IAI
Quality and Innovation

PCON-CA/CFA/CB/CFB/CGB/CGFB, ACON-CA/CB/CGB, DCON-CA/CB/CGB

First Step Guide Tenth Edition

Thank you for purchasing our product.
Make sure to read the Safety Guide and detailed Instruction Manual (DVD) included with the product in addition to this First Step Guide to ensure correct use. This First Step Guide is original manual written by only this product.

⚠ Warning : Operation of this equipment requires detailed installation and operation instructions which are provided on the DVD Manual included in the box this device was packaged in. It should be retained with this device at all times.
A hardcopy of the 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.

Product Check

The standard configuration of this product is comprised of the following parts.
If you find any fault with the product you have received, or any missing parts, contact us or our distributor.

1. Parts

No.	Part Name	Model	Reference
1	Controller Main Body	Refer to "How to read the model plate", "How to read the model of the controller"	
Accessories			
2	I/O Flat Cable	CB-PAC-PIO□□□	□□□shows the cable length
3	Power Connector	FMC1.5/8-ST-3.5 (Supplier : PHOENIX CONTACT)	Recommended cable size AWG16 to 20 (1.25 to 0.5mm^2)
4	Dummy plug	DP-5	For the safety category compliant type
5	Absolute Battery (Option)	AB-7 or SEP-ABU*	If applicable for Simple Absolute Type
6	Serial Absolute Battery (Option)	AB-5	If applicable for Serial Absolute Type (for ACON only)
7	First Step Guide		
8	Instruction Manual (DVD)		
9	Safety Guide		

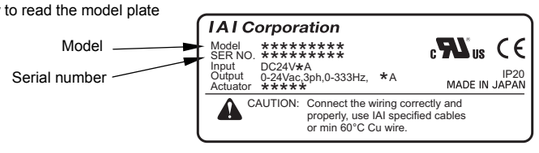
2. Teaching Tool (to be purchased separately)
A teaching tool such as PC software is necessary when performing the setup for position setting, parameter setting, etc. that can only be done on the teaching tool.
Please prepare either of the following teaching tools.

No.	Part Name	Model
1	PC Software (with RCS232C converter adapter + external equipment communication cable)	RCM-101-MW
2	PC Software (with USB converter adapter + USB cable + external equipment communication cable)	RCM-101-USB
3	Touch Panel Teaching	TB-01/D/DR
4	Touch Panel Teaching	TB-02/D
5	Data Setter	TB-03

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

No.	Name	Manual No.
1	PCON-CA/CFA Controller Instruction Manual	ME0289
2	PCON-CB/CFB Controller Instruction Manual	ME0342
3	ACON-CA, DCON-CA Controller Instruction Manual	ME0326
4	ACON-CB Series Contoroller, DCON-CB Series Contoroller Instruction Manual	ME0343
5	PC Software RCM-101-MW/ RCM-101-USB Instruction Manual	ME0155
6	Touch Panel Teaching TB-01 Applicable for Position Controller Instruction Manual	ME0324
7	Touch Panel Teaching TB-02 Applicable for Position Controller Instruction Manual	ME0355
8	Data Setter TB-03 Position Controller, Wired Link Instruction Manual	ME0376
9	Instruction Manual for the Serial Communication [for Modbus]	ME0162
10	CC-Link Instruction Manual	ME0254
11	DeviceNet Instruction Manual	ME0256
12	PROFIBUS-DP Instruction Manual	ME0258
13	CompoNet Instruction Manual	ME0220
14	MECHATROLINK-Ⅰ/Ⅱ Instruction Manual	ME0221
15	EtherCAT Instruction Manual	ME0273
16	EtherNet/IP Instruction Manual	ME0278
17	PROFINET-IO Instruction Manual	ME0333
18	MECHATROLINK-Ⅲ Instruction Manual	ME0317

4. How to read the model plate



5. How to read the model of the controller

● PCON

PCON-CA-56P WAI-NP-2-0-ABU-DN-**

<Series>

<Type>
CA/CB : Standard Type
CFA/CFB : High-Thrust Actuator Connection Type
CGB : Sagety Categories Complied Type
CGFB : High-Thrust Actuator Connection Sagety Categories Complied Type

<Detail of Connected Axis>
[Motor Type]
20P : 20□ pulse motor, 20SP : 20□ pulse motor
28P : 28□ pulse motor, 28SP : 28□ pulse motor
35P : 35□ pulse motor, 42P : 42□ pulse motor
42SP : 42□ pulse motor, 56P : 56□ pulse motor
56SP : 56□ pulse motor, 60P : 60□ pulse motor
86P : 86□ pulse motor

[Encoder Type]
WAI : Incremental / Battery-less Absolute Shared
SA : Simple Absolute

<I/O Type>
NP : NPN Type (Sync. Type) (Standard),
PN : PNP Type (Source Type),
PLN : Pulse Train Control NPN Type (Sync. Type),
PLP : Pulse Train Control PNP Type (Source Type),
DV : DeviceNet Connection Type, CC : CC-Link Connection Type
PR : PROFIBUS-DP Connection Type, CN : CompoNet Connection Type
PRT : PROFINET-IO Connection Type, EC : EtherCAT Connection Type
EP : EtherNet/IP Connection Type, ML : MECHATROLINK-Ⅰ/Ⅱ Connection Type
ML3 : MECHATROLINK-Ⅲ Connection Type (Except for PCON-CA/CFA)

<I/O Cable Length>
0 : Equipped with no cable
2 : 2m (Standard)
3 : 3m
5 : 5m

<Power-supply Voltage>
0 : 24V DC

<Applicable to Simplified Absolute Unit>
(Not Specified): Incremental / Battery-less Absolute
AB : Simple Absolute Type (With the Absolute Battery)
ABU : Simple Absolute Type (With the Absolute Battery Unit (SEP-ABU))
ABUN : Simple Absolute Type (With no Absolute Battery)

<Type of Installation>
(Not Specified) : Screw Attachment Type
DN : DIN Rail Mounting Type

<Identification for IAI use only>
* There is no identification in some cases.

● ACON

ACON-CA-30 I-NP-2-0-AB-DN-**

<Series>

<Type>
CA/CB : Standard Type
CGB : Safety Categories Complied Type

<Detail of Connected Axis>
[Motor Type]
2 : 2W AC servo motor
5 : 5W AC servo motor
10 : 10W AC servo motor
20S : 20W AC servo motor
20 : 20W AC servo motor
30 : 30W AC servo motor

[Encoder Type]
WAI : Incremental / Battery-less Absolute shared (CB only)
I : Incremental A : Absolute
[Option]
HA : High Acceleration/Deceleration Type
LA : Low Power Consumption Type
No description : Standard Type

<I/O Type>
NP : NPN Type (Sync. Type) (Standard),
PN : PNP Type (Source Type),
PLN : Pulse Train Control NPN Type (Sync. Type),
PLP : Pulse Train Control PNP Type (Source Type),
DV : DeviceNet Connection Type, CC : CC-Link Connection Type
PR : PROFIBUS-DP Connection Type, CN : CompoNet Connection Type
PRT : PROFINET-IO Connection Type, EC : EtherCAT Connection Type
EP : EtherNet/IP Connection Type ML : MECHATROLINK-Ⅰ/Ⅱ Connection Type
ML3 : MECHATROLINK-Ⅲ Connection Type (Except for ACON-CA)

<I/O Cable Length>
0 : Equipped with no cable
2 : 2m (Standard)
3 : 3m
5 : 5m

<Power-supply Voltage>
0 : 24V DC

<Applicable to Simplified Absolute Unit>
AB : Simple Absolute Type (With the Absolute Battery)
ABU : Simple Absolute Type (With the Absolute Battery Unit (SEP-ABU))
ABUN : Simple Absolute Type (With no Absolute Battery)

<Type of Installation>
(Not Specified) : Screw Attachment Type
DN : DIN Rail Mounting Type

<Identification for IAI use only>
* There is no identification in some cases.

