



SCON

First Step Guide Fifth Edition

Thank you for purchasing our product.

Make sure to read the Safety Guide and detailed Instruction Manual (CD/DVD) 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/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.

- 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 shown in the sentences are registered trademarks.

Product Check

This product is comprised of the following parts if it is of standard configuration.
If you find any fault in the contained model 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"	
Accessories			
2	I/O Flat Cable	CB-PAC-PIO***	*** shows the cable length
3	Service Connector for Pulse Train Control	Plug : 10114-3000PE, Shell : 10314-52F0 (Supplier : 3M)	
4	System I/O Plug	FMC1.5/4-ST-3.5 (Supplier : Phoenix Contact)	Applicable Cable Size 0.5mm ² (AWG20)
5	Power Supply Plug for Brake	MC1.5/2-ST-3.5 (Supplier : Phoenix Contact)	Applicable Cable Size 2.0mm ² (AWG14)
6	AC Power Supply plug	MSTB2.5/6-STF-5.08 (Supplier : Phoenix Contact)	Enclosed in Absolute Type
7	Absolute Battery	AB-5	
8	First Step Guide		
9	Instruction Manual (CD/DVD)		
10	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 such as PC software.

No.	Part Name	Model
1	PC Software (RCS232C converter adapter and external equipment communication cable are included)	RCM-101-MW
2	PC Software (USB converter adapter, USB cable and 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 and TP Adapter (RCB-LB-TG) are included)	CON-PG
6	Teaching Pendant	CON-T
7	Teaching Pendant (Dead-man Switch and TP Adapter (RCB-LB-TG) are included)	CON-TG
8	Simplified Teaching Pendant	RCM-E
9	Data Setter	RCM-P
10	Touch Panel Indicator (Specified only for SCON-C)	RCM-PM-01

3. Instruction manuals related to this product, which are contained in the Instruction manual (CD/DVD).

No.	Name	Manual No.
1	SCON Controller Instruction Manual	ME0161
2	SCON-CA Controller Instruction Manual	ME0243
3	PC Software RCM-101-MW/ RCM-101-USB Instruction Manual	ME0155
4	Touch Panel Teaching CON-PT/PD/PG Instruction Manual	ME0227
5	Teaching Pendant CON-T/TG Instruction Manual	ME0178
6	Simplified Teaching Pendant RCM-E Instruction Manual	ME0174
7	Data Setter RCM-P Instruction Manual	ME0175
8	Touch Panel Indicator RCM-PM-01 (Specified only for SCON-C)	ME0182

4. How to read the model plate

Model → MODEL SCON-CA-60A-NP-2-1
Serial number → SERIAL No. 800056144 L11 MADE IN JAPAN

5. How to read controller model

SCON-CA-20 I HA-NP-2-0

<Series> → SCON-CA
<Type> → C : Standard Type, CA : High Performance Type
<Actuator Characteristics> [Motor Type]
20 : 20W, 30D : 30W (Excluding RS), 30R : 30W (for RS), 60 : 60W, 100 : 100W, 100S : 100W (LSA), 150 : 150W
200S : 200W (LSA), 300S : 300W (LSA), 400 : 400W, 600 : 600W, 750 : 750W, 750S : 750W (LSA)
2 : 2m, 3 : 3m (Standard), 5 : 5m
<Option> → No Indication : Standard Type, HA : High Acceleration/Deceleration Type
<Encoder Type> → I : Incremental, A : Absolute
<Power-supply Voltage> → 1 : Single-Phase 100V AC, 2 : Single-Phase 200V AC
<I/O Cable Length> → 0 : Equipped with no cable, 2 : 2m, 3 : 3m (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, PR : PROFIBUS Connection Type, CN : CompoNet Connection Type, ML : MECHATROLINK Connection Type, EP : EtherCAT Connection Type, EC : EtherNet/IP Connection Type
(Note) Specified only for SCON-CA

Basic Specifications

List of Specifications

Item	Less than 400W	400W or more
Corresponding Motor Capacity	20W to 399W	400W to 750W
Power-supply Voltage	Single-Phase 100 to 115V AC (Power fluctuation within ±10%) Single-Phase 200 to 230V AC (Power fluctuation within ±10%)	Single-Phase 200 to 230V AC (Power fluctuation within ±10%)
Rush Current ^{*1}	Power-supply Voltage 100V AC Power-supply Voltage 200V AC	20A (Controller side), 70A (Drive side) 20A (Controller side), 80A (Drive side)
Load Capacity	Refer to Power Capacity and Heat Generation	
Leak Current ^{*2}	3.0mA Primary side when noise filter is connected to power supply line	
Heat Generation	Refer to Power Capacity and Heat Generation	
Power Supply Frequency	50/60Hz	
PIO Power Supply ^{*3}	24V DC±10%	
Power Supply for Electromagnetic Brake (for actuator equipped with brake)	24V DC±10% 1A (MAX.) (supplied from external equipment)	
Transient Power Cutoff Durability	SCON-C : 10ms (50Hz), 8ms (60Hz) SCON-CA : 20ms (50Hz), 16ms (60Hz)	
Motor Control System	Sine Wave PWM Vector Current Control	
Corresponding Encoder	Incremental Serial Encoder, Absolute Serial Encoder, ABZ (UVW) Parallel Encoder	
Actuator Cable Length	MAX. 20m	
Serial Communication Interface	RS485 : 1CH ... 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 Specifications Fieldbus Specification	Signal I/O dedicated for 24V DC (selected from NPN/PNP) ... Input 16 ports max., output 16 ports max. DeviceNet/CC-Link/PROFIBUS/CompoNet/MECHATROLINK ... Each dedicated controller (Refer to each Fieldbus Instruction Manual)
Cable Length	PIO RS485 Fieldbus	MAX. 10m Total cable length 100m or less. Refer to each Fieldbus specification
Data Setting and Input	PC Software, Touch Panel Teaching, Teaching Pendant	
Data Retention Memory	SCON-C SCON-CA	Saves position data and parameters to non-volatile memory (Limitation in number of writing 100,000 times) 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 Pulse Train Mode Changeover Switch on Front Panel)	
Number of Positions in Positioner Mode	Standard 64 points, maximum 512 points (PIO Type), 768 points (only for SCON-CA Fieldbus Type) (Note) Number of positions differs depending on the selection in PIO pattern and fieldbus operation mode.	
Pulse Train Control Mode	Input Pulse Frequency Common to C/CA	Differential System (Line Driver System) : MAX. 500Kpps Differential System (Line Driver System) : MAX. 2.5Mpps Open Collector Type : 200Kpps max. (under condition AK-04 is used)
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 (Dedicated for PIO Specifications)	SCON-C SCON-CA Common to C/CA	Differential System (Line Driver System) : MAX. 500Kpps (Linear output available up to 109Kpps) Differential System (Line Driver System) : MAX. 2.5Mpps Open Collector Type : MAX. 500Kpps (under condition JM-08 is used)
LED Display (mounted on Front Panel)	PWR (green) : Controller in normal condition, SV (green) : Servo on, ALM (orange) : Alarm generated, EMG (red) : Emergency Stop	
Electromagnetic Brake Compulsory Release Switch (mounted on Front Panel)	Switching NOM (standard)/BK RLS (compulsory release)	
Insulation Resistance	500V DC 100MΩ or more	
Insulation Strength	1,500V AC for 1 min. (Note) Withstand voltage of force control loadcell is 50V DC	
Environment	Surrounding air temperature Surrounding humidity Surrounding environment Surrounding storage temperature Surrounding storage humidity Vibration Durability	0 to 40°C 85%RH or less (non-condensing) [Refer to Installation Environment] -10 to 65°C 90%RH or less (non-condensing) 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	
Weight	Approx. 800g	Approx. 1100g
Cooling Method	Natural air-cooling	Forced Air Cooling
External Dimensions	58W × 194H × 121D [mm]	72W × 194H × 121D [mm]

