

Mitsubishi Servo System Controllers

SERVO SYSTEM CONTROLLER



The leader in productivity, safety and environmental performance



Motion control in harmony with man, machine and



the environment

Most-advanced

SSCNET 331H compatible Motion controller
Q173DSCPU/Q172DSCPU

SSCNET 331H compatible Stand-Alone
Motion Controller
Q170MSCPU/Q170MSCPU-S1



Pursuing Ease of use

SSCNET 331H compatible Single Motion module
QD77MS16/QD77MS4/QD77MS2

CC-Link IE Field Network Single Motion Module
QD77GF16

New-generation Motion Controller Debut

The servo system controllers have advanced to be safer for people, and more flexible for various applications with our reliable technology. Now, the "Q173DSCPU/Q170MSCPU" Motion controller and the "QD77MS/QD77GF" Simple Motion module have been released. We are proudly offering these new products, which not only having excellent functions but also are user and environmentally friendly. With a safety-compliant system, various functions for energy conservation, and high functionality, our Motion controllers lead the future of Motion control.

Harmony with machine, man, and the environment.



Most-advanced Motion controls
High response and operation fully develop
machine performance

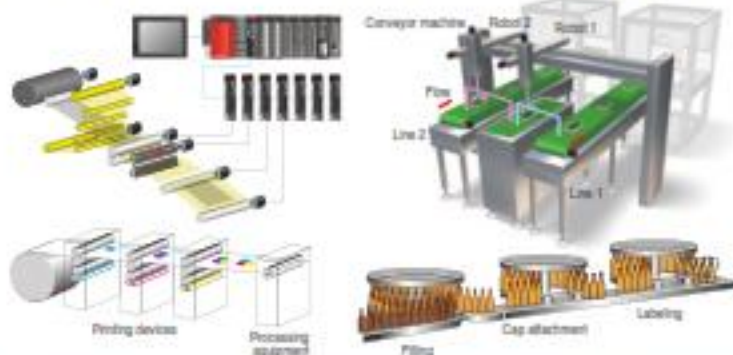
User-friendly Motion
controllers with reliable
safety observation
functions

Expanding the applications

Now that High-mix Low-volume production is the big trend in the market, the Motion controllers are expected to be used in various applications. The Motion controller and the Simple Motion module are capable of various controls such as positioning control, speed control, torque control, tightening & press-fit control, synchronous control and cam control. They are applied to various machines such as X-Y tables, unwinding machines, packing machines and filling machines.

Reliable Safety observation function

Ensuring safety in the production site is an absolute requirement; therefore devices must comply with international safety standards. Q17nDSCPU is provided with functions which achieve Performance Level d (PLd) as standard.



User-friendly engineering environment

Pursuing Ease of use. The powerful functions are aimed at creating a more user-friendly engineering environment with the enhanced design and debugging efficiency, reduced downtime, and data protection, etc.



Highly compatible Motion controller
with prior models

The Motion Controller and the Simple Motion module are highly compatible with the previous servo amplifiers and Motion Controllers, so the existing projects and programs can continue to be used.



New approach for future Motion controls.



Safety components: Safety relay, CC-Link Safety compatible products, Contactor SD-Q Series



Servo Visualization

For energy conservation, understanding the consumption of electric power is vital. The Motion controller and the Simple Motion module have the "Optional data monitor function". Information such as motor current value, power consumption and total power consumption of the servo amplifier and servo motor are available via the SSCNET III/H. You can check this information on the screen to save energy.



Reduced wiring and space saving

The servo system controller used with MR-J4 series can dramatically reduce wiring and save space. With the SSCNET III/H compatible servo amplifier, the number of wires is greatly reduced compared to the pulse train type. With the 3-axis servo amplifier, the installation space is reduced by approximately 30% compared to the MR-J3-B.

High compatibility with the previous controllers

Q17nDSCPU Motion controller and QD77MS Simple Motion module are able to divert the projects from Q17nDSCPU Motion controller and QD75MH positioning module. There's no need to create new projects when replacing the modules.

