



Service Manual



TM25S / TM30S

Hardware Version: 5.03

Document version: 0

Release Date: 2025-09-26

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1. Handling components that are sensitive to electrostatic discharge (ESD)



To prevent ESD-sensitive components (e.g., printed circuit boards) from being damaged, please handle the components in the following steps:

- Wear an anti-static wrist strap before replacing ESD sensitive components and make sure the bracket is always connected to ground when replacing components.
- Hold the protective cover for the component's edge connect and avoid touching any exposed part.
- Drop the replaced component into an antistatic bag

2. Safety information



DANGER :

Identifies an imminently hazardous situation that, if not avoided, is likely to result in serious injury, and might result in death or severe property damage.



WARNING:

Identifies a potentially hazardous situation that, if not avoided, will result in minor or moderate injury, and might result in serious injury, death, or significant property damage.

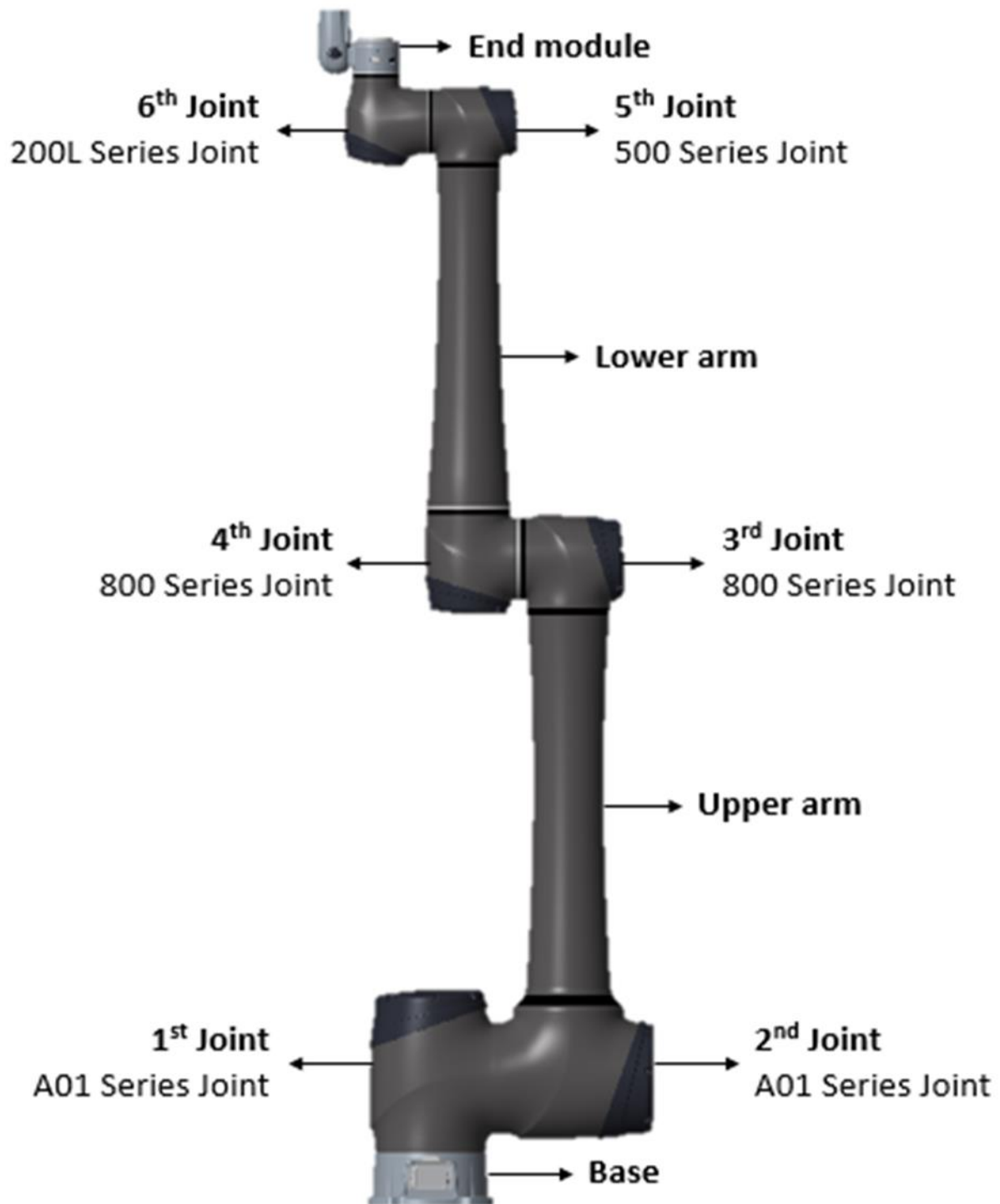


CAUTION:

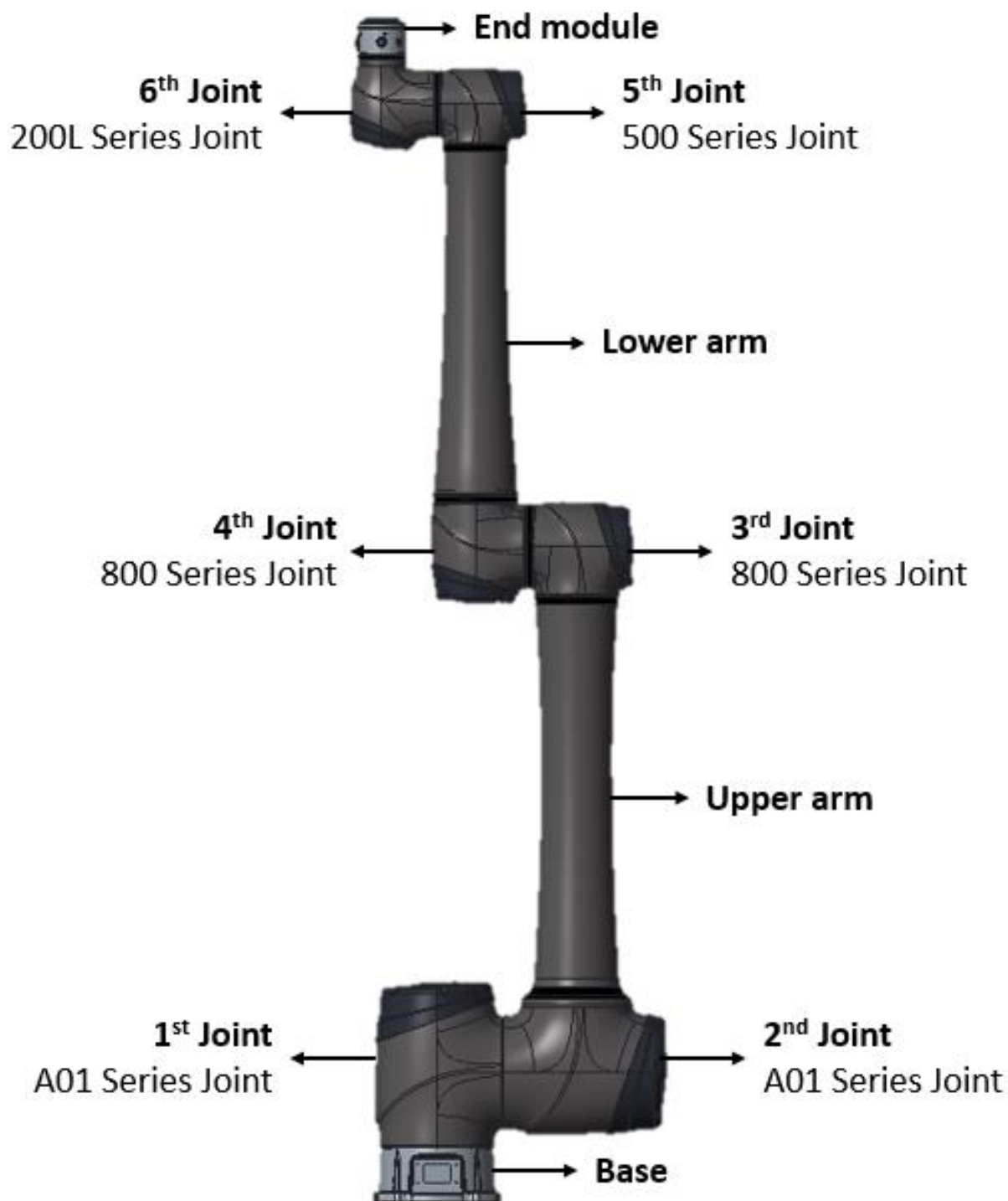
Identifies a potentially hazardous situation that, if not avoided, may result in minor injury, moderate injury, or property damage.

