SUSTAINABLE DEVELOPMENT GROUP

SHARE WELL

PowerNex

Alarm Manual

SUZHOU SHARE WELL AUTOMATION TECHNOLOGY CO.,LTD

Catalogue

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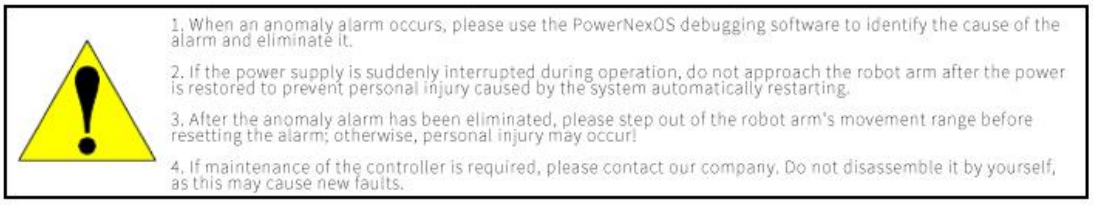
Chapter 1: Maintenance

This abnormal alert manual is designed to provide users with a comprehensive and systematic guide for handling abnormal alerts (anomalous alerts) from the robotic arm controller. By detailing various abnormal alert codes, root cause analyses, and corresponding troubleshooting methods, it aims to assist users in quickly identifying and resolving issues, thereby ensuring the efficient and stable operation of the robotic arm during the production process.



This manual is applicable to the PowerNex robot MRC-100 / MRC-60 series controllers. The content of the manual covers various abnormal conditions that may be encountered during the operation of the controller, as well as the corresponding handling measures.

1.1 Safety Considerations

The manual also emphasizes the safety considerations that must be followed during the use of the robotic arm controller, including but not limited to:

- Ensure that the safety manual is thoroughly read before use, and understand how to operate the robot safely.
- Comply with legal regulations and ensure that teaching operations are performed by trained personnel.
- Set up an emergency stop switch, and place a "Teaching in Progress" sign during teaching operations.
- During operation, ensure that barriers or enclosures are used to

isolate operators from the robot.

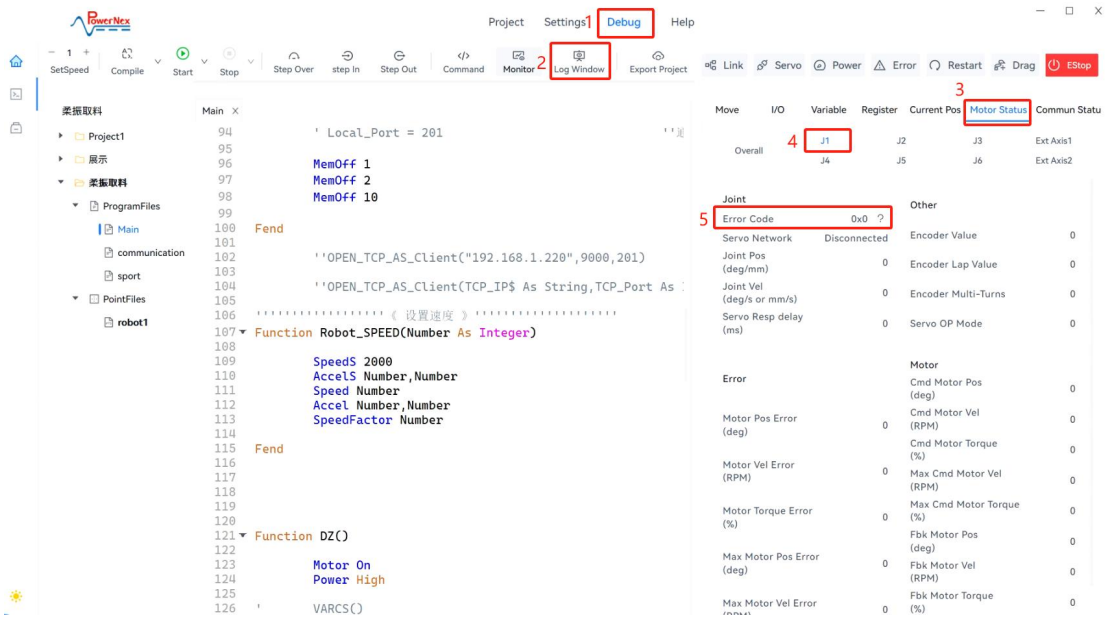
1.2 Notes

The content of this manual may be subject to change at any time without prior notice. If you find any inaccuracies or areas for improvement in this manual, please do not hesitate to provide your feedback.

Chapter 2: Alarm Handling

2.1 Alarm Inspection

Open the PowerNexOS debugging software and locate the "Motor Status" in the "Auxiliary Panel." Inspect each single-axis motor for any anomalies and take appropriate action. The method for checking alarms is as follows:



2.2 Alarm Overview

The Alarm Overview introduces the identifiable alarms and their respective attributes, including:

Clear Attribute: This indicates whether the alarm can be masked. A value of Y means the alarm can be cleared, while N means it cannot be cleared.

Reset Attribute: When set to Y, the alarm can be cleared using the reset command from the debugging software; otherwise, the alarm must be handled before it can be reset and cleared.

Default Group: The default grouping status of the alarm, used to display the priority level of the alarm.

No.	Fault Name	Fault Code	Clear Attribute	Reset Attribute	Default Group
1	Driver Short Circuit	0x2250	N	N	0
2	Phase U Output Current Excessive	0x2310	Y	N	1
3	Phase V Output Current Excessive	0x2311	Y	N	1
4	Phase W Output Current Excessive	0x2312	Y	N	1
5	Driver Hardware Overcurrent	0x2320	Y	N	0
6	Driver Output Ground Short Circuit	0x2330	N	N	0
7	DC Bus Overvoltage	0x3210	Y	N	0
8	DC Bus Undervoltage	0x3220	Y	Y	2
9	Power Module Overtemperature	0x4210	Y	Y	2
10	CPU1 Watchdog Overflow	0x6010	Y	N	0
11	CPU2 Watchdog Overflow	0x6011	Y	N	0
12	Energy Consumption Brake Resistor Overload	0x7112	Y	Y	0

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13	Motor Continuous Overload	0x8311	Y	Y	3
14	Position Tracking Error Excessive	0x8611	Y	Y	4
15	Positive Soft Limit	0x8612	Y	Y	2
16	Negative Soft Limit	0x8613	Y	Y	2
17	Encoder Data Overflow	0x8800	N	N	0
18	CPU1 Operational Anomaly	0xFF00	N	N	0
19	CPU2 Operational Anomaly	0xFF01	N	N	0
20	CPU1 Memory Anomaly	0xFF02	N	N	0
21	CPU2 Memory Anomaly	0xFF03	N	N	0
22	CPU Memory Conflict	0xFF04	N	N	0
23	Pole Position Error	0xFF05	Y	N	0
24	Encoder Data Anomaly	0xFF06	Y	N	0
25	Encoder Communication Anomaly	0xFF07	Y	N	0
26	Encoder Communication Timeout	0xFF08	Y	N	0
27	Encoder Internal Exception 1	0xFF09	N	N	0
28	Driver Other Axis Exception	0xFF10	N	N	4
29	Control Encoder Overspeed	0xFF14	Y	N	0
30	Driver Continuous Overload	0xFF15	Y	N	1
31	Driver Output Missing Phase	0xFF17	Y	N	0
32	Motor Stall	0xFF18	Y	N	0
33	Current Tracking Error Excessive	0xFF21	Y	N	0
34	Position Target Value Anomaly	0xFF22	Y	N	1
35	Encoder Power-Up Data Overflow	0xFF23	Y	N	0

