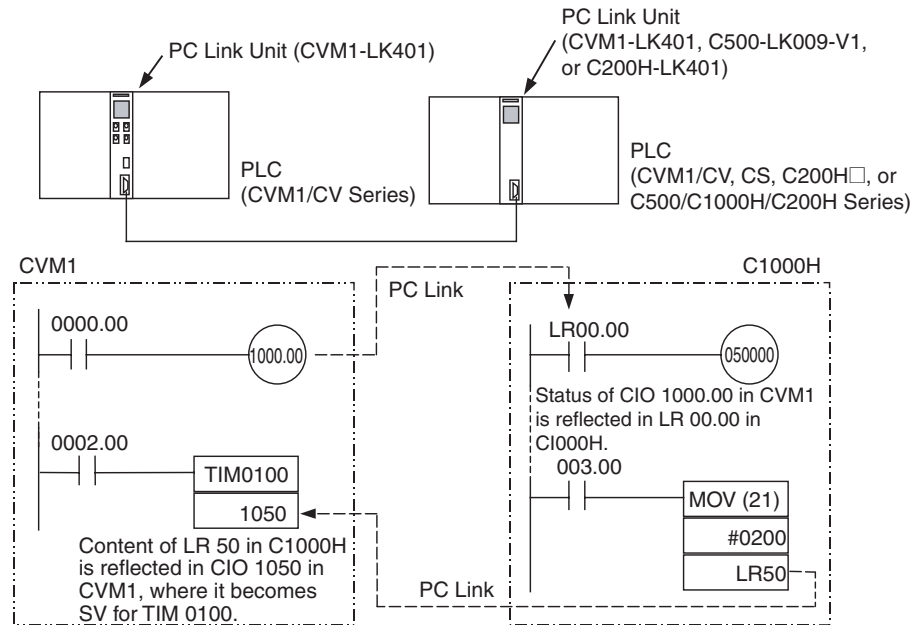
Up to 1,024 Bits in the Data Exchange

The PC Link System shares LR Areas to exchange up to 1,024 bits of data (64 words).

In the CVM1/CV-series and CS-series PLCs, words CIO 1000 to CIO 1063 are allocated as the LR Area.

In the C-series PLCs, words LR 00 to LR 63 are used as the LR Area. (In the C500, the area is LR 00 to LR 31.)

PLC series	Applicable PLCs	LR Area
CVM1/CV Series	CVM1, CV500/CV1000/CV2000, and CVM1D	CIO 1000 to CIO 1063
CS Series	CS1	CIO 1000 to CIO 1063
C Series	C1000H/C2000H, C200H/C200HS, C200HX/HG/HE	LR 00 to LR 63
	C500	LR 00 to LR 31

Up to 32 Link Units in a Single-level System

PC Link Units connected in a single operating level can exchange data between a minimum of 2 and maximum of 32 PLCs. The size of the LR Area is fixed at 64 words (1,024 points), so allocating more Link Relay bits to each Unit will reduce the number of Units that can be connected in the PC Link.
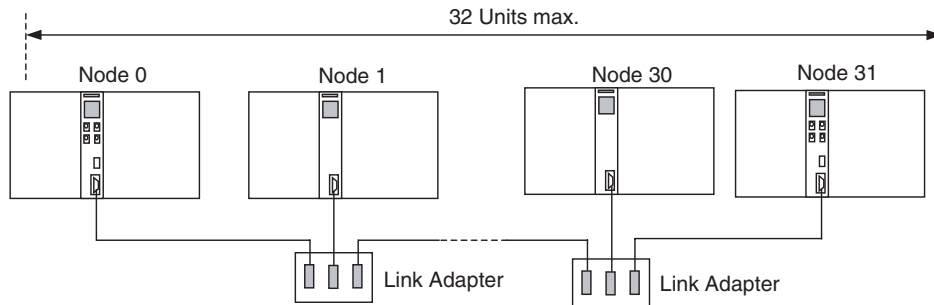
Multi-level Systems

PC Link Units can be connected in a level configuration with up to 4 operating levels. The operating level structure allows more complex distributed control.
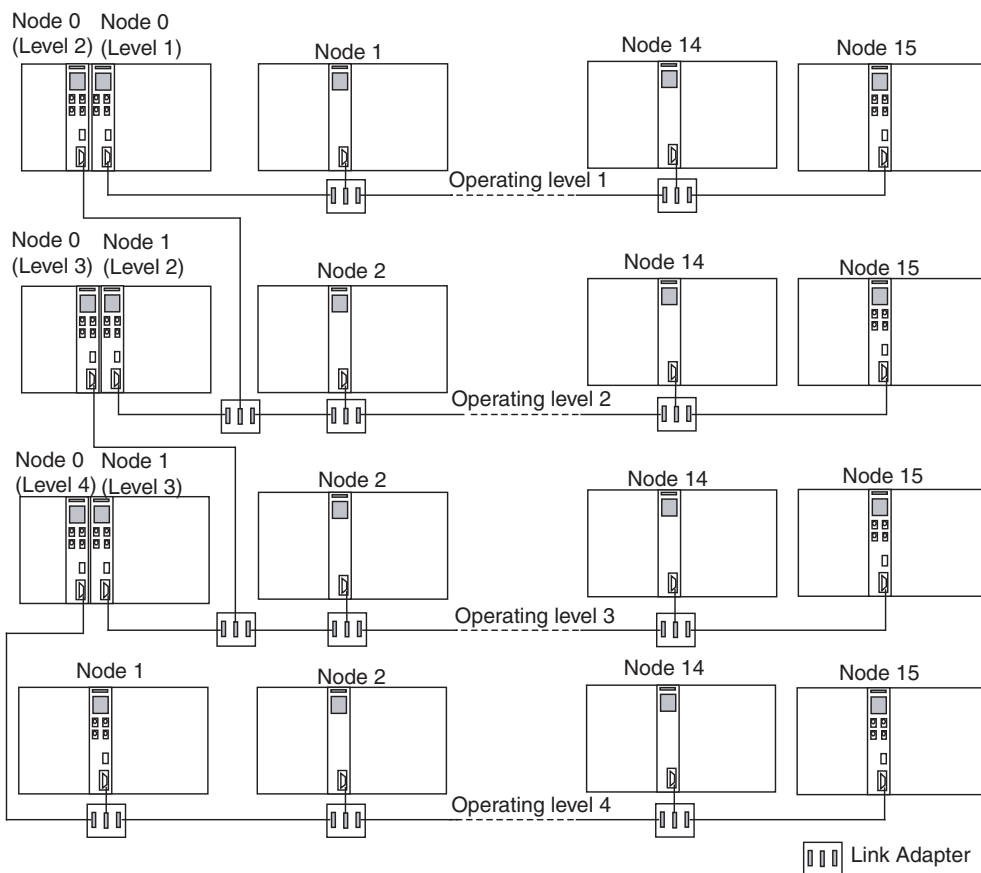
1-2 System Configuration

The following restrictions apply to PC Link Systems with CVM1-LK401 PC Link Units.

1. The CVM1-LK401 can communicate with C200H-LK401 Units as well as C500-LK009-V1 Units in single-level LK009 mode or in a multi-level system.

2. 3G2A5-LK009 and 3G2A5-LK003-E Units cannot be used. Also, C500-LK009-V1 Units cannot be used in single-level LK003 mode.

When CVM1-LK401 PC Link Units will be used, the PC Link Units described in restriction 2 above must be replaced or the Unit settings must be changed. For details, refer to *SECTION 3 Replacing an Existing PC Link System*.

1-2-1 Single-level and Multi-level Systems

Single-level Systems   Up to 32 PLCs can be connected in a single-level system and up to 64 words of data can be exchanged in the entire system.
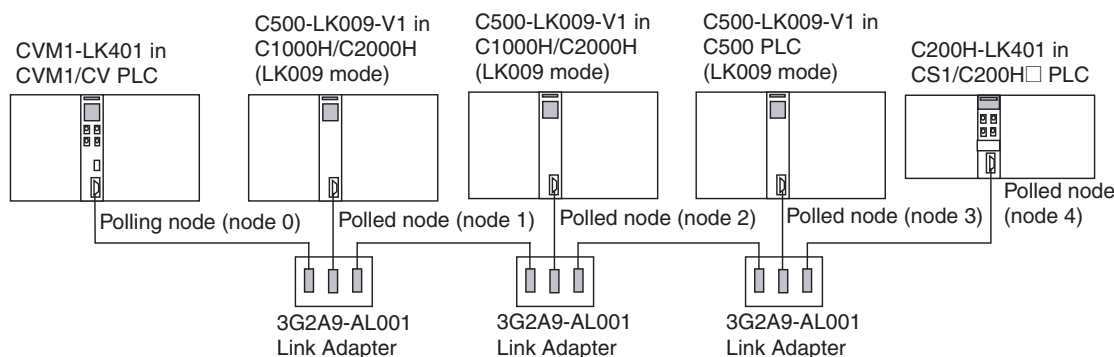
- The following table shows the maximum number of PLCs that can be connected for a given number of LR bits per PLC.

Number of LR bits per PLC	Max. number of PLCs in PC Link
32 bits (2 words)	32
64 bits (4 words)	16
128 bits (8 words)	8
256 bits (16 words)	4
512 bits (32 words)	2

- The maximum number of PLCs that can be connected in the PC Link System is determined by the number of LR bits set per PLC. Only the Node 0 (polling node) setting is valid. The other nodes' (polled node) settings are disabled.

• The following example shows the structure of a single-level system set to transfer 256 LR bits/PLC in 4 PLCs.
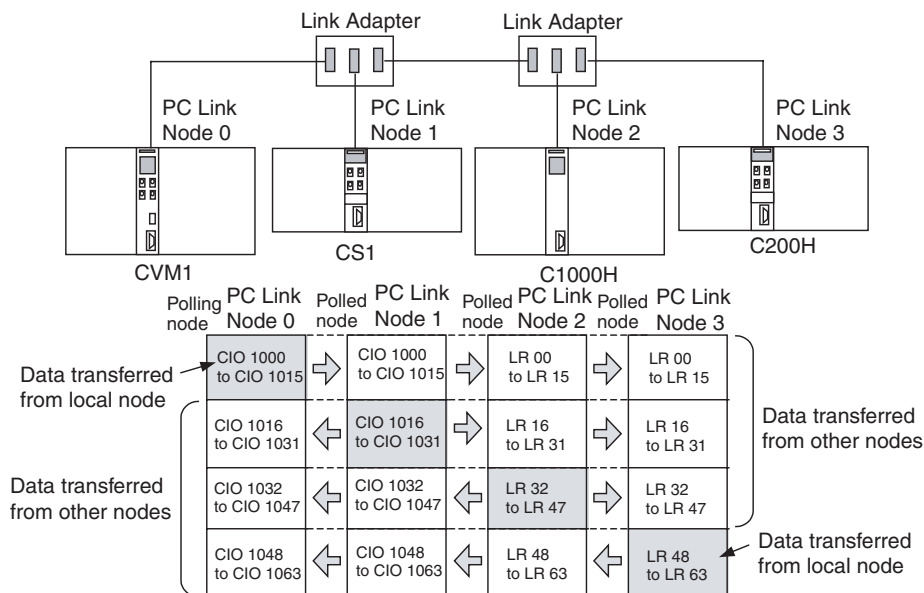
Multi-level Systems (4 Levels Max.)

Like the 3G2A5-LK009 and C200H-LK401 PC Link Units, two CVM1-LK401 PC Link Units can be mounted in a single PLC to create a multi-level system.

An operating level in a multi-level system can support one-half as many Link Relay bits (32 words total) as the operating level in a single-level system. For details, refer to *3-4-1 LR Area*.

Up to 4 operating levels can be configured in a PC Link System.

Multi-level System with Two Polling Nodes
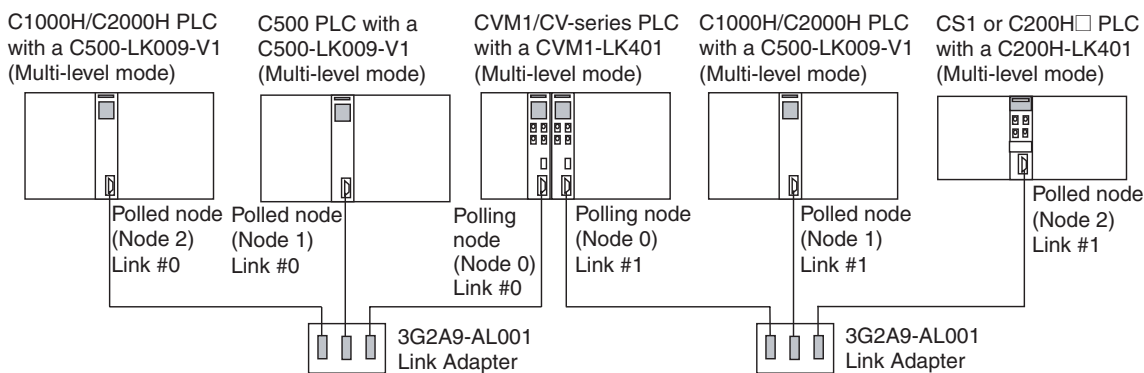
Multi-level System with Three Polling Nodes
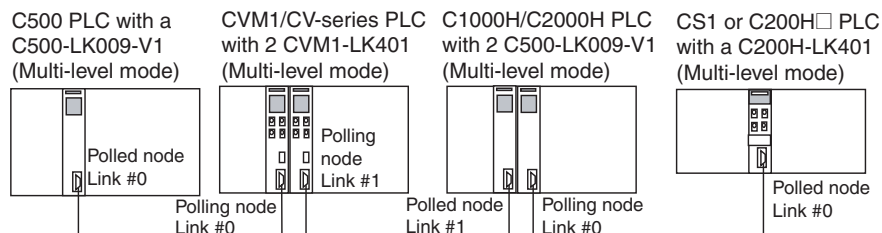
Setting the Link Number

In a multi-level system, the LR Area is divided into two parts (link #0 and link #1), so there are 512 Link Relay bits (32 words) available for each operating level.

For example, when the first level is #0 and the second level is #1, the third level would be #0 and the LR Areas used by each level will not overlap.

Link number	CVM1/CV Series or CS Series	C Series	
		C1000H/C2000H, C200H/C200HS, or C200HX/HG/HE	**C500**
#0	Data link words: CIO 1000 to CIO 1031	LR words: LR 00 to LR 31	LR words: LR 00 to LR 15
#1	Data link words: CIO 1032 to CIO 1063	LR words: LR 32 to LR 63	LR words: LR 16 to LR 31

• The operating level (link number) settings must match in all of the PC Link Units in the same operating level.

Setting the Number of Link Relay Bits

The number of Link Relay bits is set in the Unit with node address 0 (polling node) in each operating level. The settings in the other Units (polled nodes) are ignored.

• The following table shows the maximum number of PLCs that can be connected for a given number of LR bits per PLC.

Number of LR bits per PLC	Max. number of PLCs in PC Link
32 bits (2 words)	16
64 bits (4 words)	8
128 bits (8 words)	4
256 bits (16 words)	2

Example Data Transfers in a Multi-level System

Settings:

32 Link Relay bits in Level 1 (multi-level link #0)
Level 1's LR Area is divided among 16 Units.

32 Link Relay bits in Level 2 (multi-level link #1)
Level 2's LR Area is divided among 8 Units.

32 Link Relay bits in Level 3 (multi-level link #0)
Level 3's LR Area is divided among 8 Units.
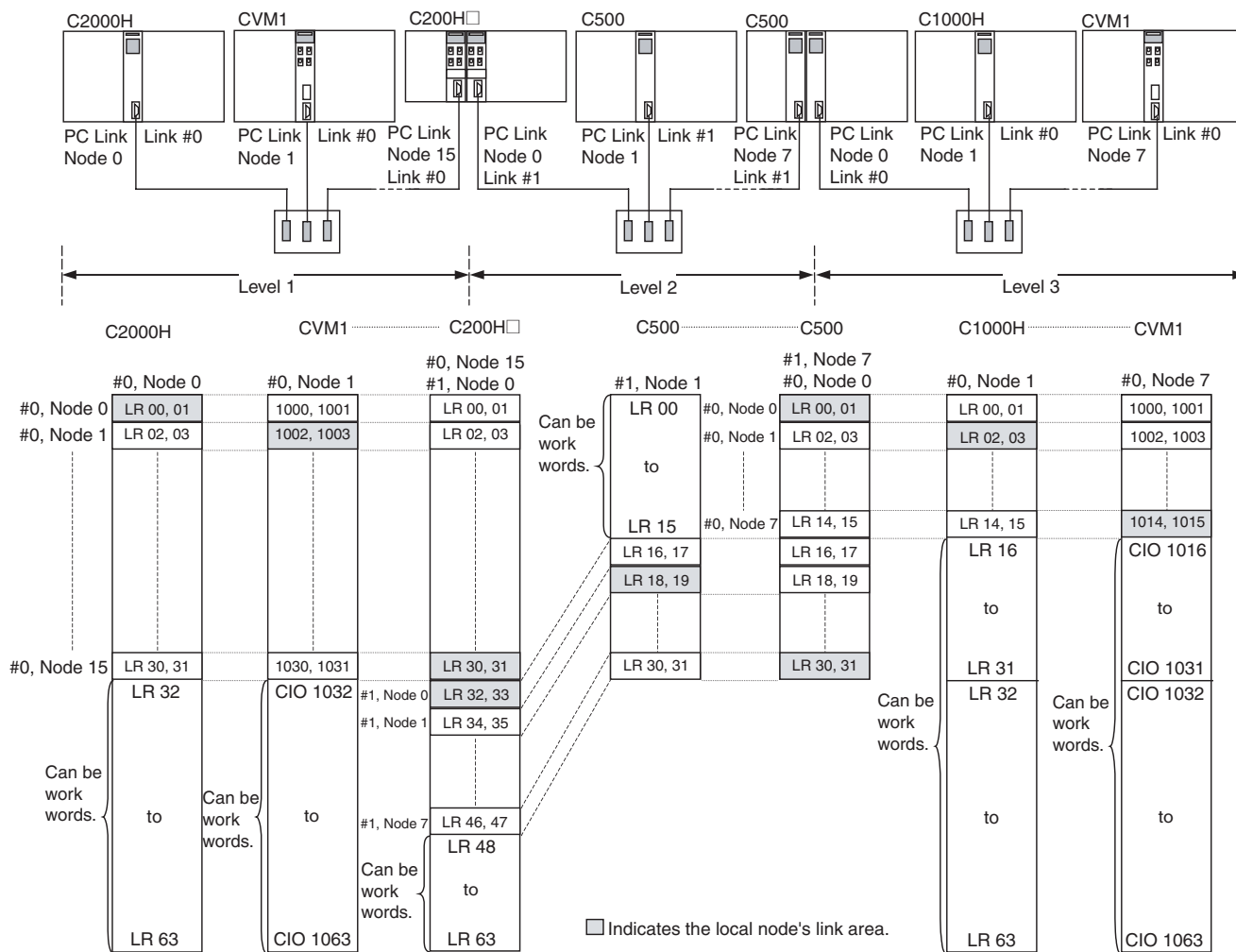
1-3　Using Optical Fiber Cable

Use optical fiber cable in environments with noise sources or environments where there is a high ground impedance difference in the PC Link. Use Link Adapters that transmit data through optical fiber cable.
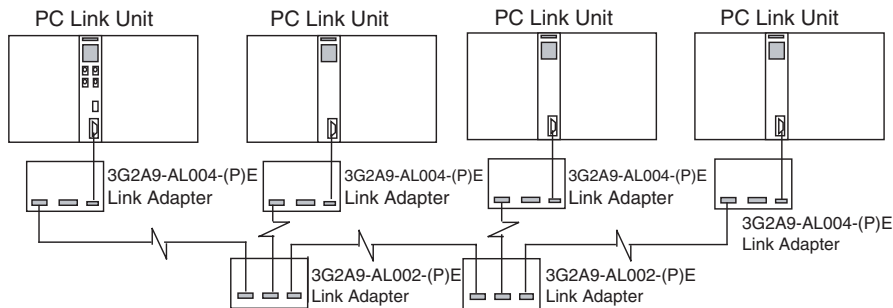
For details on optical fiber cable, refer to the *C200H-LK401/C500-LK009-V1 PC Link System Manual* (W135-E1-3). For details on Link Adapters, refer to *Appendix B Link Adapter Specifications* in this manual.

SECTION 2
Specifications and Component Functions

This section provides specifications of the PC Link Unit and describes the main components.

2-1 Specifications

General Specifications

The general specifications conform to the CVM1/CV Series specifications.

Characteristics

Item	Specification
Communication method	Two-wire half-duplex method (with electrical cable only) or four-wire half-duplex method (with electrical cable and optical fiber cable)
Synchronization	HDLC
Transmission speed	128 kbps
Transmission method	Broadcasting
Transmission distance	500 m (total cable length including branch lines)
Number of Link Relay bits per Unit	32 to 512 bits
Number of PC Link Units	32 Units max. (The allowed number of Units depends on the number of LR bits per Unit and the number of operating levels.)
Transmission time	35 ms max. (for 8 PC Link Units transferring 128 bits each)
Diagnostic functions	CPU watchdog timer, CRC transmission error check
Cable used	Shielded twisted-pair cable
Current consumption	510 mA max. at 5 VDC
Weight	389 g max.

Dimensions
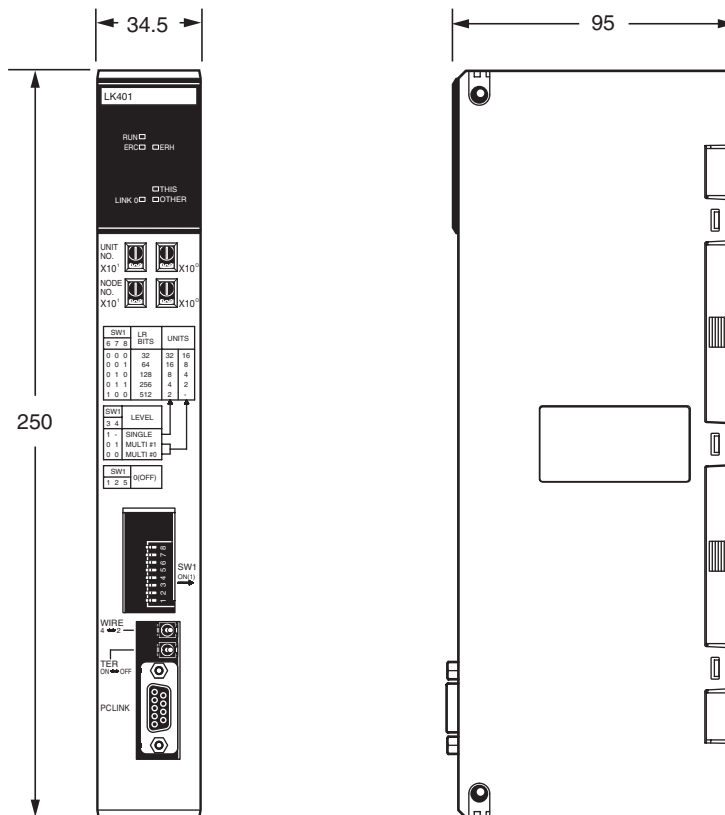
PC Link Connector Pin Arrangement

PC Link connector

PC LINK

5.

1.

9

6
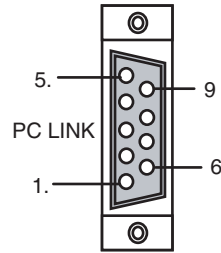
Pin number	Signal name (Abbreviation)
1	Not used.
2	Not used.
3	Not used.
4	Not used.
5	Transfer data B (DB)
6	Not used.
7	Frame ground (FG)
8	Not used.
9	Transfer date A (DA)
Hood bracket	Frame ground (FG)

Connecting cable and connectors are required to connect PC Link Units together. (One connector is included with each PC Link Unit.)

When an existing PC Link Unit is being replaced with a CVM1-LK401 PC Link Unit, the existing connector and cable can be used without changes.

For details on assembling the connecting cables, refer to the *C200H-LK401/ C500-LK009-V1 PC Link System Manual* (W135).

Interfaces

Using Electrical Cables (Two-wire Half-duplex Method)

When connecting 3 or more PC Link Units, a 3G2A9-AL001 Link Adapter is required for each branch. (A Link Adapter is equipped with 3 connectors.)

