OMRON

Programmable Controller

SYSMAC CJ-series

Motion Control Unit

CJ1W-MCH71

OPERATION MANUAL

Man. No. W435-E1-1

1

Features and System Configuration

1-1 Features

Overview

The CJ1W-MCH71 model is a CJ-series Motion Control Unit that can control thirty axes. An internal motion language programming is mounted, so that it can perform the advanced motion control operations.

1. Position Control

*Point-to-Point Control: With point-to-point (PTP) control, positioning is controlled independently for each axis. The pathway varies according to the travel distances, the feed rates, and so on.

*Continuous Path Control: With continuous path (CP) control, not only the start position and target position are controlled but also the path between those points. Functions such as linear interpolation, circular interpolation, helical circular interpolation, and traverse can be performed.

2.Speed Control: It makes the motor run at the specified speed, it also specifies the rate of speed change.

3.Torque Control: It generates specified Torque and specifies the rate of Torque change.

4.Synchronous Control

*Electronic Shaft: Functions the same as for the rolls connected to the gearbox with a gearshift.

*Electronic Cam: Functions the same as for the Machine CAM.

The MC Unit has been developed for use in simple positioning applications using servomotors. Applicable machines are as follows:

- Conveyor Systems: X/Y tables, palletizers/depalletizers, loaders/unloaders, etc. (Palletizers and depalletizers are devices used for loading goods onto pallets or for unloading them from pallets. Loaders and unloaders are devices that have shelves corresponding with the steps of a multi-step press and used for inserting or removing all the materials at one time.)
- Assembling Systems: Simple robots (including orthogonal robots), simple automated assembling machines (such as coil winding, polishing, hole punching),etc.

Note

The MC Unit is not designed to perform the interpolation movement like a linear interpolation, a circular interpolation, or a helical circular interpolation with horizontal articulated robots or cylindrical robots, because it does not support coordinate conversions (cylindrical coordinate rotation function). The MC Unit can, however, perform PTP control with these robots.

Features

Simple System Architecture

• Independent control of multiple axes (Up to 30 physical axes; including virtual axes total is 32)
• Each axis can be set as either a physical or virtual axis.
• Additional unit is not required.

Easiest Information Management

• High-speed channel with servo driver enables parameters' setting of servo driver, status monitoring. These functions are possible from computer support tool or PT.
• Backup using Memory Card in CPU Unit.

Various motion controls ~Distributed control system ~

• Besides CPU Unit of PLC, executes motion program for motion control.
• Regarding to motion task, up to 8 motion programs can be simultaneously executed. In each of these 8 programs, programs can be executed in parallel.

High-speed and flexibility

• It is possible to realize variety of applications because of its availability for Synchronous Controls (Electric Shaft, Electronic cam, Trailing Synchronization), Speed Control, Torque Control, and Position Control.
• The minimum length of servo communication cycle is 1**ms**.
• It is possible to switch position, speed, and Torque command during axis movement (there are few restrictions).
•The accurate controls of MC Unit and Servo driver or dispersion module are possible conducting a completely synchronized processing at fixed intervals.

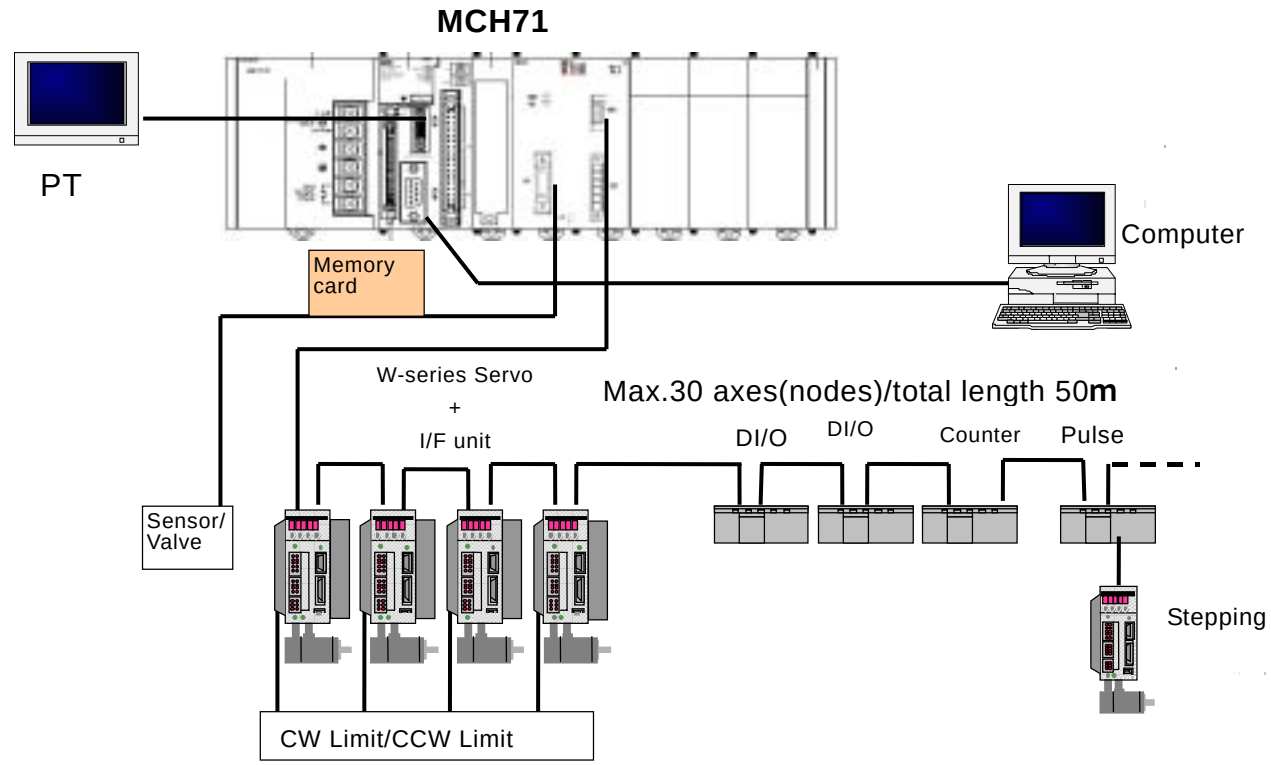
Combination of basic functions makes variety of synchronizations possible

- Electronic Shaft function
- Electronic cam function (Time, position)
- Virtual axis function
- Axis movement function for superimposed axis, ADDAX
- Resist function (with present position hardware latch and window function).
- Electronic link operation
- Trailing synchronization
- Target position change function
- Speed command
- Torque command
- Time-fixed positioning

1-2 System Configuration

System Configuration Example

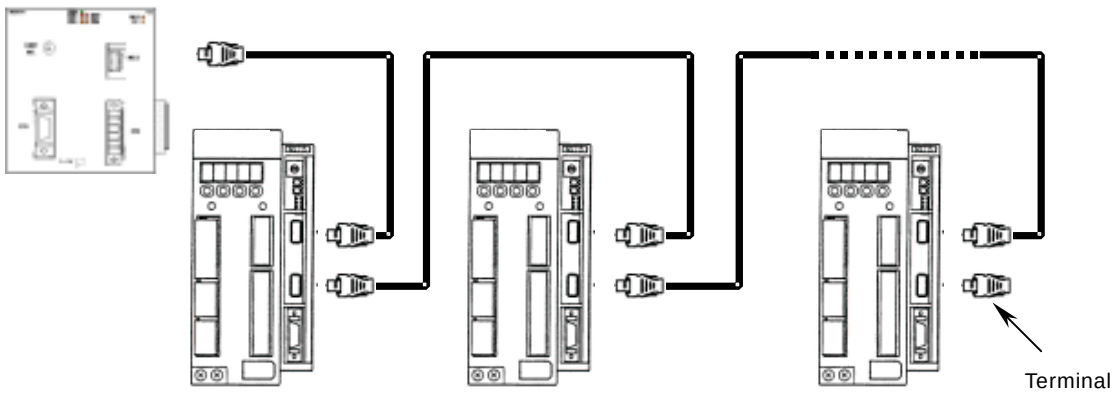
The MC Unit is adopted a high-speed communication pathway to simplify its wiring. It makes it possible to have up to 30 axes for controls.



* The MECHATROLINK is registered trademark of YASKAWA ELECTRIC CORPORATION.
* W-series servo driver requires YASKAWA MECHATROLINK-II I/F unit model JUSP-NS115.
* Each of the products of the following version can be used. The version name is identified on the nameplates of each product.

  W-series servo driver : VER.39 or Later
  I/F unit : VER ***03 Later, or Equal
* When MECHATROLINK-II devices are connected up to 16 nodes (within 30m) or 15 nodes (within 50m), a repeater unit is not required. A repeater unit is required to connect MECHATROLINK-II devices more than the cases above.

* Attach a terminator to the termination slave of MECHATROLINK devices.



Peripheral Devices (Models and Specifications)

Support Tool

Name	Cat. No.	Specification Overview
Support Tool for Motion Control Unit MC-Miel for MCH	SBCE-023C	Support Tool for computers Japanese version
Support Tool for Motion Control Unit MC-Miel for MCH	1809-E1-03	Support tool for computers English version

* When ordering support tools, please contact our sales representatives indicating the Cat. No.

MECHATROLINK-II Devices and Cables

Name	YASKAWA Model	OMRON Model	Specification Overview
MECHATROLINK-II I/F Unit	JUSP-NS115	FNY-NS115	For **W** -series servo driver
DC24V I/O Module	JEPMC-IO2310	FNY-IO2310	Input: 64 Output: 64
Counter Module	JEPMC-PL2900	FNY-PL2900	Reversing Counter 2CH
Pulse Output module	JEPMC-PL2910	FNY-PL2910	Pulse Positioning
MECHATROLINK-II Cables for W-Series (With USB connectors and Ring Core)	JEPMC-W6003-A5	FNY-W6003-A5	0.5m
	JEPMC-W6003-01	FNY-W6003-01	1.0m
	JEPMC-W6003-03	FNY-W6003-03	3.0m
	JEPMC-W6003-05	FNY-W6003-05	5.0m
	JEPMC-W6003-10	FNY-W6003-10	10.0m
	JEPMC-W6003-20	FNY-W6003-20	20.0m
	JEPMC-W6003-30	FNY-W6003-30	30.0m
Terminating resistance for MECHATROLINK-II	JEPMC-W6022	FNY-W6022	Terminating resistance
Repeater for MECHATROLINK-II	JEPMC-REP2000	FNY-REP2000	Repeater

Note) MECHATROLINK-related products are manufactured by YASKAWA ELECTRIC CORPORATION.
We, OMRON, can take orders for them. When ordering them through OMRON, follow OMRON's ordering format. (The delivered products will be of YASKAWA BRAND.)
Ask our sales representatives about the price at when ordering them through OMRON.

1-3 Basic Operations

Applicable Machines

The MC Unit was developed for the purpose of motion control using servomotors.
Even though it depends on the machine accuracy, use an encoder, which is capable to detect 5-10 times more accurate than the machine accuracy.

Applicable machines

1.Assembling Systems

Simple robots, package machinery (horizontal type forming and vertical type forming), filling machine, grinder, drilling machinery, simple automated assembling machines, etc.

2.Conveyor Systems

XY tables, palletizers/depalletizers, loaders/unloaders, etc.

Note The MC Unit is not designed to perform linear interpolation, circular interpolation, or helical circular interpolation with horizontal articulated robots or cylindrical robots, because it does not support coordinate conversions. The MC Unit can, however, perform PTP control with these robots.

Position Control

The MC Unit offers the following three types of motion control:

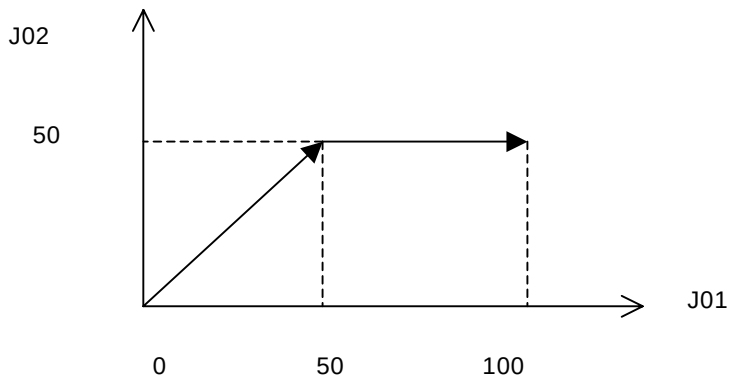
PTP Control
CP Control (linear interpolation and circular interpolation)
Interrupt Feeding

Control programs are created in the Motion language.

PTP Control PTP control is used to control each axis (J01 and J02 axis) independently. Positioning time depends on the travel distance and speed of each axis.

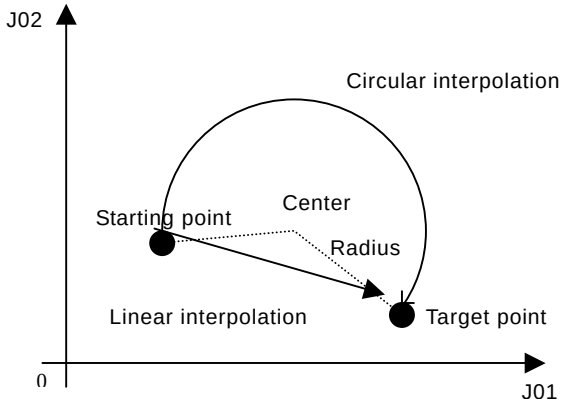
Example: Moving from the origin to the J01-axis coordinate of 100 and J02-axis coordinate of 50 at the same speed.

Positioning is executed separately for each axis, so travel between the two points is carried out as shown in the diagram below:

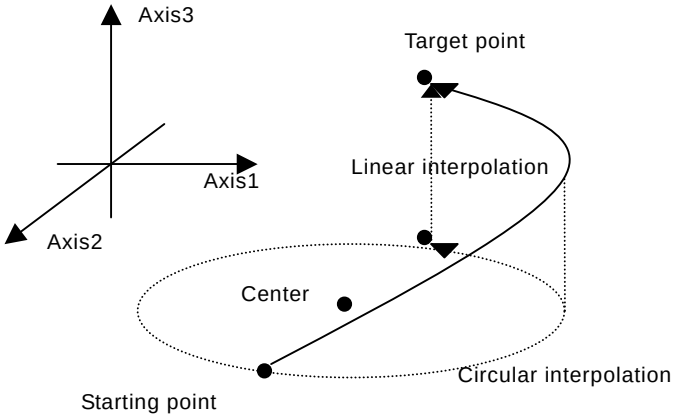


CP Control

CP Control is used to position by designing not only the starting point and the target point, but also the path between these two points. Both linear interpolation and circular interpolation are possible.

