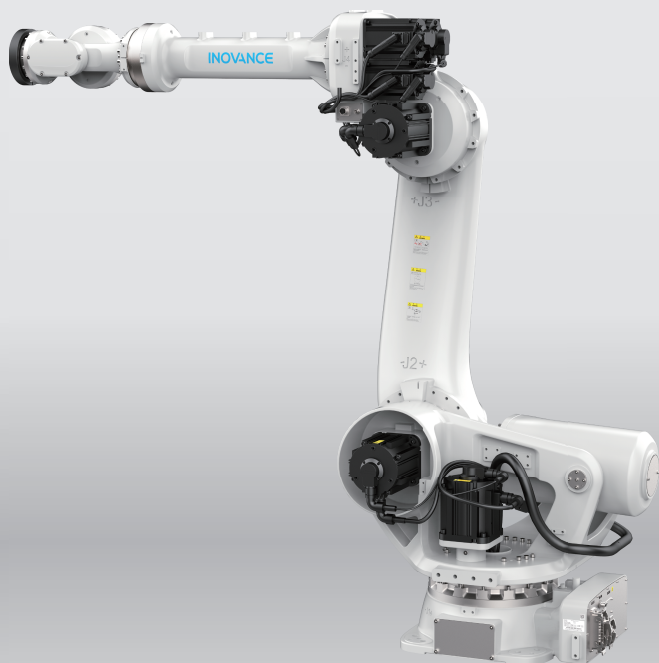




IR-R220 Series 6-Axis Robot

Maintenance Guide



Industrial
Automation



Intelligent
Elevator



New Energy
Vehicle



Industrial
Robot



Rail
Transit



Data code PS00016534A01

Preface

Introduction

The IR-R220 series robots are 6-axis robot applicable to heavy loads. They feature high safety and stability, with a small footprint and compact wrists. The robots support multiple bus communications protocols, and can achieve external axis control through the EtherCAT bus. They are widely applied in the lithium battery loading and unloading, logistics, heavy load handling, and palletizing in general industry.

This guide describes the specifications, installation, wiring, and maintenance of the product.

Note

- The drawings in the user guide are shown for illustration only and may be different from the product. Actual products may vary.
- The instructions are subject to change without notice due to product upgrade, specification modification as well as efforts to improve the accuracy and convenience of the guide.

More Data

Name	Data Code	Description
IRCB100 Series High-Protection Robot Controller User Guide	PS00005710	Describes the specifications, installation, wiring and more of the IRCB100-FT series high-protection controller.
IRCB101 Series High-Protection Robot Controller User Guide	PS00015414	Describes the basic specifications, installation and wiring, common fault diagnosis and troubleshooting, and maintenance of the IRCB101 series high-protection control cabinets.
IRTP80 Series Teach Pendant User Guide	19012261	Describes the product information, wiring, and operation of the IRTP80 series teach pendant.
IR-R220 Series 6-Axis Robot User Guide - Manipulator	PS00011894	Describes the basic specifications, installation, wiring, motion range, and maintenance of the IR-R220 series 6-axis robot.
IR-220 Series 6-Axis Robot Maintenance Guide (hereinafter "this guide")	PS00016534	Describes the specifications, installation, wiring, and maintenance of the product.

Revision History

Date	Version	Description
April 2025	A01	Update • Updated the whole content. • Updated <i>"3.3 Inspection and Maintenance Items"</i> on page 24 • Updated <i>"3.11.2 Removing Cables Inside Robot"</i> on page 74 Addition • Added <i>"3.5 Daily Control Cabinet Cable Inspection"</i> on page 27 • Added <i>"3.6.2 Oil Leakage Inspection Parts"</i> on page 28 • Added <i>"3.8.7 Dummy Cylinder"</i> on page 56
October 2024	A00	Initial release.

Access to the Guide

This guide is not in the scope of delivery. If necessary, you can download the PDF file in three ways:

- Do keyword searching under Service and Support at <http://www.inovance.com>.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install the My Inovance app, where you can search for and download guides.



Warranty

For faults and damage incurred during normal use in the warranty period, Inovance provides free repair service. (For details of the warranty period, see the purchase order.) A maintenance fee will be charged out of the warranty period.

Even in the warranty period, a maintenance fee will be charged for repair of the following damage:

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (such as natural disaster, earthquake, and lightning strike)

The maintenance fee will be charged according to our latest Price List if not otherwise agreed upon.

For details, see the Product Warranty Card.

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1 Safety

1.1 Safety Precautions

Safety Disclaimer

- This chapter presents essential safety precautions for proper use of the product. Before operating the equipment, read through the guide and comprehend all the safety instructions. Failure to comply with the safety precautions may result in equipment damage, severe physical injuries, or even death.
- "CAUTION", "WARNING", and "DANGER" items in the guide only indicate some of the instructions that need to be followed; they just supplement the safety instructions.
- Use this product in environments meeting the design and specification requirements; otherwise, a fault may occur. Noncompliance-caused malfunction or damage to parts are not covered in product quality warranty.
- Inovance shall not be held liable for any physical injuries or property damage caused by improper use.

Safety Levels and Definitions



indicates that failure to comply with the notice will result in severe physical injuries or even death.



indicates that failure to comply with the notice may result in severe physical injuries or even death.



indicates that failure to comply with the notice may result in minor or moderate physical injuries or equipment damage.

Safety Precautions

- Some drawings in this guide show the product without covers or protective guards to display more details. Be sure to install the covers and protective guards before using the product and operate the product in accordance with this guide.
- Operators must take mechanical precautions to protect personal safety and wear protective equipment, such as anti-smashing shoes, safety clothing, safety glasses, protective gloves, and protective sleeves.

Unpacking



WARNING

- Do not install the product when you find that the product and its accessories have any damage or corrosion or they have been used.
- Do not install the product when there is water inside the product or any of its parts is missing or damaged.
- Do not install the product when the product name is inconsistent with that in the packing list.



CAUTION

- Before unpacking, check whether the package is intact, without damage, water seepage, damp, and deformation.
- Unpack the product layer by layer. Do not strike the package violently.
- During unpacking, check whether the product and its accessories have any damage, corrosion, or bump on the surface.
- Check the quantity of the product and its accessories and documents against the packing list.

Storage and Transportation**WARNING**

- Large-scale or heavy equipment must be transported by qualified professionals using specialized hoisting equipment. Failure to comply may result in physical injuries or equipment damage.
- Before hoisting the equipment, ensure the equipment components such as the front cover and terminal blocks are secured firmly with screws. Loosely-connected components may disconnect and result in physical injuries or equipment damage.
- Never stand or stay below the equipment when the equipment is being hoisted.
- When hoisting the equipment with a steel rope, ensure the equipment is hoisted at a constant speed without suffering from vibration or shock. Do not turn the equipment over or let the equipment stay hanging in the air. Failure to comply may result in physical injuries or equipment damage.

**CAUTION**

- Handle the equipment with care during transportation and mind your steps to prevent personal injuries or equipment damage.
- When handling the product by hand, grab the product case tightly to avoid dropping the product and causing injuries.
- Store and transport the equipment based on the storage and transportation requirements. Failure to comply will result in equipment damage.
- Avoid storage and transportation in environments with water splash, rain, direct sunlight, strong electric field, strong magnetic field, and strong vibration.
- Avoid storing the product for more than 3 months. When the product needs to be stored for an extended period, take more strict protection and necessary inspection.
- Package the product strictly before transporting it, and use an enclosed container for long-distance transportation.
- Never transport the product with devices or materials that may damage or negatively impact the product.

Installation



DANGER

- Installation must be carried out by technicians who have received relevant training on electrical equipment and have sufficient electrical expertise. Non-professionals are not allowed to operate the equipment.



WARNING

- Read through the guide and safety instructions before installation.
- Do not install the product in places with strong electric or magnetic fields.
- Before installation, check that the mechanical strength of the installation site can bear the weight of the equipment. Failure to comply will result in mechanical hazards.
- Do not wear loose clothes or accessories during installation. Failure to comply may result in electric shocks.
- When installing the equipment (such as the control cabinet) in a closed environment (such as a cabinet or casing), use a cooling device (such as a fan or air conditioner) to cool the environment down to the required temperature. Failure to comply may result in equipment over-temperature or fire.
- Do not modify the product.
- Do not loosen the fixing bolts of the product parts and components.
- When installing the equipment (such as the control cabinet) in a cabinet or final assembly, make sure that the enclosure of the cabinet or final assembly provides adequate fire prevention, electrical protection, and mechanical protection conforming to relevant IEC standards and local laws and regulations.
- Before installing devices with strong electromagnetic interference, such as a transformer, install a shielding device for the equipment to prevent malfunction.
- Install the equipment on metal or other incombustible objects. Keep the equipment away from combustible objects. Failure to comply will result in fire.



CAUTION

- Cover the top of the equipment (such as the control cabinet) with cloth or paper during installation to prevent unwanted objects such as metal chippings, oil, and water from falling into the equipment and causing faults. After installation, remove the cloth or paper on top of the equipment to prevent over-temperature caused by poor ventilation due to blocked ventilation holes.

Wiring**DANGER**

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Before wiring, cut off all the power supplies of the equipment. Wait for at least the time designated on the equipment warning label before further operations because residual voltage still exists after power-off. After waiting for the designated time, measure the DC voltage in the main circuit to ensure the DC voltage is within the safe voltage range. Failure to comply will result in electric shocks.
- Do not perform wiring, remove the equipment cover, or touch the circuit board while power is on. Failure to comply will result in electric shocks.
- Make sure that the equipment is reliably grounded. Failure to comply will result in electric shocks.

**WARNING**

- Do not connect the input power supply to the output end of the equipment. Failure to comply can result in equipment damage or even fire.
- When connecting a drive to the motor, check that the phase sequences of the drive and motor terminals are consistent to prevent reverse motor rotation.
- Use cables with required diameter and shield. Properly ground one end of the shield if a shielded cable is used.
- Fix the terminal screws with the tightening torque specified in the user guide. Improper tightening torque may overheat or damage the connecting part, resulting in a fire.
- After wiring is done, check that all cables are connected properly and no screws, washers, or exposed cables are left inside the equipment. Failure to comply may result in electric shocks or equipment damage.

**CAUTION**

- During wiring, follow the proper electrostatic discharge (ESD) procedures and wear an anti-static wrist strap. Failure to comply will result in damage to the equipment or its internal circuits.
- Use shielded twisted pairs for the control circuit. Connect the shield to the grounding terminal of the equipment for grounding purpose. Failure to comply can result in equipment malfunction.

Power-on



DANGER

- Before power-on, ensure that the equipment is installed properly with reliable wiring and the motor can be restarted.
- Check that the power supply meets equipment requirements before power-on to prevent equipment damage or fire.
- After power-on, do not open the cabinet door or protective cover of the equipment, touch any terminal, or disassemble any unit or component of the equipment. Failure to comply will result in electric shocks.



WARNING

- Perform a trial run after wiring and parameter setting to ensure the equipment operates safely. Failure to comply may result in physical injuries or equipment damage.
- Before power-on, check that the rated voltage of the equipment is consistent with that of the power supply. Failure to comply may result in fire.
- Before power-on, check that no one is near the equipment, motor, or machine. Failure to comply may result in physical injuries or even death.

Operation



DANGER

- The equipment must be operated only by professionals. Failure to comply will result in physical injuries or even death.
- Do not touch any connecting terminals or disassemble any unit or component of the equipment during operation. Failure to comply will result in electric shocks.



WARNING

- Do not touch the equipment casing, fan, or resistor to check the temperature. Failure to comply may result in burns.
- Prevent metal or other objects from falling into the equipment during operation. Failure to comply may result in fire or equipment damage.

Maintenance



DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not maintain the equipment while power is on. Failure to comply will result in electric shocks.
- Before maintenance, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.
- In case of a permanent magnet motor, do not touch the motor terminals immediately after power-off because the motor terminals will generate induced voltage during rotation even after the equipment power supply is off. Failure to comply may result in electric shocks.



WARNING

- Perform daily and periodic inspection and maintenance on the equipment according to maintenance requirements and retain a maintenance record.

Repair



DANGER

- Equipment installation, wiring, maintenance, inspection, or parts replacement must be performed by only professionals.
- Do not repair the equipment while power is on. Failure to comply will result in electric shocks.
- Before inspection and repair, cut off all the power supplies of the equipment and wait for at least the time designated on the equipment warning label.



WARNING

- Submit the repair request according to the warranty agreement.
- When the fuse is blown or the circuit breaker or earth leakage current breaker (ELCB) trips, wait for at least the time designated on the equipment warning label before power-on or further operations. Failure to comply may result in equipment damage, physical injuries, or even death.
- When the equipment is faulty or damaged, the troubleshooting and repair work must be performed by professionals that follow the repair instructions, with repair records kept properly.
- Replace quick-wear parts of the product according to the replacement instructions.
- Do not use damaged equipment. Failure to comply may result in further equipment damage, physical injuries, or even death.
- After equipment replacement, check the wiring and set parameters again.

Disposal	
 WARNING	• Dispose of retired equipment in accordance with local regulations and standards. Failure to comply may result in property damage, physical injuries, or even death. • Recycle retired equipment in accordance with waste disposal standards of the industry to avoid environmental pollution.

Safety Sign

For safe equipment operation and maintenance, comply with the safety labels on the equipment. Do not damage or remove the safety labels. The following table describes the safety labels.

To ensure safe operation, comply with equipment-related safety labels. The following table describes the safety labels.

Safety Sign	Description
	• Read through the safety instructions before operating the equipment. Failure to comply may result in equipment damage, physical injuries, or even death. • Do not touch the terminals or remove the cover with power ON or within 10 minutes after power-off. Failure to comply will result in electric shocks.

1.2 Special Precautions

Robot installers need to receive professional training from Inovance, dealers, and third-party organizations authorized by Inovance. Trainers must work in strict accordance with the following principles.

Precautions for handling, installation, and storage



Warning

1. When using a crane or forklift to handle a robot, never support the robot body by personnel.
 2. Do not lie on the robot or stand under the lifted robot during handling.
 3. Disconnect the controller power supply and main power supply before installation.
 4. During installation, set up conspicuous signs in mounting sections, and lock the main power supply switch or hang a conspicuous sign on it, to prevent accidental power-on by operators or other personnel. Failure to comply will cause unpredictable collisions, electric shocks, and other accidents.
 5. To start a robot, ensure that the robot is properly installed before powering on the controller, and adjust the robot to the specified posture. Disconnect the controller power supply and main power supply again, lock the power switch, and set up conspicuous signs before starting related operations.
-



Caution

- The robot body contains many precision parts. Therefore, prevent excessive shocks and vibrations when handling it.
- Before using a crane or a forklift to handle a robot, clear all obstacles on the transportation route to ensure that the robot is safely transported to the designated installation position.
- Use and store robots under the ambient conditions specified in the user guide. This product is intended to be used indoors. If the robot system is not used or stored according to the environment requirements, the robot lifetime may be reduced, the robot may be damaged, and even safety accidents may be caused.
 - The temperature of the work area ranges from 0°C to 45°C, with a maximum temperature variation of 1.5°C/min.
 - The relative humidity of the environment ranges from 5% RH to 95% RH, without condensation.
 - Keep away from direct sunlight and avoid places with salt or moisture and other rust-prone places.
 - Avoid places with dust, oil fume, iron filings, or other dust pollution. Avoid places with flammable gas, explosive gas, and corrosive liquid and gas.
 - Avoid places with great shock and vibration (vibration acceleration below 4.9 m/s²)
 - Keep away from sources of electrical interference.
- Use the robot system within the range specified by the product specifications in the user guide. Never use the robot system with overlength, overlimit, overload, or overspeed. Failure to comply may reduce the robot lifetime, damage the robot, and even cause safety accidents.

Precautions for operation

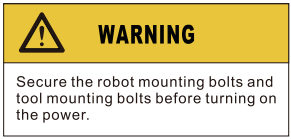


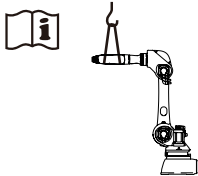
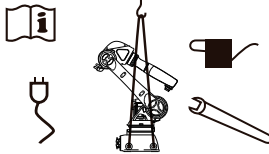
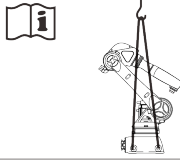
1. Before operation, operators should read the safety section of this user guide carefully. Failure to understand or follow the specifications may cause serious accidents and major losses.
2. Before power-on, ensure that there are no operators in the motion range of the robot.
3. Operators should not enter the motion range of the robot before powering off the robot, even if the robot is stationary since it may operate in a sudden.
4. Operate the robot system from a low speed to a high speed gradually. Starting with a high speed will cause equipment damage and safety accidents.
5. In case of robot action exceptions during robot system operation, press the emergency stop switch immediately. Never continue the operation upon exceptions. Failure to comply may cause unpredictable damage.
6. Disconnect the plug for complete power-off. Be sure to use the power cord and plug that come with the system, and do not replace the power cord or directly connect the chassis to the factory power source.
7. Power off all parts to be maintained and replaced, and disconnect the plug. Do not perform operations while the power is on. Failure to comply may result in electric shocks.
8. In principle, the system should be operated by one operator. If multiple operators are needed, make sure that all operators can communicate effectively and take necessary safety measures.

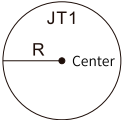
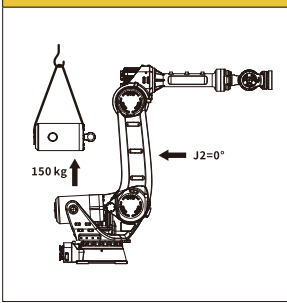
1.3 Safety Signs

The following table describes the warning labels affixed on the robot body. Pay special attention that specific dangers exist around the positions where these labels are affixed. Comply with the cautions and warnings on the warning labels to operate and maintain the robot system safely. Do not damage or remove the warning labels.

The following table lists the warning labels.

Safety Signs	Safety Instructions
	Do not touch the energized parts during power-on. Failure to comply may result in electric shocks.
	Do not step on the robot joint motor.
	Secure the robot mounting bolts and tool mounting bolts before turning on the power.
	Do not step on dummy cylinder.
	Disassembly of the dummy cylinder front cover is not allowed.