36	Position Target Value Overflow	0xFF24	Y	N	1
37	Motor Holding Brake Anomaly	0xFF25	Y	Y	2
38	Control Power Undervoltage	0xFF26	N	N	0
39	STO1 Trigger	0xFF27	Y	N	1
40	STO2 Trigger	0xFF28	Y	N	1
41	Positive Hard Limit Switch Trigger	0xFF29	Y	N	1
42	Negative Hard Limit Switch Trigger	0xFF30	Y	N	1
43	Motor Overspeed	0xFF31	Y	N	1

No.	Fault Name	Fault Code	Clear Attribute	Reset Attribute	Default Group
44	Emergency Stop Input Switch Trigger	0xFF32	Y	N	1
45	Torque Monitoring Saturation Fault	0xFF33	Y	Y	0
46	Speed Tracking Error Excessive	0xFF34	Y	Y	4
47	Driver Short Circuit 2	0xFF35	N	N	0
48	Origin Search Failure	0xFF36	Y	Y	5
49	EtherCAT Bus Command Invalid	0xFF38	Y	Y	3
50	EtherCAT Communication Cycle Error	0xFF39	Y	Y	3
51	Position Planning Runtime Error	0xFF40	Y	Y	4
52	EtherCAT Illegal Synchronization Mode	0xFF41	Y	Y	3
53	Motor Phase U Instant Overload	0xFF45	Y	N	1
54	Motor Phase V Instant Overload	0xFF46	Y	N	1

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55	Motor Phase W Instant Overload	0xFF47	Y	N	1
56	Dynamic Braking Overload	0xFF48	N	N	0
57	Driver Internal Exception	0xFF49	Y	N	0
58	Limit Switch Exception	0xFF50	Y	Y	2
59	EtherCAT Bus Communication Exception	0xFF51	Y	Y	3
60	Interface Encoder Resolution Change	0xFF52	N	N	0
61	Encoder Overheat	0xFF53	Y	Y	3
62	Encoder Battery Undervoltage Fault	0xFF54	Y	Y	3
63	Control Mode Setting Error	0xFF57	Y	Y	3
64	Power-Up Position Deviation Excessive	0xFF58	Y	Y	3
65	Encoder Acceleration Anomaly Fault	0xFF59	Y	N	0
66	Motor Stalling	0xFF60	Y	Y	2
67	Write EEPROM Data Exception	0xFF63	Y	N	0
68	Read EEPROM Data Exception	0xFF64	Y	N	0
69	Holding Brake Control Circuit Exception	0xFF66	Y	N	0
70	CPU1 Overload	0xFF68	Y	N	1
71	CPU2 Overload	0xFF69	Y	N	1
72	CPU1 Handshake Failure	0xFF70	Y	N	1
73	ESC Configuration EEPROM Exception	0xFF75	-	-	-
74	ESC Internal Access Error	0xFF76	Y	Y	3
75	Servo Enable Not Ready	0xFF77	Y	Y	5

76	CPU2 Handshake Failure	0xFF78	Y	N	0
77	CPU1 Main Task Timeout	0xFF79	Y	Y	2
78	DC Bus Charging Relay Exception	0xFF81	Y	N	0
79	CPU Internal Error	0xFF82	Y	N	0
80	Position Actual Value Overflow	0xFF83	Y	N	1
81	Encoder Internal Exception 2	0xFF85	Y	N	0
82	Encoder Internal Exception 3	0xFF87	Y	N	0
83	Second Position Tracking Error Excessive	0xFF8E	Y	N	0
84	STO Wiring Exception	0xFF8F	Y	N	1
85	Second Speed Tracking Error Excessive	0xFF90	N	N	0

2.3 Alarm Causes and Handling

Driver Short Circuit Code: 0x2250	
Possible Causes	1. Short circuit between the driver UVW output cables or to ground. 2. Short circuit of the motor UVW or to ground. 3. Internal short circuit within the driver or to ground. 4. False alarm caused by external interference affecting the driver.
Handling Recommendations	1. If a short circuit occurs between the UVW phases or between UVW and ground in the cables, either repair or replace the cables. 2. If a short circuit occurs between the UVW phases or between UVW and ground in the motor, replace the motor. 3. If the fault persists after disconnecting the driver output UVW connections, replace the driver. 4. Improve the electromagnetic environment of the equipment by standardizing wiring and layout, increasing the cross-sectional area of the ground wire, and using ferrite cores, among other measures.

U Phase Output Current Over High Code: 0x2310	
Possible Causes	1. Energy consumption braking resistor not connected or incorrectly wired. 2. Abnormality in the internal current sampling circuit of the driver.
Handling Recommendations	1. Check if the braking resistor is wired correctly. 2. Replace the driver.

V Phase Output Current Over High code: 0x2311	
Possible Causes	1. Energy consumption braking resistor not connected or incorrectly wired. 2. Abnormality in the internal current sampling circuit of the driver.
Handling Recommendations	1. Check if the braking resistor is wired correctly. 2. Replace the driver.

W Phase Output Current Over High Code: 0x2312	
Possible	1. Energy consumption braking resistor not connected or incorrectly wired. 2. Abnormality in the internal current sampling circuit of the driver.
Handling	1. Check if the braking resistor is wired correctly. 2. Replace the driver.

Driver Hardware Overcurrent Code: 0x2320	
Possible Causes	1. Motor load is too high, or motor acceleration/deceleration settings are too high, with insufficient acceleration/deceleration time. 2. Abnormal fluctuations in encoder feedback. 3. Brake or holding brake failure. 4. Internal abnormalities within the driver.
Handling Recommendations	1. Inspect and address mechanical load transmission, ensuring there are no jamming issues, and increase acceleration/deceleration time. 2. Check the wiring of the motor encoder and ensure it is correctly configured. 3. Examine the brake for any anomalies. 4. Replace the controller.

Driver Output Short Circuit to Ground Code: 0x2330	
Possible Causes	1. Short circuit between the driver UVW output cables and ground. 2. Short circuit of the motor UVW to ground. 3. Internal short circuit within the driver or to ground.
Handling Recommendations	1. If a short circuit occurs between the UVW cables and ground, repair or replace the cables. 2. If a short circuit occurs between the motor UVW and ground, replace the motor. 3. If the fault persists after disconnecting the driver output UVW connections, replace the driver.

DC Bus Overvoltage Code: 0x3210	
Possible Causes	1. Excessive input power supply voltage to the driver. 2. Excessive energy during rapid motor stop due to energy-consuming braking. 3. Energy consumption braking resistor not connected or incorrectly wired. 4. Braking resistor value is too high. 5. Internal abnormalities within the driver.
Handling Recommendations	1. Adjust the power supply voltage to the driver within the allowable range. 2. Reduce motor deceleration or decrease load. 3. Correct the wiring of the energy consumption braking resistor to ensure it is wired properly. 4. Appropriately reduce the resistance value of the energy consumption braking resistor (not below the allowable minimum), and increase the braking resistor power rating. 5. Replace the driver.

