

Advanced Power in Three Applications: Motion Control, Measurement Control, and High-speed Response Control

The All New FQM (Flexible Quick Motion)[®]

The FQM1 now supports I/O expansion, communications slaves, multiaxis control, data storage, and function block /structured text programming.

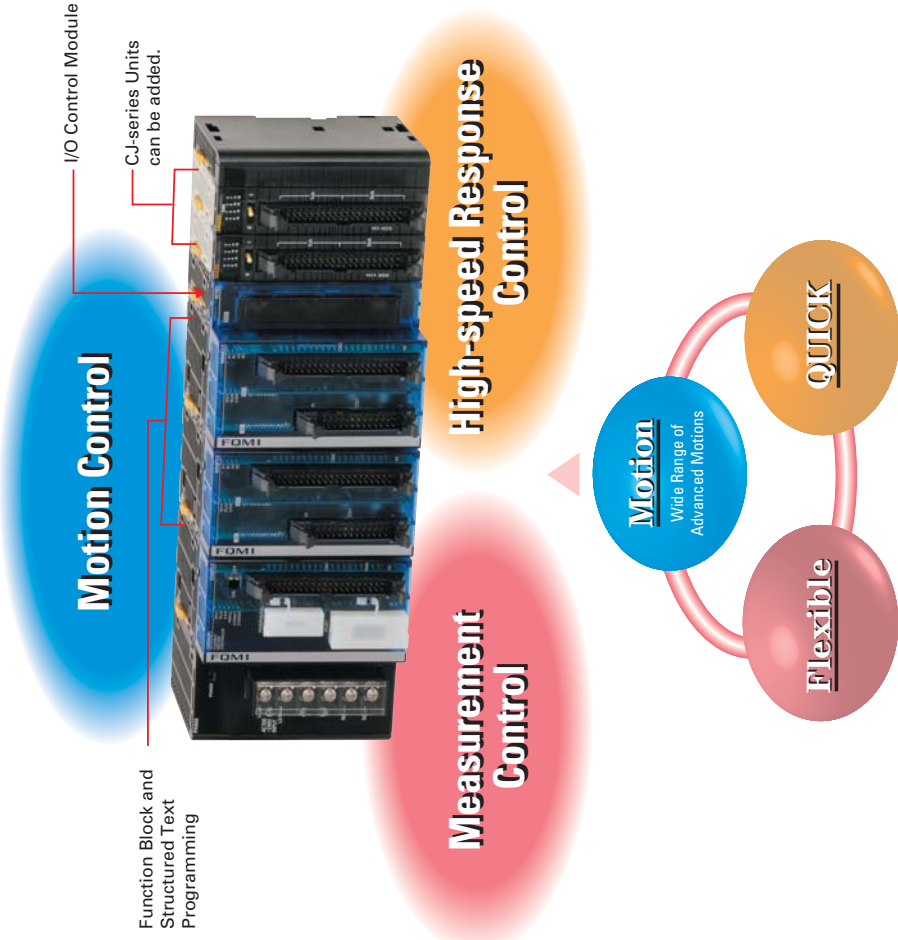
Flexibility, quickness, and a wide range of advanced motion operations enable the FQM1 to easily handle applications in the following three control areas.

1 Motion Control

2 Measurement Control

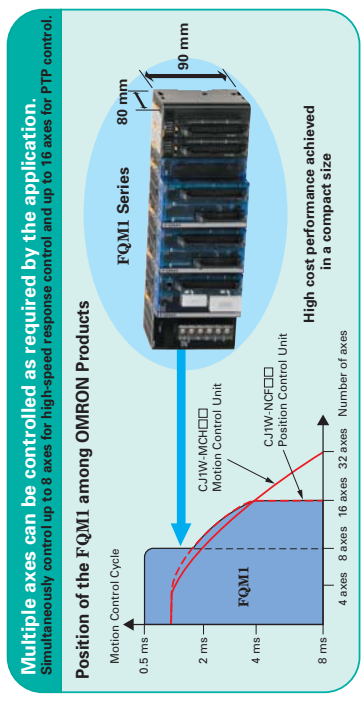
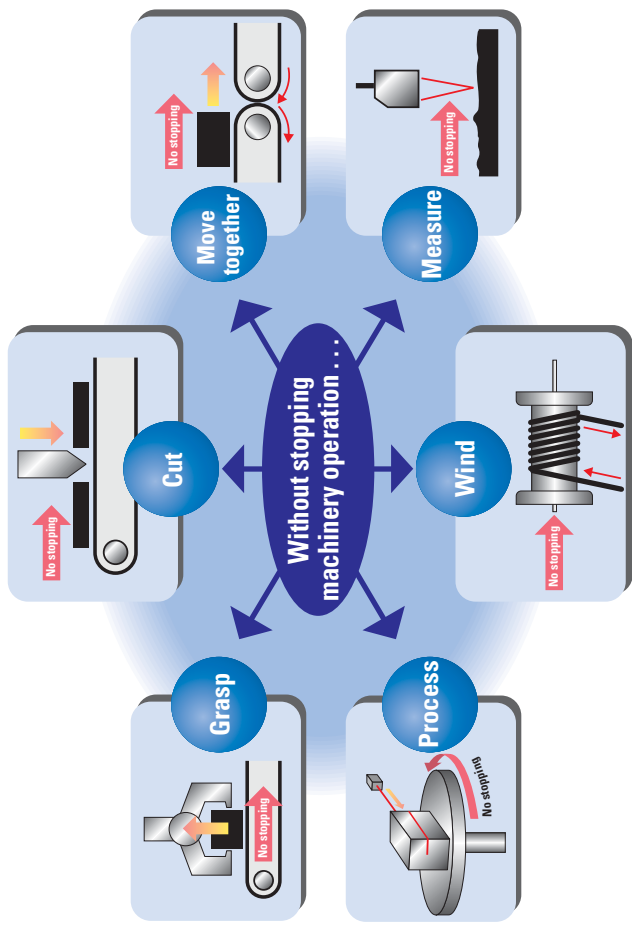
3 High-speed Response Control

The all new FQM1-CM002/MMA22/MMP22 (FQM1-series unit version 3.0) can be expanded using CJ-series Units. In addition, function block and structured text programming are supported.



For the Non-stop Control Ideal for Applications Performing Processing without Stopping Machinery Operation

To improve machinery performance, it is important to increase productivity by eliminating waste. Here, the FQM1 really performs to enable processing must be achieved without stopping machinery operation.

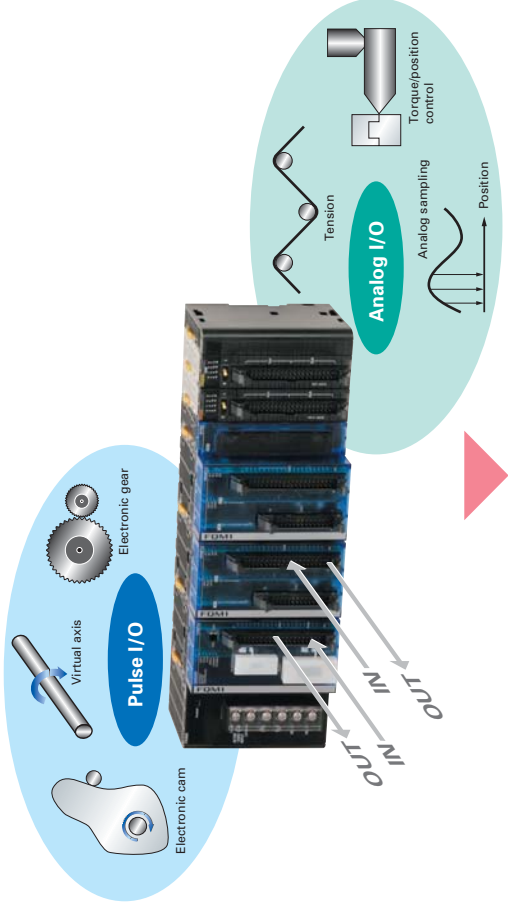


A Variety of Applications Accomplished with Motion, Measurement, and High-speed Response

High-level Wide-ranging Motion Achieved from F (Flexibility) and Q (Quickness).

- From High-speed PTP Control to Synchronous, Torque, and Tension Control

Pulse/analog I/O feedback gives the FQM1 power in high-speed I/O applications.



● Wide-ranging FQM1 Applications

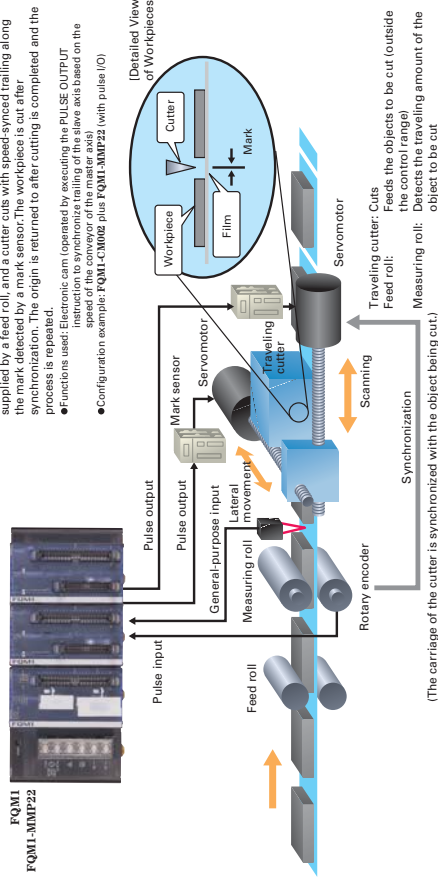
In addition to motion control, the FQM1 handles the following control areas through its ability to perform high-speed I/O processing through feedback from analog or pulse input data. Actual applications have already been implemented.

Control Category		Application example
Motion control	Rotary cutters	Packaging machines
	Flying cutters	Traveling cutters
	Electronic cams	Processing line and lens processing
	Tension control	Winding and feeding
	Draw control	Paper feeding
Torque control	Torque control	Injection molding
	Torque limit	Molding and pressing
	CP control	Processing and coating
Tracking control	Traverse control	Winding
	High-speed analog sampling	Sheet thickness inspection and quality management
Measurement control	High-speed PID control	Distance constant control
	High-speed counters	Measurement (high-speed) and FV conversion
High-speed response control	Synchronous startup	Conveyors
	Interrupt feeding	Labelers
	High-speed PTP control	Conveyors
	High-speed counters	Conveyors
	High-speed counters	Conveyors

Motion Control Applications

The FQM1 Achieves High-precision Trailing Using High-speed Control Cycles

High-precision trailing with little fluctuation is possible due to the high-speed responsiveness of the FQM1. An instruction for line segment approximation can be used during operation to change the pattern of the curve.