Safety Signs	Safety Instructions
WARNING  Fix the bearing shafts J2 and J3 with slings before releasing the brake to prevent unintentional falling.	The J2 and J3 axes are gravity bearing axes. Secure them with a sling before releasing the brake to prevent falling and injury.
WARNING  Secure the system before beginning work on the robot. Read and observe the safety instructions!	Before starting work on the robot, read and observe the safety instructions to ensure the safety of the system.
WARNING  Move the robot into its transport position before transferring or hoisting the robot.	When lifting the robot with the eye bolts, use slings that prevent the robot from rotating and tilting.

Safety Signs	Safety Instructions
 WARNING Robot motion range-JT5  R= 2701 mm Please do not enter robot motion range when the power is on.	When the robot is powered on, it is prohibited to enter its working radius area to prevent personal injury.
 WARNING 	When disassembling the dummy cylinder by lifting, adjust J2 to the zero point position.

2 Description

2.1 Model Description

IR-R220-270S7

① ② ③ ④ ⑤ ⑥

① Product family INOVANCE Robot	③ Load 130: 130 kg 170: 170 kg 220: 220 kg	⑤ Installation environment C: Clean S: Standard P: High-protection
② Series R: 6-axis robot	④ Arm length 270: 2701 mm 310: 3096 mm	⑥ Cable length 7: 7 m standard cable 10: 10 m standard cable 15: 15 m standard cable

Note

The product information in this guide is the information of standard models in a standard environment. For information about non-standard models or cleanroom models, contact the provider.

2.2 Components

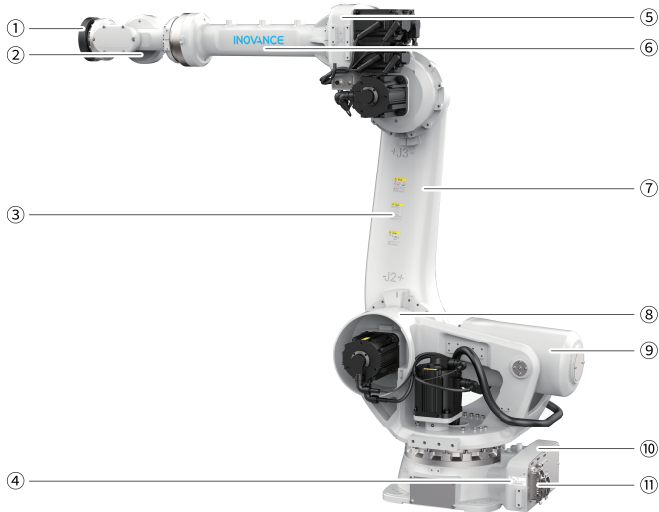


Table 2-1 Components

No.	Component	No.	Component
①	Wrist flange	⑦	Upper arm
②	Wrist	⑧	Swivel base
③	Safety sign	⑨	Dummy cylinder
④	Nameplate	⑩	Base
⑤	Elbow	⑪	Heavy-duty connector
⑥	Transition arm	-	-

3 Inspection and Maintenance

3.1 Maintenance Precautions

Before maintenance, read this guide and other related guides carefully to fully understand the methods of safe check and maintenance.



Danger

- Equipment installation, wiring, inspection, maintenance, or parts replacement must be performed by professionals.
 - Do not perform equipment maintenance or servicing while power is on. Failure to comply may result in electric shocks.
 - Do not remove any parts that are not covered in this guide. Follow the maintenance procedure strictly as described in this guide.
 - Check the motion of the robot after parts replacement outside the safety fence. Failure to comply may cause severe safety issues due to abnormal movement of the robot.
 - Make sure that the emergency stop switch and safety door switch work properly before operation. Otherwise, safety protection function will not work properly in emergency cases, causing serious injury or damage.
-



Warning

- Submit the repair request according to the warranty agreement.
 - Perform daily and periodic inspection and maintenance on the equipment according to maintenance requirements and retain a maintenance record.
 - When the equipment fails or is damaged, arrange for qualified technicians to troubleshoot and repair the equipment in accordance with the maintenance instructions and retain a maintenance record.
 - Replace quick-wear parts of the equipment according to the replacement guide.
 - Prevent foreign objects from entering the equipment and terminals during maintenance.
 - Open the equipment cover only for repair and maintenance.
 - After the equipment is replaced, perform wiring inspection and parameter settings again.
-

3.2 Schedule for Inspection and Maintenance

Inspection points are divided into five stages: 1-month, 3-month, 6-month, 12-month, and 36-month. the inspection points are added every stage. If the robot is operated for 250 hours or longer per month, the inspection points must be added every 250 hours, 750 hours, 1500 hours, and 3000 hours operation.

Check Item	Check Item					
	Daily Inspection	Monthly Inspection	Quarterly Inspection	Biannual Inspection	Annual inspection	Overhaul (Replacement)
1 month (250 h)	✓	✓	-	-	-	-
2 months (500 h)	✓	✓	-	-	-	-
3 months (750 h)	✓	✓	✓	-	-	-
4 months (1000 h)	✓	✓	-	-	-	-
5 months (1250 h)	✓	✓	-	-	-	-
6 months (1500 h)	✓	✓	✓	✓	-	-
7 months (1750 h)	✓	✓	-	-	-	-
8 months (2000 h)	✓	✓	-	-	-	-
9 months (2250 h)	✓	✓	✓	-	-	-
10 months (2500 h)	✓	✓	-	-	-	-
11 months (2750 h)	✓	✓	-	-	-	-
12 months (3000 h)	✓	✓	✓	✓	✓	-
...	-	-	-	-	-	-
36 months (9000 h)	✓	✓	✓	✓	✓	✓
...	-	-	-	-	-	-

3.3 Inspection and Maintenance Items

Inspect and maintain the robot regularly for the robot to run more safely and efficiently. The target parts can be inspected and maintained daily, monthly, quarterly, semi-annually, and annually as needed.

The list of maintenance items lists the necessary maintenance items at each stage. In the rightmost column of the table, the maintenance personnel are divided into "Professionals", "Qualified Personnel", and "Manufacturer" (that is, Inovance). You can designate skilled personnel to carry out various maintenance operations.

1. Daily inspection and maintenance

Check Item	Check Measure
Visual inspection	• Check all joint gaps, oil filling ports, and drain ports for grease leakage. • Check robot exterior for any impact damage.
Screw tightening inspection	Check all screws for looseness throughout the robot and check whether the screw tightening torques meet the requirements.
Noise inspection	Check all transmission mechanisms for unusual sounds.
Joint transmission mechanism inspection	Check for table running and abnormal jittering of the transmission mechanisms.
Pipeline accessory inspection	Check whether the pipeline accessories are complete, worn and rusted.
Control inspection of all electrical components	Check whether the control buttons of all electrical components of the robot are normal.

2. Weekly inspection and maintenance

Check Item	Check Measure
Brake inspection	Check whether the brake of each axis of the robot is effective.
Motion range of each axis	• Check whether the motion range of each axis is within the normal angle range. • Check whether the zero point position of each axis is aligned.

3. Monthly inspection and maintenance

Check Item	Check Measure
Control cabinet heat dissipation inspection	Check whether the fan behind the control cabinet is ventilated smoothly. It is recommended to replace or maintain the fan once a month.

4. Inspection and maintenance every six months

Check Item	Check Measure
All wiring harnesses for each electrical component	• Check all cable connectors of the robot body for bending, corrosion and falling off. • Check the cables outside the control cabinet for bending, corrosion and falling off. • Check the cable of the teach pendant for bending, corrosion and falling off.

5. Inspection and maintenance every year

Check Item	Check Measure
Control cabinet DI/DO signal	Check whether the DI/DO signal response of the control cabinet is normal.
Reducer of each axis	Check whether the lubrication of the reducer of each axis of the robot is normal and whether there is abnormal noise.
Cleaning of all electrical components	Check the cleanliness of all electrical components. Under normal circumstances, remove dust for all electrical components every year.
Control cabinet fan filter	Check the cleanliness of the filter of the control cabinet fan, and replace the filter once a year under normal circumstances.
Concentration of iron powder worn by each joint of robot	Check the wear iron powder concentration of each joint once a year.
Dummy Cylinder	Check whether the lubrication of the dummy cylinder is normal and whether there is abnormal noise.

6. Inspection and maintenance every 1.5 years

Check Item	Check Measure
Battery inspection	Check the battery voltage. If the battery voltage is lower than 3.1 V, replace the battery in time.



Caution

Due to the risk of screw thread stripping, inspect the torque wrench and hexagon screw-driver bit for wear before use and replace if necessary.

3.4 Inspection and Maintenance of Screws

Use hexagon screws (hereinafter referred to as screws) in places where mechanical strength is required. When assembling the robot, tighten the screws according to the tightening torque shown in the following table.

Table 3-1 Screw diagnosis part

No.	Diagnosis Part	No.	Diagnosis Part
1	Robot base mounting screws	6	J5 axis motor mounting screws
2	J1 axis motor mounting screws	7	J6 axis motor mounting screws
3	J2 axis motor mounting screws	8	Wrist parts mounting screws
4	J3 axis motor mounting screws	9	End load mounting screws
5	J4 axis motor mounting screws	-	-

When it is necessary to refasten these screws in some procedures in this guide (except special cases as noted), use a torque wrench so that the screws are fastened with the appropriate tightening torques as shown below.

Screw	Tightening torque
M2.5	1.0 N · m
M3	2.0 N · m
M4	4.0 N · m
M5	8.0 N · m
M6	13.0 N · m
M8	35.0 N · m
M10	70.0 N · m
M12	120.0 N · m
M14	210.0 N · m
M16	320.0 N · m
M20	540.0 N · m

Tighten the screws in the sequence shown below: The screws aligned on a circumference should be fastened in a crisscross pattern as shown in the figure below.

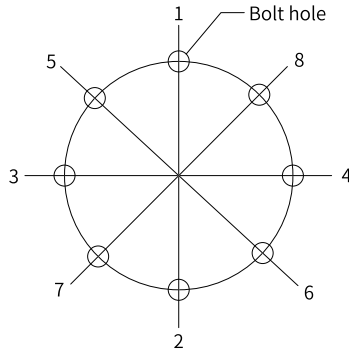


Figure 3-1 Tightening method

Do not fasten all screws securely at one time. Do not tighten the screw to the maximum torque value at a time. Tighten the screws slightly with a hexagon wrench as shown in the preceding figure. Then tighten the screws to the torque values in the table above with a torque wrench.



Caution

Due to the risk of screw thread stripping, inspect the torque wrench and hexagon screw-driver bit for wear before use and replace if necessary.

3.5 Daily Control Cabinet Cable Inspection

The following table describes the inspection of control cabinet cables:

No.	Check Item	Diagram/Illustration	Cycle
①	Check that the power cable and encoder cable of the robot are properly connected to the control cabinet.		Daily
②	Check that the teach pendant cable is properly connected to the control cabinet.		Daily

No.	Check Item	Diagram/Illustration	Cycle
③	Check that the external power cable is properly connected to the control cabinet.		Daily
④	Wipe off any acid, alkali, oil, or corrosive liquids with wiping paper or a dry cloth	All cables	Monthly

3.6 Oil Leakage Inspection

3.6.1 Daily Inspection

Check the following items each day when the system is running.

Inspection Item	Content
Oil leakage	Check for oil leakage at each joint. Wipe off any oil leaked.

3.6.2 Oil Leakage Inspection Parts

- Insert a dust-free cloth or scouring pad into the gap of each joint. Check for oil leakage at each joint. Wipe off any oil leaked.
- Depending on operating conditions and the surrounding environment, a small amount of oil may seep out from the outer side of the oil seal lip (minor adhesion). When this oil accumulates into droplets, it may drip under certain movements. Before operating the robot, wipe off any oil residue beneath the oil seal.
- If significant oil leakage is observed, contact the manufacturer for technical support.
- When opening the lubrication grease supply/drain port, take care to prevent grease splashing.
- If the operating temperature becomes excessively high, internal pressure in the grease chamber may rise. In such cases, after operation, open the pressure relief port once to restore normal internal pressure.

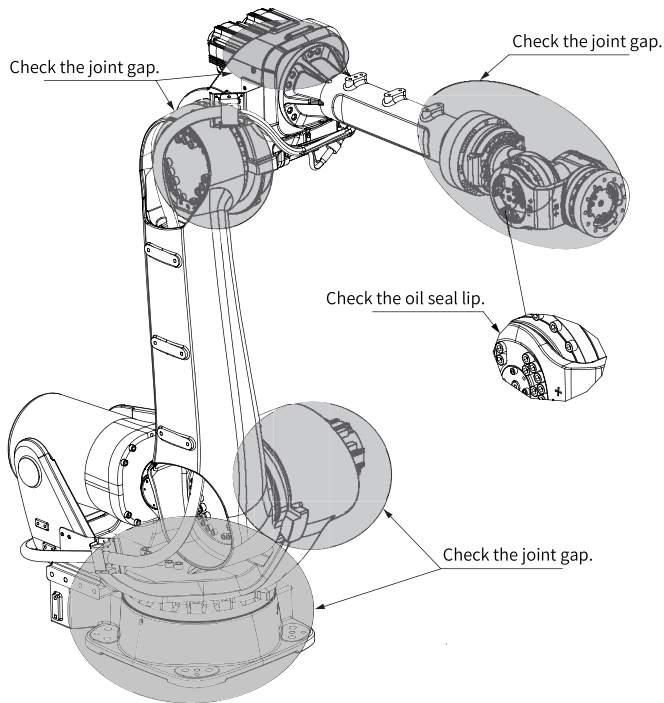


Figure 3-2 Oil leakage inspection parts

**Caution**

- When opening the pressure relief port, lubricating grease may be sprayed out at high temperature. Prepare plastic bags in advance and lay them under the pressure relief port.
- Wear heat-resistant gloves, protective goggles, masks, and protective clothing as needed.
- If oil leakage persists after frequent wiping, see ["3.6.3 Lubricating Grease Leakage and Solution" on page 30](#) for handling.
- When reinstalling the screw plug into the oil filler port, check whether the tightening torque meets the standard torque value. The torque of the M10x1 screw plug is 7 N·m.

3.6.3 Lubricating Grease Leakage and Solution

Problem	Problem Description	Cause Analysis	Solution
Oil seepage or leakage at gearbox	Oil leakage at joints	The robot has been used for an extended period, causing aging of sealing rubber parts.	Replace the sealing rubber parts or O-rings.
		Improper disassembly/ reassembly operations may damage sealing rubber parts.	
		Oil seal damage may be caused by foreign particles (such as dust) scratching the oil seal lip.	If the oil seal at the reducer is damaged (based on leakage position), replace the reducer.
		Gaps exist on sealing surfaces.	Re-tighten mounting screws to ensure a tight fit between surfaces.
		Threadlocker LT 5699 on motor or reducer mounting surfaces becomes invalid.	Re-apply the threadlocker LT 5699.
		Combined sealing washers matching hexagon socket screw plugs at oil filling and draining ports of joints function improperly.	Replace with new hexagon socket screw plugs and matching combined sealing washers.
		Cracks on castings or oil chamber damage occurs due to collisions or other impacts.	Replace with new parts.

3.7 Maintenance of Robot Covers

3.7.1 Robot Enclosure Inspection and Tool Preparation

This section describes the disassembly and installation methods for the wrist side cover during maintenance.



Warning

- Power off the robot system by removing the power plug.
- Before performing any replacement procedure, turn off the robot system and related equipment, and then disconnect the power plug from the power source. Operating with the power ON may cause electric shock or malfunction of the robot system.
- Prevent foreign objects from entering the robot, connector and pins. Turning on the power when any foreign substances exist may cause electric shock or malfunction.

The tools required are described in the following table.

Tool	Quantity
Torque wrench	1
Hexagon screwdriver bit (H5x100)	1
LT 263 threadlocker	1

3.7.2 Wrist Side Cover



Caution

- Do not remove the enclosure forcibly. Failure to comply may result in damage, break, and poor contact of the cable, causing electric shock or improper function of the robot system.
- When installing the enclosure, be careful not to get the cables caught in it or bend them forcibly to push into the enclosure. Failure to comply may result in damage, break, and poor contact of the cable, causing electric shock or improper function of the robot system. When routing the cables, check the cable locations after removing the enclosure. Be sure to place the cables back to their original locations.
- Ensure that the sealing ring is installed properly when installing the enclosure. Do not damage the gasket during installation to ensure airtightness of the robot.

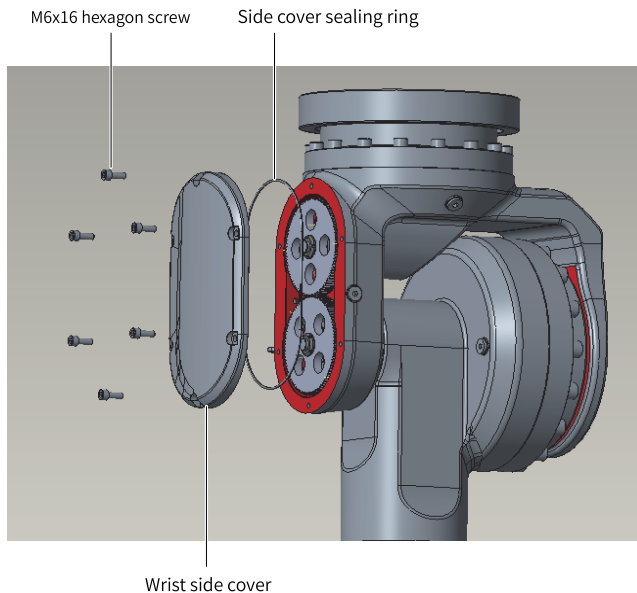


Figure 3-3 Replacing the Wrist Side Cover

Removing the wrist side cover:

1. Remove the six M6x16 hexagon screws from the wrist side cover.
2. Remove the wrist side cover.

Installing the wrist side cover:

1. Clean residual threadlocker from all screws. Apply fresh LT 263 threadlocker to all screws.
2. Install the sealing ring of the wrist side cover to the cover.
3. Secure the wrist side cover to the robot wrist with six M6x16 hexagon screws with a tightening torque of 13 N·m.

**Caution**

During installation, take care to avoid pinching or damaging internal cables and sealing rings.

