

The CQM1H's rack-less modular design lets you customize your control system by adding "inner boards" for advanced functions, as well as specialized I/O and communications modules. CQM1H offers the most flexibility of all PLC systems in its class.



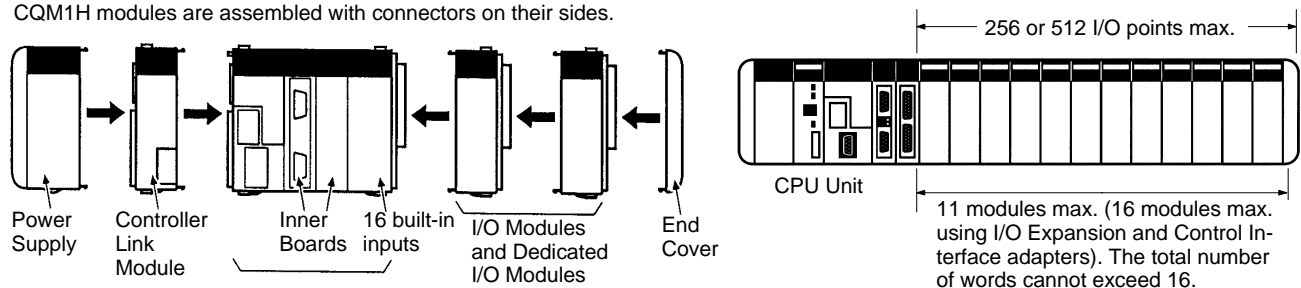
- 4 different base CPUs to choose from; 16 DC inputs built in; expands up to 512 points
- No separate backplane required
- Inner Boards allow "customized" configuration of the CPU
- Serial communications inner board supports protocol macro feature for communication with third-party serial devices
- Supports all existing and new CQM1 I/O and specialized I/O modules
- Optional memory cassettes allow backup of sensitive data, provides a real-time clock
- ControllerLink network transmits 8 kword data packets at up to 2 Mbps; 32 nodes
- Advanced instruction set includes PID, floating point math, protocol macro instructions and more
- CompoBus/S, SYSMAC BUS and AS-interface masters support remote I/O
- Up to 15.2 kwords of program memory



### Basic Configuration

Select the CPU and I/O modules (discrete, analog and dedicated special function types) then determine the power supply based on the current consumption. The I/O Control and Interface adapters give you the option of dividing the CPU and I/O system into two narrower units than the examples shown below. The CQM1H-CPU51/CPU61 models offer space-saving position and motion control solutions as well as additional analog and serial communications capabilities right at the CPU.

CQM1H modules are assembled with connectors on their sides.



# Ordering Information

## ■ CPU UNITS

Specifications						International standards	Part number
Memory capacity	Max. I/O capacity	Built-in inputs	Built-in RS-232C port	Support of Inner Boards	Support of Controller Link Unit		
Program: 3.2 kwords DM area: 3 kwords	256 points	16 DC inputs	No	No	No	U, C, N, CE	<b>CQM1H-CPU11</b>
			Yes				<b>CQM1H-CPU21</b>
Program: 7.2 kwords DM area: 6 kwords	512 points			Yes	Yes		<b>CQM1H-CPU51</b>
Program: 15.2 kwords DM area: 6 kwords EM area: 6 kwords							<b>CQM1H-CPU61</b>

## ■ POWER SUPPLY UNITS

Item	Specifications				International standards	Part number
	Rated voltage	Allowed voltage range	Output capacity	Service power supply		
AC power supply units	100 to 240 VAC, 50/60 Hz	85 to 265 VAC	18 W	None	U, C, N, L, CE	<b>CQM1-PA203</b>
			30 W	24 VDC, 0.5 A	U, C, L, N	<b>CQM1-PA206</b>
	110/230 VAC, 50/60 Hz	80 to 138 VAC 160 to 276 VAC	30 W	24 VDC, 0.5 A	CE	<b>CQM1-PA216</b>
DC power supply units	24 VDC	20 to 28 VDC	30 W	—	U, C, N, L, CE	<b>CQM1-PD026</b>

## ■ MEMORY CASSETTES

Memory	Memory capacity/Clock function	International standards	Part number
Flash memory	16 kwords	U, C, N, CE	<b>CQM1H-ME16K</b>
	with clock		<b>CQM1H-ME16R</b>
EEPROM	8 kwords	U, C, N, L, CE	<b>CQM1-ME08K</b>
			with clock
	4 kwords		<b>CQM1-ME04K</b>
			with clock
EPROM memory cassette (Memory chip not included)	Cassette with IC socket only (EPROM chip sold separately)		<b>CQM1-MP08K</b>
	with clock		<b>CQM1-MP08R</b>
EPROM chip	128 KB (8 kwords), 150 ns, 27128 IC or equivalent, 12.5 V	L	<b>ROM-ID-B</b>
	256 KB (16 kwords), 150 ns, 27256 IC or equivalent, 12.5 V	CE	<b>ROM-JD-B</b>
	512 KB (32 kwords), 150 ns, 27512 IC or equivalent, 12.5 V		<b>ROM-KD-B</b>

## ■ I/O EXPANSION AND CONTROL INTERFACE ADAPTERS

Use I/O Expansion and Control Interface adapters for applications that require 11 to 16 I/O modules.

Memory	Memory capacity/Clock function	International standards	Part number
I/O control adapter	Connects to right-hand side of CPU block	U, C, CE	<b>CQM1H-IC101</b>
I/O interface adapter	Connects to left-hand side of Expansion I/O block		<b>CQM1H-II101</b>
I/O extension cable	Connects the I/O control module to the I/O interface module	L, CE	Cable length: 0.3 m <b>CS1W-CN313</b>
			Cable length: 0.7 m <b>CS1W-CN713</b>

Note: U: UL, C: CSA, N: NK, L: LLOYD, CE: EC Directives

## ■ I/O MODULES

### Input Modules

Input type	Number of inputs	Input voltage	Input current	Common type	Connector type	International standards	Part number
DC inputs	8	12 to 24 VDC	10 mA	Independent	Terminal block	U, C, N, L, CE	<b>CQM1-ID211</b>
	16	12 VDC	6 mA	Shared		U, C	<b>CQM1-ID111</b>
		24 VDC				U, C, N, L, CE	<b>CQM1-ID212</b>
	32	12 VDC	4 mA	Shared	Connector	U, C	<b>CQM1-ID112</b>
		24 VDC				U, C, N, L, CE	<b>CQM1-ID213</b>
	AC inputs	8	100 to 120 VAC	5 mA	Shared	Terminal block	U, C, L, CE
200 to 240 VAC			6 mA	<b>CQM1-IA221</b>			

### Output Modules

Output type	Number of outputs	Max. switching voltage	Max. switching current	Common type	Connector type	International standards	Part number
Contact outputs	8	250 VAC, 24 VDC	2 A	Independent	Terminal block	U, C, N, L	<b>CQM1-OC221</b>
	16			Shared			<b>CQM1-OC222</b>
	8			Independent			CE
Transistor	8	24 VDC	2 A (NPN)	Shared (fused)	Terminal block	U, C, N, L, CE	<b>CQM1-OD211</b>
	16		0.3 A (NPN)				<b>CQM1-OD212</b>
	32		0.1 A (NPN)		Connector		<b>CQM1-OD213</b>
Transistor	8	24 VDC	1 A (PNP)	Shared (fused)	Terminal block	U, C, L, CE	<b>CQM1-OD215</b>
	16		0.3 A (PNP)				<b>CQM1-OD214</b>
	32		0.5 A (PNP)		Connector		CE
Triac	8	240 VAC	0.4 A	Shared (short circuit protected)	Terminal block	U, C, L	<b>CQM1-OA221</b>
	6					CE	<b>CQM1-OA222</b>

## ■ INNER BOARDS

Item	Specifications	International standards	Part number
High-speed counter board	4 pulse inputs (high-speed counter) at 500 kHz max. 4 external outputs	U, C, N, CE	<b>CQM1H-CTB41</b>
Pulse I/O board	2 pulse inputs: Single-phase: 50 kHz, Differential phase: 25 kHz 2 pulse outputs: 50 kHz max., both fixed and variable duty factors are supported.	U, C	<b>CQM1H-PLB21</b>
Absolute encoder interface board	2 absolute encoder (gray code binary) inputs (4 kHz)	U, C, N	<b>CQM1H-ABB21</b>
Analog setting board	4 analog settings	U, C, N, CE	<b>CQM1H-AVB41</b>
Analog I/O board	4 analog inputs of 0 to 5 V, 0 to 20 mA, -10 to +10 V 2 analog outputs of 0 to 20 mA, -10 to +10 V	CE	<b>CQM1H-MAB42</b>
Serial communications board	One RS-232C port and one RS-422A/RS-485 port	U, C, N, CE	<b>CQM1H-SCB41</b>

Note: U: UL, C: CSA, N: NK, L: LLOYD, CE: EC Directives

## ■ COMMUNICATION MODULES

### Controller Network Module

Item	Specifications	International standards	Part number
Controller Link module (wired)	Data link (Maximum number of words per node: 8,000) Communications instructions: SEND/RECV/CMND	U, C, CE	<b>CQM1H-CLK21</b>

### Field Network Modules

Item	Specifications	International standards	Part number
CompoBus/S master module	Number of I/O points per Master: 128 (64 inputs and 64 outputs; ) Communications cycle time: 0.5 ms min. Max. transmission distance: 500 m in long-distance mode 100 m in high-speed mode Max. slaves per master: 32	U, C, CE	<b>CQM1-SRM21-V1</b>
SYSMAC BUS modules	Remote master (*Use G730 transistor and relay output modules.) Connects CQM1H to G730 SYSMAC BUS remote I/O modules; max. 64 I/O (32 or 16 inputs or outputs, DIP switch selectable) Number of I/O points per Master: 128 Communications cycle time: 187.5 kbps Max. transmission distance: 200 m One master and two expansions allowed per system		<b>CQM1-G7M21</b>
	Input expansion Expands G730 input capacity of G730 remote master; adds 32 or 16 inputs, DIP switch selected		<b>CQM1-G7N11</b>
	Output expansion Expands G730 output capacity of G730 remote master; adds 32 or 16 outputs, DIP switch selected		<b>CQM1-G7N01</b>
DeviceNet I/O link module	Number of I/O points: 16 inputs and 16 outputs Maps the 16 inputs and 16 outputs as a single node.		<b>CQM1-DRT21</b>
AS-interface master module	Number of I/O points: 248 (124 inputs and 124 outputs; 4 inputs/4 outputs per slave) Communications cycle time: 5.148 ms min. Max. transmission distance: 100 m; 300 m with 2 repeaters Max. slaves per master: 31 slaves per master module		<b>CQM1-ARM21</b>

Note: \*G730 transistor and relay output modules are shown in the Complementary Products section in this catalog.

## ■ DEDICATED I/O MODULES

Item	Specifications	International standards	Part number	
Analog I/O modules	Analog inputs: 4 points, built-in power supply	U, C, N, CE	<b>CQM1-AD042</b>	
	Analog inputs: 4 points, order separate power supply	U, C, N, CE	<b>CQM1-AD041</b>	
	Analog outputs: 2 points, built-in power supply	U, C, N, CE	<b>CQM1-DA022</b>	
	Analog outputs: 2 points, order separate power supply		<b>CQM1-DA021</b>	
	Power Supply Module required for AD041 and DA021 modules	For one Analog module		<b>CQM1-IPS01</b>
		For two Analog modules		<b>CQM1-IPS02</b>
B7A Master link modules*	16 outputs	—	<b>CQM1-B7A02</b>	
	16 inputs	U, C	<b>CQM1-B7A12</b>	
	32 outputs		<b>CQM1-B7A03</b>	
	32 inputs		<b>CQM1-B7A13</b>	
	16 inputs and 16 outputs	—	<b>CQM1-B7A21</b>	
Temperature controller modules	Thermocouple input, transistor (NPN) output, 2 loops	U, C, CE	<b>CQM1-TC001</b>	
	Thermocouple input, transistor (PNP) output, 2 loops		<b>CQM1-TC002</b>	
	Platinum resistance thermometer input, transistor (NPN) output, 2 loops		<b>CQM1-TC101</b>	
	Platinum resistance thermometer input, transistor (PNP) output, 2 loops		<b>CQM1-TC102</b>	

Note: U: UL, C: CSA, N: NK, L: LLOYD, CE: EC Directives

\*B7A Slave Link Modules are listed in the Dedicated I/O Modules section describing B7A Master Link Modules.

Dedicated I/O Modules – continued from previous page

Item	Specifications	International standards	Part number
Temperature controller modules (continued)	Thermocouple input, transistor (NPN) output, 4 loops	U, C, CE	<b>CQM1-TC201</b>
	Thermocouple input, transistor (PNP) output, 4 loops		<b>CQM1-TC202</b>
	Thermocouple input, transistor (NPN) output, 2 loops (with heater burnout alarm)		<b>CQM1-TC203</b>
	Thermocouple input, transistor (PNP) output, 2 loops (with heater burnout alarm)		<b>CQM1-TC204</b>
	Platinum resistance thermometer input, transistor (NPN) output, 4 loops		<b>CQM1-TC301</b>
	Platinum resistance thermometer input, transistor (PNP) output, 4 loops		<b>CQM1-TC302</b>
	Platinum resistance thermometer input, transistor (NPN) output, 2 loops (with heater burnout alarm)		<b>CQM1-TC303</b>
	Platinum resistance thermometer input, transistor (PNP) output, 2 loops (with heater burnout alarm)		<b>CQM1-TC304</b>
Linear sensor interface modules	Standard	—	<b>CQM1-LSE01</b>
	With monitor output		<b>CQM1-LSE02</b>
Safety relay module	Emergency stop unit: 2 inputs/2 outputs, 4 general-purpose inputs	U, C	<b>CQM1-SF200</b>

## ■ PROGRAMMING DEVICES AND ACCESSORIES

### Programming Consoles

Item	Specifications	International standards	Part number
Programming consoles	2-m Connecting Cable included (No other Connecting Cables required.)	U, C, CE	<b>CQM1H-PRO01-E</b>
	2-m Connecting Cable included (compatible with C-series PLCs)	U, C, N, CE	<b>CQM1-PRO01-E</b>
	Requires a separate Connecting Cable, see below.	U, C, N, CE	<b>C200H-PRO27-E</b>
Connecting cables	Cable length: 2 m	N	<b>C200H-CN222</b>
	Cable length: 2 m (for CPUs complying with EC directives)	CE	<b>C200HS-CN222</b>
Peripheral port conversion cable	Connects the peripheral port on the CQM1H to a personal computer or Programming Console through a CQM1-CIF02 cable.	CE	<b>CS1W-CN114</b>

### Software (Windows)

Item	Specifications	Cable length	International standards	Part number
CX-Programmer (V1.2 or later)	Write and debug programs; monitor operation. CD-ROM, OS: Windows95/98/NT	—	—	<b>WS02-CXPC1-EV2.0</b>
CX-Protocol	Protocol macro software simplifies interface programming with third-party serial devices CD-ROM, OS: Windows 95/98	—	—	<b>WS02-PSTC1-E</b>
Program download cables	DB9-pin on computer to CQM1H peripheral port	2 m	—	<b>CS1W-CN226</b>
		6 m	—	<b>CS1W-CN626</b>
	Serial port on computer to Omron DB9-pin serial port	2 m	—	<b>C200HS-CN220-EU</b>
	Adapts C200HS-CN220-EU for CQM1H peripheral port	0.1 m	—	<b>CS1W-CN118</b>
	Cable-mounted communication adapter converts peripheral port to DB9-pin serial port	3.3 m	—	<b>CQM1-CIF02</b>
	Converts CQM1-CIF02 DB9-pin serial connector for CQM1H's peripheral port	0.05 m	—	<b>CS1W-CN114</b>

Note: U: UL, C: CSA, N: NK, L: LLOYD, CE: EC Directives

**Program Transfer Tools**

Item	International standards	Part number
Expansion memory unit uploads and downloads program and setup memory areas to and from the controller.	—	CPM1-EMU01-V1
EEPROM (256 kbits)	—	EEPROM-CPM1-EMU01

**MAINTENANCE PRODUCTS**

Item	Function	International standards	Part number
Battery	Backs up memory in the CPU Unit.	—	CPM2A-BAT01
End cover	Connects to the I/O module located on the extreme right	U, C, CE	CQM1H-TER01

**DIN TRACK**

Item	Specifications		International standards	Part number
Mounting track	Track length: 50 cm	Height: 7.3 mm	L	PFP-50N
	Track length: 1 m			PFP-100N
	Track length: 1 m	Height: 16 mm		PFP-100N2
End plate	Fasten mounting brackets on both sides of the PLC to prevent it from sliding left or right.			PFP-M

Note: U: UL, C: CSA, N: NK, L: LLOYD, CE: EC Directives

**MANUALS**

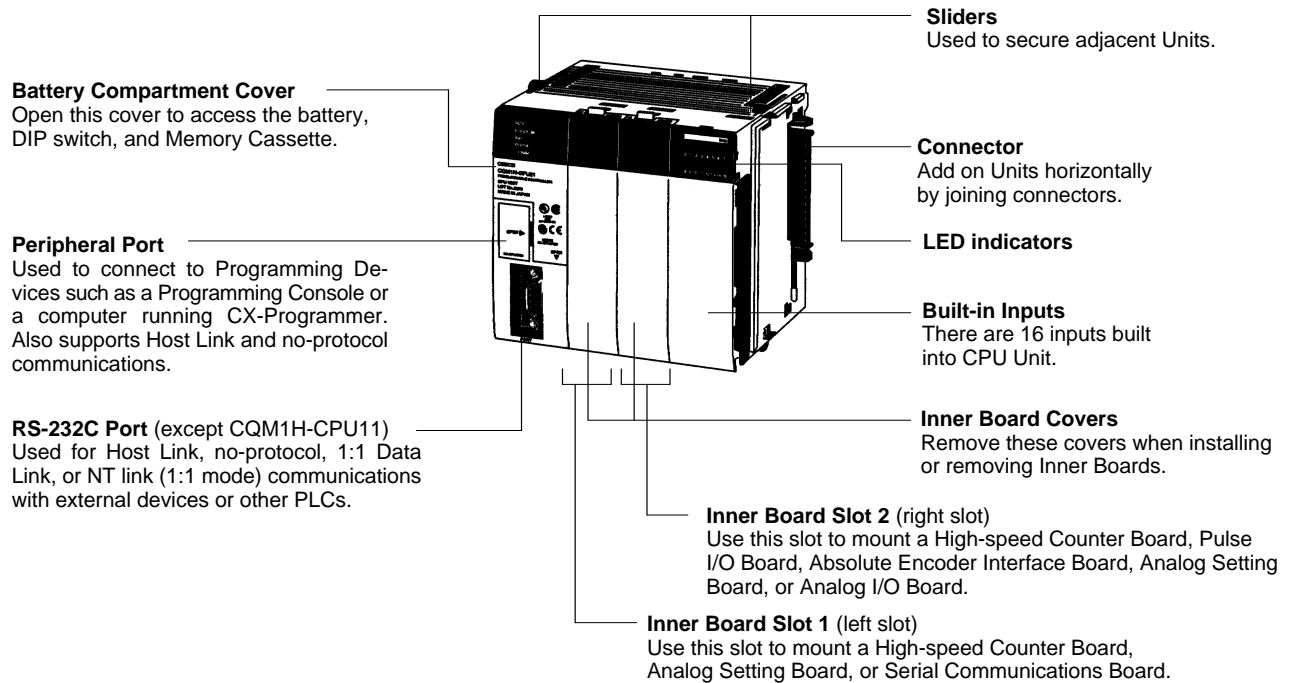
Product	Description	Part number
Operation manual	CQM1H CPUs and Inner Boards operation manual	W363
Programming manual	CQM1H CPUs and Inner Boards programming manual	W364
Dedicated I/O Modules manual	Covers analog input/output, B7A Link master, temperature controller, linear sensor interface, and safety relay modules.	W238

# CPU Units

The four models of CPU Units can be broadly divided into two groups: Models that support Inner Boards and the Controller Link Unit, and models that do not. The CPU Units also vary in their program capacities, I/O capacities, memory capacities, and the presence of an RS-232C port, as shown in the *Basic Specifications* table, below.

## ■ NOMENCLATURE

The following illustration shows the main components of a CQM1H-CPU61 CPU Unit.



## ■ OVERVIEW

Model	I/O capacity (See Note.)	Program capacity (words)	DM capacity (words)	EM capacity (words)	CPU Unit built-in inputs	Built-in serial ports		Inner Boards	Controller Link Module
						Peripheral port	RS-232C port		
CQM1H-CPU61	512	15.2 K	6 K	6 K	DC: 16	Yes	Yes	Supported	
CQM1H-CPU51		7.2 K	6 K	None					
CQM1H-CPU21	256	3.2 K	3 K				No	Not supported	
CQM1H-CPU11									

## ■ MAXIMUM NUMBER OF MODULES

CPU Unit	Controller Link Module	Inner Boards	I/O Modules and Dedicated I/O Modules
CQM1H-CPU61	1 max.	2 max.	11 max.
CQM1H-CPU51			16 max. using I/O Expansion and Control Interface modules
CQM1H-CPU21	Not supported.	Not supported.	
CQM1H-CPU11			

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

## ■ CPU UNIT SPECIFICATIONS

### Characteristics

Item	Specifications	
Control method	Stored program method	
I/O control method	Cyclic scan and direct output/immediate interrupt processing	
Programming language	Ladder-diagram programming	
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	
User 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 step per instruction, 1 to 4 words per instruction	
Number of instructions	162 (14 basic, 148 special instructions)	
Instruction execution times	Basic instructions: 0.375 to 1.125 $\mu$ s Special instructions: 17.7 $\mu$ s (MOV instruction)	
Overseeing time	0.70 ms	
Mounting structure	No backplane (Modules are joined horizontally using connectors)	
Mounting	DIN Track mounting (screw mounting not possible)	
CPU Unit built-in DC input points	16	
Maximum number of modules	Maximum of 11 modules total for I/O modules and Dedicated I/O modules	
Inner Boards	CQM1H-CPU11/21: None CQM1H-CPU51/61: 2 Boards	
Communications modules (Controller Link Module)	CQM1H-CPU11/21: None CQM1H-CPU51/61: 1 module	
Types of interrupts	Input interrupts (4 inputs max.)	Input Interrupt Mode: Interrupts are executed in response to inputs from external sources to the CPU Unit's built-in input points.  Counter Mode: Interrupts are executed in response to reception of a set number of pulses (counted down) via the CPU Unit's internal built-in input points (4 points).
	Interval timer interrupts (3 timers max.)	Scheduled Interrupt Mode: Program is interrupted at regular intervals measured by one of the CPU Unit's internal timers.  One-shot Interrupt Mode: An interrupt is executed after a set time, measured by one of the CPU Unit's internal timers.
	High-speed counter interrupts	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.  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, but can output bit patterns internally and externally.)
I/O allocations	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 to create I/O tables from a Programming Device.)	



## Memory Area Structure

Data area		Size	Words	Bits	Function
IR area	Input area	256 bits	IR 000 to IR 015	IR 00000 to IR 01515	Input bits are allocated to Input Units or Dedicated I/O Units. The 16 bits in IR 000 are always allocated to the CPU Unit's built-in inputs. Bits in IR 001 to IR 015 are allocated to I/O or Dedicated I/O Units connected to the CPU Unit.
IR area	Output area	256 bits	IR 100 to IR 115	IR 10000 to IR 11515	Output bits are allocated to Output Units or Dedicated I/O Units connected to the CPU Unit.
	Work areas	2,528 bits min.	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.  (A minimum 2,528 bits are available as work bits. Most bits in the IR and LR areas 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 PLC.)
			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	Status Area 1: Stores the Controller Link data link status information.
			IR 190 to IR 195	IR 19000 to IR 19515	Status Area 2: Stores the Controller Link error and network participation information.
MACRO operand area	Input area	64 bits	IR 096 to IR 099	IR 09600 to IR 09915	Used when the MACRO instruction, MCRO(99), is 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. High-speed Counter Board: IR 200 to IR 213 Serial Communications Board: IR 200 to IR 207
Analog settings area		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.
High-speed Counter, 0 PV		32 bits	IR 230 to IR 231	IR 23000 to IR 23115	Used to store the present values of high-speed counter 0.
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. High-speed Counter Board: IR 232 to IR 243 Absolute Encoder Interface Board: IR 232 to IR 239 Pulse I/O Board: IR 232 to IR 239 Analog I/O Board: IR 232 to IR 239
SR area		184 bits	SR 244 to SR 255	SR 24400 to SR 25507	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 or when the operating mode is changed.
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		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 module.
Timer/Counter area		512 bits	TIM/CNT 000 to TIM/CNT 511 (timer/counter numbers)		The same numbers are used for both timers and counters.  Timer numbers 000 to 015 can be used with TIMH(15) for interrupt-refreshed PVs to ensure proper timing without inaccuracy being caused by the cycle time.