DC Bus Undervoltage Code: 0x3220

Possible Causes	1. Insufficient input power supply voltage to the driver. 2. Abnormality in the internal voltage sampling circuit of the driver. 3. Incorrect settings in the power circuit of the driver, such as setting 220V supply as 380V supply. 4. Disconnection of the driver input power supply line.
Handling Recommendations	1. Adjust the input power supply to the driver within the normal operating allowable range. 2. Replace the driver. 3. Ensure that the settings of the driver power circuit match the actual power supply. 4. Inspect and address the wiring of the driver input power supply line to ensure it is correctly and securely connected.

Power Module Overtemperature Code: 0x4210	
Possible Causes	1. Excessive motor load. 2. Abnormality in the internal temperature sampling circuit of the driver. 3. Prolonged operation of large load models causing overheating due to significant lateral swing. 4. Operating environment temperature exceeds the allowable working range.
Handling Recommendations	1. Reduce the actual mechanical load on the motor. 2. Replace the driver. 3. Stop the robotic arm operation and provide a cooling environment; restart the controller after cooling and clear the fault. 4. Decrease the ambient temperature, such as improving cabinet cooling conditions.

CPU1 Watchdog Overflow Code: 0x6010	
Possible Causes	Internal anomaly within the driver.
Handling Recommendations	Replace the driver.

CPU2 Watchdog Overflow Code: 0x6011	
Possible Causes	Internal anomaly within the driver.
Handling Recommendations	Replace the driver.

Energy Consumption Braking Resistor Overload Code: 0x7112

Possible Causes	1. Frequent rapid stop operations by the motor resulting in excessive energy consumption braking. 2. Power rating settings of the energy consumption braking resistor do not match the actual resistor.
Handling Recommendations	1. Alter the robotic arm's movement path to avoid frequent rapid operations and stops of the motor, such as extending the motor stop time; alternatively, replace with a higher-rated energy consumption braking resistor. 2. Correctly set the power rating of the energy consumption braking resistor, ensuring that the set value matches the actual power rating of the resistor.

Motor Continuous Overload Code: 0x8311	
Possible Causes	1. Excessive motor load. 2. Insufficient acceleration/deceleration time settings for the motor. 3. Incorrect motor parameter settings. 4. Abnormal brake release action. 5. Incorrect motor selection, with insufficient power (e.g., a high-power driver paired with a low-power motor running at full load for an extended period). 6. Abnormality in the internal current sampling circuit of the driver.
Handling Recommendations	1. Reduce the actual mechanical load on the motor, ensuring there are no jamming issues. 2. Increase the acceleration/deceleration time during motor operation. 3. Inspect motor parameters to ensure they are set correctly. 4. Check the brake release circuitry to ensure it operates normally. 5. Verify compatibility between the motor model and the controller. 6. Replace the driver.

Position Tracking Error Too Large Code: 0x8611	
Possible Causes	1. Excessive motor load. 2. Abnormal brake release action.
Handling Recommendations	1. Reduce the actual mechanical load on the motor, ensuring there are no jamming issues. 2. Check the brake release circuitry to ensure it operates normally.

Positive Soft Limit Code: 0x8612	
Possible Causes	Position feedback value exceeds (positive soft limit value + positioning completion threshold).

Handling Recommendations	Ensure the range of motion does not exceed the set positive soft limit value.

Negative Soft Limit Code: 0x8613	
Possible Causes	Position feedback value exceeds (negative soft limit value + positioning completion threshold).
Handling Recommendations	Ensure the range of motion does not exceed the set negative soft limit value.

Encoder Data Overflow Code: 0x8800	
Possible Causes	In position mode, when infinite position control is not enabled, the encoder multi-turn value exceeds the actual multi-turn capability of the encoder.
Handling Recommendations	Perform the encoder multi-turn reset operation, and return the alarm axis to the origin.

CPU1 Operating Abnormality Code: 0xFF00	
Possible Causes	1. Anomaly in the operation of the driver firmware. 2. Internal anomaly within the driver.
Handling Recommendations	1. Upgrade the driver firmware. 2. Replace the driver.

CPU2 Operating Abnormality Code: 0xFF01	
Possible Causes	1. Anomaly in the operation of the driver firmware. 2. Internal anomaly within the driver.
Handling Recommendations	1. Upgrade the driver firmware. 2. Replace the driver.

CPU1 Memory Abnormality Code: 0xFF02	
Possible Causes	1. Anomaly in the operation of the driver firmware. 2. Internal anomaly within the driver.

Handling Recommendations	1. Upgrade the driver firmware. 2. Replace the driver.

CPU2 Memory Abnormality Code: 0xFF03	
Possible Causes	1. Anomaly in the operation of the driver firmware. 2. Internal anomaly within the driver.
Handling Recommendations	1. Upgrade the driver firmware. 2. Replace the driver.

CPU Memory conflicts Code: 0xFF04	
Possible Causes	1. Anomaly in the operation of the driver firmware. 2. Internal anomaly within the driver.
Handling Recommendations	1. Upgrade the driver firmware. 2. Replace the driver.

Pole Positioning Error Code: 0xFF05	
Possible Causes	1. The static balance torque compensation value is inconsistent with the actual load. 2. Abnormalities in the motor causing changes in the rotor phase angle. 3. Gravity load causes the servo to enable, resulting in immediate motor rotation, with speed exceeding the fault detection sensitivity threshold. 4. Abnormal internal parameters within the driver.
Handling Recommendations	1. Correctly set the static balance torque compensation value according to the actual load. 2. Replace the motor. 3. Properly set load parameters based on the actual load. 4. Replace the driver.

Encoder Data Abnormality Code: 0xFF06	
Possible Causes	1. Abnormal data from the encoder itself. 2. Incorrect wiring sequence or poor contact of the encoder cable. 3. Noise interference causing abnormal encoder data.
Handling	1. Replace the motor or encoder. 2. Correct the wiring sequence or reinforce the connections. 3. Improve the electromagnetic environment by standardizing wiring and layout, increasing grounding wire cross-section, and adding ferrite cores,

Recommendations	etc.

Encoder Communication Abnormality Code: 0xFF07	
Possible Causes	1. Abnormal data from the encoder itself. 2. Incorrect wiring sequence or poor contact of the encoder cable. 3. Noise interference causing abnormal encoder data.
Handling **Recommendations**	1. Replace the motor or encoder. 2. Correct the wiring sequence or reinforce the connections. 3. Improve the electromagnetic environment by standardizing wiring and layout, increasing grounding wire cross-section, and adding ferrite cores, etc.

Encoder Communication Timeout Code: 0xFF08	
Possible Causes	1. Abnormal data from the encoder itself. 2. Incorrect wiring sequence or poor contact of the encoder cable. 3. Noise interference causing abnormal encoder data.
Handling **Recommendations**	1. Replace the motor or encoder. 2. Correct the wiring sequence or reinforce the connections. 3. Improve the electromagnetic environment by standardizing wiring and layout, increasing grounding wire cross-section, and adding ferrite cores, etc. 4. Stop read/write operations on the controller, and after 30 minutes, attempt to restart the controller 3 to 5 times and clear the fault.

