

Configuring a CS1D System

This section provides tools to configure a CS1D system. Included in this section are:

Power and Expansion Selection

Tools are provided to calculate the total current consumption of a CS1D system. With this information, the proper power supply can be selected. When the number of modules or power requirements exceeds the capability of the power supplies available, I/O expansion racks solve the problem. If the number of modules in the CPU rack exceeds 5 or the current consumption is greater than the capacity of the power supply units, use the CPU and expansion rack configuration.

I/O Allocations

In CS1D PLC systems, part of the I/O memory is allocated to basic, special I/O and CS1 CPU bus units. This section describes in detail how each of these units is allocated in the I/O memory.

Units in a CS1D System Configuration

Use this section to determine which units and peripheral devices can be used to configure a CS1D Duplex system.

What is a CS1D Duplex system?

A CS1D system consists of two duplex power supplies, two duplex CPUs, one duplex unit, one duplex CPU backplane, and up to 5 basic I/O, special I/O and CS1 CPU bus units. See page C-218.

What goes on a CS1D expansion rack?

The CS1D expansion rack contains two duplex power supplies, an expansion CS1D I/O backplane, basic I/O units, special I/O units and CS1 CPU bus units. See page C-219.

Where are ratings to calculate overall current consumption?

The current consumption ratings for the CPU are on pages C-223 to C-224. Basic I/O, special I/O and CS1 CPU bus units are collected in the tables on pages C-161 to C-165.

What power supply is available for a CS1D system?

Only one power supply is available for the CS1D system. The same power supply is used in the CPU and expansion racks.

| | |
|----------------------|-----------------------|
| Input Voltage | 100 to 240 VAC |
| Output rating | 7 A, 5 VDC |
| Output capacity | 35 W |
| 24 VDC service power | No |
| RUN output contact | Yes |
| Power supply model | CS1D-PA207R |
| See page | C-218 |

How many expansion racks can be used?

The CS1D system can be expanded using CS1D expansion racks or CS1D long distance expansion racks. The maximum number of expansion racks in any CS1 system will depend on the combination of these racks.

The following table outlines all acceptable combinations.

| Combination of Expansion Racks | CS1D Expansion Racks Only | CS1D Long Distance Expansion Racks |
|---------------------------------|---------------------------|------------------------------------|
| Maximum expansion racks per CPU | 7 | 7 |
| Maximum distance from CPU rack | 12 m | 90 m |

Note: On a CS1D long distance configuration, the following units are required:

CS1W-IC102 – I/O control unit. One unit mounted on the CPU rack.

CS1W-II102 – I/O interface unit. One unit mounted on each CS1 expansion rack.

See page C-222 to select the appropriate I/O connecting cables.

CPU Selection

This section describes the CPUs and memory cards for a CS1D system.

How many I/O points are needed?

| | |
|----------------------|----------------------------|
| Number of I/O | 5120 |
| CPU models | CS1D-CPU65H CS1D-CPU67H |
| See page | C-12 |

How much program memory storage is required?

| Program Memory Size | CPU Models | See page |
|---------------------|-------------|----------|
| 60 K steps | CS1D-CPU65H | C-12 |
| 250 K steps | CS1D-CPU67H | C-12 |

How much data memory storage is required?

| Data Memory Size | 128 K Words | 448 K Words |
|------------------|-------------|-------------|
| CPU models | CS1D-CPU65H | CS1D-CPU67H |
| See page | C-12 | C-12 |

Note: The available data memory capacity is the sum of the data memory (DM) and the extended memory (EM).

Selecting program storage options

Memory card uses:

- Download recipes
- Replace PLC program while operating
- Auto-boot the PLC upon power up

| Memory Size | 15 MB | 30 MB | 64 MB |
|-------------|--------------|--------------|--------------|
| Memory card | HMC-EF172 | HMC-EF372 | HMC-EF672 |
| See page | C-150, C-225 | C-150, C-225 | C-150, C-225 |

Note: An adapter is available to insert the flash memory card into a computer. Go to pages C-150 and C-225 for details.

Basic I/O Selection

This section describes the standard, high-density and mixed I/O modules, terminal blocks and cables used in a CS1D system.

Input Configuration

What input voltage do you need?

DC

| Type | 24 VDC |
|--------------|--|
| Model number | CS1W-ID211 CS1W-ID231 CS1W-ID261 CS1W-ID291 CS1W-IDP01 |
| See page | C-42 |

AC

| Type | 200-240 VAC |
|--------------|-------------|
| Model number | CS1W-IA211 |
| See page | C-42 |

AC/DC

| Type | 100-120 VAC/DC |
|--------------|----------------|
| Model number | CS1W-IA111 |
| See page | C-42 |

How many input points are required?

Choose from the available point densities below.

| Input Points | 16 | 32 | 64 | 96 |
|--------------|--------------------------|------------|------------|------------|
| DC inputs | CS1W-ID211 CS1W-IDP01 | CS1W-ID231 | CS1W-ID261 | CS1W-ID291 |
| AC inputs | CS1W-IA211 | – | – | – |
| AC/DC inputs | CS1W-IA111 | – | – | – |
| See page | C-42 | C-42 | C-42 | C-42 |

What are the input current requirements?

| Input Current | 4.1 mA or Below | 7 mA or Below | 10 mA or Below |
|---------------|--------------------|--|--------------------|
| DC inputs | – | CS1W-ID211 CS1W-ID231 CS1W-ID261 CS1W-ID291 CS1W-IDP01 | – |
| AC inputs | – | – | CS1W-IA211 |
| AC/DC inputs | CS1W-IA111 (DC in) | – | CS1W-IA111 (AC in) |
| See page | C-42 | C-42 | C-42 |

Are terminal blocks and connection cables necessary?

Input modules with 8 or 16 points have removable terminal blocks that accept direct wiring from input devices. High-density 32-, 64- and 96-point modules use cables and terminal blocks to connect inputs and consolidate wiring back to the control panel. For more information see page C-67.

| Module | Connector Type | Terminal Block | Cable |
|------------|--|---------------------|-----------------|
| CS1W-ID211 | Removable terminal block | Not required | Not required |
| CS1W-IDP01 | | | |
| CS1W-IA111 | | | |
| CS1W-IA211 | | | |
| CS1W-ID231 | Fujitsu-compatible connector on module | XW2B-40G4 or G5 | XW2Z-□□□B |
| CS1W-ID261 | | Two XW2B-40G4 or G5 | Two XW2Z-□□□B |
| CS1W-ID291 | | Two XW2B-60G4 or G5 | Two XW2Z-□□□H-1 |

Note: For more information on wiring connections, please refer to the wiring section starting on page D-1.

