

# 11

## Error and Maintenance

This chapter explains the items to check when problems occur, error diagnosis using the alarm LED display and measures, error diagnosis based on the operating condition and measures, and periodic maintenance.

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# 11-1 Error Processing

## Preliminary Checks When a Problem Occurs

This section explains the preliminary checks and analytical softwares 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 terminal (L1, L2, L3)

R88D-KNxL-ML2 (50 to 400 W) : Single-phase 100 to 120 VAC (85 to 132 V) 50/60 Hz

R88D-KNxH-ML2 (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) : 3-phase 200 to 240 VAC (170 to 264 V) 50/60 Hz

(2 to 5 kW) : 3-phase 200 to 230 VAC (170 to 253 V) 50/60 Hz

R88D-KNxF-ML2 (750 W to 5 kW) : 3-phase 380 to 480 VAC (323 to 528 V) 50/60 Hz

Control circuit power supply input terminal (L1C, L2C)

R88D-KNxL-ML2 (50 to 400 W) : Single-phase 100 to 120 VAC (85 to 132 V) 50/60 Hz

R88D-KNxH-ML2 (100 W to 1.5 kW) : Single-phase 200 to 240 VAC (170 to 264 V) 50/60 Hz

(2 to 5 kW) : Single-phase 200 to 230 VAC (170 to 253 V) 50/60 Hz

R88D-KNxF-ML2 (750 W to 5 kW) : 24 VDC (21.6 to 26.4 V)

If the voltage is out 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 out of this range, there is a risk of operation failure. Be sure that the power supply is correct.

### Checking Whether an Alarm Has Occurred

- ♦ Make an analysis using the 7-segment LED display area in the front of the Servo Drive and using the Operation keys.
- ♦ When an alarm has occurred  
... Check the alarm display that displays (xx) and make an analysis based on the alarm that is indicated.
- ♦ When an alarm has not occurred  
... Make an analysis according to the error conditions.
- ♦ In either case, refer to "11-4 Troubleshooting (P.11-15)" for details.

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## Precautions When a Problem Occurs

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 wire before checking for cable 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 motor may run away, or an error may occur. Be sure to disconnect the motor from the mechanical system before checking the encoder signal.
- ♦ When measuring the encoder output, perform the measurement based on the GND (CN1 pin 16). 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 motor runs away.  
Before performing the tests, verify that you can immediately stop the machine using an emergency stop even if it runs away.

### Replacing the Servomotor and Servo Drive

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

#### Replacing the Servomotor

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- 1. Replace the motor.**
- 2. Perform origin adjustment (for position control).**
  - ♦ When the motor is replaced, the motor's origin position (phase Z) may deviate, so origin adjustment must be performed.
  - ♦ Refer to the Position Controller's manual for details on performing origin adjustment.
- 3. Set up the absolute encoder.**
  - ♦ If a motor with an absolute encoder is used, the absolute value data in the absolute encoder is cleared when the motor is replaced, so setup is again required.  
The multi-rotation data will be different from before it was replaced, so reset the initial Motion Control Unit parameters.
  - ♦ For details, refer to "Absolute Encoder Setup" (P.9-6).

#### Replacing the Servo Drive

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- 1. Copy the parameters.**

Use the Operation keys on the Servo Drive to write down all the contents of parameter settings.
- 2. Replace the Servo Drive.**
- 3. Set the parameters.**

Use the Operation keys on the Servo Drive to set all the parameters.
- 4. Set up the absolute encoder.**
  - ♦ If a motor with an absolute encoder is used, the absolute value data in the absolute encoder is cleared when the Servo Drive is replaced, so setup is again required.  
The multi-rotation data will be different from before it was replaced, so reset the initial Motion Control Unit parameters.
  - ♦ For details, refer to "Absolute Encoder Setup" (P.9-6).

# 11-2 Warning

This function outputs a warning signal and notifies the erroneous state such as overload before an alarm starts to operate.

Set the warning output type to Warning Output Selection 1 (Pn440) and Warning Output Selection 2 (Pn441). Refer to the description about the Warning Output Selection 1 (Pn440) and the Warning Output Selection 2 (Pn441) in Section 8-5 Interface Monitor Setting Parameter, and those about the Warning Mask Setting (Pn638) and the Communications Control (Pn800) in “8-7 Special Parameters”.



## Precautions for Correct Use

- ♦ All warnings are retained. To reset the retained warnings, take the same procedures as resetting the usual alarms.

## Warning List

### General Warnings

Warning number	Warning name	Warning occurrence condition	Warning Output Selection (Pn440, Pn441) *1	Warning Mask Setting (Pn638) *2
A0	Overload warning	The load ratio is 85% or more of the protection level.	1	bit7
A1	Excessive regeneration warning	The regeneration load ratio is 85% or more of the protection level.	2	bit5
A2	Battery warning	Battery voltage is 3.2 V or less.	3	bit0
A3	Fan warning	The fan stop status continues for 1 second.	4	bit6
A4	Encoder communications warning	The encoder communications errors occurred in series more frequently than the specified value.	5	bit4
A5	Encoder overheating warning	The encoder detects the overheat warning.	6	bit3
A6	Vibration detection warning	Vibrating is detected.	7	bit9
A7	Life expectancy warning	The life expectancy of the capacitor or the fan is shorter than the specified value.	8	bit2
A8	External encoder error warning	The external encoder detects a warning.	9	bit8
A9	External encoder communications warning	The external encoder has communications errors in series more than the specified value.	10	bit10

\*1. Set the Warning Output Selection 1 (Pn440) by the warning type to output to the Warning Output 1 (WARN1), and the Warning Output Selection 2 (Pn441) by the type to output to the Warning Output 2 (WARN2). If you set this to 0, all warning types are output.

\*2. Each warning detection can be masked using the Warning Mask Setting (Pn638). The table shows the corresponding bits.

When the bit is set to 1, the warning detection is masked.

### Warnings related to MECHATROLINK-II Communications

Warning number	Warning name	Warning occurrence condition	Warning Output Selection (Pn440, Pn441) *1	Communications Control (Pn800) *2
94	Data setting warning	<ul style="list-style-type: none"> <li>The set value on the command argument is out of the specified range.</li> <li>Parameter writing fails.</li> <li>The command set value is incorrect.</li> </ul>	11	bit4
95	Command warning	<ul style="list-style-type: none"> <li>The command transmission conditions are not met.</li> <li>The sub-command transmission conditions are not met.</li> <li>A rotation command is given in the prohibited direction after the motor made an emergency stop due to a drive prohibition input.</li> </ul>	12	bit5
96	MECHATROLINK-II communications warning	One or more MECHATROLINK-II communications error occur.	13	bit6

\*1. Set the Warning Output Selection (Pn440) by the warning type to output to the Warning Output 1 (WARN1), and the Warning Output Selection 2 (Pn441) by the type to output to the Warning Output 2 (WARN2).

\*2. The MECHATROLINK-II communications warning detections can be masked by the setting on the Communications Control (Pn800). The table above shows the corresponding bits. The warning detection is masked when you set the corresponding bit to 1.

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# 11-3 Alarms

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If the Servo Drive detects an error, it outputs an alarm (ALM), turns off the power drive circuit, and displays the error number on the front panel.



## Precautions for Correct Use

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- ♦ Refer to "Error Diagnosis Using the Alarm Displays" (P.11-15) for appropriate alarm measures.
- ♦ Reset the alarm using one of the following methods. Remove the cause of the alarm first.
  - Turn OFF the power supply, then turn it ON again.
  - Reset the alarm via MECHATROLINK-II communications or on CX-Drive.

However, some alarms can only be reset by turning the power supply OFF then ON again. Refer to the "Alarm List" (P.11-7).

- ♦ If you reset an alarm while the operation command (RUN) is turned ON, the Servo Drive starts operation as soon as the alarm is released, which is dangerous. Be sure to turn OFF the RUN before clearing the alarm.

If the RUN is always ON, first check safety sufficiently before clearing the alarm.