Encoder Internal Abnormality 1 Code: 0xFF09	
Possible Causes	Abnormal internal state of the encoder.
Handling **Recommendations**	1. Reset the alarm or restart the driver. 2. Replace the driver.

Other Axis Abnormality in Driver Code: 0xFF10	
Possible Causes	1. Other axes have encountered faults. 2. Abnormalities in the internal circuit of the driver.

Handling Recommendations	1. Inspect other axes and reset the faulty axes, ensuring that no other axes have faults. 2. Replace the driver.

Control Encoder Overspeed Code: 0xFF14	
Possible Causes	1. The change in the encoder position feedback value during one sampling cycle exceeds 1.3 times the maximum motor speed. 2. Abnormal encoder. 3. Noise interference causing abnormal encoder data.
Handling Recommendations	1. Optimize motor parameters and control parameters; the maximum motor speed setting should typically not be less than the actual maximum motor speed. 2. Check the encoder wiring and whether the encoder is damaged. 3. Improve the electromagnetic environment by standardizing wiring and layout, increasing grounding wire cross-section, and adding ferrite cores, etc.

Driver Continuous Overload Code: 0xFF15	
Possible Causes	1. Excessive motor load or insufficient acceleration/deceleration time settings. 2. Actual mechanical load is too high or there is a jamming issue. 3. Motor brake is not released. 4. Motor abnormalities. 5. Internal anomalies within the driver.
Handling Recommendations	1. Set load parameters appropriately. 2. Inspect the mechanical load transmission method to ensure no jamming or similar issues. 3. Check for abnormalities in the motor brake. 4. Replace the motor. 5. Replace the driver.

Driver Output Phase Loss Code: 0xFF17	
Possible Causes	1. Disconnection or poor connections in the driver U, V, W outputs. 2. Excessive motor impedance. 3. Abnormalities in the internal current sampling circuit of the driver.
Handling Recommendations	Replace the driver.

Alarm Causes and Handling

Motor Stall Code: 0xFF18	
Possible Causes	1. Abnormal changes in encoder data due to electromagnetic noise interference. 2. Abnormal changes in encoder data due to encoder damage. 3. Abnormalities in the internal circuit of the driver.
Handling Recommendations	1. Improve the electromagnetic environment by standardizing wiring and layout, increasing grounding wire cross-section, and adding ferrite cores, etc. 2. Replace the motor or encoder. 3. Replace the driver.

Current Following Error Too Large Code: 0xFF21	
Possible Causes	1. Abnormal changes in encoder data due to electromagnetic noise interference. 2. Abnormal changes in current feedback due to motor damage. 3. Abnormalities in the internal circuit of the driver.
Handling Recommendations	1. Improve the electromagnetic environment by standardizing wiring and layout, increasing grounding wire cross-section, and adding ferrite cores, etc. 2. Replace the motor. 3. Replace the driver.

Position Target Value Abnormal Code: 0xFF22	
Possible Causes	1. At the moment of servo enable, the difference between the position target value and the actual position exceeds the set threshold for position following error. 2. During motor operation, the target trajectory acceleration exceeds the maximum acceleration parameter setting threshold, and the difference between the position target value and the actual position exceeds the set threshold for position following error.
Handling Recommendations	Reset the alarm or restart the driver.

Encoder Power-On Data Overflow Code: 0xFF23	
Possible Causes	The feedback position value exceeds the maximum allowable range of the encoder upon powering on the driver.
Handling	1. Reset the alarm or restart the driver. 2. Replace the driver.

Recommendations	

Position Target Value Overflow Code: 0xFF24	
Possible Causes	In position mode, when infinite position control is disabled, the position target value exceeds the allowable maximum range.
Handling Recommendations	Perform the encoder multi-turn reset operation.

Motor Brake Abnormality Code: 0xFF25	
Possible Causes	1. The motor brake itself has malfunctioned and cannot brake normally. 2. Abnormal internal parameters within the driver.
Handling Recommendations	1. The motor brake itself has malfunctioned and cannot brake normally. 2. Abnormal internal parameters within the driver.

Control Power Undervoltage Code: 0xFF26	
Possible Causes	Abnormalities in the internal circuit of the driver.
Handling Recommendations	Abnormalities in the internal circuit of the driver.

STO1 Trigger Code: 0xFF27	
Possible Causes	STO1 trigger or poor wiring.
Handling Recommendations	Check STO wiring to ensure connections are secure and not in a triggered state.

STO1 Trigger Code: 0xFF28	
Possible Causes	STO2 trigger or poor wiring.
Handling	Check STO wiring to ensure connections are secure and not in a triggered

Recommendations	state.

Positive Hard Limit Switch Trigger Code: 0xFF29	
Possible Causes	Unidirectional operation reaches mechanical limit, resulting in hardware limit trigger.
Handling Recommendations	The fault can be cleared directly; run in the opposite direction until the mechanical limit is restored. Ensure that position planning does not exceed hardware limit ranges.

Negative Hard Limit Switch Trigger Code: 0xFF30	
Possible Causes	Unidirectional operation reaches mechanical limit, resulting in hardware limit trigger.
Handling Recommendations	The fault can be cleared directly; run in the opposite direction until the mechanical limit is restored. Ensure that position planning does not exceed hardware limit ranges.

Motor Overspeed Code: 0xFF31	
Possible Causes	1. Actual speed feedback value exceeds 1.1 times the maximum motor speed. 2. Abnormalities in the encoder.
Handling Recommendations	1. Optimize driver parameters; the maximum motor speed setting should typically not be less than the actual maximum motor speed. 2. Check the encoder wiring and inspect the encoder for damage.

Emergency Stop Input Switch Trigger Code: 0xFF32	
Possible Causes	Emergency stop input switch triggered or poor wiring.
Handling Recommendations	1. Check the wiring of the emergency stop input switch to ensure connections are secure. 2. Ensure the switch is not in a triggered state.

Torque Monitoring Saturation Fault Code: 0xFF33	
Possible Causes	1. Excessive motor load exceeding the torque monitoring alarm threshold. 2. Abnormal internal parameters within the driver.

Handling Recommendations	1. Reduce the actual mechanical load on the motor or increase the motor's acceleration and deceleration time. 2. Replace the driver.

Speed Following Error Too Large Code: 0xFF34	
Possible Causes	1. Excessive motor load. 2. Abnormal brake release action. 3. Abnormalities in the internal parameters of the driver.
Handling Recommendations	1. Reduce the actual mechanical load on the motor and ensure there are no jamming issues. 2. Inspect the motor brake circuit to ensure proper brake action. 3. Replace the driver.

Driver Short Circuit Code: 0xFF35	
Possible Causes	1. Short circuit or ground fault in the driver UVW output cables. 2. Short circuit or ground fault in the motor UVW. 3. Internal short circuit or ground fault within the driver. 4. Interference causing the driver to falsely report this fault.
Handling Recommendations	1. If a short circuit occurs between the UVW phases or between UVW and ground, address or replace the cables. 2. If a short circuit occurs between the motor UVW phases or between UVW and ground, replace the motor. 3. If the fault persists after disconnecting the driver output UVW wiring, replace the driver. 4. Improve the electromagnetic environment by standardizing wiring and layout, increasing the grounding wire cross-section, and adding ferrite cores, etc.

