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Cat. No. W174-E1-07

SYSMAC C-series SYSMAC LINK

SYSTEM MANUAL

OMRON

Cat. No. W174-E1-07

SYSMAC

C-series

SYSMAC LINK

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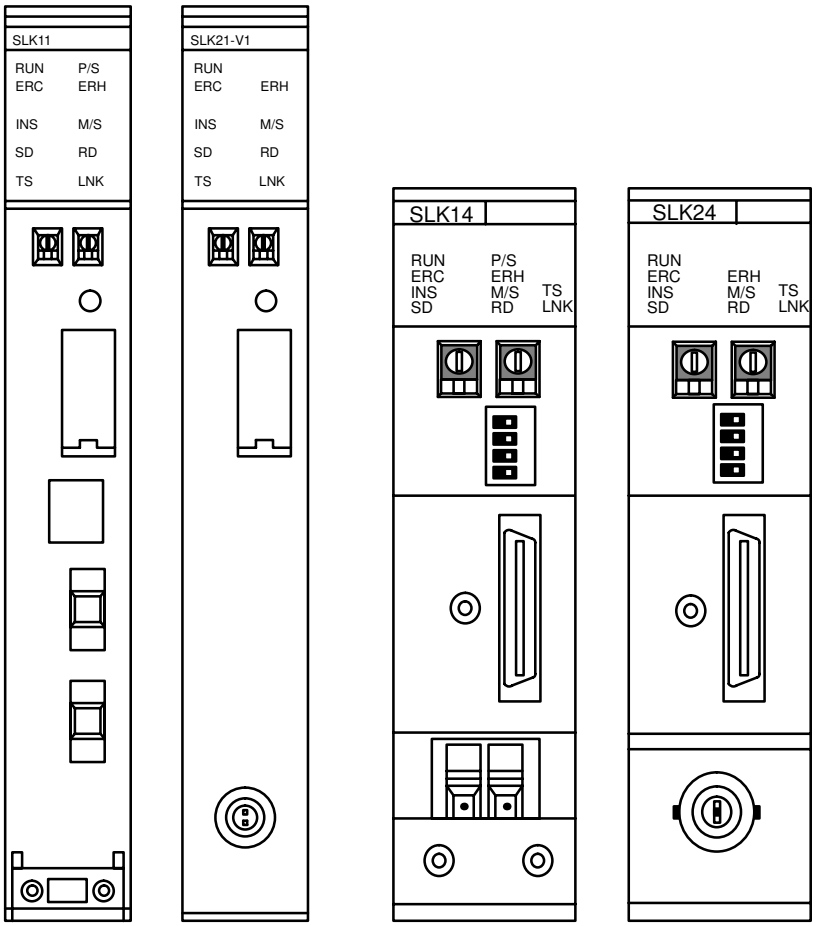
C-series SYSMAC LINK

System Manual

Revised September 2003



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 the product.

⚠ 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

TABLE OF CONTENTS

About this Manual:

This manual describes the installation and operation of C-series SYSMAC LINK Units and includes the sections described below.

Please read this manual completely and be sure you understand the information provide before attempting to install and operate a C-series SYSMAC LINK System.

Section 5 Introduction introduces the features and operations possible with SYSMAC LINK Units. It also describes the possible system configurations and compatibility with PCs and other Link Units.

Section 6 Unit Components and Switch Settings presents the names and functions of the SYSMAC LINK Units' components and the switch settings.

Section 7 Installation explains how to install SYSMAC LINK Systems.

Section 8 Basic Communications introduces the token bus method of communications used in SYSMAC LINK Systems and explains the basic settings necessary for operation.

Section 9 Data Links describes the operation of data links, procedures required to establish data links, and methods of monitoring data link operations.

Section 10 Data Read/Write Services describes the data read/write services, which provide data transmission between nodes and distributed control. The data read/write services include the NETWORK READ (RECV(98)) and NETWORK WRITE (SEND(90)) and instructions and CV-mode commands.

Section 11 Special Services provides information on remote programming and monitoring and RAS functions.