- ♦ The Overload (Alarm No.16) cannot be reset for 10 seconds once it occurs.
  - ♦ Any displays such as hh, FF, and HH on the error number mean internal malfunction on the MPU. Cut off the power immediately when you encounter such a case.
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**Alarm List**

Alarm number		Error detection function	Detection details and probable cause	Attribute		
Main	Sub			History	Can be reset	Emergency stop *1
11	0	Control power supply undervoltage	The DC voltage of the main circuit fell below the specified value.	–	√	–
12	0	Overvoltage	The DC voltage in the main circuit is abnormally high.	√	√	–
13	0	Main power supply undervoltage (Insufficient voltage between P and N)	The DC voltage of the main circuit is low.	–	√	–
	1	Main power supply undervoltage (AC cut-off detection)	A location was detected where the main circuit AC power supply is cut off.	–	√	–
14	0	Overcurrent	Overcurrent flowed to the IGBT.	√	–	–
	1	IPM error	Motor power line ground fault or short circuit.	√	–	–
15	0	Servo Drive overheat	The temperature of the Servo Drive radiator exceeded the specified value.	√	–	√
16	0	Overload	Operation was performed with torque significantly exceeding the rating for several seconds to several tens of seconds.	√	√*2	–
18	0	Regeneration overload	The regenerative energy exceeds the processing capacity of the Regeneration Resistor.	√	–	√
	1	Regeneration Tr error	An error was detected in a Servo Drive regeneration drive Tr.	√	–	–
21	0	Encoder communications disconnection error	The encoder wiring is disconnected.	√	–	–
	1	Encoder communications error	An encoder communications error was detected.	√	–	–
23	0	Encoder communications data error	Communications cannot be performed between the encoder and the Servo Drive.	√	–	–
24	0	Error counter overflow	The error counter accumulated pulse exceeds the set value for the Error Counter Overflow Level (Pn014).	√	√	√
25	0	Excessive hybrid error	During full closing control, difference between the load position from external encoder and the motor position from to encoder was larger than the pulse set by the Internal/ External Feedback Pulse Error Counter Overflow Level (Pn328).	√	–	√



Alarm number		Error detection function	Detection details and probable cause	Attribute		
Main	Sub			History	Can be reset	Emergency stop*1
26	0	Overspeed	The motor rotation speed exceeded the value set on the Overspeed Detection Level Setting (Pn513).	√	√	√
	1	Overspeed 2	The motor rotation speed exceeded the value set on the Overspeed Detection Level Setting at Emergency Stop (Pn615).	√	√	–
27	1	Absolute value cleared	The multi-turn counter for the absolute encoder was cleared by the CX-Drive.	√	–	–
	4	Command error	The position command variation after the electronic gear is higher than the specified value.	√	–	–
	5	Command generation error	During the position command processing, an error such as the "over the calculation range" occurred.	√	–	–
	6	Operation command duplicated	During a trial operation of CX-Drive, MECHATROLINK-II communication was established.	√	√	–
29	1	Internal error counter overflow 1	During the initialization of position data, after the control power is turned on in absolute value mode or after CONFIG operation, the value that is obtained by dividing the Absolute encoder position (pulse unit) by the Electronic gear ratio exceeded $\pm 2^{31}$ or 2147483648.	√	–	–
	2	Internal error counter overflow 2	The position error in units of pulse exceeded $\pm 2^{29}$ or 536870912. Alternatively, the position command in command units exceeded $\pm 2^{30}$ or 1073741824.	√	–	–
	3	Internal error counter overflow 3	The value that is obtained by multiplying the Final Distance for Origin Return (Pn825) by the Electronic gear ratio exceeded $\pm 2^{31}$ or 2147483648.	√	–	–
30 (st)	0	Safety input error	Safety input signal turned OFF.	–	√	–

Alarm number		Error detection function	Detection details and probable cause	Attribute		
Main	Sub			History	Can be reset	Emergency stop *1
33	0	Interface input duplicate allocation error 1	Detected a duplicated setting among the interface input signals (IN1, IN2, IN3 and IN4).	√	–	–
	1	Interface input duplicate allocation error 2	Detected a duplicated setting among the interface input signals (IN5, IN6, IN7 and IN8).	√	–	–
	2	Interface input function number error 1	Detected that a non-defined number was assigned to the interface input signals (IN1, IN2, IN3 or IN4). Alternatively, a setting error was detected.	√	–	–
	3	Interface input function number error 2	Detected that a non-defined number was assigned to the interface input signals (IN5, IN6, IN7 or IN8). Alternatively, a setting error was detected.	√	–	–
	4	Interface output function number error 1	Detected that a non-defined number was assigned to the interface output signal (OUTM1).	√	–	–
	5	Interface output function number error 2	Detected that a non-defined number was assigned to the interface output signal (OUTM2).	√	–	–
	8	Latch input allocation error	Detected an error on the latch input allocation.	√	–	–
34	0	Overrun limit error	The motor exceeded the allowable operating range set in the Overrun Limit Setting (Pn514) with respect to the position command input.	√	√	–
36	0 to 2	Parameter error	Data in the Parameter Save area was corrupted when the power supply was turned ON and data was read from the EEPROM.	–	–	–
37	0 to 2	Parameters destruction	The checksum for the data read from the EEPROM when the power supply was turned ON does not match.	–	–	–

Alarm number		Error detection function	Detection details and probable cause	Attribute		
Main	Sub			History	Can be reset	Emergency stop*1
38	0	Drive prohibition input error 1	Both the Forward Drive Prohibition Input (POT) and the Reverse Drive Prohibition Input (NOT) were turned on while the Drive Prohibition Input Selection (Pn504) was set to 0. Alternatively, either the Forward Drive Prohibition Input (POT) or the Reverse Drive Prohibition Input (NOT) was turned on while the Drive Prohibition Input Selection (Pn504) was set to 2.	-	√	-
	1	Drive prohibition input error 2	An operation command such as jog was made by CX-Drive, while the Drive Prohibition Input Selection (Pn504) was set to 0, the MECHATROLINK-II communications was cut off, and either the Forward Drive Prohibition Input (POT) or the Reverse Drive Prohibition Input (NOT) was turned on. Both the Forward Drive Prohibition Input (POT) and the Reverse Drive Prohibition Input (NOT) were turned on. Alternatively, either the Forward Drive Prohibition Input (POT) or the Reverse Drive Prohibition Input (NOT) was turned on while an operation command is given by CX-Drive.	-	√	-
40	0	Absolute encoder system down error <b>ABS</b>	The voltage supplied to the absolute encoder is lower than the specified value.	√	√*3	-
41	0	Absolute encoder counter overflow error <b>ABS</b>	The multi-rotation counter of the absolute encoder exceeds the specified value.	√	-	-
42	0	Absolute encoder overspeed error <b>ABS</b>	The motor rotation speed exceeds the specified value when only the battery power supply of the absolute encoder is used.	√	√*3	-
43	0	Encoder initialization error	An encoder initialization error was detected.	√	-	-
44	0	Absolute encoder 1-rotation counter error <b>ABS</b>	A 1-turn counter error was detected.	√	-	-
45	0	Absolute encoder multi-rotation counter error <b>ABS</b>	A multi-rotation counter error or phase-AB signal error was detected.	√	-	-
47	0	Absolute encoder status error <b>ABS</b>	The rotation of the absolute encoder is higher than the specified value.	√	-	-
48	0	Encoder phase-Z error	A serial incremental encoder phase Z pulse irregularity was detected.	√	-	-
49	0	Encoder CS signal error	A logic error was detected in the CS signal for serial incremental encoder.	√	-	-