(This table continues on the next page.)

Memory Area Structure – continued from previous page

Data area		Size	Words	Bits	Function
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	425 words	DM 6144 to DM 6568	—	Cannot be written from the program (only from a Programming Device). DM 6400 to DM 6409: Controller Link parameters DM 6450 to DM 6499: Routing tables DM 6550 to DM 6559: Serial Communications Board Setup
	Error history area	31 words	DM 6569 to DM 6599	—	Cannot be written from the program (only from a Programming Device). Stores the time of occurrence and error code of errors that occur.
	PLC setup	56 words	DM 6600 to DM 6655	—	Cannot be written from the program (only from a Programming Device). Stores various parameters that control PLC 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 or the operating mode is changed. (CQM1H-CPU61 CPU Unit only.)

### Other Functions

Item	Specification
Macro instructions	Subroutines called by instructions containing arguments.
Min. 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 PLC 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 9,900 ms in 100-ms units, 0 to 99 s in 1-s units. The maximum and current values of the cycle time are stored in the AR area.
I/O refreshing	Cyclic refreshing, refreshing by IORF(97), direct output refreshing (set in the PLC 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 PLC Setup.)
I/O memory status when changing operating mode	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	Forced set/reset, differential monitoring, data tracing (scheduled, cyclic, 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 and data memory (DM 6144 to DM 6655: read-only DM): Set using pin 1 of 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.) (It is possible to stop operation using FALS(07) for fatal errors.) User-defined error logs can be created in specific bits (logging) when using FAL(06).
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	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

(This table continues on the next page.)

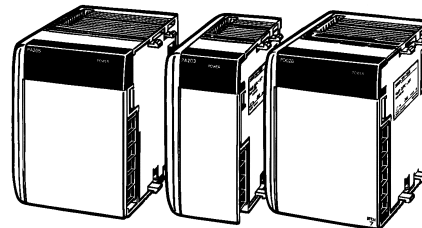
Other Functions – continued from previous page

Item	Specification	Built-in peripheral port	Built-in RS-232C port	Serial communications board
Serial communications modes				
Programming console bus	Connects to Programming Console.	YES (pin 7 OFF)	No	No
Peripheral bus	Connects to a computer running CX-Programmer or other Support Software. (Automatically used if the network type is set to peripheral bus on the Support Software.)	YES (pin 7 ON)	No	No
Host Link (SYSMAC WAY)	Enables reading/writing CPU Unit I/O memory or program using Host Link commands. Computers running Support Software or OMRON Programmable Terminals can also be connected. PLC-initiated communications are possible.	YES (pin 7 ON)	YES	YES
No-protocol	Enables sending or receiving up to 256 bytes of data without a protocol or data conversion. A start code, end code, and transmission delay can be set.	YES (pin 7 ON)	YES	YES
1:1 data link	Enables 1:1 data link with a CQM1H, CQM1, CPM-series, C200HX/HG/HE, C200HS, or SRM1 PLC.	No	YES	YES
NT links (1:1 and 1:N)	Enables 1:1 or 1:N communications with OMRON Programmable Terminals without additional programming.	No	YES (1:1 only)	YES (1:1 and 1:N)
Protocol macros	Enables user-created protocols to communicate with essential any device equipped with a serial communications port (e.g., RS-232C). Standard protocols are also provided.	No	No	YES
Clock	Some Memory Cassette are equipped with a clock. (The time of the error will recorded if a clock is used.)			
Input time constants	Used to set the ON (or OFF) response times for DC Input modules. Settings: 1, 2, 4, 8, 16, 32, 64, and 128 ms.			
Power OFF detection time	AC power supply: 10 to 25 ms (not fixed), DC power supply: 5 to 25 ms (not fixed)			
Memory protection	Held Areas: Holding bits, contents of Data Memory and Extended Data Memory, and status of the counter Completion Flags and present values. If the I/O Hold Bit (SR 25212) is turned ON, and the PLC Setup is set to maintain the I/O Hold Bit status when power is turned ON, the contents of the IR area and the LR area will be saved.			
Commands to a host 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 PLC through a Controller Link System. (This function is, however, not supported for the serial communications ports on the Serial Communications Board.)			
Program check	Program is checked at the beginning of operation for items such as no END(01) instruction and instruction errors. CX-Programmer can also 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. Min.: 1 yr) Battery replacement must be performed within 5 minutes.			
Errors from self-diagnostics	CPU (watchdog timer), I/O verification, I/O bus, memory, FALS system (FALS execution or cycle monitor time over), FAL system (FAL execution or PLC Setup error etc.), battery, cycle time over and communications port.			
Other functions	Storage of number of times power has been interrupted. (Stored in AR area.)			

## Power Supply Units

Both AC and DC Power Supply Units are available. The AC Power Supply Units require a power supply input from 100 to 240 VAC and two of the AC Power Supply Units are equipped with an auxiliary 24 VDC power supply output.

The CQM1H's left End Cover is part of the Power Supply Unit.



CQM1-PA206 CQM1-PA203 CQM1-PD026  
CQM1-PA216

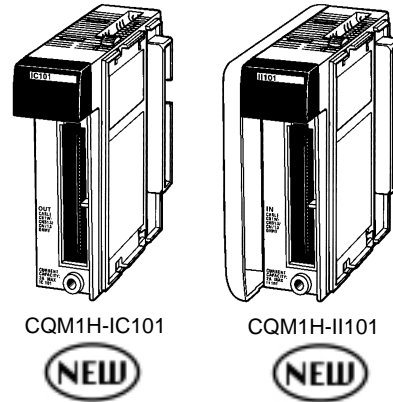
### ■ SPECIFICATIONS

Item	CQM1-PA203	CQM1-PA206	CQM1-PA216	CQM1-PD026
Supply voltage	100 to 240 VAC, 50/60 Hz		100 or 230 VAC (selectable), 50/60 Hz	24 VDC
Operating voltage range	85 to 264 VAC		85 to 132 VAC or 170 to 264 VAC	20 to 28 VDC
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 VDC: 3.6 A (18 W)	5 VDC: 6 A 24 VDC: 0.5 A (30 W total)		5 VDC: 6 A (30 W)
Insulation resistance	20 M $\Omega$ min. at 500 VDC between AC external terminals and GR terminals			
Dielectric strength	2,300 VAC 50/60 Hz for 1 min between AC external and GR terminals, leakage current: 10 mA max. 1,000 VAC 50/60 Hz for 1 min between DC external and GR terminals, leakage current: 20 mA max.			
Noise immunity	Conforms to IEC61000-4-4, 2 kV (power lines)			
Vibration resistance	10 to 57 Hz with an amplitude of 0.075 mm, and 57 to 150 Hz with an acceleration of 9.8 m/s <sup>2</sup> in the X, Y, and Z directions for 80 minutes each (i.e., swept for 8 minutes, 10 times).			
Shock resistance	147 m/s <sup>2</sup> (118 m/s <sup>2</sup> for Contact Output Units) 3 times each in X, Y, and Z directions			
Ambient temperature	Operating: 0° to 55°C (32° to 131°F) Storage: -20° to 75°C (-4° to 167°F), except battery			
Ambient operating humidity	10% to 90% RH (no condensation)			
Operating environment	No corrosive gas			
Ground	Less than 100 $\Omega$			
Construction	Panel mounted			
Weight	5 kg max.			
Internal current consumption	CQM1H-CPU11: 820 mA at 5 VDC CQM1H-CPU21/51/61: 840 mA at 5 VDC			
Dimensions (without cables)	CQM1H-CPU11/21: 187 to 571 × 110 × 107 mm (W×H×D) CQM1H-CPU51/61: 187 to 603 × 110 × 107 mm (W×H×D)			
Accessories	RS-232C connector (one XM2A-0901 Plug and one XM2S-0911-E Hood) (except CQM1H-CPU11) CQM1H-BAT01 Battery Set (installed in CPU Unit when shipped)			

Note: The total power consumed at 5 VDC and 24 VDC must be less than 30 W.  
 $(5 \times \text{Current consumed at 5 VDC}) + (24 \times \text{Current consumed at 24 VDC}) \leq 30 \text{ W}$

# I/O Expansion Adapters

Use Expansion I/O adapters to split the configuration into more than one group, allowing greater flexibility with mounting space as well as the use of at least 16 I/O Modules or Dedicated I/O Modules. Expansion Adapters can be used with any CQM1H CPU Unit.

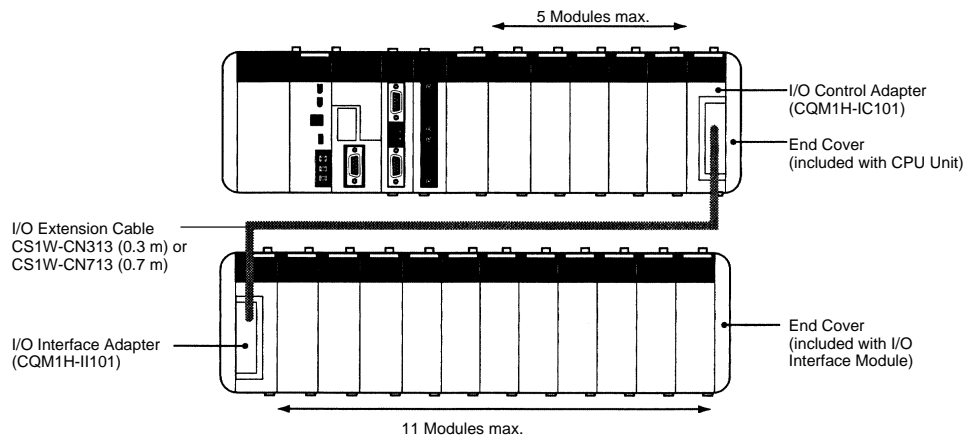


## ■ SPECIFICATIONS

### Maximum Number of Units Mountable

CPU Unit model	CPU Block only		CPU Block + I/O Expansion Adapter		
	CPU grouping	CPU grouping			Extension grouping
	I/O Modules + Dedicated I/O Modules	Controller Link Modules	Inner Boards	I/O Modules + Dedicated I/O Modules	I/O Modules + Dedicated I/O Modules
CQM1H-CPU61	11 Modules max.	1 Module	2 Boards max.	5 Modules max.	11 Modules max.
CQM1H-CPU51		Not supported			
CQM1H-CPU21					
CQM1H-CPU11					

## ■ CONFIGURATION



**CPU Grouping**  
Total current consumption:  
3.0 A max. (including CPU Unit)

**Extension Grouping**  
Total current consumption:  
2.0 A max. (I/O Modules and  
Dedicated I/O Modules)

Note: If the CQM1-PA203 Power Supply Unit is used, the maximum current consumption total is 3.6 A.

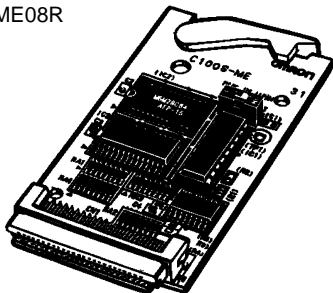
## Memory Cassettes

An optional Memory Cassette can be used to store the user program, PLC setup, and other data in ROM so that vital data will not be lost in the event of battery expiration or careless programming/monitoring operations.

If the PLC's settings need to be changed to execute another process, the entire software setup and user program can be changed just by exchanging the Memory Cassette and rebooting the PLC.

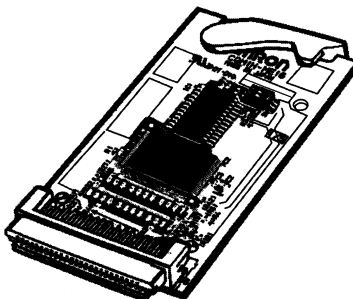
### EEPROM:

CQM1-ME04K  
CQM1-ME04R  
CQM1-ME08K  
CQM1-ME08R



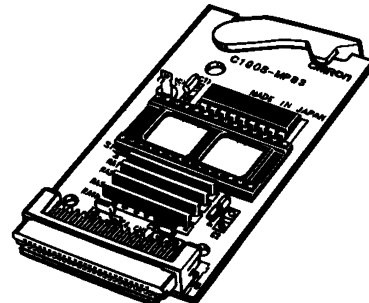
### Flash Memory:

CQM1H-ME16K  
CQM1H-ME16R



### EPROM:

CQM1-MP08K  
CQM1-MP08R



## ■ SPECIFICATIONS

Memory	Model	Specifications
EEPROM	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	CQM1-MP08K	Without clock (see below)
	CQM1-MP08R	With clock (see below)
Flash	CQM1H-ME16K	16 kwords without clock
	CQM1H-ME16R	16 kwords with clock
Memory Cassette (EEPROM or flash memory)		Mounted from the front of the CPU Unit and used to store and read the user's program, DM (read-only DM and PLC Setup), and expansion instruction information as one block. It is possible to set the CPU Unit so that data stored in the Memory Cassette (user's program, DM, expansion instruction information) is automatically sent to the CPU Unit (auto-boot) at startup. Transfer and comparison of data between the CPU Unit and Memory Cassette are possible using AR area control bits.

### EPROM Chips

The following EPROM chips (sold separately) are required for EPROM Memory Cassettes. The chip is mounted in the I/O socket on the 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

# Inputs and Outputs for CPUs and Modules

## ■ I/O MEMORY ALLOCATION

I/O words are allocated to I/O Modules according to a fixed location. When the I/O Modules and Dedicated I/O Modules are connected, the I/O words will be allocated as follows.

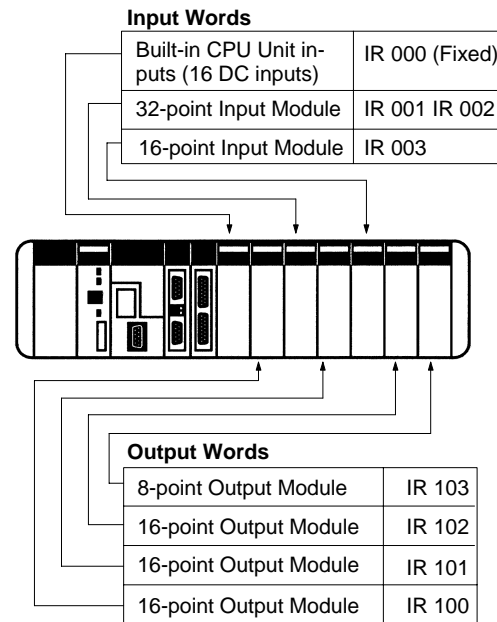
### Input Word Allocation

IR 000 to IR 015 are allocated as input bits. The first input word (IR 000), however, is allocated to the CPU Unit's 16 built-in input points.

Note: Built-in CPU Unit's inputs are used for interrupt processing and built-in high-speed counter inputs.

### Output Word Allocation

IR 100 to IR 115 are allocated as output bits. When Output Modules or Dedicated I/O Modules are connected, words will be allocated in order starting from IR 100.



Module type		I/O word allocation		
		Input words	Output words	Description
Input module		1 or 2	—	Each 8-point or 16-point input module is allocated one input word and each 32-point input module is allocated two input words. Words will be allocated in order starting from IR 001.
Output modules		—	1 or 2	Each 8-point or 16-point output module is allocated one output word and each 32-point output module is allocated two output words. Words will be allocated in order starting from IR 100.
B7A Master link modules	B7A02	—	1	Depending on the module, each B7A Master link module is allocated input words and output words.
	B7A12	1	—	
	B7A03	—	1	
	B7A13	2	—	
	B7A21	1	1	
DeviceNet I/O link module		1	1	Each DeviceNet I/O link module is allocated one input word and one output word.
CompoBus/S master modules	IN: 16 points OUT: 16 points	1	1	Depending on the module, each CompoBus/S master module is allocated input words and output words.
	IN: 32 points OUT: 32 points	2	2	
	IN: 64 points OUT: 64 points	4	4	
Analog input module		2 or 4	—	Each analog input module can be set to input either 2 or 4 points. If the module is set to input 2 points, two input words are allocated. If the module is set to input 4 points, four input words are allocated.
Analog output module		—	2	Each analog output module is allocated two output words.
Analog power supply modules for CQM1-AD041 and -DA021		—	—	Power supply modules are not involved directly in I/O operations and are thus not allocated I/O words.
Temperature control modules	00□/10□	2 or 1	2 or 1	Each temperature control module is allocated two input words and two output words when two loops are used. Only one input word and one output word are allocated when one loop is used.
	20□/30□	1	1	One input word and one output word are allocated in the order the module is connected.
Safety relay module		1	—	One input word is allocated per module in the order the module is connected.

## ■ INPUT SPECIFICATIONS

All of the Input Modules listed in the following tables have photocoupler isolation and LED input indicators.

### CPU Units

Number of inputs	Input voltage	Input current	Input impedance	Operating voltage		Response times (See Note)		External connection	Inputs/common	Current consumption (5 VDC)	Weight
				ON voltage	OFF voltage	ON delay	OFF delay				
16 pts	24 VDC +10%/15%	10 mA for IN04/05 6 mA for the rest (24 VDC)	2.2 k $\Omega$ for IN04/05 3.9 k $\Omega$ for the rest	17.4 VDC min.	5.0 VDC max.	8 ms max.	8 ms max.	Terminal block	16	—	—

Note: Selectable from 1 to 128 ms in the PLC Setup.

### DC Input Modules

Model	Number of inputs	Input voltage	Input current	Input impedance	Operating voltage		Response times (See Note)	
					ON voltage	OFF voltage	ON delay	OFF delay
CQM1-ID211	8 pts	12 to 24 VDC +10%/15%	10 mA (24 VDC)	2.4 k $\Omega$	10.2 VDC min.	3.0 VDC max.	8 ms max.	8 ms max.
CQM1-ID111	16 pts	12 VDC +10%/15%	6 mA (12 VDC)	1.8 k $\Omega$	8.0 VDC min.	3.0 VDC max.	8 ms max.	8 ms max.
CQM1-ID212	16 pts	24 VDC +10%/15%	6 mA (24 VDC)	3.9 k $\Omega$	14.4 VDC min.	5.0 VDC max.	8 ms max.	8 ms max.
CQM1-ID112	32 pts	12 VDC +10%/15%	4 mA (12 VDC)	2.2 k $\Omega$	8.0 VDC min.	3.0 VDC max.	8 ms max.	8 ms max.
CQM1-ID213	32 pts	24 VDC +10%/15%	4 mA (24 VDC)	5.6 k $\Omega$	14.4 VDC min.	5.0 VDC max.	8 ms max.	8 ms max.

Note: Selectable from 1 to 128 ms in the PLC Setup.

Model	Number of inputs	External connection	Inputs/common	Current consumption (5 VDC)	Weight
CQM1-ID211	8 pts	Terminal block	8 independent commons	50 mA max.	180 g max.
CQM1-ID111	16 pts		16	85 mA max.	180 g max.
CQM1-ID212	16 pts		16	85 mA max.	180 g max.
CQM1-ID112	32 pts	Connector	32	170 mA max.	160 g max.
CQM1-ID213	32 pts		32	170 mA max.	160 g max.
CQM1-ID214	32 pts		32	170 mA max.	160 g max.

### AC Input Modules

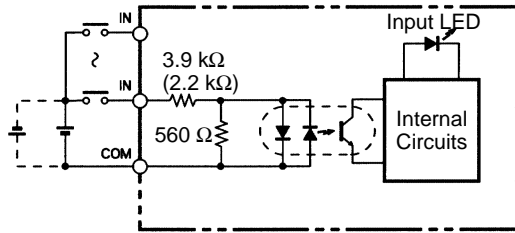
Model	Number of inputs	Input voltage	Input current	Input impedance	Operating voltage		Response times	
					ON voltage	OFF voltage	ON delay	OFF delay
CQM1-IA121	8 pts	100 to 120 VAC +10%/15%	5 mA (100 VAC)	20 k $\Omega$ (50 Hz) 17 k $\Omega$ (60 Hz)	60 VAC min.	20 VAC max.	35 ms max.	55 ms max.
CQM1-IA221	8 pts	200 to 240 VAC +10%/15%	6 mA (200 VAC)	38 k $\Omega$ (50 Hz) 32 k $\Omega$ (60 Hz)	150 VAC min.	40 VAC max.	35 ms max.	55 ms max.

Model	Number of inputs	External connection	Inputs/common	Current consumption (5 VDC)	Weight
CQM1-IA121	8 pts	Terminal block	8	50 mA max.	210 g max.
CQM1-IA221	8 pts		8	50 mA max.	210 g max.

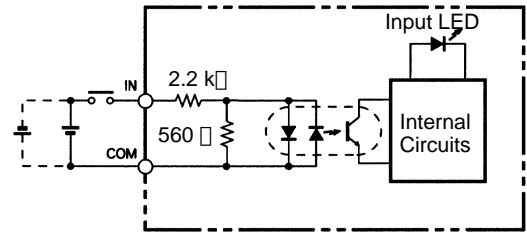


■ INPUT CIRCUIT CONFIGURATION

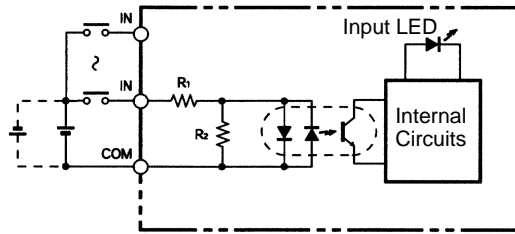
CPU Unit Inputs



CQM1-ID211

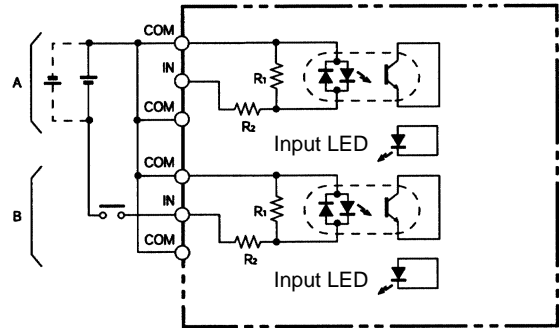


CQM1-ID111/212



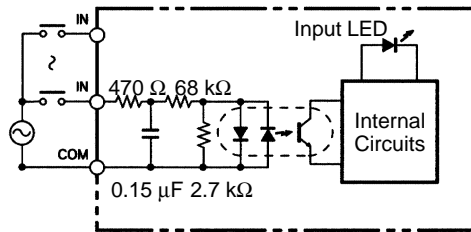
ID111: R<sub>1</sub>: 1.8 kΩ  
 R<sub>2</sub>: 620 Ω  
 ID212: R<sub>1</sub>: 3.9 kΩ  
 R<sub>2</sub>: 560 Ω

CQM1-ID112/213/214

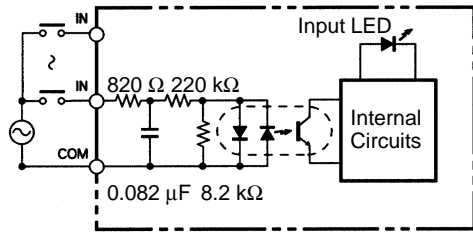


ID112: R<sub>1</sub>: 750 Ω  
 R<sub>2</sub>: 2.2 kΩ  
 ID213: R<sub>1</sub>: 620 Ω  
 R<sub>2</sub>: 5.6 kΩ  
 ID214: R<sub>1</sub>: 620 Ω  
 R<sub>2</sub>: 3.9 kΩ

CQM1-IA121



CQM1-IA221



## ■ OUTPUT MODULE SPECIFICATIONS

All of the Output Modules have LED output indicators.