● DCON

DCON-CA-3 I-NP-2-0-DN-**

<Series>

<Type>
CA/CB : Standard Type
CGB : Safety Categories Complied Type

<Detail of Connected Axis>
[Motor Type]
3 : 2.5W DC Brushless motor

[Encoder Type]
I : Incremental

<I/O Type>
NP : NPN Type (Sync. Type) (Standard),
PN : PNP Type (Source Type),
PLN : Pulse Train Control NPN Type (Sync. Type),
PLP : Pulse Train Control PNP Type (Source Type),
DV : DeviceNet Connection Type, CC : CC-Link Connection Type
PR : PROFIBUS-DP Connection Type, CN : CompoNet Connection Type
PRT : PROFINET-IO Connection Type, EC : EtherCAT Connection Type
EP : EtherNet/IP Connection Type ML : MECHATROLINK-Ⅰ/Ⅱ Connection Type
ML3 : MECHATROLINK-Ⅲ Connection Type (Except for DCON-CA)

<I/O Cable Length>
0 : Equipped with no cable
2 : 2m (Standard)
3 : 3m
5 : 5m

<Power-supply Voltage>
0 : 24V DC

<Type of Installation>
(Not Specified) : Screw Attachment Type
DN : DIN Rail Mounting Type

<Identification for IAI use only>
* There is no identification in some cases.

Basic Specifications

PCON List of Specifications

Item				Description	
				PCON-CA/CB/CGB	PCON-CFA/CFB/CGFB
Number of controlled axes				1-axis	
Power-supply Voltage				24V DC ±10%	
Load Capacity (including control side current consumption) (Note1)	RCP2 RCP3	Motor Type	20P, 28P, 28SP	MAX. 1A	
			42P, 56P	MAX. 2.2A	
			60P, 86P		MAX. 6A
	RCP4 RCP5 RCP6	Motor Type	28P, 35P, 42P, 56P	High-thrust function is disabled: MAX.2.2A	
				High-thrust function is enabled: Rated 3.5A / MAX. 4.2A	
			56SP, 60P, 86P		MAX. 6A
Power Supply for Electromagnetic Brake (for actuator equipped with brake)				24V DC ±10% 0.15A (MAX.)	
Heat Generation	RCP2, RCP3			5W	26.4W
	RCP4 to RCP6			3W	
Rush Current (Note2)				8.3A	10A
Transient Power Cutoff Durability				MAX. 500μs	
Motor Control System				Weak field-magnet vector control	
Corresponding Encoder	RCP2 to RCP5			Incremental Encoder, Battery-less Absolute Encoder Resolution 800 pulse/rev	
	RCP6			Battery-less Encoder Resolution 8192 pulse/rev	
Actuator Cable Length				MAX. 20m	
Serial Communication Interface (SIO Port)				RS485 : 1 channel (based on Modbus Protocol RTU/ASCII) Speed : 9.6 to 230.4Kbps Control available with serial communication in the modes other than the pulse train	
External Interface	PIO Type			Signal I/O dedicated for 24V DC (selected from NPN/PNP) … Input 16 points max., output 16 points max. Cable length MAX. 10m	
	Fieldbus Type			DeviceNet, CC-Link, PROFIBUS-DP, CompoNet, MECHATROLINK-Ⅰ/Ⅱ, EtherCAT, EtherNet/IP, PROFINET-IO, MECHATROLINK-Ⅲ (Except for PCON-CA/CFA)	
Data Setting and Input				PC Software, Touch Panel Teaching, Teaching Pendant, Data Setter	
Data Retention Memory				Saves position data and parameters to non-volatile memory (There is no limitation in number of writing)	
Operation Mode				Positioner Mode/Pulse Train Control Mode (selected by parameter setting)	
Number of Positions in Positioner Mode				Standard 64 points, MAX. 512 points (PIO Specification) (Note) Number of positions differs depending on the selection in PIO pattern and fieldbus operation mode.	
Pulse Train Interface	Input Pulse Frequency			Differential System (Line Driver System) : MAX. 200kpps Cable length MAX. 10m	
				Open Collector System : Not applicable. * If the host applies the open collector output, prepare AK-04 (option) separately to convert to the differential type.	
	Command Pulse Multiplying Factor (Electrical Gear : A/B)			1/50 < A/B < 50/1 Setting Range of A and B (set to parameter) : 1 to 4096	
	Feedback Pulse Output			None	
LED Display (mounted on Front Panel)				SV (GN)/ALM (RD) : Servo ON/Alarm generated STS0 to 3 : Status display RDY (GN)/ALM (RD) : Absolute function in normal / absolute function error (for the simple absolute type) 1, 0 (GN) (RD) : Absolute function status display (for the simple absolute type)	
Electromagnetic Brake Compulsory Release Switch (mounted on Front Panel)				Switching NOM (standard)/BK RLS (compulsory release)	
Insulation Resistance				500V DC 10MΩ or more	
Protection Function against Electric Shock				Class I basic insulation	
Weight (Note3)	Incremental Type			Screw fixed type : 250g or less DIN rail fixed type : 285g or less	Screw fixed type : 270g or less DIN rail fixed type : 305g or less
	Simple Absolute Type (including 190g for battery)			Screw fixed type : 450g or less DIN rail fixed type : 485g or less	
Cooling Method				Natural air-cooling	Forced air-cooling
External dimensions				Screw fixed type : 35W×178.5H×69.6D DIN rail fixed type : 35W×185H×78.1D	Screw fixed type : 35W×190H×69.6D DIN rail fixed type : 35W×196.5H×78.1D
Environment	Surrounding Air Temperature			0 to 40°C	
	Surrounding Humidity			85%RH or less (non-condensing)	
	Surrounding Environment			[Refer to Installation Environment]	
	Surrounding Storage Temperature			-20 to 70°C (Excluding battery)	
	Usage Altitude			1000m or less	
	Protection Class			IP20	
	Vibration Durability			Frequency 10 to 57Hz / Swing width : 0.075mm Frequency 57 to 150Hz / Acceleration 9.8m/s^2 XYZ directions Sweep time : 10 minutes Number of sweep : 10 times	

Note1 Value increases in 0.3A for Fieldbus Type
Note2 In-rush current will flow for approximately 5msec after the power is turned ON (at 40°C).
Note that the value of in-rush current differs depending on the impedance of the power supply line.
Note3 Value increases in 30g for Fieldbus Type.

