![Chipsmall logo]

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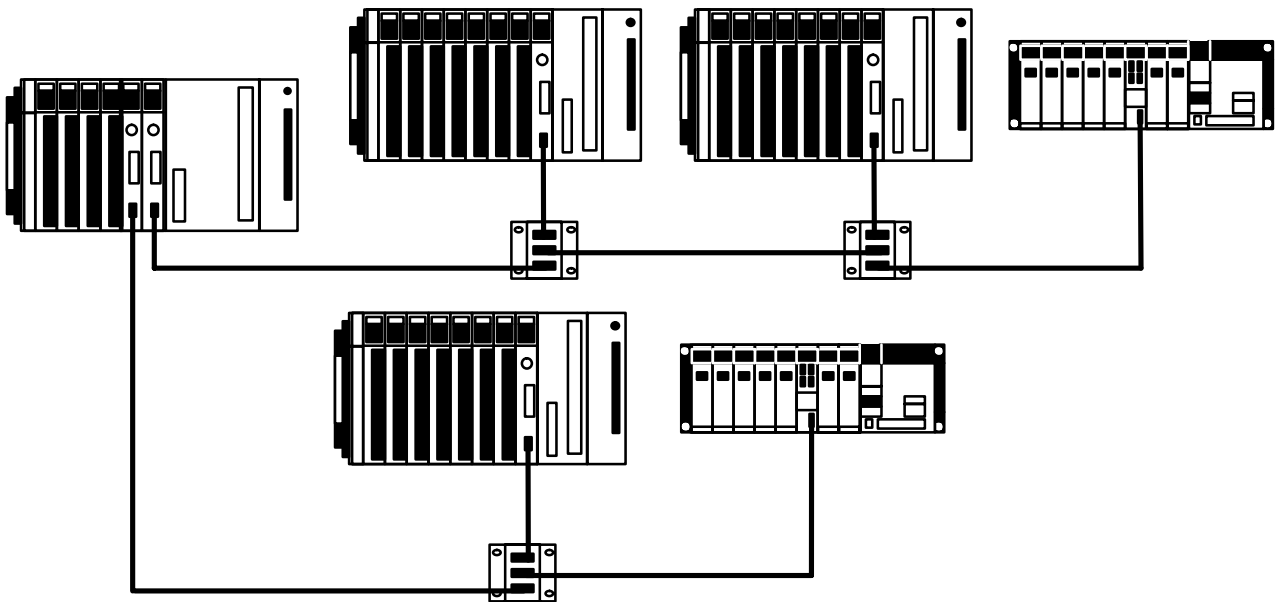Email & Skype: info@chipsmall.com Web: www.chipsmall.com
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PC Link

System Manual

Revised March 2000

Read and Understand this Manual

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

Warranty and Limitations of Liability

WARRANTY

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

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

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

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

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

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

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

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

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

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

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

PROGRAMMABLE PRODUCTS

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

Disclaimers

CHANGE IN SPECIFICATIONS

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

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

DIMENSIONS AND WEIGHTS

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

PERFORMANCE DATA

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

ERRORS AND OMISSIONS

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

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 "PC" means Programmable Controller and is not used as an abbreviation for anything else.

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

About this Manual:

A PC Link System enables use of the LR (Link Relay) data area as a common data area shared by all PCs in the PC Link System, thus simplifying programming, settings, and data exchange between PCs and permitting effective use of inputs and outputs.

This manual has been written to provide the information necessary to design and install a single-level or multilevel PC Link System using PC Link Units with C500, C500F, C1000H, C2000, C2000H, C200H, C200HS, and/or C200HX/HG/HE(-Z) PCs. Before attempting to design, install, or operate a PC Link System, be sure to thoroughly familiarize yourself with the information contained herein. During operation, refer to the relevant PC Programming Manuals for programming and control system details.

Section 1 introduces PC Link Systems and describes their advantages and characteristics. It also describes the improvements made in the most recent version.

Section 2 describes the elements that go together to construct a PC Link System and the factors required to design a System.

Section 3 describes the LR area used in data transfer between the PCs, the method used to allocate it to the PCs, and the polling process used to actually transfer data.

Section 4 provides details on PC Link Units, the main Units used to build PC Link Systems. Parts of the Units, switch setting, and examples of switch settings are provided.

Section 5 provides details on mounting and wiring PC Link Units and provides Unit dimensions.

Section 6 offers details and examples of programming PCs to utilize PC Link Systems effectively.

Section 7 describes error indications and error processing. Both indicator lights and dedicated error-related flags are provided.

Section 8 describes basic maintenance and hardware troubleshooting procedures.

Appendix A provides basic specifications and complete model numbers for OMRON products used in PC Link Systems.

Appendix B provides general specifications for PC Link Units and PC Link Systems.