High compatibility with the previous amplifiers

The SSCNET III/H compatible Motion controller and Simple Motion module are able to be connected to MR-J3-B SSCNET III compatible servo amplifier. Therefore just replace Q17nDSCPU Motion controller and QD75MH positioning modules with these new models. MR-J4-B SSCNET III/H compatible servo amplifier can also be used with MR-J3-B SSCNET III compatible servo amplifier in a same system. You can continue to use the previous servo amplifiers.

A complete system lineup to meet your production and manufacturing

Responding to expanding applications such as semiconductor and LCD manufacturing, packing machines, and cap tightening machines, collaborates with Mitsubishi Electric's product lines such as displays and programmable controllers as well as servo amplifiers and servo Mitsubishi allows you to freely create an advanced servo system.

HUMAN MACHINE I/F

Graphic Operation Terminal

Personal Computer

SOFTWARE



GOT1000 series



CONTROLLER

Motion controller



iQ Platform Programmable controller

SSCNET IIIH compatible
Motion Controller
Q173DSCPU
Q172DSCPU

Stand-Alone Motion controller



NEW

SSCNET IIIH compatible
Stand-Alone Motion controller
Q170MSCPU
Q170MSCPU-S1

NETWORK

The new-generation optical network "SSCNET IIIH" In pursuit of high response and reliability

SERVO AMPLIFIER

MR-J4-B



SSCNET IIIH compatible
servo amplifier

MR-J4-B
MR-J4-B-RJ



SSCNET IIIH compatible
2-axis servo amplifier

MR-J4W2-B



SSCNET IIIH compatible
3-axis servo amplifier

MR-J4W3-B

SERVO MOTOR

Rotary servo motor



Small capacity,
low inertia
HG-KR series
Capacity: 30 to 750 W



Small capacity,
ultra-low inertia
HG-MR series
Capacity: 30 to 750 W



Medium capacity,
medium inertia
HG-SR series
Capacity: 0.5 to 7 kW



Medium-large capacity,
low inertia
HG-JR series
Capacity: 0.5 to 22 kW



Medium capacity,
ultra-low inertia
HG-RR series
Capacity: 1 to 5 kW



Medium capacity,
fat type
HG-UR series
Capacity: 0.75 to 5 kW

SOLUTION



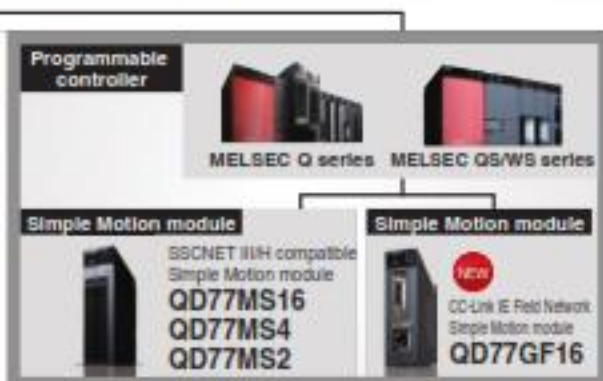
Mitsubishi Electric's integrated FA solution for achieving seamless information collaboration between information systems and control systems, and enabling lateral integration of production sites.



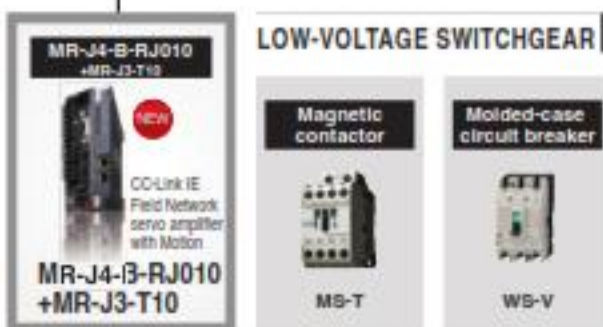


Motion controllers and Simple Motion modules flexibly
motors via SSCNET III/H.

Motion controller engineering software	MELSOFT MT Works2
Programmable controller engineering software	MELSOFT GX Works2
Servo setup software	MELSOFT MR Configurator2
Capacity selection software	



Ethernet-based Open Network CC-Link IE Field Network



Mitsubishi Electric's integrated FA platform for achieving lateral integration of controllers & HMI, engineering environments and networks at production sites.

