

# Chapter 8

## Troubleshooting

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# 8-1 Error Processing

## Preliminary Checks When a Problem Occurs

This section explains the preliminary checks and analytical tools required to determine the cause of a problem if one occurs.

### ■ Checking the Power Supply Voltage

- Check the voltage at the power supply input terminals.

Main-circuit Power Supply Input Terminals (L1, L2, and L3)

- R88D-GT□L (50 W to 400 W) : Single-phase 100 to 115 VAC (85 to 127 V), 50/60 Hz
- R88D-GT□H (100 W to 1.5 kW) : Single-phase 200 to 240 VAC (170 to 264 V), 50/60 Hz
- (750 W to 1.5 kW) : Three-phase 200 to 240 VAC (170 to 264 V), 50/60 Hz
- (2 kW to 7.5 kW) : Three-phase 200 to 230 VAC (170 to 253 V), 50/60 Hz

Control Circuit Power Supply Input Terminals (L1C and L2C)

- R88D-GT□L (50 W to 400 W) : Single-phase 100 to 115 VAC (85 to 127 V), 50/60 Hz
- R88D-GT□H (100 W to 1.5 kW) : Single-phase 200 to 240 VAC (170 to 264 V), 50/60 Hz
- (2 kW to 7.5 kW) : Single-phase 200 to 230 VAC (170 to 253 V), 50/60 Hz

If the voltage is outside of this range, there is a risk of operation failure, so be sure that the power supply is correct.

- Check the voltage of the sequence input power supply. (+24 VIN Terminal (CN1 pin 7))  
Within the range of 11 to 25 VDC  
If the voltage is outside of this range, there is a risk of operation failure, so be sure that the power supply is correct.

### ■ Checking Whether an Alarm Has Occurred

- Evaluate the problem using the 7-segment LED display on the front panel and using the operation keys. You can also evaluate the problem by using the R88A-PR02G Parameter Unit.
- When an alarm has occurred:  
Check the alarm code that is displayed (□□) and evaluate the problem based on the alarm that is indicated.
- When an alarm has not occurred:  
Make an analysis according to the problem.
- In either case, refer to *8-3 Troubleshooting* for details.

## Precautions When Troubleshooting

When checking and verifying I/O after a problem has occurred, the Servo Drive may suddenly start to operate or suddenly stop, so always take the following precautions.

You should assure that anything not described in this manual is not possible with this product.

### ■ Precautions

- Disconnect the cable before checking for wire breakage. Even if you test conduction with the cable connected, test results may not be accurate due to conduction via bypassing circuit.
- If the encoder signal is lost, the Servomotor may run away, or an error may occur. Be sure to disconnect the Servomotor from the mechanical system before checking the encoder signal.
- When measuring the encoder output, perform the measurement based on the SENGND (CN1 pin 13). When an oscilloscope is used for measurement, it will not be affected by noise if measurements are performed using the differential between CH1 and CH2.
- When performing tests, first check that there are no persons in the vicinity of the equipment, and that the equipment will not be damaged even if the Servomotor runs away. Before performing the tests, verify that you can immediately stop the machine using an emergency stop even if the Servomotor runs away.

## Replacing the Servomotor and Servo Drive

Use the following procedure to replace the Servomotor or Servo Drive.

### ■ Replacing the Servomotor

#### 1. Replace the Servomotor.

#### 2. Perform origin position alignment (for position control).

- When the Servomotor is replaced, the Servomotor's origin position (phase Z) may deviate, so origin alignment must be performed.
- Refer to the Position Controller's manual for details on performing origin alignment.

#### 3. Set up the absolute encoder.

- If a Servomotor with an absolute encoder is used, the absolute value data in the absolute encoder will be cleared when the Servomotor is replaced, so setup is again required. The rotation data will be different from before the Servomotor was replaced, so reset the initial Motion Control Unit parameters.
- For details, refer to *Absolute Encoder Setup Procedure* on page 6-5.

### ■ Replacing the Servo Drive

#### 1. Copy the parameters.

Use the Parameter Unit or the operation keys on the Servo Drive to write down all the parameter settings.

#### 2. Replace the Servo Drive.

#### 3. Set the parameters.

Use the Parameter Unit or the operation keys on the Servo Drive to set all the parameters.

#### 4. Set up the absolute encoder.

- If a Servomotor with an absolute encoder is used, the absolute value data in the absolute encoder will be cleared when the Servo Drive is replaced, so setup is again required. The rotation data will be different from before the Servo Drive was replaced, so reset the initial Motion Control Unit parameters.
- For details, refer to *Absolute Encoder Setup Procedure* on page 6-5.

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## 8-2 Alarm Table

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If the Servo Drive detects an error, the Alarm Output (ALM) will turn ON, the power drive circuit in the Servo Drive will turn OFF, and the alarm code will be displayed.

**Precautions  
for Correct Use**

- Refer to *Error Diagnosis Using the Displayed Alarm Codes* on page 8-6 for appropriate alarm countermeasures.
- Reset the alarm using one of the following methods. Remove the cause of the alarm first.
  - Turn ON the Alarm Reset Input (RESET).
  - Turn OFF the power supply, then turn it ON again.
  - Reset the alarm on the Parameter Unit.

Note, however, that some alarms can only be cleared by recycling the power (turn ON → OFF → ON). Refer to the *Alarms* table on the next page.

