FACTORY AUTOMATION

C Controller/Personal Computer Embedded Type
Servo System Controllers

e-F@ctory

Unique Servo Control Available Through C Language Based Programming
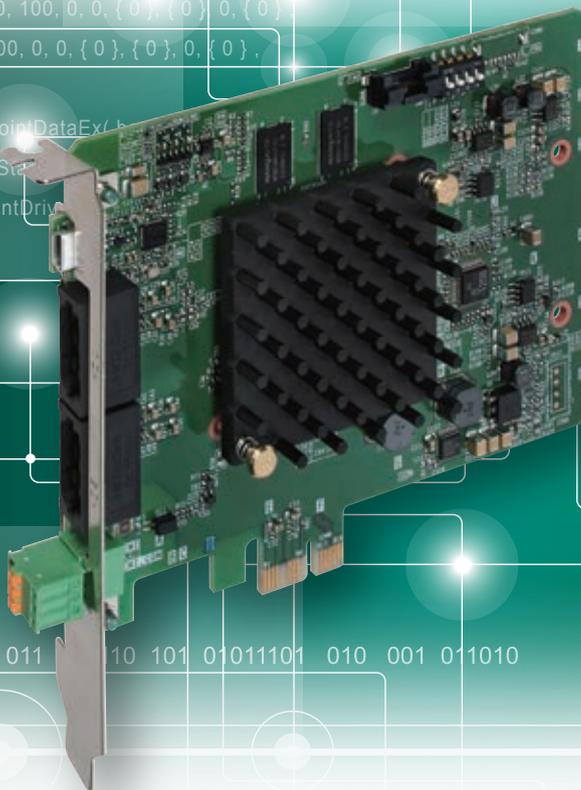
Controlling **MELSERVO-J4** from a personal computer/C Controller

PCI Express®
C Controller Interface Module

PCI Express®/Compact PCI® bus/PCI bus
Position Board

SSCNETⅢ/H
SERVO SYSTEM CONTROLLER NETWORK

GLOBAL IMPACT OF MITSUBISHI ELECTRIC

Through Mitsubishi Electric's vision, "Changes for the Better" are possible for a brighter future.

Changes for the Better

We bring together the best minds to create the best technologies. At Mitsubishi Electric, we understand that technology is the driving force of change in our lives. By bringing greater comfort to daily life, maximizing the efficiency of businesses and keeping things running across society, we integrate technology and innovation to bring changes for the better.

Mitsubishi Electric is involved in many areas including the following

Energy and Electric Systems
A wide range of power and electrical products from generators to large-scale displays.

Electronic Devices
A wide portfolio of cutting-edge semiconductor devices for systems and products.

Home Appliance
Dependable consumer products like air conditioners and home entertainment systems.

Information and Communication Systems
Commercial and consumer-centric equipment, products and systems.

Industrial Automation Systems
Maximizing productivity and efficiency with cutting-edge automation technology.

OVERVIEW

High-speed Synchronous Network "SSCNET III/H" Through C Language Based Programming ——

High-response servo control is achieved in a combination of C Controller and the Interface Module or a personal computer and the Position Board.
The system that is completely configured by Mitsubishi Electric products boosts reliability further.

- You can select a C Controller or a personal computer for the system
- Programmable controllers are not required in the system
- SSCNET III/H compatible servo amplifiers MR-J4-B are connectable
- Equipped with Point to Point positioning functionality as standard
  (set with point tables)
- High-speed processing (1 cycle startup, 0.22 ms (up to 32 axes))
- Various API functions and a test tool help user develop applications
- Real-time OS (INtime, RTX, etc.) is supported

 (Note): Contact your local Mitsubishi Electric office.

```
01 110 101 011 010110 101 01011101 01

void sample()
{
  PNT_DATA_EX PntData[2] =
  {
  { 1000, 200, 20, 100, 0, 0, { 0 }, { 0 }, 0,
  { 0, 200, 20, 100, 0, 0, { 0 }, { 0 }, 0, { 0
  };
  ans = sscSetPointDataEx( board_id, cha
  ans = sscAutoStart( board_id, channel,
  ans = sscWaitIntDriveFin( board_id, cha
}

01 110 101 011 010110 10
```

Advantages of Introducing C Controller/PC Embedded Type Servo System Controllers

Current customer situation

- Seeking a higher performance of servos and a more advanced servo interface

- Seeking products with higher performance and added value, while maintaining the program assets.

The system installed

- **SSCNET III/H compatible servo amplifiers are connectable**

- **SSCNET III/H compatible servo amplifiers, digital I/F, reduced wiring, and absolute position system**

Boost reliability

Personal computer   Pulse board

Microcomputer board

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

Configuration

C Controller/Personal computer

User program

```
void  sample()
{
    PNT_DATA_EX PntData[2] =
    {
        { 1000, 200, 20, 20, 0, 0, { 0 }, { 0 }, 0, { 0 } },
        {    0, 200, 20, 20, 0, 0, { 0 }, { 0 }, 0, { 0 } },
    };
    ans = sscSetPointDataEx( board_id, ch, ax, &PntData[0] );
    ans = sscAutoStart( board_id, ch, ax, start_pnt, end_pnt );
    ans = sscWaitIntDriveFin( board_id, ch, ax, SSC_FIN, &fin, 0 );
}
```

C Controller Interface Module/Position Board

Write to the dual port memory →

← Read from the dual port memory

← Interrupts

Dual port memory

Positioning control processing

Personal computer

PCI Express®/
Compact PCI® bus/
PCI bus/

Position Board

C Controller

PCI Express®

C Controller Interface Module

Configure a High-response Servo System in a Combination with a C Controller

■ C Controller Interface Module Q173SCCF

Connected directly to a C Controller via PCI Express®, this module is used for controlling MELSERVO-J4 SSCNET III/H compatible servo amplifiers, through a user program.

Features

● The system is configured with a C Controller that has a longer product life cycle on the market than the conventional PC.
● Event-driven programs, which use interrupts, can be created.
● Equipped with positioning functionality using point tables.
● An API library is available for more efficient software development.
● The Interface Module supports C Controllers where Lineo uLinux is installed.
  (Note): Contact your local Mitsubishi Electric office.

Q173SCCF

System Configuration

C Controller (Q24DHCCPU-V)
Q173SCCF

PCI Express® (Memory access, interrupts)

USB

Test tool is available for maintenance (graph and error check, etc.) of Q173SCCF and servo amplifiers

Forced stop input (24 V DC)

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

<External input signals of a servo amplifier>
FLS, RLS, DOG

MR-J4-B   MR-J4W2-B   MR-J4W3-B   MR-J4-B

Rotary servo motor   Direct drive motor   Direct drive motor   Linear servo motor   Rotary servo motor

Up to 20 axes

IAI
Quality and Innovation
Oriental motor
NIKKI DENSO
CKD NIKKI DENSO CO., LTD.
Mitsubishi Electric Servo System Partners (Note-1)

(Note-1): Contact your local Mitsubishi Electric office for details.

LJ72MS15 SSCNET III/H head module

MR-MT2000 series SSCNET III/H sensing module

Up to 4 stations

Configure a High-response Servo System by Embedding the Position Board in a PC

Position Board MR-MC341/MR-MC200 series

These board type controllers are used for controlling MELSERVO-J4 SSCNET III/H compatible servo amplifiers, through a user program.

Features

- MR-MC341 achieves the control cycle of 0.22 ms (when controlling 32 axes) and the maximum control axes of 64 axes.
- Various existing assets such as boards and programs for PC can be effectively used.
- Event-driven programs, which use interrupts, can be created.
- Equipped with positioning functionality using point tables.
- An API library is available for more efficient software development.
- Real-time OS (INtime, RTX, etc.) is supported.
  (Note): Contact your local Mitsubishi Electric office.

MR-MC210
MR-MC211
PCI bus
(Short sized version)

MR-MC220U3
(3U size)
MR-MC220U6
(6U size)
Compact PCI® bus

MR-MC341
MR-MC240
MR-MC241
PCI Express®
(Short sized version)

System Configuration

MR-MC341
MR-MC200 series

PCI Express®/
Compact PCI® bus/
PCI bus

<External input signals of a servo amplifier>
FLS, RLS, DOG

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

MR-J4-B   MR-J4W2-B   MR-J4W3-B   MR-J4-B

IAI
Quality and Innovation

Orientalmotor

NIKKI
DENSO
CKD NIKKI DENSO CO., LTD.

Mitsubishi Electric Servo System Partners (Note-2)

USB

Test tool is available for maintenance (graph and error check, etc.) of Position Board and servo amplifiers

Forced stop input (Note-1)
(24 V DC)

Rotary
servo motor

Direct drive
motor

Direct drive
motor

Linear
servo motor

Rotary
servo motor

MR-MC240, MR-MC220U3, MR-MC220U6, MR-MC210: Up to 20 axes
MR-MC241, MR-MC211: Up to 32 axes, MR-MC341: Up to 64 axes

(Note-1): When using an external forced stop with MR-MC200 series, prepare the forced stop input connector separately.
(Note-2): Contact your local Mitsubishi Electric office for details.

LJ72MS15
SSCNET III/H
head module

MR-MT2000 series
SSCNET III/H
sensing module

MR-MC200 series: Up to 4 stations
MR-MC341: Up to 16 stations

■ Software Development Environment

[C Controller Interface Module]

Create a user program by adding the API library for positioning control to the project of the C Controller software development environment "CW Workbench". Since the OS for the C Controller (VxWorks®) has been pre-installed, you do not need to install it.

OS: VxWorks®

C Controller
(Q24DHCCPU-V)

Q173SCCF

Ethernet   USB

PC

Utility of C Controller Interface Module

API functions compatible with VxWorks®

Add to the project

Test tool (USB connection)   API library

**Software development environment
(Ethernet connection):**
CW Workbench/Wind River Workbench
Setting/monitoring tool for the
C Controller module
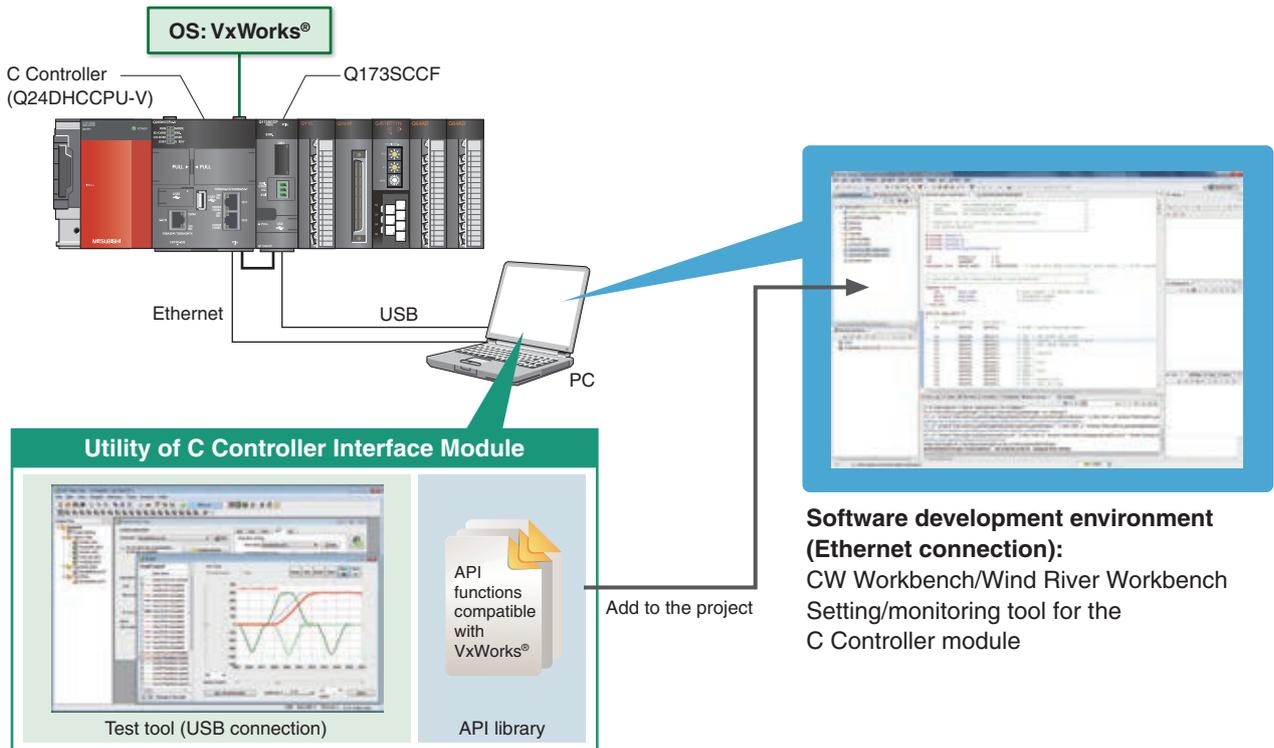
[Position Board]

Create a user program by adding the API library for positioning control to the project of Microsoft Visual Studio® which runs on a Windows® OS PC.