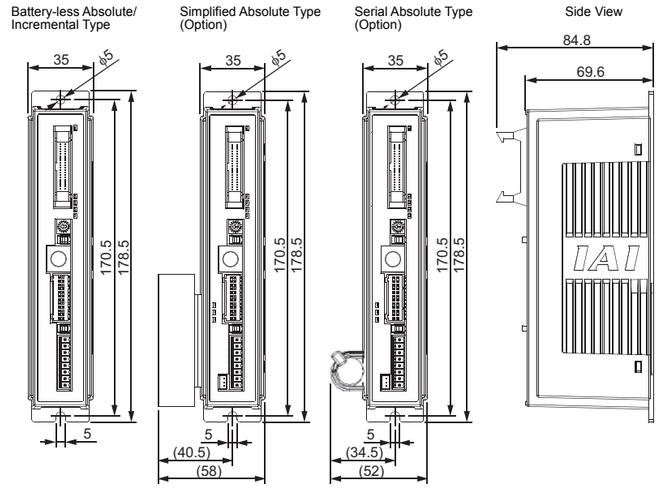
ACON, DCON List of Specifications

Item			Description				
			ACON-CA/CB/CGB			DCON-CA/CB/CGB	
Number of controlled axes			1-axis				
Power-supply Voltage			24V DC ±10%				
Load Capacity (It does not including control side current consumption) (Note1)	Series	Motor Type	Rated	Max. Power Consumption	MAX.(Note5)	Rated	MAX.
	RCA, RCA2, RCL	2W	0.8A		4.6A		
		5W	1.0A		6.4A		
		10W (RCL)	1.3A		6.4A		
		10W (RCA/ RCA2)	1.3A	2.5A	4.4A		
		20W	1.3A	2.5A	4.4A		
		20W (Model: 20S)	1.7A	3.4A	5.1A		
		30W	1.3A	2.2A	4.0A		
	RCD	3W				0.7A	1.5A
Power Supply for Electromagnetic Brake (for actuator equipped with brake)			24V DC ±10% 0.15A (MAX.)				
Heat Generation			8.4W			4W	
Rush Current (Note2)			10A				
Transient Power Cutoff Durability			MAX. 500μs				
Motor Control System			Sinusoidal Waveform (AC) Drive			Rectangular Waveform (DC) Drive	
Corresponding Encoder			Incremental Encoder Serial Absolute Encoder Battery-less Aboslute Encoder			Incremental Encoder	
Corresponding Encoder Resolution	RCA	Incremental Type	800pulse/rev				
		Serial Absolute Type	16384pulse/rev				
	RCA2	RCA2_*** N	1048pulse/rev				
		Other than RCA2_*** N	800pulse/rev				
	RCA /RCA2	Battery-less Absolute Type	16384pulse/rev				
	RCL	RA1, RA4, SA1, SA4	715pulse/rev				
		RA2, RA5, SA2, SA5	855pulse/rev				
		RA3, RA6, SA3, SA6	1145pulse/rev				
	RCD					400pulse/rev	
Actuator Cable Length			MAX. 20m			MAX. 10m	
Serial Communication Interface (SIO Port)			RS485 : 1 CH (based on Modbus Protocol RTU/ASCII) Speed : 9.6 to 230.4Kbps Control available with serial communication in the modes other than the pulse train				
External Interface	PIO Type		Signal I/O dedicated for 24V DC (selected from NPN/PNP) … Input 16 points max., output 16 points max. Cable length MAX. 10m				
	Fieldbus Type		DeviceNet, CC-Link, PROFIBUS-DP, CompoNet, MECHATROLINK-Ⅰ/Ⅱ, EtherCAT, EtherNet/IP, PROFINET-IO, MECHATROLINK-Ⅲ (Except for ACON-CA and DCON-CA)				
Data Setting and Input			PC Software, Touch Panel Teaching, Teaching Pendant, Data Setter				
Data Retention Memory			Saves position data and parameters to non-volatile memory (There is no limitation to the number of times data may be written.)				
Operation Mode			Positioner Mode/Pulse Train Control Mode (selected by parameter setting)				
Number of Positions in Positioner Mode			Standard 64 points, MAX. 512 points (PIO Type) (Note) Number of positions differs depending on the selection in PIO pattern.				
Pulse Train Interface (Note4)	Input Pulse Frequency		Differential System (Line Driver System) : MAX. 200kpps Cable length MAX. 10m				
			Open Collector System : Not applicable. * If the host applies the open collector output, prepare AK-04 (option) separately to convert to the differential type.				
	Command Pulse Multiplying Factor (Electrical Gear : A/B)		1/50 < A/B < 50/1 Setting Range of A and B (set to parameter) : 1 to 4096				
	Feedback Pulse Output		None				
LED Display (mounted on Front Panel)			SV (GN)/ALM (RD) : Servo ON/Alarm generated STS0 to 3 : Status display RDY (GN)/ALM (RD) : Absolute function in normal / absolute function error (for the simple absolute type) 1, 0 (GN) (RD) : Absolute function status display (for the simple absolute type)				
Electromagnetic Brake Compulsory Release Switch (mounted on Front Panel)			Switching NOM (standard)/BK RLS (compulsory release)				
Insulation Resistance			500V DC 10MΩ or more				
Protection Function against Electric Shock			Class I basic insulation				
Weight (Note3) (Other than Field Network Type)	Incremental Type		Screw fixed type : 230g or less DIN rail fixed type : 265g or less				
	Simple Absolute Type		Battery (AB-7) : 190g or less Absolute Battery Case (SEP-ABU): 140g or less				
	Serial Absolute Type		Battery (AB-5) : 20g				
Cooling Method			Natural air-cooling				
External dimensions			Screw fixed type : 35W×178.5H×69.6D DIN rail fixed type : 35W×185H×78.1D				
Environment	Surrounding Air Temperature		0 to 40°C				
	Surrounding Humidity		85%RH or less (non-condensing)				
	Surrounding Environment		[Refer to Installation Environment]				
	Surrounding Storage Temperature		-20 to 70°C (Excluding battery)				
	Usage Altitude		1000m or less				
	Protection Class		IP20				
	Vibration Durability		Frequency 10 to 57Hz / Swing width : 0.075mm Frequency 57 to 150Hz / Acceleration 9.8m/s^2 XYZ directions Sweep time : 10 minutes Number of sweep : 10 times				

