

Motor Error

1. Motor Error Check

- shm_viewer
 - shm_viewer provides low-level information about the robot's current state. The **upper table** displays the commands being sent to the robot. The **lower table** shows the current status received from each motor, along with the target values.
 - The lower table also provides information on the **BMS status**, **CAN bus channel status**, and **torque status**.

bash

```
./robros/ws/build/igris_c_can/application/shm_viewer
```

2. Motor Error Code

- Communication Error

Code Name	Value (Hex / Dec)	Description	Typical Condition	Recommended Action
NO_ERROR	0x0 = 0	Normal operating state.	–	–
INITIALIZE_ERROR	0x00000001 = 1	Failed to initialize the motor driver/controller.	Communication failure (no power or disconnected communication cable).	Reboot the robot. If the issue persists, contact the manufacturer.
PACKET_NOT_RECEIVED_ERROR	0x00000002 = 2	Initialization completed successfully, but no control packets are being received.	Communication failure (disconnected cable or no power).	Reboot the robot. If the issue persists, contact the manufacturer.

- Drive / Power Related

Code Name	Value (Hex / Dec)	Description	Typical Condition	Recommended Action
MOTOR_STALL_ERROR	0x00000004 = 4	Motor stall detected.	Mechanical obstruction or excessive load.	Check for mechanical interference or excessive friction.
LOW_VOLTAGE_ERROR	0x00000008 = 8	Supply voltage is below the allowable range.	Low battery charge or insufficient power supply capacity.	Check the battery charge level.
OVER_VOLTAGE_ERROR	0x00000010 = 16	Supply voltage exceeds the allowable range.	External voltage input or excessive back EMF.	Reboot the robot. If the issue persists, contact the manufacturer.
OVER_CURRENT_ERROR	0x00000020 = 32	Motor current exceeds the allowable limit.	Excessive load or motor malfunction.	Reboot the robot. If the issue persists, contact the manufacturer.
POWER_OVERRUN_ERROR	0x00000040 = 64	Power or speed limit exceeded.	The robot was moved manually at high speed.	Reboot the robot. If the issue persists, contact the manufacturer.

- Calibration Parameter Related

Code Name	Value (Hex / Dec)	Description	Typical Condition	Recommended Action
CALIBRATION_PARAMETER_WRITING_ERROR	0x00000080 = 128	Failed to write the encoder calibration parameters.	Motor malfunction or invalid encoder calibration data.	Reboot the robot. If the issue persists, contact the manufacturer.

- Motor Status Related

Code Name	Value (Hex / Dec)	Description	Typical Condition	Recommended Action
SPEEDING_ERROR	0x00000100 = 256	Motor speed exceeds the specified limit.	Excessive manual movement of the robot.	Reboot the robot. If the issue persists, contact the manufacturer.
COMPONENT_OVERTEMPERATURE_ERROR	0x00000200 = 512	Component temperature exceeds the allowable limit.	Operation beyond the cooling system's capacity.	Allow the robot to cool down before resuming operation.
MOTOR_TEMPERATURE_OVER_TEMPERATURE_ERROR	0x00000400 = 1024	Motor temperature exceeds the allowable limit.	Operation beyond the cooling system's capacity.	Allow the robot to cool down before resuming operation.

- Encoder Related

Code Name	Value (Hex / Dec)	Description	Typical Condition	Recommended Action
ENCODER_CALIBRATION_ERROR	0x00000800 = 2048	Encoder calibration error.	Various causes.	Reboot the robot. If the issue persists, contact the manufacturer.
ENCODER_DATA_ERROR	0x00001000 = 4096	Invalid encoder data detected.	Various causes.	Reboot the robot. If the issue persists, contact the manufacturer.

- Brake / Gate Driver Related

Code Name	Value (Hex / Dec)	Description	Typical Condition	Recommended Action
MOTOR_BRAKE_VOLTAGE_TOO_HIGH_ERROR	0x00002000 = 8192	Brake voltage exceeds the allowable limit.	Faulty power regulator or malfunctioning relay/gate driver.	Reboot the robot. If the issue persists, contact the manufacturer.
DRV_DRIVE_ERROR	0x00004000 = 16384	Gate driver (DRV) fault detected.	Various causes.	Reboot the robot. If the issue persists, contact the manufacturer.