Output Configuration

How many output points are required?

Choose from the available point densities below.

| Output points | 8 | 16 | 32 | 64 | 96 |
|---------------------------|------------|------------|------------|------------|------------|
| Transistor Sinking (NPN) | – | CS1W-OD211 | CS1W-OD231 | CS1W-OD261 | CS1W-OD291 |
| Transistor Sourcing (PNP) | – | CS1W-OD212 | CS1W-OD232 | CS1W-OD262 | CS1W-OD292 |
| Relay | CS1W-OC201 | CS1W-OC211 | – | – | – |
| Triac | CS1W-OA201 | CS1W-OA211 | – | – | – |
| See page | C-51, C-52 | C-51, C-52 | C-51 | C-51 | C-51 |

Are terminal blocks and connection cables necessary?

Output modules with 5, 8 or 16 points have removable terminal blocks that accept direct wiring from output devices. High-density 32-, 64- and 96-point modules use cables and terminal blocks to connect inputs and consolidate wiring back to the control panel. For more information see page C-67.

| Module | Connector Type | Terminal Block | Cable |
|------------|--|---------------------|-----------------|
| CS1W-OC201 | Removable terminal block | Not required | Not required |
| CS1W-OC211 | | | |
| CS1W-OD211 | | | |
| CS1W-OD212 | | | |
| CS1W-OA201 | | | |
| CS1W-OA211 | | | |
| CS1W-OD231 | Fujitsu-compatible connector on module | XW2B-40G4 or G5 | XW2Z-□□□B |
| CS1W-OD232 | | XW2B-40G4 or G5 | XW2Z-□□□B |
| CS1W-OD261 | | Two XW2B-40G4 or G5 | Two XW2Z-□□□B |
| CS1W-OD262 | | Two XW2B-40G4 or G5 | Two XW2Z-□□□B |
| CS1W-OD291 | | Two XW2B-60G4 or G5 | Two XW2Z-□□□H-1 |
| CS1W-OD292 | | Two XW2B-60G4 or G5 | Two XW2Z-□□□H-1 |

Note: For more information on wiring connections, please refer to the wiring section starting on page D-1.

Mixed I/O Configuration

What input voltage and transistor output type (NPN or PNP) do you need?

| Input Voltage | 5 VDC | 24 VDC | See page |
|------------------------|------------|------------|----------|
| Sinking outputs (NPN) | CS1W-MD561 | CS1W-MD261 | C-63 |
| | | CS1W-MD291 | C-63 |
| Sourcing outputs (PNP) | – | CS1W-MD262 | C-63 |
| | | CS1W-MD292 | C-63 |

How many input/output points are required?

Choose from the available point densities below.

| I/O Points | 32 In/32 Out | 48 In/48 Out | See page |
|------------|--------------|--------------|----------|
| | CS1W-MD261 | CS1W-MD291 | C-63 |
| | CS1W-MD262 | CS1W-MD292 | C-63 |
| | CS1W-MD561 | | C-63 |

Are terminal blocks and connection cables necessary?

High-density I/O modules use cables and terminal blocks to connect inputs/outputs and consolidate wiring back to the control panel. For more information see page C-67.

| Module | Connector Type | Terminal Block | Cable |
|------------|--|---------------------|-----------------|
| CS1W-MD261 | Fujitsu-compatible connector on module | Two XW2B-40G4 or G5 | Two XW2Z-□□□B |
| CS1W-MD262 | | Two XW2B-40G4 or G5 | Two XW2Z-□□□B |
| CS1W-MD561 | | Two XW2B-40G4 or G5 | Two XW2Z-□□□B |
| CS1W-MD291 | | Two XW2B-60G4 or G5 | Two XW2Z-□□□H-1 |
| CS1W-MD292 | | Two XW2B-60G4 or G5 | Two XW2Z-□□□H-1 |

Configuration Guidelines

Remember to add all the current consumptions of basic I/O, special I/O modules, and CPU bus units to determine which power supply is appropriate.

Please refer to the *System Configuration* section for current consumption of individual modules.

For more I/O options, see the *Industrial Networks and Communication* section for DeviceNet I/O on page C-123 and CompoBus/S I/O on page C-138.

Special I/O Selection

This section describes the CS1D modules that are specially designed to handle analog, single- and multiple-axis position control, multiple-axis motion control, high-speed counting, ID sensor control and voice notification module right on the PLC. All of these modules have independent co-processors to handle the specialized functions to reduce the load on the CPU and keep cycle times extremely fast.

Analog I/O Modules

Please refer to the *Analog Selection Guide* on pages C-76 to C-81. Only CS1 analog I/O modules can be used on the CS1D system.

Single- and Multiple-axis Position Control Modules

The position control modules for the CS1D series have been developed for precise positioning on pick and place machines and for the use of cutting equipment and positioning systems. Servo or stepper systems that accept pulse-train inputs can be controlled with these modules.

Configure a complete system by combining these parts:


- Position control module (CS1W-NC □□□).
- Omron SMARTSTEP or W-Series servo drive or any manufacturer's servo/stepper drive.

| Module | Output | Controlled Axes | See page |
|------------|----------------|-----------------|----------|
| CS1W-NC113 | Open collector | 1 Axis | C-97 |
| CS1W-NC213 | | 2 Axis | C-97 |
| CS1W-NC413 | | 4 Axis | C-97 |
| CS1W-NC133 | Line driver | 1 Axis | C-97 |
| CS1W-NC233 | | 2 Axis | C-97 |
| CS1W-NC433 | | 4 Axis | C-97 |

Motion Control Modules

The motion control modules for the CS1D series have been developed for precise positioning, as is necessary in pick and place machines and positioning systems. Up to four axes can be controlled dependently or independently of one another.