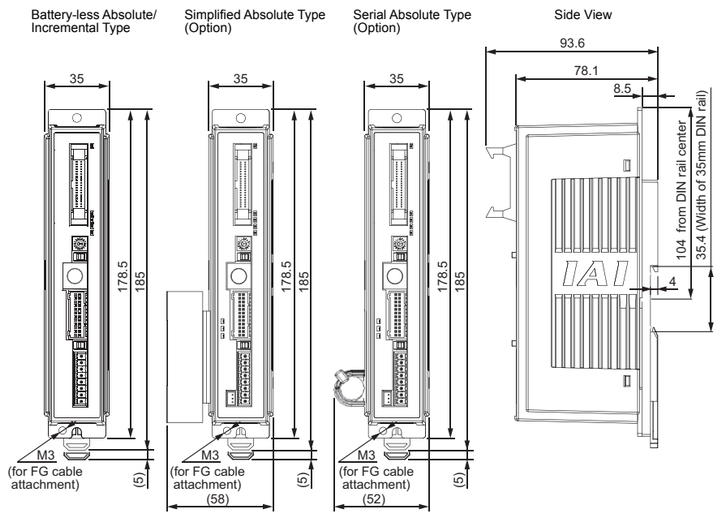
Note1 Control power capacity is 0.3A.
Note2 In-rush current will flow for approximately 5msec after the power is turned on (at 40°C).
Note that the value of in-rush current differs depending on the impedance of the power supply line.
Note3 Add the weight of the battery (case) for "Simple Absolute Type" and "Serial Absolute Type".
Note4 Serial absolute type is not applicable for the pulse train control mode.
Note5 The current reaches the maximum at the excitation phase detection of the motor conducted when the servo is turned on for the first time after the power is supplied. (TYP 1 to 2 second, MAX. 10 second)

External Dimensions (ACON, DCON and PCON-CA/CB/CGB)

- Screw fixed type

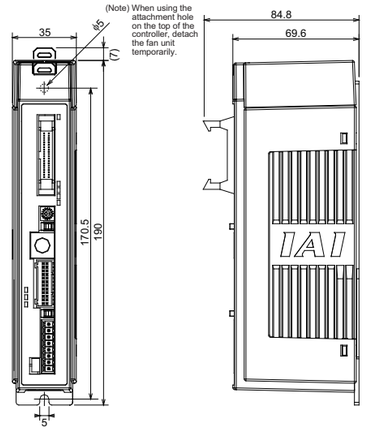


- DIN rail fixed type

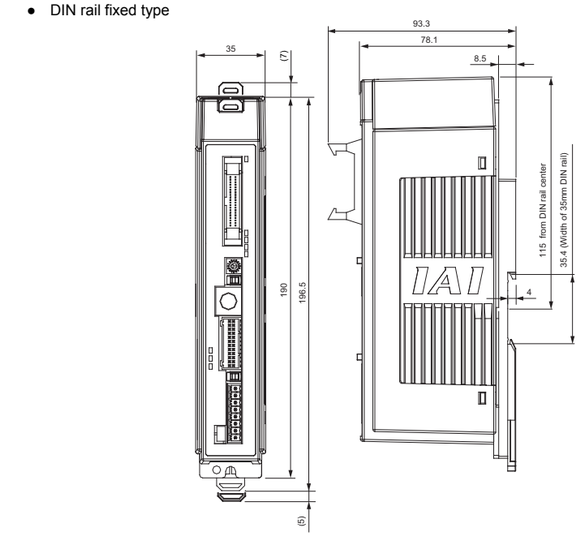


External Dimensions (PCON-CFA/CFB/CGFB)

- Screw fixed type



- DIN rail fixed type



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)

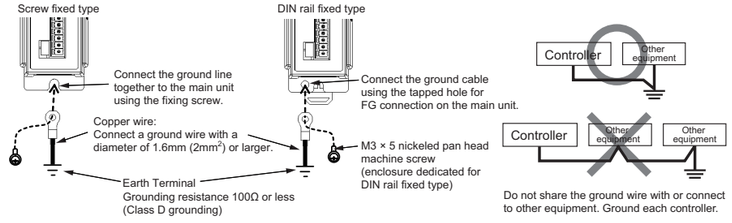
1. Installation Environment
Do not use this product in the following environment
- Location where the surrounding air temperature exceeds the range of 0 to 40°C
- Location where condensation occurs due to abrupt temperature changes
- Location where relative humidity exceeds 85%RH
- Location exposed to 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]

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
- Storage and preservation environment follows the installation environment. Especially in a long-term storage, consider to avoid condensation of surrounding air.
Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be preserved in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.

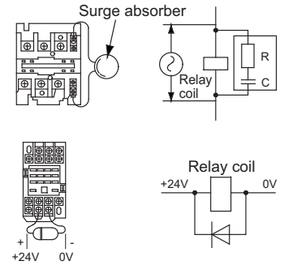
Installation and Noise Elimination

1. Noise Elimination Grounding (Frame Ground)

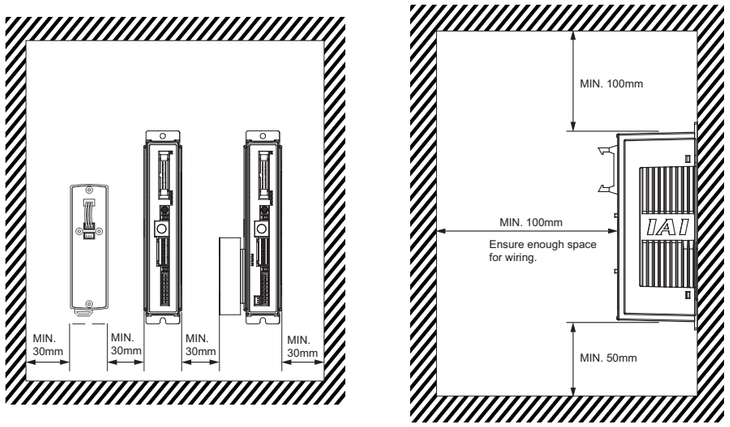


2. Precautions regarding wiring method
1) Wire is to be twisted for the 24V DC power supply.
2) Separate the signal and encoder lines from the power supply and power lines.

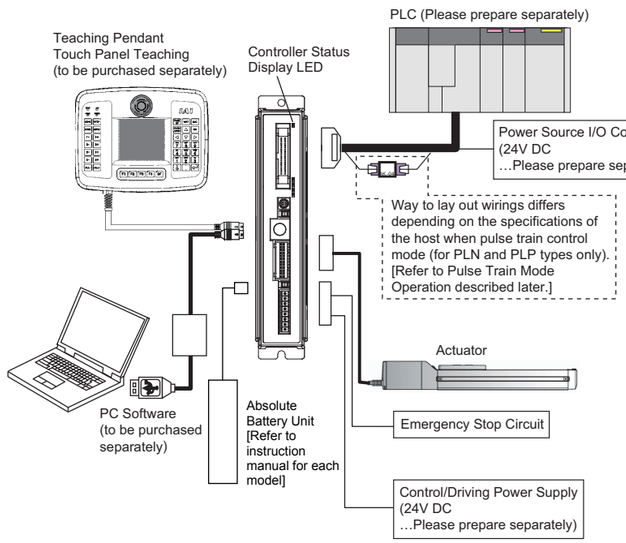
3. Noise Sources and Elimination
Carry out noise elimination measures for power devices on the same power path and in the same equipment.
The following are examples of measures to eliminate noise sources.
1) AC solenoid valves, magnet switches and relays
[Measure] Install a Surge absorber parallel with 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.



