



IAI
Quality and Innovation

EtherNet/IP

EtherCAT

ACON-C/CG, PCON-C/CG

First Step Guide Second Edition

Thank you for purchasing our product.

Make sure to read the Safety Guide and detailed Instruction Manual (CD) included with the product in addition to this First Step Guide to ensure correct use.

This Instruction Manual is original.



Warning : Operation of this equipment requires detailed installation and operation instructions which are provided on the CD Manual included in the box this device was packaged in. It should be retained with this device at all times.
A copy of the CD Manual can be requested by contacting your nearest IAI Sales Office listed at the back cover of the Instruction Manual or on the First Step Guide.

- Using or copying all or part of this Instruction Manual without permission is prohibited.
- The company names, names of products and trademarks of each company referred to are registered trademarks.
- EtherCAT® is a registered mark of Beckhoff Automation GmbH.
- EtherNet/IP is a trademark used under the license of ODVA.

Product Check

A standard configuration of this product is comprised of the following parts.

If you find any fault in the contained model or any missing parts, contact us or our distributor.

1. Parts

No.	Part Name	Model	Remarks
1	Controller	Refer to "How to read the model plate" and "How to read the model of the controller".	

Accessories

2	First Step Guide		
3	Instruction Manual (CD)		
4	Safety Guide		

2. Teaching Tool (to be purchased separately)

The PC software or teaching tool is necessary to perform setup operations such as position and parameter settings through teaching or other means. Prepare any teaching tool.

No.	Part Name	Model
1	PC Software (RS232C converter adapter + External equipment communication cable are included)	RCM-101-MW
2	PC Software (USB converter adapter + USB cable + External equipment communication cable are included)	RCM-101-USB
3	Touch panel teaching	CON-PT
4	Touch panel teaching (Dead-man Switch is included)	CON-PD
5	Touch panel teaching (Dead-man Switch + TP Adapter (RCB-LB-TG) are included)	CON-PG
6	Teaching pendant	CON-T
7	Teaching pendant (Dead-man Switch + TP Adapter (RCB-LB-TG) are included)	CON-TG
8	Simplified teaching pendant	RCM-E
9	Data setter ¹	RCM-P

*1 For the data setter, the actuator can not be moved.

3. Instruction Manuals related to this product, which are contained in the Instruction Manual (CD).

No.	Name	Manual No.
1	EtherCAT® Instruction Manual	ME0273
2	EtherNet/IP Instruction Manual	ME0278
3	ACON-C/CG Controller Instruction Manual	ME0176
4	PCON-C/CG/CF Controller Instruction Manual	ME0170
5	PC Software RCM-101-MW/ RCM-101-USB Instruction Manual	ME0155
6	Touch panel teaching CON-PT/PD/PG Instruction Manual	ME0227
7	Teaching pendant CON-T/TG Instruction Manual	ME0178
8	Simplified Teaching Pendant RCM-E Instruction Manual	ME0174
9	Data setter RCM-P instruction Manual	ME0175

4. How to read the model plate



5. How to read the model of the controller

[ACON-C/CG]

ACON-C-201HA-NP-2-0-ABU

<Series>		For Simplified Absolute Unit Connection
<Type>		
C : Positioner Drive Interruption Relay: Built-in Type		
CG : Positioner Drive Interruption Relay: External Type		
<Actuator Characteristics>		
[Motor Type]	[Encoder type]	
2 : 2W	1: Incremental	
5 : 5W	[Option]	
10 : 10W	No Indication	: Standard Type
20S : RA3, RA4, TA5	HA	: High Acceleration/Deceleration Type
Dedicated 20W	LA	: Less Power consumption Type
20 : 20W		
30 : 30W		

[PCON-C/CG/CF]

PCON-C-201-PR-2-0-ABU-H

<Series>		High Acceleration Transport Type
<Type>		
C : Positioner Drive Interruption Relay: Built-in Type		
CG : Positioner Drive Interruption Relay: External Type		
<Actuator Characteristics>		
[Motor Flange Size]		
20P : 20 □Size	35P : 35 □Size	
28P : 28 □Size	42P : 42 □Size	
28SP : 28 □Size	56P : 56 □Size	
(Dedicated to RA3C)	86P : 86 □Size	
[Encoder type]		
1: Incremental		
	<Power-supply Voltage>	
	0 : 24V DC	
	<I/O Cable Length>	
	0 : Equipped with no cable	3: 3m
	2 : 2m (standard)	5: 5m
	<I/O Type>	
	NP : NPN Specification (Sink Type) (Standard)	
	PN : PNP Specification (Source Type)	
	DV : DeviceNet Connection Type	
	CC : CC-Link Connection Type	
	EC : EtherCAT® Connection Type	
	PR : PROFIBUS Connection Type	
	CN : CompoNet Connection Type	
	ML : MECHATROLINK Connection Type	
	EP : EtherNet/IP Connection Type	

Basic Specifications

ACON Specifications (Controller for RCA2/RCA/RCL Series)

