Unique Servo Control Available Through C Language Based Programming

```c
void sample()
{
PNT_DATA_EX PntData[2] =
{
{ 1000, 200, 20, 100, 0, 0, { 0 }, { 0 }, 0, { 0 } ,
{ 0, 200, 20, 100, 0, 0, { 0 }, { 0 }, 0, { 0 } ,
};
ans = sscSetPointDataEx( board_id, channel, axnum, &PntData[0] );
ans = sscAutoStart( board_id, channel, axnum, start_pnt, end_pnt );
ans = sscWaitIntDriveFin( board_id, channel, axnum, SSC_FIN_TYPE_SMZ, &fin_status, 0 );
}
```

Embedded in a personal computer for controlling MELSERVO-J4
Connected to a C Controller via PCI Express® for controlling MELSEROV-J4

C Controller Interface Module
Embedded in a personal computer for controlling MELSERVO-J4
Position Board
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 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 table)
- High-speed processing (1 cycle startup, 0.22 ms/8 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 for details

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
void sample()
{
PNT_DATA_EX PntData[2] =
{
{ 1000, 200, 20, 100, 0, 0, { 0 }, { 0 }, 0, { 0 } ,
{ 0, 200, 20, 100, 0, 0, { 0 }, { 0 }, 0, { 0 } ,
};
ans = sscSetPointDataEx( board_id, channel, axnum, &PntData[0] );
ans = sscAutoStart( board_id, channel, axnum, start_pnt, end_pnt );
ans = sscWaitIntDriveFin( board_id, channel, axnum, SSC_FIN_TYPE_SMZ, &fin_status, 0 );
}

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(set with Point table)
High-speed processing (1 cycle startup, 0.22 ms/8 axes)
Various API functions and a test tool help user develop applications
Real-time OS (INtime®, RTX, etc.) is supported
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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
products boosts reliability further.

Dual port memory
Positioning control processing

Configuration

C Controller/Personal computer

User program
void sample()
{
    PNT_DATA_EX PntData[2] =
    {
        { 1000, 200, 20, 100, 0, 0, { 0 }, { 0 }, 0, { 0 } },
        { 0, 200, 20, 100, 0, 0, { 0 }, { 0 }, 0, { 0 } },
    };
    ans = sscSetPointDataEx( board_id, channel, axnum, &PntData[0] );
    ans = sscAutoStart( board_id, channel, axnum, start_pnt, end_pnt );
    ans = sscWaitIntDriveFin( board_id, channel, axnum, SSC_FIN_TYPE_SMZ, &fin_status, 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

C Controller

User program

Write to the dual port memory
Read from the dual port memory
Interrupts

C Controller Interface Module

Position Board

PCI Express®/PCI

C Controller

PCI Express®

C Controller Interface Module

Position Board

PCI Express®
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

- High-speed access and interrupt detection are achieved with PCI Express®.
- 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 table.
- An API library is available for more efficient software development.
- This Interface Module supports C Controllers where Lineo uLinux is installed.

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

System Configuration

Forced stop input (24 VDC)

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

Up to 20 axes

C Controller (Q24DHCCPU-V) to Q173SCCF via USB

Servo amplifier external input signals FLS, RLS, DOG
Configure a High-response Servo System by Embedding the Position Board in a PC


This board type controller is used for controlling MELSERVO-J4 SSCNET III/H compatible servo amplifiers, through a user program. The PCI Express® compatible Position Board is a new addition to our product line.

**Features**

- An SSCNET III/H servo system that is controlled by a personal computer can be configured.
- 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 table.
- 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 for more details.

**System Configuration**

![Diagram of system configuration](image)

(Note-1): When using an external forced stop, prepare the connector for forced stop input separately.
Software Development Environment

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

[Position Board]
Create a user program by adding the positioning control API library to the project of Microsoft Visual Studio® which is running on a Windows® OS PC.

