SR Mini HG SYSTEM Speed Control Module

H-SIO-A

Instruction Manual

IMS01L01-E2

Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

This manual should be used in conjunction with **Hardware Quick Manual (IMS01V01-E□).**

SYMBOLS

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

 : This mark indicates that all precautions should be taken for safe usage.

 : This mark indicates important information on installation, handling and operating procedures.

 : This mark indicates supplemental information on installation, handling and operating procedures.

 : This mark indicates where additional information may be located.

⚠ WARNING

- To prevent injury to persons, damage to instrument and equipment, a suitable external protection device shall be required.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- Do not connect modular connectors to telephone line.
- When high alarm with hold/re-hold action is used for Alarm function, alarm does not turn on while hold action is in operation. Take measures to prevent overheating which may occur if the control device fails.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

1. PRODUCT CHECK

H-SIO-A module inputs pulse from rotary encoder, and motor speed is controlled.
H-SIO-A module can be used by combining with H-PCP-J module (Power/CPU module).
The model code for the instrument you received is listed below.

H - SIO - A - F □ □ □ - □ ∗ □
(1) (2) (3) (4) (5)

(1) Type
A: 1 channel type

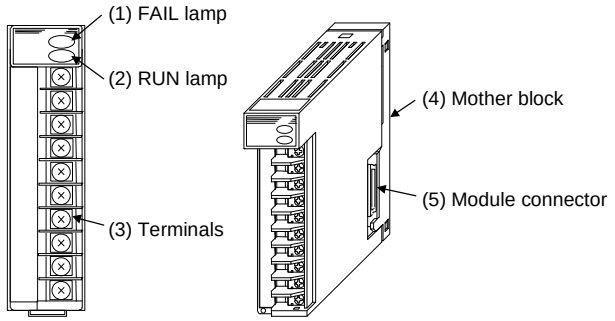
(2) Control action
F: PID action with autotuning

(3) Input type (Pulse input)
Z01: Dry contact input (Power supply for sensor, 12 V DC)
Z02: Voltage input (Power supply for sensor, 12 V DC)

(4) Control output
3: 0 to 1 V DC
4: 0 to 5 V DC
5: 0 to 10 V DC
6: 1 to 5 V DC
7: 0 to 20 mA DC
8: 4 to 20 mA DC

(5) Alarm output (Optional)
N: No alarm output
1: Alarm 1 output
2: Alarm 2 output

2. PARTS DESCRIPTION



(1) FAIL lamp [Red]
OFF: During normal operation
ON: During abnormal operation

(2) RUN lamp [Green]
Flashing: During normal operation
ON: During abnormal operation

(3) Terminals
Control output, alarm output, external contact input and pulse input terminals

(4) Mother block
Module DIN rail mounting connector

(5) Module connector
Connector for power supply and bus connection

3. SPECIFICATIONS

■ Input

Number of inputs:	1 channel Isolated between input and CPU
Input type:	Pulse input • Dry contact input • Voltage input: High level voltage: 7 to 15 V DC Low level voltage: 0 to 2 V DC Rise/fall time: 5 μs or less Specify when ordering
Power supply for sensor:	12 V DC ±10 % 70 mA or less
Input response frequency:	2 Hz to 50 kHz
Measuring method:	Periodic computation method Pulse count method Measuring method can be selected.
Divide ratio:	1 to 1000 Effective only for periodic computation method.
Gate time:	0.1 to 4.0 seconds Effective only for pulse count method.
Display resolution:	1/10000 or less
Digital input filter:	First order lag digital filter Time constant: Settable from 0.1 to 100.0 seconds (0.0: Digital filter off)
Action at input break:	Indicates display scale low value
Auto zero time:	1 to 100 seconds Effective only for periodic computation method.
Display scale range:	-9999 to +10000 However, scaling is possible within a span of 10000 maximum. Decimal point position can be varied down to 3 digits.

■ Setting range

Motor speed set value:	Same as display scale range
Proportional band:	0.1 to 1000.0 % of span
Integral time:	1 to 3600 seconds
Derivative time:	0 to 3600 seconds (0: PI action, recommended value)
Control response parameters:	Slow, Medium and Fast (3-step selection)

■ Control action

Control method:	Open loop control Closed loop control (PID control)
Control cycle:	0.1 second
Control range:	0.00 to 50.00 %

■ Control output

Current output:	
Output current:	0 to 20 mA DC and 4 to 20 mA DC Specify when ordering
Resolution:	11 bits or more
Allowable load resistance:	500 Ω or less
Output impedance:	5 MΩ or more
Voltage output:	
Output voltage:	0 to 1 V DC, 0 to 5 V DC, 0 to 10 V DC and 1 to 5 V DC Specify when ordering
Resolution:	11 bits or more
Allowable load resistance:	1 kΩ or more
Output impedance:	0.1 Ω or less
Output scale range:	-9999 to +10000 However, scaling is possible within a span of 10000 maximum. Decimal point position is common with display scale.