3.8 Maintenance and Replacement of Parts

3.8.1 J1 Axis

**Warning**

- Power off the robot system by removing the power plug.
 - Before performing any replacement procedure, turn off the robot system and related equipment, and then disconnect the power plug from the power source. Operating with the power ON may cause electric shock or malfunction of the robot system.
 - Always connect the AC power cable to the power plug. Do not connect it directly to the factory power supply.
-

**Caution**

- Do not apply excessive shock to the motor shaft during replacement. Failure to comply may shorten the service life or damage the motor or encoder.
 - Do not disassemble the encoder of the motor.
 - After parts such as motors and reducer have been replaced, the robot cannot operate properly because a mismatch exists between the zero point stored in each motor and its corresponding zero point stored in the robot system. After replacing the parts, it is necessary to match these zero points.
-

Replacing Motor of the J1 Axis

Name		Quantity
Maintenance part	Motor assembly of the J1 axis	1
	O-shaped sealing ring of the J1 axis	1
Tool	7-inch circlip pliers	1
	Hexagon wrench	1
	100-N · m torque wrench	1
	Torque screwdriver for M8 and M12 hexagon screws	1
	Screwdriver sleeve for M8 and M12 hexagon screws	1
	Dust-free cloth or scouring pad	Several
	Aviation plug disassembly tooling	1
	Motor lifting tool	1

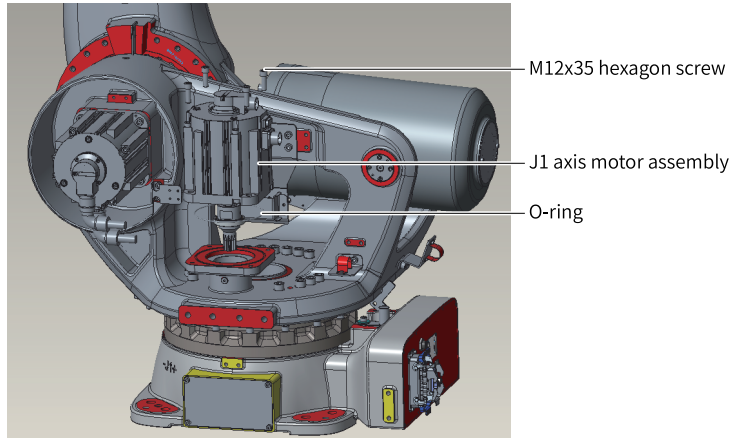


Caution

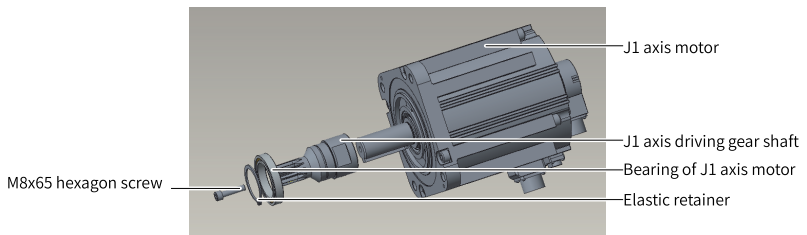
When disassembling the motor, use a lifting eye to secure the upper arm through the lifting hole, or adjust the joint to its mechanical limit position to prevent impact injuries.

- **Removing the J1 axis motor:**

1. Switch off the control switch on the controller and disconnect the heavy-duty cables from the robot.
2. Use the aviation plug disassembly tooling to remove the motor power cable and encoder cable of the J1 axis.
3. Remove the four M12x35 hexagon screws securing the J1 axis motor assembly.
4. Remove the J1 axis motor assembly and the O-shaped sealing ring.

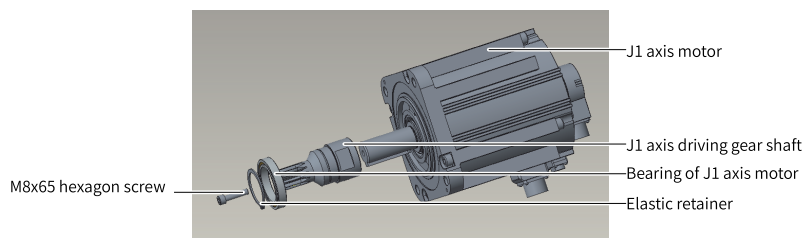


5. Remove the M8x65 hexagon screws securing the J1 axis driving gear shaft.
6. Remove the J1 axis driving gear shaft.
7. Use circlip pliers to remove the spring retainer.
8. Remove the bearing.

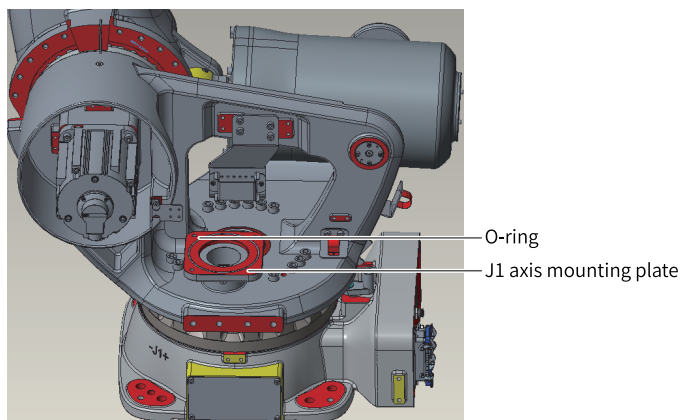


● Installing the J1 axis motor:

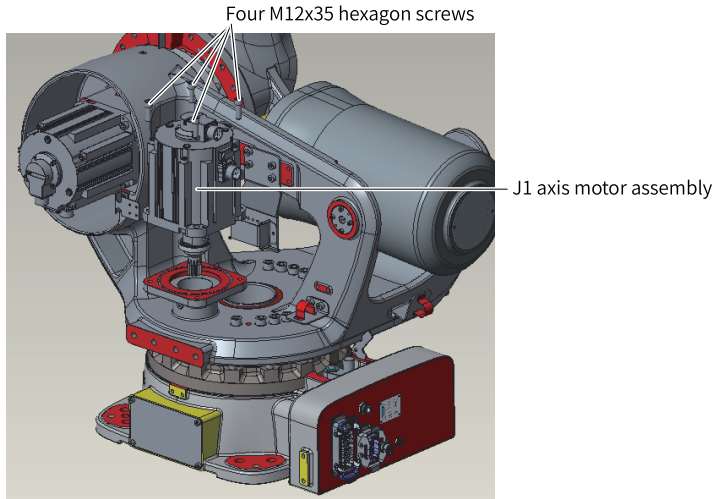
1. Check the J1 axis motor for any damage and clean the grease from the motor shaft using anhydrous ethanol.
2. Install the bearing to the corresponding position on the J1 axis driving gear shaft.
3. Install the elastic retainer into the corresponding processing groove of the bearing on the driving gear shaft of J1 axis with circlip pliers.
4. Install the J1 axis driving gear shaft onto the output shaft of the J1 axis motor, ensuring no noticeable sticking points during the engagement between the output shaft and the gear shaft.
5. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
6. Secure the gear using an M8x65 hexagon screw, with a tightening torque of 35 N · m.



7. Install the O-shaped sealing ring onto the J1 axis motor mounting plate.



8. Apply LT 5699 sealant to the J1 axis motor mounting plate first.
9. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
10. Secure the J1 axis motor assembly to the J1 axis mounting plate using four M12x35 hexagon screws, tightening them in two stages with tightening torques of 20 N·m and 80 N·m, respectively.



11. Install cables by referring to ["3.11.3 Installing Cables Inside Robot" on page 81.](#)
12. Power on the robot, reset the J1 axis encoder value, clear any alarms, and then capture the J1 axis zero point position.

Replacing the J1 axis reducer

Since replacing the reducer for the IR-R220 series 6-axis robot requires large lifting equipment, users needing reducer replacement should contact their local distributor to ensure operational safety.

3.8.2 J2 Axis

Warning

- Power off the robot system by removing the power plug.
 - Before performing any replacement procedure, turn off the robot system and related equipment, and then disconnect the power plug from the power source. Operating with the power ON may cause electric shock or malfunction of the robot system.
 - Always connect the AC power cable to the power plug. Do not connect it directly to the factory power supply.
-

**Caution**

- Do not apply excessive shock to the motor shaft during replacement. Failure to comply may shorten the service life or damage the motor or encoder.
 - Do not disassemble the encoder of the motor.
 - After parts such as motors and reducer have been replaced, the robot cannot operate properly because a mismatch exists between the zero point stored in each motor and its corresponding zero point stored in the robot system. After replacing the parts, it is necessary to match these zero points.
-

Replacing Motor of the J2 Axis

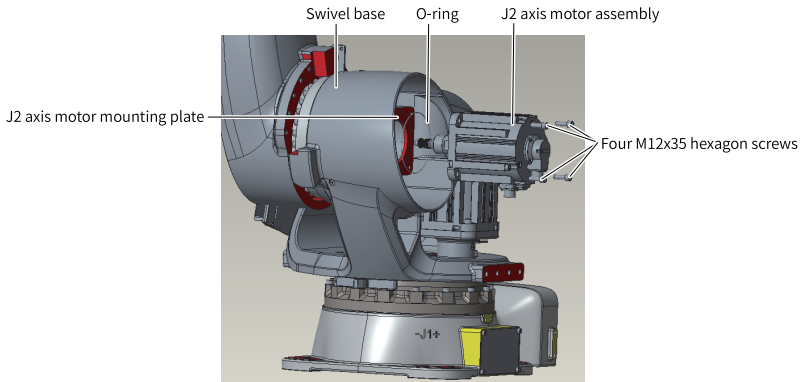
Name		Quantity
Maintenance part	Motor assembly of the J2 axis	1
	O-shaped sealing ring of the J2 axis	1
Tool	Hexagon wrench	1
	100-N·m torque wrench	1
	Torque screwdriver for M8 and M12 hexagon screws	1
	Screwdriver sleeve for M8 and M12 hexagon screws	1
	Dust-free cloth or scouring pad	Several
	Aviation plug disassembly tooling	1
	Motor lifting tool	1

**Caution**

When disassembling the motor, use a lifting eye to secure the upper arm through the lifting hole, or adjust the joint to its mechanical limit position to prevent impact injuries.

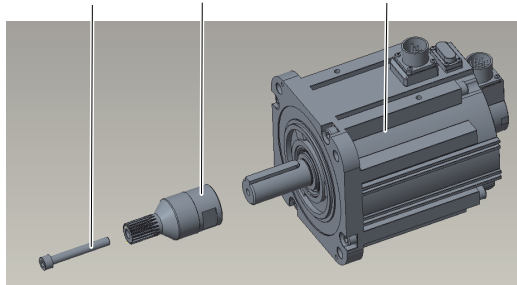
● Removing the J2 axis motor:

1. Switch off the control switch on the controller and disconnect the heavy-duty cables from the robot.
2. Use the aviation plug disassembly tooling to remove the motor power cable and encoder cable of the J2 axis.
3. Remove the four M12x35 hexagon screws securing the J2 axis motor assembly.
4. Remove the J2 axis motor assembly and the O-shaped sealing ring.



5. Remove the M8x65 hexagon screws securing the J2 axis driving gear shaft.

M8x65 hexagon screws J2 axis driving gear shaft J2 axis motor assembly

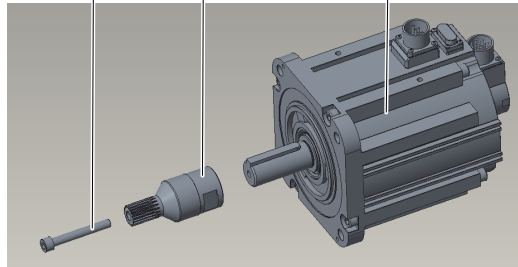


6. Remove the J2 axis driving gear shaft.

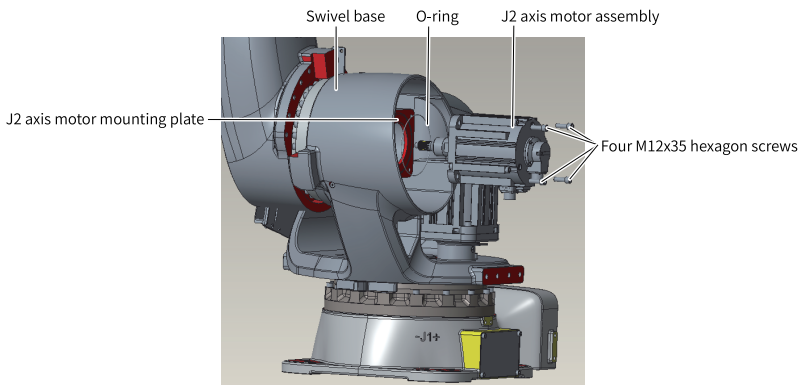
- **Installing the J2 axis motor:**

1. Check the J2 axis motor for any damage and clean the grease from the motor shaft using anhydrous ethanol.
2. Install the J2 axis driving gear shaft onto the output shaft of the J2 axis motor, ensuring no noticeable sticking points during the engagement between the output shaft and the gear shaft.
3. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
4. Secure the gear using an M8x65 hexagon screw, with a tightening torque of 35 N·m.

M8x65 hexagon screws J2 axis driving gear shaft J2 axis motor assembly



5. Install the O-shaped sealing ring onto the J2 axis motor mounting plate.
6. Apply LT 5699 sealant to the J2 axis motor mounting plate first.
7. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
8. Secure the J2 axis motor assembly to the J2 axis mounting plate using four M12x35 hexagon screws, tightening them in two stages with tightening torques of 20 N·m and 80 N·m, respectively.



9. Install cables by referring to ["3.11.3 Installing Cables Inside Robot" on page 81](#).
10. Power on the robot, reset the J2 axis encoder value, clear any alarms, and then capture the J2 axis zero point position.

Replacing the J2 axis reducer

Since replacing the reducer for the IR-R220 series 6-axis robot requires large lifting equipment, users needing reducer replacement should contact their local distributor to ensure operational safety.

3.8.3 J3 Axis



Warning

- Power off the robot system by removing the power plug.
- Before performing any replacement procedure, turn off the robot system and related equipment, and then disconnect the power plug from the power source. Operating with the power ON may cause electric shock or malfunction of the robot system.
- Always connect the AC power cable to the power plug. Do not connect it directly to the factory power supply.



Caution

- Do not apply excessive shock to the motor shaft during replacement. Failure to comply may shorten the service life or damage the motor or encoder.
- Do not disassemble the encoder of the motor.
- After parts such as motors and reducer have been replaced, the robot cannot operate properly because a mismatch exists between the zero point stored in each motor and its corresponding zero point stored in the robot system. After replacing the parts, it is necessary to match these zero points.

Replacing Motor of the J3 Axis

	Name	Quantity
Maintenance part	Motor assembly of the J3 axis	1
	O-shaped sealing ring of the J3 axis	1
Tool	Hexagon wrench	1
	100-N·m torque wrench	1
	Torque screwdriver for M8 and M12 hexagon screws	1
	Screwdriver sleeve for M8 and M12 hexagon screws	1
	Dust-free cloth or scouring pad	Several
	Aviation plug disassembly tooling	1
	Motor lifting tool	1

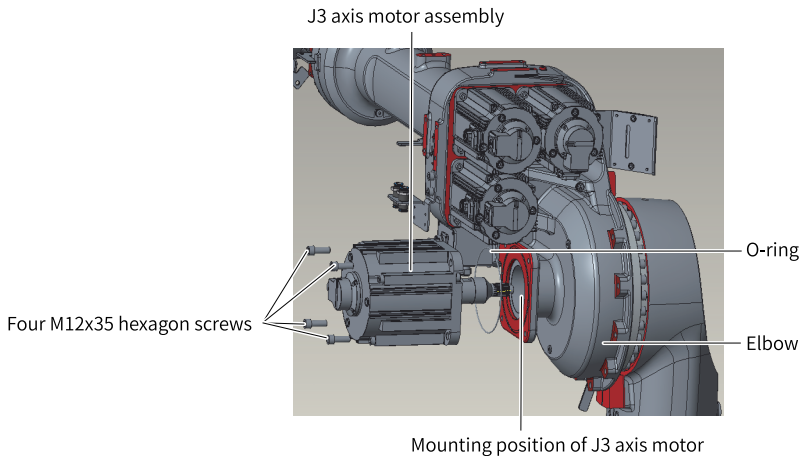


Caution

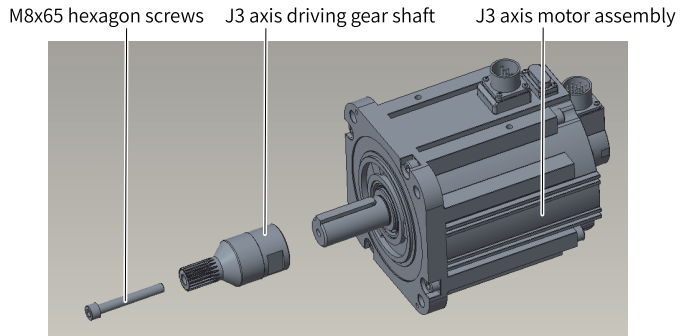
When disassembling the motor, use a lifting eye to secure the upper arm through the lifting hole, or adjust the joint to its mechanical limit position to prevent impact injuries.

- **Removing the J3 axis motor:**

1. Switch off the control switch on the controller and disconnect the heavy-duty cables from the robot.
2. Use the aviation plug disassembly tooling to remove the motor power cable and encoder cable of the J3 axis.
3. Remove the four M12x35 hexagon screws securing the J3 axis motor assembly.
4. Remove the J3 axis motor assembly and the O-shaped sealing ring.