OS: Microsoft Windows®

Position Board

PCI Express®/
Compact PCI® bus/
PCI bus

PC

Utility of Position Board

API functions compatible with Windows®

Add to the project

Test tool   API library

Software development environment:
Microsoft Visual Studio®
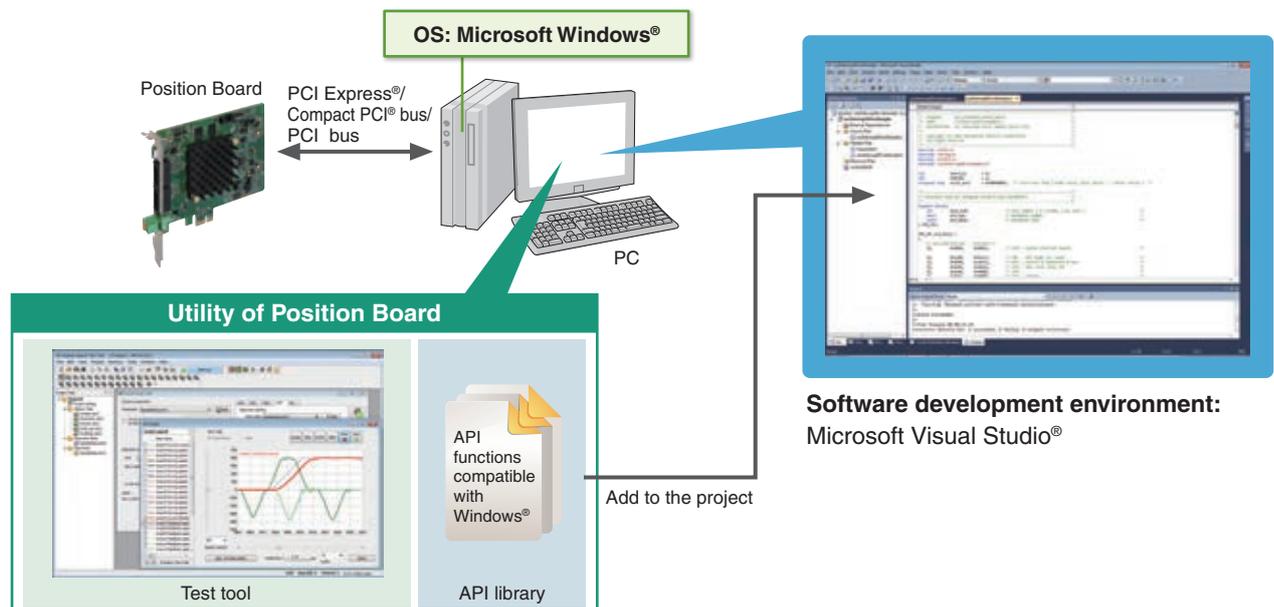
(Note): OS and the development environment are not included.

[Utility]

The utility for C Controller Interface Module/Position Board includes the following software that is necessary for application development.
● Test tool
● API library
● Device driver

Test tool

This tool supports parameter and point data settings for application development, operation check such as servo adjustment and error analysis. MR Configurator2 can be started from the test tool, so servo adjustment is easily performed.

Easy test operation check

Test operation is easily performed by using positioning test operation functions and parameter/point data setting functions.
These functions are useful for checking SSCNET III/H wiring and motor movement.
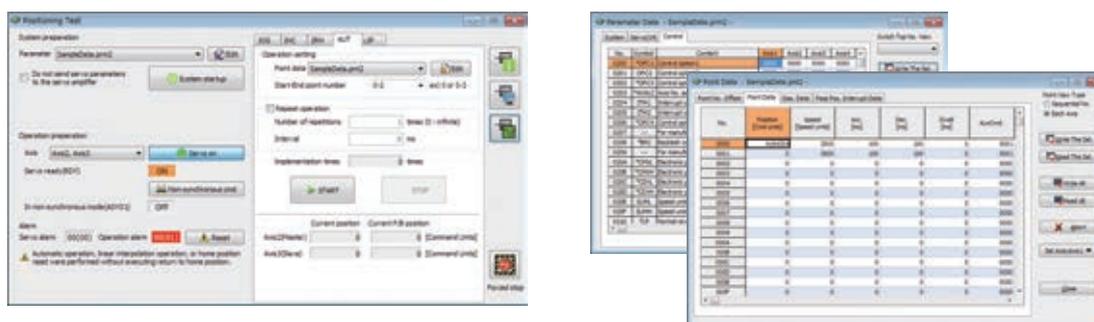
Maintenance

You can confirm the sampled waveform of monitor data (32 items) and bit data (16 items) to check the sequence of user programs and startup timing.
Error analysis is carried out with ease by reading the alarm history stored on the non-volatile memory.
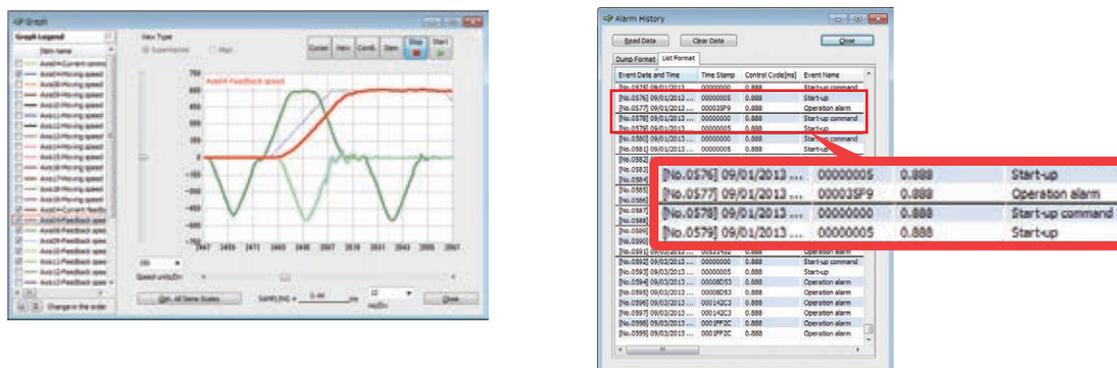
API library

The API library is the API functions for creating applications for C Controllers or on a personal computer.
Servo amplifier initialization, parameter change, startup in various operation modes, and monitor, etc., are available.

Device driver

The device driver is software required when a C Controller/a personal computer accesses to the Interface Module/Position Board from a user program via PCI Express®/Compact PCI® bus/PCI bus. You do not have to separately prepare a device driver.

Positioning Control

Positioning operation is performed using the API library in a C language user program.
The operation is started with positioning data from the point data table and waits until an event occurs by interrupts.

User program

```
void sample()
{
    int    board_id      = 0;      /* Board ID */
    int    channel       = 1;      /* Channel No.*/
    int    axnum         = 1;      /* Axis No.*/
    int    start_pnt     = 0;      /* Start point No.*/
    int    end_pnt       = 1;      /* End point No.*/
    int    fin_status;
    int    ans;

    PNT_DATA_EX PntData[2] =
    {
        { 1000, 200, 20, 20, 0, 0, { 0 }, { 0 }, 0, { 0 } },
        {    0, 200, 20, 20, 0, 0, { 0 }, { 0 }, 0, { 0 } },
    };
    /* Point data setting */
    ans = sscSetPointDataEx( board_id, channel, axnum, start_pnt, &PntData[0] );
    ans = sscSetPointDataEx( board_id, channel, axnum, end_pnt, &PntData[1] );
    /* Operation start */
    ans = sscAutoStart( board_id, channel, axnum, start_pnt, end_pnt );
    /* Operation wait */
    ans = sscWaitIntDriveFin( board_id, channel, axnum, SSC_FIN_TYPE_SMZ, &fin_status, 0 );
}
```

C Controller Interface Module/Position Board

Point Data

No.	Position data	Feed speed	Acceleration time constant	Deceleration time constant	Dwell	Auxiliary command	…
0	1000	200	20	20	0	Absolute position command, In-position stop	0
1	0	200	20	20	0	Absolute position command, In-position stop	0

MR-J4(W)-B

V

t

In-position signal
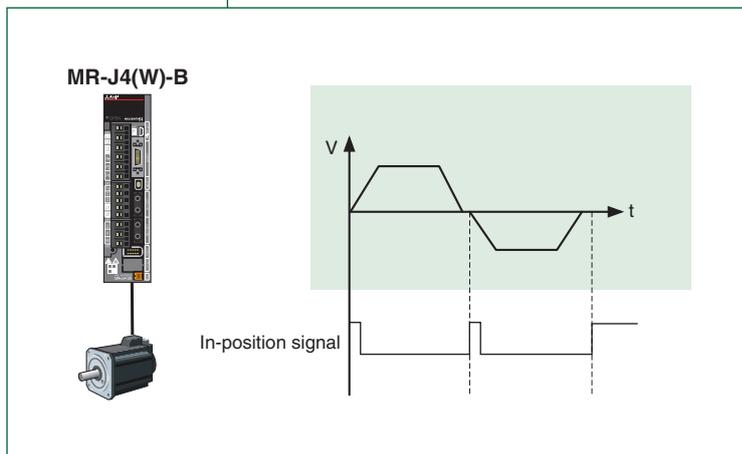
Various Optional Features for Point to Point Positioning Operation

[Jerk ratio acceleration/deceleration] Vibration is suppressed with smooth speed changes `MR-MC341`

Quick yet smooth acceleration
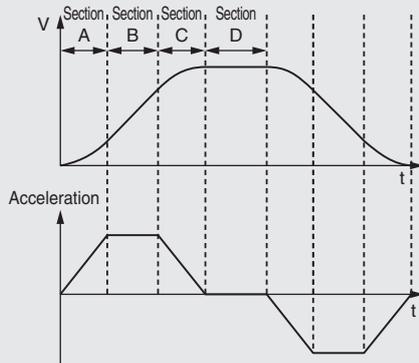
The total acceleration time can be reduced without losing smoothness because there are two different sections of acceleration: the section where acceleration rate changes smoothly, and the section where the maximum acceleration rate is maintained.

Section A : Acceleration rate changes smoothly
Section B : The maximum acceleration rate is maintained
Section C : Acceleration rate changes smoothly
Section D : Rated speed

[Vibration suppression command filter 1] Suppression of the low-frequency vibration `MR-MC341`

Suppression of the low-frequency vibration which is unable to suppress with the servo amplifier

Machine resonance frequency when the arms extend.
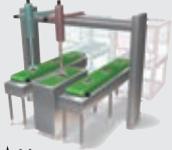
Machine resonance frequency when the arms return.
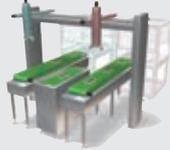
The filter function is used to suppress the vibration at the end of the workpiece and in the machine frame during positioning control. This filter is effective even for low-frequency vibration that cannot be suppressed by the machine resonance suppression filter or for when the frequency changes.
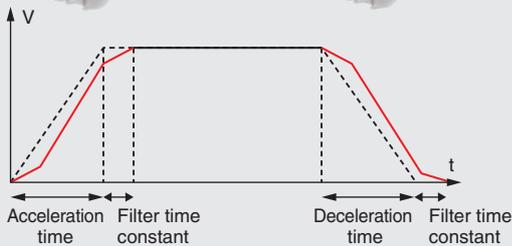
V : Positioning velocity
t : Time
Line: Speed after filtered
Dotted line: Speed before filtered

Acceleration time | Filter time constant | Deceleration time | Filter time constant

[Circular interpolation]
Circular interpolation control with sub point designation or center point designation `MR-MC341`

Circular interpolation
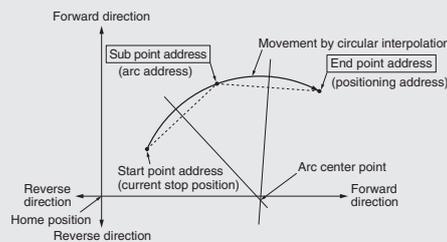
[Sub point designation]
By specifying an end point and a sub point of an arc, positioning operation which traces an arc path from the start point via the sub point to the end point is performed.
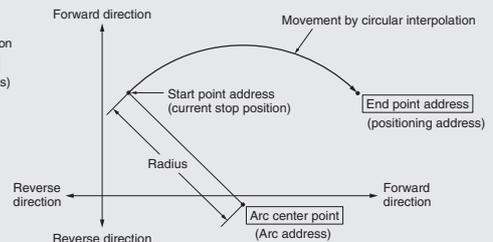
[Center point designation]
By specifying an end point, a center point of an arc, and a rotation direction, positioning operation which traces an arc path from the start point in the specified direction is performed. When a start point and an end point is set as the same, a perfect circle is drawn.

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［Deceleration check system］
When multiple points are specified, select the completion conditions of each point movement.

| Ensuring passage through the target position	Not waiting for motor stabilization	Not stopping at a point

In-position stop

V / t graph
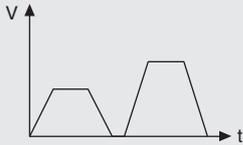
After In-position signal turns ON, operation proceeds to the next point.

Smoothing stop

V / t graph
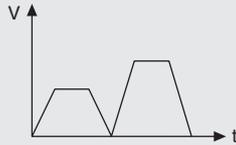
After completion of the position command output, operation proceeds to the next point.