■ Performance

Measured accuracy:

Periodic computation method:

$$\pm\left(\left(\frac{\text{Input frequency (Hz)}}{4\times10^{6}\times\text{Divide ratio}}\times100+0.01\right)\%\text{ of reading}+1\text{ digit}\right)$$

Refer to item **A** of table shown below

Input frequency (Hz)	Divide rate 1000		Divide rate 500		Divide rate 125	
	A (%)	Cycle (sec.)	A (%)	Cycle (sec.)	A (%)	Cycle (sec.)
50000	0.011	0.1	0.013	0.1	0.020	0.1
10000	0.010	0.1	0.011	0.1	0.012	0.1
1000	0.010	1	0.010	0.5	0.010	0.2
100	0.010	10	0.010	5	0.010	1.3
10	0.010	100	0.010	50	0.010	12.5

Input frequency (Hz)	Divide rate 50		Divide rate 1	
	A (%)	Cycle (sec.)	A (%)	Cycle (sec.)
50000	0.035	0.1	1.260	0.1
10000	0.015	0.1	0.260	0.1
1000	0.011	0.1	0.035	0.1
100	0.010	0.5	0.013	0.1
10	0.010	5	0.010	0.1

Cycle (sec.): Display updating cycle (sec.)

Pulse count method:

$$\pm\left(\left(\frac{1}{\text{Input frequency (Hz)}\times\text{Gate time (sec)}}\times100+0.01\right)\%\text{ of reading}+1\text{ digit}\right)$$

Refer to item **B** of table shown below

Input frequency (Hz)	Gate time 4.0 (sec.)	Gate time 3.0 (sec.)	Gate time 2.0 (sec.)	Gate time 1.0 (sec.)	Gate time 0.1 (sec.)
	B (%)	B (%)	B (%)	B (%)	B (%)
50000	0.011	0.011	0.011	0.012	0.030
10000	0.013	0.013	0.015	0.020	0.110
1000	0.035	0.043	0.060	0.110	1.010
100	0.260	0.343	0.510	1.010	10.010
10	2.510	3.343	5.010	10.010	100.010

Display updating cycle (sec.) = Gate time (sec.)

■ Alarm function

Number of alarms: 2 points

Alarm types:

Deviation high alarm
Deviation low alarm
Deviation high/low alarm
Deviation band alarm
Process high alarm
Process low alarm
Deviation high alarm with hold action
Deviation low alarm with hold action
Deviation high/low alarm with hold action
Process high alarm with hold action
Process low alarm with hold action
Deviation high alarm with re-hold action
Deviation low alarm with re-hold action
Deviation high/low alarm with re-hold action
Specify when ordering
(Alarm action is specified for the H-PCP-J module.)

Setting range:

-span to +span: Deviation high alarm, Deviation low alarm, Deviation high alarm with hold action, Deviation low alarm with hold action, Deviation high alarm with re-hold action, Deviation low alarm with re-hold action

0 to span: Deviation high/low alarm, Deviation band alarm, Deviation high/low alarm with hold action, Deviation high/low alarm with re-hold action

Same as input range: Process high alarm, Process low alarm, Process high alarm with hold action, Process low alarm with hold action

Alarm hold cancel time: 1 to 255 seconds

Setting resolution: Same as display resolution

Alarm data output: This module outputs alarm status to the H-PCP-J module as data.

