

CS1PC-PCI01-DRM
CS1PC-PCI01H-DRM
CS1PC-EIC01

SYSMAC CS1 Board

OPERATION MANUAL

OMRON


CS1PC-PCI01-DRM
CS1PC-PCI01H-DRM
CS1PC-EIC01
SYSMAC CS1 Board
Operation Manual


Revised July 2005


Notice:

OMRON products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following conventions are used to indicate and classify precautions in this manual. Always heed the information provided with them. Failure to heed precautions can result in injury to people or damage to property.

 **DANGER** Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Additionally, there may be severe property damage.

 **WARNING** Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Additionally, there may be severe property damage.

 **Caution** Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or property damage.

OMRON Product References

All OMRON products are capitalized in this manual. The word “Unit” is also capitalized when it refers to an OMRON product, regardless of whether or not it appears in the proper name of the product.

The abbreviation “Ch,” which appears in some displays and on some OMRON products, often means “word” and is abbreviated “Wd” in documentation in this sense.

In this manual “PLC” is used as the abbreviation for Programmable Controller.

Visual Aids

The following headings appear in the left column of the manual to help you locate different types of information.

Note Indicates information of particular interest for efficient and convenient operation of the product.

1, 2, 3... 1. Indicates lists of one sort or another, such as procedures, checklists, etc.

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No patent liability is assumed with respect to the use of the information contained herein. Moreover, because OMRON is constantly striving to improve its high-quality products, the information contained in this manual is subject to change without notice. Every precaution has been taken in the preparation of this manual. Nevertheless, OMRON assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained in this publication.

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About this Manual:

This manual describes the installation and operation of SYSMAC CS1 Board PLC (Programmable Controllers). The SYSMAC CS1 Board is a PCI Board that provides functionality equivalent to a SYSMAC CS-series PLC.

The following manuals may also be required to install and run a PLC System based on the SYSMAC CS1 Board.

Name	Contents	Catalog number
SYSMAC CS1 Board Operation Manual (This manual)	Describes how to use the SYSMAC CS1 Board, especially the information required to connect the Board to a PCI slot. Refer to the CS1 PLC manuals for further information on the PLC functions and the <i>CS/CJ Series DeviceNet Unit Operation Manual</i> for further information on DeviceNet functions.	V220
SYSMAC CS Series CS1G/H-CPU□□H CS1G/H-CPU□□-EV1 Programmable Controllers Operation Manual	Describes the installation and operation of the CS-series PLCs. Refer to this manual when connecting the SYSMAC CS1 Board to Expansion Racks, mounting Units in the Racks, and wiring the Units.	W339
SYSMAC CS/CJ Series Programmable Controllers Instructions Reference Manual	Describes the ladder diagram programming instructions supported by CS/CJ-series PLCs. Refer to this manual when writing programs for the SYSMAC CS1 Board.	W340
CS/CJ Series DeviceNet Unit Operation Manual	Describes operation of the CS/CJ-series DeviceNet Units. Refer to this manual for information on DeviceNet specifications and functions, including Slaves and overall Network operation. This manual is required to use the DeviceNet functions of the SYSMAC CS1 Board.	W380
DeviceNet Configurator Ver. 2.□ Operation Manual	Describes operation of the DeviceNet Configurator. Refer to this manual when making special settings for a DeviceNet Network, such as user-set allocations for remote I/O.	W382


Please read this manual and all other related manuals carefully and be sure you understand the information provided before attempting to install and operate a SYSMAC CS1 Board. You will also need the manuals for your personal computer.

This manual includes the following sections.

Section 1 describes the features, specifications, and configuration of the SYSMAC CS1 Board. Read this section before reading the rest of the manual.

Section 2 explains how to make the hardware settings on the SYSMAC CS1 Board, install the Board in the computer, and wire the Board to I/O devices and DeviceNet devices.

The **Appendix** describe how to replace the SYSMAC CS1 Board's backup battery.

 <p>WARNING</p>	<p>Failure to read and understand the information provided in this manual may result in personal injury or death, damage to the product, or product failure. Please read each section in its entirety and be sure you understand the information provided in the section and related sections before attempting any of the procedures or operations given.</p>
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Read and Understand this Manual

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

Warranty and Limitations of Liability

WARRANTY

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

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

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

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

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

Application Considerations

SUITABILITY FOR USE

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

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

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

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

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

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

PROGRAMMABLE PRODUCTS

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

Disclaimers

CHANGE IN SPECIFICATIONS

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

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

DIMENSIONS AND WEIGHTS

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

PERFORMANCE DATA

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

ERRORS AND OMISSIONS

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

PRECAUTIONS

This section provides general precautions for using the SYSMAC CS1 Board Programmable Controller (PLC) and related devices. **The information contained in this section is important for the safe and reliable application of the PLC. You must read this section and understand the information contained before attempting to set up or operate a PLC System.**

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1 Intended Audience

This manual is intended for the following personnel, who must also have knowledge of electrical systems (an electrical engineer or the equivalent).

- Personnel in charge of installing FA systems.
- Personnel in charge of designing FA systems.
- Personnel in charge of managing FA systems and facilities.


2 General Precautions

The user must operate the product according to the performance specifications described in the operation manuals.


Before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems, machines, and equipment that may have a serious influence on lives and property if used improperly, consult your OMRON representative.


Make sure that the ratings and performance characteristics of the product are sufficient for the systems, machines, and equipment, and be sure to provide the systems, machines, and equipment with double safety mechanisms.

This manual provides information for programming and operating OMRON PLCs. Be sure to read this manual before attempting to use the software and keep this manual close at hand for reference during operation.

 **WARNING** It is extremely important that a PLC and all PLC Units be used for the specified purpose and under the specified conditions, especially in applications that can directly or indirectly affect human life. You must consult with your OMRON representative before applying a PLC System to the above-mentioned applications.

3 Safety Precautions

 **WARNING** Do not attempt to disassemble or touch the inside of the SYSMAC CS1 Board while the power is being supplied. Doing so may result in electric shock.

 **WARNING** Provide safety measures in external circuits, i.e., not in the Programmable Controller (referred to as "PLC"), in order to ensure safety in the system if an abnormality occurs due to malfunction of the PLC or another external factor affecting the PLC operation. Not doing so may result in serious accidents.

- Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits.
- The PLC will turn OFF all outputs when its self-diagnosis function detects any error or when a severe failure alarm (FALS) instruction is executed. As a countermeasure for such errors, external safety measures must be provided to ensure safety in the system.
- The PLC outputs may remain ON or OFF due to deposition or burning of the output relays or destruction of the output transistors. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.
- When the 24-V DC output (service power supply to the PLC) is overloaded or short-circuited, the voltage may drop and result in the outputs being turned

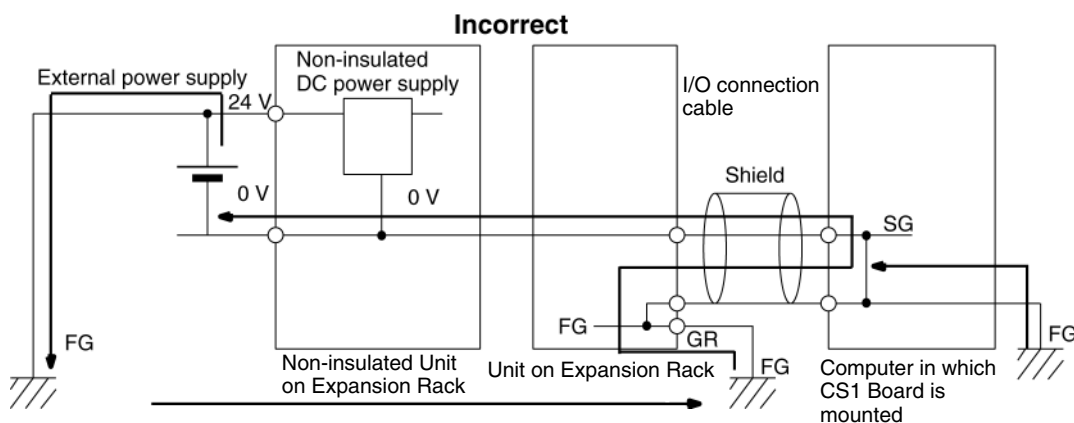
OFF. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.

Caution Execute online edit only after confirming that no adverse effects will be caused by extending the cycle time. Otherwise, the input signals may not be readable.

Caution Confirm safety at the destination node before transferring a program to another node or changing the I/O memory area. Doing either of these without confirming safety may result in injury.

Caution CS1PC-PCI01H-DRM automatically back up the user program and parameter data to flash memory when these are written to the CS1 Board. I/O memory (including the DM, EM, and HR Areas), however, is not written to flash memory. The DM, EM, and HR Areas can be held during power interruptions with a battery. If there is a battery error, the contents of these areas may not be accurate after a power interruption. If the contents of the DM, EM, and HR Areas are used to control external outputs, prevent inappropriate outputs from being made whenever the Battery Error Flag (A40204) is ON. Areas such as the DM, EM, and HR Areas, the contents of which can be held during power interrupts, is backed up by a battery. If a battery error occurs, the contents of the areas that are set to be held may not be accurate even though a memory error will not occur to stop operation. If necessary for the safety of the system, take appropriate measures in the ladder program whenever the Battery Error Flag (A40204) turns ON, such as resetting the data in these areas.

Caution Be careful when connecting a personal computer mounted with a SYSMAC CS1 Board to an Expansion Backplane to which is mounted a non-insulated Unit (CS1W-CLK12/52(-V1) or CS1W-ETN01) connected to an external power supply. A short-circuit will be created if the 24 V side of the external power supply is grounded and the 0 V side of the personal computer mounted with a SYSMAC CS1 Board is grounded. When connecting an Expansion Backplane to this type of PLC, either ground the 0 V side of the external power supply or do not ground the external power supply at all.



4 Operating Environment Precautions


Do not operate the system in the following places.

- Locations subject to direct sunlight
- Locations subject to temperatures or humidity outside the range specified in the specifications

- Locations subject to condensation as the result of severe changes in temperature
- Locations subject to corrosive or flammable gases
- Locations subject to dust (especially iron dust) or salts
- Locations subject to shock or vibration
- Locations subject to exposure to water, oil, or chemicals


Take appropriate and sufficient countermeasures when installing systems in the following locations.

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


 **Caution** The operating environment of the PLC System can have a large effect on the longevity and reliability of the system. Improper operating environments can lead to malfunction, failure, and other unforeseeable problems with the PLC System. Be sure that the operating environment is within the specified conditions at installation and remains within the specified conditions during the life of the system.

5 Application Precautions

Observe the following precautions when using the SYSMAC CS1 Board.

 **WARNING** Failure to abide by the following precaution could lead to serious or possibly fatal injury. Always heed this precaution.

- Always ground the system to 100 Ω or less when installing the system to protect against electrical shock.

 **Caution** Failure to abide by the following precautions could lead to faulty operation of the SYSMAC CS1 Board or the system. Always heed these precautions.

- You must use the CX-Programmer (programming software that runs on Windows) if you need to program more than one task. A Programming Console can be used to program only one cyclic task plus interrupt tasks. A Programming Console can, however, be used to edit multitask programs originally created with the CX-Programmer.
- Always turn OFF the power supply to the SYSMAC CS1 Board before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
 - Mounting or dismounting Power Supply Units, I/O Units, CS1 Boards, Inner Boards, or any other Units.
 - Assembling the Units.
 - Setting DIP switches or rotary switches.
 - Connecting cables or wiring the system.
 - Connecting or disconnecting the connectors.
- When using a CS1PC-PCI01-DRM for the first time, install the CS1W-BAT1 Battery provided with the Unit and clear all memory areas from a Programming Device before starting to program. (The Battery is installed in advance for CS1PC-PCI01H-DRM, so initial Battery installation and the memory clear operation are not required.)
- When using the internal clock for a CS1PC-PCI01-DRM, turn ON power after installing the battery and set the clock from a Programming Device or using the

DATE(735) instruction. The clock will not start until the time has been set. (The Battery is installed in advance for CS1PC-PCI01H-DRM, so clock does not need to be set.)

- The user program and parameter area data in CS1PC-PCI01H-DRM is backed up in the built-in flash memory. The BKUP indicator will light on the front panel when the backup operation is in progress. Do not turn OFF the power supply to the SYSMAC CS1 Board when the BKUP indicator is lit. The data will not be backed up if power is turned OFF.
- If, when using a CS1PC-PCI01H-DRM, the PLC Setup is set to specify using the mode set on the Programming Console and a Programming Console is not connected, the CPU Unit will start in RUN mode. This is the default setting in the PLC Setup. (A CS1PC-PCI01-DRM will start in PROGRAM mode under the same conditions.)
- When creating an AUTOEXEC.IOM file from a Programming Device (a Programming Console or the CX-Programmer) to automatically transfer data at startup, set the first write address to D20000 and be sure that the size of data written does not exceed the size of the DM Area. When the data file is read from the Memory Card at startup, data will be written in the CS1 Board starting at D20000 even if another address was set when the AUTOEXEC.IOM file was created. Also, if the DM Area is exceeded (which is possible when the CX-Programmer is used), the remaining data will be written to the EM Area.
- Always turn ON power to the SYSMAC CS1 Board before turning ON power to the control system. If the SYSMAC CS1 Board power supply is turned ON after the control power supply, temporary errors may result in control system signals because the output terminals on DC Output Units and other Units will momentarily turn ON when power is turned ON to the SYSMAC CS1 Board.
- Interlock circuits, limit circuits, and similar safety measures in external circuits (i.e., not in the Programmable Controller) must be provided by the customer.
- Do not turn OFF the power supply to the SYSMAC CS1 Board when data is being transferred. In particular, do not turn OFF the power supply when reading or writing a Memory Card. Also, do not remove the Memory Card when the BUSY indicator is lit. To remove a Memory Card, first press the memory card power supply switch and then wait for the BUSY indicator to go out before removing the Memory Card.
- If the I/O Hold Bit is turned ON, the outputs from the PLC will not be turned OFF and will maintain their previous status when the PLC is switched from RUN or MONITOR mode to PROGRAM mode. Make sure that the external loads will not produce dangerous conditions when this occurs. (When operation stops for a fatal error, including those produced with the FALS(007) instruction, all outputs from Output Unit will be turned OFF and only the internal output status will be maintained.)
- The contents of the DM, EM, and HR Areas in the SYSMAC CS1 Board are backed up by a Battery. If the Battery voltage drops, this data may be lost. Provide countermeasures in the program using the Battery Error Flag (A40204) to re-initialize data or take other actions if the Battery voltage drops.
- Do not apply a force greater than 100 N on the terminal block when tightening the terminals.
- Install Units as far as possible away from devices that generate strong, high-frequency noise.
- Wire all connections correctly.
- Do not drop the product or subject it to excessive vibration or shock.
- Mount Units only after checking terminal blocks and connectors completely.
- Check switch settings, the contents of the DM Area, and other preparations before starting operation. Starting operation without the proper settings or data may result in an unexpected operation.

- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
 - Changing the operating mode of the SYSMAC CS1 Board (including the setting of the startup operating mode).
 - Force-setting/force-resetting any bit in memory.
 - Changing the present value of any word or any set value in memory.
- Resume operation only after transferring to the new SYSMAC CS1 Board the contents of the DM Area, HR Area, and other data required for resuming operation. Not doing so may result in an unexpected operation.
- Always use the special cables listed in this manual or make cables according to manual specifications.
- Before touching a CS1 Board, be sure to first touch a grounded metallic object in order to discharge any static build-up. Not doing so may result in malfunction or damage.
- When transporting or storing circuit boards, cover them in antistatic material to protect them from static electricity and maintain the proper storage temperature.
- Do not touch circuit boards or the components mounted to them with your bare hands. There are sharp leads and other parts on the boards that may cause injury if handled improperly.
- Do not short the battery terminals or charge, disassemble, heat, or incinerate the battery. Do not subject the battery to strong shocks. Doing any of these may result in leakage, rupture, heat generation, or ignition of the battery. Dispose of any battery that has been dropped on the floor or otherwise subjected to excessive shock. Batteries that have been subjected to shock may leak if they are used.
- UL standards required that batteries be replaced only by experienced technicians. Do not allow unqualified persons to replace batteries.
- Unexpected operation may result if inappropriate data link tables or parameters are set. Even if appropriate data link tables and parameters have been set, confirm that the controlled system will not be adversely affected before starting or stopping data links.
- CPU Bus Units will be restarted when routing tables are transferred from a Programming Device to the SYSMAC CS1 Board. Restarting these Units is required to read and enable the new routing tables. Confirm that the system will not be adversely affected before allowing the CPU Bus Units to be reset.
- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.
- Always use the power supply voltage specified in the operation manuals. An incorrect voltage may result in malfunction or burning.
- Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.
- Make sure that wire chips or other particles are not attached to the SYSMAC CS1 Board.
Short-circuits between the component terminals caused by wire chips or other particles may result in malfunction.
- Do not attempt to disassemble, repair, or modify the SYSMAC CS1 Board. Any attempt to do so may result in malfunction, fire, or electric shock.
- Be sure that all the SYSMAC CS1 Board screws and cable connector screws are tightened to the torque specified in this manual. Incorrect tightening torque may result in malfunction.

- Double-check all the wiring before turning ON the power supply. Incorrect wiring may result in burning.
- Be sure that the connectors, expansion cables, and other items with locking devices are properly locked into place. Improper locking may result in malfunction.
- Check the user program for proper execution before actually running it on the system. Not checking the program may result in an unexpected operation.
- Confirm that no adverse effect will occur in the system before changing the operating mode of the SYSMAC CS1 Board. Not doing so may result in an unexpected operation.
- Confirm that no adverse effect will occur in the system before force-setting/force-resetting any bit in memory. Not doing so may result in an unexpected operation.
- Confirm that no adverse effect will occur in the system before changing the present value. Not doing so may result in an unexpected operation.
- Confirm that no adverse effect will occur in the system before changing the set value. Not doing so may result in an unexpected operation.
- Do not pull on or bend the communications cables beyond their natural limit. Doing either of these may break the cables.
- Do not place objects on top of the communications cables. Doing so may break the cables.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.
- Before proceeding to these operations, check carefully to be sure that there will be no adverse effects due to differences with the CPU Unit.

6 Conformance to EC Directives

6-1 Applicable Directives

- EMC Directives

6-2 Concepts

EMC Directives

OMRON devices that comply with EC Directives also conform to the related EMC standards so that they can be more easily built into other devices or the overall machine. The actual products have been checked for conformity to EMC standards (see the following note). Whether the products conform to the standards in the system used by the customer, however, must be checked by the customer.

EMC-related performance of the OMRON devices that comply with EC Directives will vary depending on the configuration, wiring, and other conditions of the equipment or control panel on which the OMRON devices are installed. The customer must, therefore, perform the final check to confirm that devices and the overall machine conform to EMC standards.

Note Applicable EMC (Electromagnetic Compatibility) standards are as follows:

EMS (Electromagnetic Susceptibility): EN61131-2 or EN61000-6-2

EMI (Electromagnetic Interference): EN61000-6-4

(Radiated emission: 10-m regulations)

6-3 Conformance to EC Directives

The SYSMAC CS1 Board comply with EC Directives. To ensure that the machine or device in which the CS-series PLC is used complies with EC Directives, the PLC must be installed as follows:

- 1, 2, 3...**
1. When using a CS-series Unit, it must be installed within a control panel.
 2. You must use reinforced insulation or double insulation for the DC power supplies used for the communications power supply and I/O power supplies.
 3. SYSMAC CS1 Boards also conform to the Common Emission Standard (EN61000-6-4). Radiated emission characteristics (10-m regulations) may vary depending on the configuration of the control panel used, other devices connected to the control panel, wiring, and other conditions. You must therefore confirm that the overall machine or equipment complies with EC Directives.