- *1 In-rush current will flow for approximately 20msec 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.
- *2 Leak current varies depending on the capacity of connected motor, cable length and the surrounding environment. Measure the leak current at the point where a ground fault circuit interrupter is to be installed when leakage protection is conducted. A ground fault circuit interrupter needs to be selected carefully considering the purposes of prevention of fire and protection of human. Use the harmonic type (for inverter) for the ground fault circuit interrupter.
- *3 It is not necessary to supply power to PIO when operating with using ROBONET, Gateway Unit or SIO Converter without using PIO. In this case, set the parameter No. 74 (PIO Power Supply Monitor) to "1" (Invalid). It will generate the error code No. 0CF (I/O 24V Power Supply Error) if the setting is not done.

Power Capacity and Heat Generation

Rated Power Capacity = Motor Power Capacity + Control Power Capacity

Peak Max. Power Capacity = Peak Max. Motor Power Capacity + Control Power Capacity

Actuator Motor Type	Motor Power Capacity [VA]	Peak Max. Motor Power Capacity [VA]	Control Power Capacity [VA]	Rated Power Capacity [VA]	Peak Max. Power Capacity [VA]	Heat Generation [W]
20	26	78	48	74	126	30
30D (Excluding RS)	46	138		94	186	31
30R (for RS)	138	414		186	462	33
60	138	414		186	462	33
100	234	702		282	750	35
100S (LSA)	283	851		331	899	36
150	328	984		376	1032	37
200	421	1263		469	1311	38
200S	486	1458		534	1506	38
(LSA excluding LSA-N15H)	773	2319		821	2367	56
200S (LSA-N15H)	662	1986		710	2034	40
300S (LSA)	920	2760		968	2808	45
400	1164	3328		1212	2376	56
600	1521	3042		1569	3090	58
750		4563			4611	

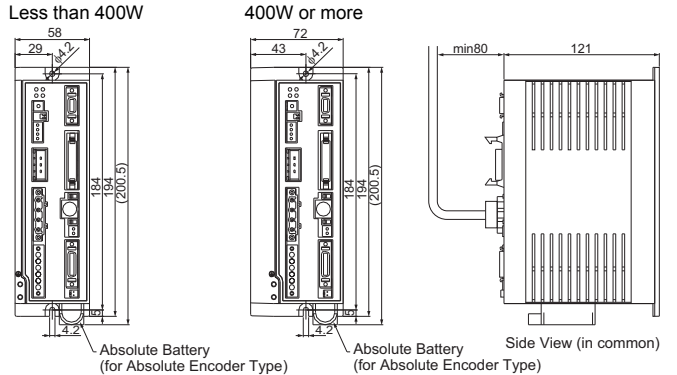
RS : Rotary Shaft LSA : Linear Actuator

Selection of Circuit Interrupter

- 3 times of the rated current flows to the controller during the acceleration/deceleration. Select an interrupter that does not trip with this value of current. If a trip occurs, select an interrupter that possesses the rated current of one grade higher. (Refer to the operation characteristics curves in the product catalog.)
- Select an interrupter that does not trip with the in-rush current. (Refer to the operation characteristics curves in the product catalog.)
- Consider the current that enables to cutoff the current even when a short circuit current is flown for the rated cutoff current. Rated Interrupting Current > Short Circuit Current = Primary Power Capacity / Power Voltage
Consider margin for the rated current on the circuit breaker.

Rated Current for Circuit Interrupter > (Rated Motor Power Capacity [VA] + Control Power Capacity [VA]) / AC Input Voltage × Safety Margin (reference 1.2 to 1.4 times)

External Dimensions



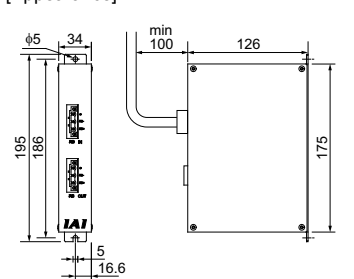
Regenerative Resistor Unit (Option) : REU-1, REU-2

This is a unit that converts the regenerative current to heat when the motor decelerates.