The new high-performance motion controller CS1W-MCH71 can also handle up to 30 axes over an electronic high-speed 10 Mbps bus and also perform electronic gear functions.

| Module | Controlled Axes | Electronic Gear Functions | See page |
|------------|-----------------|---------------------------|---|
| CS1W-MC221 | 2 max. | No | C-99 |
| CS1W-MC421 | 4 max. | No | C-99 |
| CS1W-MCH71 | 30 max. | Yes |  Go to www.omron.com/oei , type CS1W-MCH71 in "Site Search" for more information. |

High-Speed Counter Modules

The high-speed counter modules count pulse signal inputs that are too fast to be detected by normal input units.

| Module | Max. Input Frequency | Input Voltage | Number of Counters | Remarks |
|------------|---|--------------------------------------|--------------------|---|
| CS1W-CT021 | 50 kHz - 500 kHz with Line Driver Input | 5, 12, 24 VDC and RS-422 Line Driver | 2 | – |
| CS1W-CT041 | 50 kHz - 500 kHz with Line Driver Input | 5, 12, 24 VDC and RS-422 Line Driver | 4 | – |
| CS1W-HCP22 | 50 kHz - 200 kHz with Line Driver Input | 5, 12, 24 VDC and RS-422 Line Driver | 2 | Programmable unit with PLC functionality and 2 pulse outputs |
| CS1W-HCA22 | 50 kHz - 200 kHz with Line Driver Input | 5, 12, 24 VDC and RS-422 Line Driver | 2 | Programmable unit with PLC functionality and 2 analog outputs |
| CS1W-CTS21 | 1.5 MHz | RS-422/485 | 2 | SSI (Synchronous Serial Interface) encoder inputs |

ID Sensor Modules

The ID sensor modules interface with the V600-series RFID (Radio Frequency Identification) system for high-speed communications between the CPU unit and data carriers (Radio Frequency Tags).

| Module | Number of R/W Heads | See page |
|--------------|---------------------|----------|
| CS1W-V600C11 | 1 | C-107 |
| CS1W-V600C12 | 2 | C-107 |

Configuration Guidelines

Remember to add all the current consumptions of basic I/O, special I/O modules, and CPU bus units to determine which power supply is appropriate.

Please refer to the *System Configuration* section for current consumption of individual modules.

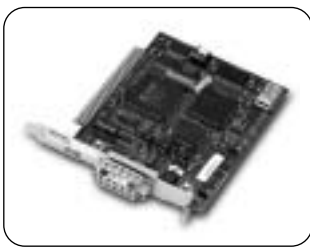
For more I/O options, see the *Industrial Networks and Communication* section for DeviceNet I/O on page C-123 and CompoBus/S I/O on page C-138.

Industrial Networking

This section describes the data and command exchange communications options available for CS1D systems:

| | | |
|---|--|--------------------------|
| <p>Need to exchange large volumes of large messages enterprise-wide?</p> | <p>Ethernet</p> | <p>Page C-116</p> |
| <p>Need a deterministic network between PLCs and between computers and PLCs?</p> | <p>Controller Link</p> | <p>Page C-120</p> |
| <p>Need to exchange data and messages with legacy large rack Omron PLCs?</p> | <p>SYSMAC Link</p> | <p>Page C-122</p> |
| <p>Need an open network that exchanges device data and status?</p> | <p>DeviceNet Wide range of connectivity options Wide range of slave I/O and master options</p> | <p>Page C-123</p> |
| <p>Need to exchange data and make remote settings available to host computers, controllers and other serial devices?</p> | <p>Serial Communications Protocol Macros allow immediate connectivity to serial controllers, offer custom protocol development and ladder program access</p> | <p>Page C-143</p> |

Collect and Share Valuable Data



Networking has become one of the core requirements of automation systems today because tomorrow's competitive edge comes from factory floor and enterprise-wide data. More and more, factory operations are becoming dependent on machine and line productivity data.

Automation systems that were once isolated and stand-alone now provide valuable data for process optimization and statistical analysis.

Omron's Industrial Networking options provide easy-to-implement connections from controllers to Data Acquisition Systems and Supervisory Control Systems that is unmatched in the industry today. This is very easy to accomplish using Omron's Programmable Controllers because:

- 1) the Communications Modules provide the intelligence for routing the commands or data, and
- 2) the memory of the processor is organized so that communications requests can access data areas in the processor without interrupting the control function of the CPU to do "block transfers."

Data memory provides a "scratch pad" for information to be written to and read from. It can also be the "working" memory to which real world I/O changes are automatically written. This allows the user to designate the desired data, what it means and what should be done with it from a remote location, *without* interfering with the execution of the control program.

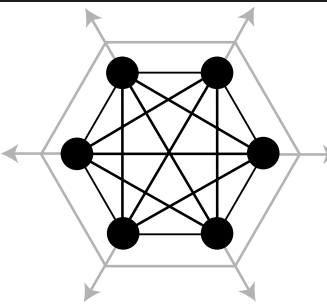
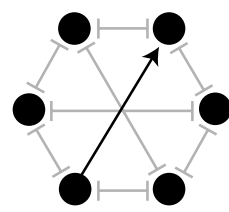


The final key to this capability is Omron's unique middleware product called FINS (Factory Intelligent Network Service) that allows messages and information to be *seamlessly* routed across and up to three networks. This means that a message or command that originates from a computer and originates on Ethernet, can route through a factory floor Programmable Controller over Controller Link and, finally, access I/O data in a "micro" controller over either a serial link or DeviceNet.



Omron Simplifies Setup for Network Communications

Examine the realities and costs involved in building the network communications that let you integrate plant floor data with front office systems. Two considerations move to the top of the list: flexibility to handle changing requirements easily and the ability to integrate legacy products. The table below clarifies the advantages of Omron's approach.

Comparison of Omron's Data Link to Traditional Block Transfer

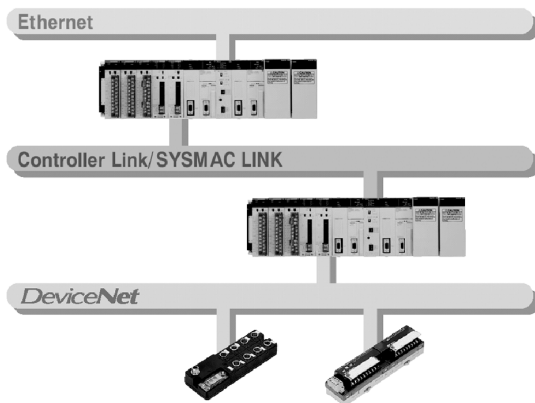
| Data Exchange Method | Data Link | Block Transfer |
|--|--|--|
| <p>What it accomplishes</p> | <p>Makes available an easily expanded area of data that is accessible to all PLCs on the network. Data requests are handled outside the scan time by co-processors in the communications modules.</p>  | <p>Defines a point-to-point connection between a desired individual data point in a PLC to make a specific link to the requesting PLC and define the amount of data that can be exchanged. Typically limited to 64 words.</p>  |
| <p>Setup procedure</p> | <ul style="list-style-type: none"> • Use dialog box "wizard" setup • User defines how much data is to be sent via the Data Link, what memory location is to be used and how much to "read" from all other network nodes | <ul style="list-style-type: none"> • Use special Move instructions • Must follow any Read or Write command • Error checking is done by programming and data consistency must be checked due to scan cycle mismatches |
| <p>Setup example</p> | <p>The screen capture shows a typical Data Link set-up in progress. The user can define:</p> <ul style="list-style-type: none"> • How much data gets sent • What memory area is the source of the data and • Where to put received data  | <p>Printout shows the first rung of an extensive program required to define point-to-point data exchange and to verify data consistency.</p> <ul style="list-style-type: none"> • Error checking is done by programming • Size of transfer affects program cycle timing  |
| <p>Making changes</p> | <ul style="list-style-type: none"> • Amount of data to be handled, changing where it goes or adding a new node is as simple as the initial setup • No impact on program execution | <ul style="list-style-type: none"> • Program must be adjusted if data size changes; program execution time changes • If different models are communicating, up to 3 programming software packages could be required |
| <p>Costs and future expandability</p> | <p>Data Link reduces the original cost of programming in setting up the routing tables for exchange and offers maximum flexibility for future changes, requiring minimal editing to routing table data.</p> | <p>Long hours of programming each individual point-to-point exchange followed by system testing to be sure cycle time is acceptable, followed by any modifications to bring cycle time back into bounds. Future changes are time consuming editing projects.</p> |
| <p>Handling legacy systems</p> | <p>Omron's CX-Programmer software covers all Omron's programmable controllers with networking capability, from micros up to large rack systems. Access to the memory areas available for each model is selected in a dialog box when the specific model is designated.</p> | <p>Depending on the manufacturer, multiple programming software packages are required to set up and modify the block transfer ladder programming across the full range of PLCs in an installation. Finding and hiring programmers with experience in older platforms becomes difficult as time goes by.</p> |