This manual is intended to be used in conjunction with the PC *Operation Manual* and/or *Installation Guides* for the PCs in the System. In most Systems, the *Link Adaptor Operation Guide* will also be required. The application of Link Adaptors to PC Link Systems is also described in this manual.

This manual is designed for the C500-LK009-V1 and C200H-LK401 PC Link Units. These are sometimes referred to as the LK009-V1 and LK401. The older 3G2A5-LK003-E and 3G2A5-LK009-E PC Link Units are mentioned only to allow combination with the newer models, and are not discussed in detail.

⚠ **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.

PRECAUTIONS

This section provides general precautions for using the Programmable Controller (PC) and related devices.

The information contained in this section is important for the safe and reliable application of the PC. You must read this section and understand the information contained before attempting to set up or operate a PC 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 OMRON PCs. Be sure to read this manual before attempting to use the software and keep this manual close at hand for reference during operation.

⚠ **WARNING** It is extreme important that a PC and all PC 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 PC System to the abovementioned applications.

3 Safety Precautions

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

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

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

4   Operating Environment Precautions

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

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

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

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

⚠ **Caution**   The operating environment of the PC 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 PC system. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

5   Application Precautions

Observe the following precautions when using the PC system.

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

- Always ground the system to 100 Ω or less when installing the Units. Not connecting to a ground of 100 Ω or less may result in electric shock.
- Always turn OFF the power supply to the PC before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
    - Mounting or dismounting I/O Units, CPU Units, Memory 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 PC or the system, or could damage the PC or PC Units. Always heed these precautions.

- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.

- Always use the power supply voltages specified in this manual. An incorrect voltage may result in malfunction or burning.

- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.

- Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.

- Do not apply voltages to the Input Units in excess of the rated input voltage. Excess voltages may result in burning.

- Do not apply voltages or connect loads to the Output Units in excess of the maximum switching capacity. Excess voltage or loads may result in burning.

- Disconnect the functional ground terminal when performing withstand voltage tests. Not disconnecting the functional ground terminal may result in burning.

- Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in this manual. Incorrect tightening torque may result in malfunction.

- Leave the label attached to the Unit when wiring. Removing the label may result in malfunction if foreign matter enters the Unit.

- Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.

- Double-check all wiring and switch settings before turning ON the power supply. Incorrect wiring may result in burning.

- Wire correctly. Incorrect wiring may result in burning.

- Mount Units only after checking terminal blocks and connectors completely.

- Be 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 an unexpected operation.

- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
    - Changing the operating mode of the PC.
    - Force-setting/force-resetting any bit in memory.
    - Changing the present value of any word or any set value in memory.

- 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.

- Do not pull on the cables or bend the cables beyond their natural limit. Doing either of these may break the cables.

- Do not place objects on top of the cables or other wiring lines. Doing so may break the cables.

- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.

- When replacing parts, be sure to confirm that the rating of a new part is correct. Not doing so may result in malfunction or burning.

- Before touching a Unit, be sure to first touch a grounded metallic object in order to discharge any static built-up. Not doing so may result in malfunction or damage.

SECTION 1
Introduction

1-1   PC Link Systems

A PC Link System is established to interconnect two or more C-series PCs through PC Link Units to allow data transfer through the LR area of each PC. PC Link Subsystems can be established within the PC Link System, creating different levels of operation. Each PC in the PC Link System automatically exchanges data with all the PCs in the same Subsystem. Any PC in two Subsystems (i.e., any PC to which two PC Link Units are mounted) can be used as a "transfer PC" to transfer data between two PC Link Subsystems.

The data communications provided by PC Link Systems allow use of the inputs and outputs on all of the PCs in the System in the program of any PC. PC Link Systems do not establish hierarchies of control between PCs. i.e., all control actions must be written in the programs of individual PCs.

Compared with I/O Links   PC Link Systems exchange data differently to I/O Links in Optical Remote I/O Systems in three main ways. First, an I/O Link requires the use of I/O points, reducing the number of I/O points available to connect to I/O devices. Second, the number of bits transferred between PCs in a PC Link System is limited only by the size of the LR area and the number of PCs in the PC Link System; an I/O Link in a Remote Optical System can handle only one or two words. Third, I/O Links use programmed input and output operations to transfer data, whereas PC Link Systems use an automatic polling method.

Effective I/O Utilization   PC Link Systems access only the LR area of the PC for data exchange and do not require the use of any of the PCs I/O points.

Simplified System Setup   Settings on the PC Link Units allow for data exchange little or no programming required.

Subsystem Data Exchange   Two PC Link Subsystems operating at different levels can exchange data via the LR area of a PC operating in both Subsystems.