- If you clear an alarm while the RUN Command Input (RUN) is turned ON, the Servo Drive will start operation as soon as the alarm is cleared, which is dangerous. Be sure to turn OFF the RUN Command Input (RUN) before clearing the alarm. If the RUN Command Input (RUN) is always ON, first check safety sufficiently before clearing the alarm.
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## ■ Alarms

Alarm code	Error detection function	Detection details and cause of error	Alarm reset possible
11	Control power supply undervoltage	The DC voltage of the main circuit fell below the specified value.	Yes
12	Overvoltage	The DC voltage in the main circuit is abnormally high.	Yes
13	Main power supply undervoltage	The DC voltage of the main circuit is low.	Yes
14	Overcurrent	Overcurrent flowed to the IGBT. Servomotor power line ground fault or short circuit.	No
15	Servo Drive overheating	The temperature of the Servo Drive radiator exceeded the specified value.	No
16	Overload	Operation was performed with torque significantly exceeding the rating for several seconds to several tens of seconds.	Yes
18	Regeneration overload	The regeneration energy exceeds the processing capacity of the regeneration resistor.	No
21	Encoder communications error	The encoder wiring is disconnected.	No
23	Encoder communications data error	Communications cannot be performed between the Encoder and the Servo Drive.	No
24	Deviation counter overflow	The number of accumulated pulses in the deviation counter exceeded the setting for the Deviation Counter Overflow Level (Pn70).	Yes
26	Overspeed	The Servomotor exceeded the maximum number of rotations.	Yes
27	Electronic gear setting error	The setting for the electronic gear ratio (Pn48 to 4B) is not appropriate.	Yes
34	Overrun limit error	The Servomotor exceeded the allowable operating range set in the Overrun Limit Setting (Pn26) with respect to the position command input.	Yes
36	Parameter error	Data in the parameter save area was corrupted when the power supply was turned ON and data was read from the EEPROM.	No
37	Parameter corruption	The checksum for the data read from the EEPROM when the power supply was turned ON does not match.	No
38	Drive prohibit input error	The forward drive prohibit and reverse drive prohibit inputs are both turned OFF.	Yes
39	Excessive analog input 1	A voltage exceeding the Speed Command/ Torque Command Input Overflow Level Setting (Pn71) was applied to the Speed Command Input (REF: CN1 pin 14).	Yes
40	Absolute encoder system down error	<b>ABS</b> The voltage supplied to the absolute encoder is lower than the specified value.	Yes
41	Absolute encoder counter overflow error	<b>ABS</b> The multi-turn counter of the absolute encoder exceeds the specified value.	No

## 8-2 Alarm Table

Alarm code	Error detection function	Detection details and cause of error	Alarm reset possible
42	Absolute encoder overspeed error <b>ABS</b>	The Servomotor rotation speed exceeds the specified value when only the battery power supply of the absolute encoder is used.	Yes
44	Absolute encoder one-turn counter error	A one-turn counter error was detected.	No
45	Absolute encoder multi-turn counter error	An absolute encoder multi-turn counter or incremental encoder phase-AB signal error was detected.	No
46	Encoder error 1	The Servomotor is faulty.	No
47	Absolute encoder status error <b>ABS</b>	The rotation of the absolute encoder is higher than the specified value.	Yes
48	Encoder phase Z error	A phase-Z pulse was not detected regularly.	No
49	Encoder PS signal error	A logic error was detected in the PS signal.	No
58	CPU error 1	The Servo Drive is faulty.	No
60	CPU error 2	The Servo Drive is faulty.	No
61	CPU error 3	The Servo Drive is faulty.	No
62	CPU error 4	The Servo Drive is faulty.	No
63	CPU error 5	The Servo Drive is faulty.	No
65	Excessive analog input 2	A voltage exceeding the Speed Command/ Torque Command Input Overflow Level Setting (Pn71) was applied to the analog command input (CN1 pin 16).	Yes
66	Excessive analog input 3	A voltage exceeding the Speed Command/ Torque Command Input Overflow Level Setting (Pn71) was applied to the analog command input (CN1 pin 18).	Yes
73	CPU error 6	The Servo Drive is faulty.	No
77	CPU error 7	The Servo Drive is faulty.	No
81	CPU error 8	The Servo Drive is faulty.	No
94	Encoder error 2	The Servomotor is faulty.	No
95	Servomotor non-conformity	The combination of the Servomotor and Servo Drive is not appropriate. The encoder was not connected when the power supply was turned ON.	No
96	CPU error 9	The Servo Drive is faulty.	No
97	CPU error 10	The Servo Drive is faulty.	No
99	CPU error 11	The Servo Drive is faulty.	No

## 8-3 Troubleshooting

If an error occurs in the machine, determine the error conditions from the alarm indicator and operating status, identify the cause of the error, and take appropriate countermeasures.

### Error Diagnosis Using the Displayed Alarm Codes

Alarm code	Error	Status when error occurs	Cause	Countermeasure
11	Power supply undervoltage	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>• The power supply voltage is low.</li> <li>• Momentary power interruption occurred.</li> <li>• Power supply capacity is insufficient.</li> <li>• The power supply voltage is reduced because the main power supply is OFF.</li> <li>• The main power supply is not input.</li> </ul>	<ul style="list-style-type: none"> <li>• Increase the power supply capacity.</li> <li>• Change the power supply.</li> <li>• Turn ON the power supply.</li> </ul>
			<ul style="list-style-type: none"> <li>• Power supply capacity is insufficient.</li> </ul>	<ul style="list-style-type: none"> <li>• Increase the power supply capacity.</li> </ul>
			<ul style="list-style-type: none"> <li>• Phase loss.</li> </ul>	<ul style="list-style-type: none"> <li>• Connect the phases (L1, L2, L3) of the power supply voltage correctly.</li> <li>• For single-phase, connect to L1 and L3 correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>• The main circuit power supply is damaged.</li> <li>• Control PCB error.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace the Servo Drive.</li> </ul>