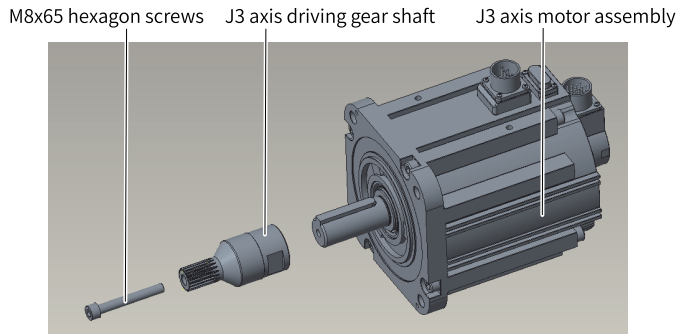


5. Remove the M8x65 hexagon screws securing the J3 axis driving gear shaft.
6. Remove the J3 axis driving gear shaft.

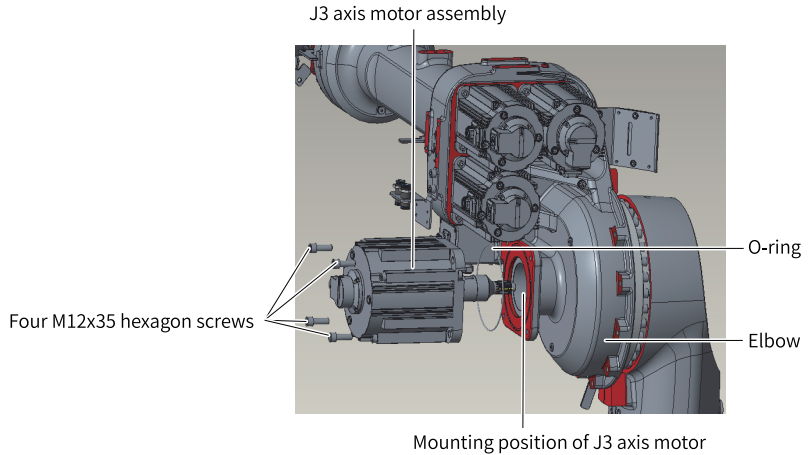


● **Installing the J3 axis motor:**

1. Check the J3 axis motor for any damage and clean the grease from the motor shaft using anhydrous ethanol.
2. Install the J3 axis driving gear shaft onto the output shaft of the J3 axis motor, ensuring no noticeable sticking points during the engagement between the output shaft and the gear shaft.
3. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
4. Secure the gear using an M8x65 hexagon screw, with a tightening torque of 35 N · m.



5. Install the O-shaped sealing ring onto the J3 axis motor mounting plate.
6. Apply LT 5699 sealant to the J3 axis motor mounting plate first.
7. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
8. Secure the J3 axis motor assembly to the J3 axis mounting plate using four M12x35 hexagon screws, tightening them in two stages with tightening torques of 20 N · m and 80 N · m, respectively.



9. Install cables by referring to ["3.11.3 Installing Cables Inside Robot" on page 81](#).
10. Power on the robot, reset the J3 axis encoder value, clear any alarms, and then capture the J3 axis zero point position.

Replacing the J3 axis reducer

Since replacing the reducer for the IR-R220 series 6-axis robot requires large lifting equipment, users needing reducer replacement should contact their local distributor to ensure operational safety.

3.8.4 J4 Axis

Warning

- Power off the robot system by removing the power plug.
 - Before performing any replacement procedure, turn off the robot system and related equipment, and then disconnect the power plug from the power source. Operating with the power ON may cause electric shock or malfunction of the robot system.
 - Always connect the AC power cable to the power plug. Do not connect it directly to the factory power supply.
-

**Caution**

- Do not apply excessive shock to the motor shaft during replacement. Failure to comply may shorten the service life or damage the motor or encoder.
- Do not disassemble the encoder of the motor.
- After parts such as motors and reducer have been replaced, the robot cannot operate properly because a mismatch exists between the zero point stored in each motor and its corresponding zero point stored in the robot system. After replacing the parts, it is necessary to match these zero points.

Replacing Motor of the J4 Axis

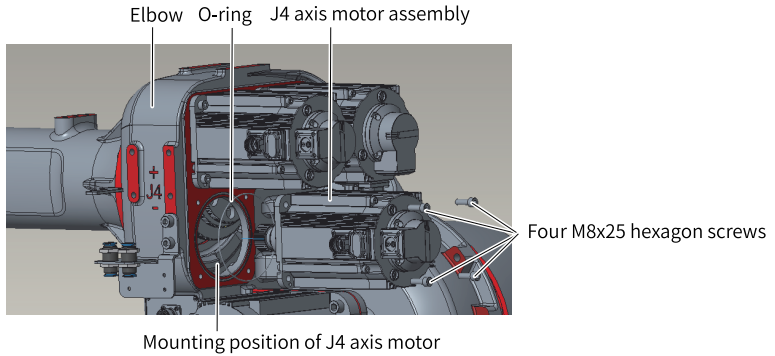
Name		Quantity
Maintenance part	Motor assembly of the J4 axis	1
	O-shaped sealing ring of the J4 axis	1
Tool	Hexagon wrench	1
	100-N·m torque wrench	1
	Torque screwdriver for M8 hexagon screws	1
	Screwdriver sleeve for M8 hexagon screws	1
	Dust-free cloth or scouring pad	Several
	Aviation plug disassembly tooling	1
	Motor lifting tool	1

**Caution**

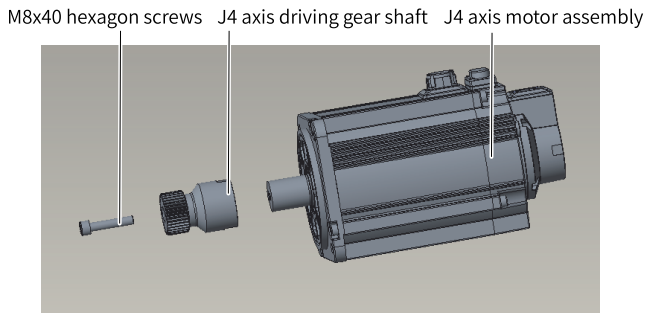
When disassembling the motor, use a lifting eye to secure the upper arm through the lifting hole, or adjust the joint to its mechanical limit position to prevent impact injuries.

- **Removing the J4 axis motor:**

1. Switch off the control switch on the controller and disconnect the heavy-duty cables from the robot.
2. Use the aviation plug disassembly tooling to remove the motor power cable and encoder cable of the J4 axis.
3. Remove the four M8x35 hexagon screws securing the J4 axis motor assembly.
4. Remove the J4 axis motor assembly and the O-shaped sealing ring.



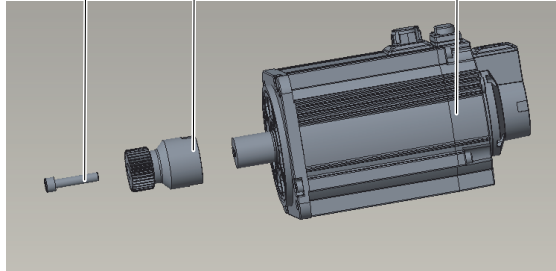
5. Remove the M8x40 hexagon screws securing the J4 axis driving gear shaft.
6. Remove the J4 axis driving gear shaft.



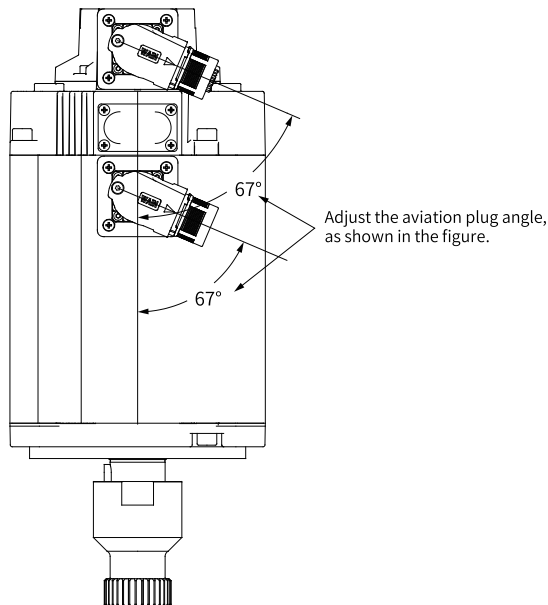
- **Installing the J4 axis motor:**

1. Check the J4 axis motor for any damage and clean the grease from the motor shaft using anhydrous ethanol.
2. Install the J4 axis driving gear shaft onto the output shaft of the J4 axis motor, ensuring no noticeable sticking points during the engagement between the output shaft and the gear shaft.
3. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
4. Secure the gear using an M8x40 hexagon screw, with a tightening torque of 35 N·m.

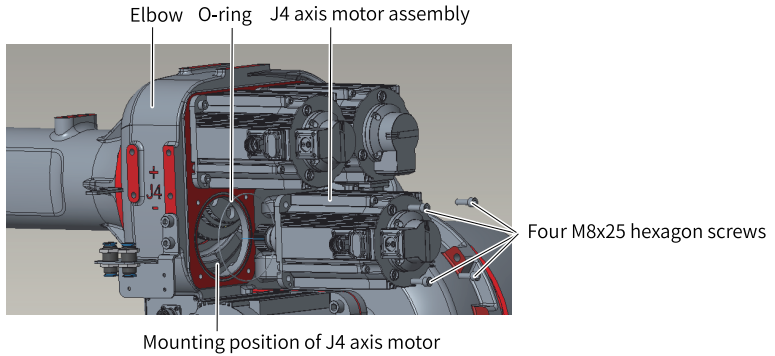
M8x40 hexagon screws J4 axis driving gear shaft J4 axis motor assembly



5. After installing the J4 axis driving gear shaft, adjust the angle of the aviation plug to prevent interference.



6. Install the O-shaped sealing ring onto the J4 axis motor mounting plate.
7. Apply LT 5699 sealant to the J4 axis motor mounting plate first.
8. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
9. Secure the J4 axis motor assembly to the J4 axis mounting plate using four M8x25 hexagon screws, tightening them in two stages with tightening torques of 10 N·m and 35 N·m, respectively.



10. Install cables by referring to ["3.11.3 Installing Cables Inside Robot" on page 81](#).
11. Power on the robot, reset the J4 axis encoder value, clear any alarms, and then capture the J4 axis zero point position.

Replacing the J4 axis reducer

Since replacing the reducer for the IR-R220 series 6-axis robot requires large lifting equipment, users needing reducer replacement should contact their local distributor to ensure operational safety.

3.8.5 J5 Axis



- Power off the robot system by removing the power plug.
 - Before performing any replacement procedure, turn off the robot system and related equipment, and then disconnect the power plug from the power source. Operating with the power ON may cause electric shock or malfunction of the robot system.
 - Always connect the AC power cable to the power plug. Do not connect it directly to the factory power supply.
-



Caution

- Do not apply excessive shock to the motor shaft during replacement. Failure to comply may shorten the service life or damage the motor or encoder.
- Do not disassemble the encoder of the motor.
- After parts such as motors and reducer have been replaced, the robot cannot operate properly because a mismatch exists between the zero point stored in each motor and its corresponding zero point stored in the robot system. After replacing the parts, it is necessary to match these zero points.

Replacing Motor of the J5 Axis

Name		Quantity
Maintenance part	Motor assembly of the J5 axis	1
	O-shaped sealing ring of the J5 axis	1
Tool	Hexagon wrench	1
	100-N·m torque wrench	1
	Torque screwdriver for M8 hexagon screws	1
	Screwdriver sleeve for M8 hexagon screws	1
	Dust-free cloth or scouring pad	Several
	Aviation plug disassembly tooling	1
	Motor lifting tool	1

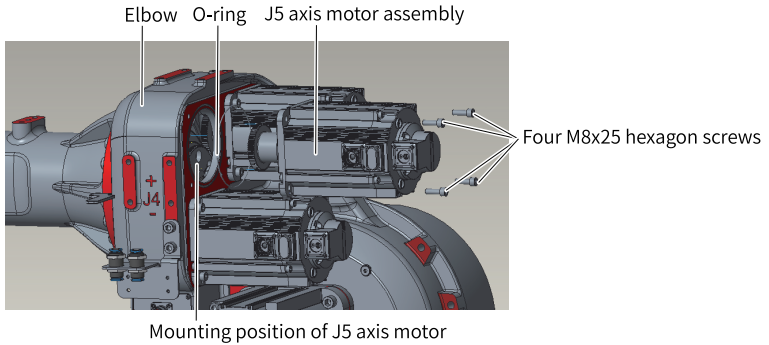


Caution

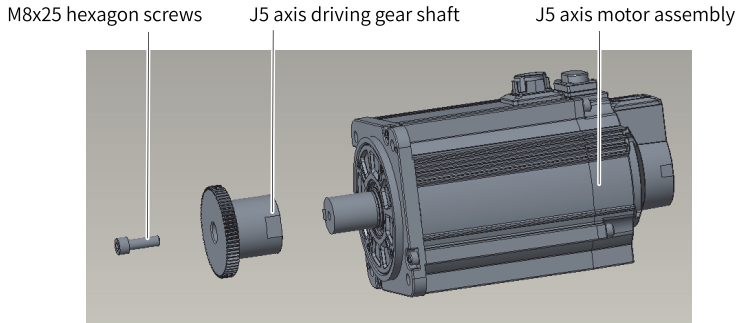
When disassembling the motor, use a lifting eye to secure the upper arm through the lifting hole, or adjust the joint to its mechanical limit position to prevent impact injuries.

● Removing the J5 axis motor:

1. Switch off the control switch on the controller and disconnect the heavy-duty cables from the robot.
2. Use the aviation plug disassembly tooling to remove the motor power cable and encoder cable of the J5 axis.
3. Remove the four M8x35 hexagon screws securing the J5 axis motor assembly.
4. Remove the J5 axis motor assembly and the O-shaped sealing ring.

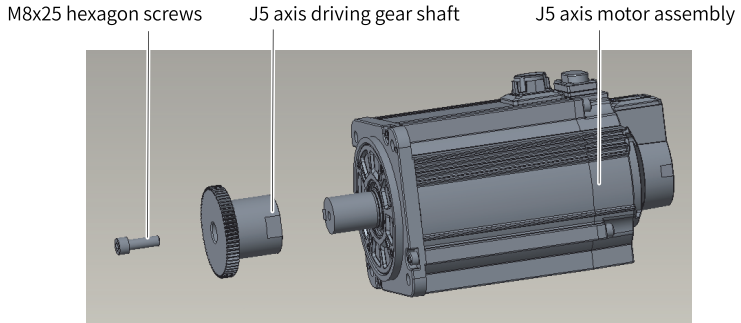


5. Remove the M8x40 hexagon screws securing the J5 axis driving gear shaft.
6. Remove the J5 axis driving gear shaft.

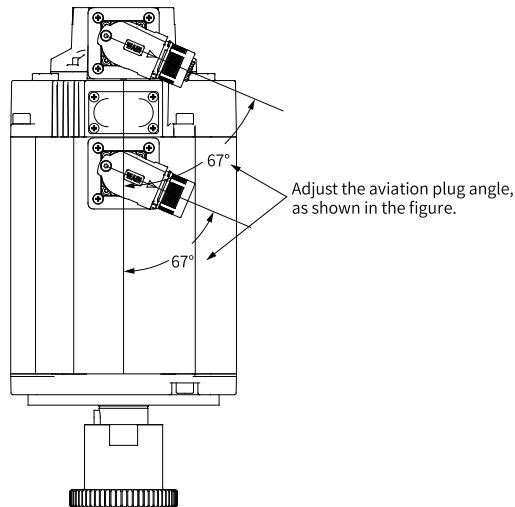


- **Installing the J5 axis motor:**

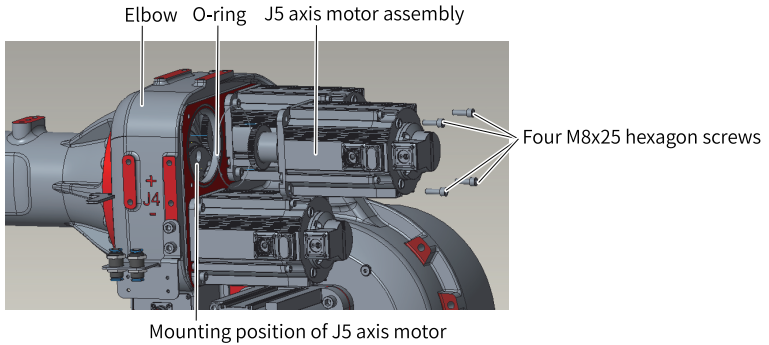
1. Check the J5 axis motor for any damage and clean the grease from the motor shaft using anhydrous ethanol.
2. Install the J5 axis driving gear shaft onto the output shaft of the J5 axis motor, ensuring no noticeable sticking points during the engagement between the output shaft and the gear shaft.
3. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
4. Secure the gear using an M8x40 hexagon screw, with a tightening torque of 35 N·m.



5. After installing the J5 axis driving gear shaft, adjust the angle of the aviation plug to prevent interference.



6. Install the O-shaped sealing ring onto the J5 axis motor mounting plate.
7. Apply LT 5699 sealant to the J5 axis motor mounting plate first.
8. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
9. Secure the J5 axis motor assembly to the J5 axis mounting plate using four M8x25 hexagon screws, tightening them in two stages with tightening torques of 10 N · m and 35 N · m, respectively.



10. Install cables by referring to ["3.11.3 Installing Cables Inside Robot" on page 81.](#)
11. Power on the robot, reset the J5 axis encoder value, clear any alarms, and then capture the J5 axis zero point position.

Replacing the J5 axis reducer

Since replacing the reducer for the IR-R220 series 6-axis robot requires large lifting equipment, users needing reducer replacement should contact their local distributor to ensure operational safety.

3.8.6 J6 Axis



- Power off the robot system by removing the power plug.
 - Before performing any replacement procedure, turn off the robot system and related equipment, and then disconnect the power plug from the power source. Operating with the power ON may cause electric shock or malfunction of the robot system.
 - Always connect the AC power cable to the power plug. Do not connect it directly to the factory power supply.
-



Caution

- Do not apply excessive shock to the motor shaft during replacement. Failure to comply may shorten the service life or damage the motor or encoder.
- Do not disassemble the encoder of the motor.
- After parts such as motors and reducer have been replaced, the robot cannot operate properly because a mismatch exists between the zero point stored in each motor and its corresponding zero point stored in the robot system. After replacing the parts, it is necessary to match these zero points.