3. Description of Robot and control box parts

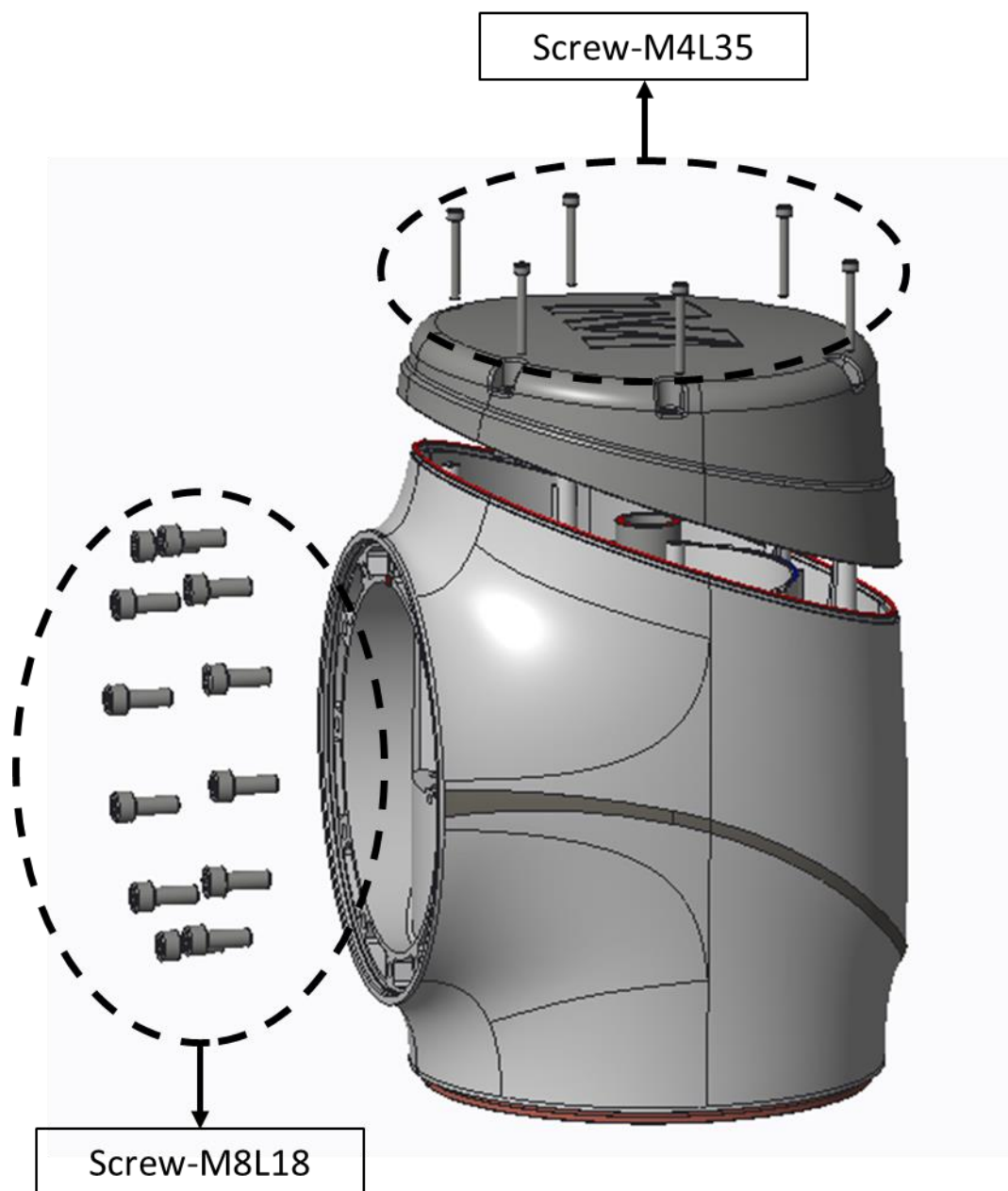
3.1 TM25S/TM30S : Robot Spare parts

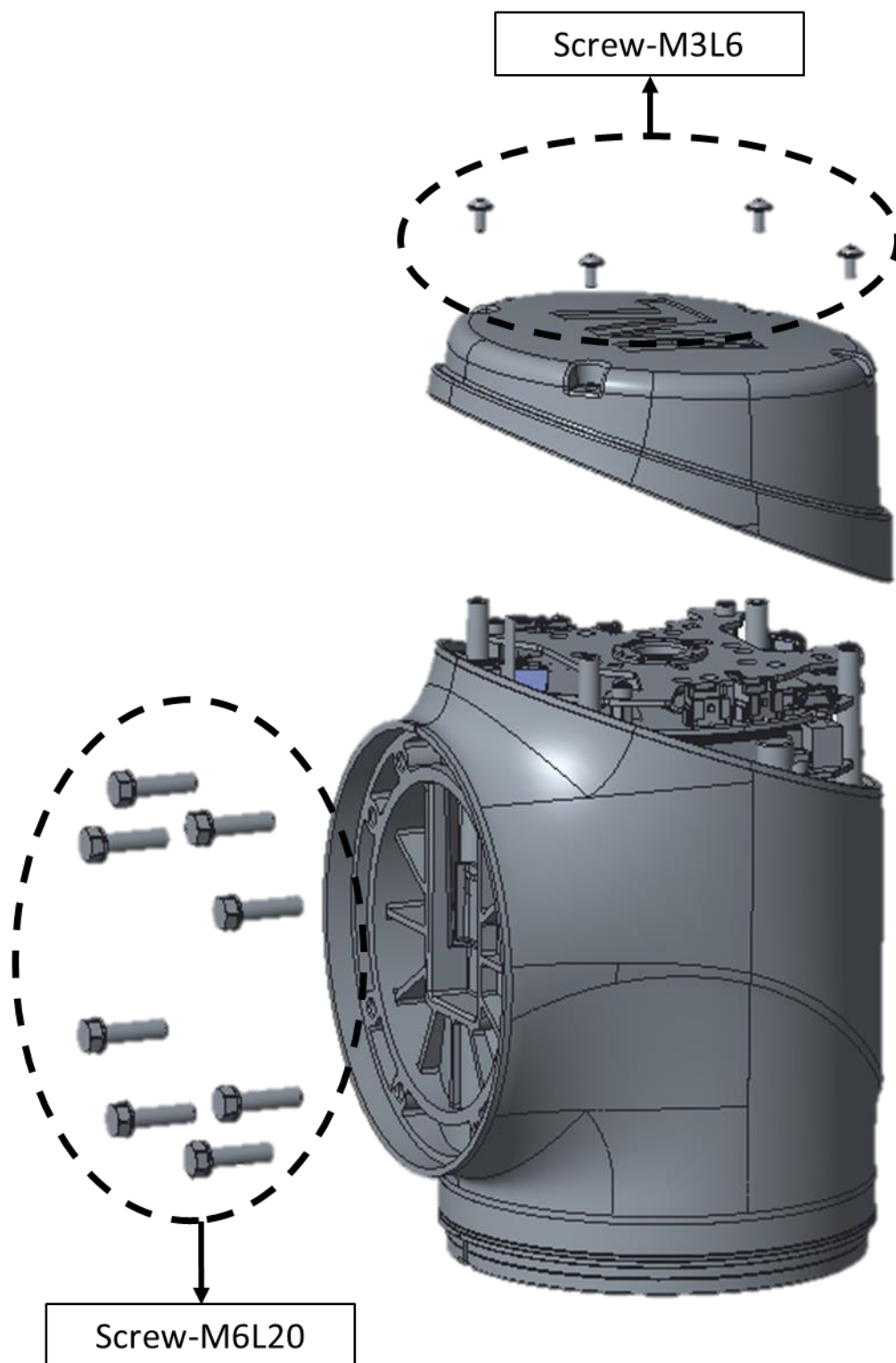


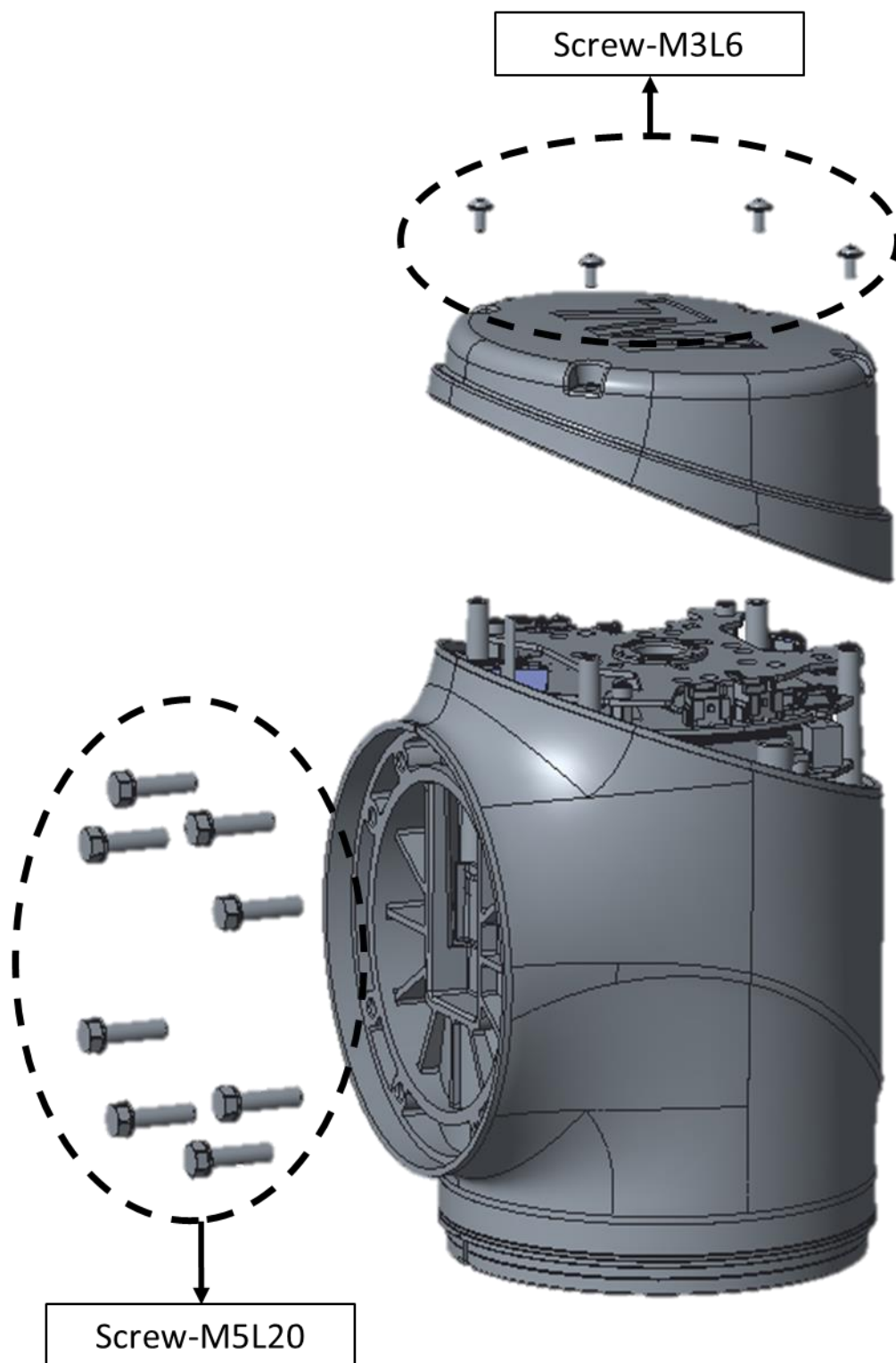
3.2 TM25SX/TM30SX : Robot Spare parts



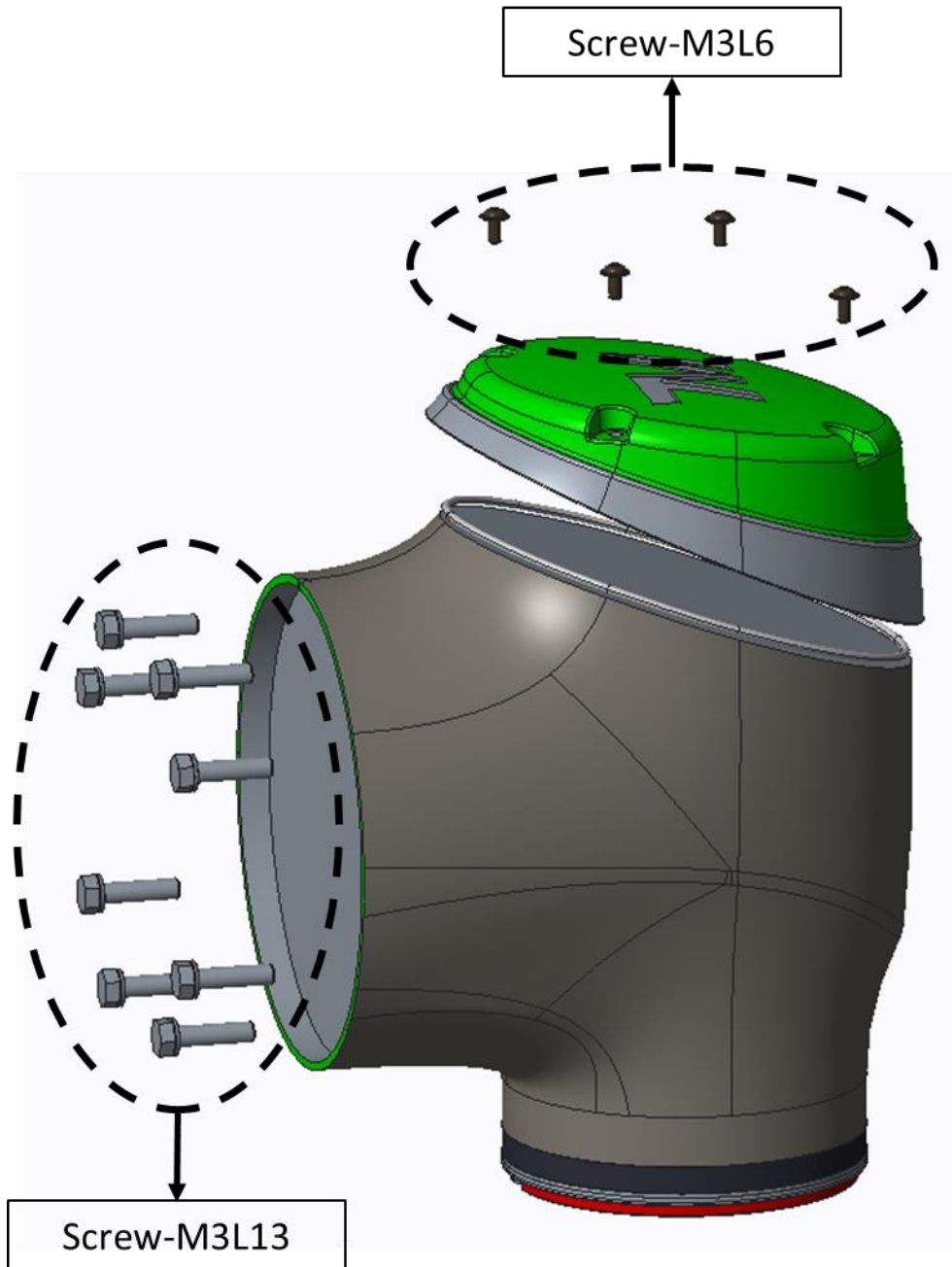
3.3 A01 Series Joint



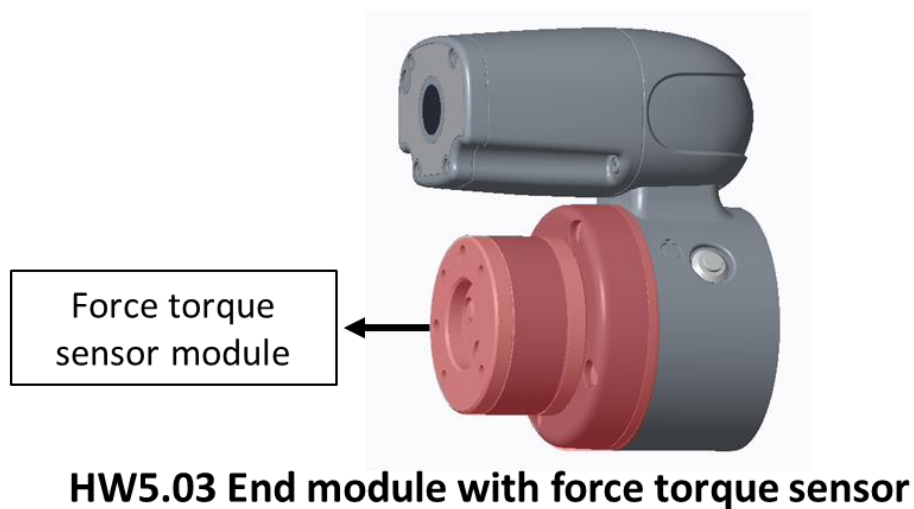
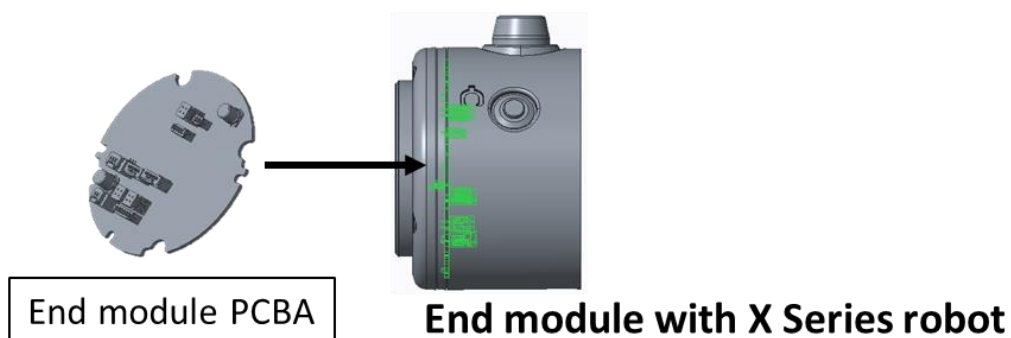
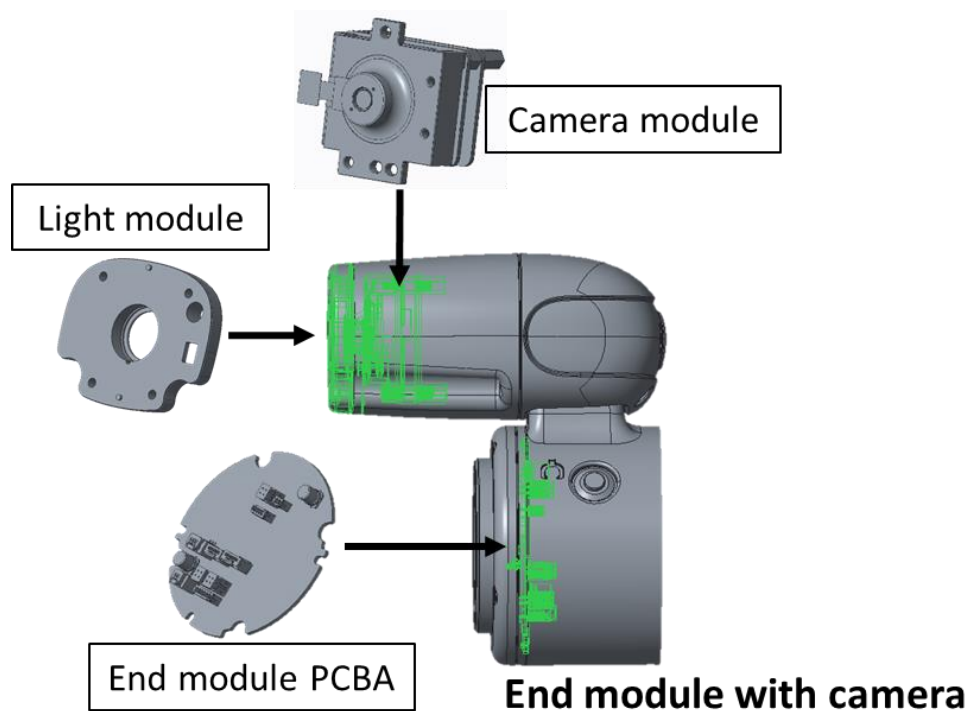




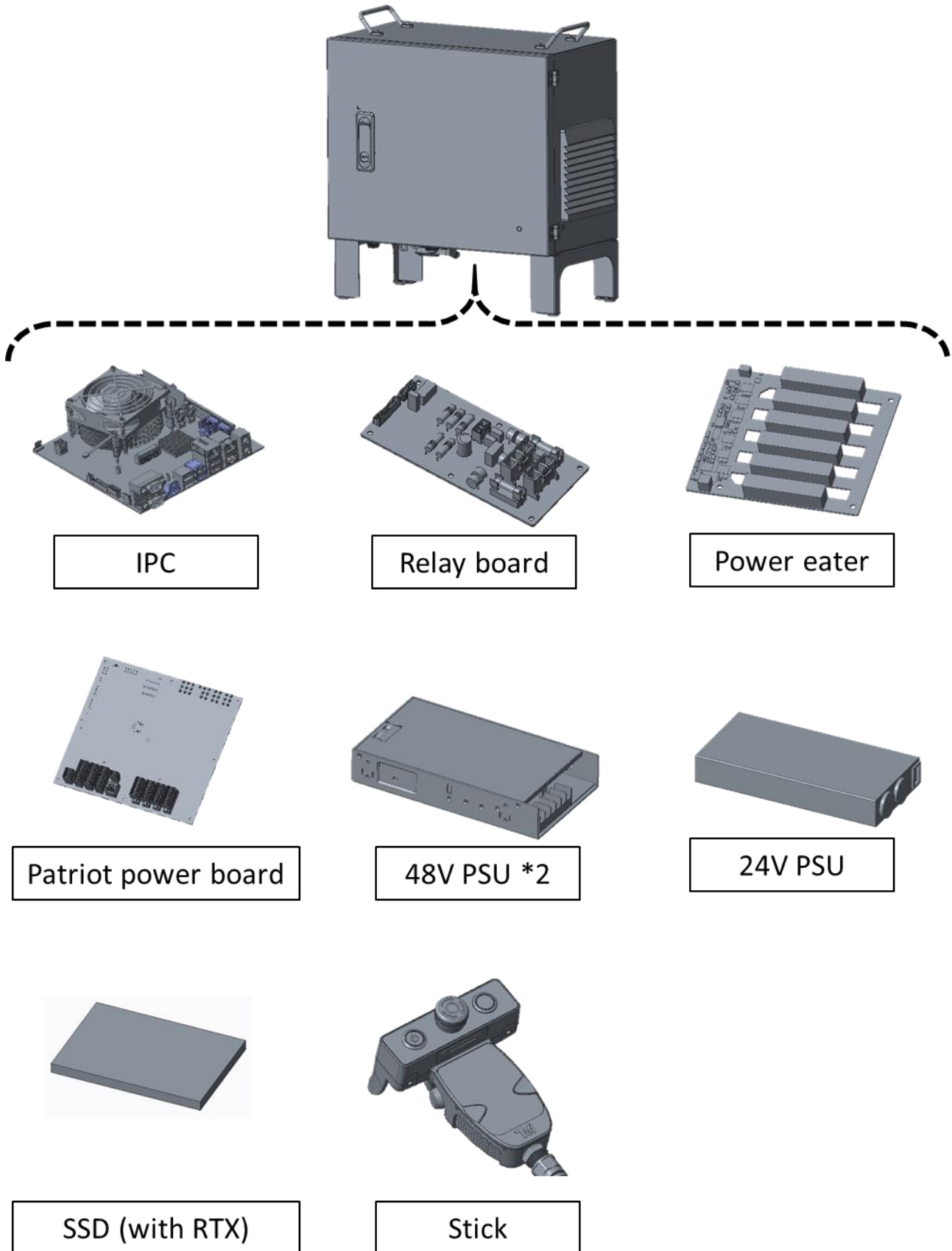
3.6 200L Series Joint



3.7 End module



3.8 Control Box

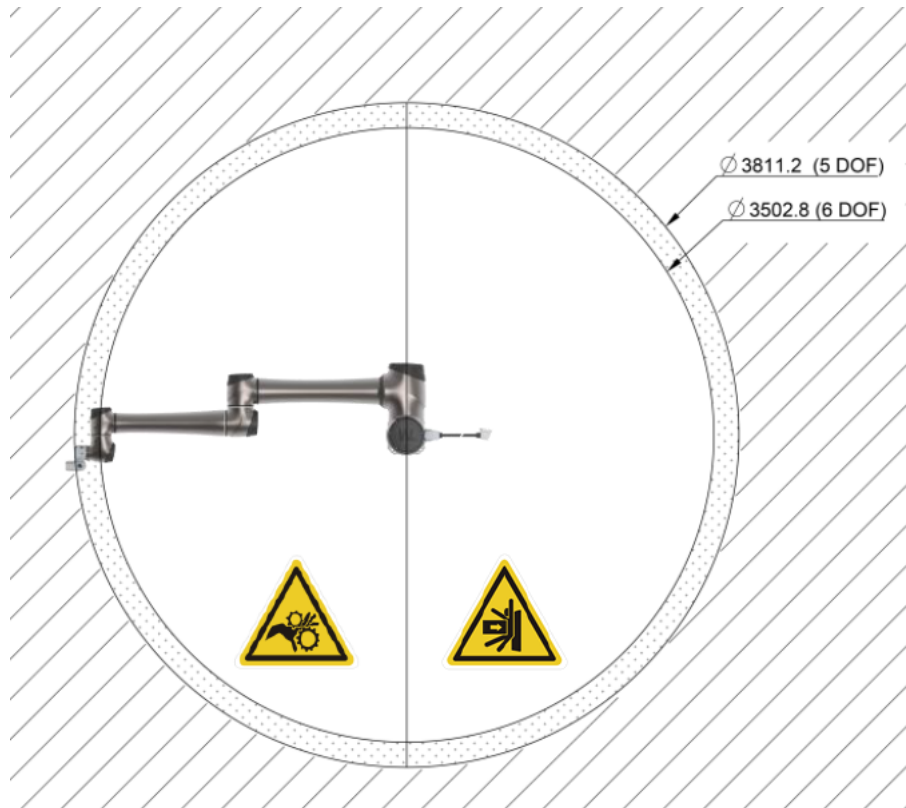


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4. TM25S/TM30S Maintenance Notes

4.1 When performing lifting, dismantling, maintenance, and calibration operations, it is recommended to place the robot in a spacious area. The following are the suggested space requirements:



4.2 For lifting or transporting robots, please refer to the "Moving the package robot" section in the hardware manual.

4.3 Limitations on Liability

- Even if the safety instructions are followed, any safety information in the manual shall not be considered as a guarantee that the product will not cause any personal injury or property damage.

4.4 Safety Precautions

- All personnel who install, operate, teach, program, or maintain the system must read the Hardware installation Manual, Software Manual, and Safety Manual according to the software and hardware version of this product, and complete a training course for their responsibilities in regard to the robot.
- All personnel who design the robot system must read the Hardware installation Manual, Software Manual, and Safety Manual according to the software and hardware version of this product, and must comply with all local and national safety regulations for the location in which the robot is installed.
- The TM AI cobot must be used according to its intended use.
- Results of the risk assessment may require the use of additional risk reduction measure.
- Power to the robot and its power supply must be locked out and tagged out or have means to control hazardous energy or implement energy isolation before any maintenance is performed.
- Failure to use appropriate power (less than or more than the rated voltage range) can lead to malfunction or failure of the robot or hazardous situations.
- Dispose of the product in accordance with the relevant rules and regulations of the country or area where the product is used.

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4.5 Validation and Liability

The information contained herein neither includes how to design, install, and operate a complete robotic arm system, nor involves the peripherals that may affect the safety of the complete system. The integrators of the robot should understand the safety laws and regulations in their countries and prevent hazards from occurring in the complete system.

This includes but is not limited to:

- Risk assessment of the whole system
- Adding other machines and additional risk reduction measures based on the results of the risk assessment
- Using appropriate software safety features
- Ensuring Users will not modify any safety measures
- Ensuring all systems are correctly designed and installed
- Clearly labeling user instructions
- Clearly marking the contact information for the integrator
- Making relevant documents accessible, including the risk assessment, and this manual



CAUTION:

- This product is a partly complete machine. The design and installation of the complete system must comply with the safety standards and regulations in the country of use. Users and integrators of the robot should understand the safety laws and regulations in their countries and prevent major hazards from occurring in the complete system.

4.6 Personnel who have not successfully completed the designated maintenance courses provided by Techman Training Center are prohibited from disassembling, assembling or repairing the robot or control box. Unauthorized repairs or disassembly will result in forfeiture of the warranty and may cause serious malfunctions.

4.7 When it is necessary to rotate joint in an unpowered state, please refer to the "Joint Movement Without Drive Power" section in the hardware manual.



DANGER:

- There is no force compensation during joint movement without drive power, which means more force is required to move each joint directly against the motor drive.
- When the brake of a joint is released, the robot's body will sag due to gravity. Therefore, please support the end of the robot before releasing the brake and hold the end of the robot to prevent harm such as the pinching of the operator. If there are any problems with the robot sagging, stop releasing the brake immediately, the and brake of each joint will be locked again.











WARNING:








User should be will trained and pay attention to moving the robot without drive power during any emergency and abnormal situations.

5. Tool list

5.1 Recommended Tool List for TM25S Maintenance

[Contact Techman to purchase tools.](#)

Name	Physical Reference	Specification	Model	Remarks
Ratchet Torque Wrench		20~100 N.m (200~1000 kgf.cm)	KANON N100QLK	Used for installation and removal A01 Series Joint
Linkage		at least 400mm Techman Robot	Techman Robot	Linkage is used in conjunction with a ratchet torque wrench and a T45 Torx screwdriver to disassemble the A01 Series Joint.
Magnetic torx Bit		T45		Used for installation and removal A01 Series Joint
Cut-Resistant Gloves		Features anti-slip and cut-resistant protection		Used to protect personnel's hands and provide anti-slip functionality
Soft Shell Cap		NA		Used to protect the head of maintenance personnel
Steel Toe Safety Shoes		NA		Used to protect the feet of maintenance personnel
Crane		500-1000kg length 2.5m height 3m	PORTA GANTRY 500kg	Used for moving the robot Note: Refer to the information below for the designated rope specification.
lifting jig		Techman Robot	Techman Robot	Used to secure onto the A01 Series Joint, facilitating the crane lifting or handling of personnel after disassembling the joint

Name	Physical Reference	Specification	Model	Remarks
TM25 maintenance platform		Recommended Specifications: Length: 90cm Width: 90cm Weight: 100kg		Please refer to the hardware manual for the robot base hole positions and dimensions. When assembling, make sure to secure the bottom swivel feet
Shackle		weight 2T width 20mm		Install on the lifting jig so that the rope can lift the joint.
Eye bolt		M8 x L15mm		Install on the lifting jig so that the rope can lift the joint.
48V PSU		DC48V & 4A	Refer to Hardware manual	Used for operating a robot without drive power. Refer to hardware manual for settle the power source.
Torque screw driver		6 – 26 kgf·cm	TOHNICHI 26RTD	Used for assembling A01 Series joint cover
Torque screw driver		20 – 100 kgf·cm	KANON 100LTDK	Used for assembling A01 cover and end module flange
Torx bit		T10 x length at least 100mm		Used for outer cover of HW5.03 camera housing

CAUTION:

The installation of a TM AI cobot using lifting equipment must satisfy the following criteria:

- Maximum working load of a lifting hook: 500 kg or above.
- Maximum working load of a synthetic fiber rope for lifting: 500kg or above.
- Length of a synthetic fiber rope for lifting: 1 m or below.
- Quality standards for the lifting rope:
BS EN 1492-1 :2000+A1: 2008
BS EN 1492-2 :2000+A1: 2008
ASME B30.9-2021
JISB8818:2015
- The robot is hoisted in accordance with local regulations.



CAUTION:














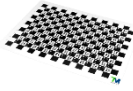



Failure to lift the robot and related parts appropriately can lead to damage and injury. Choose a proper lifting device for the corresponding weight of the robot. Follow local regulations and guidance for lifting.

5.2 Tool List Commonly Used for Other Arm Models (TM5S, TM7S, TM12S, TM14S)

Name	Physical Reference	Specification	Model	Remarks
Open end wrench		5.5 mm		Used for IO module
Open end wrench		8 mm		Used for 500 Series Joint
Open end wrench		10mm		Used for 800 Series Joint
Hex socket screwdriver		5.5 mm		Used for IO module
Hex socket screwdriver		8 mm		Used for 500 Series Joint
Hex socket screwdriver		10mm		Used for 800 Series Joint
Torque wrench		5.5 mm 20 kgf·cm	TOHNICHI 50CL-MH	Used for IO module
Torque wrench		8 mm 92 kgf·cm	TOHNICHI 150CL-MH	Used for 500 Series Joint
Torque wrench		10mm 250kgf·cm	TOHNICHI 225CL-MH	Used for 800 Series Joint
Wrench head		SH8D × 5.5 5.5 mm	TOHNICHI SH8D*5.5	Used for IO module
Wrench head		SH8D × 8 8 mm	TOHNICHI SH8D*8	Used for 500 Series Joint
Wrench head		SH10Dx10 10mm	TOHNICHI SH10D*10	Used for 800 Series Joint
Torque screw driver		6 – 10 kgf·cm	TOHNICHI 10RTD	Used for Cover, Control box
Torx bit		T10		Used for Joint cover
Hex bit		Bit 2.5mm x length 100mm		Used for outer cover of camera module
Hex wrenches		M1.5–M10		Used for Base and Control box
Extension bit Holder		1/4 inch At least 150mm magnet type is recommended		Used for internal box's fixed screws..

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Name	Physical Reference	Specification	Model	Remarks
Hex socket bit		M10		Used for internal box's fixed screws, magnet type is recommended.
Phillips screw driver				Used for control box components
Tweezer				Used for removing cables
Adjustable spanner		8 inch		Used for robot cable
Diagonal cutting plier				Used for cutting cable ties
Long nose plier				Used for removing cables
Cable tie		$120 \times 2.5 \text{ mm}^2$		Used for securing wires
Cable tie		$150 \times 3.6 \text{ mm}^2$		Used for securing wires
Multimeter				Used for checking voltage and circuit
Precision screwdriver set		T06151		Used for screws
Electrical tape		Width: 18mm		Used for wrapping around camera cable connectors
USB flash drive				Used for Windows recovery
Dongle key			Techman Robot	Must contain authorization key of maintenance
2-cm Plate calibration		$40 \text{ cm} \times 30 \text{ cm}$	Techman Robot	Used for camera calibration
1-cm Plate calibration		$20 \text{ cm} \times 15 \text{ cm}$	Techman Robot	Used for camera calibration
TM Landmark			Techman Robot	Used for Kinematic calibration and Hand-eye calibration
Ceramic Alignment Screwdriver			Engineer DA-52 Ceramic Alignment Screwdriver	Used for adjusting DIP switch on joint PCBA

6. Assembly and Disassembly Guide for Robot

6.1 Quick maintenance guide

6.1.1 Repairs, disassembly, or assembly are permitted only under the condition that at least two personnel use designated tools and wear the specified protective equipment.

6.1.2 Before disassembly, ensure that the robot is completely powered off and that both the external power cord and robot cable have been disconnected.

6.1.3 The robot arm must be securely installed on a stable platform during repair, disassembly, or assembly. Any detached components must be placed on a soft surface, such as a blanket or sponge pad.

6.1.4 Before disassembly, take photos to record the status and wiring configuration. These photos will serve as reference points during the reassembly process.

6.1.5 Follow the right-hand rule when disassembling and installing screws.

6.2 Joint model list

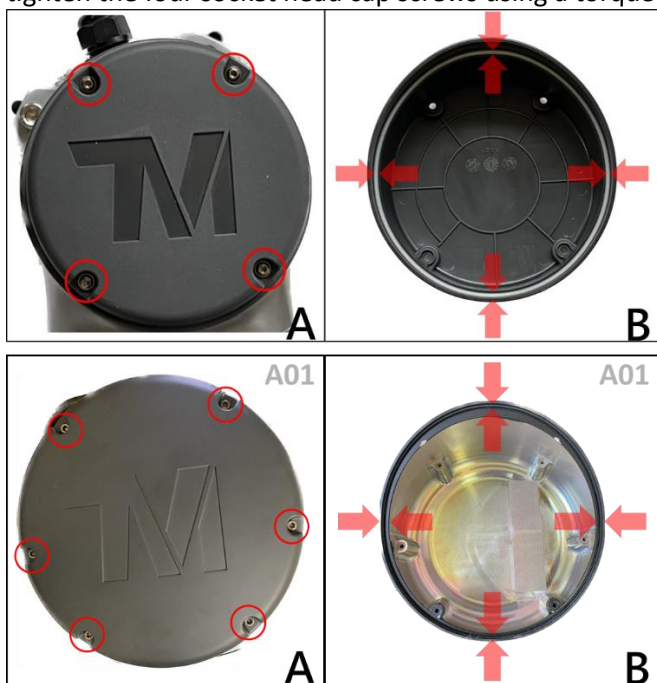
When replacing a joint, ensure that the joint model matches the one specified in the table below:

	TM25S / TM30S
1 st Joint	A01
2 nd Joint	A01
3 rd Joint	803
4 th Joint	804
5 th Joint	502
6 th Joint	204

6.3 Disassembly and assembly of Joint cover and Joint rubber

6.3.1 Joint cover disassembly: To disassemble the joint cover, use a hex cap screwdriver to loosen the hexagonal socket head cap screws (Fig. A). Then, gently remove the cover by hand, being careful to keep the O-ring in the groove.