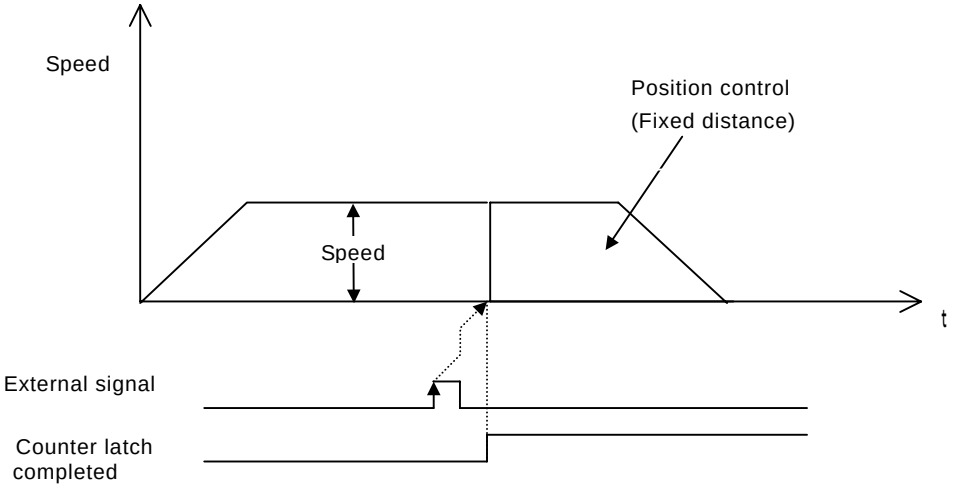


If [axis name 3] is added, helical interpolation is added to the linear interpolation.
(The linear interpolation portion for multiple revolutions specifies the total travel distance.)



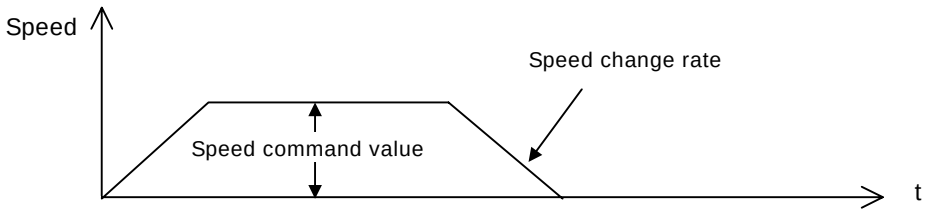
Interrupt Feeding

Interrupt feeding is used to perform position control for a fixed distance when the external signal is input.
Positioning with no interrupt signal is also possible.



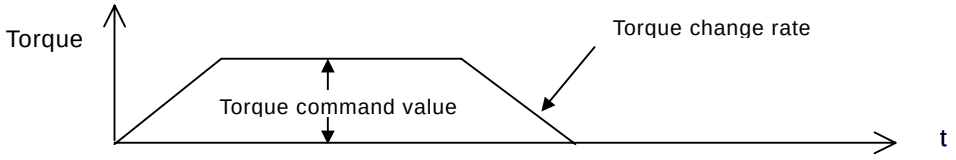
Speed Control

Make the motor run at a specified speed. It is also possible to specify the speed change rate.



Torque Control

The designated torque can be generated. It is also possible to specify the torque change rate.



Synchronous Control

Listed below are the synchronous controls of this unit.

- Electronic Shaft
- Electronic cam
- Linking motions
- Trailing synchronization
- Super position control

Each of above controls is programmed by motion language.

Electronic Shaft

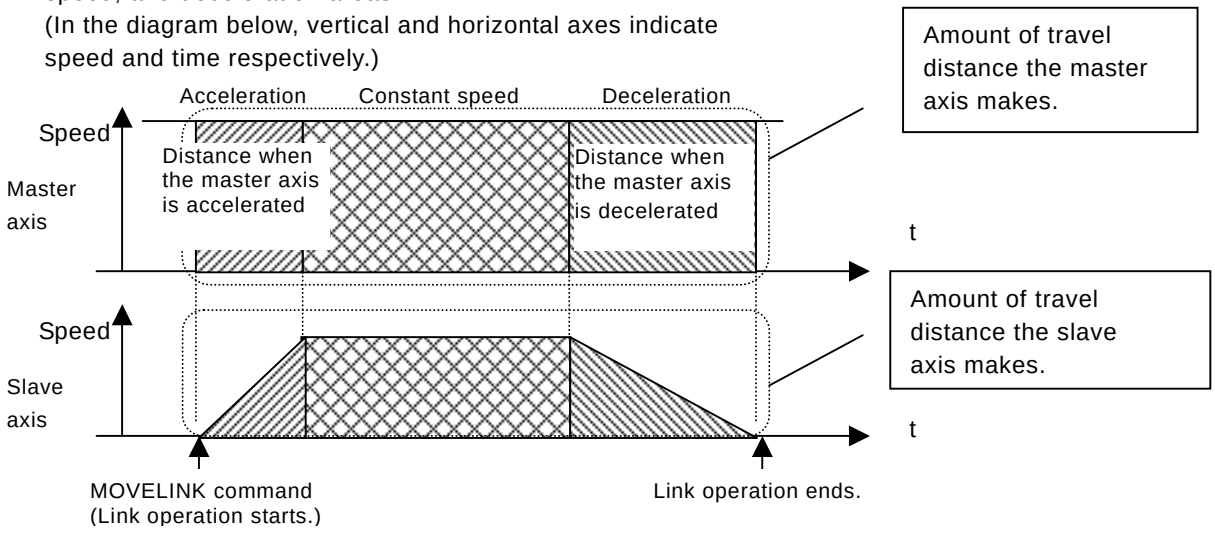
This function can be used like rolls connected to gearbox with gearshift
The slave axis synchronizes with the master axis at a specified ratio.

Electronic cam

This function can be used like the cam mechanism of a machine.
The slave axis synchronizes with the master axis according to the cam table.

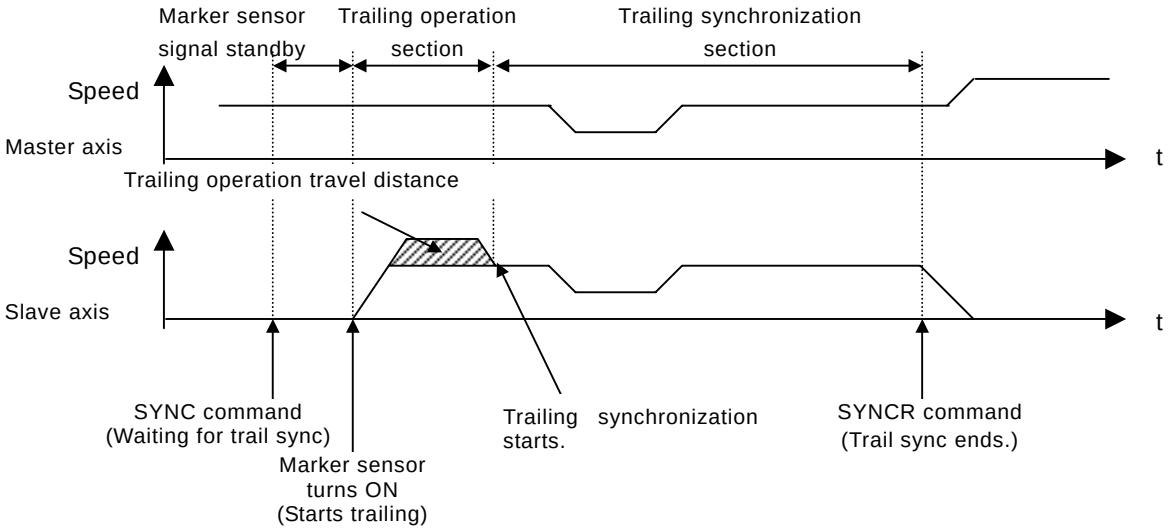
Link operation

This function can be used like the link mechanism of a machine.
The slave axis synchronizes with the master axis following the specified acceleration, constant speed, and deceleration areas.
(In the diagram below, vertical and horizontal axes indicate speed and time respectively.)



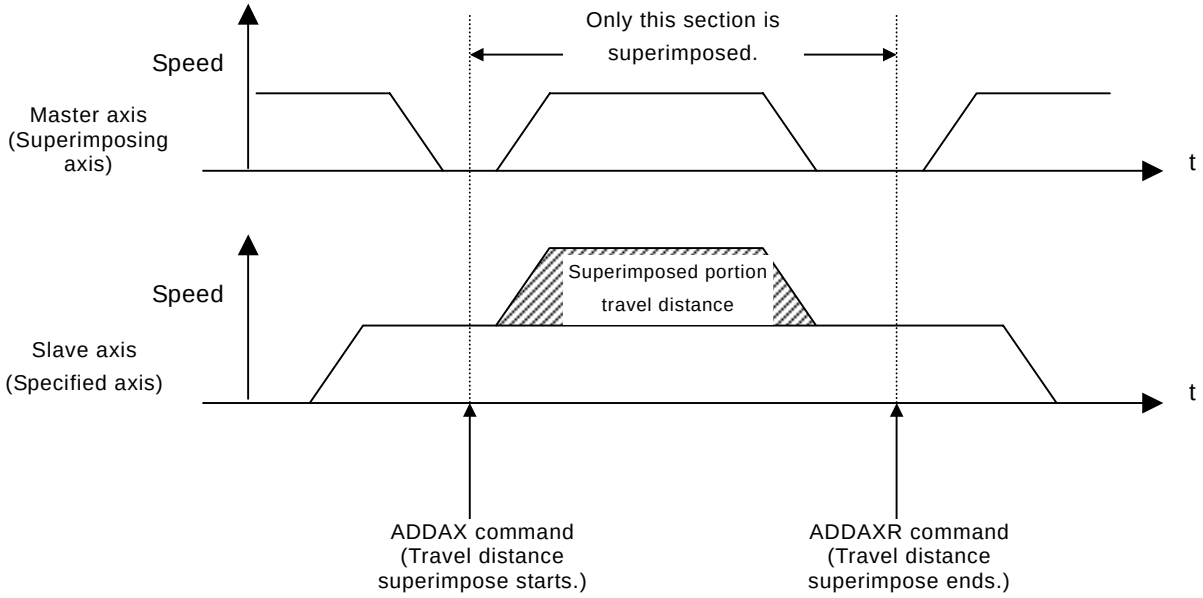
Trailing Synchronization

Trailing is started when the slave axis is standing by and the marker sensor is turned ON. Once it catches up with the master axis, synchronous operation is initiated.



Travel Distance Superimpose

The travel distance of the master axis is superimposed on the slave axis.
This function can be used like the differential gear of a machine.



Other Functions

Origin Search

Establishes the origin for a specified axis.

Jogging

Starts and stops a specified axis at a specified speed.

Error Counter Reset

Forcibly resets the error counter to zero and stops axis operation after completing a deceleration command.

Present Position Preset

Changes the present position to specified position data.

Teaching

Obtains the present position to create position data.

Override (Real-time Speed Change)

Changes the speed during PTP, linear interpolation, or circular interpolation operations.

Backlash Correction

Compensates errors caused by faulty meshing in the mechanical system.

Unlimited Feeding

Controls axes such as turntables and conveyors that are fed only in one direction unlimitedly.

Debugging

It is possible to execute just one line of a program through single block operation. It is also possible to run programs without operating the machine system through Machine Lock.

Data Storage

Backups and restores data using PLC memory cards

Arithmetical Operation Command

Performs Simple arithmetic operation, Functions, and Logic Operations.

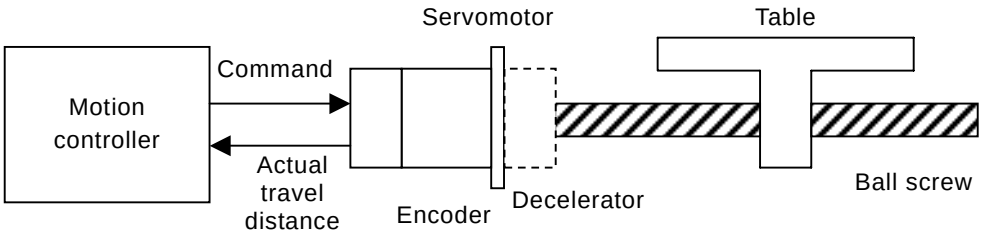
1-4 Control System Configuration and Principles

The servo system used by and the internal operations of the MC Unit are briefly described below.

Control System Configuration

Semi-closed Loop System

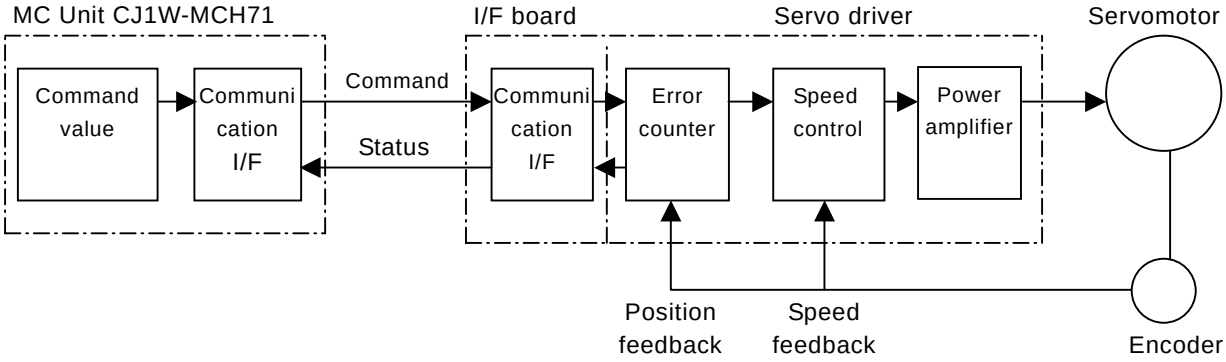
The MC unit uses the servo system called the semi-closed loop system.
This system is designed to detect actual machine travel distance for a command value using rotations of the motor and the detected value is fed back to the MC unit. The unit computes and compensates the error between the command value and actual travel distance to make it zero.



The semi-closed loop system is the mainstream in modern servo systems applied to positioning devices for industrial applications.

Control System Principles

Internal Operations of the MC Unit



Feedback Pulse

Normal rotation/Counter rotation of a motor

Reverse rotation

Forward rotation

(CCW) is the forward rotation and (CW) is the reverse rotation when viewed from the output shaft side of the motor.

1-5 Performance Specifications

General Specifications

Item	Specifications
Model	CJ1W-MCH71
Power supply voltage	DC 5V (from Backplane)
	DC24V (from external power supply)
Voltage fluctuation tolorence	DC4.5-5.5V (from Backplane)
	DC21.6-26.4V (from external power supply)
Internal current consumption	DC5V 0.6A or less
	DC24V 0.3A or less
Weight (Connectors excluded)	210g or less
Dimensions	90 (H) x 79.8 (H) x 65 (D)
Altitude	At 2,000m elevation or lower.

Specifications other than those shown above conform to the general specifications for the SYSMAC CJ series.