Continuous operation

V / t graph
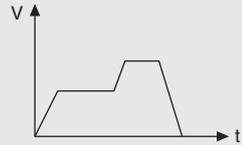
The current speed is changed to the command speed of the next point.

［Dwell time setting］ Set the wait time between points

Wait time before the point movement operation starts	Wait time after moving to the point

Pre-dwell

V / t graph
Wait time
Point 1 | Point 2
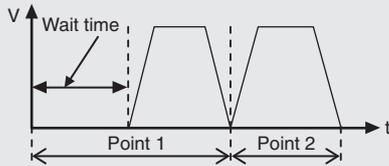
Operation starts after the specified wait time.

Dwell

V / t graph
Wait time
Point 1 | Point 2
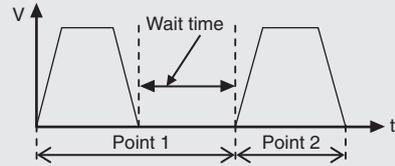
Operation is completed when the specified time has elapsed after moving to the point.

［Position command system］ Specify the reference position of position commands

| Target position with reference to the home position	Target position with reference to the current position

Absolute position command

Position command: 100

Home position 0 — Current position 50 — Target position 100
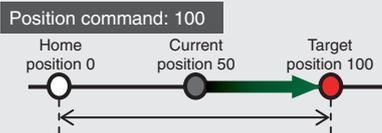
Moves to the target position, "100" away from the home position.

Relative position command

Position command: 100

Home position 0 — Current position 50 — Target position 150
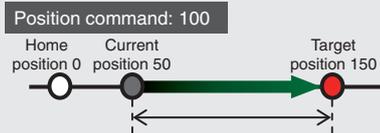
Moves to the target position, "100" away from the current position.

［Loop specification］ Specify the loop start/end point No. with the point table

Consecutive multi-point movement which exceeds the limit of settable point tables

Point table loop method
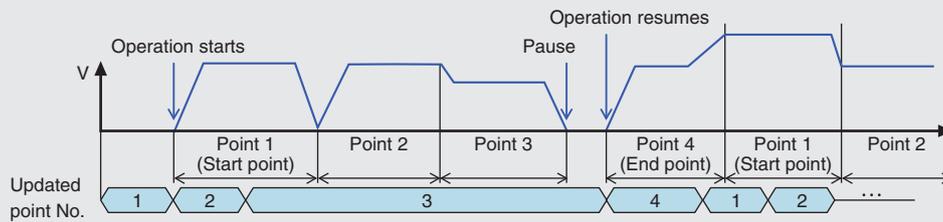
Once a point movement operation for the last point No. ends, another operation begins again from the start point No.
- Endless multi-point movement is possible by continuously updating the point table.
- The point movement operation stops by ending the update.
- The operation resumes automatically by starting the update.

［S-curve acceleration/deceleration and smoothing filter］ Vibration is suppressed with smooth speed changes

Same operation time duration

S-curve acceleration/deceleration
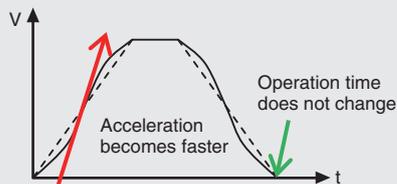
Maximum acceleration is faster than trapezoidal acceleration/deceleration.

Same maximum acceleration speed

Smoothing filter
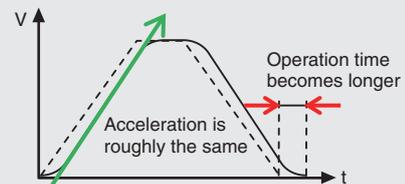
Maximum acceleration speed is roughly the same as trapezoidal acceleration/deceleration.

［Linear interpolation operation］ Maximum of 8 groups (control cycle: 0.88 ms), 2 to 4 axes per group in this operation

Interpolation operation with multiple axes

Linear interpolation operation
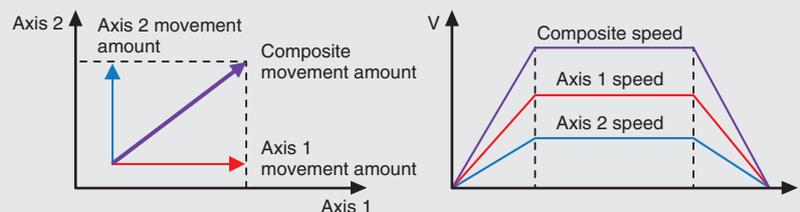
# Tandem Operation

With the operation start of the master axis, same commands start to be transmitted to both the master and slave axes, which achieve a tandem operation.

[Functions]

- Synchronous operation
- Check for synchronization error
- Stop processing in case servo error occurs
- Simultaneous home position return of multiple axes
- JOG operation

Tandem operation system

Master axis   Slave axis
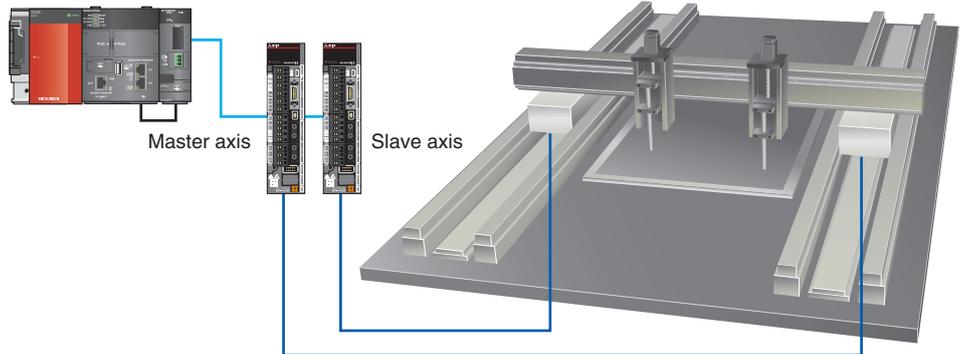
Other Axes Start Function

This function automatically starts other axes according to its startup condition and its operation pattern.
Cycle time of assembly machines, etc., is shortened with this automatic startup via controllers.

Operation example

1. Axis 2 moves to P1 from its start point.
2. When axis 2 passes the specified point, axis 1 automatically starts.
3. Axis 2 reaches P1.
4. When axis 1 passes the specified point, axis 2 automatically starts.
5. Axis 1 reaches P2.
6. Axis 2 reaches the end point.

Axis 2

Target position of axis 2

Automatic start of axis 2

P1   P2

Target position of axis 1

Automatic start of axis 1

Start point   End point

Axis 1

Other axes start condition is met

Axis 2

Operation start (ST)

Operation (OP)

Other axes start notice (OSOP1)

Other axes start completion (OSFIN1)

Axis 1

Automatic start of other axes (Axis 1)

Operation (OP)

Robot 2   Robot 1

Belt conveyor moving direction

Line 2

Line 1

Application example: Product handling equipment

■ Position Change Function

Q173SCCF MR-MC series

While linear interpolation is performed, the target position can be changed by rewriting the position data of the point table and then turning ON Position change command (PCHG).
Thus, cycle time is shortened by changing the target position during the operation.
The axes move to the new target position through an arc trace in order to maintain the current speed.

Operation example

1. Detect the compensation position with the vision system.
2. The target position is changed from P1 to P2 with the user program.
3. Move the wafer to the new target position.

Axis 2

P2 (New target position)

Change the target position

P1 (The original target position)

Axis 1

Ethernet

2. Change the target position.

1. Compensation position data

3. Move the wafer to the new target position.

COGNEX vision system

SSCNET**Ⅲ**/H
SERVO SYSTEM CONTROLLER NETWORK
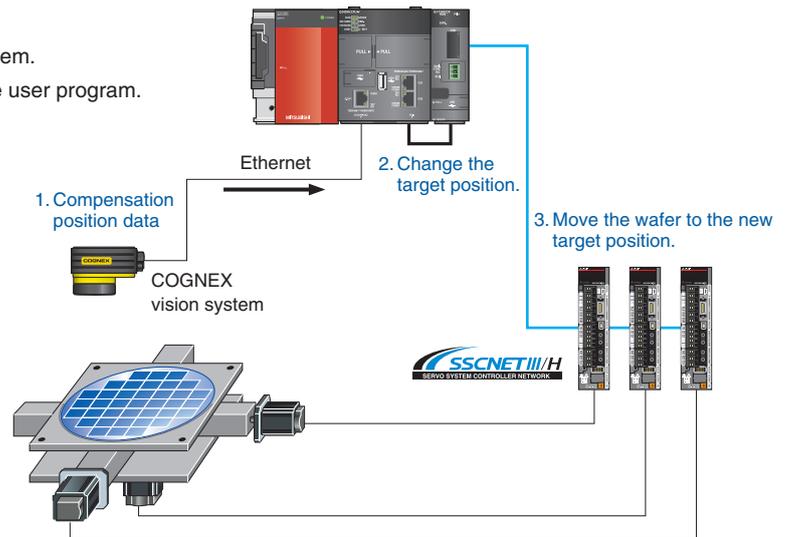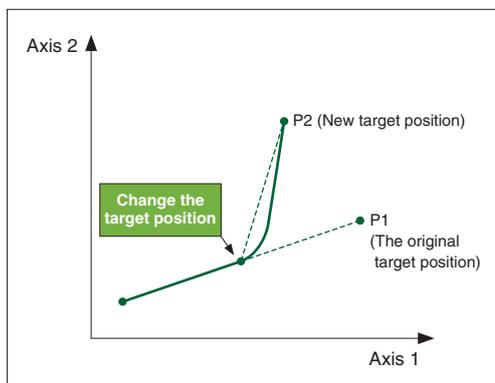
■ Pass Position Interrupt Function

Q173SCCF MR-MC series

During automatic operation, interrupts are outputted when axes pass the specified position.
After that, the corresponding interrupt process of the user program is started.
● High-speed event processing start on host side (OS) is possible based on the servo axis position

Operation example

1. As the axes are moving to P2 from P1, the interrupt occurs.
2. The vision camera takes photos of the workpiece according to the interrupts.
3. The position data is read.
   The vision camera takes photo responding to the interrupts.
   Thus by taking photos periodically with interrupts, more accurate position data is available.


V

Pass position interrupt

P1

P2

t

Vision processing

Pass position interrupt

Vision camera takes the photos

END

P1

Inspect

P2

Accepted products

Rejects
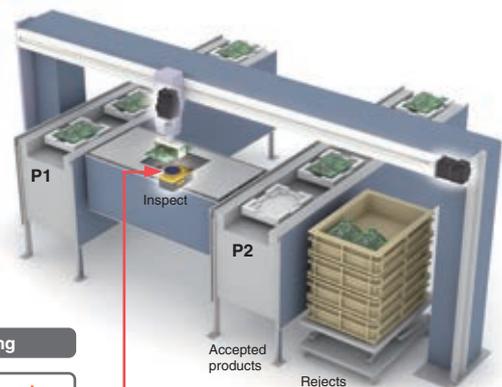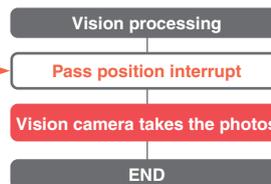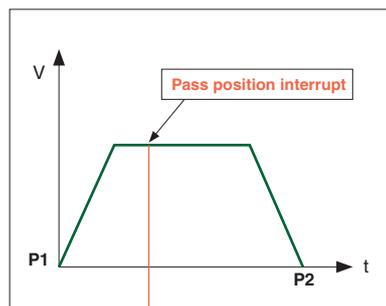
Application example: inspection machine

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Tightening & Press-fit Control

The motor can be switched to torque control (tightening & press-fit mode) during positioning without stopping.
Since the current position is controlled even during the tightening & press-fit control, positioning operation based on the absolute position coordinates can be performed smoothly after switching back to positioning control.