Specification Item			ACON-C (Driving Source Interruption Relay: Built-in Type)/ ACON-CG (Driving Source Interruption Relay: External Type)			
Number of Controlled Axes			1 Axis/unit			
Power-supply Voltage			24V DC±10%			
Control Power Capacity			0.5A			
Motor Power Capacity ^{Note 1}	Actuator	Motor Type	Standard Type /High Accel/Decel Type		Low or Less (LA) Power consumption Type	
			Rated	Max ^{Note 2}	Rated	Max ^{Note 2}
	RCA/ RCA2	10W	1.3A	4.4A	1.3A	2.5A
		20W (Model No. : 20)	1.3A	4.4A	1.3A	2.5A
		30W	1.3A	4.0A	1.3A	2.2A
		20W (Model No. : 20S) Dedicated to RA3, RA4 and TA5 Types	1.7A	5.1A	1.7A	3.4A
	RCL	2W	0.8A	4.6A		
		5W	1.0A	6.4A		
		10W	1.3A	6.4A		
Heat Generation			8.4W			
Axis Control System			Sinusoidal wave PWM vector current control			
Data Input Method			Connecting a teaching tool such as PC software [Refer to teaching tool (option)]			
Field Bus Port			For input 1 channel, For output 1 channel			
Communication Cable Length			Refer to each Fieldbus specification			
Protective Functions			Overvoltage, motor over current, motor overload, driver temperature abnormality, and Encoder abnormality etc.			
Backup Memory			Save the position data and parameters onto the non-volatile memory. About 100,000 times of serial EEPROM reload			
Encoder Resolution	RCA		800 Pulse/rev			
	RCA2	RCA2-□□□N	1048 Pulse/rev			
		Except for RCA2□□□N	800 Pulse/rev			
	RCL	RA1L-SA1L-SA4L-SM4L	715 Pulse/rev			
		RA2L-SA2L-SA5L-SM5L	855 Pulse/rev			
RA3L-SA3L-SA6L-SM6L		1145 Pulse/rev				
Serial Communication			RS485 1 channel (Modbus Complying to the Protocol)			
Electromagnetic Brake Forced Releasing Function			Releasing can be performed with NOM/BK RLS switch (on front panel)			
Cable Length			Actuator cable : 20m or less			
Insulation Strength			500V DC 10MΩ			
Environment	Ambient air temperature		0 to 40°C			
	Ambient humidity		85%RH or less (non-condensing)			
	Ambient environment		There should be no corrosive gas.			
	Ambient storage temperature		-10 to 65°C			
	Ambient storage humidity		90% RH or less (non-condensing)			
	Vibration resistance		XYZ Each direction 10 to 57Hz Pulsating amplitude 0.035mm (continuous) 0.075mm (intermittent) 57 to 150Hz 4.9m/s ² (continuous) 9.8m/s ² (intermittent)			
Protection Class			IP20			
Use Environment			Pollution degree 2			
Cooling Method			Natural air-cooling			
Weight			300g or less			
External Dimensions			35W × 178.5H × 69.1D [mm]			

Note 1 For inrush current, current 5 times to 12 times more of the rated current passes about 1 to 2msec. after the power is input. The inrush current value varies depending on the impedance of the power line.

Note 2 The current reaches its maximum level when the servo-motor exciting phase is detected which is to be performed in the first servo-motor turning ON processing after the power injection. (Normal: Approx. 1 to 2sec, Max.: 10sec)

Select a +24V DC power supply preferably offering "peak load support", or one with sufficient inrush capacity. In particular, in the case of the unit with the remote sensing function, the greatest care is required.

PCON Specifications (Controller for RCP3/RCP2 Series)

Specification Item		PCON-C (Interruption Relay: Built-in Type)		PCON-CG (Interruption Relay: External Type)	
Number of Controlled Axes		1 Axis/unit			
Power-supply Voltage		24V DC±10%			
Control Power Capacity		0.5A			
Motor Power Capacity ^{Note 1}	Actuator	Rated	Max ^{Note 2}	Rated	Max ^{Note 2}
	20P, 28P, 28SP Motor	0.4A	2.0A	0.4A	2.0A
	35P, 42P, 56P Motor	1.2A		1.2A	
Waste Heat Value		9.6W			
Control Method		Weak field-magnet vector control			
Data Input Method		Connecting a teaching tool such as PC software [Refer to teaching tool (option)]			
Field Bus Port		For input 1 channel, For output 1 channel			
Communication Cable Length		Refer to each Fieldbus specification			
Protective Functions		Overvoltage, motor over current, motor overload, driver temperature abnormality, and Encoder abnormality etc.			
Backup Memory		Save the position data and parameters onto the non-volatile memory. About 100,000 times of serial EEPROM reload			
Encoder Resolution		Incremental Type 800 Pulse/rev			
Serial Communication		RS485 1 channel (Modbus Complying to the Protocol)			
Electromagnetic Brake Forced Releasing Function		Releasing can be performed with NOM/BK RLS switch (on front panel)			
Cable Length		Actuator cable : 20m or less			
Insulation Strength		500V DC 10MΩ			
Environment	Ambient air temperature	0 to 40°C			
	Ambient humidity	85%RH or less (non-condensing)			
	Ambient environment	There should be no corrosive gas.			
	Ambient storage temperature	-10 to 65°C			
	Ambient storage humidity	90% RH or less (non-condensing)			
	Vibration resistance	XYZ Each direction 10 to 57Hz Pulsating amplitude 0.035mm (continuous) 0.075mm (intermittent) 57 to 150Hz 4.9m/s ² (continuous) 9.8m/s ² (intermittent)			
Protection Class		IP20			
Use Environment		Pollution degree 2			
Cooling Method		Natural air-cooling			
Weight		300g or less			
External Dimensions		35W × 178.5H × 69.1D [mm]			