Functions and Performance Specifications

Item		Specifications
Model		CJ1W-MCH71
Applicable PLC		CJ-H/CJ1M series Version 2.0 or greater
Type of Unit		CJ series CPU Bus Unit
Mounting		CPU unit or CJ series expansion rack
Method for data transfer with CPU Unit	CIO Area for CPU Bus Unit	Occupies the area for 1 unit (25 words) For units and tasks: 11 to 25 words (Depending on the number of motion tasks)
	DM Area for CPU Bus Unit	Occupies the area for 1 unit (100 words)
		For units and tasks: 32 to 74 words (Depending on the number of motion tasks)
	Custom Bit Area	For axes: 0-64 words (Depending on the greatest number of the axis used)
	Custom Data Area	For axes: 0-128 words (Depending on the greatest number of the axis used)
	Custom Data Area	For General I/O: 0-1280 words (Depending on setting)
Controlled Devices		MECHATROLINK-II below supported W-series Servo Driver (OMRON) + I/F Unit (YASKAWA) Various I/O units (YASKAWA) Up to 30 nodes * When MECHATROLINK-II devices are connected up to 16 nodes (within 30m) or 15 nodes (within 50m), a repeater unit is not required. A repeater unit is required to connect MECHATROLINK-II devices more than the cases described above.
Built-in program language		Dedicated motion control language
Control	Control method	MECHATROLINK-II Position commands, Speed commands, Torque commands
	Number of controlled axes	32 axes max. Physical axes/Virtual axes: 30 axes max. (Either can be selected for each axis) Dedicated for virtual axes: 2 axes
Operating modes		RUN mode, CPU mode, Tool mode/System (Depending on the tool)
Automatic/Manual Mode		Automatic mode: Executing built-in programs of MC Unit controls motion. Manual mode: Executing commands from CPU Unit (PC interface area) controls motion. Note: The Automatic or Manual Mode is set according to the PC Interface area of the CPU Unit.
Control unit	Minimum setting unit	1, 0.1, 0.01, 0.001, 0.0001
	Units	mm, inch, deg, pulse

Item		Specifications
Maximum position command value		–2147483648 to 2147483647 pulses (signed 32-bit) Mode for unlimited axes feeding is possible. Example: With 16-bit encoder (65536 pulse/rev), Minimum setting unit: 0.001mm, 10mm/rev, the position command value range will be from –327679999 to 327679999 command units.
Control operations based on commands from the CPU Unit	Servo lock/unlock	Executes Servo driver lock or unlock
	Jogging	Executes continuous feeding independently for each axis, by means of speed set in system parameter x override.
	STEP operation	Feeds a specified distance for a specified axis.
	Origin search	Defines the machines origin according to the search method set in the system parameters.
	Forced origin	Forcibly sets the present position to 0 to establish it as the origin.
	Absolute origin setting	Sets the origin when an absolute encoder is used. Offset value: Signed 32-bit (pulses)
	Error counter reset	Forcibly resets the error counter to 0.
	Machine lock	Prohibits the output of motion commands to the axes.
	Single block	Executes the motion program one block at a time.
	Auto/manual change	Switches between auto mode and manual mode.
Control Operations according to motion program	Positioning (PTP)	Executes positioning independently for each axis at the speed set in the system parameters. Simultaneous specification: 8 axes max. /block Simultaneous execution: 32 blocks max. /unit
	Linear interpolation	Executes linear interpolation for up to 8 axes simultaneously at the specified interpolation speed. Simultaneous specification: 8 axes max. /block Simultaneous execution: 32 blocks max. /system
	Circular interpolation	Executes clockwise or counterclockwise circular interpolation for two axes at their specified interpolation speed. Simultaneous specification: 2 or 3 axes/block Simultaneous execution: 16 blocks max. /system
	Origin search	Defines the machine origin according to the search method set in the system parameters. An offset can be specified for the position after the origin search. The absolute encoder can also execute origin search.
	Interrupt feeding	By means of inputs to the servo driver, moves a specified axis for a specified travel distance to perform positioning.
	Time-specified Positioning	Executes positioning with time specified.
	Traverse function	Performs winding operation (traverse control) with two specified axes.
	Electronic Cam, Single Axis	Execute cam operation according to the specified cam table data with reference to elapse of time.
	Synchronous Electronic cam	Executes cam operation according to the specified cam table data with reference to the position of the specified axis.
	Link operation	Executes link operation according to set conditions with reference to the position of the specified axis.
	Electronic Shaft	Executes synchronous operation at a speed calculated with the speed of the specified axis and gear ratio.
	Trailing synchronous operation	Executes trailing + synchronous operations with reference to the position of the specified axis.
	Speed command	Outputs speed commands to the specified axis.
	Torque command	Outputs torque commands to the specified axis.
Acceleration /deceleration curve		Trapezoidal or S-shape
Acceleration/ deceleration time	Acceleration/ deceleration time	60000ms max.
	S-shape time constant	30000ms max.
External I/O	For high-speed servo communication bus	One port for MECHATROLINK-II
	Servo encoder	Incremental rotary encoder Absolute rotary encoder (Unlimited length ABS supported with some conditions)
	I/O	Deceleration stop input: 1pt General input: 2pts General output: 2pts
	External power supply for I/O	24V

Item		Specifications
Feed rate	Rapid feed rate	1 to 2147483647 [Command unit/min]
	Interpolation feed rate	1 to 2147483647 [Command unit/min]
	Override	Changes the operation speed by applying a given factor to the speed specified by the system parameters or the motion program. 0.00 to 327.67% (Setting unit: 0.01%, can be specified for each axis or task)
Axis control	Backlash compensation	Compensates mechanical backlash (the mechanical play between driving and driven axes) with a value registered in advance. This function uses a parameter in the servo driver.
	In-position	This function is used whether a positioning is completed or not. This function uses a parameter in the servo driver.
	Position loop gain	This is the position loop gain of the servo driver. This function uses a parameter in the servo driver.
	Feed forward gain	The command values created in the MC Unit are multiplied by this feed forward gain. This function uses a parameter in the MC Unit.
Program	Number of tasks	Motion task: 8 tasks max.
	Parallel branching in task	Motion task: 8 branches max.
	Number of programs	256 programs max. /unit The program Nos. used for programs are from 0000 to 0999.
	Program numbers	0000 to 0499: Main programs for motion tasks 0500 to 0999: Sub-programs for motion tasks
	Program capacity	2 Mbytes 8000 blocks max. /unit by motion program conversion.
	Number of blocks	800 blocks/program
	Position data capacity	10240 points/unit
	Sub-program nesting	5 levels max.
	Start	Starts program operation from program (of another task)
	Start mode	Motion task: Initial, continue, next
	Deceleration stop	Motion task: Executes deceleration stop regardless of block
	Block stop	Motion task: Executes deceleration stop at the end of the block currently being executed.
	Single-block mode	Motion task: the program is executed one block at a time.
Saving program data	MC Unit	Flash memory backup
Self-diagnostic function		Watchdog, FLASH-ROM check, RAM check, etc.
Error detection function		Deceleration stop input, unit number error, CPU Unit error, software limit over errors, etc.
Error log function		The error log is to be read from the CPU Unit by means of the IORD instructions as needed.
Alarm reset		Alarm reset

Note:

1. To determine the number of MC Units that can be mounted under one CPU Unit, examine the followings:
   - Maximum number of CPU Bus Units that can be allocated words in the CPU Unit being used
   - The capacity of the power supply unit used for each rack (CPU Unit and Expansion Rack) and the current consumption of the units mounted on the racks. (Refer to the CPU Unit's operation manual for details on calculation methods.)
   - CJ1W-MCH71 occupies 3 units space. So, the number of CJ1W-MCH in 1 CPU Unit is up to 3 units.
2. The user must prepare the required power supply.
3. The service life for the flash memory is 100,000 writing operations.

The maximum command values and software limit values will be as shown in the following table corresponding to the position command decimal point position.

Position command decimal point (Setting value for P5AA02)	Setting ranges
1 (0)	-2147483648 to 2147483647
0.1 (1)	-214748364.8 to 214748364.7
0.01 (2)	-21474836.48 to 21474836.47
0.001 (3)	-2147483.648 to 2147483.647
0.0001 (4)	-214748.3648 to 214748.3647

The actual ranges that can be set may be smaller than those shown above depending on the pulse rate. The setting values must satisfy the following conditions:

•With INC Specification:

Minimum value: -2147483648
Maximum value: 2147483647

•With Limited Length Axis ABS Specification:

Minimum value: -(P5AA04 x P5AA06 x 2147483647)/(Encoder resolution x P5AA05)
Maximum value: (P5AA04 x P5AA06 x 2147483647)/(Encoder resolution x P5AA05)

•With Unlimited Length Axis ABS Specification:

Minimum value: -(P5AA04 - 1)
Maximum value: P5AA04 - 1

P5AA04: Command unit/1 machine rotation
P5AA05: Gear ratio 1 (Motor rotation speed)
P5AA06: Gear ratio 2 (Machine rotation speed)

Example: With Limited length axis ABS specification, 1mm/rev, 16384 pulses/rev with multiplication factor, and Minimum setting unit: 0.0001mm;
The value will be from -131072000 to 131071999.
Additionally, the present positions that can be displayed on support tools are to be within the range described in the above table.

The basic concept for immediate value:
There are integer and decimal immediate values; the applicable numeric value range for the MC Unit is shown below:

Integer: Numeric value without decimal point
Minimum value: -2147483648
Maximum value: 2147483647

Decimal: Numeric value with decimal point
Minimum value: -2147483648.
Maximum value: 2147483647.
Maximum number of decimals: 30 digits
Maximum number of digits excluding zero: 10 digits
(Negative definite: 2147483648, Positive definite: 2147483647)

<Example> Maximum number of decimals

Number of decimals			.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Negative definite	-	0	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	4	7	4	8	3	6	4	8
Positive definite	+	0	.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	4	7	4	8	3	6	4	7
Maximum number of digits excluding 0	<---------- 10dights---------->																																
Maximum number of decimals	<---------- 30digihts ---------->																																

1-6 Command List

Item		Contents	Page
Operating modes		The following 2 modes are provided: Manual Modes: Operation according to commands from CPU Unit PC interface area. Automatic Mode: Operation according to commands in program.	
Manual mode JOG STEP Origin Search	Jogging	Moves axes continuously by manual operation.	
	Deceleration stop (Axis)	Decelerates manual mode operations (Jogging, STEP, Origin search) and stop.	
	STEP operation	Feeds a specified axis for a specified distance.	
	Manual origin search	Searches for the machine origin (Possible with either Incremental or Absolute encoder)	
	Manual origin return	Moves the axis to the origin in the reference coordinate system.	
	Forced origin	Forcibly sets the present position to 0 to establish it as the origin. (In the absolute encoder system, only the present position of the MC Unit will be set to 0.) Note: To preset the preset position to any given value, IOWR instruction is used.	
	Absolute origin setting	Sets the origin for an absolute encoder.	
Automatic	Positioning (PTP)	Execute positioning independently for each axis at the specified speed or the speed set in the system parameters.	
	Positioning with linear interpolation	Executes linear interpolation at the specified interpolation feed rate for up to 8 axes simultaneously	
	Positioning with circular interpolation	Executes clockwise or counterclockwise 2-axis circular interpolation at the specified interpolation feed rate.	
	Positioning with helical circular interpolation	Executes clockwise or counterclockwise 2-axis circular interpolation and 1-axis linear interpolation (i.e., helical interpolation) at the specified interpolation feed rate.	
	Origin search	Defines the machine origin according to the search method set in the system parameters.	
	Interrupt feeding	Moves a specified axis for a specified distance when a general input is turned ON.	
	Time-specified positioning	Executes positioning to a specified position with time specified.	
	Target position change	Changes target position of an operating axis to a specified position.	
	Traverse	Execute winding (traverse) function.	
	Electronic Shaft function	Executes synchronous operation at a speed calculated with the speed of the specified master axis and a specified gear ratio.	
	Electronic cam (Single axis)	Executes cam operation in a specified time period using a specified cam table.	
	Electronic cam (Synchronous)	Synchronizes the slave axis to the master axis using cam table.	
	Link operation	Synchronizes the slave axis to the master axis with specified acceleration, constant speed, and deceleration areas.	
	Trailing synchronization	Slave axis starts trailing master axis at the rise of marker sensor when standing by. Once it catches up with master, synchronization starts.	
	Travel distance superimpose	Superimposes travel distance of the master axis on the slave axis. It functions like the differential gear.	
	Speed control	Rotates the motor at the specified speed. Speed change rate can also be specified.	
	Torque control	Generates the specified torque. Torque change rate can also be specified.	
	Virtual axis	This is an axis without an actual axis. It is used as a master axis to perform an ideal operation.	
	Counter latch	The present position of an axis can be stored in hardware.	
	Switching to Pass Mode	Changes to Pass Mode, in which operations are executed continuously with no deceleration stop.	
	Dwell timer	Pauses positioning for a specified time.	
	Arithmetic command	Performs arithmetic, function, and logic operations.	
	Program start	Executes a program from the beginning block, resumes a program execution from the block where it was stopped, or resumes a program from the next block to the one where it was stopped.	
	Single block	Executes programs one block at a time.	

Item		Content	Page
	Block stop	Stops program execution at the end of the block being executed.	
Automatic/ Manual mode	Backlash compensation	Compensates mechanical backlash (mechanical play between driving and driven axes) with the value registered in advance. (This is a function of the servo driver.)	
	Error counter reset	Forcibly resets the error counter to 0, and stops axis operation. (Enabled when no speed reference is given to the servo driver)	
	Unlimited feed mode/ Unlimited present position display	Moves the axis with no limit. In this mode, data range for updating the present position can be specified.	
	Present position preset	Changes the present position to the specified position data.	
	Trapezoid/S-curve acceleration and deceleration	Either trapezoid or S-curve acceleration / deceleration can be specified for starting and stopping each axis.	
	Axis alarm reset	Resets alarms occurring on axes.	
	Unit alarm reset	Resets alarms occurring on units.	
	Task alarm reset	Resets alarms occurring on tasks.	
	Teaching	Creates position data for the specified axis.	
	Deceleration stop (Task)	Decelerates each task to a stop.	
	Override	Changes the operating speed by applying a specified percentage to the speed specified in the system parameters or programs.	
	Servo-lock	Establishes the position loop and turns ON the RUN command output to the servo driver,	
	Servo-unlock	Releases the position loop and turns OFF the RUN command output to the servo driver.	
	Machine lock	Updates the position display without moving control axes. This is used for debugging program.	
Data transfer and storage	Data transfer	Transfer data from the CPU to the MC Unit and vice versa in a short period of time using IOWR/IORD instruction in the ladder program.	
	Data link	Custom data can be exchanged during I/O refresh by setting custom I/O area in the words allocated in the DM area of CPU Unit.	
	Saving data	Stores programs, CAM data, parameters, position data, etc. in the MC Unit's flash memory.	
	Backup and restore	Backs up or restores all the data in the MC Unit using the easy backup function of the CPU Unit.	