### Contact Output Modules

Model	Number of outputs	Max. switching capacity	Min. switching capacity	Response times		External connector	Leakage current
				ON delay	OFF delay		
CQM1-OC221	8 pts	2 A, 250 VAC (cosφ= 1) 2 A, 250 VAC (cosφ= 0.4) 2 A, 24 VDC (16 A/Unit)	10 mA, 5 VDC	10 ms max.	5 ms max.	Terminal block	—
CQM1-OC222	16 pts	2 A, 250 VAC (cosφ= 1) 2 A, 250 VAC (cosφ= 0.4) 2 A, 24 VDC (8 A/Unit)	10 mA, 5 VDC	10 ms max.	5 ms max.		
CQM1-OC224	8 pts	2 A, 250 VAC (cosφ= 1) 2 A, 250 VAC (cosφ= 0.4) 2 A, 24 VDC (16 A/Unit)	10 mA, 5 VDC	15 ms max.	5 ms max.		

Model	Number of outputs	Outputs/common	Fuses	External power supply capacity	Internal current consumption (5 VDC)	Weight
CQM1-OC221	8 pts	Independent commons	None	—	430 mA max.	200 g max.
CQM1-OC222	16 pts	16 pts to one common		—	850 mA max.	230 g max.
CQM1-OC224	8 pts	Independent commons		—	440 mA max.	270 g max.

### Transistor Output Modules

Model	Number of outputs	Max. switching capacity	Min. switching capacity	Response times		External connector	Leakage current
				ON delay	OFF delay		
CQM1-OD211 (NPN, sinking)	8 pts	2 A at 24 VDC +10%/−15% 5 A/Unit	—	0.1 ms max.	0.3 ms max.	Terminal block	0.1 mA max.
CQM1-OD212 (NPN, sinking)	16 pts	50 mA at 4.5 VDC to 300 mA at 26.4 V	—	0.1 ms max.	0.4 ms max.		0.1 mA max.
CQM1-OD213 (NPN, sinking)	32 pts	16 mA at 4.5 VDC to 100 mA at 26.4 V	—	0.1 ms max.	0.4 ms max.	Connector	0.1 mA max.
CQM1-OD214 (PNP, sourcing)	16 pts	50 mA at 4.5 VDC to 300 mA at 26.4 V	—	0.1 ms max.	0.4 ms max.	Terminal block	0.1 mA max.
CQM1-OD215 (PNP, sourcing)	8 pts	1.0 A at 24 VDC +10%/−15% 4 A/Unit	—	0.2 ms max.	0.8 ms max.		0.1 mA max.
CQM1-OD216 (PNP, sourcing)	32 pts	0.5 A at 24 VDC +10%/−15% 5 A/Unit	—	0.1 ms max.	0.3 ms max.	Connector	0.1 mA max.

Model	Number of outputs	Outputs/common	Fuses (See Note)	External power supply capacity	Internal current consumption (5 VDC)	Weight
CQM1-OD211 (NPN, sinking)	8 pts	8	7 A (one fuse/common)	24 VDC +10%/−15% 15 mA min.	90 mA max.	200 g max.
CQM1-OD212 (NPN, sinking)	16 pts	16	5 A (one fuse/common)	5 to 24 VDC ±10% 40 mA min.	170 mA max.	180 g max.
CQM1-OD213 (NPN, sinking)	32 pts	32	3.5 A (one fuse/common)	5 to 24 VDC ±10% 110 mA min.	240 mA max.	180 g max.
CQM1-OD214 (PNP, sourcing)	16 pts	16	3.5 A (two fuses/common)	5 to 24 VDC ±10% 60 mA min.	170 mA max.	210 g max.
CQM1-OD215 (PNP, sourcing)	8 pts	8	Short-circuit protection function	24 VDC +10%/−15% 24 mA min.	110 mA max.	240 g max.
CQM1-OD216 (PNP, sourcing)	32 pts	32	7 A (one fuse/common)	24 VDC +10%/−15% 160 mA min.	240 mA max.	210 g max.

Note: Fuses are not user-serviceable.

AC Output Modules

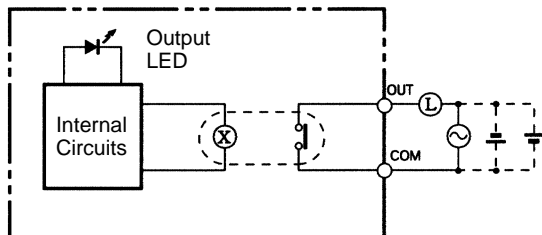
Model	Number of outputs	Max. switching capacity	Min. switching capacity	Response times		External connector	Leakage current
				ON delay	OFF delay		
CQM1-OA221	8 pts	0.4 A at 100 to 240 VAC	—	6 ms max.	1/2 cycle + 5 ms max.	Terminal block	1 mA max. at 100 VAC, 2 mA max. at 200 VAC
CQM1-OA222	6 pts	0.4 A at 100 to 240 VAC	100 mA at 10 VAC 50 mA at 24 VAC 10 mA at 100 VAC 10 mA at 240 VAC	1 ms max.	Load frequency of 1/2 cycle + 1 ms max.		

Model	Number of outputs	Outputs/common	Fuses (See note)	External power supply capacity	Internal current consumption (5 VDC)	Weight
CQM1-OA221	8 pts	4 each (2 circuits)	2 A (one fuse/common)	—	110 mA max.	240 g max.
CQM1-OA222	6 pts	4 and 2 (2 circuits)	5 A (one fuse/common)	—	250 mA max.	240 g max.

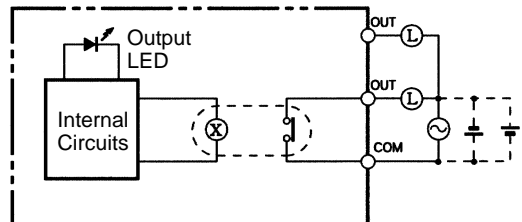
Note: Fuses are not user-serviceable.

■ OUTPUT CIRCUIT CONFIGURATION

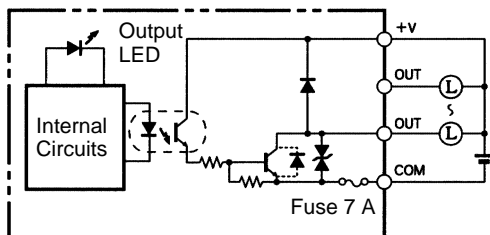
CQM1-OC221



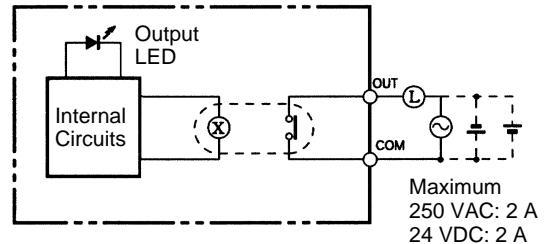
CQM1-OC222



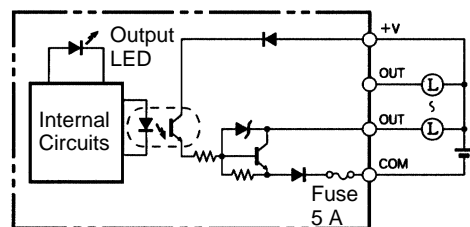
CQM1-OD211



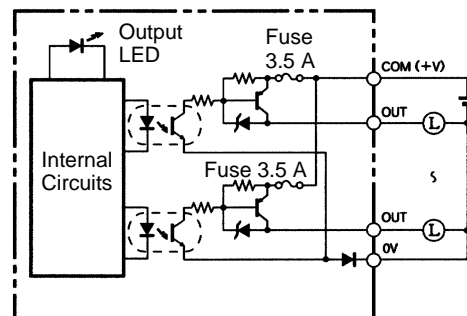
CQM1-OC224



CQM1-OD212

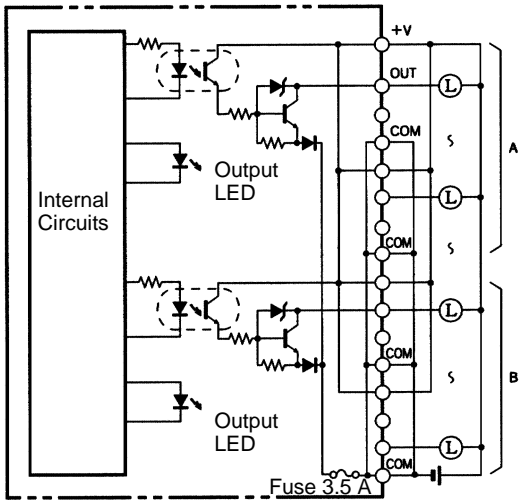


CQM1-OD214

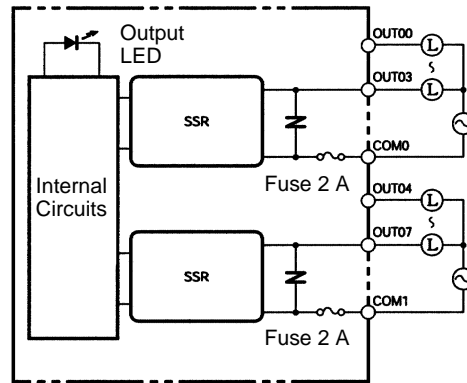


(Output Circuit Configuration continues on the next page.)

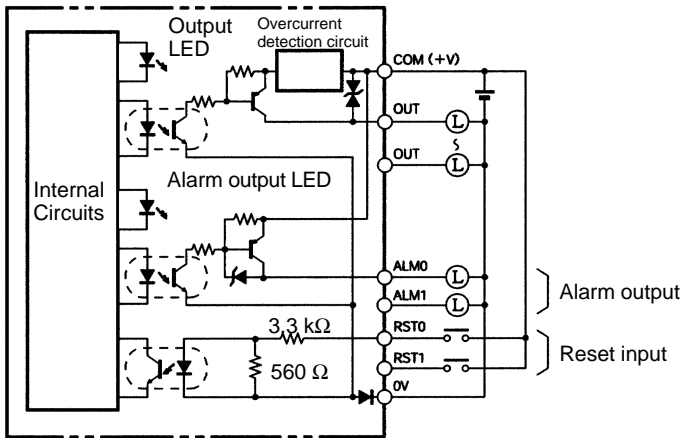
CQM1-OD213



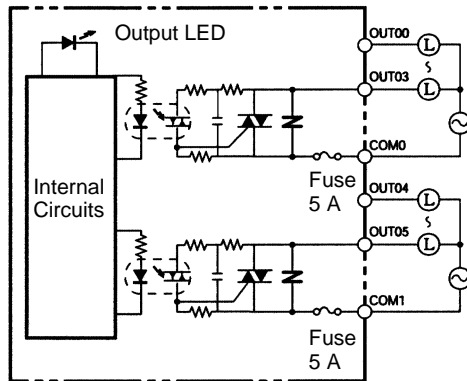
CQM1-OA221



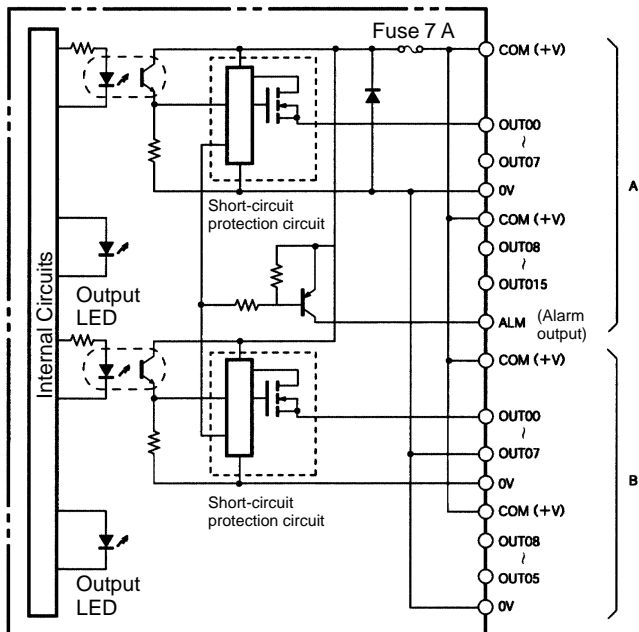
CQM1-OD215



CQM1-OA222



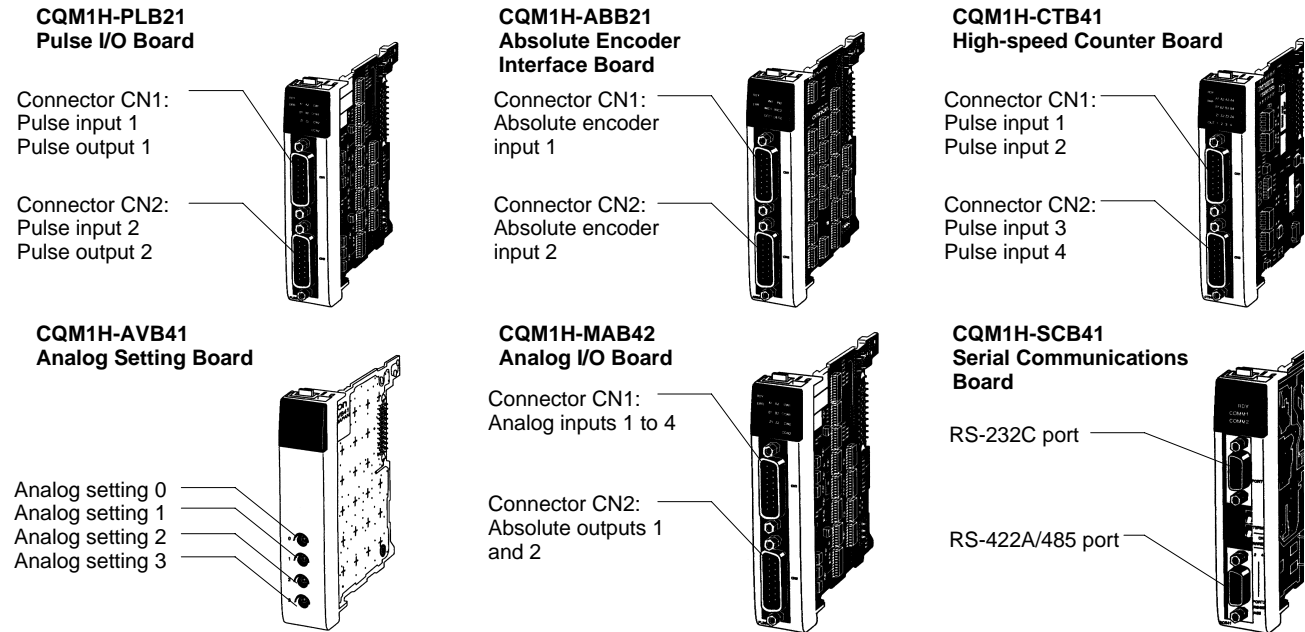
CQM1-OD216



# Inner Boards

The six available Inner Boards are shown below. Inner Boards can be mounted in slot 1 or slot 2 of a CQM1H-CPU51 or CQM1H-CPU61 CPU Unit. (Some Inner Boards must be mounted in either slot 1 or slot 2.)

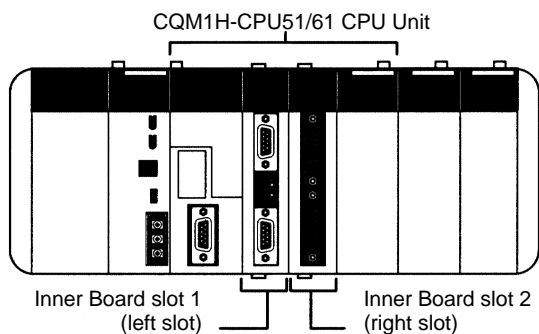
## NOMENCLATURE



## OVERVIEW

Name	Specifications	Model	Slot 1 (left slot)	Slot 2 (right slot)
High-speed counter board	Pulse inputs (high-speed counter): 4 points (50 kHz/500 kHz switchable) External outputs: 4 points	CQM1H-CTB41	Yes	Yes
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	No	Yes
Absolute encoder interface board	Encoder (binary gray code) inputs: 2 points (4 kHz)	CQM1H-ABB21	No	Yes
Analog setting board	Analog settings: 4 points	CQM1H-AVB41	Yes (Install in either but not in both slots.)	
Analog I/O board	Four inputs: 0 to 5 V, 0 to 10 V, -10 to +10 V, 0 to 20 mA Two outputs: 0 to 20 mA, -10 to +10 V	CQM1H-MAB42	No	Yes
Serial communications board	One RS-232C port and one RS-422A/485 port	CQM1H-SCB41	Yes	No

## CONFIGURATION

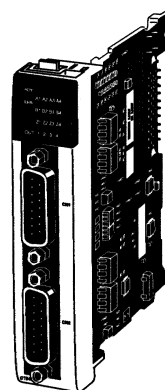


## High-speed Counter Inner Board

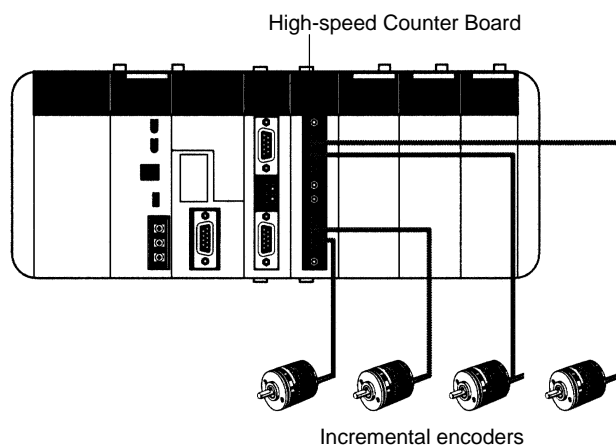
The High-speed Counter Board is an Inner Board that counts up to 4 high-speed pulse inputs at up to 500 kHz, and can perform tasks according to the number of pulses counted.

- Can count 4-axis high-speed pulses at up to 500 kHz.
- Provides 4 external outputs on the Board.
- Both linear and ring counting modes are supported.
- The input can be a voltage input or an RS-422A line driver input.
- Three input modes are available: differential phase mode, up/down mode, and pulse + direction mode
- The counters can be set to record the present values in decimal or hexadecimal.

### CQM1H-CTB41



## ■ CONFIGURATION



## ■ SPECIFICATIONS

### General

Item	Specification
Model number	CQM1H-CTB41
Applicable CPU Units	CQM1H-CPU51/61
Applicable Omron incremental rotary encoders	NPN open collector output: E6B2-CWZ6C, E6C2-CWZ6C (DC 12-24) Line-driver output: E6B2-CWZ1X, E6C2-CWZ1X
Mounting location/No. of Boards	Maximum of two Boards can be mounted simultaneously in slots 1 and 2.
Pulse inputs	4 inputs
External outputs	4 outputs
Current consumption (supplied from Power Supply Unit)	400 mA max., 5 VDC
Dimensions	25 × 110 × 107 mm (W × H × D)
Weight	90 g max.
Standard accessories	Plugs: XM2D-1501 (OMRON) x 2 Hoods: XM2S-1511 (OMRON) x 2

## High-speed Counter Inner Board

## Pulse Input Functions

Item		Specification		
Number of counters		4 counters (4 ports)		
Input modes (Set in the PLC Setup.)		Differential phase inputs	Up/Down pulse inputs	Pulse/Direction inputs
Input method		Switching between inputs using phase difference multiples of 1x, 2x, or 4x. (Set in the PLC Setup.)	Two single-phase inputs	Single-phase pulse and direction inputs
Count frequency (Set for each port in the PLC Setup.)		25 kHz (default) or 250 kHz	50 kHz (default) or 500 kHz	50 kHz (default) or 500 kHz
Count values		Linear counting: -8388608 to 8388607 BCD, F8000000 to 07FFFFFF Hex Ring counting: 00000000 to 08388607 BCD, 00000000 to 07FFFFFF Hex		
Control method	Target value comparison	Up to 48 target values and external/internal output bit patterns registered.		
	Range comparison	Up to 16 upper limits, lower limits, and external/internal output bit patterns registered.		

## Pulse Input Ratings

Item		Specification			
Number of pulse inputs		4 inputs (Ports 1 to 4 = High-speed counters 1 to 4)			
Signals		Encoder inputs A and B; pulse input Z			
Input voltage		Switched by means of input voltage switch on the Board (Specified separately for phases A, B, and Z.)			
		24 VDC $\pm$ 10%		RS-422A line driver (AM26LS31 or equivalent)	
		Phase A and B	Phase Z	Phase A and B	Phase Z
Input current		5 mA typical	8 mA typical	10 mA typical	13 mA typical
ON voltage		19.6 VDC min.	18.6 VDC min.	—	—
OFF voltage		4.0 VDC min.	4.0 VDC min.	—	—

## External Output Ratings

Item		Specification
Number of external outputs		4 transistor outputs (The four outputs are set together as sinking or sourcing outputs in the PLC Setup.)
Function		The target comparison or range comparison results of high-speed counters 1 to 4 output four user-defined 4-bit external bit patterns (bits 08 to 11 of either IR 208 to IR 211 or IR 240 to IR 243). An OR is taken of corresponding bits in these four bit patterns, and the result is output on external outputs 1 to 4.
External power supply		5 to 24 VDC $\pm$ 10%
Switching capacity		16 mA/4.5 VDC to 80 mA/26.4 V
Leakage current		0.1 mA max.
Residual voltage		0.8 V max.
Response time		ON response: 0.1 ms max.; OFF response: 0.4 ms max.

## Pulse I/O Inner Board

The Pulse I/O Board is an Inner Board that supports two pulse inputs and two pulse outputs.

### Pulse Inputs

The two pulse inputs to high-speed counters count pulses at up to 50 kHz (signal phase) or 25 kHz (differential phase). Interrupt can be created based on the counter present values (PV).

### Interrupts

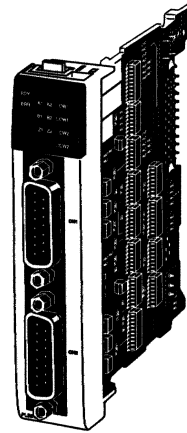
The Board can execute an interrupt subroutine when the counter PV matches a specified target value (target value comparison) or falls within a specified comparison range (range comparison.)

### Pulse Outputs 1 and 2

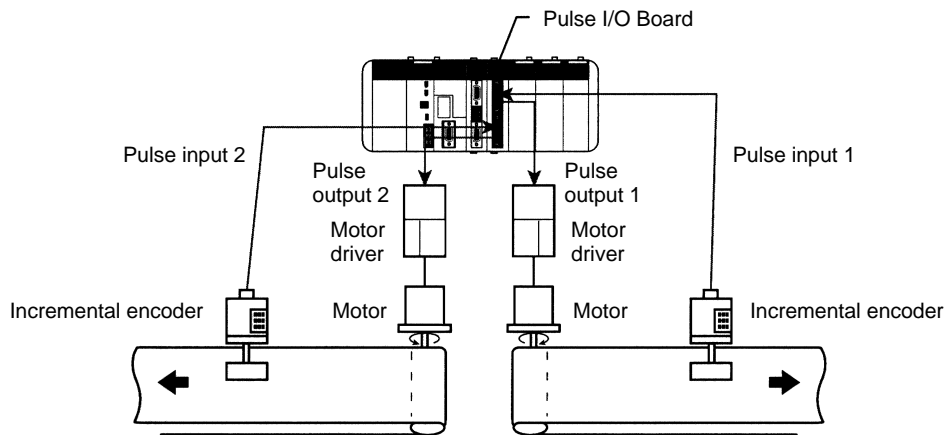
Two 10 Hz to 50 kHz pulses can be output. Both fixed and variable duty factors can be used.

- The fixed duty factor can be used to change the output frequency (accelerate or decelerate) from 10 Hz to 50 kHz smoothly.
- The variable duty factor performs using a duty factor ranging from 1% to 99%. Variable duty factor pulses can be used for applications such as time-proportional control.