Position control

Position the workpiece

Tightening & press-fit control (Torque control)

Switch to torque control, and press it with specified torque

Position control

Switch to position control, and return.

| Control mode | Position | Tightening & press-fit | Position |

Speed / Torque / Control mode
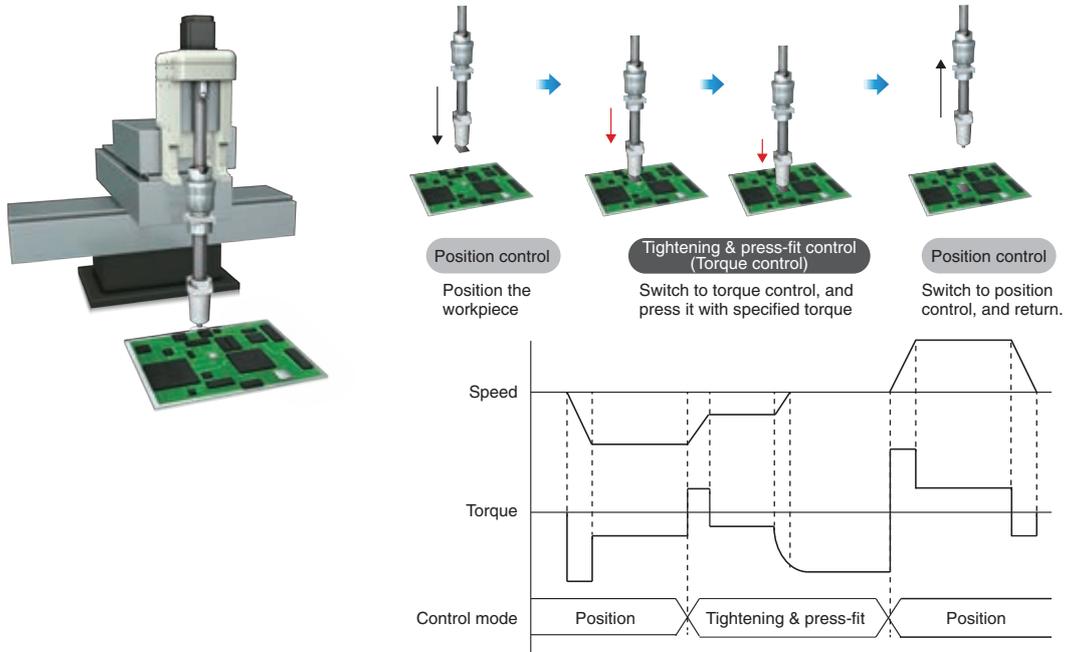

Interface Mode Function

This standard feature realizes unique control based on a C-language user program using SSCNET III/H

The interface mode function transmits the position commands received from a user program to servo amplifiers every operation cycle. This allows servo amplifier to be controlled using a user program.
Speed and torque controls are also available in this method.
So, a MR-J4-B can be controlled based on user programs created with your programming know-how of position/speed/torque commands while taking advantage of SSCNET III/H servo system synchronous network performance.
• The C Controller Interface Module or Position Board controls the SSCNET III/H processing. This allows the user-program side to focus on information processing, human machine interface, and Motion control.
• A personal computer with a real-time OS can perform fixed-cycle Motion control using interrupts at every operation cycle.
• Thanks to the position command buffers of up to 64 phases, even non-real-time OS (Windows® only) can perform at 0.22 ms (the fastest rate) cycle command operation; This enables further increase in accuracy in trajectory control.


C Controller, Personal computer

User program
(C language program)

Position / Data for every operation cycle / Time

Position commands for every operation cycle

PCI Express®/
Compact PCI® bus/
PCI bus

Interrupts for
every operation cycle

C Controller Interface Module, Position Board

Axis-1 position command buffer 0

. . . .

Axis-20 position command buffer 0

The position commands are transmitted to servo amplifier every operation cycle

MR-J4-B

SSCNET III/H

Position / Time

15

MR-MT2000 Series SSCNET III/H Sensing Module

The sensing module MR-MT2000 series consists of one head module and four types of extension modules, the I/O module, pulse I/O module, analog I/O module, and encoder I/F module. The required extension modules can be selected according to your application.

Each I/O signal connected to the sensing module is synchronized with the control cycle, enabling a processing with little variation to achieve high speed and high accuracy of equipment.
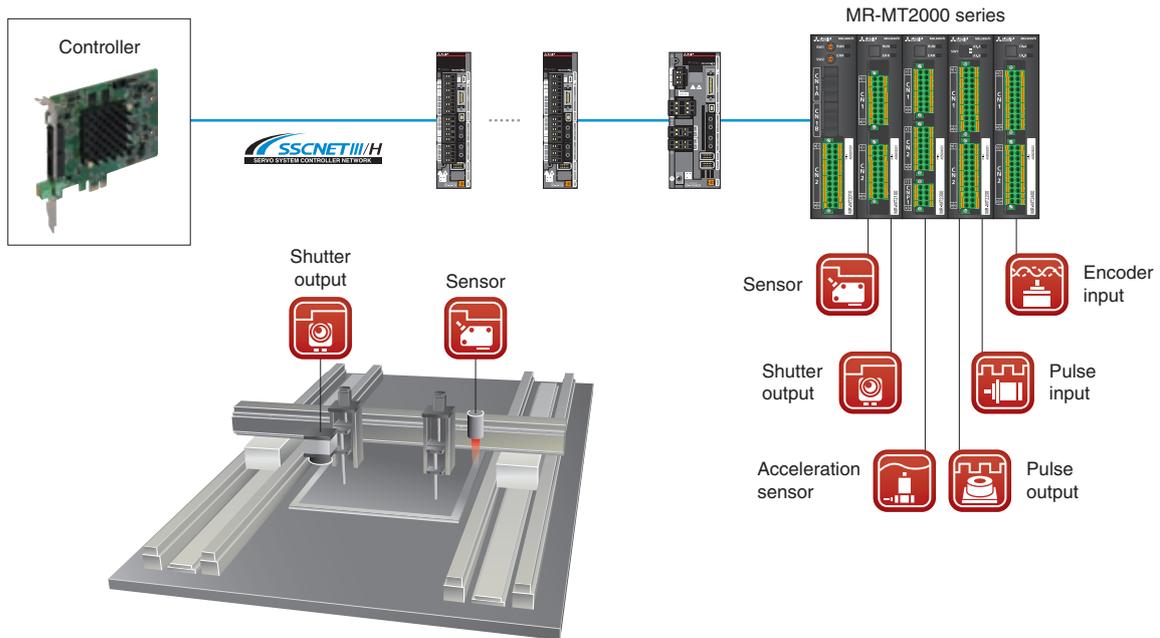

LJ72MS15 SSCNET III/H Head Module

The SSCNET III/H Head module allows the controller to connect remotely with various modules (I/O, analog, high-speed counter, etc.) via SSCNET III/H.
These remotely connected modules serve as the controller's remote stations, transmitting the inputs/outputs.
This results in reduced wiring since the controller receives the I/O and analog I/O signals directly from the servo amplifier side.

(Note): MELSOFT GX Works2 is required to set the Head module.
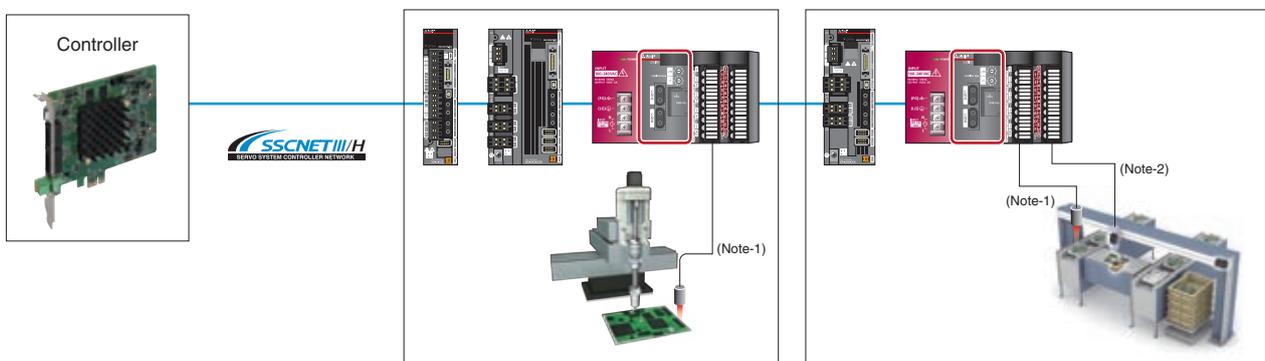
(Note-1): Sensor I/O signals for inspection devices, etc., can be read/written via the Head module.
(Note-2): Outputs the hand open/close signals.

■ Main Functions

JOG operation
Operation function

When the movement direction is specified and the start operation signal is inputted, JOG operation is started in the designated direction and the movement continues until the start operation signal is turned OFF. JOG operation can be used without completing home position return.

Automatic operation
Operation function

The point table, where position data and feed speed are set, is used in this automatic operation. Once the start operation signal is turned ON, instructions are executed sequentially from the set start point to the set end point.

Electronic gear
Application function

This function adjusts the number of pulses outputted to the servo amplifiers so that a machine moves by the specified command unit in a program.

Acceleration/deceleration
Application function

Various acceleration/deceleration methods, such as linear acceleration/deceleration, smoothing filter, and S-curve acceleration/deceleration, are available. Select the suitable method for your machine.

Servo amplifier disconnect
Application function

The servo amplifier disconnect function enables an operation without connecting a servo amplifier. User programs can be debugged without servo amplifiers.

Mark detection
Application function

The current position data of servo motor can be read when a mark detection signal is inputted from a servo amplifier.

Home position search limit
Application function

This function is used while returning to the home position in the opposite direction of the home position return. If the movement exceeds the parameter set for the home position search limit, the home position search limit error occurs and the home position return operation is terminated.

Absolute position detection system
Application function

In the absolute position detection system, if the home position is determined at the system startup, there is no need to execute the home position return again because the absolute position is restored at system startup.

Incremental feed
Operation function

A fixed feed distance is implemented for each start operation signal (ST). The amount of feed is set using the incremental feed movement amount. Incremental feed can be used without completing the home position return.

Home position return
Operation function

This function establishes the reference position (home position) for positioning control. Various methods are available, such as dog method, data set method, stopper method, and scale home position signal detection method.

Stop functions
Application function

Forced stop, operation stop, and rapid stop are available. These stop functions are used to stop a machine when detecting a machine error.

Command change
Application function

Commands for speed/time constant/position can be changed, even during the operation.

Gain switching
Application function

By turning ON the gain switching command signal (GAIN), the gain for the servo amplifier can be changed. This is used to switch the gain during rotation and while stopped, as well as switching gain responding to the changes in movement amount or speed.

Connect/disconnect
Maintenance

By turning ON the disconnection command, SSCNET III/H communication with the selected axis and later can be disconnected. The axes whose communication is disconnected become non-communicating axes, so their power supplies can be turned OFF and SSCNET III cables can be detached.

Alarm history
Maintenance

This function logs alarms and keeps them even when power is turned OFF. This is useful for analysis of machine alarms.

Log
Maintenance

This function logs event information such as operation startup, command change, and operation completion alarms, which are used for analyzing the timing of event occurrence.

Control specifications

Function		Standard Mode				Interface Mode			
		MR-MC341	MR-MC240 MR-MC220U3 MR-MC220U6 MR-MC210	MR-MC241 MR-MC211	Q173SCCF	MR-MC341	MR-MC240 MR-MC220U3 MR-MC220U6 MR-MC210	MR-MC241 MR-MC211	Q173SCCF
System function	Number of control axes	UP to 64	Up to 20 (MR-J4-B) Up to 16 (MR-JE-B)	UP to 32	Up to 20 (MR-J4-B) Up to 16 (MR-JE-B)	UP to 64	Up to 20 (MR-J4-B) Up to 16 (MR-JE-B)	UP to 32	Up to 20 (MR-J4-B) Up to 16 (MR-JE-B)
	Control cycle	0.22ms/0.44ms/0.88ms (Select using parameters.)							
	Control mode	Position control, Tightening & press-fit control				Position control, Speed control, Torque control			
Operation functions (Note-1, 2)	JOG operation	Provided				—			
	Incremental feed	Provided				—			
	Automatic operation	Point table method, 1-axis control, Tightening & press-fit control				—			
	Linear interpolation	Point table method, Up to 4 axes interpolation (Note-3)				—			
	Circular interpolation	Provided		—		—			
	Home position return	Dog method, Dog cradle method, Dog front end method, Data set method, Stopper method, Z-phase detection method, Limit switch combined method, Limit switch front end method, Scale home position signal detection method, Scale home position signal detection method 2				—			
		Home position reset (data set)				—			
Application functions 1	Electronic gear	Electronic gear numerator : 1 to 5242879 Electronic gear denominator : 1 to 589823				—			
	Speed units	Command unit/min, command unit/s, and r/min				Command unit/min, command unit/s, and r/min (the unit for speed of monitor output)			
	Acceleration/ deceleration	Command speed limits: 1 to speed limit value Start speed limits: 1 to speed limit value Time constant limits: 0 to 20000 ms Separate setting of constants for deceleration and acceleration: Provided Separate setting of constants for each point: Provided Acceleration/deceleration method: Linear acceleration/deceleration, smoothing filter, start up speed, S-curve acceleration/deceleration (sine acceleration/deceleration), Jerk ratio acceleration/deceleration (Note-4), vibration suppression command filter 1 (Note-4)				—			
	Stop function	Forced stop, Operation stop, Rapid stop				Forced stop			
	Command change	Position, Speed, Time constant				—			
Application functions 2		Hardware stroke limit, Software stroke limit, Interlock, Rough match output, Torque limit, Backlash compensation, Position switch, Interference check (Note-3), Home position search limit, Gain switching, PI-PID switching, Absolute position detection system, Home position return request, Other axes start, Digital input/output, Servo amplifier general input/output, Pass position interrupt, Tandem operation, Mark detection				Torque limit, Gain switching, PI-PID switching, Absolute position detection system, Digital input/output, Servo amplifier general input/output, Mark detection, Event detection			
Auxiliary function	Monitor	Current command position, Current feedback position, Speed command, Position droop, Electrical current command, Servo alarm number, External signal status, etc.							
	High speed monitor	Current command position, Current feedback position, Moving speed, Feedback moving speed, External signal, Electrical current feedback, Position droop (Note-5)							
	Interrupt	During start operation, Operation stoppage (During operation, in-position, during smoothing stop, rough match, etc.) When alarm occurs (servo alarm/operation alarm),etc.				Constant multiplication output of control cycle			
	Host PC watchdog	Provided (Check for the watchdog of the CPU of the host computer)							
	Parameter backup	Parameters can be saved to the flash ROM.							
	Test mode	By connecting MR Configurator2 via the controllers, the servo amplifier can be easily tested.							
	Connect/ disconnect	Provided							
	Sampling	The maximum sampling point: 65536							
	Log	History of operation start, alarms, etc., can be recorded.							
	Alarm history	Provided							
	External forced stop disabled	Provided							
Board ID		0 to 3		—		0 to 3		—	

(Note-1): The movable range: -2147483648 to 2147483647. Movement outside the limits is not covered with warranty. If software limits have been disabled, be careful not to exceed the limits.
(Note-2): For the absolute position detection system, the command limits of the position after calculation using the electronic gear are also -2147483648 to 2147483647. The moveable limits may be narrower than -2147483648 to 2147483647, depending on the electronic gear ratio.
(Note-3): Unavailable when the control cycle is 0.22 ms (MR-MC200 series/Q173SCCF).
(Note-4): Available only with MR-MC341.
(Note-5): Available only in the interface mode.