1-7 Performance

Item		Performance data	Description
Power ON startup time		Approximately (13+0.1xNo. of axes) seconds	Time from turning ON the power until the MC Unit becomes ready to accept manual operation commands.
PLC scan time		Tc	Scan time of the PLC
Unit cycle		Tm	This is the time required to execute a motion task when there is only one motion task. Refer to “Calculation Method for Unit Cycle” (page 1-19).
Communications cycle		Ts	Communications cycle of MECHATROLINK-II. Refer to “Calculation Method for Communications Cycle” (1-19).
Operation startup time		When Tc < Tm: 2Ts+Tm+0.625+Tc~2Ts+Tm+Ts+0.625+Tm+Tm When Tc > Tm: 2Ts+Tm+0.625+Tc~2Ts+Tm+Ts+0.625+Tm+Tc	This is the time from enabling the start signal allocated to the input unit of PLC until the operation command is output to the control loop of the servo driver when there is only one motion task and all the axes are operated simultaneously.
Time lag per axis (Interpolation)		0	Time delay caused when interpolation is performed with one motion task. No delay between axes.
Time lag per axis (Independent operation)		0	Time delay caused when every motion task with one axis is started simultaneously. No delay between axes.
Minimum operation time		Tm	Minimum operation time required to stay in Pass Mode. The same as the Unit Cycle.
Minimum traverse reversal time		Tm	Minimum time required for reversal operation of traverse command. The same as the Unit cycle.
External input response time	Unit Built-in general input	Tm or less	Time from accepting the Unit built-in general input until it is reflected to input variables. It is the same or less than Unit cycle.
	Unit Built-in deceleration stop input	2Ts+Tm+0.625~ 2Ts+Tm+Ts+0.625 +Tm	Time from receiving deceleration stop input until the operation command is output to the control loop of the servo driver
	CW/CCW limit origin proximity input	4Ts+Tm+0.625~ 4Ts+Tm+Ts+0.625 +Tm	Time from when the servo driver recognizes the input until the operation command is output to the control loop of the servo driver.
Synchronization delay	MECHATROLINK slaves	4Ts+Tm+0.625~ 4Ts+Tm+Ts+0.625 +Tm	Time from when the slave recognizes the input until the operation command is output to the control loop of the servo driver.
Counter latch startup time	W + NS115	[(20ms/Tm) x5+5] xTm+Tsx3+4ms ~ [(20ms/Tm) x8+5] xTm+Tsx3+4ms Case of not specifying the starting position or the end position Tmx3+Tsx3+4ms	Time taken by the MC unit to become able to execute the counter latch after issuing a LATCH command. Refer to “Calculation Method of the Counter Latch Startup Time” (page 1-20).

● Processing Cycle of MC Unit

The MC Unit holds Control Cycle for the entire Unit and Communication Control Cycle.
The system software calculates each control cycle, and it operates when “Unit cycle: Communications cycle” is “1:1” or “2:1”.
Calculation methods for each control cycle are as follows:

Calculates the Unit Cycle
Calculates the Communication Cycle
Adjusts and matches the Unit Cycle and Communications Cycle.

● Calculation Method for Unit Cycle

Basic formula for calculating Unit Cycle is shown below:

Unit Cycle [*u*s] = (85 x No. of axes)+(120 x No. of motion tasks x No. of parallel branches)
+ (0.3 x No. of general allocated words) + 200 --- (1)

No. of axes: No. of axes allocated in [P1AA01:Physical axis setting] (Sum of virtual and actual axes)
No. of Motion tasks: P00001 [No. of Motion tasks]
No. of parallel branches: P00002 [No. of parallel branches]
No. of general allocated words: No. of Allocated words to be used as general purpose I/O (Sum of inputs and outputs)

Note for P00003 [Unit Scan time]

When P00003 [Unit Scan time] is greater than the result of the formula (1), the formula (2) below is to be used.

Unit Cycle [*u*s] = P00003 x 1000 ---(2)

Determining Unit Cycle

The Unit Cycle can be determined by rounding up the Unit Cycle [*u*s] that was found by the formula (1) or (2) to 1ms/2ms/3ms/4ms/6ms/8ms.

● Calculation Method for Communications Cycle

Basic formula for calculating Communications Cycle is shown below:

Communications Cycle [*u*s]=
((No. of allocated nodes + No. of C2 Masters (=0) + No. of Retries) x 102.7 + 19.2) x 1.1 ---(3)

No. of Allocated Node: No. of MECHATROLINK-II slaves (only physical axes) allocated in [P1AA01: Physical Axis Setting]
No. of C2 Masters: With or without C2 master set in [P00009: MECHATROLINK No. of retrial nodes setting, With/without C2 master]. This parameter is reserved. Use 0 for calculation.
No. of Retries: No. of retries specified in [P00009: MECHATROLINK No. of retrial nodes setting, With/without C2 master] (= 0-7).

Note for W-series Servo Driver

When a W-series Servo Driver and NS115 communications module are allocated as slaves, Minimum communications cycle of MECHATROLINK-II will be 1ms. If the Communications cycle that was found by the formula (3) was less than 1ms, the formula (4) below is to be used.

Communications cycle [*u*s] = 1000 ---(4)

Determining Communications Cycle

The Communications Cycle can be determined by rounding up the Communications Cycle [*u*s] that was found by the formula (3) or (4) to 1ms/2ms/3ms/4ms.

● Adjusting and Matching Unit Cycle and Communications Cycle

Determine the combination of the Unit Cycle and Communications Cycle using the following table:

Control cycle relations	Adjusting/matching method
Unit Cycle < Communications Cycle	Communications Cycle remains the same, and Unit Cycle is adjusted so that it is the same as Communications Cycle.
Unit Cycle = Communications Cycle	Used as they are.
Unit Cycle > Communications Cycle	When Unit Cycle is 8ms: The Communications Cycle is 4ms. Other cases: When Unit Cycle/Communications Cycle = 2 or less: The Unit Cycle remains the same, and the Communications Cycle will be the half of the Unit Cycle. Besides the above case: The Unit Cycle remains the same, but the Communications Cycle will be the same as the Unit Cycle.

● Calculation Method for the Counter Latch Startup Time

Basic formula for calculating the counter latch startup time is shown below:

Case1) Specifying the starting position or the end position

When Unit Cycle = 1ms or 2ms:
[(20ms/Tm) x 5 + 5] x Tm + Ts x 3 + 4ms ~ [(20ms/Tm) x 6 + 5] x Tm + Ts x 3 + 4ms

When Unit Cycle = 3ms, 4ms, 6ms or 8ms:
[(20ms/Tm) x 7 + 5] x Tm + Ts x 3 + 4ms ~ [(20ms/Tm) x 8 + 5] x Tm + Ts x 3 + 4ms

* Round up the figures below the decimal place of the value found by calculations.

According to the calculation methods above, the counter latch startup time will be as follows:

Unit Cycle = 1ms : Communication Cycle = 1ms	112 ms ~ 132 ms
Unit Cycle = 2ms : Communication Cycle = 1ms	117 ms ~ 137 ms
Unit Cycle = 2ms : Communication Cycle = 2ms	120 ms ~ 140 ms
Unit Cycle = 3ms : Communication Cycle = 3ms	175 ms ~ 196 ms
Unit Cycle = 4ms : Communication Cycle = 2ms	170 ms ~ 190 ms
Unit Cycle = 4ms : Communication Cycle = 4ms	176 ms ~ 196 ms
Unit Cycle = 6ms : Communication Cycle = 3ms	211 ms ~ 235 ms
Unit Cycle = 8ms : Communication Cycle = 4ms	224 ms ~ 248 ms

Case2) Not specifying the starting position or the end position

Tmx3+Tsx3+4ms

Unit Cycle = 1ms : Communication Cycle = 1ms	10 ms
Unit Cycle = 2ms : Communication Cycle = 1ms	13 ms
Unit Cycle = 2ms : Communication Cycle = 2ms	16 ms
Unit Cycle = 3ms : Communication Cycle = 3ms	22 ms
Unit Cycle = 4ms : Communication Cycle = 2ms	22 ms
Unit Cycle = 4ms : Communication Cycle = 4ms	28 ms
Unit Cycle = 6ms : Communication Cycle = 3ms	31 ms
Unit Cycle = 8ms : Communication Cycle = 4ms	40 ms

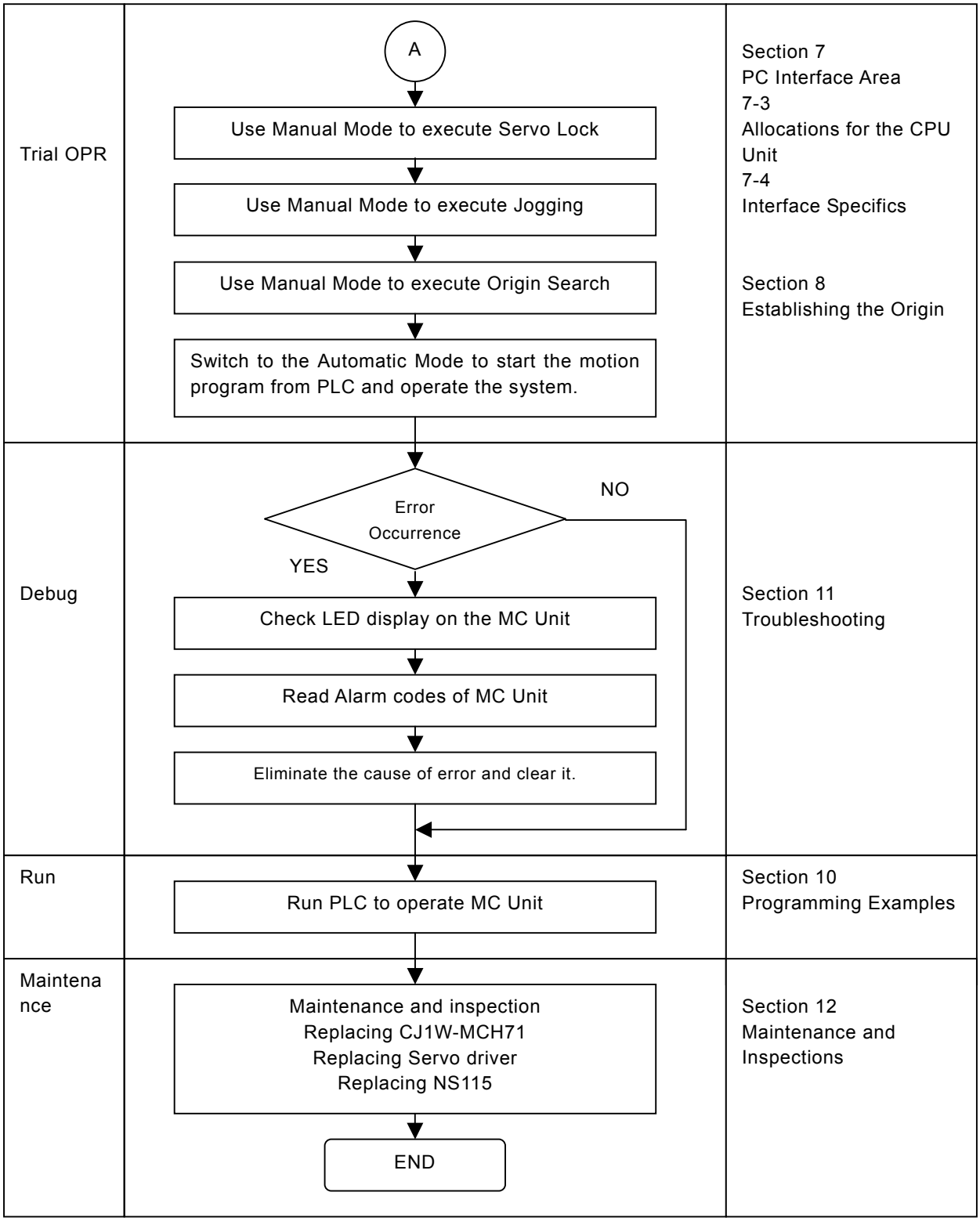
2

Basic Procedures

2-1 Basic Operation Flow

This Section gives an overview of the procedures required to use CJ1W-MCH71.

OPR.	Operation Flow	Reference
Setup	START ↓ Install MC Unit ↓ Set Unit No. for MC Unit ↓ Connect Support Tool/CX-Programmer ↓ Connect MC Unit with External Input Devices ↓ Connect Servo Driver and Servomotor ↓ Connect Servo Driver and MC Unit	Section 3 Installation and Wiring 3-2 Installation 3-1 Nomenclature and Functions 3-4 Wiring
MC Unit Setting	Turn ON the Power to the PLC ↓ Create the I/O Table of PLC ↓ Set MC Unit Allocation Area in PLC DM Area ↓ Power OFF and ON the PLC ↓ Use MC-Miel to set the system parameters, transfer them to MC Unit, and save them to flash memory. ↓ Use MC-Miel to create motion programs and position data. Transfer them to MC Unit and save them to flash memory. ↓ Turn ON the power to the PLC or restart MC Unit to enable settings. ↓ A	Users Manual for CS Series CPU Unit Section 7 PC Interface Area 7-3 Allocations for the CPU Unit Section 4 Unit Internal Data Configuration and Setting 4-2 System Parameters 4-3 Position Data Section 6 Programming



*For details of the procedure, refer to HELP of the Support Tool.

2-2 Overview and Operating Procedure of MC-Miel

This section explains the overview, features, and operating procedure of the support tool, MC-Miel for MCH (MC-Miel hereinafter). MC-Miel helps to set various parameters and data for CJ1W-MCH71.
For detailed information on the performance and operating procedure, refer to MC-Miel Online Help.

■Overview and features

MC-Miel is the software that can help to create various data used on the MC Unit model CJ1W-MCH71, (MC Unit hereinafter) and to monitor the status of the MC Unit. Its features are as follows:

● Supports eight layers of network

Using MC-Miel with OMRON's Communication Unit will enable the communication with the MC Unit over eight layers of network.

● Easy communication settings

When communicating with MC Unit, it is required only to set the network address and communication speed. Setting data length, stop bit, etc. is not necessary.

● Unitary management of data

MC Unit handles various data such as parameters, position data, programs, etc. MC-Miel manages these data unitarily, i.e. on the basis of one file for one MC Unit.

● Possible to edit parameters of servo drivers and motors

With MC-Miel, it is possible to edit not only the parameters of MC Unit, but also the ones related to the servo drivers and motors on the same network.

● Backing up and restoring the data all at once

Easy operation will make the data of MC Unit backed up and restored all at once.

● Tying up with application software on the market

Using "Copy and Paste" of the application on the market (Excel) will make it easy to create the position data and parameters.

