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Cat. No. W356-E1-08

SYSMAC
CPM2C
Programmable Controller

OPERATION MANUAL

OMRON

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.

The abbreviation “PC” means Programmable Controller and is not used as an abbreviation for anything else.

Visual Aids

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

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

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

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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:

The CPM2C is a compact, high-speed Programmable Controller (PC) designed for control operations in systems requiring from 10 to 120 I/O points per PC. There are two manuals describing the setup and operation of the CPM2C: The *CPM2C Operation Manual* (this manual) and the *CPM1/CPM1A/CPM2A/CPM2C/SRM1(-V2) Programming Manual* (W353). (The *CPM1/CPM1A/CPM2A/CPM2C/SRM1(-V2) Programming Manual* is referred to as simply the *Programming Manual* in this manual.)

This manual describes the system configuration and installation of the CPM2C and provides a basic explanation of operating procedures for the Programming Consoles.

The *Programming Manual* (W353) provides detailed descriptions of the CPM2C's programming functions. The *CX-Programmer Operation Manual* (W437) provides details of operations for the WS02-CXPC1-E CX-Programmer.

Please read this manual carefully and be sure you understand the information provided before attempting to install and operate the CPM2C.

Section 1 gives a brief overview of the steps involved in developing of a CPM2C System, describes the possible system configurations, and describes the CPM2C's special features and functions.

Section 2 provides the technical specifications of the Units that go together to create a CPM2C PC and describes the main components of the Units.

Section 3 describes how to install and wire a CPM2C PC.

Section 4 describes how to connect the Programming Console, and how to perform the various programming operations.

Section 5 describes how to perform a test run and how to diagnose and correct the hardware and software errors that can occur during PC operation.

Section 6 describes how to use the CPM1-EMU01-V1 Expansion Memory Unit.

Section 7 describes the features and functions of the CPM2C-CIF21 Simple Communications Unit, the settings required to use the Unit, and an example application. *DM Settings Assignment Sheets* are provided in Appendix C to record data settings.

Appendix A provides tables of CPM2C Units and related products.

Appendix B provides the dimensions of CPM2C Units.

Appendix C provides DM setting assignment sheets for use with the CPM2C-CIF21 Simple Communications Unit.

Appendix D describes SYSMAC and SYSMAC-CPT Support Software capabilities and how to connect the CPM2C to the personal computer with this Support Software installed.

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

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.

LIMITATIONS OF LIABILITY

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 Programmable Controller (PC) and related devices.

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

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

3 Safety Precautions

⚠WARNING Connect the ground terminal of the Power Supply Unit (CPM2C-PA201) to a ground or 100 Ω or less. Not doing so may result in electric shock.

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

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

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

⚠WARNING Provide safety measures in external circuits (i.e., not in the Programmable Controller), including the following items, in order to ensure safety in the system if an abnormality occurs due to malfunction of the PC or another external factor affecting the PC 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 PC 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 PC 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.
- If the 24-VDC output (service power supply) of the Power Supply Unit (CPM2C-PA201) is overloaded or shorted, the voltage may drop causing outputs to turn OFF. External safety measures must be provided to ensure safety in the system in such an event.

⚠ **WARNING** When handling the Memory Backup Battery, never drop, disassemble, distort, short-circuit, recharge, heat to a temperature exceeding 100°C, or throw into fire. Otherwise the Battery may explode, catch fire, or leak fluid.

⚠ **WARNING** When transferring programs to other nodes, or when making changes to I/O memory, confirm the safety of the destination node before transfer. Not doing so may result in injury.

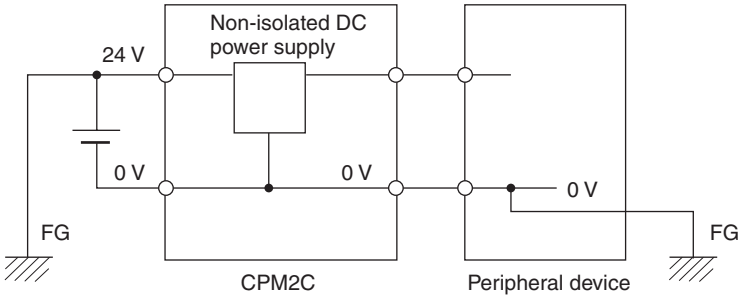
⚠ **Caution** Execute online edit only after confirming that no adverse effects will be caused by extending the cycle time. Otherwise, the input signals may not be readable.

⚠ **Caution** Tighten the screws on the terminal block of the Power Supply Unit (CPM2C-PA201) to a torque of 0.74 to 0.9 N•m. Loose screws may result in burning or malfunction.

⚠ **Caution** Do not connect the 24-VDC output (service power supply) or the Power Supply Unit (CPM2C-PA201) to an AC power supply. Connecting it to an AC power supply will damage the internal circuit.

⚠ **Caution** When connecting a personal computer or other peripheral device to the CPM2C, either ground the 0 V side of the CPM2C or do not ground at all. Depending on the method of grounding, the 24-V power supply may short-circuit; do not ground the 24-V side as shown in the following diagram.

Example: Connections where 24-V Power Supply Will Short-circuit



4 Operating Environment Precautions

⚠ **Caution** Do not operate the control 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 exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

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

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

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

5 Application Precautions

Observe the following precautions when using the PC System.

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

- Always connect to a ground such that the grounding resistance does not exceed 100 Ω when installing the Units. Not connecting to the correct ground may result in electric shock.
- Always turn OFF the power supply to the PC before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
  - Assembling the Units.
  - Connecting or disconnecting the Expansion I/O Units or Expansion Units.
  - Connecting or wiring the cables.
  - Connecting or disconnecting the connectors.
  - Setting DIP switches.
  - Replacing the battery

⚠ **Caution** Failure to abide by the following precautions could lead to faulty operation of the PC or the system, or could damage the PC or PC Units. Always heed these precautions.

- Fail-safe measures must be taken by the customer to ensure safety in the event of incorrect, missing, or abnormal signals caused by broken signal lines, momentary power interruptions, or other causes.
- Use the correct power supply voltage.
- Construct a control circuit so that power supply for the I/O circuits does not come ON before power supply for the Unit. If power supply for the I/O circuits comes ON before power supply for the Unit, normal operation may be temporarily interrupted.
- If the operating mode is changed from RUN or MONITOR mode to PROGRAM mode, with the IOM Hold Bit ON, the output will hold the most recent status. In such a case, ensure that the external load does not exceed specifications. (If operation is stopped because of an operation error (including FALS instructions), the values in the internal memory of the CPU Unit will be saved, but the outputs will all turn OFF.)
- For models with only the super-capacitor installed, the contents of the READ/WRITE enable area of the DM area, HR area, AR area, and CNT data area may be damaged if the power is turned OFF for a long time. To prevent such damage, provide ladder program that will check AR 1314 in order to ensure proper operation of the system.
- The life expectancy of the output relay varies considerably according to its switching capacity and switching conditions. If the output relay is used beyond its life expectancy, its contacts may become fused or burned.
- Install the Units properly so that they will not fall off.
- Be sure that all the mounting screws, terminal screws, and cable connector screws are tightened to the torque specified in the relevant manuals. Incorrect tightening torque may result in malfunction.
- Be sure that the terminal blocks and other items with locking devices are properly locked into place. Improper locking may result in malfunction.
- Be sure that terminal blocks and connectors are connected in the specified direction with the correct polarity. Not doing so may result in malfunction. If the power supply for the I/O circuits is turned ON with the input and output connectors reversed, the fuse of output transistor may be blown.
- Use the Unit with the battery housing cover in place to prevent dust or foreign matter from entering inside the Unit. Not doing so may result in malfunction.
- Install the expansion I/O connector cover to the last Unit (Expansion Unit or Expansion I/O Unit) to prevent dust or foreign matter from entering inside the Unit. Not doing so may result in malfunction.
- Be sure to attach the labels supplied with the CPM2C or provide other protective covers when wiring in order to prevent dust or wiring cuttings from entering the Unit.
- Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.
- Use round crimp terminals for wiring the AC power supply input to the AC Power Supply Unit (CPM2C-PA201). For wiring the ground terminals or power supply service terminals, use crimp terminals or solid wires. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.

- Be sure to perform wiring in accordance with the CPM2C Operation Manual. Incorrect wiring may result in burning.
- Use specified connectors and wiring materials (connector models: C500-CE241/C500-CE242/C500-CE243; terminal block models: AWG28-16 with stripped length of 7 mm; Power Supply Unit terminal block: AWG22-14 with stripped length of 7 mm).
- Do not apply voltages to the input terminals in excess of the rated input voltage. Excess voltages may result in burning.
- Do not apply voltages or connect loads to the output terminals in excess of the maximum switching capacity. Excess voltage or loads may result in 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.
- Always use the power supply voltage specified in the operation manuals. An incorrect voltage may result in malfunction or burning.
- Check the user program for proper execution before actually running it on the Unit. Not checking the program may result in an unexpected operation.
- Double-check all wiring and switch settings before turning ON the power supply. Incorrect wiring or switch settings may result in burning.
- Confirm that no adverse effect will occur in the system before attempting any of the following. Not doing so may result in an unexpected operation.
  - Changing the operating mode of the PC.
  - Force-setting/force-resetting any bit in memory.
  - Changing the present value of any word or any set value in memory.
- Before touching the Unit, be sure to first touch a grounded metallic object in order to discharge any static built-up. Not doing so may result in malfunction or damage.
- Do not pull on the cables or bend the cables beyond their natural limit. Doing either of these may break the cables.
- Do not apply forces exceeding 50 N to connector sections.
- Do not place objects on top of the cables. Doing so may break the cables.
- Resume operation only after transferring to the new CPU Unit the contents of the DM and HR Areas required for resuming operation. Not doing so may result in an unexpected operation.
- Install the Unit properly as specified in the operation manual. Improper installation of the Unit may result in malfunction.
- When transporting the Units, use special packing boxes. Be careful not to apply excessive vibration or shock during transportation and not to drop the product.
- Store the Units within the following temperature and humidity ranges: Storage temperature: –20 to 75°C, storage humidity: 10% to 90% (with no icing or condensation)
- When using a thermocouple-input Temperature Sensor Unit, do not touch the cold junction compensator. Doing so may result in incorrect temperature measurement.

6 EC Directives

6-1 Applicable Directives

- EMC Directives
- Low Voltage Directive

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
EMI (Electromagnetic Interference): EN61000-6-4
(Radiated emission: 10-m regulations)

Low Voltage Directive

Always ensure that devices operating at voltages of 50 to 1,000 VAC and 75 to 1,500 VDC meet the required safety standards for the PC (EN61131-2).

6-3 Conformance to EC Directives

The CPM2C PCs comply with EC Directives. To ensure that the machine or device in which the CPM2C PC is used complies with EC Directives, the PC must be installed as follows:

1,2,3...

1. The CPM2C PC must be installed within a control panel.
2. Reinforced insulation or double insulation must be used for the DC power supplies used for the communications and I/O power supplies.
3. Basic insulation is provided between the commons of different polarities of the output relay for the CPM2C-20□□R (model with 20 relay output points).
   When connecting devices that operate at voltages higher than 50 VAC and those that operate on DC power supplies to adjoining relay output terminals, use different DC power supplies for output devices from those for input devices and the CPM2C power supply.
4. CPM2C PCs complying with EC Directives 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.

6-4 Relay Output Noise Reduction Methods

The CPM2C PCs conform to the Common Emission Standards (EN61000-6-4) of the EMC Directives. However, the noise generated when the PC is switched ON or OFF using the relay output may not satisfy these standards. In such a case, a noise filter must be connected to the load side or other appropriate countermeasures must be provided external to the PC.

Countermeasures taken to satisfy the standards vary depending on the devices on the load side, wiring, configuration of machines, etc. Following are examples of countermeasures for reducing the generated noise.

Countermeasures

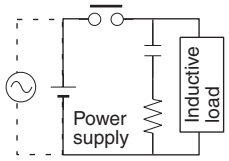
(Refer to EN61000-6-4 for more details.)

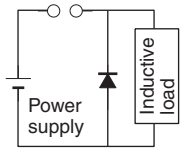
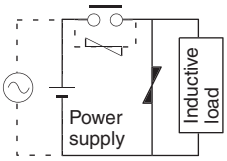
Countermeasures are not required if the frequency of load switching for the whole system with the PC included is less than 5 times per minute.

Countermeasures are required if the frequency of load switching for the whole system with the PC included is 5 times or more per minute.

Countermeasure Examples

When switching an inductive load, connect a surge protector, diodes, etc., in parallel with the load or contact as shown below.

Circuit	Current		Characteristic	Required element
	AC	DC		
CR method 	Yes	Yes	If the load is a relay or solenoid, there is a time lag between the moment the circuit is opened and the moment the load is reset. If the supply voltage is 24 to 48 V, insert the surge protector in parallel with the load. If the supply voltage is 100 to 200 V, insert the surge protector between the contacts.	The capacitance of the capacitor must be 1 to 0.5 μF per contact current of 1 A and resistance of the resistor must be 0.5 to 1 Ω per contact voltage of 1 V. These values, however, vary with the load and the characteristics of the relay. Decide these values from experiments, and take into consideration that the capacitance suppresses spark discharge when the contacts are separated and the resistance limits the current that flows into the load when the circuit is closed again. The dielectric strength of the capacitor must be 200 to 300 V. If the circuit is an AC circuit, use a capacitor with no polarity.

Circuit	Current		Characteristic	Required element
	AC	DC		
Diode method 	No	Yes	The diode connected in parallel with the load changes energy accumulated by the coil into a current, which then flows into the coil so that the current will be converted into Joule heat by the resistance of the inductive load. This time lag, between the moment the circuit is opened and the moment the load is reset, caused by this method is longer than that caused by the CR method.	The reversed dielectric strength value of the diode must be at least 10 times as large as the circuit voltage value. The forward current of the diode must be the same as or larger than the load current. The reversed dielectric strength value of the diode may be two to three times larger than the supply voltage if the surge protector is applied to electronic circuits with low circuit voltages.
Varistor method 	Yes	Yes	The varistor method prevents the imposition of high voltage between the contacts by using the constant voltage characteristic of the varistor. There is time lag between the moment the circuit is opened and the moment the load is reset. If the supply voltage is 24 to 48 V, insert the varistor in parallel with the load. If the supply voltage is 100 to 200 V, insert the varistor between the contacts.	---

SECTION 1
Introduction

This section describes the CPM2C's special features and functions, shows the possible system configurations, and outlines the steps required before operation. Read this section first when using the CPM2C for the first time.

Refer to the *CPM1/CPM1A/CPM2A/CPM2C/SRM1(-V2) Programming Manual* (W353) for details on programming operations.

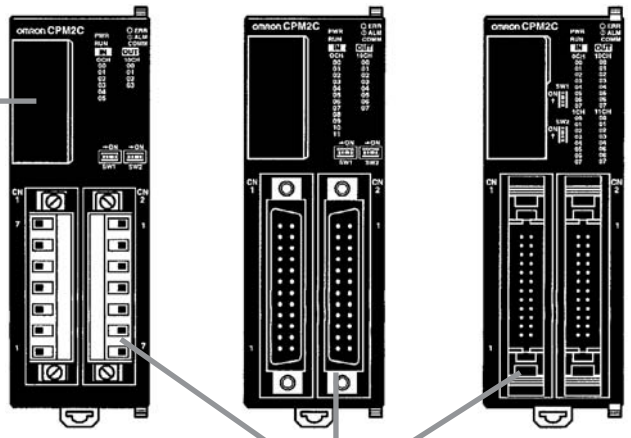
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1-1 CPM2C Features and Functions

1-1-1 CPM2C Features

The CPM2C PCs incorporate a variety of features in a compact Unit, including synchronized pulse control, interrupt inputs, pulse outputs, and a clock function. The CPM2C CPU Unit is a stand-alone Unit that can handle a broad range of machine control applications and it is small enough to be incorporated as the control unit in almost any free-standing machine.

The full complement of communications functions provide communications with personal computers, other OMRON PCs, and OMRON Programmable Terminals. These communications capabilities allow the user to design a low-cost distributed production system.



The communications port can be used simultaneously as two ports: Peripheral and RS-232C.
The peripheral port supports Programming Devices, Host Link, and no-protocol communications.
The RS-232C port supports Host Link, no-protocol (serial), 1:1 Link, and 1:1 NT Link communications.

CPU Units with 10 I/O points (relay or transistor outputs) or with 20 or 32 I/O points (transistor outputs only) are available. Expansion I/O Units can be connected to increase capacity to 192 I/O points.

Basic Functions

CPU Unit Variations

The CPM2C PCs are one-piece PCs with 10, 20, or 32 I/O points in I/O terminals or a built-in connector. There are 3 types of outputs available (relay outputs, sinking transistor outputs, and sourcing transistor outputs). All CPM2C PCs require a 24-VDC power supply.

Expansion I/O Units

Up to 5 Expansion I/O Units can be connected to the CPU Unit to increase the PC's I/O capacity to a maximum of 192 I/O points. There are 23 different Expansion I/O Units available, including Units with 10 I/O points, 24 I/O points, 32 I/O points, 8 input points, 8 output points, 16 inputs points, and 16 output points. The maximum I/O capacity of 192 I/O points is achieved by connecting five 32-point Expansion I/O Units to a CPU Unit with 32 built-in I/O points.

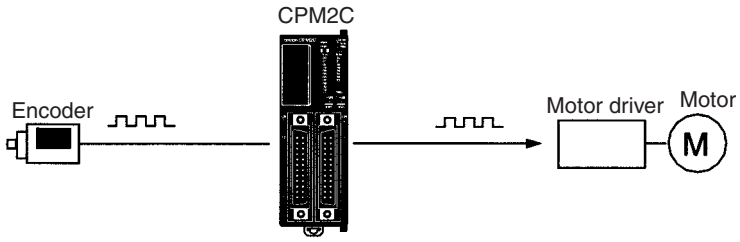
Share Programming Devices

Programming and monitoring for the CPM2C can be performed with CX-Programmer version 2.1 or higher or with a Programming Console. Programming is also possible with the SYSMAC-CPT or SYSMAC Support Software.

Built-in Motor Control Capability

Synchronized Pulse Control (Transistor Outputs Only)

Synchronized pulse control provides an easy way to synchronize the operation of a peripheral piece of equipment with the main equipment. The output pulse frequency can be controlled as some multiple of the input pulse frequency, allowing the speed of a peripheral piece of equipment (such as a supply conveyor) to be synchronized with the speed of the main piece of equipment.



Pulses are output as a fixed multiple of the input frequency.

High-speed Counters and Interrupts

The CPM2C has a two kinds of high-speed counter inputs. The high-speed counter input has a response frequency of 5 or 20 kHz and the interrupt inputs (in counter mode) have a response frequency of 2 kHz.

The single high-speed counter can be used in any one of the four input modes: differential phase mode (5 kHz), pulse plus direction input mode (20 kHz), up/down pulse mode (20 kHz), or increment mode (20 kHz). Interrupts can be triggered when the count matches a set value or falls within a specified range.

The interrupt inputs (counter mode) can be used for incrementing counters or decrementing counters (2 kHz) and trigger an interrupt (executing the interrupt program) when the count matches the target value. Four interrupt inputs can be used in the 20- and 32-point CPU Units and two interrupt inputs can be used in the 10-point CPU Units.

Easy Position Control with Pulse Outputs (Transistor Outputs Only)

CPM2C PCs with transistor outputs have two outputs that can produce 10 Hz to 10 kHz pulses (single-phase outputs).

When used as single-phase pulse outputs, there can be two outputs with a frequency range of 10 Hz to 10 kHz with a fixed duty ratio or 0.1 to 999.9 Hz with a variable duty ratio (0 to 100% duty ratio).

When used as pulse plus direction or up/down pulse outputs, there can be just one output with a frequency range of 10 Hz to 10 kHz.

High-speed Input Capabilities for Machine Control

High-speed Interrupt Input Function

The 20-point and 32-point CPU Units have 4 inputs that can be used as interrupt inputs and the 10-point CPU Units have 2 inputs that can be used as interrupt inputs. These inputs are shared with quick-response inputs and interrupt inputs in counter mode and have a minimum input signal width of 50 μs and response time of 0.3 ms. When an interrupt input goes ON, the main program is stopped and the interrupt program is executed.

Quick-response Input Function

Regardless of the cycle time, the 20-point and 32-point CPU Units have 4 inputs that can be used as quick-response inputs and the 10-point CPU Units have 2 inputs that can be used as quick-response inputs. These inputs are shared with interrupt inputs and interrupt inputs in counter mode; they can reliably read input signals with a signal width as short as 50 μs.

Stabilizing Input Filter Function

The input time constant for all inputs can be set to 1 ms, 2 ms, 3 ms, 5 ms, 10 ms, 20 ms, 40 ms, or 80 ms. The effects of chattering and external noise can be reduced by increasing the input time constant.

Other Functions

Interval Timer Interrupts

The interval timer can be set between 0.5 and 319,968 ms and can be set to generate just one interrupt (one-shot mode) or periodic interrupts (scheduled interrupt mode).

Calendar/Clock

In CPU Units with a built-in clock, the clock (accuracy within 1 minute/month) can be read from the program to show the current year, month, day, day of the week, and time. The clock can be set from a Programming Device (such as a Programming Console) or the time can be adjusted by rounding up or down to the nearest minute.

Long-term Timer

TIML(––) is a long-term timer that accommodates set values up to 99,990 seconds (27 hours, 46 minutes, 30 seconds). When combined with the SECONDS TO HOURS conversion instruction (HMS(––)), the long-term timer provides an easy way to control equipment scheduling.

Greater Data Handling Capability with Expansion Units

Analog I/O Supported

Up to 4 Analog I/O Units can be mounted to the CPM2C. For each Analog I/O Unit mounted to the Unit, 2 analog input points and 1 analog output point are available. By mounting 3 (see note) Analog I/O Units, a maximum of 8 analog input points and 4 analog output points can be made available. (By using a combination of the PID(––) instruction and PWM(––) instruction, time proportional control is possible.)

- The ranges supported for analog input signals are 0 to 5 V, 0 to 10 V, –10 to 10 V, 0 to 20 mA, and 4 to 20 mA, and the resolution is 1/6000 (full scale). The average processing function and power interruption detection function can be used.
- The ranges supported for analog output signals are 1 to 5 V, 0 to 10 V, –10 to 10 V, 0 to 20 mA, and 4 to 20 mA, and the resolution is 1/6000 (full scale).

Note When using the CPM2C-PA201, there is a limit to the number of CPM2C-MAD11 Units that can be connected. This limit ensures that the power consumption of the CPU Unit, Expansion Units, and Expansion I/O Units does not exceed the total power capacity of the service power supply from the Power Supply Unit (24 V x 600 mA = 14.4 W).

- CPU Unit with 4-W power consumption: Connect no more than two CPM2C-MAD11 Units
- CPU Unit with 3-W power consumption: Connect no more than three CPM2C-MAD11 Units

Temperature Sensor Units

Up to 4 Temperature Sensor Units can be mounted to the CPM2C. There are 2 models of Temperature Sensor Unit: One for input from a thermocouple sensor and one for input from a platinum resistance thermometer sensor. There are 2 input points on each Temperature Sensor Unit.

- Thermocouple inputs (and measurement ranges): K (–200 to 1,300°C, 0.0 to 500.0°C), J (–100 to 850°C, 0.0 to 400.0°C).
- Platinum resistance thermometer inputs (and measurement ranges): Pt100 (–200.0 to 650.0°C), JPt100 (–200.0 to 650.0°C).

CompoBus/S I/O Link Units

The CPM2C can be used as a CompoBus/S Slave (with 8 built-in inputs and 8 built-in outputs) by connecting a CompoBus/S I/O Link Unit. Up to 5 CompoBus/S I/O Link Units can be connected to the CPM2C. In addition to the conventional “PC + Remote I/O” type of distributed I/O control, “PC + miniature PC” distributed CPU control is now possible. This means increased

modularization, allowing greater standardization of design, improved suitability to special needs, and easier replacement of malfunctioning Units.

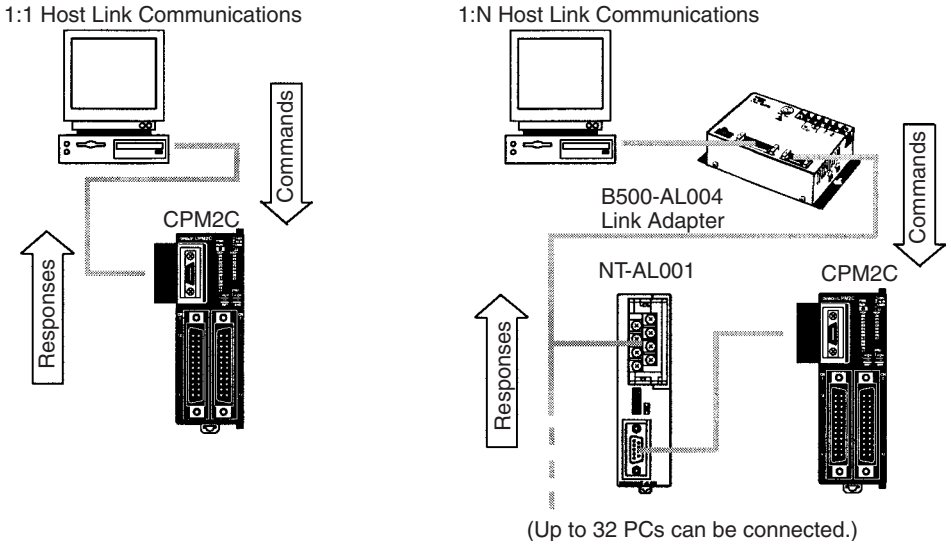
Simple Communications Unit

A Simple Communications Unit can be added to achieve data transfers with general-purpose communications components without preparing communications programs in the PC. Up to 32 communications components can be connected, including a combination of communications components supporting the CompoWay/F protocol along with temperature controllers and Digital Panel Meters supporting the SYSWAY protocol.

Complete Communications Capabilities

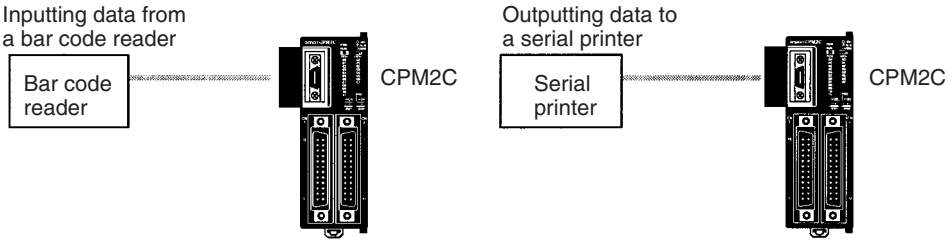
Host Link

A Host Link connection can be made through the PC's communications port used as a RS-232C or peripheral port. A personal computer or Programmable Terminal connected in Host Link mode can be used for operations such as reading/writing data in the PC's I/O memory or reading/changing the PC's operating mode.



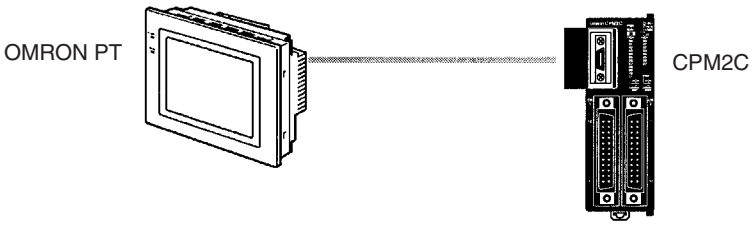
No-protocol Communications

The TXD(48) and RXD(47) instructions can be used in no-protocol mode to exchange data with standard serial devices. For example, data can be received from a bar code reader or transmitted to a serial printer. The serial devices can be connected to the communications port as a RS-232C or peripheral port.



High-speed 1:1 NT Link Communications

In a 1:1 NT Link, an OMRON Programmable Terminal (PT) can be connected directly to the CPM2C. The PT must be connected to the communications port as an RS-232C port (not as a peripheral port).



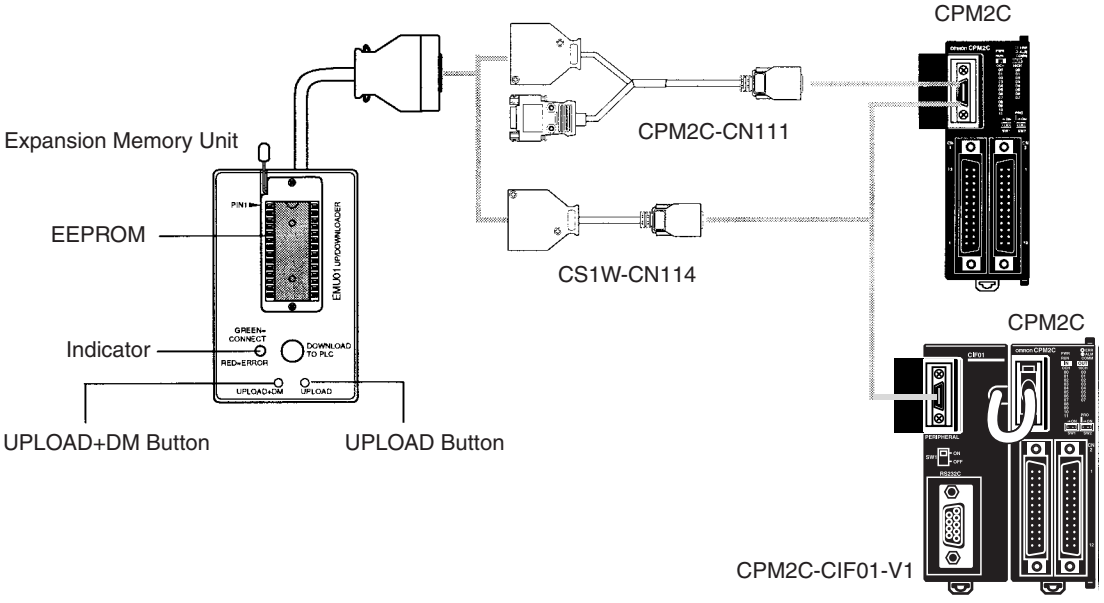
One-to-one PC Link

A CPM2C can be linked directly to another CPM2C, CQM1, CPM1, CPM1A, CPM2A, SRM1(-V2), or a C200HS or C200HX/HG/HE PC. The 1:1 PC Link allows automatic data link connections. The PC must be connected to the communications port as an RS-232C port (not as a peripheral port).



Expansion Memory Unit

The CPM1-EMU01-V1 Expansion Memory Unit is a program loader for small-size or micro PCs. Using the CPM1-EMU01-V1, simple on-site transfer of user programs and data memory is possible with PCs.



1-1-2 Overview of CPM2C Functions

Main function	Variations/Details	
Interrupts	Interrupt inputs 2 inputs in CPU Units with 10 I/O points, 4 inputs in CPU Units with 20/32 I/O points Response time: 0.3 ms	
	Interval timer interrupts 1 input Set value: 0.5 to 319,968 ms Precision: 0.1 ms	Scheduled interrupts One-shot interrupt
High-speed counters	High-speed counter 1 input, see note 1. Differential phase mode (5 kHz) Pulse plus direction input mode (20 kHz) Up/down input mode (20 kHz) Increment mode (20 kHz)	No interrupt Count-check interrupt (An interrupt can be generated when the count equals the set value or the count lies within a preset range.)
	Interrupt inputs (counter mode) 2 inputs in CPU Units with 10 I/O points, 4 inputs in CPU Units with 20/32 I/O points Incrementing counter (2 kHz) Decrementing counter (2 kHz)	No interrupt Count-up interrupt
Pulse outputs	2 outputs: Single-phase pulse output without acceleration/deceleration (See note 2.) 10 Hz to 10 kHz 2 outputs: Variable duty ratio pulse output (See note 2.) 0.1 to 999.9 Hz, duty ratio 0% to 100% 1 output: Pulse output with trapezoidal acceleration/deceleration (See note 2.) Pulse plus direction output, up/down pulse output, 10 Hz to 10 kHz	
Synchronized pulse control	1 point, see notes 1 and 2. Input frequency range: 10 to 500 Hz, 20 Hz to 1 kHz, or 300 Hz to 20 kHz Output frequency range: 10 Hz to 10 kHz	
Quick-response input	2 inputs in CPU Units with 10 I/O points, 4 inputs in CPU Units with 20/32 I/O points Minimum input signal width: 50 μs	
Input time constant	Determines the input time constant for all inputs. (Settings: 1, 2, 3, 5, 10, 20, 40, or 80 ms)	
Calendar/Clock	Shows the current year, month, day of the week, day of the month, hour, minute, and second.	
Expansion Unit functions	Analog I/O functions using CPM2C-MAD11 Analog I/O Unit Two analog inputs: Input range of 0 to 5 V, 1 to 5 V, 0 to 10 V, –10 to 10 V, 0 to 20 mA, or 4 to 20 mA One analog output: Output range of 1 to 5 V, 0 to 10 V, –10 to 10 V, 0 to 20 mA, or 4 to 20 mA	
	Temperature sensing functions using CPM2C-TS001/101 Temperature Sensor Unit Thermocouple input (measurement range):K (–200 to 1,300°C) K (0.0 to 500.0°C) J (–100 to 850°C) J (0.0 to 400.0°C) Platinum resistance thermometer (measurement range):Pt100 (–200.0 to 650.0°C) JPt100 (–200.0 to 650.0°C)	
	CompoBus/S Slave functions using CPM2C-SRT21 CompoBus/S I/O Link Unit Data exchange with the Master Unit via 8 inputs and 8 outputs.	
Simple communications	Simple communications functions using the CPM2C-CIF21 Simple Communications Unit Up to 32 communications components can be connected, including communications components supporting the CompoWay/F protocol and temperature controllers and Digital Panel Meters supporting the SYSWAY protocol. Either RS-422 or RS-485 connections.	

Note

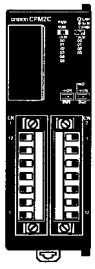
1. This input is shared by the high-speed counter and synchronized pulse control functions.
2. This output is shared by the pulse output and synchronized pulse control functions. These functions can be used with transistor outputs only.

1-2 System Configurations

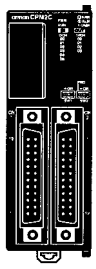
1-2-1 CPU Units

CPU Units with 10 I/O Points

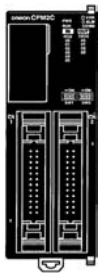
CPU Unit with Relay Outputs via Terminal Block



CPU Unit with Transistor Outputs via Fujitsu-compatible Connector



CPU Unit with Transistor Outputs via MIL Connector

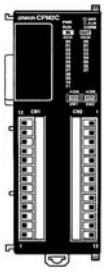


CPU Unit			Inputs	Outputs	Clock	Model
10 I/O points (6 inputs, 4 outputs)	I/O terminal block		6 inputs (24 VDC)	4 relay outputs	No	CPM2C-10CDR-D*
					Yes	CPM2C-10C1DR-D*
	I/O connector	Fujitsu-compatible connector	6 inputs (24 VDC)	4 transistor outputs (sinking)	No	CPM2C-10CDTC-D*
					Yes	CPM2C-10C1DTC-D*
				4 transistor outputs (sourcing)	No	CPM2C-10CDT1C-D*
					Yes	CPM2C-10C1DT1C-D*
		MIL connector	6 inputs (24 VDC)	4 transistor outputs (sinking)	No	CPM2C-10CDTM-D
					Yes	CPM2C-10C1DTM-D
				4 transistor outputs (sourcing)	No	CPM2C-10CDT1M-D
					Yes	CPM2C-10C1DT1M-D

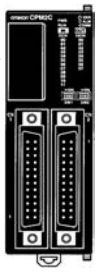
Note The function of the SW2 is different from that described in this manual for all Units marked with an asterisk in the above table with lot numbers of 3180O (August 2000) or earlier. Refer to *1-7 Changes in SW2* for details.

CPU Units with 20 I/O Points

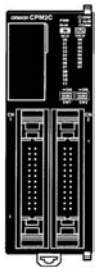
CPU Unit with Relay Outputs via Terminal Block



CPU Unit with Transistor Outputs via Fujitsu-compatible Connector



CPU Unit with Transistor Outputs via MIL Connector

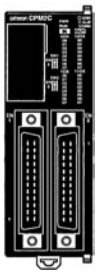


CPU Unit			Inputs	Outputs	Clock	Model
20 I/O points (12 inputs, 8 outputs)	I/O terminal block		12 inputs (24 VDC)	8 relay outputs	No	CPM2C-20CDR-D
					Yes	CPM2C-20C1DR-D
	I/O connector	Fujitsu-compatible connector	12 inputs (24 VDC)	8 transistor outputs (sinking)	No	CPM2C-20CDTC-D*
					Yes	CPM2C-20C1DTC-D*
				8 transistor outputs (sourcing)	No	CPM2C-20CDT1C-D*
					Yes	CPM2C-20C1DT1C-D*
		MIL connector	12 inputs (24 VDC)	8 transistor outputs (sinking)	No	CPM2C-20CDTM-D
					Yes	CPM2C-20C1DTM-D
				8 transistor outputs (sourcing)	No	CPM2C-20CDT1M-D
					Yes	CPM2C-20C1DT1M-D

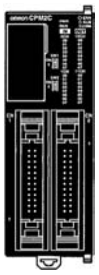
Note The function of the SW2 is different from that described in this manual for all Units marked with an asterisk in the above table with lot numbers of 3180O (August 2000) or earlier. Refer to *1-7 Changes in SW2* for details.

CPU Units with 32 I/O Points

CPU Unit with Transistor Outputs via Fujitsu-compatible Connector



CPU Unit with Transistor Outputs via MIL Connector



CPU Unit			Inputs	Outputs	Clock	Model
32 I/O points (16 inputs, 16 outputs)	I/O connector	Fujitsu-compatible connector	16 inputs (24 VDC)	16 transistor outputs (sinking)	No	CPM2C-32CDTC-D
				16 transistor outputs (sourcing)	No	CPM2C-32CDT1C-D
		MIL connector	16 inputs (24 VDC)	16 transistor outputs (sinking)	No	CPM2C-32CDTM-D
				16 transistor outputs (sourcing)	No	CPM2C-32CDT1M-D

1-2-2 Power Supply Unit

AC Power Supply Unit

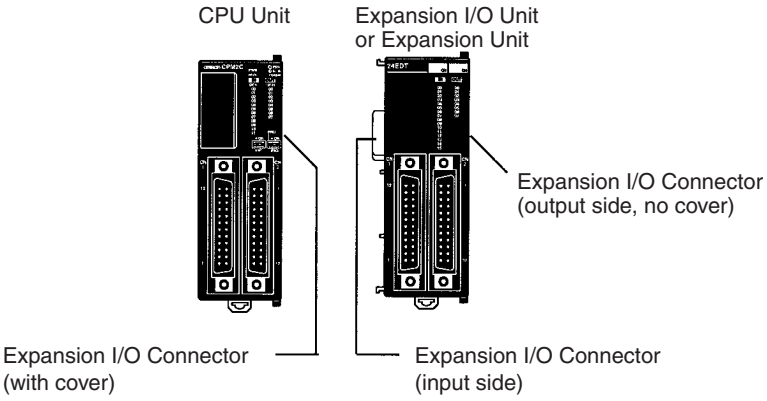


Name	Ratings	Model
AC Power Supply Unit	100 to 240 VAC input 24 VDC, 600 mA output	CPM2C-PA201

1-2-3 CPU Unit, Expansion Units, and Expansion I/O Units

A series of up to 5 Expansion I/O Units or Expansion Units can be connected to the expansion I/O connector on the CPU Unit.

There are five types of Units available: Expansion I/O Units, an Analog I/O Unit, Temperature Sensor Units, a CompoBus/S I/O Link Unit, and a Simple Communications Unit.



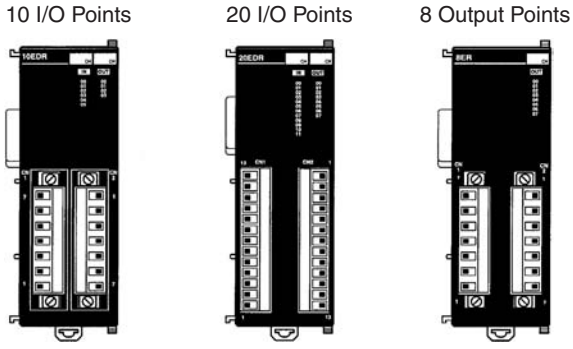
A PC with 192 I/O points (the maximum) can be assembled by connecting five Expansion I/O Units to a CPU Unit with 32 I/O points.

CPM2C-32CDTC-D (16 inputs, 16 outputs) 1 Unit + CPM2C-32EDTC (16 inputs, 16 outputs) 5 Units = 96 inputs, 96 outputs

Note Be sure that the power supply requirements of the CPU Unit, Expansion Units, and Expansion I/O Units do not exceed the available capacity. Only three Expansion I/O Units or Expansion Units can be connected when the NT-AL001 Adapter is connected to the communications port (as a RS-232C port).

Expansion I/O Units

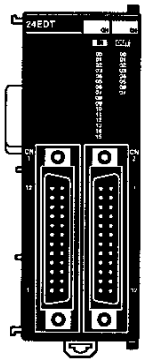
Units with Relay Outputs (via Terminal Block)



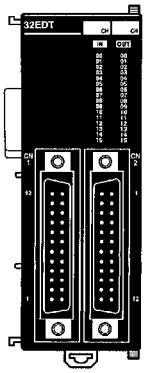
Unit I/O	Inputs	Outputs	Model
10 I/O points	6 inputs (24 VDC)	4 relay outputs	CPM2C-10EDR
20 I/O points	12 inputs (24 VDC)	8 relay outputs	CPM2C-20EDR
8 output points	---	8 relay outputs	CPM2C-8ER

Units with Transistor Outputs via Fujitsu-compatible Connector

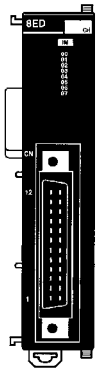
24 I/O Points



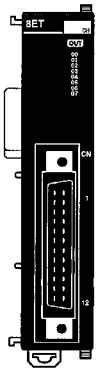
32 I/O Points



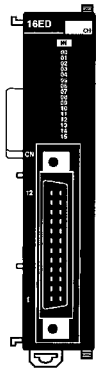
8 Input Points



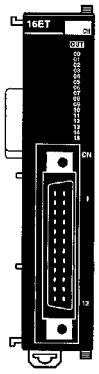
8 Output Points



16 Input Points



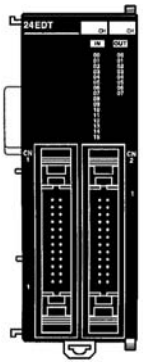
16 Output Points



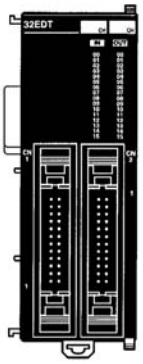
Unit I/O	Inputs	Outputs	Model
24 I/O points	16 inputs (24 VDC)	8 transistor outputs (sinking)	CPM2C-24EDTC
		8 transistor outputs (sourcing)	CPM2C-24EDT1C
32 I/O points	16 inputs (24 VDC)	16 transistor outputs (sinking)	CPM2C-32EDTC
		16 transistor outputs (sourcing)	CPM2C-32EDT1C
8 input points	8 inputs (24 VDC)	---	CPM2C-8EDC
16 input points	16 inputs (24 VDC)	---	CPM2C-16EDC
8 output points	---	8 transistor outputs (sinking)	CPM2C-8ETC
	---	8 transistor outputs (sourcing)	CPM2C-8ET1C
16 output points	---	16 transistor outputs (sinking)	CPM2C-16ETC
	---	16 transistor outputs (sourcing)	CPM2C-16ET1C

Units with Transistor Outputs via MIL Connector

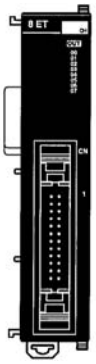
24 I/O Points



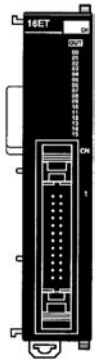
32 I/O Points



8 Input or
8 Output Points



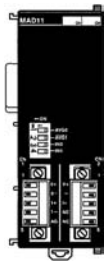
16 Input or
16 Output Points



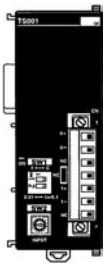
Unit I/O	Inputs	Outputs	Model
24 I/O points	16 inputs (24 VDC)	8 transistor outputs (sinking)	CPM2C-24EDTM
		8 transistor outputs (sourcing)	CPM2C-24EDT1M
32 I/O points	16 inputs (24 VDC)	16 transistor outputs (sinking)	CPM2C-32EDTM
		16 transistor outputs (sourcing)	CPM2C-32EDT1M
8 input points	8 inputs (24 VDC)	---	CPM2C-8EDM
16 input points	16 inputs (24 VDC)	---	CPM2C-16EDM
8 output points	---	8 transistor outputs (sinking)	CPM2C-8ETM
	---	8 transistor outputs (sourcing)	CPM2C-8ET1M
16 output points	---	16 transistor outputs (sinking)	CPM2C-16ETM
	---	16 transistor outputs (sourcing)	CPM2C-16ET1M

Expansion Units

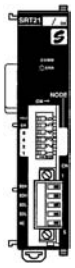
CPM2C-MAD11
Analog I/O Unit



CPM2C-TS001
Temperature Sensor Unit



CPM2C-SRT21
CompoBus/S I/O Link Unit



CPM2C-CIF21
Simple Communications Unit

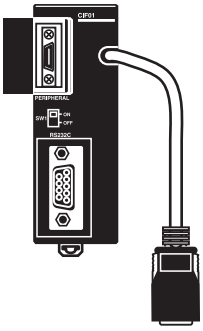


Unit		Max. number of Units	Inputs	Outputs	Model
Analog I/O Unit	2 analog inputs 1 analog output	4	2 points, 2 words allocated	1 point, 1 word allocated	CPM2C-MAD11
Temperature Sensor Unit	2 thermocouple inputs	4	2 points, 2 words allocated	---	CPM2C-TS001
	2 platinum resistance thermometer inputs		2 points, 2 words allocated	---	CPM2C-TS101
CompoBus/S I/O Link Unit	8 input points and 8 output points for the built-in outputs and inputs of the Master Unit	5	8 points, 1 word allocated (Inputs from the Master)	8 points, 1 word allocated (Outputs to the Master)	CPM2C-SRT21
Simple Communications Unit (See notes 1 and 2.)		---			CPM2C-CIF21

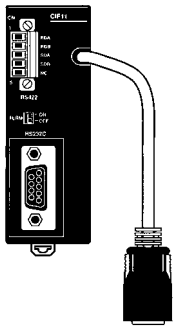
Note
1. Do not use the CPM2C-CIF21 Simple Communications Unit with an Units other than CPM2C Units.
2. The CPM2C-CIF21 Simple Communications Unit is due for release in December 2000.

Adapter Units

Peripheral/RS-232C Adapter Unit



RS-422/232C Adapter Unit



Unit	Conversion	Model
Peripheral/RS-232C Adapter Unit	CPU Unit's communications port → Peripheral port + RS-232C port	CPM2C-CIF01-V1
RS-422/RS-232C Adapter Unit	CPU Unit's communications port → RS422 port + RS-232C port	CPM2C-CIF11

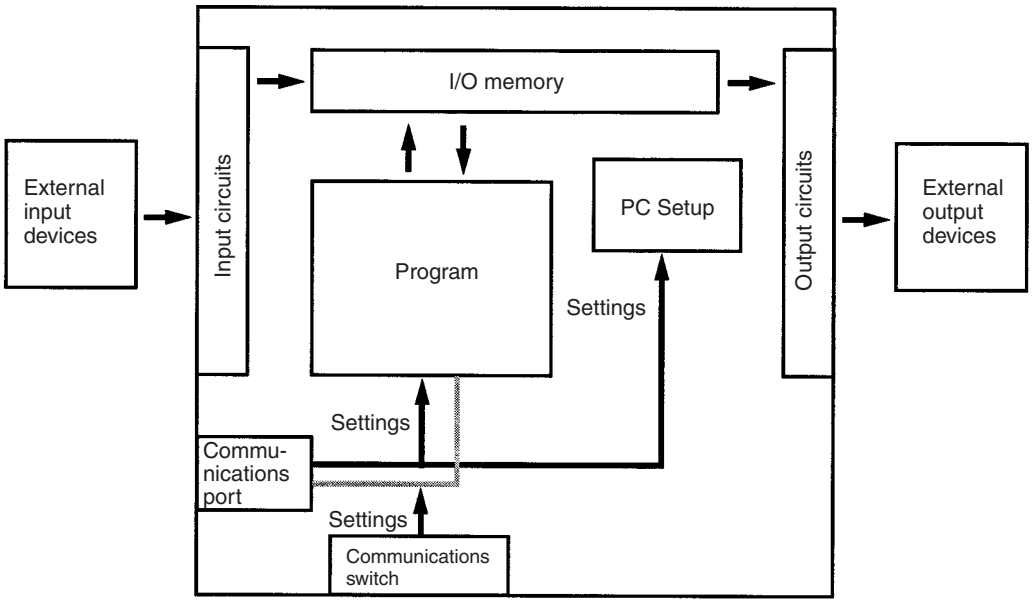
Note
1. The CPM2C-CIF01-V1 cannot be used with any PC model other than the CPM2C. A CPM2C-CIF11 or another CPM2C-CIF01-V1 cannot be connected onto a CPM2C-CIF01-V1.

2. Although a CPM2C-CN111 can be connected to a CPM2C-CIF01-V1, it is not possible to use the peripheral port and the RS-232C port on the CPM2C-CN111 simultaneously. If an attempt is made to use both ports simultaneously, communications will not be performed properly and incorrect operation may result.

1-3 Structure and Operation

1-3-1 CPU Unit Structure

The following diagram shows the internal structure of the CPU Unit.



I/O Memory

The program reads and writes data in this memory area during execution. Part of the I/O memory contains the bits that reflect the status of the PC's inputs and outputs. Parts of the I/O memory are cleared when the power is turned ON and other parts are retained.

Note Refer to *Section 3 Memory Areas* in the *Programming Manual* (W353) for more details on I/O memory.

Program

This is the program written by the user. The CPM2C executes the program cyclically. (Refer to *1-3-5 Cyclic Operation and Interrupts* for details.)

The program can be divided broadly into two parts: the "main program" that is executed cyclically and the "interrupt programs" that are executed only when the corresponding interrupt is generated.

PC Setup

The PC Setup contains various startup and operating parameters. The PC Setup parameters can be changed from a Programming Device only; they cannot be changed from the program.

Some parameters are accessed only when PC's power supply is turned ON and others are accessed regularly while the power is ON. It will be necessary to turn the power OFF and then ON again to enable a new setting if the parameter is accessed only when the power is turned ON.

Note Refer to *Section 1 PC Setup* in the *Programming Manual* (W353) for more details.

Communications Switch

The Communications Switch controls the communications settings for the peripheral port and the RS-232C port.

1-3-2 Operating Modes

CPM2C CPU Units have 3 operating modes: PROGRAM, MONITOR, and RUN.

PROGRAM Mode

The program cannot be executed in PROGRAM mode. This mode is used to perform the following operations in preparation for program execution.

- Changing initial/operating parameters such as those in the PC Setup
- Writing, transferring, or checking the program
- Checking wiring by force-setting and force-resetting I/O bits

⚠ **Caution** The PC continues to refresh I/O bits even if the PC is in PROGRAM mode, so devices connected to output points on the CPU Unit, Expansion Units, or Expansion I/O Units may operate unexpectedly if the corresponding output bit is turned ON by changing the contents of I/O memory.

MONITOR Mode

The program is executed in MONITOR mode and the following operations can be performed from a Programming Device. In general, MONITOR mode is used to debug the program, test operation, and make adjustments.

- Online editing
- Monitoring I/O memory during operation
- Force-setting/force-resetting I/O bits, changing set values, and changing present values during operation

RUN Mode

The program is executed at normal speed in RUN mode. Operations such as online editing, force-setting/force-resetting I/O bits, and changing set values/present values cannot be performed in RUN mode, but the status of I/O bits can be monitored.

1-3-3 Operating Mode at Startup

The operating mode of the CPM2C when the power is turned ON depends upon the PC Setup settings and the Programming Console's mode switch setting if a Programming Console is connected.

PC Setup setting			Operating mode	
Word	**Bits**	**Setting**	**Programming Device connected**	**Programming Device not connected**
DM 6600	08 to 15	00 (Hex)	Programming Console: Mode set on Programming Console mode switch Other Programming Device: PROGRAM mode	RUN mode
		01 (Hex)	Startup mode is the same as the operating mode before power was interrupted.	
		02 (Hex)	Startup mode is determined by bits 00 to 07.	
	00 to 07	00 (Hex)	PROGRAM mode	
		01 (Hex)	MONITOR mode	
		02 (Hex)	RUN mode	

Note 1. The default setting for DM 6600, bits 06 to 15 is 00 Hex, i.e., to start with the mode set on the Programming Console's mode switch. If a Programming Device is not connected to the peripheral connector on the CPU Unit, the CPU Unit will start in RUN mode as soon as power is turned ON. Be sure that adequate precautions are taken to ensure safety.

2. The setting of SW2 will affect the startup operating mode for all Units with lot numbers of 3180O (August 2000) or earlier. Refer to *1-7 Changes in SW2* for details.

1-3-4 PC Operation at Startup

Time Required for Initialization

The time required for startup initialization depends on several factors, such as the operating conditions (including power supply voltage, system configuration, and ambient temperature) and the program contents.

Power OFF Operation

Minimum Power Supply Voltage

The PC will stop and all outputs will be turned OFF if the power supply voltage falls below 85% of the rated value.

Momentary Power Interruption

A power interruption will not be detected and CPU Unit operation will continue if the power interruption lasts less than 2 ms.

A power interruption may or may not be detected for power interruptions somewhat longer than 2 ms.

When a power interruption is detected, the CPU Unit will stop operating and all outputs will be turned OFF.

Automatic Reset

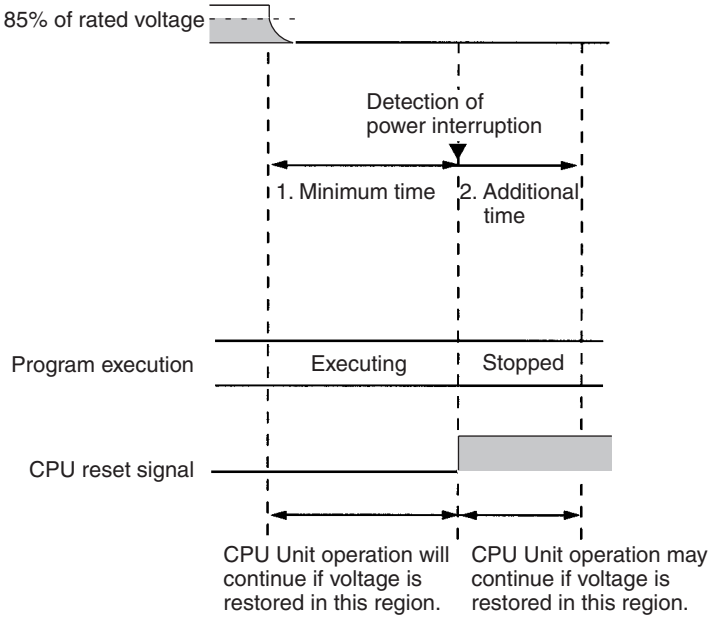
Operation will restart automatically when the power supply voltage is restored to more than 85% of the rated voltage.

Timing Chart of Power OFF Operation

The power interruption detection time is the time required for a power interruption to be detected after the power supply voltage drops below 85% of the rated value.

1,2,3... 1. Minimum power interruption detection time
Power interruptions that are shorter than 2 ms will not be detected.

2. Undetermined additional time
   Power interruptions only slightly longer than the minimum power interruption time may not be detected.

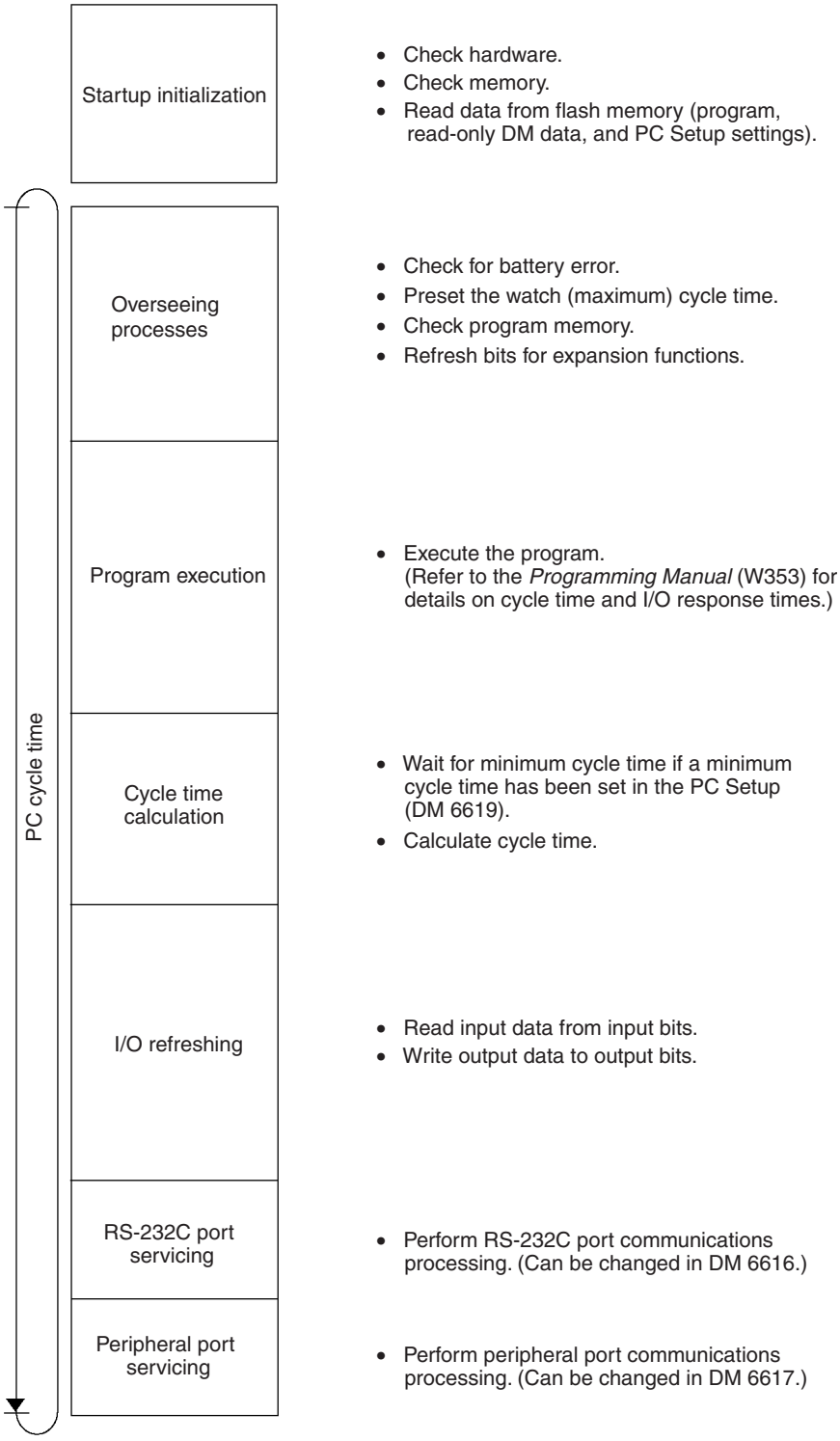


Note If the power supply voltage fluctuates around 85% of the PC's rated voltage, PC operation may stop and restart repeatedly. When repeated stopping and starting will cause problems with the controlled system, set up a protective circuit such as a circuit that shuts OFF the power supply to sensitive equipment until the power supply voltage returns to the rated value.

1-3-5 Cyclic Operation and Interrupts

Basic CPU Operation

Initialization processing is performed when the power is turned ON. If there are no initialization errors, the overseeing processes, program execution, I/O refreshing, and communications port servicing are performed repeatedly (cyclically).



The cycle time can be read from a Programming Device.

AR 14 contains the maximum cycle time and AR 15 contains the present cycle time in multiples of 0.1 ms.

The cycle time will vary slightly depending on the processing being performed in each cycle, so the calculated cycle time will not always match the actual cycle time.

Program Execution in Cyclic Operation

The following diagram shows the cyclic operation of the CPM2C when the program is being executed normally.

Normally, the results of program execution are transferred to I/O memory just after program execution (during I/O refreshing), but IORF(97) can be used to refresh a specified range of I/O words during program execution. The specified range of I/O words will be refreshed when IORF(97) is executed.

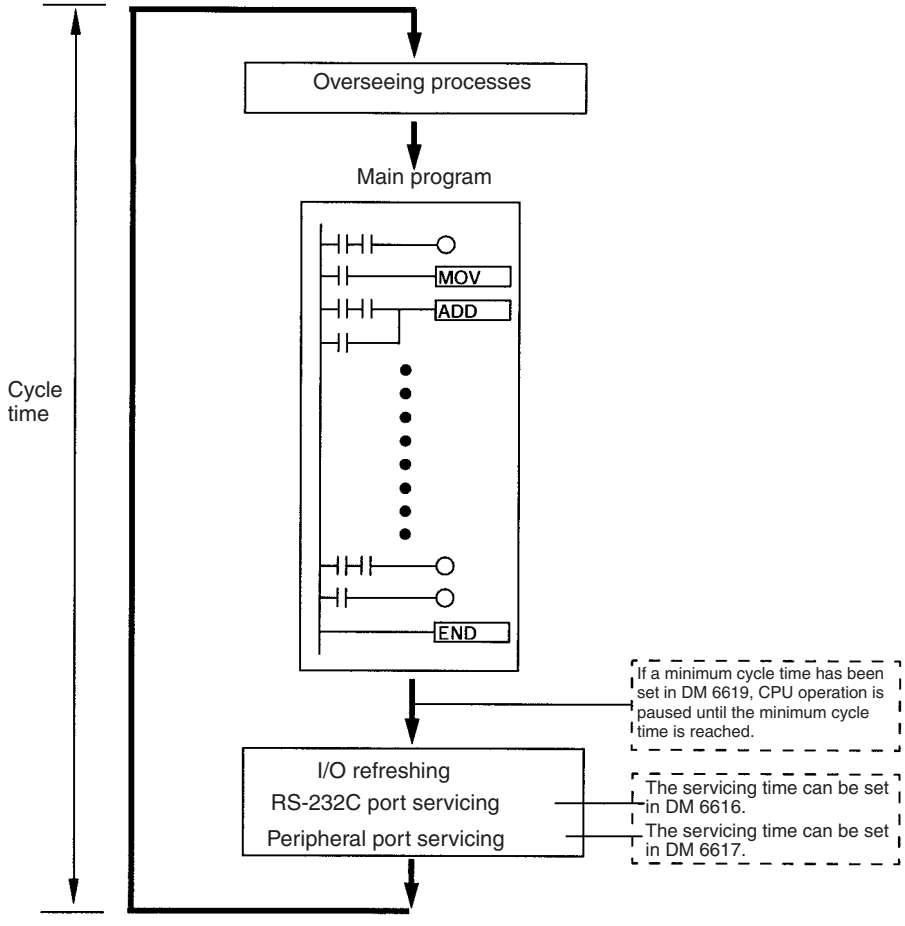
The cycle time is the sum of the time required for program execution, I/O refreshing, and communications port servicing.

A minimum cycle time (1 to 9,999 ms) can be set in the PC Setup (DM 6619). When a minimum cycle time has been set, CPU operation is paused after program execution until the minimum cycle time is reached. CPU operation will not be paused if the actual cycle time is longer than the minimum cycle time set in DM 6619.

Note A fatal error will occur and PC operation will stop if a maximum cycle time has been set in the PC Setup (DM 6618) and the actual cycle time exceeds that setting.

The default settings for RS-232C and peripheral port servicing are 5% each of the cycle time, but these settings can be changed (between 0% and 99%) in the PC Setup. The RS-232C port's setting is in DM 6616 and the peripheral port's setting is in DM 6617.

Refer to *Section 7 PC Operations and Processing Time* in the *Programming Manual* (W353) for more details and precautions on the cycle time.



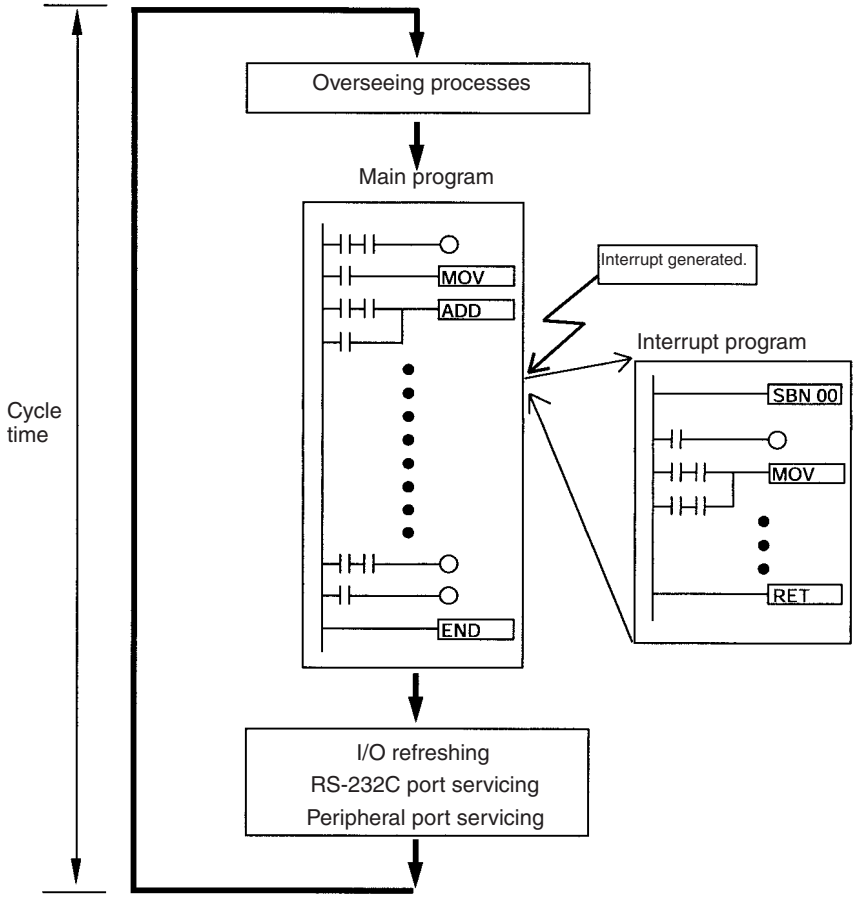
Interrupt Program Execution

When an interrupt is generated during execution of the main program, main program execution is interrupted immediately and the interrupt program is executed. The following diagram shows the cyclic operation of the CPM2C when an interrupt program is executed.

Normally, the results of interrupt program execution are transferred to I/O memory just after program execution (during I/O refreshing), but IORF(97) can be used to refresh a specified range of I/O words during execution of the interrupt program. The specified range of I/O words will be refreshed when IORF(97) is executed.

The normal cycle time is extended by the time required for execution of the interrupt program.

Refer to *Section 7 PC Operations and Processing Time* in the *Programming Manual* (W353) for more details and precautions on the cycle time.



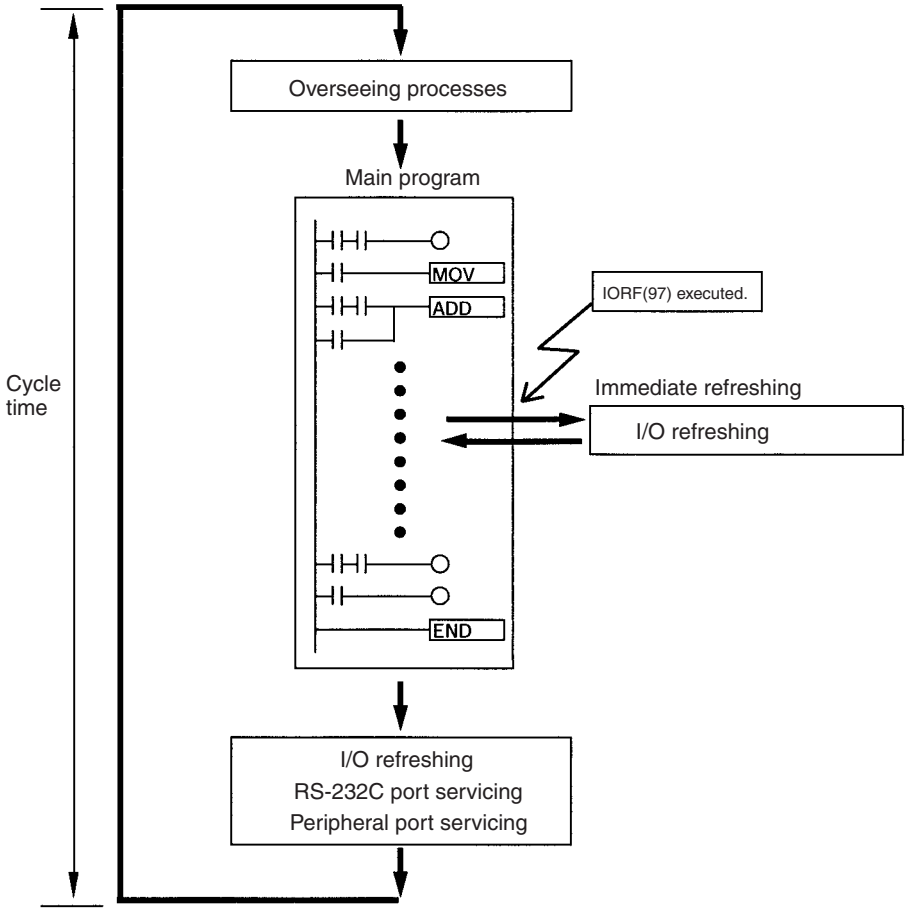
⚠ **Caution** Although IORF(97) can be used in interrupt subroutines, you must be careful of the interval between IORF(97) executions. If IORF(97) is executed too frequently, a fatal system error may occur (FALS 9F), stopping operation. The interval between executions of IORF(97) should be at least 1.3 ms + total execution time of the interrupt subroutine.

Immediate Refreshing

IORF(97) can be executed in the program to refresh a specified range of I/O words. The specified I/O words will be refreshed when IORF(97) is executed.

IORF(97) can be used to refresh I/O from the main program or the interrupt program.

When IORF(97) is used, the cycle time is extended by the time required to refresh the specified I/O words.



1-4 Functions Listed by Usage

Machine Control Functions

Usage		Function	Refer to
Receive high-speed count inputs (For example, calculating length or position with an encoder).	Max. count frequency of 2 kHz (single-phase)	Use interrupt input (counter mode) to read the present value without interrupts.	W353
	Max. count frequency of 5 kHz (differential phase) or 20 kHz (single-phase)	Use high-speed counter to read the present value without interrupts.	
Generate a pulse output based on a multiple of an input pulse to synchronize control of a peripheral process with the main process.		Pulse synchronization	
The multiple for the peripheral process (such as tool feed rate) can be changed during operation by calculating the multiple from another input value (such as an encoder) in the peripheral process. This method can be used to change the process for different products or models without stopping the equipment.			
Reliably receive input pulses with an ON-time shorter than the cycle time (such as inputs from a photomicrosensor).		Quick-response input function	

Usage		Function	Refer to
Interrupt functions	Execute a special process very quickly when an input goes ON. (For example, operating a cutter when an interrupt input is received from a Proximity Switch or Photoelectric Switch.)	Interrupt input (interrupt input mode)	W353
	Count input ON pulses and execute a special process very quickly when the count reaches the preset value. (For example, stopping the supply feed when a preset number of workpieces have passed through the system.)	Interrupt input (counter mode)	
	Execute a special process at a preset count value. (For example, cutting material very precisely at a given length.)	High-speed counter interrupt generated when the count matches the set value.	
	Execute a special process when the count is within a preset range. (For example, sorting material very quickly when it is within a given length range.)	High-speed counter interrupt generated when the count is within the set range.	
	Execute a special process when a timer times out. (For example, stopping a conveyor at very precise time (independent of the cycle time) after the workpiece is detected.)	Interval timer interrupt (One-shot mode)	
	Repeat a special process at regular intervals. (For example, the speed of a sheet feeder can be monitored by measuring the input signal from an encoder at regular intervals and calculating the speed.)	Interval timer interrupt (Scheduled interrupt mode)	
Perform simple positioning by outputting pulses to a motor driver that accepts pulse-train inputs.		Pulse output function	
Receive an analog input and output an analog output.		Analog I/O Unit (Connect the Analog I/O Unit to the CPU Unit.)	
Receive temperature sensor input directly at the PC.		Temperature Sensor Unit (Connect the Temperature Sensor Unit to the CPU Unit.)	
Reduce required wiring, space, and PC load by controlling equipment with a few low-capacity PCs dispersed near the equipment rather than a single, large, centralized PC. (Create a remote I/O link with a CompoBus/S Master and CompoBus/S Slaves.)		CompoBus/S I/O Link Unit (Connect the CompoBus/S I/O Link Unit to the CPU Unit.)	
Obtain data from SYSWAY-compatible temperature controllers, digital panel meters, or CompoWay/F-compatible general-purpose communications components.		Simple Communications Unit (Connect the Simple Communications Unit to the CPU Unit.)	page 221

Basic Functions

Usage	Function	Refer to
Set the cycle time to a fixed interval.	Set a minimum (fixed) cycle time in the PC Setup.	W353
Stop PC operation when the cycle time exceeds a maximum setting.	Set a maximum (watch) cycle time in the PC Setup.	
Keep all outputs ON when PC operation stops.	Turn ON the IOM Hold Bit (SR 25212).	
Retain the contents of I/O memory when starting operation.	Turn ON the IOM Hold Bit (SR 25212).	
Retain the contents of I/O memory when the PC is turned ON.	Turn ON the IOM Hold Bit (SR 25212) and set the PC Setup (DM 6601) so that the status of the IOM Hold Bit is maintained at startup.	
Eliminate effects from chattering and external noise.	Set a longer input time constant in the PC Setup.	

Maintenance Functions

Usage	Function	Refer to
Record data with time-stamp.	Clock/calendar function	W353
Establish user-defined errors for desired input conditions. (Fatal and non-fatal errors can be defined.)	FAL(06) defines non-fatal errors. (PC operation continues.) FALS(07) defines fatal errors. (PC operation stops.)	
Read the number of power interruptions.	The number of power interruptions is stored in AR 23.	
Set the startup operating mode.	Set the startup operating mode in the PC Setup (DM 6600).	

Communications Functions

Usage	Function	Refer to
Read/write I/O memory data and change the operating mode from a host computer.	Host Link communications (Set the communications mode to Host Link in the PC Setup.)	W353
Connect to a serial device such as a bar code reader or serial printer.	No-protocol communications (Set the communications mode to no-protocol in the PC Setup.)	
Make a high-speed connection with an OMRON Programmable Terminal.	1:1 NT Link (Set the communications mode to 1:1 NT Link in the PC Setup.)	
Make a PC-PC data link connection with another CPM2C, or a CPM1, CPM1A, CPM2A, SRM1, CQM1, C200HS, or C200HX/HG/HE PC.	1:1 PC Link (Set the communications mode to 1:1 PC Link in the PC Setup.)	
Connect a Programming Console.	Connect the Programming Console to the peripheral port.	page 152
Connect a personal computer running SYSMAC Support Software (SSS) or SYSMAC-CPT Support Software.	The computer can be connected to the peripheral port or RS-232C port.	page 289
Monitor equipment with a Programmable Terminal and program the PC with a Programming Device.	The RS-232C port and peripheral port can be used simultaneously via the communications port.	W353 page 289, page 152

1-5 Comparison with the CPM1A and CPM2A

Item		CPM2C	CPM2A	CPM1A
Instruction set	Basic instructions	14	Same as CPM2C.	Same as CPM2C.
	Special instructions	105 instructions, 185 variations	Same as CPM2C.	79 instructions, 139 variations
Instruction execution times	Basic instructions	LD: 0.64 μs	Same as CPM2C.	LD: 1.72 μs
	Special instructions	MOV(21): 7.8 μs	Same as CPM2C.	MOV(21): 16.3 μs

Item			CPM2C	CPM2A	CPM1A
Program capacity			4,096 words	Same as CPM2C.	2,048 words
Maximum number of I/O points	Stand-alone CPU Unit		10, 20, or 32 points	30, 40, or 60 points	10, 20, 30, or 40 points
	CPU Unit with Expansion I/O Units		170, 180, or 192 points max.	90, 100, or 120 points max.	90 or 100 points max.
Expansion Units and Expansion I/O Units	Maximum number of Units		A maximum of 5 Units can be connected to any of the CPU Units.	A maximum of 3 Units can be connected to any of the CPU Units.	A maximum of 3 Units can be connected to the 30-point and 40-point CPU Units.
	Available models		Expansion I/O Units, Analog I/O Unit, Temperature Sensor Unit, CompoBus/S I/O Link Unit, and Simple Communications Unit	Same as CPM2C.	Same as CPM2C.
I/O memory	Input bits		IR 00000 to IR 00915	Same as CPM2C.	Same as CPM2C.
	Output bits		IR 01000 to IR 01915	Same as CPM2C.	Same as CPM2C.
	Work bits		928 bits: IR 02000 to IR 04915, IR 20000 to IR 22715	Same as CPM2C.	512 bits: IR 20000 to IR 23115
	SR (Special Relay) area		448 bits: SR 22800 to SR 25515	Same as CPM2C.	384 bits: SR 23200 to SR 25515
	TR (Temporary Relay) area		8 bits: TR0 to TR7	Same as CPM2C.	Same as CPM2C.
	HR (Holding Relay) area		320 bits: HR 0000 to HR 1915		Same as CPM2C.
	AR (Auxiliary Relay) area		384 bits: AR 0000 to AR 2315	Same as CPM2C.	256 bits: AR 0000 to AR 1515
	LR (Link Relay) area		256 bits: LR 0000 to LR 1515	Same as CPM2C.	Same as CPM2C.
	Timer/Counter area		256 bits: TIM/CNT 000 to TIM/CNT 255	Same as CPM2C.	128 bits: TIM/CNT 0 to TIM/CNT 127
	DM (Data Memory) area	Read/write area	2,048 words (DM 0000 to DM 2047)	Same as CPM2C.	1,024 words (DM 0000 to DM 1023)
		Read-only area	456 words (DM 6144 to DM 6599)	Same as CPM2C.	Same as CPM2C.
		PC Setup	56 words (DM 6600 to DM 6655)	Same as CPM2C.	Same as CPM2C.
Memory backup	Program area, read-only DM area (including PC Setup)		Flash memory backup	Same as CPM2C.	Same as CPM2C.
	Read/write DM area, HR area, AR area, and counters		CPU Unit with clock: Internal battery backup (2-year lifetime at 25°C, replaceable) CPU Unit without clock: Capacitor backup (10-day backup at 25°C) or optional battery backup (5 years at 25°C, replaceable)	Internal battery backup (5-year lifetime at 25°C, replaceable)	Capacitor backup (20-day backup at 25°C)
Interrupt inputs (interrupt input mode)			4 (20-/32-point CPU Unit), 2 (10-point CPU Unit)	4	4

Item		CPM2C	CPM2A	CPM1A
Interrupt inputs (counter mode)	Counter mode	Incrementing counter Decrementing counter	Same as CPM2C.	Decrementing counter
	Counter upper limit	2 kHz	Same as CPM2C.	1 kHz
	SR 244 to SR 247	Contains counter PV.	Same as CPM2C.	Contains counter PV–1.
	Method(s) to read counter PV	Read SR 244 to SR 247. Execute PRV(62).	Same as CPM2C.	Read SR 244 to SR 247. (Counter PV – 1)
	Method to change counter PV	Execute INI(61).	Same as CPM2C.	Not supported.
Interval timer	One-shot mode	Yes	Same as CPM2C.	Same as CPM2C.
	Scheduled interrupt mode	Yes	Same as CPM2C.	Same as CPM2C.

Item		CPM2C/CPM2A	CPM1A
Quick-response inputs	Setting the quick-response function	PC Setup	PC Setup and INT(89) (Unmask interrupt input.)
	INT(89) (Mask)	Not supported (ignored)	Supported.
	INT(89) (Read mask)	Reads mask status.	Reads result of mask setting.
	INT(89) (Clear)	Not supported (ignored)	Supported.
	Minimum pulse width	50 μs min.	200 μs min.
High-speed counter	Count mode	Differential-phase (up/down) mode Pulse plus direction mode Up/down pulse mode Increment mode	Differential-phase (up/down) mode Increment mode
	Max. counter frequency	5 kHz in differential-phase (up/down) mode 20 kHz in pulse plus direction mode, up/down pulse mode, and increment mode	2.5 kHz in differential-phase (up/down) mode, 5 kHz in increment mode
	Counter PV range	–8,388,608 to 8,388,607 in differential-phase (up/down) mode, pulse plus direction mode, and up/down pulse mode 0 to 16,777,215 in increment mode	–32,768 to 32,767 in differential-phase (up/down) mode 0 to 65,535 in increment mode
	Check when registering target value match table	Same direction, same SV not possible	Same direction, same SV possible
	Method used to reference the target value match interrupt table	Comparison of all values in the table, regardless of order of appearance in table	Comparison in order of appearance in table
	Reading range-comparison results	Check AR 1100 to AR 1107 or execute PRV(62).	Check AR 1100 to AR 1107.
	Reading status	Check AR 1108 (comparison in progress), check AR 1109 (high-speed counter PV overflow/underflow), or execute PRV(62).	---
Pulse synchronization		Supported.	Not supported.

Item		CPM2C/CPM2A	CPM1A
Pulse output control	Trapezoidal acceleration/ deceleration	Supported with ACC(—). The initial frequency can be set.	Not supported.
	PWM(—) output	Supported.	Not supported.
	Number of simultaneous pulse outputs	2 max.	1 max.
	Maximum frequency	10 kHz max.	2 kHz max.
	Minimum frequency	10 Hz	20 Hz
	Pulse output quantity	–16,777,215 to 16,777,215	0 to 16,777,215
	Direction control	Supported.	Not supported.
	Positioning to absolute positions	Supported.	Not supported.
	Bit status while pulses are being output	No effect	Turned ON/OFF by pulse output
	Reading PV	Read SR 228 through SR 231 or execute PRV(62).	Not supported.
	Resetting PV	Supported.	Not supported.
	Status outputs	Accelerating/decelerating PV overflow/underflow Pulse quantity set Pulse output completed Pulse output status	Pulse output status

Item		CPM2C	CPM2A	CPM1A
Analog controls		None	2	2
Clock function		Internal or none	Internal	None
	Words containing time info.	AR 17 to AR 21	AR 17 to AR 21	---
Analog I/O		Analog I/O Units can be connected.	Same as CPM2C.	Same as CPM2C.
Temperature monitoring		The CPU Unit can receive temperature sensor input from either thermocouples or platinum resistance thermometers.	Same as CPM2C.	Same as CPM2C.
CompoBus/S communications		A CompoBus/S I/O Link Unit can be connected to provide CompoBus/S Slave functions.	Same as CPM2C.	Same as CPM2C.
Communications switch		This switch determines whether communications are governed by the standard settings or PC Setup settings. Also sets the Programming Device connection. (See note.)	This switch determines whether communications are governed by the standard settings or PC Setup settings.	None

Note The setting of SW2 will affect the operating mode for all Units with lot numbers of 3180O (31 August 2000) or earlier. Refer to *1-7 Changes in SW2* for details.

Item		CPM2C	CPM2A	CPM1A
Battery	Battery	CPU Unit with clock: Internal lithium battery backup CPU Unit without clock: Capacitor backup or optional lithium battery backup	Lithium	None (capacitor backup only)
	Battery replacement	Possible	Possible	---
	Life expectancy/ backup time	CPU Unit with clock: 2-year lifetime at 25°C CPU Unit without clock (capacitor): 10-day backup at 25°C CPU Unit without clock (lithium battery): 5-year lifetime at 25°C	5-year lifetime at 25°C	20-day backup at 25°C
	Battery error detection	Supported.	Same as CPM2C.	---
Communications (in CPU Unit)	Peripheral port (via communications port)	Programming Console (automatically detected) (See note 2.) Peripheral bus (automatically detected) Host Link (with Slave-initiated communications) No-protocol	Programming Console (auto-detect) Peripheral bus (auto-detect) Host Link (with Slave-initiated communications) No-protocol	Programming Console (auto-detect) Peripheral bus (auto-detect) Host Link 1:1 PC LInk 1:1 NT Link
	RS-232C port (via communications port)	Peripheral bus (Set with Communications Switch.) Host Link No-protocol 1:1 PC LInk 1:1 NT Link	Peripheral bus (auto-detect) Host Link No-protocol 1:1 PC LInk 1:1 NT Link	None
Input time constant		Can be set to 1, 2, 3, 5, 10, 20, 40, or 80 ms. (Default: 10 ms)	Same as CPM2C.	Can be set to 1, 2, 4, 8, 16, 32, 64, or 128 ms. (Default: 8 ms)

Note 1. An optional battery (CPM2C-BAT01) can be mounted to CPU Units without clocks.

2. The setting of SW2 will affect the operating mode for all Units with lot numbers of 3180O (31 August 2000) or earlier. Refer to *1-7 Changes in SW2* for details.

Differences in Instruction Sets

Instructions added to the CPM2C

Mnemonic	Name
TXD(48)	TRANSMIT
RXD(47)	RECEIVE
SCL(66)	SCALING
SCL2(—)	SIGNED BINARY TO BCD SCALING
SCL3(—)	BCD TO SIGNED BINARY SCALING
SRCH(—)	DATA SEARCH
MAX(—)	FIND MAXIMUM
MIN(—)	FIND MINIMUM
SUM(—)	SUM CALCULATION
FCS(—)	FCS CALCULATE
HEX(—)	ASCII-TO-HEXADECIMAL
AVG(—)	AVERAGE VALUE
PWM(—)	PULSE WITH VARIABLE DUTY RATIO
PID(—)	PID CONTROL
ZCP(—)	AREA RANGE COMPARE
ZCPL(—)	DOUBLE AREA RANGE COMPARE
NEG(—)	2'S COMPLEMENT
ACC(—)	ACCELERATION Control
STUP(—)	CHANGE RS-232C SETUP
SYNC(—)	SYNCHRONIZED PULSE CONTROL
BINL(58)	DOUBLE BCD TO DOUBLE BINARY
BCDL(59)	Double binary to double bcd
TMHH(—)	VERY HIGH-SPEED TIMER
TIML(—)	LONG TIMER
SEC(—)	HOURS-TO-SECONDS
HMS(—)	SECONDS-TO-HOURS

Instructions with Changed Specifications

Mnemonic	Name	CPM2C	CPM1A
INI(61)	MODE CONTROL	Supports the interrupt input (counter mode) PV change operation. Supports the pulse output PV change operation. Supports the pulse synchronization control stop operation.	Does not support these operations.
PRV(62)	HIGH-SPEED COUNTER PV READ	Supports the interrupt input (counter mode) PV read operation. Supports the pulse output PV read operation.	Does not support these operations.
CTBL(63)	COMPARISON TABLE LOAD	The count is compared with all of the target values in the target value comparison table.	The count is compared with each target value in the order that they appear in the target value comparison table.
PULS(65)	SET PULSES	Supports absolute pulse specification, but the coordinate system must be set to absolute coordinates.	Does not support absolute pulse specification.
INT(89)	Interrupt control	Supports a count-up interrupt for incrementing counters.	Does not support this interrupt function.

⚠ **Caution** Before using a CPM1A program containing one or more of the instructions in the table above, check the program to be sure that it will operate properly and edit the program if necessary. The CPM2C may not operate properly if a CPM1A program with these instructions is transferred and executed unchanged.

Added Function Code Allocations

The following three instructions are allocated function codes that were not used in the CPM1A.

Instruction	CPM2C	CPM1A
RXD(47)	RECEIVE	Not allocated. (NOP(00))
TXD(48)	TRANSMIT	
SCL(66)	SCALING	

Differences in I/O Memory

SR Area Differences

The following table shows differences in the SR area. (PV is the abbreviation for present value.)

Function	CPM2C	CPM1A
Pulse output 0 PV	SR 228 to SR 229	Not supported.
Pulse output 1 PV	SR 230 to SR 231	
Pulse output 0 PV Reset Bit	SR 25204	
Pulse output 1 PV Reset Bit	SR 25205	
RS-232C Port Reset Bit	SR 25209	
Battery Error Flag	SR 25308	
Changing RS-232C Port Setup Flag	SR 25312	

AR Area Differences

The following table shows differences in the AR area.

Function	CPM2C	CPM1A
Clock/calendar data	AR 17 to AR 21	Not supported.
RS-232C Communications Error Code	AR 0800 to AR 0803	
RS-232C Error Flag	AR 0804	
RS-232C Transmission Enabled Flag	AR 0805	
RS-232C Reception Completed Flag	AR 0806	
RS-232C Reception Overflow Flag	AR 0807	
Peripheral Port Reception Completed Flag	AR 0814	
Peripheral Port Reception Overflow Flag	AR 0815	
RS-232C Reception Counter	AR 09	
High-speed Counter Comparison Flag	AR 1108	
High-speed Counter Overflow/Underflow Flag	AR 1109	
Pulse Output 0 Output Condition	AR 1111	
Pulse Output 0 PV Overflow/Underflow Flag	AR 1112	
Pulse Output 0 Pulse Quantity Set Flag	AR 1113	
Pulse Output 0 Output Completed Flag	AR 1114	
Pulse Output 1 PV Overflow/Underflow Flag	AR 1212	
Pulse Output 1 Pulse Quantity Set Flag	AR 1213	
Pulse Output 1 Output Completed Flag	AR 1214	
Pulse Output 1 Output Status	AR 1215	
Power OFF Counter	AR 23 (See note.)	AR 10

Note CPM1A programs that use AR 10 (the Power OFF Counter) cannot be used in the CPM2C without editing the program. In the CPM2C, the Power OFF Counter is in AR 23.

DM Area Differences

The following table shows differences in the DM area other than the PC Setup.

Function	CPM2C	CPM1A
Error Log Area	DM 2000 to DM 2021	DM 1000 to DM 1021

Note CPM1A programs that use the Error Log Area cannot be used in the CPM2C without editing the program to change the location of the Error Log Area.