SECTION 1

Introduction

This section describes the features, specifications, and configuration of the SYSMAC CS1 Board.

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1-1 Features

The SYSMAC CS1 Board (CS1PC-PCI01-DRM and CS1PC-PCI01H-DRM) is an expansion board for personal computers which provides functionality equivalent to an OMRON CS1G-CPU45-EV1 and CS1G-CPU45H CPU Unit with unit version 3.0. It can be connected to the PCI bus of a personal computer. If an CS1PC-EIC01 Expansion I/O Board is installed, CS-series Expansion Racks can be connected. (CJ-series Expansion Racks cannot be used.) Also, DeviceNet communications functionality is provided as standard equipment, enabling remote control equivalent to an OMRON CS-series DeviceNet Unit (CS1W-DRM21-V1).

The SYSMAC CS1 Board provides the features described below.

Functions as PLC Inside Computer for Optimum Space Saving

When the SYSMAC CS1 Board is installed in a personal computer, it operates as a PLC equivalent to a CS1G-CPU45-EV1 or CS1G-CPU45H with unit version 3.0, independent of the personal computer.

Remote Communications Between CS1 Board and Computer Via PCI Bus

Connecting the SYSMAC CS1 Board to the PCI bus of a personal computer makes it possible to perform operations from the computer such as reading from and writing to memory on the Board using a SYSMAC CS1 Board Driver (Windows NT/2000/XP compatible; sold separately), as well as reading status and executing control operations. Ordinarily a host computer would be connected to the PLC by communications cable, but the Board enables faster communications via the PCI bus.

Standard-equipment DeviceNet Communications for Reduced Wiring Requirements

The SYSMAC CS1 Board provides a built-in DeviceNet communications function as standard equipment, and a DeviceNet slave can be connected as a CS-series DeviceNet Unit (CS1W-DRM21-V1). The I/O (contact) status of a slave on DeviceNet is always reflected automatically at the CS1 Board, so the slave's I/O is executed simply by reading to and writing from that data area. Also, the Board provides a message communications function for sending and receiving Explicit and FINS messages, and a remote I/O slave function for operating slaves.

Note DeviceNet is a floor-level FA network accepted as a global standard. Data can be input and output to and from slaves distributed at remote locations through a single cable. For details, refer to the *CS/CJ Series DeviceNet Unit Operation Manual (W380)*.

Same Power Interruption Processing as for PLC

If a power interruption or reset occurs at the personal computer, the same power interruption processing can be executed for the SYSMAC CS1 Board as for the CS1G-CPU-45-EV1 and CS1G-CPU45H with unit version 3.0. Even in the event of unexpected interruptions due to factors such as power outages, the contents of data area such as the DM Area and HR Area maintain their status prior to the interruption. It is also possible to power the Board from a separate power supply (5 V DC) that is independent of the computer's power supply so that the Board can continue executing the ladder program even if the computer is turned OFF.

Note The maximum allowable time for CS1PC-PCI01-DRM CS1 Board's Power OFF Interrupt task is 2.0 ms. The maximum allowable time for the CS1PC-PCI01H-DRM CS1 Board's Power OFF Interrupt task is 1.0 ms. In addition, the power OFF detection extension time cannot be set to anything other than 0 ms.

The C200PC-PD024 Sub-power Supply Board for the C200PC-ISA02/ISA13 cannot be used.

Continuous Operation During Computer Reset

A jumper setting on the SYSMAC CS1 Board specifies whether the Board will also be reset or will continue operation when the personal computer is reset. This feature is useful, for example when it is desirable to continue Board operation while the personal computer is reset for purposes such as OS hang-up.

Programming as a CS-series CPU Unit Using a Programming Device

When a Programming Device (CX-Programmer or Programming Console) is connected to the CS1 Board's peripheral port, the SYSMAC CS1 Board can be used for programming just like a CS-series CPU Unit.

DeviceNet Configurator Connectable to Peripheral Port

By connecting a DeviceNet Configurator (Ver. 2.0) to the SYSMAC CS1 Board's peripheral port, it is possible to make the same settings as with a DeviceNet Unit.

Up to Seven CS-series Expansion Racks or Three C200H-series Expansion I/O Racks

Although the SYSMAC CS1 Board has no I/O other than DeviceNet, connecting a CS1PC-EIC01 Expansion I/O Board allows up to seven CS-series Expansion Racks (or up to three C200H-series Expansion I/O Racks) to be connected. Mounting a Basic I/O Unit allows for I/O processing. It is not possible, however, to use CS-series Long-distance Racks or CJ-series Expansion I/O Racks.

Basic I/O Units, Special I/O Units, and CPU Bus Units Connectible

Basic I/O Units, Special I/O Units, and CPU Bus Units used by the CS Series can be mounted on CS-series or C200H-series Expansion Racks, just like CS-series CPU Units. (There are limitations depending on the type of Unit and Rack. For example, Units such as Interrupt Input Units are incompatible because they must be mounted to the CPU Rack.)

Memory Card Connectible

A Memory Card can be mounted, just as with the CS1G-CPU45-EV1 and CS1G-CPU45H with unit version 3.0. Mounting and removal from the personal computer's rear panel is not possible, however, so mount the Memory Card before the SYSMAC CS1 Board is installed in the personal computer. The functions related to the Memory Card are the same as for the CS1G-CPU45-EV1 and CS1G-CPU45H with unit version 3.0.

- Note**
1. With the SYSMAC CS1 Board, it is not possible to use Interrupt Input Units and Loop Control Units, which must be mounted to a CS-series CPU Backplane. It is also not possible to use Inner Boards.
 2. The SYSMAC CS1 Board's DeviceNet master functions are the same as the functions of a CS1W-DRM21-V1 DeviceNet Unit mounted in a CS-series CPU Rack.

1-2 List of Available Models

The following table provides a list of SYSMAC CS1 Boards that are currently available.

1-2-1 Main Board (CS1PC-PCI01-DRM)

The SYSMAC CS1 Board is composed of a CPU Unit Module and a DeviceNet Unit Module. These Modules are equivalent in functionality to the CS1G-CPU45-EV1 and CS1G-CPU45H CPU Unit with unit version 3.0 and the CS1W-DRM21-V1 DeviceNet Unit.

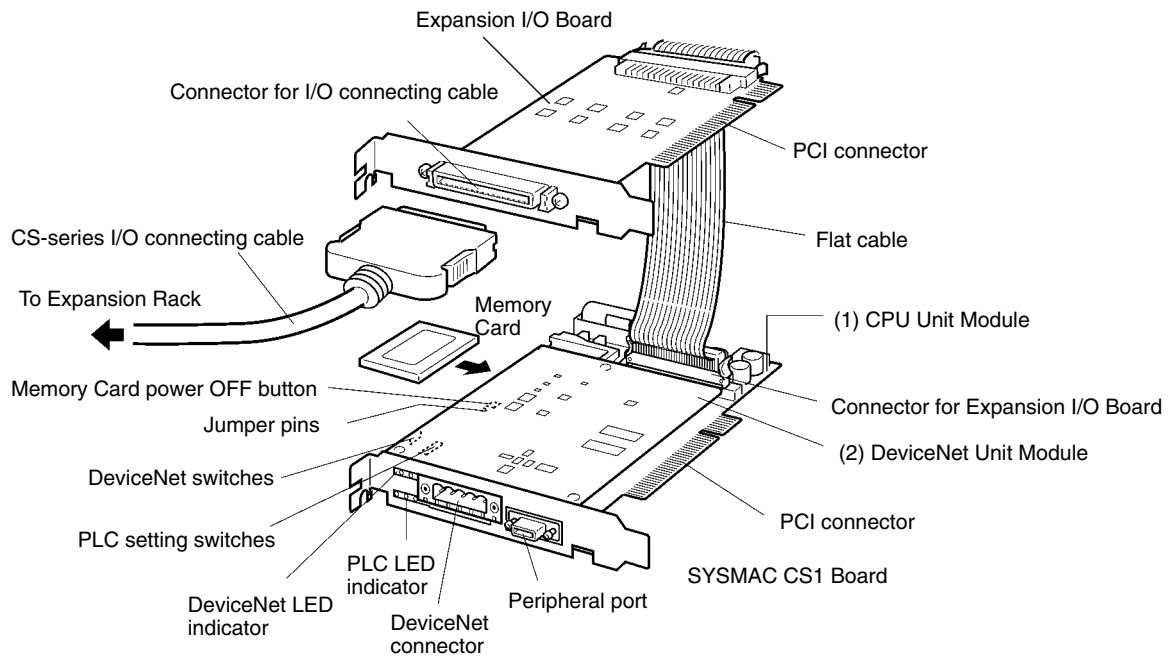
Board Model	Suitable PLC	Peripheral port	Max. No. of Expansion Racks	Program capacity	DeviceNet communications
CS1PC-PCI01-DRM	CPU Unit Module: CS1G-CPU45-EV1 DeviceNet Unit Module: CS1W-DRM21-V1	Yes	7	60 Ksteps	Yes
CS1PC-PCI01H-DRM	CPU Unit Module: CS1G-CPU45H with unit version 3.0 DeviceNet Unit Module: CS1W-DRM21-V1	Yes	7	60 Ksteps	Yes

- Note**
1. The DeviceNet communications function is the same as for a CS1W-DRM21-V1 CS-series DeviceNet Unit.
 2. The SYSMAC CS1 Board occupies one PCI slot.

1-2-2 Expansion I/O Board (CS1PC-EIC01)

Board Model	Connectors
CS1PC-EIC01	Same as the connector on the left side of the CS-series CPU Backplane. (CS-series I/O Connecting Cable can be connected.)

- Note**
1. The CS1PC-PCI01-DRM SYSMAC CS1 Board or CS1PC-PCI01H-DRM SYSMAC CS1 Board and CS1PC-EIC01 Expansion I/O Board are connected by the special flat cable provided with the Expansion I/O Board.
 2. The Expansion I/O Board is allocated one PCI bus slot. Resources (I/O port, memory, IRQ), however, are not allocated.

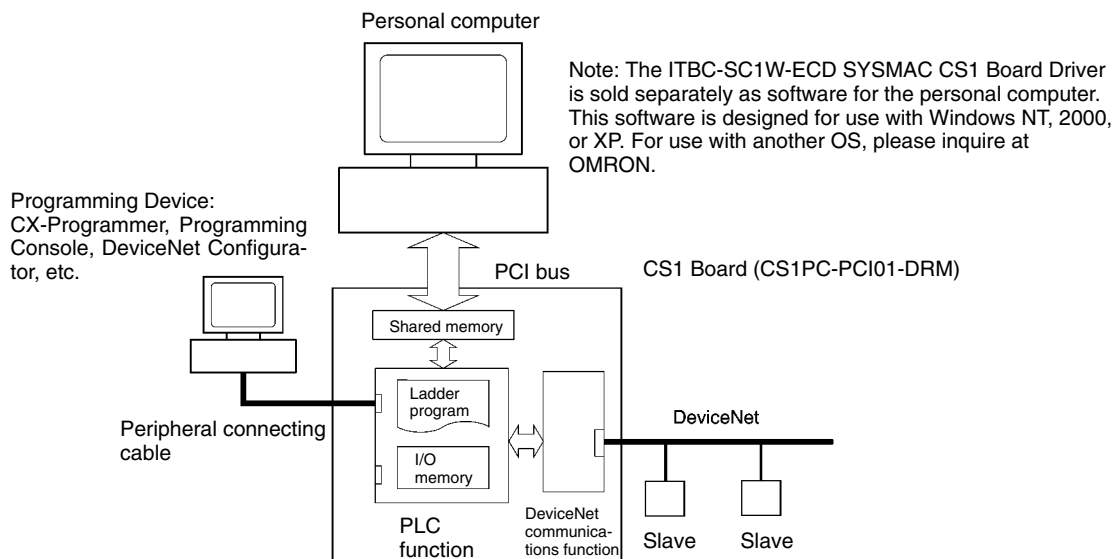


- (1) CPU Unit Module: Equivalent to CS1G-CPU45-EV1 or CS1G-CPU45H with unit version 3.0
- (2) DeviceNet Unit Module: Equivalent to CS1W-DRM21-V1

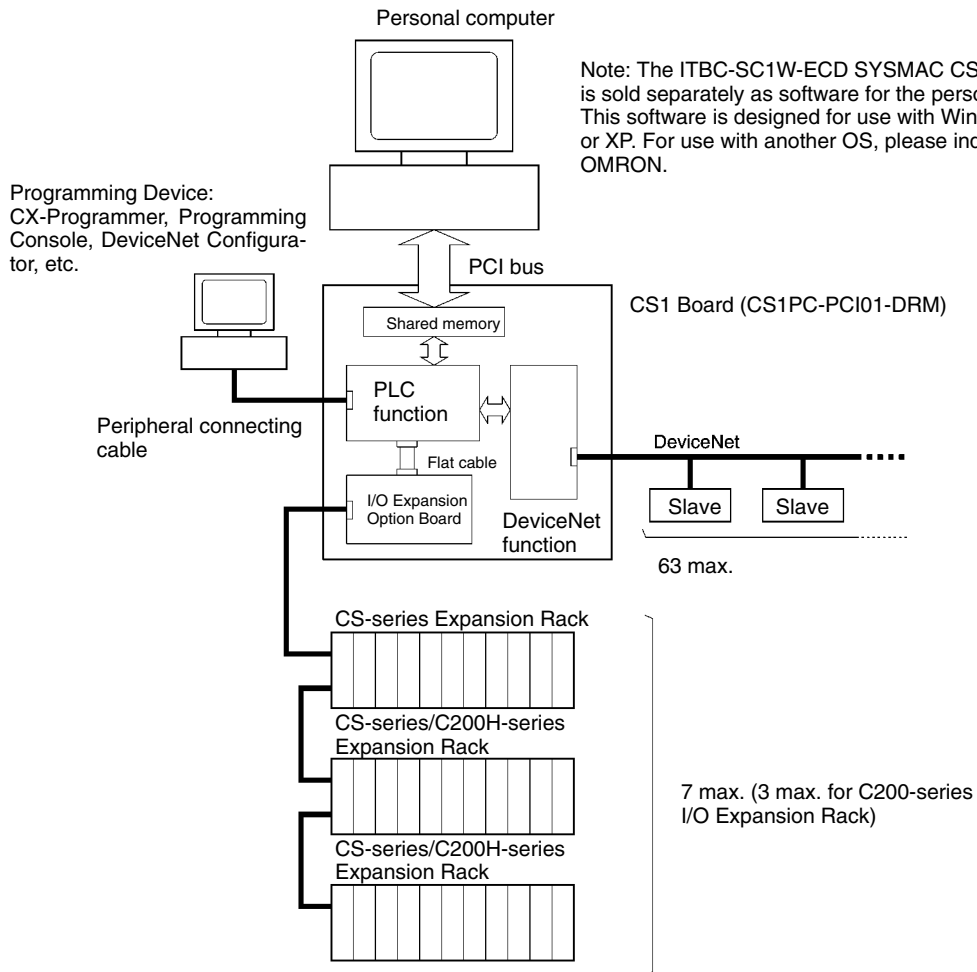
1-3 System Configuration

The following illustrations show the system configurations for the CS1 Board.

When Expansion I/O Board is Not Used (With No Expansion)



When Expansion I/O Board is Used (With Expansion)



1-3-1 Peripheral Connecting Cable

Personal computer	Connecting cable model	Cable length	Connector at personal computer
IBM PC/AT or compatible	CS1W-CN226	2.0 m	D-Sub 9-pin
	CS1W-CN626	6.0 m	D-Sub 9-pin

1-3-2 I/O Connecting Cable

CS-series I/O Connecting Cable	CS1W-CN313	For connecting a CS1PC-EIC01 Expansion I/O Board or a CS-series Expansion Rack to a CS-series Expansion Rack.	0.3 m
	CS1W-CN713		0.7 m
	CS1W-CN223		2 m
	CS1W-CN323		3 m
	CS1W-CN523		5 m
	CS1W-CN133		10 m
	CS1W-CN133B2		12 m
CS-series → C200H I/O Connecting Cable	CS1W-CN311	For connecting a CS1PC-EIC01 Expansion I/O Board or a CS-series Expansion Rack to a C200H Expansion I/O Rack.	0.3 m
	CS1W-CN711		0.7 m
	CS1W-CN221		2 m
	CS1W-CN321		3 m
	CS1W-CN521		5 m
	CS1W-CN131		10 m
	CS1W-CN131B2		12 m
C200H I/O Connecting Cable	C200H-CN311	For connecting a C200H Expansion I/O Rack to another C200H Expansion I/O Rack.	0.3 m
	C200H-CN711		0.7 m
	C200H-CN221		2 m
	C200H-CN521		5 m
	C200H-CN131		10 m

1-3-3 Application Conditions

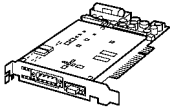
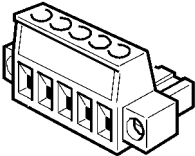
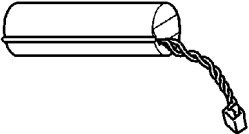
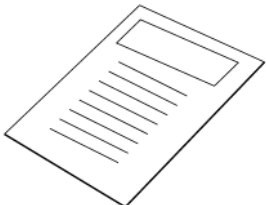
Use the CS1 Board in the following environment.

Item	Content
Personal computer	IBM PC/AT compatible (PCI slot)

1-4 Package Contents

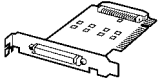
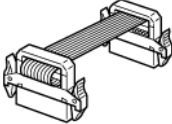
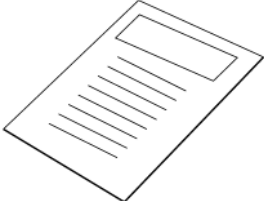
Confirm the contents of the package as soon as you open it to be sure everything is included and in proper condition.

SYSMAC CS1 Board

	SYSMAC CS1 Board	1
	DeviceNet Connector	1
	Memory Backup Battery Note Already connected to the SYSMAC CS1 Board when using a CS1PC-PCI01H-DRM.	1
	Safety Precautions	1

Note The operating system for the personal computer is not included with the SYS-MAC CS1 Board and must be provided by the user.