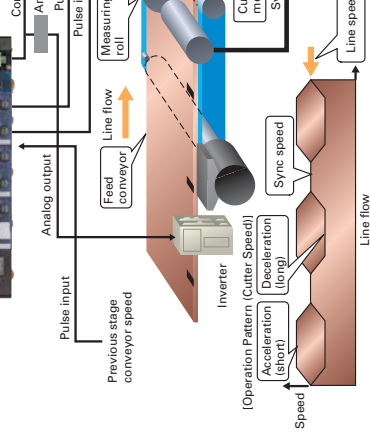
The high-speed cycle and processing method of the FQM1 enable flexible cam patterns.

The high-speed cycle and high level of processing functions enable synchronous control of electronic cams using either a cam table method or a data processing method. In particular, when the data processing method is used, it is possible to realize a high-speed control cycle during processing, enabling the cam to be changed during operation. When using the cam table method, tables can be linked and used even while switching cam tables, enabling high-resolution curves.



FQM1-MMP22 I/O Control Module

CompoBus/S Master Unit



Application Examples

- Operating the rotary cutter of a packaging machine or a food processing machine
- Matching the timing between lines - Printing

For example, a sheet is fed continuously on a production line and cut to the specified dimension without stopping the line. The encoder on the measuring roll measures the length of the feed amount, which serves as the basis of the operation of the line speed. Cutting time (the blade intersection time) is synchronized to the line speed, and the cutter is accelerated or decelerated in the remaining time to cut to the preset dimension.

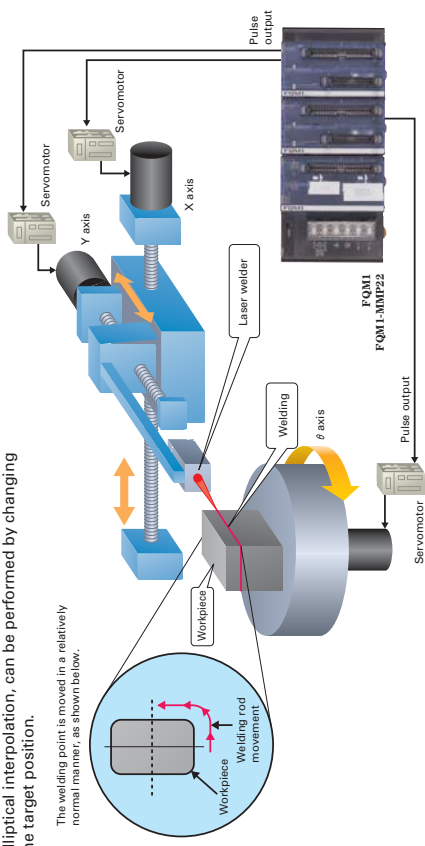
- Functions used: Electronic cam (operated by executing the PULSE OUTPUT instruction on the target position multiplied by the curve table approximation for the position of the slave axis or by using data processing)
- Configuration example: FQM1-CH006 plus FQM1-MMP22 (with pulse I/O) plus FQM1-I/O Control Module plus CFW-SRM21 (CompoBus Master Unit)

Process without stopping.

Application Examples Gluing, welding, or grinding a design to a unique shape

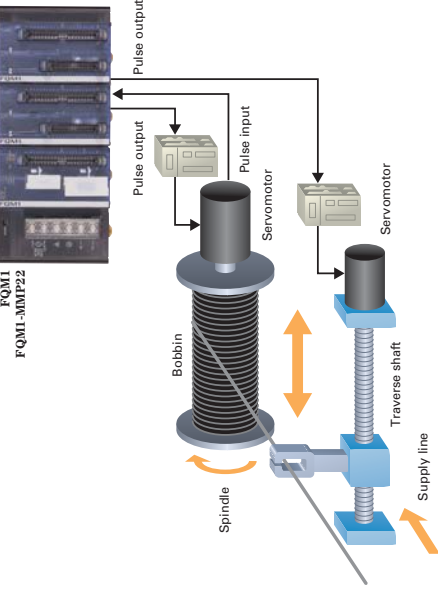
For example, taking the master axis as the base axis, two real axes are synchronized to the base axis, and then a tracking pattern is formed with an instruction for line segment approximation to set the target position.

- Functions used:
 - Synchronous control of the electronic cam, linking of the line segment (using an instruction for line segment approximation)
 - Configuration example: FQ41-CM002 plus FQ41-MMP22 (with pulse IO)



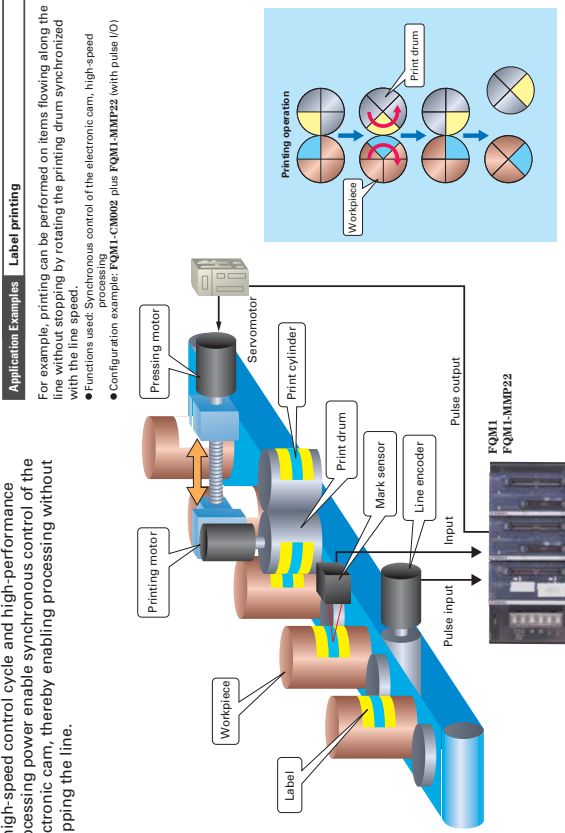
Wind without stopping.

Application Examples	Wire/Thread Winding Control
For example, the transverse motion is controlled using an electronic cam system in response to spindle commands or rotation feedback. ● Functions used: Synchronous control of the electronic cam, switching of the linear pattern using an instruction for linear approximation ● Configuration example: PQM1-CM002 with PQM1-MMP22 (with pulse I/O)	



The High-speed Control Cycle and Processing Power of the FQM1 Expand the Range of Synchronous Control.

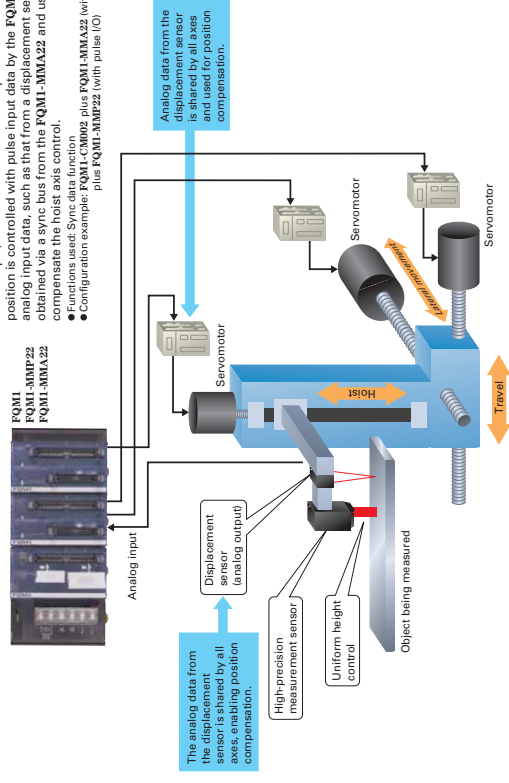
A high-speed control cycle and high-performance processing power enable synchronous control of the electronic cam, thereby enabling processing without stopping the line.



Use the FQM1 Synchronized Data Function to Enable Synchronized Compensation Control

With the FQM1, the data held by the Motion Control Modules can be shared by using a sync bus. Analog data shared in this way can be used as compensation for position control.

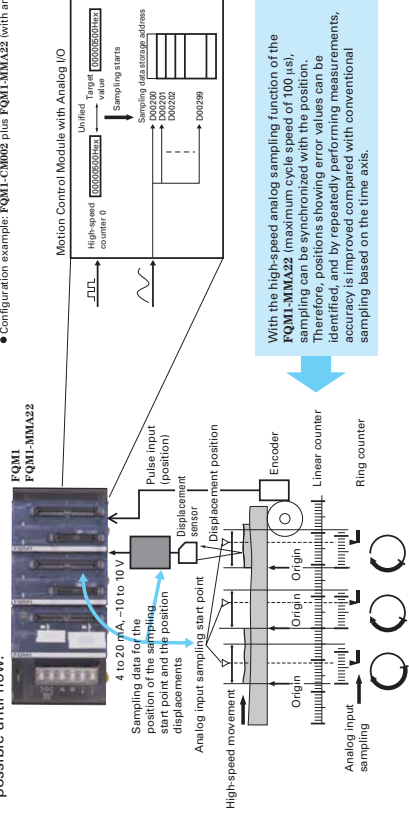
- Application Examples** **Process by maintaining a uniform distance from products that warp during processing**
- Feed control for parallel conveyors
- For example, while the base axis synchronized to the table position is controlled with pulse input data by the FQM1-MMP22, analog input data, such as that from a displacement sensor, can be obtained via a sync bus from the FQM1-MMA22 and used to compensate the hoist axis control.
- Functions used: Sync data function (FQM1-MMA22) plus FQM1-MMP22 (with analog I/O)
 - Configuration example: FQM1-MMA22 plus FQM1-MMP22 (with pulse I/O)



Measurement Control Applications

High-speed Analog Sampling Synced on an FQM1 Pulse Input

The FQM1-MMA22 has a high-speed sampling and storage function for analog input data that is synced with input pulses (i.e., the position of the target object). This achieves sampling performance beyond that achieved with conventional controllers, and also supports sampling in sync with an external signal, whereas only sampling over specified times was possible until now.

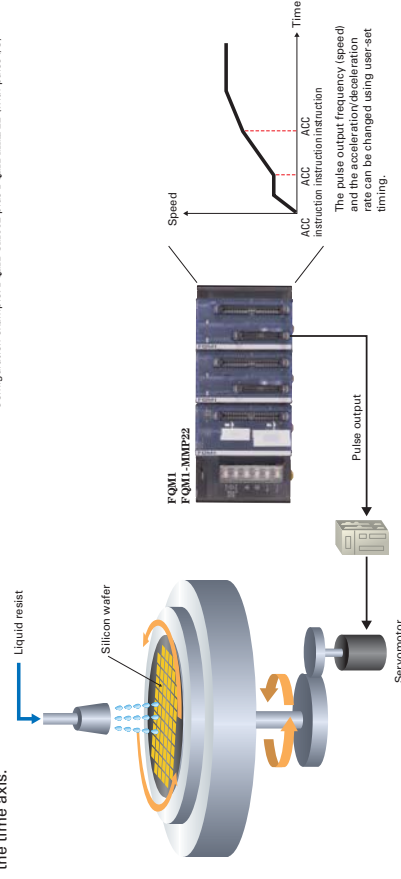


High-speed Response Control Applications

Flexible Speed Control with Freely Controlled Pulse Outputs

With the renewed FQM1, the freedom in speed control has been greatly increased by using pulse outputs. In the operation of infinite-axis feeding, the rotation speed can be changed by changing the frequency of the pulse output as desired based on the time axis.

