

AC SERVOPACK JUNMA Series INSTRUCTIONS

Model: SJDE-□□APA-OY

To properly use the product, read this manual thoroughly and retain for easy reference, inspection, and maintenance. Ensure the end user receives this manual.

AC伺服单元 JUNMA系列 使用说明书

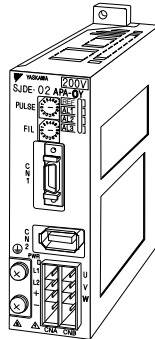
型号: SJDE-□□APA-OY

为了安全使用本产品, 请务必阅读该使用说明书。
另外, 请妥善保管该使用说明书, 并将其交至最终用户手中。

ACサーボバック JUNMAシリーズ 取扱説明書

形式: SJDE-□□APA-OY

製品を安全にお使い頂くために, 本書を必ずお読みください。
また, 本書をお手元に保管していただくとともに, 最終的に本製品をご使用になるユーザー様のお手元に確実に届けられるよう, お取り計らい願います。



English

汉语

日本語

AC SERVOPACK
JUNMA SERIES
INSTRUCTIONS

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Revision History

Introduction

This instruction manual describes the JUNMA series AC SERVOPACKs. To properly use the JUNMA series AC SERVOPACK, read these instructions thoroughly and retain for easy reference for inspections, maintenance, and so on. Make sure that the end user receives this manual.

Notation Used in this Manual

Notation for Parameters (Display Example for Pn170)

| Digit Notation | | Setting Notation | |
|----------------|---|--------------------------|---|
| Notation | Meaning | Notation | Meaning |
| Pn170.0 | Indicates the value for the 1st digit of parameter Pn170. | Pn170.0 = x or n.□□□x | Indicates that the value for the 1st digit of parameter Pn170 is x. |
| Pn170.1 | Indicates the value for the 2nd digit of parameter Pn170. | Pn170.1 = x or n.□□x□ | Indicates that the value for the 2nd digit of parameter Pn170 is x. |
| Pn170.2 | Indicates the value for the 3rd digit of parameter Pn170. | Pn170.2 = x or n.□x□□ | Indicates that the value for the 3rd digit of parameter Pn170 is x. |
| Pn170.3 | Indicates the value for the 4th digit of parameter Pn170. | Pn170.3 = x or n.x□□□ | Indicates that the value for the 4th digit of parameter Pn170 is x. |

Related Manuals

Refer to the following manuals as required.

| Manual Name | Manual Number |
|---|---------------|
| AC SERVO DRIVES JUNMA SERIES | KAEPS80000023 |
| JUNMA series AC SERVOMOTOR INSTRUCTIONS | TOBPC23026100 |
| Σ SERIES DIGITAL OPERATOR SAFETY PRECAUTIONS | TOBPC73080000 |

Safety Information

The following conventions are used to indicate precautions in this manual. Failure to heed these precautions can result in serious or possibly even fatal injury or damage to the products or to related equipment and systems.



WARNING

Indicates precautions that, if not heeded, could possibly result in loss of life or serious injury.




CAUTION

Indicates precautions that, if not heeded, could result in relatively serious or minor injury, damage to the product, or faulty operation.

In some situations, the precautions indicated could have serious consequences if not heeded.




PROHIBITED

Indicates prohibited actions that must not be performed. For example, this symbol would be used as follows to indicate that fire is prohibited:  .









MANDATORY

Indicates compulsory actions that must be performed. For example, this symbol would be used as follows to indicate that grounding is compulsory:  .










Notes for Safe Operation

Read these instructions thoroughly before checking products on delivery, storage and transportation, installation, wiring, operation and inspection, and disposal of the AC SERVOPACK.

WARNING


-  • Be sure to correctly connect the SERVOPACK connectors, CNA and CNB.
Incorrect wiring may result in electric shock, injury, or damage to the equipment. For the wiring method, refer to *3.8 Wiring the Power Supply/Regenerative Unit Connector (CNA)* and *3.9 Wiring the Servomotor Main Circuit Cable Connector (CNB)*.
-  • Make sure that the emergency-stop circuit turns OFF the Servo ON signal and the power supply of the main circuit when the EMG (emergency stop) signal turns ON.
Because of residual voltage, the servomotor rotates for a few seconds after the power supply has turned OFF. This may result in injury or damage to the equipment. Make sure that the EMG means the stop of the motor rotation.
-  • Never touch any rotating motor parts while the motor is running.
Failure to observe this warning may result in injury.
-  • Before starting operation with a machine connected, make sure that an emergency stop can be applied at any time. Also, design the circuit's power supply to be automatically cut off if /S-ON signal is OFF, and an emergency stop occurs at the same time.
Failure to observe this warning may result in injury.
-  • Never touch the inside of the SERVOPACKS.
Failure to observe this warning may result in electric shock.
-  • Do not touch terminals for five minutes after the power is turned OFF.
Residual voltage may cause electric shock.

WARNING

-  • Follow the procedures and instructions for trial operation precisely as described in this manual.
Malfunctions that occur after the servomotor is connected to the equipment not only damage the equipment, but may also cause an accident resulting in death or injury.
-  • Do not remove the cables, connectors, or optional items while the power is ON.
Failure to observe this warning may result in electric shock.
-  • Installation, wiring, advice on inspection and malfunction must be performed only by authorized personnel.
Failure to observe this warning may result in fire, electric shock, or injury.
-  • Do not damage, press, exert excessive force or place heavy objects on the cables or the cables between other objects where they might be pinched.
Failure to observe this warning may result in electric shock, stopping operation of the product, or burning.
-  • Provide an appropriate stopping device on the machine side to ensure safety.
A holding brake for a servomotor with brake is not a braking device for ensuring safety. Failure to observe this warning may result in injury.
-  • Do not come close to the machine immediately after resetting momentary power loss to avoid an unexpected restart.
Take appropriate measures to ensure safety against an unexpected restart. Failure to observe this warning may result in injury.
-  • Do not modify the product.
Failure to observe this warning may result in injury or damage to the product.
-  • Be sure to correctly ground the SERVOPACK and the servomotor.
-  • Connect the SERVOPACK's ground terminal to electrical codes (ground resistance: 100 Ω or less).
Improper grounding may result in electric shock or fire.




■ Checking on Delivery

CAUTION

-  • Always use the servomotor and SERVOPACK in one of the specified combinations.
Failure to observe this caution may result in fire or malfunction.

■ Storage and Transportation





CAUTION

-  • Do not store or install the product in the following places.
Failure to observe this caution may result in damage to the product.
 - Locations subject to direct sunlight.
 - Locations subject to temperatures outside the range specified in the storage or installation temperature conditions.
 - Locations subject to humidity outside the range specified in the storage or installation humidity conditions.
 - Locations subject to condensation as the result of extreme changes in temperature.
 - Locations subject to corrosive or flammable gases.
 - Locations subject to dust, salts, or iron dust.
 - Locations subject to exposure to water, oil, or chemicals.
 - Locations subject to shock or vibration.
-  • Do not hold the product by the cables or motor shaft while transporting it.
Failure to observe this caution may result in injury or malfunction.
-  • Do not place any load exceeding the limit specified on the packing box.
Failure to observe this caution may result in injury or malfunction.
- If disinfectants or insecticides must be used to treat packing materials such as wooden frames, pallets, or plywood, the packing materials must be treated before the product is packaged, and methods other than fumigation must be used.
Example: Heat treatment, where materials are kiln-dried to a core temperature of 56°C for 30 minutes or more.



If the electronic products, which include stand-alone products and products installed in machines, are packed with fumigated wooden materials, the electrical components may be greatly damaged by the gases or fumes resulting from the fumigation process. In particular, disinfectants containing halogen, which includes chlorine, fluorine, bromine, or iodine can contribute to the erosion of the capacitors.

■ Installation

CAUTION










-  • Make sure to follow the conditions on *2.1 Installation Conditions*.
Failure to observe this caution may result in electric shock, fire, or SERVOPACK's malfunction.
-  • Do not step on or place a heavy object on the product.
Failure to observe this caution may result in injury.
-  • Do not cover the inlet or outlet parts and prevent any foreign objects, such as metallic fragment, or combustibles from entering the product.
Failure to observe this caution may cause internal elements to deteriorate resulting in malfunction or fire.
-  • Be sure to install the product in the correct direction.
Failure to observe this caution may result in malfunction.

CAUTION





-  • Provide the specified clearances between the SERVOPACK and the control panel or with other devices.
Failure to observe this caution may result in fire or malfunction.
-  • SERVOPACK is precision equipment. Do not apply any strong impact.
Failure to observe this caution may result in malfunction.

■ Wiring

CAUTION








-  • Do not connect a three-phase power supply to the U, V, or W output terminals.
Failure to observe this caution may result in injury or fire.
-  • Securely connect the power supply terminals, regenerative unit connection terminal, and motor main circuit cable terminals.
Failure to observe this caution may result in fire.
-  • Do not bundle or run power and signal lines together in the same duct. Keep power and signal lines separated by at least 30 cm (11.81 in).
Failure to observe this caution may result in malfunction.
-  • Use twisted-pair shielded wires or multi-core twisted pair shielded wires for I/O signal cable and encoder cable.
The maximum length is 3 m (118.11 in) for reference input lines and is 20 m (787.40 in) for PG feedback lines.
-  • Do not touch the power terminals for five minutes after turning the power supply LED (PWR) are OFF because high voltage may still remain in the SERVOPACK.
-  • Avoid frequently turning power ON and OFF. Do not turn power ON or OFF more than once per minute.
Since the SERVOPACK has a capacitor in the power supply, a high charging current flows for 0.2 seconds when power is turned ON. Frequently turning power ON and OFF causes main power devices such as capacitors and fuses to deteriorate, resulting in unexpected problems.
-  • Observe the following precautions when wiring connectors for power supply/regenerative unit and for motor main circuit cable.
 - Remove the connectors from the SERVOPACK prior to wiring.
 - Insert only one wire per terminal on the connectors.
 - Make sure that the core wire is not electrically shorted to adjacent core wires.
-  • Be sure to wire correctly and securely.
Failure to observe this caution may result in motor overrun, injury, or malfunction.
-  • Always use the specified power supply voltage.
Failure to observe this caution may result in damage to the SERVOPACK. For details on the power supply voltage, refer to 8.1 *Specifications*.

CAUTION

-  • Take appropriate measures to ensure that the input power supply is supplied within the specified voltage fluctuation range. Be particularly careful in places where the power supply is unstable.
An incorrect power supply may result in damage to the product.
-  • Install external breakers or other safety devices against short-circuiting in external wiring.
Failure to observe this caution may result in fire.
-  • Take appropriate and sufficient countermeasures for each when installing systems in the following locations.
Failure to observe this caution may result in damage to the product.
 - Locations subject to static electricity or other forms of noise.
 - Locations subject to strong electromagnetic fields and magnetic fields.
 - Locations subject to possible exposure to radioactivity.
 - Locations close to power supplies including power supply lines.
-  • Do not reverse the polarity of the battery when wiring with regenerative unit.
Failure to observe this caution may result in damage to the product.





■ Operation

CAUTION

-  • Conduct trial operation on the servomotor alone with the motor shaft disconnected from machine to avoid any unexpected accidents.
Failure to observe this caution may result in injury.
-  • Before using a servomotor with a holding brake, run a trial operation to confirm that the holding brake activates correctly. Also, take appropriate measures to ensure safety against an error such as signal line disconnection.
-  • Before starting any operation with a machine connected, change the settings of the SERVOPACK's reference pulse with the PULSE rotary switch to match those of the machine.
Starting operation without matching the proper settings may cause the machine to run out of control or malfunction.
-  • When using the servomotor for a vertical axis, install safety devices to prevent workpieces from falling off because of alarms.
Workpiece's falling off may result in injury or malfunction.
-  • Do not touch the SERVOPACK heatsinks, regenerative unit, or servomotor while power is ON or soon after the power is turned OFF.
Failure to observe this caution may result in burns due to high temperatures.
-  • When an alarm occurs, remove the cause, turn OFF the power and ON again after confirming safety, and then resume operation.
Failure to observe this caution may result in injury.
-  • Do not use the holding brake of the servomotor for ordinary braking.
Failure to observe this caution may result in malfunction.

■ Maintenance and Inspection

CAUTION

-  • Do not open the SERVOPACK case for 5 minutes after the power supply lamp (PWR LED) goes out. High voltage may remain in the SERVOPACK after the power supply has been turned OFF.
-  • After turning OFF the power supply, wait 15 minutes before replacing the cooling fan. Failure to observe this caution may result in burns because the cooling fan is hot.
-  • Mount the cooling fan in the correct way explained in 6.3 *Replacement of Cooling Fan*. Mounting the cooling fan in the incorrect direction may result in the breakdown of the SERVOPACK.
-  • Do not attempt to change wiring while the power is ON. Failure to observe this caution may result in electric shock or injury.

■ Disposal

CAUTION

- When disposing of the products, treat them as general industrial waste.

■ General Precautions

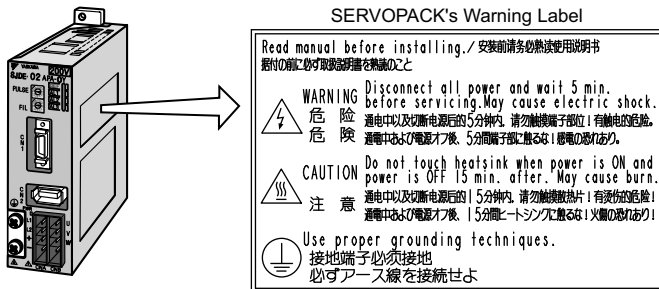
Note the following to ensure safe application.

- The drawings presented in this manual are sometimes shown without covers or protective guards. Always replace the cover or protective guard as specified first, and then operate the products in accordance with the manual.
- The drawings presented in this manual are typical examples and may not match the product you received.
- This manual is subject to change due to product improvement, specification modification, and manual improvement. When this manual is revised, the manual code is updated and the new manual is published as a next edition.
- If the manual must be ordered due to loss or damage, inform your nearest Yaskawa representative or one of the offices listed on the back of this manual.
- Yaskawa will not take responsibility for the results of unauthorized modifications of this product. Yaskawa shall not be liable for any damages or troubles resulting from unauthorized modification.

1 Before Use

1.1 Warning Label

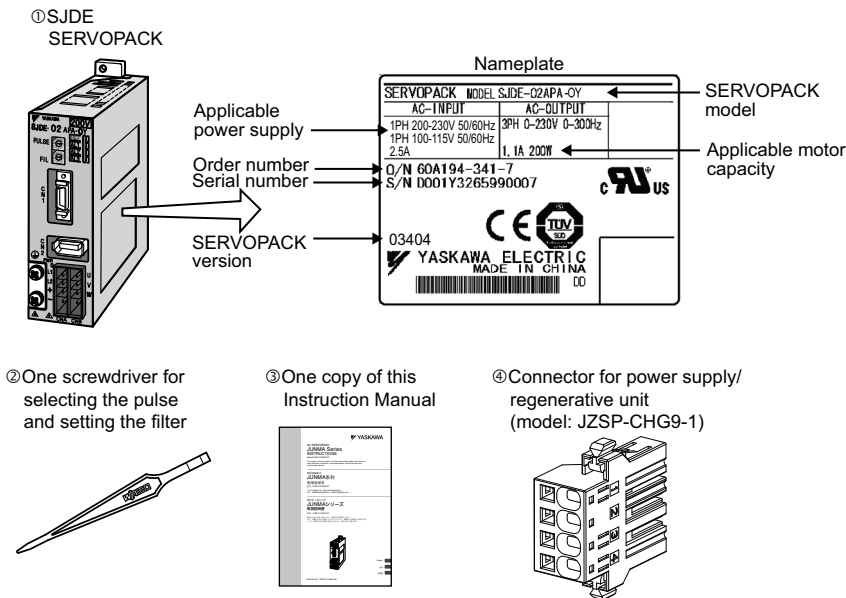
A warning label is located on the side of the SERVOPACK.



1.2 Checking Products

Confirm that the following items have been delivered together with the SERVOPACK. Verify that the ordered product as received by the model number marked on the nameplate on the SERVOPACK.

If you find any irregularities such as incorrect SERVOPACK model, damages, and missing parts or items, contact your Yaskawa representative or the dealer from whom you purchased the products.



1.3 Model Designation

SJDE-02 A P A-OY

JUNMA series SERVOPACK SJDE

Applicable servomotor capacity

| Code | Output (W) |
|------|------------|
| 01 | 100 |
| 02 | 200 |
| 04 | 400 |
| 08 | 750 |

Power supply voltage

A: 200 VAC

Interface specification

P: Pulse train reference

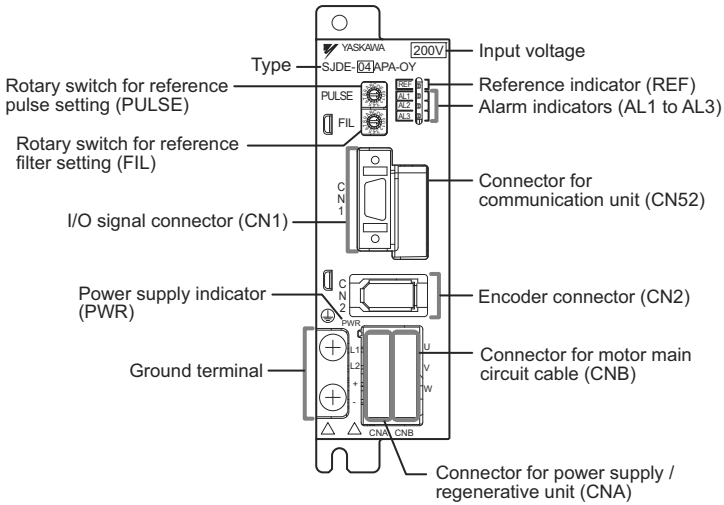
Design revision order

A

1.4 SERVOPACKs and Applicable Servomotors

| Rated Output | Servomotor | | SERVOPACK |
|--------------|-----------------|-----------------|---------------|
| | Without Brakes | With Brakes | |
| 100W | SJME-01AM□41 | SJME-01AM□4C | SJDE-01APA-OY |
| | SJME-01AM□41-OY | SJME-01AM□4C-OY | |
| 200W | SJME-02AM□41 | SJME-02AM□4C | SJDE-02APA-OY |
| | SJME-02AM□41-OY | SJME-02AM□4C-OY | |
| 400W | SJME-04AM□41 | SJME-04AM□4C | SJDE-04APA-OY |
| | SJME-04AM□41-OY | SJME-04AM□4C-OY | |
| 750W | SJME-08AM□41 | SJME-08AM□4C | SJDE-08APA-OY |
| | SJME-08AM□41-OY | SJME-08AM□4C-OY | |

1.5 Part Names and Functions



■ Reference Pulse Setting (PULSE)

PULSE



| Set Value | Input Frequency | Reference Pulse Resolution (P/REV) | Reference Pulse Connection Method | Reference Pulse Type |
|-----------|-------------------|------------------------------------|-----------------------------------|--|
| 0 | to 187.5 kpps | 1000 | Open collector or line driver | CW + CCW Positive logic |
| 1 | | 2500 | | |
| 2 | 187.5 to 750 kpps | 5000 | Line driver | CW |
| 3 | | 10000 | | CCW |
| 4 | to 187.5 kpps | 1000 | Open collector or line driver | CW + CCW Negative logic |
| 5 | | 2500 | | |
| 6 | 187.5 to 750 kpps | 5000 | Line driver | CW |
| 7 | | 10000 | | CCW |
| 8 | to 187.5 kpps | 1000 | Open collector or line driver | Mark + pulse sequence, Positive logic |
| 9 | | 2500 | | |
| A | 187.5 to 750 kpps | 5000 | Line driver | PULS |
| B | | 10000 | | SIGN |
| C | to 187.5 kpps | 1000 | Open collector or line driver | Mark + pulse sequence, Negative logic |
| D | | 2500 | | |
| E | 187.5 to 750 kpps | 5000 | Line driver | PULS |
| F | | 10000 | | SIGN |

Note: 1. Make settings after turning OFF the power.
 2. The factory setting is 0.

■ Reference Filter Setting Rotary Switch (FIL)

When the digital operator or JunmaWin is used, set Pn170.0 to 0 to enable the setting of FIL switch.



| Filter Setting Value*2 | Acceleration/Deceleration Time for Step Reference*4 | Approx. Time between Completing Reference and Completing Positioning (Settling Time)*3 | Description |
|------------------------|---|--|--|
| 0*1 | 45 ms | 100 to 200 ms | ▲ Small filter time constant (short positioning time) Large filter time constant (little vibration with a long positioning time) ▼ |
| 1 | 50 ms | 110 to 220 ms | |
| 2 | 60 ms | 130 to 260 ms | |
| 3 | 65 ms | 150 to 300 ms | |
| 4 | 70 ms | 170 to 340 ms | |
| 5 | 80 ms | 200 to 400 ms | |
| 6 | 85 ms | 250 to 500 ms | |
| 7 | 170 ms | 500 to 1000 ms | |
| 8 to F | Do not set 8 through F. | | |

- * 1. The factory setting is 0. If the machine vibrates, this value must be changed.
- * 2. If the machine vibrates when starting or stopping the machine, set a larger value.
- * 3. The value depends on conditions such as the level of command acceleration and deceleration, the machine rigidity and the motor resolution (PULSE switch).
- * 4. Select the correct servomotor capacity with these values if using a step reference that has no acceleration or deceleration time.

■ Reference Display (REF)

| Indicators* | Motor Power | Reference Pulses |
|----------------|-------------|------------------|
| Lit orange. | OFF | – |
| Blinks orange. | OFF | Input |
| Lit green. | ON | – |
| Blinks green. | ON | Input |

* Lit yellow for 1s when the clear signal is input.