Set the Transmission Line Selector Switch to the right to select two-wire communications. Refer to *2-4 Cable Length and Terminating Resistance Settings* for details.
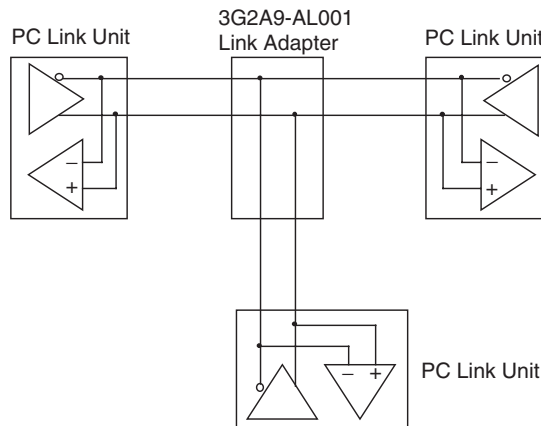
PC Link Unit

3G2A9-AL001 Link Adapter

PC Link Unit

PC Link Unit

When using optical fiber cable, a 3G2A9-AL004-(P)E Link Adapter is required at each PC Link Unit and a 3G2A9-AL002-(P)E Link Adapter is required at each branch.

Set the Transmission Line Selector Switch to the left to select four-wire communications.
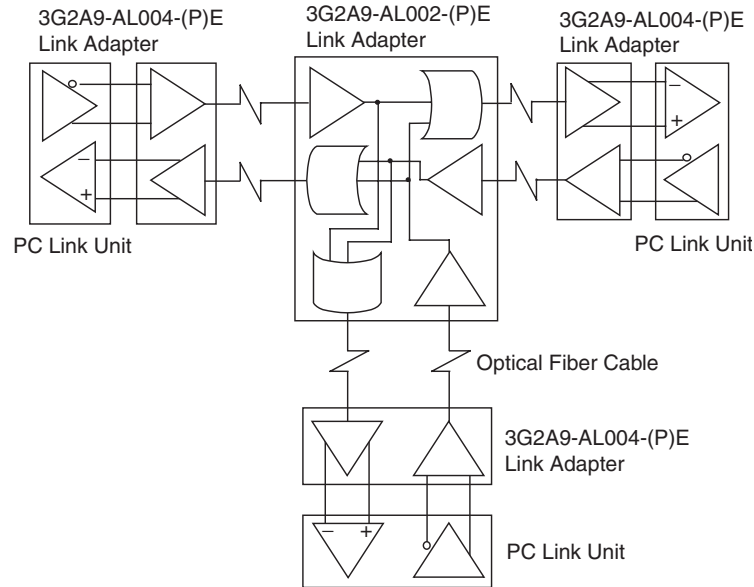
2-2   Installing PC Link Units

The CVM1-LK401 PC Link Unit is a CVM1/CV-series CPU Bus Unit, so there are restrictions on the type of Rack and number of Racks in which the Units can be mounted.

- The CPU Unit must be a CVM1, CV500, CV1000, CV2000, or CVM1D.
- The PC Link Unit must be mounted in a slot in the CPU Rack or an Expansion CPU Rack that supports CPU Bus Units. (The PC Link Unit can not be mounted in an Expansion I/O Rack.)

Component	Compatible models	Compatible Duplex models
CPU Unit	CV500-CPU01-V1 CV1000-CPU01-V1 CV2000-CPU01-V1 CVM1-CPU01-V2 CVM1-CPU11-V2 CVM1-CPU21-V2	CVM1D-CPU21
1. CPU Backplane (Number of slots for CPU Bus Units)	CV500-BC101 (10) CV500-BC051 (5) CV500-BC031 (3) CVM1-BC103 (6) CVM1-BC053 (3)	CVM1D-BC051 (5)
2. Expansion CPU Backplane (Number of slots for CPU Bus Units)	CV500-BI111 (11)	CVM1D-BI101 (10)

CVM1/CV Series
1) CPU Rack

CVM1/CV Series
1) CPU Rack

CVM1/CV Series
1) CPU Rack

Can be mounted.

Can be mounted.

Can be mounted.

Cannot be mounted in Expansion I/O Rack.

Cannot be mounted in Expansion I/O Rack.

2) Expansion CPU Rack

Can be mounted.

Cannot be mounted in Expansion I/O Rack.
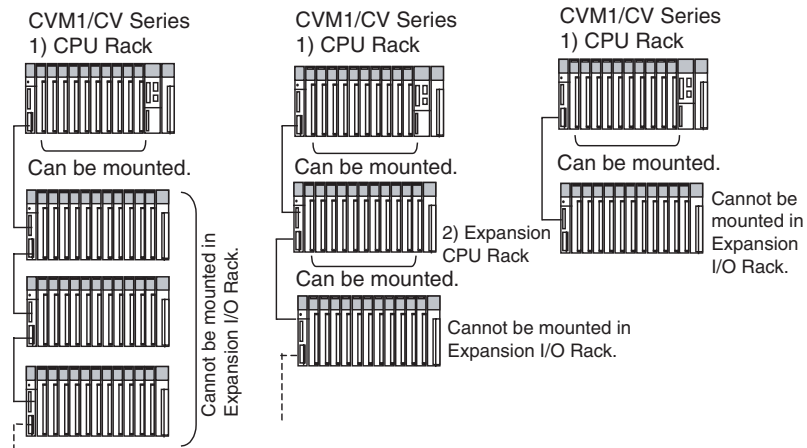
- In a single-level system, just one PC Link Unit can be mounted in a PLC. In a multi-level system, up to two PC Link Units can be mounted in a PLC.

- When mounting other CPU Bus Units, do not exceed the maximum of 16 CPU Bus Units per PLC.

Note Tighten the PLC Backplane mounting screws to a torque of 1.2 N·m and tighten the Unit securing screws to a torque of 0.9 N·m.

Number of PC Link Units per PLC

In a single-level system, one PC Link Unit can be mounted in a CVM1/CV Series PLC. In a multi-level system, two PC Link Units can be mounted.

Level setting	Number of PC Link Units	Remarks
Single-level	Just one Unit	---
Multi-level	One or two Units	Set one level as Link #0 and the other as Link #1. If a PC Link Unit is set to single-level operation, it cannot be mounted in the same PLC with another PC Link Unit.

Note The PC Link Units will not detect an error even if two PC Link Units with conflicting operating level settings (one or both single-level, both multi-level link #0, or both multi-level link #0) are mounted in the same PLC. To be sure that the PC Link operates properly, verify that the level settings are correct.

One PC Link Unit set for single-level operation can be mounted in a single PLC, or two Units set for multi-level operation (one set to Link #0 and the other set to Link #1).

2-3 Component Names and Functions

Component Names

← LED Indicators

← Unit Number Setting Switches

← Node Address Setting Switches

← DIP Switch (SW1)

← Transmission Line Selector Switch
← Terminating Resistance Setting Switch

← PC Link Connector
(Connects to another PC Link Unit or
Link Adapter.)

LED Indicators

Name	Color	Status	Unit status
RUN (Run)	Green	Lit	The Unit is operating normally. (Lit after initialization is completed.)
		Not lit	Unit error
ERC (Communications error)	Red	Lit	A hardware error or node address setting error occurred. (See note.)
		Flashing	A link error occurred with the polling node link, Local Unit link, or Other Unit link.
		Not lit	The Unit is communicating normally.
ERH (PLC error)	Red	Lit	An error occurred in the PLC, such as a CPU Unit error, PLC interface error, EEPROM error, unit number setting error, or I/O table setting error.
		Not lit	There are no errors in the CPU Unit.
LINK0 (Node 0/Polling node link)	Yellow	Lit	Normal status, link established with Node 0 (polling node)
		Not lit	Error status, link not established with Node 0 (polling node)
THIS (Local Unit link)	Yellow	Lit	Normal status, link established with local Unit
		Not lit	Error status, link not established with local Unit
OTHER (Other Unit link)	Yellow	Lit	Normal status, link established with other Unit
		Not lit	Error status, link not established with other Unit

Note A node address setting error will occur when the node address is not in the allowed setting range (0 to 31 for single-level operation or 0 to 15 for multi-level operation).

A node address setting error will **not** occur if the same node address is set on two PC Link Units. Be sure to set a unique address on each Unit.

Unit Number Setting Switches (UNIT No.)

UNIT No.

×10¹ 0   0 ×10⁰

Setting range
00 to 15
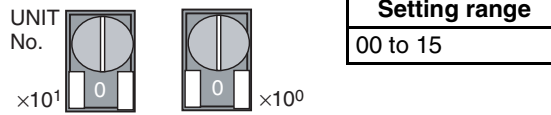
These switches set the Unit's unit number as a CPU Bus Unit. Set a unique unit number in 2-digit decimal. Do not set the same unit number already set on another CPU Bus Unit mounted in the same PLC.

Node Address Setting Switches (NODE No.)

NODE No.

×10¹ 0   0 ×10⁰

Setting range	
Single-level operation	**Multi-level operation**
00 to 31	00 to 15
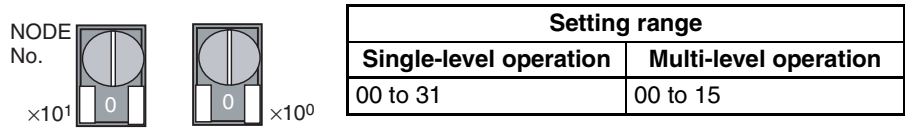
- These switches set the Unit's node address in the PC Link system in 2-digit decimal. Each PC Link Unit in the same operating level must have a unique node address. Do not set the same node address already set on another PC Link Unit in the same operating level.
- If the node address setting is out-of-range (outside of 0 to 31 for single-level operation or 0 to 15 for multi-level operation), a node address setting error will occur and the PC Link will not start.

Note A node address setting error will **not** occur if the same node address is set on two PC Link Units in the same operating level, but there will be data errors in the LR Area

DIP Switch (SW1) Settings

→ ON

8
7   — Number of LR bits setting
6
5   — Reserved (Always OFF)
4   — Level/Link setting
3
2   — Reserved (Always OFF)
1
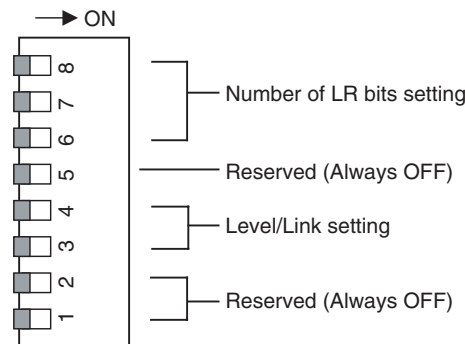
Pins 1, 2, and 5 are reserved. Leave these pins OFF.

Level/Link Setting

- When configuring a single-level PC Link system, set pin 3 to ON. The setting of pin 4 is disabled when pin 3 is ON, but set pin 4 to ON as well.

- When configuring a multi-level PC Link system, set pin 3 to OFF and set the Link number with pin 4. (A maximum of four levels is possible.) The setting of pin 4 is disabled when pin 3 is ON, but set pin 4 to ON as well. For details on the Link number setting, refer to *3-3-4 Setting the Level/ Link Number*.

- Set the same Level/Link setting on all of the PC Link Units in the same operating level.

Pin settings		Level/Link number
3	**4**	
1	--- (See note.)	Single-level operation
0	1	Multi-level operation, Link #1
0	0	Multi-level operation, Link #0

Note The setting of pin 4 is disabled in this case, but set pin 4 to ON.

Note Do not set the same Level/Link setting on two PC Link Units in the same PLC. The Unit will not detect an error, but there will be data errors in the LR Area The Level/Link settings determine how many of PC Link Units can be mounted in a PLC. One Unit can be mounted with single-level operation and one or two Units can be mounted with multi-level operation.

Number of LR Bits

The number of LR bits setting (and max. number of Units in the level) is set on the level's polling node (node 0).
It isn't necessary to set the number of LR bits on the polled nodes (Units with node addresses other than 0). The settings are disabled in the polled nodes.

Pin settings			Single-level operation		Multi-level operation	
6	**7**	**8**	**Number of LR bits**	**Max. number of Units**	**Number of LR bits**	**Max. number of Units**
0	0	0	32 bits (2 words)	32	32 bits (2 words)	16
0	0	1	64 bits (4 words)	16	64 bits (4 words)	8
0	1	0	128 bits (8 words)	8	128 bits (8 words)	4
0	1	1	256 bits (16 words)	4	256 bits (16 words)	2
1	0	0	512 bits (32 words)	2	Invalid settings (See note.)	
1	0	1	Invalid settings (See note.)			
1	1	0				
1	1	1				

Note If an invalid setting is set for single-level operation, the number of LR bits will be set to 512 bits (2 Units max.).
If an invalid setting is set for multi-level operation, the number of LR bits will be set to 256 bits (2 Units max.).

**Transmission Line
and Terminating
Resistance Switches
(WIRE and TER)**

WIRE

4 ↔ 2
TER
ON ↔ OFF

PC LINK

Transmission Line Selector Switch

Terminating Resistance Setting Switch
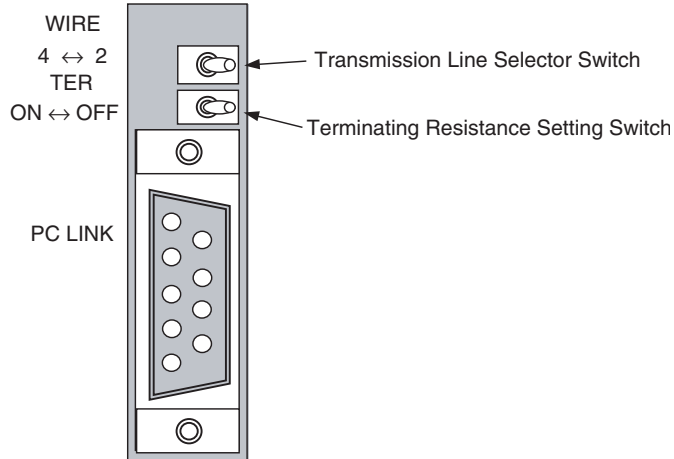
Name	Function	Left side	Right side
WIRE	Transmission line setting	Four-wire method (Set when using electrical and optical fiber cable.)	Two-wire method (Set when using electrical cable only.)
TER	Terminating resistance setting	Terminator connected.	Terminator disconnected.

For details on setting these switches, refer to *3-3-5 Setting the Transmission Line and Terminating Resistance*.

2-4   Cable Length and Terminating Resistance Settings

Cable Length

| Node 0 Terminator ON | Node 1 Terminator OFF | Node 2 Terminator OFF | Node n-1 Terminator OFF | Node n Terminator ON |
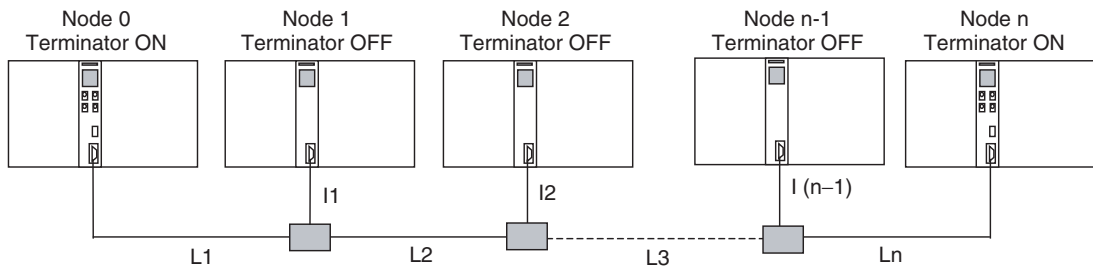
I1   I2   I (n–1)

L1   L2   L3   Ln

- The basic structure of the PC Link system has a main line with extending branch lines. The total length of the cables in the PC Link system (including the main line and branch lines) must not exceed 500 m.

    $$L_1 + L_2 + L_3 + ... L_n + I_1 + I_2 + ... I_{n-1} \leq 500 \text{ m}$$

- The individual branch lines must not exceed 10 m.

    $$I_1 \leq 10 \text{ m}, I_2 \leq 10 \text{ m}, ... \text{ and } I_{n-1} \leq 10 \text{ m}$$

Max. Cable Length

- Electrical (copper) cable length
  The total length of the electrical cables in the PC Link system can be up to 500 m. (Individual branch lines can be up to 10 m long.)
- Optical fiber cable length

Cable type	Link Adapter model	
	3G2A9-AL002-PE **3G2A9-AL004-PE**	**3G2A9-AL002-E** **3G2A9-AL004-E**
APF (All Plastic Fiber optic cable)	20 m	Cannot be used.
PCF (Plastic Clad Fiber optic cable)	200 m	800 m

If the distance between PLCs exceeds 800 m, use a 3G2A9-AL005-(P)E or 3G2A9-AL006-(P)E Link Adapter. For details, refer to the *C-Series Link Adapters Installation Guide* (W123-E1-3).

(The 3G2A9-AL005-(P)E and 3G2A9-AL006-(P)E Link Adapters are no longer being manufactured.)

Setting the Terminating Resistance Switch (TER Switch)

The basic structure of the PC Link operating level has a main line with extending branch lines. The Terminating Resistance is turned ON on the two PC Link Units at the ends of the main line in each PC Link operating level. The Terminating Resistance is turned OFF on all other PC Link Units in the system.
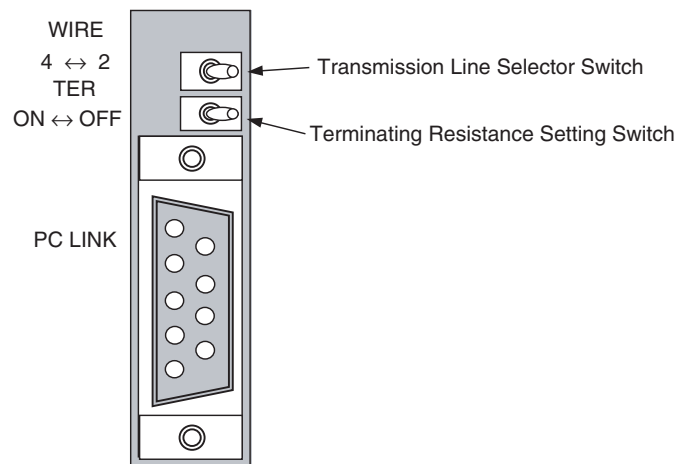
**Example Terminator
Settings in a Multi-level
System**

Terminator ON

Terminator ON

Terminator OFF

Terminator OFF

Terminator ON

Level 1

Terminator OFF

Terminator OFF

Terminator OFF

Terminator ON

Level 2

Terminator ON

Terminator ON

Terminator OFF

Terminator OFF

Level 3
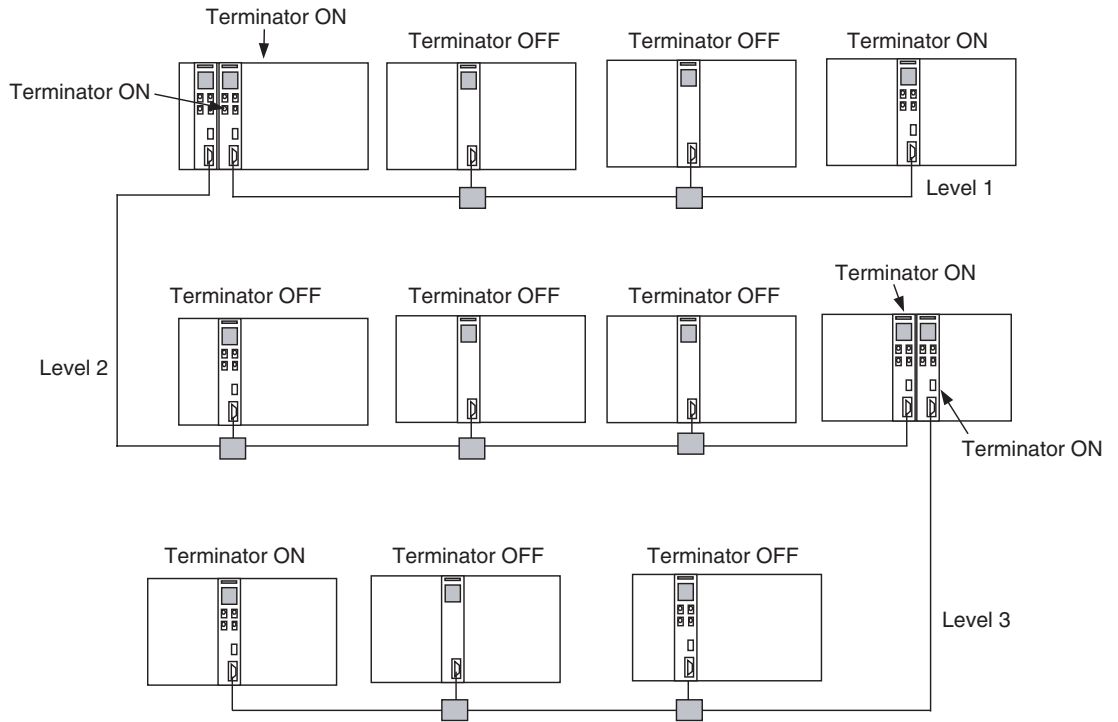
2-5   Data Areas for PC Link Systems

LR Area Allocation   In CVM1/CV Series PLCs, the Data Link Area (CIO 1000 to CIO 1063) is allocated as the PC Link's LR Area. Words CIO 1000 to CIO 1199 are also used by SYSMAC LINK Units and Controller Link Units, so be sure that the words used by those networks do not overlap the PC Link's LR Area.

LR Area Allocation for Single-level Systems

Link Relay words		32 Units connected	16 Units connected	8 Units connected	4 Units connected	2 Units connected
		32 bits (2 words) per Unit	64 bits (4 words) per Unit	128 bits (8 words) per Unit	256 bits (16 words) per Unit	512 bits (32 words) per Unit
CIO 1000	CIO 1001	Node 0	Node 0	Node 0	Node 0	Node 0
CIO 1002	CIO 1003	Node 1				
CIO 1004	CIO 1005	Node 2	Node 1			
CIO 1006	CIO 1007	Node 3				
CIO 1008	CIO 1009	Node 4	Node 2	Node 1		
CIO 1010	CIO 1011	Node 5				
CIO 1012	CIO 1013	Node 6	Node 3			
CIO 1014	CIO 1015	Node 7				
CIO 1016	CIO 1017	Node 8	Node 4	Node 2	Node 1	
CIO 1018	CIO 1019	Node 9				
CIO 1020	CIO 1021	Node 10	Node 5			
CIO 1022	CIO 1023	Node 11				
CIO 1024	CIO 1025	Node 12	Node 6	Node 3		
CIO 1026	CIO 1027	Node 13				
CIO 1028	CIO 1029	Node 14	Node 7			
CIO 1030	CIO 1031	Node 15				
CIO 1032	CIO 1033	Node 16	Node 8	Node 4	Node 2	Node 1
CIO 1034	CIO 1035	Node 17				
CIO 1036	CIO 1037	Node 18	Node 9			
CIO 1038	CIO 1039	Node 19				
CIO 1040	CIO 1041	Node 20	Node 10	Node 5		
CIO 1042	CIO 1043	Node 21				
CIO 1044	CIO 1045	Node 22	Node 11			
CIO 1046	CIO 1047	Node 23				
CIO 1048	CIO 1049	Node 24	Node 12	Node 6	Node 3	
CIO 1050	CIO 1051	Node 25				
CIO 1052	CIO 1053	Node 26	Node 13			
CIO 1054	CIO 1055	Node 27				
CIO 1056	CIO 1057	Node 28	Node 14	Node 7		
CIO 1058	CIO 1059	Node 29				
CIO 1060	CIO 1061	Node 30	Node 15			
CIO 1062	CIO 1063	Node 31				

**LR Area Allocation for
Link #0 in Multi-level
Systems**

Link Relay words		16 Units connected	8 Units connected	4 Units connected	2 Units connected
		32 bits (2 words) per Unit	64 bits (4 words) per Unit	128 bits (8 words) per Unit	256 bits (16 words) per Unit
CIO 1000	CIO 1001	Node 0	Node 0	Node 0	Node 0
CIO 1002	CIO 1003	Node 1			
CIO 1004	CIO 1005	Node 2	Node 1		
CIO 1006	CIO 1007	Node 3			
CIO 1008	CIO 1009	Node 4	Node 2	Node 1	
CIO 1010	CIO 1011	Node 5			
CIO 1012	CIO 1013	Node 6	Node 3		
CIO 1014	CIO 1015	Node 7			
CIO 1016	CIO 1017	Node 8	Node 4	Node 2	Node 1
CIO 1018	CIO 1019	Node 9			
CIO 1020	CIO 1021	Node 10	Node 5		
CIO 1022	CIO 1023	Node 11			
CIO 1024	CIO 1025	Node 12	Node 6	Node 3	
CIO 1026	CIO 1027	Node 13			
CIO 1028	CIO 1029	Node 14	Node 7		
CIO 1030	CIO 1031	Node 15			

**LR Area Allocation for
Link #1 in Multi-level
Systems**

Link Relay words		16 Units connected	8 Units connected	4 Units connected	2 Units connected
		32 bits (2 words) per Unit	64 bits (4 words) per Unit	128 bits (8 words) per Unit	256 bits (16 words) per Unit
CIO 1032	CIO 1033	Node 0	Node 0	Node 0	Node 0
CIO 1034	CIO 1035	Node 1			
CIO 1036	CIO 1037	Node 2	Node 1		
CIO 1038	CIO 1039	Node 3			
CIO 1040	CIO 1041	Node 4	Node 2	Node 1	
CIO 1042	CIO 1043	Node 5			
CIO 1044	CIO 1045	Node 6	Node 3		
CIO 1046	CIO 1047	Node 7			
CIO 1048	CIO 1049	Node 8	Node 4	Node 2	Node 1
CIO 1050	CIO 1051	Node 9			
CIO 1052	CIO 1053	Node 10	Node 5		
CIO 1054	CIO 1055	Node 11			
CIO 1056	CIO 1057	Node 12	Node 6	Node 3	
CIO 1058	CIO 1059	Node 13			
CIO 1060	CIO 1061	Node 14	Node 7		
CIO 1062	CIO 1063	Node 15			

Using the LR Area

In some cases, unused words in the PC Link's LR Area can be used as work words. Unused words at the end of the LR Area (with word addresses higher than the ones allocated to the highest actual node address in the PC Link) can be used as work words.