LK009-V1 Improvements   The C500-LK009-V1 differs from the 3G2A5-LK009 in insulation of the transmission section from the internal circuits to improve anti-noise performance. This increased performance reduces noise interfere originating in ground differences, cable inductance, etc. The C500-LK009-V1 can also be used together with the C200H-LK401. This is not possible with the 3G2A5-LK009.

LK003-E PC Link Units   Although not covered in detail in this manual, the LK003-E PC Link Unit can be used in PC Link Systems together with the LK009-V1 PC Link Unit. If the LK003-E is used, the PC Link System must be single-level and all LK009-V1 PC Link Units in the System must be set to LK003-E mode. The LK003-E (or an LK009-V1 in LK003-E mode) can be used only on C500 PCs and cannot be used in the same PC Link System as a C200H-LK401 PC Link Unit.

1-2   Operating Levels and Polling

All PC Link Units are assigned **unit numbers** which determine what part of the LR area each is to be allocated. Whenever two or more PCs are connected in a PC Link System, one of the PC Link Units must be set as the polling unit (i.e., as Unit #0) and all other PC Link Units must be set as polled units (i.e., as any Unit other than #0). The polling unit of each PC Link Subsystem does not control the other PCs, which are each controlled independently by their own CPUs.

A maximum of two PC Link Units can be mounted to the same PC. If two PC Link Units are mounted to one PC anywhere in the System, the System is multilevel, and all Units must be set for a Multilevel System (see *4-2-2 Switch Settings*). In a Multilevel System, operating levels must be set to create PC Link Subsystems. Each Subsystem will have its own polling unit.

Up to four Subsystems are possible. There will always be one more Subsystem than there are PCs to which two PC Link Units are mounted. Only operating levels 0 and 1 are set, as it is necessary only to differentiate between two PC Link Units on the same PC. All of the PC Link Unit in the same Subsystem must be set to the same level.

A PC Link System with three Subsystems is shown below. Any one of the PC Link Units in any Subsystem may be designated as the polling unit. All other Units would be polled units. The small boxes shown connecting the PC Link Units are Link Adapters, which are used to connect PC Link Units when more than two are used in a Subsystem. See following sections for details on System design and Link Adapters. (The 3G2A5-LK003-E PC Link Unit cannot be used in Multilevel Systems.)
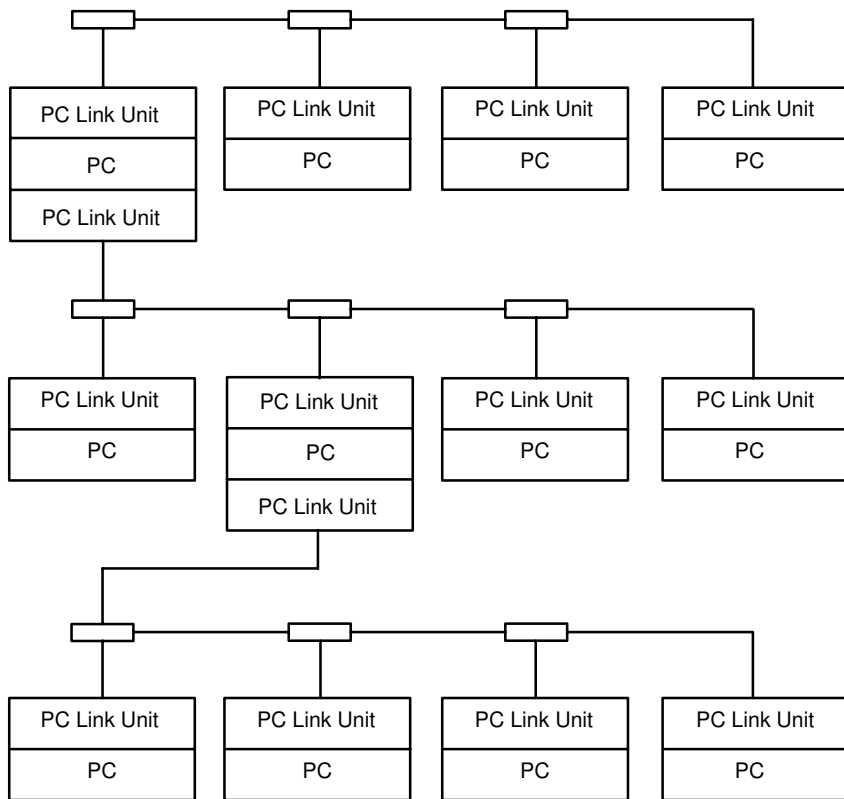
SECTION 2
System Design

2-1 System Configuration

PC Link Units are mounted to the PC Racks and connected to each other. Each PC Link Unit contains a buffer through which data is transferred to and from the other PC Link Units connected to it. The C500-LK009-V1 can be used with C500, C1000H, and C2000H PCs, but not with a C200H, C200HS, or C200HX/HG/HE(-Z) PC. The C200H-LK401 can be used with C200H, C200HS, and C200HX/HG/HE(-Z) PCs.