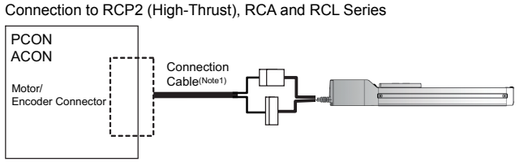
4. Heat Radiation and Installation
Design and Build the system considering the size of the controller box, location of the controller and cooling factors to keep the ambient temperature around the controller below 40°C



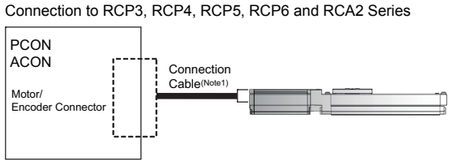
Connection Diagram



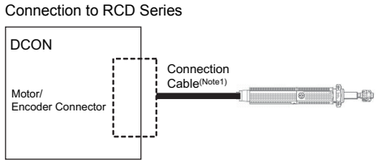
- Connection to RCP2 (High-Thrust), RCA and RCL Series



- Connection to RCP3, RCP4, RCP5, RCP6 and RCA2 Series



- Connection to RCD Series



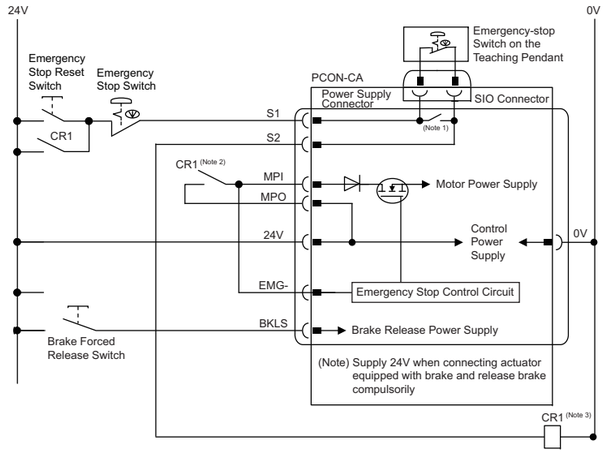
Note 1 Applicable Connection Cable Model Codes □□□ : Cable Length Example) 030 = 3m

Model Name		Cable	Reference
RCP2		CB-PSEP-MPA□□□	Robot cable from 0.5 to 20m
RCP3		CB-APSEP-MPA□□□	Robot cable from 0.5 to 20m
		CB-APSEP-MPA□□□-LC	Standard cable from 0.5 to 20m
RCP4 (Other than GR* Type) RCD (Applicable Controller Symbol : D3)		CB-CA-MPA□□□-RB	Robot cable from 0.5 to 20m (Note 1)
		CB-CA-MPA□□□	Standard cable from 0.5 to 20m (Note 1)
RCP4 (GR Type), RCP5, RCP6 RCD (Applicable Controller Symbol : D5)		CB-CAN-MPA□□□	Standard cable from 0.5 to 20m (Note 1)
		CB-CAN-MPA□□□-RB	Robot cable from 0.5 to 20m (Note 1)
High-Thrust	RCP2	CB-CFA-MPA□□□	Standard cable for CFA type from 0.5 to 20m
		CB-CFA-MPA□□□-RB	Robot cable for CFA type from 0.5 to 20m
	RCP4	CB-CFA2-MPA□□□	Standard cable for CFA type from 0.5 to 20m
		CB-CFA2-MPA□□□-RB	Robot cable for CFA type from 0.5 to 20m
	RCP5、RCP6	CB-CFA3-MPA□□□	Standard cable for CFA type from 0.5 to 20m
		CB-CFA3-MPA□□□-RB	Robot cable for CFA type from 0.5 to 20m
RCA, RCL (Incremental Type)		CB-ASEP-MPA□□□ CB-ASEP2-MPA□□□	Robot cable from 0.5 to 20m
RCA (Serial Absolute Type)		CB-APSEP-MPA□□□	Robot cable from 0.5 to 20m
RCA2			

Note 1 The length is up to 10m for RCD

Power Supply and Emergency Stop Circuit

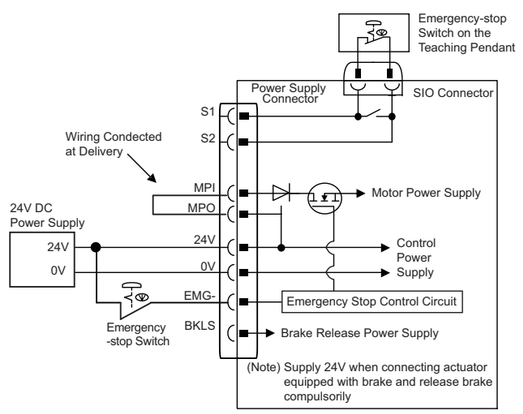
This shows the circuit example when the emergency stop switch in the teaching pendant is enabled on the emergency stop circuit to be built up by the client.
In the example below, uses PCON-CA. It is the same in case of except for PCON-CA.



Note 1 : The safety categories complied type (CGB Type, etc.) is not equipped with the relay to have the controller automatically identify that a teaching tool was plugged in and switch the wiring layout. Those other than the safety categories complied type do the automatic identification and have S1 and S2 short-circuited.
Note 2 : When the motor driving source is cut off externally for a compliance with the safety category, connect a contact such as a contactor to the wires between MPI and MPO. Also, the ratings for the emergency stop signal that turns ON/OFF at the contact CR1 are 24V DC and 10mA or less.
Note 3 : For CR1, select the one with coil current 0.1A or less.

⚠ Caution If supplying power with using a 24V DC, having it turned ON/OFF, keep the 0V connected and have the +24V supplied/cut (cut one side only).

[Reference] Example for operating an actuator by using the standard type (CA or CB Type) with optimum wiring layout
(Note) In this example, the emergency stop switch on the teaching pendant would not work.



