Cat. No. W363-E1-05

SYSMAC CQM1H Series

CQM1H-CPU□□ Programmable Controllers
CQM1H-□□□□□ Inner Boards

OPERATION MANUAL

OMRON®

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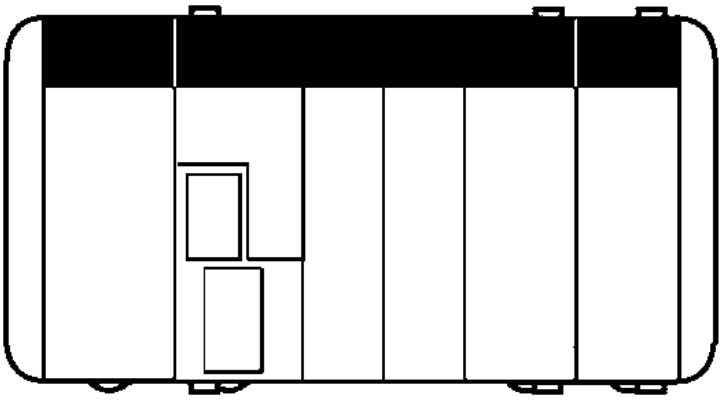
SYSMAC CQM1H Series

CQM1H-CPU□□ Programmable Controllers

CQM1H-□□□□□ Inner Boards

Operation Manual

Revised April 2003



Notice:

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

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

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

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

OMRON Product References

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

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

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

Visual Aids

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

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

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

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About this Manual:

The CQM1H is a compact, high-speed Programmable Controller (PC) designed for advanced control operations in systems requiring from 16 to 256 I/O points per PC. There are two manuals describing the setup and operation of the CQM1H: The *CQM1H Operation Manual* (this manual) and the *CQM1H Programming Manual*. Also available is the *CQM1-series Dedicated I/O Units Operation Manual*.

This manual describes the system configuration and installation of the CQM1H and provides a basic explanation of operating procedures for the Programming Consoles. It also introduces the capabilities of the SYSMAC Support Software (SSS) and SYSMAC-CPT Support Software. Read this manual first to acquaint yourself with the CQM1H.

The *CQM1H Programming Manual* (W364) provides detailed descriptions of the CQM1H's programming functions. The *SYSMAC Support Software Operation Manuals: Basics* and *C-series PCs* (W247 and W248) provide descriptions of SSS operations for the CQM1H and other SYSMAC C-series PCs. The *SYSMAC-CPT Support Software Quick Start Guide* (W332) and *User Manual* (W333) provide descriptions of ladder diagram operation in the Windows environment. The *CX-Programmer User Manual* (W361) and the *CX-Server User Manual* (W362) provide 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 CQM1H.

Section 1 describes the CQM1H's special features and functions, describes the system configurations, and outlines the steps required before operation. It also provides a list of CQM1H functions by purpose and a comparison between the CQM1H and the CQM1.

Section 2 gives specifications for the Units that go together to create a CQM1H PC and provides functional specifications of the memory areas.

Section 3 provides details on functions and nomenclature for the Units that make up the CQM1H and provides information on Programming Devices and communications specifications.

Section 4 describes how to install the CQM1H PC, including how to mount Units, wire I/O, and connect Programming Devices. Installation precautions and mounting dimensions are also provided. Follow the instructions carefully to ensure proper operation. Improper installation can cause the PC to malfunction.

Section 5 gives a general overview of CQM1H operation and includes details on the internal structure of the CPU Unit and describes the different operating modes.

Section 6 describes the setting on the DIP switch on the front of the CPU Unit. Most PC operations are controlled by parameters set in the PC Setup. Refer to the *CQM1H Programming Manual* for information on the PC Setup.

Section 7 provides information on connecting and using a Programming Console. Refer to 7-4-2 Programming Console Error Messages for details on errors that might occur during Programming Console operations.

Section 8 describes hardware information for the following Inner Boards: Serial Communications Board, High-speed Counter Board, Pulse I/O Board, Absolute Encoder Interface Board, Analog Setting Board, and Analog I/O Board. Refer to the *CQM1H Programming Manual* for information on software application.

Section 9 describes the maintenance of the battery that backs up memory in the CPU Unit, including the replacement procedure.

The Appendix describes preparing cables for Inner Boards.

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

PRECAUTIONS

This section provides general precautions for using the CQM1H-series Programmable Controllers (PCs) and related devices.

The information contained in this section is important for the safe and reliable application of Programmable Controllers. You must read this section and understand the information contained before attempting to set up or operate a PC system.

1 Intended Audience

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

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

2 General Precautions

The user must operate the product according to the performance specifications described in the 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 PC. Be sure to read this manual before attempting to use the PC 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 The CPU Unit refreshes I/O even when the program is stopped (i.e., even in PROGRAM mode). Confirm safety thoroughly in advance before changing the status of any part of memory allocated to I/O Units, Dedicated I/O Units, or Inner Board. Any changes to the data allocated to any Unit may result in unexpected operation of the loads connected to the Unit. Any of the following operation may result in changes to memory status.

- Transferring I/O memory data to the CPU Unit from a Programming Device.
- Changing present values in memory from a Programming Device.
- Force-setting/-resetting bits from a Programming Device.
- Transferring I/O memory from a host computer or from another PC on a network.

⚠WARNING Do not attempt to take any Unit apart or touch the interior 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 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.
- When the 24-VDC output (service power supply to the PC) is overloaded or short-circuited, the voltage may drop and result in the outputs being turned OFF. As a countermeasure for such problems, external safety measures must be provided to ensure safety in the system.

⚠ **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** Do not touch the Power Supply Unit while power is being supplied or immediately after power has been turned OFF. Doing so may result in burns.

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

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

⚠ **Caution** Tighten the screws on the terminal block of the AC Power Supply Unit to the torque specified in the operation manual. The loose screws may result in burning or malfunction.

4 Operating Environment Precautions

⚠ **Caution** Do not operate the control system in the following locations:

- Locations subject to direct sunlight.
- Locations subject to temperatures or humidity outside the range specified in the specifications.
- Locations subject to condensation as the result of severe changes in temperature.
- Locations subject to corrosive or flammable gases.
- Locations subject to dust (especially iron dust) or salts.
- Locations subject to exposure to water, oil, or chemicals.
- Locations subject to shock or vibration.

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

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

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

5 Application Precautions

Observe the following precautions when using the PC System.

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

- Always ground the system to 100 Ω or less when installing the Units. Not connecting to a ground of 100 Ω or less may result in electric shock.
- Always turn OFF the power supply to the PC before attempting any of the following. Not turning OFF the power supply may result in malfunction or electric shock.
- Mounting or dismounting I/O Units, CPU Units, Memory Cassettes, Power Supply Units, or any other Units.
  - Assembling the Units.
  - Connecting cables or wiring the system.
  - Connecting or disconnecting the connectors.
  - Setting DIP switches.
  - Replacing the battery.

⚠ **Caution** Failure to observe 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.
- Fail-safe measures must be taken by the customer to ensure safety in the event that outputs from Output Units remain ON as a result of internal circuit failures, which can occur in relays, transistors, and other elements.
- Always turn ON power to the PC before turning ON power to the control system. If the PC power supply is turned ON after the control power supply, temporary errors may result in control system signals because the output terminals on DC Output Units and other Units will momentarily turn ON when power is turned ON to the PC.
- Do not turn OFF the power supply to the PC when data is being transferred. In particular, do not turn OFF the power supply when reading or writing a Memory Card. Also, do not remove the Memory Card when the BUSY indicator is lit. To remove a Memory Card, first press the memory card power supply switch and then wait for the BUSY indicator to go out before removing the Memory Card.
- If the I/O Hold Bit (SR 25212) is turned ON, the outputs from the PC will not be turned OFF and will maintain their previous status when the PC is switched from RUN or MONITOR mode to PROGRAM mode. Make sure that the external loads will not produce dangerous conditions when this occurs. (When operation stops for a fatal error, including those produced with the FALS(07) instruction, all outputs from Output Unit will be turned OFF and only the internal output status will be maintained.)
- Install the Units properly as specified in the operation manuals. Improper installation of the Units may result in malfunction.
- Mount Units only after checking terminal blocks and connectors completely.
- When assembling the Units or mounting the end cover, be sure to lock them securely as shown in the following illustrations. If they are not properly locked, desired functionality may not be achieved.
- Be sure to mount the end cover to the rightmost Unit.
- 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, Memory Units, expansion I/O cables, and other items with locking devices are properly locked into place. Improper locking may result in malfunction.
- Be sure to confirm the orientation and polarities when connecting terminal blocks and connectors.
- Leave the label attached to the Unit when wiring. Removing the label may result in malfunction if foreign matter enters the Unit.
- Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.
- Wire all connections correctly.
- When supplying power at 200 to 240 V AC from a CQM1-PA216 Power Supply Unit, always remove the metal jumper from the voltage selector

terminals. The product will be destroyed if 200 to 240 V AC is supplied while the metal jumper is attached.

- A ground of 100 Ω or less must be installed when shorting the GR and LG terminals on the Power Supply Unit.
- Use crimp terminals for wiring. Do not connect bare stranded wires directly to terminals. Connection of bare stranded wires may result in burning.
- Do not apply voltages to the Input Units in excess of the rated input voltage. Excess voltages may result in burning.
- Do not apply voltages or connect loads to the Output Units in excess of the maximum switching capacity. Excess voltage or loads may result in burning.
- 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 voltages specified in the operation manuals. An incorrect voltage may result in malfunction or burning.
- Take appropriate measures to ensure that the specified power with the rated voltage and frequency is supplied. Be particularly careful in places where the power supply is unstable. An incorrect power supply may result in malfunction.
- Disconnect the functional ground terminal when performing withstand voltage tests. Not disconnecting the functional ground terminal may result in burning.
- Check switch settings, the contents of the DM Area, and other preparations before starting operation. Starting operation without the proper settings or data may result in an unexpected operation.
- 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 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 a Unit, be sure to first touch a grounded metallic object in order to discharge any static build-up. Not doing so may result in malfunction or damage.
- Do not pull on the cables or bend the cables beyond their natural limit. Doing either of these may break the cables.
- Do not place objects on top of the cables or other wiring lines. Doing so may break the cables.
- Resume operation only after transferring to the new CPU Unit the contents of the DM Area, HR Area, and other data required for resuming operation. Not doing so may result in an unexpected operation.
- Do not short the battery terminals or charge, disassemble, heat, or incinerate the battery. Do not subject the battery to strong shocks. Doing any of these may result in leakage, rupture, heat generation, or ignition of the battery. Dispose of any battery that has been dropped on the floor or oth-

erwise subjected to excessive shock. Batteries that have been subjected to shock may leak if they are used.

- UL standards required that batteries be replaced only by experienced technicians. Do not allow unqualified persons to replace batteries.
- When replacing parts, be sure to confirm that the rating of a new part is correct. Not doing so may result in malfunction or burning.
- When transporting or storing circuit boards, cover them in antistatic material to protect them from static electricity and maintain the proper storage temperature.
- Do not touch circuit boards or the components mounted to them with your bare hands. There are sharp leads and other parts on the boards that may cause injury if handled improperly.
- Before touching a Unit or Board, be sure to first touch a grounded metallic object to discharge any static build-up from your body. Not doing so may result in malfunction or damage.
- Provide sufficient clearances around the Unit and other devices to ensure proper heat dissipation. Do not cover the ventilation openings of the Unit.
- For wiring, use crimp terminals of the appropriate size as specified in relevant manuals.
- Do not allow metallic objects or conductive wires to enter the Unit.
- Set the operating settings of the Temperature Controller properly according to the system to be controlled.
- Provide appropriate safety measures, such as overheat prevention and alarm systems, in separate circuits to ensure safety of the entire system even when the Temperature Controller malfunctions.
- Allow at least 10 minutes after turning ON the Temperature Controller as warmup time.
- Do not use thinner to clean the product. Use commercially available cleaning alcohol.
- Mount the I/O Control Unit on the right of the CPU Block.
- When using Expansion I/O Blocks, configure the system so that the current consumptions for the CPU Block and each of the Expansion I/O Blocks do not exceed the specified values, and that the total current consumption does not exceed the current capacity of the Power Supply Unit.
- Configure the system so that the number of Units in both the CPU Block and Expansion I/O Blocks do not exceed the maximum number of connectable Units for the Block.

6 Conformance to 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 machines. 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 in which the OMRON devices are installed. The customer must, therefore, perform final checks 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): EN50081-2
(Radiated emission: 10-m regulations)

Low Voltage Directive

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

6-3 Conformance to EC Directives

The CQM1H-series PCs comply with EC Directives. To ensure that the machine or device in which a CQM1H-series PC is used complies with EC directives, the PC must be installed as follows:

1, 2, 3...

1. The 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. PCs complying with EC Directives also conform to the Common Emission Standard (EN50081-2). When a PC is built into a machine, however, noise can be generated by switching devices using relay outputs and cause the overall machine to fail to meet the Standards. If this occurs, surge killers must be connected or other measures taken external to the PC.

   The following methods represent typical methods for reducing noise, and may not be sufficient in all cases. Required countermeasures will vary depending on the devices connected to the control panel, wiring, the configuration of the system, and other conditions.

6-4 Relay Output Noise Reduction Methods

The CQM1H-series PCs conforms to the Common Emission Standards (EN50081-2) of the EMC Directives. However, noise generated by relay output switching 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

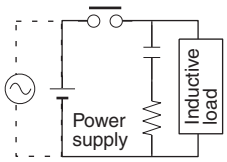
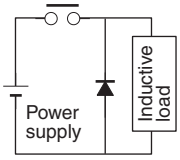
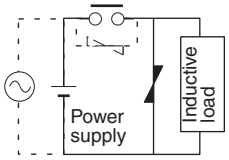
Refer to EN50081-2 for more details.

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

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

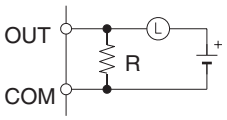
Countermeasure Examples

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 or 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 testing, 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.
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 or 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.	---

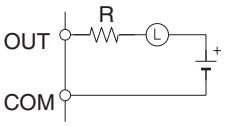
When switching a load with a high inrush current such as an incandescent lamp, suppress the inrush current as shown below.

Countermeasure 1



Providing a dark current of approx. one-third of the rated value through an incandescent lamp

Countermeasure 2

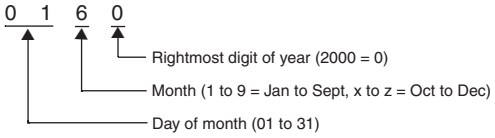


Providing a limiting resistor

7 Upgrades Made to New Version of CQM1H CPU Units

The following changes in specifications apply to all CQM1H CPU Units manufactured on or after 1 June 2000 (manufacturing number 0160). Check the manufacturing number of your CPU Units to see if these specifications apply.

7-1 Reading Manufacturing Numbers



7-2 Changes in Specifications

Change to Settings of Pin 7 on DIP Switch

It is no longer necessary to set the device being connected to the peripheral port using the setting of pin 7 on the front panel DIP switch. The setting of pin 7 is ignored and the device connected to the peripheral port (e.g., a Programming Console or personal computer running Programming Device software) will be automatically detected.

Front Panel DIP Switch

Pin 7	OFF	The setting of pin 7 has no special function. Leave it at the factory setting.	Factory setting: ON
	ON		

Effect of Pin 5 and Pin 7 on Peripheral Port

Front panel DIP switch		Peripheral port operation	
Pin 5	Pin 7	Programming Console connected	Device other than Programming Console connected
OFF	OFF/ON	Programming Console	Operation according to PLC Setup in DM 6650 to DM 6654
ON	OFF/ON	Programming Console	Operation according to standard settings

Note The setting of pin 7 is ignored. Leave it at the factory setting.

Effect of Pin 5 and Pin 7 on Serial Communications Mode

Front panel DIP switch		Peripheral port					
Pin 5	Pin 7	Programming Console	Peripheral bus	Host Link	No-protocol	1:1 data link	NT Link (1:1 mode)
OFF	OFF/ON	OK	OK	OK	OK	No	No
			According to PLC Setup				
ON	OFF/ON	OK	OK (standard settings)	OK (standard settings)	No	No	No

Note The setting of pin 7 is ignored. Leave it at the factory setting.

Effect of Pin 7 on the Operating Mode at Startup

The effect of the setting of pin 7 on the operating mode at startup is as shown below following the information provided in *Change to Settings of Pin 7 on DIP Switch* on the previous page.

PLC Setup Setting

Address	Bits	Setting
DM 6600	08 to 15	00 Hex

Operating Mode

Connected device at startup	Setting of pin 7 on DIP switch	
	ON	OFF
Nothing connected	RUN mode	PROGRAM mode
Programming Console	Mode set on key switch on Programming Console	
Device other than Programming Console	PROGRAM or RUN mode depending on the Connecting Cable (See note.)	PROGRAM mode

Note The following table shows the relationship between the operating mode and Connecting Cable when a device other than a Programming Console is connected.

Connecting Cable	Operating mode at startup
CS1W-CN114 + CQM1-CIF01/02	PROGRAM mode
CS1W-CN118 + XW2Z-200S/500S (-V)	PROGRAM mode
CS1W-CN226/626	RUN mode (See note.)
CS1W-CN118 + XW2Z-200S/500S-CV	RUN mode (See note.)

Note If the power supply to the CQM1H is cycled after connected online to a personal computer-based Programming Device, PROGRAM mode will be entered.

Addition of Special Instruction for Temperature Control Units

The I/O COMMAND TRANSMISSION instruction (IOTC(– –)) has been added for the CQM1-TC20□/TC30□ Temperature Control Units. Refer to the *CQM1H/CQM1 Series Dedicated I/O Units Operation Manual* (W238-E1-09) for details.

SECTION 1
Introduction

This section describes the CQM1H's special features and functions, describes the system configurations, and outlines the steps required before operation. It also provides a list of CQM1H functions by purpose and a comparison between the CQM1H and the CQM1. Read this section first if you have not previously used the CQM1H.

Refer to the *CQM1H Programming Manual* for information on programming.

1-1 Features

The CQM1H is a compact Programmable Controller (PC) that supports communications and other advanced functions. It is a package-type PC that is mounted to DIN Track to control small to medium-size machines.

A flexible system configuration is enhanced by serial communications with a protocol macro function, user-installed boards called Inner Boards, network communications, a wide range of monitoring and setting methods, higher speed, and larger capacity. These features enable added-value machine control.

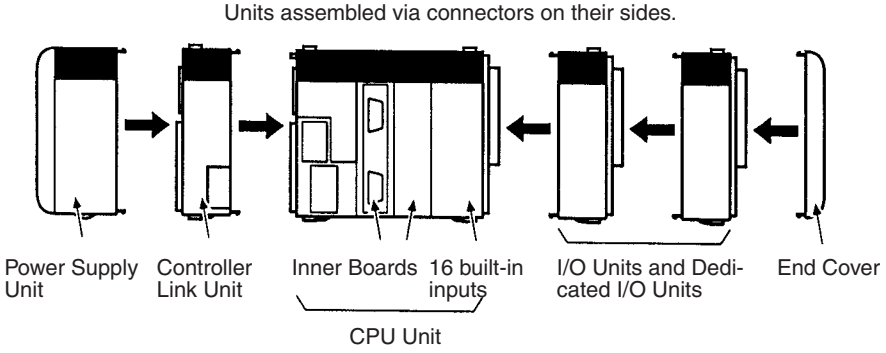
- Mount up to two Inner Boards to add communications or control functions.
  Communications Functions: Serial Communications Board
  Control Functions: High-speed Counter Board, Pulse I/O Board, Absolute Encoder Interface Board, Analog Setting Board, and Analog I/O Board
- Mount a Controller Link Unit to connect to a Controller Link Network.
- Connect simultaneously to both a Programming Device and a Programmable Terminal (PT).
- Obtain higher speed and capacity in comparison to the CQM1: 1.25 times faster, twice the program capacity (15.2 Kwords), twice the I/O capacity (512 points), and twice the data memory capacity (12 Kwords).
- Use new instructions.
- Maintain compatibility with previous models of PC.

Flexible System Configuration

The CQM1H does not require a Backplane and is constructed by connecting Units via connectors on the sides of the Units, allowing flexible system configuration. The CPU Unit contains 16 built-in DC input points. Two Inner Boards can be mounted in the CPU Unit. One Controller Link Unit (a Communications Unit) and a combined maximum of eleven I/O Units and Dedicated I/O Units can also be connected. If an Expansion I/O Block is used, a maximum of 16 Units can be connected. (See *1-2-1 Basic Configuration*.)

Note

1. The CQM1H is mounted to DIN Track.
2. Only the CQM1H-CPU51/61 CPU Units support Inner Boards and the Controller Link Unit.



Higher Speeds and Greater Capacity

Execution times have been reduced to 0.375 μs for the LOAD instruction (from 0.50 μs for the CQM1), to 17.7 μs for the MOVE instruction (from 23.5 μs) and to 0.70 ms for overseeing (from 0.80 ms), reducing the total cycle time by approximately 25%.

- The program capacity, the I/O capacity, and the data memory capacity have all been approximately doubled. The program capacity has been increased to 15.2 Kwords (from 7.2 Kwords for the CQM1); the I/O capac-

ity, to 512 points (from 256 points); and the data memory capacity, to 6 Kwords of DM and 6 Kwords of EM (from 6 Kwords of DM only).

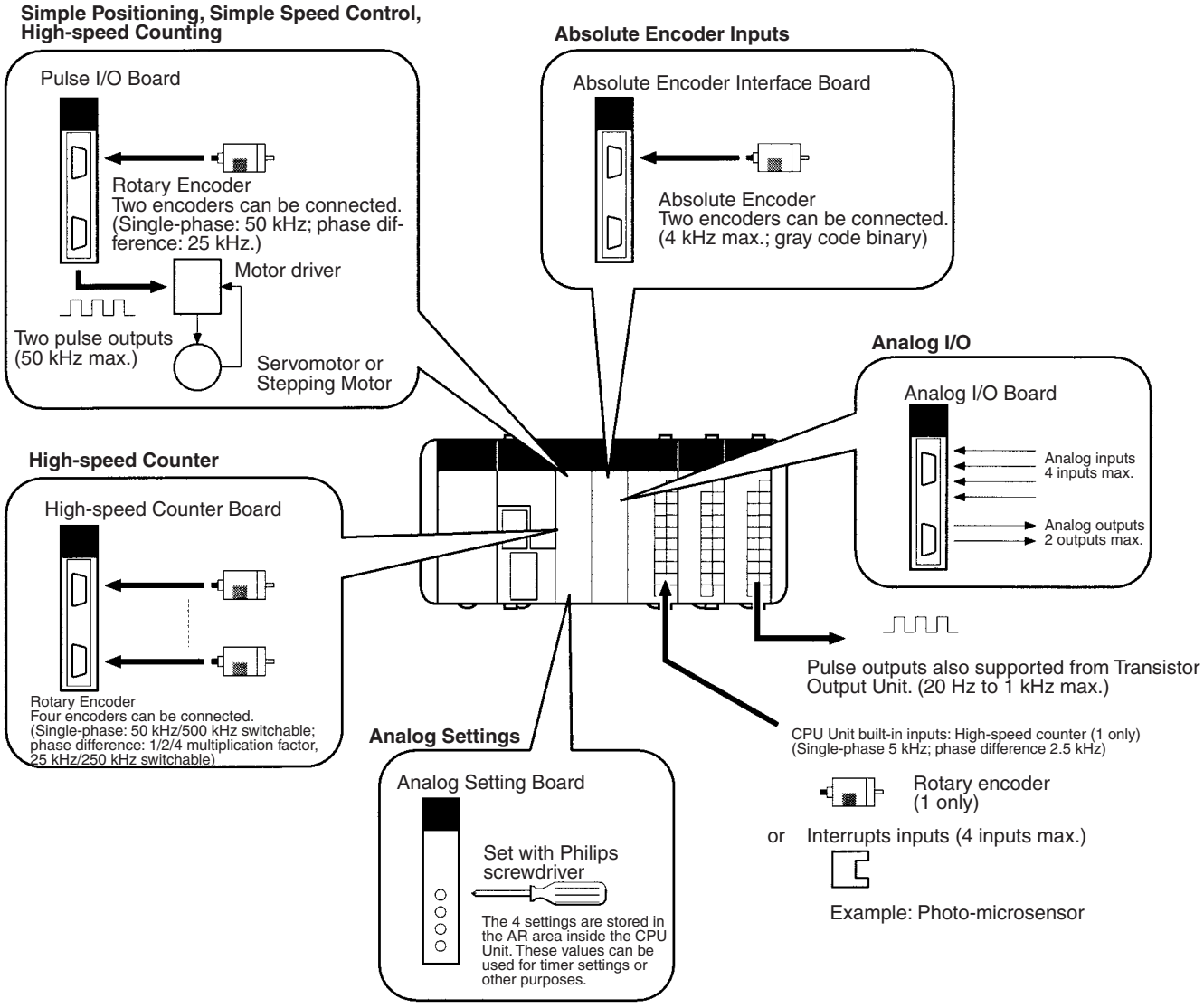
- A 16-Kword Memory Cassette can be mounted in the CQM1H to handle large user programs or more data. These features ensure a higher level of machine control and greater ease of use.

Increased Functionality with Inner Boards

The CQM1H features Inner Boards that allow serial communications, multi-point high-speed counter (rotary encoder) inputs, simple positioning (trapezoidal acceleration/deceleration pulse outputs), speed changes, PWM (variable duty-factor pulse) outputs, absolute rotary encoder inputs, analog I/O (4 inputs, 2 outputs), and analog settings.

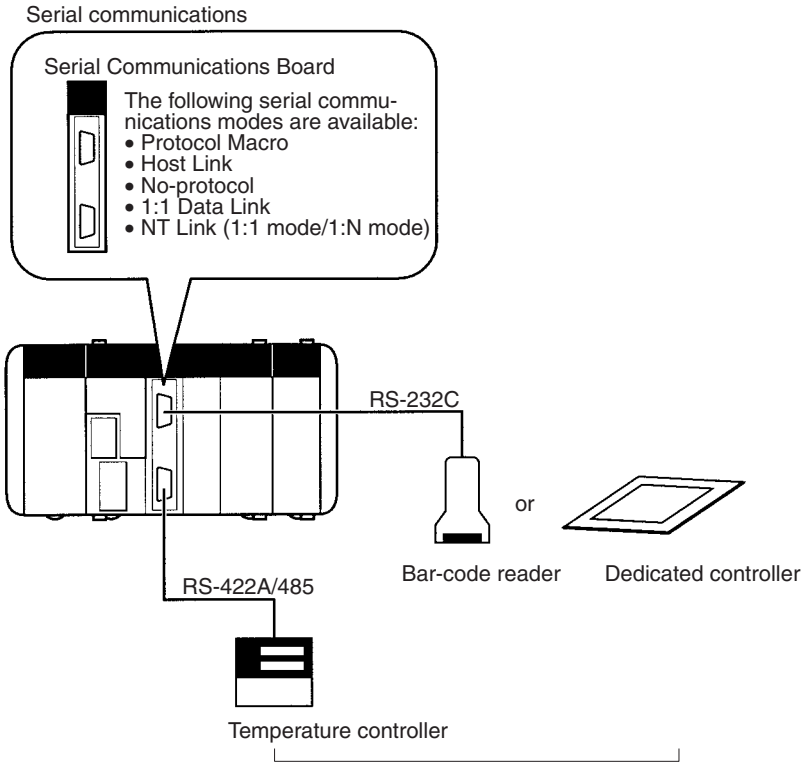
A Serial Communications Board, High-speed Counter Board, Pulse I/O Board, Absolute Encoder Interface Board, Analog I/O Board, and Analog Setting Board are available. These Inner Boards can be combined, mounted and used as required for the machine being controlled. (There are mounting restrictions for some of the Inner Boards.)

Note The CPU Unit also provides16 built-in inputs, as well as high-speed counter and input interrupt functions. Pulse outputs are also supported using a standard Transistor Output Unit.



Better Connections to Machine Components with Serial Communications

Connections can be easily made to general-purpose machine components and dedicated controllers. The Serial Communications Board (an Inner Board) supports a protocol macro function. You can create macros for protocols according to the communications specifications of the external device, allowing data transfers with general-purpose devices to be executed with a single PMCR instruction. Essentially any device with a serial port can be communicated with, such as temperature controllers, bar-code readers, and dedicated numeric controllers.

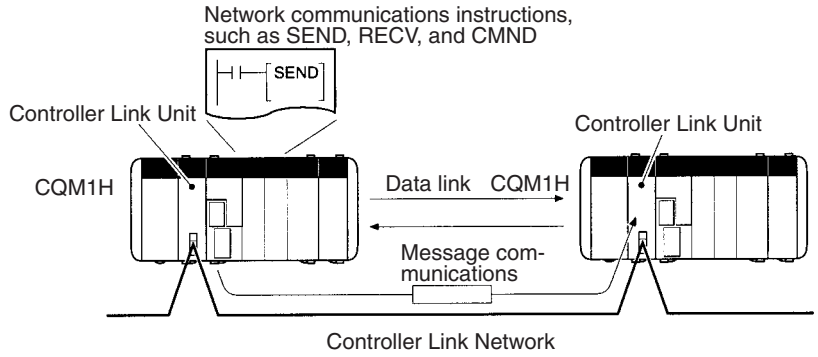


General-purpose external devices with RS-232C or RS-422A/485 port.

Distributed Control with Compact PCs with Network Communications

A Controller Link Unit can be included in the CQM1H. Data can be exchanged between several PCs using a Controller Link Network. Data links are supported to create shared data areas and message communications are supported to enable sending required data and commands using network communications instructions. The Controller Link Network can be easily constructed using twisted-pair cable. Data exchange is also supported with C200HX/HG/HE, CS1, CVM1, and CV-series PCs, as well as with personal computers.

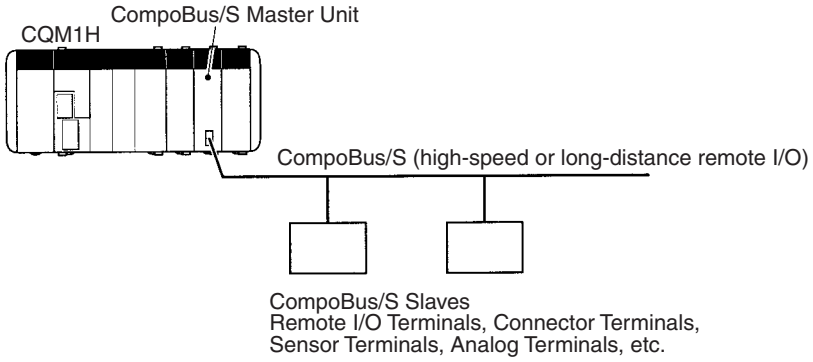
Note Data links can be created with another CQM1H or with a CQM1, CPM1, CPM1A, CPM2A, CPM2C, SRM1, C200HX/HG/HE, or C200HS simply by making a 1:1 connection between the built-in RS-232C ports in the CPU Units.



Baud rate: 2 Mbps; transmission distance: 1 km (when baud rate is 500 kbps); max. No. of nodes: 32.
A maximum of 8,000 words per node can be sent for the CQM1H.
Data exchange supported for CQM1, CQM1H, CS1, C200HX/HG/HE, and CVM1/CV-series PCs.

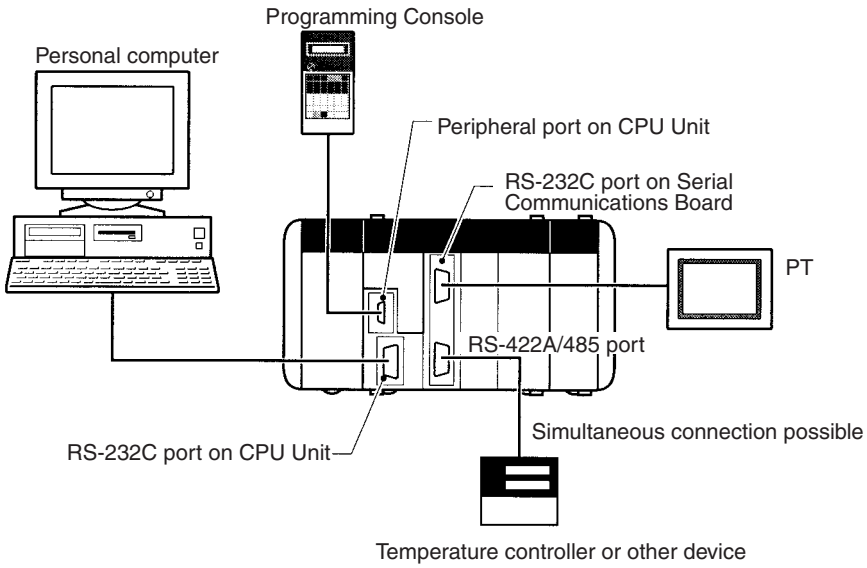
High-speed/ Long-distance Communications with CompoBus/S

A CompoBus/S Master Unit can be included in the CQM1H. High-speed or long-distance remote I/O communications can be performed with CompoBus/S Slaves. (The CompoBus/S Master Unit is a Dedicated I/O Unit for the CQM1H.)



A Wide Range of HMI Monitoring and Setting Methods

Programming Devices and Programmable Terminals (PTs) can be connected to up to four ports, two ports on the CPU Unit and two ports on a Serial Communications Board. It is thus possible to set up and monitor machine control from a PT while monitoring or programming from a Programming Console or a personal computer.



You can also program and monitor from a personal computer at a remote location via a modem. When used in combination with the protocol macro function, it is also possible to call the personal computer from the CQM1H using the PMCR(—) instruction, and when the connection is made, switch the serial communications mode to Host Link (for remote programming/monitoring) using the STUP(—) instruction.

If an Analog Setting Board is mounted, fine adjustments of settings, such as rotational speed or timer settings, are possible on-site using the adjustments on the front of the Board.

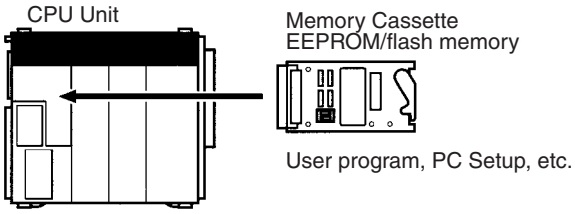
The ON/OFF status of a user-programmable DIP switch pin is stored in the AR area. The setting of this pin can be used on-site to switch between trial operation and actual operation, to switch set values, or to perform any other function that can be programmed in response to the changes in status of the AR bit corresponding to this DIP switch pin.

Easier Programming with a Complete Instruction Set and Interrupt Functions

Math instructions (such as floating-point math, exponential functions, logarithmic functions, and trigonometric functions), a TOTALIZING TIMER (TTIM(—)) instruction, a CHANGE RS-232C SETUP (STUP(—)) instruction, and network communications instructions have been added. In addition, complete interrupt functions for the CPU Unit are supported, including input interrupts, high-speed counter interrupts, and interval timer interrupts (with scheduled interrupts and one-shot interrupts). Interrupts from serial communications using a protocol macro (interrupt notification) are also supported. These interrupts enable easier and more flexible machine control.

Memory Cassettes for Program/Data Management; Clock Included

A Memory Cassette (EEPROM or flash memory) can be mounted in the front of the CPU Unit. User programs, data memory (read-only DM, PC Setup) and expansion instruction information can be saved and read in batch. It is also possible to make settings so that data contained in the Memory Cassette is loaded automatically at startup. This feature means that, in the event of battery expiration or careless programming/monitoring operations, data for user programs and data memory is not lost. It also means that changes in user programs required for different controlled machines can be made easily. Further, by using a Memory Cassette with a clock, times and dates can be used in the user program.



Compatibility with CQM1 Units

The Power Supply Units, Basic I/O Units, and Dedicated I/O Units for the CQM1 can be used in the CQM1H. Consequently, Dedicated I/O Units like Temperature Control Units, Sensor Units, B7A Interface Units, and CompoBus/D (DeviceNet) Link Units can all be used. In addition, user programs used on the CQM1, Programming Consoles for the CQM1 and conventional Memory Cassettes can also be used. (A conversion adapter is necessary to use the Programming Console.)

1-2 System Configuration

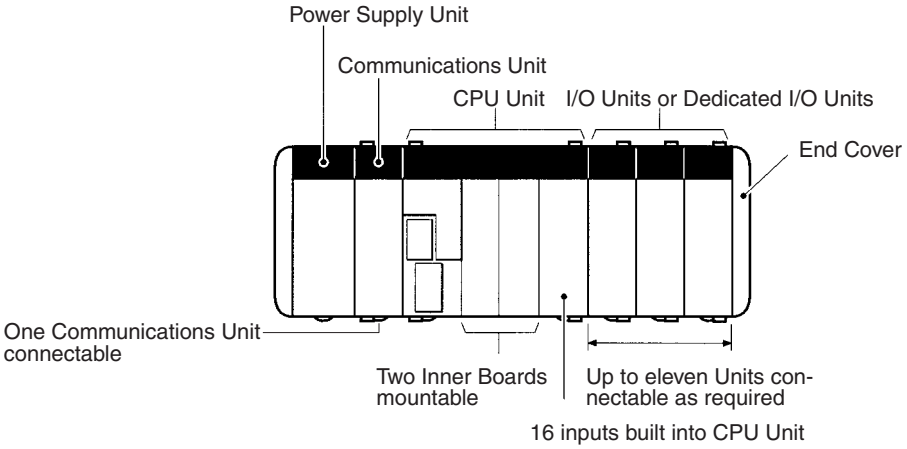
1-2-1 Basic Configuration

The PC configuration depends on the model of CPU Unit being used and on whether or not an Expansion I/O Block is connected. Examples are shown below.

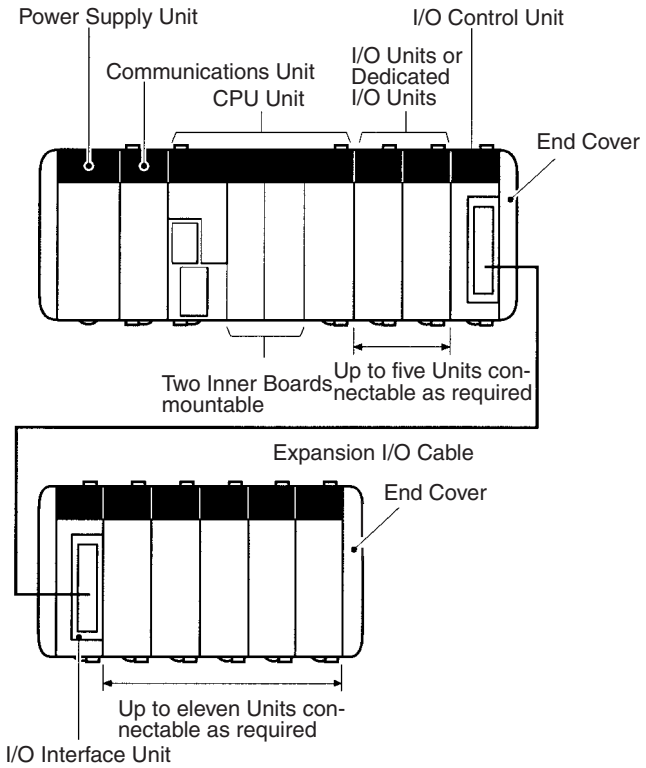
CQM1H-CPU51/61

Up to two Inner Boards can be mounted and one Communications Unit can be connected with the CQM1H-CPU51 or CQM1H-CPU61 CPU Unit. The configuration is shown below.

CPU Block Only



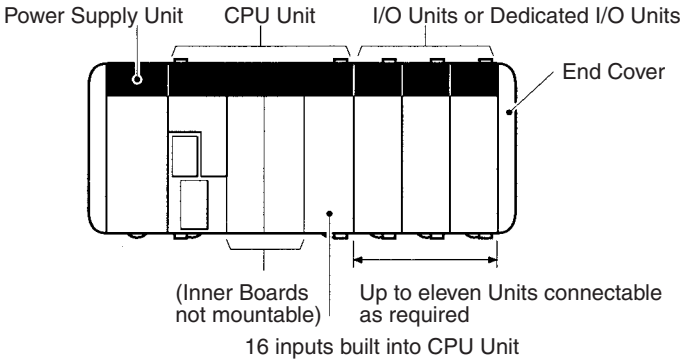
CPU Block and Expansion I/O Block



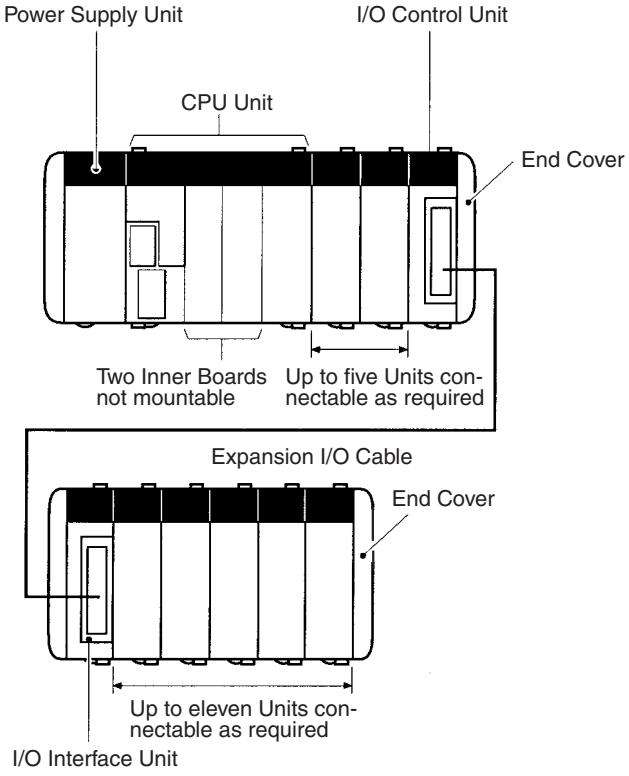
CQM1H-CPU11/21

The CQM1H-CPU11 and CQM1H-CPU21 CPU Units do not support Inner Boards or Communications Units. The configuration is shown below.