### CQM1H-PLB21



## SYSTEM CONFIGURATION



## SPECIFICATIONS

### General

Item	Specification
Model number	CQM1H-PLB21
Applicable CPU Units	CQM1H-CPU51/61
Applicable Omron incremental rotary encoders	NPN open collector output: E6B2-CWZ6C (DC 5-24), E6C2-CWZ6C (DC 5-24), E6D-CWZ2C (DC12), E6A2-CWZ3C (DC5-12)
Mounting locations/No. of Boards	One in Inner Board slot 2 (right slot)
Pulse inputs	2 inputs
Pulse outputs	2 outputs
Current consumption (Supplied from Power Supply Unit)	5 VDC, 160 mA max.
Dimensions	25 × 110 × 107 mm (W × H × D)
Weight	90 g max.
Standard accessories	Two XM2D-1501 Plugs and two XM2S-1511 Hoods (OMRON)



## Pulse I/O Inner Board

## Pulse Input Function

Item	Specification		
Number of counters	2 counters (ports)		
Input Modes (Set for each port in the PLC Setup.)	Differential phase input	Pulse/Direction input	Up/Down pulse input
Input method	Phase difference multiple of 4 (Fixed)	Single-phase pulse + direction	Single-phase input x 2
Count frequency	25 kHz	50 kHz	50 kHz
Count values	Linear counting: -8388608 to 8388607 BCD Ring counting: 00000000 to 00064999 BCD		
Control method	Target value comparison	Register up to 48 target values and interrupt subroutine numbers.	
	Range comparison	Register up to 8 upper limits, lower limits, and interrupt subroutine numbers.	

## Pulse Input Ratings

Item	Specification			
Number of pulse inputs	2 inputs (Ports 1 and 2 = Pulses 1 and 2)			
Signal names	Encoder input A, encoder input B, pulse input Z			
Input voltage	Switched by means of connector pins (Can be specified separately for phases A, B, and Z.)			
	12 VDC $\pm$ 10%		24 V DC $\pm$ 10%	
Input current	Phases A and B	Phase Z	Phases A and B	Phase Z
	5 mA typical	12 mA typical	5 mA typical	12 mA typical
ON voltage	10.2 VDC min.		20.4 VDC min.	
OFF voltage	3.0 VDC min.		4.0 VDC min.	

## Pulse Output

## Pulse Output Function

Pulse output function is determined by the output method, as indicated below.

Item	Fixed duty factor			Variable duty factor
	Without trapezoidal acceleration/deceleration	Same acceleration/deceleration rates	Separate acceleration/deceleration rates	
Instruction	PULS(65)/SPED(64)	PLS2(—)	PULS(65)/ ACC(—)	PWM(—)
Output frequency	10 Hz to 50 kHz (10 Hz to 20 kHz for stepping motor)	0 Hz to 50 kHz	100 Hz to 50 kHz	91.6 Hz, 1.5 kHz, 5.9 kHz
Output frequency pitch	1 or 10 Hz	10 Hz		—
Duty factor	50% fixed			1 to 99%
Number of output pulses	1 to 16,777,215			—
Acceleration/ deceleration rate	—	10 Hz to 2 kHz (every 4.08 ms)		—

## Output Ratings

Item	Specification
Number of pulse outputs	2 outputs (Ports 1 and 2 = Pulse outputs 1 and 2)
Signal names	CW and CCW pulse output
Max. output frequency	50 kHz (20 kHz with stepping motor connected.)
External power supply	5 VDC $\pm$ 5% 30 mA min.; 24 VDC $+10\%$ / $-15\%$ 30 mA min.
Max. switching capacity	NPN open collector, 30 mA/5 to 24 VDC $\pm$ 10%
Min. switching capacity	NPN open collector, 7 mA/5 to 24 VDC $\pm$ 10%
Leakage current	0.1 mA max.
Residual voltage	0.4 V max.

## Absolute Encoder Interface Inner Board

The Absolute Encoder Interface Board is an Inner Board that allows position data to be directly input from absolute rotary encoders.

CQM1H-ABB21

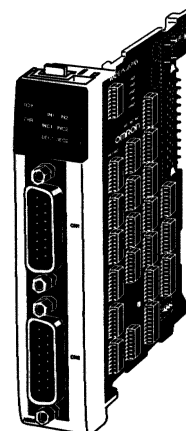
### Absolute High-speed Counter

The Absolute Encoder Interface Board reads binary gray codes (inverted binary codes) input from an absolute encoder at a maximum counting rate of 4 kHz, and can perform interrupt processing according to the input values.

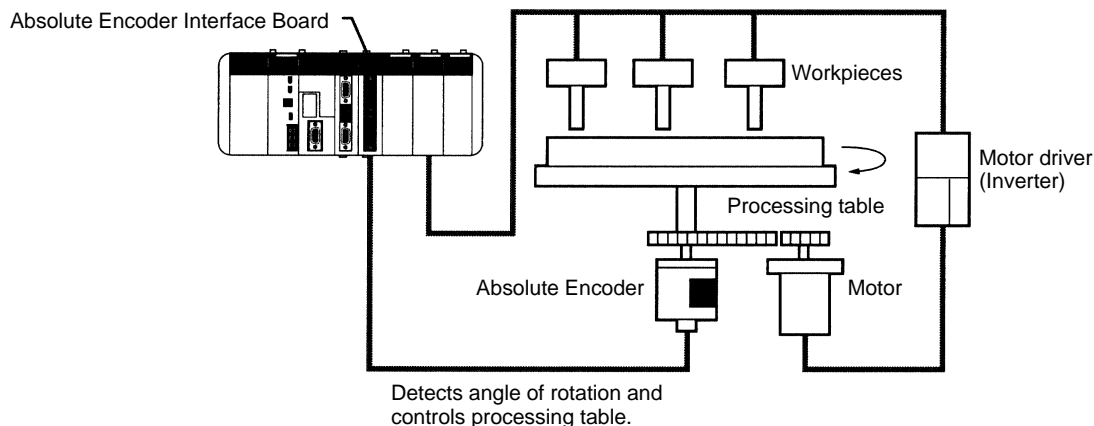
### Interrupts

An interrupt subroutine can be executed when the PV (present value) of the absolute high-speed counter matches a specified target value (target value comparison) or falls within a specified comparison range (range comparison.)

Note: When an absolute encoder is used the position data can be retained even during power interruptions, so it isn't necessary to perform an origin return when power is returned. In addition, the origin compensation function allows the user to specify any position as the origin.



## SYSTEM CONFIGURATION



## SPECIFICATIONS

### General

Item	Specification
Model number	CQM1H-ABB21
Applicable CPU Units	CQM1H-CPU51/61
Applicable Omron absolute encoders	E6F-AG5C-C, E6CP-AG5C-C, E6C2-AG5C-C
Mounting locations and number of Boards	1 Board can be mounted in slot 2.
Absolute Encoder inputs	2 inputs
Current consumption (supplied from Power Supply Unit)	5 VDC, 150 mA max.
Dimensions	25 × 110 × 107 mm (W × H × D)
Weight	90 g max.
Standard accessories	Plugs: XM2D-1501 (OMRON) x 2 Hoods: XM2S-1511 (OMRON) x 2

(Specifications continue on the next page.)

**Absolute Encoder Interface Inner Board****Absolute Encoder Input Ratings**

Item	Specification	
Number of inputs	Two inputs	
Input code	Binary gray code	
Operating modes	BCD Mode or 360° Mode (Set in PLC Setup.)	
Resolutions	8-bit, 10-bit, or 12-bit (Set in PLC Setup.)	
Origin compensation	Supported. (Current position can be designated as origin). Compensation is set in PLC Setup.	
Counting rate	4 kHz max.	
Control methods	Target value comparison	Register up to 48 target values and interrupt subroutine numbers.
	Range comparison	Register up to 8 upper limits, lower limits, and interrupt subroutine numbers.

**Pulse Input Ratings**

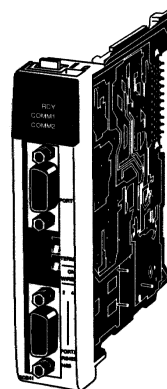
Item	Specification
Input voltage	24 VDC +10%, -15%
Input impedance	5.4 k $\Omega$
Input current	4 mA typical
ON voltage	16.8 VDC min.
OFF voltage	3.0 VDC max.

## Serial Communications Inner Board

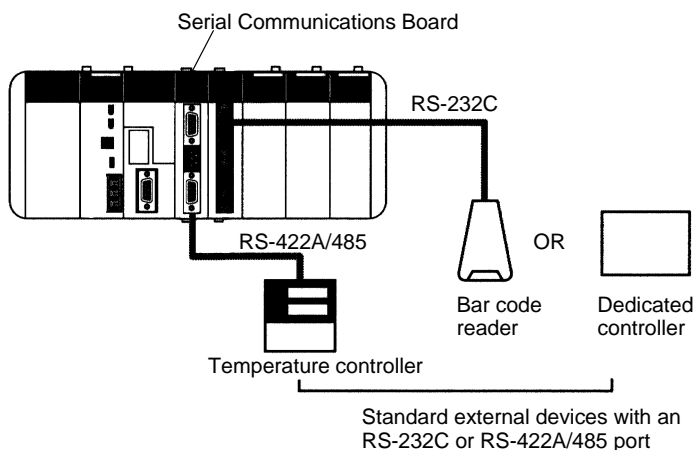
The Serial Communications Board is an Inner Board equipped with 2 ports that can be used to connect host computers, Programmable Terminals, external serial devices, or Programming Devices other than a Programming Console.

- Unlike the CPU Unit's built-in ports, the Serial Communications Board supports the protocol macro function which can provide communications between the CQM1H and external serial devices.
- The Serial Communications Board has 2 ports: an RS-232C port and an RS-422A/485 port. The RS-422A/485 port supports 1:N connections (protocol macro or NT Link in 1:N mode) without an adapter.

### CQM1H-SCB41



## SYSTEM CONFIGURATION



## COMMUNICATIONS MODES

The following 6 communications modes can be set independently for the two Serial Communications Board ports.

- Host Link  
Communications with a host computer, Programming Device, or Programmable Terminal
- No-protocol  
No-protocol communications (TXD and RXD) with standard external devices
- Protocol macro  
Communications can be tailored to the external serial device's communications protocol
- 1:1 Data Link  
Data link with a CQM1H, CQM1, or other C-series PLC
- NT Link in 1:N mode  
One-to-one or one-to-N communications with Programmable Terminals
- NT Link in 1:1 mode  
One-to-one communications with Programmable Terminal

## ■ COMMUNICATIONS PORTS AND SERIAL COMMUNICATIONS MODES

Serial communications protocol	CQM1H-SCB41 Serial communications board	
	RS-232C port (port 1)	RS-422A/485 port (port 2)
Peripheral bus or Programming Console bus	No	No
Host Link (SYSMAC WAY)	YES	YES (See Note 1)
Protocol macro	YES	YES
No-protocol	YES	YES (See Note 1)
1:1 Data Link	YES	YES (See Note 1)
NT Link in 1:1 mode	YES (See Note 2)	YES (See Note 2)
NT Link in 1:N mode	YES (See Note 2)	YES (See Note 2)

Note: 1. The 4-wire method must be used if the RS-422A/485 port is used in Host Link, No-protocol, or 1:1 Data Link mode.  
 2. A Programmable Terminal's Programming Console function cannot be used.

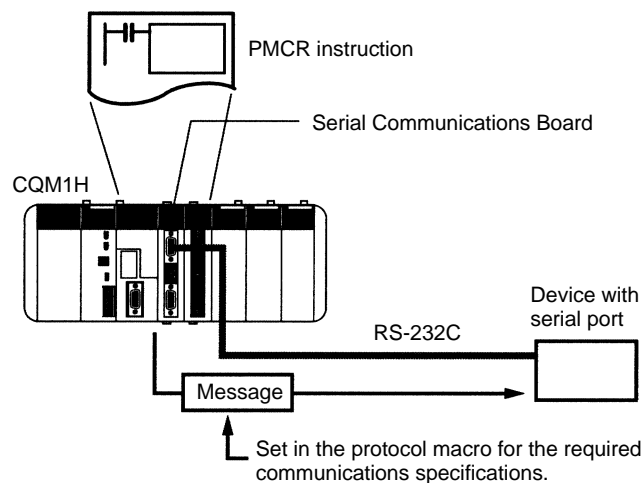
## ■ SPECIFICATIONS

Item	Specification	
Model	CQM1H-SCB41	
Unit classification	CQM1H-series Inner Board	
Applicable CPU Units	CQM1H-CPU61/51	
Mounting locations and number of Boards	1 Board can be mounted in slot 1.	
Serial Communications ports	Port 1	RS-232C: 19.2 kbps max., 15 m max.
	Port 2	RS-422A/485: 19.2 kbps max., 500 m max.
Protocols	Port 1	Each port can be set independently to Host Link, No-protocol, Protocol macro, 1:1 Data Link, NT Link in 1:N mode, or NT Link in 1:1 mode.
	Port 2	
Current consumption	200 mA max.	
Dimensions	32 × 131 × 107 mm (W × H × D)	
Weight	90 g max.	
Standard accessories	Plugs: XM2SA-0901 (OMRON) x 1 Hoods: XM2SA-0911 (OMRON) x 1 (ESD)	

## ■ PROTOCOL MACRO

Protocol macro provides a way to create data communications protocols that meet the specifications of external devices with serial communications ports (half-duplex, start-stop sync only). The protocol macro is made on the CX-Protocol Support Software and then recorded in the Serial Communications Board, where it can be executed at any time using the PMCR instruction in the CPU Unit's ladder program.

Standard system protocols are also provided with the CX-Protocol and Serial Communications Board for easy communications with OMRON components, such as Temperature Controllers, Intelligent Signal Processors, Bar Code Readers, and Modems. The standard system protocols can also be modified to communicate with virtually any third-party serial device using the CX-Protocol.



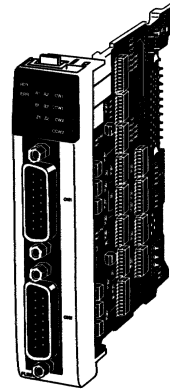
## Analog I/O Inner Board

The Analog I/O Board is an Inner Board with four analog inputs and two analog outputs.

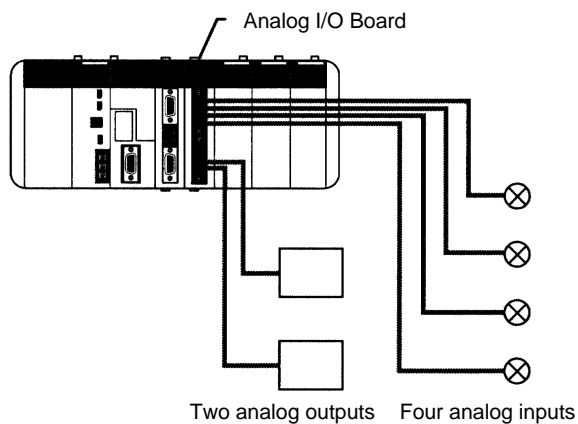
**CQM1H-MAB42**

The signal ranges that can be used for each of the four analog inputs are  $-10$  to  $+10$  V,  $0$  to  $10$  V,  $0$  to  $5$  V, and  $0$  to  $20$  mA. Each input's signal range can be set independently.

The signal ranges that can be used for each of the two analog output points are  $-10$  to  $+10$  V and  $0$  to  $20$  mA. Each output's signal range can be set independently.



### SYSTEM CONFIGURATION



### SPECIFICATIONS

#### General

Item	Specification
Model number	CQM1H-MAB42
Applicable CPU Units	CQM1H-CPU51/61
Mounting locations and number of Boards	1 Board in Inner Board slot 2 (right slot)
Analog inputs	4 inputs
Analog outputs	2 outputs
Current consumption (Supplied from Power Supply Unit)	400 mA max., 5 VDC
Dimensions	25 × 110 × 107 mm (W × H × D)
Weight	100 g max.
Standard accessories	Plugs: XM2D-1501 (OMRON) x 2 Hoods: XM2S-1511 (OMRON) x 2

## Analog I/O Inner Board

## Analog Input Ratings

Item	Specification	
Input signals	Voltage inputs	Current inputs
Number of analog inputs	4 inputs	
Input signal ranges (See Note 1)	-10 to 10 V 0 to 10 V 0 to 5 V	0 to 20 mA
A/D conversion time (See Note 2)	1.7 ms max./point	
Resolution	1/4,096	
A/D conversion output data	12-bit binary data -10 to +10 V: F800 to 07FF Hex 0 to 10 V, 0 to 5 V: 0000 to 0FFF Hex	12-bit binary data 0 to 20 mA: 0000 to 0FFF Hex
External input impedance	1 M $\Omega$ typical	250 $\Omega$ typical
Absolute maximum rated input	$\pm$ 15 V	$\pm$ 30 mA
Overall precision (See Note 3)	23 $\pm$ 2 $^{\circ}$ C	$\pm$ 0.5% of FS
	0 to 55 $^{\circ}$ C	$\pm$ 1.0% of FS

- Note: 1. Separate input signal ranges can be set for each input.  
 2. The A/D conversion time is the time taken for an analog signal to be stored in memory as digital data. At least one cycle is required to transfer the data to the CPU Unit.  
 3. The overall precision is the precision with respect to full scale.  
 4. The CQM1H-MAB42 Analog I/O Board, unlike the CQM1-AD041, does not have a hardware average processing function. If averaging of data is required, use the CPU Unit's data averaging instruction (AVG).

## Analog Output Ratings

Item	Specification	
Output signals	Voltage outputs	Current outputs
Number of analog outputs	2 outputs	
Output signal ranges (See Note 1)	-10 to 10 V	0 to 20 mA
D/A conversion time (See Note 2)	1.7 ms max./2 points	
Resolution	1/4,096	1/2,048
Set output data	12-bit binary data -10 to +10 V: F800 to 07FF Hex	11-bit binary data 0 to 20 mA: 0000 to 07FF Hex
Allowable external output load resistance	2 K $\Omega$ min.	350 $\Omega$ max.
Overall precision (See Note 3)	23 $\pm$ 2 $^{\circ}$ C	$\pm$ 0.5% of FS
	0 to 55 $^{\circ}$ C	$\pm$ 1.0% of FS

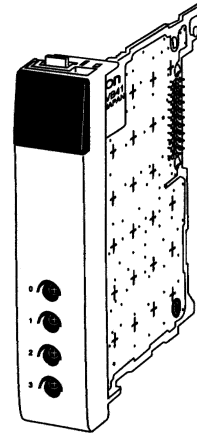
- Note: 1. Separate output signal ranges can be set for each output.  
 2. The D/A conversion time is the time taken for the output data set in memory to be converted to analog signals and output. At least one cycle is required to transfer the data in the CPU Unit to the Analog I/O Board.  
 3. The overall precision is the precision with respect to full scale.

## Analog Setting Board

The Analog Setting Board is an Inner Board that provides four variable resistor adjustments. The settings on the four adjustments are stored in the analog setting words.

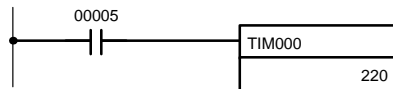
By using the Analog Setting Board, an operator can, for example, set the value of a timer instruction using an analog adjustment, and thereby slightly speed up or slow down the speed or timing of a conveyor belt simply by turning an adjustment screw with a screwdriver, removing the need for a Programming Device.

### CQM1H-AVB41



### ■ USING THE ANALOG TIMER

The following example shows the 4-digit BCD setting (0000 to 0200) stored in IR 220 to IR 223 being used as a timer setting.



The setting of TIM 000 is set externally in IR 220. (TIM 000 is executed using the SV set with analog adjustment 0.)

### ■ SPECIFICATIONS

Item	Specification
Model number	CQM1H-AVB41
Applicable CPU Units	CQM1H-CPU51/61
Mounting locations and number of Boards	1 Board can be mounted in either slot 1 or slot 2. Note: Two Analog Setting Boards cannot be used at the same time.
Settings	4 analog (variable resistor) adjustment screws on front panel (Adjustable using Phillips screwdriver.) The settings of adjustments 0 to 3 are stored as 4-digit BCD values between 0000 and 0200 in IR 220 to IR 223 respectively.
Current consumption (supplied from Power Supply Unit)	10 mA max., 5 VDC
Dimensions	25 × 110 × 107 mm (W × H × D)
Weight	60 g max.



# Communication Modules

## OVERVIEW

Classification	Name	Model	Specifications	
Controller network	Controller Link module	CQM1H-CLK21	Number of data link words: 1000 words per node Message length: 2,012 bytes max. (including the header) Communications cycle time: 2 Mbps at 500 m Max. transmission distance: 1 km Max. slaves per master: 31 slaves per master module	
Field network	CompoBus/S master module	CQM1-SRM21-V1	Number of I/O points per Master: 128 (64 inputs/64 outputs) Communications cycle time: 0.5 ms min. Max. transmission distance: 500 m in long-distance mode 100 m in high-speed mode Max. slaves per master: 32	
	SYSMAC BUS	G730 remote master	CQM1-G7M21	Connects CQM1H to G730 SYSMAC BUS remote I/O blocks; 64 I/O max. on the master; 32 inputs or outputs max. on expansion modules  Number of I/O points per Master: 128 Communications cycle time: 187.5 kbps Max. transmission distance: 200 m One master and two expansions allowed per system
		Input expansion module	CQM1-G7N11	
		Output expansion module	CQM1-G7N01	
	DeviceNet I/O link module	CQM1-DRT21	Number of I/O points: 16 inputs and 16 outputs	
AS-Interface master module	CQM1-ARM21	Number of I/O points: 248 (124 inputs/124 outputs; 4 inputs/4 outputs per slave) Communications cycle time: 5.148 ms min. Max. transmission distance: 100 m; 300 m with 2 repeaters Max. slaves per master: 31 slaves per master module		

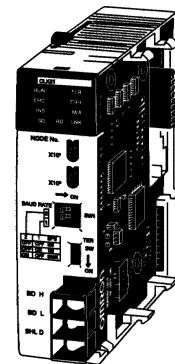
## Controller Link Module

The Controller Link is a communications network that can send and receive large data packets flexibly and easily among the OMRON CQM1H-series, C200HX/HG/HE, CS1-series, CVM1, and CV-series PLCs.

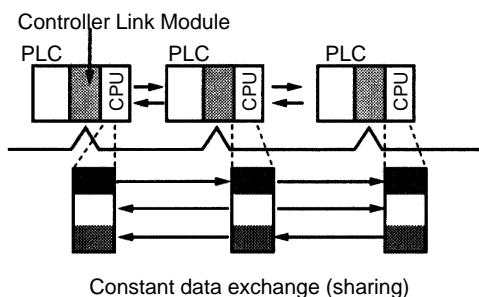
Controller Link supports data links that enable data sharing and a message service that enables sending and receiving data when required. Data link areas can be freely set to create a flexible data link system and effectively use data areas.

- High-capacity, flexible, and efficient data links
- Message service can transfer large quantities of data.
- Simple twisted-pair wiring
- Easily connects different PLC models and computers.
- Flexible inter-network connections
- Robust error-handling functions

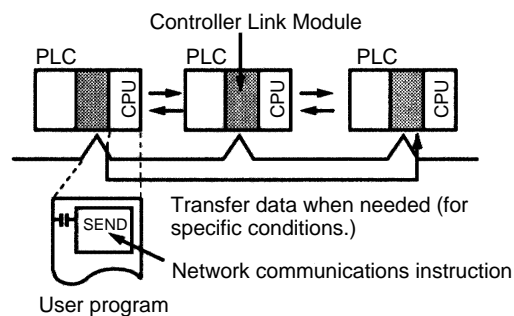
### CQM1H-CLK21



### Data Links



### Message Service



## ■ SPECIFICATIONS

### General

Item	Specification
Model number	CQM1H-CLK21
Applicable CPU Units	CQM1H-CPU51/CPU61
Connection location and number of modules	One module only. The module must be connected between the Power Supply Unit and the CPU Unit.
Current consumption	270 mA, 5 VDC
Dimensions	32 × 110 × 107 mm (W × H × D) (without terminals)
Weight	170 g max.