The following table shows differences in the PC Setup.

Function	CPM2C	CPM1A
RS-232C Port Servicing Time Setting	DM 6616 bits 00 to 07	Not supported
RS-232C Port Servicing Time Enable	DM 6616 bits 08 to 15	
Pulse Output 0 Coordinate System	DM 6629 bits 00 to 03	
Pulse Output 1 Coordinate System	DM 6629 bits 04 to 07	
RS-232C Communications Settings Selector	DM 6645 bits 00 to 03	
RS-232C Port CTS Control Settings	DM 6645 bits 04 to 07	
RS-232C Port Link Words for 1:1 PC Link	DM 6645 bits 08 to 11	
RS-232C Port Communications Mode	DM 6645 bits 12 to 15	
RS-232C Port Baud Rate	DM 6646 bits 00 to 07	
RS-232C Port Frame Format	DM 6646 bits 08 to 15	
RS-232C Port Transmission Delay	DM 6647	
RS-232C Port Host Link Node Number	DM 6648 bits 00 to 07	
RS-232C Port No-protocol Start Code Enable	DM 6648 bits 08 to 11	
RS-232C Port No-protocol End Code Enable	DM 6648 bits 12 to 15	
RS-232C Port No-protocol Start Code Setting	DM 6649 bits 00 to 07	
RS-232C Port No-protocol End Code Setting or Number of Bytes Received	DM 6649 bits 08 to 15	
Peripheral Port No-protocol Start Code Enable	DM 6653 bits 08 to 11	
Peripheral Port No-protocol End Code Enable	DM 6653 bits 12 to 15	
Peripheral Port No-protocol Start Code Setting	DM 6654 bits 00 to 07	
Peripheral Port No-protocol End Code Setting or Number of Bytes Received	DM 6654 bits 08 to 15	
Battery Error Detect Setting	DM 6655 bits 12 to 15	

1-6 Preparation for Operation

Follow the steps listed below when setting up a CPM2C system.

1,2,3...

1. System Design
   - Select a CPM2C CPU Unit, Expansion Units, and Expansion I/O Units with the specifications required in the controlled system.
   - Design external fail-safe circuits such as interlock circuits and limit circuits.

   Refer to *2-1 Specifications* and *3-1 Design Precautions* for details.
2. Installation
   - Connect the Expansion Units and Expansion I/O Units.
   - Install the CPU Unit. (DIN-track installation)

   Refer to *3-3 Installing the CPM2C* and *3-4 Wiring and Connections* for details.
3. Wiring
   - Wire the power supply and I/O devices.
   - Connect communications devices if necessary.
   - Connect the Programming Console.

Refer to *3-4 Wiring and Connections, 4-1 Using a Programming Console,* for details.

4. Initial Settings
   - Set the Communications Switch on the front of the CPU Unit, if necessary. (The switch must be set when a device other than the Programming Console is connected or the standard communications settings are not used.)
   - Connect the Programming Console, set the mode switch to PROGRAM mode, and turn ON the PC.
   - Check the CPU Unit's LED indicators and the Programming Console's display.
   - Clear the PC's memory. (All Clear)
   - Make PC Setup settings.

   Refer to *3-3 Installing the CPM2C* and *4-1-4 Preparation for Operation* for details.

   Note The setting of SW2 will affect the operating mode for all Units with lot numbers of 3180O (August 2000) or earlier. Refer to *1-7 Changes in SW2* for details.
5. Create Ladder Program
   - Create a ladder program to control the system.

   Refer to *SECTION 4 Using a Programming Console* and the *Programming Manual* for details.
6. Write Ladder Program in PC
   - Write the ladder program in the PC with the Programming Console or transfer the program to the PC from the Support Software.

   Refer to *SECTION 4 Using a Programming Console,* to the *SYSMAC Support Software Operation Manuals* and to the *CPT User Manual* for details.
7. Test Run
   - Check I/O wiring in PROGRAM mode.
   - Check and debug program execution in MONITOR mode.

   Refer to *SECTION 5 Test Runs and Error Processing* for details.

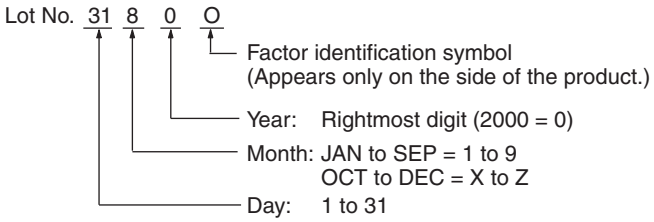
1-7 Changes in SW2

The connection of a Programming Console to the peripheral connector is automatically detected for CPU Units with lot numbers of 0190O (1 September 2000) or later. This has resulted in a change to the operation of SW2 on the front of the CPU Unit. Check the lot number to confirm the operation of SW2 for any of the following model numbers before attempting operations.

CPU Units with Changed Specifications for SW2

I/O	Units with Relay Outputs and a Terminal Block	Units with Transistor Outputs and a Connector	
		Sinking outputs	Sourcing outputs
10 I/O points	CPM2C-10CDR-D CPM2C-10C1DR-D	CPM2C-10CDTC-D CPM2C-10C1DTC-D	CPM2C-10CDT1C-D CPM2C-10C1DT1C-D
20 I/O points	---	CPM2C-20CDTC-D CPM2C-20C1DTC-D	CPM2C-20CDT1C-D CPM2C-20C1DT1C-D

Interpreting Lot Numbers

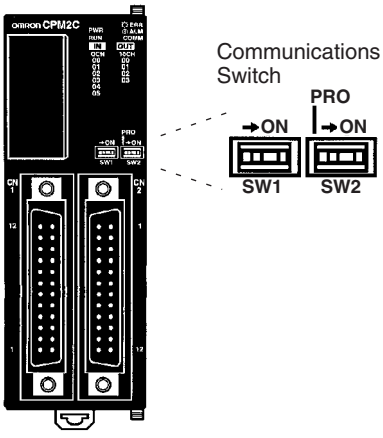


Operating Previous CPU Units

The following instructions apply to CPU Units with lot numbers of 3180O (August 2000) or earlier.

The previous CPU Units do not detect a Programming Console connected to the peripheral port, and SW2 of the DIP switch was used to set either "Programming Console" or "Other device."

SW2 Setting



SW1	SW2	Peripheral port	RS-232C port
OFF	OFF	Programming Console connection	According to PC Setup in DM 6645 to DM 6649.
OFF	ON	Connection other than to Programming Console according to PC Setup in DM 6650 to DM 6654.	According to PC Setup in DM 6645 to DM 6649.
ON	OFF	Programming Console connection	According to standard settings.
ON	ON	Connection other than to Programming Console according to standard settings.	According to standard settings.

The relationship between the PC Setup settings, the setting of SW2, and the startup operating mode for previous CPU Units is shown in the following table.

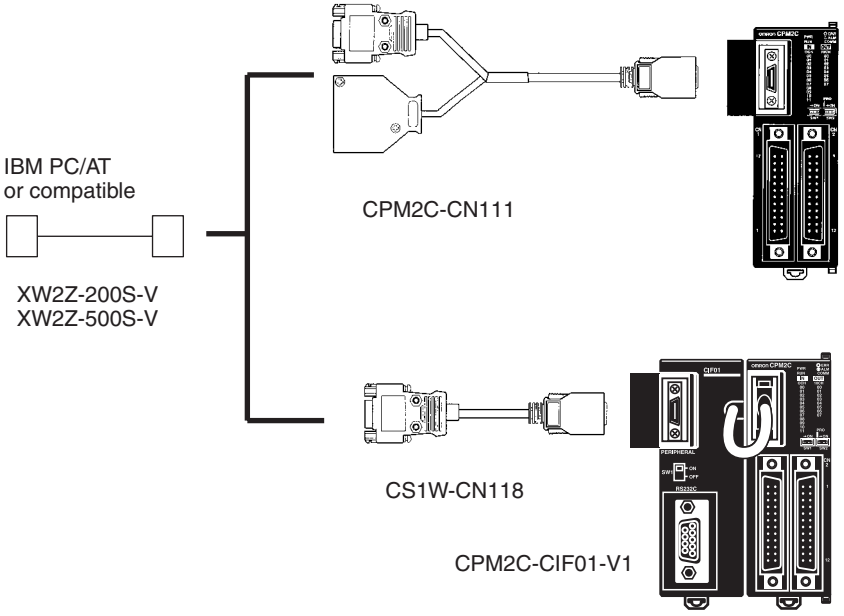
<table>
<tr><th colspan="3">PC Setup</th><th rowspan="2">CPM2C Operating Mode</th></tr>
<tr><th>Address</th><th>Bits</th><th>Setting</th></tr>
<tr><td rowspan="5">DM6600</td><td rowspan="3">08 to 15</td><td>00 Hex</td><td>According to communications switch SW2 and peripheral port device.
<table>
<tr><th rowspan="2">Peripheral device</th><th colspan="2">SW2 setting</th></tr>
<tr><th>OFF</th><th>ON</th></tr>
<tr><td>Nothing connected</td><td>PROGRAM mode</td><td>RUN mode</td></tr>
<tr><td>Programming Console</td><td>According to Programming Console key switch.</td><td>PROGRAM mode (See note.)</td></tr>
<tr><td>Other</td><td>PROGRAM mode (See note.)</td><td>PROGRAM mode</td></tr>
</table>
Note: Communications will not be possible between the CPM2C and the peripheral device for these combinations.</td></tr>
<tr><td>01 Hex</td><td>Mode used immediately before power interruption</td></tr>
<tr><td>02 Hex</td><td>Mode specified in bits 00 to 07.</td></tr>
<tr><td rowspan="3">00 to 07</td><td>00 Hex</td><td>PROGRAM mode</td></tr>
<tr><td>01 Hex</td><td>MONITOR mode</td></tr>
<tr><td>02 Hex</td><td>RUN mode</td></tr>
</table>

Note 1. The default setting for DM 6600, bits 06 to 15 is 00 Hex, i.e., according to the communications switch on the front panel. If SW2 is set for connecting a device other than a Programming Console to the peripheral connector,

the CPU Unit will start in RUN mode as soon as power is turned ON. Be sure that adequate precautions are taken to ensure safety.

2. If SW2 is for connecting a device other than a Programming Console to the peripheral connector, the CPU Unit will start in RUN mode as soon as power is turned ON even if a device is connected to the RS-232C port. Be sure that adequate precautions are taken to ensure safety.

Connections



SECTION 2
Unit Components and Specifications

This section describes the main components of the Units that go together to create a CPM2C PC and provides the technical specifications of the Units.

2-1 Specifications 36
2-1-1 General Specifications 36
2-1-2 Characteristics. 36
2-1-3 I/O Specifications 38
2-1-4 AC Power Supply Unit Specifications 46
2-2 Unit Components 47
2-2-1 CPU Unit Components 47
2-2-2 Expansion I/O Units 59
2-2-3 CPM2C-MAD11 Analog I/O Unit 69
2-2-4 CPM2C-TS001/TS101 Temperature Sensor Units. 70
2-2-5 CPM2C-SRT21 CompoBus/S I/O Link Unit 72
2-2-6 CPM2C-CIF21 Simple Communications Unit. 73
2-2-7 CPM2C-CIF01-V1 Peripheral/RS-232C Adapter Unit 77
2-2-8 CPM2C-CIF11 RS-422/RS-232C Adapter Unit 79
2-2-9 AC Power Supply Unit 82

2-1 Specifications

2-1-1 General Specifications

Item	CPU Units with 10/20 I/O points		CPU Units with 32 I/O points transistor outputs	Expansion I/O Units and Expansion Units
	Relay outputs	Transistor outputs		
Supply voltage	24 VDC			
Operating voltage range	20.4 to 26.4 VDC			
Power consumption	CPM2C-10C□DR-□: 4 W CPM2C-10C□DT□C-D: 3 W CPM2C-10C□DT□M-D: 3 W CPM2C-20C□DR-□: 4 W CPM2C-20C□DT□C-D: 3 W CPM2C-20C□DT□M-D: 3 W CPM2C-32CDT□C-D: 3 W CPM2C-32CDT□M-D: 3 W Note The above values for CPU Unit power consumption include the power consumption for Programming Consoles and Communications Adapter Units (CIF□□).			CPM2C-10EDR: 1 W CPM2C-20EDR: 2 W CPM2C-8ER: 2 W CPM2C-24EDTC: 1 W CPM2C-24EDT1C: 1 W CPM2C-32EDTC: 1 W CPM2C-32EDT1C: 1 W CPM2C-8EDC: 1 W CPM2C-16EDC: 1 W CPM2C-8ETC: 1 W CPM2C-8ET1C: 1 W CPM2C-16ETC: 1 W CPM2C-16ET1C: 1 W CPM2C-24EDTM: 1 W CPM2C-24EDT1M: 1 W CPM2C-32EDTM: 1 W CPM2C-32EDT1M: 1 W CPM2C-8EDM: 1 W CPM2C-16EDM: 1 W CPM2C-8ETM: 1 W CPM2C-8ET1M: 1 W CPM2C-16ETM: 1 W CPM2C-16ET1M: 1 W CPM2C-MAD11: 3.5 W CPM2C-TS001: 1.5 W CPM2C-TS101: 1.5 W CPM2C-SRT21: 1 W CPM2C-CIF21: 1 W
Inrush current	25 A max.			
Insulation resistance	20 MΩ min. (at 500 VDC) between insulated circuits			
Dielectric strength	2,300 VAC for 1 min (between insulated circuits)			
Noise immunity	Conforms to IEC61000-4-4; 2 kV (power lines)			
Vibration resistance	10 to 57 Hz, 0.075-mm double amplitude, 57 to 150 Hz, acceleration: 9.8 m/s^2 in X, Y, and Z directions for 80 minutes each (Time coefficient; 8 minutes × coefficient factor 10 = total time 80 minutes)			
Shock resistance	147 m/s^2 three times each in X, Y, and Z directions			
Ambient temperature	Operating: 0 to 55°C Storage: –20 to 75°C (except for the battery)			
Humidity	10% to 90% (with no condensation)			
Atmosphere	Must be free from corrosive gas			
Power interrupt time	2 ms min.			

2-1-2 Characteristics

Item	CPU Unit Specification		
	10 I/O points (relay/transistor outputs)	20 I/O points (relay/transistor outputs)	32 I/O points (transistor outputs)
Control method	Stored program method		
I/O control method	Cyclic scan with direct output (Immediate refreshing can be performed with IORF(97).)		

Item		CPU Unit Specification		
		10 I/O points (relay/transistor outputs)	**20 I/O points (relay/transistor outputs)**	**32 I/O points (transistor outputs)**
Programming language		Ladder diagram		
Instruction length		1 step per instruction, 1 to 5 words per instruction		
Instructions		Basic instructions: 14 Special instructions: 105 instructions, 185 variations		
Execution time		Basic instructions: 0.64 μs (LD instruction) Special instructions: 7.8 μs (MOV instruction)		
Program capacity		4,096 words		
Max. I/O capacity	CPU Unit only	10 points	20 points	32 points
	With Expansion I/O Units and Expansion Units	170 points max.	180 points max.	192 points max.
Input bits		IR 00000 to IR 00915 (Words not used for input bits can be used for work bits.)		
Output bits		IR 01000 to IR 01915 (Words not used for output bits can be used for work bits.)		
Work bits		928 bits: IR 02000 to IR 04915 and IR 20000 to IR 22715		
Special bits (SR area)		448 bits: SR 22800 to SR 25515		
Temporary bits (TR area)		8 bits (TR0 to TR7)		
Holding bits (HR area)		320 bits: HR 0000 to HR 1915 (Words HR 00 to HR 19)		
Auxiliary bits (AR area)		384 bits: AR 0000 to AR 2315 (Words AR 00 to AR 23)		
Link bits (LR area)		256 bits: LR 0000 to LR 1515 (Words LR 00 to LR 15)		
Timers/Counters		256 timers/counters (TIM/CNT 000 to TIM/CNT 255) 1-ms timers: TMHH(—) 10-ms timers: TIMH(15) 100-ms timers: TIM 1-s/10-s timers: TIML(—) Decrementing counters: CNT Reversible counters: CNTR(12)		
Data memory		Read/Write: 2,048 words (DM 0000 to DM 2047)* Read-only: 456 words (DM 6144 to DM 6599) PC Setup: 56 words (DM 6600 to DM 6655) *The Error Log is contained in DM 2000 to DM 2021.		
Interrupt processing		2 interrupts	4 interrupts	4 interrupts
		Shared by the external interrupt inputs (counter mode) and the quick-response inputs.		
Interval timer interrupts		1 (Scheduled Interrupt Mode or Single Interrupt Mode)		
High-speed counter		One high-speed counter: 20 kHz single-phase or 5 kHz two-phase (linear count method) Counter interrupt: 1 (set value comparison or set-value range comparison)		
Interrupt Inputs (Counter mode)		2 inputs	4 inputs	4 inputs
		Shared by the external interrupt inputs and the quick-response inputs.		
Pulse output		Two points with no acceleration/deceleration, 10 Hz to 10 kHz each, and no direction control. One point with trapezoid acceleration/deceleration, 10 Hz to 10 kHz, and direction control. Two points with variable duty-ratio outputs. (Pulse outputs can be used with transistor outputs only, they cannot be used with relay outputs.)		
Synchronized pulse control		One point: A pulse output can be created by combining the high-speed counter with pulse outputs and multiplying the frequency of the input pulses from the high-speed counter by a fixed factor. (This output is possible with transistor outputs only, it cannot be used with relay outputs.)		
Quick-response inputs		2 inputs	4 inputs	4 inputs
		Shared by the external interrupt inputs and the interrupt inputs (counter mode). Min. input pulse width: 50 μs max.		
Input time constant (ON response time = OFF response time)		Can be set for all input points. (1 ms, 2 ms, 3 ms, 5 ms, 10 ms, 20 ms, 40 ms, or 80 ms)		

Item	CPU Unit Specification		
	10 I/O points (relay/transistor outputs)	**20 I/O points (relay/transistor outputs)**	**32 I/O points (transistor outputs)**
Clock function	Shows the year, month, day of the week, day, hour, minute, and second. (Battery backup) The CPU Units with "C1" in the model number have a built-in clock.		Not provided on CPU Units with 32 I/O points.
Communications functions	A CPM2C-CN111, CS1W-CN114, or CS1W-CN118 Connecting Cable is required to connect to the CPM2C's communications port. The communications port can be used as both a peripheral and RS-232C port. Peripheral port: Supports Host Link, peripheral bus, no-protocol, or Programming Console connections. RS-232C port: Supports Host Link, no-protocol, 1:1 Slave Unit Link, 1:1 Master Unit Link, or 1:1 NT Link connections.		
Functions provided by Expansion Units	Analog I/O Unit: Provides 2 analog inputs and 1 analog output. Temperature Sensor Unit: Provides up to 8 thermocouple or platinum resistance thermometer inputs. CompoBus/S I/O Link Unit: Provides 8 inputs and 8 outputs as a CompoBus/S Slave.		
Memory protection (See notes 1 and 2.)	HR area, AR area, program contents, read/write DM area contents, and counter values maintained during power interruptions.		
Memory backup (See notes 1 and 2.)	Flash memory: Program, read-only DM area, and PC Setup Memory backup: The read/write DM area, HR area, AR area, and counter values are backed up. CPU Unit with clock (battery): 2-year lifetime at 25°C CPU Unit without clock (capacitor): 10-day backup at 25°C CPU Unit without clock (lithium battery): 5-year lifetime at 25°C		
Self-diagnostic functions	CPU Unit failure (watchdog timer), I/O bus error, battery error, and memory failure		
Program checks	No END instruction, programming errors (checked when operation is started)		

Note

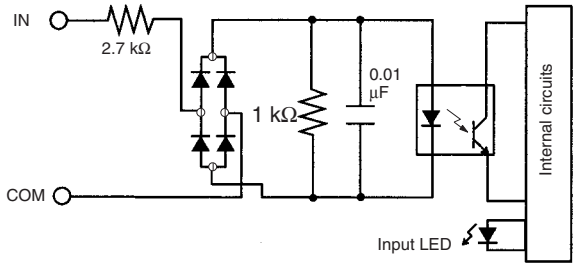
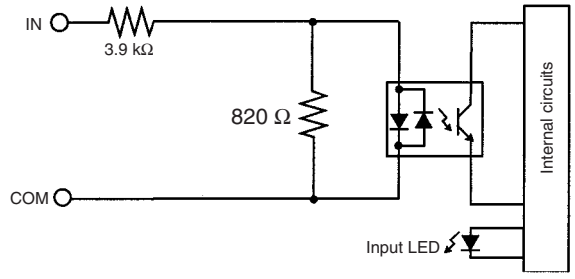
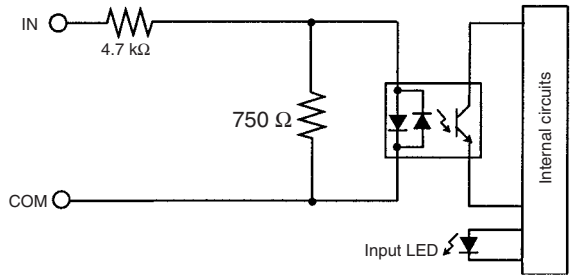
1. The DM area, HR area, AR area, and counter values are backed up. If the backup battery or capacitor is discharged, the contents of these areas will be lost and the data values will revert to the defaults.
2. The contents of the program area, read-only DM area (DM 6144 to DM 6599), and PC Setup (DM 6600 to DM 6655) are stored in flash memory. The contents of these areas will be read from flash memory the next time the power is turned ON, even if the backup battery or capacitor is discharged.

   When data has been changed in any of these areas, write the new values to flash memory by switching the CPM2C to MONITOR or RUN mode, or by turning the power OFF and then ON again.

2-1-3 I/O Specifications

CPU Unit Input Specifications

Item	Inputs	Specification		
		Units with 10 I/O pts	**Units with 20 I/O pts**	**Units with 32 I/O pts**
Input voltage	All	24 VDC $^{+10\%}/_{-15\%}$		
Input impedance	IN00000 to IN00001	2.7 kΩ		
	IN00002 to IN00004	3.9 kΩ	---	---
	IN00002 to IN00006	---	3.9 kΩ	3.9 kΩ
	IN00005	4.7 kΩ	---	---
	IN00007 and up	---	4.7 kΩ	4.7 kΩ

Item	Inputs	Specification		
		Units with 10 I/O pts	**Units with 20 I/O pts**	**Units with 32 I/O pts**
Input current	IN00000 to IN00001	8 mA typical		
	IN00002 to IN00004	6 mA typical	---	---
	IN00002 to IN00006	---	6 mA typical	6 mA typical
	IN00005 and up	5 mA typical	---	---
	IN00007 and up	---	5 mA typical	---
	IN00007	---	---	5 mA typical
	IN00100 to IN00107	---	---	5 mA typical
ON voltage/current	IN00000 to IN00001	17 VDC min., 5 mA		
	IN00002 and up	14.4 VDC min., 3.5 mA		
OFF voltage/current	All	5.0 VDC max., 1.1 mA		
ON delay	All	1 to 80 ms max. Default: 10 ms (See note.)		
OFF delay	All	1 to 80 ms max. Default: 10 ms (See note.)		
Circuit configuration	IN00000 to IN00001			
	CPU Units with 10 I/O points: IN00002 to IN00004 CPU Units with 20 or 32 I/O points: IN00002 to IN00006			
	CPU Units with 10 I/O points: IN00005 CPU Units with 20 I/O points: IN00007 to IN00011 CPU Units with 32 I/O points: IN00007 and IN00100 to IN00107			

Note The input time constant can be set to 1, 2, 3, 5, 10, 20, 40, or 80 ms in the PC Setup.

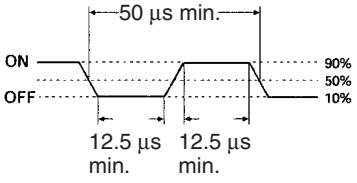
High-speed Counter Inputs

The following CPU Unit input bits can be used as high-speed counter inputs. The maximum count frequency is 5 kHz in differential phase mode and 20 kHz in the other modes.

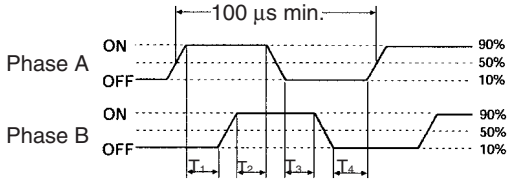
Input	Function			
	Differential phase mode	**Pulse plus direction input mode**	**Up/down input mode**	**Increment mode**
IN00000	A-phase pulse input	Pulse input	Increment pulse input	Increment pulse input
IN00001	B-phase pulse input	Direction input	Decrement pulse input	Normal input
IN00002	Z-phase pulse input or hardware reset input (IN00002 can be used as a normal input when it is not used as a high-speed counter input.)			

The minimum pulse widths for inputs IN00000 (A-phase input) and IN00001 (B-phase input) are as follows:

Pulse plus direction input mode, Up/down input mode, Increment mode

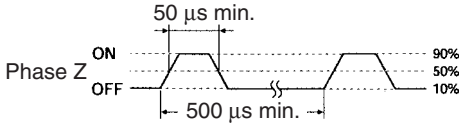


Differential phase mode



T1 T2 T3 T4: 12.5 µs min.

The minimum pulse width for input IN00002 (Z-phase input) is as follows:

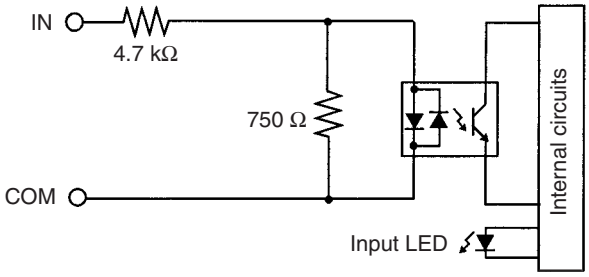


Interrupt Inputs

CPM2C PCs are equipped with inputs that can be used as interrupt inputs (interrupt input mode or counter mode) and quick-response inputs. The minimum pulse width for these inputs is 50 µs.

In CPU Units with 10 I/O points, inputs IN00003 and IN00004 can be used as interrupt inputs. In CPU Units with 20/32 I/O points, inputs IN00003 through IN00006 can be used as interrupt inputs.

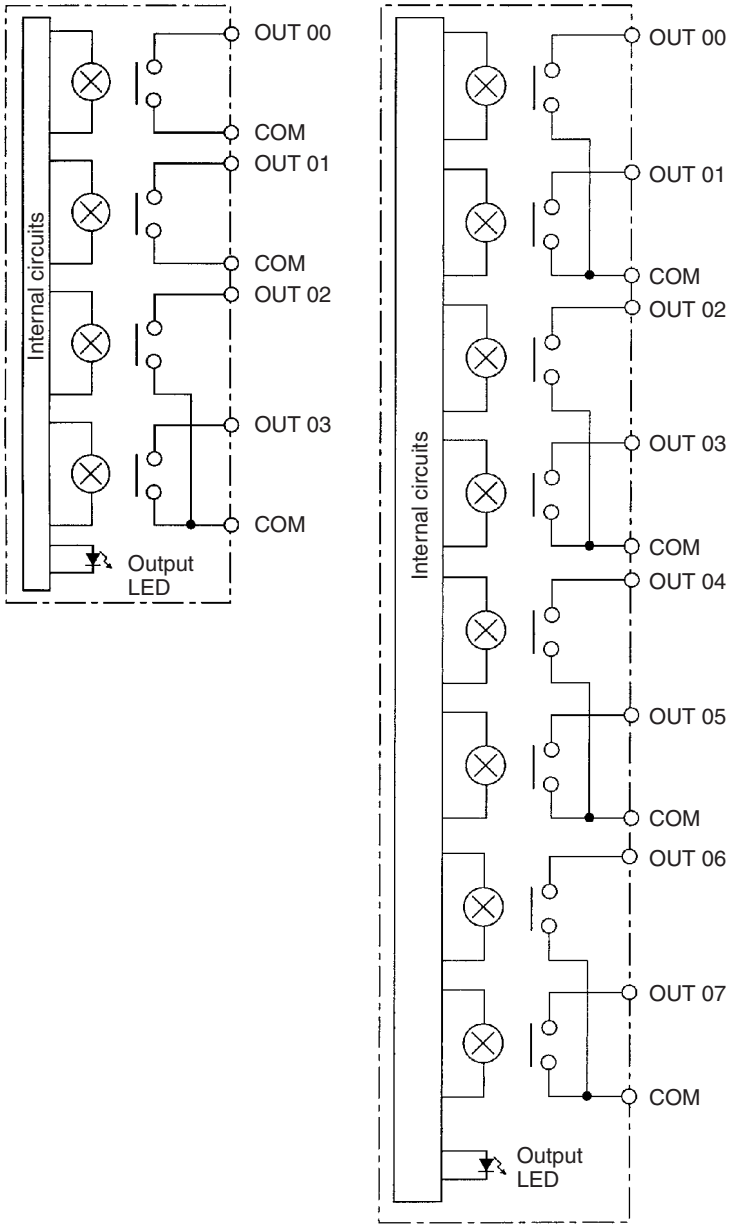
Expansion I/O Unit Input Specifications

Item	Specification
Input voltage	24 VDC $^{+10\%}/_{-15\%}$
Input impedance	4.7 kΩ
Input current	5 mA typical
ON voltage/current	14.4 VDC min., 3.5 mA
OFF voltage/current	5.0 VDC max., 1.1 mA
ON delay	1 to 80 ms max. Default: 10 ms (See note.)
OFF delay	1 to 80 ms max. Default: 10 ms (See note.)
Circuit configuration	

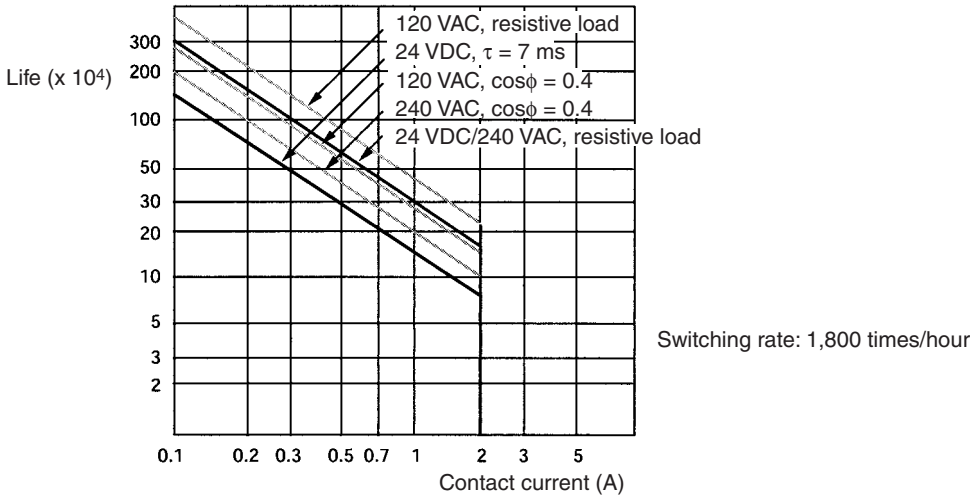
Note The input time constant can be set to 1, 2, 3, 5, 10, 20, 40, or 80 ms in the PC Setup.

CPU Unit and Expansion I/O Unit Output Specifications

Relay Outputs

Item	Specification
Max. switching capacity	2 A, 250 VAC (cosϕ = 1) 2 A, 24 VDC (4 A/common)
Min. switching capacity	10 mA, 5 VDC
Service life of relay (See note.)	Electrical: 150,000 operations (24-VDC resistive load) 100,000 operations (240-VAC inductive load, cosϕ = 0.4) Mechanical: 20,000,000 operations
ON delay	15 ms max.
OFF delay	15 ms max.
Circuit configuration	

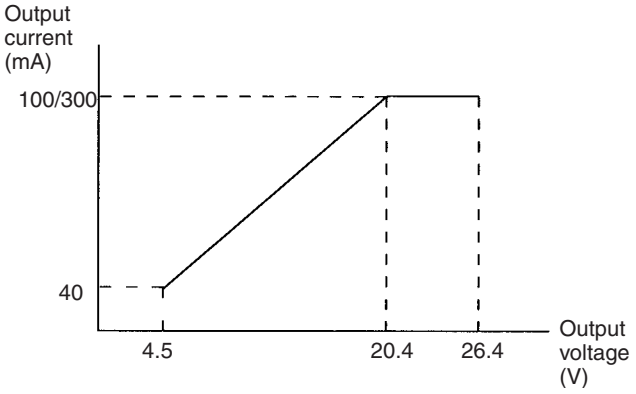
Note The service life of relay output contacts shown in the table assumes the worst conditions. The following graph shows the results of OMRON's service life tests at a switching rate of 1,800 times/hour.



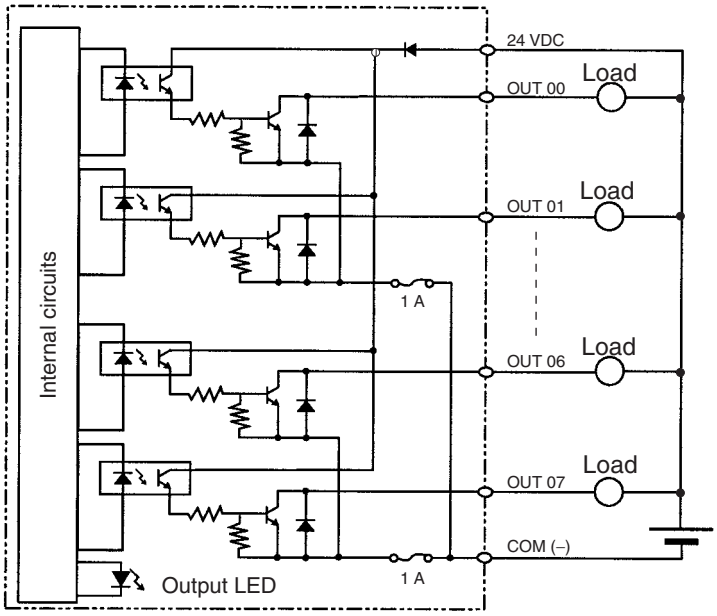
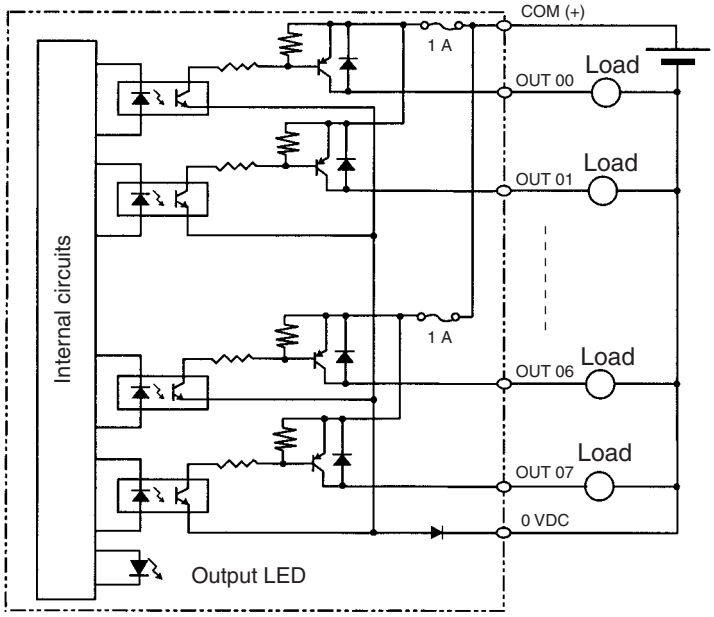
Transistor Outputs (Sinking or Sourcing)

Item	Specification
Max. switching capacity (See note.)	CPU Units with 10 or 20 I/O Points OUT01000 to OUT01007:40 mA/4.5 VDC to 300 mA/20.4 VDC, 300 mA (20.4 VDC to 26.4 VDC) CPU Units with 32 I/O Points OUT01000 to OUT01007:40 mA/4.5 VDC to 300 mA/20.4 VDC, 300 mA (20.4 VDC to 26.4 VDC) OUT01100 to OUT01107:40 mA/4.5 VDC to 100 mA/20.4 VDC, 100 mA (20.4 VDC to 26.4 VDC) Expansion I/O Units OUT01□00 to OUT01□07:40 mA/4.5 VDC to 300 mA/20.4 VDC, 300 mA (20.4 VDC to 26.4 VDC) OUT01□08 to OUT01□15:40 mA/4.5 VDC to 100 mA/20.4 VDC, 100 mA (20.4 VDC to 26.4 VDC) When using OUT01000 or OUT01001 as a pulse output, connect a dummy resistor as required to bring the load current between 10 and 150 mA. If the load current is below 10 mA, the ON/OFF response time will be longer and high-speed pulses will not be output. The transistor will heat if used at 150 mA or higher, possibly damaging elements.
Max. inrush current	0.9 A for 10 ms (charging and discharging waveform)
Leakage current	0.1 mA max.
Residual voltage	0.8 V max.
ON delay	OUT01000 and OUT01001: 20 μs max. OUT01002 and up: 0.1 ms max.
OFF delay	OUT01000 and OUT01001: 40 μs max. at 10 to 300 mA 0.1 ms max. at 0.5 to 10 mA OUT01002 and up: 1 ms max. at 0.5 mA or more
Fuse	1 fuse for each 2outputs (cannot be replaced by user)

Note The following graph shows the maximum switching capacity.



⚠ **Caution** Do not apply voltage in excess of the maximum switching capacity to an output terminal. It may result in damage to the product or fire.

Item	Specification
Circuit configuration	**Sinking Outputs**  **Sourcing Outputs** 

2-1-4 AC Power Supply Unit Specifications

Item			Specification
Rating			24 VDC, 600 mA
Efficiency			75% min. (at rated output)
Input conditions	Rated voltage		100 to 240 VAC
	Frequency		47 to 63 Hz
	Allowable voltage range		85 to 264 VAC
	Current	100 V	0.4 A
		200 V	0.2 A
	Leakage current	100 V	0.5 mA max. (at rated output)
		200 V	1 mA max. (at rated output)
	Inrush current	100 V	15 A (at 25°C cold start)
		200 V	30 A (at 25°C cold start)
Output characteristics	Output voltage accuracy		10%/–15% (including input, load, and temperature fluctuations)
	Minimum output current		30 mA
	Ripple noise voltage		2% (p-p) max.
	Input fluctuation		0.75% max.
	Load fluctuation		4% max.
	Temperature fluctuation		0.05%/°C max.
	Startup time		300 ms max. (at input voltage of 100 VAC or 200 VAC and the rated output)
	Output hold time		10 ms (at input voltage of 100 VAC or 200 VAC and the rated output)
Overcurrent protection			Self-resetting, operates at 105% to 350% of the rated current, suspended and independent operation
Overvoltage protection			None
Ambient operating temperature			0 to 55°C
Ambient storage temperature			–20 to 75°C
Ambient operating humidity			10% to 90% (no condensation)
Dielectric strength			2,000 V for 1 min between all inputs and GR Leakage current: 10 mA 3,000 V for 1 min between all inputs and all outputs Leakage current: 10 mA 1,000 V for 1 min between all outputs and GR Leakage current: 10 mA
Insulation resistance			100 MΩ min. at 500 VDC between all outputs and any input, and between all outputs and GR
Vibration resistance			10 to 57 Hz, amplitude, 57 to 150 Hz, acceleration: 9.8 m/s^2 in X, Y, and Z directions for 80 minutes according (Time coefficient: 8 minutes × coefficient factor 10 = total time 80 min.)
Shock resistance			147 m/s^2 3 times each in X, Y, and Z directions
Noise terminal voltage			FCC class A

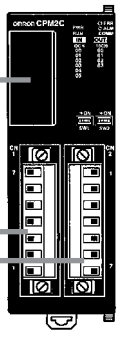
2-2 Unit Components

2-2-1 CPU Unit Components

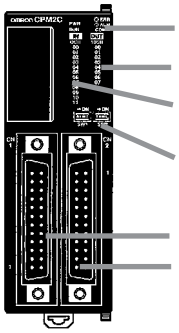
CPU Unit Component Names

Front View

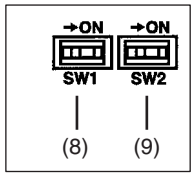
CPU Unit with Relay Outputs via Terminal Block



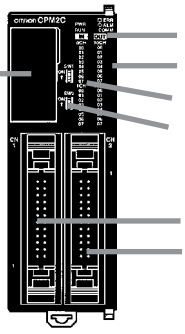
CPU Unit with Transistor Outputs via Fujitsu-compatible Connector



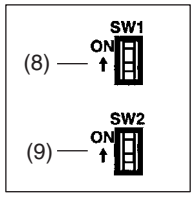
DIP switch for Units with 10/20 I/O points



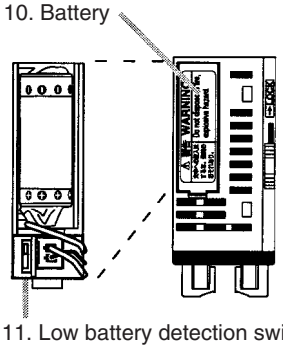
CPU Unit with Transistor Outputs via MIL Connector



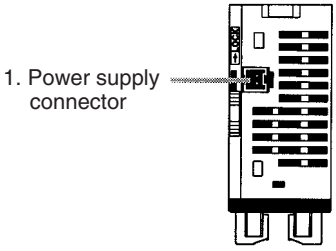
DIP switch for Units with 32 I/O points



Top View

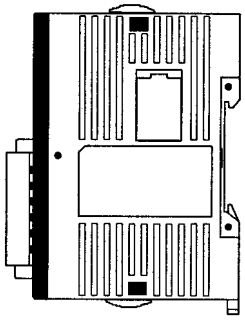


Bottom View

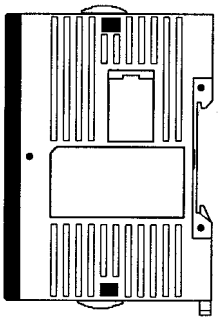


Right Side:

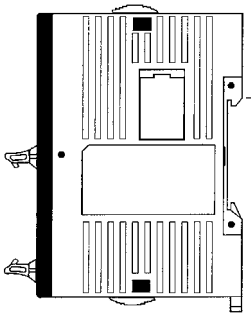
CPU Unit with Relay Outputs via Terminal Block



CPU Unit with Transistor Outputs via Fujitsu-compatible Connector



CPU Unit with Transistor Outputs via MIL Connector



CPU Unit Component Descriptions

1,2,3... 1. Power Supply Connector

Connect the power supply (24 VDC) to this connector.

2. Input Terminals/Connector

Connects the CPU Unit to external input devices.

3. Output Terminals/Connector

Connects the CPU Unit to external output devices.

4. PC Status Indicators

These indicators show the operating status of the PC, as shown in the following table.

Indicator	Status	Meaning
PWR (green)	ON	Power is being supplied to the PC.
	OFF	Power isn't being supplied to the PC.
RUN (green)	ON	The PC is operating in RUN or MONITOR mode.
	OFF	The PC is in PROGRAM mode or a fatal error has occurred.
COMM (yellow)	Flashing	Data is being transferred via the communications port (peripheral or RS-232C).
	OFF	Data isn't being transferred via communications port.
ERR/ALARM (red)	ON	A fatal error has occurred. (PC operation stops.)
	Flashing	A non-fatal error has occurred. (PC operation continues.)
	OFF	Indicates normal operation.

Note CPU Units with lot numbers of 3180O or earlier (produced 31 August 2000 or earlier) also have a PRO (green) indicator that operates as follows:

Indicator	Status	Meaning
PRO (green)	ON	The CPU Unit is set for Programming Console connection.
	OFF	The CPU Unit is not set for Programming Console connection.

5. Input Indicators

The input indicators are lit when the corresponding input terminal is ON. The status of an input indicator will reflect the status of the input even when that input is being used for a high-speed counter.

Note a) When interrupt inputs are used in interrupt input mode, the indicator may not light even when the interrupt condition is met if the input is not ON long enough.

b) Input indicators will reflect the status of the corresponding inputs even when the PC is stopped, but the corresponding input bits will not be refreshed.

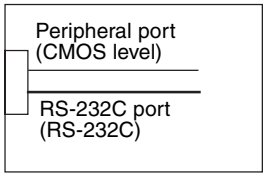
6. Output Indicators

The output indicators are lit when the corresponding output terminal is ON. The indicators are lit during I/O refreshing. The status of an output indicator will also reflect the status of the corresponding output when the output is being used as a pulse output.

7. Communications Port

   Connects the PC to a Programming Device (including Programming Consoles), host computer, or standard external device. The one connector support two different ports: Peripheral and RS-232C.

   CPM2C CPU Unit



   Use the correct Connecting Cable (CPM2C-CN111, CS1W-CN114, or CS1W-CN118).

   Note a) A C200H-PRO27-E Programming Console can be connected directly to the PC with a CS1W-CN224/CN624 Connecting Cable.

   b) Use a CPM2C-CN111 or CS1W-CN114 Connecting Cable to connect to the communications port as a peripheral port. The communications port can be used simultaneously as both a peripheral port and RS-232C port by using the CPM2C-CN111 Connecting Cable.

   c) Use a CPM2C-CN111 or CS1W-CN118 Connecting Cable to connect to the communications port as a RS-232C port. The communications port can be used simultaneously as both a peripheral port and RS-232C port by using the CPM2C-CN111 Connecting Cable

8. Communications Switch

   The Communications Switch controls the communications settings for the communications port (peripheral port and RS-232C port).

SW1	Communications settings
OFF	Use the settings in the PC Setup (DM 6645 to DM 6649). If a Programming Console is connected to the peripheral port, however, operation will be in the Programming Console mode.
ON	Use the standard settings (1 start bit, 7 data bits, 2 stop bits, even parity, and 9,600 bps baud rate.) If a Programming Console is connected to the peripheral port, however, operation will be in the Programming Console mode.

9. Customize Switch

   The Customize Switch can be used to turn ON and OFF AR 0712 in CPU Unit memory. AR 0712 will turn ON and OFF according to the status of SW2 regardless of the operating mode of the CPM2C.

SW2	Operation
OFF	Turns OFF AR 0712.
ON	Turns ON AR 0712.

   Note SW2 functions as the communications switch for some Units. Refer to *1-7 Changes in SW2* for details.

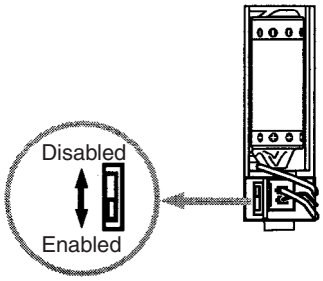
10. Battery

    This battery backs up memory in CPU Units with an internal clock. The battery is connected when the Unit is shipped.

    Note A battery is not included in CPU Units without an internal clock, but a CPM2C-BAT01 Battery can be purchased separately and connected to backup memory.

11. Low Battery Detection Switch

This switch enables or disables the detection of a low-battery error. When a battery is not connected, disable low-battery detection by sliding the switch back (toward the battery).



Switch position	Low-battery detection
Forward (away from battery)	Error detection enabled
Back (toward battery)	Error detection disabled

Note Detection of a low battery is disabled by default on CPU Units without an internal clock. If the PLC Setup memory area is cleared, detection of a low battery will be enabled and a low-battery error will be displayed. If you do mount the optional CPM2C-BAT01 Battery, be sure to enable detection of a low battery in the PLC Setup.

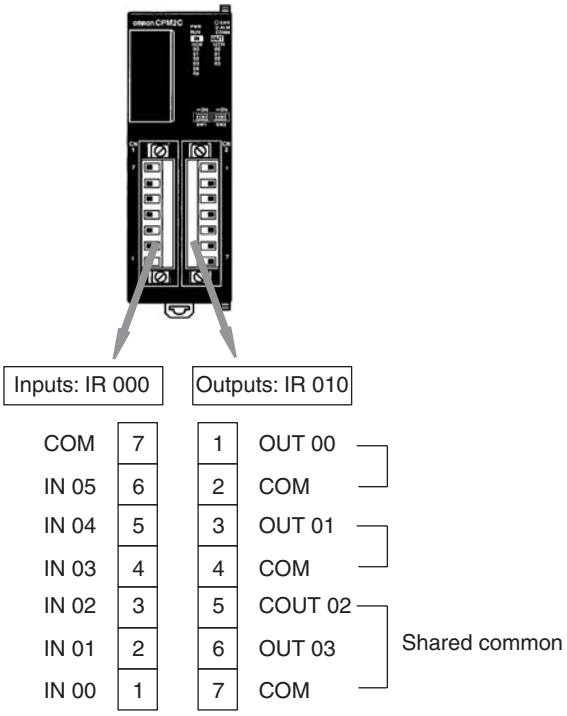
12. Expansion I/O Connector

    Connects the PC's CPU Unit to an Expansion I/O Unit or Expansion Unit. Up to 5 Expansion I/O Units and Expansion Units can be connected to a CPU Unit. A cover for the expansion I/O connector is included with the CPU Unit.

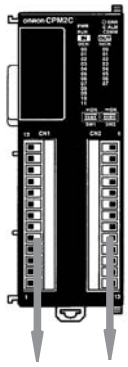
I/O Terminal and Connector Pin Allocation

CPU Units with Relay Outputs via Terminal Block

CPU Units with 10 I/O Points: CPM2C-10C□DR-D



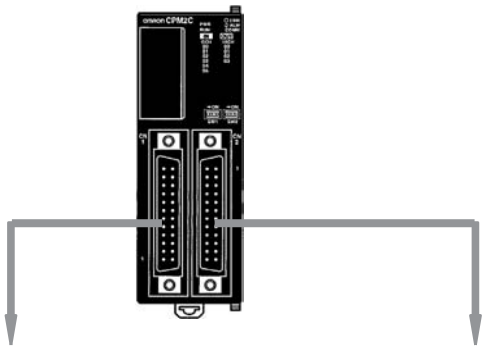
CPU Units with 20 I/O Points: CPM2C-20C□DR-D



Inputs: IR 000		Outputs: IR 010		
COM	13	1	OUT 00	Shared common
IN 11	12	2	OUT 01	
IN 10	11	3	COM	
IN 09	10	4	COUT 02	Shared common
IN 08	9	5	OUT 03	
IN 07	8	6	COM	
IN 06	7	7	OUT 04	Shared common
IN 05	6	8	OUT 05	
IN 04	5	9	COM	
IN 03	4	10	OUT 06	Shared common
IN 02	3	11	OUT 07	
IN 01	2	12	COM	
IN 00	1	13	COM	

CPU Units with Transistor Outputs via Fujitsu-compatible Connector

CPU Units with 10 I/O Points: CPM2C-10C□DT□C-D



Inputs: IR 000

B		A	
NC	12	12	NC
NC	11	11	NC
NC	10	10	NC
NC	9	9	COM
NC	8	8	NC
NC	7	7	NC
NC	6	6	IN 05
NC	5	5	IN 04
NC	4	4	IN 03
NC	3	3	IN 02
NC	2	2	IN 01
NC	1	1	IN 00

Outputs: IR 010

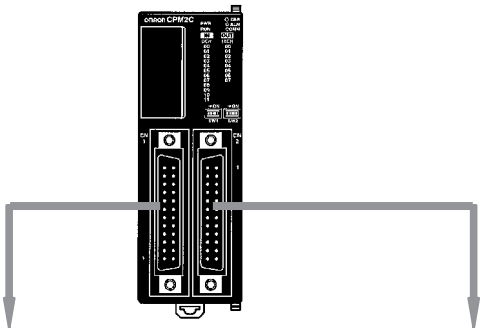
Sinking: CPM2C-10C□DTC-D

A		B	
OUT 00	1	1	NC
OUT 01	2	2	NC
OUT 02	3	3	NC
OUT 03	4	4	NC
NC	5	5	NC
NC	6	6	NC
NC	7	7	NC
NC	8	8	NC
COM (–)	9	9	NC
24 V	10	10	NC
NC	11	11	NC
NC	12	12	NC

Sourcing: CPM2C-10C□DT1C-D

A		B	
OUT 00	1	1	NC
OUT 01	2	2	NC
OUT 02	3	3	NC
OUT 03	4	4	NC
NC	5	5	NC
NC	6	6	NC
NC	7	7	NC
NC	8	8	NC
COM (+24 V)	9	9	NC
0 V	10	10	NC
NC	11	11	NC
NC	12	12	NC

CPU Units with 20 I/O Points: CPM2C-20C□DT□C-D



Inputs: IR 000

	B	A	
NC	12	12	NC
NC	11	11	NC
NC	10	10	NC
COM	9	9	COM
NC	8	8	IN 07
NC	7	7	IN 06
NC	6	6	IN 05
NC	5	5	IN 04
IN 11	4	4	IN 03
IN 10	3	3	IN 02
IN 09	2	2	IN 01
IN 08	1	1	IN 00

Outputs: IR 010

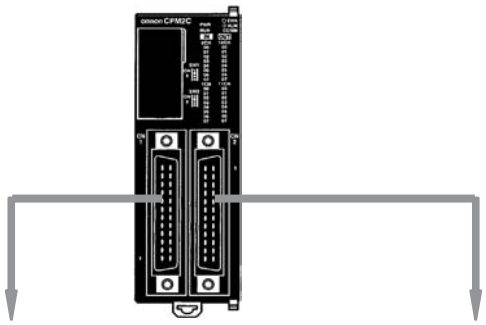
Sinking: CPM2C-20C DTC-D

	A	B	
OUT 00	1	1	NC
OUT 01	2	2	NC
OUT 02	3	3	NC
OUT 04	4	4	NC
OUT 03	5	5	NC
OUT 05	6	6	NC
OUT 06	7	7	NC
OUT 07	8	8	NC
COM (–)	9	9	NC
24 V	10	10	NC
NC	11	11	NC
NC	12	12	NC

Sourcing: CPM2C-20C DT1C-D

	A	B	
OUT 00	1	1	NC
OUT 01	2	2	NC
OUT 02	3	3	NC
OUT 03	4	4	NC
OUT 04	5	5	NC
OUT 05	6	6	NC
OUT 06	7	7	NC
OUT 07	8	8	NC
COM (+24 V)	9	9	NC
0 V	10	10	NC
NC	11	11	NC
NC	12	12	NC

CPU Unit with 32 I/O Points: CPM2C-32CDT□C-D



Inputs: IR 000/IR 001

	B	A	
NC	12	12	NC
NC	11	11	NC
NC	10	10	NC
COM	9	9	COM
IN 07	8	8	IN 07
IN 06	7	7	IN 06
IN 05	6	6	IN 05
IN 04	5	5	IN 04
IN 03	4	4	IN 03
IN 02	3	3	IN 02
IN 01	2	2	IN 01
IN 00	1	1	IN 00

IR 001 (IN 07 – IN 00)

IR 000 (IN 07 – IN 00)

Outputs: IR 010/IR 011

Sinking: CPM2C-32CDTC-D

	A	B	
OUT 00	1	1	OUT 00
OUT 01	2	2	OUT 01
OUT 02	3	3	OUT 02
OUT 04	4	4	OUT 04
OUT 03	5	5	OUT 03
OUT 05	6	6	OUT 05
OUT 06	7	7	OUT 06
OUT 07	8	8	OUT 07
COM (–)	9	9	COM (–)
24 V	10	10	24 V
NC	11	11	NC
NC	12	12	NC

IR 010 (OUT 00 – OUT 07)

IR 011 (OUT 00 – OUT 07)

Sourcing: CPM2C-32CDT1C-D

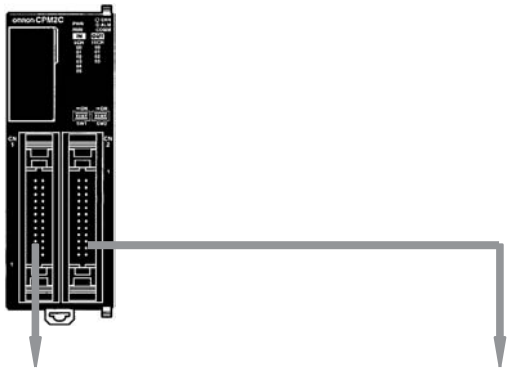
	A	B	
OUT 00	1	1	OUT 00
OUT 01	2	2	OUT 01
OUT 02	3	3	OUT 02
OUT 03	4	4	OUT 03
OUT 04	5	5	OUT 04
OUT 05	6	6	OUT 05
OUT 06	7	7	OUT 06
OUT 07	8	8	OUT 07
COM (+24 V)	9	9	COM (+24 V)
0 V	10	10	0 V
NC	11	11	NC
NC	12	12	NC

IR 010 (OUT 00 – OUT 07)

IR 011 (OUT 00 – OUT 07)

CPU Units with Transistor Outputs via MIL Connector

CPU Units with 10 I/O Points: CPM2C-10C□DT□M-D

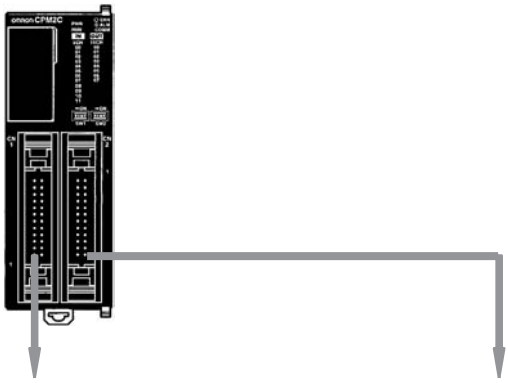


Inputs: IR 000			
IN 00	20	19	NC
IN 01	18	17	NC
IN 02	16	15	NC
IN 03	14	13	NC
IN 04	12	11	NC
IN 05	10	9	NC
NC	8	7	NC
NC	6	5	NC
COM	4	3	NC
NC	2	1	NC

Outputs: IR 010							
Sinking: CPM2C-10C DTM-D				Sourcing: CPM2C-10C DT1M-D			
NC	1	2	24 V	NC	1	2	0 V
NC	3	4	COM (–)	NC	3	4	COM (+24 V)
NC	5	6	NC	NC	5	6	NC
NC	7	8	NC	NC	7	8	NC
NC	9	10	NC	NC	9	10	NC
NC	11	12	NC	NC	11	12	NC
NC	13	14	OUT 03	NC	13	14	OUT 03
NC	15	16	OUT 02	NC	15	16	OUT 02
NC	17	18	OUT 01	NC	17	18	OUT 01
NC	19	20	OUT 00	NC	19	20	OUT 00

Note Pin 1 is in the positions given above. This differs from the indications on the case. Be sure to wire according to the following positions.
Input connectors: Bottom of right row
Output connectors: Top of left row

CPU Units with 20 I/O Points: CPM2C-20C□DT□M-D



Inputs: IR 000

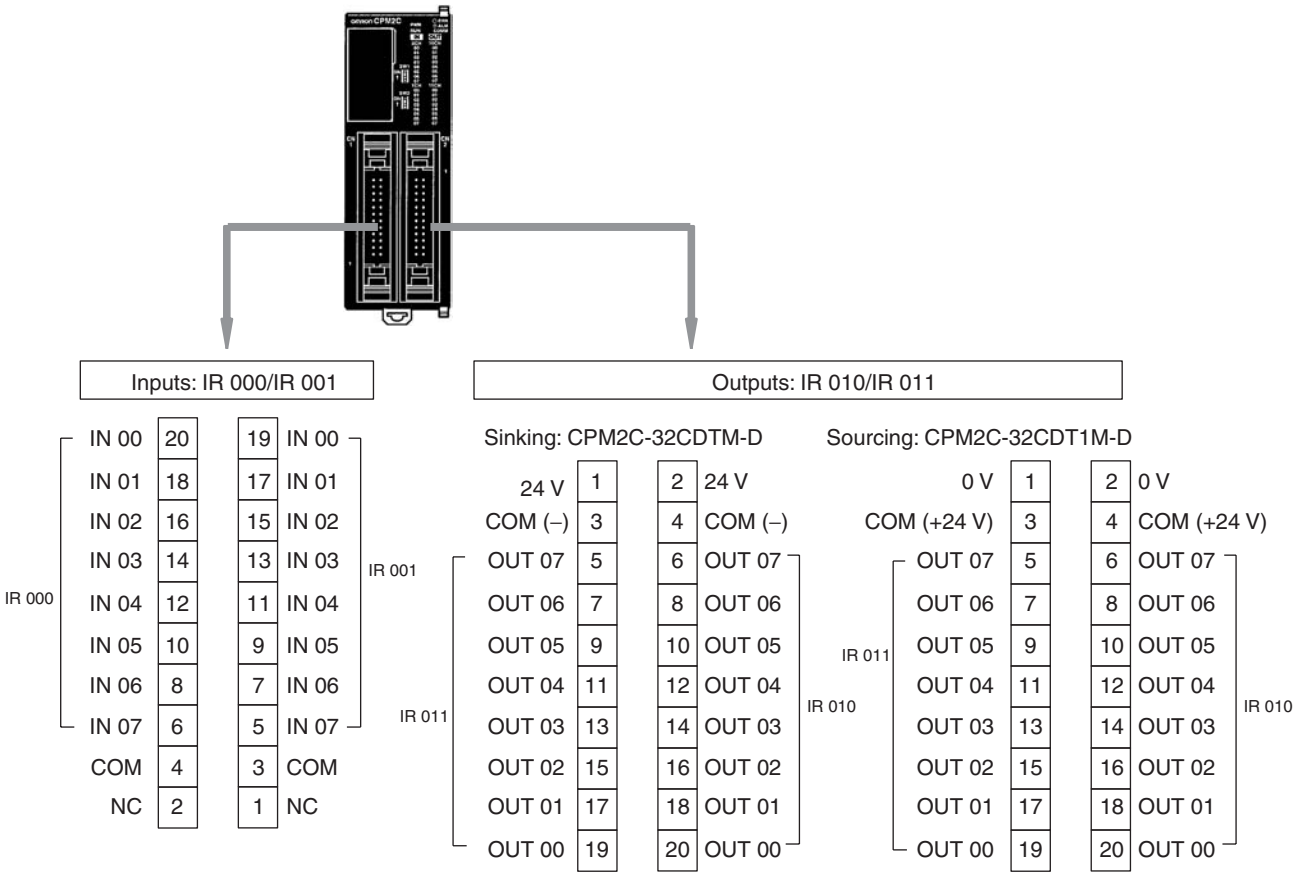
IN 00	20	19	IN 08
IN 01	18	17	IN 09
IN 02	16	15	IN 10
IN 03	14	13	IN 11
IN 04	12	11	NC
IN 05	10	9	NC
IN 06	8	7	NC
IN 07	6	5	NC
COM	4	3	COM
NC	2	1	NC

Outputs: IR 010

Sinking: CPM2C-20C DTM-D				Sourcing: CPM2C-20C DT1M-D			
NC	1	2	24 V	NC	1	2	0 V
NC	3	4	COM (–)	NC	3	4	COM (+24 V)
NC	5	6	OUT 07	NC	5	6	OUT 07
NC	7	8	OUT 06	NC	7	8	OUT 06
NC	9	10	OUT 05	NC	9	10	OUT 05
NC	11	12	OUT 04	NC	11	12	OUT 04
NC	13	14	OUT 03	NC	13	14	OUT 03
NC	15	16	OUT 02	NC	15	16	OUT 02
NC	17	18	OUT 01	NC	17	18	OUT 01
NC	19	20	OUT 00	NC	19	20	OUT 00

Note Pin 1 is in the positions given above. This differs from the indications on the case. Be sure to wire according to the following positions.
Input connectors: Bottom of right row
Output connectors: Top of left row

CPU Units with 32 I/O Points: CPM2C-32CDT□M-D



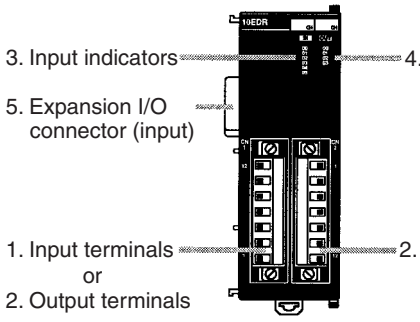
Note Pin 1 is in the positions given above. This differs from the indications on the case. Be sure to wire according to the following positions.
Input connectors: Bottom of right row
Output connectors: Top of left row

2-2-2 Expansion I/O Units

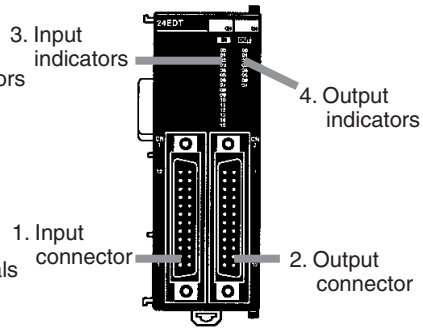
Expansion I/O Unit Components

Front View

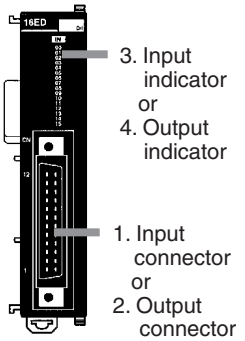
Units with Relay Outputs via Terminal Block



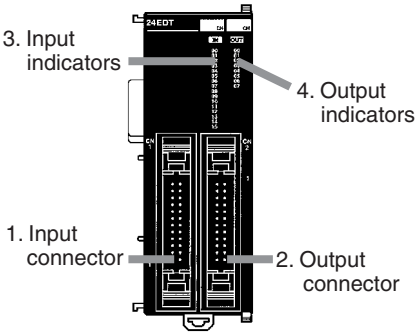
Units with Transistor Outputs via Fujitsu-compatible Connector



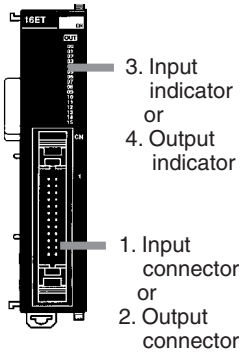
Units with Inputs or Transistor Outputs via Fujitsu-compatible Connector



Units with Transistor Outputs via MIL Connector

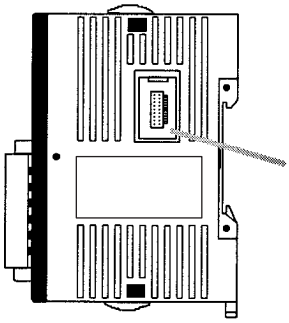


Units with Inputs or Transistor Outputs via MIL Connector

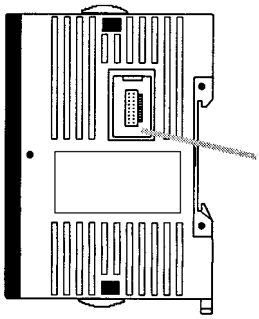


Side

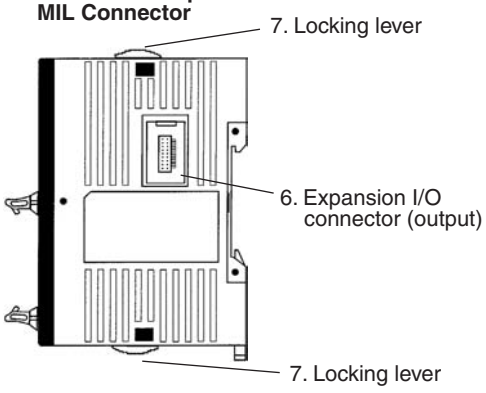
Units with Relay Outputs via Terminal Block



Units with Inputs or Transistor Outputs via Fujitsu-compatible Connector



Units with Inputs or Transistor Outputs via MIL Connector



1,2,3... 1. Input Terminals/Connector

Connects the CPU Unit to external input devices.

2. Output Terminals/Connector

Connects the CPU Unit to external output devices.

3. Input Indicators

The input indicators are lit when the corresponding input terminal is ON.

Note Input indicators will reflect the status of the corresponding inputs even when the PC is stopped, but the corresponding input bits will not be refreshed.

4. Output Indicators

   The output indicators are lit when the corresponding output terminal is ON.

5. Expansion I/O Connector (Input)

   Connects the Expansion I/O Unit to the CPU Unit or the previous Expansion Unit or Expansion I/O Unit.

   Note The indicators are lit during I/O refreshing. The status of an output indicator will also reflect the status of the corresponding output when the output is being used as a pulse output.

6. Expansion I/O Connector (Output)

   Connects the Expansion I/O Unit to the next Expansion I/O Unit or Expansion Unit, if necessary. Up to 5 Expansion I/O Units and Expansion Units can be connected to a CPU Unit. Only 10 words, however, can be allocated for input and output.

   A cover for the expansion I/O connector is not included with the Expansion I/O Unit. Use the cover included with the CPU Unit to cover the unused expansion I/O connector on the last Expansion I/O Unit or Expansion Unit in the PC.

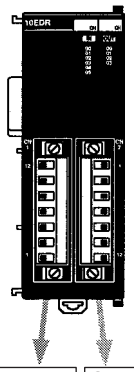
7. Locking Lever

   Used for securing Expansion I/O Units.

I/O Terminal and Connector Pin Allocation

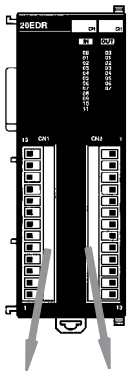
Expansion I/O Units with Relay Outputs via Terminal Block

10 I/O Points: CPM2C-10EDR



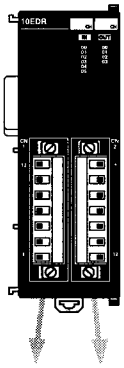
Inputs: IR word m			Outputs: IR word n		
COM	7	1	OUT 00		
IN 05	6	2	COM		
IN 04	5	3	OUT 01		
IN 03	4	4	COM		
IN 02	3	5	OUT 02		
IN 01	2	6	OUT 03	Shared common	
IN 00	1	7	COM		

20 I/O Points: CPM2C-20EDR



Inputs: IR word m			Outputs: IR word n	
COM	13	1	OUT 00	
IN 11	12	2	OUT 01	Shared common
IN 10	11	3	COM	
IN 09	10	4	OUT 02	
IN 08	9	5	OUT 03	Shared common
IN 07	8	6	COM	
IN 06	7	7	OUT 04	
IN 05	6	8	OUT 05	Shared common
IN 04	5	9	COM	
IN 03	4	10	OUT 06	
IN 02	3	11	OUT 07	Shared common
IN 01	2	12	COM	
IN 00	1	13	COM	

8 Output Points: CPM2C-8ER

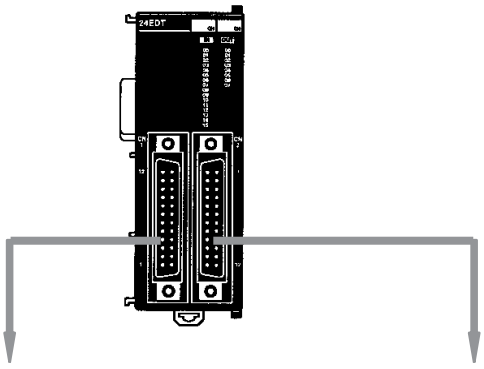


Outputs: IR word n				
Shared common	COM	7	1	OUT 04
	OUT 03	6	2	COM
	OUT 02	5	3	OUT 05
	COM	4	4	COM
	OUT 01	3	5	OUT 06
	COM	2	6	OUT 07
	OUT 00	1	7	COM

Shared common

Expansion I/O Units with Transistor Outputs via Fujitsu-compatible Connector

24 I/O Points: CPM2C-24EDT□C



Inputs: IR word m

B		A	
NC	12	12	NC
NC	11	11	NC
NC	10	10	NC
COM	9	9	COM
IN 15	8	8	IN 07
IN 14	7	7	IN 06
IN 13	6	6	IN 05
IN 12	5	5	IN 04
IN 11	4	4	IN 03
IN 10	3	3	IN 02
IN 9	2	2	IN 01
IN 8	1	1	IN 00

Outputs: IR word n

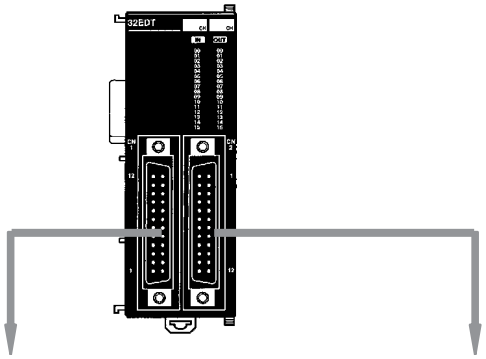
Sinking: CPM2C-24EDTC

A		B	
OUT 00	1	1	NC
OUT 01	2	2	NC
OUT 02	3	3	NC
OUT 04	4	4	NC
OUT 03	5	5	NC
OUT 05	6	6	NC
OUT 06	7	7	NC
OUT 07	8	8	NC
COM (–)	9	9	NC
24 V	10	10	NC
NC	11	11	NC
NC	12	12	NC

Sourcing: CPM2C-24EDT1C

A		B	
OUT 00	1	1	NC
OUT 01	2	2	NC
OUT 02	3	3	NC
OUT 03	4	4	NC
OUT 04	5	5	NC
OUT 05	6	6	NC
OUT 06	7	7	NC
OUT 07	8	8	NC
COM (+24 V)	9	9	NC
0 V	10	10	NC
NC	11	11	NC
NC	12	12	NC

32 I/O Points: CPM2C-32EDT□C



Inputs: IR word m

B		A	
NC	12	12	NC
NC	11	11	NC
NC	10	10	NC
COM	9	9	COM
IN 15	8	8	IN 07
IN 14	7	7	IN 06
IN 13	6	6	IN 05
IN 12	5	5	IN 04
IN 11	4	4	IN 03
IN 10	3	3	IN 02
IN 9	2	2	IN 01
IN 8	1	1	IN 00

Outputs: IR word n

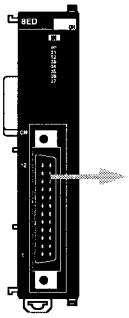
Sinking: CPM2C-32EDTC

A		B	
OUT 00	1	1	OUT 08
OUT 01	2	2	OUT 09
OUT 02	3	3	OUT 10
OUT 04	4	4	OUT 11
OUT 03	5	5	OUT 12
OUT 05	6	6	OUT 13
OUT 06	7	7	OUT 14
OUT 07	8	8	OUT 15
COM (–)	9	9	COM (–)
24 V	10	10	24 V
NC	11	11	NC
NC	12	12	NC

Sourcing: CPM2C-32EDT1C

A		B	
OUT 00	1	1	OUT 08
OUT 01	2	2	OUT 09
OUT 02	3	3	OUT 10
OUT 03	4	4	OUT 11
OUT 04	5	5	OUT 12
OUT 05	6	6	OUT 13
OUT 06	7	7	OUT 14
OUT 07	8	8	OUT 15
COM (+24 V)	9	9	COM (+24 V)
0 V	10	10	0 V
NC	11	11	NC
NC	12	12	NC

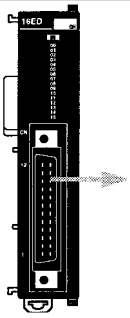
8 Input Points: CPM2C-8EDC



Inputs: IR word m

B		A	
NC	12	12	NC
NC	11	11	NC
NC	10	10	NC
NC	9	9	COM
NC	8	8	IN 07
NC	7	7	IN 06
NC	6	6	IN 05
NC	5	5	IN 04
NC	4	4	IN 03
NC	3	3	IN 02
NC	2	2	IN 01
NC	1	1	IN 00

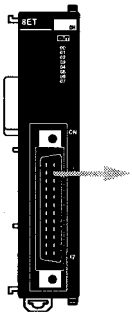
16 Input Points: CPM2C-16EDC



Inputs: IR word m

B		A	
NC	12	12	NC
NC	11	11	NC
NC	10	10	NC
COM	9	9	COM
IN 15	8	8	IN 07
IN 14	7	7	IN 06
IN 13	6	6	IN 05
IN 12	5	5	IN 04
IN 11	4	4	IN 03
IN 10	3	3	IN 02
IN 09	2	2	IN 01
IN 08	1	1	IN 00

8 Output Points: CPM2C-8ET□C



Outputs: IR word n

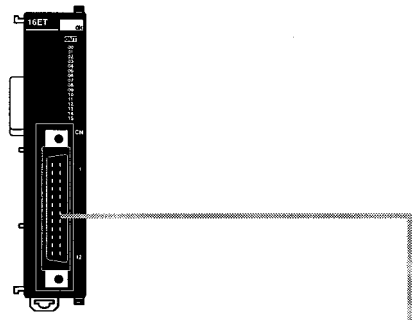
Sinking: CPM2C-8ETC

A		B	
OUT 00	1	1	NC
OUT 01	2	2	NC
OUT 02	3	3	NC
OUT 03	4	4	NC
OUT 04	5	5	NC
OUT 05	6	6	NC
OUT 06	7	7	NC
OUT 07	8	8	NC
COM ( )	9	9	NC
24 V	10	10	NC
NC	11	11	NC
NC	12	12	NC

Sourcing: CPM2C-8ET1C

A		B	
OUT 00	1	1	NC
OUT 01	2	2	NC
OUT 02	3	3	NC
OUT 03	4	4	NC
OUT 04	5	5	NC
OUT 05	6	6	NC
OUT 06	7	7	NC
OUT 07	8	8	NC
COM (+24 V)	9	9	NC
0 V	10	10	NC
NC	11	11	NC
NC	12	12	NC

16 Output Points: CPM2C-16ET□C



Outputs: IR word n

Sinking: CPM2C-16ETC

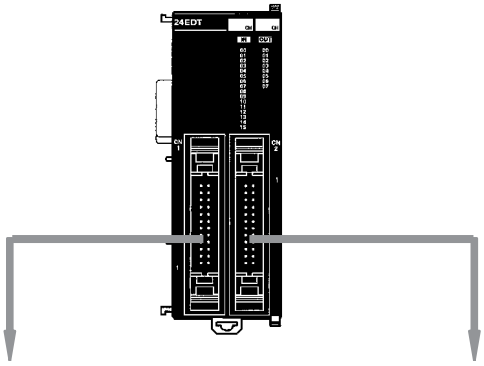
	A	B	
OUT 00	1	1	OUT 08
OUT 01	2	2	OUT 09
OUT 02	3	3	OUT 10
OUT 03	4	4	OUT 11
OUT 04	5	5	OUT 12
OUT 05	6	6	OUT 13
OUT 06	7	7	OUT 14
OUT 07	8	8	OUT 15
COM (–)	9	9	COM (–)
24 V	10	10	24 V
NC	11	11	NC
NC	12	12	NC

Sourcing: CPM2C-16ET1C

	A	B	
OUT 00	1	1	OUT 08
OUT 01	2	2	OUT 09
OUT 02	3	3	OUT 10
OUT 03	4	4	OUT 11
OUT 04	5	5	OUT 12
OUT 05	6	6	OUT 13
OUT 06	7	7	OUT 14
OUT 07	8	8	OUT 15
COM (+24 V)	9	9	COM (+24 V)
0 V	10	10	0 V
NC	11	11	NC
NC	12	12	NC

Expansion I/O Units with Transistor Outputs via MIL Connector

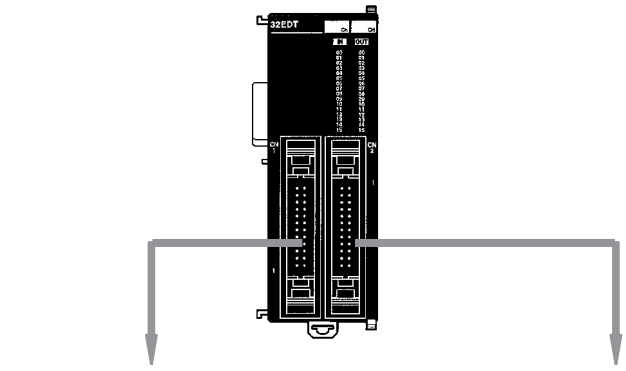
24 I/O Points: CPM2C-24EDT□M



Inputs: IR word m				Outputs: IR word n							
				Sinking: CPM2C-24EDTM				Sourcing: CPM2C-24EDT1M			
IN 00	20	19	IN 08	NC	1	2	24 V	NC	1	2	0 V
IN 01	18	17	IN 09	NC	3	4	COM (–)	NC	3	4	COM (+24 V)
IN 02	16	15	IN 10	NC	5	6	OUT 07	NC	5	6	OUT 07
IN 03	14	13	IN 11	NC	7	8	OUT 06	NC	7	8	OUT 06
IN 04	12	11	NC	NC	9	10	OUT 05	NC	9	10	OUT 05
IN 05	10	9	NC	NC	11	12	OUT 04	NC	11	12	OUT 04
IN 06	8	7	NC	NC	13	14	OUT 03	NC	13	14	OUT 03
IN 07	6	5	NC	NC	15	16	OUT 02	NC	15	16	OUT 02
COM	4	3	COM	NC	17	18	OUT 01	NC	17	18	OUT 01
NC	2	1	NC	NC	19	20	OUT 00	NC	19	20	OUT 00

Note Pin 1 is in the positions given above. This differs from the indications on the case. Be sure to wire according to the following positions.
Input connectors: Bottom of right row
Output connectors: Top of left row

32 I/O Points: CPM2C-32EDT□M



Inputs: IR word m

IN 00	20	19	IN 08
IN 01	18	17	IN 09
IN 02	16	15	IN 10
IN 03	14	13	IN 11
IN 04	12	11	IN 12
IN 05	10	9	IN 13
IN 06	8	7	IN 14
IN 07	6	5	IN 15
COM	4	3	COM
NC	2	1	NC

Outputs: IR word n

Sinking: CPM2C-32EDTM

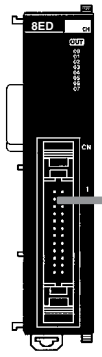
24 V	1	2	24 V
COM (–)	3	4	COM (–)
OUT 15	5	6	OUT 07
OUT 14	7	8	OUT 06
OUT 13	9	10	OUT 05
OUT 12	11	12	OUT 04
OUT 11	13	14	OUT 03
OUT 10	15	16	OUT 02
OUT 09	17	18	OUT 01
OUT 08	19	20	OUT 00

Sourcing: CPM2C-32EDT1M

0 V	1	2	0 V
COM (+24 V)	3	4	COM (+24 V)
OUT 15	5	6	OUT 07
OUT 14	7	8	OUT 06
OUT 13	9	10	OUT 05
OUT 12	11	12	OUT 04
OUT 11	13	14	OUT 03
OUT 10	15	16	OUT 02
OUT 09	17	18	OUT 01
OUT 08	19	20	OUT 00

Note Pin 1 is in the positions given above. This differs from the indications on the case. Be sure to wire according to the following positions.
Input connectors: Bottom of right row
Output connectors: Top of left row

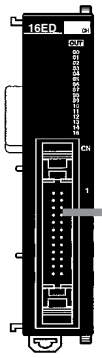
8 Input Points: CPM2C-8EDM



Inputs: IR word m

IN 00	20	19	NC
IN 01	18	17	NC
IN 02	16	15	NC
IN 03	14	13	NC
IN 04	12	11	NC
IN 05	10	9	NC
IN 06	8	7	NC
IN 07	6	5	NC
COM	4	3	NC
NC	2	1	NC

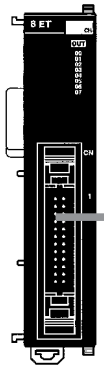
16 Input Points: CPM2C-16EDM



Inputs: IR word m

IN 00	20	19	IN 08
IN 01	18	17	IN 09
IN 02	16	15	IN 10
IN 03	14	13	IN 11
IN 04	12	11	IN 12
IN 05	10	9	IN 13
IN 06	8	7	IN 14
IN 07	6	5	IN 15
COM	4	3	COM
NC	2	1	NC

8 Output Points: CPM2C-8ET□M



Outputs: IR word n

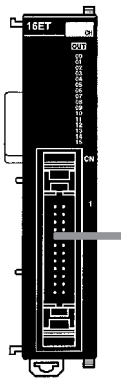
Sinking: CPM2C-8ETM

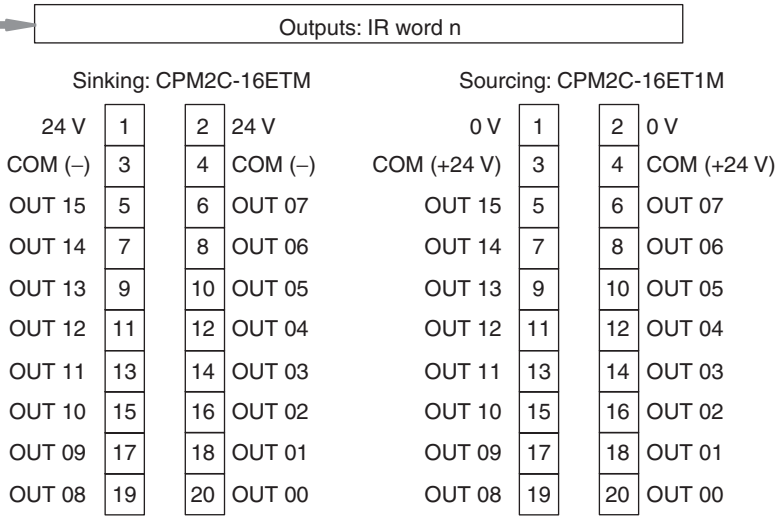
NC	1	2	24 V
NC	3	4	COM (–)
NC	5	6	OUT 07
NC	7	8	OUT 06
NC	9	10	OUT 05
NC	11	12	OUT 04
NC	13	14	OUT 03
NC	15	16	OUT 02
NC	17	18	OUT 01
NC	19	20	OUT 00

Sourcing: CPM2C-8ET1M

NC	1	2	0 V
NC	3	4	COM (+24 V)
NC	5	6	OUT 07
NC	7	8	OUT 06
NC	9	10	OUT 05
NC	11	12	OUT 04
NC	13	14	OUT 03
NC	15	16	OUT 02
NC	17	18	OUT 01
NC	19	20	OUT 00

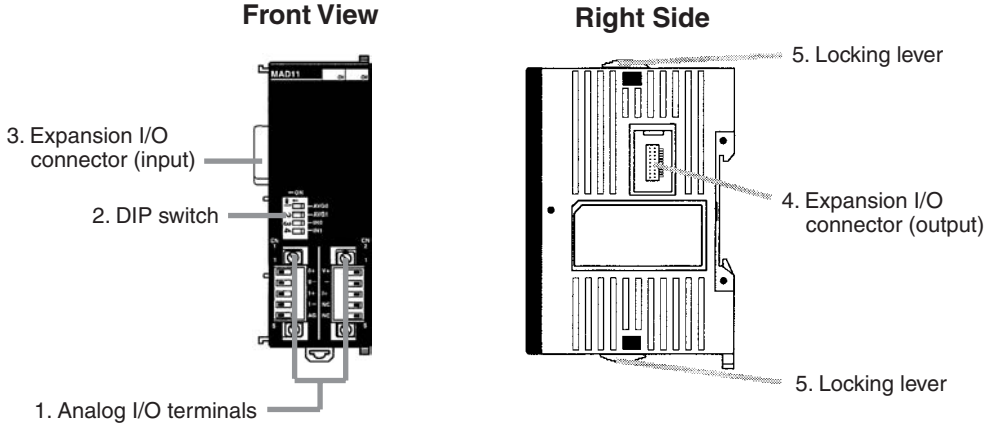
16 Output Points: CPM2C-16ET□M





24 V	1	2	24 V	0 V	1	2	0 V
COM (–)	3	4	COM (–)	COM (+24 V)	3	4	COM (+24 V)
OUT 15	5	6	OUT 07	OUT 15	5	6	OUT 07
OUT 14	7	8	OUT 06	OUT 14	7	8	OUT 06
OUT 13	9	10	OUT 05	OUT 13	9	10	OUT 05
OUT 12	11	12	OUT 04	OUT 12	11	12	OUT 04
OUT 11	13	14	OUT 03	OUT 11	13	14	OUT 03
OUT 10	15	16	OUT 02	OUT 10	15	16	OUT 02
OUT 09	17	18	OUT 01	OUT 09	17	18	OUT 01
OUT 08	19	20	OUT 00	OUT 08	19	20	OUT 00

2-2-3 CPM2C-MAD11 Analog I/O Unit

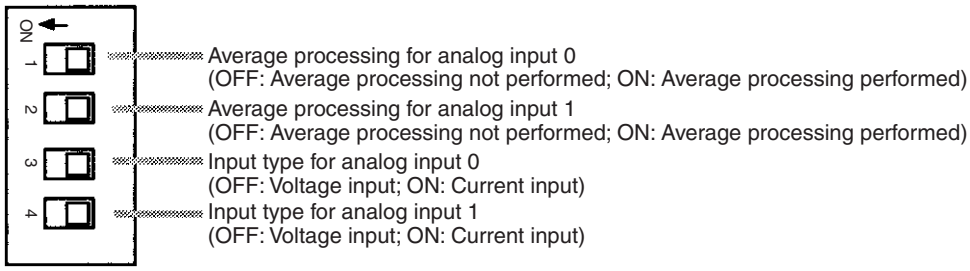


1,2,3... 1. Analog I/O Terminals

Connect the CPU Unit to analog input and analog output devices.

2. DIP Switch

   Used to switch between voltage and current input, and to perform average processing.



3. Expansion I/O Connector (Input)

   Connects the Analog I/O Unit to the CPU Unit or previous Expansion Unit or Expansion I/O Unit.

4. Expansion I/O Connector (Output)

   Connects the Analog I/O Unit to the next Expansion I/O Unit or Expansion Unit, if necessary. Up to 5 Expansion I/O Units and Expansion Units can be connected to a CPU Unit. Only 10 words, however, can be allocated for input and output respectively.

   A cover for the expansion I/O connector is not included with the Expansion Unit. Use the cover included with the CPU Unit to cover the unused expansion I/O connector on the last Expansion I/O Unit or Expansion Unit in the PC.

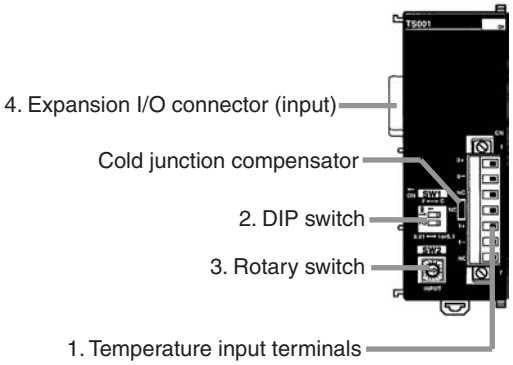
5. Locking Lever

   Used for securing Expansion Units.