CPU Block Only



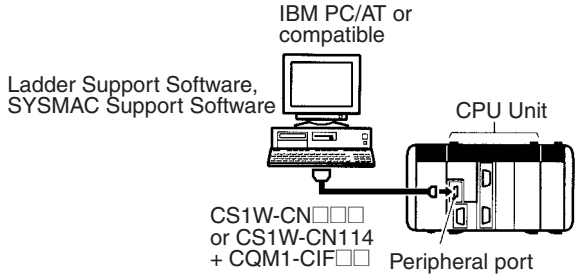
CPU Block and Expansion I/O Block



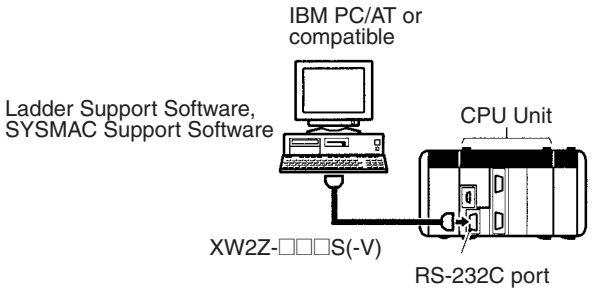
1-2-2 Connections to Programming Devices

Connections to personal computers running Support Software and connections to Programming Consoles are shown below.

Personal Computer Connecting to CPU Unit's Peripheral Port

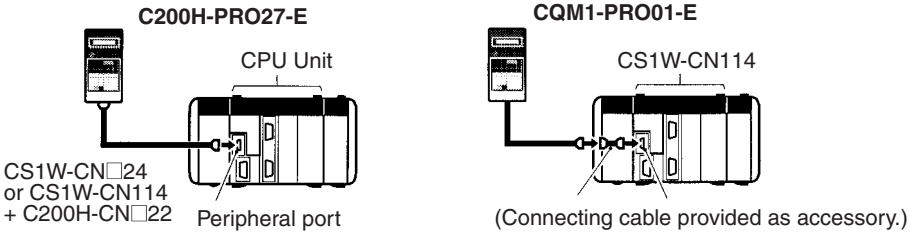


Connecting to CPU Unit's RS-232C Port



Note You can also connect to the RS-232C port on a Serial Communications Board.

Programming Console



1-2-3 CPU Units

Basic Specifications

Model	Number of I/O points (see note)	Program capacity (words)	CPU Unit external input points	DM capacity (words)	EM capacity (words)	Built-in serial communications ports		Inner Boards	Communications Units
						Peripheral port	RS-232C port		
CQM1H-CPU61	512	15.2 K	DC: 16	6 K	6 K	With	With	Supported	Supported
CQM1H-CPU51		7.2 K		6 K	None				
CQM1H-CPU21	256	3.2 K		3 K				Not supported	Not supported
CQM1H-CPU11							Without		

Note Number of I/O points = Number of input points (≤ 256) + Number of output points (≤ 256).

Maximum Number of Units

CPU Block Only

CPU Unit	Maximum number of Units connectable			
	Communications Units	Inner Boards	I/O Units	Dedicated I/O Units
CQM1H-CPU61	1	2	11	
CQM1H-CPU51				
CQM1H-CPU21	None	None		
CQM1H-CPU11				

CPU Block and Expansion I/O Block

CPU Unit	Maximum number of Units connectable			
	Communications Units	Inner Boards	I/O Units	Dedicated I/O Units
CQM1H-CPU61	1	2	5 on CPU Block 11 on Expansion I/O Block	
CQM1H-CPU51				
CQM1H-CPU21	None	None		
CQM1H-CPU11				

Note

1. An Analog Power Supply Unit is counted as one Unit, the same as I/O Units and Dedicated I/O Units.
2. The Units that can be connected to the CPU Block and Expansion I/O Block are also limited by power supply capacity, as shown in the following table.

Block	Max. current consumption	
CPU Block	3.0 A (See note 2.)	5.0 A total (see note 1)
Expansion I/O Block	2.0 A (See note 3.)	

Note

1. If the CQM1-PA203 Power Supply Unit is used, the maximum current consumption total is 3.6 A.
2. Includes current consumed by the CPU Unit, Communications Unit, and Inner Boards.
3. Includes current consumed by the I/O Control Unit.

1-2-4 Inner Boards

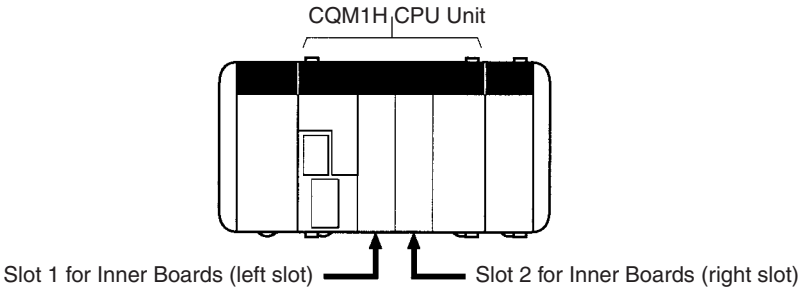
Name	Specifications	Model number
High-speed Counter Board	Pulse inputs (high-speed counter): 4 points (single-phase: 50 kHz/500 kHz switchable; phase difference: 1x/2x/4x multiplication ratio, 25 kHz/250 kHz switchable) External outputs: 4 points	CQM1H-CTB41
Pulse I/O Board	Pulse inputs (high-speed counter): 2 points (single-phase: 50 kHz, phase difference: 25 kHz) Pulse outputs: 2 points (50 kHz) (fixed duty factor and variable duty factor supported)	CQM1H-PLB21
Absolute Encoder Interface Board	Absolute encoder (gray code binary) inputs: 2 points (4 kHz)	CQM1H-ABB21
Analog Setting Board	Analog settings: 4 points	CQM1H-AVB41

Name	Specifications	Model number
Analog I/O Board	Analog inputs of 0 to 5 V, 0 to 20 mA, –10 to +10 V: 4 points Analog outputs of 0 to 20 mA, –10 to +10 V: 2 points	CQM1H-MAB42
Serial Communications Board	One RS-232C port and one RS-422A/485 port	CQM1H-SCB41

Mounting Combinations

CPU Unit and slot		Inner Board					
		High-speed Counter Board	Pulse I/O Board	Absolute Encoder Interface Board	Analog Setting Board	Analog I/O Board	Serial Communications Board
		CQM1H-CTB41	CQM1H-PLB21	CQM1H-ABB21	CQM1H-AVB41	CQM1H-MAB42	CQM1H-SCB41
CQM1H-CPU61/51	Slot 1 (left slot)	OK	Not possible	Not possible	OK	Not possible	OK
	Slot 2 (right slot)	OK	OK	OK	OK	OK	Not possible
CQM1H-CPU21/11		Not possible	Not possible	Not possible	Not possible	Not possible	Not possible

Note
1. High-speed Counter Boards can be mounted in both slots of the CQM1H-CPU51/61 simultaneously.
2. Analog Setting Boards cannot be mounted in both slots of the CQM1H-CPU51/61 simultaneously.



1-2-5 Communications Units

Name	Specifications	Model
Controller Link Unit (wired)	Data link (Maximum number of words per node: 8,000) Message communications (SEND/RECV/CMND instructions)	CQM1H-CLK21

Note A Communications Unit is connected between the Power Supply Unit and the CPU Unit. Communications Units cannot be connected to Expansion I/O Blocks.

1-2-6 Memory Cassettes

Model number	Memory	Capacity	Clock (see note)	Saveable data (saved together)			Reading/ writing
				User programs	Data memory (read-only areas, PC Setup)	Expansion instruction information	
CQM1H-ME16K	Flash memory	16 Kwords	No	Yes	Yes	Yes	AR area: Memory Cassette ↔ CPU (comparison available) Automatic transfer at power ON: Memory Cassette → CPU
CQM1H-ME16R			Yes				
CQM1H-ME08K	EEPROM	8 Kwords	No				
CQM1H-ME08R			Yes				
CQM1H-ME04K		4 Kwords	No				
CQM1H-ME04R			Yes				
CQM1H-MP08K	EPROM	8K/16 Kwords (According to switch setting)	No	Yes	Yes	Yes	Read only: Memory Cassette → CPU
CQM1H-MP08R			Yes				

Note The accuracy of the clock is affected by the ambient temperature, as shown in the following table.

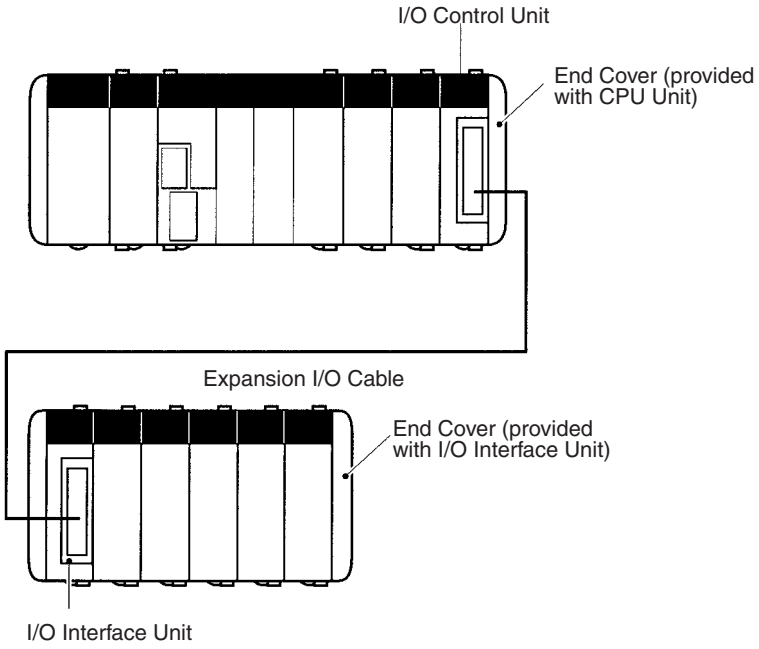
Ambient temperature	Accuracy by month
55°C	–3 to 0 min
25°C	±1 min
0°C	–2 to 0 min

1-2-7 Power Supply Units

Name	Specifications				Model number
	Supply voltage	Operating voltage range	Output capacity	Service power supply	
AC Power Supply Units	100 to 240 V AC, 50/60 Hz (wide range)	85 to 265 V AC	5 V DC: 3.6 A (18 W)	None	CQM1-PA203
			5 V DC: 6 A 24 V DC: 0.5 A (30 W total)	24 V DC: 0.5 A	CQM1-PA206
	100 or 230 V AC (selectable), 50/60 Hz		5 V DC: 6 A 24 V DC: 0.5 A (30 W total)		CQM1-PA216
DC Power Supply Units	24 V DC	20 to 28 V DC	30 W 5 V DC: 6 A	None	CQM1-PD026

1-2-8 Products for Expansion I/O Blocks

Name	Model	Specifications	
I/O Control Unit	CQM1H-IC101	Connected to right end of CPU Block.	
I/O Interface Unit	CQM1H-II101	Connected to the left end of Expansion I/O Block. An End Cover is provided.	
Expansion I/O Cable	CS1W-CN313	Length: 0.3 m	Connects the I/O Control Unit to the I/O Interface Unit.
	CS1W-CN713	Length: 0.7 m	



1-2-9 I/O Units

Name	Number of points	Specifications	Connection method	Model number	Input words allocated from IR 001	Output words allocated from IR 100
DC Input Units	8	12 to 24 V DC, independent commons (1 point per common, 8 circuits)	Terminal block	CQM1-ID211	1 word	---
	16	12 V DC (16 points per common, 1circuit)		CQM1-ID111		
		24 V DC (16 points per common, 1 circuit)		CQM1-ID212		
	32	12 V DC (32 points per common)	Connector	CQM1-ID112	2 words	
		24 V DC (32 points per common)		CQM1-ID213		
		24 V DC (32 points per common)		CQM1-ID214		
AC Input Units	8	100 to 120 V AC (8 points per common)	Terminal block	CQM1-IA121	1 word	
		200 to 240 V AC (8 points per common)		CQM1-IA221		
Contact Output Units	8	2 A at 250 V AC (cosϕ =1.0) 2 A at 250 V AC (cosϕ =0.4) 2 A at 24 V DC (16 A per Unit), independent commons		CQM1-OC221	---	1 word
	16	2 A at 250 V AC (cosϕ =1.0) 2 A at 250 V AC (cosϕ =0.4) 2 A at 24 V DC (8 A per Unit)		CQM1-OC222		
	8	2 A at 250 V AC (cosϕ =1.0) 2 A at 250 V AC (cosϕ =0.4) 2 A at 24 V DC (16 A per Unit), independent commons		CQM1-OC224		
Transistor Output Units	8	2 A at 24 V DC (5 A per Unit) 8 points per common		CQM1-OD211		
	16	50 mA/4.5 V DC to 300 mA/26.4 V DC 16 points per common		CQM1-OD212		
	32	16 mA/4.5 V DC to 100 mA/26.4 V DC	Connector	CQM1-OD213		2 words
		500 mA/24 V DC, PNP output		CQM1-OD216		
	16	300 mA/24 V DC, PNP output	Terminal block	CQM1-OD214		1 word
	8	1.0 A/24 V DC, PNP output (4A per Unit), short-circuit protection		CQM1-OD215		
Triac Output Units	8	0.4 A at 100 to 240 V AC, 4 points per common, 2 circuits		CQM1-OA221		
	6	0.4 A at 100 to 240 V AC		CQM1-OA222		

1-2-10 Dedicated I/O Units

Name	Specifications	Model number	Input words allocated from IR 001	Output words allocated from IR 100
Analog Input Unit	4 analog input points –10 to +10 V, 0 to 10 V, 1 to 5 V, 4 to 20 mA	CQM1-AD041	2 or 4 words	---
Analog Output Unit	2 analog output points –10 to +10 V, 0 to 20 mA	CQM1-DA021	---	2 words
Analog Power Supply Units	Power supply for Analog Input or Output Unit (required when using Analog Input or Output Unit)	CQM1-IPS01 (Supplies 1 Unit.)	---	---
		CQM1-IPS02 (Supplies 2 Units.)		
B7A Interface Units	16 output points	CQM1-B7A02	---	1 word
	16 input points	CQM1-B7A12	1 word	---
	32 output points	CQM1-B7A03	---	2 words
	32 input points	CQM1-B7A13	2 words	---
	16 input points and 16 output points	CQM1-B7A21	1 word	1 word
G730 Interface Units	2-wire transmission terminal G730 Master Unit 32 inputs/32 outputs max.) 32 points/16 points switchable	CQM1-G7M21	1 or 2 words	1 or 2 words
	For Expansion Master Input (32 points max.), 32 points/16 points switchable	CQM1-G7N11	1 or 2 words	---
	For Expansion Master Output (32 points max.), 32 points/16 points switchable	CQM1-G7N01	---	1 or 2 words
I/O Link Unit (SYSMAC BUS Wired Slave Unit)	For SYSMAC BUS Wired Slave Unit 32 input points and 32 output points	CQM1-LK501	2 words	2 words
Sensor Unit	Sensor input points: 4 max. Used with Sensor Module(s). Up to four Sensor Modules can be mounted to a single Sensor Unit.	CQM1-SEN01	1 word (Up to 5 words with following 4 Modules.)	---
Optical Fiber Photoelectric Module	For E32 series Fiber Units. Automatic teaching is supported.	E3X-MA11	1 word	---
Photoelectric Module with Separate Amplifier	For E3C-series Photoelectric Sensors. An automatic teaching function is incorporated	E3C-MA11	1 word	---
Proximity Module with Separate Amplifier	For E2C-series Proximity Sensors. Automatic teaching is supported.	E2C-MA11	1 word	---
Dummy Module	Mounted as spacers to the open slots of the CQM1 when no Sensor Module is mounted to the CQM1H.	E39-M11	1 word	---
Remote Console	Connected to a Sensor Unit for the adjustment of the sensitivities of the modules incorporated by the Sensor Unit, reading and changing of the set value, and teaching. Cable length: 3 m	CQM1-TU001	---	---

Name	Specifications	Model number	Input words allocated from IR 001	Output words allocated from IR 100
Temperature Control Units	2 thermocouple inputs (K/J), ON/OFF or advanced PID control, transistor (NPN) output, 2 loops	CQM1-TC001	1 or 2 words	1 or 2 words
	2 thermocouple inputs (K/J), ON/OFF or advanced PID control, transistor (NPN) output, 2 loops	CQM1-TC002	1 or 2 words	1 or 2 words
	2 platinum resistance thermometer inputs (Pt, JPt), ON/OFF or advanced PID control, transistor (NPN) output, 2 loops	CQM1-TC101	1 or 2 words	1 or 2 words
	2 platinum resistance thermometer inputs (Pt, JPt), ON/OFF or advanced PID control, transistor (NPN) output, 2 loops	CQM1-TC102	1 or 2 words	1 or 2 words
	2 thermocouple inputs (K/J/T/L/R/S/B), ON/OFF or advanced PID control, transistor (NPN) output, 4 loops	CQM1-TC201	1 word	1 word
	4 thermocouple inputs (K/J/T/L/R/S/B), ON/OFF or advanced PID control, transistor (PNP) output, 4 loops	CQM1-TC202	1 word	1 word
	4 platinum resistance thermometer inputs (Pt, JPt), ON/OFF or advanced PID control, transistor (NPN) output, 4 loops	CQM1-TC301	1 word	1 word
	4 platinum resistance thermometer inputs (Pt, JPt), ON/OFF or advanced PID control, transistor (PNP) output, 4 loops	CQM1-TC302	1 word	1 word
	2 thermocouple inputs (K/J/T/L/R/S/B), ON/OFF or advanced PID control, transistor (NPN) output, 2 loops, heater burnout detection function	CQM1-TC203	1 word	1 word
	2 thermocouple inputs (K/J/T/L/R/S/B), ON/OFF or advanced PID control, transistor (PNP) output, 2 loops, heater burnout detection function	CQM1-TC204	1 word	1 word
	2 platinum resistance thermometer inputs (Pt, JPt), ON/OFF or advanced PID control, transistor (NPN) output, 2 loops, heater burnout detection function	CQM1-TC303	1 word	1 word
	2 platinum resistance thermometer inputs (Pt, JPt), ON/OFF or advanced PID control, transistor (PNP) output, 2 loops, heater burnout detection function	CQM1-TC304	1 word	1 word
Linear Sensor Interface Units	Measure voltage or current inputs from linear sensors and convert the measurements to numeric data for comparative decision processing. Standard type	CQM1-LSE01	1 word	1 word
	With monitor output (–9.999 V to 9.999 V).	CQM1-LSE02	1 word	1 word
CompoBus/S Master Unit	128 points (64 inputs and 64 outputs), 64 points (32 inputs and 32 outputs), or 32 points (16 inputs and 16 outputs) selectable with a switch.	CQM1-SRM21-V1	1, 2, or 4 words	1, 2, or 4 words
CompoBus/D (DeviceNet) I/O Link Unit	CompoBus/D Slave: 32 points (16 inputs and 16 outputs)	CQM1-DRT21	1 word	1 word

1-2-11 Accessories

DIN Track

Name	Specifications	Model number
DIN Track	Track length: 1 m	PFP-100N
	Track length: 50 cm	PFP-50N
	Track length: 1 m	PFP-100N2
DIN Track Brackets	Mounting brackets fastened on both sides of the PC to prevent it from sliding left or right. Two are provided with the CPU Unit.	PFP-M

Maintenance Accessories

Name	Model number
Backup Battery	CPM2A-BAT01
End Cover	CQM1H-TER01

Inner Board Connectors

Inner Board	Name of connector on cable	Model number	Remarks
High-speed Counter Board, Pulse I/O Board, Absolute Encoder Interface Board, Analog I/O Board	Socket	XM2D-1501	Standard accessories for each Board
	Hood	XM2S-1511	

Cables for Connecting Pulse I/O Boards to OMRON Servo Drivers

Inner Board	Relay Cable	Servo Relay Unit	Cable	Servo Driver
Pulse I/O Board (pulse outputs)	XW2Z-□□□J-A3	XW2B-20J6-3B	For U-series Servo Drivers: XW2Z-□□□J-B1	R88D-UP□□□
			For M-series Servo Drivers: XW2Z-□□□J-B2	R88D-MT□□□
			For H-series Servo Drivers: XW2Z-□□□J-B3	R88D-H□□□

Cable for Connecting Absolute Encoder Interface Boards to OMRON Absolute Encoders

Inner Board	Cable	Compatible OMRON Absolute Encoder
Absolute Encoder Interface Board	E69-DC5	E6F-AG5C-C E6CP-AG5C-C E6C2-AG5C-C

Connectors for 32-point I/O Units

I/O Unit	Connector type		Model number (by Fujitsu)	Set model number (from OMRON)
CQM1-ID112/213 (32 inputs) CQM1-OD213 (32 outputs)	Soldered (Standard accessory)	Socket	FCN-361J040-AU	C500-CE404
		Connector cover	FCN-360C040-J2	
	Crimped	Housing	FCN-363J040	C500-CE405
		Contact	FCN-363J-AU	
		Connector cover	FCN-360C040-J2	
	Pressure welded		FCN-367J040-AU	C500-CE403

Cables for 32-point I/O Units

Purpose	I/O Unit	Connecting cable	Connector-Terminal Block Conversion Unit	
For connections to Terminal Blocks	CQM1-ID112/213 (32 inputs) CQM1-OD213 (32 outputs)	XW2Z-□□□B	XW2B-40G5	M3.5 terminal screws
			XW2B-40G4	M2.5 terminal screws
	CQM1-ID112/213 (32 inputs)	XW2Z-□□□D	XW2C-20G5-IN16	Common type

Purpose	I/O Unit	Connecting Cable	I/O Relay Terminal for input or output
For connections to Relay Terminals	CQM1-ID112/213 (32 inputs)	G79-I□C-□	G7TC-I□16
	CQM1-OD213 (32 outputs)	G79-O□C-□	G7TC-OC□□, G70D, G70A

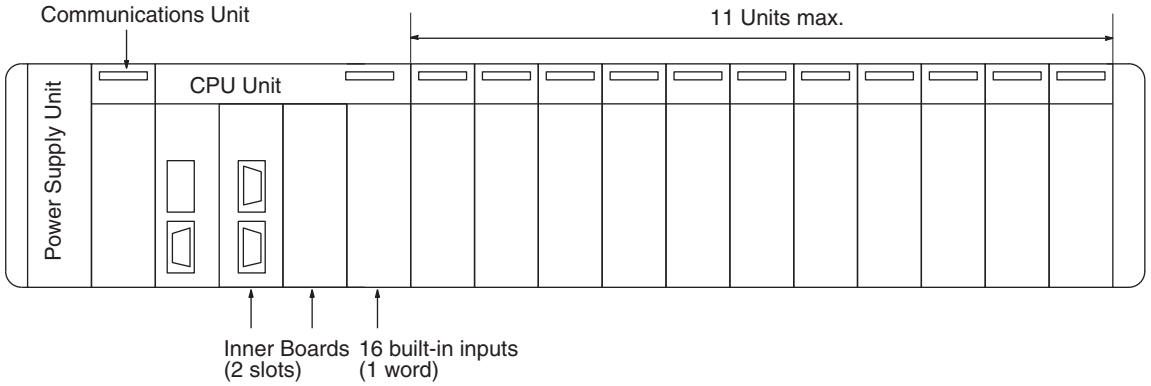
1-2-12 Maximum Number of I/O Units and I/O Points

The maximum number of I/O Units, Dedicated I/O Units, Communications Units, and Inner Boards that can be connected and the maximum number of I/O points (i.e., allocated words) that can be controlled are listed in the following table.

CPU Block Only

CPU Unit	No. of I/O Units and Dedicated I/O Units	No. of Communications Units	No. of Inner Boards	Max. I/O points* (allocated words)
CQM1H-CPU61	11 max.	1 max.	2 max.	512 (32 words)
CQM1H-CPU51				
CQM1H-CPU21		Connection not supported	Connection not supported	256 (16 words)
CQM1H-CPU11				

Note *Number of I/O points = Number of input points (≤ 256) + Number of output points (≤ 256).

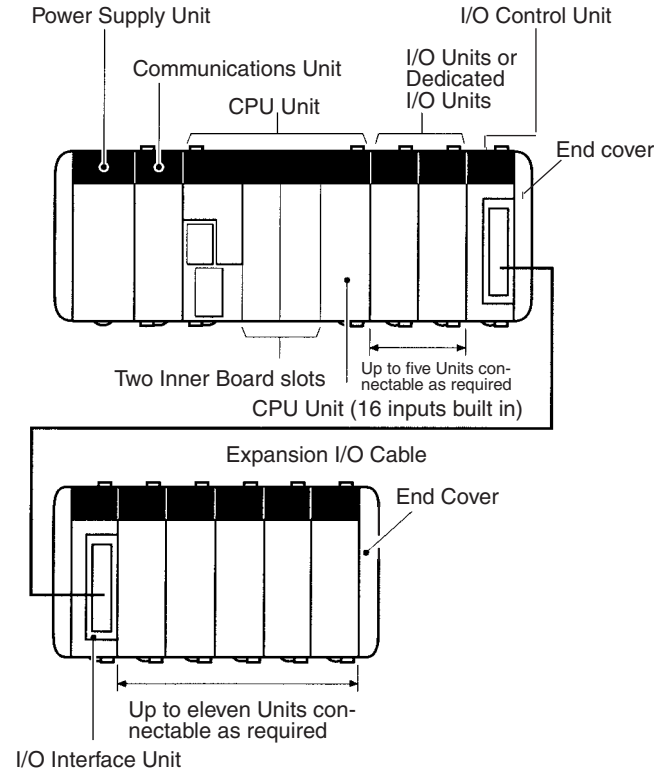


CPU Block and Expansion I/O Block

CPU Unit	No. of I/O Units and Dedicated I/O Units (see note 1)		No. of Communications Units	No. of Inner Boards	Max. I/O points (see note 2) (allocated words)
	CPU Block	Expansion I/O Block			
CQM1H-CPU61	5 max.	11 max.	1 max.	2 max.	512 (32 words)
CQM1H-CPU51					
CQM1H-CPU21			Connection not supported	Connection not supported	256 (16 words)
CQM1H-CPU11					

Note

1. An Analog Power Supply Unit is counted as one Unit, the same as I/O Units and Dedicated I/O Units.
2. I/O points = Input points (256 max.) + Output points (256 max.)



Exceeding the Maximum Number of I/O Units

When only a CPU Block is used, a maximum of 11 I/O Units and Dedicated I/O Units can be connected to the CQM1H-series CPU Unit. When an Expansion I/O Block is also used, a maximum of 5 I/O Units and Dedicated I/O Units can be connected to the CQM1H-series CPU Unit and a maximum of 11 I/O Units and Dedicated I/O Units can be connected to the Expansion I/O Block. If these limits are exceeded, the CQM1H may not operate properly because of drops in the voltage of the 5-V internal power supply. The CQM1H will detect if the maximum number of I/O points has been exceeded (as explained below), but will not detect if the maximum number of Units has been exceeded. Therefore, design the system so that the maximum number of Units is not exceeded.

Exceeding Maximum Number of I/O Points

When the maximum number of I/O points is exceeded, an "I/O UNIT OVER" message will be displayed and operation will stop. For details on I/O UNIT OVER errors, refer to the *CQM1H Programming Manual*.

The relationship between the maximum number of I/O points and Unit word allocation is shown in the following table. The CPU Unit has 16 built-in inputs for which one word is allocated.

CPU Unit	Max. no. of I/O points	Input allocation		Output allocation	Requirements
		CPU Unit	Connected Units	Connected Units	
CQM1H-CPU61	512 (32 words)	1 word	n words	m words	1 + n + m ≤ 32 (n, m ≤ 16)
CQM1H-CPU51					
CQM1H-CPU21	256 (16 words)	1 word	n words	m words	1 + n + m ≤ 16 (n, m ≤ 16)
CQM1H-CPU11					

Refer to the *CQM1H Programming Manual* for the number of words allocated to each Unit and other information on memory allocation to Units.

Note

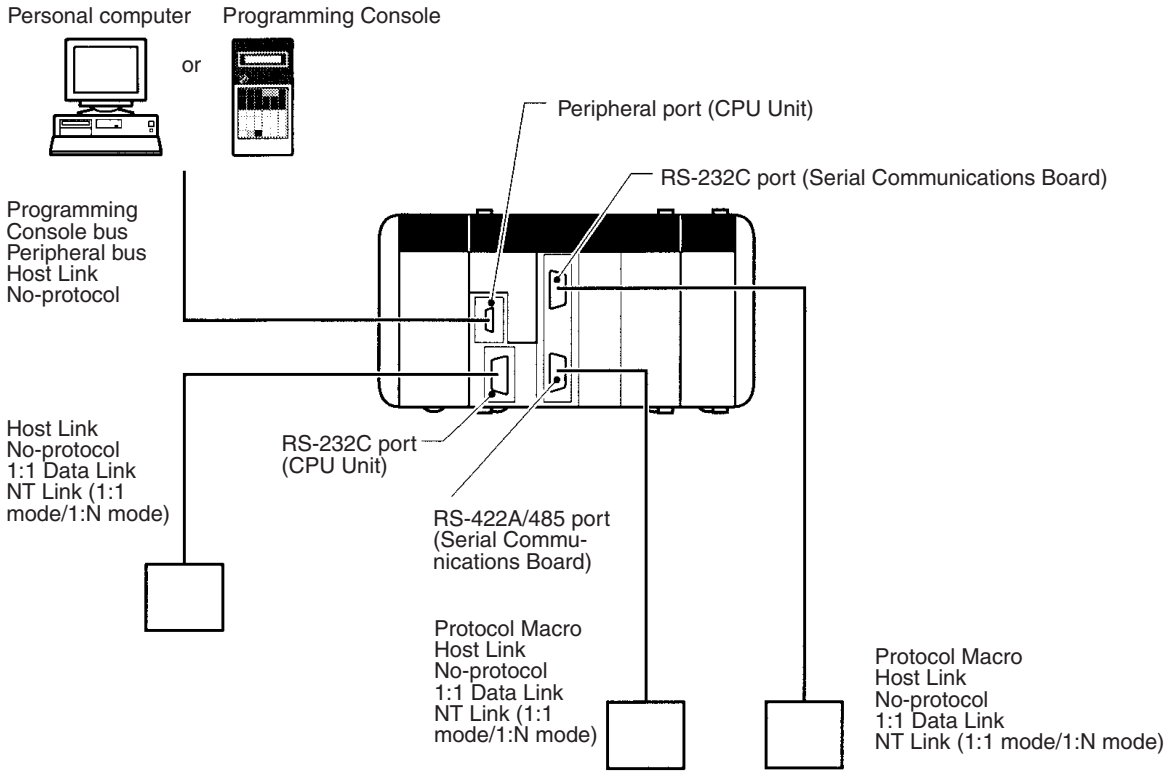
1. It is possible to exceed the maximum number of Units without exceeding the maximum number of I/O points (and words allocated). For example, with the CQM1H-CPU61, if 12 Units that are allocated 1 word each are connected, the total number of words allocated will be 13 (including the 1 word allocated for the CPU Unit built-in inputs), which is less than the specified maximum. The number of Units, however, exceeds the maximum of 11.
2. It is also possible to exceed the maximum number of I/O points (and words allocated) without exceeding the maximum number of Units. For example, with the CQM1H-CPU61, if 8 Units that are allocated 4 words each are connected, the maximum number of Units is not exceeded. However, the total word allocation will be $(4 \times 8) + 1 = 33$ words (including the 1 word allocated for the CPU Unit built-in inputs), and so consequently the maximum number of 32 words is exceeded.

1-3 Expanded System Configuration

1-3-1 Serial Communications System

The CQM1H system configuration can be expanded by using the following serial communications ports.

- CPU Unit built-in ports, 2 ports: Peripheral port and RS-232C port
- Serial Communications Board ports, 2 ports: RS-232C port and RS-422/485 port (CQM1H-CPU51/61 only)



Communications Ports and Serial Communications Modes (Protocols)

Serial communications protocol	Application	CPU Unit		CQM1H-SCB41 Serial Communications Board	
		Peripheral port	RS-232C port (Not on CQM1H-CPU11)	RS-232C port (port 1)	RS-422A/485 port (port 2)
Programming Console bus	Communications with Programming Consoles	YES	No	No	No
Peripheral bus	Communications with Programming Devices	YES	No	No	No
Host Link (SYSMAC WAY)	Communications with a host computer or PT	YES	YES	YES	YES
Protocol macro	Sending and receiving messages according to the communications specifications of external devices	No	No	YES	YES
No-protocol	No-protocol communications with general-purpose devices	YES	YES	YES	YES
1:1 Data Link	Data links with other CPU Units	No	YES	YES	YES
NT Link (1:1 mode)	One-to-one communications with PT	No	YES (See note.)	YES	YES
NT Link (1:N mode)	One-to-one or one-to-many communications with PTs	No	No	YES	YES

Note Programming Console functions are possible with a PT. They are, however, not possible when pin 7 on the DIP switch on the front of the CPU Unit is OFF.

Protocols

The serial communications port protocol can be switched in the CPU Unit's PC Setup. Depending on the protocol selected, the following systems can be configured to support serial communications.

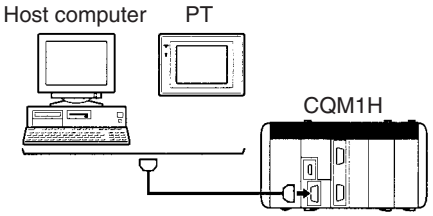
Protocol	Main connection	Application	Applicable commands, communications instructions
Programming Console bus	Programming Console	Communications between Programming Console and PC	None
Peripheral bus (see note)	Programming Devices, e.g., CX-Programmer	Communications between Programming Devices and the PC from the computer	None
Host Link	Personal computer OMRON Programmable Terminals	Communications between the host computer and the PC Commands can be sent to a computer from the PC.	Host Link commands/ FINS commands Commands can be sent to a computer from the PC.
Protocol macro	General-purpose external devices	Sending and receiving messages (communications frames) according to the communications specifications of external devices SYSMAC-PST is used to create protocols by setting various parameters.	PMCR(—) instruction
No-protocol communications	General-purpose external devices	No-protocol communications with general-purpose devices	TXD(—) and RXD(—) instructions
1:1 Data Link	C-series PCs	Shared link words between PCs	None
NT Link (1:1)	OMRON Programmable Terminals	High-speed one-to-one communications with a Programmable Terminal using direct access	None
NT Link (1: N)	OMRON Programmable Terminals	High-speed one-to-one or one-to-many communications with Programmable Terminals using direct access	None

Note The peripheral bus mode is used for Programming Devices other than Programming Consoles (e.g., CX-Programmer).

Host Link System (SYSMAC WAY Mode, 1:N)

The Host Link System allows the I/O memory of the PC to be read/written, and the operating mode to be changed from a host computer (personal computer or Programmable Terminal) by executing Host Link commands. Other Programming Devices can also be connected via a computer using this mode. Alternatively, it is also possible to send data from the CPU Unit of the CQM1H to the host computer using TXD(—) instructions to initiate communications from the PC. This mode is supported by the peripheral port and the RS-232C

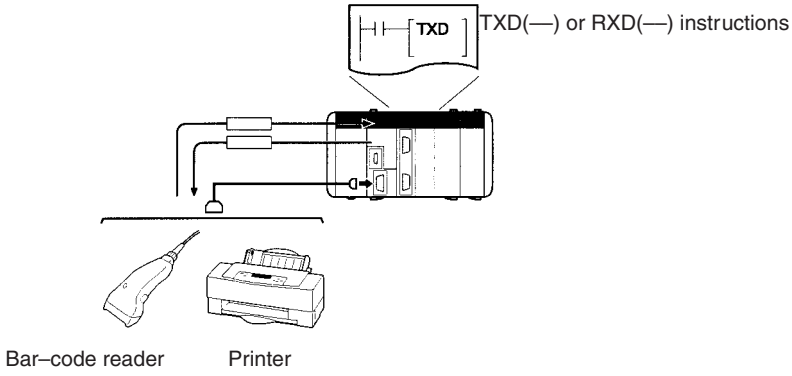
port on the CPU Unit, as well as the RS-232C port and RS-422A/485 port on the Serial Communications Board.



For details on cables required to connect the host computer to the CQM1H in Host Link Mode, refer to *3-6 Programming Devices*.

No-protocol Communications

The TXD(—) and RXD(—) instructions in the ladder program can be used with no communications protocol or conversion to transfer data with a general-purpose external device equipped with an RS-232C port. It is possible to attach a start code to the beginning and an end code to the end of data (or specify the amount of data) when sending/receiving. Unlike protocol macro, it is not possible to construct a communications frame (message) according to the communications specifications of the communications partner. Also, there are no procedures for retry processing, data format conversion processing or branch processing for receiving data. This communications mode is thus used for simple data transmissions, such as inputting bar code data and outputting printer data. This mode is supported by the peripheral port and the RS-232C port on the CPU Unit, as well as the RS-232C port and RS-422A/485 port on the Serial Communications Board.



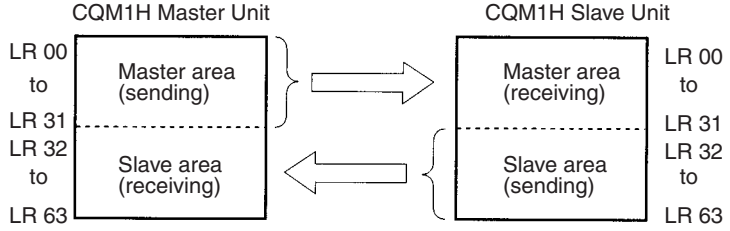
1:1 Data Link System

If two PCs are linked one-to-one by connecting them together through their RS-232C ports, they can share up to 64 words of LR area. One of the PCs will serve as the master and the other as the slave.

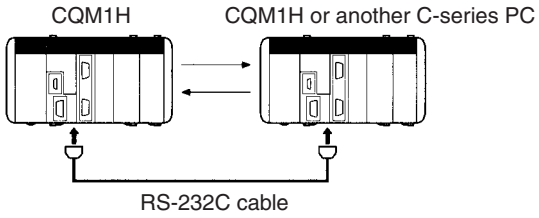
One of the following three ranges of words can be set to be linked:
LR 00 to LR 63, LR 00 to LR 31, or LR 00 to LR 15

A 1:1 Data Link communications system can be created between the CQM1H and another CQM1H, or between the CQM1H and the CQM1, C200HX/HG/HE, C200HS, CPM1, CPM1A, CPM2A, CPM2C, or SRM1(-V2).

Note The link area will always be LR 00 to LR 15 (16 words) for 1:1 Data Link communications with the CPM1, CPM1A, CPM2A, CPM2C, or SRM1(-V2).



This mode is supported by the RS-232C port on the CPU Unit, as well as the RS-232C port and RS-422A/485 port on the Serial Communications Board.



Wiring

Connect the Units with the cables wired as shown below.

CQM1H		CQM1H or another C–series PC	
Signal Abb.	Pin No.	Pin No.	Signal Abb.
FG	Hood	Hood	FG
SD	2	2	SD
RD	3	3	RD
RTS	4	4	RTS
CTS	5	5	CTS
–	6	6	–
–	7	7	–
–	8	8	–
SG	9	9	SG

Recommended Cables

UL2464 AWG28x5P IFS-RVV-SB (UL-approved, Fujikura Ltd.)
AWG28x5P IFVV-SB (not UL standard) (not UL-approved, Fujikura Ltd.)

UL2464-SB (MA) 5Px28AWG (7/0.127) (UL-approved, Hitachi Cable, Ltd.)
CO-MA-VV-SB 5Px28AWG (7/0.127) not UL-approved, Hitachi Cable, Ltd.)

Applicable Connectors (Standard Accessories for CQM1H)

Socket: XM2A-0901 (OMRON); Hood: XM2S-0911-E (OMRON)

NT Link System

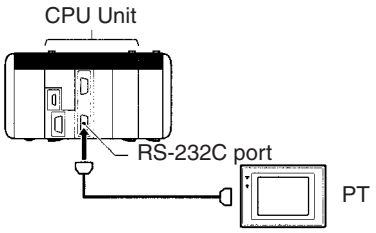
If a PC and Programmable Terminal (PT) are connected together using RS-232C or RS-422A/485, the allocations for the PT's status control area, status notify area, and objects (such as touch switches, indicators, and memory maps) can be allocated in the I/O memory of the PC. The NT Link System allows the PT to be controlled by the PC, and the PT can periodically read data from the status control area of the PC to perform necessary operations if there are any changes in the area. The PT can communicate with the PC by writing data to the status notify area or the I/O memory of the PC from the PT. The NT Link system allows the PT status to be controlled and monitored without using the PC's ladder program.

There are two NT Link modes: One is for communications between one PC and one PT (1:1 mode), and the other is for communications between one PC, and one or many PTs (1:N mode). These modes support completely different communications.

NT Link: 1:1 Mode

This mode is used for communications between one PC and one PT. This mode is supported by the RS-232C port on the CPU Unit, as well as the RS-232C port and RS-422A/485 port on the Serial Communications Board. The

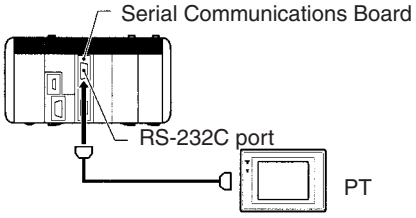
1:1 NT Link mode is supported for communications between only one PC and one PT. Set the PT communications settings for a 1:1 NT Link.



Link Mode: 1:N Mode

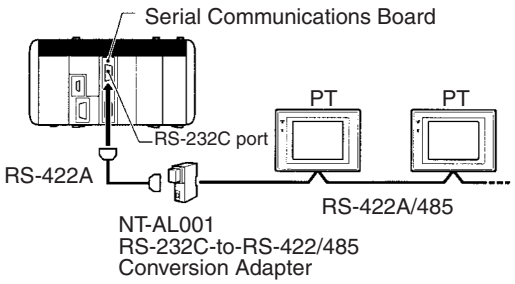
This mode is used for communications between one PC and n (8≥n≥1) PTs. This mode is supported by the RS-232C port on the CPU Unit, as well as the RS-232C port and RS-422A/485 port on the Serial Communications Board. The 1:N NT Link mode is supported for communications between one PC and one or more PTs. Set the PT communications settings for a 1:N NT Link.

NT Link: 1:1 Mode

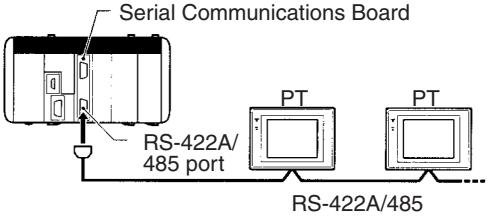


NT Link: 1:N Mode

Connection to RS-232C port of Serial Communications Board



Connection to RS-422A/485 port of Serial Communications Board

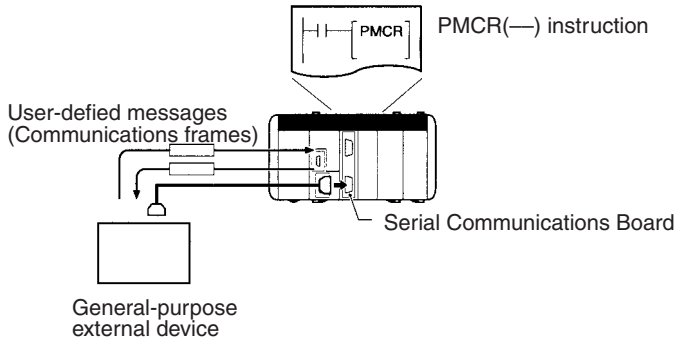


Note The 1:1 NT Link mode and 1:N NT Link mode use different types of serial communications and there is no data compatibility between them.

