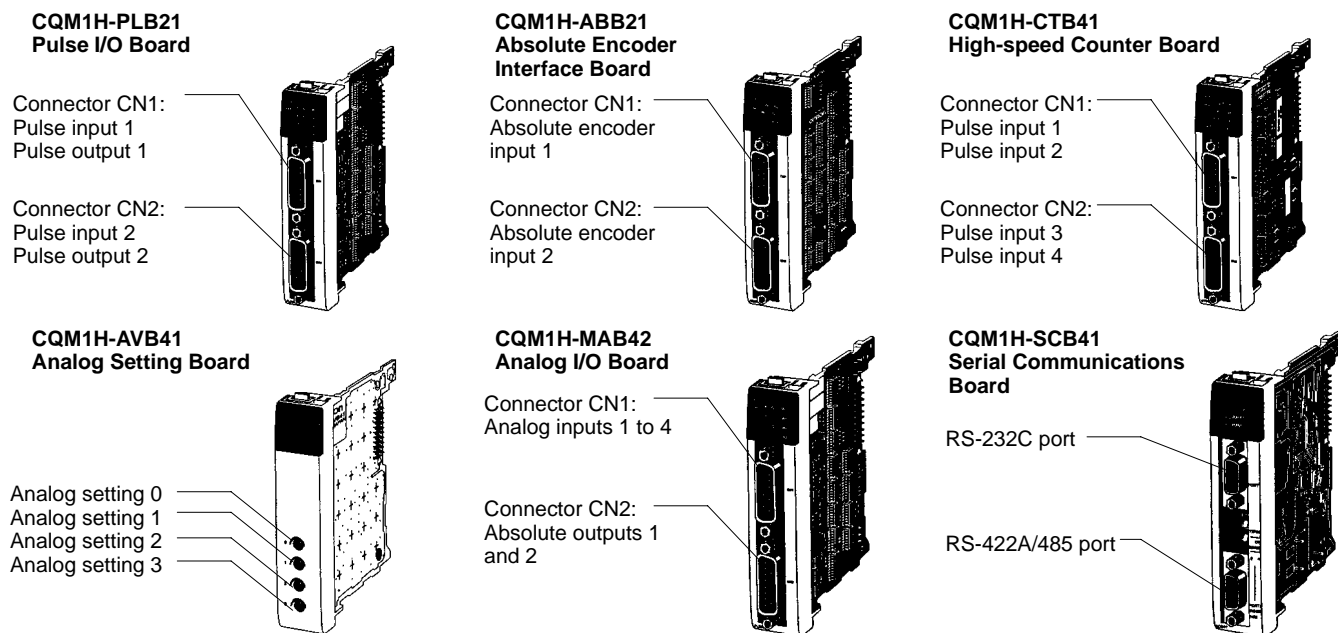


Inner Boards

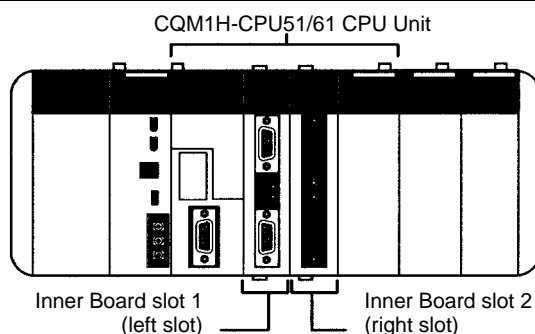
■ Inner Boards

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.)



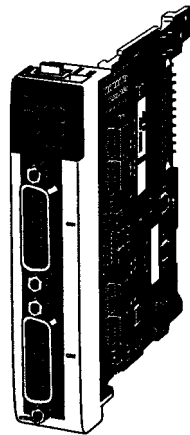
Inner Board Specifications

Name	Specifications	Model number	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		
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



■ High-speed Counter Board

CQM1H-CTB41

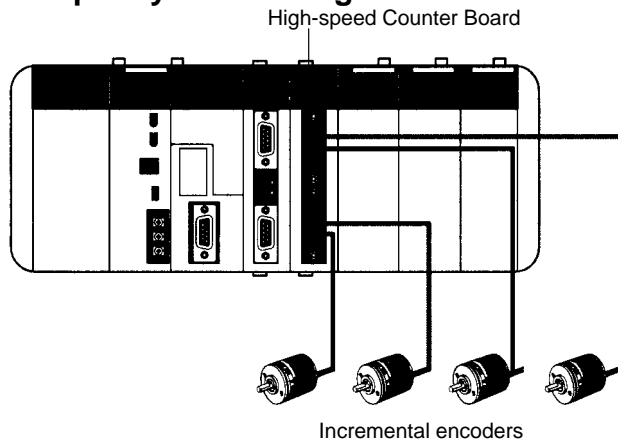


Features

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.