I N D E X

■ Concept	.....	P03
■ System Configuration	.....	P05
■ SSCNET III/H	.....	P07
■ Solutions	.....	P09
■ Line up	.....	P11
■ Motion controller	The features of Q17nDSCPU	P13
	The features of Q170MSCPU	P27
■ Simple Motion module	The features of QD77MS	P29
	The features of QD77GF	P35
■ MELSERVO-J4 series	.....	P37
■ Motion controller specifications	The specification of Q17nDSCPU	P41
	The specification of Q170MSCPU	P51
■ Simple Motion module specifications	The specifications of QD77MS	P59
	The specifications of QD77GF	P63
■ Production/Development system	.....	P67
■ SSCNET Partner Association	.....	P68
■ Global support network	.....	P69
■ FA Products	.....	P73
■ About warranty	.....	P75

SSCNET III/H

SERVO SYSTEM CONTROLLER NETWORK

The blazingly fast

MELSERVO J4

High-response system achieved with SSCNET III/H

Three times faster communication speed



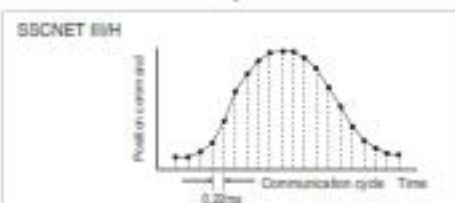
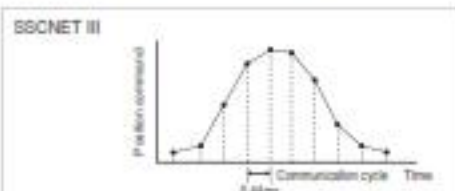
Communication speed is increased to 150 Mbps full duplex (equivalent to 300 Mbps half duplex), three times faster than the conventional speed. System response is dramatically improved.



Cycle times as fast as 0.22 ms



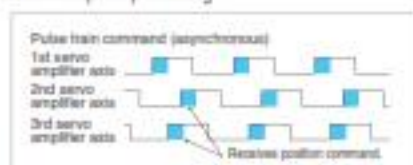
Smooth control of machine is possible using high-speed serial communication with cycle times of 0.22 ms.



Deterministic and synchronized communication

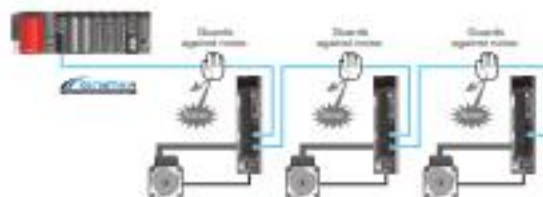
Complete deterministic and synchronized communication is achieved with SSCNET III/H, offering technical advantages in machines such as printing and food processing machines that require synchronous accuracy.

■ Timing of servo amplifier processing



No transmission collision

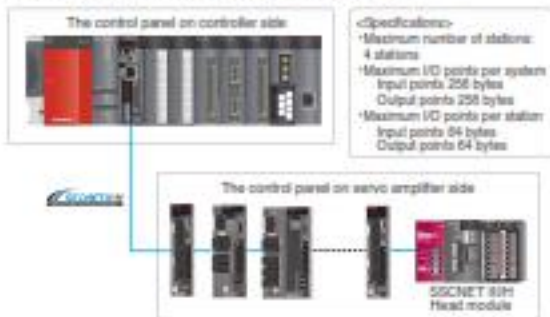
The fiber-optic cables thoroughly shut out noise that enters from the power cable or external devices. Noise immunity is dramatically improved as compared to metal cables.



speed and response of 150 Mbps full-duplex baud rate SSCNET III/H optical networking

Dramatically reduced wiring

Using the SSCNET III/H Head module enables establishing the connection from the controller to various modules, such as I/O, analog, and high-speed counter via the SSCNET III/H network. Therefore, the wires can be drastically reduced by receiving I/O and analog I/O signals directly from the control panel on servo amplifier side.