I/O Signal

Explanation of I/O Signal Functions

Category	Abbreviated Code	Signal Name	Contents of Functions
Input	CSTR	PTP Strobe (Start Signal)	Starts moving toward the position set in Command Position No.
	PC1 to PC256	Command Position No.	To input position No. desired to move (binary input).
	BKRL	Brake Compulsory Release	To release the brake compulsorily.
	RMOD	Operation Mode Changeover	Operation Mode can be changed over when MODE Switch on the controller is on AUTO. (The setting is AUTO when signal is OFF, and MANU when ON.)
	*STP	Pause	When this signal is turned OFF while in move, the actuator decelerates and then stops. The remaining movement is in a hold while the actuator is stopped and will resume when the signal turns back ON.
	RES	Reset	Turn the signal ON to reset the alarm. Also, when it is turned ON in the pause mode (*STP is turned OFF), the remaining movement amount can be cancelled.
	SON	Servo ON	The servo remains ON while this signal is ON, or OFF while this signal is OFF.
	HOME	Home Return	The controller will perform home return operation when this signal is turned ON.
	MODE	Teaching Mode	The operating mode will change to the teaching mode when this signal is turned ON. The mode will not be switched over unless CSTR, JOG+ and JOG– are all OFF and the actuator operation is stopped.
	JISL	Jog/Inching Changeover	Jog Operation can be performed with JOG+ and JOG– while this signal is OFF. Inching Operation is performed with JOG+ and JOG– when it is ON.
	JOG+ JOG–	Jog	Jog Operation is performed to positive direction by detecting ON edge of JOG+ signal and to negative direction by JOG– signal while JISL signal is OFF. The actuator will decelerate and stop if OFF edge is detected while in each Jog Operation. Inching Operation is performed while JISL signal is ON.
	PWRT	Current Position Writing	Write the current position to the indicated position if indicating the written position and turn this signal ON for more than 26ms during the Teaching Mode.
	ST0 to ST6	Start Signal	The actuator moves to the commanded position with this signal ON during the electromagnetic valve mode.
	CSTP	Compulsory Stop	Turning it continuously input for more than 16ms compulsorily stops the actuator.
	TL	Torque Limit Select	Puts torque limitation to the motor with the signal on and the value set to the parameter.
	DCLR	Deviation Counter Clear	This is the signal to clear up the differential counter.
	RSTR	Datum Position Movement Command	Applies torque limit to the motor with the signal ON and the value set to the parameter No.167
Output	PEND/INP	Position Completion	Turns ON in the positioning band range after actuator operation. The INP signal will turn OFF if the position deviation exceeds the in-position range. PEND and INP can be switched over by the parameter.
	PM1 to PM256	Completion Position No.	The position No. reached after the positioning completion, is output (binary output).
	HEND	Home Return Completion	Turns ON when home-return operation is complete. It will be kept ON unless the home position is lost.
	ZONE1 ZONE2	Zone	Turns ON if the current actuator position is within the range set to the parameter.
	PZONE	Position Zone	Turns ON when the current actuator position gets into the range set to the position data during the move towards the position. Even though it can be used together with ZONE1, PZONE will become only available for operation by the set position number.
	RMDS	Operation Mode Output	Outputs the operation mode status. It turns ON when the controller is ON Manual Mode.
	*ALM	Alarm	Turns ON when controller in normal condition, and OFF when alarm is generated.
	ALM1 to 8	Alarm Code	The detail of the alarm is output with binary code when an alarm more than the operation cancel level is issued.
	MOVE	While in Operation	Turns ON while the actuator is moving (including home return and pressing operations).
	SV	Servo ON	Turns ON when the servo is ON.
	*EMGS	Emergency Stop Output	Turns ON when the controller emergency stop is cancelled, and OFF during the emergency stop (regardless of alarms).
	MODES	Teaching Mode Output	Turns ON when it turns to the Teaching Mode by MODE signal input. It is OFF in the normal mode.
	WEND	Writing Complete	It is OFF during the teaching mode and turns ON when the writing by PWRT Signal is complete. It turns OFF when PWRT Signal turns OFF.
	PE0 to PE6	Current Position Number	Turns ON when moving to the target position is complete in Electromagnetic Valve Mode.
	LS0 to LS2	Limit Switch Output	Turns ON when the current actuator position is within the range of positioning band (±) of the target position. It is output even before the movement command and the servo is OFF if the home-return operation is completed.
	*ALML	Light Error Output	Outputs when a message level alarm is generated. (Parameter setting necessary)
	LOAD(Note1)	Load Output Judgment Signal	Output is made when the current exceeded the value set in “Threshold” for certain time (Note) within the range of “Zone+” and “Zone-“ in the position data during the pressing operation. (Note) Setting to be established in Parameter No. 50 It is used for judgments such as to determine if press-fitting process is completed normally.
	TRQS(Note1)	Torque Level Output	Turns ON when the motor current has exceeded the value set in “Threshold” in the position table in such cases as the slider (or rod) hitting an obstacle while in pressing operation, and turns OFF when current goes below the value
	*BALM (ACON only)	Absolute battery voltage drop alarm	It turns on when the battery is in the normal voltage range for the serial absolute type actuator. It is on all the time for the incremental type actuator. It can be set to turn off when a message level alarm is generated by the setting in Parameter No. 151.
	TLR	Torque Limit Restricted	Turns ON when torque reaches the limit while in torque restriction.
	REND	Datum Position Movement Command	Turns ON when movement to the datum position set in Parameter No.167 is finished.

Signal with “*” expresses the signal of active low. It is ON when the power is applied to the controller, and turns OFF when the signal is output.
(Note 1) It is a signal dedicated for High-Thrust Actuator (CFA Type). Use this as a reference output for other actuators.

Signal Assignment for Each Mode

The signal assignment of I/O flat cable by the PIO pattern is as shown below. Follow the following table to connect the external equipment (such as PLC).

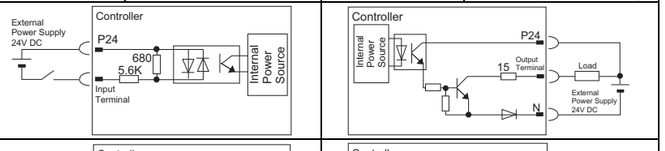
Pin No.	Category	PIO Functions	Selection in Parameter No. 25 (PIO Pattern) 0 Positioning mode	1 Teaching mode	2 256-point mode	3 512-point mode	4 Electro-magnetic valve mode 1	5 Electro-magnetic valve mode 2	6 Pulse train control mode (For Incremental)	Pulse train control mode (For Battery-less Absolute
	Input	Number of Positioning Points	64 points	64 points	256 points	512 points	7 points	3 points	–	–
		Home Return Signal	○	○	○	○	○	×	○	○
		Jog Signal	×	○	×	×	×	×	×	×
		Teaching Signal (Current Position Writing)	×	○	×	×	×	×	×	×
		Brake Release	○	×	○	○	○	○	○	○
	Output	Signal during Operation	○	○	×	×	×	×	×	×
		Zone Signal	○	△ (Note1)	△ (Note1)	×	○	○	○	○
		Position Zone Signal	○	○	○	×	○	○	×	×
1A	24V		P24							
2A	24V		P24							
3A	–		–						PP	PP
4A	–		–						/PP	/PP
5A	Input	IN0	PC1	PC1	PC1	PC1	ST0	ST0	SON	SON
6A		IN1	PC2	PC2	PC2	PC2	ST1	ST1 (JOG+)	RES	RES
7A		IN2	PC4	PC4	PC4	PC4	ST2	ST2 (Note2)	HOME	HOME
8A		IN3	PC8	PC8	PC8	PC8	ST3	–	TL	TL
9A		IN4	PC16	PC16	PC16	PC16	ST4	–	CSTP	CSTP
10A		IN5	PC32	PC32	PC32	PC32	ST5	–	DCLR	DCLR
11A		IN6	–	MODE	PC64	PC64	ST6	–	BKRL	BKRL
12A		IN7	–	JISL	PC128	P128	–	–	RMOD	RMOD
13A		IN8	–	JOG+	–	PC256	–	–	–	RSTR
14A		IN9	BKRL	JOG–	BKRL	BKRL	BKRL	BKRL	–	–
15A		IN10	RMOD	RMOD	RMOD	RMOD	RMOD	RMOD	–	–
16A		IN11	HOME	HOME	HOME	HOME	HOME	–	–	–
17A		IN12	*STP	*STP	*STP	*STP	*STP	–	–	–
18A		IN13	CSTR	CSTR/PWRT	CSTR	CSTR	–	–	–	–
19A		IN14	RES	RES	RES	RES	RES	RES	–	–
20A		IN15	SON	SON	SON	SON	SON	SON	–	–
1B	Output	OUT0	PM1 (ALM1)	PM1 (ALM1)	PM1 (ALM1)	PM1 (ALM1)	PE0	LS0	PWR	PWR
2B		OUT1	PM2 (ALM2)	PM2 (ALM2)	PM2 (ALM2)	PM2 (ALM2)	PE1	LS1 (TRQS)	SV	SV
3B		OUT2	PM4 (ALM4)	PM4 (ALM4)	PM4 (ALM4)	PM4 (ALM4)	PE2	LS2 (Note2)	INP	INP
4B		OUT3	PM8 (ALM8)	PM8 (ALM8)	PM8 (ALM8)	PM8 (ALM8)	PE3	–	HEND	HEND
5B		OUT4	PM16	PM16	PM16	PM16	PE4	–	TLR	TLR
6B		OUT5	PM32	PM32	PM32	PM32	PE5	–	*ALM	*ALM
7B		OUT6	MOVE	MOVE	PM64	PM64	PE6	–	*EMGS	*EMGS
8B		OUT7	ZONE1	MODES	PM128	PM128	ZONE1	ZONE1	RMDS	RMDS
9B		OUT8	PZONE/ ZONE2	PZONE/ ZONE1	PZONE/ ZONE1	PM256	PZONE/ ZONE2	PZONE/ ZONE2	ALM1	ALM1
10B		OUT9	RMDS	RMDS	RMDS	RMDS	RMDS	RMDS	ALM2	ALM2
11B		OUT10	HEND	HEND	HEND	HEND	HEND	HEND	ALM4	ALM4
12B		OUT11	PEND	PEND/ WEND	PEND	PEND	PEND	–	ALM8	ALM8
13B		OUT12	SV	SV	SV	SV	SV	SV	*ALML	*ALML
14B		OUT13	*EMGS	*EMGS	*EMGS	*EMGS	*EMGS	*EMGS	–	REND
15B		OUT14	*ALM	*ALM	*ALM	*ALM	*ALM	*ALM	ZONE1	ZONE1
16B		OUT15 (Note3)	LOAD/TRQS *ALML /*BALM	*ALML /*BALM	LOAD/TRQS *ALML /*BALM	LOAD/TRQS *ALML /*BALM	LOAD/TRQS *ALML /*BALM	*BALM/ *ALML	ZONE2	ZONE2
17B	–		–						NP	NP
18B	–		–						/NP	/NP
19B	0V		N							
20B	0V		N							

