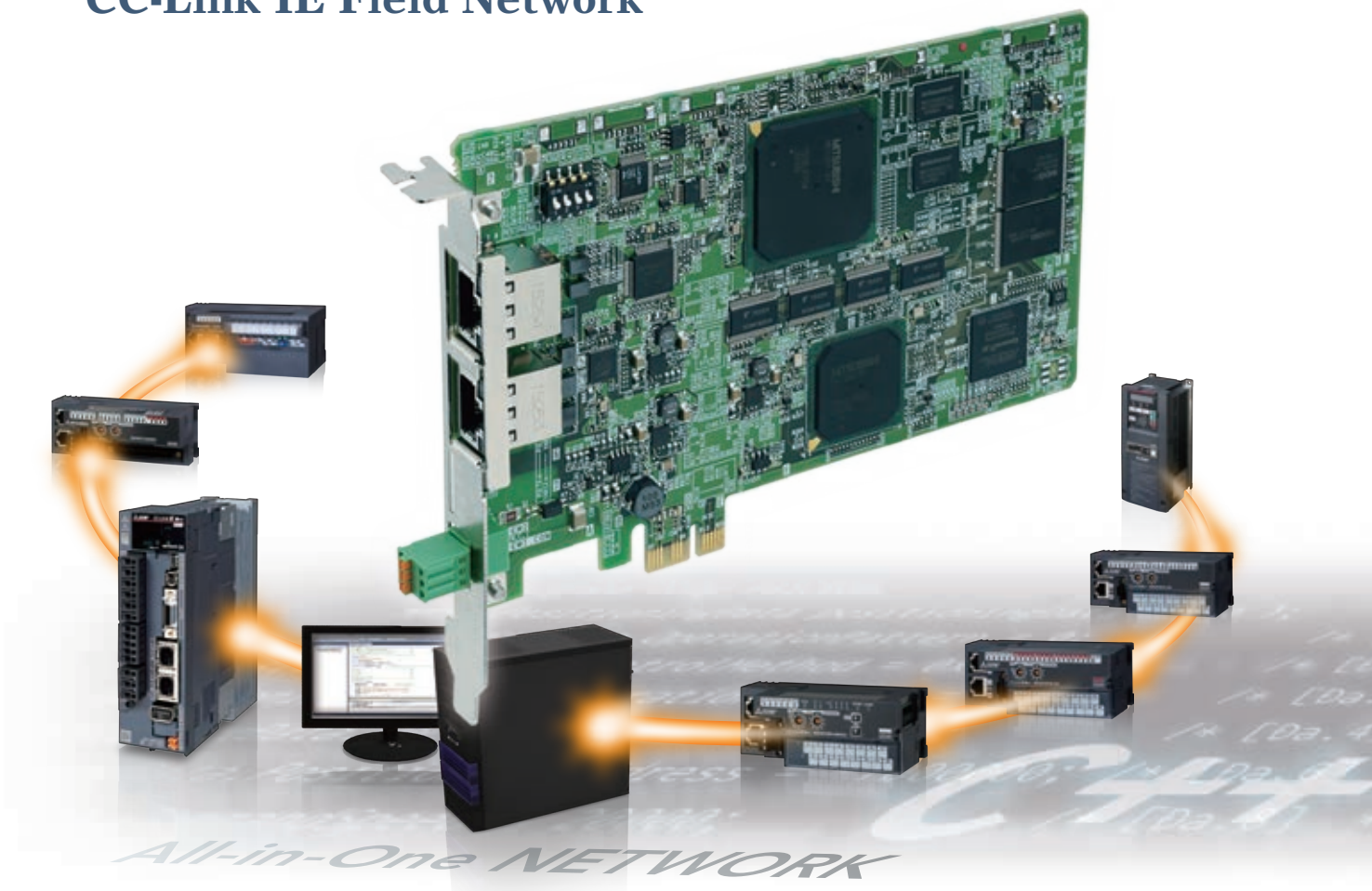
eco Changes for a greener tomorrow

MITSUBISHI ELECTRIC
Changes for the Better

Personal Computer Embedded Type Servo System Controller
CC-Link IE Simple Motion Board/
MELSOFT EM Software Development Kit

e-F@ctory

Motion Control on PC Environment with CC-Link IE Field Network



CC-Link IE
Ethernet-based integrated 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.

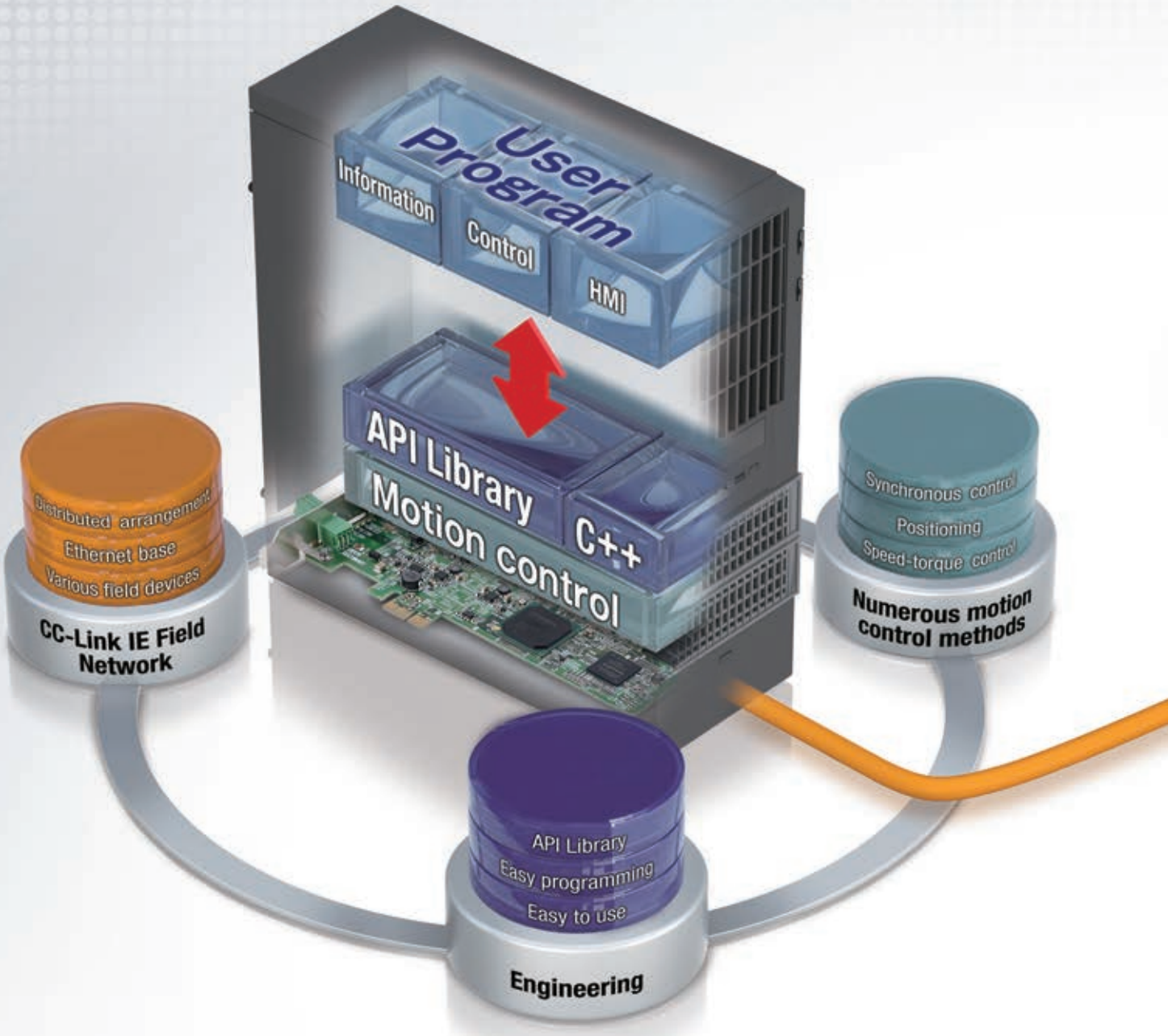
Information and Communication Systems
Commercial and consumer-centric equipment, products and systems.

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

OVERVIEW

Personal Computer Embedded Type Servo System Controller

CC-Link IE
Simple Motion Board



Numerous motion control functions on PC environment

Numerous motion control functions are available and can be applied to various machines by the Simple Motion board being embedded to an industrial personal computer (IPC) which performs customer data processing (recipe data and logging data) and image data processing.

Easy programming and increased efficiency in debugging with engineering software

Easy programming is possible with Visual C++® by adding an API library and a PCI Express® device driver to the IPC. Additionally, the engineering software achieves increased efficiency in debugging because the software enables settings and monitoring of servo amplifiers and various field devices.

Seamless integration of Mitsubishi Electric's servo system into one network

CC-Link IE Field Network is a single network which combines the versatility of Ethernet and highly accurate synchronous operation for motion control. With the single network, various field devices, such as servo amplifiers, I/O modules, and high-speed counter modules, are connected with no restriction.

CC-Link IE Field Network Simple Motion Board

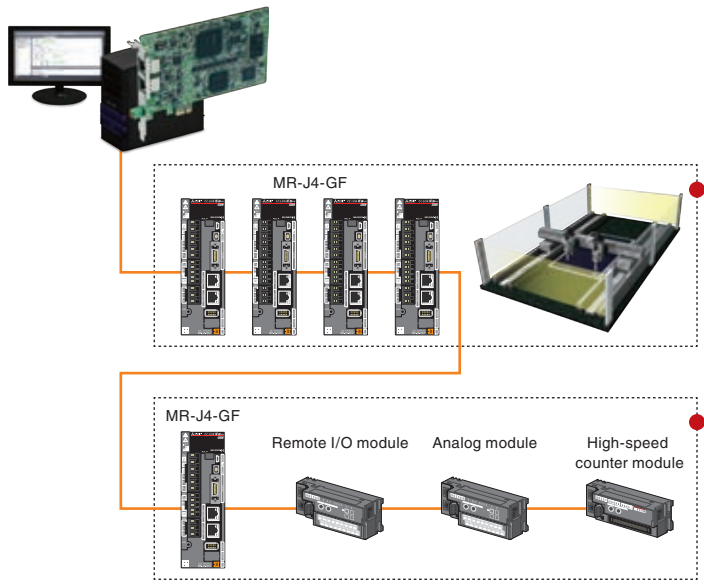
MR-EM340GF

Numerous motion control functions, such as positioning, synchronous control, and speed-torque control are performed by the Simple Motion board being embedded in a PC which supports PCI Express®.

- Various field devices, such as servo amplifiers, I/O modules, and high-speed counter modules are connected flexibly with the same network.
- The Simple Motion board functions as a master station of CC-Link IE Field Network.
- The interrupt function via PCI Express® enables an event-driven program to be created with Visual C++®.

Servo System Configuration

The Simple Motion board is equipped with not only functions for Motion control, but also a function as a master station of CC-Link IE Field Network. Up to 120 stations including servo amplifiers are connectable.

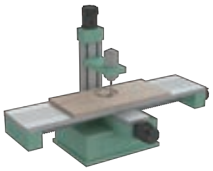


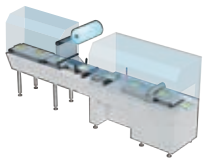
Motion mode:
This mode enables advanced motion control functions, such as positioning for multi-axis interpolation, synchronous control, and speed-torque control in combination with the Simple Motion board.
Maximum number of control axes: 16 axes

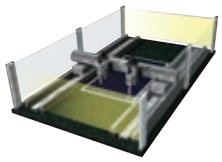
I/O mode:
With CC-Link IE Field Network, various field devices, such as servo amplifiers, I/O modules, and high-speed counter modules, can be connected with no restriction.
Maximum number of control stations: 120 stations
(including the number of servo amplifiers for motion mode)

Application Examples

Selecting the best suitable control methods and functions for your machine achieves an optimal solution.

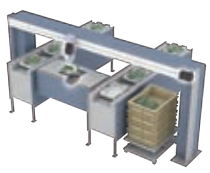
Woodworking machine

Positioning | Circular Interpolation | Helical Interpolation

Packaging machine

Advanced Sync. | Mark Detection

Liquid crystal apparatus

Advanced Sync.