## 8-3 Troubleshooting

Alarm code	Error	Status when error occurs	Cause	Countermeasure
12	Overvoltage	Occurs when power supply is turned ON.	<ul style="list-style-type: none"> <li>Main circuit power supply voltage is outside allowable range.</li> </ul>	<ul style="list-style-type: none"> <li>Change the main circuit power supply voltage to within allowable range.</li> </ul>
		Occurs when Servomotor is decelerating.	<ul style="list-style-type: none"> <li>Load inertia is too great.</li> </ul>	<ul style="list-style-type: none"> <li>Calculate the regenerative energy, and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> <li>Extend the deceleration time.</li> </ul>
			<ul style="list-style-type: none"> <li>Main circuit power supply voltage is outside allowable range.</li> </ul>	<ul style="list-style-type: none"> <li>Change main circuit power supply voltage to within allowable range.</li> </ul>
		Occurs during descent (vertical axis).	<ul style="list-style-type: none"> <li>Gravitational torque is too large.</li> </ul>	<ul style="list-style-type: none"> <li>Add a counterbalance to the machine to lower gravitational torque.</li> <li>Slow the descent speed.</li> <li>Calculate the regenerative energy, and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> </ul>
13	Main power supply undervoltage	Occurs when the Servo Drive is turned ON.	<ul style="list-style-type: none"> <li>The power supply voltage is low.</li> <li>Momentary power interruption occurred.</li> <li>Power supply capacity is insufficient.</li> <li>The power supply voltage is reduced because the main power supply is OFF.</li> <li>The main power supply is not input.</li> </ul>	<ul style="list-style-type: none"> <li>Check the power supply capacity.</li> <li>Change the power supply.</li> <li>Turn ON the power supply.</li> <li>Extend the Momentary Hold Time (Pn6D).</li> </ul>
		Occurs when power supply is turned ON.	<ul style="list-style-type: none"> <li>Phase loss.</li> </ul>	<ul style="list-style-type: none"> <li>Correctly connect the phases of the power supply voltage.</li> <li>Correctly connect the single phase.</li> </ul>
			<ul style="list-style-type: none"> <li>The main circuit power supply is damaged.</li> <li>Control PCB error.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>



Alarm code	Error	Status when error occurs	Cause	Countermeasure
14	Overcurrent	Occurs when the Servo Drive is turned ON.	<ul style="list-style-type: none"> <li>Control PCB error</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
			<ul style="list-style-type: none"> <li>Servomotor power line is short-circuited or ground-faulted between phases.</li> </ul>	<ul style="list-style-type: none"> <li>Repair the short-circuited or ground-faulted wire.</li> <li>Measure the insulation resistance at the Servomotor and, if there is a short-circuit, replace the Servomotor.</li> </ul>
			<ul style="list-style-type: none"> <li>Miswiring between phase U, phase V, phase W, and ground.</li> </ul>	<ul style="list-style-type: none"> <li>Correct the wiring.</li> </ul>
			<ul style="list-style-type: none"> <li>Servomotor winding is burned out.</li> </ul>	<ul style="list-style-type: none"> <li>Measure the winding resistance, and if the winding is burned out, replace the Servomotor.</li> </ul>
			<ul style="list-style-type: none"> <li>The relay for the dynamic brake has been consequently welded.</li> </ul>	<ul style="list-style-type: none"> <li>Do not frequently input the RUN Command Input.</li> <li>Do not operate the system by turning the servo ON and OFF.</li> </ul>
			<ul style="list-style-type: none"> <li>Servomotor non-conformity</li> </ul>	<ul style="list-style-type: none"> <li>Use a Servomotor that is appropriate for use with the Servo Drive.</li> </ul>
			<ul style="list-style-type: none"> <li>The pulse input timing is too fast.</li> </ul>	<ul style="list-style-type: none"> <li>Wait 100 ms min. before inputting pulses after turning ON the RUN Command Input (RUN).</li> </ul>
			<ul style="list-style-type: none"> <li>The resistor in the Servo Drive is abnormally overheating.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the ambient temperature of the Servo Drive to 55°C or lower.</li> <li>If the relay doesn't click when the power supply is turned ON, replace the Servo Drive.</li> </ul>
15	Servo Drive overheating	Occurs during operation.	<ul style="list-style-type: none"> <li>The ambient temperature is too high.</li> <li>The load is too large.</li> </ul>	<ul style="list-style-type: none"> <li>Lower the ambient temperature.</li> <li>Increase the capacity of the Servo Drive and Servomotor.</li> <li>Lighten the load.</li> <li>Extend the acceleration and deceleration times.</li> </ul>

## 8-3 Troubleshooting

Alarm code	Error	Status when error occurs	Cause	Countermeasure
16	Overload	Occurs when the Servo Drive is turned ON.	<ul style="list-style-type: none"> <li>There is an error in the Servomotor wiring (e.g., the wiring or the contacts are faulty).</li> </ul>	<ul style="list-style-type: none"> <li>Wire the Servomotor power cable correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>The electromagnetic brake is ON.</li> </ul>	<ul style="list-style-type: none"> <li>Turn OFF the brake.</li> </ul>
		Occurs during operation.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
			<ul style="list-style-type: none"> <li>The actual torque exceeds the rated torque.</li> <li>The starting torque exceeds the maximum torque.</li> </ul>	<ul style="list-style-type: none"> <li>Review the load conditions and operating conditions.</li> <li>Review the Servomotor capacity.</li> </ul>
			<ul style="list-style-type: none"> <li>An unusual noise, oscillation, or vibration is caused by faulty gain adjustment.</li> </ul>	<ul style="list-style-type: none"> <li>Adjust the gain correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>

Alarm code	Error	Status when error occurs	Cause	Countermeasure
18	Regeneration overload	Occurs when the Servomotor is decelerating.	<ul style="list-style-type: none"> <li>• Load inertia is too great.</li> </ul>	<ul style="list-style-type: none"> <li>• Calculate the regenerative energy, and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> <li>• Extend the deceleration time.</li> </ul>
			<ul style="list-style-type: none"> <li>• The deceleration time is too short.</li> <li>• The Servomotor rotation speed is too high.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce the Servomotor rotation speed.</li> <li>• Extend the deceleration time.</li> <li>• Calculate the regenerative energy, and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> </ul>
			<ul style="list-style-type: none"> <li>• The operating limit of the External Regeneration Resistor is limited to 10%.</li> </ul>	<ul style="list-style-type: none"> <li>• Set Pn6C to 2. For details, refer to <i>Parameters Details</i> on page 5-50.</li> </ul>
		Occurs during descent (vertical axis)	<ul style="list-style-type: none"> <li>• Gravitational torque is too large.</li> </ul>	<ul style="list-style-type: none"> <li>• Add a counterbalance to the machine to lower gravitational torque.</li> <li>• Reduce the descent speed.</li> <li>• Calculate the regenerative energy and connect an External Regeneration Resistor with the required regeneration absorption capacity.</li> </ul>
			<ul style="list-style-type: none"> <li>• The operating limit of the External Regeneration Resistor is limited to 10%.</li> </ul>	<ul style="list-style-type: none"> <li>• Set Pn6C to 2. For details, refer to <i>Parameters Details</i> on page 5-50.</li> </ul>
21	Encoder communications error	Occurs during operation.	<ul style="list-style-type: none"> <li>• The encoder is disconnected.</li> <li>• Connector contacts are faulty.</li> </ul>	<ul style="list-style-type: none"> <li>• Fix the locations that are disconnected.</li> <li>• Correct the wiring.</li> </ul>
			<ul style="list-style-type: none"> <li>• The encoder wiring is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>• Correct the wiring</li> </ul>
			<ul style="list-style-type: none"> <li>• The encoder is damaged.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace the Servomotor.</li> </ul>
			<ul style="list-style-type: none"> <li>• The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>• Replace the Servo Drive.</li> </ul>
			<ul style="list-style-type: none"> <li>• The Servomotor is mechanically being held.</li> </ul>	<ul style="list-style-type: none"> <li>• If the Servomotor shaft is held by external force, release it.</li> </ul>