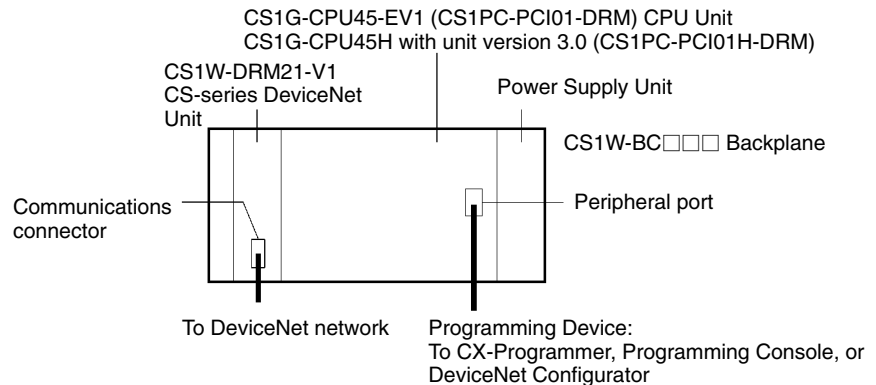
Expansion I/O Board

	CS1PC-EIC01 Expansion I/O Board	1
	Flat Cable	1
	Safety Precautions	1

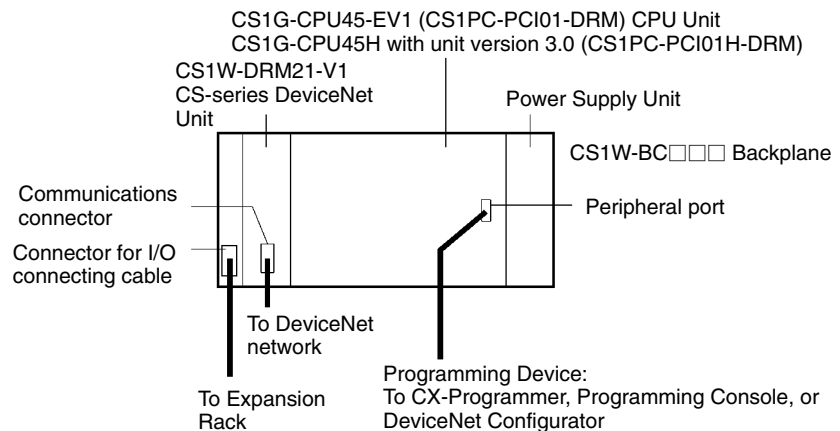
1-5 Programmable Controller Functions

The SYSMAC CS1 Board contains the same functions as the PLC shown in the following diagrams. The specific functions vary with the model.

Not Using an Expansion I/O Board (Without Expansion)



Using Expansion I/O Board (With Expansion)



Note The functions of the CS1 Board are the same as for the CS1G-CPU45-EV1 and CS1G-CPU45H CPU Unit with unit version 3.0. Explanations of ranges, functions, usable instructions, communications commands, and so on, are abbreviated in this manual. For details, refer to the applicable CS-series manuals.

For details on the points of difference between the CS1 Board and the PLC, refer to 1-5-2 Related Data Area Addresses and 1-10 Differences from a Standard CS-series CPU Unit.

Expansion Racks

A total of 7 CS-series Expansion Racks and C200H Expansion I/O Racks can be connected. Up to 3 C200H Expansion I/O Racks can be connected.

Expansion I/O Cables

Different cables are used for the following applications.

- Expansion I/O Board to CS-series Expansion Rack
 Use a CS1W-CN□□3 I/O Connecting Cable (sold separately) to connect the Expansion I/O Board to a CS-series Expansion Rack. Refer to the *CS-series Programmable Controllers Operation Manual (W339)* for details.
- C200H Expansion I/O Rack to C200H Expansion I/O Rack
 Use standard C200H-CN□□□ I/O Connecting Cables between C200H Expansion I/O Racks.

Peripheral Connecting Cables

A Peripheral Connecting Cable connects the SYSMAC CS1 Board to a Programming Device, e.g., a computer or Programming Console. Use only the following cable (sold separately). Refer to the *CS-series Programmable Controllers Operation Manual (W339)* for details.

CS1W-CN□□□

Mountable Units

The Power Supply Units, I/O Units, Special I/O Units, and CPU Bus Units that can be mounted to CS-series Expansion Racks can be used with the SYSMAC CS1 Board **except** for Inner Boards and Units that must be mounted to the CPU Rack. Refer to the *CS-series Programmable Controllers Operation Manual (W339)* for details.

The following Units cannot be used: Interrupt Input Units, Loop Control Units, and Serial Communications Boards.

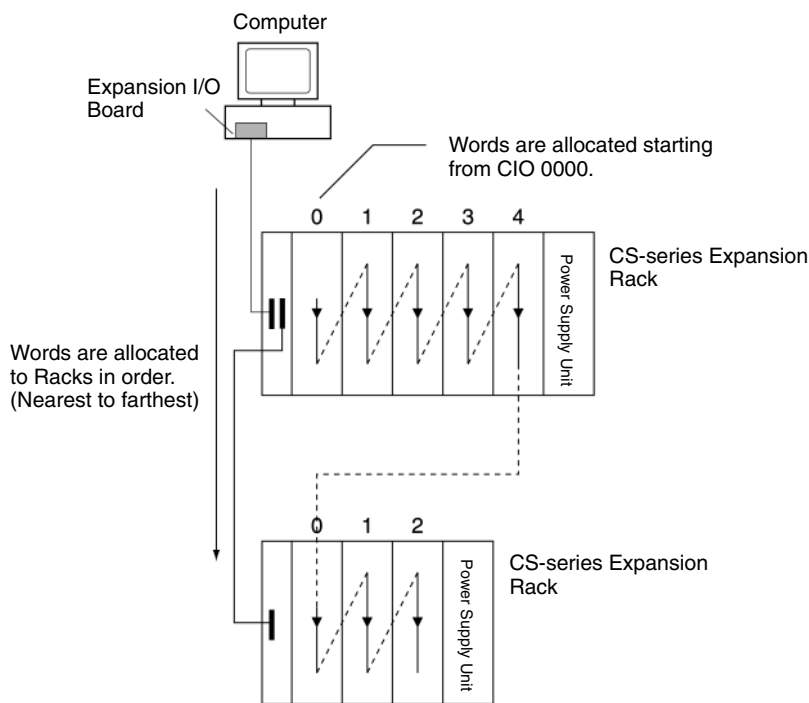
Programming Devices

Any CS-series Programming Device that connects to the peripheral port can be used with the SYSMAC CS1 Board. Use the same Connecting Cables that are used with CS-series PLCs. Refer to the *CS-series Programmable Controllers Operation Manual (W339)* for details.

1-5-1 I/O Allocation

Allocation of I/O words for the SYSMAC CS1 Board is the same as for the CS-series PLCs, i.e., Units can be mounted in any slot and words are allocated to the Units based on the Units mounted in the PLC.

Words are allocated to Units in the Expansion Racks from left to right, as shown in the following diagram. Words are not allocated to empty slots.



Words (starting with CIO 0000) are allocated to slots starting with the leftmost slot in the first Rack.

- Note**
1. There are special data areas allocated for Special I/O Units and CPU Bus Units. The allocation of words for these Units is the same as for the CS-series PLCs.
 2. Refer to the *CS-series Programmable Controllers Operation Manual (W339)* for more details on the word addresses allocated to I/O Units, Special I/O Units, and CPU Bus Units.

1-5-2 Related Data Area Addresses

Address		Name	Description
Word	Bit		
A355	00	Computer Initializing Flag	ON when the SYSMAC CS1 Board is turned ON or the computer was turned OFF and restarted. This Flag is turned OFF automatically when the computer's software completes initialization of the interface with the Board. Pin 6 of the PLC DIP Switch specifies whether the CS1 Board will wait until the computer completes initialization (when this Flag goes OFF) or start executing the ladder program immediately even though this Flag is still ON.
A356	00	Computer OFF/Resetting Flag	ON when the computer is OFF or is being reset. This Flag is turned OFF automatically when the computer's software starts to use the interface with the Board. OFF when the computer's software is using the interface with the Board. This Flag is OFF when the computer is not OFF or being reset. After turning this Flag OFF, the computer's software will initialize the interface with the Board. A35500 will be turned OFF when initialization is completed.
A401	12	Inner Board Stopped Error Flag (Fatal error)	ON when there was a Fatal Inner Board Error from the computer's software. The error code is defined in the computer's software and stored in A424 bits 00 to 03.
A402	08	Inner Board Error Flag (Non-fatal error)	ON when there was a Non-fatal Inner Board Error from the computer's software. The error code is defined in the computer's software and stored in A424 bits 04 to 15.
A424	00 to 03	Inner Board Fatal Error Information	These bits contain the error code from a Fatal Inner Board Error. The error code registered in the computer's software is written without change.
	04 to 15	Inner Board Non-fatal Error Information	These bits contain the error code from a Non-fatal Inner Board Error. The error code registered in the computer's software is written without change.
A608	00	Inner Board Restart Bit	Turn the bit from OFF to ON to send a restart interrupt signal to the computer's software. The processing performed when a restart interrupt occurs is defined in the computer's software.
A609 to A613, A636 to A638	00 to 15	Inner Board User Interface Area	These areas can be used by the computer's software. The function of the data depends on the computer's software specifications.
CIO 1900 to CIO 1999	00 to 15	Inner Board Area	This area can be used by the computer's software. The function of the data depends on the computer's software specifications.
DM 32000 to DM 32099	---	Inner Board DM Area	This initial settings area can be used by the computer's software. The function of the data depends on the computer's software specifications.

- Note**
1. If the SYSMAC CS1 Board is being used independently and the computer's software is not being used, the Computer Initializing Flag and Computer OFF/Resetting Flag will always be ON.
 2. If the Board is set to continue operation when the computer is turned OFF or reset, these computer events will not be recorded in the Board's error log. If it is necessary to record these events, monitor the status of the Computer OFF/Resetting Flag in the ladder program and use the FAL Instruction to generate a non-fatal error that will be recorded in the error log.
 3. When you are accessing the computer's software from the ladder program with a FINS command or other method, monitor the status of the Computer Initializing Flag to verify that the interface between the computer and Board has been initialized. (If pin 6 of the PLC DIP Switch (the Initial Operation Conditions Switch) is OFF, the ladder program will not be executed until the Computer Initializing Flag goes OFF.)

Error Log

The error codes registered in the computer's software can be recorded in the SYSMAC CS1 Board's Error Log Area.

Error	CS1 error code	Error code from computer	Cause of error
Inner Board Stopped Error (Fatal error)	82F0	A424 bits 00 to 03	Occurs when a Fatal Inner Board Error was registered in the computer's software. The error code from the computer data depends on the computer's software specifications.
Inner Board Error (Non-fatal error)	02F0	A424 bits 04 to 15	Occurs when a Non-fatal Inner Board Error was registered in the computer's software. The error code from the computer data depends on the computer's software specifications.

1-6 DeviceNet Master Function

The SYSMAC CS1 Board is equipped with the same remote I/O functions as a CS1W-DRM21-V1 DeviceNet Master Unit. The remote I/O functions can be used to transfer data between the Board and Slaves without special programming in the Board.

In addition to the Master function, the Board is equipped with an explicit messaging/FINS messaging function (message communications) and a Slave function (Remote I/O Slave capability).

- Note**
1. When using a DeviceNet Configurator to make DeviceNet settings for the Board, select the "CS1W-DRM21" EDS file.
 2. This manual does not provide detailed information on DeviceNet functions. Refer to the *CS/CJ Series DeviceNet Unit Operation Manual (W380)* for details.

1-6-1 Overview of the Board's DeviceNet Functions

Maximum I/O Capacity and Maximum Number of Slaves

The following table shows the maximum number of I/O points and Slaves that can be connected to the SYSMAC CS1 Board.

Item		DeviceNet Configurator not being used	DeviceNet Configurator being used
Max. number of I/O points	Master function	2,048 points (64 input words and 64 output words) or 16,000 points (500 input words and 500 output words)	32,000 points (500 words × 4 blocks)
	Slave function	32 points (1 input word and 1 output word) or 3,200 points (100 input words and 100 output words)	4,800 points (100 input words × 2 blocks + 100 output words × 1 block)
Max. number of Slaves		64 Slaves	

Baud Rate and Communications Distance

The communications distance in a DeviceNet Network is restricted by the baud rate, as shown in the following table.

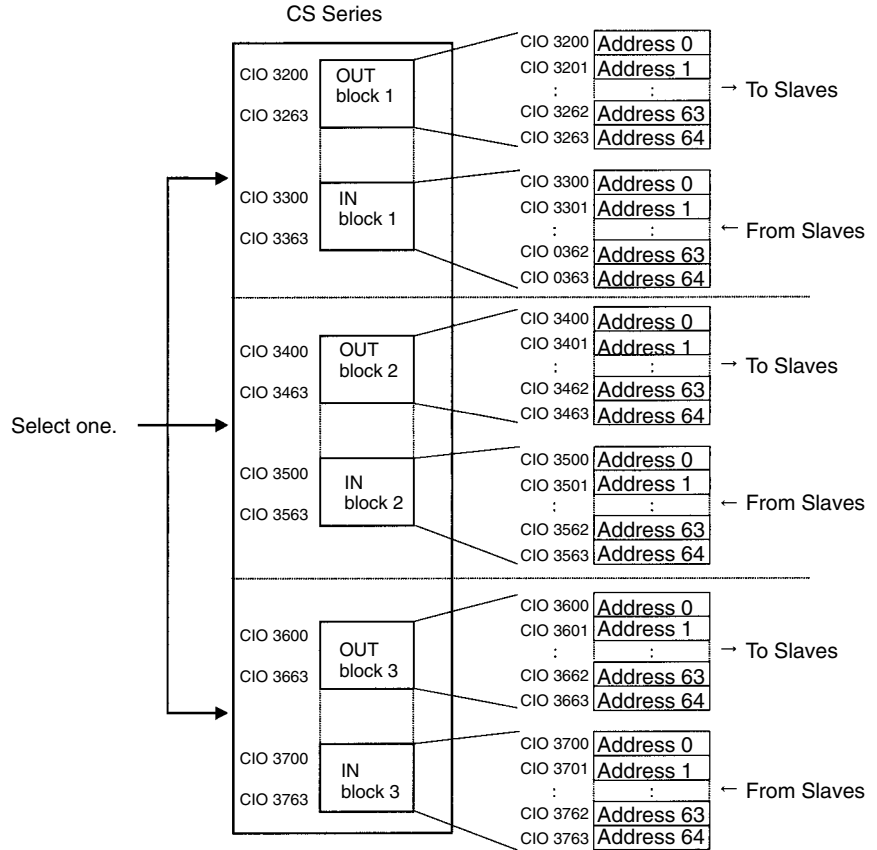
Baud rate	Maximum network length		Drop line length	Total drop line length
	Thick Cable	Thin Cable		
500 kbps	100 m max.	100 m max.	6 m max.	39 m max.
250 kbps	250 m max.		6 m max.	78 m max.
125 kbps	500 m max.		6 m max.	156 m max.

1-6-2 Remote I/O Communications

All slaves are allocated words in the I/O memory of the CPU Unit Module to which the Master Unit is mounted. Words are allocated by fixed allocation or user-set allocation.

Fixed Allocations

Any one of the three areas below can be specified as the words allocated in the CIO Area for fixed allocations. The output (OUT) block and the input (IN) block are allocated strictly in order of node addresses in one of the areas shown below.



Words are allocated to Slaves starting from address 0 in the output (OUT) and input (IN) blocks. Each address is allocated at least one byte (rightmost).

- When a Slave requires more than 16 input points or 16 output points, more than one word will be allocated to the Slave (according to it's node address).
- When a Slave requires 16 or fewer input points or output points, it simply uses the rightmost bits in the word allocated to it.

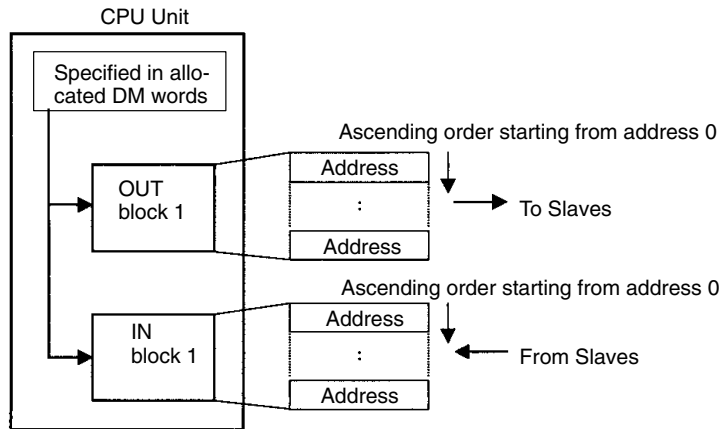
User-set Allocations

User-set allocations can be made using either a Master User Allocations Table (allocated DM Area words) or the Configurator.

Using the Master User Allocations Table

In the Master User Allocations Table, specify the data areas and first word addresses of the output block (OUT block 1) and the input block (IN block 1) and specify the data area and first word address the Allocation Size Setup Table. In the Allocation Size Setup Table, set the allocation sizes for the slave input and output blocks. Each slave can be allocated two blocks, OUT block 1 and IN block

1, according to the settings in these tables. The OUT and IN blocks will be allocated in order of slave node addresses. Each block can be up to 500 words long.

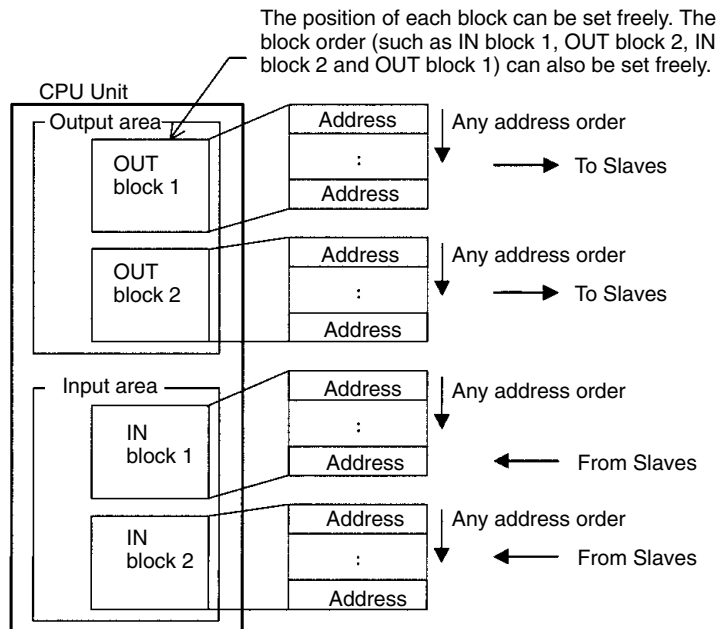


Each address is allocated at least one byte (rightmost).

- When a Slave requires more than 16 input points or 16 output points, more than one word will be allocated to the Slave (according to its node address).
- When a Slave requires 16 or fewer input points or output points, it simply uses the rightmost bits in the word allocated to it.

Using the Configurator

When using the Configurator, each slave can be allocated up to four blocks: Output (OUT) blocks 1 and 2 and input (IN) blocks 1 and 2. Each block can be up to 500 words long.



1-6-3 Message Communications

The SYSMAC CS1 Board also supports message communications. Message communications enable messages to be sent between nodes on a DeviceNet network when required by system conditions. The messages can be sent between PLCs, between an OMRON PLC and a master made by another company, or between slaves. They can be used to send/receive data; read time data, error histories, and other data; or control operation, e.g., by force-setting/resetting bits.

Refer to the *CS/CJ Series DeviceNet Unit Operation Manual (W380)* for more details on message communications.