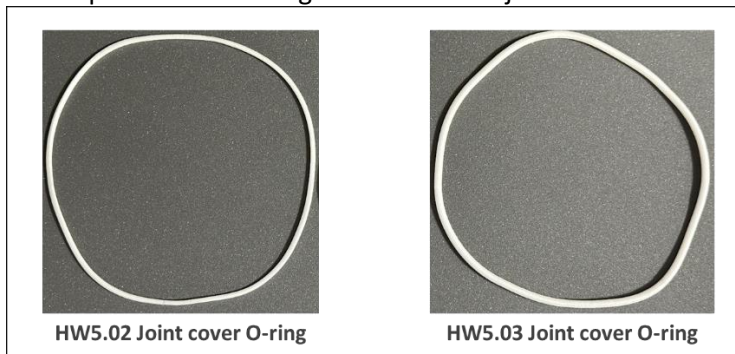
6.3.2 Joint cover assembly: To assemble the joint cover, ensure that the O-ring is in the groove (Fig. B) and tighten the four socket head cap screws using a torque screwdriver and a socket head torque screwdriver.



6.3.3 Since the HW5.03 robot has an enhanced IP65 rating, the specifications for the joint cover screws have been updated. These leak-proofing screws can be reused for up to five disassembly cycles while maintaining the standard IP65 protection level.



6.3.4 Since the HW5.03 robot has an enhanced IP65 rating, the specifications for the joint cover O-rings have been updated. The O-ring on the HW5.03 joint covers are thicker than those on the HW5.02

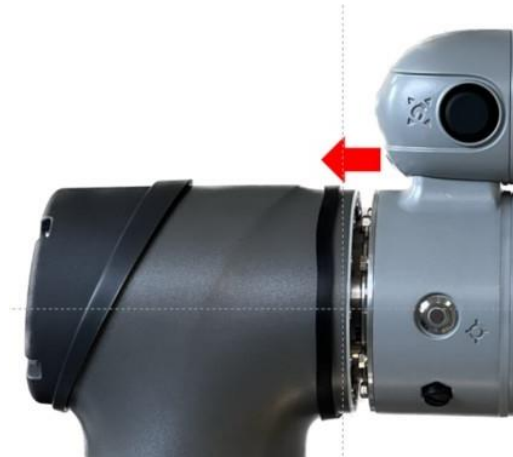


CAUTION:

Use the correct torque to tighten the screws according to the table below. Insufficient torque may result in inadequate sealing of the joint cover. Excessive torque during screw tightening may cause damage to the joint cover.

Torque specifications for Joint screws				
Joint Type	Screw Type	Torque Value (Kgf.cm)	Torque Value(Nm)	Total Screws
200L series	M3L6 TORX SOCKETHEAD CAP	6	0.6	4
500 series	M3L6 TORX SOCKETHEAD CAP	6	0.6	4
800 series	M3L6 TORX SOCKETHEAD CAP	6	0.6	4
A01 Series	M4L35 TORX SOCKETHEAD CAP	25	2.5	6

- 6.3.5 Remove Joint Rubber: Remove the Rubber with tweezers and open the white anti-dust cover to reveal the 200 Series / 500 Series / 800 Series Joint Screws.
- 6.3.6 Reverse the previous steps to install the dust cover and Rubber.

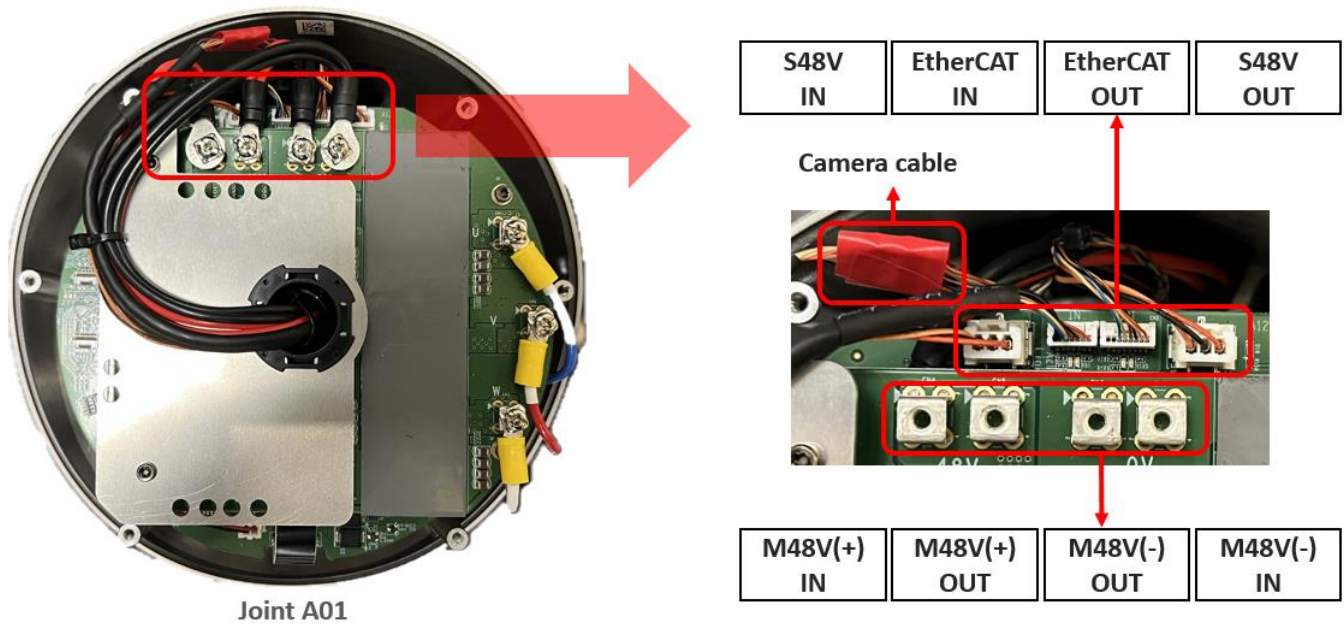


- 6.3.7 Remove A01 Series Joint rubber: Use a flathead screwdriver to pry open the rubber upward, revealing the screws for the A01 Series Joint. Reverse the above steps to reinstall the Rubber.

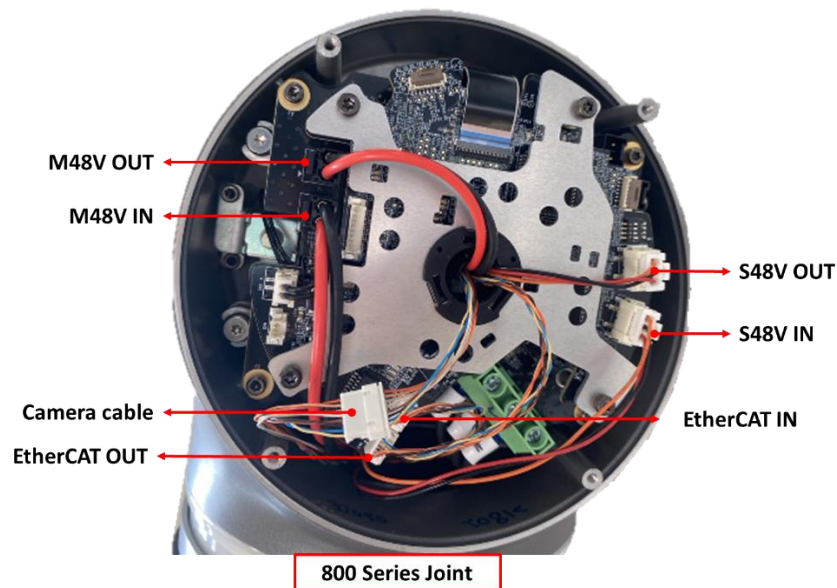


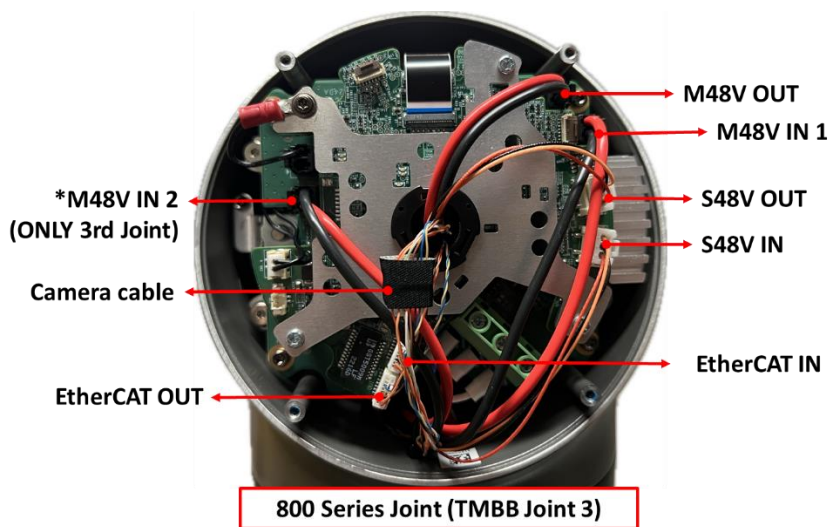
6.4 Disassembly and assembly Joint cable

6.4.1 A01 Series Joint

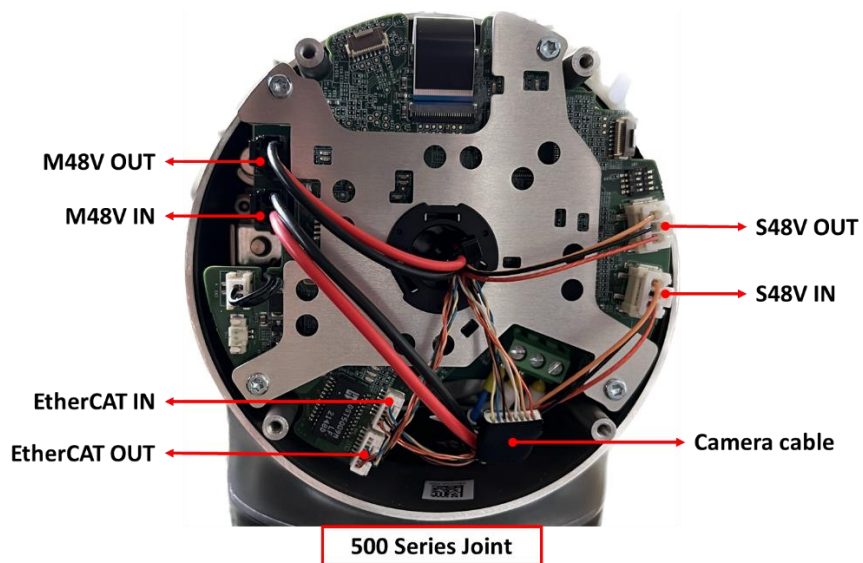


6.4.2 800 Series Joint

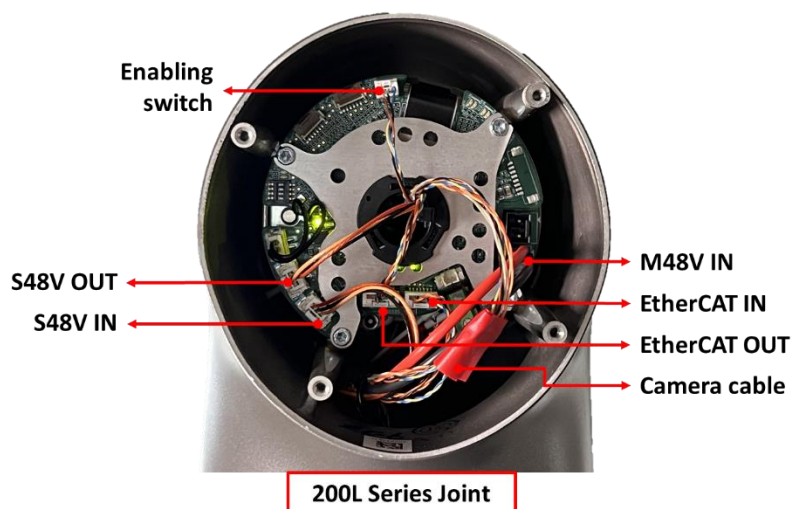




6.4.3 500 Series Joint

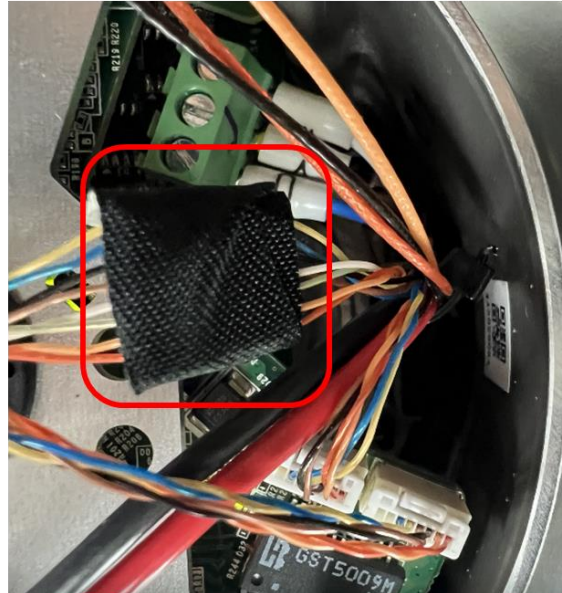
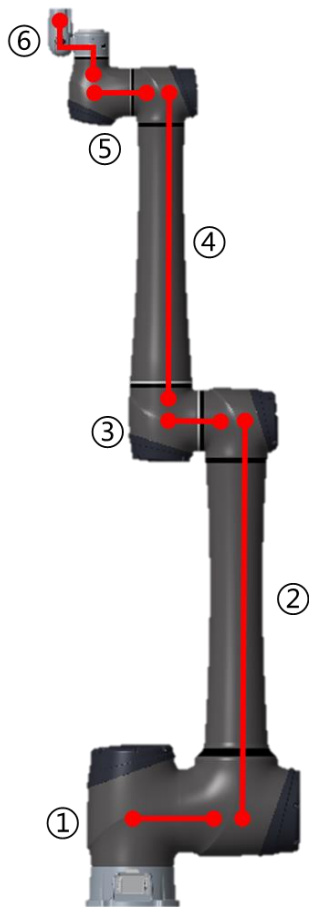


6.4.4 200L Series Joint



6.5 Camera Cable location

Before disconnecting the camera cable connector, remove the tape wrapped around it.



Remove the tape from the camera cable connector before disconnecting the cables.

6.6 Disassembly and Assembly Joint screw



CAUTION: Before remove joint screws, ensure the joint cables and connectors are disconnected; failure to disconnect the cable may result in damage to the Joint cable or components due to pulling or interference when removing the Joint.

6.6.1 Before remove joint screws, remove joint cover and Joint rubber.

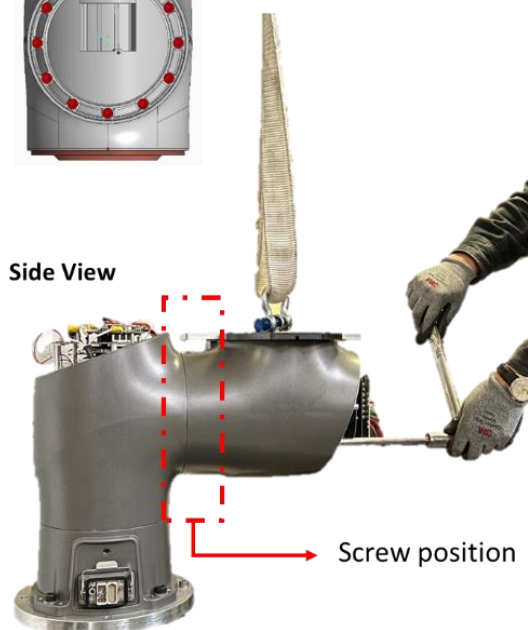
6.6.2 Using open end wrench to loosen the screw for joint connecting screws

Front View

A01 Series



Side View





DANGER: Repeated use of disassembled screws is prohibited, as the screw adhesive on the screws will become ineffective, and the repeated use will increase unforeseen risks.



DANGER: Tighten the joint screws according to the specified torque value provided below.

Torque specifications for Joint screws

Joint Type	Screw Type	Torque Value (Kgf.cm)	Torque Value(Nm)	Total Screws
200L series	M3L14 HEX HEAD CAP	20	2.0	8
500 series	M5L20 HEX HEAD CAP	92	9.0	8
800 series	M6L20 HEX HEAD CAP	150	15	10
A01 series	M8L18 HEX HEAD CAP	180/370	18/37	10

6.6.3 When assembling the joint, to ensure the correct installation orientation, it is necessary to interlock the key and slot between the joints (refer to Figure 1 & Figure 2) (refer to Figure 3). Operators can visually align the holes or insert an $\varnothing 1.9\text{mm}$ pin into the hole to verify proper installation (refer to Figure 4). If the hole of two joints are not in the same direction, or if misalignment prevents the insertion of the locating pin, do not proceed with further assembly.

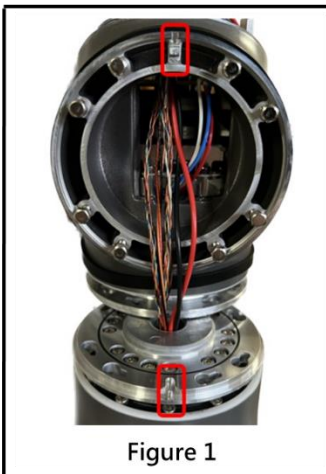


Figure 1

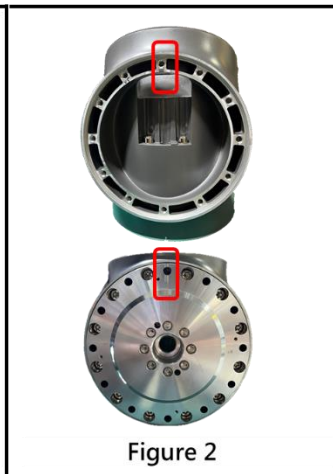


Figure 2

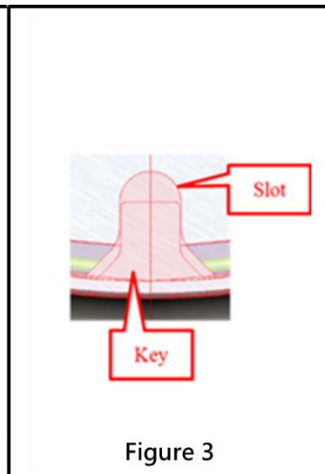


Figure 3

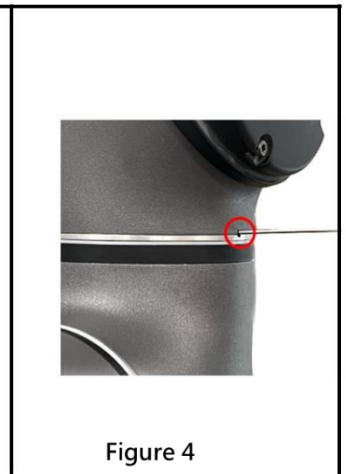
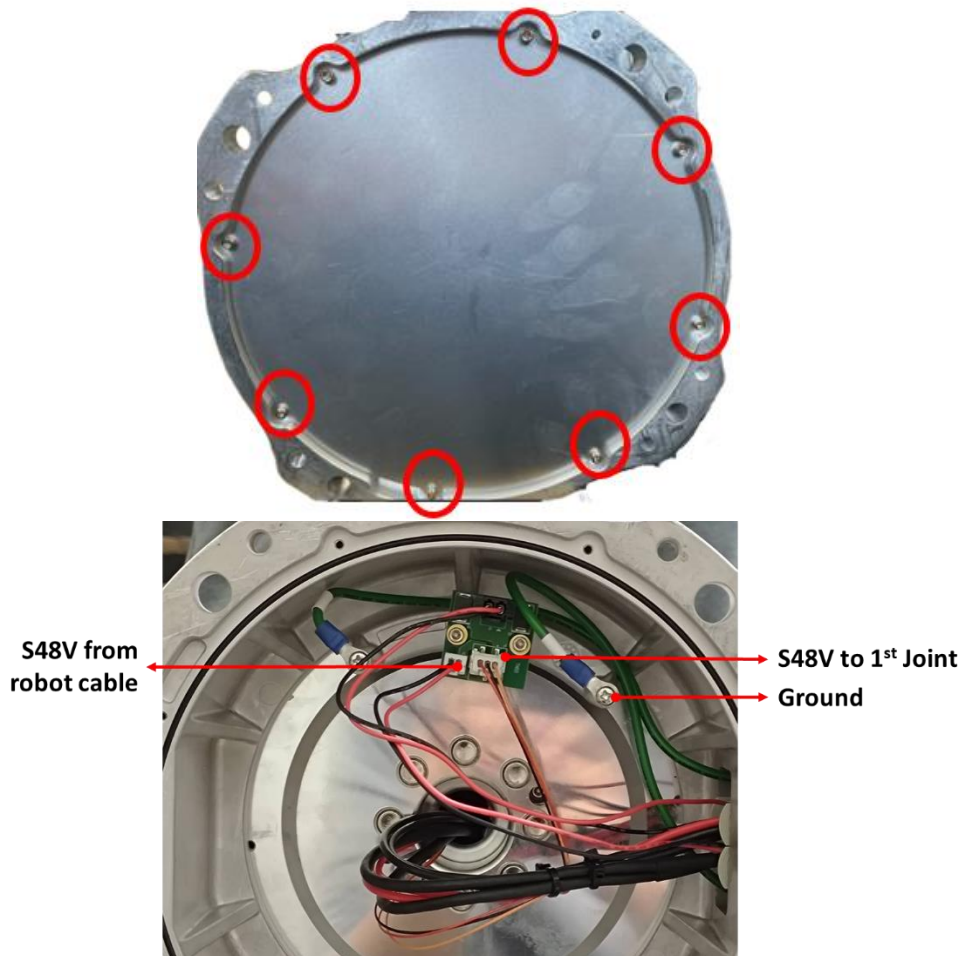


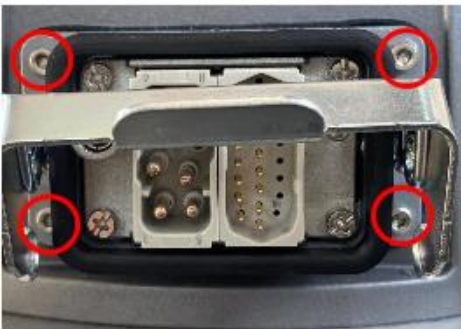
Figure 4

6.7 Disassembly and Assembly of Base and Robot Cable

6.7.1 Before removing the Base cover, loosen the corresponding screws and disconnect the wiring between the Robot cable and Joint 1.