(Note): Be sure to prepare the operating system software and software development environment separately.
[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®/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.

```c
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

<table>
<thead>
<tr>
<th>No.</th>
<th>Position data</th>
<th>Feed speed</th>
<th>Acceleration time constant</th>
<th>Deceleration time constant</th>
<th>Dwell</th>
<th>Auxiliary command</th>
<th>...</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1000</td>
<td>200</td>
<td>20</td>
<td>20</td>
<td>0</td>
<td>Absolute position command, In-position stop</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>200</td>
<td>20</td>
<td>20</td>
<td>0</td>
<td>Absolute position command, In-position stop</td>
<td>0</td>
</tr>
</tbody>
</table>
Various Optional Features for Point to Point Positioning Operation

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

- **Ensuring passing the target position**
  In-position stop
  After In-position signal turns ON, operation proceeds to the next point.

- **Not waiting for motor stabilization**
  Smoothing stop
  After completion of the position command output, operation proceeds to the next point.

- **Not stopping at a point**
  Continuous operation
  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**
  Pre-dwell
  Operation starts after the specified wait time

- **Wait time after moving to the point**
  Dwell
  Operation is completed when the specified time has elapsed after moving to the point.

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

- **Same operation time duration**
  S-curve acceleration/deceleration
  Acceleration becomes faster
  Operation time does not change
  Maximum acceleration is faster than trapezoidal acceleration/deceleration.

- **Same maximum acceleration speed**
  Smoothing filter
  Acceleration is roughly the same
  Operation time becomes longer
  Maximum acceleration speed is roughly the same as trapezoidal acceleration/deceleration.

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

- **Target position with reference to the home 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.

- **Target position with reference to the current 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.

[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
  Composite speed

  Axis 1 speed
  Axis 2 speed

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 );
### Tandem Operation

With the operation start of the master axis, same commands start to be transmitted to both the master and slave axes, which achieves 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

### Other Axes Start Function

This function automatically starts other axes according to its startup condition and its operation pattern. Tact 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.
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, tact 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.

**Pass Position Interrupt Function**
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
- A total of 64 points can be specified for pass position data of all axes

**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.

**Application example:**
- Vision processing
- Pass position interrupt
- Vision camera takes the photos
- Application example: inspection machine
**Main Functions**

**Application function**

**MR-MC series**

**NEW**

### 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.

### 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. **NEW**

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.
Main Functions

**JOG operation**

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**

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 start point to the end point.

**Electronic gear**

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**

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**

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

**Mark detection**

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**

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**

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**

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**

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**

Forced stop, operation stop, and rapid stop are available. These stop functions are executed in case of detecting a machine error.

**Command change**

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

**Gain switching**

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**

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**

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

**Log**

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

<table>
<thead>
<tr>
<th>Function</th>
<th>Standard Mode</th>
<th>Interface Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>System functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of control axes</td>
<td>Up to 20 axes</td>
<td>Up to 20 axes</td>
</tr>
<tr>
<td>Control cycle</td>
<td>0.22ms/0.44ms/0.88ms (Select using parameters.)</td>
<td></td>
</tr>
<tr>
<td>Control mode</td>
<td>Position control, Tightening &amp; press-fit control</td>
<td>Position control, Speed control, Torque control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Operation functions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JOG operation</td>
<td>Provided</td>
<td></td>
</tr>
<tr>
<td>Incremental feed</td>
<td>Provided</td>
<td></td>
</tr>
<tr>
<td>Automatic operation</td>
<td>Point table method, 1-axis control, Tightening &amp; press-fit control</td>