Section 12 Error Processing provides information to help identify and correct errors that might occur in the System.

Section 13 Inspection and Maintenance describes periodic maintenance required by the System and how to replace a SYSMAC LINK Unit.

⚠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 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 relevant 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 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 above-mentioned applications.

3 Safety Precautions

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

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

⚠ WARNING 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 Power Supply Units, 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

This section introduces the features and operations of the SYSMAC LINK Units. It also describes the possible system configurations and compatibility with PCs and other Link Units.

1-1 OMRON Network Systems

As production processes become more complex and diversified, it is necessary to develop networks that link control components such as PCs to more powerful host computers in LANs that control entire production processes.

OMRON provides 3 types of network systems for large, medium, and small-scale networks.

SYSMAC NET Link System

The SYSMAC NET Link System is a high-speed, high-capacity LAN. It can be used as a gateway to a general LAN composed of different kinds of computers or to an Ethernet to create a large-scale network.

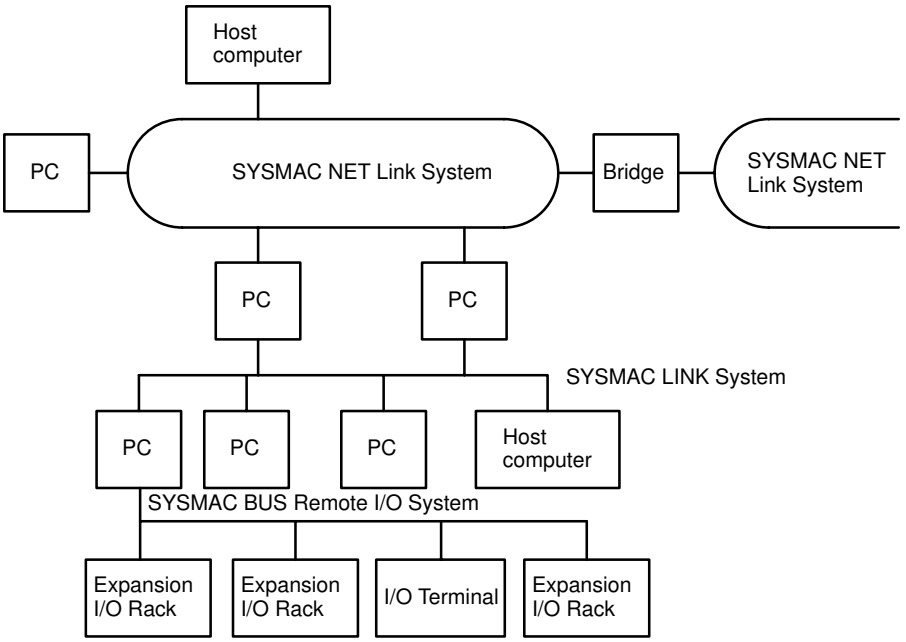
SYSMAC LINK System

The SYSMAC LINK System provides high-speed, high-capacity communications between any nodes (PCs, or IBM-PC/AT or compatible running SSS) in the network, as well as remote monitoring and programming functions and automatic data transfer via data links.

SYSMAC BUS System

The SYSMAC BUS Remote I/O System is used to link a single PC to remote racks called Slave Racks and/or components (e.g., I/O Terminals or Programmable Terminals) to form a small, decentralized control network.

Depending on the size and complexity of the production process, these systems can be used alone or in combination as shown below.



1-2 SYSMAC LINK System Features

SYSMAC LINK Units are equipped with a variety of special features.

High Speed, Reliability, and Flexibility

The specialized communications LSIs used in all SYSMAC LINK Units deliver high speed, reliability, and flexibility in an advanced data link system, while optical fiber cable systems provide high-speed communications with unparalleled immunity to noise.

In the event of an error or failure in the polling unit, another node automatically takes over management of the SYSMAC LINK System without stopping the entire network. SSS or CVSS running on an IBM-PC/AT or compatible can monitor and/or program PCs anywhere in the network via the SYSMAC LINK System.

