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# Industrial Communication




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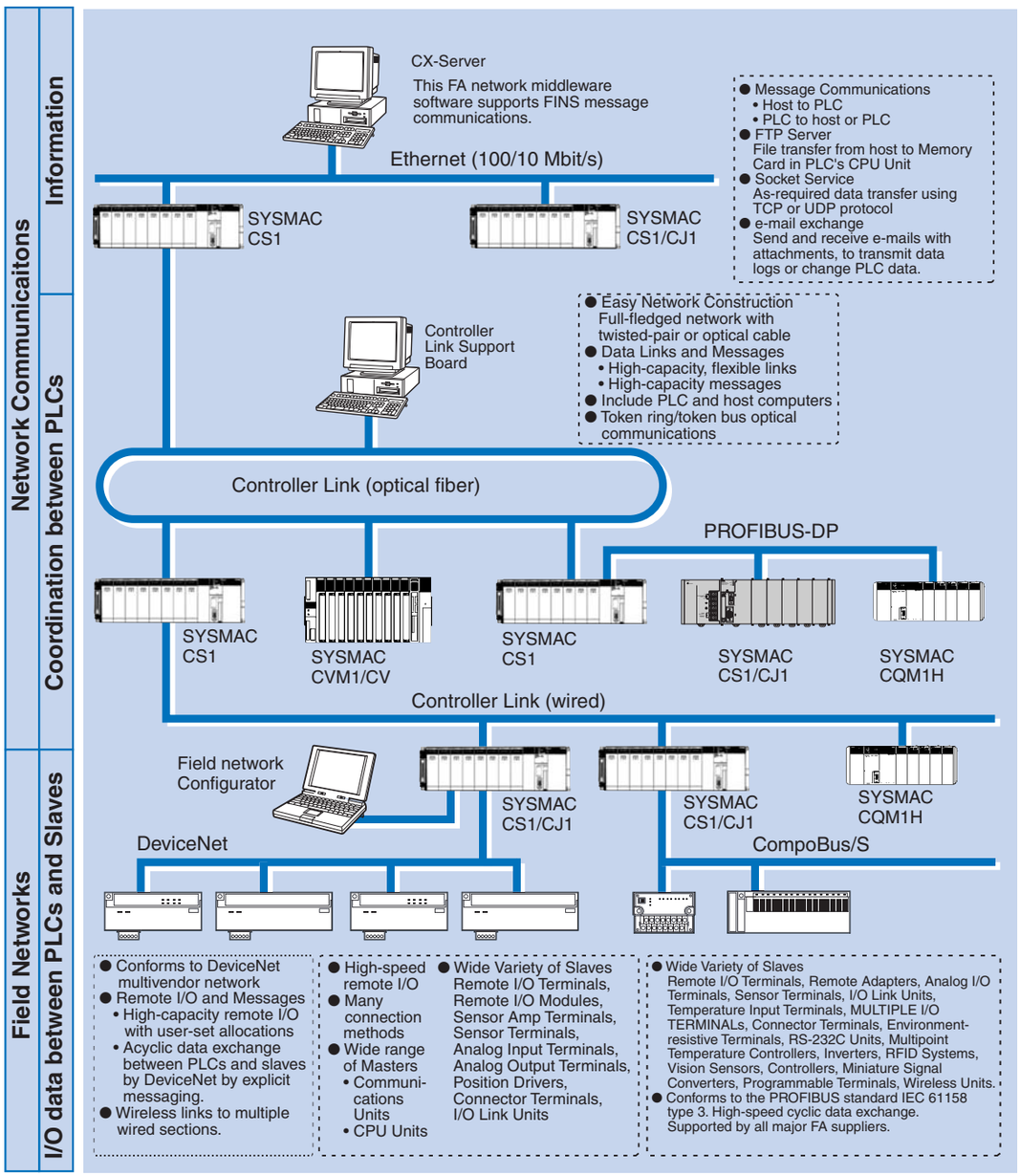
# Industrial Communication

## Overview

### Seamlessly connect control networks to information

Omron has pioneered seamless communication through multiple network levels. The FINS (Factory Information Network System) protocol was designed to be used over open standard networks like Ethernet and DeviceNet, as well as proprietary networks like Controller Link.

On fieldbus level, multi-vendor field networks are supported with DeviceNet and PROFIBUS-DP, whereas Omron's fast CompoBus/S system offers a simple and cost-effective remote I/O solution.






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### Communications Network Overview

| Network type | | Network name | Connections | Communications | Applicable PLCs |
|---|---|---|---|---|---|
| Communi-cations networks | Information | Ethernet | Host to PLC | FINS message communications | CJ1, CS1: Ethernet Unit<br>C200HX/HG/HE(-Z):PC Card Unit<br>(Ethernet Card) |
| | | | PLC to PLC | | |
| | | | Host to Memory Card in CPU Unit | FTP server | |
| | | | Unix computer or other node with socket service to PLC | Socket service | |
| | | | PLC to Host | Mail transmissions<br>(CS1/CJ1 Ethernet Unit only) | |
| | | | Host to PLC | | |
| | Port-to-port PLC control networks | Controller Link | Network-connected computer and PLC | FINS message communications | CJ1, CS1, C200HX/HG/HE(-Z), CQM1H:<br>Controller Link Unit |
| | | | | Data links (Offset designation and easy setting possible.) | |
| | | Controller Link | PLC to PLC | FINS message communications | |
| | | | | Data links (Offset designation and easy setting possible.) | |
| Field networks | PLC-to-slave control networks | DeviceNet | PLC to PLC | Explicit and FINS communications on open network.<br>With the CS1W-DRM21, communications are possible with upper-level networks. | Master: CJ1, CS1, C200HX/HG/HE(-Z), Open Network Controller, VME Board<br>Slaves:CJ1, CS1, C200HX/HG/HE(-Z), CQM1H, CPM, PC Board |
| | | DeviceNet | PLC to slaves (components) | Large-volume remote I/O on open network (automatic or user-specified allocations) | |
| | | PROFIBUS-DP | | | Master: CS1, C200H-series, CJ1<br>Slave: CS1, C200H-series, CJ1, CQM1H, CPM2A, CPM1A |
| | | CompoBus/S | | High-speed remote I/O (fixed allocations) on special OMRON network | Master:CJ1, CS1, C200HX/HG/HE(-Z), CQM1H, SRM1, CPM2C-S, SYSMAC Board<br>Slaves:CPM1A, CPM2A, CPM2C |
| Motion Network | PLC to Servo control network | MechatroLink | CS1 PLC and<br>Sigma II servo drives | Co-ordinating motion.<br>Up to 30 axes. | CS1 |

## Basic Specifications Communication Networks

| Item | | Ethernet | Controller Link |
|---|---|---|---|
| Communications | Messages | Supported | Supported |
| | Automatic Data links | Not supported | Supported |
| Other functions | | • Socket service<br>• FTP server<br>• Mail notification | --- |
| Maximum baud rate | | 100 Mbps (CS1, CJ1) | 2 Mbps, Communications cycle time: approx 34 ms (for wired network with 32 nodes and data links of 2 Kbits + 2 kWords) |
| Maximum communications distance | | 2.5 km | Twisted-pair: 1 km*<br>H-PCF optical fiber: 20 km<br>GI optical fiber: 30 km<br>*At 500 Kbps |
| Maximum number of nodes | | 254 nodes | Wired: 32 nodes, 64 with repeaters<br>Optical: 62 nodes |
| Communications media | | Coaxial cable (10Base-5) or twisted-pair cable (10Base-T, 100Base-Tx) | Twisted-pair or optical fiber cable |
| Data link capacity of network | | --- | 32,000 words |
| Remote I/O | | --- | --- |
| Applicable PLCs | | CJ Series, CS Series, C200HX/HG/HE(-Z) | CJ Series, CS Series, C200HX/HG/HE(-Z)*<br>*: Twisted-pair cable only |



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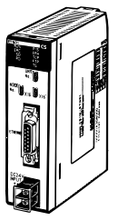
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# Ethernet

***Unite Factory Controls and Office Information***



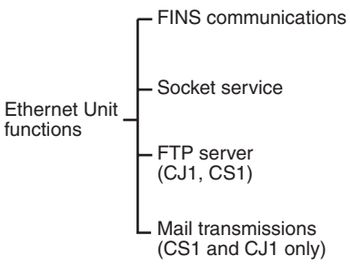
CJ1W-ETN11/21
for CJ1
Modular PLC



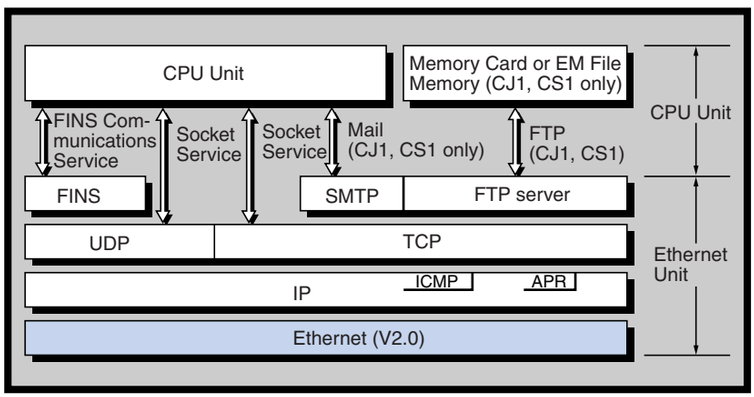
CS1W-ETN01/11/21
for CS1 Rack PLCs

## Outline

- Use the socket service to send and receive the required data using TCP/IP or UDP/IP.
- Execute FINS commands using any of the standard protocols provided by OMRON.
- Send files via FTP.
- Send mail to provide information using SMTP, POP3.
- All of this is supported using Ethernet. Communications services can be selected based on the need at hand to flexibly merge PLCs into the Ethernet information network.



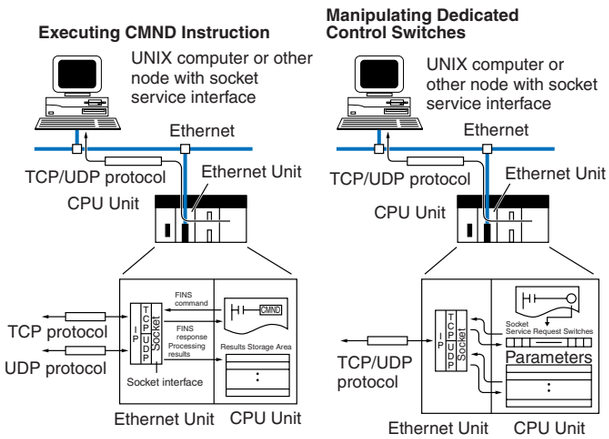

## Software Configuration




## Features

### Socket Service Using UDP/IP or TCP/IP

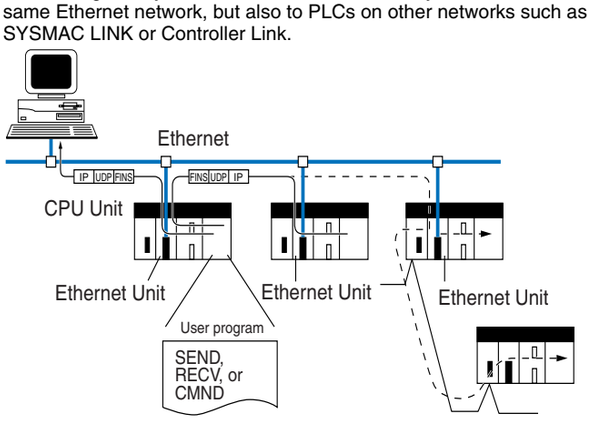
The socket service enables sending and receiving various data with UDP/IP or TCP/IP using standard protocols for Ethernet. This enables communications with a wide range of devices that support Ethernet communications, including control devices, workstations, personal computers, and Ethernet Units from other manufacturers.




### FINS Message Communications

FINS commands, a special communications services from OMRON, can be sent to or received from other PLCs or computers on the same Ethernet network by executing SEND, RECV, or CMND instructions in the ladder-diagram program.

The FINS gateway function allows access not only to PLCs on the same Ethernet network, but also to PLCs on other networks such as SYSMAC LINK or Controller Link.





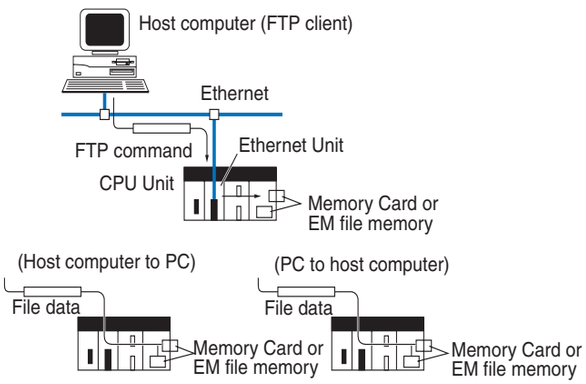

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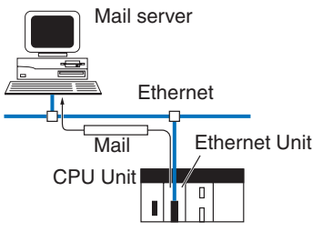
## FTP Server (CS1, CJ1, and CVM1/CV Series Only)

The Ethernet Unit has a built-in FTP server function, so that workstations and other computers on the Ethernet with FTP client functions can read or write individual files with PLCs. This enables the client to download large quantities of data without any programming in the ladder program in the PLC.




## Mail (CS1 and CJ1 Series Only)

Data such as user-created messages, Ethernet Unit error log information, data and status information can be sent as e-mail to a host computer. This enables on-site information to be sent from the PLC to the host computer in a single e-mail message. With the CS1W- and CJ1W-ETN21 Units, it is possible to send/receive e-mails with attachments, transfer programs and data to the PLC CPU by e-mail, and send FINS commands to the PLC CPU.




## Connect Networks to the Controller Link Network

FINS message communications can be used to communicate between information networks and the Controller Link control network. A host computer can thus communicate through a PLC on Ethernet to monitor PLCs on the Controller Link FA network. Also, PLCs on the Controller Link Network can send and receive data with the host computer on Ethernet by communicating through a PLC on Ethernet.

## Network Troubleshooting Functions

A wealth of RAS functions are provided for rapid troubleshooting.