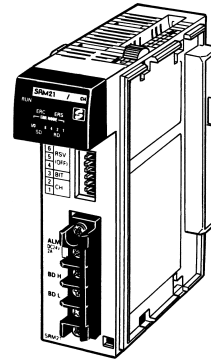
### Communications

Item	Specification
Communications method	N:N token bus
Code	Manchester code
Modulation	Baseband code
Synchronization	Flag synchronization (conforms to HDLC frames)
Transmission path form	Multi-drop bus
Baud rate and maximum transmission distance	The maximum transmission distance varies with the baud rate as follows: 2 Mbps: 500 m 1 Mbps: 800 m 500 kbps: 1 km
Media	Specified shielded twisted-pair cable Number of signal lines: 2, shield line: 1
Maximum number of nodes	32 nodes
Communications functions	Data links and message service
Number of data link words	Transmission area per node: 1,000 words max. Data link area in one CQM1H-series PLC (send/receive): 8,000 words max.
Data link areas	Bit areas (IR, AR, LR, CIO), data memory (DM), and extended data memory (EM)
Message length	2,012 bytes max. (including the header)
RAS functions	Polling node backup function Self-diagnosis function (hardware checking at startup) Echoback test and broadcast test (using the FINS command) Watchdog timer Error log function
Error control	Manchester code check CRC check (CCITT $X^{16} + X^{12} + X^5 + 1$ )

## CompoBus/S Master Module

The CompoBus/S Master Module supports both a high-speed communications mode and a long-distance communications mode for distributed remote I/O.

CQM1-SRM21-V1



- Number of I/O points per master: 128 max. (may be set to 64 or 32 points)
- Number of slaves per master: 16 or 32
- High-speed mode: 750 kbps at 100 m max.)
- Long-distance mode: 500 m max. at 93.75 kbps
- Supports Analog Terminal connections

## ■ SPECIFICATIONS

### Communications

Communications protocol		Dedicated CompoBus/S protocol			
Code		Manchester code			
Connection method		Multi-drop, T-type bifurcation (both methods require external terminating resistor)			
Baud rate		750 kbps, 93.75 kbps (selectable with a DIP switch)			
Communications cycle time	High-speed communications mode	0.5 ms (with a maximum number of 8 Input and 8 Output Slaves) 0.8 ms (with a maximum number of 16 Input and 16 Output Slaves)			
	Long-distance communications mode	4.0 ms (with a maximum number of 8 Input and 8 Output Slaves) 6.0 ms (with a maximum number of 16 Input and 16 Output Slaves)			
Cable		Two-conductor cable (VCTF 0.75 x 2 or Belden #9409 cable) or dedicated flat cable (SCA1-4F10)			
Communications distance	High-speed communications mode	Cable type	Trunk line length	Branch line length	Total line length
		VCTF or Belden #9409	100 m max.	3 m max.	50 m max.
	Flat cable SCA1-4F10	30 m max.	3 m max.	30 m max.	
	The maximum trunk line and branch length using flat cable can be 100 m and 50 m, respectively, if the number of slaves connected is 16 or less.				
Long-distance communications mode	Cable type	Trunk line length	Branch line length	Total line length	
	VCTF or Belden #9409	500 m max.	6 m max.	120 m max.	
Max. number of connectable nodes		32			
Error control		Manchester code, frame length, and parity checks			

### Master Unit

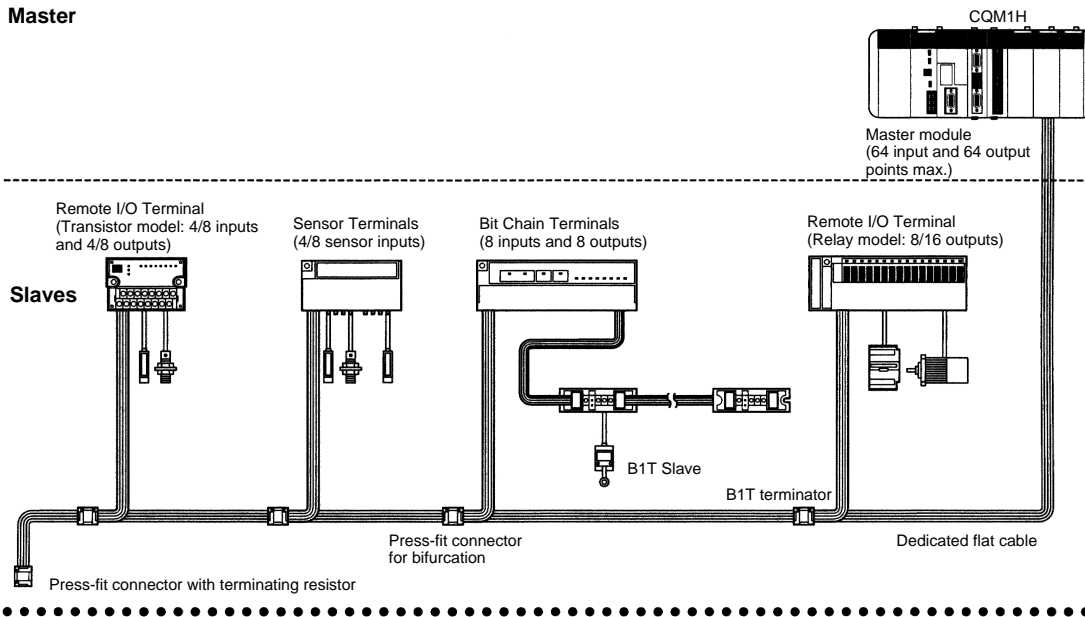
Internal current consumption	180 mA max., 5 VDC
Number of I/O points	128 points (64 inputs and 64 outputs), 64 points (32 inputs and 32 outputs), or 32 points (16 inputs and 16 outputs) selectable with a switch.
Number of occupied words	128 points: 4 input words and 4 output words 64 points: 2 input words and 2 output words 32 points: 1 input word and 1 output word
Number of points per node	8 or 4 points (selectable with a switch)
Max. number of connectable Slaves	32 (with 4 points per node)
Status data	Alarm terminal output
Weight	200 g max.

Note: For details about CompoBus/S, refer to the CompoBus/S section in Omron's *Remote I/O and Wiring Solutions Catalog (GC RIO1)*.

■ CONFIGURATION

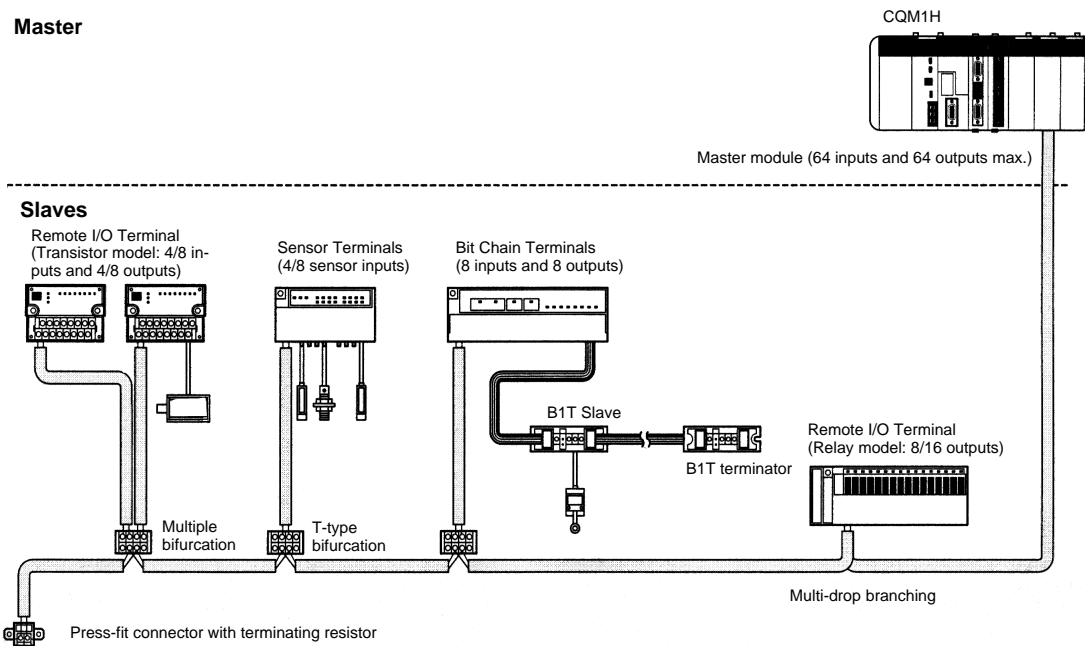
Connections with Flat Cable

Master



Connections with VCTF or Twisted Pair Cable

Master



Note: For details about CompoBus/S, refer to the CompoBus/S section in Omron's *Remote I/O and Wiring Solutions Catalog (GC RIO1)*.

## SYSMAC BUS Master and Expansion Modules

The SYSMAC BUS Master and Expansion Modules provide reliable remote I/O using G730 relay and transistor I/O blocks.

- Transmission distance up to 200 m at 187.5 kbps
- Reduce I/O wiring back to the controller to a single twisted pair cable
- Master modules connect up to 128 I/O; one master and two expansions allowed per system
- Use G730 transistor and relay input and output blocks shown in the Complementary Products section

### CQM1-G7M21 Master and CQM1-G7N□1 Expansion

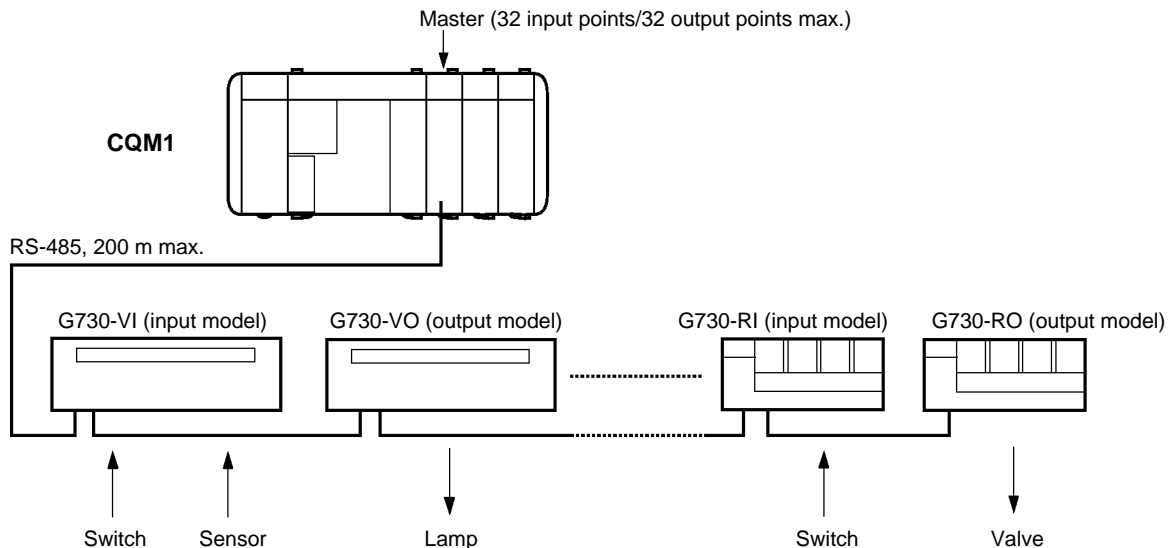


## ■ SPECIFICATIONS

Item	Specification		
Model	CQM1-G7M21	CQM1-G7N11	CQM1-G7N01
Description	G730 remote master	Input expansion module	Output expansion module
Max. I/O points	64 max. (32 inputs/32 outputs or 16 inputs/16 outputs, DIP switch selectable)	32 max. (32 or 16 inputs, DIP switch selectable)	32 max. (32 or 16 outputs, DIP switch selectable)
Communications protocol	Dedicated SYSMAC BUS protocol		
Communications method	Two-wire, half-duplex		
Interface	RS-485		
Synchronization	Start-stop		
Baud rate	187.5 kbps		
Cable	Two-conductor cable (VCTF 0.75 x 2 or Belden #9409 cable)		
Communications distance	200 m max.		
Current consumption	80 mA at 5 VDC		

## ■ CONFIGURATION

The following example shows one master and no expansions. The maximum system consists of one master and two expansion modules per CQM1H CPU. Information on the G730 input and output blocks is shown in the Complementary Products section.



## DeviceNet Slave I/O Link Module

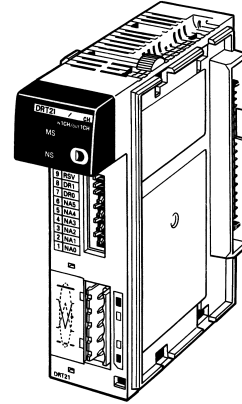
This CompoBus/D slave module conforms to the multivendor DeviceNet standards. DeviceNet I/O Link Modules connect one or more CQM1H PLCs to a DeviceNet Master. Each module allows 16 inputs/16 outputs to be mapped as a node.

CQM1-DRT21

### ■ SPECIFICATIONS

#### General

Communications power supply voltage	11 to 25 VDC supplied from the communications connector. (See Note)
Current consumption	Communications: 40 mA max. at 24 VDC Internal circuit: 80 mA max. at 5 VDC
Number of I/O points	32 points (16 inputs/16 outputs)
Number of occupied words	Input: 1 word Output: 1 word
Weight	185 g max.



Note: Refer to the *DeviceNet Operation Manual (W267)* for the communications power supply specifications.

#### Communications (conforming to DeviceNet standards)

Connection method	Multi-drop, T-type bifurcation (both require external terminating resistor)			
Baud rate	500, 250 or 125 kbps (selectable with a switch)			
Communications cycle time	9.3 ms with 16 Input Slaves (16 inputs) and 16 Output Slaves (16 outputs) at a speed of 500 kbps			
Cable	Dedicated 5-conductor cable (with two signal wires, two power wires, and a shield wire) One XW4B-05C1-H1-D connector is supplied to connect to the module; order another if your cable does not have a DeviceNet connector on the other end.			
Communications distance	Baud rate	Max. network length (See Notes 1 and 2)	Branch line length	Total branch line length
	500 kbps	100 m max.	6 m max.	39 m max.
	250 kbps	250 m max.	6 m max.	78 m max.
	125 kbps	500 m max.	6 m max.	156 m max.
Max. number of connectable nodes	CVM1 or CV series:	64 nodes		
	C200HX/HG/HE:	50 nodes		
	C200HS:	32 nodes		
Error control	CRC errors, node address duplications, scan line checks			

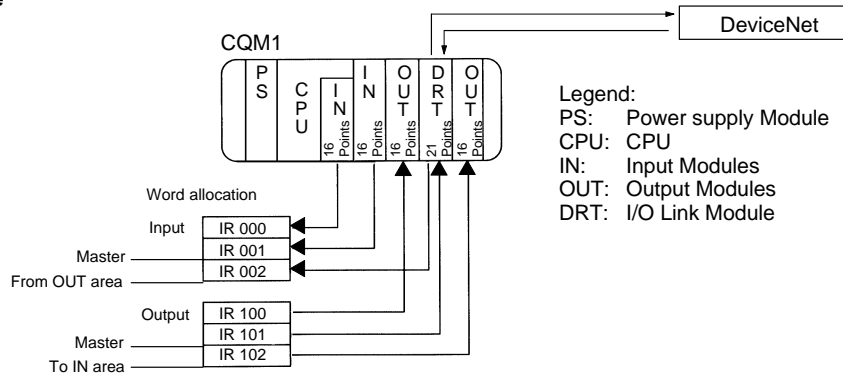
- Note: 1. The maximum network length refers to the distance between two nodes farthest from each other.  
2. The communications distance will be 100 m or less if a thin dedicated cable (DCA1-5C10) is used for the trunk line.

### ■ MEMORY ALLOCATION

#### Words Allocated by CQM1H Slaves

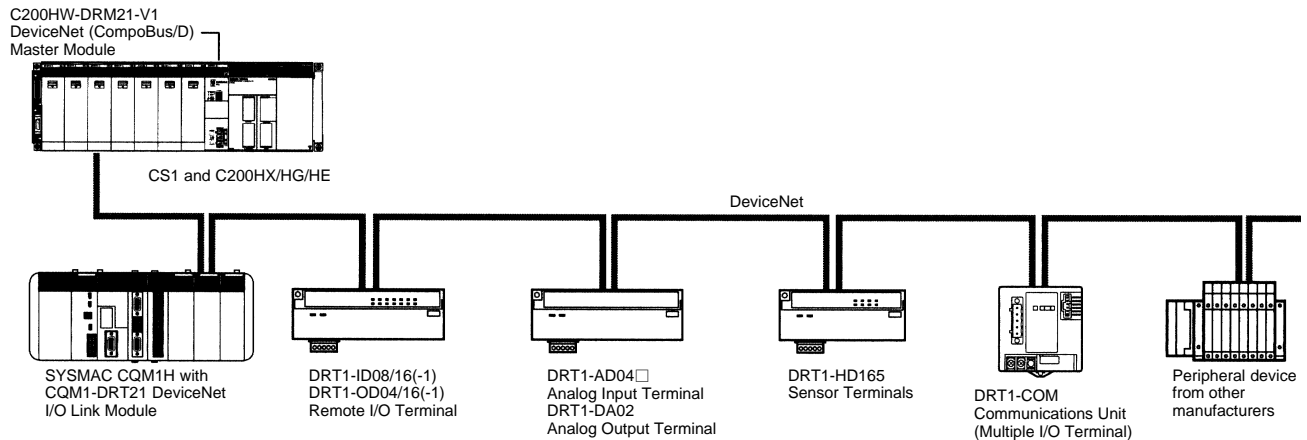
In CQM1H PLCs, an I/O Link Module is treated just like an I/O Module with one input word and one output word, so word allocation is identical to a standard I/O Module. Words are allocated from the left side of the PLC, beginning with IR 001 for inputs and IR 100 for outputs.

#### Example



## ■ CONFIGURATION

### System Configuration Example



Note: For details on DeviceNet (CompoBus/D), refer to Omron's *DeviceNet Products* catalog (Catalog number: P10FAX1A).

## AS-Interface Master Module

The ASI module conforms to version 2.04 of the multivender AS International standards. The system requires one master unit to control all data exchanges over the bus. During normal operation, the master cyclically sends output data to all slaves and receives the slaves' input data in return. The maximum number of slaves that an AS-Interface master can exchange data with at any time is 31. The network uses any shielded or unshielded two-wire cable meeting specified requirements.

### CQM1-ARM21

**NEW**



## ■ SPECIFICATIONS

### General

Communications power supply voltage	30.5 VDC supplied from the communications connector. (See note)
Current consumption	Communications: 300 mA max. at 30.5 VDC Internal circuit: 300 mA max. at 5 VDC
Number of I/O points	8 points (4 inputs/4 outputs) per node 248 points max. (124 inputs/124 outputs) with 31 slave units
Number of occupied words	Input: 3 or 8 words, selectable Output: 3 or 8 words, selectable
Weight	Approx. 200 g

Note: Refer to the *AS-Interface Master Unit Operation Manual (W357)* for additional specifications.

### Communications (conforming to AS-Interface standards)

Connection method	Star, line, branch lines or tree topology, termination not required.
Baud rate	167 k baud
Communications cycle time	0.4 to 5 ms max., depending on the number of slave units on the network.
Cable	AS-interface "yellow cable" for IP67 protection, or any shielded or unshielded two-wire cable with a cross section of 2 x 1.5 mm <sup>2</sup>
Communications distance	100 m per master Up to 300 m using 2 repeaters and additional AS-Interface power supplies
Max. number of connectable nodes	CQM1H: 31 nodes

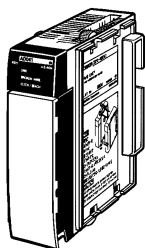
## Dedicated I/O Modules

### ■ SUMMARY OF MODULES AVAILABLE

Name	Model	Specifications	
Analog I/O modules	CQM1-AD042	Analog inputs: 4 points, built-in power supply –10 to + 10 V, 0 to 10 V, 0 to 5 V, or 0 to 20 mA	
	CQM1-AD041	Analog inputs: 4 points, order separate power supply –10 to + 10 V, 0 to 10 V, 1 to 5 V, or 0 to 20 mA	
	CQM1-DA022	Analog outputs: 2 points, built-in power supply –10 to +10 V or 0 to 20 mA	
	CQM1-DA021	Analog outputs: 2 points, order separate power supply –10 to +10 V or 0 to 20 mA	
	CQM1-IPS01	Power Supply Module required for AD041 and DA021 modules	For one Analog module
	CQM1-IPS02		For two Analog modules
B7A Link master modules	CQM1-B7A02	16 outputs	
	CQM1-B7A12	16 inputs	
	CQM1-B7A03	32 outputs	
	CQM1-B7A13	32 inputs	
	CQM1-B7A21	16 inputs and 16 outputs	
	B7A Link slave modules	B7A-□6□, B7AS-R6□	16-point transistor inputs and outputs
		G70D-R6□-B7A	16-point relay outputs
		B7AM-6□, B7AM-8□	Mixed I/O with 16 inputs/16 outputs or 8 inputs/8 outputs
		B7A-□10□, B7AC-T10	10-point transistor inputs and outputs, 10-point sealed input link
	Temperature controller modules	CQM1-TC001	Thermocouple input (types J and K), transistor (NPN) output, 2 loops
CQM1-TC002		Thermocouple input (types J and K), transistor (PNP) output, 2 loops	
CQM1-TC101		Platinum resistance thermometer input (Pt and JPt), transistor (NPN) output, 2 loops	
CQM1-TC102		Platinum resistance thermometer input, transistor (PNP) output, 2 loops	
CQM1-TC201		Thermocouple input, transistor (NPN) output, 4 loops	
CQM1-TC202		Thermocouple input, transistor (PNP) output, 4 loops	
CQM1-TC203		Thermocouple input, transistor (NPN) output, 2 loops (with heater burn-out alarm)	
CQM1-TC204		Thermocouple input, transistor (PNP) output, 2 loops (with heater burn-out alarm)	
CQM1-TC301		Platinum resistance thermometer input, transistor (NPN) output, 4 loops	
CQM1-TC302		Platinum resistance thermometer input, transistor (PNP) output, 4 loops	
CQM1-TC303		Platinum resistance thermometer input, transistor (NPN) output, 2 loops (with heater burnout alarm)	
CQM1-TC304		Platinum resistance thermometer input, transistor (PNP) output, 2 loops (with heater burnout alarm)	
Linear sensor interface modules		CQM1-LSE01	Measure voltage or current inputs from linear sensors and convert the measurements to numeric data for comparative decision processing. Standard type.
	CQM1-LSE02	Module with monitor output: –9.999 V to +9.999 V	
Safety relay module	CQM1-SF200	Emergency stop unit: 2 inputs/2 outputs, 4 general-purpose inputs	

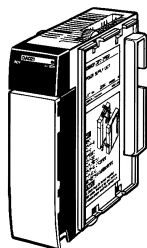


## Analog Input and Output Modules

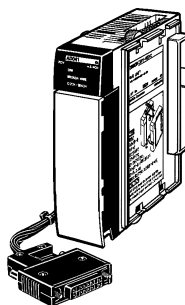


**CQM1-AD042**  
Analog Input Module with  
built-in power supply

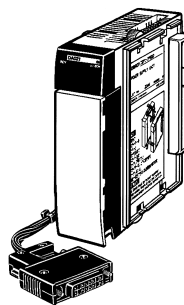
**NEW**



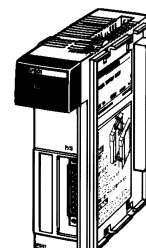
**CQM1-DA022**  
Analog Output Module  
with built-in power supply



**CQM1-AD041**  
Analog Input Module, use  
separate power supply



**CQM1-DA021**  
Analog Output Module, use  
separate power supply



**CQM1-IPS01/IPS02**  
Power Supply Modules

## ■ SPECIFICATIONS

### Analog I/O Modules

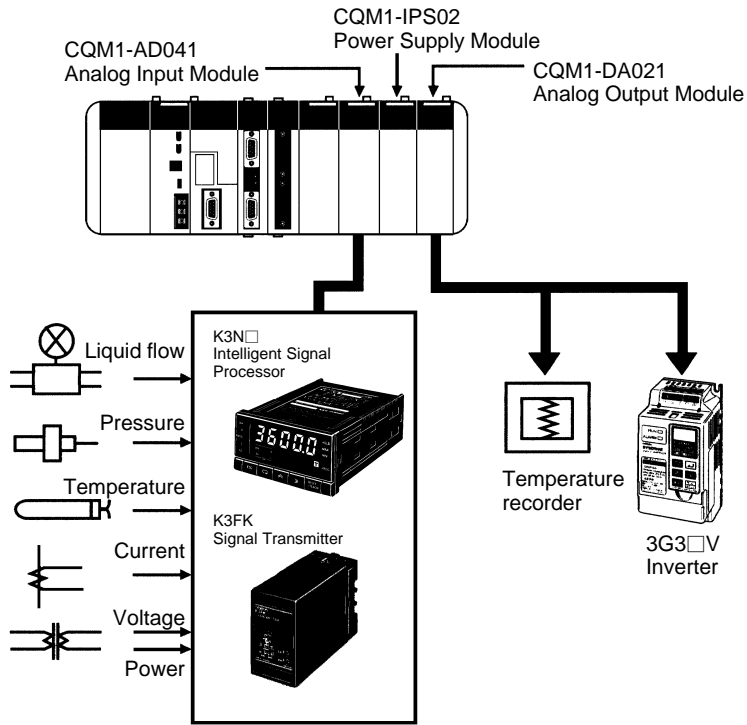
Module type		Analog input		Analog output	
Model number		CQM1-AD042	CQM1-AD041	CQM1-DA022	CQM1-DA021
I/O points		4	4 or 2, selectable	2	2
Ranges		-10 V to +10 V 0 V to 10 V 0 V to 5 V 0 mA to 20 mA	-10 to +10 V 0 V to 10 V 1 V to 5 V 4 mA to 20 mA	-10 V to +10 V 0 mA to 20 mA	-10 V to +10 V 0 mA to 20 mA
Resolution	Voltage	12 bit binary (1/4096)	12 bit binary (1/4000)	12 bit binary (1/4096)	12 bit binary (1/4096)
	Current	12 bit binary (1/4096)	12 bit binary (1/4000)	11 bit binary (1/2048)	11 bit binary (1/2048)
Accuracy	At 25°C	±0.5% of FS	—	±0.5% of FS	—
	0°C to 55°C	±1.0% of FS	±1.0% of FS	±1.0% of FS	±1.0% of FS
Conversion speed		1.2 ms/point	2.5 ms/point	5 ms/2 points	5 ms/2 points
Input impedance	Voltage	1 MΩ min.	1 MΩ min.	—	—
	Current	250 Ω	250 Ω	—	—
External output load resistance	Voltage	—	—	1 kΩ min.	2 kΩ min.
	Current	—	—	520 Ω max. including wiring impedance	350 Ω max.
Power supply		Built-in, DC/DC converter	External, use CQM1-IPS01 or IPS02	Built-in, DC/DC converter	External, use CQM1-IPS01 or IPS02
Current consumption		170 mA at 5 VDC	80 mA max. at 5 VDC	340 mA at 5 VDC	90 mA at 5 VDC

### Power Supply Modules

Model number	CQM1-IPS01	CQM1-IPS02
Number of analog modules supported	One CQM1-AD041 or one CQM1-DA021	Two CQM1-AD041; one CQM1-AD041 and one CQM1-DA021
Current consumption (add to current consumption for analog module)	420 mA max. at 5 VDC	950 mA max. at 5 VDC

Note: To power two CQM1-DA021 analog output modules, use two CQM1-IPS01 power supply modules.