■ Alarm Display (AL1, AL2, and AL3)

■: Lit □: OFF

| Indicators | Meaning of Alarm | Indicators | Meaning of Alarm |
|-------------------------|------------------|---|---|
| AL1 □ AL2 □ AL3 □ | Normal | AL1 ■ AL2 □ AL3 ■ | Overcurrent |
| AL1 ■ AL2 □ AL3 □ | Speed error | AL1 □ AL2 ■ AL3 ■ | SERVOPACK's built-in fan stop |
| AL1 □ AL2 ■ AL3 □ | Overload | AL1 ■ AL2 ■ AL3 ■ | System error |
| AL1 ■ AL2 ■ AL3 □ | Encoder error | AL1 ■ □ AL2 ■ ↔ □ AL3 ■ □ Blinks at regular intervals. | Rotary switch for reference pulse setting (PULSE) changed. The settings were changed for parameters that require the power to be restarted. |
| AL1 □ AL2 □ AL3 ■ | Voltage error | | |

2 Installation

The following shows the installation location and method of the SERVOPACK.

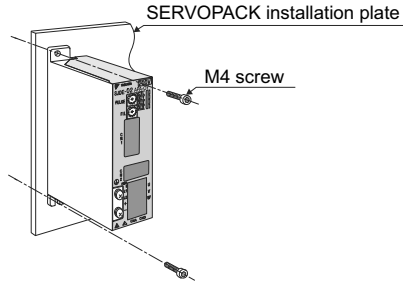
2.1 Installation Conditions

| Item | | Specifications |
|-----------------------|---|--|
| Operating temperature | | 0 °C to +55 °C |
| Operating humidity | | 90% RH or less (with no condensation) |
| Storage temperature | | -20 °C to +70 °C |
| Storage humidity | | 90% RH or less (with no condensation) |
| Installation site | | Free of corrosive gases Free of dust and iron powder Clean and dry |
| Altitude | | 1000 m or below |
| Vibration resistance | | 4.9 m/s ² |
| Shock resistance | | 19.6 m/s ² |
| Operating conditions | | Installation category (overvoltage category): II Pollution degree: 2 Protection class: IP10 (EN50178) |
| Installation Site | Installation in a control panel | Design the control panel size, unit layout, and cooling method so the temperature around the SERVOPACK does not exceed 55 °C. Note: For long-term reliability the internal temperature of the control panel must be 45 °C or lower. |
| | Installation near a heating unit | Minimize the heat radiating from the heating unit as well as any temperature rise caused by natural convection so the temperature around the SERVOPACK does not exceed 55 °C. |
| | Installation near a source of vibration | Install a vibration isolator beneath the SERVOPACK to avoid subjecting it to vibration. |
| | Installation at a site exposed to corrosive gas | Corrosive gas does not have an immediate effect on the SERVOPACK but will eventually cause the electronic components and contactor-related devices to malfunction. Take appropriate action to avoid corrosive gas. |

2.2 Installation Method

■ Installation Method and Direction

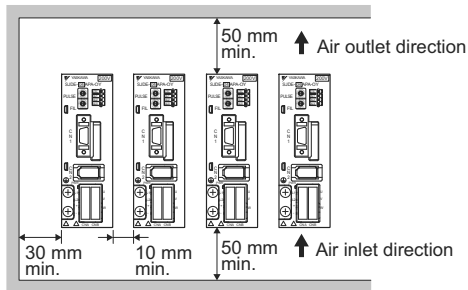
- Install the SERVOPACK perpendicular to the wall. The SERVOPACK contains a built-in fan for cooling and must be mounted in the specified direction.
- Connect the mounting holes securely to the mounting surface with M4 screws (two mounting holes).



■ Space between SERVOPACK Units

- Be sure to keep a space between adjacent SERVOPACK units if they are mounted inside the control panel so that the units can be cooled.
- Do not cover the inlet or outlet parts and prevent any foreign objects, such as metallic fragment, or combustibles from entering the product.

Failure to observe this caution may cause internal elements to deteriorate resulting in malfunction or fire.



3 Wiring

3.1 Precautions on Wiring

WARNING

- Be sure to correctly ground the SERVOPACK and the servomotor.
- Wiring must be performed by an authorized person qualified in electrical work.

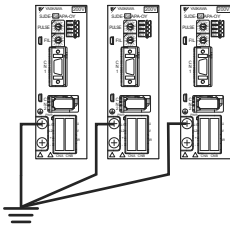
■ Protection for Power Supply Line

- Use a molded-case circuit breaker and fuse to protect the power supply line from high voltage. The SJDE SERVOPACK connects directly to a commercial power supply without a transformer, so always use a circuit breaker and fuse to protect the SERVOPACK from accidental high voltage.

■ Caution for Grounding

Consider the following conditions when grounding the SERVOPACK.

- For a ground wire, use as thick a cable as possible (2.0 mm^2 or thicker).
- A ground resistance of $100 \text{ } (\Omega)$ or less is recommended.
- Ground to one point only.



■ Caution for Cable

- For wiring, use the specified cables. Use cables that are as short as possible.
- Do not bend or apply tension to cables. The conductor of a signal cable is very thin (0.08 to 0.12 mm^2), so handle the cables carefully.

■ Other Precautions

- Make sure that the emergency-stop circuit turns OFF the /S-ON signal as well as the power supply of the main circuit. Refer to 3.14 EMG Sequence.
- An overtravel function is not provided for the SERVOPACK.
For system safety, include a sequence so that the /S-ON signal will turn OFF when the limit switch is activated.
- If the servomotor is used to drive a vertical axis, install a safety device with an alarm function to prevent the workpiece from falling down. Failure to observe this precaution may result in injury or damage to the equipment from fallen workpieces.
- Install an interlock system in the circuit to avoid any accident when opening or closing the machine's protective cover.
- Whether the electricity is served or not to the motor, do not use the motor being rotated from the outside.
- When restarting the power supply soon after turning OFF, alarm may occur to the SERVOPACK. Refer to the power supply holding time in the following table to restart the power supply correctly.

| SERVOPACK | | Min. Waiting Time before Restarting (s) |
|---------------|----------|---|
| Model | Capacity | |
| SJDE-01APA-OY | 100W | 20 |
| SJDE-02APA-OY | 200W | |
| SJDE-04APA-OY | 400W | |
| SJDE-08APA-OY | 750W | 30 |

■ Power Loss

Power Loss with SERVOPACK Rated Output

| Main Circuit Power Supply | Max. Applicable Servomotor Capacity kW | SERVOPACK Model No. | Output Current (Effective Value) A | Main Circuit Power Loss W | Diode Power Loss W | IPM Power Loss W | Control Circuit Power Loss W | Total Power Loss W |
|---------------------------|--|---------------------|------------------------------------|---------------------------|--------------------|------------------|------------------------------|--------------------|
| Single-phase 200 V | 0.1 | SJDE-01APA-OY | 0.84 | 6 | 0.9 | 4.2 | 9 | 15 |
| | 0.2 | SJDE-02APA-OY | 1.1 | 8 | 1.8 | 5.8 | | 17 |
| | 0.4 | SJDE-04APA-OY | 2.0 | 16 | 3.6 | 11.9 | | 25 |
| | 0.75 | SJDE-08APA-OY | 3.7 | 27 | 6.4 | 20.3 | | 36 |

Note: Valued obtained with the servomotor with the rated output.

3.1 Precautions on Wiring

■ Molded-Case Circuit Breaker (MCCB) or Fuse Capacity Relation to Power-Supply Capacity

MCCB or Fuse Capacity Relation to Power-Supply Capacity

| Main Circuit Power Supply | SERVOPACK | | Applicable Servomotor Model: SJME- | Power-Supply Capacity kVA | MCCB Current Capacity Arms ^{*1} | External Fuse Model No. [Power-Supply Capacity Arms] ^{*2} | Inrush Current A |
|---------------------------|-------------|------------------|------------------------------------|---------------------------|--|--|------------------|
| | Capacity kW | Model No.: SJDE- | | | | | |
| Single-phase 200 V | 0.1 | 01APA-OY | 01AM□41 | 0.4 | 4 | OKLK 015.T [15] | 30 |
| | | | 01AM□41-OY | | | | |
| | 0.2 | 02APA-OY | 02AM□41 | 0.75 | | | |
| | | | 02AM□41-OY | | | | |
| | 0.4 | 04APA-OY | 04AM□41 | 1.2 | 8 | | |
| | | | 04AM□41-OY | | | | |
| | 0.75 | 08APA-OY | 08AM□41 | 2.2 | 16 | OKLK 030.T [30] | 60 |
| | | | 08AM□41-OY | | | | |

* 1. Valued obtained with the servomotor with the rated output.

* 2. Fuse manufactured by Littelfuse Inc.



Ground Fault

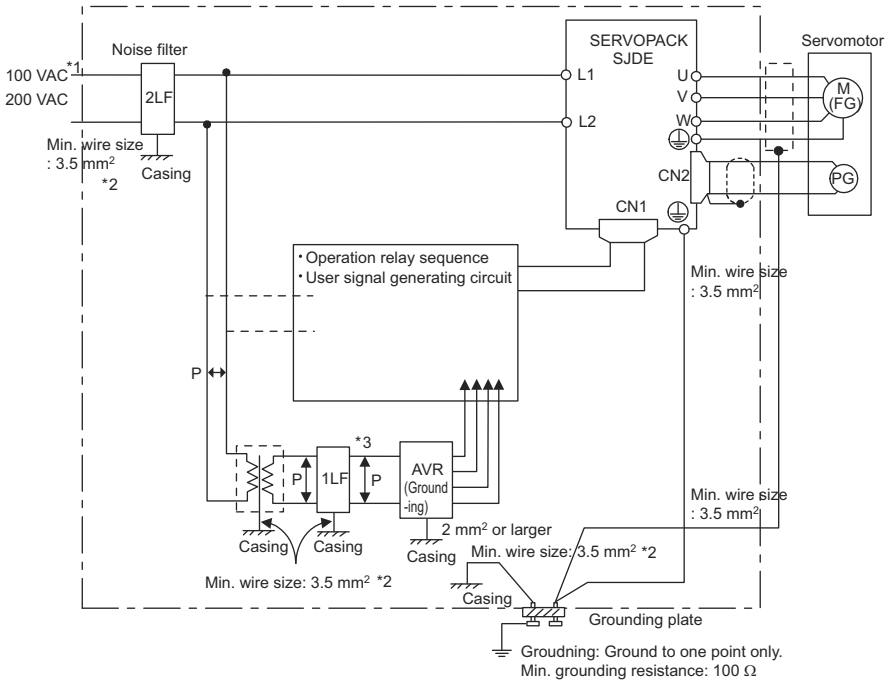
The ground protection circuit is designed for ground fault inside the motor windings while the motor is running. Therefore, it may not protect the system under the following conditions.

- A low-resistance ground fault occurs between the main circuit cable and connector for the servomotor.
- The power supply is turned ON during a ground fault.

To configure a safer system, install an earth leakage breaker for protection against overloads and short-circuiting, or install an earth leakage breaker combined with a wiring circuit breaker for ground protection.

■ Noise Prevention

Example of Wiring for Noise Prevention



- * 1. A 100 VAC power supply can be used with a SERVOPACK version 03404 or firmware version 0004 or later.
- * 2. For the wires connected to the casings for installation purposes, use wires with a diameter of 3.5 mm² or larger. Flat braided copper wires are recommended.
- * 3. Use twisted pair wires for section P.

Correct Grounding

- Servomotor frame grounding:
Be sure to connect the FG grounding terminal on the frame of the servomotor to the grounding terminal on the SERVOPACK.
- Be sure to ground the grounding terminal of the SERVOPACK.
- If the wires of the servomotor's main circuit are laid in a metal conduit, ground the conduit and the grounding box.

One-point grounding must be used.

3.1 Precautions on Wiring

Noise Filters

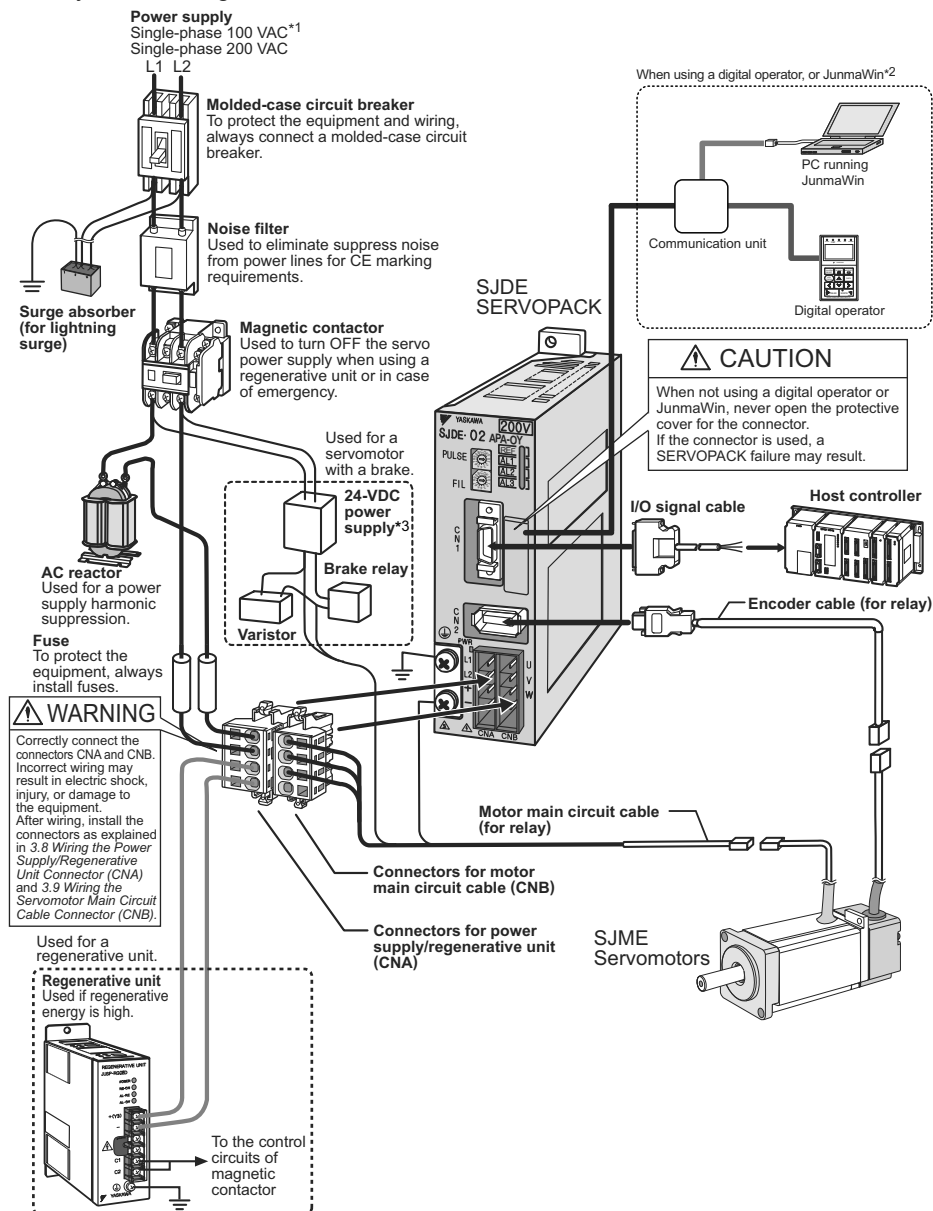
Use noise filters to prevent any noise interference from the power-supply line.

The following table lists the recommended noise filters.

Recommended Noise Filters

| Power-Supply Voltage | SERVOPACK Model | Recommended Noise Filters | | |
|-----------------------|------------------------------|---------------------------|---------------------------|---------------------|
| | | Model | Specifications | Manufacturer |
| Single-phase 200 V | SJDE-01APA-OY to 02APA-OY | FN2070-6/07 | Single-phase 250 VAC, 6A | Schaffner EMC, Inc. |
| | SJDE-04APA-OY | FN2070-10/07 | Single-phase 250 VAC, 10A | |
| | SJDE-08APA-OY | FN2070L-16/07 | Single-phase 250 VAC, 16A | |

3.2 System Configuration

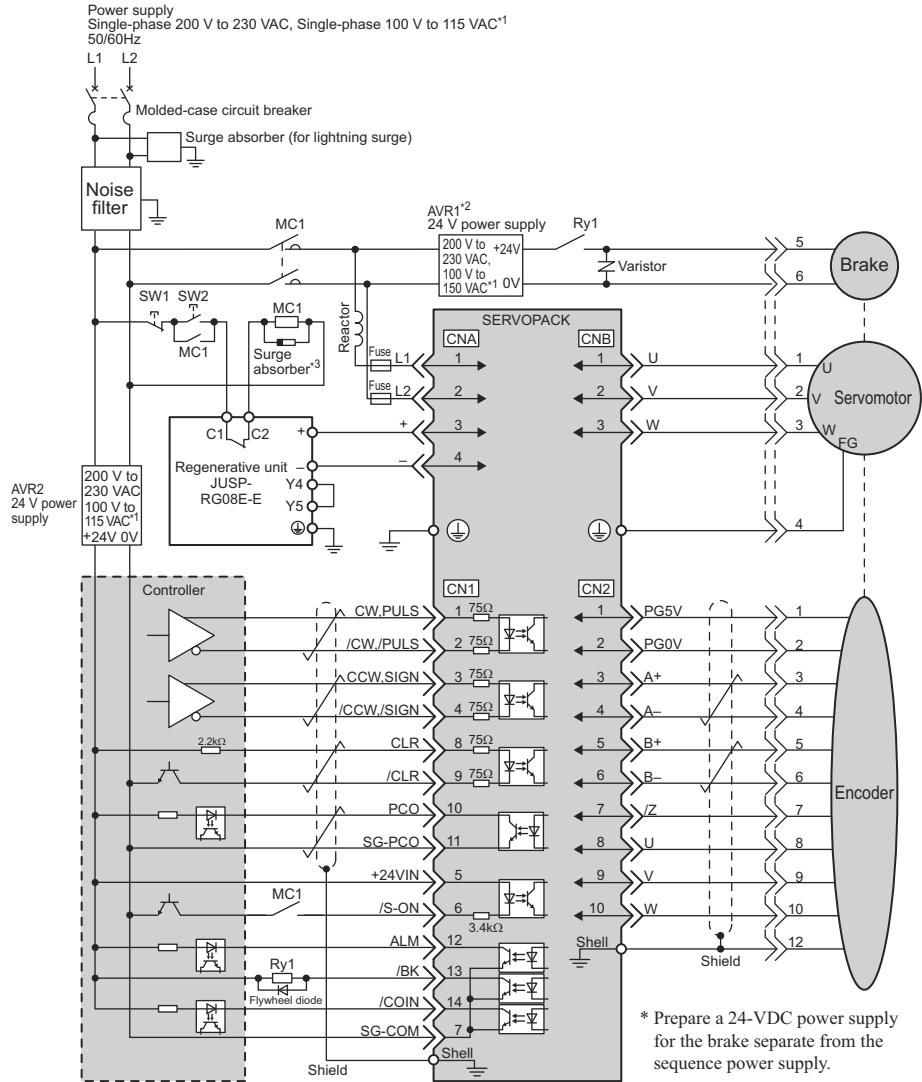


* 1. A 100 VAC power supply can be used with a SERVOPACK version 03404 or firmware version 0004 or later.

* 2. A digital operator or JunmaWin can be used with a SERVOPACK version 03303 or firmware version 0003 or later.

* 3. Prepare a 24-VDC power supply for the brake separately from the sequence power supply.

3.3 Standard Connection



* 1. A 100 VAC power supply can be used with a SERVOPACK version 03404 or firmware version 0004 or later.
 * 2. Prepare a 24 VDC power supply for sequence separately from the 24 VDC power supply for brake.
 * 3. For switching surge

- Note: 1. AVR1: 24 VDC power supply for brake
 AVR2: 24 VDC power supply for
 sequence
 SW1: Power OFF switch
 SW2: Power ON switch
 MC1: Magnetic contactor
 Ry1: Brake relay

• Parts example

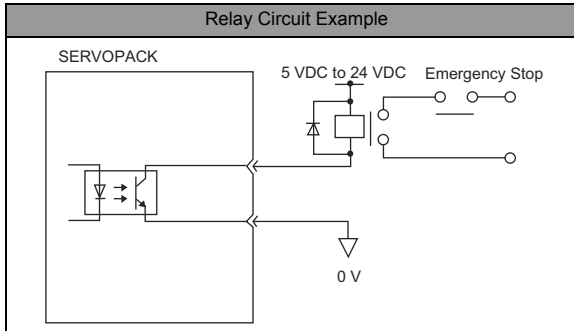
| | |
|----------------|--|
| Surge absorber | Okaya Electric Industries Co., Ltd. CRE-50500 (Sold as: Spark Quencher) |
| Flywheel diode | Toshiba Corporation 1NH42 |
| Brake relay | OMRON Corporation MY series |
| Varistor | Nippon Chemi-Con Corporation TNR7V121K |

2. The ground protection circuit is designed for ground fault inside the motor windings while the motor is running. Therefore, it may not protect the system under the following conditions.
- A low-resistance ground fault occurs between the main circuit cable and connector for the servomotor.
 - The power supply is turned ON during a ground fault.

To configure a safer system, install an earth leakage breaker for protection against overloads and short-circuiting, or install an earth leakage breaker combined with a wiring circuit breaker for ground protection.

NOTE

Configure the holding brake circuit that is to be activated upon occurrence of emergency stop.