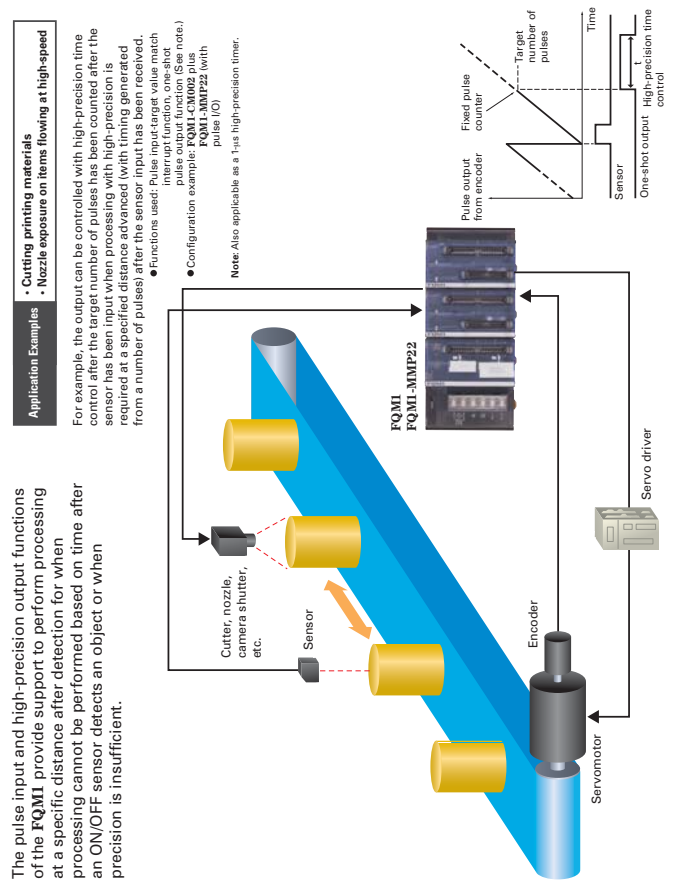
- Application Examples** **Speed Control for Infinite-axis Feeding**
- For example, the ideal rotational operation can be performed for the speed of a rotating body by changing the speed or acceleration/deceleration as desired over time.
- Functions used: ACC instruction (ACCELERATION CONTROL)
 - Configuration example: FQM1-CM002 plus FQM1-MMP22 (with pulse I/O)



Sensor inputs can be detected with high precision by using the **FQMI**'s dependable interrupt input response and the high-speed input latching function for pulse inputs. This improves precision when switching or stopping machine operation and performing processing from sensor inputs.



The pulse input and high-precision output functions of the **FQMI** provide support to perform processing at a specific distance after detection for when processing cannot be performed based on time after an ON/OFF sensor detects an object or when precision is insufficient.



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02

Pulse output	Fixed pulse

from encoder counter

---Target number

number of pulses

Sensor	
--------	--

One-shot output High-precision time

control

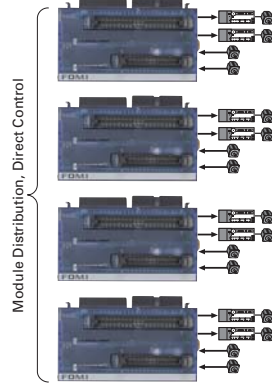
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Note 2: MECHATROLINK is a registered trademark of Yaskawa Electric Corporation.

For the Optimal Control Customers Demand for Their Machines Flexible

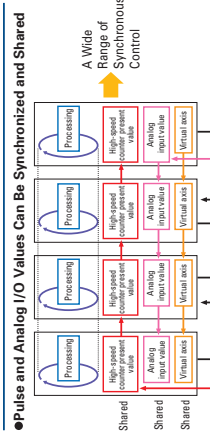
Each Module Controls I/O Directly

The FQM1 distributes control to each Module, and each Module controls I/O directly. The Motion Control Modules and Coordinator Module independently execute their own ladder programming, enabling independent, high-speed processing of analog and or pulse I/O controls.



Sync Data Shared between Modules

With the FQM1, each Module can broadcast any two types of data as shared data. Data, such as present values of high-speed counters, analog input values, and virtual axes, can be shared between Modules, enabling a wide variety of synchronized control.

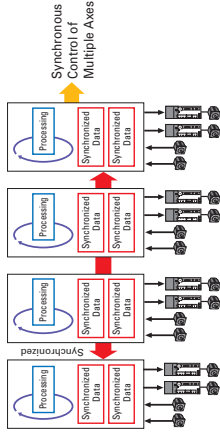


Note: The following types of information can be shared between Modules: Ladder processing results, high-speed counter present values, pulse output present values, analog input values, analog output values, and built-in input values.

Synchronize Up to Eight Axes

With the FQM1, each Motion Control Module can control two axes. If you mount four Modules, synchronous control can be performed for up to eight axes.

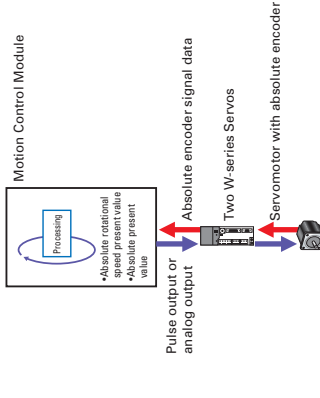
Up to Eight Axes Can Be Synchronized (Processing Cycles of All Modules Are Synchronized)



Compatible with Absolute Encoders

A Servo Driver with an absolute encoder can be connected to the FQM1.

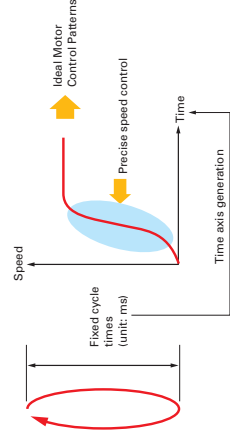
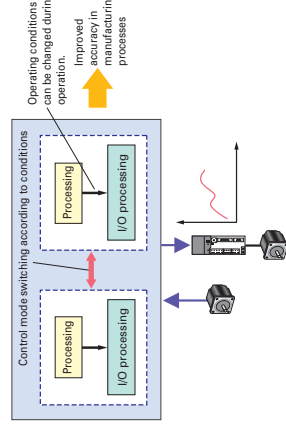
Servo Drivers with Absolute Encoders Can Be Used.



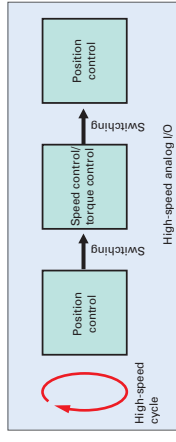
Detailed Programming of Motion Control

With the FQM1, each Module contains a user ladder program, enabling programming detailed operations that conventionally could not be implemented by the comparatively conservative processing of specialized motion languages.

Support for Highly Flexible Programming, such as Control Mode Switching, Operating Condition Changes during Operation, etc.



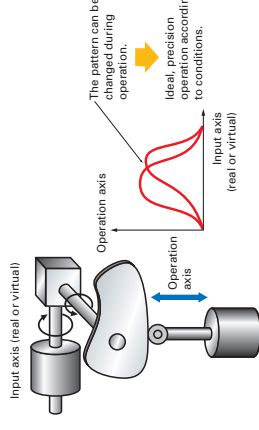
Operation Switching, such as from Position Control to Speed Control or from Torque Control to Position Control



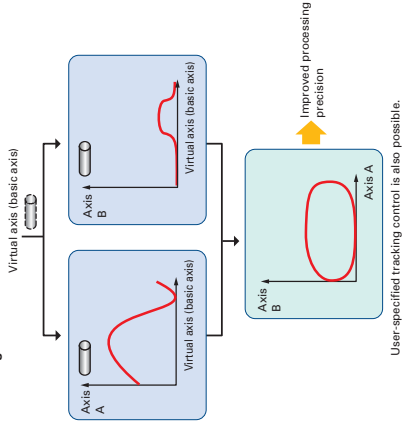
High-speed cycle and high-speed analog I/O make higher precision control, and enable speed/torque limit switching.

Improved accuracy in manufacturing processes

Ideal Flexible Electronic Cam Operation



Tracking Pattern Generation



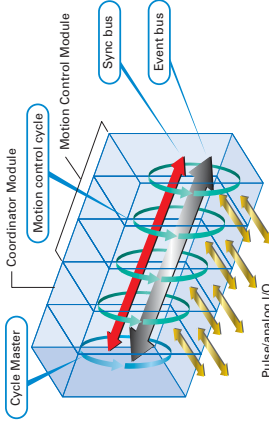
User-specified tracking control is also possible.

For the Optimal Response Demanded from Your Machines

Quick

Parallel Distributed Processing System

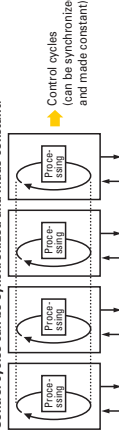
Stable Motion Control Cycles for 2 to 8 Axes
With the FQM1, the Coordinator Module and each Motion Control Module have its own application program (ladder diagram). The Coordinator Module processes communications services with peripherals, such as computers and PTs. This enables each Motion Control Module to concentrate on its processing exclusively, as a closed unit, resulting in high-speed motion control cycles of 0.5 to 2 ms (overhead time in cycle time is 0.19 ms min.). Also, even if the number of control axes increases, control is distributed and executed at each Module so that the same stable motion control cycles can be achieved as for only a few control axes.



Control Cycles Synced between Axes

The FQM1 has a sync bus running between the Modules so that control can be carried out in the same control cycle (Coordinator Module cycle, or specified cycle time between 0.5 and 10.0 ms) while data, e.g., for virtual axes and real axes, is shared among all Motion Control Modules. By making the control cycle of the Coordinator Module constant, it also becomes possible to make the control cycles of the Motion Control Modules constant.

Control cycles can be synchronized and made constant.