Industrial Networks and Communications

Note: Only CS1 Basic and High-density I/O modules as well as Special I/O modules can be used with the CS1D. Please refer to the appropriate I/O section for more information.

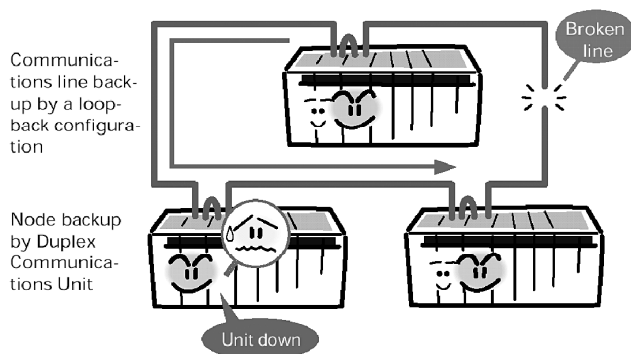
Seamless Network Environments

With the CS1D, Networks are available for every level: Ethernet communications for data, Controller Link and SYSMAC LINK for controllers, and DeviceNet for components. Messages can be sent and received over a maximum of three network levels.



Higher Network Reliability

Duplex communications using Controller Link Fiber Optic Modules offer a loopback configuration that enables continuous communications even in the event of a problem.



- Note:**
1. Controller Link Modules CS1W-CLK12-V or CS1W-CLK52-V1 are required for network duplexing.
 2. For more details and specifications, refer to the newest version of manual W370.
 3. Please refer to the CS1 Industrial Networks and Communications section for Ethernet, Controller Link, SYSMAC LINK and DeviceNet specifications.

■ System Configuration

A CS1D System can be configured as either a CS1D Duplex System or a CS1D Simplex System.

■ CS1D Duplex Systems

A CS1D System with two CPU Units mounted is called a CS1D Duplex System.

Duplex Functions

The following duplex functions are supported by a CS1D Duplex System.

| Duplex functions | Support |
|---|---------|
| Duplex CPUs (with Duplex Inner boards) | Yes |
| Duplex power supply modules | Yes |
| Duplex communications modules (e.g., Controller Link modules) | Yes |
| Online unit replacement | Yes |

The Two Modes in a CS1D Duplex System

A CS1D Duplex System can be operated in either Duplex Mode or Simplex Mode.

- **Duplex Mode**
In Duplex Mode, the CPUs are placed in duplex system status. If a fatal error occurs in the active CPU, control is switched to the standby CPU and operation continues.
- **Simplex Mode**
In Simplex Mode, a single CPU controls operation.

■ CS1D Simplex Systems

In a CS1D Simplex System, operation is possible with only a single CPU mounted.

Aside from having just one CPU mounted, a CS1D Simplex System is the same as the Simplex Mode in a CS1D Duplex System in all other respects, such as system configuration (mounted Units) and operating restrictions.

Duplex Functions

The following duplex functions are supported in a CS1D Simplex System.

As shown in the table, duplex Power Supply Units, duplex Communications Units, and online Unit replacement are supported, but duplex CPUs are not.

| Duplex function | Support |
|---|---------|
| Duplex CPUs (with duplex inner boards) | No |
| Duplex power supply modules | Yes |
| Duplex communications modules (e.g., Controller Link modules) | Yes |
| Online unit replacement | Yes |

CS1D Simplex System Mode

Only the Simplex Mode is possible in a CS1D Simplex System.

System Configuration

One CS1D CPU (on either side of the Duplex Unit) and one Duplex Unit are mounted to a CS1D-BC052 Duplex CPU Backplane.

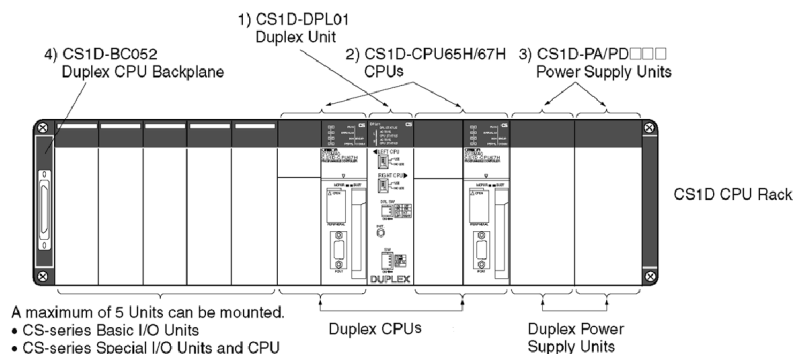
Note: A Duplex Unit is required even in a Simplex System.

CPU Rack

System Configuration

Note: Observe the following precautions when configuring a system.

- CS1D-□□□□ models must be used for all CPUs, Power Supply Units, and Backplanes.
- CS-series and C200H Expansion Backplanes cannot be connected. CS1D-series Backplanes must be used.
- C200H I/O and communication modules cannot be used. (They cannot be mounted to CPU Racks, Expansion Racks, or Long-distance Expansion Racks.)