C Controller Interface Module specifications

Item		Specification
Servo amplifier connection system		SSCNET III/H (1 line)
Maximum distance between stations [m(ft.)]		SSCNET III/H: 100 (328.08)
Peripheral I/F		USB
Forced stop input signal (EMI) [(Note-1)]	Number of input points	1 point
	Input method	Positive Common/Negative Common Shared Type (Photocoupler isolation)
	Rated input voltage/current	24 V DC/approx. 2.4 mA
	Operating voltage range	20.4 to 26.4 V DC (24 V DC +10%/−15%, ripple ratio 5% or less)
	ON voltage/current	17.5 V DC or more/2.0 mA or more
	OFF voltage/current	1.8 V DC or less/0.18 mA or less
	Input resistance	Approx. 10kΩ
	Response time	1ms or less (OFF to ON, ON to OFF)
	Recommended wire size	AWG26 to AWG16 (0.12 to 1.3 mm^2)
Number of Interface Modules for one C Controller		1
Bus specification		PCI Express®
Number of I/O occupying points		0
Number of module occupied slots		1
5 V DC internal current consumption [A]		0.7
Mass [kg]		0.17
Exterior dimensions [mm(inch)]		98 (3.86) (H) × 27.4 (1.08) (W) × 115 (4.53) (D)

(Note-1): The forced stop input connector is enclosed in the C Controller Interface Module package.

Position Board specifications

Item		Specification						
		MR-MC341 (Note-1)	MR-MC240	MR-MC241	MR-MC220U3	MR-MC220U6	MR-MC210	MR-MC211
Servo amplifier connection system		SSCNET III/H						
Number of SSCNET III/H lines		2 lines	1 line	2 lines	1 line	1 line	1 line	2 lines
Maximum distance between stations [m(ft.)]		SSCNET III/H: 100 (328.08)						
Peripheral I/F		USB						
Forced stop input signal (EMI) (Note-2)	Number of input points	1 point						
	Input method	Positive Common/Negative Common Shared Type (Photocoupler isolation)						
	Rated input voltage/current	24 V DC/approx. 2.4 mA						
	Operating voltage range	20.4 to 26.4 V DC (24 V DC +10%/–15%, ripple ratio 5% or less)						
	ON voltage/current	17.5 V DC or more/2.0 mA or more						
	OFF voltage/current	1.8 V DC or less/0.18 mA or less						
	Input resistance	Approx. 10kΩ						
	Response time	1ms or less (OFF to ON, ON to OFF)						
	Recommended wire size	AWG28 to AWG20 (0.08 to 0.52 mm^2)	AWG28 to AWG22 (0.08 to 0.32 mm^2)					
Number of Position Boards for one computer		4						
Bus specification		PCI Express® 2.0	PCI Express®1.1 × 1		Compact PCI® bus		PCI bus	
	Size [mm(inch)]	Short sized version 105.8 (4.17) × 128.8 (5.07)	Short sized version 111.2 (4.38) × 167.6 (6.60)		3U size 128.7 (5.07) × 160.0 (6.30)	6U size 262.05 (10.32) × 160.0 (6.30)	Short sized version 106.7 (4.20) × 167.6 (6.60)	
Operating ambient temperature		0 to 45°C (Secure an air flow)	0 to 55°C					
Cooling method		Air cooling (cooling fan required)	Self cooling					
Power supply voltage		3.3 V DC	12 V DC	3.3 V DC		5 V DC		
Current consumption [A]		3.0	0.5	1.1	1.5	0.45		0.7
Mass [kg]		0.15		0.11		0.17	0.19	0.11

(Note-1): Be sure to induce an airflow in the PC case of the host controller that the MR-MC341 is installed. Refer to "MR-MC200/MR-MC300 Series Position Board User's Manual (Details)" for details.
(Note-2): For MR-MC200 series, crimping tools and connectors are needed for cable fabrication. Be sure to prepare ones separately.
(The forced stop input connector is included with MR-MC341 in the package.)

Position Board connector for forced stop input (cable-side)

Manufacturer	Name	Model	Description
Molex, LLC	Housing	51103-0300	
	Terminal	50351-8100	Applicable wire size : AWG28 to AWG22 Two terminals are needed for one housing
	Hand crimp tool	57295-5000	Applicable terminal: 50351

Dedicated API library functions

Easy programming for easy access to C Controller Interface Module/Position Board

More than 100 functions, such as operating functions, monitor functions, other axes start functions, pass position interrupt functions, sampling functions, and log functions are available for creating user application.

Function Type	Function (some functions are omitted)	Function Content
Support Functions	sscGetLastError	Gets the detailed error codes.
Device Functions	sscOpen	Opens memory access port.
	sscClose	Closes memory access port.
Parameter Functions	sscResetAllParameter	Writes the initial values in all parameters before system startup.
	sscChangeParameter	Writes the parameter.
	sscCheckParameter	Reads the parameter set value.
	sscLoadAllParameterFromFlashROM	Loads all the parameters from a flash ROM before system startup.
	sscSaveAllParameterToFlashROM	Saves all the parameters into a flash ROM before system startup.
System Functions	sscReboot	Reboots the system.
	sscSystemStart	Starts the system.
	sscGetSystemStatusCode	Gets the system status code.
	sscReconnectSSCNET	Reconnects the SSCNET communication.
	sscDisconnectSSCNET	Disconnects the SSCNET communication.
Command/ Status Functions	sscSetCommandBitSignalEx	Arbitrarily sets the command bit.
	sscGetStatusBitSignalEx	Arbitrarily gets the status bit.
	sscWaitStatusBitSignalEx	Waits until the specified bit turns on/off.
Point Table Functions	sscSetPointDataEx	Sets the point data.
	sscCheckPointDataEx	Gets the point data.
	sscSetPointOffset	Sets the point number offset.
	sscGetDrivingPointNumber	Gets the operation point number.
Operating Functions	sscJogStart	Starts JOG operation.
	sscJogStop	Stops JOG operation.
	sscIncStart	Starts incremental feed.
	sscAutoStart	Starts automatic operation.
	sscHomeReturnStart	Starts home position return.
	sscLinearStart	Starts linear interpolation.
	sscDataSetStart	Starts the home position reset (data set).
	sscDriveStop	Stops operation.
	sscGetDriveFinStatus	Gets the operation completion status.
Change Functions	sscChangeAutoPosition	Changes position during automatic operation.
	sscChangeLinearPosition	Changes position during linear interpolation.
Alarm Functions	sscGetAlarm	Gets the alarm number.
	sscResetAlarm	Resets the alarm.
General Monitor Functions	sscSetMonitor	Starts monitoring.
	sscStopMonitor	Stops monitoring.
	sscGetMonitor	Gets monitoring data.
High Speed Monitor Functions	sscGetCurrentCmdPositionFast	Gets the current command position.
	sscGetCurrentFbPositionFast	Gets the current feedback position.
	sscGetIoStatusFast	Gets the external signal status.
	sscGetCmdSpeedFast	Gets the moving speed.
	sscGetFbSpeedFast	Gets the feedback moving speed.
	sscGetCurrentFbFast	Gets the current feedback.

Function Type	Function (some functions are omitted)	Function Content
User Watchdog Functions	sscWdEnable	Enables the user watchdog function.
	sscWdDisable	Disables the user watchdog function.
	sscChangeWdCounter	Updates the watchdog counter.
Other Axes Start Functions	sscSetOtherAxisStartData	Sets the data for starting other axes.
	sscGetOtherAxisStartData	Gets the data for starting other axes.
	sscOtherAxisStartAbortOn	Turns the other axes start cancel signal ON.
	sscOtherAxisStartAbortOff	Turns the other axes start cancel signal OFF.
	sscGetOtherAxisStartStatus	Gets the other axes start status.
Pass Position Interrupt Functions	sscSetIntPassPositionData	Sets the pass position interrupt condition data.
	sscSetStartingPassNumber	Sets the pass position condition start and end numbers.
	sscGetExecutingPassNumber	Gets the running pass position condition number.
Sampling Functions	sscStartSampling	Starts sampling.
	sscStopSampling	Stops sampling.
	sscGetSamplingStatus	Gets the sampling execution information.
	sscGetSamplingData	Gets the sampling data.
Log Functions	sscStartLog	Starts the log.
	sscStopLog	Stops the log.
	sscCheckLogStatus	Gets the running status of the log.
	sscReadLogData	Reads the log data.
	sscClearLogData	Clears (initializes) the log data.
	sscGetAlarmHistoryData	Gets alarm history data.
	sscClearAlarmHistoryData	Clears (initializes) the alarm history data.
Digital Input/Output Functions	sscGetDigitalInputDataBit	Gets the DI data of the designated digital input on 1-point basis.
	sscSetDigitalOutputDataBit	Sets the DO data of the designated digital output on 1-point basis.
Interrupt Functions	sscIntStart	Starts up the interrupt driver.
	sscIntEnd	Closes the interrupt driver.
	sscIntEnable	Enables interrupt output.
	sscIntDisable	Disables interrupt output.
	sscRegisterIntCallback	Registers the interrupt callback function.
	sscUnregisterIntCallback	Unregisters the interrupt callback function.
	sscResetIntEvent	Sets the interrupt event signal status to nonsignaled.
	sscSetIntEvent	Sets the interrupt event signal status to signaled.
	sscWaitIntEvent	Waits until the interrupt event status becomes signaled.
	sscResetIntOasEvent	Sets the status of the other axes start interrupt event to nonsignaled.
	sscSetIntOasEvent	Sets the status of the other axes start interrupt event to signaled.
	sscWaitIntOasEvent	Waits until the status of the other axes start interrupt event becomes signaled.
	sscResetIntPassPosition	Sets the status of the pass position interrupt event to nonsignaled.
	sscSetIntPassPosition	Sets the status of the pass position interrupt event to signaled.
	sscWaitIntPassPosition	Waits until the status of the pass position interrupt event becomes signaled.
	sscResetIntDriveFin	Sets the status of the operation completion interrupt event to nonsignaled.
	sscSetIntDriveFin	Sets the status of the operation completion interrupt event to signaled.
	sscWaitIntDriveFin	Waits until the status of the operation completion interrupt event becomes signaled.

C Controller Interface Module Specifications

Operation environment for test tool

Item		Description
Personal computer	Personal computer	Microsoft® Windows® supported personal computer
	OS	Microsoft® Windows® 10 English version (64-bit/32-bit) Microsoft® Windows® 8.1 English version (64-bit/32-bit) Microsoft® Windows® 8 English version (64-bit/32-bit) Microsoft® Windows® 7 English version (64-bit/32-bit) [Service Pack 1] Microsoft® Windows Vista® English version (32-bit) [Service Pack 2] Microsoft® Windows® XP English version (32-bit) [Service Pack 3]
	CPU	Desktop PC: Intel® Celeron® Processor 2.8GHz or higher Laptop PC : Intel® Pentium® M Processor 1.7GHz or higher
	Required memory	1GB or more recommended (For 32-bit edition) 2GB or more recommended (For 64-bit edition)
Available hard disk space		When installing the test tool: Available hard disk space 1GB or more When operating the test tool: Available virtual memory space 512MB or more
Disk drive		CD-ROM supported disk drive
Monitor		Resolution 1024 × 768 pixels or higher
Communication interface		USB port

Development environment

Item	Description
User program OS	VxWorks® 6.8.1
Software development environment	C Controller Engineering Tool CW Workbench SW1DND-CWWLQ24-E/SW1DND-CWWLQ24-EZ/SW1DND-CWWLQ24-EVZ
	A product of Wind River Systems Inc. (Note-1) Wind River Workbench 3.2

(Note-1): Need to purchase the product separately.