In multi-level systems, the words at the end of each Link's (Link #0 and Link #1) LR Area can be used as work words.

Even though these LR Area words can be used as work words, we recommend reserving all LR Area words for the Link functions only in order to avoid future conflicts and simplify maintenance.

- Example:

  In a single-level system with 128 bits/Unit, up to 8 PC Link Units can be mounted with node addresses 0 to 7. If the highest actual node address is 5, the LR Area words allocated to node addresses 6 and 7 can be used as work words.

  Even if any of the node addresses between 1 and 4 are not being used, the LR Area words allocated to those node addresses can not be used as work words.

  The following table shows the usage of the LR Area in this case.

Link Relay words	Node address	Unit mounted	Usage
CIO 1000 to CIO 1007	0 (Polling Node)	Yes	PC Link
CIO 1008 to CIO 1015	1	No	PC Link (Overwritten during refreshing)
CIO 1016 to CIO 1023	2	Yes	PC Link
CIO 1024 to CIO 1031	3	No	PC Link (Overwritten during refreshing)
CIO 1032 to CIO 1039	4	Yes	PC Link
CIO 1040 to CIO 1047	5	Yes	PC Link
CIO 1048 to CIO 1055	6	No	Can be used as work words.
CIO 1056 to CIO 1063	7	No	Can be used as work words.

Status Flags for the PC Link System

PLC Run Flags

The PLC Run Flags can be read from any PLC in the system to determine the operational status of each PLC in which a PC Link Unit is mounted. Each PLC Run Flag is ON when the corresponding PLC is operating normally or OFF when the corresponding PLC is stopped.

A flag status of ON indicates that the PLC is operating in RUN or MONITOR mode, so the flag will be turned OFF if the PLC is in RUN or MONITOR mode and an error occurs. A flag status of OFF indicates that the PLC is in PROGRAM mode or an error has occurred.

The PLC Run Flags are output to bits 00 to 07 of the first 4 words of the CPU Bus Unit Area and are read-only. (Bits 08 to 15 of these words contain the PC Link Error Flags.)

- PLC Run Flags in a Single-level System (N = PC Link Unit's unit number)

Word in CPU Bus Unit Area	Bit							
	07	06	05	04	03	02	01	00
CIO 1500 + 25 × N	Node 31	Node 30	Node 29	Node 28	Node 27	Node 26	Node 25	Node 24
CIO 1500 + 25 × N + 1	Node 23	Node 22	Node 21	Node 20	Node 19	Node 18	Node 17	Node 16
CIO 1500 + 25 × N + 2	Node 15	Node 14	Node 13	Node 12	Node 11	Node 10	Node 9	Node 8
CIO 1500 + 25 × N + 3	Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1	Node 0

• PLC Run Flags in a Multi-level System (N = PC Link Unit's unit number)

Word in CPU Bus Unit Area	Link	Bit							
		07	**06**	**05**	**04**	**03**	**02**	**01**	**00**
CIO 1500 + 25 × N	Link #1	Node 15	Node 14	Node 13	Node 12	Node 11	Node 10	Node 9	Node 8
CIO 1500 + 25 × N + 1		Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1	Node 0
CIO 1500 + 25 × N + 2	Link #0	Node 15	Node 14	Node 13	Node 12	Node 11	Node 10	Node 9	Node 8
CIO 1500 + 25 × N + 3		Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1	Node 0

PC Link Error Flags

• The PC Link Error Flags indicate communications errors with other PC Link Units. After the PC Link is established, an Error Flag will be ON when there is a transfer error or a power interruption occurs in the corresponding PC Link Unit. The Error Flag will be OFF when the PC Link Unit is operating normally.

• If an error occurs when the power is turned ON and the PC Link is not established, these flags will not operate and will all remain OFF.

• The Error Flags will not be turned ON when a PLC is stopped by execution of a FALS(07) instruction. In this case, use the PC Run Flags to identify the stoppage.

• The PC Link Error Flags are output to bits 08 to 15 of the first 4 words of the CPU Bus Unit Area and are read-only. (Bits 00 to 07 of these words contain the PLC Run Flags.)

• PC Link Error Flags in a Single-level System

Word (N: Unit number)	Bit							
	15	**14**	**13**	**12**	**11**	**10**	**09**	**08**
CIO 1500 + 25 × N	Node 31	Node 30	Node 29	Node 28	Node 27	Node 26	Node 25	Node 24
CIO 1500 + 25 × N + 1	Node 23	Node 22	Node 21	Node 20	Node 19	Node 18	Node 17	Node 16
CIO 1500 + 25 × N + 2	Node 15	Node 14	Node 13	Node 12	Node 11	Node 10	Node 9	Node 8
CIO 1500 + 25 × N + 3	Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1	Node 0

• PC Link Error Flags in a Multi-level System

Word (N: Unit number)	Link	Bit							
		15	**14**	**13**	**12**	**11**	**10**	**09**	**08**
CIO 1500 + 25 × N	Link #1	Node 15	Node 14	Node 13	Node 12	Node 11	Node 10	Node 9	Node 8
CIO 1500 + 25 × N + 1		Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1	Node 0
CIO 1500 + 25 × N + 2	Link #0	Node 15	Node 14	Node 13	Node 12	Node 11	Node 10	Node 9	Node 8
CIO 1500 + 25 × N + 3		Node 7	Node 6	Node 5	Node 4	Node 3	Node 2	Node 1	Node 0

<u>**Level Flags**</u>

These flags can be used to check the operating level setting (link number setting) of the PC Link Unit(s) mounted in the PLC. The flags contained in the fifth word of the CPU Bus Unit Area and are read-only.

Word (N: Unit number)	Bit	Description
CIO 1500 + 25 × N + 4	11	ON when the PLC contains is a PC Link Unit that is set to multi-level operation Link #1.
	12	ON when the PLC contains is a PC Link Unit that is set to single-level operation or multi-level operation Link #0.

CPU Bus Unit Flags and Control Bits

Since the PC Link Unit is a CPU Bus Unit, the following Auxiliary Area flags and control bits are used to indicate status or control operation of the Unit.

Word	Bit(s)	Name	Function
A001	00 to 15	CPU Bus Unit Restart Bits	These bits can be turned ON to reset the corresponding CPU Bus Units. The Restart Bits are turned OFF automatically when restarting is completed. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A015	00 to 15	CPU Bus Service Disable Bits	These bits can be turned ON to stop service to the corresponding CPU Bus Units. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
			Turn the bit OFF again to resume service to the CPU Bus Unit.
A302	00 to 15	CPU Bus Unit Initializing Flags	ON while the corresponding CPU Bus Units are initializing. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A401	12	CPU Bus Error Flag	ON when an error occurs during the transmission of data over the CPU bus, or a WDT (watchdog timer) error occurs in a CPU Bus Unit. The unit numbers of the affected CPU Bus Units are indicated in word A405.
A401	13	Duplication Error Flag	ON when two Racks are assigned the same rack number, two CPU Bus Units are assigned the same unit number, or the same words are allocated to more than one Rack or Unit in the PC Setup. The unit numbers of the affected CPU Bus Units are indicated in word A410.
A402	03	CPU Bus Unit Setting Error Flag	ON when the CPU Bus Units actually installed differ from the Units registered in the I/O table. The unit numbers of the affected CPU Bus Units are indicated in word A427.
A402	07	CPU Bus Unit Error Flag	ON when an error occurs during the transmission of data between the PLC and CPU Bus Unit. The unit numbers of the affected CPU Bus Units are indicated in word A422.
A405	00 to 15	CPU Bus Error Unit Number	ON when an error occurs during the transmission of data over the CPU bus, or a WDT (watchdog timer) error occurs in a CPU Bus Unit. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A410	00 to 15	CPU Bus Unit Duplicate Number	ON when two CPU Bus Units are assigned the same unit number. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A422	00 to 15	CPU Bus Unit Error Unit Number	ON when an error occurs during the transmission of data between the PLC and CPU Bus Unit. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A427	00 to 15	CPU Bus Unit Setting Error Unit Number	ON when the CPU Bus Units actually installed differ from the Units registered in the I/O table. (Bits 00 to 15 correspond to unit numbers 0 to 15.)

2-6   Differences from Earlier PC Link Units

Item		CVM1-LK401	C200H-LK401	C500-LK009-V1	3G2A5-LK009 (See note 2.)	3G2A5-LK003-E
Compatible PLCs		CVM1/CV Series	C200H, C200HS, C200HX/C200HG/ C200HE, and CS Series	C500, C1000H, and C2000H		C500
Unit family		CPU Bus Unit (Unit number must be set.)	Special I/O Unit (Unit number must be set.)	Link Unit (A unit number setting is not required.)		
LR Area		CIO 1000 to CIO 1063	C200H☐: LR 00 to LR 63 CS Series: CIO 1000 to CIO 1063	LR 00 to LR 63		LR 00 to LR 31
Level setting (Link number)	Single-level LK009 mode	Supported	Supported	Supported	Supported	---
	Single-level LK009 mode	---	---	Supported	Supported	Supported
	Multi-level	Supported	Supported	Supported	Supported	---
Incompatible PC Link Units		3G2A5-LK009 and 3G2A5-LK003-E		None	CVM1-LK401 and C200H-LK401	
LED Indicator pattern		See note 3.	See note 3.	See note 3. (Can be switched between patterns A and B.)		See note 3. (Pattern A only)
Double allocation setting		Single Unit only	Single or double Unit allocation	Single Unit only		
I/O refresh setting		---	Supported	---		
Use LR Area words as work words		Allowed (See note 1.)	Allowed	Allowed		

Note   (1) Refer to *2-5 Data Areas for PC Link Systems* for details.

(2) The 3G2A5-LK009 cannot be used together with the CVM1-LK401 or C200H-LK401. When replacing a 3G2A5-LK009 with a C500-LK009-V1, use LK009 mode.

The C500-LK009-V1 has better noise resistance than the 3G2A5-LK009.

(3) LED Indicator patterns:

SECTION 3
Replacing an Existing PC Link System

This section provides step-by-step procedures to follow when replacing earlier PC Link Units with the C500-LK009-V1 and CVM1-LK401 PC Link Units.

3-1   Replacing an Existing PC Link System

Use CVM1-LK401 PC Link Units when replacing the CPU Rack of a C500/C1000H/C2000H PC Link system with a CVM1-series Rack. Existing PC Link cables can be used without changes, but there are limitations on communications between CVM1-LK401 PC Link Units and earlier models, as shown in the following table.

Compatibility with Other PC Link Units

CVM1-LK401 PC Link Units can communicate with other CVM1-LK401 Units, C200H-LK401 Units, as well as C500-LK009-V1 Units in multi-level mode or single-level LK009 mode. Depending on the existing models in the system and their level settings, it may be necessary to replace Units or change operating level settings.

• Compatibility with CVM1-LK401 PC Link Units

PC Link Unit model	Level and mode settings		Communications
C500-LK009-V1	Multi-level		Compatible
	Single-level	LK009	Compatible
		LK003	Incompatible (Change setting to multi-level or single-level LK009 mode.)
3G2A5-LK009	Multi-level		Incompatible (Replace with C500-LK009-V1and set to multi-level or single-level LK009 mode.)
	Single-level	LK009	
		LK003	
3G2A5-LK003-E	---		
C200H-LK401	---		Compatible

Examples and Precautions

Use the following 3 examples as reference when replacing the CPU Rack of a C500/C1000H/C2000H PC Link system with a CVM1-series Rack.

System with a C200H-LK401 Unit

If the PC Link system includes a C200H-LK401 PC Link Unit, C500-LK009-V1 PC Link Units will be used in the C500/C1000H/C2000H Racks.

1. Mount CVM1-LK401 PC Link Units in the CVM1/CV Series PLCs being added as replacements.
2. The remaining C500-LK009-V1 and C200H-LK401 PC Link Units in the system can be used without changes.

PLCs that are not being replaced.   PLC that is being replaced.

2. Remaining PC Link Units can be used unchanged.

1. Replace CPU Unit, PC Link Unit, and other Units.
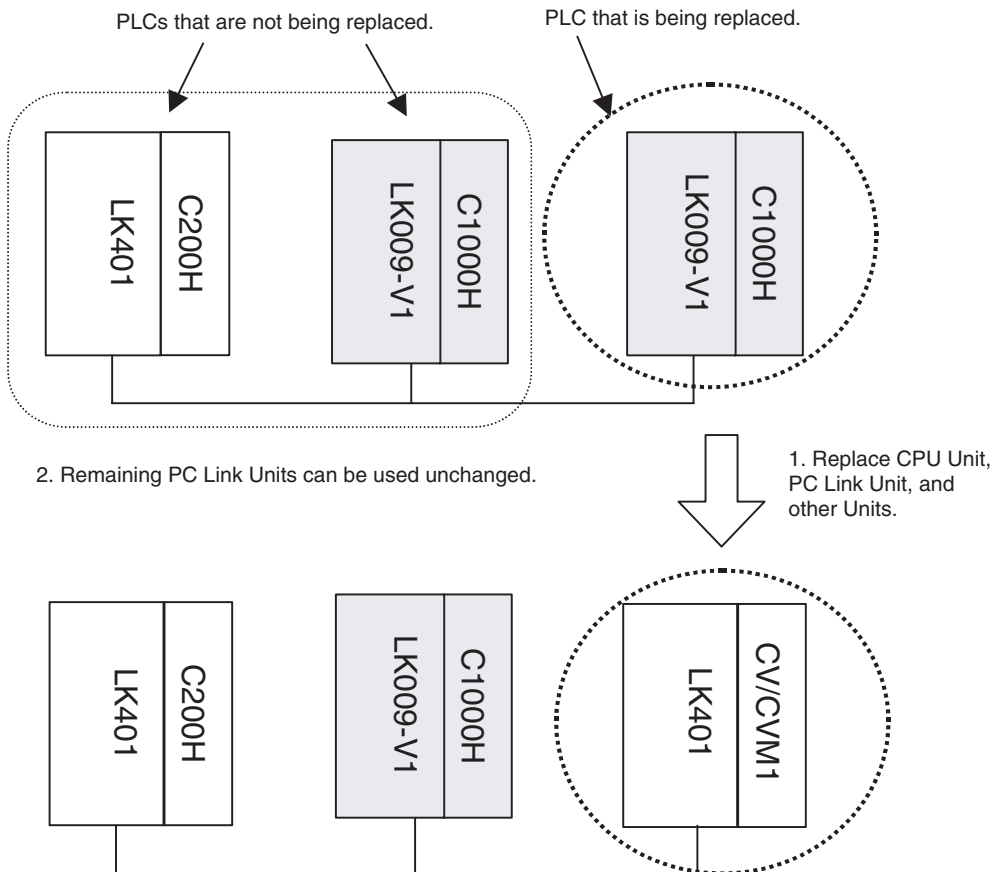
System with 3G2A5-LK009 Units in Single-level LK009 Mode or Multi-level Mode and C500-LK009-V1 Units

This example applies to existing PC Link systems containing 3G2A5-LK009 or C500-LK009-V1 PC Link Units, operating in either single-level LK009 mode or multi-level mode.

1. Mount CVM1-LK401 PC Link Units in the CVM1/CV Series PLCs being added as replacements.

2. The C500-LK009-V1 PC Link Units can be used without changes.

3. Replace the 3G2A5-LK009 PC Link Units with C500-LK009-V1 PC Link Units.

PLCs that are not being replaced.   PLC that is being replaced.

2. C500-LK009-V1 PC Link Units can be used unchanged.

3. Replace with C500-LK009-V1 PC Link Units (LK009 mode).

1. Replace CPU Unit, PC Link Unit, and other Units.
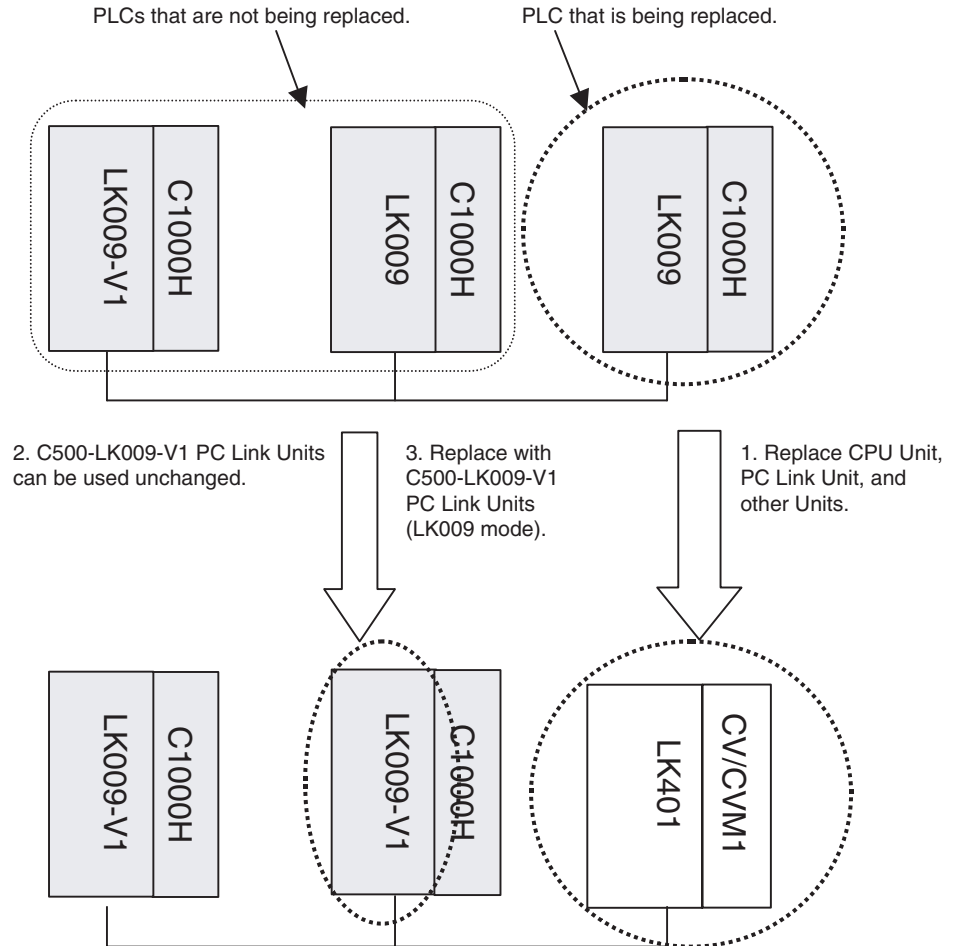
System with C500-LK009-V1 or 3G2A5-LK009 Units in Single-level LK003 Mode or with 3G2A5-LK003-E Units

This example applies to existing PC Link systems containing 3G2A5-LK003-E PC Link Units and 3G2A5-LK009/C500-LK009-V1 PC Link Units operating in single-level LK003 mode.

1. Use CVM1-LK401 PC Link Units in the CVM1/CV Series PLCs being added as replacements.

2. Change the settings of the C500-LK009-V1 PC Link Units from single-level LK003 mode to single-level LK009 mode.

3. Replace the 3G2A5-LK003-E and 3G2A5-LK009 PC Link Units with C500-LK009-V1 PC Link Units set to single-level LK009 mode.

PLCs that are not being replaced. PLC that is being replaced.

| C500 / LK009-V1 (LK003 mode) | C500 / LK003-E (LK003 mode) | C500 / LK009 (LK003 mode) | C500 / LK003-E (LK003 mode) |

2. C500-LK009-V1 PC Link Unit can be kept. Change to LK009 mode.

3. Replace with C500-LK009-V1 PC Link Unit (LK009 mode).

3. Replace with C500-LK009-V1 PC Link Units (LK009 mode).

1. Replace CPU Unit, PC Link Unit, and other Units.

| C500 / LK009-V1 (LK009 mode) | C500 / LK009-V1 (LK009 mode) | C500 / LK009-V1 (LK009 mode) | CV/CVM1 / LK401 |

Note PC Link Models and Operating Level Settings

Set the same operating level settings for all PC Link Unit's in the same PC Link.

CVM1-LK401

• When set to either multi-level mode or single-level mode (equivalent to single-level LK009 mode), the CVM1-LK401 can communicate with the CVM1-LK401, C200H-LK401, and C500-LK009-V1.

• Can not communicate with the 3G2A5-LK009 or 3G2A5-LK003-E.

C200H-LK401

• When set to either multi-level mode or single-level mode (equivalent to single-level LK009 mode), the C200H-LK401 can communicate with the C200H-LK401, CVM1-LK401, and C500-LK009-V1.

• Can not communicate with the 3G2A5-LK009 or 3G2A5-LK003-E.

C500-LK009-V1 in Multi-level Mode or Single-level LK009 Mode

- Can communicate with the C500-LK009-V1, CVM1-LK401, C200H-LK401, and 3G2A5-LK009.
- Can not communicate with the 3G2A5-LK003-E.
  Also, the PC Link will not operate properly if the earlier 3G2A5-LK009 is combined with a CVM1-LK401 or C200H-LK401.

C500-LK009-V1 in Single-level LK003 Mode

- Can communicate with the C500-LK009-V1, 3G2A5-LK009, and 3G2A5-LK003-E.
- Can not communicate with the CVM1-LK401 or C200H-LK401.

3G2A5-LK009 in Multi-level Mode or Single-level LK009 Mode

- Can communicate with the 3G2A5-LK009 and C500-LK009-V1.
- Can not communicate with the CVM1-LK401, C200H-LK401, or 3G2A5-LK003-E.

3G2A5-LK009 in Single-level LK003 Mode

- Can communicate with the 3G2A5-LK009, C500-LK009-V1, and 3G2A5-LK003-E.
- Can not communicate with the CVM1-LK401 or C200H-LK401.

3G2A5-LK003-E

- This PC Link Unit is for the C500 PLC; it can communicate with the 3G2A5-LK003-E, 3G2A5-LK009, and C500-LK009-V1.
- Can not communicate with the CVM1-LK401 or C200H-LK401.

PC Link Unit Combinations

The following table shows the allowed combinations of PC Link Units in a PC Link system. (An "x" indicates that the combination is not allowed. A number indicates the maximum number of the PC Link Units allowed in a PC Link, including the Polling Node.)