Alarm number		Error detection function	Detection details and probable cause	Attribute		
Main	Sub			History	Can be reset	Emergency stop *1
50	0	External encoder connection error	An error was detected in external encoder connection.	√	–	–
	1	External encoder communications data error	An error was detected in external encoder communications data.	√	–	–
51	0	External encoder status error 0	An external encoder error code was detected.	√	–	–
	1	External encoder status error 1		√	–	–
	2	External encoder status error 2		√	–	–
	3	External encoder status error 3		√	–	–
	4	External encoder status error 4		√	–	–
	5	External encoder status error 5		√	–	–
55	0	Phase-A connection error	An error was detected in the external encoder phase A connection.	√	–	–
	1	Phase-B connection error	An error was detected in the external encoder phase B connection.	√	–	–
	2	Phase-Z connection error	An error was detected in the external encoder phase Z connection.	√	–	–
82	0	Node address setting error	The node address set by the rotary switches on the Drive exceeded the setting range, when the control power was turned on.	√	–	–
83	0	Communications error	Failures to correctly receive the data to receive during the MECHATROLINK-II communication cycles continued in series more often than the value set on the Communications Control (Pn800).	√	√	√
84	0	Transmission cycle error	Failed to receive synchronization frames (SYNC) according to transmission cycle while the MECHATROLINK-II communication connection is being established.	√	√	√
	3	Synchronization error	An error occurred while synchronization is established.	√	–	–
	4	SYNC_SET error	In the asynchronous MECHATROLINK-II communications state, a communication error occurs while SYNC_SET command is executed.	√	√	–
86	0	Watchdog data error	An error occurred in the synchronization data that is exchanged between Master and Slave nodes for every MECHATROLINK-II communications cycle.	√	√	√
87	0	Forced alarm input error	The forced alarm input signal was input.	–	√	–

Alarm number		Error detection function	Detection details and probable cause	Attribute		
Main	Sub			History	Can be reset	Emergency stop*1
90	0	Transmission cycle setting error	Transmission cycle has a setting error when the MECHATROLINK-II CONNECT command is received.	√	√	–
	1	CONNECT error	In the standby state for a MECHATROLINK-II communications CONNECT command, a communications error occurred when the CONNECT command is received.	√	√	–
91	0	SYNC command error	During asynchronous MECHATROLINK-II communications, a synchronous type of command is issued.	√	√	√
92	0	Encoder data restoration error	In semi-closing control mode and absolute value mode as well, initialization of internal position data is not processed correctly.	√	–	–
	1	External encoder data restoration error	In FULL CLOSING CONTROL mode and absolute value mode as well, initialization of internal position data is not processed correctly.	√	–	–
93	0	Parameter setting error 1	Electronic gear ratio exceeded the allowable range.	√	–	–
	2	Parameter setting error 2	External encoder ratio exceeded the allowable range.	√	–	–
	3	External encoder connection error	The value set on the External Feedback Pulse Type Selection (Pn323) differs from the external encoder type that is connected for serial communications.	√	–	–
95	0 to 4	Motor 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.	–	–	–

\*1. An emergency stop means that there is an error causing an immediate stop when the Stop Selection for Alarm Detection (Pn510) is set to a value between 4 and 7. Refer to the description about the Stop Selection for Alarm Detection (Pn510) in “8-6 Extended parameters”.

\*2. The alarm is not reset for 10 seconds once it occurs.

\*3. The alarm cannot be reset unless the absolute value is cleared.

Note 1. If an unresettable alarm occurs, remove the error factor, cut off the control power to reset the alarm.

2. If a resettable alarm occurs, reset the alarm via MECHATROLINK-II communications or on the CX-Drive.

3. Any displays such as hh, FF, and HH on the error number mean internal malfunction on the MPU. Cut off the power immediately when you encounter such a case.

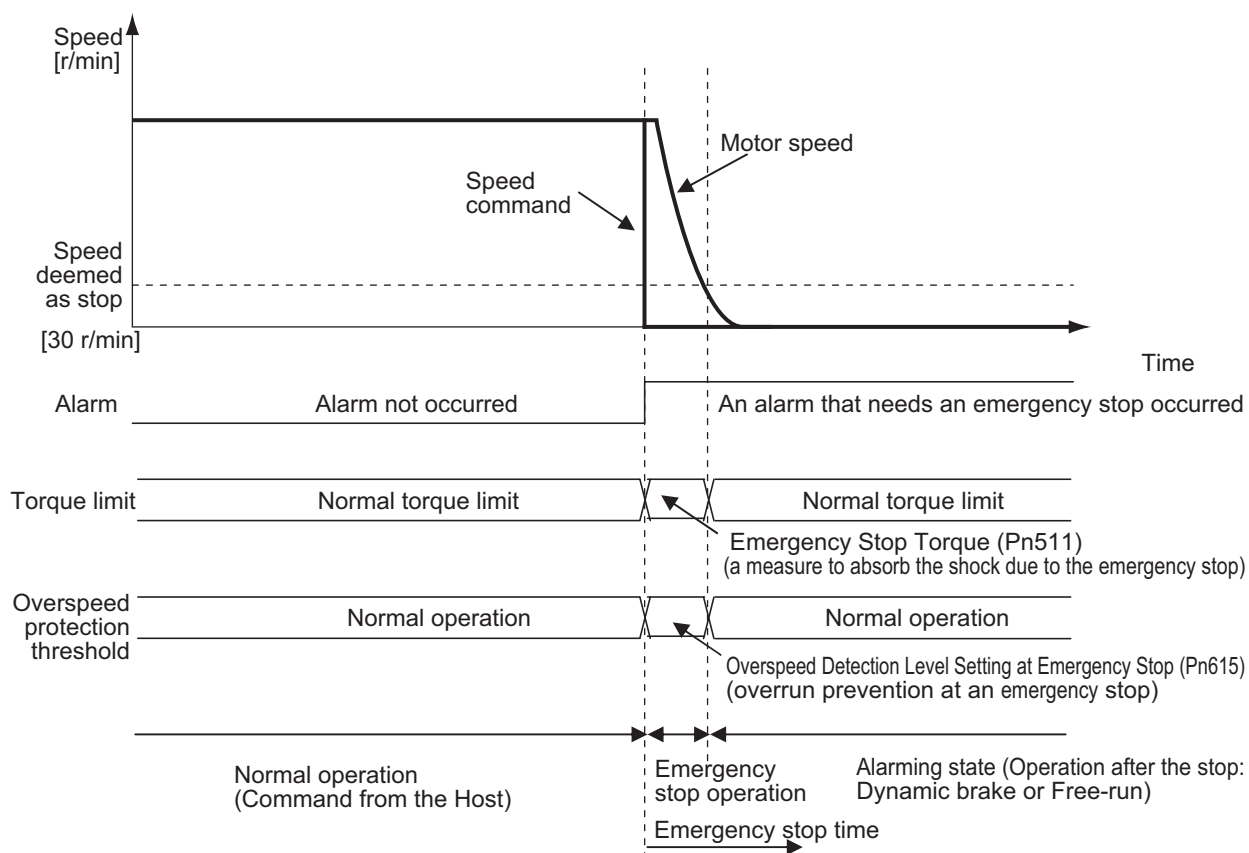
## Emergency Stop Operation at Alarms

The emergency stop function controls the motor and stop it immediately, if an alarm that supports for emergency stop occurs.

### Related Parameters

Parameter number	Parameter name	Explanation	Reference
Pn510	Stop Selection for Alarm Detection	Set the states during deceleration and after stop, when an alarm occurs.	P.8-46
Pn511	Emergency Stop Torque	Set the torque limit for emergency stops.	P.8-47
Pn513	Overspeed Detection Level Setting	If the motor rotation speed exceeds the set value, the Overspeed (Alarm No.26.0) occurs.	P.8-47
Pn614	Alarm Detection Allowable Time Setting	Set the allowable time required until the motor stops by an emergency stop due to an alarm.	P.8-54
Pn615	Overspeed Detection Level Setting at Emergency Stop	If the motor speed exceeds the set value during an emergency stop due to an alarm, the Overspeed 2 (Alarm No.26.1) occurs.	P.8-54

## Emergency Stop Operation



### Precautions for Correct Use

- ◆ As the prevention of overrun at an emergency stop, set the allowable overspeed level on the Overspeed Detection Level Setting at Emergency Stop (Pn615). The Overspeed 2 (Alarm No.26.1) is the alarm that does not support emergency stop. If it occurs, error trip occurs immediately.
- ◆ Set a higher value on the Overspeed Detection Level Setting at Emergency Stop (Pn615) than one on the Overspeed Detection Level Setting (Pn513). Otherwise, the Overspeed 2 (Alarm No.26.1) occurs earlier than the Overspeed (Alarm No.26.0). Thus an emergency stop does not happen. If the Overspeed (Alarm No.26.0) and the Overspeed 2 (Alarm No.26.1) occur at the same time, the emergency stop does not happen, either.
- ◆ If the actual rotation speed is not lower than 30 r/min after the time set on the Alarm Detection Allowable Time Setting (Pn614) elapses since an alarm that support an emergency stop occurs, it will be an alarming state immediately.
- ◆ If an alarm which is not supported by emergency stop operation occurs while in emergency stop, Alarming state occurs immediately.