CS1D CPU Racks

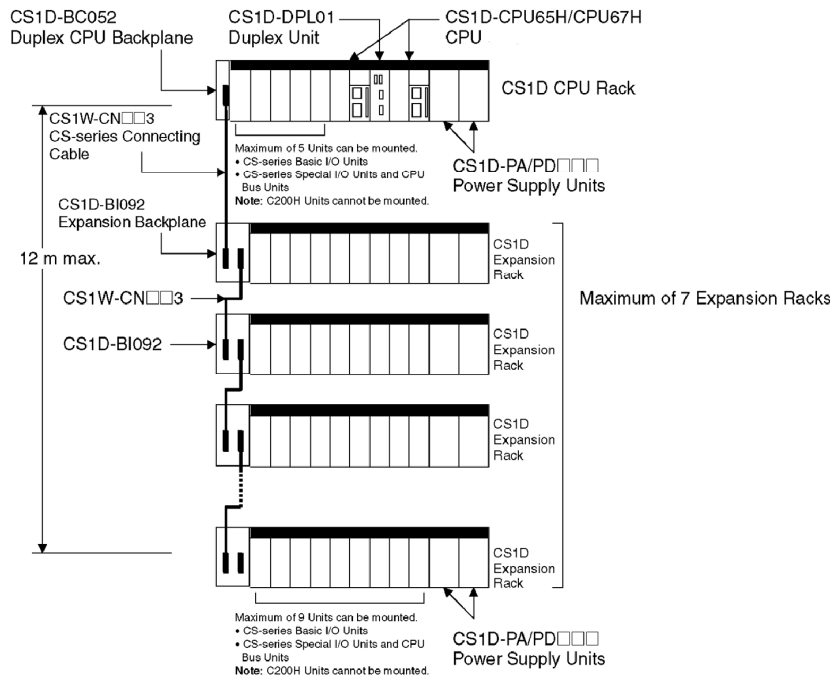
| Name | Model | Contents |
|---------------------------------------|-------------|--|
| 1 Duplex unit | CS1D-DPL01 | The duplex unit is the unit that controls duplex system operation. It monitors for errors and switches operation when an error occurs. |
| 2 CS1D CPUs (with Duplex inner board) | CS1D-CPU□□H | CS1D CPUs are designed especially for a duplex system. Two CPUs of the identical model are mounted in a duplex system. If the inner board is to be configured for duplex operation, two duplex inner boards are also mounted. In a simplex system (i.e., operation by a single CPU), only one CPU is mounted. |
| 3 CS1D Power supply unit | CS1D-PA207R | CS1D Power supply units are designed especially for a duplex system. Two power supply units are mounted to a CPU rack, expansion rack or long distance expansion rack for a duplex power supply configuration. When not configuring a duplex power supply only one power supply unit is mounted. |
| 4 Duplex CPU backplane | CS1D-BC052 | The duplex CPU backplane is used in a CS1D duplex system. It allows duplex CPUs, duplex power supplies and duplex communications units to be mounted and enables online replacement of units. |

- Note:**
1. A Duplex System including an Inner Board can be used with CS1D CPUs with lot numbers of 030422 (manufactured April 22, 2003) or later.
 2. When Inner Boards are used in a duplex configuration, one Duplex Inner Board must be mounted in each CPU. Non-duplex Inner Boards cannot be used.
 3. When using a Memory Card in Duplex Mode, mount it in the active CPU. (Duplex Memory Card operation is not possible.) Duplex EM File Memory operation is possible.
 4. In Simplex Mode, the single CPU can be mounted to either the right or the left slot. A Duplex Unit is required in either case.

■ CPU Rack + CS1D Expansion Racks

Use the following CS1D Expansion Backplane.

| Name | Model number | Contents |
|--|--------------|---|
| CS1D Expansion Backplane (supports online unit replacement) | CS1D-BI092 | This Backplane must be used for any Expansion Racks in a CS1D Duplex System. It enables duplex Power Supply Units, duplex Communications Units, and online Unit replacement. It is also used as the Backplane for a Long-distance Expansion Rack. |



Expansion Racks

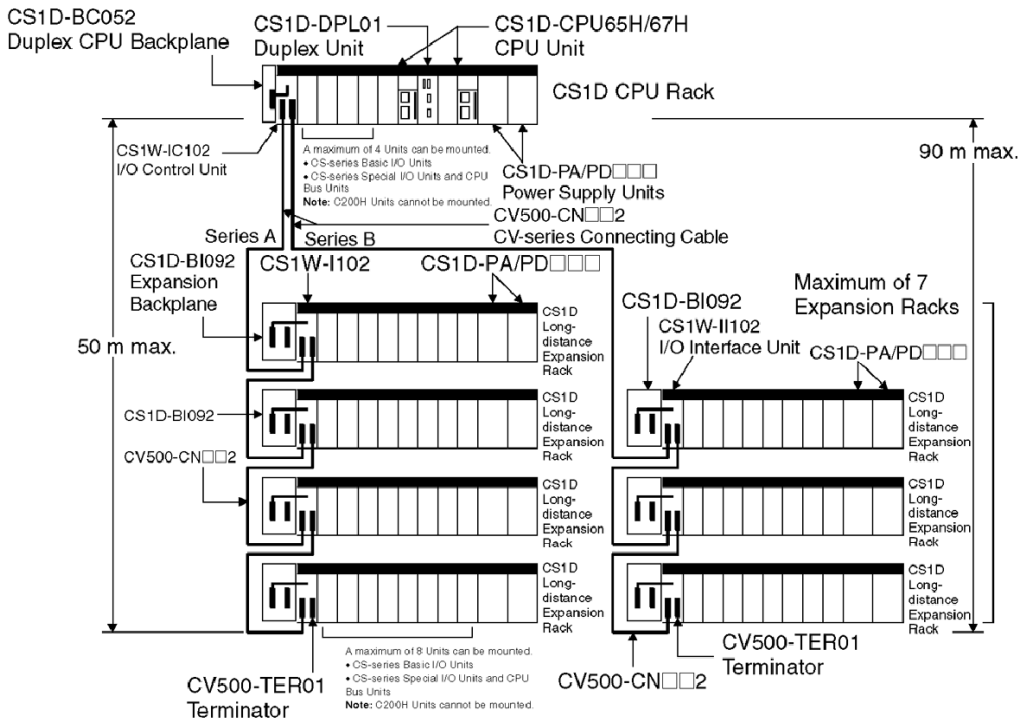
■ CS1D CPU Rack + CS1D Long-distance Expansion Racks

A Long-distance Expansion System can also be configured as a Simplex System.