Link Adaptors are used in any System other than one containing only two PC Link Units connected with wire cable. They serve as branching points to enable connecting more than two PC Link Units, which provide only one connector each allowing only two PC Link Units to be connected directly, or they serve as conversion points to change between wire and optical fiber cables.The 3G2A9-AL001 Link Adapter is used as the Branching Link Adapter (see Example 3, below), and combinations of the 3G2A9-AL004 and 3G2A9-AL002 Link Adapters are used to convert to and from optical fiber cable.Refer to the *Link Adapter Installation Guide* for Link Adapter specifications and details.

Multilink Systems

Each PC Link Unit has only one connector, making it impossible to connect more than two PC Link Units directly. Many more PCs can become part of the same PC Link System however, if Branching Link Adapters are used to connect through. A PC Link System including six PCs is illustrated below to show this. This arrangement also protects PC Link communications from shutting down completely for failures in the line, i.e., if communications are broken off on a branch line, data transfer will continue to PCs still connected though PC Link Units to the polling unit.
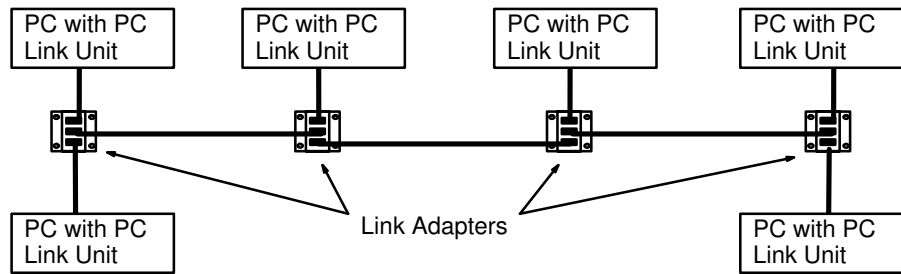

Multilevel Systems

Up to two PC Link Units can be mounted to one PC. Any PC with two PC Link Units mounted to it or any PC part of a PC Link System that contains such a PC is in a **Multilevel PC Link System**. If any one PC in the PC Link System has two PC Link Units mounted to it, the entire System is multilevel**.**

Each group of PCs connected by PC Link Units and sharing parts of the LR area are part of the same **PC Link Subsystem**. If a PC has two PC Link Units mounted to it, it is part of two PC Link Subsystems, with each Subsystem extending from a PC with two PC Link Units to either the end PC or the next PC with two PC Link Units (see diagram below).

Each Subsystem will have its own polling unit. Each Subsystem is also assigned an **operating level** to differentiate the two Subsystems to which one PC belongs. These operating levels do not imply a hierarchy or in anyway affect operation of the Subsystems except to determine which LR words are allocated to which Subsystem (see next subsection for details).

The following example conceptually shows a Multilevel PC Link System with three Subsystems. Although Subsystems 1 and 3 are assigned the same operating level, they are not related in any special way.