- Self-diagnosis functions at startup
- PING command support to confirm connections to other nodes
- Internode echo tests to confirm connections to other nodes
- Error logs to record realtime error information
- Error notification via e-mail

## Ethernet Unit Comparison

| Item | | CJ1W-ETN11<br>CJ-series Ethernet Unit | CS1W-ETN01/ETN11<br>CS-series Ethernet Unit | CJ1W-ETN21, CS1W-ETN21<br>CJ-, CS1series PLCs |
|---|---|---|---|---|
| Applicable PLCs | | CJ-series PLCs | | |
| Transmission media (connections) | | CS1W-ETN01:10Base-5<br>Others:10Base-T | | 100Base-Tx |
| FINS service | FINS commands | Implemented with CMND (COMMAND) instructions | | |
| | Command reception | FINS commands can be received simultaneously from multiple nodes. | | FINS commands can also be received by e-mail. |
| Socket service | Number of TCP/IP sockets | 8 sockets | | |
| | Number of UDP/IP sockets | 8 sockets | | |
| | Methods | Implemented with CMND (COMMAND) instructions | | |
| | | Implemented by manipulating specific bits. | | |
| FTP server functions (file transfer) | | Supported | | |
| e-mail functions | | Possible only when manipulating specific bits. | Transmit pre-defined e-mails by command bits. | Transmit and receive e-mail (SMTP, POP3) with attachments. Exchange data files and receive FINS commands. |
| Programming Device connections through gateway from serial to Ethernet communications | | Supported | | |





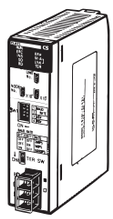
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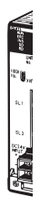
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# Controller Link

***A main FA network supporting data links and message communications.***
***Select from wired, optical, and optical ring models.***



CS1W-CLK21-V1
(wired) for
CS1 PLCs



CS1\
CS1\
(optic
CS1



CQM1H-CLK21
(wired) for CQM1-
Series PLCs



CJ1V
(wire
Serie





## Outline

These Units connect to the Controller Link FA network to enable data links (shared memory areas) between PLCs and between PLCs and FA computers. They also enable message communications between PLCs and between PLCs and FA computers to enable sending required data only when needed.

### What is Controller Link?

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

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

A Controller Link Network can be connected by either shielded twisted-pair cable or optical fiber cable, including optical ring connections. Large quantities of data can be sent and received at high speeds to enable easy creation of a wide-range network encompassing both lower and higher network levels.

Repeaters can be used to extend a Controller Link network up to 62 nodes, to extend a wired network up to 3 km, and to bridge distances up to 2 km by an optical fiber link.

## Controller Link Features

- Controller Link
  - Data links
    - Manual settings
    - Automatic settings
  - Message communications
    - SEND/RECV instructions
    - CMND instructions
  - RAS functions
    - Status area
    - Error log
    - Polling node backup
    - Node bypass
    - Transmission path duplication*
    - Disconnect detection and notification*
    - Node connection configuration readout*

*Only for Optical Ring models in token ring mode.



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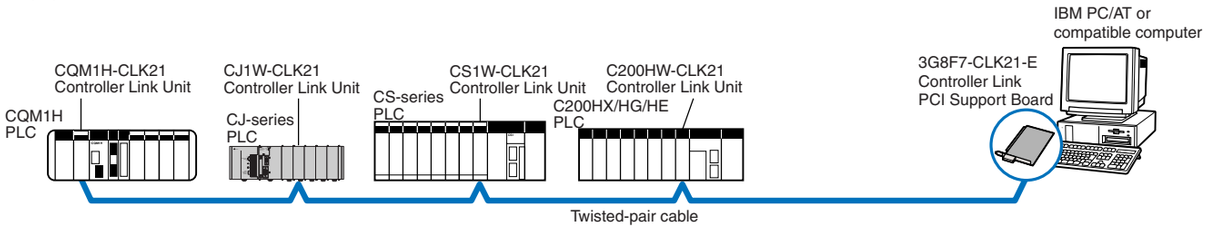




## System Configuration

### Wired System (Twisted-pair Cable)

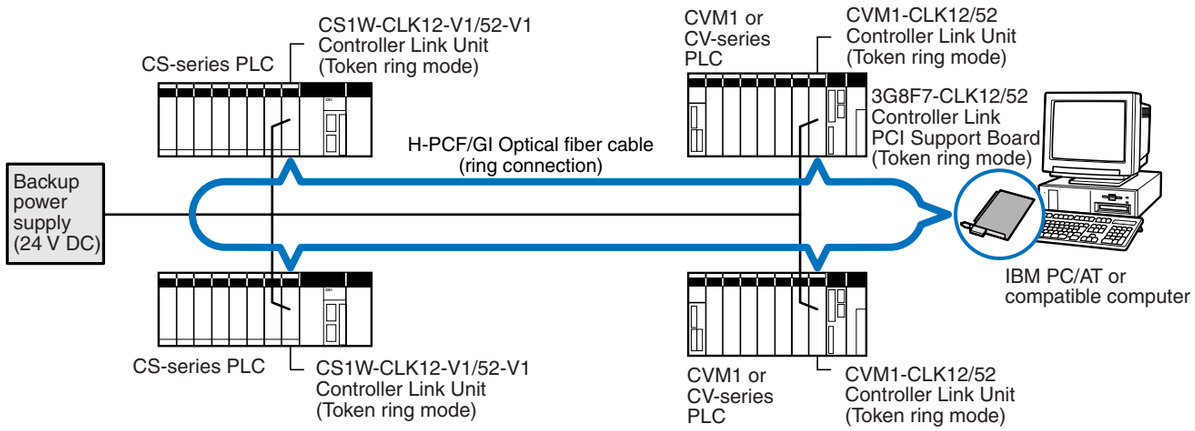
Wired Systems are supported by CJ-series, CS-series, C200HX/HG/HE(-Z), CQM1H, CVM1, and CV-series PLCs.



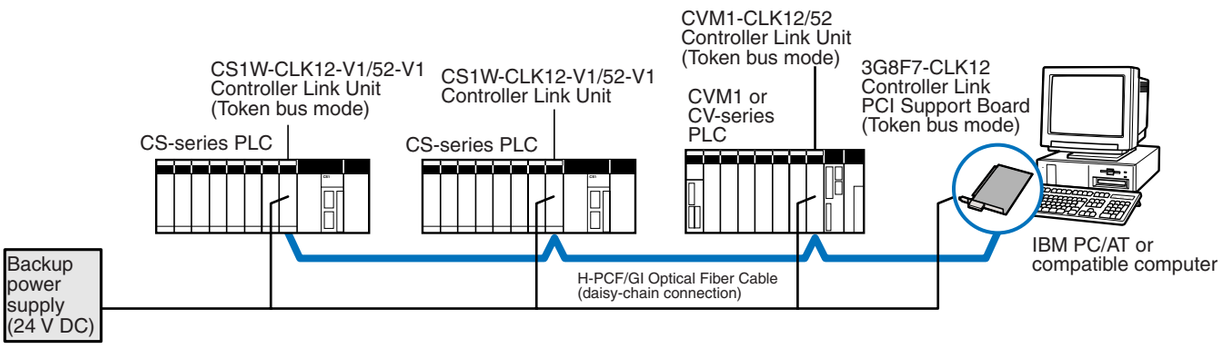

### Optical Bus or Optical Ring System (H-PCF or GI Cable)

Optical Systems are supported by CS-series, CVM1, and CV-series PLCs.

**Token Ring Mode**




**Token Bus Mode**




## Features

### Data Links

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

The I/O area (CIO area), data link area (LR area), data memory area (DM area), and extended data memory area (EM area) can be freely set in the send or receive area.

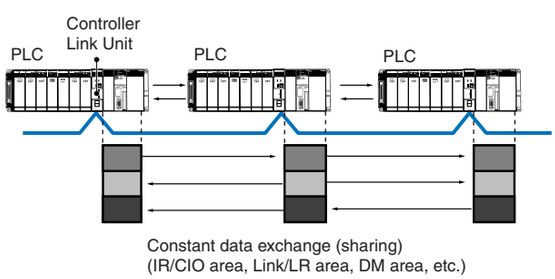
- Number of send words per node: 1,000 words max.
- Number of send and receive words per node:
  CS/CJ-series PLCs: 12,000 words max.
  C200HX/HG/HE(-Z)/CVM1/CV-series PLCs: 8,000 words max.
  Computer nodes: 32,000 words max.

The data link areas can be set automatically or manually.

**Automatic Setting**

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

Various predefined communication modes can be selected (equal size areas, master-slave type, chain link type) using -V1 models.



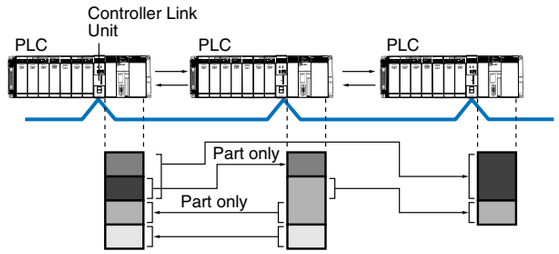



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**Manual Setting**
Used for flexible data link processing depending on each system.

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




## Message Service

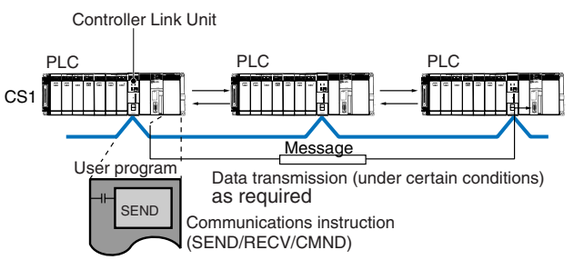
The message service can be used to control data transmission with particular nodes, reading or writing of status data, changing of operation modes, etc., by executing communications instructions in the user program. The communications instructions include SEND and RECV instructions for data transmission and CMND instructions for sending various commands.

**SEND/RECV**
The SEND and RECV instructions sends and receives data in an area of a particular node.

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

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

**CMND**
The CMND instruction sends commands such as those to read or write data at other nodes, perform control operations, or read error logs. With the Controller LInk Unit, OMRON's command protocol called FINS is used.




## Twisted-pair Cable or Optical Fiber Cable Connections

The Controller Link Units can be connected to the network using either shielded twisted-pair cable, H-PCF fiber-optic cable, or GI fiber-optic cable. Select the system that suits your application.

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

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

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

**Features of Optical Fiber Cable**
Optical Fiber Cable has superior noise resistance, so this system can provide highly reliable communications even in very noisy conditions. The fiber-optic cable allows long-distance and large-scale networks.

With H-PCF fiber-optic cable, the communications distance can be up to 20 km in total, enabling a wider range of system size and network scale.

## Compatibility with Different Node Configurations

The following Controller Link Units and Controller Link Boards are available for communications between different models. Wired Units and Optical/Optical Ring Units, however, cannot be combined on the same network.

**Wired System**
- Units for CQM1H, CJ-series, CS-series, C200HX/HG/HE(-Z), and CVM1/CV-series PLCs and Support Board interfaces for computers with a PCI bus

**Optical Ring System (H-PCF or GI Cable)**
- Units for CS-series and CVM1/CV-series PLCs and Support Board interfaces for computers with a PCI bus

## Flexible Inter-network Connections

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

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

## RAS Functions

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

## Status Area

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

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

## Error Log

The error log function records contents (codes) and times of errors that occur in the network into the RAM or EEPROM, up to the maximum of 39 errors.

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

## Node Bypass

Data communications can be continued by bypassing the node, even when a node in the communications line malfunctions or the PLC or IBM PC/AT or compatible computer power supply is turned OFF. This prevents the whole network system from being affected by a node malfunction or power interruption.

To use the bypass node function, a 24-V DC backup power must be supplied to the Controller Link Unit/Support Board.

## Transmission Path Duplication

In the token-ring mode in an Optical Ring System (H-PCF cable), data transmission will be unaffected even by a cable or connector break at one location in the ring connection. With the fiber-optic cable wired in a ring shape, a break at one point will simply cause the transmission to be routed in the other path.

## Disconnect Detection and Notification

Even with transmission path duplication, the network will be broken if disconnections occur in two or more places. In the token-ring mode in an Optical Ring System (H-PCF cable), the location of a disconnection can be detected and can be identified by means of the status display for all nodes. This function can be used to prevent system crashes in advance, by performing maintenance when a disconnection occurs at one place.

## Node Connection Configuration Data Reading

In the token-ring mode in an Optical Ring System (H-PCF cable), connection data can be read for all of the nodes configured in the network. The information that can be read includes the order in which the nodes are connected and which of two optical connectors is connected to which node. Special support software (Controller Link Support Soft-



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ware, Ver. 2.00 or later) is required in order to read the node connection configuration data.

## Data Link Settings with CX-Programmer

With the CS-series Controller Link Unit, the CX-Programmer programming software can be used to set data links freely or monitor data link status. (The Controller Link Support Software cannot be used connected directly to the RS-232C port on a CS-series PLC.)



### Communications Specifications

| Items | | Wired | Optical Ring, H-PCF cable (See note 1.) | Optical Ring, GI cable |
|---|---|---|---|---|
| Baud rate | | 2 Mbps, 1 Mbps, or 500 kbps | 2 Mbps | 2 Mbps |
| Data Link cycle time (2 kWords + 2 Kbits for 32 nodes) | | 35 ms (2 bps) | 37 ms | 37 ms |
| Maximum transmission distance | | 500 m, 800 m, 1 km | 20 km | 30 km |
| Maximum distance between nodes | | 500 m, 800 m, 1 km | Crimp cut: 800 m<br>Adhesive: 1 km | 62.5/124 µm: 2 km<br>50/125 µm: 1 km |
| Transmission medium (cable) | | Shielded twisted-pair cable (special cable) | H-PCF cable (200/230 µm) | GI cable (62.5/125 µm or 50/125 µm) |
| Node connection method | | Terminal block (M3 crimp terminals) | Connected via special 2-carrier optical cable (JIS-F07) | Connected via ST connectors (IEC-874-10) |
| Transmission path format | | Multidrop connections (token-bus mode) | Ring method (token-ring mode)<br>Daisy-chain method (token-bus mode) | Ring method (token-ring mode)<br>Daisy-chain method (token-bus mode) |
| Maximum number of nodes | | 32 nodes | 62 nodes (See note 2.) | 62 nodes (See note 2.) |
| Number of network levels | | 8 (via FINS communications) | 8 (via FINS communications) | 8 (via FINS communications) |
| Number of data link words | Per network | 32,000 words | 64,000 words | 64,000 words |
| | Per node | Send:1,000 words max.<br>Receive: 20,000 (See note 3.)<br>(Computer with Support Board: 32,000 words) | Send:1,000 words max.<br>Receive: 20,000 (See note 3.)<br>(Computer with Support Board: 62,000 words) | Send:1,000 words max.<br>Receive: 20,000 (See note 3.)<br>(Computer with Support Board: 62,000 words) |
| Message length | | 2,012 bytes max.<br>(including the header) | 2,012 bytes max.<br>(including the header) | 2,012 bytes max.<br>(including the header) |
| International standards | | EC, UL/CSA | EC, UL/CSA | EC, UL/CSA |
| RAS functions | | Node bypass<br>Error detection<br>Polling node backup<br>Self-diagnosis function (hardware checking at startup)<br>Watchdog timer<br>Broadcast test<br>Error log function | Node bypass<br>Error detection<br>Polling node backup<br>Self-diagnosis function (hardware checking at startup)<br>Watchdog timer<br>Broadcast test<br>Error log function<br>Loop bypass power supply<br>Loopback functionality (token ring mode) | Node bypass<br>Error detection<br>Polling node backup<br>Self-diagnosis function (hardware checking at startup)<br>Watchdog timer<br>Broadcast test<br>Error log function<br>Loop bypass power supply<br>Loopback functionality (token ring mode) |
| Models | For PLCs | CS1W-CLK21-V1,<br>CJ1W-CLK21-V1,<br>CQM1H-CLK21 | CS1W-CLK12-V1 | CS1W-CLK52-V1 |
| | For computers | 3G8F7-CLK21 (PCI bus) | 3G8F7-CLK12-V1 (PCI bus) | 3G8F7-CLK52-V1 (PCI bus) |

**Note: 1.** Optical Ring Units in token bus mode can be used on the same network as Optical Bus Units/Boards (CS1W-CLK11 and 3G8F5-CLK11).