Protocol Macros

The CX-Protocol is used to create sets of data transmission procedures called protocols for general-purpose external devices according to the communications specifications of the general-purpose external devices. Communications must be half-duplex and must use start-stop synchronization. The protocols that have been created are recorded in a Serial Communications Board, enabling data to be sent to and received from the external devices by simply executing the PMCR(—) instruction in the CPU Unit. Protocols for data communications with OMRON devices, such as Temperature Controllers, Intelligent Signal Processors, Bar Code Readers, and Modems, are supported as standard protocols (see note 1). These protocols can be changed to suit user needs. Protocol macros are supported by the RS-232C port and RS-422A/485 port on the Serial Communications Board (see note 2).

Note
1. The standard protocols are provided as standard features with the CX-Protocol and Serial Communications Boards.
2. Protocol macros not supported by the CPU Unit's built-in ports.



Note **CompoWay/F (Host Function)**
A CQM1H CPU Unit can operate as a host to send CompoWay/F commands to OMRON components connected in the system. CompoWay/F commands are executed by using the CompoWay/F send/receive sequences in one of the standard protocols provided in the protocol macros.

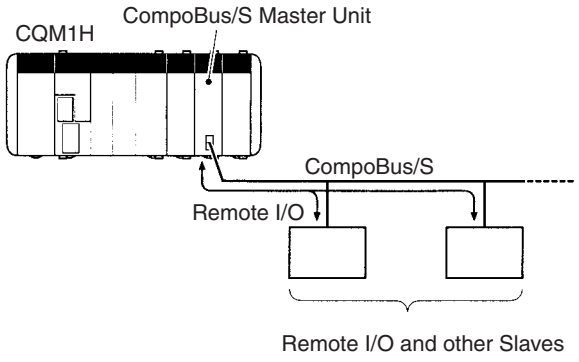
1-3-2 Communications Networks

With the CQM1H CPU Unit, networks can be created using the following Communications Units:

- CompoBus/S Master Unit
- Controller Link Unit (CQM1H-CPU51/61 only)

CompoBus/S Network

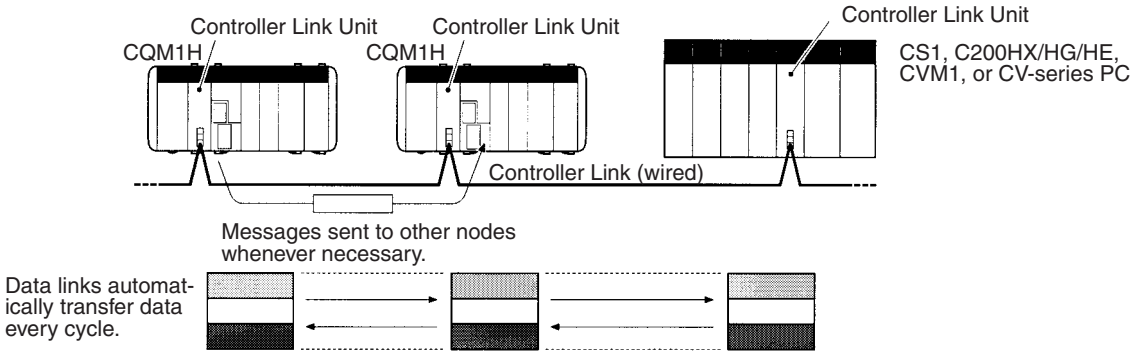
CompoBus/S is a high-speed ON/OFF bus for remote I/O communications. Connecting a CQM1-SRM21-V1 CompoBus/S Master Unit (a Dedicated I/O Unit) to the network allows remote I/O communications, without programming in the CPU Unit, between the PC and Slaves. High-speed communications are performed with 256 points in a cycle time of 1 ms max. With the CQM1H-SRM21-V1, a long-distance communications mode is also available in addition to the previous high-speed communications mode, enabling communications on a trunk line of up to 500 m.



Controller Link Network

The Controller Link Network is the basic network of the OMRON PC FA Networks. When using a CQM1H-CPU51/61 CPU Unit, the CQM1H can be connected to the network using a Controller Link Unit. This enables the flexible and simple transfer of large amounts of data with other OMRON PCs (e.g., CQM1H, CS1, C200HX/HG/HE, CVM1, and CV-series PCs) or with personal computers. Data links can be created between PCs so that data can be shared without programming and FINS message communications can be per-

formed, enabling separate control and data transfer when required. In particular, direct setting using data links allows the creation of a flexible data link system with effective use of data areas.



1-4 Functions Listed by Purpose

Purpose		Unit/Board	Function	Details
System design	Connecting 12 or more I/O or Dedicated I/O Units	I/O Control Unit and I/O Interface Unit	Using an Expansion I/O Block	You can connect up to 5 Units to the CPU Block and 11 Units to the Expansion I/O Block.
	Installing a PC in a narrow space			
Cycle time settings	Creating a minimum cycle time	CPU Unit	PC Setup: Cycle Time, Minimum Cycle Time	Set in DM 6619 (0001 to 9999 ms).
	Stopping operation if the cycle time exceeds a set time		PC Setup: Cycle Monitor Time	Set in DM 6618 (00 to 99; setting units: 10 ms, 100 ms, 1 s).
	Detecting when the cycle time exceeds 100 ms		SR area: Cycle Time Over Flag	SR 25309 turns ON.
	Detecting the maximum and current values of the cycle time		AR area: Maximum Cycle Time, Current Cycle Time	Maximum Cycle Time is stored in AR 26, and the Current Cycle Time is stored in AR 27.
Refresh method	Refreshing an output whenever an OUTPUT instruction is executed	CPU Unit	PC Setup: Output Refresh Method, Direct	Set direct output refresh method in DM 6639 bits 00 to 07. Output is refreshed when OUT is executed in the user program.
	Refreshing inputs when an interrupt occurs		PC Setup: First Input Refresh Word and Number of Input Refresh Words for interrupts	Set input refresh word for each interrupt in DM 6630 to DM 6638. The inputs for the specified words will be refreshed before the interrupt subroutine is executed when input interrupt, interval timer interrupt, or high-speed counter interrupt occurs.

Purpose		Unit/Board	Function	Details
Debugging	Turning OFF outputs from Output Units in any operating mode (stopping output refreshing)	CPU Unit	SR area: Output OFF Bit	Turn ON SR 25215.
	Detecting ON-to-OFF and OFF-to-ON transitions in specified bits		Differential Monitoring (from Programming Device)	---
	Sampling specified I/O memory data		Data Tracing	Sampling can be set to be performed at regular intervals, at the end of each cycle, or according to timing defined by the user.
	Changing the program during operation		Online Editing (from Programming Device)	---
Maintenance	Maintaining status of all outputs when operation stops	CPU Unit	SR area: I/O Hold Bit	Turn ON SR 25212.
	Starting operation with I/O memory in saved status			
	Maintaining I/O memory status when power is turned ON		SR area: I/O Hold Bit PC Setup: I/O Hold Bit Status, Maintain	Turn ON SR 25212 and set DM 6601 bits 08 to 11 in the PC Setup to maintain the I/O Hold Bit status at startup.
	Enabling input condition to be set using the DIP switch pin instead of Input Units (e.g., switching between trial and actual operation)		DIP switch: DIP switch pin customized for user operation is stored in the AR area.	Pin 6 setting is stored in the AR 0712.
	Write-protecting Program Memory and read-only DM data (general-purpose read-only area and PC Setup only) from a Peripheral Device		DIP switch: Program and data memory write-protection	Turn ON pin 1 on the DIP switch to prohibit writing.
	Specifying the startup mode		PC Setup: Startup Mode	Set in DM 6600 bits 00 to 07
	Counting the times power turned OFF		AR area: Power OFF Counter	Monitor AR 23.
Failure diagnosis	Handling user-defined errors and continuing or stopping PC operation accordingly	CPU Unit	User error instructions	FAL(06) and FALS(07)
	Performing time diagnosis and logic diagnosis for one section of the program		FPD(—) instruction	---
	Recording time-stamped errors, including user-defined errors		Error log	A logging function for input bits using FAL(06) and FALS(07) instruction is also supported.

Purpose		Unit/Board	Function	Details
Instructions	Creating step control programs	CPU Unit	Step programming instructions	---
	Performing floating-point math		Floating-point math instructions	---
	Performing trigonometric, logarithmic, or exponential functions on numerical data			
	Creating ladder subroutines that can be used at different places in the ladder program, changing only the operands.		MACRO instruction	(MCRO(99))
Memory Cassette	Changing systems when changing processes or machines	Memory Cassette	DIP switch: Automatic transfer of Memory Cassette contents	Turn ON pin 2 on the DIP switch for automatic transfer of Memory Cassette contents. At startup, user programs, part of the DM area (read-only DM and PC Setup) and expansion instruction information will be automatically read from the Memory Cassette to the CPU Unit.
	Transferring and verifying data between Memory Cassette and CPU Unit according to AR area settings		AR area: Backup functions	Turn ON AR 1400 to transfer data from the CPU Unit to the Memory Cassette. Turn ON AR 1401 to transfer data from the Memory Cassette to the CPU Unit. Turn ON AR 1402 to compare contents of Memory Cassette and CPU Unit data. (Results output to AR 1403.)
	Using clock functions to store data, such as error logs, with time of error occurrence	Memory Cassette with clock	AR area: Clock function	Use a Memory Cassette with a clock to store time data (minutes, hours, seconds, day of month, month, year, day of week) in AR 17 to AR 21.
Others	Reducing influence from chattering of input points and external noise	CPU Unit	PC Setup: Input Time Constants	Set input time constants for DC Input Units in DM 6620 to DM 6627. Settings available: 1, 2, 4, 8, 16, 32, 64, 128 ms.

Purpose		Unit/Board	Function	Details
Interrupt functions	Processing interrupt when an input turns ON Example: Cut-to-length processing (sending instruction to a tool when interrupt input is received from a proximity or photoelectric sensor)	CPU Unit (built-in inputs)	Input interrupts (4 inputs): Input Interrupt Mode Input interrupt permitted by clearing mask using the INT(89) instruction with CC=000.	Interrupt subroutine is executed when CPU Unit built-in input (IR 00000 to IR 00003) turns ON.
	Processing interrupts at regular intervals Example: Sheet speed calculation (calculates speed using input signals from an encoder at regular intervals)		Interval timer interrupt: Scheduled Interrupt Mode Specified with the first operand of the STIM(69) instruction.	Interrupt subroutine is executed at regular intervals.
	Processing interrupt after a fixed time Example: Stopping conveyor belt with high precision after workpiece detected (independent of cycle time)		Interval timer interrupt: One-shot Mode Three interval timers (0 to 2). (Interval timer 2 cannot be used at the same time as high-speed counter 0.) Specified with the first operand of STIM(69).	Interrupt subroutine is executed once when the time expires.
	Processing interrupt when the PV of a low-speed (1 kHz) counter reaches 0 Example: Counting workpieces (e.g., chip components), and stopping feeding when a set value is reached		Input interrupts (4 inputs): Counter Mode (decrementing) Counter Mode set value updated and masking cleared using the INT(89) instruction with CC=003.	Decrements the PV every time CPU Unit built-in input (IR 00000 to IR 00003) turns ON, and executes the subroutine when the PV reaches 0.
	Processing interrupt when the high-speed counter PV matches a certain value Example: Performing processing required for cutting a workpiece (e.g., wire) when it is a certain length	CPU Unit (built-in inputs) Pulse I/O Board Absolute Encoder Interface Board	High-speed counter interrupt: Target value comparison	Interrupt subroutine is executed when the PV matches a value registered in the comparison table.
	Processing interrupt when the high-speed counter PV is within a certain range Example: Picking workpieces (e.g., wires) within specified lengths at high speed		High-speed counter interrupt: Range comparison	Interrupt subroutine is executed when the counter PV lies between set upper and lower limits.
	Interrupting program when data is received via serial communications	Serial Communications Board	Protocol macro interrupt notification	---

Purpose		Unit/Board	Function	Details
High-speed counter functions	Detecting position and length when input is received from incremental rotary encoder			
	Low-speed (1 kHz) frequency count	CPU Unit (built-in inputs)	Input interrupt: Counter Mode (decrementing, 1 kHz)	CPU Unit built-in inputs (IR 00000 to IR 00003) can be used as high-speed counters without executing interrupt. PVs are stored in SR 244 to SR 247.
	Low-speed (2.5 kHz/ 5 kHz) frequency count		High-speed counter 0: Differential Phase Mode (2.5 kHz) Incrementing Mode (5 kHz)	High-speed pulse input from CPU Unit built-in inputs (IR 00004 to IR 00006) is counted. PVs are stored in SR 230 and SR 231.
	High-speed (25 kHz/ 50 kHz or 250 kHz/ 500 kHz) frequency count	High-speed Counter Board	High-speed counters 1 to 4: Differential Phase Mode (25 kHz/ 250 kHz, multiplication factor: 1/2/4) Pulse + Direction Mode (50 kHz/500 kHz) Up/Down Mode (50 kHz/500 kHz)	High-speed pulse input from ports 1, 2, 3 and 4 of the High-speed Counter Board is counted. For slot 1, the PVs are stored in IR 200 to IR 207 and for slot 2, in SR 232 to SR 239. (Ring mode or linear mode can be set as the numeric range.)
	High-speed (25 kHz/ 50 kHz) frequency count	Pulse I/O Board	High-speed counters 1 and 2: Differential Phase Mode (25 kHz) Pulse + Direction Mode (50 kHz) Up/Down Mode (50 kHz)	High-speed pulse input from ports 1 and 2 of the High-speed Counter Board is counted. For slot 1, the PVs are stored in IR 200 to IR 207 and for slot 2, in SR 232 to SR 239. (Ring mode or linear mode can be set as the numeric range.)
	High-speed counting of signals from an absolute rotary encoder	Absolute Encoder Interface Board	High-speed counters 1 and 2: Input modes: BCD Mode and 360° Mode Resolution settings: 8-bit (0 to 255), 10-bit (0 to 1023), 12-bit (0 to 4095) Set the resolution to match the connected encoder.	Binary Grey code input from an absolute rotary encoder is counted. The PVs are stored in SR 232 to SR 235.

Purpose		Unit/Board	Function	Details
Pulse output functions	Making simple pulse outputs	CPU Unit	PC Setup and SPED(64)/ PULS(65) instructions: Pulse outputs can be made from standard Transistor Output Units.	Set the pulse output word address (specify a word from IR 100 to IR 115). Frequency: 20 Hz to 1 kHz Duty factor: 50%
	Making output to pulse train input motor driver (servomotor driver or stepping-motor driver) for positioning	Pulse I/O Board	Ports 1 and 2: Single-phase pulse output with without acceleration/deceleration (using SPED(64) instruction) Trapezoidal single-phase pulse output with same acceleration and deceleration rates (using PLS2(--) instruction) Trapezoidal single-phase pulse output with different acceleration/ deceleration rates (using ACC(--) instruction)	Frequency: 10 Hz to 50 kHz for servo driver; 10 Hz to 20 kHz for stepping motor Duty factor: 50% Pulse output PVs stored in SR 236 to SR 239.
	Performing time-proportional control of temperature using variable duty factor pulse output function		Ports 1 and 2: Variable duty factor pulse output (using PWM(--) instruction)	Frequency: 5.9 kHz, 1.5 kHz, 91.6 Hz Duty factor: 1% to 99% Pulse output PVs stored in SR 236 to SR 239.
Analog setting	By setting the time for which a conveyor belt is temporarily stopped, the low-speed feed rate over a fixed distance can be simply controlled using the adjuster.	Analog Setting Board	Analog setting function	Values indicated by the adjuster are converted to digital values between 0 to 200 (BCD) and are stored in IR 220 to IR 223.
Analog I/O	Obtaining temperature data, pressure data, etc.	Analog I/O Board	Analog I/O function Analog control also possible when used in combination with PID(--).	Two input points and one output point for analog values (0 to 5 V, 0 to 20 mA, 0 to 10 V)

Purpose		Unit/Board	Function	Details
Serial communications	Changing protocols during operation (e.g., to Host Link via modem)	CPU Unit	STUP(--)	---
	Sending and receiving messages according to the communications protocol of the communications partner	Serial Communications Board	Protocol macro function	---
	Making one-to-one data links with other PCs	CPU Unit or Serial Communications Board	1:1 data link	---
	Sending and receiving data without protocol (no conversion)		No-protocol (TXD(48) and RXD(47))	---
	Sending unsolicited messages to a host computer		PC-initiated communications (TXD(48))	---
	Performing data transfer with PT (Programmable Terminal)		NT Link (1:1 mode or 1:N mode available)	---
Network communications	Making data links (shared data area) via FA network	Controller Link Unit	Data links	---
	Performing message communications (sending and receiving data when necessary) via FA network		Message communications (SEND(90), RECV(98), and CMND(—))	---
	Remote programming or monitoring of another PC on the network via a Host Link or a peripheral bus		Remote programming/ monitoring	---
I/O communications	Reducing wiring using high-speed ON/OFF bus in machine	CompoBus/S Master Unit	CompoBus/S Master	Acts as CompoBus/S Master with up to 64 inputs and 64 outputs.
	Machine modularization and reduced wiring using distributed control of CPU Unit through the Master. Conforms to the DeviceNet multivendor bus, providing data compatibility with devices from other companies.	CompoBus/D I/O Link Unit	CompoBus/D Slaves	Act as CompoBus/D Slaves with 16 inputs and 16 outputs.
	Reducing wiring Example: Simple communications between PCs, connections between PC robots etc.	B7A Interface Unit	Remote I/O communications	Five types of Unit are available to be used according to the scale of control. Connections possible with B7A Link Terminal at distance of up to 500 m.

Purpose		Unit/Board	Function	Details
Detection sensor input	Reducing wiring and space required for sensor output	Sensor Unit	Input function for Optic Fiber Photoelectric Module, Photoelectric Module with Separate Amplifier and Proximity Module with Separate Amplifier (amplifier function)	Up to four Sensor Modules (amplifier sections) of three kinds of sensor (fiber photoelectric sensor, photoelectric sensor with separable amplifier and proximity sensor with separable amplifier) can be mounted to a single Sensor Unit. Sensor Modules can be selected and combined according to the object to be detected and the distance.
Analog sensor input	Reading analog voltage or current signals from sensors or measuring devices, and outputting analog signals to inverters or analog control devices	Analog Input Unit or Analog Output Unit (Power Supply Unit required)	Analog I/O	Analog input: 4 points (0 to 20 mA, 0 to 5 V, –10 to +10 V) Analog output: 2 points (0 to 20 mA, –10 to +10 V)
	Reading distance data such as level differences and panel thicknesses, by using in combination with displacement sensors	Linear Sensor Interface Unit	Input/operation function for data from linear sensor/ amplifier	High-speed, high-precision measurement of voltage or current input from linear (displacement) sensors is performed and the measurements are converted to numeric data for comparative decision processing. Input can be held according to external timing signals. Sampling cycle: 1 ms; External timing sampling time: 0.3 ms
Temperature control functions	Reading data from two temperature controllers with one Unit	Temperature Controller Unit CQM1-TC00□ CQM1-TC10□	Temperature control function	Number of loops: 2 Input: Thermocouple (K, J) or platinum resistance thermometer (Pt, JPt) Output: ON/OFF or advanced PID control (time-proportional) control
	Reading data from two or four temperature controllers with one Unit	Temperature Controller Unit CQM1-TC20□ CQM1-TC30□		Number of loops: 4 or 2 (heater burnout detection function) Input: Thermocouple (K, J, L, T, R, S, B) or platinum resistance thermometer (Pt, JPt) Output: ON/OFF or advanced PID control (time-proportional) control

1-4-1 High-speed Counters

CPU Unit/ Board	Name	No. of counters	Max. counting rate for each input mode				
			Differential Phase	Pulse + Direction	Up/Down	Incrementing	Decrementing
CPU Unit: Input interrupts (Counter Mode)	Input interrupts (Counter Mode)	4	---	---	---	---	1 kHz
CPU Unit: Built-in high-speed counter	High-speed counter 0	1	2.5 kHz	---	---	5 kHz	---
High-speed Counter Board	High-speed counters 1, 2, 3, and 4	4	25 kHz or 250 kHz; multiplication factor: 1/2/4	50 kHz or 500 kHz	50 kHz or 500 kHz	---	---
Pulse I/O Board	High-speed counters 1 and 2	2	25 kHz	50 kHz	50 kHz	---	---

System Configurations Supporting High-speed Counters

System configuration	Unit/Board	Function	Input modes and max. counting rate	No. of counters
Configuration A (13 counters total)	CPU Unit	Decrementing counters for input interrupts (Counter Mode)	Decrementing counter: 1 kHz	4
		High-speed counter 0 for built-in inputs (IR 00004 to IR 00006)	Differential Phase Mode: 2.5 kHz Incrementing Mode: 5 kHz	1
	High-speed Counter Board (mounted in slot 1)	High-speed counters 1, 2, 3 and 4	Differential Phase Mode (multiplication factor: 1/2/4): 25 kHz or 250 kHz, Pulse and Direction Mode, Up/Down Mode: 50 kHz or 500 kHz	4
	High-speed Counter Board (mounted in slot 2)	High-speed counters 1, 2, 3 and 4	Differential Phase Mode (multiplication factor: 1/2/4): 25 kHz or 250 kHz, Pulse and Direction Mode, Up/Down Mode: 50 kHz or 500 kHz	4
Configuration B (11 counters total)	CPU Unit	Decrementing counters for input interrupts (Counter Mode)	Decrementing count: 1 kHz	4
		High-speed counter 0 for built-in inputs (IR 00004 to IR 00006)	Differential Phase Mode: 2.5 kHz Incrementing Mode: 5 kHz	1
	High-speed Counter Board (mounted in slot 1)	High-speed counters 1, 2, 3 and 4	Differential Phase Mode (multiplication factor: 1/2/4): 25 kHz or 250 kHz, Pulse and Direction Mode, Up/Down Mode: 50 kHz or 500 kHz	4
	High-speed Counter Board (mounted in slot 2)	High-speed counters 1 and 2	Differential Phase Mode: 25 kHz Pulse and Direction Mode, Up/Down Mode 50 kHz	2

1-4-2 Pulse Outputs

Unit/Board	Name	No. of pulse output points	Standard pulse output frequency		Variable duty factor pulse output frequency
			Without acceleration/ deceleration	With trapezoidal acceleration/ deceleration	
Transistor Output Unit	Pulse outputs from an output point	1	20 Hz to 1 kHz	---	---
Pulse Output Board	Pulse outputs from port 1 or 2	2	10 Hz to 50 kHz (20 kHz for a stepping motor)	Acceleration or deceleration only: 0 to 50 kHz Acceleration/ deceleration together: 100 Hz to 50 kHz	91.6 Hz, 1.5 kHz, 5.9 kHz

System Configuration Supporting Pulse Outputs

System Configuration	Unit/Board	Function	Output	No. of points
Configuration A (3 outputs total)	CPU Unit	Pulse outputs from Transistor Output Unit output point	Standard pulse output with no acceleration/ deceleration: 20 Hz to 1 kHz	1
	Pulse I/O Board (in slot 2)	Pulse outputs 1 and 2	Standard pulse output with no acceleration/ deceleration: 10 Hz to 50 kHz Standard pulse output with trapezoidal acceleration/ deceleration: 0 Hz to 50 kHz Variable duty-factor pulse output	2

1-5 CQM1-CQM1H Comparison

The differences between the CQM1H and the CQM1 are listed in the following table.

Item	CQM1H	CQM1
Mounting structure	No Backplane (use connectors for mounting)	
Mounting	DIN Track mounting (screw mounting not possible)	
I/O capacity	CQM1H-CPU11/21: 256 points CQM1H-CPU51/61: 512 points	CQM1-CPU11/21-EV1: 128 points CQM1-CPU41/42/43/44/45-EV1: 256 points
Program capacity	CQM1H-CPU11/21: 3.2 Kwords CQM1H-CPU51: 7.2 Kwords CQM1H-CPU61: 15.2 Kwords	CQM1-CPU11/21-EV1: 3.2 Kwords CQM1-CPU41/42/43/44/45-EV1: 7.2 Kwords
Data memory capacity	CQM1H-CPU11/21: 3 Kwords CQM1H-CPU51: 6 Kwords CQM1H-CPU61: 12 Kwords (DM area: 6 Kwords; EM area: 6 Kwords)	CQM1-CPU11/21-EV1: 1 Kword CQM1-CPU41/42/43/44/45-EV1: 6 Kwords
Instruction lengths	1 step per instruction, 1 to 4 words per instruction	
Number of instructions in instruction set	162 (14 basic, 148 special instructions)	CQM1-CPU11/21-EV1: 117 (14 basic, 103 special instructions) CQM1-CPU41/42/43/44/45-EV1: 137 (14 basic, 123 special instructions)

Item	CQM1H	CQM1
Instruction execution times	LD instruction: 0.375 µs MOV instruction: 17.6 µs	LD instruction: 0.5 µs MOV instruction: 23.5 µs
Overseeing time	0.70 ms	0.80 ms
CPU Unit built-in input points	16 points	
Maximum number of Units (see note)	The number of I/O Units and Dedicated I/O Units that can be connected to a CQM1H CPU Unit is as follows: CPU Block only: 11 Units max. CPU Block and Expansion I/O Block CPU Block: 5 Units max. Expansion I/O Block: 11 Units max.	The number of I/O Units and Dedicated I/O Units that can be connected to a CQM1 CPU Units is as follows: CQM1-CPU11/21-EV1: 7 Units max. (I/O Units only) CQM1-CPU41/42/43/44-EV1: 11 Units max. (I/O Units or Dedicated I/O Units)
Inner Boards	CQM1H-CPU51/61: 2 slots	None
High-speed counters	Supported if CQM1H-CTB41 High-speed Counter Board is mounted.	Not supported

Note When considering the restrictions on the number of connectable Units, an Analog Power Supply Unit must be counted as a Unit, just like I/O or Dedicated I/O Units.

Item		CQM1H	CQM1
Pulse I/O		Supported if CQM1H-PLB2 Pulse I/O Board 1 is mounted.	Supported for CQM1-CPU43-EV1 CPU Unit.
Absolute encoder interface		Supported if CQM1H-ABB21 Absolute Encoder Interface Board is mounted.	Supported for CQM1-CPU44-EV1 CPU Unit.
Analog settings		Supported if CQM1H-AVB41 Analog Setting Board is mounted.	Supported for CQM1-CPU42-EV1 CPU Unit.
Analog I/O		Supported if CQM1H-MAB42 Analog I/O Board is mounted.	Supported for CQM1-CPU45-EV1 CPU Unit.
Protocol macros		Supported if CQM1H-SCB41 Serial Communications Board is mounted.	Not supported
Communications Units		CQM1H-CPU51/61: 1 Unit	None
Controller Link		Supported if CQM1H-CLK21 Controller Link Unit is connected.	Not supported
Peripheral port connections	**Connecting cable for personal computer**	CS1W-CN□□□ **Note** Connection to personal computer also possible with CQM1-CIF01/02 via CS1W-CN114 Conversion Cable.	CQM1-CIF01/02
	Connecting cable for Programming Console	CQM1-PRO01 Programming Console: Use the cable provided with the Console or CS1W-CN114. C200H-PRO27 Programming Console: CS1W-CN224/624 **Note** Connection to Programming Console also possible with C200H-CN222/422 via CS1W-CN114 Conversion Cable.	CQM1-PRO01 Programming Console: Use the cable provided with the Console. C200H-PRO27 Programming Console: C200H-CN222/422

Item		CQM1H	CQM1	
Interrupts	**Input interrupts (4 points max.)**	Input Interrupt Mode: Interrupts are executed from the CPU Unit's built-in input points (4 points) in response to inputs from external sources.		
		Counter Mode: Interrupts are executed from the CPU Unit's internal built-in input points (4 points) in response to inputs received a certain number of times, counted down.		
	Interval timer interrupts (3 points max.)	Scheduled Interrupt Mode: Program is interrupted at regular intervals measured by internal clock.		
		One-shot Interrupt Mode: One interrupt is executed after a certain time, measured by the internal clock.		
	High-speed counter interrupts	Target-value comparison: Interrupts are executed when the high-speed counter PV is equal to a specified value. Range Comparison: Interrupts are executed when the high-speed counter PV lies within specified ranges.		
		Counting is possible for high-speed counter input from the CPU Unit's internal input points, Pulse I/O Boards or Absolute Encoder Interface Boards.	Counting is possible for high-speed counter input from the CPU Unit's internal input points and, for the CQM1-CPU43/44-EV1, for input to ports 1 and 2.	
	Interrupts from Serial Communications Board	Interrupt subroutines can be called from Serial Communications Board using the interrupt notification function.	Not supported	
I/O bits		CQM1H-CPU11/21: 256 points CQM1H-CPU51/61: 512 points	CQM1-CPU11/21-EV1: 128 points CQM1-CPU41/42/43/44/45-EV1: 256 points	
I/O points for Inner Board slot 1		256 points (16 words) Words used by Inner Board in slot 1: IR 200 to IR 215	None	
I/O points for Inner Board slot 2		192 points (12 words) Words used by Inner Board mounted to slot 2: IR 232 to IR 243	64 points (4 words)	CQM1-CPU43/44-EV1: PVs of high-speed counters 1 and 2 are stored in IR 232 to IR 235. Other CPU Units: IR 232 to IR 235 can be used as work bits.
			64 points (4 words)	CQM1-CPU43-EV1: PVs of pulse outputs are stored in IR 236 to IR 239. Other CPU Units: IR 236 to IR 239 are either used by the system or can be used as work bits.
			96 points (6 words)	CQM1-CPU45-EV1: Analog input conversion values and analog output values are stored in IR 232 to IR 237. Other CPU Units: IR 232 to IR 237 can be used as work bits.
Analog set values		64 points (4 words) Words where analog set values are stored when using the CQM1-AVB41 Analog Setting Board: IR 220 to IR 223	64 points (4 words)	CQM1-CPU42-EV1: Analog set values are stored in IR 220 to IR 223. Other CPU Units: IR 220 to IR 223 can be used as work bits.

Item	CQM1H		CQM1	
DM area	CQM1H-CPU51/61: 6,656 words CQM1H-CPU11/21: 3,584 words	DM area data is accessed (read/write) in word (16-bit) units. Word values are retained when the power is turned OFF or the mode is changed.	CQM1-CPU4□-EV1: 6,656 words CQM1-CPU11/21-EV1: 1,536 words	DM area data is accessed (read/write) in word (16-bit) units only. Word values are retained when the power is turned OFF or the mode is changed.
	Read/write	CQM1H-CPU51/61: DM 0000 to DM 6143 (6,144 words) CQM1H-CPU21/11: DM 0000 to DM 3071 (3,072 words) Can be written by program.	Read/write	CQM1-CPU4□-EV1: DM 0000 to DM 6143 (6,144 words) CQM1-CPU11/21-EV1: DM 0000 to DM 1023 (1,024 words) Can be written by program.
	Read-only	DM 6144 to DM 6568 (425 words) Cannot be written by program.	Read-only	DM 6144 to DM 6568 (425 words) Cannot be written by program.
	Controller Link DM parameter area	CQM1H-CPU51/61: DM 6400 to DM 6409 (11 words) CQM1H-CPU11/21: None	None	---
	Routing table area	CQM1H-CPU51/61: DM 6450 to DM 6499 (50 words) CQM1H-CPU11/21: None	None	---
	Serial Communications Board	CQM1H-CPU51/61: DM 6550 to DM 6559 (10 words) CQM1H-CPU11/21: None	None	---
	Error history area	DM 6569 to DM 6599 (31 words)	Error history area	DM 6569 to DM 6599 (31 words)
	PC Setup	DM 6600 to DM 6655 (56 words)	PC Setup	DM 6600 to DM 6655 (56 words)
EM area	6,144 words	EM area data can be read or written in word (16-bit) units. Contents are retained when the power is turned OFF or the mode is changed. Accessible using instructions from the program or Programming Devices. Read/write words: EM 0000 to EM 6143 (6,144 words)	None	---
Memory Cassette (EEPROM or flash memory)	Mounted from the front of the CPU Unit. Memory Cassettes are used to store and read the user's program, DM (read-only data and PC Setup), and expansion instruction information (as one block of data). It is possible to set the CPU Unit so that when power is turned ON, data stored in the Memory Cassette (user's program, DM, expansion instruction information) is automatically transferred, in one block, to the CPU Unit (auto-boot). Two-way transfer, and comparison of data between the CPU Unit and Memory Cassette is possible using AR area settings.			
	In addition to 4-Kword and 8-Kword EEPROM Memory Cassettes, 15.2-Kword flash memory Memory Cassettes are also available.		4-Kword and 8-Kword EEPROM Memory Cassettes are available.	
Trace memory	1, 024 words (trace comparison data: 12 points, 3 words)		CQM1-CPU4□-EV1: 1,024 words (trace comparison data: 12 points, 3 words)	

<table>
<tr><th>Item</th><th colspan="2">CQM1H</th><th colspan="2">CQM1</th></tr>
<tr><td>New instructions</td><td colspan="2">TTIM (TOTALIZING TIMER) instruction, SEND(90)/RECV(98)/CMND(—) (network communications) instructions, PMCR (PROTOCOL MACRO) instruction, STUP(—) (CHANGE RS-232C SETUP) instruction and 19 floating-point math instructions available.</td><td colspan="2">The instructions on the left are not supported by the CQM1.</td></tr>
<tr><td rowspan="4">Serial communications ports</td><td colspan="4">One built-in peripheral port
Supports the following communications: Peripheral bus, Programming Console bus, Host Link, no-protocol</td></tr>
<tr><td>One built-in RS-232C port</td><td>CQM1H-CPU61/51/21: Supports Host Link, no-protocol, NT Link (1:1 mode) and 1:1 Data Link communications.
CQM1H-CPU11: None
Note Programming Console functions supported from a PT (except when pin 7 on the DIP switch is OFF).</td><td>One built-in RS-232C port</td><td>Supports Host Link and no-protocol communications (except CQM1-CPU11/21-EV1).
CQM1-CPU4□-EV1 also supports 1:1 Data Link, NT Link (1:1 mode)
Note CQM1-CPU4□-EV1 supports Programming Console functions from a PT.</td></tr>
<tr><td>Serial Communications Board (available separately): 1 RS-232C port and 1 RS-422A/485 port</td><td>Host Link, no-protocol, 1:1 Data Link, NT Link (1:1 mode, 1:N mode) and protocol macro communications supported.</td><td>None</td><td>---</td></tr>
<tr><td colspan="4"></td></tr>
<tr><td rowspan="4">Serial communications modes</td><td colspan="4">No-protocol
Up to 256 bytes can be sent or received with special instruction. Header codes and end codes can be set. Transmission delay time setting available.</td></tr>
<tr><td colspan="4">Host Link
All of the CPU Unit's I/O memory areas, and the user's program can be accessed using Host Link commands.</td></tr>
<tr><td>NT Link (1:1 mode, 1:N mode)</td><td>Data transfer is possible without program between the PC and an OMRON PT. The ratio of PCs to PTs can be one-to-one or one-to-many.
The 1:N-mode NT Link connections are possible only for the RS-232C port or RS-422A/485 port on the Serial Communications Board.</td><td>NT Link (1:1 mode only)</td><td>CQM1-CPU4□-EV1 only</td></tr>
<tr><td>Protocol macro</td><td>Protocol macro communications supported using the RS-232C port or RS-422A/485 port on the Serial Communications Board (CQM1H-CPU51/61 only).
Sending and receiving data is possible using one instruction via a user-defined protocol from the ladder program.</td><td>Not supported</td><td>---</td></tr>
<tr><td>Power failure detection time</td><td colspan="4">AC power supply: 10 to 25 ms
DC power supply: 5 to 25 ms</td></tr>
<tr><td>Standard accessories</td><td colspan="2">Battery Set: CPM2A-BAT01</td><td colspan="2">Battery Set: C500-BAT08</td></tr>
</table>

<table>
<tr><th colspan="2">Item</th><th>CQM1H</th><th>CQM1</th></tr>
<tr><td rowspan="2">Timing of data area changes
(See note.)</td><td rowspan="2">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)</td><td>The Reception Completed Flags and Reception Overflow Flags are turned OFF after execution of RXD instruction is completed (during program execution).</td><td>The Reception Completed Flags and Reception Overflow Flags are turned OFF in the overseeing processes in the next cycle after the RXD instruction is executed.</td></tr>
<tr><td colspan="2">Example showing when the Reception Completed Flags are turned OFF:
<table>
<tr><th rowspan="2"></th><th colspan="2">CQM1H</th><th colspan="3">CQM1</th></tr>
<tr><th>Previous cycle</th><th>Current cycle</th><th>Previous cycle</th><th>Current cycle</th><th>Next cycle</th></tr>
<tr><td>Overseeing</td><td>---</td><td>---</td><td>---</td><td>---</td><td>Reception Completed Flag OFF</td></tr>
<tr><td>Program execution</td><td>---</td><td>RXD instruction execution
Reception Completed Flag OFF</td><td>---</td><td>RXD instruction execution</td><td>---</td></tr>
<tr><td>Peripheral servicing</td><td>Reception Completed Flag ON</td><td>---</td><td>Reception Completed Flag ON</td><td>---</td><td>---</td></tr>
</table></td></tr>
</table>

Note There is a difference in timing, but there is no difference in functionality.

1-6 Overview Application Procedure

The following procedure outlines the steps necessary to set up, program, and operate a CQM1H control system.

1,2,3...

1. Determine the system configuration.

   Decide if one or more Inner Boards are required in the system and whether they are to be mounted in the left or right slot. The following boards are available.

   - Serial Communications Board for serial communications.
   - High-speed Counter Board or Pulse I/O Board for high-speed counter inputs.
   - Pulse I/O Board or pulse outputs.
   - Absolute Encoder Interface Board for inputs from an absolute encoder.
   - Analog Setting Board to input settings via variable resistors.
   - Analog I/O Board for analog I/O.

   Also, decide if it will be necessary to connect to a Controller Link System.

2. Allocate I/O.

   Nothing is required to allocate I/O with the CQM1H. I/O tables are not required and all I/O is allocated automatically. Words are allocated to I/O Units starting at the CPU Unit and going to the right, with Input Units being allocated words starting at IR 001 and Output Units being allocated words starting at IR 100.

3. Set settings in the PC Setup.

   The PC Setup can be used to control the functions of the CPU Unit and Inner Boards. The default settings in the PC Setup must be confirmed and if any changes are required, they must be made from a Programming Device before starting operation. The PC Setup must be changed to use Inner Boards.

4. Assemble the PC.
5. Turn ON the power supply.
6. Write the ladder program.
7. Transfer the program to the CPU Unit.
8. Test operation.

   The following steps must be performed in trial operation.

   a) Check I/O wiring.

   b) Set the required bits in memory (such as the I/O Hold Bit).

   c) Monitor operation and debug the system in MONITOR Mode.
9. Correct the program and return to step 7., above.
10. Store/print the program.
11. Begin actual operation.

SECTION 2
Specifications

This section gives specifications for the Units that go together to create a CQM1H PC and provides functional specifications of the memory areas.

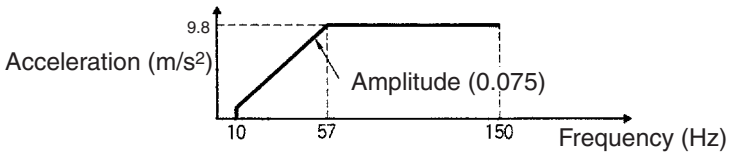
2-1 Unit Specifications

2-1-1 Power Supply Units

Item	CQM1-PA203	CQM1-PA206	CQM1-PA216	CQM1-PD026
Supply voltage	100 to 240 V AC, 50/60 Hz		100 or 230 V AC (selectable), 50/60 Hz	24 V DC
Allowable voltage range	85 to 264 V AC		85 to 132 V AC or 170 to 264 V AC	20 to 28 V DC
Operating frequency range	47 to 63 Hz			---
Power consumption	60 VA max.	120 VA max.		50 W max.
Inrush current	30 A max.			
Output capacity	5 V DC: 3.6 A (18 W)	5 V DC: 6 A 24 V DC: 0.5 A (30 W total)		5 V DC: 6 A (30 W)
Insulation resistance	20 MΩ min. (at 500 V DC) between AC external terminals and GR terminals (see note 1)			20 MΩ min. (at 500 V DC) between AC external terminals and GR terminals (see note 1)
Dielectric strength	2,300 V AC 50/60 Hz for 1 min between AC external and GR terminals, (see note 1) leakage current: 10 mA max. 1,000 V AC 50/60 Hz for 1 min between DC external and GR terminals, (see note 1) leakage current: 20 mA max.			
Noise immunity	Conforms to IEC61000-4-4; 2 kV (power lines)			
Vibration resistance	10 to 57 Hz, 0.075-mm amplitude, 57 to 150 Hz, acceleration: 9.8 m/s^2 (see note 2) in X, Y, and Z directions for 80 minutes each (Time coefficient of 8 minutes × coefficient factor of 10 = total time of 80 minutes)			
Shock resistance	147 m/s^2 (118 m/s^2 for Contact Output Units) 3 times each in X, Y, and Z directions			
Ambient temperature	Operating: 0 to 55 °C Storage: –20 to 75 °C (except battery)			
Humidity	10% to 90% (with no condensation)			
Atmosphere	Must be free from corrosive gases			
Grounding	Less than 100 Ω			
Enclosure rating	Mounted in a panel			
Weight	5 kg max.			
Dimensions (without cables)	187 to 603 × 110 × 107 mm (W×H×D)			

Note 1. Disconnect the LG terminal of the Power Supply Unit from the GR terminal when performing insulation and dielectric strength tests. If the tests are repeatedly performed with the LG and GR terminals short-circuited, the internal components may be damaged.

2.



