Industrial robot

Mechanical Use and Maintenance Manual

Models include:

1. Four axis robot:QJRB15-1、QJRB30-1

Please make sure that the relevant instruction book reaches the end user of the product.

Preface

	▪ Before operating the robot, please read the instruction book carefully and follow all the safety related issues and instructions provided in the text. ▪ The installation, operation and maintenance of the robot shall be undertaken by the personnel who have attended the training courses of our company.
	▪ Please be sure to deliver the instruction book to the personnel who actually operate the robot.
	▪ If there is any ambiguity in the instruction book or if you have any questions about the after-sales service of the robot, please contact the service center directly. See the back cover for the contact way.

Notes

1 The contents described in the instruction book are subject to change without notice.

2 The display of the screen of the suspended teaching operation control key board is just an example. If there is any difference from the actual display, please understand.

3 The contents described in the operating instruction have been given full attention to prevent mistakes, but the company is not responsible for any direct or indirect damages in case of errors.

4 The operating instruction is a part of the robot product. When moving, transferring, or selling the robot, please make sure to attach the operating instruction.

5 All or part of the contents of the operating instruction is prohibited from being reproduced without the consent of our company.

6 On Prohibition of modification

・It is strictly forbidden to make any modifications to our products.

・Fires, faults and malfunctions due to modifications may cause injury and damage to the machine.

・The modifications of the product made by the customer are outside the warranty scope of our company, therefore no responsibility is granted.

Revision history record of instruction book		
Version	Year/Month	Change contents
V1.0	July,2019	1. First edition

Contents

Chapter I Safety specification

1.1 Safety introduction

Before use(installation, operation, maintain, maintenance),please read and understand this manual and other auxiliary materials. Do not use the robot until you are familiar with the equipment content, safety knowledge and precautions.

The safety precaution in this manual are divided into four categories:"danger", " caution ", "mandatory" and "prohibition".

DANGER!

There will be danger in case of misoperation, which may lead to major casualties.

CAUTION!

Misoperation can be dangerous and may cause moderate injury or damage to items.

MANDATORY!

Matters to be observed.

PROHIBITION!

Prohibited matters.

In order to prevent accidents, the following dangerous operation behaviors are listed:

Example 1	The automatic operation is started without confirming that no one is in the working area of the operator.
Example 2	The operator is in automatic operation mode, someone enters the working area of the operator and the operator starts unexpectedly.
Example 3	Someone in the range of an operator's actions notices one operator and ignores the other.
Example 4	The movement suddenly changed from low speed to high speed.
Example 5	Another operator operated without permission.
Example 6	The operator uses another program for operation due to a program error or peripheral device failure.
Example 7	Work is carried out while the operator stops waiting for the interlock, and the interlock is suddenly released, and then the operator unexpectedly starts to move.

1.2 Pre-employment training

MANDATORY!

The personnel for teaching and maintaining the robot must be subject to prior training. The repair and maintenance of the robot must be carried out by professionals. The adverse consequences caused by the disassembly of the robot without permission are not the responsibility of our company. The relevant personnel shall not maintain, repair or use the teaching after being affected by drinking, taking drugs and stimulant medications.

1.3 Safety precautions for operators

There is potential danger within the entire maximum range of motion of the robot.

All personnel working for the robot (security administrators, installers, operators and service personnel, etc.) must always set up "safety first" thinking to ensure the personal safety of all personnel.

-Make sure to operate outside the range of motion of the robot when there is no need to enter into the working area of the robot.

-Make sure that there is not anything abnormal of the robot or peripheral equipments before teaching.

-The programmer must be careful not to allow others to enter into the working range of the robot. If someone enters by mistake, must stop!

CAUTION!

Any dangerous work is prohibited within the installation area of the robot, safety measures must be taken:

-The relative obvious warning signs such as "stop" or "No Entrance" shall be placed in the relevant working area of the robot, and the isolation fences shall be arranged in the placement area of the robot and subsidiary tools to prevent accidental injury during production.

-It is recommended to lay washer switches or photoelectric switches on the floor so that when the operator enters into the range of motion of the machine, an alarm is sounded through buzzer and light to stop the robot to ensure staff safety.

Operators should Strictly observe the following provisions:

-Wear work clothes (do not wear loose clothes).

-Do not wear gloves when operating the robot.

-Shirts and ties shall not be exposed from the work clothes.

-The female workers shall wear work caps with hair inside the cap.

-Do not wear big jewelry such as earrings, rings or pendants.

Wear appropriate personal protective equipments such as safety helmets, safety shoes (with anti-skidding soles), masks, safety goggles and gloves if necessary. Unsuitable clothes may cause personal injury, for example, loose clothes hang on the robot or accessory equipments, causing the robot to suddenly stop or start.

CAUTION!

Unauthorized personnel shall not access the robot and its peripheral auxiliary equipments. Failure to observe the instruction may cause injury due to touching the control cabinet, workpieces and positioning device, etc.

CAUTION!

The operators shall have the awareness of emergency escape. In case of an emergency, they must be able to escape immediately.

DANGER!

Always pay attention to the action of the operator, and do not work back to the operator at work. It is possible that the action of the robot is not found in time, which leads to the occurrence of injury accidents.

CAUTION!

In case of any abnormality, please press the emergency stop button immediately. In addition, please carefully implement this instruction. Do not just have a look and take emergency measures.

CAUTION!

When there is no need for the action or operation of the robot, please cut off the power supply of the robot control device. After cutting off the power supply, the robot will never act.

CAUTION!

During the teaching, please pay attention to the program number and the correctness and rationality of the program steps. If you edit the program with the wrong program number, an accident may occur.

DANGER!

Do not lean on the control cabinet or other control cabinets and do not press the operation

key at will. Otherwise, it will cause unexpected action of the robot, resulting in personal injury and equipment damage.

CAUTION!

After the teaching, please check the movement of the robot with the operation or back button at low speed. If the robot is directly operated at 100% in the reproduction mode, it is easy to cause safety accidents.

DANGER!

During the automatic operation of the robot, no one is allowed to enter the protective fence to avoid personal injury.

CAUTION!

After the teaching operation, please clean the inside of the protective fence and confirm whether there are any left tools and oil. If not cleaned in time, it may trip and cause accidents. Cleaning up is the first step to safety.

CAUTION!

When carrying out maintenance and inspection, please operate when the electrical appliance is disconnected, and put up the notice of no power on.

1.4 Safety precautions for robots

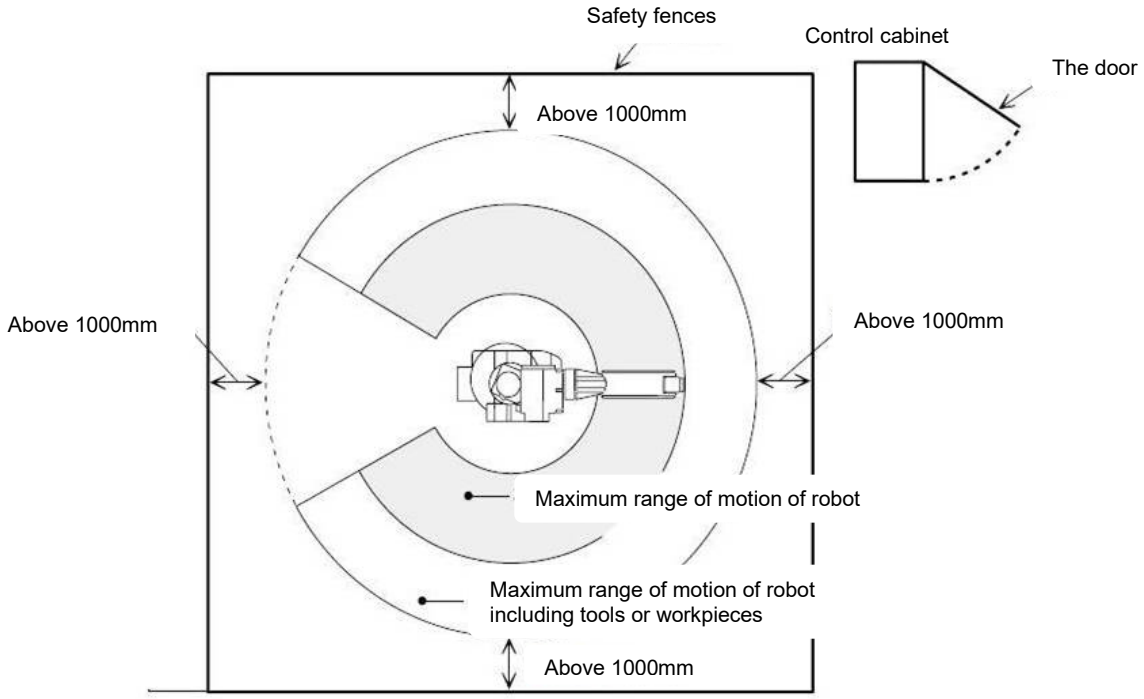
1.4.1 Installation and wiring safety

Look up the requirements of robot installation and wiring in the instruction book and the specific installation requirements are described subsequently in the instruction book. In a planned installation, develop simple measures to ensure safety. When planning the installation area, take full account of safety issues.

When installing the robot, observe the following items:

DANGER!

Select an area to install the robot and verify that the area is large enough to ensure that the robot equipped with tools does not touch the wall when rotating, safety fences or control cabinet when it rotates. Otherwise it may cause personal injury or equipment damage due to unintended actions of the robot.



In order to ensure safety, it is necessary to operate at a position where the robot can be seen. The control cabinet shall be installed outside the safety fence of the range of motion of the robot. After setting, fix the control cabinet with bolts through the bolt holes at the bottom.

Be familiar with the wiring diagram before wiring the control cabinet, and wring must be done according to the wiring diagram. Incorrect wiring or incorrect displacement of parts can cause equipment damage or personal injury.

CAUTION!

Cranes, spreaders or forklifts shall be operated by authorized personnel. Otherwise it may cause personal injury and equipment damage.