Note that a Link Adapter is not used in Subsystem 3. As explained above, it does not require any because it contains only two PCs.
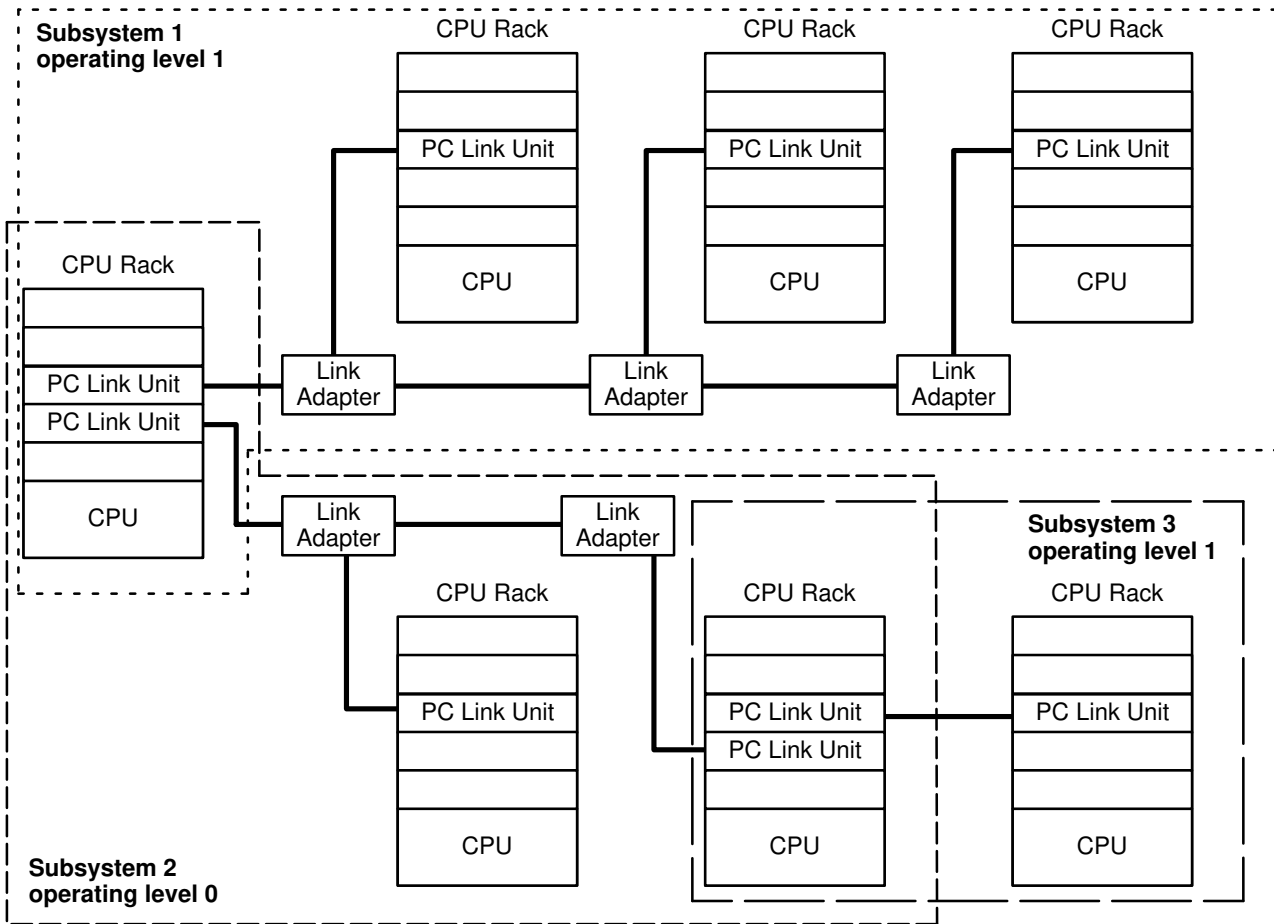
Transfer PCs

A PC that has two PC Link Units mounted to it is called a transfer PC. This is because it can be used to transfer data between the two PC Link Subsystems to which it belongs.

Although all the PCs in the same Subsystem automatically have data written into their LR areas from the PCs in the same Subsystem, this is not the case with PCs in different Subsystems. A PC that belongs to two Subsystems can, however, transfer data between Subsystems by reading it from any part of the LR words it shares with one of the Subsystems and writing the data to the words allocated it in the other Subsystem. This transfer operation is programmed by the user in the normal user program.

Transmission Distance

The total length of wire cable (e.g., RS-485 or RS-422) must not exceed 500 m. Individual branch lines from Link Adapters to PC Link Units must not exceed 10 m. Greater transmission distances can be achieved by using optical links between PC Link Units (see Section 2 Link Adapters).

<u>Examples</u>

The following examples demonstrate some of the ways that PCs can be connected in PC Link Systems. Example 3 also provides the appearance two of the CPU Racks in the System.

An example of a PC Link System designed using optical links is provided in *2-2 Using Link Adapters*.