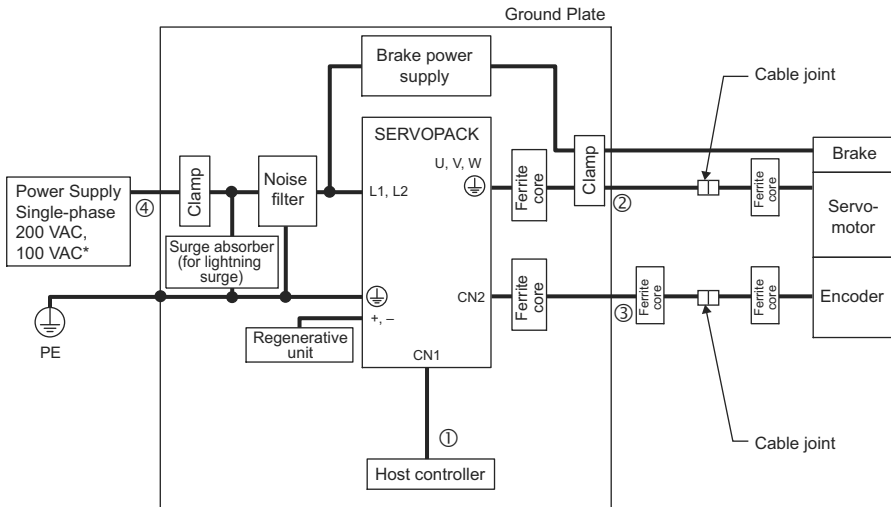


3.4 Installation and Wiring Conditions on CE Marking

To adapt a combination of a SJME servomotor and a SJDE SERVOPACK to EMC Directives (EN55011, group 1, class A and EN61000-6-2), the following conditions must be satisfied. After installing the SERVOPACK, do a test run to make sure that the machine operates correctly.

NOTE

The actual EMC level may differ depending on the actual system's configuration, wiring, and other conditions.

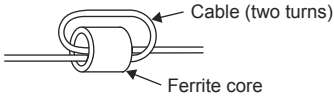


| Symbol | Cable Name | Specifications |
|--------|-------------------------------|----------------|
| ① | I/O Signals cable | Shield cable |
| ② | Servomotor Main Circuit cable | Shield cable |
| ③ | Encoder cable | Shield cable |
| ④ | AC Line cable | Shield cable |

* A 100 VAC power supply can be used with a SERVOPACK version 03404 or firmware version 0004 or later.

■ Attaching the Ferrite Core

Coil the motor main circuit cable (as a connection) around the ferrite core with two turns, then attach them by the SERVOPACK. Refer to the diagram in the previous page.

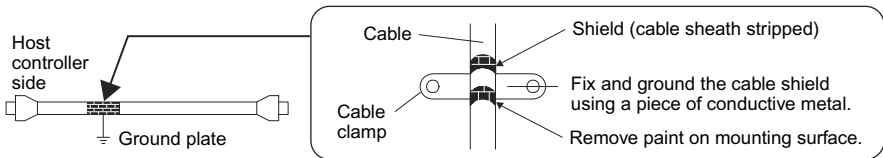


Note: Recommended Ferrite-core
Model: ESD-SR-25 (Tokin. Corp.)

■ Fixing the Cable

Fix and ground the cable shield using a piece of conductive metal.

- Example of Cable Clamp



■ Shield Box

A shield box, which is a closed metallic enclosure, should be used for shielding magnetic interference. The structure of the box should allow the main body, door, and cooling unit to be attached to the ground. The box opening should be as small as possible.

3.5 SERVOPACKs and Applicable Peripheral Devices

| SERVOPACK | | Power Supply Capacity per SERVOPACK kVA | Current Capacity of Molded-case Circuit Breaker Arms ^{*1 *2} | Current Capacity and Model of External Fuse | Inrush Current A0-p | Magnetic Contactor ^{*3} | Noise Filter | Surge Absorber | AC Reactor |
|---------------|----------|---|---|---|---------------------|----------------------------------|----------------------|--|----------------------------|
| Type | Capacity | | | | | | | | |
| SJDE-01APA-OY | 100 W | 0.40 | 4 | 0KLK 015.T (15 Arms) | 30 | HI-11J | FN2070 -6/07 | R·C·M-601BQZ-4 | X5052 |
| SJDE-02APA-OY | 200 W | 0.75 | | | | | | | X5053 |
| SJDE-04APA-OY | 400 W | 1.2 | 8 | FN2070 -10/07 | X5054 | | | | |
| SJDE-08APA-OY | 750 W | 2.2 | 16 | 0KLK 030.T (30 Arms) | 60 | HI-15J | FN2070 -16/07 | | X5056 |
| Manufacturer | | — | — | Littelfuse Inc. | — | Yaskawa Controls Co., Ltd. | Schaffner Electronic | Okaya Electric Industries Co., Ltd. (Sold as: Surge Protector) | Yaskawa Controls Co., Ltd. |

* 1. Nominal value at the rated load. The specified derating is required to select the appropriate molded-case circuit breaker.

* 2. Cut-off characteristics (25 °C): 200 % two seconds min. and 700 % 0.01 seconds min.

Note: 1. The ground protection circuit is designed for ground fault inside the motor windings while the motor is running. Therefore, it may not protect the system under the following conditions.

- A low-resistance ground fault occurs between the main circuit cable and connector for the servomotor.
- The power supply is turned ON during a ground fault.

To configure a safer system, install an earth leakage breaker for protection against overloads and short-circuiting, or install an earth leakage breaker combined with a wiring circuit breaker for ground protection.

2. It is recommended to use a general-purpose circuit breaker of the rated current 200 mA or more, or a circuit breaker for inverters (for high-frequency).

3.6 Main Circuit Wiring

- SJDE SERVOPACKs are suitable where the power supply is less than 5000 Arms (230 V max.).
- SERVOPACKs must be used with UL-listed fuses or circuit breakers, in accordance with the National Electrical Code (NEC).
- Use 75 °C heat-resistant copper wires or an equivalent.

3.7 SERVOPACK Main Circuit Wire Size

■ Cable Types

| Symbol | Name | Allowable Conductor Temperature |
|--------|-----------------------------------|---------------------------------|
| PVC | Normal vinyl cable | — |
| IV | 600 V vinyl cable | 60 °C |
| HIV | Temperature-resistant vinyl cable | 75 °C |

- Wire sizes are selected for three cables per bundle at 40 °C ambient temperature with the rated current.
- Use cables with a minimum withstand voltage of 600 V for main circuits.
- If cables are bundled in PVC or metal ducts, consider the reduction ratio of the allowable current.
- Use heat-resistant cables under high ambient or panel temperatures where normal vinyl cables will rapidly deteriorate.
- Do not use cables under continuous regenerative state.

■ Cable Size and Allowable Current

The following table shows the wire size and allowable current for three cables. Use a cable whose specifications meet or are less than allowable current in the table.

- 600 V Heat-resistant Vinyl Cables (HIV)

| AWG Size | Nominal Cross Section Diameter mm ² | Configuration Number of wires/mm ² | Conductive Resistance Ω/mm ² | Allowable Current at Ambient Temperature A | | |
|----------|---|---|--|---|-------|-------|
| | | | | 30 °C | 40 °C | 50 °C |
| 20 | 0.5 | 19/0.18 | 39.5 | 6.6 | 5.6 | 4.5 |
| – | 0.75 | 30/0.18 | 26.0 | 8.8 | 7.0 | 5.5 |
| 18 | 0.9 | 37/0.18 | 24.4 | 9.0 | 7.7 | 6.0 |
| 16 | 1.25 | 50/0.18 | 15.6 | 12.0 | 11.0 | 8.5 |
| 14 | 2.0 | 7/0.6 | 9.53 | 23 | 20 | 16 |

Note: The values in the table are only for reference.

■ Power Supply Input Terminals (L1, L2), Motor Connection Terminals (U, V, W), and Regenerative Unit Connection Terminals (+, -)

| Capacity W | SERVOPACK Type | Terminal Symbol | | |
|---------------|----------------|-------------------------|---|--|
| | | L1, L2 | U, V, W | +, - |
| 100 | SJDE-01APA-OY | HIV1.25 mm ² | HIV1.25mm ² Wiring length: 20 m max. | HIV1.25mm ² Wiring length: 0.5 m max. |
| 200 | SJDE-02APA-OY | | | |
| 400 | SJDE-04APA-OY | HIV2.0 mm ² | HIV1.25mm ² Wiring length: 20 m max. | HIV1.25mm ² Wiring length: 0.5 m max. |
| 750 | SJDE-08APA-OY | | | |

Note: Connectors are used for all wiring.

■ Ground Terminal (⊕)

| Wire Size | Terminal Screw Size | Tightening Torque |
|------------------------------|---------------------|-------------------|
| HIV 2.0 mm ² min. | M4 | 1.2 to 1.4 N·m |

■ Encoder Signal Connector

| Item | Specifications |
|-------------------------------|--|
| Cable | Use Yaskawa specified wires, or shielded twisted-pair wires. |
| Maximum cable length | 20 m |
| Applicable wires | AWG22 (0.33 mm ²) and AWG26 (0.12 mm ²) Used AWG22 for the encoder power supply and AWG26 for signal lines. |
| Finished cable outer diameter | φ9 mm max. |

■ I/O Signal Connector

| Item | Specifications |
|-------------------------------|--|
| Cable | Use twisted-pair wires or shielded twisted-pair wires. |
| Maximum cable length | 3 m |
| Applicable wires | AWG24 (0.2 mm ²), AWG26 (0.12 mm ²), AWG28 (0.08 mm ²) |
| Finished cable outer diameter | φ8 mm max. |

3.8 Wiring the Power Supply/Regenerative Unit Connector (CNA)

⚠ CAUTION

- Observe the following precautions when wiring connectors for power supply/regenerative unit and for motor main circuit cable.
 - Remove the connectors from the SERVOPACK prior to wiring.
 - Insert only one wire per terminal on the connectors.
 - Make sure that the core wire is not electrically shorted to adjacent core wires.

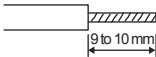
Use the following procedure when connecting the SERVOPACK to the power supply/regenerative unit connector.

1. Remove the connector from the SERVOPACK.

Make sure to remove the connector from the SERVOPACK when wiring.

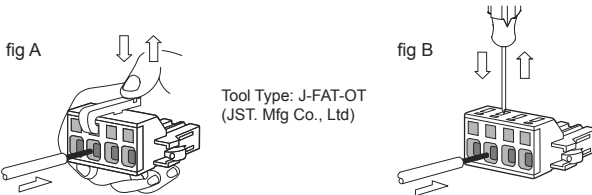
2. Strip the outer coating.

Straighten the wire core with your fingers to prevent the wires from unwinding.



3. Open the wire terminal on the power supply connector housing (plug) with the tool (lever for wiring) using the procedure shown in Fig. A or B.

- Insert the connection hook end of the provided tool into the slot as shown in Fig. A. Tool must be purchased by the customer.
- Use a standard flat-blade screwdriver (blade width of 2.5 to 3.0 mm (0.09 to 0.12 in)). Put the blade into the slot, as shown in Fig. B, and press down firmly to open the wire terminal. Either the procedure shown in Fig. A or B can be used to open the wire insert opening.



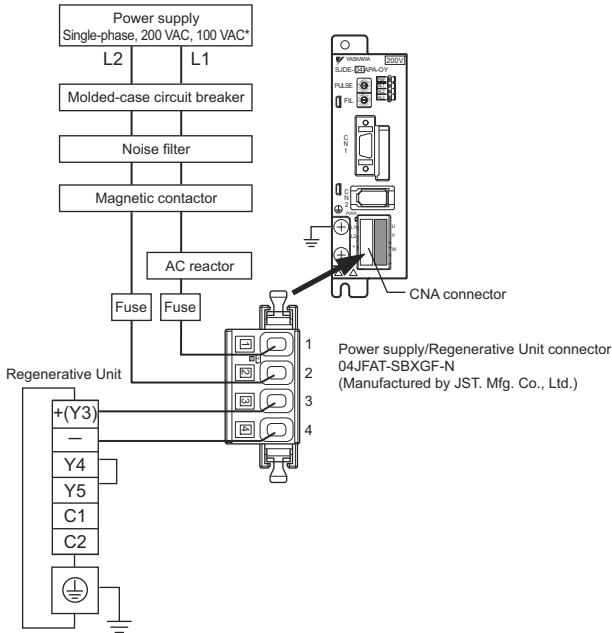
4. Insert the wire core into the opening and then close the opening by releasing the tool hook or removing the screwdriver.

■ Wire Size

| Item | | Wire Size |
|------------------|--------------|-------------------|
| Conductor Size | Braided wire | AWG14 to AWG22 |
| | Single wire | φ1.6mm to φ0.65mm |
| Sheath Dimension | | φ3.8mm to φ1.7mm |

5. Connect the connector to the SERVOPACK.

After wiring the connector, reconnect the connector to the SERVOPACK.



* A 100 VAC power supply can be used with a SERVOPACK version 03404 or firmware version 0004 or later.

- Note: 1. Pull lightly on the wires to confirm that they are securely connected.
2. Be sure that none of the insulating sheaths of the wires are caught in the springs.

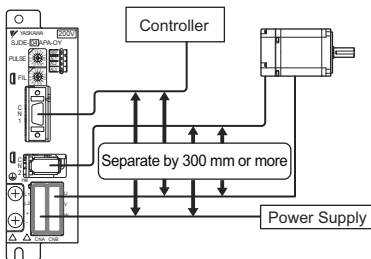
■ Connector for Power Supply/Regenerative Unit (CNA)

| Pin No. | Symbol | Signal Name |
|---------|--------|--|
| 1 | L1 | Power supply input terminals |
| 2 | L2 | |
| 3 | + | Regenerative unit connection terminals |
| 4 | - | |

3.9 Wiring the Servomotor Main Circuit Cable Connector (CNB)

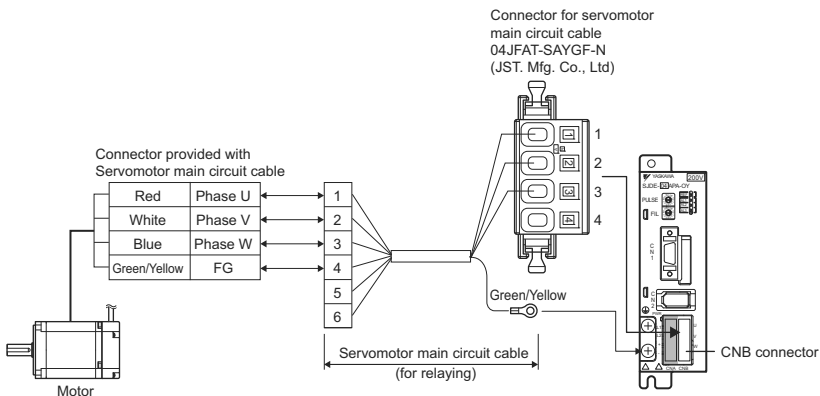
3.9 Wiring the Servomotor Main Circuit Cable Connector (CNB)

Wire the connector for the servomotor main circuit cable (CNB) in the same way as the connector for the power supply/regenerative unit (CNA). Refer to the previous section for details and the procedure.



- The distance between the cable for the servomotor's main circuit and the encoder as well as the I/O cable is 300 mm or more.
- Do not bundle or run the servomotor main circuit cable in the same duct with other cables.
- Be sure that the maximum wiring length of the servomotor main circuit cable is 20 m.

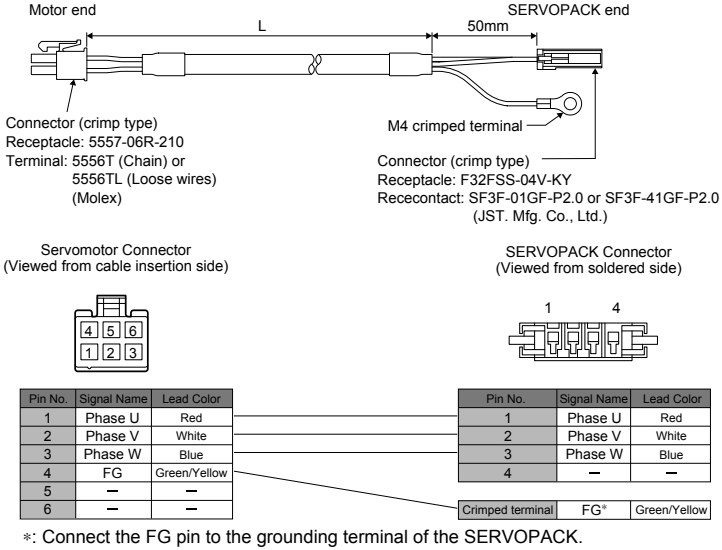
■ Servomotors without Brakes



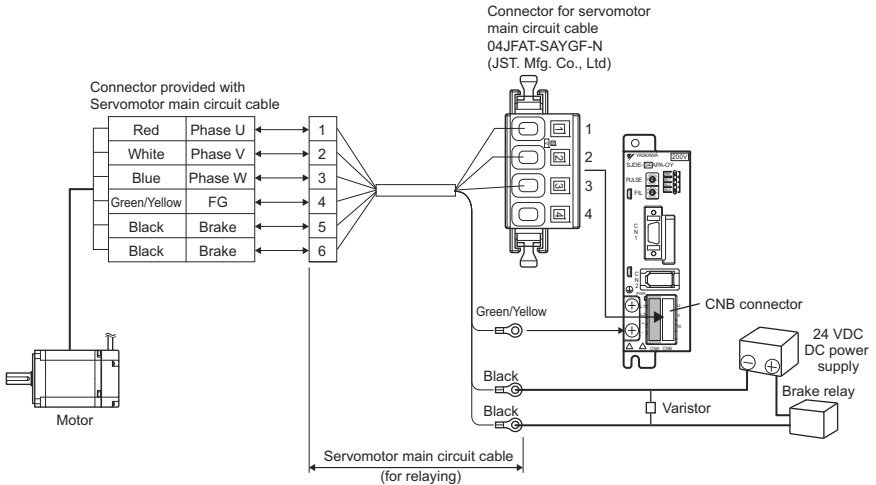
Note: Pin numbers are given on the connector as well. Confirm all pin numbers.

Connection Diagram for Standard Servomotor Main Circuit Cable

If a user-prepared servomotor main circuit cable is used, refer to the following connection diagram for the standard cable (JZSP-CHM000-□□ Cable with Connectors on Both Ends) and wire the servomotor main circuit cable.



■ Servomotors with Brakes



- Note: 1. Prepare a double-insulated 24-VDC power supply.
2. Connect the varistor in parallel with the 24-V power supply terminal and GND terminal to suppress the surge voltage resulting from the holding brake turned ON and OFF.
3. Pin numbers are given on the connector as well.

3.9 Wiring the Servomotor Main Circuit Cable Connector (CNB)

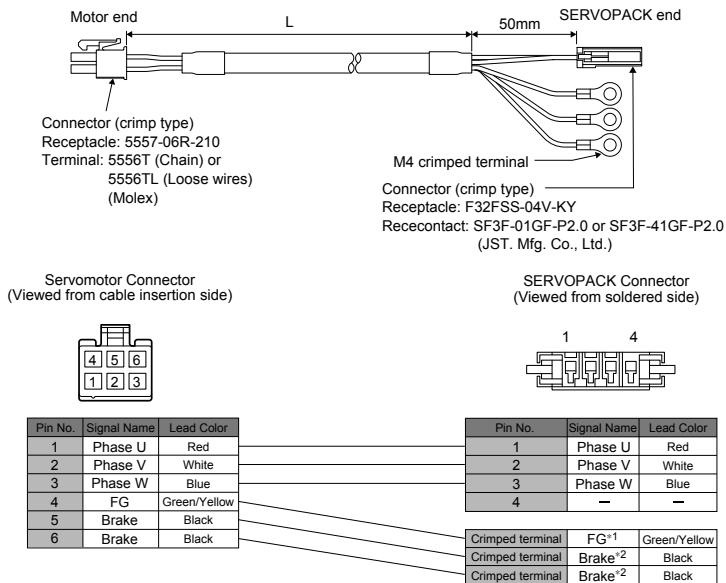
- If using the servomotor to drive a vertical axis, provide a circuit to turn the holding brake ON so that the movable section will not be pulled down by gravity when the power supply of the SERVOPACK is turned OFF.



Failures caused by incorrect wiring or wrong voltage application in the brake circuit may damage the equipment or cause an accident resulting in death or injury.
Follow the procedures and instructions for wiring and trial operation precisely as described in this manual.

Connection Diagram for Standard Servomotor Main Circuit Cable

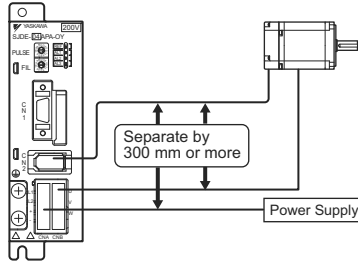
If a user-prepared servomotor main circuit cable is used, refer to the following connection diagram for the standard cable (JZSP-CHM030-□□ Cable with Connectors on Both Ends) and wire the servomotor main circuit cable.



*1: Connect the FG pin to the grounding terminal of the SERVOPACK.

*2: No polarity for connection to the brake.

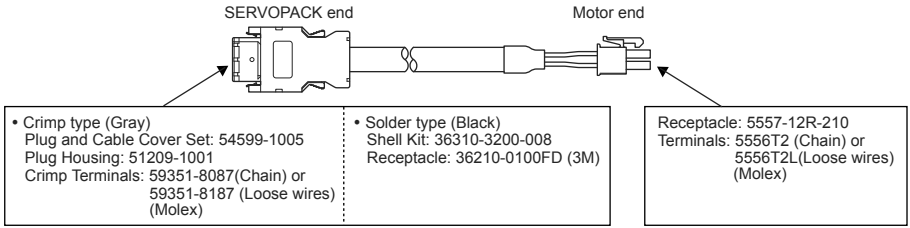
3.10 Wiring the Encoder Connector (CN2)



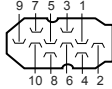
- Separate the encoder cable at least 300 mm from power lines (i.e., high-voltage lines such as the power supply line and servomotor main circuit cable).
- Do not bundle with or run the encode cable in the same duct as power lines.
- Be sure that the maximum wiring length of the encoder cable is 20 m.