Replacing Motor of the J6 Axis

Name		Quantity
Maintenance part	Motor assembly of the J6 axis	1
	O-shaped sealing ring of the J6 axis	1
Tool	Hexagon wrench	1
	100-N·m torque wrench	1
	Torque screwdriver for M8 hexagon screws	1
	Screwdriver sleeve for M8 hexagon screws	1
	Dust-free cloth or scouring pad	Several
	Aviation plug disassembly tooling	1
	Motor lifting tool	1

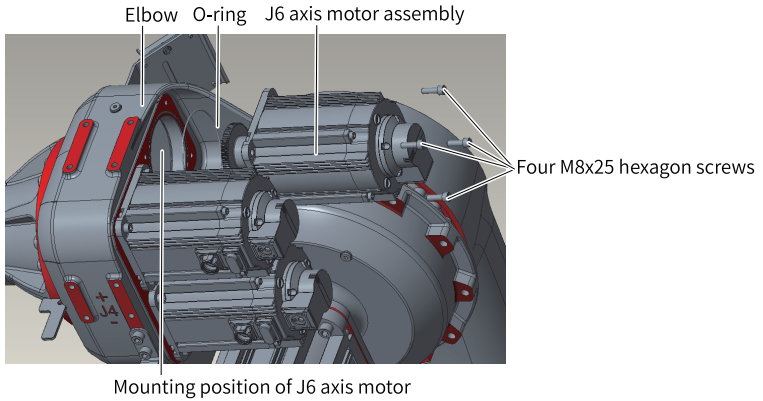


Caution

When disassembling the motor, use a lifting eye to secure the upper arm through the lifting hole, or adjust the joint to its mechanical limit position to prevent impact injuries.

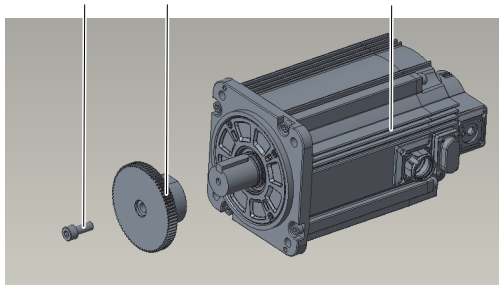
● Removing the J6 axis motor:

1. Switch off the control switch on the controller and disconnect the heavy-duty cables from the robot.
2. Use the aviation plug disassembly tooling to remove the motor power cable and encoder cable of the J6 axis.
3. Remove the four M8x35 hexagon screws securing the J6 axis motor assembly.
4. Remove the J6 axis motor assembly and the O-shaped sealing ring.



5. Remove the M8x20 hexagon screws securing the J6 axis driving gear shaft.
6. Remove the J6 axis driving gear shaft.

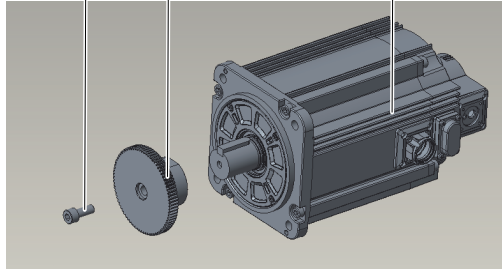
M8x20 hexagon screws J6 axis driving gear shaft J6 axis motor assembly



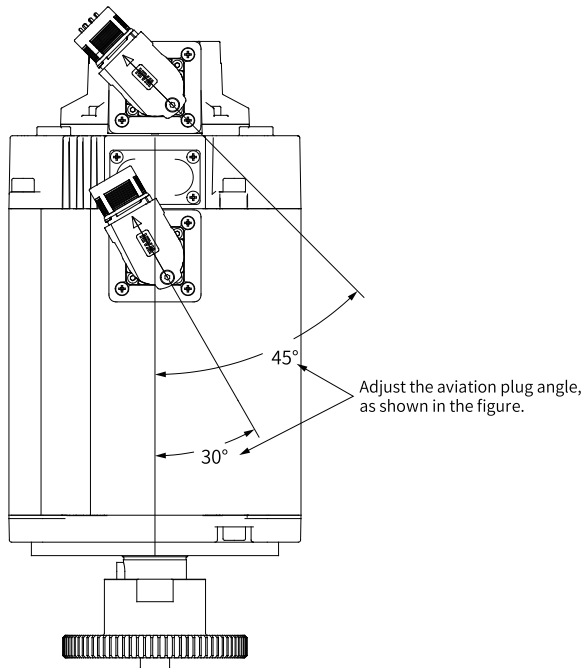
- **Installing the J6 axis motor:**

1. Check the J6 axis motor for any damage and clean the grease from the motor shaft using anhydrous ethanol.
2. Install the J6 axis driving gear shaft onto the output shaft of the J6 axis motor, ensuring no noticeable sticking points during the engagement between the output shaft and the gear shaft.
3. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
4. Secure the gear using an M8x20 hexagon screw, with a tightening torque of 35 N·m.

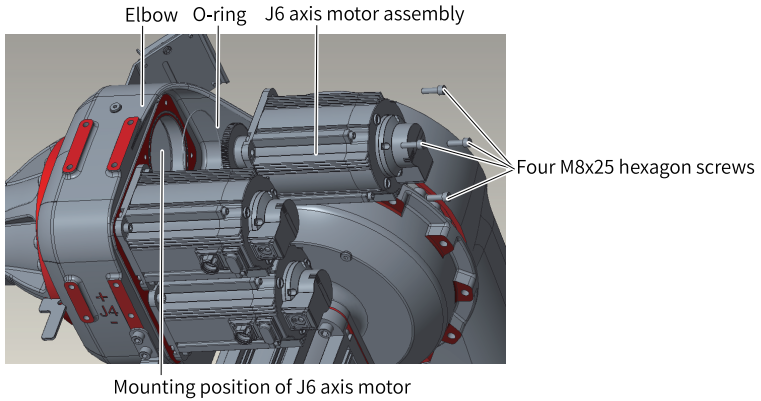
M8x20 hexagon screws J6 axis driving gear shaft J6 axis motor assembly



5. After installing the J6 axis driving gear shaft, adjust the angle of the aviation plug to prevent interference.



6. Install the O-shaped sealing ring onto the J6 axis motor mounting plate.
7. Apply LT 5699 sealant to the J6 axis motor mounting plate first.
8. Remove residual threadlocker from the screws and reapply LT 263 threadlocker.
9. Secure the J6 axis motor assembly to the J6 axis mounting plate using four M8x25 hexagon screws, tightening them in two stages with tightening torques of 10 N·m and 35 N·m, respectively.



10. Install cables by referring to ["3.11.3 Installing Cables Inside Robot" on page 81](#).
11. Power on the robot, reset the J6 axis encoder value, clear any alarms, and then capture the J6 axis zero point position.

Replacing the J6 axis reducer

Since replacing the reducer for the IR-R220 series 6-axis robot requires large lifting equipment, users needing reducer replacement should contact their local distributor to ensure operational safety.

3.8.7 Dummy Cylinder



- Power off the robot system by removing the power plug.
 - Before performing any replacement procedure, turn off the robot system and related equipment, and then disconnect the power plug from the power source. Operating with the power ON may cause electric shock or malfunction of the robot system.
 - Always connect the AC power cable to the power plug. Do not connect it directly to the factory power supply.
-



Caution

- Do not apply excessive shock to the motor shaft during replacement. Failure to comply may shorten the service life or damage the motor or encoder.
- Do not disassemble the encoder of the motor.
- After parts such as motors and reducer have been replaced, the robot cannot operate properly because a mismatch exists between the zero point stored in each motor and its corresponding zero point stored in the robot system. After replacing the parts, it is necessary to match these zero points.

Replacing the dummy cylinder

	Name	Quantity
Tool	Hexagon wrench	1
	Torque wrench with a range of 5 N · m to 320 N · m	1
	Torque screwdriver for M6 hexagon screws	1
	Screwdriver sleeve for M6 hexagon screws	1
	Torque screwdriver for M16 hexagon screws	1
	Sling	2
	M12 eye bolt	2
	Hand chain hoist	1
	Rubber hammer	1
	Upper arm limit tooling	2
	Rod anti-loosening nut tooling	1
	Movable lifting frame with a load capacity of 500 kg	1

Note

If no lifting frame is available, an overhead crane must be provided on-site for hoisting operations.

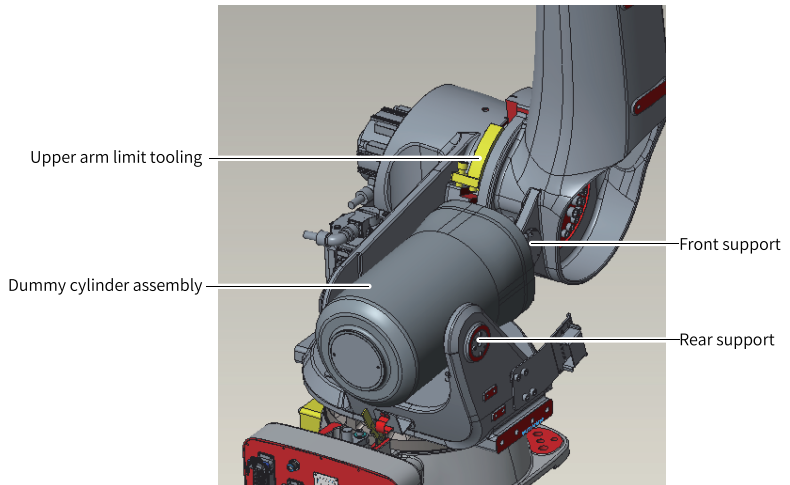


Danger

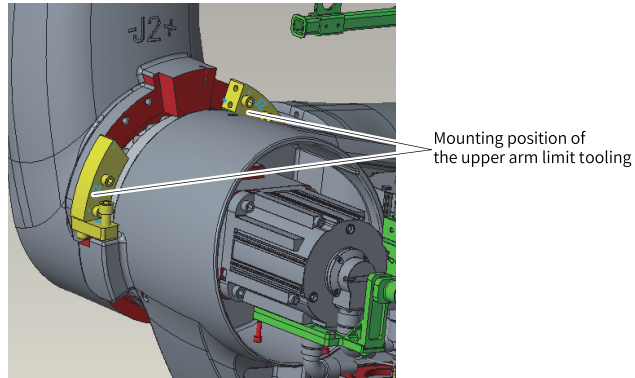
- When replacing the dummy cylinder, the entire unit must be replaced.
 - The disassembly of the dummy cylinder must be performed with the assistance of Inovance technical professionals.
 - Safety precautions must be observed throughout the entire dummy cylinder replacement process.
-

- **Removing the dummy cylinder:**

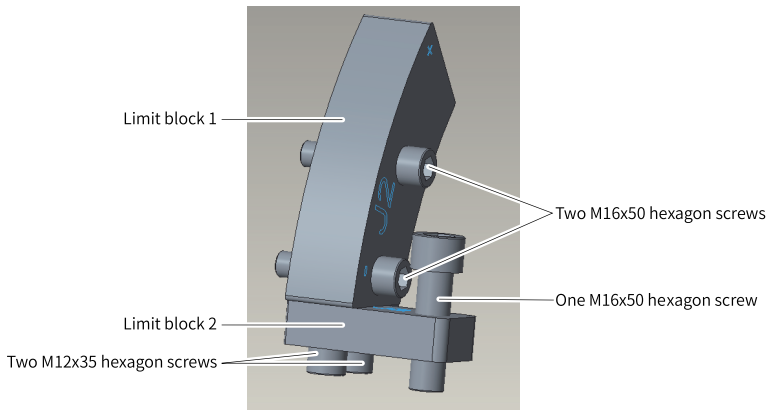
1. Adjust the J2 axis to the zero position and lower the J3 axis as much as possible to reduce the gravitational moment.
2. Use the upper arm limit tooling to mechanically limit the upper arm.
3. Switch off the control switch on the controller.
4. Move the movable stand to the middle position of the dummy cylinder. After positioning, lock the support wheels under the stand.
5. Use slings to hang two hand chain hoists on the lifting holes of the movable stand.



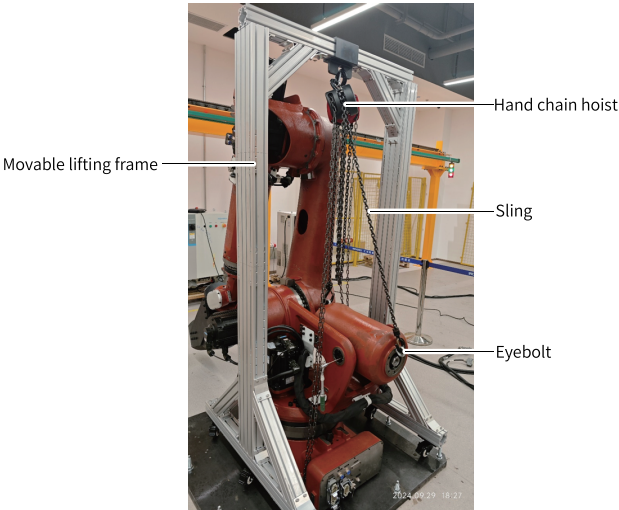
6. Install the upper arm limit tooling at the upper arm joint according to the laser marks on the limit block, installing one in each direction (forward and reverse).



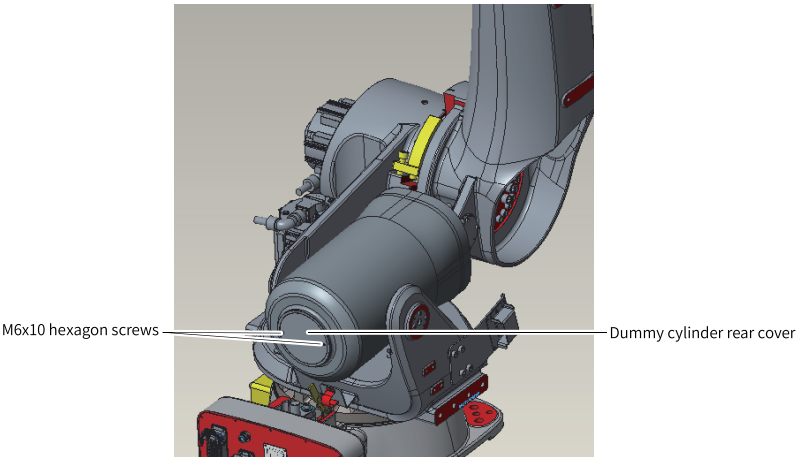
7. Tighten the two M12x50 hexagon screws on limit block 1 of the upper arm limit tooling in two stages, with tightening torques of 40 N·m and 120 N·m, respectively.
8. The M16x50 hexagon screw on limit block 2 presses against the end face of the mechanical limit block on the swivel base casting. Use a torque wrench to tighten it with a torque of 30 N·m.



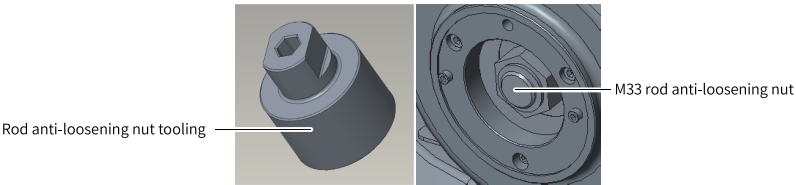
9. Install one M12 lifting eye at each end (front and rear) of the dummy cylinder. Use hand chain hoists and slings to pull the lifting eyes at both ends of the dummy cylinder to achieve a pre-loaded state.



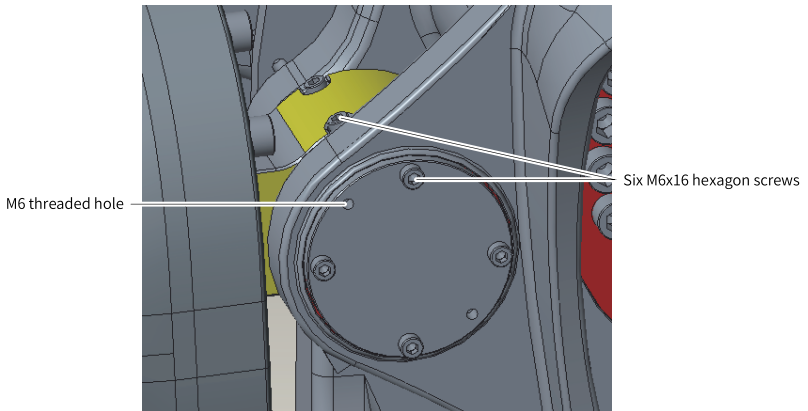
10. Use a hexagon wrench to remove the two M6x10 hexagon screws at the rear cover of the dummy cylinder and take off the rear cover.



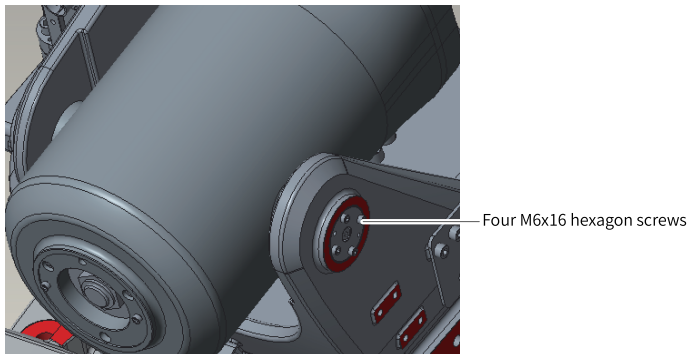
11. Use a torque screwdriver for M16 hexagon screws attached to the rod anti-loosening nut tooling to remove the M33 rod anti-loosening nut at the rear end of the dummy cylinder, with a torque of 320 N·m or higher.



12. Use a hexagon wrench to remove the four M6x16 hexagon screws on the front support assembly and the two M6x16 hexagon screws on the dummy cylinder rod seat.



13. Use a 12.9-grade M6 hexagon screw through the M6 threaded hole of the front support. Use a torque wrench to push the front support assembly outward, with a torque no more than 13 N·m to prevent screw breakage.
14. Use a hexagon wrench to remove the eight M6x16 hexagon screws on the left and right rear support assemblies.