Distributed Control with Data Links

The data link function transfers data to and from other nodes automatically, establishing simple but powerful peer-to-peer links between nodes. Data links can be generated automatically between 2, 4, 8, or 16 nodes by changing the value of just one byte in the AR Area of the start-up node. Or the user can use the flexibility of manually generating data links to eliminate unused link words, improve data link I/O response time, and to even create several data link groups in one network.

The data link communications cycle time can be fixed at a constant value, so even simultaneous remote programming/monitoring and NETWORK READ/WRITE instruction (RECV(98)/SEND(90)) execution have no effect on the data link I/O response time.

Active PC Transmission

PCs can communicate actively with other PCs in the network. The four functions listed below can be performed from the PC's program using the SEND(90) and RECV(98) instructions (SEND(192), RECV(193), and CMND(194) in the CV-series).

1, 2, 3...

1. Broadcast transmission
2. Response monitoring time setting (response time-out setting)
3. Transmit retry setting
4. Enabling/disabling response

RAS Functions

SYSMAC LINK Units are equipped with three RAS functions (RAS is an acronym for reliability, availability, and serviceability). The Polling Unit Backup and Failed Node Bypass (optical systems only) functions prevent the network from failing when one Unit fails. The Internode Echo Test function aids in communications troubleshooting.

Remote monitoring of the network's operating status also aids in troubleshooting and quick correction of communications problems.

Improvements on the C200HS-SLK12/SLK22 (C200HW-SLK13/SLK14/SLK23/SLK24)

Up to 2,966 words can be linked using the data link function with the C200HW-SLK14/SLK24.

The input interrupt response time is 1 ms maximum when the new SYSMAC LINK Units are mounted to a C200HX, C200HG, or C200HE PC.

1-3 System Configuration

Up to 62 nodes (including all PCs and, in coaxial systems, computers) can be connected in a SYSMAC LINK Network via SYSMAC LINK Units or Network Service Boards. One of the Units in the network will function as the polling unit and the remainder will be polled units. The polling unit manages the System communications during and after configuration.

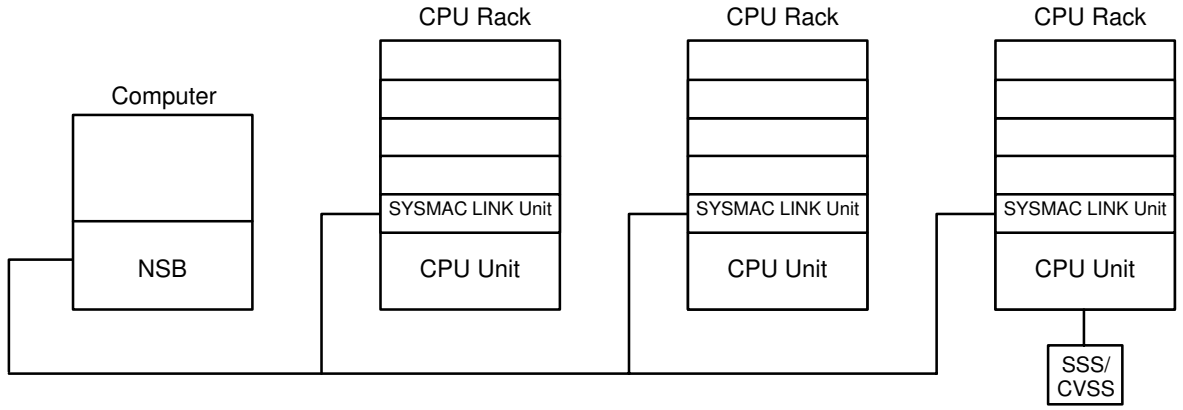
1-3-1 Single-level Systems

The following diagrams show the general configuration of Single-level SYSMAC LINK Systems connected with coaxial and optical fiber cables. The Systems are considered single-level because each PC has only one SYSMAC LINK Units mounted to it.

The SSS/CVSS connection is not a required part of the System. It is shown here because of its usefulness in monitoring and controlling not only the operation of the SYSMAC LINK System itself, but the general operation of all the PCs connected in the System.