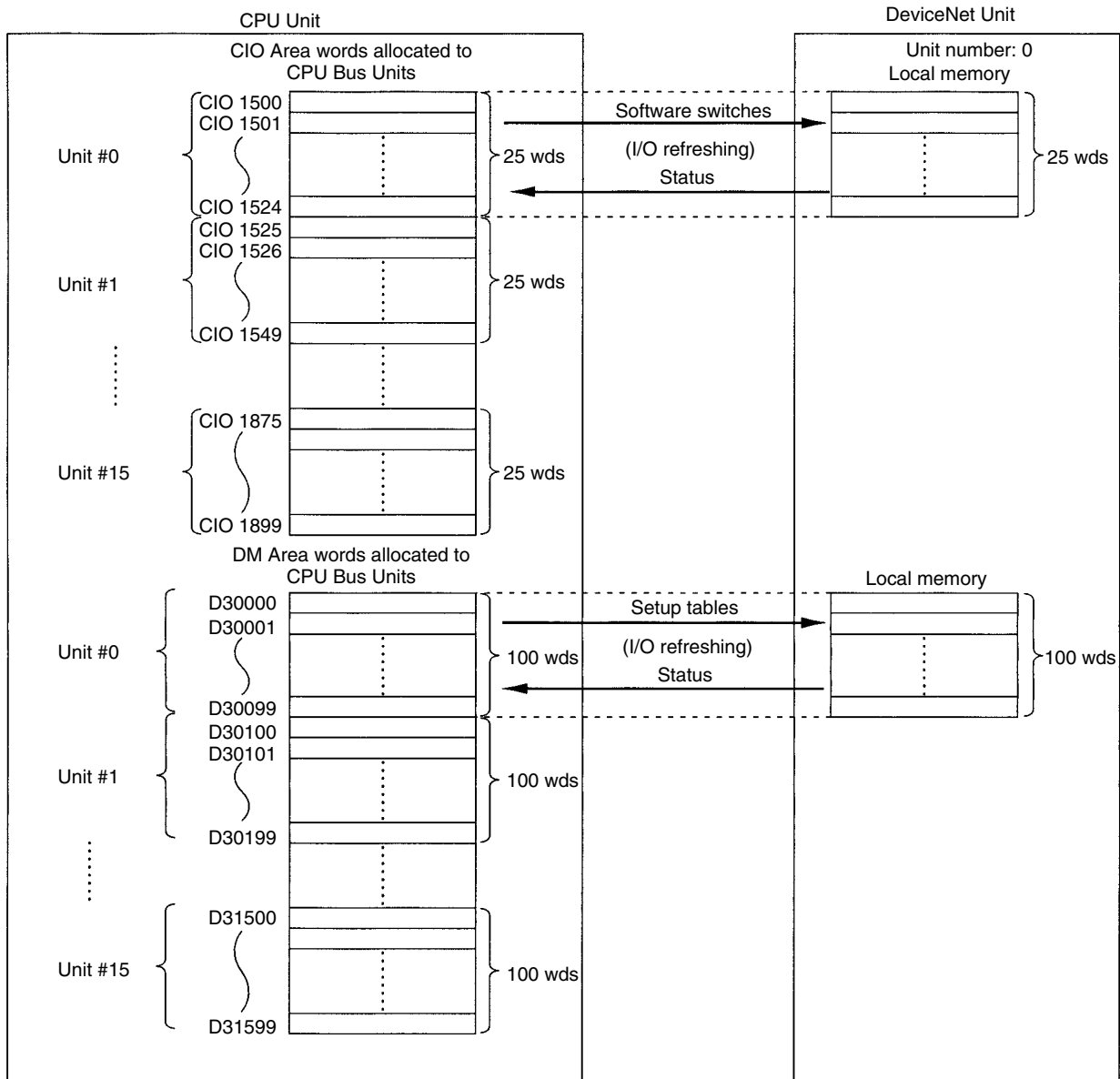
Messages can be sent from the SYSMAC CS1 Board by sending FINS commands or explicit DeviceNet messages using ladder diagram instructions (CMND).

1-6-4 Overview of Word Allocations

The words shown in the following diagram are allocated according to the unit number set on the Board's DeviceNet Module. Each Unit is allocated 25 words in the CIO Area and 100 words in the DM Area.

First CIO word allocated to the Unit: $n = \text{CIO } 1500 + (25 \times \text{unit number})$

First DM word allocated to the Unit: $m = \text{D30000} + (100 \times \text{unit number})$



Note This manual does not provide details on the functions of the allocated words. Refer to the *CS/CJ Series DeviceNet Unit Operation Manual (W380)* for details.

Allocated CIO Area Words

The following table shows which data is stored in the CIO words allocated to the DeviceNet Module. The CIO addresses are expressed as the offset from the first CIO word (n) allocated to the Unit.

The first word can be calculated as follows from the unit number setting:
 First word n = CIO 1500 + (25 × unit number)

Word	Bit 15	Bit 00	Direction
n	Software Switches 1		I/O CPU Unit ↔ DeviceNet Unit
n+1	Software Switches 2		
n+2	Master COS Send Switches (4 words)		I/O CPU Unit ↔ DeviceNet Unit
n+3			
n+4			
n+5			
n+6	Disconnect/Connect Switches (4 words)		Output CPU Unit → DeviceNet Unit
n+7			
n+8			
n+9			
n+10	Unit Status 1		Input CPU Unit ← DeviceNet Unit
n+11	Unit Status 2		
n+12	Master Status 1		
n+13	Master Status 2		
n+14	Slave Status 1		
n+15	Slave Status 2		
n+16	Registered Slave Table (4 words)		
n+17			
n+18			
n+19			
n+20	Normal Slave Table (4 words)		
n+21			
n+22			
n+23			
n+24	C200H Master Replacement Status (1)		

Allocated DM Area Words

The following table shows which data is stored in the DM words allocated to the DeviceNet Module. The DM addresses are expressed as the offset from the first DM word (m) allocated to the Unit.

The first word can be calculated as follows from the unit number setting:

$$\text{First word } m = D30000 + (25 \times \text{unit number})$$

Word	Bit 15	Bit 00	Direction
m	Communications Cycle Time Setup Table		Output CPU Unit → DeviceNet Unit
m+1 to m+7	Master User Allocations Setup Table (7 words)		I/O CPU Unit ↔ DeviceNet Unit
m+8 to m+14	Slave User Allocations Setup Table (7 words)		
m+15 to m+18	Communications Cycle Time Reference Table (4 words)		Input CPU Unit ← DeviceNet Unit
m+19 to m+30	Master User-set Allocations Reference Table (12 words)		
m+31 to m+42	Slave User-set Allocations Reference Table (12 words)		
m+43 to m+74	Slave Detailed Status Table (32 words)		
m+75 to m+99	Reserved by system		

1-7 Computer Board Functions

The SYSMAC CS1 Board normally executes a user program downloaded from a Programming Device and operates independently from the personal computer on which it is installed. The personal computer can function as a host computer for the SYSMAC CS1 Board to read/write memory areas in the, read the Board's status, or control the Board's operation.

The ITBC-SC1W-ECD SYSMAC CS1 Board Driver is compatible with Windows NT, 2000, and XP and is sold separately. Contact your OMRON dealer for information on using the SYSMAC CS1 Board with other operating systems.

- Note**
1. The Fins Gateway version 2003 included with the SYSMAC CS1 Board's Driver (ITBC-SC1W-CD) is compatible with Windows 2000 and XP operating systems.
 2. Only the Fins Gateway version 2003 supports the function for increasing the data link capacity.
 3. Use the Fins Gateway version 3 for CS1PC-PCI01-DRM CS1 Boards, and Fins Gateway version 2003 for CS1PC-PCI01H-DRM CS1 Boards.






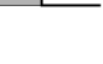


1-8 Power OFF Operation

The SYSMAC CS1 Board performs the same power OFF processing as other CS PLCs when its power is interrupted. The Board can be set to perform the same processing when the computer is turned OFF or reset. This function can be used to retain the status of backed-up data areas such as the DM and HR Areas even if the power is interrupted unexpectedly.

- Note** The Board's jumper pin setting determines whether or not the Board will be reset when the computer is turned OFF or reset. Refer to *1-9 Operation during Computer Reset* for details.

Power OFF Processing

The following processing is performed if the power supply from the computer or the Sub-power supply goes OFF while the Board is operating. (The down arrow in the diagrams indicates when power is interrupted.)

Power supply status	Board processing
<p>Computer power </p> <p>Sub-power supply (Not supplied) </p>	<p>Power OFF processing (same as the CS-series CPU Unit)</p> <p>The Power OFF Detection Delay Time must be set to 0 ms.</p> <p>The maximum allowable time for the CS1 Board's Power OFF Interrupt Task is 2 ms when using a CS1PC-PCI01-DRM and 1 ms when using a CS1PC-PCI01H-DRM.</p>
<p>Computer power </p> <p>Sub-power supply (Being supplied) </p>	<p>Operation continues.</p> <p>Inner Board servicing stops. (Communications with the computer are stopped.)</p>
<p>Computer power </p> <p>Sub-power supply </p>	<p>Power OFF processing (same as the CS-series CPU Unit)</p> <p>The Power OFF Detection Delay Time must be set to 0 ms.</p> <p>The maximum allowable time for the CS1 Board's Power OFF Interrupt Task is 2 ms when using a CS1PC-PCI01-DRM and 1 ms when using a CS1PC-PCI01H-DRM.</p>
<p>Computer power </p> <p>Sub-power supply </p>	<p>Operation continues.</p>

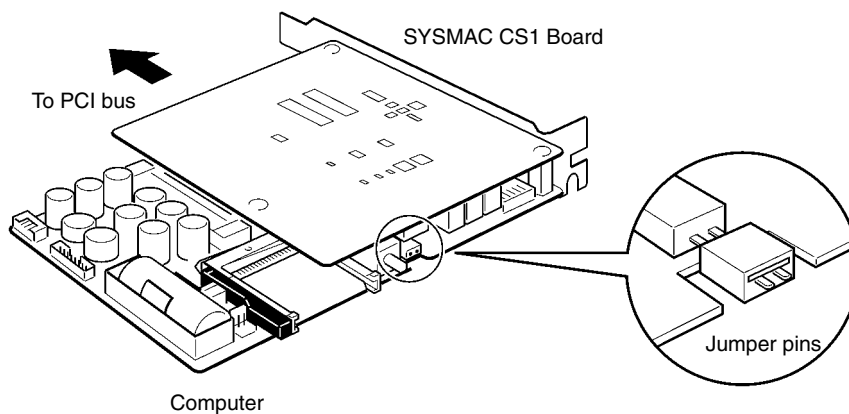
Related Settings

Set the Power OFF Detection Delay Time to 0 ms (00 Hex) in the PC Setup. (This is the default setting.)

Refer to 1-5-2 Related Data Area Addresses for details on other flags and interface areas.

1-9 Operation during Computer Reset

The SYSMAC CS1 Board is equipped with a jumper pin that determines whether or not the Board will be reset when the computer is turned OFF or reset. The jumper can be removed if you want to reset the computer without stopping operation of the Board.



The following table describes the Board's operation when the jumper is in place or removed. The jumper pins are "shorted" when the jumper is in place and "open" when the jumper is removed.

Jumper pins	Operation when computer is reset	Board processing when computer is reset
Shorted (factory setting)	Board is reset.	<ul style="list-style-type: none"> • Power OFF processing (same as the CS-series CPU Unit) • Board restarts.
Open	Board is not reset.	<ul style="list-style-type: none"> • Board continues operating. • Inner Board servicing stops. (Communications with the computer are stopped.)

- Note**
1. Always remove the jumper (jumper pins open) when supplying the Board with an independent 5-V power supply through its external power supply input terminals.
 2. Refer to 1-5-2 Related Data Area Addresses for details on other flags and interface areas.

1-10 Differences from a Standard CS-series CPU Unit

The SYSMAC CS1 Board has the essentially the same functions as a CS1G-CPU45-EV1 and CS1G-CPU45H CPU Unit with unit version 3.0, there are a few differences because the CPU Unit is a Module on a PCI board rather than a Unit in a Rack. This section describes those differences, which must be considered when programming or operating the SYSMAC CS1 Board.

CPU Rack

The Board corresponds to the CPU Rack, making it impossible to mount Units and other hardware, such as Inner Boards, to the CPU Rack.

Incompatible Units and Boards

The following Units and Boards cannot be used with the SYSMAC CS1 Board:

- Units which must be mounted in the CPU Rack, such as Loop Control Units and Interrupt Input Units
- Inner Boards such as Serial Communications Boards

RS-232C Port

There is no RS-232C port on the SYSMAC CS1 Board.

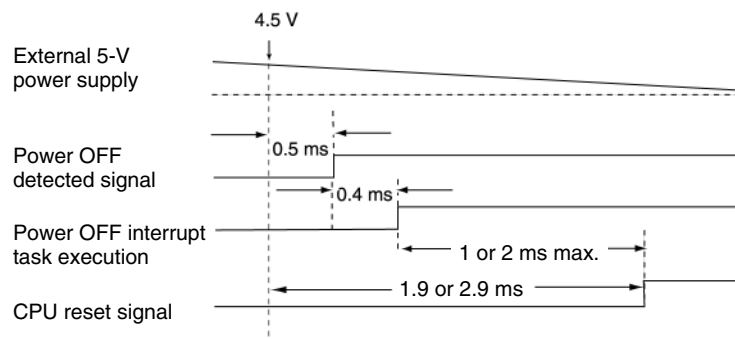
Memory Card Limitations

A Memory Card can be used just like one in a CS-series CPU Unit, but the Card cannot be accessed from outside of the computer. It will be necessary to open the computer case to use a Memory Card other than the one that is in the Board when the Board is installed in the computer. For example, the Card that is in the Board will be the source for the Board's program and parameter area data if you are using the "Automatic Transfer at Startup" function.

No Power OFF Detection Delay

Unlike the Rack-style CS-series PLCs, the Board's Power OFF Detection Delay Time must be set to 0 ms (00 Hex) in the PC Setup. A PC Setup error will occur if this setting is not 00 Hex.

The following timing chart shows the timing of the power OFF processing.



CS1PC-PCI01-DRM

The CPU will be reset 2.9 ms after the voltage drops below 4.5 V. The 2.9 ms interval allows 2 ms for execution of an interrupt task. The power OFF interrupt task will be cut off at 2 ms if it takes longer than 2 ms to execute. If the task requires less than 2 ms, no instructions will be executed in the extra time.

CS1PC-PCI01H-DRM

The CPU will be reset to 1.9 ms after the voltage drops below 4.5 V. The 1.9 ms interval allows 1 ms for execution of an interrupt task. The power OFF interrupt task will be cut off at 1 ms if it takes longer than 1 ms to execute. If the task requires less than 1 ms, no instructions will be executed in the extra time.

Initial Operation Conditions Setting

When the operating mode at startup is set to RUN or MONITOR mode, the SYSMAC CS1 Board can be set to wait until the computer has initialized the PCI interface before starting to execute the ladder program. This function is controlled by pin 6 of the PLC DIP Switch (the Initial Operation Conditions Switch).

If pin 6 is OFF, the Board will not execute the ladder program (CPU standby) until the computer has completed initialization even if the Board's operating mode at startup is set to RUN or MONITOR mode.

If pin 6 is ON and the Board's operating mode at startup is set to RUN or MONITOR mode, the Board will begin executing the ladder program without waiting for the computer to complete initialization. The Board will execute the ladder program before the PCI interface is initialized, but it cannot exchange data with the computer until the interface is initialized.

Pin 6 setting	Operation
OFF (factory setting)	The Board will wait for PCI interface initialization to be completed before executing the ladder program. (CPU standby status)
ON	The Board will begin executing the ladder program without waiting for PCI interface initialization to be completed.

- Note**
1. Pin 6 is used as the Initial Operation Conditions Switch in the SYSMAC CS1 Board, so the Board does not have a user-defined pin like pin 6 of the CS-series CPU Units. The status of pin 6 can still be monitored with A39512 (Status of DIP Switch Pin 6 Flag) as it is in CS-series CPU Units.
 2. If the CS-series CPU Unit does not recognize even one Unit or Board, it will not begin executing the ladder program. (A CPU standby error (CPU WAIT'G) will occur.)

1-11 Specifications

1-11-1 General Specifications

Item	Specifications
Power supply voltage	4.875 to 5.25 VDC
Power consumption	CS1PC-PCI01-DRM SYSMAC CS1 Board: 1.7 A max. CS1PC-PCI01H-DRM SYSMAC CS1 Board: 1.3 A max. CS1PC-EIC01 Expansion I/O Board: 0.1 A max.
Vibration resistance	Conforms to JIS C0911: 10 to 57 Hz; 0.075 mm amplitude 57 to 150 Hz; 9.8 m/s ² acceleration in X, Y, and Z directions, for 80 minutes each
Shock resistance	Conforms to JIS C0912: 147 m/s ² in X, Y, and Z directions, 3 times each
Ambient temperature	Operating: 0° to 55°C Storage: -20° to 75°C (excluding battery)
Humidity	10% to 90% (without condensation)
Atmosphere	Must be free of corrosive gases.
Weight	CS1PC-PCI01-DRM, CS1PC-PCI01H-DRM SYSMAC CS1 Board: 300 g max. CS1PC-EIC01 Expansion I/O Board: 100 g max.
Dimensions	CS1PC-PCI01-DRM, CS1PC-PCI01H-DRM SYSMAC CS1 Board: 106.7 × 176.6 × 18.7 mm (W × H × D) (The depth measurement is the measurement at the battery.) Expansion I/O Board Expansion I/O Board: 106.7 × 105.5 × 11 mm (W × H × D) (The depth measurement is the measurement of the Board components.)