<td></td>
</tr>
<tr>
<td>Linear interpolation</td>
<td>Point table method, Up to 4 axes interpolation (Note-1)</td>
<td></td>
</tr>
<tr>
<td>Home position return</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Home position reset (data set)</td>
<td></td>
</tr>
<tr>
<td>Electronic gear</td>
<td>Electronic gear numerator: 1 to 5242879</td>
<td>Electronic gear denominator: 1 to 589623</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed units</td>
<td>Command unit/min, command unit/s, and r/min</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Application functions 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceleration/deceleration</td>
<td>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)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stop function</td>
<td>Forced stop, Operation stop, Rapid stop</td>
<td>Forced stop</td>
</tr>
<tr>
<td>Command change</td>
<td>Position, Speed, Time constant</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Application functions 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitor</td>
<td>Current command position, Current feedback position, Speed command, Position droop, Electrical current command, Servo alarm number, External signal status, etc.</td>
<td>Provided</td>
</tr>
<tr>
<td>High speed monitor</td>
<td>Current command position, Current feedback position, Moving speed, Feedback moving speed, External signal, Electrical current feedback</td>
<td>Provided</td>
</tr>
<tr>
<td>Interrupt</td>
<td>During start operation, Operation stoppage (During operation, in-position, during smoothing stop, rough match, etc.), When alarm occurs (servo alarm/operation alarm), etc.</td>
<td>Provided</td>
</tr>
<tr>
<td>Host PC watchdog</td>
<td>Provided (Check for the watchdog of the CPU of the host computer)</td>
<td>Provided</td>
</tr>
<tr>
<td>Parameter backup</td>
<td>Parameters can be saved to the flash ROM</td>
<td>Provided</td>
</tr>
<tr>
<td>Test mode</td>
<td>By connecting MR Configurator2 via the controllers, the servo amplifier can be easily tested</td>
<td>Provided</td>
</tr>
<tr>
<td>Connect/disconnect</td>
<td>Provided</td>
<td></td>
</tr>
<tr>
<td>Sampling</td>
<td>The maximum sampling point: 65536 (Ring buffer of 8192 points)</td>
<td>Provided</td>
</tr>
<tr>
<td>Log</td>
<td>History of operation start, alarms, etc., can be recorded</td>
<td>Provided</td>
</tr>
<tr>
<td>Alarm history</td>
<td>Provided</td>
<td></td>
</tr>
<tr>
<td>External forced stop disabled</td>
<td>Provided</td>
<td>Provided</td>
</tr>
</tbody>
</table>

(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 0.02 ms.

**Board ID**

| 0 to 3 | — | 0 to 3 | — |
C Controller Interface Module specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo amplifier connection system</td>
<td>SSCNET III/H (1 line)</td>
</tr>
<tr>
<td>Maximum overall cable distance [m(ft.)]</td>
<td>SSCNET III/H: 2000 (6561.68)</td>
</tr>
<tr>
<td>Maximum distance between stations [m(ft.)]</td>
<td>SSCNET III/H: 100 (328.08)</td>
</tr>
<tr>
<td>Peripheral I/F</td>
<td>USB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Forced stop input signal (EMI) (Note-1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of input points</td>
<td>1 point</td>
</tr>
<tr>
<td>Input method</td>
<td>Positive Common/ Negative Common Shared Type (Photocoupler isolation)</td>
</tr>
<tr>
<td>Rated input voltage/current</td>
<td>24 VDC/approx. 2.4 mA</td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>20.4 to 26.4 VDC (24 VDC +10%~15%, ripple ratio 5% or less)</td>
</tr>
<tr>
<td>ON voltage/current</td>
<td>17.5 VDC or more/2.0 mA or more</td>
</tr>
<tr>
<td>OFF voltage/current</td>
<td>1.8 VDC or less/0.18 mA or less</td>
</tr>
<tr>
<td>Input resistance</td>
<td>Approx. 10kΩ</td>
</tr>
<tr>
<td>Response time</td>
<td>1ms or less (OFF to ON, ON to OFF)</td>
</tr>
<tr>
<td>Recommended wire size</td>
<td>AWG16 to 26 (0.12 to 1.3 mm²)</td>
</tr>
</tbody>
</table>

Number of Interface Modules for one C Controller: 1

Bus specification: PCI Express®

Position Board specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
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<tbody>
<tr>
<td>Servo amplifier connection system</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Forced stop input signal (EMI) (Note-1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of input points</td>
<td>1 point</td>
</tr>
<tr>
<td>Input method</td>
<td>Positive Common/ Negative Common Shared Type (Photocoupler isolation)</td>
</tr>
<tr>
<td>Rated input voltage/current</td>
<td>24 VDC/approx. 2.4 mA</td>
</tr>
<tr>
<td>Operating voltage range</td>
<td>20.4 to 26.4 VDC (24 VDC +10%~15%, ripple ratio 5% or less)</td>
</tr>
<tr>
<td>ON voltage/current</td>
<td>17.5 VDC or more/2.0 mA or more</td>
</tr>
<tr>
<td>OFF voltage/current</td>
<td>1.8 VDC or less/0.18 mA or less</td>
</tr>
<tr>
<td>Input resistance</td>
<td>Approx. 10kΩ</td>
</tr>
<tr>
<td>Response time</td>
<td>1ms or less (OFF to ON, ON to OFF)</td>
</tr>
<tr>
<td>Recommended wire size</td>
<td>AWG16 to 26 (0.12 to 1.3 mm²)</td>
</tr>
</tbody>
</table>

Number of Position Boards for one computer: 4

Bus specification: PCI Express®

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

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Name</th>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molex</td>
<td>Housing</td>
<td>51103-0000</td>
<td>Applicable wire size (AWG): 22, 24, 26, 28</td>
</tr>
<tr>
<td></td>
<td>Terminal</td>
<td>50351-8100</td>
<td>Two terminals are needed for one housing</td>
</tr>
<tr>
<td></td>