Origin Search Failure Code: 0xFF36	
Possible Causes	1. Inappropriate settings for origin search parameters. 2. At the start of the origin search, the motor is already in the limit switch triggered state. 3. Switching to non-HM mode during the origin search process.
Handling Recommendations	1. Set the origin search parameters correctly. 2. Ensure the motor is not in the limit switch triggered state at the start of the origin search. 3. Avoid switching control modes during the origin search process.

Invalid EtherCAT Bus Command Code: 0xFF38	
Possible Causes	Mismatch between the EtherCAT communication state machine and the control word timing.
Handling Recommendations	Ensure the host computer correctly handles the EtherCAT communication state machine and control word timing.

EtherCAT Communication Cycle Error Code: 0xFF39	
Possible Causes	Abnormal internal parameters within the driver.
Handling Recommendations	Replace the driver.

Position Planning Runtime Error Code: 0xFF40	
Possible Causes	Abnormalities within the driver.
Handling Recommendations	Replace the driver.

EtherCAT Illegal Synchronous Mode Code: 0xFF41	
Possible Causes	Abnormalities within the driver.
Handling Recommendations	Replace the driver.

Motor U Phase Instant Overload Code: 0xFF45	
Possible Causes	1. Excessive motor load. 2. Insufficient acceleration/deceleration time settings. 3. Abnormal brake release action. 4. Incorrect motor selection, power is too low (e.g., using a high-power driver with a low-power motor running at high speed under full load for extended periods). 5. Abnormal internal parameters within the driver.

Handling Recommendations	1. Reduce the actual mechanical load on the motor and ensure there are no jamming issues. 2. Increase the acceleration and deceleration time during motor operation. 3. Check the motor brake circuit to ensure proper brake action. 4. Replace with a higher capacity motor. 5. Replace the driver.

Motor V Phase Instant Overload Code: 0xFF46	
Possible Causes	1. Excessive motor load. 2. Insufficient acceleration/deceleration time settings. 3. Abnormal brake release action. 4. Incorrect motor selection, power is too low (e.g., using a high-power driver with a low-power motor running at high speed under full load for extended periods). 5. Abnormal internal parameters within the driver.
Handling Recommendations	1. Reduce the actual mechanical load on the motor and ensure there are no jamming issues. 2. Increase the acceleration and deceleration time during motor operation. 3. Check the motor brake circuit to ensure proper brake action. 4. Replace with a higher capacity motor. 5. Replace the driver.

Motor W Phase Instant Overload code: 0xFF47	
Possible Causes	1. Excessive motor load. 2. Insufficient acceleration/deceleration time settings. 3. Abnormal brake release action. 4. Incorrect motor selection, power is too low (e.g., using a high-power driver with a low-power motor running at high speed under full load for extended periods). 5. Abnormal internal parameters within the driver.
Handling Recommendations	1. Reduce the actual mechanical load on the motor and ensure there are no jamming issues. 2. Increase the acceleration and deceleration time during motor operation. 3. Check the motor brake circuit to ensure proper brake action. 4. Replace with a higher capacity motor. 5. Replace the driver.

Dynamic Braking Overload Code: 0xFF48	
Possible Causes	The interval between two consecutive dynamic braking stops is too short during motor operation.

Handling Recommendations	If dynamic braking occurs during motor operation, ensure an interval of at least 360* actualspeed²/ rated speed ² seconds.

Internal Driver Abnormality Code: 0xFF49	
Possible Causes	Internal abnormalities within the driver.
Handling Recommendations	Replace the driver.

Limit Switch Abnormality Code: 0xFF50	
Possible Causes	Limit switch triggered or poor wiring.
Handling Recommendations	Check the wiring of the limit switch to ensure connections are secure and that it is not in a triggered state.

EtherCAT Bus Communication Abnormality Code: 0xFF51	
Possible Causes	1. Internal communication harness has become detached or has poor connections. 2. Internal abnormalities within the driver.
Handling Recommendations	1. Stop read/write operations to the controller, and after 30 minutes, attempt to restart the controller 3 to 5 times and clear any alarms. 2. Check if external EtherCAT communication is offline. 3. Replace the driver.

Interface Encoder Resolution Change Code: 0xFF52	
Possible Causes	The resolution of the interface encoder has been changed.
Handling Recommendations	Reset the alarm or restart the driver.

Encoder Overheating Code: 0xFF53	
Possible Causes	1. Actual temperature of the encoder is too high. 2. Abnormalities within the encoder.
Handling	1. Lower the operating environmental temperature of the encoder to within allowable limits.

Recommendations	2. Replace the motor or encoder.

Encoder Battery Undervoltage Fault Code: 0xFF54	
Possible Causes	1. Actual temperature of the encoder is too high. 2. Abnormalities within the encoder.
Handling Recommendations	1. Clear the alarm for the multi-turn axis and eliminate any false alarms. 2. Inspect and secure the battery wiring to ensure correct and tight connections. 3. Replace the encoder battery. 4. Replace the motor or encoder..

Control Mode Setting Error Code: 0xFF57	
Possible Causes	Abnormal parameters within the driver.
Handling Recommendations	Replace the driver.

Power-On Position Deviation Too Large Code: 0xFF58	
Possible Causes	On power-up, the position saved during the last power-down does not match and exceeds the set threshold.
Handling Recommendations	Reset the alarm or restart the driver.

Encoder Acceleration Abnormal Fault Code: 0xFF59	
Possible Causes	1. Abnormal data from the encoder itself. 2. Incorrect wiring sequence or poor contact in the encoder cable. 3. Noise interference causing abnormal encoder data.
Handling Recommendations	1. Replace the motor or encoder. 2. Correct the wiring sequence or reinforce the connections. 3. Improve the electromagnetic environment by standardizing wiring and layout, increasing the grounding wire cross-section, and adding ferrite cores.

Motor Stalled Code: 0xFF60	
Possible Causes	1. Mechanical load has jamming or stalling issues. 2. Motor brake has not been released.
Handling Recommendations	1. Properly set the load parameters and ensure there are no jamming issues. 2. Inspect and address the brake circuit to ensure that the motor brake releases properly.

EEPROM Write Data Exception Code: 0xFF63	
Possible Causes	Internal abnormalities within the driver.
Handling Recommendations	Replace the driver.

EEPROM Read Data Exception Code: 0xFF64	
Possible Causes	Internal abnormalities within the driver.
Handling Recommendations	Replace the driver.

Brake Control Circuit Abnormality Code: 0xFF66	
Possible Causes	1. Short circuit or poor contact in the motor brake wiring. 2. Internal short circuit or poor contact within the motor brake. 3. Internal abnormalities within the driver.
Handling Recommendations	1. Check the brake output wiring and ensure connections are secure and reliable. 2. Replace the brake. 3. Replace the driver.

CPU1 Overload Code: 0xFF68	
Possible Causes	1. Driver operation is affected by noise interference. 2. Internal circuit abnormalities within the driver.
Handling Recommendations	1. Improve the electromagnetic environment by standardizing wiring and layout, increasing the cross-section of grounding wires, and adding ferrite cores. 2. Replace the driver.

CPU2 Overload code: 0xFF69	
Possible Causes	1. Driver operation is affected by noise interference. 2. Internal circuit abnormalities within the driver.
Handling Recommendations	1. Improve the electromagnetic environment by standardizing wiring and layout, increasing the cross-section of grounding wires, and adding ferrite cores. 2. Replace the driver.