# 11-4 Troubleshooting

If an error occurs in the machine, determine the error conditions from the alarm displays and operation status, identify the cause of the error, and take appropriate measures.

## Error Diagnosis Using the Alarm Displays

Alarm number	Error conditions	Status when error occurs	Cause	Measures
11	Power supply undervoltage	Occurs when the power 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>
12	Overvoltage	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>Main circuit power supply voltage is out of allowable range.</li> </ul>	<ul style="list-style-type: none"> <li>Change the main circuit power supply voltage to within allowable range.</li> </ul>
			<ul style="list-style-type: none"> <li>Load inertia is too large.</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>
		Occurs during descent (vertical axis).	<ul style="list-style-type: none"> <li>Main circuit power supply voltage is out of allowable range.</li> </ul>	<ul style="list-style-type: none"> <li>Change the main circuit power supply voltage to within allowable range.</li> </ul>
			<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>



Alarm number	Error conditions	Status when error occurs	Cause	Measures
13	Main circuit power supply undervoltage	Occurs when the servo 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 (Pn509).</li> </ul>
		Occurs when the power supply is turned ON.	Phase loss	<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 damage.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
14	Overcurrent	Occurs when the servo is turned ON.	Control PCB error	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
			<ul style="list-style-type: none"> <li>The motor 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 power line.</li> <li>Measure the insulation resistance at the motor and, if there is a short circuit, replace the motor.</li> </ul>
			Phase U, phase V, phase W, and the ground are wired incorrectly.	<ul style="list-style-type: none"> <li>Wire correctly.</li> </ul>
			Motor winding is burned out.	<ul style="list-style-type: none"> <li>Measure the winding resistance, and if the winding is burned out, replace the motor.</li> </ul>
			The relay for the dynamic brake has been deposited.	<ul style="list-style-type: none"> <li>Do not frequently input the operation command (RUN) input.</li> <li>Do not operate the system by turning the servo ON and OFF.</li> </ul>
			Motor non-conformity	<ul style="list-style-type: none"> <li>Use a Servomotor that is appropriate for use with the Servo Drive.</li> </ul>
			The pulse input timing is too early.	<ul style="list-style-type: none"> <li>Wait at least 100 ms before inputting pulses after turning ON the operation command (RUN).</li> </ul>
			The resistor in the Servo Drive is abnormally overheating.	<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 does not click when the power supply is turned ON, replace the Servo Drive.</li> </ul>

## 11-4 Troubleshooting

Alarm number	Error conditions	Status when error occurs	Cause	Measures
15	Servo Drive overheat	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 driver and motor.</li> <li>Reduce the load.</li> <li>Extend the acceleration/ deceleration times.</li> </ul>
16	Overload	Occurs when the servo is turned ON.	<ul style="list-style-type: none"> <li>There is an error in the motor wiring (the wiring or the connections are faulty).</li> </ul>	<ul style="list-style-type: none"> <li>Wire the motor 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>
			<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>
		Occurs during operation.	<ul style="list-style-type: none"> <li>The effective torque exceeds the rated torque.</li> <li>The initial 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 motor capacity.</li> </ul>
			<ul style="list-style-type: none"> <li>Unusual noise 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>			
18	Regeneration overload	Occurs when the motor is decelerating.	<ul style="list-style-type: none"> <li>Load inertia is too large.</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 motor rotation speed is too high.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the motor 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% duty.</li> </ul>	<ul style="list-style-type: none"> <li>Set the Regeneration Resistor Selection (Pn016) to 2. Refer to "Basic Parameters" (P.8-1)</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>The operating limit of the External Regeneration Resistor is limited to 10% duty.</li> </ul>		<ul style="list-style-type: none"> <li>Set the Regeneration Resistor Selection (Pn016) to 2. Refer to "Basic Parameters" (P.8-1)</li> </ul>

Alarm number	Error conditions	Status when error occurs	Cause	Measures
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>Wire correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>The encoder is wired incorrectly.</li> </ul>	<ul style="list-style-type: none"> <li>Wire correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>The encoder is damaged.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the motor.</li> </ul>
			<ul style="list-style-type: none"> <li>The 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 motor is mechanically held.</li> </ul>	<ul style="list-style-type: none"> <li>If the motor shaft is held, release it.</li> </ul>
23	Encoder communications data error	Occurs when the power supply is turned ON. Or, occurs during operation.	<ul style="list-style-type: none"> <li>The encoder signal line is wired incorrectly.</li> </ul>	<ul style="list-style-type: none"> <li>Wire correctly.</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 encoder power supply voltage 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 ± 5%).</li> </ul>
24	Error counter overflow	Occurs when the motor does not rotate even when command pulses are input.	<ul style="list-style-type: none"> <li>The motor power line or the encoder wiring is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>Wire correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>The motor is mechanically held.</li> </ul>	<ul style="list-style-type: none"> <li>If the motor shaft is held, release it.</li> <li>Release the electromagnetic 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 motor power line or the encoder wiring is incorrect.</li> </ul>	<ul style="list-style-type: none"> <li>Wire correctly.</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/ deceleration is too rapid.</li> </ul>	<ul style="list-style-type: none"> <li>Extend the acceleration/ deceleration times.</li> </ul>
			<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 motor.</li> </ul>
Occurs during operation.	<ul style="list-style-type: none"> <li>The set value for the Error Counter Overflow Level (Pn014) is exceeded.</li> </ul>	<ul style="list-style-type: none"> <li>Increase the set value of Pn014.</li> <li>Reduce the rotation speed.</li> <li>Reduce the load.</li> <li>Extend the acceleration/ deceleration times.</li> </ul>		

## 11-4 Troubleshooting

Alarm number	Error conditions	Status when error occurs	Cause	Measures
25	Excessive hybrid deviation error	Occurs for full closing control.	<ul style="list-style-type: none"> <li>There is deviation between the load position according to the external encoder and the motor position according to the encoder.</li> </ul>	<ul style="list-style-type: none"> <li>Check the motor and load connection.</li> <li>Check the external encoder and drive connection.</li> <li>Check the external encoder load position and encoder motor position settings.</li> </ul>
26	Overspeed	Occurs during high-speed rotation.	<ul style="list-style-type: none"> <li>The speed command input is too large.</li> </ul>	<ul style="list-style-type: none"> <li>Give a speed command of 500 Kpps or lower.</li> </ul>
			<ul style="list-style-type: none"> <li>The setting for the Electronic Gear Ratio Numerator (Pn009) is not appropriate.</li> </ul>	<ul style="list-style-type: none"> <li>Set the electronic gear ratio in a way to give the speed command of 500 Kpps or lower.</li> </ul>
			<ul style="list-style-type: none"> <li>The speed exceeds the maximum rotation speed due to overshooting.</li> </ul>	<ul style="list-style-type: none"> <li>Adjust the gain.</li> <li>Reduce the maximum command speed.</li> </ul>
		<ul style="list-style-type: none"> <li>The encoder is wired incorrectly.</li> </ul>	<ul style="list-style-type: none"> <li>Wire correctly.</li> </ul>	
		Occurs when torque limit switching function is used.	<ul style="list-style-type: none"> <li>The set value for the Overspeed Detection Level Setting (Pn513) is exceeded.</li> </ul>	<ul style="list-style-type: none"> <li>When the torque limit switching function is used, set the motor operating speed range correctly on the Error Counter Overflow Level (Pn014).</li> </ul>
27	Command pulse error	Occurs during a trial operation.	<ul style="list-style-type: none"> <li>The multi-turn counter of the absolute encoder was cleared by the CX-Drive.</li> </ul>	<ul style="list-style-type: none"> <li>Turn off the control power, and turn it on again.</li> </ul>
			<ul style="list-style-type: none"> <li>MECHATROLINK-II communication is established during CX-Drive trial operation.</li> </ul>	<ul style="list-style-type: none"> <li>Do not establish MECHATROLINK-II communications during CX-Drive trial operation.</li> </ul>
		Occurs when control signal is input or command is input.	<ul style="list-style-type: none"> <li>The speed command exceeds the limit.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm the speed command.</li> </ul>
			<ul style="list-style-type: none"> <li>The position command variation during interpolation and others is too large.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm the position command variation volume.</li> </ul>
		<ul style="list-style-type: none"> <li>The setting for the Electronic Gear Ratio Numerator (Pn009) is not appropriate.</li> </ul>	<ul style="list-style-type: none"> <li>Set the electronic gear ratio numerator so that the command pulse frequency is 500 Kpps max.</li> </ul>	
		<ul style="list-style-type: none"> <li>Backlash compensation amount is too large.</li> </ul>	<ul style="list-style-type: none"> <li>Reduce the backlash compensation amount.</li> </ul>	