<td>Hand crimp tool</td>
<td>57295-5000</td>
<td>Applicable terminal: 50351</td>
</tr>
</tbody>
</table>

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

(Note-2): Depending on the specifications of the controller unit, the PCI Express® slot may be directly connected to the CPU of the personal computer. If the PCI Express® compatible Position Board is mounted to a PCI Express® slot that is directly connected to the CPU of the host controller, it may not be able to operate. Mount the PCI Express® compatible Position Board to a PCI Express® slot that is not directly connected to the CPU of the personal computer (connected to a chipset).
Dedicated library functions

Simpler programming by using a dedicated library suite for access to hardware.

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

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

Dedicated library functions
- Other axes start functions, pass position interrupt functions, sampling functions, and log functions.

More than 100 functions are available for creating user application, such as:
- Operating functions
- Monitor functions
- Alarm functions
- Change functions
- Point table functions
- Command/status functions
- System functions
- Parameter functions
- Device functions
- Support functions

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

## Exterior dimensions

**Q173SCCF**

![Exterior Dimensions Diagram]

<table>
<thead>
<tr>
<th>[Unit: mm (inch)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 (4.53)</td>
</tr>
<tr>
<td>29.6 (1.17)</td>
</tr>
<tr>
<td>27.4 (1.08)</td>
</tr>
<tr>
<td>10.6 (0.42)</td>
</tr>
<tr>
<td>10.4 (0.41)</td>
</tr>
</tbody>
</table>

## Operation environment for test tool

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal computer</td>
<td>Microsoft Windows® supported personal computer</td>
</tr>
<tr>
<td>OS</td>
<td>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]</td>
</tr>
<tr>
<td>CPU</td>
<td>Desktop PC: Intel® Celeron® Processor 2.8GHz or higher, Laptop PC : Intel® Pentium® M Processor 1.7GHz or higher</td>
</tr>
<tr>
<td>Required memory</td>
<td>1GB or more recommended (For 32-bit edition), 2GB or more recommended (For 64-bit edition)</td>
</tr>
<tr>
<td>Available hard disk space</td>
<td>When installing the test tool: Available hard disk space 1GB or more, When operating the test tool: Available virtual memory space 512MB or more</td>
</tr>
<tr>
<td>Disk drive</td>
<td>CD-ROM supported disk drive</td>
</tr>
<tr>
<td>Monitor</td>
<td>Resolution 1024 x 768 pixels or higher</td>
</tr>
<tr>
<td>Communication interface</td>
<td>USB port</td>
</tr>
</tbody>
</table>

## Development environment

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User program OS</td>
<td>VxWorks® 6.8.1</td>
</tr>
<tr>
<td>Software development environment</td>
<td>C Controller Engineering Tool CW Workbench SW1DNDC-WWLQ24-E/SW1DNDC-WWLQ24-EZ/SW1DNDC-WWLQ24-EVZ A product of Wind River Systems Inc. Wind River Workbench 3.2</td>
</tr>
</tbody>
</table>

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

## Component list

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>Specification</th>
<th>Applicable standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>C Controller Interface Module</td>
<td>Q173SCCF</td>
<td>Up to 20 axes (A forced stop input cable connector is provided.)</td>
<td>CE, UL, KC</td>
</tr>
<tr>
<td>C Controller Module</td>
<td>Q24DHCCPU-V</td>
<td>CPU : SH4A, Endian format: Little endian OS : VxWorks® 6.8.1</td>
<td>CE, UL, KC</td>
</tr>
<tr>
<td>C Controller Interface Module utility</td>
<td>SW1DNDC-QSCCF-B</td>
<td>• Test tool (for setup, debugging) • API library (library of functions for VxWorks®) • Device driver</td>
<td>—</td>
</tr>
<tr>
<td>SSCNET III cable</td>
<td>MR-J3BUSC:3M</td>
<td>Standard code for inside panel 0.15m (0.49ft.), 0.3m (0.98ft.), 0.5m (1.64ft.), 1m (3.28ft.), 3m (9.84ft.)</td>
<td>—</td>
</tr>
<tr>
<td>MR-J3BUSC:3M-A</td>
<td>MR-J3BUSC:3M-B</td>
<td>Standard code for outside panel 5m (16.40ft.), 10m (32.81ft.), 20m (65.62ft.)</td>
<td>—</td>
</tr>
<tr>
<td>MR-J3BUSC:3M-B (Note-1)</td>
<td></td>
<td>Long distance cable 30m (98.43ft.), 40m (131.23ft.), 50m (164.05ft.)</td>
<td>—</td>
</tr>
<tr>
<td>PCI Express® cable</td>
<td>Q173PCIECBL05M</td>
<td>Q24DHCCPU-V &lt;= Q173SCCF Cable length: 0.5m (1.64ft.)</td>
<td>—</td>
</tr>
<tr>
<td>USB cable</td>
<td>MR-J3USBCCBL3M</td>
<td>3m (9.84ft.)</td>
<td>—</td>
</tr>
<tr>
<td>MELSOFT MR Configurator2</td>
<td>SW1DNDC-MRC2-E</td>
<td>Servo amplifier MELSEROV-J4 series setting and adjustment</td>
<td>—</td>
</tr>
</tbody>
</table>

(Nota-1): Contact your local Mitsubishi Electric office for cables shorter than 30m (98.43ft.).
Specifications for C Controller Interface Module

Exterior dimensions

- **MR-MC240/MR-MC241**
  - 167.6 (6.60)

- **MR-MC210/MR-MC211**
  - 167.6 (6.60)

**Operation environment for test tool**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal computer</td>
<td>Microsoft® Windows® supported personal computer</td>
</tr>
</tbody>
</table>
| OS                       | 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 2.6GHz 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 x 768 pixels or higher           |
| Communication interface  | PCI/PCI Express® BUS  
USB port                   |

**Development environment**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>User program OS</td>
<td>The same OS as the test tool above.</td>
</tr>
</tbody>
</table>
Microsoft® Visual C# 2013/2012/2010/2008/2005  

**Component list**

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>Specification</th>