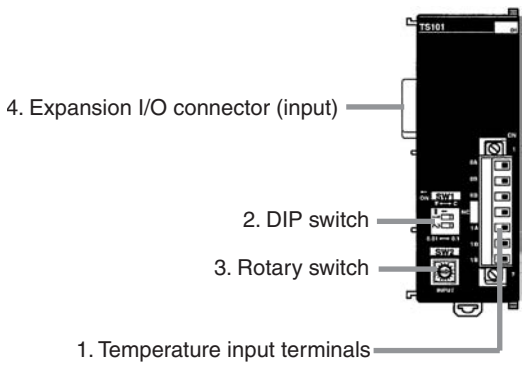
2-2-4 CPM2C-TS001/TS101 Temperature Sensor Units

Front View

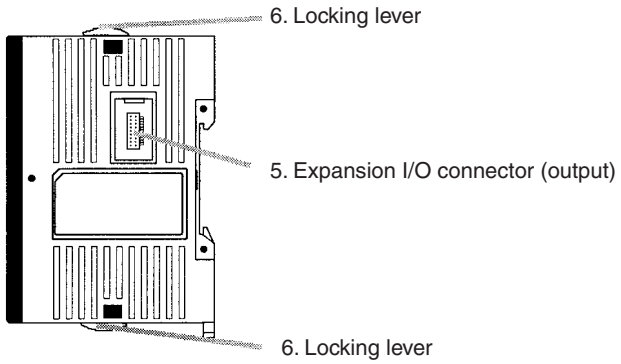
CPM2C-TS001



CPM2C-TS101



Right Side

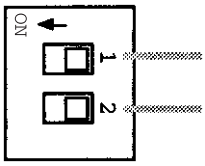


1,2,3... 1. Temperature Input Terminals

Connect to a thermocouple or a platinum resistance thermometer.

2. DIP Switch

Sets the temperature unit (°C or °F) and the number of decimal places used.

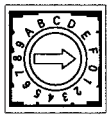


Temperature unit for temperature input 0
OFF: C; ON: F

Number of decimal places used
OFF: Normal (0 or 1); ON: 2

3. Rotary Switch

Sets the temperature range.



CPM2C-TS001

Set value	Thermocouple	Range (°C)	Range (°F)
0	K	–200 to 1,300	–300 to 2,300
1		0.0 to 500.0	0.0 to 900.0
2	J	–100 to 850	–100 to 1,500
3		0.0 to 400.0	0.0 to 750.0
4 to F	---	Setting not possible	

CPM2C-TS101

Set value	Platinum resistance thermometer	Range (°C)	Range (°F)
0	Pt100	–200.0 to 650.0	–300.0 to 1,200.0
1	JPt100	–200.0 to 650.0	–300.0 to 1,200.0
2 to F	---	Setting not possible	

4. Expansion I/O Connector (Input)

Connects the Temperature Sensor Unit to the CPU Unit or the previous Expansion I/O Unit or Expansion Unit.

5. Expansion I/O Connector (Output)

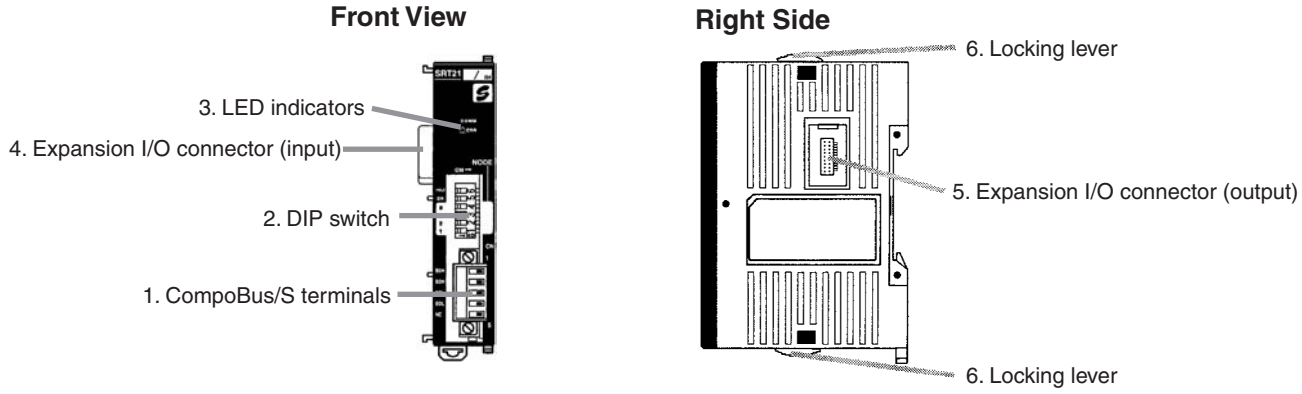
Connects the Temperature Sensor Unit to the next Expansion I/O Unit or Expansion Unit, if necessary. Up to 5 Expansion I/O Units and Expansion Units can be connected to a CPU Unit. Only 10 words, however, can be allocated for input and output.

A cover for the expansion I/O connector is not included with the Expansion Unit. Use the cover included with the CPU Unit to cover the unused expansion I/O connector on the last Expansion I/O Unit or Expansion Unit in the PC.

6. Locking Lever

Used for securing Expansion Units.

2-2-5 CPM2C-SRT21 CompoBus/S I/O Link Unit

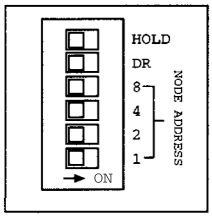


1,2,3... 1. CompoBus/S Terminals

Include the CompoBus/S communications data high/low terminal, and NC terminals. Power is supplied to the Unit internally.

2. DIP Switch

The DIP switch sets the Unit's node address, sets the communications mode, and determines whether or not the outputs will be cleared in the event of a communications error.



Pin(s)	Function
1 to 4 (labeled 1, 2, 4, and 8)	These pins set the Unit's node address using the DIP switch pins as binary digits. (1 = ON) 0: 0000 1: 0001 2: 0010 3: 0011 4: 0100 5: 0101 6: 0110 7: 0111 8: 1000 9: 1001 10: 1010 11: 1011 12: 1100 13: 1101 14: 1110 15: 1111
DR	ON: Long-distance Communications Mode OFF: High-speed Communications Mode (See note.)
HOLD	ON: Retain inputs when a communications error occurs. OFF: Clear inputs when a communications error occurs.

Note The Long-distance Communications Mode can be used only when connected to one of the following Master Units: C200HW-SRM21-V1, CQM1-SRM21-V1, SRM1-C0□-V2, or CPM2C-S.

3. LED Indicators

These indicators show the status of CompoBus/S communications.

Indicator	Status	Meaning
COMM (yellow)	ON	Communications in progress.
	OFF	Communications error or stopped.
ERR (red)	ON	A communications error has occurred.
	OFF	Indicates normal or no communications.

4. Expansion I/O Connector (Input)

Connects the CompoBus/S I/O Link Unit to the CPU Unit or the previous Expansion I/O Unit or Expansion Unit.

5. Expansion I/O Connector (Output)

Connects the CompoBus/S I/O Link Unit to the next Expansion I/O Unit or Expansion Unit, if necessary. Up to 5 Expansion I/O Units and Expansion

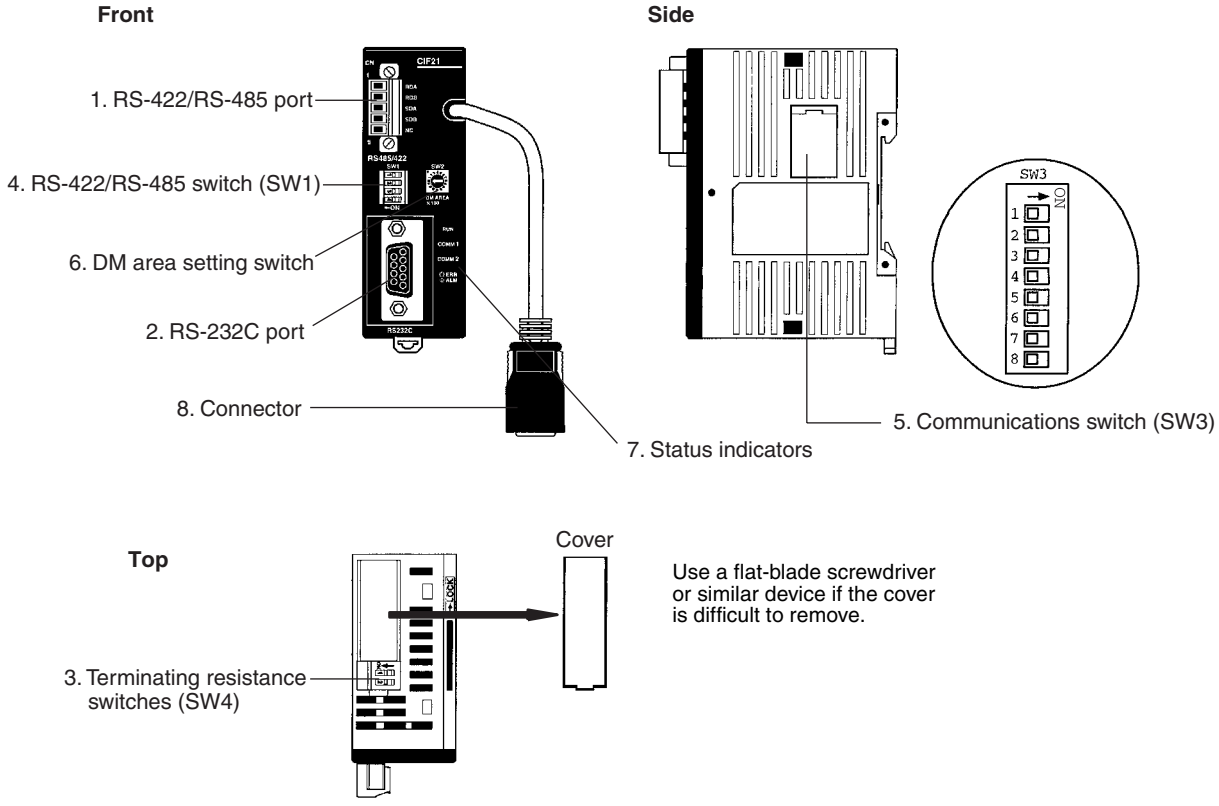
Units can be connected to a CPU Unit. Only 10 words, however, can be allocated for input and output respectively.

A cover for the expansion I/O connector is not included with the Expansion Unit. Use the cover included with the CPU Unit to cover the unused expansion I/O connector on the last Expansion I/O Unit or Expansion Unit in the PC.

6. Locking Lever

   Used for securing Expansion Units.

2-2-6 CPM2C-CIF21 Simple Communications Unit

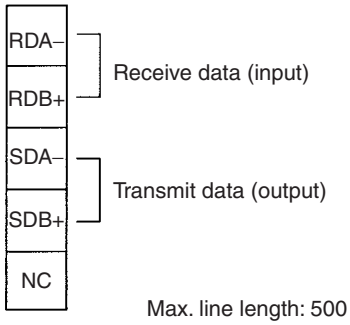


Note The CPM2C-CIF21 can be used only with the CPM2C.

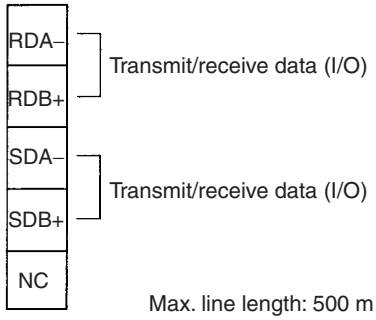
1,2,3... 1. RS-422/RS-485 Port

Connects CompoWay/F general-purpose communications components and SYSWAY Temperature Controllers and Digital Panel Meters.

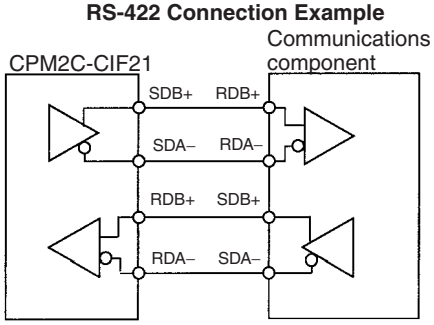
RS-422 Pin Assignments



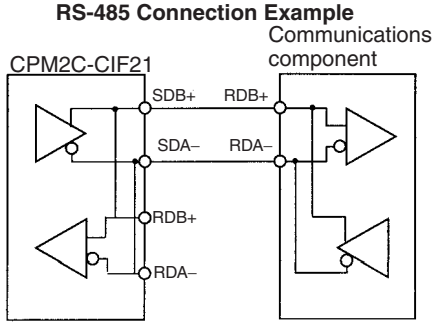
RS-485 Pin Assignments



RS-422 Connection Example



RS-485 Connection Example

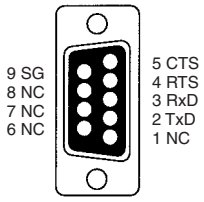


Note Confirm polarity before connecting RS-422/485 lines. Some devices require that SDA/SDB or RDA/RDB and the +/– signal be reversed.

2. RS-232C Port

Connects to an RS-232C interface on a computer, PT (Programmable Terminal), etc.

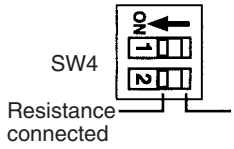
Pin Assignments



Top port	Signal conversion	Changes levels between CMOS (CPU Unit) and RS-422 (general-purpose communications components). RS-422 (general-purpose communications components) insulated using DC/DC converter or photocoupler.
	Function	Conversion between CPU Unit and Host Link General-purpose communications components are CompoWay/F or SYSWAY components, which support general-purpose serial communications.
Bottom port	Signal conversion	Outputs the RS-232C interface directly from the CPU Unit.
	Function	Host Link, no-protocol, 1:1 link, or 1:1 NT Link

3. Terminating Resistance Switches (SW4)

Turn ON both SW4-1 and SW4-2 on both ends of the RS-422/RS-485 transmission path. These switches are set to OFF at the factory.

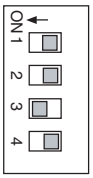


Terminating Resistance
RS-422: 235 Ω (combined resistance must be 110 Ω min)
RS-485: 118 Ω (combined resistance must be 54 Ω min)

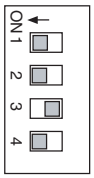
4. RS-422/RS-485 Switch (SW1)

Switches the RS-485 interface and sets RS/CS controls for the RS-485 interface.

RS-422 Setting
SW1



RS-485 Setting
SW1

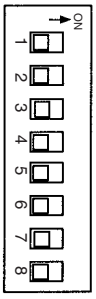


Pin on SW1	RS-422	RS-485
1	OFF	ON
2	OFF	ON
3	ON	OFF
4	OFF	ON

Note The default setting is for 2-wire RS-485 communications. Do not turn ON both SW1-3 and SW1-4 at the same time. Doing so will destroy internal circuits.

5. Communications Switch (SW3)

SW3



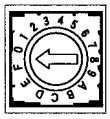
All pins are turned OFF at the factory.

Pin	Setting		OFF	ON
1	Baud rate with CPU Unit		9,600 bps	19,200 bps
2	Baud rate with components	Normal	9,600 bps	19,200 bps
		High-speed	38,400 bps	57,600 bps
3	Data length with components		7 bits	8 bits
4	Parity 1 setting with components		Yes	None
5	Parity 2 setting with components		Even	Odd
6	Stop bits with components		2	1
7	Not used. (Always leave pin 7 OFF.)		Leave OFF.	---
8	Component communications speed		Normal	High-speed

Note a) Pins 3 to 6 on SW3 are used to set communications between general-purpose communications components and the Simple Communications Unit.

b) Turn OFF pin 7 on SW3. Operation may not be correct if this pin is turned ON.

6. DM Area Setting Switch (SW2)
   Sets the starting word in the DM Area



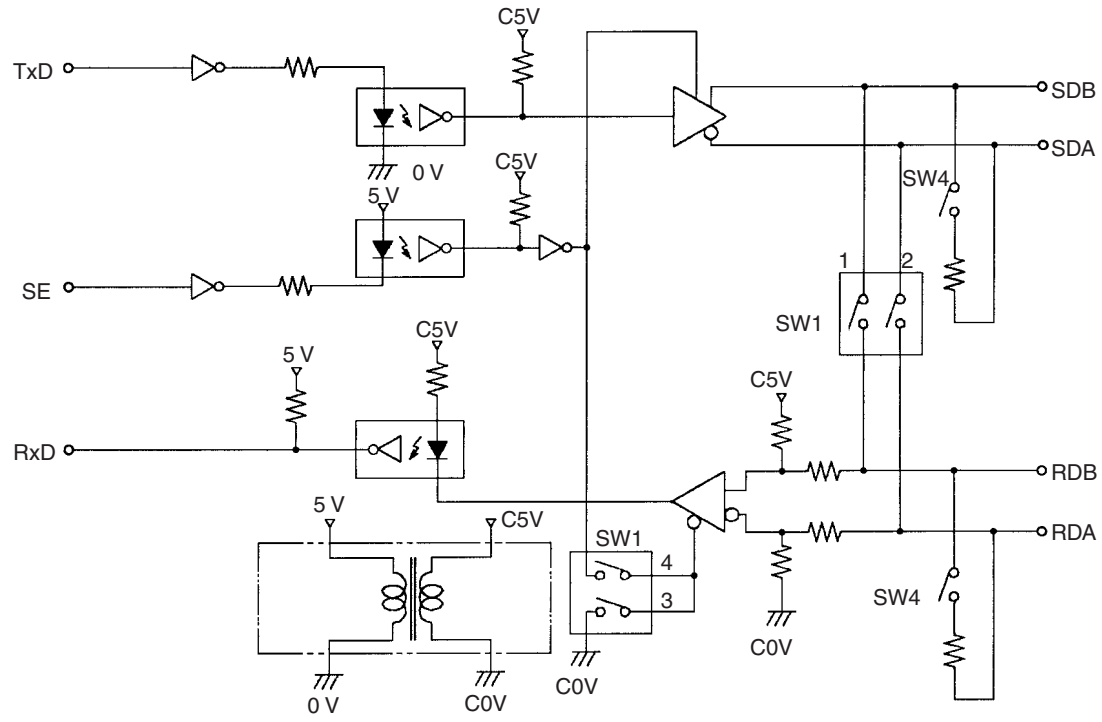
Setting	Starting word in DM Area
0	DM 0000
1	DM 0100
2	DM 0200
3	DM 0300
4	DM 0400
5	DM 0500
6	DM 0600
7	DM 0700
8	DM 0800
9	DM 0900
A	DM 1000
B	DM 1100
C	DM 1200
D	DM 1300
E	DM 1400
F	DM 1500

7. Status Indicators
   Indicate the operating status of the Simple Communications Unit.

Label	Status	Meaning
RUN	Lit	Communications established between Simple Communications Unit and CPU Unit. Simple Communications Unit operating.
	Not lit	Simple Communications Unit not operating.
	Flashing	Communications between Simple Communications Unit and CPU Unit either not established or interrupted.
ERR/ALM	Lit	Fatal error occurred. (Unit operation stops.)
	Flashing	Non-fatal error occurred. (Unit operation continues.)
	Not lit	Unit operating normally.
COMM1	Flashing	Transferring data between Simple Communications Unit and CPU Unit
	Not lit	Not transferring data
COMM2	Flashing	Transferring data between Simple Communications Unit and connected components
	Not lit	Not transferring data

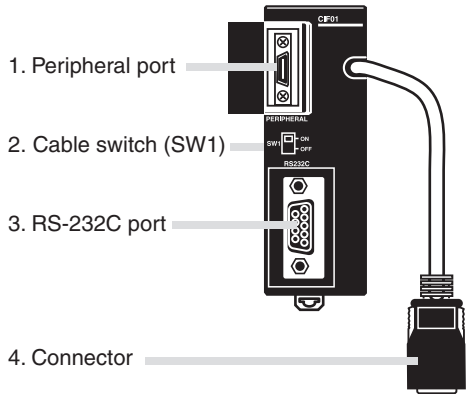
8. Connector
   Connects to CPU Unit communications port.

RS-422 Interface Block Diagram



2-2-7 CPM2C-CIF01-V1 Peripheral/RS-232C Adapter Unit

Front View



Do not use the CPM2C-CIF01-V1 with any PC other than the CPM2C. Do not connect another CPM2C-CIF01-V1 or the CPM2C-CIF11 to the CPM2C-CIF01-V1. The CPM2C-CN111 can be connected to the CPM2C-CIF01, but the peripheral port and the RS-232C port of the CPM2C-CN111 cannot be used simultaneously. If an attempt to use these ports simultaneously is made, communications will not be performed properly, and this may result in malfunction of equipment.

*: The CPM2C-CIF01 does not have a cable switch (SW1).

1,2,3... 1. Peripheral Port

Used to connect to Programming Devices (including Programming Consoles), host computers, or general-purpose external devices. Use a special connecting cable (CS1W-CN114, CS1W-CN118) for connections.
With the CPM2C-CIF01-V1, the cable switch (SW1) can be turned ON to enable connecting to a personal computer with a CS1W-CN226/CN626 Connecting Cable.

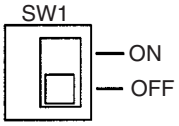
Note a) The C200H-PRO27-E Programming Console can be connected directly to the CPM2C's CPU Unit using a special connecting cable (CS1W-CN224/624).

b) Use the CS1W-CN114 when using the port as a peripheral port.

c) Use the CS1W-CN118 when using the port as a RS-232C port.

2. Cable Switch (SW1, CPM2C-CIF01-V1 Only)

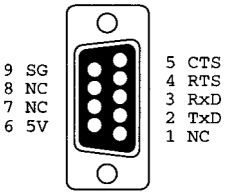
   Turn ON SW1 to use a CS1W-CN226/CN626 Connecting Cable to connect to a personal computer. Turn OFF SW1 to use any other cable.



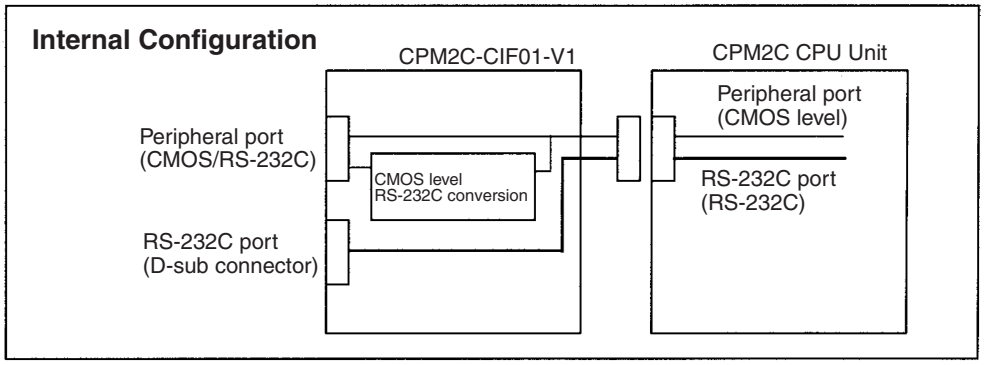
3. RS-232C Port

   Used to connect to the RS-232C interface of a personal computer or Programmable Terminal (operator interface).

Connector Pin Allocation



Internal Configuration



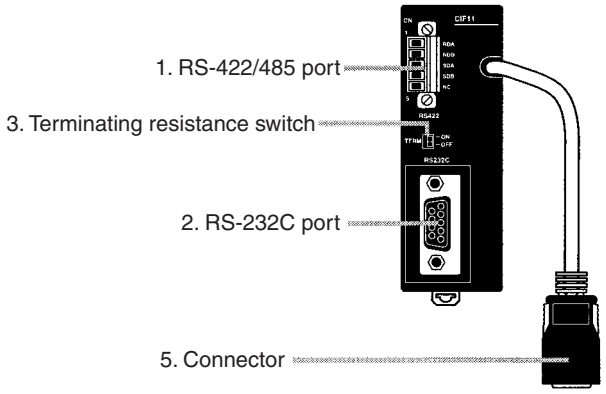
Peripheral port on CPM2C-CIF01-V1	Signal conversion	Outputs signals from the CPU Unit's CMOS interface without conversion, or converts CMOS level (CPU Unit side) to RS-232C (connected device side).
	Function	Host Link, peripheral bus, no-protocol, or Programming Console connections.
RS-232C port on CPM2C-CIF01-V1	Signal conversion	Outputs signals from the CPU Unit's CMOS interface without conversion.
	Function	Host Link, no-protocol, 1:1 Link, or 1:1 NT Link connections.

4. Connector

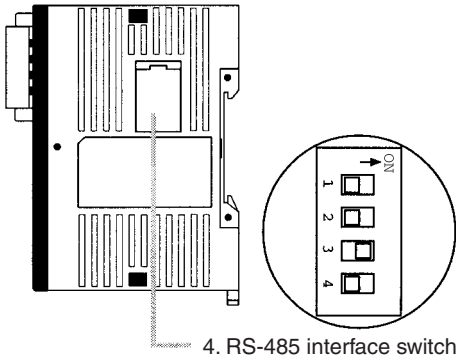
   Connects to the communications port on the CPU Unit.

2-2-8 CPM2C-CIF11 RS-422/RS-232C Adapter Unit

Front View



Right Side

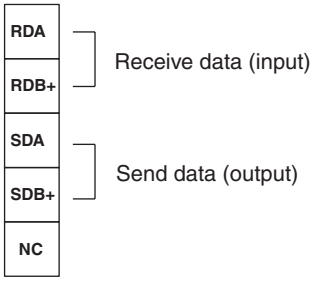


Note Do not use the CPM2C-CIF11 with any PC other than the CPM2C.

1,2,3... 1. RS422/485 Port

Used to connect to host computers, or standard external devices.

Terminal Arrangement

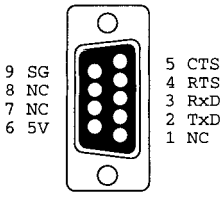


Note The maximum line length is 500 m.

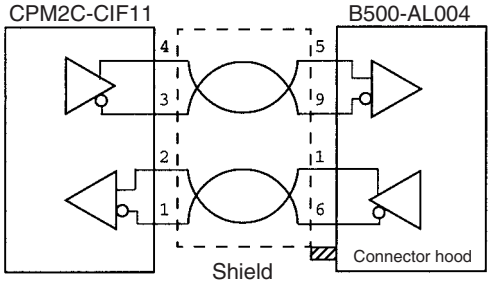
2. RS-232C Port

Used to connect to the RS-232C interface of a personal computer or Programmable Terminal (operator interface).

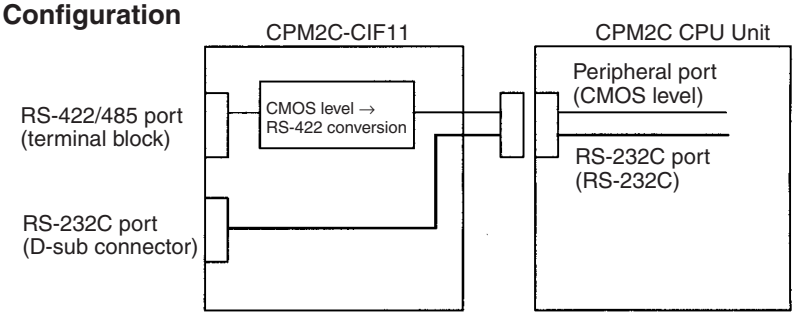
Connector Pin Arrangement



RS-422/485 Connection Example



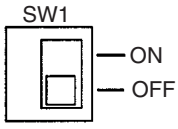
Internal Configuration



RS-422/485 port on CPM2C-CIF11	Signal conversion	Converts CMOS level (CPU Unit side) to RS-422 (connected device side). RS-422 (externally connected device) insulated using DC/DC converter or photocoupler.
	Function	Host Link, peripheral bus, or no-protocol connections.
RS-232C port on CPM2C-CIF11	Signal conversion	Outputs signals from the CPU Unit's CMOS interface without conversion.
	Function	Host Link, no-protocol, 1:1 Link, or 1:1 NT Link connections.

3. Terminating Resistance Switch

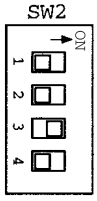
   Set this switch to ON only for double-ended connection to a Host Link network. This switch is factory-set to OFF.



Terminating Resistance
RS-422: 235 Ω (combined resistance must be 110 Ω min)
RS-485: 118 Ω (combined resistance must be 54 Ω min)

4. RS-485 Interface Switch

   Used to switch to the RS-485 interface, and to enable or disable RS/CS control when performing RS-485 communications.



SW2	Factory setting
1	OFF
2	OFF
3	ON
4	OFF

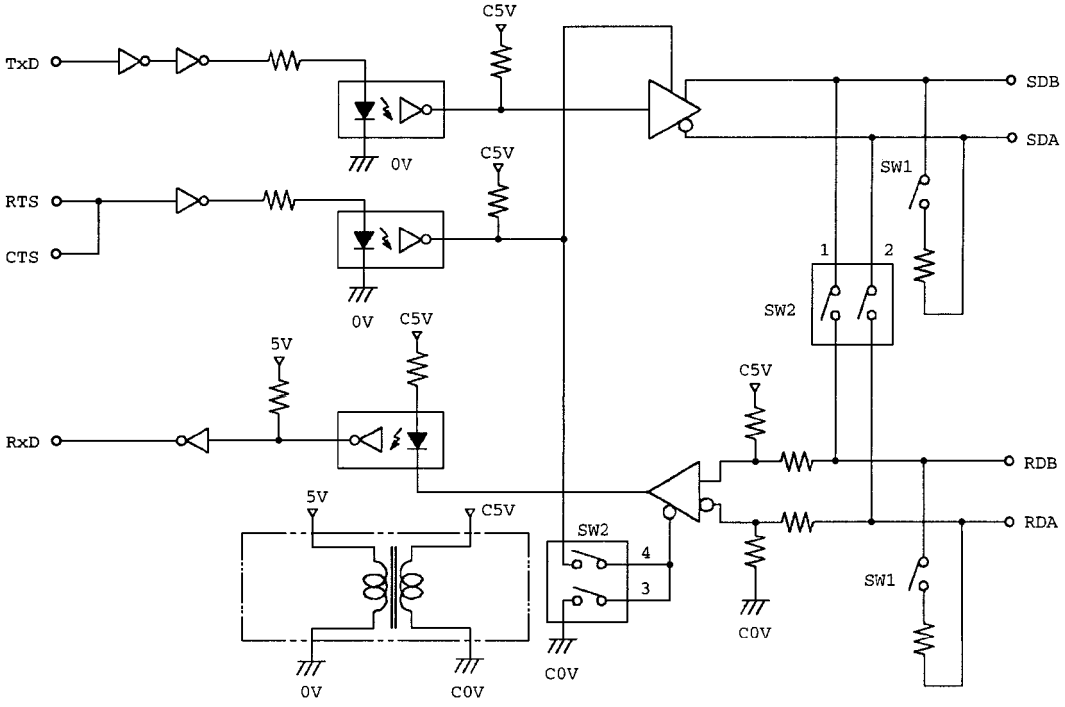
SW2	Status
SW2-1 SW2-2	SW2-1 / SW2-2: OFF / OFF: 4-wire communications; OFF / ON: Setting not possible; ON / OFF: Setting not possible; ON / ON: 2-wire communications
SW2-3 SW2-4	SW2-3 / SW2-4: OFF / OFF: Setting not possible; OFF / ON: Data can be received at any time; ON / OFF: RS control possible for CPU Unit; ON / ON: Setting not possible

Note Do not set both SW2-3 and SW2-4 to ON. Doing so may result in damage to internal circuitry. Set SW2-3 to OFF and SW2-4 to OFF when performing RS-485 2-wire communications.

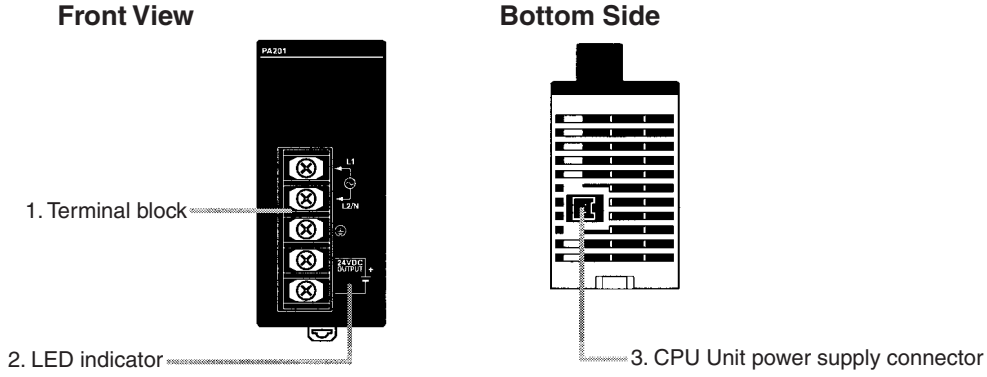
5. Connector

   Connects to the communications port on the CPU Unit.

RS-422 Interface Block Diagram



2-2-9 AC Power Supply Unit



1,2,3... 1. Terminal Block

Terminals for AC power supply input and service power supply (24 VDC).

2. LED Indicator

Lights when power is supplied.

3. CPU Unit Power Supply Connector

Use the connecting cable provided as an accessory to connect this connector to the power supply connector on the CPU Unit (24 VDC).

Note The ratings for the CPM2C-PA201 AC Power Supply Unit are 100 to 240 VAC input; 24 VDC/600 mA output. The maximum current that can be supplied via the CPU Unit power supply connector and the service power supply terminals on the terminal block is 600 mA.

SECTION 3
Installation and Wiring

This section provides information on installing and wiring a CPM2C PC. Be sure to follow the directions and precautions in this section when installing the CPM2C in a panel or cabinet, wiring the power supply, or wiring I/O.

3-1 Design Precautions 84
3-1-1 Power Supply Wiring 84
3-1-2 Power Supply Voltage 84
3-1-3 Interlock and Limit Circuits 84
3-2 Selecting an Installation Site 85
3-2-1 Installation Site Conditions 85
3-2-2 Panel/Cabinet Installation 85
3-3 Installing the CPM2C 86
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3-1 Design Precautions

Observe the following precautions when designing a system incorporating a CPM2C PC.

3-1-1 Power Supply Wiring

Separate the power supply wiring from the control system, CPM2C system, and DC I/O system wiring. Separate the control circuits that supply power to the main Unit from the main circuits using dedicated circuit protectors and fuses.

3-1-2 Power Supply Voltage

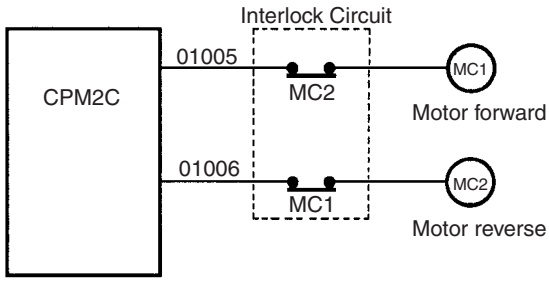
⚠ **Caution** Use the power supply voltages indicated in *SECTION 2 Unit Components and Specifications*. Failure to adhere to the specifications may result in fire.
If the power supply voltage falls below 85% of the rated voltage, the CPM2C will stop and all outputs will be turned OFF. If low voltage affects the equipment, etc., provide a protection circuit which shuts OFF the output until the supply voltage returns to the rated value.
In places where power supply conditions are poor, take steps to ensure that power is supplied at the rated voltage. Be sure to adhere to safety precautions, such as providing breakers to prevent short circuits in external wiring.
When conducting any of the following operations, turn OFF the power to the PC. Electrocution, product damage and malfunction may result.

- Connecting or disconnecting Expansion I/O Units, Expansion Units, and CPU Units.
- Assembling Units.
- Connecting cables and wiring.
- Connecting or disconnecting connectors.
- Replacing the battery.

3-1-3 Interlock and Limit Circuits

⚠ **WARNING** Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits (i.e., not in the Programmable Controller) to ensure safety in the system if an abnormality occurs due to malfunction of the PC or another external factor affecting the PC operation. Not providing proper safety measures may result in serious accidents.

The following diagram shows an example of an interlock circuit.



In the interlock circuit above, MC1 and MC2 can't be ON at the same time even if CPM2C outputs 01005 and 01006 are both ON (an incorrect PC operation).

3-2 Selecting an Installation Site

The CPM2C is resistant to harsh conditions and highly reliable, but installing the PC in a favorable site will maximize its reliability and operating lifetime.

⚠ **Caution** Be sure to install the CPM2C correctly, as outlined in this manual. Failure to do so may result in Unit malfunction.

3-2-1 Installation Site Conditions

Note Do not install the CPM2C under any of the following conditions.

- Locations subject to direct sunlight.
- Locations subject to a temperature below 0°C or over 55°C.
- Locations subject to a humidity below 10% or over 90%.
- 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.

Be sure that the conditions at the installation site conform to the CPM2C's general specifications. Refer to *2-1-1 General Specifications* for details.

Note Provide proper shielding when installing in the following locations:

- Locations subject to static electricity or other sources of noise.
- Locations subject to strong electromagnetic fields.
- Locations subject to possible exposure to radiation.
- Locations near to power supply lines.

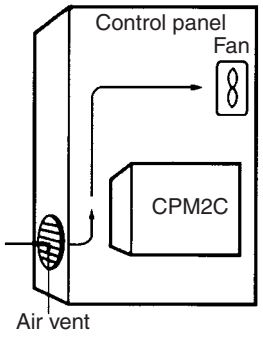
3-2-2 Panel/Cabinet Installation

Consider PC operation, maintenance, and surrounding conditions when installing the CPM2C in a panel or cabinet.

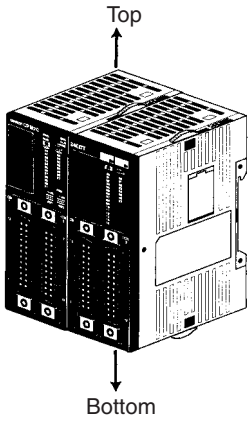
Overheating

The operating temperature range for the CPM2C is 0 to 55°C. Be sure that there is adequate ventilation for cooling.

- Allow enough space for air circulation.
- Do not install the CPM2C above equipment that generates a large amount of heat, such as heaters, transformers, or large resistors.
- Install a cooling fan or system when the ambient temperature exceeds 55°C.



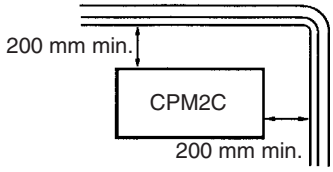
- Orient the CPM2C as shown below when installing it.



Electrical Noise

Power lines and high-voltage equipment can cause electrical noise in the PC.

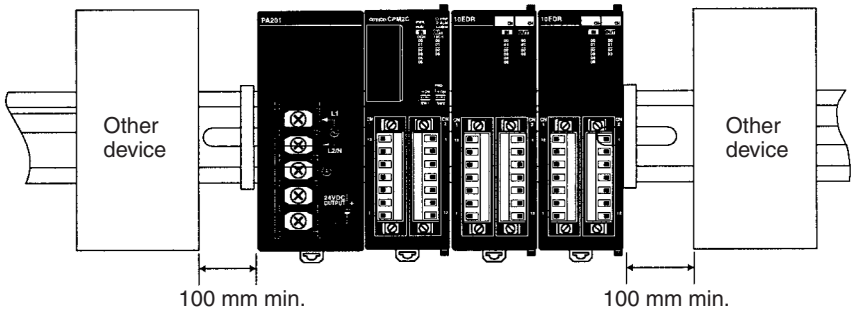
- Do not install the CPM2C in a panel or cabinet with high-voltage equipment.
- Allow at least 200 mm between the CPM2C and nearby power lines.



Accessibility

Ensure that the CPM2C can be accessed for normal operation and maintenance.

- Provide a clear path to the CPM2C for operation and maintenance. High-voltage equipment or power lines could be dangerous if they are in the way during routine operations.
- The PC will be easiest to access if the panel or cabinet is installed about 1 to 1.6 m above the floor.
- Separate the CPM2C by at least 100 mm from other devices.



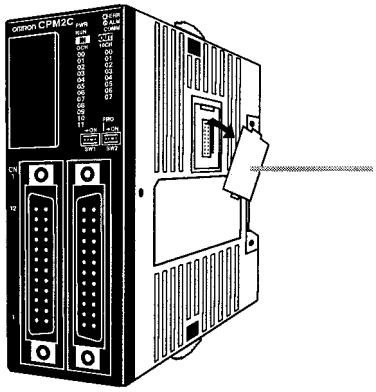
3-3 Installing the CPM2C

This section describes how to install the CPM2C and connect Expansion Units and Expansion I/O Units. Refer to *Appendix B* for diagrams showing the dimensions of the Units.

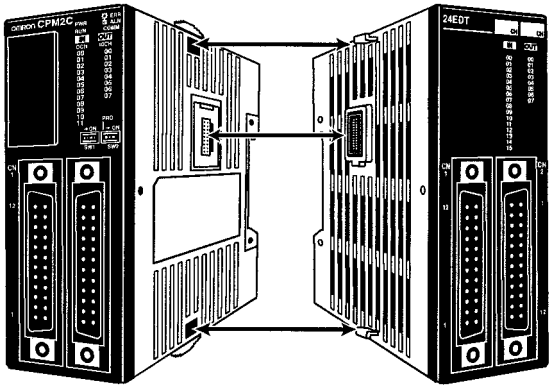
3-3-1 Connecting Units

Up to 5 Expansion I/O Units and Expansion Units can be connected to a CPM2C CPU Unit. Use the following procedure when connecting an Expansion I/O Unit or Expansion Unit.

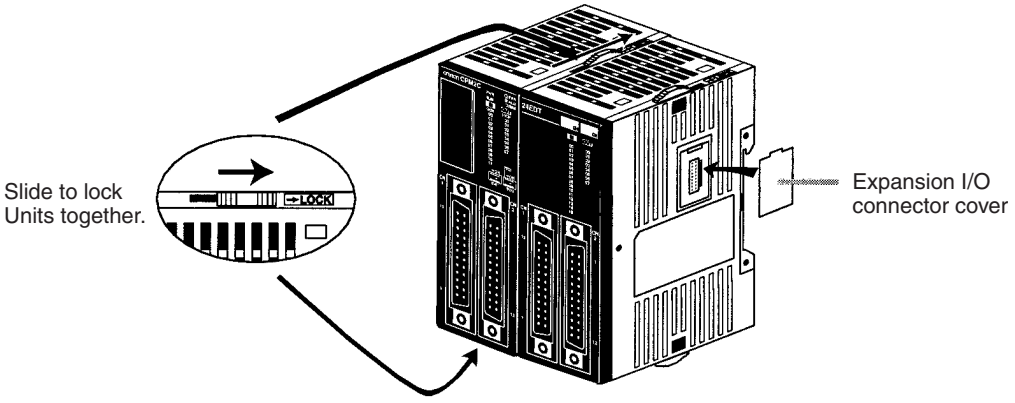
1,2,3... 1. Remove the cover from the CPU Unit's or the last Expansion I/O Unit's or Expansion Unit's expansion I/O connector. If the cover is difficult to remove, use a flat-blade screwdriver to pry the cover from the expansion I/O connector.



2. Align the Unit and CPU Unit (or previous Expansion I/O Unit or Expansion Unit) so that the catches (top and bottom) on the connectors fit together. Press the Units together to connect them.

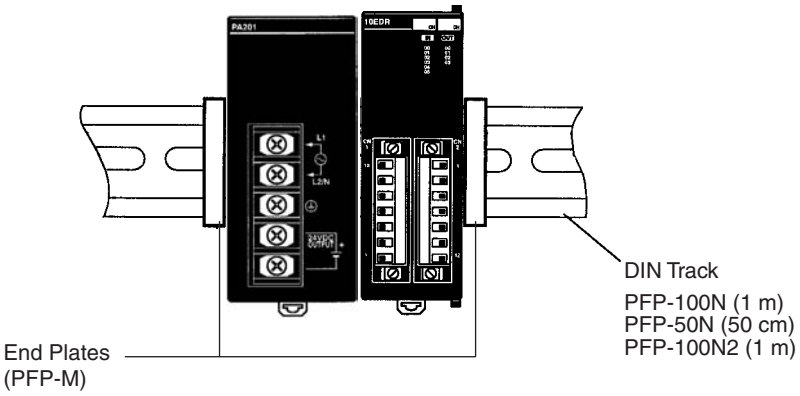


3. Lock the Units together by closing the locks (top and bottom) on the CPU Unit (or previous Expansion I/O Unit or Expansion Unit). Place the cover (included with the CPU Unit) on the last Unit's expansion I/O connector.



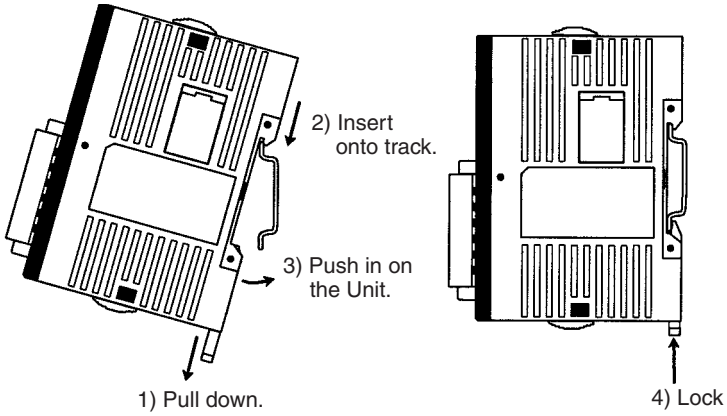
3-3-2 CPM2C Installation

The CPM2C can be installed on a 35-mm DIN track.



Installation

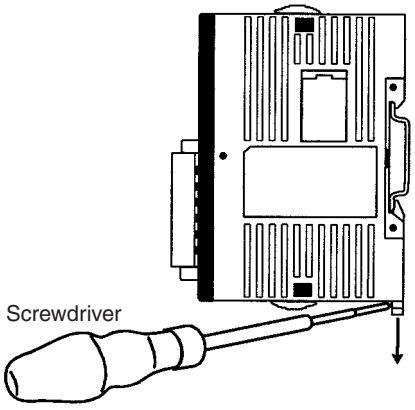
Lower the CPM2C so that the notch on the back of the PC catches the top of the DIN Track. Push the PC forward until the lock snaps into place.



⚠ **Caution** Be sure that the DIN Track is installed horizontally. Installing the Track vertically will inhibit the airflow that cools the CPM2C and could cause overheating.

Removal

Pry the lock down with a flat-blade screwdriver and pivot the PC upward to remove it.

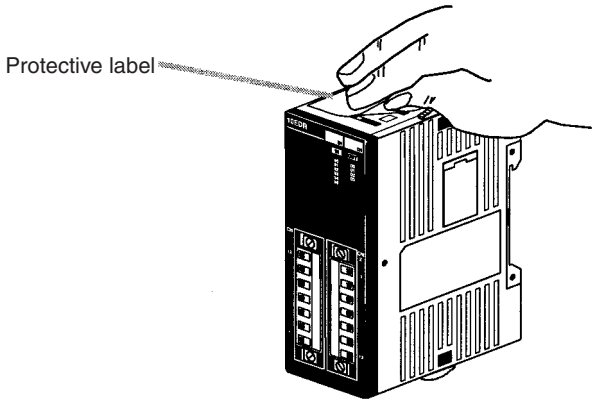


3-4 Wiring and Connections

This section provides basic information on wiring the Power Supply Unit and Expansion I/O Units, and on connecting Programming Devices.

3-4-1 General Precautions for Wiring

⚠ **Caution** Leave the protective label in place while wiring. The Unit may malfunction if strands of wire get inside the Unit. After completing wiring be sure to remove the label to avoid overheating.

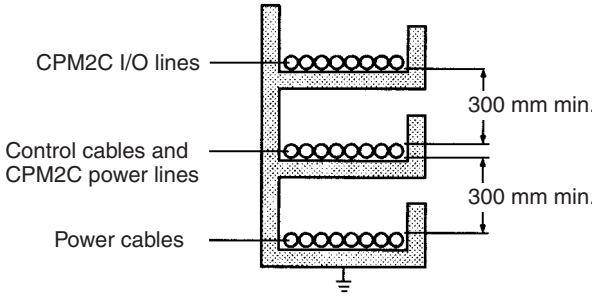


I/O Line Noise

Do not run CPM2C I/O lines in the same duct or conduit as power lines.

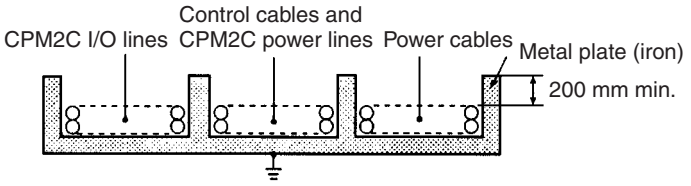
Hanging Ducts

Leave at least 300 mm between the power cables and the I/O or control wiring, as shown in the following diagram.



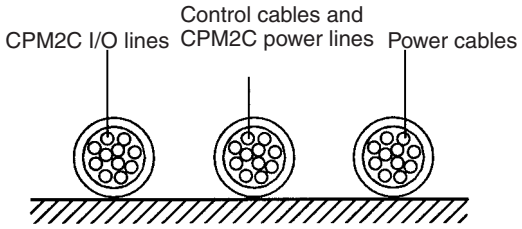
Floor Ducts

Leave at least 200 mm between the wiring and the top of the duct, as shown in the following diagram.



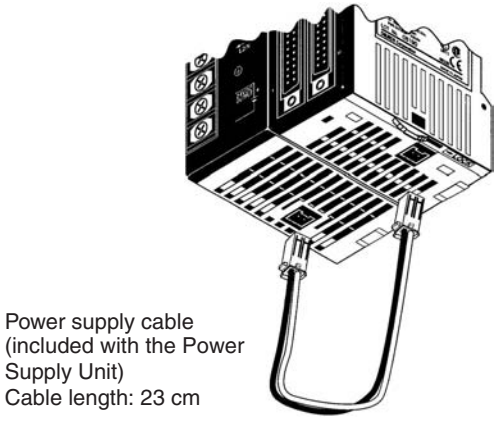
Conduits

Separate the CPM2C I/O lines, power and control lines, and power cables, as shown in the following diagram.

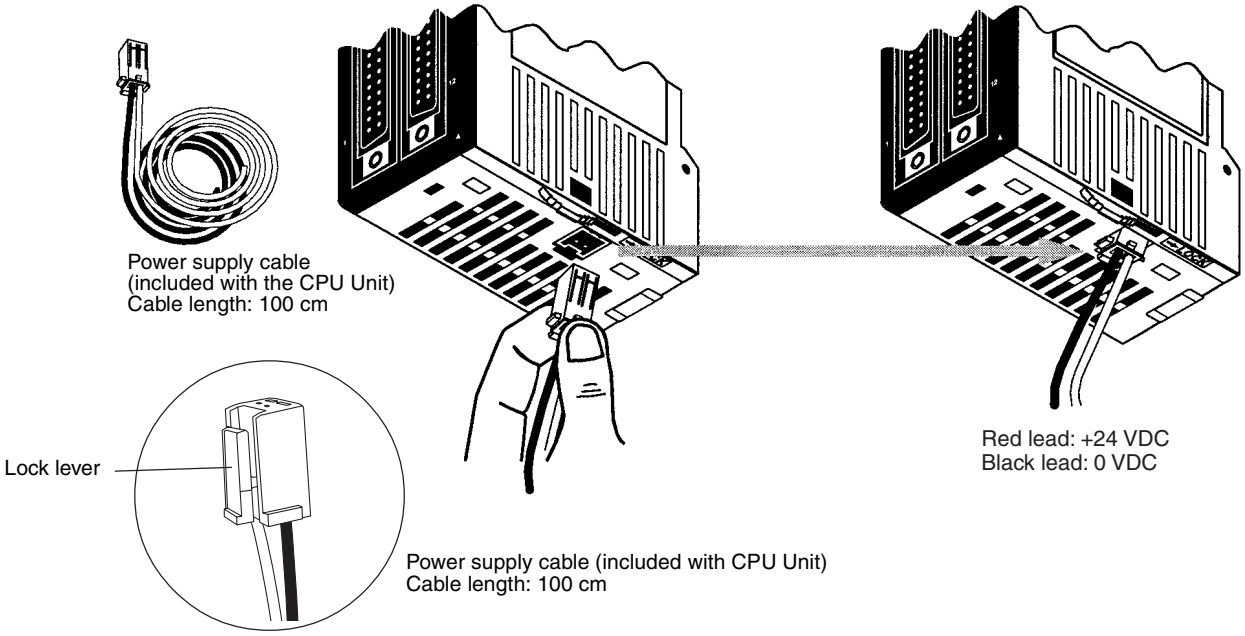


3-4-2 Power Supply Wiring

The following procedure explains how to connect the CPU Unit to the AC Power Supply Unit (CPM2C-PA201) with the power supply connector (included) to provide a 24-VDC power supply.



1,2,3... 1. Align the power supply connector with the socket on the bottom of the CPM2C and insert the connector.



2. To remove the power supply connector, grasp the power supply connector (not the wires), press on the lock level to release the lock tab on the connector, and remove the connector.

Note

1. The CPM2C-PA201 is the recommended Power Supply Unit. When using other power supplies, be sure to use a DC power supply with sufficient capacity and low ripple.
2. Do not perform a voltage withstand test on the DC power supply terminals on the CPU Unit. The test might damage the PC's internal components.
3. When the equipment must conform to the EC Directives (Low-voltage Directives), use a power supply with double insulation or reinforced insulation.

3-4-3 Using the AC Power Supply Unit

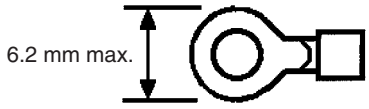
Wiring Terminal Blocks

Use round crimp terminals for wiring AC power supply input to the AC Power Supply Unit (CPM2C-PA201). Use crimp terminals or solid wires for wiring to the ground terminal and the service power supply terminals. Do not connect bare stranded wires directly to terminals.

- Use M3.5 terminal screws.
- Tighten the terminal screws securely to a torque of 0.74 to 0.9 N•m.

Use round terminals of the dimensions shown.

Round Terminal



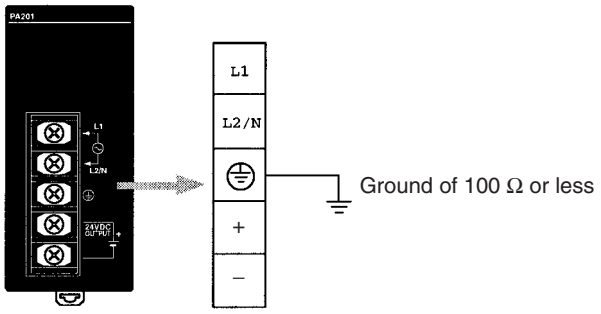
Recommended wire size: 0.3 to 1.65 mm^2 (AWG 22 to 16)

Terminals can also be wired with solid wires. The recommended wire size is 0.6 to 1.6 mm diameter (AWG 22 to 14).

Grounding

To prevent electric shock resulting from malfunction due to factors such as noise, connect to a ground of 100 Ω or less. When grounding, use a wire at least 1.25 mm^2 thick.

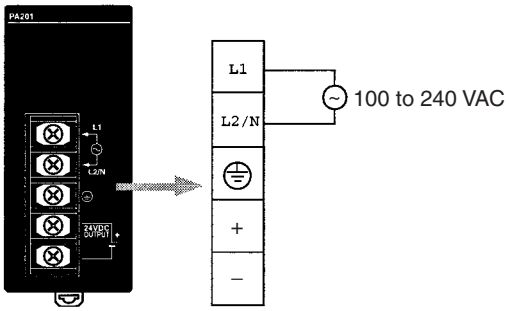
⚠ WARNING Connect the ground terminal of the Power Supply Unit to a ground of 100 Ω or less when installing the Unit. Not connecting to a ground of 100 Ω or less may result in electric shock.



Power Supply Wiring

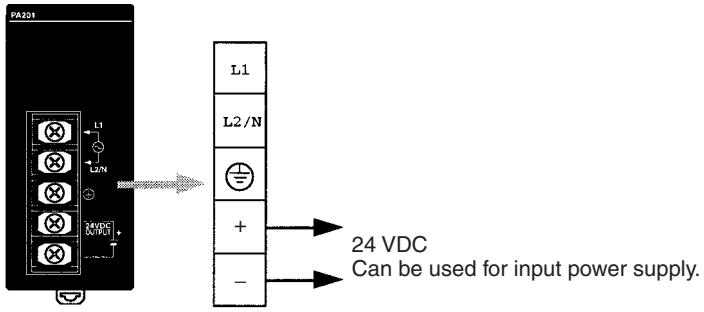
- To prevent voltage drops caused by startup currents and inrush currents from other devices, wire the power supply circuits of the CPM2C separately from power line circuits.

- When using several CPM2C's together, it is recommended that circuits are wired separately in order to prevent circuit-breaker malfunctions and voltage drops due to inrush current.
- Twist power supply lines to prevent noise from the power supply lines. Noise can further be prevented by wiring via a 1:1 isolation transformer.
- Use wires at least 1.25 mm^2 thick in order to allow for voltage drops and to keep the current within the allowable level.



⚠WARNING Tighten the screws on the terminal block of the AC Power Supply Unit to a torque of 0.74 to 0.9 N•m. Loose screws may result in burning or malfunction.

The 24-VDC service power supply terminals on the terminal block can be used for input power supply.



Use the following to obtain the capacity of the service power supply that can be used.

Example: CPU Unit + 5 Expansion I/O Units (1-W Power Consumption)

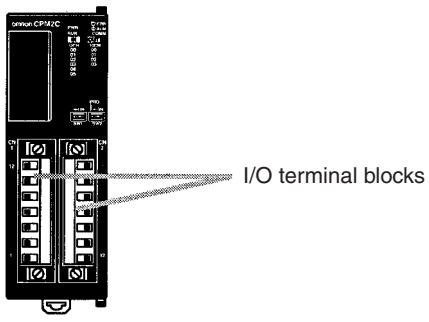
Power consumption = 4 (CPU Unit's power consumption) + 1 (Expansion I/O Unit's power consumption) × 5 (No. of Expansion I/O Units) = 9 (W)
Service power supply current = (14.4 (CPM2C-PA201's rated capacity) – 9 (power consumption)) ÷ 24 (V) = 208 (mA)

⚠WARNING If the 24-VDC output (either the service power supply or the power supply to the CPU Unit) is overloaded, or is short-circuited, the voltage will drop, and the output will turn OFF. Take external countermeasures to ensure the safety of the system in such an event. Failure to do so may result in a serious accident.

⚠WARNING Do not connect a power supply to the service power supply terminals. If an AC power supply is mistakenly connected to these terminals, the internal circuitry will be damaged.

3-4-4 Removing and Wiring I/O Terminal Blocks

The following tables provide I/O terminal block specifications.



Terminal Block Specifications

Item	Specification
Screw size	M2
Recommended tightening torque	0.22 to 0.25 N·m Recommended Screwdriver: XW4Z-00B

Recommended Wire and Terminals

Item	Specification
Solid wire	0.14 to 1.5 mm^2 (AWG 28 to AWG 16) (Strip 7 mm.)
Stranded wire (See notes.)	0.14 to 1.5 mm^2 (AWG 28 to AWG 16) (Strip 7 mm.)
Pin terminal	0.25 to 1.5 mm^2, 7-mm terminal length **Recommended pin terminals** Phoenix AI0.25-8Y; Applicable wire size: 0.2 to 0.25 mm^2 Phoenix AI0.34-8TQ; Applicable wire size: 0.25 to 0.34 mm^2 Phoenix AI0.5-8WH; Applicable wire size: 0.34 to 0.50 mm^2 Phoenix AI-TWIN2×0.5-8WH; Applicable wire size: 2×0.50 mm^2

Note

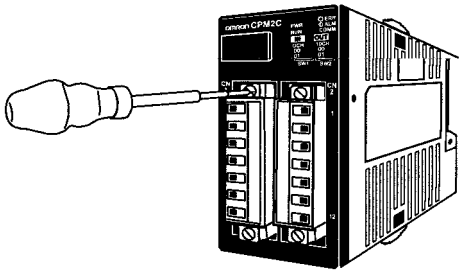
1. When using stranded wire, be sure to avoid stray wire strands that might short-circuit an adjacent terminal.
2. Do not solder the ends of stranded wires. Solder can break and cause wiring problems. Also, the solder can cause corrosion on the contact surface.

Removing and Wiring a Terminal Block

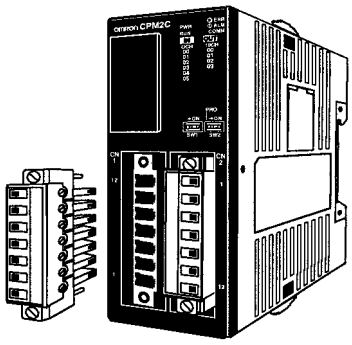
Use the following procedure when wiring a terminal block.

1,2,3...

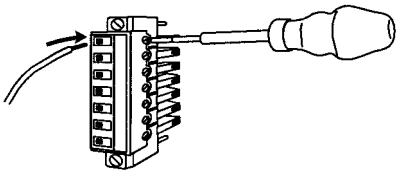
1. Loosen the screws at the top and bottom of the terminal block as shown in the following diagram.



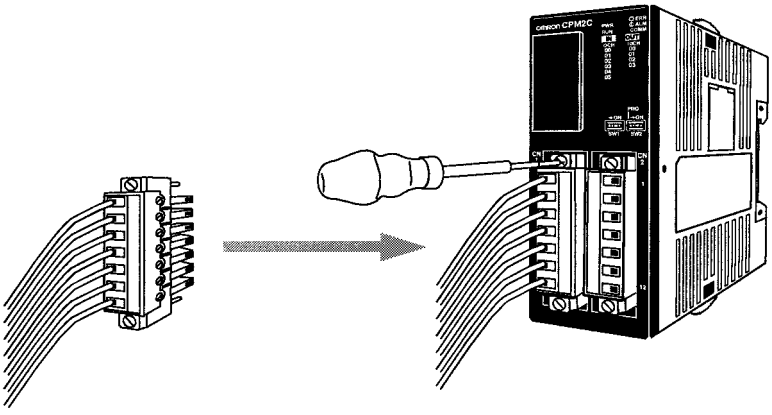
2. Pull the terminal block out of the Unit.



3. Insert each lead wire into the terminal block and tighten that terminal's screw.



4. After wiring the terminal block, insert the block into the Unit and tighten the screws at the top and bottom of the terminal block.

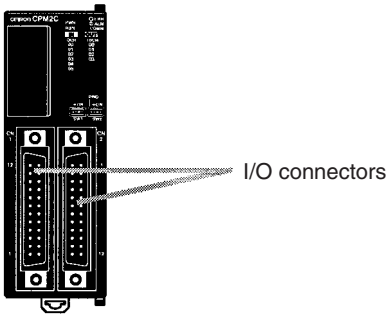


Note CPM2C-20□□R Units do not have terminal block screws.

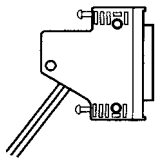
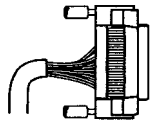
3-4-5 Removing and Wiring I/O Connectors

Fujitsu-compatible Connectors

The following tables provide specifications of compatible I/O connectors.



Compatible Connector Specifications (OMRON)

Connector		Specifications	Model number
	24-pin soldered connector and cover	Connector: Fujitsu FCN-361J024-AU equivalent Cover: Fujitsu FCN-360C024-J2 equivalent	C500-CE241
	24-pin crimp connector and cover	Housing: Fujitsu FCN-363J024 equivalent Contacts: Fujitsu FCN-363J-AU equivalent Cover: Fujitsu FCN-360C024-J2 equivalent	C500-CE242
	24-pin pressure connector	Connector: Fujitsu FCN-367J024-AU/F equivalent	C500-CE243

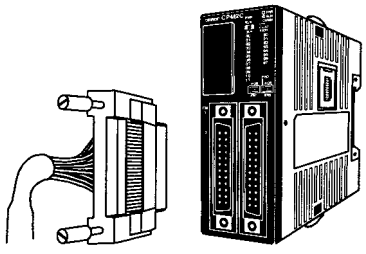
Connector Specifications (Fujitsu)

Item			Specifications	Model number
Soldered jack			24-pin gold-plated terminals	FCN-361J024-AU
Crimp connector	Crimp jack housing		24-pin	FCN-363J024
	Crimp contacts		For wire gauges 24 AWG to 28 AWG	FCN-363J-AU
	Hand crimp tool		---	FCN-363T-T005/H
	Contact removal tool		---	FCN-360T-T001/H
Pressure connector	Pressure jack with closed end cover		24-pin gold-plated terminals	FCN-367J024-AU/F
			24-pin silver-plated terminals	FCN-367J024-AG/F
	Pressure jack with open end cover		24-pin gold-plated terminals	FCN-367J024-AU/H
			24-pin silver-plated terminals	FCN-367J024-AG/H
	Pressing tools	Hand press	General purpose	FCN-707T-T101/H
		Cable cutter	General purpose	FCN-707T-T001/H
		Locator plate	For the 360-series connectors	FCN-367T-T012/H
Connector cover (Not compatible with the closed-end cover pressure jack.)			Thin slanted cover for 24-pin connector	FCN-360C024-J2
			With slotted screws for 24-pin connector (Can be turned by hand.)	FCN-360C024E
			With Phillips-head screws for 24-pin connector	FCN-360C024B
			With intermediate Phillips-head screws for 24-pin connector	FCN-360C024C

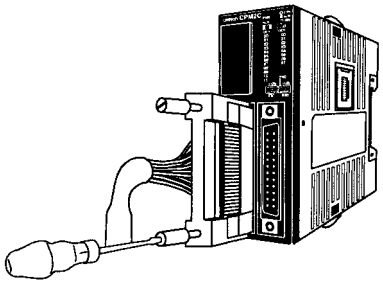
Connecting I/O Connectors (Pressure Connectors)

Use the following procedure when connecting a pressure connector.

1,2,3... 1. Align the connector and insert it into the Unit.



2. Use a flat-blade screwdriver to tighten the connector's fastening screws.



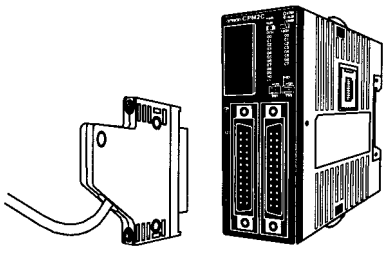
Flat-blade screwdriver

Connecting I/O Connectors (Soldered Connectors)

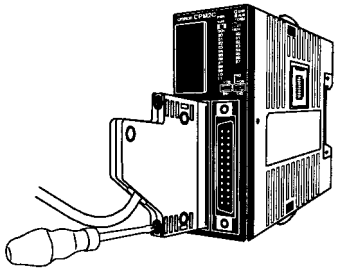
Use the following procedure when connecting a soldered connector.

1,2,3...

1. Align the connector and insert it into the Unit.



2. Use a Phillips screwdriver to tighten the connector's fastening screws.



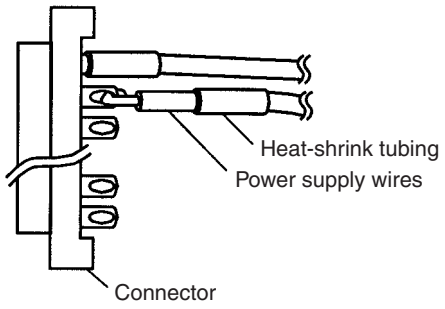
Phillips screwdriver

Assembling Soldered Connectors

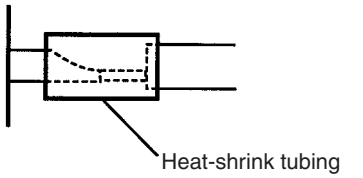
Use the following procedure when wiring and assembling a soldered connector (OMRON C500-CE241).

1,2,3...

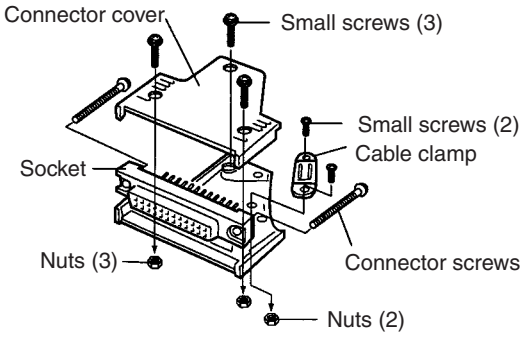
1. Slide heat-shrink tubing over the power supply wires and solder the wires to the appropriate pins on the socket.



2. After soldering all of the pins, slide the heat-shrink tubing over the soldered power supply pins and shrink the tubing by heating it with a heat gun.

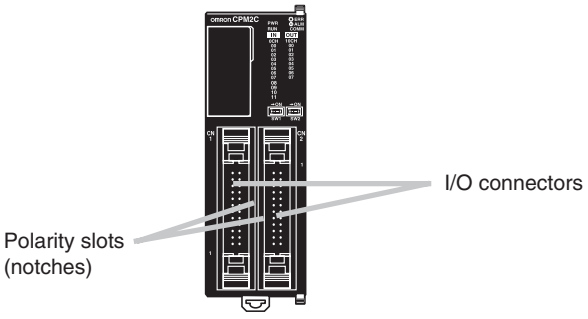


3. Assemble the socket and connector as shown in the following diagram.



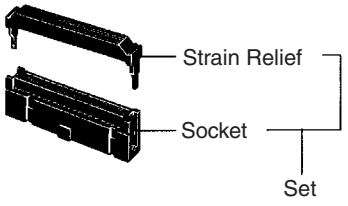
MIL Connectors

The following tables provide specifications of compatible I/O connectors.



Compatible MIL Connector Specifications (OMRON)

MIL Flat Cable Connectors



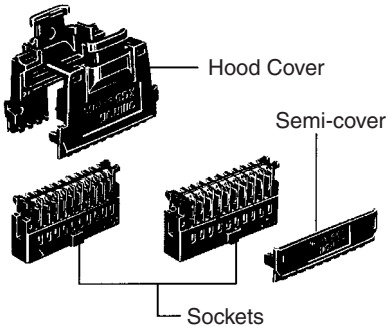
Name	Model
Socket	XG4M-2030
Strain Relief	XG4T-2004
Set model number	XG4M-2030-T
Recommended Flat Cable	XY3A-200□

Note The rated current for the flat cable is 1 A max. Do not allow the common terminal current to exceed 1 A.

Crimp Tools (OMRON)

Crimp Tool	XY2B-0002
Attachment	XY2B-1007

MIL Loose-wire, Pressure-fitted Connectors



Name		Model
Socket	AWG24	XG5M-2032-N
	AWG26 to AWG28	XG5M-2035-N
Hood Cover		XG5S-2012
Semi-cover (Two required for each Socket.)		XG5S-1001

Pressure Fitting Tools (OMRON)

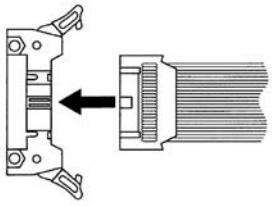
Pressure Fitting Tool Set (Handiplex)	XY2B-2104
Simple Pressure Fitting Tool	XY2B-7006

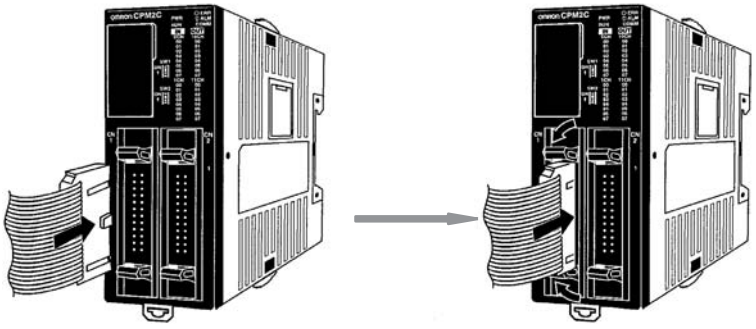
Connecting and Disconnecting MIL I/O Connectors

Use the following procedure to connect and disconnect MIL I/O connectors.

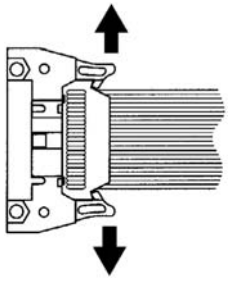
1,2,3...

1. Open the lock levers on both sides of the connector before connecting the cable.
2. Insert the cable into the connector and press in firmly until the lock levers lock into place.





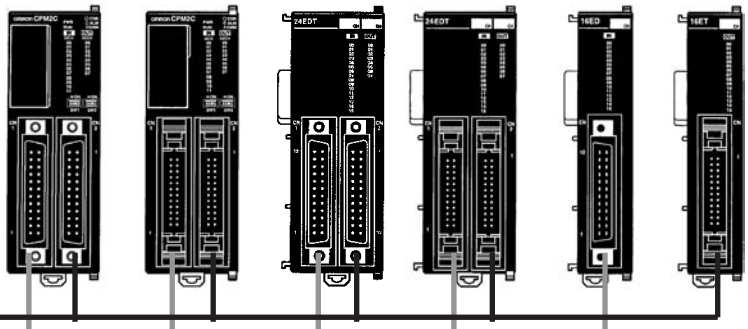
3. To remove the cable, pull the lock lever out to the sides to release the lock mechanism and pull out the connector.



Note Be sure to make connections to terminal blocks and connectors with the correct direction and polarity. Output transistor fuses may burn out if power is supplied to I/O circuits with the I/O connector connected in reverse.

3-4-6 Using I/O Terminals and Relay Terminals

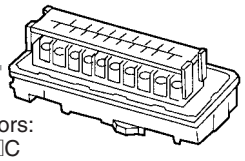
We recommend using the following I/O Terminals and Relay Terminals to wire devices to the CPM2C's I/O connector.



Note The allowable current for the XW2Z-□□□A is 1 A. Do not allow the current on the common terminal to exceed 1 A.

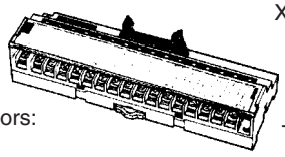
Outputs

Inputs



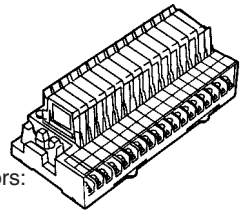
Cables (See note.)
Fujitsu-compatible connectors:
XW2Z-□□□A, G79-□□□C
MIL connectors:
G79-O□□C

Terminal Blocks
XW2B-20G4 (M3 screws)
XW2B-20G5 (M3.5 screws)
XW2D-20G6



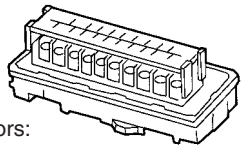
Cables (See note.)
Fujitsu-compatible connectors:
XW2Z-□□□A
MIL connectors:
G79-O□□C

Terminal Blocks
XW2C-20G5-IN16 (M3.5 screws)
XW2E-20G5-IN16



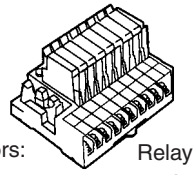
Cables
Fujitsu-compatible connectors:
G79-□□□C
MIL connectors:
G79-O□□C

Relay Terminals
G7TC-ID16
G7TC-IA16



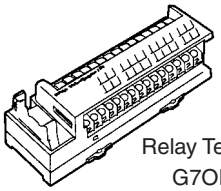
Cables (See note.)
Fujitsu-compatible connectors:
XW2Z-□□□A
G79-□□□C
MIL connectors:
G79-O□□C

Terminal Blocks
XW2B-20G4 (M3 screws)
XW2B-20G5 (M3.5 screws)
XW2D-20G6

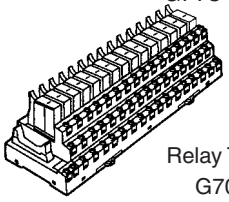


Cables
Fujitsu-compatible connectors:
G79-□□□C
MIL connectors:
G79-O□□C

Relay Terminals
G7TC-OC08
G7TC-OC16
G7TC-OC16-1



Relay Terminals
G7OD-OC16
G7OD-OC16-1
G7OD-SOC16
G7OD-SOC16-1
G7OD-FOM16
G7OD-FOM16-1



Cables
Fujitsu-compatible connectors:
G79-□□□C (G70A-ZOC16-3)
MIL connectors:
G79-O□□C (G70A-ZOC16-5)
G79-I□□C (G70A-ZOC16-9)

Relay Terminals
G70A-ZOC16-3
G70A-ZOC16-4

3-4-7 Connecting Input Devices

Wire inputs to the CPM2C's CPU Unit and Expansion I/O Units as shown in the following diagrams.

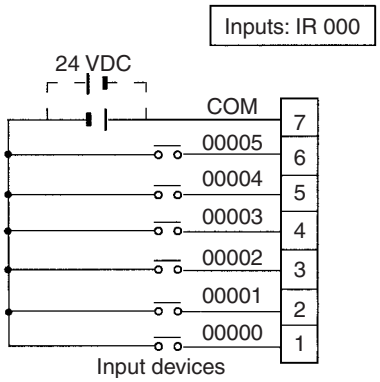
Note

1. Be sure to make connections to terminal blocks and connectors with the correct direction and polarity. Output transistor fuses may burn out if power is supplied to I/O circuits with the I/O connector connected in reverse.
2. When equipment must conform to the EC Directives (Low-voltage Directives), use a power supply with double insulation or reinforced insulation.

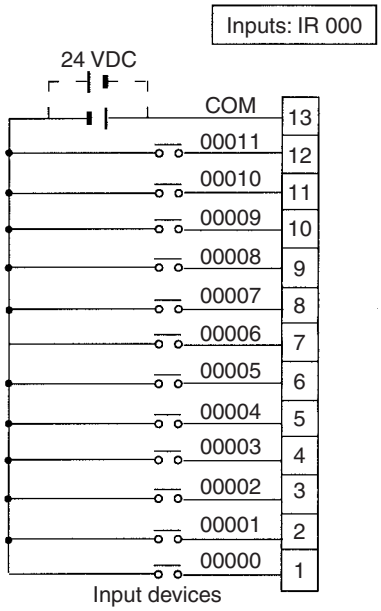
Units with Relay Outputs via Terminal Block

The following diagrams show the input configurations.

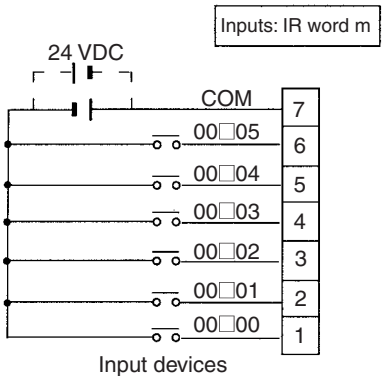
CPU Units with 10 I/O Points: CPM2C-10C□DR-D



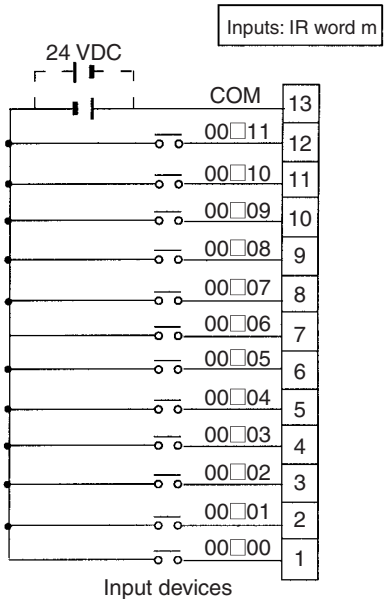
CPU Units with 20 I/O Points: CPM2C-20C□DR-D



Expansion I/O Unit with 10 I/O Points: CPM2C-10EDR

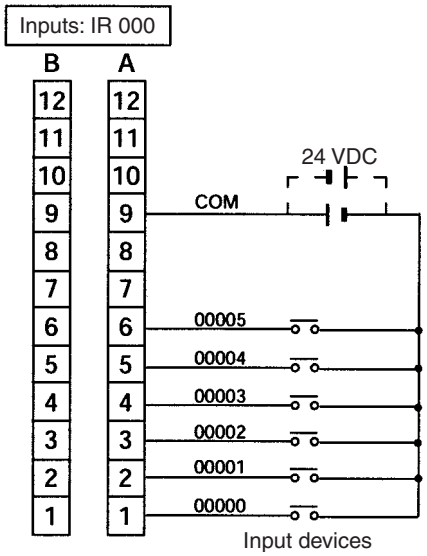


Expansion I/O Unit with 20 I/O Points: CPM2C-20EDR

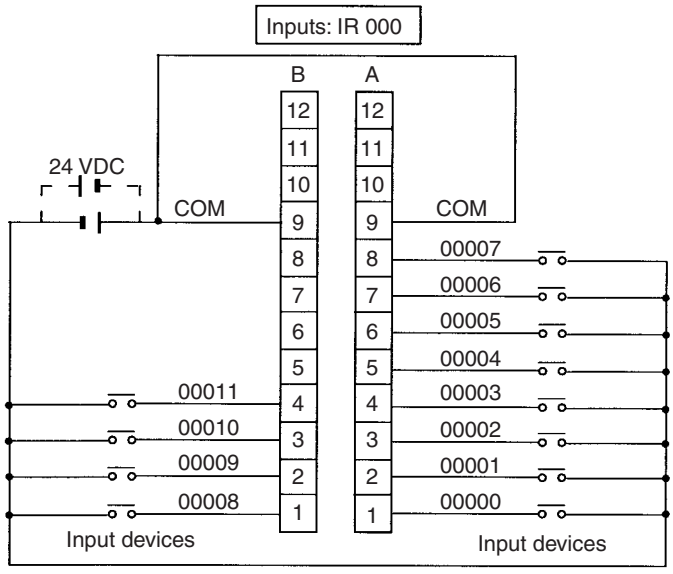


Units with Transistor Outputs via Fujitsu-compatible Connector

CPU Units with 10 I/O Points: CPM2C-10C□DT□C-D

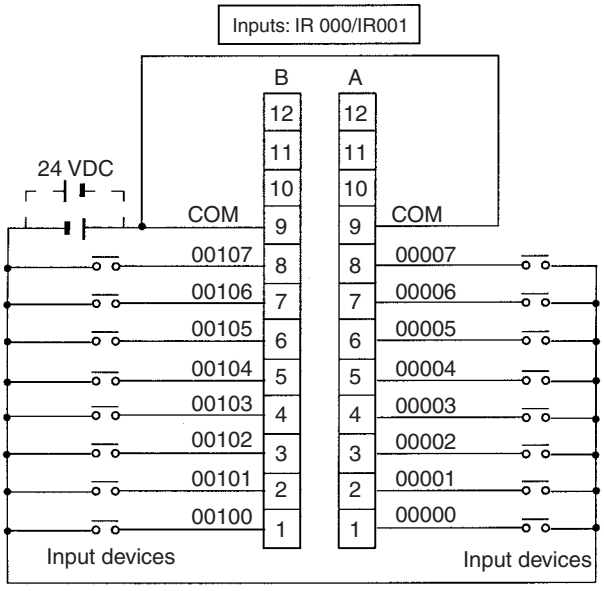


CPU Units with 20 I/O Points: CPM2C-20C□DT□C-D



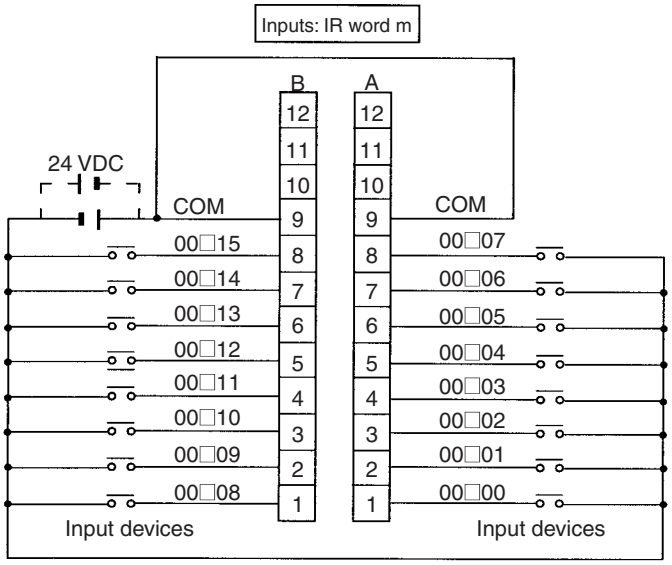
Note COM terminals (A9 and B9) are connected internally.

CPU Units with 32 I/O Points: CPM2C-32CDT□C-D



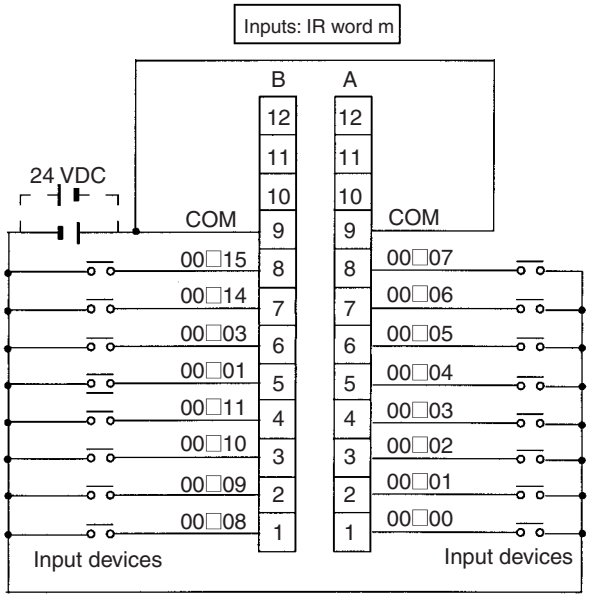
Note COM terminals (A9 and B9) are connected internally.

Expansion I/O Units with 24 I/O Points: CPM2C-24EDT□C



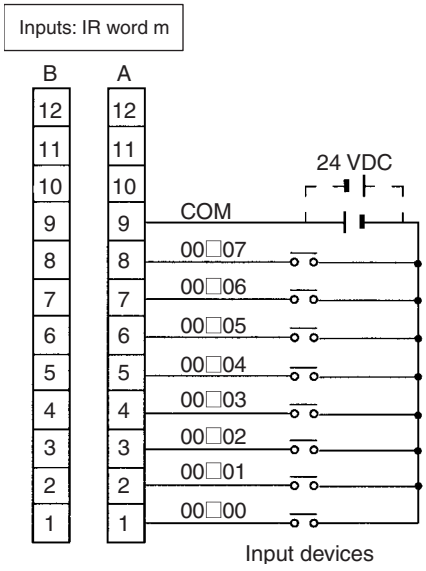
Note COM terminals (A9 and B9) are connected internally.

Expansion I/O Units with 32 I/O Points: CPM2C-32EDT□C

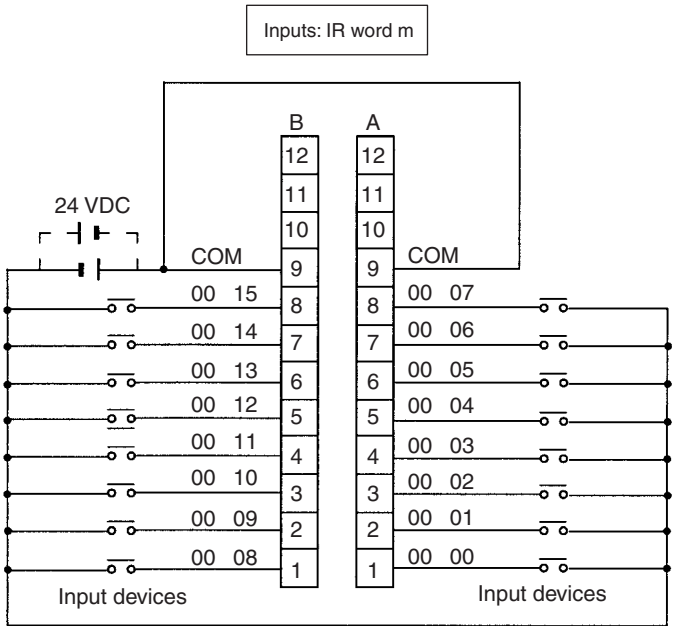


Note COM terminals (A9 and B9) are connected internally.

Expansion I/O Unit with 8 Input Points: CPM2C-8EDC



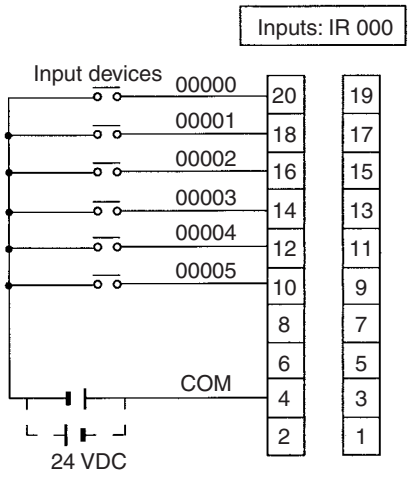
Expansion I/O Unit with 16 Input Points: CPM2C-16EDC



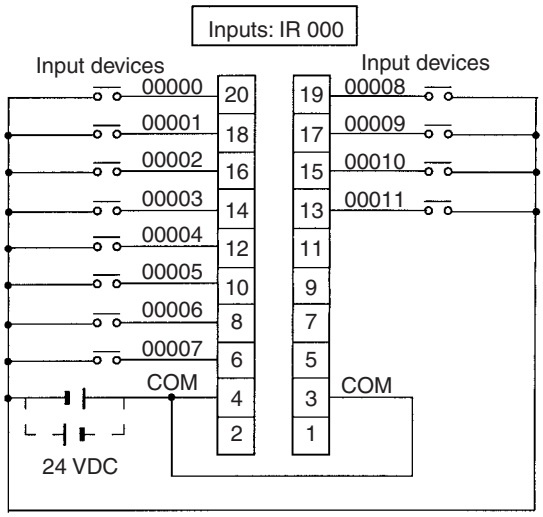
Note COM terminals (A9 and B9) are connected internally.