High-speed Processing Performance

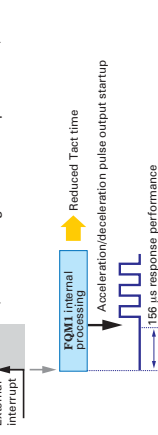
High-speed Cyclic Processing Engine Directly Controls Built-in Pulse/Analog I/O

Each FQM1 Motion Control Module has built-in I/O. Therefore each Motion Control Module can perform I/O processing directly as a self-contained unit. Also, the I/O interfaces are designed specifically for speed to enable the following high-speed I/O.

High-speed Pulse Startup

High-speed Pulse Startup at 25 μ s Minimum
Examples: Electronic cam pulse output 32 μ s Trapezoidal PTP pulse output: 54 μ s
Pulse startup
Improved accurate positioning
Electronic cam pulse output startup
Highly accurate positioning
Improved processing precision

● **Input Interrupt** Interrupt Response: approx. 70 μ s
(Not including hardware response time)



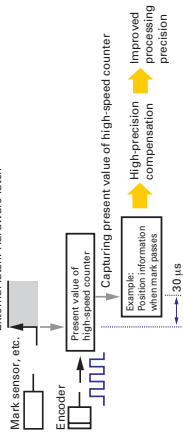
This results in, for example, an interval of 156 μ s between an external input and pulse distribution startup when pulses are output for a PTP operation in response to an input interrupt (using the PLS2 instruction).

High-speed Analog I/O

• Analog input conversion: 40 μ s
• Analog output conversion: 40 μ s
High-speed analog input
Linear sensor
High-speed conversion: 40 μ s
Detection of measurement in the FQM1
Product quality improvement in warpage, sagging, fouling, etc.
Collection

Capturing High-speed Counter Present Value with Hardware Latch

• Latch input response: 30 μ s
• Latching captured present value of high-speed counter: Control cycle
External latch: Hardware latch



Higher-Frequency Pulse I/O

To support applications demanding high precision, the FQM1 has increased the frequencies for pulse I/O.
• Pulse input: 500 kHz (phase difference with multiple of 4: 2 MHz)
• Pulse output: Maximum output frequency of 1 MHz

High-speed Pulse Inputs



High-speed Pulse Outputs



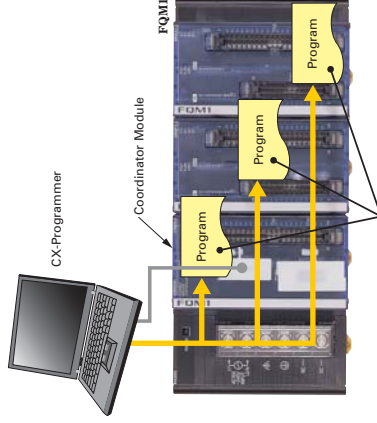
High-speed Analog Outputs



Program Development Environment

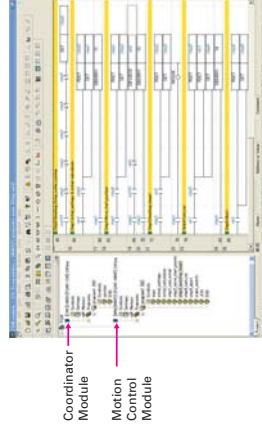
Application program development is as easy for the FQM1 as for a PLC.

Connect the CX-Programmer Support Software to the Coordinator Module to create and monitor programs for all Modules. While monitoring the ladder programs in Motion Control Modules, it is possible to input operation conditions for monitoring the I/O of the Coordinator Module, and to debug programs.



Ladder programs for the Coordinator Module and all Motion Control Modules can be created, transferred, and monitored.

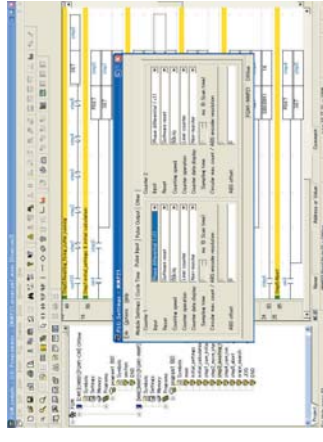
Manage the FQM1 Module Configuration on a Directory Tree on the Support Software.



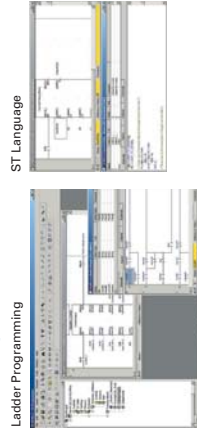
Note: Use CX-Programmer version 6.11 or higher with the FQM1.

Set the Module Operations on the System Setup Window

System Setup, such as the FQM1 synchronous/asynchronous mode setting, to determine the FQM1 operation modes are required along with creating application programs and can be selected in special windows.

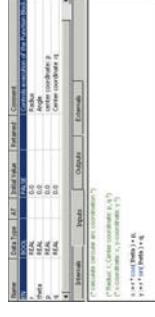


Function Block (Ladder Programming and ST Language) Support Further Improve Development Efficiency and Maintenance.



Calculation processing can be written with Structured Text

Efficiency of development and maintenance is increased for motion control applications with a lot of calculation processing.



Connecting Peripherals

Serial communications systems can be constructed with the host PC.

- Host Links with CS/CJ-series PLCs
- Serial PLC Links with CJ1M PLCs

Connecting Peripherals

Construct Touch Panel (PT) Systems and DeviceNet Systems.

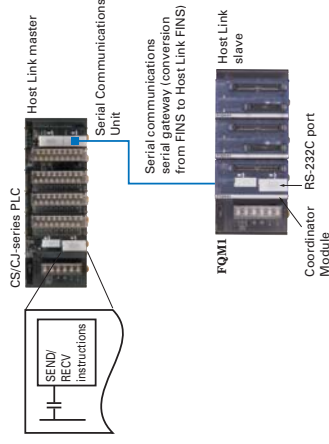
- NS-series PTs supported.
- DeviceNet supported.

Serial Communications with the Host PLC

FQM1 data can be read and written using communications instructions from the host PLC.

■ Equipped with Host Link Functions as Standard Feature: Coordinator Module

By mounting a Serial Communications Unit (of Unit version 1.2 or later) to a CS/CJ-series PLC, accessed data can be read and written for the **FQM1** using the SEND/RECV network communications instructions with the CS/CJ-series PLC as the Host Link master and the **FQM1** as the Host Link slave (using the RS-232C port on the Coordinator Module).



Seamless Data Exchange with Host Controllers

Serial PLC Links Supported

(Data Sharing with the OMRON CJ1M PLC)

Exchange of control data with the machine's main controller (PLC) can be performed without any special programming. With the Cj1M CPU Unit as master and the **FQM1** as slave, data can be exchanged between the two without special programming. Connect the **FQM1** Coordinator Module to the RS-232C port.

Note 1: The master link method and complete link method for Serial PLC Links are supported.

2: When connecting 1:N (where N = 8 units max.) via RS-422A/485, use an RS-422A converter (CJ1W-CIF11).

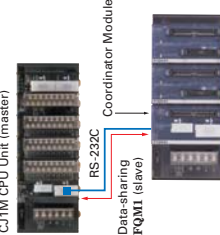
2: When connecting 1:N (where N =

RS-422A converter (CJ1W-CIF11)

The maximum size of each CJ1M/FQMI transmission is ten words. Transmissions smaller than ten words (unified CJ1M/FQMI size) can also be sent (set as the number of link words).

● System Configuration

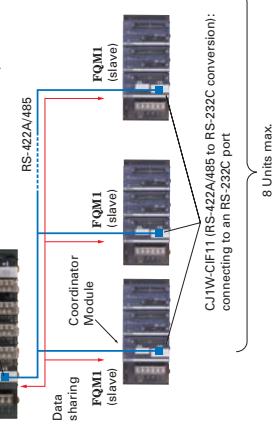
- CJ1M:FQM1 = 1:1 Connection



•CJ1M:FQM1 = 1:N (8 Max.) Connection

C:\1MCP\11\Init (master)

CJ1W-CIF11
(RS-422A/485 to RS-232C conversion):
Connection to an RS-232C port



Reference information: In the complete link method, the CJ1M CPU Unit will be the master and data transfer will be possible among the FQM1 slaves.

Serial Communications with NS-series PTs

Easy Servo Parameter Setup/Monitoring from NS-series PTs

Serial Gateway Function

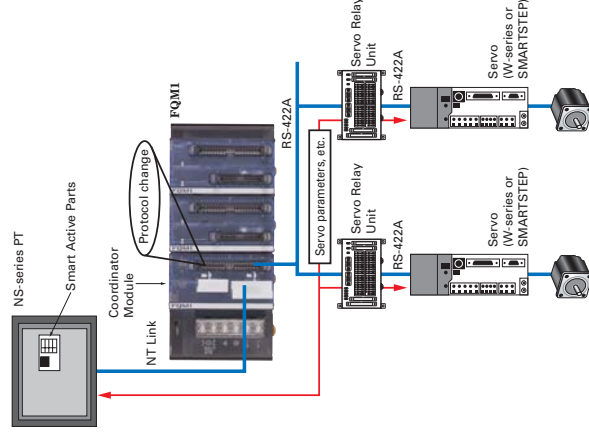
(Built-in RS-422A for Connecting to Servo)

Servo parameters and other data can be read or written from an NS-series PT or computer (application running on the CX-Server) via the **FQMI** Coordinator Module for servo drivers connected by RS-422A. This makes it easy to enter servo driver parameter settings at system startup, and to monitor operation.

- RS-422A-compatible Servo Drivers
OMRON W-series or SMARTSTEP

●System Configuration

Example: Accessing a Servo Driver (W-series or SMARTSTEP) Using Smart Active Parts on an NS-series PT Connected Using an NT Link



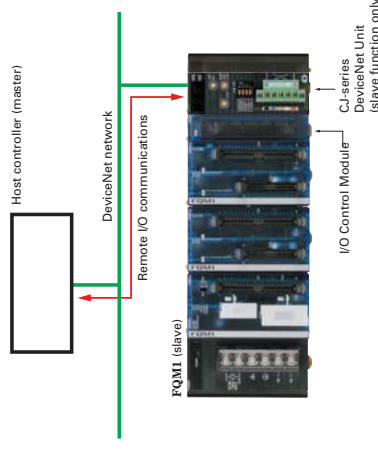
Note: The Servo Relay Unit has a built-in RS-422A connector for connecting to the **FQM1**.

DeviceNet communications with the host controller

Data can be exchanged with the host controller using DeviceNet without special programming.