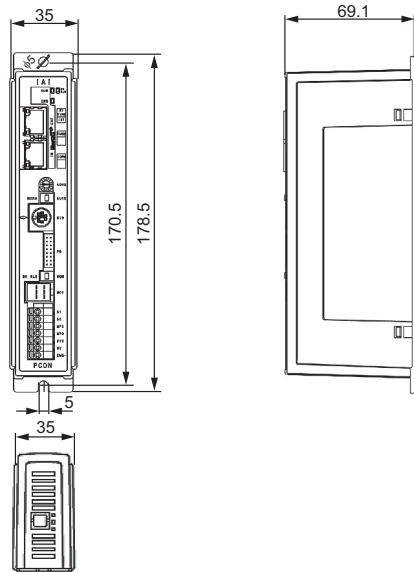
Note 1 For inrush current, current 5 times to 12 times more of the rated current passes about 1 to 2msec. after the power is input. The inrush current value varies depending on the impedance of the power line.

Note 2 The excitation detection operation is performed after the power is input. In such a case, the current becomes maximum (normally 100msec) However, a current of approx. 6.0A flows if the motor driving power is turned on again after it is shutdown. (for approx. 1 to 2msec)

Select a +24V DC power supply preferably offering "peak load support", or one with sufficient inrush capacity. In particular, in the case of the unit with the remote sensing function, the greatest care is required.

External Dimensions

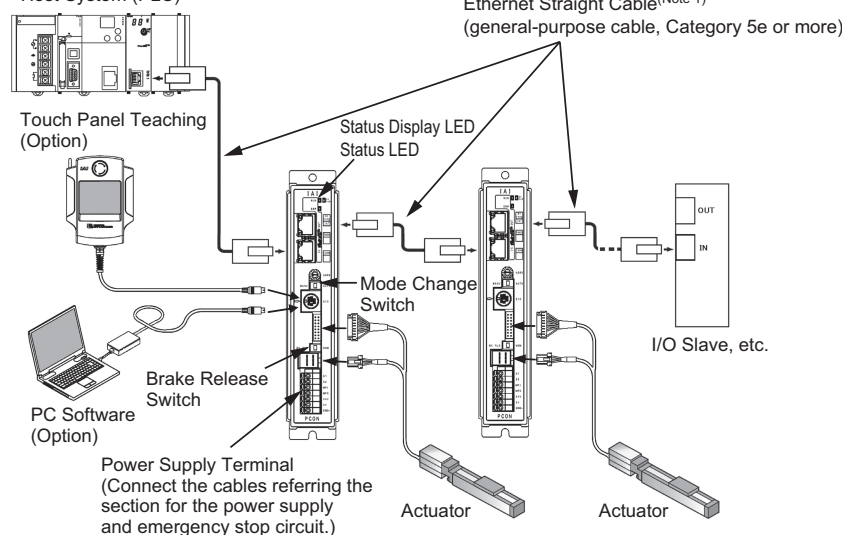
Shown below are the dimensions for EtherCAT® type. The dimensions for EtherNet/IP should also be the same.



Connection Diagram

• In the case of EtherCAT®

Host System (PLC)

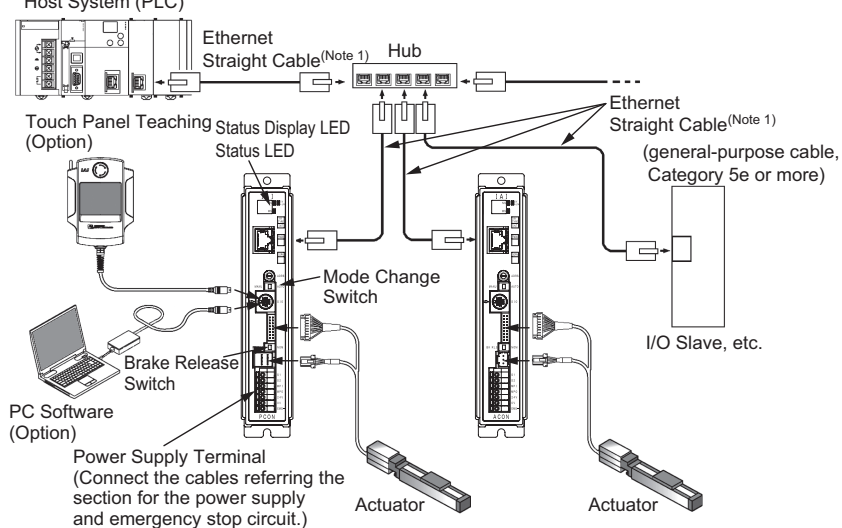


(Note 1) STP (single twisted pair) (with shield) is recommended for Ethernet cable.

(Note 2) It is necessary to prepare a power supply cable and the cables for the emergency stop circuit wiring as well as this cable. [Refer to Power Supply and Emergency Stop Circuit.]

• In the case of EtherNet/IP

Host System (PLC)



(Note 1) STP (single twisted pair) (with shield) is recommended for Ethernet cable.

(Note 2) It is necessary to prepare a power supply cable and the cables for the emergency stop circuit wiring as well as this cable. [Refer to Power Supply and Emergency Stop Circuit.]