1-11-2 PLC CPU Specifications

Common Specifications

Item	Specification	Reference
Control method	Stored program	---
I/O control method	Cyclic scan and immediate processing are both possible.	---
Programming	Ladder diagram	---
CPU processing mode	CS1PC-PCI01-DRM: Normal Mode, Parallel Processing Mode with Asynchronous Memory Access, Parallel Processing Mode with Synchronous Memory Access, or Peripheral Servicing Priority Mode CS1PC-PCI01H-DRM: Normal Mode or Peripheral Servicing Priority Mode	---
Instruction length	1 to 7 steps per instruction	---
Ladder instructions	Approx. 400 (3-digit function codes)	---
Execution time	CS1PC-PCI01-DRM: 0.04 μs min. CS1PC-PCI01H-DRM: 0.08 μs min.	---
Overhead processing time	CS1PC-PCI01-DRM: Normal mode: 0.3 ms min. Parallel processing: 0.2 ms min. CS1PC-PCI01H-DRM: 0.5 ms min.	---
Number of Expansion Racks	7 max. (C200H Expansion I/O Racks: 3 max.)	---
Number of tasks	288 (cyclic tasks: 32, interrupt tasks: 256) When using CS1PC-PCI01H-DRM, interrupt tasks can be executed every cycle (called additional tasks) in the same way as cyclic tasks. As a result, the maximum number of cyclic tasks is actually 288. Note Cyclic tasks are executed each cycle and are controlled with TKON(820) and TKOF(821) instructions. Note The following 4 types of interrupt tasks are supported. Power OFF interrupt tasks: 1 max. Scheduled interrupt tasks: 2 max. I/O interrupt tasks: 32 max. External interrupt tasks: 256 max.	---

Item	Specification	Reference	
Interrupt types	<p>Scheduled Interrupts: Interrupts generated at a time scheduled by the built-in timer of the CS1 Board's CPU Unit Module.</p> <p>I/O Interrupts: Not supported</p> <p>Power OFF Interrupts: Interrupts executed when the CS1 Board's CPU Unit Module power is turned OFF.</p> <p>External I/O Interrupts: Interrupts from the Special I/O Units or CS-series CPU Bus Units.</p>	---	
Calling subroutines from more than one task	<p>CS1PC-PCI01H-DRM: Supported. CS1PC-PCI01-DRM: Not supported</p>	---	
Function blocks (CS1PC-PCI01H-DRM only)	<p>Languages in function block definitions: ladder programming, structured text</p>	---	
CIO (Core I/O) Area	I/O Area	<p>5,120: CIO 000000 to CIO 031915 (320 words from CIO 0000 to CIO 0319)</p> <p>The setting of the first word can be changed from the default (CIO 0000) so that CIO 0000 to CIO 0999 can be used.</p> <p>I/O bits are allocated to Basic I/O Units, such as CS-series Basic I/O Units, C200H Basic I/O Units, and C200H Group-2 High-density I/O Units.</p>	The CIO Area can be used as work bits if the bits are not used as shown here.
	DeviceNet Area	Refer to <i>1-6 DeviceNet Master Function</i> for details.	
	Link Area	<p>3,200 (200 words): CIO 10000 to CIO 119915 (words CIO 1000 to CIO 1199)</p> <p>Link bits are used for data links and are allocated to Units in Controller Link Systems and PLC Link Systems.</p>	
	CPU Bus Unit Area	<p>6,400 (400 words): CIO 150000 to CIO 189915 (words CIO 1500 to CIO 1899)</p> <p>CS-series CPU Bus Unit bits store the operating status of CS-series CPU Bus Units. (25 words per Unit, 16 Units max.)</p>	
	Special I/O Unit Area	<p>15,360 (960 words): CIO 200000 to CIO 295915 (words CIO 2000 to CIO 2959)</p> <p>Special I/O Unit bits are allocated to CS-series Special I/O Units and C200H Special I/O Units. (See note.) (10 words per Unit, 96 Units max.)</p> <p>Note Special I/O Units are I/O Units that belong to a special group called "Special I/O Units." Examples: C200H-ID215/OD215/MD215</p>	
	Inner Board Area	<p>1,600 (100 words): CIO 190000 to CIO 199915 (words CIO 1900 to CIO 1999)</p> <p>Inner Board bits are allocated to Inner Boards. (100 I/O words max.) The CS1 Board can be accessed using software on the personal computer.</p>	
	SYSMAC BUS Area	<p>1,280 (80 words): CIO 300000 to CIO 307915 (words CIO 3000 to CIO 3079)</p> <p>SYSMAC BUS bits are allocated to Slave Racks connected to SYSMAC BUS Remote I/O Master Units. (10 words per Rack, 8 Racks max.)</p>	
	I/O Terminal Area	<p>512 (32 words): CIO 310000 to CIO 313115 (words CIO 3100 to CIO 3131)</p> <p>I/O Terminal bits are allocated to I/O Terminal Units (but not to Slave Racks) connected to SYSMAC BUS Remote I/O Master Units. (1 word per Terminal, 32 Terminals max.)</p>	

Item	Specification	Reference
Internal I/O Area	4,800 (300 words): CIO 120000 to CIO 149915 (words CIO 1200 to CIO 1499) 37,504 (2,344 words): CIO 380000 to CIO 614315 (words CIO 3800 to CIO 6143) These bits in the CIO Area can be used as work bits in programming to control program execution. They cannot be used for external I/O.	---
Work Area	8,192 bits (512 words): W00000 to W51115 (W000 to W511) Controls the programs only. (I/O from external I/O terminals is not possible.) Note When using work bits in programming, use the bits in the Work Area first before using bits from other areas.	---
Holding Area	8,192 bits (512 words): H00000 to H51115 (H000 to H511) Holding bits are used to control the execution of the program, and maintain their ON/OFF status when the PLC is turned OFF or the operating mode is changed. Note The Function Block Holding Area words are allocated from H512 to H1535. These words can be used only for the function block instance area (internally allocated variable area).	---
Auxiliary Area	Read only: 7,168 bits (448 words): A00000 to A44715 (words A000 to A447) Read/write: 8,192 bits (512 words): A44800 to A95915 (words A448 to A959) Auxiliary bits are allocated specific functions.	---
Temporary Area	16 bits (TR0 to TR15) Temporary bits are used to temporarily store the ON/OFF execution conditions at program branches.	---
Timer Area	4,096: T0000 to T4095 (used for timers only)	---
Counter Area	4,096: C0000 to C4095 (used for counters only)	---
DM Area	32K words: D00000 to D32767 Used as a general-purpose data area for reading and writing data in word units (16 bits). Words in the DM Area maintain their status when the PLC is turned OFF or the operating mode is changed. Internal Special I/O Unit DM Area: D20000 to D29599 (100 words × 96 Units) Used to set parameters for Special I/O Units. CPU Bus Unit DM Area: D30000 to D31599 (100 words × 16 Units) Used to set parameters for CPU Bus Units. Inner Board DM Area: D32000 to D32099 The CS1 Board can be accessed using software on the personal computer. The words in the general-purpose data area, which is used for reading and writing data in word units (16 bits), maintain their ON/OFF status when the power is recovered after an interruption or the operating mode is changed.	---

Item	Specification	Reference
EM Area	<p>32K words per bank, 13 banks max.: E0_00000 to EC_32767 max. (Not available on some CPU Units.)</p> <p>Used as a general-purpose data area for reading and writing data in word units (16 bits). Words in the EM Area maintain their status when the PLC is turned OFF or the operating mode is changed.</p> <p>The EM Area is divided into banks, and the addresses can be set by either of the following methods.</p> <p>Changing the current bank using the EMBC(281) instruction and setting addresses for the current bank.</p> <p>Setting bank numbers and addresses directly.</p> <p>EM data can be stored in files by specifying the number of the first bank.</p>	---
Data Registers	<p>DR0 to DR15</p> <p>Store offset values for indirect addressing. One register is 16 bits (1 word).</p> <p>CS1 CPU Units: Data registers used independently in each task.</p> <p>CS1-H CPU Units: Setting to use data registers either independently in each task or to share them between tasks.</p>	---
Index Registers	<p>IR0 to IR15</p> <p>Store PLC memory addresses for indirect addressing. One register is 32 bits (2 words).</p> <p>CS1 CPU Units: Index registers used independently in each task.</p> <p>CS1-H CPU Units: Setting to use index registers either independently in each task or to share them between tasks.</p>	---
Task Flag Area	<p>32 (TK0000 to TK0031)</p> <p>Task Flags are read-only flags that are ON when the corresponding cyclic task is executable and OFF when the corresponding task is not executable or in standby status.</p>	---
Trace Memory	<p>4,000 words (trace data: 31 bits, 6 words)</p>	---
File Memory	<p>Memory Cards: Compact flash memory cards can be used (MS-DOS format).</p> <p>EM file memory: Part of the EM Area can be converted to file memory (MS-DOS format).</p>	---

Function Specifications

Item	Specification
Constant cycle time	<p>1 to 32,000 ms (Unit: 1 ms)</p> <p>When a parallel processing mode is used for a CS1PC-PCI01H-DRM CS1 Board, the cycle time for executing instructions is constant.</p>
Cycle time monitoring	<p>Possible (Unit stops operating if the cycle is too long): 1 to 40,000 ms (Unit: 10 ms)</p> <p>When a parallel processing mode is used for a CS1PC-PCI01H-DRM CS1 Board, the instruction execution cycle is monitored. The CS1 Board's CPU Unit Module operation will stop if the peripheral servicing cycle time exceeds 2 s (fixed).</p>
I/O refreshing	<p>Cyclic refreshing, immediate refreshing, refreshing by IORF(097).</p> <p>IORF(097) refreshes I/O bits allocated to Basic I/O Units and Special I/O Units.</p> <p>With the CS1PC-PCI01H-DRM CS1 Boards, the CPU BUS UNIT I/O REFRESH (DLNK(226)) instruction can be used to refresh bits allocated to CPU Bus Units in the CIO and DM Areas.</p>
Timing of special refreshing for CPU Bus Units	<p>Data links for Controller Link Units and SYSMAC LINK Units, remote I/O for DeviceNet Units, and other special refreshing for CPU Bus Units is performed at the following times:</p> <p>CS1PC-PCI01-DRM CS1 Boards: I/O refresh period</p> <p>CS1PC-PCI01H-DRM CS1 Boards: I/O refresh period and when the CPU BUS UNIT I/O REFRESH (DLNK(226)) instruction is executed</p>
I/O memory holding when changing operating modes	<p>Depends on the ON/OFF status of the IOM Hold Bit in the Auxiliary Area.</p>

Item	Specification	
Load OFF	All outputs on Output Units can be turned OFF when the CPU Unit is operating in RUN, MONITOR, or PROGRAM mode.	
Input response time setting	Time constants can be set for inputs from Basic I/O Units. The time constant can be increased to reduce the influence of noise and chattering or it can be decreased to detect shorter pulses on the inputs.	
Startup mode setting	Supported The startup mode will be as follows if the PLC Setup is set to use the Programming Console mode (default) and a Programming Console is not connected: CS1PC-PCI01-DRM CS1 Boards: PROGRAM mode CS1PC-PCI01H-DRM CS1 Boards: RUN mode	
Flash memory (CS1PC-PCI01H-DRM CS1 Boards only)	<ul style="list-style-type: none"> • The user program and parameter area data (e.g., PLC Setup) are always backed up automatically in flash memory. • CS1PC-PCI01H-DRM CS1 Boards only: When downloading projects from CX-Programmer Ver. 5.0 or higher, symbol table files (including CX-Programmer symbol names, I/O comments), comment files (CX-Programmer rung comments, other comments), and program index files (CX-Programmer section names, section comments, or program comments) are stored in comment memory within the flash memory. 	
Memory Card functions	Automatically reading programs (autoboot) from the Memory Card when the power is turned ON.	Supported
	Program replacement during PLC operation	Supported
	Format in which data is stored in Memory Card	User program: Program file format PLC Setup and other parameters: Data file format I/O memory: Data file format (binary format), text format, or CSV format
	Functions for which Memory Card read/write is supported	User program instructions, Programming Devices (including Programming Consoles), Host Link computers, AR Area control bits, easy backup operation
Filing	Memory Card data and the EM (Extended Data Memory) Area can be handled as files.	
Debugging	Control set/reset, differential monitoring, data tracing (scheduled, each cycle, or when instruction is executed), storing location generating error when a program error occurs	
Online editing	User programs can be overwritten in program-block units when the CPU Unit is in MONITOR or PROGRAM mode. This function is not available for block programming areas. With the CX-Programmer, more than one program block can be edited at the same time.	
Program protection	Overwrite protection: Set using DIP switch. Copy protection: Password set using Programming Device.	
Error check	User-defined errors (i.e., user can define fatal errors and non-fatal errors) The FPD(269) instruction can be used to check the execution time and logic of each programming block. FAL and FALS instructions can be used with the CS1PC-PCI01H-DRM CS1 Boards to simulate errors.	
Error log	Up to 20 errors are stored in the error log. Information includes the error code, error details, and the time the error occurred. CS1PC-PCI01H-DRM CS1 Boards can be set so that user-defined FAL errors are not stored in the error log.	
Serial communications	Built-in peripheral port: Programming Device (including Programming Console) connections, Host Links, NT Links	

Item	Specification
Clock	Provided on all models. Accuracy: ± 30 s/mo. at 25°C (accuracy varies with the temperature) Note Used to store the time when power is turned ON and when errors occur.
Power OFF detection delay time	Cannot be set. (always 0 ms.)
Memory protection	Held Areas: Holding bits, contents of Data Memory and Extended Data Memory, and status of the counter Completion Flags and present values. Note If the IOM Hold Bit in the Auxiliary Area is turned ON, and the PLC Setup is set to maintain the IOM Hold Bit status when power to the PLC is turned ON, the contents of the CIO Area, the Work Area, part of the Auxiliary Area, timer Completion Flag and PVs, Index Registers, and the Data Registers will be saved for up to 20 days.
Sending commands to a Host Link computer	FINS commands can be sent to a computer connected via the Host Link System by executing Network Communications Instructions from the PLC.
Remote programming and monitoring	Host Link communications can be used for remote programming and remote monitoring through a Controller Link System or Ethernet network.
Three-level communications	Host Link communications can be used for remote programming and remote monitoring from devices on networks up to two levels away (Controller Link Network, Ethernet Network, or other network).
Storing comments in CPU Unit	I/O comments can be stored as symbol table files in the Memory Card, EM file memory, or comment memory (See note.). Note CS1PC-PCI01H-DRM CS1 Boards only.
Program check	Program checks are performed at the beginning of operation for items such as no END instruction and instruction errors. CX-Programmer can also be used to check programs.
Control output signals	None
Battery life	Battery Set: CS1W-BAT01
Self-diagnostics	CPU errors (watchdog timer), I/O verification errors, I/O bus errors, memory errors, and battery errors.
Other functions	Storage of number of times power has been interrupted. (Stored in A514.)

1-11-3 DeviceNet Communications Specifications

DeviceNet communications specifications conform to the DeviceNet specification.

Item	Specification
Baud rate	500 kbps, 250 kbps, or 125 kbps (switchable)
Communications distances	500 kbps Network length: 100 m max. Drop line length: 6 m max. Total drop line length: 39 m max.
	250 kbps Network length: 250 m max. (see note 1) Drop line length: 6 m max. Total drop line length: 78 m max.
	125 kbps Network length: 500 m max. (see note 1) Drop line length: 6 m max. Total drop line length: 156 m max.
Max. number of Slaves	64 Slaves
Max. I/O capacity	Without DeviceNet Configurator: 2,048 points (64 input words, 64 output words) or 16,000 points (500 input words, 500 output words) With DeviceNet Configurator: 32,000 points (500 words \times 4 blocks)
Slave function	Without DeviceNet Configurator: 32 points (1 input word, 1 output word) or 3,200 points (100 input words, 100 output words) With DeviceNet Configurator: 4,800 points (100 input words \times 2 blocks, 100 output words \times 1 block)
Error control checks	CRC error check, node address duplication check, scan list verification
Cables	5-wire cable: 2 signal lines, 2 power supply lines, 1 shield line

- Note**
1. Indicates the max. length when Thick Cables are used. Reduce the network length to 100 m max. when using Thin Cables. When using both Thick and Thin Cables together, refer to the *CS/CJ Series DeviceNet Unit Operation Manual (W380)* for details.
 2. The DeviceNet connector on the CS1PC-PCI01-DRM SYSMAC CS1 Board is the same as the connector provided with the CS1W-DRM DeviceNet Unit.

1-12 Setup Procedures

Hardware Setup

Refer to *Section 2 Hardware Setup and Installation* for details. Make the following settings before mounting the SYSMAC CS1 Board into the computer.

Setting	Switch	Description
UM Write-protection	PLC DIP switch, pin 1	Enables or disables writing to the user memory area.
Program Transfer at Startup	PLC DIP switch, pin 2	Specifies whether or not to automatically load the program and parameter data from the Memory Card when the SYSMAC CS1 Board is started.
Programming Console Display Language	PLC DIP switch, pin 3	Keep set to ON for English.
Peripheral Port Communications Settings	PLC DIP switch, pin 4	Specifies whether or not default communications parameters are to be used.
Reserved for system.	PLC DIP switch, pin 5	Keep set to OFF.
Initial Operation Conditions	PLC DIP switch, pin 6	Specifies whether the PLC waits (CPU standby) until the computer completes initialization of the PCI interface before executing the ladder program or starts executing the ladder program without waiting for initialization to be completed.
Easy Backup Setting	PLC DIP switch, pins 7 and 8	Sets the type of easy backup operation to be performed.
DeviceNet Node Address	DeviceNet node address switches	Set the node address of the SYSMAC CS1 Board as a DeviceNet Master Unit.
DeviceNet Unit Number	DeviceNet node number switch	Set the unit number of the SYSMAC CS1 Board as a DeviceNet Master Unit.
DeviceNet Communications Parameters	DeviceNet DIP switch	Sets the baud rate and whether to stop or continue operations after a communications error occurs in DeviceNet communications.

Installation

Refer to *Section 2 Hardware Setup and Installation* for details.

Install the SYSMAC CS1 Board in the computer and connect external devices to Expansion Racks or through the DeviceNet Network.

This manual covers only the installation and wiring specific to the SYSMAC CS1 Board. Refer to the *CS-series Programmable Controllers Operation Manual (W339)* and *CS/CJ Series DeviceNet Unit Operation Manual (W380)* for details on system installation.

Programming

Write the programs that will control the SYSMAC CS1 Board.

When writing user applications for the computer, use the ITBC-SC1W-ECD SYSMAC CS1 Board Driver software to write the programming that controls the Board.

Refer to the following manuals for details on writing the ladder program that is executed in the Board:

- For details on ladder programming as a PLC, refer to the *CS-series Programmable Controllers Operation Manual (W339)* and the *CS/CJ-Series Programmable Controllers Programming Manual (W394)*.
- For details on remote I/O communications and message communications through DeviceNet, refer to the *CS/CJ Series DeviceNet Unit Operation Manual (W380)*.

- Note** Thoroughly check the user program after writing it before using it to control device or system.

SECTION 2

Hardware Setup and Installation

This section describes procedures such as making the hardware settings on the SYSMAC CS1 Board, installing the Board in the computer, and wiring the Board to I/O devices and DeviceNet devices.

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2-1 Checking Resources before Installation

Check the following items before starting to set up or install the SYSMAC CS1 Board.

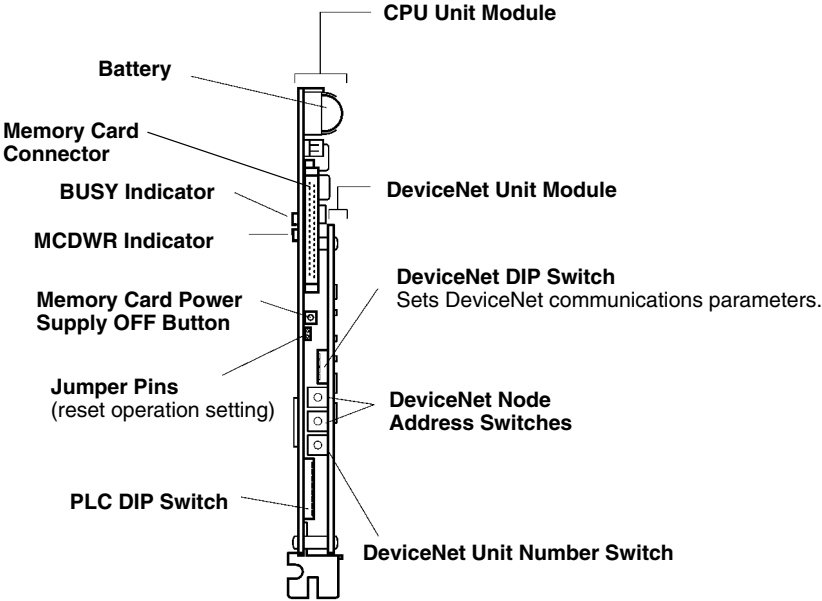
Note The SYSMAC CS1 Board is a Plug and Play compatible PCI Board.