Alarm number	Error conditions	Status when error occurs	Cause	Measures
29	Error counter overflow	Occurs when the control power is turned ON. <b>ABS</b>	<ul style="list-style-type: none"> <li>During the initialization of position data, the value that is obtained by dividing the Absolute encoder position (pulse unit) by the Electronic gear ratio exceeded <math>\pm 2^{31}</math> (or 2147483648).</li> </ul>	<ul style="list-style-type: none"> <li>Review the operation range of Absolute encoder position and the electronic gear ratio.</li> </ul>
		Occurs during operation.	<ul style="list-style-type: none"> <li>The error counter value for the encoder pulse reference exceeded <math>\pm 2^{29}</math> (536870912).</li> </ul>	<ul style="list-style-type: none"> <li>Check that the motor rotates in accordance with the position command.</li> <li>Check that the output torque is not saturated on the torque monitor.</li> <li>Adjust the gain.</li> <li>Maximize the set values on the No.1 Torque Limit (Pn013) and the No2. Torque Limit (Pn522).</li> <li>Wire the encoder correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>The position error in command unit exceeded <math>\pm 2^{30}</math> or 1073741824.</li> </ul>	<ul style="list-style-type: none"> <li>Check that the motor rotates in accordance with the position command.</li> <li>Check that the output torque is not saturated on the torque monitor.</li> <li>Adjust the gain.</li> <li>Maximize the set values on the No.1 Torque Limit (Pn013) and the No2. Torque Limit (Pn522).</li> <li>Wire the encoder correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>The value set on the Final Distance for Origin Return (Pn825).exceeded <math>\pm 2^{31}</math> (or 2147483648).</li> </ul>	<ul style="list-style-type: none"> <li>Review the value set on the Final Distance for Origin Return (Pn825) and for the electronic gear ratio.</li> </ul>
30 (st)	Safety input error	Occurs during operation.	<ul style="list-style-type: none"> <li>Safety input signal turned OFF.</li> </ul>	<ul style="list-style-type: none"> <li>Check the statuses of safety inputs 1 and 2.</li> </ul>

## 11-4 Troubleshooting

Alarm number	Error conditions	Status when error occurs	Cause	Measures
33	Interface I/O allocation error	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>There is a duplicate setting in the I/O signal function allocation.</li> <li>Specify the undefined number with the I/O signal function allocation.</li> </ul>	<ul style="list-style-type: none"> <li>Set the function allocation correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>The latch input function is allocated incorrectly.</li> </ul>	<ul style="list-style-type: none"> <li>Assign it to IN5, IN6 and IN7.</li> <li>Assign it in NO contact.</li> <li>Assignments in all modes must be the same.</li> </ul>
34	Overrun limit error	Occurs during operation.	<ul style="list-style-type: none"> <li>The Overrun Limit Setting (Pn514) was exceeded during operation.</li> </ul>	<ul style="list-style-type: none"> <li>Adjust the gain.</li> <li>Increase the set value of Pn514.</li> <li>Set Pn514 to 0 to disable the function.</li> </ul>
36	Parameter error	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>There are data errors in the parameters that were read.</li> </ul>	<ul style="list-style-type: none"> <li>Reset all parameters.</li> </ul>
			<ul style="list-style-type: none"> <li>The drive is faulty.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>
37	Parameters destruction	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The parameters that were read are corrupt.</li> </ul>	<ul style="list-style-type: none"> <li>Replace the Servo Drive.</li> </ul>

Alarm number	Error conditions	Status when error occurs	Cause	Measures
38	Drive prohibition input error	Occurs during a trial operation.	<ul style="list-style-type: none"> <li>During the trial operation, both the Forward Drive Prohibition (POT) input and the Reverse Drive Prohibition (NOT) input became off.</li> </ul>	<ul style="list-style-type: none"> <li>Wire correctly.</li> <li>Replace the limit sensor with a new one.</li> <li>Confirm that the control power is input correctly.</li> </ul>
			<ul style="list-style-type: none"> <li>An operation command was issued by the CX-Drive, when the Drive Prohibition Input Selection (Pn504) was set to 0, and either the Forward Drive Prohibition (POT) input or the Reverse Drive Prohibition (NOT) input was off.</li> </ul>	<ul style="list-style-type: none"> <li>Wire correctly.</li> <li>Replace the limit sensor with a new one.</li> <li>Confirm that the control power is input correctly.</li> <li>Move to the position where both POT and NOT do not turn off. Gain an operation command by the CX-Drive.</li> </ul>
		Occurs when the servo is turned ON. Or, occurs during operation.	<ul style="list-style-type: none"> <li>When the Drive Prohibition Input Selection (Pn504) was set to 0, both the Forward Drive Prohibition (POT) input and the Reverse Drive Prohibition (NOT) input were off simultaneously.</li> </ul>	<ul style="list-style-type: none"> <li>Wire correctly.</li> <li>Replace the limit sensor with a new one.</li> <li>Confirm that the control power is input correctly.</li> <li>Confirm that the Pn504 is set correctly.</li> </ul>
40	Absolute encoder system down error <b>ABS</b>	Occurs when the power supply is turned ON. Occurs 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-rotation 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 (Pn015).</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 motor 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>Reduce the motor rotation speed and supply power.</li> <li>Check the wiring.</li> </ul>
43	Encoder initialization error	Occurs when the power 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>

## 11-4 Troubleshooting

Alarm number	Error conditions	Status when error occurs	Cause	Measures
44	Absolute encoder 1-turn counter error <b>ABS</b>	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-rotation counter error <b>ABS</b>	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>
47	Absolute encoder status error <b>ABS</b>	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The motor was moving when the power supply was turned ON.</li> </ul>	<ul style="list-style-type: none"> <li>Do not let the motor 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>
50	External encoder communications error	Occurs during operation.	<ul style="list-style-type: none"> <li>The disconnection detection function was activated because communications between the external encoder and drive were interrupted.</li> </ul>	<ul style="list-style-type: none"> <li>Wire correctly.</li> <li>Fix the locations that are disconnected.</li> </ul>
			<ul style="list-style-type: none"> <li>There was a communications error in data from external encoder.</li> </ul>	<ul style="list-style-type: none"> <li>Provide the required external encoder power supply voltage.</li> <li>Wire correctly.</li> <li>Connect the shield to FG.</li> </ul>
51	External encoder status error	Occurs during operation.	<ul style="list-style-type: none"> <li>An external encoder error code was detected.</li> </ul>	<ul style="list-style-type: none"> <li>Check the external encoder specifications.</li> <li>From the front panel, clear the external encoder error, then turn the power supply OFF, then ON again.</li> </ul>
55	Phases-A, B and Z connection error	Occurs during operation.	<ul style="list-style-type: none"> <li>A disconnection or other error was detected in external encoder phase A, phase B, or phase Z connection.</li> </ul>	<ul style="list-style-type: none"> <li>Check the connection.</li> </ul>
82	Node address setting error	Occurs when the power is turned on.	<ul style="list-style-type: none"> <li>The node address set by the rotary switches on the Drive exceeded the setting range.</li> </ul>	<ul style="list-style-type: none"> <li>Set the rotary switches for node address setting correctly. Turn on the control power again.</li> </ul>