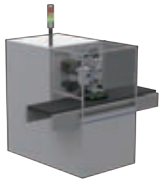
Cutting machine

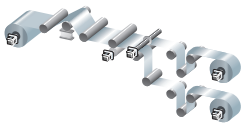
Cam Auto-Generation | Advanced Sync.

Inspection equipment

Shutter Output | Positioning

Flip chip bonder

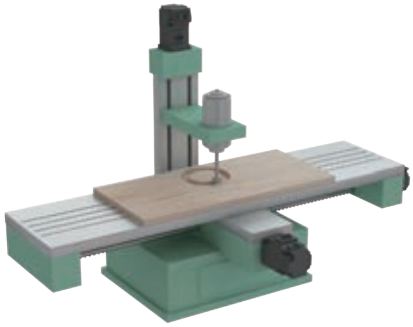
Positioning

Electronic component assembling machine

Positioning

Converting machine

Speed-Toque

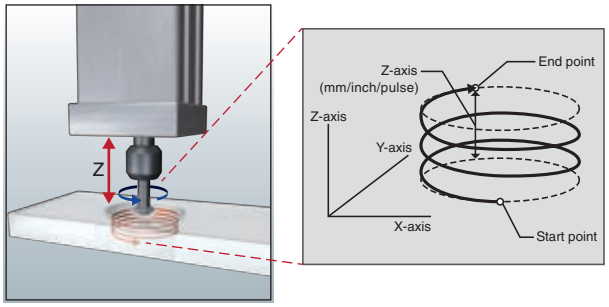
Positioning Control

- To respond to various application needs, the Simple Motion board offers various control functions, such as linear interpolation, 2-axis circular interpolation, fixed-pitch feed, and continuous trajectory control.
- Automatic operation can be executed easily by setting positioning addresses, speeds, and other setting items with the API library.
- Powerful sub-functions, such as M-code output, skip, speed change, and target position change, are available.



```
void StartPositioningSample( MMC_Axis* axis1 )
{
    unsigned long retCode;

    /* Starts positioning by positioning data No.1 */
    retCode = axis1->StartPositioning( 1 );
    if( retCode != MMC_OK ) { /* Error processing */ }

    /* Waits until completion of positioning control */
    retCode = axis1->WaitPositioningDone
    ( MMC_POSITIONING_DONE_INP, 10000 );
    if( retCode != MMC_OK ) { /* Error processing */ }
}
```

Helical interpolation

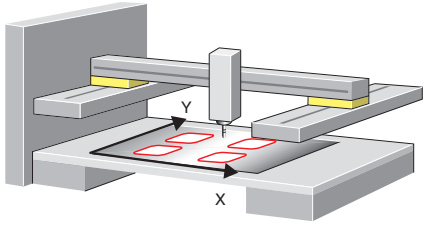


Helical interpolation draws a helical path by a linear interpolation axis (Z-axis) following to 2-axis circular interpolation control (X-axis and Y-axis). For applications that require the boring of deep, large holes, usually the helical interpolation of the three axes must be taken into consideration.

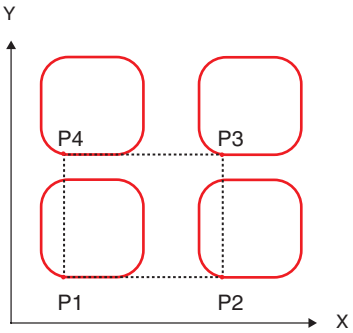
- Milling is done in a circle, with the X and Y axes synchronized to achieve the pre-set size.
- The depth of the hole is simultaneously controlled along the Z axis, ensuring minimal deviation in the cutting bit position.

Block-start

The block-start executes multiple sequential positioning data set as block start data by a single start trigger, and is used in control that follows the same repetitive path.

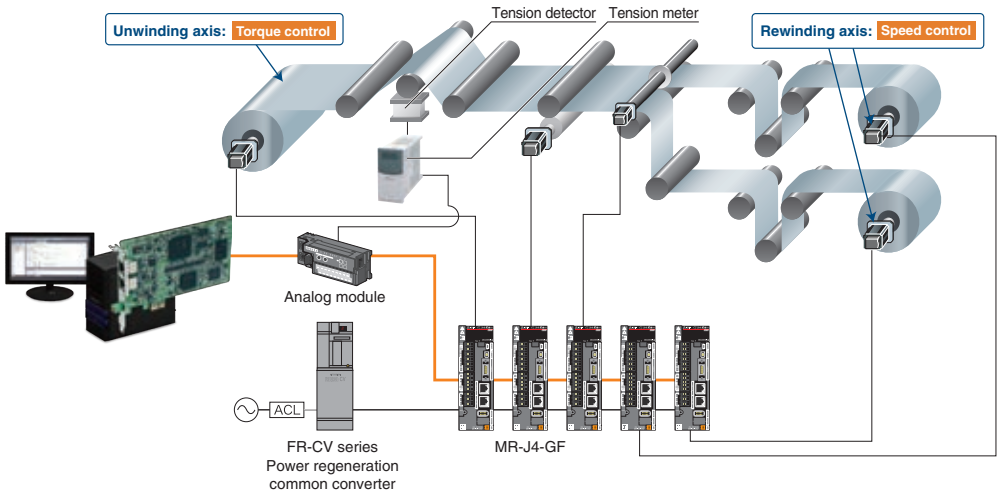


Positioning starts from “First point” in block start data to draw four squircles.



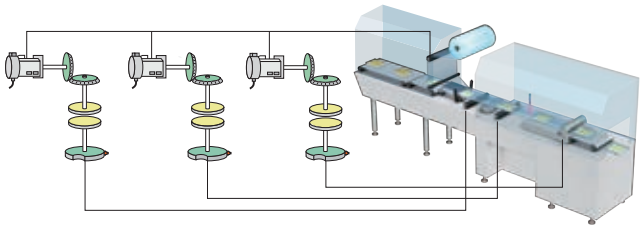
Speed-Torque Control

Speed control follows speed commands to keep the speed constant, and torque control follows torque commands to keep the torque constant.
The Simple Motion board can be used for the speed-torque control, such as unwinding and rewinding.
Positioning using absolute position coordinates can be smoothly performed even after switching back to position control because the current position is controlled during the speed-torque control.



Advanced Synchronous Control

Advanced synchronous control is software-based synchronous control as an alternative to mechanical control, such as gear, shaft, clutch, speed change gear, and cam. In addition, a cam is easily generated with cam auto-generation function.
The synchronous control can be started and ended for each axis, allowing the synchronous control axis and positioning control axis within the same program.



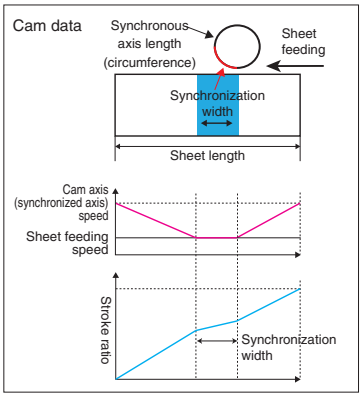
```
void SynchronizationSample
        ( MMC_Controller *controller,
        MMC_Axis *axis1, MMC_Axis *axis4 )
{
    unsigned long retCode;
    /* Starts synchronous control */
    retCode = axis1->StartSync();
    if( retCode != MMC_OK ) { /* Error processing */ }

    /* Starts JOG operation of virtual servo axis */
    retCode = axis4->StartJog( 20000 );
    if( retCode != MMC_OK ) { /* Error processing */ }
    .
    .
    .
    /* Stops synchronous control */
    axis1->StopSync( );
    if( retCode != MMC_OK ) { /* Error processing */ }
}
```

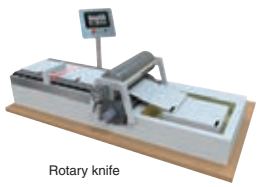
Cam auto-generation

Cam data for a rotary knife can be automatically generated by parameter settings of sheet length, synchronization width, cam resolution, etc.

User-created screen

Parameter settings, including items like sheet length, etc.



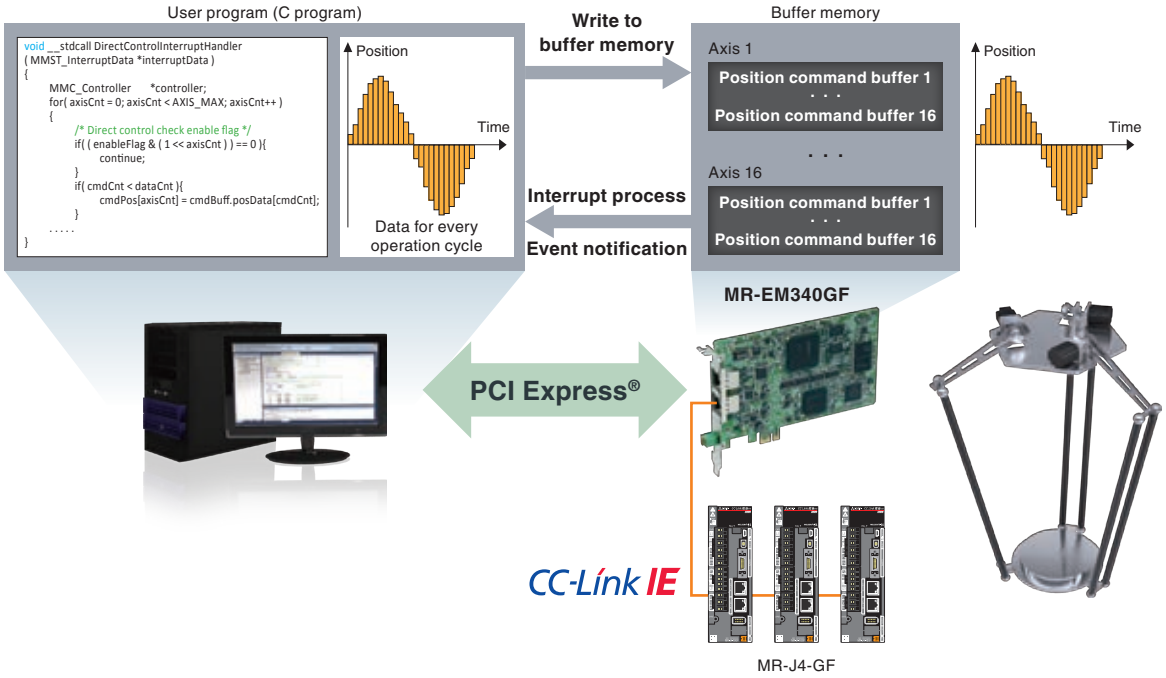


Rotary knife

Direct control

The direct control is a function that controls servo amplifiers directly by transmitting set command positions for each operation cycle from a user program to the servo amplifiers.

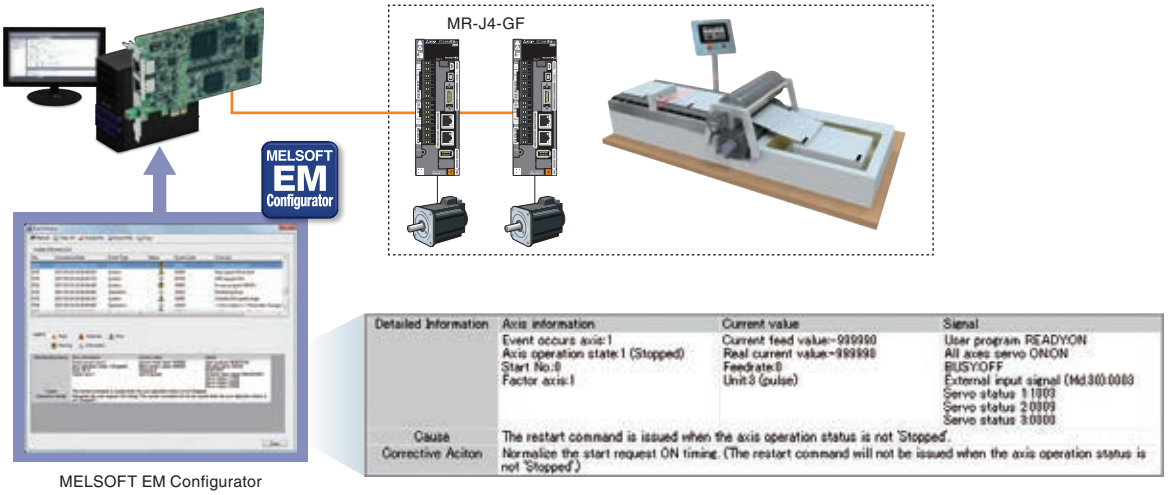
- The direct control can be combined with positioning control.
- Control can be switched between the direct control and the positioning control.
- A personal computer with a real-time operating system can perform fixed-cycle Motion control using interrupts at every operation cycle.
- Thanks to the position command buffers of up to 16 phases, even non-real-time operating system (Windows®) can perform at 0.5 ms (the fastest rate) cycle command operation; This enables further increase in accuracy in trajectory control.