**2.** With the token-bus method, the maximum number of nodes in an Optical Bus System with optical bus nodes (i.e., model numbers ending in CLK11) is 32 (node addresses 1 to 32). The total number of words that can be transmitted in a data link is 32,000 words max. CX-Net in CX-Programmer can be used in systems with up to 32 nodes (node addresses 1 to 32). Use Controller Link Support Software (Ver. 2.00 or later) for systems with up to 62 nodes (node addresses 1 to 62).

**3.** For CS1/CSJ. C200HX/HG/HE, CVM1/CV-series, and CQM1H PLCs: 8,000 words.

## Data Link Specifications

| Item | | Automatically set links | | User-set links | |
|---|---|---|---|---|---|
| Number of data link nodes | | 32 nodes max. (2 nodes min.) | | | |
| Number of data link words | Send/receive words per node (total of areas 1 and 2) | CS/CJ Series: 20,000 words max.<br>CVM1/CV Series, C200HX/HG/HE, CQM1H: 8,000 words<br>Personal computers: 32,000 words | | | |
| Data link areas | Area 1 | CIO/IR area (I/O bits, works bits, etc., including data link bits) | | CIO/IR area (I/O bits, works bits, etc., including data link bits), DM area, EM area | |
| | Area 2 | DM area, EM area | | CIO/IR area (I/O bits, works bits, etc., including data link bits), DM area, EM area | |
| Number of send words per node | Area 1 | 0 to 1,000 words (same number for each node) | Max. total for area 1 and area 2: 1,000 words | 0 to 1,000 words (may be different for each node) | Max. total for area 1 and area 2: 1,000 words |
| | Area 2 | 0 to 1,000 words (same number for each node) | | 0 to 1,000 words (may be different for each node) | |
| Data reception | Area 1 | All of the data sent by the other nodes is received. It is not possible to receive only part of the data. | | Settings can be made to receive all, none, or part of the data from any specific node. | |
| | Area 2 | | | | |
| Offset setting | Area 1 | Not supported | | Supported (Settings can be made to receive a specified number of words from a specified word offset from the first word.) | |
| | Area 2 | | | | |
| Send node order | Area 1 | The order is the same as the node addresses. | | Any order | The same order must be used for areas 1 and 2. |
| | Area 2 | | | Any order | |



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## Message Communications Specifications

| Item | | SEND/RECV | CMND |
|---|---|---|---|
| Application | | Sending and receiving data | Reading and writing data at other nodes (e.g., file memory), changing the operating mode and other control operations, reading error logs, etc. |
| Message contents | | Sending commands to send or receive data | Sending any FINS command |
| Local node to remote node | PLC to PLC | Supported. | Supported. |
| | PLC to computer | Supported, but programming is required on the computer to return a response) | Supported, but programming is required on the computer to return a response) |
| | Computer to PLC | Supported, but programming is required on the computer to receive a response) | Supported, but programming is required on the computer to receive a response) |
| Local node: Remote nodes | | SEND: 1:1 or 1:N (broadcasting)<br>RECV: 1:1 | 1:1 or 1:N (broadcasting) |
| Data length | | 1,980 bytes (990 words) max. | 1,990 bytes max. |

### Conversion guide from SYSMAC LINK to Controller Link

| Item | | | | SYSMAC LINK | | Controller Link |
|---|---|---|---|---|---|---|
| Transmission path | | | | Coaxial cable (5C-2V) or optical fiber cable (optical bus) | | Twisted-pair cable or optical fiber cable (optical ring or optical bus) |
| Transmission distance | | | | Coaxial cable: 1km max.<br>Optical fiber cable: 10 km max | | Twisted-pair cable: 1km max. at 500 kbps, 500 m max. at 2 Mbps<br>Optical fiber cable: 20 km max |
| Baud rate | | | | Coaxial: 2 Mbps (fixed)<br>Optical fiber cable: 2 Mbps (fixed) | | Twisted-pair cable: 2 Mbps, 1 Mbps, 500 kpbs<br>Optical fiber cable: 2 Mbps (fixed) |
| Maximum number of nodes | | | | 62 nodes | | Twisted-pair cable: 32 nodes<br>Optical fiber cable: 62 nodes (See note.) |
| Data links | Automatically set | No. of send/receive data link words per node | | CS Series: 2,966 words max. | | CS Series: 20,000 words max.<br>CVM1/CV Series, C200HX/HG/HE(-Z), CQM1H: 8,000 words max. |
| | | Link areas | Area 1 | Data Link Area in CIO Area, fixed first word: CIO 1000 (or LR 00) | Automatic setting in LR area only, DM area only, or both LR and DM areas. | CIO/IR area, user-specified first word |
| | | | Area 2 | DM Area, fixed first word: DM 0000 | | DM or EM area, user-specified first word |
| | | No. of send words per node (same for each node) | | 4, 8, 16, or 32 words | | 1 to 1,000 words, user specified |
| | User-set | Node order | | User-set | | |
| | | Send size | | Can be set | | |
| | | Receive-only nodes | | Not supported (Send area size can be set to 0.) | | Supported |
| | | Send-only nodes | | Supported | | |
| | | Data areas | | Fixed (Area 1: CIO, Area 2: DM) | | Can be set |
| | | Receive size | | All or nothing | | Can be set |
| | | Receive offset (from first word) | | Cannot be set (must receive from beginning) | | Can be set |
| Communications cycle time | | | | Can be set | | Cannot be set |

Note: With the token-bus method, the maximum number of nodes in an Optical Bus System with optical bus nodes (i.e., model numbers ending in CLK11) is 32 (node addresses 1 to 32). The total number of words that can be transmitted in a data link is 32,000 words max. CX-Net in CX-Programmer can be used in systems with up to 32 nodes (node addresses 1 to 32). Use Controller Link Support Software (Ver. 2.00 or later) for systems with up to 62 nodes (node addresses 1 to 62).



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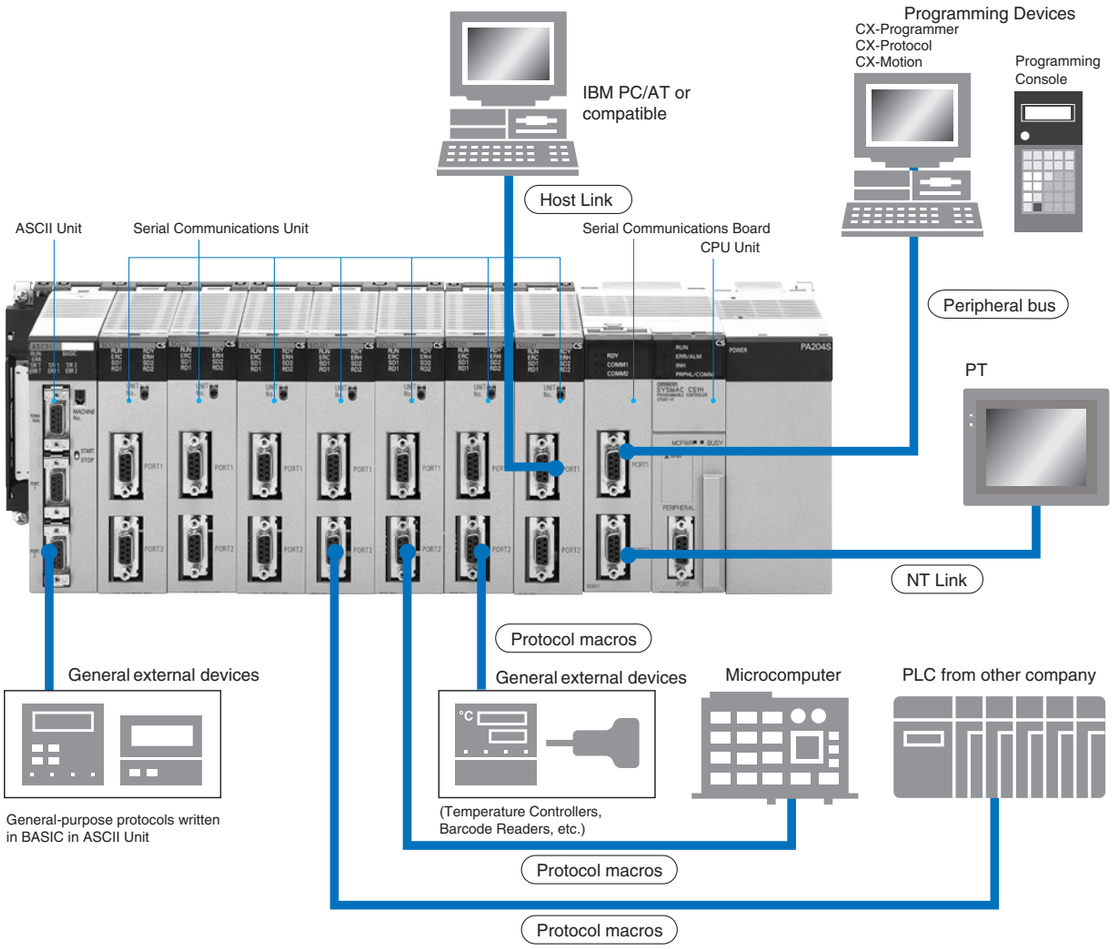
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# Serial Communication



## Serial Communications Connections Examples




## Serial Communications Support

| PLC | Unit name | Port | Serial communications mode | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Protocol macro | Host Link | 1:N NT Link | 1:1 NT Link | No-protocol | 1:1 link | Peripheral bus | Programming Console bus |
| | | | General purpose | Host computer | OMRON PTs | OMRON PTs | General purpose | C-series PLCs | Programming Devices | Programming Console |
| CS1/CJ1 | CPU Unit | Peripheral | --- | Supported | Supported | --- | --- | --- | Supported | Supported |
| | | RS-232C | --- | Supported | Supported | --- | Supported | --- | Supported | --- |
| C200HX/HG/HE(-Z) | | Peripheral | --- | Supported | --- | --- | Supported | --- | Supported | Supported |
| | | RS-232C | --- | Supported | Supported | Supported | Supported | Supported | --- | --- |
| CVM1/CV | | Peripheral | --- | --- | --- | --- | --- | --- | Supported | Supported |
| | | RS-232C | --- | Supported (DIP switch setting) | --- | Supported (DIP switch setting) | --- | --- | --- | --- |
| CQM1H | | Peripheral | --- | Supported | --- | --- | Supported | --- | Supported | Supported |
| | | RS-232C | --- | Supported | --- | Supported | Supported | Supported | --- | --- |
| CPM2A/ CPM2C | | Peripheral | --- | Supported | --- | --- | Supported | --- | Supported | Supported |
| | | RS-232C | --- | Supported | Supported (-V2 only) | Supported | Supported | Supported | --- | --- |
| SRM1(-V2) | | Peripheral | --- | Supported | --- | --- | Supported | --- | Supported | Supported |
| | | RS-232C | --- | Supported | --- | Supported | Supported | Supported | --- | --- |
| C200HX/HG/HE(-Z) | C200H Communications Board | RS232C, RS422A/485 | Supported | Supported | Supported | Supported | Supported | Supported | --- | --- |
| CQM1H | CQM1H Serial Communications Board | RS232C, RS422A/485 | Supported | Supported | Supported | Supported | Supported | Supported | --- | --- |



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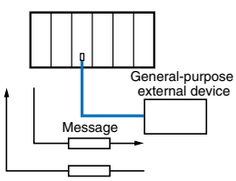
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| PLC | Unit name | Port | Serial communications mode | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Protocol macro | Host Link | 1:N NT Link | 1:1 NT Link | No-protocol | 1:1 link | Peripheral bus | Programming Console bus |
| | | | General purpose | Host computer | OMRON PTs | OMRON PTs | General purpose | C-series PLCs | Programming Devices | Programming Console |
| C200H, C200HS, C200HX/HG/HE(-Z) | Host Link Unit | RS232C, RS422A/485 | --- | Supported | --- | --- | --- | --- | --- | --- |
| CS1 | Serial Communications Board | RS232C, RS422A/485 | Supported | Supported | Supported | --- | Supported | --- | --- | --- |
| | Serial Communications Unit | RS232C | Supported | Supported | Supported | --- | Supported | --- | --- | --- |
| CJ1 | Serial Communications Unit | RS232C, RS422A/485 | Supported | Supported | Supported | --- | Supported | --- | --- | --- |

### Protocol Macros

Data communications procedures called protocols can be created on the CX-Protocol to match the communications specifications of an external devices with an RS-232C or RS-422A/485 port. (Communications, however, must be half-duplex or full-duplex and use start-stop synchronization.) The protocols are transferred to Serial Communications Board or Units to then enable data communications with the external devices merely by executing the PMCR instruction in the CPU Unit.

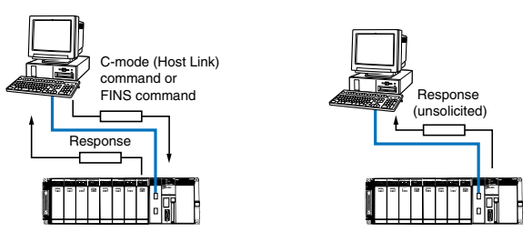
Standard protocols for OMRON components (Temperature Controllers, Panel Meters, Bar Code Readers, Modems, etc.) are provided as a standard feature. The standard protocols can be modified according to application needs and easily used.




### Host Links

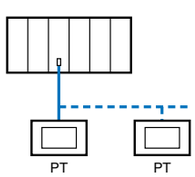
C-mode (Host Link) commands or FINS command wrapped in Host Link headers and terminators can be sent from a host computer (e.g., a personal computer or PT) to perform many operations, such as reading and writing I/O memory or controlling the operating mode of the PLC.

Unsolicited commands can be sent from the PLCs to the host computers. FINS commands are wrapped in Host Link headers and terminators automatically when SEND, RECV, or CMND instructions are executed.