6.7.2 Remove the connector screws.



6.7.3 When assembling the Base and Robot cable, please follow the reverse steps of the previous procedure.

6.8 Disassembly and assembly A01 Series Joint – Joint 1

6.8.1 Before disassembling Joint 1, disassemble Joint 2 to the End Module.

6.8.2 Rotate Joint 1 to the home position and ensure that all joint screws are visible.



Not located at the home position.



located at the home position.

6.8.3 Remove the Joint Cover of Joint 1.

6.8.4 Remove the Joint Cable of Joint 1.

6.8.5 Install the lifting jig, secure the lifting rope to the auxiliary tool, and adjust the lifting rope slightly tight to prevent the Joint from tilting in other directions after the Joint connection screws are removed.

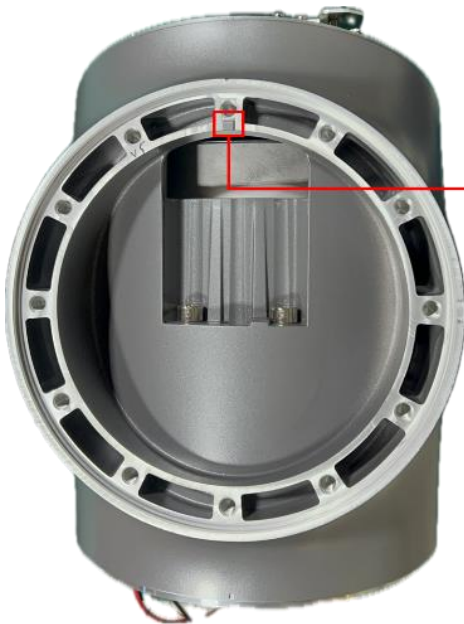


6.8.6 Remove the connection screws between Joint 1 and the Base, and take off Joint 1.

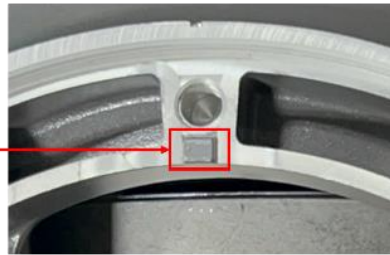
6.8.7 When assembling Joint 1, align the Key and Slot of the A01 Series Joint in the figure below and follow the previous steps in reverse. °



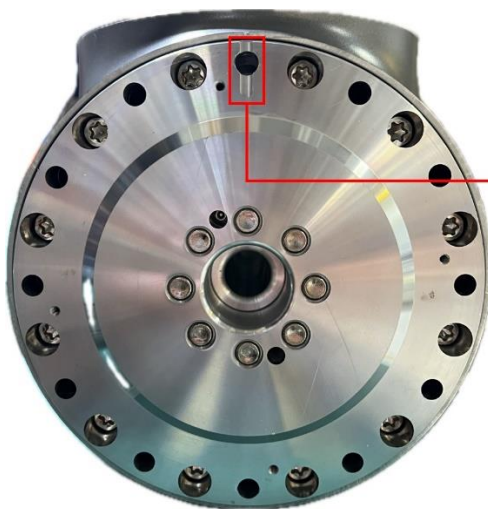
Caution: When assembling the A01 series joints, make sure that the A01 series joint key is securely attached to the slot to prevent abnormal operation of the arm controller or unexpected errors.



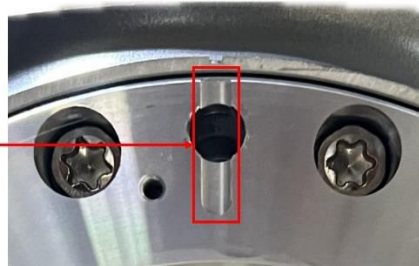
A01 Series Joint Screw Side



A01 Series Key Slot



A01 Series Joint Flange Side

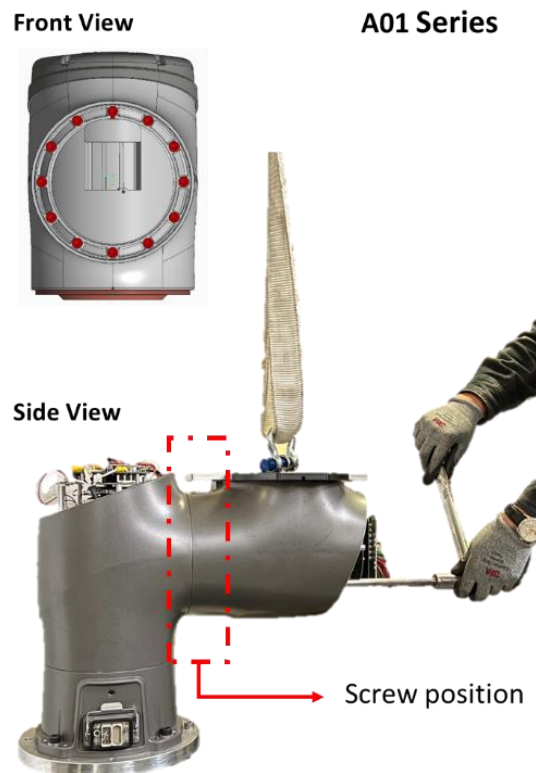


A01 Series Flange Slot

6.9 Disassembly and assembly A01 Series Joint – Joint 2

6.9.1 Before disassembling Joint 2, disassemble Upper arm to the End Module.

6.9.2 Rotate Joint 2 to the home position and ensure that all joint screws are visible.



6.9.1 Remove the Joint Cover of Joint 2.

6.9.2 Remove the Joint cable of Joint 2.

6.9.3 Install the jig, secure the lifting rope to the auxiliary tool, and adjust the lifting rope slightly tight to prevent the Joint from tilting in other directions after the Joint connection screws are removed.

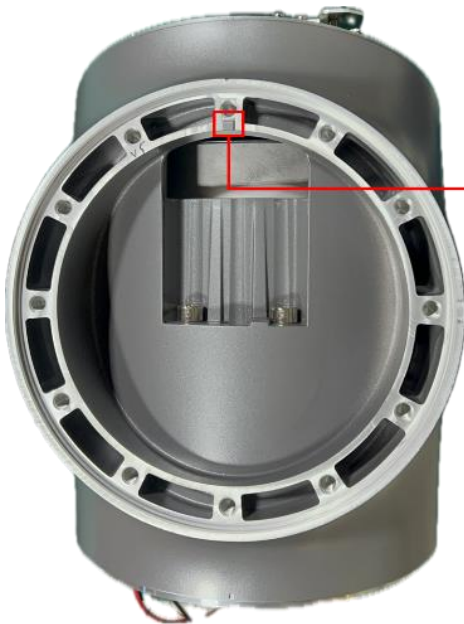


6.9.1 Remove the connecting screws between Joint 2 and Joint 1, and take off Joint.

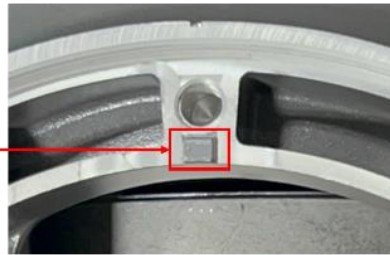
6.9.2 When assembling Joint 2, align the Key and Slot of the A01 Series Joint in the figure below and follow the previous steps in reverse. °



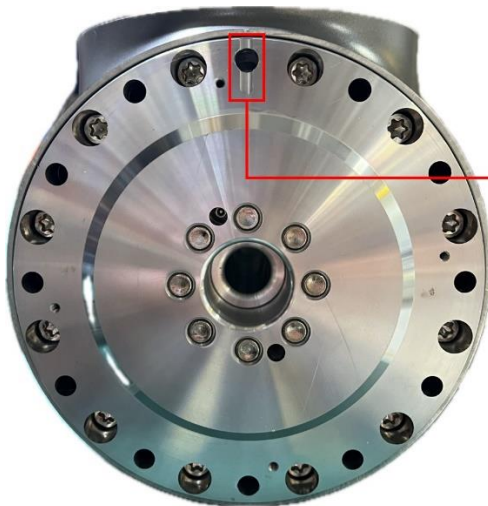
Caution: When assembling the A01 series joints, make sure that the A01 series joint key is securely attached to the slot to prevent abnormal operation of the arm controller or unexpected errors



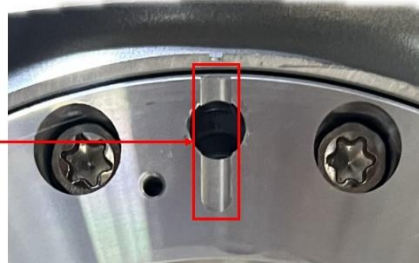
A01 Series Joint Screw Side




A01 Series Key Slot



A01 Series Joint Flange Side



A01 Series Flange Slot



6.10 Disassembly and assembly 800 Series Joint

6.10.1 Remove the Joint cover and Joint rubber.

6.10.2 Remove the Joint cable from the Joint.

6.10.3 Remove the screws connecting the Joint to other Joints or the Arm, and then detach the Joint.

6.10.4 During assembly, follow the reverse steps of the previously mentioned procedure.

6.11 Disassembly and assembly 500 Series Joint

6.11.1 Remove the Joint cover and Joint rubber.

6.11.2 Remove the Joint cable from the Joint.

6.11.3 Remove the screws connecting the Joint to other Joints or the Arm, and then detach the Joint.

6.11.4 During assembly, follow the reverse steps of the previously mentioned procedure.

6.12 Disassembly and assembly 200L Series Joint

6.12.1 Remove the Joint cover and Joint rubber.

6.12.2 Remove the Joint cable from the Joint.

6.12.3 Remove the screws connecting the Joint to other Joints or the Arm, and then detach the Joint.

6.12.4 During assembly, follow the reverse steps of the previously mentioned procedure.

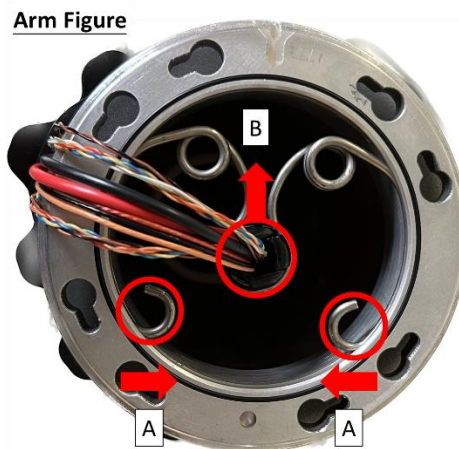
6.13 Disassembly and assembly Upper arm

6.13.1 Remove Joint cover and Joint rubber which in Joint 2 & Joint 3

6.13.2 Remove Joint cable which in Joint 2 & Joint 3

6.13.3 Remove the screws connecting the Upper arm to Joint 2 and Joint 3, and then detach the Upper arm.

6.13.4 (Please refer Arm figure below) After removing the Upper arm, use needle-nose pliers to compress the bracket at location A, then extract the bracket from the groove. Next, remove the wiring and plastic bushing at location B.



6.13.5 During Upper assembly, follow the reverse steps of the previously mentioned procedure.

6.13.6 When replacing the MII cable, camera cable, and S48V cable from Joint 2 to Joint 3, there is no need to disassemble the Arm tube. You can directly insert the new cables from Joint 3 and pull them out from Joint 2. For the old cables, trim the connectors at both ends and pull them out.

6.13.7 When inserting the new cables, apart from the power cable, the other cables (MII cable, camera cable, S48V cable) do not need to be tied inside the metal ring. However, it is necessary to use acetic acid cloth to secure the new cables.

6.14 Disassembly and assembly Lower arm

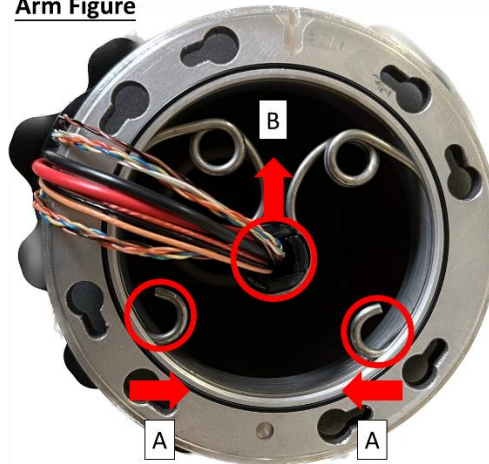
6.14.1 Remove Joint cover and Joint rubber which in Joint 4 & Joint 5

6.14.2 Remove Joint cable which in Joint 4 & Joint 5

6.14.3 Remove the screws connecting the Lower arm to Joint 2 and Joint 3, and then detach the Upper arm.

6.14.4 (Please refer Arm figure below) After removing the Upper arm, use needle-nose pliers to compress the bracket at location A, then extract the bracket from the groove. Next, remove the wiring and plastic bushing at location B.

Arm Figure



6.14.5 During Lower arm assembly, follow the reverse steps of the previously mentioned procedure.

6.14.6 When replacing the MII cable, camera cable, and S48V cable from Joint 4 to Joint 5, there is no need to disassemble the Arm tube. You can directly insert the new cables from Joint 5 and pull them out from Joint 4. For the old cables, trim the connectors at both ends and pull them out.

6.14.7 When inserting the new cables, apart from the power cable, the other cables (MII cable, camera cable, S48V cable) do not need to be tied inside the metal ring. However, it is necessary to use acetic acid cloth to secure the new cables.

6.15 Disassembly and assembly End module

6.15.1 Remove Joint cover and Joint rubber which in Joint 6

6.15.2 Remove Joint cable which in Joint 6.

6.15.3 Remove the connecting screws between Joint 6 and the End module, and then detach the End module.

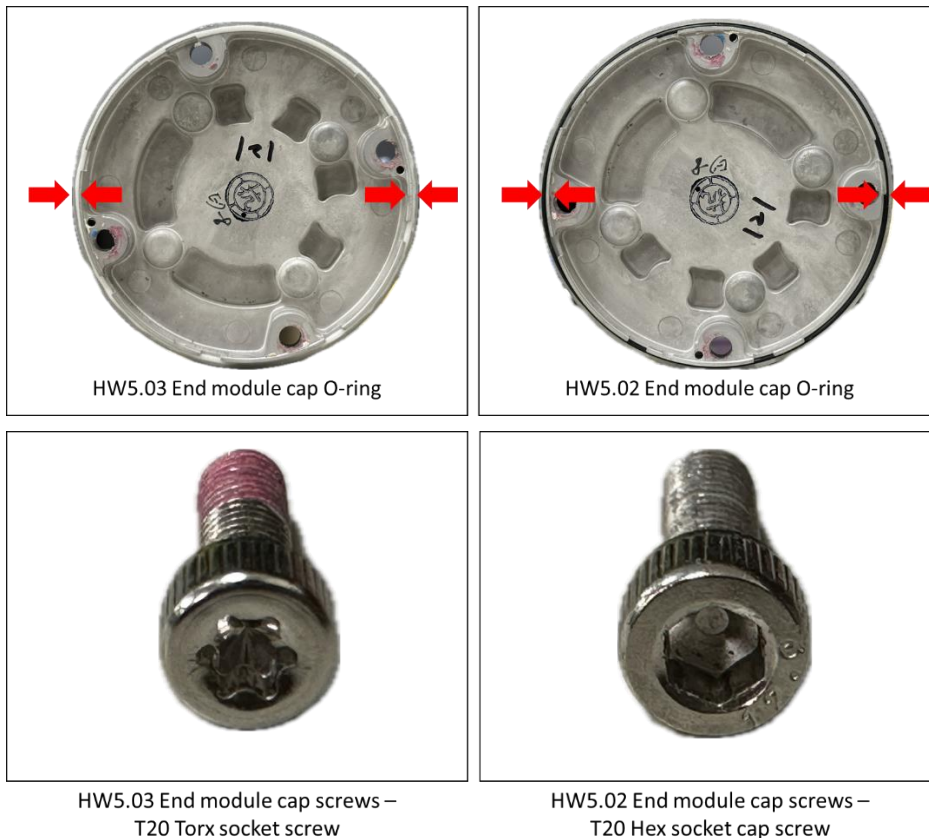
6.15.4 During assembly, follow the reverse steps of the previously mentioned procedure.

6.16 Disassembly and assembly End module PCBA

6.16.1 Use a tool to loosen the 4 screws on the end module flange cover. A hex wrench, as shown below, is recommended.

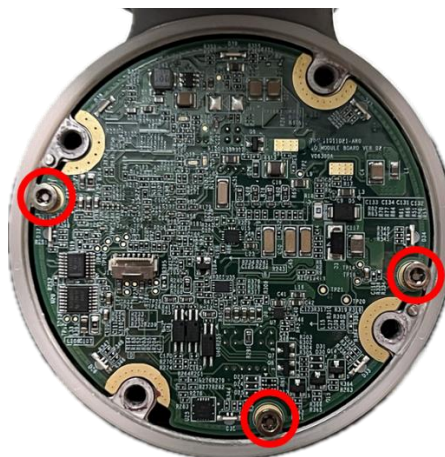


6.16.2 Since the HW5.03 robot has an enhanced IP65 rating, the specifications for the screws and O-ring on the end-module cap have been revised. The original hex cap screws have been replaced with Torx cap screws, and the O-ring has been made thicker to enhance the IP protection level (see figure below).



6.16.3 Remove the flange. If it is too tight and difficult to remove, insert a screw into the flange and gently pry it off.

6.16.4 Loosen the 3 screws on the end module PCBA.



Loosen the 3 screws

6.16.5 Beginning with HW5.03, the original hex cap screws on the end-module PCBA have been replaced with Torx cap screws.

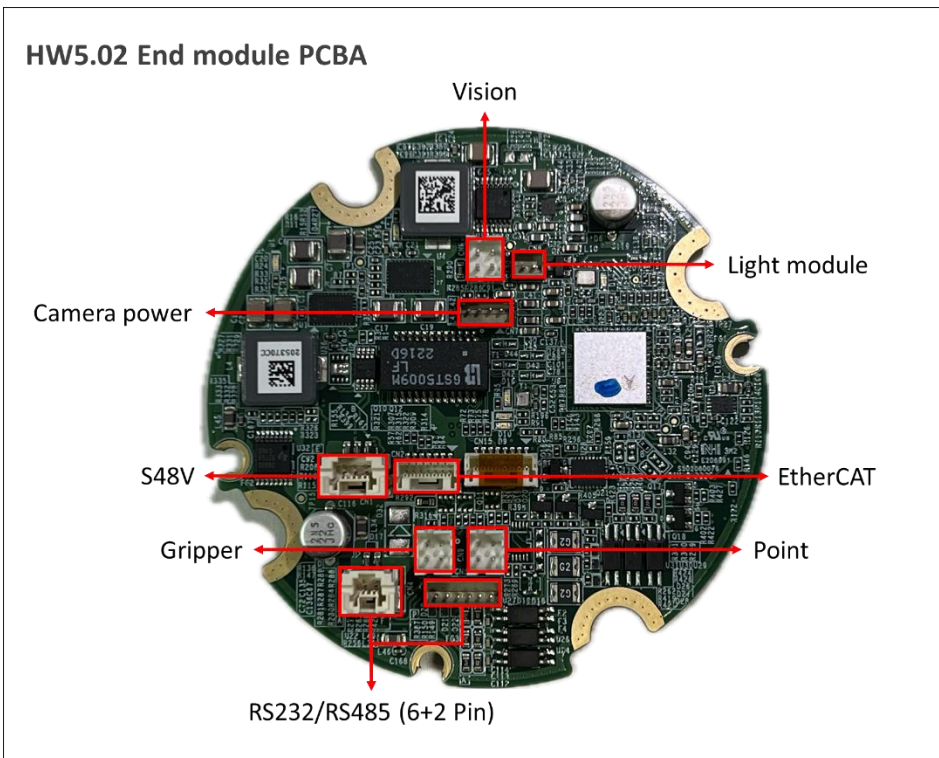


HW5.03 End module PCBA screws –
T10 Torx socket screw

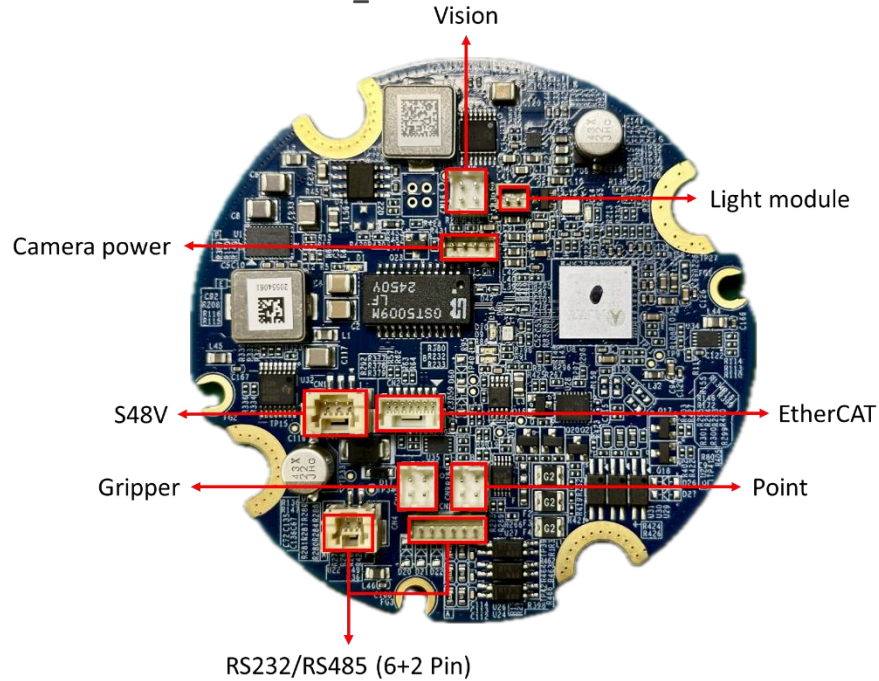


HW5.02 End module PCBA screws –
T10 Hex socket cap screw

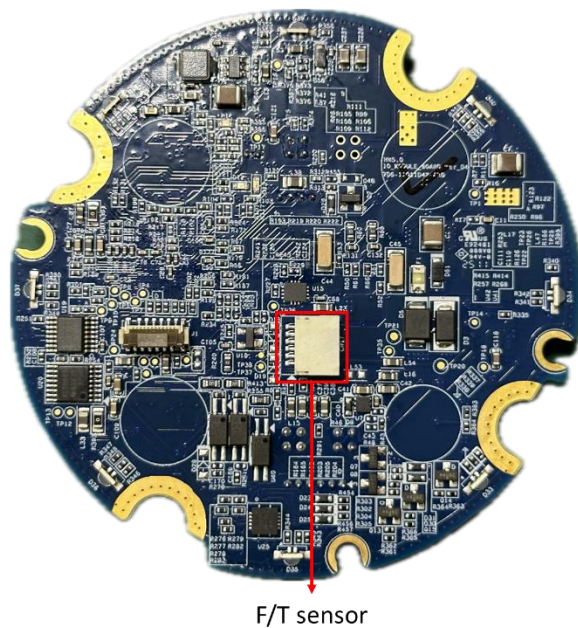
6.16.6 Disconnect all cables. It is strongly recommended to take a photo beforehand for reference.