(Note) "*" in codes above shows the signal of the active low.
PM1 to PM8 indicate the alarm binary code output signal when an alarm is generated. [Refer to the Instruction Manual for the details]
(Note 1) The setting can be changed over to PZONE if set in the parameter setting.
(Note 2) It is invalid before home-return operation.
(Note 3) *BALM is dedicated for ACON.

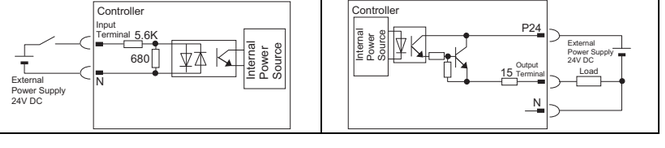
PIO Input and Output Interface

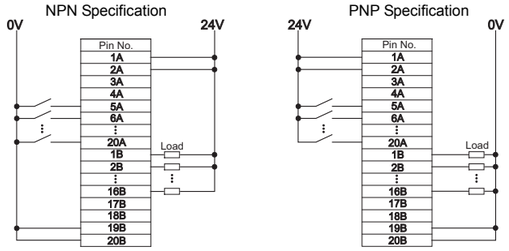
	Input section		Output section	
Specification	Input voltage	24V DC±10%	Load voltage	24V DC
	Input current	5mA 1 circuit	Peak load electric current	50mA/1 point
	ON/OFF voltage	ON voltage MIN. 18V DC OFF voltage MAX. 6V DC	Leak Current	MAX. 2mA/1 point (PCON) MAX. 1mA/1 point (ACON, DCON)

NPN



PNP

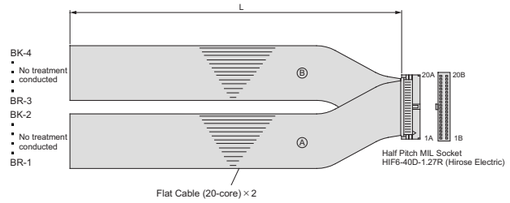




I/O Cable

Model : CB-PAC-PIO□□□

(Enter the cable length (L) in □□□ Example. 020 = 2m)



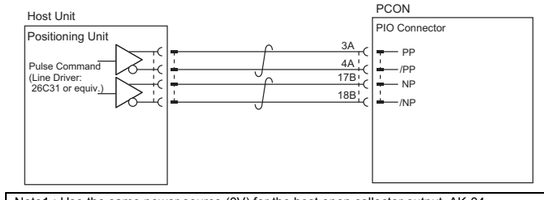
No.	Signal Name	Cable Color	Wiring	No.	Signal Name	Cable Color	Wiring
1A	24V	BR-1	Flat Cable Ⓐ (Insulation-Displacement Connectors) AWG28	1B	OUT0	BR-3	Flat Cable Ⓑ (Insulation-Displacement Connectors) AWG28
2A	24V	RD-1		2B	OUT1	RD-3	
3A	PP	OR-1		3B	OUT2	OR-3	
4A	/PP	YW-1		4B	OUT3	YW-3	
5A	IN0	GN-1		5B	OUT4	GN-3	
6A	IN1	BL-1		6B	OUT5	BL-3	
7A	IN2	PL-1		7B	OUT6	PL-3	
8A	IN3	GY-1		8B	OUT7	GY-3	
9A	IN4	WT-1		9B	OUT8	WT-3	
10A	IN5	BK-1		10B	OUT9	BK-3	
11A	IN6	BR-2		11B	OUT10	BR-4	
12A	IN7	RD-2		12B	OUT11	RD-4	
13A	IN8	OR-2		13B	OUT12	OR-4	
14A	IN9	YW-2		14B	OUT13	YW-4	
15A	IN10	GN-2		15B	OUT14	GN-4	
16A	IN11	BL-2		16B	OUT15	BL-4	
17A	IN12	PL-2		17B	NP	PL-4	
18A	IN13	GY-2		18B	/NP	GY-4	
19A	IN14	WT-2		19B	0V	WT-4	
20A	IN15	BK-2		20B	0V	BK-4	

Operation in Pulse Train Control Mode (function for PLN and PLP Types only)

Pulse Train Input and Output Interface

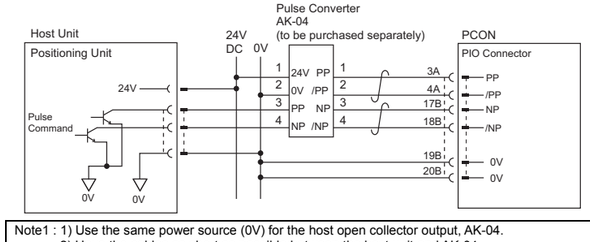
Category	Abbreviated Code	Signal Name	Contents of Functions
Input	PP, /PP	Command Pulse Input	Inputs the command pulse train. Input pulse frequency differs depending on the type. [Refer to Basic Specifications]
	NP, /NP		

- When Host Unit is Differential System
(Although the example shows PCON, it is the same for ACON and DCON.)