7

**Example 1
Single-level System**
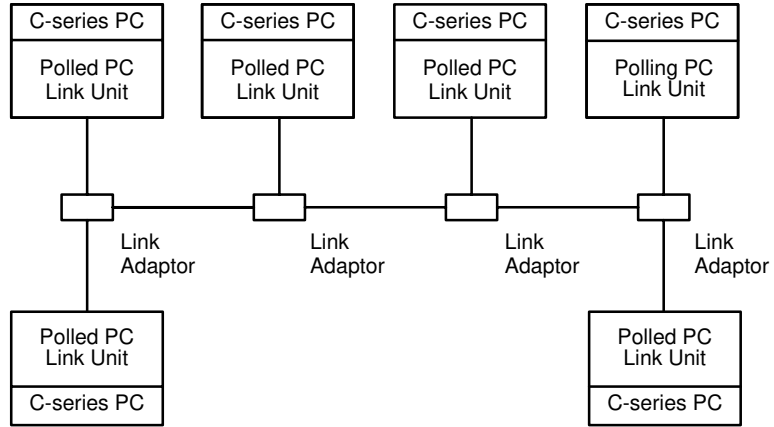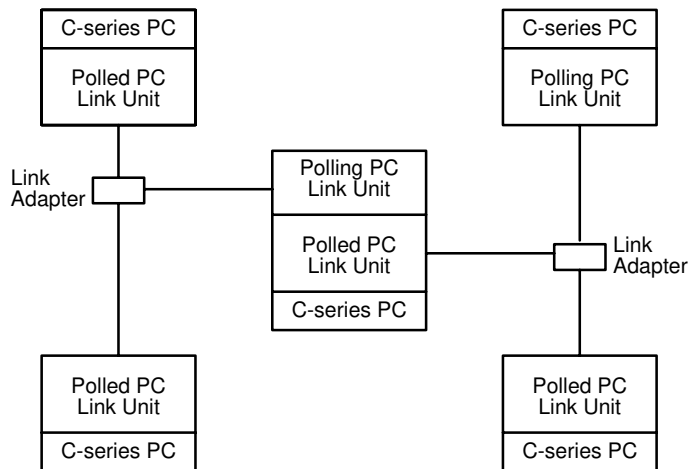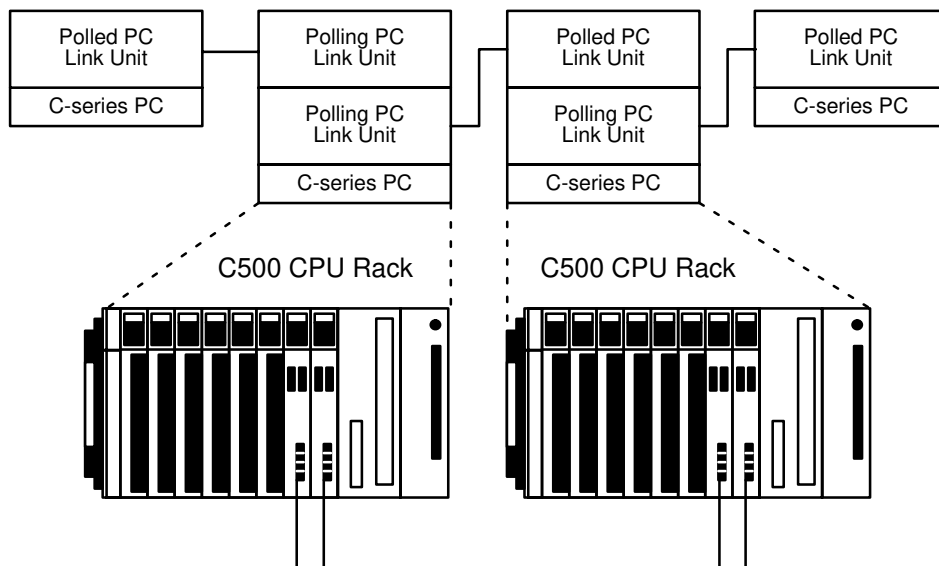

**Example 2
Two-level System**

**Example 3
Three-level System**

System Limitations

The maximum number of PCs that may be used in a PC Link System is limited by the number of LR words available. This is determined by the number of levels, the specific PCs employed, and the mode settings on the PC Link Units.

A PC Link Unit must be assigned a number no greater than one less than the maximum number of allowable PCs to be acknowledge as part of the System. A PC Link Unit assigned a number greater than this limit will not be acknowledged. The maximum number of Units available in a specific PC Link System is described in the following tables.

Only the PC Link Unit combinations shown below are possible. Note particularly that the LK003-E (or LK009-V1 in LK003-E mode) can only be used with other LK003-E PC Link Units (or LK009-V1 in LK003-E mode).

Polling Unit: C200H-LK401 PC Link Unit on C200H, C200HS, or C200HX/HG/HE(-Z) PC

	Polled units			
	LK401 on C200H, C200HS, or C200HX/HG/HE(-Z)	LK009-V1 on C500	LK009-V1 on C1000H or C2000H	Max. total
Multilevel	16	8	16	16
Single-level	32	8	32	32

Polling Unit: C500-LK009-V1 PC Link Unit on C1000H or C2000H PC

	Polled units			
	LK009-V1 on C1000H or C2000H	LK009-V1 on C500	LK401 on C200H, C200HS, or C200HX/HG/HE(-Z)	Max. total
Multilevel	16	8	16	16
Single-level	32	8	32	32

Polling Unit: C500-LK009-V1 PC Link Unit on C500 PC

	Polled units				
	LK009-V1 on C1000H or C2000H	LK009-V1 on C500	LK003-E on C500	LK401 on C200H, C200HS, or C200HX/HG/HE(-Z)	Max. total
Multilevel	8	8	Not possible	8	8
Single-level	8	8	Not possible.	8	8
LK003-E mode	Not possible	8	8	Not possible.	8

Polling Unit: 3G2A5-LK003-E PC Link Unit on C500 PC

|	Polled units		
	LK009-V1 on C500 in LK003-E mode	LK003-E on C500	Max. total
Single-level	8	8	8

2-2 Using Link Adaptors

In a PC Link System, Link Adapters are used whenever more than two PC Link Units are connected in any one PC Link Subsystem. They are also used to enable optical links between PC Link Units to provide greater transmission distance and greater noise resistance. When using Link Adaptors, refer to the *Link Adaptor Installation Guide*.