Installation Environment

This product is capable for use in the environment of pollution degree 2^{*1} or equivalent.

*1 Pollution Degree 2 : Environment that may cause non-conductive pollution or transient conductive pollution by frost. (IEC60664-1)

1. Installation Environment

Do not use this product in the following environment.

- Location where the surrounding air temperature exceeds the range of 0 to 40°C
- Location where condensation occurs due to abrupt temperature changes
- Location where relative humidity exceeds 85%RH
- Location exposed to corrosive gases or combustible gases
- Location exposed to significant amount of dust, salt or iron powder
- Location subject to direct vibration or impact
- Location exposed to direct sunlight
- Location where the product may come in contact with water, oil or chemical droplets
- Environment that blocks the air vent [Refer to Installation and Noise Elimination Section]

When using the product in any of the locations specified below, provide a sufficient shield.

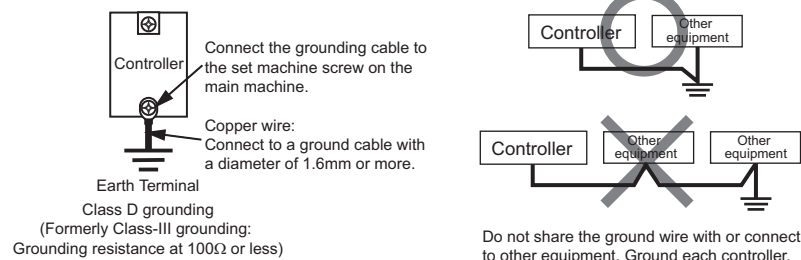
- Location subject to electrostatic noise
- Location where high electrical or magnetic field is present
- Location with the mains or power lines passing nearby

2. Storage and Preservation Environment

- The storage and preservation environment should comply with the same standards as those for the installation environment. In particular, when the machine is to be stored for a long time, pay close attention to environmental conditions so that no condensation forms. Unless specially specified, moisture absorber protection is not included in the package when the machine is delivered. In the case that the machine is to be stored and preserved in an environment where condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.

Installation and Noise Elimination

1. Noise Elimination Grounding (Frame Ground)



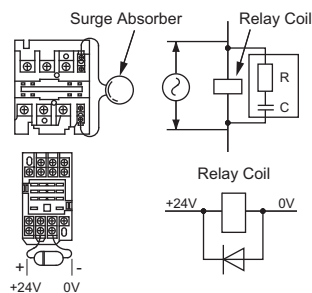
2. Precautions regarding wiring method

- (1) Twist the wires for the 24V DC power unit.
- (2) Separate the communication line from the power line.

3. Noise Sources and Elimination

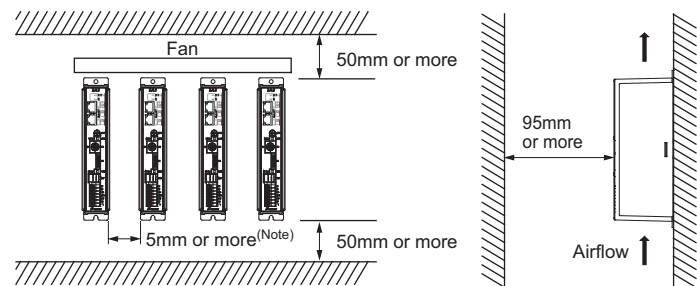
Carry out noise elimination measures for power devices on the same power path and in the same equipment. The following are examples of measures to eliminate noise sources.

- (1) AC solenoid valves, magnet switches and relays
[Measure] Install a Surge absorber parallel with the coil.
- (2) DC solenoid valves, magnet switches and relays
[Measure] Install a diode parallel with the coil. Use a DC relay with a built-in diode.



4. Heat Radiation and Installation

Conduct design and manufacture in consideration of the control box size, controller layout and cooling in such a way that the temperature around the controller will be 40°C or less.

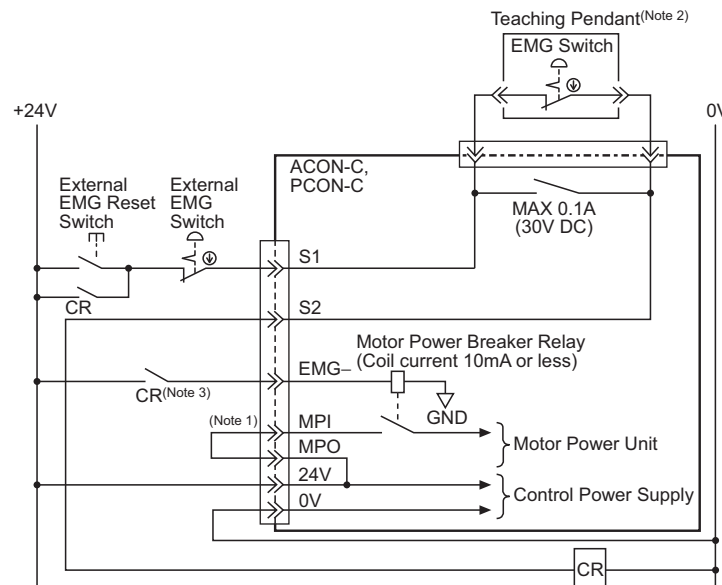


(Note) Make sure to keep a space between each controller so the work procedures to attach and detach the controllers can be performed easily.
(5mm or more is recommended.)