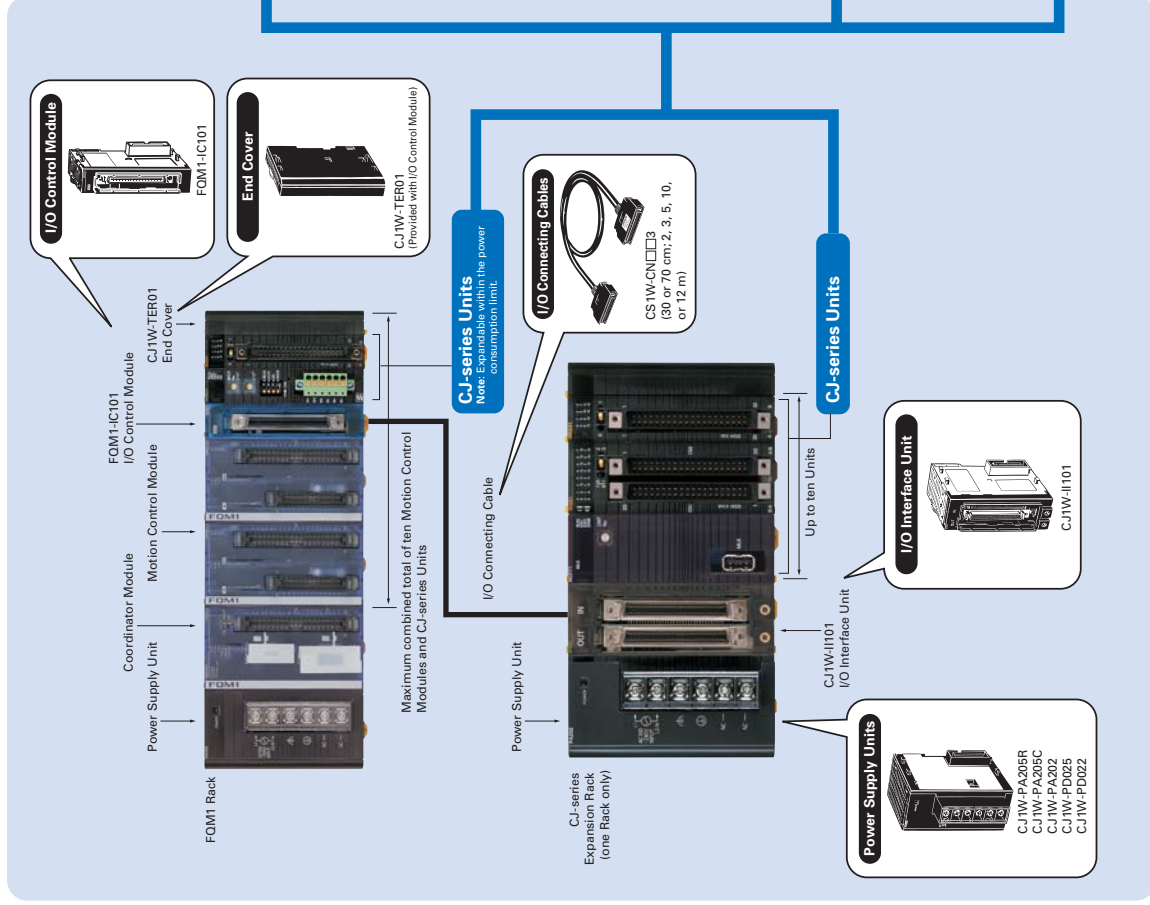
■ Add a DeviceNet Slave Function

Remote I/O communications will be possible between the host controller (master) and **FQM1** (slave) if the **FQM1** is expanded using an I/O Control Module and the slave function of a CJ-series DeviceNet Unit.

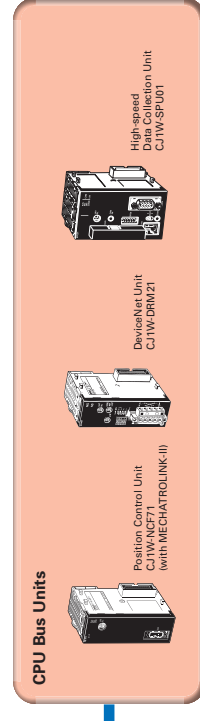
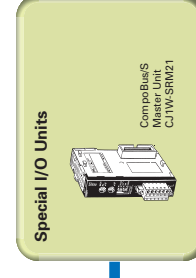
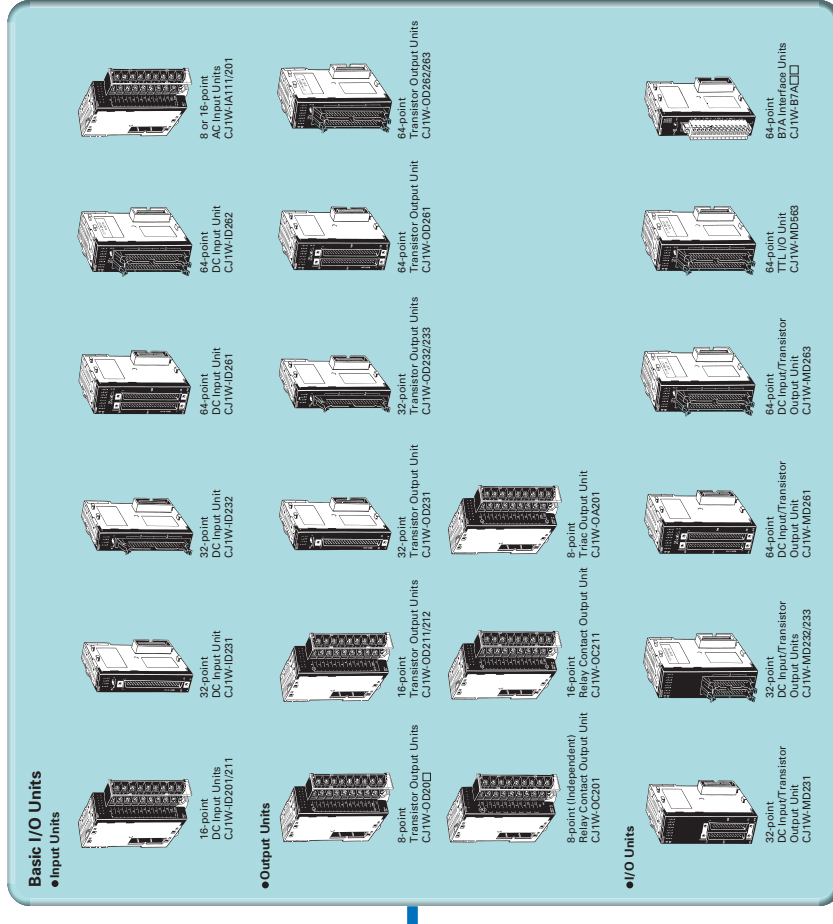


Expansion Possible Using CJ-series Units Expansion Is Performed though an I/O Control Module (for Bus Conversion and I/O Expansion)

- CJ-series Basic I/O Units
- CompoBus/S Master Units, Position Control Units, High-speed Data Collection Units
- CJ-series Expansion Rack (The above Units can be mounted; one Rack only.)



CJ-series Units for FQM1 Expansion



Performance and Specifications

■ General Specifications

Item		Specifications	
Coordinator Module		Motion Control Module	
Control method	Stored program method	Stored program method	
I/O control method	Cyclic scan method	Cyclic scan method	
Programming language	Ladder diagram method	Ladder diagram method	
Instruction length	1 to 7 steps/instruction	1 to 7 steps/instruction	
Number of instructions	Approx. 300	Approx. 300	
Executing speed	Basic instructions	0.1 μs/min.	
	Special instructions	0.3 μs/min.	
Common processing time (overhead)			
	Synchronous mode: 390 μs when 1 Motion Control Module is connected	FQM1-MMP22	Synchronous mode: 250 μs Asynchronous mode: 190 μs
	Asynchronous mode: 180 μs	FQM1-MMA22	Synchronous mode: 340 μs Asynchronous mode: 280 μs Analog output disabled and Immediate analog output enabled Analog Input/END: 220 μs
Program capacity	Ladder	10 Ksteps	
	Comment storage	Yes	
Number of tasks	Cyclic tasks: 1, Interrupt tasks: 50	Cyclic tasks: 1, Interrupt tasks: 50	
Subroutines	256	256	
JMP instruction	256	256	
Number of basic I/O points	24	20 per Module	
Built-in Input Bits	16 bits (1 word): CIO 2960.00 to CIO 2960.15	12 bits (1 word): CIO 2960.00 to CIO 2960.11	
Built-in Output Bits	8 bits (1 word): CIO 2961.00 to CIO 2961.07	8 bits (1 word): CIO 2961.00 to CIO 2961.07	
I/O bits	320 bits (20 words): CIO 0000 to CIO 0019	None	
CPU Bus Unit Area	6,400 bits (400 words): CIO 1500 to CIO 1999	None	
Special I/O Unit Area	13,760 bits (860 words): CIO 2100 to CIO 2999	None	
Cyclic Refresh Bit Area	640 bits (40 words): CIO 4000 to CIO 4039 Refresh with Motion Module # 1: CIO 4000 to CIO 4009 Refresh with Motion Module # 1: CIO 4010 to CIO 4019 Refresh with Motion Module # 1: CIO 4020 to CIO 4029 Refresh with Motion Module # 1: CIO 4030 to CIO 4039	160 bits (10 words): CIO 4000 to CIO 4009 Transmission refresh from Coordinator Module to Motion Control Module: CIO 4000 to CIO 4004 Output refresh from Motion Control Module to Coordinator Module: CIO 4005 to CIO 4009	
Sync Data Link Bit Area	320 bits (20 words): CIO 1200 to CIO 1219 Transmission refresh from Coordinator Module: CIO 1200 to CIO 1203 Transmission refresh from Motion Module # 1: CIO 1204 to CIO 1207 Transmission refresh from Motion Module # 2: CIO 1208 to CIO 1211 Transmission refresh from Motion Module # 3: CIO 1212 to CIO 1215 Transmission refresh from Motion Module # 4: CIO 1216 to CIO 1219	320 bits (20 words): CIO 1200 to CIO 1219 Transmission refresh from Coordinator Module: CIO 1200 to CIO 1203 Transmission refresh from Motion Module # 1: CIO 1204 to CIO 1207 Transmission refresh from Motion Module # 2: CIO 1208 to CIO 1211 Transmission refresh from Motion Module # 3: CIO 1212 to CIO 1215 Transmission refresh from Motion Module # 4: CIO 1216 to CIO 1219	
Serial PLC Link Bit Area (complete link method)	1,440 bits (90 words): CIO 3100 to CIO 3189 CIO 3100 to CIO 3189: C-JIM to FQM1 and sources other than FQM1 (10 words each according to unit number)	None	
Serial PLC Link Bit Area (master link method)	320 bits (20 words): CIO 3100 to CIO 3119 CIO 3100 to CIO 3109: C-JIM to FQM1 CIO 3110 to CIO 3119: FQM1 to C-JIM Connectable to the host PLC (C-JIM) as a Serial PLC Link slave.	None	
DeviceNet Link Bit Area	9,600 bits (600 words): CIO 3200 to CIO 3799	None	
Internal Auxiliary Area	CIO Area	81,792 bits: CIO 0000 to CIO 1199, CIO 1220 to CIO 2999, CIO 2962 to CIO 3999, CIO 4010 to CIO 4999, CIO 6000 to CIO 6143	
	Work Area	4,096 bits: W000 to W255	