3. General Troubleshooting Guidelines

- In most abnormal conditions, **immediately stop robot operation or disable motor torque and power** to ensure safety.
- Since most fault conditions cannot be resolved by the user, **shut down the robot immediately and contact qualified maintenance personnel or the manufacturer.**
- **Do not attempt to operate the robot again until the root cause has been identified and resolved**, as doing so may increase the risk of damage to the robot.

Emergency Response

1. Common Issues and Troubleshooting

Power Issues (Robot Does Not Power On / Unexpected Shutdown)

1. Check that the power cable is securely connected.
2. Verify the power supply.
 - a. Check the battery charge level and the battery's physical condition.
 - b. Confirm that the power supply unit is operating properly.
 - If the power cable and power supply are functioning normally, the issue is likely caused by an internal circuit failure. Disconnect the power immediately and contact qualified service personnel.

Motor Issues (Unexpected Shutdown / Abnormal Motion)

1. Check the communication status.
 - If communication data is not being received, the issue is likely caused by an internal communication cable failure or a motor driver malfunction. Disconnect the power immediately and contact qualified service personnel.
2. Check the motor temperature.
 - If the motor has overheated due to repeated high-speed operation:
 - Stop the robot and allow the motor to cool down before restarting.
 - If the issue persists after restarting, inspect the motor for mechanical friction.
 - If excessive mechanical friction is suspected:
 - Follow the shutdown procedure described in **Section 5. Shutting Down the Robot**.
 - Manually move the affected joint to check for abnormal mechanical resistance.
 - If excessive mechanical resistance is detected, a mechanical failure may have occurred. Disconnect the power immediately and contact qualified service personnel.

Abnormal Motor Noise

1. Check for mechanical friction.

- Follow the shutdown procedure described in **Section 5. Shutting Down the Robot.**
- Manually move the affected joint to check for abnormal mechanical resistance.
 - If excessive mechanical resistance is detected, a mechanical failure may have occurred. Disconnect the power immediately and contact qualified service personnel.

2. Check for loose internal fasteners.

- Follow the shutdown procedure described in **Section 5. Shutting Down the Robot.**
- Move the affected joint back and forth in multiple directions to check for loosened screws or fasteners.
 - Loose fasteners may cause abnormal noise and require reassembly of the affected joint. Disconnect the power immediately and contact qualified service personnel.

3. If neither mechanical friction nor loose connections are found:

- **Further diagnosis is required, as the issue may be caused by communication timing or other complex factors. Disconnect the power immediately and contact qualified service personnel.**

Battery Issues (Charging Failure / Overheating)

: If an abnormal condition occurs while charging, first move the battery to a safe location.

1. Inspect the battery.

- Check for physical damage such as dents or swelling.
- Inspect the connectors and cables.
 - **If any physical damage is found, stop using the battery immediately and contact the manufacturer to obtain a replacement battery.**

2. Check the battery temperature.

- Verify whether the battery has overheated.
 - **Allow the battery to cool before attempting to recharge it. If the problem recurs or the battery overheats again, discontinue use immediately and contact the manufacturer for a replacement battery.**

Sensor Issues (No Response / Incorrect Detection)

1. Robot Status Cannot Be Updated

- **The issue is likely caused by an internal communication cable failure or a sensor malfunction. Disconnect the power immediately and contact qualified service personnel.**

Communication Connection Issues

1. Verify that the robot is powered on.

2. Ensure that the host computer is connected to the same network as the robot.

3. Verify that the correct IP address and port number have been entered.

- **If the connection cannot be established after following the instructions in this manual, contact qualified service personnel.**

2. Emergency Response Guide

Stop Using the Robot Immediately If:

1. The robot vibrates excessively.

2. The robot suddenly loses its posture (for example, a robot arm drops unexpectedly).

3. The robot briefly loses posture and then moves abruptly.

-> Immediately activate the Emergency Off (EMO) function or perform a Torque OFF operation.

If the Robot Moves into an Abnormal Pose

1. The robot performs an unintended motion.

2. A joint moves in an unexpected direction.

- Reboot the robot. Check the communication status and joint positions.
- Power only the motor drivers and verify the communication cycle of each joint.
- Do not enable Torque ON until all inspections have been completed.

If You Notice a Burning Smell

1. **Immediately activate the Emergency Off (EMO) function or perform a Torque OFF operation, then contact qualified service personnel.**

2. If a burning smell or any other power-related abnormality is detected, do not attempt to restart the robot under any circumstances.

If the Robot Overheats

1. Power off the robot immediately and allow it to cool completely before attempting further operation.