(Note): Execute coordinate conversion of a parallel link robot with a user program.

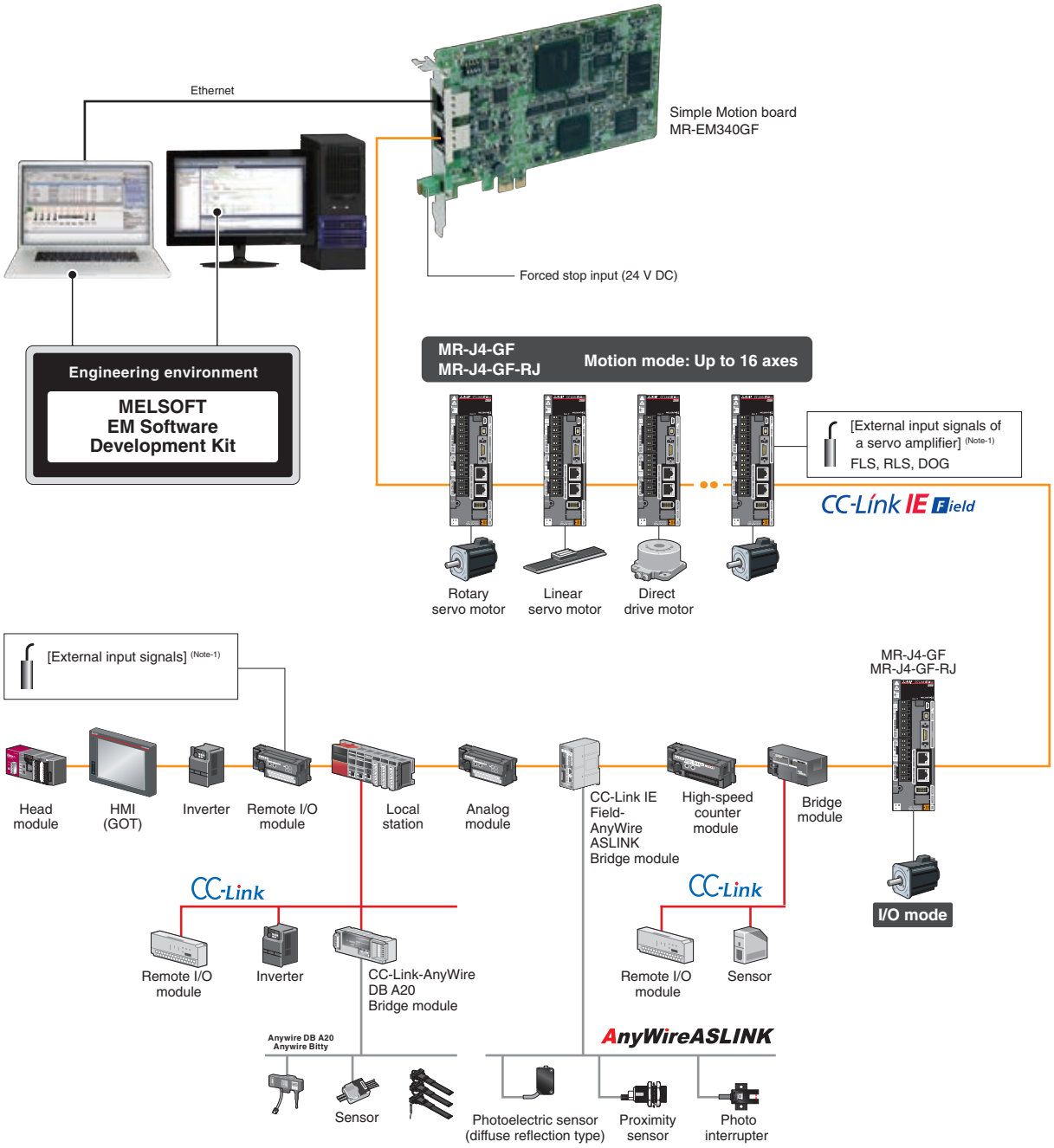
Event history

Events occurred on each slave device and servo amplifiers can be stored to the Simple Motion board. Information of "WRITE" operation to the program, error occurrence, etc. is listed chronologically, enabling an investigation of the cause of the error and a prompt restoration of servo amplifiers.



MELSOFT EM Configurator

System configuration



(Note-1): An input destination of external input signals (FLS, RLS, and DOG) is changed by parameters.

Slave station: Up to 120 control stations (including the number of motion mode compatible servo amplifiers)
(Note): A switching hub is required for star topology.

Software Development Kit

MELSOFT EM Software Development Kit

MELSOFT EM Software Development Kit is a development software package, supporting the engineering process from system design and programming to debug and maintenance for the Simple Motion board.

[Included software]
- ●MELSOFT EM Configurator
- ●MELSOFT MR Configurator2
- ●API library
- ●PCI Express® device driver

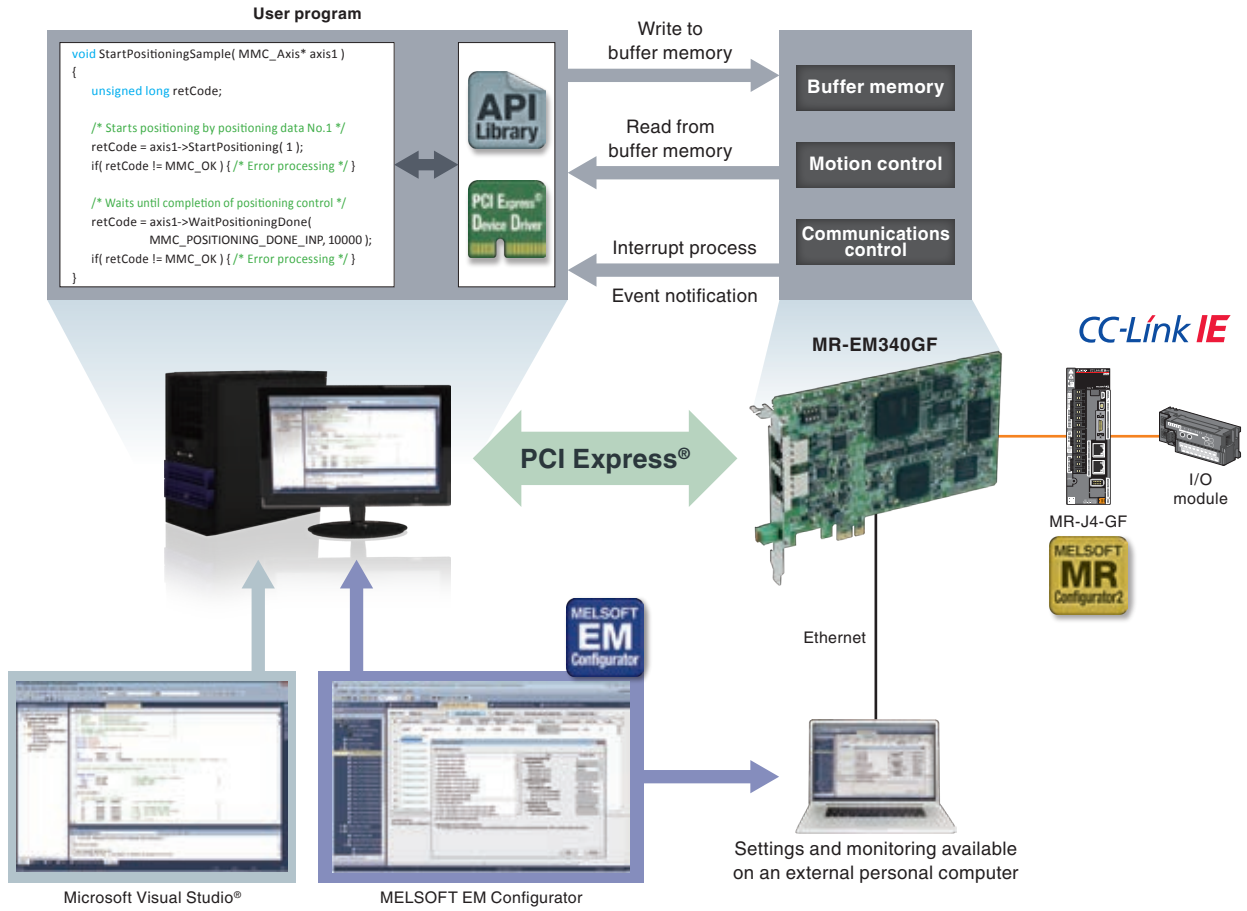
(Note): Contact your local sales office for the latest version of Software Development Kit.

Development and Debugging Environments

A user program is created by adding the API library (for motion control) to a project of Microsoft Visual Studio®.

●INtime® and RTX (real-time operating system) are supported.

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



(Note): OS and the development environment are not included.

MELSOFT EM Configurator
Every step in the engineering process from system design and programming to debug and maintenance, is supported by this software.

MELSOFT MR Configurator2
Primarily, tuning, monitoring, and diagnosis are easily performed with this software by being connected to a servo amplifier.

API library
The API library is an add-on library which uses functions (method) and labels (member) of controller and axis classes, and enables easy programming with Visual C++®.

PCI Express® device driver
The PCI Express® device driver is software for a user program to gain access to the Simple Motion board via PCI Express®.

MELSOFT EM Configurator (Setting Tool for Simple Motion Board)

Easy system design

No need of manuals in system and parameter settings

- MELSOFT EM Configurator includes everything needed from system configuration to servo parameter settings.
- One-point help enables easy settings without manuals.

[CC-Link IE configuration]

[Electronic gear setting]

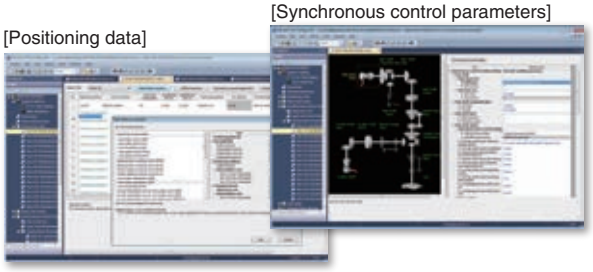
Easy motion control

Increased usability in synchronous control and positioning settings

- Numerous sub-functions help you create positioning data easily.
- Synchronous control is performed easily simply by parameter settings.
- Creation of a rough cam waveform on a graph via drag & drop, or direct numerical value input to the graph enables easy creation of cam data.

[Positioning data]

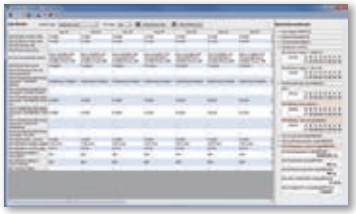
[Synchronous control parameters]



System Design → Programming → Debug → Maintenance

Easy startup

[Axis monitor]



[Test operation]

Increased efficiency in debugging and maintenance

- A customizable axis monitor increases efficiency in startup.
- An operation check of servo motors is possible by test operation before creating a program.