				C200H□/CS1		C1000H/C2000H						C500							CVM1/CV1		Max. total Units
	CPU Unit →			C200H-LK401		C500-LK009-V1			3G2A5-LK009			C500-LK009-V1			3G2A5-LK009			3G2A5-LK003-E	CVM1-LK401		
CPU Unit	PC Link Unit	Mode	Mode	Multi-level	Single-level	Multi-level	LK009	LK003	Multi-level	LK009	LK003	Multi-level	LK009	LK003	Multi-level	LK009	LK003		Multi-level	Single-level	
							Single-level			Single-level			Single-level			Single-level					
Polling node	C200H□/CS1	C200H-LK401	Multi-level	16	×	16	×	×	×	×	×	8	×	×	×	×	×	×	16	×	16
			Single-level	×	32	×	32	×	×	×	×	×	8	×	×	×	×	×	×	32	32
	C1000H/C2000H	C500-LK009-V1 (See note.)	Multi-level	16	×	16	×	×	16	×	×	8	×	×	8	×	×	×	16	×	16
			Single-level LK009	×	32	×	32	×	×	32	×	×	8	×	×	8	×	×	×	32	32
			Single-level LK003	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
		3G2A5-LK009	Multi-level	×	×	16	×	×	16	×	×	8	×	×	8	×	×	×	×	×	16
			Single-level LK009	×	×	×	32	×	×	32	×	×	8	×	×	8	×	×	×	×	32
			Single-level LK003	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×	×
	C500	C500-LK009-V1 (See note.)	Multi-level	8	×	8	×	×	8	×	×	8	×	×	8	×	×	×	8	×	8
			Single-level LK009	×	8	×	8	×	×	8	×	×	8	×	×	8	×	×	×	8	8
			Single-level LK003	×	×	×	×	×	×	×	×	×	×	8	×	×	8	8	×	×	8
		3G2A5-LK009	Multi-level	×	×	8	×	×	8	×	×	8	×	×	8	×	×	×	×	×	8
			Single-level LK009	×	×	×	8	×	×	8	×	×	8	×	×	8	×	×	×	×	8
			Single-level LK003	×	×	×	×	×	×	×	×	×	×	8	×	×	8	8	×	×	8
		3G2A5-LK003-E		×	×	×	×	×	×	×	×	×	×	8	×	×	8	8	×	×	8
	CVM1/CV1	CVM1-LK401	Multi-level	16	×	16	×	×	×	×	×	8	×	×	×	×	×	×	16	×	16
			Single-level	×	32	×	32	×	×	×	×	×	8	×	×	×	×	×	×	32	32

Note Do not combine the 3G2A5-LK009 with a CVM1-LK401 or C200H-LK401 polled node. The PC Link will not operate properly if these Units are combined.

3-2   PC Link Unit Replacement Procedure

The following table outlines the procedures and precautions for replacement of PC Link Units.

Item	Unit or setting	Description	Reference
CPU Rack replacement	CPU Unit (C500, C1000H, or C2000H) CPU Backplane Power Supply Unit	Replace with CVM1/CV-series components.	CV-Series Programmable Controllers Installation Guide (W195-E1-5)
	I/O Units Special I/O Units	Some can be used in the CVM1/CV Series.	
	SYSMAC LINK Units Host Link Units	Replace with CVM1/CV-series components.	
	PC Link Units	Replace with CVM1-LK401.	*3-3 CVM1-LK401 Switch Settings*
PC Link Unit settings	CPU Bus Unit unit number setting	The unit number must be set since the CVM1-LK401 is a CPU Bus Unit.	*3-3-1 Setting the Unit Number*
	Node address setting	Match the CVM1-LK401's settings to the settings of the C500-LK009-V1 Units in the PC Link. (One exception is the LK003 mode, which cannot be used. In this case, change the C500-LK009-V1 Units' settings.)	*3-3-2 Setting the Node Address in the PC Link*
	Number of LR bits setting		*3-3-3 Setting the Number of LR Bits (Max. Number of PC Link Units)*
	Operating level/Link number setting		*3-3-4 Setting the Level/Link Number*
	Transmission line setting (two-wire or four-wire method)		*3-3-5 Setting the Transmission Line and Terminating Resistance*
	Terminating resistance		
	Number of I/O points to refresh	These settings are not set in the CVM1-LK401.	---
	Single/Double Unit allocation		
Precautions when writing ladder program	LR Area words used in PC Link	Replace LR 00 to LR 63 addresses with CIO 1000 to CIO 1063.	*3-4-1 LR Area*
	PLC Run and PC Link Error Flags	Replace SR 247 to SR 250 bit addresses with CIO 1500 + 25 × N to CIO 1500 + 25 × N +3 (N = unit number).	*3-4-2 PC Link Status Area*
	Level Flags	Replace AR 2411 and AR 2412 bit addresses with bits 11 and 12 of CIO 1500 + 25 × N +4 (N = unit number).	*3-4-3 Level Flags*
	CPU Bus Unit status area	In the CVM1/CV Series, the status of the CVM1-LK401 can be monitored from the ladder program.	*3-4-4 CPU Bus Unit Status Flags*
PLC CPU Unit settings	Setting the PLC's operation mode (synchronous/asynchronous operation)	We recommend using synchronous operation.	*3-5 PLC Operation Mode (Synchronous/Asynchronous Mode)*

3-3 CVM1-LK401 Switch Settings

This section explains how to make the necessary settings in the replacement CVM1-LK401 PC Link Unit and compares the settings to the ones in the C500-LK009-V1 PC Link Unit being replaced.
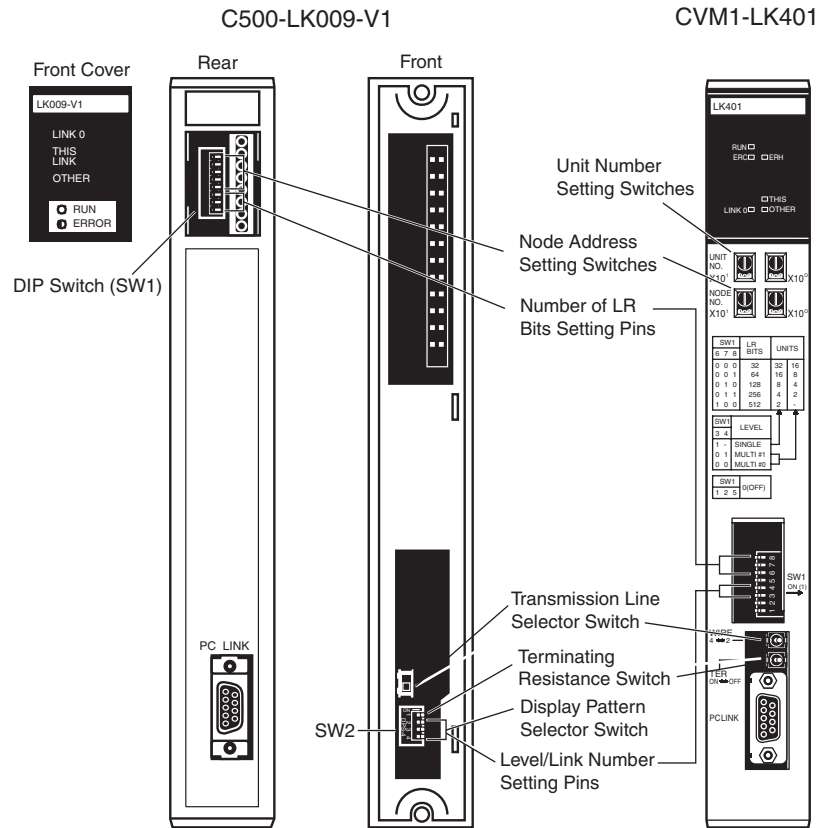
3-3-1 Setting the Unit Number

This setting was not required with the C500-LK009-V1, but it is required with the CVM1-LK401 because the CVM1-LK401 is a CPU Bus Unit.

The unit number setting range is 0 to 15. Do not set a unit number that is already set on another CPU Bus Unit mounted in the same PLC. If there are no other CPU Bus Units in the PLC, the unit number can be left set to 0.
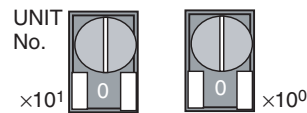
The unit number setting determines the location in the CPU Bus Unit Area where the PC Link Status Flags are output. For details, refer to *3-4-2 PC Link Status Area*.

3-3-2 Setting the Node Address in the PC Link

Set the CVM1-LK401's node address in the PC Link to the same node address that was set on the C500-LK009-V1. Remove the front cover of the C500-LK009-V1 to check the settings on pins 1 to 5 of the DIP switch (node address setting). The following table shows the relationship between the pin settings and node address.

Set that node address on the CVM1-LK401.

In the CVM1-LK401, the node address is set in 2-digit decimal with the NODE NO. rotary switches on the front of the Unit. The $\yen 10^1$ switch sets the tens digit and the 10^0 switch sets the ones digit.

- Use a thin, standard screwdriver to set the rotary switches. The setting ranges are 00 to 31 for single-level operation and 00 to 15 for multi-level operation. If the setting exceeds the allowed range, a communications error will be detected and the ERC Indicator will be lit.

- The Unit with node address 0 polling node in the PC Link. The number of Link Relay bits per Unit is set on the polling node. Refer to *3-3-3 Setting the Number of LR Bits (Max. Number of PC Link Units)* for details.
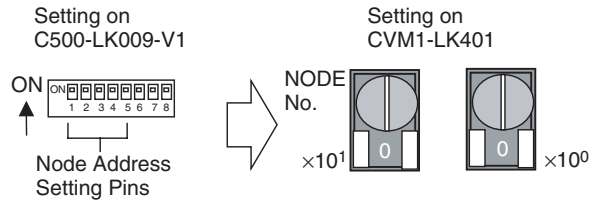
C500-LK009-V1 Node Address Settings

Pin					Node address in PC Link	Pin					Node address in PC Link
1	**2**	**3**	**4**	**5**		**1**	**2**	**3**	**4**	**5**	
0	0	0	0	0	Node 0	1	0	0	0	0	Node 16
0	0	0	0	1	Node 1	1	0	0	0	1	Node 17
0	0	0	1	0	Node 2	1	0	0	1	0	Node 18
0	0	0	1	1	Node 3	1	0	0	1	1	Node 19
0	0	1	0	0	Node 4	1	0	1	0	0	Node 20
0	0	1	0	1	Node 5	1	0	1	0	1	Node 21
0	0	1	1	0	Node 6	1	0	1	1	0	Node 22
0	0	1	1	1	Node 7	1	0	1	1	1	Node 23
0	1	0	0	0	Node 8	1	1	0	0	0	Node 24
0	1	0	0	1	Node 9	1	1	0	0	1	Node 25
0	1	0	1	0	Node 10	1	1	0	1	0	Node 26
0	1	0	1	1	Node 11	1	1	0	1	1	Node 27
0	1	1	0	0	Node 12	1	1	1	0	0	Node 28
0	1	1	0	1	Node 13	1	1	1	0	1	Node 29
0	1	1	1	0	Node 14	1	1	1	1	0	Node 30
0	1	1	1	1	Node 15	1	1	1	1	1	Node 31

1 = ON and 0 = OFF

Note There will be data errors in the LR Area if the same node address is set on two PC Link Units in the same operating level. This condition is not detected as a Unit error, so be sure to check the node address settings.

3-3-3   Setting the Number of LR Bits (Max. Number of PC Link Units)

When the PC Link Unit's node address is set to 0, that Unit is the polling node and its Number of LR Bits setting sets the number of LR bits/Unit in that PC Link. This setting is not required on any Units with non-zero node addresses (polled nodes). The Number of LR Bits settings on polled nodes are ignored.

- Check whether the node address setting on the C500-LK009-V1 is node 0 (pins 1 to 5 all OFF).

- If the C500-LK009-V1 was node 0, set the Number of LR Bits setting on the CVM1-LK401 too.

• The Number of Bits is set with pins 6 to 8 of the CVM1-LK401's DIP Switch.

Setting on C500-LK009-V1 ⟹ Setting on CVM1-LK401

Number of LR Bits Setting (Pins 6 to 8)

Number of LR Bits Setting (Pins 6 to 8)
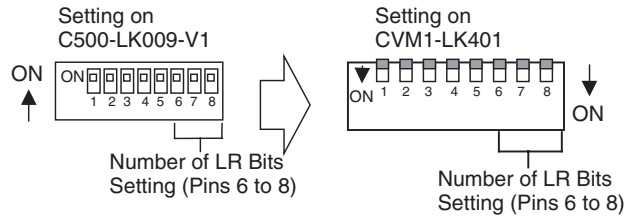
C500-LK009-V1/CVM1-LK401 Number of LR Bits Settings

Pin			Single-level mode or single-level LK009 mode	Multi-level mode
6	**7**	**8**		
0	0	0	32 bits (32 Units max.)	32 bits (16 Units max.)
0	0	1	64 bits (16 Units max.)	64 bits (8 Units max.)
0	1	0	128 bits (8 Units max.)	128 bits (4 Units max.)
0	1	1	256 bits (4 Units max.)	256 bits (2 Units max.)
1	0	0	512 bits (2 Units max.)	Invalid settings (See note.)
1	0	1	Invalid settings (See note.)	
1	1	0		
1	1	1		

Note   (1) 1 = ON and 0 = OFF

(2) If an invalid setting is set for single-level operation, the number of LR bits will be set to 512 bits (2 Units max.).

If an invalid setting is set for multi-level operation, the number of LR bits will be set to 256 bits (2 Units max.).

3-3-4   Setting the Level/Link Number

Set the CVM1-LK401's Level/Link Number to the to the same Level/Link setting that was set on the DIP Switch (SW3) on the back of the C500-LK009-V1.

Setting on C500-LK009-V1 ⟹ Setting on CVM1-LK401

Level/Link Number Setting (Pins 3 and 4)

Level/Link Number Setting (Pins 3 and 4)
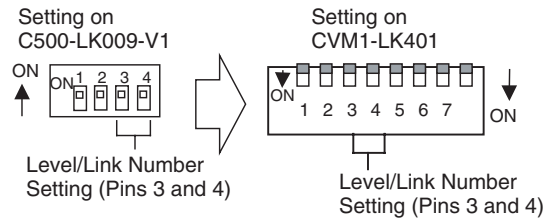
Setting on C500-LK009-V1

Pin		Level/Link number
3	**4**	
0	0	Multi-level, Link #0
0	1	Multi-level, Link #1
1	0	Single-level LK003 mode (See note 2.)
1	1	Single-level LK009 mode

Setting on CVM1-LK401

Pin		Level/Link number
3	**4**	
0	0	Multi-level, Link #0
0	1	Multi-level, Link #1
1	--- See note 3.	Single-level

Note   (1) 1 = ON and 0 = OFF

(2) When the C500-LK009-V1 was set to multi-level LK003 mode, it will be necessary to change the settings on the other PC Link Units or replace

them with compatible models. For details, refer to *3-1 Replacing an Existing PC Link System*.

(3) Pin 4 can be set to either 0 or 1, but set it to 1 (ON).

(4) There will be data errors in the LR Area if two PC Link Units with the same level settings (both single-level, both multi-level link #0, or both multi-level link #0) are mounted in the same PLC. Since an error will not be detected even if there are conflicting level settings, be sure that the level settings are correct.

The Level/Link settings determine how many of PC Link Units can be mounted in a PLC. One Unit can be mounted with single-level operation and one or two Units can be mounted with multi-level operation.

3-3-5 Setting the Transmission Line and Terminating Resistance

Set the CVM1-LK401's Transmission Link Switch to the to the same setting that was set on the switch (SW2) on the back of the C500-LK009-V1.
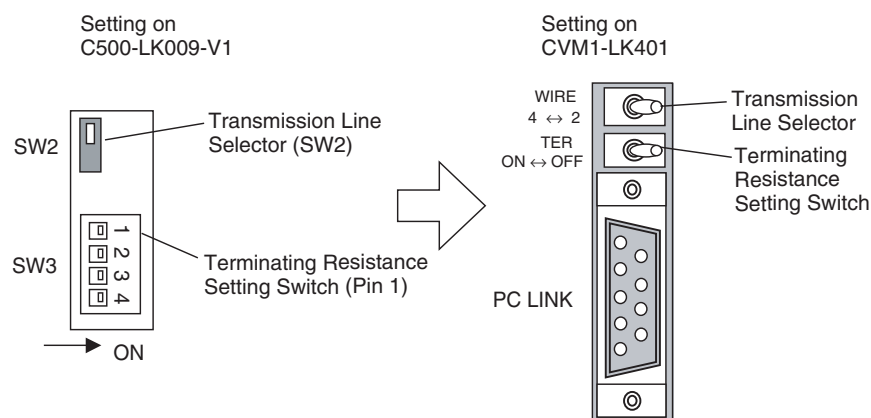
Switch	Setting on C500-LK009-V1	Setting on CVM1-LK401
Transmission Line Selector	Use two-wire method (electrical cable).	WIRE 4 ↔ 2 — Use two-wire method (electrical cable).
	Use four-wire method (optical fiber cable).	WIRE 4 ↔ 2 — Use four-wire method (optical fiber cable).
Terminating Resistance Setting Switch	ON 1 2 3 4 — Connect terminating resistance: ON	TER ON ↔ OFF — Connect terminating resistance: ON
	ON 1 2 3 4 — Disconnect terminating resistance: OFF	TER ON ↔ OFF — Disconnect terminating resistance: OFF

3-4 Ladder Programming Precautions

When a SYSMAC C500/C1000H/C2000H system is replaced with a CVM1/CV-series system, the PC Link's LR Area and Status Flags are in a different data area location. The different data area addresses must be used in ladder programs.

3-4-1 LR Area

In C1000H/C2000H PLCs, the 64 words between LR 00 and LR 63 are used as the LR Area, but in CVM1/CV-series PLCs, the LR Area is allocated in CIO Area words CIO 1000 to CIO 1063 (the Data Link Area).

Check the level/link number setting, node address setting, and number of LR bits setting to verify which words in the LR Area to use in the ladder program.

Setting	Setting on back of C500-LK009-V1	Setting on CVM1-LK401
Level/link number (*3-3-4 Setting the Level/Link Number*)	Level/Link Number Setting (Pins 3 and 4)	Level/Link Number Setting (Pins 3 and 4)
Node address (*3-3-2 Setting the Node Address in the PC Link*)	PC Link Node Address (Pins 1 to 5)	NODE No. $\times 10^1$ $\times 10^0$
Number of LR bits (*3-3-3 Setting the Number of LR Bits (Max. Number of PC Link Units)*)	Number of LR Bits Setting (Pins 6 to 8)	Number of LR Bits Setting (Pins 6 to 8)

1. Check the level/link number set for the C500-LK009-V1 on the DIP Switch (SW3) on the back of the C500-LK009-V1.
   Set the same level/link number setting on the CVM1-LK401.

2. Check the node address set for the C500-LK009-V1 on the DIP Switch (SW1) on the back of the C500-LK009-V1.
   Set the same node address on the CVM1-LK401.

3. If the node address is set to 0 (polling node), the Number of LR Bits must be set on the Unit. Check the Number of LR Bits set on the DIP Switch (SW1) on the back of the C500-LK009-V1.
   Set the same Number of LR Bits setting on the CVM1-LK401

Note If the node address of the C500-LK009-V1 being replaced is non-zero (polled node), it's Number of LR Bits setting is ignored so it may not have been set. To confirm the polled node's LR Area settings, it is necessary to check the Number of LR Bits setting in that PC Link's polling node (node 0).

LR Area Allocation for Single-level Mode

C1000H/C2000H LR Area LR 00 to LR 63		CVM1/CV Series LR Area CIO 1000 to CIO 1063		32 Units max. 32 bits (2 words)/Unit	16 Units max. 64 bits (4 words)/Unit	8 Units max. 128 bits (8 words)/Unit	4 Units max. 256 bits (16 words)/Unit	2 Units max. 512 bits (32 words)/Unit
LR 00	LR 01	1000	1001	Node 0	Node 0	Node 0	Node 0	Node 0
LR 02	LR 03	1002	1003	Node 1				
LR 04	LR 05	1004	1005	Node 2	Node 1			
LR 06	LR 07	1006	1007	Node 3				
LR 08	LR 09	1008	1009	Node 4	Node 2	Node 1		
LR 10	LR 11	1010	1011	Node 5				
LR 12	LR 13	1012	1013	Node 6	Node 3			
LR 14	LR 15	1014	1015	Node 7				
LR 16	LR 17	1016	1017	Node 8	Node 4	Node 2	Node 1	
LR 18	LR 19	1018	1019	Node 9				
LR 20	LR 21	1020	1021	Node 10	Node 5			
LR 22	LR 23	1022	1023	Node 11				
LR 24	LR 25	1024	1025	Node 12	Node 6	Node 3		
LR 26	LR 27	1026	1027	Node 13				
LR 28	LR 29	1028	1029	Node 14	Node 7			
LR 30	LR 31	1030	1031	Node 15				
LR 32	LR 33	1032	1033	Node 16	Node 8	Node 4	Node 2	Node 1
LR 34	LR 35	1034	1035	Node 17				
LR 36	LR 37	1036	1037	Node 18	Node 9			
LR 38	LR 39	1038	1039	Node 19				
LR 40	LR 41	1040	1041	Node 20	Node 10	Node 5		
LR 42	LR 43	1042	1043	Node 21				
LR 44	LR 45	1044	1045	Node 22	Node 11			
LR 46	LR 47	1046	1047	Node 23				
LR 48	LR 49	1048	1049	Node 24	Node 12	Node 6	Node 3	
LR 50	LR 51	1050	1051	Node 25				
LR 52	LR 53	1052	1053	Node 26	Node 13			
LR 54	LR 55	1054	1055	Node 27				
LR 56	LR 57	1056	1057	Node 28	Node 14	Node 7		
LR 58	LR 59	1058	1059	Node 29				
LR 60	LR 61	1060	1061	Node 30	Node 15			
LR 62	LR 63	1062	1063	Node 31				

Example 1:

An existing C1000H/C2000H PLC is set to single-level mode operation, node address 2, and 128 Link Relay bits/Unit, so LR 16 to LR 23 are used as the transfer area.

In the replacement CVM1/CV-series PLC, use CIO 1016 to CIO 1023 as the transfer area.

Example 2:

An existing C1000H/C2000H PLC is set to single-level mode operation, node address 0, and 64 Link Relay bits/Unit, so LR 00 to LR 03 are used as the transfer area.

In the replacement CVM1/CV-series PLC, use CIO 1003 to CIO 1003 as the transfer area. Since the Unit is node 0 (polling node), the Number of LR Bits must be set on the Unit's DIP switch.

LR Area Allocation for Multi-level Mode

• Link #0

C1000H/C2000H LR Area LR 00 to LR 31		CVM1/CV Series LR Area CIO 1000 to CIO 1031		16 Units max. 32 bits (2 words)/Unit	8 Units max. 64 bits (4 words)/Unit	4 Units max. 128 bits (8 words)/Unit	2 Units max. 256 bits (16 words)/Unit
LR 00	LR 01	1000	1001	Node 0	Node 0	Node 0	Node 0
LR 02	LR 03	1002	1003	Node 1			
LR 04	LR 05	1004	1005	Node 2	Node 1		
LR 06	LR 07	1006	1007	Node 3			
LR 08	LR 09	1008	1009	Node 4	Node 2	Node 1	
LR 10	LR 11	1010	1011	Node 5			
LR 12	LR 13	1012	1013	Node 6	Node 3		
LR 14	LR 15	1014	1015	Node 7			
LR 16	LR 17	1016	1017	Node 8	Node 4	Node 2	Node 1
LR 18	LR 19	1018	1019	Node 9			
LR 20	LR 21	1020	1021	Node 10	Node 5		
LR 22	LR 23	1022	1023	Node 11			
LR 24	LR 25	1024	1025	Node 12	Node 6	Node 3	
LR 26	LR 27	1026	1027	Node 13			
LR 28	LR 29	1028	1029	Node 14	Node 7		
LR 30	LR 31	1030	1031	Node 15			

• Link #1

C1000H/C2000H LR Area LR 32 to LR 63		CVM1/CV Series LR Area CIO 1032 to CIO 1063		16 Units max. 32 bits (2 words)/Unit	8 Units max. 64 bits (4 words)/Unit	4 Units max. 128 bits (8 words)/Unit	2 Units max. 256 bits (16 words)/Unit
LR 32	LR 33	1032	1033	Node 0	Node 0	Node 0	Node 0
LR 34	LR 35	1034	1035	Node 1			
LR 36	LR 37	1036	1037	Node 2	Node 1		
LR 38	LR 39	1038	1039	Node 3			
LR 40	LR 41	1040	1041	Node 4	Node 2	Node 1	
LR 42	LR 43	1042	1043	Node 5			
LR 44	LR 45	1044	1045	Node 6	Node 3		
LR 46	LR 47	1046	1047	Node 7			
LR 48	LR 49	1048	1049	Node 8	Node 4	Node 2	Node 1
LR 50	LR 51	1050	1051	Node 9			
LR 52	LR 53	1052	1053	Node 10	Node 5		
LR 54	LR 55	1054	1055	Node 11			
LR 56	LR 57	1056	1057	Node 12	Node 6	Node 3	
LR 58	LR 59	1058	1059	Node 13			
LR 60	LR 61	1060	1061	Node 14	Node 7		
LR 62	LR 63	1062	1063	Node 15			

Example 1:

An existing C1000H/C2000H PLC is set to multi-level mode operation, link #0, node address 5, and 32 Link Relay bits/Unit, so LR 10 and LR 11 are used as the transfer area.

In the replacement CVM1/CV-series PLC, use CIO 1010 and CIO 1011 as the transfer area.

Example 2:

An existing C1000H/C2000H PLC is set to multi-level mode operation, link #1, node address 0, and 64 Link Relay bits/Unit, so LR 32 to LR 35 are used as the transfer area.

In the replacement CVM1/CV-series PLC, use CIO 1032 to CIO 1035 as the transfer area. Since the Unit is node 0 (polling node), the Number of LR Bits must be set on the Unit's DIP switch.