Alarm number	Error conditions	Status when error occurs	Cause	Measures
83	Communications error	Occurs during operation.	<ul style="list-style-type: none"> <li>The data to be received during the MECHATROLINK-II communication cycles was not received. The failures continued in series more often than the value set on the Communications Control Setting (Pn800).</li> </ul>	<ul style="list-style-type: none"> <li>Wire the MECHATROLINK-II communications cable correctly.</li> <li>Connect the Terminating Resistor correctly.</li> <li>Confirm that the MECHATROLINK-II communications cable does not have excessive noise. Mount a ferrite core to the communications cable.</li> <li>Increase the detection setting on the Pn800.</li> </ul>
84	Transmission cycle error	Occurs when the power is turned on.	<ul style="list-style-type: none"> <li>An error occurred when the synchronization is established.</li> </ul>	<ul style="list-style-type: none"> <li>Turn off the power once, and turn it on again.</li> <li>Replace the Servomotor.</li> <li>Replace the Servo Drive with a new one.</li> </ul>
		Occurs when the operation starts up.	<ul style="list-style-type: none"> <li>In the asynchronous MECHATROLINK-II communications state, a communication error occurs while SYNC_SET command is executed.</li> <li>While the MECHATROLINK-II communication connection is being established, the synchronization frames (SYNC) were not received according to transmission cycle.</li> </ul>	<ul style="list-style-type: none"> <li>Wire the MECHATROLINK-II communications cable correctly.</li> <li>Connect the Terminating Resistor correctly.</li> <li>Confirm the MECHATROLINK-II communications cable do not have excessive noise. Mount a ferrite core to the communications cable.</li> </ul>
86	Watchdog data error	Occurs during operation.	<ul style="list-style-type: none"> <li>An error occurred in the synchronization data of MECHATROLINK-II communications.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm the updating process of the watchdog data by the host controller.</li> </ul>
87	Forced alarm input error	Occurs during operation.	<ul style="list-style-type: none"> <li>An Emergency Stop (STOP) signal was entered.</li> </ul>	<ul style="list-style-type: none"> <li>Turn OFF the Emergency Stop (STOP) signal.</li> </ul>

## 11-4 Troubleshooting

Alarm number	Error conditions	Status when error occurs	Cause	Measures
90	CONNECT error	Occurs when the operation starts up.	<ul style="list-style-type: none"> <li>A communications error occurred when a MECHATROLINK-II communications CONNECT command is received.</li> </ul>	<ul style="list-style-type: none"> <li>Wire the MECHATROLINK-II communications cable correctly.</li> <li>Connect the Terminating Resistor correctly.</li> <li>Confirm the MECHATROLINK-II communications cable do not have excessive noise. Mount a ferrite core to the communications cable.</li> </ul>
91	SYNC command error	Occurs when the operation starts up.	<ul style="list-style-type: none"> <li>During asynchronous MECHATROLINK-II communications, a synchronous type of command was issued.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm the command sent by the host controller.</li> </ul>
92	Encoder data restoration error <b>ABS</b>	Occurs when the power is turned ON	<ul style="list-style-type: none"> <li>In semi-closing control, initialization of internal position data is not processed correctly.</li> <li>In FULL CLOSING CONTROL mode, initialization of internal position data is not processed correctly.</li> </ul>	<ul style="list-style-type: none"> <li>Apply the correct power voltage for the long encoder wire.</li> <li>Install the motor power line separately from the encoder wire.</li> <li>Connect the shield cable to FG.</li> <li>Apply the correct power voltage for the long connection cable for the external encoder.</li> <li>Install the motor power line separately from the encoder wire.</li> <li>Connect the shield cable to FG.</li> </ul>

Alarm number	Error conditions	Status when error occurs	Cause	Measures
93	Parameter setting error	Occurs when the power is turned ON.	<ul style="list-style-type: none"> <li>The electronic gear ratio is inappropriate.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm that the values on the Electronic Gear Ratio Numerator (Pn009) and the Electronic Gear Ratio Denominator (Pn010) are set correctly.</li> <li>The settable range of electronic gear ratio must be between 1/1000 x and 1000 x.</li> </ul>
			<ul style="list-style-type: none"> <li>The value set on the external encoder ratio is inappropriate.</li> </ul>	<ul style="list-style-type: none"> <li>Confirm the values on the External Feedback Pulse Dividing Numerator (Pn324) and the External Feedback Pulse Dividing Denominator (Pn325) are set correctly.</li> <li>The settable range of external encoder ratio must be between 1/40 x and 160 x.</li> </ul>
			<ul style="list-style-type: none"> <li>The value set on the External Feedback Pulse Type Selection (Pn323) differs from the external encoder type that is connected for serial communications.</li> </ul>	<ul style="list-style-type: none"> <li>Change the setting on the Pn323 to conform with the external encoder type that is actually connected.</li> </ul>
95	Motor non-conformity	Occurs when the power supply is turned ON.	<ul style="list-style-type: none"> <li>The motor and 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 wiring.</li> <li>Fix the locations that are disconnected.</li> </ul>

**Error Diagnosis Using the Operation Status**

Symptom	Probable cause	Items to check	Measures
The 7-segment LED indicator does not light.	The control power is not supplied.	Check whether the power supply input is within the allowed power supply voltage range.	Supply the correct power supply voltage.
		Check whether the power supply input is wired correctly.	Wire correctly.
The LED (COM) is unlit.	The MECHATROLINK-II communications is not established.	Check that the communications cable is connected correctly.	Check that the host controller has started up.
		Check that the Terminating Resistor is connected correctly.	Check the connector and its connection.
The LED (COM) flashes in green.	Asynchronous MECHATROLINK-II communications is established.	Controllable by the host controller. (normal state)	Normal state
The LED (COM) lights in green.	Synchronous MECHATROLINK-II communications is established.	Controllable (normal state)	Normal state
The LED (COM) flashes in red.	A recoverable alarm occurs in MECHATROLINK-II communications.	<ul style="list-style-type: none"> <li>Reset the network by the host controller, and establish the communications again.</li> <li>Check that the communications cable has no error.</li> </ul>	Check the wiring and noise condition.
The LED (COM) lights in red.	An unresettable alarm occurs in MECHATROLINK-II communications.	Check that no node address duplication occurs on the network, and that the number of connected nodes is not over the specification.	Correct the network address.
An alarm occurs.	Read the Error No. and the alarm log.	Check the cause listed in Error Diagnosis Using the Alarm Display in previous pages.	Take appropriate measures against the cause of the alarm that are listed in Error Diagnosis Using the Alarm Display in previous pages.

Symptom	Probable cause	Items to check	Measures
Servo Lock state does not occur.	The power cable is not connected correctly.	Check that the motor power cable is connected properly.	Wire the cable correctly.
	The motor power is not on.	Check the main circuit wiring and power voltage.	Input the correct power and voltage for the main circuit.
	The Forward or Reverse Drive Prohibition (POT or NOT) signal is OFF.	<ul style="list-style-type: none"> <li>• Check that the input for Forward or Reverse Drive Prohibition (POT or NOT) is not OFF.</li> <li>• Check the input of +24 VIN to CN1.</li> </ul>	<ul style="list-style-type: none"> <li>• Turn on the POT and NOT.</li> <li>• Input +24 VIN to CN1.</li> </ul>
	The torque limit is set to 0.	Check that the torque limits on No.1 Torque Limit (Pn013) and the No.2 Torque Limit (Pn522) are not set to 0.	Set the maximum torque to be used for each of these parameters.
	The torque command value is set to 0 while the host controller commands the torque control.	Check the control mode set by the host controller and the given torque command.	Change the setting of control mode by the host controller to position. Check for the servo lock.
	The Servo Drive breaks down.	–	Replace the Servo Drive with a new one.