■ Performance Specifications

Item		Specifications	
Coordinator Module		Motion Control Module	
Auxiliary Area	READ/WRITE	Read-only: 7,168 bits (A000 to A437) Read/Write: 6,192 bits (A448 to A959)	
	Error log	100 words: A100 to A199 (20 records)	
Tr Area		16 bits: TR0 to TR15	
Timer Area		256 timers: T0000 to T0255 (1-ms timers, 10-ms timers, 100-ms timers)	
Counter Area		256 counters: C0000 to C0255 (decrementing counters, reversible counters) *Not retained on power interruption.	
DM Area	Read/Write (not retained)	20,000 words: D00000 to D19999 (Not retained on power interruption)	
	Read/Write (retained)	12,768 words: D20000 to D32767 Data is retained when written by ladder program, however, saved in flash memory (written by Programming Device such as the CX-Programmer.)	
System Setup		System Setup Area (shared by Coordinator Module, Motion Control Modules, and peripheral services), Peripheral Service Settings	
Function block address allocation area	CIO Area	16,000 bits (1,000 words): CIO 5000 to CIO 9999	
	Timer Area	100 bits: T0206 to T0255	
Index Registers		100 bits: C0206 to C0255	
Data Registers	Input interrupts	DR0 to DR15 (DR9 and DR11 used with the JSB instruction) Note: IR16 to IR 63 for FBST (used by the system)	
	Timer interrupts	None	
Power OFF backup function (momentary power interruptions)	Input interrupts	1 (scheduled or one-shot interrupts)	
	Timer interrupts	Super capacitor	
Memory backup	Super capacitor	Error log	
	Flash memory	User programs, System Setup, part of DM	
Trace Memory		4,000 words	
Peripheral services		Peripheral port CX-Programmer connection only, RS-232C port Host Link (no protocol, NT Link, Serial PLC Link (slave)), RS-422A (servo driver connection) services	
Self-diagnosis		CPU error (WDT), memory error	
Program check functions		Checked using Programming Device	
Super capacitor life		Approx. 100 hours (ambient temperature: 25°C, see note 2)	
Clock		None	
Power interruption detection time		AC: 10 to 25 ms (not fixed)	
Power interruption detection delay		0 to 10 ms	
RUN output		Yes (When using C-JIW-PA205R)	

Note 1: Can also be retained in flash memory. A bit can be manipulated to automatically restore the data according to a parameter setting in the System Setup when the power supply is turned ON.
2: Depends on the ambient temperature and number of years in use.

Performance and Specifications

■ General Specifications

Item	Specifications
Insulation resistance	20 MΩ min. between AC external terminals and GR terminal at 500 VDC, see note 1.)
Dielectric strength	2,300 VAC, 50/60 Hz between AC external terminals and GR terminal for 1 min, leakage current: 10 mA max. (See notes 1 and 3.)
Noise immunity	720 VAC, 50/60 Hz between DC external terminals and GR terminal for 1 min, leakage current: 10 mA max. (See note 1.)
Noise immunity	Conforms to IEC61000-4-4, 2 kV (power line)
Vibration resistance	Conforms to JIS C0040 (10 to 57 Hz), Acceleration: 9.8 m/s ² (57 to 150 Hz for 80 min in X, Y, and Z directions (10 sweeps of 8 min = 80 min total))
Shock resistance	Conforms to JIS C0041 147 m/s ² 3 times each in X, Y, and Z directions
Ambient operating temperature	0 to 55°C
Ambient operating humidity	10% to 90% (with no condensation)
Atmosphere	No corrosive gases
Ambient storage temperature	-20 to 75°C
Structure	Less than 100 Ω
Dimensions (mm)	For installation in a control panel
Weight	49 x 90 x 80 mm (W x H x D) excluding cable
Safety standards	5 kg max. per Module EC, CE, Ticks, UL approval pending (See note 4.)

Note 1: Disconnect the LG terminal on the Power Supply Unit from the GR terminal before performing the insulation resistance test. If the test is performed with the GR terminal connected, the test results may be destroyed. If testing is performed with the LR and GR terminals connected.

Note 2: Values for AC power are at room temperature and a cold start. Values for DC power are for a cold start. A thermostat is used in the inrush current control circuit of the AC power supply. The inrush current may be higher than the value given above. If the inrush current exceeds the value given above by up to twice the given value when starting at high temperatures or if a hot start is performed immediately after the current is turned OFF for a short period of time because the thermostat element will not be sufficiently cooled, the inrush current may be higher than the value given above. The capacitor-charged delay circuit is used for the inrush current control circuit in the DC power supply. If hot starts are performed after turning OFF the power supply for only a short period of time, the inrush current may be higher than the value given above by up to twice the given value because the capacitor will not be discharged.

Note 3: Do not apply voltages exceeding 800 V when performing dielectric testing for the analog I/O terminals. Internal elements may deteriorate.

Note 4: UL-approved products are scheduled for shipment in March 2008.

■ Combinations of Power Supply Unit and Models

FQ01 without Expansion Using CJ-series Units			
No. of axes	No. of FQ01-MMP22 Modules	No. of FQ01-MMA22 Modules	Power Supply Units
2 Axes	1	0	CJ1W-PA202 CJ1W-PA205R
4 Axes	2	0	
	1	1	
	0	2	
6 Axes	3	0	
	2	1	
	1	2	
	0	3	CJ1W-PA205R
	4	0	
	3	1	
8 Axes	2	2	
	1	3	
	0	4	Not possible.

Item	Specifications	
	Coordinator Module	Motion Control Module
Individual Functions	Serial communications	High-speed counters
		Single phase, up-down counting, pulse plus direction input (50 kHz/1 ms), pulse minus direction input (50/600 kHz, with phase difference multiplier of 4: 2 MHz)
	Coordinator Module built-in RS-292C port (H Link, no protocol), INT Link, Serial PC Link	High-speed pulse outputs
		CW/CCW (1 MHz line-driver) one-shot pulse output
Coordinator Module built-in RS-422A port (servo driver interface, serial gateway, no protocol)	Serial communications	Analog inputs
		Conversion speed: 40 is/point Resolution: 100 to 10 V; 16,000 0 to 5 V; 4,000 1 to 5 V; 4,000 4 to 20 mA; 4,000
Coordinator Module built-in RS-422A port (servo driver interface, serial gateway, no protocol)	Serial communications	Analog outputs
		Conversion speed: 40 is/point Resolution: -10 to 10 V; 10,000 0 to 10 V; 0 to 5 V, or 1 to 5 V; 4,000

■ Coordinator Module

● Built-in General-purpose I/O

Item	Specifications
Input specifications	16
Input voltage	20.4 to 26.4 V
Input voltage	Normal inputs (I ₀): ON: 100 μs, OFF response: 1 ms max. 8 inputs common
Outputs	8
Output form	NPN transistors
Switching capacity	4.5 to 30 VDC, 0.3 A per transistor
ON response time	0.1 ms max.
OFF response time	1 ms max.

■ Motion Control Module

● Built-in General-purpose I/O

Item	Specifications
Inputs	12
Input voltage	20.4 to 26.4 V
Input voltage	Interrupt inputs (4): ON response: 30 μs max. OFF response: 0.2 ms max. Normal inputs (8): ON response: 100 μs max. OFF response: 1 ms max.
Outputs	8
Output form	NPN transistors
Switching capacity	4.5 to 30 VDC, 0.3 A per transistor
Output response	ON response: 0.1 ms max. OFF response: 1 ms max.

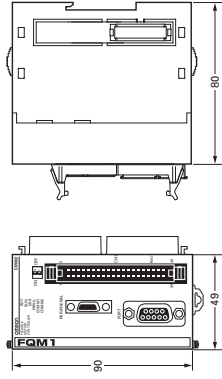
■ Power Supply Unit Specifications

Item	Specifications
Power Supply Unit model	CJ1W-PA205R
Power supply voltage	100 to 240 VAC (wide range), 50/60 Hz
Allowable power supply voltage and frequency ranges	85 to 264 VAC, 47 to 63 Hz
Power consumption	100 VA max. 50 VA max.
Inrush current (See note 2.)	100 to 120 VAC input: 15 A max. for 8 ms max. (for cold start at room temperature) 200 to 240 VAC input: 0.5 A at 250 VAC (inductive load) 200 to 240 VAC input: 2.0 A at 240 VAC (inductive load) (for cold start at room temperature)
Power supply capacity	5.0 A at 5 VDC (including power supplied to Modules) 2.5 A at 5 VDC (including power supplied to Modules) 0.8 A at 24 VDC 0.4 A at 24 VDC
Power output terminals	25 W total max. 14 W total max.
RUN output	None
Insulation resistance	20 MΩ min. between AC external terminals and GR terminal at 500 VDC. (See note 1.)
Dielectric strength	2,300 VAC, 50/60 Hz between AC external terminals and GR terminal for 1 min, leakage current: 10 mA max. (See note 1.)
Noise immunity	1,000 VAC, 50/60 Hz between DC external terminals and GR terminal for 1 min, leakage current: 10 mA max. (See note 1.)
Vibration resistance	Conforms to JIS C0040 Amplitude: 0.075 mm (10 to 57 Hz), Acceleration: 9.8 m/s ² (57 to 150 Hz) for 80 min in X, Y, and Z directions (10 sweeps of 8 min = 80 min total)
Shock resistance	Conforms to JIS C0041 147 m/s ² 3 times each in X, Y, and Z directions
Ambient operating temperature	0 to 55°C
Ambient operating humidity	0% to 90% (with no condensation)
Atmosphere	No corrosive gases
Ambient storage temperature	-20 to 75°C
Ground	Less than 100 Ω
Structure	For installation in a control panel
Weight	5 kg max. per Module
Dimensions (mm)	80 x 90 x 65 mm (W x H x D) excluding cable
Safety standards	cULus, EC directives