■MC-Miel Function List

Overview of the MC-Miel functions is listed below:

Function classification	Function	Description
Basic function	Create	Creates new MCH data. Note: Contents of MCH data are as follows: Parameters, Position data, Programs, and Cam data
	Read	Reads the MCH data stored in external memory device.
	Save	Saves the MCH data that was read or is being edited to external memory device.
	Transfer all at once	Transfers various data in MC Unit to personal computer all at once. Transfers various data in personal computer to MC Unit all at once.
	Print	Prints out parameters, position data, and programs.
	Network setting	Helps various settings to establish communication with MC Unit.
	Help	Explains the operation method of MC-Miel.
	Version display	Displays the version of MC-Miel.
Edit function	Parameter edit	Creates, edits, and transfers parameters.
	Program edit	Creates, edits, and transfers programs.
	Position data edit	Creates, edits, and transfers position data.
	Cam data edit	Creates, edits, and transfers cam data.
	Factory default setting	Brings the dragged portion of MCH data back to its factory default setting.
	Copy and paste	Copies the dragged portion of MCH data to clipboard. Pastes the data in clipboard to the dragged area of MCH data.
MC unit supporting function	Flash memory save	Saves various data in MC unit to F-ROM of MC Unit. Saves parameters of servo driver in MC Unit to EEP-ROM of servo driver.
	Memory initialization	Initializes various data in MC Unit.
	Error log	Displays or initializes error log in MC Unit.
	Device information	Reads information (model, software version) of MC Unit.
Tool function	Present position/alarm monitor	Monitors present position and alarm information of each axis. Monitors program No. being executed by each task.
	Variables monitor/setting	Monitors and sets different types of variables in MC Unit.

■Installing and Uninstalling MC-Miel

● Installing Procedure

1. Start Windows.
2. Insert MC-Miel (CD-ROM) into CD-ROM drive.
3. Installer will start automatically. Follow the instruction on the screen to install.

Installing MC-Miel completed

Note: To see the operating manual
To see the operating manual of MC Unit provided in the CD-ROM, Acrobat Reader is required.

1. Double-click “AcroReader51_ENU.exe” in Acrobat¥Reader to install Adobe Acrobat Reader 5.1.
2. After installation, open the operating manual.

● Uninstalling Procedure

1. Start “add/delete application” following the operation below:
   Select **Start** button →**Setting**→ **Control Panel**.
   Then, start “Add/delete application”.
2. Delete “MC-Miel for MCH” after having found it with search.

Uninstalling MC-Miel completed

■ MC-Miel Operation Flow

When using motion control system (MC System hereinafter), settings for PLC, MC Unit, and Peripherals are required.

The explanation below is provided on the assumption that all the devices required for MC System are prepared. (For details, refer to the MC-Miel Online Help.)

● Operating Procedure

1. Connect a personal computer to PLC with MC Unit not mounted yet.
2. Turn ON the personal computer.
3. Turn ON PLC.
4. Set allocation area in DM area corresponding to the unit No. (UNIT No.) of the MC Unit using CX-programmer or the Programming Console of PLC.
5. Turn OFF PLC.
6. Mount MC Unit on PLC.
7. Set unit No. (UNIT No.) of MC Unit.
8. Connect various peripherals (servo driver, motor, etc.) including the Communication I/F Board to MC Unit.
9. Set Communication I/F Board.
10. Turn ON PLC.
11. Turn ON peripherals.
12. Create I/O table using CX-Programmer or the Programming Console of PLC. When finished creating I/O table, end CX-Programmer or set it Off-line.
13. Start MC-Miel.
14. Set and save parameters that have to be set with MC-Miel.
    - Allocate an axis to MC Unit.
    - After the allocation, save parameters to F-ROM of MC Unit.
    - After saving, turn OFF PLC once, then ON again.
15. Set the initial values of the following parameters and transfer them to MC Unit and servo driver.
    - Set parameters of the servo driver.
    - Set parameters of the motor.
16. After transferring the parameters, save them into F-ROM of MC Unit and EEP-ROM of servo driver.
17. Turn OFF the peripherals including the servo driver once, and then turn OFF PLC.
18. Turn ON PLC, and then turn ON peripherals including the servo driver.
19. Create and edit other parameters and data.
    - Parameters
    - Programs
    - Position data
    - Cam data
20. Transfer and save the parameters and data above to MC Unit and the servo driver.
21. At last, save all the data into the personal computer.
22. End MC-Miel.

[Important]

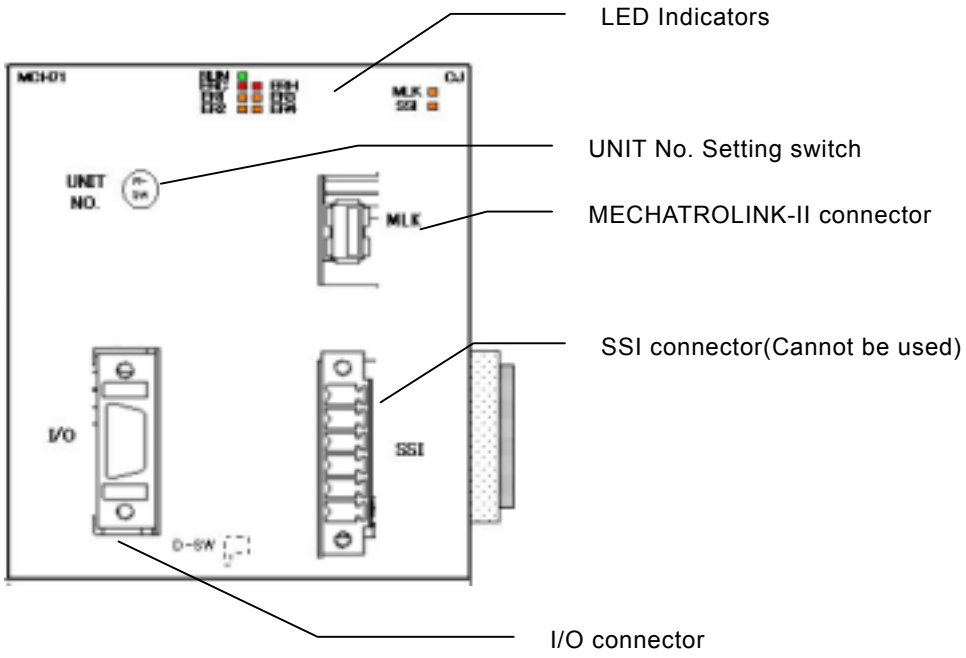
CX-Programmer and MC-Miel cannot use the same communication port at the same time. To use the same communication port, set one Off-line and the other On-line.

3

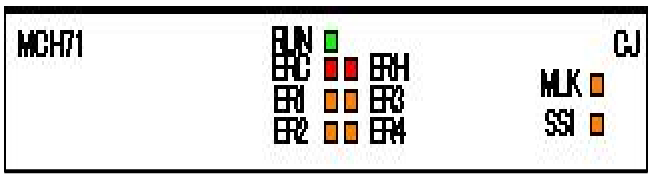
Installation and Wiring

3-1 Nomenclature and Functions

□Nomenclature



□LED Indicators



Name	Color	Status	Content
RUN (RUN)	Green	Lit	Motion Control Unit is operating normally.
		Not lit	Not recognized by PLC, or MC Unit is broken.
ERC (MC Unit Error)	Red	Lit	An error has occurred in the MC Unit.
		Not lit	MC Unit is operating normally.
ERH (CPU Unit Error)	Red	Lit	An error has occurred in the CPU Unit.
		Not lit	CPU Unit is operating normally.
ER1 *1 (Internal error status)	Yellow	Lit	An internal error has occurred.
		Not lit	MC Unit is operating normally.
ER2 *1 (Internal error status)	Yellow	Lit	An internal error has occurred.
		Not lit	MC Unit is operating normally.
ER3 *1 (Internal error status)	Yellow	Lit	An internal error has occurred.
		Not lit	MC Unit is operating normally.
ER4 *1 (Internal error status)	Yellow	Lit	An internal error has occurred.
		Not lit	MC Unit is operating normally.
SSI	Yellow	Lit	Not used.
		Not lit	Not used.
MLK (MECHATROLINK-II)	Yellow	Lit	MLK is operating normally.
		Not lit	An error has occurred in the MLK.

*1: When the ERC or ERH indicator is lit, these four indicators show the internal error status.

□Unit Number Setting Switch

Several MC Units can be mounted on one CJ series PLC.
It is necessary to set the unit numbers to identify these units when several MC or CPU Bus Units are mounted.

The rotary switch located on the forehead of MC Unit can set the unit numbers.

(Examples)

Unit Number: 6

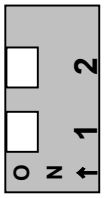
Unit Number: 12 (Hexadecimal)

A maximum of 3 MC Units or other CPU Bus Units can be mounted on one PLC.
The setting range for the unit number is between 0 to F in hexadecimal.
The same unit number cannot be used in one PLC.

Caution **Please check if the power is OFF when you start the settings.**

□Piano Switch On the Back Panel of the Unit

These switches are used for special purposes like shipping inspection mode, etc. Therefore, do not operate them.



1	2	Status
OFF	OFF	Normal operation
ON	OFF	Reserved for shipping inspection by OMRON (Do not set.)
OFF	ON	Reserved for shipping inspection by OMRON (Do not set.)
ON	ON	Reserved for shipping inspection by OMRON (Do not set.) *1

*1: If the power is turned ON under this setting, the MC Unit will be started after various user settings are set beck to their factory default values.

Area Allocations

Word Allocations Using Unit Numbers

The bit and DM areas used by the MC Unit are allocated based on the unit number.

CPU Bus Unit Allocated Bit Area

The bit area is allocated 25 words for each unit number starting from the word 1500.
The following table describes the allocations.

Unit number	Bit area	Unit number	Bit area
0	Words 1500-1524	8	Words 1700-1724
1	Words 1525-1549	9	Words 1725-1749
2	Words 1550-1574	10	Words 1750-1774
3	Words 1575-1599	11	Words 1775-1799
4	Words 1600-1624	12	Words 1800-1824
5	Words 1625-1649	13	Words 1825-1849
6	Words 1650-1674	14	Words 1850-1874
7	Words 1675-1699	15	Words 1875-1899

CPU Bus Unit Allocated DM Area (DM Parameter Area)

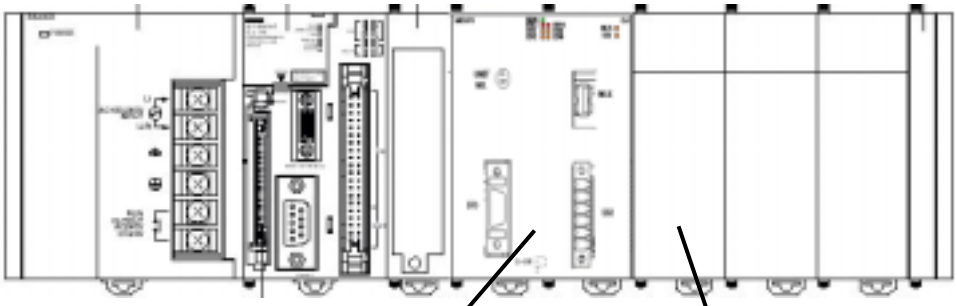
The DM area is allocated 100 words for each unit number starting from the words D30000.
The following table describes the allocations.

Unit number	DM area	Unit number	DM area
0	Words 30000-30099	8	Words 30800-30899
1	Words 30100-30199	9	Words 30900-30999
2	Words 30200-30299	10	Words 31000-31099
3	Words 30300-30399	11	Words 31100-31199
4	Words 30400-30499	12	Words 31200-31299
5	Words 30500-30599	13	Words 31300-31399
6	Words 30600-30699	14	Words 31400-31499
7	Words 30700-30799	15	Words 31500-31599

3-2 Installation

System Configuration Precautions

- I/O bit numbers of the CPU Bus Unit are allocated based on the setting of the Unit Number Setting Switch on the front panel of the Unit, not on the slot number to which the Unit has been mounted.
- When mounting a relay output unit on the very right of the MC Unit, make sure to use the surge absorber for the relay output line.



MC Unit

Make sure to use the surge absorber for the contact output of this relay output unit.

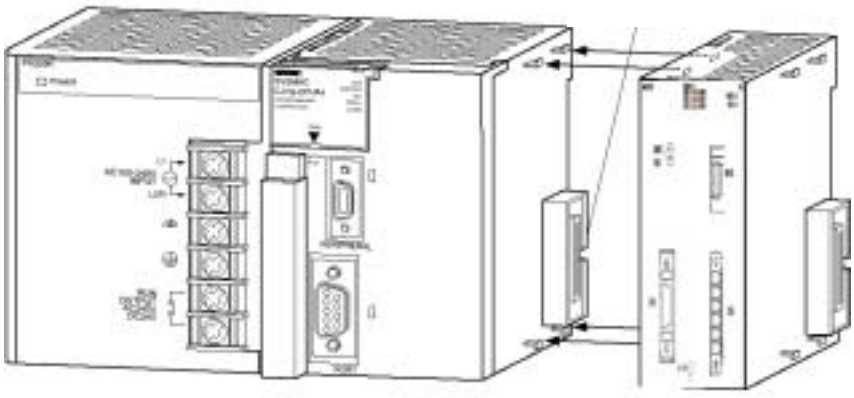
- When MECHATROLINK-II devices are connected up to 16 nodes (within 30m) or 15 nodes (within 50m), no repeater unit is required. A repeater unit is required to connect MECHATROLINK-II devices more than the cases above.

□Mounting the Unit

Follow the procedure outlined below to mount the MC unit.

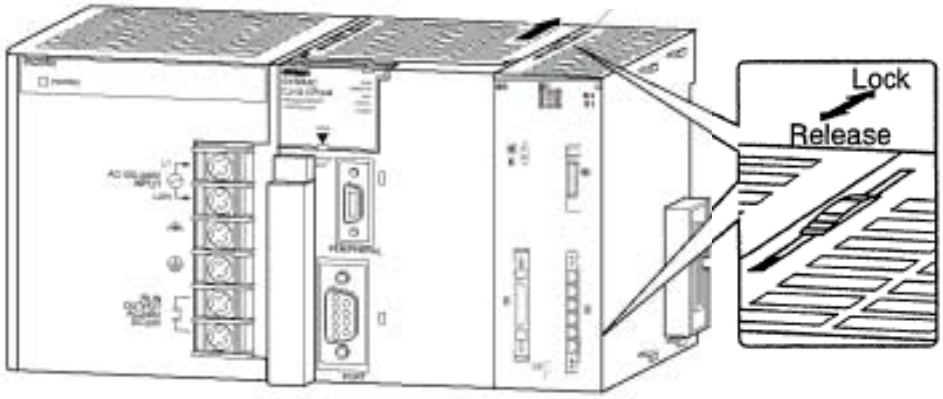
1. Join the PCU to the Rack, ensuring that the connectors engage properly.