### 1:N NT Links

A PLC can be linked to PTs (Programmable Terminals) from an RS-232C or RS-422A/485 port so that I/O memory in the PLC can be allocated for PT control areas, PT status areas, and objects, such as touch switches, lamps, and memory tables. One PLC can be linked to from 1 to 8 PTs.




**Note: 1.** There are two types of NT Links: 1:1 and 1:N. These are completely different communications modes and are not compatible with each other. Always set the PT for the 1:N mode. Communications will not be possible if it is set to 1:1.

**2.** The NT-AL001 Adapter Unit is required to connect the RS-232C port on the NT30/NT30C PTs in a 1:N NT Link.

**3.** The PT's Programming Console functionality is not supported with 1:N NT Links.

### Protocol Macro Features

#### Support a Wide-range of Protocols

With both RS-232C and RS-422A/485 ports, essentially any device that supports full or half duplex communications and start-stop synchronization can be connected. Send and receive frames can be created as required to meet communications frame specifications, Essentially all send frames (e.g., command + data) and expected receive frames (e.g., responses) can be matched to the communications frames (messages) of the external device.

#### Use Processing Functions for Communications

Error check code calculations, send frame length calculations, and numeric conversions between ASCII and hexadecimal are all supported.

#### Monitor Communications Time

Response wait monitoring, response completion monitoring, and send completion monitoring are all supported, and ending or retrying communications can be set for when monitor times are exceeded.

#### Retry Processing

Just set the number of retries to execute retry processing when something happens to cause an error.

#### Include PLC Read/Write Variables in Send and Receive (Expected) Frames

Read/write variables for I/O memory in the PLC can be included in the send frames (messages). PLC data will be read when sending and used as the destination address or data. Read/write variables for I/O memory in the PLC can also be included in the receive frames. PLC data will be written as the source address or data when response is received.

#### Repeat Variables to Switch Write Destinations for 1:N Communications

Repeat counters for send/receive processing can be included in variables so that, for example, the same data can be sent to up to 32 different destinations by switching the destination address. (The limit of 32 is imposed by the physical layer.) When receiving data, the write address can be easily switched when receiving data for I/O memory in the PLC.

#### PLC Interrupt Processing at Data Reception

Interrupts to the PLC's CPU Unit can be generated when data is received to execute an interrupt program. (Interrupts are supported only by Serial Communications Boards, and not by Serial Communications Units.)

#### Next Processing Switches in Receive Data

The received data can be compared to up two 15 expected reception messages that have been registered in advance and the results of comparison can be used to switch the next process to be executed.



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# Field Networks



## Field Network Specifications

| Item | | PROFIBUS-DP | DeviceNet | CompoBus/S |
|---|---|---|---|---|
| Communications supported | Remote I/O | Yes | Yes | Yes |
| | Messages | Limited (DPV1 specification) | Yes | --- |
| Maximum baud rate | | 12 Mbps | 500 kpbs<br>Communications cycle time: Approx. 5 ms (with 128 inputs, 128 outputs) | 750 kbps (in high-speed mode)<br>Communications cycle time: 0.8 ms max. (with 128 inputs, 128 outputs in high-speed mode) |
| Maximum communications distance | | 1200 m up to 93.75 kbit/s<br>to 100 m at 12 Mbps | 500 m (at 125 kbps)<br>This value is when Thick Cable is used for the trunk line. The value is 100 m for Thin Cable. | 2-conductor cable<br>Main line length:100 m max. in high-speed mode, 500 m in long-distance mode<br>Special Flat Cable or 4-conductor cable:<br>Total line length: 200 m max. total with no other specific restrictions for main or branch line lengths |
| Maximum number of slaves | | 125 slaves | 63 slaves | 32 slaves |
| Communications media | | Special PROFIBUS cable | Special DeviceNet cable | 2-conductor or 4-conductor cable, or special flat cable |
| Maximum number of remote I/O points | | C200HW-PRM21:<br>300 words = 4800 points<br>CJ1W-PRM21,<br>CS1W-PRM21:<br>7000 words = 112000 points | • CS1: 2,048 points (Allocated using DM area settings: 16,000 points, allocated using Configurator: 32,000 points.)<br>• C200HX/HG/HE(-Z): 1,600 points (allocated using Configurator: 4,800 points.)<br>• C200HS: 1,024 points (allocated using Configurator: 1,280 points.)<br>• CVM1/CV: 2,048 points (allocated using Configurator: 6,400 points.) | • CS1, C200HX/HG/HE(-Z), SYSMAC Board, C200HS, SRM1, CPM2C-S: 256 points<br>• CQM1H: 128 points |
| Masters | PLCs | CJ series, CS series,<br>C200H series<br>(Master Unit is classified as a CPU Bus Unit.) | CJ Series, CS Series, CVM1/CV Series, C200HX/HG/HE(-Z), C200HS | CJ Series, CS Series, C200HX/HG/HE(-Z), C200HS, CQM1, SRM1, CPM2C-S |
| | Other | None | Open Network Controllers, VME Boards | SYSMAC Boards, VME Boards |
| Remote I/O slaves | | GT1 I/O terminals, C200H I/O Link Unit, CJ1 I/O Link Unit, CQM1 I/O Link Unit, CPM I/O Link Unit, Inverter communication interface, F150 vision sytem | DRT1 and DRT2 sensor terminals, GT1 terminals, RS-232C Units, E5EK Digital Controller, 3G3MV Multifunction Miniature Inverters, 3G3FV Advanced General-purpose Inverters, V600 Intelligent Flags (ID system), F150 Vision Sensors, NT-DRT21 Programmable Terminal Interface Unit, WD30 Wireless Units, CS1 DeviceNet Unit, CJ1 DeviceNet Unit, C200H I/O Link Unit, CQM1 I/O Link Unit, CPM I/O Link | Remote I/O Terminals, Connector Terminals, Water-resistive Terminals, Sensor Terminals, Analog<br>Analog Output Terminals, Remote I/O Modules, CPM2C I/O Link Unit, CPM1A/CPM2A I/O Link Unit |

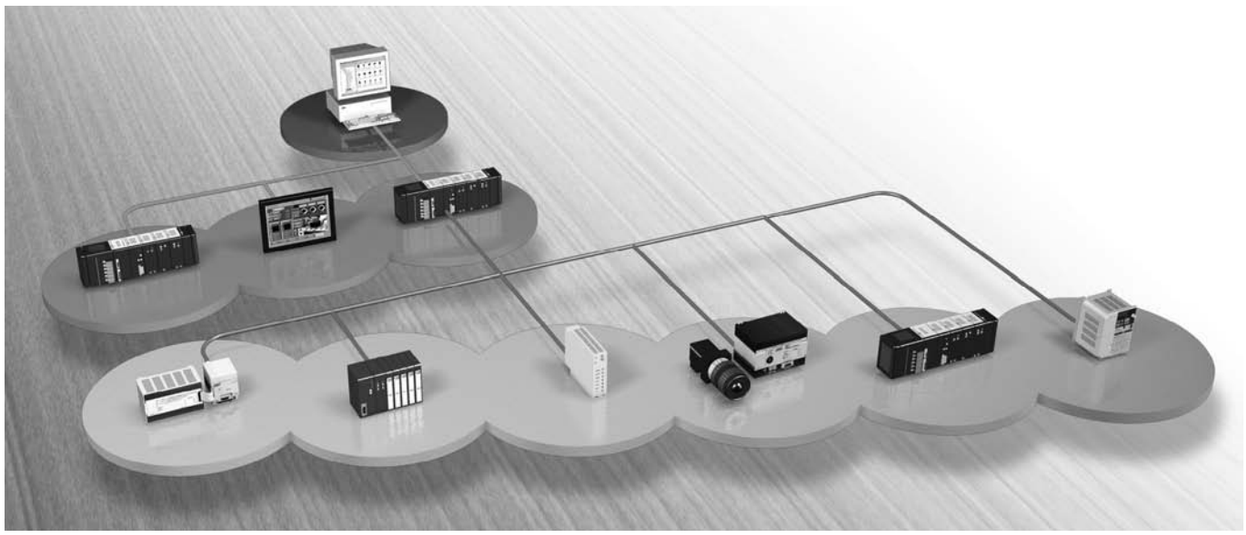


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# PROFIBUS-DP



## PROFIBUS-DP introduction

PROFIBUS is a vendor-independent, open fieldbus standard for a wide range of applications in manufacturing-, process- and building automation. The PROFIBUS standards are set and maintained by the PROFIBUS Nutzer Organisation (PNO) since 1990. Over the years PROFIBUS has become one of the most favoured industry standards for accomplishing a wide variety of process automation tasks.

The importance of this common ground for engineers and process automation specialists was immediately recognised by the OMRON company. OMRON became a member of PNO in 1991. Vendor independence and openness are guaranteed by the PROFIBUS standard IEC 61158 Type 3. With PROFIBUS, devices of different manufacturers can communicate without special interface adjustments.

DP stands for Decentralised Peripherals. It is optimised for high speed and low-cost interfacing, especially designed for communication between automation control systems and distributed I/O at the device level.

## Protocol architecture

The PROFIBUS protocol architecture is oriented on the Open System Interconnection (OSI) reference model in accordance with the international standard ISO 7498. PROFIBUS-DP uses layers 1 and 2, and the user interface. Layers 3 to 7 are not defined.

Layer 1 (physical layer) defines the physical transmission characteristics.

Layer 2 (data link layer) defines the bus access control.

This streamlined architecture ensures fast and efficient data transmission. The application functions which are availible to the user, as well as the system and device behaviour of the various PROFIBUS-DP device-types are specified in the user interface.

## Transmission medium

RS-485 transmission technology or fibre optics are defined as transmission media. RS-485 transmission is the most frequently used transmission technology. Its application includes all areas in which high transmission speed and simple inexpensive installation are required. Twisted pair shielded copper cable with one conductor pair is used.

## Easy installation

The RS-485 transmission technology is very easy to handle. Installation of the twisted pair cable does not require expert knowledge. The bus structure permits addition and removal of stations or step-by-step commissioning of the system without influencing the other stations. Later expansions have no effect on stations which are already in operation.

Various transmission speeds between 9.6 kbit/s and 12 Mbit/s can be selected. One unique transmission speed is selected for all devices on the bus when the system is commissioned.

## Cable length

The maximum cable length depends on the transmission speed. The specified cable lengths are based on type-A cable. The length can be increased by the use of repeaters. The use of more than 3 repeaters in series is not recommended.

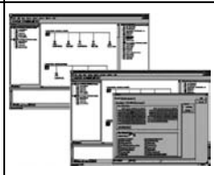
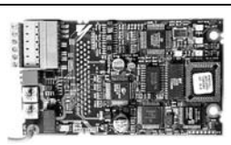
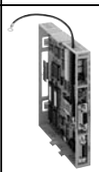


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| Product | Appearance | Model | Specifications | Page |
|---|---|---|---|---|
| PLC masters |  | CS1W-PRM21 | - PROFIBUS-DP master class one with support of DP-V1 data types<br>- 7k word I/O<br>- Simple configuration<br>- Handles data independently, thus reduces CPU load | 361 |
| |  | CJ1W-PRM21 | - PROFIBUS-DP master class one with support of DP-V1 data types<br>- 7k word I/O<br>- Simple configuration<br>- Handles data independently, thus reduces CPU load | 236 |
| Configurator |  | CX-PROFIBUS | Advanced configuration tool that uses FDT/DTM (Field Device Tool and Device Type Manager) Technology<br>- The PROFIBUS-DP network topology and system characteristics are defined and then downloaded in the OMRON PROFIBUS Master Unit<br>- Configuration can be done remotely, via other networks as Ethernet or ControllerLink | 647 |
| PLC slave units |  | CJ1W-PRT21 | PROFIBUS-DP I/O Link<br>- Data link to any PLC data area<br>- Simple configuration using<br>- Max. data input 100 words<br>- Max. data output 100 words | 237 |
| |  | C200HW-PRT21 | Can be used on C200HS/HE/HG/HX and CS1G/H<br>- Default 2 words in + 2 words out, maximum 100 words in and 100 words out<br>- Simple PROFIBUS-DP node address setting by rotary switches<br>- Supports SYNC/FREEZE and Fail/ Safe functions | 362 |
| |  | CQM1-PRT21 | - Auto-detects all PROFIBUS-DP baudrates from 9.6 kbits/s to 12 Mbits/s<br>- Support and indication of PROFIBUS-DP broadcast functions (Sync/Freeze/Clear)<br>- Communication status available externally via relay output<br>- Configurable for 2, 4, 6 or 8 words | For more information please contact your local OMRON representative |
| |  | CPM1A-PRT21 | PROFIBUS I/O link for CPM1A/CPM2A<br>- LED status display<br>- Max. data input 16 bits and 16 output bits | 74 |
| Inverter PROFIBUS Option |  | SI-P1 | PROFIBUS-DP slave for E7(PV), F7(RV), G5(FV) Inverters | For more information please contact your local OMRON representative |
| |  | SI-P1/V7 | PROFIBUS-DP slave for 3G3MV Inverters | For more information please contact your local OMRON representative |
| Servo Drive PROFIBUS Option |  | JUSP-NS500 | PROFIBUS option unit for Sigma-II (W-Series) Servo Drives | For more information please contact your local OMRON representative |



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| Product | Appearance | Model | Specifications | Page |
|---|---|---|---|---|
| XtraDrive with PROFIBUS |  | XD-□□-□□DO | Intelligent Servo Drive with Embedded PROFIBUS | For more information please contact your local OMRON representative |
| F150 Vision system |  | F150-C15E-3-PRT | Number of connected camers:<br>1 unit / 2 units (using the F150-A20)<br>Processing resolution:<br>512 (H) x 484 (V)<br>Number of scenes:<br>16 scenes (can be saved to a computer through the RS-232C)<br>Image memory function:<br>Up to 23 scdreebs can be saved)<br>Processing method:<br>Dark-light/2-value method | For more information please contact your local OMRON representative |
| Temperature Controllers |  | E5ZN | A dedicated gateway is available. | For more information please contact your local OMRON representative |
| PROFIBUS Gateway |  | PRT-SCU11 | PROFIBUS-DP Gateway to HostLink and Compoway-F<br>for MCW151-E<br>for E5□N, E5□R, E5□K | |



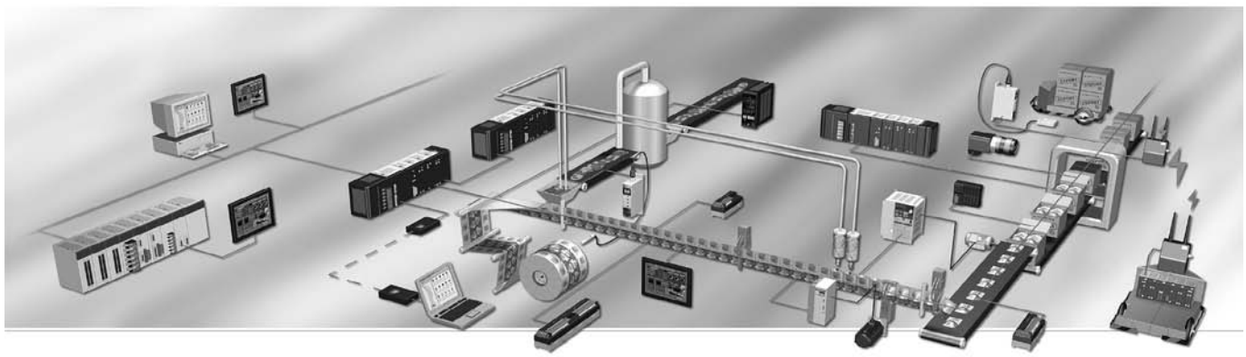
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# DeviceNet





## DeviceNet: Optimising industrial networking

DeviceNet is an innovative industrial network system that enables a wide range of devices to be easily networked and managed remotely. Everything - from PLCs and remote I/O, to fibre optic sensors, vision systems controllers, servos and inverters - can be seamlessly integrated into DeviceNet, making it one of the best industrial field busses around. As a founding member of ODVA, Omron is one of the companies that integrates DeviceNet interfaces into its many core products.