Easy maintenance

[Digital oscilloscope]

[Network diagnostics]

A wide variety of diagnosis functions

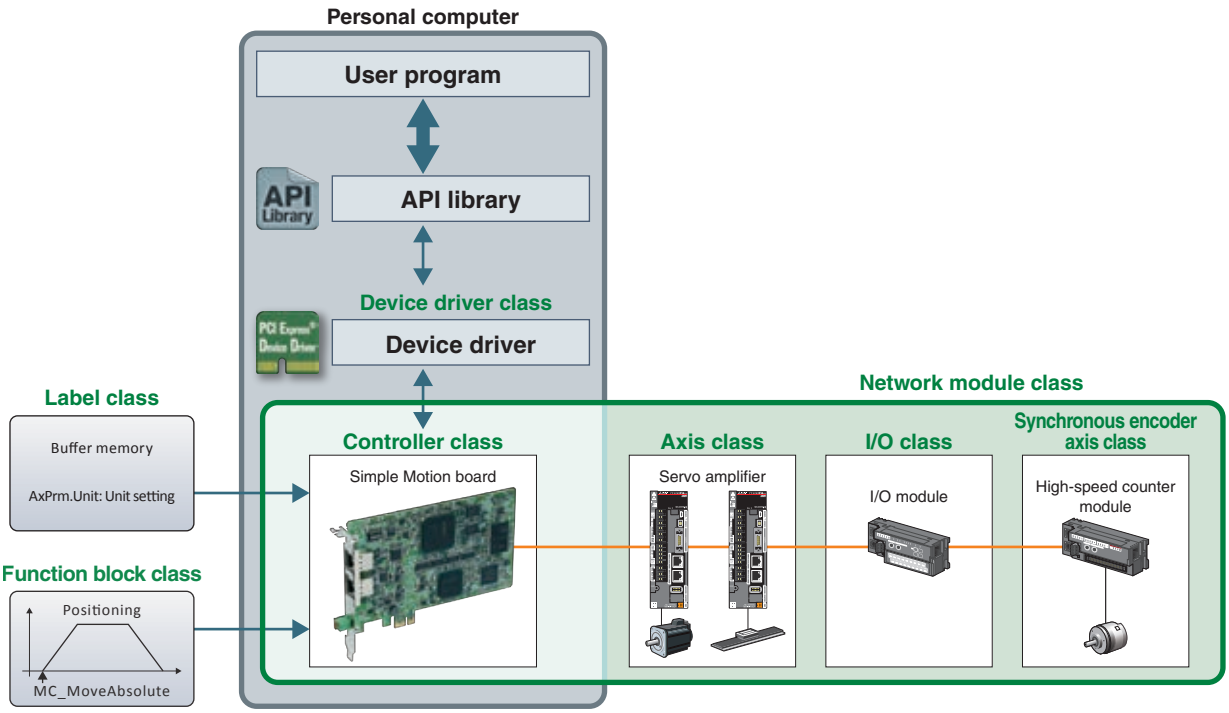
- Waveform display on a digital oscilloscope supports troubleshooting.
- Network errors are displayed with Network diagnostics.

API library (C++ motion class library)

With the C++ motion class library, a program is created using functions (method) and labels (member) of controller and axis classes, and other classes.

- The class library creates the program with high readability.
- Coding time is reduced with Microsoft Visual Studio® IntelliSense®.
- Compatibility with event-driven programming is improved by specifying any bit data as a condition of interruption.
- The library with the same interface specifications as PLCopen® Motion Control FB, is available and suitable for fixed-cycle programming.

[Conception diagram of class types in C++ motion class library]

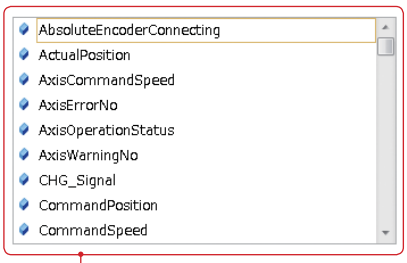


Programming using motion functions and axis labels

```
void ObjectSample( MMC_DeviceDriver *pciDev,
MMC_Controller* controller, MMC_Axis* axis1 )
{
    long data;
    unsigned long retCode;
    /* Generates PCI Express® device driver class objects */
    retCode = MmfCreatePciDevice( boardID, &pciDev );

    /* Generates MMC_EM340GF class objects */
    retCode = MmfCreateEM340GF( pciDev,
    (MMC_EM340GF **)&controller );
    /* Gets axis class objects */
    retCode = controller->GetAxis( 1, &axis1 );

    /* Sets parameters for acceleration time constant=0 */
    axis1->AxPrm.AccelerationTime0 = 1000;
    /* Gets the actual current value */
    data = axis1->AxMntr.ActualPosition;

    /* Starts positioning by positioning data No.1 */
    retCode = axis1->StartPositioning( 1 );
    if( retCode != MMC_OK ) { /* Error processing */ }
}
```

Microsoft Visual Studio® IntelliSense®

```
void Sample( MMC_Axis* axis1 )
{
    axis1->AxMntr.
}
```



The complete word (IntelliSense) function lists the axis class motion functions (method) and axis labels (member) that can be used.

Event-driven programming (CPU resources are maximally used)

```
void InterruptSample( MMC_Axis* axis1 )
{
    unsigned long retCode;
    MMST_PositioningData positioningData = { 0 };

    /* Structures positioning data No.1 */
    positioningData.OperationPattern   = 0;              /* [Da.1] Operation pattern */
    positioningData.ControlMethod      = 0x01;           /* [Da.2] Control method    */
    positioningData.AccelerationTimeNo = 0;              /* [Da.3] Acceleration time No. */
    positioningData.DecelerationTimeNo = 0;              /* [Da.4] Deceleration time No. */
    positioningData.PositioningAddress = -1000000;       /* [Da.6] Positioning address */
    positioningData.CommandSpeed       = 20000;          /* [Da.8] Command speed  */

    /* Sets positioning data No.1 */
    axis1->SetPositioningData( 1, positioningData );

    /* Sets the interrupt event of positioning completion to a nonsignaled state */
    retCode = axis1->ResetPositioningDoneIntEvent( MMC_POSITIONING_DONE_INP );
    if( retCode != MMC_OK ) { /* Error processing */ }

    /* Starts positioning by positioning data No.1 */
    retCode = axis1->StartPositioning( 1 );
    if( retCode != MMC_OK ) { /* Error processing */ }

    /* Waits until completion of positioning control */
    retCode = axis1->WaitPositioningDoneIntEvent( MMC_POSITIONING_DONE_INP, 10000 );
    if( retCode != MMC_OK ) { /* Error processing */ }
}
```

Waits until the positioning complete interrupt event is in a signaled state.

Fixed-cycle programming (API library with the same interface specifications as PLCopen® Motion Control FB)

The library is effective when the ST language is replaced with the C language or when the program cannot be in a wait state inside methods to keep the constant scan time.

```
void FunctionBlockSample( MC_MoveAbsolute *fbMC_MoveAbsolute, AXIS_REF *axis, int phase )
{
    switch( phase )
    {
        case 0:

            /* Executes MC_MoveAbsolute */
            fbMC_MoveAbsolute->Axis = axis;              /* Axis information     */
            fbMC_MoveAbsolute->PositionDataNo = 1;       /* Positioning data No.  */
            fbMC_MoveAbsolute->Position = -1000.0;       /* Target position      */
            fbMC_MoveAbsolute->Velocity = 20.00;         /* Speed       */
            fbMC_MoveAbsolute->Acceleration = 1000;      /* Acceleration time     */
            fbMC_MoveAbsolute->Deceleration = 1000;      /* Deceleration time     */
            fbMC_MoveAbsolute->Direction = 1;            /* Rotation direction     */
            fbMC_MoveAbsolute->Execute = true;           /* Execute command  ON    */
            fbMC_MoveAbsolute->Update();                 /* Executes FB */
            if( fbMC_MoveAbsolute->Error ) { /* Error processing */ }
            if( fbMC_MoveAbsolute->Done )
            {
                phase = 1;
            }
                    break;

        case 1:
            fbMC_MoveAbsolute->Execute = false;    /* Execute command  OFF    */
            fbMC_MoveAbsolute->Update();           /* Executes FB */
            phase = 2;
            break;

        case 2:
            :
            :
            break;
    }
}
```

Programming to start positioning

Positioning is started simply by setting positioning data to the Simple Motion board with the API library.

User program

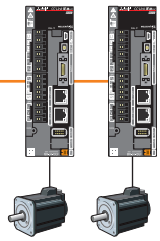
```
void InterruptSample( MMC_Axis* axis1 )
{
    unsigned long retCode;
    MMST_PositioningData positioningData = { 0 };

    /* Structures positioning data No.1 */
    positioningData.OperationPattern   = 0;          /* [Da.1] Operation pattern  */
    positioningData.ControlMethod      = 0x01;       /* [Da.2] Control method   */
    positioningData.AccelerationTimeNo = 0;          /* [Da.3] Acceleration time No.  */
    positioningData.DecelerationTimeNo = 0;          /* [Da.4] Deceleration time No.  */
    positioningData.PositioningAddress = -1000000;   /* [Da.6] Positioning address */
    positioningData.CommandSpeed       = 20000;      /* [Da.8] Command speed   */

    /* Sets positioning data No.1 */
    axis1->SetPositioningData( 1, positioningData );

    /* Sets the interrupt event of positioning completion to a nonsignaled state. */
    retCode = axis1->ResetPositioningDoneIntEvent( MMC_POSITIONING_DONE_INP );
    if( retCode != MMC_OK ) { /* Error processing */ }

    /* Starts positioning by positioning data No.1 */
    retCode = axis1->StartPositioning( 1 );
    if( retCode != MMC_OK ) { /* Error processing */ }

    /* Waits until completion of positioning control */
    retCode = axis1->WaitPositioningDoneIntEvent( MMC_POSITIONING_DONE_INP, 10000 );
    if( retCode != MMC_OK ) { /* Error processing */ }
}
```

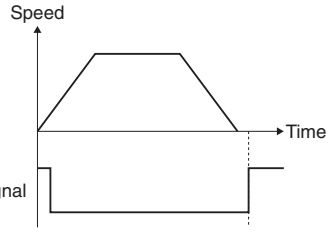
Simple Motion board

Axis 1 | Axis 2

No.	[Da.1] Operation pattern	[Da.2] Control method	[Da.3] Acceleration time No.	[Da.4] Deceleration time No.	[Da.5] Positioning address	[Da.8] Command speed	…
1	0	0x01	0:1000	0:1000	−1000000	20000	0
2	0	0x08	0:1000	0:1000	200000	10000	0

Servo amplifier





Main API library list

MMC_Controller Class

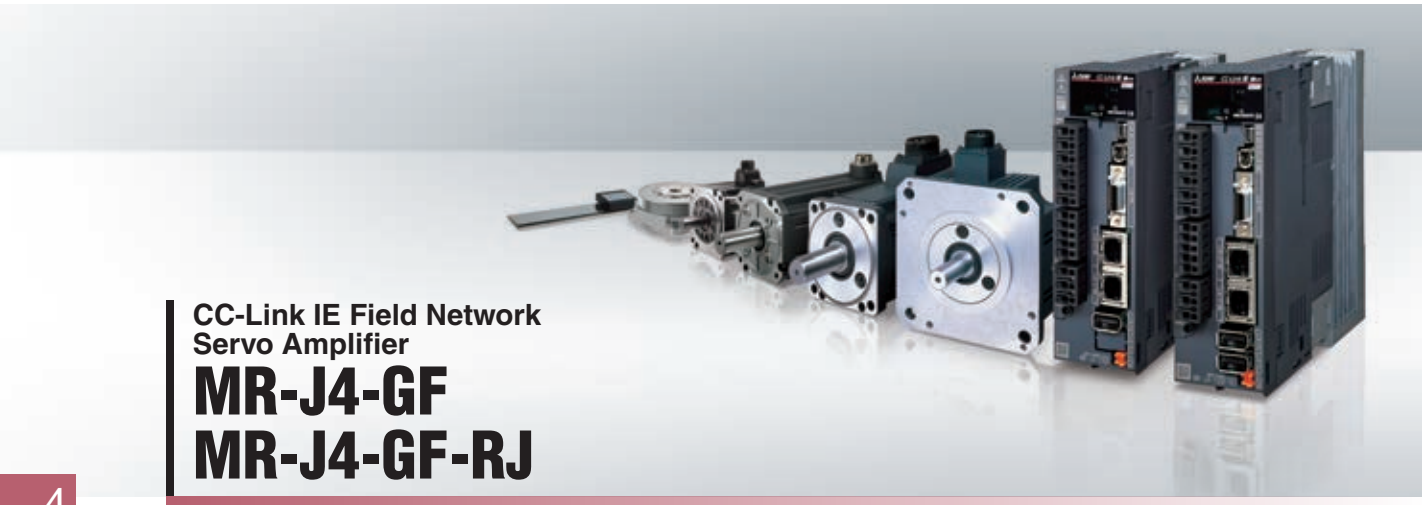
Get object method	
GetAxis	Gets the object of the axis class.
GetSlaveIo	Gets the object of the I/O class.
GetSyncEncoder	Gets the object of the synchronous encoder axis class.
System method	
ResetController	Executes remote RESET.
SetUserProgramReady	Sets the user program ready signal [Y0].
Interrupt method	
SetInterruptParameter	Sets the interrupt parameter.
EnableInterrupt	Enables the interrupt output.
DisableInterrupt	Disables the interrupt output.
Synchronous control method	
CalcCamCommandPosition	Calculates cam axis feed current value.
CalcCamCommandPositionPerCycle	Calculates cam axis current value per cycle.
MakeRotaryCutterCam	Auto-generates the cam (central reference) for rotary cutter.
MakeEasyStrokeRatioCam	Auto-generates the easy stroke ratio cam.
MakeAdvancedStrokeRatioCam	Auto-generates the advanced stroke ratio cam.