Example System Configuration



Specifications

Item	Specifications
Name	High-speed Counter Board
Model number	CQM1H-CTB41
Applicable CPU Units	CQM1H-CPU51/61
Unit classification	CQM1H-series Inner Board
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)	5 V DC, 400 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

Inner Boards

Pulse Inputs (High-speed Counters)

Pulse Input Function

Item		Specifications		
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 Specifications

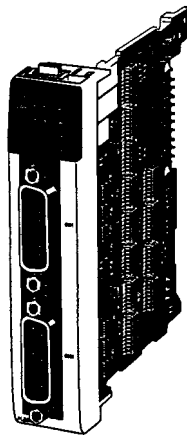
Item	Specifications			
Number of pulse inputs	4 inputs (Ports 1 to 4 = High-speed counters 1 to 4)			
Signals	Encoder inputs A and B; pulse input Z			
Input voltage	Switched by means of input voltage switch on the Board (Specified separately for phases A, B, and Z.)			
	24 V DC±10%		RS-422A line driver (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 V DC min.	18.6 V DC min.	---	---
OFF voltage	4.0 V DC min.	4.0 V DC min.	---	---

External Output Specifications

Item	Specifications
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 V DC±10%
Switching capacity	16 mA/4.5 V DC 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 Board

CQM1H-PLB21



Features

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

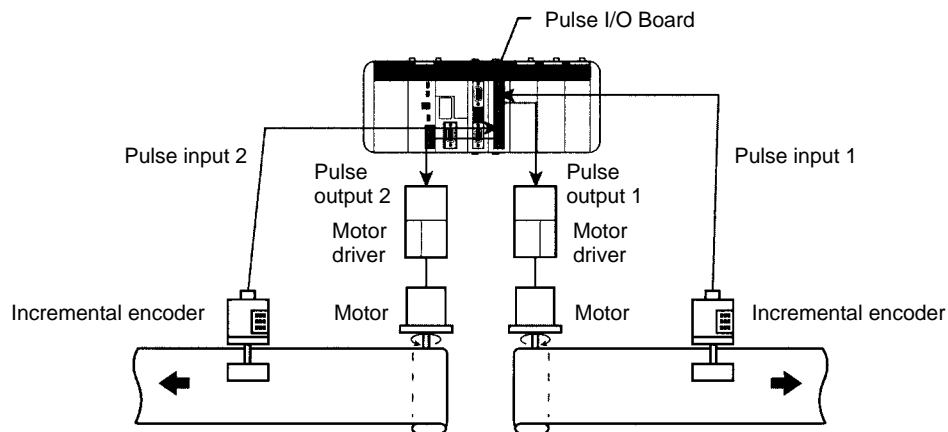
The Board can execute an interrupt subroutine when the counter PV matches a specified target value (target value comparison) or falls within a specified comparison range (range comparison.)

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.

System Configuration



Specifications

Item	Specifications
Name	Pulse I/O Board
Model number	CQM1H-PLB21
Applicable CPU Units	CQM1H-CPU51/61
Unit classification	CQM1H-series Inner Board
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 V DC, 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)

Inner Boards

Pulse Input (High-speed Counter) Specifications

Pulse Input Function

Item		Specifications		
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 Specifications

Item	Specifications			
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 V DC±10%		24 V DC±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 V DC min.		20.4 V DC min.	
OFF voltage	3.0 V DC min.		4.0 V DC min.	

Pulse Output Specifications

Pulse Output Function

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

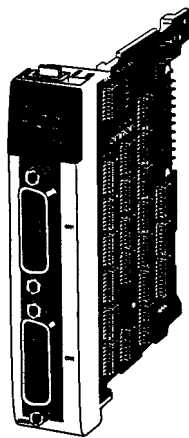
Item	Fixed duty factor			Variable duty factor
	Without trapezoidal acceleration/ deceleration	With trapezoidal acceleration/ deceleration		
		Same acceleration/ deceleration rates	Separate acceleration/ deceleration rates	
Instruction	PULS(65)/SPED(64)	PLS2(—)	PULS(65)/ ACC(—)	PWM(—)
Output frequency	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 Specifications

Item	Specifications
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 V DC \pm 5% 30 mA min.; 24 V DC $+10\%/_{-15\%}$ 30 mA min.
Max. switching capacity	NPN open collector, 30 mA/5 to 24 V DC \pm 10%
Min. switching capacity	NPN open collector, 7 mA/5 to 24 V DC \pm 10%
Leakage current	0.1 mA max.
Residual voltage	0.4 V max.