■ Connection Diagram for Standard Encoder Cable

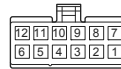
If a user-prepared encoder cable is used for relaying, refer to the following connection diagram for the standard cable (JZSP-CHP800-□□ Cable with Connectors on Both Ends) and wire the encoder cable.



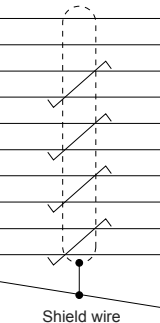
SERVOPACK Connector
(Viewed from soldered side)



Servomotor Connector
(Viewed from cable insertion side)



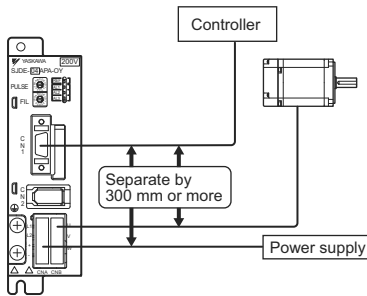
| Pin No. | Signal Name | Lead Color |
|---------|-------------|--------------|
| 1 | PG5V | Red |
| 2 | PG0V(GND) | Black |
| 3 | Phase A (+) | Blue |
| 4 | Phase A (-) | Blue/White |
| 5 | Phase B (+) | Yellow |
| 6 | Phase B (-) | Yellow/White |
| 7 | Phase /Z | Purple |
| 8 | Phase U | Gray |
| 9 | Phase V | Green |
| 10 | Phase W | Orange |
| Shell | — | Shield |



| Pin No. | Signal Name | Lead Color |
|---------|-------------|--------------|
| 1 | PG5V | Red |
| 2 | PG0V(GND) | Black |
| 3 | Phase A (+) | Blue |
| 4 | Phase A (-) | Blue/White |
| 5 | Phase B (+) | Yellow |
| 6 | Phase B (-) | Yellow/White |
| 7 | Phase /Z | Purple |
| 8 | Phase U | Gray |
| 9 | Phase V | Green |
| 10 | Phase W | Orange |
| 11 | — | — |
| 12 | Shield | Shield |

Note: Pin numbers are given on the connector as well.

3.11 Wiring I/O Connectors



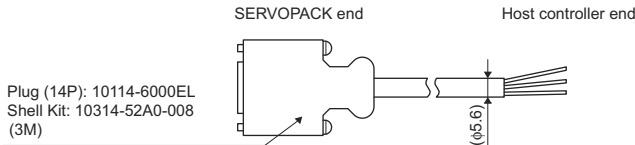
Note: Do not apply excessive force when connecting or disconnecting the cable or the connector.
Damage to the cable or connectors may cause the product to stop operating or malfunction.



- Separate the I/O cable at least 300 mm from power lines (i.e., high-voltage lines, such as the power supply line and servomotor main circuit cable).
- Be sure that the maximum wiring length of the I/O cable is 3 m.
- The longer the I/O cable is, the lower the maximum transmission frequency will be.

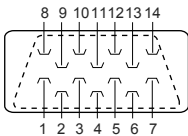
■ Connection Diagram for Standard I/O Cable

If a user-prepared I/O cable is used for relaying, refer to the following connection diagram for the standard cable (JZSP-CHI003-□□ Cable with Connector) and wire the encoder cable.



Plug (14P): 10114-6000EL
Shell Kit: 10314-52A0-008 (3M)

SERVOPACK Connector (Plug)
(Viewed from soldered side)



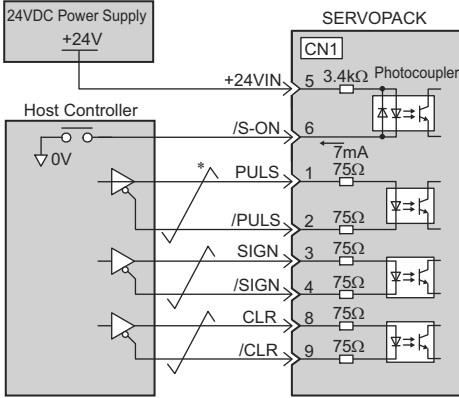
| Pin No. | I/O | Code | Signal Name | Lead Color | Dot Mark | |
|---------|--------|-------------|--------------------------------|------------|----------|-------|
| | | | | | Number | Color |
| 1 | Input | CW, PULS | Reverse pulse, Reference pulse | Orange | 1 | Black |
| 2 | Input | /CW, /PULS | | | | Red |
| 3 | Input | CCW, SIGN | Forward pulse, Reference sign | Light gray | | Black |
| 4 | Input | /CCW, /SIGN | | | | Red |
| 5 | Input | +24VIN | External input power supply | White | | Black |
| 6 | Input | /S-ON | Servo ON | | | Red |
| 7 | Output | SG-COM | Output signal ground | Yellow | | Black |
| 8 | Input | CLR | Position deviation Pulse clear | Pink | | Red |
| 9 | Input | /CLR | | | | Black |
| 10 | Output | PCO | Phase-C signal | Orange | 2 | Red |
| 11 | Output | SG-PCO | Phase-C signal ground | | | Black |
| 12 | Output | ALM | Servo alarm | | | Red |
| 13 | Output | /BK | Brake | Light gray | | Black |
| 14 | Output | /COIN | Positioning completion | | | Red |
| Shell | - | - | FG | - | | - |

Note: Pin numbers are given on the connector as well.

3.12 Connection Examples of Input Signal

Line Driver Output

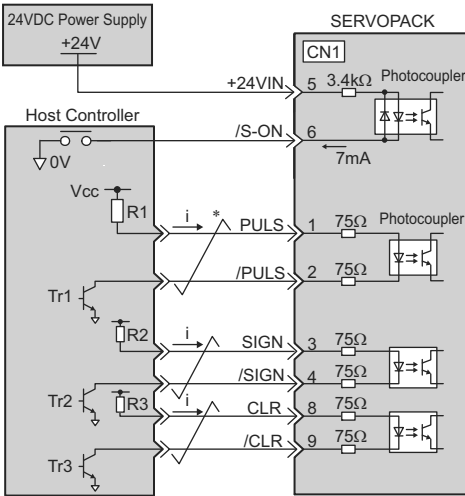
Applicable line driver: SN75174 or MC3487 (Manufactured by Texas Instruments or equivalent)



* Twisted-pair wires

Open-collector Output

Set the current limit resistors R1 through R3 so that the input current (i) will be within the following range.
Input Current (i) = 7 mA to 15 mA



* Twisted-pair wires

Examples:

- When Vcc is +24V: R1 through R3=2.2 kΩ
- When Vcc is +12V: R1 through R3=1 kΩ
- When Vcc is +5V: R1 through R3=180 Ω

Note: The following signal logic applies for an open-collector output.

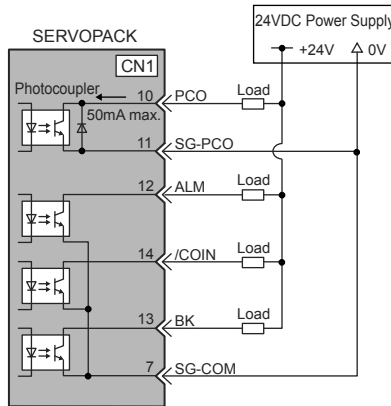
| | |
|----------------|---------------------------------|
| Tr1 to Tr3 ON | Equivalent to high level input. |
| Tr1 to Tr3 OFF | Equivalent to low level input. |

3.13 Connection Example of Output Signal

Set the load so that the output current (i) will fall within 50 mA or less.

Photocoupler output (Per output signal)

- Max. voltage: 30VDC
- Max. current: 50m ADC



NOTE

Incorrect wiring or wrong voltage application in the output circuit may cause short-circuit.

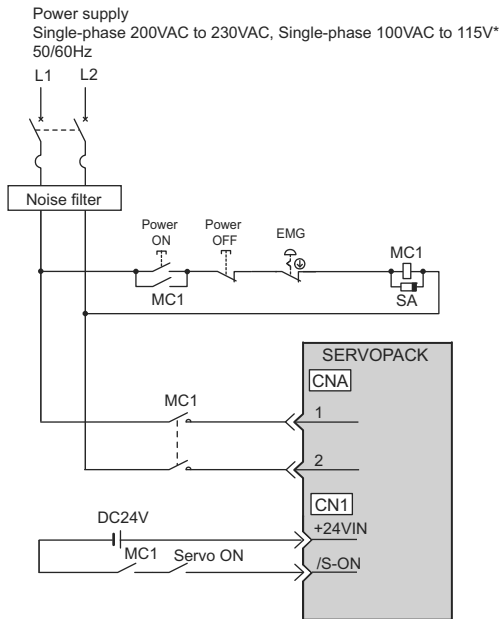
3.14 EMG Sequence

⚠ WARNING

- Make sure that the emergency-stop circuit turns OFF the Servo ON signal and the power supply of the main circuit when the EMG (emergency stop) signal turns ON.
Because of residual voltage, the servomotor rotates for a few seconds after the power supply has turned OFF. This may result in injury or damage to the equipment. Make sure that the EMG means the stop of the motor rotation.

NOTE

- Use the power ON/OFF signals or the servo ON/OFF signals only when necessary to turn the servomotor's power supply ON or OFF.
Failure to observe this caution may result in unpredictable performance of the servomotor.



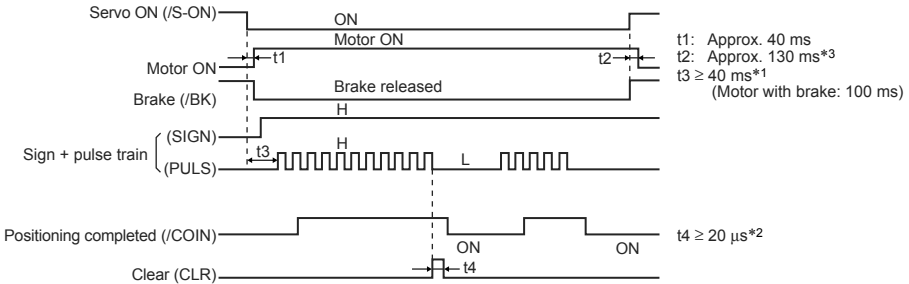
* A 100 VAC power supply can be used with a SERVOPACK version 03404 or firmware version 0004 or later.

3.15 Explanation of I/O Signals

Pulse train references are given to control the position of the servomotor. The following pulse train output forms are supported from the host controller.

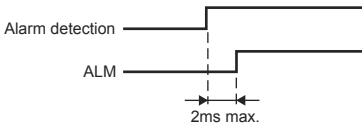
- Line driver output
- +24-V open-collector output
- +12-V open-collector output
- +5-V open-collector output

I/O Signal Timing Examples

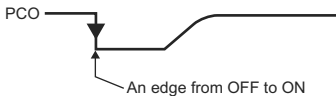


- * 1. The interval from when the servo ON signal is turned ON until the reference pulse is input must be at least 40 ms, or the reference pulse may not be received by the SERVOPACK. If a motor with a brake is in used, more time will be required to release the brake. Therefore, provide an interval of at least 100 ms.
- * 2. The error counter clear signal must be ON for at least 20 μ s. The clear signal clears the error counter of the SERVOPACK when the signal is turned from OFF to ON. If the reference pulse is stops when the clear signal is turned ON, the motor will also stop at that position.
- * 3. The lag time for the brake is 100 ms. Use a relay for brakes with an operating time of 30 ms or less.

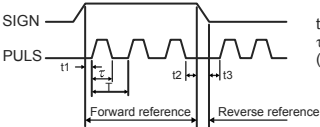
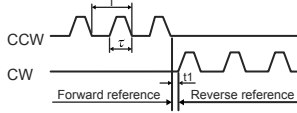
Note: 1. The maximum lag time from the time that the error or fault is detected until the time that the alarm signal is turned ON is 2 ms.



- 2. If using the phase-C output signal, use an edge exactly when the signal changes from OFF to ON. Because the wave curve is gentle, the timing to start the next sequence might vary if not specified.



Failures caused by incorrect wiring or wrong voltage application in the brake circuit may damage the equipment or cause an accident resulting in death or injury. Follow the procedures and instructions for wiring and trial operation precisely as described in this manual.

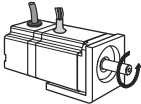
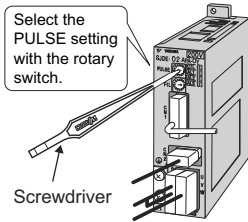
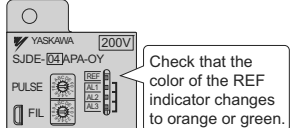
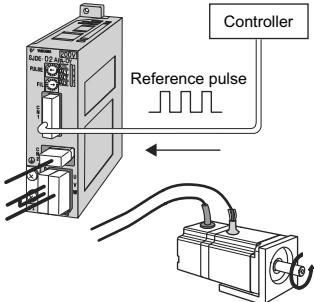
| Reference Pulse Signal Form | Electrical Specifications | Remarks |
|---|---|--|
| <p>Sign + pulse train input (SIGN + PULS signal)</p> <p>Maximum reference frequency: 750 kpps (187.5 kpps for an open-collector output)</p> |  <p>$t_1, t_2, t_3 > 3\mu\text{s}$ $\tau \geq 0.65\mu\text{s}$ $(\tau/T) \times 100 \leq 50\%$</p> | <p>Sign (SIGN): High = Forward reference Low = Reverse reference</p> |
| <p>CW pulse + CCW pulse</p> <p>Maximum reference frequency: 750 kpps (187.5 kpps for an open-collector output)</p> |  <p>$t_1 > 3\mu\text{s}$ $\tau \geq 0.65\mu\text{s}$ $(\tau/T) \times 100 \leq 50\%$</p> | <p>—</p> |

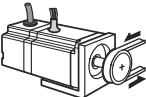
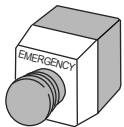
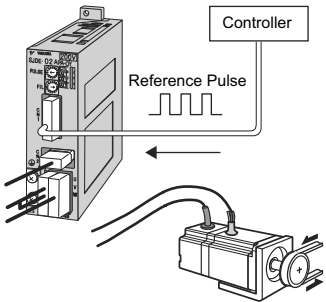
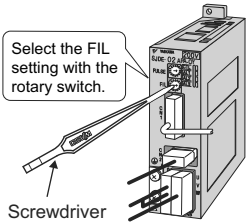
4 Trial Operation



Failures caused by incorrect wiring or wrong voltage application in the brake circuit may damage the equipment or cause an accident resulting in death or injury. Follow the procedures and instructions for wiring and trial operation precisely as described in this manual.

Use the following procedure to perform trial operation.

| Step | Details |
|---|---|
| <p>1. Installation</p>  | <ul style="list-style-type: none"> • Install the SERVOPACK and servomotor under the installation conditions. Do not connect the servomotor shaft to the machine. |
| <p>2. Wiring and PULSE Settings</p>  | <ul style="list-style-type: none"> • Wire the power supply connector, servomotor main circuit cable, encoder cable, and the I/O signal cable correctly following the procedures in 3 <i>Wiring</i>. • If a servomotor with a brake is used, connect all signal cables including those for the brake power supply and the relay. • Use the PULSE rotary switch to select the type of controller's output pulse and set the resolution of the servomotor. <p>Note: Use the screwdriver to change the setting on the rotary switch. Never use the screwdriver for any purpose other than setting the rotary switch.</p> |
| <p>3. LED Check</p>  | <ul style="list-style-type: none"> • Turn ON the power and confirm that the REF indicator is lit orange or green. If the indicator is orange, turn ON the servo ON (S-ON) input signal and check that the color of the REF indicator changes from orange to green. • If the REF indicator is not orange or green, or the indicator of the AL1, AL2 or AL3 alarm is red, refer to 6 <i>Troubleshooting</i> and clear the alarm. |
| <p>4. PULSE Reference Input 1</p>  | <ul style="list-style-type: none"> • Input the reference pulse from the controller, and then check on the number of the pulses and servomotor's rotational direction. Make sure the servomotor rotates in the correct direction while the REF indicator is blinking green. • If the servomotor does not rotate according to the reference, refer to 6 <i>Troubleshooting</i> and clear the alarm. |

| Step | Details |
|---|---|
| <p>5. Servomotor Shaft Coupling</p>  | <ul style="list-style-type: none"> Set the servomotor to servo OFF (servomotor OFF) status to turn OFF the power. Couple the servomotor shaft to the machine under the conditions outlined in the servomotor instructions. |
| <p>6. Protective Functions</p>  | <ul style="list-style-type: none"> Turn ON the power, activate the servo ON (S-ON) input signal. The machine may momentarily make a sound after the servo is turned ON. This is due to the setting of the automatic filter in the servo and is not an error. Check that all the protective functions, such as the emergency stop and holding brake functions are working correctly. |
| <p>7. PULSE Reference Input 2</p>  | <ul style="list-style-type: none"> Input the reference pulse from the controller, and then check that the machine is running in the correct direction and at the correct rate designed by the settings. The machine may momentarily make a sound after the machine moves. This is due to the setting of the automatic filter in the servo and is not an error. |
| <p>8. Filter Settings</p>  | <ul style="list-style-type: none"> If the machine vibrates or if the positioning completed signal (/COIN) repeatedly turns ON and OFF after the servomotor stops, turn the FIL rotary switch from 0 to 1, and then to 0 again. If the machine still vibrates, gradually increase the setting on the FIL rotary switch from 0 to 7 until the optimum setting is reached. <p>Note: Use the screwdriver to change the setting on the rotary switch. Never use the screwdriver for any purpose other than setting the rotary switch.</p> |

5 Additional Functions When Digital Operator or JunmaWin is Used

CAUTION

- Never run the SERVOPACK with a digital operator or JunmaWin connected.
Use a digital operator or JunmaWin only during:
 - Setup, such as when the gear ratio is changed, and
 - Maintenance, such as when the Monitor function is used to confirm the status.

5.1 Requirements

The following devices must be connected to the SERVOPACK to use the functions described in this chapter.

- A digital operator or personal computer running JunmaWin
- A communication unit (Model: JUSP-JC001-1)

For the operations of a digital operator, refer to *Σ-V Series USER'S MANUAL Operation of Digital Operator* (Manual No.: SIEP S800000 55).

5.2 List of Available Functions and Applicable SERVOPACKs





| Items | | SERVOPACK Version | | |
|------------------------------|---|-------------------------------|--------------------------------------|---------------------------------------|
| | | Version4 | Version3 | Version2* |
| Applicable SERVOPACK version | | 03404 | 03303 | 03202 |
| Applicable firmware version | | 0004 | 0003 | 0002 |
| Applicable JunmaWin version | | JunmaWin Ver.1.20 or later | JunmaWin for SJDEP-OY Ver.1.00 | cannot be connected to JunmaWin |
| Functions | Servomotor rotation direction setting | Applicable | Not applicable | Not applicable |
| | Electronic gear ratio setting | Applicable | Applicable | Not applicable |
| | Positioning completed signal setting | Applicable | Not applicable | Not applicable |
| | Internal torque limit setting | Applicable | Not applicable | Not applicable |
| | Filter setting using parameters | Applicable | Not applicable | Not applicable |
| | Utility functions (alarm history display, clearing alarm history, JOG operation, origin search, software version display) | Applicable | Not applicable | Not applicable |
| | Alarm display | Applicable | Not applicable | Not applicable |
| Monitor | Applicable | Applicable | Not applicable | |

* The digital operator cannot be connected to a Version 2 SERVOPACK (SERVOPACK: version 03202, firmware: version 0002).

5.3 Servomotor Rotation Direction

The servomotor rotation direction can be reversed with parameter Pn000.0 without changing the polarity of the position reference.

The standard setting for forward rotation is counterclockwise (CCW) as viewed from the load end of the servomotor.

| Parameter | | Forward/ Reverse Reference | Direction of Motor Rotation |
|--------------|--|----------------------------------|---|
| Pn000 | n.□□□0 The forward rotation is CCW. [Factory setting] | Forward Reference |  Forward (CCW) |
| | | Reverse Reference |  Reverse (CW) |
| | n.□□□1 The forward rotation is CW. (reverse rotation mode) | Forward Reference |  Reverse (CW) |
| | | Reverse Reference |  Forward (CCW) |

5.3 Servomotor Rotation Direction

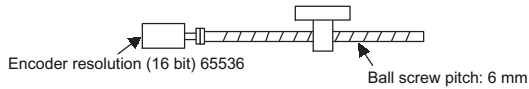
■ Related Parameter

| Parameter No. | Name | Setting Range | Units | Factory Setting | When Enabled | | | | | | | | | | | |
|----------------------------------|--|---------------|-------|-----------------|---------------|----------------------------------|--|---|---------------------------|---|---|---------------------------|--|---------------------------|--|---------------------------|
| Pn000 | Basic Function Select Switch 0 | 0010 to 0011 | – | 0010 | After restart | | | | | | | | | | | |
| | <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Direction Selection (rotational)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>CCW for forward rotation.</td> </tr> <tr> <td style="text-align: center;">1</td> <td>CW for reverse rotation. (reverse rotation mode)</td> </tr> </tbody> </table> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td colspan="2">Reserved (Do not change.)</td> </tr> <tr> <td colspan="2">Reserved (Do not change.)</td> </tr> <tr> <td colspan="2">Reserved (Do not change.)</td> </tr> </table> | | | | | Direction Selection (rotational) | | 0 | CCW for forward rotation. | 1 | CW for reverse rotation. (reverse rotation mode) | Reserved (Do not change.) | | Reserved (Do not change.) | | Reserved (Do not change.) |
| Direction Selection (rotational) | | | | | | | | | | | | | | | | |
| 0 | CCW for forward rotation. | | | | | | | | | | | | | | | |
| 1 | CW for reverse rotation. (reverse rotation mode) | | | | | | | | | | | | | | | |
| Reserved (Do not change.) | | | | | | | | | | | | | | | | |
| Reserved (Do not change.) | | | | | | | | | | | | | | | | |
| Reserved (Do not change.) | | | | | | | | | | | | | | | | |

5.4 Electronic Gear

The electronic gear enables the workpiece travel distance per reference pulse input from the host controller. The minimum unit of the position data moving a load is called a reference unit.