Coaxial System

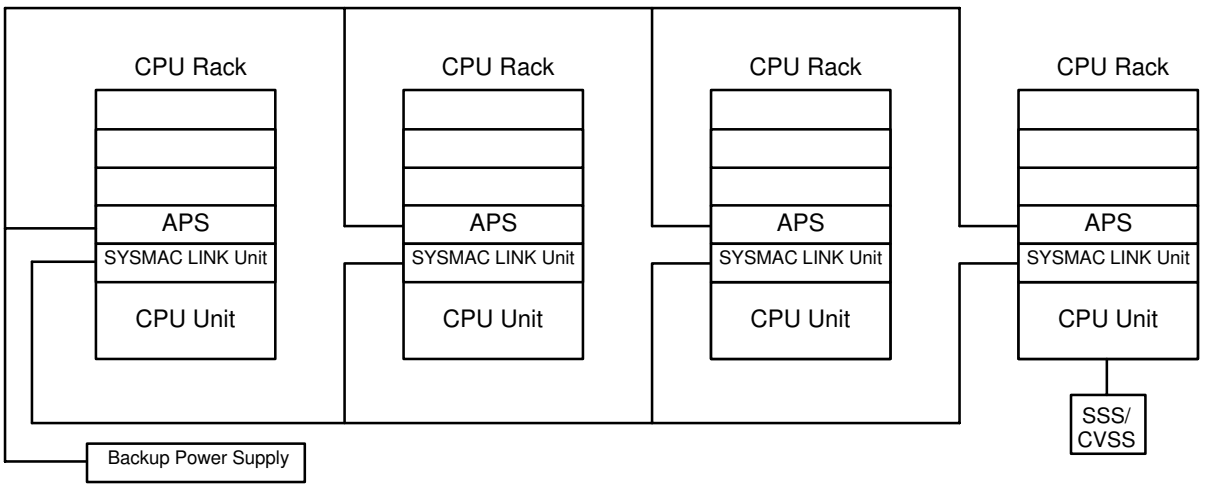
The abbreviation NSB indicates a SYSMAC LINK Network Service Board.



Note Terminators must be connected to the Units on the ends of the network.

Optical System

The abbreviation APS indicates an Auxiliary Power Supply Unit.