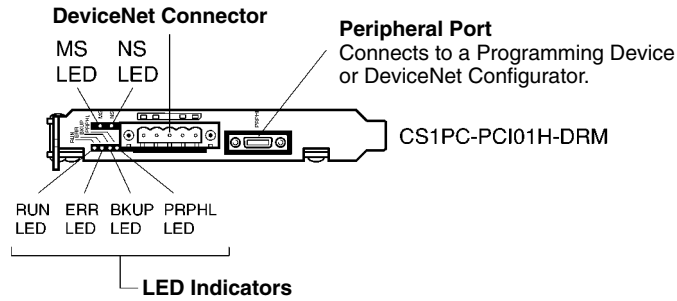
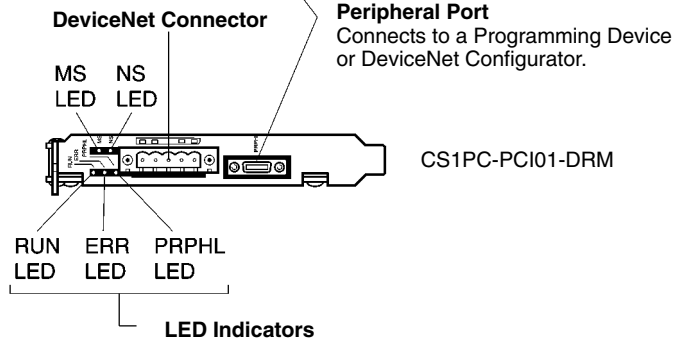
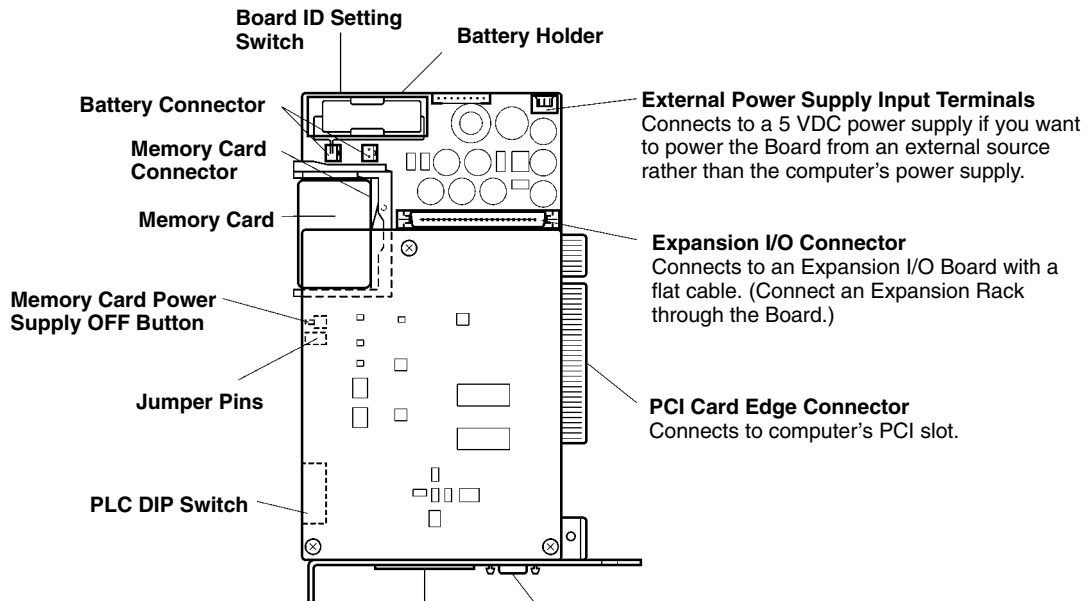
Item to check	Explanation
Available PCI Slot	Check that the computer has an open PCI slot.
IRQ conflict	<p>This Board uses an IRQ (interrupt request). An IRQ is automatically assigned to the PCI bus, but the IRQ may already be in use by the ISA bus in a computer with an ISA bus. The computer may not boot properly if there is an IRQ conflict between the PCI bus and ISA bus. Use one of the following methods to avoid allocation of an IRQ that is being used by the ISA bus.</p> <ul style="list-style-type: none"> • Open the computer’s BIOS menu and disable Plug and Play operation. • Open the computer’s BIOS menu and set any IRQs that are being used by ISA devices to “Reserved” in the PCI bus’ IRQ allocation settings.

- Note**
1. The CS1PC-PCI01-DRM and its battery are packed separately, so refer to the *CS Series Programmable Controllers Operation Manual (W339)* for details and perform the following procedure:
 - Install the battery. (Refer to *Appendix A Replacing the Battery* for details.)
 - Clear the memory (all clear.)
 - Clear all error messages.
 - Set the clock if the clock function is being used.
 2. I/O words are allocated to I/O Units based on the I/O Units that are actually mounted in the PLC, so it is necessary to create an I/O table.
 3. Refer to your computer’s User’s Guide for details on accessing the BIOS menu and changing BIOS settings.
 4. Use the following procedure to determine which IRQ number is being used by an ISA device.
 - Start up the computer without the SYSMAC CS1 Board installed.
 - Select **Start/Settings/Control Panel** from the Start menu. Double-click the **System** icon and click the **Device Manager** tab.
 - Double-click the desired ISA board to display its properties. Click **Resources** to list the resources being used by the ISA board and check the board’s Interrupt Request setting.

2-2 Components

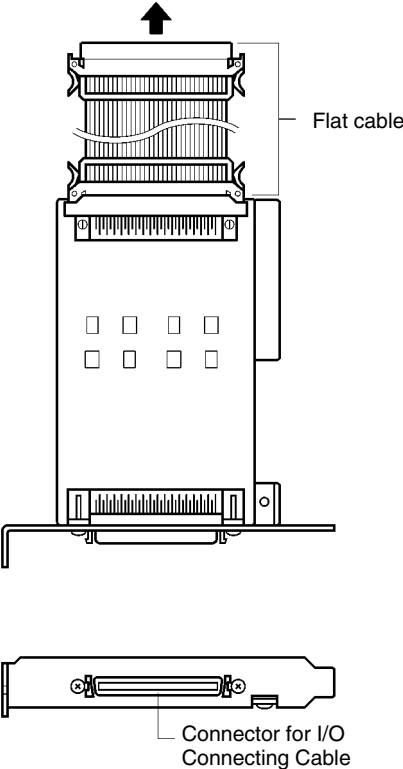
CS1PC-PCI01-DRM, CS1PC-PCI01H-DRM SYSMAC CS1 Board





CS1PC-EIC01 Expansion I/O Board

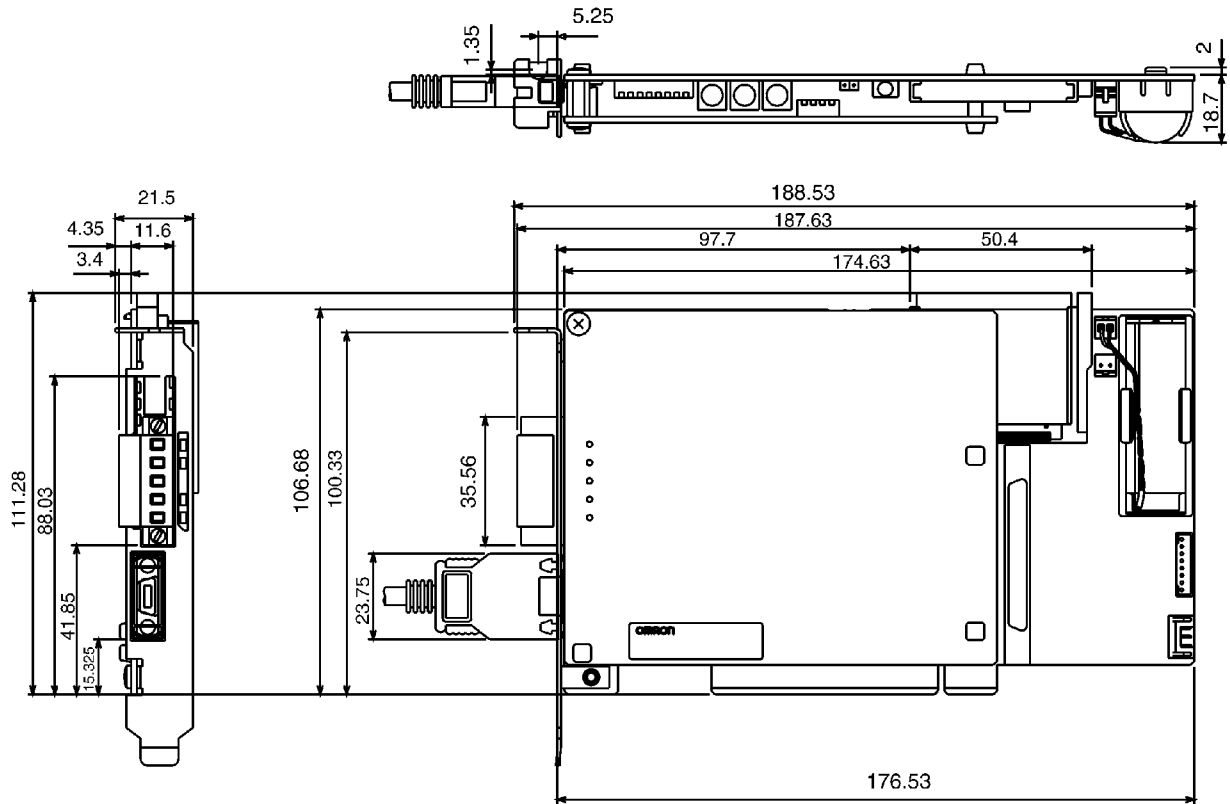
Connects to the SYSMAC CS1 Board's Expansion I/O Connector.



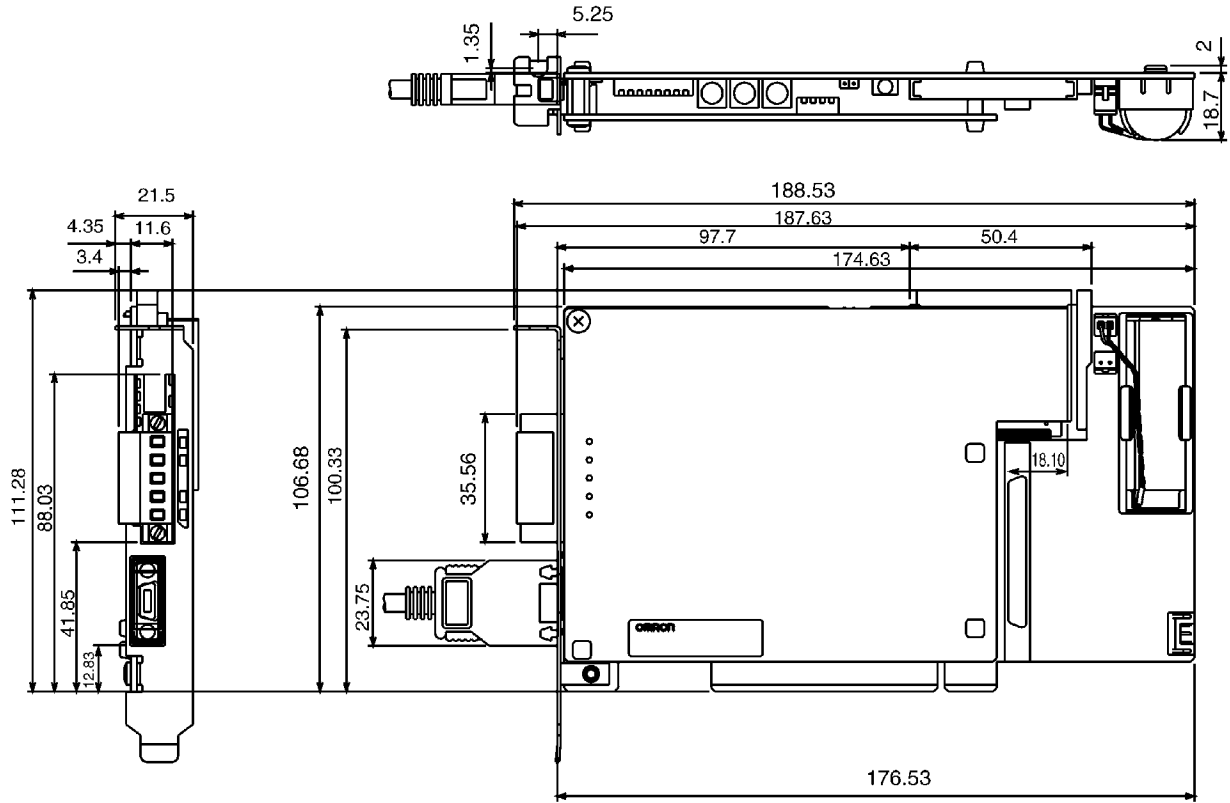
2-2-1 Dimensions

All dimensions are in mm.

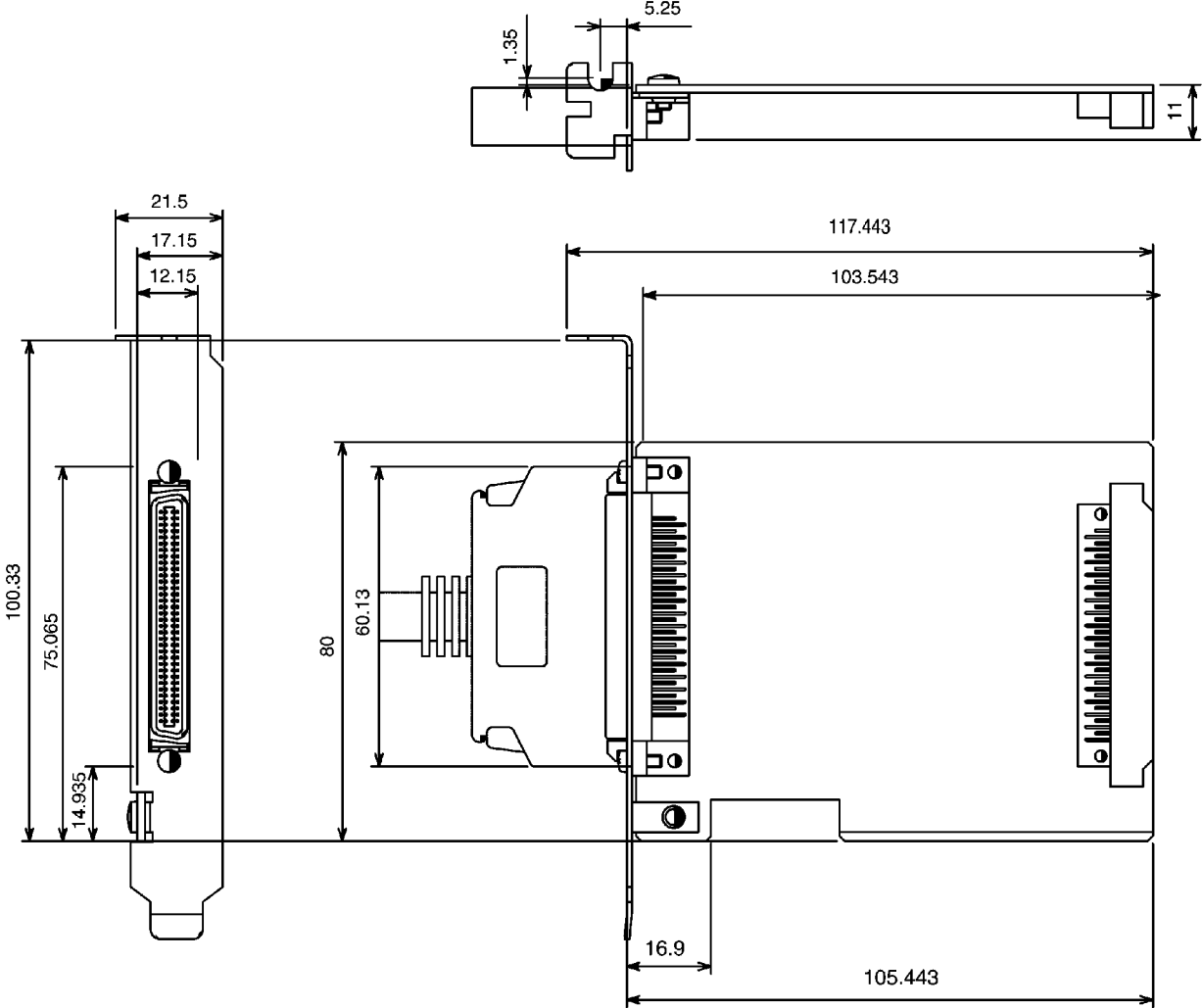
CS1PC-PCI01-DRM SYSMAC CS1 Board



CS1PC-PCI01H-DRM SYSMAC CS1 Board



CS1PC-EIC01 Expansion I/O Board



2-2-2 LED Indicators

Indicator	Color	Status	Meaning
RUN	Green	ON	The PLC Module is operating normally in MONITOR or RUN mode.
		Flashing	DIP switch settings error.
		OFF	PLC is in PROGRAM mode or has stopped operating due to a fatal error.
ERR/ALM	Red	ON	A fatal error has occurred (including FALS instruction execution), or a hardware error (watchdog timer error) has occurred. The PLC Module will stop operating, and all outputs will turn OFF.
		Flashing	A non-fatal error has occurred (including FAL instruction execution) The PLC Module will continue operating.
		OFF	PLC Module's normal operating status
BKUP (CS1PC- PCI01H- DRM only)	Yellow	ON	The user program and parameter area data are being backed up (written) to the internal flash memory. The power to the CS1 Board has been turned ON and the user program is being restored. Note Do not turn OFF the power to the CS1 Board while this indicator is lit (ON).
		OFF	Data is not being written to flash memory.
PRPHL	Yellow	Flashing	PLC Module is communicating (sending or receiving) via the peripheral port.
		OFF	PLC Module is not communicating via the peripheral port.
MCPWR	Green	ON	Power is being supplied to the Memory Card.
		Flashing	Flashes once: Easy backup operation (read, write, or verify) normal Flashes three times: Easy backup operation (read) warning Flashes five times: Easy backup operation (read) malfunction Flashes continuously: Easy backup operation (write or verify) malfunction
		OFF	Power is not being supplied to the Memory Card.
BUSY	Yellow	Flashing	Memory Card is being accessed.
		OFF	Memory Card is not being accessed.

Indicator	Color	Status	Meaning
MS	Green	ON	The Unit is operating normally.
		Flashing	Switch settings are being read.
	Red	ON	A fatal error (Unit hardware error) has occurred.
		Flashing	A non-fatal error (such as a switch setting error or routing table error) has occurred.
---	OFF	<ul style="list-style-type: none"> • There is a Unit hardware error. • Power is not being supplied to the DeviceNet Master. • The Unit is resetting. • The Unit is waiting to start initialization. 	
NS	Green	ON	Normal network status (Communications connection established.)
		Flashing	The network is normal, but the communications connection isn't established.
	Red	ON	A fatal communications error has occurred. (The Unit detected an error indicating that network communications are disabled.) <ul style="list-style-type: none"> • Node address duplication • Bus OFF error
		Flashing	A non-fatal communications error (a communications error in a Slave) has occurred.
---	OFF	A Network error has occurred. For example, the master is the only node in the network.	

Refer to the *CS/CJ Series DeviceNet Unit Operation Manual (W380)* for more details on the MS and NS Indicators.

2-3 Board Switch Settings

The following settings must be made on the SYSMAC CS1 Board.

We recommend making these settings before installing the Board in the computer. It may be possible to change the settings after installation, but it will probably be necessary to open the computer case to access the Board.

If the settings are being changed while the Board is installed in the computer, turn OFF the computer and all connected peripheral devices before changing the settings. If any Slaves are connected, turn OFF all of the Slaves' power supplies and communications power supplies.