Use the following CS1D Expansion Backplane.

| Name | model number | Contents |
|---|--------------|---|
| CS1D Expansion Backplane (supports online Unit replacement) | CS1D-BI092 | This Backplane must be used for any Long-distance Expansion Racks in a CS1D Duplex System. It enables duplex Power Supply Units, duplex Communications Units, and online Unit replacement. It is also used as the Backplane for a Long-distance Expansion Rack. |

Note: An I/O Control Unit (CS1W-IC102) is mounted only to the CPU Rack.



■ Units in a CS1D System Configuration

This section lists the Units and Peripheral Devices that can be used to configure a CS1D Duplex System.

Note: Special CS1D products must be used for the CPUs, Power Supply Units, CPU Backplane, and Expansion Backplanes. CS-series products cannot be used.

| Name | | Model | Usable in CS1D Duplex System? | Remarks |
|----------------------|--|----------------------------------|-------------------------------|--|
| CPUs | CS1D CPUs | CS1D-CPU65H | Yes | Use CS1D products only. CS-series products cannot be used. |
| | | CS1D-CPU67H | Yes | |
| | CS-series CPUs | CH1G/H-CPU□□-V1 CS1G/H-CPU□□H | No | |
| Duplex Module | | CS1D-DPL01 | Yes | — |
| Power supply unit | CS1D Power supply | CS1D-PA207R | Yes | Use CS1D products only. C200H and CS-series products cannot be used. |
| | Power supply for C200H and CS-series | C200H-P□□□□□ | No | |
| CPU backplanes | Duplex CPU backplane | CS1D-BC052 | Yes | |
| | CS-series backplane | CS1W-BC□□□ | No | |
| Expansion backplanes | CS1D expansion backplane | CS1D-BI092 | Yes | Use CS1D products only. C200H and CS-series products cannot be used. The same backplane is used for CS1D Expansion Racks and long-distance expansion racks. The connecting cables are the same as for the CS-series. |
| | CS-series expansion backplane | CS1W-BI□□□ | No | |
| | C200H expansion backplane | C200HW-BI□□□-V1 | No | |
| I/O control module | | CS1W-IC102 | Yes | Used with long-distance expansion rack. (Mounted to CPU rack. Cannot be mounted to expansion racks.) |
| I/O interface module | | CS1D-II102 | Yes | Used with long-distance expansion rack. (Mounted to expansion racks.) |
| Basic I/O modules | CS-series I/O modules | | Yes | — |
| | CS-series interrupt input module (CS1W-INT01) | | Restrictions | Can be used only as an ordinary input module in a CS1D Duplex system. |
| | C200H basic I/O modules | | No | C200H basic I/O units cannot be used. |
| Special I/O units | CS-Series special I/O units | | Yes | — |
| | C200H special I/O units | | No | C200H special I/O units cannot be used. |
| CPU Bus units | CS-Series CPU Bus units | | Yes | — |
| | Controller Link units (for duplex communications) CS1W-CLK12-V1 (H-PCF cable) CS1W-CLK52-V1 (GI cable) | | Yes | Allows communications units to be used in duplex operation. |
| | Non-duplex inner boards | | No | Cannot be used in either Duplex Mode or Simplex Mode. |

(This table continues on the next page.)

System Configuration

CS1D System Configuration (continued)

| Name | | Model | Usable in CS1D Duplex System? | Remarks | |
|--------------------------------|----------------------|-----------------------------------|-------------------------------|---|--|
| Memory cards | | HMC-EF□□□ | Yes | Memory cards cannot be used in duplex operation. Mount the memory card to the active CPU. | |
| Battery set | | CS1W-BAT01 | Yes | — | |
| Connector covers | | C500-COV01 | No | — | |
| | | CV500-COV01 | Yes | — | |
| Programming devices | Computer software | CX-Programmer Ver. 3.0 or later | Yes | — | |
| | | CX-Programmer Ver. 2.1 or earlier | No | CX-Programmer Ver 2.1 or earlier cannot be used. | |
| | | CX-Protocol | Yes | — | |
| | | SYSMAC-CPT | No | — | |
| | | SYSMAC Support Software (SSS) | No | — | |
| | Programming consoles | CQM1H-PRO01E | Yes | The Key Sheet and Connecting Cable are the same for the CS1D and CS1-H systems. | |
| | | C200H-PRO27-E | Yes | | |
| CS-series connecting cables | | CS1W-CN313 | Yes | 0.3 m | Used to connect CPU rack to expansion rack, or to connect expansion racks. |
| | | CS1W-CN713 | Yes | 0.7 m | |
| | | CS1W-CN223 | Yes | 2 m | |
| | | CS1W-CN323 | Yes | 3 m | |
| | | CS1W-CN523 | Yes | 5 m | |
| | | CS1W-CN133 | Yes | 10 m | |
| | | CS1W-CN133-2 | Yes | 12 m | |
| Long-distance expansion cables | | CV500-CN312 | Yes | 0.3 m | Used to connect Long-distance expansion racks. |
| | | CV500-CN612 | Yes | 0.6 m | |
| | | CV500-CN122 | Yes | 1 m | |
| | | CV500-CN222 | Yes | 2 m | |
| | | CV500-CN322 | Yes | 3 m | |
| | | CV500-CN522 | Yes | 5 m | |
| | | CV500-CN132 | Yes | 10 m | |
| | | CV500-CN232 | Yes | 20 m | |
| | | CV500-CN332 | Yes | 30 m | |
| | | CV500-CN432 | Yes | 40 m | |
| | | CV500-CN532 | Yes | 50 m | |
| Terminator | | CV500-TER01 | Yes | Used as terminating resistance for long-distance expansion racks. | |

■ I/O Allocations

CS1D I/O allocations are the same as with the CS1. The only difference is the maximum number of CS1 Special I/O modules that can be mounted on a PLC. For the CS1D, the maximum number is 68 units.

■ Current Consumption

There is a fixed amount of current and power that can be provided to the units on the rack. Even when using only one power supply unit, design the system so that the total current consumption of units on the rack does not exceed the values for the maximum power supply unit current and the maximum total power.

When Duplex power supplies are used, the load for each CS1D power supply is reduced by approximately half. Calculate the total current consumption under normal conditions (i.e., with one power supply mounted), taking into account the load when an error occurs at one of the power supplies.

■ CPU Rack and Expansion Racks

The maximum current and power provided for the CPU rack and expansion racks is shown below.