<th>Applicable standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position Board</td>
<td>MR-MC240/MR-MC210</td>
<td>Up to 20 axes</td>
<td>CE, UL, KC</td>
</tr>
<tr>
<td></td>
<td>MR-MC241/MR-MC211</td>
<td>Up to 32 axes</td>
<td>CE, UL, KC</td>
</tr>
</tbody>
</table>
| Position Board utility 2 | MRJ-W3-MC2-UTL | Test tool (for setup, debugging)  
Position Board compatible Position Board  
Device driver            |                      |
| SSCNET III cable        | MR-J3BUS:M      | Standard code for inside panel     | —                   |
|                         | MR-J3BUS:M-A    | Standard code for outside panel    | —                   |
|                         | MR-J3BUS:M-B    | Long distance cable               | —                   |
| USB cable               | MR-J3USBCBL3M   | 3m (9.84ft.)                      | —                   |
| MELSOFT MR Configurator2| SW1DNC-MRC2-E   | Servo amplifier MELSERVO-J4 series setting and adjustment | —                   |

(Note-1): When using an external forced stop, prepare the connector for forced stop separately.  
(Note-2): Contact your local Mitsubishi Electric office for cables shorter than 30 m.
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.

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 Position Board operates on the RTX2011. We also offer the API library/device driver for the Position Board control.
Contact your local Mitsubishi Electric office for more details.
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.

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.

An inquiry of a product URL: http://www.mnc.co.jp/english/
MAIL: bcd@mnc.co.jp

TenAsys Corporation
Micronet Company

Features
- Multicore SMP aware Real-time scheduler
- RTX64 is supported on the 64-bit versions of Windows®, including Windows® Embedded Standard
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Partner Products

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MEMO
A global support network for MELSERVO users

Across the globe, FA Centers provide customers with local assistance for purchasing Mitsubishi Electric products and with after-sales service. To enable national branch offices and local representatives to work together in responding to local needs, we have developed a service network throughout the world. We provide repairs, on-site engineering support, and sales of replacement parts. We also provide various services from technical consulting services by our expert engineers to practical training for equipment operations.

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

Servo system controllers conform to global standards.

* This product is not subject to China Compulsory Certification (CCC).
* Refer to “Servo Amplifier Instruction Manual” and “EMC Installation Guidelines” when your system needs to meet the EMC directive.
* For corresponding standards and models, contact your local sales office.
Complies with Restriction of Hazardous Substances Directive (RoHS).

Human and environment-friendly Mitsubishi servo system controllers are 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. A “<G>” mark indicating RoHS Directive compliance is printed on the package.

(Note): Refer to “Servo Amplifier Instruction Manual” and “EMC Installation Guidelines” when your system needs to meet the EMC directive.

Our optional cables and connectors comply with “Measures for Administration of the Pollution Control of Electronic Information Products” (Chinese RoHS).
Global FA Centers

China

Shanghai FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.
No.1386 Hongqiao Road,
Mitsubishi Electric Automation Center,
Shanghai, China
Tel: 86-21-2222-3000 Fax: 86-21-2222-3000 (B6116)

Beijing FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD. Beijing Branch
Unit 901, 9F, Office Tower 1, Henderson Centre,
18 Jiangguomennei Avenue, Dongcheng District,
Beijing, China
Tel: 86-10-6518-8830 Fax: 86-10-6518-2938

Tianjin FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.
Tianjin Branch
Room 2003 City Tower, No.35, Youyi Road,
Hexi District, Tianjin, China
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Guangzhou FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.
Guangzhou Branch
Room 1609, North Tower, The Hub Center,
No.1386 Hongqiao Road,
Mitsubishi Electric Automation Center,
Guangzhou, China
Tel: 86-20-6923-6730 Fax: 86-20-6923-6715

Taiwan

Taipei FA Center
SETSUYO ENTERPRISE CO., LTD.
3F, No.105, Wugong 3rd Road,
B/4, 3rd Floor, Safal Profitaire, Corporate Road,
Prestige Emerald, 6-3 J Block, M.I.D.C Bhosari,
Pune - 411026, Maharashtra, India
Tel: 91-20-2710-2100 Fax: 91-20-2710-2100

India

Korea FA Center
MITSUBISHI ELECTRIC AUTOMATION KOREA CO., LTD.
7F-9F, Gangseo Hangang Xi-tower A, 401,
Cheongshino-ro, Gangnam-gu, Seoul 157-801, Korea
Tel: 02-2-960-9630 Fax: 02-2-2299-9963

Korea

Indonesia

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Tel: 84-4-3937-8075 Fax: 84-4-3937-8076

Ho Chi Minh FA Center
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Ho Chi Minh Branch
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India

India Pune FA Center
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Pune - 411026, Maharashtra, India
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India

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India
As a recognized leader in factory automation, Mitsubishi Electric offers a world-class level of customer satisfaction.