Central control with network

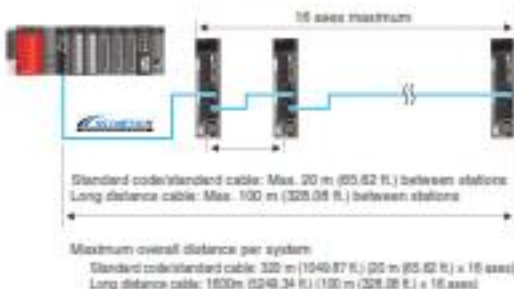
Large amounts of servo data are exchanged in real-time between the controller and the servo amplifier. Using MR Configurator2 on a personal computer that is connected to the Motion controller or the Simple Motion module helps consolidate information such as parameter settings and monitoring for the multiple servo amplifiers.



Long distance wiring up to 1600 m (5249.34 ft.)

Long distance wiring is possible up to 1600 m (5249.34 ft.) per system (maximum of 100 m (328.08 ft.) between stations x 16 axes). Thus, it is suitable for large-scale systems.

* This is when all axes are connected via SSCNET III/H.



SSCNET III/H compatible and SSCNET III compatible products connected in a same system

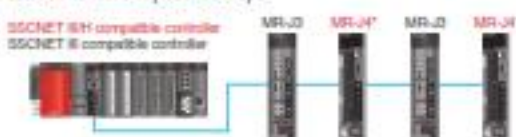
SSCNET III/H and SSCNET III compatible controllers support the use of SSCNET III/H and SSCNET III compatible servo amplifiers together in a same system.

* When the SSCNET III compatible products are in the system, the communication speed is 50 Mbps, and the function and the performance are equivalent to those of MR-J3.

■ Communication speed: 150Mbps



■ Communication speed: 50 Mbps



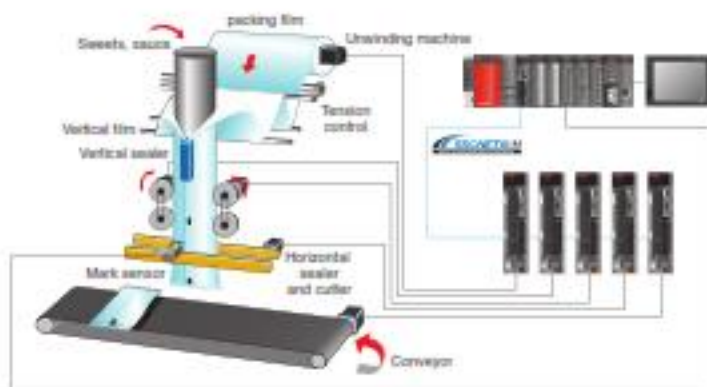
Q17nDSCPU & QD77MS solutions for advanced Motion control

Solutions

CASE1 | Packing machines (Synchronous control, Cam control, Mark detection function)

Q17nDSCPU	QD77MS
Q17nDSCPU	QD77MS

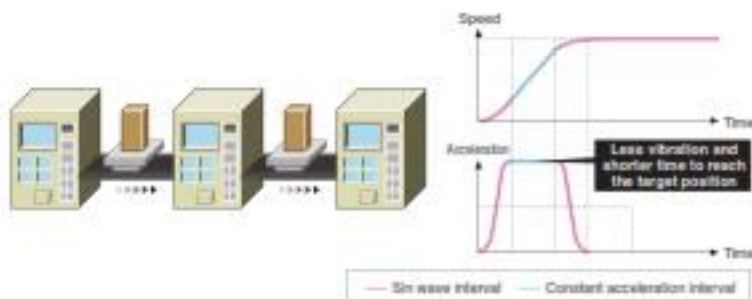
When the machine packs materials, each process is synchronized by using synchronous control and cam control. The packing film is cut using the registration mark as a reference with the mark detection function.