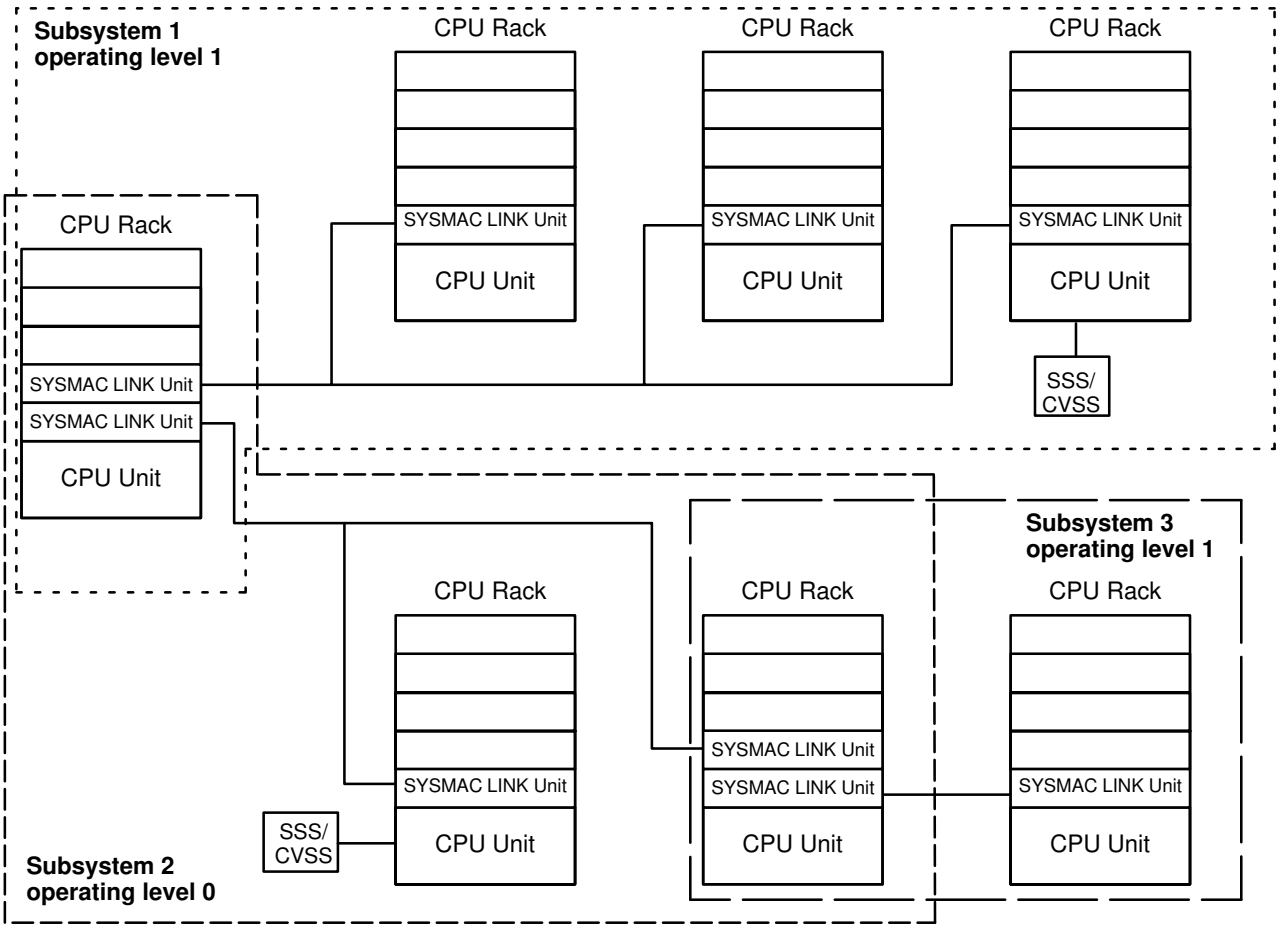


1-3-2 Multilevel System

Each PC can have up to two SYSMAC LINK Units mounted. Each SYSMAC LINK Unit will connect it to a SYSMAC LINK Network, i.e., if a PC has two SYSMAC LINK Units mounted, it is part of two SYSMAC LINK Networks and the overall system is considered a Multilevel SYSMAC LINK System. Operating levels, which are described later in this manual, are used to differentiate between the two Networks to which one PC might belong.

The SSS/CVSS connection is not a required part of the System. It is shown here because of its usefulness in monitoring and controlling not only the operation of the SYSMAC LINK System itself, but the general operation of all the PCs connected in the same Network(s) as the PC to which the SSS/CVSS is connected.

The abbreviation SLK indicates a SYSMAC LINK Unit.



Note Terminators must be connected to the Units on the ends of networks connected by coaxial cable.

1-4 Unit Compatibility

There are some restrictions regarding the models and versions of PCs to which SYSMAC LINK Units can be mounted. There are also limitations in using SYSMAC LINK Units together with other Link Units. These limitations are described in this section.

1-4-1 Compatibility with PCs

The following table shows which CPU Units are compatible with which SYSMAC LINK Units. The SYSMAC LINK Units cannot be used with other CPU Units or with a C2000H Duplex System (even one set for Simplex operation.)

A Communications Board equipped with a Link Interface (C200HW-COM01/04-EV1) is required to mount a SYSMAC LINK Unit to a C200HX, C200HG, or C200HE PC.

