Gripper Product Operation Manual

Articulated Gripper

CAN Version

Preface

Thank you for purchasing and using the Raybot articulated gripper.

This manual introduces the usage methods, precautions, and other information of the articulated gripper. Relevant operators, commissioning personnel, and maintenance personnel must read this manual carefully before operating.

If you need to learn about other products of our company, please feel free to contact us.

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Revision History

Date	Version	Description
20260206	V1.0	Initial version, documenting operation and instruction-related descriptions

📑 Table of Contents

- Usage Precautions
  - Unboxing
  - Test Usage
  - Storage
- After-Sales Policy
- Gripper Overview
- Interface Definition
- Host Computer Software
- CAN Command Description
  - Parameters
  - Message Format
  - Gripper ID Setting
  - Initialize Gripper
  - Force-Controlled Position Closed-Loop
  - Read Gripper Error Status
  - Gripper Reset Command
    - Read Gripper Current Running Data
    - Gripper Stop Command
  - Gripper Clamped Object Drop Auto-Reply
- Common Fault Troubleshooting and Handling Methods
- Periodic Inspection

Usage Precautions

Unboxing

1. Please unpack in layers in order. Violent striking or hitting during unpacking is strictly prohibited.
2. Please check the packing list to verify that the gripper name is correct, accessories are complete, and there is no damage to the surface of the equipment and its accessories. If there are any issues, do not install and contact us promptly.

Test Usage

1. Do not plug or unplug power cables and communication cables while powered on. Ensure the power indicator light is off before performing wiring and maintenance on the equipment.
2. It is strictly prohibited to disassemble any device or accessory of the equipment while powered on, otherwise there is a risk of electric shock.
3. Failure to ground the gripper housing may cause charge accumulation on the housing, affecting the normal operation of the gripper and potentially causing personal injury. The wiring cables must comply with the corresponding wire gauge and shielding requirements, and the shielding layer of the shielded cable must be reliably grounded.
4. Please conduct a risk assessment before use and take appropriate measures to ensure personal and equipment safety.
5. Set appropriate position limits, speed limits, and current limits. Exceeding the limits may damage the gripper and even threaten personal safety.
6. To prevent accidents, please perform a no-load test run of the gripper.
7. The gripper is a precision device. Do not strike it forcefully with a hammer or similar tools. Handle with care to prevent the gripper from falling off the workbench and causing cracks or other damage.
8. During gripper operation, the surface may become very hot. Please take protective measures. When the surface temperature exceeds 40°C, avoid prolonged contact to prevent low-temperature burns. When the surface temperature exceeds 85°C, avoid touching to prevent minor burns.

Storage

1. Please strictly follow the manual's requirements for transportation and storage temperature and humidity, and avoid direct sunlight, strong magnetic fields, strong electric fields, strong vibrations, etc. Recommended temperature: -20°C~60°C, relative humidity ⩽85% (no condensation).
2. Avoid storing the gripper for more than 3 months. If the storage time is too long, please take more stringent protective measures and necessary inspection and maintenance.
3. Please strictly package the gripper before transportation. It is strictly prohibited to transport it together with equipment that may affect it.

After-Sales Policy

This product is subject to the following after-sales service in strict accordance with the "Consumer Rights Protection Law of the People's Republic of China" and the "Product Quality Law of the People's Republic of China":

- For users who purchase this product, if quality issues occur within 7 days, return or exchange service is available. When returning or exchanging, a valid purchase certificate and return invoice should be provided, and the returned item must be in good functional condition, with no cosmetic damage, and with complete accessories.
- For users who purchase this product, free warranty service is provided within one year from the day after receipt. If there is human-caused damage, unauthorized disassembly, etc., warranty service will not be provided. If, after inspection, it is confirmed that the gripper needs replacement parts, the seller and the customer shall negotiate whether to purchase repair parts additionally.
- From the day after receipt, within 7 to 15 days, if quality issues occur with the product, exchange service is available after confirmation. When exchanging, a valid purchase certificate and return invoice should be provided, and the returned item must be in good functional condition, with no cosmetic damage, and with complete accessories.
- The following situations are not covered by the warranty:

> 1. The gripper is burnt out due to failure to install and connect other control equipment according to the user manual.
> 2. Use exceeding the specifications or standards shown in the user manual (e.g., incorrect gripper parameter settings).
> 3. Storage method and working environment exceeding the specified range in the user manual (e.g., contamination, salt damage, condensation, etc.).
> 4. Product damage caused by abnormal conditions (e.g., dropping, impact, liquid ingress, severe impact, etc.).
> 5. Product damage caused by force majeure (natural disasters, fires, floods, etc.).
> 6. Damage to the gripper caused by the user disassembling the product on their own.
> 7. Exceeding the warranty period provided by the after-sales policy.
> 8. Unable to provide a valid purchase certificate.

In the event of a gripper failure, please contact the sales representative immediately to obtain a solution. Users shall not disassemble or maintain the articulated gripper for any reason, otherwise the warranty service will be terminated.

Gripper Overview

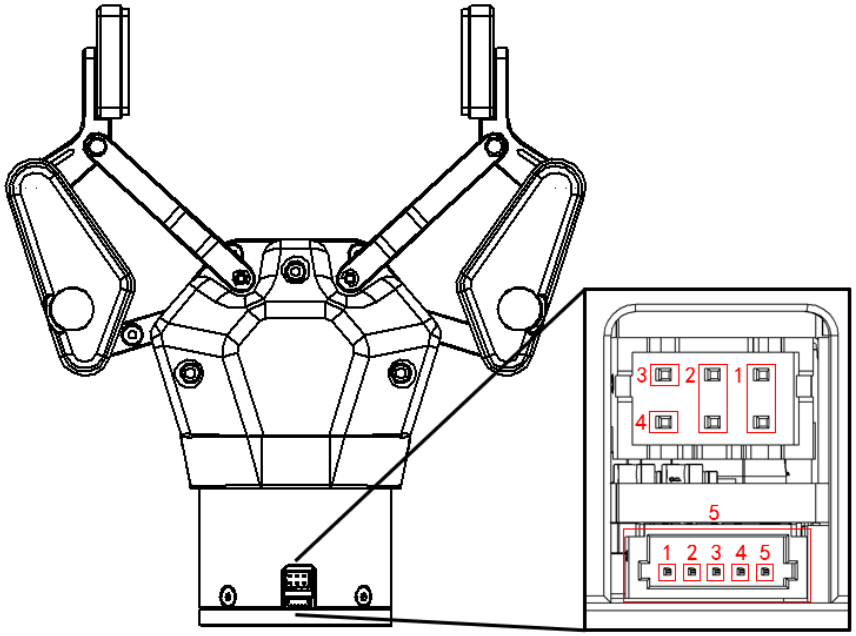
The articulated gripper features two adaptive parallel mechanical joint fingers (hereinafter referred to as joint fingers). Each joint finger consists of multiple linkage mechanisms and a spring. This design simplifies the grasping control method, enabling the joint fingers to automatically adapt to the shape of the objects they grasp.

Force and Position Controllable: The gripper allows programming adjustment of the clamping position and clamping force value. During gripper operation, the clamping force is related to the set value.

Multiple Communication Methods: The gripper body uses the standard CAN2.0 communication protocol and EtherCAT communication protocol for control.

Clamping Detection: A combination of force control and position control is used during the clamping process.