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Alarm code	Error	Status when error occurs	Cause	Countermeasure
23	Encoder communications data error	Occurs when the power supply is turned ON or during operation.	<ul style="list-style-type: none"> <li>The encoder signal wiring is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>Correct the wiring.</li> </ul>
			<ul style="list-style-type: none"> <li>Noise on the encoder wiring causes incorrect operation.</li> </ul>	<ul style="list-style-type: none"> <li>Take measures against noise on the encoder wiring.</li> </ul>
			<ul style="list-style-type: none"> <li>The power supply voltage for the encoder has dropped (especially when the cable is long.)</li> </ul>	<ul style="list-style-type: none"> <li>Provide the required encoder power supply voltage (5 VDC<math>\pm</math>5%).</li> </ul>
24	Deviation counter overflow	Occurs when the Servomotor does not rotate even when command pulses are input.	<ul style="list-style-type: none"> <li>The Servomotor power wiring or the encoder wiring is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>Correct the wiring.</li> </ul>
			<ul style="list-style-type: none"> <li>The Servomotor is mechanically being held.</li> </ul>	<ul style="list-style-type: none"> <li>If the Servomotor shaft is held by external force, release it.</li> <li>Release the electro-magnetic brake.</li> </ul>
			<ul style="list-style-type: none"> <li>Control PCB error.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
		Occurs during high-speed rotation.	<ul style="list-style-type: none"> <li>The Servomotor power wiring or the encoder wiring is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>Correct the wiring.</li> </ul>
		Occurs when a long string of command pulses is given.	<ul style="list-style-type: none"> <li>Gain adjustment is insufficient.</li> </ul>	<ul style="list-style-type: none"> <li>Adjust the gain.</li> </ul>
			<ul style="list-style-type: none"> <li>The acceleration and deceleration rapid.</li> </ul>	<ul style="list-style-type: none"> <li>Extend the acceleration and deceleration times.</li> </ul>
		Occurs during operation.	<ul style="list-style-type: none"> <li>The load is too large.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the load.</li> <li>Select a suitable Servomotor.</li> </ul>
			<ul style="list-style-type: none"> <li>The setting for the Deviation Counter Overflow Level (Pn70) was exceeded.</li> </ul>	<ul style="list-style-type: none"> <li>Increase the setting of Pn70.</li> <li>Reduce the rotation speed.</li> <li>Lighten the load.</li> <li>Extend the acceleration and deceleration times.</li> </ul>

Alarm code	Error	Status when error occurs	Cause	Countermeasure
26	Overspeed	Occurs during high-speed rotation.	• The speed command input is too large.	• Set the command pulse frequency to 500 kpps max.
			• The setting for the Electronic Gear Ratio Numerator (Pn48 or Pn49) is not appropriate.	• Set Pn48 and Pn49 so that the command pulse frequency is 500 kpps max.
			• The maximum number of rotations is exceeded due to overshooting.	• Adjust the gain. • Reduce the maximum command speed.
		• The encoder wiring is incorrect.	• Correct the wiring	
		Occurs when torque limit switching is used.	• The Overspeed Detection Level Setting (Pn73) has been exceeded.	• If torque limit switching is used, correctly set the allowable operating speed for Pn73.
27	Electronic gear setting error	Occurs when command signal is input or command is input.	• The setting for the Electronic Gear Ratio Numerator (Pn48 or Pn49) is not appropriate.	• Set Pn48 and Pn49 so that the command pulse frequency is 500 kpps max.
34	Overrun limit error	Occurs during operation.	• The Overrun Limit Setting (Pn26) is exceeded during operation.	• Adjust the gain. • Increase the setting for Pn26. • Set Pn26 to 0 to disable the function.
36	Overrun limit error	Occurs when the power supply is turned ON.	• There are data errors in the parameters that were read.	• Reset all parameters.
			• The Servo Drive is faulty.	• Replace the Servo Drive.
37	Parameter corruption	Occurs when the power supply is turned ON.	• The parameters that were read are corrupt.	• Replace the Servo Drive.
38	Drive prohibit input error	Occurs when the Servo Drive is turned ON or during operation.	• The Forward Drive Prohibit Input (POT) and Reverse Drive Prohibit Input (NOT) were both OFF at the same time.	• Correct the wiring. • Replace the limit sensor. • Check whether the power supply for control is input correctly. • Check whether the setting for Drive Prohibit Input Selection (Pn04) is correct.
39	Excessive analog input 1	Occurs during operation.	• The voltage input to pin 14 is too high.	• Lower the input voltage. • Change the value for Pn71.