SYSMAC LINK Unit	Cable	Applicable CPU Unit(s)
C1000H-SLK21-V1	Coaxial	C1000H-CPU01-EV1 or C2000H-CPU01-EV1
C1000H-SLK11	Optical fiber	
C200HW-SLK23 C200HW-SLK24	Coaxial	C200H-CPU11-E C200H-CPU31-E C200HS-CPU31-E C200HS-CPU33-E C200HE-CPU32-E C200HE-CPU42-E C200HG-CPU33-E C200HG-CPU43-E C200HG-CPU53-E C200HG-CPU63-E C200HX-CPU34-E C200HX-CPU44-E C200HX-CPU54-E C200HX-CPU64-E
C200HW-SLK13 C200HW-SLK14	Optical fiber	

1-4-2 Compatibility with Other Link Units

C1000H-SLK11 and C1000H-SLK21-V1

The following combinations of Units can be mounted on a single C1000H or C2000H PC.

1, 2, 3...

1. Two SYSMAC LINK Units
2. One SYSMAC LINK Unit and one SYSMAC NET Link Unit
3. One SYSMAC LINK Unit and one Rack-mounting Host Link Unit

In addition to the Units in the above combinations you may also mount one CPU Unit-mounting Host Unit or up to two PC Link Units. Only one PC Link Unit can be mounted on the C500-BC081 and C500-BC051 Backplanes, because these Backplanes have only 3 linkable slots.

When combining Units as shown above, use the following models.

Name	Model	Remarks
SYSMAC LINK Unit	C1000H-SLK11	Optical type
	C1000H-SLK21-V1	Coaxial type
SYSMAC NET Link Unit	C500-SNT31-V4	Other versions cannot be used.
Rack-mounting Host Link Units	C500-LK103 C500-LK103-P C500-LK203	Other versions cannot be used.
CPU Unit-mounting Host Link Units	3G2A6-LK101-EV1 3G2A6-LK101-PEV1 3G2A6-LK201-EV1 3G2A6-LK202-EV1	---
PC Link Units	C500-LK009-V1 C500-LK009	---

⚠ Caution Be sure to set a unique operating level for each system when combining SYSMAC LINK Units, SYSMAC NET Link Units, and/or Host Link Units (SYSMAC WAY) on the same PC.

C200HW-SLK13, C200HW-SLK14, C200HW-SLK23, and C200HW-SLK24

The following combinations of Units can be mounted on a single PC. Some power supplies might not have sufficient capacity for all system configurations; be sure to check power supply requirements and capacities carefully.

1, 2, 3... 1. Two SYSMAC LINK Units

2. One SYSMAC LINK Unit and one SYSMAC NET Link Unit

In addition to the Units in the above combinations you may also mount one CPU Unit-mounting Host Link Unit, up to two rack-mounting Host Link Units, or up to two PC Link Units. For the C200HX, C200HG, or C200HE PC, one SYSMAC LINK Unit and one PC Card Unit may be mounted.

When combining Units as shown above, use the following models.

Name	Model	Remarks
SYSMAC LINK Unit	C200HW-SLK13 C200HW-SLK14	Optical type
	C200HW-SLK23 C200HW-SLK24	Coaxial type
SYSMAC NET Link Unit	C200HS-SNT32	---
PC Card Unit	C200HW-PCU01	Can be used only with with the C200HX, C200HG, or C200HE.
Rack-mounting Host Link Units	C200H-LK101 (-PV1) C200H-LK201-V1 C200H-LK202-V1	---
CPU Unit-mounting Host Link Units	3G2A6-LK101-EV1 3G2A6-LK101-PEV1 3G2A6-LK201-EV1 3G2A6-LK202-EV1	Cannot be used with the C200HS, C200HX, C200HG, or C200HE.
PC Link Units	C200H-LK401	---

Note Be sure to set a unique operating level for each system when combining SYSMAC LINK Systems, SYSMAC NET Link Systems, and the PC Card Unit on the same PC.