[Specification]

Item	Specification
Body Size	W34mm × H195mm × D126mm
Body Weight	0.9kg
Internal Regenerative Resistor	235Ω 80W
Accessories	REU-1 (2nd unit or later) : Controller Connection Cable (Model Code CB-ST-REU010) 1m REU-2 (First Unit) : Controller Connection Cable (Model Code CB-SC-REU010) 1m

[Appearance]



[Reference Connectable Quantity]

Motor Wattage	Connectable Number of Regenerative Resistor Units
Horizontal Mount/Vertical Mount	
to 99W	Not Required
100 to 399W, 100 to 300S	1
400 to 750W	2

(Note 1) This is a reference for the case when the actuator is ran forward and backward on 1,000mm stroke with the operation duty 50% under the rated acceleration/deceleration speed and rated load.

(Note 2) It is necessary to have the regenerative resistor listed above when the operation duty is above 50%. The maximum quantity of the external regenerative resistor units that can be connected is as stated below:
• 2 units for less than 400W • 4 units for 400W or more

Brake Box (Option) : RCB-110-RA13-0

This is applied on NS Actuator and RCS-RA13R with brake.

1 unit of Brake Box possesses brakes for 2 shafts.

[Specification]

Item	Specification
Body Size	W162 × H94 × D65.5mm
Power Voltage and Current	24V DC±10% 1A
Connection Cable	Encoder Cable (Model Code CB-RCS2-PLA010) 1m

[24V Power Supply Connector]

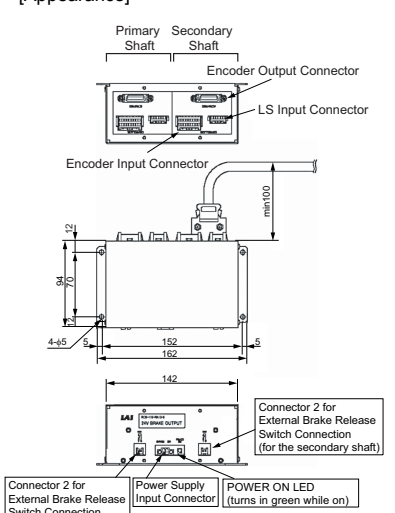
Connector on Cable Side (Enclosed in standard package)	MC1.5/2-STF-3.5 (Phoenix Contact)
Applicable Cable	AWG28 to 16
Terminal Assignment	Pin No. Signal Explanation
1	0V Power Supply Grounding for Brake Excitation
2	24VIN For Brake Excitation and 24V Power Supply

[Connectors 1 and 2 for external brake release switch connection]

Connected Equipment	Brake Release Switch
Connector on Cable Side (Please prepare separately)	XAP-02V-1 (Contact BXA-001T-P0.6) (JST)
Switch Rating	30V DC Minimum Current 1.5mA
Terminal Assignment	Pin No. Signal Explanation
1	BKMLR Brake Release Switch Input
2	COM Power Supply Output for Brake Release Switch Input

(Note) Short circuit of pin No. 1 and 2 of this connector releases the brake compulsorily. Same as the brake release switch on SCON main unit, it is possible to release the brake. Do not keep the compulsory release condition while in automatic operation.

[Appearance]



Loadcell (Dedicated Option for SCON-CA)

This is the pressing force measurement unit that is used for the force control.
This is used by connecting to the actuator corresponding to the force control.

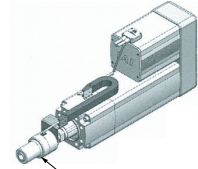
[Specification]

Item	Specification
Loadcell System	Strain Gauge
Rated Capacity	20000N
Allowable Overload	200%R.C ^{*1}
Loadcell Accuracy	±1%R.C ^{*1}
Temperature Drift	Zero ±0.2%R.C/10°C Output ±0.1%R.C/10°C
Applicable Temperature Range	0 to 40°C

*1 R.C.: Rated Capacity

[Refer to RCS2-RA13R Instruction Manual for details of how to attach and the dimensions.]

Attached to RCS2-RA13R



Installation Environment, Storage Environment

This product is capable for use in the environment of pollution degree 2¹ 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.

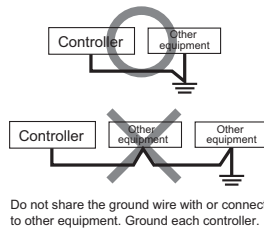
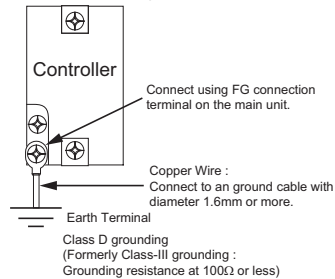
- Location subject to electrostatic noise
- Location where high electrical or magnetic field is present
- Location with the mains or power lines passing nearby

2. Storage and Preservation Environment

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

- Wire is to be twisted for the 24V DC power supply.
- Separate the signal and encoder lines from the power supply and power lines.

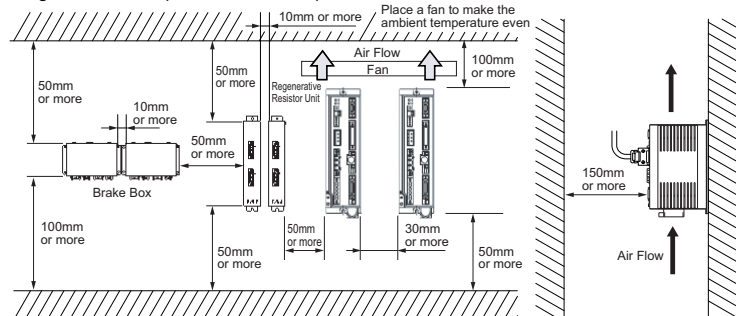
3. Noise Sources and Elimination

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.