## 8-3 Troubleshooting

Alarm code	Error	Status when error occurs	Cause	Countermeasure
40	Absolute encoder system down error <b>ABS</b>	Occurs when the power supply is turned ON or during operation.	<ul style="list-style-type: none"> <li>The voltage supplied to the absolute encoder is low.</li> </ul>	<ul style="list-style-type: none"> <li>Set up the absolute encoder.</li> <li>Connect the battery power supply.</li> </ul>
41	Absolute encoder counter overflow error <b>ABS</b>	Occurs during operation.	<ul style="list-style-type: none"> <li>The multi-turn counter of the absolute encoder exceeds the specified value.</li> </ul>	<ul style="list-style-type: none"> <li>Properly set the Operation Switch when Using Absolute Encoder (Pn0B).</li> </ul>
42	Absolute encoder overspeed error <b>ABS</b>	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servomotor rotation speed exceeds the specified value when the battery power supply is turned ON.</li> <li>The wiring is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>Lower the Servomotor rotation speed and supply power.</li> <li>Check the wiring.</li> </ul>
44	Absolute encoder one-turn counter error	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The encoder is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servomotor.</li> </ul>
45	Absolute encoder multi-turn counter error	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The encoder is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servomotor.</li> </ul>
46	Encoder error 1	Occurs when the power supply is turned ON	<ul style="list-style-type: none"> <li>The Servomotor is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> <li>Replace the Servomotor.</li> </ul>
47	Absolute encoder status error <b>ABS</b>	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servomotor was moving when the power supply was turned ON.</li> </ul>	<ul style="list-style-type: none"> <li>Do not let the Servomotor move when the power supply is turned ON.</li> </ul>
48	Encoder phase Z error	Occurs during operation.	<ul style="list-style-type: none"> <li>A phase-Z pulse from the encoder was not detected regularly.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servomotor.</li> </ul>
49	Encoder PS signal error	Occurs during operation.	<ul style="list-style-type: none"> <li>A logic error was detected in the PS signal from the encoder.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servomotor.</li> </ul>
58	CPU error 1	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
60	CPU error 2	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
61	CPU error 3	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
62	CPU error 4	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
63	CPU error 5	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
65	Excessive analog input 2	Occurs during operation.	<ul style="list-style-type: none"> <li>The voltage input to pin 16 is too high.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the input voltage.</li> <li>Change the value for Pn71.</li> </ul>

Alarm code	Error	Status when error occurs	Cause	Countermeasure
66	Excessive analog input 3	Occurs during operation.	<ul style="list-style-type: none"> <li>The voltage input to pin 18 is too high.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the input voltage.</li> <li>Change the value for Pn71.</li> </ul>
73	CPU error 6	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
77	CPU error 7	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
81	CPU error 8	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
94	Encoder error 2	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servomotor is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> <li>Replace the Servomotor.</li> </ul>
95	Servomotor non-conformity	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servomotor and Servo Drive combination is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>Use a correct combination.</li> </ul>
			<ul style="list-style-type: none"> <li>The encoder wiring is disconnected.</li> </ul>	<ul style="list-style-type: none"> <li>Wire the encoder.</li> <li>Fix the locations that are disconnected.</li> </ul>
96	CPU error 9	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
97	CPU error 10	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
99	CPU error 11	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The Servo Drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>

## Error Diagnosis Using the Operating Status

Symptom	Probable cause	Items to check	Countermeasures
The power LED indicator (PWR) does not light when the power supply is turned ON.	The power supply cable is wired incorrectly.	Check whether the power supply input is within the allowed voltage range.	Supply the correct voltage.
		Check whether the power supply input is wired correctly.	Correct the wiring.
The Servomotor does not rotate even if commands are input from the Controller. (Continued on next page.)	The RUN Command Input is OFF.	In monitor mode, check whether the RUN signal is ON or OFF.	<ul style="list-style-type: none"> <li>• Turn ON the RUN Command Input.</li> <li>• Correct the wiring.</li> </ul>
	The Forward Drive Prohibit Input (POT) and Reverse Drive Prohibit Input (NOT) are OFF.	In monitor mode, check whether the POT input and NOT input are ON or OFF.	<ul style="list-style-type: none"> <li>• Turn ON the POT and NOT inputs.</li> <li>• If the POT and NOT inputs are not used, disabled them.</li> </ul>
	The control mode is not correct.	Check the Control Mode Selection (Pn02).	Set the control mode to match the command type.
	The Deviation Counter Reset Input (ECRST) is ON.	In monitor mode, check whether the ECRST Input is ON or OFF.	<ul style="list-style-type: none"> <li>• Turn the ECRST Input OFF.</li> <li>• Correct the wiring.</li> </ul>
	The Command Pulse Mode (Pn42) is incorrect.	Check the Controller's command pulse type and the Servo Drive's command pulse type.	Set the Servo Drive's pulse type to match the Controller's command pulse type.
	The Zero Speed Designation Input (VZERO) is OFF.	In monitor mode, check whether the VZERO Input is ON or OFF.	<ul style="list-style-type: none"> <li>• Turn ON the VZERO Input.</li> <li>• Correct the wiring.</li> </ul>
	The internally set speeds are not set.	Check the settings for Pn53 to Pn56 or Pn74 to Pn77.	Set the desired speeds.
	No. 1 Torque Limit (Pn5E) or No. 2 Torque Limit (Pn5F) is set to 0.	Check the setting for Pn5E or Pn5F.	Return the setting to the default.
	The Servomotor Power Cable is wired incorrectly.	Check the wiring.	Correct the wiring.
	The Encoder Cable is wired incorrectly.		
	The Control I/O Connector (CN1) is wired incorrectly.	Check the command pulse's wiring.	Correct the wiring.
		Check the command pulse type.	Set the Servo Drive's pulse type to match the Controller's command pulse type.
		Check the command pulse's voltage.	Connect a resistor that matches the voltage.
	The power supply is not ON.	Check whether the power supply is ON and check the PWR LED indicator.	Turn ON the power supply.
Check the voltage across the power supply terminals.		Wire the power supply's ON circuit correctly.	
The speed command is disabled.	Check if the speed command procedure is correct.	<ul style="list-style-type: none"> <li>• Correctly set the external analog command.</li> <li>• Correctly set the internal speed.</li> </ul>	