■ Alarm output (Optional)

Number of outputs: 1 point

Output type: Relay contact output

Isolation method: Photocoupler isolation

Relay contact output:

Rating: 250 V AC/24 V DC

Maximum load current: 2 A (Resistive load)

Electrical life: 300,000 times or more (Rated load)

Contact type: 1a contact

Minimum switching voltage and current: 5 V DC, 1 mA

■ External contact input

Number of inputs: 2 points

Input type: Dry contact input

Isolation method: Photocoupler isolation
However, external contact input and pulse input are not isolated

Dry contact input

Open voltage: 18 V DC or less

Short-circuit current: 10 mA DC or less

Allowable contact resistance: 100 Ω or less

Function:

Control ON/OFF: ON: Open loop control; OFF: Closed loop control

RUN/STOP: ON: Control output ON; OFF: Control output OFF

■ Self-diagnostic

Check item: RAM check, Adjustment data check, Watchdog timer

Operation at error occurrence in self-diagnosis: FAIL lamp lights, All channel control outputs are turned off

■ General specifications

Internal consuming current:
5 V DC: 45 mA
12 V DC: 90 mA
In using the power supply for sensor: 160 mA max.

Ambient temperature: 0 to 50 °C
for storage: -20 to +50 °C

Ambient humidity: 45 to 85 % RH (Non condensing) for storage: 95 % RH or less (Non condensing)

Usage atmosphere: There must be no corrosive gas and dust must not be excessive

Dimensions: 24 (W) × 96 (H) × 100 (D) mm

Weight: Approx. 120 g

4. MOUNTING

WARNING

To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

4.1 Mounting Cautions

(1) This instrument is intended to be used under the following environmental conditions. **(IEC61010-1)**
[OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

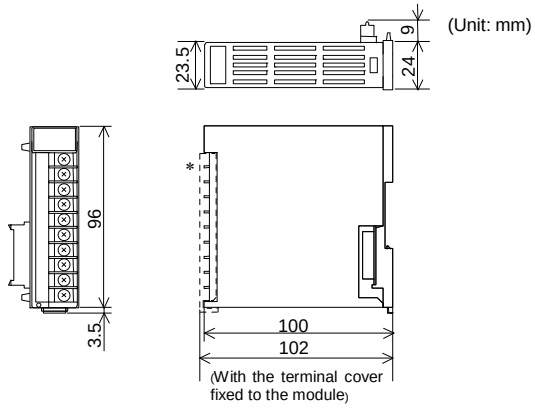
(2) Use this instrument within the following environment conditions:
- Allowable ambient temperature: 0 to 50 °C
- Allowable ambient humidity: 45 to 85%RH
  (Absolute humidity: MAX. W. C 29 g/m^3 dry air at 101.3 kPa)
- Installation environment conditions: Indoor use
  Altitude up to 2000m

(3) Avoid the following when selecting the mounting location:
- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Excessive heat accumulation.

(4) Mount this instrument in the panel considering the following conditions:
- Provide adequate ventilation space so that heat does not build up.
- Do not mount this instrument directly above equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors.)
- If the ambient temperature rises above 50 °C, cool this instrument with a forced air fan, cooler, etc. Cooled air should not blow directly on this instrument.
- In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
  – High voltage equipment: Do not mount within the same panel.
  – Power lines: Separate at least 200 mm.
  – Rotating machinery: Separate as far as possible.
- Ensure at least 50 mm space on top and bottom of the control unit for maintenance and environmental reasons.

(5) In case this instrument is connected to a supply by means of a permanent connection a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.

4.2 Dimensions



* Dotted-line section: Terminal cover

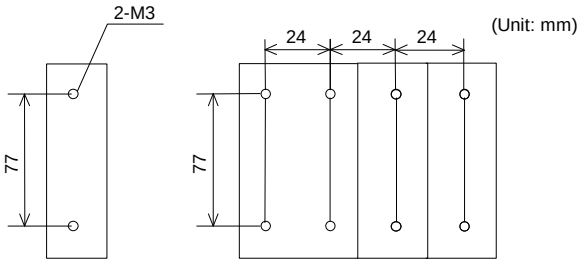
Module mounting depth:
The mounting depth of each module is 108 mm from the mounting surface inside the panel to the front of the module with the module mounted on the DIN rail.

4.3 Mounting the Mother Block

The mother block can be mounted to a panel or DIN rail.

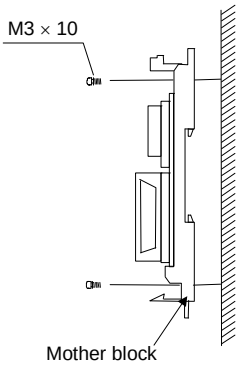
■ Panel mounting directions

1. Refer to both the panel mounting dimensions below and the external dimensions in previous section when selecting the location.



2. Remove the module from the mother block. For details of removing the module, refer to **4.5 Removing the Module Mainframe**.