### Production/Development System

For more than 80 years from the start of operations in 1924, Mitsubishi Electric Nagoya Works has manufactured various universal devices including motors, programmable controllers and inverters. The history of AC servo production at Nagoya Works spans over 30 years. We have expanded our production system based on the technology and tradition amassed during this time, and have incorporated world-class research and development to create high-performance, high-quality products that can be supplied for a long time.

#### Production system

To guarantee the high quality and performance of MELSERVO, Mitsubishi Electric has built a cooperative system of three facilities - Shinshiro Factory, a branch factory of Nagoya Works; Mitsubishi Electric Automation Manufacturing (Changshu) Co., Ltd., a manufacturing base; and Nagoya Works at the core. Mitsubishi Electric responds to various needs throughout the world by uniting technologies and know-how of these facilities. Mitsubishi Electric’s FA energy solutions, "e&eco-F@ctory", are at work in the servo motor factory at the Nagoya Works. They are being used to boost capacity utilization and product quality, and reduce energy consumption.

#### Development system

To spread advanced servo systems to the world as quickly as possible, Mitsubishi Electric has established FA-related development centers at its Nagoya Works, and in North America and Europe. Furthermore, we have established strong connections between our Advanced Technology R&D Center, which pushes technology development beyond the limits of FA, and Information Technology R&D Center. We are moving forward with the development of new products that reflect the latest technological directions and customer input.
FA Products

PLC  |  MELSEC iQ-R Series

Revolutionary, next generation controllers building a new era in automation

- High-speed, high-accuracy multiple CPU control system based on the iQ Platform
- New high-speed system bus and inter-module sync realizes improved productivity and reduced TCO*
- Reducing development costs through intuitive engineering (GX Works3)
- Robust security features (such as security key authentication, IP filter)

<table>
<thead>
<tr>
<th>Product Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program capacity</td>
</tr>
<tr>
<td>LB instruction speed</td>
</tr>
<tr>
<td>Available modules</td>
</tr>
<tr>
<td>Control system architecture</td>
</tr>
<tr>
<td>Supported networks</td>
</tr>
</tbody>
</table>

*Total Cost of Ownership

HMI  |  Graphic Operation Terminal GOT2000 Series GT27 Model

To the top of HMIs with further user-friendly, satisfactory standard features.

- Comfortable screen operation even if high-load processing (e.g., logging, device data transfer) is running. (Monitoring performance is twice faster than GT16)
- Actual usable space without using a SD card is expanded to 128MB for more flexible screen design.
- Multi-touch features, two-point press, and scroll operations for more user-friendliness.
- Outline font and PNG images for clear, beautiful screen display.

<table>
<thead>
<tr>
<th>Product Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen size</td>
</tr>
<tr>
<td>Resolution</td>
</tr>
<tr>
<td>Intensify adjustment</td>
</tr>
<tr>
<td>Touch panel type</td>
</tr>
<tr>
<td>Built-in interface</td>
</tr>
<tr>
<td>Applicable software</td>
</tr>
<tr>
<td>Input power supply voltage</td>
</tr>
</tbody>
</table>

Inverter  |  FR-A800 Series

High-functionality, high-performance inverter

- Realize even higher responsiveness during real sensorless vector control or vector control, and achieve faster operating frequencies.
- The latest automatic tuning function supports various induction motors and also sensorless PM motors.
- The standard model is compatible with EU Safety Standards STO (PLd, SIL2). Add options to support higher level safety standards.
- Control and monitor inverters via CC-Link/CC-Link IE Field Network (option interface).

<table>
<thead>
<tr>
<th>Product Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inverter capacity</td>
</tr>
<tr>
<td>Control method</td>
</tr>
<tr>
<td>Output frequency range</td>
</tr>
<tr>
<td>Regenerative braking torque (Maximum allowable duty)</td>
</tr>
<tr>
<td>Starting torque</td>
</tr>
</tbody>
</table>
Low Voltage Circuit Breakers | Mitsubishi WS-V Series Molded Case Circuit Breakers, Earth Leakage Circuit Breakers

Technologies based on long year experience realize more improved performance.
- The new electronic circuit breakers can display various measurement items.
- Improvement of breaking performance with new breaking technology “Expanded ISTAC”.
- Compliance with global standard for panel and machine export.
- Commoditization of internal accessories for shorter delivery time and stock reduction.

Product Specifications:

<table>
<thead>
<tr>
<th>Frame</th>
<th>32-250A Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable standard</td>
<td>Applicable to IEC, GB, UL, CSA, JIS and etc.</td>
</tr>
<tr>
<td>Expansion of UL listed product line-up</td>
<td>New line-up of 480VAC type with high breaking performance for SCCR requirement</td>
</tr>
<tr>
<td>Commoditization of internal accessories</td>
<td>Reduction of internal accessory types from 3 to 1</td>
</tr>
<tr>
<td>Commoditization for AC and DC circuit use</td>
<td>Common use of 32/63A frame in both AC and DC circuit</td>
</tr>
<tr>
<td>Compact size for easy to use</td>
<td>Thermal adjustable and electronic circuit breakers are same size as 250AF fixed type</td>
</tr>
<tr>
<td>Measuring Display Unit (MDU) breakers</td>
<td>MDU breakers measure, display and transmit energy date to realize energy management</td>