■ SYSTEM CONFIGURATION



## B7A Link Interface Modules

A wire-saving B7A Link for remote I/O consists of master modules mounted to the PLC and remote terminal blocks connected to I/O devices. The terminal blocks can be located up to 500 m away using a single cable.

- Just two wires transmit data, simplifies installation and troubleshooting
- High-speed (100 m max. at 3 ms) and long distance (500 m max. at 19.2 ms) configurations available
- Wide range of transistor and relay blocks to meet application needs
- Transmission distance up to 500 m
- Master acts like a high-density I/O module connecting 16 or 32 points to the controller with just two or three wires
- Supports 16-point input, output, mixed I/O and 10-point B7A terminal blocks and printed circuit board modules
- Output modules offer Hold and Load OFF handling of transmission errors

### CQM1-B7A□□



## ■ B7A LINK MASTER MODULES

I/O classification	Model	Transmission capabilities
16-point output	CQM1-B7A02	Long distance (19.2 ms) and high-speed (3 ms) systems, selectable
32-point output	CQM1-B7A03	
16-point input	CQM1-B7A12	
32-point input	CQM1-B7A13	
16-point input/16-point output	CQM1-B7A21	

## ■ SPECIFICATIONS

Item	CQM1-B7A21	CQM1-B7A13	CQM1-B7A03	CQM1-B7A12	CQM1-B7A02
No. of I/O points	16 inputs, 16 outputs (See Note 1)	32 inputs (See Note 2)	32 outputs	16 inputs (See Note 1)	16 outputs
Transmission method	Single-direction, time-division multiplex				
Transmission distance	Long distance: 500 m max. or 100 m max. High-speed: 100 m max. or 50 m max. (See Note 3)				
Transmission speed	Normal: 19.2 ms (typical); 31 ms max. High-speed: 3 ms (typical); 5 ms max.				
I/O word allocation (See Note 4)	1 word each for input and output (2 words total)	2 words for input	2 words for output	1 word for input	1 word for output
Required power supply	0.11 A min.	0.07 A min.	0.10 A min.	0.05 A min.	0.04 A min.
Current consumption (module as part of CQM1)	100 mA max., 5 VDC				

Note: 1. Input mode setting allows selection between 16-point input and 15-point input + 1 error input.

2. Input mode setting allows selection between 32-point input and 30-point input + 2 error inputs.

3. The transmission distance varies with the transmission speed and depends on where power is applied:

For normal speed setting:

If B7A Master Link and the B7A input and output modules each have power supplies, the transmission distance is 500 m. If one power supply is attached, the transmission distance is 100 m.

For high-speed setting:

If B7A Master Link and the B7A input and output modules each have power supplies, the transmission distance is 100 m. If one power supply is attached, the transmission distance is 50 m.

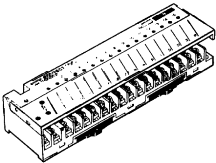
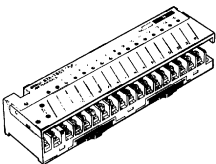
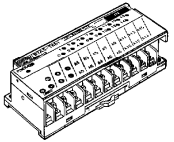
4. For addressing, words are allocated in sequence according to the location of the B7A Master on the PLC, as with other CQM1 I/O modules.

For more details on the B7A Master Link Interface Modules, refer to the CQM1 *Dedicated I/O Modules Operation Manual* (W238).

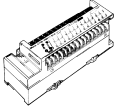
## ■ B7A LINK SLAVES

### 16-point Terminals

#### Transistor I/O Link Modules

Appearance	I/O classification	I/O configuration	I/O delay (typical)	Internal I/O common	Error processing (See Note 1)	Part number	
	Input, 16 points	NPN compatible	Normal speed 19.2 ms	- common	—	<b>B7A-T6A1</b> (See Note 2)	
				+/- common	—	<b>B7A-T6B1</b> (See Note 2)	
		PNP compatible	High speed 3 ms	+/- common	—	<b>B7A-T6C1</b>	
				- common	—	<b>B7A-T6A6</b> (See Note 2)	
		NPN compatible	High speed 3 ms	+/- common	—	<b>B7A-T6B6</b> (See Note 2)	
				- common	—	<b>B7A-T6C6</b>	
	Output, 16 points	NPN open collector 100 mA/point	Normal speed 19.2 ms	+ common	HOLD	<b>B7A-R6B11</b>	
					LOAD OFF	<b>B7A-R6B31</b>	
		NPN open collector 500 mA/point (See Note 3)	Normal speed 19.2 ms	+ common	HOLD	<b>B7A-R6C11</b>	
					LOAD OFF	<b>B7A-R6C31</b>	
		PNP open collector 100 mA/point	Normal speed 19.2 ms	- common	HOLD	<b>B7A-R6F11</b>	
					LOAD OFF	<b>B7A-R6F31</b>	
		PNP open collector 500 mA/point (See Note 4)	Normal speed 19.2 ms	- common	HOLD	<b>B7A-R6G11</b>	
					LOAD OFF	<b>B7A-R6G31</b>	
		NPN open collector 100 mA/point	High speed 3 ms	+ common	HOLD	<b>B7A-R6B16</b>	
					LOAD OFF	<b>B7A-R6B36</b>	
		NPN open collector 500 mA/point (See Note 3)	High speed 3 ms	+ common	HOLD	<b>B7A-R6C16</b>	
					LOAD OFF	<b>B7A-R6C36</b>	
		PNP open collector 100 mA/point	High speed 3 ms	- common	HOLD	<b>B7A-R6F16</b>	
					LOAD OFF	<b>B7A-R6F36</b>	
PNP open collector 500 mA/point (See Note 4)	High speed 3 ms	- common	HOLD	<b>B7A-R6G16</b>			
			LOAD OFF	<b>B7A-R6G36</b>			
	Input, 16 points	NPN compatible	Normal speed 19.2 ms	+/- common	—	<b>B7AS-T6B1</b>	
			High speed 3 ms		—	<b>B7AS-T6B6</b>	
	Output, 16 points	NPN open collector 100 mA/point	Normal speed 19.2 ms	+/- common	HOLD	<b>B7AS-R6B11</b>	
					LOAD OFF	<b>B7AS-R6B31</b>	
					High speed 3 ms	HOLD	<b>B7AS-R6B16</b>
					LOAD OFF	<b>B7AS-R6B36</b>	


#### 16-point Relay Output Link Modules

Appearance	I/O classification	I/O configuration	I/O delay (typical)	Error processing (See Note 1)	Part number
	Output, 16 points (SPST-NO)	Relay outputs G6D-1A DC24	Normal speed 19.2 ms (See Note 2)	HOLD	<b>G70D-R6R11-B7A</b>
				LOAD OFF	<b>G70D-R6R31-B7A</b>
		Power MOSFET relay outputs G3DZ-2R6PL DC24		HOLD	<b>G70D-R6M11-B7A</b>
				LOAD OFF	<b>G70D-R6M31-B7A</b>

Note: 1. HOLD: The previous output condition will be on hold when an error occurs.  
LOAD OFF: All outputs will be OFF when an error occurs.

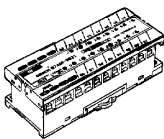
- The 16-point B7A-T6A□ and 16-point B7A-T6B□ are different from each other in terminal configuration.
- N-channel MOSFET open drain output
- P-channel MOSFET open drain output

## Link Master Adapters for High-density I/O Modules

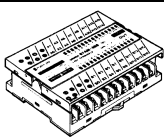
Appearance	I/O classification	I/O configuration	I/O delay (typical)	Error processing (See Note 1)	Part number
	Input, 32 points Use with CQM1-OD213.	NPN compatible	Normal speed 19.2 ms	—	<b>B7A-T3E3</b>
			High speed 3 ms	—	<b>B7A-T3E8</b>
	Output, 32 points Use with CQM1-ID213.	NPN open collector 50 mA/point	Normal speed 19.2 ms	HOLD	<b>B7A-R3A13</b>
				LOAD OFF	<b>B7A-R3A33</b>
			High speed 3 ms	HOLD	<b>B7A-R3A18</b>
				LOAD OFF	<b>B7A-R3A38</b>

## Mixed I/O Link Modules

## Screw Terminal Models (with 8 Input and 8 Output Points)

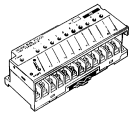
Appearance	I/O configuration	I/O delay (typical)	Error processing (See Note 1)	Part number
	NPN compatible/ NPN open collector 100 mA/point 8 input/8 output points	Normal speed 19.2 ms	HOLD	<b>B7AM-8B11</b>
			LOAD OFF	<b>B7AM-8B31</b>
		High speed 3 ms	HOLD	<b>B7AM-8B16</b>
			LOAD OFF	<b>B7AM-8B36</b>
	PNP compatible/ PNP open collector 100 mA/point 8 input/8 output points	Normal speed 19.2 ms	LOAD OFF	<b>B7AM-8F31</b>

## Screw Terminal Model (with 16 Input and 16 Output Points)

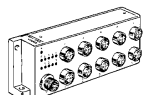
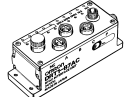
Appearance	I/O configuration	I/O delay (typical)	Error processing (See Note 1)	Part number
	NPN compatible/ NPN open collector 100 mA/point 16 input/16 output points	Normal speed 19.2 ms High speed 3 ms (switch selectable)	HOLD/ LOAD OFF (switch setting)	<b>B7AM-6BS</b>

## 10-point Terminal Models

## Transistor I/O Link Modules

Appearance	I/O classification	I/O configuration	Internal I/O common	Error processing (See Note 1)	Part number
	Input, 10 points (See Note 2)	NPN compatible (No two-wire sensor can be connected.)	– common	—	<b>B7A-T10S1</b>
			+/- common	—	<b>B7A-T10S3</b>
	Output, 10 points	NPN open collector 100 mA/point	+ common	HOLD	<b>B7A-R10SC01</b>

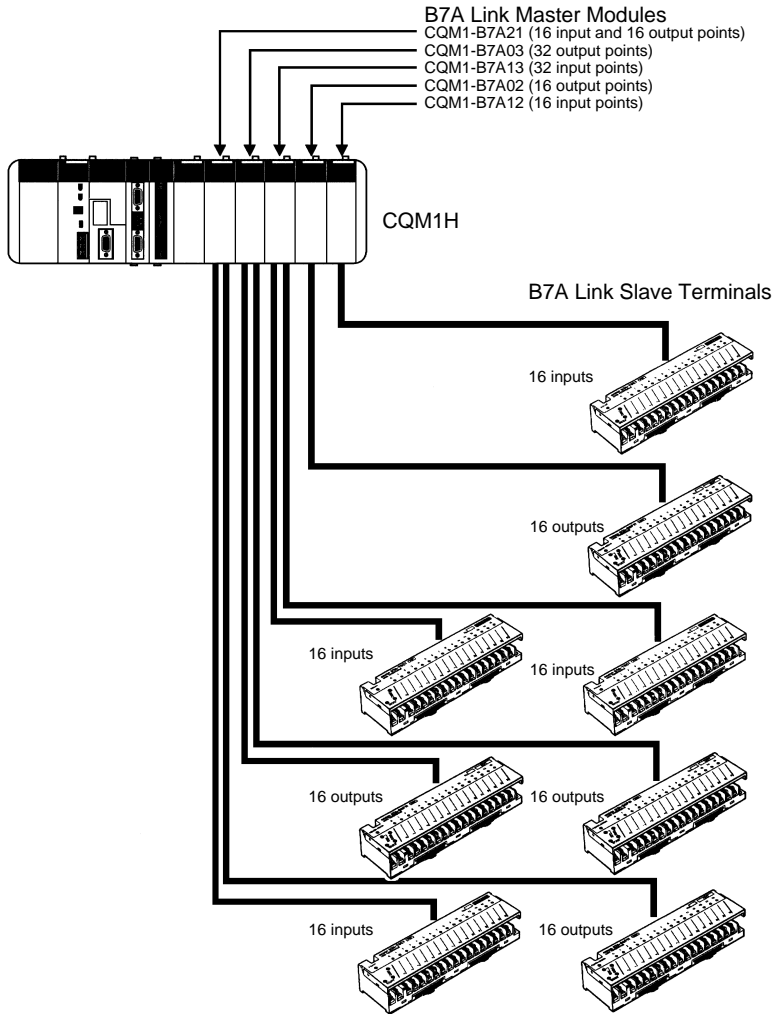
## Sealed Input Module with M12 Connectors

Appearance	Description	I/O configuration	I/O delay (typical)	Enclosure rating	Part number
	B7A 10-point sealed input module; M12 connectors	NPN compatible	19.2 ms	IP67	<b>B7AC-T10A1</b>
	DeviceNet interface module connects up to 3 B7AC modules			IP66	<b>DRT1-B7AC</b>

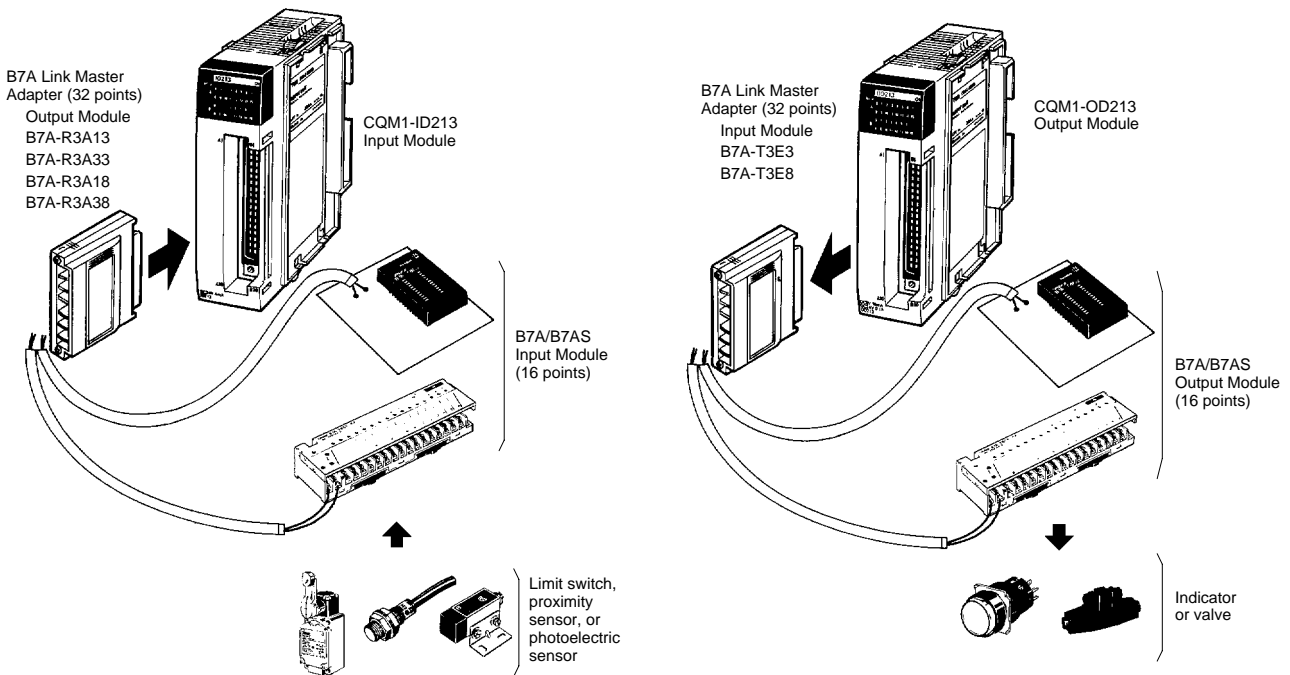
Note: 1. HOLD: The previous output condition will be on hold when an error results.  
LOAD OFF: All outputs will be OFF when an error results.

2. The 10-point B7A-T10S1 and 10-point B7A-T10S3 are different from each other in terminal configuration.

■ SYSTEM CONFIGURATION



**CQM1 High-Density I/O Modules with B7A Link Master Adapters**



## Temperature Controller Modules

Omron offers Temperature Controller Modules for 4-loop temperature control, 2-loop temperature control, and 2-loop temperature control with heater burnout alarm.

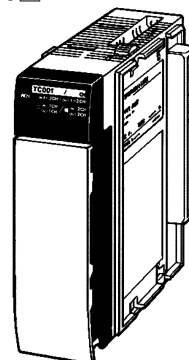
Parameters can be set and data read for these Temperature Controllers by transferring commands from the PLC. With only one word each allocated to the Temperature Controller Module for inputs and outputs, high-density temperature control applications become economical. Commands can be transferred easily using the TRANSFER I/O COMMAND instruction that has been added to the CQM1H CPU Units (See Note). The PID with advanced feed-forward circuitry assures stable temperature control. The controllers can also be set to ON/OFF control.

Note: Parameters can be set and data read for the TC20□ and TC30□ using the new IOTC(—) instruction. The IOTC instruction is supported by CQM1H CPU Units with a lot number of 0160 or later and CX-Programmer support software version 2.0 or later.

**Thermocouple Inputs:**  
CQM1-TC00□/TC20□

**Platinum Resistance Thermometer Inputs:**  
CQM1-TC10□/TC30□

NEW



### MODULES

Name	Model	Specifications
Temperature Controller Modules	CQM1-TC001	Thermocouple input (types J and K), transistor (NPN) output, 2 loops
	CQM1-TC002	Thermocouple input (types J and K), transistor (PNP) output, 2 loops
	CQM1-TC101	Platinum resistance thermometer input (Pt and JPt), transistor (NPN) output, 2 loops
	CQM1-TC102	Platinum resistance thermometer input, transistor (PNP) output, 2 loops
	CQM1-TC201	Thermocouple input, transistor (NPN) output, 4 loops
	CQM1-TC202	Thermocouple input, transistor (PNP) output, 4 loops
	CQM1-TC203	Thermocouple input, transistor (NPN) output, 2 loops (with heater burnout alarm)
	CQM1-TC204	Thermocouple input, transistor (PNP) output, 2 loops (with heater burnout alarm)
	CQM1-TC301	Platinum resistance thermometer input, transistor (NPN) output, 4 loops
	CQM1-TC302	Platinum resistance thermometer input, transistor (PNP) output, 4 loops
	CQM1-TC303	Platinum resistance thermometer input, transistor (NPN) output, 2 loops (with heater burnout alarm)
	CQM1-TC304	Platinum resistance thermometer input, transistor (PNP) output, 2 loops (with heater burnout alarm)
	Current detectors for heater burnout alarm	E54-CT1
E54-CT2		Measuring range of 0 to 50 A, 12 mm dia. hole

## ■ SPECIFICATIONS

### Temperature Controller Modules

Model		CQM1-TC00□	CQM1-TC10□	CQM1-TC20□	CQM1-TC30□
Input	Input type	Thermocouple input	Platinum resistance thermometer input	Thermocouple input	Platinum resistance thermometer input
	Input sensor types and set point ranges	K: 200 to 1,300°C (-300 to 2,300°F) J: 100 to 850°C (-100 to 1,500°F)	JPt: -99.9 to 450.0°C (-99.9 to 800.0°F) Pt: -99.9 to 450.0°C (-99.9 to 800.0°F)	K, J, T, L, R, S, B (See the following table for temperature ranges.)	Pt, JPt (See the following table for temperature ranges.)
	Number of control loops	Two (either 1 or 2 loops can be used)		4 loops (TC□01 or TC□02) or 2 loops with heater burnout alarm (TC□03 or TC□04)	
Control mode		ON/OFF or advanced PID control		ON/OFF control, advanced PID control (2 degrees of freedom), or manual operation	
Setting and display accuracy		°C Ranges (Set point ±1% or ±3°C, whichever is larger) ±1 digit max.  °F Ranges (Set point ±1% or ±6°F, whichever is larger) ±1 digit max.	°C Ranges (Set point ±1% or ±2°C, whichever is larger) ±1 digit max.  °F Ranges (Set point ±1% or ±4°F, whichever is larger) ±1 digit max.	°C Ranges (Set point ±0.3% or ±1°C, whichever is larger) ±1 digit max.  °F Ranges (Set point ±0.3% or ±2°F, whichever is larger) ±1 digit max.	0.1°C Ranges (Set point ±0.3% or ±0.8°C, whichever is larger) ±1 digit max.  0.1°F Ranges (Set point ±0.3% or ±1.6°F, whichever is larger) ±1 digit max. (See note 1.)  0.01°C Ranges (Set point ±0.3% or ±0.5°C, whichever is larger) ±1 digit max.
Temperature adjustment		0.8 °C/°F		0.1 to 999.9 °C/°F (0.1°C/°F unit)	
Proportional band		40.0 °C/°F		0.1 to 999.9 °C/°F (0.1°C/°F unit)	
Derivative time		240 s		0 to 3,999 s (1 s unit)	
Integral time		40 s		0 to 3,999 s (1 s unit)	
Manual output		—		0.0% to 100.0% (0.1% unit)	
Control period		20 s		1 to 99 s (1 s unit)	
Input shift range		—		-99.9 to 999.9 °C/°F (0.1°C/°F unit)	0.1 °C Ranges -99.9 to 999.9 °C/°F (0.1°C/°F unit)  0.01 °C Ranges -9.99 to 99.99 °C/°F (0.01°C/°F unit)
Sampling period		1 s		0.5 s	
Output	Output refresh period	1 s		0.5 s	
	Output form	NPN (TC□01) or PNP (TC□02) outputs with short-circuit protection		NPN (TC□01/TC□03) or PNP (TC□02/TC□04) outputs with short-circuit protection	
	Maximum switching capacity	100 mA, 24 VDC +10%/-15%		100 mA, 24 VDC +10%/-15%	
	Leakage current	0.3 mA max.		0.1 mA max.	
	Residual voltage	3.0 V max.		0.8 V max.	
External supply voltage		15 mA min., 24 VDC +10%/-15%		30 mA min., 24 VDC +10%/-15%	
Internal current consumption		220 mA max. at 5 VDC		190 mA max. at 5 VDC	
Heater burnout alarm	Maximum heater current	—		50 A, single-phase AC	
	Input current monitoring accuracy	—		±5% FS ±1 digit	
	Heater burnout alarm setting	—		0.1 to 49.9 A in 0.1 A increments (See Note 1)	
	Minimum ON time for detection	—		200 ms (See Note 2)	

Note: 1. Heater burnout detection will be disabled if the alarm is set to 0.0 A. The heater burnout alarm output will turn ON if the alarm is set to 50.0 A.