CASE2 | Conveyor machines (Advanced S-curve acceleration/deceleration function)

Q17nDSCPU
Q17nDSCPU

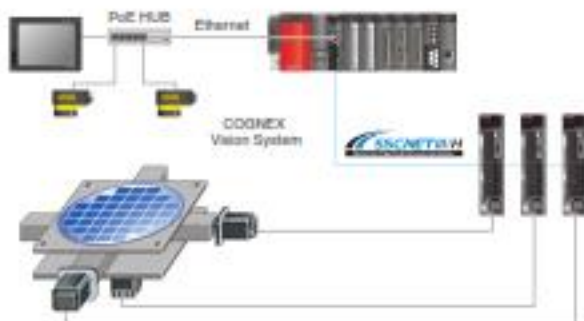
Vibration is minimized and a short tact time is achieved with the advanced S-curve acceleration/deceleration function by setting the smooth acceleration period (Sin wave interval) and maximum acceleration period (Constant acceleration interval).



CASE3 | Alignment system (Ethernet connection, Vision system, Target position change function)

Q17nDSCPU
Q17nDSCPU

COGNEX Vision System is connected to the built-in PERIPHERAL VF of the Motion CPU with Ethernet. Alignment time is reduced with the target position change function which uses the workpiece position data from the vision system for high-speed Motion control.



Cap tightening machines (Position control, Torque control, Tightening & Press-fit control)

QD75SCPU	QD77MS
QD75MCPU	QD77GF

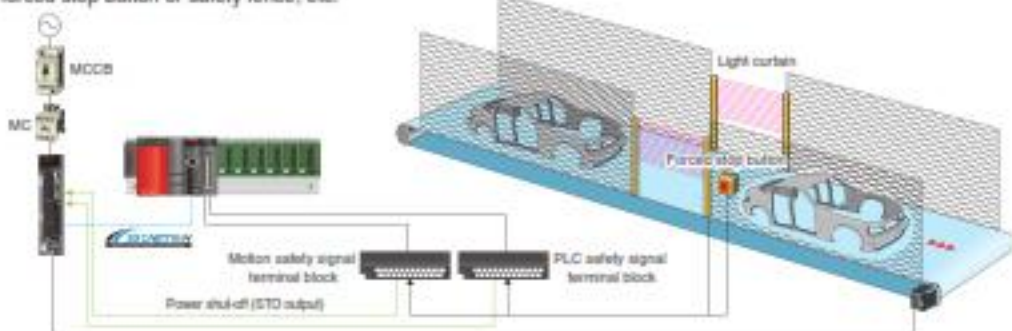
Control mode is able to be switched, such as from position control to torque control or vice versa is also possible. Tightening & Press-fit control, which switches from position control to torque control without stopping the movement during positioning, is also available. The absolute position is stored when the machine is in control modes (except for position control). Therefore the positioning is carried out smoothly even after switching back to position control.



Safety system (Safety signal comparison function)

QD75SCPU

Safety systems is simply structured using the light curtain, forced stop button or safety fence, etc.

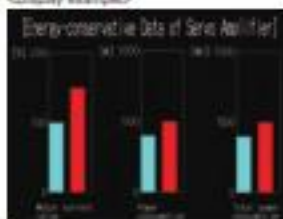


Servo visualization (Optional data monitor function)

QD75SCPU	QD77MS
QD75MCPU	QD77GF

The motor current value, power consumption and total power consumption of the servo amplifier and servo motor via SSCNET III/H are visible on the user-designed graphic operation terminal screen. The ability to check the information helps you to save power.

<Display example>



- Motor current value
- Power consumption
- Total power consumption



Harmony with a wide range of applications and controls

Lineup

Features of the Motion Controllers and the Simple Motion Modules

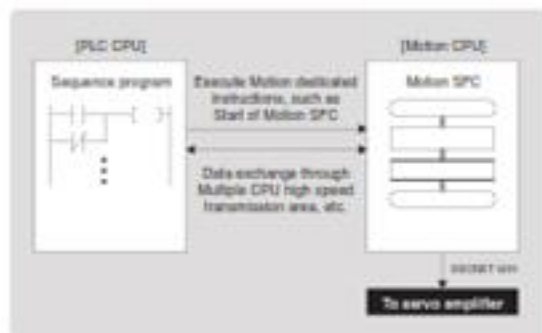


Most-advanced Motion controller

SSCNET II/H compatible Motion controller

Q173DSCPU
Q172DSCPU
Q170MSCPU
Q170MSCPU-S1

The Motion controller is a CPU module used with the PLC CPU for Motion control. Using Motion SFC program, the Motion controller separately controls I/O modules, etc., from PLC CPUs; therefore high speed control is achieved. The Q170MSCPU is a CPU module integrating Motion controller functions, PLC CPU functions, and power supply all in one.