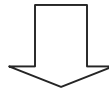
The section indicates the difference between using and not using an electronic gear when a workpiece is moved 10 mm in the following configuration.



When the Electronic Gear is Not Used:

- ① Calculate the revolutions.
1 revolution is 6 mm. Therefore, $10 \div 6 = 1.6666$ revolutions.
- ② Calculate the required reference pulses.
65536 pulses is 1 revolution. Therefore, $1.6666 \times 65536 = 109222$ pulses.
- ③ Input 109222 pulses as reference pulses.

Reference pulses must be calculated per reference. → complicated



When the Electronic Gear is Used:

The reference unit is $1\mu\text{m}$. Therefore, to move the workpiece 10 mm ($10000\mu\text{m}$),
1 pulse = $1\mu\text{m}$, so $10000 \div 1 = 10000$ pulses.
Input 10000 pulses as reference pulses.

Calculation of reference pulses per reference is not required. → simplified

■ Electronic Gear Ratio

Set the electronic gear ratio using Pn20E and Pn210.

| Pn20E | Electronic Gear Ratio (Numerator) | | | |
|-------|-------------------------------------|--------------|-----------------|---------------|
| | Setting Range | Setting Unit | Factory Setting | When Enabled |
| | 1 to 1073741824 | 1 | 4 | After restart |
| Pn210 | Electronic Gear Ratio (Denominator) | | | |
| | Setting Range | Setting Unit | Factory Setting | When Enabled |
| | 1 to 1073741824 | 1 | 1 | After restart |

If the gear ratio of the servomotor and the load shaft is given as m/n where m is the rotation of the servomotor and n is the rotation of the load shaft,

$$\text{Electronic gear ratio: } \frac{B}{A} = \frac{\text{Pn20E}}{\text{Pn210}} = \frac{\text{Encoder resolution}}{\text{Travel distance per load shaft revolution (reference units)}} \times \frac{m}{n}$$

■ Encoder Resolution

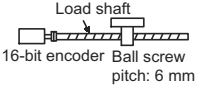

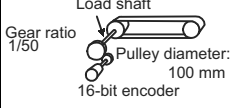
Encoder resolution is 65536.

NOTE

Electronic gear ratio setting range: $0.01 \leq \text{Electronic gear ratio (B/A)} \leq 100$
 If the electronic gear ratio is outside this range, a parameter setting error 1 (A.040) will be output.

■ Electronic Gear Ratio Setting Examples

The following examples show electronic gear ratio settings for different load configurations.

| Step | Operation | Load Configuration | | |
|------|---|--|---|--|
| | | Ball Screw | Disc Table | Belt and Pulley |
| | | Reference unit: 0.001 mm Load shaft  16-bit encoder Ball screw pitch: 6 mm | Reference unit: 0.01° Gear ratio: 1/10  Load shaft 16-bit encoder | Reference unit: 0.005 mm Load shaft Gear ratio: 1/50  16-bit encoder Pulley diameter: 100 mm |
| 1 | Check machine specifications. | <ul style="list-style-type: none"> Ball screw pitch: 6 mm Gear ratio: 1/1 | Rotation angle per revolution: 360° Gear ratio: 1/10 | Pulley diameter: 100 mm (pulley circumference: 314 mm) <ul style="list-style-type: none"> Gear ratio: 1/50 |
| 2 | Check the encoder resolution. | 65536 (16-bit) | 65536 (16-bit) | 65536 (16-bit) |
| 3 | Determine the reference unit used. | Reference unit: 0.001 mm (1 μm) | Reference unit: 0.01° | Reference unit: 0.005 mm (5 μm) |
| 4 | Calculate the travel distance per load shaft revolution. (Reference unit) | 6 mm/0.001 mm=6000 | 360°/0.01°=36000 | 314 mm/0.005 mm =62800 |
| 5 | Calculate the electronic gear ratio. | $\frac{B}{A} = \frac{65536}{6000} \times \frac{1}{1}$ | $\frac{B}{A} = \frac{65536}{36000} \times \frac{10}{1}$ | $\frac{B}{A} = \frac{65536}{62800} \times \frac{50}{1}$ |
| 6 | Set parameters. | Pn20E: 65536 | Pn20E: 655360 | Pn20E: 3276800 |
| | | Pn210: 6000 | Pn210: 36000 | Pn210: 62800 |

5.5 Positioning Completed Signal

■ Related Parameter

| Parameter No. | Name | Setting Range | Units | Factory Setting | When Enabled | |
|----------------------------|--|---|-------|-----------------|---------------|--|
| Pn21B | Electronic Gear Function Select Switch | 0000 to 0001 | – | 0000 | After restart | |
| | | | | | | |
| | Electronic Gear Ratio Selection | | | | | |
| | 0 | Reference pulse resolution that is in accordance with the setting of the rotary switch for the reference pulse setting (PULSE). | | | | |
| | 1 | Reference pulse resolution that is in accordance with the electronic gear ratio (Pn20E/Pn210).* | | | | |
| | Reserved. (Do not change.) | | | | | |
| Reserved. (Do not change.) | | | | | | |
| Reserved. (Do not change.) | | | | | | |

* This parameter is only used to set the reference pulse resolution. Use the rotary switch for the reference pulse setting (PULSE) to set the type of reference pulse. For details, refer to ■ *Reference Pulse Setting (PULSE)* under 1.5 Part Names and Functions.

5.5 Positioning Completed Signal

This signal indicates that servomotor movement has been completed during position control.

When the difference between the number of reference pulses output by the host controller and the travel distance of the servomotor (position error) drops below the set value in the parameter, the positioning completion signal will be output.

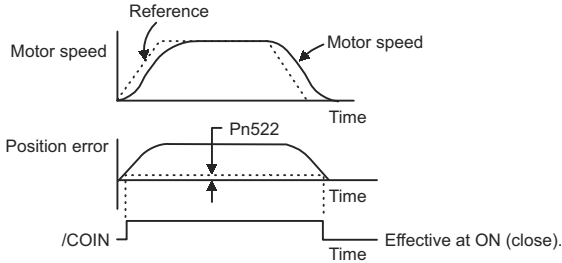
Use this signal to check the completion of positioning from the host controller.

| Type | Signal Name | Connector Pin Number | Setting | Meaning |
|--------|-------------|----------------------|------------|---------------------------------|
| Output | /COIN | CN1-14 | ON (close) | Positioning has been completed. |
| | | | OFF (open) | Positioning is not completed. |

■ Related Parameter

| Pn522 | Positioning Completed Width | | | |
|-------|-----------------------------|------------------|-----------------|--------------|
| | Setting Range | Setting Unit | Factory Setting | When Enabled |
| | 0 to 1073741824 | 1 reference unit | 10 | Immediately |

The positioning completed width setting has no effect on final positioning accuracy.



Note: If the parameter is set to a value that is too large, a positioning completed signal might be output if the position error is low during a low speed operation. This will cause the positioning completed signal to be output continuously. If this signal is output unexpectedly, reduce the set value until it is no longer output.

5.6 Internal Torque Limit

This function always limits maximum output torque by setting values of following parameters.

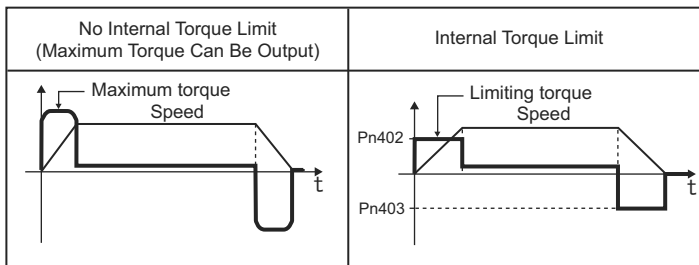
■ Related Parameters

| | | | | |
|--------------|----------------------|--------------|-----------------|--------------|
| Pn402 | Forward Torque Limit | | | |
| | Setting Range | Setting Unit | Factory Setting | When Enabled |
| | 0 to 800 | 1% | 800 | Immediately |
| Pn403 | Reverse Torque Limit | | | |
| | Setting Range | Setting Unit | Factory Setting | When Enabled |
| | 0 to 800 | 1% | 800 | Immediately |

The setting unit is a percentage of the rated torque.

- Note:
1. The maximum torque of the servomotor is used when the set value exceeds the maximum torque.
 2. If the settings of Pn402 and Pn403 are too low, the torque may be insufficient for acceleration or deceleration of the servomotor.

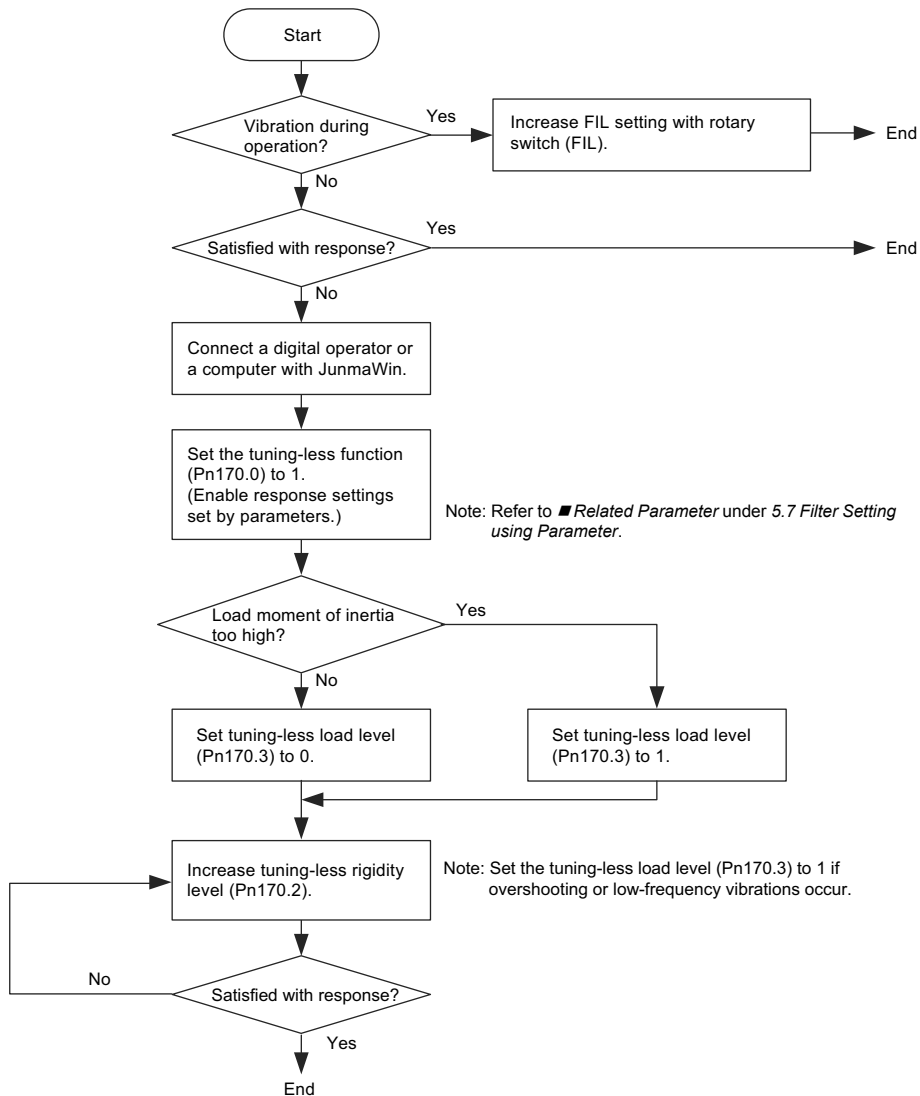
Torque waveform



5.7 Filter Setting using Parameter

If the machine vibrates or overshooting occurs, use the Pn170 parameter. Response can be improved by changing the parameter setting to select a filter.

■ Filter Setting Procedure



5.7 Filter Setting using Parameter

■ Related Parameter

| Parameter No. | Name | Setting Range | Units | Factory Setting | When Enabled | |
|-------------------------------|--|---|---|--|---------------------|---------------------|
| Pn170 | Tuning-less Function Related Switch | 0000 to 1F01 | – | 0700 | – | |
| | <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>4th digit</p> <p>n. <input type="checkbox"/></p> </div> <div style="text-align: center;"> <p>3rd digit</p> <p><input type="checkbox"/></p> </div> <div style="text-align: center;"> <p>2nd digit</p> <p><input type="checkbox"/></p> </div> <div style="text-align: center;"> <p>1st digit</p> <p><input type="checkbox"/></p> </div> </div> | | | | | |
| | Tuning-less Function Selection | | | | | When Enabled |
| | 0 | Uses the setting of the reference filter setting rotary switch (FIL). | | | | After restart |
| | 1 | Uses the settings in Pn170.2 and Pn170.3. | | | | |
| | Reserved (Do not change.) | | | | | |
| | Tuning-less Rigidity Level | | | | | |
| | | Acceleration/Deceleration Time for step Reference | Approx. Time between Completing Reference and Completing Positioning (Setting Time) | Description | When Enabled | |
| | 0 | 170 ms | 500 to 1000 ms | <div style="display: flex; align-items: center;"> <div style="flex: 1; border-left: 1px solid black; border-right: 1px solid black; margin: 0 5px;"> ↑ </div> <div style="flex: 1; text-align: center;"> <p>Large filter time constant (little vibration with a long positioning time)</p> </div> </div> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="flex: 1; border-left: 1px solid black; border-right: 1px solid black; margin: 0 5px;"> ↓ </div> <div style="flex: 1; text-align: center;"> <p>Small filter time constant (short positioning time)</p> </div> </div> | Immediately | |
| | 1 | 85 ms | 250 to 500 ms | | | |
| | 2 | 80 ms | 200 to 400 ms | | | |
| | 3 | 70 ms | 170 to 340 ms | | | |
| | 4 | 65 ms | 150 to 300 ms | | | |
| | 5 | 60 ms | 130 to 260 ms | | | |
| | 6 | 50 ms | 110 to 220 ms | | | |
| | 7 | 45 ms | 100 to 200 ms | | | |
| | 8 | 40 ms | 90 to 180 ms | | | |
| | 9 | 36 ms | 80 to 160 ms | | | |
| | A | 33 ms | 75 to 145 ms | | | |
| | B | 30 ms | 70 to 135 ms | | | |
| C | 28 ms | 65 to 125 ms | | | | |
| D | 26 ms | 60 to 115 ms | | | | |
| E | 24 ms | 55 to 110 ms | | | | |
| F | 22 ms | 50 to 100 ms | | | | |
| Tuning-less Load Level | | | | | When Enabled | |
| 0 | Small load level | | | | Immediately | |
| 1 | Large load level | | | | | |

5.8 Utility Functions

■ Utility Function List

| Fn No. | Function | Remarks |
|--------|--------------------------|-----------------------|
| Fn000 | Alarm History Display | – |
| Fn002 | JOG Operation | – |
| Fn003 | Origin Search | – |
| Fn006 | Clearing Alarm History | – |
| Fn010 | Write Prohibited Setting | Cannot to be changed. |
| Fn012 | Software Version Display | – |

■ Alarm History Display (Fn000)

This function displays the last ten alarms that have occurred in the SERVOPACK.
The latest ten alarm numbers and time stamps* can be checked.

* Time Stamps

A function that measures the ON times of the control power supply and main circuit power supply in 100-ms units and displays the total operating time when an alarm occurs. The time stamp operates around the clock for approximately 13 years.

<Example of Time Stamps>

If 36000 is displayed,

$3600000 \text{ [ms]} = 3600 \text{ [s]} = 60 \text{ [min]} = 1 \text{ [h]}$

Therefore, the total number of operating hours is 1 hour.

















Preparation

There are no tasks that must be performed before displaying the alarm history.

5.8 Utility Functions

Operating Procedure

Use the following procedure.

| Step | Display after Operation | Keys | Operation |
|------|---|--|---|
| 1 | <pre> BB - FUNCTION - Fn012 Fn000 Fn002 Fn003 </pre> |    | Press the  Key to open the Utility Function Mode main menu, and select Fn000 using the  or  Key. |
| 2 | <pre> BB - ALARM - 0: D00 0001207196 1: 720 0000032651 2: 511 0000009043 3: --- </pre> |  | Press the  Key. The display is switched to the display of Fn000 (alarm history display). |
| 3 | <pre> BB - ALARM - 1: 720 0000032651 2: 511 0000009043 3: --- 4: --- </pre> <p>  or  </p> <p> Time stamps Alarm Number Alarm Sequence Number The higher the number, the older the alarm data. </p> |  or  | Press the  or  Key to scroll the alarm history display. |
| 4 | <pre> BB - FUNCTION - Fn012 Fn000 Fn002 Fn003 </pre> |  | Press the  Key. The display returns to the Utility Function Mode main menu. |

Note: 1. If the same alarm occurs after more than one hour, the alarm will be saved. If it occurs in less than one hour, it will not be saved.

2. The display "□.---" means no alarm occurs.

3. Delete the alarm history using the parameter Fn006. The alarm history is not cleared on alarm reset or when the SERVOPACK main circuit power is turned OFF.

4. CPF00 and CPF01 are the alarms related to digital operator, and not recorded in Alarm Data.

5. Warnings are not recorded in Alarm Data.

■ JOG Operation (Fn002)

JOG operation is used to check the operation of the servomotor under speed control without connecting the SERVO-PACK to the host controller.

Preparation

The following conditions must be met to perform a jog operation.









- All alarms must be cleared.
- The servo ON signal (/S-ON) must be OFF.
- The JOG speed must be set considering the operating range of the machine.

Set the jog speed in Pn304.





















| | | | | |
|--------------|------------------------------|---------------------|-----------------|--------------|
| Pn304 | Jog Speed | | | |
| | Setting Range | Setting Unit | Factory Setting | When Enabled |
| | 0 to 10000 | 1 min ⁻¹ | 500 | Immediately |
| Pn305 | Soft Start Acceleration Time | | | |
| | Setting Range | Setting Unit | Factory Setting | When Enabled |
| | 0 to 10000 | 1 ms | 100 | Immediately |
| Pn306 | Soft Start Deceleration Time | | | |
| | Setting Range | Setting Unit | Factory Setting | When Enabled |
| | 0 to 10000 | 1 ms | 100 | Immediately |



Operating Procedure

Use the following procedure. The following operation example shows when the servomotor rotates at the JOG speed 1000 min⁻¹. The factory setting of JOG speed is 500 min⁻¹.

| Step | Display after Operation | Keys | Operation |
|------|--|--|---|
| 1 | <pre> BB - FUNCTION - Fn 0 0 0 <u>Fn 0 0 2</u> Fn 0 0 3 Fn 0 0 6 </pre> |    | Press the  Key to open the Utility Function Mode main menu, and select Fn002 using the  or  Key. |
| 2 | <pre> BB - JOG - P n 3 0 4 = 0 0 5 0 0 U n 0 0 0 = 0 0 0 0 0 U n 0 0 2 = 0 0 0 0 0 U n 0 0 D = 0 0 0 0 0 0 0 0 0 </pre> |  | Press the  Key. The display is switched to the execution display of Fn002 (JOG mode operation). |

5.8 Utility Functions

| Step | Display after Operation | Keys | Operation |
|------|--|--|---|
| 3 | <pre> BB - JOG - P n 3 0 4 = 0 0 5 0 0 U n 0 0 0 = 0 0 0 0 0 U n 0 0 2 = 0 0 0 0 0 U n 0 0 D = 0 0 0 0 0 0 0 0 0 0 </pre> |  | <p>Press the  Key.</p> <p>The cursor moves to the setting side (the right side) of Pn304 (JOG mode operation).</p> |
| 4 | <pre> BB - JOG - P n 3 0 4 = 0 1 0 0 0 U n 0 0 0 = 0 0 0 0 0 U n 0 0 2 = 0 0 0 0 0 U n 0 0 D = 0 0 0 0 0 0 0 0 0 0 </pre> |     | <p>Press the  or  Key and the  or  Key to set the JOG speed to 1000 min⁻¹.</p> |
| 5 | <pre> BB - JOG - P n 3 0 4 = 0 1 0 0 0 U n 0 0 0 = 0 0 0 0 0 U n 0 0 2 = 0 0 0 0 0 U n 0 0 D = 0 0 0 0 0 0 0 0 0 0 </pre> |  | <p>Press the  Key.</p> <p>The setting value is entered, and the cursor moves to the parameter number side (the left side).</p> |
| 6 | <pre> RUN - JOG - P n 3 0 4 = 0 1 0 0 0 U n 0 0 0 = 0 0 0 0 0 U n 0 0 2 = 0 0 0 0 0 U n 0 0 D = 0 0 0 0 0 0 0 0 0 0 </pre> |  | <p>Press the  Key.</p> <p>“RUN” is displayed in the status display, and the servo turns ON.</p> |
| 7 | <pre> RUN - JOG - P n 3 0 4 = 0 1 0 0 0 U n 0 0 0 = 0 0 0 0 0 U n 0 0 2 = 0 0 0 0 0 U n 0 0 D = 0 0 0 0 0 0 0 0 0 0 </pre> |   | <p>Press the  Key to rotate the servomotor at the speed 1000 min⁻¹ in forward direction.</p> <p>Press the  Key to rotate the servomotor at the speed 1000 min⁻¹ in reverse direction.</p> |
| 8 | <pre> BB - JOG - P n 3 0 4 = 0 1 0 0 0 U n 0 0 0 = 0 0 0 0 0 U n 0 0 2 = 0 0 0 0 0 U n 0 0 D = 0 0 0 0 0 0 0 0 0 0 </pre> |  | <p>After having confirmed the correct motion of servomotor, press the  Key.</p> <p>“BB” is displayed in the status display, and the servo turns OFF.</p> |

| Step | Display after Operation | Keys | Operation |
|------|--|---|---|
| 9 | <div style="border: 1px solid black; padding: 5px; width: fit-content;"> B B - F U N C T I O N - F n 0 0 0 F n 0 0 2 F n 0 0 3 F n 0 0 6 </div> |  | Press the  Key. The display returns to the Utility Function Mode main menu. |
| 10 | | | After JOG operation, turn OFF the power to the SERVOPACK and then turn ON again. |

■ Origin Search (Fn003)

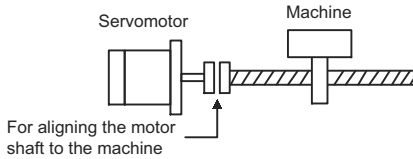
The origin search is designed to position the origin pulse position of the incremental encoder (phase C) and to clamp at the position.