Setting	Switch	Description
UM Write-protection	PLC DIP switch, pin 1	Enables or disables writing to the user memory area.
Program Transfer at Startup	PLC DIP switch, pin 2	Specifies whether or not to automatically load the program and parameter data from the Memory Card when the SYSMAC CS1 Board is started.
Programming Console Display Language	PLC DIP switch, pin 3	Keep set to ON for English.
Peripheral Port Communications Settings	PLC DIP switch, pin 4	Specifies whether or not default communications parameters are to be used.
Reserved for system.	PLC DIP switch, pin 5	Keep set to OFF.
Initial Operation Conditions	PLC DIP switch, pin 6	Specifies whether the PLC will wait (CPU standby) until the computer completes initialization or start executing the ladder program without waiting for initialization to be completed.
Easy Backup Setting	PLC DIP switch, pins 7 and 8	Sets the type of easy backup operation to be performed.
DeviceNet Node Address	DeviceNet node address switches	Set the node address of the SYSMAC CS1 Board as a DeviceNet Master Unit.
DeviceNet Unit Number	DeviceNet node number switch	Set the unit number of the SYSMAC CS1 Board as a DeviceNet Master Unit.
DeviceNet Communications Parameters	DeviceNet DIP switch	Sets the baud rate and whether to stop or continue operations after a communications error occurs in DeviceNet communications.

2-3-1 PLC DIP Switch Settings (PC SETTING SW)

The PLC DIP Switch determines how the SYSMAC CS1 Board operates as a PLC. This switch also sets the I/O port address that determines which registers are used for communications between the Board and the computer. (The default setting is OFF for all pins.)



(Factory defaults shown in diagram.)

Pin(s)	Use	Settings		Function
1	UM write-protection (See note 1.)	ON	User memory write-protected	Write-protecting UM prevents the user program and PC Setup from being overwritten from a Programming Device (including a Programming Console.) Turn this pin ON if you want to prevent the program from being changed on-site without authorization.
		OFF	User memory not write-protected	
2	Program transfer at startup	ON	Transfer	When this pin is ON, the program (AUTOEXEC.OBJ) and parameter area data (AUTOEXEC.STD) will be transferred from the Memory Card to the PLC automatically at start-up. (See note 2.) A PLC's software (program and parameter area data) can be changed completely just by inserting a new Memory Card and turning ON the power. This can be used to switch the system to a new arrangement very quickly. If pin 7 is ON and pin 8 is OFF, the simple backup function's Memory Card read operation will override the program transfer function. In this case, the program and parameter area data won't be transferred even if pin 2 is ON.
		OFF	Do not transfer	
3 (See note 3.)	Programming Console display language	ON	English	Programming Console messages are displayed in English when this pin is ON. Turn OFF to display messages in the language stored in system ROM.
		OFF	Japanese	
4	Peripheral port communications settings	ON	Use parameters set in the PC Setup.	Leave this pin OFF when using a Programming Console or CX-Programmer (with the peripheral bus setting) connected to the peripheral port. Turn this pin ON when the peripheral port is being used for a device other than a Programming Console or CX-Programmer (with the peripheral bus setting).
		OFF	Auto-detect Programming Device (See note 4.)	
6	Initial operation conditions	ON	Start operation without waiting for computer initialization	This pin determines whether or not the Board waits for the computer to complete initialization before starting operation if it is set for RUN or MONITOR mode at startup. Turn pin 6 ON if the host's startup is slow and you want to start ladder program execution first. (The SYSMAC CS1 Board does not have a user-defined pin like pin 6 of the CS-series CPU Units.)
		OFF	Wait to start operation after computer initialization	
7 and 8	Easy backup setting	See note 5.		The settings on pins 7 and 8 determine what kind of easy backup operation will be performed.

- Note**
- The following data is write-protected when pin 1 is ON:
 - The user program
 - All data in the parameter area (such as the PC Setup and registered I/O table)

Furthermore when pin 1 is ON, the user program and parameter area won't be cleared even when the memory clear operation (all clear) is performed from a Programming Device.
 - When pin 2 is ON and the power is turned ON, any I/O Memory file (AUTOEXEC.IOM, ATEXEC□□.IOM) will also be transferred automatically. Both the program (AUTOEXEC.OBJ) and the parameter area (AUTOEXEC.STD) must exist in the Memory Card. I/O Memory files (AUTOEXEC.IOM, ATEXEC□□.IOM) are optional.
 - Always leave pin 3 turned OFF on the CS1PC-PCI01H-DRM. To change the Programming Console messages to English when using the CS1PC-PCI01H-DRM, select English on the initial Programming Console display.
 - The auto-detect operation goes through baud rates in the following order: Programming Console, and then peripheral bus at 9,600 bps, 19,200 bps, 38,400 bps, and 115,200 bps. Programming Devices that aren't in peripher-

al bus mode and devices in peripheral bus mode operating at any other speeds will not be detected.

5. The following table shows the settings for the “easy backup function.”

Pin 7	Pin 8	Type of backup	Required operation
ON	OFF	Writing from the CPU Unit Module to the Memory Card	Press and hold the Memory Card Power Supply Switch for three seconds.
		Restoring from the Memory Card to the CPU Unit Module	To read from the Memory Card to the CPU Unit Module, turn ON the PLC power. This operation takes precedence over the automatic transfer operation (pin 2 ON) when power is turned ON.
OFF	OFF	Comparing contents of Memory Card and CPU Unit Module	Press and hold the Memory Card Power Supply Switch for three seconds.

2-3-2 Switch Settings for the DeviceNet Module

Unit Number Switch (UNIT NO.)

Use this switch to set the unit number of DeviceNet Unit as a CPU Bus Unit. The unit number setting determines the CIO and DM area words allocated to the Unit as software switches and the status area.



Setting method: One-digit hexadecimal

Setting range: 0 to F

- Note**
1. The unit number is set to 0 at the factory.
 2. Any unit number from 0 to F can be set as long as it hasn't been set on another CPU Bus Unit connected to the same PLC.
 3. Use a small flat-blade screwdriver to turn the rotary switches; be careful not to damage the switch.
 4. Always turn OFF the CS1 Board before changing the unit number setting.
 5. If the unit number is the same as one set on another CPU Bus Unit connected to the same PLC, a unit number duplication error will occur in the PLC and it won't be possible to start up the DeviceNet network.

Node Address Switches (NODE ADDR)

Use these switches to set the node address of the Unit.



Setting method: Two-digit decimal

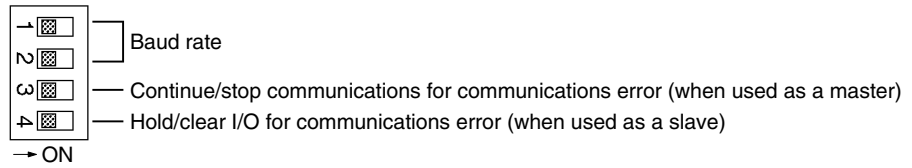
Setting range: 0 to 63

- Note**
1. The node address is set to 63 at the factory.
 2. Any node address from 0 through 63 can be set as long as it hasn't been set on another slave node.
 3. If the node address is the same as one set on another node, a node address duplication error will occur and it won't be possible to start up network communications.

DeviceNet DIP Switch

The DeviceNet DIP switch on the top of the DeviceNet Module is used to set the baud rate, whether communications will be continued or stopped when a com-

munications error occurs, and whether to hold or clear the remote outputs when a communications error occurs in the slave function.



The settings of the DIP switch pins are shown in the following table. All pins are set to OFF at the factory.

Pin	Function	Setting
1	Baud rate	See the next table.
2		
3	Continue/stop remote I/O communications for communication errors (when used as a master)	OFF: Continue communications ON: Stop communications
4	Hold/clear remote outputs for communications error (when used as a slave)	OFF: Clear remote outputs ON: Hold remote outputs

Baud Rate

Pins 1 and 2 are used to set the baud rate as shown in the following table.

Pin 1	Pin 2	Baud rate
OFF	OFF	125 kbps
ON	OFF	250 kbps
OFF	ON	500 kbps
ON	ON	Not allowed.

- Note**
1. Always turn OFF the CS1 Board before changing the DIP switch settings.
 2. Set the same baud rate on all of the nodes (Master and Slaves) in the Network. Any slaves with baud rates different from the master's rate won't be able to participate in communications and may cause a communications error between nodes that have been set properly.

Continue/Stop Remote I/O Communications

When the DeviceNet Unit is used as a master, pin 3 is used to set whether or not communications will stop after a communications error.

Pin 3	Function
OFF	Continue communications.
ON	Stop communications.

If pin 3 is ON, remote I/O communications will be stopped if one of the following errors occurs.

- Remote I/O Communications Error Flag (n+12, bit 02 is ON)
- Send Timeout Flag (n+10, bit 08 is ON)
- Network Power Error Flag (n+10, bit 07 is ON)

Remote I/O communications will remain stopped even if the error is cleared. (Message communications and slave functions will continue.) To resume communications, turn ON the Remote I/O Communications Start Bit (word n, bit 02) of Software Switches 1.

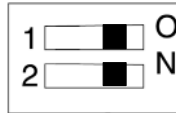
If pin 3 is OFF, remote I/O communications will stop if a send timeout or network power error occurs, but will restart automatically when the cause of the error is cleared.

Hold/Clear Remote Outputs

When the DeviceNet Unit is used as a slave, pin 4 is used to set whether to hold or clear the remote I/O communications output data when a communications error occurs.

2-3-3 Board ID Setting Switches

Up to 4 SYSMAC CS1 Boards can be installed in a single computer. If more than one SYSMAC CS1 Board is installed, you must set a unique Board ID on each Board with the Board ID Setting Switch (switch number 100) located behind the Battery Holder. Set the switches when using the SYSMAC CS1 Board Driver. The factory default setting is 0 (pins 1 and 2 ON).



Pin 1	Pin 2	ID number
ON	ON	0
OFF	ON	1
ON	OFF	2
OFF	OFF	3

2-4 Installing the Board in the Computer

After setting the SYSMAC CS1 Board's switches, install the Board in a PCI slot of the computer.

Precautions

Observe the following precautions to avoid injury or damage to the SYSMAC CS1 Board or the computer.

- Turn the power off to the computer and all peripheral devices before starting to install the SYSMAC CS1 Board.
- Take necessary steps to discharge static electricity before installing the SYSMAC CS1 Board. Static electricity can damage the Board or your computer.
- When installing the Board, be extremely careful not to damage the memory or any other components inside your computer.
- Some of the Board's components are sharp. Do not touch the surface of the Board directly.

Installing the Board

The following procedure is an example procedure for installation of the SYSMAC CS1 Board. The procedure will vary depending on the computer being used, so refer to the user's manual for your computer and install the Board correctly.

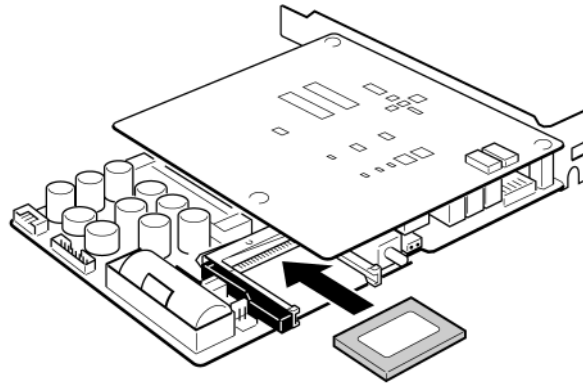
- 1, 2, 3... 1. Disconnect all cables from the SYSMAC CS1 Board (communications cables and power supply cables).
2. Turn OFF the computer in which the board is being installed and unplug the computer's power cord.
3. Remove the computer's cover and make any other preparations needed to install a PCI board. (Refer to your computer's User's Guide for details.)
4. Align the Board with the computer's PCI slot, slide it into position, and press it firmly into the slot. Check that the Board's PCI interface is completely and evenly installed into the PCI slot. Do not use much force when pressing the board; it should slide into the slot with little resistance.
5. Pull on the Board lightly to check that it is installed securely and won't slip out.
6. Secure the Board by tightening the retaining screw to 0.5 N • m.

Installing a Memory Card in the Board

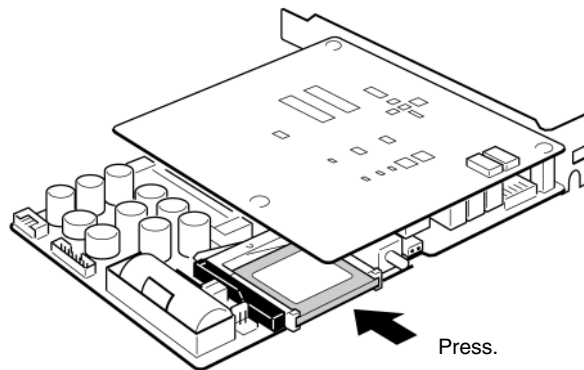
If you are planning to install a Memory Card, install it in the Board before installing the Board in the computer. The Memory Card cannot be installed or removed from outside of the computer, so the Memory Card must be installed beforehand.

Note We assume that one Memory Card will be installed in the Board and used as ROM.

- 1, 2, 3...** 1. Align the Memory Card with its label facing up and insert it into the Memory Card slot.



2. Press the Memory Card firmly so that it is inserted all the way into the slot.



2-5 External Connections

This section describes how to connect external devices such as Expansion Racks, DeviceNet Slaves, CompoBus/S Slaves, and Programming Devices to the SYSMAC CS1 Board.

- Note**
1. Turn the power supply OFF to the CS1 Board and all Slaves, and turn OFF the communications power supply before connecting communications cables.
 2. Tighten the screws holding the cables to the DeviceNet connectors to a torque of 0.5 N•m.
 3. Be sure to confirm that the terminal blocks, expansion cables, and other items with locking devices are properly locked into place.
 4. Do not pull on the communications cables.
 5. Do not forcibly bend the communications cables.
 6. Do not place objects on the communications cables.
 7. Always use crimp terminals when connecting communications cables. Connecting bare twisted wires can result in disconnection, broken wires, faulty operation, or damage to the product.
 8. Use an appropriate crimp tool and appropriate methods to attach the crimp terminals. Consult the manufacturer of the crimp tool for specific instructions. Inappropriate crimp tools or crimping methods can result in broken wires.

9. Be sure to connect the signal lines, power lines, and shield lines correctly and do not get them mixed up.
10. Be sure that the signal lines, power lines, and shield line do not become disconnected during communications.
11. Double-check all wiring before turning the power supplies back ON.

2-5-1 Connecting Programming Devices

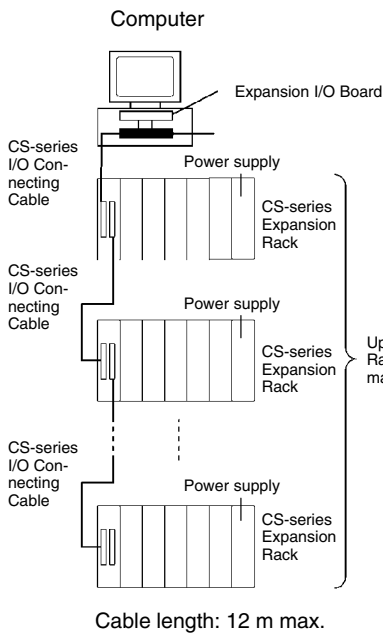
Use the same Connecting Cables and Programming Consoles that are used with CS-series PLCs.

Connecting Cable model number	Cable length	Computer connection
CS1W-CN226	2.0 m	9-pin D-SUB
CS1W-CN626	6.0 m	9-pin D-SUB

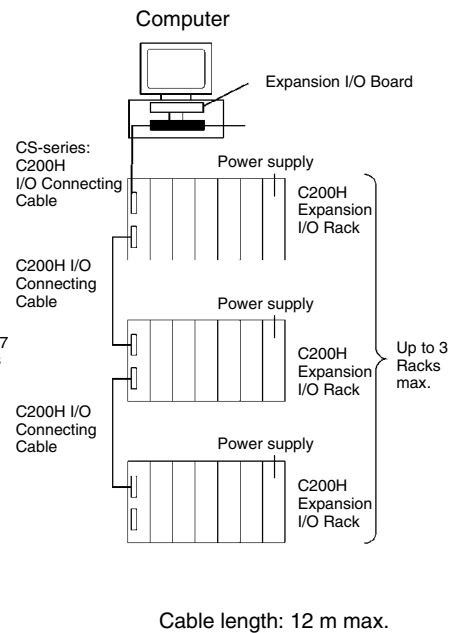
2-5-2 Connecting Expansion Racks

The SYSMAC CS1 Board can be connected Expansion Racks through an Expansion I/O Board, as shown in the following examples.

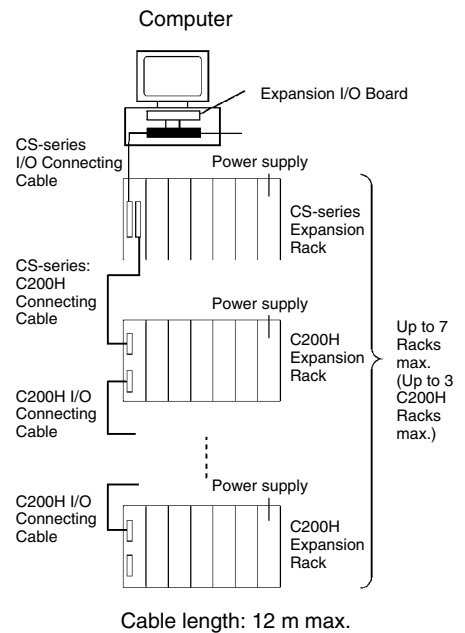
1. SYSMAC CS1 Board + Expansion I/O Board + CS-series Expansion Racks



2. SYSMAC CS1 Board + Expansion I/O Board + C200H Expansion I/O Racks

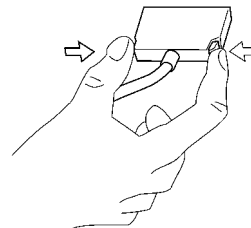


3. SYSMAC CS1 Board + Expansion I/O Board + CS-series and C200H Expansion Racks



Connecting to the Expansion I/O Board

Press the latches on the connector and insert it until it locks securely. The connected devices will not operate properly with an incomplete connection. To remove the connector, press the latches and pull the connector straight out of the Board.



- Note**
1. Turn OFF the computer, all peripheral devices, and all Expansion Racks before connecting the I/O Connecting Cable.

2. The total length of I/O Connecting Cables must not exceed 12 m.
3. Double-check the position of the connectors to avoid connecting to the wrong one.

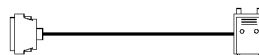
Compatible I/O Connecting Cables

CS-series I/O Connecting Cables



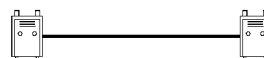
Model	Cable length
CS1W-CN313	0.3 m
CS1W-CN713	0.7 m
CS1W-CN223	2 m
CS1W-CN323	3 m
CS1W-CN523	5 m
CS1W-CN133	10 m
CS1W-CN133B2	12 m

CS-series → C200H I/O Connecting Cables



Model	Cable length
CS1W-CN311	0.3 m
CS1W-CN711	0.7 m
CS1W-CN221	2 m
CS1W-CN321	3 m
CS1W-CN521	5 m
CS1W-CN131	10 m
CS1W-CN131B2	12 m

C200H I/O Connecting Cables



Model	Cable length
CS1W-CN311	0.3 m
CS1W-CN711	0.7 m
CS1W-CN221	2 m
CS1W-CN521	5 m
CS1W-CN131	10 m

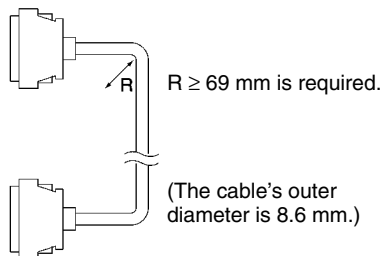
Precautions when Connecting Expansion Racks

Observe the following precautions when connecting Expansion Racks to the SYSMAC CS1 Board.