The robot is kept vertical using the wire rope passing through the lifting ring and the positioning device, and the overhead crane is used to lift and transport according to the requirements specified in the robot instruction book. Otherwise, it may cause the robot to tip over, thus resulting in personal injury or equipment damage.

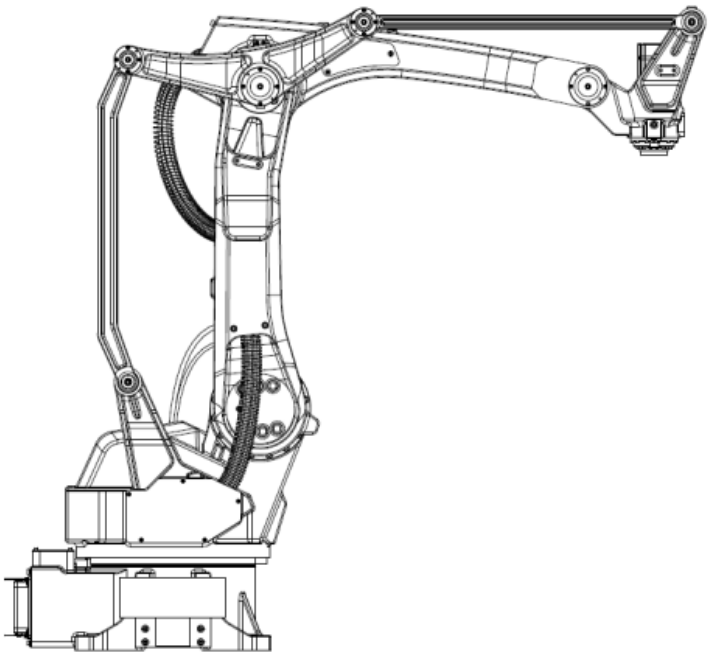
-Generally, when lifting the control cabinet or robot, it is necessary to use the wire rope to pass through the eyebolt bolt fixed to the robot, lifting with overhead crane. Make sure the wire rope is strong enough to withstand the weight of the robot. The weight of the control cabinet is about 120Kg and the weight of the robot is about 160Kg.

-Check the wire rope before lifting. Do not use damaged, broken or rusted wire ropes. Select the well-maintained wire ropes for work. Otherwise it may cause the equipment to suddenly fall off and cause serious damage to persons and equipments. Make sure the eyebolts are fixed firmly. Otherwise it may result in personal injury and equipment damage.

注意

CAUTION!

Make sure there is enough space to repair the robot, control cabinet and other peripheral equipments, which shall be performed by professionals. It is strictly forbidden for non-professionals to disassemble the robot system.

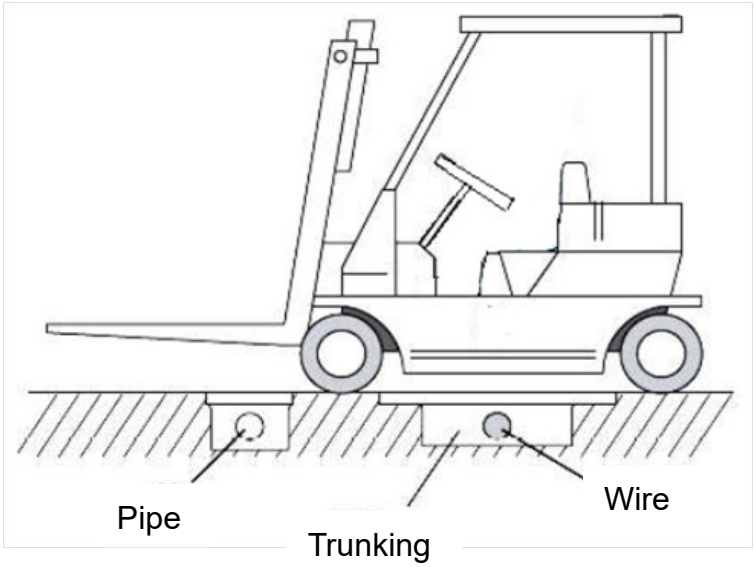


The maximum size shown in the figure is the robot maintenance space, to ensure that the staff has enough space to install and maintain the robot and accessory equipments, for different types of robots, please refer to different instructions for installation.

注意

CAUTION!

Take protective measures when performing the wiring and piping between the control cabinet and the robot and peripheral equipments. For example, run the pipe, wire or cable through pit or covered with a protective cap to prevent from being trampled by individuals or crushed by the forklifts. The operators and other personnel may be caught by the open wires, cables or pipelines, causing damage, thus causing the abnormal movements of the robot, thus resulting in personal injury or equipment damage.



Note the following items about the cable:

-Do not add cables and hoses other than those recommended by our company to the robot system.

-When installing cables outside the mechanism, avoid blocking the mechanism operation, and the installation of the peripheral equipments shall avoid cable interference.

-For the cables exposed outside the mechanism, do not modify the cable harness freely for convenience (such as adding cover and external cable, etc.).

-Always comb the knotted cable to avoid excessive winding, but it must be done in accordance with the relevant safety instructions.

1.4.2 Safety at work area

Careless during work in the work area will cause serious accidents, therefore it is strongly recommended to implement the following precautions:

危险

DANGER!

Set the safety fences around the robot to prevent accidental contact with the powered robot. Post the warning sign “Keep away from work area” at the entrance of the safety fence. The door of the safety fence must be installed with a reliable safety interlock devive. Ignoring the warning will cause serious accidents due to contact with the robot.

注意

CAUTION!

Spare tools and similar equipments shall be placed in the suitable areas outside the safety fences. Tools and scattered equipments shall not be left around the robot, control cabinet or application (such as welding fixtures). Personal injury or equipment accidents can occur if the robot hits the items left in the work area.

注意

CAUTION!

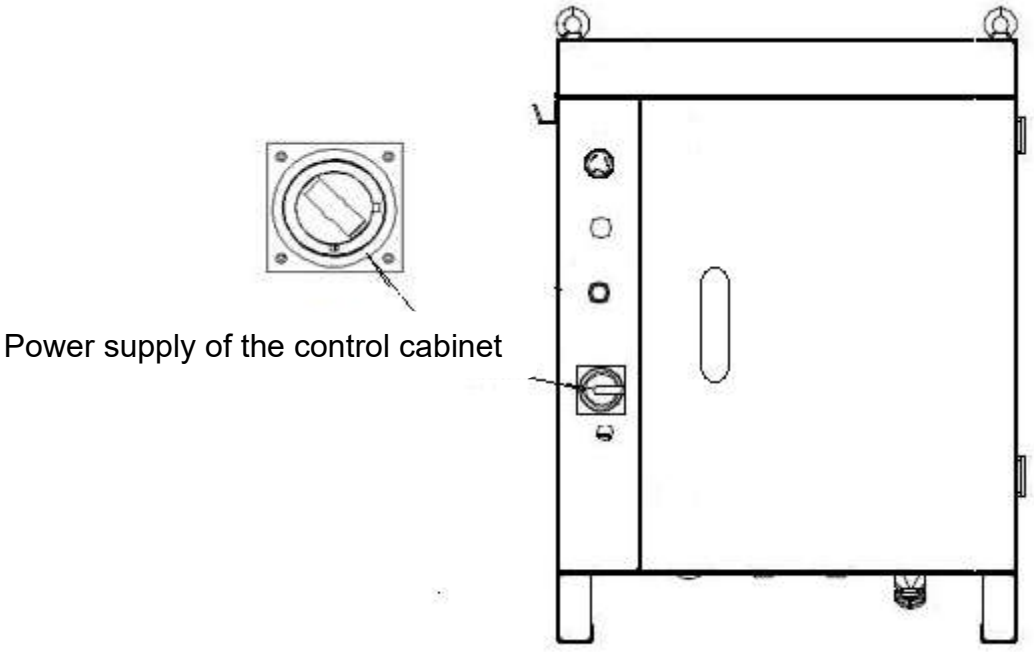
The fire-fighting equipments must be placed in strict accordance with national standards, regularly inspected and replaced.

1.4.3 Operational Safety

危险

DANGER!

When installing the tools on the robot, cut off (OFF) the power supply of the control cabinet and the installed tools firstly and lock the robot power switch (position of power supply as shown below), and hang the obvious warning sign.



During the installation process (such as swithing on the power supply), it may cause electric shock, or abnormal movement of the robot, thus resulting in damage.

The control cabinet shall be placed on the console so that the power supply of the control cabinet is 0.6-1.9m above the ground.

The following warnings shall be observed when the teaching must be carried out within the range of motion of the robot:

-Always observe from the front of the robot.

-Always operate in accordance with pre-determined operating procedures.

-Always have an idea of avoiding a robot in case of an unexpected motion.

- Make sure there is a route of retreat in case of emergency.

Otherwise, the robot may be wrong operated, causing injury accidents.

Before operating the robot, press the emergency stop keys on the front door of the control cabinet and on the upper right of the teaching pendant to check whether the indicator of “Servo ready” is off and confirm the power supply is off.

危险

DANGER!

Before performing the following operations, make sure that there is no one in the range of motion of the robot.

-Switch on the power supply of the control cabinet;

-Use the teaching pendant to make the robot move;

-Reproduce to operate the robot;

If an individual accidentally enters into the range of motion of the robot that he/she may be injured due to contact with the robot, press the emergency stop keys immediately. The emergency stop keys are located at the front door of the control cabinet and on the upper right of the teaching pendant (as shown in the figure below)

注意

CAUTION!

Perform the following inspection steps before teaching the robot. If problems are found, correct them immediately and confirm that all preparations have been completed.

-Check for problems of robot movement.

-Check the insulation and cover of the external cable for damage.

After using the teaching pendant, make sure to put back on the hook of the control cabinet.

MANDATORY!
The operators or maintenance personnel for robot must be subject to the training of relevant regulations and company strategies.