</tr>
</tbody>
</table>

Magnetic Starter | MS-T Series

Exceed your expectations.
- 10A frame model is over 16% smaller with a width of just 36mm!!
- New integrated terminal covers.
- Reduce your coil inventory by up to 50%.
- Be certified to the highest international levels while work is ongoing to gain other country.

Product specifications

<table>
<thead>
<tr>
<th>Frame</th>
<th>10 A to 32 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable standards</td>
<td>Certification to various standards including IEC, JIS, CE, UL, TÜV, CCC.</td>
</tr>
<tr>
<td>Terminal cover</td>
<td>Standard terminal cover improves safety, simplifies ordering, and reduces inventory, etc.</td>
</tr>
<tr>
<td>Improved wiring</td>
<td>Wiring and operability are improved with streamlining wiring terminal BC specifications</td>
</tr>
<tr>
<td>Operation coil rating</td>
<td>Wider range of operation coil ratings reduces number of coil types from 14 (N Series) to 7 types and simplifies selection</td>
</tr>
<tr>
<td>Option units</td>
<td>Diverse lineup includes Auxiliary Contact Block, Operation Coil Surge Absorber Unit, Mechanical Interlock Unit</td>
</tr>
</tbody>
</table>

Robot | MELFA F Series

High speed, high precision and high reliability industrial robot
- Compact body and slim arm design, allowing operating area to be expanded and load capacity increased.
- The fastest in its class using high performance motors and unique driver control technology.
- Improved flexibility for robot layout design considerations.
- Optimal motor control tuning set automatically based on operating position, posture, and load conditions.

Product Specifications

<table>
<thead>
<tr>
<th>Degrees of freedom</th>
<th>Vertical:6  Horizontal:4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation</td>
<td>Vertical: Floor-mount, ceiling mount, wall mount (Range of motion for J1 is limited)  Horizontal: Floor-mount</td>
</tr>
<tr>
<td>Maximum load capacity</td>
<td>Vertical: 2-20kg  Horizontal: 3-20kg</td>
</tr>
<tr>
<td>Maximum reach radius</td>
<td>Vertical: 504-1500mm  Horizontal: 350-1,000mm</td>
</tr>
</tbody>
</table>
**FA Products**

**CNC | Mitsubishi CNC M700V Series**

High-grade model equipped with advanced complete nano control
- Achieve complete nano control with the latest RISC-CPU and high-speed optical servo network.
- Realize super-high grade processing by combining the complete nano control, state-of-the-art SSS control and OMR control, etc.
- Display of essential information of grouped on three screens to greatly reduce processing setup time with easy operability.
- The M700VW Series with WindowsXP and M700VS Series with integrated control unit and display type are available.

**Product Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of control axis (x axes + spindle + PLC axes)</td>
<td>16 axes (M720VW/M720VS have 12 axes)</td>
</tr>
<tr>
<td>Maximum number of part systems</td>
<td>Machining center system: 2 systems, Lathe system: 4 systems</td>
</tr>
<tr>
<td>Least command increment</td>
<td>1 mm (M720VW/M720VS 0.1 μm)</td>
</tr>
<tr>
<td>Least control increment</td>
<td>1 mm</td>
</tr>
<tr>
<td>Maximum program capacity</td>
<td>2,000KB (5,120m)</td>
</tr>
<tr>
<td>Maximum PLC program capacity</td>
<td>128,000 steps</td>
</tr>
<tr>
<td>Main functions (for machining center)</td>
<td>Simultaneous 5-axis machining, SSS control, high-speed high-accuracy control, tool nose point control, tilt plane machining, etc.</td>
</tr>
<tr>
<td>Main functions (for lathe)</td>
<td>Milling interpolator, 2-axis simultaneous thread cutting, intersect system control axis synchronization, control axis perpendicular, combination control, etc.</td>
</tr>
</tbody>
</table>

**Three-Phase Motor | High Performance Energy-Saving Motor | Super Line Premium Series | SF-PR**

Premium Efficiency & Compatible. New Launch of Super Line Premium Series SF-PR Model
- Compared to general efficiency motor SF-JR model, generated loss is reduced by 37% on average, and it is compatible with highly efficient premium IE3.
- Easy replacement is achieved as mounting dimension (frame number) is compatible with general efficiency motor SF-JR model.
- One motor can accommodate different power sources of Japan and the U.S. These ratings in Japan meet the Top Runner standards, while it corresponds to EISA in the U.S.
- Can be driven by inverters as standard. Advanced magnetic-flux vector control by our FR-A800 achieves steady torque drive up to 0.5Hz.

**Product Specifications**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of poles</td>
<td>2-poles, 4-poles, 6-poles</td>
</tr>
<tr>
<td>Voltage-Frequency</td>
<td>200/200/220/230V 50/60/60Hz EISA 230V 60Hz or 400/440/480V 50/60/60Hz EISA 480V 60Hz</td>
</tr>
<tr>
<td>Exterior</td>
<td>Totally enclosed fan cooled type (inside, outside installation)</td>
</tr>
<tr>
<td>Protection system</td>
<td>IP-44</td>
</tr>
<tr>
<td>Electrically-driven power system</td>
<td>Motor with 2-poles over 11kW is dedicated for a direct connection. Motors with 4-poles and 6-poles are for both direct and crossed belt connections.</td>
</tr>
<tr>
<td>Rotation direction</td>
<td>Counter-clock-wise (CCW) direction viewed from the edge of axis</td>
</tr>
<tr>
<td>Compatible standard</td>
<td>JEC-2137-2000 (Efficiency is compatible with IEC 60034-30.)</td>
</tr>
</tbody>
</table>
## 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.

### [Limitation]

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 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, electrolytic capacitor, 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.**