Units with Transistor Outputs via MIL Connector

CPU Units with 10 I/O Points: CPM2C-10C□DT□M-D

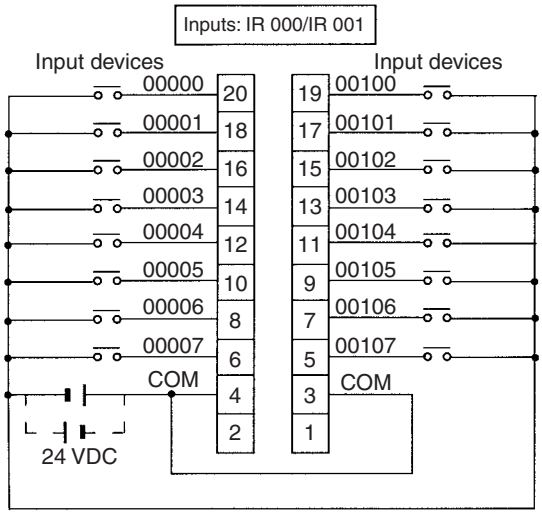


CPU Units with 20 I/O Points: CPM2C-20C□DT□M-D



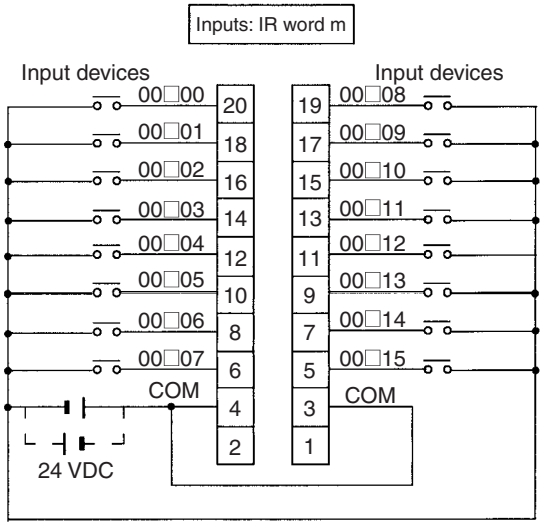
Note COM terminals (3 and 4) are connected internally.

CPU Units with 32 I/O Points: CPM2C-32C□DT□M-D



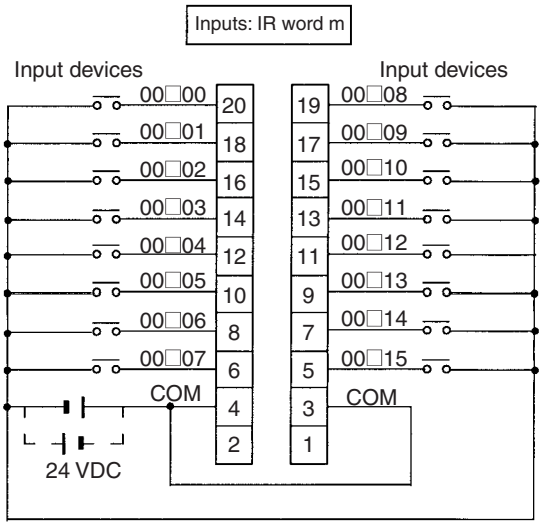
Note COM terminals (3 and 4) are connected internally.

Expansion I/O Units with 24 I/O Points: CPM2C-24EDT□M



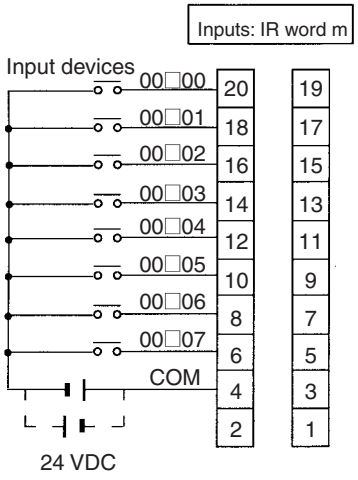
Note COM terminals (3 and 4) are connected internally.

Expansion I/O Units with 32 I/O Points: CPM2C-32EDT□M

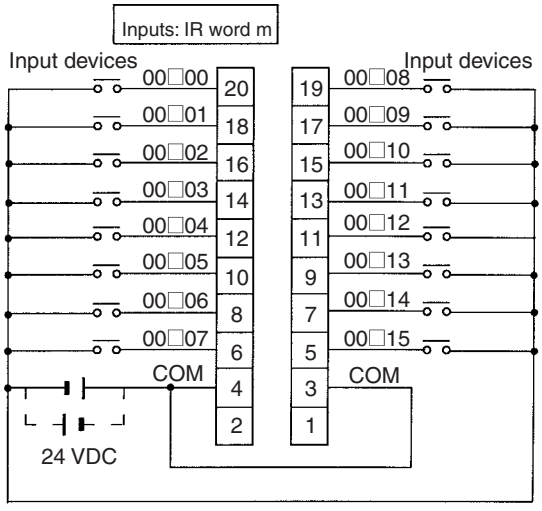


Note COM terminals (3 and 4) are connected internally.

Expansion I/O Units with 8 Input Points: CPM2C-8EDM

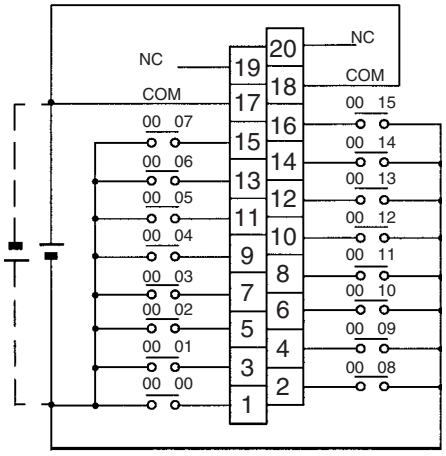
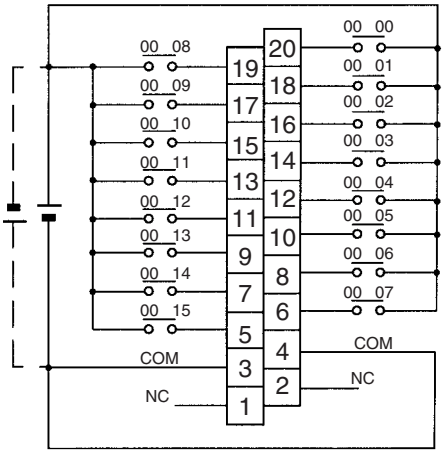


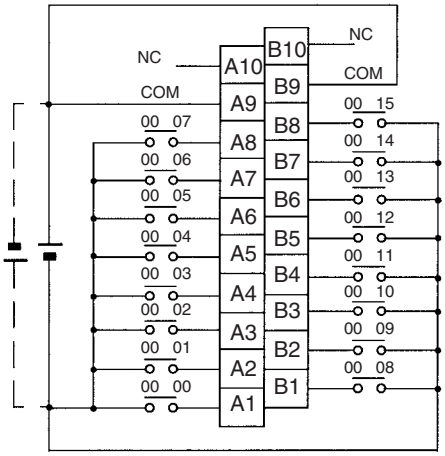
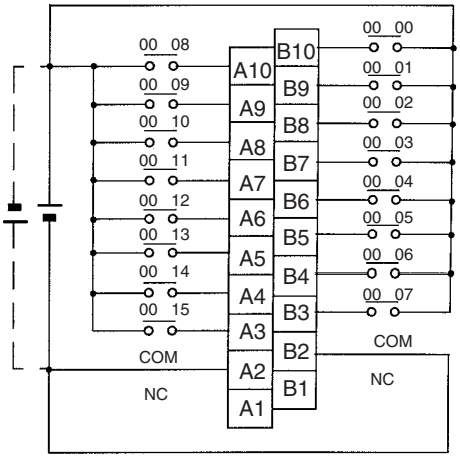
Expansion I/O Units with 16 Input Points: CPM2C-16EDM



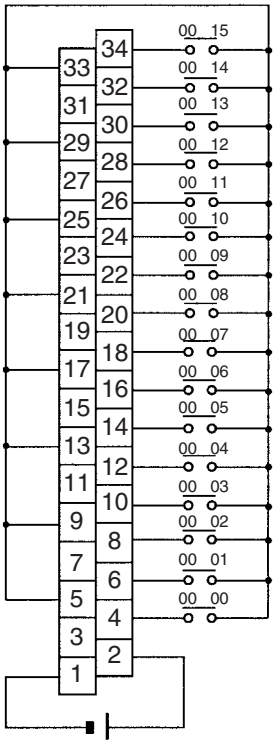
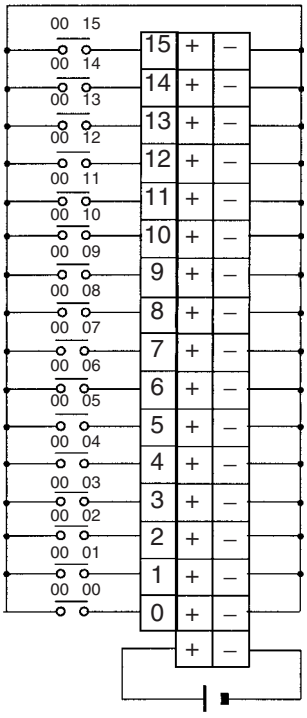
Note COM terminals (3 and 4) are connected internally.

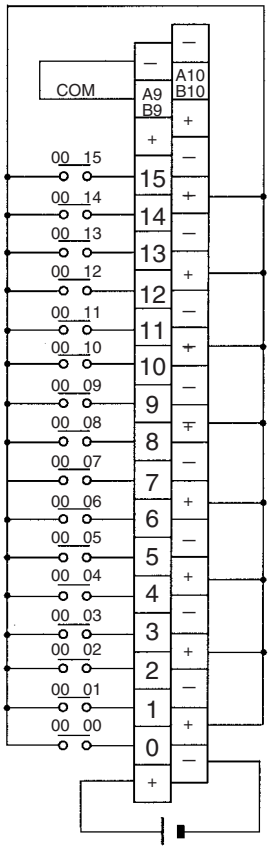
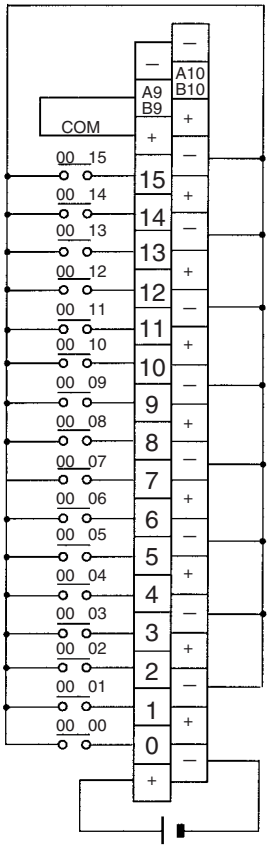
Wiring Input Terminals The wiring for input terminals is as shown below.

Terminal Blocks: XW2B-20G4, XW2B-20G5	
Cable: XW2Z-□□□A (Fujitsu-compatible connector)	Cable: G79-□C (Fujitsu-compatible connector), G79-O□□C (MIL connector)
	

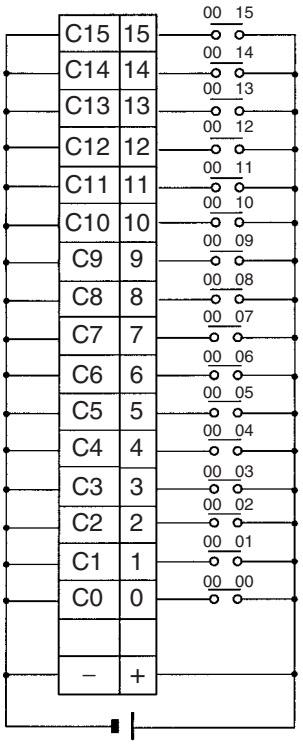
Terminal Blocks: XW2D-20G6	
Cable: XW2Z-□□□A (Fujitsu-compatible connector)	Cable: G79-□C (Fujitsu-compatible connector), G79-O□□C (MIL connector)
	

Note For CPU Units with 32 I/O Points, relay numbers 00□00 to 00□07 correspond to 00000 to 00007, relay numbers 00□08 to 00□15 correspond to 00100 to 00107, and relay numbers 01□00 to 01□07 correspond to 01000 to 01007, and relay numbers 01□08 to 01□15 correspond to 01100 to 01107.

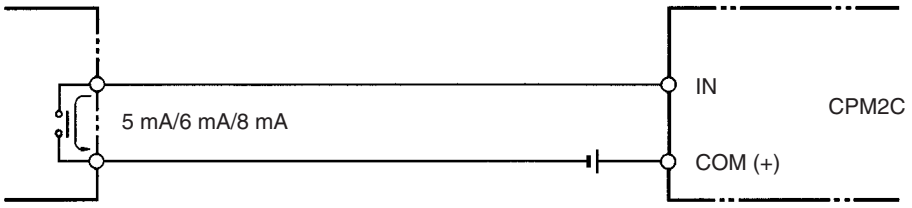
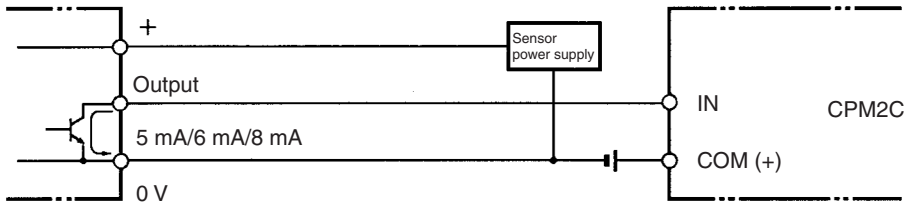
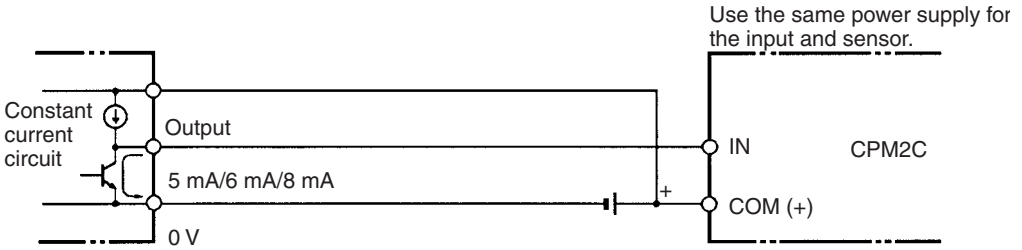
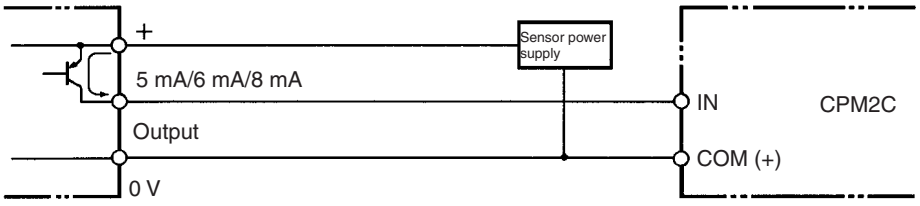
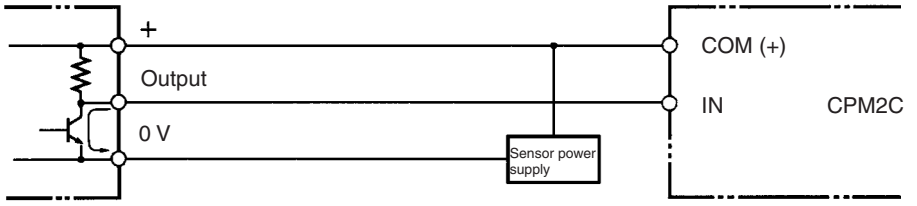
Terminal Block: XW2C-20G5-IN16	Relay Terminals: XW2E-20G5-IN16
Cable: XW2Z-□□□A (Fujitsu-compatible connector)	Cable: XW2Z-□□□A (Fujitsu-compatible connector)
	

Terminal Blocks: XW2C-20G6-IO16	
Cable: XW2Z-□□□A (Fujitsu-compatible connector)	
Connecting COM to – Terminal	Connecting COM to + Terminal
	

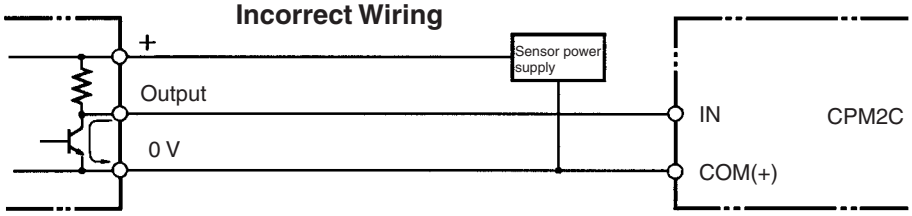
Relay Terminals: G7TC-ID16, G7TC-IA16
Cable: G79-□C (Fujitsu-compatible connector), G79-O□□C (MIL connector)



Input Devices The following table shows how to connect various input devices.

Device	Circuit diagram
Relay output	
NPN open collector	
NPN current output	
PNP current output	
Voltage output	

Note Do **not** use the following wiring with voltage-output devices:

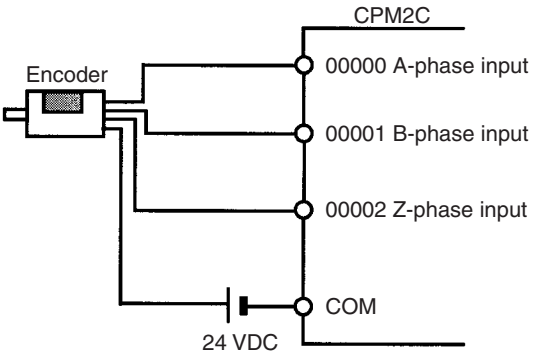


High-speed Counter Inputs

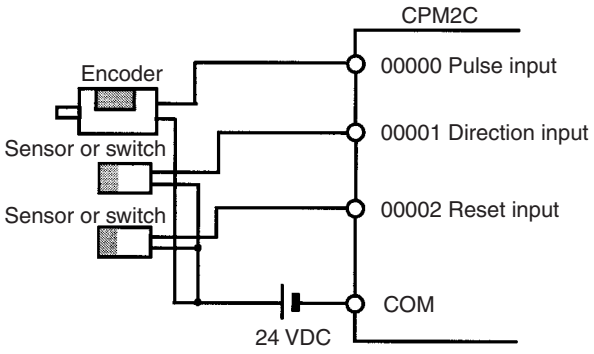
Using IR 00000 to IR 00002 as High-speed Counter Inputs

In these examples, Encoders with an external 24-VDC open-collector output are connected.

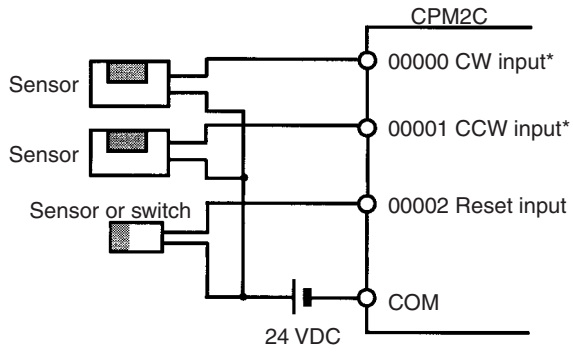
Differential Phase Mode (Count frequency: 5 kHz)



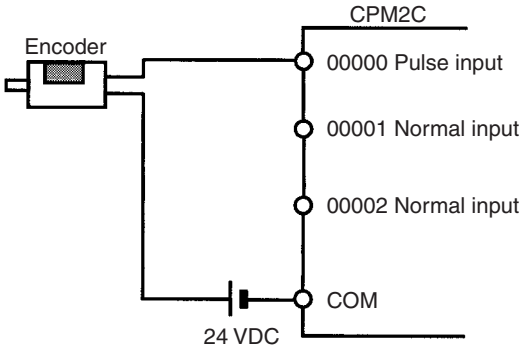
Pulse Plus Direction Input Mode (Count frequency: 20 kHz)



Up/Down Mode (Count frequency: 20 kHz)



Increment Mode (Count frequency: 20 kHz)

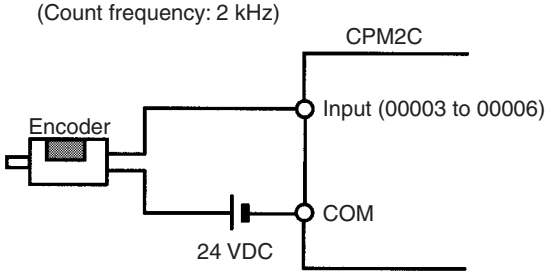


Note *CW is clockwise and CCW is counter-clockwise.

Using IR 00003 to IR 00006 as Interrupt Inputs (Counter Mode)

In these examples, an Encoder with an external 24-VDC open-collector output is connected.

Increment or decrement (Count frequency: 2 kHz)



PC Setup Settings

The input bits shown in the following tables can operate as normal inputs or they can be assigned special functions in the PC Setup.

Special functions for input bits IR 00000 through IR 00002 are set in DM 6642:

Bit address	PC Setup setting (DM 6642 bits 08 to15)		
	00	01	02, 03, or 04
IR 00000	Used as normal inputs.	Used as high-speed counter inputs.	Used as inputs for synchronized pulse control.
IR 00001			
IR 00002			Used as a normal input.

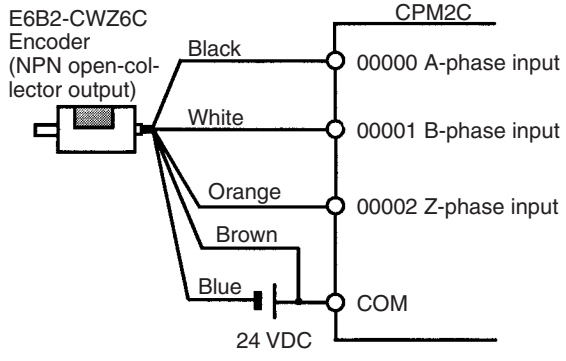
Special functions for input bits IR 00003 through IR 00006 are set in DM 6628:

Bit address	Bits in DM 6628	PC Setup setting (in DM 6628)		
		0	1	2
IR 00003	00 to 03	Used as normal inputs.	Used as interrupt inputs (including counter mode).	Used as quick-response inputs.
IR 00004	04 to 07			
IR 00005	08 to 11*			
IR 00006	12 to 15*			

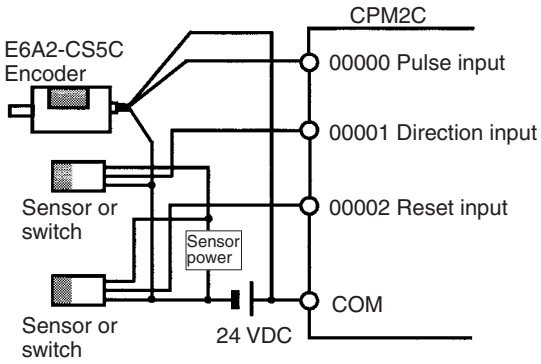
Note *These inputs must be set as normal inputs (setting: 0) when a CPU Unit with 10 I/O points is being used.

High-speed Counter Input Connection Examples

Differential Phase Mode (Count frequency: 5 kHz)

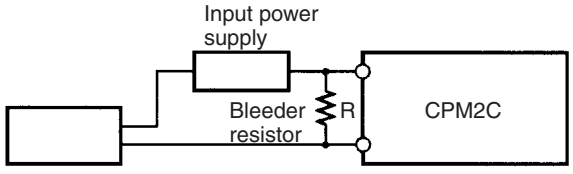


Pulse Plus Direction Input mode (Count frequency: 20 kHz)



Leakage Current

A leakage current can cause false inputs when using 2-wire sensors (proximity switches or photoelectric switches) or limit switches with LEDs. False inputs won't occur if the leakage current is less than 1.0 mA. If the leakage current exceeds these values, insert a bleeder resistor in the circuit to reduce the input impedance, as shown in the following diagram.



I: Device's leakage current (mA)
R: Bleeder resistance (kΩ)
W: Bleeder resistor's power rating (W)
L_C: CPM2C's input impedance (kΩ)
I_C: CPM2C's input current (mA)
E_C: CPM2C's OFF voltage (V) = 5.0 V

$$R = \frac{L_C \times 5.0}{I \times L_C - 5.0}\ \text{k}\Omega\ \text{max.} \qquad W = \frac{2.3}{R}\ \text{W min.}$$

The equations above were derived from the following equations:

$$I \times \frac{R \times \dfrac{\text{Input voltage (24)}}{\text{Input current } (I_C)}}{R + \dfrac{\text{Input voltage (24)}}{\text{Input current } (I_C)}} \leq \text{OFF voltage } (E_C\text{: 5.0})$$

$$W \geq \frac{\text{Input voltage (24)}}{R} \times \text{Input voltage (24)} \times \text{tolerance (4)}$$

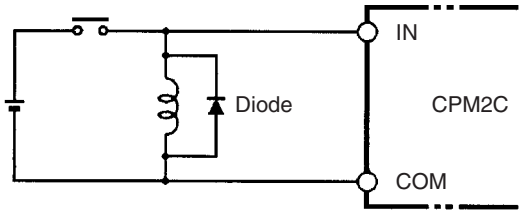
Refer to *2-1-3 I/O Specifications* for details on the values L_C, I_C, and E_C.
The input impedance, input current, and OFF voltage may vary depending on the ir put being used. (IN00000 through IN00002 have different values.)

Inductive Loads

When connecting an inductive load to an input, connect a diode in parallel with the load. The diode should satisfy the following requirements:

1,2,3...

1. Peak reverse-breakdown voltage must be at least 3 times the load voltage.
2. Average rectified current must be 1 A.



3-4-8 Connecting Output Devices

Wire the outputs to the CPM2C's CPU Unit and Expansion I/O Unit as shown in the following diagrams.

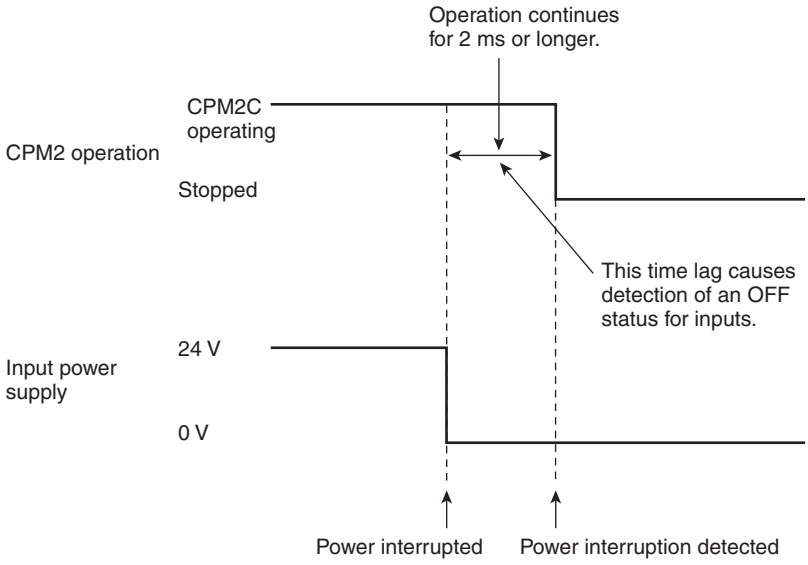
Don't exceed the output capacity or the maximum common current shown in the following table.

⚠ **WARNING** The PC outputs may remain ON or OFF due to deposits on or burning of the output relays or destruction of the output transistors. External safety measures must be provided to ensure safety in the system. Not providing proper safety measures may result in serious accidents.

Units with Relay Outputs via Terminal Block

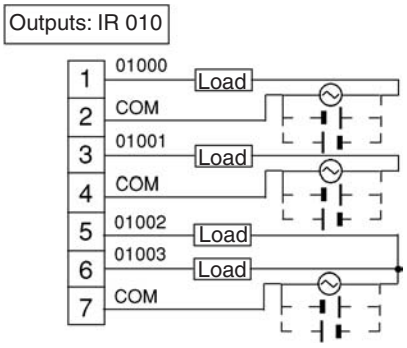
Note

1. Be sure to make connections to terminal blocks and connectors with the correct direction and polarity. Output transistor fuses may burn out if power is supplied to I/O circuits with the I/O connector connected in reverse.
2. Basic insulation is provided between the commons of different polarities of the output relay for the CPM2C-20□□R (model with 20 relay output points).
   Therefore, to conform to EC Directives (Low Voltage Directive), when connecting devices that operate at voltages higher than 50 VAC and those that operate on DC power supplies to adjoining relay output terminals, use different DC power supplies for output devices from those for input devices and the CPM2C power supply.
3. If input status is being held in HR area bits or counter values are being held when the power supply turns OFF, configure the system so that the I/O power supply turns OFF after the power supply to the CPM2C or delay reading the status of inputs.



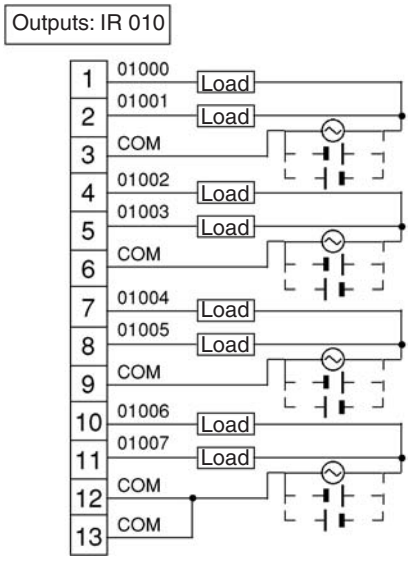
CPU Units with 10 I/O Points: CPM2C-10C□DR-D

Output capacity	Max. common capacity
2 A (250 VAC or 24 VDC)	4 A/common



CPU Units with 20 I/O Points: CPM2C-20C□DR-D

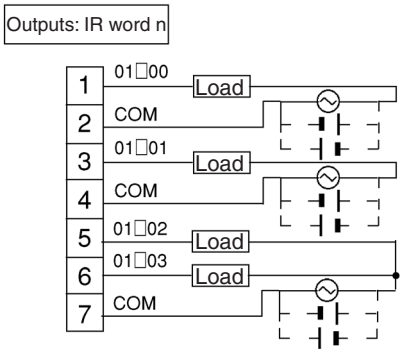
Output capacity	Max. common capacity
2 A (250 VAC or 24 VDC)	4 A/common



Note Terminals 12 and 13 are internally connected. The maximum common capacity is the same as for other common circuits.

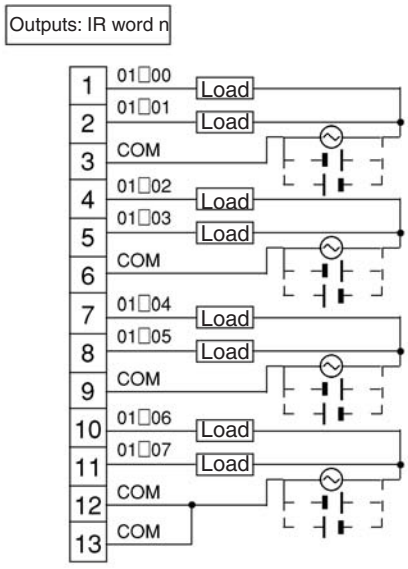
Expansion I/O Unit with 10 I/O Points: CPM2C-10EDR

Output capacity	Max. common capacity
2 A (250 VAC or 24 VDC)	4 A/common



Expansion I/O Unit with 20 I/O Points: CPM2C-20EDR

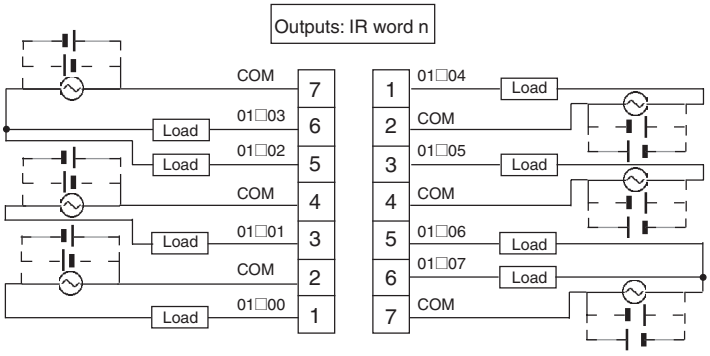
Output capacity	Max. common capacity
2 A (250 VAC or 24 VDC)	4 A/common



Note Terminals 12 and 13 are internally connected. The maximum common capacity is the same as for other common circuits.

Expansion I/O Unit with 8 Output Points: CPM2C-8ER

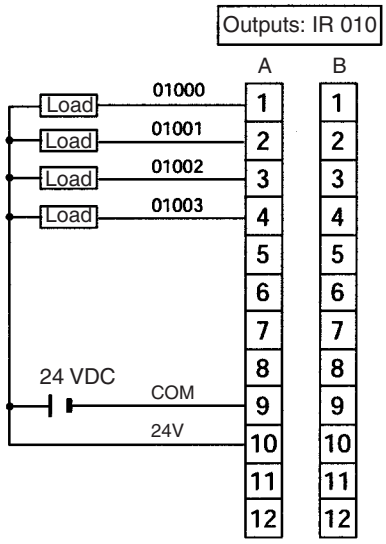
Output capacity	Max. common capacity
2 A (250 VAC/24 VDC)	4 A/common



Units with Transistor Outputs via Fujitsu-compatible Connector

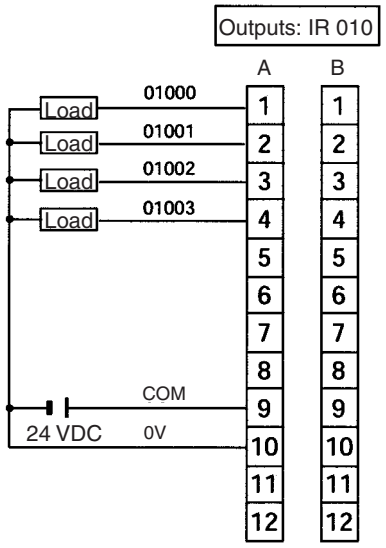
CPU Units with 10 I/O Points, Sinking Outputs: CPM2C-10C□DTC-D

Output capacity	Max. common capacity
300 mA (24 VDC)	1.2 A/common



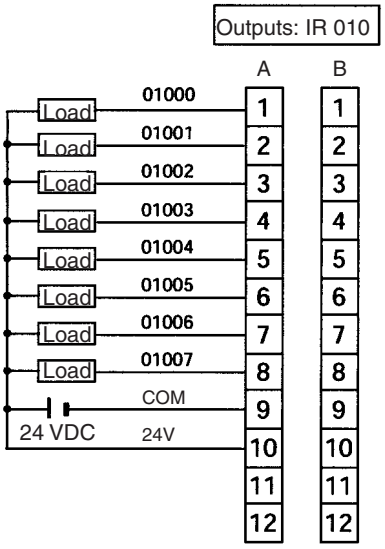
CPU Units with 10 I/O Points, Sourcing Outputs: CPM2C-10C□DT1C-D

Output capacity	Max. common capacity
300 mA (24 VDC)	1.2 A/common



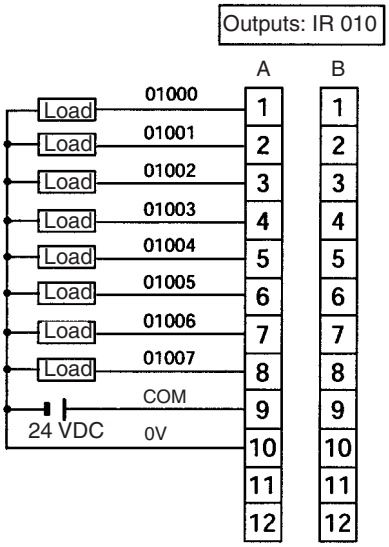
CPU Units with 20 I/O Points, Sinking Outputs: CPM2C-20C□DTC-D

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



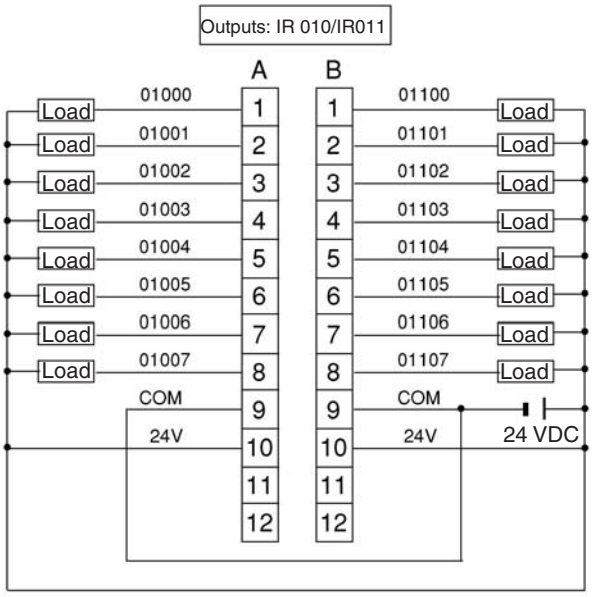
CPU Units with 20 I/O Points, Sourcing Outputs: CPM2C-20C□DT1C-D

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



CPU Units with 32 I/O Points, Sinking Outputs: CPM2C-32CDTC-D

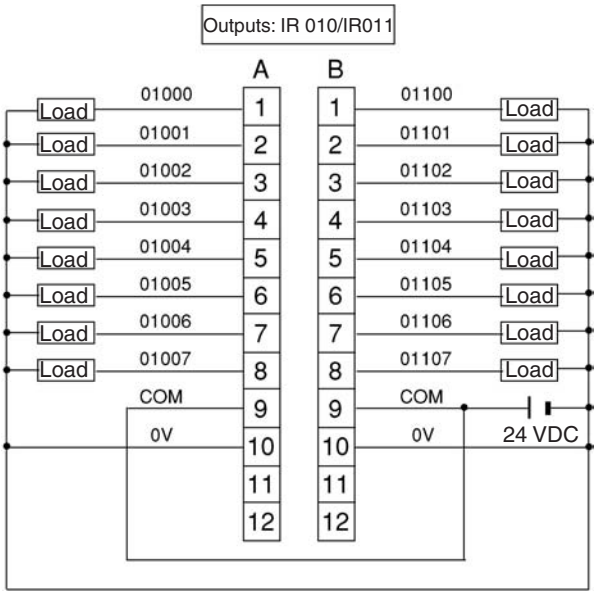
Output capacity	Max. common capacity
OUT01000 to OUT01007: 300 mA (24 VDC) OUT01100 to OUT01107: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (A9 and B9) and 24-V terminals (A10 and B10) even though they are connected internally.

CPU Units with 32 I/O Points, Sourcing Outputs: CPM2C-32CDT1C-D

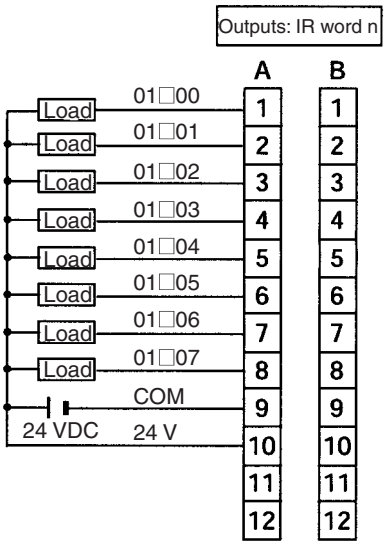
Output capacity	Max. common capacity
OUT01000 to OUT01007: 300 mA (24 VDC) OUT01100 to OUT01107: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (A9 and B9) and 0-V terminals (A10 and B10) even though they are connected internally.

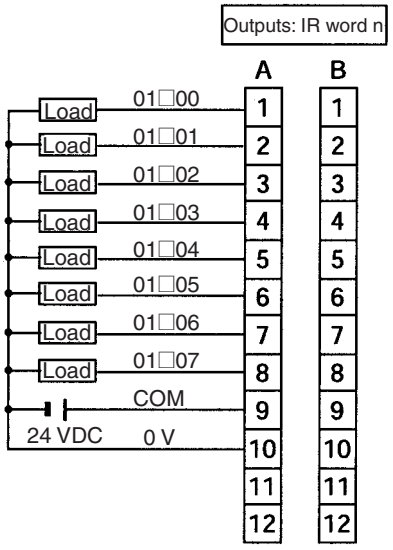
Expansion I/O Unit with 24 I/O Points, Sinking Outputs: CPM2C-24EDTC

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



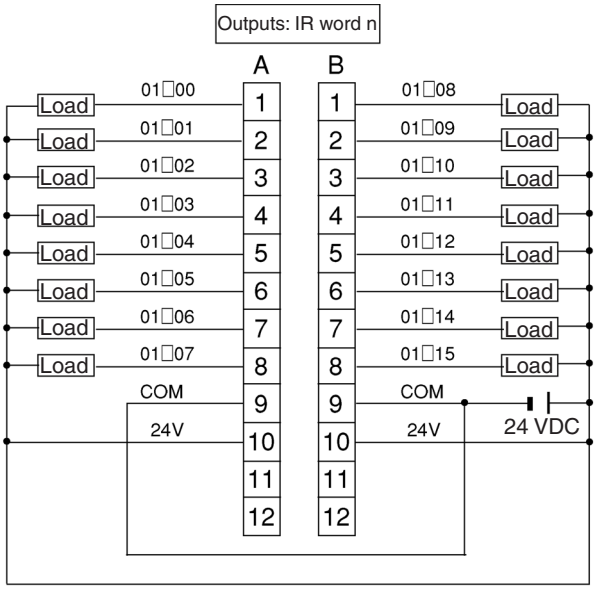
Expansion I/O Unit with 24 I/O Points, Sourcing Outputs: CPM2C-24EDT1C

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



Expansion I/O Unit with 32 I/O Points, Sinking Outputs: CPM2C-32EDTC

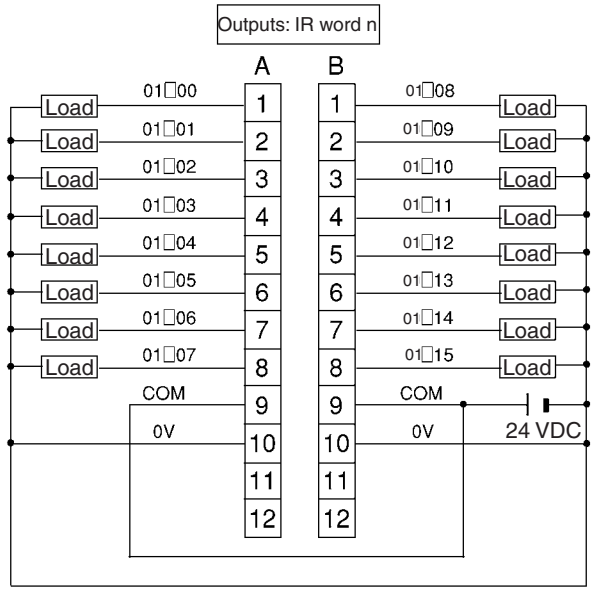
Output capacity	Max. common capacity
00 to 07: 300 mA (24 VDC) 08 to 15: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (A9 and B9) and 24-V terminals (A10 and B10) even though they are connected internally.

Expansion I/O Unit with 32 I/O Points, Sourcing Outputs: CPM2C-32EDT1C

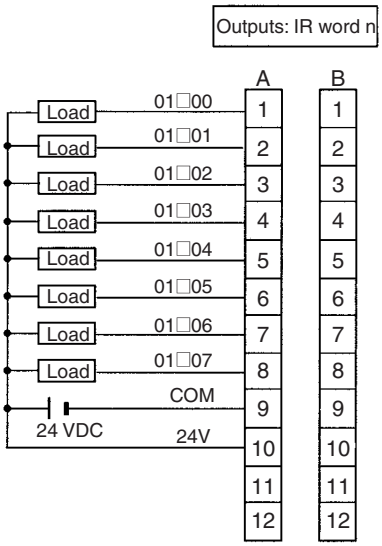
Output capacity	Max. common capacity
00 to 07: 300 mA (24 VDC) 08 to 15: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (A9 and B9) and 0-V terminals (A10 and B10) even though they are connected internally.

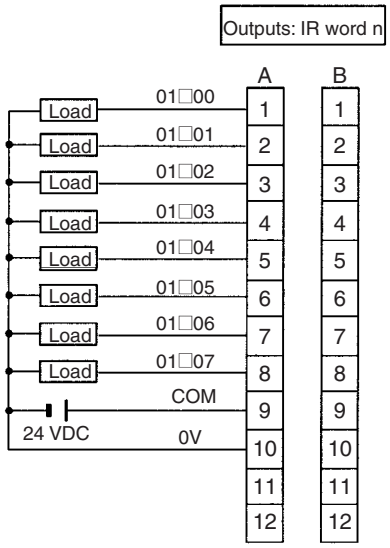
Expansion I/O Unit with 8 Sinking Output Points: CPM2C-8ETC

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



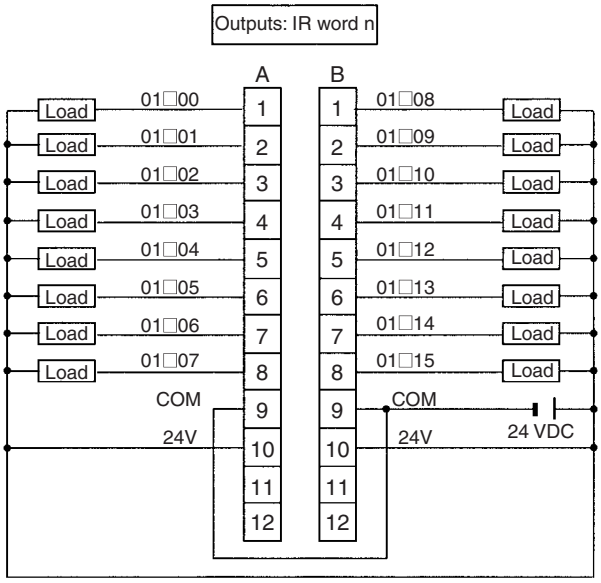
Expansion I/O Unit with 8 Sourcing Output Points: CPM2C-8ET1C

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



Expansion I/O Unit with 16 Sinking Output Points: CPM2C-16ETC

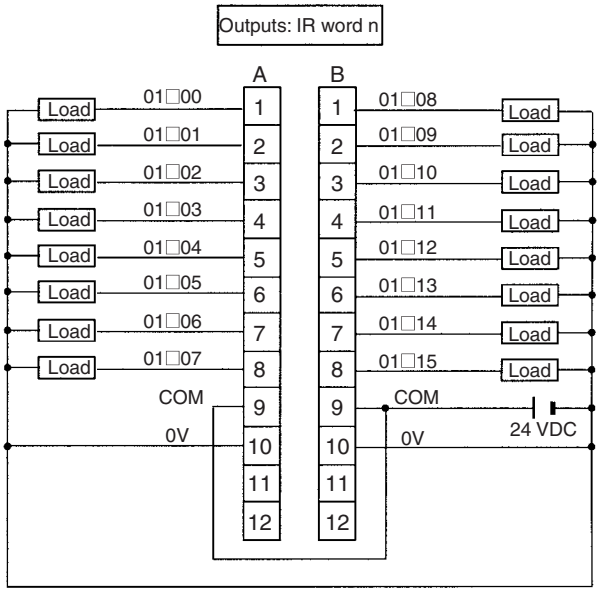
Output capacity	Max. common capacity
00 to 07: 300 mA (24 VDC) 08 to 15: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (A9 and B9) and 24-V terminals (A10 and B10) even though they are connected internally.

Expansion I/O Unit with 16 Sourcing Output Points: CPM2C-16ET1C

Output capacity	Max. common capacity
00 to 07: 300 mA (24 VDC) 08 to 15: 100 mA (24 VDC)	3.2 A/common

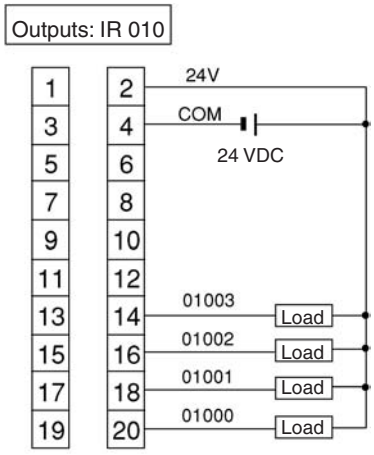


Note Wire COM terminals (A9 and B9) and 0-V terminals (A10 and B10) even though they are connected internally.

Units with Transistor Outputs via MIL Connector

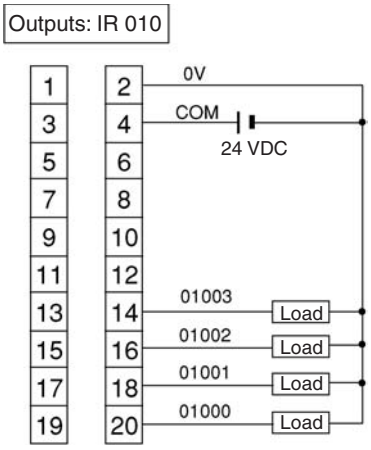
CPU Units with 10 I/O Points, Sinking Outputs: CPM2C-10C□DTM-D

Output capacity	Max. common capacity
300 mA (24 VDC)	1.2 A/common



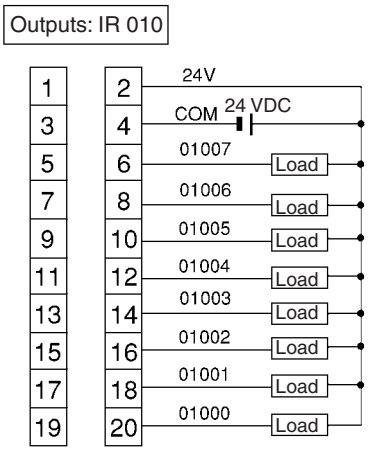
CPU Units with 10 I/O Points, Sourcing Outputs: CPM2C-10C□DT1M-D

Output capacity	Max. common capacity
300 mA (24 VDC)	1.2 A/common



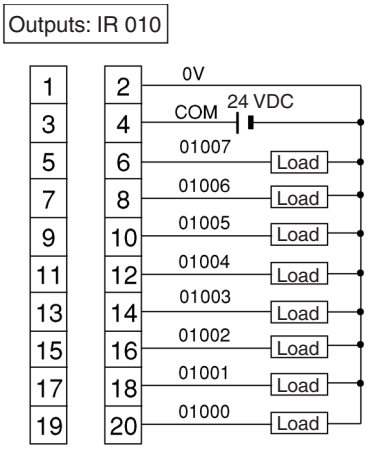
CPU Units with 20 I/O Points, Sinking Outputs: CPM2C-20C□DTM-D

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



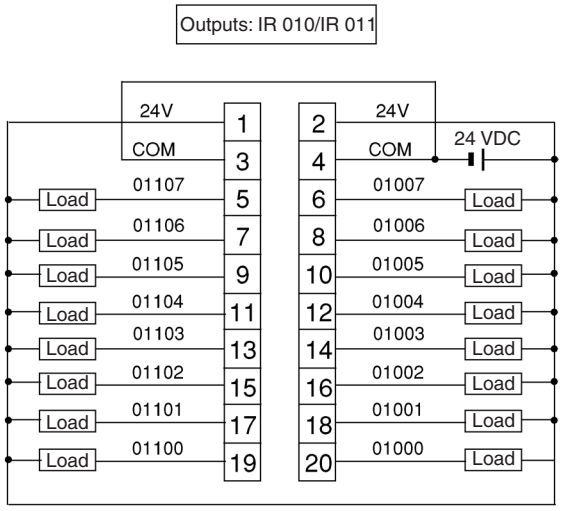
CPU Units with 20 I/O Points, Sourcing Outputs: CPM2C-20C□DT1M-D

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



CPU Units with 32 I/O Points, Sinking Outputs: CPM2C-32CDTM-D

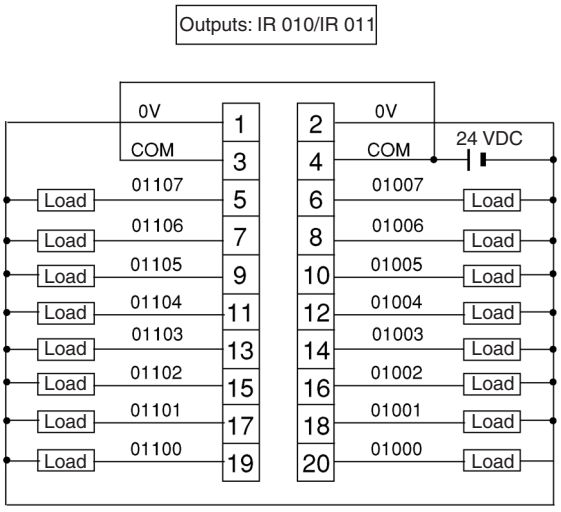
Output capacity	Max. common capacity
OUT01000 to OUT01007: 300 mA (24 VDC) OUT01100 to OUT01107: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (3 and 4) and 24-V terminals (1 and 2) even though they are connected internally.

CPU Units with 32 I/O Points, Sourcing Outputs: CPM2C-32CDT1M-D

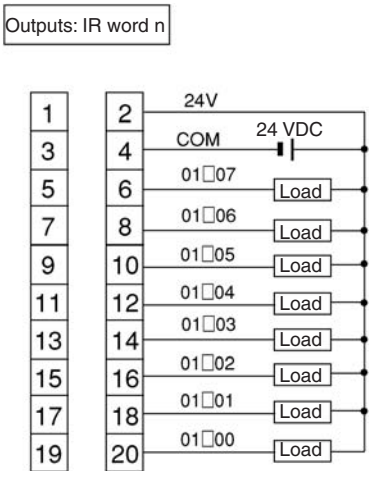
Output capacity	Max. common capacity
OUT01000 to OUT01007: 300 mA (24 VDC) OUT01100 to OUT01107: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (3 and 4) and 0-V terminals (1 and 2) even though they are connected internally.

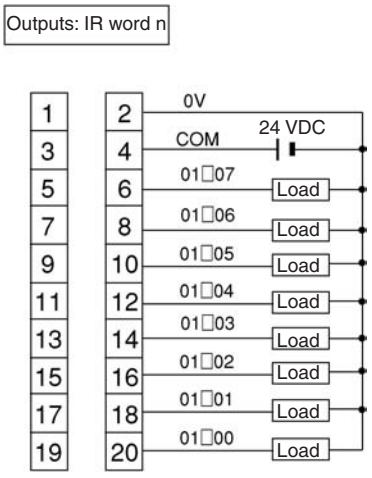
Expansion I/O Unit with 24 I/O Points Sinking Outputs: CPM2C-24EDTM

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



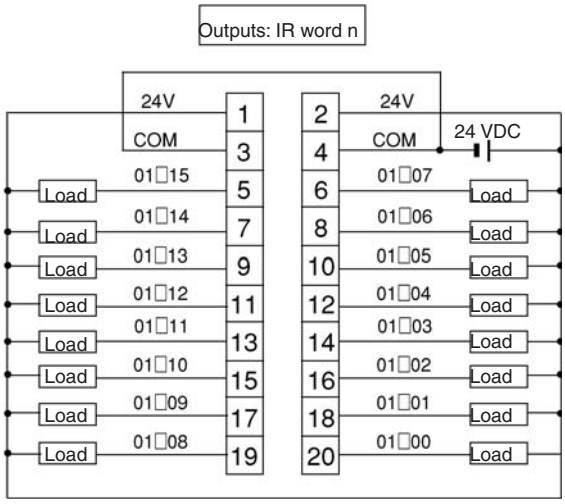
Expansion I/O Unit with 24 I/O Points, Sourcing Outputs: CPM2C-24EDT1M

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



Expansion I/O Unit with 32 I/O Points Sinking Outputs: CPM2C-32EDTM

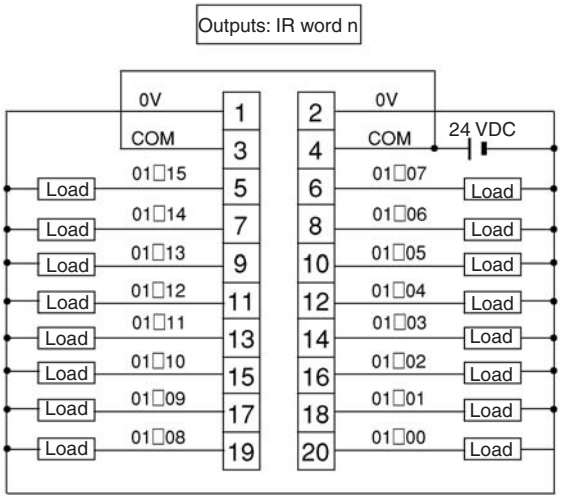
Output capacity	Max. common capacity
00 to 07: 300 mA (24 VDC) 08 to 15: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (3 and 4) and 24-V terminals (1 and 2) even though they are connected internally.

Expansion I/O Unit with 32 I/O Points Sourcing Outputs: CPM2C-32EDT1M

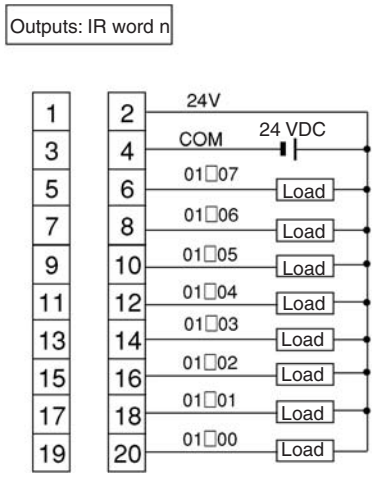
Output capacity	Max. common capacity
00 to 07: 300 mA (24 VDC) 08 to 15: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (3 and 4) and 0-V terminals (1 and 2) even though they are connected internally.

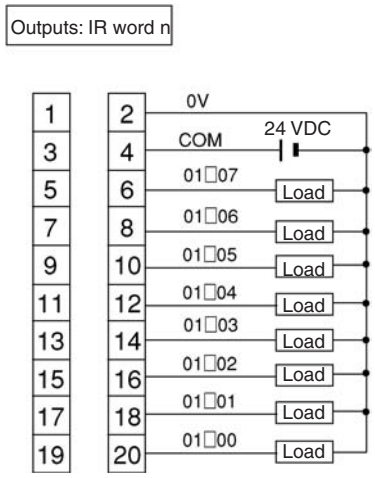
Expansion I/O Unit with 8 Sinking Outputs: CPM2C-8ETM

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



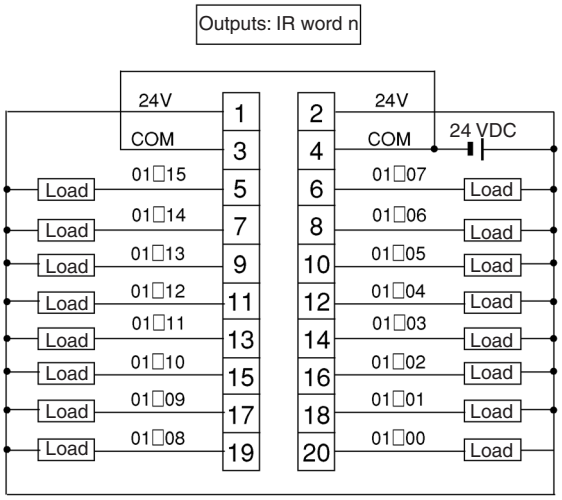
Expansion I/O Unit with 8 Sourcing Outputs: CPM2C-8ET1M

Output capacity	Max. common capacity
300 mA (24 VDC)	2.4 A/common



Expansion I/O Unit with 16 Sinking Outputs: CPM2C-16ETM

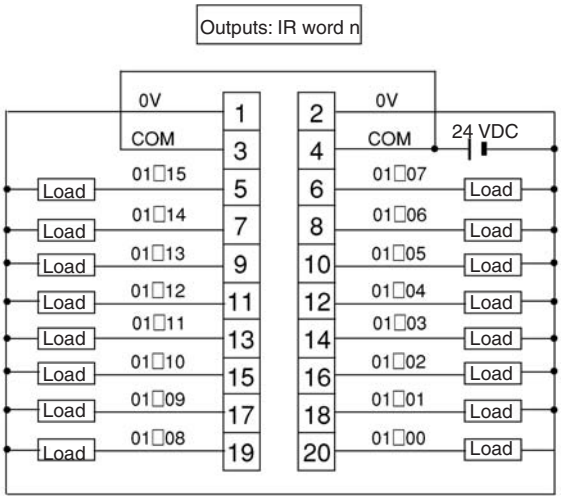
Output capacity	Max. common capacity
00 to 07: 300 mA (24 VDC) 08 to 15: 100 mA (24 VDC)	3.2 A/common



Note Wire COM terminals (3 and 4) and 24-V terminals (1 and 2) even though they are connected internally.

Expansion I/O Unit with 16 Sourcing Outputs: CPM2C-16ET1M

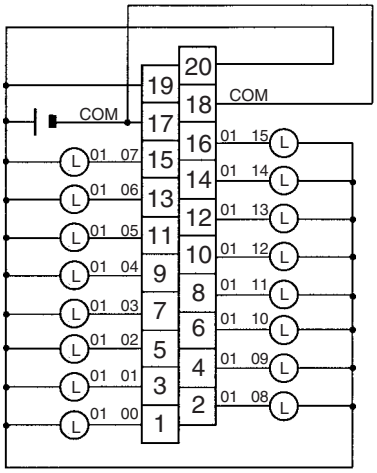
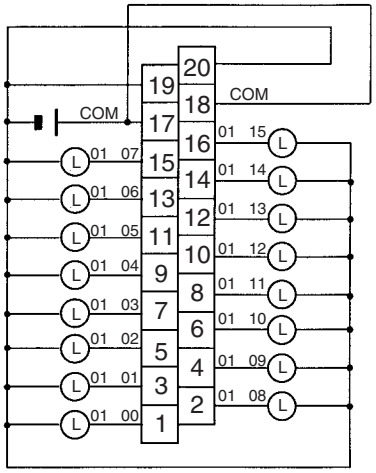
Output capacity	Max. common capacity
00 to 07: 300 mA (24 VDC) 08 to 15: 100 mA (24 VDC)	3.2 A/common

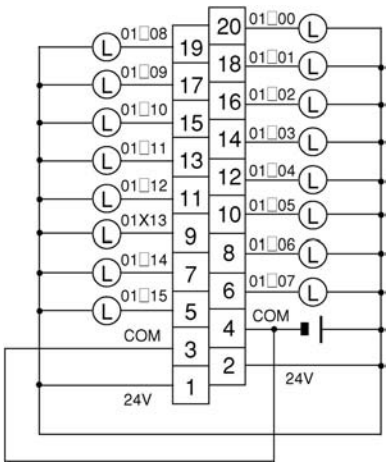
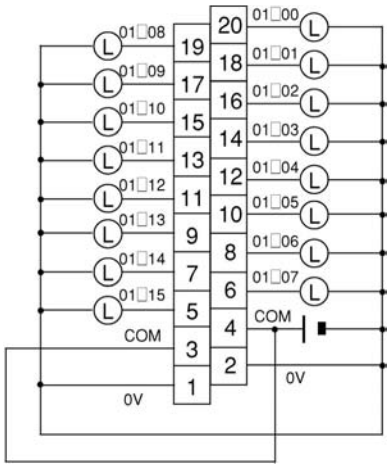


Note Wire COM terminals (3 and 4) and 0-V terminals (1 and 2) even though they are connected internally.

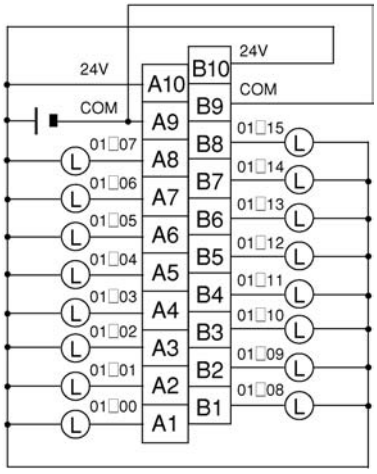
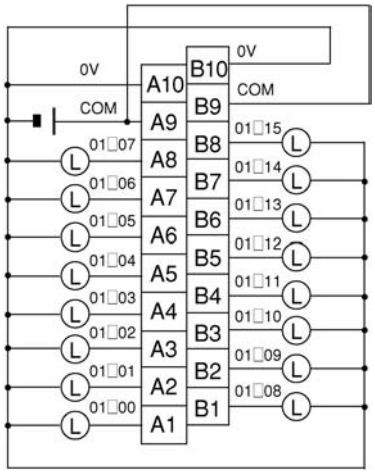
Wiring Output Terminals

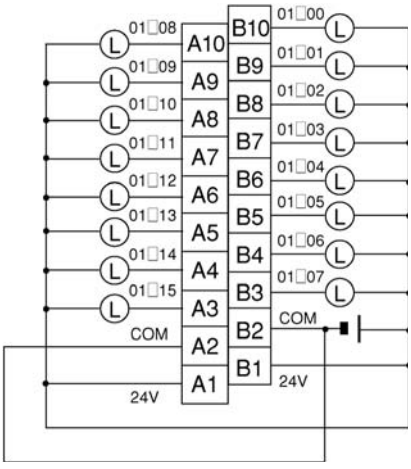
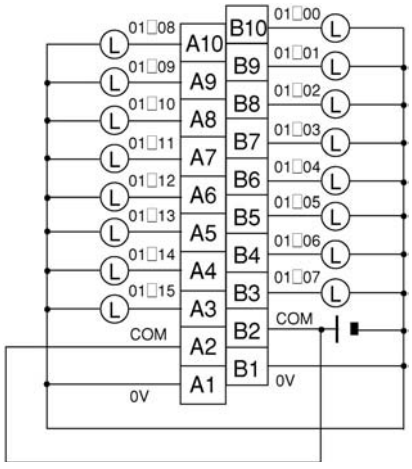
The wiring for output terminals is as shown below.

Terminal Blocks: XW2B-20G4, XW2B-20G5; Cable: XW2Z-□□□A (Fujitsu-compatible connector)	
Sinking transistor outputs	Sourcing transistor outputs
	

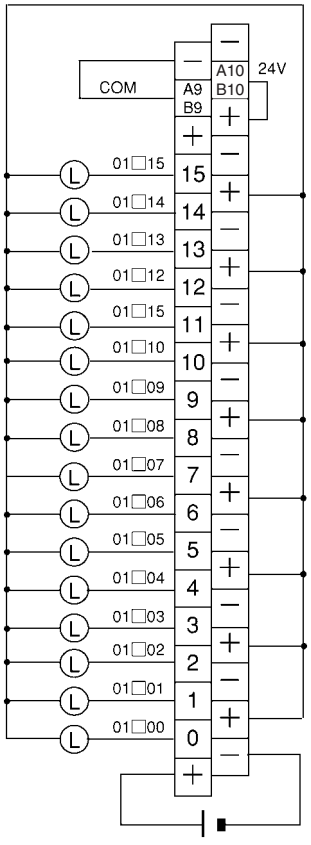
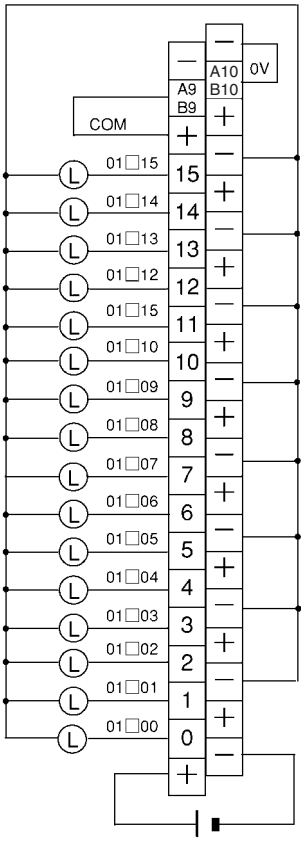
Terminal Blocks: XW2B-20G4, XW2B-20G5; Cable: G79-□C (Fujitsu-compatible connector), G79-O□□C (MIL connector)	
Sinking outputs	Sourcing outputs
	

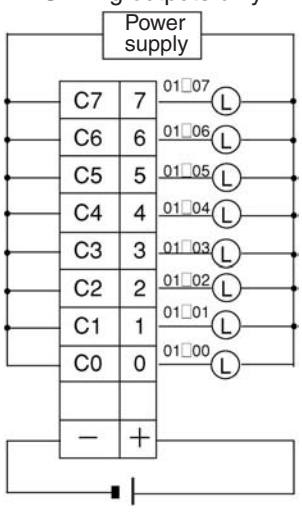
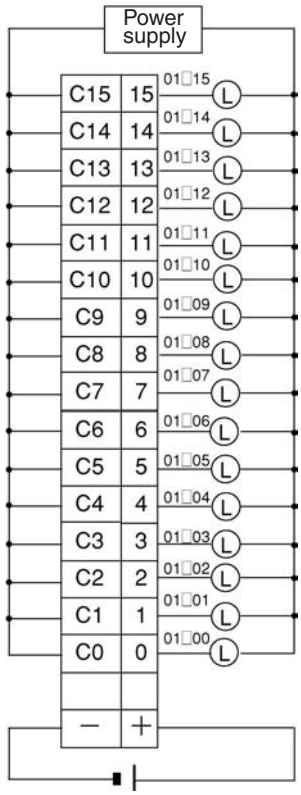
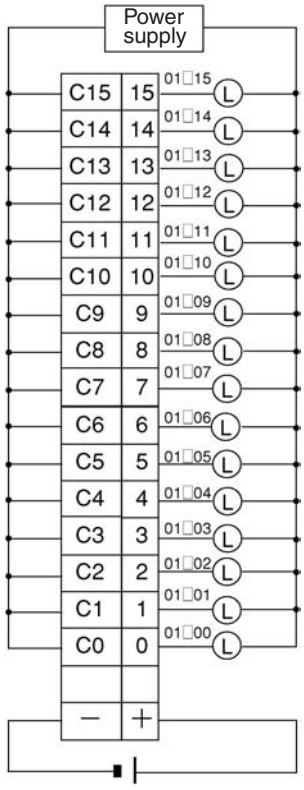
Note For CPU Units with 32 I/O Points, relay numbers 00□00 to 00□07 correspond to 00000 to 00007, relay numbers 00□08 to 00□15 correspond to 00100 to 00107, and relay numbers 01□00 to 01□07 correspond to 01000 to 01007, and relay numbers 01□08 to 01□15 correspond to 01100 to 01107.

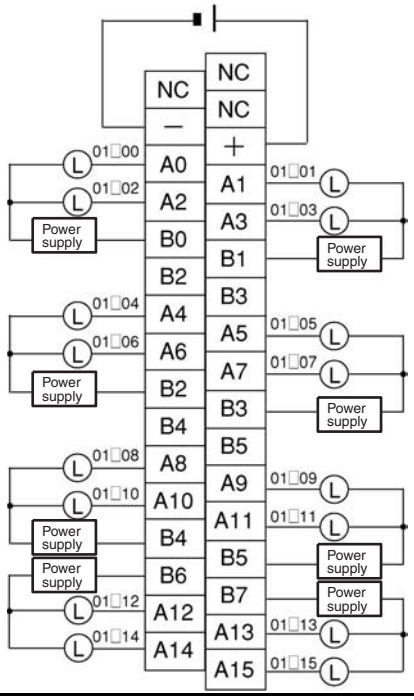
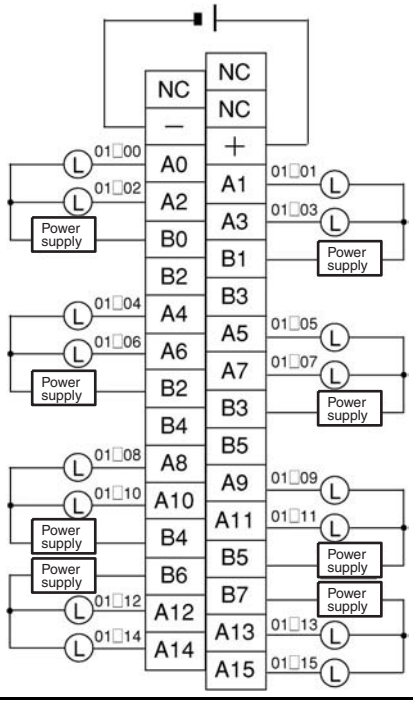
Terminal Blocks: XW2D-20G6; Cable: XW2Z-□□□A (Fujitsu-compatible connector)	
Sinking outputs	Sourcing outputs
	

Terminal Blocks: XW2D-20G6; Cable: G79-□C (Fujitsu-compatible connector), G79-O□□C (MIL connector)	
Sinking outputs	Sourcing outputs
	

Note For CPU Units with 32 I/O Points, relay numbers 00□00 to 00□07 correspond to 00000 to 00007, relay numbers 00□08 to 00□15 correspond to 00100 to 00107, and relay numbers 01□00 to 01□07 correspond to 01000 to 01007, and relay numbers 01□08 to 01□15 correspond to 01100 to 01107.

Terminal Blocks: XW2C-20G6-IO16; Cable: XW2Z-□□□A (Fujitsu-compatible connector)	
Sinking outputs	Sourcing outputs
	

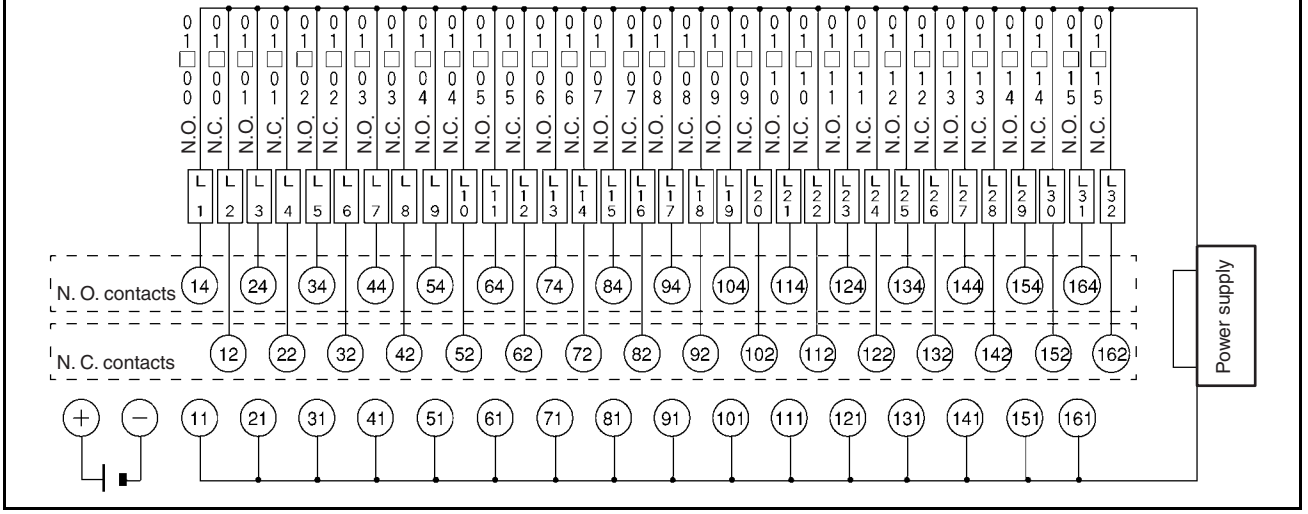
Relay Terminal: G7TC-OC08	Relay Terminal: G7TC-OC16	Relay Terminal: G7TC-OC16-1
Cable: G79-□C (Fujitsu), G79-O□□C (MIL) (See note.)	Cable: G79-□C (Fujitsu), G79-O□□C (MIL) (See note.)	Cable: G79-□C (Fujitsu), G79-O□□C (MIL) (See note.)
Sinking outputs only 	Sinking outputs only 	Sourcing outputs only 

Relay Terminals: G70D-SOC16, G70D-FOM16	Relay Terminal: G70D-SOC16-1, G70D-FOM16-1
Cable: G79-□C (Fujitsu), G79-O□□C (MIL) (See note.)	Cable: G79-I□□C (MIL) (See note.)
Sinking outputs only 	Sourcing outputs only 

Note Fujitsu = Fujitsu-compatible connector, MIL = MIL connector

Relay Terminals: G70A-ZOC16-3 (sinking outputs, Fujitsu), G70A-ZOC16-4 (sourcing outputs, MIL) (See note 1.)

Cables: G79-□C (sinking outputs, Fujitsu), G79-O□□C (sourcing outputs, MIL), G79-I□□C (sourcing outputs, MIL), and G2R-1-S(N) (See note 1.)



Note

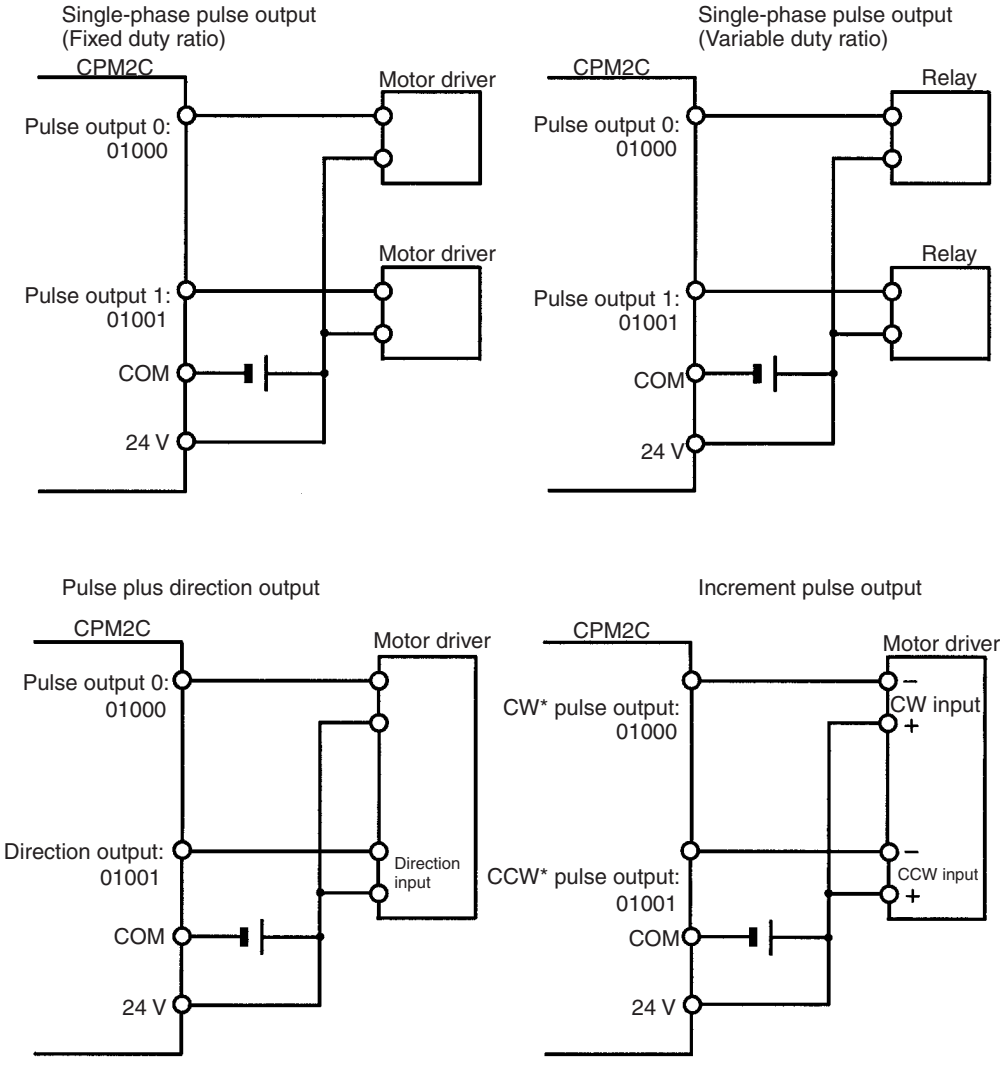
1. Fujitsu = Fujitsu-compatible connector, MIL = MIL connector
2. The polarity of G70A-ZOC16-3 (NPN with + common) and G70A-ZOC16-4 (PNP with − common) are reversed. Use a G79-I□□C Cable for the G70A-ZOC16-4. (Only a MIL connector can be used.)
3. The IR area addresses that can be used vary with the Unit used, as shown in the following table.

Unit	Input IR area addresses	Output IR area addresses
CPU Unit with 10 I/O points	IR 00000 to IR 00005	IR 01000 to IR 01003
CPU Unit with 20 I/O points	IR 00000 to IR 00011	IR 01000 to IR 01007
CPU Unit with 32 I/O points	IR 00000 to IR 00007 IR 00100 to IR 00107 (See note.)	IR 01000 to IR 01007 IR 01100 to IR 01107 (See note.)
Expansion I/O Unit with 10 I/O points	IR 00□00 to IR 00□05	IR 01□00 to IR 01□03
Expansion I/O Unit with 24 I/O points	IR 00□00 to IR 00□15	IR 01□00 to IR 01□07
Expansion I/O Unit with 32 I/O points	IR 00□00 to IR 00□15	IR 01□00 to IR 01□15
Expansion I/O Unit with 8 input points	IR 00□00 to IR 00□07	---
Expansion I/O Unit with 16 input points	IR 00□00 to IR 00□15	---
Expansion I/O Unit with 8 output points	---	IR 01□00 to IR 01□07
Expansion I/O Unit with 16 output points	---	IR 01□00 to IR 01□15

Note For CPU Units with 32 I/O points, 00□08 to 00□15 in the diagram correspond to IR 00100 to IR 00107 and 01□08 to 01□15 in the diagram correspond to IR 01100 to IR 01107.

Using Pulse Outputs

The following diagrams show example applications of sink-type transistor outputs using output bits IR 01000 and IR 01001. Use the PULS(65), SPED(—), ACC(—), PWM(—), and SYNC(—) instructions to produce pulse outputs (rather than normal outputs) from output bits IR 01000 and IR 01001.



Note *CW is clockwise and CCW is counter-clockwise.

Output Wiring Precautions

Observe the following precautions to protect the PC's internal components.

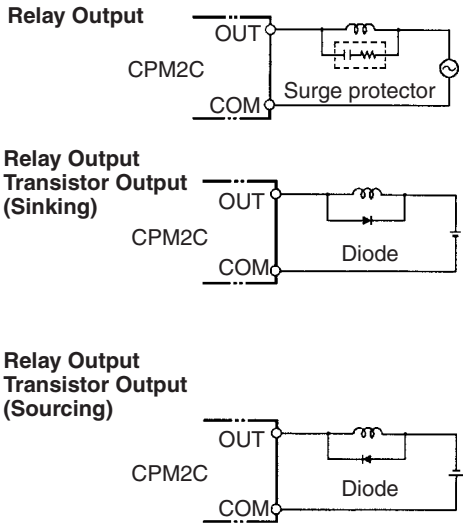
Output Short Protection

The output or internal circuitry might be damaged when the load connected to an output is short-circuited, so it is recommended to install a protective fuse in each output circuit. Use a fuse that has a capacity of about twice the output ratings.

Inductive Loads

When connecting an inductive load to an input, connect a surge protector or diode in parallel with the load.

The surge protector's components should have the following ratings:

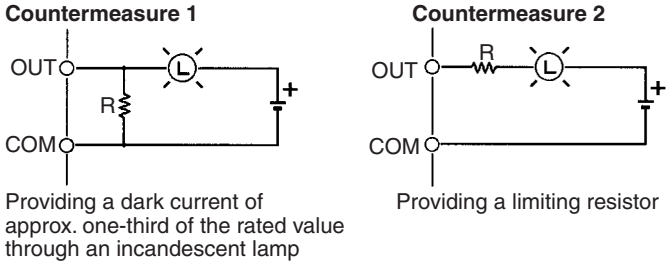


The diode should satisfy the following requirements:

Peak reverse-breakdown voltage must be at least 3 times the load voltage.
Average rectified current must be 1 A.

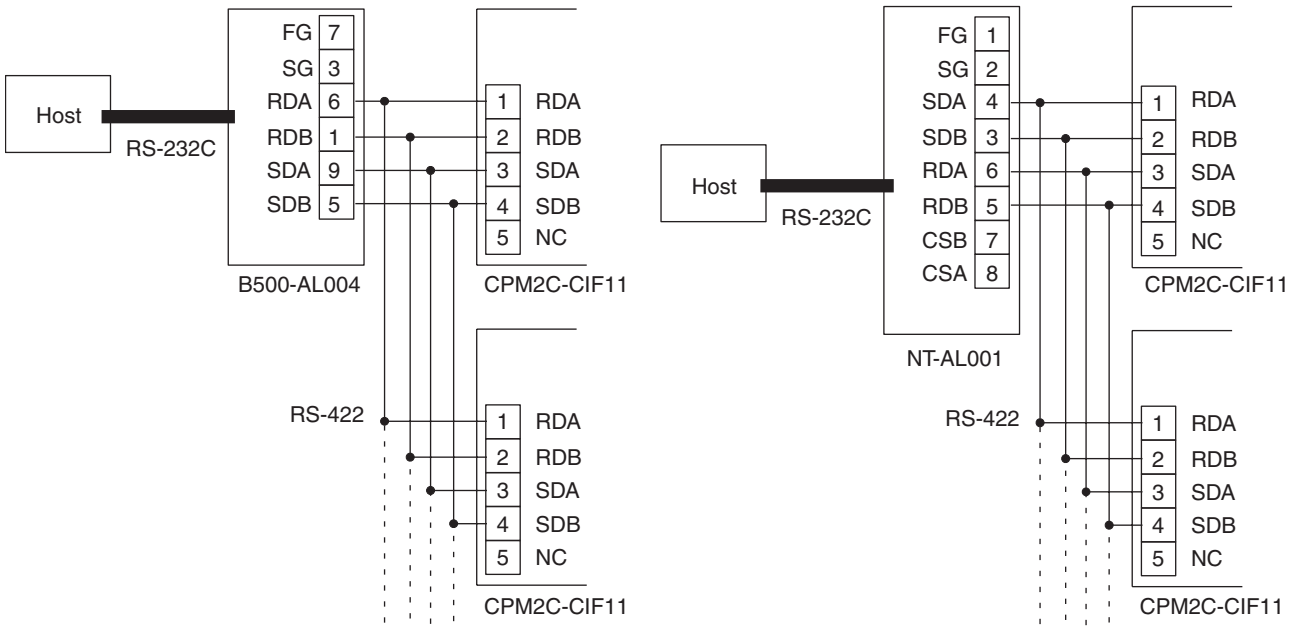
Inrush Current Considerations

When switching a load with a high inrush current in the CPM2C relay output or transistor output model, such as an incandescent lamp, suppress the inrush current as shown below.



3-4-9 RS-422 Port Connection

When using the RS-422/RS-232C Adapter Unit (CPM2C-CIF11) in a Host Link connection (1:N), wire the RS-422 port as shown below.

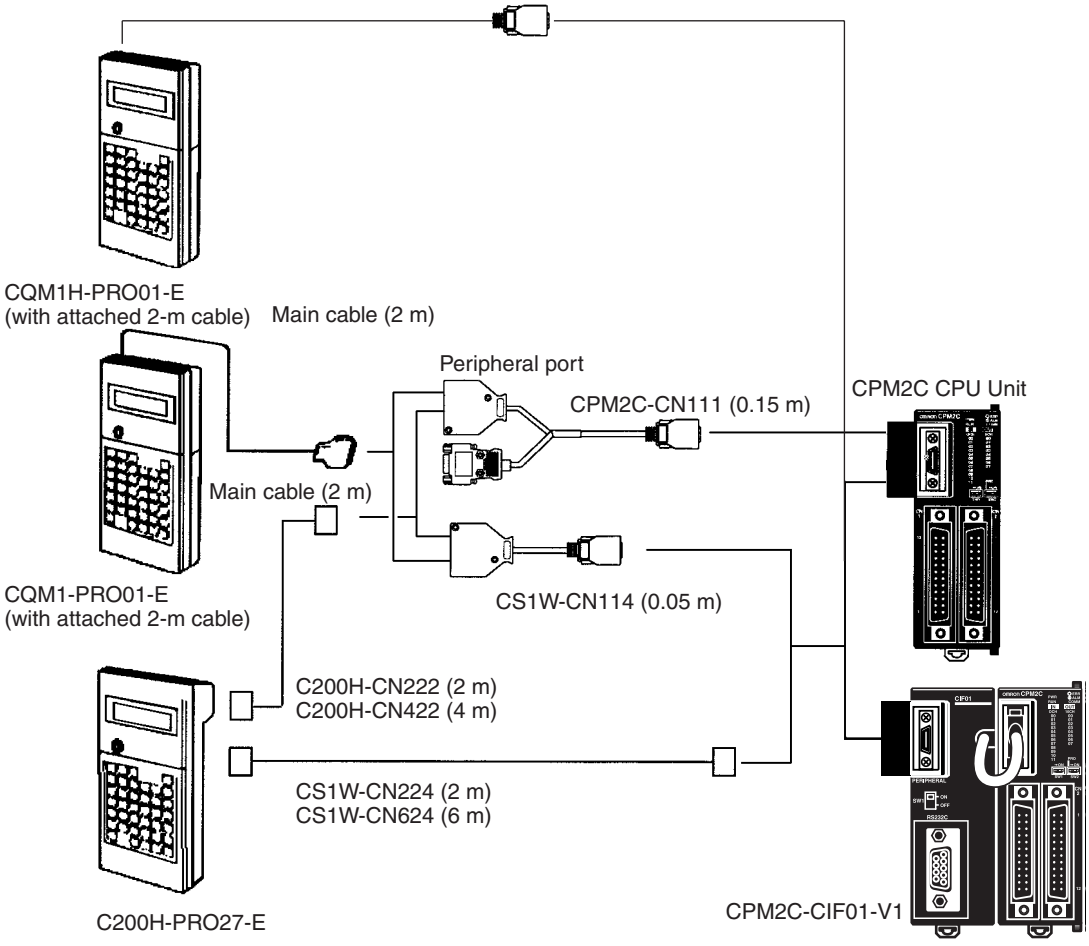


Note Turn ON the terminating resistance in the last Unit for stable communications.

3-4-10 Programming Device Connections

Programming Console

Use one of the connecting cables shown in the following diagram to connect a Programming Console to the CPM2C.