1.4.4 Robot safety

In case of emergency, any arm of the robot is clamped to the operator and needs to be removed. Please ask our technical personnel for details about safety demolition.
Small robot arms can be removed manually, but large robots need cranes or other small devices.
Before releasing the joint brake, the mechanical arm needs to be fixed first to ensure that the mechanical arm will not cause secondary injury to the trapped person under the action of gravity.

1.4.5 Environment and operation conditions of robot

The environment used by the robot is free of ionizing and non-ionic radiation.
The robot environment temperature is 5-40 ℃, humidity is 30-95%, 1000m ≤ altitude ≤ 5000m, it is recommended to use in the environment below IP43.

1.4.6 Robot transportation and storage

The robot needs to be transported and stored in the range of - 25 ℃ to 55 ℃, and can withstand short-term transportation and storage with a temperature of up to 70 ℃ and a time of no more than 24 hours.

1.5 Precautions for moving and transferring robots

CAUTION!
When moving or transferring the robot, the relevant instruction books for the robot shall be attached so that all users have the right to use these necessary instruction books.
If the warning sign on the robot or control cabinet is blurred, please clear the warning sign so that they can be recognized correctly. Please also pay attention to some local regulations, for example, if the safety warning sign is not in the right place, the equipment may be prohibited to use.
When moving or transferring the robot, it is recommended to ask our company to send personnel for inspection.
Incorrect installation and wiring will cause significant personal injury and equipment

accidents.

PROHIBITION!

Never make any modification to the robot or control cabinet.

Failure to comply with the warning may result in fire, power fault or operational error. Our company is not responsible for the equipment damage and personal injury caused.

1.6 Precautions for abandoning Robots

CAUTION!

The robots must be abandoned in accordance with the national and local laws and regulations. Before abandoned, even for temporary storage, the robot shall be fixed firmly to prevent dumping.

If disassembly is required when abandoning the robot, please remember the following items before starting disassembly to avoid personal injury.

Make sure to remove all the batteries inside the robot which will explode if heated (such as from a blowtorch).

Make sure to drain the oil in the gearbox which will catch fire if heated (such as from a blowtorch).

When removing the motor from the robot, if the robot is not properly supported before removing the motor, it will suddenly fall down.

Chapter II Robot control cabinet description

Before getting familiar with the control cabinet, it is necessary to understand that the mode setting of the control cabinet is protected by the security system. Please confirm the correct level of the operator (refer to the following instructions for robot use), and acknowledge and manage it.

2.1 Power Supply

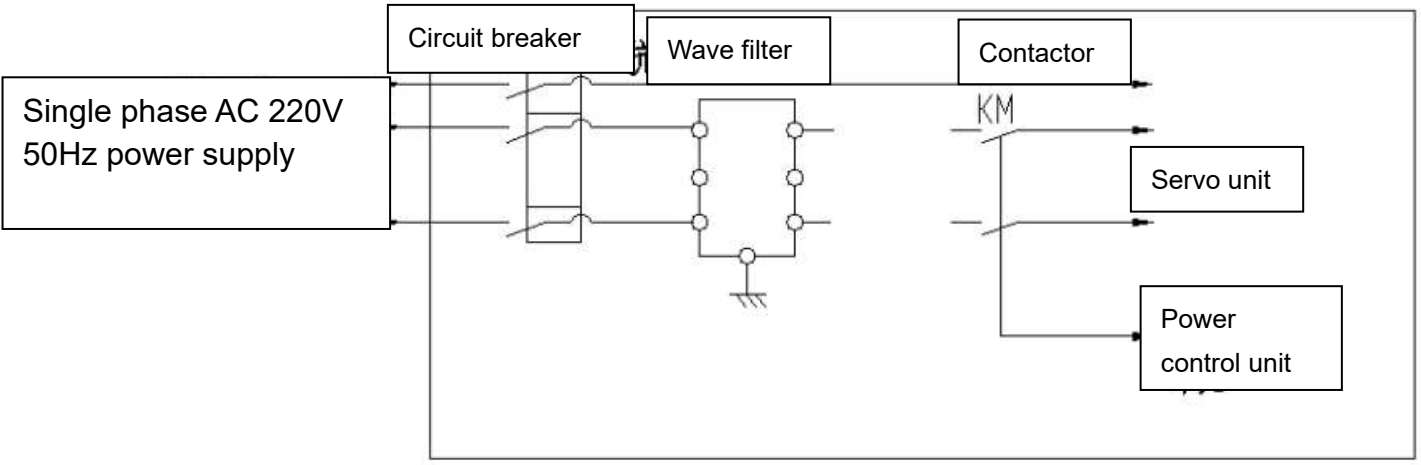
(a) Positive

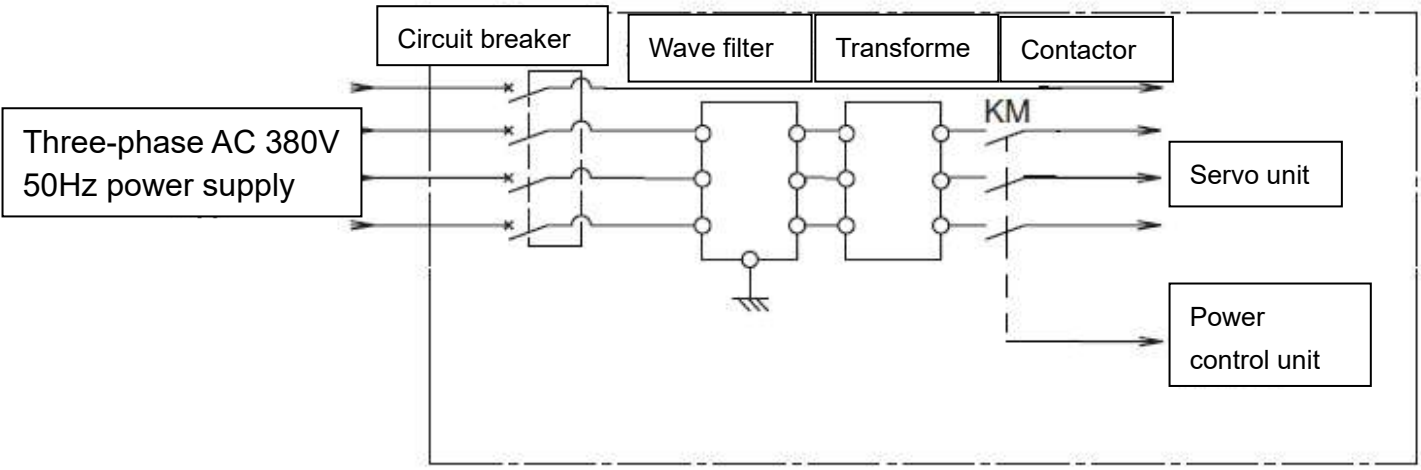
(b) inside

Schematic diagram of control cabinet

Qjrb15-1 is composed of single-phase AC 220V and grounding wire, and qjrb30-1 is composed of three-phase AC 380V and grounding wire.

The function of the circuit breaker is to turn on and off the 220V / 380V power supply. After the power grid voltage is connected, the anti-interference filter is applied to filter the noise of the power grid voltage, and the intelligent transformer transforms the power frequency 380V AC voltage into the voltage required by the servo unit. When the circuit breaker is connected, the controller unit sends a signal to control the AC contactor to pull in to control the three-phase power on and off.





2.2 Installation of residual-current circuit breaker

危险

DANGER!

If the power supply of the control cabinet is connected to the residual-current circuit breaker, the residual-current circuit breakers that can prevent high frequency shall be used, which can prevent malfunction caused by high frequency leakage current of the rectifier.

2.3 Power on and off

DANGER!

When switching on the main power switch on the control cabinet, make sure that there are no one within the range of motion of the robot.
-Ignoring this reminder may cause personal injury due to accidental contact with the robot.
- In case of any problem, immediately press the emergency stop keys.
- The emergency stop keys are located at the upper left of the front door of the control cabinet and at the upper right corner of the teaching pendant.

2.4 Switching on the main power supply

Turn on the main power switch on the front door of the control cabinet to ON position. At this time, the main power is switched on, but the main power of the drive unit is not switched on. Need to press the “Servo power” key and enable signals are sent out after judged by the control unit, and then the power of the servo unit is fully switched on. At this time, perform the initialization diagnosis and read the current starting position value.

2.4.1 Initialization diagnosis

When the main power is switched on, the controller performs initialization diagnosis and displays the start screen on the screen of the teaching pendant. If the teaching programmer establishes communication with the industrial personal computer successfully, the green light of the teaching programmer will light up, and waiting for a moment, then the initialization diagnosis process is completed.

2.4.2 Successful status after initial diagnosis

After the initialization diagnosis is completed, the main interface of the program edit is popped up, and the current angle, position, and teaching procedure when the program is exited are displayed.

2.5 Switching on the servo power

Before switching on the robot servo power, the operator must be located outside the safety fences (or safety range) to ensure the safety of the staff. Press the "Servo power" key on the control cabinet to switch on the main power of the control cabinet. At this time, the “Servo power indicator” lights up. After a pause for about 30 seconds, confirm that the servo power of the control cabinet is switched on.

2.6 Teaching/representation/remote mode

2.6.1 Teaching mode

1) Toggle the teaching/representation option switch on the control cabinet so that the indicator arrow of the option switch points to “teaching”.

2) When the operator has to hold the safety switch on the teaching pendant (as shown in figure below), the status bar display on the teaching pendant changes from "Servo off" to "Servo on" and the background color changes from red to green. At this time, the operator can teach movements of the robot.

2.6.2 Representation mode

1) Toggle the teaching/representation option switch on the control cabinet so that the indicator arrow of the option switch points to “Representation”.

2) The operator does not need to hold the safety switch on the teaching pendant. Just press the “Run” key on the teaching pendant to make the robot repeat the teaching program under the teaching mode to take action.