MMC_Axis Class

Positioning data method	
SetPositioningData	Sets the positioning data.
SetBlockStartData	Sets the block start data.
SetBlockConditionData	Sets the condition data used by block start.
GetPositioningData	Gets the positioning data.
GetBlockStartData	Gets the block start data.
GetBlockConditionData	Gets the condition data used by block start.
Operation method	
StartPositioning	Starts positioning control.
StartBlockPositioning	Starts advanced positioning control.
StopPositioning	Stops axis.
RestartPositioning	Restarts stopped axis.
WaitPositioningDone	Waits until completion of positioning control.
ResetPositioningDoneIntEvent	Sets the positioning complete interrupt event to a nonsignaled state.
SetPositioningDoneIntEvent	Sets the positioning complete interrupt event to a signaled state.
WaitPositioningDoneIntEvent	Waits until the positioning complete interrupt event is in a signaled state.
StartJog	Starts JOG operation.
StopJog	Stops JOG operation.
EnableMPG	Enables manual pulse generator operation.
DisableMPG	Disables manual pulse generator operation.
ChangeControlMode	Changes control mode.
Change method	
ChangeSpeed	Changes speed and acceleration/deceleration time.
ChangePosition	Changes target position and command speed.
Interrupt method	
SetInterruptParameter	Sets the interrupt parameter.
ResetIntEvent	Sets the interrupt event to a nonsignaled state.
SetIntEvent	Sets the interrupt event to a signaled state.
WaitIntEvent	Waits until the interrupt event is in a signaled state.
Synchronous control method	
StartSync	Starts synchronous control.
StopSync	Stops synchronous control.
ChangeSyncPosition	Changes current value during synchronous control.
MoveCamPosition	Moves cam axis during synchronous control.

MC_FunctionBlock Class

MC_Power	Changes the servo amplifier of the specified axis to an operable state.
MCv_Home	Executes home position return.
MC_Stop	Stops the specified axis.
MC_MoveAbsolute	Specifies the absolute target position of the specified axis and executes positioning.
MC_MoveRelative	Moves the specified distance from the current position.
MC_Reset	Cancels the errors and warnings of the specified axis.
MC_MoveAdditive	Adds the most recent relative position specified by the positioning command of the specified axis, and executes positioning.
MC_MoveVelocity	Executes speed control for the specified axis at the specified speed.
MC_TorqueControl	Executes torque control for the specified axis at the specified torque.
MC_SetPosition	Changes the current position (command position and feedback position) of the specified axis.
MC_SetOverride	Changes the target speed of the specified axis.



CC-Link IE Field Network Servo Amplifier

MR-J4-GF
MR-J4-GF-RJ

CC-Link IE Field Network servo amplifiers achieve an optimal solution and improve productivity in combination with the Simple Motion board.

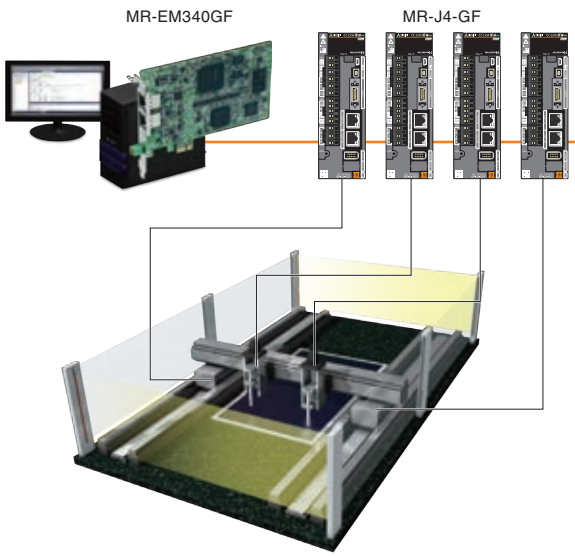
- **Industry-leading basic performance**
  Industry-leading levels of servo amplifier basic performance shorten a machine cycle time.
- **Advanced servo gain adjustment**
  The advanced vibration suppression control function is easily used for maximizing your machine performance.
- **A wide range of product series and capacities**
  From rotary to linear and direct drive motors, a wide range of servo motors are available, significantly improving your machine performance.
- **Preventive maintenance**
  The data inside a servo amplifier are read via the network, and used for preventive maintenance, such as machine diagnostics.

Control mode

Two types of modes are available according to your needs:

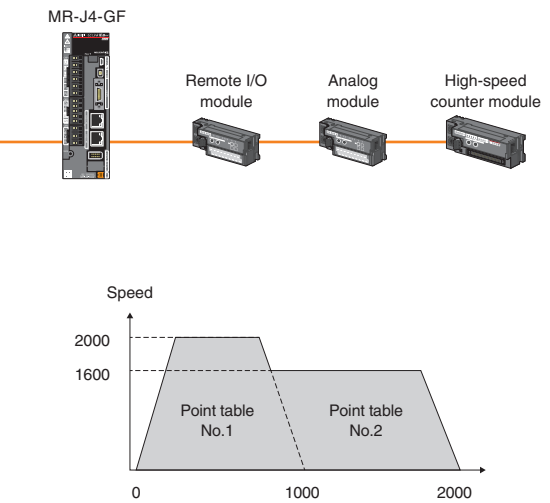
- Motion mode for a wide range of motion control functions, such as multiple-axis positioning, synchronous control, etc.
- I/O mode for single-axis positioning

Motion mode



This mode enables advanced motion control functions, such as multi-axis positioning, synchronous control, and speed-torque control in combination with the Simple Motion board.

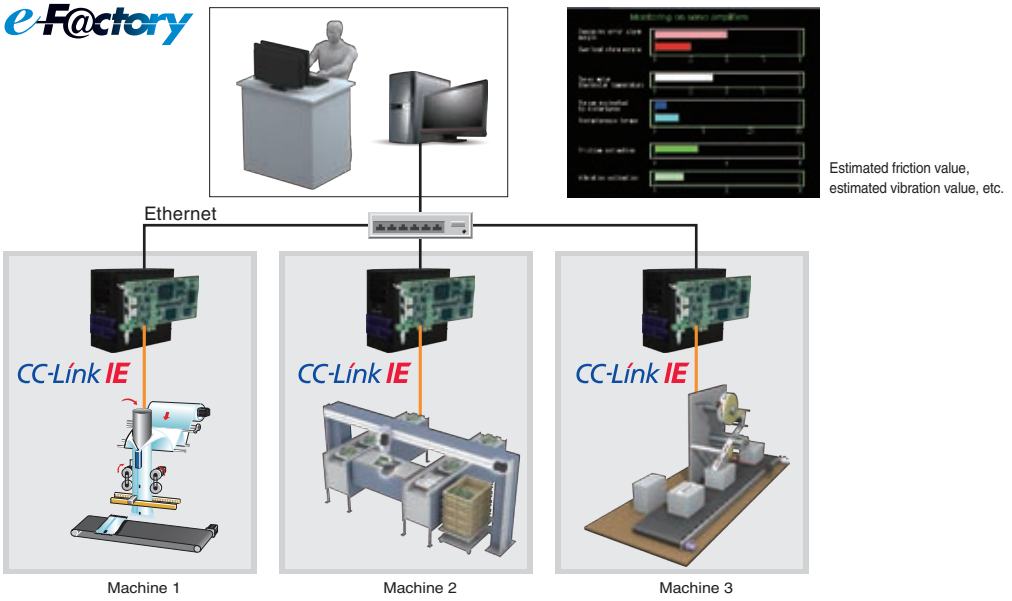
I/O mode



This mode easily drives a belt conveyor, a rotary table, a ball screw mechanism, etc. by using the built-in positioning function in a servo amplifier.

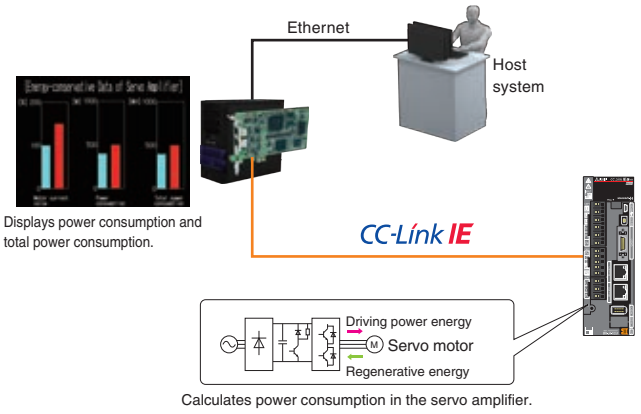
Direct Access to IT System

Data of servo amplifiers and servo motors for each machine can be collected via CC-Link IE Field Network.
The status of the entire product line can be visualized by batch management of the collected data.
A CC-Link IE Field Network servo system supports to build IoT (Note-1) for your machine.
(Note-1): IoT (Internet of Things)



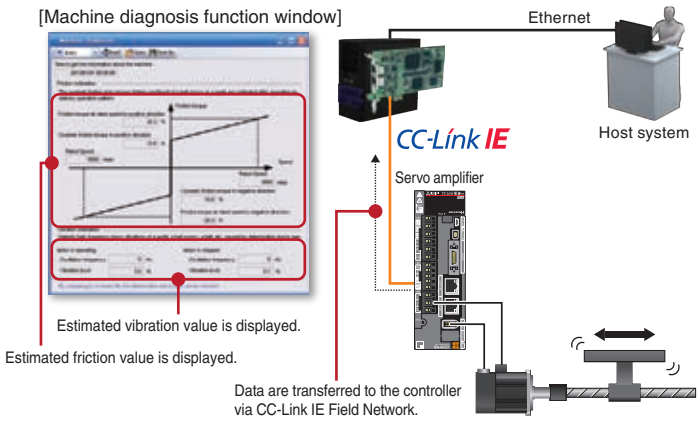
Monitoring of Servo Data

Servo data up to fifty monitoring items can be monitored and modified successively during operation. The operation status of servo amplifiers and servo motors acquired via CC-Link IE Field Network is transferred and displayed on the host system.



Preventive Maintenance

Machine diagnosis function detects changes in mechanical components (ball screw, guide, bearing, belt, etc.) by analyzing machine friction, load moment of inertia, unbalanced torque, and changes in vibration components using the data inside a servo amplifier, supporting timely maintenance of these components. In addition, the data are transferred to a host system and used to monitor the entire line.