Symptom	Probable cause	Items to check	Countermeasures
The Servomotor does not rotate even if commands are input from the Controller.	The torque command is disabled.	Check if the torque command input procedure is correct.	Correctly set the torque command.
	The CW Input and CCW Input are ON at the same time.	Check the command pulse's wiring.	<ul style="list-style-type: none"> <li>• Input the pulse signal either to the CW Input or CCW Input to the pulse signal.</li> <li>• Always turn OFF the terminal that is not being input to.</li> </ul>
	Servo Drive is faulty.	---	Replace the Servo Drive.
The Servomotor operates momentarily, but then it does not operate after that.	The Servomotor Power Cable is wired incorrectly.	Check the wiring of the Servomotor Power Cable's phases U, V, and W.	Wire correctly.
	The Encoder Cable is wired incorrectly.	Check the Encoder Cable's wiring.	Wire correctly.
The Servomotor rotates without a command.	The command pulse input is incorrect.	Check the command pulse type.	Set the correct command pulse input.
		Check the command pulse's voltage.	Connect a resistor that matches the voltage.
	Servo Drive is faulty.	---	Replace the Servo Drive.
The Servomotor rotates in the opposite direction from the command.	The CW input and CCW input connections are reversed.	Check the Controller's command pulse type and the Servo Drive's command pulse type.	Connect the CW pulse signal to the CW Input and the CCW pulse signal to the CCW Input.

## 8-3 Troubleshooting

Symptom	Probable cause	Items to check	Countermeasures
Servomotor rotation is unstable.	The Servomotor Power Cable or Encoder Cable is wired incorrectly.	Check the wiring of the Servomotor Power Cable's phases U, V, and W and check the Encoder Cable's wiring.	Wire correctly.
	The coupling system between the Servomotor shaft and the mechanical system has eccentricity or loose screws, or the torque is fluctuating due to engagement between pulleys or gears.	Check the mechanical system's coupling section.	Review and adjust the machine.
		Try rotating the Servomotor without a load. (Disconnect it from the mechanical system.)	
	The load's moment of inertia exceeds the Servo Drive's allowed value.	Try rotating the Servomotor without a load. (Disconnect it from the mechanical system.)	<ul style="list-style-type: none"> <li>• Lighten the load.</li> <li>• Replace the Servomotor and Servo Drive with higher capacity models.</li> </ul>
	The pulse signal line's connections are loose.	Check the pulse signal wiring at the Controller and Servo Drive.	Wire correctly.
		Check the Controller's command pulse type and the Servo Drive's command pulse type.	Set the Servo Drive's pulse type to match the Controller's command pulse type.
	The gain is wrong.	---	<ul style="list-style-type: none"> <li>• Use normal mode autotuning.</li> <li>• Adjust the gain manually.</li> </ul>
The CN1 input signal is chattering.	Check the RUN Command Input (RUN), Deviation Counter Reset Input (ECRST), Zero Speed Designation Input (VZERO), Internally set Speed Selection 1 Input (VSEL1) and Internally Set Speed Selection 2 Input (VSEL2).	Correct the wiring so that there is no chattering.	
The Servomotor is overheating.	The ambient temperature is too high.	Check that the ambient temperature around the Servomotor is below 40°C.	Lower the ambient temperature to 40°C or less. (Use a cooler or fan.)
	Ventilation is obstructed.	Check to see whether anything is blocking ventilation.	Improve ventilation.
	The Servomotor is overloaded.	Try rotating the Servomotor without a load. (Disconnect it from the mechanical system.)	<ul style="list-style-type: none"> <li>• Reduce the load.</li> <li>• Replace the Servomotor and Servo Drive with higher capacity models.</li> </ul>
	The Servomotor is vibrating.		
The holding brake is ineffective.	Power is supplied to the holding brake.	Check whether power is supplied to the holding brake.	Configure a circuit that cuts power to the holding brake when the motor stops and the load is held by the holding brake.
The Servomotor does not stop or is hard to stop even if the RUN Command Input (RUN) is turned OFF while the Servomotor is rotating.	The load inertia is too large.	Check the following: <ul style="list-style-type: none"> <li>• Is the load too large?</li> <li>• Is the Servomotor speed too high?</li> </ul>	Re-evaluate the load conditions and replace the Servomotor/Servo Drive with appropriate models if necessary.
	The stop circuit failed.	---	Replace the Servo Drive.

Symptom	Probable cause	Items to check	Countermeasures
The Servomotor is producing unusual noises or the machine is vibrating.	There are problems with the machine's installation.	Check whether the Servomotor's mounting screws are loose.	Tighten the mounting screws.
		Check whether the axes are misaligned in the mechanical coupling system.	Align the mechanical couplings.
		Check whether the coupling is unbalanced.	Adjust the coupling's balance.
	There is a problem with the bearings.	Check for noise or vibration around the bearings.	Contact your OMRON representative.
	The gain is wrong.	---	<ul style="list-style-type: none"> <li>• Use normal mode autotuning.</li> <li>• Adjust the gain manually.</li> </ul>
	The Speed Feedback Filter Time Constant (Pn13) is wrong.	Check the setting of Pn13.	Return the setting to 0 (default) or increase the setting.
	Noise is entering the Control I/O Cable because the cable does not meet specifications.	Check that the cable wire is a twisted-pair wire or shielded twisted-pair cable with wires of at least 0.08 mm <sup>2</sup> .	Use Control I/O Cable that meets specifications.
	Noise is entering the Control I/O Cable because the cable is longer than the specified length.	Check the length of the Control I/O Cable.	Shorten the Control I/O Cable to 3 m or less.
	Noise is entering the cable because the Encoder Cable does not meet specifications.	Check that the cable wires are shielded twisted-pair wires that are at least 0.12 mm <sup>2</sup> .	Use Encoder Cable that meets specifications.
	Noise is entering the Encoder Cable because the cable is longer than the specified length.	Check the length of the Encoder Cable.	Shorten the Encoder Cable to less than 50 m.
	Noise is entering the signal wires because the Encoder Cable is stuck or the sheath is damaged.	Check the Encoder Cable for cuts or other damage.	Correct the Encoder Cable's pathway to prevent damage.
	Too much noise is entering the Encoder Cable.	Separate the Encoder Cables far from high-current lines or check whether the lines are too close.	Install the Encoder Cable where it won't be subjected to surges.
	The FG's potential is fluctuating due to devices near the Servomotor, such as welding machines.	Check for ground problems (loss of ground or incomplete ground) at equipment such as welding machines near the Servomotor.	Ground the equipment properly and prevent currents from flowing to the encoder FG.
	Errors are being caused by excessive vibration or shock on the encoder.	There are problems with mechanical vibration or motor installation (such as the mounting surface, attachment, or axial offset).	Reduce the mechanical vibration or correct the Servomotor's installation.
	The machine and the Servomotor are resonating.	Check whether the machine is resonating.	<ul style="list-style-type: none"> <li>• Readjust the Torque Command Filter Time Constant.</li> <li>• If there is resonance, set the Notch Filter 1 Frequency (Pn1D) and Notch Filter 1 Width (Pn1E).</li> </ul>