Advanced control but simple to use just like the positioning module

SSCNET II/H compatible Simple Motion module

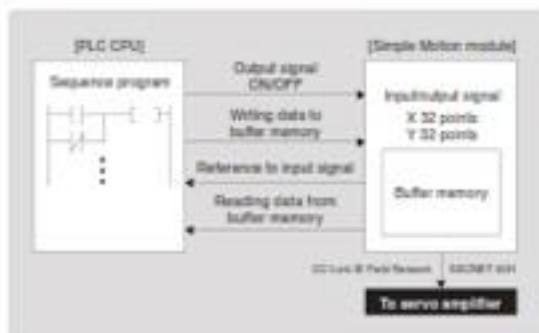
QD77MS16
QD77MS4
QD77MS2

CC-Link IE Field Network Simple Motion Module

QD77GF16

The Simple Motion module is an intelligent function module performing positioning control following the PLC CPU's instructions. Synchronous control that was unavailable with the previous positioning module is now available with these new Simple Motion modules, while being simple to use just like the positioning module.

The positioning function in this Simple Motion module is used in the same way as the positioning module.



Comparison of Motion controller and Simple Motion module

Depend

	Motion controller			Simple Motion module		
	Q1720SCPU	Q1720SCPU	Q1720SCPU, 5 I/O MR	Q077M516	Q077M516/Q077M52	Q077GP16 MR
Module type	CPU module			Intelligent Function Module		
Serial amplifier interface	SSCONNECT IGH			SSCONNECT IGH	CCLink RT Field Network	
Serial amplifier type	MR-JA-2			MR-JA-2	MR-JA-2-RJ45/ MR-JA-2-TX	
Number of control axes	Up to 32 axes			Up to 16 axes	Up to 42 axes	Up to 16 axes
Operation cycle	0.22 ms or more			0.28ms / 1.77ms	0.88ms	0.88ms / 1.77ms
PLC CPU type	ML300-Q series		Q1720CPU or successor	ML300-Q series		
Engineering environment	MT Work2	MR Configurator2	MR Configurator2	Simple Motion Work Setting Tool	MR Configurator2	MR Configurator2
Programming language	Motion GPC			—		
Control mode	Position control	Speed control	Torque control	Position control	Speed control ⁽¹⁾	Torque control ⁽¹⁾
	Tightening & Press fit control	Synchronous control	Cam control	Tightening & Press fit control ⁽²⁾	Cam control	
	Advanced synchronous control			Synchronous control		
Positioning control	Linear interpolation	Circular interpolation	Trajectory control	Linear interpolation	Circular interpolation	Trajectory control
	Helical interpolation	Position following control	Lead-in and lead-out control	Synchronous setting mode MR		Helical interpolation control
	High-speed positioning control	Speed-position setting mode		Speed-position setting mode MR	Helical interpolation control	
Acceleration/deceleration control	Speed-dependent control	Curve speed-dependent control	Variable control mode ⁽³⁾	Speed-dependent control	Curve speed-dependent control	
Manual control	JOG operation	Manual pulse generator		JOG operation	Manual pulse generator	locking operation
	IO operation analog set					
Functions to change the control details	Current value change	Target position change	Target limit value change	Current value change	Target position change	Target limit value change
	Speed change		Velocity command no. change	Speed change	Override	Command mode change
Home position return type	Proximity stop type 1	Proximity stop type 2	Limit stop type 1	Proximity stop type		Limit stop type 1
	Count type 1	Count type 2	Count type 3	Count type 1	Count type 2	
	Data set type 1	Data set type 2	Stop mode type	Data set type		
	Slipper type 1	Slipper type 2	Limit switch combined type			
	Scale displace alarm reset					
Built-in functions	Forward stop	Hardware stroke limit	Software stroke limit	Forward stop	Hardware stroke limit	Software stroke limit
	Absolute position system	Another-axis operation	Undertank length limit	Absolute position system	Another-axis operation	Undertank length limit
	Optimal data monitoring	Mark detection	RCM operation	Optimal data monitoring	Mark detection	Flash-RCM backup
	M-code output	Error history	Digital scale/stoppage	M-code output	Error collection	Digital scale/stoppage
	Safety observation ⁽⁴⁾	Watch system	Software security key			
	High-speed reading	Limit switch output	Cam auto-generation			Cam auto-generation