- Note:**
1. CPU Rack: When making calculations, include the current and power consumption for a duplex CPU backplane, a duplex unit and two CS1D power supply units.
 2. When making calculations, include the current and power consumption for an online replacement expansion backplane.

| Power supply unit model | Maximum current provided | | | Maximum total power provided |
|-------------------------|-----------------------------------|---------------------------|-----------------------------|------------------------------|
| | 5 V (internal logic power supply) | 26 V (relay power supply) | 24 V (service power supply) | |
| CS1D-PA207R | 7 A | 1.3 A | None | 35 W |

Current Consumption

■ Total Current and Power Consumption Calculation Example

Example 1: Mounting the following units on a CPU Rack with a CS1D-PA207R power supply unit.

| Item | Model | Quantity | Voltage group | |
|--------------------------------|-------------|----------|---|--|
| | | | 5 V | 26 V |
| Duplex CPU backplane (5 slots) | CS1D-BC052 | 1 | 0.55 A | — |
| Duplex Unit | CS1D-DPL01 | 1 | | |
| CPU | CS1D-CPU67H | 2 | 0.82 A | — |
| Input unit | CS1W-ID291 | 1 | 0.20 A | — |
| Output unit | CS1W-OC221 | 1 | 0.13 A | 0.096 A |
| Special I/O unit | CS1W-MAD44 | 2 | 0.20 A | 0.20 A |
| CPU bus unit | CS1W-CLK21 | 1 | 0.33 A | — |
| Service power supply | — | — | — | — |
| Current consumption | Calculation | | $0.55 + 0.82 \times 2 + 0.20 + 0.13 + 0.20 \times 2 + 0.33$ | $0.096 + 0.20 \times 2$ |
| | Result | | 3.25 A (≤ 7 A) | 0.496 A (≤ 1.3 A) |
| Power consumption | Calculation | | $3.25 \text{ A} \times 5 \text{ V} = 16.3 \text{ W}$ | $0.496 \text{ A} \times 26 \text{ V} = 12.9 \text{ W}$ |
| | Result | | $16.3 + 12.9 = 29.2 \text{ W}$ ($\leq 35 \text{ W}$) | |

Example 2: Mounting the following units on an Expansion Rack with a CS1D-PA207R Power supply unit.

| Item | Model | Quantity | Voltage group | |
|--|-------------|----------|--|------|
| | | | 5 V | 26 V |
| Online replacement expansion backplane | CS1D-BI092 | 1 | 0.28 A | — |
| Input unit | CS1W-ID291 | 2 | 0.20 A | — |
| Output unit | CS1W-OC291 | 7 | 0.48 A | — |
| Current consumption | Calculation | | $0.28 + 0.20 \times 2 + 0.48 \times 7$ | — |
| | Result | | 4.04 A (≤ 7 A) | — |
| Power consumption | Calculation | | $4.04 \text{ A} \times 5 \text{ V} = 20.2 \text{ W}$ | — |
| | Result | | 20.2 W ($\leq 35 \text{ W}$) | |

■ Current Consumption Tables




Note: Please refer to the CS1 System Power and Expansion section for current consumption of CS1 Basic I/O, CS1 Special I/O and CS1 CPU Bus units.

5 V Voltage Group

| Name | Model | Current consumption (A) |
|--|-------------|--|
| Duplex CPU backplane | CS1D-BC052 | 0.55 (total for backplane and duplex unit) |
| Duplex unit | CS1D-DPL01 | |
| CS1D CPU | CS1D-CPU67H | 0.82 (See note 1.) |
| | CS1D-CPU65H | 0.82 (See note 1.) |
| Online replacement expansion backplane | CS1D-BI092 | 0.28 |
| I/O control unit | CS1W-IO102 | 0.92 |
| I/O interface unit | CS1W-II102 | 0.23 |

Note: 1. The values shown include the current consumption for programming devices.
2. NT-AL001-E Link adapters consume an additional 0.15 each when used.



■ CPU Rack

| Name | Specifications | | | Standards | Part number |
|--|--|---|--|--------------------|-----------------------------|
| CPUs | I/O bits | Program capacity | Data memory capacity | --- | --- |
| | 5,120 | 60K steps | 128K words (DM: 32K words, EM: 3 banks of 32K words each) | UC, N, L, CE, CID2 | CS1D-CPU65H |
| | 5,120 | 250K steps | 448K words (DM: 32K words, EM: 13 banks of 32K words each) | | CS1D-CPU67H |
| CPU Backplane | | | 5 slots | | CS1D-BC052 |
| Power Supply Units | 100 to 120 VAC or 200 to 240 VAC (with RUN output); Output capacity: 7 A, 5 VDC | | | | CS1D-PA207R |
| Duplex Unit | — | | | | CS1D-DPL01 |
| I/O Control Unit | For Expansion Racks connected over a distance of more than 12 m (2 terminating resistors included. C200H Modules cannot be used on Long-distance Expansion Racks.) | | | U, C, CE, N | CS1W-IC102 |
| Memory Cards  | Flash memory, 15 MB | | | L, CE | HMC-EF172 |
| | Flash memory, 30 MB | | | | HMC-EF372 |
| | Flash memory, 64 MB | | | | HMC-EF672 |
| | Memory Card Adapter (for computer PCMCIA slot) | | | CE | HMC-AP001 |
| Serial Communications Boards | 2 × RS-232C ports, protocol macro function | | | U, C, N, L, CE | CS1W-SCB21-V1 |
| | 1 × RS-232C port + 1 × RS-422/485 port, protocol macro function | | | | CS1W-SCB41-V1 |
| Programming Consoles  | An English Keyboard Sheet (CS1W-KS001-E) is required. (Connects to peripheral port on CPU only. Cannot be connected to RS-232C port.) | | | U, C, N, CE | CQM1H-PRO01-E |
| | | | | | C200H-PRO27-E |
| Programming Console Key Sheet | For C200H-PRO27 and CQM1-PRO01 | | | CE | CS1W-KS001-E |
| Programming Console Connecting Cables  | Connects the C200H-PRO27-E Programming Console. (2.0 m) | | | | CS1W-CN224 |
| | Connects the C200H-PRO27-E Programming Console. (6.0 m) | | | | CS1W-CN624 |
| CX-Programmer software | For 1 license | Windows-based Support Software for ladder programming on Windows 95, 98, Me, NT 4.0, 2000, or XP (Connects to peripheral port on CPU or RS-232C port on CPU or Serial Communications Unit/Board.) | | --- | WS02-CXPC1-EV3 |
| | For 3 licenses | | | | WS02-CXPC1-EV3L03 |
| | For 10 licenses | | | | WS02-CXPC1-EV3L10 |
| Peripheral Device Connecting Cables (for peripheral port) | Connects DOS computers, D-Sub 9-pin receptacle (Length: 0.1 m) (Conversion cable to connect RS-232C cable to peripheral port) | | | CE | CS1W-CN118 |
| | Peripheral bus or Host Link | Connects DOS computers, D-Sub 9-pin (2.0 m) | | | CS1W-CN226 |
| | | Connects DOS computers, D-Sub 9-pin (6.0 m) | | | CS1W-CN626 |
| Peripheral Device Connecting Cables (for RS-232C port) | Peripheral bus or Host Link, anti-static | Connects DOS computers, D-Sub 9-pin (2.0 m) | | --- | C200H-CN229-EU CBL-202 * |
| PC USB Adapter | Converts PC USB port to a PC serial port for use with Omron serial programming cables. | | | --- | CS1W-C1F31 |
| CX-Protocol | Windows-based Protocol Creation Software for Windows 95, 98, Me, NT 4.0, 2000, or XP | | | --- | WS02-PSTC1-E |
| Battery Set | For CS1 Series only. (Replace battery within 2 years of the production date.) | | | L, CE | CS1W-BAT01 |

* Available in Canada only.