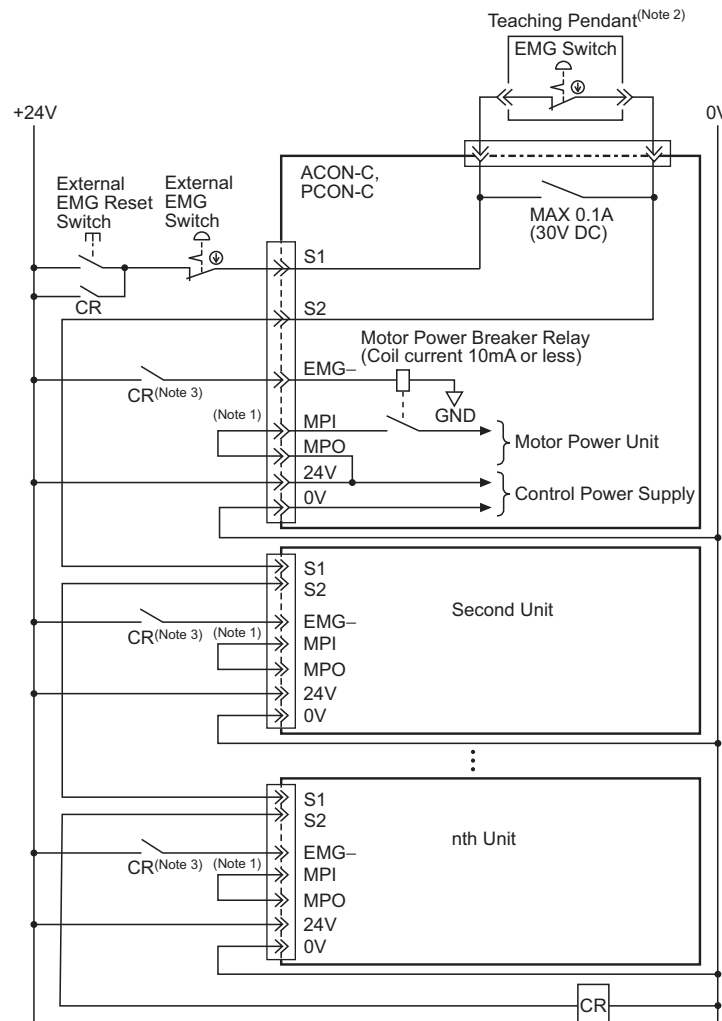
Power Supply and Emergency Stop Circuit

This shows the circuit example when the emergency stop switch in the teaching pendant is enabled on the emergency stop circuit to be built up by the client.

- **Driving Source Interruption Relay : Built-in Type : ACON-C, PCON-C**
- **In the case of the use of a single controller:**



- **In the case of the use of two or more controllers:**

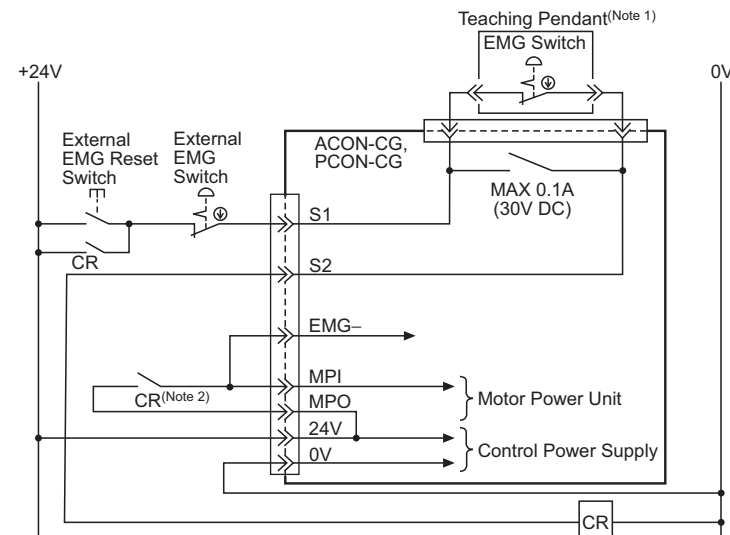


Note 1 When a shutoff is required for the motor driving power supply equivalent to Safety Category 2, connect 24V to EMG terminal and connect a safety contactor to the wire between MPI and MPO terminals.