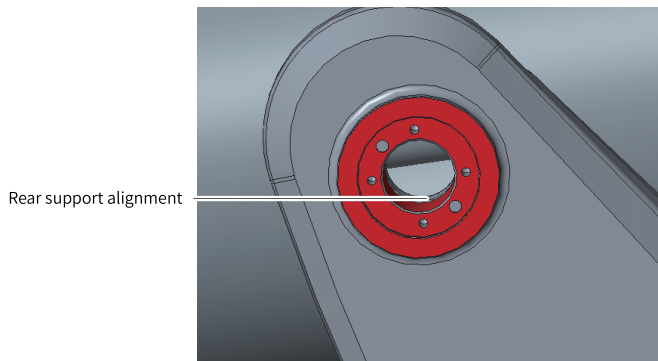


15. Use a 12.9-grade M6 hexagon screw through the threaded hole of the rear support. Use a torque wrench to push the rear support assembly outward, with a torque no more than 13 N·m to prevent screw breakage.
16. After removing the front and rear support assemblies, adjust the hand chain hoists to lift the dummy cylinder to an appropriate position.
17. Release the support wheel lock, use the movable stand to lift the dummy cylinder to the designated position, and then adjust the hand chain hoists to place the dummy cylinder in the specified location.

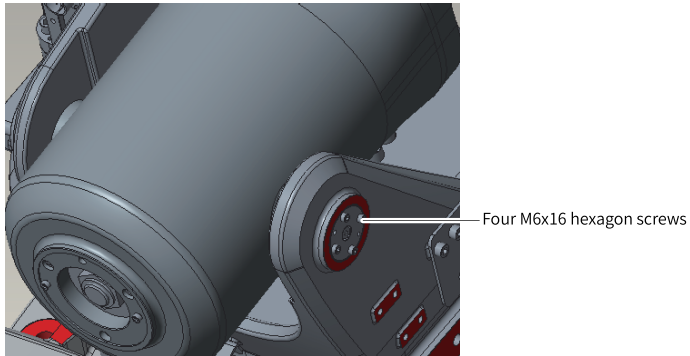


- **Installing the dummy cylinder:**

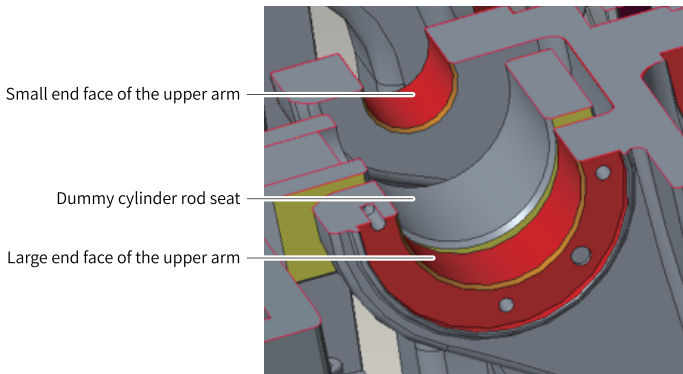
1. Use the movable stand to position the dummy cylinder appropriately and lock the support wheels.
2. Adjust the rear support hand chain hoist to align the rear support of the dummy cylinder with the swivel base hole.



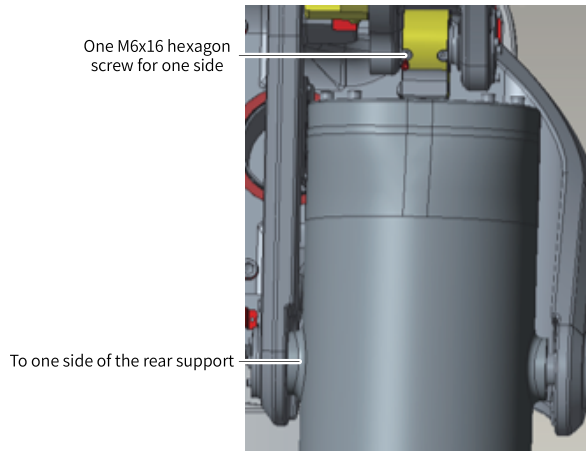
3. Use a rubber hammer to gently tap and install the left and right rear support assemblies.
4. Clean residual threadlocker from all screws. Apply fresh LT 263 threadlocker to all screws.
5. Tighten the eight M6x16 hexagon screws for the left and right rear support assemblies with a torque of 13 N·m.



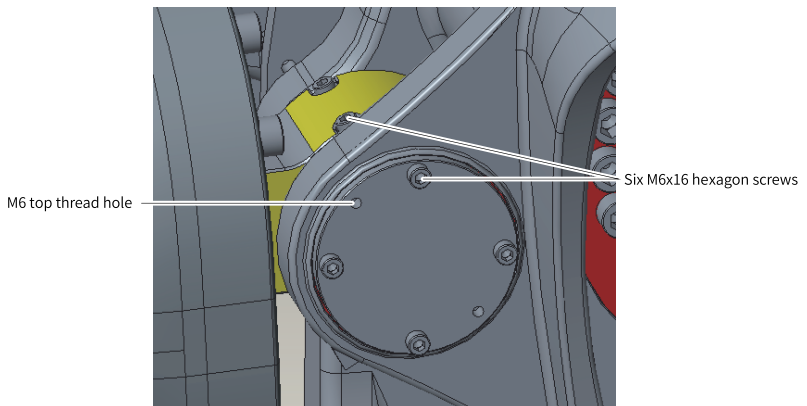
6. Adjust the front support hand chain hoist to align the large end face of the upper arm, the small end face of the upper arm, and the dummy cylinder rod seat for three-hole alignment, and then install the front support assembly.



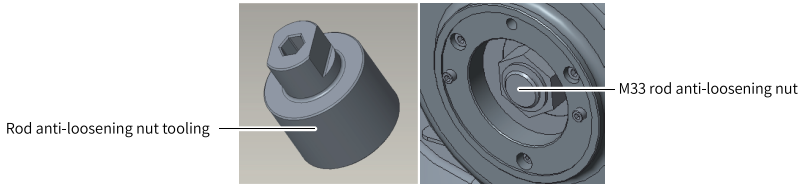
7. Use 12.9-grade M6 hexagon screws for positioning to prevent tilting during installation or misalignment after installation.
8. Clean residual threadlocker from all screws. Apply fresh LT 263 threadlocker to all screws.
9. Tighten the four M6x16 hexagon screws for the front support assembly with a torque of 13 N · m.
10. Push the dummy cylinder to one side so that the rear support end face closely contacts the swivel base casting end face.



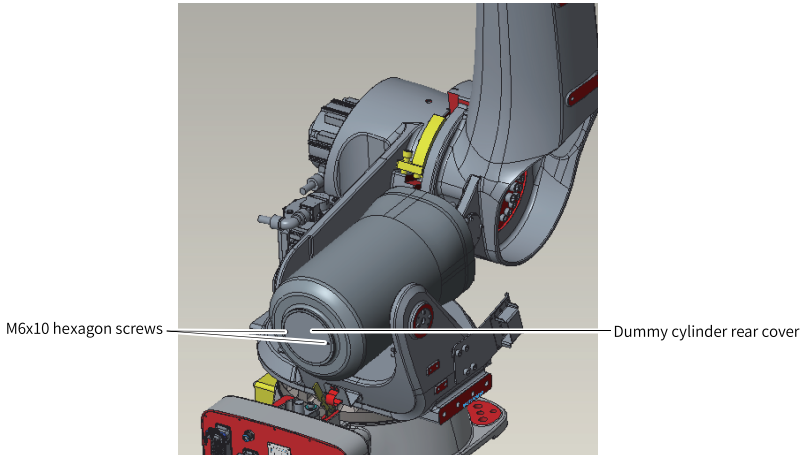
11. Install one M6x16 hexagon screw into the screw hole on the same side of the dummy cylinder rod seat and tighten it with a torque of $13 \text{ N} \cdot \text{m}$.



12. Check the rear support position to ensure it does not interfere with the swivel base.
13. Push the dummy cylinder to the other side. Install one M6x16 hexagon screw into the screw hole on the other side of the dummy cylinder rod seat and tighten it with a torque of $13 \text{ N} \cdot \text{m}$.
14. Use the rod anti-loosening nut tooling and a torque wrench to tighten the M33 rod anti-loosening nut at the rear end of the dummy cylinder with a torque of $320 \text{ N} \cdot \text{m}$.



15. Clean residual threadlocker from all screws. Apply fresh LT 263 threadlocker to all screws.
16. Use a torque wrench to tighten the two M6x10 hexagon screws for the dummy cylinder rear cover with a torque of 13 N · m.



17. After installation, the dummy cylinder should not move left or right.

3.9 Replacement of Battery (Lithium Battery)



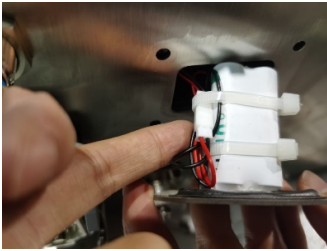
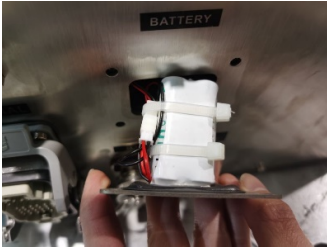
- Do not perform equipment maintenance or servicing while power is on. Failure to comply may result in electric shocks.
- If a lithium battery is used, avoid the following improper use; otherwise, severe safety issues may occur due to heat, leakage, explosion, or fire of the lithium battery.
 - Charge
 - Compression and deformation
 - Dismantlement
 - Short circuit
 - Improper battery connections
 - Heating
 - Throwing into fire
 - Soldering battery terminals
 - Forced discharge
- When disposing of the battery, consult with the professional disposal services or comply with the local regulation.

The following table lists the order code of the robot battery.

Accessory	Code
Robot battery	98051002

To prevent loss of zero points, after removing the back cover of the robot body, first insert a new battery into the white 2P connector. Secure the new battery in the wiring compartment, and then remove the used battery. The replacement steps are as follows:

1. Cut off the zip tie fixing the battery to the cable board.
2. Tie the new battery onto the cable plate with a zip tie.
3. Connect the terminal of the new battery to the empty white 2P connector.
4. Remove the used battery.

Procedure	Diagram
1. Turn off all power supplies.	
2. Loosen four M4 screws and remove the battery supporting plate.	
3. Insert a new battery, remove the used battery, and then fix the new battery to the supporting sheet metal.	
4. Install the base cable board and connector in the reverse direction of step 1.	



Caution

If the origin is lost due to failure to comply with the preceding steps, see ["3.10.1 Overview of Zero Point Adjustment" on page 68.](#)

3.10 Zero Point Adjustment

3.10.1 Overview of Zero Point Adjustment

The zero point is the reference point and base point for the robot. When robot parts (such as the motor, reducer, timing belt, and cables) are replaced, the robot cannot position properly because a gap exists between the zero point stored in each motor and its corresponding zero point stored in the controller. Therefore, after the parts are replaced, zero point adjustment is required.

Note

After home position calibration, the absolute accuracy of the robot may deviate from the default absolute accuracy at delivery.



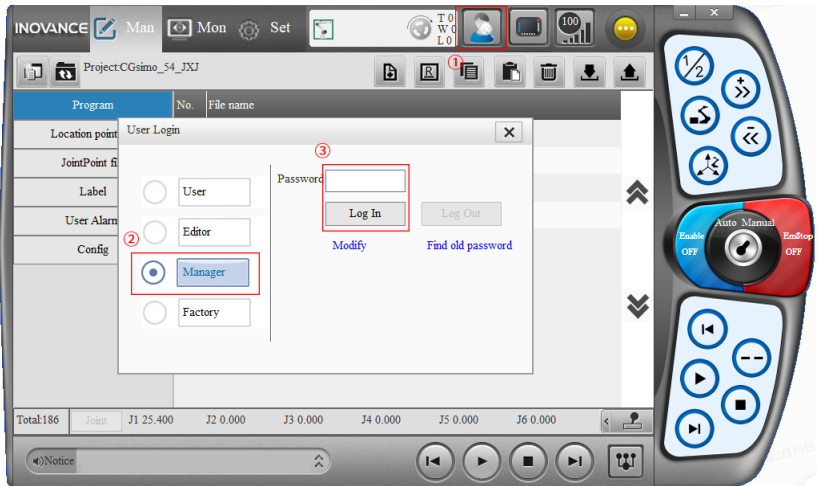
- Install a safety fence for the system to prevent people from entering the motion range of the system. Failure to comply may result in severe safety issues.
 - Before operation, ensure that there is no person within the safety fence. Do not enter the motion range during system running. Failure to comply may result in severe safety issues.
 - Operating the robot system in teach mode can ensure the safety of the operator to a certain extent, although the motion is limited (low speed and low power). However, severe safety issues may also occur when the robot performs unexpected actions.
-

3.10.2 Procedure of Zero Point Adjustment

Both the PC-based teach pendant and the hand-held teach pendant provide an operation interface for zero point adjustment. The following is an explanation using the PC-based teach pendant, with similar operations for the hand-held teach pendant.

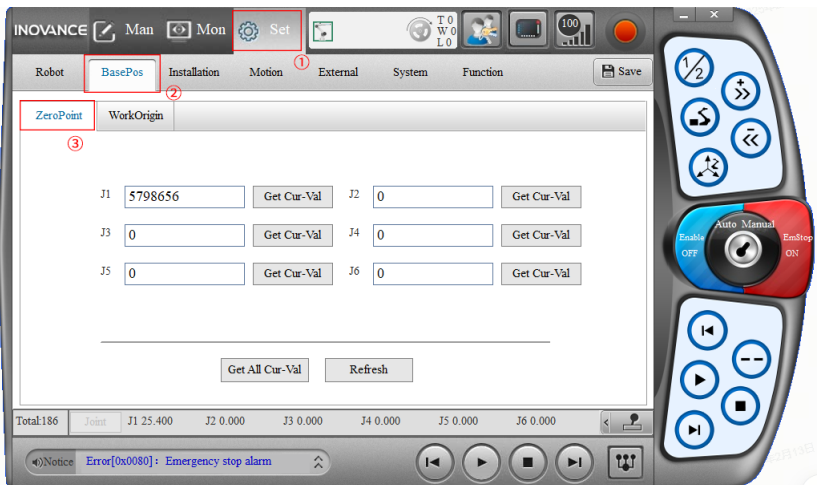
When performing zero point adjustment using the teach pendant, adjust J4 and J3 at the same time.

1. Select a role and log in to the system.
 - a. On the main screen of the teach pendant, click the "User Settings" shortcut key to open the "User Settings" screen.
 - b. Enter the password in the password input box and click "Log In".



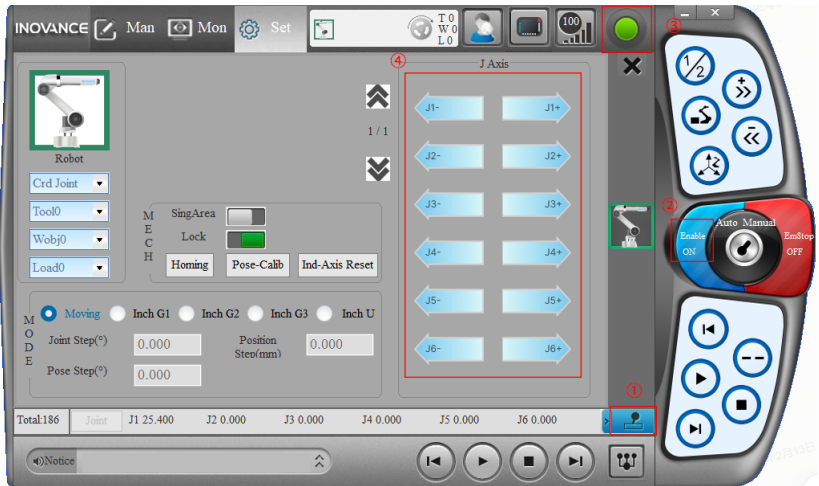
2. Switch to the ZeroPoint setting screen.

On the main screen of the teach pendant, choose "Set" > "BasePos" > "ZeroPoint" to open the "ZeroPoint" screen.



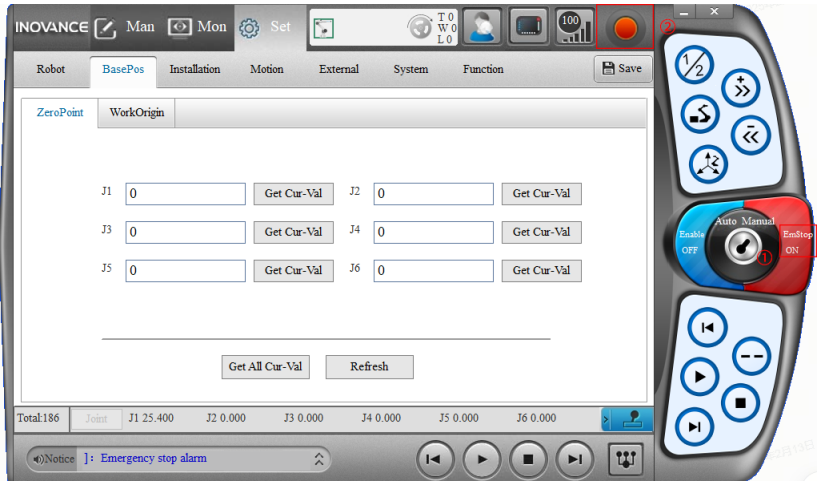
3. Move each axis of the robot to the corresponding zero point.

- Move the robot axes to their respective zero points on the hand-held or PC-based teach pendant. For details, see Teach Pendant User Guide.
- For the zero point of each axis, see ["3.10.3 Zero Point Position of Each Joint" on page 71](#). Calibrate the zero points using the calibration tool.



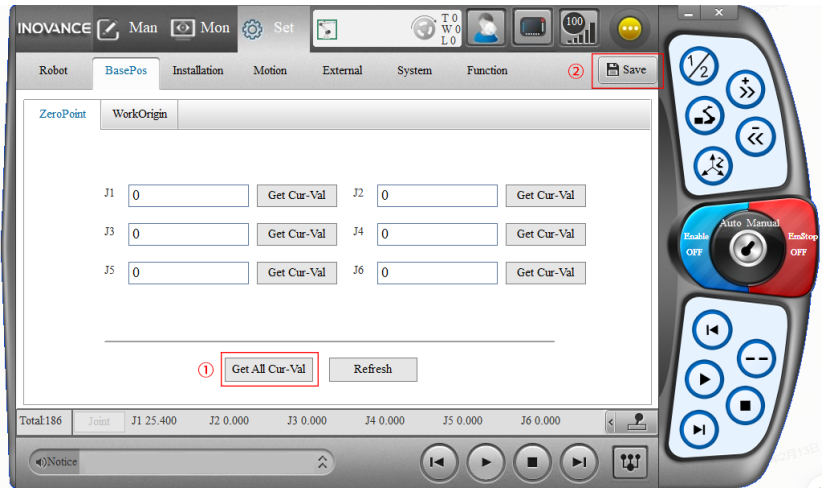
4. Switch to the emergency stop state.