- AC solenoid valves, magnet switches and relays
[Measure] Install a Surge absorber parallel with the coil.
- DC solenoid valves, magnet switches and relays
[Measure] Mount the windings and diodes in parallel.
Select a diode built-in type for the DC relay

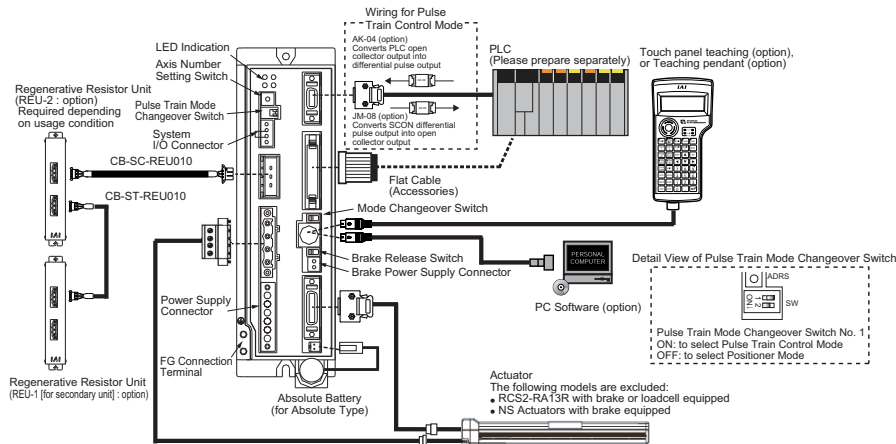
4. Heat Radiation and Installation

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

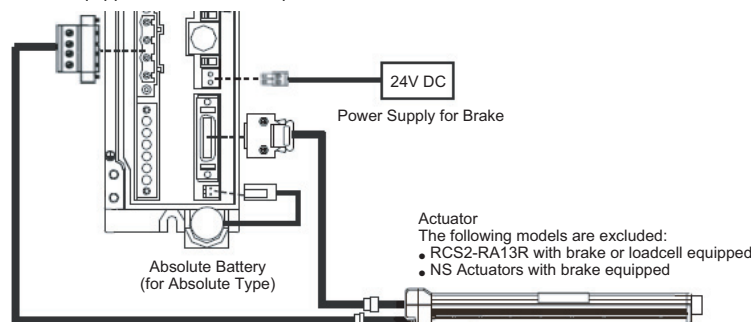


Connection Diagram

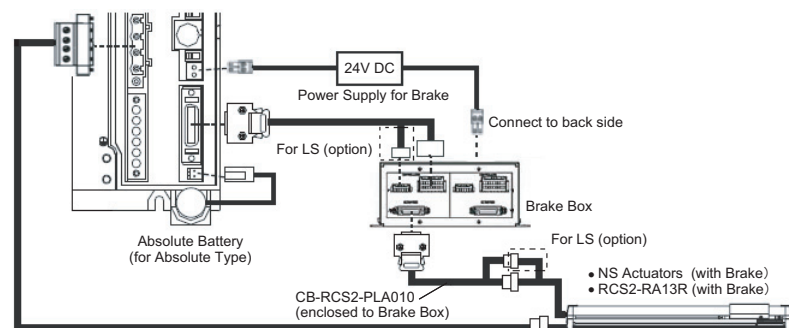
• Standard



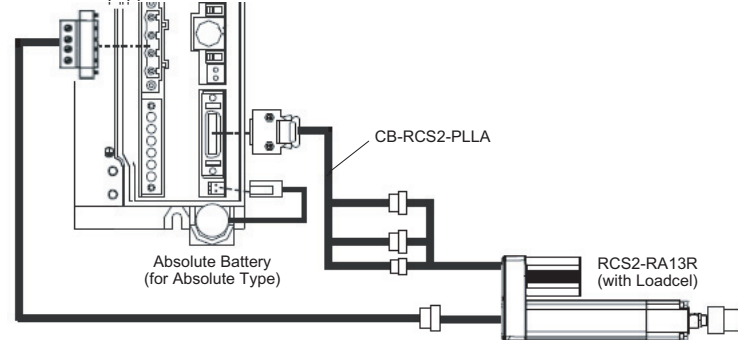
• For Models Equipped with brake Except for RCS2-RA13R and NS Actuators



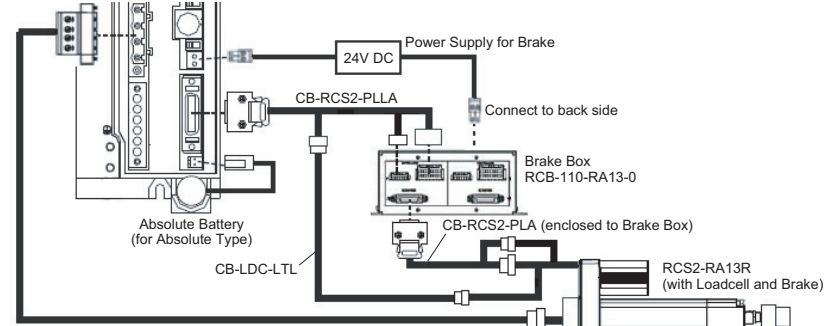
• RCS2-RA13R Equipped with Brake, with no Loadcell, or NS Actuators with Brake



• RCS2-RA13R Equipped with no Brake, with Loadcell in SCON-CA

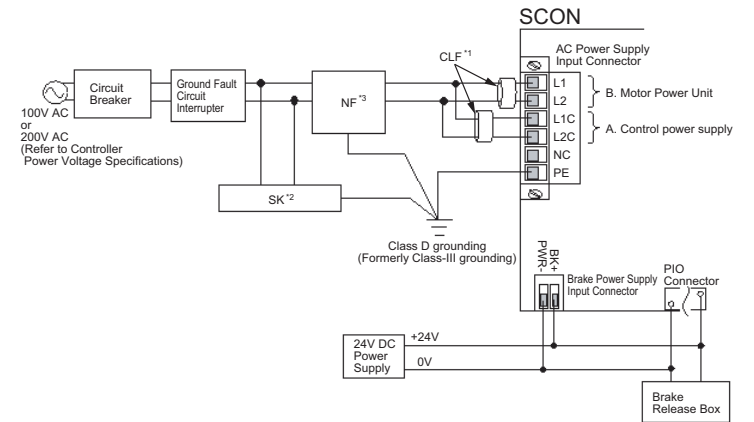


• RCS2-RA13R Equipped with Brake and Loadcell in SCON-CA



Power Supply and Emergency Stop Circuit

• Wiring for Power Supply (to be prepared by customer)



Power consumption of SCON varies depending on the connected actuator, etc. Select the circuit breaker that suits to the specification.

[Refer to Basic Specifications]

A ground fault circuit interrupter needs to be selected carefully considering the purposes of prevention of fire and protection of human.

Have a measurement of the leak current where a ground fault circuit interrupter is to be installed.

Use the "harmonic type" for the ground fault circuit interrupter.