2-1-2 CPU Unit Specifications

Performance Specifications

Item		Specifications
Control method		Stored program method
I/O control method		Cyclic scan and direct output/immediate interrupt processing used together
Programming language		Ladder diagram
I/O capacity		CQM1H-CPU11/21: 256 CQM1H-CPU51/61: 512
Program capacity		CQM1H-CPU11/21: 3.2 Kwords CQM1H-CPU51: 7.2 Kwords CQM1H-CPU61: 15.2 Kwords
Data memory capacity		CQM1H-CPU11/21: 3 Kwords CQM1H-CPU51: 6 Kwords CQM1H-CPU61: 12 Kwords (DM: 6 Kwords; EM: 6 Kwords)
Instruction length		1 to 4 words per instruction
Number of instructions in instruction set		162 (14 basic, 148 special instructions)
Instruction execution times		Basic instructions: 0.375 to 1.125 μs Special instructions: 17.7 μs (MOV instruction)
Overseeing time		0.70 ms
Mounting structure		No Backplane (Units are joined horizontally using connectors)
Mounting		DIN Track mounting (screw mounting not possible)
CPU Unit built-in DC input points		16
Maximum number of Units		Maximum number of I/O and Dedication I/O Units (Analog Power Supply Units must also be counted.) CPU Block only: 11 Units max. CPU Block and Expansion I/O Block CPU Block: 5 Units max. Expansion I/O Block: 11 Units max.
Inner Boards		CQM1H-CPU11/21: None CQM1H-CPU51/61: 2 Boards
Communications Units		CQM1H-CPU11/21: None CQM1H-CPU51/61: 1 Unit
Types of interrupts	Input interrupts (4 points max.)	Input Interrupt Mode: Interrupt is executed in response to input from an external source to the CPU Unit's built-in input points. Counter Mode: Interrupt is executed in response to input received a certain number of times (counted down) via the CPU Unit's internal built-in input points (4 points).
	Interval timer interrupts (3 points max.)	Scheduled Interrupt Mode: Program is interrupted at regular intervals measured by one the CPU Unit's internal timers. One-shot Interrupt Mode: One interrupt is executed after a certain time, measured by one of the CPU Unit's internal timers.
	High-speed counter interrupt	Target Value Comparison: Interrupt is executed when the high-speed counter PV is equal to a specified value. Range Comparison: Interrupt is executed when the high-speed counter PV lies within a specified range. **Note** Counting is possible for high-speed counter inputs from the CPU Unit's internal input points, Pulse I/O Boards, or Absolute Encoder Interface Boards. (The High-speed Counter Board has no interrupt function, and can only output bit patterns internally and externally.)
I/O allocation		I/O is automatically allocated in order from the Unit nearest to the CPU Unit. (Because there are no I/O tables, it is not necessary, and not possible, to create I/O tables from a Programming Device.)

Memory Area Structure

Data area		Size	Words	Bits	Function
IR area (note 1)	Input area	256 bits	IR 000 to IR 015	IR 00000 to IR 01515	Input bits can be allocated to Input Units or I/O Units. The 16 bits in IR 000 are always allocated to the CPU Unit's built-in inputs.
	Output area	256 bits	IR 100 to IR 115	IR 10000 to IR 11515	Output bits can be allocated to Output Units or I/O Units.
	Work areas	2,528 bits min. (note 2)	IR 016 to IR 089	IR 01600 to IR 08915	Work bits do not have any specific function and they can be freely used within the program.
			IR 116 to IR 189	IR 11600 to IR 18915	
			IR 216 to IR 219	IR 21600 to IR 21915	
			IR 224 to IR 229	IR 22400 to IR 22915	
Controller Link status areas		96 bits	IR 090 to IR 095	IR 09000 to IR 09515	Used to indicate the Controller Link data link status information. (Can be used as work bits when a Controller Link Unit is not connected.)
		96 bits	IR 190 to IR 195	IR 19000 to IR 19515	Used to indicate the Controller Link error and network participation information. (Can be used as work bits when a Controller Link Unit is not connected.)
MACRO operand area (note 2)	Input area	64 bits	IR 096 to IR 099	IR 09600 to IR 09915	Used when the MACRO instruction, MCRO(99), is used. (Can be used as work bits when the MACRO instruction is not used.)
	Output area	64 bits	IR 196 to IR 199	IR 19600 to IR 19915	
Inner Board slot 1 area		256 bits	IR 200 to IR 215	IR 20000 to IR 21515	These bits are allocated to the Inner Board mounted in slot 1 of a CQM1H-CPU51/61. (Can be used as work bits when slot 1 is empty.) CQM1H-CTB41 High-speed Counter Board: IR 200 to IR 213 (14 words): Used by the Board IR 214 and IR 215 (2 words): Not used. CQM1H-SCB41 Serial Communications Board: IR 200 to IR 207 (8 words): Used by the Board IR 208 to IR 215 (8 words): Not used.
Analog settings area (note 1)		64 bits	IR 220 to IR 223	IR 22000 to IR 22315	Used to store the analog settings when a CQM1H-AVB41 Analog Setting Board is mounted. (Can be used as work bits when an Analog Setting Board is not mounted.)
High-speed Counter 0 PV (note 1)		32 bits	IR 230 to IR 231	IR 23000 to IR 23115	Used to store the present values of high-speed counter 0. (Can be used as work bits when high-speed counter 0 is not being used.)
Inner Board slot 2 area		192 bits	IR 232 to IR 243	IR 23200 to IR 24315	These bits are allocated to the Inner Board mounted in slot 2. (Can be used as work bits when a CQM1H-CPU11/21 is being used or slot 2 is empty.) CQM1H-CTB41 High-speed Counter Board: IR 232 to IR 243 (12 words): Used by the Board CQM1H-ABB21 Absolute Encoder Interface Board: IR 232 to IR 239 (8 words): Used by the Board IR 240 to IR 243 (4 words): Not used. CQM1H-PLB21 Pulse I/O Board: IR 232 to IR 239 (8 words): Used by the Board IR 240 to IR 243 (4 words): Not used. CQM1H-MAB42 Analog I/O Board: IR 232 to IR 239 (8 words): Used by the Board IR 240 to IR 243 (4 words): Not used.
SR area		184 bits	SR 244 to SR 255	SR 24400 to SR 25515	These bits serve specific functions such as flags and control bits.
HR area		1,600 bits	HR 00 to HR 99	HR 0000 to HR 9915	These bits store data and retain their ON/OFF status when power is turned off.

Data area		Size	Words	Bits	Function
AR area		448 bits	AR 00 to AR 27	AR 0000 to AR 2715	These bits serve specific functions such as flags and control bits.
TR area		8 bits	---	TR 0 to TR 7	These bits are used to temporarily store ON/OFF status at program branches.
LR area (note 1)		1,024 bits	LR 00 to LR 63	LR 0000 to LR 6315	Used for 1:1 data link through the RS-232 port or through a Controller Link Unit.
Timer/Counter area (note 3)		512 bits	TIM/CNT 000 to TIM/CNT 511 (timer/counter numbers)		The same numbers are used for both timers and counters. When TIMH(15) is being used, timer numbers 000 to 015 can be interrupt-refreshed to ensure proper timing during long cycles.
DM area	Read/ write	3,072 words	DM 0000 to DM 3071	---	DM area data can be accessed in word units only. Word values are retained when the power is turned off.
		3,072 words	DM 3072 to DM 6143	---	Available in CQM1H-CPU51/61 CPU Units only.
	Read-only (note 4)	425 words	DM 6144 to DM 6568	---	Cannot be written from the program (only from a Programming Device). DM 6400 to DM 6409 (10 words): Controller Link parameters DM 6450 to DM 6499 (50 words): Routing tables DM 6550 to DM 6559 (10 words): Serial Communications Board settings
	Error history area (note 4)	31 words	DM 6569 to DM 6599	---	Used to store the time of occurrence and error code of errors that occur.
	PC Setup (note 4)	56 words	DM 6600 to DM 6655	---	Used to store various parameters that control PC operation.
EM area		6,144 words	EM 0000 to EM 6143	---	EM area data can be accessed in word units only. Word values are retained when the power is turned off. Available in the CQM1H-CPU61 CPU Unit only.

Note

1. IR and LR bits that are not used for their allocated functions can be used as work bits.
2. A minimum of 2,528 bits are available as work bits. Other bits can be used as work bits when they are not used for their allocated functions, so the total number of available work bits depends on the configuration of the PC.
3. When accessing a PV, TIM/CNT numbers are used as word address; when accessing Completion Flags, they are used as bit addresses.
4. DM 6144 to DM 6655 cannot be written from the program.

Other Memory Specifications

Item	Details
Memory Cassette (EEPROM or flash memory)	Mounted from the front of the CPU Unit. Memory Cassettes are used to store and read the user's program, DM (read-only DM and PC Setup), and expansion instruction information as one block. It is possible to set the CPU Unit so that when power is turned ON, data stored in the Memory Cassette (user's program, DM, expansion instruction information) is automatically sent to the CPU Unit (auto-boot). Two-way transfer and comparison of data between the CPU Unit and Memory Cassette are possible using AR area control bits.
Trace memory	1,024 words (trace comparison data: 12 points, 3 words)

Function Specifications

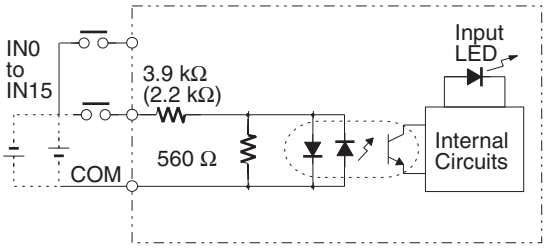
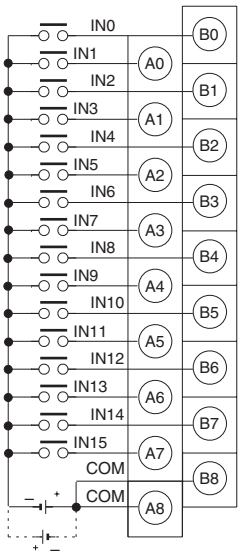
Item	Specification		
Macro instructions	Subroutines called by instructions containing arguments.		
Constant cycle time	1 to 9,999 ms (Unit: 1 ms)		
Cycle time monitoring	When the cycle time exceeds 100 ms, the Cycle Time Over Flag turns ON, and operation continues. (A setting can be made in the PC Setup so that this error is not generated.) When the cycle time exceeds the cycle monitor time, operation is stopped. Cycle monitor time settings: 0 to 990 ms in 10-ms units, 0 to 9,990 ms in 100-ms units, 0 to 99 s in 1-s units. **Note** The maximum and current values of the cycle time are stored in the AR area.		
I/O refreshing	Cyclic refreshing, refreshing by IORF(097), direct output refreshing (set in the PC Setup), interrupt input refreshing. (The inputs that are refreshed can be set separately for input interrupts, high-speed counter interrupts, and interval timer interrupts in the PC Setup.)		
I/O memory holding when changing operating modes	Depends on the ON/OFF status of the I/O Hold Bit (SR 25212).		
Load OFF	All outputs on Output Units can be turned OFF when the CPU Unit is operating in RUN, MONITOR, or PROGRAM mode. (Used for stopping output in emergencies, for debugging, etc.)		
User-customized DIP switch setting	A pin setting on the DIP switch on the front of the CPU Unit is stored in AR 0712. This setting can be used as an ON/OFF condition (e.g., to switch between trial operation and actual operation).		
Mode setting at power-up	Possible		
Debugging	Control set/reset, differential monitoring, data tracing (scheduled, each cycle, or when instruction is executed).		
Online editing	User programs can be overwritten in program-block units when the CPU Unit is in MONITOR mode. With the CX-Programmer, more than one program block can be edited at the same time.		
Program protection	Write-protection of user program, data memory (DM 6144 to DM 6655: read-only DM), and PC Setup (DM 6600 to DM 6655): Set using pin 1 on the DIP switch.		
Error check	User-defined errors (i.e., user can define fatal errors and non-fatal errors using the FAL(06) and FALS(07) instructions.) **Note** It is possible to stop operation using user-programmed instructions for fatal errors. User-defined error logs can be created in specific bits (logging) when using user-programmed instructions for non-fatal errors.		
Error log	Up to 10 errors (including user-defined errors) are stored in the error log. Information includes the error code, error details, and the time the error occurred.		
Serial communications ports	Built-in peripheral port: Programming Device (including Programming Console) connections, Host Links, no-protocol communications Built-in RS-232C port: Programming Device (excluding Programming Console) connections, Host Links, no-protocol communications, NT Links (1:1 mode), 1:1 Data LInks		
	RS-232C port and RS-422A/485 port on Serial Communications Board (sold separately): Programming Device (excluding Programming Console) connections, Host Links, no-protocol communications, NT Links (1:1 mode, 1:N mode), 1:1 Data LInks, protocol macros		
Serial Communications Modes	CPU Unit built-in ports		Serial Communications Board ports
	Built-in peripheral port	Built-in RS-232C port	

Item		Specification			
	Programming Console bus	Used for communications with Programming Consoles.	Yes (SW7: ON)	No	No
	Peripheral bus	Used for communications with Programming Devices such as CX-Programmer.	Yes (SW7: ON)	No	No
	Host Link (SYSMAC WAY)	Used to access the CPU Unit's I/O memory and programs using Host Link commands. Supports communications with Programming Devices and OMRON PTs. Communications can be initiated from the CQM1H in this mode.	Yes (SW7: ON)	Yes	Yes
	No-protocol	Used for sending or receiving up to 256 bytes of data using special instructions with no protocol or conversion.	Yes (SW7: ON)	Yes	Yes
	1:1 Data LInk	Used for 1:1 communications via a data link with another CQM1H or with a CQM1, CPM1, C200HX/HG/HE, or C200HS PC.	No	Yes	Yes
	NT Link (1:1 mode, 1:N mode)	Used for data exchange with OMRON PTs without program. One-to-one or one-to-many (PC:PT) connections supported. **Note** The 1:1 mode and 1:N mode are not compatible. Be sure to use the correct communications port at the PT.	No	Yes (1:1 mode only)	Yes (1:1 mode or 1:N mode)
	Protocol macro	Used to freely exchange data with general-purpose external devices with a serial port (e.g., RS-232C). **Note** This mode is supported only by a Serial Communications Board.	No	No	Yes
Clock		Some Memory Cassette are equipped with a clock. **Note** Used to store the time when errors occur.			
Input time constants		Used to set the ON (or OFF) response times for DC Input Units. Available settings: 1, 2, 4, 8, 16, 32, 64, 128 ms.			
Power OFF detection time		AC power supply: 10 to 25 ms, DC power supply: 5 to 25 ms			
Memory protection		Held Areas: Holding bits, contents of Data Memory and Extended Data Memory, and status of the counter Completion Flags and present values. **Note** If the I/O Hold Bit (SR 25212) is turned ON, and the PC Setup is set to maintain the I/O Hold Bit status when power to the PC is turned ON, the contents of the IR area and the LR area will be saved.			
Sending commands to a Host Link computer		Host Link command responses can be sent to a computer connected via the Host Link System using the TXD(—) (communications port output) instruction.			
Remote programming and monitoring		Host Link or peripheral bus communications via a CPU Unit's serial communications port can be used for remote programming and remote monitoring of the PC through a Controller Link System. (This function is, however, not supported for the serial communications ports on the Serial Communications Board.)			
Program check		Program checks are performed at the beginning of operation for items such as no END(01) instruction and instruction errors. CX-Programmer can also be used to check programs. (The level of program checking can be set.)			
Battery life		5 years at 25°C (Depends on the ambient temperature and power supply conditions. Minimum: 1 year.) Battery replacement must be performed within 5 minutes.			
Self-diagnostics		CPU errors (watchdog timer), I/O verification errors, I/O bus errors, memory errors, FALS system errors (FALS instruction execution or cycle monitor time over), FAL system errors (FAL instruction execution or PC Setup error etc.), battery errors, Cycle Time Over errors and communications port errors.			

Item	Specification
Other functions	Storage of number of times power has been interrupted. (Stored in AR area.)
Internal current consumption	CQM1H-CPU21/51/61: 5 V DC: 840 mA max. CQM1H-CPU11: 5 V DC: 820 mA max.
Dimensions	CQM1H-CPU11/21: 187 to 571 × 110 × 107 mm (W × H × D) CQM1H-CPU51/61: 187 to 603 × 110 × 107 mm (W × H × D)
Standard accessories	One connector for RS-232C port (Except CQM1H-CPU11). Socket: XM2A-0901; Hood: XM2S-0911-E. One CPM2A-BAT01 Battery Set (installed in CPU Unit at time of delivery)

2-2 Input Unit Specifications

2-2-1 CPU Unit's Built-in 24-V DC Inputs

Item	CQM1H-CPU11/21/51/61
Input Voltage	24 V DC $^{+10\%}/_{-15\%}$
Input Impedance	IN4 and IN5: 2.2 kΩ; other inputs: 3.9 kΩ
Input Current	IN4 and IN5: 10 mA typical; other inputs: 6 mA typical (at 24 V DC)
ON Voltage	17.4 V DC min.
OFF Voltage	5.0 V DC max.
ON Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup; see note)
OFF Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup; see note)
No. of Inputs	16 points (16 inputs/common, 1 circuit)
Circuit Configuration	 **Note** Figures in parentheses are for IN4 and IN5. The input power supply polarity may be connected in either direction.
Terminal Connections	

IR 00000 to IR 00015 are always allocated to the CPU Unit's 16 built-in input points.

- Inputs IN0 to IN 3 (corresponding to IR 00000 to IR 00003) can be set in the PC Setup to be used as input interrupts.
- Inputs IN4 to IN7 (corresponding to IR 00004 to 00007) can be used as high-speed counter 0.

Terminal	Input number	Input bit	Function
B0	IN0	IR 00000	Normal inputs or input interrupts (Input Interrupt Mode or Counter Mode): set in PC Setup (DM 6628).
A0	IN1	IR 00001	
B1	IN2	IR 00002	
A1	IN3	IR 00003	
B2	IN4	IR 00004	Normal inputs or high-speed counter 0: set in PC Setup (DM 6642).
A2	IN5	IR 00005	
B3	IN6	IR 00006	
A3	IN7	IR 00007	Only usable as normal inputs.
to	to	to	
B7	IN14	IR 00014	
A7	IN15	IR 00015	

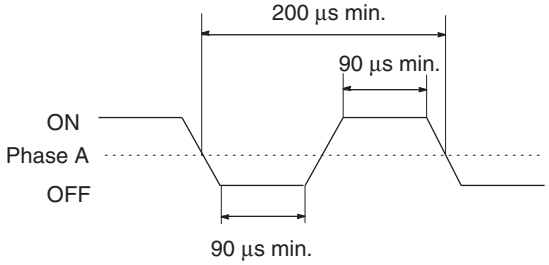
Note If IN0 through IN3 are set for use as input interrupts in the PC Setup, the ON and OFF delays for input interrupts are fixed at 0.1 ms max. and 0.5 ms max., respectively. If IN4 through IN6 are set for use as high-speed counter interrupts, the delays for high-speed counters are as shown in the following table.

Input	Incrementing mode	Differential phase mode
IN4 (A)	5 kHz	2.5 kHz
IN5 (B)	Normal input	
IN6 (Z)	ON: 100 μs min. required; OFF delay: 500 μs min. required	

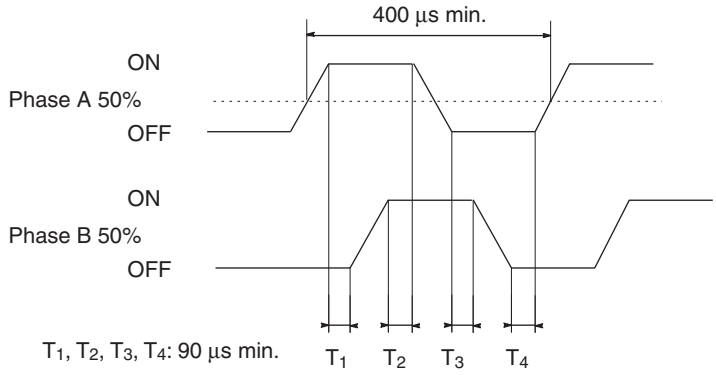
The minimum response pulses will be as follows:

Input A (IN4), Input B (IN5)

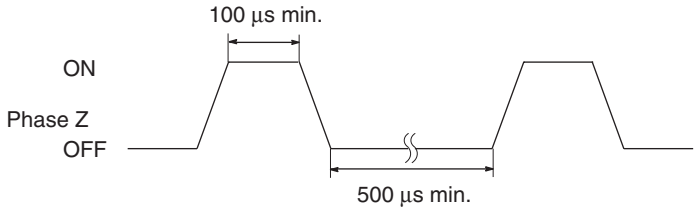
Incrementing Mode (5 kHz max.)



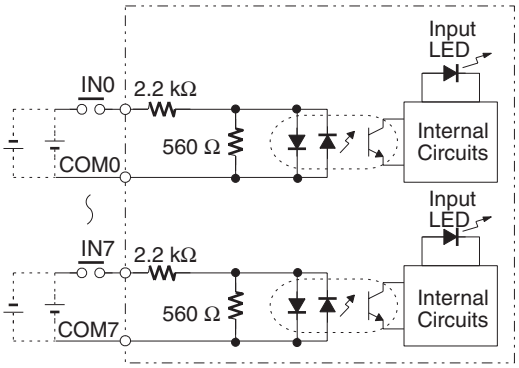
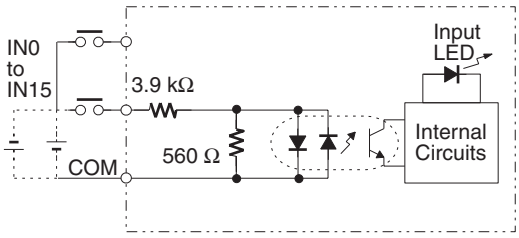
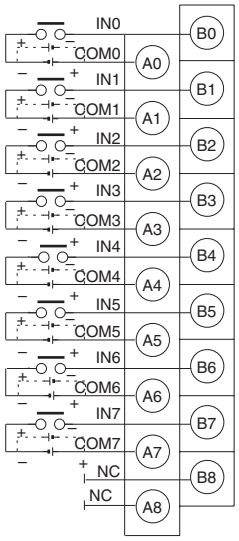
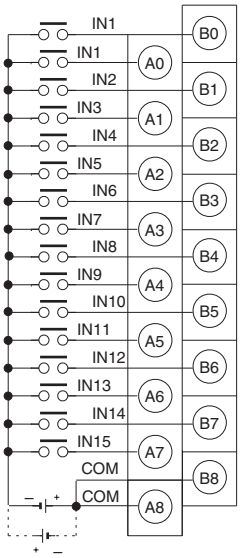
Differential Phase Mode (2.5 kHz max.)

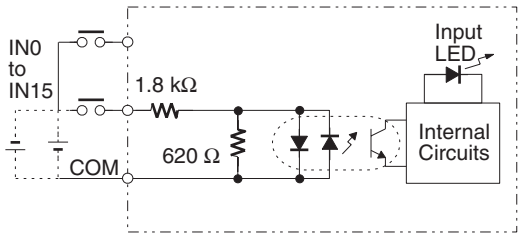
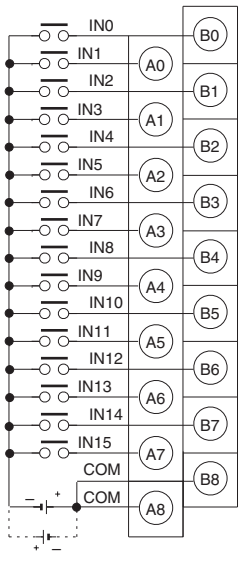


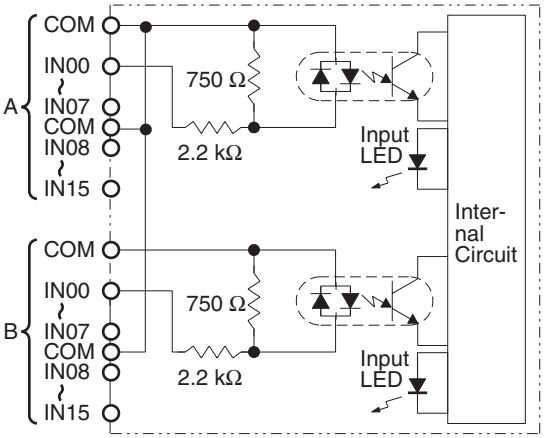
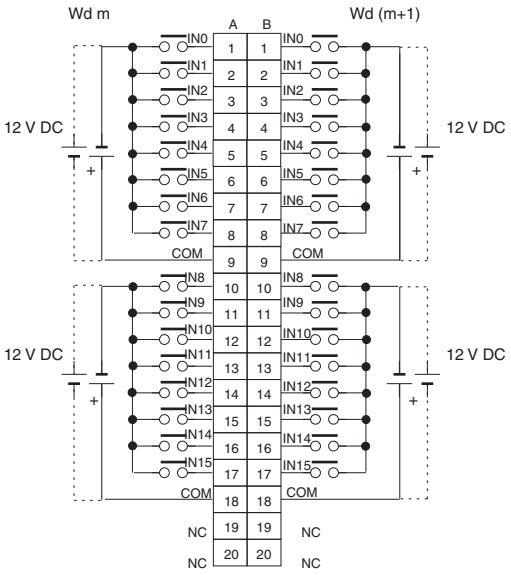
Input Z (IN6)

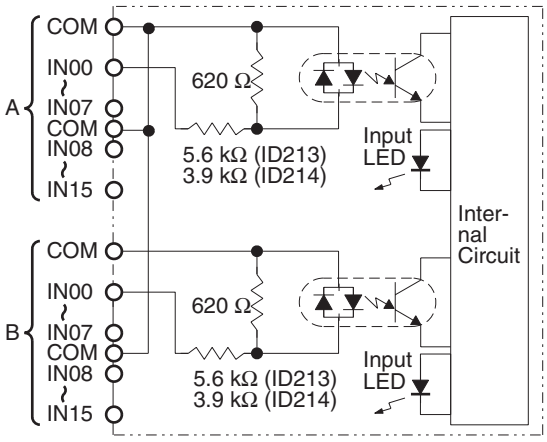


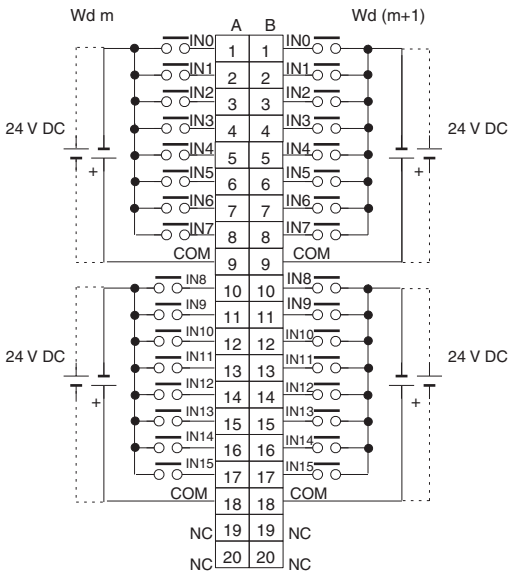
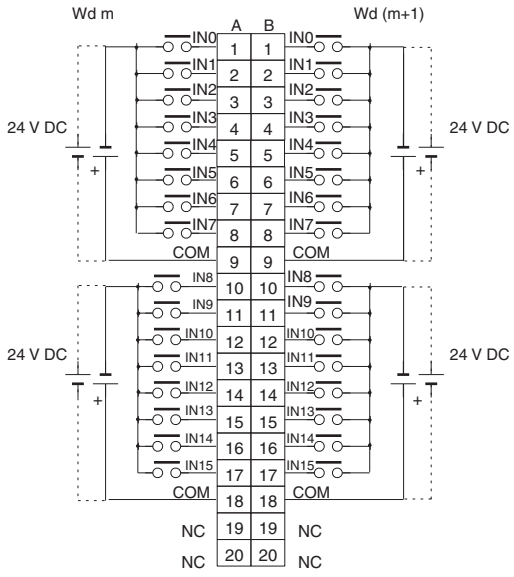
2-2-2 DC Input Units

Item	CQM1-ID211	CQM1-ID212
Name	**12 to 24-V DC 8-point Input Unit**	**24-V DC 16-point Input Unit**
Input Voltage	12 to 24 V DC $^{+10\%}/_{-15\%}$	24 V DC $^{+10\%}/_{-15\%}$
Input Impedance	2.4 kΩ	3.9 kΩ
Input Current	10 mA typical (at 24 V DC)	6 mA typical (at 24 V DC)
ON Voltage	10.2 V DC min.	14.4 V DC min.
OFF Voltage	3.0 V DC max.	5.0 V DC max.
ON Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup, see note)	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup, see note)
OFF Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup, see note)	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup, see note)
No. of Inputs	8 points (independent commons)	16 points (16 points/common, 1 circuit)
Internal Current Consumption	50 mA max. at 5 V DC	85 mA max. at 5 V DC
Weight	180 grams max.	180 grams max.
Circuit Configuration	 **Note** The input power supply polarity may be connected in either direction.	 **Note** The input power supply polarity may be connected in either direction.
Terminal Connections		

Item	CQM1-ID111
Name	**12-V DC 16-point Input Unit**
Input Voltage	12 V DC $^{+10\%}/_{-15\%}$
Input Impedance	1.8 kΩ
Input Current	6 mA typical (at 24 V DC)
ON Voltage	8.0 V DC min.
OFF Voltage	3.0 V DC max.
ON Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup, see note)
OFF Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup, see note)
No. of Inputs	16 points (16 points/common, 1 circuit)
Internal Current Consumption	85 mA max. at 5 V DC
Weight	180 grams max.
Circuit Configuration	 **Note** The input power supply polarity may be connected in either direction.
Terminal Connections	

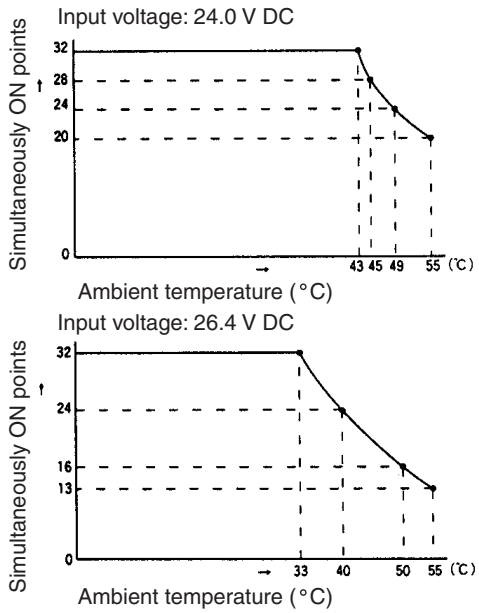
Item	CQM1-ID112
Name	**12-V DC 32-point Input Unit**
Input Voltage	12 V DC $^{+10\%}/_{-15\%}$
Input Impedance	2.2 kΩ
Input Current	4 mA typical (at 12 V DC)
ON Voltage	8.0 V DC min.
OFF Voltage	3.0 V DC max.
ON Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup)
OFF Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup)
No. of Inputs	32 points (32 inputs/common, 1 circuit)
Internal current consumption	5 V DC, 170 mA max.
Weight	160 g max.
Circuit Configuration	
Terminal Connections	 The polarity of the input power supply can be either plus or minus. The polarity of all the commons, however, must match. The COM terminals are internally connected, but they all must be wired.

Item	CQM1-ID213	CQM1-ID214
Name	**24-V DC 32-point Input Unit**	**24-V DC 32-point Input Unit**
Input Voltage	24 V DC $^{+10\%}/_{-15\%}$	24 V DC $^{+10\%}/_{-15\%}$
Input Impedance	5.6 kΩ	3.9 kΩ
Input Current	4 mA typical (at 24 V DC)	6 mA typical (at 24 V DC)
ON Voltage/ Current	14.4 V DC min.	15.4 V DC/3.5 mA min.
OFF Voltage/ Current	5.0 V DC max.	5.0 V DC/1 mA max.
ON Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup)	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup)
OFF Delay	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup)	Default: 8 ms max. (can be set between 1 and 128 ms in PC Setup)
No. of Inputs	32 points (32 inputs/common, 1 circuit)	32 points (32 inputs/common, 1 circuit) Number of simultaneously ON inputs is limited by ambient temperature. See diagrams after table.
Internal Current Consumption	5 V DC, 170 mA max.	5 V DC, 170 mA max.
Weight	160 g max.	160 g max.
Circuit Configuration		

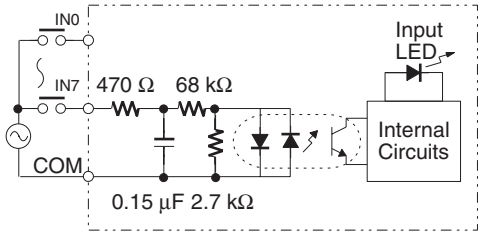
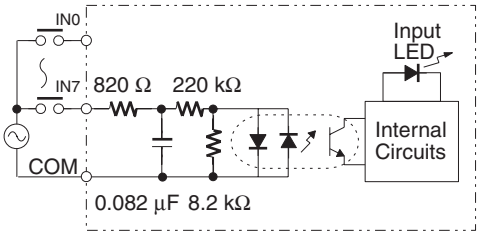
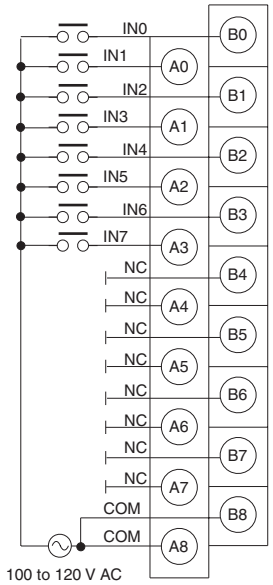
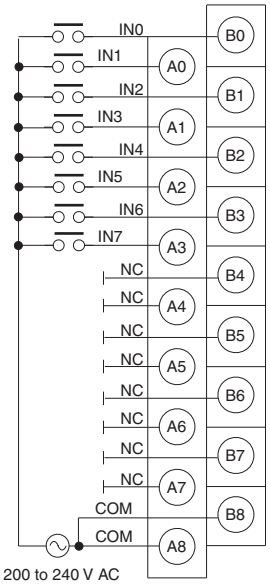
Item	CQM1-ID213	CQM1-ID214
Terminal Connections	 The polarity of the input power supply can be either plus or minus. The polarity of all the commons, however, must be the same. The COM terminals are internally connected, but they all must be wired.	 The polarity of the input power supply can be either plus or minus. The polarity of all the commons, however, must be the same. The COM terminals are internally connected, but they all must be wired.

Number of Simultaneously ON Inputs for CQM1-ID214

Ambient Temperature for Simultaneously ON Points

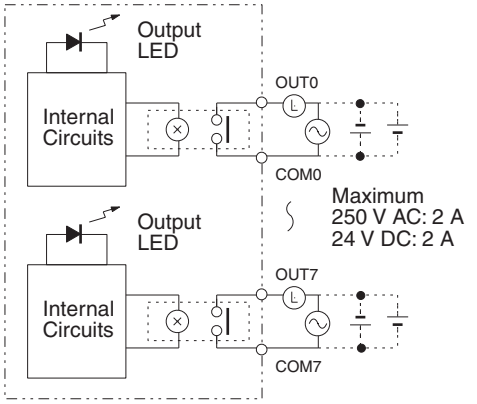
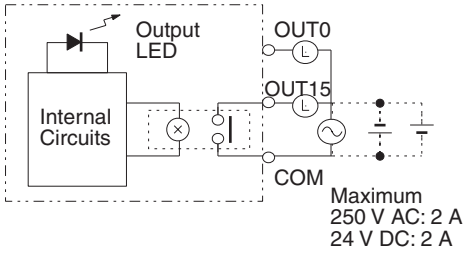
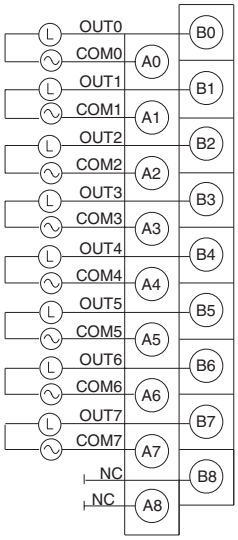
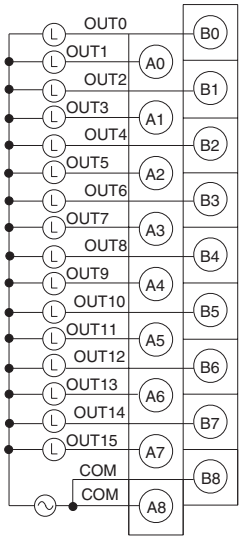


2-2-3 AC Input Units

Item	CQM1-IA121	CQM1-IA221
Name	**100 to 120-V AC 8-point Input Unit**	**200 to 240-V AC 8-point Input Unit**
Input Voltage	100 to 120 V AC $^{+10\%}/_{-15\%}$, 50/60 Hz	200 to 240 V AC $^{+10\%}/_{-15\%}$, 50/60 Hz
Input Impedance	20 kΩ (50 Hz), 17 kΩ (60 Hz)	38 kΩ (50 Hz), 32 kΩ (60 Hz)
Input Current	5 mA typical (at 100 V AC)	6 mA typical (at 200 V AC)
ON Voltage	60 V AC min.	150 V AC min.
OFF Voltage	20 V AC max.	40 V AC max.
ON Delay	35 ms max.	35 ms max.
OFF Delay	55 ms max.	55 ms max.
No. of Inputs	8 points (8 points/common, 1 circuit)	8 points (8 points/common, 1 circuit)
Internal Current Consumption	50 mA max. at 5 V DC	50 mA max. at 5 V DC
Weight	210 grams max.	210 grams max.
Circuit Configuration	 The polarity of the input power supply can be either plus or minus. The polarity of all the commons, however, must be the same.	 The polarity of the input power supply can be either plus or minus. The polarity of all the commons, however, must be the same.
Terminal Connections		

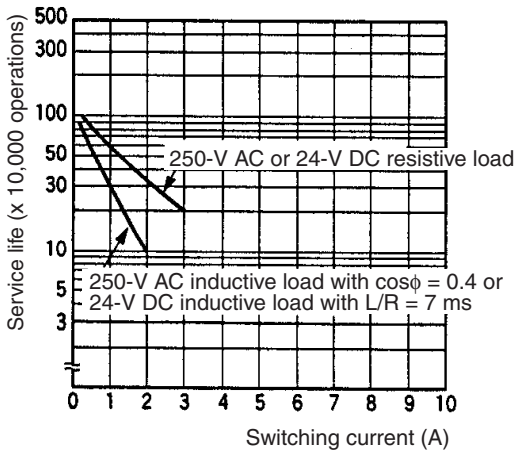
2-3 Output Unit Specifications

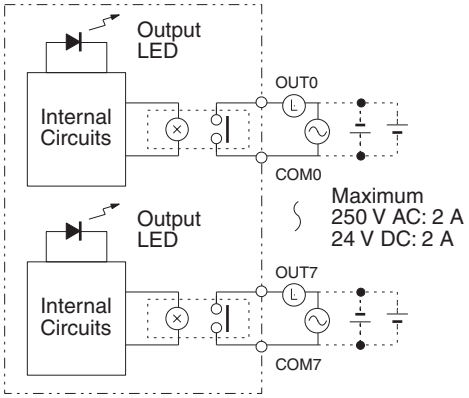
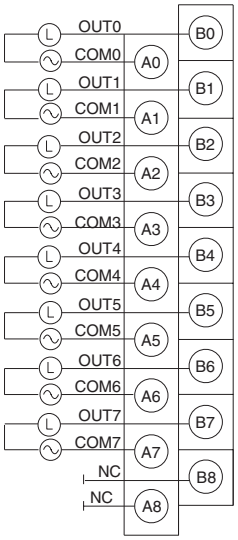
2-3-1 Contact Output Units

Item	CQM1-OC221	CQM1-OC222
Name	**8-point Contact Output Unit**	**16-point Contact Output Unit**
Max. Switching Capacity	2 A, 250 V AC (cosϕ= 1) 2 A, 250 V AC (cosϕ= 0.4) 2 A, 24 V DC (16 A/Unit)	2 A, 250 V AC (cosϕ= 1) 2 A, 250 V AC (cosϕ= 0.4) 2 A, 24 V DC (8 A/Unit)
Min. Switching Capacity	10 mA, 5 V DC	10 mA, 5 V DC
Relay	G6D-1A	G6D-1A
Service Life of Relay	Electrical: 300,000 operations (resistive load) 100,000 operations (inductive load) Mechanical: 20,000,000 operations (See note.)	Electrical: 300,000 operations (resistive load) 100,000 operations (inductive load) Mechanical: 20,000,000 operations (See note.)
ON Delay	10 ms max.	10 ms max.
OFF Delay	5 ms max.	5 ms max.
No. of Outputs	8 points (independent commons)	16 points (16 points/common, 1 circuit))
Internal Current Consumption	430 mA max. at 5 V DC	850 mA max. at 5 V DC
Weight	200 grams max.	230 grams max.
Circuit Configuration		
Terminal Connections		

Note The values for relay service life in the above table represent the minimum values. The following chart gives reference values for the actual service life.

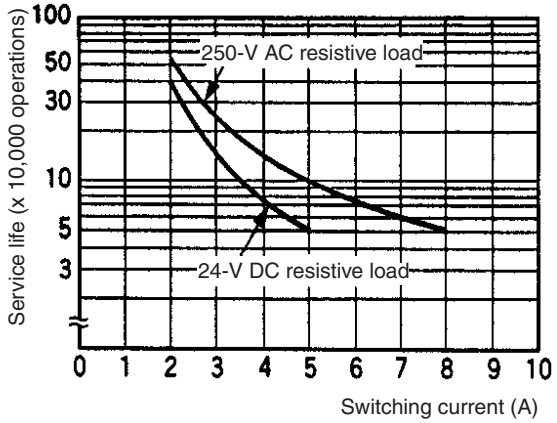
Relay Service Life for CQM1-OC221/222



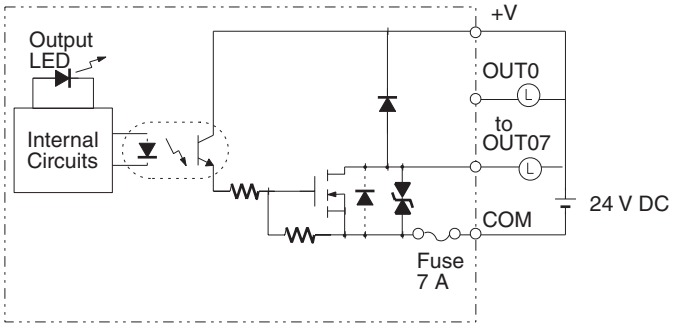
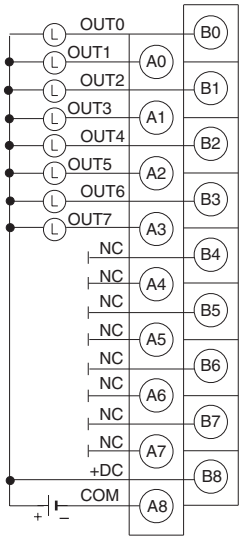
Item	CQM1-OC224
Name	**8-point Contact Output Unit**
Max. Switching Capacity	2 A, 250 V AC (cosϕ= 1) 2 A, 250 V AC (cosϕ= 0.4) 2 A, 24 V DC (16 A/Unit)
Min. Switching Capacity	10 mA, 5 V DC
Relay	G6R-1A or G6RN-1A
Service Life of Relay	Electrical: 300,000 operations Mechanical: 10,000,000 operations (See note.)
ON Delay	15 ms max.
OFF Delay	5 ms max.
No. of Outputs	8 points (independent commons)
Internal Current Consumption	440 mA max. at 5 V DC
Weight	270 grams max.
Circuit Configuration	
Terminal Connections	

Note The values for relay service life in the above table represent the minimum values. The following chart gives reference values for the actual service life.