Component list

Item	Model	Specification			Applicable standard
C Controller Interface Module	Q173SCCF	Up to 20 axes (A forced stop input connector is included.)			CE, UL, KC, EAC
C Controller Module	Q24DHCCPU-V	CPU : SH4A, Endian format: Little endian OS : VxWorks® 6.8.1			CE, UL, KC, EAC
C Controller Interface Module utility	SW1DNC-QSCCF-B	• Test tool (for setup, debugging) • API library (library of functions for VxWorks®) • Device driver			—
SSCNET III cable (Note-1)	MR-J3BUS☐M	• Q173SCCF ⇔ Servo amplifier • Servo amplifier ⇔ Servo amplifier	Standard code for inside panel	0.15m (0.49ft.), 0.3m (0.98ft.), 0.5m (1.64ft.), 1m (3.28ft.), 3m (9.84ft)	—
	MR-J3BUS☐M-A		Standard cable for outside panel	5m (16.40ft.), 10m (32.81ft.), 20m (65.62ft.)	—
	MR-J3BUS☐M-B (Note-2)		Long distance cable	30m (98.43ft.), 40m (131.23ft.), 50m (164.04ft.)	—
PCI Express® cable	Q173PCIECBL05M	Q24DHCCPU-V ⇔ Q173SCCF Cable length: 0.5m (1.64ft.)			—
USB cable	MR-J3USBCBL3M	3m (9.84ft.)			—
MR Configurator2	SW1DNC-MRC2-E	Servo amplifier MELSERVO-J4 series setting and adjustment			—

(Note-1): "_" indicates cable length. (015: 0.15m (0.49ft.), 03: 0.3m (0.98ft.), 05: 0.5m (1.64ft.), 1: 1m (3.28ft.), 3: 3m (9.84ft.), 5: 5m (16.40ft.), 10: 10m (32.81ft.), 20: 20m (65.62ft.), 30: 30m (98.43ft.),
40: 40m (131.23ft.), 50: 50m (164.04ft.))
(Note-2): For a long distance cable of up to 100m (328.08ft.) or an ultra-long bending life cable, contact Mitsubishi Electric System & Service Co., Ltd.
OVERSEAS SERVICE SECTION (Email:osb.webmaster@melsc.jp)

Position Board Specifications

Operation environment for test tool

● : Supported – : Not supported

Item		Description	MR-MC341	MR-MC200 series
Personal computer	Personal computer	Microsoft® Windows® supported personal computer		
	OS	Microsoft® Windows® 10 English version (64-bit/32-bit)	●	●
		Microsoft® Windows® 8.1 English version (64-bit/32-bit)	—	●
		Microsoft® Windows® 8 English version (64-bit/32-bit)	—	●
		Microsoft® Windows® 7 English version (64-bit/32-bit) [Service Pack 1]	●	●
		Microsoft® Windows Vista® English version (32-bit) [Service Pack 2]	—	●
		Microsoft® Windows® XP English version (32-bit) [Service Pack 3]	—	●
	CPU	Desktop PC: Intel® Celeron® Processor 2.8GHz or higher Laptop PC : Intel® Pentium® M Processor 1.7GHz or higher		
	Required memory	1GB or more recommended (For 32-bit edition) 2GB or more recommended (For 64-bit edition)		
Available hard disk space		When installing the test tool: Available hard disk space 1GB or more When operating the test tool: Available virtual memory space 512MB or more		
Disk drive		CD-ROM supported disk drive		
Monitor		Resolution 1024 × 768 pixels or higher		
Communication interface		PCI Express®/Compact PCI® bus/PCI bus USB port		

Development environment

Item		Description
User program OS		The same OS as the test tool above.
Software development environment	MR-MC341	Microsoft® Visual C++® 2015/2013/2012/2010 Microsoft® Visual C#® 2015/2013/2012/2010
	MR-MC200 series	Microsoft® Visual C++® 2015/2013/2012/2010/2008/2005 Microsoft® Visual C#® 2015/2013/2012/2010/2008/2005 Microsoft® Visual Basic® 2015/2013/2012/2010/2008/2005 Embarcadero® C++ Builder® 2010/2009/2007

Component list

| Item	Model	Specification			Applicable standard
Position Board (Note-1)	MR-MC341	Up to 64 axes			CE, UL, KC, EAC
	MR-MC210	Up to 20 axes			CE, UL, KC, EAC
	MR-MC211	Up to 32 axes			CE, UL, KC, EAC
	MR-MC220U3	Up to 20 axes 3U size front panel			CE, UL, KC, EAC
	MR-MC220U6	Up to 20 axes 6U size front panel			CE, UL, KC, EAC
	MR-MC240	Up to 20 axes			CE, UL, KC, EAC
	MR-MC241	Up to 32 axes			CE, UL, KC, EAC
Position Board utility 2	MRZJW3-MC2-UTL	• Test tool (for setup, debugging) • API library for PCI bus compatible Position Board • Device driver			—
SSCNET III cable (Note-2)	MR-J3BUS□M	• Position Board ⇔ Servo amplifier • Servo amplifier ⇔ Servo amplifier	Standard code for inside panel	0.15m (0.49ft.), 0.3m (0.98ft.), 0.5m (1.64ft.), 1m (3.28ft.), 3m (9.84ft)	—
	MR-J3BUS□M-A		Standard cable for outside panel	5m (16.40ft.), 10m (32.81ft.), 20m (65.62ft.)	—
	MR-J3BUS□M-B (Note-3)		Long distance cable	30m (98.43ft.), 40m (131.23ft.), 50m (164.04ft.)	—
USB cable	MR-J3USBCBL3M	3m (9.84ft.)			—
MR Configurator2	SW1DNC-MRC2-E	Servo amplifier MELSERVO-J4 series setting and adjustment			—

(Note-1): When using an external forced stop, prepare the forced stop input connector separately. (The forced stop input connector is included with MR-MC341 in the package.)
(Note-2): "□" indicates cable length. (015: 0.15m (0.49ft.), 03: 0.3m (0.98ft.), 05: 0.5m (1.64ft.), 1: 1m (3.28ft.), 3: 3m (9.84ft.), 5: 5m (16.40ft.), 10: 10m (32.81ft.), 20: 20m (65.62ft.), 30: 30m (98.43ft.), 40: 40m (131.23ft.), 50: 50m (164.04ft.))
(Note-3): For a long distance cable of up to 100m (328.08ft.) or an ultra-long bending life cable, contact Mitsubishi Electric System & Service Co., Ltd.
OVERSEAS SERVICE SECTION (Email:osb.webmaster@melsc.jp)

Exterior Dimensions

C Controller Interface Module
●Q173SCCF

98 (3.86)

115 (4.53)

23 (0.91)
27.4 (1.08)
4 (0.16)

[Unit: mm (inch)]

Position Board
●MR-MC341

129.15 (5.08)

93.02 (3.66)
105.77 (4.16)

[Unit: mm (inch)]
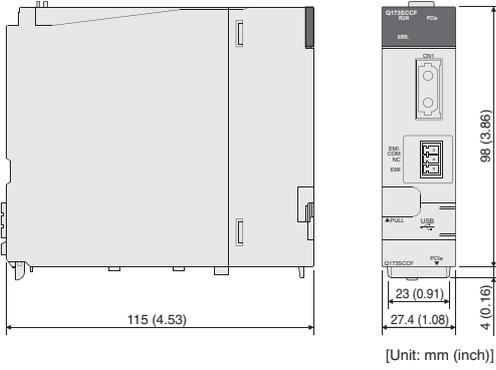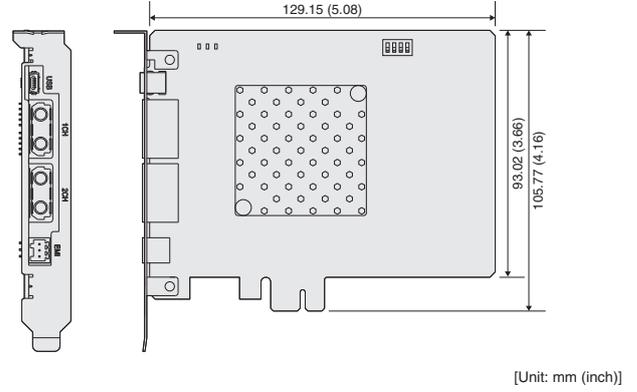
Position Board
●MR-MC240/MR-MC241
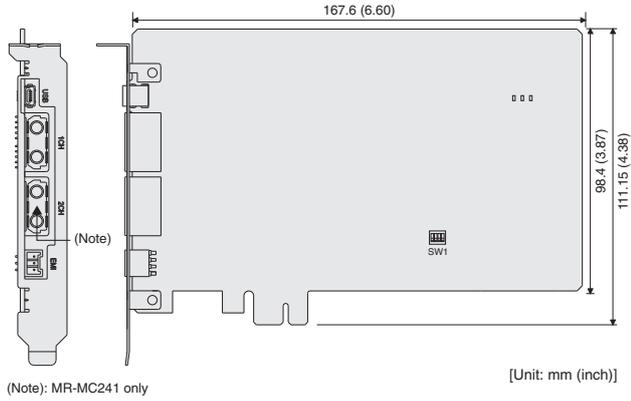
167.6 (6.60)

98.4 (3.87)
111.15 (4.38)

(Note)

SW1

(Note): MR-MC241 only

[Unit: mm (inch)]

●MR-MC210/MR-MC211

167.6 (6.60)

98.4 (3.87)
106.7 (4.20)

(Note)

SW1

(Note): MR-MC211 only

[Unit: mm (inch)]

●MR-MC220U3

35 (1.38)
160 (6.30)

128.7 (5.07)

100 (3.94)

SW1

[Unit: mm (inch)]

●MR-MC220U6

35 (1.38)
160 (6.30)

262.05 (10.32)

100 (3.94)

SW1

[Unit: mm (inch)]
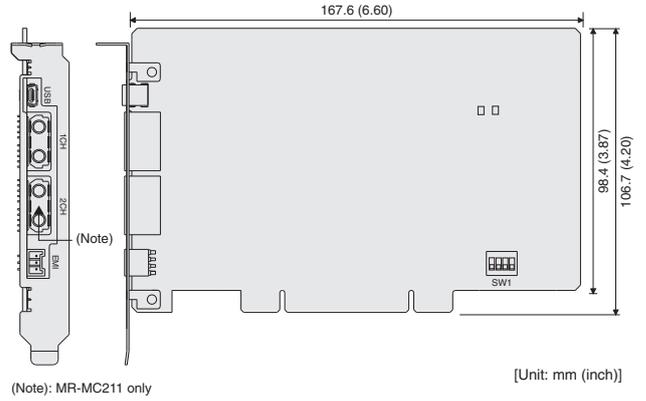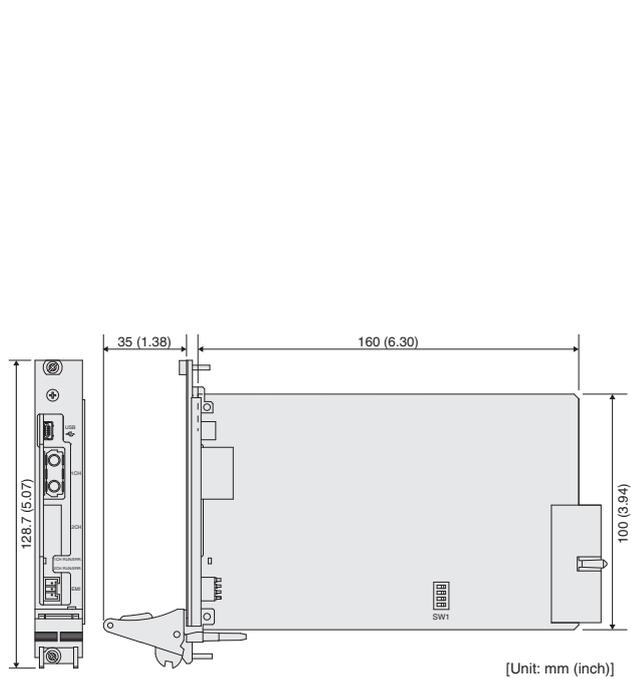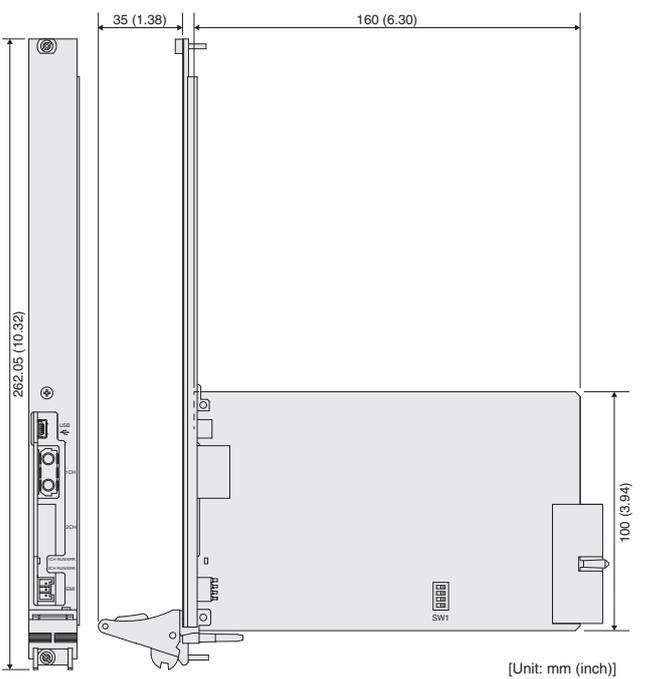
■ Partner Products

INtime®

Real-time motion control is realized by Windows® PC.