*1 CLF : Clamp Filter ... It is recommended to attach it to improve noise immunity.

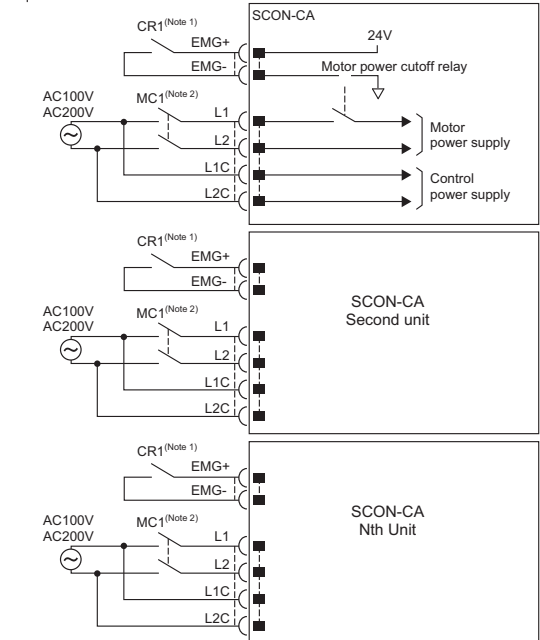
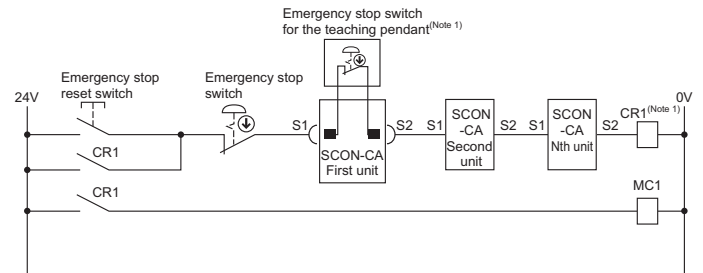
*2 SK : Surge Killer ... It is recommended to attach it to improve noise immunity.

*3 NF : Noise Filter ... Make sure to install it. It is recommended to have it installed within 0.3m of the cable length from SCON.

Parts Name	Supplier	Model
CLF	TDK	ZCAT3035-1330
SK	Okaya ELECTRIC CO.,LTD	R-A-V-781BWZ-2A
NF	SOSHIN ELECTRIC CO.,LTD	NF2010A-UP
	DENSEI-LAMBDA	MC1210

• Wiring for Emergency Stop Input

The following diagram shows an example of how the emergency stop switch for the teaching pendant may be included in the emergency stop circuit you may construct.



Note 1 When the teaching pendant is not connected, S1 and S2 become short-circuited inside the controller.

Note 2 Connect a contactor to L1 and L2 terminals for external power cutoff by the emergency stop if the motor power is required to be cut off externally to comply with the Safety Categories.

Note 3 The rating for the emergency stop signal to turn ON/OFF at contact CR1 is 24V DC and 10mA.

Note 4 For CR1, select the one with coil current 0.1A or less.

I/O Signal

Explanation of I/O Signal Functions

Category	Abbreviated Code	Signal Name	Contents of Functions
Input	CSTR	Start Signal (PTP Strobe)	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	Turn the signal off during operation to decelerate and stop. Turn the signal ON to resume the operation.
	RES	Reset	Turn the signal on to reset the alarm. Also, it is possible to cancel the residual operation if turning on during the pause (*STP is off).
	SON	Servo ON	Turn on to turn the servo ON, and off to turn the servo OFF.
	HOME	Home return	Perform the home-return operation with the signal rising edge (OFF → ON).
	MODE	Teaching Mode	Turn the signal on to set to the Teaching Mode, and off to cancel the Teaching Mode. 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	Teaching	Write the current position to the indicated position if indicating the written position and turn this signal on for more than 20ms during the Teaching Mode.
	CLBR (Specified only for CA)	Loadcell Calibration Command	Turn this signal on for more than 20ms to perform calibration of loadcell.
	ST0 to ST6	Start Signal 0 to 6	The actuator moves to the commanded position with this signal on during the electromagnetic valve mode. (CSTR signal is not required)
	TL	Torque Limit Select	Puts torque limitation to the motor with the signal on and the value set to the parameter.
	DCRL	Deviation Counter Clear	Clears the deviation count with the signal on.
	CSTP	Compulsory Stop	Performs compulsory stop of the actuator. Turn the signal on to decelerate and stop the actuator and turns the servo off.
Output	PEND/INP	Position Completion	Turns on in the positioning band range after actuator operation. PEND signal will not turn off once it turns on until the next operation even if the actuator goes off the range of positioning band. INP will turn off. PEND and INP can be switched over by the parameter.
	PM1 to PM256	Completion Position No.	Outputs (binary output) the position No. that is reached at the same time the positioning is complete.
	HEND	Home Return Completion	Turns on when home-return operation is complete. It will be kept on unless the home position is lost.
	ZONE1, 2	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. It can be utilized together with ZONE 1, however, PZONE is effective only when moving towards the set position.
	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.
	MOVE	While in Operation	Turns on during the actuator is moving (including home-return operation and pressing operation).
	SV	Servo ON status	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	Turns on after the writing by PWRT signal is complete in the Teaching Mode. This signal turns off if PWRT signal is turned 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.
	CEND (Specified only for CA)	Loadcell Calibration Complete	Turns on after loadcell calibration is complete. This signal turns off if CLBR signal is turned off.
	*BALM	Warning for Absolute Battery Voltage Drop	Turns on when the battery voltage for the absolute type actuator is within the normal voltage range. Replace the battery if it is turned off. (this signal is always on for the incremental type actuator.)
	LOAD	Load Output Judgment Signal	Outputs when current exceeds the value set to "threshold" within range of position data "ZONE+" or "ZONE-" during the pressing operation. Utilize this signal for a judgment of a press-fitting process being properly performed, etc.
	TRQS	Torque Level Output	Outputs when current of motor reaches the value set to "threshold" by the slider (or rod) being hit to an obstacle during the pressing movement.
	ALM1 to 8	Alarm Code Output	Outputs the alarm code when an alarm is generated
	TLR	Torque Limit Restricted	Turns on when torque reaches the limit while in torque restriction (TL signal is on).
	PWR	System Standby	Turns on when the controller is able to be controlled.
	*ALML	Light Error Alarm (only for SCON-CA)	This turns on when any of the absolute battery alarm, overload alarm or message level alarm is occurred.