Interface Definition



No.	Interface Definition	Interface Description
1	DC+	24~48V power positive
2	DC-	24~48V power negative
3	CAN_L	CAN network signal
4	CAN_H	CAN network signal
5	1.R+ 2.R- 3.T+ 4.T-	EtherCAT input interface
6	1.R+ 2.R- 3.T+ 4.T-	EtherCAT output interface

Host Computer Software

For the full functionality of the host computer software, please refer to this document:

上位机使用说明书--V3驱动.pdf

To download the host computer software, click the link below:
https://cloud-1251007531.bcdn8.com/maita0712/uploads/20251120/MYACTUATOR_%E8%B0%83%E8%AF%95%E8%BD%AF%E4%BB%B6_V4.0_20250704.zip

CAN Command Description

Parameters

- Bus interface: CAN
- Baud rate: 1Mbps

Message Format

- Identifier: Single gripper command send: 0x140 + ID(1~32)
- Frame format: Data frame
- Frame type: Standard frame
- DLC: 8 bytes

Gripper ID Setting

The host sends this command to set and read the CAN ID. Communication ID uses 0x300, all devices on the bus will receive and process this command. When modifying, please note whether multiple devices are connected, as this may change the IDs of multiple devices to the same value simultaneously.
The host sends this command to set and read the CAN ID, parameters as follows.

1. Read/Write flag ReadWriteFlag is of bool type, 1 for read, 0 for write;
2. CANID, range (#1~#32), uint16_t type (synchronized with host computer software function), device identifier 0x140 + ID(1~32).

Data Field	Description	Data
DATA[0]	Command byte	0x79
DATA[1]	NULL	0x00
DATA[2]	Read/Write flag	ReadWriteFlag
DATA[3]	NULL	0x00
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	CANID	0x01~0x20

Gripper reply parameters as follows.

1. The gripper replies to the host after receiving the command, in the following two situations:
2. Set CANID, range 1-32, returns the original command;

3. Read CANID, returns the following parameters.

Data Field	Description	Data
DATA[0]	Command byte	0x79
DATA[1]	NULL	0x00
DATA[2]	Read/Write flag	ReadWriteFlag
DATA[3]	NULL	0x00
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	CANID	0x01~0x20

Example:

Send command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x300	0x79	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Reply command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x300	0x79	0x00	0x00	0x00	0x00	0x00	0x00	0x01

Initialize Gripper

The host sends this command to initialize and set the gripper zero position. Used for recalibrating the gripper and returning to the zero position. Please do not control the gripper during initialization. The initialization time is approximately 1-5 seconds. Please perform control after initialization is complete.

Note: This operation is required every time after power-on.

The host sends this command to initialize and set the gripper zero position, parameters as follows.

Data Field	Description	Data
DATA[0]	Command byte	0x65
DATA[1]	NULL	0x00
DATA[2]	NULL	0x00
DATA[3]	NULL	0x00
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	NULL	0x00

Gripper reply parameters as follows.

After receiving the command, the gripper replies to the host with status byte 0x00. After zeroing is complete, it will automatically reply with status byte 0x01 to indicate initialization is complete.

Data Field	Description	Data
DATA[0]	Command byte	0x65
DATA[1]	Status byte	0x00/0x01
DATA[2]	NULL	0x00
DATA[3]	NULL	0x00
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	NULL	0x00

Note:

During the initialization process, the gripper searches for the maximum position. If the position is obstructed during this process, it will identify an incorrect maximum position, causing it to not open to the actual maximum position when opening.

Example:

Send command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x141	0x65	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Reply command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x241	0x65	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Wait for initialization to complete, then it will reply again:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x241	0x65	0x01	0x00	0x00	0x00	0x00	0x00	0x00

Force-Controlled Position Closed-Loop

The host sends this command to control the opening and closing stroke of the gripper.

Control value **Stroke Percentage**, uint8_t type, range 0~100, 0 is the closed state, 100 is the fully open state. In units of percentage of the maximum stroke, the gripper stroke direction is determined by the difference between the target percentage and the current percentage. The maximum stroke of the gripper is limited by the maximum positive angle in the host computer software.

Control value **Speed Percentage** limits the maximum opening/closing speed of the gripper, uint8_t type, range 0~100, corresponding to a percentage of the rated speed. The speed of the gripper is limited by the rated speed in the host computer software.

Control value **Maximum Torque** limits the maximum torque of the gripper output shaft, uint8_t type, range 0~255, in units of percentage of the rated current, i.e., 1% × rated current/LSB. If the given current is greater than the stall current, force control mode is not enabled. The maximum torque current of the gripper is limited by the stall current value in the host computer software.