## 8-3 Troubleshooting

Symptom	Probable cause	Items to check	Countermeasures
Vibration is occurring at the same frequency as the power supply.	Inductive noise is occurring.	Check whether the Servo Drive control signal lines are too long.	Shorten the control signal lines.
		Check to see whether control signal lines and power supply lines are bundled together.	<ul style="list-style-type: none"> <li>• Separate control signal lines from power supply lines.</li> <li>• Use a low-impedance power supply for control signals.</li> </ul>
The position is misaligned. (Position misalignment occurs without an alarm being output.)	There is an error in the coupling of the mechanical system and the Servomotor.	Check whether the coupling of the mechanical system and the Servomotor is misaligned.	Correct the coupling between the mechanical system and the Servomotor.
	Noise is entering the Deviation Counter Reset Input (ECRST).	Check whether the control signal lines and power supply lines are bundled together.	Separate the control signal lines from the power supply lines or take other measures against noise.
	The gain is wrong.	---	<ul style="list-style-type: none"> <li>• Perform normal mode autotuning.</li> <li>• Perform manual tuning.</li> </ul>
	The load inertia is too large.	Check the following: <ul style="list-style-type: none"> <li>• Check whether the load is too large.</li> <li>• Check whether the rotation speed of the Servomotor is too high.</li> </ul>	<ul style="list-style-type: none"> <li>• Adjust the gain.</li> <li>• Review the load conditions, and replace the Servomotor and Servo Drive with appropriate models.</li> </ul>

# 8-4 Overload Characteristics (Electronic Thermal Function)

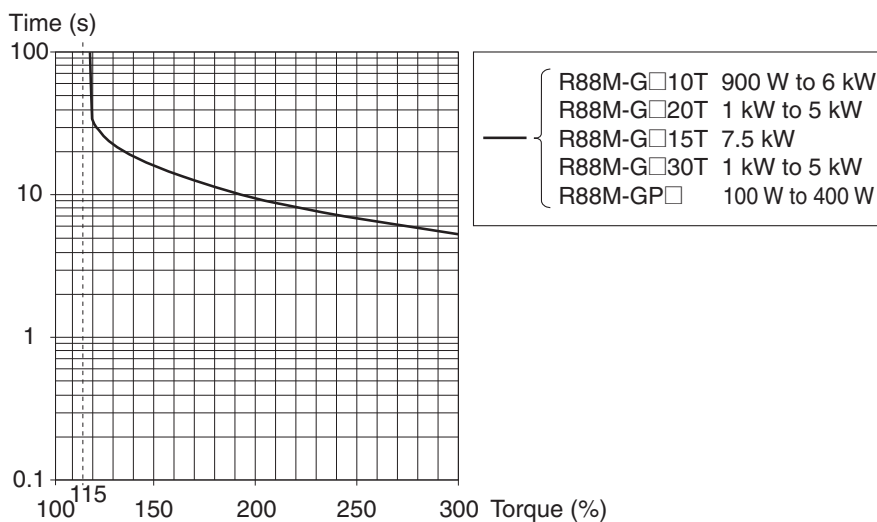
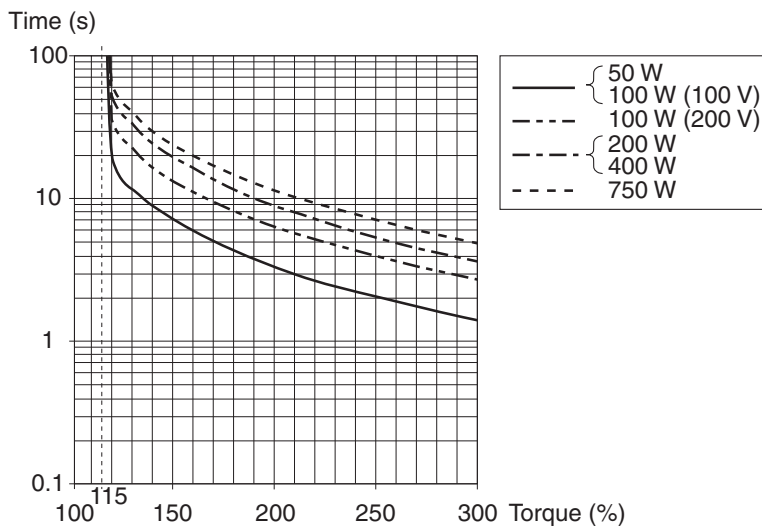
An overload protection (electronic thermal) function is built into the Servo Drive to protect the Servo Drive and Servomotor from overloading.

If an overload does occur, first eliminate the cause of the error and then wait at least one minute for the Servomotor temperature to drop before turning ON the power again.

If the power is turned ON again repeatedly at short intervals, the Servomotor windings may burn out.

## Overload Characteristics Graphs

The following graphs show the characteristics of the load rate and electronic thermal function's operation time.



When the torque command = 0, and a constant torque command is continuously applied after three or more times the overload time constant has elapsed, the overload time  $t$  [s] will be:

$$t \text{ [s]} = - \text{Overload time constant [s]} \times \log_e (1 - \text{Overload level [\%]} / \text{Torque command [\%]})^2$$

(The overload time constant [s] depends on the Servomotor. The standard overload level is 115%.)

### Precautions for Correct Use

- Overload (alarm code 16) cannot be reset for approximately 10 seconds after its occurrence.