Optical Cable in PC Link Systems

A PC Link System can be set up to take advantage of optical communications by using combinations of Branching and Converting Link Adapters. As shown below, each PC Link Unit is connected to a Converting Link Adapter that converts to optical communications. Optical fiber cable is then used to form the main line and branch lines that connect each PC Link Unit-Converting Link Adapter pair.

The straight lines in the following diagram represent wire cables; those with zig-zags in them, optical fiber cable.

In the following example, any of the PC Link Units may be set as the polling unit.
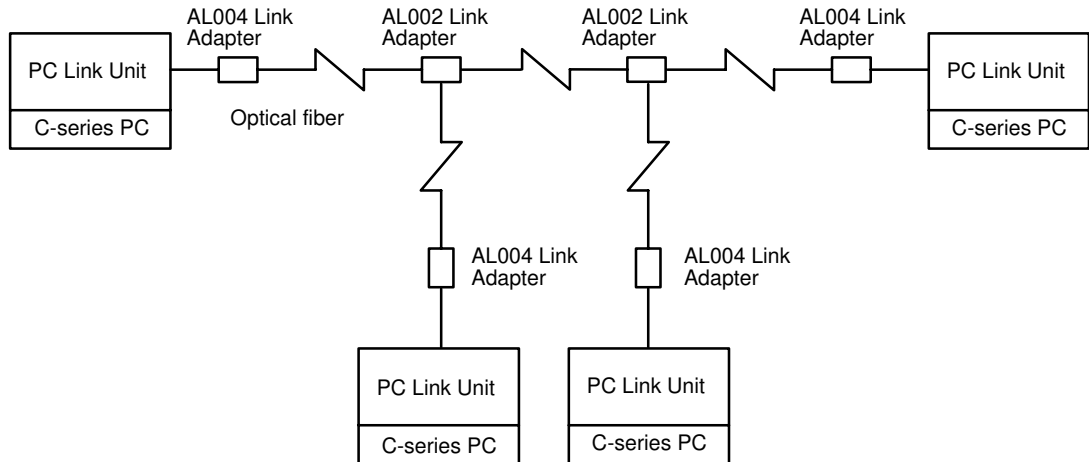
Handling Optical Fiber Cable

Although special characteristics of optical fibers call for care in connecting optical devices, laying optical fiber cable basically does not differ from laying wire cable. All OMRON PCF and the 3G5A2-PF101 APF (length: 1 m) cable come with connectors attached. Connectors for all other APF cables must be assembled by the customer. As using Optical Fiber cable requires the use of Link Adaptors, refer to the *Link Adaptor Installation Guide* for more detailed information.

SECTION 3
Data Exchange and Operations

3-1   LR Area Data

PC Link Systems employ the LR area in the exchange of data. The content of the LR areas in all PCs in the same PC Link Subsystem (or Single-level System) is kept consistent. To achieve this, the LR area is divided among all of the PCs in the Subsystem according to switch settings, and each PC writes data only to the part of the LR area allocated to it. When a PC writes to its LR area, the data is updated in the LR areas of all the other PCs in the PC Link Subsystem during the next polling cycle. The other PCs can then read this data and use it to coordinate activities with the PC that has written the data. Each PC thus writes data to its **write words** and reads data from the words written to by all of the other PC Link Units in the same Subsystem. Any action that affects the contents of the LR area is reflected in the LR area in all PCs. The data transfer is shown below in a Single-level System. Arrows indicate data flow within the PC Link System.

"Write area" is the area written by that Unit. "Read area" is an area read by that Unit (i.e., written by another Unit). All unused portions of the LR area may be used as work bits in programming.
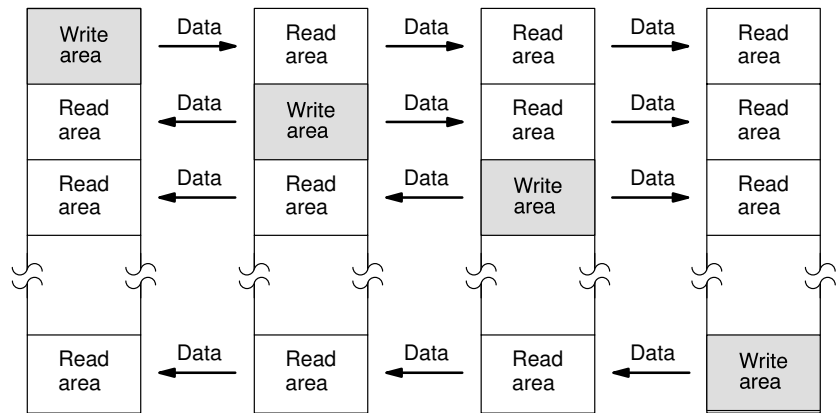
What determines what part of the LR area is allocated to which PC is the unit number assigned to each PC Link Unit. These numbers in turn determine which PC Link Units are **polling units** and which are **polled units**.