CPU1 Handshake Failure Code: 0xFF70	
Possible Causes	1. Abnormal operation of driver firmware. 2. Internal abnormalities within the driver.
Handling Recommendations	1. Upgrade the driver firmware. 2. Replace the driver.

ESC Configuration EEPROM Exception Code: 0xFF75	
Possible Causes	Internal abnormalities within the driver.
Handling Recommendations	Replace the driver.

ESC Internal Access Error Exception Code: 0xFF76	
Possible Causes	Internal abnormalities within the driver.
Handling	Replace the driver.

Recommendations	

Servo Enable Not Ready Code: 0xFF77	
Possible Causes	1. Encoder communication is disconnected when servo is ON. 2. Motor speed exceeds 30 RPM when servo is ON. 3. STO state is not released when servo is ON. 4. DC bus voltage is too low when servo is ON. 5. Dynamic braking state is not released when servo is ON. 6. Internal abnormalities within the driver.
Handling Recommendations	1. Check the encoder communication status to ensure it is normal when the servo is ON. 2. Check the motor operating status to ensure it is stationary when the servo is ON. 3. Check the STO state to ensure it is released when the servo is ON. 4. Check the DC bus voltage status to ensure it meets the enable threshold and the charging relay is engaged when the servo is ON. 5. Check the dynamic braking state to ensure it is released when the servo is ON. 6. Replace the driver.

CPU2 Handshake Failure Code: 0xFF78	
Possible Causes	1. Abnormal operation of driver firmware. 2. Internal abnormalities within the driver.
Handling Recommendations	1. Upgrade the driver firmware. 2. Replace the driver.

CPU1 Main Task Timeout code: 0xFF79	
Possible Causes	1. Driver operation is affected by noise interference. 2. Internal circuit abnormalities within the driver.
Handling Recommendations	1. Improve the electromagnetic environment by standardizing wiring and layout, increasing the cross-section of grounding wires, and adding ferrite cores. 2. Replace the driver.

DC Bus Charging Relay Abnormality Code: 0xFF81

Possible Causes	Internal abnormalities within the driver.
Handling Recommendations	Replace the driver.

CPU Internal Error Code: 0xFF82	
Possible Causes	1. Abnormal operation of driver firmware. 2. Internal abnormalities within the driver.
Handling Recommendations	1. Upgrade the driver firmware. 2. Replace the driver.

Position Actual Value Overflow Code: 0xFF83	
Possible Causes	In position mode, when infinite position control is prohibited, the actual position value exceeds the allowed maximum range.
Handling Recommendations	Perform a multi-turn encoder zeroing operation, enable infinite position control mode, or operate in non-position mode.

Encoder Internal Abnormality 2 Code: 0xFF85	
Possible Causes	Abnormal internal status of the encoder.
Handling	Reset the alarm or restart the driver.

Encoder Internal Abnormality 3 Code: 0xFF87	
Possible Causes	Abnormal internal status of the encoder.
Handling Recommendations	Reset the alarm or restart the driver.

Position Tracking Error Too Large (2nd Position) Code: 0xFF8E	
	1. Excessive motor load. 2. Abnormal brake release operation.

Possible Causes	3. Internal parameter abnormalities within the driver.
Handling Recommendations	1. Reduce the actual mechanical load on the motor, ensuring there are no jamming issues in the mechanics. 2. Check the motor brake circuit to ensure proper brake operation. 3. Replace the driver.

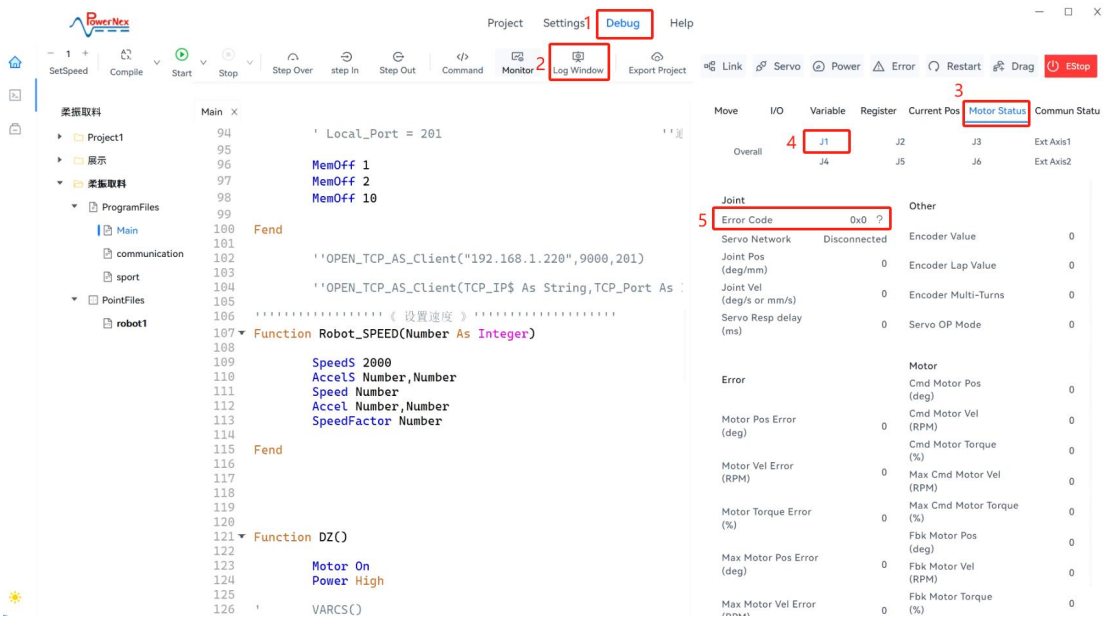
STO Wiring Abnormality 3 Code: 0xFF8F	
Possible Causes	STO1 or STO2 triggered or poor wiring.
Handling Recommendations	Inspect the STO wiring to ensure connections are secure and that it is not in a triggered state.

Speed Tracking Error Too Large (2nd Speed) Code: 0xFF90	
Possible Causes	1. Excessive motor load. 2. Abnormal brake release operation. 3. Internal parameter abnormalities within the driver.
Handling Recommendations	1. Reduce the actual mechanical load on the motor, ensuring there are no jamming issues in the mechanics. 2. Check the motor brake circuit to ensure proper brake operation. 3. Replace the driver.

Chapter 3: Warning Handling

3.1 Warning Inspection

Open the PowerNexOS debugging software and locate the "Motor Status" in the "log Windows." Check the warning messages generated by each single-axis motor one by one and take appropriate action. The method for viewing warning information is as follows:



3.2 Warning Overview

This section introduces the various warning messages that can be detected by the driver.