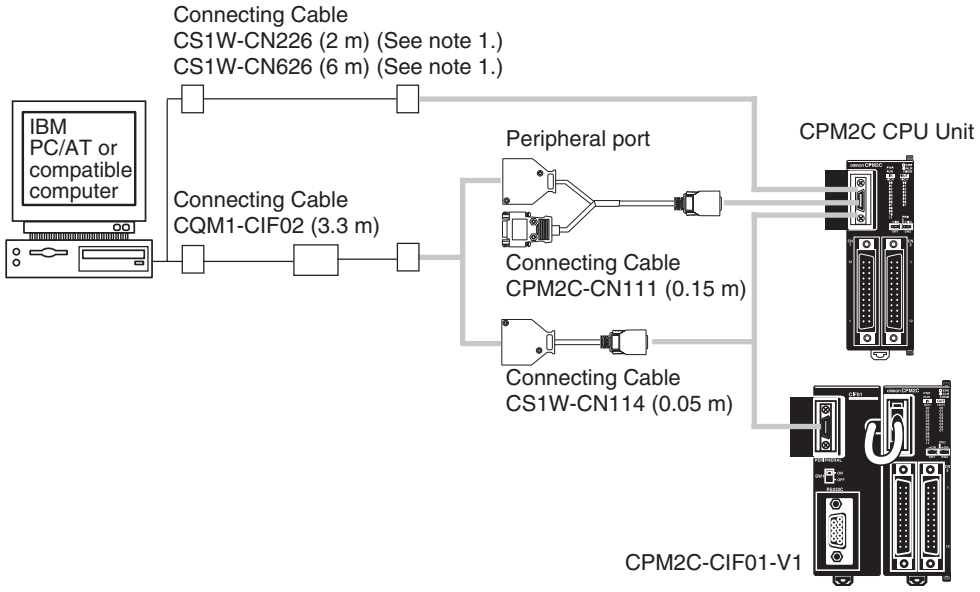
Note When connecting a Programming Console to the peripheral port of the CPM2C-CIF01-V1 Peripheral/RS-232C Adapter Unit, turn OFF the cable switch (SW1).

Connections for the CX-Programmer

The CPM2C is supported by CX-Programmer version 2.1 or higher. Either the tool bus (peripheral) or SYSMAC WAY (Host Link) can be used for communications.

Connecting to the Peripheral Port

With a peripheral port connection, communications are possible by selecting either the tool bus or SYSMAC WAY as the CX-Programmer's network type (i.e., serial communications mode).

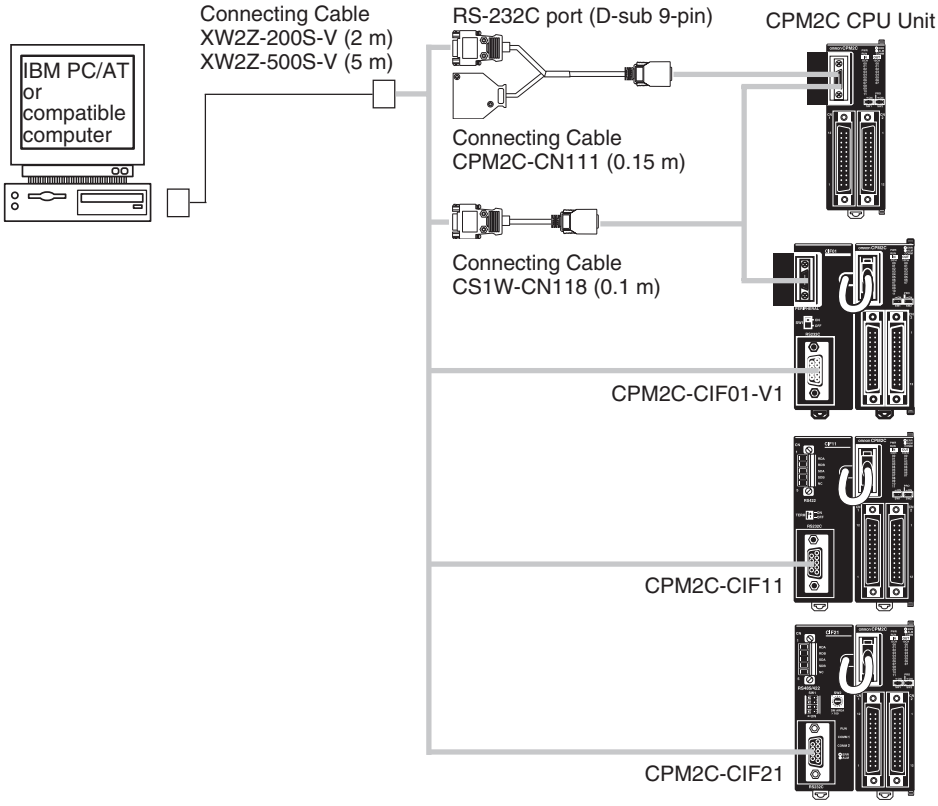


Note

1. The CS1W-CN226/CN626 can be connected to the CPU Unit, but they cannot be connected to the CPM2C-CIF01-V1. Also, they cannot be used for tool bus communications. The CS1W-CN226/CN626 can be connected to the CPM2C-CIF01-V1, however, if pin 1 on the front-panel DIP switch is turned ON.
2. The CS1W-CN226/CN626 cannot be connected to the CPM2C-CIF01.
3. The CS1W-CN225/CN625/CN227/CN627 cannot be used.
4. The CQM1-CIF11 cannot be used. If it is connected, the CPM2C will not detect a tool connection and, with the default PC Setup settings (i.e., operation at startup determined by tool connection), the CPM2C will start operation in RUN mode.

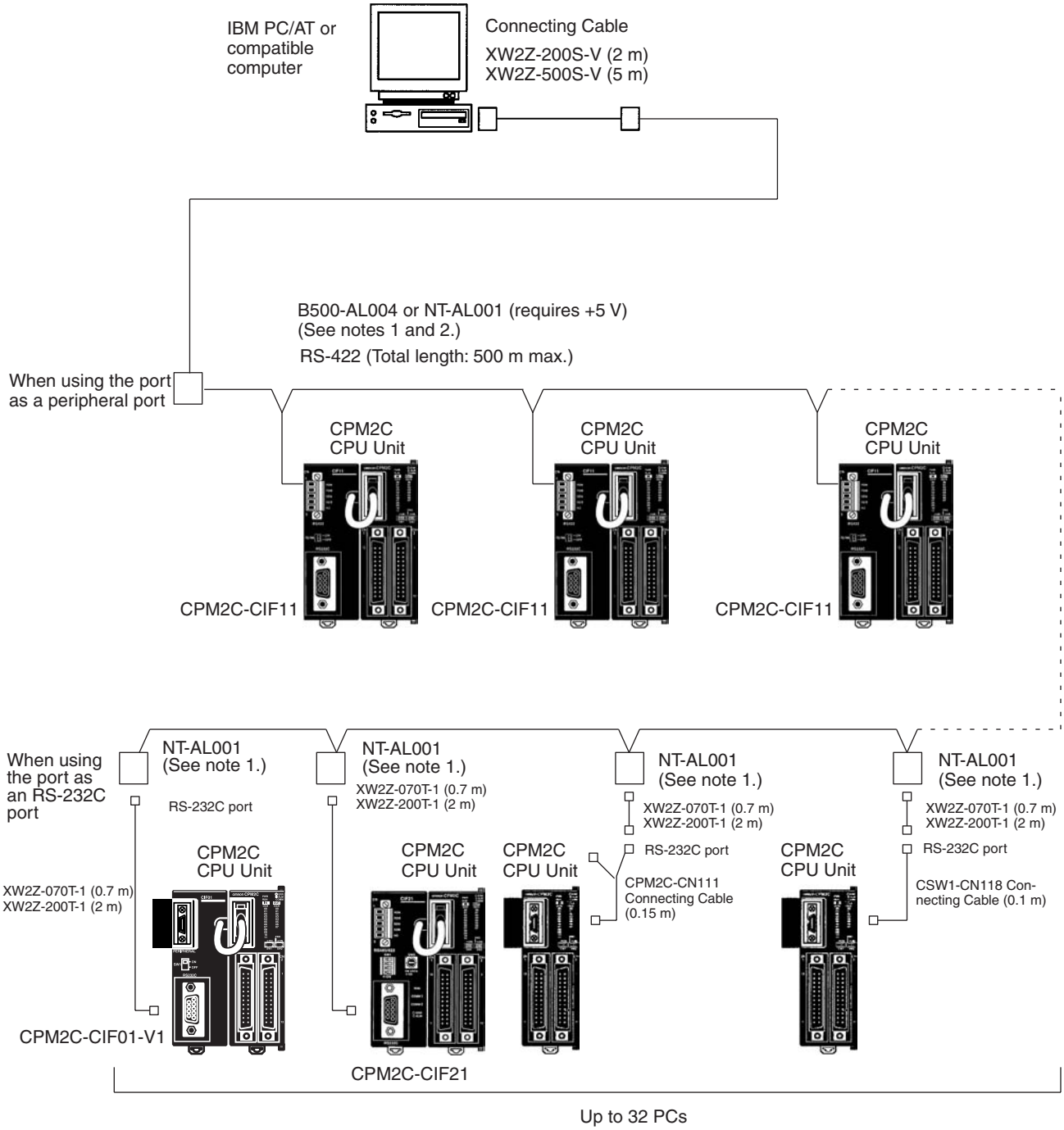
Connecting to the RS-232C Port

With an RS-232C port connection, communications are possible by using SYSMAC WAY as the CX-Programmer's network type (i.e., serial communications mode). Tool bus communications are not possible.



One-to-N Host Link Connection

Up to 32 OMRON PCs, including CPM2C PCs, can be connected to a host computer.

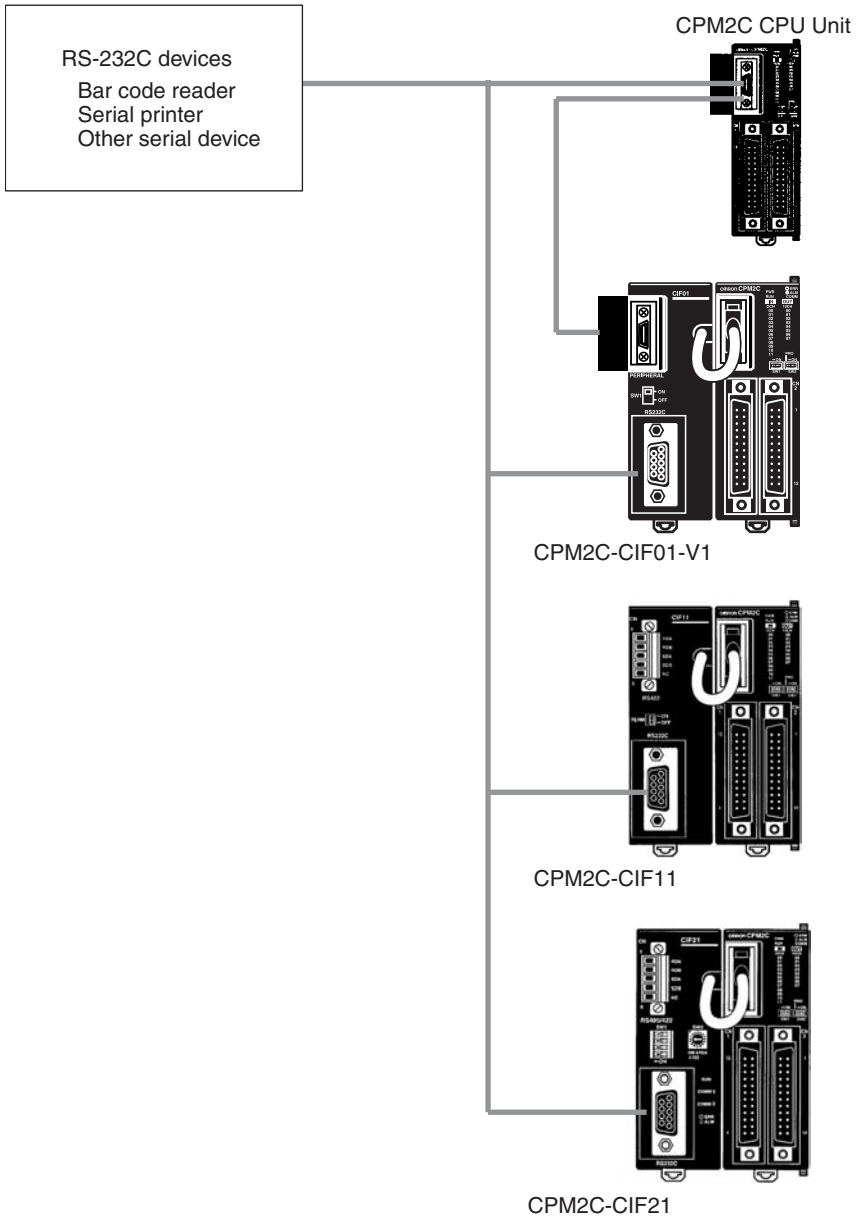


Note

1. The NT-AL001 must be supplied externally with 5 VDC. When an NT-AL001 is connected to a CPM2C PC, pin 6 of the CPM2C's RS-232C port supplies +5 VDC and an external power supply is not necessary.
2. The B500-AL004 requires an external AC power supply (110 VAC or 220 VAC).
3. Be sure that the power supply requirements of the CPU Unit, Expansion Units, and Expansion I/O Units do not exceed the available capacity. Only three Expansion I/O Units and Expansion Units can be connected when the NT-AL001 Adapter connected to the RS-232C port.

3-4-11 No-Protocol Communications

The TXD(48) and RXD(47) instructions can be used in no-protocol mode to exchange data with standard serial devices. For example, data can be received from a bar code reader or transmitted to a serial printer. The serial devices can be connected to the communications port as a RS-232C port or peripheral port, as shown in the following diagrams.

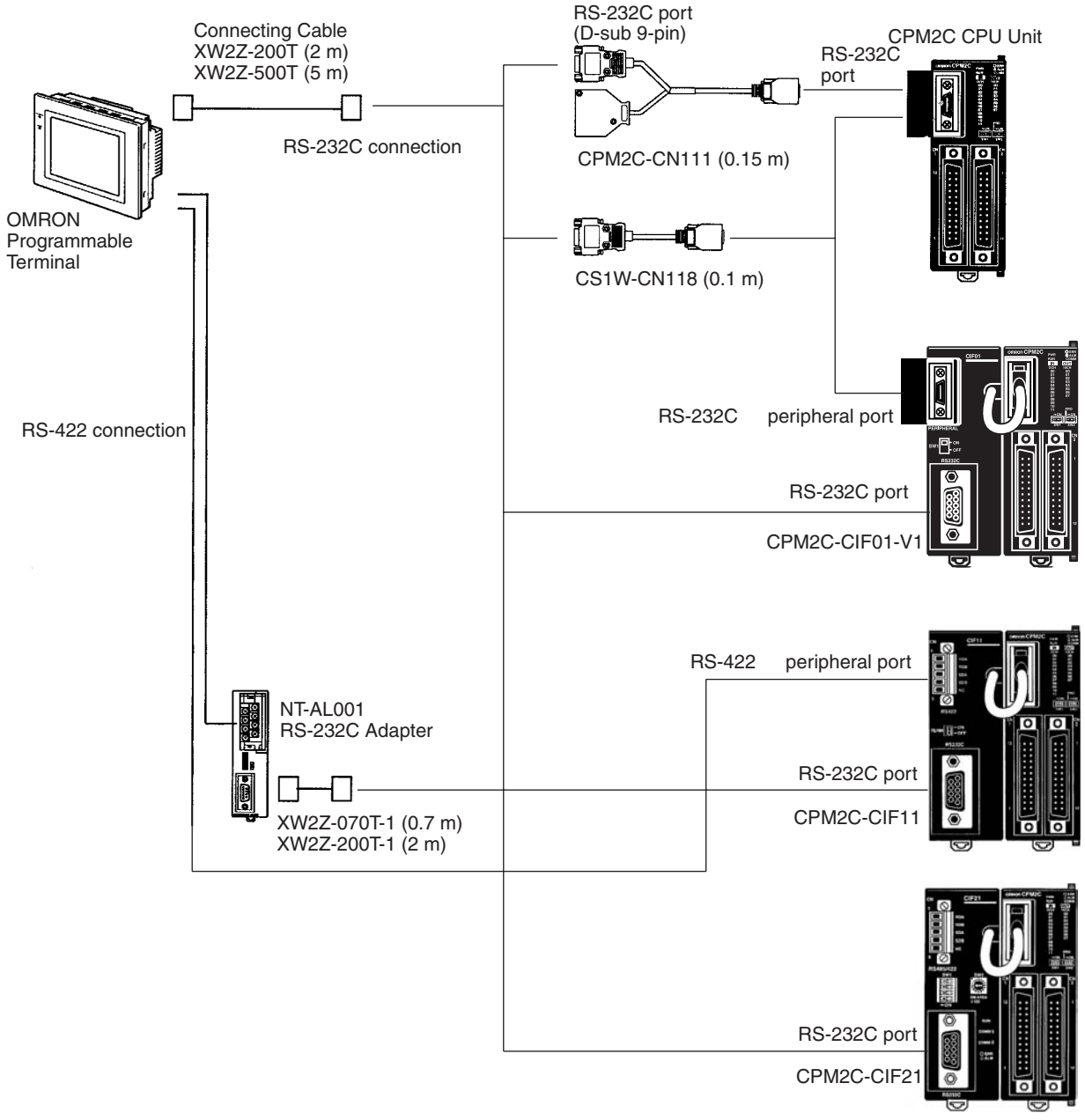


Note See *One-to-one Computer Connections* on page 142 for details on the system configurations that can be assembled for serial communications.

3-4-12 OMRON PT Connections

In a 1:1 NT Link, a CPM2C can be connected directly to a Programmable Terminal. The direct connection with a Programmable Terminal is possible by using the communications as a RS-232C port only (not as a peripheral port).

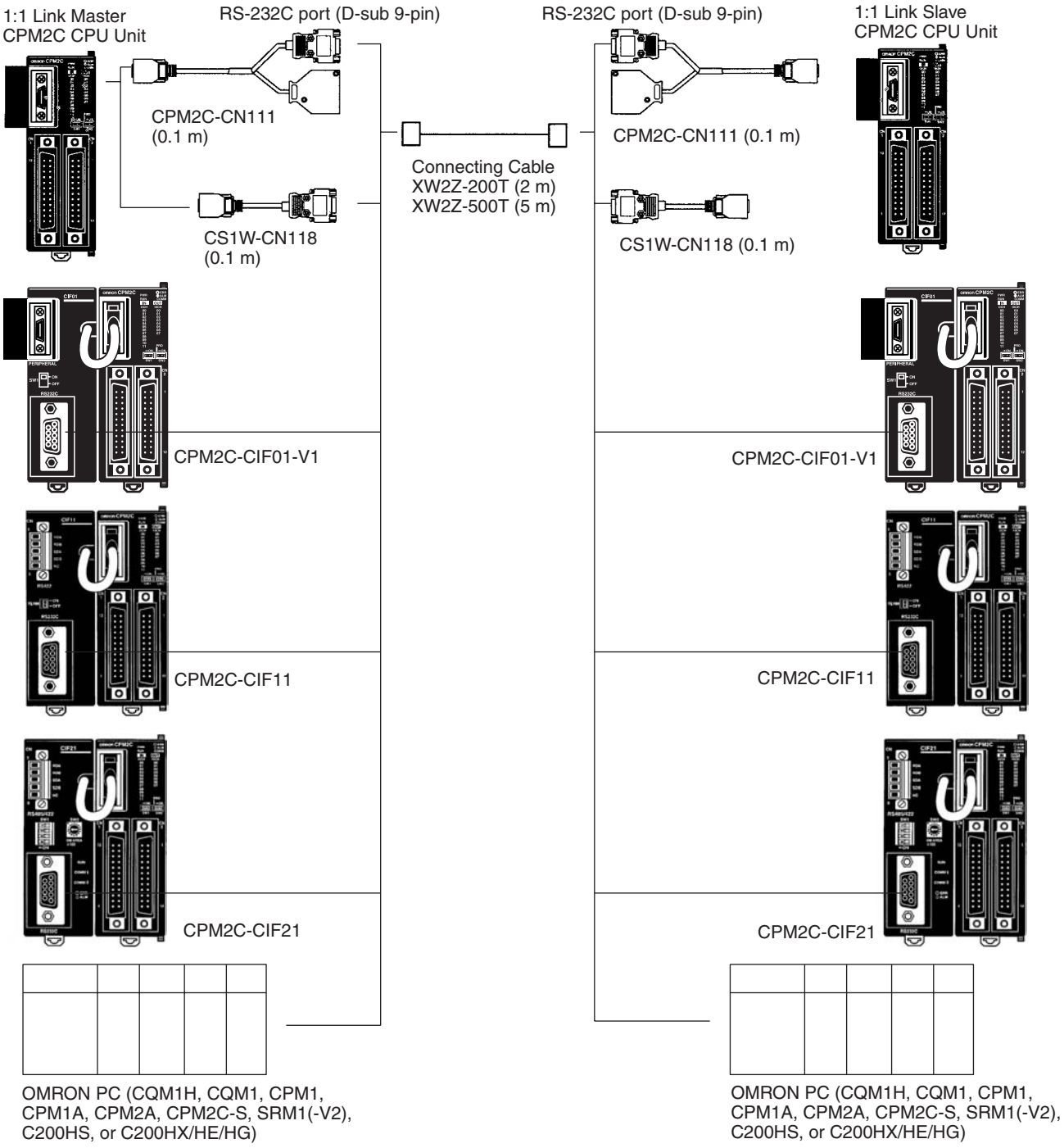
A Programmable Terminal can also be connected by a Host Link connection. Either the RS-232C port or peripheral port connection can be used for the Host Link.



Note The Programmable Terminal cannot be connected using a peripheral port connection when communicating via an NT Link.

3-4-13 One-to-one PC Link Connections

A CPM2C can be linked to another CPM2C, a CQM1, CPM1, CPM1A, CPM2A, SRM1(-V2), C200HS, or C200HX/HE/HG PC. The PC must be connected using the communications port as an RS-232C port (not as a peripheral port).

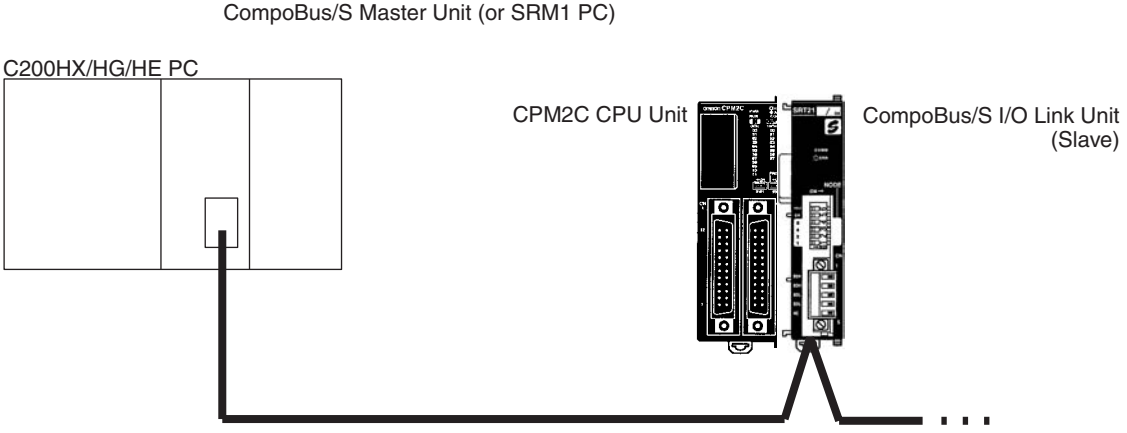


Note A 1:1 link cannot be used for a CPM2C-CN111 connection to the peripheral port on the CPM2C-CIF01-V1 or a CS1W-CN118 connection to the RS-232C port on the CPM2C-CIF01-V1.

3-4-14 CompoBus/S I/O Link Connections

A CompoBus/S I/O Link can be used to create an I/O link (remote I/O) of 8 input points and 8 output points with a CompoBus/S Master Unit or SRM1 PC. The connection is made through a CompoBus/S I/O Link Unit.

From the standpoint of the CPM2C CPU Unit, the area allocated to the CompoBus/S I/O Link Unit can be treated just like the area allocated to an Expansion I/O Unit. The difference is that the bits are not actual I/O points, but I/O bits in the Master Unit.



Cables

Use special flat cable or VCTF cable to connect the nodes in the CompoBus/S I/O Link. (Special flat cables and VCTF cables cannot be combined in the same system.)

Name	Specifications
Flat cable	4-core flat cable, 0.75 mm^2
VCTF cable	2-core x 0.75 mm^2

SECTION 4
Using a Programming Console

This section outlines the operations possible with the Programming Consoles. Actual CPT operating procedures are provided in the *CPT User Manual*. Operations for the WS02-CXPC1-E CX-Programmer are provided in the *WS02-CXPC1-E CX-Programmer Operation Manual* (W437).

Refer to *3-4-10 Programming Device Connections* and *4-1-1 Connecting the Programming Console* for details on connecting a Programming Console or personal computer to the CPM2C.

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4-1 Using a Programming Console

This section provides information on connecting and using a Programming Console. Refer to *5-3 Programming Console Operation Errors* for details on errors that might occur during Programming Console operations.

4-1-1 Connecting the Programming Console

A Programming Console can be connected to the CPM2C's communications port or the peripheral port on a CPM2C-CN111 Connecting Cable; it cannot be connected to the CPM2C-CN111 Connecting Cable's RS-232C port.

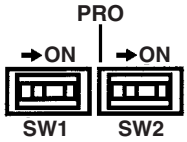


Communications Switch

Note The setting of SW2 will affect the startup operating mode for all Units with lot numbers of 3180O (31 August 2000) or earlier. Refer to *1-7 Changes in SW2* for details.

a) With CPU Units with lot numbers of 3180O or earlier, before connecting the Programming Console, turn OFF Communications Switch (SW2) on the front of the CPM2C CPU Unit. The PRO indicator will light.

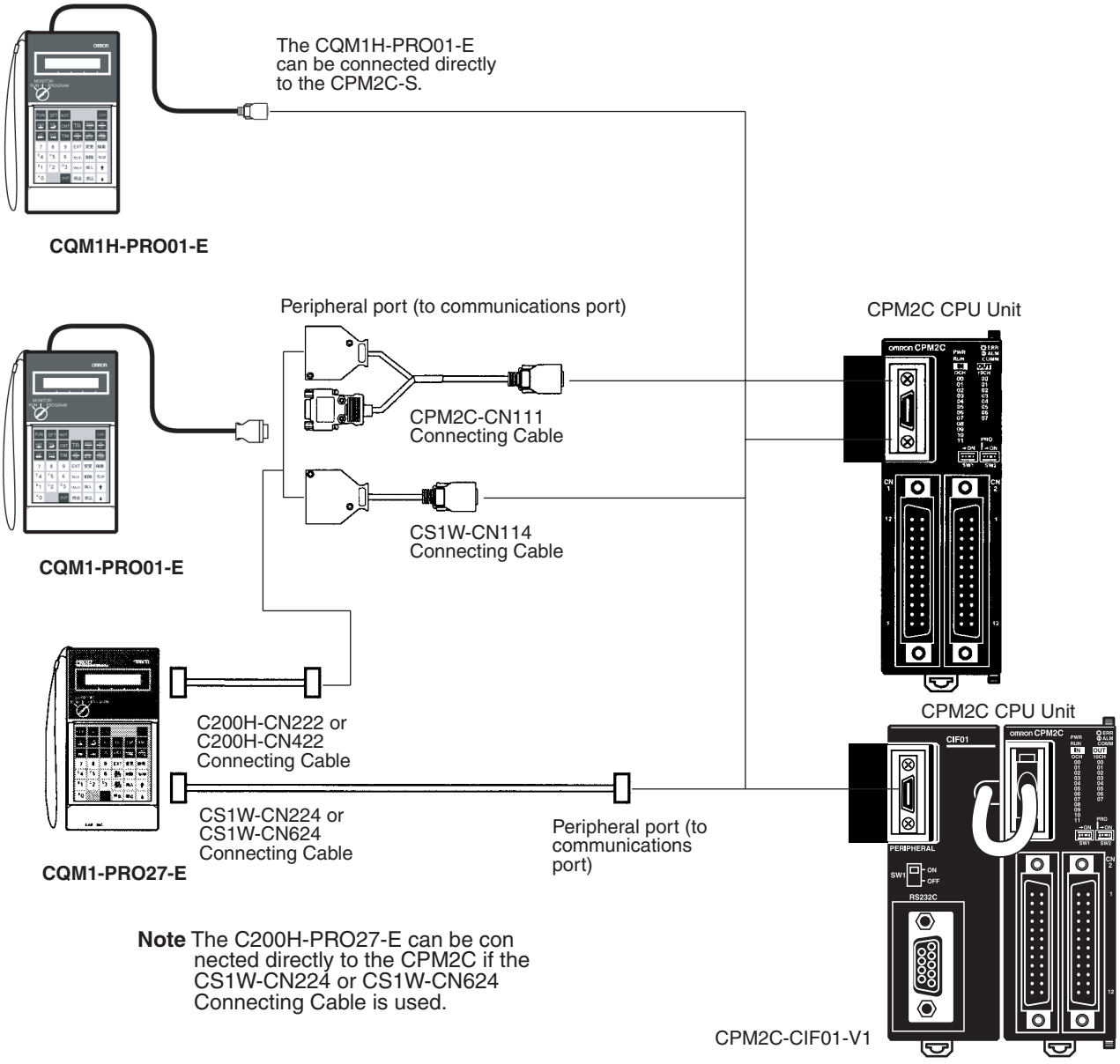
Communications Switches



b) If SW2 is turned OFF for a Programming Console connection, a PT cannot be used in PT Programming Console Mode connected to the RS-232C port. Turn ON SW2 to specify that a Programming Console will not be connected before attempting to use PT Programming Console Mode for the RS-232C port.

c) Do not change the setting of SW2 when a Programming Console, CPM2C-CIF01-V1, CPM2C-CIF11, CQM1-CIF01, or CQM1-CIF02 is connected. Communications will be disconnected if the switch setting is changed, causing a communications error or causing the Programming Console not to respond (i.e., the display will not change when keys are pressed).

Connect the Programming Console to the CPM2C as shown below.



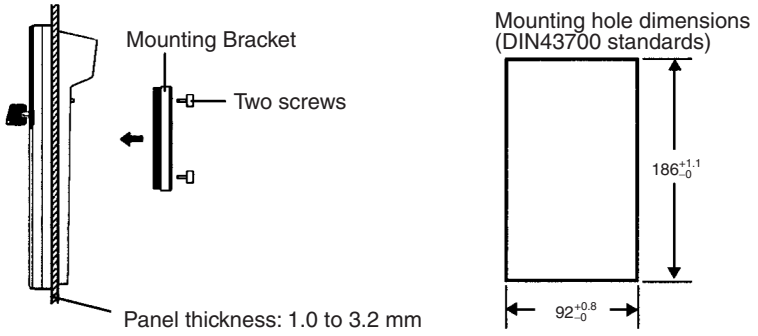
Note The C200H-PRO27-E can be connected directly to the CPM2C if the CS1W-CN224 or CS1W-CN624 Connecting Cable is used.

Note

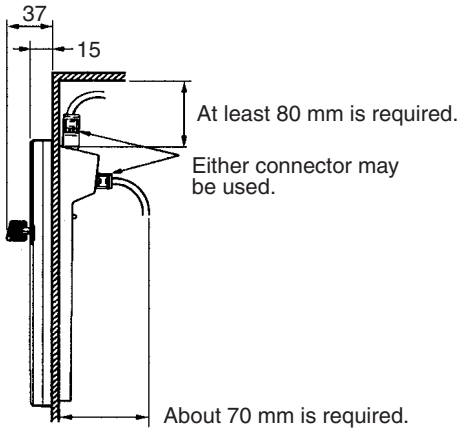
1. Connect the Programming Console to the peripheral port. The CPM2C-CN111 Connecting Cable cannot be connected to the RS-232C port.
2. If the Programming Console is reconnected within 2 seconds of being disconnected, the previous display will be maintained and the password will not need to be input. It is also possible to disconnect and reconnect the Programming Console without loosing the current display during long operations, such as program checks.
3. When connecting a Programming Console to the peripheral port of the CPM2C-CIF01-V1 Peripheral/RS-232C Adapter Unit, turn OFF the cable switch (SW1).

Panel Installation

The C200H-PRO27-E Programming Console can be installed in a control panel as shown in the following diagram. (The C200H-ATT01 Mounting Bracket is sold separately.)



Allow at least 80 mm for the cable connector above the Programming Console.

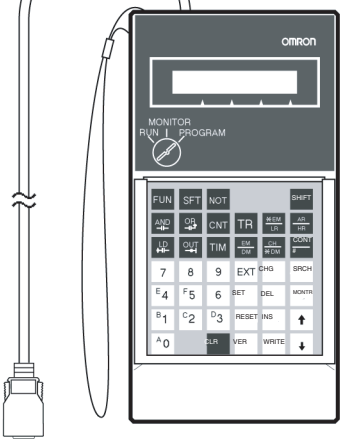


4-1-2 Compatible Programming Consoles

There are three Programming Consoles that can be used with the CPM2C: The CQM1H-PRO01-E, the CQM1-PRO01-E, and the C200H-PRO27-E. The key functions for these Programming Consoles are identical.

Press and hold the Shift Key to input a letter shown in the upper-left corner of the key or the upper function of a key that has two functions. For example, the CQM1-PRO01-E's AR/HR Key can specify either the AR or HR Area; press and release the Shift Key and then press the AR/HR Key to specify the AR Area.

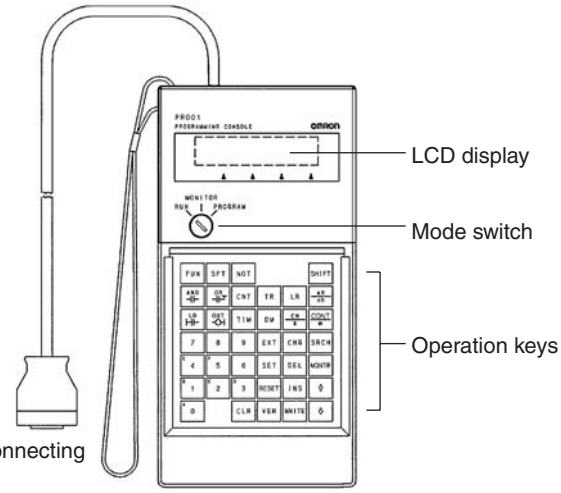
CQM1H-PRO01-E



Attached Connecting Cable (2 m)

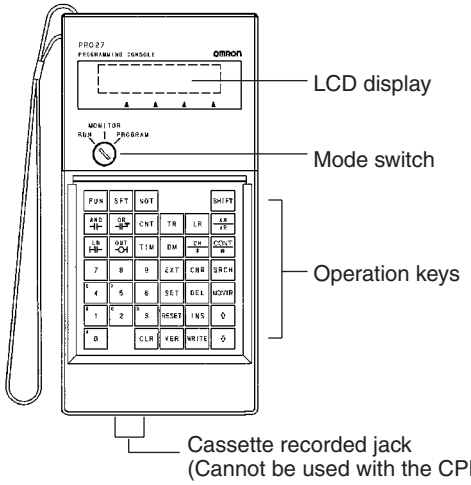
The CQM1H-PRO01-E can be connected directly to the CPM2C.

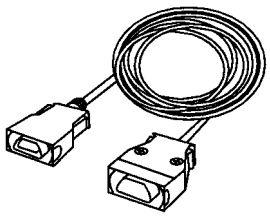
CQM1-PRO01-E



Attached Connecting Cable (2 m)

C200H-PRO27-E





Connecting Cables

C200H-CN222 (2 m)
C200H-CN422 (4 m)
CS1W-CN224 (2 m)
CS1W-CN624 (6 m)

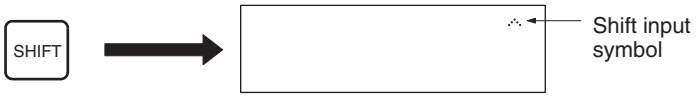
Different Keys

The following keys are labeled differently on the CQM1-PRO01-E and the C200H-PRO27-E, but the operation of the keys in each pair is identical.

CQM1-PRO01-E Keys	C200H-PRO27-E Keys
AR / HR	HR
SET	PLAY / SET
RESET	REC / RESET

Note To specify the AR area, use SHIFT and HR Keys for the C200H-PRO27-E and use SHIFT and AR/HR Keys for the CQM1-PRO01-E.

A shift symbol will be displayed in the upper-right corner of the screen when the Shift Key is pressed. The shift input can be cleared by pressing the Shift Key again.

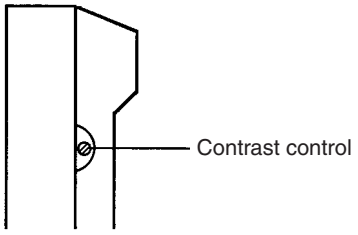


Mode Switch

The mode switch controls the CPM2C's operating mode. The key can be removed when the switch is set to RUN or MONITOR but it cannot be removed when the switch is set to PROGRAM.

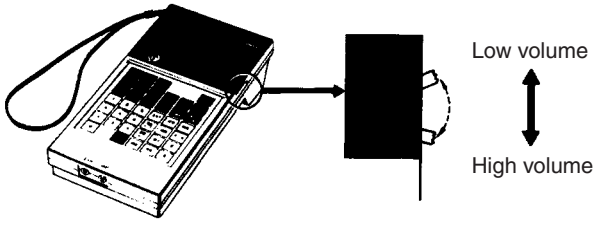
Contrast Control

The display contrast can be adjusted with the control on the right side of the Programming Console.



Buzzer Volume

The C200H-PRO27-E's buzzer volume can be adjusted with the lever on the right side of the Programming Console. The CQM1-PRO01-E's buzzer volume cannot be adjusted.



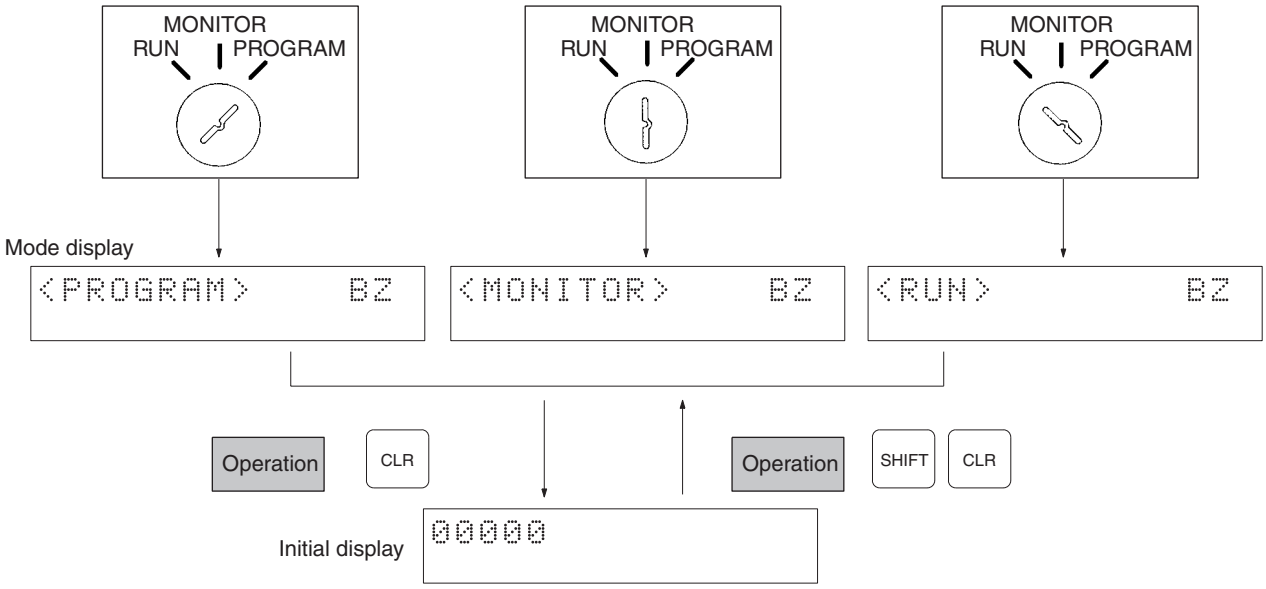
C200H-PRO27-E

Note The buzzer volume can be turned on and off with a key operation. See *4-2-6 Buzzer Operation* for details.

4-1-3 Changing the CPM2C's Mode with the Mode Switch

Once the Programming Console has been connected, its mode switch can be used to change the CPM2C's operating mode. The mode display (<PROGRAM>, <MONITOR>, or <RUN>) will appear on the Programming Console screen.

- No key operations can be performed while the mode display is displayed on the Programming Console screen. Press CLR to clear the display so that key operations can be performed.
- If the SHIFT Key is pressed while the mode switch is turned, the original display will remain on the Programming Console's screen and the mode display won't appear.
- The CPM2C will enter RUN mode automatically if a Programming Console isn't connected when the CPM2C is turned on.



Operating Modes

PROGRAM Mode

The CPM2C program isn't executed in PROGRAM mode. Use PROGRAM mode to create and edit the program, clear memory, or check the program for errors.

MONITOR Mode

The CPM2C program is executed in MONITOR mode and I/O is processed just as it is in RUN mode. Use MONITOR mode to test system operations, such as monitoring CPM2C operating status, force-setting and resetting I/O bits, changing the SV/PV of timers and counters, changing word data, and online editing.

RUN Mode

This is the CPM2C's normal operating mode. The CPM2C's operating status can be monitored from a Programming Device, but bits can't be force-set/force-reset and the SV/PV of timers and counters can't be changed.

⚠ **Caution** Check the system thoroughly before changing the operating mode of the PC to prevent any accidents that might occur when the program is first started.

⚠ **Caution** Never change the mode while pressing any of the keys.

Startup Modes

The operating mode of the CPM2C when the power is turned ON depends upon the PC Setup settings and whether or not a Programming Console is connected.

PC Setup setting			Operating mode	
Word	**Bits**	**Setting**	**Programming Console connected**	**Programming Console not connected**
DM 6600	08 to 15	00 (Hex)	Mode set on Programming Console mode switch	RUN mode
		01 (Hex)	Startup mode is the same as the operating mode before power was interrupted.	
		02 (Hex)	Startup mode is determined by bits 00 to 07.	
	00 to 07	00 (Hex)	PROGRAM mode	
		01 (Hex)	MONITOR mode	
		02 (Hex)	RUN mode	

Note

1. The default setting for DM 6600, bits 06 to 15 is 00 Hex, i.e., to start with the mode set on the Programming Console's mode switch. If a Programming Console is not connected to the peripheral connector on the CPU Unit, the CPU Unit will start in RUN mode as soon as power is turned ON. Be sure that adequate precautions are taken to ensure safety.
2. The setting of SW2 will affect the startup operating mode for all Units with lot numbers of 3180O (August 2000) or earlier. Refer to *1-7 Changes in SW2* for details.

4-1-4 Preparation for Operation

This section describes the procedures required to begin Programming Console operation when using the Programming Console for the first time.

⚠ **Caution** Always confirm that the Programming Console is in PROGRAM mode when turning ON the PC with a Programming Console connected unless another mode is desired for a specific purpose. If the Programming Console is in RUN mode when PC power is turned ON, any program in Program Memory will be executed, possibly causing a PC-controlled system to begin operation.

The following sequence of operations must be performed before beginning initial program input.

1,2,3...

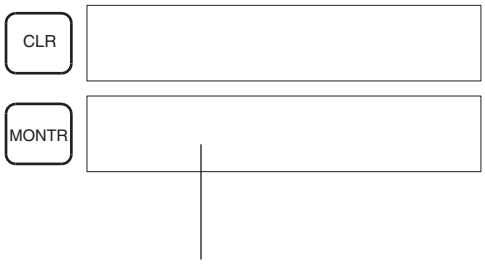
1. Be sure that the PC is OFF.
2. Connect the Programming Console to the CPU Unit's communications port (peripheral port). See *4-1-1 Connecting the Programming Console* for details.
   (The CPU Unit's Communications Switch setting has no effect on communications with the Programming Console.)
3. Set the mode switch to PROGRAM mode.
4. Turn ON the PC.
5. Enter the password. See *4-1-5 Entering the Password* for details.
6. Clear (All Clear) the PC's memory. See *4-2-2 Clearing Memory* for details.
7. Read and clear all errors and messages. See *4-2-5 Reading/Clearing Error Messages* for details.
8. Start programming.

4-1-5 Entering the Password

To gain access to the PC's programming functions, you must first enter the password. The password prevents unauthorized access to the program.

The PC prompts you for a password when PC power is turned on or, if PC power is already on, after the Programming Console has been connected to the PC. To gain access to the system when the "Password!" message appears, press CLR and then MONTR. Then press CLR to clear the display.

If the Programming Console is connected to the PC when PC power is already on, the first display below will indicate the mode the PC was in before the Programming Console was connected. **Ensure that the PC is in PROGRAM mode before you enter the password.** When the password is entered, the PC will shift to the mode set on the mode switch, causing PC operation to begin if the mode is set to RUN or MONITOR. The mode can be changed to RUN or MONITOR with the mode switch after entering the password.



Indicates the mode set by the mode selector switch.

4-2 Programming Console Operations

4-2-1 Overview

The following table lists the programming and monitoring operations that can be performed from a Programming Console. Refer to the rest of this section for details on operational procedures.

Name	Function	Page
Clearing memory	Clears all or part of the Program Memory and any data areas that are not read-only, as well as the contents of the Programming Console's memory.	161
Memory all clear	Clears all of the user program, PC Setup, I/O memory area, timer/counter, and DM area data, including the I/O comment area set from the CX-Programmer (Ver. 2.0 or higher).	162
UM allocation information read	When an I/O comment area has been set from the CX-Programmer (Ver. 2.0 or higher), reads the I/O comment area and ladder program area sizes.	162
Reading/clearing error messages	Displays and clears error messages and displays MESSAGE instruction messages.	163
Buzzer operation	Turns on and off the buzzer that sounds when Programming Console keys are pressed.	163
Assigning expansion instruction function codes	Reads or changes the function codes assigned to expansion instructions	164
Setting a program memory address	Sets the specified program memory address when reading, writing, inserting and deleting programs.	165
Reading a program memory address	Reads the contents of the Program Memory. Displays the status of the currently displayed bit in PROGRAM and MONITOR modes.	165
Instruction search	Finds occurrences of the specified instruction in the program.	168
Bit operand search	Finds occurrences of the specified operand bit in the program.	169
Inserting and deleting instructions	Inserts or deletes instructions from the program.	170
Entering or editing programs	Overwrites the contents of the current Program Memory to either input a program for the first time or to change a program that already exists.	165
Checking the program	Checks for programming errors and displays the program address and error when errors are found.	171
Bit, digit, word monitor	Monitors the status of up to 16 bits and words, although only 3 can be shown on the display at one time.	172
Multiple address monitor	Monitors the status of up to 6 bits and words simultaneously.	173
Differentiation monitor	Monitors the up or down differentiation status of a particular bit.	174
Binary monitor	Monitors the ON/OFF status of any word's 16 bits.	174
3-word monitor	Monitors the status of three consecutive words.	175
Signed decimal monitor	Converts the contents of the specified word from signed hexadecimal (two's complement format) to signed decimal for display.	176
Unsigned decimal monitor	Converts hexadecimal data in a word to unsigned decimal for display.	176
3-word data modification	Changes the contents of one or more of the 3 consecutive words displayed in the 3-Word Monitor operation.	177
Changing timer, counter SV 1	Changes the SV of a timer or counter.	177
Changing timer, counter SV 2	Makes fine adjustment changes to the SV of the timer or counter.	178
Hexadecimal, BCD data modification	Changes the BCD or hexadecimal value of a word being monitored.	178
Binary data modification	Changes the status of a word's bits when the word is being monitored.	179
Signed decimal data modification	Changes the decimal value of a word being monitored as signed decimal data, within a range of –32,768 to 32,767. The contents of the specified word are converted automatically to signed hexadecimal (two's complement format.)	180

Name	Function	Page
Unsigned decimal data modification	Changes the decimal value of a word being monitored as unsigned decimal data, within a range of 0 to 65,535. A change into hexadecimal data is made automatically.	181
Force set/reset	Forces bits ON (force set) or OFF (force reset.)	181
Clear force set/reset	Restores the status of all bits which have been force set of reset.	182
Hex-ASCII display change	Converts word data displays back and forth between 4-digit hexadecimal data and ASCII.	183
Displaying the cycle time	Displays the current average cycle time (scan time.)	183
Reading and setting the clock	Reads or sets the internal clock.	184

4-2-2 Clearing Memory

This operation is used to clear all or part of the Program Memory and data areas, as well as the contents of the Programming Console's memory. This operation is possible in PROGRAM mode only.

RUN	MONITOR	PROGRAM
No	No	OK

Before beginning to program for the first time or when installing a new program, clear all areas.

All Clear

The following procedure is used to clear memory completely, including the program, all data areas, counter PVs, Data Memory, and the PC Setup (DM 6600 to DM 6655).

1,2,3...

1. Bring up the initial display by pressing the CLR Key repeatedly.
2. Press the SET, NOT, and then the RESET Key to begin the operation.



3. Press the MONTR Key to clear memory completely.



⚠ **Caution** The PC Setup (DM 6600 through DM 6655) will be cleared when this operation is performed.

Partial Clear

It is possible to retain the data in specified areas or part of the Program Memory. To retain the data in the HR, TC, or DM Areas, press the appropriate key after pressing SET, NOT, and RESET. Any data area that still appears on the display will be cleared when the MONTR Key is pressed.

The HR Key is used to specify both the AR and HR Areas, the CNT Key is used to specify the entire timer/counter area, and the DM Key is used to specify the DM Area.

It is also possible to retain a portion of the Program Memory from the first memory address to a specified address. After designating the data areas to be retained, specify the first Program Memory address to be cleared. For example, input 030 to leave addresses 000 to 029 untouched, but to clear addresses from 030 to the end of Program Memory.

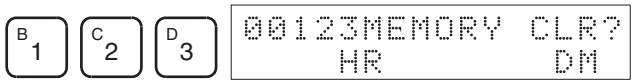
As an example, follow the procedure below to retain the timer/counter area and Program Memory addresses 000 through 122:

1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Press the SET, NOT, and then the RESET Key to begin the operation.
3. Press the CNT Key to remove the timer/counter area from the data areas shown on the display. (Counter PVs will not be cleared.)



4. Press 123 to specify 123 as the starting program address.



5. Press the MONTR Key to clear the specified regions of memory.

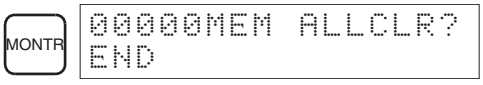


4-2-3 Memory All Clear

With the upgrade from CX-Programmer version 1.2 to version 2.0, I/O comments can be used with the CPM2A. Use the Memory All Clear operation to delete data from the I/O comment area. All I/O memory area data will be cleared by this operation and the area size will be set to the default value of 2.0 Kwords.

RUN	MONITOR	PROGRAM
No	No	OK





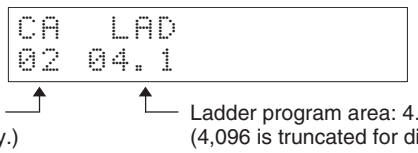
The Memory All Clear operation must be performed to clear the program including the I/O comment area. The normal operation to clear memory will not clear the I/O comment area.

4-2-4 UM Allocation Information Read

The UM allocation information can be read when an I/O comment area has been set from the CX-Programmer (Ver. 2.0 or higher) to display the I/O comment area and ladder program area sizes. Refer to the *CX-Programmer Version 2.0 (or higher) Operation Manual* (W437) for information on changing the size of the I/O comment area.

RUN	MONITOR	PROGRAM
OK	OK	OK





4-2-5 Reading/Clearing Error Messages

This operation is used to display and clear error messages. It is possible to display and clear non-fatal errors and MESSAGE instruction messages in any mode, but fatal errors can be cleared in PROGRAM mode only.

RUN	MONITOR	PROGRAM
OK	OK	OK

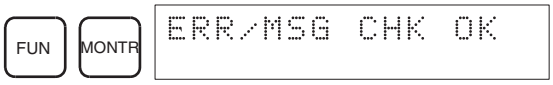
Before inputting a new program, any error messages recorded in memory should be cleared. It is assumed here that the causes of any of the errors for which error messages appear have already been taken care of. If the buzzer sounds when an attempt is made to clear an error message, eliminate the cause of the error, and then clear the error message. (Refer to *SECTION 5 Test Runs and Error Processing* for troubleshooting information.)

Key Sequence

Follow the procedure below to display and clear messages.

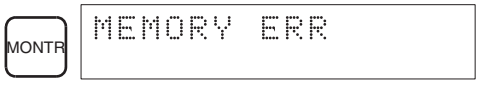
1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Press the FUN and then the MONTR Key to begin the operation. If there are no messages, the following display will appear:

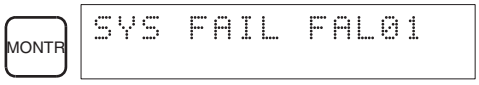


If there are messages, the most serious message will be displayed when the MONTR Key is pressed. Pressing MONTR again will clear the present message and display the next most serious error message. Continue pressing MONTR until all messages have been cleared. These are some examples of error messages:

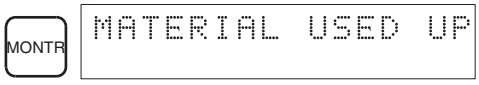
A memory error:



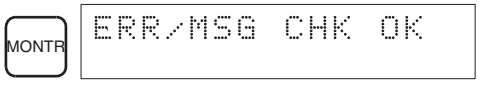
A system error:



A message (displayed with MSG(46)):



All messages cleared:



4-2-6 Buzzer Operation

This operation is used to turn on and off the buzzer that sounds when Programming Console keys are pressed. This buzzer will also sound whenever an error occurs during PC operation. Buzzer operation for errors is not affected by this setting.

This operation is possible in any mode.

RUN	MONITOR	PROGRAM
OK	OK	OK

Key Sequence

Follow the procedure below to turn the key-input buzzer on and off.

1,2,3...

1. Press the CLR, SHIFT, and then the CLR Key to bring up the mode display. In this case the PC is in PROGRAM mode and the buzzer is ON.



2. Press the SHIFT and then the 1 Key to turn off the buzzer.



3. Press the SHIFT and then the 1 Key again to turn the buzzer back ON.



4-2-7 Assigning Expansion Instruction Function Codes

This operation is used to display or change the expansion instructions assigned to expansion instruction function codes. The assignments can be displayed in any mode, but can be changed in PROGRAM mode only.

Operation	RUN	MONITOR	PROGRAM
Read assignment	OK	OK	OK
Change assignment	No	No	OK

Assign expansion instruction function codes before inputting the program. The CPM2C will not operate properly if expansion instructions aren't assigned correctly. An expansion instruction can be assigned to one function code only.

The PC Setup must be set for user-defined expansion instruction assignments. Set bits 8 to 11 of DM 6602 to 1 and turn the PC's power off and then on again to enable the new setting.

There is a table on page 290 showing the default function code assignments in the CPM2C.

1,2,3... 1. Press the CLR Key to bring up the initial display.

2. Press the EXT Key to display the assignment for the first function code (17).



3. Press the Up and Down Arrow Keys to scroll through the expansion instruction function codes.



4. Press the CHG Key to assign a different expansion instruction to the selected function code.



5. Press the Up and Down Arrow Keys to scroll through the expansion instructions that can be assigned to the selected function code.



6. Press the WRITE Key to assign the displayed instruction to the function code.



4-2-8 Setting and Reading a Program Memory Address and Monitoring I/O Bit Status

This operation is used to display the specified program memory address and is possible in any mode. In the RUN or MONITOR mode, the I/O bit status of bits in the program will be displayed.

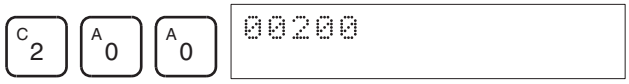
RUN	MONITOR	PROGRAM
OK	OK	OK

When inputting a program for the first time, it is generally written to Program Memory starting from address 000. Because this address appears when the display is cleared, it is not necessary to specify it.

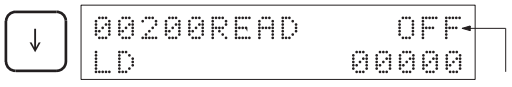
When inputting a program starting from other than 000 or to read or modify a program that already exists in memory, the desired address must be designated.

1,2,3... 1. Press the CLR Key to bring up the initial display.

2. Input the desired address. It is not necessary to input leading zeroes.



3. Press the Down Arrow Key.

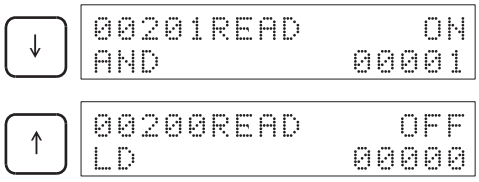


In the RUN or MONITOR mode, ON/OFF status of the bit will be displayed.

Pressing the MONTR Key will change to the I/O monitor display. Bits can be force-set or force-reset from the I/O monitor display in MONITOR or PROGRAM mode.

Note The ON/OFF status of any displayed bit will be shown if the PC is in RUN or MONITOR mode.

4. Press the Up and Down Arrow Keys to scroll through the program.



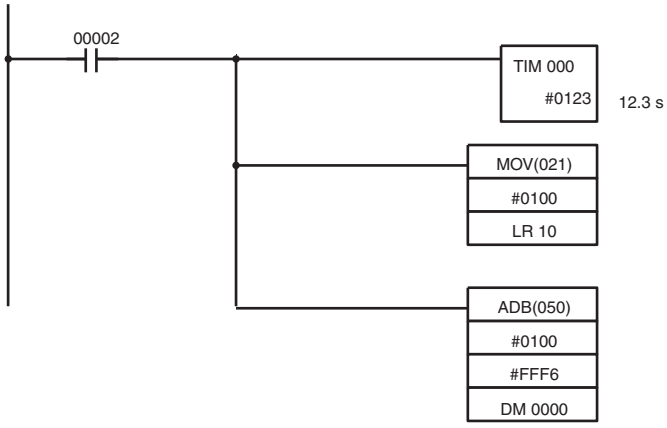
4-2-9 Entering or Editing Programs

This operation is used enter or edit programs. It is possible in PROGRAM mode only.

RUN	MONITOR	PROGRAM
No	No	OK

The same procedure is used to either input a program for the first time or to change a program that already exists. In either case, the current contents of Program Memory is overwritten.

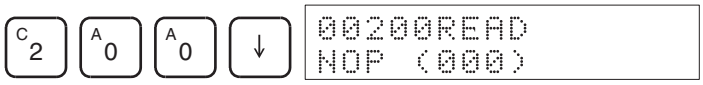
The program shown in the following diagram will be entered to demonstrate this operation.



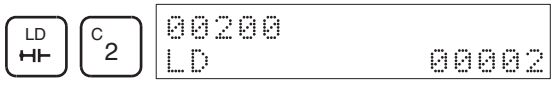
Address	Instruction	Operands
00200	LD	IR 00002
00201	TIM	000
		#0123
00202	MOV(021)	
		#0100
		LR 10
00203	ADB(050)	
		#0100
		#FFF6
		DM 0000

1,2,3...

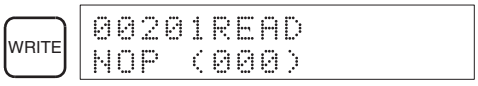
1. Press the CLR Key to bring up the initial display.
2. Specify the address where the program will begin.
3. Input the address where the program will begin and press the Down Arrow Key. It is not necessary to input leading zeroes.



4. Input the first instruction and operand.



5. Press the WRITE Key to write the instruction to Program Memory. The next program address will be displayed.



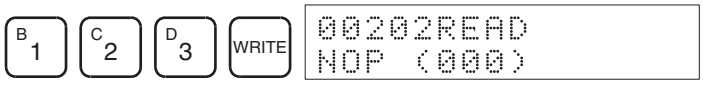
If a mistake was made inputting the instruction, press the Up Arrow Key to return to the previous program address and input the instruction again. The mistaken instruction will be overwritten

To specify the Completion Flag for a timer or counter, press the LD, AND, OR, or NOT Key followed by the TIM or CNT Key, and then input the timer/counter number last.

6. Input the second instruction and operand. (In this case it isn't necessary to enter the timer number, because it's 000.) Press the WRITE Key to write the instruction to Program Memory.



7. Input the second operand (123 to specify 12.3 seconds) and press the WRITE Key. The next program address will be displayed.

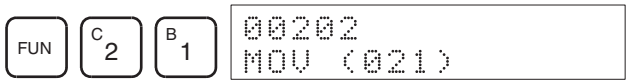


If a mistake was made inputting the operand, press the Up Arrow Key to return to display the mistaken operand and input the operand again.

Note a) Counters are input in the same basic way as timers except the CNT Key is pressed instead of the TIM Key.

b) Timer and counter SVs are input in BCD, so it isn't necessary to press the CONT/# Key.

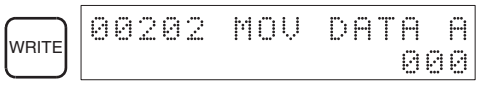
8. Input the third instruction and its operands. First input the instruction by pressing the FUN Key and then the function code (21 in this case).



To input the differentiated version of an instruction, press the NOT Key after the function code (FUN 2 1 NOT). The "@" symbol will be displayed next to differentiated instructions. Press the NOT Key again to change back the instruction back to a non-differentiated instruction. The "@" symbol will disappear.

To change an instruction after it has been entered, simply scroll through the program until the desired instruction is displayed and press the NOT Key. The "@" symbol should be displayed next to the instruction.

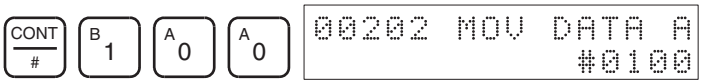
9. Press the WRITE Key to write the instruction to Program Memory. The input display for the first operand will be displayed.



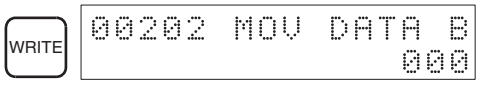
• Writing Hexadecimal, BCD Constant

10. Input the first operand.

The operands of MOV (21) are normally word addresses, but a constant can be input by pressing the CONT/# Key first. When the CONT/# Key is pressed, the display will change to "#0000," indicating that a constant can be entered.



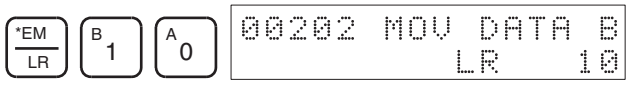
Press the WRITE Key to write the instruction to Program Memory. The input display for the second operand will appear.



Note The operands of MOV(21) can be word addresses, so the CONT/# Key must be pressed to input a constant.

• Writing a Word Address

11. Input the second operand.

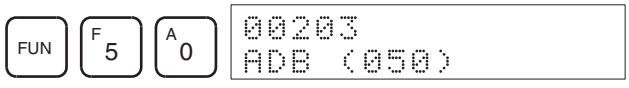


Press the WRITE Key to write the instruction to Program Memory. The next program address will be displayed.

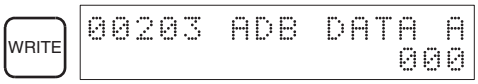


Note When the default display value is "000", a word address can be input immediately without pressing the Shift and CH/# Keys.

12. Input the next instruction.

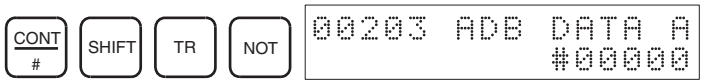


Press the WRITE Key to write the instruction to Program Memory.

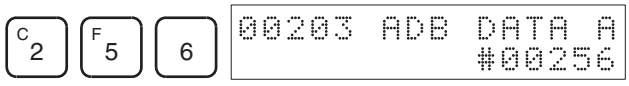


• Writing an Unsigned Decimal Number

13. The first operand is input as an unsigned integer.



Input the value of the operand from 0 to 65535.



Note If an erroneous input is made, press the CLR Key to restore the status prior to the input. Then enter the correct input.

14. Restore the hexadecimal display.



Note If an input is made outside of the permissible range, a buzzer will sound and the hexadecimal display will not be displayed.



15. The second operand is input as a signed integer.

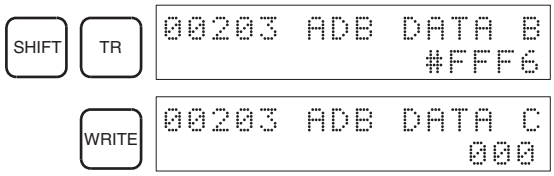


Input the value of the operand from –32,768 to 32,767. Use the SET Key to input a positive number, and use the RESET Key to input a negative number.



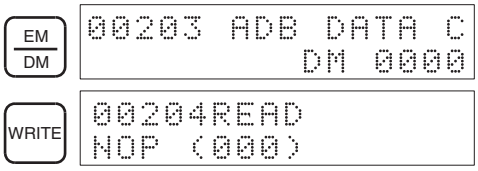
Note If an erroneous input is made, press the CLR Key to restore the status prior to the input. Then enter the correct input.

16. Restore the hexadecimal display.



• Writing a Word Address (DM 0000)

17. Input the final operand and then press the WRITE Key. (It isn't necessary to input leading zeroes.)



4-2-10 Instruction Search

This operation is used to find occurrences of the specified instruction in the program and is possible in any mode.

RUN	MONITOR	PROGRAM
OK	OK	OK

The ON/OFF status of any displayed bit will be shown if the PC is in RUN or MONITOR mode.

1,2,3...

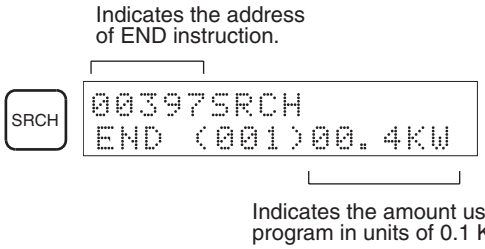
1. Press the CLR Key to bring up the initial display.
2. Input the address from which the search will begin and press the Down Arrow Key. It is not necessary to input leading zeroes.



3. Input the instruction to be found and press the SRCH Key. In this case, the search is for OUT 01000.
   In this case, the next OUT 01000 instruction is at address 200, as shown below.



4. Press the Down Arrow Key to display the instruction's operands or press the SRCH Key to search for the next occurrence of the instruction.
5. The search will continue until an END instruction or the end of Program Memory is reached. In this case, an END instruction was reached at address 397.



4-2-11 Bit Operand Search

This operation is used to find occurrences of the specified operand bit in the program and is possible in any mode.

RUN	MONITOR	PROGRAM
OK	OK	OK

The ON/OFF status of any displayed bit will be shown if the PC is in RUN or MONITOR mode.

1,2,3...

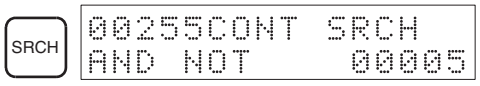
1. Press the CLR Key to bring up the initial display.
2. Input the operand address. It is not necessary to input leading zeroes.



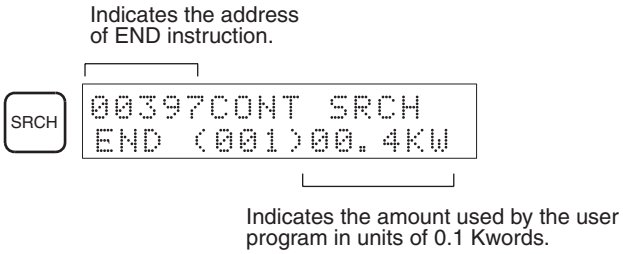
3. Press the SRCH Key to begin the search.



4. Press the SRCH Key to search for the next occurrence of the operand bit.



5. The search will continue until an END instruction or the end of Program Memory is reached. In this case, an END instruction was reached.

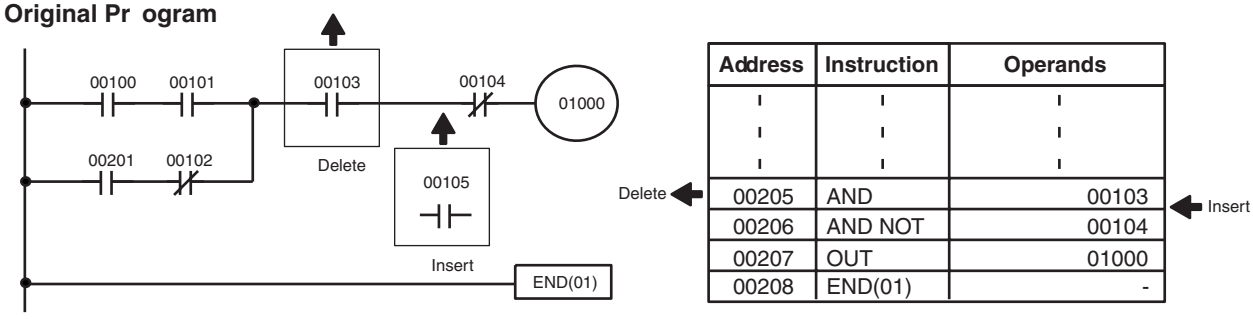


4-2-12 Inserting and Deleting Instructions

This operation is used to insert or delete instructions from the program. It is possible in PROGRAM mode only.

RUN	MONITOR	PROGRAM
No	No	OK

To demonstrate this operation, an IR 00105 NO condition will be inserted at program address 00206 and an IR 00103 NO condition deleted from address 00205, as shown in the following diagram.



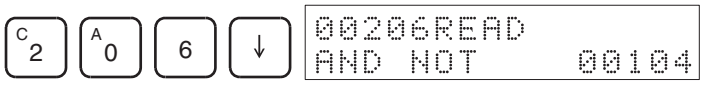
Address	Instruction	Operands
00205	AND	00103
00206	AND NOT	00104
00207	OUT	01000
00208	END(01)	-

Insertion

Follow the procedure below to insert the IR 00105 NO condition at address 00206.

1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Input the address where the NO condition will be inserted and press the Down Arrow Key. It is not necessary to input leading zeroes.



3. Input the new instruction and press the INS Key.



4. Press the Down Arrow Key to insert the new instruction.



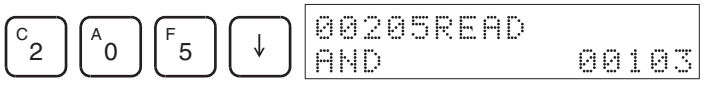
Note For instructions that require more operands (such as set values), input the operands and then press the WRITE Key.

Deletion

Follow the procedure below to delete the IR 00103 NO condition at address 00205.

1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Input the address where the NO condition will be deleted and press the Down Arrow Key. It is not necessary to input leading zeroes.



3. Press the DEL Key.

DEL

```
00205DELETE?
AND          00103
```

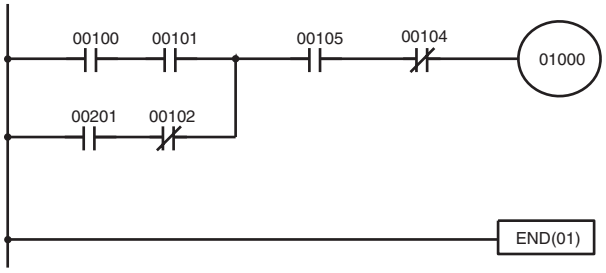
4. Press the Up Arrow Key to delete the specified instruction.
   If the instruction has more operands, the operands will be deleted automatically with the instruction.

↑

```
00205 DELETE END
AND          00105
```

After completing the insertion and deletion procedures, use the Up and Down Arrow Keys to scroll through the program and verify that it has been changed correctly, as shown in the following diagram.

Corrected Program



Address	Instruction	Operands
⋮	⋮	⋮
00205	AND	00105
00206	AND NOT	00104
00207	OUT	01000
00208	END(01)	-

4-2-13 Checking the Program

This operation checks for programming errors and displays the program address and error when errors are found. It is possible in PROGRAM mode only.

RUN	MONITOR	PROGRAM
No	No	OK

1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Press the SRCH Key. An input prompt will appear requesting the desired check level.

SRCH

```
00000PROG CHK
CHK LBL    (0-2)?
```

3. Input the desired check level (0, 1, or 2). The program check will begin when the check level is input, and the first error found will be displayed.

A 0

```
00178CIRCUIT ERR
OUT          00200
```

Note Refer to *5-4 Programming Errors* for details on check levels and the errors that may be detected when the program is checked.

4. Press the SRCH Key to continue the search. The next error will be displayed. Continue pressing the SRCH Key to continue the search.
   The search will continue until an END instruction or the end of Program Memory is reached. A display like this will appear if the end of Program Memory is reached:

SRCH

```
00300NO END INST
END
```

A display like this will appear if an END instruction is reached:



No more errors exist if the END instruction is displayed.

If errors are displayed, edit the program to correct the errors and check the program again. Continue checking the program by pressing the SRCH Key again until all errors have been corrected.

4-2-14 Bit, Digit, Word Monitor

This operation is used to monitor the status of up to 16 bits and words, although only 3 can be shown on the display at any one time. Operation is possible in any mode.

RUN	MONITOR	PROGRAM
OK	OK	OK

Program Read then Monitor

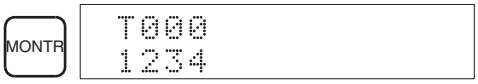
When a program address is being displayed, the status of the bit or word in that address can be monitored by pressing the MONTR Key.

1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Input the desired program address and press the Down Arrow Key.



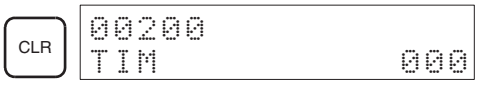
3. Press the MONTR Key to begin monitoring.



If the status of a bit is being monitored, that bit's status can be changed using the Force Set/Reset operation. Refer to *4-2-26 Force Set, Reset* for details.

If the status of a word is being monitored, that word's value can be changed using the Hexadecimal/BCD Data Modification operation. Refer to *4-2-22 Hexadecimal, BCD Data Modification, 4-2-23 Binary Data Modification, 4-2-24 Signed Decimal Data Modification,* and *4-2-25 Unsigned Decimal Data Modification* for details.

4. Press the CLR Key to end monitoring.

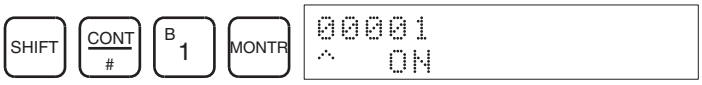


Bit Monitor

Follow the procedure below to monitor the status of a particular bit.

1,2,3...

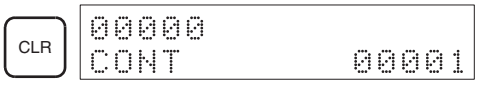
1. Press the CLR Key to bring up the initial display.
2. Input the bit address of the desired bit and press the MONTR Key.



The Up or Down Arrow Key can be pressed to display the status of the previous or next bit.

The displayed bit's status can be changed using the Force Set/Reset operation in MONITOR or PROGRAM mode. Refer to *4-2-26 Force Set, Reset* for details.

3. Press the CLR Key to end monitoring.



Word Monitor

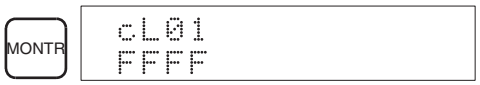
Follow the procedure below to monitor the status of a particular word.

1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Input the word address of the desired word.



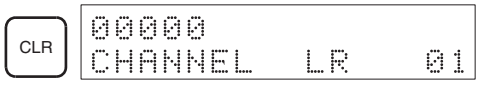
3. Press the MONTR Key to begin monitoring.



The Up or Down Arrow Key can be pressed to display the status of the previous or next word.

The displayed word's status can be changed using the Hexadecimal/BCD Data Modification operation. Refer to *4-2-22 Hexadecimal, BCD Data Modification, 4-2-23 Binary Data Modification, 4-2-24 Signed Decimal Data Modification,* and *4-2-25 Unsigned Decimal Data Modification* for details.

4. Press the CLR Key to end monitoring.



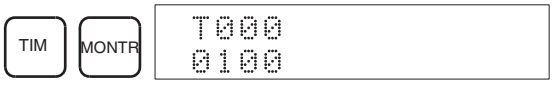
Note The operating mode can be changed without altering the current monitor display by holding down the SHIFT Key and then changing the operating mode.

Multiple Address Monitoring

The status of up to six bits and words can be monitored simultaneously, although only three can be shown on the display at any one time.

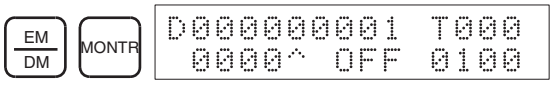
1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Input the address of the first bit or word and press the MONTR Key.



3. Repeat step 2 up to 6 times to display the next addresses to be monitored.





If 4 or more bits and words are being monitored, the bits and words that do not appear on the display can be displayed by pressing the MONTR Key. If the MONTR Key is pressed alone, the display will shift to the right.

If more than six bits and words are input, monitoring of the bit or word input first will be canceled.

4. Press the CLR Key to stop monitoring the leftmost bit or word and clear it from the display.



5. Press the SHIFT and CLR Keys to end monitoring altogether.



Note Press the SHIFT Key, CLR Key, and then CLR Key again to return to the initial Programming Console display with the multiple address monitoring state

unchanged. Press the SHIFT Key and then the MONTR Key from the initial display to return to the multiple address monitoring state. The monitoring states can be retained for 6 bits and words.

The operating mode can be changed without altering the current monitor display by holding down the SHIFT Key and then changing the operating mode.

4-2-15 Differentiation Monitor

This operation is used to monitor the up or down differentiation status of a particular bit. When detected, the up or down differentiation will be displayed and the buzzer will sound. It is possible in any mode.

RUN	MONITOR	PROGRAM
OK	OK	OK

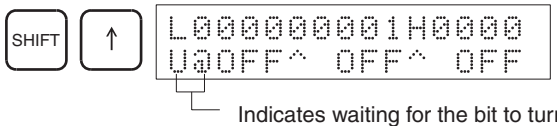
1,2,3...

1. Monitor the status of the desired bit according to the procedure described in *4-2-14 Bit, Digit, Word Monitor*. If 2 or more bits are being monitored, the desired bit should be leftmost on the display.

   In this case the differentiation status of LR 00 will be monitored.

2. To specify up-differentiation monitoring, press the SHIFT and then the Up Arrow Key. The symbols “U@” will appear.

   Indicates waiting for the bit to turn ON.

   To specify down-differentiation monitoring, press the SHIFT and then the Down Arrow Key. The symbols “D@” will appear.

3. The buzzer will sound when the specified bit goes from off to on (for up-differentiation) or from on to off (for down-differentiation).

   Note The buzzer will not sound if it has been turned off.

4. Press the CLR Key to end differentiation monitoring and return to the normal monitoring display.

4-2-16 Binary Monitor

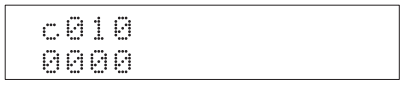
This operation is used to monitor the ON/OFF status of any word’s 16 bits. It is possible in any mode.

RUN	MONITOR	PROGRAM
OK	OK	OK

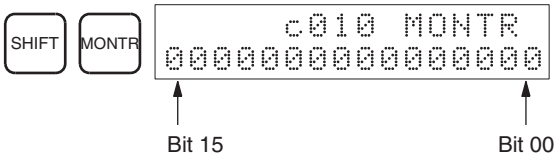
1,2,3...

1. Monitor the status of the desired word according to the procedure described in *4-2-14 Bit, Digit, Word Monitor*. The desired word should be leftmost on the display if 2 or more words are being monitored.

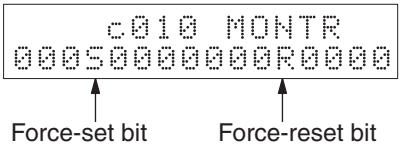
   (Word monitor)

2. Press the SHIFT and then the MONTR Key to begin binary monitoring. The ON/OFF status of the selected word's 16 bits will be shown along the bottom of the display. A 1 indicates a bit is on, and a 0 indicates it is off.



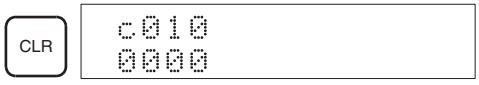
The status of force-set bits is indicated by "S," and the status of a force-reset bits is indicated by "R," as shown below.



Note a) The status of displayed bits can be changed at this point. Refer to *4-2-23 Binary Data Modification* for details.

b) The Up or Down Arrow Key can be pressed to display the status of the previous or next word's bits.

3. Press the CLR Key to end binary monitoring and return to the normal monitoring display.



4-2-17 Three-Word Monitor

This operation is used to monitor the status of three consecutive words. It is possible in any mode.

RUN	MONTIOR	PROGRAM
OK	OK	OK

1,2,3...

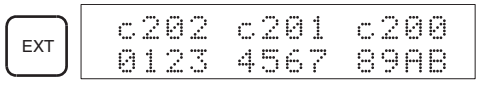
1. Monitor the status of the first of the three words according to the procedure described in *4-2-14 Bit, Digit, Word Monitor*.

   If 2 or more words are being monitored, the desired first word should be leftmost on the display.



(Word monitor)

2. Press the EXT Key to begin 3-word monitoring. The status of the selected word and the next two words will be displayed, as shown below. In this case, DM 0000 was selected.

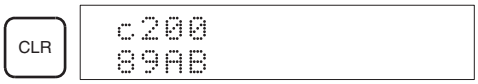


The Up and Down Arrow Keys can be used to shift one address up or down.

The status of the displayed words can be changed at this point. Refer to *4-2-20 Three-Word Data Modification*.

The display can be changed to display ASCII text, which is useful when three consecutive words containing an ASCII message are displayed. Refer to *4-2-28 Hex-ASCII Display Change.*

3. Press the CLR Key to end 3-word monitoring and return to the normal monitoring display. The rightmost word on the 3-word monitor display will be monitored.



Note The operating mode can be changed without altering the current monitor display by holding down the SHIFT Key and then changing the operating mode.

4-2-18 Signed Decimal Monitor

This operation converts the contents of the specified word from signed hexadecimal (two's complement format) to signed decimal for display. The operation can be executed while using I/O monitoring, multiple address monitoring or 3-word monitoring.

RUN	MONITOR	PROGRAM
OK	OK	OK

1,2,3... 1. Monitor the word that is to be used for decimal monitor with sign. During multiple address monitoring, the leftmost word will be converted.



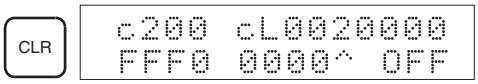
(Multiple address monitor)

2. Press the SHIFT+TR Keys to display the leftmost word as signed decimal.



At this point, the contents of the displayed word can be changed with a signed-decimal input. Refer to *4-2-24 Signed Decimal Data Modification*.

3. Press the CLR Key or the SHIFT+TR Keys to end the unsigned decimal display and return to normal monitoring.



4-2-19 Unsigned Decimal Monitor

This operation is used to convert hexadecimal data in a word to unsigned decimal for display. The operation can be executed while using I/O monitoring, multiple address monitoring or 3-word monitoring.

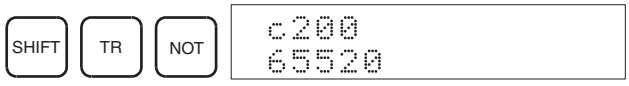
RUN	MONITOR	PROGRAM
OK	OK	OK

1,2,3... 1. Monitor the word that is to be used for decimal monitor without sign. During multiple address monitoring, the leftmost word will be converted.



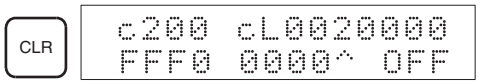
Multiple address monitoring

2. Press the SHIFT+TR+NOT Keys to display the leftmost word as unsigned decimal.



At this point, the contents of the displayed word can be changed with an unsigned-decimal input. Refer to *4-2-25 Unsigned Decimal Data Modification*.

3. Press the CLR Key or the SHIFT+TR Keys to end the unsigned decimal display and return to normal monitoring.



4-2-20 Three-Word Data Modification

This operation is used to change the contents of one or more of the 3 consecutive words displayed in the Three-Word Monitor operation. It is possible in MONITOR or PROGRAM mode only.

RUN	MONITOR	PROGRAM
No	OK	OK

⚠ Caution Before changing the contents of I/O memory, be sure that the changes will not cause equipment to operate unexpectedly or dangerously. In particular, take care when changing the status of output bits. The PC continues to refresh I/O bits even if the PC is in PROGRAM mode, so devices connected to output points on the CPU Unit, Expansion Units, or Expansion I/O Units may operate unexpectedly.

1,2,3... 1. Monitor the status of the desired words according to the procedure described *4-2-17 Three-Word Monitor*.



(Three-word monitor)

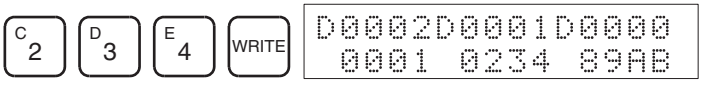
2. Press the CHG Key to begin 3-word data modification. The cursor will appear next to the contents of the leftmost word.



3. Input the new value for the leftmost word on the display and press the CHG Key if more changes will be made.
(Input the new value and press the WRITE Key to write the changes in memory if no more changes will be made.)



4. Input the new value for the middle word on the display and press the CHG Key if the rightmost word will be changed. Input the new value and press the WRITE Key to write the changes in memory if the rightmost word will not be changed. (In this case, it will not.)



Note If the CLR Key is pressed before the WRITE Key, the operation will be cancelled and the 3-word monitor display will return without any changes in data memory.

4-2-21 Changing Timer, Counter SV

There are two operations that can be used to change the SV of a timer or counter. They are possible in MONITOR or PROGRAM mode only. In MONITOR mode, the SV can be changed while the program is being executed.

RUN	MONITOR	PROGRAM
No	OK	OK

The timer or counter SV can be changed either by inputting a new value or by incrementing or decrementing the current SV.

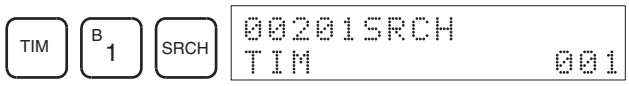
Inputting a New SV Constant

This operation can be used to input a new SV constant, as well as to change an SV from a constant to a word address designation and vice versa. The fol-

lowing examples show how to input a new SV constant and how to change the SV from a constant to an address.

1,2,3...

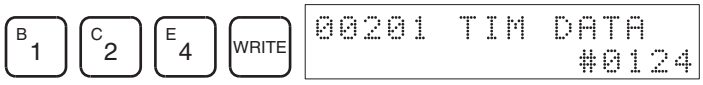
1. Press the CLR Key to bring up the initial display.
2. Display the desired timer or counter.



3. Press the Down Arrow Key and then the CHG Key.



4. At this point a new SV constant can be input or the SV constant can be changed to a word address designation
   a) To input a new SV constant, input the constant and press the WRITE Key.



   b) To change to a word address designation, input the word address and press the WRITE Key.

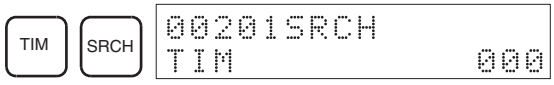


Incrementing and Decrementing a Constant

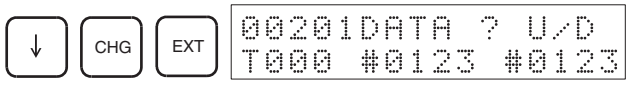
This operation can be used to increment and decrement an SV constant. It is possible only when the SV has been entered as a constant.

1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Display the desired timer or counter.



3. Press the Down Arrow, CHG, and then the EXT Key.

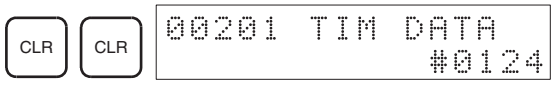


   The constant on the left is the old SV and the constant on the right will become the new SV constant in step 5.

4. Press the Up and Down Arrow Keys to increment and decrement the constant on the right. (In this case the SV is incremented once.)



5. Press the CLR Key twice to change the timer's SV to the new value.



4-2-22 Hexadecimal, BCD Data Modification

This operation is used to change the BCD or hexadecimal value of a word being monitored using the procedure described in *4-2-14 Bit, Digit, Word Monitor*. It is possible in MONITOR or PROGRAM mode only.

RUN	MONITOR	PROGRAM
No	OK	OK

Words SR 253 to SR 255 cannot be changed.

⚠ **Caution** Before changing the contents of I/O memory, be sure that the changes will not cause equipment to operate unexpectedly or dangerously. In particular, take care when changing the status of output bits. The PC continues to refresh I/O bits even if the PC is in PROGRAM mode, so devices connected to output points on the CPU Unit, Expansion Units, or Expansion I/O Units may operate unexpectedly.

1,2,3... 1. Monitor the status of the desired word according to the procedure described in *4-2-14 Bit, Digit, Word Monitor*. If two or more words are being monitored, the desired word should be leftmost on the display.

(Word monitor)

```
D0000
 0119
```

2. Press the CHG Key to begin hexadecimal, BCD data modification.

CHG

```
     PRES VAL?
D0000 0119  ????
```

3. Input the new PV and press the WRITE Key to change the PV.
The operation will end and the normal monitoring display will return when the WRITE Key is pressed.

C 2 | A 0 | A 0 | WRITE

```
D0000
 0200
```

4-2-23 Binary Data Modification

This operation is used to change the status of a word's bits when the word is monitored using the procedure described in *4-2-16 Binary Monitor*. It is possible in MONITOR or PROGRAM mode only.

RUN	MONITOR	PROGRAM
No	OK	OK

Bits SR 25300 to SR 25507 and timer/counter flags cannot be changed.

⚠ **Caution** Before changing the contents of I/O memory, be sure that the changes will not cause equipment to operate unexpectedly or dangerously. In particular, take care when changing the status of output bits. The PC continues to refresh I/O bits even if the PC is in PROGRAM mode, so devices connected to output points on the CPU Unit, Expansion Units, or Expansion I/O Units may operate unexpectedly.

1,2,3... 1. Monitor the status of the desired word according to the procedure described *4-2-16 Binary Monitor*.

(BInary monitor)

```
     c010 MONTR
1000010101010101
```

Bit 15 Bit 00

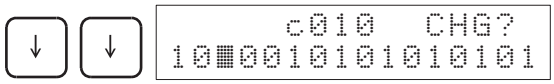
2. Press the CHG Key to begin binary data modification.

CHG

```
     c010  CHG?
▩0000101010101010
```

A flashing cursor will appear over bit 15. The cursor indicates which bit can be changed.