2.7 Power off

2.7.1 Cutting off the servo power supply (emergency stop)

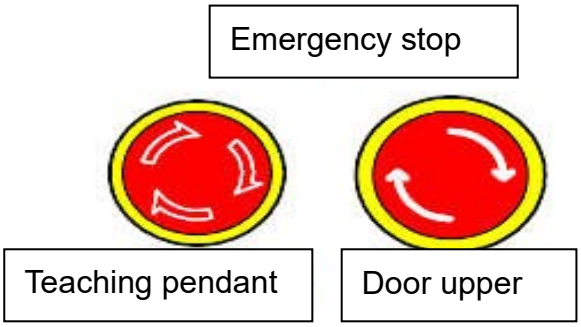
The emergency stop button on the control cabinet and teaching box belongs to class 0 stop (uncontrollable stop: stop the mechanical movement by cutting off the power supply of the mechanical brake mechanism).

When the emergency stop keys are pressed, the servo power is cut off, and the robot can not be operated. Cut off the servo power supply:

- Toggle the emergency stop key on the front door of the control

cabinet or on the teaching pendant to cut off the servo power supply.

- Once the servo power is cut off, the brake device is activated and the robot is braking that it can not be operated any more.



2.8 Action confirm

Before operating the robot, press the emergency stop keys on the right side of the front door of the control cabinet and on the teaching pendant firstly. Confirm that the "Servo power indicator" is off.

If the robot cannot be stopped in case of emergency, it may cause mechanical damage. There are emergency stop keys both on the front door of the control cabinet and on the right side of the teaching pendant.

When teaching within the range of motion of the robot, the following warnings shall be observed:

- Always observe from the front of the robot.
- Always operate in accordance with pre-determined operating procedures.
- Always have an idea of avoiding a robot in case of an unexpected motion.
- Make sure there is a route of retreat in case of emergency.

Improper and careless operation of the robot can cause injury.

Before performing the following operations, make sure that there are one within the range of motion of the robot and ensure that you are within a safe area.

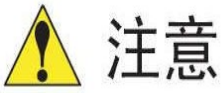
- Switch on the servo power supply of the control cabinet;
- Operate the robot with the teaching pendant;
- Trial run
- Representation mode.

If the robot impacts with any person entering into the range of motion, it will cause personal injury.

CAUTION!

Before teaching the robot, perform the following inspection steps. If problems are found, correct immediately and confirm that all other necessary work has been completed.

- Check the motion of the robot for any abnormal problems.
- Check the insulation and cover of the external cable for damage.



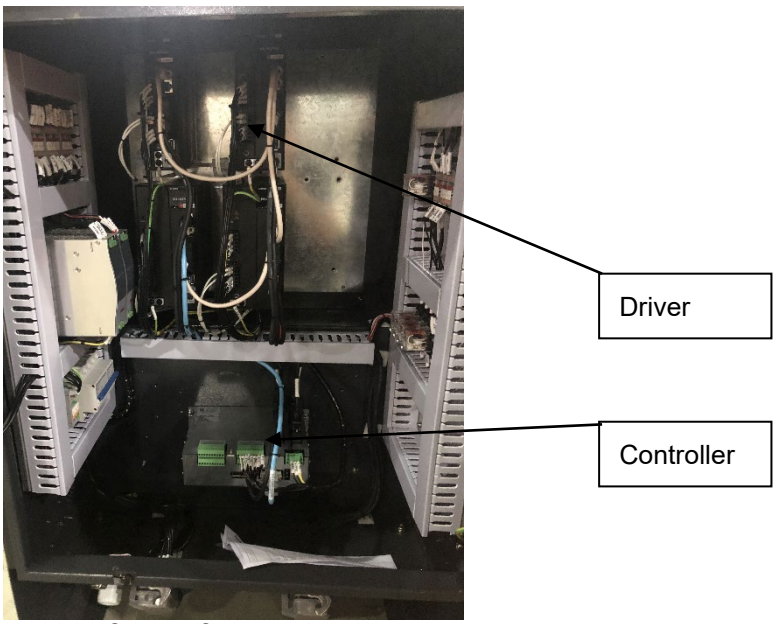
CAUTION!

After the teaching pendant is used, make sure to hang it back to the original position.

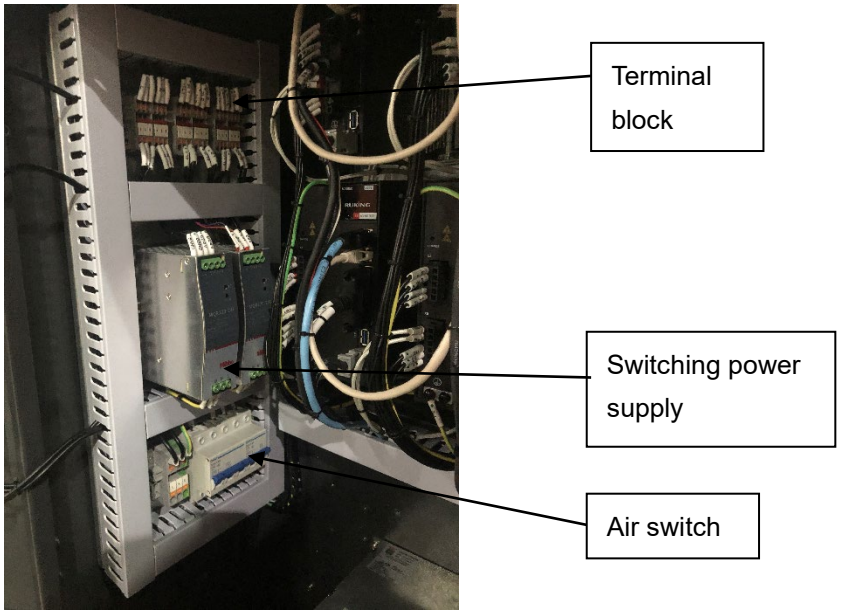
If the teaching pendant is left on the robot, on the system fixtures or on the ground, the robot or the tools installed on it will hit it, which may cause personal injury or equipment damage.

Chapter III Description of the internal Hardware inside the control cabinet

3.1 Schematic diagram of the internal hardware inside the Control Cabinet

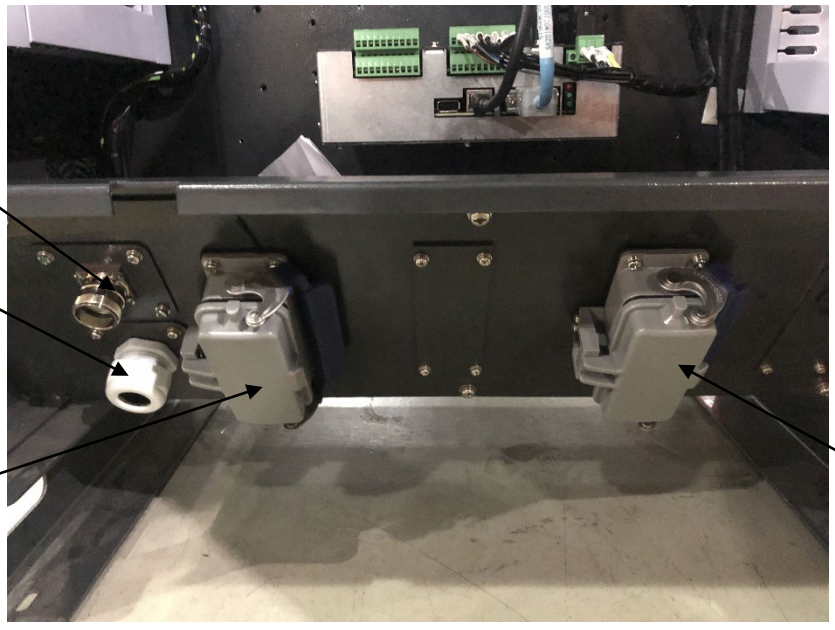


Inside front of control cabinet



Inside left side of control cabinet

Inside right side of control cabinet



Bottom of control cabinet

Regenerative resistor

No transformer on the back of rb15-1 control cabinet

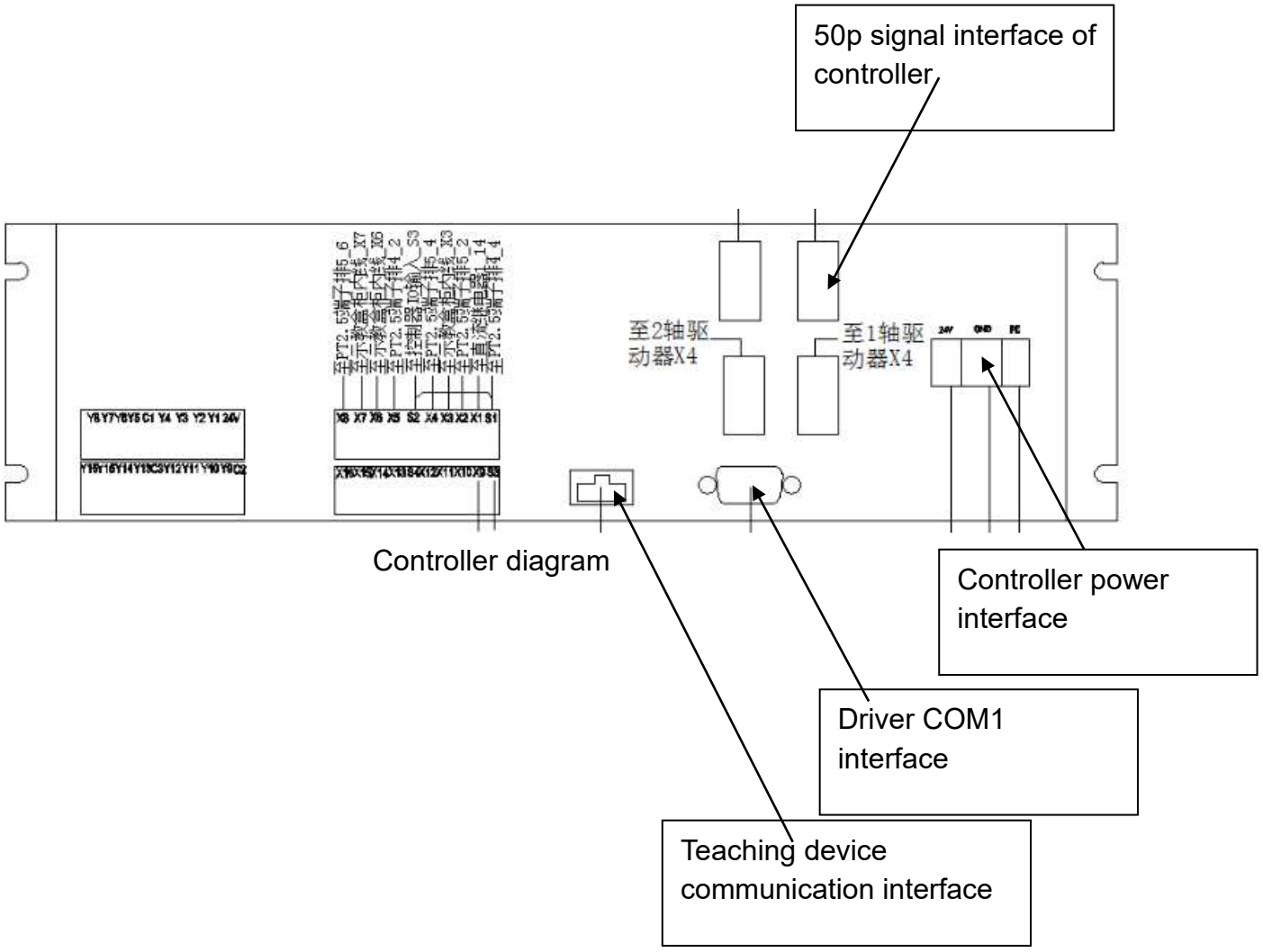
Special instruction: switching power supply, air switch, components for replacing power supply capacity