## 11-4 Troubleshooting

Symptom	Probable cause	Items to check	Measures
The Servomotor does not rotate in the Servo lock state.	The host controller does not give a command.	If it is the position command, check that the speed and position are not set to 0.	Enter a position and speed data. Start up the Servomotor.
	The torque command value is too small, while the host controller commands the torque control.	Check the control mode set by the host controller and the given torque command.	Change the setting of control mode by the host controller to position. Check for the servo lock.
	Hard to determine that the motor rotates.	Check that the speed command given by the host controller is not too small.	Check the speed command from the host controller.
	The holding brake works.	Check the brake interlock output (BKIR) signal and the +24 VDC power supply.	Check that the holding brake on a Servomotor with brake is released by Servo lock.
	The torque limits on No.1 Torque Limit (Pn013) and the No.2 Torque Limit (Pn522) are too small.	Check that the torque limits on Pn013 and Pn522 are not set to a value close to 0.	Set the maximum torque to be used for each of these parameters.
	In torque control mode, the Speed Limit Value Setting (Pn321) is set to 0.	Check the value set on the Pn321.	Set a larger value on the Pn321.
	The Servo Drive breaks down.	–	Replace the Servo Drive with a new one.
	The Forward or Reverse Drive Prohibition (POT or NOT) signal is OFF.	Check the ON-OFF status of POT and NOT signals in the monitor mode.	<ul style="list-style-type: none"> <li>• Turn on the POT and NOT signals.</li> <li>• Set to disable, when the POT and NOT signals are not used.</li> </ul>
	The control mode does not conform with the command.	Check the value set on the Control Mode Selection (Pn001).	Set the Pn001 in accordance with the command.
	The motor power cable is wired incorrectly.	Check the wiring.	Wire correctly.
The encoder cable is wired incorrectly.			
The power is not supplied.	Check the power supply and the 7-segment LED state.	Turn on the power.	
	Check the voltage between the power terminals.	Wire the power-on circuits correctly.	
	–	Replace the Servo Drive with a new one.	
The motor operates momentarily, but then it does not operate after that.	The position commands given are too little.	Check the position data and the electronic gear ratio on the host controller.	Set the correct data.
	The motor power cable is wired incorrectly.	Check the wiring of the motor power cable's phases U, V, and W.	Wire correctly.
	The encoder cable is wired incorrectly.	Check the encoder cable's wiring.	Wire correctly.

Symptom	Probable cause	Items to check	Measures
The motor rotates without a command.	There are inputs of small values in speed control mode.	Check if there is any inputs in speed control mode.	Set the speed command to 0. Alternatively, change the mode to position control.
	There are inputs of small values in torque control mode.	Check if there is any inputs in torque control mode.	Change the mode from torque control to position control.
	The Servo Drive breaks down.	–	Replace the Servo Drive with a new one.
The motor rotates in the reverse direction from the command.	The value set on the Rotation Direction Switching (Pn000) is incorrect.	Check the value set on the Pn000.	Change the setting on the Pn000.
	The command given by the host controller is incorrect.	<ul style="list-style-type: none"> <li>The absolute command is set improperly in size.</li> <li>The incremental command is set improperly in polarity.</li> </ul>	<ul style="list-style-type: none"> <li>Check the present and target values.</li> <li>Check the rotation direction.</li> </ul>
The holding brake does not work.	Power is supplied to the holding brake.	Check whether power is supplied to the holding brake.	<ul style="list-style-type: none"> <li>Check the brake interlock output (BKIR) signal and the relay circuit.</li> <li>Check that the holding brake is not worn down.</li> </ul>
Motor rotation is unstable.	The motor power cable or encoder cable is wired incorrectly.	Check the wiring of the motor power cable's phases U, V, and W and check the encoder cable's wiring.	Wire correctly.
	Low rigidity. It causes vibration.	Measure the vibration frequency of the load.	Enable the damping control. Set the damping filter frequency.
	The load's moment of inertia exceeds the Servo Drive's allowable value.	Calculate the load inertia.	<ul style="list-style-type: none"> <li>Check if the manual tuning can make a proper adjustment.</li> <li>Increase the Servomotor capacity.</li> </ul>
	Loose joint and/or large clearance with the machine	Check the joint with the machine.	Remove the joint looseness with the machine.
	The pulse signal line's connections are loose.	Check the pulse signal line's wiring at the controller and Servo Drive.	Wire correctly.
		Check the controller's command pulse type and the Servo Drive's commands pulse type.	Set the Servo Drive's pulse type to match the controller's command pulse type.
	The load and gain do not conform.	Check the response waveforms for speed and torque.	Adjust the speed loop gain to stabilize the rotation.

## 11-4 Troubleshooting

Symptom	Probable cause	Items to check	Measures
The motor is overheating.	The ambient temperature is too high.	Check the ambient temperature around the motor is not over 40°C.	<ul style="list-style-type: none"> <li>Lower the ambient temperature around the motor to 40°C or less. (Use a fan or air conditioner.)</li> <li>Lower the load rate.</li> </ul>
	The heat radiation condition for the motor is inappropriate.	<ul style="list-style-type: none"> <li>Check that the specified radiation condition is observed.</li> <li>Check the load ratio for the servomotor with brake.</li> </ul>	<ul style="list-style-type: none"> <li>Improve the radiation condition.</li> <li>Reduce the load.</li> <li>Improve ventilation.</li> </ul>
	The motor is overloaded. The motor vibrates during rotation.	Measure the torque on the analog monitor on the front panel or by the CX-Drive.	<ul style="list-style-type: none"> <li>Decrease the acceleration and deceleration speed.</li> <li>Lower the speed and check the load.</li> </ul>
The machine position is misaligned.	The coupling of the servomotor axis and the machine is abnormal.	Check that the coupling of the servomotor and the machine is not misaligned.	<ul style="list-style-type: none"> <li>Tighten the coupling again.</li> <li>Replace with a coupling which has no looseness.</li> </ul>
	The host controller gives a deceleration stop command.	Check the control ladder on the host controller.	Review the control on the host controller.
The motor does not stop or is hard to stop even if the operation command (RUN) is turned OFF while the motor is rotating.	The load inertia is too large.	<ul style="list-style-type: none"> <li>Check the load inertia.</li> <li>Check the motor rotation speed.</li> <li>The dynamic brake resistance is disconnected.</li> </ul>	<ul style="list-style-type: none"> <li>Review the load inertia.</li> <li>Replace the motor and drive with appropriate ones.</li> </ul>
	The dynamic brake is disabled.	Check if the dynamic brake is not disabled or broken.	<ul style="list-style-type: none"> <li>Enable, if it is disabled.</li> <li>Replace the brake with a new one, if it is broken or resistor disconnection is detected.</li> </ul>



Symptom	Probable cause	Items to check	Measures
The Servomotor or the load generates abnormal noise or vibration.	Vibration occurs due to improper mechanical installation.	Check whether the Servomotor's mounting screws are loose.	Retighten the mounting screws.
		Check the load for eccentricity.	Eliminate the eccentricity, which results in torque fluctuation and noise.
		Check that the coupling with the load is not unbalanced.	Balance the rotation.
		Check that the decelerator does not generate any abnormal noise.	Check the decelerator specification. Investigate the decelerator for breakage.
	Vibration occurs due to low mechanical rigidity.	Check that the vibration frequency is not 100 Hz or lower.	If the frequency is 100 Hz or lower, set the correct damping frequency on the damping filter to eliminate the vibration.
	Vibration occurs due to machine resonance.	Check if the resonance frequency is high or low.	If the frequency is high, set the adaptive filter in a manner that stops the resonance. Alternatively, measure the resonance frequency and set the Notch Filter 1 and 2.
	There is a problem with the bearings.	Check for noise or vibration around the bearings.	Contact your OMRON dealer or sales office.
	The gain is wrong.	–	Check if the manual tuning can make a proper adjustment.
	The Speed Feedback Filter Time Constant 1 (Pn103) is wrong.	Check the value set on the Pn103. Normally set 0 to Pn103.	Return the setting to the initial 0. Alternatively, set a large value and operate the motor.
	The Torque Command Filter Time Constant 1 (Pn104) does not match the load.	Review the setting on the Pn104.	Set a larger value on the Pn104 and eliminate the vibration.
	The Position Loop Gain 1 (Pn100) is too large.	Review the setting on the Pn100.	By the CX-Drive or the analog monitor, measure the response and adjust the gain.
	The Speed Loop Gain 1 (Pn101) and the Speed Loop Integration Time Constant 1 (Pn102) are balanced incorrectly.	Review the settings on the Pn101 and Pn102.	
	Noise is applied to the control I/O signal cable because the cable does not meet specifications.	Check that it is a twisted-pair wire or twisted-pair shielded cable with core wires that are at least 0.08 mm <sup>2</sup> .	Use control I/O signal cable that meets specifications.