Specifications

■Control specifications

Item			Specification MR-EM340GF
Maximum number of control axes (virtual servo amplifier axis included)			16 axes
Operation cycle (operation cycle settings)			0.5 ms, 1.0 ms, 2.0 ms, 4.0 ms
Interpolation function			Linear interpolation (up to 4 axes), Circular interpolation (2 axes), Helical interpolation (3 axes)
Control modes			Positioning, Trajectory control (linear, arc, and helical), Speed control, Speed-torque control
Acceleration/deceleration process			Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration
Compensation function			Backlash compensation, Electronic gear, Near pass function
Synchronous control			Synchronous encoder input, Cam, Phase compensation, Cam auto-generation
Control unit			mm, inch, degree, pulse
Number of positioning data			600 data/axis
Backup			Parameters, positioning data, and block start data can be saved on flash ROM (battery-less backup)
Home position return	Home position return method		Driver home position return method
	Fast home position return control		Provided
	Sub-function		Provided (the sub-function of a servo amplifier)
Positioning control	Linear control		Linear interpolation control (up to 4 axes) (Note-1) (vector speed, reference axis speed)
	Fixed-pitch feed		Fixed-pitch feed control
	2-axis circular interpolation		Auxiliary point-specified circular interpolation, Central point-specified circular interpolation
	Speed control		Speed control
	Speed-position switching		INC mode, ABS mode
	Position-speed switching		INC mode
	Current value change		Positioning data, Start No. for a current value changing
	NOP instruction		Provided
	JUMP instruction		Conditional JUMP, Unconditional JUMP
	LOOP, LEND		Provided
	High-level positioning		Block start, Condition start, Wait start, Simultaneous start, Repeated start
Manual control	JOG operation		Provided
	Inching operation		Provided
	Manual pulse generator		Possible to connect 1 module (incremental), Unit magnification (1 to 10000 times)
			Via link device
Expansion control	Speed-torque control		Speed control without positioning loops, Torque control
	Direct control		Provided
Absolute position system			Made compatible by setting a battery to a servo amplifier
Synchronous encoder interface			16CH
	Via buffer memory		Provided (incremental)
	Link device		Provided (incremental)
	Via servo amplifier		16CH
Functions that limit control	Speed limit		Speed limit value, JOG speed limit value
	Torque limit		Torque limit value same setting, torque limit value individual setting
	Forced stop	Internal interface	Provided
		Buffer memory	Provided
		Link device	Provided
	Software stroke limit		Movable range check with current feed value, movable range check with machine feed value
	Hardware stroke limit		Provided
Functions that change control details	Speed change		Provided
	Override		0 to 300 [%]
	Acceleration/deceleration time change		Provided
	Torque change		Provided
	Target position change		Target position address and speed are changeable
Other functions	M-code output		WITH mode/AFTER mode
	Step function		Deceleration unit step, Data No. unit step
	Skip function		Via buffer memory, Via external command signal
	Teaching function		Provided
Parameter initialization function			Provided
External input signal setting function	Via buffer memory		Provided
	Link device		Provided
	Via servo amplifier		Provided
Amplifier-less operation function (virtual servo amplifier function)			Provided
Mark detection function			Continuous Detection mode, Specified Number of Detections mode, Ring Buffer mode
	Mark detection signal		Up to 16 points (Note-3)
	Mark detection setting		16 settings
Digital oscilloscope function (Note-2)		Bit data	16CH
		Word data	16CH

(Note-1): 4-axis linear interpolation control is enabled only at the reference axis speed.
(Note-2): 8CH word data and 8CH bit data are displayed in real time.
(Note-3): The Mitsubishi Electric remote input module is required.

■Simple Motion board specifications

Item		Specification
		MR-EM340GF
Servo amplifier connection system		CC-Link IE Field Network
Maximum distance between stations [m(ft.)]		100 (328.08)
Peripheral I/F		Ethernet (100BASE)
Forced stop input signal (EMI)	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. 10 kΩ
	Response time	1 ms or less (OFF to ON, ON to OFF)
	Recommended wire size [mm^2]	0.08 to 0.5 (AWG 20 to AWG 28)
Number of Simple Motion boards for one computer		4
Bus specification		PCI Express® 2.0 × 1
	Size [mm(inch)]	Short sized version (167.65(6.60) × 111.15(4.38))
Power supply voltage		12 V DC/3.3 V DC
Current consumption [A]	12 V DC	0.4
	3.3 V DC	0.6
Mass [kg]		0.13

■Operation environment for MELSOFT EM Development Kit

Item		Description
Personal computer	Personal computer	Microsoft® Windows® supported personal computer
	OS	Microsoft® Windows® 10 (Pro, Enterprise) English version (64-bit/32-bit) Microsoft® Windows® 8.1 (Pro, Enterprise) English version (64-bit/32-bit) Microsoft® Windows® 7 (Professional, Ultimate, Enterprise) English version (64-bit/32-bit) [Service Pack 1]
	CPU	Desktop: Intel® Celeron® Processor 2.8 GHz or more recommended Laptop: Intel® Pentium® M Processor 1.7 GHz or more recommended
	Required memory	1 GB or more recommended (For 32-bit edition) 2 GB or more recommended (For 64-bit edition)
Available hard disk space		When installing the test tool: 3 GB or more of available hard disk space required When operating the test tool: 512 MB or more of available hard disk space required
Disk drive		DVD-ROM supported disk drive
Monitor		Resolution 1024 × 768 pixels or higher
Communications interface		PCI Express® BUS Ethernet port

■Development environment

Item	Description
OS for user program operation	The same operation environment as MELSOFT EM Software Development Kit
Software development environment	Microsoft® Visual C++® 2015/2013/2012/2010
API library	Class library (Only compiled into C++)

Specifications

■Performance specifications of CC-Link IE Field Network

Item			Specification
			MR-EM340GF
Maximum link points per network		RX	16k points (16384 points, 2 kbytes)
		RY	16k points (16384 points, 2 kbytes)
		RWr	8k points (8192 points, 16 kbytes)
		RWw	8k points (8192 points, 16 kbytes)
Maximum link points per station	Master station	RX	16k points (16384 points, 2 kbytes)
		RY	16k points (16384 points, 2 kbytes)
		RWr	8k points (8192 points, 16 kbytes)
		RWw	8k points (8192 points, 16 kbytes)
	Local station	RX	2k points (2048 points, 256 bytes)
		RY	2k points (2048 points, 256 bytes)
		RWr	256 points, 512 bytes
		RWw	256 points, 512 bytes
	Intelligent device station	RX	2k points (2048 points, 256 bytes)
		RY	2k points (2048 points, 256 bytes)
		RWr	256 points, 512 bytes
		RWw	256 points, 512 bytes
	Remote device station	RX	128 points, 16 bytes
		RY	128 points, 16 bytes
		RWr	64 points, 128 bytes
		RWw	64 points, 128 bytes
Ethernet	Communication speed		1 Gbps
	Connection cable		1000BASE-T Ethernet cable (Note-1): category 5e or higher (double shielded/STP) straight cable
	Maximum distance between stations [m(ft.)]		100(328.08) (conforms to ANSI/TIA/EIA-568-B (category 5e))
	Topology		Line type, star type, line/star mixed type
Overall cable distance	Line type [m(ft.)]		12000(39370.08) (When 1 master station and 120 slave stations are connected)
	Star type(Note-2)		Depends on system configuration
Maximum connectable stations per network			121 stations (1 master station. 120 slave stations)
Maximum number of networks			239

(Note-1): Use the cables recommended by CC-Link Partner Association for CC-Link IE Field Network.
CC-Link IE Controller Network cables are not compatible with CC-Link IE Field Network.
(Note-2): A switching hub is required for star topology.

Ethernet Cable Specifications

Item		Specification
Ethernet cable		Category 5e or higher (double shielded/STP) straight cable
	Standard	The cable must meet the following standards: • IEEE802.3 (1000BASE-T) • ANSI/TIA/EIA-568-B (category 5e)
	Connector	RJ-45 connector with shield

■Products on the Market

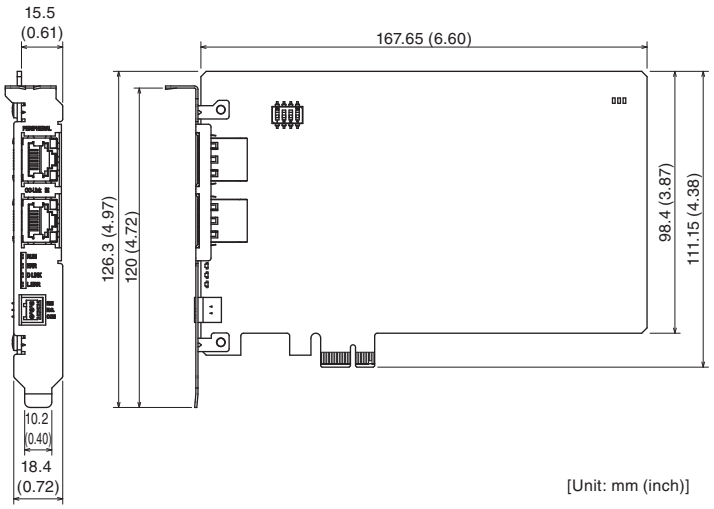
Ethernet Cable

Item		Model	Specification	Note
Ethernet cable	For indoor	SC-E5EW-S_M	_: cable length (100 m max., unit of 1 m)	Double shielded cable (category 5e)
	For indoor and moving part	SC-E5EW-S_M-MV	_: cable length (45 m max., unit of 1 m)	
	For indoor/outdoor	SC-E5EW-S_M-L	_: cable length (100 m max., unit of 1 m)	

For details, contact Mitsubishi Electric System & Service Co., Ltd.
[Sales office] FA PRODUCT DIVISION mail: osb.webmaster@melsc.jp

■Exterior dimensions

Simple Motion board MR-EM340GF



[Unit: mm (inch)]

■Product list

Name	Model	Description	Standard
Simple motion board	MR-EM340GF	Up to 16 axes	CE, UL, KC, EAC
MELSOFT EM Software Development Kit	SW1DND-EMSDK-B	● MELSOFT EM Configurator (setting tool) ● MELSOFT MR Configurator2 ● API library (C++ motion class library) ● PCI Express® device driver (including the driver for interrupt)	—

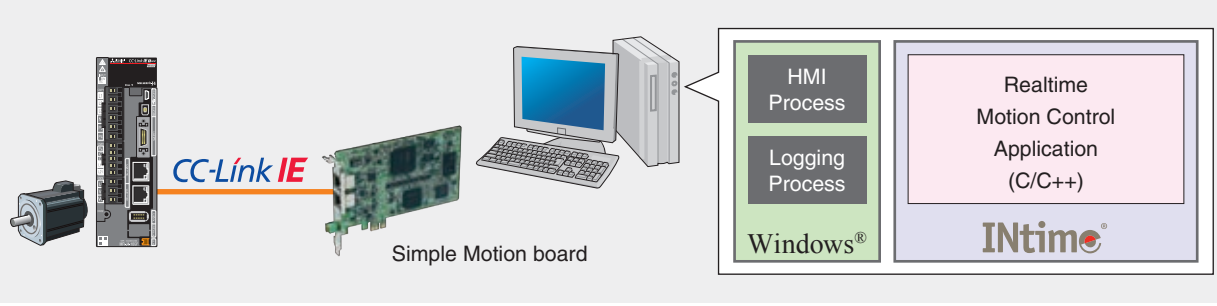
■Partner Products

INtime®

TenAsys Corporation

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 CC-Link IE Field Network is realizable.



(Note): Mitsubishi Electric has confirmed that the Simple Motion board operates on the INtime 5.2. We also offer the API library/device driver for the Simple Motion board control.
Contact your local Mitsubishi Electric office for more details.

An inquiry of a product

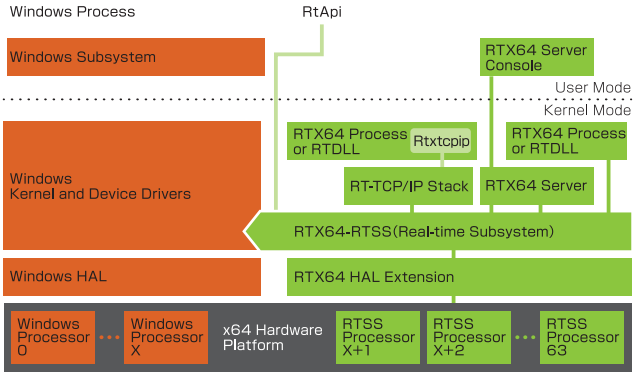
Micronet Company Micronet
URL : http://www.mnc.co.jp/index_E.htm
MAIL : bcd@mnc.co.jp

RTX/RTX64 (Real-time Extensions)

IntervalZero, Inc.