2. If the control output is ON for less than 200 ms, heater burnout will not be detected and the heater current will not be measured.



**Temperature Ranges**

**Temperature Ranges for Thermocouples**

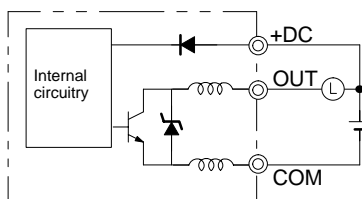
Input type	Code No.	°C	°F
K	0	-200 to 1300	-300 to 2300
K	1	0.0 to 500.0	0.0 to 900.0
J	2	-100 to 850	-100 to 1500
J	3	0.0 to 400.0	0.0 to 750.0
T	4	-200.0 to 400.0	-300.0 to 700.0
L	5	-100 to 850	-100 to 1500
L	6	0.0 to 400.0	0.0 to 750.0
R	7	0 to 1700	0 to 3000
S	8	0 to 1700	0 to 3000
B	9	100 to 1800	300 to 3200

**Temperature Ranges for Platinum Resistance Thermometers**

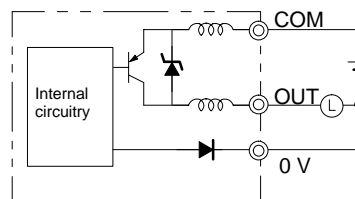
Input type	Code No.	°C	°F
Pt100	0	-200.0 to 650.0	-300.0 to 1200.0
JPt100	1	-200.0 to 650.0	-300.0 to 1200.0
Pt100	2	-20.00 to 250.00	Do not set.
JPt100	3	-20.00 to 250.00	

**Output Circuits**

CQM1-TC□01/TC□03: Sinking Outputs (NPN)



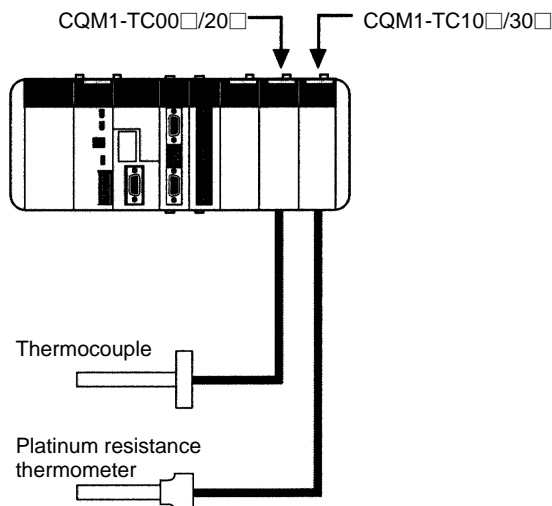
CQM1-TC□02/TC□04: Sourcing Outputs (PNP)



**Heater Burnout Current Detector Ratings**

Item	E54-CT1	E54-CT3
Continuous max. heater current	50 A	
Range for accurate measurement	0 to 30 A	0 to 50 A
Withstand voltage	1,000 VAC	
Shock resistance	50 Hz (Approx. 98 m/s <sup>2</sup> )	
Hole diameter	5.8 mm	12.0 mm
Weight	Approx. 11.5 g	Approx. 50 g
Accessories	None	Contactors: 2 Plugs: 2

**■ CONFIGURATION**

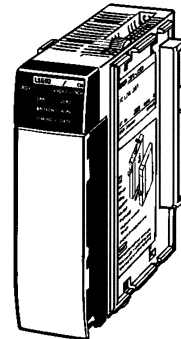


## Linear Sensor Interface Modules

Used primarily for length and distance calculations, the Linear Sensor Interface Modules measure voltage or current inputs from an Omron measurement sensor then quickly and accurately convert the analog signal to numeric data for comparative decision processing. You can also sync internal processing using external timing signals.

- A high-speed sampling cycle of 1 ms can be combined with high-speed external timing at 0.3 ms to easily detect high-speed changes in analog signals.
- Scaling and comparative decision processing reduces the burden on the CQM1H's CPU Unit, achieving faster processing both in the module and for the PLC all around.
- A forced-zero function lets you easily change reference points for different workpieces.
- The monitor output allows a specified voltage to be output from the ladder-diagram program to provide analog output capability (CQM1-LSE02 only).

### CQM1-LSE01 (Standard Interface) CQM1-LSE02 (Interface with Monitor Output)

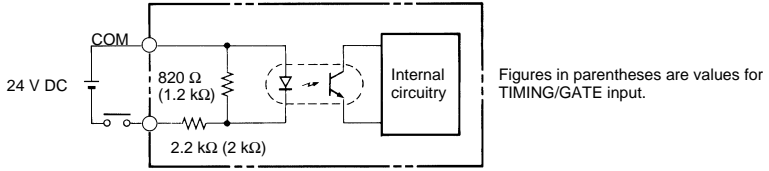


## ■ SPECIFICATIONS

### General

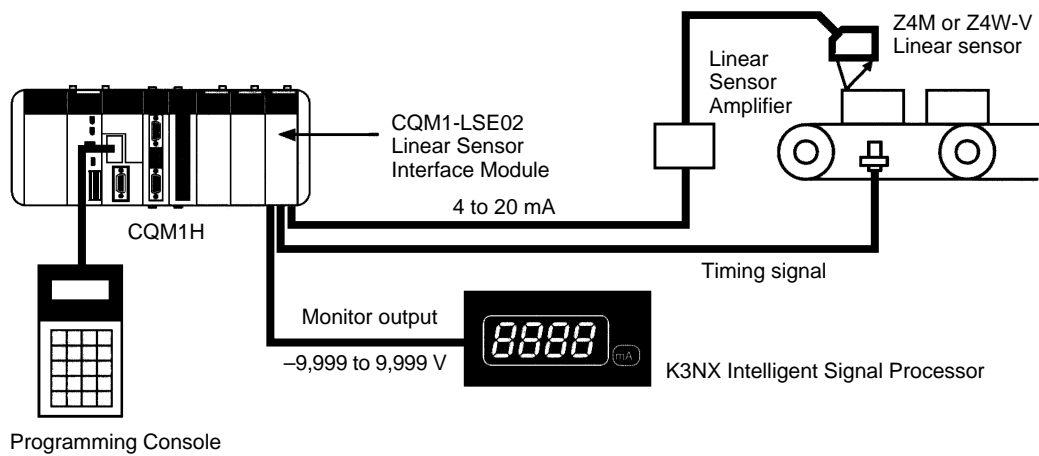
Item		CQM1-LSE01	CQM1-LSE02	
Input	No. of analog input points	1		
	Input signal range	Voltage	-9.999 to 9.999 V, -5 to 5 V, 1 to 5 V	
		Current	4 to 20 mA	
	Input impedance	Voltage	1 M $\Omega$ min.	
		Current	10 $\Omega$	
Linearity	$\pm 0.1\%$ FS $\pm 1$ digit max. with input sampling speed set to slow $\pm 0.5\%$ FS $\pm 1$ digit max. with input sampling speed set to fast			
PLC output code		Signed binary (-9999 to 9999)		
Sampling time		0.3 ms with input sampling speed set to fast and 0.6 ms with input sampling speed set to slow		
Sampling cycle		1 ms with input sampling speed set to fast and 2 ms with input sampling speed set to slow		
Arithmetic processing time		5 ms		
External control inputs		TIMING/GATE, ZERO, ZERO RESET, RESET		
Words allocated		1 input word and 1 output word		
Monitor output	Output signal	—	-9.999 V to 9.999 V	
	Output linearity	—	$\pm 0.1\%$ FS	
	Output resolution	—	1/8192	
	Output refresh period	—	0.5 s	
	Output response time	—	0.5 s	
	Allowable load resistance	—	10 k $\Omega$ min.	
Insulation		Photocoupler insulation between input terminals and PLC signals and between input terminals and output terminals.		
Dielectric strength		500 VAC for 1 minute between input terminals and output terminals 1,000 VAC for 1 minute between I/O terminals and FG		
Internal current consumption		380 mA max. at 5 VDC	450 mA max. at 5 VDC	
Weight		230 g max.		

**Control Input**

Item	Specification
Input voltage	24 VDC +10%/-15%
Input impedance	TIMING/GATE: 2 kΩ Other control output: 2.2 kΩ
Input current	TIMING/GATE: 9.2 mA typical (24 VDC) Other control output: 10.0 mA typical (24 VDC)
ON voltage	TIMING/GATE: 16.3 VDC min. Other control output: 17.1 VDC min.
OFF voltage	TIMING/GATE: 3.8 VDC max. Other control output: 3.6 VDC max.
ON/OFF response time (See note)	TIMING/GATE: 50 μs typical Other control output: 4 ms typical
Circuit configuration	

Note: The ON/OFF response time is the time required for the CPU Unit to detect input turned ON or OFF.

**■ CONFIGURATION**



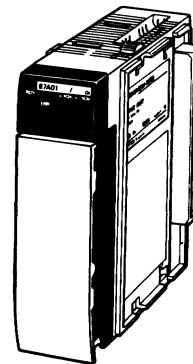
## Safety Relay Module

Use the Safety Relay Module to reduce the wiring time and costs and installation space for safety circuits. It can monitor the following four statuses of the safety circuit:

1. Safety Circuit Output Status  
Monitors if the safety circuit is operating and producing outputs.
2. Safety Circuit Power Status  
Monitors the status of the power supply to the safety circuit.
3. K1 Relay Operating Status
4. K2 Relay Operating Status  
Monitors the status of the internal relays that form the safety circuit. This helps troubleshooting safety circuit problems.

In addition to the safety circuit, the module offers general-purpose inputs for synchronization: 4 inputs and 1 common.

### CQM1-SF200



## ■ SPECIFICATIONS

### General

Item	Specifications	
Contact resistance (See Note 1)	100 mΩ	
Operating time (See Note 2)	300 ms max.	
Response time (See Notes 2 and 3)	10 ms max.	
Durability	Mechanical	5 million operations min. (switching frequency: 7,200 times/hour)
	Electrical	100,000 operations min. (rated load, switching frequency: 1,800 times/hour)
Error rate (P level: reference value)	1 mA at 5 VDC	
Weight	260 g max.	

- Note: 1. Measurement conditions: 1 A at 5 VDC voltage drop method  
 2. Bounce time is not included.  
 3. The response time is from when the input is turned OFF to when the main contact turns OFF.

## Safety Circuit Ratings

### Power Supply Section

Item	Specifications
Supply voltage	24 VDC
Permissible voltage fluctuation range	-15%/+10% of supply voltage
Power consumption	1.7 W max., 24 VDC

### Input Section

Item	Specifications
Input current	75 mA max.

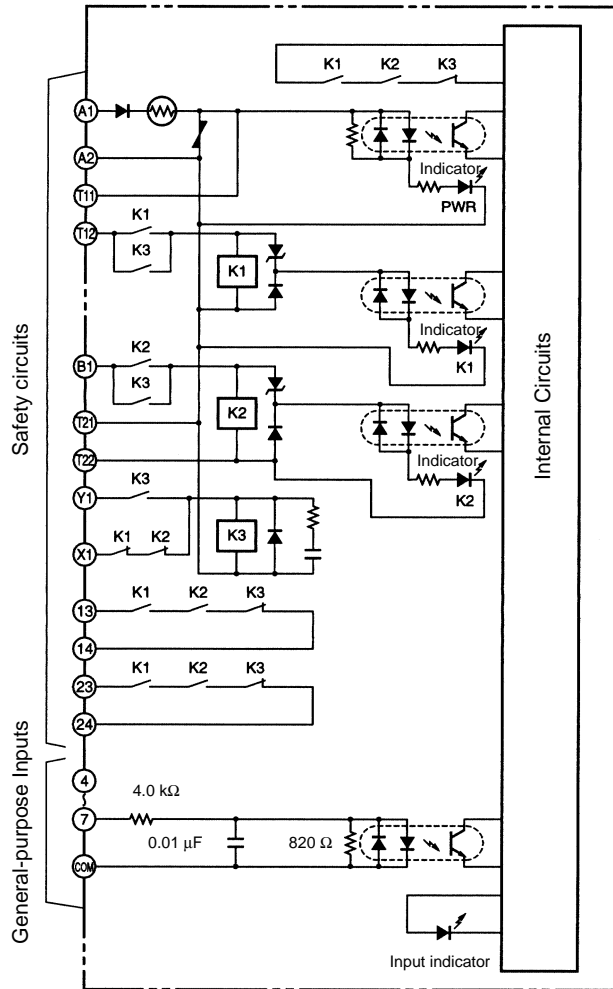
### Switching Section

Item	Specifications
Load	Resistive load ( $\cos = \phi 1$ )
Rated load	5 A at 250 VAC
Rated switching current	5 A

General-purpose Input Ratings

Item	Specifications
Rated input voltage	24 VDC -15%/+10%
Input impedance	4.0 kΩ
Input current	6 mA typ. (24 VDC)
ON voltage/ON current	14.4 VDC min./3 mA min.
OFF voltage/OFF current	5 VDC max./1 mA max.
ON/OFF response time	8 ms max. (selectable from 1 to 128 ms using System Setup.)
Number of circuits	4 inputs and 1 common
Number of points that turn ON simultaneously	100% simultaneously ON
Internal current consumption	50 mA max.

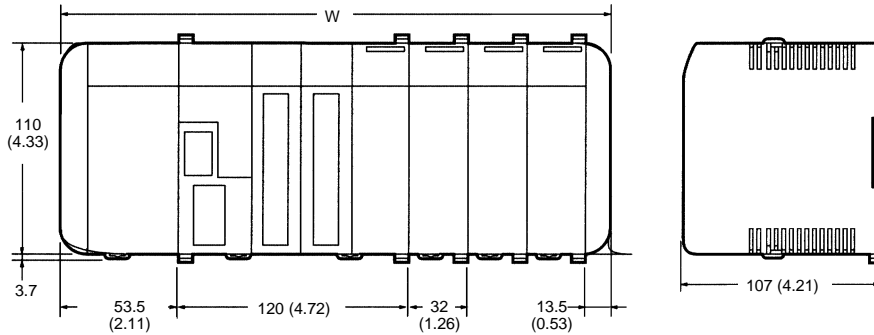
Output Circuit



# Dimensions

Unit: mm (inch)

## OVERALL CQM1H DIMENSIONS



### Overall PLC Widths for Example Configurations

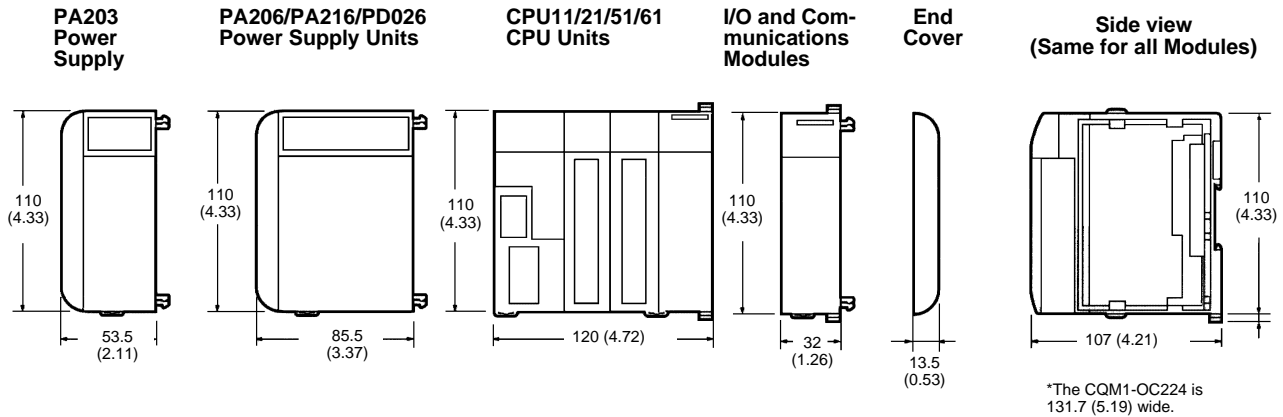
Number of I/O Modules	Width with PA203 Power Supply Unit	Width with PA206, PA216, or PD026 Power Supply Unit
3	283 (11.14)	315 (12.40)
4	315 (12.40)	347 (13.66)
5	347 (13.66)	379 (14.92)

### Calculating Overall PLC Width with "n" I/O Modules

Power Supply Unit	Width formula
CQM1-PA203	$32 \times n + 187$ (1.26 × n + 7.36)
CQM1-PA206	$32 \times n + 219$ (1.26 × n + 8.62)
CQM1-PA216	
CQM1-PD026	

Note: The total number of I/O Modules and Dedicated I/O Modules (n) is limited to 12 Modules (11 without a Communications Module) for the CQM1H-CPU51/61 and 11 Modules for the CQM1H-CPU11/21.

## POWER SUPPLY, CPU, COMMUNICATIONS, DEDICATED I/O, AND I/O MODULES



## WEIGHT

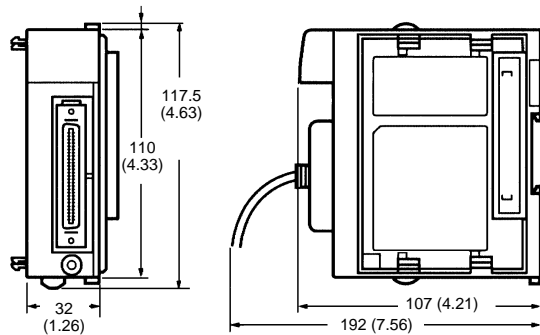
Name	Model	Weight
Power Supply Units	CQM1-PA203	460 g max
	CQM1-PA206	560 g max
	CQM1-PD026	
	CQM1-PA216	
CPU Units	CQM1H-CPU11	500 g max.
	CQM1H-CPU21	510 g max.
	CQM1H-CPU51	
	CQM1H-CPU61	

Name	Model	Weight
Input Units	CQM1-ID211	180 g max.
	CQM1-ID111	
	CQM1-ID212	
	CQM1-ID112	160 g max.
	CQM1-ID213	
	CQM1-ID214	
	CQM1-IA121	210 g max.
	CQM1-IA221	

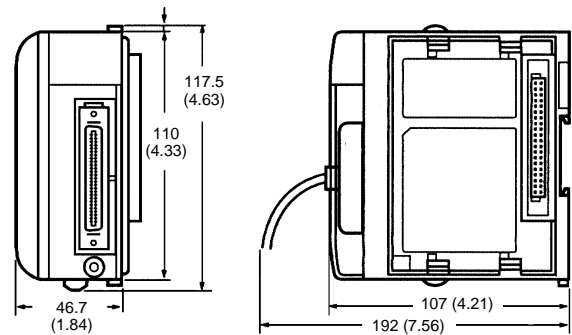
Name	Model	Weight
Output Units	CQM1-OC221	200 g max.
	CQM1-OC222	230 g max.
	CQM1-OC224	270 g max.
	CQM1-OD211	200 g max.
	CQM1-OD212	180 g max.
	CQM1-OD213	160 g max.
Output Units	CQM1-OD214	210 g max.
	CQM1-OD215	240 g max.
	CQM1-OD216	210 g max.
	CQM1-OA221	240 g max.
	CQM1-OA222	

## I/O CONTROL AND INTERFACE MODULES

CQM1H-IC101



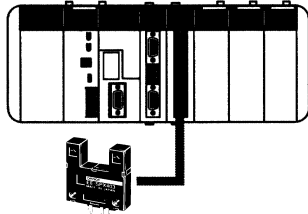
CQM1H-II101



# Functions

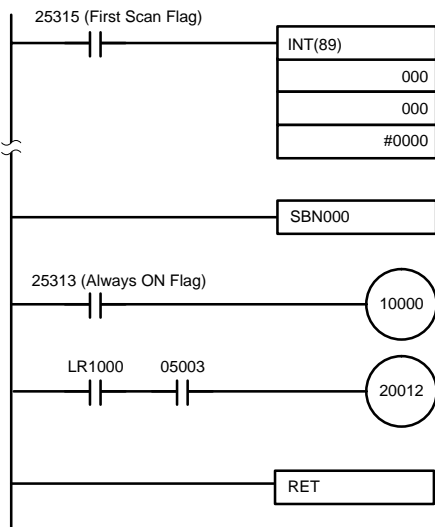
## ■ INTERRUPT INPUT PROCESSING

All CQM1H CPU Units are equipped with four inputs (IR 00000 to IR 00003) that can be used as interrupt inputs. Interrupt processing can be enabled and disabled with the INTERRUPT CONTROL – INT(89) instruction.



Photomicrosensor etc.

### Sample Program



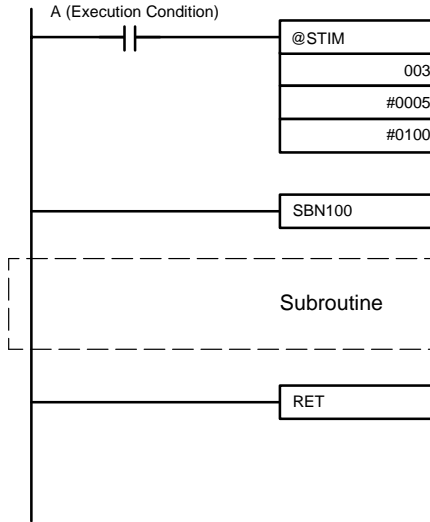
In order for interrupt input processing to be performed, the INTERRUPT CONTROL – INT(89) instruction is set so that interrupt processing is enabled when IR 00000 goes ON. When the external signal to IR 00000 goes from OFF to ON, program execution is temporarily halted, and processing moves to subroutine 00. When subroutine 000 (SBN000) is completed, its results are output immediately. The entire interrupt process, from IR 00000 going ON to the refreshing of outputs IR 10000 and IR 20012, provides high-speed I/O response that is not affected by the PLC's cycle time.

## ■ INTERVAL TIMER INTERRUPT PROCESSING

The INTERVAL TIMER – STIM(69) instruction is useful for performing repetitive processes, such as output processing, that need to be performed regularly at intervals shorter than the cycle time.

Place an STIM(69) instruction in the program to define a timer that will call and execute a subroutine at regular intervals. Up to 3 interval timers can be used.

### Sample Program



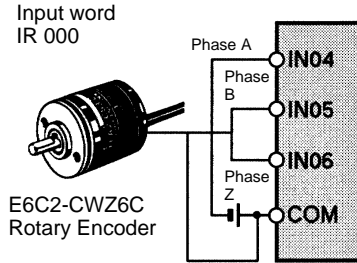
The STIM(69) instruction is used to control an interval timer. In this example, timer 0 is started in repetitive mode. As long as A (the execution condition) is ON, the main program will be halted and the interrupt routine SBN100 will be executed every 5 ms (i.e., each time the interval timer times out). Main program execution is continued when interrupt routine execution has been completed.



**INTERNAL HIGH-SPEED COUNTERS**

Pulses from a rotary encoder can be input directly into 3 of the CPU Unit's inputs (IN04, IN05, and IN06) and used as internal high-speed counter.