Expansion Rack





■ Expansion Rack

| Name | Specifications | Standards | Part number | |
|---|---|--------------------|-------------------|----------------------|
|  CS1D Expansion Backplane | 9 slots | UC, N, L, CE, CID2 | CS1D-BI092 | |
|  Power Supply Module | 100 to 120 VAC or 200 to 240 VAC (with RUN output), Output capacity: 7 A , 5 VDC | | | CS1D-PA207R |
| I/O Interface Unit | For Expansion Racks connected over a distance of more than 12 m. (C200H Modules cannot be used on Long-distance Expansion Racks.) | U, C, CE | CS1W-II102 | |
| CS1 I/O Connecting Cables | Connects CS1 Expansion I/O Backplanes to CPU Backplane or other CS1 Expansion I/O Backplanes. | Length: 0.3 m | L, CE | CS1W-CN313 |
| | | Length: 0.7 m | | CS1W-CN713 |
| | | Length: 2 m | | CS1W-CN223 |
| | | Length: 3 m | | CS1W-CN323 |
| | | Length: 5 m | | CS1W-CN523 |
| | | Length: 10 m | | CS1W-CN133 |
| | | Length: 12 m | | CS1W-CN133-B2 |
| Long-distance Expansion Rack Cables | Connect I/O Control Unit to I/O Interface Unit or connects two I/O Interface Modules | Length: 0.3 m | N, L, CE | CV500-CN312 |
| | | Length: 0.6 m | N, CE | CV500-CN612 |
| | | Length: 1 m | | CV500-CN122 |
| | | Length: 2 m | CE | CV500-CN222 |
| | | Length: 3 m | | CV500-CN322 |
| | | Length: 5 m | | CV500-CN522 |
| | | Length: 10 m | | CV500-CN132 |
| | | Length: 20 m | | CV500-CN232 |
| | | Length: 30 m | | CV500-CN332 |
| | | Length: 40 m | | CV500-CN432 |
| Length: 50 m | CV500-CN532 | | | |

Note: Refer to the CS1 Ordering Guide for:

- CS1 High-density I/O modules
- CS1 Special I/O modules
- CS1 CPU Bus units
- DeviceNet product line

■ Mounting Rails and Accessories

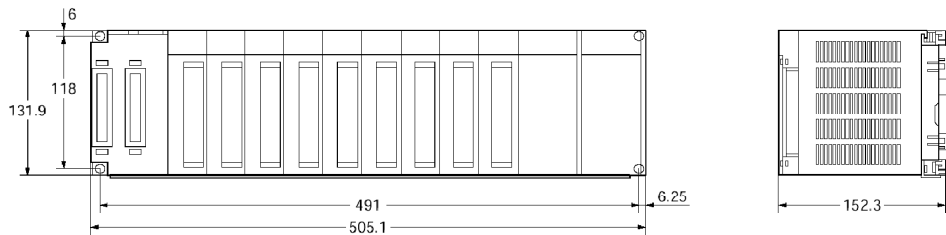
| Name | Specifications | Standards | Part number |
|---|-------------------------------|-----------|--------------------|
|  DIN Track Mounting Bracket | 1 set (2 included) | --- | C200H-DIN01 |
|  DIN Tracks | Length: 50 cm; height: 7.3 cm | | PFP-50N |
| | Length: 1 m; height: 7.3 cm | | PFP-100N |
| | Length: 50 cm; height: 16 mm | | PFP-100N2 |
|  End Plate | --- | | PFP-M |
|  Spacer | --- | | PFP-S |

Unit: mm

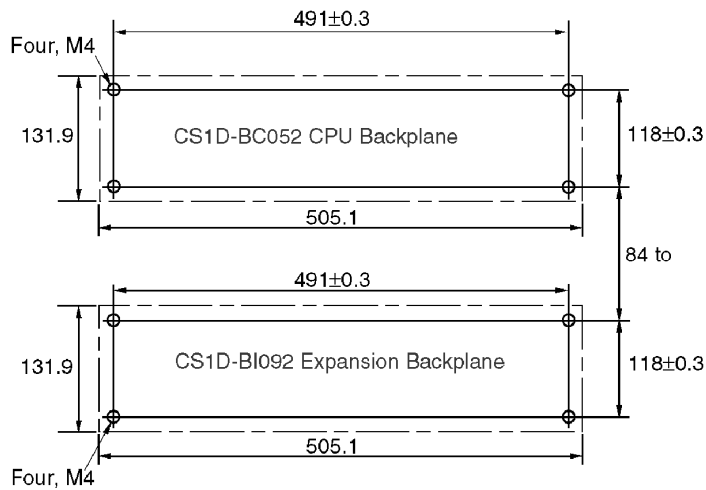
■ CS1D CPU Backplane



■ CS1D Expansion Backplane



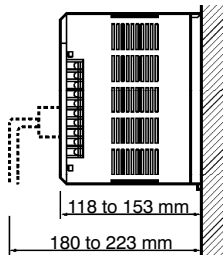
■ Backplane Mounting Dimensions



Dimensions

■ Mounting Depth

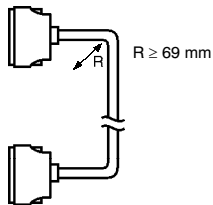
The depth of all Racks is from 118 to 153 mm depending on the Units that are mounted. Additional depth is required to connect Peripheral Devices and Cables. Be sure to allow sufficient mounting depth.



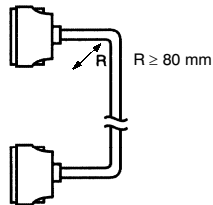
Cable Bending Radius

Note: I/O Connecting Cables are 12 m long max. and require sufficient space to maintain the min. bending radius.

CS1 I/O Connecting Cable
(Cable diameter: 8.6 mm)



Long-distance Connecting Cable
(Cable diameter: 10 mm)



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To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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