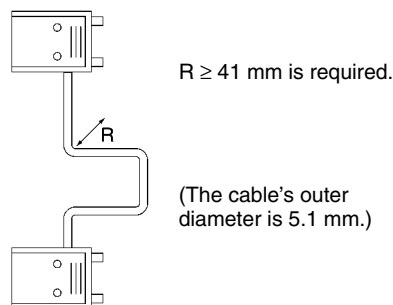
- Note**
1. Do not run I/O Connecting Cables in the same duct as I/O wiring or power wiring.
 2. Turn OFF the CS1 Board power supply before connecting the cables.
 3. An I/O bus error will occur and operation will stop if an I/O Connecting Cable becomes disconnected, so the cables must be connected carefully.
 4. If the I/O Connecting Cable will be routed through a hole, the hole must be at least 75 mm in diameter for a long CS-series I/O Connecting Cable or 63 mm in diameter for other I/O Connecting Cables.

5. Do not bend or pull on the Cables forcefully.
6. The cable's pull strength is 49 N.
7. The following diagrams show how sharply the Cables can be bent.

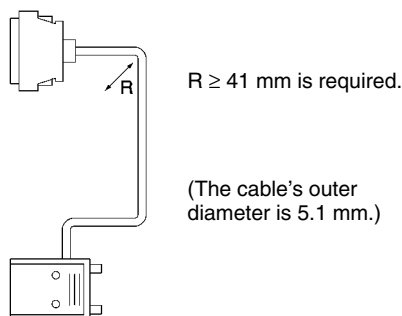
CS-series I/O Connecting Cables



C200H I/O Connecting Cables



CS-series → C200H I/O Connecting Cables



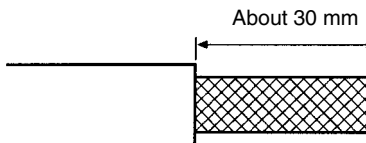
2-5-3 Connecting DeviceNet Communications Cables

The DeviceNet communications cables can be installed as soon as the SYSMAC CS1 Board is installed in the computer. This manual provides information only on wiring the communications cables to the SYSMAC CS1 Board. Refer to the *CS/CJ Series DeviceNet Unit Operation Manual (W380)* for details on wiring communications cables and Slaves.

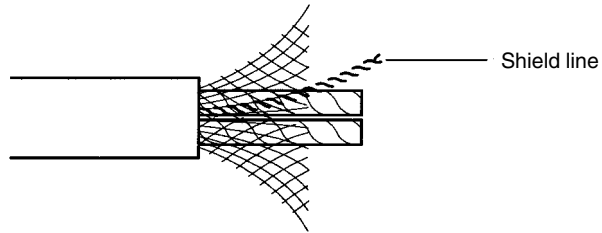
Preparing Cables

This section explains how to prepare and connect the communications cables to connectors for the DeviceNet Network. Use the following procedure to prepare and connect the communications cables to the connectors.

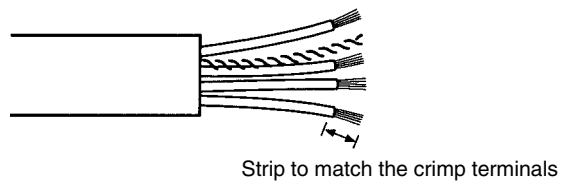
- 1, 2, 3...** 1. Remove about 30 mm of the cable covering being careful not to damage the shield weaving underneath. Do not remove more than about 30 mm; removing too much of the covering can result in short-circuits.



- Carefully peel back the weaving. You'll find the signal lines, the power lines, and the shield line. The shield line will be loose on the outside of the other lines, but it is harder than the weaving and should be easily identified.

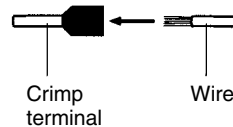


- Remove the exposed weaving, remove the aluminum tape from the signal lines and the power lines, and strip the covering from the signal lines and power lines to the proper length for the crimp terminal connectors. Twist together the wire strands of each signal line and power line.



- Connect a crimp terminal to each line and then cover any exposed areas of the cable and lines with electricians tape or heat-shrinking tubes.

We recommend the following crimp terminals.
Phoenix Contact K.K., AI-series Crimp Terminals

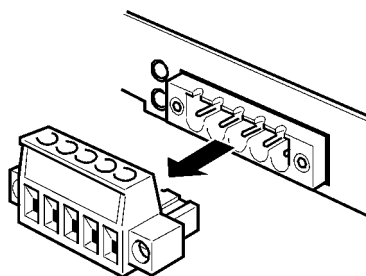


Insert the line into the terminal and then crimp.
The following crimp tool is also available.
Phoenix Contact K.K., ZA3 Crimp Tool

Connecting Communications Cables

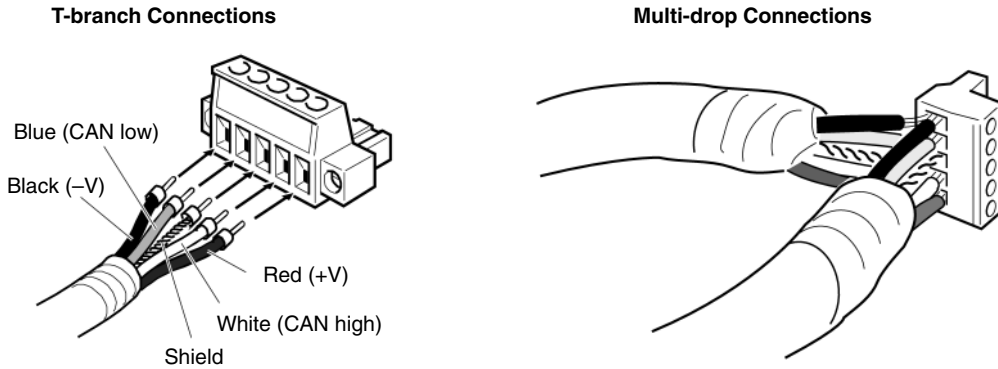
Turn off the power supply to the CS1 Board and Slaves, and turn off the communications power supply before connecting DeviceNet Communications Cables.

- 1, 2, 3...** 1. Remove the connector from the DeviceNet communications connector on the SYSMAC CS1 Board.



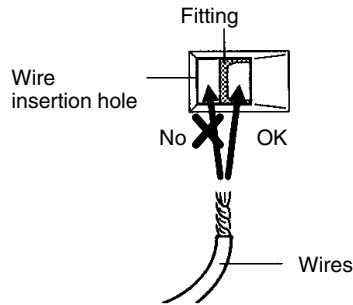
Note The connector can be wired even when connected to the SYSMAC CS1 Board as long as it is accessible.

2. Orient the connector properly, loosen the line lock screws, and then insert the lines into the holes in order: Black, blue, shield, white, and then red.



For multi-drop connections with Thin Cables, two lines are inserted into each hole, as shown in the diagram on the right above. Be sure to place crimp terminals on each of the lines. (Do not use a multi-drop connection with Thick Cables; use a T-branch Connector.)

Note Be sure the line set screws are sufficiently loosened before attempting to insert the lines. If these screws are not loose, the lines will enter the gaps in the back of the connector and will not lock properly.

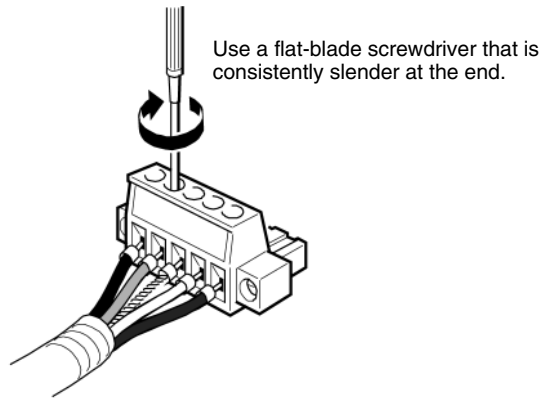


The cable colors are as follows:

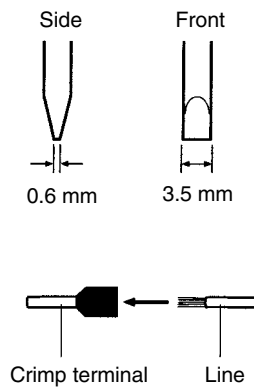
Color	Signal
Black	Power line, negative voltage (-V)
Blue	Communications line, low (CAN low)
---	Shield
White	Communications line, high (CAN high)
Red	Power line, positive voltage (+V)

3. Tighten the line lock screws for each line in the connector.
You will not be able to tighten these screws with a normal screwdriver, which narrows to a point at the end. You will need a screwdriver that is consistently

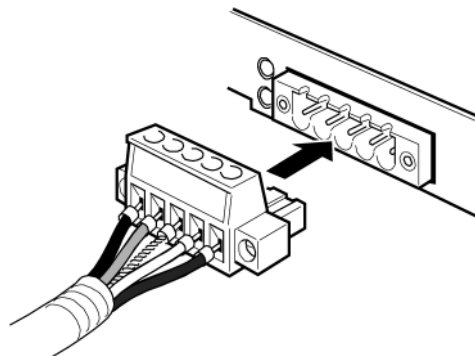
thin for the entire length. The line set screws must be tightened to a torque of 0.5 N·m.



The following OMRON XW4Z-00C Screwdriver is available to tighten the line lock screws. The shape of this Screwdriver is shown in the following illustration.



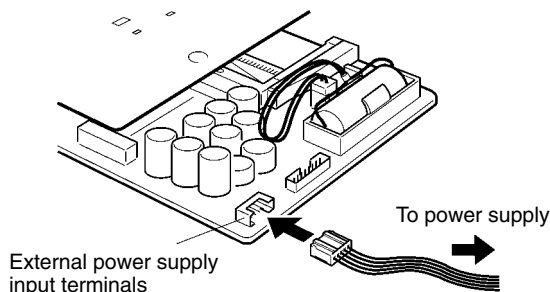
4. Connect the connector back to the SYSMAC CS1 Board, being sure to orient the connector in the correct direction. Press the connector all the way to the back.



2-5-4 Connecting an External Power Supply

If the Board is supplied with a 5-VDC power supply through its external power supply input terminals and this power supply is independent of the computer's

power supply, the Board's ladder program will continue to be executed even if the computer is turned OFF.

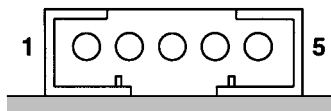


- Note**
1. Use the following recommended cable components or equivalents to make the power supply connecting cable.
 2. Design the power supply side of the connecting cable to meet the requirements of your system.
 3. A C200PC-PD024 Power Supply Board cannot be used.

Recommended Cable Components

Component	Model number	Manufacturer
Socket housing	IL-S-5S-S2C2-S	JAE
Socket contact	IL-S-C2-S-10000	JAE
Cable	10007#26	Sumitomo

Connector Pin Allocation



Pin	Signal
1	5 V
2	5 V
3	Reserved
4	0 V
5	0 V

- Note**
1. Do not connect anything to pin number 3.
 2. Refer to 1-11 Specifications for details on the Board's current consumption and use a power supply with some extra output capacity.

2-6 Error Processing

Refer to the appropriate manual below for information on identifying and correcting PLC errors and DeviceNet errors.

- PLC errors: *CS-series Programmable Controllers Operation Manual (W339)*
- DeviceNet errors: *CS/CJ Series DeviceNet Unit Operation Manual (W380)*

Refer to the User's Manual included with the ITBC-SC1W-CD SYSMAC CS1 Board Driver for details on troubleshooting errors related to the SYSMAC CS1 Board Driver.

- Note** Before troubleshooting errors, check that the Board is installed correctly. If the Board is not screwed tightly into the slot, the card edge connector may not be contacting the computer's PCI slot completely. The Board will not operate properly if there isn't proper contact between the Board and slot.


Appendix

Replacing the Backup Battery

The SYSMAC CS1 Board contains a battery that backs up memory data when power is turned off. If the voltage of the battery drops, HR area bits, DM area words, the PC Setup, and other data will not be maintained properly. Change the battery as soon as the voltage begins to drop.

The SYSMAC CS1 Board contains the following battery.

OMRON Battery Set: CS1W-BAT01

 **WARNING** Never touch the Board or attempt to replace the Battery while power is being supplied. Doing so may result in serious electrical shock or electrocution.

Note You may not be able to replace the battery in time to save the data unless you have a spare battery on hand. Prepare a spare battery in advance so that it is ready when you need it.

Battery Life

The life of the battery is 5 years at 25°C. The battery life will be shortened if it is used at higher temperatures or the computer's power is OFF much of the time. (Under the worst conditions, the battery will last less than 6 months.)

The following table shows the minimum battery lifetimes (at 55°C) and typical battery lifetimes (at 25°C) under a variety of conditions. The "Power ON percentage" is the percentage of the time that the computer's power is ON.

CS1PC-PCI01-DRM

Battery lifetime (i.e., maximum life)	Power ON percentage	Minimum battery lifetime (at 55°C)	Typical battery lifetime (at 25°C)
5 years	0%	304 days	1109 days
	30%	406 days	1261 days
	50%	522 days	1388 days
	70%	733 days	1543 days
	100%	1855 days	

CS1PC-PCI01H-DRM

Battery lifetime (i.e., maximum life)	Power ON percentage	Minimum battery lifetime (at 55°C)	Typical battery lifetime (at 25°C)
5 years	0%	780 days	1855 days
	30%	1101 days	1855 days
	50%	1519 days	1855 days
	70%	1855 days	1855 days
	100%	1855 days	

Battery Error Detection

A battery error (non-fatal) will occur when the voltage of the battery drops and the following indications will be made.

- The ERR indicator will flash.
 - The Battery Error Flag (A40204) will turn ON.
 - A battery error will be registered in the SYSMAC CS1 Board and can be read out from a Programming Device.
- Detection of a low battery voltage can be disabled in the PC Setup (DM 6655). If detection is disabled, none of the above indications will be made, i.e., a battery error will not occur regardless of the voltage of the battery.

- Note**
1. Replace the battery within 5 days after the battery error occurs. Program and other data will be lost if the battery is not replaced.
 2. The battery must be replaced every 5 years even if a battery error does not occur. Never use a battery longer than 5 years.

3. When the battery of a CS1 Board that has not been used for a long period of time requires replacement, turn ON the power after replacing the battery. The battery life may be shortened if the power is not turned ON after replacing the battery.

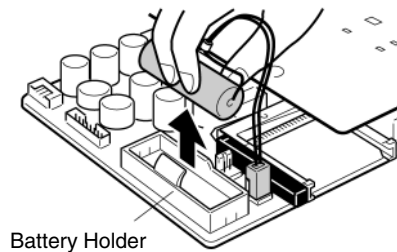
Battery Replacement Procedure

Use the following procedure to replace the battery.

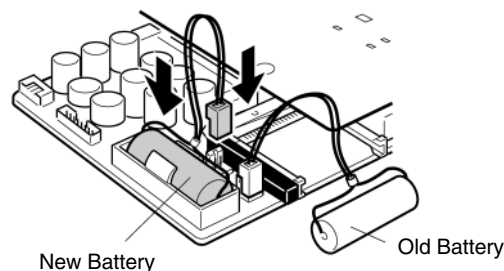
- Note**
1. Before starting to replace the battery, take appropriate anti-static measures, such as grounding, to prevent computer circuits from being destroyed.
 2. There are shape points and edges on the SYSMAC CS1 Board. Be careful not to touch the components on either side when handling the SYSMAC CS1 Board.
 3. The battery may leak if the terminals are shorted or if the battery is charged, disassembled, heated, or incinerated. Never do any of these; handle and dispose of the battery correctly.

Use the following procedure to replace the battery.

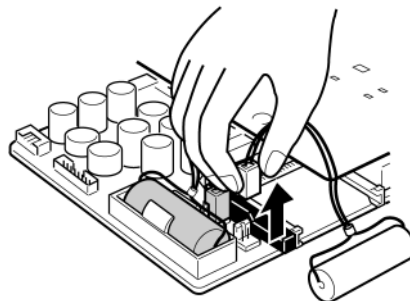
- 1, 2, 3...**
1. Turn OFF the computer.
If the computer is already OFF, turn it ON for at least one minute and then turn it OFF.
 2. Remove the computer's cover and remove the SYSMAC CS1 Board.
Refer to your computer's User's Manual for details on removing the cover and removing a PCI Board.
 3. Remove the old battery from the Battery Holder.
Pull the Battery straight out as shown in the following diagram. Leave the Battery Connector connected to the Board at this point.



4. Place the new Battery in the Battery Holder.
Leave the old Battery connected to the Board. Connect the new Battery to the open connector on the Board.



5. Disconnect the old Battery's connector by pulling it straight out.



6. Replace the SYSMAC CS1 Board into the computer and replace the computer's cover, again referring to your computer's User's Manual for details.
7. After replacing the battery, use the error clear operation to clear the battery error.

Note The Board is equipped with an internal memory-backup capacitor that will backup memory for about 30 seconds, so it is possible to disconnect the old Battery before connecting the new Battery as long as the new Battery is connected quickly.

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Revision History

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

Cat. No. V220-E1-02
 Revision code

The following table outlines the changes made to the manual during each revision. Page numbers refer to the previous version.

Revision code	Date	Revised content
1	August 2001	Original production
02	July 2005	<p>Changes were made throughout the manual to add information on the new model CS1PC-PCI01H-DRM, to change “PC” to “PLC,” and “CS1 Series” to “CS Series” or “CS/CJ Series” (as applicable). The -V1 suffix was also added to the model number CS1W-DRM21 throughout the manual.</p> <p>The following minor corrections and other changes were also made.</p> <p>Page v: Information added to general precautions, and Windows XP added to list of registered trademarks.</p> <p>Page ix: Manual names changed in table, and warranty and liability information added.</p> <p>Pages xii, xiii, xiv, and xvi: Precautions added and/or changed.</p> <p>Pages xviii, xix, xx, 34, 37, 38, 40, 42, and 44: “CPU Unit(s)” changed to “CS1 Board(s)”.</p> <p>Page 2: Reference to CS1G-CPU45H CPU Unit with unit version 3.0 added. Information on power interruption processing changed and added to distinguish between the CS1PC-PCI01-DRM and CS1PC-PCI01H-DRM. Last sentence removed.</p> <p>Page 3: CS1 changed to SYSMAC CS1 Board, reference to CS1G-CPU45H with unit version 3.0 added, and information added to table.</p> <p>Pages 4, 8, and 18: Reference to CS1G-CPU45H CPU Unit with unit version 3.0 added.</p> <p>Page 6: Note added to table on package contents.</p> <p>Page 16: Windows XP added as a compatible OS. Note also added. Note changed.</p> <p>Page 17: Information in table changed.</p> <p>Page 18: Changed CS1-CPU45-EV1 PLC to CS-series CPU Unit. Information in diagram changed.</p> <p>Page 19: Information on power interruption processing changed and added to distinguish between the CS1PC-PCI01-DRM and CS1PC-PCI01H-DRM. Information in table also changed.</p> <p>Pages 20 to 24: Table replaced.</p> <p>Page 28: Reference manual changed.</p> <p>Pages 29 and 31: Diagram added.</p> <p>Page 30: Diagram added.</p> <p>Page 33: Information added to table.</p> <p>Page 35: DIP switch graphic changed.</p> <p>Page 47: Table changed and new table added.</p> <p>Page 49: Information added to table, and note also added.</p>

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