3-4-2 PC Link Status Area

The location of the Status Area used to monitor the PC Link system's operation is also different in the C1000H/C2000H and CVM1/CV-series. In the C1000H/C2000H PLCs, the Status Flags were always in SR 247 to SR 250, but in the CVM1/CV-series PLCs, the CPU Bus Unit is used for the Status Flags.

The location of the CPU Bus Unit Status Flags depends on the unit number set with the Unit Number Setting Switches (UNIT NO.) on the front of the CVM1-LK401.
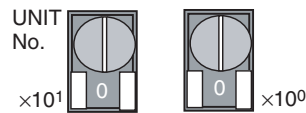
The CPU Bus Unit unit number can be set between 00 and 15. Refer to *3-3-1 Setting the Unit Number*.)

PC Link Error and PLC Run Flags

The read-only Status Area contains flags that indicate the operating status of the PC Link and each PLC connected to the PC Link system.

PLC Run Flags	ON when the corresponding PLC is operating normally. OFF when the corresponding PLC is stopped.
PC Link Error Flags	ON when there is a transfer error or a power interruption in the corresponding PC Link Unit. OFF when the PC Link Unit is operating normally.

Flag Allocation in Single-level Mode

The following table shows the location of the PLC Run Flags and PC Link Error Flags, based on the PLC model and PC Link Unit's unit number.

C1000H/ C2000H	CVM1/CV Series (N = Unit number)	Bit	PC Link Error Flags								PLC Run Flags							
			15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
SR 247	CIO 1500 + 25 × N		31	30	29	28	27	26	25	24	31	30	29	28	27	26	25	24
SR 248	CIO 1500 + 25 × N + 1		23	22	21	20	19	18	17	16	23	22	21	20	19	18	17	16
SR 249	CIO 1500 + 25 × N + 2		15	14	13	12	11	10	9	8	15	14	13	12	11	10	9	8
SR 250	CIO 1500 + 25 × N + 3		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Example:

In this example, the existing PC Link system is made up of 8 PLCs and the PC Link Unit being replaced is node 0 (the polling node). The C1000H/C2000H flags are as follows:

- The PC Link Error Flags for nodes 1 to 7 are in SR 25009 to SR 25015.
- The PLC Run Flags for nodes 1 to 7 are in SR 25001 to SR 25007

In the CVM1/CV-series PLC, the Status Area depends on the unit number (N). When the unit number is set to 0, the word CIO 1500 + 25 × N + 3 = CIO 1503 is equivalent to SR 250 in the C1000H/C2000H. Consequently, change any ladder program occurrences of SR 250 to CIO 1503.

Flag Allocation in Multi-level Mode

The following table shows the location of the PLC Run Flags and PC Link Error Flags, based on the PLC model and PC Link Unit's unit number.

C1000H/ C2000H	CVM1/CV Series (N = Unit number)	Bit	PC Link Error Flags								PLC Run Flags							
			15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
SR 247	CIO 1500 + 25 × N	Link #1	15	14	13	12	11	10	9	8	15	14	13	12	11	10	9	8
SR 248	CIO 1500 + 25 × N + 1		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
SR 249	CIO 1500 + 25 × N + 2	Link #0	15	14	13	12	11	10	9	8	15	14	13	12	11	10	9	8
SR 250	CIO 1500 + 25 × N + 3		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Example:

In this example, the existing PC Link system is a multi-level system, and the PC Link Units being replaced are node 1 in Link #0 (made up of 8 PLCs) and node 0 in Link #1 (made up of 4 PLCs). The C1000H/C2000H flags are as follows:

- The PLC Run Flags for Link #0 are in SR 25000 to SR 25007 (the local node's flag is bit 01) and the flags for Link #1 are in SR 24800 to SR 24803 (the local node's flag is bit 00).

- The PC Link Error Flags for Link #0 are in SR 25008 to SR 25015 (the local node's flag is bit 09) and the flags for Link #1 are in SR 24808 to SR 24811 (the local node's flag is bit 08).

In the CVM1/CV-series PLC, the Status Area depends on the unit number (N) set on the CVM1-LK401. When the unit number is set to 0, the word CIO 1500 + 25 × N + 3 = CIO 1503 is equivalent to SR 250 in the C1000H/C2000(H) and CIO 1500 + 25 × N + 1 = CIO 1501 is equivalent to SR 248. Consequently, change any ladder program occurrences of SR 248 to CIO 1501 and occurrences of SR 250 to CIO 1503.

3-4-3   Level Flags

In the C1000H/C2000H-series PLCs the Level Flags in AR 2411 and AR 2412 indicated whether any PC Link Units were mounted in the PLC. In the CVM1/CV-series PLCs, the equivalent flags are bits 11 and 12 of CIO 1500 + 25 × N + 4. The flags are read-only.

C1000H/ C2000H	CVM1/CV Series (N = Unit number)	Function
AR 2411	CIO 1500 + 25 × N + 4, bit 11	ON when the PLC contains is a PC Link Unit that is set to multi-level operation Link #1.
AR 2412	CIO 1500 + 25 × N + 4, bit 12	ON when the PLC contains is a PC Link Unit that is set to single-level operation or multi-level operation Link #0.

3-4-4 CPU Bus Unit Status Flags

Since the PC Link Unit is a CVM1/CV-series CPU Bus Unit, the following Auxiliary Area flags and control bits are used to indicate status or control operation of the Unit.

The C1000H/C2000H PLCs do not have an equivalent area, but these flags can be used after replacing a C1000H/C2000H Rack with a CVM1/CV-series Rack.

Word	Bit(s)	Name	Function
A001	00 to 15	CPU Bus Unit Restart Bits	These bits can be turned ON to reset the corresponding CPU Bus Units. The Restart Bits are turned OFF automatically when restarting is completed. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A015	00 to 15	CPU Bus Service Disable Bits	These bits can be turned ON to stop service to the corresponding CPU Bus Units. (Bits 00 to 15 correspond to unit numbers 0 to 15.) Turn the bit OFF again to resume service to the CPU Bus Unit.
A302	00 to 15	CPU Bus Unit Initializing Flags	ON while the corresponding CPU Bus Units are initializing. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A401	12	CPU Bus Error Flag	ON when an error occurs during the transmission of data over the CPU bus, or a WDT (watchdog timer) error occurs in a CPU Bus Unit. The unit numbers of the affected CPU Bus Units are indicated in word A405.
A401	13	Duplication Error Flag	ON when two Racks are assigned the same rack number, two CPU Bus Units are assigned the same unit number, or the same words are allocated to more than one Rack or Unit in the PC Setup. The unit numbers of the affected CPU Bus Units are indicated in word A410.
A402	03	CPU Bus Unit Setting Error Flag	ON when the CPU Bus Units actually installed differ from the Units registered in the I/O table. The unit numbers of the affected CPU Bus Units are indicated in word A427.
A402	07	CPU Bus Unit Error Flag	ON when an error occurs during the transmission of data between the PLC and CPU Bus Unit. The unit numbers of the affected CPU Bus Units are indicated in word A422.
A405	00 to 15	CPU Bus Error Unit Number	ON when an error occurs during the transmission of data over the CPU bus, or a WDT (watchdog timer) error occurs in a CPU Bus Unit. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A410	00 to 15	CPU Bus Unit Duplicate Number	ON when two CPU Bus Units are assigned the same unit number. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A422	00 to 15	CPU Bus Unit Error Unit Number	ON when an error occurs during the transmission of data between the PLC and CPU Bus Unit. (Bits 00 to 15 correspond to unit numbers 0 to 15.)
A427	00 to 15	CPU Bus Unit Setting Error Unit Number	ON when the CPU Bus Units actually installed differ from the Units registered in the I/O table. (Bits 00 to 15 correspond to unit numbers 0 to 15.)

3-5 PLC Operation Mode (Synchronous/Asynchronous Mode)

The CVM1/CV-series CPU Units can be set to synchronous mode or asynchronous mode. In synchronous mode, the CPU Unit synchronizes processing of the instruction execution cycle (instruction execution and I/O refreshing) and peripheral servicing cycle (peripheral servicing of devices such as CPU Bus Units). Asynchronous mode is an non-synchronized, high-speed processing mode.

The default processing setting is asynchronous mode. For details, refer to the *CV Ladder Diagram Operation Manual* (W202-E1-5).

- The PC Link Unit is a CPU Bus Unit, so the LR Area is refreshed in the peripheral processing cycle.

- The PC Link I/O response characteristics depend on the PLC model. For example, the PC Link data refreshing of a CVM1/CV-series PLC set for synchronous mode processing is about one cycle (one instruction execution cycle) longer than it would be in a C1000H/C2000H PLC.
  For details on I/O response times, refer to *Appendix C PC Link System I/O Response Time*.

- When the CPU Unit is set for asynchronous mode processing, the peripheral processing cycle is not synchronized with the instruction execution cycle, so the data in the LR Area may change within an instruction execution cycle. Consequently, we generally recommend using synchronous mode processing. Select synchronous operation in the PLC Setup (in the *Execute control 2* settings).

- The I/O response time tends to be longer when using synchronous mode processing.
  Asynchronous mode can be used to reduce the I/O response time, but it is possible for the content of words to change during execution of an instruction that accesses many words. To ensure the uniformity of a block of words, use the DISABLE ACCESS IOSP(187) and ENABLE ACCESS IORS(188) instructions or the CPU Bus Service Disable Bits in A015 to prevent the words from being changed by peripheral servicing during instruction execution.

3-6   Replacement Checklists

This section provides a checklist for PC Link settings when upgrading from a C500/C1000H/C2000H to a CVM1/CV-series Rack. It is assumed that only the PLC is being replaced and the basic PC Link system layout and settings (such as the level settings, number of LR bits/Unit, and node addresses) are being left unchanged.

Check the system in advance and prepare a system configuration diagram (showing the models of all PC Link Units and switch settings) and ladder diagram specifications (showing the program specifications in the PLC being replaced) in advance.

Based on the PC Link system diagram, the replacement pattern can be classified as pattern A, B, or C. Select the corresponding pattern checklist and make the necessary settings indicated in the replacement checklist.

Pattern Selection Flowchart
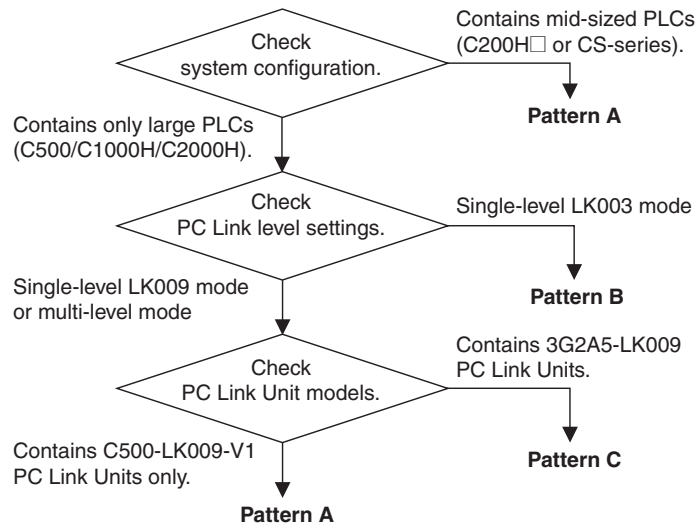
Note (1) There will be data errors in the LR Area if the same node address is set on two PC Link Units in the same level. This condition is not detected as a Unit error, so be sure to check the node address settings.

(2) There will be data errors in the LR Area if two PC Link Units with the same level settings (both single-level, both multi-level link #0, or both multi-level link #0) are mounted in the same PLC. This condition is not detected as a Unit error, so be sure to check the level/link number settings.

(3) The Level/Link settings determine how many of PC Link Units can be mounted in a PLC. One Unit can be mounted with single-level operation and two Units can be mounted with multi-level operation (one set to Link #0 and the other set to Link #1).

The following table shows the PC Link Unit models that may be included in each pattern.

Model	Pattern A	Pattern B	Pattern C
3G2A5-LK003-E	---	Yes	---
3G2A5-LK009	---	Yes	Yes
C500-LK009-V1	Yes	Yes	Yes
C200H-LK401	Yes	---	---

3G2A5-LK003-E and 3G2A5-LK009 PC Link Units can not be included in the PC Link system to which the CVM1-LK401 will be connected. The CVM1-LK401 can be connected only to PC Links containing CVM1-LK401, C200H-LK401, and C500-LK009-V1 PC Link Units.

The pattern B and pattern C systems may contain 3G2A5-LK003-E and 3G2A5-LK009 PC Link Units. In these cases, the 3G2A5-LK003-E and 3G2A5-LK009 Units must be replaced with C500-LK009-V1 Units in order to add a CVM1-LK401.

Switches

• CVM1-LK401

SW1

ON

Number of LR bits setting
(Pins 6 to 8)

Reserved (Always OFF)

Level/Link Number setting
(Pins 3 and 4)

Reserved (Always OFF)

Unit Number Setting Switches

Node Address Setting Switches

DIP Switch (SW1)

Transmission Line Selector Switch
Terminating Resistance Setting Switch

• 3G2A5-LK003-E

Front-panel
DIP Switch

ON

Pins 6 to 8:
Number of
LR bits setting

Pins 1 to 5: Node address setting

Rear-panel
DIP Switch

ON

Pin 2: Always OFF

Pin 1: Terminating Resistance Setting Switch

• 3G2A5-LK009/C500-LK009-V1

PC LINK

SW2

Transmission Line
Selector Switch

SW1

ON

ON
1 2 3 4 5 6 7 8

SW3

ON

ON
1 2 3 4

Pins 3 and 4: Level/Link Number setting

Pin 2: LED Display Pattern (A/B) selector

Pins 6 to 8:
Number of
LR bits setting

Pin 1: Terminating Resistance setting

Pins 1 to 5: Node address setting

3-6-1 Pattern A: Mixed Mid-sized and Large PLCs

The pattern A system contains mid-sized (C200H□ or CS-series) PLCs and large (C500, C1000H, or C2000H) PLCs. Set the replacement PC Link Units as shown in the following table.

Checklist 1
Use the following checklist when replacing a C500-LK009-V1 with a CVM1-LK401.

Item	Original Unit: C500-LK009-V1				Replacement Unit: CVM1-LK401			Remarks
CPU Bus Unit unit number	Not applicable				Any unique number in setting range (Do not set the same unit number on two CPU Bus Units in a PLC.)			Do not mount more PC Link Units than allowed.
Node address	Check setting on pins 1 to 5: [ ]				Set the CVM1-LK401's node address to the same node address that was set on the C500-LK009-V1. (Set the rotary switches in 2-digit decimal.)			Check the node address settings on other nodes in the PC Link to confirm that the same address is not already taken.
	Pins 1 to 5	Node address	Pins 1 to 5	Node address				A Unit error will **not** occur if the same node address is set on two PC Link Units in the same PC Link, but there will be data errors in the LR Area.
	00000	0	10000	16				
	00001	1	10001	17				
	00010	2	10010	18				
	00011	3	10011	19				
	00100	4	10100	20				
	00101	5	10101	21				
	00110	6	10110	22				
	00111	7	10111	23				
	01000	8	11000	24				
	01001	9	11001	25				
	01010	10	11010	26				
	01011	11	11011	27				
	01100	12	11100	28				
	01101	13	11101	29				
	01110	14	11110	30				
	01111	15	11111	31				
Number of LR Bits	Check setting on pins 6 to 8 of SW1: [ ] Bits / [ ] Units				Set the same number of LR bits that was set on the C500-LK009-V1.			Make the "number of LR bits" setting on the polling node (node 0) in the PC Link. The "number of LR bits" settings on the other nodes (polled nodes) are ignored.
	Pins 6 to 8	Pin 3 of SW3			Pins 6 to 8	Pin 3		
		1 (Single-level LK009)	0 (Multi-level)			1 (Single-level LK009)	0 (Multi-level)	Set the same level/link number (next item in table) that was set on the Unit being replaced. If an invalid setting is set, the max. valid number of bits setting will be used instead.
	000	32 bits/ 32 (8) Units	32 bits/ 16 (8) Units		000	32 bits/ 32 Units	32 bits/ 16 Units	
	001	64 bits/ 16 (8) Units	64 bits/ 8 (4) Units		001	64 bits/ 16 Units	64 bits/ 8 Units	
	010	128 bits/ 8 (4) Units	128 bits/ 4 (2) Units		010	128 bits/ 8 Units	128 bits/ 4 Units	The number of Units listed in parentheses for the C500-LK009-V1 is the maximum number of Units for the C500 PLC. The (*1) setting is invalid for the C500.
	011	256 bits/ 4 (2) Units	256 bits/ 2 (*1) Units		011	256 bits/ 4 Units	256 bits/ 2 Units	
	100	512 bits/ 2 (*1) Units	Invalid setting		100	512 bits/ 2 Units	Invalid setting	
	101	Invalid setting			101	Invalid setting		
	110				110			
	111				111			

Item	Original Unit: C500-LK009-V1		Replacement Unit: CVM1-LK401		Remarks
Level/Link Number	Check setting on pins 3 and 4 of SW3: [ ]		Pins 3 and 4: Set the same Level/ Link Number as set on the C500-LK009-V1.		The CVM1-LK401's single-level mode is equivalent to the C500-LK009-V1's single-level LK009 mode. The CVM1-LK401 cannot emulate the single-level LK003 mode.
	Pins 3 & 4	Level/Link Number setting	Pins 3 & 4	Level/Link Number setting	
	11	Single-level LK009	11	Single-level (Either 11 or 10 can be set.)	
	10	Single-level LK003	10		Pattern A systems do not include Units set to single-level LK003 mode.
	01	Multi-level Link #1	01	Multi-level Link #1	
	00	Multi-level Link #0	00	Multi-level Link #0	
Transmission Line Selector	Check setting on SW2: [Up (4-wire) Down (2-wire)]		WIRE switch: Set the same setting as set on the C500-LK009-V1.		---
	Up	4-wire/Use optical fiber cable.	4 (left)	4-wire/Use optical fiber cable.	
	Down	2-wire/Use electrical cable.	2 (right)	2-wire/Use electrical cable.	
Terminating Resistance	Check setting on pin 1 of SW3: [1(ON)/ 0 (OFF)]		TER switch: Set the same setting as set on the C500-LK009-V1.		---
	1	Terminator connected.	ON (left)	Terminator connected.	
	0	Terminator not connected.	OFF (right)	Terminator not connected.	
LR Area	LR 00 to LR 63 (or LR 00 to LR 31 in the C500)		CIO 1000 to CIO 1063		N is the CPU Bus Unit's unit number.
PC Link Error and PLC Run Flags	SR 247 to SR 250 (or SR 58 and SR 62 in the C500)		CIO $1500 + 25 \times N$ to CIO $1500 + 25 \times N + 3$		
Level Flags	Level #1	AR 2411 (Except C500)	Level #1	CIO $1500 + 25 \times N + 4$, bit 11	
	Single-level or level #0	AR 2412 (Except C500)	Single-level or level #0	CIO $1500 + 25 \times N + 4$, bit 12	
PC Link Unit Restart Bits	Level #1	SR 25210 (SR 6010 in C500)	Corresponding bit in A001 (CPU Bus Unit Restart Bits)		
	Single-level or level #0	SR 25214 (SR 6014 in C500)			

3-6-2 Pattern B: C500 PLCs in Single-level LK003 Mode Only

The pattern B system contains only C500 PLCs operating in single-level LK003 mode. The PC Link's level setting must be changed to single-level LK009 mode. All 3G2A5-LK003-E and 3G2A5-LK009 PC Link Units in the PC Link must be replaced with C500-LK009-V1 PC Link Units (including 3G2A5-LK003-E and 3G2A5-LK009 PC Link Units in PLCs other than the one being replaced).

Checklist 2 Use the following checklist when replacing a 3G2A5-LK003-E with a C500-LK009-V1.

Item	Original Unit: 3G2A5-LK003-E		Replacement Unit: C500-LK009-V1		Remarks
Node address	Check setting on pins 1 to 5: [ ]		Set the C500-LK009-V1's node address to the same node address set on the 3G2A5-LK003-E.		The setting range for the 3G2A5-LK003-E's node address is 0 to 7. When the CPU Unit is a C500 model, set the C500-LK009-V1's node address in the 0 to 7 range as well.
	Pins 1 to 5	Node address	Pins 1 to 5	Node address	
	XX000	0	00000	0	
	XX001	1	00001	1	
	XX010	2	00010	2	
	XX011	3	00011	3	Check the node address settings on other nodes in the PC Link to confirm that the same address is not already taken.
	XX100	4	00100	4	
	XX101	5	00101	5	
	XX110	6	00110	6	
	XX111	7	00111	7	A Unit error will **not** be detected if the same node address is set on two PC Link Units in the same PC Link, but there will be data errors in the LR Area.
	Pins 1 and 2 of the front-panel switch are not used and do not affect the node address setting.		When a C500 PLC is being used, the node address setting range is 0 to 7. Do not set a node address higher than 7.		
Number of LR Bits	Check setting on pins 6 to 8: [ ] Bits / [ ] Units		Set the same number of LR bits that was set on the 3G2A5-LK003-E.		Make the "number of LR bits" setting on the polling node (node 0) in the PC Link. The "number of LR bits" settings on the other nodes (polled nodes) are ignored.
	Pins 6 to 8	LR bits setting	Pins 6 to 8	LR bits setting	
	000	256 bits / 2 Units	000	32 bits / 8 Units	
	001	128 bits / 4 Units	001	64 bits / 8 Units	
	010	64 bits / 8 Units	010	128 bits / 4 Units	
	011		011	256 bits / 2 Units	Set the replacement C500-LK009-V1's level/ link number (next item in table) to single-level LK009 mode. Settings 011 to 111 are invalid settings in the C500-LK009-V1.
	100		100	Invalid setting	
	101		101		
	110		110		
	111		111		
Level/Link Number	Not applicable.		Pins 3 and 4 of SW3: Set to single-level LK009 mode (11).		The 3G2A5-LK003-E supports only single-level LK003 mode.
			Pins 3 & 4	Level/Link Number setting	
			11	Single-level LK009	
			10	Single-level LK003	
			01	Multi-level Link #1	
			00	Multi-level Link #0	
Transmission Line Selector	Not applicable.		SW2: Set to down (2-wire/Electrical cable).		The 3G2A5-LK003-E does not support optical fiber cable; it supports only electrical cables.
			Up	4-wire/Use optical fiber cable.	
			Down	2-wire/Use electrical cable.	

Item	Original Unit: 3G2A5-LK003-E		Replacement Unit: C500-LK009-V1		Remarks
Terminating Resistance	Check pin 1 of rear-panel switch: [1(ON)0 (OFF)]		Pin 1 of SW3: Set the same terminator setting as set on the 3G2A5-LK003-E.		---
	1	Terminator connected.	1	Terminator connected.	
	0	Terminator not connected.	0	Terminator not connected.	
LR Area	LR 00 to LR 31		LR 00 to LR 31		The C500-LK009-V1 is set to single-level LK009 mode, so the level #1 flags and control bits are not used.
PC Link Error and PLC Run Flags	SR 62		SR 62		
Level Flags	Not applicable.		Level #1	AR 2411	
			Single-level or level #0	AR 2412	
PC Link Unit Restart Bits	SR 6014		Level #1	SR 6010	
			Single-level or level #0	SR 6014	

Checklist 3

Use the following checklist when replacing a 3G2A5-LK009 or C500-LK009-V1 in single-level LK003 mode with a C500-LK009-V1 in single-level LK009 mode.
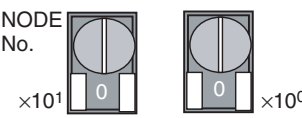
Item	Original Unit: 3G2A5-LK009/ C500-LK009-V1		Replacement Unit: C500-LK009-V1		Remarks
Node address	Check setting on pins 1 to 5: [ ]		Set the node address to the same one set on the original Unit.		When the CPU Unit is a C500 model, set the C500-LK009-V1's node address in the 0 to 7 range.
	Pins 1 to 5	Node address	Pins 1 to 5	Node address	Check the node address settings on other nodes in the PC Link to confirm that the same address is not already taken.
	00000	0	00000	0	
	00001	1	00001	1	A Unit error will **not** be detected if the same node address is set on two PC Link Units in the same PC Link, but there will be data errors in the LR Area.
	00010	2	00010	2	
	00011	3	00011	3	
	00100	4	00100	4	
	00101	5	00101	5	
	00110	6	00110	6	
	00111	7	00111	7	
	When a C500 PLC is being used, the node address setting range is 0 to 7.		When a C500 PLC is being used, the node address setting range is 0 to 7. Do not set a node address higher than 7.		