No.	Warning Name	Warning
1.	Control Power Undervoltage Warning	0xE000
2.	STO Trigger	0xE002
3.	Torque Monitoring Saturation Warning	0xE003
4.	CPU1 Overload Warning	0xE004
5.	CPU2 Overload Warning	0xE005
6.	Mechanical Origin Not Calibrated	0xE008
7.	Motor Overload Warning	0xE009
8.	Speed Limit Warning	0xE010
9.	DC Bus Undervoltage Warning	0xE011
10.	Fault History Record Abnormality	0xE012
11.	AD Calibration Coefficient Invalid	0xE013
12.	CoE Communication Parameter Abnormality	0xE014
13.	Servo Parameters Reset to Default	0xE015
14.	Encoder Battery Undervoltage Warning	0xE017
15.	Internal Driver Warning	0xE019
16.	Encoder Communication Abnormality Warning	0xE020
17.	Encoder Communication Timeout Warning	0xE022
18.	Encoder Data Abnormality Warning	0xE024
19.	Position Limit Warning	0xE026
20.	Position Planning Parameter Abnormality Warning	0xE027
21.	SDO Write Failure Warning	0xE028
22.	Encoder Internal Warning	0xE030
23.	Energy Consumption Brake Resistor Overload Warning	0xE031

3.3 Warning Causes and Handling

Control Power Undervoltage Warning Code: 0xE000	
Possible Causes	Abnormal internal circuitry of the driver
Handling Recommendations	Replace the driver

STO Trigger Code: 0xE002	
Possible Causes	STO1 or STO2 triggered, or poor wiring
Handling Recommendations	Check the STO wiring to ensure reliable connections and that it is not in the triggered state

Torque Monitoring Saturation Warning Code: 0xE003	
Possible Causes	1. Motor load is too high, exceeding the torque monitoring alarm threshold 2. Abnormal internal parameters of the driver
Handling Recommendations	1. Reduce the actual mechanical load on the motor or increase the motor acceleration and deceleration time 2. Replace the driver

CPU1 Overload Warning code: 0xE004	
Possible Causes	1. The driver operation is affected by noise interference 2. Abnormal internal circuitry of the driver
Handling Recommendations	1. Improve the electromagnetic environment by following proper wiring practices, increasing the ground wire cross-sectional area, and adding ferrite beads 2. Replace the driver

CPU2 Overload Warning Code: 0xE005

Possible Causes	1. The driver operation is affected by noise interference 2. Abnormal internal circuitry of the driver
Handling Recommendations	1. Improve the electromagnetic environment by following proper wiring practices, increasing the ground wire cross-sectional area, and adding ferrite beads 2. Replace the driver

Mechanical Origin Not Calibrated Code: 0xE008	
Possible Causes	Mechanical origin not calibrated
Handling Recommendations	Recalibrate the mechanical origin

Motor Overload Warning Code: 0xE009	
Possible Causes	1. Motor load is too high 2. Abnormal release action of the holding brake 3. Incorrect motor selection, power too low (e.g., high-power driver with a small power motor running at full load for an extended period) 4. Abnormal internal current sampling circuit of the driver
Handling Recommendations	1. Reduce the actual mechanical load on the motor to ensure there is no jamming 2. Check the motor brake wiring to ensure it operates normally 3. Replace with a higher-capacity motor 4. Replace the driver

Speed Limit Warning Code: 0xE010	
Possible Causes	Motor speed is limited due to low input power supply voltage to the driver
Handling Recommendations	Check the input power supply voltage

DC Bus Undervoltage Warning Code: 0xE011	
	1. Low input power supply voltage to the driver 2. Abnormal internal voltage sampling circuit of the driver 3. Incorrect power circuit settings of the driver; 220V supply set

Possible Causes	as 380V supply 4. Disconnection of the driver power input supply line
Handling Recommendations	1. Adjust the driver power input supply to within the normal operating range 2. Replace the driver 3. Ensure that the driver power circuit settings match the actual power supply 4. Check and secure the connections of the driver power input supply line to ensure they are correct and firm

Fault History Record Abnormality Code: 0xE012

Possible Causes	1. Abnormal historical fault records 2. Internal anomalies in the driver
Handling Recommendations	1. Restart the driver 2. If the alarm persists after restarting, repair or replace the driver

AD Calibration Coefficient Invalid Code: 0xE013

Possible Causes	Internal anomalies in the driver
Handling Recommendations	Replace the driver

CoE Communication Parameter Abnormality Code: 0xE014

Possible Causes	Internal anomalies in the driver
Handling Recommendations	Restart the driver; if the issue persists, replace the driver

Servo Parameters Reset to Default Code: 0xE015

Possible Causes	Servo parameters have been reset to default values
Handling Recommendations	It is recommended to return the unit for repair

Encoder Battery Undervoltage Warning Code: 0xE017	
Possible Causes	1. Low encoder battery voltage 2. Poor connection of encoder battery wiring
Handling Recommendations	1. Replace the encoder battery 2. Check and secure the battery connections to ensure they are correct and firm

Internal Driver Warning Code: 0xE019	
Possible Causes	Internal anomalies in the driver
Handling Recommendations	Replace the driver

Encoder Communication Abnormality Warning Code: 0xE020	
Possible Causes	1. Anomalies in the encoder itself 2. Incorrect wiring sequence or poor connection of the encoder cable 3. Abnormal encoder data due to noise interference
Handling Recommendations	1. Replace the motor or encoder. 2. Correct the wiring sequence or reinforce the connections. 3. Improve the electromagnetic environment of the equipment by following proper wiring practices, increasing the ground wire cross-sectional area, and adding ferrite beads.

Encoder Communication Timeout Warning Code: 0xE022	
Possible Causes	1. Anomalies in the encoder itself 2. Incorrect wiring sequence or poor connection of the encoder cable 3. Abnormal encoder data due to noise interference
Handling Recommendations	1. Replace the motor or encoder. 2. Correct the wiring sequence or reinforce the connections. 3. Improve the electromagnetic environment of the equipment by following proper wiring practices, increasing the ground wire cross-sectional area, and adding ferrite beads.

Encoder Data Abnormality Warning Code: 0xE024	
Possible Causes	1. Anomalies in the encoder itself 2. Incorrect wiring sequence or poor connection of the encoder cable 3. Abnormal encoder data due to noise interference
Handling Recommendations	1. Replace the motor or encoder. 2. Correct the wiring sequence or reinforce the connections. 3. Improve the electromagnetic environment of the equipment by following proper wiring practices, increasing the ground wire cross-sectional area, and adding ferrite beads.

Position Limit Warning Code: 0xE026	
Possible Causes	Unidirectional movement reaches mechanical limit, triggering hardware limits
Handling Recommendations	The fault can be cleared directly, and run in the opposite direction until the mechanical limit is restored. Ensure that position planning does not exceed the range of hardware limits.