■ Absolute Encoder Interface Board

CQM1H-ABB21



Features

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

Absolute High-speed Counter

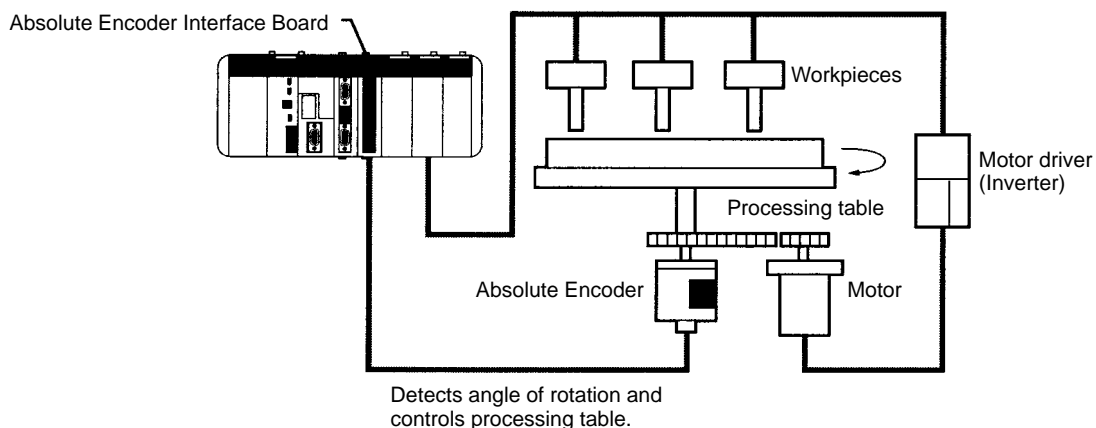
The Absolute Encoder Interface Board reads binary gray codes (inverted binary codes) input from an absolute encoder at a maximum counting rate of 4 kHz, and can perform interrupt processing according to the input values.

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 interrupts, 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



Inner Boards

Specifications

Item	Specifications
Name	Absolute Encoder Interface Board
Model number	CQM1H-ABB21
Applicable CPU Units	CQM1H-CPU51/61
Unit classification	CQM1H-series Inner Board
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 V DC, 150 mA max.
Dimensions	25 × 110 × 107 mm (W × H × D)
Weight	90 g max.
Standard accessories	Plugs: XM2D-1501 (OMRON) × 2 Hoods: XM2S-1511 (OMRON) × 2

Absolute Encoder Input Specifications

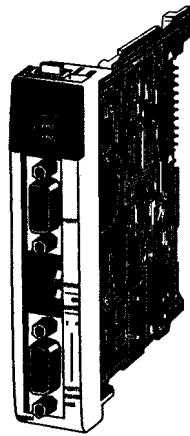
Item	Specifications	
Number of inputs	Two inputs	
Input code	Binary gray code	
Operating modes	BCD Mode or 360° Mode (Set in PLC Setup.)	
Resolutions	8-bit, 10-bit, or 12-bit (Set in PLC Setup.)	
Origin compensation	Supported. (Current position can be designated as origin). Compensation is set in PLC 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 Inputs

Item	Specifications
Input voltage	24 V DC +10%, -15%
Input impedance	5.4 kΩ
Input current	4 mA typical
ON voltage	16.8 V DC min.
OFF voltage	3.0 V DC max.

■ Serial Communications Board

CQM1H-SCB41

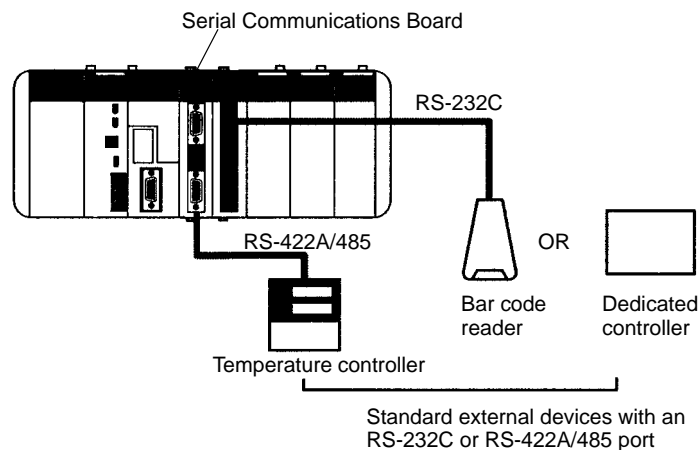


Features

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 improve 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.

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 according to the external device's communications specifications
- 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

Inner Boards

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 ¹
Protocol macro	YES	YES
No-protocol	YES	YES ¹
1:1 Data Link	YES	YES ¹
NT Link in 1:1 mode	YES ²	YES ²
NT Link in 1:N mode	YES ²	YES 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.