Item	Original Unit: 3G2A5-LK009/ C500-LK009-V1		Replacement Unit: C500-LK009-V1		Remarks
Number of LR Bits	Check setting on pins 6 to 8: [ ] Bits / [ ] Units		Set the same number of LR bits that was set on the original Unit.		Make the "number of LR bits" setting on the polling node (node 0) in the PC Link. The "number of LR bits" settings on the other nodes (polled nodes) are ignored.
	Pins 6 to 8	Single-level LK003 mode	Pins 6 to 8	Single-level LK009 mode	
	000	256 bits / 2 Units	000	32 bits / 8 Units	In pattern B, the original C500-LK009-V1/3G2A5-LK009 is set to single-level LK003 mode. Set the replacement C500-LK009-V1's level/link number (next item in table) to single-level LK009 mode. that was set on the Unit being replaced.
	001	128 bits / 4 Units	001	64 bits / 8 Units	
	010	64 bits / 8 Units	010	128 bits / 4 Units	
	011	64 bits / 8 Units	011	256 bits / 2 Units	
	100	(See note.)	100	Invalid setting	
	101		101		
	110		110		
	111		111		**Note**: Settings 011 to 111 are invalid settings in the C500-LK009-V1, but the number of LR bits will be set to 64 bits/8 Units if the setting is in the invalid range.
Level/Link Number	Pins 3 and 4 of SW3: Check if set to single-level LK003 mode (10).		Pins 3 and 4 of SW3: Set to single-level LK009 mode (11).		Set the replacement C500-LK009-V1's level/link number to single-level LK009 mode.
	Pins 3 & 4	Level/Link Number setting	Pins 3 & 4	Level/Link Number setting	
	11	Single-level LK009	11	Single-level LK009	
	10	Single-level LK003	10	Single-level LK003	
	01	Multi-level Link #1	01	Multi-level Link #1	
	00	Multi-level Link #0	00	Multi-level Link #0	
Transmission Line Selector	Check SW2: [Up (4-wire) / Down (2-wire)]		SW2: Set to the same as the original 3G2A5-LK009/C500-LK009-V1.		---
	Up	4-wire/Use optical fiber cable.	Up	4-wire/Use optical fiber cable.	
	Down	2-wire/Use electrical cable.	Down	2-wire/Use electrical cable.	
Terminating Resistance	Check pin 1 of SW3: [1(ON)/0 (OFF)]		Pin 1 of SW3: Set to the same as the original 3G2A5-LK009/C500-LK009-V1.		---
	1	Terminator connected.	1	Terminator connected.	
	0	Terminator not connected.	0	Terminator not connected.	
LR Area	LR 00 to LR 31		LR 00 to LR 31		When the PC Link Unit is set to single-level LK003 mode, the level #1 PC Link Unit Restart Bit does not function. When the PC Link Unit is set to single-level LK009 mode in pattern B, the status flags and control bits for level #1 are not used.
PC Link Error and PLC Run Flags	SR 62		SR 62		
Level Flags	Not applicable.		Level #1	AR 2411	
			Single-level or level #0	AR 2412	
PC Link Unit Restart Bits	SR 6014		Level #1	SR 6010	
			Single-level or level #0	SR 6014	

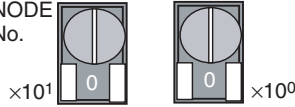<u>**Checklist 4**</u>   Use the following checklist when replacing a 3G2A5-LK003-E with a CVM1-LK401.

Item	Original Unit: 3G2A5-LK003-E		Replacement Unit: CVM1-LK401		Remarks
CPU Bus Unit unit number	Not applicable		Any unique number in setting range (Do not set the same unit number on two CPU Bus Units in a PLC.)		Do not mount more PC Link Units than allowed.
Node address	Check pins 1 to 5: [ ]		Set the CVM1-LK401's node address to the same node address that was set on the 3G2A5-LK003-E. (Set the rotary switches in 2-digit decimal in the range 00 to 07.)		The setting range for the 3G2A5-LK003-E's node address is 0 to 7.
	Pins 1 to 5	Node address			Check the node address settings on other nodes in the PC Link to confirm that the same address is not already taken.
	XX000	0			
	XX001	1	NODE No. $\times 10^1$ 0 0 $\times 10^0$		A Unit error will **not** occur if the same node address is set on two PC Link Units in the same PC Link, but there will be data errors in the LR Area.
	XX010	2			
	XX011	3			
	XX100	4			
	XX101	5			
	XX110	6			
	XX111	7			
	Pins 1 and 2 of the front-panel switch are not used and do not affect the node address setting.				
Number of LR Bits	Check setting on pins 6 to 8: [ ] Bits / [ ] Units		Set the same number of LR bits that was set on the 3G2A5-LK003-E.		Make the "number of LR bits" setting on the polling node (node 0) in the PC Link. The "number of LR bits" settings on the other nodes (polled nodes) are ignored.
	Pins 6 to 8	LR bits setting	Pins 6 to 8	Pin 3 (single-level)	
	000	256 bits / 2 Units	000	32 bits / 32 Units	
	001	128 bits / 4 Units	001	64 bits / 16 Units	When a C500 PLC is replaced with a CVM1/CV-series PLC, the maximum number of Units is double the original value for the same number of LR bits, because the LR Area is twice as large.
	010	64 bits / 8 Units	010	128 bits / 8 Units	
	011		011	256 bits / 4 Units	
	100		100	512 bits / 2 Units	
	101		101	Invalid setting	
	110		110		Set the level/link number (next item in table) to single-level mode.
	111		111		
Level/Link Number	Not applicable.		Pins 3 and 4: Set both pins to 1 (single-level).		The 3G2A5-LK003-E supports only single-level LK003 mode.
			Pins 3 and 4	Level/Link Number setting	Set the replacement CVM1-LK401 to single-level mode.
			11	Single-level (Set either 11 or 10.)	
			10		
			01	Multi-level Link #1	
			00	Multi-level Link #0	
Transmission Line Selector	Not applicable.		WIRE switch: Set to 2 (right).		The 3G2A5-LK003-E does not support optical fiber cable; it supports only electrical cables.
			4 (left)	4-wire/Use optical fiber cable.	
			2 (right)	2-wire/Use electrical cable.	
Terminating Resistance	Check pin 1 of rear-panel switch: [1(ON)/0 (OFF)]		TER switch: Set the same setting as set on the 3G2A5-LK003-E.		---
	1	Terminator connected.	ON (left)	Terminator connected.	
	0	Terminator not connected.	OFF (right)	Terminator not connected.	

Item	Original Unit: 3G2A5-LK003-E	Replacement Unit: CVM1-LK401		Remarks
LR Area	LR 00 to LR 31	CIO 1000 to CIO 1063		N is the CPU Bus Unit's unit number.
PC Link Error and PLC Run Flags	SR 62	CIO 1500 + 25 × N to CIO 1500 + 25 × N + 3		When the CVM1-LK401 is set to single-level mode, the Level Flag for level #1 does not function.
Level Flags	Not applicable.	Level #1	CIO 1500 + 25 × N + 4, bit 11	
		Single-level or level #0	CIO 1500 + 25 × N + 4, bit 12	
PC Link Unit Restart Bits	SR 6014	Corresponding bit in A001 (CPU Bus Unit Restart Bits)		

Checklist 5   Use the following checklist when replacing a 3G2A5-LK009 or C500-LK009-V1 in single-level LK003 mode with a CVM1-LK401.

Item	Original Unit: 3G2A5-LK009/ C500-LK009-V1	Replacement Unit: CVM1-LK401	Remarks
CPU Bus Unit unit number	Not applicable	Any unique number in setting range (Do not set the same unit number on two CPU Bus Units in a PLC.)	Do not mount more PC Link Units than allowed.
Node address	Node address: [ ] <table><tr><td>Pins 1 to 5</td><td>Node address</td></tr><tr><td>00000</td><td>0</td></tr><tr><td>00001</td><td>1</td></tr><tr><td>00010</td><td>2</td></tr><tr><td>00011</td><td>3</td></tr><tr><td>00100</td><td>4</td></tr><tr><td>00101</td><td>5</td></tr><tr><td>00110</td><td>6</td></tr><tr><td>00111</td><td>7</td></tr></table> When a C500 PLC is being used, the node address setting range is 0 to 7.	Set the CVM1-LK401's node address to the same node address that was set on the 3G2A5-LK009/C500-LK009-V1. (Set the rotary switches in 2-digit decimal in the range 00 to 07.)	Check the node address settings on other nodes in the PC Link to confirm that the same address is not already taken. A Unit error will **not** occur if the same node address is set on two PC Link Units in the same PC Link, but there will be data errors in the LR Area.

Item	Original Unit: 3G2A5-LK009/ C500-LK009-V1		Replacement Unit: CVM1-LK401		Remarks
Number of LR Bits	Check setting on pins 6 to 8: [ ] Bits / [ ] Units		Set the same number of LR bits that was set on the 3G2A5-LK009/C500-LK009-V1.		Make the "number of LR bits" setting on the polling node (node 0) in the PC Link. The "number of LR bits" settings on the other nodes (polled nodes) are ignored.
	Pins 6 to 8	Single-level LK003 mode	Pins 6 to 8	Pin 3 (single-level)	
	000	256 bits / 2 Units	000	32 bits / 32 Units	When a C500 PLC is replaced with a CVM1/CV-series PLC, the maximum number of Units is double the original value for the same number of LR bits, because the LR Area is twice as large.
	001	128 bits / 4 Units	001	64 bits / 16 Units	
	010	64 bits / 8 Units	010	128 bits / 8 Units	
	011	64 bits / 8 Units	011	256 bits / 4 Units	
	100	(See note.)	100	512 bits / 2 Units	
	101		101	Invalid setting	In pattern B, the original 3G2A5-LK009/C500-LK009-V1 is set to single-level LK003 mode.
	110		110		
	111		111		Set the level/link number (next item in table) to single-level mode.
					Note: Settings 011 to 111 are invalid settings in the C500-LK009-V1, but the number of LR bits will be set to 64 bits/8 Units if the setting is in the invalid range.
Level/Link Number	Pins 3 and 4: Check if set to single-level LK003 mode (10).		Pins 3 and 4: Set both pins to 1 (single-level).		Set the replacement CVM1-LK401 to single-level mode.
	Pins 3 & 4	Level/Link Number setting	Pins 3 and 4	Level/Link Number setting	
	11	Single-level LK009	11	Single-level (Set either 11 or 10.)	
	10	Single-level LK003	10		
	01	Multi-level Link #1	01	Multi-level Link #1	
	00	Multi-level Link #0	00	Multi-level Link #0	
Transmission Line Selector	Check SW2: [Up (4-wire) Down (2-wire)]		WIRE switch: Set the same setting as set on the 3G2A5-LK009/C500-LK009-V1.		---
	Up	4-wire/Use optical fiber cable.	4 (left)	4-wire/Use optical fiber cable.	
	Down	2-wire/Use electrical cable.	2 (right)	2-wire/Use electrical cable.	
Terminating Resistance	Check pin 1 of SW3: [1(ON)/0 (OFF)]		TER switch: Set the same setting as set on the 3G2A5-LK009/C500-LK009-V1.		---
	1	Terminator connected.	ON (left)	Terminator connected.	
	0	Terminator not connected.	OFF (right)	Terminator not connected.	

Item	Original Unit: 3G2A5-LK009/ C500-LK009-V1	Replacement Unit: CVM1-LK401		Remarks
LR Area	LR 00 to LR 31	CIO 1000 to CIO 1063		When the PC Link Unit is set to single-level LK003 mode, the level #1 PC Link Unit Restart Bit does not function.
PC Link Error and PLC Run Flags	SR 62	CIO 1500 + 25 × N to CIO 1500 + 25 × N + 3		
Level Flags	Not applicable.	Level #1	CIO 1500 + 25 × N + 4, bit 11	N is the CPU Bus Unit's unit number.
		Single-level or level #0	CIO 1500 + 25 × N + 4, bit 12	When the CVM1-LK401 is set to single-level mode, the Level Flag for level #1 does not function.
PC Link Unit Restart Bits	SR 6014	Corresponding bit in A001 (CPU Bus Unit Restart Bits)		

3-6-3 Pattern C: Large PLCs in Multi-level or Single-level LK009 Mode

The pattern C system contains only large PLCs (C500, C1000H, and C2000H) operating in single-level LK009 mode. All 3G2A5-LK009 PC Link Units in the PC Link must be replaced with C500-LK009-V1 PC Link Units.
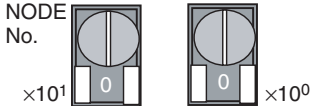
Checklist 6

Use the following checklist when replacing a 3G2A5-LK009 with a C500-LK009-V1.

Item	Original Unit: 3G2A5-LK009	Replacement Unit: C500-LK009-V1	Remarks
Node address	Check setting on pins 1 to 5: [ ] For details on the settings, refer to *Checklist 1*.	Pins 1 to 5: Set the same setting as on the 3G2A5-LK009.	Set exactly the same DIP switch setting. Check the node address settings on other nodes in the PC Link to confirm that the same address is not already taken. A Unit error will **not** be detected if the same node address is set on two PC Link Units in the same PC Link, but there will be data errors in the LR Area.
Number of LR Bits	Check setting on pins 6 to 8: [ ] For details on the settings, refer to *Checklist 1*.	Pins 6 to 8: Set the same setting as on the 3G2A5-LK009.	Set exactly the same DIP switch setting. Make the "number of LR bits" setting on the polling node (node 0) in the PC Link. The "number of LR bits" settings on the other nodes (polled nodes) are ignored.
Level/Link Number	Check setting on pins 3 and 4 of SW3. [ ] For details on the settings, refer to *Checklist 1*.	Pins 3 and 4 of SW3: Set the same setting as on the 3G2A5-LK009.	Set exactly the same DIP switch setting.
Transmission Line Selector	Check SW2: [Up (4-wire) / Down (2-wire)] For details on the settings, refer to *Checklist 1*.	SW2: Set to the same as the that was set on the 3G2A5-LK009.	Set exactly the same switch setting.
Terminating Resistance	Check pin 1 of SW3: [1(ON)/0 (OFF)] For details on the settings, refer to *Checklist 1*.	Pin 1 of SW3: Set to the same as the that was set on the 3G2A5-LK009.	Set exactly the same switch setting.

Item	Original Unit: 3G2A5-LK009		Replacement Unit: C500-LK009-V1		Remarks
LR Area	LR 00 to LR 63 (LR 00 to LR 31 in C500)		LR 00 to LR 63 (LR 00 to LR 31 in C500)		---
PC Link Error and PLC Run Flags	SR 247 to SR 250/SR258 (SR 62 in C500)		SR 247 to SR 250/SR258 (SR 62 in C500)		
Level Flags	Level #1	AR 2411 (Except C500)	Level #1	AR 2411 (Except C500)	
	Single-level or level #0	AR 2412 (Except C500)	Single-level or level #0	AR 2412 (Except C500)	
PC Link Unit Restart Bits	Level #1	SR 25210 (SR 6010 in C500)	Level #1	SR 25210 (SR 6010 in C500)	
	Single-level or level #0	SR 25214 (SR 6014 in C500)	Single-level or level #0	SR 25214 (SR 6014 in C500)	

Checklist 7

Use the following checklist when replacing a 3G2A5-LK009 or C500-LK009-V1 with a CVM1-LK401.

Item	Original Unit: 3G2A5-LK009/C500-LK009-V1				Replacement Unit: CVM1-LK401	Remarks
CPU Bus Unit unit number	Not applicable				Any unique number in setting range (Do not set the same unit number on two CPU Bus Units in a PLC.)	Do not mount more PC Link Units than allowed.
Node address	Check setting on pins 1 to 5: [ ]				Set the CVM1-LK401's node address to the same node address that was set on the 3G2A5-LK009/C500-LK009-V1. Set the rotary switches in 2-digit decimal.	Check the node address settings on other nodes in the PC Link to confirm that the same address is not already taken.
	Pins 1 to 5	Node address	Pins 1 to 5	Node address	If upgrading from a C500 PLC, set a node address between 00 and 07.	A Unit error will **not** occur if the same node address is set on two PC Link Units in the same PC Link, but there will be data errors in the LR Area.
	00000	0	10000	16	NODE No.	
	00001	1	10001	17		
	00010	2	10010	18		
	00011	3	10011	19	$\times 10^1$ 0 0 $\times 10^0$	
	00100	4	10100	20		
	00101	5	10101	21		
	00110	6	10110	22		
	00111	7	10111	23		
	01000	8	11000	24		
	01001	9	11001	25		
	01010	10	11010	26		
	01011	11	11011	27		
	01100	12	11100	28		
	01101	13	11101	29		
	01110	14	11110	30		
	01111	15	11111	31		

Item	Original Unit: 3G2A5-LK009/C500-LK009-V1			Replacement Unit: CVM1-LK401			Remarks
Number of LR Bits	Check setting on pins 6 to 8 of SW1: [ ] Bits / [ ] Units			Set the same number of LR bits that was on the 3G2A5-LK009/C500-LK009-V1.			Make the "number of LR bits" setting on the polling node (node 0) in the PC Link. The "number of LR bits" settings on the other nodes (polled nodes) are ignored.
	Pins 6 to 8	Pin 3 of SW3		Pins 6 to 8	Pin 3		
		1 (Single-level LK009)	0 (Multi-level)		1 (Single-level)	0 (Multi-level)	Set the same level/link number (next item in table) that was set on the Unit being replaced.
	000	32 bits/ 32 (8) Units	32 bits/ 16 (8) Units	000	32 bits/ 32 Units	32 bits/ 16 Units	The number of Units listed in parentheses for the 3G2A5-LK009/C500-LK009-V1 is the maximum number of Units for the C500 PLC. The (*1) setting is invalid for the C500.
	001	64 bits/ 16 (8) Units	64 bits/ 8 (4) Units	001	64 bits/ 16 Units	64 bits/ 8 Units	
	010	128 bits/ 8 (4) Units	128 bits/ 4 (2) Units	010	128 bits/ 8 Units	128 bits/ 4 Units	
	011	256 bits/ 4 (2) Units	256 bits/ 2 (*1) Units	011	256 bits/ 4 Units	256 bits/ 2 Units	
	100	512 bits/ 2 (*1) Units	256 bits/2 Units (*2)	100	512 bits/ 2 Units	Invalid setting	(*2) These settings are not supported by the C500-LK009-V. If one of these values is set, the max. valid number of bits will be used instead.
	101	256 bits/ 2 Units (*2)		101	Invalid setting		
	110			110			
	111			111			
Level/Link Number	Check setting on pins 3 and 4 of SW3: [ ]			Pins 3 and 4: Set the same Level/ Link Number as set on the 3G2A5-LK009/C500-LK009-V1.			The CVM1-LK401's single-level mode is equivalent to the C500-LK009-V1's single-level LK009 mode. The CVM1-LK401 cannot emulate the single-level LK003 mode.
	Pins 3 & 4	Level/Link Number setting		Pins 3 & 4	Level/Link Number setting		
	11	Single-level LK009		11	Single-level (Either 11 or 10 can be set.)		
	10	Single-level LK003		10			Pattern C systems do not include Units set to single-level LK003 mode.
	01	Multi-level Link #1		01	Multi-level Link #1		
	00	Multi-level Link #0		00	Multi-level Link #0		
Transmission Line Selector	Check setting on SW2: [Up (4-wire)/ Down (2-wire)]			WIRE switch: Set the same setting as set on the 3G2A5-LK009/C500-LK009-V1.			---
	Up	4-wire/Use optical fiber cable.		4 (left)	4-wire/Use optical fiber cable.		
	Down	2-wire/Use electrical cable.		2 (right)	2-wire/Use electrical cable.		
Terminating Resistance	Check setting on pin 1 of SW3: [1(ON)/ 0 (OFF)]			TER switch: Set the same setting as set on the 3G2A5-LK009/C500-LK009-V1.			---
	1	Terminator connected.		ON (left)	Terminator connected.		
	0	Terminator not connected.		OFF (right)	Terminator not connected.		

Item	Original Unit: 3G2A5-LK009/C500-LK009-V1		Replacement Unit: CVM1-LK401		Remarks
LR Area	LR 00 to LR 63 (or LR 00 to LR 31 in the C500)		CIO 1000 to CIO 1063		N is the CPU Bus Unit's unit number.
PC Link Error and PLC Run Flags	SR 247 to SR 250 (or SR 58 and SR 62 in the C500)		CIO 1500 + 25 × N to CIO 1500 + 25 × N + 3		
Level Flags	Level #1	AR 2411 (Except C500)	Level #1	CIO 1500 + 25 × N + 4, bit 11	
	Single-level or level #0	AR 2412 (Except C500)	Single-level or level #0	CIO 1500 + 25 × N + 4, bit 12	
PC Link Unit Restart Bits	Level #1	SR 25210 (SR 6010 in C500)	Corresponding bit in A001 (CPU Bus Unit Restart Bits)		
	Single-level or level #0	SR 25214 (SR 6014 in C500)			

SECTION 4
Starting the PC Link System

This section explains how to start the PC Link system and verify that links have been established.

4-1 Starting the PC Link System

After replacing the PLCs and PC Link Units in the existing system and making the necessary settings on the new PC Link Units, use a Programming Device (CX-Programmer or a Programming Console) to make the necessary settings in the PLC and start the PC Link.

Checkpoints

Check the following items before starting the system. For details, refer to *3-6 Replacement Checklists*.

1. Have PLCs been replaced with CVM1/CV-series PLCs?
2. Have PC Link Units been replaced with CVM1-LK401 Units?
3. Are the switch settings on the CVM1-LK401 Units correct?
4. Is the Unit wiring and communications cable wiring correct?
5. Are the changes to the ladder program, LR Area, and Status Area correct?

Startup Procedure

1,2,3...
1. Turn ON the power to the replacement CVM1/CV-series PLC and connect the Programming Device (Programming Console or CX-Programmer).
2. Create the I/O table.
   - For details on creating the I/O table with a Programming Console, refer to the *CVM1-PRS21-E Programming Console Operation Manual* (W222).
   - For details on creating the I/O table with the CX-Programmer, refer to the *CX-Programmer Operation Manual*.
   - The I/O table cannot be created offline with Version 4.0 or earlier versions of the CX-Programmer. In that case, create the I/O table online.
   - The CVM1-LK401 PC Link Units cannot be registered with Version 4.0 or earlier versions of the CX-Programmer, so those PC Link Units will be listed as unknown when the I/O table is read.
   - It is not necessary to register this PC Link Unit in the routing table.
3. Set the CPU Unit's mode to synchronous operation mode in the PLC Setup.

   The C500, C1000H, and C2000H PLCs operate in synchronous operation mode.

   The default mode for the CVM1/CV-series PLCs is asynchronous operation mode, but the data in the LR Area may change within one execution cycle in asynchronous mode and adjacent words may not contain synchronous data. We recommend changing to synchronous mode when connecting to a PC Link system. For details, refer to *3-5 PLC Operation Mode (Synchronous/Asynchronous Mode)*.
   - When changing the PLC Setup with the CX-Programmer, select **PLC Setup - Execution Controls - Execute Processing**, and select *Synchronous*. Make this setting in PROGRAM mode. The setting will be enabled the next time that the power is turned ON.
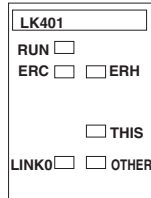
   The setting can also be changed with the CVSS, but it cannot be changed with a Programming Console.

4-2   Checking the PC Link's Operating Conditions

LED Indicators

Turn ON the power supplies to all PLCs in the PC Link system and check the status of the PC Link Units' LED Indicators with the PLCs in PROGRAM mode.