(Note 1): ML300-Q MR Configurator2 is included in ML300-Q MT Work2.

(Note 2): The Simple Motion module setting tool is included in ML300-Q MT Work2.

(Note 3): The safety observation function is available with the Q1720SCPU/Q1720SCPU.

(Note 4): Available only with the Q077M5.

(Note 5): The Q077GP can perform only speed control with position loop, while Q077M5 can perform speed control.

(Note 6): Refer to the specification page in the catalog for the applicable CPUs.

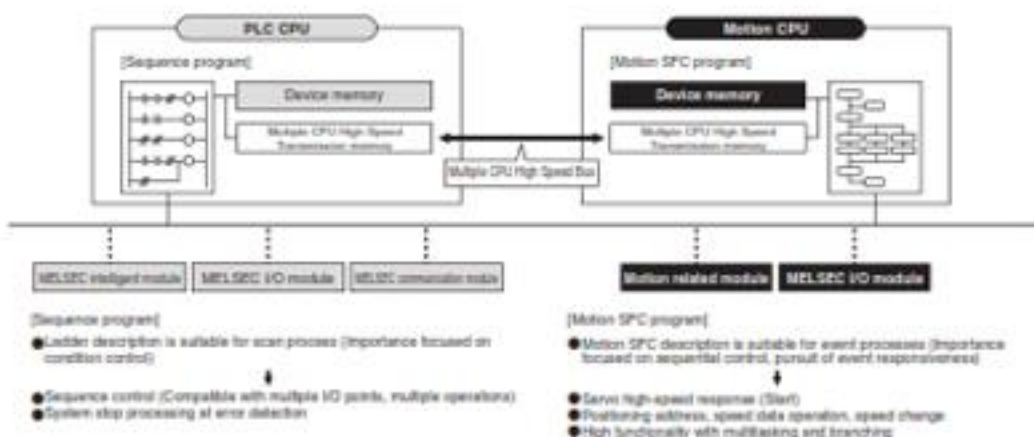
Reduced wiring, basic performance, Multiple CPU control for all customer needs