3. Three sets of keys are used to move the cursor and change bit status:
   a) Use the Up and Down Arrow Keys to move the cursor to the left and right.



b) Use the 1 and 0 Keys to change a bit's status to on or off. The cursor will move one bit to the right after one of these keys is pressed.



c) Use the SHIFT+SET and SHIFT+RESET Keys to force-set or force-reset a bit's status. The cursor will move one bit to the right after one of these keys is pressed. The NOT Key will clear force-set or force-reset status.

Note Bits in the DM Area cannot be force-set or force-reset.

4. Press the WRITE Key to write the changes in memory and return to the binary monitor.



4-2-24 Signed Decimal Data Modification

This operation is used to change the decimal value of a word being monitored as signed decimal data, within a range of –32,768 to 32,767. The contents of the specified word are converted automatically to signed hexadecimal (two's complement format).

Words SR 253 to SR 255 cannot be changed.

RUN	MONITOR	PROGRAM
No	OK	OK

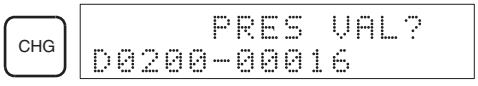
⚠ **Caution** Before changing the contents of I/O memory, be sure that the changes will not cause equipment to operate unexpectedly or dangerously. In particular, take care when changing the status of output bits. The PC continues to refresh I/O bits even if the PC is in PROGRAM mode, so devices connected to output points on the CPU Unit, Expansion Units, or Expansion I/O Units may operate unexpectedly.

1,2,3... 1. Monitor (signed decimal) the status of the word for which the present value is to be changed.



(Signed decimal monitor)

2. Press the CHG Key to begin decimal data modification.



3. Input the new PV and press the WRITE Key to change the PV. The operation will end and the signed-decimal monitoring display will return when the WRITE Key is pressed.

The PV can be set within a range of –32,768 and 32,767. Use the SET Key to input a positive number, and use the RESET Key to input a negative number.



If an erroneous input has been made, press the CLR Key to restore the status prior to the input. Then enter the correct input.

The buzzer will sound if a value outside the specified range is input, allowing no writing.

4-2-25 Unsigned Decimal Data Modification

This operation is used to change the decimal value of a word being monitored as unsigned decimal data, within a range of 0 to 65,535. A change into hexadecimal data is made automatically.

Words SR 253 to SR 255 cannot be changed.

RUN	MONITOR	PROGRAM
No	OK	OK

⚠ **Caution** Before changing the contents of I/O memory, be sure that the changes will not cause equipment to operate unexpectedly or dangerously. In particular, take care when changing the status of output bits. The PC continues to refresh I/O bits even if the PC is in PROGRAM mode, so devices connected to output points on the CPU Unit, Expansion Units, or Expansion I/O Units may operate unexpectedly.

1,2,3... 1. Monitor (unsigned decimal) the status of the word for which the present value is to be changed.

(Unsigned decimal monitor)



2. Press the CHG Key to begin decimal data modification.



3. Input the new PV and press the WRITE Key to change the PV. The operation will end and the decimal-without-sign monitoring display will return when the WRITE Key is pressed.
   The PV can be set within a range of 0 to 65,535.



If an erroneous input has been made, press the CLR Key to restore the status prior to the input. Then enter the correct input.

The buzzer will sound if a value outside the specified range is input, allowing no writing.

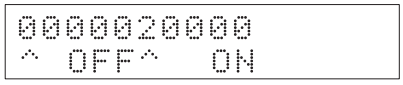
4-2-26 Force Set, Reset

This operation is used to force bits ON (force set) or OFF (force reset) and is useful when debugging the program or checking output wiring. It is possible in MONITOR or PROGRAM mode only.

RUN	MONITOR	PROGRAM
No	OK	OK

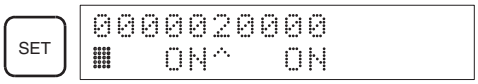
⚠ **Caution** Before changing the contents of I/O memory, be sure that the changes will not cause equipment to operate unexpectedly or dangerously. In particular, take care when changing the status of output bits. The PC continues to refresh I/O bits even if the PC is in PROGRAM mode, so devices connected to output points on the CPU Unit, Expansion Units, or Expansion I/O Units may operate unexpectedly.

1,2,3... 1. Monitor the status of the desired bit according to the procedure described in *4-2-14 Bit, Digit, Word Monitor*. If two or more words are being monitored, the desired bit should be leftmost on the display.



(Multiple address monitor)

2. Press the SET Key to force the bit ON or press the RESET Key to force the bit OFF.



The cursor in the lower left corner of the display indicates that the force set/reset is in progress. Bit status will remain ON or OFF only as long as the key is held down; the original status will return one cycle after the key is released.

3. Press the SHIFT and SET Keys or SHIFT and RESET Keys to maintain the status of the bit after the key is released. In this case, the force-set status is indicated by an "S" and the force-reset status is indicated by an "R."

   To return the bit to its original status, press the NOT Key or perform the Clear Force Set/Reset operation. Refer to *4-2-27 Clear Force Set/Reset* for details.

   Forced status will also be cleared in the following cases:

   a) When the PC's operating mode is changed (although the forced status will not be cleared when the mode is changed from PROGRAM to MONITOR if SR 25211 is ON)
   b) When the PC stops because a fatal error occurred
   c) When the PC stops because of a power interruption
   d) When the Clear Force Set/Reset Operation is performed

4-2-27 Clear Force Set/Reset

This operation is used to restore the status of all bits which have been force set or reset. It is possible in MONITOR or PROGRAM mode only.

RUN	MONITOR	PROGRAM
No	OK	OK

⚠Caution Before changing the contents of I/O memory, be sure that the changes will not cause equipment to operate unexpectedly or dangerously. In particular, take care when changing the status of output bits. The PC continues to refresh I/O bits even if the PC is in PROGRAM mode, so devices connected to output points on the CPU Unit, Expansion Units, or Expansion I/O Units may operate unexpectedly.

1,2,3... 1. Press the CLR Key to bring up the initial display.
2. Press the SET and then the RESET Key. A confirmation message will appear.



Note If you mistakenly press the wrong key, press CLR and start again from the beginning.

3. Press the NOT Key to clear the force-set/reset status of bits in all data areas.

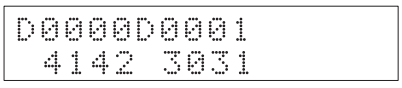


4-2-28 Hex-ASCII Display Change

This operation is used to convert word data displays back and forth between 4-digit hexadecimal data and ASCII. It is possible in any mode.
The displayed PV of the timer or counter cannot be changed.

RUN	MONITOR	PROGRAM
OK	OK	OK

1,2,3... 1. Monitor the status of the desired word(s) according to the procedure described in *4-2-14 Bit, Digit, Word Monitor*. While the multiple addresses are being monitored, the leftmost word is subject to change.



(Multiple address monitor)

2. Press the TR Key to switch to ASCII display. The display will toggle between hexadecimal and ASCII displays each time the TR Key is pressed.





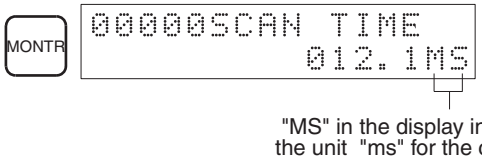
Note 1. A message contained in three words can be displayed by using ASCII display in combination with the Three-word monitor operation.
2. The Hexadecimal, BCD Data Modification Operation can be used while displaying ASCII data. Input values in 4-digit hexadecimal.

4-2-29 Displaying the Cycle Time

This operation is used to display the current average cycle time (scan time). It is possible only in RUN or MONITOR mode while the program is being executed.

RUN	MONITOR	PROGRAM
OK	OK	No

1,2,3... 1. Press the CLR Key to bring up the initial display.
2. Press the MONTR Key to display the cycle time.



There might be differences in displayed values when the MONTR Key is pressed repeatedly. These differences are caused by changing execution conditions.

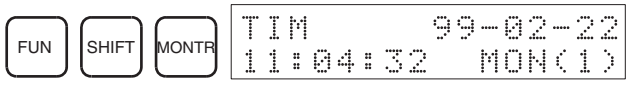
4-2-30 Reading and Setting the Clock

This operation is used to read or set the CPU's clock. The clock can be read in any mode, but can be set in MONITOR or PROGRAM mode only.

Operation	RUN	MONITOR	PROGRAM
Read clock	OK	OK	OK
Set clock	No	OK	OK

1,2,3...

1. Press the CLR Key to bring up the initial display.
2. Press the FUN Key, SHIFT Key, and then the MONTR Key to display the date and time.



3. Press the CHG Key to change the date and/or time.



The digit that can be changed will flash. If necessary, input a new value with the Up and Down Arrow Keys or Numeric Keys. Press the CHG Key to move the cursor to the next digit. The following table shows the setting ranges for each value.

Year	Month	Day	Hour	Minute	Second	Day-of-week
00 to 99	01 to 12	01 to 31	00 to 23	00 to 59	00 to 59	0 to 6 (SUN to SAT)

4. Press the WRITE Key to write the new value.



Press the CLR Key to return to the initial display.

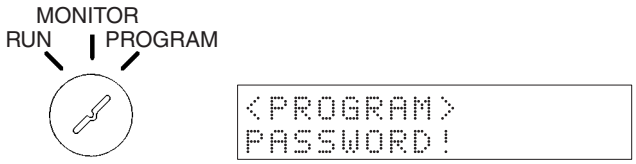
4-3 Programming Example

This section demonstrates all of the steps needed to write a program with the Programming Console.

4-3-1 Preparatory Operations

Use the following procedure when writing a program to the CPM2C for the first time.

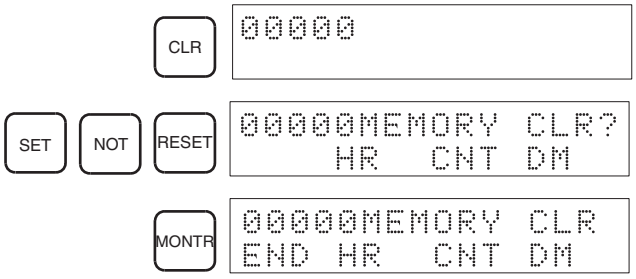
1,2,3... 1. Set the Programming Console's mode switch to PROGRAM mode and turn on the CPM2C's power supply. The password input display will appear on the Programming Console.



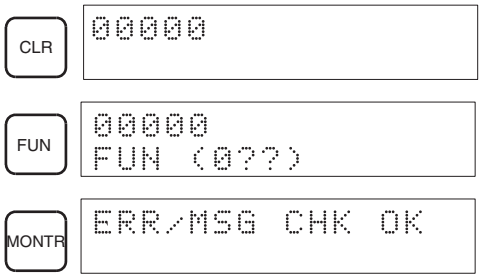
2. Enter the password by pressing the CLR and then the MONTR Key.



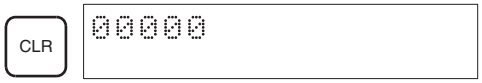
3. Clear the CPM2C's memory by pressing the CLR, SET, NOT, RESET, and then the MONTR Key. Press the CLR Key several times if memory errors are displayed.



4. Display and clear error messages by pressing the CLR, FUN, and then the MONTR Key. Continue pressing the MONTR Key until all error messages have been cleared.



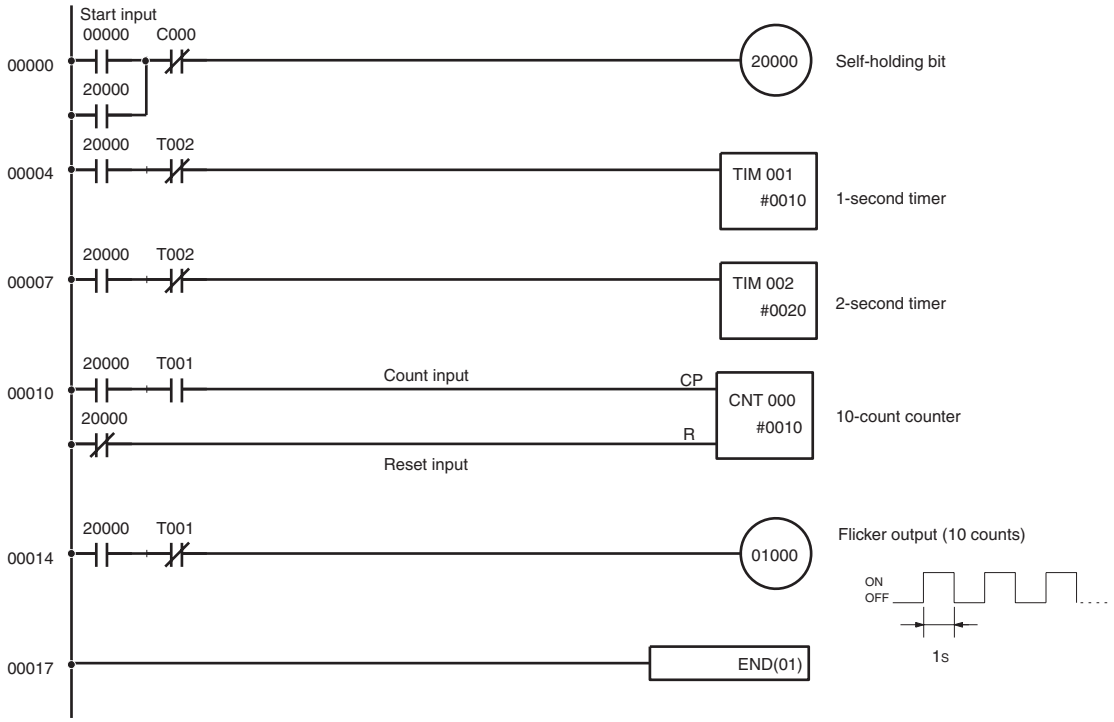
5. Press the CLR Key to bring up the initial programming display (program address 00000). The new program can be written at this point.



⚠ **Caution** Check the system thoroughly before starting or stopping the CPM2C to prevent any accidents that might occur when the program is first started.

4-3-2 Example Program

The following ladder program will be used to demonstrate how to write a program with the Programming Console. This program makes output IR 01000 flicker ON/OFF (one second ON, one second OFF) ten times after input IR 00000 is turned ON.



The mnemonic list for the example program is shown in the following table. The steps required to enter this program from a Programming Console are described in *4-3-3 Programming Procedures*.

Address	Instruction	Data		Programming example procedures in *4-3-3 Programming Procedures*
00000	LD		00000	(1) Self-holding bit
00001	OR		20000	
00002	AND NOT	CNT	000	
00003	OUT		20000	
00004	LD		20000	(2) 1-second timer
00005	AND NOT	TIM	002	
00006	TIM		001	
		#	0010	
00007	LD		20000	(3) 2-second timer
00008	AND NOT	TIM	002	
00009	TIM		002	
		#	0020	
00010	LD		20000	(4) 10-count counter
00011	AND	TIM	001	
00012	LD NOT		20000	
00013	CNT		000	
		#	0010	

Address	Instruction	Data		Programming example procedures in *4-3-3 Programming Procedures*
00014	LD		20000	(5) Flicker output (10 counts)
00015	AND NOT	TIM	001	
00016	OUT		01000	
00017	END (01)		---	(6) END(01) instruction

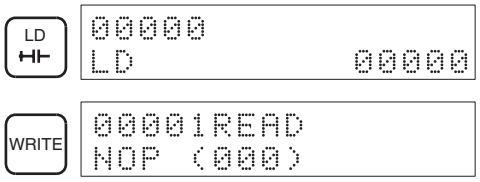
4-3-3 Programming Procedures

The example program will be written to the CPM2C according to the mnemonic list in *4-3-2 Example Program*. The procedure is performed beginning with the initial display. (Clear the memory before entering a new program.)

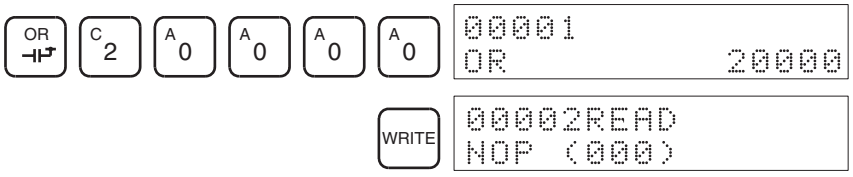
Note If an error occurs while inputting the program, refer to *5-3 Programming Console Operation Errors* for details on correcting the error. Refer to the relevant *Support Software Operation Manual* for details on errors that appear when operating the SSS or SYSMAC-CPT Support Software.

(1) Inputting the Self-holding Bit

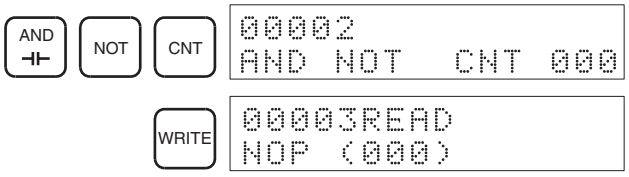
1,2,3... 1. Input the normally open condition IR 00000.
(It isn't necessary to input leading zeroes.)



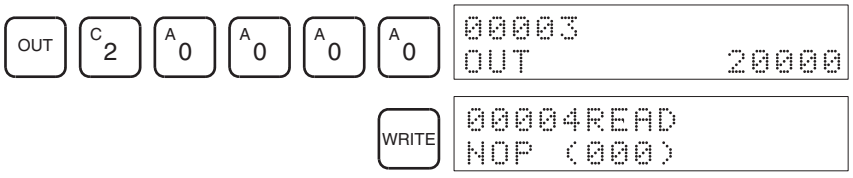
2. Input the OR condition IR 20000.



3. Input the normally closed AND condition C000.
(It isn't necessary to input leading zeroes.)

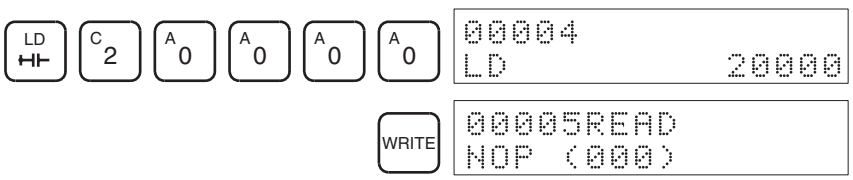


4. Input the OUT instruction IR 20000.

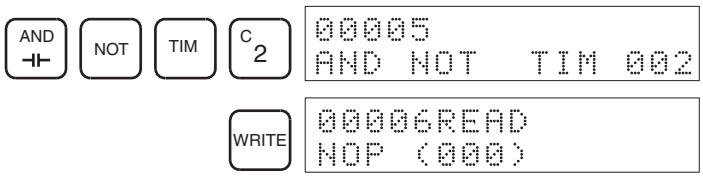


(2) Inputting the One-second Timer

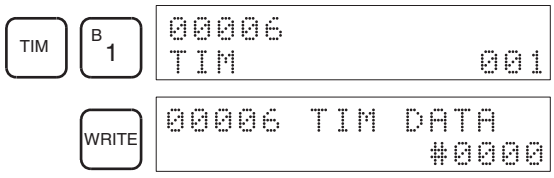
1,2,3... 1. Input the normally open condition IR 20000.



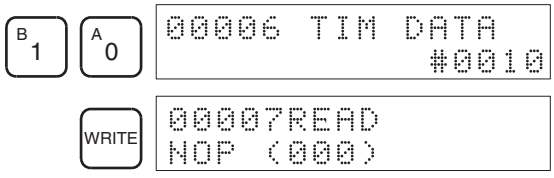
2. Input the normally closed AND condition T002.
(It isn't necessary to input leading zeroes.)



3. Input the 1-second timer T001.



4. Input the SV for T001 (#0010 = 1.0 s).

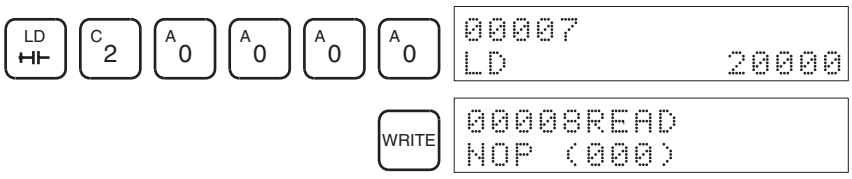


(3) Inputting the Two-second Timer

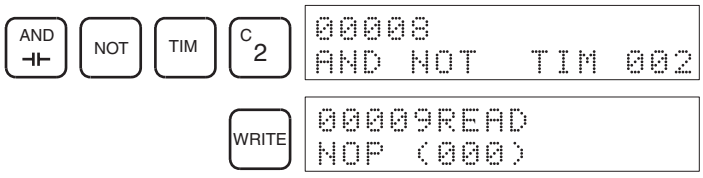
The following key operations are used to input the 2-second timer.

1,2,3...

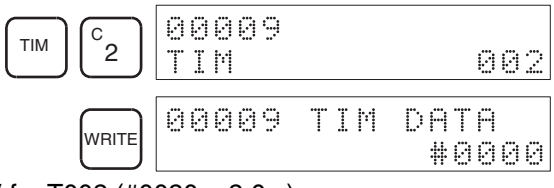
1. Input the normally open condition IR 20000.



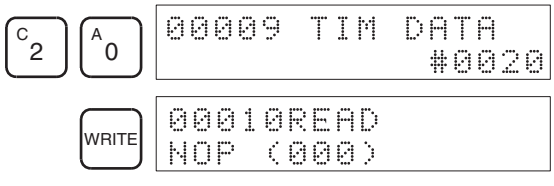
2. Input the normally closed AND condition T002.
(It isn't necessary to input leading zeroes.)



3. Input the 2-second timer T002.



4. Input the SV for T002 (#0020 = 2.0 s).

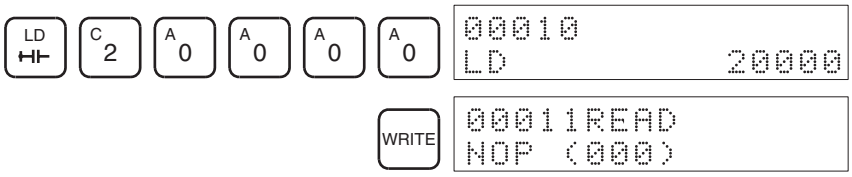


(4) Inputting the 10-count Counter

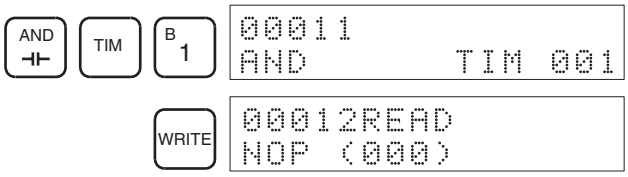
The following key operations are used to input the 10-count counter.

1,2,3...

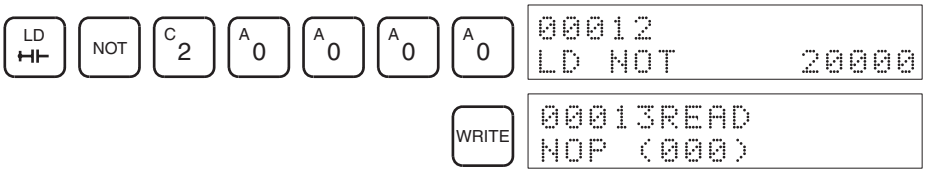
1. Input the normally open condition IR 20000.



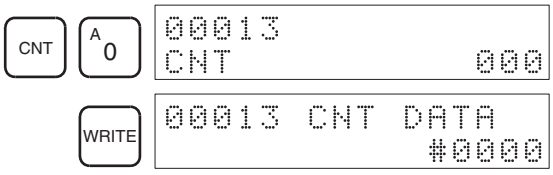
2. Input the normally open AND condition T001.
(It isn't necessary to input leading zeroes.)



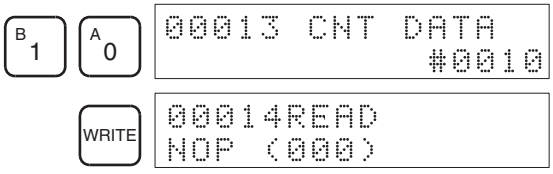
3. Input the normally closed condition IR 20000.



4. Input the counter 000.

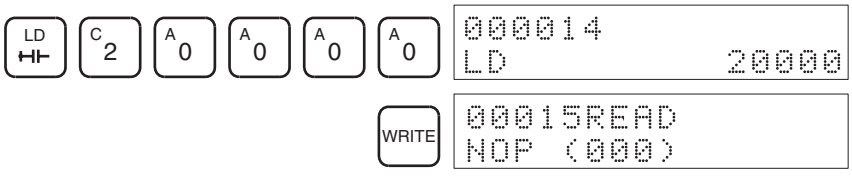


5. Input the SV for counter 000 (#0010 = 10 counts).

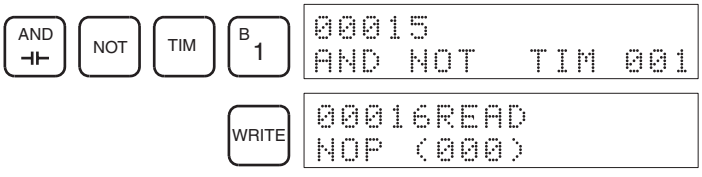


(5) Inputting the Flicker Output

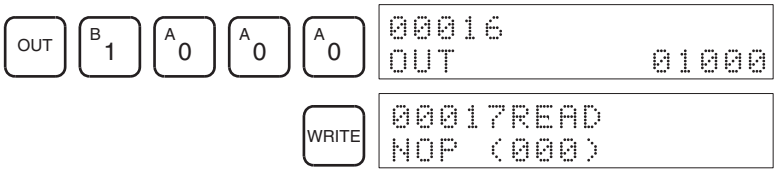
1,2,3... 1. Input the normally open condition IR 20000.



2. Input the normally closed AND condition T001.
(It isn't necessary to input leading zeroes.)



3. Input the OUT instruction IR 01000.
(It isn't necessary to input leading zeroes.)



(6) Inputting the END(001) Instruction

Input END(01). (The display shows three digits in the function code, but only the last two digits are input for CPM2C PCs.)



4-3-4 Checking the Program

Check the program syntax in PROGRAM mode to make sure that the program has been input correctly.

1,2,3...

1. Press the CLR Key to bring up the initial display.



2. Press the SRCH Key. An input prompt will appear requesting the desired check level.



3. Input the desired check level (0, 1, or 2). The program check will begin when the check level is input, and the first error found will be displayed. If no errors are found, the following display will appear.



Note Refer to *5-4 Programming Errors* for details on check levels and the programming errors that may be displayed during a program check.

4. Press the SRCH Key to continue the search. The next error will be displayed. Continue pressing the SRCH Key to continue the search.
The search will continue until an END(01) instruction or the end of Program Memory is reached.

If errors are displayed, edit the program to correct the errors and check the program again. Continue checking the program until all errors have been corrected.

4-3-5 Test Run in MONITOR Mode

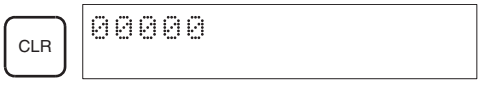
Switch the CPM2C in MONITOR mode and check the operation of the program.

1,2,3...

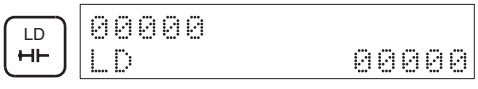
1. Set the Programming Console's mode switch to MONITOR mode.

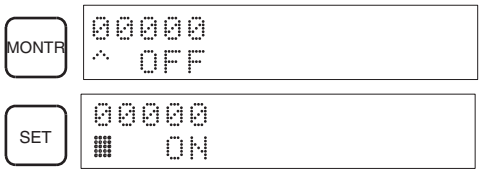


2. Press the CLR Key to bring up the initial display.



3. Force-set the start input bit (IR 00000) from the Programming Console to start the program.





The cursor in the lower left corner of the display indicates that the force set is in progress. The bit will remain ON as long as the Set Key is held down.

4. The output indicator for output IR 01000 will flash ten times if the program is operating correctly. The indicator should go OFF after ten one-second flashes.

   There is a mistake in the program if the output indicator doesn't flash. In this case, check the program and force set/reset bits to check operation.

SECTION 5
Test Runs and Error Processing

This section describes procedures for test runs of CPM2C operation, self-diagnosis functions, and error processing to identify and correct the hardware and software errors that can occur during PC operation.

5-1 Initial System Checks and Test Run Procedure 194
5-1-1 Initial System Checks. 194
5-1-2 Flash Memory Precautions. 194
5-1-3 CPM2C Test Run Procedure 194
5-2 Self-diagnostic Functions 195
5-2-1 Identifying Errors. 195
5-2-2 User-defined Errors 196
5-2-3 Non-fatal Errors 196
5-2-4 Fatal Errors. 197
5-2-5 Communications Errors 198
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5-7 Battery Replacement 209

5-1 Initial System Checks and Test Run Procedure

5-1-1 Initial System Checks

Check the following items after setting up and wiring the CPM2C, but before performing a test run.

Item	Points to check
Power supply and I/O connections	Is the wiring correct? Are the terminals securely tightened? Are there any shorts between crimp terminals or wires? Refer to *3-4 Wiring and Connections* for details.
Connecting cables	Are the cables all connected correctly and locked? Refer to *3-4 Wiring and Connections* for details.
Protective label	Has the protective label been removed?

Note

1. Always clear memory before beginning to program the CPM2C. Although memory is cleared before the CPU Unit is shipped, the contents of the DM, HR, AR, and counter areas may change in transit. See *4-2-2 Clearing Memory* for details on the All Clear operation.
2. See *1-3-3 Operating Mode at Startup* to determine what mode the CPM2C will enter when the power is turned ON.

5-1-2 Flash Memory Precautions

Observe the following precautions to protect the flash memory and ensure proper operation.

1,2,3...

1. If changes are made in the read-only DM area (DM 6144 through DM 6599) or PC Setup (DM 6600 through DM 6655), the PC's operating mode must be changed to write the new contents to flash memory. If backup battery is changed before the changes are written to flash memory, the changes will be lost.
   The changes can be saved by switching the CPM2C to RUN or MONITOR mode or turning the CPM2C OFF and then ON again.
2. When contents of the program, read-only DM (DM 6144 through DM 6599), or PC Setup (DM 6600 through DM 6655) have been changed, startup processing will take up to 1,200 ms longer than usual. Be sure to take this one-time startup delay into account if it may affect operations.
3. If one of the following three operations is performed in MONITOR or RUN mode, the CPM2C's cycle time will be extended by up to 1,200 ms and interrupts will be disabled while the program or PC Setup is being overwritten.
   - Program changes with the online edit operation
   - Changes to the read-only DM area (DM 6144 through DM 6599)
   - Changes to the PC Setup (DM 6600 through DM 6655)

   A "SCAN TIME OVER" error won't occur during these operations. Be sure to take this delay in the CPM2C's I/O response times into account when performing online editing.

5-1-3 CPM2C Test Run Procedure

1,2,3...

1. Power Supply Application
   a) Check the CPM2C's power supply voltage and terminal connections.
   b) Check the I/O devices' power supply voltage and terminal connections.
   c) Turn ON the power supply and check that the "PWR" indicator lights.

d) Use a Programming Device to set the CPM2C to PROGRAM mode.

2. I/O Wiring Checks
   a) With the CPM2C in PROGRAM mode, check the output wiring by turning ON the output bits with the force set and force reset operations. Refer to *4-2-26 Force Set, Reset* for details.
   b) Check the input wiring with the CPM2C's input indicators or a Programming Device's monitor operations.
3. Test Run
   a) Use a Programming Device to set the CPM2C to RUN or MONITOR mode and check that the "RUN" indicator lights.
   b) Check the sequence of operation with the force set/reset operations, etc.
4. Debugging
   Correct any programming errors that are detected.
5. Saving the Program
   a) Use a Programming Device to write the program to a backup floppy disk.
   b) Print out a hard copy of the program with a printer.

Note Refer to *Section 4 Using Programming Devices* for details on the Support Software and Programming Console operations.

5-2 Self-diagnostic Functions

The CPM2C is equipped with a variety of self-diagnostic functions to help identify and correct errors and reduce down time.

5-2-1 Identifying Errors

An error can be identified by the error message displayed on a Programming Device, error flags in the AR and SR areas, and the error code output to SR 253.

Fatal and Non-fatal Errors

PC errors are divided into 2 categories based on the severity of the errors. The status of the ERR/ALM indicator (lit or flashing) shows which type of error has occurred.

ERR/ALM Lit (Fatal Error)

Fatal errors are serious errors which stop CPM2C operation. There are two ways to restart operation:

- Turn the PC OFF and then ON again.
- Use a Programming Device to switch the PC to PROGRAM mode, and read/clear the error.

ERR/ALM Flashing (Non-fatal Error)

Non-fatal errors are less serious errors which don't stop CPM2C operation.

Error Messages

When an error is detected, a corresponding error message will be displayed on the Programming Console or other Programming Device connected to the PC.

Error Flags

When a hardware error is detected, the corresponding error flag in the AR or SR area will be turned ON.

Error Code

When an error is detected, a specific 2-digit hexadecimal error code is output to SR 25300 to SR 25307. The error code and time of occurrence are also output to the Error Log Area (DM 2000 to DM 2021).

⚠ WARNING Emergency stop circuits, interlock circuits, limit circuits, and similar safety measures must be provided in external control circuits (i.e., not in the Programmable Controller) to ensure safety in the system if an abnormality occurs

due to malfunction of the PC or another external factor affecting the PC operation. Not providing proper safety measures may result in serious accidents.

⚠ WARNING The PC will turn OFF all outputs when its self-diagnosis function detects any error or when a severe failure alarm (FALS) instruction is executed. External safety measures must be provided to ensure safety in the system. Not providing proper safety measures may result in serious accidents.

5-2-2 User-defined Errors

There are three instructions that can be used to define errors or messages. FAL(06) causes a non-fatal error, FAL(07) causes a fatal error, and MSG(46) sends a message to the Programming Console or host computer connected to the PC.

FAILURE ALARM – FAL(06)

FAL(06) is an instruction that causes a non-fatal error. The following will occur when an FAL(06) instruction is executed:

1,2,3...

1. The ERR/ALM indicator on the CPU Unit will flash. PC operation will continue.
2. The instruction's 2-digit BCD FAL number (01 to 99) will be written to SR 25300 to SR 25307.

The FAL numbers can be set arbitrarily to indicate particular conditions, but the same number should not be used as both an FAL number and an FALS number.

To clear an FAL error, correct the cause of the error and then execute FAL 00 or use a Programming Device to clear the error.

SEVERE FAILURE ALARM – FALS(07)

FALS(07) is an instruction that causes a fatal error. The following will occur when an FALS(07) instruction is executed:

1,2,3...

1. Program execution will be stopped and all outputs will be turned OFF.
2. The ERR/ALM indicator on the CPU Unit will be lit.
3. The instruction's 2-digit BCD FALS number (01 to 99) will be written to SR 25300 to SR 25307.

The FALS numbers can be set arbitrarily to indicate particular conditions, but the same number should not be used as both an FAL number and an FALS number.

To clear an FALS error, use a Programming Device to switch the PC to PROGRAM Mode, correct the cause of the error, and then clear the error.

MESSAGE – MSG(46)

MSG(46) is used to display a message on a Programming Device connected to the CPM2C. The message, which can be up to 16 characters long, is displayed when the instruction's execution condition is ON.

5-2-3 Non-fatal Errors

PC operation and program execution will continue after one or more of these errors have occurred. Although PC operation will continue, the cause of the error should be corrected and the error cleared as soon as possible.

When one of these errors occurs, the POWER and RUN indicators will remain lit and the ERR/ALM indicator will flash.

Message	FAL No.	Meaning and appropriate response
SYS FAIL FAL** (** is 01 to 99 or 9B.)	01 to 99	An FAL(06) instruction has been executed in the program. Check the FAL number to determine conditions that would cause execution, correct the cause, and clear the error.
	9B	An error has been detected in the PC Setup. Check flags AR 1300 to AR 1302, and correct as directed. AR 1300 ON: An incorrect setting was detected in the PC Setup (DM 6600 to DM 6614) when power was turned ON. Correct the settings in PROGRAM Mode and turn ON the power again. AR 1301 ON: An incorrect setting was detected in the PC Setup (DM 6615 to DM 6644) when switching to RUN or MONITOR mode. Correct the settings in PROGRAM Mode and switch to RUN or MONITOR mode again. AR 1302 ON: An incorrect setting was detected in the PC Setup (DM 6645 to DM 6655) during operation. Correct the settings and clear the error.
SCAN TIME OVER	F8	The cycle time has exceeded 100 ms. (SR 25309 will be ON.) This indicates that the program cycle time is longer than recommended. Reduce cycle time if possible. (The CPM2C can be set so that this error won't be detected.)
Battery error (no message)	F7	If the Low Battery Detection Switch is ON and the voltage of the CPM2C-BAT01 backup battery is below the minimum level, the ERR/ALM indicator will flash and SR 25308 will be turned ON. (See page 49 for details on the Low Battery Detection Switch.) Replace the battery. (See *5-7 Battery Replacement* for details.)

5-2-4 Fatal Errors

PC operation and program execution will stop and all outputs from the PC will be turned OFF when any of these errors have occurred. CPM2C operation can't be restarted until the PC is turned OFF and then ON again or a Programming Device is used to switch the PC to PROGRAM mode and clear the fatal error.

All CPU Unit indicators will be OFF for the power interruption error. For all other fatal operating errors, the POWER and ERR/ALM indicators will be lit. The RUN indicator will be OFF.

Message	FALS No.	Meaning and appropriate response
Power interruption (no message)	None	Power has been interrupted for more than 10 ms (2 ms for DC power types.) Check power supply voltage and power lines. Try to power-up again.
MEMORY ERR	F1	AR 1308 ON: There is a non-existent bit or word address in the user program. Check the program and correct errors.
		AR 1309 ON: An error has occurred in flash memory. Replace the CPU Unit.
		AR 1310 ON: A checksum error has occurred in read-only DM (DM 6144 to DM 6599). Check and correct the settings in the read-only DM area.
		AR 1311 ON: A checksum error has occurred in the PC Setup. Initialize the PC Setup and input the settings again.
		AR 1312 ON: A checksum error has occurred in the program. Check the program and correct any errors detected.
		AR 1313 ON: A checksum error has occurred in the expansion instructions data and all function codes have been set the their default values. Reset the expansion instructions.
		AR 1314 ON: Data was not maintained in an area specified for holding. Clear the error, check the data in the areas specified for holding, and try again.
NO END INST	F0	END(01) is not written in the program. Write END(01) at the end of the program.
I/O BUS ERR	C0	An error has occurred during data transfer between the CPU Unit and an Expansion I/O Unit or Expansion Unit. Check the Unit's connecting cable.
I/O UNIT OVER	E1	Too many Expansion Units or Expansion I/O Units have been connected. Check the Unit configuration.

Message	FALS No.	Meaning and appropriate response
SYS FAIL FALS** (** is 01 to 99 or 9F.)	01 to 99	A FALS(07) instruction has been executed in the program. Check the FALS number to determine the conditions that caused execution, correct the cause, and clear the error.
	9F	The cycle time has exceeded the Maximum (Watch) Cycle Time setting (DM 6618). Check the cycle time and adjust the Maximum Cycle Time setting if necessary.

5-2-5 Communications Errors

The COMM indicator will be turned OFF and AR 0812 will be turned ON if an error occurs in communications through the peripheral port or AR 0804 will be turned ON if an error occurs in communications through the RS-232C port. Check the connecting cables and restart.

There are no error messages or error codes generated by this error and the ERR/ALM indicator is not affected.

5-3 Programming Console Operation Errors

The following error messages may appear when performing operations on the Programming Console. Correct the error as indicated and continue operation.

Message	Meaning and appropriate response
REPL ROM	An attempt was made to write to write-protected memory. Set bits 00 to 03 of DM 6602 to “0.”
PROG OVER	The instruction at the last address in memory is not NOP(00). Erase all unnecessary instructions after END(01).
ADDR OVER	An address was set that is larger than the highest memory address in Program Memory. Input a smaller address.
SETDATA ERR	FALS 00 has been input, and “00” cannot be input. Reinput the data.
I/O NO. ERR	A data area address has been designated that exceeds the limit of the data area, e.g., an address is too large. Confirm the requirements for the instruction and re-enter the address.

Note Refer to the relevant Support Software Operation Manual for details on errors that may appear when operating the SSS or SYSMAC-CPT Support Software.

5-4 Programming Errors

These errors in program syntax will be detected when the program is checked using the Program Check operation.

Three levels of program checking are available. The desired level must be designated to indicate the type of errors that are to be detected. The following table provides the error types, displays, and explanations of all syntax errors.

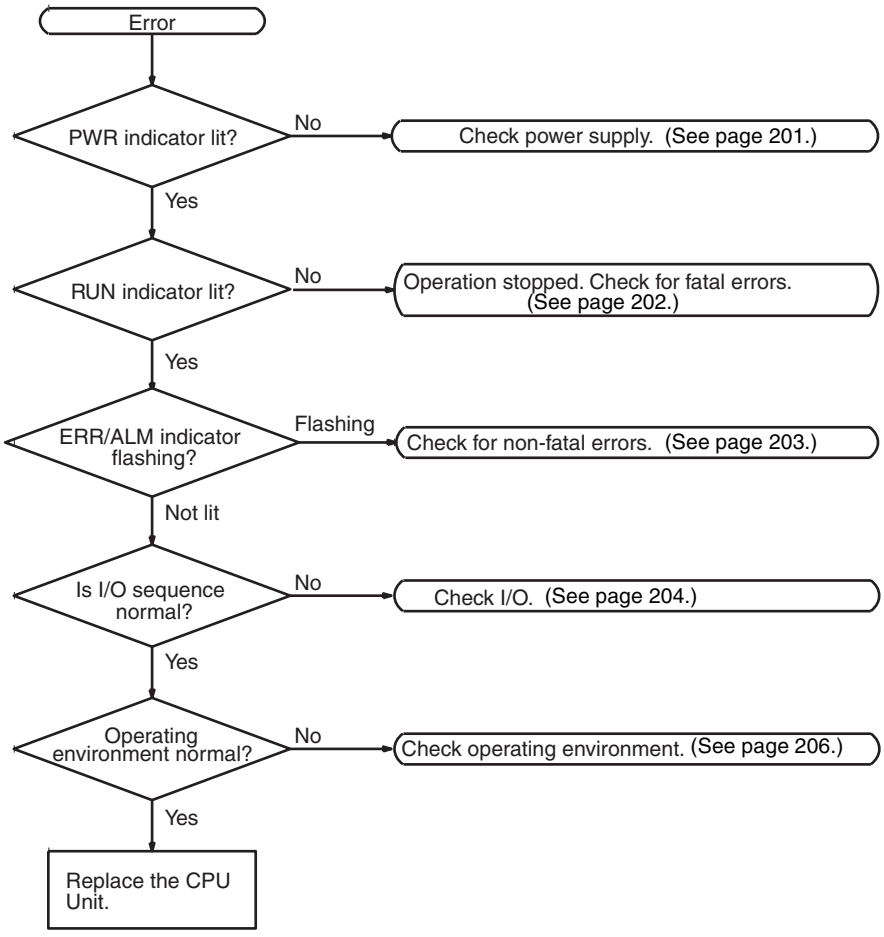
Check level 0 checks for type A, B, and C errors; check level 1, for type A and B errors; and check level 2, for type A errors only.

Type	Message	Meaning and appropriate response
A	????	The program has been damaged, creating a non-existent function code. Re-enter the program.
	CIRCUIT ERR	The number of LD instructions (LD or LD NOT) does not match the number of logic block instructions (OR LD or AND LD).Check your program.
	OPERAND ERR	A constant entered for the instruction is not within defined values. Change the constant so that it lies within the proper range.
	NO END INSTR	There is no END(01) in the program. Write END(01) at the end of the program.
	LOCN ERR	An instruction is in the wrong place in the program. Check instruction requirements and correct the program.
	JME UNDEFD	A JME(05) instruction is missing for a JMP(04) instruction. Correct the jump number or insert the proper JME(05) instruction.
	DUPL	The same jump number or subroutine number has been used twice. Correct the program so that the same number is only used once for each.
	SBN UNDEFD	An SBN(92) has not been programmed with the same subroutine number as an SBS(91) instruction in the program. Correct the program.
	STEP ERR	STEP(08) with a section number and STEP(08) without a section number have been used incorrectly. Check STEP(08) programming requirements and correct the program.
B	IL-ILC ERR	IL(02) and ILC(03) are not used in pairs. Correct the program so that each IL(02) has a unique ILC(03). Although this error message will appear if more than one IL(02) is used with the same ILC(03), the program will executed as written. Make sure your program is written as desired before proceeding.
	JMP-JME ERR	JMP(04) and JME(05) are not used in pairs. Make sure your program is written as desired before proceeding.
	SBN-RET ERR	RET(93) has not been used properly or the relationship between SBN(92) and RET(93) is not correct. Correct the program.
C	COIL DUPL	The same bit is being controlled (i.e., turned ON and/or OFF) by more than one instruction (e.g., OUT, OUT NOT, DIFU(13), DIFD(14), KEEP(11), SFT(10)). Although this is allowed for certain instructions, check instruction requirements to confirm that the program is correct or rewrite the program so that each bit is controlled by only one instruction.
	JMP UNDEFD	JME(05) has been used with no JMP(04) with the same jump number. Add a JMP(04) with the same number or delete the JME(05) that is not being used.
	SBS UNDEFD	A subroutine exists that is not called by SBS(91). Program a subroutine call in the proper place, or delete the subroutine if it is not required.

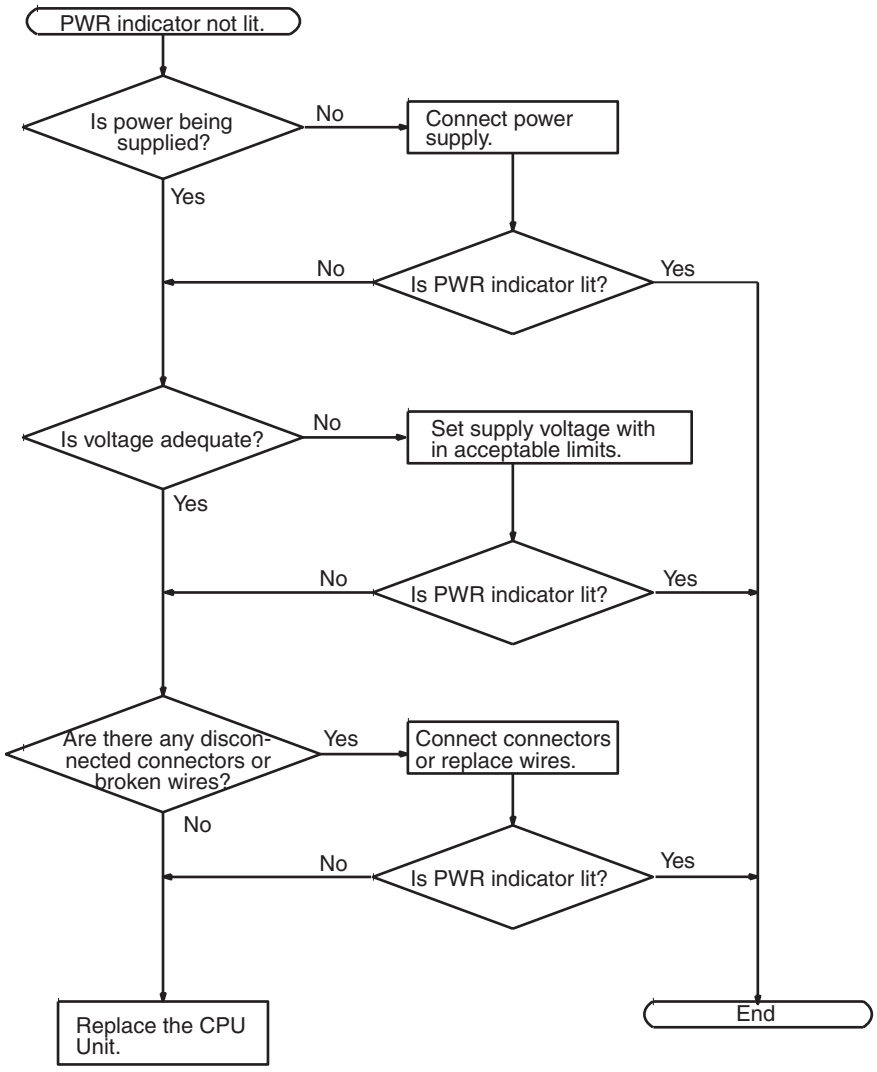
5-5 Troubleshooting Flowcharts

Use the following flowcharts to troubleshoot errors that occur during operation.

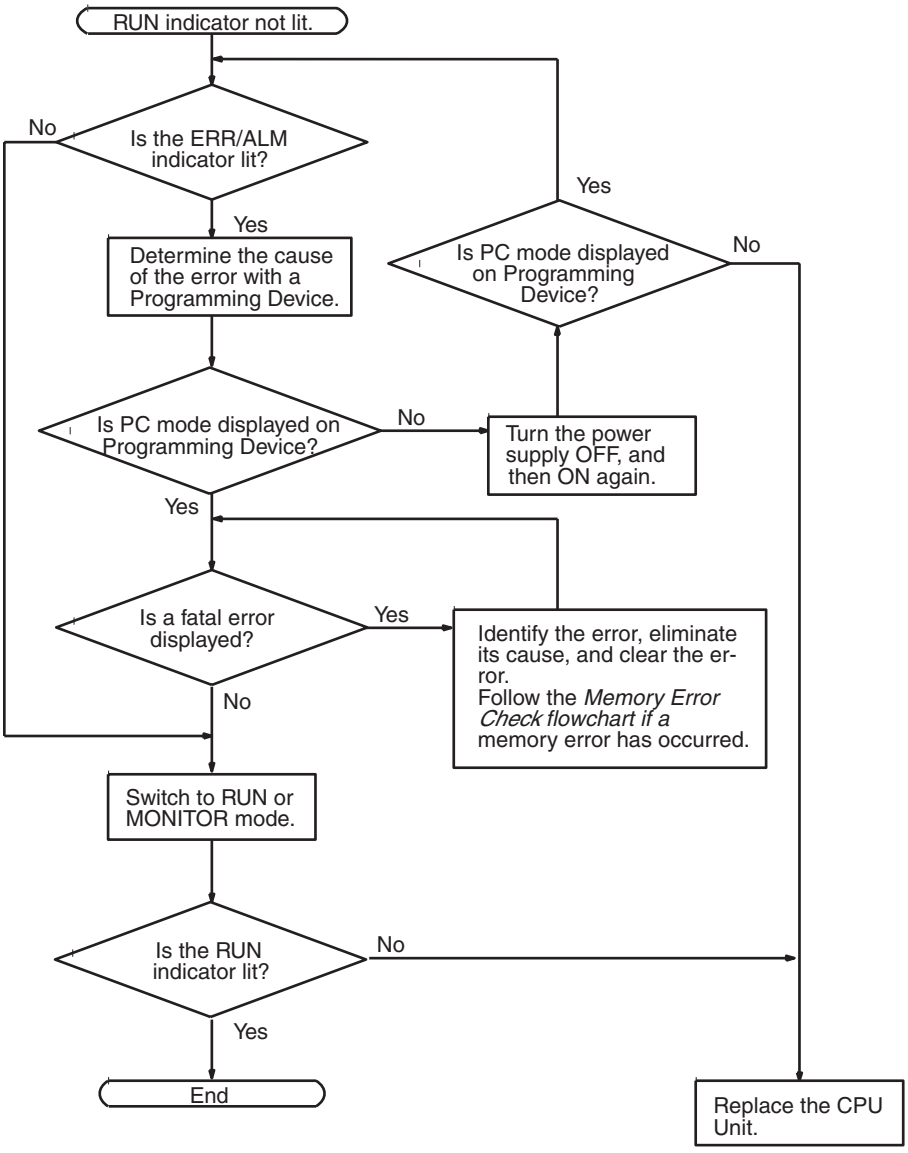
Main Check



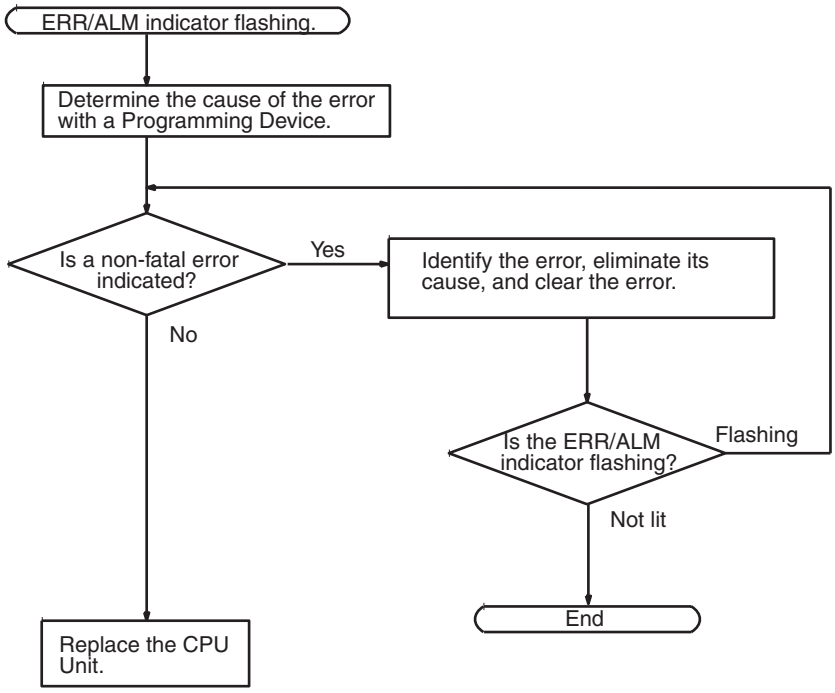
Power Supply Check



Fatal Error Check

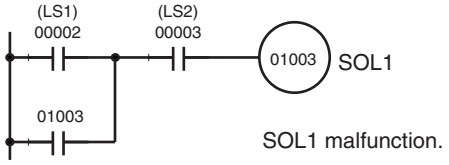


Non-fatal Error Check

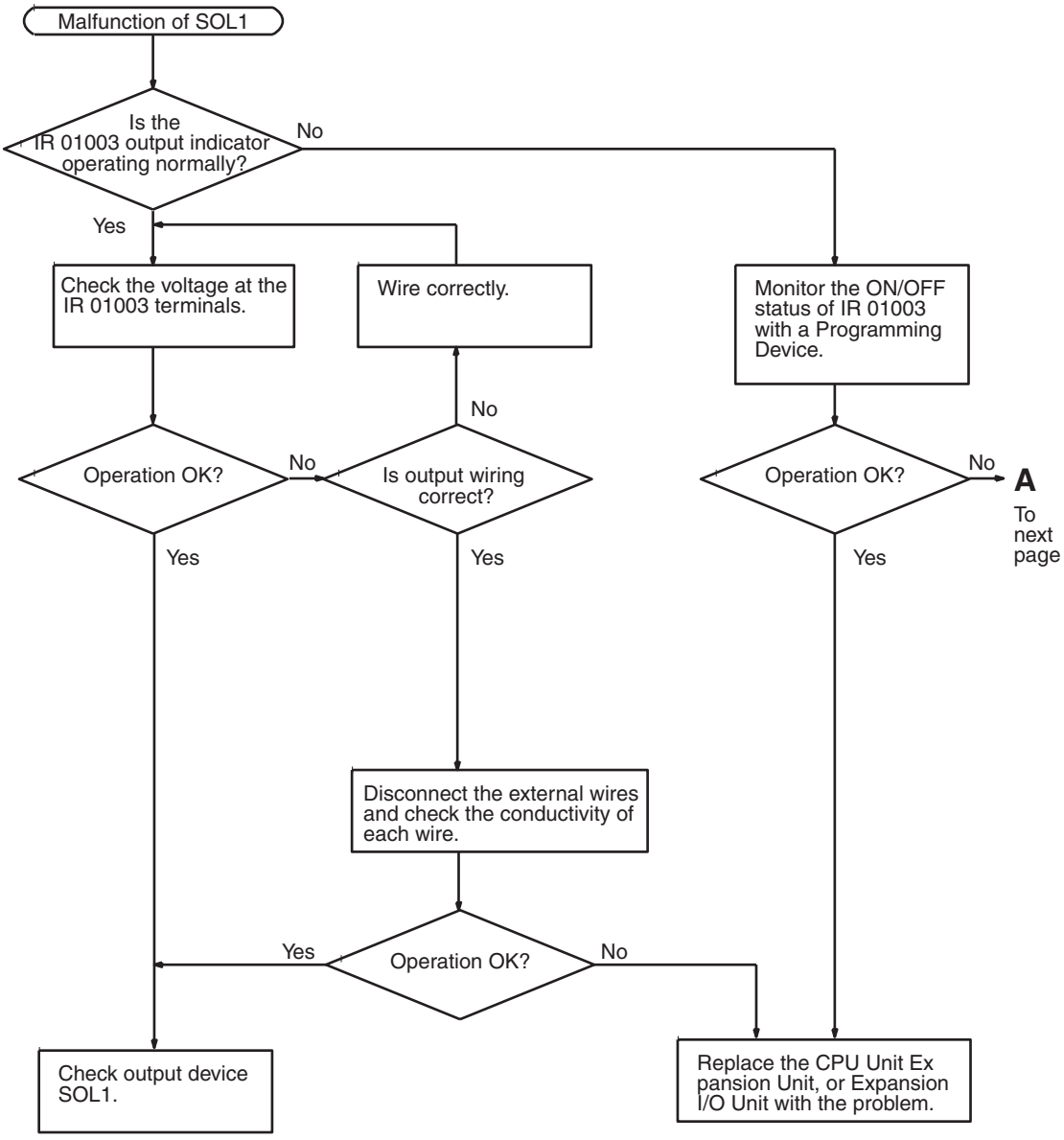


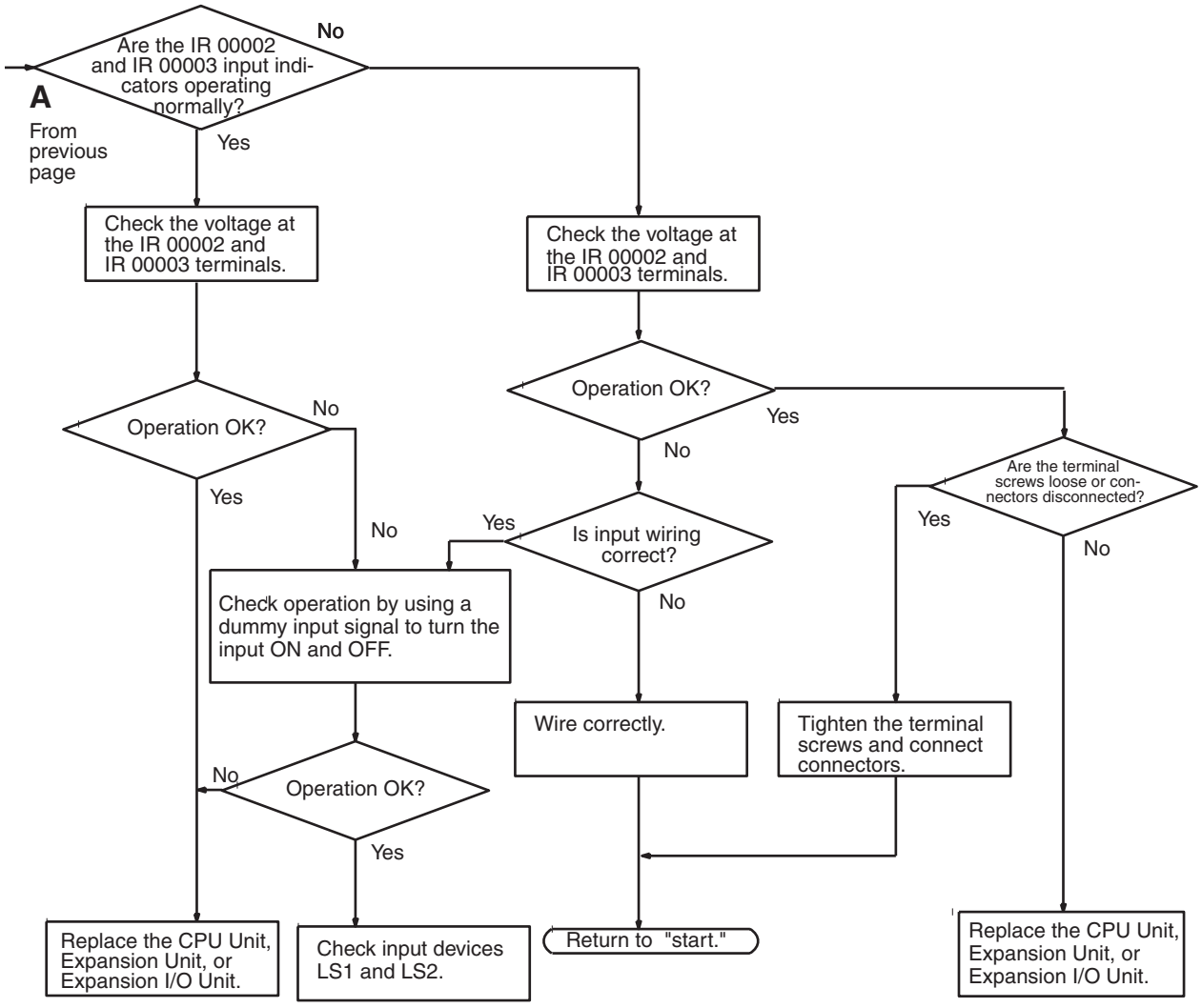
I/O Check

The I/O check flowchart is based on the following ladder diagram section.

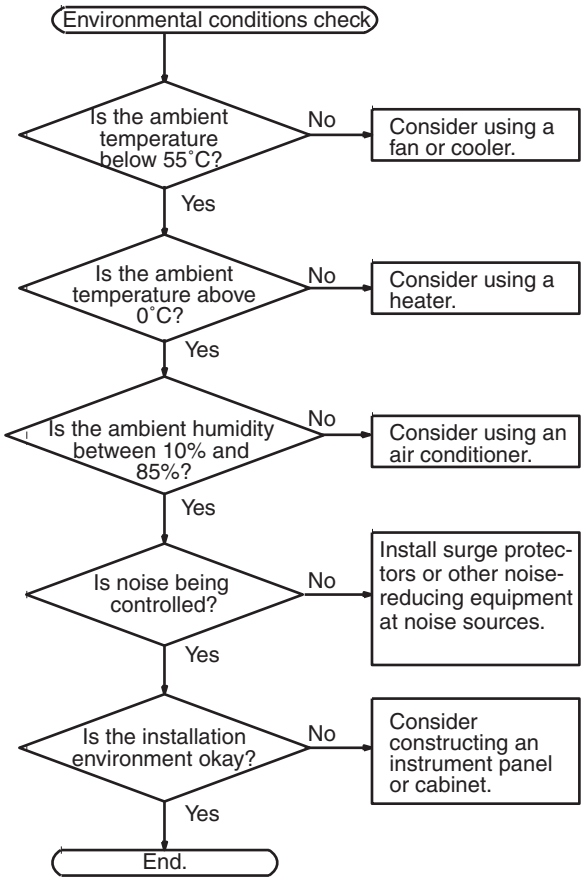


SOL1 malfunction.

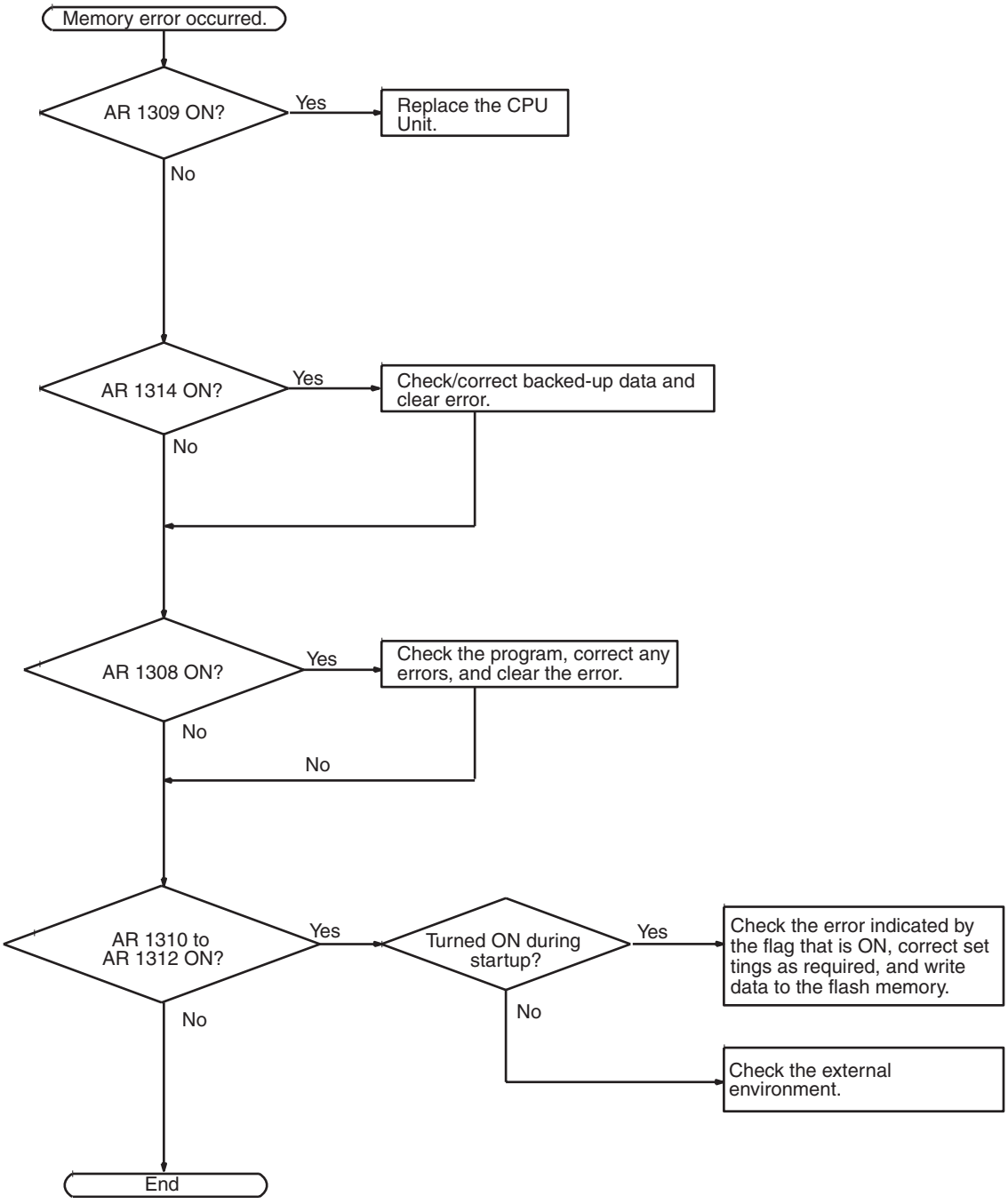



Are the IR 00002 and IR 00003 input indicators operating normally?
No
Yes
A
From previous page
Check the voltage at the IR 00002 and IR 00003 terminals.
Operation OK?
No
Yes
Check operation by using a dummy input signal to turn the input ON and OFF.
Operation OK?
No
Yes
Replace the CPU Unit, Expansion Unit, or Expansion I/O Unit.
Check input devices LS1 and LS2.
Check the voltage at the IR 00002 and IR 00003 terminals.
Operation OK?
Yes
No
Is input wiring correct?
Yes
No
Wire correctly.
Return to "start."
Are the terminal screws loose or connectors disconnected?
Yes
No
Tighten the terminal screws and connect connectors.
Replace the CPU Unit, Expansion Unit, or Expansion I/O Unit.

Environmental Conditions Check



Memory Error Check



5-6 Maintenance Inspections

In order for your SYSMAC system to operate in optimum condition, be sure to carry out daily or periodical inspections.

Inspection Items

The main system components of a SYSMAC system are semiconductors, and it contains few components with limited lifetimes. Poor environmental conditions, however, can lead to deterioration of the electrical components, making regular maintenance necessary.

The standard period for maintenance checks is 6 months to 1 year, but more frequent checks are required if the PC is operated in more demanding conditions.

If the criteria are not met, adjust to within the specified ranges.

Inspection items	Details	Criteria	Remarks
Power supply	Determine whether the voltage fluctuation at the power supply terminals is within specifications.	Within the voltage variation range (see note)	Tester
Environmental conditions	Is the ambient temperature inside the panel appropriate?	0 to 55°C	Thermometer
	Is the ambient humidity inside the panel appropriate?	10% to 90% RH with no condensation	Hygrometer
	Has dirt or dust collected?	None	Visual inspection
I/O power supply	Is the voltage fluctuation measured at the I/O terminals within the standard range?	Each I/O terminal must conform to the specifications	Tester
Installation status	Are all units securely installed?	Nothing is loose	Phillips screwdriver
	Are all connection cables and connectors inserted completely and locked?	Nothing is loose	Visual inspection
	Are any of the external wiring screws loose?	Nothing is loose	Phillips screwdriver
	Are any of the external wiring cables frayed?	No external abnormalities	Visual inspection
Product service life	Contact output relay	Electrical: Resistance load: 150,000 operations Inductive load: 100,000 operations Mechanical: 20,000,000 operations	---
	Battery (CPM2C-BAT01)	2 years at 25°C	---

Note Power supply voltage range:

Power supply	Allowable voltage fluctuation range
100 to 240 VAC (CPM2C-PA201 only)	85 to 264 VAC
24 VDC	20.4 to 26.4 VDC

Required Tools

Standard Tools (Required)

- Screwdrivers (Phillips and flat-blade)
- Voltage tester or digital voltage meter
- Industrial alcohol and a cotton cloth

Measurement Devices (May be Needed)

- Synchroscope
- Cathode-ray oscilloscope
- Thermometer, hygrometer

Note Do not attempt to disassemble, repair, or modify the PC in any way.

5-7 Battery Replacement

⚠WARNING The backup battery may explode, catch fire, or leak if dropped, broken apart, crushed, short-circuited, recharged, heated to 100°C or higher, or burned.

If power has not been supplied to the PC for some time, turn ON the power supply for at least 5 minutes to charge the backup capacitor before replacing the battery.

Turn OFF the power supply to the PC before replacing the battery. To prevent memory loss when replacing the Battery for a CPU Unit with a clock, complete Battery replacement within 5 minutes. (CPU Units without a clock will hold memory for 10 days (at 25°C) using a super capacitor.)

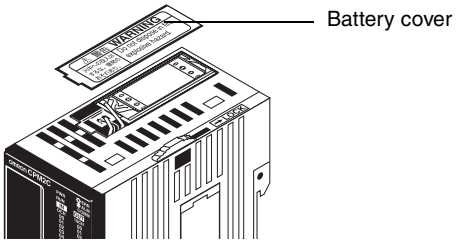
A label has been included to remind the user when the battery needs to be replaced. After replacing the battery, write the next date that the battery should be replaced on the label and affix the label in a visible place such as the inside of the communications port cover.

Be sure to dispose of the old battery in accordance with local laws and regulations.

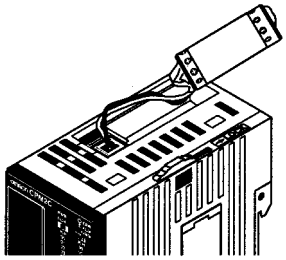
A CPM2C-BAT01 Backup Battery is built into CPU Units that are equipped with an internal clock. Replace the battery within two years when used under 25°C. When the battery voltage drops, the ERR/ALM indicator will flash and SR 25308 will be turned ON. (Refer to page 197.) In this case, replace the battery within seven days. Use the procedure below when replacing the battery.

1,2,3...

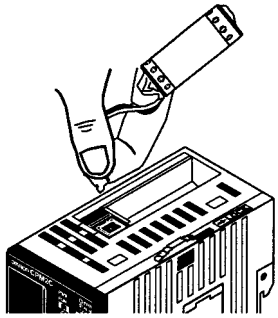
1. Stop CPM2C operation and turn OFF the power supply.
2. Remove the battery cover with a flat-blade screwdriver.



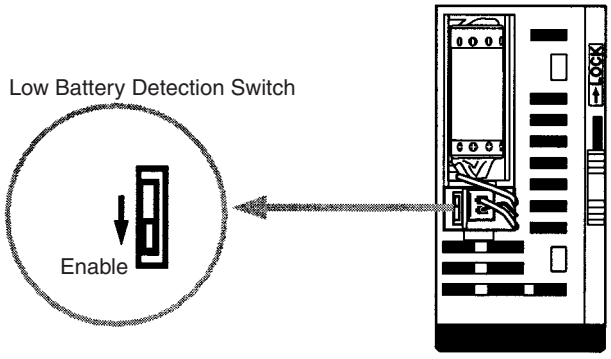
3. Remove the battery and disconnect the battery connector.



4. Install the new battery. Be sure that the connector is aligned correctly and the wires are not pinched or kinked when the battery is inserted.



5. To enable the detection of low battery errors, slide the Low Battery Detection Switch towards the front of the Unit and set bits 12 to 15 of DM 6655 to “0.”



6. Replace the battery cover.
7. Write the next date that the battery should be replaced on the reminder label. The battery lifetime of the CPU Unit with clock is 2 years at 25°C and that of the CPU Unit without clock is 5 years at 25°C.

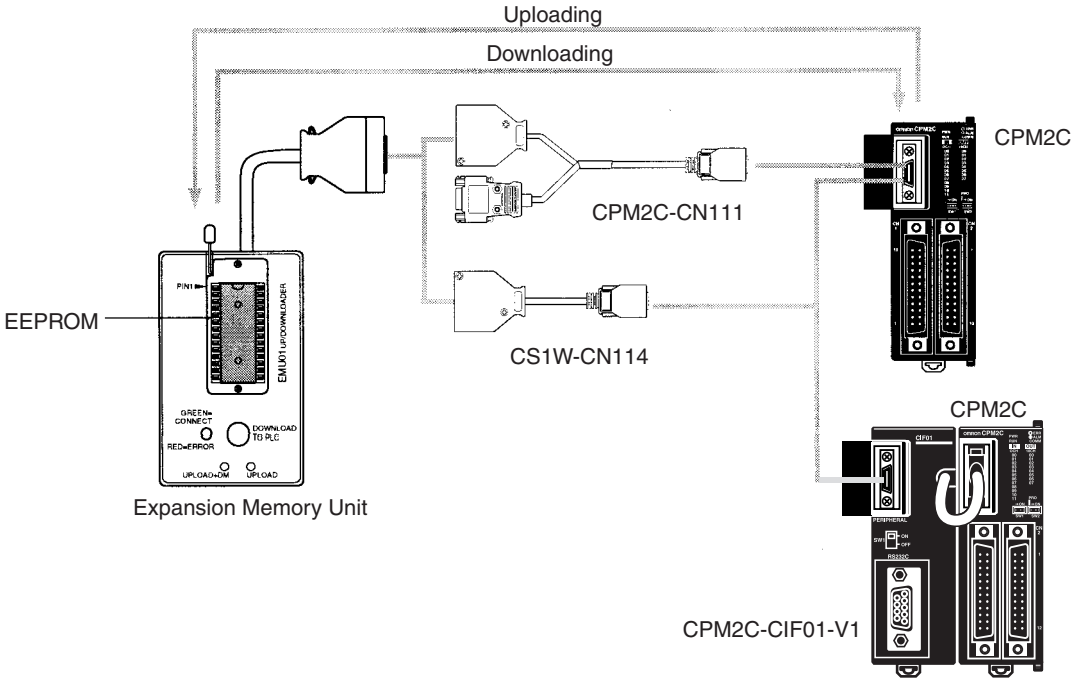
SECTION 6
Expansion Memory Unit

This section describes how to use the CPM1-EMU01-V1 Expansion Memory Unit. Follow the handling precautions and procedures to properly use the Unit.

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6-3-1 Mounting/Removing EEPROM 214
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6-1 Overview

The CPM1-EMU01-V1 Expansion Memory Unit is a program loader for small-size or micro PCs. Using the CPM1-EMU01-V1, simple on-site transfer of user programs and data memory between PCs is possible.



Note The "PLC" in the "DOWNLOAD TO PLC" Button indicates PCs (Programmable Controllers).

6-1-1 Memory Areas

The memory areas that are uploaded or downloaded vary with the button used as shown in the following table.

Button	UPLOAD + DM	UPLOAD	DOWNLOAD TO PLC
Ladder program and expansion instructions	Read from PC to EEPROM.	Read from PC to EEPROM.	All contents of EEPROM written to PC.
DM 6144 to 6655		Not affected.	

Note For details on program size, DM area, and the availability of expansion instructions, refer to the relevant PC manual.

6-1-2 Precautions

- Do not attempt to use the CPM1-EMU01-V1 for any applications other than those described here. Doing so may result in malfunction.
- Do not attempt to upload or download data between different types of PC. Doing so may result in malfunction.
- Do not download when the PC is in RUN or MONITOR mode. If downloading is performed when the PC is running, it will automatically switch to PROGRAM mode and operation will stop.
- Do not attempt to disassemble, repair, or modify the CPM1-EMU01-V1. Any attempt to do so may result in malfunction, fire, or electric shock.

- After downloading has been completed, be sure to confirm the user program, data, and expansion instruction information. Not doing so may result in faulty operation.
- Before touching the EEPROM or the CPM1-EMU01-V1, first touch a grounded metallic object to discharge any static build-up. Not doing so may result in malfunction or damage.

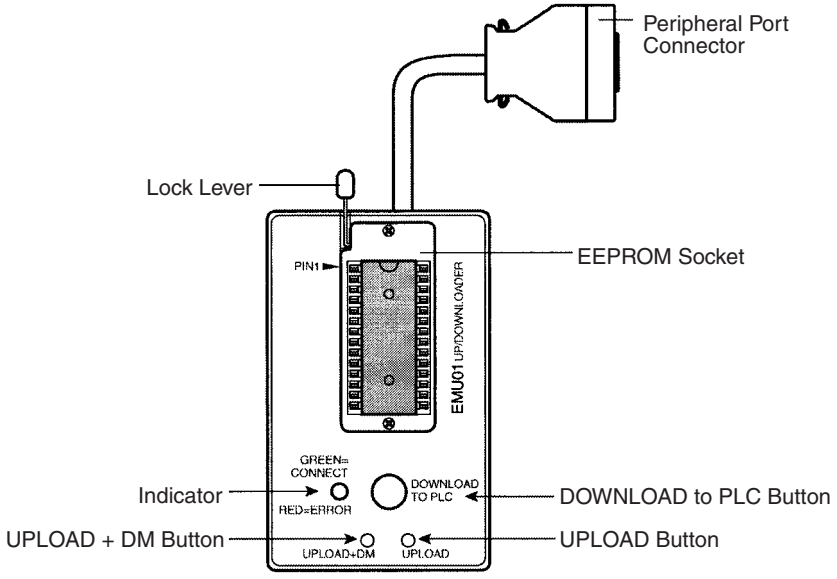
6-2 Specifications and Nomenclature

6-2-1 Specifications

Item	Specifications
Supported PCs	CPM1, CPM1A, CPM2A, CPM2C, SRM1 (-V2), CQM1, CQM1H
Read/Write memory areas	User program: 15.2 Kwords max. Data memory: DM 6144 to DM 6655 (Read-only DM and PC Setup) Expansion instructions: 18 instructions
Connector	Connector compatible with CPM1, CPM1A, CPM2A, SRM1 (-V2), and CQM1 PCs. For CPM2C and CQM1H PCs, connect via CS1W-CN114 or CPM2C-CN111 Connecting Cable.
Communications setting	1 start bit, 7 data bits, even parity, 2 stop bits, 9,600 bps
EEPROM (See note 1.)	256-Kbit EEPROM ATMEL:AT28C256-15PC OMRON:EEROM-JD
Current consumption	129 mA max.
Dimensions	Main body (not including cables or connectors): 57 × 92 × 38 mm (W × H × D)
Weight	200 g max. (not including EEPROM)

Note 1. The EEPROM must be purchased separately.
2. For general specifications, refer to the relevant PC manual.

6-2-2 Nomenclature



Lock Lever
For mounting and removing EEPROM.
DOWNLOAD TO PLC Button
Writes all EEPROM data (ladder programs, data memory etc.) to the PC.
UPLOAD + DM Button
Reads PC user program and contents of DM 6144 to DM 6655 to EEPROM.
UPLOAD Button
Reads only PC user program to EEPROM.

Note The “PLC” in the “DOWNLOAD TO PLC” Button indicates PCs (Programmable Controllers).

LED Indicator

CONNECT (green)	ERR (red)	Meaning
OFF	OFF	Not connected to PC (power supply OFF).
ON	OFF	Connected to a recognized PC.
Blinking	OFF	Uploading/downloading data.
ON	Blinking	Host link communications error, retry by user.
OFF	ON	PC model and EEPROM data not compatible.
OFF	Blinking	One of the following errors has occurred: An unrecognized PC is connected. An EEPROM error (EEPROM not present, EEPROM defect, or no program to download) or checksum error.

6-3 Handling

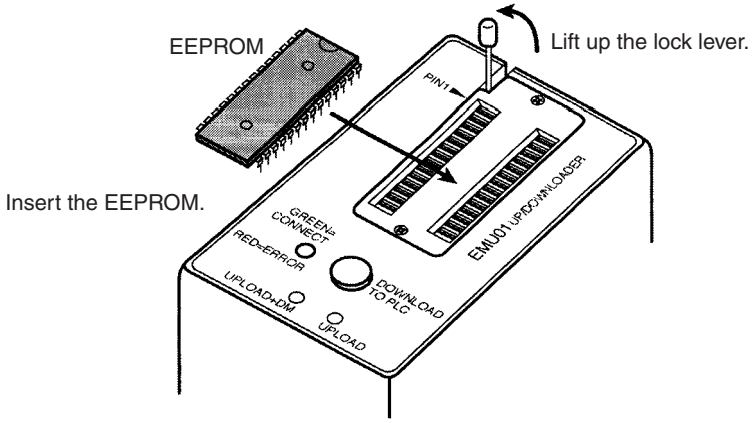
6-3-1 Mounting/Removing EEPROM

⚠ **Caution** Do not mount or remove the EEPROM with the CPM1-EMU01-V1 connected to the PC. Doing so may damage the EEPROM.

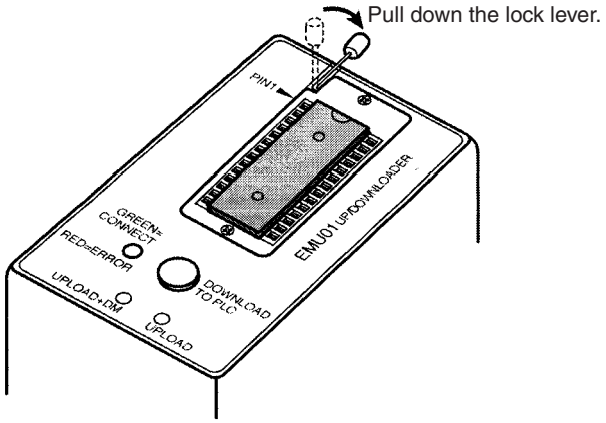
Mounting EEPROM

1,2,3... 1. Lift up the lock lever.

2. Straighten the pins on the EEPROM, line up with the socket and lower into the socket, as shown in the following diagram. If the EEPROM is loose, place it in the center of the socket.



3. Gently hold down the EEPROM and pull down the lock lever.



Removing EEPROM Lift up the lock lever and detach the EEPROM.

6-3-2 PC Connections

⚠ Caution Mount the EEPROM to the CPM1-EMU01-V1 before connecting the CPM1-EMU01-V1 to the PC.

⚠ Caution Do not disconnect the CPM1-EMU01-V1 from the PC when the indicator is blinking green.

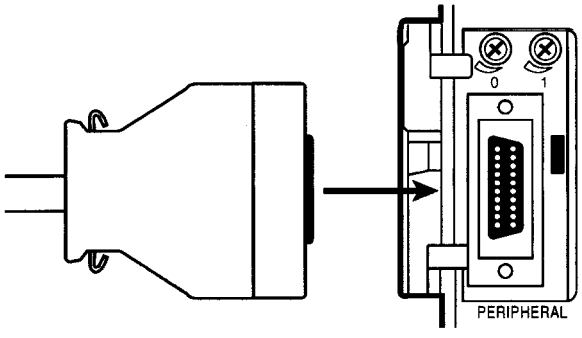
CPM2C and CQM1H PCs When connecting to the CPM2C or CQM1H, connect to the peripheral port via the CPM2C-CN111 or CS1W-CN114 Connecting Cable. Also, set the pins on the CPU Unit's DIP switch as follows:

CPM2C	Pin 1: ON (see note)
CQM1H	Pin 5: ON (see note)

Note If pin 1 on the CPM2C or pin 5 on the CQM1H is OFF, connection is still possible if the peripheral port is set to the defaults.

CPM1, CPM1A, CPM2A, CQM1, and SRM1 (-V2) PCs When connecting to the CPM1, CPM1A, CPM2A, CQM1 or SRM1 (-V2),insert the connector into the peripheral port making sure that the connector is oriented correctly.

- Insert the connector until it securely locks into place.
- Connections are not possible to the RS-232C port or any other port.



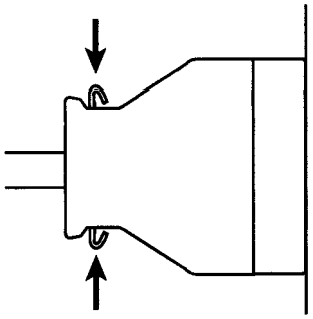
Peripheral Port Communications Settings The peripheral port must be set to the default communications settings shown below.

Start bits: 1

Data bits: 7
Stop bits: 2
Parity: Even
Baud rate: 9,600 bps

Disconnecting

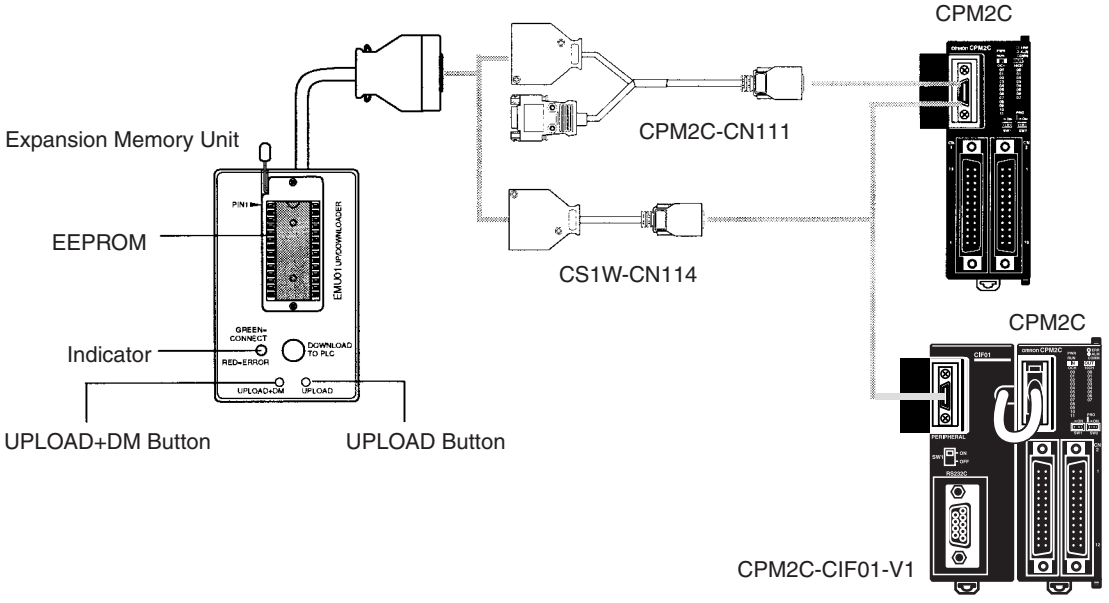
Press the levers on the top and bottom of the connector inwards to unlock the connector and pull out as shown in the following diagram.



Note Do not attempt to remove the connector by pulling the cable.

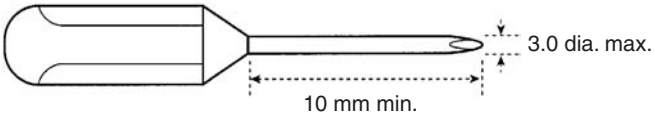
6-3-3 Uploading Programs

Ladder programs and the contents of data memory can be uploaded to the EEPROM using the following procedure. The buttons used will determine whether the contents of data memory are uploaded or not.