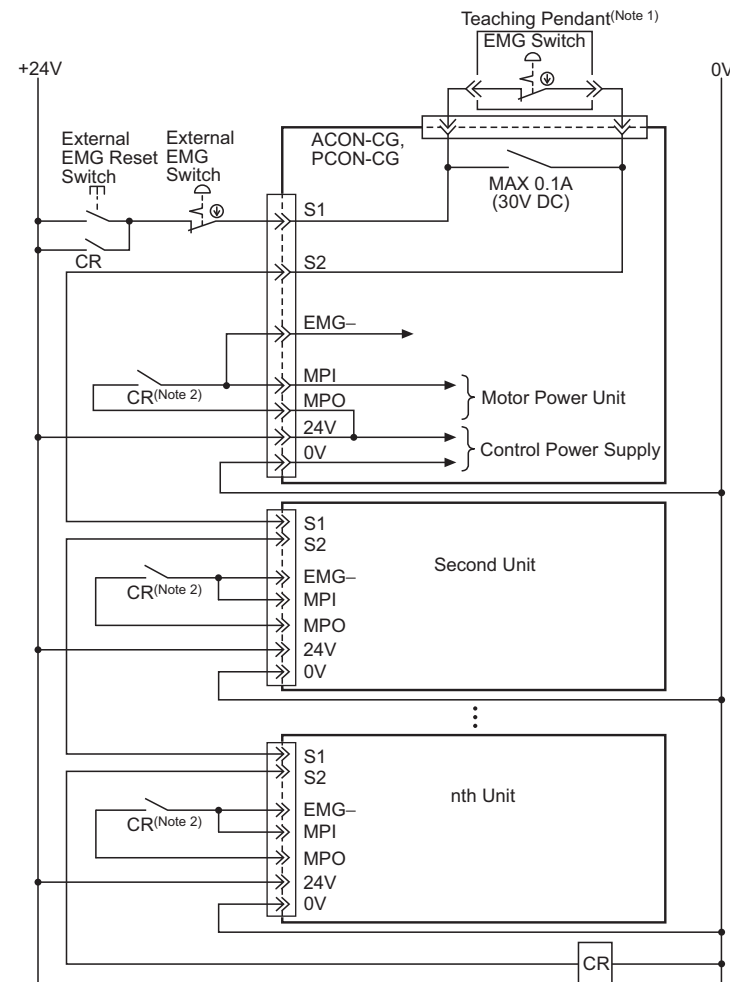
Note 2 When the teaching pendant is inserted into the controller, the controller confirms it automatically.

Note 3 The CR contact must be rated for 24V DC at 0.1A or more.

- **Driving Source Interruption Relay : Built-in Type : ACON-CG, PCON-CG**
- **In the case of the use of a single controller:**



- **In the case of the use of two or more controllers:**



Note 1 When the teaching pendant is inserted into the controller, the controller confirms it automatically.

Note 2 The CR contact must be rated according to the load it will encounter, which is dependent upon the motor current rating.

Operation Modes and Functions (Common to Each Fieldbus)

The machine can be operated selecting one of the following five operation modes.

- (1) Remote I/O Mode : This is the method whereby operation replicates hard wire PIO operation through field bus bit manipulation.
- (2) Position/ Simple Direct Value Mode : This is the method where the machine is operated by means of directly specifying the target position using numerical values.
For the speed, acceleration, deceleration, or positioning width, the already registered position data values are used.
- (3) Half Direct Value Mode : In this operation mode, in addition to the target position, the speed, acceleration, deceleration and push current value are directly specified using numerical values.
- (4) Full Direct Value Mode : In this operation mode, all the values related to the position control, are directly specified using numerical values.
- (5) Remote I/O Mode 2 : Here, current position and current speed feedback functions are added to the remote I/O mode.

Operation Modes and Main Functions

Main Functions	Remote I/O Mode	Position/ Simple Direct Value Mode	Half Direct Value Mode	Full Direct Value Mode	Remote I/O Mode 2
No. of Occupied Bytes	2	8	16	32	12
Operation with the Position No. Specified	○	○	×	×	○
Operation with the Position Data Specified	×	○ (Note)	○	○	×
Speed and Acceleration Direct Setup	×	×	○	○	×
Pressing Operation	○	○	○	○	○
Current Position Read	×	○	○	○	○
Current Speed Read	×	×	○	○	○
Completion Position No. Read	○	○	×	×	○
Max. Number of position table	512	768	Not Applicable	Not Applicable	512

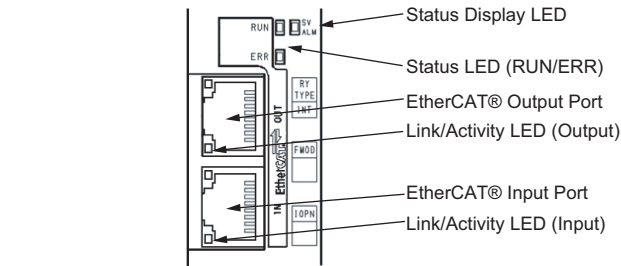
(Note) The actuator is operated by specifying all position data, other than the position, using a position number.

EtherCAT®

• Specification

Item	Specification
Communication Protocol	IEC61158Type12
Physical Layer	100BASE-TX (IEEE802.3)
Communication Frequency	Automatically follows the Master
Communication Cable Length	Depends on EtherCAT® Specification (Distance between each node: 100m max.)
Slave Type	I/O slave
Applicable Node Address	0 to 127 (17 to 80 : When connected to the master (CJ1W-NC*82) manufactured by OMRON)
Communication Cable	Category 5e or more (Double shielded cable braided with aluminum foil recommended)
Connector	RJ45 Connector × 2pcs (Input × 1, Output × 1)
Connection	Daisy chain only

• Interface Section



(Note) Refer to the troubleshooting or the Instruction Manual for the details of LED displays.