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).

Corresponding Type			All Types			
Pin No.	Category	PIO Functions	Selection in Parameter No. 25 (PIO Pattern)			
			0	1	2	3
	Input	Number of Positioning Points	Positioning mode 64 points	Teaching mode 64 points	256-point mode 256 points	512-point mode 512 points
		Jog Signal	x	O	x	x
		Teaching Signal (Current Position Writing)	x	O	x	x
	Output	Brake Release	O	x	O	O
Signal during Operation		O	O	x	x	
Zone Signal		O	x	x	x	
		Position Zone Signal	O	O	O	x
1A	24V	P24				
2A	24V	P24				
3A	—	—				
4A	—	—				
5A	Input	IN0	PC1	PC1	PC1	PC1
6A		IN1	PC2	PC2	PC2	PC2
7A		IN2	PC4	PC4	PC4	PC4
8A		IN3	PC8	PC8	PC8	PC8
9A		IN4	PC16	PC16	PC16	PC16
10A		IN5	PC32	PC32	PC32	PC32
11A		IN6	—	MODE	PC64	PC64
12A		IN7	—	JISL	PC128	P128
13A		IN8	—	JOG+	—	PC256
14A		IN9	BKRL	JOG-	BKRL	BKRL
15A		IN10	RMOD	RMOD	RMOD	RMOD
16A		IN11	HOME	HOME	HOME	HOME
17A		IN12	*STP	*STP	*STP	*STP
18A		IN13	CSTR	CSTR/PWRT	CSTR	CSTR
19A		IN14	RES	RES	RES	RES
20A		IN15	SON	SON	SON	SON
1B	Output	OUT0	PM1 (ALM1)	PM1 (ALM1)	PM1 (ALM1)	PM1 (ALM1)
2B		OUT1	PM2 (ALM2)	PM2 (ALM2)	PM2 (ALM2)	PM2 (ALM2)
3B		OUT2	PM4 (ALM4)	PM4 (ALM4)	PM4 (ALM4)	PM4 (ALM4)
4B		OUT3	PM8 (ALM8)	PM8 (ALM8)	PM8 (ALM8)	PM8 (ALM8)
5B		OUT4	PM16	PM16	PM16	PM16
6B		OUT5	PM32	PM32	PM32	PM32
7B		OUT6	MOVE	MOVE	PM64	PM64
8B		OUT7	ZONE1	MODES	PM128	PM128
9B		OUT8	PZONE/ZONE2	PZONE/ZONE1	PZONE/ZONE1	PM256
10B		OUT9	RMDS	RMDS	RMDS	RMDS
11B		OUT10	HEND	HEND	HEND	HEND
12B		OUT11	PEND	PEND/WEND	PEND	PEND
13B		OUT12	SV	SV	SV	SV
14B		OUT13	*EMGS	*EMGS	*EMGS	*EMGS
15B		OUT14	*ALM	*ALM	*ALM	*ALM
16B		OUT15	*BALM	*BALM	*BALM	*BALM
17B	—	—				
18B	—	—				
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.

(Reference) Signal of Active Low

Signal with "*" expresses the signal of active low. A signal of active low is a signal that the input signal is processed when it is turned off, output signal is ordinary on while the power is on, and turns off when the signal is output.

Corresponding Type			All Types		CA Type		All Types
Pin No.	Category	PIO Functions	Selection in Parameter No. 25 (PIO Pattern)				Pulse Train Control Mode
			4	5	6	7	
	Input	Electromagnetic Valve Mode 1	Electromagnetic Valve Mode 2	Force Control Mode 1	Force Control Mode 2		
		7 points	3 points	32 points	5 points	—	
		Jog Signal	×	×	×	×	
		Teaching Signal (Current Position Writing)	×	×	×	×	
	Output	Brake Release	○	○	○	○	
Signal during Operation		×	×	×	×		
Zone Signal		○	○	×	○		
Position Zone Signal		○	○	○	×		
1A	24V	P24					
2A	24V	P24					
3A	—						
4A	—						
5A	Input	IN0	ST0	ST0	PC1	ST0	SON
6A		IN1	ST1	ST1 (JOG+)	PC2	ST1	RES
7A		IN2	ST2	ST2 ¹	PC4	ST2	HOME
8A		IN3	ST3	—	PC8	ST3	TL
9A		IN4	ST4	—	PC16	ST4	CSTP
10A		IN5	ST5	—	—	—	DCLR
11A		IN6	ST6	—	—	—	BKRL
12A		IN7	—	—	—	—	RMOD
13A		IN8	—	—	CLBR	CLBR	—
14A		IN9	BKRL	BKRL	BKRL	BKRL	—
15A		IN10	RMOD	RMOD	RMOD	RMOD	—
16A		IN11	HOME	—	HOME	HOME	—
17A		IN12	*STP	—	*STP	*STP	—
18A		IN13	—	—	CSTR	—	—
19A		IN14	RES	RES	RES	RES	—
20A		IN15	SON	SON	SON	SON	—
1B	Output	OUT0	PE0	LS0	PM1(ALM1)	PE0	PWR
2B		OUT1	PE1	LS1(TRQS)	PM2(ALM2)	PE1	SV
3B		OUT2	PE2	LS2 ¹	PM4(ALM4)	PE2	INP
4B		OUT3	PE3	—	PM8(ALM8)	PE3	HEND
5B		OUT4	PE4	—	PM16	PE4	TLR
6B		OUT5	PE5	—	TRQS	TRQS	*ALM
7B		OUT6	PE6	—	LOAD	LOAD	*EMGS
8B		OUT7	ZONE1	ZONE1	CEND	CEND	RMDS
9B		OUT8	PZONE/ZONE2	PZONE/ZONE2	PZONE/ZONE1	PZONE/ZONE1	ALM1
10B		OUT9	RMDS	RMDS	RMDS	RMDS	ALM2
11B		OUT10	HEND	HEND	HEND	HEND	ALM4
12B		OUT11	PEND	—	PEND	PEND	ALM8
13B		OUT12	SV	SV	SV	SV	—/*ALML ²
14B		OUT13	*EMGS	*EMGS	*EMGS	*EMGS	—
15B		OUT14	*ALM	*ALM	*ALM	*ALM	ZONE1
16B		OUT15	*BALM	*BALM	*BALM	*BALM	ZONE2
17B	—	—					
18B	—	—					
19B	0V	N					
20B	0V	N					

(Note) Shown in () after the signal names above tell the functions performed before the home-return operation. "*" in codes above shows the signal of the active low.