Relay Service Life for CQM1-OC224

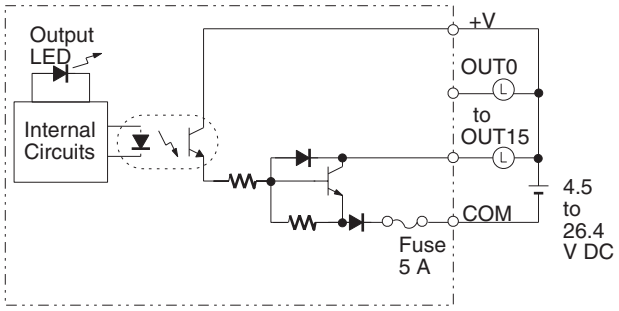
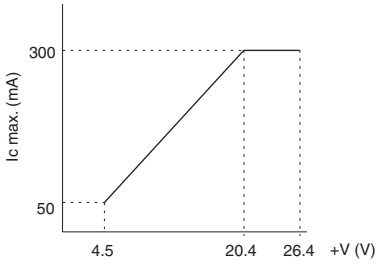
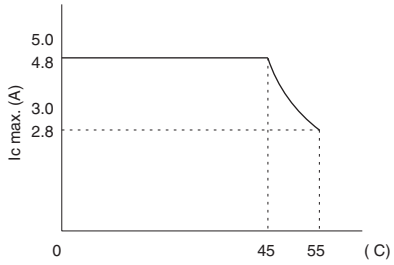
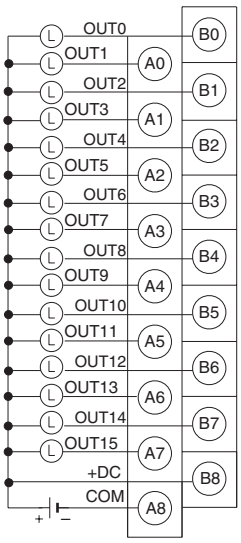


2-3-2 Transistor Output Units

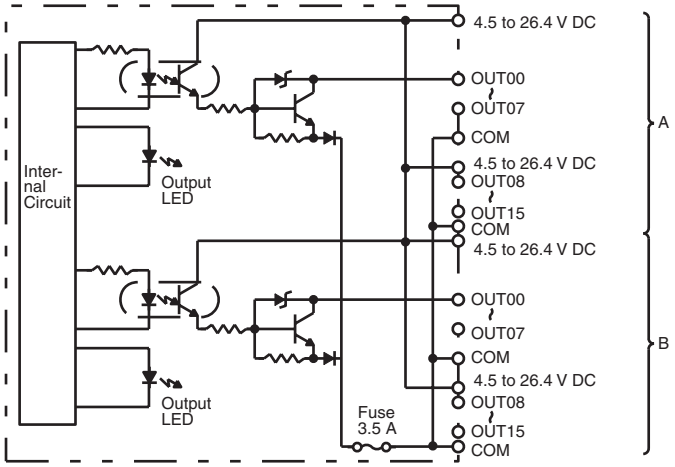
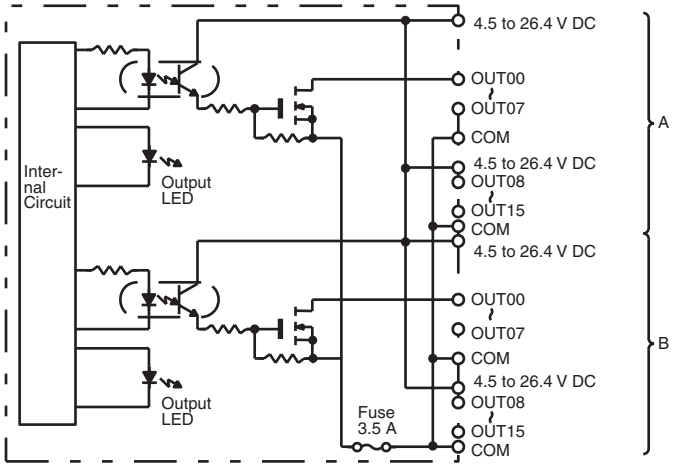
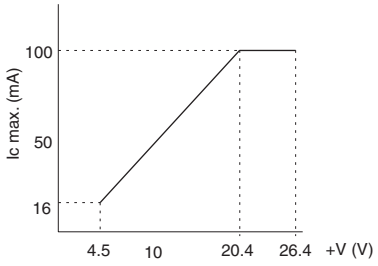
Item	CQM1-OD211
Name	**8-point Transistor Output Unit**
Max. Switching Capacity	2 A at 24 V DC $^{+10\%}/_{-15\%}$ 5 A/Unit
Leakage Current	0.1 mA max.
Residual Voltage	0.7 V max.
ON Delay	0.1 ms max.
OFF Delay	0.3 ms max.
No. of Outputs	8 points (8 points/common, 1 circuit)
Internal Current Consumption	90 mA max. at 5 V DC max.
Fuse	7 A (one per common), one used Fuse is not user replaceable.
Service Power Supply	15 mA min. at 24 V DC $^{+10\%}/_{-15\%}$ (1.9 mA × number of ON points)
Weight	200 grams max.
Circuit Configuration	
Terminal Connections	

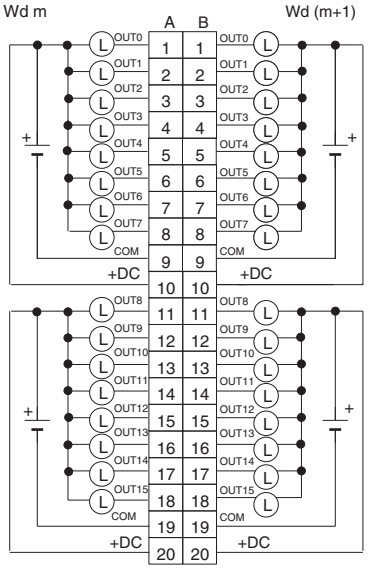
Note

1. Do not reverse the polarity of the load power supply. If the load power supply is connected in correctly, the loads may not op erate correctly.
2. Do not reverse the connections for +DC and the common. If +DC and the common are connected incorrectly, internal circuits may be damaged.

Item	CQM1-OD212
Name	**16-point Transistor Output Unit**
Max. Switching Capacity	50 mA at 4.5 V DC to 300 mA at 26.4 V (see diagram below)
Leakage Current	0.1 mA max.
Residual Voltage	0.8 V max.
ON Delay	0.1 ms max.
OFF Delay	0.4 ms max.
No. of Outputs	16 points (16 points/common, 1 circuit)
Internal Current Consumption	170 mA max. at 5 V DC
Fuse	5 A (one per common), one used Fuse is not user replaceable.
Service Power Supply	40 mA min. at 5 to 24 V DC ±10% (2.5 mA × number of ON points)
Weight	180 grams max.
Circuit Configuration	 **Max. Switch Capacity (per Point)**  **Max. Switch Capacity (Total for Unit)** 
Terminal Connections	

Item	CQM1-OD213
Name	**32-point Transistor Output Unit**
Max. Switching Capacity	16 mA at 4.5 V DC to 100 mA at 26.4 V (see diagram below)
Leakage Current	0.1 mA max.
Residual Voltage	0.8 V max.
ON Delay	0.1 ms max.
OFF Delay	0.4 ms max.
No. of Outputs	32 points (32 points/common, 1 circuit)
Internal Current Consumption	240 mA max. at 5 V DC
Fuse	3.5 A (one per common), one used Fuse is not user replaceable.
Service Power Supply	110 mA min. at 5 to 24 V DC ±10% (3.4 mA × number of ON points)
Weight	180 grams max.

Item	CQM1-OD213
Circuit Configuration	Units manufactured on or before December 28th, 1999 (manufacturing numbers 28Z9 or earlier)  Units manufactured on or after January 5th, 2000 (manufacturing numbers 0510 or later)  **Max. Switch Capacity (per Point)** 

Item	CQM1-OD213
Terminal Connections	 4.5 to 26.4 V DC **Note** Do not reverse the polarity of the load power supply. If the load power supply is connected incorrectly, the loads may not operate correctly. The COM terminals are internally connected, but they all must be wired.

Details of Changes

Output elements have been changed from NPN transistors to field-effect transistors (FET). Part of the circuit configuration has been changed. There are no changes in performance characteristics as a result of these improvements.

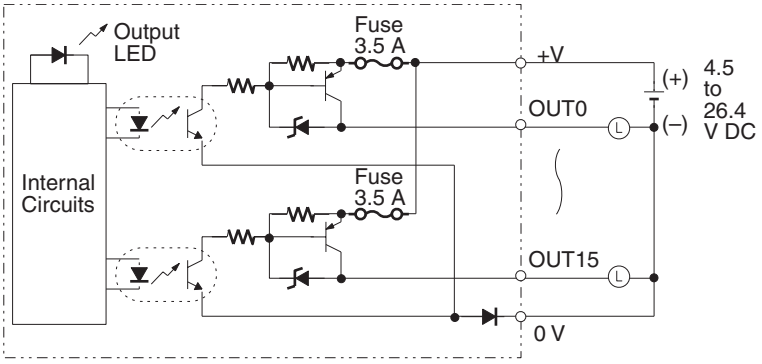
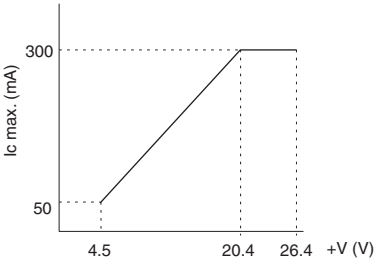
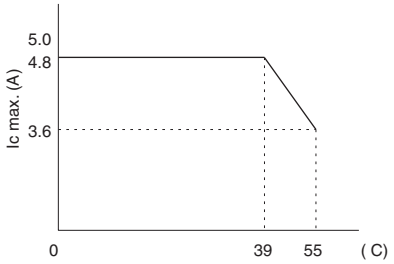
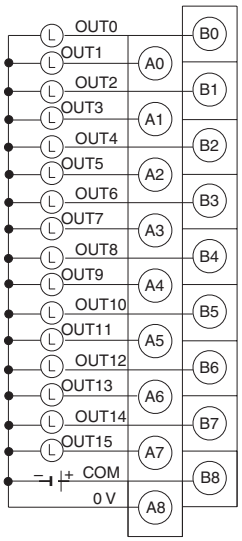
Manufacturing Numbers

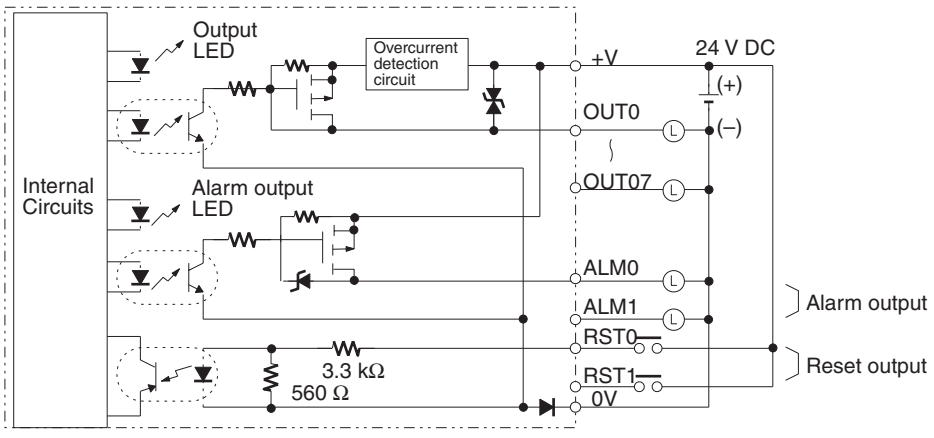
□□Z9

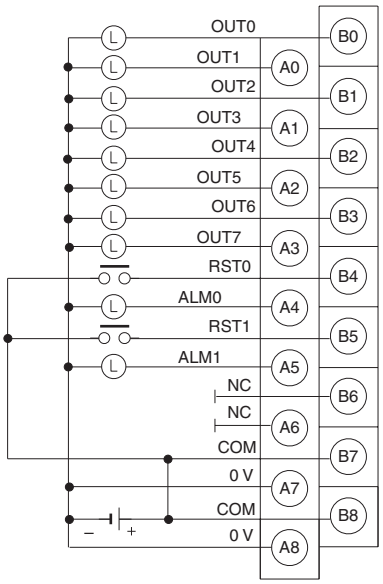
Year: Last digit of calendar year; e.g., 1999→9, 2000→0

Month: 1 to 9 (January to September), X (October), Y (November), Z (December)

Day: 01 to 31

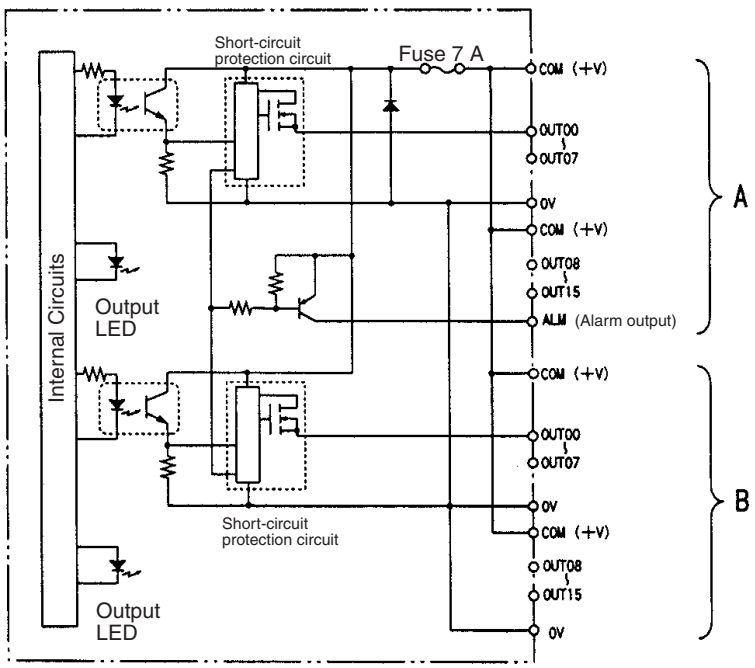
Item	CQM1-OD214
Name	**16-point PNP Transistor Output Unit**
Max. Switching Capacity	50 mA at 4.5 V DC to 300 mA at 26.4 V (see diagram below)
Leakage Current	0.1 mA max.
Residual Voltage	0.8 V max.
ON Delay	0.1 ms max.
OFF Delay	0.4 ms max.
No. of Outputs	16 points (16 points/common, 1 circuit)
Internal Current Consumption	170 mA max. at 5 V DC
Fuse	3.5 A (one per common), two used. Fuse is not user replaceable.
Service Power Supply	60 mA min. at 5 to 24 V DC ±10% (3.5 mA × number of ON points)
Weight	210 grams max.
Circuit Configuration	 **Max. Switch Capacity (per Point)**  **Max. Switch Capacity (Total for Unit)** 
Terminal Connections	

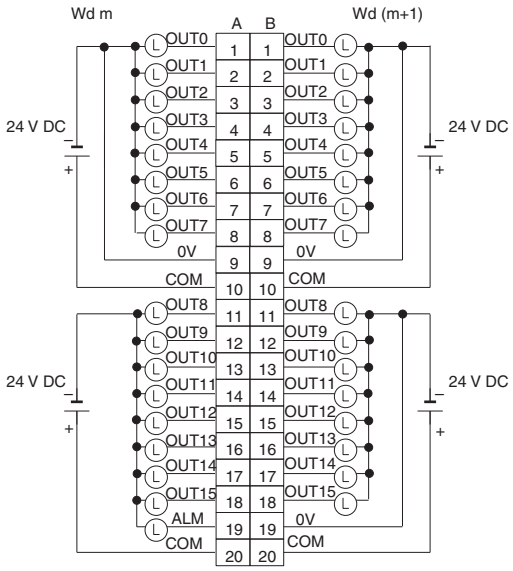
Item	CQM1-OD215	
Name	**8-point PNP Transistor Output Unit**	
Max. Switching Capacity	1.0 A at 24 V DC $^{+10\%}/_{-15\%}$ 4 A/Unit	
Leakage Current	0.1 mA max.	
Residual Voltage	1.2 V max.	
ON Delay	0.2 ms max.	
OFF Delay	0.8 ms max.	
No. of Outputs	8 points (8 points/common, 1 circuit)	
Internal Current Consumption	110 mA max. at 5 V DC max.	
Service Power Supply	24 mA min. at 24 V DC $^{+10\%}/_{-15\%}$ (3 mA × number of ON points)	
Weight	240 grams max.	
Alarm Output	No. of outputs	2 outputs ALM0: Alarm output OUT 0 to 3 ALM1: Alarm output OUT 4 to 7
	Output specifications	Max. switching capacity: 100 mA at 24 V DC $^{+10\%}/_{-15\%}$ Leakage current: 0.1 mA max. Residual voltage: 0.7 V max.
Reset Input	No. of inputs	2 inputs RST0: Reset input OUT 0 to 3 RST1: Reset input OUT 4 to 7
	Input specifications	Input voltage: 24 V DC $^{+10\%}/_{-15\%}$ Input current: 7 mA, typical (24 V DC) ON voltage: 16.0 V DC min. OFF voltage: 5.0 V DC max.
Short-circuit Protection (see note)	Detection current: 2 A (minimum value), 1.6 A (typical)	
Circuit Configuration		

Item	CQM1-OD215
Terminal Connections	 **Note** Do not reverse the polarity of the load power supply. If the load power supply is connected incorrectly, the loads may not operate correctly.

Note If the output current of any output exceeds the detection current, the outputs will be turned OFF at the four points (OUT0 to 3 or OUT4 to 7) which include that output. At the same time, the alarm output (ALM0 or ALM 1) will turn ON and the alarm indicator will light.

If an alarm output turns ON, first eliminate the problem that caused the detection current to be exceeded. Then turn from ON to OFF the reset input (RST0 or RST1) on the side where the alarm output turned ON. The alarm output indicator will then turn off, the alarm output will return to OFF, and the contact's output will be restored.

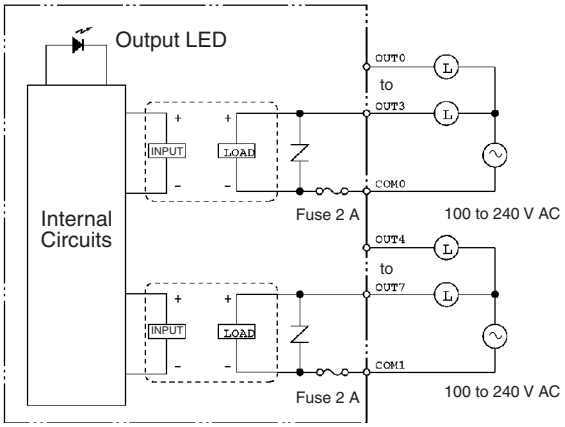
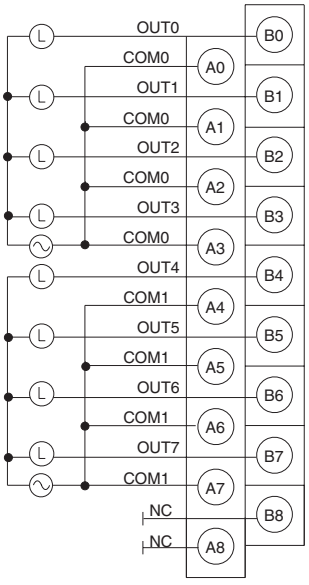
Item	CQM1-OD216	
Name	**32-point PNP Transistor Output Unit**	
Max. Switching Capacity	0.5 A at 24 V DC $^{+10\%}/_{-15\%}$ 5 A/Unit	
Leakage Current	0.1 mA max.	
Residual Voltage	0.8 V max.	
ON Delay	0.1 ms max.	
OFF Delay	0.3 ms max.	
No. of Outputs	32 points (32 points/common, 1 circuit)	
Internal Current Consumption	240 mA max. at 5 V DC max.	
Fuse	7 A (one per common), one used Fuse is not user replaceable.	
Service Power Supply	160 mA min. at 24 V DC $^{+10\%}/_{-15\%}$ (5 mA × number of ON points)	
Weight	210 grams max.	
Alarm Output	No. of outputs	1 output (PNP): Turns ON when output short-circuit or overcurrent is detected.
	Output specifications	Max. switching capacity: 50 mA at 24 V DC $^{+10\%}/_{-15\%}$ Leakage current: 0.1 mA max. Residual voltage: 0.8 V max.
Short-circuit Protection (see note)	Detection current: 0.7 to 2.5 A (Operation restored automatically after error cleared.)	
Circuit Configuration		

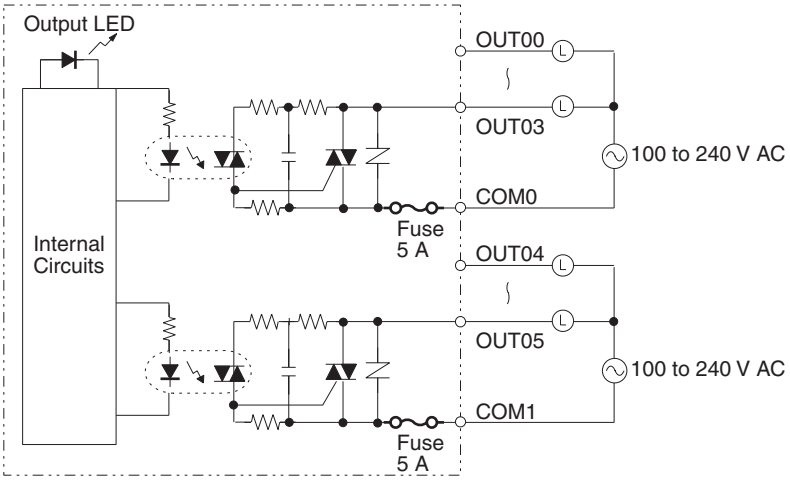
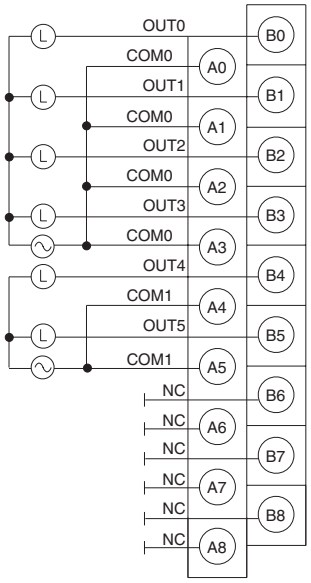
Item	CQM1-OD216
Terminal Connections	 The COM terminals and 0-V outputs are internally connected, but they all must be wired. **Note** Do not reverse the polarity of the load power supply. If the load power supply is connected incorrectly, the loads may not operate correctly.

Note If the output current of any output exceeds the detection current, the output will be turned OFF. At the same time, the alarm output (ALM) will turn ON (Low).

If an alarm output turns ON, eliminate the problem that caused the detection current to be exceeded. The internal temperature of the element will drop and the alarm will automatically be cleared.

2-3-3 Triac Output Units

Item	CQM1-OA221
Name	**8-point Triac Output Unit**
Max. Switching Capacity	0.4 A at 100 to 240 V AC
Leakage Current	1 mA max. at 100 V AC and 2 mA max. at 200 V AC
Residual Voltage	1.5 V max. (0.4 A)
ON Delay	6 ms max.
OFF Delay	1/2 cycle + 5 ms max.
No. of Outputs	8 points (4 points/common, 2 circuits)
Internal Current Consumption	110 mA max. at 5 V DC
Fuse	2 A (one per common), two used. Fuse is not user replaceable.
Weight	240 grams max.
Circuit Configuration	
Terminal Connections	 COM0 and COM1 are not connected internally.

Item	CQM1-OA222
Name	**6-point Triac Output Unit**
Max. Switching Capacity	0.4 A at 100 to 240 V AC (50/60 Hz)
Min. Switching Capacity	100 mA at 10 V AC 50 mA at 24 V AC 10 mA at 100 V AC 10 mA at 240 V AC
Leakage Current	1 mA max. at 100 V AC and 2 mA max. at 200 V AC
Residual Voltage	1.5 V max. (0.4 A)
ON Delay	1 ms max.
OFF Delay	Load frequency of 1/2 cycle + 1 ms max.
No. of Outputs	6 points (4 points/common, 1 circuit; 2 points/common, 1 circuit)
Inrush current	6 A at 100 ms 15 A at 10 ms
Internal Current Consumption	250 mA max. at 5 V DC
Fuse	5 A at 250 V (one per common), two used. Fuse is not user replaceable.
Weight	240 grams max.
Circuit Configuration	
Terminal Connections	 COM0 and COM1 are not connected internally.

SECTION 3
Units

This section provides details on functions and nomenclature for the Units that make up the CQM1H and provides information on Programming Devices and communications specifications.

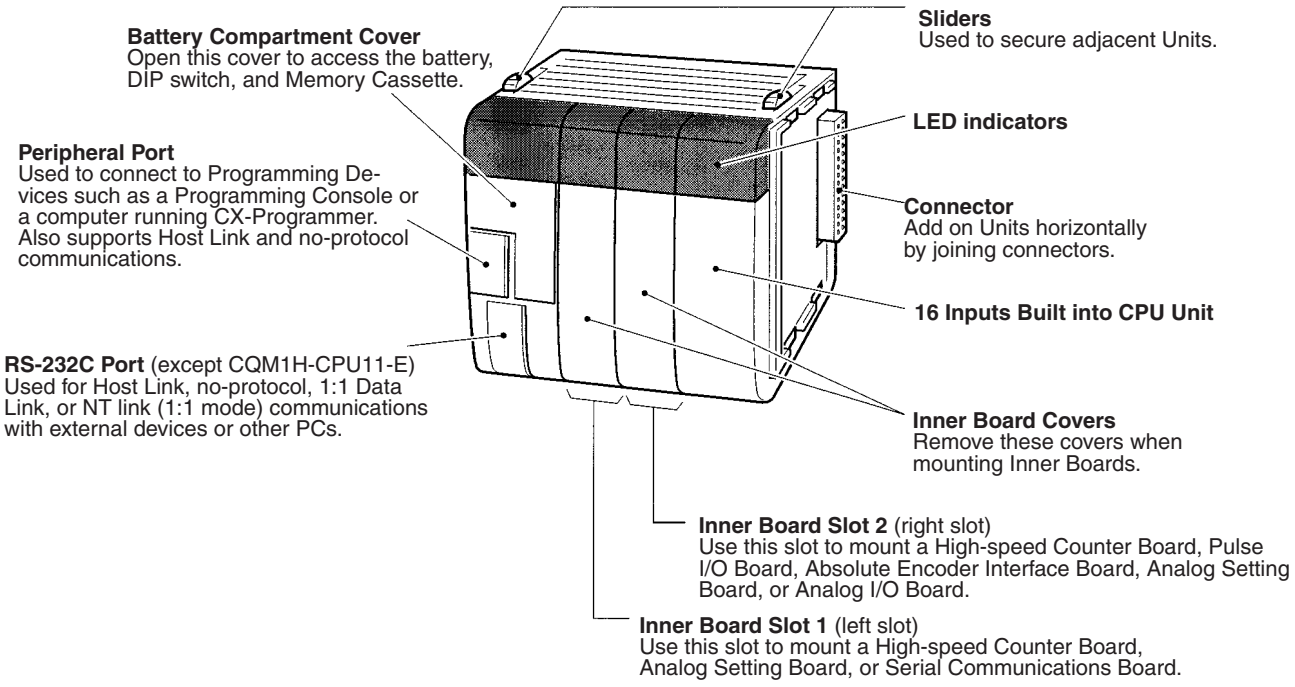
3-1 CPU Units

There are four different CPU Units. These are listed in the following table. The four models can be thought of in two groups: Those which support Inner Boards and a Communications Unit, and those that do not. There are also differences between the CPU Units in program capacity, I/O capacity, the availability of EM, and the availability of a built-in RS-232C port.

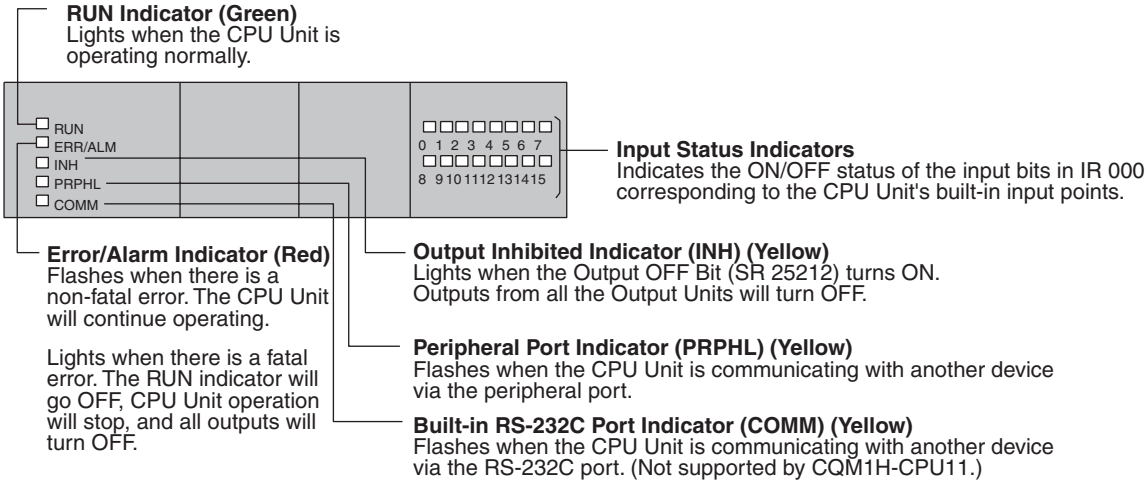
Model number	I/O capacity (points, see note)	Program capacity (Kwords)	CPU Unit built-in input points	DM capacity (Kwords)	EM capacity (Kwords)	Built-in serial communications ports		Inner Boards	Communications Unit
						Peripheral port	RS-232C port		
CQM1H-CPU61	512	15.2	DC: 16	6	6	YES	YES	Supported	Supported
CQM1H-CPU51		7.2		6	None				
CQM1H-CPU21	256	3.2		3				Not supported	Not supported
CQM1H-CPU11							No		

Note I/O capacity = No. of input points (≤ 256) + No. of output points (≤ 256).

CPU Unit Components



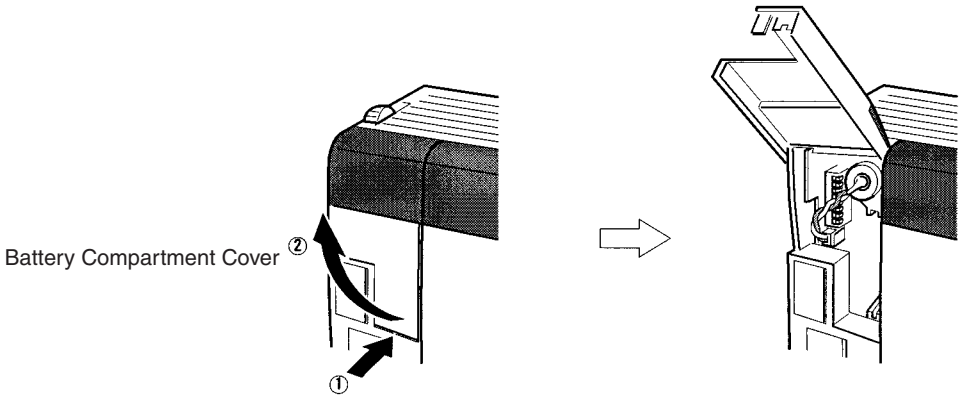
3-1-1 Indicators

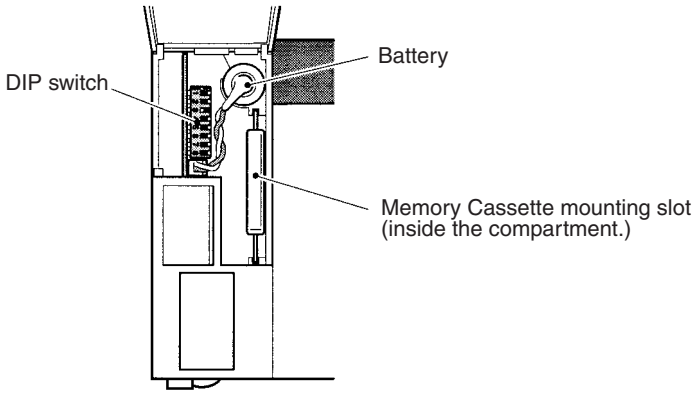


Indicator	Color	Status	Meaning
RUN	Green	Lit	PC is operating normally in MONITOR or RUN mode.
		Not lit	PC has stopped operating while in PROGRAM mode, or has stopped operating due to a fatal error.
ERR/ALM	Red	Lit	A fatal error has occurred. The CPU Unit will stop operating, and the outputs from all Output Units will turn OFF.
		Flash	A non-fatal error has occurred. The CPU Unit will continue operating.
		Not lit	CPU Unit is operating normally or a watchdog timer error has occurred.
INH	Yellow	Lit	Output OFF Bit (SR 25212) has been turned ON. The outputs from all Output Units will turn OFF.
		Not lit	Output OFF Bit (SR 25212) is OFF.
PRPHL	Yellow	Lit	CPU Unit is sending or receiving via the peripheral port.
		Not lit	CPU Unit is not communicating via the peripheral port.
COMM	Yellow	Lit	CPU Unit is sending or receiving via the built-in RS-232C port.
		Not lit	CPU Unit is not communicating via the built-in RS-232C port.

3-1-2 Battery Compartment Cover

To open the battery compartment cover, insert your fingertip or a small screwdriver in the gap at the bottom of the cover and open upwards.





3-1-3 Battery

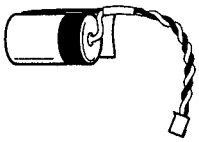
The CPU Unit has an internal battery. The following data is backed up using the battery.

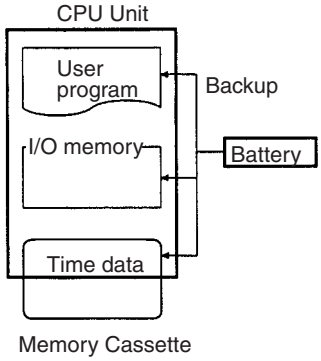
- I/O memory (including PC Setup)
- User program
- Clock data (when a Memory Cassette with a clock is mounted)

The battery life at an ambient temperature of 25°C is 5 years. When the battery expires, the ERR/ALM indicator on the front of the CPU Unit will light. Replace with a new battery within one week.

Replacement Battery Set

Model number: CPM2A-BAT01





Note Do not remove the battery except when replacing it. If the battery is not replaced within 5 minutes after removal, internal data may be lost. For details on the replacement method, refer to *9-1 Battery Replacement.*

3-1-4 DIP Switch

The DIP switch is used to set the following: Memory write protection, auto-transfer of data from Memory Cassette, the Programming Console display language, the expansion instruction setting, communications settings, a user-determined setting, and the device connected to peripheral port.

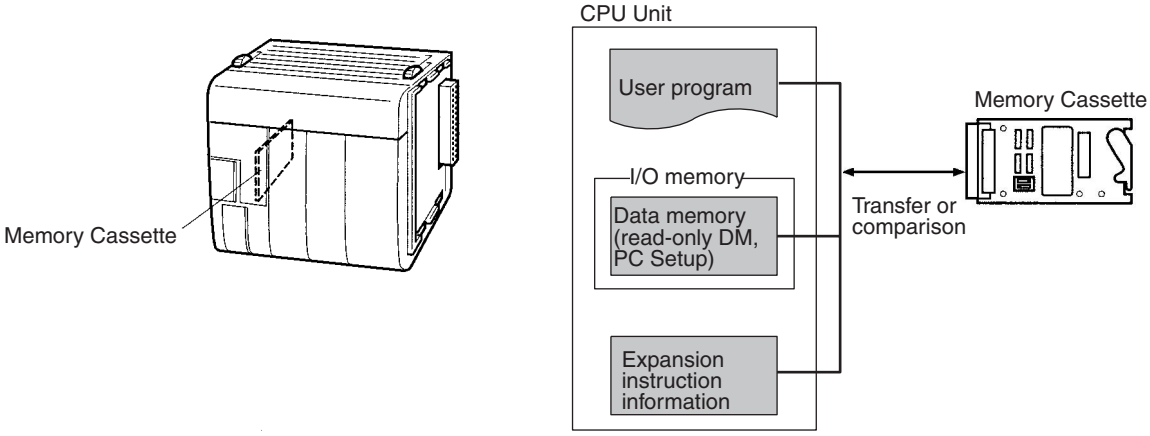
Refer to *6-1 DIP Switch Settings*.

3-1-5 Memory Cassettes

A Memory Cassette can be mounted in the CPU Unit to transfer or compare the following data between the CPU Unit and the Memory Cassette.

- User program
- Data memory
  (Read-only DM: DM 6144 to DM 6568; PC Setup: DM 6600 to DM 6655)
- Expansion instruction information

It is not necessary to specify the areas to be read or written. All the data is transferred in one batch. A Memory Cassette must be purchased separately.



Memory Cassette Types

There are three types of Memory Cassette: EEPROM, EPROM, and Flash Memory. The models of Memory Cassette that are available are listed in the following tables.

Memory	Model	Specifications
EEPROM[1]	CQM1-ME04K	4 Kwords without clock
	CQM1-ME04R	4 Kwords with clock
	CQM1-ME08K	8 Kwords without clock
	CQM1-ME08R	8 Kwords with clock
EPROM[2]	CQM1-MP08K	8 Kwords, 16 Kwords, or 32 Kwords without clock
	CQM1-MP08R	8 Kwords, 16 Kwords, or 32 Kwords with clock
Flash[1, 3]	CQM1H-ME16K	16 Kwords without clock
	CQM1H-ME16R	16 Kwords with clock

Note

1. Data can be read and written for an EEPROM Memory Cassette with a Programming Device.
2. Data can be read from a EPROM Memory Cassette with a Programming Device, but must be written with a PROM Writer.

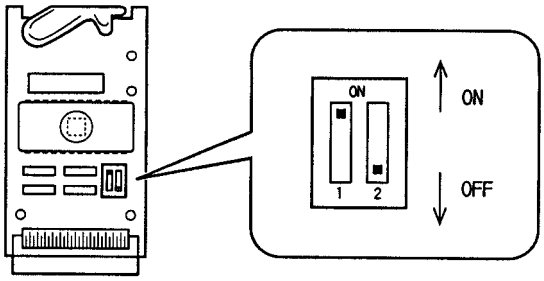
3. The CQM1H-ME16K and CQM1H-ME16R cannot be used in CQM1 PCs.
4. The effective life of the EEPROM and flash memory is 50,000 writes. Data may become unstable if the memory is used after exceeding the effective life.

Mounting EPROM Chips

One of the following EPROM Chips must be purchased separately and mounted to a EPROM Memory Cassette.

Model	ROM version	Capacity	Access speed
ROM-ID-B	27128 or equivalent	8 Kwords	150 ns
ROM-JD-B	27256 or equivalent	16 Kwords	150 ns
ROM-KD-B	27512 or equivalent	32 Kwords	150 ns

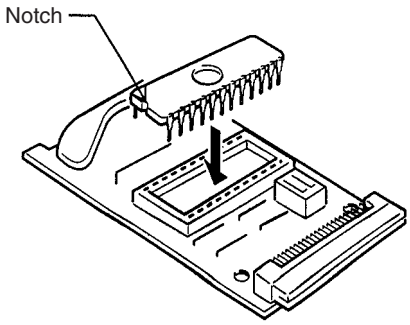
Before mounting the EPROM Chip, set the switches on the Memory Cassette according to the type of Chip.



The switches are set as follows:

EPROM type	SW1	SW2
27128	Off	Off
27256	ON	Off
27512	ON	ON

Mount the EPROM Chip to the EPROM Memory Cassette as shown below. Align the notch in the EEPROM Chip with the notch on the socket on the Memory Cassette.

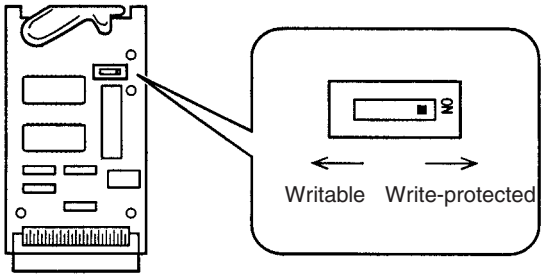


Write-protecting EEPROM or Flash Memory Cassettes

EEPROM Memory Casettes

EEPROM Memory Cassettes have a write-protect switch that can be used to prevent data on the Cassette from being deleted or overwritten. The switch is

shown in the following diagram. Turn ON the switch to write-protect the Cassette. Turn OFF the switch to write data.

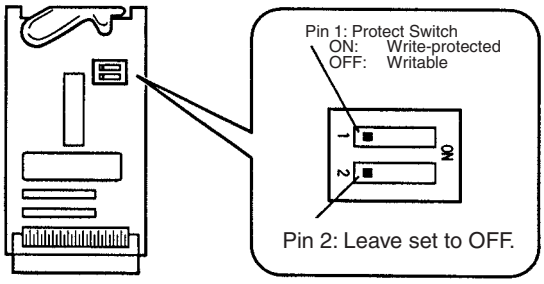


Note

1. Turn OFF power to the CQM1H and remove the Memory Cassette to change the switch setting.
2. AR 1302 will be ON when the Memory Cassette is write-protected.
3. The effective life of the EEPROM is 50,000 writes. Data may become unstable if the memory is used after exceeding the effective life.