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.



Features

- Multicore SMP aware Real-time scheduler
- RTX64 is supported on the 64-bit versions of Windows®, including Windows® Embedded Standard
- 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 the Simple Motion board operates on the RTX2012 and RTX64 2014 with Service Pack 2. We also offer the API library/device driver for the Simple Motion board control.
Contact your local Mitsubishi Electric office for more details.

An inquiry of a product

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

MEMO

Conformity with Global Standards and Regulations

Mitsubishi Electric servo system conforms to global standards.

(Note-1): This product is not subject to China Compulsory Certification (CCC).

(Note-2): Refer to relevant manuals and "EMC Installation Guidelines" when your system needs to meet the EMC directive.

(Note-3): Refer to "MELSERVO-J4 Series Catalog" for details of MR-J4 series conformity with global standards and regulations.

(Note-4): For corresponding standards and models, contact your local sales office.

Complies with EN, UL, CSA (c-UL) standards, and Korea Radio Wave Law (KC).

Conformity with Restriction of Hazardous Substances Directive (RoHS)

The human and environment-friendly Mitsubishi Electric servo system is compliant with RoHS Directive.

< About RoHS directive >

RoHS Directive requires member nations to guarantee that new electrical and electronic equipment sold in the market after July 1, 2006 do not contain lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyl (PBB) and polybrominated diphenyl ether (PBDE) flame retardants. <G> mark indicating RoHS Directive compliance is printed on the package.

(Note-1): Refer to relevant manuals and "EMC Installation Guidelines" when your system needs to meet the EMC directive.

(Note-2): Our optional cables and connectors comply with "Measures for Administration of the Pollution Control of Electronic Information Products" (Chinese RoHS).

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.

Maximizing productivity and reducing costs across the entire enterprise

e-F@ctory is the Mitsubishi Electric solution for improving the performance of any manufacturing enterprise by enhancing productivity, and reducing the maintenance and operations costs together with seamless information flow throughout the plant. e-F@ctory uses a combination of factory automation and IT technologies, offering solutions to reduce the total cost of development, production, and maintenance by supporting advanced *Monozukuri**.

e-F@ctory helps to reduce overall costs and is achieved in the following four areas:

* Monozukuri is an initiative started in Japan for promoting its unique manufacturing style for continuous improvement in production processes and operations. The word is derived by combining the words "*mono*", the thing that is manufactured, and "*zukuri*", the process of manufacturing

Reduce energy costs

e&eco-F@ctory (energy saving solution)

Modern manufacturing depends much on reducing energy costs as a way to realize an efficient manufacturing enterprise. e-F@ctory supports this by allowing visualization of real-time energy usage, helping to reduce the overall energy consumption.

Reduce development, production, and maintenance costs

iQ Platform

The iQ Platform minimizes costs at all phases of the automation life cycle by improving development times, enhancing productivity, reducing maintenance costs, and making information more easily accessible. Integration is at the heart of the iQ Platform, with a highly intelligent controller platform as the core, combined with a seamless communication network and an integrated engineering environment.

iQ Platform

Integrate FA and IT systems at low cost

Connecting enterprise with the shop floor

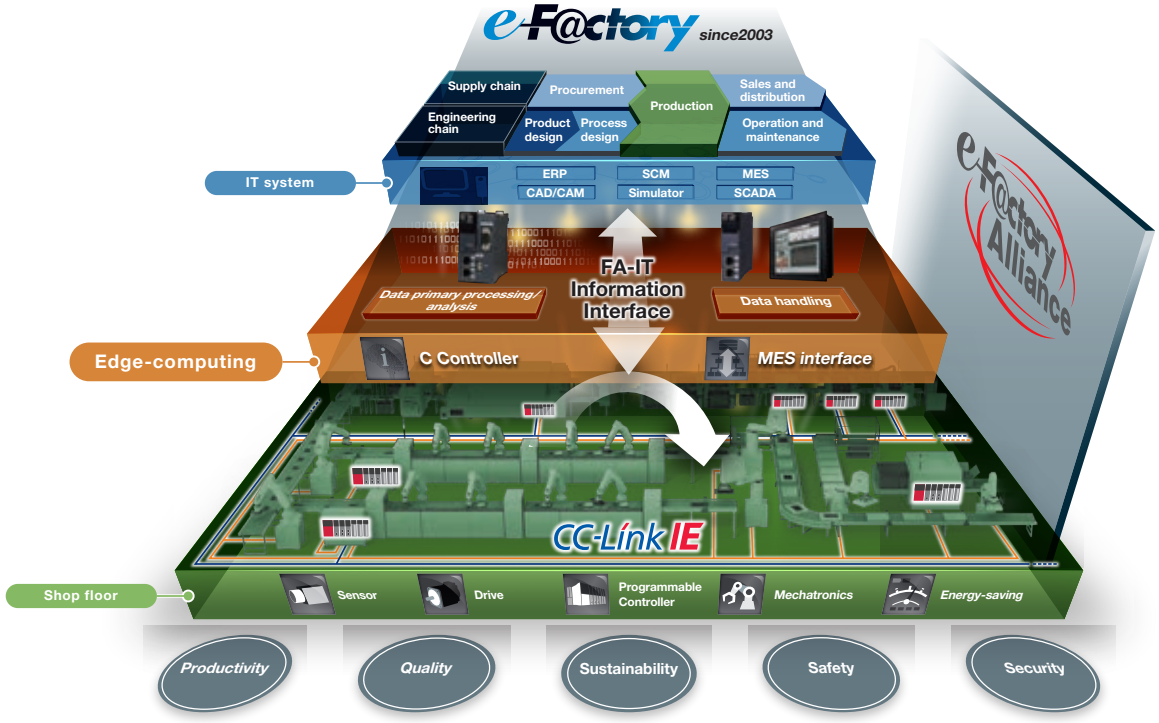
e-F@ctory solutions provide direct connectivity from the shop floor to enterprise, such as Manufacturing Execution System (MES) without requiring a gateway computer. This enables leaner operations, improved yield, and efficient management of the supply chain.

Reduce setup and maintenance costs

iQ Sensor Solution

Easily setup and maintain various types of sensors. Maintenance and design costs can be reduced as compatible iQSS partner sensors can be managed together.

iQSS



Best-in-class solutions across the ecosystem

e-F@ctory Alliance

The e-F@ctory Alliance is an ecosystem offering best-in-class solutions by combining products between Mitsubishi Electric and its various partners. Close collaboration with such partners broaden the choices for the customer and realize the best solution possible.

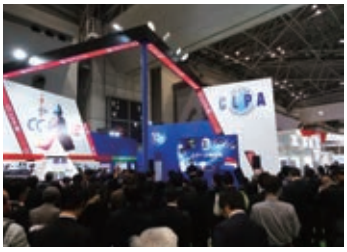
e-F@ctory Alliance

CC-Link Partner Association (CLPA) - Actively promoting worldwide adoption of CC-Link networks

Proactively supporting CC-Link, from promotion to specification development

The CC-Link Partner Association (CLPA) was established to promote the worldwide adoption of the CC-Link open-field network. By conducting promotional activities such as organizing trade shows and seminars, conducting conformance tests, and providing catalogs, brochures and website information, CLPA activities are successfully increasing the number of CC-Link partner manufacturers and CC-Link-compatible products. As such, CLPA is playing a major role in the globalization of CC-Link.

Seminar



Trade show

Conformance testing lab

Visit the CLPA website for the latest CC-Link information.

URL:www.cc-link.org

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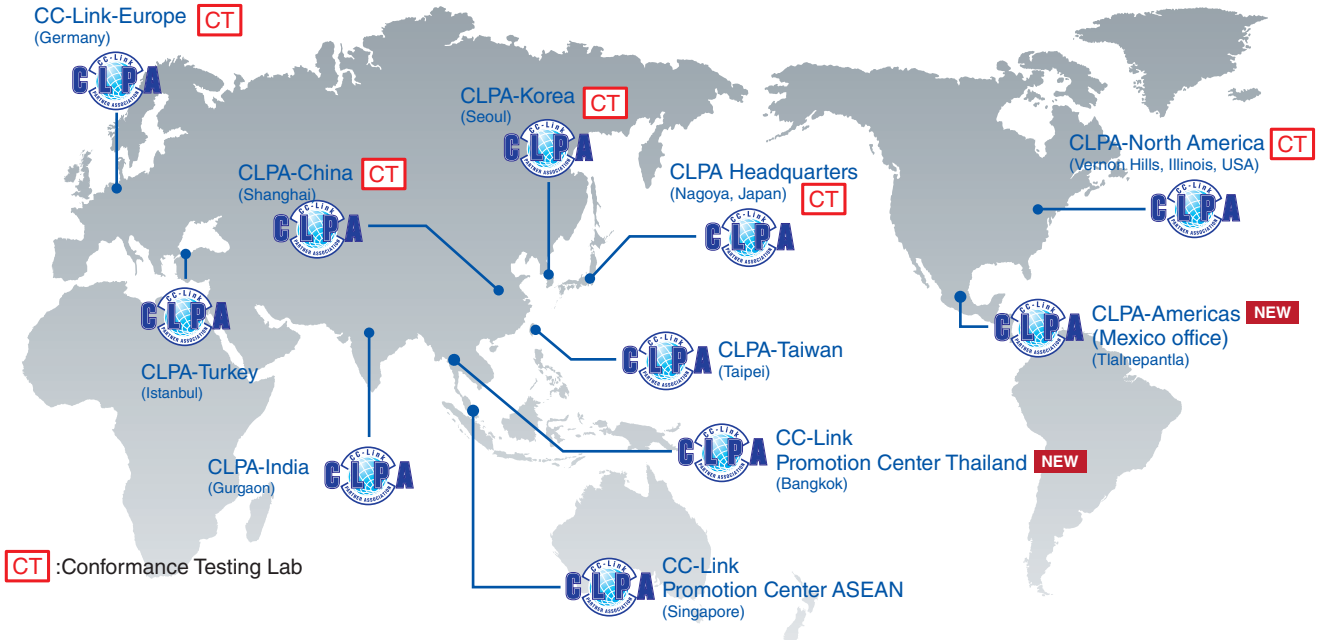
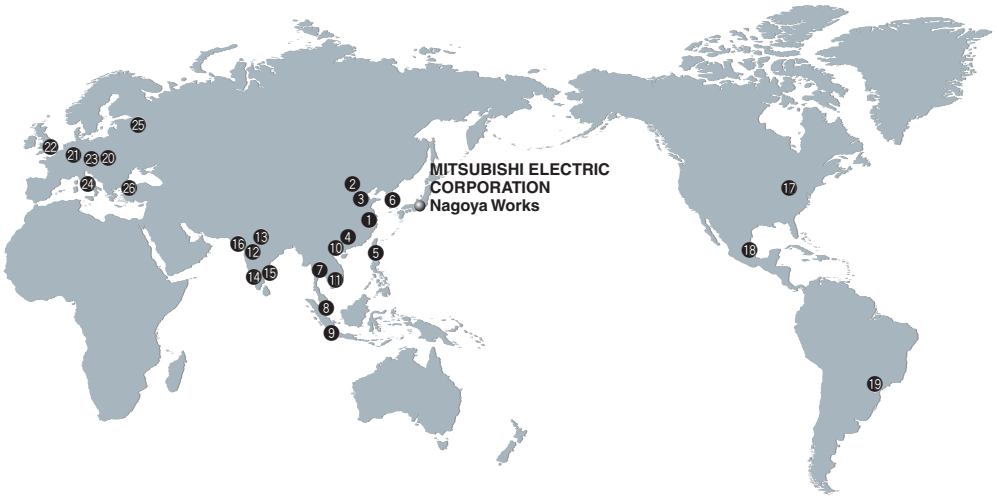
CC-Link Partner Association

Global influence of CC-Link continues to spread

CC-Link is supported globally by CLPA. With offices throughout the world, support for partner companies can be found locally. Each regional CLPA office undertakes various support and promotional activities to further the influence of CC-Link/CC-Link IE in that part of the world. For companies looking to increase their presence in their local area, CLPA is well placed to assist these efforts through offices in all major regions.