## 8-5 Periodic Maintenance



### Caution



Resume operation only after transferring to the new Unit the contents of the data required for operation. Not doing so may result in equipment damage.



Do not attempt to disassemble or repair any of the products. Any attempt to do so may result in electric shock or injury.

Servomotors and Servo Drives contain many components and will operate properly only when each of the individual components is operating properly.

Some of the electrical and mechanical components require maintenance depending on application conditions. Periodic inspection and part replacement are necessary to ensure proper long-term operation of Servomotors and Servo Drives. (quotes from "The Recommendation for Periodic Maintenance of a General-purpose Inverter" published by JEMA)

The periodic maintenance cycle depends on the installation environment and application conditions of the Servomotor or Servo Drive.

Recommended maintenance times are listed below for Servomotors and Servo Drives. Use these for reference in determining actual maintenance schedules.

### Servomotor Service Life

- The service life for components is listed below.

Bearings: 20,000 hours

Decelerator: 20,000 hours

Oil seal: 5,000 hours

Encoder: 30,000 hours

These values presume an ambient Servomotor operating temperature of 40°C, shaft loads within the allowable range, rated operation (rated torque and rated r/min), and proper installation as described in this manual.

The oil seal can be replaced.

- The radial loads during operation (rotation) on timing pulleys and other components contacting belts is twice the still load. Consult with the belt and pulley manufacturers and adjust designs and system settings so that the allowable shaft load is not exceeded even during operation. If a Servomotor is used under a shaft load exceeding the allowable limit, the Servomotor shaft can break, the bearings can burn out, and other problems can occur.

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## Servo Drive Service Life

- Details on the service life of the Servo Drive are provided below.
  - Aluminum electrolytic capacitors: 28,000 hours  
(at an ambient Servo Drive operating temperature of 55°C, the rated operation output (rated torque), installed as described in this manual.)
  - Axial fan: 10,000 to 30,000 hours
  - Inrush current prevention relay: Approx. 20,000 operations (The service life depends on the operating conditions.)
- When using the Servo Drive in continuous operation, use fans or air conditioners to maintain an ambient operating temperature below 40°C.
- We recommend that ambient operating temperature and the power ON time be reduced as much as possible to lengthen the service life of the Servo Drive.
- The life of aluminum electrolytic capacitors is greatly affected by the ambient operating temperature. Generally speaking, an increase of 10°C in the ambient operating temperature will reduce capacitor life by 50%.
- The aluminum electrolytic capacitors deteriorate even when the Servo Drive is stored with no power supplied. If the Servo Drive is not used for a long time, we recommend a periodic inspection and part replacement schedule of five years.
- If the Servomotor or Servo Drive is not to be used for a long time, or if they are to be used under conditions worse than those described above, a periodic inspection schedule of five years is recommended.
- Upon request, OMRON will examine the Servo Drive and Servomotor and determine if a replacement is required.

## Replacing the Absolute Encoder Battery **ABS**

Replace the Absolute Encoder Backup Battery if it has been used for more than three years or if an absolute encoder system down error (alarm code 40) has occurred.

### ■ Replacement Battery Model and Specifications

Item	Specifications
Name	Absolute Encoder Backup Battery
Model	R88A-BAT01G
Battery model	ER6V (Toshiba)
Battery voltage	3.6 V
Current capacity	2000 mA·h

### ■ Mounting the Backup Battery

#### Mounting the Battery for the First Time

Connect the absolute encoder battery to the Servomotor, and then set up the absolute encoder.

Refer to *Absolute Encoder Setup Procedure* on page 6-5.

Once the absolute encoder battery is attached, it is recommended that the control power supply be turned ON and OFF once a day to refresh the battery.

If you neglect to refresh the battery, battery errors will occur due to voltage delay in the battery.

#### Replacing the Battery

If a battery alarm occurs, the absolute encoder battery must be replaced.

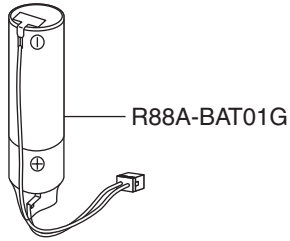
Replace the battery with the control power supply of the Servo Drive ON. If the battery is replaced with the control power supply of the Servo Drive OFF, data held in the encoder will be lost. Once the absolute encoder battery has been replaced, clear the battery alarm from the front panel. Refer to *Alarm Reset* on page 6-21 for information on clearing alarms.

**Note** If the absolute encoder is cleared using the front panel or the absolute values are cleared using communications, all error and rotation data will be lost and the absolute encoder must be set up. Refer to *Absolute Encoder Setup Procedure* on page 6-5.

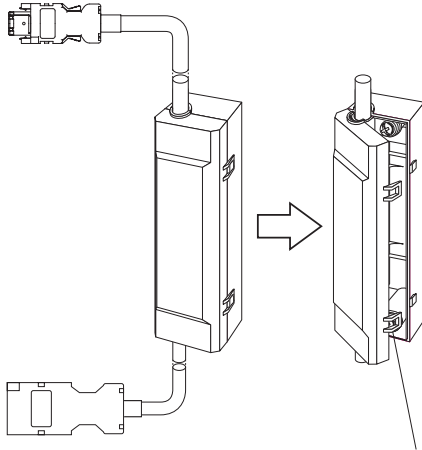


**Battery Mounting Procedure**

1. Prepare the R88A-BAT01G replacement battery.

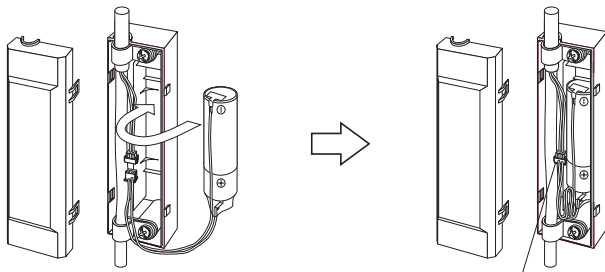


2. Remove the battery box cover.



Raise the hooks to remove the cover.

3. Put the battery into the battery box.



Insert the battery.

Attach the connector.

4. Close the cover to the battery box.