Control I/O switching power supply

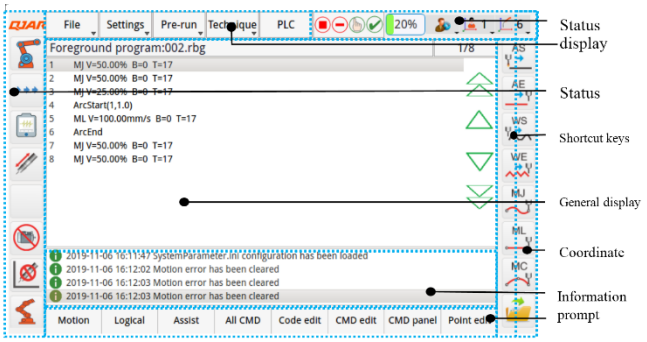
Special switch power supply for holding brake (b24v / bgnd special for holding brake, power supply for other equipment is not allowed)


Control cooling fan
Control main power

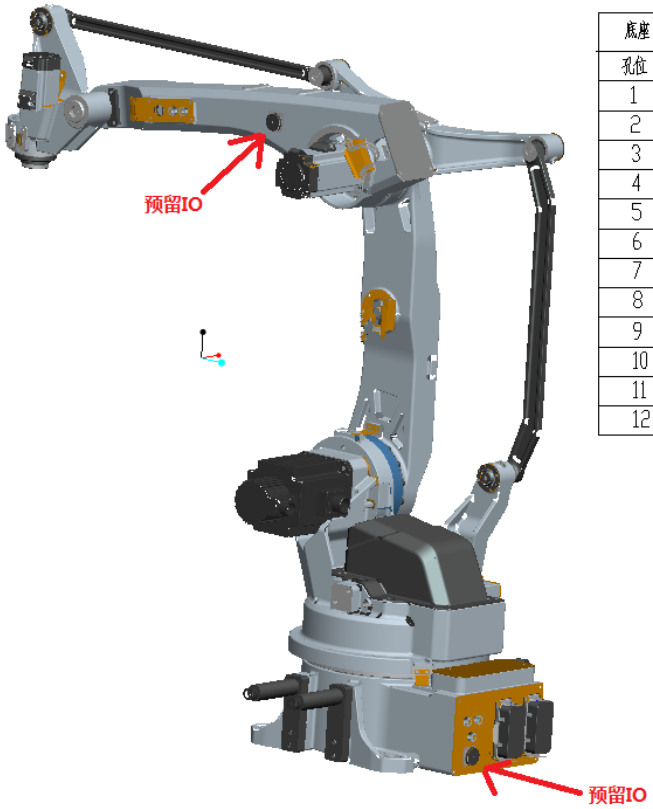
3.2 Controller



3.3 Teaching box

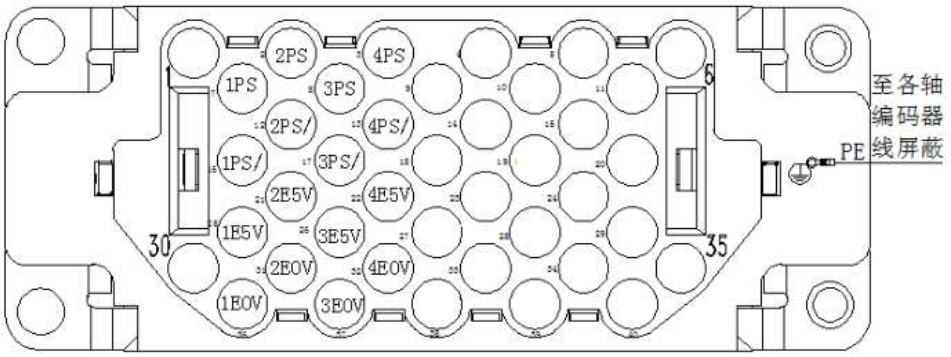


3.4 Definition of air insertion of interconnection line

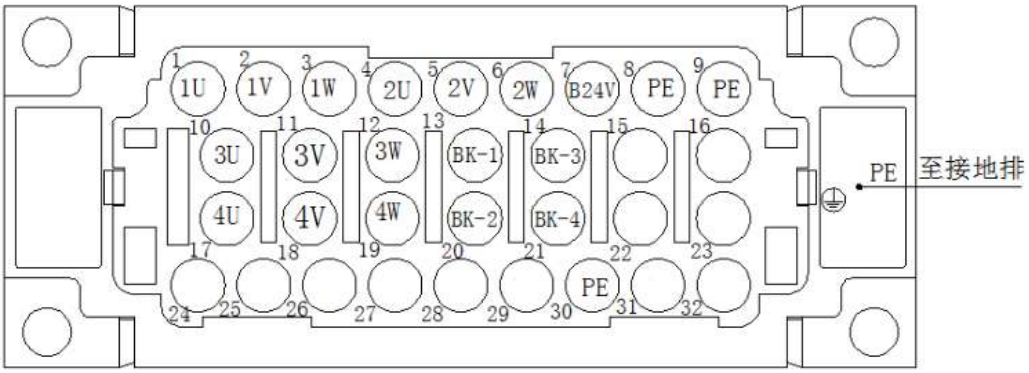


底座	两端码管	小臂
孔位		孔位
1	IO1	1
2	IO2	2
3	IO3	3
4	IO4	4
5	IO5	5
6	IO6	6
7	IO7	7
8	IO8	8
9	IO9	9
10	IO10	10
11	IO11	11
12	IO12	12