CVM1-LK401 Indicators

Meaning of the CVM1-LK401 LED Indicators

Name	Color	Status	Unit status
RUN (Run)	Green	Lit	The Unit is operating normally. (Lit after initialization is completed.)
		Not lit	Unit error
ERC (Communications error)	Red	Lit	A hardware error or node address setting error occurred. (See note.)
		Flashing	A link error occurred with the polling node link, Local Unit link, or Other Unit link.
		Not lit	The Unit is communicating normally.
ERH (PLC error)	Red	Lit	An error occurred in the PLC, such as a CPU Unit error, PLC interface error, EEPROM error, unit number setting error, or I/O table setting error.
		Not lit	There are no errors in the CPU Unit.
LINK0 (Node 0/Polling node link)	Yellow	Lit	Normal status, link established with Node 0 (polling node)
		Not lit	Error status, link not established with Node 0 (polling node)
THIS (Local Unit link)	Yellow	Lit	Normal status, link established with local Unit
		Not lit	Error status, link not established with local Unit
OTHER (Other Unit link)	Yellow	Lit	Normal status, link established with other Unit
		Not lit	Error status, link not established with other Unit

Checking the PC Link's Status with LED Indicators

The following table compares common LED Indicator displays with those of the C500-LK009-V1 and C200H-LK401. (□: Lit, □: Not lit, ▨: Flashing)

Indicator status			Meaning
CVM1-LK401	**C200H-LK401**	**C500-LK009-V1 (Display pattern B)**	
LK401 RUN ■ ERC □ □ ERH ■ THIS LINK0 ■ ■ OTHER	LK401 RUN ■ ■ THIS LINK0 ■ ■ □ ERROR	LINK 0 ● THIS LINK ● OTHER ● ☼ RUN ✻ ERROR	Node 0 (the polling node), the local node, and other nodes are operating normally.
LK401 RUN ■ ERC □ □ ERH □ THIS LINK0 □ □ OTHER	LK401 RUN ■ □ THIS LINK0 □ □ □ ERROR	LINK 0 ○ THIS LINK ● OTHER ○ ☼ RUN ✻ ERROR	The local node is not node 0 and could not establish communications with other nodes after power was turned ON.
LK401 RUN ■ ERC □ □ ERH ■ THIS LINK0 ■ □ OTHER	LK401 RUN ■ ■ THIS LINK0 ■ □ OTHER □ ERROR	LINK 0 ● THIS LINK ● OTHER ○ ☼ RUN ✻ ERROR	The local node is node 0 and could not establish communications with other nodes after power was turned ON.

Indicator status			Meaning
CVM1-LK401	**C200H-LK401**	**C500-LK009-V1 (Display pattern B)**	
LK401 RUN ■ ERC ▨ □ ERH ■ THIS LINK0 ■ □ OTHER	LK401 RUN ■ ■ THIS LINK0 ■ □ OTHER ▨ ERROR	LINK 0 ● THIS LINK ● OTHER ◐ ☼ RUN ✻ ERROR	An error occurred in a node other than the local node and node 0.
LK401 RUN ■ ERC ▨ □ ERH ■ THIS LINK0 □ □ OTHER	LK401 RUN ■ ■ THIS LINK0 □ □ OTHER ▨ ERROR	LINK 0 ◐ THIS LINK ● OTHER ◑ ☼ RUN ✻ ERROR	The local node is not node 0 and a communications error occurred between the local node and node 0 (the polling node).
LK401 RUN ■ ERC ■ □ ERH □ THIS LINK0 □ □ OTHER	LK401 RUN ■ □ THIS LINK0 □ □ OTHER ■ ERROR	No equivalent Indicator status	A node address setting error occurred. This error occurs when the node address is set outside of the allowed range. Single-level: 00 to 31 Multi-level: 00 to 15

Note Check the switch settings before operation. If the PC Link Unit's node address is duplicated on another node in the PC Link, the ERC and ERROR Indicators will not light, but data errors will occur in the LR Area.

This section provides tables to help identify and correct errors in the PC Link system.

5-1   Troubleshooting with LED Indicators
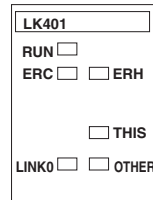
LED Indicators

The LED Indicators on the front of the PC Link Unit indicate when an error has occurred.

• Display

```
┌─────────────────────┐
│ ┌─────────────────┐ │
│ │ LK401           │ │
│ └─────────────────┘ │
│ RUN ☐               │
│ ERC ☐    ☐ ERH      │
│                     │
│                     │
│          ☐ THIS     │
│ LINK0 ☐  ☐ OTHER    │
└─────────────────────┘
```

Name	Color	Status	Unit status
RUN (Run)	Green	Lit	The Unit is operating normally. (Lit after initialization is completed.)
		Not lit	Unit error
ERC (Communications error)	Red	Lit	A hardware error or node address setting error occurred. (See note.)
		Flashing	A link error occurred with the polling node link, Local Unit link, or Other Unit link.
		Not lit	The Unit is communicating normally.
ERH (PLC error)	Red	Lit	An error occurred in the PLC, such as a CPU Unit error, PLC interface error, EEPROM error, unit number setting error, or I/O table setting error.
		Not lit	There are no errors in the CPU Unit.
LINK0 (Node 0/Polling node link)	Yellow	Lit	Normal status, link established with Node 0 (polling node)
		Not lit	Error status, link not established with Node 0 (polling node)
THIS (Local Unit link)	Yellow	Lit	Normal status, link established with local Unit
		Not lit	Error status, link not established with local Unit
OTHER (Other Unit link)	Yellow	Lit	Normal status, link established with other Unit
		Not lit	Error status, link not established with other Unit

Note   A node address setting error will occur when the node address is not in the allowed setting range (0 to 31 for single-level operation or 0 to 15 for multi-level operation).

A node address setting error will **not** occur if the same node address is set on two PC Link Units, but there will be data errors in the LR Area. Be sure to set a unique address on each Unit.

Troubleshooting with LED Indicators

Use the following table to identify and correct errors based on the LED Indicator status.

Indicator status						Probable cause	Remedy
RUN	ERC	ERH	LINK0	THIS	OTHER		
Not lit	Not lit	Not lit	Not lit	Not lit	Not lit	The PC Link Unit is faulty.	Mount the Unit in another CPU Rack and replace the Unit if the Error recurs.
						Power is not being supplied properly to the CPU Unit.	Check the power supply voltage and supply the proper power.
						The PC Link Unit is not mounted securely.	Secure the Unit in the Rack.
						The PC Link Unit is mounted in a slot that does not support it.	Mount the Unit in a slot that supports it.
Not lit	Not lit	Lit	Lit	Lit	Not lit	Local node is the polling node (node 0): The affected Unit is not in the CPU Unit's I/O Table or is registered incorrectly.	Create a correct I/O table.
						Local node is the polling node (node 0): The CPU Unit is faulty or an error occurred in the CPU Unit so the Unit is not being serviced.	Eliminate the CPU Unit's error. Replace the CPU Unit if the error recurs.
						Local node is the polling node (node 0): The CPU Bus Unit unit number is not within the allowed range.	Set the PC Link Unit's unit number (as a CPU Bus Unit) between 0 and 15.
						Local node is the polling node (node 0): The same unit number is set on another CPU Bus Unit in the PLC.	Set the unit numbers again to eliminate the duplication.
Not lit	Not lit	Lit	Not lit	---	Not lit	Local node is a polled node: The affected Unit is not in the CPU Unit's I/O Table or is registered incorrectly.	Create a correct I/O table.
						Local node is a polled node: The CPU Unit is faulty.or an error occurred in the CPU Unit so the Unit is not being serviced.	Eliminate the CPU Unit's error. Replace the CPU Unit if the error recurs.
						Local node is a polled node: The CPU Bus Unit unit number is not within the allowed range.	Set the PC Link Unit's unit number (as a CPU Bus Unit) between 0 and 15.
						Local node is a polled node: The same unit number is set on another CPU Bus Unit in the PLC.	Set the unit numbers again to eliminate the duplication.

Indicator status						Probable cause	Remedy
RUN	ERC	ERH	LINK0	THIS	OTHER		
Lit	Not lit	---	Lit	Lit	Not lit	Local node is the polling node (node 0): Cables are disconnected or connected incorrectly.	Check the Terminating Resistance switch setting. Check the cable connections and fix or replace the cable if necessary.
						Local node is the polling node (node 0): There are no other nodes in the PC Link.	Set up the network with at least two functioning nodes.
						The PC Link Unit is set incorrectly.	Check whether there is another node in the PC Link with the same node address. Check whether the level/link number setting is correct.
Lit	Not lit	---	Not lit	Not lit	Not lit	Local node is a polled node: Cables are disconnected or connected incorrectly.	Check the Terminating Resistance switch setting. Check the cable connections and fix or replace the cable if necessary.
						Local node is a polled node: There are no other nodes in the PC Link.	Set up the network with at least two functioning nodes.
						The PC Link Unit is set incorrectly.	Check whether there is another node in the PC Link with the same node address. Check whether the level/link number setting is correct.
Lit	Lit	Not lit	Not lit	Not lit	Not lit	The PC Link Unit is faulty or an error occurred in the PC Link Unit so that it can't communicate properly.	Mount the Unit in another CPU Rack and replace the Unit if the Error recurs.
Lit	Lit	---	Not lit	Not lit	Not lit	The node address is set outside of the allowed range.	Set the node address within the following ranges. Single-level: 00 to 31 Multi-level: 00 to 15
Lit	Flashing	---	Lit	Lit	Not lit	A polled node's (another node's) cables are disconnected or connected incorrectly.	Check the Terminating Resistance switch setting. Check the cable connections and fix or replace the cable if necessary.
						An error occurred in communications with a polled node (another node).	If noise is causing errors, check and correct the operating environment. Separate the communications cables from power/high voltage lines.
						Power is not being supplied properly to the CPU Unit of a polled node (another node).	Check the power supply voltage and supply the proper power.
						The PC Link Unit is set incorrectly.	Check whether there is another node in the PC Link with the same node address. Check whether the level/link number setting is correct.

Indicator status						Probable cause	Remedy
RUN	**ERC**	**ERH**	**LINK0**	**THIS**	**OTHER**		
Lit	Flash-ing	---	Not lit	Lit	Not lit	A polling node's (node 0) cables are disconnected or connected incorrectly.	Check the Terminating Resistance switch setting. Check the cable connections and fix or replace the cable if necessary.
						Power is not being supplied properly to the CPU Unit of the polling node (node 0).	Check the power supply voltage and supply the proper power.
						An error occurred in the CPU Unit of the PLC in which the polling node is mounted.	Eliminate the CPU Unit's error. Replace the CPU Unit if the error recurs.
						The PC Link Unit is set incorrectly.	Check whether there is another node in the PC Link with the same node address. Check whether the level/link number setting is correct.

Note (1) The PC Link Units will not detect an error even if there are two PC Link Units with the same level settings (both single-level, both multi-level link #0, or both multi-level link #1) in the same PLC. Be sure that the level/link number settings are correct so that the PC Link operates properly.

(2) Check the switch settings and confirm that the same node address is not set on more than one PC Link Unit in the PC Link. The PC Link Unit will not detect an error even if the same node address is set on another PC Link Unit, but there will be data errors in the LR Area.

5-2 Troubleshooting with Status Area Functions

PC Link Error and PLC Run Flags

The first four words of the allocated CPU Bus Unit Area (CIO 1500 + 25 × N to CIO 1500 + 25 × N + 3) contain flags that indicate the operating status of the PC Link and each PLC connected to the PC Link system. (N is the unit number set on the PC Link Unit as a CPU Bus Unit.)

PLC Run Flags	ON when the corresponding PLC is operating normally. OFF when the corresponding PLC is stopped.
	The PLC Run Flags can be read from any PLC in the system to determine the operational status of each PLC in the PC Link.
	Operating in RUN or MONITOR mode: ON PROGRAM mode or error occurred: OFF
PC Link Error Flags	ON when there is a transfer error or a power interruption in the corresponding PC Link Unit. OFF when the PC Link Unit is operating normally.
	If an error occurs when the power is turned ON and the PC Link is not established, these flags will not operate (all OFF).

Flag Allocation in Single-level Mode

Word	PC Link Error Flags								PLC Run Flags							
(N = Unit number)	**15**	**14**	**13**	**12**	**11**	**10**	**09**	**08**	**07**	**06**	**05**	**04**	**03**	**02**	**01**	**00**
1500 + 25 × N	31	30	29	28	27	26	25	24	31	30	29	28	27	26	25	24
1500 + 25 × N + 1	23	22	21	20	19	18	17	16	23	22	21	20	19	18	17	16
1500 + 25 × N + 2	15	14	13	12	11	10	9	8	15	14	13	12	11	10	9	8
1500 + 25 × N + 3	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Flag Allocation in Multi-level Mode

Word		PC Link Error Flags								PLC Run Flags							
(N = Unit number)		15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
$1500 + 25 \times N$	Link #1	15	14	13	12	11	10	9	8	15	14	13	12	11	10	9	8
$1500 + 25 \times N + 1$		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
$1500 + 25 \times N + 2$	Link #0	15	14	13	12	11	10	9	8	15	14	13	12	11	10	9	8
$1500 + 25 \times N + 3$		7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0

Troubleshooting with Status Flags

Flag status	Probable cause	Remedy
PLC Run Flag OFF	The PC Link Unit's switch settings are incorrect.	Check settings such as the level/link number, node address, and number of LR bits.
		Confirm that the PC Link Unit's node address is not set on another node in the PC Link.
		Confirm that all of the nodes in the PC Link have the same level/link number setting.
	An error occurred in the PLC in which the affected Unit is mounted.	Refer to the PLC's Operating Manual to clear the error.
		If the error recurs, replace the PLC.
	The PLC is stopped.	Switch the PLC to RUN mode.
PC Link Error Flag ON	The PC Link Unit's switch settings are incorrect.	Check settings such as the level/link number, node address, and number of LR bits.
		Confirm that the PC Link Unit's node address is not set on another node in the PC Link.
	The cable is disconnected or damaged.	Check the connections and the cable itself.
	An error occurred in the affected Unit.	Check the affected Unit's LED Indicators, identify the error using the table in *5-1 Troubleshooting with LED Indicators*, and correct the error.
	A communications error occurred due to noise.	Check the length of the branch lines and main line.
		Check the Terminating Resistance switch settings.
		Separate the communications cables from power/high voltage lines.

Appendix A
Standard Models

PC Link Units

Applicable PLCs	Model number	Remarks
CVM1/CV Series	CVM1-LK401	For details on compatibility, refer to the table *PC Link Unit Combinations* on page 33.
C500, C1000H, and C2000H	C500-LK009-V1	
C200H, C200HS, C200HX/HG/HE, and CS Series	C200H-LK401	

Link Adapters

Applicable cables	Model number	Remarks
Electrical cable	3G2A9-AL001	RS-422/RS-485 (3 connectors)
Electrical and optical fiber cable	3G2A9-AL004-PE	RS-232C (1 connector), RS-422/RS-485 (1 connector), and Optical (APF/PCF, 1 connector)
	3G2A9-AL004-E	RS-232C (1 connector), RS-422/RS-485 (1 connector), and Optical (PCF, 1 connector)
Optical fiber cable	3G2A9-AL002-E	Optical (PCF, 3 connectors)
	3G2A9-AL005-E (See note.)	Optical (PCF, 1 connector) Optical (AGF, 1 connector)
	3G2A9-AL006-E (See note.)	Optical (PCF, 1 connector) Optical (AGF, 2 connectors)
	3G2A9-AL002-PE	Optical (APF/PCF, 3 connectors)
	3G2A9-AL005-PE (See note.)	Optical (APF/PCF, 1 connector) Optical (AGF, 1 connector)
	3G2A9-AL006-PE (See note.)	Optical (APF/PCF, 1 connector) Optical (AGF, 2 connectors)

Note The 3G2A9-AL005-(P)E and 3G2A9-AL006-(P)E are no longer being produced.

RS-485 Connectors

Name	Model number	Manufacturer
Connector	XM2A-0901	OMRON
Housing	XM2S-0911	OMRON

One XM2A-0901 Connector and one XM2S-0911 Connector Housing are included with the PC Link Unit.

Recommended Cable

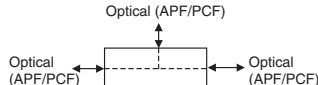| Model number	Manufacturer
CO-HC-ESV-3P × 7/0.2 (H-9293A)	Hiragawa Hewtech Corp.

Optical Fiber Cables

All Plastic Optical Fiber Cable (APF)

Name	Specifications	Model number
Plastic Optical Fiber Cable	Cable only (w/o connector) Order in multiples of 5 m from 5 to 100 m, or in lengths of 200 m or 500 m	B500-PF002
Optical Connector A	With two optical connectors (brown) For plastic optical fiber cable up to 10 m long	3G5A2-C0001
Optical Connector B	With two optical connectors (black) For plastic optical fiber cable between 8 and 20 m long	3G5A2-C0002
Plastic Optical Fiber Set	1 m cable with Connector A attached to both ends	3G5A2-PF101
Optical Connector Puller	---	B500-TL101

- APF cable up to 20 m long can be used with Link Adapters with model numbers ending in the "-P" suffix.
- APF cable can not be used with Link Adapters without the "-P" suffix at the end of the model number.
- Connectors must be attached to the ends of the B500-PF002 cable by the user.
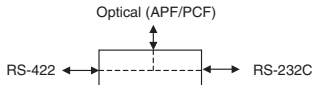- The B500-TL101 Optical Connector Puller is no longer being produced.
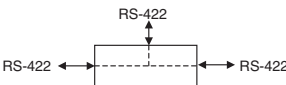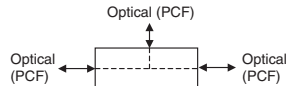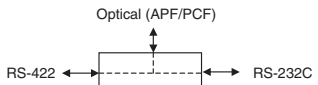
Plastic Clad Optical Fiber Cable (PCF)

Name	Specifications		Model number
Optical Fiber Cable (Indoor use only)	Operating temperature: −10 to 70°C	0.1 m	3G5A2-0F011
		1 m	3G5A2-0F101
		2 m	3G5A2-0F201
		3 m	3G5A2-0F301
		5 m	3G5A2-0F501
		10 m	3G5A2-0F111
		20 m	3G5A2-0F211
		30 m	3G5A2-0F311
		40 m	3G5A2-0F411
		50 m	3G5A2-0F511
Optical Fiber Cable (Indoor/outdoor use)	Operating temperature: −10 to 70°C	1 to 500 m (Order in multiples of 1 m.)	3G5A2-0F002
	Operating temperature: 0 to 55°C (Do not expose to direct sunlight.)	501 to 800 m (Order in multiples of 1 m.)	

- PCF cable up to 200 m long can be used with Link Adapters with model numbers ending in the "-P" suffix.
- PCF cable up to 800 m long can be used with Link Adapters without the "-P" suffix at the end of the model number.
- The cable lengths in the table above do **not** include the optical connectors at both ends of the cable.
- Since optical fiber cable cannot be cut and spliced easily like ordinary electrical cables, be sure to add some extra length to the cable length when ordering.

Appendix B
Link Adapter Specifications

Model number	Function	Connection method	Power supply (Allowable range)	Power consumption	Weight
3G2A9-AL001	Branches an RS-422 line.	RS-422 ← → RS-422, RS-422	Not required.	---	250 g max.
3G2A9-AL002-PE	Branches an optical fiber line (APF or PCF).	Optical (APF/PCF), Optical (APF/PCF) ← → Optical (APF/PCF)	100/200 VAC (85 to 132 VAC or 170 to 264 VAC) or 12 to 24 V AC/DC (10.2 to 26.4 VAC or VDC)	10 VA max.	900 g max.
3G2A9-AL002-E	Branches an optical fiber line (PCF).	Optical (PCF), Optical (PCF) ← → Optical (PCF)			
3G2A9-AL004-PE	Branches an optical fiber line (APF or PCF) and RS-232C/RS-422 line.	Optical (APF/PCF), RS-422 ← → RS-232C	100/200 VAC (85 to 132 VAC or 170 to 264 VAC)	10 VA max.	1 kg max.
3G2A9-AL004-E	Branches an optical fiber line (PCF) and RS-232C/RS-422 line.	Optical (APF/PCF), RS-422 ← → RS-232C			

APF: All Plastic Optical Fiber Cable
PCF: Plastic Clad Optical Fiber Cable

Cable Length (Maximum)

RS-232C: 15 m max.

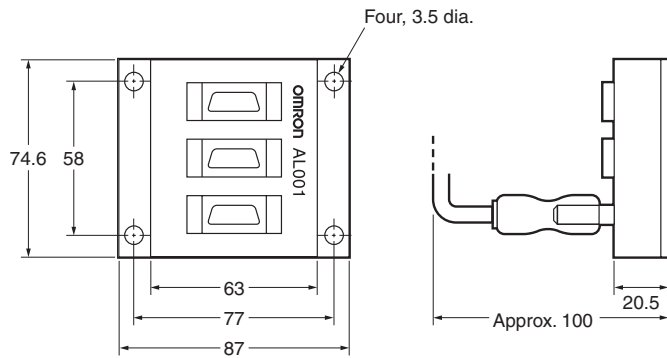RS-422: 500 m max. total cable length (branch lines 10 m max. each)

Optical fiber cable: Max. cable length depends on Link Adapter model, as shown in the following table.

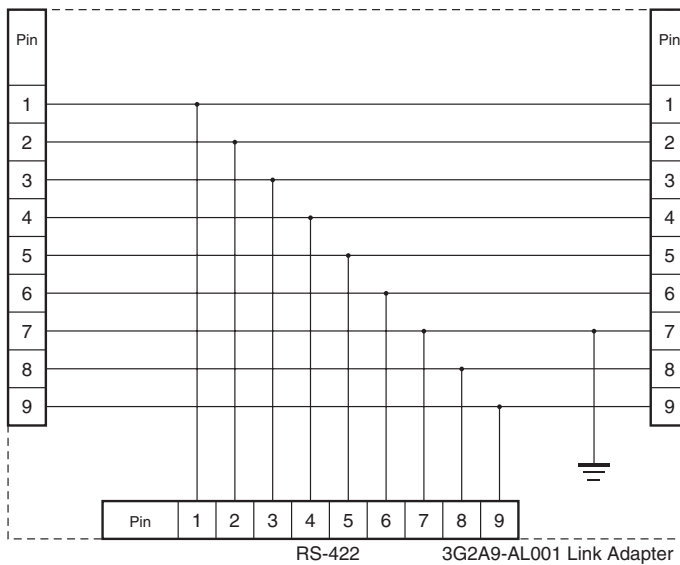| Cable type	Max. cable length for Link Adapter models with the "-P" suffix	Max. cable length for Link Adapter models without the "-P" suffix
APF	20 m	Cannot be connected.
PCF	200 m	800 m

A 3G2A9-AL005-(P)E or 3G2A9-AL006-(P)E Link Adapter is required if the distance between PLCs exceeds 800 m. For details, refer to the *C-series Link Adapters Installation Guide* (Cat. No. W123).