Data Field	Description	Data
DATA[0]	Command byte	0xAA
DATA[1]	Maximum torque	0x01~0xFF
DATA[2]	Speed percentage	0x00~0x64
DATA[3]	Stroke percentage	0x00~0x64
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	NULL	0x00

Gripper reply parameters as follows.

After receiving the command, the gripper replies to the host. This frame data

contains the following parameters.

1. Gripper temperature (int8_t type, 1°C/LSB);
2. Gripper torque current value iq (int16_t type, 0.01A/LSB);
3. Gripper output shaft speed (int16_t type, 1dps/LSB);
4. Gripper set maximum torque maxTorque (uint8_t type, range 0~255);
5. Gripper stroke percentage Itinerary (uint8_t type, range 0~100);

Data Field	Description	Data
DATA[0]	Command byte	0xAA
DATA[1]	Gripper temperature	(uint8_t)(temperature)
DATA[2]	Torque current low byte	(uint8_t)(iq)
DATA[3]	Torque current high byte	(uint8_t)(iq>>8)
DATA[4]	Gripper speed low byte	(uint8_t)(speed)
DATA[5]	Gripper speed high byte	(uint8_t)(speed>>8)
DATA[6]	Maximum torque	(uint8_t)(maxTorque)
DATA[7]	Stroke percentage	(uint8_t)(Itinerary)

Example:

Send command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x141	0xAA	0x0A	0x64	0x00	0x64	0x00	0x00	0x00

Reply command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x241	0xAA	0x32	0x00	0x00	0x00	0x00	0x0A	0x64

Read Gripper Error Status

The host sends this command to read the current temperature, voltage, and error status flags of the gripper.

Data Field	Description	Data
DATA[0]	Command byte	0x9A
DATA[1]	NULL	0x00
DATA[2]	NULL	0x00
DATA[3]	NULL	0x00
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	NULL	0x00

After receiving the command, the gripper replies to the host. This frame data contains the following parameters:

1. Gripper temperature (int8_t type, unit 1°C/LSB);
2. Voltage (uint16_t type, unit 0.1V/LSB);
3. Error flag errorState (uint16_t type, each bit represents a different gripper status).

Data Field	Description	Data
DATA[0]	Command byte	0x9A
DATA[1]	Gripper temperature	(uint8_t)(temperature)
DATA[2]	MOS temperature	(uint8_t) (motorMOStemperature)
DATA[3]	NULL	0x00
DATA[4]	Voltage low byte	(uint8_t)(voltage)
DATA[5]	Voltage high byte	(uint8_t)(voltage>>8)
DATA[6]	Error status low byte	(uint8_t)(errorState)
DATA[7]	Error status high byte	(uint8_t)(errorState>>8)

The System_errorState status table for system abnormal states is as follows:

System_errorState Value	Status Description
0x0002	Gripper stall
0x0004	Low voltage
0x0008	Overvoltage
0x0010	Phase current overcurrent
0x0040	Power limit exceeded
0x0080	Calibration parameter write error
0x0100	Overspeed
0x0800	Drive board MOS overtemperature
0x1000	Gripper temperature overtemperature
0x2000	Encoder calibration error

When multiple errors occur simultaneously, the error status bits will be displayed as a sum. For example, if the value 0x0016 appears, it represents 0x0002+0x0004+0x0010 added together, meaning the gripper has three errors: stall, low voltage, and phase current overcurrent.

Example:

Send command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x141	0x9A	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Reply command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x241	0x9A	0x32	0x00	0x01	0xE5	0x01	0x04	0x00

Gripper Reset Command

The host sends this command to reset the system program.

Data Field	Description	Data
DATA[0]	Command byte	0x76
DATA[1]	NULL	0x00
DATA[2]	NULL	0x00
DATA[3]	NULL	0x00
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	NULL	0x00

After receiving the command, the gripper resets and does not return a reply.

Example:

Send command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x141	0x76	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Read Gripper Current Running Data

The host sends this command to read the current temperature, speed, and encoder position of the gripper.