Connector



2. Secure the PCU by sliding the yellow sliders on the top and bottom unit they click into place.

Slider

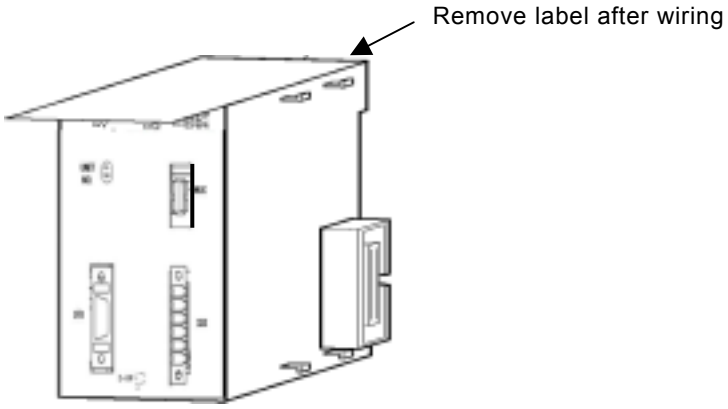


□Unit Handling Precautions

- Always turn OFF the CPU Unit before mounting or removing a MC Unit or connecting or disconnecting cables to or from the MC Unit.

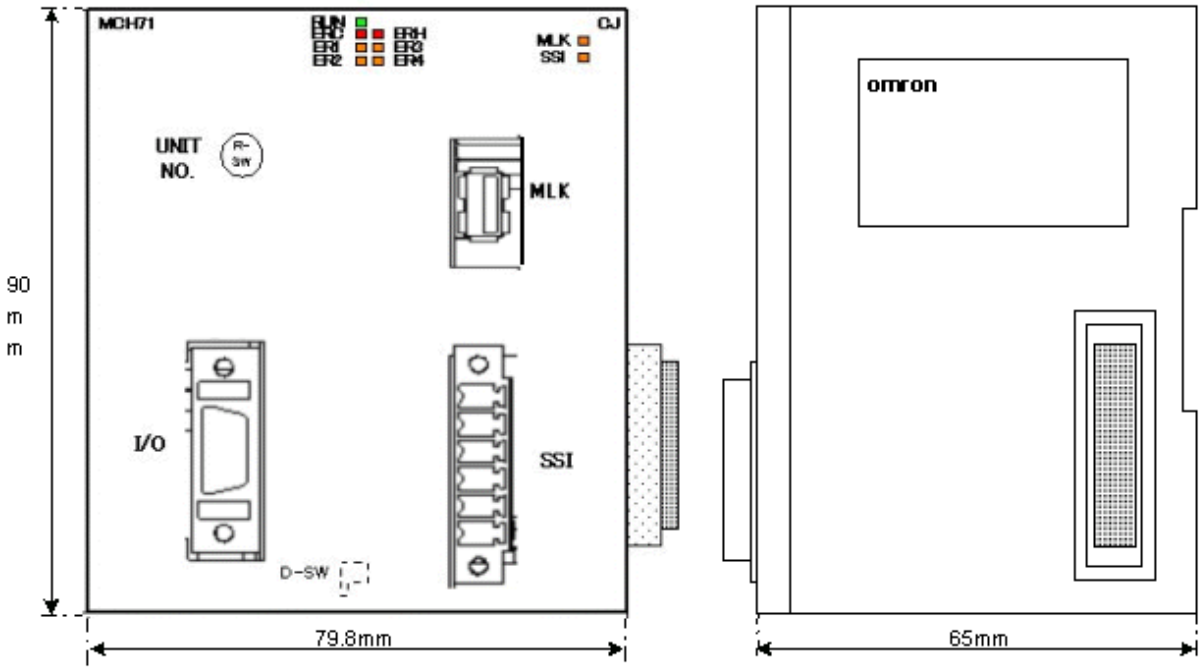
- Place the port connecting cables in a different duct from those for high-voltage lines or power lines to prevent the effects of electrical noise from these lines.

- Do not remove the protective label from the top of the unit until wiring has been completed. This label prevents wire strands and other foreign matter from entering the Unit during wiring. Remove the label after wiring has been completed to allow air circulation needed for cooling.



Diensions

CJ1W-MCH71



3-3 External I/O Circuitry

□MECHATROLINK-II Connector

Item	Description	
Connector name	CN1	MECHATROLINK-II connector
Applicable connector	USB connector	DUSB-ARA41-T11 (DDK)
Mating connector	USB connector	DUSB-APA41-B1-C50 (DDK) *Including shell.

Pin arrangement

No.	Signal	I/O	Description
1	(NC)	-	-
2	SRD-	I/O	Send/Receive Data (-)
3	SRD+	I/O	Send/Receive Data (+)
4	SLD	-	Shield Ground

MECHATROLINK-II Standard Cable
USB connectors on both ends: JEPMC-W6003-**

□I/O Connectors

Item	Classification	Component and Maker
Connector name	CN2	I/O connector
Applicable connector	MDR connector	10214-52A2JL (3M)
Mating connector	Connector Housing	10114-3000VE (3M) 10314-52F0-008 (3M)

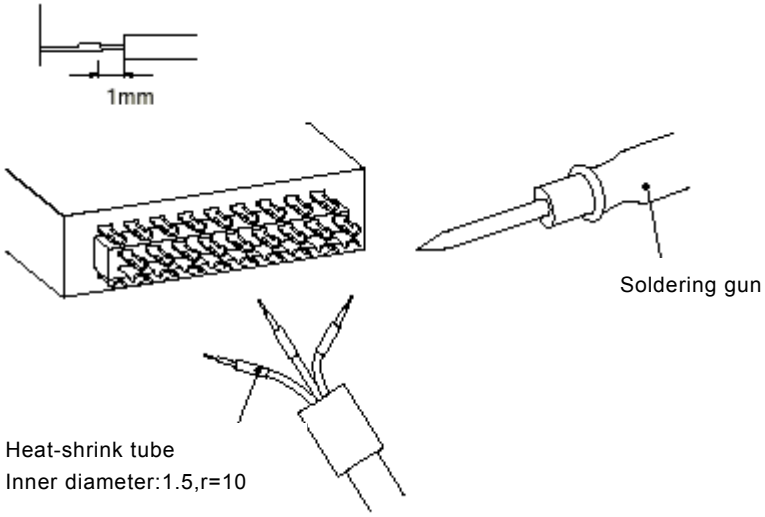
Pin arrangement

No.	Signal	I/O	Description	No.	Signal	I/O	Description
1	DI_24V	P	DI common	8	DI_24V	P	DI common
2	DI_00	I	DI input (Deceleration stop)	9	DI_01	I	DI input (Reserved)
3	DI_02	I	DI input 1	10	DI_03	I	DI input 2
4	-	-	-	11	-	-	-
5	DO_24V	P		12	DO_24V	P	
6	DO_COM	P	DO common	13	DO_COM	P	DO common
7	DO_00	O.C	DO00 output	14	DO_01	O.C	DO01 output

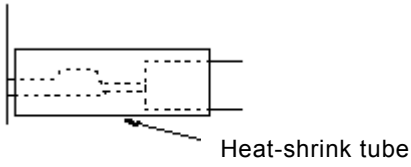
P: Power supply input
I: Input signal
O.C.: Open collector output

□Wiring Connectors

Instruction: 1. Pass each wire through heat-shrink tubing.
2. Spot-solder the wires and connector terminals
3. Solder the wires



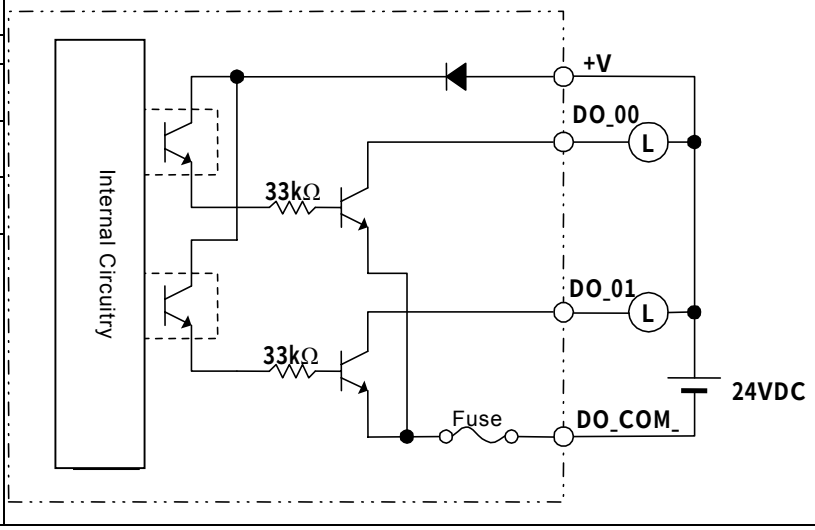
4. Pull the heat-shrink tubing back over the soldered area and heat the tubing to shrink it.



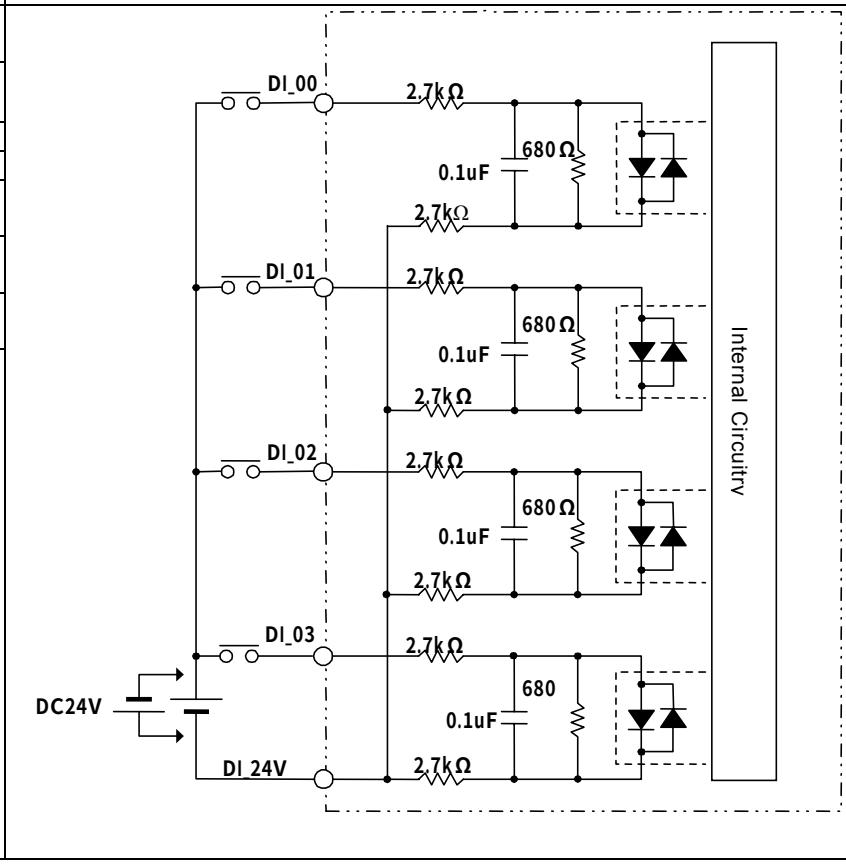
□I/O Circuitry

● Connector Interface Circuits

• 24VDC Digital Output (2 outputs)

Item	Specifications	Circuitry
Max. Output Current	100mA／24VDC	
Leakage current	1mA or lower	
Residual Voltage	1.5V or lower	
External Supply Voltage	24VDC±10%	
Number of Common	2	

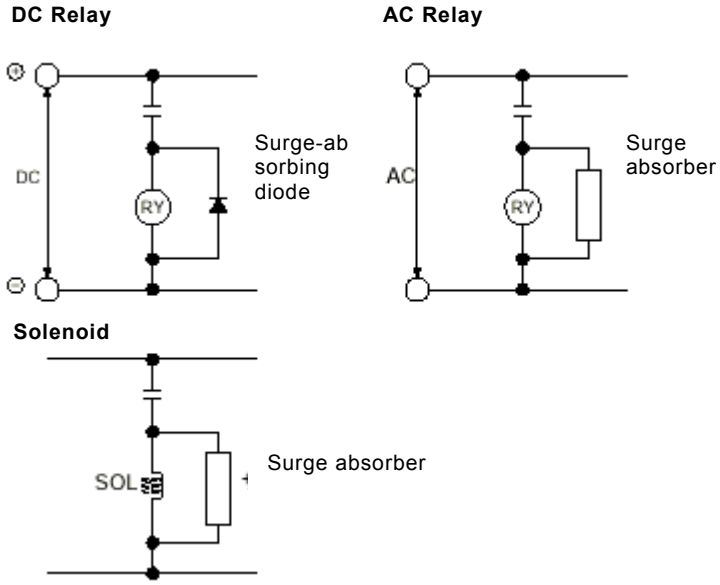
• 24VDC Digital Input

Item	Specifications	Circuitry
Rated Input Voltage	24VDC±10%	
Rated Input Current	4.02~4.52mA (24VDC)	
ON Voltage	Min. 14V	
OFF Current	Max. 6V	
ON Response Time	1ms or less	
OFF Response Time	1ms or less	
Number of commons	4	

3-4 Wiring

Wiring Precautions

Heed the following precautions when wiring the MC Unit to the servo drivers and motors.
Electronically controlled equipment may malfunction because of noise generated by power supply lines or external loads. Such malfunctions are difficult to reproduce; hence, determining the cause often requires a great deal of time.
The following tips should aid in avoiding noise malfunction and improving system reliability.
Use electrical wires or cables of designated sizes as specified in the instruction manual for the servo driver.
Separate power cables (AC power supply lines and motor power supply lines) from control cables (pulse output lines and external input signal lines). Do not group the two types of cable together or place them in the same conduit.
Using the laminated ceramic capacitor of 1*u*F for the output of 24VDC power supply will improve noise-resistance.
Use shielded cables for control lines.
For inductive loads such as relays or solenoid valves, connect surge absorbers.
The connecting cable for the servo driver must be the specified cable with ring core.



Note:

- **Connect a surge-absorbing diode or surge absorber close to the relay. Use a surge absorbing diode with a voltage tolerance at least five times greater than the circuit voltage.**
- **Noise may interfere from the power supply line if the same power supply as the electric welder or spark erosion machine is used for the MC Unit, or if there is a source of high-frequency noise around. If it occurs, insert the noise filter at the input section of the power supply.**
- **Use the twisted pair-cable for the power line.**
- **Provide grounding of 100Ω or less and use the thickest possible wire, greater than 1.25 square mm.**

3-5 Connecting MECHATROLINK Devices

This section explains the method of connecting the MC Unit to devices with MECHATROLINK-II.
(As for the method of setting parameters, refer to “10-2 Slave Modules” (page 10-36).)

* For details, refer to YASKAWA ELECTRIC CORPORATION’s “Σ-II SERIES SGDH MECHATROLINK-II APPLICATION MODULE USER’S MANUAL MODEL: JUSP-NS115 (MANUAL NO. SIEPC71080001*)”.

■Method of Connecting MECHATROLINK Devices

●Connection cable

To connect MECHATROLINK devices to MC units, use the connecting cables (sold separately) in the table below.