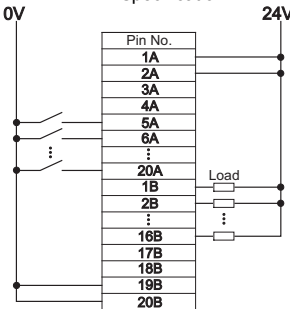
*1 It is invalid before home-return operation.

*2 Only for SCON-CA.

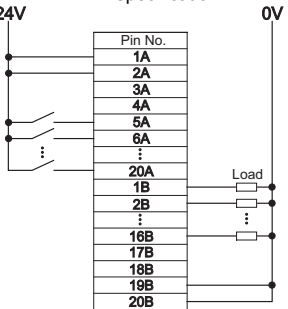
PIO Input and Output Interface

		Input section		Output section	
Specifi- cation		Input voltage	24V DC±10%	Load voltage	24V DC
		Input current	5mA 1 circuit : SCON-CA 4mA 1 circuit : SCON-C	Peak load electric current	100mA/1 point, 400mA/(Load current total)
		ON/OFF voltage	ON voltage MIN. 18V DC OFF voltage MAX. 6V DC	Leak Current	MAX.0.1mA/1 point
SCON-CA	NPN	Controller		Controller	
	PNP	Controller		Controller	
SCON-C	NPN	Controller		Controller	
	PNP	Controller		Controller	

NPN Specification



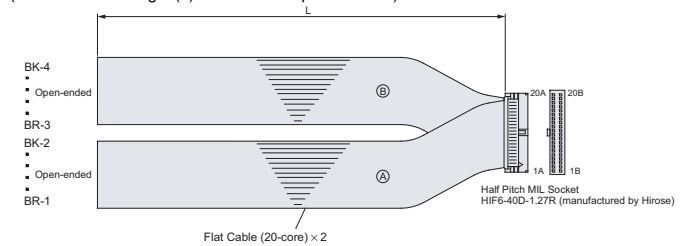
PNP Specification



I/O Cable

Model : CB-PAC-PIO□□□

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



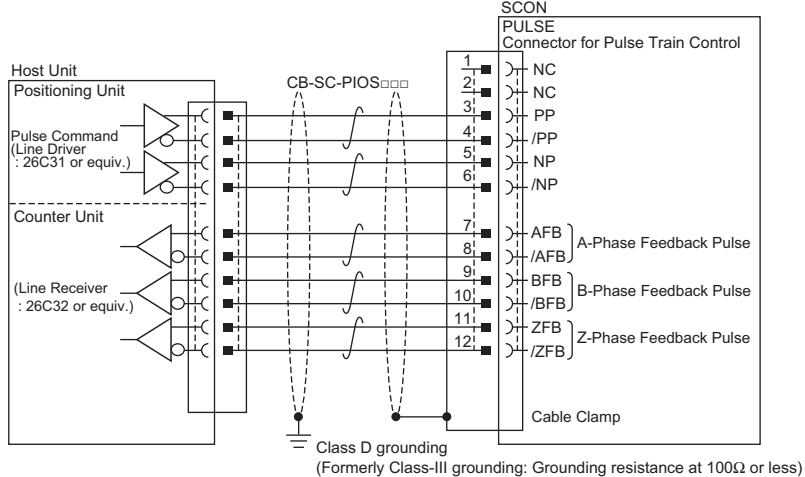
No.	Signal Name	Cable Color	Wiring	No.	Signal Name	Cable Color	Wiring
1A	24V	BR-1	Flat CableⒶ (Insulation-Displacement Connectors) AWG28	1B	OUT0	BR-3	Flat CableⒷ (Insulation-Displacement Connectors) AWG28
2A	24V	RD-1		2B	OUT1	RD-3	
3A	—	OR-1		3B	OUT2	OR-3	
4A	—	YW-1		4B	OUT3	YW-3	
5A	IN0	GN-1		5B	OUT4	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	—	PL-4	
18A	IN13	GY-2		18B	—	GY-4	
19A	IN14	WT-2		19B	0V	WT-4	
20A	IN15	BK-2		20B	0V	BK-4	

Operation in Pulse Train Control Mode

Pulse Train Input and Output Interface

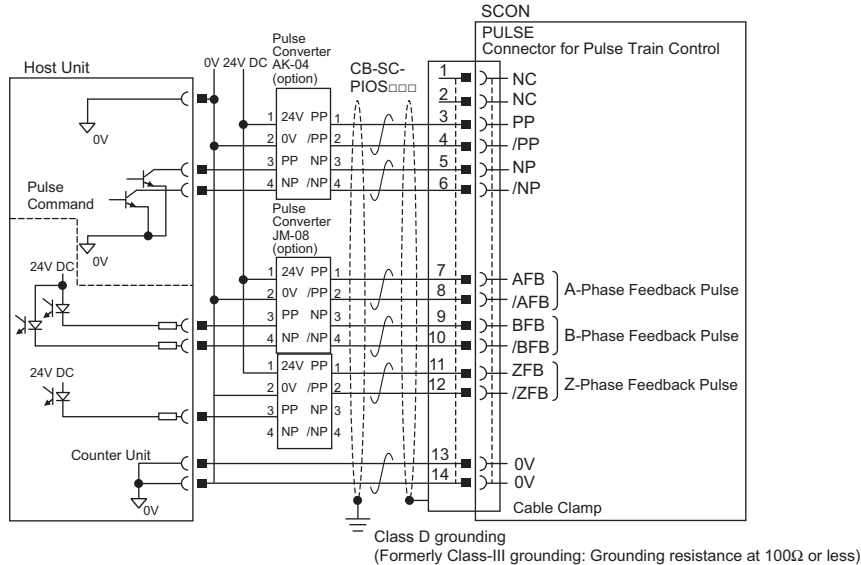
Category	Abbreviated Code	Signal Name	Contents of Functions
Input	PP, /PP	Command Pulse Input	Inputs the command pulse train. Input pulse frequency differs depending on the type. [Refer to Basic Specifications]
	NP, /NP		
Output	AFB, /AFB	Feedback Pulse Output	Outputs the feedback pulse train. Input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

- When Host Unit is Differential System



- When Host Unit is Open Collector System

AK-04 (option) is required for pulse train input. JM-08 (option) is required for pulse train output.