1-5 Precautions

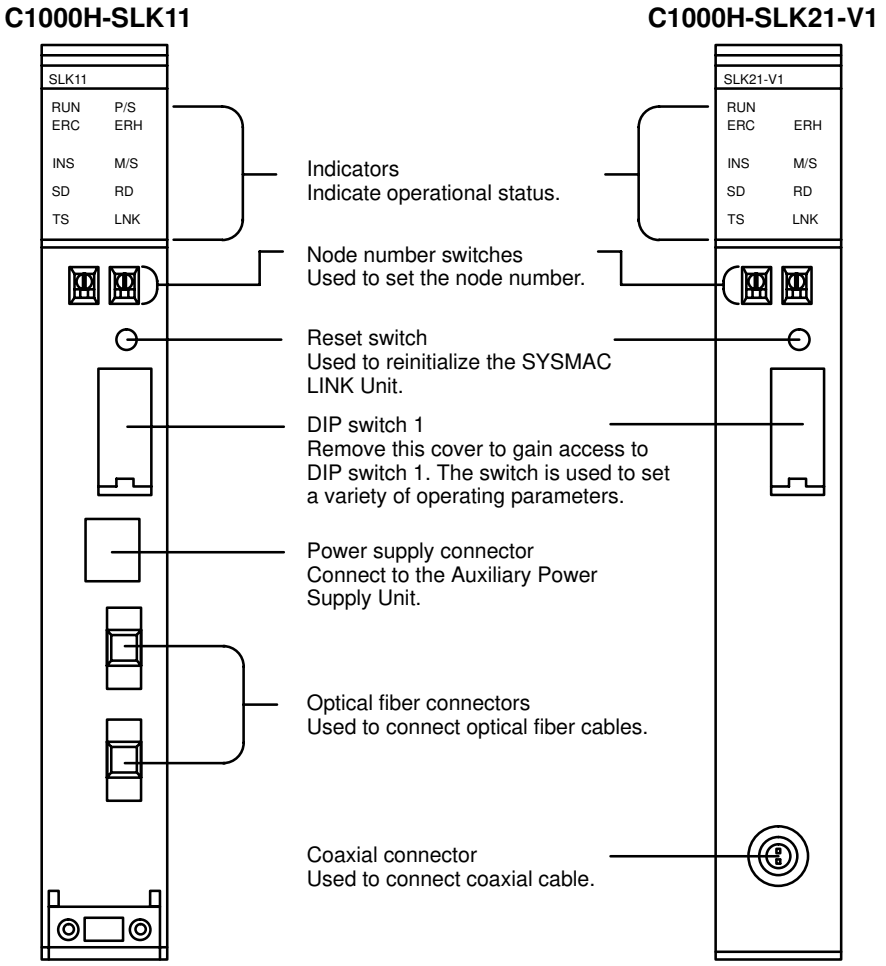
- A Bus Connector is required to mount the C200HW-SLK13, C200HW-SLK14, C200HW-SLK23, or C200HW-SLK24. Refer to *Section 3 Installation* for details.
- Be sure to set different operating levels when mounting a SYSMAC LINK Unit on the same PC with a SYSMAC NET Link Unit, Host Link Unit (Rack-mounting type), or PC Card Unit. Refer to *Section 2 Unit Components and Switch Settings* for details.
- The input interrupt response speed is 1 ms max. for the C200HW-SLK13, C200HW-SLK14, C200HW-SLK23, or C200HW-SLK24 when mounted to the C200HX/HG/HE and 10 ms max. when mounted to the C200H or C200HS.
- The C200HW-SLK13, C200HW-SLK14, C200HW-SLK23, or C200HW-SLK24 are totally upwardly compatible from the C200HS-SLK12 and C200HS-SLK22.
- The power supply capacity depends on the CPU Unit that is being used. Refer to you PC's *Installation Guide* for details and do not run over the power supply capacity.

SECTION 2
Unit Components and Switch Settings

The names and functions of the SYSMAC LINK Units' components and switch settings are described in this section.