Data Field	Description	Data
DATA[0]	Command byte	0x9C
DATA[1]	NULL	0x00
DATA[2]	NULL	0x00
DATA[3]	NULL	0x00
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	NULL	0x00

Gripper reply parameters as follows.

After receiving the command, the gripper replies to the host. This frame data contains the following parameters.

1. Gripper temperature (int8_t type, 1°C/LSB);
2. Gripper torque current value iq (int16_t type, 0.01A/LSB);
3. Gripper output shaft speed (int16_t type, 1dps/LSB);

4. Gripper set maximum torque maxTorque (uint8_t type, range 0~255);

5. Gripper stroke percentage Itinerary (uint8_t type, range 0~100);

Data Field	Description	Data
DATA[0]	Command byte	0x9C
DATA[1]	Gripper temperature	(uint8_t)(temperature)
DATA[2]	Torque current low byte	(uint8_t)(iq)
DATA[3]	Torque current high byte	(uint8_t)(iq>>8)
DATA[4]	Gripper speed low byte	(uint8_t)(speed)
DATA[5]	Gripper speed high byte	(uint8_t)(speed>>8)
DATA[6]	Maximum torque	(uint8_t)(maxTorque)
DATA[7]	Stroke percentage	(uint8_t)(Itinerary)

Example:

Send command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x141	0x9C	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Reply command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x241	0x9C	0x32	0x64	0x00	0xF4	0x01	0x2D	0x00

Gripper Stop Command

The host sends this command to shut off the gripper output and clear the gripper running status, not in any closed-loop mode.

Data Field	Description	Data
DATA[0]	Command byte	0x80
DATA[1]	NULL	0x00
DATA[2]	NULL	0x00
DATA[3]	NULL	0x00
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	NULL	0x00

The gripper replies to the host, frame data is the same as what the host sent.

Example:

Send command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x141	0x80	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Reply command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x241	0x80	0x00	0x00	0x00	0x00	0x00	0x00	0x00

Gripper Clamped Object Drop Auto-Reply

When the gripper is in the clamping state and the clamped object drops, the gripper will automatically reply with this command.

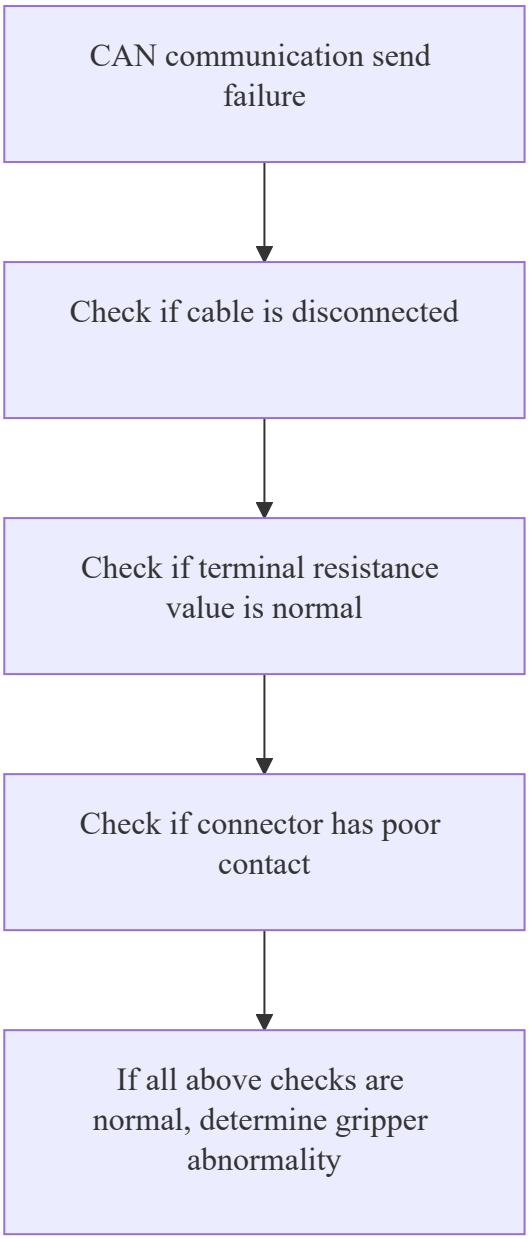
Data Field	Description	Data
DATA[0]	Fixed	0x01
DATA[1]	Fixed	0x10
DATA[2]	NULL	0x00
DATA[3]	NULL	0x00
DATA[4]	NULL	0x00
DATA[5]	NULL	0x00
DATA[6]	NULL	0x00
DATA[7]	NULL	0x00