Multiple CPU control by PLC CPU and Motion CPU

QJ70D/CPU
QJ71M/CPU

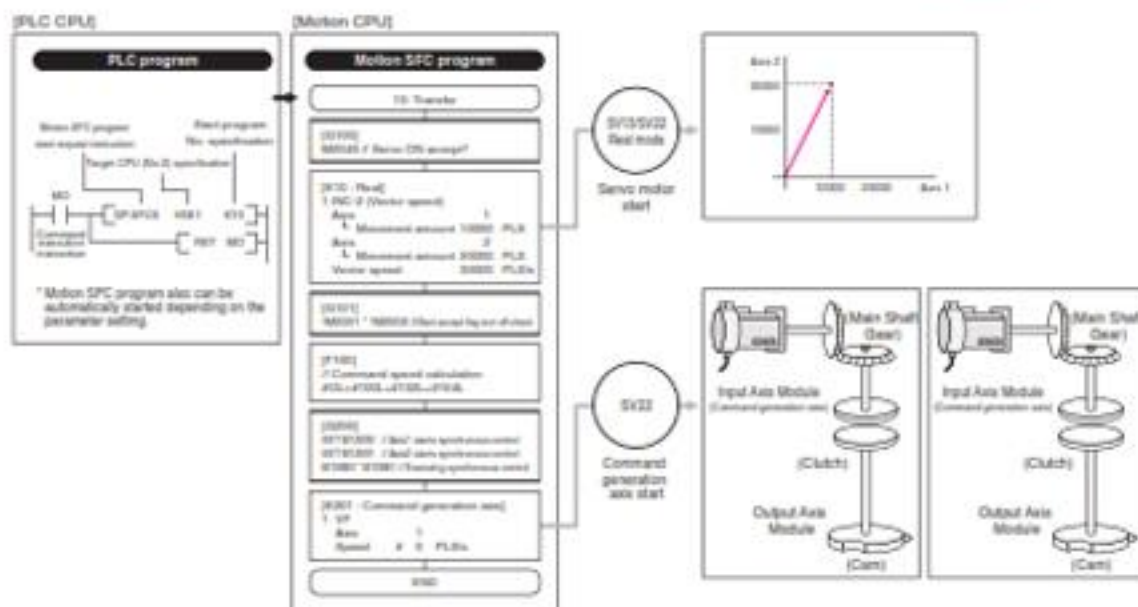
Loads are dispersed by distributing tasks such as servo control to Motion CPU, and machine control and information control to PLC CPU. By selecting the Motion CPU and PLC CPU according to the application, a flexible system is configured. The program of Motion CPU is described by the Motion SFC program.

[Multiple CPU High Speed Bus] Maximum of 14k words are transferred every 0.88ms by the dedicated multiple CPU high speed bus. The Multiple CPU high speed transmission cycle is synchronized with the Motion control cycle thus optimizing the control system.



Control flow

QJ70D/CPU
QJ71M/CPU





Faster response time enabling shorter tact time

Operation Cycle of 0.22 ms/4 axes

Q173DSCPU
Q172DSCPU

The Motion operation cycle of 0.22 ms/4 axes is achieved to meet the needs for a shorter tact time. Even at an operation cycle of 0.44 ms, up to 10 axes are controlled without losing the high response.

<Perfect for smooth curve control>

The command data from the Motion controller is transmitted to the servo amplifier every 0.22 ms. Motion Controller with Servo amplifier (MR-J4-B) and servo motor (HG-KR motor: 4,194,304PLS/rev) achieves the shorter operation cycle and smooth motion.

	Operation cycle	
	0.22 ms	0.44 ms
Q173DSCPU	4 axes	10 axes
Q172DSCPU	-	8 axes



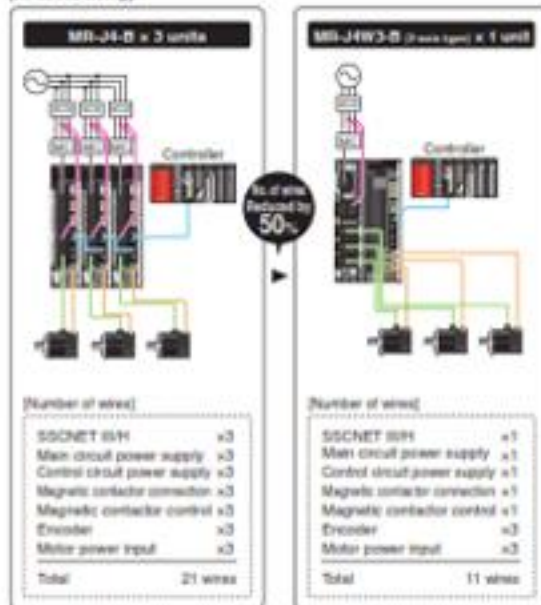
Motion controller with MR-J4 series greatly reduces wiring

Reduced wiring, space saving

Q173DSCPU Q172DSCPU
Q173DSCPU Q172DSCPU

The number of wires and parts is drastically reduced when the Motion controller is used with 2-axis servo amplifier or 3-axis servo amplifier of MR-J4 series. When the Motion controller is used with MR-J4W3-B servo amplifier (3-axis type), the installation space is reduced by approximately 30%.

[Reduced wiring]



[Space saving]