   Whether under or after the term of warranty, we assume no responsibility for any damages arisen from causes for which we are not responsible, any losses of opportunity and/or profit incurred by you due to a failure of the Product, any damages, secondary damages or compensation for accidents arisen under a specific circumstance that are foreseen or unforeseen by our company, any damages to products other than the Product, and also compensation for any replacement work, readjustment, start-up test run of local machines and the Product and any other operations conducted by you.

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 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.

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Intel, Pentium and Celeron are registered trademarks of Intel Corporation.

PCI Express® is US registered trademark and/or a service mark of PCI-SIG.

VxWorks and Wind River Workbench are registered trademarks of Wind River Systems, Inc. in the United States.

C++Builder® is a trademark or a registered trademark of Embarcadero Technologies, Inc.

Lineo uLinux ELITE is a trademark of Lineo Solutions, Inc.

INtime® is a registered trademark of TenAsys® Corporation.

All other company names and product names used in this document are trademarks or registered trademarks of their respective companies.
Warranty

Limitations

This limited warranty applies only when the condition, method, environment, etc. of use are in compliance with the terms and conditions of the failure.

However, it will not be charged if we are responsible for the cause of failure, and no compensation for accidents arisen under a specific circumstance that may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced.

(i) a failure caused by your improper storing or handling, on you in the following cases;

(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 hardware or software problem is caused by an unforeseeable cause with a safety device required by applicable laws and has any accidents, including without limitation fire and abnormal ventilation, readjustment, start-up test run of local machines and the Product maintenance.

(iv) a failure which may be regarded as avoidable if consumable parts designated in the instruction manual, etc. are duly maintained and replaced.

(v) a failure caused by external factors such as inevitable limitation earthquake, lightning and natural disasters.

(vi) a failure caused by scientific technology that was not available at the time of the production of the product is discontinued. The shipment of the Product from our company may be changed without notice.

(vii) a failure generated by an unforeseeable cause with a condition, method, environment, etc. of use are in compliance with the terms and conditions of the failure.

(viii) any on-site readjustment and/or trial run that may be required after a customer in Japan or overseas countries. We are not responsible for the repair of the Product or our service provider. However, we will charge the actual cost due to causes for which we are not responsible for or which may be changed without notice.

This limited warranty is valid for thirty-six (36) months after the date of manufacture whichever comes first. After the term of warranty, the repair cost will be charged.

We will repair any failure or defect (hereinafter referred to as “failure”) in any FA equipment (hereinafter referred to as the “Product”) arisen in our FA equipment (hereinafter referred to as the “Product”).

We will not be held liable for any damages, including but not limited to direct, indirect, incidental, consequential or punitive damages, arising from the use of the Product.

3. Service in overseas

Our regional FA Center in overseas countries will accept the repair of the Product; however, the terms and conditions of the repair work, readjustment, start-up test run of local machines and the Product will be different from those in Japan.

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

The purpose of this warranty is to limit your legal liability to us in connection with the sale of the Product and does not affect any rights you may have against third parties. We do not warrant the Product in any manner other than the warranty provided herein. We do not warrant any quality or performance of the Product for any specific application. Please contact us for consultation.

5. Change of Product specifications

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

6. Application and use of the Product

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 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.

Applications, if you agree not to require a specific quality for a general purpose product for use at general industries.

Specific application. Please contact us for consultation.

Please note that the Product (including its spare parts) cannot be seen in our Sales & Service, etc.
C Controller/Personal Computer Embedded Type Servo System Controllers

void sample()
{
PNT_DATA_EX PntData[2] =
{
{1000, 200, 20, 100, 0, 0, {0}, {0}, 0, {0},
{0, 200, 20, 100, ... axnum, start_pnt, end_pnt);
ans = sscWaitIntDriveFin( board_id, channel, axnum, SSC_FIN_TYPE_SMZ, &fin_status, 0 );
}

{0, 200, 20, 100, 0, 0, {0}, {0}, 0, {0},
{1000, 200, 20, 100, 0, 0, {0}, {0}, 0, {0},
{0, 200, 20, 100, ... axnum, start_pnt, end_pnt)};
ans = sscSetPointDataEx( board_id, channel, axnum, &PntData[0] );
}

Position Board

for controlling MELSERVO-J4

Embedded in a personal computer for controlling MELSERVO-J4