All of Omron's products are optimised for seamless integration into a DeviceNet system. You can configure Omron's devices over the network on-the-fly, and add a device or machine to a production line without powering down. DeviceNet is a flexible network, designed to accommodate your growing needs.

## Easy to use software

Omron's DeviceNet configuration software is specially developed to integrate products in a more user-friendly way than in other bus systems. Omron's DeviceNet units have a default mode that enables you to set the addresses, plug the products in and watch everything run. The configuration software allows you to monitor and fine-tune the DeviceNet products in your network for optimum operation. The products are literally plug-and-play, and the software is drag-and-drop.

Nothing could be easier.

## ODVA and Omron –setting the standards

DeviceNet is based on open standards and specifications defined by the Open DeviceNet Vendors Association (ODVA), a consortium whose main task is to promote DeviceNet

world-wide. Omron is a founding member of ODVA and a leading player in promoting DeviceNet, and is dedicated to producing and improving products that work with DeviceNet. All Omron products are ODVA certified, making them fully DeviceNet compatible. Thanks to ODVA's strong conformance testing policies, DeviceNet also ensures the interchangeability and interoperability of control devices from hundreds of manufacturers world-wide.

## Overview of DeviceNet

Two types of communications are supported:
1) Remote I/O communications that automatically transfer I/O between slaves and the CPU Unit to which a DeviceNet Unit is mounted without any special programming in the CPU Unit.
2) Message communications that read/write messages, control operation, or perform other functions for other CPU Units to which a DeviceNet Unit is mounted and slaves. Message communications are achieved by executing specific instructions (CMND) from the program in the CPU Unit to which the DeviceNet Unit is mounted.

The following functions are supported by a CS/CJ-series DeviceNet Unit.

- I/O area words can be flexibly allocated for remote I/O Master and Slave communication.
- Multiple DeviceNet Units can be mounted on a single PLC. Fixed (automatic) allocations are possible for up to three DeviceNet Units.
- More than one DeviceNet master unit can be connected to a single network. With the DeviceNet Configurator, remote I/O can be allocated in any order, i.e., not necessarily in the order of node addresses.

**Note:** When the DeviceNet configurator is connected through a dedicated Board or Card it uses one node address in the DeviceNet network. It does not use a node address if it is connected throuogh the serial port of the PLC.

A CS/CJ-series DeviceNet Unit can function as either a master or slave in remote I/O communication. Both can be used simultaneously.

With a CS/CJ-series DeviceNet Unit, the DeviceNet network can be treated exactly like a Controller Link, Ethernet, or other network for message communications or remote programming and monitoring by a CX-Programmer.

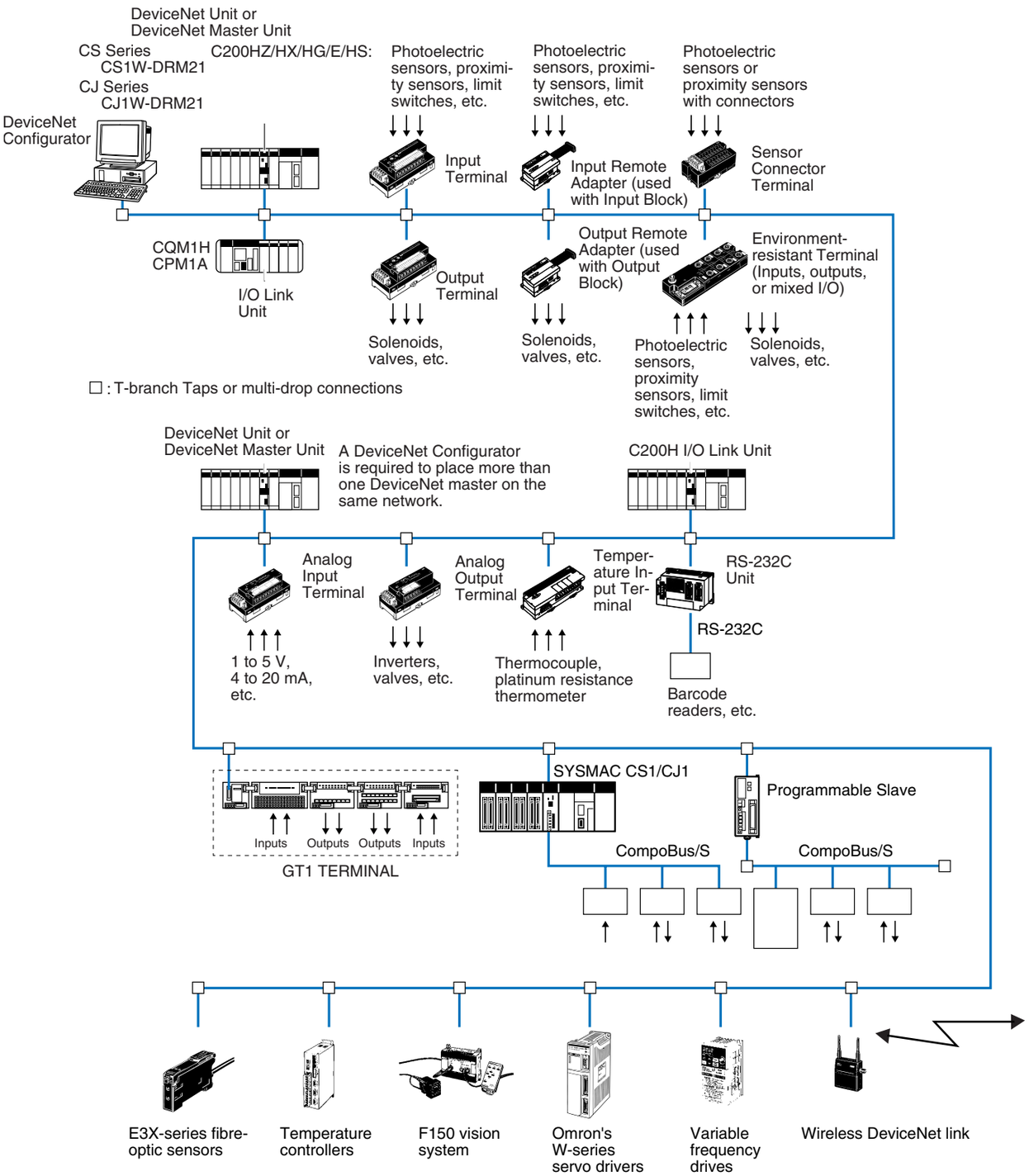


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## Overall System Configuration






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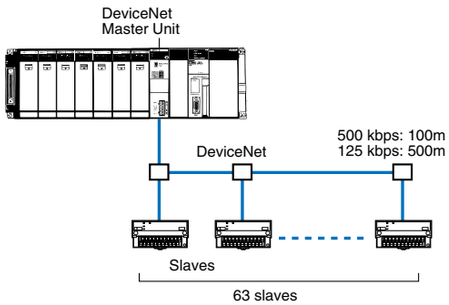
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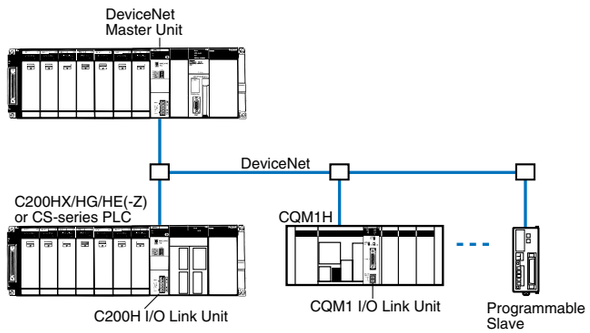


## System Configuration Examples

### I/O Terminals Connected as Slaves




### Other PLCs Connected as Slaves




### Masters

| PLC | Model | Mountable position | Master/Slave function | Maximum number of mountable units | |
|---|---|---|---|---|---|
| | | | | With Configurator | Without Configurator |
| CJ Series | CJ1W-DRM21 DeviceNet Unit | CPU or Expansion CPU Rack (Classified as CPU Bus Units) | Master and Slave | 3 | 16 |
| CS Series | CS1W-DRM21 DeviceNet Unit | | | | |
| CS Series | C200HW-DRM21-V1 DeviceNet Master Unit | CPU Rack or Expansion I/O Rack (Classified as Special I/O Units) | Master only | 16 | 1 |
| C200HX/HG/HE | | | | 10 or 16 | |
| C200HS | | | | 10 | |

### Remote I/O Master Functions

| Item | Master | Model | Without Configurator | With Configurator |
|---|---|---|---|---|
| Max. No. of Slave nodes per Master | CJ Series | CJ1W-DRM21 | 63 nodes | |
| | CS Series | CS1W-DRM21 | | |
| | CS Series, C200HX/HG/HE | C200HW-DRM21-V1 | 50 nodes | 63 nodes |
| | C200HS | | 32 nodes | 63 nodes |
| Max. No. of control points per Master | CJ Series | CJ1W-DRM21 | 2,048 pts (64 input /64 output words) or 16,000 pts (500 input/500 output words) | 32,000 pts (500 words x 4 blocks) |
| | CS Series | CS1W-DRM21 | | |
| | CS Series, C200HX/HG/HE | C200HW-DRM21-V1 | 1,600 pts (50 input/50 output words) | Without messages: 4,800 pts<br>With messages: 1,600 pts |
| | C200HS | | 1,024 pts (32 input/32 output words) | 1,280 |
| Max. No. of I/O points per Slave controllable by Master | CJ Series | CJ1W-DRM21 | 100 input/100 output words | |
| | CS Series | CS1W-DRM21 | | |
| | CS Series, C200HX/HG/HE | C200HW-DRM21-V1 | 32 input/32 output words | |
| | C200HS | | | |
| Remote I/O allocation areas | CJ Series | CJ1W-DRM21 | DeviceNet Area in CIO Area, and user-allocated words in CIO Area, DM Area, and other areas. | User-allocated words in CIO Area, DM Area, and other areas. |
| | CS Series | CS1W-DRM21 | | |
| | CS Series, C200HX/HG/HE | C200HW-DRM21-V1 | DeviceNet Area<br>C200H DeviceNet words in CIO Area (including dedicated words/ bits) | User-allocated words in CIO Area, DM Area, and other areas. |
| | C200HS | | | |

### Remote I/O Slave (only Units Mounted in a PLC)

| Item | CPU Unit to which a Slave is mounted | Unit Model | Without the Configurator | With the Configurator |
|---|---|---|---|---|
| Max. No. of I/O pts per Slave | CJ Series | CJ1W-DRM21 | 32 pts (1 input/ 1 output word) or 3,200 pts (100 input/100 output words) | 4,800 pts (100 input words x 2/100 output words x 1) |
| | CS Series | CS1W-DRM21 | | |
| | CS Series, C200HX/HG/HE | C200HW-DRT21 | 1,024 pts (32 input/32 output words) | |
| | CQM1H, CQM1 Series | CQM1-DRT21 | 32 pts (1 input/1 output word) | |
| Allocation areas in the CPU Unit to which this Slave is mounted | CJ Series | CJ1W-DRM21 | CIO, WR, DM, EM, HR | |
| | CS Series | CS1W-DRM21 | | |
| | CS Series, C200HX/HG/HE | C200HW-DRT21 | CIO, DM, EM, AR, LR, T/C | |
| | CQM1H, CQM1 Series | CQM1-DRT21 | CIO | |



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## Message Communications

| Master | Unit model | Send | Receive | FINS commands |
|---|---|---|---|---|
| CJ Series | CJ1W-DRM21 | SEND | RECV | CMND |
| CS Series | CS1W-DRM21 | | | |
| CS Series, C200HX/HG/HE | C200HW-DRM21-V1 | None | None | IOWR |
| C200HS | | Not supported | | |

| Item | Master model | Model | Capacity |
|---|---|---|---|
| Max. No. of nodes per Master for message communications using FINS commands | CJ Series | CJ1W-DRM21 | 63 nodes |
| | CS Series | CS1W-DRM21 | |
| | CS Series, C200HX/HG/HE | C200HW-DRM21-V1 | 8 nodes |
| | C200HS | | Not supported |
| Max. No. of nodes per Master for message communications using explicit messages | CJ Series | CJ1W-DRM21 | 63 nodes |
| | CS Series | CS1W-DRM21 | |
| | CS Series, C200HX/HG/HE | C200HW-DRM21-V1 | 63 nodes |
| | C200HS | | Not supported |
| Max. message length | CJ Series | CJ1W-DRM21 | SEND:267 words<br>RECV:269 words<br>CMND:542 bytes (starting with command code) |
| | CS Series | CS1W-DRM21 | |
| | CS Series, C200HX/HG/HE | C200HW-DRM21-V1 | IOWR: 160 bytes (starting with command code) |



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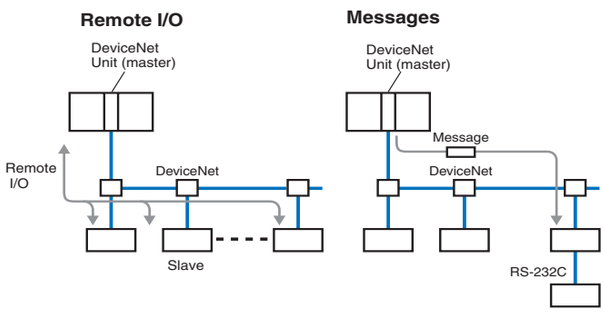


## Features of DeviceNet

### Simultaneous Remote I/O Communications and Message Services

Remote I/O communications that constantly transfer I/O between a DeviceNet Unit and slaves as well as message communications where the DeviceNet Unit sends and receives data as needed can both be executed simultaneously. When a DeviceNet network is constructed, this feature ensures the network will be able to handle applications that require the free flow back and forth of bit data and message data. FINS commands can be executed along with DeviceNet explicit messages in message communications.