⚠ CAUTION

- Perform origin searches without connecting the coupling.

This function is used when the motor shaft needs to be aligned to the machine.

Motor speed at the time of execution: 60 min⁻¹











Preparation










The following conditions must be met to perform the origin search.

- All alarms must be cleared.
- The servo ON signal (/S-ON) must be OFF.

Operation Procedure

Use the following procedure. The following operation example shows when the servomotor rotates counterclockwise until the servomotor stops at the detected phase-C position.

| Step | Display after Operation | Keys | Operation |
|------|--|--|--|
| 1 | <pre> BB - FUNCTION - Fn002 <u>Fn003</u> Fn006 Fn010 </pre> |    | Press the  Key to open the Utility Function Mode main menu, and select Fn003 using the  or  Key. |
| 2 | <pre> BB - Z - Search - Un00<u>0</u> = 00000 Un002 = 00000 Un003 = 0000000774 Un00D = 0000000000 </pre> |  | Press the  Key. The display is switched to the execution display of Fn003 (Origin Search Mode). |

| Step | Display after Operation | Keys | Operation |
|------|--|--|--|
| 3 | <pre> RUN - Z - Search - Un000= 00000 Un002= 00000 Un003= 0000000774 Un00D= 0000000000 </pre> |  | <p>Press the  Key.</p> <p>"RUN" is displayed in the status display, and the servomotor becomes servo ON status.</p> <p>Note: If the servomotor is already at the zero position, "-Complete-" is displayed.</p> |
| 4 | <pre> RUN - Complete - Un000= 00000 Un002= 00000 Un003= 0000000000 Un00D= 0000001D58 </pre> |  or  | <p>Press the  Key to rotate the servomotor in forward direction. And then stops at the phase-C position.</p> <p>Note: 1. Keep pressing the key until the servomotor stops. 2. When the origin search completed normally, "-Complete-" is displayed on the right top on the screen.</p> |
| 5 | <pre> BB - Z - Search - Un000= 00000 Un002= 00000 Un003= 0000000000 Un00D= 0000001D58 </pre> |  | <p>When the origin search is completed, press the  Key.</p> <p>"BB" is displayed in the status display, and the servomotor becomes servo OFF status. The display "-Complete-" changes to "-Z-Search-".</p> |
| 6 | <pre> BB - FUNCTION - Fn002 Fn003 Fn006 Fn010 </pre> |  | <p>Press the  Key.</p> <p>The display returns to the Utility Function Mode main menu.</p> |
| 7 | | | <p>After origin search operation, turn OFF the power to the SERVOPACK and then turn ON again.</p> |

■ Clearing Alarm History (Fn006)

The clear alarm history function deletes all of the alarm history recorded in the SERVOPACK.













Note: The alarm history is not deleted when the alarm reset is executed or the main circuit power supply of the SERVOPACK is turned OFF.

Preparation

There are no tasks that must be performed before clearing the alarm history.

Operating Procedure

Use the following procedure.

| Step | Display after Operation | Keys | Operation |
|------|---|--|---|
| 1 | <pre> BB - FUNCTION - Fn003 Fn006 Fn010 Fn012 </pre> |    | Press the  Key to open the Utility Function Mode main menu, and select Fn006 using the  or  Key. |
| 2 | <pre> BB Alarm History Data Clear Start : [DATA] Return: [SET] </pre> |  | Press the  Key. The display is switched to the execution display of Fn006 (Clearing Alarm History). |
| 3 | <pre> BB Alarm History Data Clear Start : [DATA] Return: [SET] </pre> |  or  | Press the  Key to clear the alarm history. During clearing, "Done" is displayed in the status display. After the clearing is completed, "BB" is displayed. Note: Press the  Key not to clear the alarm history. The display returns to the Utility Function Mode main menu. |

■ Software Version Display (Fn012)











Select Fn012 to check the SERVOPACK software version numbers.

Preparation

There are no tasks that must be performed before the execution.

Operating Procedure

Use the following procedure.

| Step | Display after Operation | Keys | Operation |
|------|--|--|---|
| 1 | <pre> BB - FUNCTION - Fn010 <u>Fn012</u> Fn000 Fn002 </pre> |    | Press the  key to open the Utility Function Mode main menu, and select Fn012 using the  or  Key. |
| 2 | <pre> BB - Soft Ver - DRIVER Ver. = 0001 </pre> |  | Press the  Key. The SERVOPACK software version number is displayed. |
| 3 | <pre> BB - FUNCTION - Fn010 <u>Fn012</u> Fn000 Fn002 </pre> |  | Press the  Key. The display returns to the Utility Function Mode main menu. |

5.9 Alarm Display

If an alarm occurs, remove the cause of the alarm, and then clear the alarm. When a digital operator is being used, press ALARM RESET Key on the digital operator to clear the alarm. When JunmaWin is being used, click RESET in the Alarm Display window to clear the alarm.

■ Alarm List

| Alarm | ALARM LED Display | Alarm Code | Alarm Name | Alarm Reset |
|--------------------------------------|---|------------|----------------------------------|-------------|
| Normal | ALM1 <input type="checkbox"/> ALM2 <input type="checkbox"/> ALM3 <input type="checkbox"/> | - | - | - |
| Speed error | ALM1 <input checked="" type="checkbox"/> ALM2 <input type="checkbox"/> ALM3 <input type="checkbox"/> | A.510 | Overspeed | Available |
| | | A.d00 | Position Error Pulse Overflow | Available |
| Overload | ALM1 <input type="checkbox"/> ALM2 <input checked="" type="checkbox"/> ALM3 <input type="checkbox"/> | A.710 | Overload: High load | Available |
| | | A.720 | Overload: Low load | Available |
| | | A.730 | Dynamic Brake Overload | Available |
| | | A.7AA | Board Overheated | Available |
| Encoder error | ALM1 <input checked="" type="checkbox"/> ALM2 <input checked="" type="checkbox"/> ALM3 <input type="checkbox"/> | A.C10 | Servo Overrun Detected | Available |
| | | A.C20 | Incorrect Phase Detection | N/A |
| | | A.C50 | Incorrect Polarity Detection | N/A |
| | | A.C90 | Encoder Signal Error | N/A |
| Voltage error | ALM1 <input type="checkbox"/> ALM2 <input type="checkbox"/> ALM3 <input checked="" type="checkbox"/> | A.400 | Overvoltage | Available |
| | | A.410 | Undervoltage | Available |
| Overcurrent | ALM1 <input checked="" type="checkbox"/> ALM2 <input type="checkbox"/> ALM3 <input checked="" type="checkbox"/> | A.100 | Overcurrent | N/A |
| SERVOPACK built-in fan stopped | ALM1 <input type="checkbox"/> ALM2 <input checked="" type="checkbox"/> ALM3 <input checked="" type="checkbox"/> | A.7Ab | SERVOPACK Built-in Fan stop | N/A |

| Alarm | ALARM LED Display | Alarm Code | Alarm Name | Alarm Reset |
|--------------|----------------------------|------------|-----------------------------|-------------|
| System error | ALM1 ■ ALM2 ■ ALM3 ■ | A.020 | Parameter Error 0 | N/A |
| | | A.021 | Parameter Error 1 | N/A |
| | | A.022 | Parameter Error 2 | N/A |
| | | A.023 | Parameter Error 3 | N/A |
| | | A.030 | Main Circuit Detector Error | N/A |
| | | A.040 | Parameter Setting Error | N/A |
| | | A.b33 | Current Detection Error | N/A |
| | | A.bF0 | System Alarm 0 | N/A |
| | | A.bF1 | System Alarm 1 | N/A |
| | | A.bF2 | System Alarm 2 | N/A |
| | | A.bF3 | System Alarm 3 | N/A |
| | | A.bF4 | System Alarm 4 | N/A |
| | | A.bFA | System Alarm A | N/A |

■ Warning List

| Warning | ALARM LED Display | Warning Code | Warning Name |
|--|---|--------------|--|
| Servo Setup • Rotary switch change • Parameter change | ALM1 ■ □ ALM2 ■ ↔ □ ALM3 ■ □ Blinks at regular intervals | A.941 | Setting changed for parameters requiring restart |
| | | A.94E | PULSE setting changed (rotary switch) |
| Note: The alarm classification LED has priority over the alarm LED for warning. Alarm LED for warning will not blink until the alarm is cleared. | | | |
| Overload | ALM1 □ ALM2 □ ALM3 □ | A.910 | Overload |

5.10 Monitor

■ Monitor List

| Un Number | Content of Display | Unit |
|-----------|---|-----------------------------|
| Un000 | Motor rotating speed | min ⁻¹ |
| Un001 | Speed reference | min ⁻¹ |
| Un002 | Internal torque reference (in percentage to the rated torque) | % |
| Un003 | Rotation angle 1 | feedback unit ^{*1} |
| Un004 | Rotation angle 2 (electric angle from polarity origin) | deg |
| Un005 | Input signal monitor ^{*2} | – |
| Un006 | Output signal monitor ^{*3} | – |
| Un007 | Input reference pulse speed | min ⁻¹ |
| Un008 | Position error amount | reference unit |
| Un009 | Accumulated load ratio (in percentage to the rated torque: effective torque in cycle of 10 s) | % |
| Un00C | Input reference pulse counter | reference unit |
| Un00D | Feedback pulse counter | feedback unit ^{*1} |

* 1. 65536 pulses/rev for SJDE-□□APA-OY SERVOPACK.

* 2. Example of a display on the input signal monitor (Un005) is shown below. The top row indicates which signals are OFF, and the bottom row which signals are ON. Signals that have not been defined are set to ON.

Un005 =

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|-------|
| ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | | | | | | |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | | digit |

| Digit Number | Input Pin Number | Signal Name |
|--------------|------------------|-------------|
| 1 | CN1-6 | /S-ON |
| 2 to 8 | – | – |

* 3. Example of a display on the output signal monitor (Un006) is shown below. The top row indicates which signals are OFF, and the bottom row which signals are ON. Signals that have not been defined are set to ON.

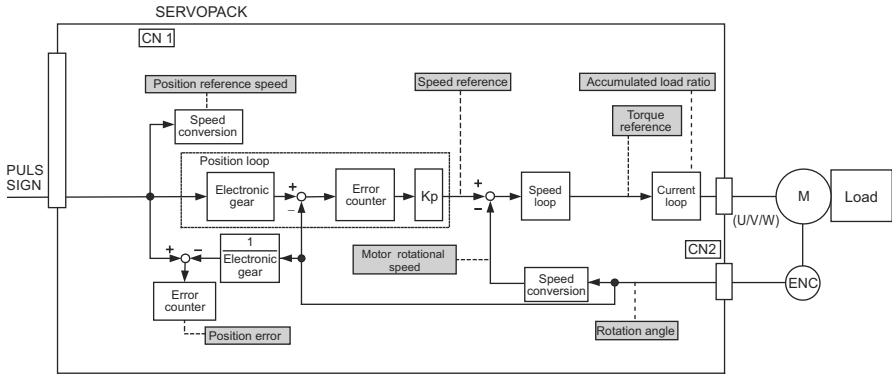
Un006 =

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|-------|
| ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| | | | | | | | | | |
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | | digit |

| Digit Number | Output Pin Number | Signal Name |
|--------------|-------------------|-------------|
| 1 | CN1-12 | ALM |
| 2 | CN1-13 | /BK |
| 3 | CN1-14 | /COIN |
| 4 to 8 | – | – |

■ Analog Output Signals that can be Monitored

The shaded parts in the following diagram indicate analog output signals that can be monitored.



5.11 Parameter List

■ Related Parameter

| Parameter No. | Name | Setting Range | Units | Factory Setting | When Enabled | |
|---------------|--|---------------|-------|----------------------------------|---|--|
| Pn000 | Basic Function Select Switch 0 | 0010 to 0011 | - | 0010 | After restart | |
| | 4th digit 3rd digit 2nd digit 1st digit n. <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | | | | | |
| | | | | Direction Selection (rotational) | | |
| | | | | 0 | CCW for forward rotation. | |
| | | | | 1 | CW for reverse rotation. (reverse rotation mode) | |
| | | | | Reserved (Do not change.) | | |
| | | | | Reserved (Do not change.) | | |
| | | | | Reserved (Do not change.) | | |

■ Related Parameter

| Parameter No. | Name | Setting Range | Units | Factory Setting | When Enabled | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|------------------------|--------------------------------|----------------------------|--------------|------------------|---|---------------|------------------|---|---|-------------|--|---|--------|----------------|---|-------------|---|-------|---------------|---|-------|---------------|---|-------|---------------|---|-------|---------------|---|-------|---------------|---|-------|---------------|---|-------|---------------|---|-------|--------------|---|-------|--------------|---|-------|--------------|---|-------|--------------|---|-------|--------------|---|-------|--------------|---|-------|--------------|---|-------|--------------|
| Pn170 | Tuning-less Function Related Switch | 0000 to 1F01 | – | 0700 | – | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 4th digit | □ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 3rd digit | □ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 2nd digit | □ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1st digit | □ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | n. □ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th colspan="2">Tuning-less Function Selection</th> <th>When Enabled</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Uses the setting of the reference filter setting rotary switch (FIL).</td> <td rowspan="2">After restart</td> </tr> <tr> <td>1</td> <td>Uses the settings in Pn170.2 and Pn170.3.</td> </tr> </tbody> </table> | | | | | Tuning-less Function Selection | | When Enabled | 0 | Uses the setting of the reference filter setting rotary switch (FIL). | After restart | 1 | Uses the settings in Pn170.2 and Pn170.3. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Tuning-less Function Selection | | When Enabled | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | Uses the setting of the reference filter setting rotary switch (FIL). | After restart | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 1 | Uses the settings in Pn170.2 and Pn170.3. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Reserved (Do not change.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th colspan="4">Tuning-less Rigidity Level</th> <th>When Enabled</th> </tr> <tr> <th></th> <th>Acceleration/Deceleration Time for step Reference</th> <th>Approx. Time between Completing Reference and Completing Positioning (Setting Time)</th> <th>Description</th> <th></th> </tr> </thead> <tbody> <tr> <td>0</td> <td>170 ms</td> <td>500 to 1000 ms</td> <td rowspan="16"> Large filter time constant (little vibration with a long positioning time) Small filter time constant (short positioning time) </td> <td rowspan="16">Immediately</td> </tr> <tr><td>1</td><td>85 ms</td><td>250 to 500 ms</td></tr> <tr><td>2</td><td>80 ms</td><td>200 to 400 ms</td></tr> <tr><td>3</td><td>70 ms</td><td>170 to 340 ms</td></tr> <tr><td>4</td><td>65 ms</td><td>150 to 300 ms</td></tr> <tr><td>5</td><td>60 ms</td><td>130 to 260 ms</td></tr> <tr><td>6</td><td>50 ms</td><td>110 to 220 ms</td></tr> <tr><td>7</td><td>45 ms</td><td>100 to 200 ms</td></tr> <tr><td>8</td><td>40 ms</td><td>90 to 180 ms</td></tr> <tr><td>9</td><td>36 ms</td><td>80 to 160 ms</td></tr> <tr><td>A</td><td>33 ms</td><td>75 to 145 ms</td></tr> <tr><td>B</td><td>30 ms</td><td>70 to 135 ms</td></tr> <tr><td>C</td><td>28 ms</td><td>65 to 125 ms</td></tr> <tr><td>D</td><td>26 ms</td><td>60 to 115 ms</td></tr> <tr><td>E</td><td>24 ms</td><td>55 to 110 ms</td></tr> <tr><td>F</td><td>22 ms</td><td>50 to 100 ms</td></tr> </tbody> </table> | | | | | | Tuning-less Rigidity Level | | | | When Enabled | | Acceleration/Deceleration Time for step Reference | Approx. Time between Completing Reference and Completing Positioning (Setting Time) | Description | | 0 | 170 ms | 500 to 1000 ms | Large filter time constant (little vibration with a long positioning time) Small filter time constant (short positioning time) | Immediately | 1 | 85 ms | 250 to 500 ms | 2 | 80 ms | 200 to 400 ms | 3 | 70 ms | 170 to 340 ms | 4 | 65 ms | 150 to 300 ms | 5 | 60 ms | 130 to 260 ms | 6 | 50 ms | 110 to 220 ms | 7 | 45 ms | 100 to 200 ms | 8 | 40 ms | 90 to 180 ms | 9 | 36 ms | 80 to 160 ms | A | 33 ms | 75 to 145 ms | B | 30 ms | 70 to 135 ms | C | 28 ms | 65 to 125 ms | D | 26 ms | 60 to 115 ms | E | 24 ms | 55 to 110 ms | F | 22 ms | 50 to 100 ms |
| | Tuning-less Rigidity Level | | | | When Enabled | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Acceleration/Deceleration Time for step Reference | Approx. Time between Completing Reference and Completing Positioning (Setting Time) | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0 | 170 ms | 500 to 1000 ms | Large filter time constant (little vibration with a long positioning time) Small filter time constant (short positioning time) | Immediately | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 85 ms | 250 to 500 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 80 ms | 200 to 400 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 70 ms | 170 to 340 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 65 ms | 150 to 300 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 60 ms | 130 to 260 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | 50 ms | 110 to 220 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | 45 ms | 100 to 200 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | 40 ms | 90 to 180 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | 36 ms | 80 to 160 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| A | 33 ms | 75 to 145 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B | 30 ms | 70 to 135 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C | 28 ms | 65 to 125 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D | 26 ms | 60 to 115 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| E | 24 ms | 55 to 110 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F | 22 ms | 50 to 100 ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1"> <thead> <tr> <th colspan="2">Tuning-less Load Level</th> <th>When Enabled</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Small load level</td> <td rowspan="2">Immediately</td> </tr> <tr> <td>1</td> <td>Large load level</td> </tr> </tbody> </table> | | | | | Tuning-less Load Level | | When Enabled | 0 | Small load level | Immediately | 1 | Large load level | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tuning-less Load Level | | When Enabled | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Small load level | Immediately | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Large load level | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

5.11 Parameter List

| Parameter No. | Name | Setting Range | Units | Factory Setting | When Enabled | | | | | | |
|----------------------------|---|---|---------------------|-----------------|---------------|---------------------------------|--|---|---|---|---|
| Pn20E | Electronic Gear Ratio (Numerator) | 1 to 1073741824 | 1 | 4 | After restart | | | | | | |
| Pn210 | Electronic Gear Ratio (Denominator) | 1 to 1073741824 | 1 | 1 | After restart | | | | | | |
| Pn21B | Electronic Gear Function Select Switch | 0000 to 0001 | – | 0000 | After restart | | | | | | |
| | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th colspan="2">Electronic Gear Ratio Selection</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Reference pulse resolution that is in accordance with the setting of the rotary switch for the reference pulse setting (PULSE).</td> </tr> <tr> <td>1</td> <td>Reference pulse resolution that is in accordance with the electronic gear ratio (Pn20E/Pn210).*</td> </tr> </tbody> </table> | | | | | Electronic Gear Ratio Selection | | 0 | Reference pulse resolution that is in accordance with the setting of the rotary switch for the reference pulse setting (PULSE). | 1 | Reference pulse resolution that is in accordance with the electronic gear ratio (Pn20E/Pn210).* |
| | Electronic Gear Ratio Selection | | | | | | | | | | |
| | 0 | Reference pulse resolution that is in accordance with the setting of the rotary switch for the reference pulse setting (PULSE). | | | | | | | | | |
| 1 | Reference pulse resolution that is in accordance with the electronic gear ratio (Pn20E/Pn210).* | | | | | | | | | | |
| Reserved. (Do not change.) | | | | | | | | | | | |
| Reserved. (Do not change.) | | | | | | | | | | | |
| Pn304 | Jog Speed | 0 to 10000 | 1 min ⁻¹ | 500 | Immediately | | | | | | |
| Pn305 | Soft Start Acceleration Time | 0 to 10000 | 1 ms | 100 | Immediately | | | | | | |
| Pn306 | Soft Start Deceleration Time | 0 to 10000 | 1 ms | 100 | Immediately | | | | | | |
| Pn402 | Forward Torque Limit | 0 to 800 | 1% | 800 | Immediately | | | | | | |
| Pn403 | Reverse Torque Limit | 0 to 800 | 1% | 800 | Immediately | | | | | | |
| Pn522 | Positioning Completed Width | 0 to 1073741824 | 1 reference unit | 10 | Immediately | | | | | | |

* This parameter is only used to set the reference pulse resolution. Use the rotary switch for the reference pulse setting (PULSE) to set the type of reference pulse. For details, refer to ■ *Reference Pulse Setting (PULSE)* under 1.5 *Part Names and Functions*.