编码器航插定义

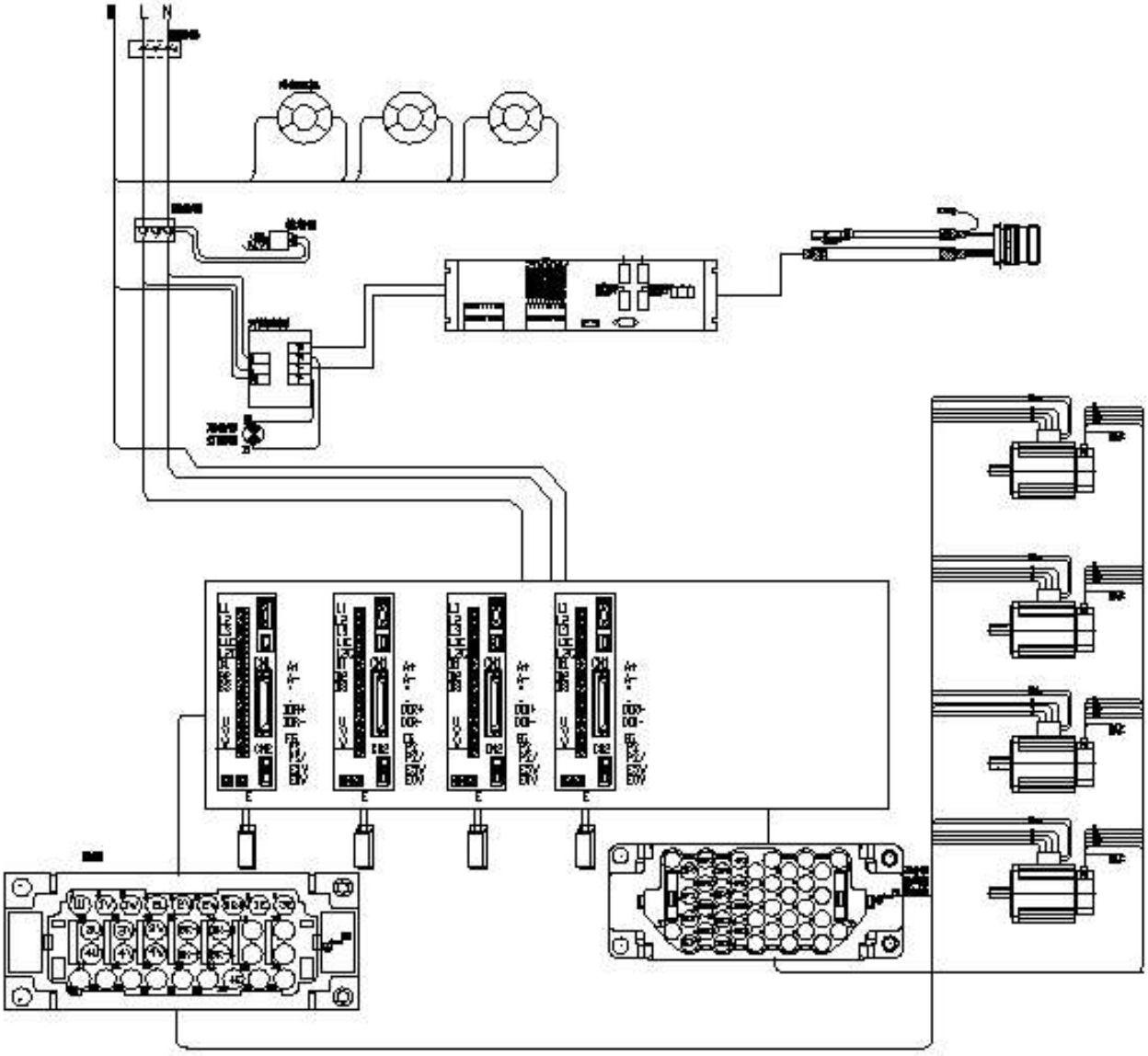


动力航插定义

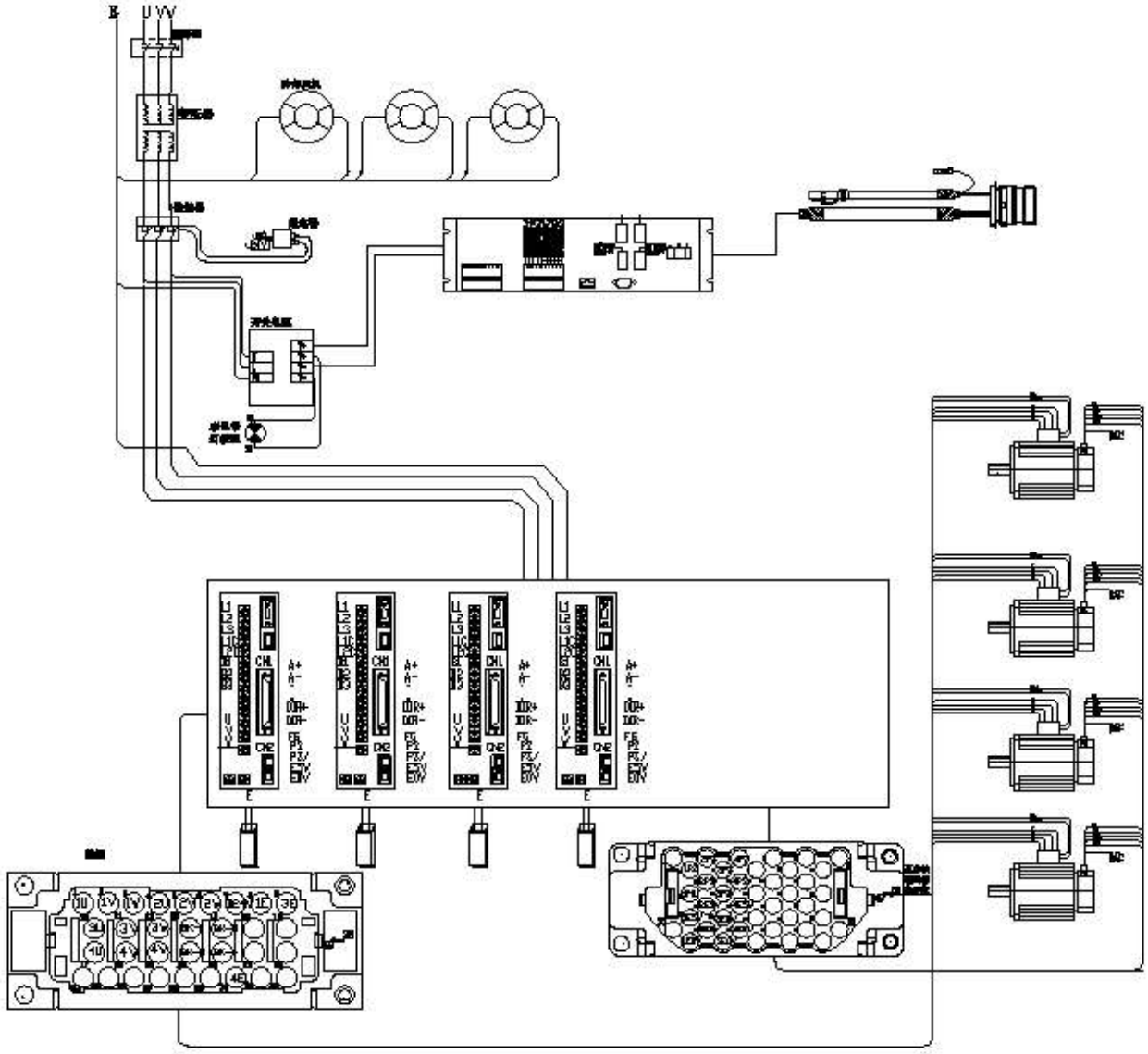


3.5 Schematic diagram of electric control cabinet

3.5.1 Rb15-1 four axis schematic diagram



3.5.2 Rb30-1 four axis schematic diagram



Chapter IV Introduction of relevant fault treatments

4.1 Alarm list

Fault name	Trouble code
Over current and earth fault	Er801
Repeated function error of input I / O port	Er802
AF assist operation error	Er803
Excessive speed deviation	Er804
overload	Er805
Positive and negative drive inhibit fault	Er806
Overvoltage	Er807
EEPROM fault	Er808
Undervoltage of main power supply	Er809
Software failure	Er811
Control power supply under voltage	Er820
Motor or servo drive overheated	Er821
IPM fault	Er831
Hardware over-current fault	Er832
Regeneration discharge resistance overload	Er836
Encoder initial position detection error	Er839
Output power line disconnection fault	Er847
Excessive position deviation	Er883
Over speed	Er885
FPGA fault	Er890
EEPROM data read error on encoder	Er891
Motor and controller mismatch fault	Er892
Encoder type error	Er893
Zero point fault of 17bit encoder	Er894
Encoder communication data error	Er897
Jog mode failure	Er899

In case of alarm, it is necessary to find out the possible cause of the fault and then power on again, or select the function of alarm CLR to clear directly. To ensure safety, please stop sending external pulse command at the first time or turn off the servo enable function.

4.2 Handling method of alarm cause

Fault name	Trouble code	Cause of failure	Countermeasures
Over current and earth fault	Er801	The current flowing into the inverter exceeds the specified value, and the servo driver (internal circuit, IGBT or other components) fails	Disconnect the motor cable and activate the servo on signal. If this alarm appears immediately, please replace it with a new servo driver
		Short circuit of motor cable (U, V, w)	Check the motor cable to make sure that u, V and W are not short circuited.
		Motor cable (U, V, w) grounding	Check the motor cable to ensure the insulation resistance of u, V, W and the ground wire. If the insulation is damaged, replace the motor with a new one.
		The motor is burnt out	Check the motor cable to ensure the resistance between u, V and W. If the resistance is unbalanced, replace the motor with a new one.
		Poor contact of motor cable	Check whether the U, V, w terminals of the motor are loose or not, and ensure reliable electrical contact.
		Frequent servo on / off (srv-on) action causes the relay contact of dynamic brake to melt and stick.	Please replace with a new servo driver. Do not use the servo on / off signal (srv-on) to start or stop the motor.
		Motor does not match this servo driver。	Check the nameplate of the servo driver, and replace the matched motor according to the above prompts.
		The input of the pulse is activated at the same time as the servo on action, even earlier。	Wait at least 100ms after the servo is on before entering the pulse command.
Repeated function error of input I / O port	Er802	Parameters pr105-pr112 are set repeatedly.	Set pr105 ~ pr112 parameters to make the content not repeated, and save it to EEPROM for power off and restart.
AF assist operation error	Er803	In the state of servo on, the operation fault is cleared and the parameter is initialized.	In the servo off state, the operation fault is cleared and the parameter is initialized.

Excessive speed deviation	Er804	Motor power cable wiring error	Ensure that the output of servo driver u, V and W corresponds to the input of motor u, V and W one by one.
		Speed deviation threshold set too small	Speed deviation threshold setting is increased.
overload	Er805	The effective torque of the motor exceeds the rated value when it runs for a long time under heavy load.	Replace the large capacity servo driver and motor;
		The gain setting is too large, causing vibration or oscillation. The motor vibrates or makes abnormal noise. Parameter pr040 (inertia ratio) is not set correctly.	The gain of position loop and velocity loop is reduced, and the inertia ratio is reduced.
		Motor cable connection error or disconnection.	Check the motor cable, and connect the motor cable correctly according to the wiring diagram.
		The machine encounters heavy objects, or the load becomes heavy, or is entangled.	Remove the winding and reduce the load.
		When multiple motors are connected, some motor cables are wrongly connected to other shafts.	Connect the motor cable and encoder cable to the corresponding shaft correctly.
Positive and negative drive inhibit fault	Er806	Forward and reverse drive inhibit are valid at the same time	Avoid both forward and reverse drive inhibit and clear faults

Overvoltage	Er807	The supply voltage is too high for the allowable input voltage range.	Equipped with appropriate voltage input power supply to ensure that the input voltage is within the allowable range of the servo driver;
		There is a capacitive load or UPS (uninterruptible power supply) that causes the line voltage to rise.	Exclude capacitive loads.
		Not connected with regeneration discharge resistance	Measure the external resistance between P and B on the servo driver with an electricity meter. If the reading is infinite, the resistance may be burnt or open, please replace the regenerative resistance.
		The external regenerative discharge resistance does not match and cannot absorb regenerative energy	Replace with an external resistance whose resistance and power meet the specified value
		Servo driver internal circuit failure	Please replace with a new servo driver
EEPROM fault	Er808	EEPROM error	If it fails to write several times, replace the servo driver and send the servo driver to the dealer for maintenance.
Undervoltage of main power supply	Er809	In the servo on state, the input power supply voltage is too low; the input power supply is in instantaneous power loss and power failure	Increase the input power supply voltage, or replace with a new power supply.
		Servo driver electromagnetic relay damaged	Check whether the electromagnetic relay works normally, and turn on the power again after troubleshooting.
		The capacity of the power supply is too small, and the impulse current at the moment when the power supply is connected causes the voltage drop.	Increase the power supply capacity.
		The input power is out of phase: the actual input of the servo driver that should input three-phase alternating current is single-phase	Connect all phases (L1, L2, L3) of the power supply correctly.