Flash Memory Casettes

Flash Memory Cassettes have a write-protect switch that can be used to prevent data on the Cassette from being deleted or overwritten. The switch is shown in the following diagram. Turn ON the switch to write-protect the Cassette. Turn OFF the switch to write data.



Note

1. Turn OFF power to the CQM1H and remove the Memory Cassette to change the switch setting.
2. AR 1302 will be ON when the Memory Cassette is write-protected.
3. The effective life of the flash memory is 50,000 writes. Data may become unstable if the memory is used after exceeding the effective life.

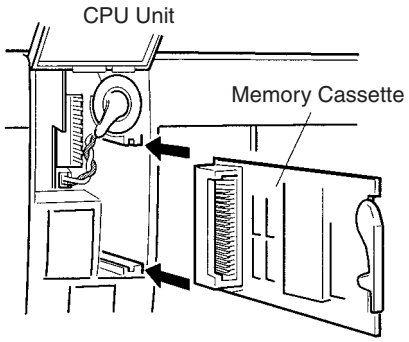
Mounting a Memory Cassette

Slide the Memory Cassette into the grooves and press in until it engages with the connector inside the CPU Unit, as shown in the following diagram. Close the cover when finished.

Note

1. Always turn OFF power to the CQM1H before mounting or removing a Memory Cassette.
2. Do not remove the battery. If the batter is removed for more than 5 minutes, data in the CPU Unit may be lost.

3. Do not leave the cover open during operation.



Transferring and Comparing Data

There are two methods to read/write and compare data between a Memory Cassette and the CPU Unit: AR area control bits/flag and automatic transfer at startup. Refer to the *CQM1H Programming Manual* for details.

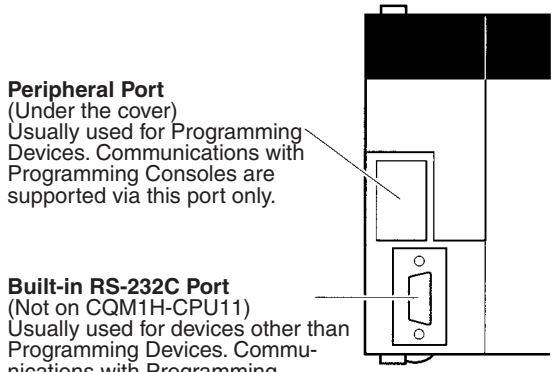
AR Area Control Bits and Flag

AR 1400: Turn ON to write data from the CPU Unit to the Memory Cassette.
AR 1401: Turn ON to read data from the Memory Cassette to the CPU Unit.
AR 1402: Turn ON to compare contents of the CPU Unit and Memory Cassette.
AR 1403: Turns ON when comparison shows the CPU Unit and Memory Cassette to contain different data.

Automatic Transfer at Startup (auto-boot)

If pin 2 on the DIP switch on the front of the CPU Unit is ON, Memory Cassette data will be automatically transferred to the CPU Unit at startup.

3-1-6 Serial Communications Ports



Serial Communications Modes and Ports

Device and mode	Peripheral port	Built-in RS-232C port
Programming Console in Programming Console Bus Mode	Yes (Pin 7: OFF)	No
Programming Device running on personal computer in Peripheral Bus Mode	Yes (Pin 7: ON)	No
Host computer or PT in Host Link Mode	Yes (Pin 7: ON)	Yes
General-purpose external device in No-protocol Mode	Yes (Pin 7: ON)	Yes

Device and mode	Peripheral port	Built-in RS-232C port
C-series PC in 1:1 Data Link Mode	No	Yes
PT in 1:1 NT Link Mode	No	Yes

3-1-7 Peripheral Port

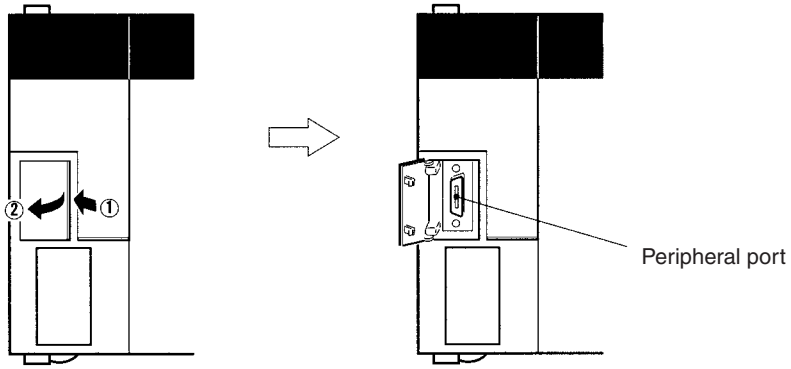
The peripheral port is mainly used for connecting Programming Devices, such as Programming Consoles and personal computers running Support Software. Programming Consoles can be connected only to this port. Host Link and no-protocol communications are also supported for this port.

Note

1. When connecting a Programming Console to the peripheral port, turn OFF pin 7 on the DIP switch on the front of the CPU Unit.
2. When connecting a device to the peripheral port other than a Programming Console, such as a personal computer running Support Software, be sure to turn ON pin 7 on the DIP switch on the front of the CPU Unit. When connecting to a peripheral bus, it is also necessary to set the communications mode in the PC Setup to Host Link mode.

Opening the Peripheral Port Cover

Insert your fingertip or a small screwdriver in the gap on the right of the cover and pull to the left to open, as shown on the left in the following illustration.

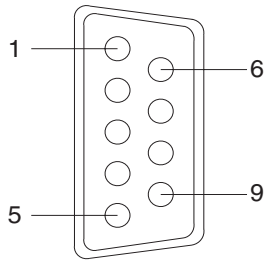


3-1-8 Built-in RS-232C Port

The RS-232C port built into the CPU Unit is mainly used for connecting devices other than Programming Devices. It is not possible to perform communications with a Programming Console or any other Programming Device via a peripheral bus using this port. The following communications modes are supported: Host Link, no-protocol, 1:1 Data Link, and 1:1-mode NT link.

Connector Pin Assignments

Pin assignments for the RS-232C port are given in the following table.



Pin	Abbreviation	Name	Direction
1	FG	Field ground	---
2	SD (TXD)	Send data	Output
3	RD (RXD)	Receive data	Input
4	RS (RTS)	Request to send	Output
5	CS (CTS)	Clear to send	Input
6	+5V (see note)	Power supply	---
7	---	Not used.	---
8	---	Not used.	---

Pin	Abbreviation	Name	Direction
9	SG	Signal ground	---
Connector fitting	FG	Field ground	---

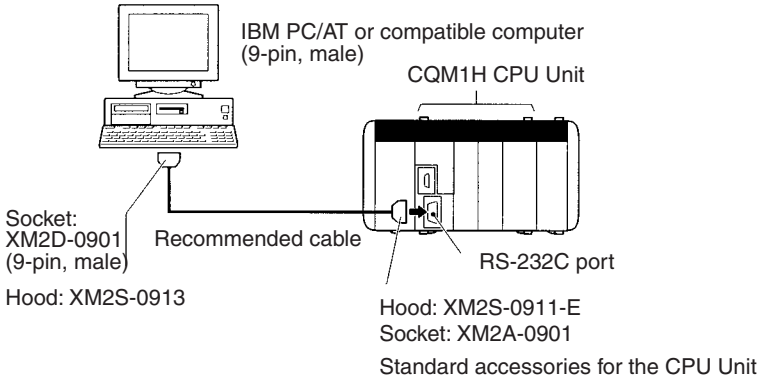
Note The 5-V power supply connected via pin 6 is only for the NT-AL001 RS-232C/RS-422S Converting Link Adapter.

Port Specifications

Item	Specification
Communications method	Half duplex
Sync	Start-stop
Baud rate	1,200, 2,400, 4,800, 9,600, or 19,200 bps
Transmission method	Point to point
Transmission distance	15 m max.
Interface	EIA RS-232C

Connecting to a Computer

The CPU Unit can be connected to an IBM PC/AT or compatible computer via the RS-232C port as shown below.



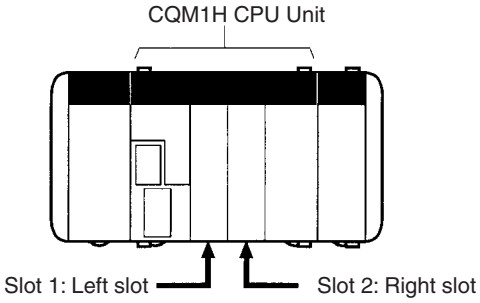
Recommended Cables

UL2464 AWG28 × 5P IFS-RVV-SB (UL standard) (Fujikura Ltd.)
AWG28 × 5P IFVV-SB (not UL standard) (Fujikura Ltd.)
UL2464-SB (MA) 5P × 28AWG (7/0.127) (UL standard) (Hitachi Cable Ltd.)
CO-MA-VV-SB 5P × 28AWG (7/0.127) (not UL standard) (Hitachi Cable Ltd.)

3-1-9 Inner Board Slots 1 and 2

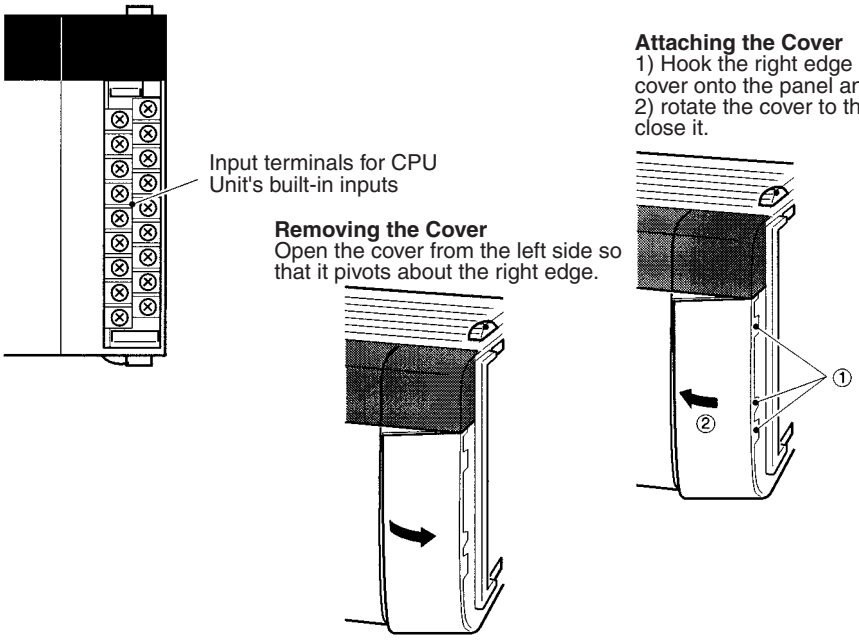
CQM1H-CPU51 or CQM1H-CPU61 CPU Unit has two slots for mounting Inner Boards: Slot 1 (left slot) and slot 2 (right slot).

Note The Inner Boards that can be mounted are different for each slot. For details refer to *3-4 Inner Boards*.



3-1-10 Built-in Inputs

The CPU Unit has 16 built-in inputs. The 16 input bits in IR 000 are always allocated to these inputs. For specifications, refer to *2-2-1 CPU Unit's Built-in 24-V DC Inputs*.

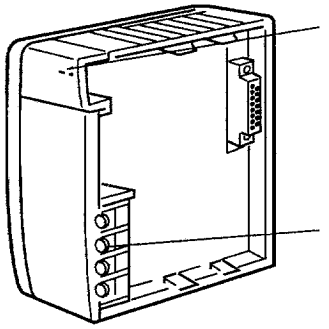


3-2 Power Supply Unit

There are three AC Power Supply Units available, the CQM1-PA203, the CQM1-PA206, and the CQM1-PA216, There is also one DC Power Supply Unit available, the CQM1-PD026. Select a Power Supply Unit that matches the current requirements of the system.

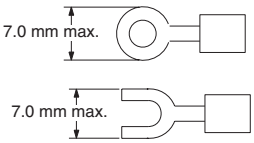
3-2-1 Power Supply Unit Components

The following diagram shows the basic components of a Power Supply Unit.



Crimp Terminals

Use the crimp terminals shown below for Power Supply Unit wiring. The connectors should be less than 7 mm wide and the wires should be between 1.04 and 2.63 mm^2.

Power supply	Model number	Crimp terminal
AC power	CQM1-PA203 CQM1-PA206 CQM1-PA216	
DC power	CQM1-PD026	

3-2-2 Selecting a Power Supply Unit

As mentioned previously, there are three AC Power Supply Units and one DC Power Supply Unit. Select the appropriate Power Supply Unit based on the total 5-V DC current requirements of the Units in the configured system and the 24-V DC output terminals (PA206/PA216).

Calculation Example:

To calculate the capacity required for a PC configuration consisting of the CPU Unit (e.g., CPU21), two 16-point DC Input Units, and three 16-point Contact Output Units, perform the following calculation:

CPU Unit (CPU21) current capacity + 16-point Input Unit current capacity × 2 + 16-point Contact Output Unit current capacity × 3 = 0.82 + 0.085 × 2 + 0.85 × 3 = 3.54

A Power Supply Unit with a capacity of at least 3.54 A is required.

Model number	Capacity
CQM1-PA203	5 V DC, 3.6 A (18 W)
CQM1-PA206, CQM1-PA216	5 V DC, 6.0 A; 24 V DC output, 0.5 A (30 W total) The total power consumption from the 5-V DC supply and 24-V DC output must be less than 30 W. In other words: 5 V DC current consumption × 5 + 24 V DC current consumption × 24 ≤ 30 (W).
CQM1-PD026	5 V DC, 6 A (30 W)

Current Consumptions

The following table shows the current consumption of the CPU Unit and I/O Units:

Unit		Model number	Current consumption (5 V DC)
CPU Units		CQM1H-CPU11	800 mA
		CQM1H-CPU21	820 mA
		CQM1H-CPU51	840 mA
		CQM1H-CPU61	840 mA
Inner Boards	Pulse I/O Board	CQM1H-PLB21	160 mA
	Absolute Encoder Interface Board	CQM1H-ABB21	150 mA
	High-speed Counter Board	CQM1H-CTB21	400 mA
	Analog Setting Board	CQM1H-AVB41	10 mA
	Analog I/O Board	CQM1H-MAB42	400 mA
	Serial Communications Board	CQM1H-SCB41	200 mA
Communications Unit	Controller Link Unit	CQM1H-CLK21	270 mA
DC Input Units		CQM1-ID111	85 mA
		CQM1-ID112	170 mA
		CQM1-ID211	50 mA
		CQM1-ID212	85 mA
		CQM1-ID213	170 mA
		CQM1-ID214	170 mA
AC Input Units		CQM1-IA121/221	50 mA
Contact Output Units		CQM1-OC221	430 mA
		CQM1-OC222	850 mA
		CQM1-OC224	440 mA
Transistor Output Units		CQM1-OD211	90 mA
		CQM1-OD212	170 mA
		CQM1-OD213	240 mA
		CQM1-OD214	170 mA
		CQM1-OD215	110 mA
		CQM1-OD216	240 mA
Triac Output Unit		CQM1-OA221	110 mA
		CQM1-OA222	250 mA
B7A Interface Units		CQM1-B7A□□	100 mA
G730 Interface Units		CQM1-G7M21 (Master)	250 mA
		CQM1-G7N11/01 Expansion Master	80 mA
I/O Link Unit		CQM1-LK501	150 mA
Analog Input Unit		CQM1-AD041	80 mA
Analog Output Unit		CQM1-DA021	90 mA
Power Supply Units		CQM1-IPS01	420 mA
		CQM1-IPS02	950 mA
Sensor Unit		CQM1-SEN01	600 mA max.
Linear Sensor Interface Unit		CQM1-LSE01	380 mA
		CQM1-LSE02	450 mA

Unit	Model number	Current consumption (5 V DC)
Temperature Control Units	CQM1-TC00□ CQM1-TC10□	220 mA
	CQM1-TC20□ CQM1-TC30□	190 mA
CompoBus Units	CQM1-SRM21	180 mA
	CQM1-DRT21	80 mA
I/O Control Units	CQM1H-IC101	2 mA
I/O Interface Units	CQM1H-II101	3 mA

Unit Limits for Expansion I/O Blocks

The current consumption limits for the CPU Block and Expansion I/O Block are given in the following table. Be sure that current consumption of the connected Units does not exceed the following limits.

Block	Number of Units	Maximum current consumption	
CPU Block	5 max.	3.0 A max. (See note 1.)	5.0 A max. total (See note 4.)
Expansion I/O Block	11 max.	2.0 A max. (See note 2.)	

Note

1. The CPU Block current consumption includes the CPU Unit, Communications Unit, Inner Boards, and I/O Control Unit.
2. The Expansion I/O Block current consumption includes I/O Interface Unit.
3. An Analog Power Supply Unit must be counted as a Unit, just like I/O or Dedicated I/O Units.
4. The maximum current consumption will be 3.6 A if the CQM1-PA203 Power Supply Unit is used.

3-2-3 Unit Weights

CPU Units

Model number	Weight
CQM1H-CPU11	500 g max.
CQM1H-CPU21	510 g max.
CQM1H-CPU51	
CQM1H-CPU61	

Power Supply Units

Model number	Weight
CQM1-PA203	460 g max.
CQM1-PA206	560 g max.
CQM1-PA216	
CQM1-PD026	

Inner Boards

Inner Board	Model number	Weight
Pulse I/O Board	CQM1H-PLB21	90 g max.
Absolute Encoder Interface Board	CQM1H-ABB21	
High-speed Counter Board	CQM1H-CTB21	
Analog Setting Board	CQM1H-AVB41	60 g max.
Analog I/O Board	CQM1H-MAB42	100 g max.
Serial Communications Board	CQM1H-SCB41	90 g max.

Communications Unit

Unit	Model number	Weight
Controller Link Unit	CQM1H-CLK21	170 g max.

I/O Units

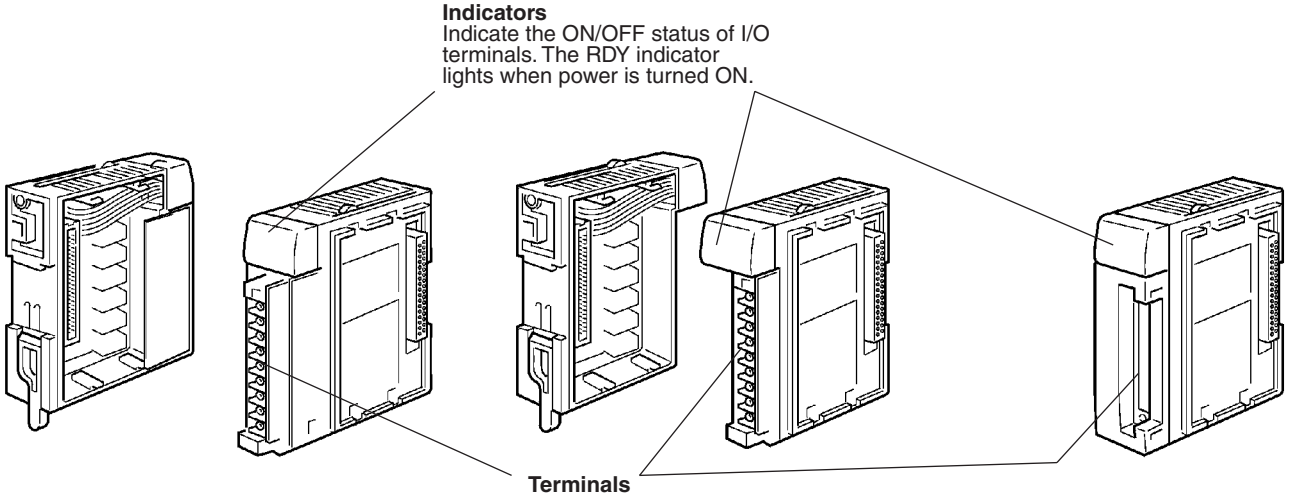
Unit	Model number	Weight
DC Input Units	CQM1-ID111	180 g max.
	CQM1-ID112	160 g max.
	CQM1-ID211	180 g max.
	CQM1-ID212	
	CQM1-ID213	160 g max.
AC Input Units	CQM1-IA121	210 g max.
	CQM1-IA221	
Contact Output Units	CQM1-OC221	200 g max.
	CQM1-OC222	230 g max.
	CQM1-OC224	270 g max.
Transistor Output Units	CQM1-OD211	200 g max.
	CQM1-OD212	180 g max.
	CQM1-OD213	160 g max.
	CQM1-OD214	210 g max.
	CQM1-OD215	240 g max.
AC Output Units	CQM1-OA221	
	CQM1-OA222	
I/O Control Unit	CQM1H-IC101	131 g max.
I/O Interface Unit	CQM1H-II101	211 g max. (including the end cover)

Note For details on Dedicated I/O Units, refer to the *CQM1 Dedicated I/O Units Operation Manual (W238)*.

3-3 I/O Units

There are two basic types of I/O Unit: Those with terminal blocks and those with connectors.

The following diagram shows the basic components of I/O Units.

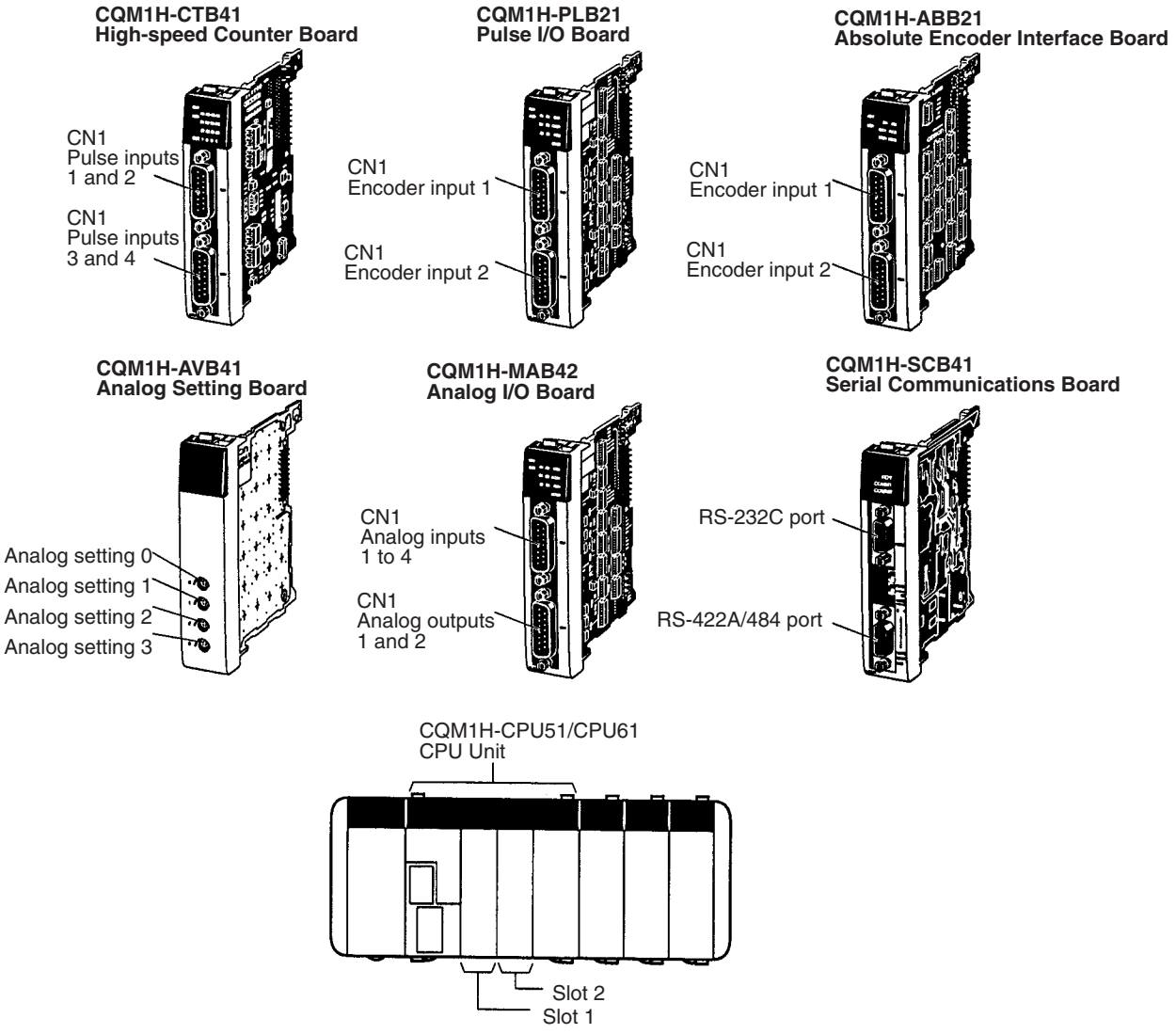


3-4 Inner Boards

The Inner Boards listed in the following table are available. These must be mounted in Inner Board slot 1 or slot 2 of a CQM1H-CPU51 or CQM1H-CPU61 CPU Unit. The slots that can be used are determined by the shape of the Board.

Name	Model number	Specifications	Mountable slot	
			Slot 1 (left slot)	Slot 2 (right slot)
High-speed Counter Board	CQM1H-CTB41	Four pulse inputs and four external outputs	YES	YES
Pulse I/O Board	CQM1H-PLB21	Two pulse inputs and two pulse outputs	No	YES
Absolute Encoder Interface Board	CQM1H-ABB21	Two absolute encoder inputs		
Analog Setting Board	CQM1H-AVB41	Four analog settings	YES (See note.)	YES (See note.)
Analog I/O Board	CQM1H-MAB42	Four analog inputs and two analog outputs	No	YES
Serial Communications Board	CQM1H-SCB41	One RS-232C port and one RS-422A/485 port	YES	No

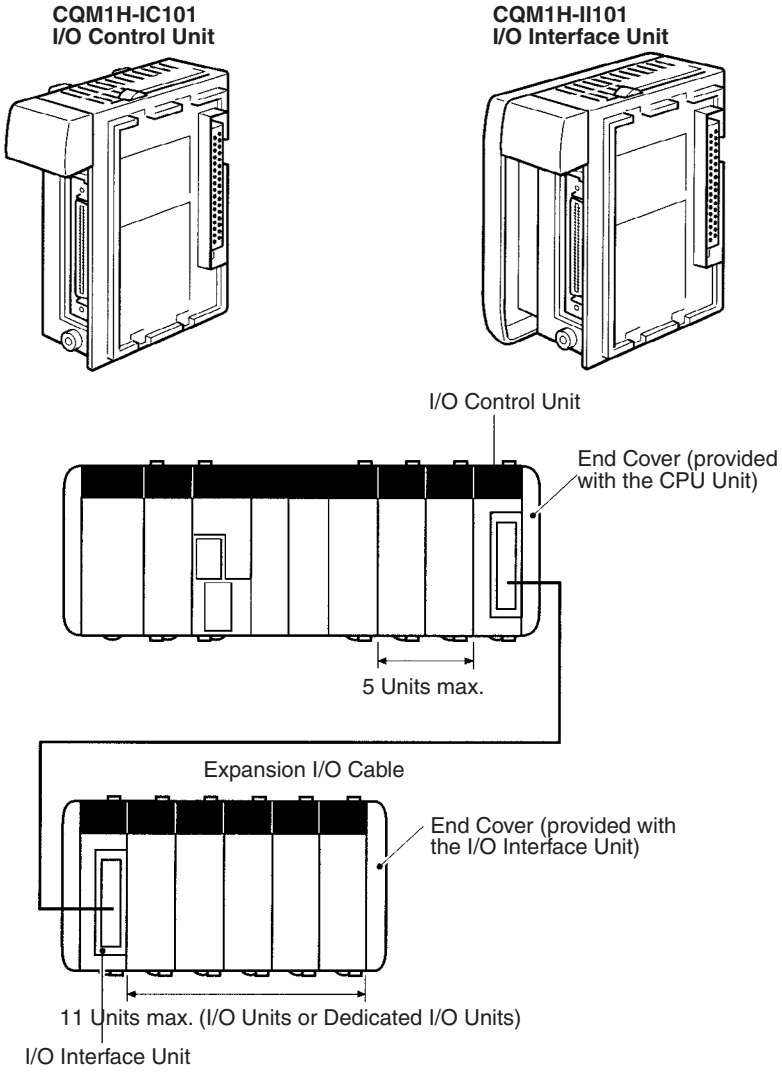
Note The Analog Setting Board cannot be mounted in both slots at the same time.



3-5 Products for Expansion I/O Blocks

An Expansion I/O Block can be connected to enable connecting more than 11 Units or two mounted the PC in two tiers in a narrow location. Expansion I/O Blocks are supported by all CQM1H CPU Units.

Name	Model	Specifications	
I/O Control Unit	CQM1H-IC101	Connects to right end of CPU Block.	
I/O Interface Unit	CQM1H-II101	Connected to left end of Expansion I/O Block. An End Cover is included.	
Expansion I/O Cables	CS1W-CN313	Length: 0.3 m	Connects the I/O Control Unit to the I/O Interface Unit.
	CS1W-CN713	Length: 0.7 m	



Note

1. Connect the I/O Control Unit to the right end of the CPU Block.
2. Connect the End Cover provided with the CPU Unit to the I/O Control Unit.
3. An End Cover is provided with the I/O Interface Unit. Connect this End Cover to the right end of the Expansion I/O Block.
4. Use either the CS1W-CN331 (0.3 m) or the CS1W-CN731 (0.7 m) Expansion I/O Cable. Do not use a cable that is longer than 0.7 m.

3-6 Programming Devices

There are two types of Programming Devices that can be used: Hand-held Programming Consoles and Support Software that is run on a Windows computer. Support Software is usually used to write the programs, and a Programming Console is then used to change operating modes, edit programs, and monitor a limited number of points.

The following Programming Devices can be used with the CQM1H.

- Programming Consoles
- Support Software

  CX-Programmer V1.2 or higher (see note 1)
  SYSMAC-CPT (see note 2)
  SYSMAC Support Software (SSS) (see note 2)

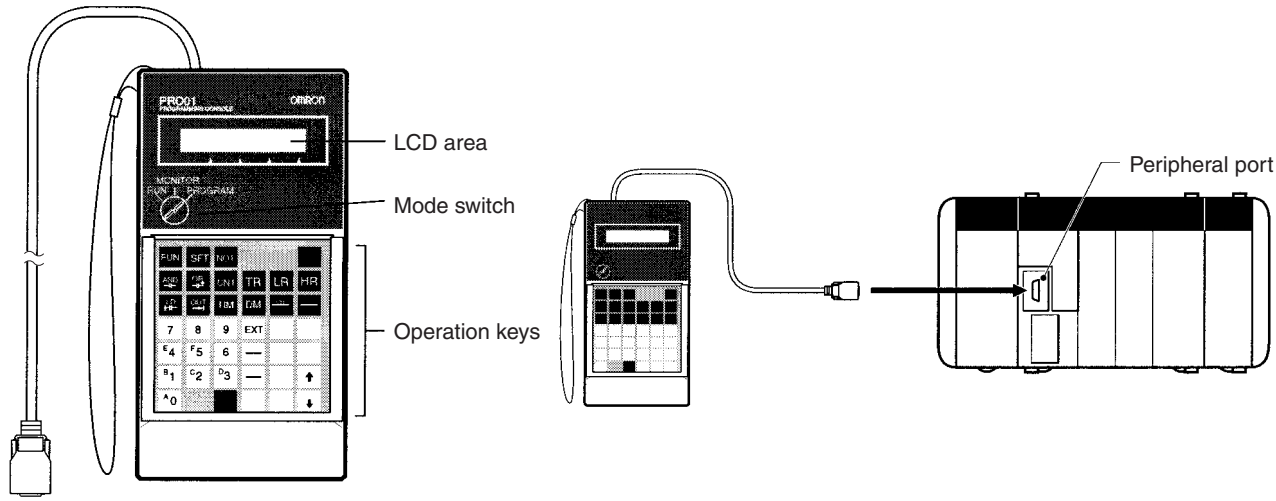
Note

1. None of the CQM1H-series CPU Units can connect to CX-Programmer V1.1 or lower.
2. Refer to *Restrictions when Using Support Software* under *3-6-2 Support Software* when using the SYSMAC-CPT or SYSMAC Support Software.

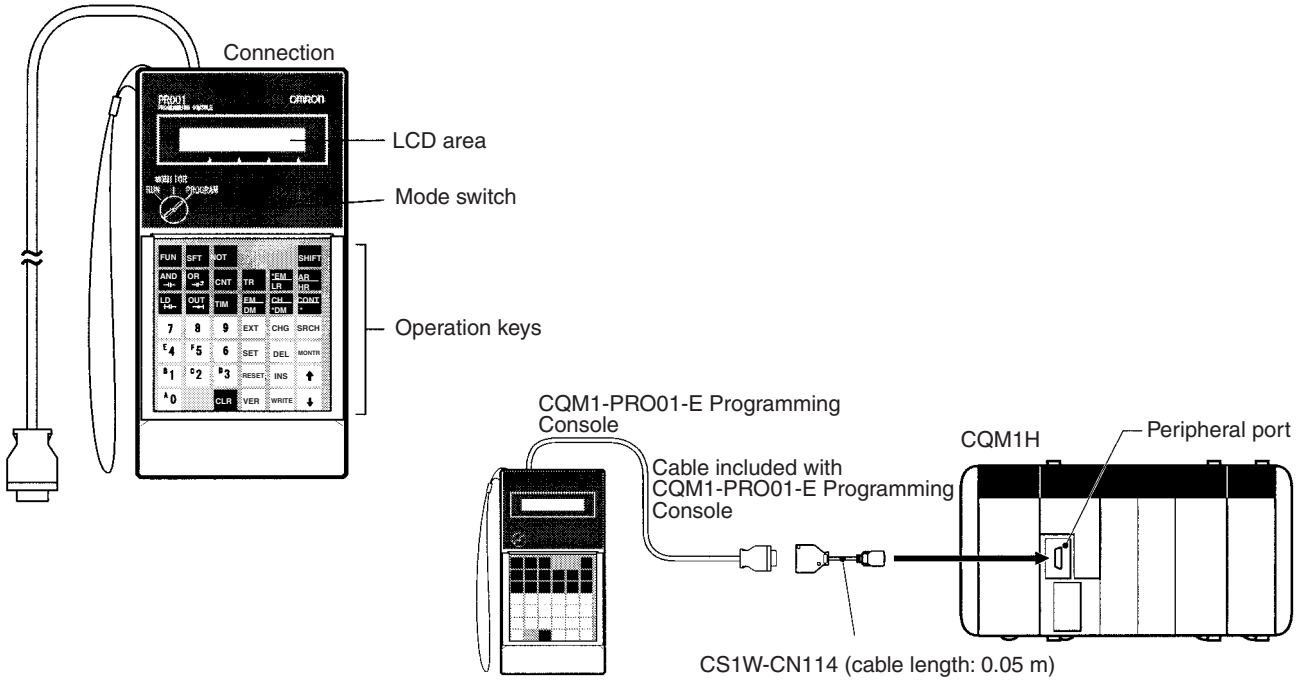
3-6-1 Programming Consoles

There are two Programming Consoles that can be used with the CQM1H: The CQM1H-PRO01-E, CQM1-PRO01-E and C200H-PRO27-E. These Programming Consoles are shown below.

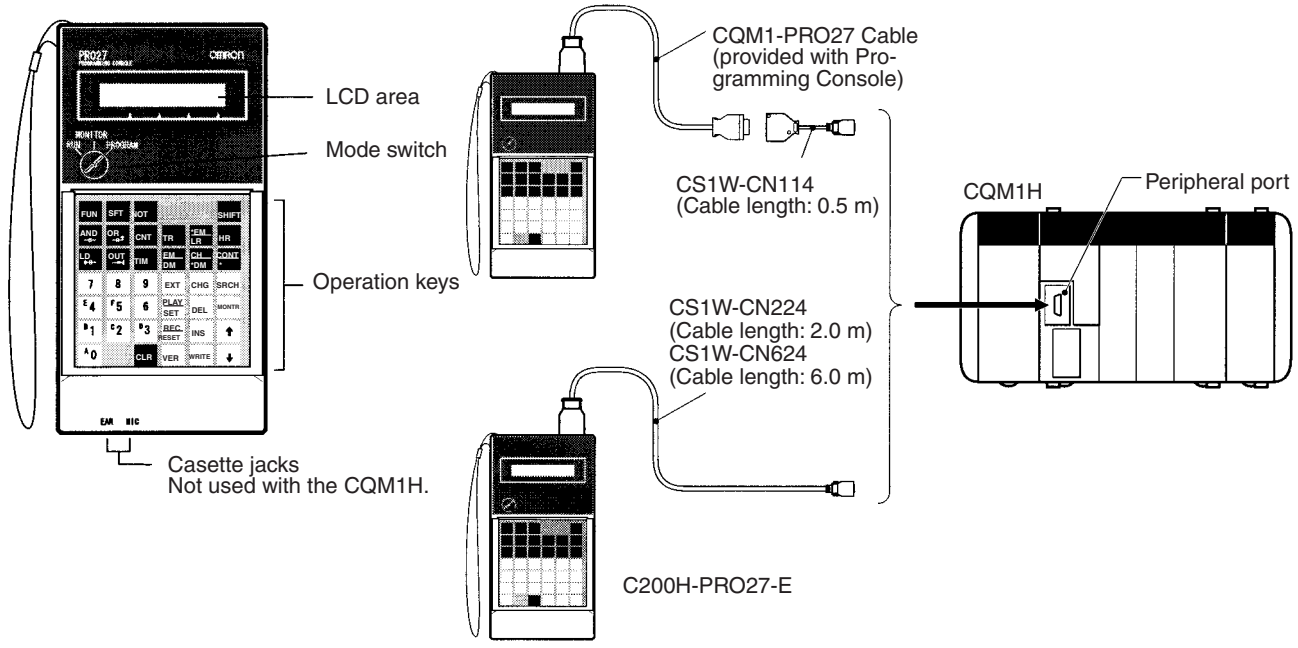
CQM1H-PRO01-E Programming Console



CQM1-PRO01-E Programming Console



C200H-PRO27-E Programming Console



Programming Console Connections

Unit	Port	DIP switch	Programming Console	Cable	
				Length	Model number
CPU Unit	Built-in peripheral port	Turn OFF pin 7.	CQM1H-PRO01-E	2 m	Cable included with Programming Console
			CQM1-PRO01-E	2 m and 0.05 m	Cable included with Programming Console and CS1W-CN114
			C200H-PRO27-E	2 m and 0.05 m	C200H-CN222 and CS1W-CN114
				4 m and 0.05 m	C200H-CN422 and CS1W-CN114
				2 m	CS1W-CN224
				6 m	CS1W-CN624

DIP Switch Settings

When connecting a Programming Console to the peripheral port, turn OFF pin 7 on the DIP switch. When pin 7 is OFF, the setting of pin 5 and the PC Setup settings are disabled as shown in the following table.

DIP switch pin 5	DIP switch pin 7	PC Setup (DM 6650)
Disabled	OFF	Disabled

3-6-2 Support Software

The different types of Support Software that can be used with the CQM1H are shown in the following table.

Name	Model number	Format	Computer	OS	Serial communications mode	Model	Functional limitations
CX-Programmer V1.2 or higher	WS02-CXP□□-E	CD-ROM	IBM PC/AT or compatible	Microsoft Windows 95 or 98	Peripheral bus or Host Link	CQM1H	No
SYSMAC-CPT	WS01-CPTB1-E	3.5-inch floppy disks (1.44 MB) and CD-ROM		Microsoft Windows V 3.1	Host Link	CQM1-CPU43	Yes (see note)
SYSMAC Support Software (SSS)	C500-ZL3AT1-E	3.5-inch floppy disks		Microsoft DOS V 3.2 or higher	Peripheral bus or Host Link	CQM1	

Note Functional limitations are shown in the following table.

Restrictions when Using Support Software

Item	CX-Programmer V1.2 or later	SYSMAC-CPT	SYSMAC Support Software (SSS)
PC model	Select CQM1H.	Select CQM1-CPU43-E.	Select CQM1.
CPU Unit models that are not supported	None	The CQM1H-CPU61 CPU Unit cannot be used. (An error message will appear when you attempt to connect.) The CQM1H-CPU11/21/51 CPU Units can be used.	The CQM1H-CPU61 CPU Unit cannot be used. (An error message will appear when you attempt to connect.) The CQM1H-CPU11/21/51 CPU Units can be used.
Instructions that cannot be used	None	The following instructions are not supported by the CQM1 CPU Units and cannot be used on the SYSMAC-CPT. If an attempt is made to transfer a program containing any of them to the SYSMAC-CPT, an error will occur. Timer Instructions TTIM Serial Communications Instructions PMCR and STUP Network Communications Instructions SEND, RECV, and CMND Floating-point Instructions FIX, FIXL, FLT, FLTL, +F, –F, *F, /F, DEG, RAD, SIN, COS, TAN, ASIN, ACOS, ATAN, SQRT, EXP, and LOG	The following instructions can be used on the SSS by transferring them to the SSS from the CQM1H-series CPU Unit as expansion instructions. Use the transfer operation for expansion instructions under the expansion functions menu. Network Communications Instructions CMND Floating-point Instructions FIX, FIXL, FLT, FLTL, +F, –F, *F, /F, DEG, RAD, SIN, COS, TAN, ASIN, ACOS, ATAN, SQRT, EXP, and LOG Other instructions that are new on the CQM1H (in respect to the CQM1) can be used without transferring them as expansion instructions.
Memory displays	Displayed for CQM1H.	Memory will be displayed for the CQM1-CPU43, i.e., to a maximum of 7.2 Kwords.	Memory will be displayed for the CQM1 CPU Units, i.e., to a maximum of 7.2 Kwords.
DM verification	None	With the CQM1H-CPU11/21, the error message “Verification Error” will be displayed if a verification check results in a value other than “0000” for any data in DM 3072 to DM 6143 of the CPU Unit.	Cannot be used. (A communications error will be generated the PC will be offline.)

Serial Communications Mode Characteristics

The two following serial communications modes are supported for connecting Support Software to the PC.

Serial Communications Mode	Features
Peripheral bus	High-speed communications are possible. Usually, this mode should be used when connecting with CX-Programmer. Only 1:1 connection is supported.
Host Link (SYSMAC WAY)	Basic protocol for communications with a host computer. Communications speed lower than peripheral bus. One-to-one or one-to-many communications are possible. Connections to a modem or Optical Link Adapter are possible.

DIP Switch and PC Setup Settings

Peripheral Bus Connection

Make the following settings when connecting Support Software to the peripheral port via the peripheral bus protocol. The serial communications mode must be set to Host Link.