**Remote I/O Communications**




### Various Connection Methods

Normal multi-drop, T-branch multi-drop, and daisy-chain line connections are available. These methods can be combined to construct a flexible system that suits the floor layout.

### Maximum Network Length of 500 m

A maximum network length of 500 m is possible with a baud rate of 125 Kbps using thick cable.

### Large Slave and I/O Capacities

A network can connect up to 63 Slaves and can handle remote I/O communications of up to 2,048 points (without a DeviceNet configurator) per Master Unit.

### High-speed Communications

High-speed communications are possible at up to 500 Kbps for a trunk line length of 100 m.

### Multiple PLCs in a Single Network

With the CS1W-DRM21 and CJ1W-DRM21, Multiple DeviceNet Units can be connected in a single network without using a DeviceNet configurator. With the C200HW-DRM21-V1, multiple PLCs are possible if a DeviceNet configurator (sold separately) is used. This enables message communications between PLCs as well as for remote I/O communications between PLCs and slaves in multiple groups. This feature allows a DeviceNet to be used as a common bus that can integrate all types of control with less wiring.

### Multiple Master Units on a Single PLC

If a DeviceNet configurator (sold separately) is used, more than one Master Unit can be mounted to a single PLC. This feature enables greater DeviceNet remote I/O control capacity and ensures that DeviceNet can easily handle line expansion as well as other applications.

### Application-specific Remote I/O Allocations

With the CS1W-DRM21 and CJ1W-DRM21, word allocations can be set for any area and in any node order without using a DeviceNet configurator. With the C200HW-DRM21-V1 user-specified allocations are possible if a DeviceNet configurator (sold separately) is used. By making allocations application-specific, programming can be structure more logically and coded much more efficiently.

### Compatibility with Slow Slaves

With the CS1W-DRM21 and CJ1W-DRM21, the communications cycle time can be set even without a DeviceNet configurator so slaves with slow response times can be used. With the C200HW-DRM21-V1, I/O this same feature is supported by using a DeviceNet configurator (sold separately).

### A Wide Variety of Slaves

A wide variety of I/O devices can be used as slaves, such as Remote I/O Terminals, Environment-resistant Terminals, Water-resistant Terminals, Remote Adapters, Sensor Terminals, Temperature Input Terminals, CQM1 I/O Link Units, Analog I/O Terminals, C200H I/O Link Units, RS-232C Units, GT1 I/O TERMINALs, Temperature Controllers, Inverters, and Intelligent Flags.

### Constant Data Exchange with Slave CPU Units

With C200H I/O Link Units, Programmable Terminals, and other products, up to 32 input words and 32 output words can be constantly exchanged in the specified area of I/O memory in a slave CPU Unit. The CPU Unit where the Master Unit is mounted can thus control the Programmable Slave or the CPU Unit of the I/O Link Unit as a high-function slave.

## Communications Specifications

| Item | Specification | | | |
|---|---|---|---|---|
| Communications protocol | DeviceNet | | | |
| Connections | Multidrop or T-branch (See note 1.) | | | |
| Baud rate | 125, 250, or 500 kbps (set via switch) | | | |
| Communications media | Special 5-conductor cable (2 signal lines, 2 power supply lines, 1 shield) | | | |
| Communications distance | **Baud rate** | **Overall network length (See note 2.)** | **Branch length** | **Total branch length** |
| | 500 kbps | 100 m max. (See note 3.) | 6 m max. | 39 m max. |
| | 250 kbps | 250 m max. (See note 3.) | 6 m max. | 78 m max. |
| | 125 kbps | 500 m max. (See note 3.) | 6 m max. | 156 m max. |
| Maximum number of nodes | 64 nodes (Including master, maximum number of slaves: 63) | | | |
| Maximum number of slaves | CS1W-DRM21 and CJ1W-DRM21: 63 (even without a DeviceNet configurator)<br>C200HW-DRM21-V1: without DeviceNet configurator: 1<br>with DeviceNet configurator: 63 | | | |
| Error control checks | CRC errors, node address redundancy check, scan list verification | | | |

**Note: 1.** Terminating resistance must be connected to both ends of the trunk line.

**2.** The distance between the two most separated nodes.

**3.** With Thin Cable, the overall network length must be 100 m or less at any baud rate.



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# DeviceNet product overview

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## International Standards and EC Directives

- The abbreviations used in the “Standards” column in the following tables indicate the following international standards.
  U: UL, C:CSA, UC: cULus, CU: cUL, N: NK, L: Lloyd, CE: EC Directives
  See OMRON sales representatives for conditions under which UL, CSA, cULus, cUL, NK, LLOYD, and CE standards were met. The information on standards is current as of August 2002.

### EC Directives

The EC Directives applicable to PLCs include the EMC Directives and the Low Voltage Directive. OMRON complies with these directives as described below.

#### EMC Directives

**Applicable Standards**

EMI:EN50081-2

EMS:EN61131-2 and EN61000-6-2 (See note.)

PLCs are electrical devices that are incorporated in machines and manufacturing installations. OMRON PLCs conform to the related EMC standards so that the devices and machines into which they are built can more easily conform to EMC standards. The actual PLCs have been checked for conformity to EMC standards. Whether these standards are satisfied for the actual system, however, must be checked by the customer.

EMC-related performance will vary depending on the configuration, wiring, and other conditions of the equipment or control panel in which the PLC is installed. The customer must, therefore, perform final checks to confirm that the overall machine or device conforms to EMC standards.

**Note:** The applicable EMI standard depends on the product.

#### Low Voltage Directive

**Applicable Standard**

EN61131-2

Devices that operate at voltages from 50 to 1,000 V AC or 75 to 150 V DC must satisfy the appropriate safety requirements. With PLCs, this applies to Power Supply Units and I/O Units that operate in these voltage ranges.

These Units have been designed to conform to EN61131-2, which is the applicable standard for PLCs.



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## Masters

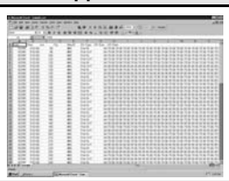
| Product | Appearance | Model | Specifications | Standards | Page |
|---|---|---|---|---|---|
| DeviceNet Unit |  | CJ1W-DRM21 | For CJ Series<br>Functions as either a master or a slave.<br>2,048 I/O points | U, C, N, CE | 233 |
| |  | CS1W-DRM21-V1 | For CS1 Series<br>• Unit can be used either as master, or as slave. Master and slave functionality can be used simultaneously.<br>• Up to 2,048 I/O points<br>• By means of a pre-set allocations, the need for configuration software is optional<br>* Supports the same seamless transparency as Controller Link and Ethernet, by using FINS message communications | | 363 |

**Note:** Refer to the CS1 catalog (Cat. No. P047) for details on SYSMAC CS1-series PLCs and to the C200HX/HG/HE catalog (Cat. No. P036) for details on SYSMAC C200HX/HG/HE PLCs.

## Configurator

| Product | Appearance | Model | Specifications | Standards |
|---|---|---|---|---|
| DeviceNet Configurator |  | WS02-CFDC1-E | DeviceNet Configurator Software<br>(Windows 95, 98, NT4.0, 2000, or XP) | --- |
| |  | 3G8E2-DRM21-EV1 | PC Card (provided with software running on Windows 95, 98, Me, 2000, or XP) | |

## Software

| Product | Appearance | Model | Specifications | Standards |
|---|---|---|---|---|
| NX-Server |  | WS02-NXD1-E | DDE Edition<br>(Windows 95, 98, NT4.0, ME, 2000, or XP) | --- |
| DeviceNet Proxy Server |  | WS02-PEDC1-E | Software<br>(Windows 95, 98, NT4.0, 2000, or XP) | --- |

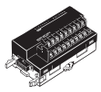
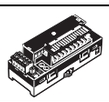
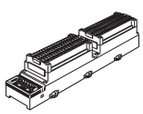


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## Slaves

### Smart Slaves

| Product | Appearance | Model | Specifications | Standards |
|---|---|---|---|---|
| Remote I/O Terminals with Transistors |  | DRT2-ID16 | 16 inputs with NPN, ⊕ common | UC, CE |
| | | DRT2-ID16-1 | 16 inputs with PNP, ⊖ common | |
| | | DRT2-OD16 | 16 outputs with NPN, ⊖ common | |
| | | DRT2-OD16-1 | 16 outputs with PNP, ⊕ common | |
| Remote I/O Terminal Expansion Units with Transistors |  | XWT-ID08 | 8 inputs with NPN, ⊕ common | UC, CE |
| | | XWT-ID08-1 | 8 inputs with PNP, ⊖ common | |
| | | XWT-OD08 | 8 outputs with NPN, ⊖ common | |
| | | XWT-OD08-1 | 8 outputs with PNP, ⊕ common | |
| | | XWT-ID16 | 16 inputs with NPN, ⊕ common | |
| | | XWT-ID16-1 | 16 inputs with PNP, ⊖ common | |
| | | XWT-OD16 | 16 outputs with NPN, ⊖ common | |
| | | XWT-OD16-1 | 16 outputs with PNP, ⊕ common | |
| Remote I/O Terminal with Relays |  | DRT2-ROS16 | 16 outputs | UR, CE |
| Remote I/O Terminals with 3-tier Terminal Blocks and Transistors |  | DRT2-ID16TA | 16 inputs with NPN, ⊕ common | UC, CE |
| | | DRT2-ID16TA-1 | 16 inputs with PNP, ⊖ common | |
| | | DRT2-OD16TA | 16 outputs with NPN, ⊖ common | |
| | | DRT2-OD16TA-1 | 16 outputs with PNP, ⊕ common | |
| | | DRT2-MD16TA | 8 inputs/8 outputs with NPN, ⊕ common for inputs, ⊖ common for outputs | |
| | | DRT2-MD16TA-1 | 8 inputs/8 outputs with PNP, ⊖ common for inputs, ⊕ common for outputs | |
| Sensor Connector Terminals with Transistors and Connectors |  | DRT2-ID16S | 16 inputs with NPN, ⊕ common | UC, CE |
| | | DRT2-ID16S-1 | 16 inputs with PNP, ⊖ common | |
| | | DRT2-MD16S | 8 inputs/8 outputs with NPN, ⊕ common for inputs, ⊖ common for outputs | |
| | | DRT2-MD16S-1 | 8 inputs/8 outputs with PNP, ⊖ common for inputs, ⊕ common for outputs | |
| Screw-less Clamp Terminals with Transistors |  | DRT2-ID32SLH | 32 inputs with NPN, ⊕ common, with detection functions | UC, CE |
| | | DRT2-ID32SLH-1 | 32 inputs with PNP, ⊖ common, with detection functions | |
| | | DRT2-OD32SLH | 32 outputs with NPN, ⊖ common, with detection functions | |
| | | DRT2-OD32SLH-1 | 32 outputs with PNP, ⊕ common, with detection functions | |
| | | DRT2-MD32SLH | 16 inputs/16 outputs with NPN, ⊕ common for inputs, ⊖ common for outputs, with detection functions | |
| | | DRT2-MD32SLH-1 | 16 inputs/16 outputs with PNP, ⊖ common for inputs, ⊕ common for outputs, with detection functions | |
| | | DRT2-ID32SL | 32 inputs with NPN, ⊕ common, without detection functions | |
| | | DRT2-ID32SL-1 | 32 inputs with PNP, ⊖ common, without detection functions | |
| | | DRT2-OD32SL | 32 outputs with NPN, ⊖ common, without detection functions | |
| | | DRT2-OD32SL-1 | 32 outputs with PNP, ⊕ common, without detection functions | |
| | | DRT2-MD32SL | 16 inputs/16 outputs with NPN, ⊕ common for inputs, ⊖ common for outputs, without detection functions | |
| | | DRT2-MD32SL-1 | 16 inputs/16 outputs with PNP, ⊖ common for inputs, ⊕ common for outputs, without detection functions | |

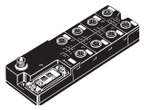
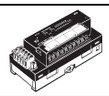
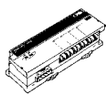


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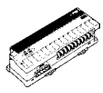
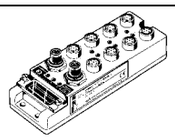
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| Product | Appearance | Model | Specifications | | Standards |
|---|---|---|---|---|---|
| Environment-resistive Terminals with Transistors |  | DRT2-ID08C | 8 inputs with NPN, ⊕ common | | UC, CE |
| | | DRT2-ID08C-1 | 8 inputs with PNP, ⊖ common | | |
| | | DRT2-OD08C | 8 outputs with NPN, ⊖ common | | |
| | | DRT2-OD08C-1 | 8 outputs with PNP, ⊕ common | | |
| | | DRT2-HD16C | 16 inputs with NPN, ⊕ common | | |
| | | DRT2-HD16C-1 | 16 inputs with PNP, ⊖ common | | |
| Analog Input Terminals |  | DRT2-AD04 | 4 inputs | | UC, CE |
| Analog Output Terminal | | DRT2-DA02 | 2 outputs | | |
| Temperature Input Terminals |  | DRT2-TS04T | 4 input points (Allocated 4 input words at the master) | Input types: R, S, K1, K2, J1, J2, T, E, B, N, L1, L2, U, W, PLII | U, CE |
| | | DRT2-TS04P | | Input types: Pt100, JPt100 | |

### General-purpose Slaves, DR1 Series

| Product | Appearance | Model | Specifications | Standards |
|---|---|---|---|---|
| Remote I/O Terminals with Transistors |   | DRT1-ID08 | 8 inputs with NPN, ⊕ common | U, C, CE |
| | | DRT1-ID08-1 | 8 inputs with PNP, ⊖ common | |
| | | DRT1-ID16 | 16 inputs with NPN, ⊕ common | |
| | | DRT1-ID16-1 | 16 inputs with PNP, ⊖ common | |
| | | DRT1-OD08 | 8 outputs with PNP, ⊖ common | |
| | | DRT1-OD08-1 | 8 outputs with NPN, ⊕ common | |
| | | DRT1-OD16 | 16 outputs with PNP, ⊖ common | |
| | | DRT1-OD16-1 | 16 outputs with NPN, ⊕ common | |
| Waterproof Terminals (with Transistors) |  | DRT1-ID04CL | 4 transistor inputs, NPN (⊕ common) | UC, CE, L |
| | | DRT1-ID04CL-1 | 4 transistor inputs, PNP (⊖ common) | |
| | | DRT1-OD04CL | 4 transistor outputs, NPN (⊖ common) | |
| | | DRT1-OD04CL-1 | 4 transistor outputs, PNP (⊕ common) | |
| |  | DRT1-ID08CL | 8 transistor inputs, NPN (⊕ common) | |
| | | DRT1-ID08CL-1 | 8 transistor inputs, PNP (⊖ common) | |
| | | DRT1-OD08CL | 8 transistor outputs, NPN (⊖ common) | |
| | | DRT1-OD08CL-1 | 8 transistor outputs, PNP (⊕ common) | |
| Environment-resistive Transistor Terminals |   | DRT1-ID08C | 8 inputs, NPN (⊕ common) | U, C, CE |
| | | DRT1-HD16C | 16 inputs, NPN (⊕ common) | |
| | | DRT1-HD16C-1 | 16 inputs, PNP (⊖ common) | U, C |
| | | DRT1-OD08C | 8 outputs, NPN (⊖ common) | U, C, CE |
| | | DRT1-WD16C | 16 outputs, NPN (⊖ common) | |
| | | DRT1-WD16C-1 | 16 outputs, PNP (⊕ common) | U, C |
| | | DRT1-MD16C | 8 inputs, NPN (⊕ common)<br>8 outputs, NPN (⊖ common) | U, C, CE |
| | | DRT1-MD16C-1 | 8 inputs, PNP (⊖ common)<br>8 outputs, PNP (⊕ common) | U, C |

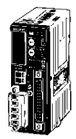
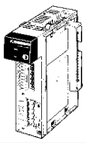
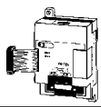
**Note:** Orders are accepted in units of 10 Connectors.