HW5.03 End module PCBA_Front



HW5.03 End module PCBA_Back



6.16.7 Replace the PCBA with a new one. Reconnect all cables and tighten the 3 screws. The designated torque value for the PCBA screws is 10 kgf.cm.

6.16.8 Reinstall the flange cover. The designated torque value is 72 kgf.cm.

6.17 Disassembly and assembly Light module

6.17.1 Refer to the picture below to remove the four screws securing the camera light source module.



6.17.1 Unplug the power cable of the light source module and remove the light source module, being careful not to let the O-ring fall off.



6.17.2 During the assembly of the End module, please follow the reverse steps of the previously mentioned procedure.

6.18 Disassembly and assembly Camera module

6.18.1 Loosen the three M3L10 screws on the camera module, separate the camera module casing from the End module. The torque during assembly is 10 kgf-cm.



6.18.2 Beginning with HW5.03, the original hex cap screws on the end-module PCBA have been replaced with Torx cap screws.

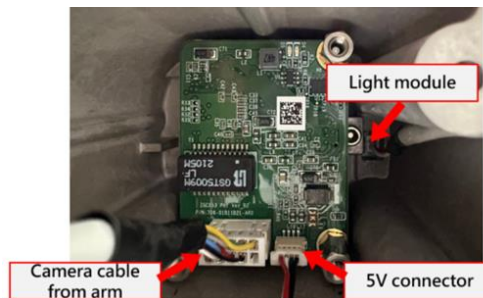


HW5.03 camera housing screws –
T10 Torx socket screw



HW5.02 camera housing screws –
T10 Hex socket cap screw

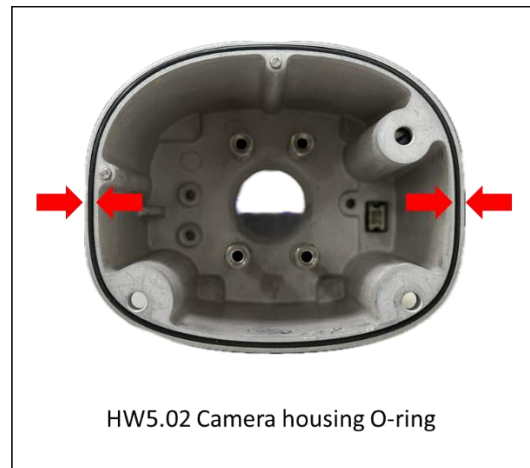
6.18.3 Disconnect the cables as shown in the below.



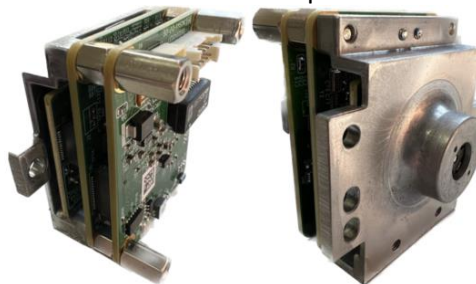
6.18.1 After removing the camera module, take off the three M3L6 screws securing the TRI camera. The torque during assembly is 10 kgf·cm.



6.18.2 Since the HW5.03 robot has an enhanced IP65 rating, the specifications for the O-ring on the camera housing has been revised. The O-ring has been made thicker to enhance the IP protection level (see figure below).



6.18.1 After removing the TRI camera unit (refer to the below picture), replace it directly with a new TRI camera. Do not perform any disassembly or modifications on the components of the unit.

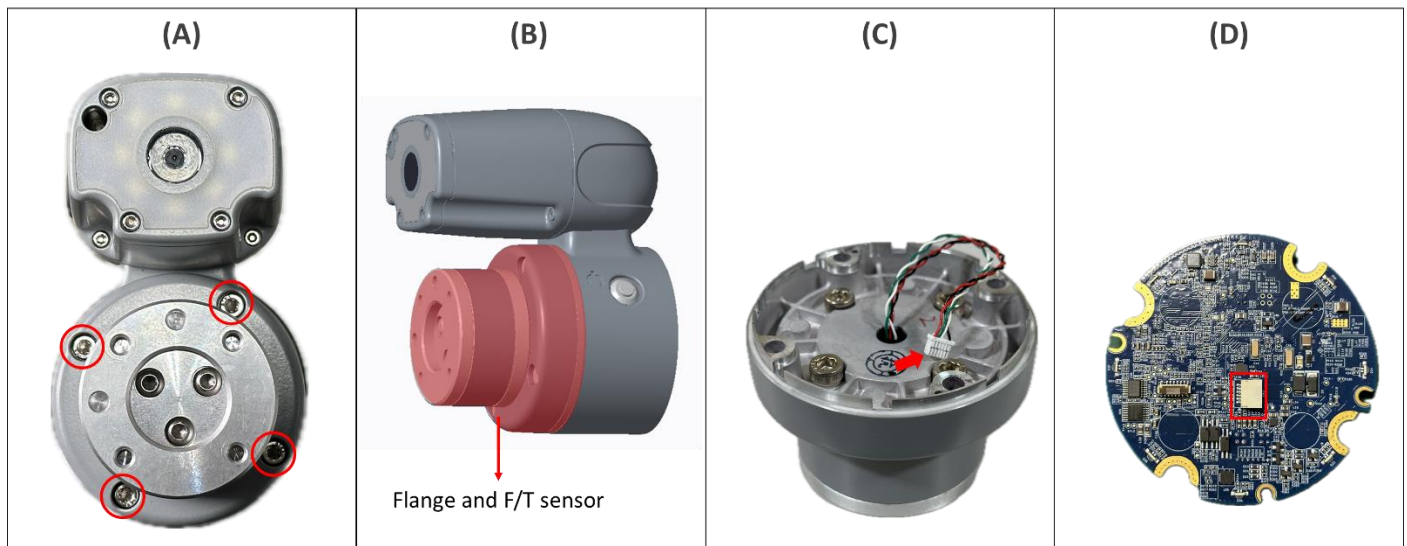


6.18.2 When assembling the camera, please follow the reverse steps of the previously mentioned procedure.

6.19 Disassembly and assembly Force/Torque (F/T) sensor

6.19.1 Loosen the 4 flange screws and remove the F/T sensor together with the flange. (see Figure A and B)

6.19.2 Disconnect the F/T sensor connector from the end module PCBA. (see Figure C and D)



6.19.3 Do not disassemble the F/T sensor itself or remove F/T sensor from flange.

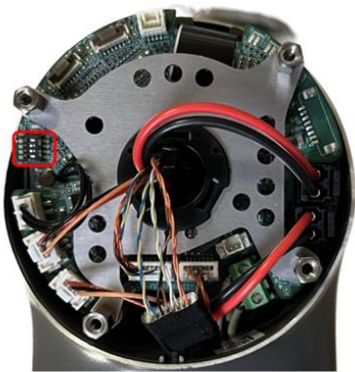
6.19.4 To install an F/T sensor on an HW5.02 robot, replace the end-module PCBA with the HW5.03 version and replace the flange with the HW5.03 flange with F/T sensor.

6.19.5 To install an F/T sensor on an HW5.03 robot that was not originally equipped with one, replace the flange with the HW5.03 flange with F/T sensor.

6.19.6 The F/T sensor and flange are factory-assembled and pre-calibrated by Techman. No user calibration of the F/T sensor is required.

6.20 DIP Switch Setting

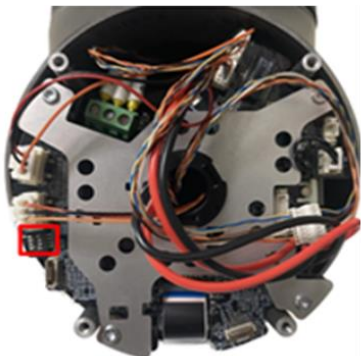
6.20.1 After replacing or rearranging Joints, use designated tool to set the Joint DIP switch to the corresponding position according to the following specifications:



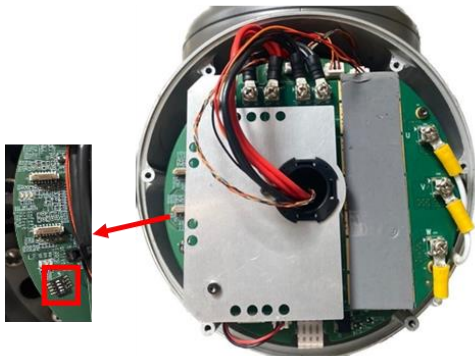
200L Series Joint



500 Series Joint



800 Series Joint



A01 Series Joint

J1	ON				J4	ON			
	H					H			
	L					L			
J2	ON				J5	ON			
	H					H			
	L					L			
J3	ON				J6	ON			
	H					H			
	L					L			



CAUTION: Failure to set the DIP switch on the Joint to the specified position may trigger Error Code 0x0000004E or other unexpected errors.

6.21 Software Update

6.21.1 Notes:

6.21.1.1 If **any** of the following components is replaced—Joints, Patriot power board, or End module (including the End module PCBA)—the user must update the ESI and firmware and run ReinstallRobotId to ensure the robot operates properly.

6.21.1.2 Follow the table below to update ReinstallrobotID, ESI and Firmware(FW) updates:

	ESI update	Firmware update	ReinstallRobotId
Replace Patriot power board	●	●	●
Replace End module (or End module PCBA)	●	●	●
Replace Joints	●	●	○
● Update required ○ Not required			

6.21.1.3 The Robot ID is stored in both patriot power board and end module PCBA. System may trigger error code 0x3C or others if it detects a discrepancy between the robot IDs of those two parts.

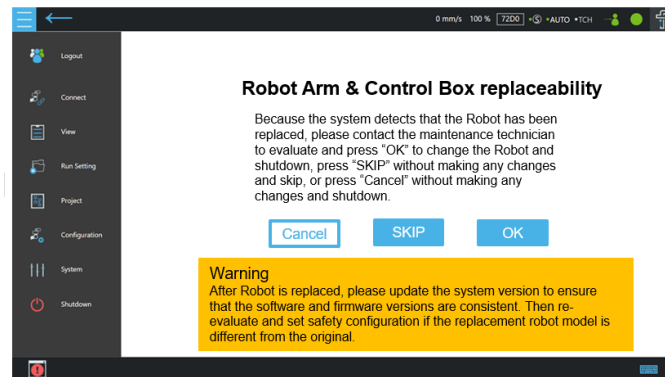
6.21.1.4 Replacing the above-mentioned components without updating the ESI and firmware as required will not trigger errors immediately. However, to prevent potential unforeseen errors caused by inconsistencies in ESI and firmware versions between components or mismatches with the current TM Flow version, it is essential to perform updates after replacing components. This ensures that the ESI and firmware of all components align with the current TM Flow version.

6.21.1.5 Two update methods are provided below. Refer to the table for appropriate applications:

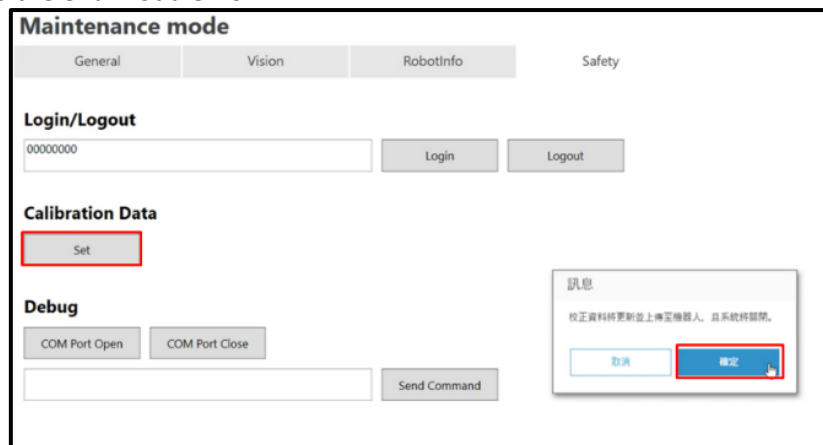
	TM Flow	Manually updating
Patriot power board (new)	●	●
Patriot power board (used)	○	●
End module (new)	●	●
End module (used)	○	●
Joint (new)	●	●
Joint (used)	●	●
● Applicable ○ Not Applicable Both methods require a maintenance dongle.		

6.21.1.6 Restoring the calibration data:

- (a.)Replacing patriot power board: User may see the following screen upon startup after replacing a new patriot power board. Click 'OK' and enter the default password (default 00000000), the control box will reboot and synchronize the calibration data to the patriot power board.



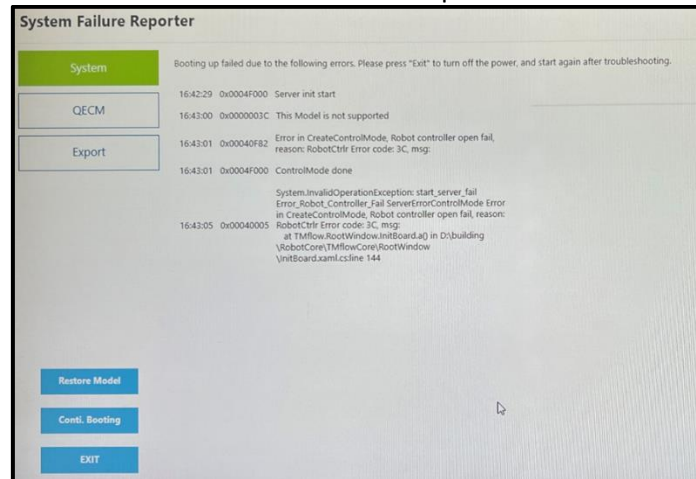
- (b.)Replacing end module: After replacing and new end module, user must enter the maintenance mode (firstly click SKIP on the page 'Robot Arm & Control Box replaceability') and type in the password (default 00000000) and log in. Then, click calibration data 'Set' to upload the calibration data to the end module PCBA.



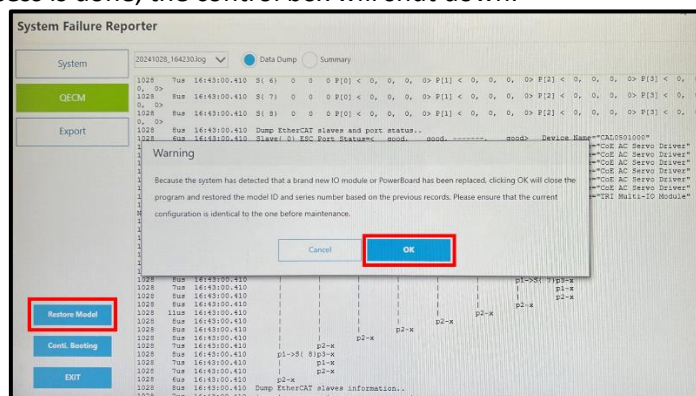
6.21.2 Updating Robot ID, ESI and Firmware via TM Flow:

6.21.2.1 When replacing robot joints, it is only necessary to perform TM Flow update after powering on. There is no need to update the Robot ID.

6.21.2.2 After replacing brand-new end module or patriot power board, since these components do not initially have a Robot ID written into them, the system will display the following error screen (Error code 0x3C) when it detects that the Robot ID in these components does not match the robot model.



6.21.2.3 Click Restore model. The system will write the corresponding Robot ID into the blank end module and patriot power board base on the robot model last time recorded by the control box. Once the written process is done, the control box will shut down.



6.21.2.4 After restarting, follow the 'System Update' section in the software manual to update the TM Flow to the same or newer version. During the system update process, ESI and firmware will be updated automatically.


6.21.3 Manually updating Robot ID, ESI and Firmware:

6.21.3.1 Enter Windows:

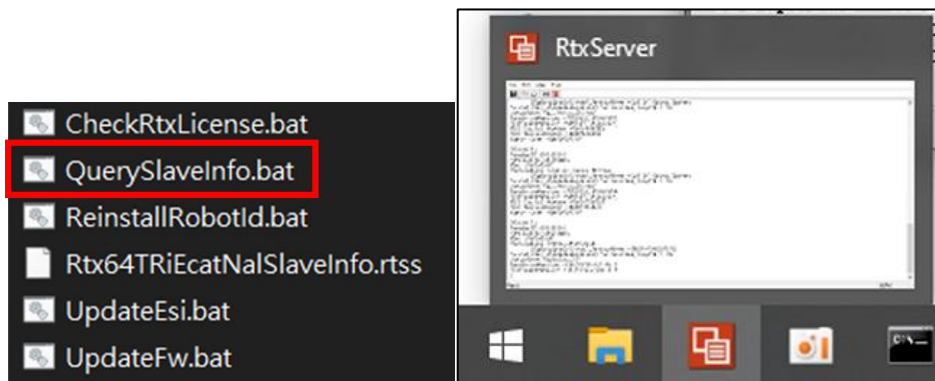
- (a.) While the control box is powered off, press the emergency stop button and insert the maintenance dongle to the control box. After powering on, TM Flow will display error codes due to the emergency stop cutting off the power between control box and the robot arm. Click 'Exit' at the bottom left of the screen to enter Windows.



Warning: After entering Windows, release the emergency stop button. Once released, check if the end module indicator light is blinking. If the light is not blinking, it indicates that the control box is not correctly connected to the robot arm. Do not proceed with the subsequent steps and prioritize troubleshooting the issue.

- (b.) Starting from TM Flow version 2.20, when the user inserts the maintenance dongle, a new option will appear in the left function bar. Clicking this option  allows the user to access the Windows operating system.

6.21.3.2 Before proceeding with the update process for the ESI and firmware, make sure that the number of slaves and the device sequence are correct. Click on Query SlaveInfo.bat to verify the slave count. **Do not proceed** with the following steps if any errors are shown.



- (a.) Click QuerySlaveInfo.bat and click the red icon on the toolbar to show more details

```

RtxServer
File Edit View Help

DeviceName =CoE AC Servo Driver
[UpdateLog]:Slave6_DeviceName =CoE AC Servo Driver
WriteFile(_pUpdaterLogFile) OK written_length = 40
GroupName =AC_Servo_Driver
HardwareVersion =JT203A2_00060904
SoftwareVersion =SDB143_20241017_
ESI Serial Number =0xE0320020
Mcu SerialNumber =0xE0320020
Agent Code =0x00000100

Slave[7]
VendorID:00545249
ProductID:02041E00
Rev.:00000018
DeviceName =TM5B-090050100
[UpdateLog]:Slave7_DeviceName =TM5B-090050100
WriteFile(_pUpdaterLogFile) OK written_length = 35
GroupName =Modular_IO
HardwareVersion =20220715-G3.0D.1
SoftwareVersion =20231213-028.0.0
ESI Serial Number =0x20535008

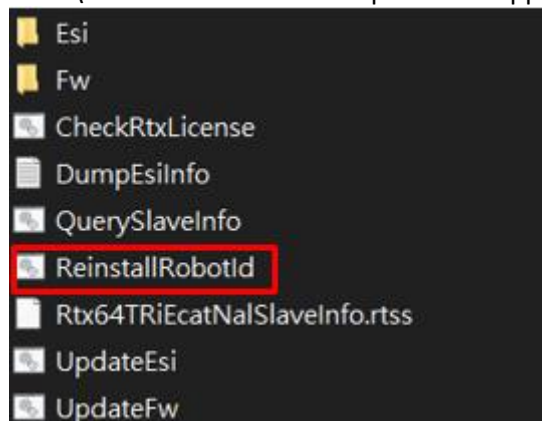
Slave[8]
VendorID:00545249
ProductID:02203800
Rev.:00000005
DeviceName =EcatPatriotSafetyMonitor
[UpdateLog]:Slave8_DeviceName =EcatPatriotSafetyMonitor
WriteFile(_pUpdaterLogFile) OK written_length = 45
GroupName =Safety
HardwareVersion =20220802-D0-0000
SoftwareVersion =20241008_060.000
ESI Serial Number =0x00520011
([-----End Dump SlaveInfo-----])

Ready

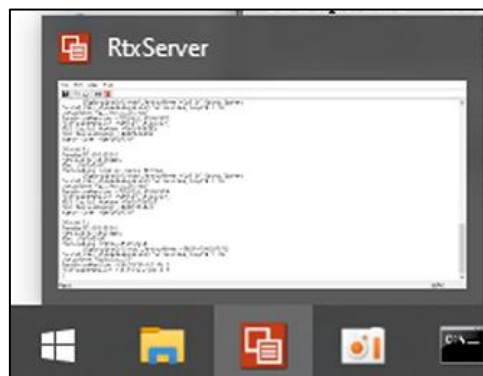
```

(b.) Check if any errors are shown. Under normal conditions, all slaves should be detected. The last one should be the EcatPatriotSafetyMonitor, with its sequence number as slave[8].

6.21.3.3 ReinstallrobotID: After replacing **Patriot power board** or **End module (or End module PCBA)**, the robot ID should be updated. Enter Windows, run the file 'ReinstallRobotID' located in the path: D:\Techman Robot\TM Flow\ModuleRelease. This step can be skipped if only joints were replaced.



(a.)Click ReinstallRobotId.bat

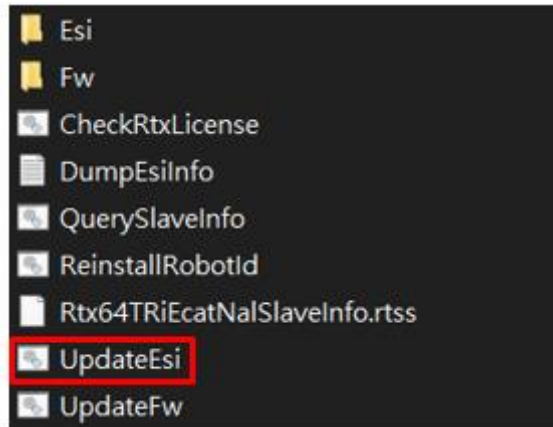


(b.)Click the red icon on the toolbar to show more details

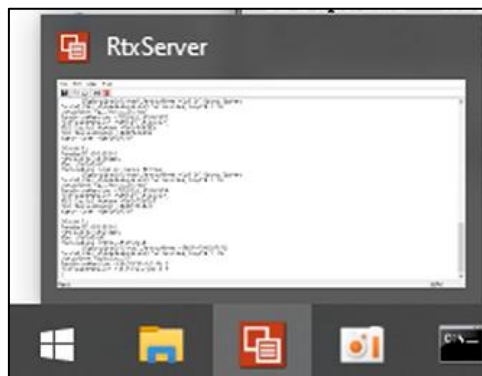


(c.) Close the window after viewing the result.

6.21.3.4 UpdateEsi: After entering Windows, run the file 'UpdateEsi' located in the path: D:\Techman Robot\TM Flow\ModuleRelease.