When PC Link Unit 0 is set for the total number of LR bits used, and each of the PC Link Units is assigned a unit number, the LR area is divided and assigned to each PC Link Unit automatically.

In a Multilevel System, all PCs have their LR areas divided in half, with one half being assigned to each of two Subsystems. This is true regardless of whether or not the PC is actually in two Subsystems, i.e., if only one PC Link Unit is mounted to a PC in a Multilevel System, one have of the LR area is not used by the PC Link System.
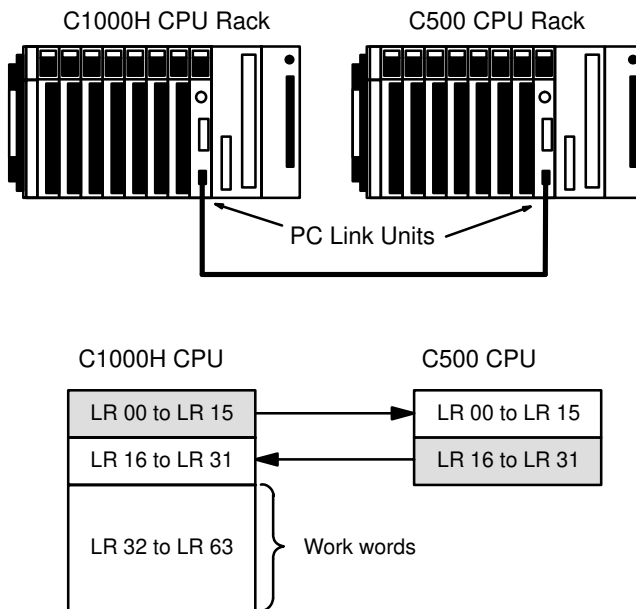
Each PC in two Subsystems (i.e.,with two PC Link Units mounted to it) thus contains all the LR area data from both Subsystems and has a write data area in assigned to each. Any PC with only one PC Link Unit contains only the LR area data for the Subsystem it is in. The LR area of any PC with two PC Link Units (i.e., the data-transfer PCs) can thus be used to transfer data between two Subsystems by programming the data-transfer PC to move data between its section of the first half and its section of the last half of its LR area. See Section 6 Application Examples for specific LR area allocation examples for both Single-level and Multilevel Systems.

3-2   LR Area Allocations

To enable data transfer between PCs in an PC Link System, part of the LR area is allocated as the write area for each PC in the System. Which and how many LR words are allocated to each PC are determined by switch settings, which are described in *4-2-2 Switch Settings*. This section describes the method for allocating words assuming that each PC is allocated the maximum number of words possible.

LR Area Allocation in Mixed-PC Systems

If a System contains PCs that have different sizes of LR areas, only the words that are common to both areas are used in actual PC Link communications. In the following example, the LR areas of each PC are illustrated below it. Words labeled "**work words**" are not used by the PC Link System and are available for use in programming if required. As shown, the rest of the LR area is divided with the smaller LR area of the other PC to form the write words for each.

C1000H CPU Rack   C500 CPU Rack

PC Link Units

C1000H CPU	C500 CPU
LR 00 to LR 15 →	LR 00 to LR 15
LR 16 to LR 31 ←	LR 16 to LR 31
LR 32 to LR 63 } Work words	

Single-level System

The following example combines one C2000H PC, two C500 PCs, and a C200H PC in a Single-level System using 128 LR bits per PC. The PC Link Unit on the C2000H PC at the left end of the System has been designated as the polling unit. The C500 PCs, providing the smallest LR areas, limit the number of bits that can be transferred via the PC Link Units. Because the C500 PC has only 32 words, only words 00 through 31 may be used in the C2000H PCs (Units #0 and #2). The C2000H and C200H LR words that are not used (32 to 63) may be used as work bits in programming. The LR word allocations for each PC Link Unit are given below it. The shaded area is the section of the LR area written to by the PC Link Unit. The arrows indicate data flow.

In this example, data written to words LR 8 through 15 by the PC to which PC Link Unit 2 is mounted is automatically transmitted to words LR 8 through 15 in the other PCs. While the PCs for PC Link Units #0, #1, and #3 are able to read this data freely, they cannot write in this area. All of the other PCs also

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