5.12 Communication Unit

■ Wiring

For the wirings, see the following figures.

⚠ CAUTION

- Do not frequently plug or unplug the cable.

The cable can only be connected 20 times. If the cable is connected more often, contact failure of the connector will occur and communications will be disabled.
- Do not bend the cable unless necessary.

Frequent bending may cause the cable to break.
- Do not connect the PC running JunmaWin and the digital operator to the communication unit at the same time.

Only the JunmaWin or the digital operator will be enabled.
- Be sure that the cable connectors are correctly inserted.

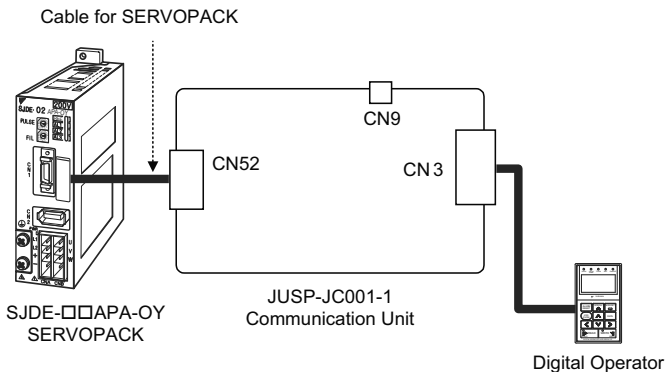
If the connectors are incorrectly or loosely connected, a communications failure will occur.
- Open the connector cover on the SERVOPACK only if necessary.

Frequent opening and closing may cause the cover to break.
- Do not pull on the cable when disconnecting it from the SERVOPACK.

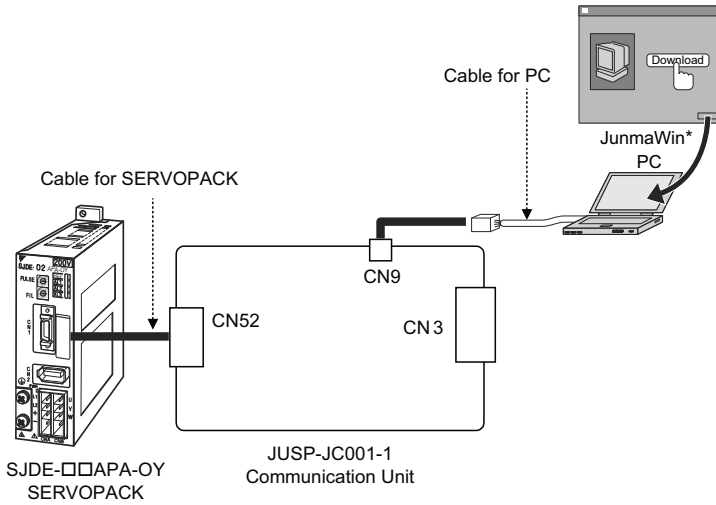
If the cable is disconnected incorrectly, it might be pulled out of the cable connector.
- Be sure that the cable connectors are correctly aligned.

If the connectors are incorrectly inserted, malfunction or damage to the connector pins may occur. To make it easy to check, a red wire is used to make pin 1 on the cable.

Connecting to Digital Operator



Connecting to PC running JunmaWin



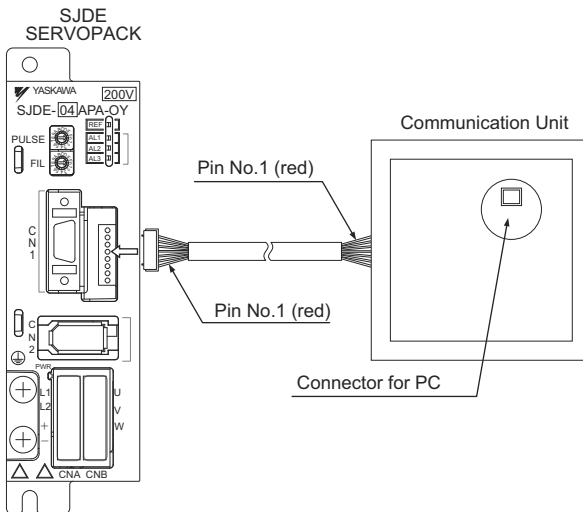
* JunmaWin software can be downloaded from <http://www.e-mechatronics.com>.

Connecting to SERVOPACK

1. Open the panel which is to the right of the CN1 connector on the SERVOPACK.
2. Connect the cable to the connector inside. When connecting the cable, make sure that pin 1 (red) is bottom.

Connecting to Communication Unit

Connect the cable, making sure that pin 1 (red) is on the top.



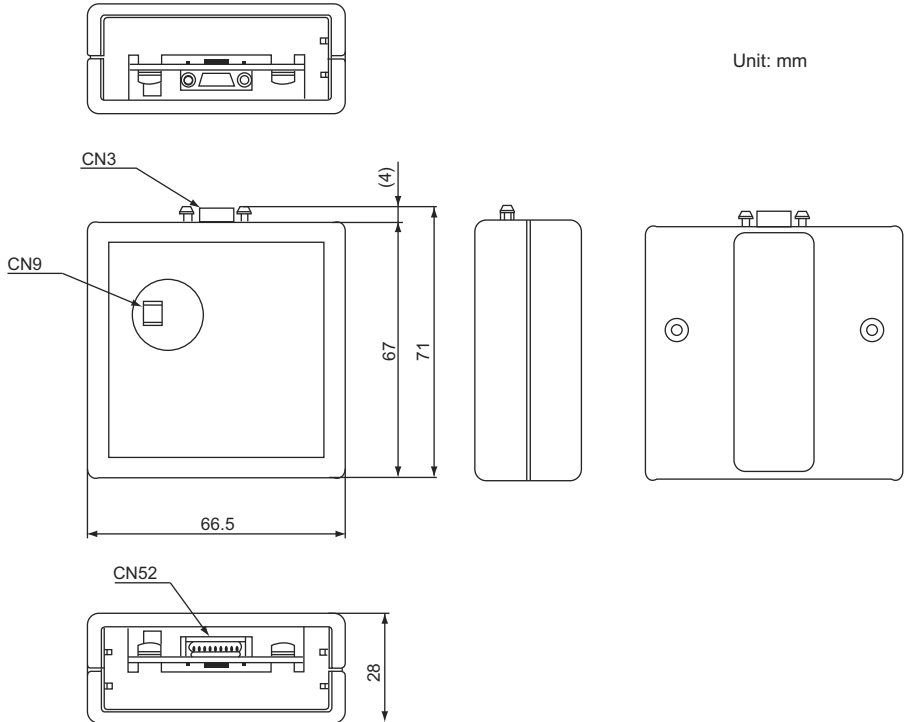
■ Operation

Never run the SERVOPACK with a digital operator or JunmaWin connected.

Use a digital operator or JunmaWin only during:

- Setup, such as when the gear ratio is changed, and
- Maintenance, such as when the Monitor function is used to confirm the status.

■ Dimensions



■ Specifications of Connector for PC (CN9)

Connector Specifications

| Item | Manufacturer | Model |
|----------------|-----------------------------|----------------------|
| Board-side | Hirose Electric Corporation | DF11-4DP-2DS(52)(4P) |
| Connector-side | Hirose Electric Corporation | DF-4DS-2C(4P) |

Connector Pin Arrangement

| Pin Number | Symbol | I/O | Function | Pin Number | Symbol | I/O | Function |
|------------|--------|-----|--------------|------------|--------|-----|----------|
| 1 | /TXD | I | Transmitting | 3 | GND | – | GND |
| 2 | /RXD | O | Receiving | 4 | GND | – | GND |

6 Troubleshooting

If the servomotor does not operate correctly due to setting failures, wiring faults, or other problems, refer to this section and take corrective actions. Contact your Yaskawa representative if the problem cannot be solved by the corrective actions described here.



When taking a corrective action, turn OFF the power, remove the cause of the alarm, and then turn ON the power again.

6.1 Alarm Indicator Lights

| Alarm Display | Alarm Name | Conditions at Alarm Occurrence | Cause | Corrective Action | |
|---|--|---|---|--|---|
| AL1 <input checked="" type="checkbox"/> AL2 <input type="checkbox"/> AL3 <input type="checkbox"/> | Speed error | Power was turned ON. | A SERVOPACK fault occurred. | Replace the SERVOPACK. | |
| | | | Servo was turned ON. | Phases U, V, and W in the servomotor are wired to the wrong terminals. | Correct the servomotor wiring. |
| | | | | The encoder wiring is incorrect. | |
| | | | Servomotor operation was started or was switched to high-speed operation. | Malfunction occurred due to noise interference in the encoder wiring. | Take measures against noise for the encoder wiring. |
| | | A SERVOPACK fault occurred. | | Replace the SERVOPACK. | |
| | | Servomotor operation was started or was switched to high-speed operation. | Phases U, V, and W in the servomotor are wired to the wrong terminals. | The encoder wiring is incorrect. | Check and correct the servomotor wiring. |
| | | | | | |
| | | | The position reference is too large. | Input the correct reference value. | |
| | | | A SERVOPACK fault occurred. | Replace the SERVOPACK. | |
| | | AL1 <input type="checkbox"/> AL2 <input checked="" type="checkbox"/> AL3 <input type="checkbox"/> | Overload | Power was turned ON. | An overload alarm was cleared excessive number of times by turning OFF the power. |
| A SERVOPACK fault occurred. | Replace the SERVOPACK. | | | | |
| Servo was turned ON. | Servomotor main circuit cable wiring is incorrect or a contact in servomotor wiring is faulty. | | | Check and correct the servomotor wiring. | |
| | Encoder cable wiring is incorrect or a contact in encoder wiring is faulty. | | | | |
| | A SERVOPACK fault occurred. | | | Replace the SERVOPACK. | |

| Alarm Display | Alarm Name | Conditions at Alarm Occurrence | Cause | Corrective Action | |
|---|-------------------|--|--|---|---|
| AL1 <input type="checkbox"/> AL2 <input checked="" type="checkbox"/> AL3 <input type="checkbox"/> | Overload | The servomotor did not rotate for a reference input from the controller. | Servomotor main circuit cable wiring is incorrect or a contact in servomotor wiring is faulty. | Check and correct the servomotor wiring. | |
| | | | Encoder cable wiring is incorrect or a contact in the cable is faulty. | | |
| | | | The starting torque exceeds the maximum torque. | Reconsider and correct the load, operating conditions, and servomotor capacity. | |
| | | | A SERVOPACK fault occurred. | Replace the SERVOPACK. | |
| | Normal operation. | | The effective torque continued over the period of the rated torque, or the starting torque greatly exceeds the rated torque. | Reconsider the load and operation conditions. | Reconsider the servomotor capacity and use a servomotor with a larger capacity. |
| | | | Drop in power supply voltage. | Make sure that the power supply voltage is within the permissible range. | |
| | | | The servomotor coil burned out. | Measure the coil resistance. If the coil burned out, replace the servomotor. | |
| | | | The servomotor was operated with the holding brake engaged. | Measure the voltage of the brake terminals and release the brake. | |
| | | | The ambient temperature around the servomotor exceeded 55 °C. | Reconsider the installation conditions so that the ambient temperature will be 55 °C or less. | |
| | | | The installation conditions of the SERVOPACK are not suitable (the SERVOPACK is influenced by the mounting direction, mounting space, or ambient objects). | | |
| | | | A SERVOPACK fault occurred. | Replace the SERVOPACK. | |
| | | | An overload alarm was cleared excessive number of times by turning OFF the power. | Reconsider and correct the load, operating conditions, and servomotor capacity. | |
| | | | The SERVOPACK is used with the 100 VAC input voltage, and the motor is trying to rotate at a speed outside the allowable range defined by the speed/torque characteristic curve. | Use the 200 VAC input voltage or input the reference correctly. | |
| | Servo OFF status. | | The servomotor did not stop three seconds after the SERVOPACK is set to servo OFF status. | Reconsider the load conditions. | Check to see if the servomotor is being rotated by an external force. |
| | | | | | |

6.1 Alarm Indicator Lights

| Alarm Display | Alarm Name | Conditions at Alarm Occurrence | Cause | Corrective Action |
|---|---------------|---|---|--|
| AL1 <input checked="" type="checkbox"/> | Encoder error | Power was turned ON or during servomotor operation. | The encoder wiring and the contact are incorrect. | Correct the encoder wiring. |
| AL2 <input checked="" type="checkbox"/> | | | Noise interference occurred due to incorrect encoder cable specifications. | Use twisted-pair or shielded twisted-pair cables with a core of at least 0.12 mm ² . |
| AL3 <input type="checkbox"/> | | | Noise interference occurred because the wiring distance for the encoder cable is too long. | The wiring distance must be 20 m maximum. |
| | | | The encoder cable is disconnected. | Replace the encoder cable. |
| | | | An zero point error occurred. | Replace the servomotor. |
| | | | An encoder fault occurred. | |
| AL1 <input type="checkbox"/> | Voltage error | Power was turned ON. | The AC power supply voltage exceeded the permissible range. | Make sure the AC power voltage is within the specified range. |
| AL2 <input type="checkbox"/> | | | The power supply was turned ON again before the power supply to the SERVOPACK was completely OFF. | Wait until the REF indicator is OFF, and turn ON the power supply again. |
| AL3 <input checked="" type="checkbox"/> | | | A SERVOPACK fault occurred. | Replace the SERVOPACK. |
| | | Normal operation. | The AC power supply voltage exceeded the permissible range. | Make sure the AC power voltage is within the specified range. |
| | | | The servomotor speed is high and load moment of inertia is excessive. | Reconsider the load and operation conditions. |
| | | | The regenerative unit is not connected or the selection of the regenerative unit is wrong. | Calculate the regenerative energy and connect a regenerative unit with sufficient processing capacity. |
| | | | A SERVOPACK fault occurred. | Replace the SERVOPACK. |

| Alarm Display | Alarm Name | Conditions at Alarm Occurrence | Cause | Corrective Action |
|-------------------------|-------------|--------------------------------|---|--|
| AL1 ■ AL2 □ AL3 ■ | Overcurrent | Power was turned ON. | Phases U, V, and W in the servomotor are wired to the wrong terminals. | Check and correct the servomotor wiring. |
| | | | The ground wire is caught on other terminals. | |
| | | | <ul style="list-style-type: none"> A short circuit occurred between ground and U, V, or W of the servomotor main circuit cable. A short circuit occurred between phase U, V, or W of the servomotor main circuit cable. | Correct the servomotor circuits or cable. Replace the servomotor. Note: Before turning ON the power supply, make sure that the circuit is correctly grounded without a short circuit. |
| | | | The Regenerative Unit is wired incorrectly. | Check and correct the wiring. |
| | | | A short circuit occurred between ground and U, V, or W of the SERVOPACK. | Replace the SERVOPACK. |
| | | | <ul style="list-style-type: none"> A short circuit occurred between ground and U, V, or W of the servomotor. A short circuit occurred between phase U, V, or W of the servomotor. | Replace the servomotor. |
| | | | The load is excessive or beyond the capacity of regeneration processing. | Reconsider and correct the load and operating conditions. |
| | | | The installation conditions of the SERVOPACK are not suitable (the SERVOPACK is influenced by the mounting direction, mounting space, or ambient heat). | Reconsider the installation conditions so that the ambient temperature will be 55 °C or less. |
| | | | The servomotor is operating in excess of the rated output. | Reduce the load. |
| | | | The built-in cooling fan of the SERVOPACK stopped operating. | Replace the cooling fan. |
| | | | The SERVOPACK and servomotor capacities do not match each other. | Refer to the catalog and select the proper combination of SERVOPACK and servomotor capacities. |
| | | | A SERVOPACK fault occurred. | Replace the SERVOPACK. |
| | | | The servomotor burned out. | Check the balance of the resistance between servomotor phases. If there is any unbalance, replace the servomotor. |

6.1 Alarm Indicator Lights

| Alarm Display | Alarm Name | Conditions at Alarm Occurrence | Cause | Corrective Action |
|--|--|--|--|--|
| AL1 <input type="checkbox"/> AL2 <input checked="" type="checkbox"/> AL3 <input checked="" type="checkbox"/> | SERVO ACK built- in fan stopped. | Power was turned ON or during servo- motor opera- tion. | The cooling fan built into the SERVOACK stopped. | Refer to <i>7 Inspections</i> and replace the cooling fan. |
| The air inlet of the cooling fan is blocked with dirt or other foreign matter. | | | Inspect the cooling fan. | |
| AL1 <input checked="" type="checkbox"/> AL2 <input checked="" type="checkbox"/> AL3 <input checked="" type="checkbox"/> | System error | Power was turned ON. | The power was turned OFF while the parameter was being set. | Execute <i>Initialize Servo</i> of the parameter edit function of JunmaWin, and set the parameter. |
| A value outside the allow- able setting range was set for the parameter. | | | Reset the value to be within the allowable setting range. | |
| The electronic gear ratio is outside the setting range. | | | Reset the value to be within the allowable range: $0.01 \leq \frac{Pn20E}{Pn210} \leq 100$ | |
| A SERVOPACK fault occurred. | | | <ul style="list-style-type: none"> Replace the SERVOPACK. Contact your Yaskawa representative. | |
| Servo was turned ON. | | A SERVOPACK fault occurred. | <ul style="list-style-type: none"> Replace the SERVOPACK. Contact your Yaskawa representative. | |
| | | The cable for the servomo- tor main circuit was discon- nected. | Reconsider the wiring of the cable for the servomotor main circuit. | |
| Normal operation | A SERVOPACK fault occurred. | <ul style="list-style-type: none"> Replace the SERVOPACK. Contact your Yaskawa representative. | | |
| AL1 <input checked="" type="checkbox"/> <input type="checkbox"/> AL2 <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> AL3 <input checked="" type="checkbox"/> <input type="checkbox"/> Flashing at regular intervals. | Refer- ence pulse set- ting rotary switch (PULSE) changed. The set- tings were changed for parame- ters that require the power to be restarted. | Power was turned ON or during servo- motor opera- tion. | - | Turn ON the power again. (The operation of the servo- motor can continue during display of this alarm.) |

6.2 Troubleshooting for Malfunctions when Alarm Indicators Are Not Lit

Troubleshooting for malfunctions that occur with the servomotor even though the alarm indicators do not light are listed below. Perform the appropriate corrective actions accordingly.

■ : Take corrective actions for the shaded items only after turning the servo system OFF.

| Problem | Cause | Inspection Items | Corrective Action |
|---|---|---|---|
| PWR indicator does not light when power is turned ON. | The wiring of the power cable is incorrect. | Check the power supply to be sure it is within the permissible voltage range. | Set the power supply input within the permissible power supply voltage range. |
| | | Check the wiring of the power supply input. | Correct the wiring. |
| | The wiring of the regenerative unit is incorrect. | Check the connection cable for the regenerative unit is correctly wired. | Replace the SERVOPACK and the regenerative unit, and correct the wiring. |
| Servomotor does not rotate for reference input from the controller. | The servo ON (/S-ON) input is OFF. | Check to see if the REF indicator is lit green. | Turn ON the servo ON signal or set the pulse type of the SERVOPACK correctly if the REF indicator is lit orange. |
| | The reference pulse settings are incorrect. | Check to see if the REF indicator is flashing. | Wire the servomotor correctly or wire the servomotor correctly to the reference pulse type of the controller if the REF indicator is not lit. |
| | | Check the reference pulse types of the controller and the SERVOPACK. | Set the pulse type of the SERVOPACK according to the reference pulse type of the controller. |
| | The wiring of the servomotor main circuit cable is incorrect. | Check the wiring. | Correct the wiring. |
| | The wiring of the encoder cable is incorrect | | |
| | The wiring of the I/O signal (connector CN1) is incorrect. | Check the wiring of the reference pulse. | Correct the wiring. |
| | | Check the reference pulse type. | Set the pulse type of the SERVOPACK according to the reference pulse type of the controller. |
| | | Check the voltage of the reference pulse. | Connect a resistor according to the voltage. |
| | The power is not turned ON. | Check the power supply and the status of PWR indicator. | Turn ON the power. |
| | | Check the voltage between the power supply terminals. | Correct the power ON circuit. |
| Both CW input and CCW input are ON simultaneously. | Check the wiring of the reference pulses. | <ul style="list-style-type: none"> • Input either the CW pulse signal or CCW pulse signal. • Be sure to turn OFF all terminals with no input signals. | |
| A SERVOPACK fault occurred. | – | Replace the SERVOPACK. | |