Position Planning Parameter Abnormality Warning Code: 0xE027	
Possible Causes	Abnormal internal parameters of the driver
Handling Recommendations	Replace the driver or return for repair

SDO Write Failure Warning Code: 0xE028	
Possible Causes	SDO object write failure due to set values exceeding the allowable range of the object
Handling Recommendations	Confirm that the set values are within the allowable range of the object

Encoder Internal Warning Code: 0xE030

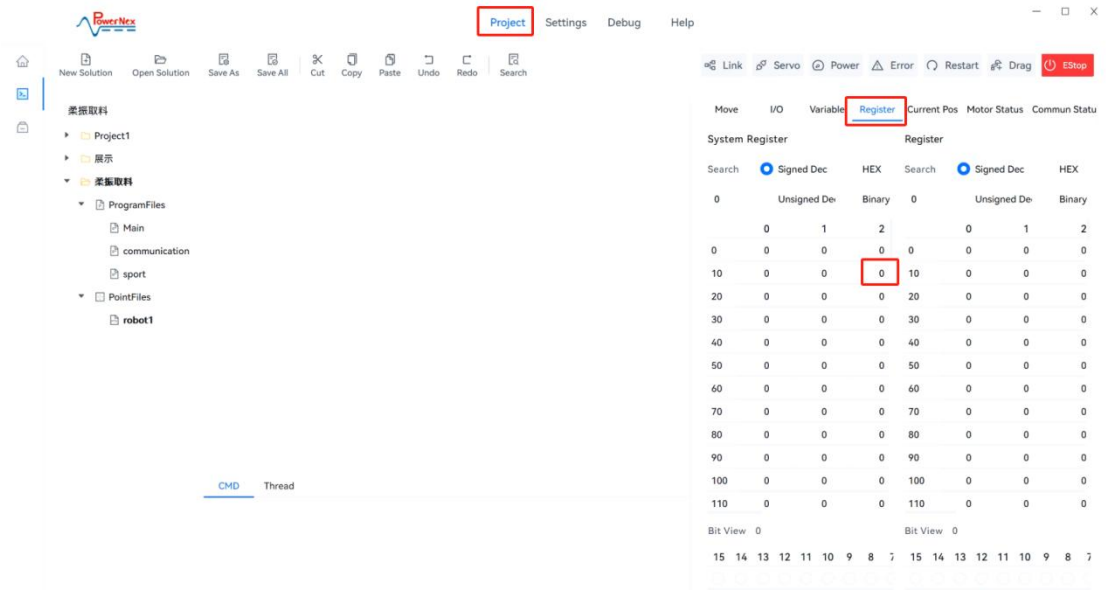
Possible Causes	1. Anomalies in the encoder itself 2. Incorrect wiring sequence or poor connection of the encoder cable 3. Abnormal encoder data due to noise interference
Handling Recommendations	1. Replace the motor or encoder. 2. Correct the wiring sequence or reinforce the connections. 3. Improve the electromagnetic environment of the equipment by following proper wiring practices, increasing the ground wire cross-sectional area, and adding ferrite beads.。

Energy Consumption Brake Resistor Overload Warning Code: 0xE031	
Possible Causes	1. Frequent rapid stop operations of the motor leading to excessive energy consumption brake energy 2. The power setting of the energy consumption brake resistor does not match the actual resistor
Handling Recommendations	1. Modify the motion path of the manipulator to avoid frequent rapid operation and stopping of the motor, for example, by extending the motor stop time. Alternatively, replace with a higher-capacity energy consumption brake resistor. 2. Correctly set the power of the energy consumption brake resistor to match the actual power of the resistor.

Chapter 4: System Alarm Handling

4.1 System Alarm Inspection

Open the PowerNexOS debugging software and locate the "Registers" section in the "Auxiliary Panel." Monitor the system register at address 12. Query the corresponding alarm code based on the value at register address 12.



4.2 System Alarm Overview

This section outlines the various system alarm information that can be detected by the controller.

No.	Warning Name	Warning Code
1.	No Error	0
2.	Internal System Error	1001
3.	Emergency Stop	1002
4.	Automatic Stop	1003
5.	Protective Stop	1004
6.	Collision Detection Stop	1005
7.	Collision Input Stop	1006
8.	ECAT Bus Error	2002
9.	Servo Error	2003
10.	Joint Torque Over Limit	2004
11.	Internal Calculation Error	3001
12.	Joint Position Over Limit	3002
13.	External Axis Position Over Limit	3003
14.	Base X-Axis Position Over Limit	3004
15.	Base Y-Axis Position Over Limit	3005
16.	Base Z-Axis Position Over Limit	3006
17.	Target Position Unreachable	3008
18.	Robot Singularity Error	3009
19.	Inverse Kinematics Calculation Error	3012
20.	Tracking Calculation Error	3013
21.	Arc Motion Error	3014

4.3 System Alarm Handling

Internal System Error Code: 1001	
Possible Causes	System internal parameters are disordered.
Handling Recommendations	1. Clear the alarm and restart the drive. 2. Replace the drive.

Emergency Stop Code: 1002	
Possible Causes	The emergency stop signal has been triggered.
Handling Recommendations	Disconnect the emergency stop signal and clear the alarm.

Automatic Stop Code: 1003	
Possible Causes	
Handling Recommendations	

Protective Stop Code: 1004	
Possible Causes	
Handling Recommendations	

Collision Detection Stop Code: 1005	
Possible Causes	An external force collision occurred during the robot's movement.
Handling Recommendations	Modify the robot's movement path to avoid equipment collisions.

Collision Input Stop Code: 1006	
Possible Causes	
Handling Recommendations	

ECAT Bus Error Code: 2002	
Possible Causes	An error occurred in ECAT bus communication.
Handling Recommendations	Check if the communication interface and protocol are correct.

Servo Error Code: 2003	
Possible Causes	An error was detected in the servo, causing the program to stop movement.
Handling Recommendations	Open the debugging software and investigate the servo error step by step.

Joint Torque Over Limit Code: 2004	
Possible Causes	The torque generated during movement of joints 1 – 4 exceeded parameter limits.
Handling Recommendations	Repeat the path motion, check the torque ratio of the joints during movement, and adjust parameters appropriately.

Internal Calculation Error Code: 3001	
Possible Causes	Abnormal data processing by the controller.
Handling Recommendations	1. Clear the alarm and restart the drive. 2. Replace the drive.

Joint Position Over Limit Code: 3002	
Possible Causes	The target position exceeds the joint's motion range.
Handling Recommendations	Adjust the target position.

External Axis Position Over Limit Code: 3003	
Possible Causes	The target position exceeds the travel limit of the external axis.
Handling Recommendations	Adjust the position of the external axis target.

Base X-Axis Position Over Limit Code: 3004	
Possible Causes	The target position X-axis coordinate exceeds the robot's travel limit.
Handling Recommendations	Adjust the target position's X-axis coordinate.

Base Y-Axis Position Over Limit Code: 3005	
Possible Causes	The target position Y-axis coordinate exceeds the robot's travel limit.
Handling Recommendations	Adjust the target position's Y-axis coordinate.

Base Z-Axis Position Over Limit Code: 3006	
Possible Causes	The target position Z-axis coordinate exceeds the robot's travel limit.
Handling Recommendations	Adjust the target position's Z-axis coordinate

Target Position Unreachable Code: 3008	
Possible Causes	The required target point exceeds the robot's motion range.
Handling Recommendations	Adjust the target position.

Robot Singularity Error Code: 3009	
Possible Causes	The robot is in a specific position or posture within its motion range.
Handling Recommendations	Move the robot away from the singularity position.

Inverse Kinematics Calculation Error Code: 3012	
Possible Causes	1. The target position exceeds the joint's motion range. 2. The robot is currently in a singularity position.
Handling Recommendations	Check if the target position exceeds limits and verify if the robot is at a singularity position.

Tracking Calculation Error Code: 3013	
Possible Causes	The conveyor belt's tracking target point exceeds the robot's motion range.
Handling Recommendations	Check if the conveyor belt tracking parameters are incorrect.

Arc Motion Error Code: 3014	
Possible Causes	Path planning error or the target position is unreachable.
Handling Recommendations	Check the robot's movement path.