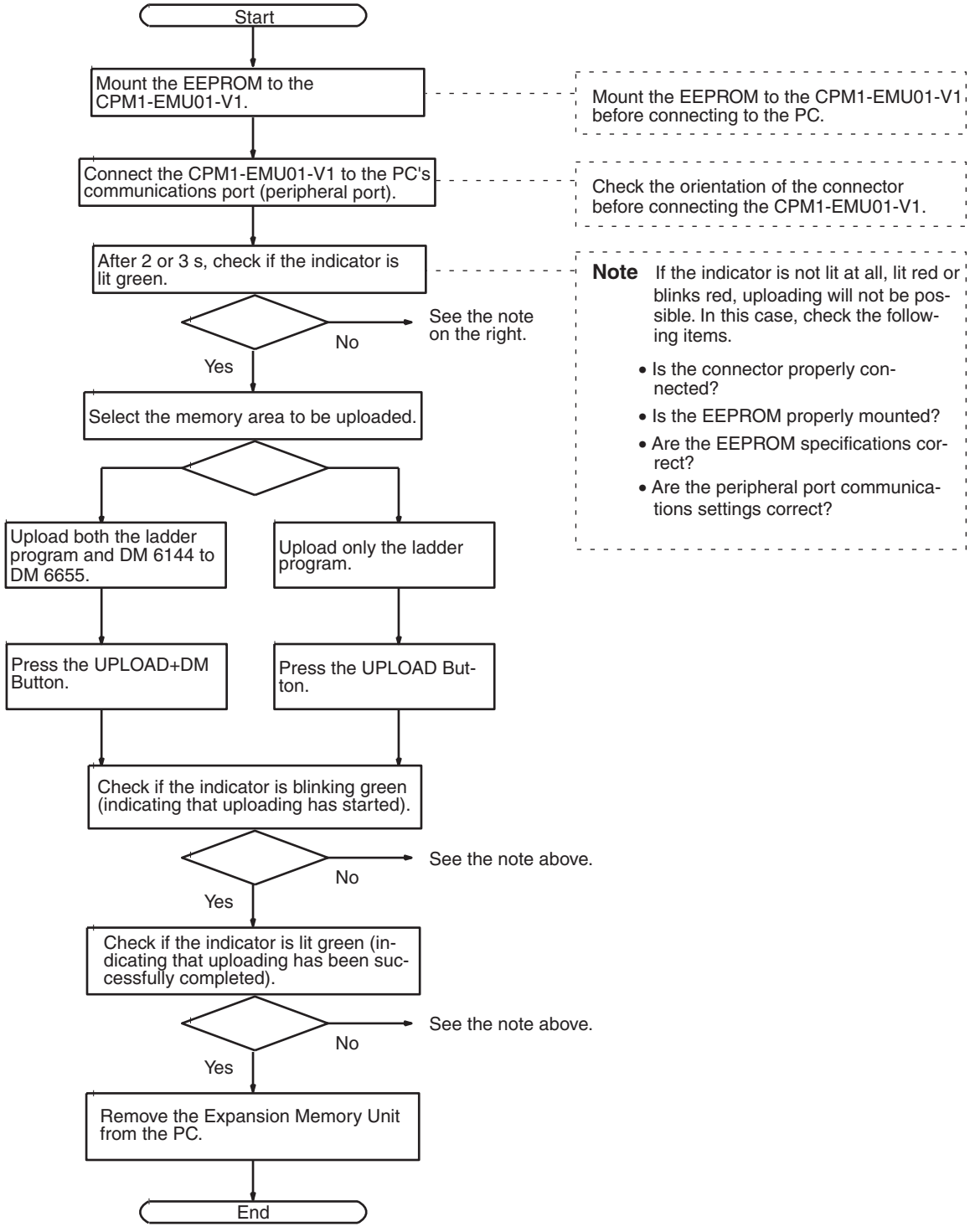
Button	UPLOAD + DM	UPLOAD
Ladder program and expansion instructions	Read from PC to EEPROM.	Read from PC to EEPROM.
DM6144 to 6655		Not affected.

Note Use a Phillips screwdriver or other tool with a diameter of 3.0 mm max. and a blade length of 10 mm min. to press the upload button.



Uploading is possible even if the PC is in RUN or MONITOR mode.

Operation Procedure



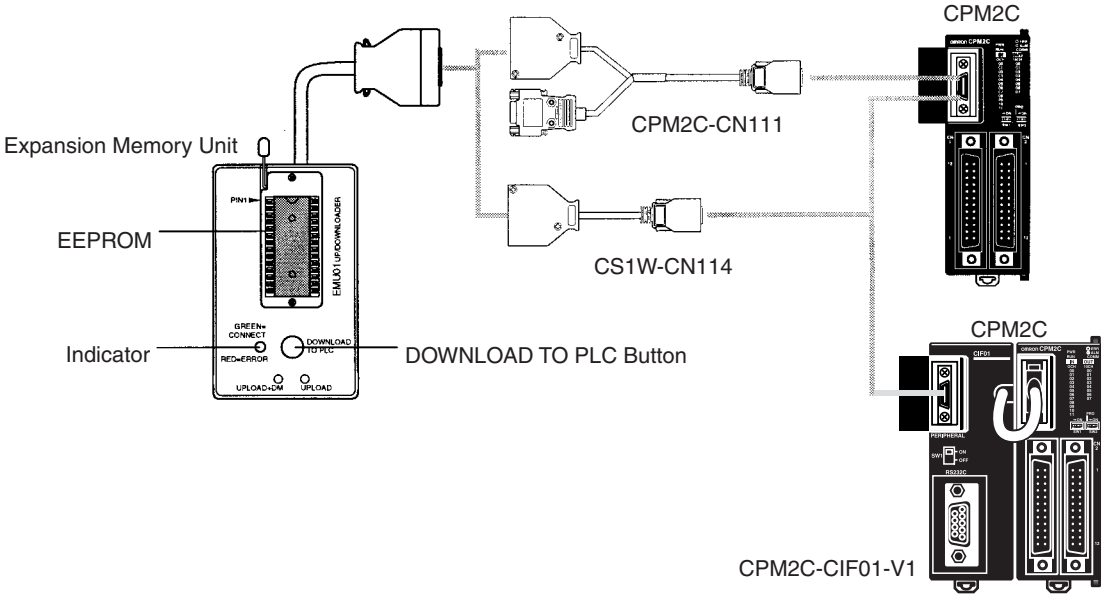
6-3-4 Downloading Programs

Ladder programs and the contents of data memory can be downloaded from the EEPROM to the PC using the procedure given below. When downloading, note the following points.

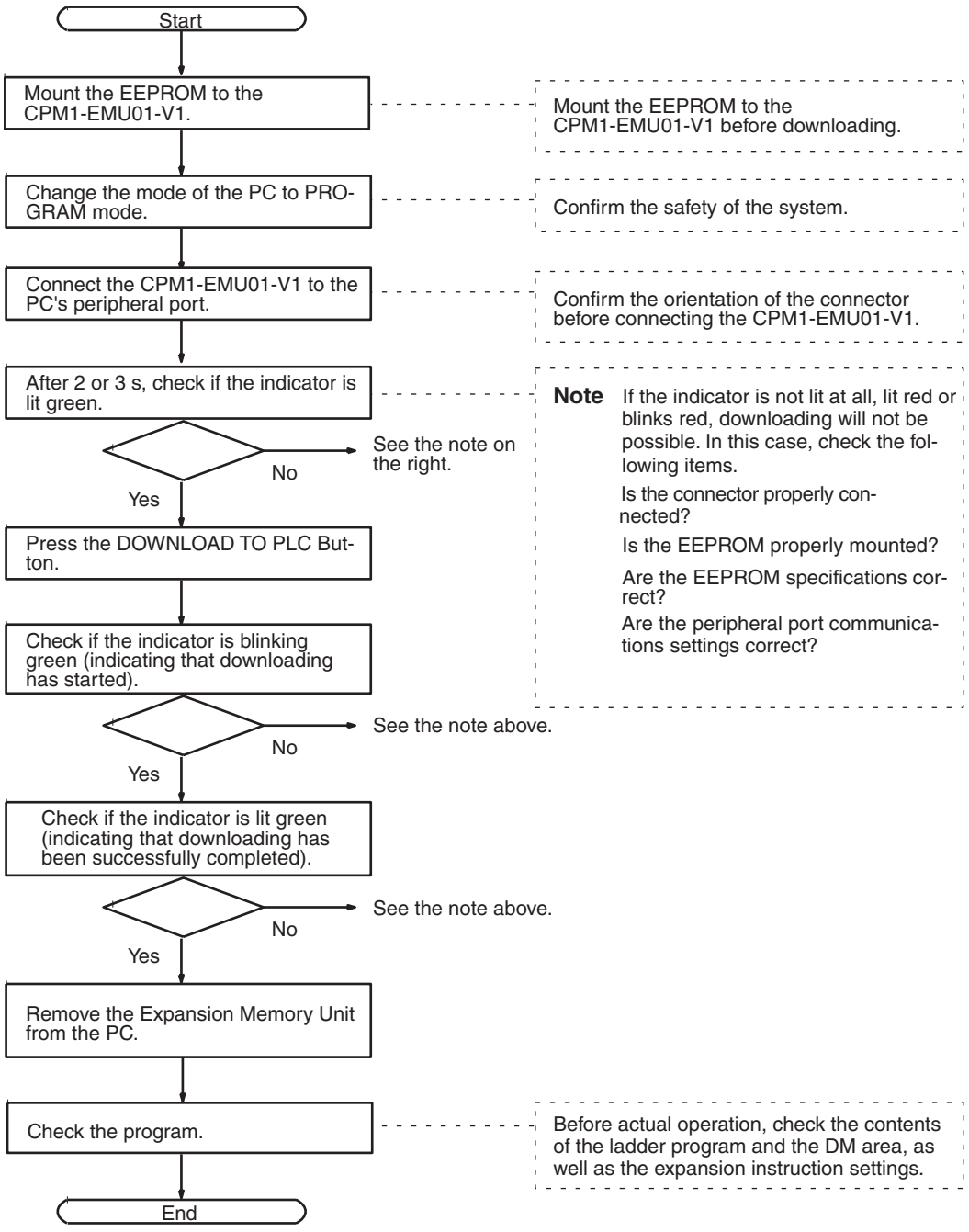
⚠ **Caution** If the PC is in RUN or MONITOR mode when downloading is started, it will automatically switch to PROGRAM mode and operation will stop. Confirm that no adverse effects will occur to the system before downloading. Not doing so may result in unexpected operation.

Note

1. If the PC is in RUN or MONITOR mode, switch the PC mode to PROGRAM mode.
2. Confirm that the program or other data to be downloaded to the PC is compatible with the PC before downloading.
3. For the CQM1 or CQM1H, when downloading programs that use user-assigned function codes for expansion instructions, be sure that pin 4 on the CPU Unit's DIP switch is ON. If these programs are downloaded while the pin is OFF, the assignments for the expansion instructions will return to their default settings.
4. After downloading has been completed, be sure to confirm the user program, data, and expansion instructions.
5. When the DOWNLOAD TO PLC Button is pressed, all EEPROM data (ladder programs, data memory etc.) is written to the PC.



Operation Procedure



SECTION 7
Simple Communications Unit

This section describes the features and functions of the CPM2C-CIF21 Simple Communications Unit, the settings required to use the Unit, and an example application. *DM Settings Assignment Sheets* are provided in Appendix C to record data settings.

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7-1 Introduction

7-1-1 Features

Easily Transfer Data between the PC and OMRON Components

Ladder programming is not required to transfer data between the PC (CPU Unit) and supported OMRON components because the Simple Communications Unit exchanges data between the PC's DM area and the OMRON components.

Connect a Wide Variety of Components

Connects OMRON components equipped with CompoWay/F and SYSWAY communications functions including Temperature Controllers, Electronic Timer/Counters, and Digital Panel Meters.

Monitor All of the Components from the PC

The PVs and status of Temperature Controllers, Electronic Timer/Counters, and Digital Panel Meters can be monitored in the PC's DM area, so all of the connected components can be monitored together.

Easily Change Component SVs

Set values in the connected components can be changed just by changing the corresponding value in the PC's DM area.

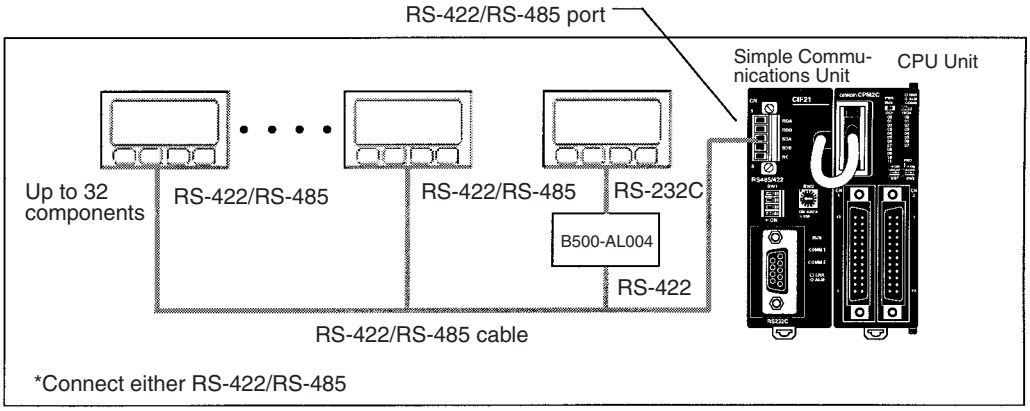
Connect up to 32 Components

Components can be connected with unit numbers 0 to 31.

7-1-2 System Configuration

Component Connections

The following diagram shows how to connect OMRON components to the CPM2C CPU Unit through the CPM2C-CIF21 Simple Communications Unit. The Simple Communications Unit uses the CPU Unit's peripheral port to transfer data with the connected components. Use the Simple Communications Unit's RS-232C port to connect a PT or computer to the CPM2C's CPU Unit.



Top port	Signal conversion	Changes levels between CMOS (CPU Unit) and RS-422 (general-purpose communications components). RS-422 (general-purpose communications components) insulated using DC/DC converter or photocoupler.
	Function	Conversion between CPU Unit and Host Link General-purpose communications components are CompoWay/F or SYSWAY components, which support general-purpose serial communications.

Bottom port	Signal conversion	Outputs the RS-232C interface directly from the CPU Unit.
	Function	Host Link, no-protocol, 1:1 link, or 1:1 NT Link

Note 1. The CPM2C-CIF21 can be used only with the CPM2C.

2. Up to 32 OMRON components can be connected.

Supported Components The following table shows the OMRON components equipped with CompoWay/F or SYSWAY communications functions that can be connected to the CPM2C-CIF21.

Product name	Series name	Model number	SYSWAY		CompoWay/F connection	Comments
			Connection	Segment info. (See note 5.)		
Temperature Controllers	Temperature Controllers	E5GN	OK	1	OK	---
		E5CN	OK	1	OK	---
		E5EN	OK	1	OK	---
		E5AN	OK	1	OK	---
	Digital Controllers, Standard Models	E5CK	OK	1	No	---
		E5EK	OK	1	No	---
		E5AK	OK	1	No	---
	Digital Controllers (Valve Control)	E5EK	OK	1	No	Valve system communications are not supported.
		E5AK	OK	1	No	
	Digital Controllers (Programmable)	E5CK-T	No	---	No	---
		E5EK-T	No	---	No	---
		E5AK-T	No	---	No	---
	Digital Controllers (Programmable, Valve Control)	E5EK-T	No	---	No	---
		E5AK-T	No	---	No	---
	Temperature Controllers	E5EJ	OK	1	No	---
		E5AJ	OK	1	No	---
	Fuzzy Temperature Controller	E5AF	OK	1	No	---
	Modular Temperature Controller	E5ZN	No	---	OK	---
	Digital Controller Board	E5ZM	No	---	OK	---
Timers	Electronic Timer/ Counter	H8GN	No	---	OK	---
Digital Panel Meters	Digital Panel Meter	K3GN	No	---	OK	---
	Process Meter	K3NX	Limited functions	2	Limited functions	Some commands cannot be used. Only the CompoWay/F variable area can be read. (See note 3.)
	Weighing Meter	K3NV	Limited functions	2	Limited functions	
	Frequency/Rate Meter	K3NR	Limited functions	2	Limited functions	
	Period Meter	K3NP	Limited functions	2	Limited functions	
	Up/Down Counting Meter	K3NC	Limited functions	2	Limited functions	
	Temperature Meter	K3NH	Limited functions	2	Limited functions	
	Intelligent Signal Processor	K3TS	Limited functions	2	No	SYSWAY connection only (See note 2.)

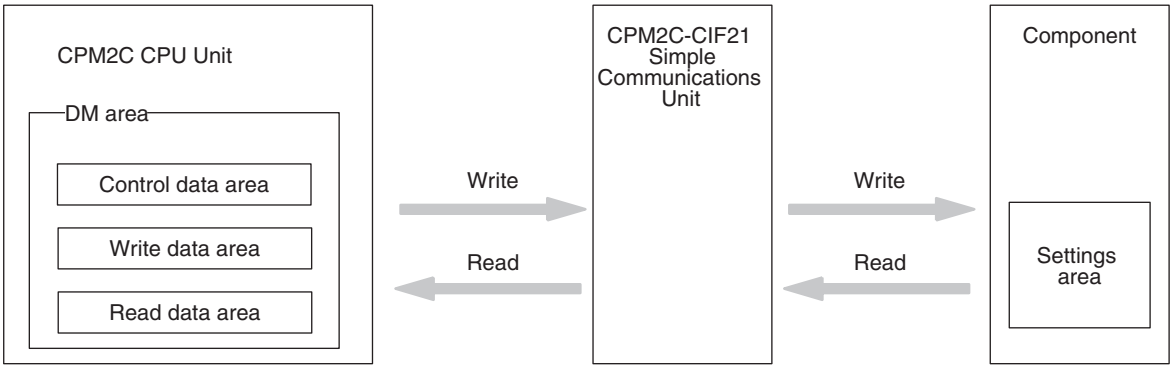
Note 1. Components that support only host link or CompoWay/F communications must be connected with that communications protocol.

2. When a K3TS is connected, connect the other components by SYSWAY as well. The K3TS cannot be combined with components that communicate by CompoWay/F communications.
3. With CompoWay/F communications for some Digital Panel Meters, unlike Temperature Controllers and Timers, present values and set values are stored in BCD format. (These values are stored in binary format with Temperature Controllers.)
4. There are some SYSWAY commands that are not supported by OMRON components. Refer to the User's Manual for the component and confirm the contents of CPM2C-CIF21 command groups before using SYSWAY communications.
5. SYSWAY communications must be set to indicate whether Temperature Controllers or Digital Panel Meters are connected. Refer to page 241 for the setting method.

7-1-3 Processing Component Data

Data Processing Basics

Reading and writing are performed cyclically when the Read and Write Command Bits are ON.



Interface between the Simple Communications Unit and the CPU Unit

The Simple Communications Unit interfaces with the CPU Unit through the CPU Unit's DM area using the CPU Unit's peripheral port.

Interface between the Simple Communications Unit and the Components

The Simple Communications Unit interfaces with the OMRON components by transferring data with SYSWAY or CompoWay/F communications.

Differences between SYSWAY and CompoWay/F

Data can be written between the Simple Communications Unit and OMRON components with host link or CompoWay/F communications. The methods used to read and write data are different in these communications protocol. (Some components are not limited to just one of these protocols.)

SYSWAY Communications

When SYSWAY communications are being used, there are 5 possible variable groups. Select the variable group of the data that will be transferred.

Also, the type of component being connected (Temperature Controller Unit or Digital Panel Meter) must be set when using SYSWAY communications. Different variables are transferred with Temperature Controller Units and Digital Panel Meters.

CompoWay/F Communications

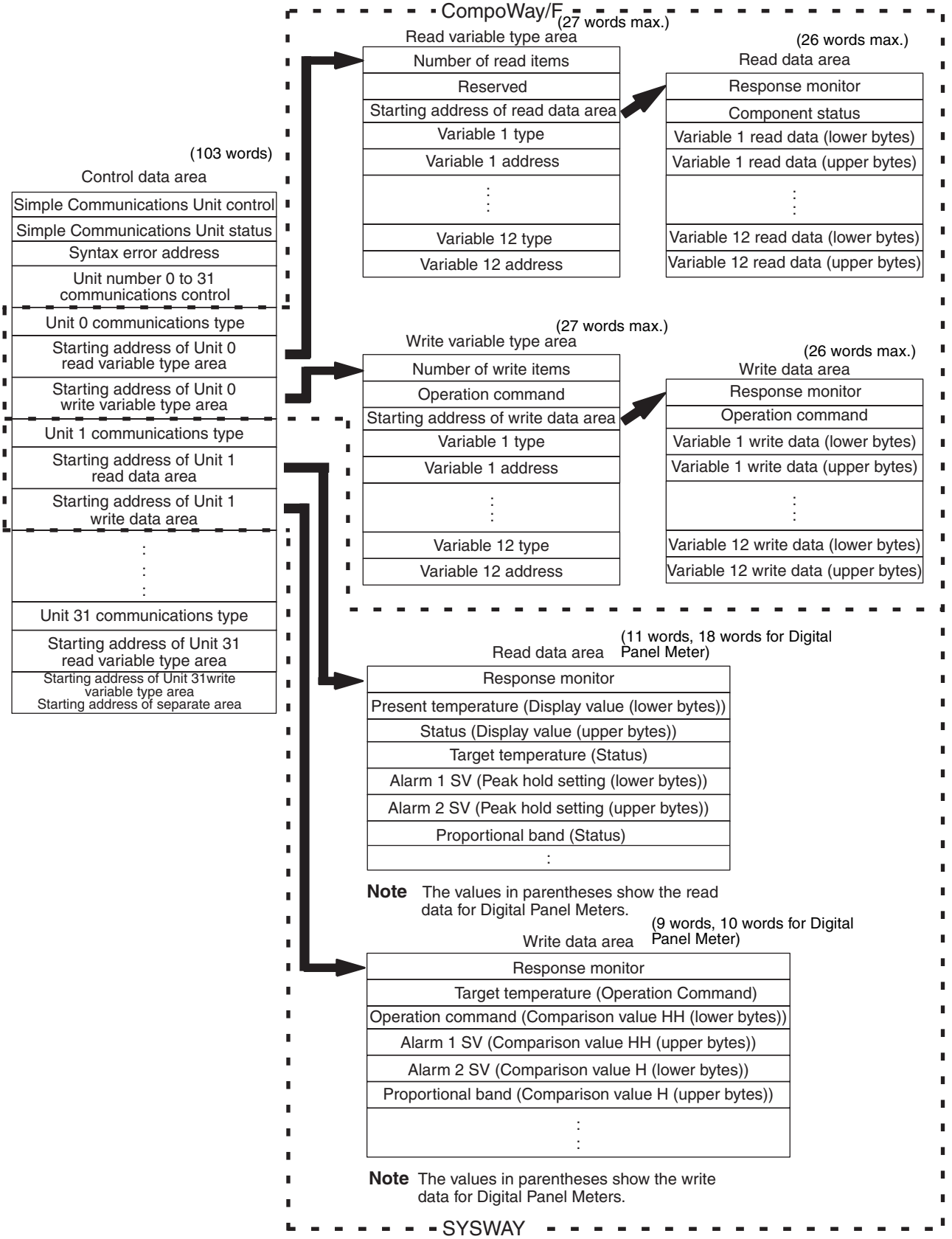
When CompoWay/F communications are being used, the variables that will be transferred must be registered beforehand one-by-one. Register the vari-

ables that you want to write/read in the write variable type area and read variable type area.

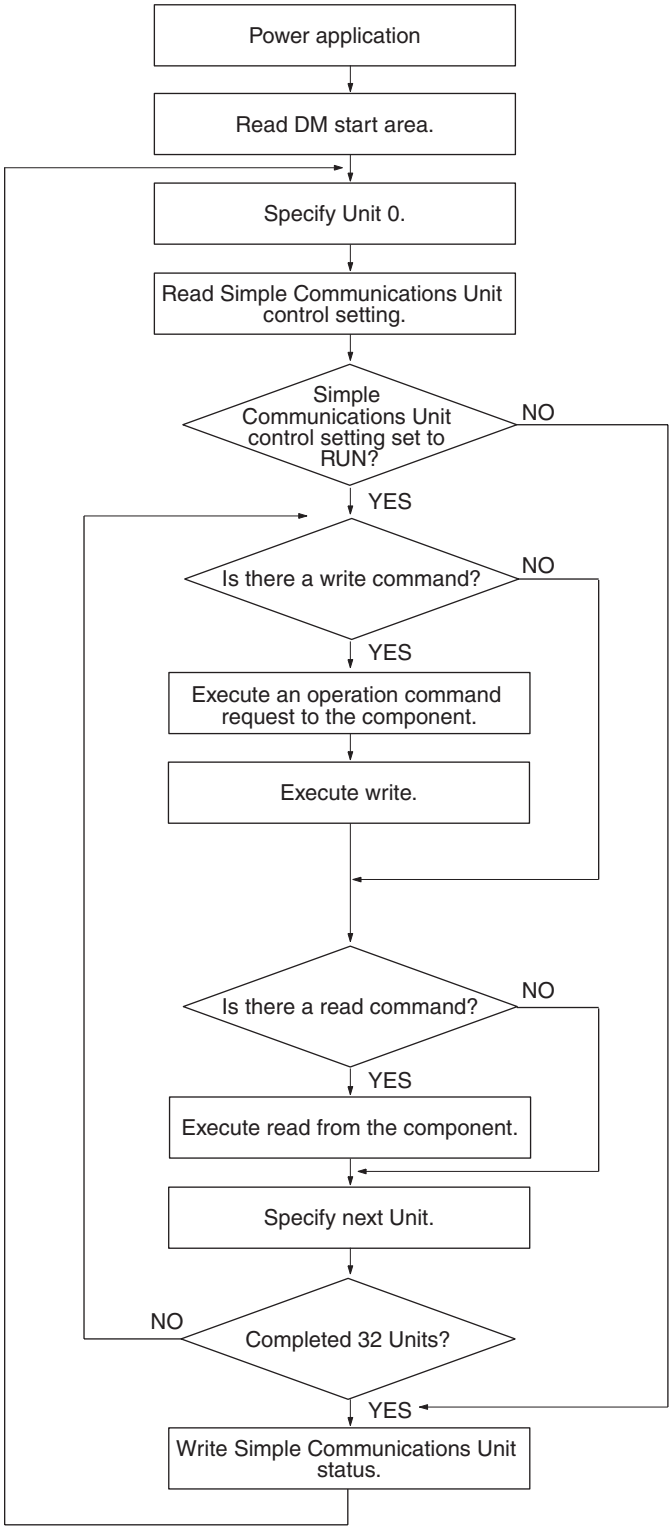
When CompoWay/F communications are being used, only these registered variables can be written and read.

Data Memory Structure

The following diagram shows the structure of the DM area used for communications through the Simple Communications Unit.



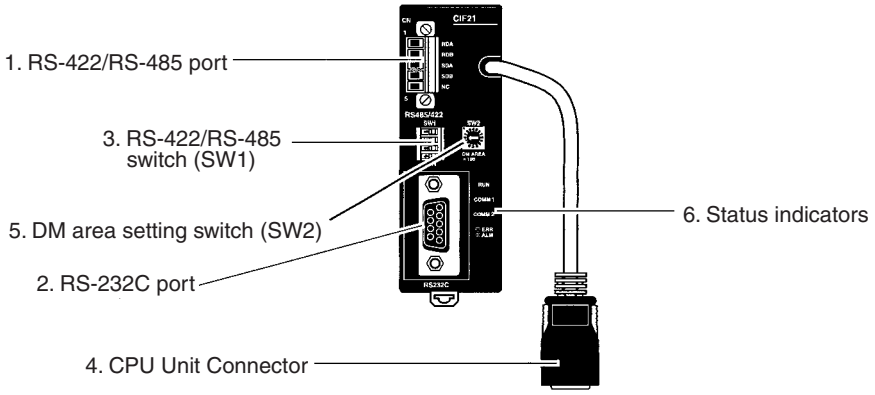
Flow of Data Processing The following flowchart shows the flow of data processing.



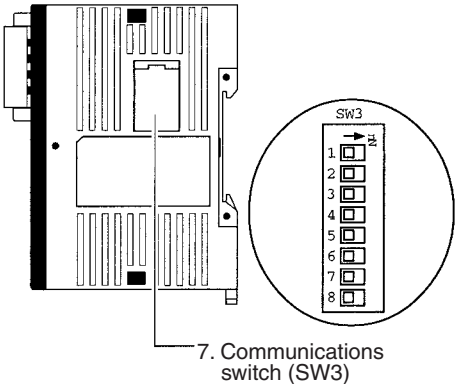
7-2 Unit Components and Functions

The following diagram shows the major components of the Simple Communications Unit.

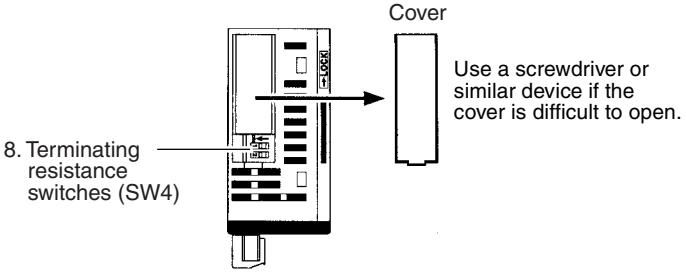
Front View



Side View



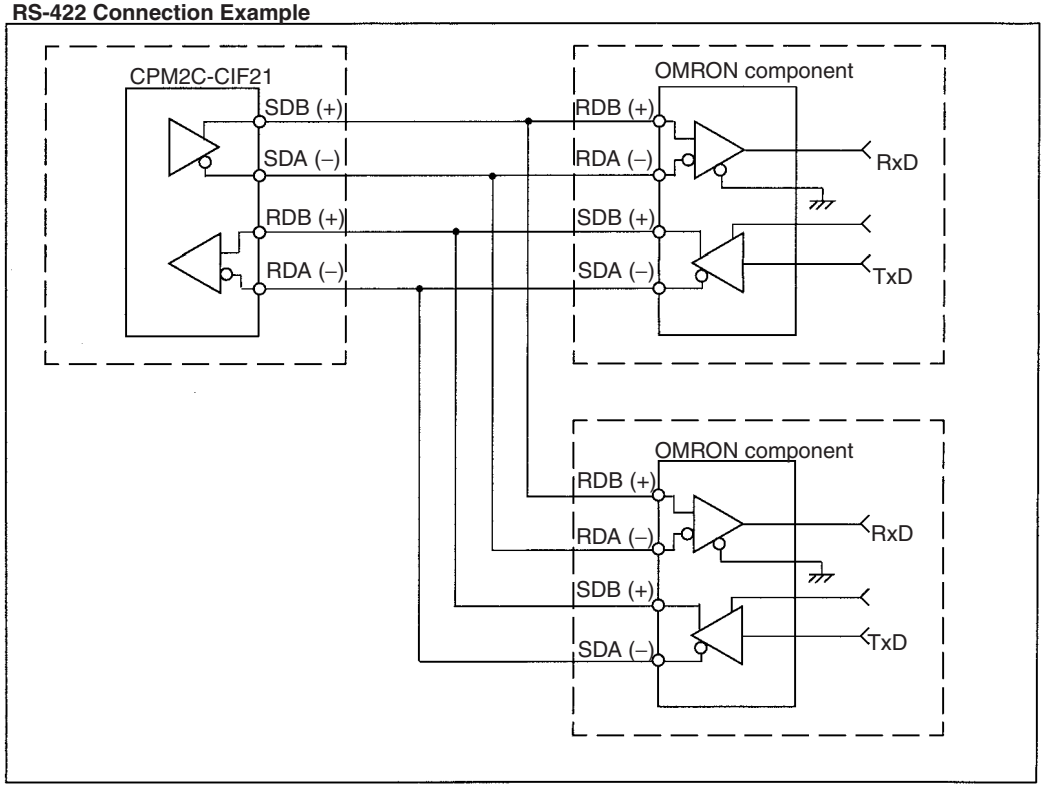
Top View



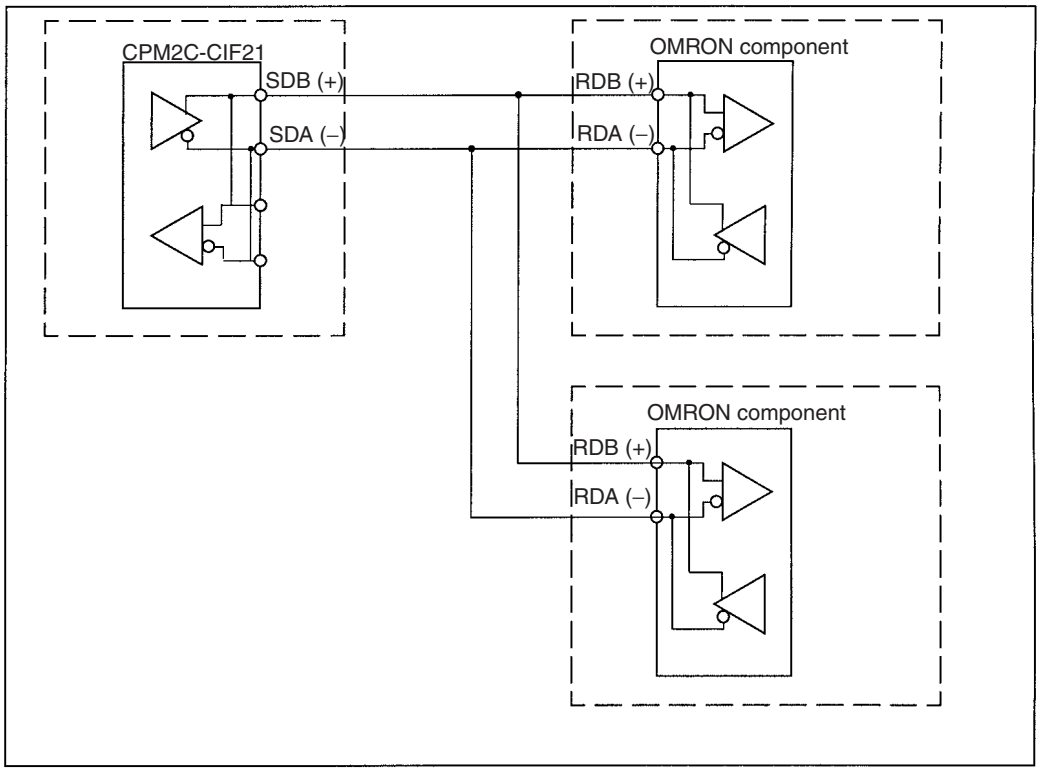
1,2,3... 1. RS-422/RS-485 Port

Connects to Temperature Controllers, Electronic Timer/Counters, and Digital Panel Meters.

RS-422 Connection Example

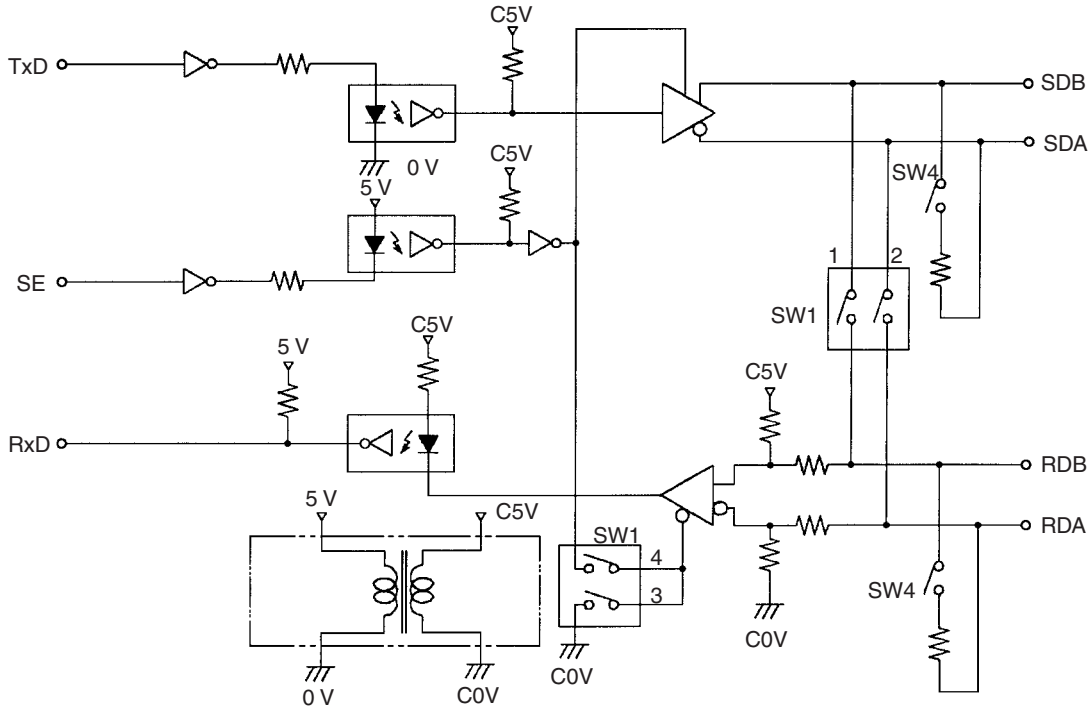


RS-485 Connection Example



Note RS-422 and RS-485 communications cannot be used together.

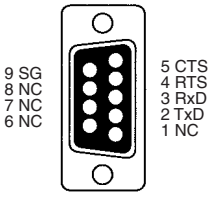
RS-422 Interface Block Diagram



2. RS-232C Port

Outputs the CPU Unit's RS-232C port interface. Connects to an RS-232C interface on a computer, PT (Programmable Terminal), etc.

Pin Assignments

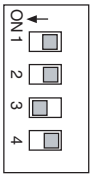


3. RS-422/RS-485 Switch (SW1)

Switches the RS-485 interface and sets RS/CS controls for the RS-485 interface.

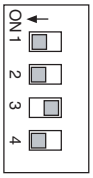
RS-422 Setting

SW1



RS-485 Setting

SW1

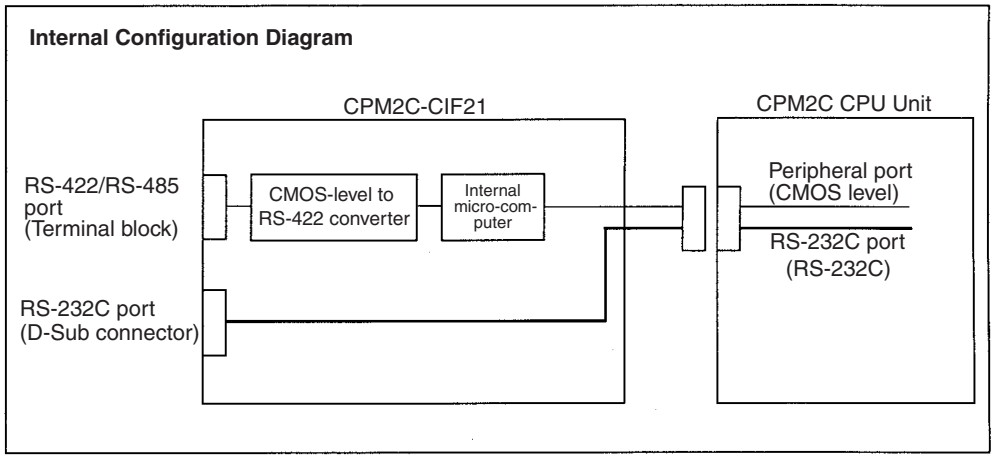


Pin on SW1	RS-422	RS-485
1	OFF	ON
2	OFF	ON
3	ON	OFF
4	OFF	ON

Note Do not turn ON both SW1-3 and SW1-4 at the same time. Doing so will destroy internal circuits. The default setting is for RS-485.

4. CPU Unit Connector

   Connects to CPU Unit communications port.

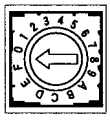


Note Do not mount or remove connectors for the CPU Unit while power is supplied. Normal communications may not be possible and devices may malfunction.

5. DM Area Setting Switch (SW2)

   Sets the starting word in the DM Area that is used to exchange data between the Simple Communications Unit and CPU Unit. The following table shows the relationship between the rotary-switch setting and starting DM Area word.

SW2



Setting	Starting word in DM Area
0	DM 0000
1	DM 0100
2	DM 0200
3	DM 0300
4	DM 0400
5	DM 0500
6	DM 0600
7	DM 0700
8	DM 0800
9	DM 0900
A	DM 1000
B	DM 1100
C	DM 1200
D	DM 1300
E	DM 1400
F	DM 1500

6. Status Indicators

Indicate the operating status of the Simple Communications Unit.

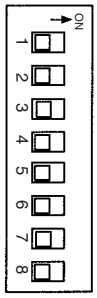
Label	Status	Meaning
RUN	Lit	Communications established between Simple Communications Unit and CPU Unit. Simple Communications Unit operating.
	Not lit	Simple Communications Unit not operating.
	Flashing	Communications between Simple Communications Unit and CPU Unit either not established or interrupted.
ERR/ALM	Lit	Fatal error occurred. (See note a.)
	Flashing	Non-fatal error occurred. (See note b.)
	Not lit	Unit operating normally.
COMM1	Flashing	Transferring data between Simple Communications Unit and CPU Unit
	Not lit	Not transferring data
COMM2	Flashing	Transferring data between Simple Communications Unit and connected components
	Not lit	Not transferring data

Note a) Fatal errors will stop Unit operation. Remove the cause of the error and then turn the power supply OFF and back ON.

b) Even non-fatal errors will stop Unit operation. Normal operation will continue if the cause of the error is remove or if Unit operation is specified from a Programming Device.

7. Communications Switch (SW3)

Sets the baud rates and frame formats for communications between the Simple Communications Unit and the CPU Unit/components. Remove the cover on the side of the Unit to access SW3.



All pins are turned OFF at the factory.

Pin	Setting		OFF	ON
1	Baud rate with CPU Unit (See note 2.)		9,600 bps	19,200 bps
2	Baud rate with components	Normal	9,600 bps	19,200 bps
		High-speed	38,400 bps	57,600 bps
3	Data length with components (See note b).)		7 bits	8 bits
4	Parity 1 setting with components		Yes	None
5	Parity 2 setting with components		Even	Odd
6	Stop bits with components		2	1
7	Not used. (Always leave pin 7 OFF.)		Leave OFF.	---
8	Component communications speed		Normal	High-speed

Note a) All pins are set to OFF at the factory. (The default communications method is normal communications.)

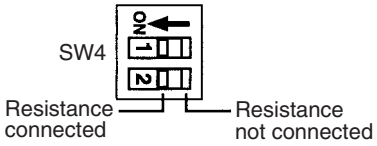
b) Pins 3 to 6 on SW3 are used to set communications between general-purpose communications components and the Simple Communications Unit.

c) Turn OFF pin 7 on SW3. Operation may not be correct if this pin is turned ON.

d) The communications conditions with the CPU Unit are fixed to the following: Data length: 7 bits; Parity: Even; Stop bits: 2.

8. Terminating Resistance Switches (SW4)

Turn ON both SW4-1 and SW4-2 if the Simple Communications Unit is at the end of the RS-422/RS-485 transmission path. Remove the cover on the top of the Unit to access SW4. If the cover is difficult to remove, use a flat-blade screwdriver or similar tool.



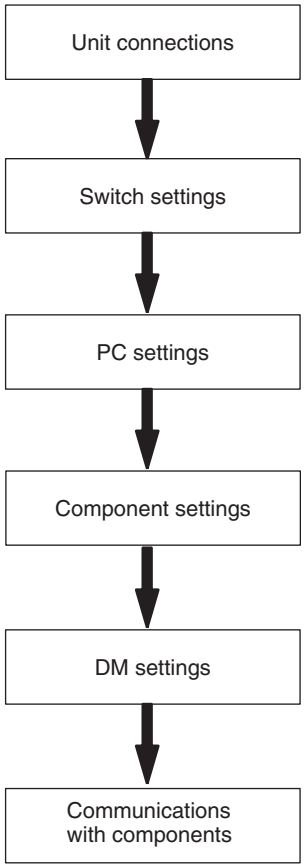
SW4-1	SW4-2	Function
ON	ON	Terminating resistance connected.
OFF	OFF	Terminating resistance disconnected.

Note a) Both pins are set to OFF at the factory.

b) Terminating Resistance
RS-422: 235 Ω (combined resistance must be 110 Ω min)
RS-485: 118 Ω (combined resistance must be 54 Ω min)

7-3 Preparation for Operation

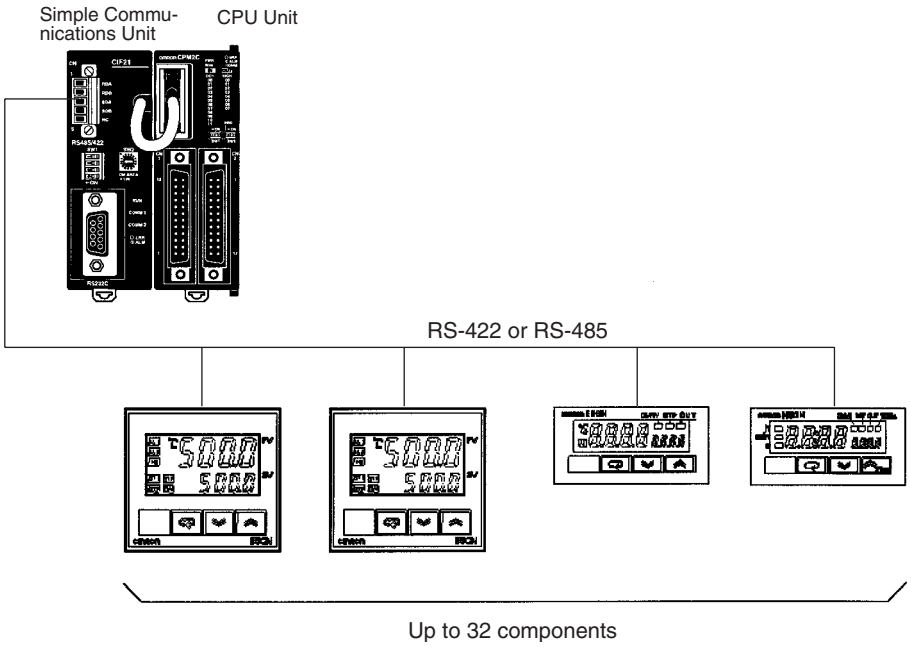
This section describes the procedures to prepare for communications.



7-3-1 Unit Connections

Connect the Simple Communications Unit to the PC's CPU Unit. Power is supplied from the CPU Unit to the Simple Communications Unit through the communications cable.

Connect components through their RS-422 or RS-485 interfaces. Up to 32 components can be connected.



When the CPM2C-CIF21 Simple Communications Unit is connected to the CPU Unit, a computer or Programmable Terminal can be connected to the RS-232C port on the front of the CPM2C-CIF21. A Programming Console cannot be connected while the CPM2C-CIF21 is being used because the CPM2C-CIF21 occupies the peripheral port.

7-3-2 Switch Settings

RS-422/RS-485 Switch (SW1)

This switch determines whether components are connected to the Simple Communications Unit through an RS-485 interface or RS-422 interface. When the RS-485 interface is being used, set SW1-3 OFF and SW1-4 ON so that data is received continuously.

The following table shows the factory default (RS-485) settings.

SW1 pin	Default setting	Function
1	ON	RS-485 interface (2-wire communications)
2	ON	
3	OFF	Reception permitted after sending of data is completed
4	ON	

DM Area Setting Switch (SW2)

Sets the starting word of the range DM Area words used to exchange data between the Simple Communications Unit and CPU Unit. Rotary switch settings 0 to F correspond to starting DM Area words DM 0000 to DM 1500. (The starting word is set in 100-word steps.)

The following table shows the factory default setting.

Setting	Starting word in DM Area
0	DM 0000

Communications Switch (SW3)

Sets the baud rate for communications between the Simple Communications Unit and the CPU Unit as well as the baud rate and frame format for communications between the Simple Communications Unit and the components. The baud rates and frame format set on SW3 must match the settings in the CPU Unit and components.

In general, set only the baud rate with the CPU Unit and leave the frame format settings set to their defaults (1 start bit, 7 data bits, 2 stop bits, and even parity.)

The following table shows the factory default settings.

Pin	Default setting	Function
1	OFF	Baud rate with CPU Unit (9,600 bps)
2	OFF	Baud rate with components (9,600 bps)
3	OFF	Data length with components (7 bits)
4	OFF	Parity setting with components (enabled)
5	OFF	Parity setting with components (even)
6	OFF	Stop bits with components (2 bits)
7	OFF	Not used. (Leave OFF.)
8	OFF	Component communications speed (normal)

Terminating Resistance Switches (SW4)

Turn ON both SW4-1 and SW4-2 if the Simple Communications Unit is at the end of the RS-422/RS-485 transmission path. The factory default setting is OFF (terminating resistance disconnected) for these switches.

⚠ **Caution** The power must be turned OFF before changing the settings on SW4-1 and SW4-2. Do not touch SW4 when the power is ON because static electricity may cause a malfunction.

7-3-3 PC Settings

Communicating at the Default Baud Rate

Set the CPM2C CPU Unit's Communications Switch and PC Setup as follows when communicating at the default baud rate (9,600 bps) between the Simple Communications Unit and CPU Unit.

Using Standard Port Settings for the RS-232C Port

Turn ON the CPU Unit's Communications Switch to use standard communications settings for the communications port. When this switch is ON, the standard settings are used for communications through the RS-232C port and peripheral port regardless of the PC Setup settings in DM 6645 through DM 6649 and DM 6650 through DM 6654.

Note The peripheral port's Host Link node number must be set to 00. Operation will be disabled if any other value is set.

Using Customized Port Settings for the RS-232C Port

Turn OFF the CPU Unit's Communications Switch to use allow customized communications settings for the communications port. Communications through the RS-232C port are governed by the PC Setup settings in DM 6645 through DM 6649 and communications through the peripheral port are governed by the PC Setup settings in DM 6650 through DM 6654.

Set DM 6650 to 0000 to specify standard host link communications through the peripheral port.

Word	Setting	Function
DM 6650	0000	Use standard Host Link communications settings.

Note The peripheral port's host link node number must be set to 00. Operation will be disabled if any other value is set.

Communicating at 19,200 bps

Set the CPM2C CPU Unit's Communications Switch and PC Setup as follows to communicate at 19,200 bps between the Simple Communications Unit and CPU Unit.

Turn OFF the CPU Unit's Communications Switch to use allow customized communications settings for the communications port. Communications through the RS-232C port are governed by the PC Setup settings in DM 6645 through DM 6649 and communications through the peripheral port are governed by the PC Setup settings in DM 6650 through DM 6654.

Set DM 6650 and DM 6651 as follows.

Word	Setting	Function
DM 6650	0001	Use communications settings in DM 6651.
DM 6651	0304	19,200 bps baud rate, 1 start bit, 7 data bits, 2 stop bits, and even parity

Note The peripheral port's host link node number must be set to 00. Operation will be disabled if any other value is set.

7-3-4 Component Settings

Make the following settings on the components connected to the Simple Communications Unit. Refer to the component's manuals for details on these settings.

Unit Number

Set the component's unit number between 0 and 31. Do not use a unit number that is already set on another component.

Communications Settings

Set the same communications settings that were set for the Simple Communications Unit in *7-3-2 Switch Settings*.

Enable Remote Communications Writing

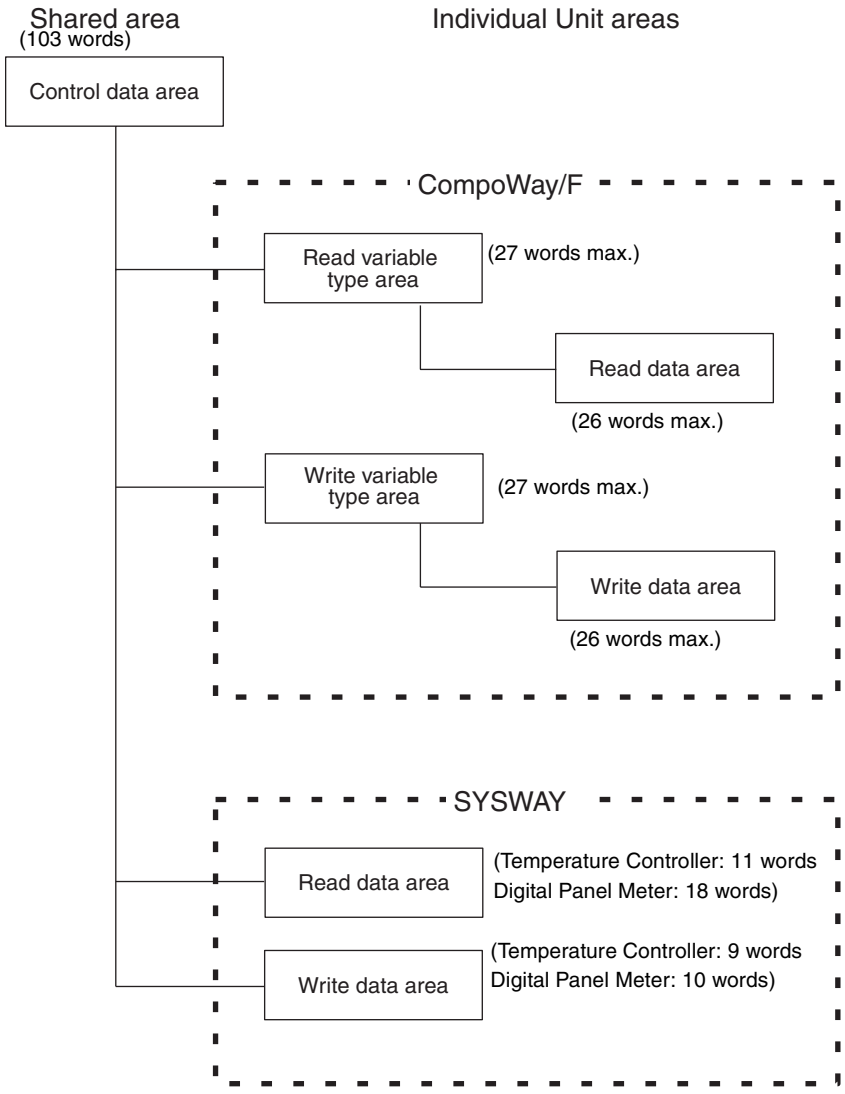
Specify "Enable Communications Writing (Remote)" for the setting mode. If "Disable Communications Writing (Local)" is specified, it won't be possible to change the component's SVs.

Terminating Resistance

Terminating resistance must be set on the component at the end of the RS-422/RS-485 communications cable. Turn on the termination resistance switch on the last component.

7-4 Data Memory (DM) Allocation

The following diagram shows the usage of the Unit's allocated DM words.



7-4-1 Shared Area

The shared area is used to set and monitor values shared by all of the Units (components).

Structure of the Control Data Area

The control data area contains 103 words that are used to control operation of the Simple Communications Unit and monitor the Unit's operating status. **Ensure that there are 103 words available for the Control Data Area regardless of the number of connected Units.** The starting DM address is set with Operation Switch SW2. Refer to *Operation Switch (SW2)* on page 231 for details.

Offset	Function
+0	Simple Communications Unit control
+1	Simple Communications Unit status*1
+2	Syntax error DM address*1
+3	Communications control for Units 0 to 7
+4	Communications control for Units 8 to 15

Offset	Function
+5	Communications control for Units 16 to 23
+6	Communications control for Units 24 to 31
+7	Unit 0 communications type
+8	Starting address of Unit 0 read data area (Starting address of Unit 0 read variable type area*2)
+9	Starting address of Unit 0 write data area (Starting address of Unit 0 write variable type area*2)
+10	Unit 1 communications type
+11	Starting address of Unit 1 read data area (Starting address of Unit 1 read variable type area*2)
+12	Starting address of Unit 1 write data area (Starting address of Unit 1 write variable type area*2)
: :	: :
+100	Unit 31 communications type
+101	Starting address of Unit 31 read data area (Starting address of Unit 31 read variable type area*2)
+102	Starting address of Unit 31 write data area (Starting address of Unit 31 write variable type area*2)

Note
1. These words are used to notify the CPU Unit of the Simple Communications Unit's status.
2. The functions in parentheses are for CompoWay/F communications.

Simple Communications Unit Control (Offset: +0)

Bits	Setting	Range	Function
0 to 3 (Digit 16^0)	RUN/Stop	1: RUN 0: Stop	If this digit is set to 1 after the power is turned ON, the Simple Communications Unit will start communications with components and the CPU Unit. (If a fatal error has occurred, the Unit will not start communications with components even if this digit is set to 1.) The Simple Communications Unit will not communicate with components if this digit is set to 0.
4 to 7 (Digit 16^1)	Communications timeout	0 to 9 (BCD)	Sets the response monitoring time for access from the Simple Communications to connected components. The timeout time is set in multiples of 500 ms ((Set value + 1) × 500 ms). This setting is usually set to 0, which sets a response monitoring time of 500 ms.
8 to 15 (Digits 16^2 and 16^3)	Number of connected components	00 to 32 (BCD)	Specifies the number of components connected to the Simple Communications Unit. The Simple Communications Unit will not communicate with components if the number of connected components is set to 0.

Simple Communications Unit Status (Offset: +1)

Error condition	Bits	Setting	Range	Function
Error occurred (Bit 15 ON)	0 to 7 (Digits 16^0 and 16^1)	Error code	01, 02, or 15	The rightmost 2 digits contain an error code. 01: Watchdog timer error (fatal error) When this error occurs, the Simple Communications Unit will stop all communications and light the ERR indicator after writing the "Simple Communications Unit Status" word. 02: Syntax error (non-fatal error) When this error occurs, the Simple Communications Unit will stop communications with the components and light the ERR indicator after writing the DM address where the error occurred in the "Syntax Error DM Address" word. 15: DM allocation error (fatal error) This error occurs when the Unit attempts to read or write a DM address that does not exist in the CPM2C. After the error occurs, the Simple Communications Unit will stop communications with the components and light the ERR indicator. Check the range of the PC's DM area and keep DM allocation within that range.
	8 to 11 (Digit 16^2)	Stop flag	0	Operation will stop if an error occurs, and this flag will turn OFF.
	12 to 15 (Digit 16^3)	Error flag	8	A value of 8 (bit 15 ON) indicates that a fatal error has occurred in the Simple Communications Unit.
No error occurred (Bit 15 OFF)	0 to 7 (Digits 16^0 and 16^1)	Unit number	00 to 31 (BCD)	Indicates the unit number of the last component with which the communications were completed. The Unit read data from this component and transferred that data to the CPU Unit. These digits contain 00 when the power is first turned ON and communications haven't been completed for any of the components. These digits will also contain 00 in the following cases: 1) The "number of connected components" in the Simple Communications Unit Control word (Offset: +0) is set to 00. 2) The "RUN/Stop" setting in the Simple Communications Unit Control word (Offset: +0) is set to 00. 3) "No Unit connected" is set in the Unit's Communications Type word.
	8 to 11 (Digit 16^2)	Run/Stop flag	0 or 1	This flag will be ON when the Simple Communications Unit is running and OFF when it is stopped.
	12 to 15 (Digit 16^3)	Error flag	0	A value of 0 (bit 15 OFF) indicates that a fatal error has not occurred in the Simple Communications Unit. The Unit will not be able to notify the CPU Unit that a fatal error has occurred in the following cases: 1) The CPU Unit is in RUN mode and DM cannot be written. 2) An error occurred in communications with the CPU Unit. 3) Program memory is write-protected in the PC Setup (DM 6602). When one of these 3 errors error occurs, the Simple Communications Unit will stop all communications and light the ERR indicator.

Syntax Error DM address (Offset: +2)

Range	Function
0000 to 9999 (BCD)	The Simple Communications Unit indicates the DM address where the syntax error occurred. When two or more syntax errors have been detected, the Unit will indicate the DM address that was detected first.

Communications Control Bits (Offset: +3, +4, +5, and +6)

Bit	Offset +3 (Units 0 to 7)	Offset +4 (Units 8 to 15)	Offset +5 (Units 16 to 23)	Offset +6 (Units 24 to 31)
0	Unit 7 Read Command Bit	Unit 15 Read Command Bit	Unit 23 Read Command Bit	Unit 31 Read Command Bit
1	Unit 7 Write Command Bit	Unit 15 Write Command Bit	Unit 23 Write Command Bit	Unit 31 Write Command Bit
2	Unit 6 Read Command Bit	Unit 14 Read Command Bit	Unit 22 Read Command Bit	Unit 30 Read Command Bit
3	Unit 6 Write Command Bit	Unit 14 Write Command Bit	Unit 22 Write Command Bit	Unit 30 Write Command Bit
4	Unit 5 Read Command Bit	Unit 13 Read Command Bit	Unit 21 Read Command Bit	Unit 29 Read Command Bit
5	Unit 5 Write Command Bit	Unit 13 Write Command Bit	Unit 21 Write Command Bit	Unit 29 Write Command Bit
6	Unit 4 Read Command Bit	Unit 12 Read Command Bit	Unit 20 Read Command Bit	Unit 28 Read Command Bit
7	Unit 4 Write Command Bit	Unit 12 Write Command Bit	Unit 20 Write Command Bit	Unit 28 Write Command Bit
8	Unit 3 Read Command Bit	Unit 11 Read Command Bit	Unit 19 Read Command Bit	Unit 27 Read Command Bit
9	Unit 3 Write Command Bit	Unit 11 Write Command Bit	Unit 19 Write Command Bit	Unit 27 Write Command Bit
10	Unit 2 Read Command Bit	Unit 10 Read Command Bit	Unit 18 Read Command Bit	Unit 26 Read Command Bit
11	Unit 2 Write Command Bit	Unit 10 Write Command Bit	Unit 18 Write Command Bit	Unit 26 Write Command Bit
12	Unit 1 Read Command Bit	Unit 9 Read Command Bit	Unit 17 Read Command Bit	Unit 25 Read Command Bit
13	Unit 1 Write Command Bit	Unit 9 Write Command Bit	Unit 17 Write Command Bit	Unit 25 Write Command Bit
14	Unit 0 Read Command Bit	Unit 8 Read Command Bit	Unit 16 Read Command Bit	Unit 24 Read Command Bit
15	Unit 0 Write Command Bit	Unit 8 Write Command Bit	Unit 16 Write Command Bit	Unit 24 Write Command Bit

Bit	Range	Function
Write Command Bit	0: Writing prohibited 1: Writing allowed	Setting this bit to 1 allows operation commands and data writes to the component with the corresponding unit number. Data is not written when this bit is set to 0. When an error occurs while writing data, the appropriate error code is written to the write data area's response monitor area. (See *Response Monitor Area* on page 248 for details.)
Read Command Bit	0: Reading prohibited 1: Reading allowed	Setting this bit to 1 allows data to be read from the component with the corresponding unit number. Data is not read when this bit is set to 0. When an error occurs while reading data, the appropriate error code is written to the read data area's response monitor area. (See *Response Monitor Area* on page 246 for details.)

Note There are restrictions on the number of times data can be written to the Temperature Controller's non-volatile memory. When frequently sending data to a Temperature Controller, either set the Write Command Bit to 0 after writing is completed, or set the write mode for the Temperature Controller to RAM write mode. Also, execute commands to select the RAM write mode and backup mode in only one scan. Some devices will write to non-volatile memory each time the modes are selected, and the life of the non-volatile memory will be exhausted much more quickly if selections are made every scan.

Unit Communications Type (Offset: +7, +10, +13, ... , +97, and +100)

Use the following equation to calculate the offset for a given unit number:

Offset = 7 + (3 × unit number)

Bits	Setting	Range	Function
0 to 7 (Digits 16^0 and 16^1)	Communications protocol	00, 01, or 02	Specifies the communications protocol (SYSWAY or CompoWay/F) of the connected component if a component is connected. 00: No Unit connected 01: SYSWAY 02: CompoWay/F A syntax error will occur and this word's settings will be invalid if a value other than 00, 01, or 02 is specified.
8 to 11 (Digit 16^2)	Command group (valid with host link only)	1 to 5 (BCD)	This setting is valid only when SYSWAY (01) is specified for the communications protocol. When SYSWAY is specified, the command group determines which values are read/written when reading or writing data. The command group setting will be invalid in the following cases: 1) The communications protocol is set to 02 (CompoWay/F). 2) The communications protocol is set to 00 (No Unit connected). 3) The communications protocol is set to 01 (SYSWAY), but the command group setting is not within the allowed range (1 to 5).
12 to 15 (Digit 16^3)	Segment information (valid with SYSWAY only)	0, 1, or 2	This setting is valid only when host link (01) is specified for the communications protocol. The segment information specifies whether a Temperature Controller or Digital Panel Meter is connected with the host link protocol. The segment information setting will be invalid in the following cases: 1) The communications protocol is set to 02 (CompoWay/F). 2) The communications protocol is set to 00 (No Unit connected). 3) The communications protocol is set to 01 (SYSWAY), but the segment information setting is not 1 or 2.

Note The command group and segment information settings are valid only when the communications protocol is set to SYSWAY. These settings are not valid when the communications protocol is set to CompoWay/F.

The following table shows the data that will be read and written for each combination of the command group and segment information settings.

Segment information	Access	Data	Command group				
			1	2	3	4	5
1: Temperature Controller	Read	Present temperature	YES	YES	YES	YES	YES
		Status	YES	YES	YES	YES	YES
		Target temperature	YES	YES	YES	YES	YES
		Alarm 1 SV	---	---	YES	YES	YES
		Alarm 2 SV	---	---	YES	YES	YES
		Proportional band	---	---	---	YES	YES
		Reset time	---	---	---	YES	YES
		Derivative time	---	---	---	YES	YES
		Heater current	---	---	---	---	YES
		Heater current status	---	---	---	---	YES
	Write	Target temperature	YES	YES	YES	YES	YES
		Operation command	---	YES	YES	YES	YES
		Alarm 1 SV	---	---	YES	YES	YES
		Alarm 2 SV	---	---	YES	YES	YES
		Proportional band	---	---	---	YES	YES
		Reset time	---	---	---	YES	YES
		Derivative time	---	---	---	YES	YES
		Heater burnout detection value	---	---	---	---	YES
2: Digital Panel Meter	Read	Display value	YES	YES	YES	YES	YES
		Display value status	YES	YES	YES	YES	YES
		Peak hold	---	YES	YES	---	YES
		Peak hold status	---	YES	YES	---	YES
		Bottom hold	---	YES	YES	---	YES
		Bottom hold status	---	YES	YES	---	YES
		Comparison value (HH)	---	---	---	YES	YES
		Comparison value (H)	---	---	---	YES	YES
		Comparison value (L)	---	---	---	YES	YES
		Comparison value (LL)	---	---	---	YES	YES
	Write	Operation command	---	---	YES	---	YES
		Comparison value (HH)	---	---	---	YES	YES
		Comparison value (H)	---	---	---	YES	YES
		Comparison value (L)	---	---	---	YES	YES
		Comparison value (LL)	---	---	---	YES	YES

Starting Address of Read Data Area or Read Variable Type Area (Offset: +8, +11, ... , +98, and +101)

Use the following equation to calculate the offset for a given unit number:

Offset = 8 + (3 × unit number)

Setting	Range	Function
Starting Address of Read Data Area (SYSWAY protocol)	0000 to 9999 BCD (DM address)	Specifies the starting DM address in the CPU Unit's DM area where the data read from the component will be stored. A syntax error will occur if the starting address specified in this word is not BCD.
Starting Address of Read Variable Type Area (CompoWay/F protocol)	0000 to 9999 BCD (DM address)	Specifies the starting DM address of the words that show which variables will be read from the component. The data that will be read from the component is determined by the variable type and address written in the variable type area. A syntax error will occur if the starting address specified in this word is not BCD.

Starting Address of Write Data Area or Write Variable Type Area (Offset: +9, +12, ... , +99, and +102)

Use the following equation to calculate the offset for a given unit number:

Offset = 9 + (3 × unit number)

Setting	Range	Function
Starting Address of Write Data Area (SYSWAY protocol)	0000 to 9999 BCD (DM address)	Specifies the starting DM address in the CPU Unit's DM area containing the data to be written to the component. A syntax error will occur if the starting address specified in this word is not BCD.
Starting Address of Write Variable Type Area (CompoWay/F protocol)	0000 to 9999 BCD (DM address)	Specifies the starting DM address of the words that show which component variables will be written. The data that will be written to the component is determined by the variable type and address written in the variable type area. A syntax error will occur if the starting address specified in this word is not BCD.

7-4-2 Individual Unit Areas

The individual Unit areas are used to monitor and set connected components individually. The structure of the individual area is different for CompoWay/F and SYSWAY.

Area Structure for CompoWay/F Communications

Read Variable Type Area (27 words max.)

When CompoWay/F has been specified as the component communications protocol, this "read variable type area" contains the variable type and variable address settings for the SVs and PVs that will be read.

Offset	Contents
+0	Number of read items
+1	Reserved
+2	Starting address of read data area
+3	Variable 1 type
+4	Variable 1 address
+5	Variable 2 type
:	:
:	:
+23	Variable 11 type
+24	Variable 11 address
+25	Variable 12 type
+26	Variable 12 address

Number of Read Items (Offset: +0)

Range	Function
0001 to 0012 (BCD)	Specify the number of variables that you want to read. For example, the variables set in variable 1 type and variable 2 type will be read if the "number of read items" is set to 0002. A syntax error will occur if the number of items specified in this word is not between 0001 and 0012 BCD.

Reserved (Offset: +1)

Range	Function
0000	Always set this word to 0000.

Starting Address of Read Data Area (Offset: +2)

Range	Function
0000 to 9999 (BCD)	Specifies the starting DM address in the CPU Unit's DM area where the data read from the component will be stored.

Variable Types (Offset: +3, +5, ... , +23, and +25)

Use the following equation to calculate the offset for a given variable number:

Offset = 1 + (2 × variable number)

Range	Function
00C0 to 00CF (Hex)	Sets the type of variable data that you want to read. The variable types are predetermined in each component, so refer to the component's manual to find the actual variable type. A syntax error will occur if the variable type specified in this word is not between 00C0 and 00CF Hex.

Variable Addresses (Offset: +4, +6, ... , +24, and +26)

Use the following equation to calculate the offset for a given variable number:

Offset = 2 + (2 × variable number)

Range	Function
0000 to FFFF (Hex)	Sets the variable address of the data that you want to read. The variable addresses are predetermined in each component, so refer to the component's manual to find the actual variable address.

Write Variable Type Area (27 words max.)

When CompoWay/F has been specified as the component communications protocol, this "write variable type area" contains the variable type and variable address settings for the SVs that will be written.

Offset	Contents
+0	Number of write items
+1	Operation command
+2	Starting address of write data area
+3	Variable 1 type
+4	Variable 1 address
+5	Variable 2 type
: :	: :
+23	Variable 11 type
+24	Variable 11 address
+25	Variable 12 type
+26	Variable 12 address

Number of Write Items (Offset: +0)

Range	Function
0000 to 0012 (BCD)	Specify the number of variables that you want to write. For example, the variables set in variable 1 type and variable 2 type will be written if the "number of write items" is set to 0002. Variables will not be written if the "number of write items" is set to 0000; in this case, only the operation command is valid. A syntax error will occur if the number of items specified in this word is not between 0000 and 0012 BCD.

Operation Command (Offset: +1)

Range	Function
0000 or 0001	The write data area's operation command is disabled when 0000 is specified. The write data area's operation command is enabled to the component when 0001 is specified. A syntax error will occur if the Operation Command is not 0000 or 0001.

Note There are restrictions on the number of times data can be written to the Temperature Controller's non-volatile memory. When frequently sending data to a Temperature Controller, either set the Write Command Bit to 0 after writing is completed, or set the write mode for the Temperature Controller to RAM write mode. Also, execute commands to select the RAM write mode and backup mode in only one scan. Some devices will write to non-volatile memory each time the modes are selected, and the life of the non-volatile memory will be exhausted much more quickly if selections are made every scan.

Starting Address of Write Data Area (Offset: +2)

Range	Function
0000 to 9999 (BCD)	Specifies the starting DM address in the CPU Unit's DM area containing the data that you want to write to the component.

Variable Types (Offset: +3, +5, ... , +23, and +25)

Use the following equation to calculate the offset for a given variable number:

Offset = 1 + (2 × variable number)

Range	Function
00C0 to 00CF (Hex)	Sets the type of variable data that you want to write. The variable types are predetermined in each component, so refer to the component's manual to find the actual variable type. A syntax error will occur if the variable type specified in this word is not between 00C0 and 00CF Hex.

Variable Addresses (Offset: +4, +6, ... , +24, and +26)

Use the following equation to calculate the offset for a given variable number:

Offset = 2 + (2 × variable number)

Range	Function
0000 to FFFF (Hex)	Sets the variable address of the data that you want to write. The variable addresses are predetermined in each component, so refer to the component's manual to find the actual variable address.

Read Data Area (26 words max.)

The starting address of the "read data area" is specified in the "read variable type area." This "read data area" stores the variable data read from the component.

Offset	Contents
+0	Response monitor
+1	Component status
+2	Variable 1 read data (lower bytes)
+3	Variable 1 read data (upper bytes)
+4	Variable 2 read data (lower bytes)
+5	Variable 2 read data (upper bytes)
:	:
:	:
+22	Variable 11 read data (lower bytes)

Offset	Contents
+23	Variable 11 read data (upper bytes)
+24	Variable 12 read data (lower bytes)
+25	Variable 12 read data (upper bytes)

Response Monitor Area (Offset: +0)

This area contains the results of communications when communicating with the component to read variables.

1,2,3... 1. End Code = 00
When the function's end code is 00, the "response monitor area" contains the response code.

Response code	Meaning
0000	Indicates normal completion.
0401	Unsupported command
1001	Command length too long
1002	Command length too short
1101	Area type error
1103	Starting address out-of-range error
1104	End address out-of-range error
1003	Number of elements doesn't match amount of data
110B	Response length too long
1100	Parameter error
2203	Operating error

2. End Code ≠ 00
When an error occurs and the function's end code is a value other than 00, the "response monitor area" contains the end code (error code). The value of FF in the first two digits indicates that an error occurred during transmission of the CompoWay/F command.

Error code	Meaning
FF04	Address overflow
FF0D	Could not execute command
FF10	Parity error
FF11	Framing error
FF12	Overrun error
FF13	BCC error
FF14	Format error
FF15	Numeric data error
FF16	Sub-address error/Not defined error (IC) (See note.)
FF18	Frame length error
FF97	Response data BCC error

Note A Not Defined Error can occur when using SYSWAY communications with a general-purpose communications component. An example of a Not Defined Error would be when a Temperature Controller was connected via SYSWAY and the Temperature Controller was set for ON/OFF control, yet a command was sent to read the proportional band, integral time, and derivative time. A Not Defined Error would occur in this case.

3. Timeout error occurred

Timeout code	Meaning
E999	Indicates that there was no response from the component.

Component Status (Offset: +1)

16^3	16^2	16^1	16^0
Component status			
Contain the controller status of the component.			

Read Data (Offset: +2, +4, ... , +22, and +24)

The read data is contained in two words starting at offset 2 × n (n = variable number.)

Offset	Range	Function
2 × n (n = variable number)	0000 to FFFF (Hex)	Contains the lower (rightmost) two bytes of the data. Data is expressed in 2's complement signed binary format.
(2 × n) + 1 (n = variable number)	0000 to FFFF (Hex)	Contains the upper (leftmost) two bytes of the data. Data is expressed in 2's complement signed binary format.

The variable data read from a component can have a value ranging from 0000 0000 to FFFF FFFF. The read data will be 0000 0000 if a communications error occurred. The following example shows the contents of the read data area when a communications error occurred while reading the variable 2 read data.

- Response Monitor Area: Contains the error code.
- Status: Contains the controller status.
- Read data 1: Contains the data read from the component.
- Read data 2: Contains 0000 0000.
- Remaining read items: Contain 0000 0000.

Note

1. The decimal point position has to be managed by the user since the component's decimal point position is not transferred in CompoWay/F communications.
2. BCD format is used with Digital Panel Meters (K3N□). For details, refer to the manual for the model used.

Write Data Area (26 words max.)

The starting address of the "write data area" is specified in the "write variable type area." Store the variable data that you want to write to the component in this "write data area."

Offset	Contents
+0	Response monitor
+1	Operation Command
+2	Variable 1 write data (lower bytes)
+3	Variable 1 write data (upper bytes)
+4	Variable 2 write data (lower bytes)
+5	Variable 2 write data (upper bytes)
: :	: :
+22	Variable 11 write data (lower bytes)
+23	Variable 11 write data (upper bytes)
+24	Variable 12 write data (lower bytes)
+25	Variable 12 write data (upper bytes)

Response Monitor Area (Offset: +0)

This area contains the results of communications when communicating with the component to write variables.

1,2,3... 1. End Code = 00
When the function's end code is 00, the "response monitor area" contains the response code.

Response code	Meaning
0000	Indicates normal completion.
0401	Unsupported command
1001	Command length too long
1002	Command length too short
1101	Area type error
1103	Starting address out-of-range error
1104	End address out-of-range error
1003	Number of elements doesn't match amount of data
110B	Response length too long
1100	Parameter error
3003	Read-only error
2203	Operating error

2. End Code ≠ 00
When an error occurs and the function's end code is a value other than 00, the "response monitor area" contains the end code (error code). The value of FF in the first two digits indicates that an error occurred during transmission of the CompoWay/F command.

Error code	Meaning
FF04	Address overflow
FF0D	Could not execute command
FF10	Parity error
FF11	Framing error
FF12	Overrun error
FF13	BCC error
FF14	Format error
FF15	Numeric data error
FF16	Sub-address error/Not defined error (IC) (See note.)
FF18	Frame length error
FF21	Non-volatile memory write error
FF97	Response data BCC error

Note A Not Defined Error can occur when using SYSWAY communications with a general-purpose communications component. An example of a Not Defined Error would be when a Temperature Controller was connected via SYSWAY and the Temperature Controller was set for ON/OFF control, yet a command was sent to read the proportional band, integral time, and derivative time. A Not Defined Error would occur in this case.

3. Timeout error occurred

Timeout code	Meaning
E999	Indicates that there was no response from the component.

Operation Command (Offset: +1)

Refer to the component's Operation Manual for details on the command codes for the various CompoWay/F communications functions.

Bits	Function
0 to 7 (Digits 16^0 and 16^1)	Related information Set any related information required by the CompoWay/F command code as described in the component's manual.
8 to 15 (Digits 16^2 and 16^3)	Command code Set the CompoWay/F command code as described in the component's manual.

Note

1. SVs cannot be written in a scan in which "start auto-tuning" has been specified.
2. Execute commands to select the RAM write mode and backup mode in only one scan. Some devices will write to non-volatile memory each time the modes are selected, and the life of the non-volatile memory will be exhausted much more quickly if selections are made every scan.

Write Data (Offset: +2, +4, ... , +22, and +24)

The write data is contained in two words starting at offset 2 × n (n = variable number.)

Offset	Range	Function
2 × n (n = variable number)	0000 to FFFF (Hex)	Store the lower (rightmost) two bytes of the SV data that you want to write to the corresponding component. Data is expressed in 2's complement signed binary format.
(2 × n) + 1 (n = variable number)	0000 to FFFF (Hex)	Store the upper (leftmost) two bytes of the SV data that you want to write to the corresponding component. Data is expressed in 2's complement signed binary format.

If a communications error occurs, the write operation that is in progress will be stopped and the next process will be performed for the general-purpose communications device.

The following example shows the results of the write operation when a communications error occurred while writing variable 2.

- Response Monitor Area: Contains the error code.
- Operation Command: The operation command won't be executed.
- Variable 1 write data: The SV will be written normally.
- Variable 2 write data: The SV won't be written.
- Remaining write items: SVs won't be written.

Note

1. The decimal point position has to be managed by the user since the component's decimal point position is not transferred in CompoWay/F communications.
2. BCD format is used with Digital Panel Meters (K3N□). For details, refer to the manual for the model used.

Area Structure for SYSWAY Communications

Read Data Area: Temperature Controllers (11 words)

The following data will be read from a Temperature Controller when host link has been specified as the component communications protocol.

The starting address of the "read data area" is specified in the "control data area." Select any one of the 5 command groups to specify which PVs and SVs

will be read, although 11 DM words will be allocated to the read data area regardless of the command group selected.

Offset	Data	Command group				
		1	2	3	4	5
+0	Response monitor	Read	Read	Read	Read	Read
+1	Present temperature	Read	Read	Read	Read	Read
+2	Status	Read	Read	Read	Read	Read
+3	Target temperature	Read	Read	Read	Read	Read
+4	Alarm 1 SV	---	---	Read	Read	Read
+5	Alarm 2 SV	---	---	Read	Read	Read
+6	Proportional band	---	---	---	Read	Read
+7	Reset time	---	---	---	Read	Read
+8	Derivative time	---	---	---	Read	Read
+9	Heater current monitor	---	---	---	---	Read
+10	Heater current status	---	---	---	---	Read

Response Monitor Area (Offset: +0)

The structure of the response monitor area is the same whether SYSWAY or CompoWay/F communications are used. See *Response Monitor Area* on page 246 for details on the response monitor area.

Read Data (Offset: +1, +3, +4, +5, +6, +7, +8, and +9)

Each word of data read from the Temperature Controller has a value ranging from 0000 to FFFF, which is 2's complement signed binary data. The word will contain 0000 if a communications error occurred. The following example shows the contents of the read data when a communications error occurred while reading the target temperature in command group 1.

- Response Monitor Area: Contains the error code.
- Present temperature: Contains data read from Temperature Controller.
- Status: Contains status read from Temperature Controller.
- Target temperature: Contains 0000.

Note The decimal point position has to be managed by the user since the Temperature Controller's decimal point position is not transferred in host link (X format) communications.

Status (Offset: +2 and +10)

The read data area's +2 offset word contains the status when reading the present temperature. The +10 offset word contains the heater current status when reading the heater current. Refer to the Temperature Controller's Operation Manual for details on the status values.

Read Data Area: Digital Panel Meters (18 words)

The following data will be read from a Digital Panel Meter when SYSWAY has been specified as the component communications protocol.

The starting address of the "read data area" is specified in the "control data area." Select any one of the 5 command groups to specify which PVs and SVs will be read, although 18 DM words will be allocated to the read data area regardless of the command group selected.

Offset	Data	Command group				
		1	2	3	4*	5
+0	Response monitor area	Read	Read	Read	Read	Read
+1 and +2	Display value	Read	Read	Read	Read	Read

Offset	Data	Command group				
		1	2	3	4*	5
+3	Display value status	Read	Read	Read	Read	Read
+4 and +5	Peak hold	---	Read	Read	---	Read
+6	Peak hold status	---	Read	Read	---	Read
+7 and +8	Bottom hold	---	Read	Read	---	Read
+9	Bottom hold status	---	Read	Read	---	Read
+10 and +11	Comparison value (HH)	---	---	---	Read	Read
+12 and +13	Comparison value (H)	---	---	---	Read	Read
+14 and +15	Comparison value (L)	---	---	---	Read	Read
+16 and +17	Comparison value (LL)	---	---	---	Read	Read

Note When command group 4 is selected, words with offsets +4 through +9 will be cleared to 0000.

Response Monitor Area (Offset: +0)

The structure of the response monitor area is the same whether SYSWAY or CompoWay/F communications are used. See *Response Monitor Area* on page 246 for details on the response monitor area.

Read Data

Offsets: +1, 4, 7, 10, 12, 14, 16	16^3	16^2	16^1	16^0
	Read data lower byte (Binary, 2's complement)			
	0000 to FFFF Hex			
Offsets: +2, 5, 8, 11, 13, 15, 17	16^3	16^2	16^1	16^0
	Read data upper byte (Binary, 2's complement)			
	0000 to FFFF Hex			

Each two-word value read from the Digital Panel Meter has a value ranging from 0000 0000 to FFFF FFFF and is 2's complement signed binary data. The words will contain 0000 0000 if a communications error occurred. The following example shows the contents of the read data area when a communications error occurred while reading the display value in command group 1.

- Response Monitor Area: Contains the error code.
- Display value: Contains 0000 0000.
- Status: Contains 0000.

Note The decimal point position has to be managed by the user since the Digital Panel Meter's decimal point position is not transferred in SYSWAY (X format) communications.

Status (Offset: +3, +6, and +9)

The read data area's +3, +6, and +9 offset words contain the status when reading the display value, peak hold value, or bottom hold value, respectively. Refer to the Digital Panel Meter's Operation Manual for details on the status values.

Write Data Area: Temperature Controllers (9 words)

The following data will be written to a Temperature Controller when SYSWAY has been specified as the component communications protocol.

The starting address of the "write data area" is specified in the "control data area." Select any one of the 5 command groups to specify which SVs will be

written, although 9 DM words will be allocated to the write data area regardless of the command group selected.

Offset	Data	Command group				
		1	2	3	4	5
+0	Response monitor area	Written	Written	Written	Written	Written
+1	Target temperature	Written	Written	Written	Written	Written
+2	Operation command	---	Written	Written	Written	Written
+3	Alarm 1 SV	---	---	Written	Written	Written
+4	Alarm 2 SV	---	---	Written	Written	Written
+5	Proportional band	---	---	---	Written	Written
+6	Reset time	---	---	---	Written	Written
+7	Derivative time	---	---	---	Written	Written
+8	Heater burnout detection value	---	---	---	---	Written

Response Monitor Area (Offset: +0)

The structure of the response monitor area is the same whether SYSWAY or CompoWay/F communications are used. See *Response Monitor Area* on page 248 for details on the response monitor area.

Write Data (Offset: +1, +3, +4, +5, +6, +7, and +8)

Set the words of data to be written to the Temperature Controller as 2's complement signed binary data.

If a communications error occurs while writing data, the remaining write data will not be written and the next process for the general-purpose communications device will be executed. The error code will be written to the response monitor area.

The following example shows the results of the write operation when a communications error occurred while writing the target temperature in command group 2.

- Response Monitor Area: Contains the error code.
- Target temperature: The SV won't be written.
- Operation Command: The operation command won't be written.

Note The decimal point position has to be managed by the user since the Temperature Controller's decimal point position is not transferred in SYSWAY (X format) communications.

Operation Command (Offset: +2)

Store the operation command code (0000 to 0005) in this word. When a command group that includes the operation command is selected, the corresponding operation command will be sent to the Temperature Controller.

Command code	Operation
0000	Don't perform operation command. (No operation)
0001	Stop auto-tuning.
0002	Start auto-tuning.
0003	Select backup mode.
0004	Select RAM write mode.
0005	Hold the Run/Adjust SV.

Note

1. SVs cannot be written in a scan in which "start auto-tuning" has been specified.
2. Starting and stopping auto-tuning is possible for E5EK, E5AK, and E5AF models only.

3. When selecting the RAM write mode or backup mode, program the selection operation so that it is executed only one scan. Some components write to EEPROM when this selection is made, and if it is made each scan, the service live of the EEPROM will be affected.
4. There are restrictions on the number of times data can be written to the Temperature Controller's non-volatile memory. When frequently sending data to a Temperature Controller, either set the Write Command Bit to 0 after writing is completed, or set the write mode for the Temperature Controller to RAM write mode. Also, execute commands to select the RAM write mode and backup mode in only one scan. Some devices will write to non-volatile memory each time the modes are selected, and the life of the non-volatile memory will be exhausted much more quickly if selections are made every scan.

Write Data Area: Digital Panel Meters (10 words)

The following data will be written to a Digital Panel Meter when host link has been specified as the component communications protocol.

The starting address of the "write data area" is specified in the "control data area." Select any one of the 5 command groups to specify which SVs will be written, although 10 DM words will be allocated to the write data area regardless of the command group selected.

Offset	Data	Command group				
		1	2	3	4	5
+0	Response monitor area	Written	Written	Written	Written	Written
+1	Operation command	---	---	Written	---	Written
+2 and +3	Comparison value (HH)	---	---	---	Written	Written
+4 and +5	Comparison value (H)	---	---	---	Written	Written
+6 and +7	Comparison value (L)	---	---	---	Written	Written
+8 and +9	Comparison value (LL)	---	---	---	Written	Written

Response Monitor Area (Offset: +0)

The structure of the response monitor area is the same whether host link or CompoWay/F communications are used. See *Response Monitor Area* on page 248 for details on the response monitor area.

Write Data

Offsets: +2, 4, 6, 8	16^3	16^2	16^1	16^0
	Write data lower byte (Binary, 2's complement)			
	0000 to FFFF Hex			
Offsets: +3, 5, 7, 9	16^3	16^2	16^1	16^0
	Write data upper byte (Binary, 2's complement)			
	0000 to FFFF Hex			

Set the words of data to be written to the Digital Panel Meter as 2's complement signed binary data.

If a communications error occurs while writing data, the remaining write data will not be written and the next process for the general-purpose communications device will be executed. The error code will be written to the response monitor area.

The following example shows the results of the write operation when a communications error occurred while writing comparison value (H) in command group 4.

- Response Monitor Area: Contains the error code.
- Comparison value (HH): The SV will be written normally.
- Comparison value (H): The SV won't be written.

- Comparison value (L): The SV won't be written.
- Comparison value (LL): The SV won't be written.

Note The decimal point position has to be managed by the user since the Digital Panel Meter's decimal point position is not transferred in SYSWAY (X format) communications.

Operation Command (Offset: +2)

Store the operation command code (0000 to 0004) in this word. When a command group that includes the operation command is selected, the corresponding operation command will be sent to the Temperature controller.

Command code	Operation
0000	Don't perform operation command. (No operation)
0001	Reset.
0002	Select backup mode.
0003	Select RAM write mode.
0004	Hold the Setting/Adjust values.

Note

1. When selecting the RAM write mode or backup mode, program the selection operation so that it is executed only one scan. Some components write to EEPROM when this selection is made, and if it is made each scan, the service live of the EEPROM will be affected.
2. There are restrictions on the number of times data can be written to the Temperature Controller's non-volatile memory. When frequently sending data to a Temperature Controller, either set the Write Command Bit to 0 after writing is completed, or set the write mode for the Temperature Controller to RAM write mode. Also, execute commands to select the RAM write mode and backup mode in only one scan. Some devices will write to non-volatile memory each time the modes are selected, and the life of the non-volatile memory will be exhausted much more quickly if selections are made every scan.

7-5 DM Settings and Component Communications

This section explains the basic procedures required to communicate with connected components. Refer to *7-4 Data Memory (DM) Allocation* for details on DM settings and setting procedures.

Write the following program sections in the user program to establish communications with the connected components.

7-5-1 DM Settings

Verify that the components that you want to connect are supported by the CPM2C-CIF21. Determine whether the components will communicate by SYSWAY or CompoWay/F communications.

Write the following program sections at the beginning of the user program so that the DM settings are made when the CPM2C is turned ON.

1,2,3...

1. Parameter Settings in the Control Data Area
   - Set the number of connected components (32 max.)
   - When using SYSWAY, set each component's segment information.
   - When using SYSWAY, select and set a command group that contains the values that you want to read or write.
   - Set the communications protocol.
   - When using SYSWAY, set the starting addresses of each component's read/write areas.

- When using CompoWay/F, set the starting addresses of each component's read/write variable type areas.

2. When using CompoWay/F, set the variable type and variable address of each variable that you want to read or write. (Set this information in the read/write variable type area.)
3. When writing data, set the data that you want to write in the write data area.

7-5-2 Starting Communications with the Components

Use the following procedure to start communications with the components.

1,2,3...

1. Set the rightmost digit of the "Simple Communications Unit control" word in the Control Data Area (the RUN/Stop digit) to 1 (RUN).
2. Turn ON the Read Command Bit or Write Command Bit of the desired component. (These bits are in the Control Data Area with word offsets +3, +4, +5, and +6. See *Communications Control Bits* on page 240.)

Changes to the following values are recognized only when the Simple Communications Unit control word's RUN/Stop digit is switched from Stop to RUN. When one of these values has been changed, switch the Simple Communications Unit from RUN to Stop and then back to RUN again.

- Segment information
- Command group
- Communications protocol
- Starting addresses of read/write data areas
- Starting addresses of read/write variable type areas

Note Refer to *Simple Communications Unit Control* on page 238 for details on the RUN/Stop Digit.