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### Intelligent Slaves Operating as PLC Units

| Product | Appearance | Model | Specifications | | Standards |
|---|---|---|---|---|---|
| Programmable Slaves |  | CPM2C-S100C-DRT | Slave equipped with CPM2C CPU Unit functions<br>1,024 points max. for Remote I/O Links<br>Includes CompoBus/s Master. | 4 transistor outputs (sinking) | U, C, CE |
| | | CPM2C-S110C-DRT | | 4 transistor outputs (sourcing) | |
| I/O Link Units |  | C200HW-DRT21 | For CS1, C200HX/HG/HE<br>512 input points max.<br>512 output points max. | | U, C, N, CE |
| |  | CQM1-DRT21 | For CQM1H/CQM1<br>16 input points<br>16 output points | | U, C, CE |
| |  | CPM1A-DRT21 | For CPM1A/CPM2A<br>32 input points<br>32 output points | | |



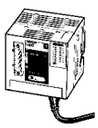
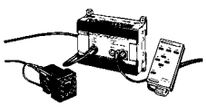
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### Other Intelligent Slaves

| Product | Appearance | Model | Specifications | | Standards |
|---|---|---|---|---|---|
| RS-232C Unit |  | DRT1-232C2 | 2 RS-232C ports<br>16 input points (communications status) | | U, C, CE |
| Fiber Amplifier DeviceNet Communications Unit |  | E3X-DRT21 | Up to 16 E3X-DA-N Fiber Amplifiers can be connected. | | --- |
| | --- | E3X-DA6-P (See note.) | Fiber Amplifier | | |
| | | E3X-CN02 (See note.) | Reduced-wiring Connector | | |
| |  | E39-TM1 | Terminal Block Unit | | |
| Intelligent Flag III |  | V600-HAM42-DRT | ID system for DeviceNet | | CE |
| Vision Sensor Controller |  | F150-C10E-3-DRT | Vision Sensor for DeviceNet | | CE |
| DeviceNet-compliant Indicators |  | K3HB-XVD-A-DRT1 | Voltage | DeviceNet-compliant Process Indicator<br>DC input | UC, CE |
| | | K3HB-XAD-A-DRT1 | Current | | |
| | | K3HB-XVA-DRT1 | Voltage | DeviceNet-compliant Process Indicator<br>AC input | |
| | | K3HB-XAA-DRT1 | Current | | |
| | | K3HB-VLC-B-DRT1 | DeviceNet-compliant Weighing Indicator | | |
| | | K3HB-HTA-DRT1 | DeviceNet-compliant Temperature Indicator | | |
| | | K3HB-SSD-A-DRT1 | DeviceNet-compliant Linear Sensor Indicators | | |
| DeviceNet-compliant Digital Controllers |  | E5AR-Q4B-DRT | Basic Type<br>(1 input) | | CU, CE |
| | | E5AR-C4B-DRT | | | |
| | | E5AR-QC4B-DRT | | | |
| | | E5AR-QQ4W-DRT | 2-input Type | | |
| | | E5AR-CC4WW-DRT | 4-input Type | | |
| | | E5AR-PR4F-DRT | Control Valve Control Type (1 input) | | |
| | | E5AR-PRQ4F-DRT | | | |
| |  | E5ER-QTB-DRT | Basic Type<br>(1 input) | | |
| | | E5ER-CTB-DRT | | | |
| | | E5ER-QTW-DRT | 2-input Type | | |
| | | E5ER-CTW-DRT | | | |
| | | E5ER-PRTF-DRT | Control Valve Control Type (1 input) | | |
| Digital Controller |  | E5EK-AA2-DRT-500 | Digital Controller for DeviceNet | | --- |
| Modular Temperature Controller |  | E5ZN-DRT | E5ZN DeviceNet Communications Unit | | --- |
| | | E5ZN-SCT24S | Terminal Unit | | |
| | --- | E3ZN-SDL | Setting/Display Device | | |

**Note:** Order the Fiber Amplifier and Reduced-wiring Connector together.



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| Product | Appearance | Model | Specifications | | Standards |
|---|---|---|---|---|---|
| High-density Temperature Controllers |  | E5ZE-8AQHD1-TCB-V2 | Thermocouple | Heating control, voltage output | --- |
| | | E5ZE-8ACAD1-TCB-V2 | | Heating control, current output | |
| | | E5ZE-8VQHD1-TCB-V2 | | Heating/cooling control, voltage output | |
| | | E5ZE-8VCAD1-TCB-V2 | | Heating/cooling control, current output | |
| | | E5ZE-8AQHD1-TPB-V2 | Platinum-resistance thermometer | Heating control, voltage output | |
| | | E5ZE-8ACAD1-TPB-V2 | | Heating control, current output | |
| | | E5ZE-8VQHD1-TPB-V2 | | Heating/cooling control, voltage output | |
| | | E5ZE-8VCAD1-TPB-V2 | | Heating/cooling control, current output | |
| AC Servo Drivers |  | R88A-NCW152-DRT | DeviceNet Option Unit for OMNUC W-series AC Servo Drivers | | CE |
| | --- | R88A-CNU01R | External I/O Connector | | --- |
| | | R88A-CCW002P4 | Cable for Setup Tool (IBM PC/AT or compatible, 2 m) | | |
| Multi-function Compact Inverter |  | 3G3MV-PDRT2 | DeviceNet Communications Unit for 3G3MV | | U, CE |
| High-function General-purpose Inverter |  | 3G3RV-PDRT2 | DeviceNet Communications Card for 3G3RV/3G3FV Inverters | | U, CE |
| Programmable Terminals |  | NT-DRT21 | DeviceNet Interface Unit for NT31/NT631 Programmable Terminals | | U, CE |
| DeviceNet Wireless Units |  | WD30-ME | DeviceNet Wireless Master Station | Pencil-type antenna | --- |
| | | WD30-ME01 | | Magnetic Base Antenna | |
| | | WD30-SE | DeviceNet Wireless Slave Station | Pencil-type antenna | |
| | | WD30-SE01 | | Magnetic Base Antenna | |
| |  | WT30-M01-FLK | Wireless Serial Master : RS-232C | | CE |
| | | WT30-SID16 | Wireless Screw-less Terminals: 16 Input (NPN/PNP) | | |
| | | WT30-SMD16 | Wireless Screw-less Terminals: 8 Input + 8 Output (NPN) | | |
| | | WT30-SMD16-1 | Wireless Screw-less Terminals: 8 Input + 8 Output (PNP) | | |

**Note:** Order the Fiber Amplifier and Reduced-wiring Connector together.



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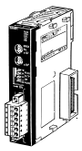
# CompoBus/S

## *A High-speed I/O Bus Ideal for Distributed Machine Control and Reducing Wiring*

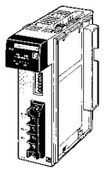




C200HW-SRM21-V1
for C200HX/HG/HE(-Z)
Medium-size PLCs



CJ1W-SRM21 for
CJ1 Small PLCs



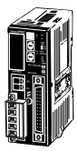
CQM1-SRM21-V1
for CQM1H/CQM1
Small PLCs



SRM1-C□-V2
Master Control Unit



CPM2C-S1□C
Master Unit



CPM2C-S1□C-DRT
Programmable Slave

### Outline

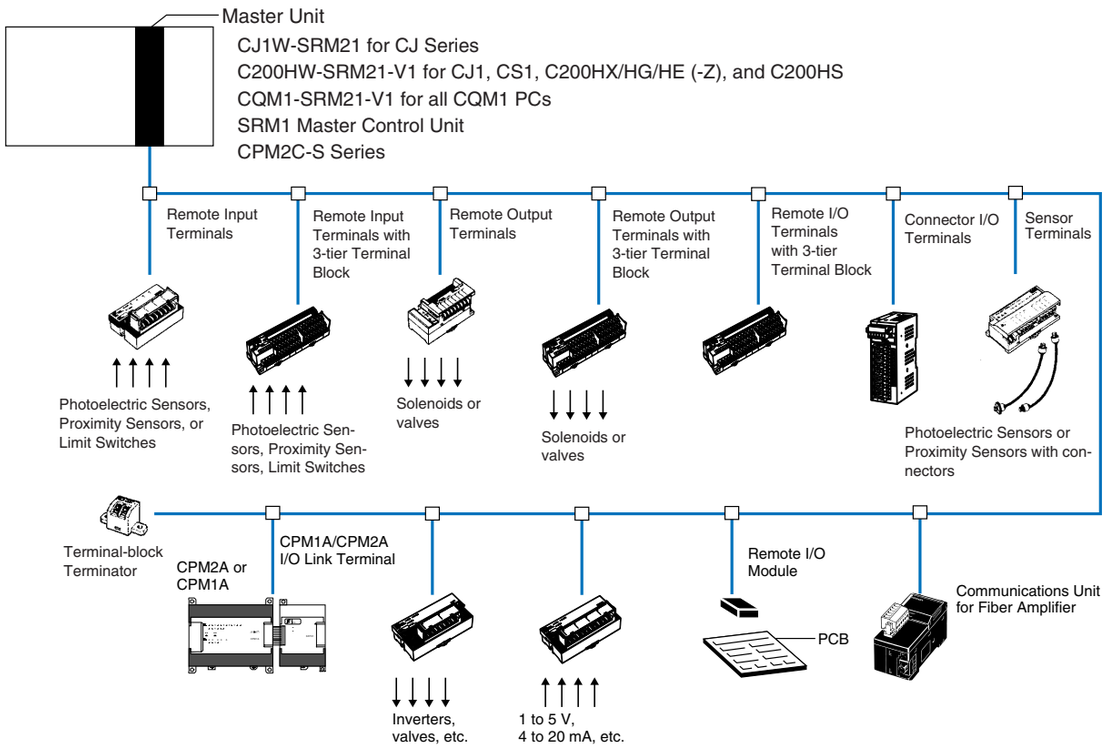
The CompoBus/S high-speed, wire-reduction bus is ideal for machine control. Reduce wiring both within devices and within the overall machine system. I/O data is transferred between the slaves and the CPU Unit of the PLC without any special programming.

In high-speed mode, a communications cycle time of 1 ms max. for 256 I/O points enables fast processing of remote I/O. In long-distance mode, communicate over a 500-m main line.

Within a total length of 200 m, you can also branch freely to connect slaves wherever needed using a special flat cable or 4-conductor cable.

All of this means easier designing of plant-floor layout.

### Basic System Configuration






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## Features

### CompoBus/S - a high-speed fieldbus for 128 inputs and 128 outputs

CompoBus/S is a very fast, and easy to install high-speed bus for use with sensors and actuators. The amount of wiring that is required is minimal, making CompoBus/S ideal for machine control.

### A complete line-up of master units and slaves

Compobus/S allows digital and anlogue I/O signals to be exchanged between a master and the distributed I/O slaves over a flat cable or standard twisted cable over max. 500 meters. It requires no special software tools making it an real I/O bus that puts the PLC I/O on a remote location, without any additional programming effort.

### Communication distances up to 500 m

In Long-distance Communications Mode, communications over the main line of up to 500 m are possible to control I/O devices in a wide area using standard cable and up to 200 m if flat cable is used. In the high-speed communications mode, the main line is limited to 100 m for standard cable, and 30 m for flat cable.

### High-speed Communications

In High-speed Communications Mode, up to 16 Slaves with 128 I/O. In the 100 meter high-speed mode there is a fixed communication cycle time of 0.8 msec for 256 remote I/O, providing CompoBus/S with an unprecedented performance.

### Backwards compatible

Remote I/O communications are also possible in high-speed communications mode by combining these Master Units and slaves with previously released master units and slaves.

### Free topology

Within a total lenght of 200 meters, you can also branch freely to connect slaves wherever needed.
Only one cable is required to connect a master to a slave or a slave to another slave.
If a special flat cable with 4 conductors is used, the communications power supply can also be drawn from the same cable to greatly reduce the amount of floor wiring.
Branching from the main line to branch lines is also greatly simplified with a special connector.
Both the T-branch and multidrop methods can be combined flexibly when wiring. This wiring feature allows a very flexible system configuration that can be adjusted to the floor layout.
There are two types of cables (VCTF cable and Special Flat Cable), and when the Special Flat Cable is used, T-branch Connectors can be installed by simply snapping the connector on.

### Easy startup and maintenance

The CompoBus/S System can be started just by wiring the cables and making some simple settings, and the power up the system!
Troubleshooting is easy because the Slave's node number is shown on the master's indicators if an error occurs with a Slave. Error information is also stored in PLC memory.

### Wide variety of masters

Seperate PLC master units are available, or you can use a SRM or CPM2C with an integrated Compobus/S master function in the CPU. The variety of Masters provides flexibility in configuring a system to match your application needs.

### Wide variety of slaves

Units in a wide range are available as I/O Slaves for a variety of applications. The variety of Slaves provides flexibility in configuring a system to match the required application.

## Connectability for Upgraded Terminals

| **Slave series** | **Previous Master Units**<br>C200HW-SRM21<br>CQM1-SRM21<br>SRM1-C01(-V1)<br>SRM1-C02(-V1)<br>3G8B3-SRM00/01<br>C200PC-ISA02/12-SRM | **Master Units manufactured April 1999 or later**<br>CJ1W-SRM21<br>C200HW-SRM21-V1<br>CQM1-SRM21-V1<br>SRM1-C01-V2<br>SRM1-C02-V2<br>TP1000-A-SRM<br>C200PC-ISA03/13-SRM<br>CPM2C-S100C/S110C<br>CPM2C-S100C/S110C-DRT | |
|---|---|---|---|
| | | **Communications mode setting** | |
| | | **High-speed** | **Long-distance** |
| SRT1 Series<br>FND-X□-SRT | Connectable | Connectable | --- |
| SRT2 Series (See note 1.)<br>CPM2C-SRT21<br>CPM1A-SRT21 | Connectable | Connectable | Connectable |
| SRT2-AD04<br>SRT2-DA02 | --- | Connectable | Connectable |

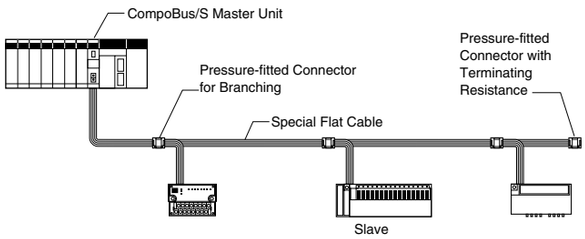
**Note: 1.** All of the SRT2 Series except for the SRT2-AD04 and SRT2-DA02.