• EtherCAT® Connector

Pin No.	Signal Name	Abbreviated Code
1	Data sending +	TD+
2	Data sending –	TD–
3	Data receiving +	RD+
4	Not used	
5	Not used	
6	Data receiving –	RD–
7	Not used	
8	Not used	
Connector Hood	Security grounding	FG

- Operation Mode Setting and Address Allocation
The operation mode is set using the parameters.
Set the mode change switch on the controller front panel to “MANU” side and set the parameter No. 84 “FMOD: Field Bus Operation Mode” using the teaching tool such as PC software for RC.
[Refer to the Instruction Manual for the details]
- Node address setting
Node address can be set with the parameter.
Set Parameter No. 85 “NADR: Fieldbus Node Address” with a teaching tool such as PC software for RC.
Settable Range : 0 to 127 (It is set to 17 which is the I/O slave top address of EtherCAT® at the delivery.)
- Communication Speed Setting
The setting for the communication speed is not required because it automatically follows the master’s communication speed.

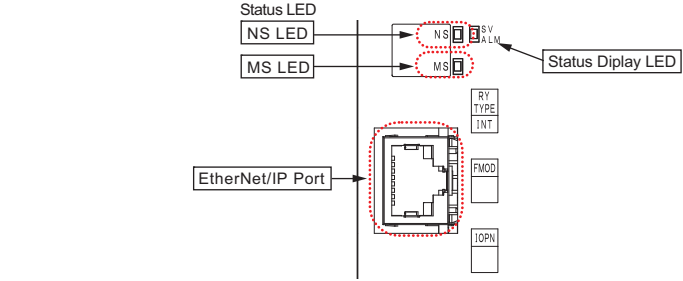
(Note) After parameter setting, reset the controller mode change witch to “AUTO” side, and then cycle the controller power.

EtherNet/IP

• Specification

Item	Specification
Communication Protocol	IEC61158Type12
Physical Layer	100BASE-TX (IEEE802.3)
Communication Cable Length	Depends on EtherCAT® Specification (Distance between each node: 100m max.)
Number of Connection	Depends on the master unit
Applicable Node Address	0.0.0.0 to 255.255.255.255
Communication Cable	Category 5e or more (Double shielded cable braided with aluminum foil recommended)
Connector	RJ45 Connector × 1pc

• Interface Section



(Note) Refer to the troubleshooting or the Instruction Manual for the details of LED displays.

• EtherNet/IP Connector

Pin No.	Signal Name	Abbreviated Code
1	Data sending +	TD+
2	Data sending –	TD–
3	Data receiving +	RD+
4	Not used	
5	Not used	
6	Data receiving –	RD–
7	Not used	
8	Not used	
Connector Hood	Security grounding	FG

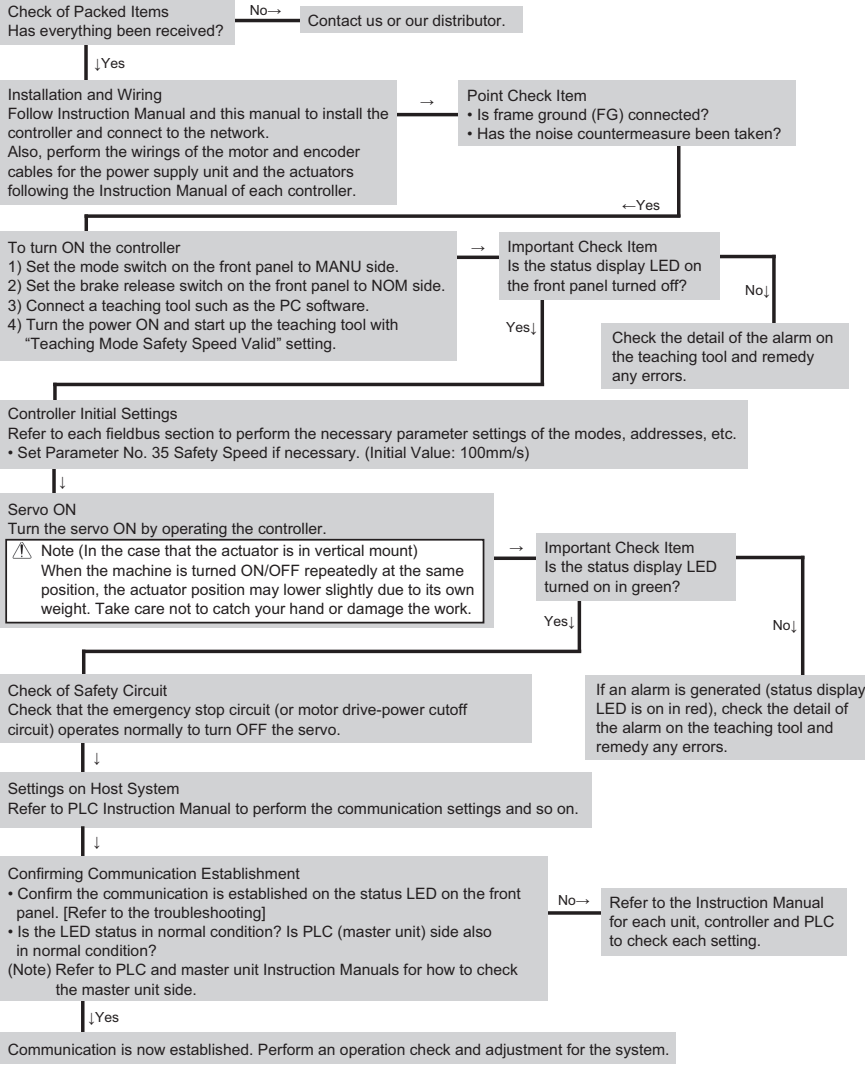
- Operation Mode Setting and Address Allocation
The operation mode is set using the parameters.
Set the mode change switch on the controller front panel to “MANU” side and set the parameter No. 84 “FMOD: Field Bus Operation Mode” using the teaching tool such as PC software for RC.
[Refer to the Instruction Manual for the details]
- Communication Speed Setting
The Communication speed can be set with the parameter. A special setting is not necessary since it is set to automatic negotiation when the product is delivered. However, when a fixed speed is required, change the setting to the desired speed in Parameter No. 86 “FBRs: Fieldbus Communication Speed” of the teaching tool in the PC software for RC.
[Refer to the Instruction Manual for the details]
- IP Address Setting
IP Address can be set with the parameter.
Set Parameter No. 140 “IPAD: IP Address” with a teaching tool such as PC software for RC.
Settable Range : 0.0.0.0 to 255.255.255.255 (It is set to “192.168.0.1” when the machine is delivered from the factory.)
- Settings for Subnet Mask
Subnet Mask can be set with the parameter.
Set Parameter No. 141 “SNMK: Subnet Mask” with a teaching tool such as PC software for RC.
Settable Range : 0.0.0.0 to 255.255.255.255 (It is set to “255.255.255.0” when the machine is delivered from the factory.)
- Settings for Default Gateway
Default Gateway can be set with the parameter.
Set Parameter No. 142 “DFGW: Default Gateway” with a teaching tool such as PC software for RC.
Settable Range : 0.0.0.0 to 255.255.255.255 (It is set to “0.0.0.0” when the machine is delivered from the factory.)