DIP switch pin 5	DIP switch pin 7	PC Setup: DM 6650
OFF	ON	0000 Hex (standard settings) or 0001 Hex (custom settings)
ON	ON	Ignored (standard settings)

Note Always turn ON pin 7 on the DIP switch when connecting Support Software running on a computer using the peripheral bus. You will not be able to connect if pin 7 is OFF.

Host Link Connection

Make the following settings when connecting Support Software via the Host Link protocol.

Peripheral Port

Use the following settings for the standard communications settings in the PC Setup:

DIP switch pin 5	DIP switch pin 7	PC Setup: DM 6650
OFF	ON	0000 Hex (standard settings)

Use the following settings to make custom communications settings in the PC Setup:

DIP switch pin 5	DIP switch pin 7	PC Setup: DM 6650
OFF	ON	0001 Hex (Custom settings: Set the baud rate, data length, etc., in DM 6651)

Use the following settings for communications according to pin 5 default settings:

DIP switch pin 5	DIP switch pin 7	PC Setup: DM 6650
ON	ON	Ignored (standard settings)

Note Always turn ON pin 7 on the DIP switch when connecting Support Software running on a computer using a Host Link connection. You will not be able to connect if pin 7 is OFF.

RS-232C Port

Use the following settings for the standard communications settings in the PC Setup:

DIP switch pin 5	DIP switch pin 7	PC Setup: DM 6645
OFF	Ignored	0000 Hex (Standard settings)

Use the following settings to make custom communications settings in the PC Setup:

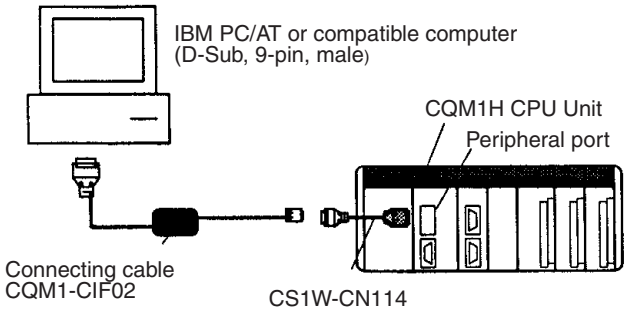
DIP switch pin 5	DIP switch pin 7	PC Setup: DM 6645
OFF	Ignored	0001 Hex (Custom settings: Set the baud rate, data length, etc., in DM 6646)

Use the following settings for communications according to pin 5 default settings:

DIP switch pin 5	DIP switch pin 7	PC Setup: DM 6645
ON	Ignored	Ignored (standard settings)

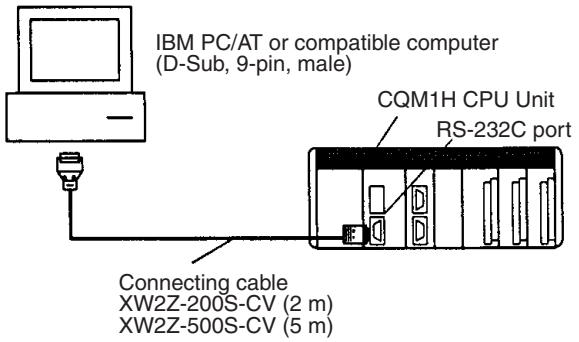
Connecting Cables

Connecting to Peripheral Port



Note
1. Connecting cables CS1W-CN225/625/227/627 cannot be used with the CQM1H.
2. The FIT 10/20 connecting cable CQM1-CIF-11 cannot be used with the CQM1H.

Connecting to RS-232C Port (on CPU Unit or Serial Communications Board)



One-to-one Communications

Use the following cables for one-to-one communications between the personal computer and the PC.

Unit/Board	Port	Serial communications mode	Model number	Length	Comments	Startup Mode (see note)
CPU Unit	Peripheral port	Peripheral bus or Host Link (SYSMAC WAY)	CS1W-CN114 + CQM1-CIF02	0.05 m + 3.3 m	---	PROGRAM mode
	RS-232C port (D-Sub, 9-pin, male)	Host Link (SYSMAC WAY)	XW2Z-200S-CV	2 m	Use a connector for which ESD countermeasures have been taken.	Ignored
			XW2Z-500S-CV	5 m		
Serial Communications Board	RS-232C port (D-Sub, 9-pin, female)	Host Link (SYSMAC WAY)	XW2Z-200S-CV	2 m	Use a connector for which ESD countermeasures have been taken.	
			XW2Z-500S-CV	5 m		

Note The Startup Modes in the above table are for when DM 6600 in the PC Setup is set to the default settings. The Startup Mode depends on the type of cable used. For details refer to *5-2-3 Startup Mode.*

Direct Connection to Peripheral Port

It is possible to connect the personal computer directly to the peripheral port using the CS1W-CN226/626 Connecting Cable (dedicated cable for IBM PC/AT or compatible computers). If this cable is used, the Startup Mode (when

DM 6600 in the PC Setup is set to the default settings), will be RUN mode as shown in the following table.

Unit	Port	Serial communications mode	Model number	Length	Startup Mode (see note)
CPU Unit	Peripheral port	Peripheral bus or Host Link (SYSMAC WAY)	CS1W-CN226 or CS1W-CN626	2 m or 6 m	RUN mode

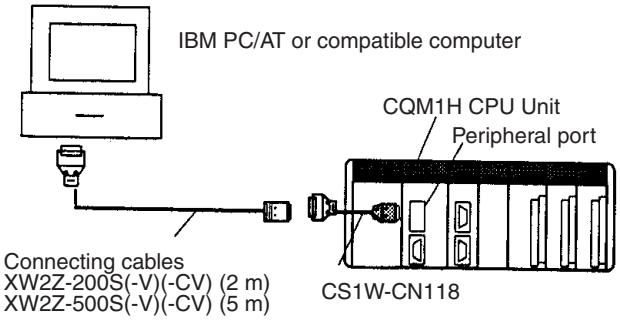
Note The Startup Mode in the above table is for when DM 6600 in the PC Setup is set to the default settings. The Startup Mode depends on the type of cable used. For details refer to *5-2-3 Startup Mode.*

Connecting to Peripheral Port using RS-232C Cable

When connecting an RS-232C cable to the peripheral port, use the CS1W-CN118 Connecting Cable as indicated below. When the XW2Z-200S-CV/500S-CV is connected, the Startup Mode (when DM 6600 in the PC Setup is set to the default settings) will be RUN mode.

Unit	Port	Serial communications mode	Model number	Length	Comments	Startup Mode (see note)
CPU Unit	Peripheral port	Peripheral bus or Host Link (SYSMAC WAY)	CS1W-CN118 + XW2Z-200S-CV/500S-CV	0.1 m + (2 m or 5 m)	Use a connector for which ESD countermeasures have been taken with the XW2Z-□□□S-CV.	RUN mode
			CS1W-CN118 + XW2Z-200S-V/500S-V		---	PROGRAM mode

Note The Startup Modes in the above table are for when DM 6600 in the PC Setup is set to the default settings. The Startup Mode depends on the type of connecting cable used. For details refer to *5-2-3 Startup Mode.*



Connecting to RS-232C Port using RS-232C Cable

When connecting an IBM PC/AT or compatible computer to the RS-232C port (built-in or on the Serial Communications Board) using an RS-232C cable, the following connection methods are possible.

Unit/Board	Port	Serial communications mode	Model number	Length	Comments	Startup Mode (see note)
CPU Unit	Built-in RS-232C port (D-Sub, 9-pin, female)	Host Link (SYSMAC WAY)	XW2Z-200S-V	2 m	---	Ignored
			XW2Z-500S-V	5 m		
Serial Communications Board	RS-232C port (D-Sub, 9-pin, female)		XW2Z-200S-V	2 m		
			XW2Z-500S-V	5 m		

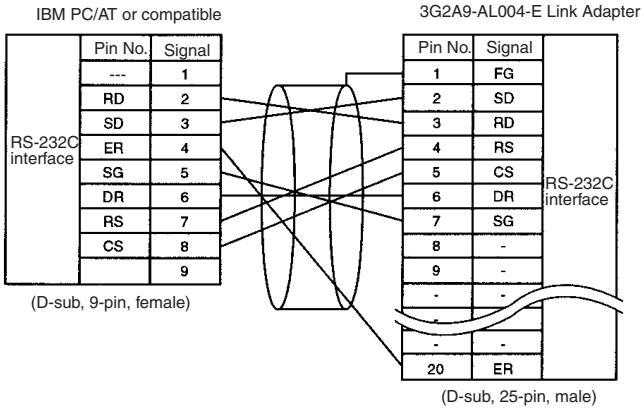
Note The Startup Mode in the above table is for when DM 6600 in the PC Setup is set to the default setting. The Startup Mode depends on the type of connecting cable used. For details refer to *5-2-3 Startup Mode.*

One-to-many Communications

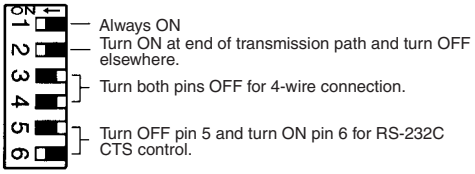
The following table shows the connections methods for communications between one personal computer and many PCs.

Serial communications mode	RS-232C cable at the personal computer	RS-232C-to-RS422A/485 Converting Link Adapter	RS-422A/485 -to-RS-232C Converting Link Adapter	Connecting cable		Port at PC
				Length	Model number	
Host Link	Make your own cable (See below.)	3G2A9-AL004-E	NT-AL001-E	0.7 m	XW2Z-070T-1	RS-232C port (D-Sub, 9-pin, female)
				2 m	XW2Z-200T-1	

Prepare the RS-232C cable between the 3G2A9-AL004-E Link Adapter and the computer as shown below.



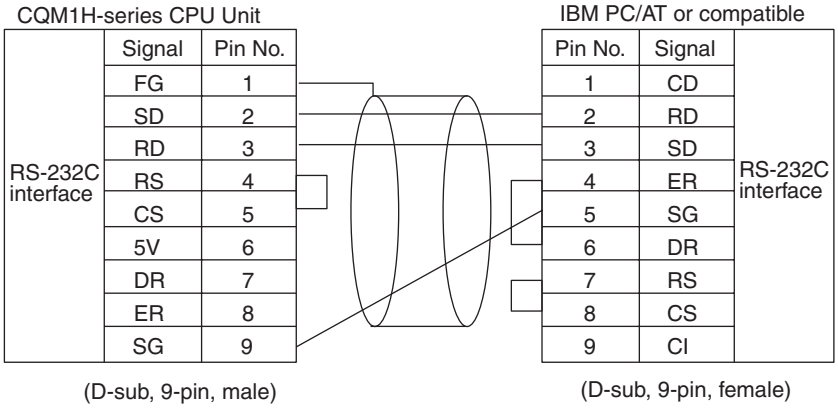
The DIP switch settings of the NT-AL001-E Link Adapter are shown below.



Preparing RS-232C Cables

Connecting to CX-Programmer

When connecting the RS-232C port to the CX-Programmer, set the communications mode to Host Link mode and connect in the following way.



When preparing an RS-232C cable to be connected to the RS-232C port, use the following connector cables.

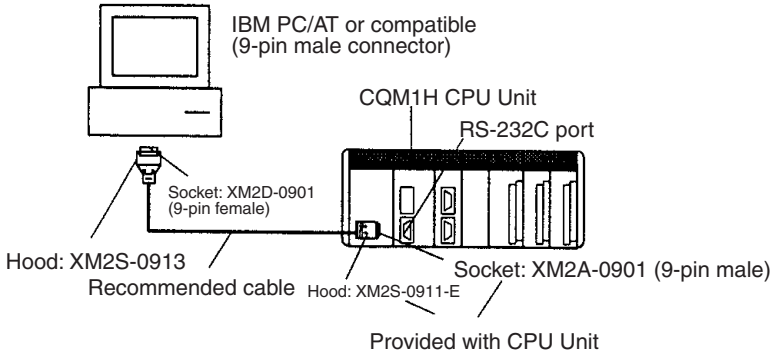
Applicable Connectors

CPU Unit Connector

Item	Model number	Specifications	
Socket	XM2A-0901	9-pin male	Used together (One of each provided with CPU Unit.)
Hood	XM2S-0911-E	9-pin, millimeter screws	

Personal Computer Connector

Item	Model number	Specifications	
Socket	XM2D-0901	9-pin female	Used together
Hood	XM2S-0913	9-pin, inch screws	



Recommended Cables

Fujikura Ltd.: UL2464 AWG28 × 5P IFS-RVV-SB (UL product)
AWG 28 × 5P IFVV-SB (non-UL product)

Hitachi Cable, Ltd.: UL2464-SB(MA) 5P × 28AWG (7/0.127) (UL product)
CO-MA-VV-SB 5P × 28AWG (7/0.127) (non-UL product)

SECTION 4
Installation

This section describes how to install the CQM1H PC, including how to mount Units, wire I/O, and connect Programming Devices. Installation precautions and mounting dimensions are also provided. Follow the instructions carefully to ensure proper operation. Improper installation can cause the PC to malfunction.

4-1 Fail-safe Circuits

You must set up safety circuits outside of the PC to prevent dangerous conditions in the event of errors in the PC or external power supply.

⚠WARNING Take any safety measures necessary outside of the PC to ensure the safety of the system in the event of an error due to PC malfunction or external factors. Observe the following precautions. Failure to do so could lead to serious or possibly fatal injury.

- Provide interlock circuits, limit circuits, emergency stop circuits, and similar safety measures in external circuits (i.e., not only in the Programmable Controller).
- Operation will stop and all outputs will turn OFF when the PC detects an error or when a FALS(07) (fatal error) instruction is executed. You must take any safety measures necessary outside of the PC to ensure the safety of the system in the event that all outputs turn OFF.
- It is possible for an output to remain ON or OFF due to a malfunction in the internal circuits of an Output Unit, such as a relay or transistor malfunction. Provide any circuits necessary outside of the PC to ensure the safety of the system in the event that an output fails to turn OFF or ON.
- If there is an overload or a short-circuit in the PC's 24-V DC service power supply, the voltage may drop and the outputs may turn OFF. Take any safety measures necessary outside of the PC to ensure the safety of the system in the event that outputs turn OFF.

Supply Power to the PC before Outputs

If the PC's power supply is turned ON after the controlled system's power supply, outputs in Units such as DC Output Units may malfunction momentarily. To prevent any malfunction, add an external circuit that prevents the power supply to the controlled system from going ON before the power supply to the PC itself.

Managing PC Errors

When any of the following errors occurs, PC operation will stop and all outputs from Output Units will be turned OFF.

- Operation of the Power Supply Unit's overcurrent protection circuit
- A CPU error (watchdog timer error)
- A fatal error* (memory error, no END(01) instruction error, I/O bus error, too many I/O points error, or FALS fatal system error)

Be sure to add any circuits necessary outside of the PC to ensure the safety of the system in the event of an error that stops PC operation.

Note *When a fatal error occurs, all outputs from Output Units will be turned OFF even if the IOM Hold Bit has been turned ON to protect the contents of I/O memory. (When the IOM Hold Bit is ON, the outputs will retain their previous status after the PC has been switched from RUN/MONITOR mode to PROGRAM mode.)

Managing Output Malfunctions

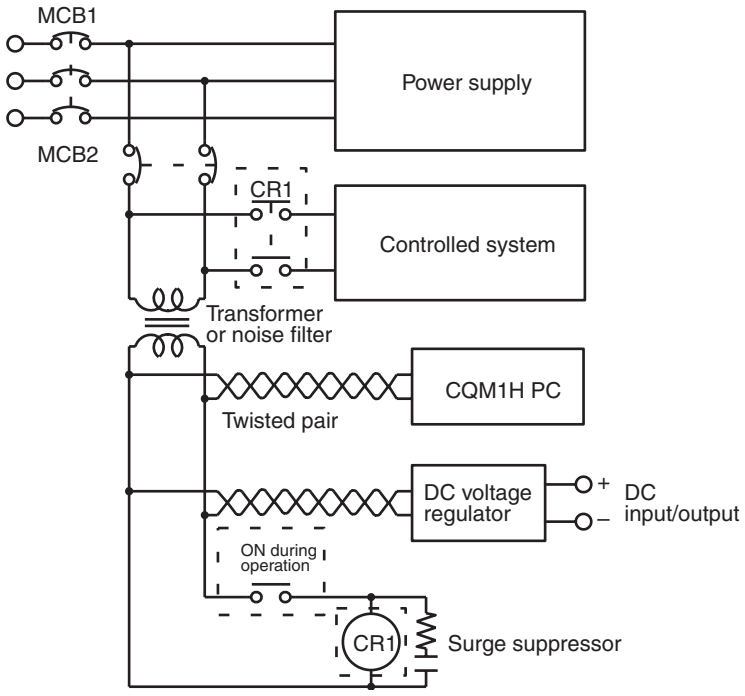
It is possible for an output to remain ON due to a malfunction in the internal circuitry of the Output Unit, such as a relay or transistor malfunction. Be sure to add any circuits necessary outside of the PC to ensure the safety of the system in the event that an output fails to go OFF.

Emergency Stop Circuit

The following example emergency stop circuit controls the power supply to the controlled system so that power is supplied to the controlled system only when the PC is operating. Program the Always ON Flag (SR 25313) as the execution condition for an output point from an Output Unit and use this point

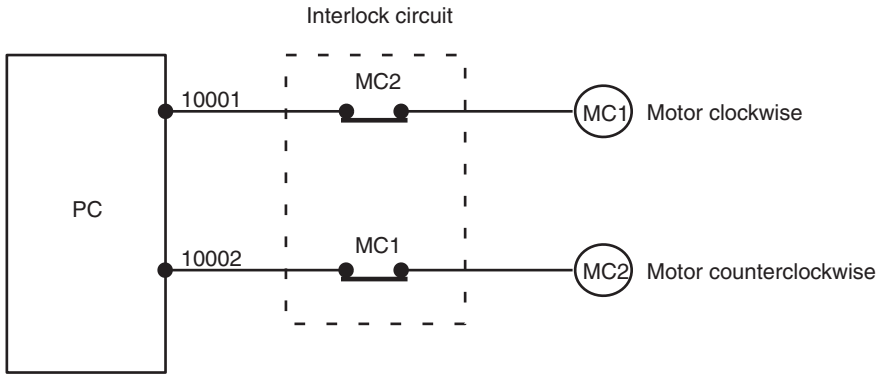
as a RUN output. Connect an external relay (CR1) to this RUN output as shown in the following diagram.

Note Use the Always ON Flag (SR 25213) as an execution condition for an Output from the Output Unit.



Interlock Circuits

When the PC controls an operation such as the clockwise and counterclockwise operation of a motor, provide an external interlock such as the one shown below to prevent both the forward and reverse outputs from turning ON at the same time.

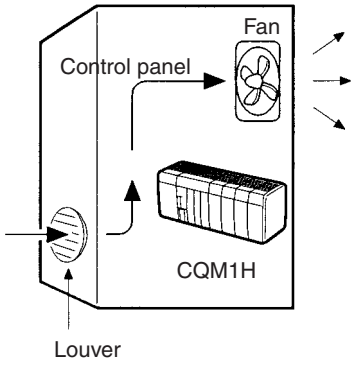


This circuit prevents outputs MC1 and MC2 from both being ON at the same time even if IR 10001 and IR 10002 are both ON, so the motor is protected even if the PC is programmed improperly or malfunctions.

4-2 Installation Precautions

When installing the CQM1H in a control panel, observe the following points.

Ambient Temperature



The ambient temperature range in which the CQM1H can be used is 0 to 55°C (0 to 45°C if a Programming Console is connected to the CPU Unit).

Use the CQM1H in a well-ventilated area.

Do not mount the CQM1H directly above heaters, transformers, large-capacity resistors, or any other devices that radiate a large amount of heat energy.

If the ambient temperature is higher than 55°C, install a fan or cooler as shown in the above diagram so that the temperature is maintained at a maximum of 55°C.

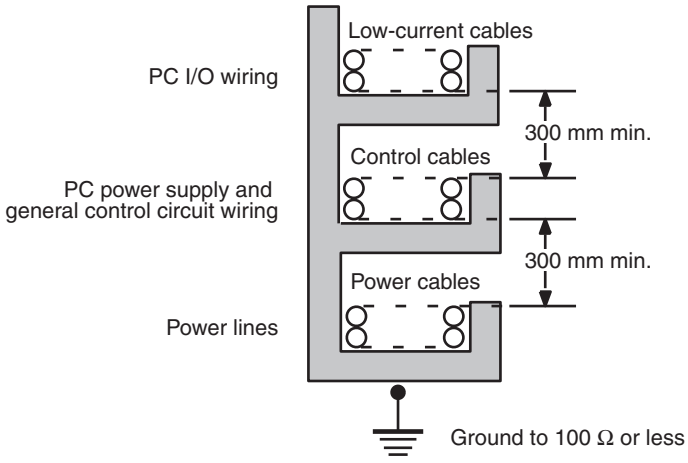
Maintenance

Do not install the CQM1H close to high-voltage or power devices.

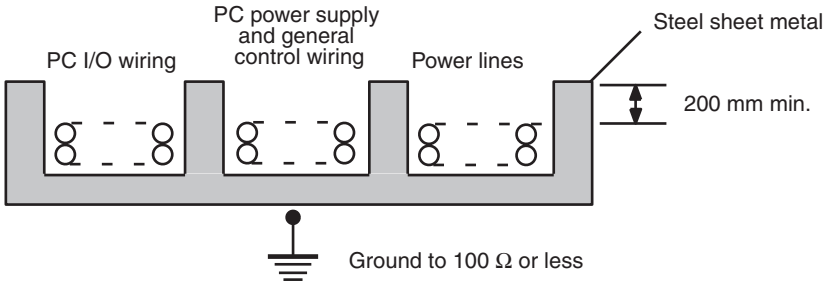
External Wiring

Observe the following precautions for external wiring.

- When multi-conductor signal cable is being used, avoid combining I/O wires and other control wires in the same cable.
- If wiring racks are parallel, allow at least 300 mm (12 inches) between the racks.
- Run CQM1H power supply lines and power cables (400-V/10-A max. or 220-V/20-A max.) as shown in the following diagram.



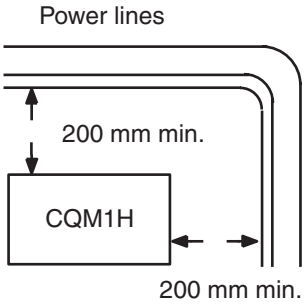
If the I/O wiring and power cables must be placed in the same duct, they must be shielded from each other using grounded steel sheet metal.



Improving Noise Resistance

Reduce the effects of noise by observing the following points.

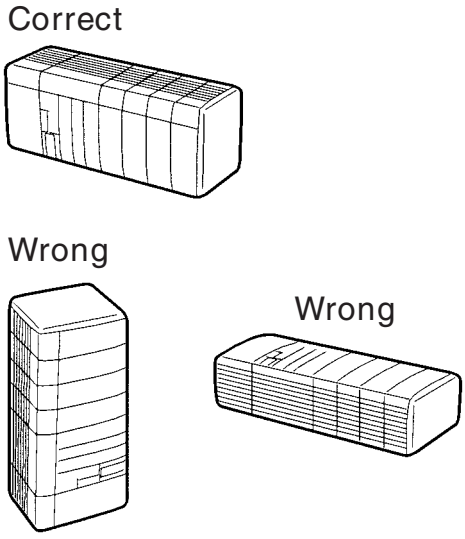
- Do not mount the PC in a control panel containing high-voltage equipment.
- Install the PC at least 200 mm (6.5 feet) from power lines.



- Ground the mounting plate between the PC and the mounting surface.

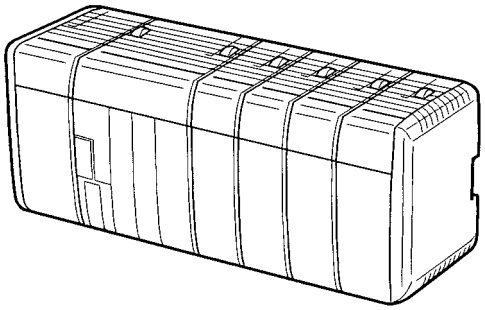
PC Orientation

When installing the CQM1H in the control panel, always mount the Units so that the ventilation openings are facing up. Also, there must be at least a 20-mm space both above and below the PC.

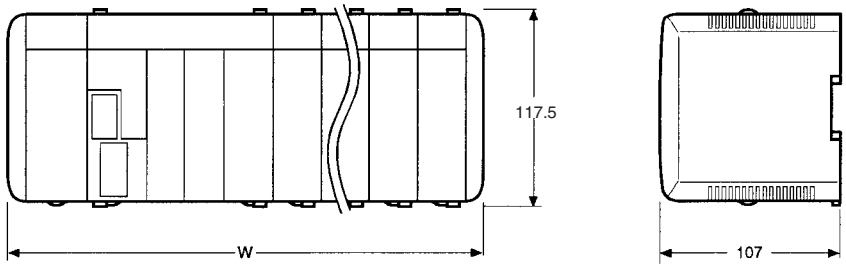


4-3 Mounting Dimensions

The following diagram shows a CQM1H PC consisting of a Power Supply Unit, Communications Unit, CPU Unit, and I/O Units. Be sure to connect an End Cover to the right side of the Unit on the opposite end of the PC from the CPU Unit.



External Dimensions for CPU Block



Unit: mm

The following table lists the total width, W, of the PC.

n = No. of I/O Units + No. of Dedicated I/O Units.

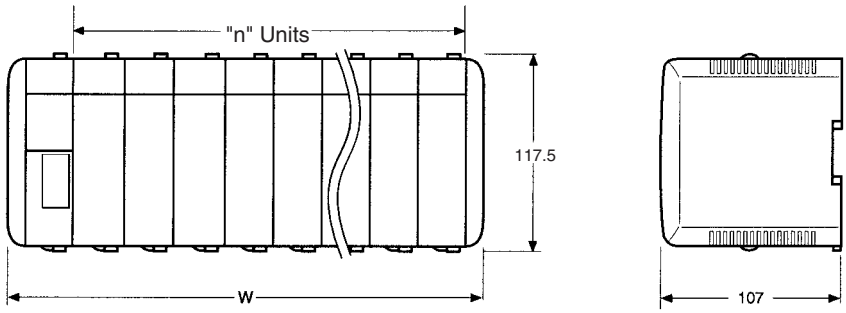
Power Supply Unit	Width (mm)	
	CPU Block only $0 \leq n \leq 11$	**With Expansion I/O Block connected $0 \leq n \leq 5$**
CQM1-PA203	$32 \times n + 187$	$32 \times n + 219$
CQM1-PA206	$32 \times n + 219$	$32 \times n + 251$
CQM1-PA216		
CQM1-PD026		

Note For example, if a CQM1-CPU51/61 Power Supply Unit is used and there is a total of four I/O Units and Dedicated I/O Units, the width would be 347 mm.

$W = 32 \times 4 + 219 = 347$ mm

If a Communications Unit is connected to the CQM1-CPU51/61, add 32 mm to obtain the total width.

External Dimensions for Expansion I/O Block

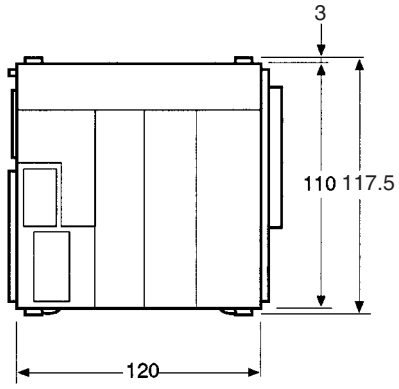


n = No. of I/O Units + No. of Dedicated I/O Units.
W = 32 × n + 60.2 (1 ≤ n ≤ 11)

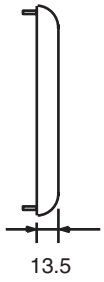
CPU Unit

The following diagrams show the dimensions of the CPU Unit and End Cover, which covers the Unit at the far right side of the PC. The End Cover is provided with the CPU Unit. All dimensions are in millimeters.

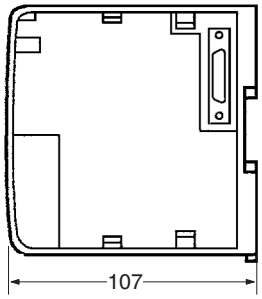
CPU Unit Front View



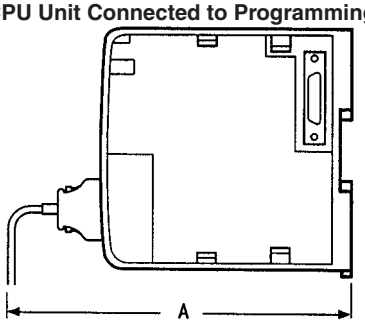
End Cover Front View



CPU Unit Side View



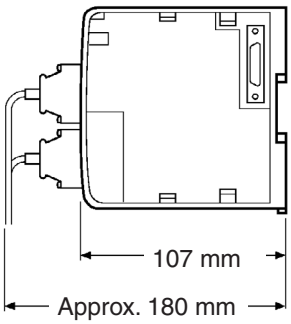
CPU Unit Connected to Programming Device



A: Peripheral port: Approx. 160 mm
RS-232C port: Approx. 160 mm

Note The depth is the same for all Units.

CPU Unit with Inner Board Connectors Connected

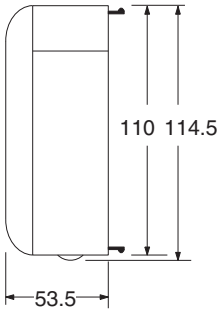


Note The depth is the same for all Units.

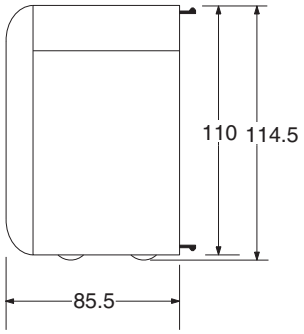
Power Supply Units

The following diagrams show the dimensions of the Power Supply Units. All dimensions are in millimeters.

CQM1-PA203



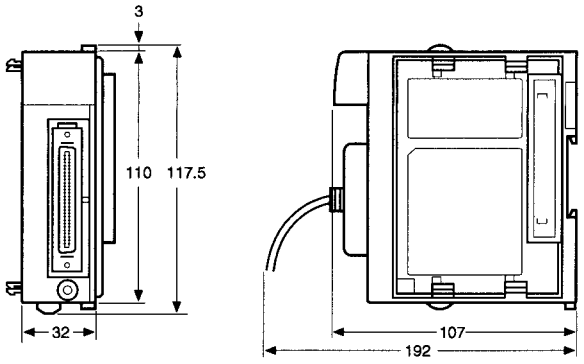
CQM1-PA206/PA216/PD026



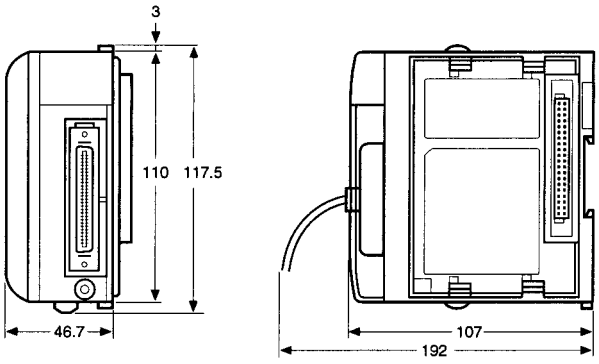
Units for Expansion I/O Blocks

The following diagrams show the dimensions of the I/O Control Unit and I/O Interface Unit. All dimensions are in millimeters.

I/O Control Unit



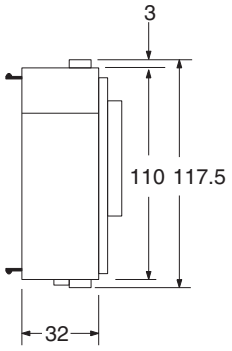
I/O Interface Unit



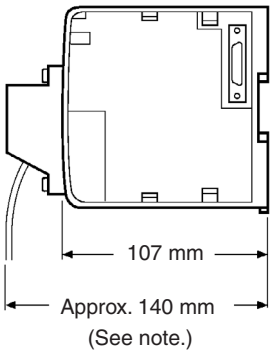
I/O Units

The following diagrams show the dimensions of the I/O Units. All dimensions are in millimeters.

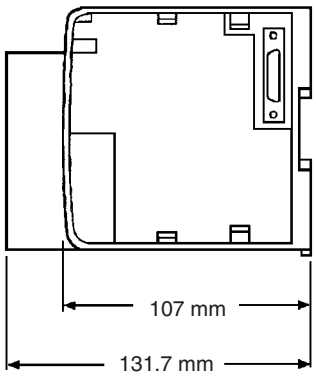
I/O Unit Front View



Connector-type I/O Unit Side View



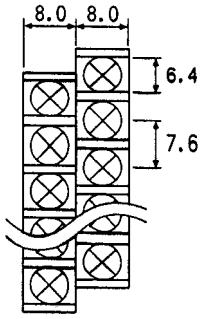
CQM1-OC224 Output Unit Side View



Note The depth of connector-type I/O Units is approx. 120 mm when pressure-welded connectors are used.

Terminal Block

The following diagram shows the dimensions of the terminal block for the terminal block-type I/O Units. All dimensions are in millimeters.



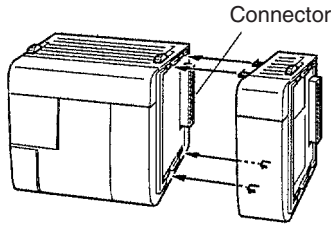
Unit: mm

4-4 Connecting PC Components

The Units that make up a CQM1H PC can be connected simply by pressing the Units together and sliding the locking tabs towards the back of the Units. The End Cover is connected in the same way to the Unit on the far right side of the PC. Follow the procedure listed below to connect PC components.

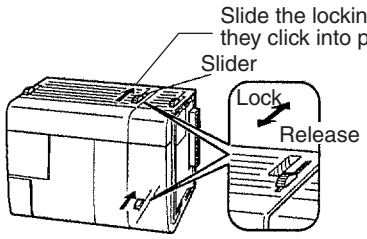
Always turn OFF the CQM1H when connecting or disconnecting Units. Replace Units only after shutting down the CQM1H system.

1,2,3... 1. The following diagram shows the connection of two Units that make up a CQM1H PC. Join the Units so that the connectors fit exactly.



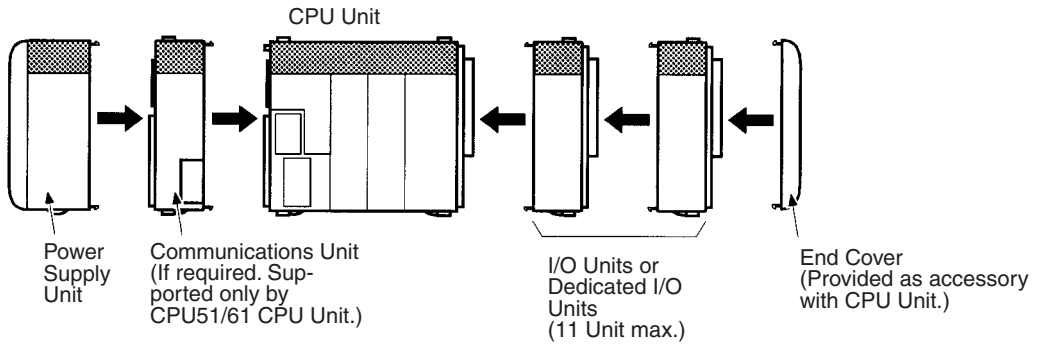
2. The yellow locking tabs at the top and bottom of each Unit lock the Units together. Slide these locking tabs towards the back of the Units as shown below until they click into place.

   Note If the locking tabs are not secured properly, the CQM1H may not function properly. Be sure to slide the locking tabs until they are securely in place.

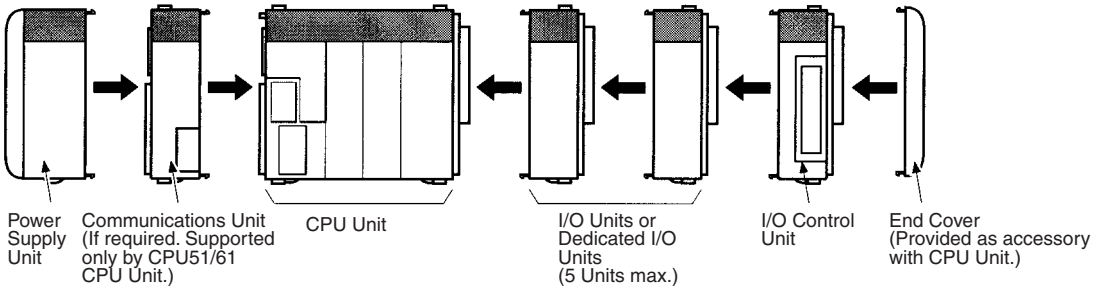


3. Attach the End Cover to the Unit on the far right side of the PC.

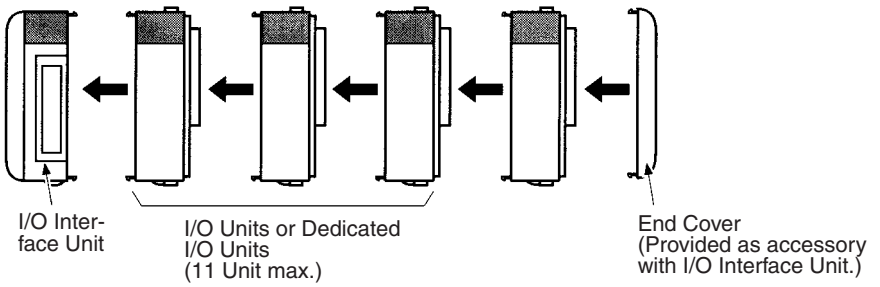
CPU Block Only



CPU Block for Connection to Expansion I/O Block



Expansion I/O Block



There is no Backplane for the CQM1H. The PC is constructed by connecting Units together using the connectors on the sides.

⚠ **Caution** Attach the End Cover to the Unit on the far right side of the PC. The PC will not operate properly if the End Cover is not connected.

CPU Unit	CPU Block Only		CPU Block and Expansion I/O Block			
			CPU Block			Expansion I/O Block
	Communications Unit	I/O and Dedicated I/O Units	Communications Unit	Inner Boards	I/O and Dedicated I/O Units	I/O and Dedicated I/O Units
CQM1H-CPU61	1	11 max. (See note 1.)	1	2 max.	5 max. (See note 2.)	11 max. (See note 3.)
CQM1H-CPU51						
CQM1H-CPU21	Cannot be connected.		Cannot be connected.	Cannot be mounted.		
CQM1H-CPU11						

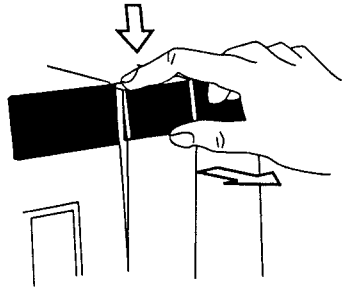
Note

1. The connected Units (CPU Unit, Communications Unit, Inner Boards, I/O Units, and Dedicated I/O Units) must be selected so that the maximum current capacity of the Power Supply Unit is not exceeded.
2. The connected Units (CPU Unit, Communications Unit, Inner Boards, I/O Units, Dedicated I/O Units, and I/O Control Unit) must be selected so that the current consumption does not exceed 3.0 A.
3. The connected Units (I/O Interface Unit, I/O Units, and Dedicated I/O Units) must be selected so that the current consumption does not exceed 2.0 A
4. The combined current consumption of the CPU Block and the Expansion I/O Block must not exceed 5 A.
5. An Analog Power Supply Unit must be counted as a Unit, just like the I/O and Dedicated I/O Units.

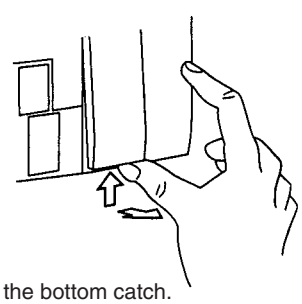
4-5 Inner Board Installation

Use the following procedure to mount Inner Boards in the CPU Unit.

1,2,3... 1. Press the catch at the top of the Inner Board compartment cover.

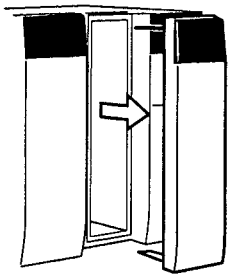


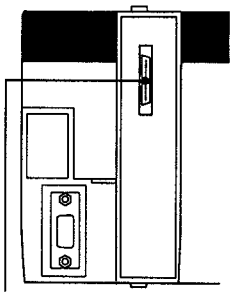
Press the top catch.



Press the bottom catch.

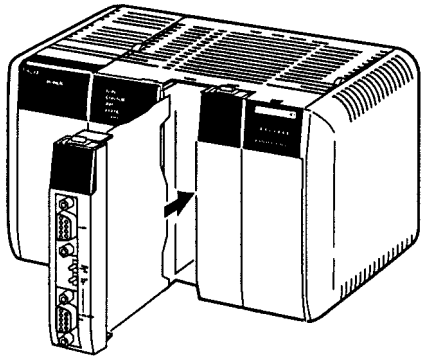
2. Remove the Inner Board compartment cover.





Inner Board connector

3. Mount the Inner Board.



⚠ **Caution** Always turn the power OFF before installing or removing the Inner Board. Installing or removing the Inner Board with the power ON can cause the CPU Unit to malfunction, damage internal components, or cause communications errors.

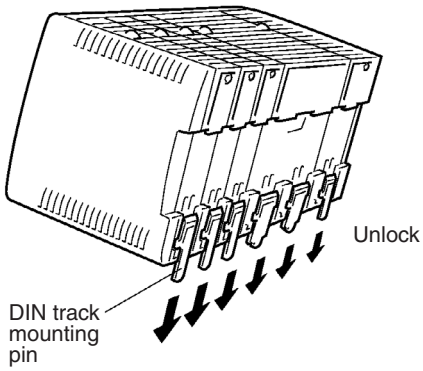
⚠ **Caution** Before installing the Inner Board, be sure to first touch a grounded metallic object, such as a metal water pipe, in order to discharge any static build-up.

4-6 DIN Track Installation

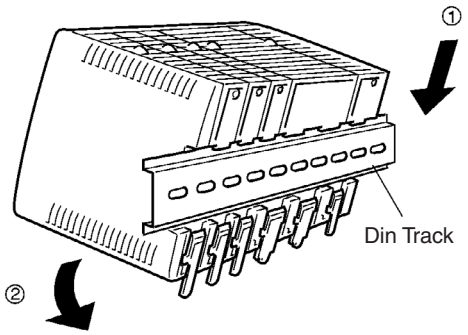
Use the following procedure to install a CQM1H PC on DIN Track.