(a.)Click UpdateEsi.bat

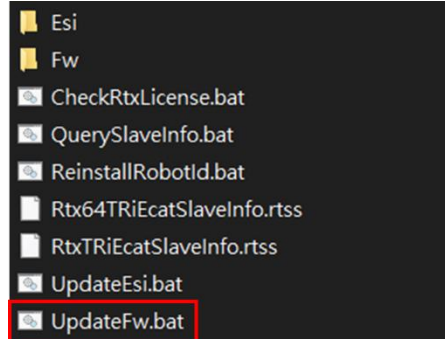


(b.)Click the red icon on the toolbar to show more details

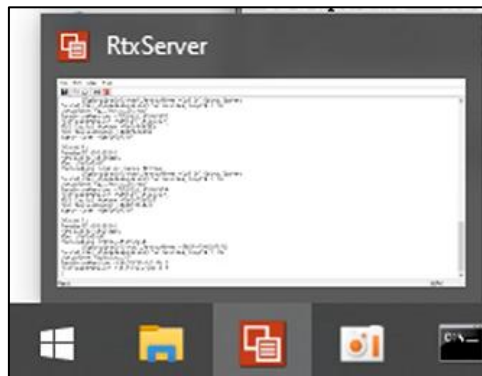


(c.) Close the window after viewing the result.

6.21.3.5 UpdateFW: After entering Windows, run the file 'UpdateFW' located in the path: D:\Techman Robot\TM Flow\ModuleRelease. **Once the firmware update is complete, completely power off the control box and robot arm.** It is recommended to unplug the external power cable after shutting down and then plug it back in to ensure the power is fully turned off before restarting.



(a.)Click UpdateFw.bat



(b.)Click the red icon on the toolbar to show more details

```

RtxServer
File Edit View Help

ulFirmwareOffset=00000000 ulFlashOffset=00040000 ulCompareSize = 00000080
ulFirmwareOffset=0003ff80 ulFlashOffset=0007ff80 ulCompareSize = 00000080
[UpdateLog]:[Slave#7][SerialNum=0x20535008][Old(EEPROM/SII)=0x02041E0F-20220715-G3.0D.1-20231213-028.0.0]
[New=IoModule_20231213-028.0.0_Gen3_D.mcb]
[Identical]

Slave ID = 8, FW filename = PatriotSafetyMonitor_20241008_060.000_Gen3_G.mcb
FileFormatRev=2 (new F/W file for Core N-1,...,1.0)FileFwNumber=3FwOffset[0]=0x00100098FwSize[0]=0x00070000FwOffset[1]=
0x00080098FwSize[1]=0x00080000FwOffset[2]=0x00000098FwSize[2]=0x00080000ulFirmwareOffset=0000c000 ulFlashOffset=0010c000
ulCompareSize = 00000080
Verify found different at 0x10c000 Len=112...(0000800D)

[UpdateLog]:[Slave#8][SerialNum=0x00520011][Old(EEPROM/SII)=0x02203805-20220802-D0-0000-20241008_060.000]
[New=PatriotSafetyMonitor_20241008_060.000_Gen3_G.mcb]
[Incompatible] ErrorCode = 19 (FIRMWARE_NOT_COMPATIBLE_WITH_SELECTED_SLAVE)

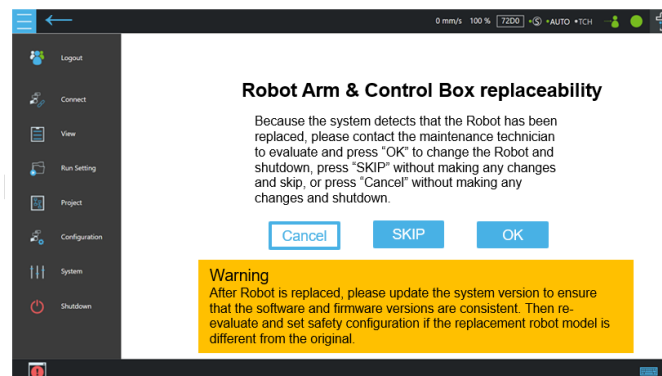
Slave ID = 8, FW filename = PatriotSafetyMonitor_20241008_060.000_Gen3_D.mcb
FileFormatRev=2 (new F/W file for Core N-1,...,1.0)FileFwNumber=3FwOffset[0]=0x00100098FwSize[0]=0x00070000FwOffset[1]=
0x00080098FwSize[1]=0x00080000FwOffset[2]=0x00000098FwSize[2]=0x00080000ulFirmwareOffset=0000c000 ulFlashOffset=0010c000
ulCompareSize = 00000080
ulFirmwareOffset=0007ff80 ulFlashOffset=0017ff80 ulCompareSize = 00000080
ulFirmwareOffset=0000c000 ulFlashOffset=0010c000 ulCompareSize = 00000080
ulFirmwareOffset=0007ff80 ulFlashOffset=0017ff80 ulCompareSize = 00000080
ulFirmwareOffset=0000c000 ulFlashOffset=0010c000 ulCompareSize = 00000080
ulFirmwareOffset=0006ff80 ulFlashOffset=0016ff80 ulCompareSize = 00000080
[UpdateLog]:[Slave#8][SerialNum=0x00520011][Old(EEPROM/SII)=0x02203805-20220802-D0-0000-20241008_060.000]
[New=PatriotSafetyMonitor_20241008_060.000_Gen3_D.mcb]
[Identical]
[UpdateLog]:Jobs : 9Skip : 9NoCompatibleFW : 0Updated : 0Update Failed : 0

Please reset the EtherCAT Slave.
Program terminated normally.

```

(c.) Close the window after viewing the result.

6.21.3.6 When the ESI and FW update processes are complete, the user may encounter the replaceability screen after powering up (as shown below). Select **SKIP**, complete the designated calibration processes, and synchronize the calibration data.



7. Control Box Disassembly /Assembly Control Box

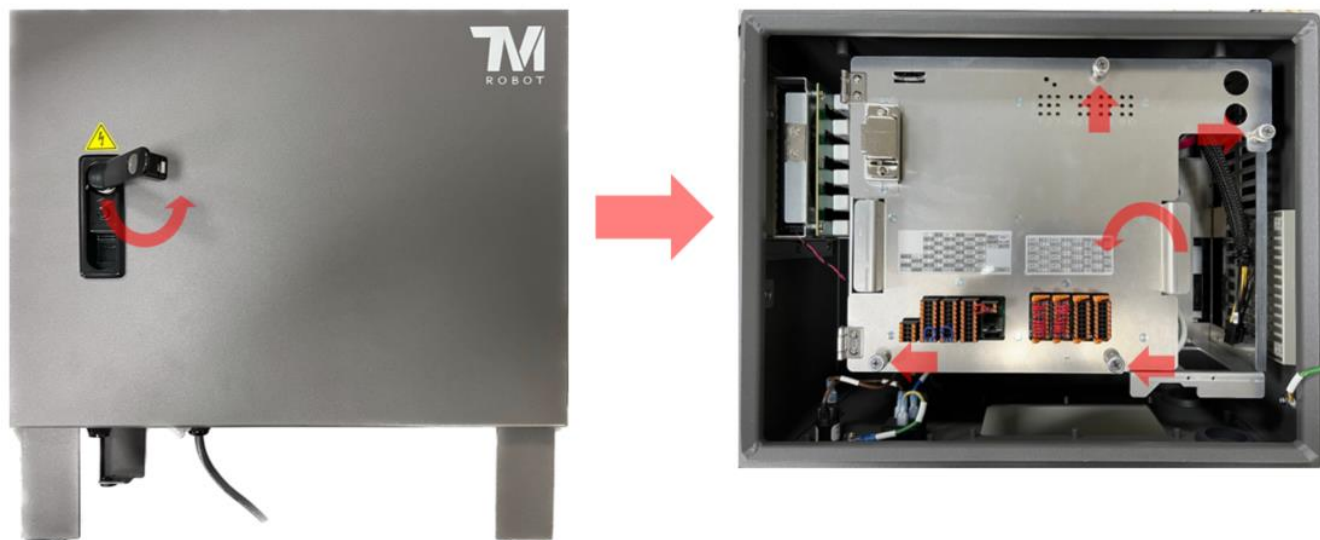
7.1 Quick maintenance guide

- 7.1.1 To ensure operational safety, at least two persons are required to collaborate in the disassembly process.
- 7.1.2 Before disassembly, place the control box on a soft surface (such as a blanket or sponge pad) for disassembly.
- 7.1.3 Before disassembly, take photos to record the status and wiring configuration. These photos will serve as reference points during the reassembly process.
- 7.1.4 Follow the right-hand rule when disassembling and installing screws.
- 7.1.5 When installing components, use a torque wrench to tighten the parts according to the torque specifications table below:

Torque specifications for Control board		
Item	torque value(Kgf.cm)	torque value(Nm)
IPC	6	0.6
Patriot power board	6	0.6
Relay board	6	0.6
Power eater board	6	0.6
PSU cable	10	0.98
PSU Bracket	14	1.37
SSD Bracket	14	1.37

7.2 Open the Control Box Outer Casing

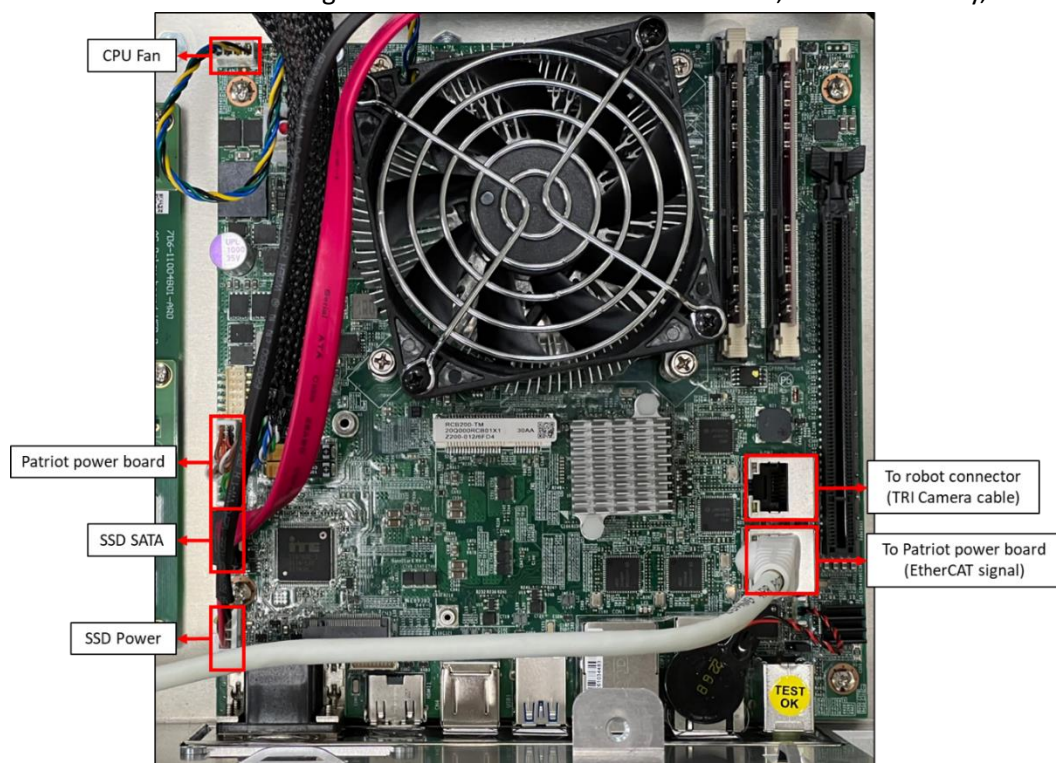
- 7.2.1 Before opening the outer casing of the control box, ensure that the control box is completely powered off, and disconnect the external power cord and robot cable.
- 7.2.2 Open the outer casing cover of the control box, loosen the four inner casing screws, and open the inner casing cover.



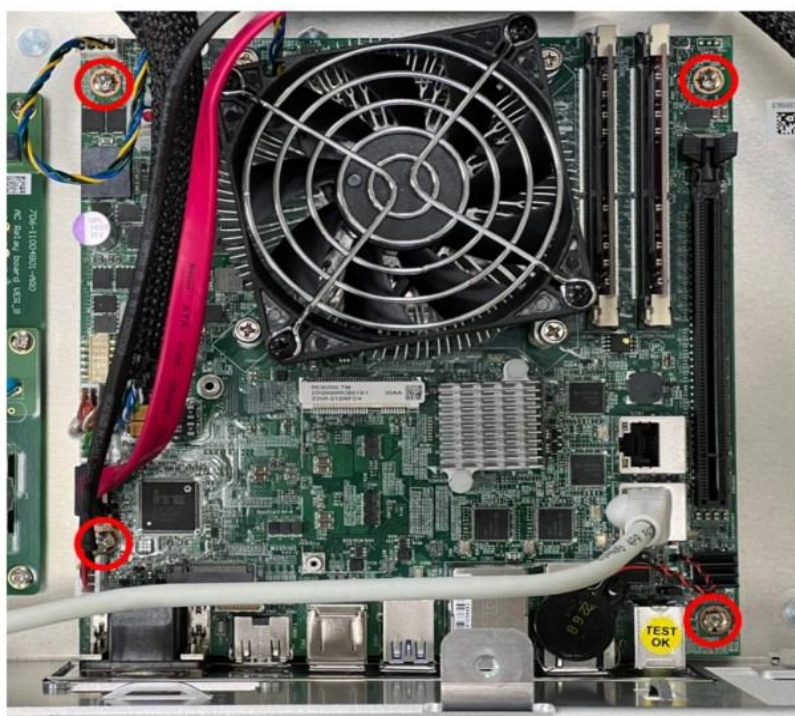
7.3 Disassembly/Assembly of IPC

7.3.1 Refer to "Open the Control Box Outer Casing" to open the outer casing cover and inner casing cover.

7.3.2 Refer to the diagram below to remove the connectors, and if necessary, cut cable ties.



7.3.1 Loosen the four screws securing the IPC.



7.3.1 During installation, follow the reverse steps of the above procedure. If cable ties were cut, secure the wires again in the original manner.

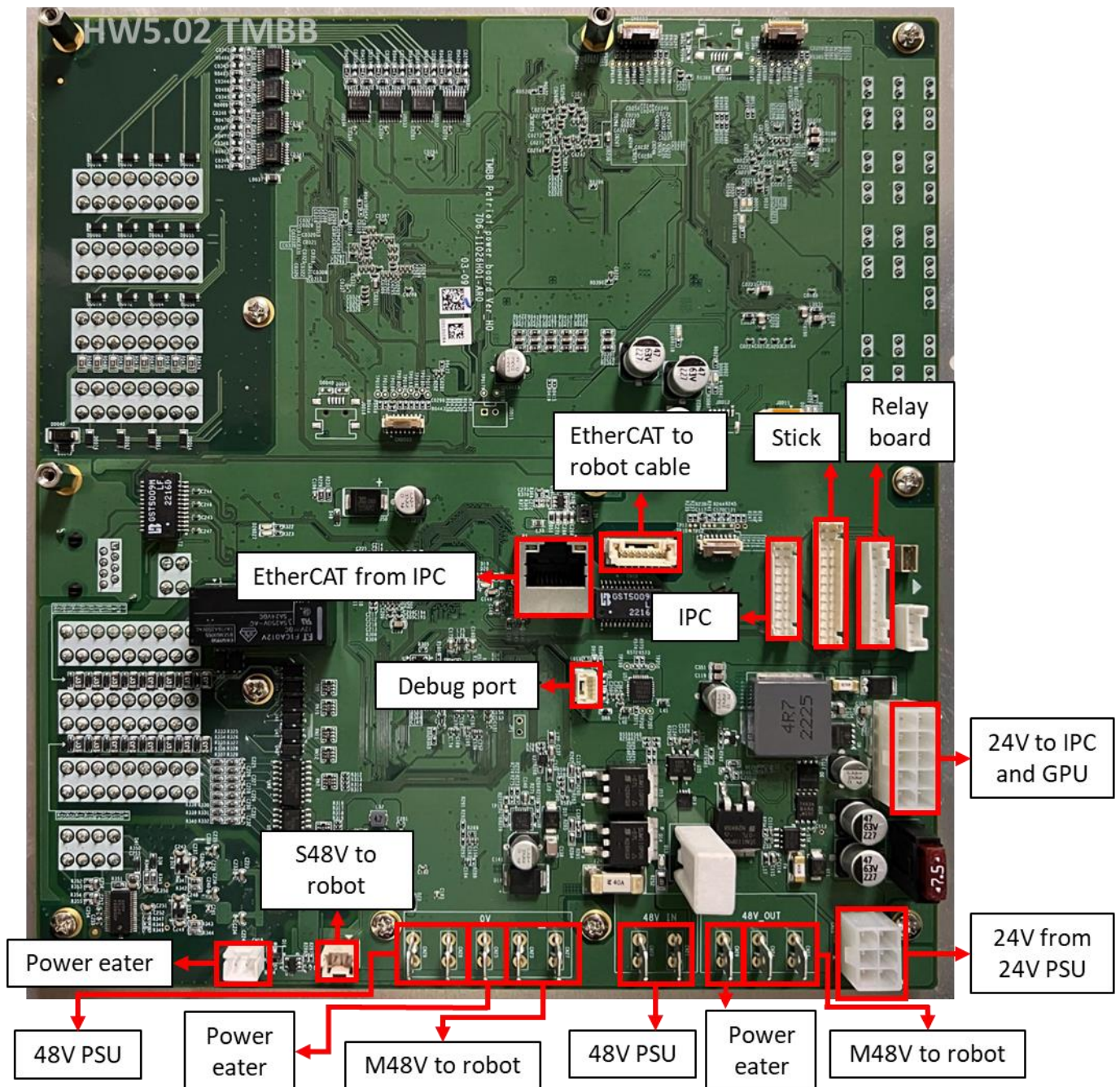
7.4 Disassembly/Assembly of the Patriot Power Board

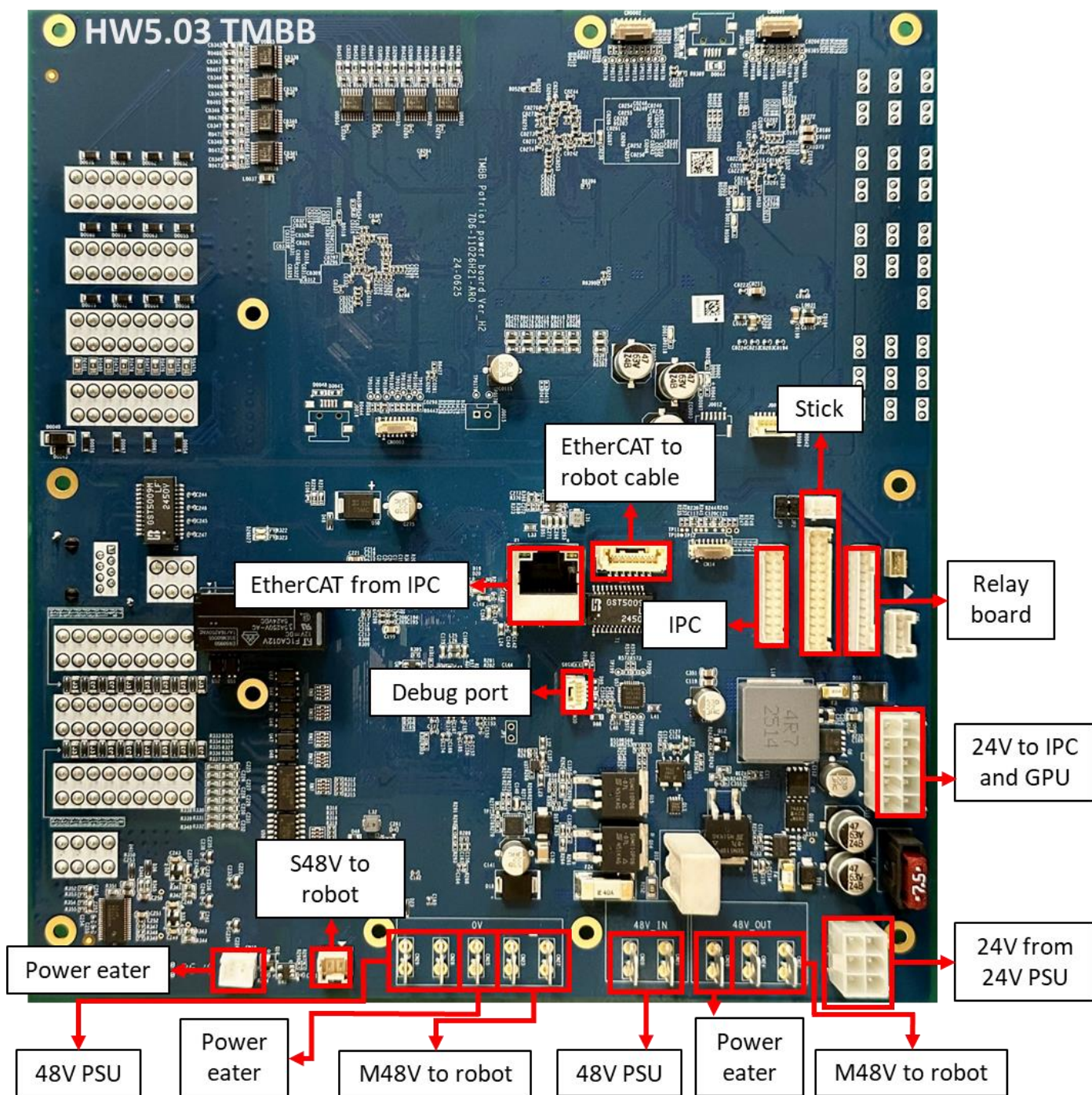


Caution: Replacing the Patriot power board will reset the Safety settings in the TM flow, please refer to the Safety settings section in the software manual for saving and recovery.