- Click the virtual emergency stop button on the PC-based teach pendant, or press the red "EmStop" button on the hand-held teach pendant.
- The status indicator in the upper right corner of the PC-based teach pendant (or the display of the hand-held teach pendant) indicates the emergency stop state (red).



5. Obtain and save the zero point information.

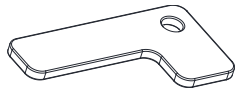
- Click the "Get Cur" button when the robot moves to the zero point position to obtain the encoder pulses at the zero point position.
- Click "Save" to complete zero point adjustment.



3.10.3Zero Point Position of Each Joint

- **Calibration tool**

The calibration tool is used to calibrate the rotary axes of the robot manually.



Tool	Material Code	Applicable Model
Zero point calibration tool	01660014	IR-R130/IR-R170/IR-R220

- **Calibration of axes J1 to J6**

During calibration, control the robot to move at the lowest speed by using the teach pendant. Adjust J1 to J6 until the calibration tool fits snugly in the slot, as shown in the figure below.

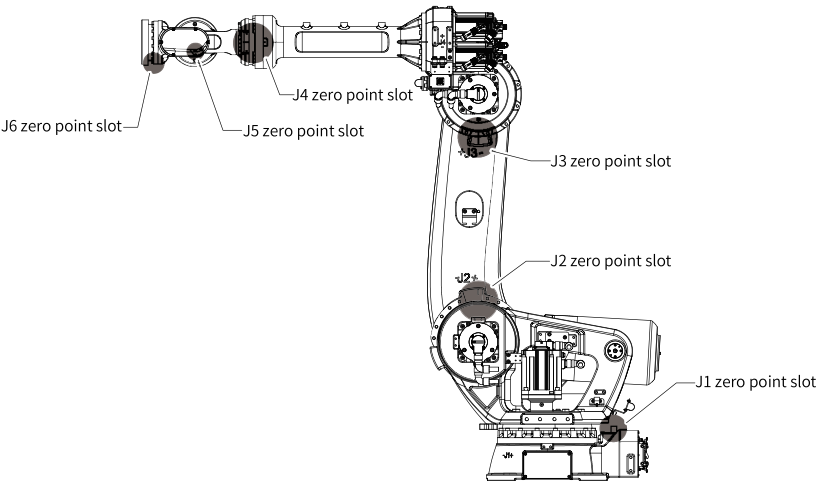


Figure 3-4 Zero point slots of axes J1 to J6

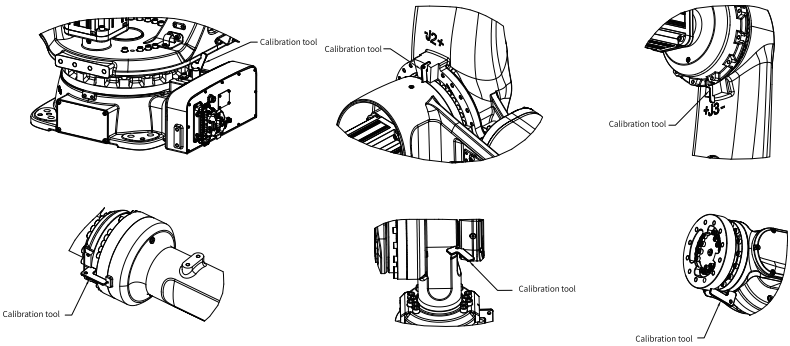


Figure 3-5 Calibration illustration of axes J1 to J6

3.10.4Zero Calibration of Each Joint

The following figure shows the zero calibration effect of each joint.

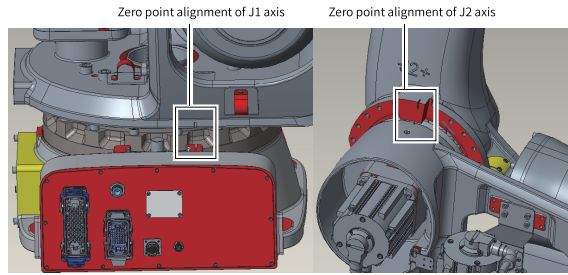


Figure 3-6 Zero position of axes J1 and J2

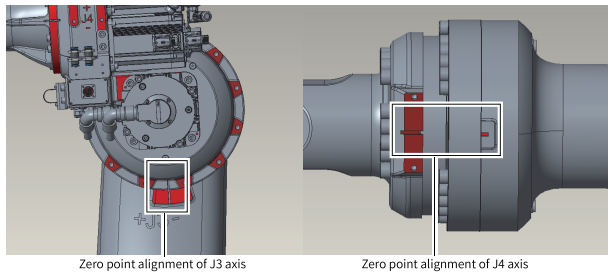


Figure 3-7 Zero position of axes J3 and J4

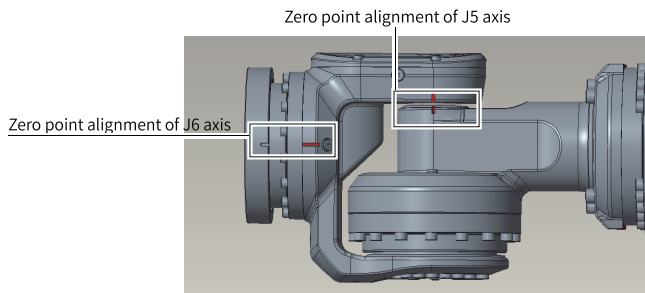


Figure 3-8 Zero position of axes J5 and J6

3.11 Replacing Cables Inside Robot

3.11.1 List of Tools for Replacing Cables Inside Robot

Name	Quantity	Code	Remarks
Robot connection cable	1	1504S711	-
Hexagon wrench	-	-	-

Name	Quantity	Code	Remarks
Phillips screwdriver	-	-	-
Diagonal pliers	-	-	-
Tie strap	-	-	-
Monkey spanner	-	-	-
Locking pliers	-	-	-

3.11.2 Removing Cables Inside Robot

Preparation



Caution

- Photograph all cable routing before disassembly to ensure correct re-installation reference.
 - Ensure locking pliers and other auxiliary tools are available in case manual loosening is insufficient.
 - Return all axes to their zero point positions before cable removal. Failure to comply may result in:
 - Crossed cable routing.
 - Reduced operational accuracy of the robot.
 - Inconsistent cable positioning, complicating absolute zero recalibration.
-

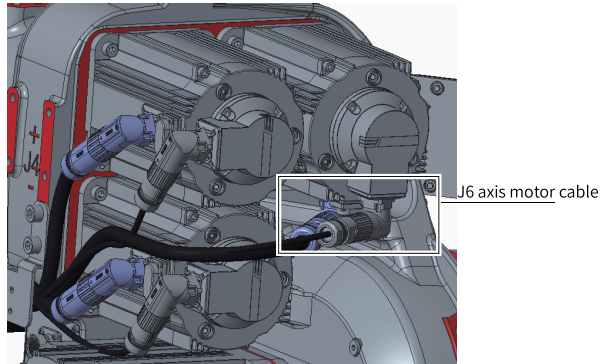


Danger

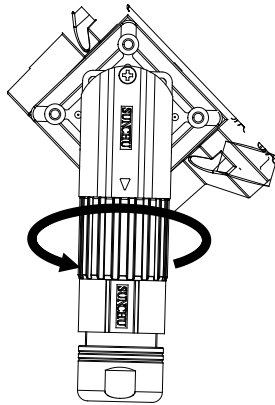
Before entering the operating area of the robot, turn off all the power and air pressure sources connected to the robot, and put up work-in-progress signs.

Removing procedure

1. Remove the J6 axis motor cable.
 - a. Locate the power cable and encoder cable of the J6 axis motor.



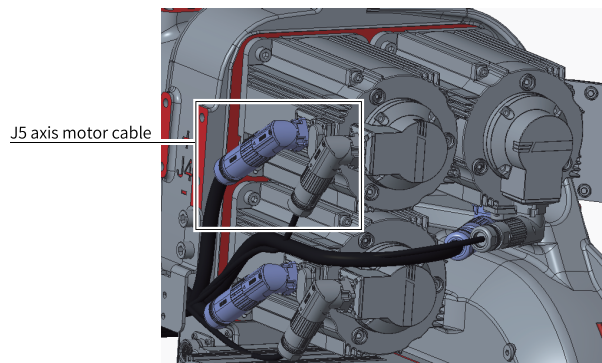
b. Loosen the connector nut.



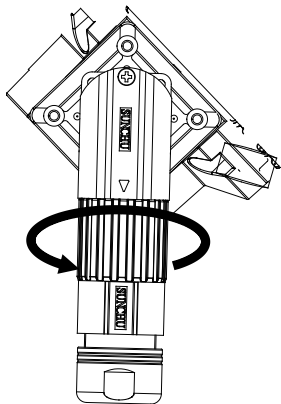
c. After the nut is loosened, remove the connector, and then cut off the zip tie.

2. Remove the J5 axis motor cable.

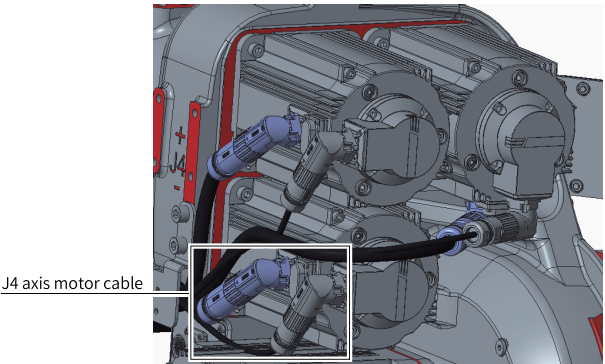
a. Locate the power cable and encoder cable of the J5 axis motor.



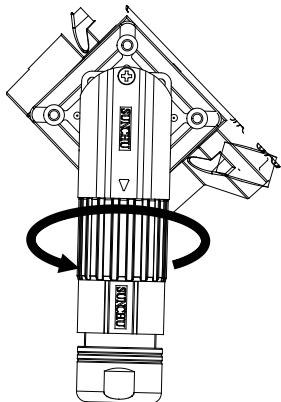
b. Loosen the connector nut.



3. Remove the J4 axis motor cable.
- a. Locate the power cable and encoder cable of the J4 axis motor.



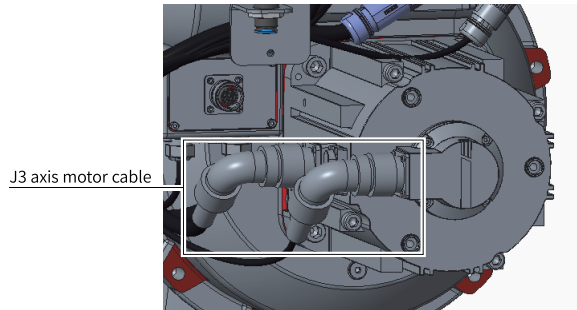
- b. Loosen the connector nut.



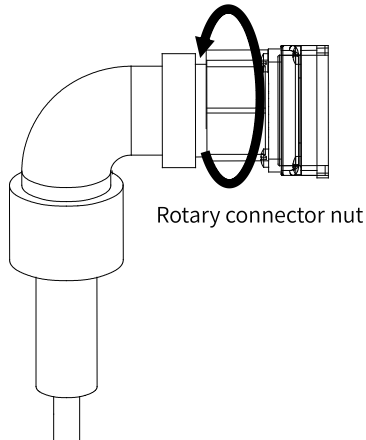
- c. After the nut is loosened, remove the connector, and then cut off the zip tie.

4. Remove the J3 axis motor cable.

- a. Locate the power cable and encoder cable of the J3 axis motor.



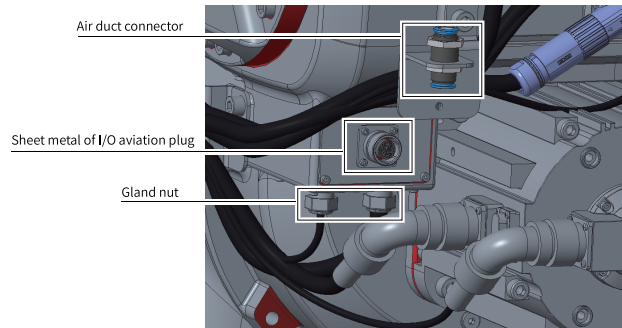
- b. Loosen the connector nut.



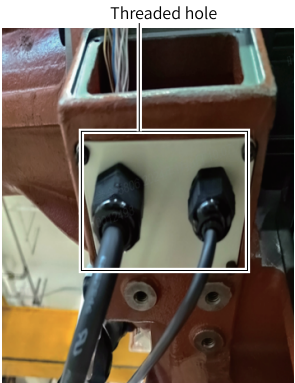
- c. After the nut is loosened, remove the connector, and then cut off the zip tie.

5. Remove the air duct, I/O aviation plug, and gyroscope cables.

- a. Press the air duct connector and then remove the air duct.
b. Use a screwdriver to remove the I/O aviation plug sheet metal.
c. Open the sheet metal and disconnect the internal I/O aviation plug connector.
d. Unscrew the gland nut below.



e. Take all the cables out from the inside of the robot along the threaded holes of the lower sheet metal.



6. Remove the cable fixing sheet metal from the cable tie point.
- a. Use a screwdriver to remove the sheet metal of the threaded hole.
 - b. Remove the fixing screws of the sheet metals ① to ⑦.

No.	Name
①	Cable sheet metal at the elbow side
②	Cable sheet metal at the upper side of upper arm
③	Cable sheet metal at the lower side of upper arm
④	Cable sheet metal at the swivel base reducer side
⑤	Cable sheet metal at the rear size of the swivel base
⑥	Cable sheet metal at the swivel base side
⑦	Sheet metal at the upper side of J1 axis cable duct

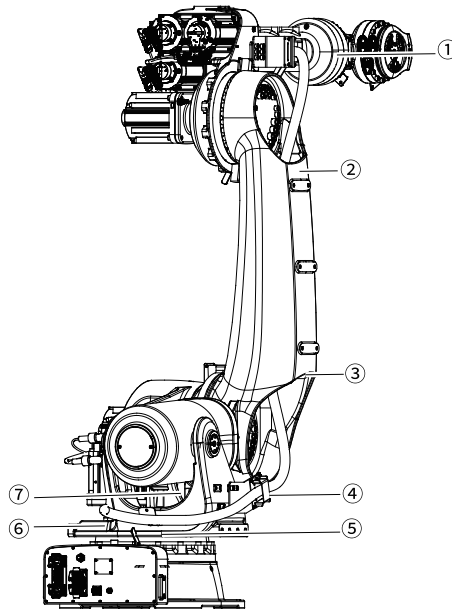
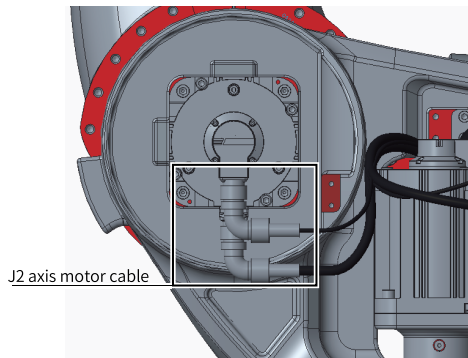


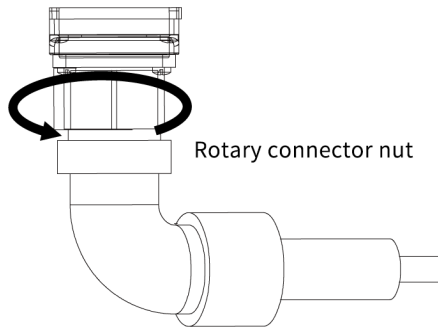
Figure 3-9 Cable tie removing points

7. Remove the J2 axis motor cable.

- a. Locate the power cable and encoder cable of the J2 axis motor.

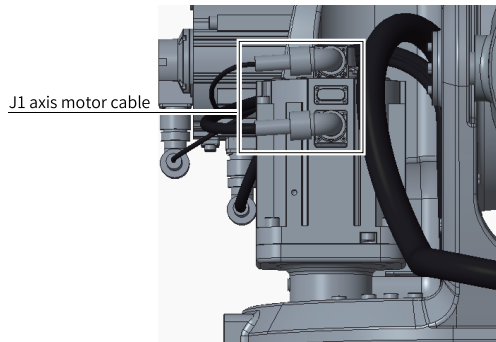


- b. Loosen the connector nut and then remove the connector.

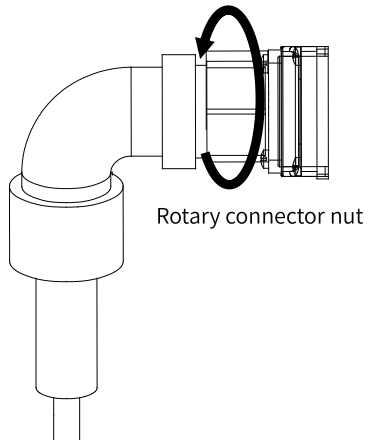


8. Remove the J1 axis motor cable.

a. Locate the power cable and encoder cable of the J1 axis motor.



b. Loosen the connector nut and then remove the connector.



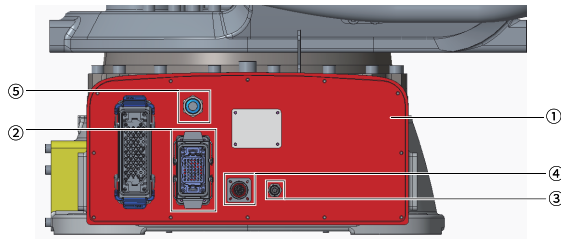
9. Remove the base cables.

a. Open the electrical cover of the base connector.

b. Use a screwdriver to remove the heavy-duty connector from the heavy-duty base.