7-6 Precautions for Component Communications

Observe the following precautions when communicating with components.

Time Required to Refresh Read/Write Data

The time required to refresh read or write data varies with the CPM2C's cycle time. Moreover, the refreshing interval is not fixed.

Establishment of Communications with the CPU Unit

Power is supplied to the Simple Communications Unit and the CPU Unit at the same time. After the power is turned ON, the Simple Communications Unit will attempt to establish communications with the CPU Unit and will wait for a response. If there is no response from the CPU Unit after retrying for 2 minutes, a fatal error will occur and the ERR indicator will light.

Operating Mode of the CPU Unit

It is not possible for the Simple Communications Unit to write data to the CPU Unit if the CPU Unit is in RUN mode. Just before writing data, the CPU Unit's operating mode is checked with the STATUS READ host link command. If the CPU Unit is found to be in RUN mode, the mode is changed to MONITOR mode with the STATUS WRITE host link command so that the data can be written.

When a data write error occurs because the CPU Unit was changed to RUN mode from a Programming Device, the Simple Communications Unit will attempt to change the operating mode and write data twice. If these retries fail, a fatal error will occur and the ERR indicator will light.

Switching the Simple Communications Unit from "Stop" to "RUN"

The Simple Communications Unit must be switched from Stop to RUN in order to validate any changes made in Control Data Area words +7 through +102. After editing these words, always switch the Unit from RUN to Stop and

then back to RUN again. Refer to *Simple Communications Unit Control* on page 238 for details on the RUN/Stop Digit.

Note The Communications Control Area (Read and Write Command Bits) and the CompoWay/F Read and Write Variable Type Areas are read every scan, so it is not necessary to switch the Unit from Stop to RUN after these areas have been edited.

Syntax Errors

When a syntax error occurs in the Simple Communications Unit, switch the Unit from RUN to Stop, correct the cause of the syntax error, and then switch the Unit back to RUN.

Syntax errors are non-fatal errors that are cleared by switching the Unit from Stop to RUN. Non-fatal errors are not cleared just by eliminating the cause of the error.

DM Allocation Errors

When a DM allocation error occurs, it is possible that the DM allocation exceeds the boundary of the CPM2C's DM Area. After correcting the DM allocation, reset the power supply for the Simple Communications Unit.

DM allocation errors are fatal errors that are cleared by resetting the power supply. Fatal errors are not cleared just by eliminating the cause of the error.

Delaying the Communications Response with Components

The communications timeout setting must be extended if you are using a system configuration that causes a significant delay in the communications response between the Simple Communications Unit and the components, such as wireless communications between the Unit and components. The communications timeout setting can be set in multiples of 500 ms, up to the maximum monitoring time of 5.0 s. Set a monitoring time appropriate for your system.

Note

1. Under normal conditions, it is not necessary to change the communications timeout setting. In general use a setting of 0, which sets a response monitoring time of 500 ms. Refer to *Simple Communications Unit Control* on page 238 for details on the communications timeout setting.
2. There are restrictions on the number of times data can be written to the Temperature Controller's non-volatile memory. When frequently sending data to a Temperature Controller, either set the Write Command Bit to 0 after writing is completed, or set the write mode for the Temperature Controller to RAM write mode. Also, execute commands to select the RAM write mode and backup mode in only one scan. Some devices will write to non-volatile memory each time the modes are selected, and the life of the non-volatile memory will be exhausted much more quickly if selections are made every scan.

7-7 Error Processing

The Simple Communications Unit can detect two kinds of errors: fatal errors cause the ERR indicator to light and non-fatal errors cause the ERR indicator to flash. The following tables show the likely causes of these errors and the error processing required.

7-7-1 Fatal Errors (ERR Indicator Lit)

Error	Likely cause and correction
Communications cannot be established with the CPU Unit.	Check the communications baud rate and other communications settings in the CPU Unit and Simple Communications Unit. Correct the settings and turn ON the Simple Communications Unit again.
There was a communications error with the CPU Unit.	Noise can cause communications errors. If noise is suspected, use cables and wiring methods that will reduce noise in the communications lines and turn ON the Simple Communications Unit again.
Cannot write data while the CPU Unit is in RUN mode.	Check whether the CPU Unit is in RUN mode. If so, switch the CPU Unit to MONITOR mode or PROGRAM mode and turn ON the power again.
A watchdog timer error occurred.	Watchdog timer errors are indicated in the Simple Communications Unit status word. (Refer to *Simple Communications Unit Status* on page 239.) It is possible for noise to affect the Simple Communications Unit's processing. If noise is suspected, take steps to reduce noise around the Unit or shield the Unit. The watchdog timer error can be cleared by turning the power supply OFF and then ON again.
DM allocation error (See note.)	The DM allocation may exceed the boundary of the CPM2C's DM Area. When a DM allocation error is detected, error code "15" is written to the Simple Communications Unit Status word (see page 239). To restore normal operation, correct the DM allocation and switch the Unit from RUN to Stop and then back to RUN again. Refer to *Simple Communications Unit Control* on page 238 for details on the RUN/Stop Digit.

Note DM allocation errors are indicated in the Simple Communications Unit status word. (Refer to *Simple Communications Unit Status* on page 239 for details.)

7-7-2 Non-fatal Errors (ERR Indicator Flashing)

Error	Likely cause and correction
There was a communications error with a component. (See note 1.)	Check whether the communications settings in the components match the settings in the Simple Communications Unit. Correct the settings if necessary. Normal operation will be restored when the cause of the communications error is corrected.
	Noise can cause communications errors. If noise is suspected, use cables and wiring methods that will reduce noise in the communications lines. Normal operation will be restored when the cause of the communications error is corrected.
Syntax error (See note 2.)	A syntax error occurs when there is an error in the DM settings. When a syntax error is detected, error code "02" is written to the Simple Communications Unit Status word (see page 239) and the DM word address is written to the Syntax Error DM Address word (see page 239). To restore normal operation, correct the setting in the indicated DM word and switch the Unit from RUN to Stop and then back to RUN again. Refer to *Simple Communications Unit Control* on page 238 for details on the RUN/Stop Digit.

Note

1. Details on communications errors can be found in the Response Monitor Area. See *Response Monitor Area* on page 246 for details on errors that occur while reading or page 248 for details on errors that occur while writing.
2. Syntax errors are indicated in the Simple Communications Unit status word. (Refer to *Simple Communications Unit Status* on page 239 for details.)

7-8 Data Refresh Intervals (Reference Data)

The following table shows the period between data refreshes for various communications conditions. The actual period depends upon the system configuration and size of the user program, so these values are approximate.

Communications speed (bps)	Number of components connected	Communications protocol	Read data items	Write data items	Command group	Refresh period
9,600	16	CompoWay/F	12 × 16 = 192	12 × 16 = 192	---	52 s
9,600	16	CompoWay/F	12 × 16 = 192	0	---	25 s
19,200	16	CompoWay/F	12 × 16 = 192	12 × 16 = 192	---	35 s
19,200	16	CompoWay/F	12 × 16 = 192	0	---	16 s
19,200	16	CompoWay/F	1 × 16 = 16	0	---	4 s
9,600	16	CompoWay/F	0	1 × 16 = 16	---	8 s
19,200	16	CompoWay/F	0	1 × 16 = 16	---	5 s
19,200	4	CompoWay/F	1 × 16 = 16	0	---	1.5 s
19,200	4	CompoWay/F	0	1 × 16 = 16	---	2 s
9,600	16	SYSWAY	Yes	Yes	4	20 s
9,600	16	SYSWAY	Yes	No	4	10 s
19,200	16	SYSWAY	Yes	Yes	4	15 s
19,200	16	SYSWAY	Yes	No	4	7 s
9,600	16	SYSWAY	No	Yes	1	5 s
19,200	16	SYSWAY	No	Yes	1	4 s
19,200	4	SYSWAY	Yes	No	1	1 s
19,200	4	SYSWAY	No	Yes	1	1.2 s

Note

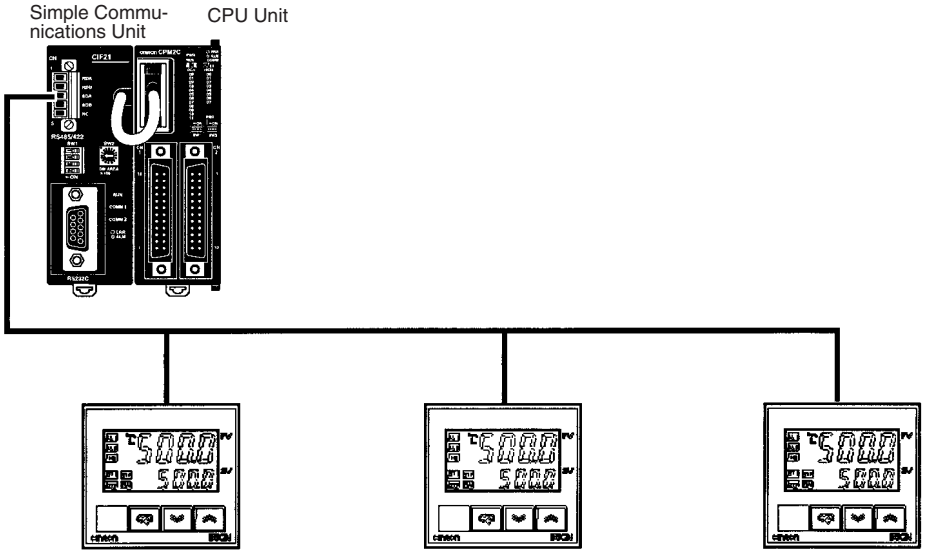
1. The refresh period is not fixed because the communications response times of the components and the CPU Unit are not fixed. The refresh periods shown in the table above are average times for the given conditions.
2. The number of read data items and write data items show the number of data items read and written for each component. When SYSWAY communications are used, the number of items is determined by the command group that has been selected.

7-9 Example Application

This section shows the system configuration and settings of an example system to help explain how to use the Simple Communications Unit.

7-9-1 System Configuration

The example system has three E5CN Temperature Controllers connected to the Simple Communications Unit.



DM Allocation

The DM allocation is shown in the following table.

Unit settings	Area name	DM words
All (shared)	Control Data Area	DM 0000 to DM 0102
Unit 0	Unit 0 Read Variable Type Area	DM 0150 to DM 0154
	Unit 0 Write Variable Type Area	DM 0160 to DM 0164
	Unit 0 Read Data Area	DM 0170 to DM 0173
	Unit 0 Write Data Area	DM 0180 to DM 0183
Unit 2	Unit 2 Read Data Area	DM 0200 to DM 0210
	Unit 2 Write Data Area	DM 0220 to DM 0228
Unit 3	Unit 3 Read Data Area	DM 0240 to DM 0250
	Unit 3 Write Data Area	DM 0260 to DM 0268

Communications with CPU Unit

Communications speed: 19,200 bps

Communications with Components

The following settings are used for the RS-485 communications:

Item	Setting
Communications speed	19,200 bps
Data bits	7 bits
Parity	Even
Stop bits	2 bits

7-9-2 System Preparation

Refer to *SECTION 3 Installation and Wiring* and make the following preparations.

1,2,3...

1. Connect the Units.
2. Set switches.
3. Make required settings in the PC.
4. Make required settings in the components.

7-9-3 DM Settings and Component Communications

The following tables show the DM settings for this example. Words are shown in bold if they contain required settings. Other words are generally used to monitor operation.

Control Data Area

Word	Bit(s)	Function	Setting
DM 0000	0 to 3	RUN/Stop command	0 (→1)
	4 to 7	Communications timeout setting	0
	8 to 15	Number of connected components	03
DM 0001	0 to 15	Simple Communications Unit status	---
DM 0002	0 to 15	Syntax Error DM Address	---
DM 0003	0 to 7	Read/Write Command Bits for Units 7 to 4	0
	8	Unit 3 Read Command Bit	1
	9	Unit 3 Write Command Bit	1
	10	Unit 2 Read Command Bit	1
	11	Unit 2 Write Command Bit	0
	12	Unit 1 Read Command Bit	0
	13	Unit 1 Write Command Bit	0
	14	Unit 0 Read Command Bit	1
	15	Unit 0 Write Command Bit	0 (→1)
DM 0004	0 to 15	Read/Write Command Bits for Units 15 to 8	0000
DM 0005	0 to 15	Read/Write Command Bits for Units 23 to 16	0000
DM 0006	0 to 15	Read/Write Command Bits for Units 31 to 24	0000
DM 0007	0 to 7	Unit 0 Communications protocol	02
	8 to 11	Unit 0 Command group	0
	12 to 15	Unit 0 Segment information	0
DM 0008	0 to 15	Starting address of Unit 0 read variable type area	0150
DM 0009	0 to 15	Starting address of Unit 0 write variable type area	0160
DM 0010	0 to 7	Unit 1 Communications protocol	00
	8 to 11	Unit 1 Command group	0
	12 to 15	Unit 1 Segment information	0
DM 0011	0 to 15	Starting address of Unit 1 read data area	0000
DM 0012	0 to 15	Starting address of Unit 1 write data area	0000
DM 0013	0 to 7	Unit 2 Communications protocol	01
	8 to 11	Unit 2 Command group	1
	12 to 15	Unit 2 Segment information	1
DM 0014	0 to 15	Starting address of Unit 2 read data area	0200
DM 0015	0 to 15	Starting address of Unit 2 write data area	0220
DM 0016	0 to 7	Unit 3 Communications protocol	01
	8 to 11	Unit 3 Command group	1
	12 to 15	Unit 3 Segment information	1
DM 0017	0 to 15	Starting address of Unit 3 read data area	0240
DM 0018	0 to 15	Starting address of Unit 3 write data area	0260
DM 0019 to DM 0102	0 to 15	Not used.	0000

Unit 0 Read Variable Type Area (CompoWay/F)

Word	Bit(s)	Function	Setting
DM 0150	0 to 15	Number of read items	0001
DM 0151	0 to 15	Reserved	---
DM 0152	0 to 15	Starting address of read data area	0170
DM 0153	0 to 15	Variable 1 type	00C0
DM 0154	0 to 15	Variable 1 address	0000

Note Variable type 00C0 and variable address 0000 indicate the PV.

Unit 0 Write Variable Type Area (CompoWay/F)

Word	Bit(s)	Function	Setting
DM 0160	0 to 15	Number of write items	0001
DM 0161	0 to 15	Operation Command	0000
DM 0162	0 to 15	Starting address of write data area	0180
DM 0163	0 to 15	Variable 1 type	00C1
DM 0164	0 to 15	Variable 1 address	0003

Note Variable type 00C1 and variable address 0003 indicate the target temperature.

Unit 0 Read Data Area (CompoWay/F)

Word	Bit(s)	Function
DM 0170	0 to 15	Response monitor area Contains 0000 when component communications are normal.
DM 0171	0 to 15	Status The component's status is read to this word.
DM 0172	0 to 15	Variable 1 read data (lower bytes)
DM 0173	0 to 15	Variable 1 read data (upper bytes)

Note The Temperature Controller's PV is read to DM 0172 and DM 0173 because the "Unit 0 read variable type area" specified the PV.

Unit 0 Write Data Area (CompoWay/F)

Word	Bit(s)	Function	Setting
DM 0180	0 to 15	Response monitor area Contains 0000 when communications with the component are normal.	---
DM 0181	0 to 7	Operation Command: command code*1	---
	8 to 15	Operation Command: related information*1	---
DM 0182	0 to 15	Variable 1 write data (lower bytes)*2	0064
DM 0183	0 to 15	Variable 1 write data (upper bytes)*2	0000

Note

1. The operation command is set to 0000 (disabled) in the Unit 0 write variable type area, so the command code and related information are not used.
2. Sets the hexadecimal equivalent of the target temperature (100°C) which is the variable that was registered in the Unit 0 write variable type area.

Unit 2 Read Data Area (SYSWAY)

The segment information is 1 and the command group is 1.

Word	Function
DM 0200	Response monitor area Contains 0000 when component communications are normal.
DM 0201	Present temperature Contains the PV in 2's complement signed binary format.
DM 0202	Status Contains the status when the PV was read.
DM 0203	Target temperature (See note.) Contains the target temperature in 2's complement signed binary format.
DM 0204	Alarm 1 SV (See note.) Contains the alarm 1 set value in 2's complement signed binary format.
DM 0205	Alarm 2 SV (See note.) Contains the alarm 2 set value in 2's complement signed binary format.
DM 0206	Proportional band (See note.) Contains the proportional band setting in binary.
DM 0207	Reset time (See note.) Contains the reset time setting in binary.
DM 0208	Derivative time (See note.) Contains the derivative time setting in binary.
DM 0209	Heater current monitor (See note.) Contains the heater's electrical current in binary.
DM 0210	Heater current status (See note.) Contains the status when the heater's electrical current was read.

Note The entire Unit 2 read data area is refreshed even though command group 1 is selected and only the values in DM 0200 to DM 0202 are read from the component. (The contents of DM 0204 to DM 0210 are cleared to 0000.)
When communicating with a Temperature Controller through SYSWAY, always allocate 11 words to the read data area even if the selected command group limits the number of words actually read.

Unit 2 Write Data Area (SYSWAY)

The segment information is 1 and the command group is 1.

Allocate words DM 0220 through DM 0228 to the Unit 2 write data area. In this example data isn't written to Unit 2, so it isn't necessary to set data in the Unit 2 write data area.

Unit 3 Read Data Area (SYSWAY)

The segment information is 1 and the command group is 1.

Word	Function
DM 0240	Response monitor area Contains 0000 when component communications are normal.
DM 0241	Present temperature Contains the PV in 2's complement signed binary format.
DM 0242	Status Contains the status when the PV was read.
DM 0243	Target temperature (See note.) Contains the target temperature in 2's complement signed binary format.
DM 0244	Alarm 1 SV (See note.) Contains the alarm 1 set value in 2's complement signed binary format.
DM 0245	Alarm 2 SV (See note.) Contains the alarm 2 set value in 2's complement signed binary format.
DM 0246	Proportional band (See note.) Contains the proportional band setting in binary.
DM 0247	Reset time (See note.) Contains the reset time setting in binary.
DM 0248	Derivative time (See note.) Contains the derivative time setting in binary.
DM 0249	Heater current monitor (See note.) Contains the heater's electrical current in binary.
DM 0250	Heater current status (See note.) Contains the status when the heater's electrical current was read.

Note The entire Unit 3 read data area is refreshed even though command group 1 is selected and only the values in DM 0240 to DM 0242 are read from the component. (The contents of DM 0244 to DM 0250 are cleared to 0000.)
When communicating with a Temperature Controller through SYSWAY, always allocate 11 words to the read data area even if the selected command group limits the number of words actually read.

Unit 3 Write Data Area (SYSWAY)

The segment information is 1 and the command group is 1.

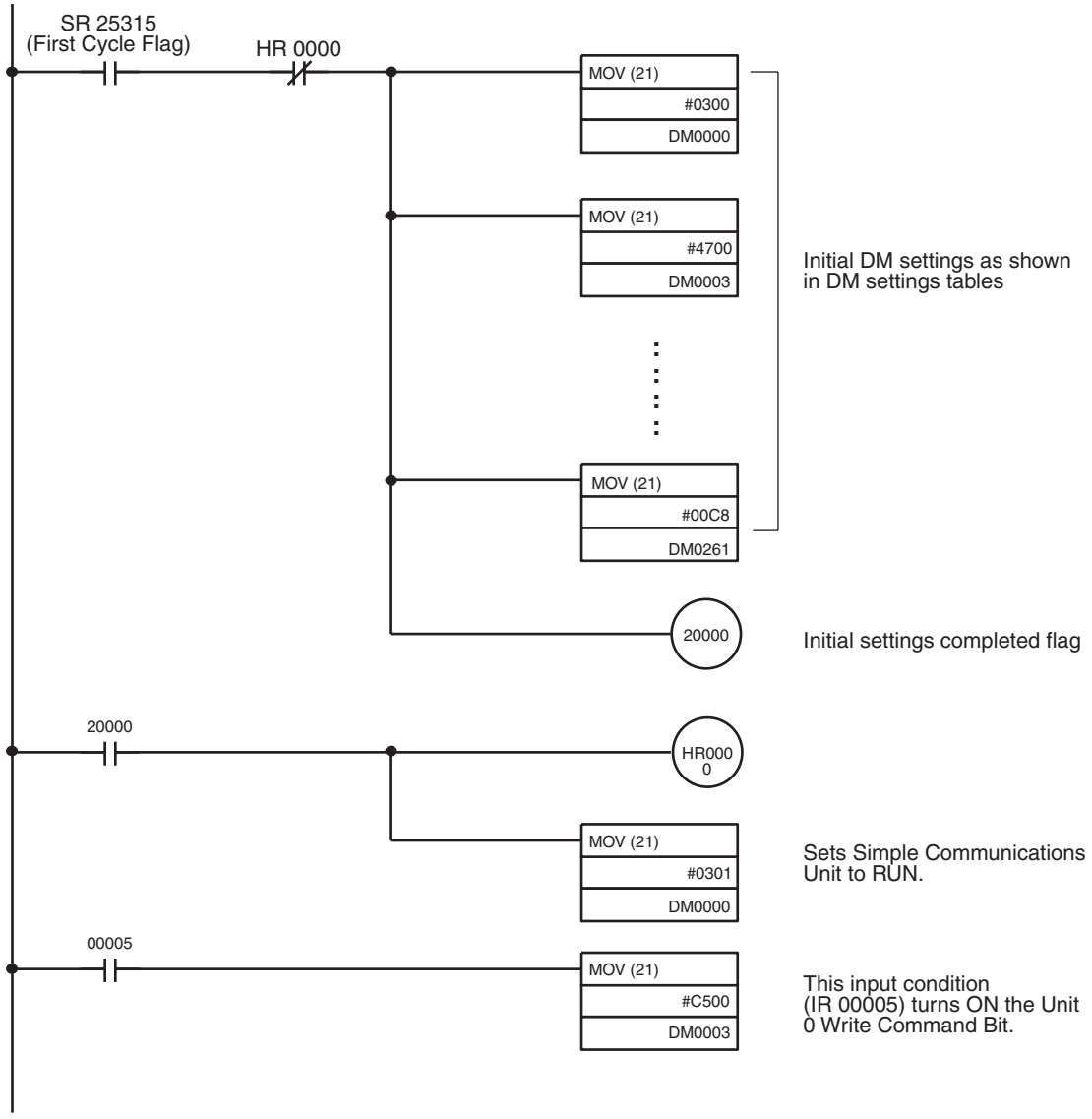
Word	Function
DM 0260	Response monitor area Contains 0000 when component communications are normal.
DM 0261	Target temperature 00C8 (200°C)
DM 0262	Operation command (See note.) 0000
DM 0263	Alarm 1 SV (See note.) Set the alarm 1 set value in 2's complement signed binary format.
DM 0264	Alarm 2 SV (See note.) Set the alarm 2 set value in 2's complement signed binary format.
DM 0265	Proportional band (See note.) Set the proportional band setting in binary.
DM 0266	Reset time (See note.) Set the reset time setting in binary.
DM 0267	Derivative time (See note.) Set the derivative time setting in binary.
DM 0268	Heater burnout detection value (See note.) Set the heater burnout detection value in binary.

Note It is possible to write just the target temperature by selecting command group 1.
When communicating with a Temperature Controller through SYSWAY,

always allocate 9 words to the write data area even if the selected command group limits the number of words actually written.

7-9-4 Ladder Program for DM Settings

The following diagram shows an example program section used to set the required DM values.



Appendix A
Standard Models

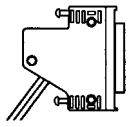
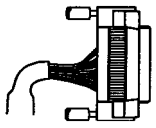
CPU Units

Classification and Appearance	I/O capacity	Inputs	Outputs	Clock	Model
Units with Terminal Blocks 	10 I/O points	6 points (24 VDC)	4 relay outputs	No	CPM2C-10CDR-D
				Yes	CPM2C-10C1DR-D
	20 I/O points	12 points (24 VDC)	8 relay outputs	No	CPM2C-20CDR-D
				Yes	CPM2C-20C1DR-D
Units with Fujitsu-compatible Connectors 	10 I/O points	6 points (24 VDC)	4 transistor outputs (sinking)	No	CPM2C-10CDTC-D
				Yes	CPM2C-10C1DTC-D
			4 transistor outputs (sourcing)	No	CPM2C-10CDT1C-D
				Yes	CPM2C-10C1DT1C-D
	20 I/O points	12 points (24 VDC)	8 transistor outputs (sinking)	No	CPM2C-20CDTC-D
				Yes	CPM2C-20C1DTC-D
			8 transistor outputs (sourcing)	No	CPM2C-20CDT1C-D
				Yes	CPM2C-20C1DT1C-D
	32 I/O points	16 points (24 VDC)	16 transistor outputs (sinking)	No	CPM2C-32CDTC-D
			16 transistor outputs (sourcing)	No	CPM2C-32CDT1C-D
Units with MIL Connectors 	10 I/O points	6 points (24 VDC)	4 transistor outputs (sinking)	No	CPM2C-10CDTM-D
				Yes	CPM2C-10C1DTM-D
			4 transistor outputs (sourcing)	No	CPM2C-10CDT1M-D
				Yes	CPM2C-10C1DT1M-D
	20 I/O points	12 points (24 VDC)	8 transistor outputs (sinking)	No	CPM2C-20CDTM-D
				Yes	CPM2C-20C1DTM-D
			8 transistor outputs (sourcing)	No	CPM2C-20CDT1M-D
				Yes	CPM2C-20C1DT1M-D
	32 I/O points	16 points (24 VDC)	16 transistor outputs (sinking)	No	CPM2C-32CDTM-D
			16 transistor outputs (sourcing)	No	CPM2C-32CDT1M-D

Expansion I/O Units

Classification and Appearance	I/O capacity	Inputs	Outputs	Model
Units with Terminal Blocks 	10 I/O points	6 points (24 VDC)	4 relay outputs	CPM2C-10EDR
	20 I/O points	12 points (24 VDC)	8 relay outputs	CPM2C-20EDR
	8 output points	---	8 relay outputs	CPM2C-8ER
Units with Fujitsu-compatible Connectors 	24 I/O points	16 points (24 VDC)	8 transistor outputs (sinking)	CPM2C-24EDTC
			8 transistor outputs (sourcing)	CPM2C-24EDT1C
	32 I/O points	16 points (24 VDC)	16 transistor outputs (sinking)	CPM2C-32EDTC
			16 transistor outputs (sourcing)	CPM2C-32EDT1C
	8 input points	8 points (24 VDC)	---	CPM2C-8EDC
	16 input points	16 points (24 VDC)	---	CPM2C-16EDC
	8 output points	---	8 transistor outputs (sinking)	CPM2C-8ETC
			8 transistor outputs (sourcing)	CPM2C-8ET1C
	16 output points	---	16 transistor outputs (sinking)	CPM2C-16ETC
			16 transistor outputs (sourcing)	CPM2C-16ET1C
Units with MIL Connectors 	24 I/O points	16 points (24 VDC)	8 transistor outputs (sinking)	CPM2C-24EDTM
			8 transistor outputs (sourcing)	CPM2C-24EDT1M
	32 I/O points	16 points (24 VDC)	16 transistor outputs (sinking)	CPM2C-32EDTM
			16 transistor outputs (sourcing)	CPM2C-32EDT1M
	8 input points	8 points (24 VDC)	---	CPM2C-8EDM
	16 input points	16 points (24 VDC)	---	CPM2C-16EDM
	8 output points	---	8 transistor outputs (sinking)	CPM2C-8ETM
			8 transistor outputs (sourcing)	CPM2C-8ET1M
	16 outputs points	---	16 transistor outputs (sinking)	CPM2C-16ETM
			16 transistor outputs (sourcing)	CPM2C-16ET1M

I/O Connectors (OMRON Products)

Connector		Description
	C500-CE241	24-pin soldered connector with cover
	C500-CE242	24-pin crimp connector with cover
	C500-CE243	24-pin pressure connector

Expansion Units

Analog I/O Unit

Model		Name	Specifications
	CPM2C-MAD11	Analog I/O Unit	2 analog inputs, 1 analog output

Temperature Sensor Units

Model		Name	Specifications
	CPM2C-TS001	Temperature Sensor Unit	2 thermocouple inputs
	CPM2C-TS101		2 platinum resistance thermometer inputs

CompoBus/S I/O Link Unit

Model		Name	Specifications
	CPM2C-SRT21	CompoBus/S I/O Link Unit	Allocates CPM2C I/O (8 inputs and 8 outputs) when CPM2C used as a CompoBus Slave.

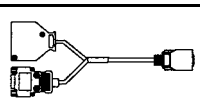
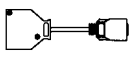
Simple Communications Unit

Model		Name	Specifications
	CPM2C-CIF21	Simple Communications Unit	Up to 32 communications components supporting the CompoWay/F protocol and temperature controllers and Digital Panel Meters supporting the SYSWAY protocol can be connected.

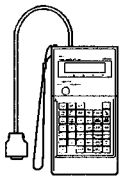
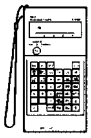
AC Power Supply Unit

Model		Name	Specifications
	CPM2C-PA201	AC Power Supply Unit	Input: 100 to 240 VAC Output: 24 VDC/600 mA

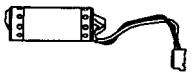
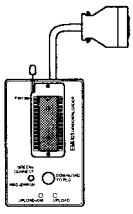
Communications Port Connecting Cables

Connector		Description	Cable length
	CPM2C-CN111 Connecting Cable	Converts the CPM2C CPU Unit's communications port to a peripheral port and RS-232C port.	0.15 m (about 4")
	CS1W-CN114 Connecting Cable	Converts the CPM2C CPU Unit's communications port to a peripheral port.	0.05 m (about 2")
	CS1W-CN118 Connecting Cable	Converts the CPM2C CPU Unit's communications port to an RS-232C port.	0.1 m (about 2")

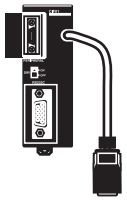
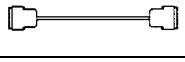
Peripheral Devices

Name	Appearance	Model Number	Specifications	
Programming Console		CQM1H-PRO01-E	2-m Connecting Cable attached Connects directly to the CPM2C.	
		CQM1-PRO01-E	2-m Connecting Cable attached CS1W-CN114 or CPM2C-CN111 also required.	
		C200H-PRO27-E	Hand-held, w/backlight; requires one of the Connecting Cables listed below.	
		C200H-CN222	Connects the C200H-PRO27-E to a peripheral port.	2-m cable
		C200H-CN422		4-m cable
		CS1W-CN224	Connects the C200H-PRO27-E directly to the CPM2C CPU Unit's communications port.	2-m cable
		CS1W-CN624		6-m cable
CX-Programmer		WS02-CXPC1-E	For MS-Windows 95/98 (CD-ROM)	

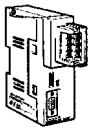
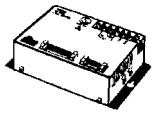
Maintenance Accessories

Name	Appearance	Model Number	Specifications
Backup Battery		CPM2C-BAT01	---
Expansion Memory Unit		CPM1-EMU01-V1	Uploads the ladder program and DM 6144 to DM 6655 from the PC to the EEPROM and downloads the ladder program and DM 6144 to DM 6655 from the EEPROM to the PC.
EEPROM		EEROM-JD	256 Kbits

Adapters and Connecting Cables

CPM2C communications port usage	Name	Appearance	Model number	Comments	Cable length
Personal Computer Connecting Cable			CS1W-CN226	Use to connect a personal computer to the peripheral port. D-sub, 9-pin	2 m
			CS1W-CN626		6 m
Peripheral	RS-232C Adapter		CQM1-CIF02	For a 9-pin computer serial port	3.3 m
	Peripheral/ RS-232C Adapter Unit		CPM2C-CIF01-V1	Use for peripheral port to RS-232C conversion.	---
RS-232C	RS-232C Cable		XW2Z-200S	For a 25-pin computer serial port	2 m
			XW2Z-500S		5 m
			XW2Z-200S-V	For a 9-pin computer serial port	2 m
			XW2Z-500S-V		5 m
RS-232C Cables (For use with the NT-AL001.)			XW2Z-070T-1	Use for CPM2C RS-232C port to NT-AL001 connection. (70-cm cable)	
			XW2Z-070T-1	Use for CPM2C RS-232C port to NT-AL001 connection. (2-m cable)	

Adapters (1:N Connections)

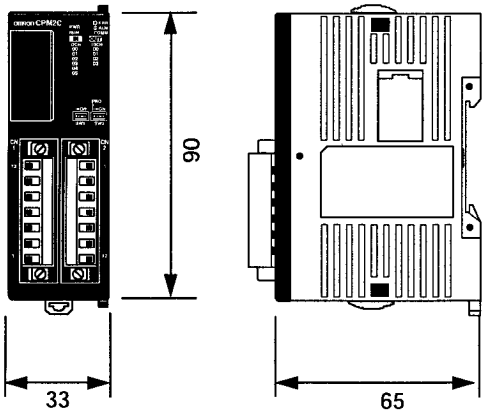
Name	Appearance	Model number	Specifications
RS-422 Adapter		NT-AL001	Use for CPM2C RS-232C port to RS-422A conversion. Requires a 5-VDC, 150 mA power supply which is supplied through the CPM2C connection. (Can also be connected to a personal computer, but this connection requires an external 5-VDC power supply.)
Link Adapter		B500-AL004	Use for personal computer RS-232C port to RS-422A conversion. (Can also be connected to a CPM2C.)
RS-422/RS-232C Adapter Unit		CPM2C-CIF11	Use for CPM2C peripheral port to RS-422 conversion.

Appendix B
Dimensions

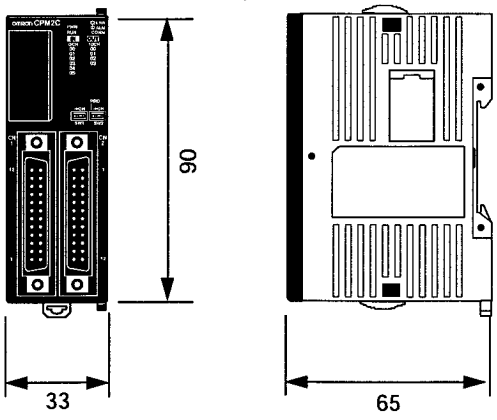
All dimensions are in millimeters.

CPU Units

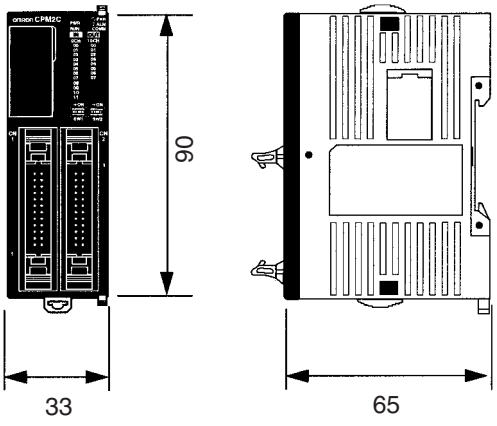
CPU Units with Relay Outputs (CPM2C-□0CDR-D, CPM2C-□0C1DR-D)



CPU Units with Transistor Outputs and Fujitsu-compatible Connectors (CPM2C-□□CDTC-D, CPM2C-□0C1DTC-D, CPM2C-□□CDT1C-D, CPM2C-□0C1DT1C-D)

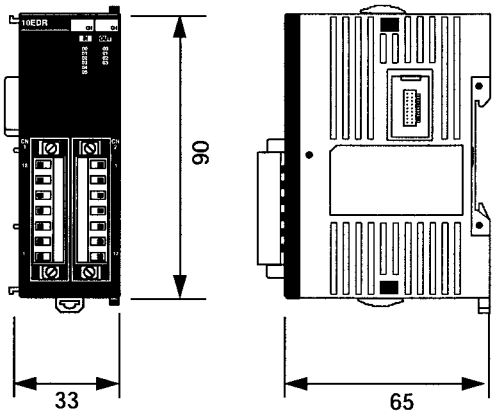


CPU Units with Transistor Outputs and MIL Connectors (CPM2C-□□CDTM-D, CPM2C-□0C1DTM-D, CPM2C-□□CDT1M-D, CPM2C-□0C1DT1M-D)

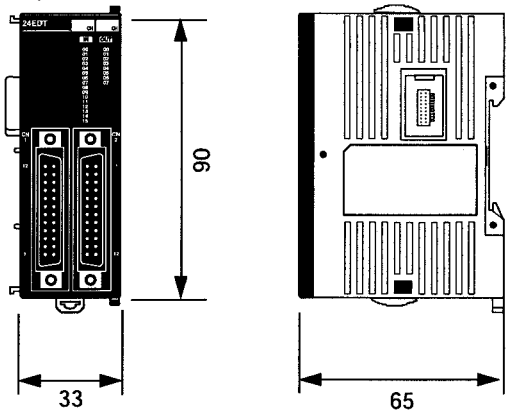


Expansion I/O Units

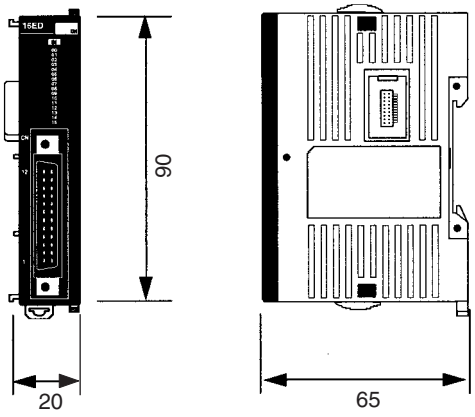
Units with Relay Outputs
(CPM2C-10EDR/8ER)



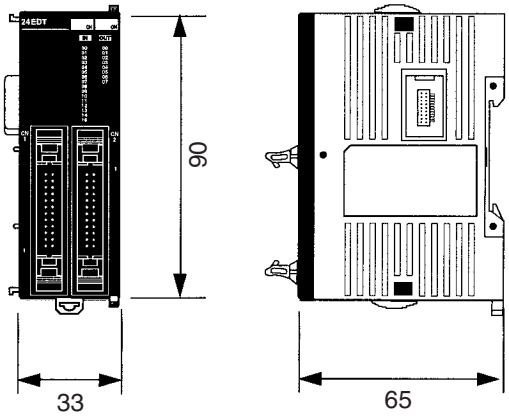
Units with Transistor Outputs and
Fujitsu-compatible Connectors
(CPM2C-24/32EDTC, CPM2C-24/32EDT1C)



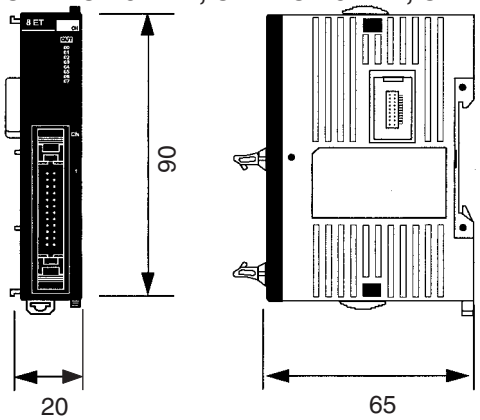
Units with Inputs or Outputs Only and Fujitsu-compatible Connectors (CPM2C-8EDC, CPM2C-8ETC, CPM2C-8ET1C, CPM2C-16EDC, CPM2C-16ETC, CPM2C-16ET1C)



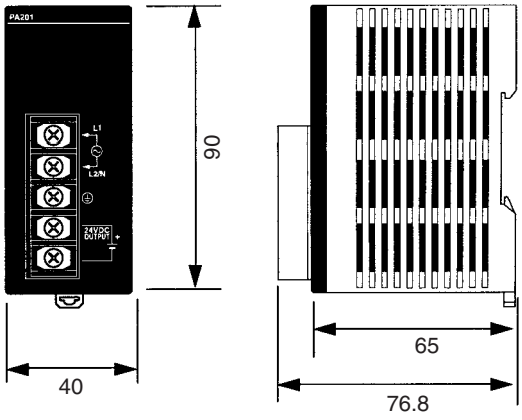
Units with Transistor Outputs and MIL Connectors (CPM2C-24/32EDTM, CPM2C-24/32EDT1M)



Units with Inputs or Outputs Only (CPM2C-8EDM, CPM2C-8ETM, CPM2C-8ET1M, CPM2C-16EDM, CPM2C-16ETM, CPM2C-16ET1M)

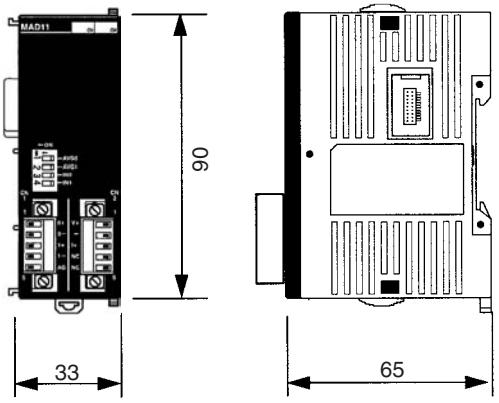


CPM2C-PA201 AC Power Supply Unit

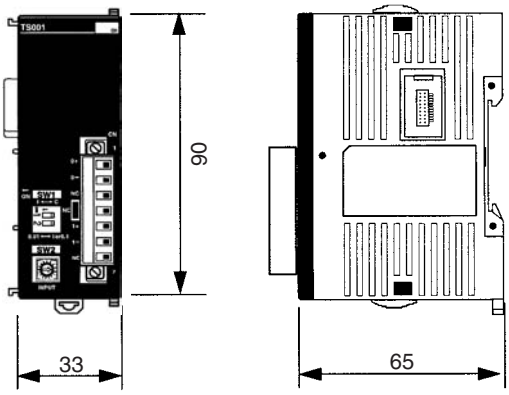


Expansion Units

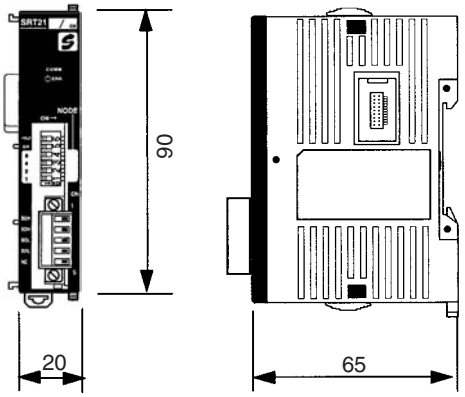
CPM2C-MAD11 Analog I/O Unit



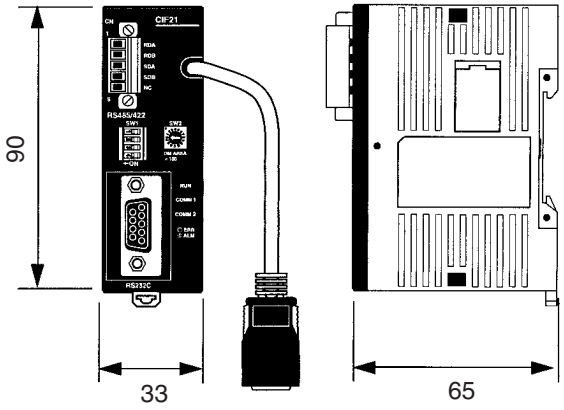
CPM2C-TS001, CPM2C-TS101 Temperature Sensor Units



CPM2C-SRT21 CompoBus/S I/O Link Unit

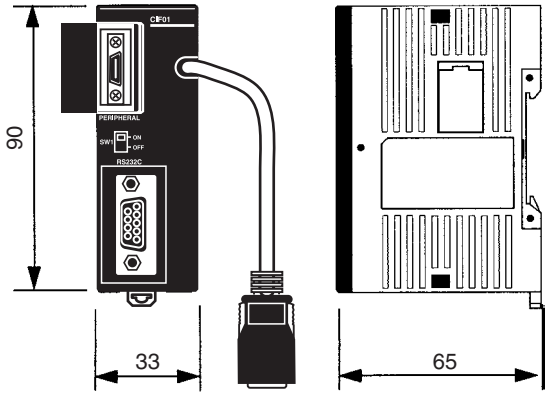


CPM2C-CIF21 Simple Communications Unit

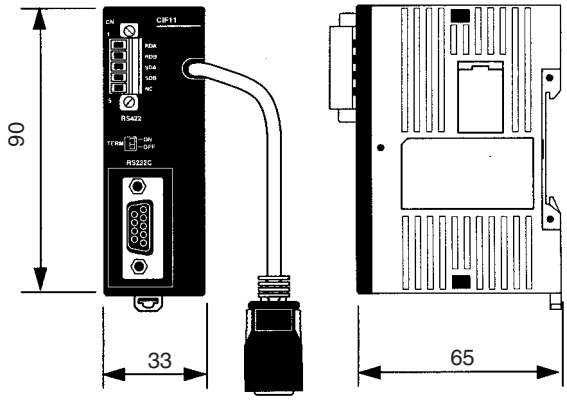


Adapter Units

CPM2C-CIF01-V1 Peripheral/RS-232C Adapter Unit

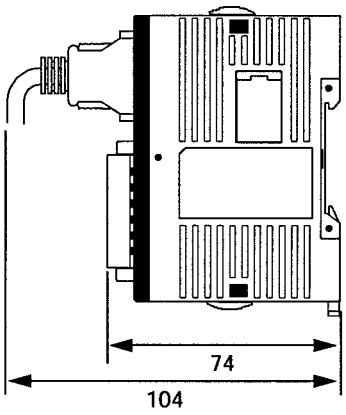


CPM2C-CIF11 RS-422/RS-232C Adapter Unit

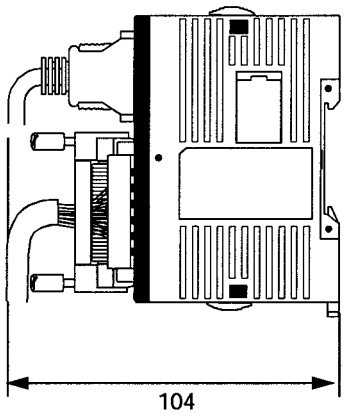


CPM2C Units with Connectors Attached

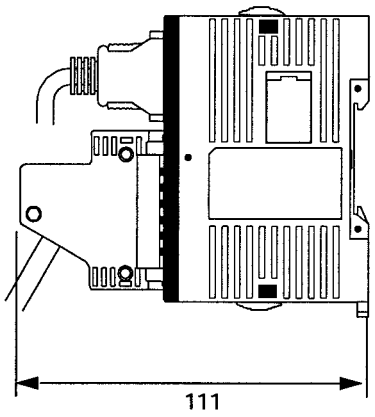
Units with Relay Outputs



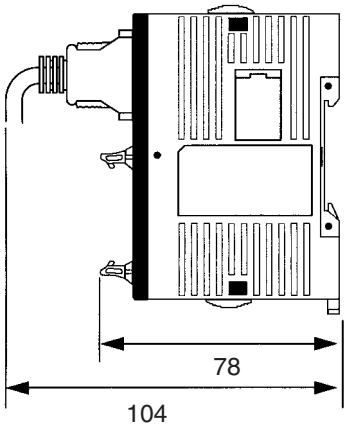
Units with Transistor Outputs (Using pressure connectors)



Units with Transistor Outputs (Using soldered connectors)



Units with Transistor Outputs and MIL Connectors



Weights

Unit			Model number	Weight
CPU Units	Terminal Blocks (Relay Outputs)	10 I/O points	CPM2C-10CDR-D	200 g max.
			CPM2C-10C1DR-D	200 g max.
		20 I/O points	CPM2C-20CDR-D	250 g max.
			CPM2C-20C1DR-D	250 g max.
	Fujitsu-compatible Connectors	10 I/O points	CPM2C-10CDTC-D	200 g max.
			CPM2C-10CD1DTC-D	200 g max.
			CPM2C-10CDT1C-D	200 g max.
			CPM2C-10C1DT1C-D	200 g max.
		20 I/O points	CPM2C-20CDTC-D	200 g max.
			CPM2C-20C1DTC-D	200 g max.
			CPM2C-20CDT1C-D	200 g max.
			CPM2C-20C1DT1C-D	200 g max.
		32 I/O points	CPM2C-32CDTC-D	200 g max.
			CPM2C-32CDT1C-D	200 g max.
	MIL Connectors	10 I/O points	CPM2C-10CDTM-D	200 g max.
			CPM2C-10C1DTM-D	200 g max.
			CPM2C-10CDT1M-D	200 g max.
			CPM2C-10C1DT1M-D	200 g max.
		20 I/O points	CPM2C-20CDTM-D	200 g max.
			CPM2C-20C1DTM-D	200 g max.
			CPM2C-20CDT1M-D	200 g max.
			CPM2C-20C1DT1M-D	200 g max.
		32 I/O points	CPM2C-32CDTM-D	200 g max.
			CPM2C-32CDT1M-D	200 g max.

Unit			Model number	Weight
Expansion I/O Units	Terminal Blocks (Relay Outputs)	10 I/O points	CPM2C-10EDR	200 g max.
		20 I/O points	CPM2C-20EDR	200 g max.
		8 output points	CPM2C-8ER	200 g max.
	Fujitsu-compatible Connectors	24 I/O points	CPM2C-24EDTC	200 g max.
			CPM2C-24EDT1C	200 g max.
		32 I/O points	CPM2C-32EDTC	200 g max.
			CPM2C-32EDT1C	200 g max.
		8 input points	CPM2C-8EDC	150 g max.
		16 input points	CPM2C-16EDC	150 g max.
		8 output points	CPM2C-8ETC	150 g max.
			CPM2C-8ET1C	150 g max.
		16 output points	CPM2C-16ETC	150 g max.
			CPM2C-16ET1C	150 g max.
	MIL Connectors	24 I/O points	CPM2C-24EDTM	200 g max.
			CPM2C-24EDT1M	200 g max.
		32 I/O points	CPM2C-32EDTM	200 g max.
			CPM2C-32EDT1M	200 g max.
		8 input points	CPM2C-8EDM	150 g max.
		16 input points	CPM2C-16EDM	150 g max.
		8 output points	CPM2C-8ETM	150 g max.
			CPM2C-8ET1M	150 g max.
		16 output points	CPM2C-16ETM	150 g max.
			CPM2C-16ET1M	150 g max.
Power Supply Unit			CPM2C-PA201	250 g max.
Expansion I/O Units	Analog I/O Unit		CPM2C-MAD11	200 g max.
	Temperature Sensor Unit		CPM2C-TS001	200 g max.
			CPM2C-TS101	200 g max.
	CompoBus/S I/O Link Unit		CPM2C-SRT21	150 g max.
	Simple Communications Unit		CPM2C-CIF21	150 g max.
Peripheral/RS-232C Adapter Unit			CPM2C-CIF01-V1	150 g max.
RS-422/RS-232C Adapter Unit			CPM2C-CIF11	150 g max.

Appendix C
DM Settings Assignment Sheets

Control Data Area

DM _____		Contents	Data
DM	(+0)	Simple Communications Unit control	
DM	(+1)	Simple Communications Unit status*1	
DM	(+2)	Syntax error DM address*1	
DM	(+3)	Communications control for Units 0 to 7	
DM	(+4)	Communications control for Units 8 to 15	
DM	(+5)	Communications control for Units 16 to 23	
DM	(+6)	Communications control for Units 24 to 31	
DM	(+7)	Unit 0 communications type	
DM	(+8)	Starting address of Unit 0 read data area (Starting address of Unit 0 read variable type area)	
DM	(+9)	Starting address of Unit 0 write data area (Starting address of Unit 0 write variable type area)	
DM	(+10)	Unit 1 communications type	
DM	(+11)	Starting address of Unit 1 read data area (Starting address of Unit 1 read variable type area)	
DM	(+12)	Starting address of Unit 1 write data area (Starting address of Unit 1 write variable type area)	
DM	(+13)	Unit 2 communications type	
DM	(+14)	Starting address of Unit 2 read data area (Starting address of Unit 2 read variable type area)	
DM	(+15)	Starting address of Unit 2 write data area (Starting address of Unit 2 write variable type area)	
DM	(+16)	Unit 3 communications type	
DM	(+17)	Starting address of Unit 3 read data area (Starting address of Unit 3 read variable type area)	
DM	(+18)	Starting address of Unit 3 write data area (Starting address of Unit 3 write variable type area)	
DM	(+19)	Unit 4 communications type	
DM	(+20)	Starting address of Unit 4 read data area (Starting address of Unit 4 read variable type area)	
DM	(+21)	Starting address of Unit 4 write data area (Starting address of Unit 4 write variable type area)	
DM	(+22)	Unit 5 communications type	
DM	(+23)	Starting address of Unit 5 read data area (Starting address of Unit 5 read variable type area)	
DM	(+24)	Starting address of Unit 5 write data area (Starting address of Unit 5 write variable type area)	
DM	(+25)	Unit 6 communications type	
DM	(+26)	Starting address of Unit 6 read data area (Starting address of Unit 6 read variable type area)	
DM	(+27)	Starting address of Unit 6 write data area (Starting address of Unit 6 write variable type area)	
DM	(+28)	Unit 7 communications type	
DM	(+29)	Starting address of Unit 7 read data area (Starting address of Unit 7 read variable type area)	
DM	(+30)	Starting address of Unit 7 write data area (Starting address of Unit 7 write variable type area)	
DM	(+31)	Unit 8 communications type	
DM	(+32)	Starting address of Unit 8 read data area (Starting address of Unit 8 read variable type area)	
DM	(+33)	Starting address of Unit 8 write data area (Starting address of Unit 8 write variable type area)	
DM	(+34)	Unit 9 communications type	
DM	(+35)	Starting address of Unit 9 read data area (Starting address of Unit 9 read variable type area)	
DM	(+36)	Starting address of Unit 9 write data area (Starting address of Unit 9 write variable type area)	
DM	(+37)	Unit 10 communications type	
DM	(+38)	Starting address of Unit 10 read data area (Starting address of Unit 10 read variable type area)	
DM	(+39)	Starting address of Unit 10 write data area (Starting address of Unit 10 write variable type area)	
DM	(+40)	Unit 11 communications type	
DM	(+41)	Starting address of Unit 11 read data area (Starting address of Unit 11 read variable type area)	
DM	(+42)	Starting address of Unit 11 write data area (Starting address of Unit 11 write variable type area)	
DM	(+43)	Unit 12 communications type	
DM	(+44)	Starting address of Unit 12 read data area (Starting address of Unit 12 read variable type area)	

DM _____	Contents	Data
DM (+45)	Starting address of Unit 12 write data area (Starting address of Unit 12 write variable type area)	
DM (+46)	Unit 13 communications type	
DM (+47)	Starting address of Unit 13 read data area (Starting address of Unit 13 read variable type area)	
DM (+48)	Starting address of Unit 13 write data area (Starting address of Unit 13 write variable type area)	
DM (+49)	Unit 14 communications type	
DM (+50)	Starting address of Unit 14 read data area (Starting address of Unit 14 read variable type area)	
DM (+51)	Starting address of Unit 14 write data area (Starting address of Unit 14 write variable type area)	
DM (+52)	Unit 15 communications type	
DM (+53)	Starting address of Unit 15 read data area (Starting address of Unit 15 read variable type area)	
DM (+54)	Starting address of Unit 15 write data area (Starting address of Unit 15 write variable type area)	
DM (+55)	Unit 16 communications type	
DM (+56)	Starting address of Unit 16 read data area (Starting address of Unit 16 read variable type area)	
DM (+57)	Starting address of Unit 16 write data area (Starting address of Unit 16 write variable type area)	
DM (+58)	Unit 17 communications type	
DM (+59)	Starting address of Unit 17 read data area (Starting address of Unit 17 read variable type area)	
DM (+60)	Starting address of Unit 17 write data area (Starting address of Unit 17 write variable type area)	
DM (+61)	Unit 18 communications type	
DM (+62)	Starting address of Unit 18 read data area (Starting address of Unit 18 read variable type area)	
DM (+63)	Starting address of Unit 18 write data area (Starting address of Unit 18 write variable type area)	
DM (+64)	Unit 19 communications type	
DM (+65)	Starting address of Unit 19 read data area (Starting address of Unit 19 read variable type area)	
DM (+66)	Starting address of Unit 19 write data area (Starting address of Unit 19 write variable type area)	
DM (+67)	Unit 20 communications type	
DM (+68)	Starting address of Unit 20 read data area (Starting address of Unit 20 read variable type area)	
DM (+69)	Starting address of Unit 20 write data area (Starting address of Unit 20 write variable type area)	
DM (+70)	Unit 21 communications type	
DM (+71)	Starting address of Unit 21 read data area (Starting address of Unit 21 read variable type area)	
DM (+72)	Starting address of Unit 21 write data area (Starting address of Unit 21 write variable type area)	
DM (+73)	Unit 22 communications type	
DM (+74)	Starting address of Unit 22 read data area (Starting address of Unit 22 read variable type area)	
DM (+75)	Starting address of Unit 22 write data area (Starting address of Unit 22 write variable type area)	
DM (+76)	Unit 23 communications type	
DM (+77)	Starting address of Unit 23 read data area (Starting address of Unit 23 read variable type area)	
DM (+78)	Starting address of Unit 23 write data area (Starting address of Unit 23 write variable type area)	
DM (+79)	Unit 24 communications type	
DM (+80)	Starting address of Unit 24 read data area (Starting address of Unit 24 read variable type area)	
DM (+81)	Starting address of Unit 24 write data area (Starting address of Unit 24 write variable type area)	
DM (+82)	Unit 25 communications type	
DM (+83)	Starting address of Unit 25 read data area (Starting address of Unit 25 read variable type area)	
DM (+84)	Starting address of Unit 25 write data area (Starting address of Unit 25 write variable type area)	
DM (+85)	Unit 26 communications type	
DM (+86)	Starting address of Unit 26 read data area (Starting address of Unit 26 read variable type area)	
DM (+87)	Starting address of Unit 26 write data area (Starting address of Unit 26 write variable type area)	
DM (+88)	Unit 27 communications type	
DM (+89)	Starting address of Unit 27 read data area (Starting address of Unit 27 read variable type area)	
DM (+90)	Starting address of Unit 27 write data area (Starting address of Unit 27 write variable type area)	
DM (+91)	Unit 28 communications type	
DM (+92)	Starting address of Unit 28 read data area (Starting address of Unit 28 read variable type area)	
DM (+93)	Starting address of Unit 28 write data area (Starting address of Unit 28 write variable type area)	
DM (+94)	Unit 29 communications type	
DM (+95)	Starting address of Unit 29 read data area (Starting address of Unit 29 read variable type area)	
DM (+96)	Starting address of Unit 29 write data area (Starting address of Unit 29 write variable type area)	

DM _____		Contents	Data
DM	(+97)	Unit 30 communications type	
DM	(+98)	Starting address of Unit 30 read data area (Starting address of Unit 30 read variable type area)	
DM	(+99)	Starting address of Unit 30 write data area (Starting address of Unit 30 write variable type area)	
DM	(+100)	Unit 31 communications type	
DM	(+101)	Starting address of Unit 31 read data area (Starting address of Unit 31 read variable type area)	
DM	(+102)	Starting address of Unit 31 write data area (Starting address of Unit 31 write variable type area)	

Read Variable Type Area (CompoWay/F)

DM _____		Contents	Data	Variable name	Setting range
DM	(+0)	Number of read items		---	0001 to 0012 BCD
DM	(+1)	Reserved	Always 0000	---	---
DM	(+2)	Starting address of read data area		---	0000 to 9999 BCD
DM	(+3)	Variable 1 type			Variable type: 00C0 to 00CF Hex Variable address: 0000 to FFFF Hex
DM	(+4)	Variable 1 address			
DM	(+5)	Variable 2 type			
DM	(+6)	Variable 2 address			
DM	(+7)	Variable 3 type			
DM	(+8)	Variable 3 address			
DM	(+9)	Variable 4 type			
DM	(+10)	Variable 4 address			
DM	(+11)	Variable 5 type			
DM	(+12)	Variable 5 address			
DM	(+13)	Variable 6 type			
DM	(+14)	Variable 6 address			
DM	(+15)	Variable 7 type			
DM	(+16)	Variable 7 address			
DM	(+17)	Variable 8 type			
DM	(+18)	Variable 8 address			
DM	(+19)	Variable 9 type			
DM	(+20)	Variable 9 address			
DM	(+21)	Variable 10 type			
DM	(+22)	Variable 10 address			
DM	(+23)	Variable 11 type			
DM	(+24)	Variable 11 address			
DM	(+25)	Variable 12 type			
DM	(+26)	Variable 12 address			

Write Variable Type Area (CompoWay/F)

DM _____	Contents	Data	Variable name	Setting range
DM (+0)	Number of write items		---	0000 to 0012 BCD
DM (+1)	Operation Command		---	0000: None 0001: Command set
DM (+2)	Starting address of write data area		---	0000 to 9999 BCD
DM (+3)	Variable 1 type			Variable type: 00C0 to 00CF Hex Variable address: 0000 to FFFF Hex
DM (+4)	Variable 1 address			
DM (+5)	Variable 2 type			
DM (+6)	Variable 2 address			
DM (+7)	Variable 3 type			
DM (+8)	Variable 3 address			
DM (+9)	Variable 4 type			
DM (+10)	Variable 4 address			
DM (+11)	Variable 5 type			
DM (+12)	Variable 5 address			
DM (+13)	Variable 6 type			
DM (+14)	Variable 6 address			
DM (+15)	Variable 7 type			
DM (+16)	Variable 7 address			
DM (+17)	Variable 8 type			
DM (+18)	Variable 8 address			
DM (+19)	Variable 9 type			
DM (+20)	Variable 9 address			
DM (+21)	Variable 10 type			
DM (+22)	Variable 10 address			
DM (+23)	Variable 11 type			
DM (+24)	Variable 11 address			
DM (+25)	Variable 12 type			
DM (+26)	Variable 12 address			

Read Data Area (CompoWay/F)

DM _____	Contents	Data	Variable name
DM (+0)	Response monitor area		---
DM (+1)	Component status		---
DM (+2)	Variable 1 read data (lower bytes)		
DM (+3)	Variable 1 read data (upper bytes)		
DM (+4)	Variable 2 read data (lower bytes)		
DM (+5)	Variable 2 read data (upper bytes)		
DM (+6)	Variable 3 read data (lower bytes)		
DM (+7)	Variable 3 read data (upper bytes)		
DM (+8)	Variable 4 read data (lower bytes)		
DM (+9)	Variable 4 read data (upper bytes)		
DM (+10)	Variable 5 read data (lower bytes)		
DM (+11)	Variable 5 read data (upper bytes)		
DM (+12)	Variable 6 read data (lower bytes)		
DM (+13)	Variable 6 read data (upper bytes)		
DM (+14)	Variable 7 read data (lower bytes)		
DM (+15)	Variable 7 read data (upper bytes)		
DM (+16)	Variable 8 read data (lower bytes)		
DM (+17)	Variable 8 read data (upper bytes)		
DM (+18)	Variable 9 read data (lower bytes)		
DM (+19)	Variable 9 read data (upper bytes)		
DM (+20)	Variable 10 read data (lower bytes)		
DM (+21)	Variable 10 read data (upper bytes)		
DM (+22)	Variable 11 read data (lower bytes)		
DM (+23)	Variable 11 read data (upper bytes)		
DM (+24)	Variable 12 read data (lower bytes)		
DM (+25)	Variable 12 read data (upper bytes)		

Write Data Area (CompoWay/F)

DM _____	Contents	Data	Variable name
DM (+0)	Response monitor area		---
DM (+1)	Operation Command		---
DM (+2)	Variable 1 write data (lower bytes)		
DM (+3)	Variable 1 write data (upper bytes)		
DM (+4)	Variable 2 write data (lower bytes)		
DM (+5)	Variable 2 write data (upper bytes)		
DM (+6)	Variable 3 write data (lower bytes)		
DM (+7)	Variable 3 write data (upper bytes)		
DM (+8)	Variable 4 write data (lower bytes)		
DM (+9)	Variable 4 write data (upper bytes)		
DM (+10)	Variable 5 write data (lower bytes)		
DM (+11)	Variable 5 write data (upper bytes)		
DM (+12)	Variable 6 write data (lower bytes)		
DM (+13)	Variable 6 write data (upper bytes)		
DM (+14)	Variable 7 write data (lower bytes)		
DM (+15)	Variable 7 write data (upper bytes)		
DM (+16)	Variable 8 write data (lower bytes)		
DM (+17)	Variable 8 write data (upper bytes)		
DM (+18)	Variable 9 write data (lower bytes)		
DM (+19)	Variable 9 write data (upper bytes)		
DM (+20)	Variable 10 write data (lower bytes)		
DM (+21)	Variable 10 write data (upper bytes)		
DM (+22)	Variable 11 write data (lower bytes)		
DM (+23)	Variable 11 write data (upper bytes)		
DM (+24)	Variable 12 write data (lower bytes)		
DM (+25)	Variable 12 write data (upper bytes)		

Read Data Area (SYSWAY: Temperature Controllers)

DM _____		Contents	Data	Command group				
				1	2	3	4	5
DM	(+0)	Response monitor area		Read	Read	Read	Read	Read
DM	(+1)	Present temperature		Read	Read	Read	Read	Read
DM	(+2)	Status		Read	Read	Read	Read	Read
DM	(+3)	Target temperature		Read	Read	Read	Read	Read
DM	(+4)	Alarm 1 SV		---	---	Read	Read	Read
DM	(+5)	Alarm 2 SV		---	---	Read	Read	Read
DM	(+6)	Proportional band		---	---	---	Read	Read
DM	(+7)	Reset time		---	---	---	Read	Read
DM	(+8)	Derivative time		---	---	---	Read	Read
DM	(+9)	Heater current monitor		---	---	---	---	Read
DM	(+10)	Heater current status		---	---	---	---	Read

Read Data Area (SYSWAY: Digital Panel Meters)

DM _____		Contents	Data	Command group				
				1	2	3	4	5
DM	(+0)	Response monitor area		Read	Read	Read	Read	Read
DM	(+1)	Display value (Lower bytes)		Read	Read	Read	Read	Read
DM	(+2)	Display value (Upper bytes)		Read	Read	Read	Read	Read
DM	(+3)	Display value status		Read	Read	Read	---	Read
DM	(+4)	Peak hold (Lower bytes)		---	Read	Read	---	Read
DM	(+5)	Peak hold (Upper bytes)		---	Read	Read	---	Read
DM	(+6)	Peak hold status		---	Read	Read	---	Read
DM	(+7)	Bottom hold (Lower bytes)		---	Read	Read	---	Read
DM	(+8)	Bottom hold (Upper bytes)		---	Read	Read	---	Read
DM	(+9)	Bottom hold status		---	Read	Read	---	Read
DM	(+10)	Comparison value HH (Lower bytes)		---	---	---	Read	Read
DM	(+11)	Comparison value HH (Upper bytes)		---	---	---	Read	Read
DM	(+12)	Comparison value H (Lower bytes)		---	---	---	Read	Read
DM	(+13)	Comparison value H (Upper bytes)		---	---	---	Read	Read
DM	(+14)	Comparison value L (Lower bytes)		---	---	---	Read	Read
DM	(+15)	Comparison value L (Upper bytes)		---	---	---	Read	Read
DM	(+16)	Comparison value LL (Lower bytes)		---	---	---	Read	Read
DM	(+17)	Comparison value LL (Upper bytes)		---	---	---	Read	Read

Write Data Area (SYSWAY: Temperature Controllers)

DM _____		Contents	Data	Command group				
				1	2	3	4	5
DM	(+0)	Response monitor area		Written	Written	Written	Written	Written
DM	(+1)	Target temperature SV		Written	Written	Written	Written	Written
DM	(+2)	Operation Command		---	Written	Written	Written	Written
DM	(+3)	Alarm 1 SV		---	---	Written	Written	Written
DM	(+4)	Alarm 2 SV		---	---	Written	Written	Written
DM	(+5)	Proportional band		---	---	---	Written	Written
DM	(+6)	Reset time		---	---	---	Written	Written
DM	(+7)	Derivative time		---	---	---	Written	Written
DM	(+8)	Heater burnout detection value		---	---	---	---	Written

Write Data Area (SYSWAY: Digital Panel Meters)

DM _____		Contents	Data	Command group				
				1	2	3	4	5
DM	(+0)	Response monitor area		Written	Written	Written	Written	Written
DM	(+1)	Operation Command		---	---	Written	---	Written
DM	(+2)	Comparison value HH (Lower bytes)		---	---	---	Written	Written
DM	(+3)	Comparison value HH (Upper bytes)		---	---	---		
DM	(+4)	Comparison value H (Lower bytes)		---	---	---	Written	Written
DM	(+5)	Comparison value H (Upper bytes)		---	---	---		
DM	(+6)	Comparison value L (Lower bytes)		---	---	---	Written	Written
DM	(+7)	Comparison value L (Upper bytes)		---	---	---		
DM	(+8)	Comparison value LL (Lower bytes)		---	---	---	Written	Written
DM	(+9)	Comparison value LL (Upper bytes)		---	---	---		

Appendix D
SYSMAC and SYSMAC-CPT Support Software

SYSMAC-CPT Support Software

Introduction

The SYSMAC-CPT Support Software is a complete programming and control package. It provides not only programming capabilities, but also advanced debugging, monitoring, and program/data management. The software is compatible with Windows 3.1, Windows 95, and Windows 98.

Any version of the SYSMAC-CPT Support Software can be used to program CPM2C PCs with the limitations described later in this section. For further information and actual operating procedures, please refer to the *SYSMAC-CPT Support Software Quick Start Guide* (W332) and *User Manual* (W333).

Refer to *3-4-10 Programming Device Connections* for details on connecting a personal computer to the CPM2C.

Limitations and Precautions

When programming a CPM2C PC with the SYSMAC-CPT Support Software, set the PC model to "CQM1" and the CPU model to "CPU43." There are some software limitations because of differences between the CPM2C and CQM1-CPU43 CPUs.

Program Input and Program Check

CQM1 data areas are larger than the corresponding CPM2C data areas, so the data area addresses that don't actually exist in the CPM2C or instructions not supported by the CPM2C can be input and won't be detected in the program check. Be sure that the word and bit addresses are within the specified ranges and that all instructions are supported.

If a program contains a data area address that exceeds the range of a CPM2C data area, a memory error will be generated when the program is executed and the Memory Area Specification Error Flag (AR 1308) will be turned ON.

Data area		CQM1 range	CPM2C range
Input words		IR 000 to IR 011	IR 000 to IR 009
Output words		IR 100 to IR 111	IR 010 to IR 019
Work words and dedicated words		IR 012 to IR 099 IR 112 to IR 227	IR 020 to IR 049/IR 200 to IR 227 (IR 050 to IR 199 cannot be used.)
SR area		SR 228 to SR 255	SR 228 to SR 255
HR area		HR 00 to HR 99	HR 00 to HR 19 (HR 20 to HR 99 cannot be used.)
AR area		AR 00 to AR 27	AR 00 to AR 23 (AR 24 to AR 27 cannot be used.)
LR area		LR 00 to LR 63	LR 00 to LR 15 (LR 16 to LR 63 cannot be used.)
Timer/Counter area		TIM/CNT 000 to 511	TIM/CNT 000 to 255 (TIM/CNT 256 to 511 cannot be used.)
DM area	Read/write	DM 0000 to DM 6143	DM 0000 to DM 1999, DM 2022 to DM 2047 (DM 2048 to DM 6143 cannot be used.)
	Read-only	DM 6144 to DM 6568	DM 6144 to DM 6599
	Error Log	DM 6569 to DM 6599	DM 2000 to DM 2021
	PC Setup	DM 6600 to DM 6655	DM 6600 to DM 6655

Since the PC model is set to "CQM1," a program that will run properly in the CQM1 will pass the program check even if it won't run properly in the CPM2C.

Monitoring, Online Editing, and Set Values

An error message will be displayed and the values will not be accepted if a data area address that exceeds the range of a CPM2C data area is entered for monitoring, an instruction operand, or a timer/counter SV.

Available Program Memory

The program capacity of the CQM1 (7,200 words) is greater than that of the CPM2C (4,096 words), and so the display will show more free space than is actually available. Be sure to keep the actual program capacity in mind while programming.

Program Transfer

When the program is transferred from the PC to the CPT with the default function code assignments, FUN18, FUN19, FUN87, and FUN88 will be displayed as TKY, MCMP, DSW, and 7SEG. The instructions, however, will be transferred correctly.

An error will occur if any instructions not supported by the CPT are transferred from the CPM2C.

When the program is transferred from the CPT to the PC, TKY, MCMP, DSW, and 7SEG will be displayed on the CPT, but will not be executed in the CPU Unit. They will be treated as NOP(00).

If expansion instructions are transferred to the PC with DM 6602 is set to the "default settings" or if instructions not supported by the CPM2C are transferred to the PC, a message saying that expansion instructions cannot be written because DIP switch pin 4 is OFF will be displayed. Change the setting of DM 6602 to enable user settings to use expansion instructions.

Expansion Instructions

It will not be possible to transfer the program if the function codes assigned to expansion instructions (18 instructions) have been changed from their default settings. A message to turn ON the DIP switch of the PC and execute again will be displayed. Change the function code assignments to the CQM1 defaults shown in the following table before programming.

Function code	Default CPM2C Assignments	Default CQM1 Assignments
17	ASFT	ASFT
18	---	TKY
19	---	MCMP
47	RXD	RXD
48	TXD	TXD
60	CMPL	CMPL
61	INI	INI
62	PRV	PRV
63	CTBL	CTBL
64	SPED	SPED
65	PULS	PULS
66	SCL	SCL
67	BCNT	BCNT
68	BCMP	BCMP
69	STIM	STIM
87	---	DSW
88	---	7SEG
89	INT	INT

There are four CPM2C instructions (STUP(––), SYNC(––), TIML(––), and TMHH(––)) that are not supported by the CQM1 and cannot be used. If one of these instructions is used in the program, an error will occur when the program is transferred from the PC to the computer.

The input word for the frequency for PWM must be between IR 000 and IR 049, or between IR 200 and IR 252.

If a CQM1 instruction that is not supported by the CPM2C is used in the program, an error will occur when the program is transferred from the computer to the PC.

Error Log

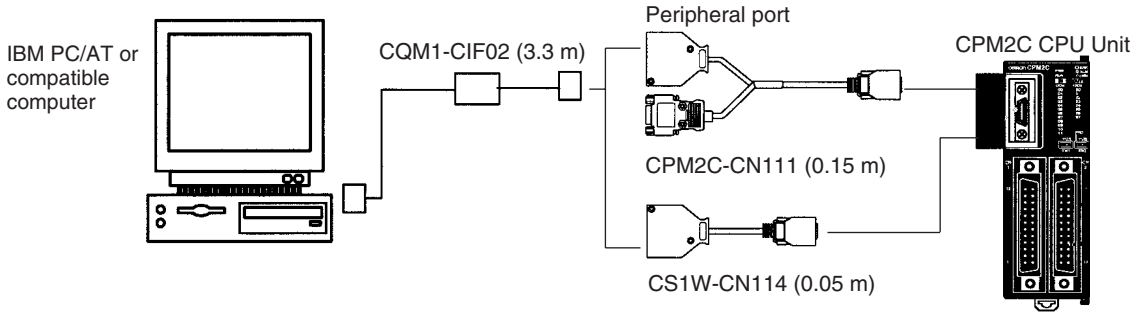
The error log cannot be displayed. If data has been written to DM 6569 to DM 6599, however, this data will be incorrectly displayed as the error log. Do not use the information that is displayed.

PC Setup

Some of the CPM2C's PC Setup settings are different from those in the CQM1, so not all settings can be made from the menus. These settings have to be made by writing data directly to the word containing the setting.

Connecting the CPM2C to a Personal Computer

A computer with SYSMAC-CPT installed can be connected to CPM2C. Connect the Connecting Cable to the computer and to the peripheral port of the CPM2C. Then turn ON the power supply to the CPM2C.



Note 1. If the power is turned ON to the CPM2C without connecting the Connecting Cable to the peripheral port, the CPM2C will start operation in RUN mode. If the CPM2C starts operation in RUN mode even though the Connecting Cable is properly connected to the peripheral port, check the PC Setup settings in the CPM2C.

2. The CPM2C has three operating modes: RUN, MONITOR, and PROGRAM. The CPM2C will operate in PROGRAM mode when offline. When online, the operating mode of the CPM2C can be changed from the SYSMAC-CPT.

Operating mode	Function
PROGRAM	The CPU Unit will stop operation while in PROGRAM mode. The user program can be written or changed, memory can be cleared, the program can be checked, and other program processing operations are possible.
MONITOR	The CPU Unit will operate in MONITOR mode and I/O processing is performed the same as in RUN mode. The following operations are possible in MONITOR mode: monitoring CPU Unit operation, force-setting/resetting bits in memory, changing timer/counter SVs and PVs, changing the PVs of word data, online editing, and other operations required for trial operation and adjustments to the system.
RUN	The CPU Unit will be in full operation in RUN mode. Although CPU Unit operation can be monitored in RUN mode, force-setting/resetting bits in memory and changing the PVs and SVs is not possible.

SYSMAC Support Software (SSS)

Introduction

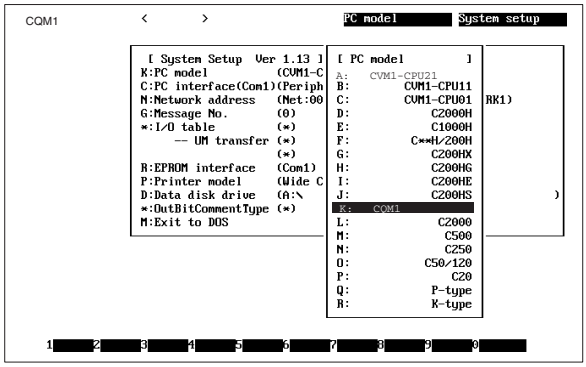
The SSS is a complete programming and control package designed for C-series and CVM1 PCs. It provides not only programming capabilities, but also advanced debugging, monitoring, and program/data management. For further information and actual operating procedures, please refer to the *SYSMAC Support Software Operation Manuals: Basics* and *C Series*.

CPM2C programming can be performed with any version of the SSS.

Refer to *3-4-10 Programming Device Connections* for details on connecting a personal computer to the CPM2C.

Limitations and Precautions

When programming a CPM2C PC with the SSS, set the PC model to "CQM1." There are some software limitations because of differences between the CPM2C and CQM1 CPUs.



Program Input and Program Check

CQM1 data areas are larger than the corresponding CPM2C data areas, so the data area addresses that don't actually exist in the CPM2C or instructions not supported by the CPM2C can be input and won't be detected in the program check. Be sure that the word and bit addresses are within the specified ranges and that all instructions are supported.

If a program contains a data area address that exceeds the range of a CPM2C data area, a memory error will be generated when the program is executed and the Memory Area Specification Error Flag (AR 1308) will be turned ON.

Data area		CQM1 range	CPM2C range
Input words		IR 000 to IR 011	IR 000 to IR 009
Output words		IR 100 to IR 111	IR 010 to IR 019
Work words		IR 012 to IR 099 IR 112 to IR 227	IR 020 to IR 049/IR 200 to IR 227 (IR 050 to IR 199 cannot be used.)
SR area		SR 228 to SR 255	SR 228 to SR 255
HR area		HR 00 to HR 99	HR 00 to HR 19 (HR 20 to HR 99 cannot be used.)
AR area		AR 00 to AR 27	AR 00 to AR 23 (AR 24 to AR 27 cannot be used.)
LR area		LR 00 to LR 63	LR 00 to LR 15 (LR 16 to LR 63 cannot be used.)
Timer/Counter area		TIM/CNT 000 to 511	TIM/CNT 000 to 255 (TIM/CNT 256 to 511 cannot be used.)
DM area	Read/write	DM 0000 to DM 6143	DM 0000 to DM 1999, DM 2022 to DM 2047 (DM 2048 to DM 6143 cannot be used.)
	Read-only	DM 6144 to DM 6568	DM 6144 to DM 6599
	Error Log	DM 6569 to DM 6599	DM 2000 to DM 2021
	PC Setup	DM 6600 to DM 6655	DM 6600 to DM 6655

Since the PC model is set to "CQM1," a program that will run properly in the CQM1 will pass the program check even if it won't run properly in the CPM2C.

Monitoring, Online Editing, and Set Values

An error message will be displayed and the values will not be accepted if a data area address that exceeds the range of a CPM2C data area is entered for monitoring, time charts, an instruction operand, or a timer/counter SV.

Transferring and Verifying DM Area Data

DM Area addresses not supported by the CPM2C cannot be transferred or monitored. DM 1024 to DM 6143 are not checked for DM Area verification.

Available Program Memory

Since the program capacity of the CQM1 (7,200 words) is greater than that of the CPM2C (4,096 words), the display will show more free space than is actually available. Be sure to keep the actual program capacity in mind while programming.

Program Transfer

When the program is transferred from the PC to the SSS with the default function code assignments, FUN18, FUN19, FUN87, and FUN88 will be displayed as TKY, MCMP, DSW, and 7SEG. The instructions, however, will be transferred correctly.

"???" will be displayed if any instructions not supported by the SSS are transferred from the CPM2C. Mnemonics will be displayed, however, if any have been defined for the specified function code.

When the program is transferred from the SSS to the PC, TKY, MCMP, DSW, and 7SEG will be displayed on the SSS, but will not be executed in the CPU Unit. They will be treated as NOP.

If expansion instructions are transferred to the PC with DM 6602 is set to the "default settings," a message saying that expansion instructions cannot be written because DIP switch pin 4 is OFF will be displayed. Change the setting of DM 6602 to enable user settings to use expansion instructions. If instructions not supported by the CPM2C are transferred to the PC, a message saying to set expansion instructions will be displayed, and transfer will not be possible.

Expansion Instructions

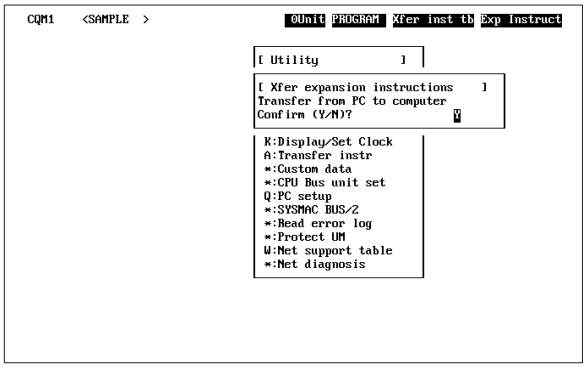
It will not be possible to transfer the program if the function codes assigned to expansion instructions have been changed from their default settings. A message to turn ON the DIP switch of the PC and execute again will be displayed. Change the function code assignments to the CQM1 defaults shown in the following table before programming.

Function code	Default CPM2C Assignments	Default CQM1 Assignments
17	ASFT	ASFT
18	---	TKY
19	---	MCMP
47	RXD	RXD
48	TXD	TXD
60	CMPL	CMPL
61	INI	INI
62	PRV	PRV
63	CTBL	CTBL
64	SPED	SPED
65	PULS	PULS
66	SCL	SCL
67	BCNT	BCNT
68	BCMP	BCMP
69	STIM	STIM
87	---	DSW
88	---	7SEG
89	INT	INT

If a CQM1 instruction that is not supported by the CPM2C is used in the program, an error will occur when the program is transferred from the computer to the PC.

There are four CPM2C instructions (STUP(––), SYNC(––), TIML(-––), and TMHH(––)) that are not supported by the CQM1. These instructions can be used by transferring the expansion instructions from the CPM2C to the SSS. This procedure is outlined in the following.

1. Select “Transfer Instr” from the “Utility” menu.
2. Confirm the transfer by pressing “Y” when the confirmation pop-up is displayed.



3. The “Utility” menu will be displayed again when the transfer is completed.

PC Setup

Since some of the CPM2C’s PC Setup settings are different from those in the CQM1, not all settings can be made from the menus. These settings have to be made by writing data directly to the word containing the setting.

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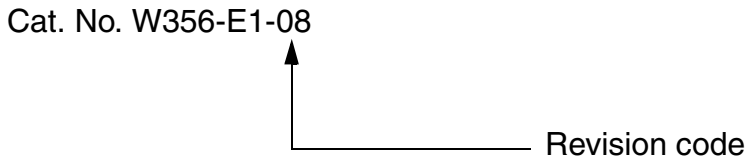
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Revision History

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



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	June 1999	Original production
2	January 2000	Major revisions throughout the manual. Information altered on the Analog I/O Unit, Temperature Sensor Units, the CompoBus/S I/O Link Unit, Expansion I/O Units, Adapter Units, the AC Power Supply Unit, the Expansion Memory Unit, Relay Terminals, Terminal Blocks, and Programming Console connections.
3	November 2000	A new section 7 was added for the CPM2C-CIF21 Simple Communications Unit. New models of CPU Units and Expansion Units added. Changes to DIP switch pin 2 function described. Specific corrections are as follows: **Page xiv:** "Emergency stop circuits, ..." replaced with a different precaution. **Page xv:** "The life of relays largely...," "Be sure that terminal blocks...," and "Use round crimp terminals for..." revised. **Page xviii:** Addition to top of page. **Page 2:** Illustration changed. **Pages 2, 3, 6, 7, 8, 20, 21, 30 to 32, 34, 35, 37, and 38:** Information added on Units with 20 or 32 I/O points. **Pages 4, 7, 8, 10, 19, 20, 54, and 94 to 100:** Simple Communications Unit added. **Page 7 to 9, 40, 43 to 45, 47 to 50, 73 to 78, 82 to 89, 179 to 182, and 185 to 189:** Revised or expanded. **Page 12, 20, 24, 28, 41, 114, and 120:** Information on SW2 changed or added. **Page 23:** Added note. **Page 30:** Power consumption information expanded and dielectric strength changed. **Page 31:** Interrupt processing and clock function information expanded. **Page 42:** Switch functions revised. **Page 67:** Revised information on crimp terminals. **Page 70:** Added note and heading. **Pages 94, 115, 116:** CQM1H-PRO01-E added. **Page 97:** Model numbers corrected in graphic. **Page 106:** Windows versions corrected. **Page 126:** "Pressing the MONTR Key will change..." paragraph changed. **Page 133:** "In MONITOR or PROGRAM mode" added in Bit Monitor description. **Page 190:** Appendix C added.
4	May 2001	The following changes were made. **Page 13:** Description of communications switch changed. **Page 14:** Table and notes changed. **Page 36:** Clock function entry in table changed for clarity. **Page 46:** Communications port description updated. **Pages 47, 136, 229, 230, 237, 241, 245, 249, 250, and 252:** Note added. **Pages 40, 71, 77, 86, 223, 225, and 234:** Information added in diagram. **Pages 71 and 226**: Signal labels changed in diagram. **Pages 72 and 228:** SW1 switch description changed. **Page 86:** Step 2 changed. **Page 96:** Models added at bottom of diagram. **Pages 104 to 106 and 127 to 130:** Connector types designated. **Pages 112 and 117:** Bottom graphic corrected. **Pages 220, 281, and 282:** "Host link" changed to "SYSWAY." **Page 235:** First column of top table changed. **Pages 245, 248, and 249:** Description of Write Data changed. **Page 247:** Top note corrected. **Page 251:** Description of Syntax Errors corrected. **Pages 256 and 257:** Bold removed from some addresses. **Pages 258 to 260:** Parenthetic information removed. **Pages 275 to 282:** Leading zeros removed. **Page 279:** "Component status" added.

Revision code	Date	Revised content
05	April 2002	Specifications were changed to update to CPM2C-CIF01-V1 Peripheral/RS-232C Adapter Unit. Specific changes are as follows: **Page 4:** Last line on page removed. **Pages 6, 12, 13, 32, 76, 139, 142 to 144, 160, 161, 218, 222, 224, 280, and 283:** Graphics and model numbers (-V1 added) changed. **Pages 52, 54 to 56, 60, 61, 63 to 67, and 108 to 110:** "COM ( )" changed to "COM (-) or "-" added to diagram. **Page 72:** Table added. **Pages 73, 183, 161, and 237:** Notes added. **Page 75:** Information added on SW1. **Page 229:** Digital Controller Board added. **Page 231:** Read data area and write data area corrected at bottom of page. **Page 244:** Description of bits 12 to 15 at bottom of page altered. **Page 255:** "Read" added in table at bottom of page. **Page 266:** DM 0013 corrected (including setting of bits 9 to 11). **Page 275:** Cable added.
06	November 2004	Minor changes and corrections to information were made, and *Appendix D* was created from information in *Section 4*. Specific changes are as follows: **Page xiii:** Safety precaution added. **Pages xvi and xvii:** Standard changed from EN50081-2 to EN61000-6-4. **Page 2:** Information on sharing Programming Devices changed. **Pages 12, 75, 275, and 280:** Diagram showing Peripheral/RS-232C Adapter Unit changed. **Page 23:** Optional battery backup lifetime changed from 2 to 5 years. **Page 30:** Lot number 31800 changed to 3180O in note. **Pages 40 and 43:** Numbers added to outputs in diagram. **Pages 54, 55, 56, 64, 65, 107, 131, and 132:** Note added. **Page 95:** Diagram showing connectors changed. **Page 114:** Diagram added. **Page 133:** Applicable cable model changed for G70D-SOC16-1 and G70D-FOM16-1 Relay Terminals. **Pages 139 to 140:** Information removed and new information on CX-Programmer connections added. **Page 144:** Note changed. **Pages 147 to 159:** Information on SYSMAC-CPT and SYSMAC Support Software removed from Section 4 and most of this information moved to Appendix D (new). **Page 168:** Functions added to table. **Page 170:** Information on new operations added. **Page 193:** "C" changed to "CNT" and "T" changed to "TIM" in *Data* column of table. **Page 215:** Information on battery replacement changed. **Page 219:** "-15PC" suffix added to ATMEL model number for EEPROM. **Page 228:** Table added. **Page 231:** "Starting address of separate area" added to end of control data area table. **Pages 251 and 253:** Meaning of FF16 error code changed and corresponding note added. **Page 274:** SYSMAC-CPT and SYSMAC Support Software removed from table. **Page 278:** Diagrams changed. **Page 292:** *Appendix D* added.
07	September 2005	**Page v:** Information on general precautions notation added. **Page xi:** Information on liability and warranty added.
08	February 2008	**Page 4:** Change number of mountable Analog I/O Units to 3 and added note. **Pages 5, 116, and 117:** Added note. **Page 91:** Added recommended Screwdriver to top table. **Page 137:** Added sentence to bottom of page. **Page 138:** Remove last heading and paragraph from page.

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