		electricity	
		Servo driver (internal circuit) fault.	Please replace the servo drive with a new one.
Software failure	Er811	Servo driver program error	Send to the dealer for maintenance
Control power supply under voltage	Er820	The input control power supply voltage is lower than the specified value.	Increase the control power supply voltage, or replace the control power supply.
		The power supply capacity is too small. Voltage drop caused by impulse current at the moment of power connection	Increase power capacity
		Servo driver (internal circuit) fault	Please replace with a new servo driver
Motor or servo drive overheated	Er821	The temperature of the heat sink or power device of the servo driver is higher than the specified value, and the ambient temperature of the servo driver is higher than the specified value.	Reduce ambient temperature and improve cooling conditions.
		Long time overload operation of servo driver	Increase the capacity of servo driver and motor, reduce the load.
		Servo driver cooling fan damaged	Replace the cooling fan
IPM fault	Er831	The instantaneous current is too large, the current flowing into the inverter exceeds the specified value, and the servo driver (internal circuit, IGBT or other components) fails	Disconnect the motor cable, power on the controller again and activate the servo on signal. If this alarm appears immediately, please replace it with a new servo driver.

Hardware over-current fault	Er832	Short circuit of motor cable (U, V, w)	Check the motor cable to make sure that u, V and W are not short circuited.
		Motor cable (U, V, w) grounding	Check the motor cable to ensure the insulation resistance of u, V, W and the ground wire. If the insulation is damaged, replace the motor with a new one.
		The motor is burnt out.	Check the motor cable to ensure the resistance between u, V and W. If the resistance is unbalanced, replace the motor with a new one.
		Poor contact of motor cable	Check whether the U, V, w terminals of the motor are loose or not, and ensure reliable electrical contact.
Regeneration discharge resistance overload	Er836	The regenerative energy exceeds the capacity of the discharge resistor.	(1) use external braking resistor; (2) relax the utilization rate of external braking resistor; (3) replace the large capacity servo driver;
Encoder initial position detection error	Er839	Encoder problem	Replace the motor with a new one
Output power line disconnection fault	Er847	Servo driver u, V, W output power line is broken	Check the U, V and W output power lines of the servo driver to ensure that the power lines are firmly wired and the phase sequence is correct
Excessive position deviation	Er883	The motor does not operate correctly according to the command pulse. The position deviation pulse counter value is greater than the set value of parameter pr126 [position deviation excessive level].	Make sure that the motor operates correctly according to the command pulse. Check the torque to ensure that the output torque is not saturated. Adjust speed feedforward and gain. Connect the encoder circuit correctly according to the

			wiring diagram.
		Pr126 [excessive position deviation level] value is set too small.	Increase the value of pr126.
Over speed	Er885	The motor speed exceeds the set value of parameter pr128 [over speed level]	(1) avoid high command speed. (2) detect the command pulse frequency and frequency division ratio. (3) for overshoot caused by improper gain, please adjust the gain correctly. (4) connect the encoder circuit correctly according to the wiring diagram. (5) increase the value of pr128;
FPGA fault	Er890	Servo driver failure	Replace servo driver
EEPROM data read error on encoder	Er891	Motor encoder failure	Replace motor encoder
Motor and controller mismatch fault	Er892	Power mismatch between motor and servo driver	Replace the servo driver with larger capacity;
		Motor parameter setting is abnormal	Update the motor parameters stored in the encoder transfer board;
Encoder type setting error	Er893	When the 17bit encoder is automatically zeroed, the parameters of servo driver pr014 [encoder type] are not consistent with the actual encoder type.	Set the servo driver pr014 [encoder type] parameter to the actual encoder type.
17bit encoder zero error	Er894	After the motor is installed with 17bit encoder, "automatic zero calibration" is not carried out	Ensure that the motor is separated from the load, the motor shaft has no connection and can rotate freely, and carry out the "automatic zero calibration" operation on the motor.
Absolute encoder battery alarm	Er896	Battery voltage below the specified value (2.7V)	Battery replacement
		Servo driver failure	Replace servo driver

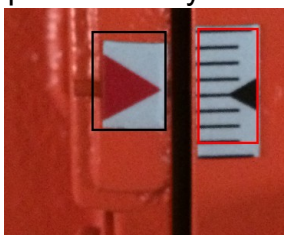
Encoder communication data error	Er897	Communication cable disconnected or poor contact	(1) check whether the encoder cable is conductive, if not, replace the encoder cable; (2) check whether the encoder cable terminal is loose, please fasten it Terminal connection;
		Communication cable impedance is too large	When encoder cable is very long (more than 10m), please select shielded cable with larger wire diameter (more than 0.5mm2);
		Encoder type setting does not match the actual encoder of motor	Set the servo driver pr014 [encoder type] parameters according to the actual encoder model of the motor;
		Line interference	(1) please separate the motor power cable and encoder cable; (2) reliably ground the shield wire of motor power cable; (3) reliably ground the encoder cable shield wire;
Jog mode failure	Er899	Jog operation with servo enabled.	Turn off the servo enable signal before jog operation.

4.3 Instructions for battery replacement

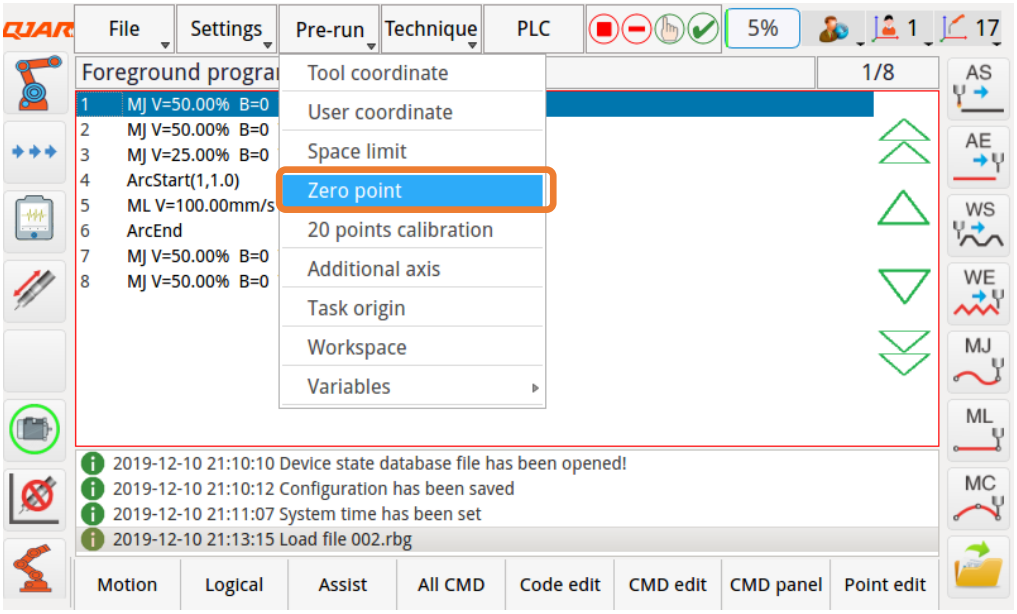
When er986 alarm appears on the driver display panel, it indicates that the battery voltage is low. Check the battery voltage and replace it. When replacing the battery, first return the robot to zero (to prevent the loss of zero position during operation). Please replace the battery when the driver control power is on. If the battery is replaced when the driver control power is off, the data saved in the encoder will be lost. Please pay attention. After the encoder loses the zero position, it is necessary to use the teaching system to move each joint to recalibrate the zero position scale and record the zero position of the system again (please refer to the relevant instructions of the system operation manual and the relevant training instructions of the technical training personnel for the details of the relevant system zero position recording operation and permission use)

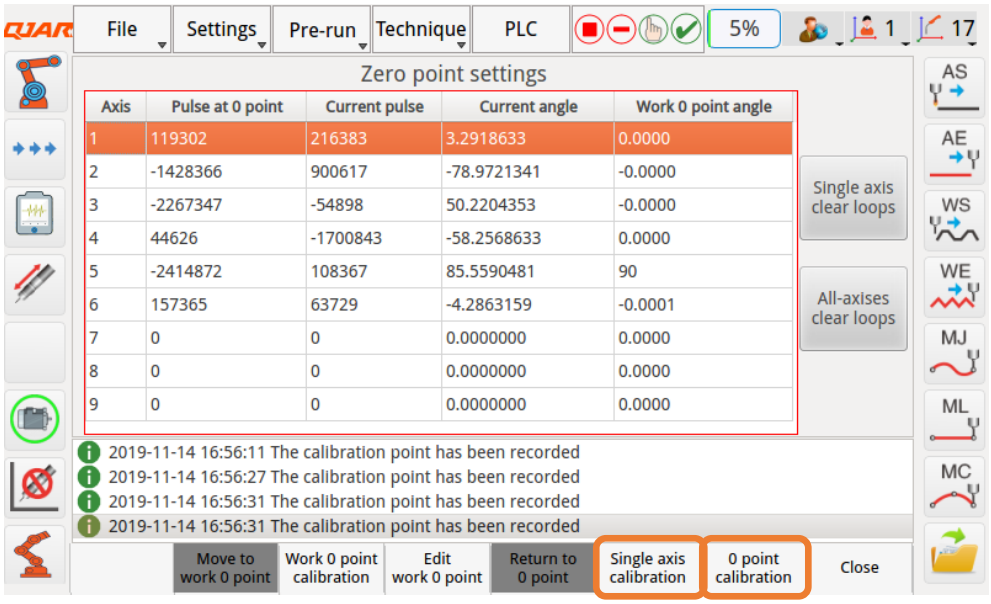
4.4 System zero record operation setting

1. After reset the encoder or replace the battery, confirm whether the mechanical zero position is at the zero mark position. If it is not aligned, align each axis to the mechanical zero mark position firstly.