## 11-4 Troubleshooting

Symptom	Probable cause	Items to check	Measures
	Noise is applied to the control I/O signal cable because the cable is longer than the specified length.	Check the length of the control I/O signal cable.	Shorten the control I/O signal cable to 3 m or less.
	Noise is applied to the cable because the encoder cable does not meet specifications.	Check that it is a twisted-pair shielded cable with core wires that are at least 0.12 mm <sup>2</sup> .	Use encoder cable that meets specifications.
	Noise is applied to 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 applied to the signal lines because the encoder cable is stuck or the sheath is damaged.	Check the encoder cable for damage.	Correct the encoder cable's pathway.
	Too much noise is applied to the encoder cable.	Check whether the encoder cable is bound together with or too close to high-current lines.	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 precision of the mounting surface, attachment, or axial offset).	Reduce the mechanical vibration or correct the Servomotor's installation.
Overshooting at a startup or stop	The Position Loop Gain 1 (Pn100) is too large.	Review the Pn100.	Adjust the gain in a manner that prevents overshoots.
	The Speed Loop Gain 1 (Pn101) and the Speed Loop Integral Time Constant 1 (Pn102) are balanced incorrectly.	Review the settings on the Pn101 and Pn102.	By the CX-Drive or the analog monitor, measure the response and adjust the gain.
	The machine rigidity set by the realtime autotuning is incorrect.	Review the setting of machine rigidity.	Match the machine rigidity setting to the load rigidity.
	The set inertia ratio differs from the load.	Review the Inertial Ratio (Pn004).	Align the setting on the Pn004 with the load.
Vibration is occurring at the same frequency as the power supply.	Inductive noise is occurring.	Check whether the drive control signal lines are too long.	Shorten the control signal lines.
		Check whether the control signal lines and power supply lines are not bound 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>

Symptom	Probable cause	Items to check	Measures
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.
	The gain is wrong.	–	Check if the manual tuning can make a proper adjustment.
	The load inertia is too large.	<ul style="list-style-type: none"> <li>• Check the load inertia.</li> <li>• Check the motor rotation speed.</li> <li>• The dynamic brake resistance is disconnected.</li> </ul>	<ul style="list-style-type: none"> <li>• Review the load inertia.</li> <li>• Replace the motor and drive with proper ones.</li> </ul>

# 11-5 Periodic Maintenance



## Caution



After replacing the unit, transfer to the new unit all data needed to resume operation, before restarting the operation. Equipment damage may result.



Never repair the product by disassembling it. Electric shock or injury may result.

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 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 Servomotors and Servo Drives.

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

## Servomotor Life Expectancy

- ♦ The life expectancy for units 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 motor operating temperature of 40°C, within the allowable axial load, rated operation (rated torque and rated rotation speed), and proper installation as described in this manual.

The oil seal can be replaced.

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

## Servo Drive Life Expectancy

- ♦ The life expectancy for units is listed below.  
Aluminum electrolytic capacitors: 28,000 hours  
(at an ambient drive operating temperature of 55°C, constant output of rated torque, constant output of rated rotation speed, and installation as described in this manual)  
Axial-flow fan: 10,000 to 30,000 hours (The limit depends on the operating conditions.)  
Inrush current prevention relay: Approx. 20,000 operations (The limit depends on the operation conditions.)
- ♦ When using the Servo Drive in continuous operation, use fans or air conditioners to maintain an ambient temperature below 40°C.
- ♦ We recommend that ambient temperature and the power supply ON time be reduced as much as possible to lengthen the service life of the drive.
- ♦ The limit of aluminum electrolytic capacitors is greatly affected by the ambient operating temperature. Generally, an increase of 10°C in the operating ambient temperature will reduce capacitor service life by 50%.
- ♦ For example, when the ambient operating temperature is 25°C, the life expectancy will be as follows:

$$\begin{aligned} \text{Life Expectancy (at 25°C)} &= \text{Life Expectancy (at 55°C)} \times 2^{\frac{55-25}{10}} \\ &= 224,000 \text{ hours} \end{aligned}$$

- ♦ 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 replacement schedule of 5 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 5 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 3 years or if an absolute encoder system down error (Alarm No.40) has occurred.

#### Replacement Battery Model and Specifications

Item	Specifications
Name	Absolute Encoder Backup Battery Unit
Model	R88A-BAT01G
Battery model	ER6V (Toshiba)
Battery voltage	3.6 V
Current capacity	2,000 mA · h

#### Mounting the Backup Battery

##### Mounting the Battery for the First Time

Connect the absolute encoder battery to the motor, then set up the absolute encoder. Refer to "Absolute Encoder Setup" (P.9-6).

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 occur due to voltage delay in the battery.

##### Replacing the Battery

If a battery warning occurs, the absolute encoder power supply must be replaced.

Replace the battery with the control power supply of the drive ON. If the battery is replaced with the control power supply of the drive OFF, data held in the encoder is lost.

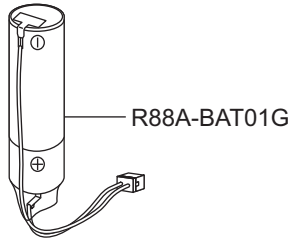


##### Precautions for Correct Use

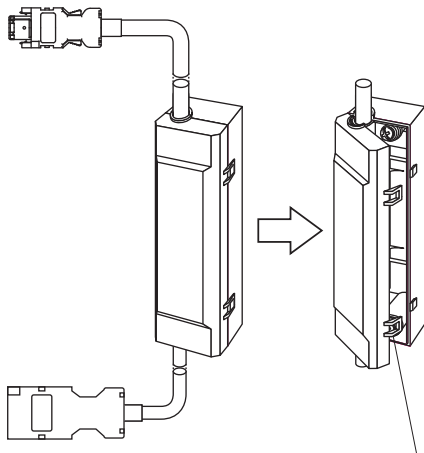
- ◆ If the absolute encoder is cleared using the front panel or the absolute values are cleared using communications, all error and multi-rotation data is lost and the absolute encoder must be set up. Refer to "Absolute Encoder Setup" (P.9-6).

**Battery Mounting Method**

1. Prepare the replacement battery (R88A-BAT01G).

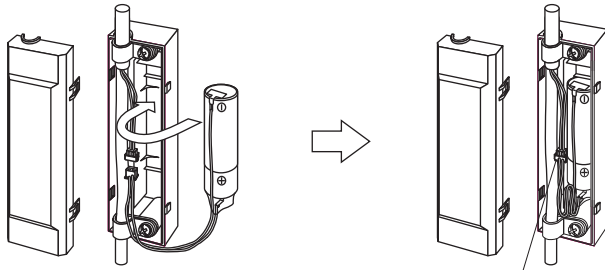


2. Remove the battery box cover.



Raise the tabs and remove the cover.

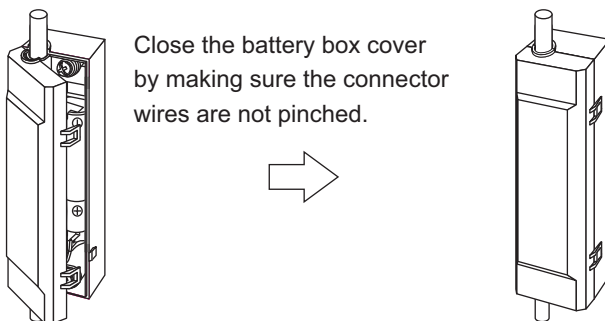
3. Put the battery into the battery box.



Insert the battery.

Plug in the connector.

4. Close the cover to the battery box.



Close the battery box cover by making sure the connector wires are not pinched.