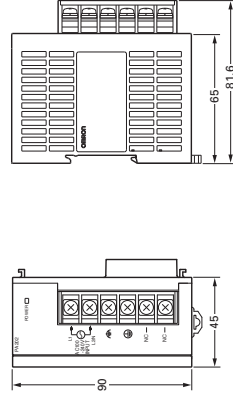
Dimensions

Unit: mm

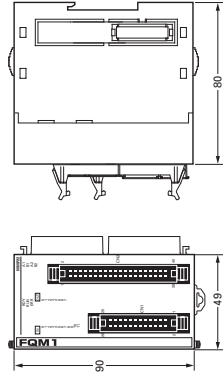
Coordinator Module FQM1-CM002



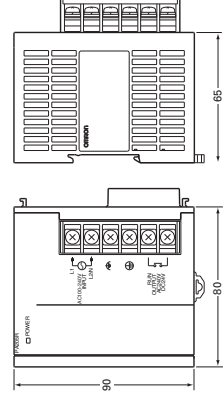
Power Supply Units CJ1W-PA202



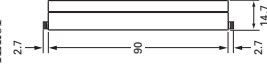
Motion Control Modules FQM1-MMP22/MMA22



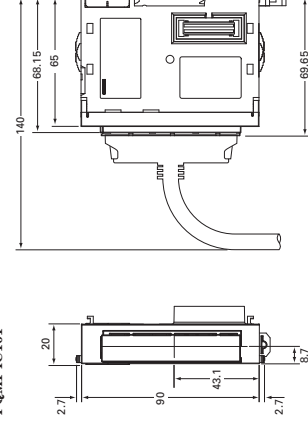
Power Supply Units CJ1W-PA205R



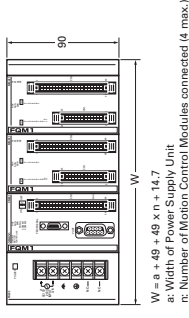
End Module FQM1-TER01



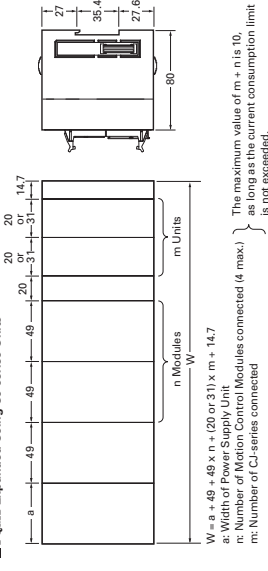
I/O Control Module FQM1-IC101



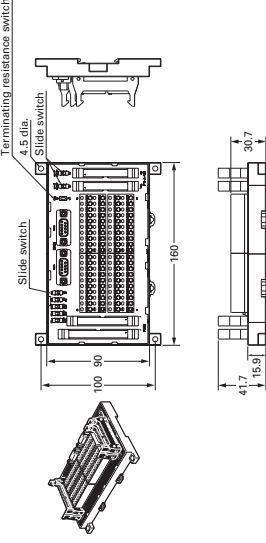
Assembled Dimensions



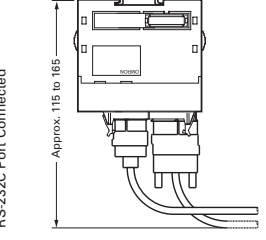
FQM1 Expanded Using CJ-series Units



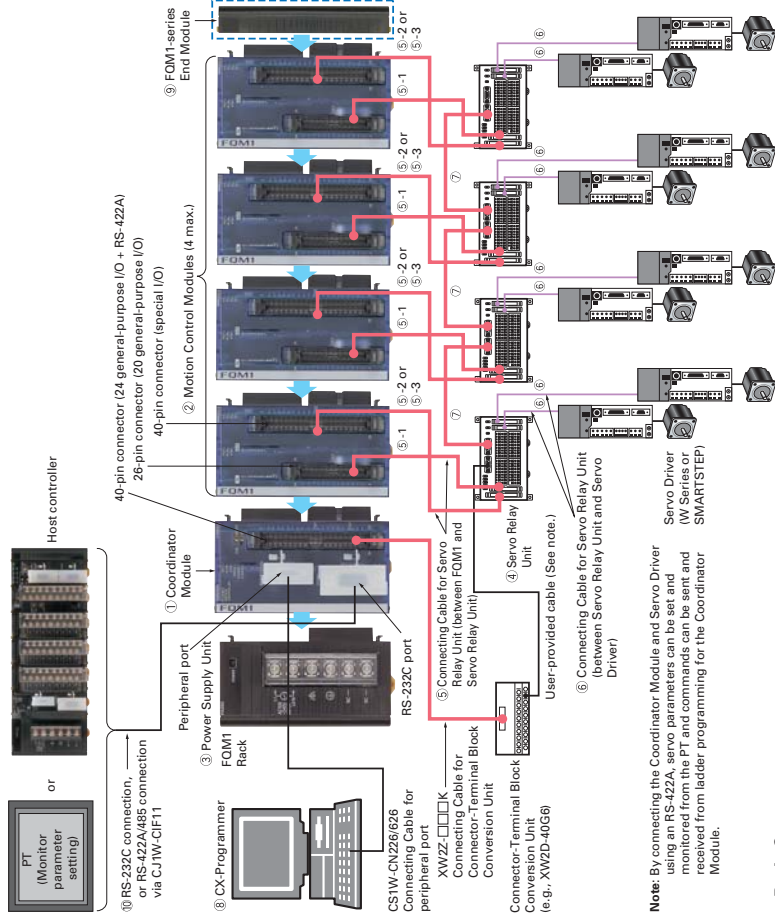
Servo Relay Unit XW2B-80J7-1A



Height with Cables Connected Height with Peripheral Port and RS-232C Port Connected



Ordering Information



Note: By connecting the Coordinator Module and Servo Driver using an RS-422A, servo parameters can be set and monitored from the PT and commands can be sent and received from ladder programming for the Coordinator Module.

Basic Sets NEW

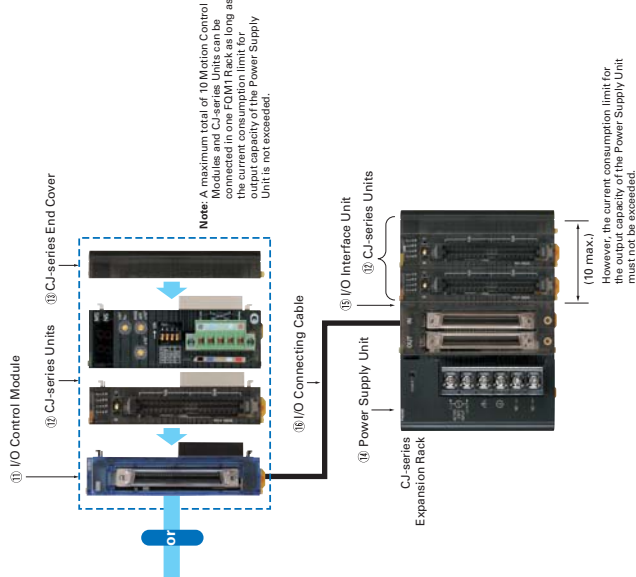
Name	Specifications	Model	Standards
FQMI Pulse Set	A basic set for pulse outputs and 2 axes ③ C.J1W-PA20R + ① FQMI-CH002 + ② FQMI-MMP22 + ③ FQMI-TER01	FQMI-CH002	CE, UL approval (See note 1.)
FQMI Analog Set	A basic set for analog outputs and 2 axes ③ C.J1W-PA20R + ① FQMI-CH002 + ② FQMI-MMA22 + ③ FQMI-TER01	FQMI-MMA22	CE, UL approval pending (See note 2.)

Note 1: The IO Control Module (FQMI-IC100) is not included.
2: UL-approved products are scheduled for shipment in March 2006.

Basic Modules NEW

No. in diagram	Name	Specifications	Current consumption (A)	Model	Standards
①	Coordinator Module	Program capacity: 10 Ksteps, DM Area capacity: 32 Kwords, Built-in IO (16 inputs and 8 outputs), IO Area for CJ-series Basic IO Unit: 220 bits, Serial PLC Link Area: 1,440 bits, DeviceNet Area: 9,600 bits, Built-in peripheral ports: RS-232C port and RS-422A port	5 V 0.37	FQMI-CH002 (See note 1.)	CE, UL approval pending (See note 2.)
②	Motion Control Modules	Program capacity: 10 Ksteps, DM Area capacity: 32 Kwords, Built-in IO (12 inputs and 8 outputs), 2 pulse inputs, 1 analog input, 2 analog outputs	5 V 0.824	FQMI-MMP22	CE, UL approval (See note 2.)
③	Power Supply Unit	Program capacity: 10 Ksteps, DM Area capacity: 32 Kwords, Built-in IO (12 inputs and 8 outputs), 2 pulse inputs, 100 to 240 VAC output capacity: 2.8 A at 5 VDC, 0.4 A at 24 VDC, total power consumption: 14 W	0.095	FQMI-MMA22	CE, UL approval pending (See note 2.)
		100 to 240 VAC (with RUN output), output capacity: 5 A at 5 VDC, 0.8 A at 24 VDC, total power consumption: 25 W		C.J1W-PA20R	UL, CE, N.L.
		Output capacity: 5 A at 5 VDC, 0.8 A at 24 VDC, total power consumption: 25 W		C.J1W-PA20R	UL, CE, N.L.

Note 1: A FQMI-TER01 End Module is included.
2: UL-approved products are scheduled for shipment in March 2006.



Servo Relay Unit and Cables

No. in diagram	Name	Specifications	Model	Standards
④	Servo Relay Unit	FQMI-series Servo Relay Unit with 2 axis connections	XWZB-80J-1A	UC1
⑤	Connecting Cable for Servo Relay Unit between FQMI and Servo Unit	For connecting 25-pin connector on FQMI-MM□22 to Servo Relay Unit	XWZ2-050J-A28	UC1
		For connecting 40-pin connector on FQMI-MMP22 to Servo Relay Unit	XWZ2-100J-A28	UC1
		For connecting 40-pin connector on FQMI-MMA22 to Servo Relay Unit	XWZ2-050J-A30	UC1
		For connecting 40-pin connector on FQMI-MMA22 to Servo Relay Unit	XWZ2-100J-A30	UC1
		For connecting Servo Relay Unit to W-series Servo Driver	XWZ2-050J-A31	UC1
		For connecting Servo Relay Unit to SMARTSTEP	XWZ2-100J-B9	—
		For connecting Servo Relay Unit to SMARTSTEP	XWZ2-200J-B9	—
		For connecting Servo Relay Unit to SMARTSTEP	XWZ2-100J-B10	—
		For connecting Servo Relay Unit to W-series Servo Driver	XWZ2-200J-B10	—
		For connecting Servo Relay Unit to W-series Servo Driver	XWZ2-100J-B13	—
⑦	RS-422A Communications Cable between Servo Relay Units		XWZ2-200J-C1	—

■ Support Software

No. in diagram	Name	Specifications	Model	Standards
③	FX Integrated Tool Package CX-One version 1.1	The CX-One is an integrated tool package that provides programming and monitoring software for OMRON PLCs and components. The CX-Programmer includes the following components: SE, ME, NT 4.0 (Service Pack 6), 2000 (Service Pack 3 or higher), or XP. CX-One includes CX-Programmer version 6.1. Refer to the CX-One Catalog (R134) for details.	1 license CXONE-AL01C-E	—
			3 licenses CXONE-AL03C-E	—
			10 licenses CXONE-AL10C-E	—
④	CX-Programmer Ver.6.11 or higher	As previously, the CX-Programmer can also be ordered individually using the following model numbers.	30 licenses CXONE-AL30C-E	—
			50 licenses CXONE-AL50C-E	—
			1 license WS02-CXPC1-E-V6□	—
⑤	CX-Programmer Ver.6.11 or higher	Support Software for PLC programming on Windows 98SE, Me, NT 4.0 (Service Pack 6), 2000 (Service Pack 3 or higher), or XP	3 licenses WS02-CXPC1-E03-V6□	—
			10 licenses WS02-CXPC1-E10-V6□	—
			10 licenses WS02-CXPC1-E10-V6□	—

Site licenses are also available for users that need to use the CX-One on many computers. Ask your OMRON representative for details.