1,2,3...

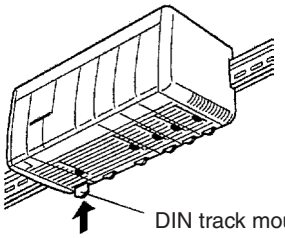
1. Mount the DIN Track securely to the control board or inside the control panel using screws in at least 3 separate locations.
2. Release the pins on the backs of the CQM1H Units. These pins lock the PC to the DIN Track.



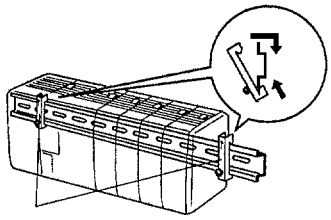
3. Fit the back of the PC onto the DIN Track by inserting the top of the track and then pressing in at the bottom of the PC, as shown below.



4. Lock the pins on the backs of the CQM1H Units.



5. Install a DIN Track End Bracket on each side of the PC. To install a Bracket, hook the bottom of the Bracket on the bottom of the track, rotate the Bracket to hook the top of the Bracket on the top of the track, and then tighten the screw to lock the Bracket in place.

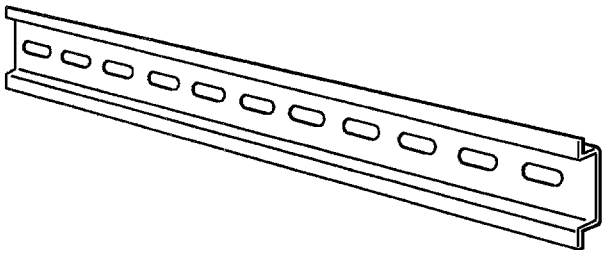


DIN Track End Brackets

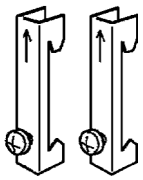
DIN Track and Accessories

Use the DIN Track and DIN Track End Brackets shown below.

DIN Track
Model numbers: PFP-50N (50 cm), PFP-100N (100 cm), PFP-100N2 (100 cm)



DIN Track End Plates (2 required)
Model number: PFP-M



4-7 Wiring and Connections

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

4-7-1 Power Supply Unit Wiring

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

⚠ **Caution** Disconnect the LG terminal of the Power Supply Unit when performing dielectric strength tests.

⚠ **Caution** Use crimp connectors for wiring. Do not connect bare stranded wires directly to terminals.

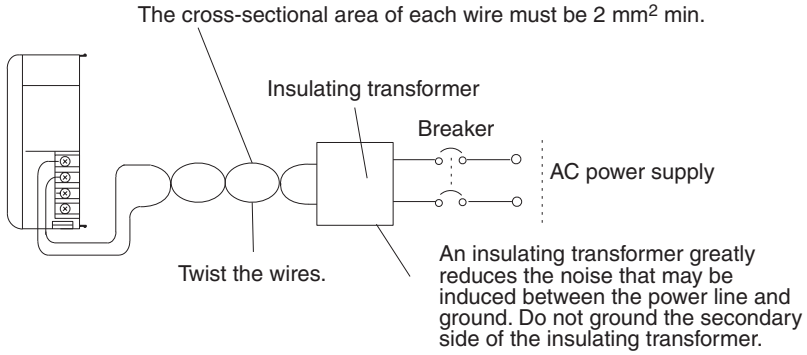
⚠ **Caution** Do not remove the seal from the top of the Power Supply Unit until wiring has been completed. Remove the seal before operating the Unit to prevent overheating.

AC Power Supply Unit Wiring

The following diagram shows the proper connections to an AC power supply. The AC voltage should be between 100 and 240 V AC (50 to 60 Hz). Refer to *3-2-2 Selecting a Power Supply Unit* for details on Power Supply Unit capacity.

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

⚠ **Caution** Tighten the AC power terminal screws to a torque of 0.8 N • m. Loose terminal screws can cause fires or errors in operation.



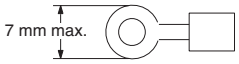
⚠ **Caution** Be sure that the AC power supply voltage remains within the allowable voltage range. For details refer to *2-1-1 Power Supply Units*.

The CQM1-PA216 Power Supply Unit is switchable with an input voltage range of 80 to 138 V AC or 160 to 264 V AC. Refer to *3-2-2 Selecting a Power Supply Unit* for details.

Crimp Connectors

Use round M3.5 crimp connectors of the dimensions shown below for wiring AC Power Supply Units.

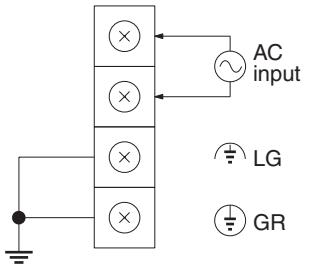
Note Always use crimp connectors for wiring. Do not connect bare stranded wires directly to terminals.



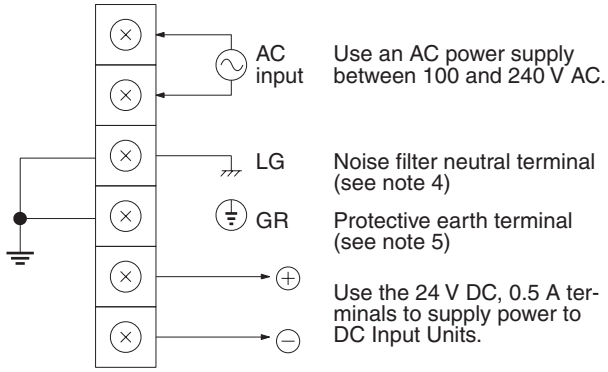
Terminal Blocks

The following diagram shows the terminal blocks for the AC Power Supply Units.

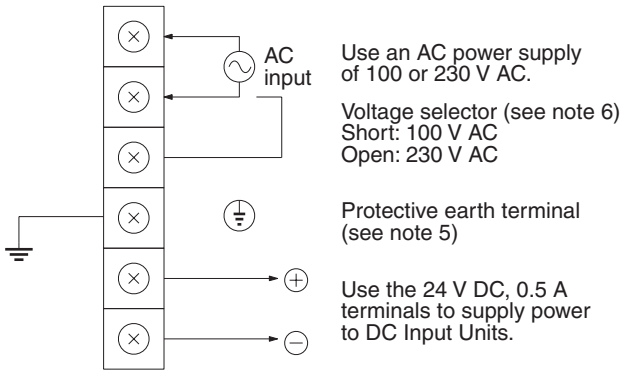
CQM1-PA203



CQM1-PA206



CQM1-PA216

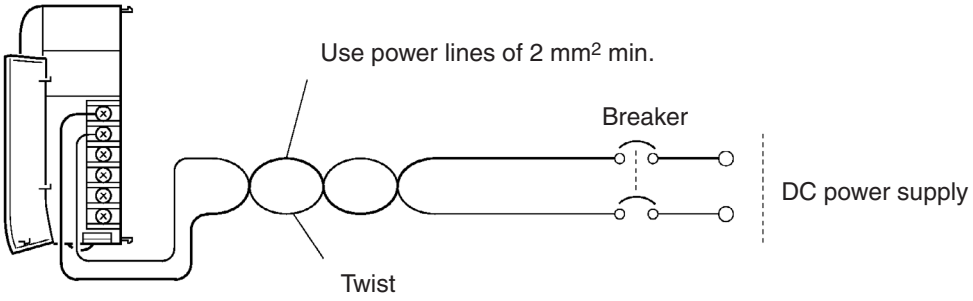


Note

1. The wire used should be at least 2 mm^2.
2. Provide the grounding point as close to the CQM1H PC as possible.
3. Tighten the terminal screws to a torque of 0.8 N • m.
4. LG (or):
   Noise filter neutral terminal. Short-circuit the LG (or) terminal and GR ( ) terminals using the short-circuit bar and ground them at a resistance of less than 100 Ω to reduce noise and prevent electric shock.
5. GR ( ):
   Protective earth terminal. Connect to a separate ground wire of at least 2 mm^2 to ground the terminal at a resistance of less than 100 Ω to prevent electric shock.
6. When supplying voltage at 100 V AC with the CQM1-PA216, the voltage selector terminals must be shorted, and when supplying voltage at 230 V AC the must be open. When power is supplied at 230 V AC using the CQM1-PA216, remove the short-circuit bar (provided as an accessory) that shorts the voltage selector terminals. The Unit will be damaged if 230 V AC is supplied with the short-circuit bar connected.

DC Power Supply Unit Wiring

The following diagram shows the proper connections to a DC power supply. Use a 24-V DC power supply. Refer to *3-2-2 Selecting a Power Supply Unit* for details on Power Supply Unit capacity.



⚠ **Caution** Be sure that the DC power supply voltage remains within the allowed fluctuation range of 20 to 28 V DC.

Crimp Connectors

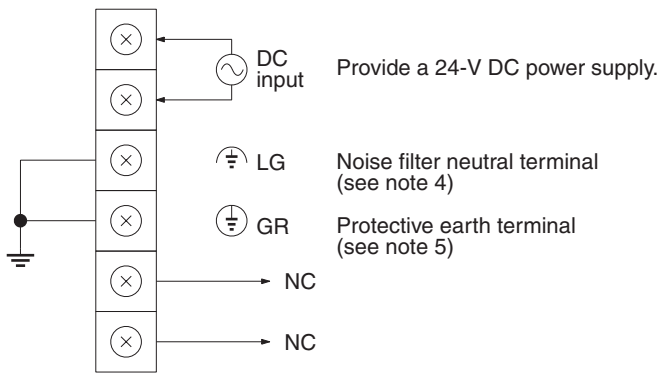
Use M3.5 crimp connectors of the dimensions shown below for wiring DC Power Supply Units.

Note Always use crimp connectors for wiring. Do not connect bare stranded wires directly to terminals.

Terminal Block

The following diagram shows the terminal block for the DC Power Supply Unit.

CQM1-PD026



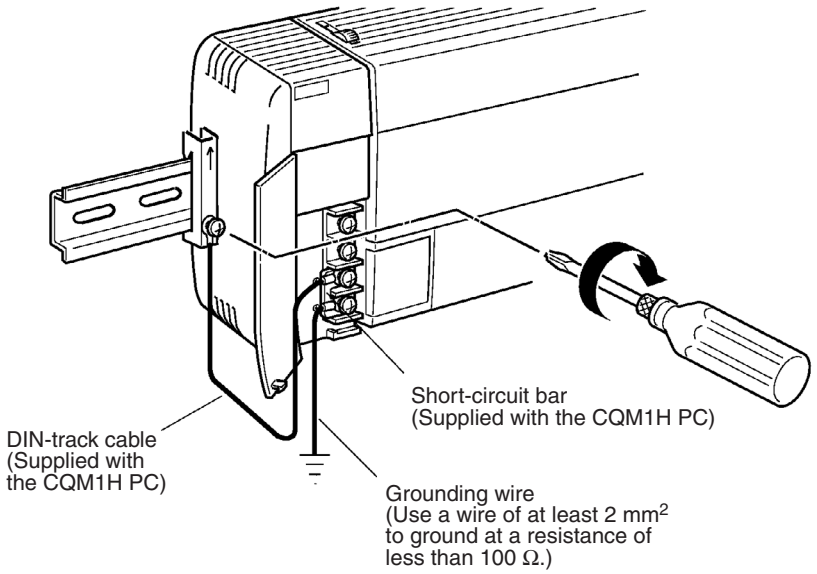
Note

1. The wire used should be at least 2 mm^2.
2. Provide the grounding point as close to the CQM1H PC as possible.
3. Tighten the terminal screws to a torque of 0.8 N • m.
4. LG ( ):
   Noise filter neutral terminal. Short-circuit the LG ( ) terminal and GR ( ) terminals using the attached short-circuit bar and ground them at a resistance of less than 100 Ω to reduce noise and prevent electric shock.
5. GR ( ):
   Protective earth terminal. Connect to a separate ground wire of at least 2 mm^2 to ground the terminal at a resistance of less than 100 Ω to prevent electric shock.
6. To satisfy the EC directives (low-voltage directive), provide reinforced insulation or double insulation for the power supply.

Wiring Precautions for Ground Wires

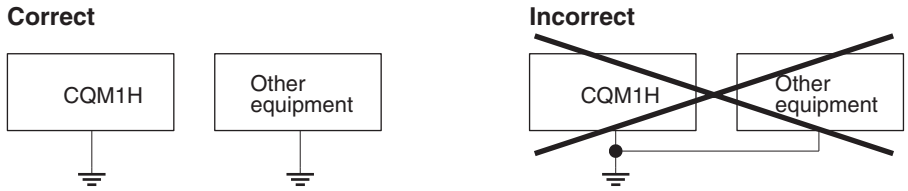
Wire the grounding wires according to the diagram below.

In order to improve the electromagnetic compatibility (EMC), connect the LG (or) terminal to the screw on the end plate using the DIN-track connecting cable provided.



Note Definition of EMC:
The EMC refers to the capacity of equipment represented in terms of emission, which indicates the degree to which electromagnetic waves produced by equipment do not affect other communications equipment, and also in terms of immunity, which indicates the degree of resistance against electromagnetic disturbance.

⚠ **Caution** Do not share grounds with other equipment or attaching to the beam of a building. Improper grounding will cause adverse results.



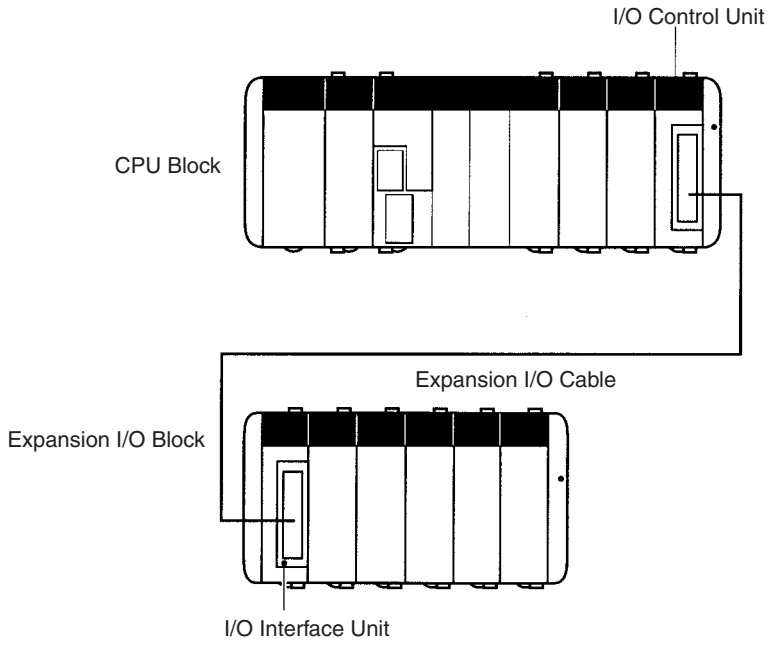
4-7-2 Connecting the CPU Block and Expansion I/O Block

Expansion I/O Cable

A CS1-series Expansion I/O Cable must be used. One of these cables is shown below.

Name	Model	Specifications
Expansion I/O Cable	CS1W-CN313	Length: 0.3 m
	CS1W-CN713	Length: 0.7 m

Note A cable longer than 0.7 m cannot be used.



Connecting the Cable

Connect the I/O Control Unit on the CPU Block to the I/O Interface Unit on the Expansion I/O Block.

Connecting the Connectors

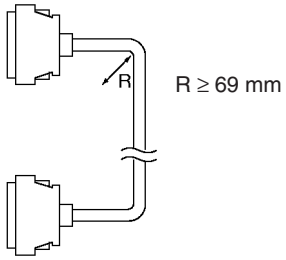
Press the locks on both sides of the connector and press in firmly until the connector locks into place. I/O bus errors will occur and operation will stop if the connector is not corrected properly.

Removing the Connectors

Press the locks on both sides of the connector until it releases and pull the connector straight out.

Cable Bending Radius

The maximum bending radius of the Expansion I/O Cable is 69 mm.

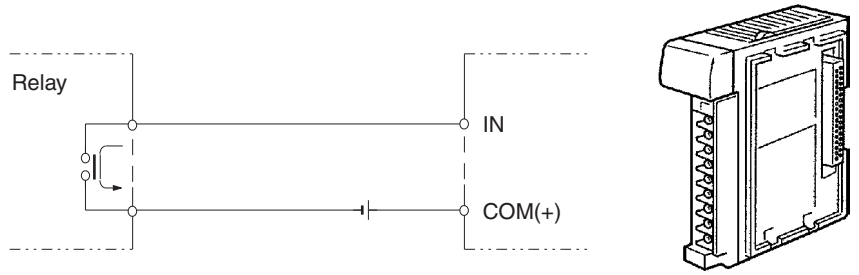
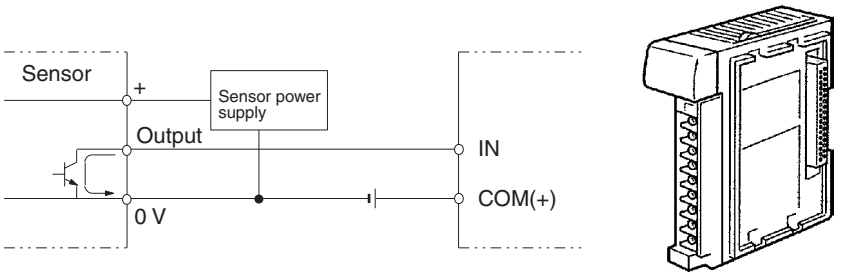
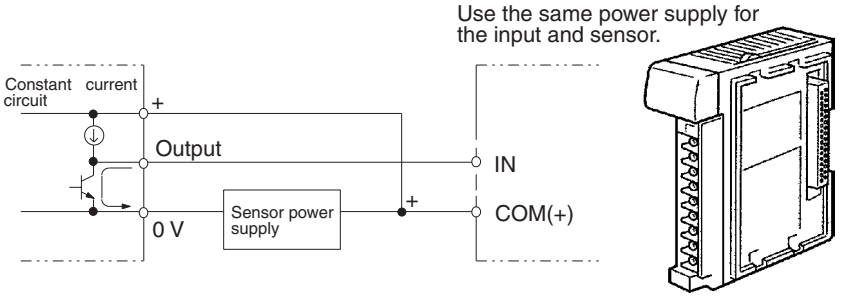
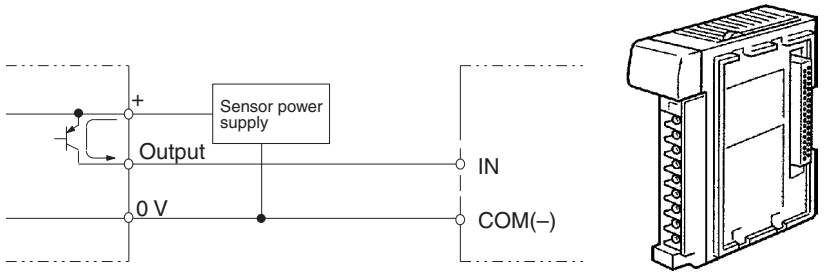
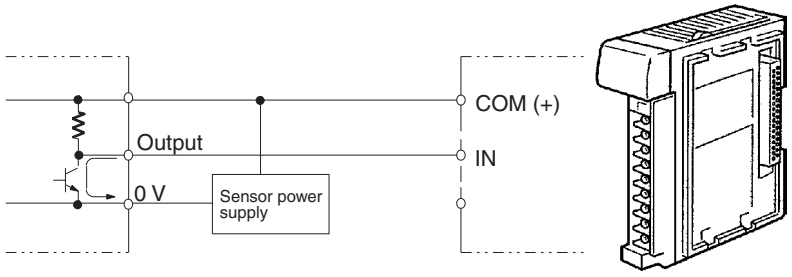


Note Place the Expansion I/O Cable into a separate duct from power lines and I/O lines to protect it from noise.

4-7-3 I/O Unit Wiring

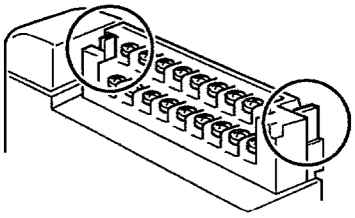
Input Devices

When connecting an external device with a DC output to a DC Input Unit, wire the device as shown in the following table.

Device	Circuit Diagram
Contact output	
NPN open collector	
NPN current output	
PNP current output	
Voltage output	

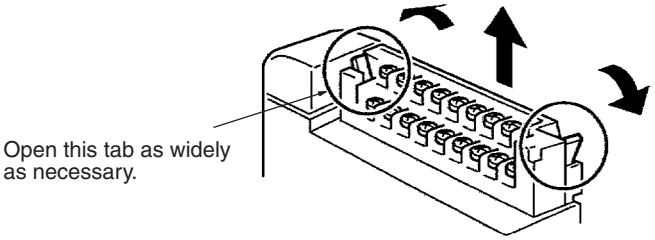
Terminal Block I/O Units with Terminal Block

The I/O Unit's terminal blocks are removable. Make sure that the connector tabs are locked in the vertical position, as shown in the following diagram. Although the terminal block position of the CQM1-OC224 is different, the removal method is the same.



Note Confirm that the terminal block is securely locked before use.

To remove the terminal block, push the connector tabs to the sides and lift the terminal block off the connector, as shown in the following diagram.



Crimp Connectors

Use M3 crimp connectors of the dimensions shown below for wiring terminal block-type I/O Units.

Note Tighten the terminal screws to a torque of 0.5 N • m.

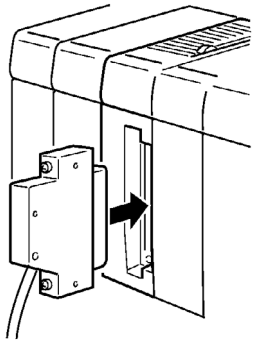
⚠ **Caution** Crimp connectors are required by UL and CSA standards.

I/O Units with Connectors

Connect either a cable prepared by the user or a dedicated cable to the I/O Unit connectors.

Name	No. of points	Specifications	Model
DC Input Unit	32	12 V DC (32 points per common)	CQM1-ID112
		24 V DC (32 points per common)	CQM1-ID213 CQM1-ID214
Transistor Output Unit	32	4.5 V DC, 16 mA to 26.4 V, 100 mA	CQM1-OD213
		24 V DC, 500 mA, PNP	CQM1-OD216

Connector Position



Note When using a cable connector with a locking mechanism, check that the lock is secure before use.

Prepare a cable for use with connector-type I/O Units (32-point Input or Output Units) in one of the following ways:

- Prepare a cable using a soldered-type socket and a connector cover (provided as accessories).
- Prepare a cable using a crimp-type or pressure-welded-type socket and a connector cover (purchased separately).
- Use an OMRON Terminal Block Conversion Unit dedicated cable or an I/O relay terminal connector cable.

4-7-4 Preparing Cables for 32-point Input and Output Units

Prepare cables for connectors on 32-point Input and Output I/O Units (CQM1-ID112, CQM1-ID213, CQM1-ID214 and CQM1-OD213, CQM1-OD216) as explained below.

Recommended Connectors (Cable Side)

Connector type	Model (by Fujitsu)	Set (from OMRON)
Soldered	Socket: FCN-361J040-AU Connector cover: FCN-360C040-J2	C500-CE404
Crimp	Housing: FCN-363J040 Contact: FCN-363J-AU Connector cover: FCN-360C040-J2	C500-CE405
Pressure welded	FCN-367J040-AU/F	C500-CE403

A soldered-type socket and connector cover are provided with each I/O Unit.

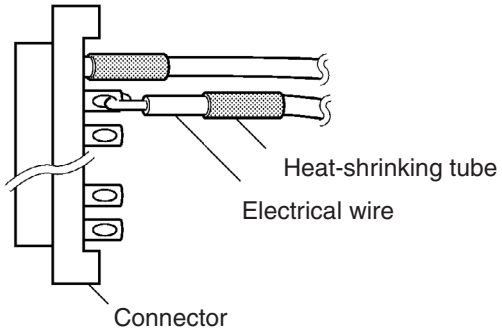
Recommended Wire

Use AWG26 to 24 (0.2 to 0.13 mm^2) wire for connecting to all of the connector pins.

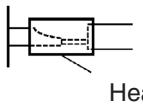
Note For details on pin arrangement and the internal circuitry of connectors at the CQM1H side, refer to the sections on DC Input Units (32 points) and Transistor Output Units (32 points) in this manual.

Wiring and Assembly

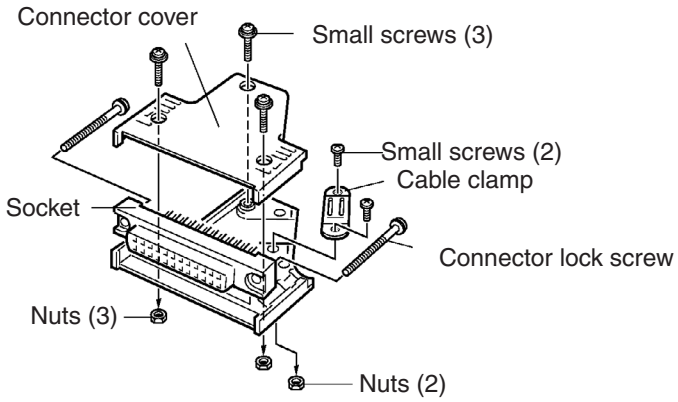
The following illustrations show the procedure for wiring and assembly of solder-type connectors. First pass the electrical wires through heat-shrinking tubes and solder them to the socket pins.



After soldering all of the necessary pins, slide the heat-shrinking tubes over the soldered areas of the respective wires. Then shrink the tubes by heating them with a jet of hot air.

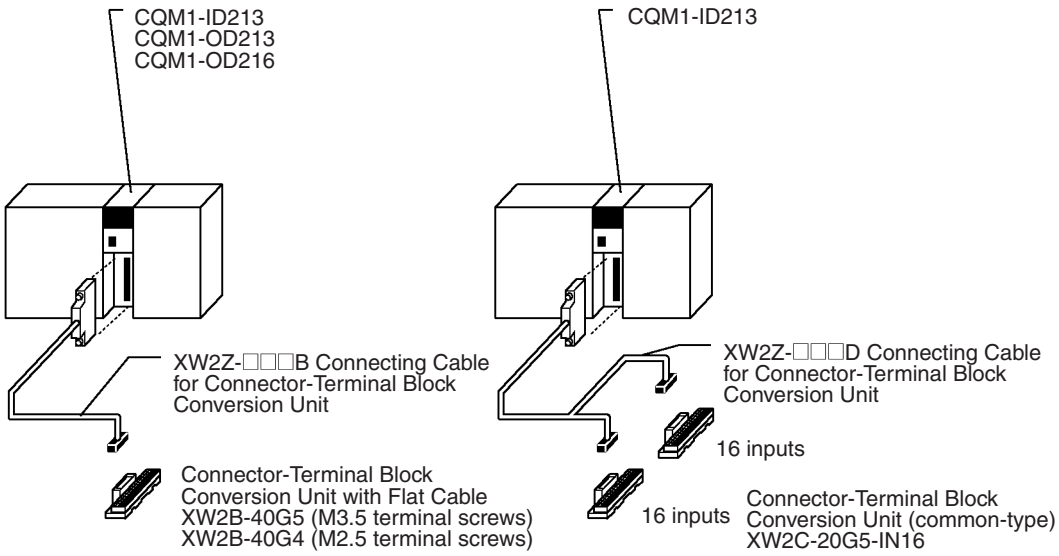


Finally, assemble the socket and connector cover as shown below.

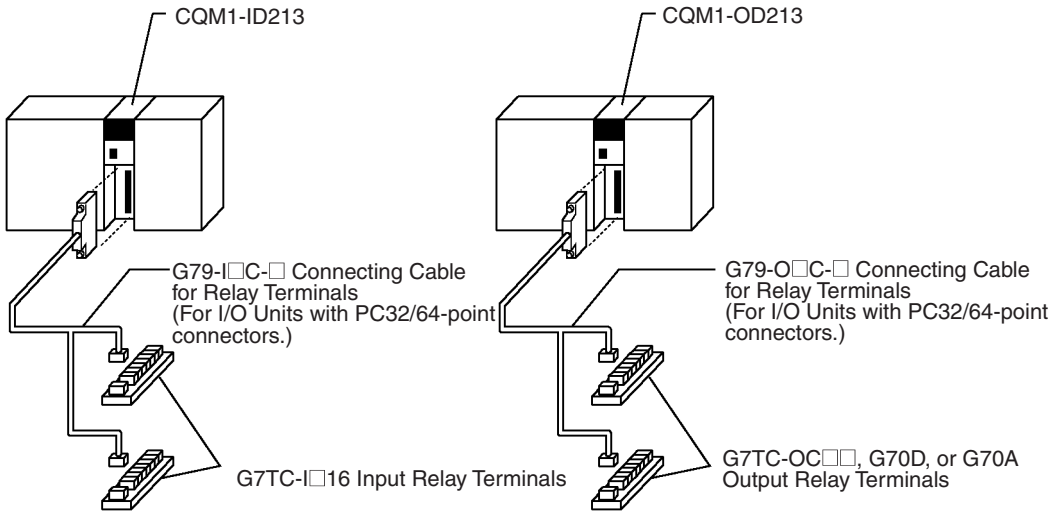


Preassembled Cables The following examples show applications for preassembled OMRON Cables. Contact your OMRON representative for details.

1,2,3... 1. Connecting to a terminal block.



2. Connecting to a Relay Terminal.



4-8 I/O Unit Wiring Precautions

⚠ **Caution** Do not remove the protective label from the top of the Unit until wiring has been completed. This label prevents wire strands and other foreign matter from entering the Unit during wiring procedures. Remove the label after the completion of wiring to ensure proper heat dissipation. Leaving the label attached may result in malfunction.

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

⚠ **Caution** Tighten the terminal screws to a torque of 0.5 N • m.

⚠ **Caution** Always use crimp connectors for wiring. Do not connect bare stranded wires directly to terminals.

⚠ **Caution** To satisfy the EC directives (low-voltage directive), provide reinforced insulation or double insulation on the I/O Units' DC power supply.

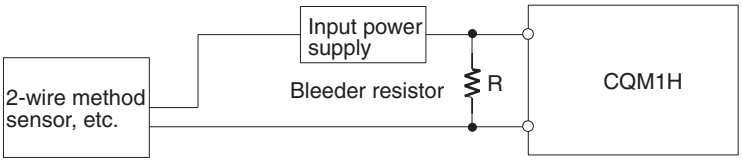
⚠ **Caution** Install external breakers and take other safety measures against short-circuiting in external wiring. Insufficient safety measures against short-circuiting may result in burning.

⚠ **Caution** Double-check all the wiring before turning ON the power supply. Incorrect wiring may result in burning.

⚠ **Caution** Do not apply voltages exceeding the input voltages to Input Units or voltages exceeding the switching capacity to Output Units. Doing so may result in damage or destruction of the I/O Unit or result in fire.

Leakage Current (24 V DC)

When two-wire sensors, such as photoelectric sensors, proximity sensors, or limit switches with LEDs, are used, the input bit may be turned ON erroneously by leakage current. If the leakage current exceeds 1.3 mA, insert a bleeder resistor in the circuit to reduce the input impedance, as shown in the following diagram.



$R = 7.2/(2.4\ I - 3)\ k\Omega$ max. I: Device's leakage current (mA)
R: Bleeder resistance (kΩ)
$W = 2.3/R$ W min. W: Bleeder resistor's power rating (W)

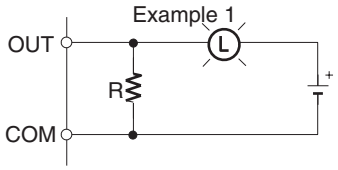
The equations above were derived from the following equation:

$$I \times \frac{R \times \dfrac{\text{Input voltage (24)}}{\text{Input current (10)}}}{R + \dfrac{\text{Input voltage (24)}}{\text{Input current (10)}}} \leq \text{OFF voltage (3)}$$

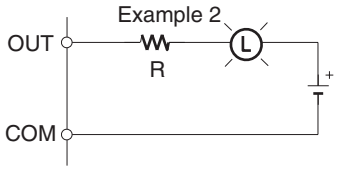
$$W \geq \text{Input voltage (24)}/R \times \text{Input voltage (24)} \times \text{margin (4)}$$

Inrush Current

The following diagram shows two methods that can be used to reduce the large inrush current caused by certain loads, such as incandescent light bulbs.



Generating a dark current (about 1/3 of the rated current) through the incandescent bulb.

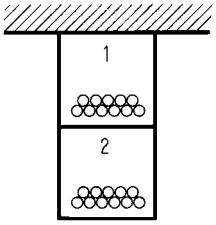


Inserting a regulating resistance.

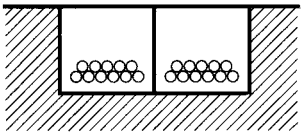
Be careful not to damage the output transistor.

Reducing Noise in I/O Signals

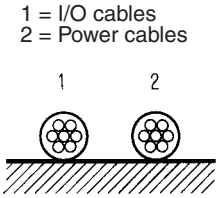
Whenever possible, place I/O signal lines and power lines in separate ducts or raceways both inside and outside of the control panel.



Suspended duct



In-floor duct

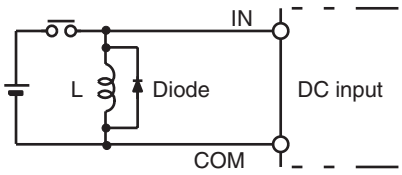


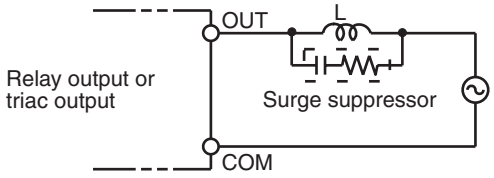
Conduits

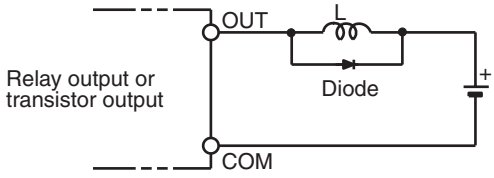
If the I/O wiring and power wiring must be routed in the same duct, use shielded cable and connect the shield to the GR terminal to reduce noise.

Inductive Loads

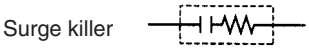
When an inductive load is connected to an I/O Unit, connect a surge suppressor or diode in parallel with the load as shown below.







Note Use surge suppressors and diodes with the following specifications.



Surge killer

Resistance: 50 Ω
Capacitor: 0.47 μF
Voltage: 200 V

Diode

Peak inverse voltage:
Minimum of 3 times load voltage

Average rectifying current: 1 A

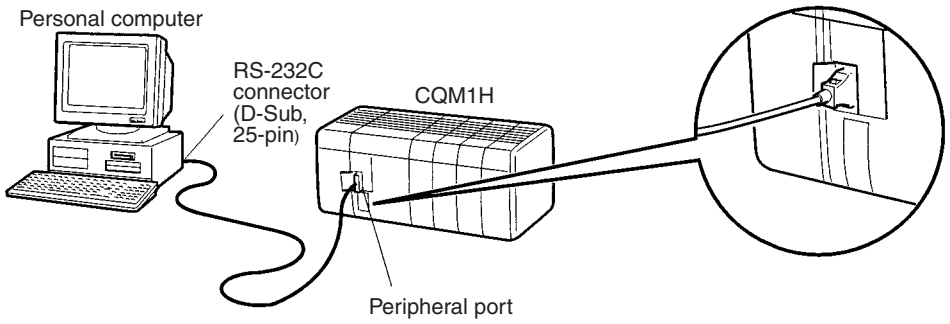
4-9 Connecting Programming Devices

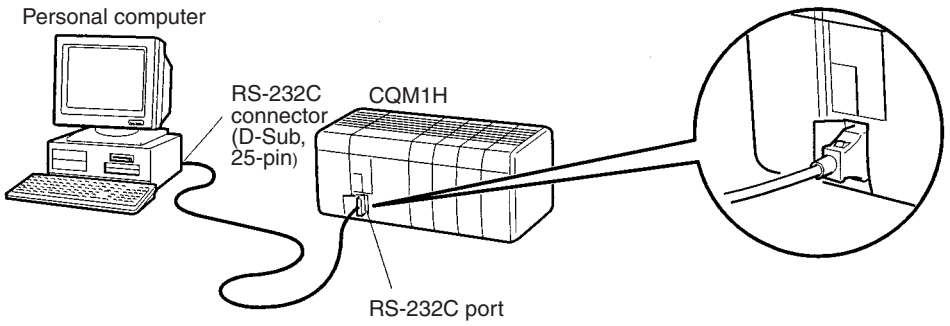
Programming Devices can be connected to the CQM1H. When connecting to the peripheral port, be sure to insert the connector securely.

Host Computer Connection

The CQM1H CPU Unit can be connected to an IBM PC/AT compatible computer running Support Software using a compatible connecting cable.

Note When connecting the CQM1H to Support Software, turn ON pin 7 on the DIP switch. If pin 7 is OFF, it will not be possible to use Support Software and only Programming Console connections will be supported. When communicating via a peripheral bus, it is also necessary to turn OFF pin 5 on the DIP switch and make the communications settings in the PC Setup for Host Link. For details refer to *3-6 Programming Devices.*

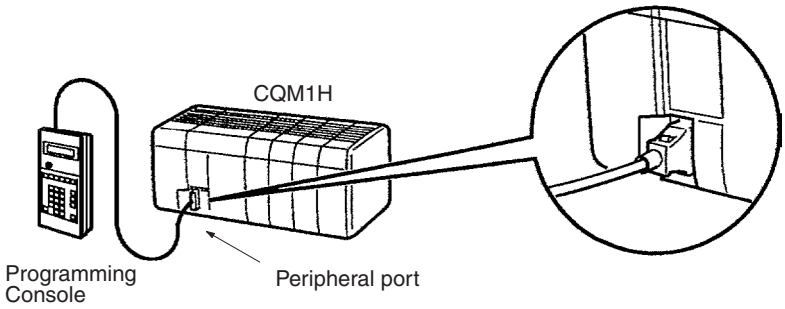




Programming Console Connection

The CQM1H CPU Unit can be connected to a Programming Console as shown below.

Note When connecting the CQM1H to a Programming Console, be sure to turn OFF pin 7 on the DIP switch (factory setting). If pin 7 is ON, it will not be possible to use a Programming Console.



4-10 Connecting Programmable Terminals

The different communications configurations available for communications with a Programming Terminal (PT) are shown in the following table.

Serial communications port		Serial communications mode	PC-to-PT ratio	Programming Console functions
CPU Unit's built-in RS-232C port		NT Link (1:1 mode)	One-to-one only	Supported (from PT)
Serial Communications Board	RS-232C port (port 1)	NT Link (1:1 mode, 1:N mode)	One-to-one or one-to-many	No
	RS-422A/485 (port 2)	NT Link (1:1 mode, 1:N mode)	One-to-one or one-to-many	No

Note

1. When communicating via a 1:1-mode NT Link, connect to the port on the PT that supports this mode. Communications will not be possible if connection is made to a port that supports only 1:N-mode communications.
2. When communicating via a 1:N-mode NT Link, connect to the port on the PT that supports this mode. Communications will not be possible if connection is made to a port that does not support this mode (e.g., the RS-232C port on the NT30/NT30C supports only 1:1 communications).
3. The NT20S, NT600S, NT30, NT30C, NT620S, NT620C, and NT625C cannot be used if the cycle time of the CPU Unit is 800 ms or longer (even if only one of these PTs is used in a 1:N NT Link.)
4. The Programming Console functions of the PT (Expansion Mode) cannot be used when connected to Serial Communications Board ports. They can be used only by connecting to the RS-232C port on the CPU Unit.

   Turn ON pin 7 on the DIP switch on the CPU Unit when using the Programming Console function of the PT.
5. Set a unique unit number for each PT connected to the same PC. If the same unit number is set for more than one PT, malfunctions will occur.

Use the following cables to connect to the PT. For details, refer to the relevant operation manual.

Cables for 1:1 Connections between PC and PT

PC Unit or Board	PC port	PT	PT port	Serial communications mode (see note)	Length	Model
CPU Unit or Serial Communications Board For the CPU Unit, the mode will be 1:1, for the Serial Communications Board, the mode will be 1:1 or 1:N.	RS-232C port (D-Sub, 9-pin, female)	NT20S, NT600S, NT620S, NT620C, NT625C	RS-232C port (D-Sub, 9-pin, female)	Host Link or NT Link (1:1 mode or 1:N mode)	2 m	XW2Z-200T
					5 m	XW2Z-500T
		NT30, NT30C	RS-232C port (D-Sub, 9-pin, female)	Host Link or NT Link (1:1 mode)	2 m	XW2Z-200T
					5 m	XW2Z-500T
		NT31, NT31C, NT631, NT631C	Port A: RS-232C port (D-Sub, 9-pin, female)	Host Link or NT Link (1:1 mode or 1:N mode)	2 m	XW2Z-200T
					5 m	XW2Z-500T
			Port B: RS-232C port (D-Sub, 25-pin, female)	Host Link or NT Link (1:1 mode or 1:N mode)	2 m	XW2Z-200S
					5 m	XW2Z-500S
		NT20M, NT600M, NT610G, NT612G, NT610C	RS-232C port (D-Sub, 25-pin, female)	Host Link	2 m	XW2Z-200S
					5 m	XW2Z-500S

Note For details of connections to the RS-422A/485 port on the Serial Communications Board, refer to the relevant operation manual.

Automatic Mode Change

When the PC is in RUN mode with a Programming Console connected to the peripheral port of the CPU Unit, if a PT is connected to the CPU Unit's built-in RS-232C port or either of the ports of a CQM1H-SCB41 using Host Link mode, the following message will be displayed at the Programming Console indicating that a password is required to continue operation (using the Programming Console).

```
<MONITOR>
PASSWORD!
```

This is because, in order to write data to the CPU Unit, the PT changed the operation mode from RUN mode to MONITOR mode. To continue operation using the Programming Console, it is necessary to input the password again.

Inputting the Password

```
<MONITOR>
PASSWORD!
```

CLR MONTR

```
<MONITOR>      BZ
```

CLR

```
00000
```

- The mode will not be changed if the PT is connected via an NT Link.

- When a Programming Device installed on a computer is connected to the peripheral port, the display (at the computer) for the CPU Unit's operation mode will simply change from "RUN" to "MONITOR."