7.4.1 Refer to "Open the Control Box Outer Casing" to open the outer casing cover and inner casing cover.

7.4.2 Refer to the diagram below to remove the connectors, and if necessary, cut cable ties:

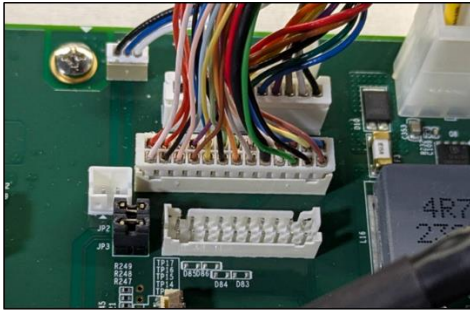




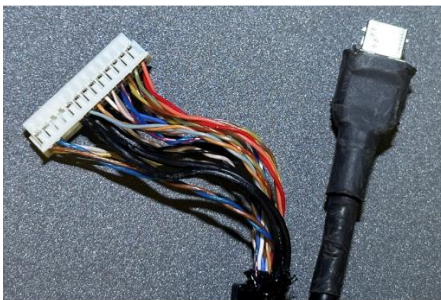
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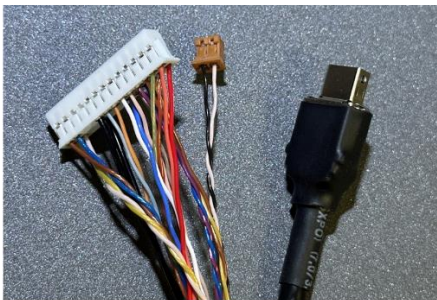
7.4.3 When an HW5.02 Stick is installed on an HW5.03 Patriot power board, the 2pins connectors shown below do not require any cable connections. (See Figure below)



HW5.02 Stick + HW5.03 Patriot power board

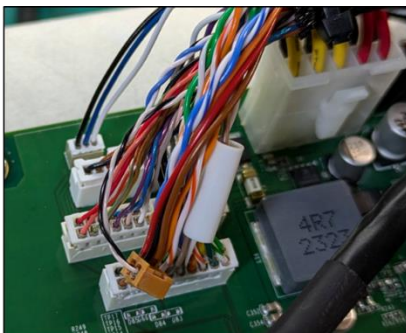


HW5.02 Stick connector



HW5.03 Stick connector

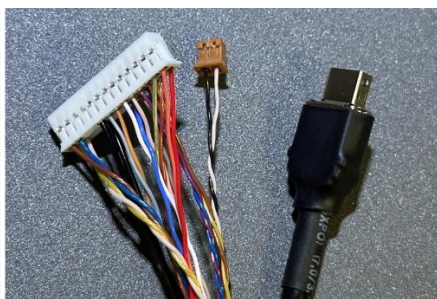
7.4.4 When an HW5.03 Stick is installed on an HW5.02 Patriot power board, the 2pins do not require any connector connections. (See Figure below)



HW5.03 Stick + HW5.02 Patriot power board

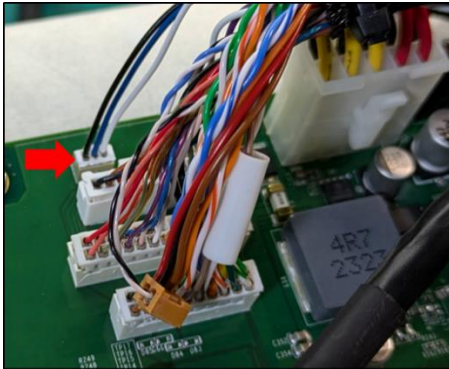


HW5.02 Stick connector



HW5.03 Stick connector

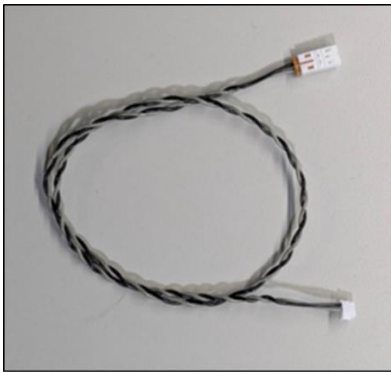
7.4.5 When using an HW5.03 Stick with an HW5.02 DC Patriot power board, the cable between the relay board (see Figure B) and the Patriot power board (see Figure A) must be replaced. Disconnect the existing cable from both the relay board and the Patriot power board, then connect the new cable from the Stick to the relay board. (see Figure C and D).



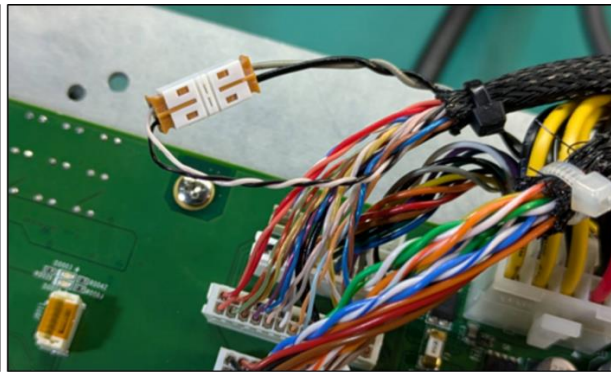
(A)



(B)

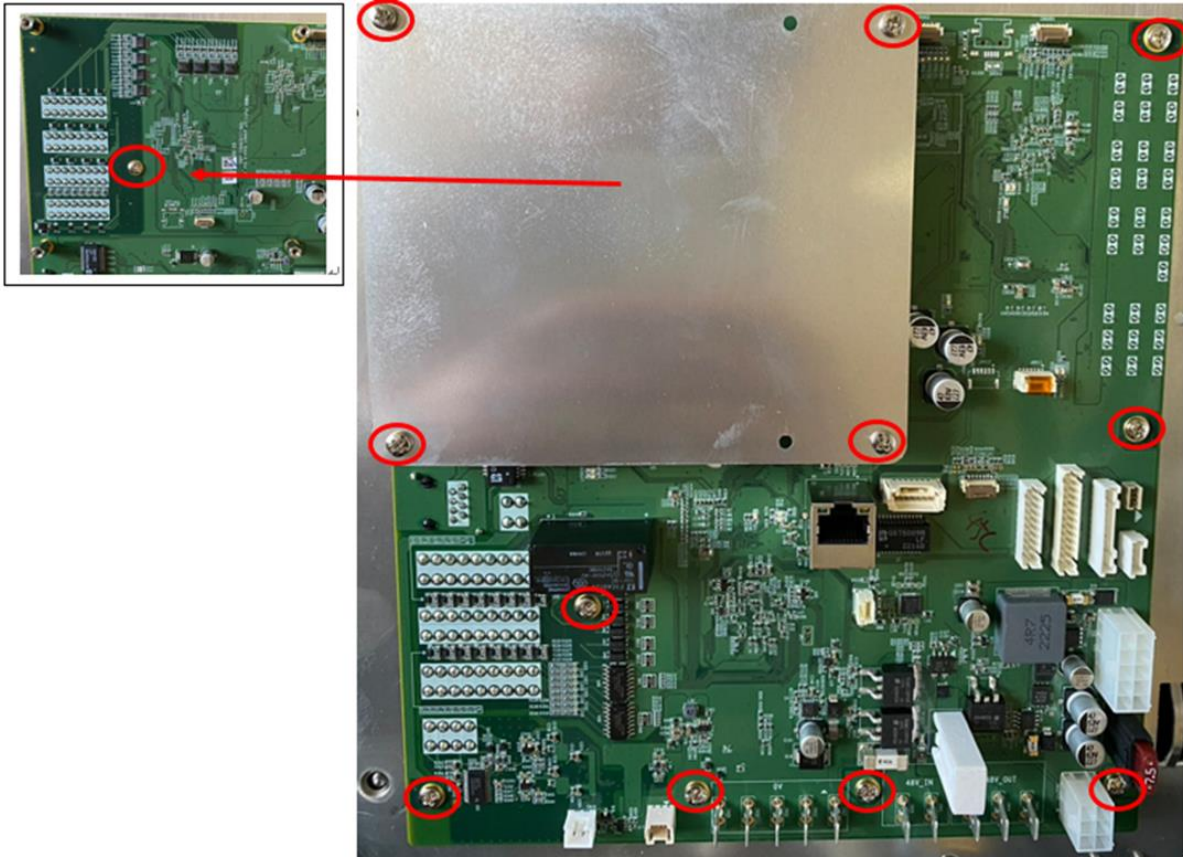


(C)



(D)

7.4.6 Loosen the 12 screws securing the Patriot Power Board.

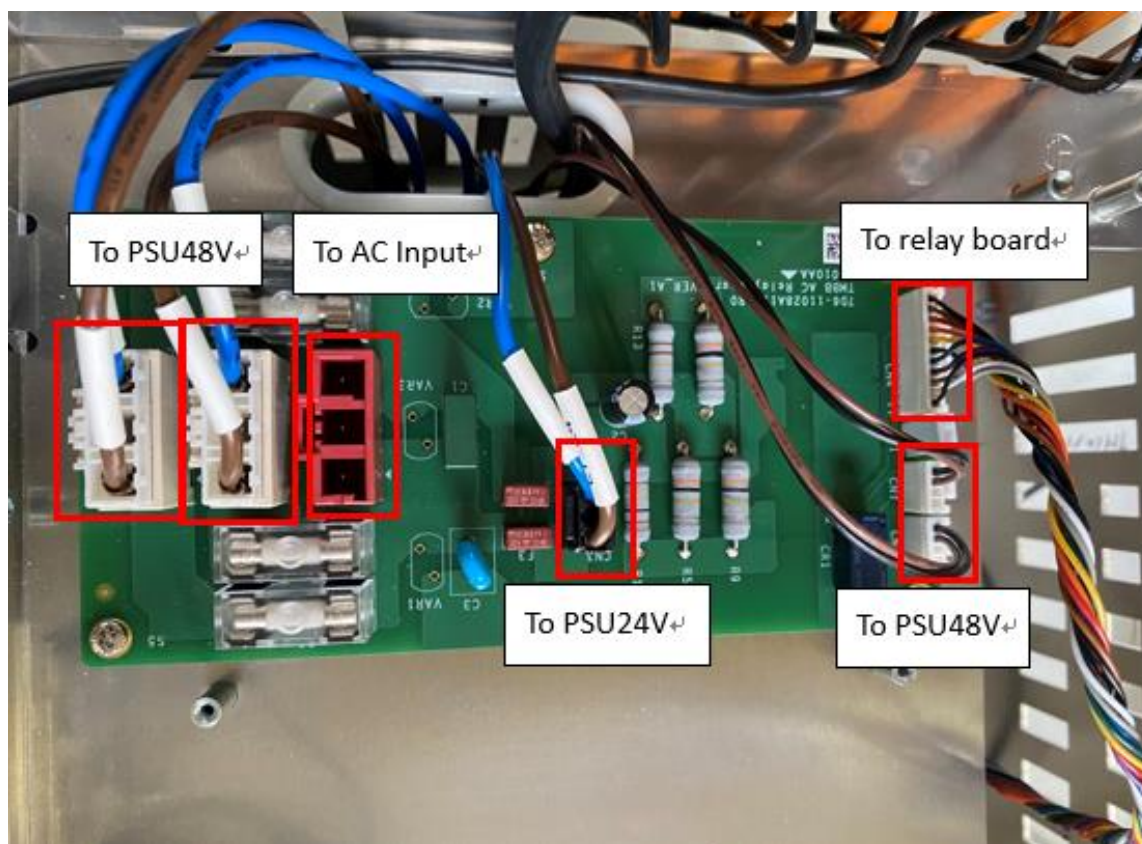


7.4.7 During installation, follow the reverse steps of the above procedure. If cable ties were cut, secure the wires again in the original manner

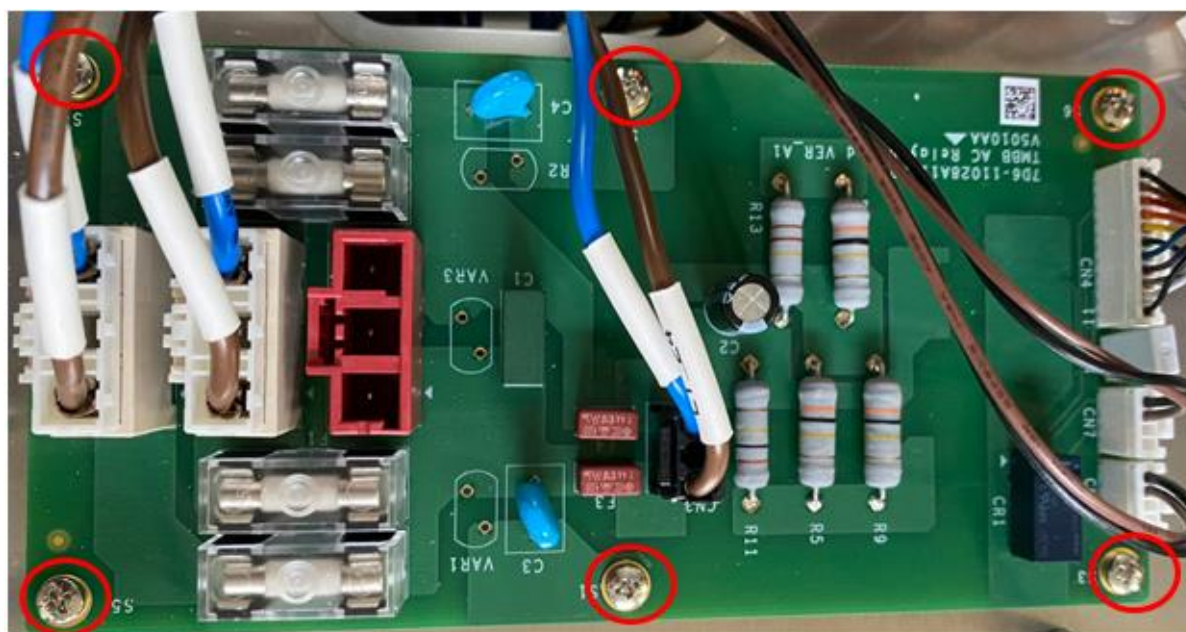
7.5 Disassembly/Assembly Relay board

7.5.1 Refer to "Open the Control Box Outer Casing" to open the outer casing cover and inner casing cover.

7.5.2 Refer to the diagram below to remove the connectors, and if necessary, cut cable ties



7.5.3 Loosen the 6 screws securing the Relay Board.



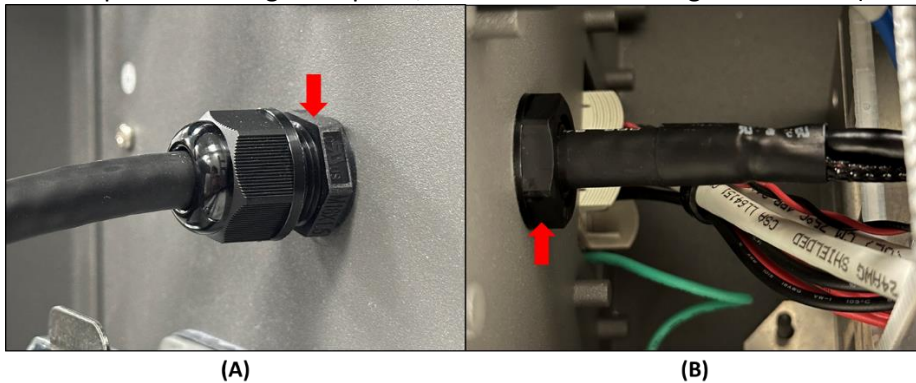
7.5.1 During installation, follow the reverse steps of the above procedure. If cable ties were cut, secure the wires again in the original manner

7.6 Disassembly/Assembly Stick

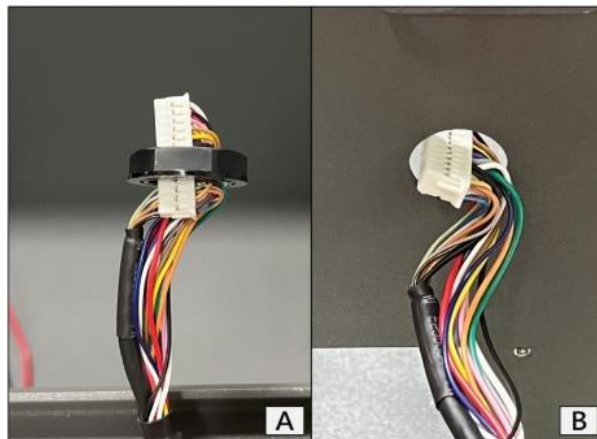
7.6.1 Refer to "Open the Control Box Outer Casing" to open the outer casing cover and inner casing cover

7.6.2 Disconnect the stick connector on patriot power board.

7.6.1 Using an adjustable spanner or long-nose pliers, hold the outer hexagonal locknut (see Figure A).
With another adjustable spanner or long-nose pliers, loosen the inner hexagonal locknut (see Figure B).



7.6.2 Gently bend the Stick connector and carefully thread it, in sequence, through the hexagonal locknut (see Figure A) and then through the control box (see Figure B) to remove the Stick.



7.6.1 During installation, follow the reverse steps of the above procedure. If cable ties were cut, secure the wires again in the original manner

7.7 Disassembly/Assembly of Robot Connector and Internal Composite Cable

7.7.1 Refer to "Open the Control Box Outer Casing" to open the outer casing cover and inner casing cover

7.7.2 Refer to "Disassembly/Assembly Patriot power board" to remove" Robot connector (Servo 48V)"

7.7.3 Refer to "Disassembly/Assembly Patriot power board" to remove" Robot connector (Motor 48V)".

7.7.4 Refer to "Disassembly/Assembly Patriot power board" to remove" Robot connector (EtherCAT).

7.7.5 Refer to "Disassembly/Assembly IPC" to remove" Robot connector (Camera).

7.7.6 Remove the grounding wire as shown in the diagram below.



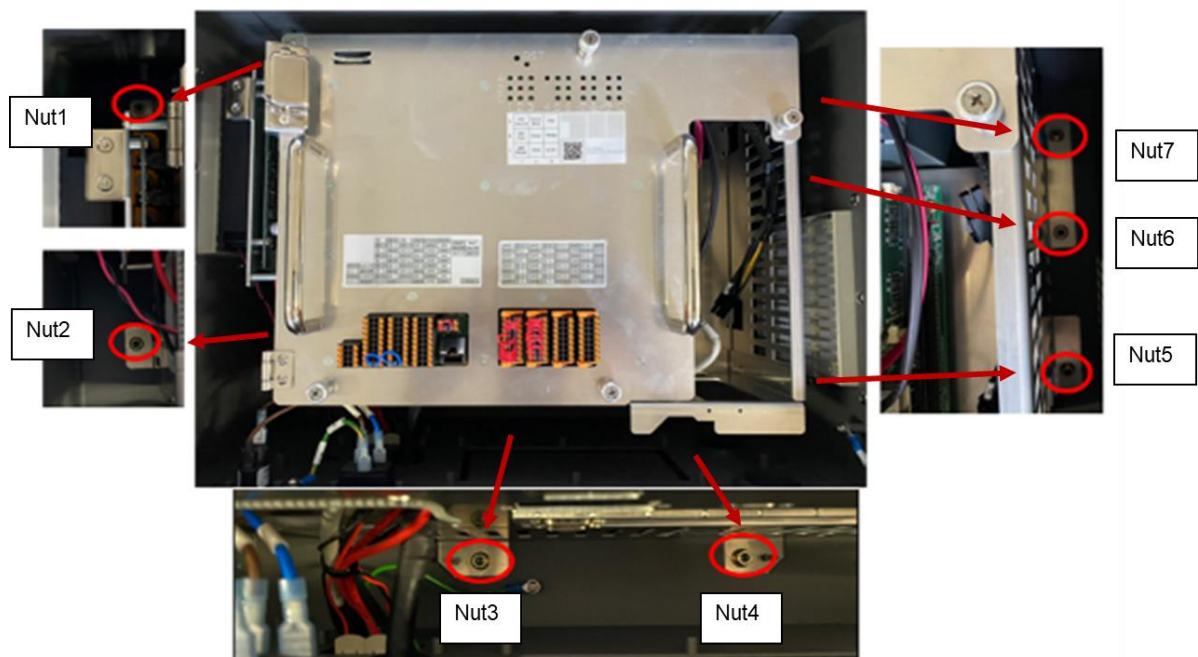
7.7.7 Remove the four Robot connector screws shown in the diagram and take out the internal composite cable



7.7.8 During installation, follow the reverse steps of the above procedure. If cable ties were cut, secure the wires again in the original manner

7.8 Disassembly/Assembly of Inner Casing

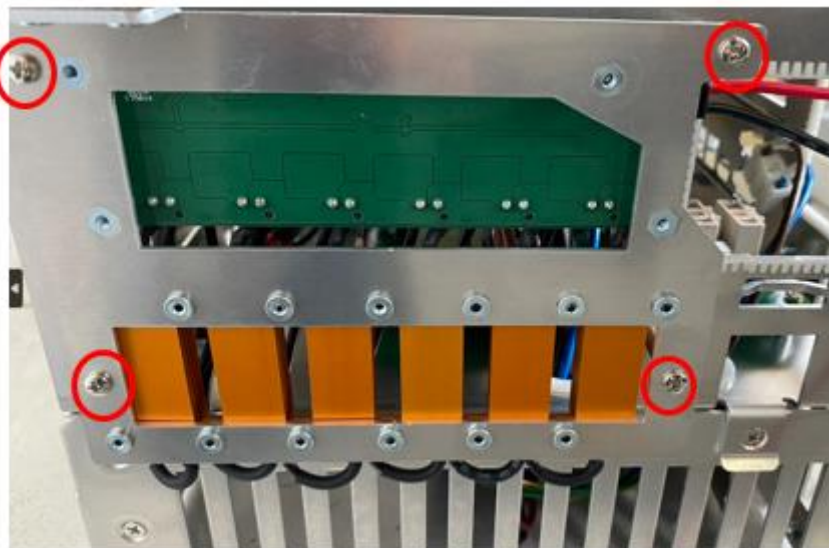
- 7.8.1 Refer to "Open the Control Box Outer Casing" to open the outer casing cover and inner casing cover
- 7.8.2 Refer to "Disassembly/Assembly of Robot Connector and Internal Composite Cable" to remove the Robot connector and internal composite cable.
- 7.8.3 Refer to "Disassembly/Assembly of the Patriot Power Board" to remove the "To Power eater board B" connector.
- 7.8.4 Refer to "Disassembly/Assembly of the Patriot Power Board" to remove the "To Power eater board B" connector.
- 7.8.5 Refer to "Disassembly/Assembly of the Patriot Power Board" to remove the "To Control box fan" connector.
- 7.8.6 Refer to "Disassembly/Assembly of the Relay Board" to remove the "From external power (AC IN)" connector.
- 7.8.7 Refer to the diagram below to remove the 7 inner casing securing nuts and take out the inner casing.
- 7.8.8 During installation, follow the reverse steps of the above procedure. If cable ties were cut, secure the wires again in the original manner



7.9 Disassembly/Assembly Power eater board

7.9.1 Refer to "Disassembly/Assembly of Inner Casing" to remove the inner casing

7.9.2 Refer to the diagram below to remove the connectors "To Patriot power board A" and "To Patriot power board B". After removing the four securing screws, take out the Power Eater Board.

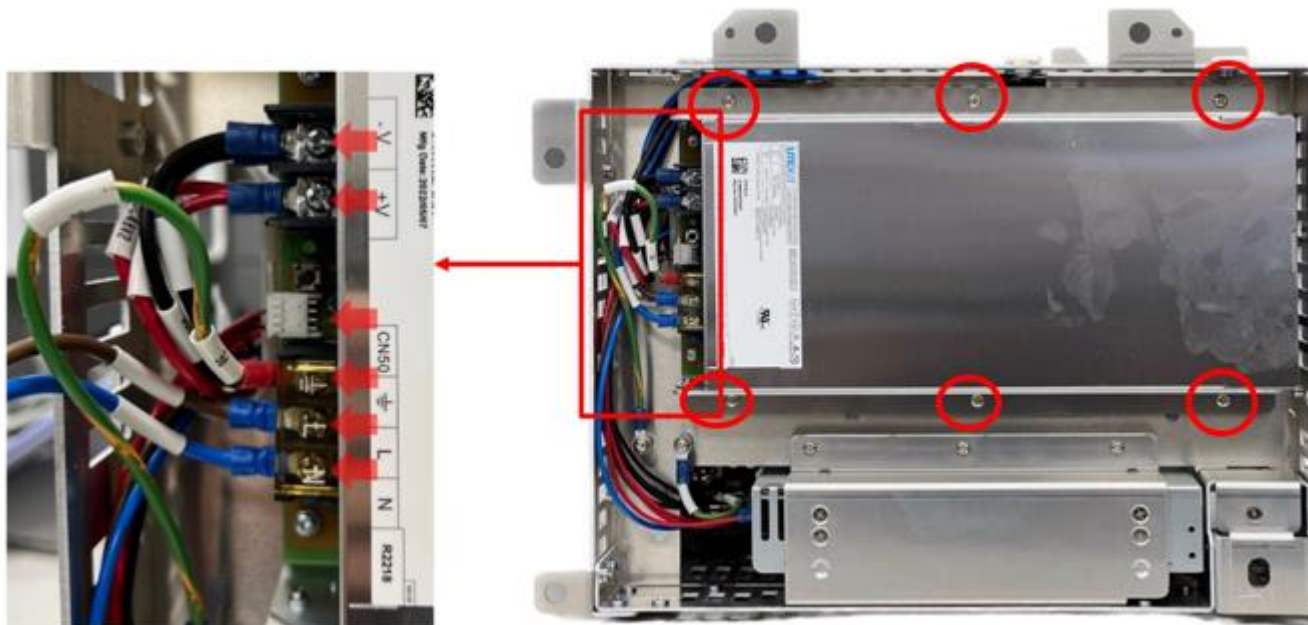


7.9.3 During installation, follow the reverse steps of the above procedure. If cable ties were cut, secure the wires again in the original manner.