(Note) After parameter setting, reset the controller mode change witch to “AUTO” side, and then cycle the controller power.

Starting Procedure

When using this product for the first time, make sure to avoid mistakes and incorrect wiring by referring to the procedure below.

This section explains how to start up an EtherCAT® or EtherNet/IP complaint ACON or PCON (described as the “controller” in the following diagram). For the settings and wiring of each of the individual devices, controllers, and actuators connected to the network, refer to the individual device’s Instruction Manual.



Trouble Shooting

If an error has occurred, it is possible to check the operation condition on the status LEDs on the front panel.

● Status LED Displays of EtherCAT® Type

Name	Indication Color	Description
RUN	OFF	Initial condition (EtherCAT® communication in "INIT" condition) or the power is OFF
	GN (Illuminating)	In normal operation (EtherCAT® communication in "OPERATION" condition)
	GN (Flashing) (ON:200ms/OFF:200ms)	(EtherCAT® communication in "PRE-OPERATION" condition)
	GN (Flashing) (ON:200ms/OFF:1000ms)	(EtherCAT® communication in "SAFE-OPERATION" condition)
	OR (Illuminating)	Communication component (module) error
ERR	OFF	No abnormality or the power is OFF
	OR (Flashing) (ON:200ms/OFF:200ms)	Construction information (settings) error (Information received from the master cannot be set)
	OR (Flashing) (ON:200ms × 2 times /OFF:1000ms)	Communication section circuit error (Watchdog timer timeout)
	OR (Illuminating)	Communication component (module) error
Link/ Activity	OFF	Link status not detected or the power is OFF
	GN (Illuminating)	Linked (No network congestion)
	GN (Flashing) (ON:50ms/OFF:50ms)	Linked (Network in congestion)

● Status LED Displays of EtherNet/IP Type

Name	Indication Color	Description	
NS	OFF	Power is OFF or IP addresses are not set	
	GN (Illuminating)	Connection is established and the communication under normal condition.	
	GN (Flashing)	Online but network connection is not yet established. Communication Stop (Network is normal). Check the conditions of master unit.	
	RD (Illuminating)	Communication Error. Communication cannot be established due to the error detection such as IP address duplication.	Check the conditions of IP address settings, communication line, the power of hub units, noise prevention, etc.
	RD (Flashing)	Communication Error. (Communication Time-out Detection)	
MS	OFF	Power OFF	
	GN (Illuminating)	The machine is in the normal operation. The machine is under the control of the scanner (master)	
	GN (Flashing)	The connection with the scanner (master) is not established. Check the construction information settings. Check if the scanner (master) is in the idle condition.	
	RD (Illuminating)	Hardware Error. The replacement of the board is required. Please contact us.	
	RD (Flashing)	There is an error occurred but is not critical such like a user setting error or configuration error. It can be recovered with a rebuild of the settings.	

When an error occurs, connect the teaching tool such as PC software or teaching pendant and check it using the status monitor.
All the alarms for the fieldbus related are described as follows. For other alarms, refer to the instruction manual for the controller body and remedy it.

Code	Error Name	ID (*1)	RES (*2)	Cause/Treatment
0F2	Fieldbus Module Error	05	×	Cause : An error is detected on Fieldbus module (circuit component) Treatment : Check the parameter.
0F3	Undetected Fieldbus Module Error	04	×	Cause : Fieldbus module (circuit component) cannot be detected Treatment : Turn ON the power again. If the error is not removed, contact our company.

(*1) ID → Simple Alarm Code

(*2) RES → Alarm Reset Available/Unavailable ○ : Alarm Reset Available/× : Alarm Reset Unavailable



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