Name	Model (OMRON)	Model (YASKAWA)	Length
MECHATROLINK-II cable (For W-series) (With ring core and USB connector on both ends)	FNY-W6003-A5	JEPMC-W6003-A5	0.5m
	FNY-W6003-01	JEPMC-W6003-01	1.0m
	FNY-W6003-03	JEPMC-W6003-03	3.0m
	FNY-W6003-05	JEPMC-W6003-05	5.0m
	FNY-W6003-10	JEPMC-W6003-10	10.0m
	FNY-W6003-20	JEPMC-W6003-20	20.0m
	FNY-W6003-30	JEPMC-W6003-30	30.0m

The terminating resistance (sold separately) in the table below should be connected to the MECHATROLINK-II termination.

Name	Model (OMRON)	Model (YASKAWA)
Terminating resistance for MECHATROLINK-II	FNY-W6022	JEPMC-W6022

●Repeater unit

When MECHATROLINK-II devices are connected up to 16 nodes (within 30m) or 15 nodes (within 50m), no repeater unit is required. A repeater unit is required to connect MECHATROLINK-II devices more than the cases above.

Name	Model (OMRON)	Model (YASKAWA)
Repeater for MECHATROLINK-II	FNY-REP2000	JEPMC-REP2000

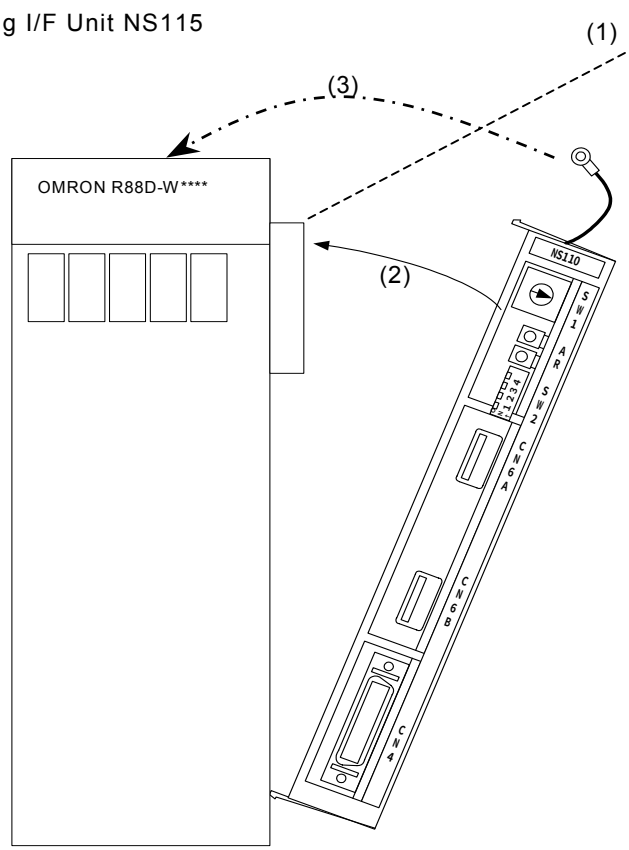
■W-series Servo Driver

W-series Servo Driver requires YASKAWA MECHATROLINK-II I/F Unit model JUSP-NS115.
Each version of the following products can be used. The version name is indicated on the nameplates of each product.

W-series Servo Driver: Ver.39 or later
I/F Unit: VER.***03 or later

Note Using either a W-series Servo Driver or an I/F Unit of older versions can be the cause of abnormal operations. Make sure to use the versions mentioned above.

●Attaching I/F Unit NS115



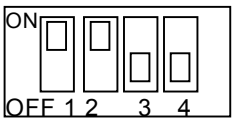
(1) Remove the connector cover of the option connector (CN10) on W-series Servo Driver.

(2) Attach NS115.

(3) For grounding, connect the ground wire of NS115 to the part indicated as “G” on the top surface of the Servo Driver.

●Communications setting

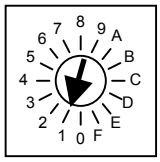
Set MECAHTROLINK communications using SW1and SW2.



SW2 (Default setting)

■Transmission setting

MECHATROLINK communications can be specified using the DIP switches (SW2). See the table below.
Any change of the settings becomes valid after turning OFF the power once, then ON again.



SW1 (Default setting)

SW2	Name	Setting	Content	Default setting
Bit 1	Baud rate	OFF	4 Mbps	ON (Do not change.)
		ON	10 Mbps	
Bit 2	No. of Transmitted bytes	OFF	17 bytes	ON (Do not change.)
		ON	30 bytes	
Bit 3	Station address	OFF	Refer to Station address setting	OFF
		ON		
Bit 4	Reserved	OFF	-	OFF

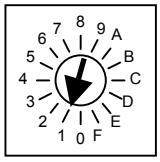
■Station address setting

The station address can be set as shown in the table below using the rotary switch (SW1) and piano switch (SW2 bit 3).

The piano switch 3 of SW2 specifies the number of 10s and SW1 specifies the number of units.

Do not change the setting while the power is being supplied.

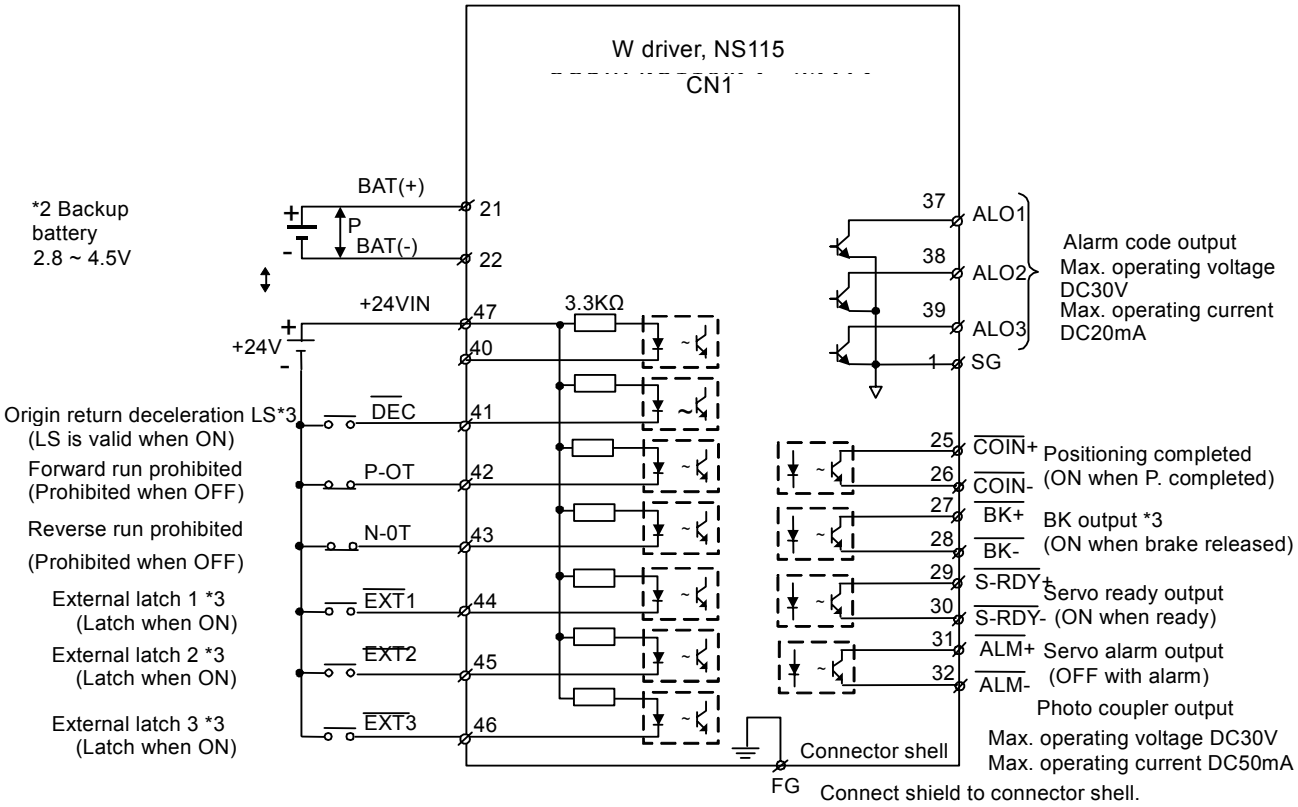
Bit 3 of SW2	SW1	Station No.	SW1 default setting
OFF	0	Do not set.	1
	1 to F	1 to 15 (1 to FH)	
ON	0 to F	16 to 30 (10H to 1EH)	



SW1

●Example of connecting I/O signals

A typical connecting example with standard settings (default settings) is shown here.



*1. ↕P indicates twisted-pair wires.

*2. When using an ABS encoder, connect a backup battery only when there is no battery connected to CN8.

*3. Allocate signals using user constants.

■CN1 terminal layout

CN1 terminal layout

2	SG	GND	1	SG	GND	27	/BK+*3	Brake interlock output	26	/COIN-	Positioning complete output
4			3			29	/S-RDY+	Servo ready output	28	/BK-*3	Brake interlock output
6	SG	GND	5			31	ALM+	Servo alarm output	30	/S-RDY-	Servo ready output
8			7			33			32	ALM-	Servo alarm output
10	SG	GND	9			35			34		
12			11			37	ALO1	Alarm code output (Open-collector output)	36		
14			13			39	ALO3		38	ALMO2	Alarm code output
16			15			41	/DEC*3	Origin return deceleration LS input	40		
18			17			43	N-OT	Reverse run prohibited input	42	P-OT	Forward run prohibited input
20			19			45	/EXT2*3	External latch signal 2 input	44	/EXT1*3	External latch signal 1 input
22	BAT (-)	Battery (-)	21	BAT(+)	Battery (+)	47	+24VIN	External power supply input	46	/EXT3*3	External latch signal 3 input
24			23			49			48		
			25	/COIN	Positioning completed output				50		

*1: Connector shell: Connected to FG (Frame ground)

*2: Do not use unused terminals for relays.

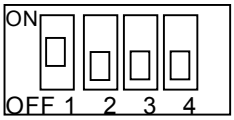
*3: Allocate the signal using user constants.

* For details, refer to YASKAWA ELECTRIC CORPORATION's "Σ-II SERIES SGDH MECHATROLINK-II APPLICATION MODULE USER'S MANUAL MODEL: JUSP-NS115 (MANUAL NO. SIEPC71080001*)".

■ 24VDC I/O Module

●Communications setting

Set MECAHTROLINK communications using SW1 and SW2.



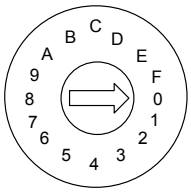
SW1 (Default setting)

■Transmission settings[<1>]

MECHATROLINK communications can be specified using the DIP switch (SW1). See the table below.

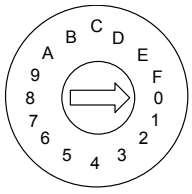
<Reminder>

Any change of the settings becomes valid after turning OFF the power once, and then ON again.



SW2 (Default setting)

SW1	Name	Setting	Content	Default setting
1	Baud rate	OFF	4 Mbps	ON (Do not set to OFF.)
		ON	10 Mbps	
2	No. of Transmitted bytes	OFF	17 bytes	OFF (Do not set to ON.)
		ON	30 bytes	
3	Station address	OFF	Refer to Station address setting	OFF
		ON		
-	Reserved	OFF	-	OFF



SW2

■Station address setting

Station address can be set as shown in the table below using the rotary switch (SW2) and piano switch (SW1 bit 3).

The bit 3 of SW1 specifies the number of 10s while the SW2 specifies the number of units.

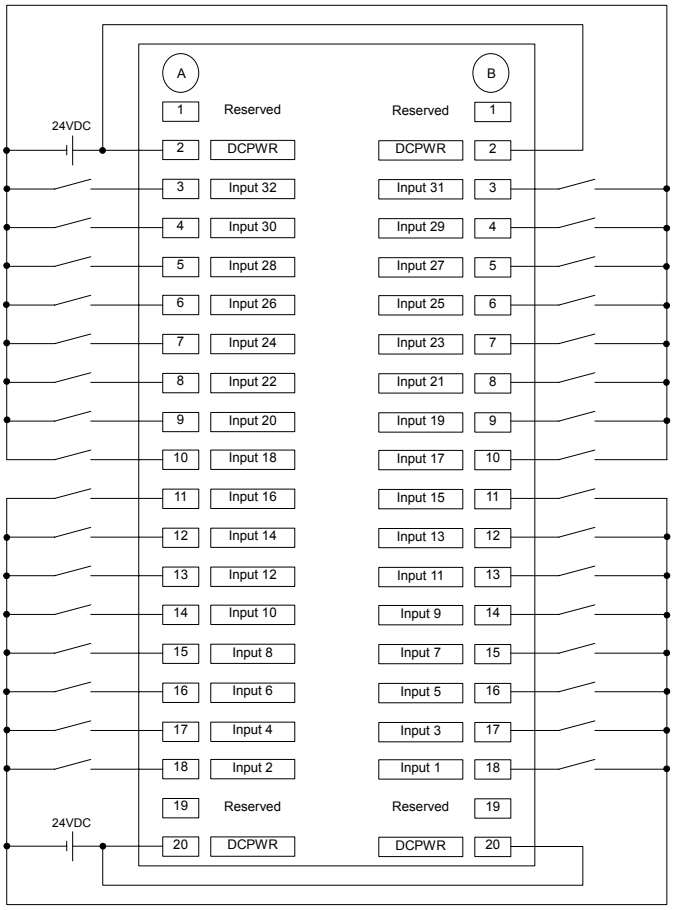
Do not change the setting while the power is being supplied.

Bit 3 of SW1	SW2	Station address	SW2 default setting
OFF	0	Do not set.	0
	1 to F	1 to 15 (1 to FH)	
ON	0 to F	16 to 30 (10H to 1EH)	

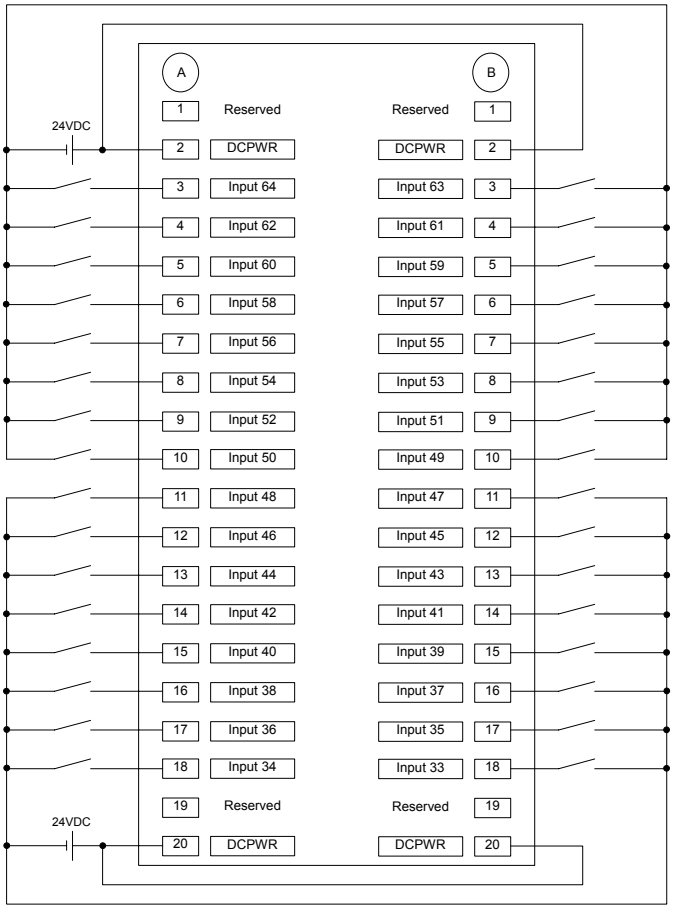
■64-point I/O module (IO2310) connector pin layout, signal names, and wiring example

* For details, refer to YASKAWA ELECTRIC CORPORATION's "Machine Controller MP900 Series MECHATROLINK System USER'S MANUAL (MANUAL NO. SIEZ-C887-5.1*)".