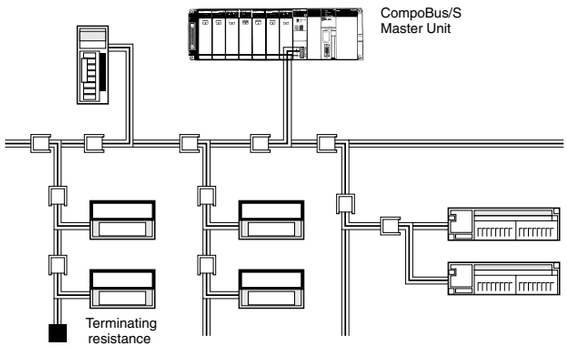
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## CompoBus/S Network Configuration Examples

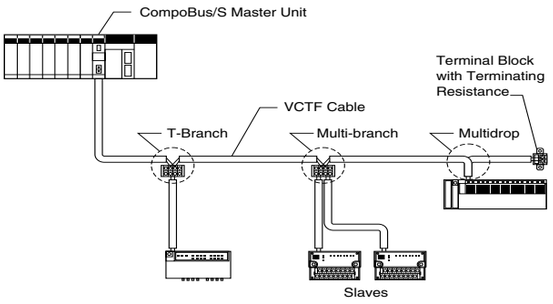
### Special Flat Cable



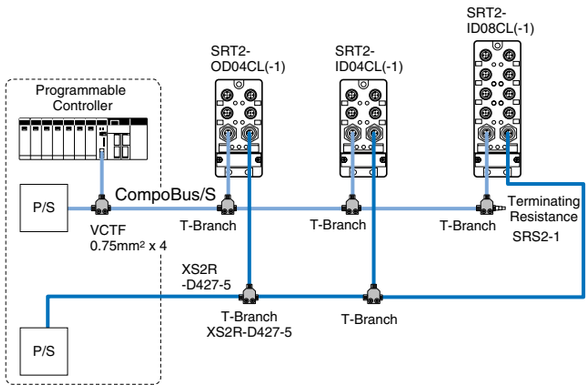

### Special Flat Cable in Long-distance Mode




### Standard Cable




### 4-Conductor Cable






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## Communications Specifications

| Item | | Specification |
|---|---|---|
| Communications method | | Special CompoBus/S protocol |
| Communications baud rate | | High-speed Communications Mode: 750 kbps<br>Long-distance Communications Mode: 93.75 kbps |
| Modulation method | | Baseband method |
| Coding method | | Manchester coding method |
| Error control checks | | Manchester code check, frame length check, and parity check |
| Cable | VCTF cable (JIS C 3306) | Two 0.75 $mm^2$ conductors (2 signal wires)<br>Four 0.75 $mm^2$ conductors (2 signal wires and 2 power supply wires) |
| | Special Flat Cable | Four 0.75 $mm^2$ conductors (2 signal wires and 2 power supply wires) |
| Communications distance | 2-conductor VCTF cable | High-speed Communications ModeMain line length: 100 m max.<br>Branch line length: 3 m max.<br>Total branch line length: 50 m max. |
| | | Long-distance Communications ModeMain line length: 500 m max.<br>Branch line length: 6 m max.<br>Total branch line length: 120 m max. |
| | 4-conductor VCTF cable | High-speed Communications ModeMain line length: 30 m max.<br>Branch line length: 3 m max.<br>Total branch line length: 30 m max. |
| | | Long-distance Communications Mode:<br>Flexibly branched, provided that the total length of cable is a maximum of 200 m. |
| | Special Flat Cable | High-speed Communications ModeMain line length: 30 m max.<br>Branch line length: 3 m max.<br>Total branch line length: 30 m max. |
| | | Long-distance Communications Mode:<br>Flexibly branched, provided that the total length of cable is a maximum of 200 m. |
| I/O points, Slaves, usable node numbers, and communications cycle time | C200HW-SRM21-V1 Master Unit (used for CS-series, C200HX/C200HG/C200HE-(Z)E, and C200HS PLCs), CJ1W-SRM21 Master Unit (used for CJ-series PLCs), SRM1 Master Control Unit, and CPM2C-S PLC | |
| | | Max. number of I/O points: 64 inputs/64 outputs<br>Usable node numbers:IN0 to IN7 and OUT0 to OUT7<br>Communications cycle time:<br>High-speed Communications Mode: 0.5 ms<br>Long-distance Communications Mode:4.0 ms |
| | | Max. number of I/O points: 128 inputs/128 outputs<br>Usable node numbers:IN0 to IN15 and OUT0 to OUT15<br>Communications cycle time:<br>High-speed Communications Mode: 0.8 ms<br>Long-distance Communications Mode: 6.0 ms |
| | CQM1-SRM21-V1 Master Unit (CQM1/CQM1H PLCs) | |
| | | Max. number of I/O points: 64 inputs/64 outputs<br>Usable node numbers:IN0 to IN7 and OUT0 to OUT7 (8-point mode)<br>Communications cycle time:<br>High-speed Communications Mode: 0.5 ms<br>Long-distance Communications Mode: 4.0 ms<br>Usable node numbers:IN0 to IN15 and OUT0 to OUT15 (4-point mode)<br>Communications cycle time:<br>High-speed Communications Mode: 0.8 ms<br>Long-distance Communications Mode: 6.0 ms |
| | | Max. number of I/O points: 32 inputs/32 outputs<br>Usable node numbers:IN0 to IN3 and OUT0 to OUT3 (8-point mode)<br>IN0 to IN7 and OUT0 to OUT7 (4-point mode)<br>Communications cycle time:<br>High-speed Communications Mode: 0.5 ms<br>Long-distance Communications Mode: 4.0 ms |
| | | Max. number of I/O points: 16 inputs/16 outputs<br>Usable node numbers:IN0 to IN1 and OUT0 to OUT1 (8-point mode)<br>IN0 to IN3 and OUT0 to OUT3 (4-point mode)<br>Communications cycle time:<br>High-speed Communications Mode: 0.5 ms<br>Long-distance Communications Mode: 4.0 ms |



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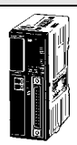
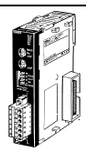
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# CompoBus/S product overview



## Masters

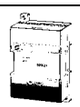
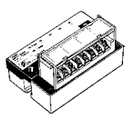
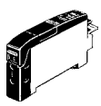
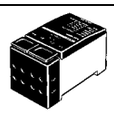
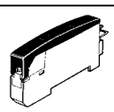
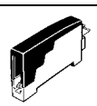
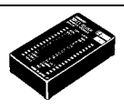
| Product | Appearance | Model | Specifications | Standards | Page |
|---|---|---|---|---|---|
| CPM2C CPU Units with build-in CompoBus/S Master |  | CPM2C-S100C | CPM2C PLC<br>6 inputs and 4 outputs (sinking) build-in<br>Three local expension units | U<br>C<br>CE | 93 |
| | | CPM2C-S110C | CPM2C PLC<br>6 inputs and 4 outputs (sourcing) build-in<br>Three local expension units | | |
| CPM2C PLC with build-in Compobus/S master, and DeviceNet slave functionality |  | CPM2C-S100C-DRT | CPM2C PLC<br>6 inputs and 4 outputs (sinking) build-in<br>Three local expension units | U<br>C<br>CE | 96 |
| | | CPM2C-S110C-DRT | CPM2C PLC<br>6 inputs and 4 outputs (sourcing) build-in<br>Three local expension units | | |
| Master Units |  | CJ1W-SRM21 | For the SYSMAC CJ Series<br>128 inputs and 128 outputs (256 points total) | U<br>C<br>CE | 238 |
| |  | C200HW-SRM21-V1 | For CS1, C200HX/HG/HE (-ZE), and C200HS<br>128 inputs and 128 outputs<br>(256 points in total)<br>Program capacity of 4,096 word | U<br>C<br>CE | 368 |
| |  | CQM1-SRM21-V1 | For CQM1 and CQM1H<br>64 inputs and 64 outputs<br>(128 points in total) | | - |



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## Slaves

| Product | Appearance | Model | Specifications | Standards | Page |
|---|---|---|---|---|---|
| I/O Link Units |  | CPM2C-SRT21 | I/O Link Unit for CPM2C<br>• Exchanges eight inputs and eight outputs with the master. | CE | 107 |
| |  | CPM1A-SRT21 | I/O Link Unit for CPM2A/CPM1A<br>• Exchanges eight inputs and eight outputs with the master. | U<br>C<br>CE | 75 |
| Transistor Remote I/O Terminals |  | SRT2-ID04<br>SRT2-ID04-1<br>SRT2-OD04<br>SRT2-OD04-1 | 4 NPN inputs (+ common)<br>4 PNP inputs (– common)<br>4 NPN outputs (– common)<br>4 PNP outputs (+ common) | U<br>C<br>CE | 524 |
| | | SRT2-ID08<br>SRT2-ID08-1<br>SRT2-OD08<br>SRT2-OD08-1 | 8 NPN inputs (+ common)<br>8 PNP inputs (– common)<br>8 NPN outputs (– common)<br>8 PNP outputs (+ common) | | |
| | | SRT2-ID16<br>SRT2-ID16-1<br>SRT2-OD16<br>SRT2-OD16-1 | 16 NPN inputs (+ common)<br>16 PNP inputs (– common)<br>16 NPN outputs (– common)<br>16 PNP outputs (+ common) | | |
| CompoBus/S Communications Unit for Optical Fiber Amplifiers |  | E3X-SRT21 | Up to 14 Optical Fiber Amplifiers can be connected. | --- | --- |
| Photoelectric Sensors |  | E3X-NT16<br>E3X-NT26<br>E3X-NH16<br>E3X-DA16 | 1-channel general-purpose teaching<br>1-channel multi-functional, general-purpose teaching<br>1-channel long-distance, high-precision bar-display teaching<br>1-channel digital model | U<br>C<br>CE | Please refer to OMRON's Sensor & Safety Catalog for more information |
| |  | E3X-NM16 | 4-channel multi-functional, general-purpose teaching | | |
| Proximity Sensors |  | E2CY-T16<br>E2C-T16 | Aluminum detection<br>Compact model with teaching function | U<br>C | |
| Terminal Block Unit |  | E39-JID01 | One input point | --- | |
| Analog Input Terminal |  | SRT2-AD04 | 1 to 4 inputs (set with DIP switch) | U<br>C<br>CE | 547 |
| Analog Output Terminal |  | SRT2-DA02 | 1 or 2 outputs (set with DIP switch) | | 549 |
| Remote I/O Modules |  | SRT2-ID16P<br>SRT2-OD16P | 16 NPN inputs (+ common)<br>16 NPN outputs (– common) | --- | 551 |



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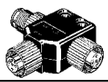
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# Peripheral Devices



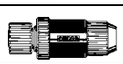
## VCTF Cable Products

| Product | Appearance | Model | Specifications | Standards |
|---|---|---|---|---|
| Terminal-block Terminator |  | SRS1-T | 100 Ω | --- |
| T-branch Connector |  | XS2R-D427-5 | Waterproof | |
| Connector Terminator (plug) |  | SRS2-1 | Waterproof terminator | |

## Special Flat Cable Products

| Product | Appearance | Model | Specifications | Standards |
|---|---|---|---|---|
| Branch Connector |  | SCN1-TH4 | Connector for Special Flat Cable | --- |
| Extension Connector |  | SCN1-TH4E | | |
| Connector Terminator |  | SCN1-TH4T | | |
| Special Flat Cable |  | SCA1-4F10 | 100 m | |

## Four-conductor VCTF Cable Products

| Product | Appearance | Model | Specifications | Standards |
|---|---|---|---|---|
| Assembling Connector |  | XS2C-D4S7 | Connector plug for 4-conductor VCTF cable communications | --- |
| |  | XS2G-D4S7 | Connector socket for 4-conductor VCTF cable communications | |

## Recommended cable types, non-Omron

| Product | Specifications |
|---|---|
| Belden 9409 or compatible | Non shielded two conductor VCTF communication cable |
| Belden 5341UE or compatible | Non shielded four conductor VCTF communication cable |



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# MechatroLink II

**The MechatroLink II is the perfect solution for satisfying all your complex motion application requirements, including packaging, electronics, converting, food processing, textiles – in fact any multi-axes application is solved and integrated perfectly in a complete factory line.**



### MechatroLink-II high-speed motion link

This high-speed interface replaces the costly discrete wiring required with traditional systems. Just one MechatroLink-II cable eliminates the need for about 15 for each axis, which simplifies wiring, and reduces the cost and time needed for installation. It also means that maintenance and troubleshooting are minimised. With a frequency of 10 Mbps, the MechatroLink-II link provides communication cycle times of 0.5 ms for 4 axes, to 4 ms for 30 axes, ensuring fast, precise motion control.

### MechatroLink-II Communications cycle

| Number of axes | Communications cycle (ms) |
|---|---|
| 1 – 4 | 0.5 |
| 5 – 9 | 1.0 |
| 10 – 21 | 2.0 |
| 22 – 30 | 4.0 |

### MechatroLink-II Network

| Product | Appearance | Model | Specifications | Page |
|---|---|---|---|---|
| Motion controller over MechatroLink |  | CS1W-MCH71 | Advanced Multi-axes Controller over MechatroLink-II | 343 |
| Servo Drive MechatroLink Option |  | JUSP-NS115 | MechatroLink-II option unit for Sigma-II (W-Series) Servo Drives | 343 |
| MechatroLink-II related accessories | | JEPMC-W6022 | MechatroLink-II Terminator | 343 |
| | | JEPMC-W6003-A5 | MechatroLink-II Cables | |
| | | JEPMC-W6003-01 | | |
| | | JEPMC-W6003-03 | | |
| | | JEPMC-W6003-05 | | |
| | | JEPMC-W6003-10 | | |
| | | JEPMC-W6003-20 | | |
| | | JEPMC-W6003-30 | | |
| | | JEPMC-IO2310 | 24V DC I/O Module | |
| | | JEPMC-PL2900 | Counter Module | |
| | | JEPMC-PL2910 | Pulse Output Module | |

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. P11E-EN-03A In the interest of product improvement, specifications are subject to change without notice.



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