Global FA centers



China

❶ Shanghai FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Shanghai FA Center

Mitsubishi Electric Automation Center, No.1386 Hongqiao Road, Shanghai, China
Tel: +86-21-2322-3030 / Fax: +86-21-2322-3000

❷ Beijing FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Beijin FA Center

Unit 901, Office Tower 1, Henderson Centre, 18 Jianguomennei Avenue, Dongcheng District, Beijing, China
Tel: +86-10-6518-8830 / Fax: +86-10-6518-2938

❸ Tianjin FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Tianjin FA Center

Room 2003 City Tower, No.35, Youyi Road, Hexi District, Tianjin, China
Tel: +86-22-2813-1015 / Fax: +86-22-2813-1017

❹ Guangzhou FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Guangzhou FA Center

Room 1609, North Tower, The Hub Center, No.1068, Xingang East Road, Haizhu District, Guangzhou, China
Tel: +86-20-8923-6730 / Fax: +86-20-8923-6715

Taiwan

❺ Taipei FA Center
SETSUYO ENTERPRISE CO., LTD.

3F, No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan
Tel: +886-2-2299-9917 / Fax: +886-2-2299-9963

Korea

❻ Korea FA Center
MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD.

8F, Gangseo Hangang Xi-tower A, 401, Yangcheon-ro, Gangseo-Gu, Seoul 07528, Korea
Tel: +82-2-3660-9630 / Fax: +82-2-3664-0475

Thailand

❼ Thailand FA Center
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, Knet Yannawa, Bangkok 10120, Thailand
Tel: +66-2682-6522 to 31 / Fax: +66-2682-6020

ASEAN

❽ ASEAN FA Center
MITSUBISHI ELECTRIC ASIA PTE. LTD.

307 Alexandra Road, Mitsubishi Electric Building, Singapore 159943
Tel: +65-6470-2475 / Fax: +65-6476-7439

Indonesia

❾ Indonesia FA Center
PT. MITSUBISHI ELECTRIC INDONESIA Cikarang Office

Jl. Kenari Raya Blok G2-07A Delta Silicon 5, Lippo Cikarang - Bekasi 17550, Indonesia
Tel: +62-21-2961-7797 / Fax: +62-21-2961-7794

Vietnam

❿ Hanoi FA Center
MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED Hanoi Branch Office

6th Floor, Detech Tower, 8 Ton That Thuyet Street, My Dinh2 Ward, Nam Tu Liem District, Hanoi, Vietnam
Tel: +84-4-3937-8075 / Fax: +84-4-3937-8076

⓫ Ho Chi Minh FA Center
MITSUBISHI ELECTRIC VIETNAM COMPANY LIMITED

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Tel: +84-8-3910-5945 / Fax: +84-8-3910-5947

India

⓬ India Pune FA Center
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 / Fax: +91-20-2710-2100

⓭ India Gurgaon FA Center
MITSUBISHI ELECTRIC INDIA PVT. LTD. Gurgaon Head Office

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⓮ India Bangalore FA Center
MITSUBISHI ELECTRIC INDIA PVT. LTD. Bangalore Branch

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⓯ India Chennai FA Center
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⓰ India Ahmedabad FA Center
MITSUBISHI ELECTRIC INDIA PVT. LTD. Ahmedabad Branch

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Tel: +91-7965120063

Americas

⓱ North America FA Center
MITSUBISHI ELECTRIC AUTOMATION, INC.

500 Corporate Woods Parkway, Vernon Hills, IL 60061, U.S.A.
Tel: +1-847-478-2100 / Fax: +1-847-478-2253

⓲ Mexico FA Center
MITSUBISHI ELECTRIC AUTOMATION, INC. Mexico Branch

Mariano Escobedo #69, Col.Zona Industrial, Tlalnepantla Edo. Mexico, C.P.54030
Tel: +52-55-3067-7511

Brazil

⓳ Brazil FA Center
MITSUBISHI ELECTRIC DO BRASIL COMÉRCIO E SERVIÇOS LTDA.

Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brazil
Tel: +55-11-4689-3000 / Fax: +55-11-4689-3016

Europe

⓴ Europe FA Center
MITSUBISHI ELECTRIC EUROPE B.V. Polish Branch

ul. Krakowska 50, 32-083 Balice, Poland
Tel: +48-12-347-65-00 / Fax: +48-12-630-47-01

㉑ Germany FA Center
MITSUBISHI ELECTRIC EUROPE B.V. German Branch

Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany
Tel: +49-2102-486-0 / Fax: +49-2102-486-1120

㉒ UK FA Center
MITSUBISHI ELECTRIC EUROPE B.V. UK Branch

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Tel: +44-1707-27-8780 / Fax: +44-1707-27-8695

㉓ Czech Republic FA Center
MITSUBISHI ELECTRIC EUROPE B.V. Czech Branch

Pekarska 621/7, 155 00 Praha 5, Czech Republic
Tel: +420-255 719 200

㉔ Italy FA Center
MITSUBISHI ELECTRIC EUROPE B.V. Italian Branch

Centro Direzionale Colleoni - Palazzo Sirio, Viale Colleoni 7, 20864 Agrate Brianza (Milano), Italy
Tel: +39-039-60531 / Fax: +39-039-6053-312

㉕ Russia FA Center
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 / Fax: +7-812-633-3499

㉖ Turkey FA Center
MITSUBISHI ELECTRIC TURKEY A.Ş Ümraniye Branch

Serifali Mahallesi Nutuk Sokak No:5, TR-34775 Umraniye / Istanbul, Turkey
Tel: +90-216-526-3990 / Fax: +90-216-526-3995

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 and Service, etc.

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

3. Service in overseas countries

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 loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to:

(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

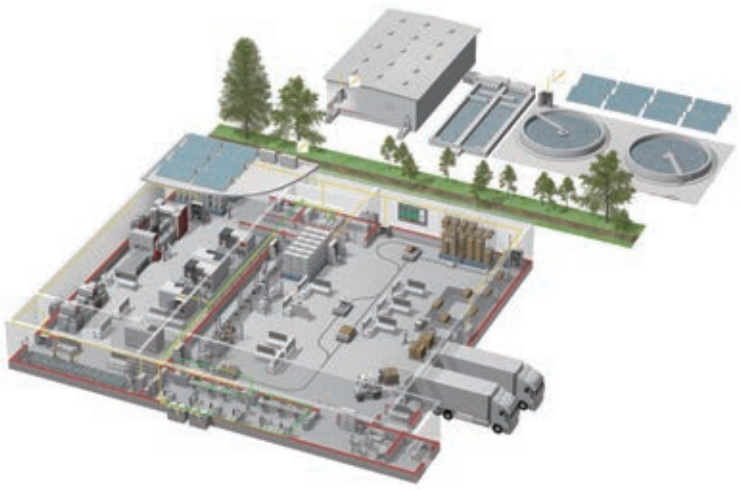
Specifications listed in our catalogs, manuals or technical documents may be changed without notice.

6. Application and use of the Product

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

(2) Our Simple Motion Board 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.

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.

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

* Not all products are available in all countries.

Personal Computer Embedded Type Servo System Controller
CC-Link IE Simple Motion Board/
MELSOFT EM Software Development Kit

Country/Region	Sales office	Tel/Fax
USA	MITSUBISHI ELECTRIC AUTOMATION, INC. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, U.S.A.	Tel : +1-847-478-2100 Fax : +1-847-478-2253
Mexico	MITSUBISHI ELECTRIC AUTOMATION, INC. Mexico Branch Mariano Escobedo #69, Col. Zona Industrial, Tlalnepantla Edo. Mexico, C.P.54030	Tel : +52-55-3067-7500
Brazil	MITSUBISHI ELECTRIC DO BRASIL COMÉRCIO E SERVIÇOS LTDA. Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brazil	Tel : +55-11-4689-3000 Fax : +55-11-4689-3016
Germany	MITSUBISHI ELECTRIC EUROPE B.V. German Branch Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany	Tel : +49-2102-486-0 Fax : +49-2102-486-1120
UK	MITSUBISHI ELECTRIC EUROPE B.V. UK Branch Travellers Lane, UK-Hatfield, Hertfordshire, AL10 8XB, U.K.	Tel : +44-1707-28-8780 Fax : +44-1707-27-8695
Ireland	MITSUBISHI ELECTRIC EUROPE B.V. Irish Branch Westgate Business Park, Ballymount, Dublin 24, Ireland	Tel : +353-1-4198800 Fax : +353-1-4198890
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 Fax : +39-039-6053-312
Spain	MITSUBISHI ELECTRIC EUROPE, B.V. Spanish Branch Carretera de Rubí, 76-80-Apdo. 420, 08190 Sant Cugat del Vallés (Barcelona), Spain	Tel : +34-935-65-3131 Fax : +34-935-89-1579
France	MITSUBISHI ELECTRIC EUROPE B.V. French Branch 25, Boulevard des Bouvets, 92741 Nanterre Cedex, France	Tel : +33-1-55-68-55-68 Fax : +33-1-55-68-57-57
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 Fax : +48-12-630-47-01
Sweden	MITSUBISHI ELECTRIC EUROPE B.V. (Scandinavia) Fjelievägen 8, SE-22736 Lund, Sweden	Tel : +46-8-625-10-00 Fax : +46-46-39-70-18
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 Fax : +7-812-633-3499
Turkey	MITSUBISHI ELECTRIC TURKEY A.Ş Ümraniye Branch Serifali Mahallesi Nutuk Sokak No:5, TR-34775 Umraniye/Istanbul, Turkey	Tel : +90-216-526-3990 Fax : +90-216-526-3995
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South Africa	ADROIT TECHNOLOGIES 20 Waterford Office Park, 189 Witkoppen Road, Fourways, South Africa	Tel : +27-11-658-8100 Fax : +27-11-658-8101
China	MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Mitsubishi Electric Automation Center, No.1386 Hongqiao Road, Shanghai, China	Tel : +86-21-2322-3030 Fax : +86-21-2322-3000
Taiwan	SETSUYO ENTERPRISE CO., LTD. 6F, No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan	Tel : +886-2-2299-2499 Fax : +886-2-2299-2509
Korea	MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD. 7F-9F, Gangseo Hangang Xi-tower A, 401, Yangcheon-ro, Gangseo-Gu, Seoul 07528, Korea	Tel : +82-2-3660-9529 Fax : +82-2-3664-8372
Singapore	MITSUBISHI ELECTRIC ASIA PTE. LTD. 307 Alexandra Road, Mitsubishi Electric Building, Singapore 159943	Tel : +65-6473-2308 Fax : +65-6476-7439
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 31 Fax : +66-2682-6020
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 : +84-8-3910-5945 Fax : +84-8-3910-5947
Indonesia	PT. MITSUBISHI ELECTRIC INDONESIA Gedung Jaya 8th Floor, JL. MH. Thamrin No.12, Jakarta Pusat 10340, Indonesia	Tel : +62-21-3192-6461 Fax : +62-21-3192-3942
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 Fax : +91-20-2710-2100
Australia	MITSUBISHI ELECTRIC AUSTRALIA PTY. LTD. 348 Victoria Road, P.O. Box 11, Rydalmere, N.S.W 2116, Australia	Tel : +61-2-9684-7777 Fax : +61-2-9684-7245

Mitsubishi Electric Corporation Nagoya Works is a factory certified for ISO 14001 (standards for environmental management systems) and ISO 9001 (standards for quality assurance management systems).

ISO 14001 JACO EC97J1113 — UKAS MANAGEMENT SYSTEMS 051

ISO 9001 BUREAU VERITAS Certification — UKAS MANAGEMENT SYSTEMS 008

MITSUBISHI ELECTRIC CORPORATION

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