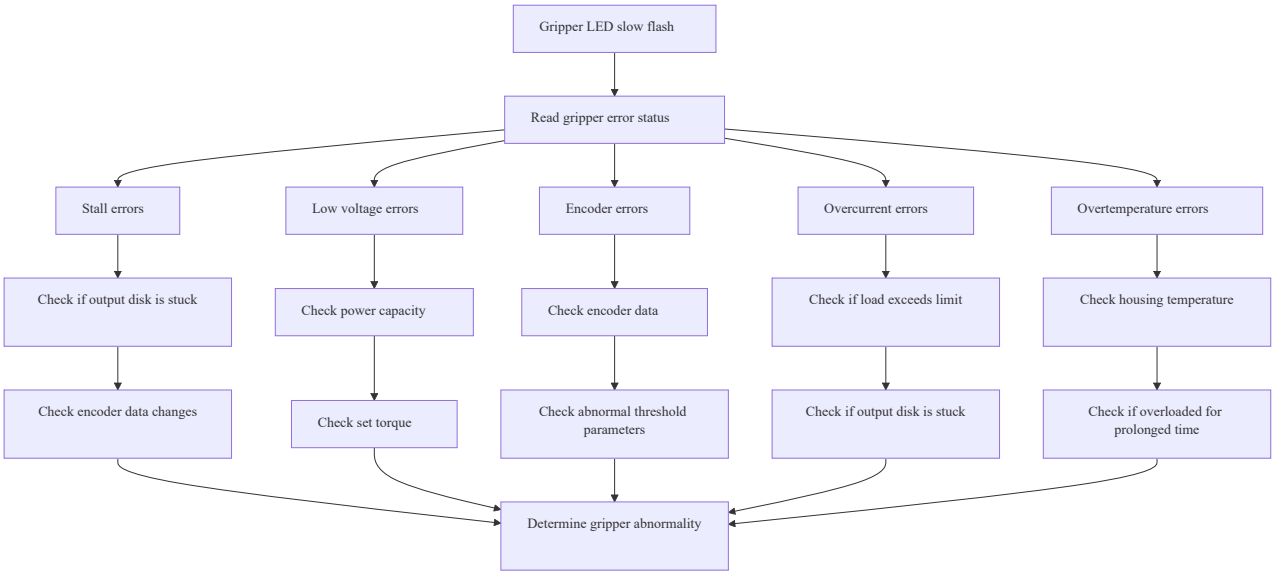
Example:

Auto-reply command:

ID	Data[0]	Data[1]	Data[2]	Data[3]	Data[4]	Data[5]	Data[6]	Data[7]
0x241	0x01	0x10	0x00	0x00	0x00	0x00	0x00	0x00

Common Fault Troubleshooting and Handling Methods





Periodic Inspection

The steps for periodic inspection of the gripper are as follows:

1. The finger movement must be symmetrical and smooth: Test the stroke by opening the fingers, the fingers must return to their initial starting position on their own; check whether the gripper has any sticking or jittering during operation.
2. Finger rubber wear must not affect clamping. If wear is severe and affects the gripper's ability to grasp objects, please replace the finger pads.
3. Check for collision damage. If there is any damage, please contact technical support.
4. Check all screws for rust or damage. If any are found, please replace them.

Note:

· Before performing any operations on the gripper, please turn off the robot and gripper power.

· Cleaning personnel must wear anti-static wristbands and other anti-static measures to avoid damaging electronic components.