6.2 Troubleshooting for Malfunctions when Alarm Indicators Are Not Lit

| Problem | Cause | Inspection Items | Corrective Action |
|--|--|---|--|
| Servomotor turns for a moment and stops. | The wiring of the servomotor main circuit cable and encoder cable is incorrect. | Check the order of phases U, V, and W in the servomotor main circuit cable and the wiring of the encoder cable. | Correct the wiring. |
| Servomotor turns even without a reference. | The reference pulse input is not correct. | Check the reference pulse type. | Set the suitable reference pulse type. |
| | | Check the voltage of the reference pulse. | Connect a resistor according to the voltage. |
| | The SERVOPACK is faulty. | – | Replace the SERVOPACK. |
| The motor does not rotate at the speed specified by the reference input. | The SERVOPACK is used with the 100 VAC input voltage, and the motor is trying to rotate at a speed outside the allowable range defined by the speed/torque characteristic curve. | Check the input voltage. | Reenter the correct reference. |
| | | Check the speed/torque characteristics. | |
| | | Check the reference pulse speed. | |
| Servomotor turns in the wrong direction. | The CW and CCW inputs are connected backward. | Check the reference pulse types of the controller and the SERVOPACK. | Connect the CW pulse signal to the CW input and the CCW pulse signal to the CCW input. |
| Servomotor operation is not stable. | The servomotor main circuit cable or encoder cable is not wired correctly. | Check the wiring of the servomotor main circuit cable phases U, V, and W and the encoder cable. | Correct the wiring. |
| | Misalignment of the coupling connecting the servomotor shaft and machine, loose screws, or load torque changes resulting from pulley and gear engagement. | Check the coupling to the machine system. | Review and adjust the machine. |
| | | Operate the servomotor with no load (i.e., disconnect the servomotor from the machine). | |
| | The load moment of inertia exceeds the permissible value of the SERVOPACK. | Operate the servomotor with no load (i.e., disconnect the servomotor from the machine). | Reduce the load. |
| | The connection of the pulse signal wires is incorrect. | Check the wiring of the pulse signal wires of the host controller and SERVOPACK. | Replace the servomotor and SERVOPACK with ones with higher capacities. |
| | | Check the reference pulse types of the controller and the SERVOPACK. | |
| Motor overheated | The ambient temperature around the servomotor is too high. | Be sure that the ambient temperature around the servomotor is 40 °C or less. | Reconsider the installation conditions so that the ambient temperature will be 40 °C or less. Cool down the servomotor with a fan or cooler. |
| | The ventilation is obstructed. | Check to see if ventilation is obstructed. | Provide good ventilation. |
| | The servomotor is overloaded. | Operate the servomotor with no load (i.e., disconnect the servomotor from the machine). | Reduce the load. Replace the servomotor and SERVOPACK with ones with higher capacities. |

| Problem | Cause | Inspection Items | Corrective Action |
|--|--|--|---|
| The holding brake does not work. | The holding brake power is turned ON. | Check to see if the holding brake power is turned ON. | Design the circuit so that the holding brake is turned OFF when the holding brake needs to hold the load when the servomotor comes to a stop. |
| Servomotor does not stop operation smoothly or at all when servo is turned OFF. | The servomotor is overloaded. | Check to see if the load is excessive or the servomotor speed is too high. | Reconsider the load conditions and replace the SERVOPACK. |
| | A stop circuit fault occurred. | — | Replace the SERVOPACK. |
| Abnormal noise from Servomotor or machine vibrates, or an overshoot occurs. | Mounting not secured. | Check to see if there are any loose mounting screws. | Tighten the mounting screws. |
| | | Check to see if the coupling is misaligned. | Align the coupling. |
| | | Check to see if the coupling is unbalanced. | Balance the coupling. |
| | Defective bearings | Check for the noise and vibration around the bearings. | If there is a fault, contact your Yaskawa representative. |
| | Vibration source on the driven machine | Foreign matter, looseness, or deformation on the machine movable section. | (Contact the machine manufacturer.) |
| | Noise interference due to incorrect input signal cable specifications. | Be sure that the twisted-pair or shielded twisted-pair cable with a core of at least 0.08 mm ² is used. | Use the specified input signal cables. |
| | Noise interference because the input signal cable is longer than the applicable range. | The wiring distance must be 3 m max. | Shorten the wiring distance for input signal cable to 3 m or less. |
| | Noise interference because the encoder cable specifications are incorrect. | Check to see if a shielded twisted-pair cable with a core of at least 0.12 mm ² is being used. | Use a cable that meets the encoder cable specifications. |
| | Noise interference because the encoder cable is longer than the applicable range. | Check the length of the encoder cable. | The wiring distance must be 20 m or less. |
| | Noise is entering the encoder cable because the sheath is damaged. | Check to see if the encoder cable is damaged. | Modify the encoder cable layout so the cable is not subjected to surge. |
| Excessive noise interference on encoder cable. | Check to see if the encoder cable is bundled with high-current lines or near high-current lines. | Install a surge absorber (for lightning surge) on the encoder cable. | |
| FG potential varies due to the influence of machines such as a welder at the servomotor. | Check to see if the machine is correctly grounded properly. | Ground the machine separately from the PG's FG. | |

6.2 Troubleshooting for Malfunctions when Alarm Indicators Are Not Lit

| Problem | Cause | Inspection Items | Corrective Action |
|---|---|---|---|
| Abnormal noise from Servomotor or machine vibrates, or an overshoot occurs. | Excessive vibration and shock on the encoder. | Vibration from the machine occurred or servomotor installation is incorrect. (Mounting surface accuracy, securing, alignment, etc.) | Reduce vibration from the machine or secure the servomotor. |
| | The filter setting is improper. | Check the set value on the reference filter (FIL) rotary switch. | Increase the set value on the reference filter (FIL) rotary switch. |

7 Inspections

7.1 Regular Inspections

For inspection and maintenance of the SERVOPACK, follow the inspection procedures in the following table at least once every year. Other routine inspections are not required.

| Item | Frequency | Procedure | Comments |
|--------------|----------------------|--|-------------------------------------|
| Exterior | At least once a year | Check for dust, dirt, and oil on the surfaces. | Clean with cloth or compressed air. |
| Loose Screws | | Check for loose connector screws. | Tighten any loose screws. |

7.2 Part's Life Expectancy

The following electric or electrical parts are subject to mechanical wear or deterioration over time.

If an unusual noise or vibration occurs, refer to the life expectancy table and contact your Yaskawa representative. After examining the part in question, we will determine whether the parts should be replaced or not. When the part has expired before the expected time, further inspection will be required.

| Part | Life Expectancy | Comments |
|-------------|-----------------|--|
| Cooling Fan | 30,000 hours | Life depends on operation conditions. Check that there is no unusual noise or vibration. |

Note: 1. The life expectancy listed in the table is a reference period that may be affected by the environmental and operating conditions.

2. The recommended models of the replacement cooling fans are:

| SERVOPACK | Model | Manufacturer |
|---------------------------|--------------|---|
| SJDE-01APA-OY to 04APA-OY | JZSP-CHF08-1 | Sun-Wa Technos Co., Ltd. http://www.sunwa.co.jp/ |
| SJDE-08APA-OY | JZSP-CHF08-2 | |

7.3 Replacement of Cooling Fan

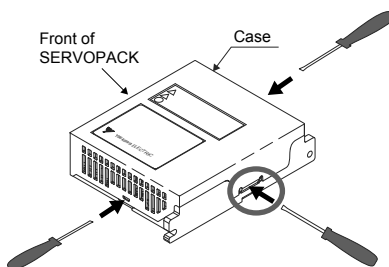
CAUTION

- Do not open the SERVOPACK case for five minutes after the LED (PWR) is turned OFF. Residual voltage may cause electric shock.
- After turning OFF the power supply, wait 15 minutes before replacing the cooling fan. Failure to observe this caution may result in burns because the cooling fan is hot.
- Mount the cooling fan in the correct way explained in *6.3 Replacement of Cooling Fan*. Mounting the cooling fan in the incorrect direction may result in the breakdown of the SERVOPACK.

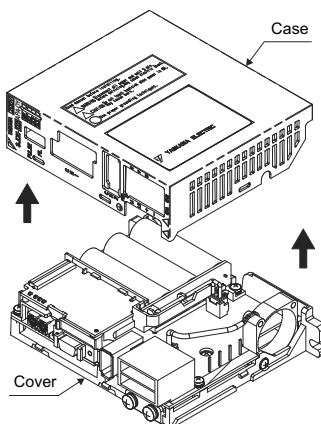
■ SJDE-01APA-OY to 04APA-OY SERVOPACKs

1. Open the case of the SERVOPACK.

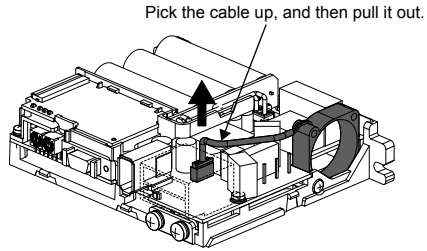
Insert the tip of a straight-edge screwdriver into the three notches on the SERVOPACK one by one and pry the case off.



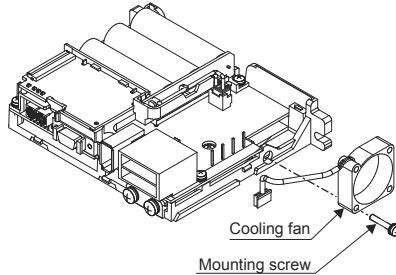
2. Lift up to remove the case.



3. Disconnect the cable of the cooling fan from the fan connector on the SERVOPACK.



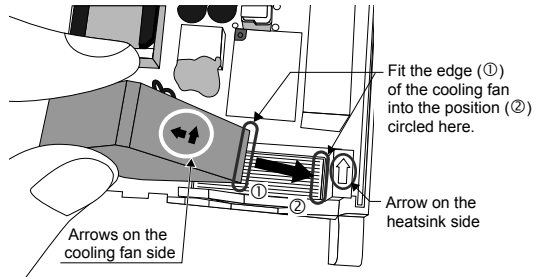
4. Unscrew the cooling fan and remove it.



5. Install the new cooling fan.
(Type: JZSP-CHF08-1)

CAUTION: Before installing the new cooling fan, make sure that the arrow on the heatsink and the arrow on the fan face the same direction as shown in the diagram.

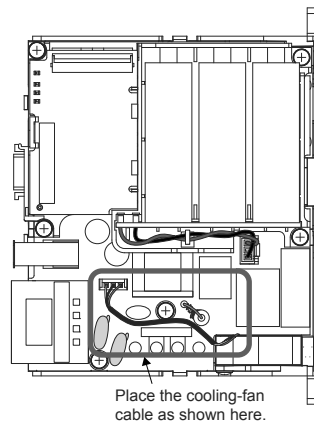
6. Secure the new cooling fan on the SERVOPACK with mounting screws.



7. Connect the cooling-fan cable to the fan connector on the SERVOPACK.

CAUTION: Make sure that the wiring layout of the cable matches that shown in the diagram.

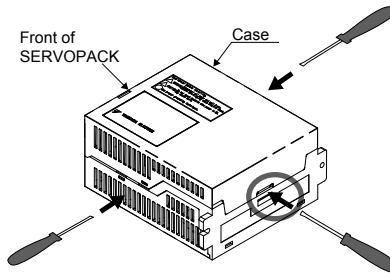
8. Reattach the case and cover to the SERVOPACK in their original positions.



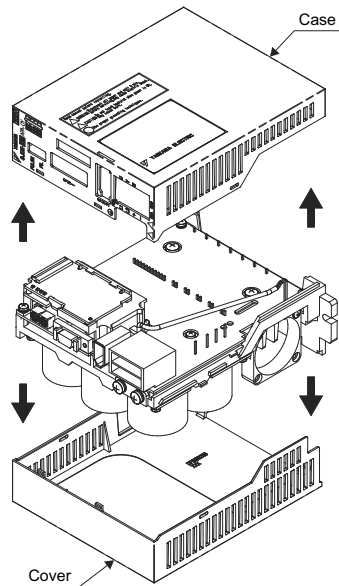
■ SJDE-08APA-OY SERVOPACKs

1. Open the case of the SERVOPACK.

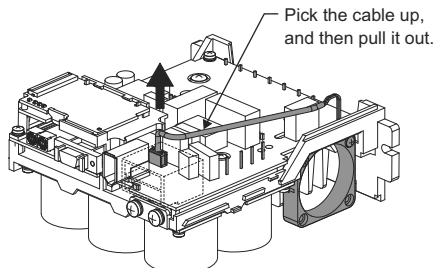
Insert the tip of a straight-edge screwdriver into the three notches on the case and the two on the cover on the SERVOPACK one by one and pry the case off.



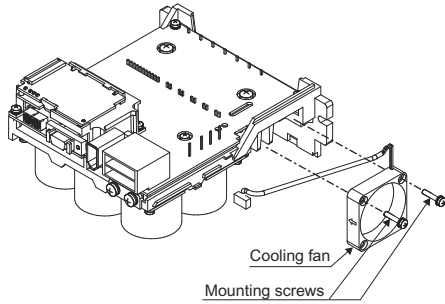
2. Pull the case and the cover off of the SERVOPACK.



3. Disconnect the cable of the cooling fan from the fan connector on the SERVOPACK.



4. Remove the two mounting screws of the cooling fan.



5. Install the new cooling fan.
Thread the cooling-fan cable through the opening (C) as shown in the diagram A.

CAUTION: Make sure that the arrow on the heatsink and the arrow on the fan face the same direction as shown in the diagram B.

Diagram A

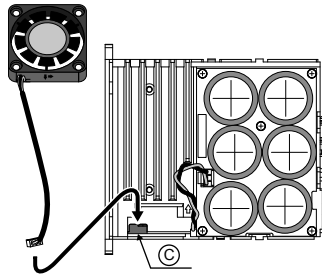
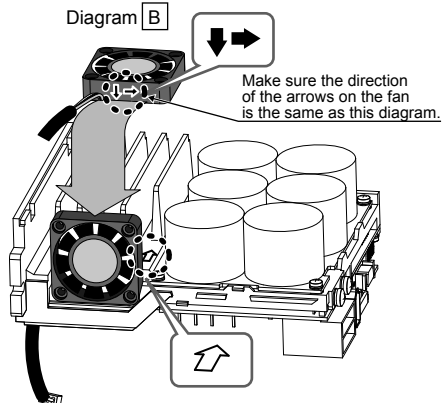


Diagram B



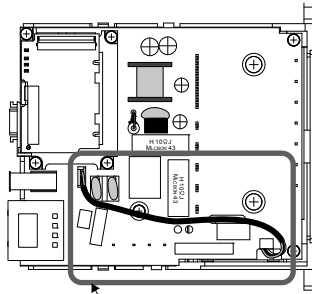
6. Secure the fan on the SERVO PACK with mounting screws.

7.3 Replacement of Cooling Fan

7. Turn the SERVOPACK over, and then connect the cooling-fan cable to the fan connector on the SERVOPACK.

CAUTION: Make sure that the wiring layout of the cable matches that shown in the diagram.

8. Reattach the case and cover to the SERVOPACK in their original positions.



Place the cooling-fan cable as shown here.

8 Specifications

8.1 Specifications

| SERVOPACK model | | SJDE- | 01APA-OY | 02APA-OY | 04APA-OY | 08APA-OY |
|--|--|--|--|--------------------|---------------------|----------|
| Max. applicable servomotor capacity [kW] | | | 0.1 | 0.2 | 0.4 | 0.75 |
| Continuous output current [Arms] | | | 0.84 | 1.1 | 2.0 | 3.7 |
| Instantaneous max. output current [Arms] | | | 2.5 | 3.3 | 6.0 | 11.1 |
| Input power supply (for main circuit and control circuit) | Voltage | 200 VAC | Single-phase 200 V to 230 VAC, +10% to -15% | | | |
| | | 100 VAC* | Single-phase 100 V to 115 VAC, +10% to -15% | | | |
| | Frequency | | 50/60Hz ± 5% | | | |
| | Capacity at rated output [kVA] | 200 VAC | 0.40 | 0.75 | 1.2 | 2.2 |
| 100 VAC* | | 0.20 | 0.38 | 0.60 | 1.1 | |
| Power loss at rated output [W] | | 200 VAC | 14 | 16 | 24 | 35 |
| | | 100 VAC* | 7 | 8 | 12 | 17.5 |
| Input control method | | Capacitor-input type, single-phase full-wave rectification with resistance to prevent inrush currents. | | | | |
| Output control method | | PWM control, sine wave power driven system | | | | |
| Feedback | | Analog output encoder | | | | |
| Allowable load inertia [kgm ²]* | | 0.6×10 ⁻⁴ | 3×10 ⁻⁴ | 5×10 ⁻⁴ | 10×10 ⁻⁴ | |
| Leakage current | | Power-supply frequency | 5 mA or less | | | |
| | | High frequency | 2.5 A0-p Motor cable length: 20 m max. | | | |
| I/O Signals | Input signal for reference Designated pulse type, pulse resolution and pulse connection method with PULSE switch. | Pulse type | Select one of the following signals: 1. CCW + CW 2. Sign + pulse train 3. CCW + CW (logic reversal) 4. Sign + pulse train (logic reversal) | | | |
| | | Pulse resolution, pulse connection method | Select one of the following signals: 1. 1000 pulses/rev (Open collector/line driver) 75 kpps max. 2. 2500 pulses/rev (Open collector/line driver) 187.5 kpps max. 3. 5000 pulses/rev (Line driver) 375 kpps max. 4. 10000 pulses/rev (Line driver) 750 kpps max. | | | |
| | Clear input signal | Clears the positioning error when turned from OFF to ON. | | | | |
| | Servo ON input signal | Turns the servomotor on or off. | | | | |
| | Alarm output signal | OFF if an alarm occurs. Note: OFF for 2s when power is turned ON. | | | | |
| | Brake output signal | External signal to control brakes. Turn ON to release the brake. | | | | |

8.2 Torque-Motor Speed Characteristics

| SERVOPACK model SJDE- | | 01APA-OY | 02APA-OY | 04APA-OY | 08APA-OY |
|-----------------------|-------------------------------------|--|----------|----------|----------|
| I/O Signals | Positioning completed output signal | ON if the current position is equal to the reference position ± 10 pulses. External signal to control brakes. | | | |
| | Origin output signal | ON if the motor is at the origin. (Width: 1/500 rev) Note: Use the pulse edge that changes the signal from OFF to ON. | | | |
| Built-in functions | Dynamic brake (DB) | Operated at main power OFF, servo alarm, servo OFF. (OFF after motor stops; ON if the motor power is off.) | | | |
| | Regenerative processing | Optional (If the regenerated energy is too large, install a regenerative unit.) | | | |
| | LED display | 5 (PWE, REF, AL1, AL2, AL3) | | | |
| | Reference filter | Select one of eight levels with FIL switch. | | | |
| Cooling method | | Forced cooling (built-in fan) | | | |

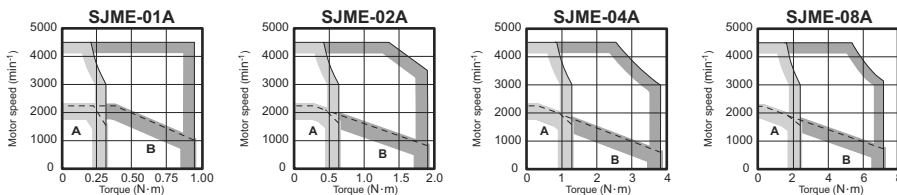
* A 100 VAC power supply can be used with a SERVOPACK version 03404 or firmware version 0004 or later.
When a 100 VAC power supply is used, reduced ratings are applied. For details, refer to 8.2 Torque-Motor Speed Characteristics.

NOTE

Use the input power supply within the specified voltage range: 200 VAC to 230 VAC or 100 VAC to 115 VAC

8.2 Torque-Motor Speed Characteristics

A: Continuous Duty Zone B: Intermittent Duty Zone



- Note: 1. The characteristics of the intermittent duty zone differ depending on the supply voltages. The solid and dotted lines of the intermittent duty zone indicate the characteristics when a servomotor runs with the following combinations:
- The solid line: With a single-phase 200 V SERVOPACK
 - The dotted line: With a single-phase 100 V SERVOPACK
2. When the effective torque is within the rated torque, the servomotor can be used within the intermittent duty zone.
3. When the main circuit cable length exceeds 20 m, note that the intermittent duty zone of the *Torque-Motor Speed Characteristics* will shrink as the line-to-line voltage drops.

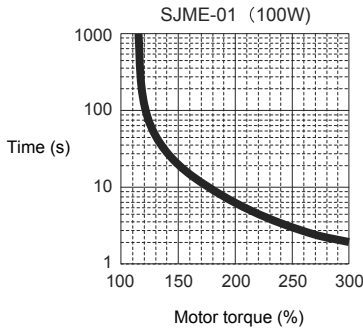
8.3 Overload Protection Characteristics

The SERVOPACK provides a function to protect the servomotor and SERVOPACK from overloads.

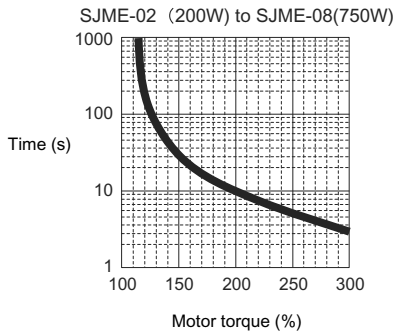
NOTE

- If an overload alarm occurs, remove the cause of the alarm and wait for at least one minute. Turn ON the servomotor again after the servomotor has cooled sufficiently. If the operation of the servomotor is repeated within a short time, the servomotor coil may burn out.
- Use a correct combination of the SERVOPACK and servomotor.
- Overload protection characteristics are the values used when the motor attached to the aluminum heatsink [250 mm × 250 mm × 6 mm (23.62 in × 23.62 in × 0.24 in)] at the ambient temperature of 40 °C (104 °F). Make sure to use the SERVOPACK in the recommended operating conditions.
- When using SERVOPACKs with a 100 VAC power supply, depending on the motor speed, an overload alarm may occur even if values are within the allowable range for the overload protection characteristics shown in the following figures.

The overload protection characteristics are shown below.



Example: If the Servomotor torque is 300 %, an overload alarm will occur in approximately two seconds.



Note: The servomotor torque is given as a percentage of the rated torque.

Revision History

The revision dates and numbers of the revised manuals are given on the bottom of the back cover.

MANUAL NO. TOMP C710806 06A

Published in China October 2010 10-10

└─ Date of
publication

└─ Date of original
publication

| Date of Publication | Rev. No. | WEB Rev. No. | Section | Revised Content |
|---------------------|----------|--------------|---------|-----------------|
| October 2010 | - | - | - | First edition |

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MANUAL NO. TOMP C710806 06A

Published in China October 2010 10-10-4
10-10-4