Note1 : Use the same power source (0V) for the host open collector output, AK-04.

- When Host Unit is Open Collector System [AK-04 (option) is required]
(Although the example shows PCON, it is the same for ACON and DCON.)



Note1 : 1) Use the same power source (0V) for the host open collector output, AK-04.
2) Have the cables as short as possible between the host unit and AK-04.

Starting Procedures

When using this product for the first time, make sure to avoid mistakes and incorrect wiring by referring to the procedure below. "PC" stated in this section means "PC software".

Check of Packed Items
Are there all the delivered items?
No → Contact us or our distributor.
↓ Yes

Installation and Wiring
Perform the installation of and wiring for the actuator and controller.
→ Point Check Item
• Is frame ground (FG) connected?
• Has the noise countermeasure been taken?
← Yes

Power Supply and Alarm Check
Connect a teaching tool such as PC, turn the operation mode setting switch to "MANU" side and turn the power ON for unit.
Select [Teaching Mode 1 Safety Speed Activated / PIO Operation Invalid] in the teaching tool such as PC.
→ Check Item
Is the Controller Status Display LED turned OFF?
No → Connect the teaching tool such as PC to confirm the content of alarm and have an appropriate treatment.
↓ Yes
Have the settings and checks suitable for the used mode selected from "Positioner Mode" and "Pulse Train Control Mode" below.

[In the case of Positioner Mode]

PIO Pattern Settings
Set the used PIO pattern to Parameter No.25.

Safety Speed Setting
Set the Parameter No.35 if necessary.
The safety speed is set to 100mm/s at the delivery.

Servo ON
Turn the servo ON with the operation on the teaching tool such as PC.
→ Check Item
Is the Controller Status Display LED turned ON in green [SV]?
No → If an alarm is generated, connect the PC or teaching pendant and check the content of the alarm to have the right treatment.

⚠ Caution
Please perform this process with the actuator away from the mechanical end or interfering subjects as much as possible.
Put the actuator away if it interferes with surroundings. It may generate an alarm if the actuator hit the mechanical end or interfering subjects when the servo is turned ON.
The slider may get slightly dropped by self-weight if servo ON and OFF is repeatedly performed at the same position. Be careful not to pinch the hand or damage the work.
↓ Yes

Safety Circuit Check
Does the emergency stop circuit (drive cutoff circuit) work properly and turn the servo OFF?
No → Check the emergency stop circuit.
↓ Yes

Target Position Setting
Set the target position in "Position" Box in each position table.
Perform a home-return operation first when Direct Teaching is to be performed. When moving the actuator manually, set the Brake Release Switch to "BK RLS" side for the brake equipped type. Put the switch back after the setting is complete.
⚠ Warning Be careful not to pinch fingers or damage the work with the dropped actuator when releasing the brake in vertical orientation.
↓

Test Run Adjustment 1
Check the operation without mounting a work and set the safety speed invalid on the teaching tool such as PC, and then check the operation with a work mounted.
→ Check Item
Any vibration or abnormal noise?
No → Check if there is any problem with the installation of the actuator and the condition of the actuator use exceeds the ranges of the rated values.
Adjust the servo if necessary.
↓ Yes
⚠ Caution To ensure safety, it is recommended that safety speed be enabled during initial movements.

Test Run Adjustment 2
1) Set the operation mode setting switch to "AUTO".
2) Output the operation command from PLC to the controller and check the system operation.

[In the case of Pulse Train Control Mode (for PLN and PLP types only)]

PIO Pattern Settings
Set the used 6 "Pulse train control mode" or 7 "Pulse train control mode for Battery-less Absolute" to Parameter No.25.

Set the Electronic Gear
[Refer to Instruction Manual]
Set the electronic gear ratio based on the amount of actuator operation per pulse in Parameters No.65 and 66.
→ Check Item
Is the minimum unit of operation set to the value bigger than the minimum resolution of the encoder?
Is the fraction of the electronic gear ratio reduced to its lowest terms?
← Yes

Pulse Train Input Output Mode Setting [Refer to Instruction Manual]
Set the command pulse train input status for the parameter No.63 and No.64.
Put Operation Mode Setting Switch to "AUTO" side when the setting is complete.

Servo ON
Input servo ON signal from PLC.
→ Check Item
Is the Controller Status Display LED turned ON in green [SV]?
No → Confirm the content of alarm on the teaching tool such as PC to have an appropriate treatment.
← Yes

Safety Circuit Check
Check that the emergency stop circuit (or motor drive-power cutoff circuit) operates normally to turn OFF the servo.
↓ Yes

Test Run Adjustment 1
[Operation Mode MANU]
Check with a teaching tool such as the PC software with no work being loaded, and check the operation range with JOG operation with the work being loaded.
Check Item
Is there any risk of interfering with peripheral equipment?
No → Check if there is any problem in the way of actuator mount.
↓ Yes

Test Run Adjustment 2
[Operation Mode AUTO]
Output the pulse train from PLC to the controller and check the system operation.
→ Can the positioning operation be performed normally?
No → Check the electronic gear ratio setting. Confirm the command pulse train input mode setting.
↓ Yes
Is it in condition without any vibration and abnormal noise?
No → Confirm that there is no problem in the actuator installation, the actuator operation condition demands a voltage more than rated voltage, and appropriate pulse trains are input.
↓ Yes

Test Run Adjustment 3
Check the system operation conducted by PLC.

● Action to Take When Error Occurred
Shown below are the alarms that you may often see after power up. Have an appropriate treatment following the instructions below.
Please refer to the Instruction Manual for other alarms.

Error Code	Error Description	Cause and Treatment
069	Real Time Clock Operation Stop Detection	It indicates the calendar function has stopped and the current time data has lost. Have the clock settings again from the teaching tool.
0B8	Excitement Detection Error	The detection of excitation is conducted when the servo is turned ON for the first time after the power is supplied. The status is that the detection did not complete even after a certain time (set in Parameter No.29) was passed. 1) Connection error or wire breakage of motor/encoder cables 2) Brake is not released (when equipped with a brake). 3) Load to the motor is high due to external force. 4) Power was turned on while touching to the mechanical end. 5) The slide resistance of the actuator itself is large. Those described above can be considered.
0E5	Encoder Receive Error	This error code appears when the right signal was not received from the encoder side to the controller command. Check if any wire breakage on a connector and the condition of wire connections. If no error is generated under the condition that the power to all the peripheral equipment is shut and operate only this controller and the actuator, noise can be considered as the cause of the problem.
0E8	A- and B-Phases Breakage Error	It is the condition that the encoder signal is not properly detected. Check if any wire breakage on a connector and the condition of wire connections.
0EE	Absolute Encoder Error Detection 2	This error code appears when the absolute encoder PCB cannot detect the position information properly. The voltage for the absolute data battery is dropped. Check the battery alarm output on PIO, and if it is off, replace the battery. Perform Absolute Reset after the replacement. Check the encoder cable connection.
20A	Servo OFF While in Operation	It shows the operation command was generated in the condition that the servo is OFF. Resume the operation after turning the servo ON.

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