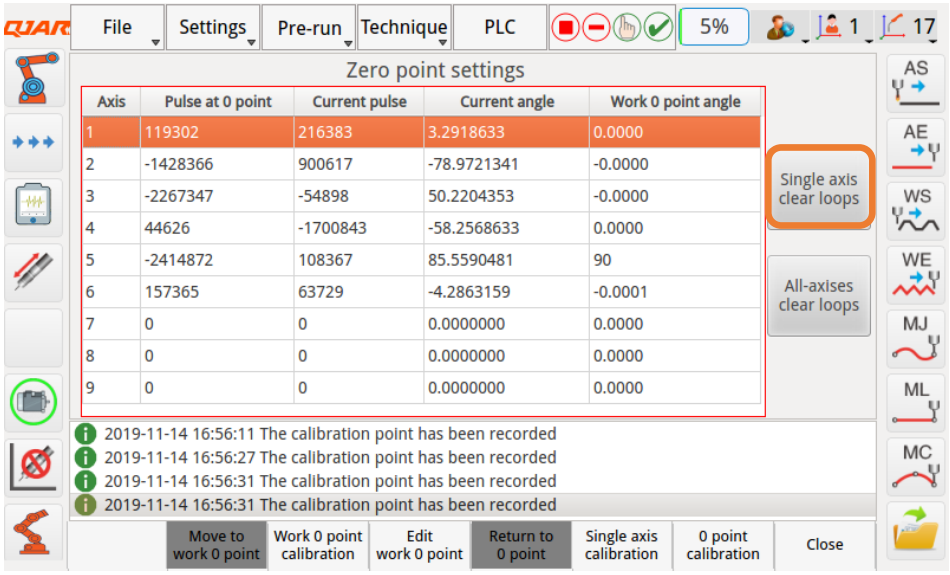


2. Click <Parameter Setting> Operation Permission in the system interface parameter setting to select the manufacturer permission and then enter the password 888999.
3. Click <Run Preparation> to select <Robot Zero Setting>. Move the cursor to each axis and click the single-axis calibration button below to record the zero pulse of the encoder or click the zero calibration to one-key record the zero position of all axes.





4. When the motor encoder needs to clear the high circle after losing the battery, press the <Alternate function key> next to the mechanism and then select the axis which needs to clear the encoder high circle by the cursor, then click the <Single-axis Clear multi-circle> button on the screen to clear the high-circle of the encoder.



5. Pay attention to performing the “Zero Calibration” operation after clearing the encoder high circle.

Chapter V Electrical maintenance and service

5.1 Precautions

During maintenance or replacing parts, the following precautions shall be observed for safe operation.

1) When replacing parts, please cut off the power once and then work again after 5 minutes. (Do not open the door of the control unit within 5 minutes after the power is cut off.). Further, do not work with wet hands.

2) The replacement operation must be carried out by personnel who have received the relevant maintenance training from our company.

3) The body (hands) of the operator and the “GND terminal” of the control system must be electrically shorted and shall be operated at the same point location.

4) Do not damage the connection cable during replacement. Further, do not touch the electronic components and wiring of the printing circuit board or the contact parts of the connectors (should hold the periphery of the printed substrate by hands).

5.2 Precautions for periodic maintenance

1） The maintenance must be carried out by personnel who have received the relevant training of maintenance by our company.

2）Before maintenance, please confirm the parts, tools and drawings required for the work.

3） Replace parts with the designated parts by our company.

4） When carrying out the overhaul of the robot, please make sure to cut off the power before operation.

5） When opening the control cabinet door, please make sure to cut off the power supply once, and take care not to let the surrounding dust in.

6） When using hands to touching the parts inside the control cabinet, wipe off the oil before touching, and particularly, when touching parts such as printing substrate boards and connectors, take care to avoid damage to IC parts such as electrostatic discharge.

7) When performing maintenance while operating the robot, it is prohibited to enter into the range of motion.

8) Voltage measurement shall be carried out at the designated parts, and pay full attention to preventing electric shock and wiring short circuit.

9) It is forbidden to carry out maintenance work on the robot and control device at the same time.

10) After maintenance, must confirm the motion of the robot fully before entering into normal operation.

5.3 Periodic maintenance item list

	Period				Test item	Maintenance contents	Method
	Daily	3 months	6 months	1 year			
1	○	●			Fan filter	Whether there is dust	Visual inspection, cleaning, replacement
2	○		●		Cable	Whether the connector is loose, and whether the cable is damaged.	Visual inspection,
3				●	Driver unit	Whether the connection state is good, and whether there is any looseness	Visual inspection, tightening up
4	○			●	Controller	Check the cable connection for looseness	Visual inspection,
5	○		●		Special interface board	Whether the connection cable loose or working properly	Visual inspection, tightening up, replacement
6	●		●		Transformer	Whether there are abnormal heat, noise, and odor.	Visual inspection, replacement
7	○		●		Grounding wire	Check for slack and defect	Visual inspection, tightening up
8	○		●		Relay	Check for contamination and missing	Visual inspection, replacement
9	○		●		Operation switch	Failure or not?	Visual inspection,
10	○	●			24 switch power supply	Working properly or not?	Visual inspection, replacement

11	○	○	●		Voltage measuremen	Voltage confirm of L1/L2/L3	AV200V±15%
12	●			●	Teaching box	Check for damage and operation panel cleaning	Visual inspection, cleaning, replacement
13	○	●			Fan inspection	Whether there are dust accumulation, fan/radiator cleaning and check fan rotation	Visual inspection, cleaning, replacement
14	○	●			Emergency stop switch detection	Check whether the emergency stop button function is normal	Visual inspection, pressing

Note: In the table, ● indicates it must be checked; ○ indicates it is recommended to inspect, but it must be dealt with promptly when the problem is found.

5.5 Maintenance before long vacation

Before preparing for the vacation, please perform the following maintenance before cutting off the power of the robot:

1) Make the robot run to the mechanical zero position for shutdown operation

2) Confirm the voltage of the encoder battery. If the voltage is too low and there is a flickering alarm on the driver, please replace the battery. If it not replaced timely, the motor encoder position data will be lost, and then the encoder reset and position correction work are required. (See the relevant contents of the troubleshooting manual for system zero position recording steps)

5.6 Description of battery replacement step

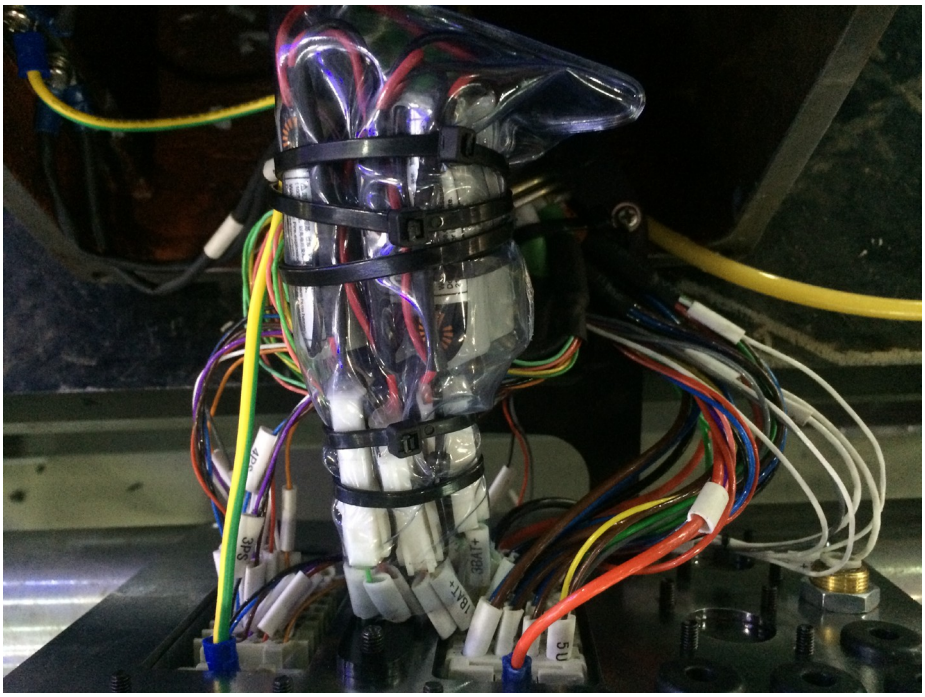
1. Preparing tools and materials: M4—M6 h socket head wrench;

Nylon cable ties and scissors;

Encoder battery with the same connector (3.6V single battery, 3.6V dual battery pack)

2. The storage position of the encoder battery

The encoder battery is stored in the robot base which is used to save the position information of the motor encoder. When the battery is low and the battery needs to be replaced, open the left side cover of the base. The battery installation position is as follows in the figure below:



3. Battery replacement operation

1) In the state of control cabinet on, the axes of the robot can return to the mechanical zero state before moving.

2) Press the emergency stop button

3) Use the socket head wrench to dismantle the plug-in cover of the robot base and pull out the cover to find the axis of the battery undervoltage.

4) Cut off the ties and remove the battery connector to take out the battery that needs to be replaced.

5) Install the new battery into the battery pack and connect to the battery head

connector with the same model.

6) Bundle with the nylon cable ties to the original fixing position, plug it back into the plug-in fixing plate and re-tighten the hexagon socket to fix.

7) Shutdown and power on again. Re-check whether the code position is zero position code. If each axis does not return to the mechanical mark zero position firstly before operation, then enter into the system manufacturer permission and zero position operation to record the zero-coded position of each axis.

Thank you very much for selecting our products!
Please keep the relevant manual of the system properly for review in case of need!
If the equipment needs to be switched, please forward the relevant information to the other party!
Buttons, functions, and options not described in the relevant manual of the system are considered to be unavailable. Please do not use!