INtime is the real-time OS products which extend real-time performance for Windows® PC.

Real-time control is realizable only by installing in usual Windows® PC.

Since parallel operation is carried out with Windows®, both the Windows® side processings, such as HMI and log file save, and the machine control processings which needs real-time performance are able to be realized on one set of hardware.

Since applications are developed by Microsoft Visual Studio®, it is easy to introduce.

By introducing a dedicated position board, the motion positioning operation which utilizes SSCNET is realizable.

SSCNETⅢ/H
SERVO SYSTEM CONTROLLER NETWORK

Position Board

HMI Process

Logging Process

Windows®

Realtime Motion Control Application (C/C++)
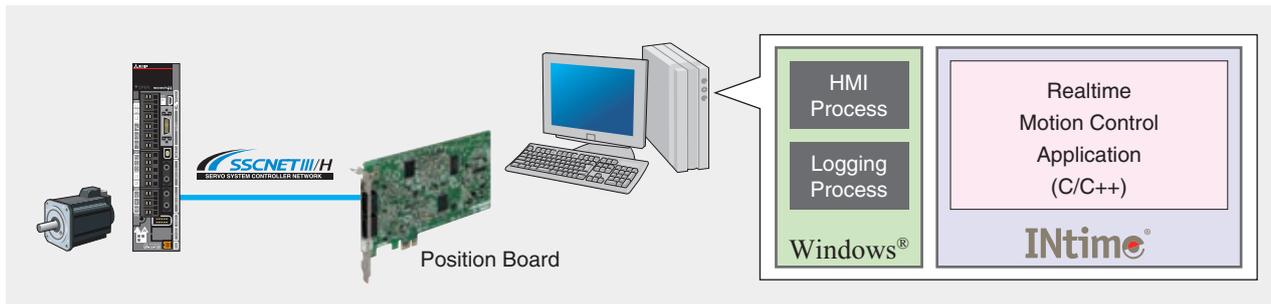
INtime®

(Note): Mitsubishi Electric has confirmed that the Position Board MR-MC200 series operate on the INtime 4.2/INtime 5.0/INtime 5.2, and MR-MC300 series on INtime6.3.
We also offer the API library/device driver for the Position Board control.
Contact your local Mitsubishi Electric office for details.

An inquiry of a product

Micronet Company **Micronet**
URL : http://www.mnc.co.jp/index_E.htm
MAIL : bcd@mnc.co.jp

RTX/RTX64 (Real-time Extensions)

Transform Windows® into a Real-Time Operating System

RTX (32-bit) and RTX64 (64-bit) real-time software are key components of the IntervalZero RTOS Platform that comprises x86 and x64 multicore multiprocessors, the Windows® operating system, and real-time Ethernet to outperform real-time hardware such as DSPs and radically reduce the development costs for systems that require determinism or hard real-time.

Windows Process

Windows Process Linked with RTM64   RtApi

Windows Subsystem

RTX64 Server Console

User Mode
Kernel Mode

RTX64 Process or RTDLL   Rtxtcpip   RTX64 Process or RTDLL

Windows Kernel and Device Drivers

RT-TCP/IP Stack   RTX64 Server

RTX64-RTSS (Real-time Subsystem)

Windows HAL   RTX64 HAL Extension

Windows Processor 0   Windows Processor X   x64 Hardware Platform   RTSS Processor X+1   RTSS Processor X+2   RTSS Processor 63

Features

■ Multicore SMP aware Real-time scheduler

■ RTX64 is supported on the 64-bit versions of Windows® 10 IoT including Windows® Embedded Standard 7 and Windows® Embedded Standard 8

■ Real-time Win32 like API

■ Direct access to hardware(I/O, Memory)

■ Direct memory addressing
Non-Page Pool - up to 128Gbyte on a 64-bit system

■ Single integrated development environment
Visual Studio - C# managed code and C++ support

■ Provides a real-time network driver and Virtual Network driver

IntervalZero's customer-centered philosophy combined with more than three decades of embedded software innovation, and the proven value of our RTX hard real-time software, which transforms Windows® into a real-time operating system (RTOS), have enabled us to build a global customer base of market-leading OEMs and end users in Industrial Automation, Medical Systems, Digital Media, Test & Measurement, Military & Aerospace, and other industries.

(Note): Mitsubishi Electric has confirmed that MR-MC200 series Position Boards operate on the RTX2011/RTX64 2014 with Service Pack 2. We also offer the API library/device driver for the Position Board control.
Contact your local Mitsubishi Electric office for details.

An inquiry of a product

IntervalZero, Inc. **IntervalZero**
URL : http://www.intervalzero.com/

e-F@ctory creates "Smart Factories" through IoT-based Big Data utilization

e-F@ctory optimizes manufacturing overall by connecting all devices and equipment involved in development, manufacturing, logistics, etc., and then analyzing and utilizing the vast amount of data collected.
By taking full advantage of Mitsubishi Electric's technological capability that achieved development of FA devices, along with our connectivity technology which makes it possible to connect FA with IT, we will create next-generation manufacturing encompassing elements such as mass customization, preventive maintenance and traceability.
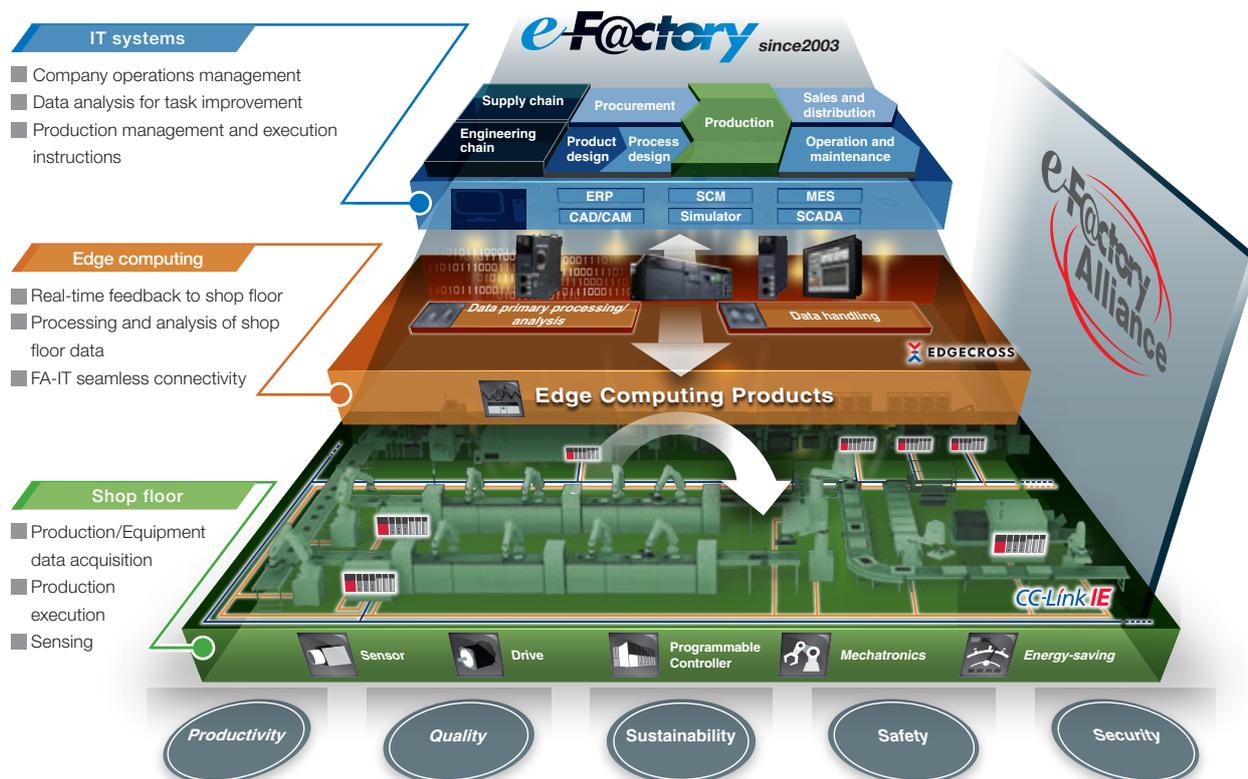
Powerful Alliances with Over 450 Partner Companies*

e-F@ctory Alliance

In order to propose optimal solutions to our customers, e-F@ctory works in collaboration with many partner manufacturers. Through powerful alliances between Mitsubishi Electric, who boasts a broad-ranging product appeal in the FA domain, and partners that participate in the FA partnership program (e-F@ctory Alliance) promoted by Mitsubishi Electric, we will achieve new business creation and new monozukuri never before imaginable.
*As of October 2017

Extensive global support coverage providing expert help whenever needed

■ Global FA centers

EMEA

Europe FA Center
MITSUBISHI ELECTRIC EUROPE B.V. Polish Branch
Tel: +48-12-347-65-00

Germany FA Center
MITSUBISHI ELECTRIC EUROPE B.V. German Branch
Tel: +49-2102-486-0

UK FA Center
MITSUBISHI ELECTRIC EUROPE B.V. UK Branch
Tel: +44-1707-27-8780

Czech Republic FA Center
MITSUBISHI ELECTRIC EUROPE B.V. Czech Branch
Tel: +420-255 719 200

Italy FA Center
MITSUBISHI ELECTRIC EUROPE B.V. Italian Branch
Tel: +39-039-60531

Russia FA Center
MITSUBISHI ELECTRIC (RUSSIA) LLC
St. Petersburg Branch
Tel: +7-812-633-3497

Turkey FA Center
MITSUBISHI ELECTRIC TURKEY A.S. Umraniye Branch
Tel: +90-216-526-3990

Asia-Pacific

China

Beijing FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.
Beijing FA Center
Tel: +86-10-6518-8830

Guangzhou FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.
Guangzhou FA Center
Tel: +86-20-8923-6730

Shanghai FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.
Shanghai FA Center
Tel: +86-21-2322-3030

Tianjin FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.
Tianjin FA Center
Tel: +86-22-2813-1015

Taiwan

Taipei FA Center
SETSUYO ENTERPRISE CO., LTD.
Tel: +886-2-2299-9917

Korea

Korea FA Center
MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD.
Tel: +82-2-3660-9630

Thailand

Thailand FA Center
MITSUBISHI ELECTRIC FACTORY AUTOMATION
(THAILAND) CO., LTD.
Tel: +66-2682-6522~31

ASEAN

ASEAN FA Center
MITSUBISHI ELECTRIC ASIA PTE. LTD.
Tel: +65-6470-2475

Indonesia

Indonesia FA Center
PT. MITSUBISHI ELECTRIC INDONESIA
Cikarang Office
Tel: +62-21-2961-7797

Vietnam

Hanoi FA Center
MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED
Hanoi Branch Office
Tel: +84-4-3937-8075

Ho Chi Minh FA Center
MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED
Tel: +84-8-3910-5945

India

India Ahmedabad FA Center
MITSUBISHI ELECTRIC INDIA PVT. LTD.
Ahmedabad Branch
Tel: +91-7965120063

India Bangalore FA Center
MITSUBISHI ELECTRIC INDIA PVT. LTD.
Bangalore Branch
Tel: +91-80-4020-1600

India Chennai FA Center
MITSUBISHI ELECTRIC INDIA PVT. LTD.
Chennai Branch
Tel: +91-4445548772

India Gurgaon FA Center
MITSUBISHI ELECTRIC INDIA PVT. LTD.
Gurgaon Head Office
Tel: +91-124-463-0300

India Pune FA Center
MITSUBISHI ELECTRIC INDIA PVT. LTD.
Pune Branch
Tel: +91-20-2710-2000

Americas

USA

North America FA Center
MITSUBISHI ELECTRIC AUTOMATION, INC.
Tel: +1-847-478-2100

Mexico

Mexico City FA Center
MITSUBISHI ELECTRIC AUTOMATION, INC.
Mexico Branch
Tel: +52-55-3067-7511

Mexico FA Center
MITSUBISHI ELECTRIC AUTOMATION, INC.
Queretaro Office
Tel: +52-442-153-6014

Mexico Monterrey FA Center
MITSUBISHI ELECTRIC AUTOMATION, INC.
Monterrey Office
Tel: +52-55-3067-7521

Brazil

Brazil FA Center
MITSUBISHI ELECTRIC DO BRASIL COMERCIO E
SERVICOS LTDA.
Tel: +55-11-4689-3000

MITSUBISHI ELECTRIC CORPORATION
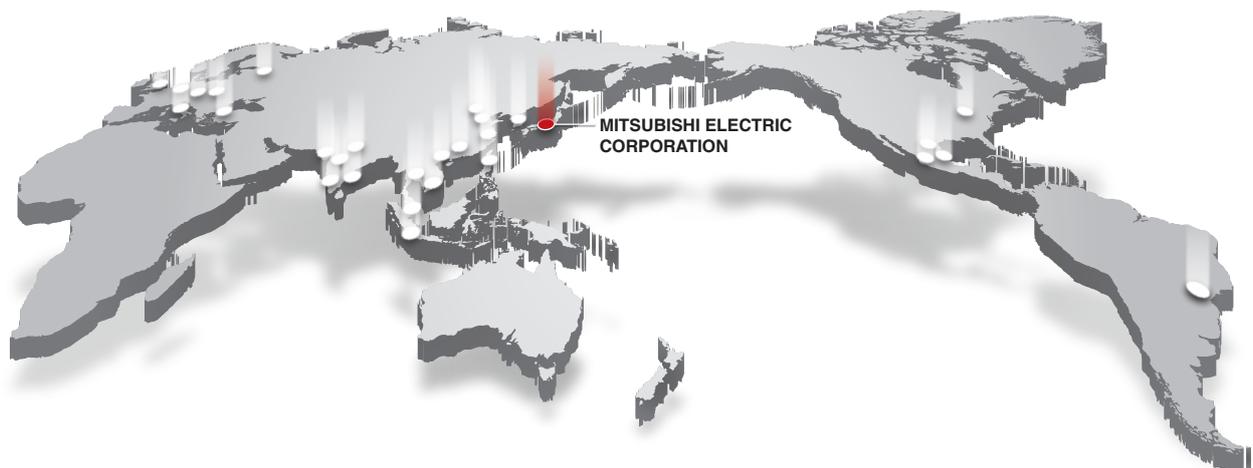
Conformity with Global Standards and Regulations

Mitsubishi Electric servo system conforms to global standards.