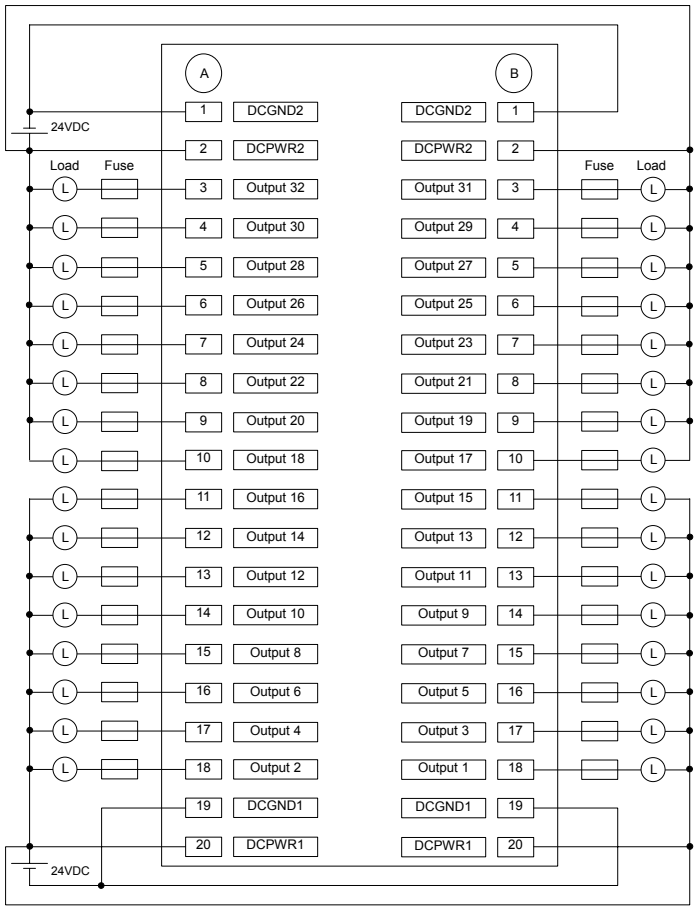
(IN1 connector)



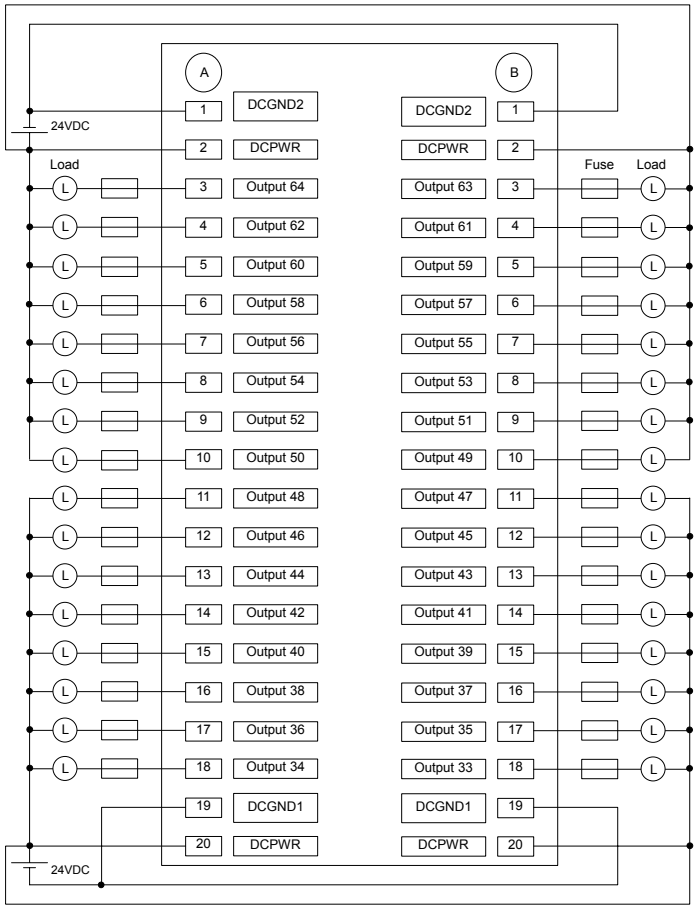
(IN2 connector)



(OUT1 connector)



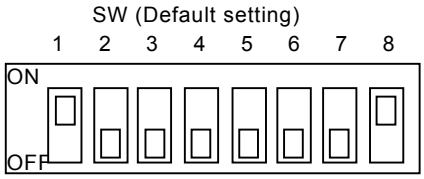
(OUT2 connector)



■ Counter Module, Pulse Output Module

●Communications setting

For counter modules and pulse output modules, MECHATROLINK communications can be set using the DIP switches.



■Transmission setting

MECHATROLINK communications can be specified using the DIP switches (SW) 6 to 8.
See the table below.
Any change of the settings becomes valid after turning OFF the power once, then ON again.

Pin	Name	Setting	Content	Default setting
6	Baud rate	OFF	4Mbps	OFF (Do not set to ON.)
		ON	10Mbps	
7	Transmission bytes	OFF	17byte	OFF (Do not set to ON.)
		ON	30byte	
8	Station address	OFF	Refer to Station address setting	ON
		ON		

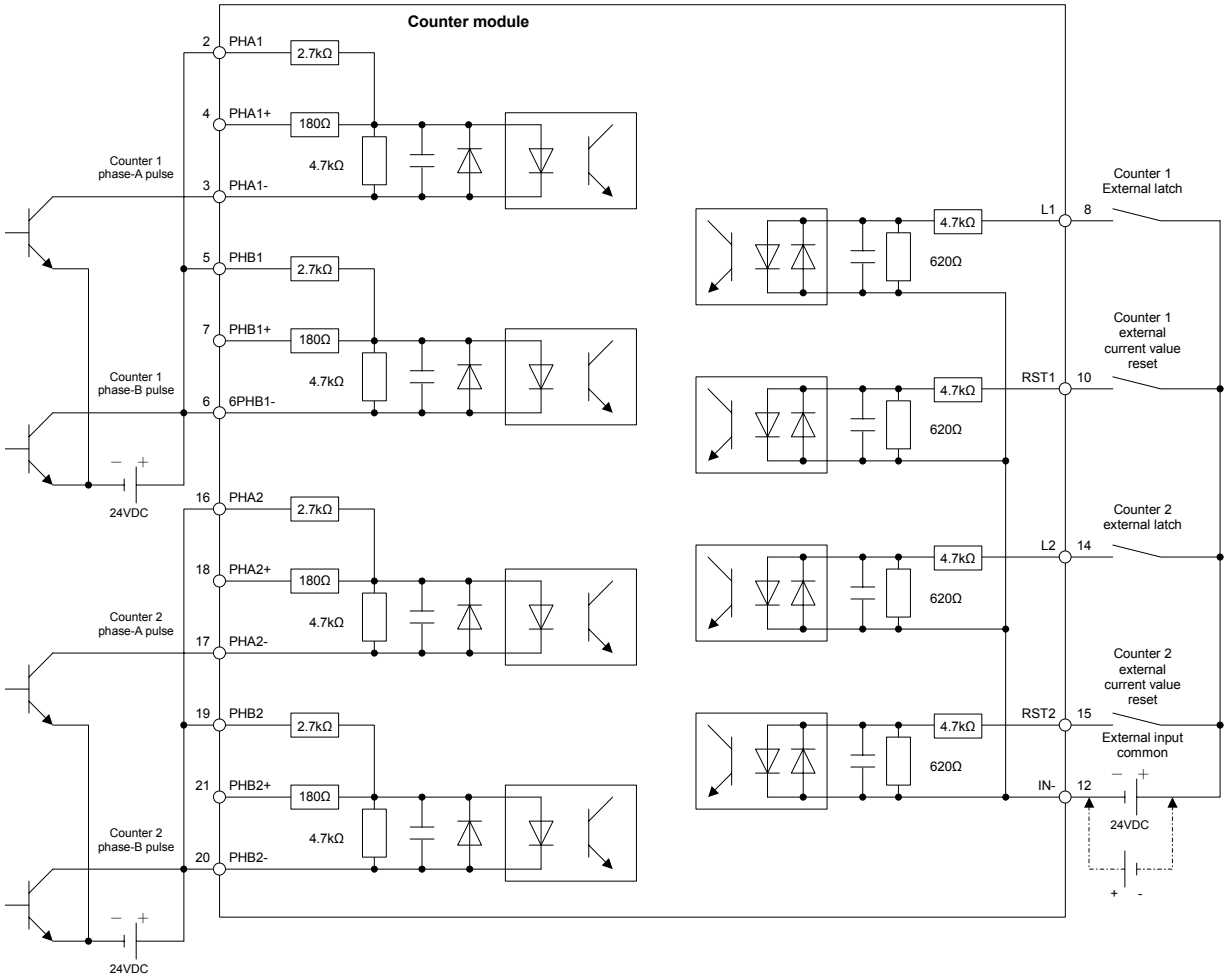
■Station address setting

Station address can be set as shown in the table below using the DIP switch 1 to 5 (SW).
The bit 5 of SW specifies the number of 10s while the bit 1 to 4 of SW specifies the number of units.
Do not change the setting while the power is being supplied.

SW					Station address
5	4	3	2	1	
OFF	OFF	OFF	OFF	OFF	Do not set.
OFF	OFF	OFF	OFF	ON	1 (01H): Default setting
OFF	OFF	OFF	ON	OFF	2 (02H)
OFF	OFF	OFF	ON	ON	3 (03H)
~					~
OFF	ON	ON	ON	ON	15 (0FH)
ON	OFF	OFF	OFF	OFF	16 (10H)
ON	OFF	OFF	OFF	ON	17 (11H)
ON	OFF	OFF	ON	OFF	18 (12H)
ON	OFF	OFF	ON	ON	19 (13H)
~					~
ON	ON	ON	ON	ON	Do not set.

●Counter module (PL2900)

■ Circuit Configuration and signal connection



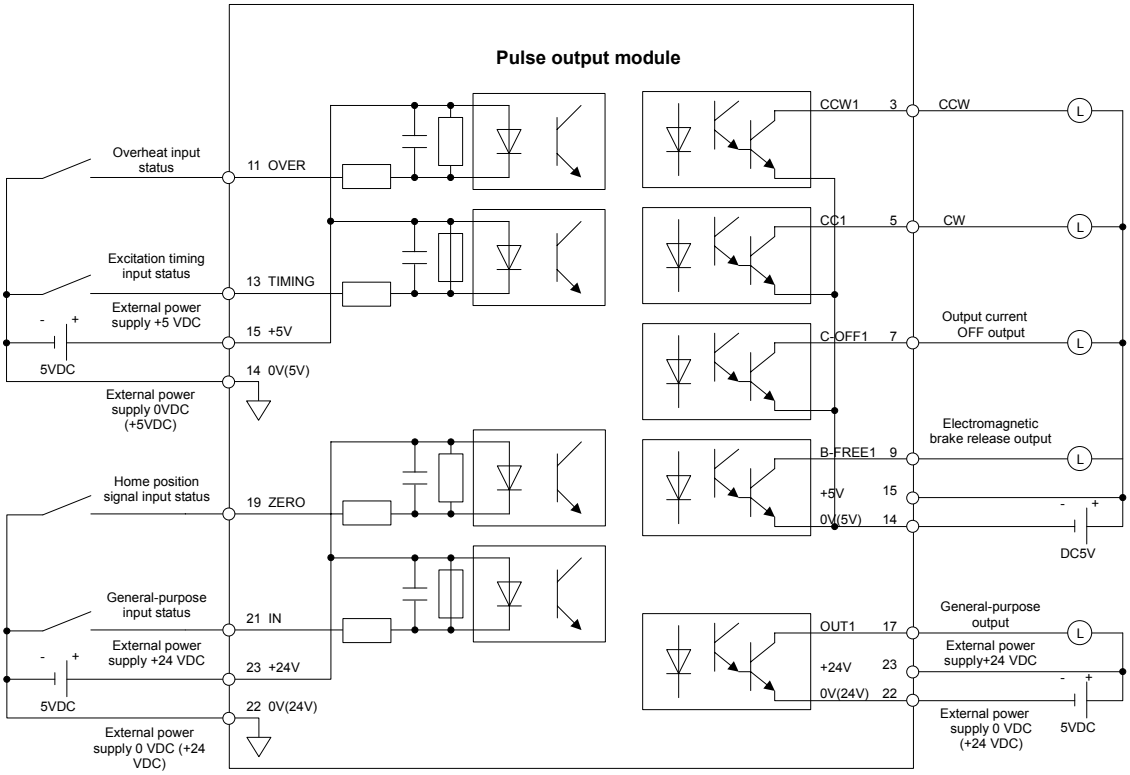
■Signal arrangement of the terminal block

1	3 PHA1-	5 PHB1	7 PHB1+	9 N1	11 OUT-	13 N2	15 RST2	17 PHA2-	19 PHB2	21 PHB2+	23 +24V
2 PHA1	4 PHA1+	6 PHB1-	8 L1	10 RST1	12 IN-	14 L2	16 PHA2	18 PHA2+	20 PHB2-	22 0(24V)		

* For details, refer to YASKAWA ELECTRIC CORPORATION's "Machine Controller MP900 Series MECHATROLINK System USER'S MANUAL (MANUAL NO. SIEZ-C887-5.1*)".

●Pulse output module (PL2910)

■Circuit configuration and signal arrangement



■ Signal arrangement of the terminal block

1 FG	3 CCW1	5 CW1	7 COFF1	9 BFRE1	11 OVER1	13 TIMG1	15 +5V	17 OUT1	19 ZERO1	21 IN1	23 +24V
2 CCW2	4 CW2	6 COFF2	8 BFRE2	10 OVER2	12 TIMG2	14 0(5V)	16 OUT2	18 ZERO2	20 IN2	22 0(24V)	

* For details, refer to YASKAWA ELECTRIC CORPORATION's "Machine Controller MP900 Series MECHATROLINK System USER'S MANUAL (MANUAL NO. SIEZ-C887-5.1*)".