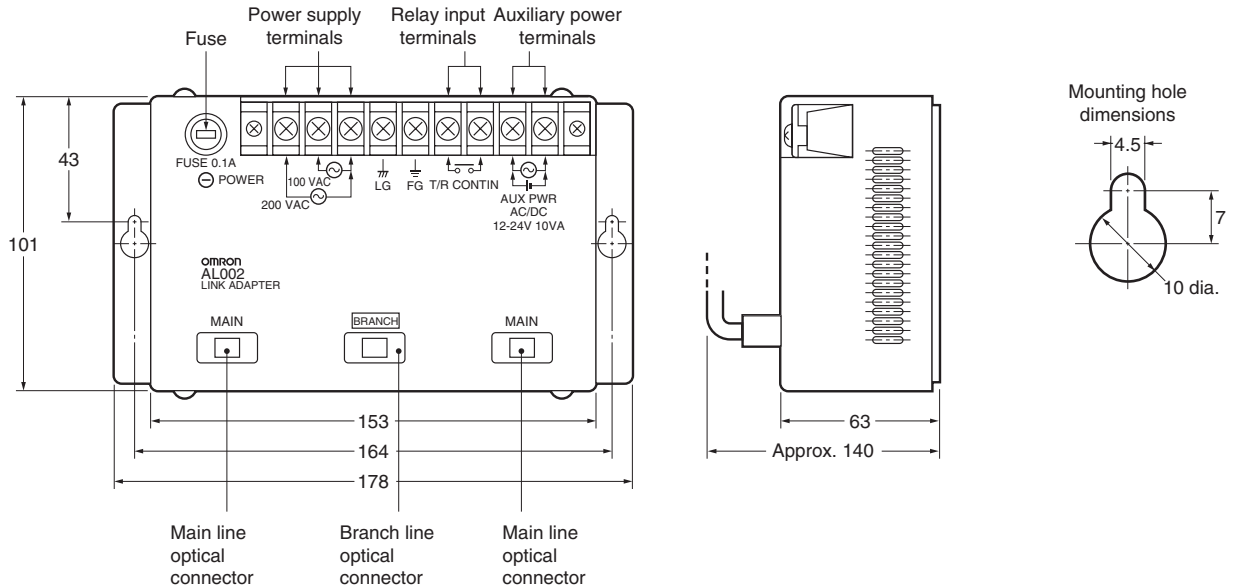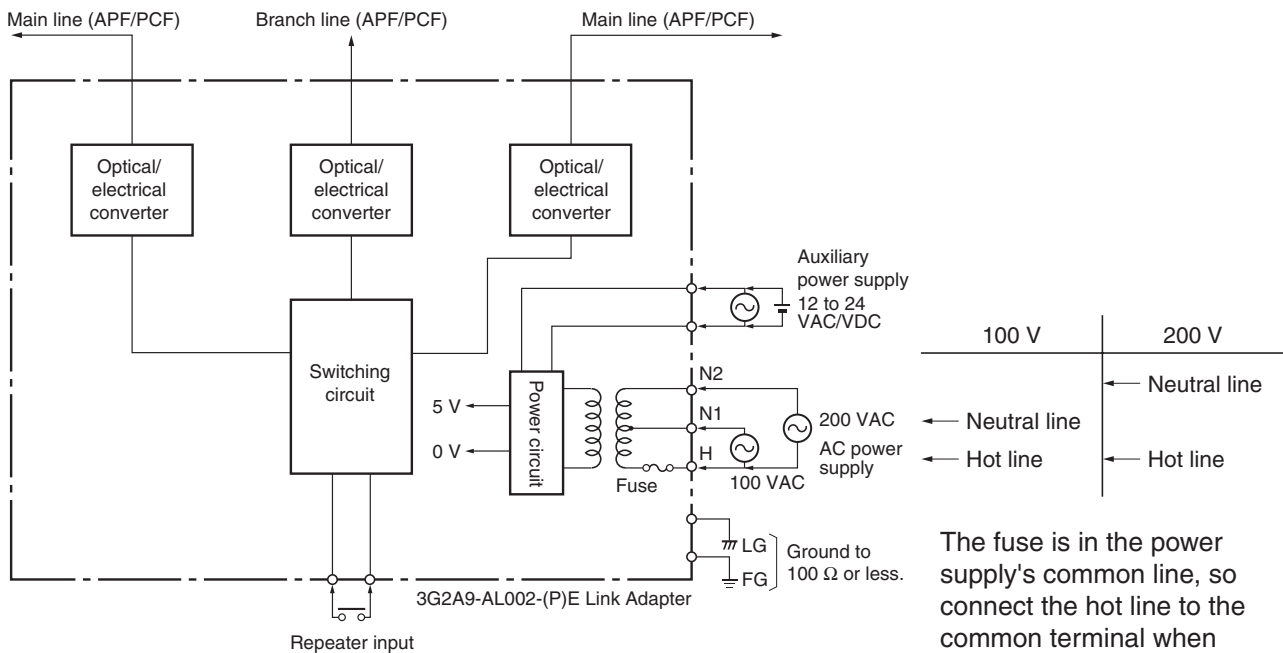# 3G2A9-AL001 Link Adapter

Dimensions

Pin Arrangement

3G2A9-AL002-(P)E Link Adapter

Dimensions

Fuse

Power supply terminals

Relay input terminals

Auxiliary power terminals

FUSE 0.1A
⊖ POWER

100 VAC
200 VAC

LG FG T/R CONTIN

AUX PWR
AC/DC
12-24V 10VA

43

101

OMRON
AL002
LINK ADAPTER

MAIN   BRANCH   MAIN

153

164

178

Main line optical connector

Branch line optical connector

Main line optical connector

63

Approx. 140

Mounting hole dimensions

4.5

7

10 dia.

Internal Structure

Main line (APF/PCF)   Branch line (APF/PCF)   Main line (APF/PCF)

Optical/
electrical
converter

Optical/
electrical
converter

Optical/
electrical
converter

Auxiliary
power supply
12 to 24
VAC/VDC

Switching
circuit

Power circuit

5 V

0 V

Fuse

N2

N1

H

200 VAC
AC power
supply
100 VAC

LG Ground to
FG 100 Ω or less.

3G2A9-AL002-(P)E Link Adapter

Repeater input

Always short the repeater input terminals
when using the Link Adapter.

	100 V	200 V
		Neutral line
	Neutral line	
	Hot line	Hot line

The fuse is in the power supply's common line, so connect the hot line to the common terminal when wiring the AC power supply.

Cable Length (Maximum)

Cable type	3G2A9-AL002-PE	3G2A9-AL002-E
APF	20 m	Cannot be connected.
PCF	200 m	800 m

APF: All Plastic Optical Fiber Cable
PCF: Plastic Clad Optical Fiber Cable

- The Link Adapter will operate with either a 100/200 VAC or 12 to 24 V (AC or DC) power supply.
- The repeater input terminals should be shorted during normal use.

Note (1) Always short the repeater input terminals when using the Link Adapter. The Link Adapter will not operate unless the terminals are shorted.

(2) Always place the protective caps on unused optical connectors. When the cap is not in place, it is possible for scattered light to cause transmission errors.

(3) When the Link Adapter is installed in an office or on a desk, take steps to prevent the power supply terminals from being touched accidentally, which can cause an electric shock.

3G2A9-AL004-(P)E Link Adapter

Dimensions

Internal Structure

3G2A9-AL004-(P)E Link Adapter
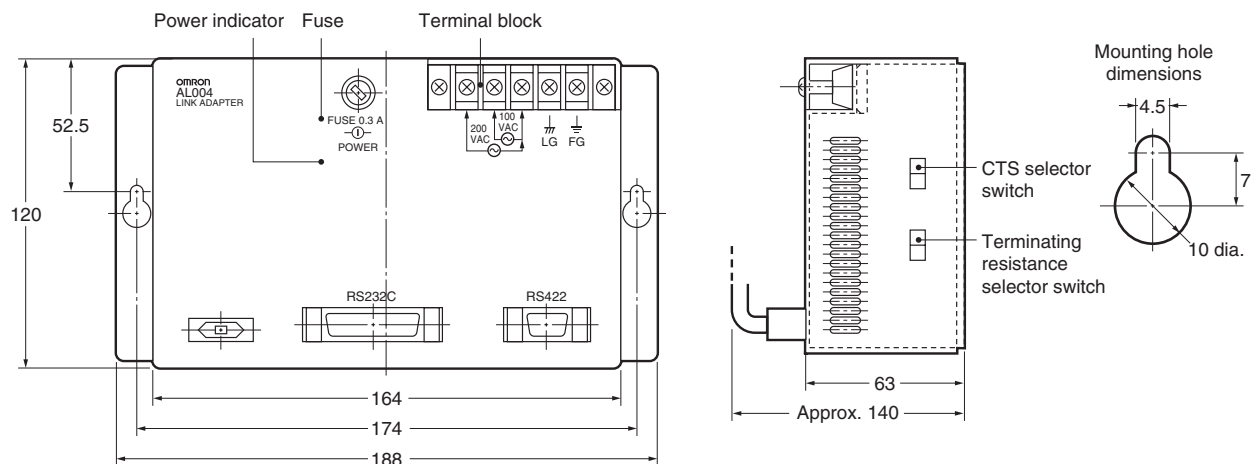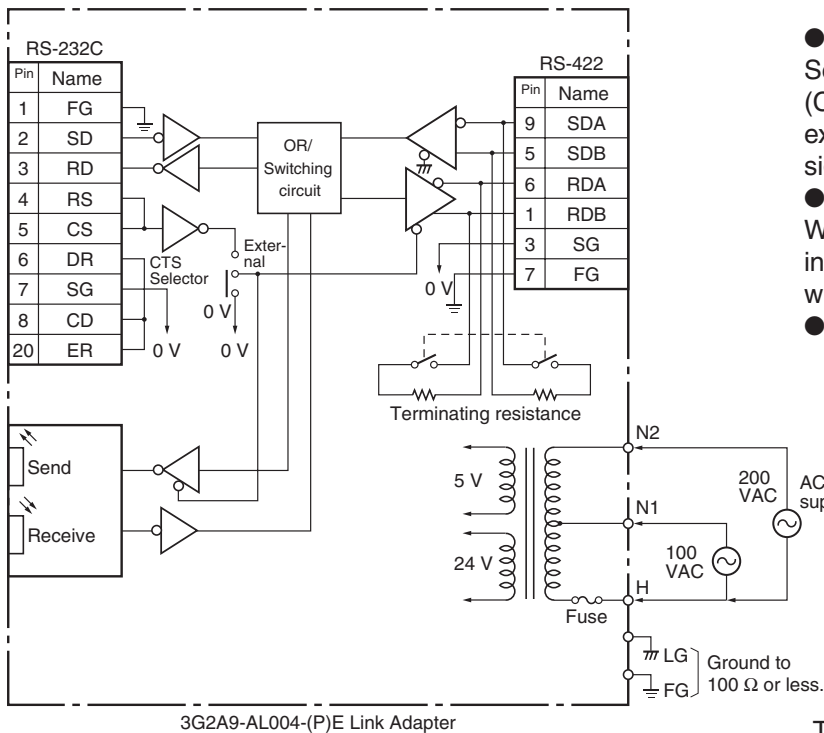
● CTS (CS) Selector
Set to 0 V to have the clear-to-send (CTS) signal always ON. Set to external to receive an external CTS signal.
● Terminating Resistance Selector
When set to ON, connects the built-in terminating resistance (220 Ω); when set to OFF, disconnects it.
● Power Supply Connection
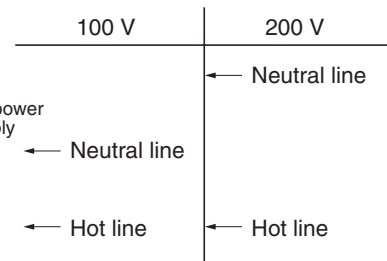
	100 V	200 V
		← Neutral line
	← Neutral line	
	← Hot line	← Hot line

The fuse is in the power supply's common line, so connect the hot line to the common terminal when wiring the AC power supply.

Cable Length (Maximum)

Cable type	3G2A9-AL004-PE	3G2A9-AL004-E
APF	20 m	Cannot be connected.
PCF	200 m	800 m

APF: All Plastic Optical Fiber Cable
PCF: Plastic Clad Optical Fiber Cable

Note (1) Always place the protective caps on unused optical connectors.

(2) Never use the Link Adapter with the Terminal Block Cover removed. Attach the Terminal Block Cover securely.

(3) When the Link Adapter is installed in an office or on a desk, take steps to prevent the power supply terminals from being touched accidentally, which can cause an electric shock.

Appendix C
PC Link System I/O Response Time

Calculating the PC Link Transmission Time

Calculating the PC Link Cycle Time

The following diagram shows the PC Link's cycle time.
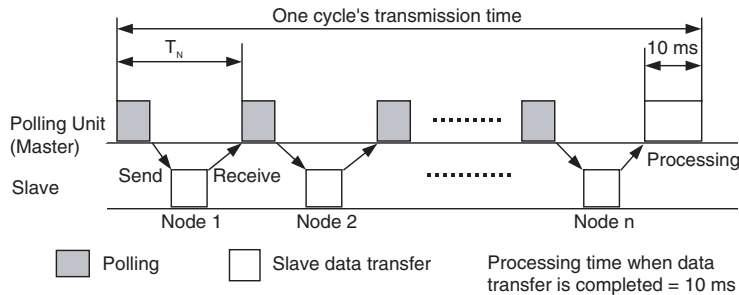
PC Link cycle time = (T_N × Total number of PLCs in PC Link) + 10 ms

T_N = Transmission time/Node

Number of Link bits/Unit	32	64	128	256	512
T_N (ms)	2.2	2.5	2.8	3.8	5.8

Example Calculation:

When there are 128 Link Relay bits/Unit and 8 Units are connected, T_N = 2.8 ms.
PC Link cycle time = 2.8 × 8 + 10 ms = 32.4 ms

Calculating the Polling Sequence Processing Time

The link polling sequence, which is directed to nodes that have not yet joined the PC Link, is sent once every 256 PC Link cycles. Consequently the polling sequence cycle is 256 × one PC Link cycle.
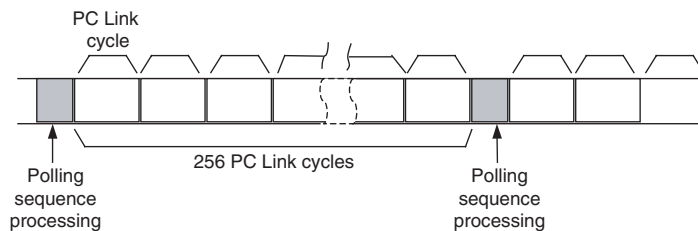
Polling sequence processing time = 15 ms × (n − m)

(n: max. number of connectable Units; m: number of Units joined into PC Link)

Minimum Transmission Time

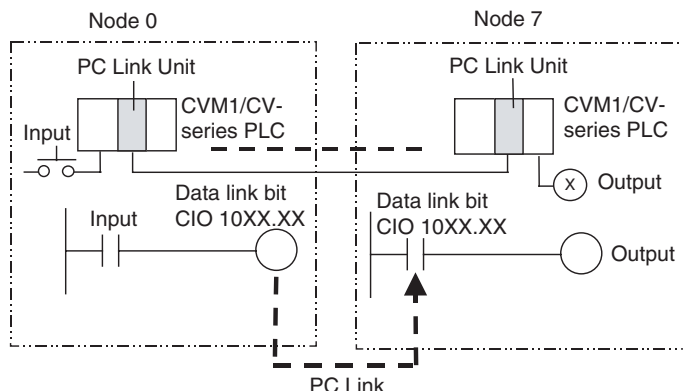Minimum transmission time = T_N + 10 ms

To determine the value of T_N, refer to the table above.

I/O Response Time

In these examples, the I/O response time is defined as the time required for an external input to PC Link node 0 (the polling node) to be output at node 7. The entire process includes the time required for the Link Relay bit in node 0 to turned ON by an external input, the data to be transferred to node 7, and the output to be turned ON by instruction execution.
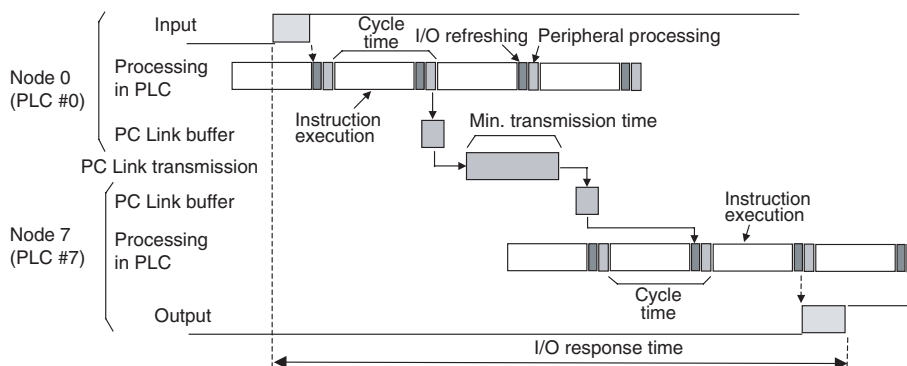
In CVM1/CV-series PLCs, the operation mode can be set to synchronous or asynchronous operation. (The default setting is asynchronous operation.) The I/O response time will vary depending on the CPU's operation mode.

- Conditions

Number of Units in PC Link	8 Units
Number of LR bits	128 bits/Unit
Max. number of Units	8 Units

Minimum I/O Response Time (in Synchronous Mode)

Minimum I/O response time = Input ON delay + Cycle time of PLC #0 + Minimum transmission time + (Cycle time of PLC #7 $\times$ n) + Output ON delay

The value n is as shown in the following table.

PLC model	n (multiplier)
CVM1/CV Series	2
C1000H/C2000H	1

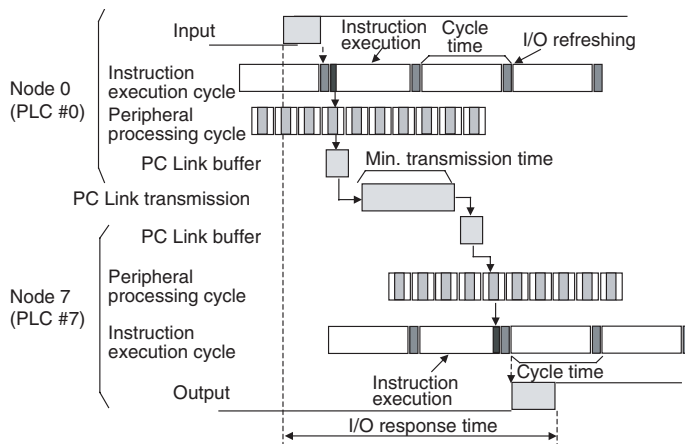- Example Calculation

Input ON delay	1.5 ms
Output ON delay	15 ms
Cycle time of PLC #0	20 ms
Cycle time of PLC #7	50 ms
Min. transmission time	2.8 + 10 = 12.8 ms

If the PLCs are CVM1/CV-series PLCs, the multiplier (n) is 2.

Minimum I/O response time = $1.5 + 20 + 12.8 + (50 \times 2) + 15 = 149.3$ ms

Note (1) The I/O response time may be extended by environmental factors such as noise.

(2) Differences in I/O response times among different PLC models:
The PC Link Unit's I/O response time is different in C1000H/C2000H PLCs and CVM1/CV-series PLCs. When a CVM1/CV-series CPU Unit is operating in synchronous mode, it one PLC execution cycle longer to read data from the PC Link, in comparison with a C1000H/C2000H PLC.

Minimum I/O Response Time (in Asynchronous Mode)

Minimum I/O response time =   Input ON delay + Minimum transmission time + Peripheral processing time of PLC #7 + Output ON delay
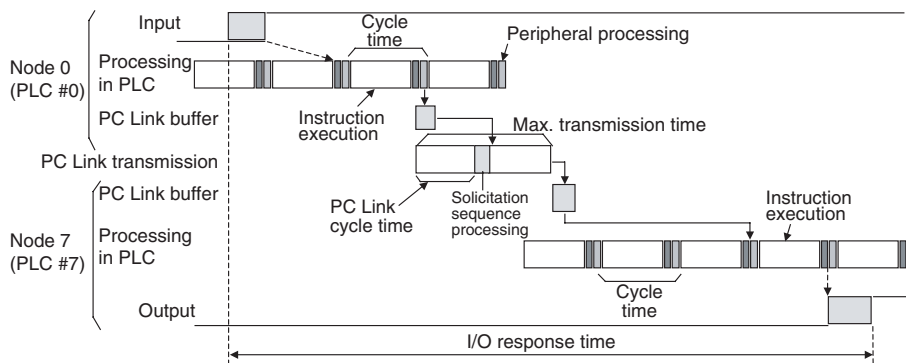
• Example Calculation

Input ON delay	1.5 ms
Output ON delay	15 ms
Peripheral processing time of PLC #7	3 ms
Min. transmission time	2.8 + 10 = 12.8 ms

Minimum I/O response time = $1.5 + 12.8 + 3 + 15 = 32.3$ ms

Note The I/O response time may be extended by environmental factors such as noise.

Maximum I/O Response Time (in Synchronous Mode)

Maximum I/O response time =   Input ON delay + (Cycle time of PLC #0 $\times$ 2) + (PC Link cycle time $\times$ 2) + Polling sequence processing time + (Cycle time of PLC #7 $\times$ (n + 1)) + Output ON delay

PLC model	n (multiplier)
CVM1/CV Series	2
C1000H/C2000H	1
C2000	3

• Example Calculation

Input ON delay	1.5 ms
Output ON delay	15 ms
Cycle time of PLC #0	20 ms
Cycle time of PLC #7	50 ms
PC Link Cycle Time	2.8×8 Units + 10 = 32.4 ms
Polling sequence processing time	15 ms $\times$ (16 Units – 8 Units) = 120 ms

If the PLCs are CVM1/CV-series PLCs, the multiplier (n) is 2.

Maximum I/O response time = $1.5 + (20 \times 2) + (32.4 \times 2) + 120 + (50 \times 3) + 15 = 386.5$ ms

Note   (1) The I/O response time may be extended by environmental factors such as noise.

(2) Differences in I/O response times among different PLC models:
The PC Link Unit's I/O response time is different in C1000H/C2000H PLCs and CVM1/CV-series PLCs. When a CVM1/CV-series CPU Unit is operating in synchronous mode, it one PLC execution cycle longer to read data from the PC Link, in comparison with a C1000H/C2000H PLC.

Maximum I/O Response Time (in Asynchronous Mode)
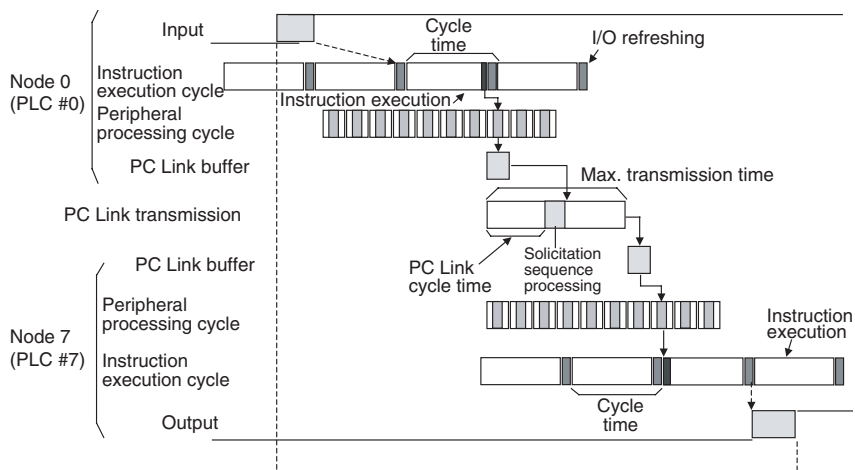
Maximum I/O response time = Input ON delay + Cycle time of PLC #0 + Peripheral processing time of PLC #0 + (PC Link cycle time × 2) + Polling sequence processing time + (Peripheral processing time PLC #7 × 2) + Cycle time of PLC #7 + Output ON delay

• Example Calculation

Input ON delay	1.5 ms
Output ON delay	15 ms
Cycle time of PLC #0	20 ms
Peripheral processing time of PLC #0	3 ms
Cycle time of PLC #7	50 ms
Peripheral processing time of PLC #7	3 ms
PC Link Cycle Time	2.8 × 8 Units + 10 = 32.4 ms
Polling sequence processing time	15 ms × (16 Units − 8 Units) = 120 ms

Maximum I/O response time = 1.5 + 20 + 3 + (32.4 × 2) + 120 + (3 × 2) + 50 + 15 = 280.3 ms

Note The I/O response time may be extended by environmental factors such as noise.

Appendix D
PC Link Settings and Status Areas

Comparison of Data Areas for the C500-LK009-V1, C200H-LK401, and CVM1-LK401

Item			C500-LK009-V1		C200H-LK401	CVM1-LK401
			C1000H and C2000H	C500	C200H, C200HS, and C200HX/HG/HE	CVM1/CV Series (N = Unit number)
Link Relay Area			LR 00 to LR 63	LR 00 to LR 31	LR 00 to LR 63	CIO 1000 to CIO 1063 (Data Link Area)
PC Link Error and PLC Run Flags (See note 1.)			SR 247 to SR 250	SR 58 and SR 62	SR 247 to SR 250	CIO 1500 + 25 × N to 1500 + 25 × N + 3
Level Flags	Link #1		AR 24.11	---	AR 24.11	CIO 1500 + 25 × N + 4, bit 11
	Link #0 or single-level		AR 24.12	---	AR 24.12	CIO 1500 + 25 × N + 4, bit 12
Unit Error Flags	Special Unit Error Flag		---	---	SR 254.15	---
	Special I/O Unit Error Flags (See note 2.)		---	---	AR 00	---
	CPU Bus Unit Setting Error Flag		---	---	---	A 402.03
	CPU Bus Unit Setting Error Unit Number (See note 2.)		---	---	---	A 427
	CPU Bus Unit Error Flag		---	---	---	A 402.07
	CPU Bus Unit Error Unit Number (See note 2.)		---	---	---	A 422
	CPU Bus Error Flag		---	---	---	A 401.12
	CPU Bus Error Unit Number (See note 2.)		---	---	---	A 405
	Duplication Error Flag		---	---	---	A 401.13
	CPU Bus Unit Duplicate Number		---	---	---	A 410
Unit Restart Bits	PC Link Restart Bits	Link #1	SR 252.10	SR 60.10	---	---
		Link #0 or single-level	SR 252.14	SR 60.14	---	---
	Special I/O Unit Restart Bits (See note 2.)		---	---	AR 01	---
	CPU Bus Unit Restart Bits (See note 3.)		---	---	---	A 001
CPU Bus Service Disable Bits (See note 3.)			---	---	---	A 015
CPU Bus Unit Initializing Flags (See note 2.)			---	---	---	A 302

Note (1) The bit corresponding to the Unit's node address is that Unit's flag or control bit, i.e., bit 00 is the flag or control bit for Node 0. The order of the flags in each word is the same for all PLC models.

(2) The bit corresponding to the Unit's node address is that Unit's flag, i.e., bit 00 is the flag for Node 0.

(3) The bit corresponding to the Unit's node address is that Unit's control bit, i.e., bit 00 is the control bit for Node 0.

Revision History

A manual revision code appears as a suffix to the catalog number on the front cover of the manual.

Cat. No. W434-E1-01

Revision code

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
01	July 2004	Original production