2-1 C1000H-SLK11/SLK21-V1 Components

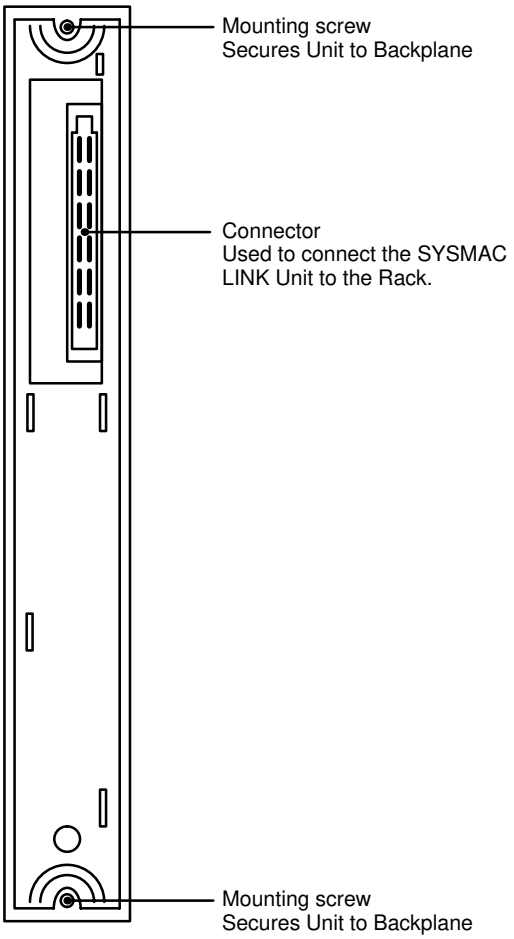
Front



Note Do not push the Reset Switch on SYSMAC LINK Units when the RUN indicator is not lit (watchdog timer error).

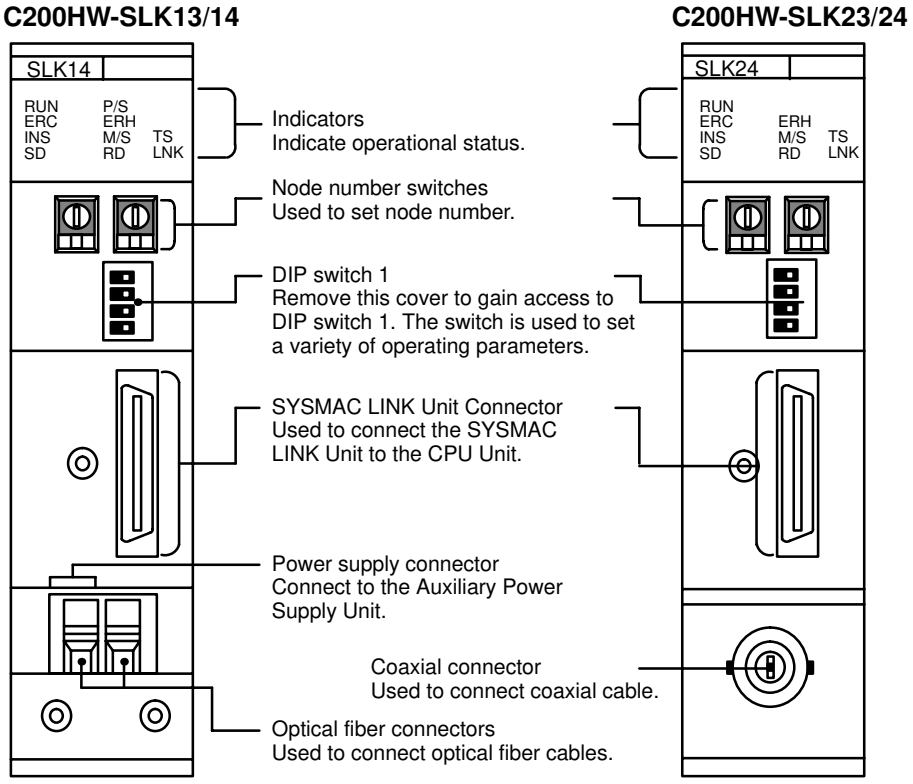
Back

The backs of the C1000H-SLK11 and C1000H-SLK21-V1 are identical.



2-2 C200HW-SLK13/14/23/24 Components

Front



Back

The backs of the C200HW-SLK13/14 and C200HW-SLK23/24 are identical.