3. Connect the mother blocks together before tightening the screws on the panel. (Customer must provide the set screws.)



Recommended tightening torque:
0.3 N·m (3 kgf·cm)

■ DIN rail mounting directions

1. Remove the module mainframe from the mother block. For details of removing the module mainframe, refer to **4.5 Removing the Module Mainframe**.

2. Pull down both locking devices at the bottom of the mother block. (Figure 1)

3. Attach the top bracket of the mother block to the DIN rail and push the lower section into place on the DIN rail. (Figure 2)

4. Slide the locking devices up to secure the mother block to the DIN rail. (Figure 3)

5. Slide connectors together to complete mother block installation. (Figure 4)

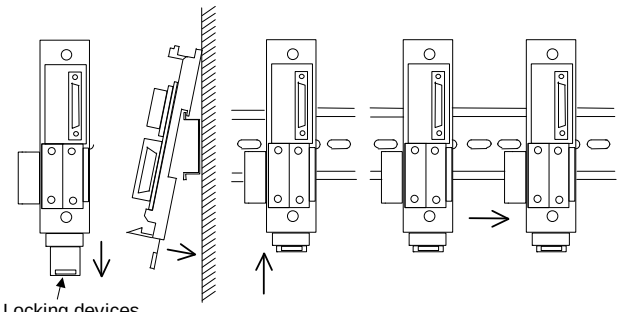


Figure 1 Figure 2 Figure 3 Figure 4

When the mother block is mounted on panel, 50 mm or more space is required at the top and bottom of the mother block to attach the module mainframe.

4.4 Mounting the Module Mainframe

1. Place the module mainframe opening on top of the mother block tab. (Figure 1)

2. Snap the lower part of module mainframe on to the mother block. (Figure 2)
A snapping sound will be heard when module mainframe is securely connected to mother block.

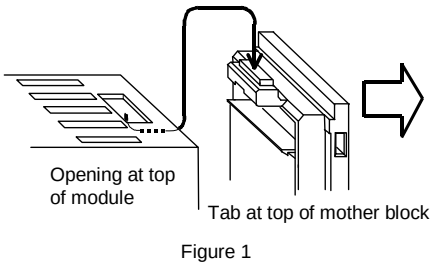


Figure 1

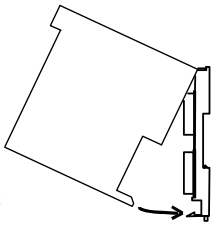
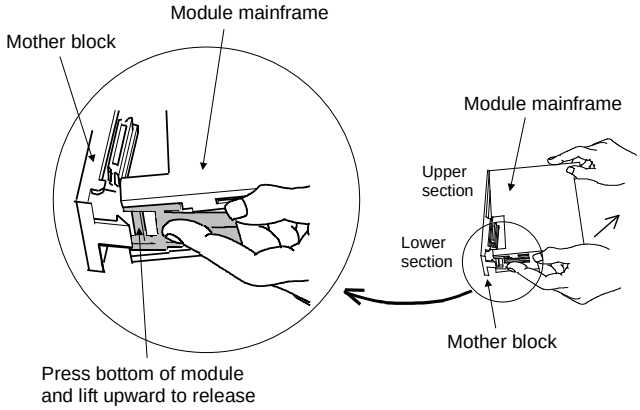


Figure 2

4.5 Removing the Module Mainframe

To separate the module mainframe from the mother block, press the bottom on the module, lifting upward, to release connection.