Pulses can be counted from 0 to 65535 in the increment mode and -32767 to 32767 in the up/down mode, with a single-phase response speed of 5 KHz and a two-phase response speed of 2.5 kHz.



The high-speed counter's input mode is set in the DM Area's PLC Setup.

**Input Modes**

Up/Down mode	Uses phase A and phase B to count up and down.
Increment mode	Uses phase A only to count up.
Normal mode	Input bit 04 to bit 06 are used as normal inputs.

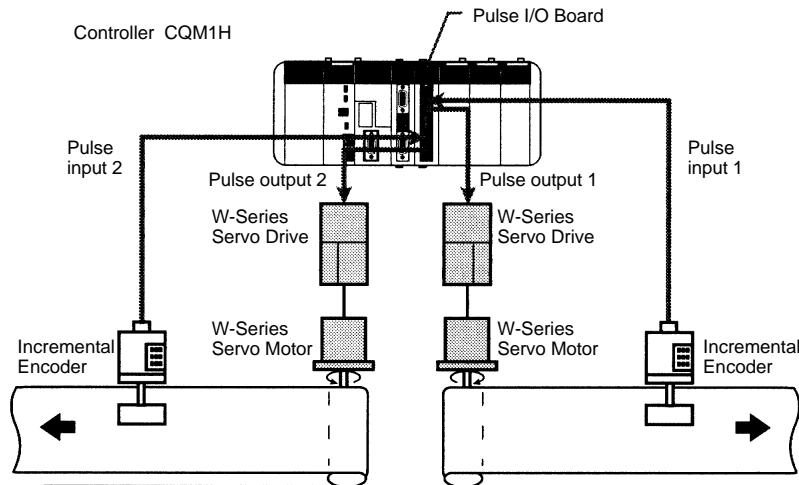
**Reset Method**

There are two ways to reset the counter's PV. The PV can be reset by the software reset alone or by a logical AND between the phase-Z input and the software reset.

**Comparison Conditions**

Target value	Up to 16 target values can be set. The specified subroutine will be executed when the count value reaches a target value.
Zone comparison	Up to 8 zones (upper/lower limits) can be set. The specified subroutine will be executed when the count value is within a zone.

**Typical Application: Two-axis Positioning or Speed Control**

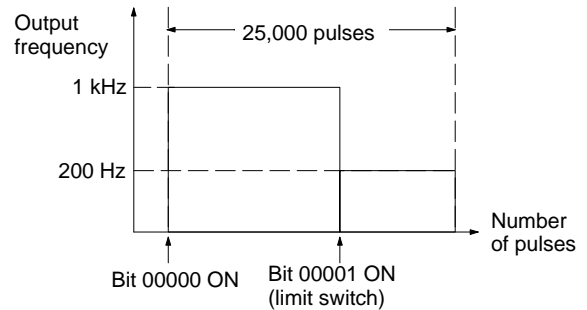
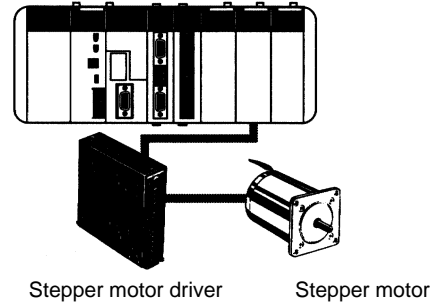


**PULSE OUTPUT: PULS(65) AND CHANGE FREQUENCY – SPED(64)**

These instructions are used to control pulse outputs. They can greatly simplify tasks such as controlling stepper motors directly from the CQM1H.

**Example**

In this example, the speed of a stepper motor is changed.



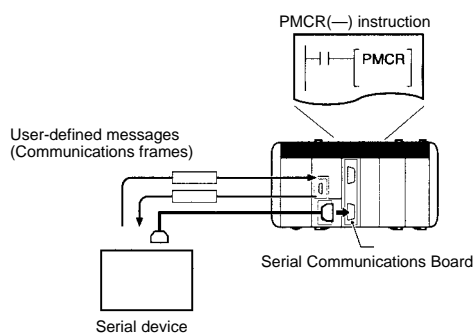
Note: A programming example using Pulse Output and Speed Change instructions follows on the next page.

# Communications

## ■ PROTOCOL MACRO FOR SERIAL COMMUNICATION TO ANY SERIAL DEVICE

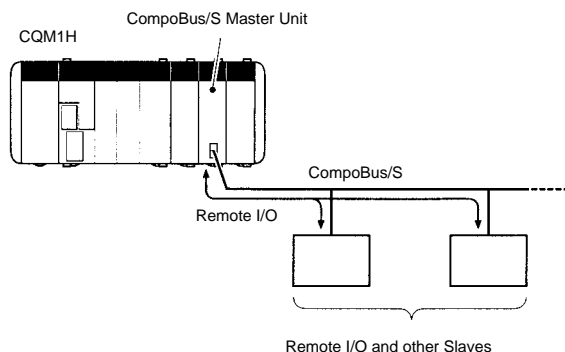
The CX-Protocol can create sets of data transmission procedures called protocols for general-purpose external devices according to the communications specifications of the external devices. Communications must be half-duplex and must use start-stop synchronization. The created protocols are recorded 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). These protocols can be changed to communicate with virtually any third-party serial device.

Note: Standard protocols for these devices are included with the CX-Protocol and Serial Communications Boards.

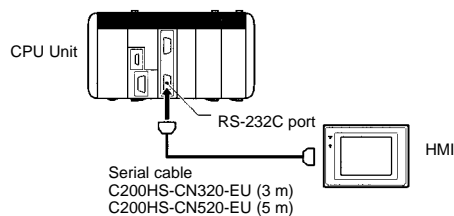


## Host Function to Other Omron Controls

A CQM1H CPU Unit can operate as a host to send 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.

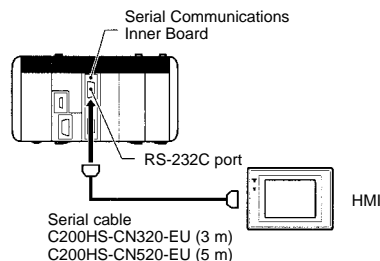


## ■ NT LINK FOR PROGRAMMABLE TERMINALS



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

### 1:1 NT Link

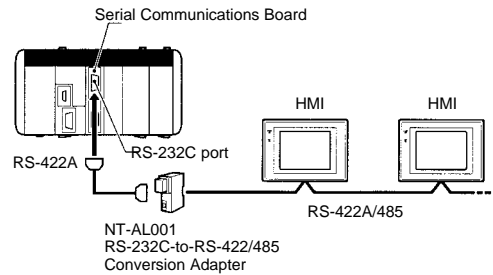


There are two NT Link modes: One is for communications between one PLC and one HMI (1:1 mode), and the other is for communications between one PLC, and one or many HMIs (1:N mode). These modes support completely different communications. This mode is used for communications between one PLC and one HMI. 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 PLC and one HMI. Set the HMI communications settings for a 1:1 NT Link.

**1:N NT Link**

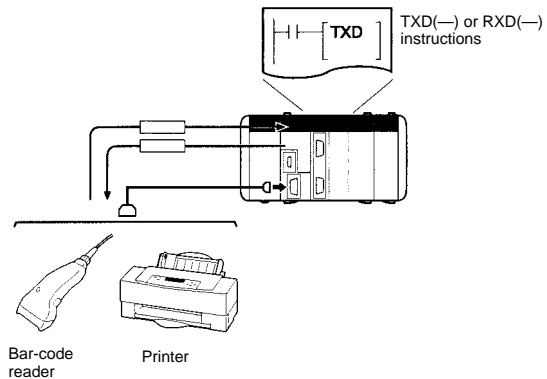
This mode is used for communications between one PLC and n (8≥n≥1) HMIs. This mode is supported by the RS-232C port on the CPU Unit, as well as the RS-232C port and RS-422A/485 port on the Serial Communications Board. The 1:N NT Link mode is supported for communications between one PLC and one or more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

Connection to RS-232C port of Serial Communications Board



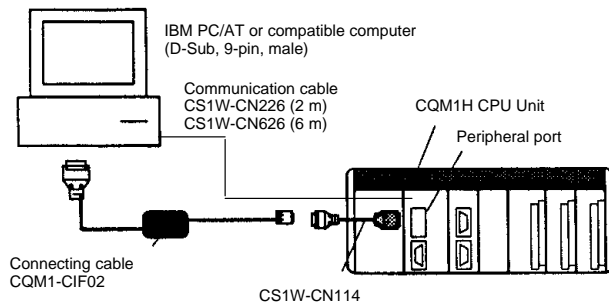
**NO-PROTOCOL COMMUNICATIONS**

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.

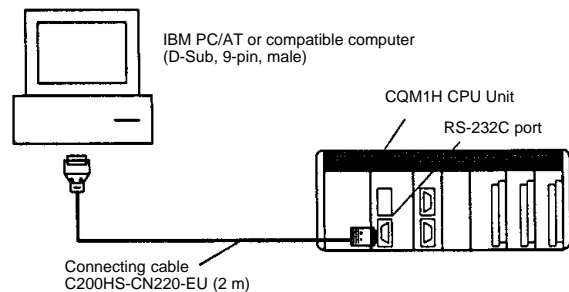


**HOST LINK COMMUNICATIONS**

**Connecting to Peripheral Port**



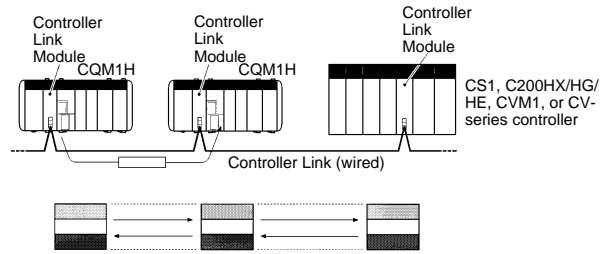
**Connecting to RS-232C Port (on CPU Unit or Serial Communications Board)**



- Note: 1. Connecting cables CS1W-CN225/625/227/627 cannot be used with the CQM1H.  
 2. The CQM1-CIF11 connecting cable cannot be used with the CQM1H.

## ■ CONTROLLER LINK

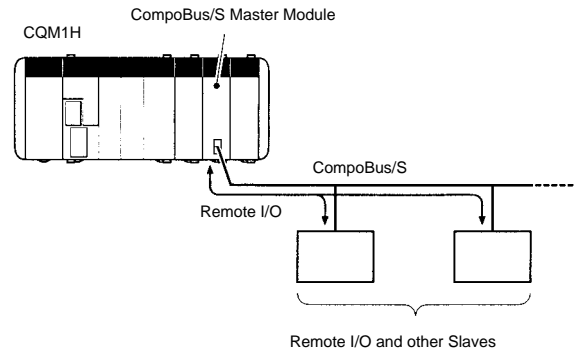
The Controller Link Network is the high-speed data network used by Omron programmable controllers. When using a CQM1H-CPU51/61 CPU Unit, the CQM1H can be connected to the network using a Controller Link module. This enables the flexible and simple transfer of large amounts of data with other OMRON PLCs (e.g., CQM1H, CS1, C200HX/HG/HE, CVM1, and CV-series PLCs) or with personal computers. Data links can be created between PLCs so that data can be shared without programming and FINS message communications can be performed, 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.



Data links automatically transfer data every cycle.  
Messages sent to other nodes whenever necessary.

## ■ COMPOBUS/S

CompoBus/S is a high-speed ON/OFF bus for remote I/O communications. Connecting a CQM1-SRM21-V1 CompoBus/S Master Module (a Dedicated I/O module) to the network allows remote I/O communications, without programming in the CPU Unit, between the PLC 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.



# Instruction Set

## ■ SEQUENCE INSTRUCTIONS

### Sequence Input Instructions

Instruction	Mnemonic	Code
LOAD	LD	○
LOAD NOT	LD NOT	○
AND	AND	○
AND NOT	AND NOT	○
OR	OR	○
OR NOT	OR NOT	○
AND LOAD	AND LD	○
OR LOAD	OR LD	○

### Sequence Output Instructions

Instruction	Mnemonic	Code
OUTPUT	OUT	○
OUT NOT	OUT NOT	○
SET	SET	○
RESET	RSET	○
KEEP	KEEP	11
DIFFERENTIATE UP	DIFU	13
DIFFERENTIATE DOWN	DIFD	14

### Sequence Control Instructions

Instruction	Mnemonic	Code
NO OPERATION	NOP	00
END	END	01
INTERLOCK	IL	02
INTERLOCK CLEAR	ILC	03
JUMP	JMP	04
JUMP END	JME	05

## ■ TIMER/COUNTER INSTRUCTIONS

Instruction	Mnemonic	Code
TIMER	TIM	○
COUNTER	CNT	○
REVERSIBLE COUNTER	CNTR	12
HIGH-SPEED TIMER	TIMH	15
TOTALIZING TIMER	TTIM	—

Note: ○: Instruction keys allocated to the Programming Console.

(@): Instruction can be differentiated using input rise time to execute the instruction in just one cycle.

—: Identifies an expansion instruction.

†: Identifies an expansion instruction assigned a default code.

## ■ COMPARISON INSTRUCTIONS

Instruction	Mnemonic	Code
COMPARE	CMP	20
DOUBLE COMPARE	CMPL†	60
SIGNED BINARY COMPARE	CPS	—
SIGNED BINARY DOUBLE COMPARE	CPSL	—
MULTI-WORD COMPARE	MCMP(@)†	19
TABLE COMPARE	TCMP(@)	85
DOUBLE COMPARE	CMPL(@)†	60
BLOCK COMPARE	BCMP(@)†	68
AREA RANGE COMPARE	ZCP	—
DOUBLE AREA RANGE COMPARE	ZCPL	—

## ■ DATA MOVEMENT INSTRUCTIONS

Instruction	Mnemonic	Code
MOVE	MOV(@)	21
MOVE NOT	MVN(@)	22
MOVE BIT	MOVB(@)	82
MOVE DIGIT	MOVD(@)	83
TRANSFER BITS	XFRB(@)	—
BLOCK TRANSFER	XFER(@)	70
BLOCK SET	BSET(@)	71
DATA EXCHANGE	XCHG(@)	73
SINGLE WORD DISTRIBUTE	DIST(@)	80
DATA COLLECT	COLL(@)	81

## ■ SHIFT INSTRUCTIONS

Instruction	Mnemonic	Code
SHIFT REGISTER	SFT	○/10
REVERSIBLE SHIFT REGISTER	SFTR(@)	84
ONE DIGIT SHIFT LEFT	SLD(@)	74
ONE DIGIT SHIFT RIGHT	SRD(@)	75
ASYNCHRONOUS SHIFT REGISTER	ASFT(@)†	17
WORD SHIFT	WSFT(@)	16
ARITHMETIC SHIFT LEFT	ASL(@)	25
ARITHMETIC SHIFT RIGHT	ASR(@)	26
ROTATE LEFT	ROL(@)	27
ROTATE RIGHT	ROR(@)	28

## ■ INCREMENT/DECREMENT

Instruction	Mnemonic	Code
INCREMENT	INC(@)	38
DECREMENT	DEC(@)	39

## ■ ARITHMETIC INSTRUCTIONS

Instruction	Mnemonic	Code
BCD ADD	ADD(@)	30
BCD SUBTRACT	SUB(@)	31
BCD MULTIPLY	MUL(@)	32
BCD DIVIDE	DIV(@)	33
DOUBLE BCD ADD	ADDL(@)	54
DOUBLE BCD SUBTRACT	SUBL(@)	55
DOUBLE BCD MULTIPLY	MULL(@)	56
DOUBLE BCD DIVIDE	DIVL(@)	57
BINARY ADD	ADB(@)	50
BINARY SUBTRACT	SBB(@)	51
BINARY MULTIPLY	MLB(@)	52
BINARY DIVIDE	DVB(@)	53
DOUBLE BINARY ADD	ADBL(@)	—
DOUBLE BINARY SUBTRACT	SBBL(@)	—
SIGNED BINARY MULTIPLY	MBS(@)	—
DOUBLE SIGNED BINARY MULTIPLY	MBSL(@)	—
SIGNED BINARY DIVIDE	DBS(@)	—
DOUBLE SIGNED BINARY DIVIDE	DBSL(@)	—
ARITHMETIC PROCESS	APR(@)	—
BIT COUNTER	BCNT(@)†	67
SQUARE ROOT	ROOT(@)	72

## ■ DATA CONVERSION INSTRUCTIONS

Instruction	Mnemonic	Code
BCD TO BINARY	BIN(@)	23
BINARY TO BCD	BCD(@)	24
DOUBLE BCD-TO-DOUBLE BINARY	BINL(@)	58
DOUBLE BINARY-TO-DOUBLE BCD	BCDL(@)	59
4 TO 16 DECODER	MLPX(@)	76
16 TO 4 DECODER	DMPX(@)	77
ASCII CODE CONVERT	ASC(@)	86
ASCII-TO-HEXADECIMAL	HEX(@)	—
COLUMN TO LINE	LINE(@)	—
LINE TO COLUMN	COLM(@)	—
2'S COMPLEMENT	NEG(@)	—
2'S COMPLEMENT DOUBLE CON- VERT	NEGL(@)	—
HOURS-TO-SECONDS	SEC(@)	—
SECONDS-TO-HOURS	HMS(@)	—

## ■ LOGIC INSTRUCTIONS

Instruction	Mnemonic	Code
LOGICAL AND	ANDW(@)	34
LOGICAL OR	ORW(@)	35
EXCLUSIVE OR	XORW(@)	36
EXCLUSIVE NOR	XNRW(@)	37
COMPLEMENT	COM(@)	29

## ■ FLOATING-POINT MATH AND CONVERSION INSTRUCTIONS

Instruction	Mnemonic	Code
FLOATING TO 16-BIT	FIX(@)	—
FLOATING TO 32-BIT	FIXL(@)	—
16-BIT TO FLOATING	FLT(@)	—
32-BIT TO FLOATING	FLTL(@)	—
FLOATING POINT ADD	+F(@)	—
FLOATING POINT SUBTRACT	-F(@)	—
FLOATING POINT MULTIPLY	*F(@)	—
FLOATING POINT DIVIDE	/F(@)	—
DEGREES TO RADIANS	RAD(@)	—
RADIANS TO DEGREES	DEG(@)	—
SINE	SIN(@)	—
COSINE	COS(@)	—
TANGENT	TAN(@)	—
ARC SINE	ASIN(@)	—
ARC COSINE	ACOS(@)	—
ARC TANGENT	ATAN(@)	—
SQUARE ROOT	SQRT(@)	—
EXPONENT	EXP(@)	—
LOGARITHM	LOG(@)	—

## ■ TABLE DATA MANIPULATION INSTRUCTIONS

Instruction	Mnemonic	Code
DATA SEARCH	SRCH(@)	—
FIND MAXIMUM	MAX(@)	—
FIND MINIMUM	MIN(@)	—
SUM CALCULATION	SUM(@)	—
FRAME CHECKSUM	FCS(@)	—

## ■ DATA CONTROL INSTRUCTIONS

Instruction	Mnemonic	Code
PID CONTROL	PID	—
SCALING	SCL(@)†	66
SIGNED BINARY TO BCD SCALING	SCL2(@)	—
BCD TO SIGNED BINARY SCALING	SCL3(@)	—
AVERAGE VALUE	AVG	—

Note: ○: Instruction keys allocated to the Programming Console.

(@): Instruction can be differentiated using input rise time to execute the instruction in just one cycle.

—: Identifies an expansion instruction.

†: Identifies an expansion instruction assigned a default code.

## ■ SUBROUTINE INSTRUCTIONS

Instruction	Mnemonic	Code
SUBROUTINE ENTER	SBS(@)	91
SUBROUTINE ENTRY	SBN	92
SUBROUTINE RETURN	RET	93
MACRO	MCRO	99

## ■ INTERRUPT CONTROL INSTRUCTIONS

Instruction	Mnemonic	Code
INTERRUPT CONTROL	INT(@)†	89
INTERVAL TIMER	STIM(@)†	69

## ■ TEMPERATURE CONTROLLER MODULE INSTRUCTION

Instruction	Mnemonic	Code
TRANSFER I/O COMMAND	IOTC	—

## ■ PULSE CONTROL INSTRUCTIONS

### High-speed Counter Control Instructions

Instruction	Mnemonic	Code
MODE CONTROL	INI(@)†	61
PV READ	PRV(@)†	62
COMPARE TABLE LOAD	CTBL(@)†	63

## ■ POSITION CONTROL INSTRUCTIONS

### Pulse Output Control Instructions

Instruction	Mnemonic	Code
SPEED OUTPUT	SPED(@)†	64
SET PULSES	PULS(@)†	65
POSITIONING	PLS2(@)	—
PULSE W/VARIABLE DUTY RATIO	PWM(@)	—
ACCELERATION CONTROL	ACC(@)	—

## ■ STEP INSTRUCTIONS

Instruction	Mnemonic	Code
STEP DEFINE	STEP	08
STEP START	SNXT	09

## ■ PERIPHERAL DEVICE CONTROL

### I/O Unit Instructions

Instruction	Mnemonic	Code
I/O REFRESH	IORF(@)	97
7-SEGMENT DECODER	SDEC(@)	78
7-SEGMENT DISPLAY OUTPUT	7SEG†	88
DIGITAL SWITCH	DSW†	87
TEN KEY INPUT	TKY(@)†	18
HEXADECIMAL KEY INPUT	HKY	—

## ■ COMMUNICATIONS INSTRUCTIONS

### Serial Communications

Instruction	Mnemonic	Code
PROTOCOL MACRO	PMCR(@)	—
TRANSMIT	TXD(@)†	48
RECEIVE	RXD(@)†	47
CHANGE RS-232C SETUP	STUP(@)†	—

### Network Communications

Instruction	Mnemonic	Code
NETWORK SEND	SEND(@)†	90
NETWORK RECEIVE	RECV(@)†	98
DELIVERY COMMAND	CMND(@)	—

## ■ DISPLAY INSTRUCTION

Instruction	Mnemonic	Code
MESSAGE	MSG(@)	46

## ■ DAMAGE DIAGNOSIS AND TROUBLE-SHOOTING INSTRUCTIONS

Instruction	Mnemonic	Code
FAILURE ALARM	FAL(@)	06
SEVERE FAILURE ALARM	FALS	07
FAILURE POINT DETECT	FPD	—
TRACE MEMORY SAMPLE	TRSM	45

## ■ CARRY FLAG INSTRUCTIONS

Instruction	Mnemonic	Code
SET CARRY	STC(@)	40
CLEAR CARRY	CLC(@)	41

Note: ○: Instruction keys allocated to the Programming Console.

(@): Instruction can be differentiated using input rise time to execute the instruction in just one cycle.

—: Identifies an expansion instruction.

†: Identifies an expansion instruction assigned a default code.

## ■ USING EXPANSION INSTRUCTIONS IN CQM1H PROGRAMS

The following 18 function codes can be used for expansion instructions: 17, 18, 19, 47, 48, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 87, 88, and 89. The 74 expansion instructions that can be used are listed below, along with the default function codes that are assigned.

Mnemonic	Code
ASFT	17
TKY	18
MCMP	19
RXD	47
TXD	48
CMPL	60
INI	61
PRV	62
CTBL	63
SPED	64
PULS	65
SCL	66
BCNT	67
BCMP	68
STIM	69
DSW	87
7SEG	88
INT	89

Mnemonic	Code
ACC	---
ACOS	---
ADBL	---
APR	---
ASIN	---
ATAN	---
AVG	---
CMND	---
COLM	---
COS	---
CPS	---
CPSL	---
DBS	---
DBSL	---
DEG	---
EXP	---
FCS	---
FIX	---

Mnemonic	Code
FIXL	---
FLT	---
FLTL	---
FPD	---
HEX	---
HKY	---
HMS	---
LINE	---
LOG	---
MAX	---
MBS	---
MBSL	---
MIN	---
NEG	---
NEGL	---
PID	---
PLS2	---
PMCR	---
PWM	---

Mnemonic	Code
RAD	---
SBBL	---
SCL2	---
SCL3	---
SEC	---
SIN	---
SQRT	---
SRCH	---
STUP	---
SUM	---
TAN	---
TTIM	---
XFRB	---
ZCP	---
ZCPL	---
+F	---
-F	---
*F	---
/F	---

**NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.**

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