■ Others

No. in diagram	Name	Specifications	Model	Standards
③	End Module	Connected to the right end of the FQM1 Rack. Provided with the FQM1 Sats and with the FQM1-CM002.	FQM1-TER01	UC1, CE
	DIN Track	Track length: 0.5 m, Height: 7.3 mm Track length: 1 m, Height: 7.3 mm Track length: 1 m, Height: 16 mm	PPF-SIN PPF-100N PPF-100N2	—
	End Plate	Placed on both ends of the Controller on the DIN Track to hold the Controller in place. Two End Plates are provided with the FQM1 Sats and with the FQM1-CM002.	PPF-M	—
④	RS-422A Adapter	Converts RS-232C to RS-422A/485.	CJ1W-CF11	UC, CE, N

■ Expansion Using CJ-series Units

No. in diagram	Name	Specifications	Current consumption (A)	Model	Mountable Racks	Standards
①	I/O Control Module	Used when CJ-series Units are connected to the FQM1. A CJ-series Expansion Rack can be connected at the same time.	5 V 24 V	FQM1-IC101 (See note 1.)	○ ×	UL approval (See note 4), CE
		Terminal block, 12 to 24 VDC, 10 mA, 8 inputs	0.02	CJ1W-ID201	○	UC, CE, N, L
		Terminal block, 24 VDC, 7 mA, 16 inputs	0.09	CJ1W-ID211	○	UC1, CE, N, L
②	Input Units	Terminal block, 24 VDC, 7 mA, 16 inputs	0.08	CJ1W-ID231 (See note 2.)	○	—
		Fujitsu connector, 24 VDC, 4.1 mA, 32 inputs	0.09	CJ1W-ID232 (See note 2.)	○	—
		MIL connector, 24 VDC, 4.1 mA, 32 inputs	0.09	CJ1W-ID261 (See note 2.)	○	—
		Fujitsu connector, 24 VDC, 4.1 mA, 64 inputs	0.09	CJ1W-ID262 (See note 2.)	○	—
		MIL connector, 24 VDC, 4.1 mA, 64 inputs	0.09	CJ1W-ID262 (See note 2.)	○	—
		Terminal block, 100 to 120 VAC, 7 mA (100 V, 50 Hz), 16 inputs	0.08	CJ1W-IA211	○	—
③	AC Input Units	Terminal block, 200 to 240 VAC, 10 mA (200 V, 50 Hz), 8 inputs	0.08	CJ1W-IA201	○	—

■ CJ-series Unit Expansion

No. in diagram	Name	Specifications	Current consumption (A)	Model	Mountable Racks	Standards
④	Relay Output Units	Terminal block, 250 VAC, 24 VDC max., 2 A, 8 outputs, independent contacts	5 V 24 V	CJ1W-QC201	○	—
		Terminal block, 250 VAC, 24 VDC max., 2 A, 16 outputs, independent contacts	0.09	CJ1W-QC211	○	—
		Terminal block, 250 VAC, 24 VDC max., 2 A, 16 outputs, independent contacts	0.11	CJ1W-QC211	○	—
		Terminal block, 12 to 24 VDC, 2 A, 8 sinking outputs	0.08	CJ1W-QD201	○	—
		Terminal block, 24 VDC, 2 A, 8 sourcing outputs, load short-circuit protection, wiring disconnect detection and alarm function	0.11	CJ1W-QD202	○	—
		Terminal block, 12 to 24 VDC, 0.5 A, 8 sinking outputs	0.10	CJ1W-QD203	○	—
	Transistor Output Units	Terminal block, 24 VDC, 0.5 A, 8 sourcing outputs, with load short-circuit protection and alarm function	0.10	CJ1W-QD204	○	—
		Terminal block, 12 to 24 VDC, 0.5 A, 16 sinking outputs	0.10	CJ1W-QD211	○	—
		Terminal block, 24 VDC, 0.5 A, 16 sourcing outputs, load short-circuit protection and alarm function	0.10	CJ1W-QD212	○	—
		Fujitsu connector, 12 to 24 VDC, 0.5 A, 32 sinking outputs	0.14	CJ1W-QD231 (See note 2.)	○	—
		MIL connector, 12 to 24 VDC, 0.5 A, 32 sourcing outputs, load short-circuit protection and alarm function	0.15	CJ1W-QD232 (See note 2.)	○	—
		MIL connector, 12 to 24 VDC, 0.5 A, 32 sinking outputs	0.14	CJ1W-QD233 (See note 2.)	○	—
⑤	Thick Output Unit	Fujitsu connector, 12 to 24 VDC, 0.3 A, 64 sinking outputs	0.17	CJ1W-QD261 (See note 2.)	○	—
		MIL connector, 12 to 24 VDC, 0.3 A, 64 sourcing outputs	0.17	CJ1W-QD262 (See note 2.)	○	—
		MIL connector, 12 to 24 VDC, 0.3 A, 64 sinking outputs	0.17	CJ1W-QD263 (See note 2.)	○	—
		Terminal block, 250 VAC, 0.8 A, 8 outputs	0.22	CJ1W-QA201	○	—
		24 VDC, 7 mA, 16 inputs	0.13	CJ1W-MD231 (See note 3.)	○	—
		12 to 24 VDC, 0.5 A, 16 sinking outputs	0.13	CJ1W-MD232 (See note 3.)	○	—
	I/O Units	24 VDC, 7 mA, 16 inputs	0.13	CJ1W-MD233 (See note 3.)	○	—
		24 VDC, 0.5 A, 16 sourcing outputs, load short-circuit protection and alarm function	0.13	CJ1W-MD233 (See note 3.)	○	—
		24 VDC, 4.1 mA, 16 inputs	0.13	CJ1W-MD233 (See note 3.)	○	—
		12 to 24 VDC, 0.5 A, 16 sinking outputs	0.13	CJ1W-MD233 (See note 3.)	○	—
		24 VDC, 4.1 mA, 32 inputs	0.14	CJ1W-MD261 (See note 2.)	○	—
		12 to 24 VDC, 0.3 A, 32 sinking outputs	0.14	CJ1W-MD263 (See note 2.)	○	—
⑥	TTL I/O Unit	24 VDC, 4.1 mA, 32 inputs	0.14	CJ1W-MD263 (See note 2.)	○	—
		12 to 24 VDC, 0.3 A, 32 sinking outputs	0.14	CJ1W-MD263 (See note 2.)	○	—
		5 VDC, 3.5 mA, 32 inputs	0.19	CJ1W-MD563 (See note 2.)	○	—
	B7A Interface Unit	64 inputs	0.07	CJ1W-B7A14	○	—
		64 outputs	0.07	CJ1W-B7A04	○	—
		32 inputs/32 outputs	0.07	CJ1W-B7A22	○	—

Note 1: The CJ-series End Cover (CJ1W-TER01) is included.

Note 2: Connectors are not included with the Unit. For the 64-pole connector, or use an OMRON Connector Terminal Block Conversion Unit (XW2□ series) or a GT□-series I/O Block.

Note 3: Connectors are not included with the Unit.

Note 4: UL-approved products are scheduled for shipment in March 2006.

■ CJ-series Unit Expansion

No. in diagram	Name	Specifications	Current consumption (A)	Model	Mountable Racks FOM1 Expansion Rack	Standards
②	CJ-series Special I/O Units	Communications functions: Remote I/O communications, maximum number of I/O points per master: 256 (128 inputs, 128 outputs)	0.15	CJ1W-SRM21	○ ○	UC1, CE, N, L
		Communications functions: Remote I/O communications, maximum number of I/O points per master: 128 (64 inputs, 64 outputs)				
	DeviceNet Unit	Provides DeviceNet remote I/O communications (Slave functions only) for 3200 bits max. (with fixed or user-set allocation).	0.29	CJ1W-DRM21	○ ○	UC1, CE, N, L
③	CJ-series CPU Bus Units	Position Control Unit with MECHATROLINK-II communications	0.36	CJ1W-NGF71	○ ○	UC1, CE
		High-speed Collection Unit				
	CJ-series End Cover	Automatically collects the specified data through the CJ bus at intervals of a few ms.	0.56	CJ1W-SPU01	○ ○	U, CE
④	CJ-series Power Supply Units	Mounted on the right end when CJ-series Units are used for expansion.	—	CJ1W-TER01	○ ○	UC1, CE, N, L
		100 to 240 VAC, output capacity: 2.8 A at 5 VDC, 0.4 A at 24 VDC, total power consumption: 14 W	0.13	CJ1W-PA202		UC1, N, L
		100 to 240 VAC (with RUN output), output capacity: 5 A at 5 VDC, 0.8 A at 24 VDC, total power consumption: 25 W		CJ1W-PA205R		
		100 to 240 VAC, replacement time notification function, no RUN output, output capacity: 5A at 5 VDC, 0.8 A at 24 VDC, total power consumption: 25 W		CJ1W-PA205C		UC1, CE, N, L
		24 VDC, output capacity: 5 A at 5 VDC, 0.8 A at 24 VDC, total power consumption: 25 W		CJ1W-PD025		UC1, CE, N, L
		24 VDC, output capacity: 2 A at 5 VDC, 0.4 A at 24 VDC, total power consumption: 19.6 W		CJ1W-PD022		UC1, CE
⑤	CJ-series I/O Interface Unit	One Unit required on the CJ-series Expansion Rack to connect CJ-series Expansion Rack.	—	CJ1W-II101		UC1, CE, N, L
⑥	CJ-series I/O Connecting Cables	Connects I/O Control Module on FOM1 Rack to I/O Interface Unit on CJ-series Expansion Rack	Cable length: 0.3 m	CS1W-CN313	—	L, CE
			Cable length: 0.7 m	CS1W-CN713	—	
			Cable length: 2 m	CS1W-CN223	—	
			Cable length: 3 m	CS1W-CN223	—	
			Cable length: 5 m	CS1W-CN623	—	
			Cable length: 10 m	CS1W-CN133	—	
			Cable length: 12 m	CS1W-CN133 B2	—	

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