●Our servo system products are not subject to China Compulsory Certification (CCC).

●Refer to relevant manuals and "EMC Installation Guidelines" when your system needs to meet the EMC directive.

●Refer to "MELSERVO-J4 Series Catalog" for details of MR-J4 series conformity with global standards and regulations.

●For corresponding standards and models, contact your local sales office.

Precautions before use

This publication explains the typical features and functions of the products herein and does not provide restrictions or other information related to usage and module combinations. Before using the products, always read the product user manuals. Mitsubishi Electric will not be held liable for damage caused by factors found not to be the cause of Mitsubishi Electric; opportunity loss or lost profits caused by faults in Mitsubishi Electric products; damage, secondary damage, or accident compensation, whether foreseeable or not, caused by special factors; damage to products other than Mitsubishi Electric products; or any other duties.

⚠ For safe use

• To use the products given in this publication properly, always read the relevant manuals before beginning operation.
• The products have been manufactured as general-purpose parts for general industries, and are not designed or manufactured to be incorporated in a device or system used in purposes related to human life.
• Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine or passenger-carrying vehicles, consult with Mitsubishi Electric.
• The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

MEMO

MEMO

MEMO

Warranty

1. Warranty period and coverage

We will repair any failure or defect (hereinafter referred to as "failure") in our FA equipment (hereinafter referred to as the "Product") arisen during warranty period at no charge due to causes for which we are responsible through the distributor from which you purchased the Product or our service provider. However, we will charge the actual cost of dispatching our engineer for an on-site repair work on request by customer in Japan or overseas countries. We are not responsible for any on-site readjustment and/or trial run that may be required after a defective unit is repaired or replaced.

[Term]

The term of warranty for Product is thirty six (36) months after your purchase or delivery of the Product to a place designated by you or forty two (42) months from the date of manufacture whichever comes first ("Warranty Period"). Warranty period for repaired Product cannot exceed beyond the original warranty period before any repair work.

[Limitations]

（1） You are requested to conduct an initial failure diagnosis by yourself, as a general rule.
It can also be carried out by us or our service company upon your request and the actual cost will be charged.
However, it will not be charged if we are responsible for the cause of the failure.

（2） This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions and instructions that are set forth in the instruction manual and user manual for the Product and the caution label affixed to the Product.

（3） Even during the term of warranty, the repair cost will be charged on you in the following cases;
  (i) a failure caused by your improper storing or handling, carelessness or negligence, etc., and a failure caused by your hardware or software problem
  (ii) a failure caused by any alteration, etc. to the Product made on your side without our approval
  (iii) a failure which may be regarded as avoidable, if your equipment in which the Product is incorporated is equipped with a safety device required by applicable laws and has any function or structure considered to be indispensable according to a common sense in the industry
  (iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced
  (v) any replacement of consumable parts (battery, fan, etc.)
  (vi) a failure caused by external factors such as inevitable accidents, including without limitation fire and abnormal fluctuation of voltage, and acts of God, including without limitation earthquake, lightning and natural disasters
  (vii) a failure generated by an unforeseeable cause with a scientific technology that was not available at the time of the shipment of the Product from our company
  (viii) any other failures which we are not responsible for or which you acknowledge we are not responsible for

2. Term of warranty after the stop of production

（1） We may accept the repair at charge for another seven (7) years after the production of the product is discontinued. The announcement of the stop of production for each model can be seen in our Sales & Service, etc.

（2） Please note that the Product (including its spare parts) cannot be ordered after its stop of production.

3. Service in overseas

Our regional FA Center in overseas countries will accept the repair work of the Product; however, the terms and conditions of the repair work may differ depending on each FA Center. Please ask your local FA center for details.

4. Exclusion of responsibility for compensation against loss of opportunity, secondary loss, etc.

（1） Damages caused by any cause found not to be the responsibility of Mitsubishi.

（2） Loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products.

（3） Special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products.

（4） Replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Change of Product specifications

Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Application and use of the Product

（1） For the use of our Servo System Controller, its applications should be those that may not result in a serious damage even if any failure or malfunction occurs in Servo System Controller, and a backup or fail-safe function should operate on an external system to Servo System Controller when any failure or malfunction occurs.

（2） Our Servo System Controller is designed and manufactured as a general purpose product for use at general industries.
Therefore, applications substantially influential on the public interest for such as atomic power plants and other power plants of electric power companies, and also which require a special quality assurance system, including applications for railway companies and government or public offices are not recommended, and we assume no responsibility for any failure caused by these applications when used.
In addition, applications which may be substantially influential to human lives or properties for such as airlines, medical treatments, railway service, incineration and fuel systems, man-operated material handling equipment, entertainment machines, safety machines, etc. are not recommended, and we assume no responsibility for any failure caused by these applications when used.
We will review the acceptability of the abovementioned applications, if you agree not to require a specific quality for a specific application. Please contact us for consultation.

YOUR SOLUTION PARTNER
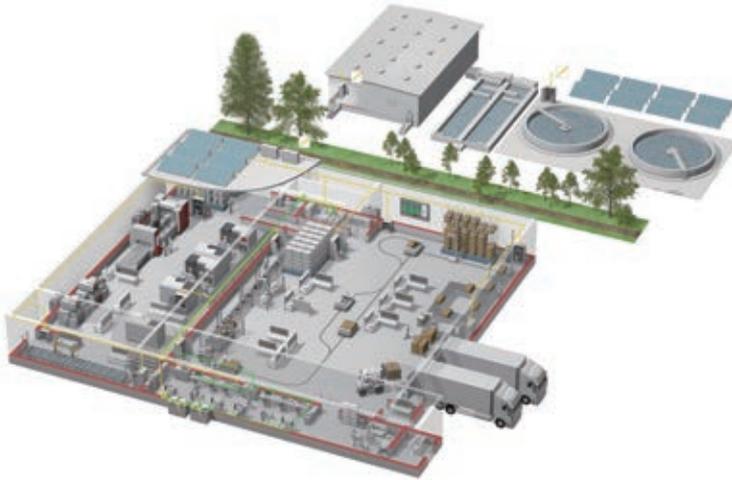
Mitsubishi Electric offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

Low voltage: MCCB, MCB, ACB

Medium voltage: VCB, VCC

Power monitoring, energy management

Compact and Modular Controllers

Inverters, Servos and Motors

Visualisation: HMIs

Numerical Control (NC)

Robots: SCARA, Articulated arm

Processing machines: EDM, Lasers, IDS

Transformers, Air conditioning, Photovoltaic systems

A NAME TO TRUST

Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation is active in space development, transportation, semi-conductors, energy systems, communications and information processing, audio visual equipment and home electronics, building and energy management and automation systems, and has 237 factories and laboratories worldwide in over 121 countries.

This is why you can rely on Mitsubishi Electric automation solution - because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over $40 billion), employing over 100,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.

* Not all products are available in all countries.

C Controller/Personal Computer Embedded Type Servo System Controllers

Country/Region	Sales office	
USA	Mitsubishi Electric Automation, Inc. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, U.S.A.	Tel : +1-847-478-2100
Mexico	Mitsubishi Electric Automation, Inc. Mexico Branch Boulevard Miguel de Cervantes Saavedra 301, Torre Norte Piso 5, Ampliacion Granada, Miguel Hidalgo, Ciudad de Mexico, Mexico, C.P.11520	Tel : +52-55-3067-7512
Brazil	Mitsubishi Electric do Brasil Comercio e Servicos Ltda. Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brazil	Tel : +55-11-4689-3000
Germany	Mitsubishi Electric Europe B.V. German Branch Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany	Tel : +49-2102-486-0
UK	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, UK-Hatfield, Hertfordshire, AL10 8XB, U.K.	Tel : +44-1707-28-8780
Italy	Mitsubishi Electric Europe B.V. Italian Branch Centro Direzionale Colleoni - Palazzo Sirio, Viale Colleoni 7, 20864 Agrate Brianza (MB), Italy	Tel : +39-039-60531
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi, 76-80-Apdo. 420, E-08190 Sant Cugat del Valles (Barcelona), Spain	Tel : +34-935-65-3131
France	Mitsubishi Electric Europe B.V. French Branch 25, Boulevard des Bouvets, 92741 Nanterre Cedex, France	Tel : +33-1-55-68-55-68
Czech Republic	Mitsubishi Electric Europe B.V. Czech Branch, Prague Office Pekarska 621/7, 155 00 Praha 5, Czech Republic	Tel : +420-255-719-200
Poland	Mitsubishi Electric Europe B.V. Polish Branch ul. Krakowska 50, 32-083 Balice, Poland	Tel : +48-12-347-65-00
Russia	Mitsubishi Electric (Russia) LLC St. Petersburg Branch Piskarevsky pr. 2, bld 2, lit "Sch", BC "Benua", office 720; 195027 St. Petersburg, Russia	Tel : +7-812-633-3497
Sweden	Mitsubishi Electric Europe B.V. (Scandinavia) Hedvig Mollersgata 6, 223 55 Lund, Sweden	Tel : +46-8-625-10-00
Turkey	Mitsubishi Electric Turkey A.S. Umraniye Branch Serifali Mahallesi Nutuk Sokak No:5, TR-34775 Umraniye / Istanbul, Turkey	Tel : +90-216-526-3990
UAE	Mitsubishi Electric Europe B.V. Dubai Branch Dubai Silicon Oasis, P.O.BOX 341241, Dubai, U.A.E.	Tel : +971-4-3724716
South Africa	Adroit Technologies 20 Waterford Office Park, 189 Witkoppen Road, Fourways, South Africa	Tel : +27-11-658-8100
China	Mitsubishi Electric Automation (China) Ltd. Mitsubishi Electric Automation Center, No.1386 Hongqiao Road, Shanghai, China	Tel : +86-21-2322-3030
Taiwan	SETSUYO ENTERPRISE CO., LTD. 6F, No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan	Tel : +886-2-2299-2499
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 7F to 9F, Gangseo Hangang Xi-tower A, 401, Yangcheon-ro, Gangseo-Gu, Seoul 07528, Korea	Tel : +82-2-3660-9529
Singapore	Mitsubishi Electric Asia Pte. Ltd. 307 Alexandra Road, Mitsubishi Electric Building, Singapore 159943	Tel : +65-6473-2308
Thailand	Mitsubishi Electric Factory Automation (Thailand) Co., Ltd. 12th Floor, SV.City Building, Office Tower 1, No. 896/19 and 20 Rama 3 Road, Kwaeng Bangpongpang, Khet Yannawa, Bangkok 10120, Thailand	Tel : +66-2682-6522 to 6531
Indonesia	PT. Mitsubishi Electric Indonesia Gedung Jaya 8th Floor, JL. MH. Thamrin No.12, Jakarta Pusat 10340, Indonesia	Tel : +62-21-3192-6461
Vietnam	Mitsubishi Electric Vietnam Company Limited Unit 01-04, 10th Floor, Vincom Center, 72 Le Thanh Ton Street, District 1, Ho Chi Minh City, Vietnam	Tel : +84-28-3910-5945
India	Mitsubishi Electric India Pvt. Ltd. Pune Branch Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune - 411026, Maharashtra, India	Tel : +91-20-2710-2000
Australia	Mitsubishi Electric Australia Pty. Ltd. 348 Victoria Road, P.O. Box 11, Rydalmere, N.S.W 2116, Australia	Tel : +61-2-9684-7777