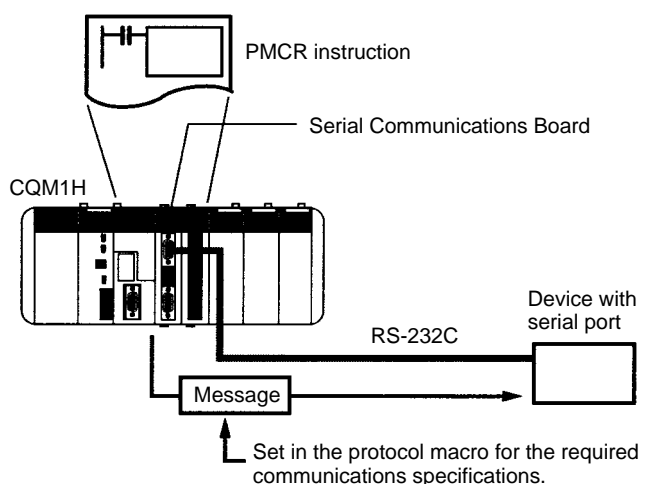
Serial Communications Board Specifications

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		5 VDC, 200 mA max.
Dimensions		25 × 110 × 107 mm (W × H × D)
Weight		90 g max.
Standard accessories		Plugs: XM2SA-0901 (OMRON) x 2 Hoods: XM2SA-0911 (OMRON) x 2 (ESD)

Protocol Macros

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

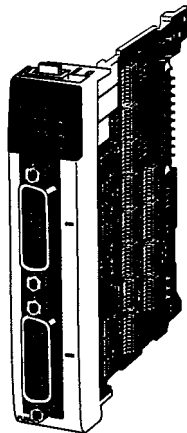
Standard system protocols are also provided with the CX-Protocol and Serial Communications Board for easy communications with OMRON components, such as Temperature Controllers, Intelligent Signal Processors, Bar Code Readers, and Modems. The standard system protocols can also be modified for specific applications using the CX-Protocol.



Inner Boards

■ Analog I/O Board

CQM1H-MAB42



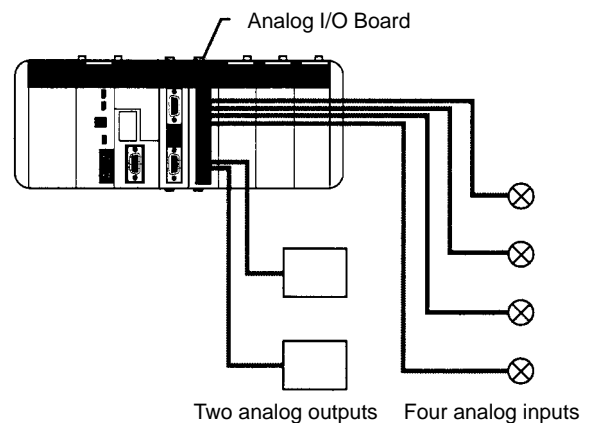
Features

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

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

Item	Specifications
Name	Analog I/O Board
Model number	CQM1H-MAB42
Applicable CPU Units	CQM1H-CPU51/61
Unit classification	CQM1H-series Inner Board
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)	5 V DC, 400 mA max.
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

Inner Boards

Analog Inputs

Item	Specifications	
	Voltage inputs	Current inputs
Input signals		
Number of analog inputs	4 inputs	
Input signal ranges ¹	-10 to 10 V 0 to 10 V 0 to 5 V	0 to 20 mA
A/D conversion time 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 Ω typical	250 Ω typical
Absolute maximum rated input	± 15 V	± 30 mA
Overall precision 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).

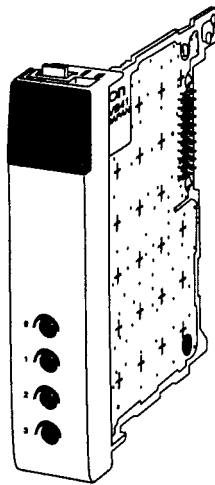
Analog Outputs

Item	Specifications	
	Voltage outputs	Current outputs
Output signals		
Number of analog outputs	2 outputs	
Output signal ranges ¹	-10 to 10 V	0 to 20 mA
D/A conversion time 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 Ω min.	350 Ω max.
Overall precision 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

CQM1H-AVB41



Features

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.

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	Specifications
Name	Analog Setting Board
Model number	CQM1H-AVB41
Applicable CPU Units	CQM1H-CPU51/61
Unit classification	CQM1H-series Inner Board
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)	5 V DC, 10 mA max.
Dimensions	25 × 110 × 107 mm (W × H × D)
Weight	60 g max.