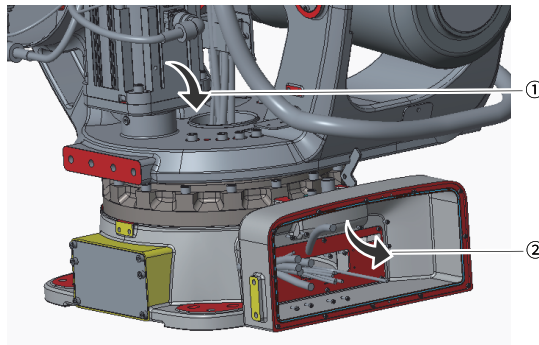
- c. Remove the circular brake aviation plug from the sheet metal.
- d. Remove the connector of the I/O aviation plug.
- e. Remove all grounding cables from the grounding bar with a screwdriver.
- f. Remove the battery cable connector and remove the air dust from the air duct connector.

No.	Name
①	Electrical cover of the base connector
②	Heavy-duty connector
③	Circular brake aviation plug
④	I/O aviation plug
⑤	Air duct connector



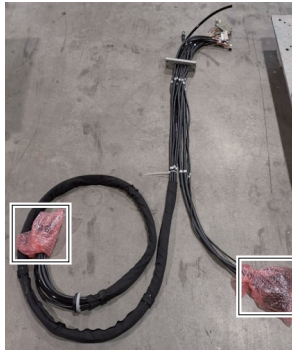
10. Remove all cables.

- a. Cut off the zip tie and place all cables to the base chamber along the arrow ①.
- b. Take out all cables along the arrow ②.

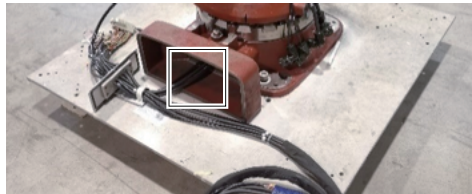


3.11.3 Installing Cables Inside Robot

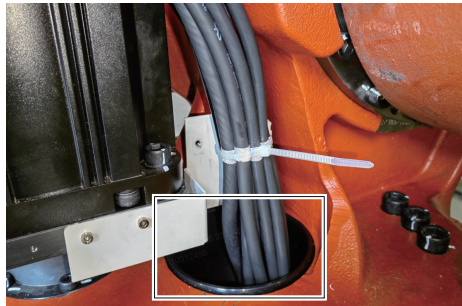
- 1. Reconnect the cables.
 - a. Prepare cables for replacement and tidy them up.
 - b. Wrap the cable connectors to avoid damage.



c. Feed cables into the base chamber.



d. Pull the cables from the J1 axis cable duct.

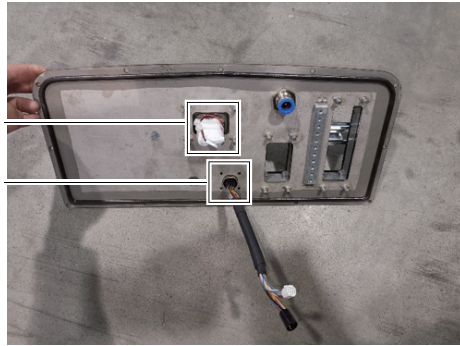


2. Install the I/O aviation plug and battery.

- a. Secure the I/O aviation plug to the base cable plate with screws.
- b. Secure the battery to the sheet metal with a cable tie.

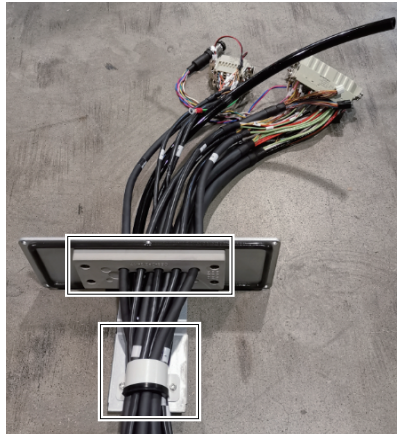
Battery sheet metal

I/O aviation plug

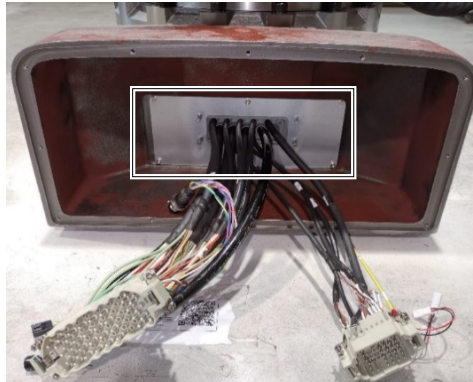


3. Install the base heavy-load connector.

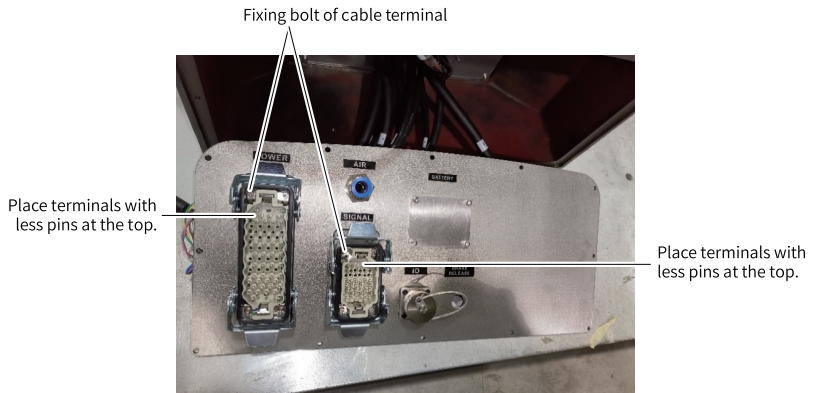
- a. Insert cables through the wall bushing rubber module. Bundle cables according to white marking points on sheet metal.



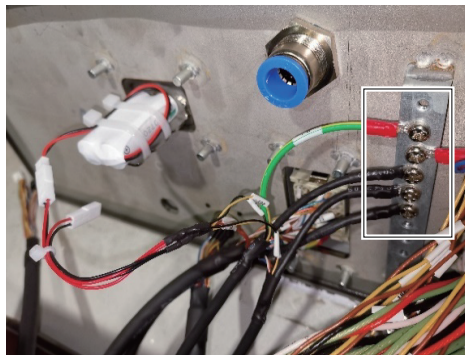
- b. After installation, route cables into the base chamber and secure sheet metal with screws.



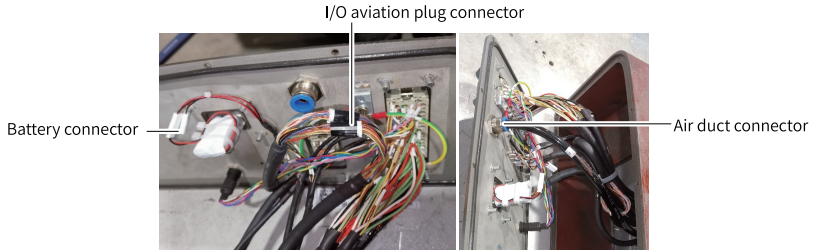
- c. Install the heavy-duty connector and brake aviation plug to the cable plate and orient the heavy-duty connector with fewer pin holes upward.



- d. Connect all grounding terminals of robot cables to the grounding row and tighten them.

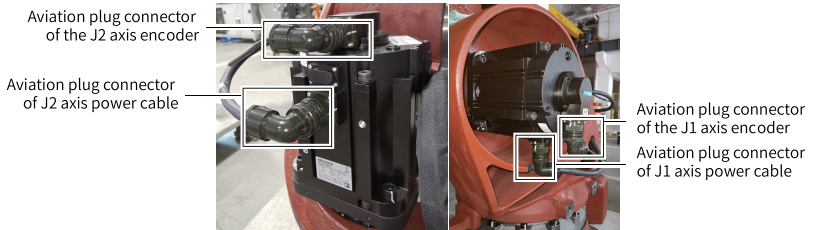


- e. Connect the battery connector and I/O aviation plug connector, and attach air duct to the connector.

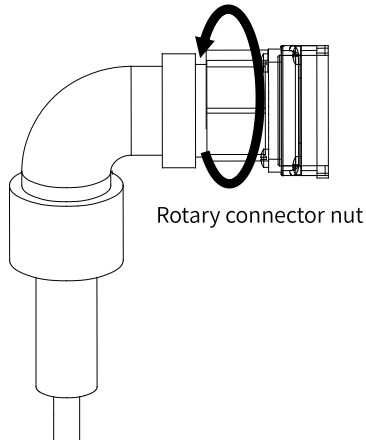


4. Install the J1 and J2 axis motor cables.

- a. Connect the aviation plugs of the motor power cables and encoder powers of J1 and J2 axes.

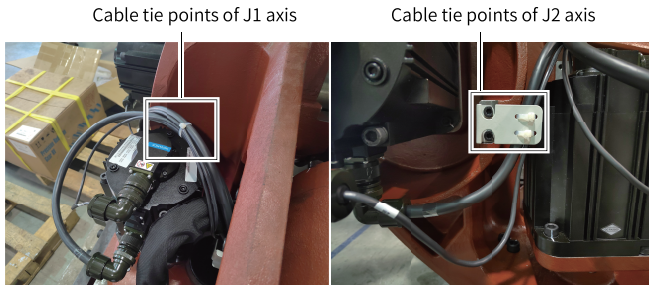


- b. Tighten the nut.



5. Tie the cables of the J1 and J2 axes to the robot body.

- Tie the J1 and J2 axis cables to the corresponding positions of the robot with zip ties.



6. Install the cable to the robot body.

- a. Fix the cable to the hose fixing clamp.
- b. Fix the fixing sheet metals ① to ⑦ on the cable to the corresponding sheet metal fixing points on the robot.
- c. Ensure no twisting or stress on cables/tubes. Re-arrange them if necessary.

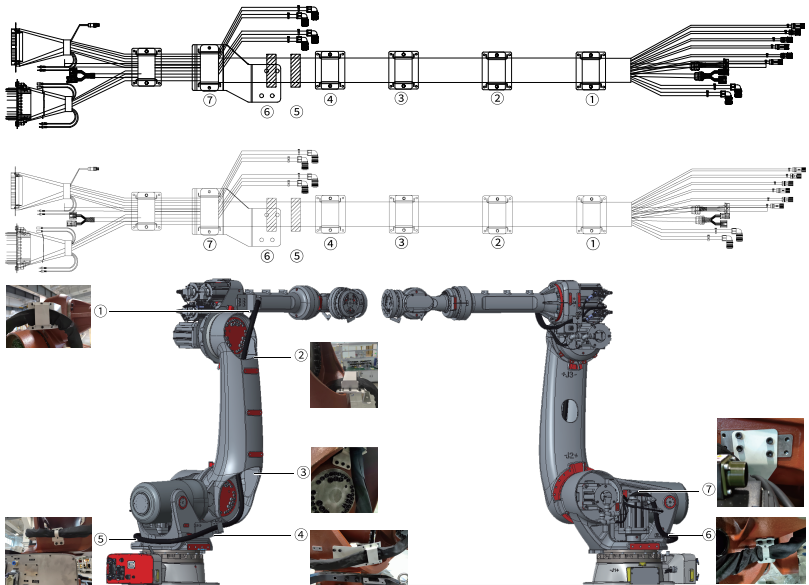
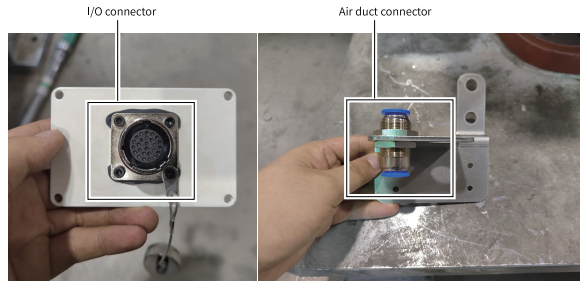


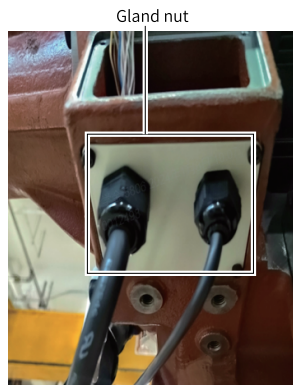
Figure 3-10 Fix the cable to the hose fixing clamp.

7. Install the I/O aviation plug cable and air duct.

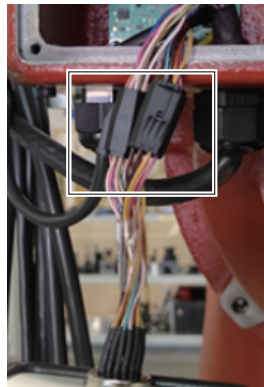
- a. Install the I/O aviation and air duct connector to the sheet metal.



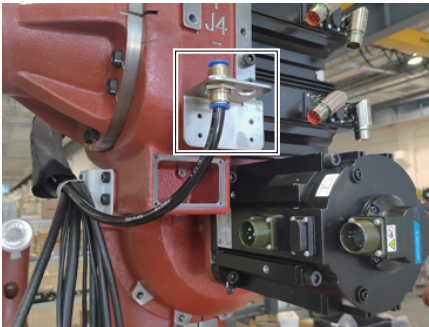
- b. Thread the bundled I/O aviation plug cable and gyroscope cable from the lower part of the robot.
- c. Tighten the gland nut.



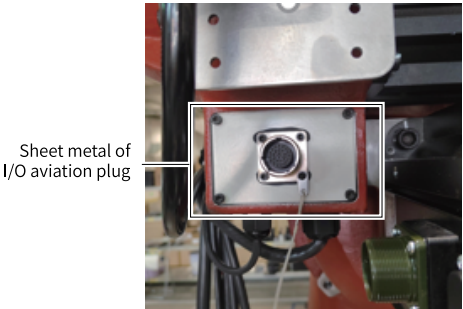
- d. Connect the cable.



- e. Insert the air duct to the connector.

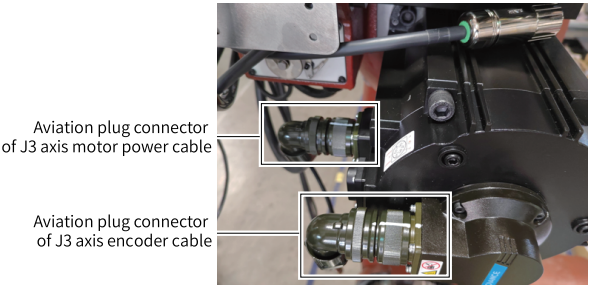


f. Fix the I/O aviation plug sheet metal to the elbow.

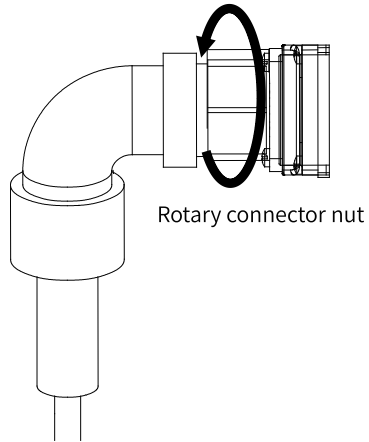


8. Install the J3 axis motor cable.

a. Connect the aviation plugs of the motor power cables and encoder powers of the J3 axis.

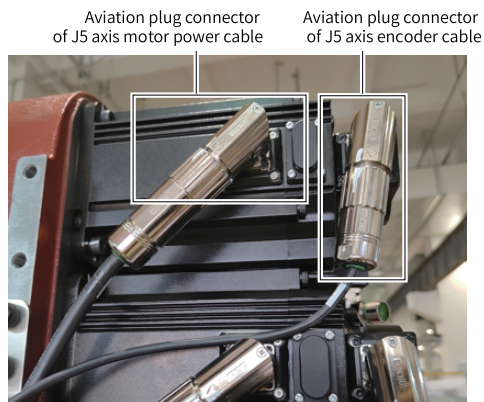
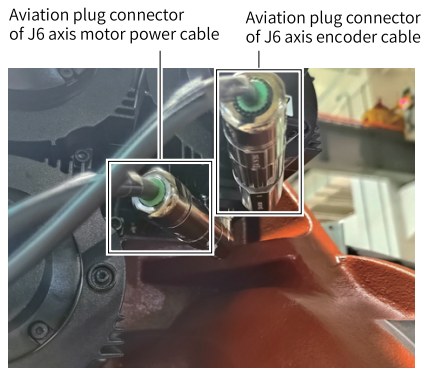


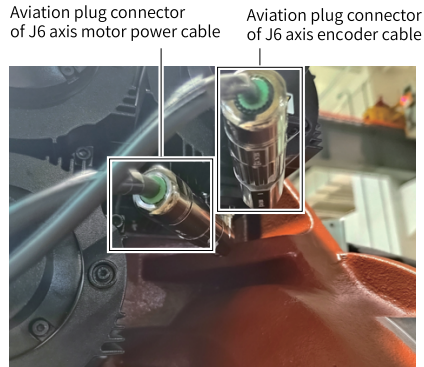
b. Tighten the nut.



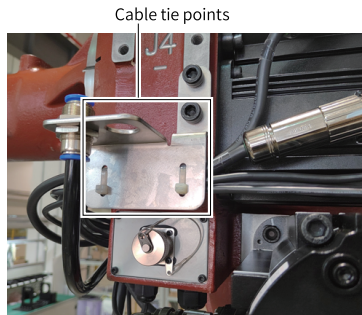
9. Install the motor cables of J4, J5, and J6 axes.

- a. Connect the aviation plug connectors of motor power cable and encoder of J4, J5 and J6 axes to corresponding motors per label.





- b. Tighten the nut.
- c. After fixing the joint, tie the motor power cable and encoder cable of J4, J5 and J6 axes to the position shown in the figure.



3.11.4 Checking Internal Cables



Caution

- When the cable is slack, it may cause unnecessary friction during robot movement and lead to wire breakage. Ensure that the cables at the bending points are free from unnecessary squeezing or crossing.
- If the motor cable plug is not properly installed, it may result in poor electrical connection and robot malfunction.
- Bent air ducts with creases may cause the air ducts to fail to function normally.

Procedure

1. Ensure that all the cables and stamping parts are installed properly and all the cables are tied firmly.

2. Ensure that all connectors of the motor are screwed in place.
3. Ensure that no air duct is bent.



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