5. WIRING

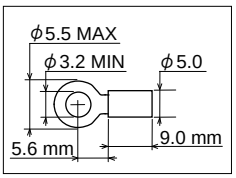
WARNING

To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

5.1 Wiring Cautions

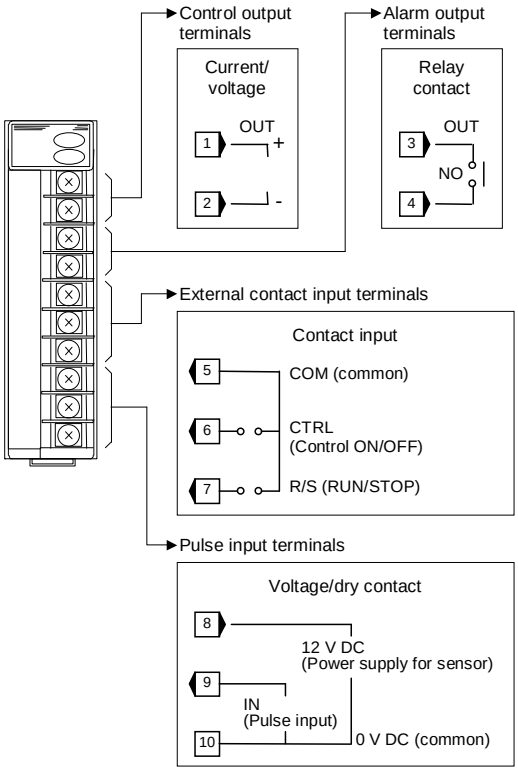
(1) Signal connected to Voltage input and Current input shall be low voltage defined as "SELV" circuit per IEC 60950-1.
(2) Use the solderless terminal appropriate to the screw size.
-Screw size:
M3 × 6
(with 5.8 × 8 square washer)
-Recommended tightening torque:
0.4 N· m [4 kgf· cm]
-Specified solderless terminals:
Circular terminal with isolation
V1.25-MS3
Manufactured by J.S.T MFG CO., LTD.

V1.25–MS3



(3) Make sure that during field wiring parts of conductors can not come into contact with adjacent conductive parts.

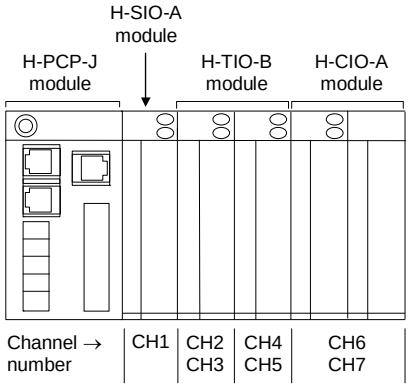
5.2 Terminal Configuration



6. ASSIGNMENT OF CHANNELS

Channel number of H-SIO-A modules uses the same kind of channel number as H-TIO-☐ modules and H-CIO-A modules. If the H-SIO-A modules are mounted together with H-TIO-☐ modules and H-CIO-A modules, the channel numbers are continued. Channel number is decided in order automatically from the left.

Example: Examples of channel number assigning in the following system configuration.
H-PCP-J module..... 1 H-TIO-B module.....2
H-SIO-A module ..... 1 H-CIO-A module 1



7. TROUBLESHOOTING

This section lists some basic causes and solutions to be taken when any problem would arise in this instrument. If you can not solve a problem, please contact RKC sales office or the agent, on confirming the type name and specifications of the product.

WARNING

- To prevent electric shock or instrument failure, always turn off the system power before replacing the instrument.
- To prevent electrical shock or instrument failure, always turn off the power before mounting or removing the instrument.
- To prevent electrical shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.
- To prevent electrical shock or instrument failure, do not touch the inside of the instrument.
- All wiring must be performed by authorized personnel with electrical experience in this type of work.

When replacing the module with a new one, always use the module with the same model code. In addition, when replacing the module with a new one of the different module type, please contact RKC sales office or the agent as it becomes necessary to initialize the module, etc.

Problem	Probable cause	Solution
RUN lamp does not flash	Power line defect	Replace mother block
	Power supply section defect	Replace H-PCP-J module
	CPU section breakdown	Replace module
RUN lamp stays lit	Module different from system specifications inserted	Replace with module matching specifications
	Maximum number of linkable units exceeded	Eliminate a module
FAIL lamp lit up	CPU section breakdown	Replace module
No outputs operate	System set to *Unused* mode	Switch to *Used* mode
	Input cut line	Replace sensor
	External operating device defect	Inspect external operating device
	Output section mis-wiring, cut line	Inspect wiring, replace as necessary
No outputs operate	Terminal screw loose	Tighten more
	Output circuit, CPU breakdown	Replace module
	Bus line defect	Replace mother block
	Main CPU section breakdown	Replace H-PCP-J module
Output unstable	Terminal screw loose	Tighten more
	Malfunction due to excess noise	Investigate noise filter installation
No input values change	System set to *Unused* mode	Switch to *Used* mode
	Main CPU section breakdown	Replace H-PCP-J module
	Bus line defect	Replace mother block
	Sensor cut line	Replace sensor
	Terminal screw loose	Tighten more
	Input circuit, CPU breakdown	Replace module
Control unstable	PID constant values inappropriate	Change the PID constant settings
	Terminal screw loose	Tighten more
	External operating device operation defects	Inspect the external operating device
	Output circuit, CPU breakdown	Replace module

The first edition: DEC. 2001
The second edition: FEB. 2013 [IMQ00]

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