Only the plug and the shell are equipped for the standard type. [Refer to Product Check Section.]
Perform the same cable layout as the optional connector cable for the pulse train control.
Pin assignment should be the same.

- Option : Cable with Connectors for Pulse Train Control

Model : CB-SC-PIOS□□□ (Enter the cable length in □□□ Example. 010 = 1m)

Pin No. 1



Plug : 10114-3000PE (Sumitomo 3M)
Shell : 10314-52FO-008 (Sumitomo 3M)

Wiring	Color	Abbreviated Code	Signal Name	No.
0.2sq Soldered	BK	-	-	1
	WT/BK	-	-	2
	RD	PP	Pulse Train Input	3
	WT/RD	/PP		4
	GN	NP		5
	WT/GN	/NP		6
	YW	AFB	+A	7
	WT/YW	/AFB	-A	8
	BR	BFB	+B	9
	WT/BR	/BFB	-B	10
	BL	ZFB	+Z	11
	WT/BL	/ZFB	-Z	12
	GY	GND	Line Driver Output Line for Feedback Pulse Output	13
	WT/GY	GND		14

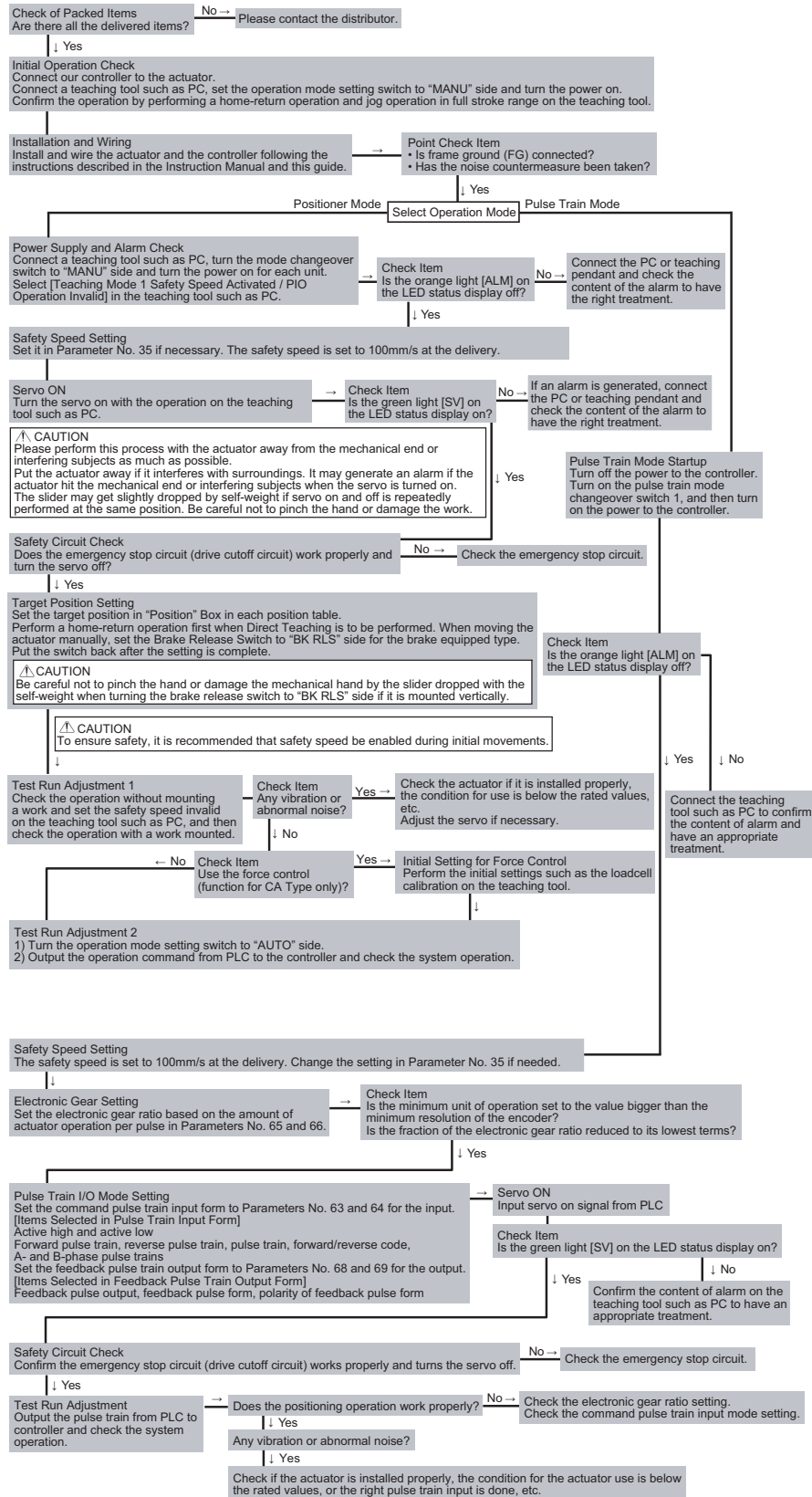
Shield is connected to the cable clamp

Host System Side

Shield

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".



- 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.
0A5	Electromagnetic Brake Release Failure Error	Brake could not be released for the electromagnetic brake equipped type. Check the 24V power supply for electromagnetic brake.
0CF	I/O 24V Power Supply Error	An error is occurred in 24V power supply for PIO. Check the voltage of the 24V power supply for PIO.
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.
0E7	A-, B- and Z-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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Manual No.: ME0202-5A