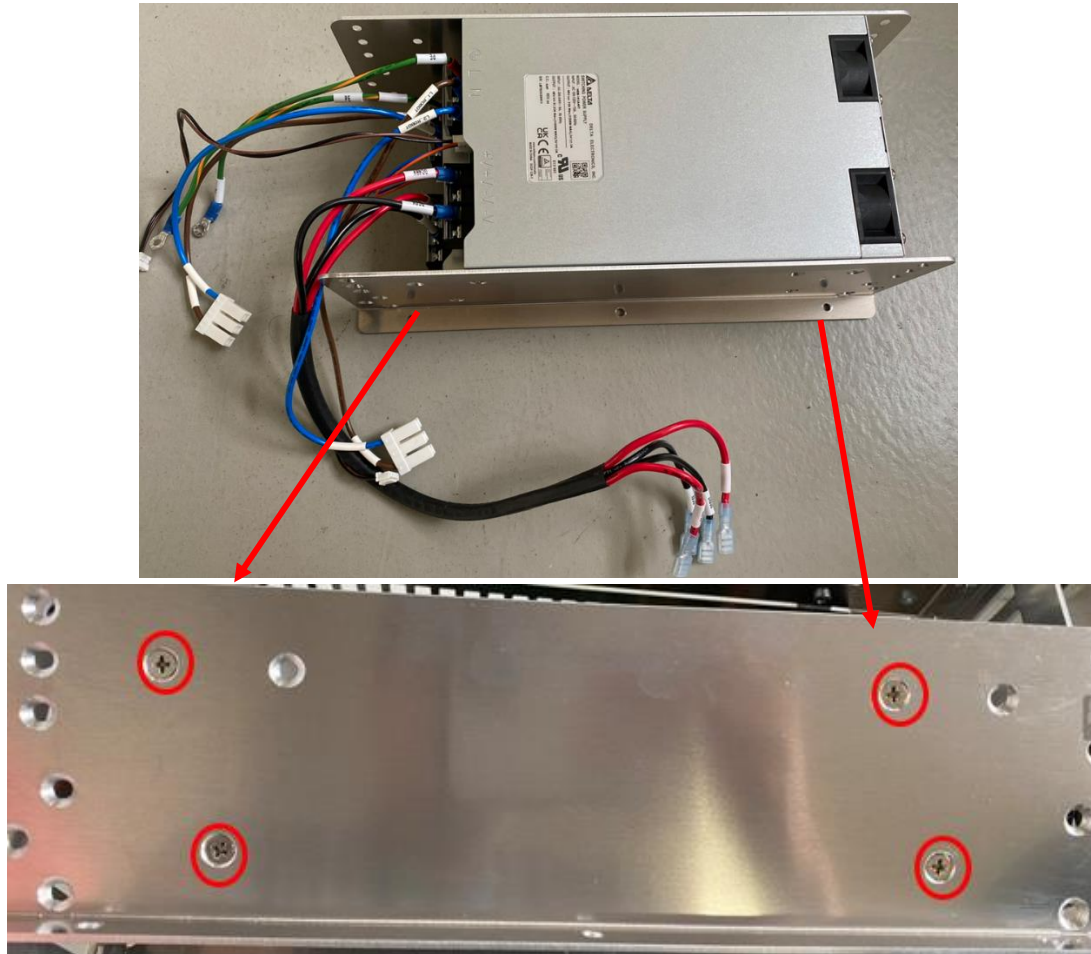
7.10 Disassembly/Assembly of 48V PSU (Two 48V PSU inside the TM25S control box)

7.10.1 Refer to "Disassembly/Assembly of Inner Casing" to remove the inner casing.

7.10.2 Refer to the diagram below to disconnect the wiring.



7.10.1 Refer to the diagram below to remove the six securing screws and take out the 48V PSU with the bracket.



7.10.2 Refer to the diagram above to remove the four securing screws and take out the 48V PSU with the bracket.

7.10.3 During installation, reverse the above steps. If cable ties were cut, reattach the cables using the original securing method.

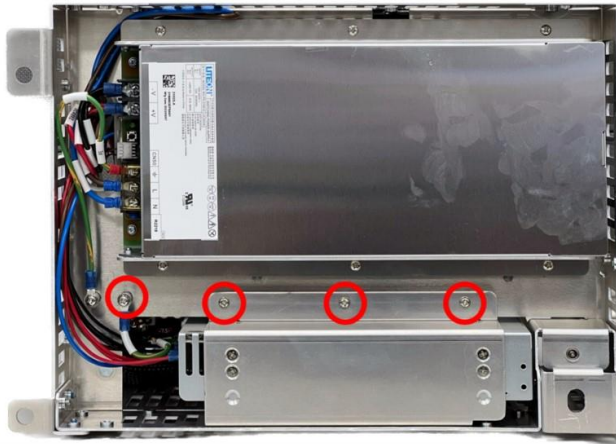
7.11 Disassembly/Assembly 24V PSU

7.11.1 Refer to "Disassembly/Assembly of Inner Casing" to remove the inner casing.

7.11.2 Refer to the diagram below to remove the two securing screws.



7.11.1 Refer to the diagram below to remove the four securing screws and one grounding wire screw.



7.11.1 Refer to the diagram below to disconnect the wiring and take out the 24V PSU with the bracket.



7.11.1 Refer to the diagram below to remove the six bracket securing screws and take out the 24V PSU.



7.11.2 During installation, follow the reverse steps of the above procedure. If cable ties were cut, secure the wires again in the original manner

7.12 Disassembly/Assembly of Filter

7.12.1 Slide the tray upward along the tray slide to remove it

7.12.2 Remove the filter and replace it with a new one.



7.12.3 Reinstall the tray.

8. Indication Light

8.1 Power board Light Indication

LED Position



LED Position Corresponding Function

A	24V Source	Heart-beat	PW!
B	48V PSU	Error	Temp!
C	48V Mode	STO!	ECAT!
	1	2	3

LED Position	LED Name	LED Status Description
A1	24V Source	Off = External 24V
		On = Internal 24V
		100ms/100ms Rapid Blink = Internal 24V Error
		500ms/500ms Blink = Internal 24V Current Exceeded
B1	48V PSU	Off = PSU off
		On = (Reserved)
		500ms/500ms Blink = PSU on
C1	48V Mode	Off = 48V off
		On = Normal Mode
		500ms/500ms Blink = Limit Mode
A2	Heartbeat	Off = FW Stuck or Abnormal Protection Pause
		On = FW Stuck
		500ms/500ms Blink = Running
B2	Error	Off = Normal
		100ms/100ms Rapid Blink = ESC Not Ready
		500ms/500ms Blink = Abnormal Protection Pause
		Coding = Error code (Reserved)
C2	STO Alarm	Off = Normal
		On = STO (ESM<OP)
		100ms/100ms Rapid Blink = STO (Low Voltage)
		500ms/500ms Blink = STO (Patriot Act.)
A3	Power Alarm	Off = Normal
		On = 48V & 24V Warning
		100ms/100ms Rapid Blink = 48V Warning
		500ms/500ms Blink = 24V Warning
B3	Temperature Alarm	Off = Normal
		On = PCB & Eater Warning
		100ms/100ms Rapid Blink = PCB Warning
		500ms/500ms Blink = Eater Warning
C3	EtherCAT Alarm	Off = Normal
		On = Packet Loss Warning
		100ms/100ms Rapid Blink = InvalidFrame or RxErr or PUErr counted
		500ms/500ms Blink = PDIErr counted
		1000ms/1000ms Slow Blink = Forwarded RxERR counted

8.2 End module Indication Light Ring

8.2.1 Special Light Indication

Initializing:	Alternating between Red and Light Off equally
Power On with STO status:	Failed to finish booting up and Light Off (Buzzer no beep)
Power On with SOS status:	Finished booting up and the light indicated as the tables below.
Robot in STO status:	Light Off (Buzzer no beep)
Robot in SOS status:	Light indicated as the tables below.
Updating:	Alternating between Red and Light Off equally (at doubled speed)
Fatal Error(Need to re-boot):	Solid Red Light (Buzzer emits a long beep)

NOTE:

STO (Safe Torque Off)* status condition includes:

1. Category 0 Stop.
2. Category 1 Stop.
3. Emergency Stop function input LOW signal.

SOS (Safe Operation Stop)* status condition includes:

1. Safeguard function Input LOW signal.
2. Enabling Switch function at OFF Status.
3. Under safety configuration status of either safety-related parameters parameterization, Robot Stick MODE Switch function or Enable/Disable of Robot Stick function.

Refer to *Safety Manual* for details.

*Both names come from IEC 61800-5-2

NOTE:

The different Light Indication of HW3.2 here are:

AUTO Mode: Blue

Recovery Mode: (Not provided in HW3.2)

Maintenance Setting: White

8.2.2 Regular Light Indication

The regular Light Indication alternates between 2 categories of light indication: Operation Mode Light Indication and Auxiliary Light Indication. The blinking ratio of the light indications indicates the various status of the robot. In addition, the display color of Auxiliary Light Indication prioritizes by conditions.

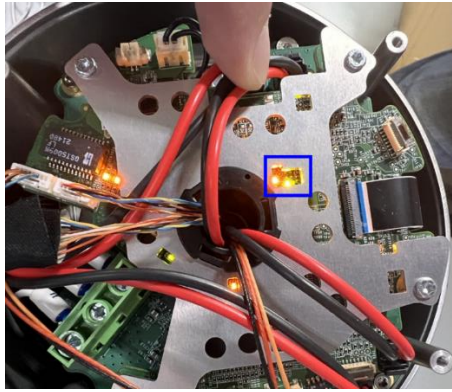
Operation Mode	Running status	Space/Status	Operation Mode Light Indication	Auxiliary Light Indication
MANUAL MODE	Hold to Run or Step Run	Normal	Green (100%)	-
		Error	Green (50%)	Red (50%)
		In Recovery Mode	Green (50%)	Yellow (50%)
		Trigger Maintenance Settings	Green (90%)	Blue (10%)
		Trigger Human-Machine Safety Settings	Green (90%)	Purple (10%)
	Project is running	Normal	Green (50%)	Light Off (50%)
		Error	Green (50%)	Red (50%)
		In Recovery Mode	Green (50%)	Yellow (50%)
		Trigger Maintenance	Green (50%)	Blue (50%)
Operation	Running status	Space/Status	Operation Mode	Auxiliary Light

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Mode			Light Indication		Indication
		Settings			
		Trigger Human-Machine Safety Settings	Green (50%)	Purple (50%)	
	System under SOS status	Normal	Green (10%)	Light Off (90%)	
		Error	Green (50%)	Red (50%)	
		In Recovery Mode	Green (50%)	Yellow (50%)	
		Trigger Maintenance Settings	Green (10%)	Blue (90%)	
		Trigger Human-Machine Safety Settings	Green (10%)	Purple (90%)	
AUTO MODE	Project is not running	Normal	White (100%)	-	
		Error	White (50%)	Red (50%)	
		In Recovery Mode	White (50%)	Yellow (50%)	
		Trigger Maintenance Settings	White (90%)	Blue (10%)	
		Trigger Human-Machine Safety Settings	White (90%)	Purple (10%)	
	Project is running	Normal	White (50%)	Light Off (50%)	
		Error	White (50%)	Red (50%)	
		In Recovery Mode	White (50%)	Yellow (50%)	
		Trigger Maintenance Settings	White (50%)	Blue (50%)	
		Trigger Human-Machine Safety Settings	White (50%)	Purple (50%)	
	Paused in Project or system under SOS status	Normal	White (10%)	Light Off (90%)	
		Error	White (50%)	Red (50%)	
		In Recovery Mode	White (50%)	Yellow (50%)	
		Trigger Maintenance Settings	White (10%)	Blue (90%)	
		Trigger Human-Machine Safety Settings	White (10%)	Purple (90%)	

8.3 Joint LED Indication



LED Indicator Locations on the Arm Mainboard Assembly

Status		Servo LED (Green)	Error LED (Red)
MCU power on		NA	NA
Error		Error Slow Blink (Refer to the explanation below)	Flashes with Error code (Refer to the explanation below)
FW integrity Fail	Bootstrap	Flashes: Off/On (0.042/0.042 sec)	FW integrity Fail
	Failsafe	Flashes: Off/On (0.168/0.168 sec)	Always On
Without FW		Never On	Never On
Servo on		Fast Blink	Never On
Servo off		Slow Blink	Never On

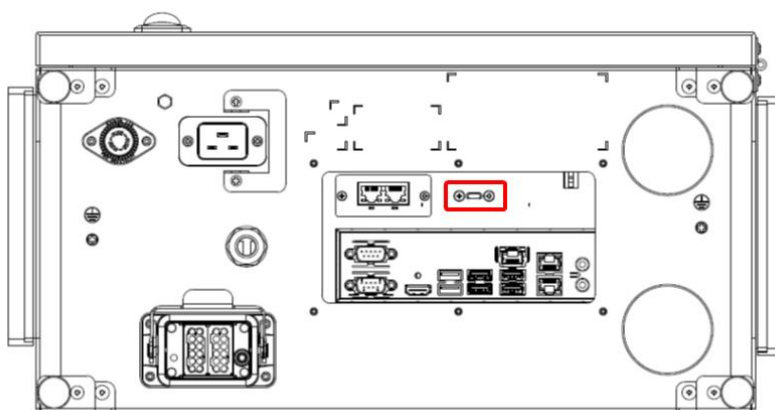
9. Other Software for support functions

9.1 Debug port

9.1.1 Tool list

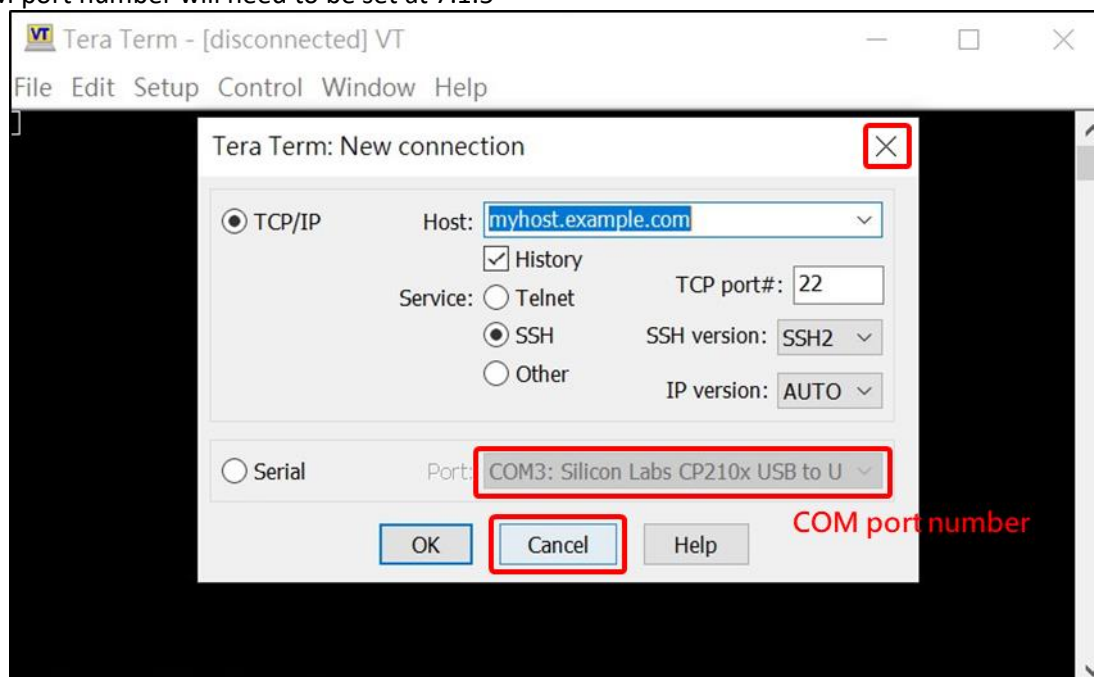
Item	Description
Laptop	Used for installing Tera term and CP2102 driver
USB cable	Used for connecting control box and laptop. Type C to Type A is recommended *Need data transfer function
CP2102 *Software	To ensure that the laptop correctly detects the debug port Recommended download link: https://www.silabs.com/developers/usb-to-uart-bridge-vcp-drivers?tab=downloads
Tera term *Software	Used for establishing the connection and displaying the information Recommended download link: https://ttssh2.osdn.jp/index.html.en

9.1.2 Power up the control box and connect it to the laptop by using a USB cable.

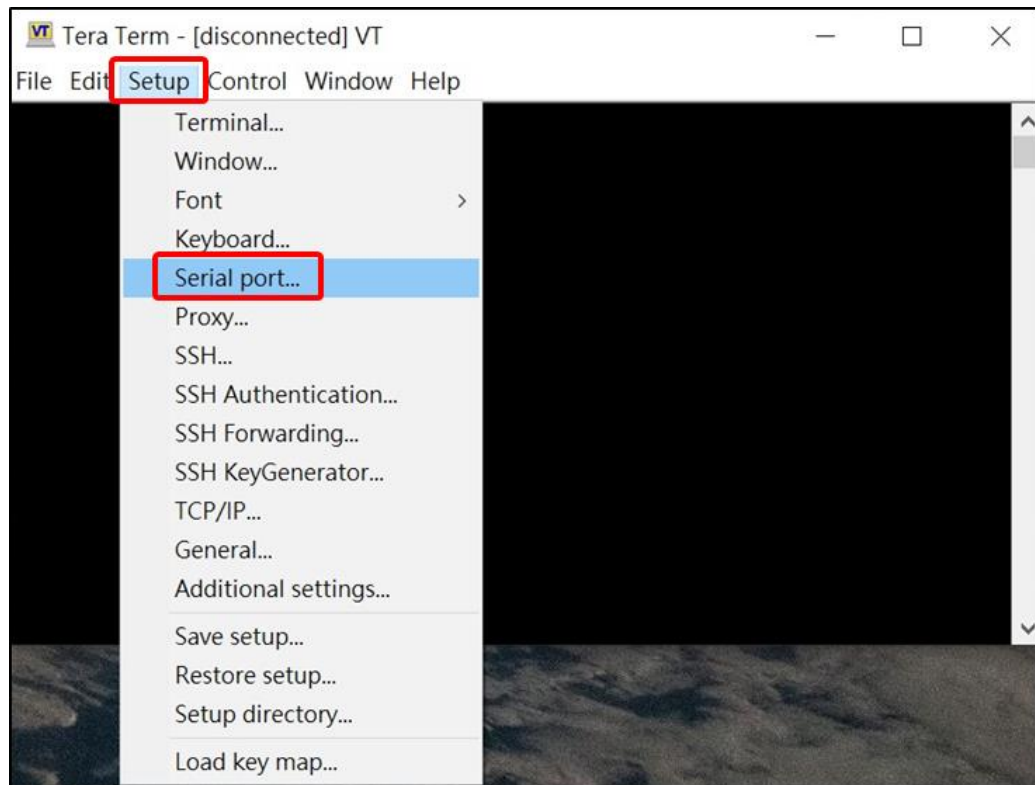


9.1.3 Activate Tera Term and then close the pop-up window by selecting "Cancel" or "Close"

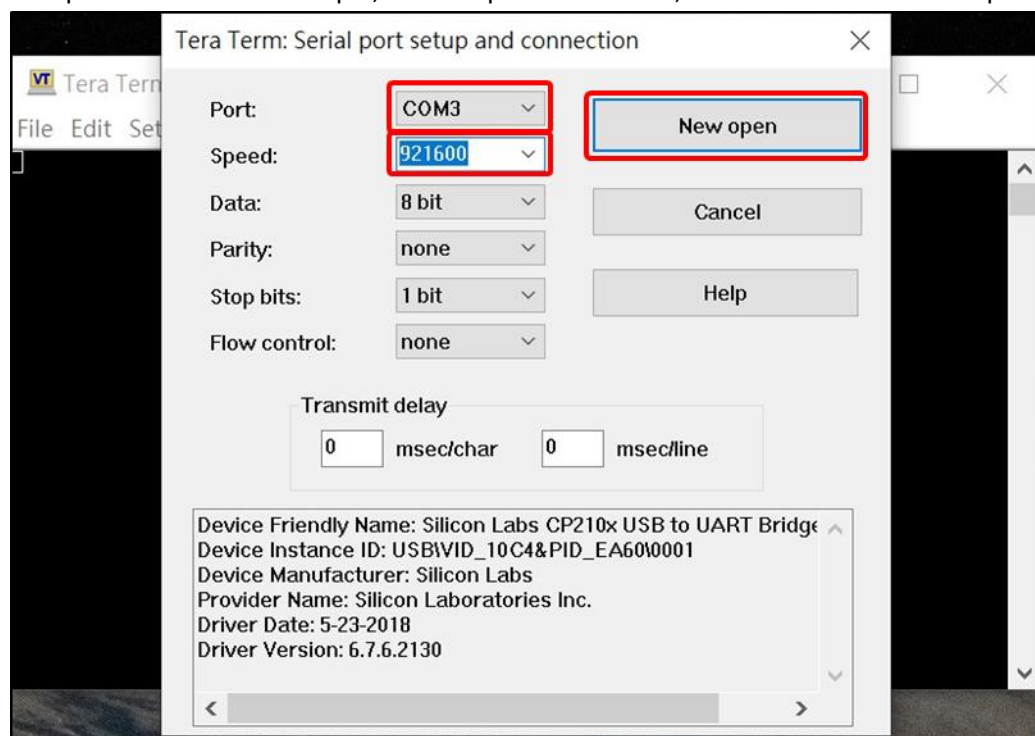
*The COM port number will need to be set at 7.1.5



9.1.4 Choose "Setup" and then select "Serial Port"



9.1.5 Choose the port as indicated in step 2; set the speed to 921600, and then click on "New open"



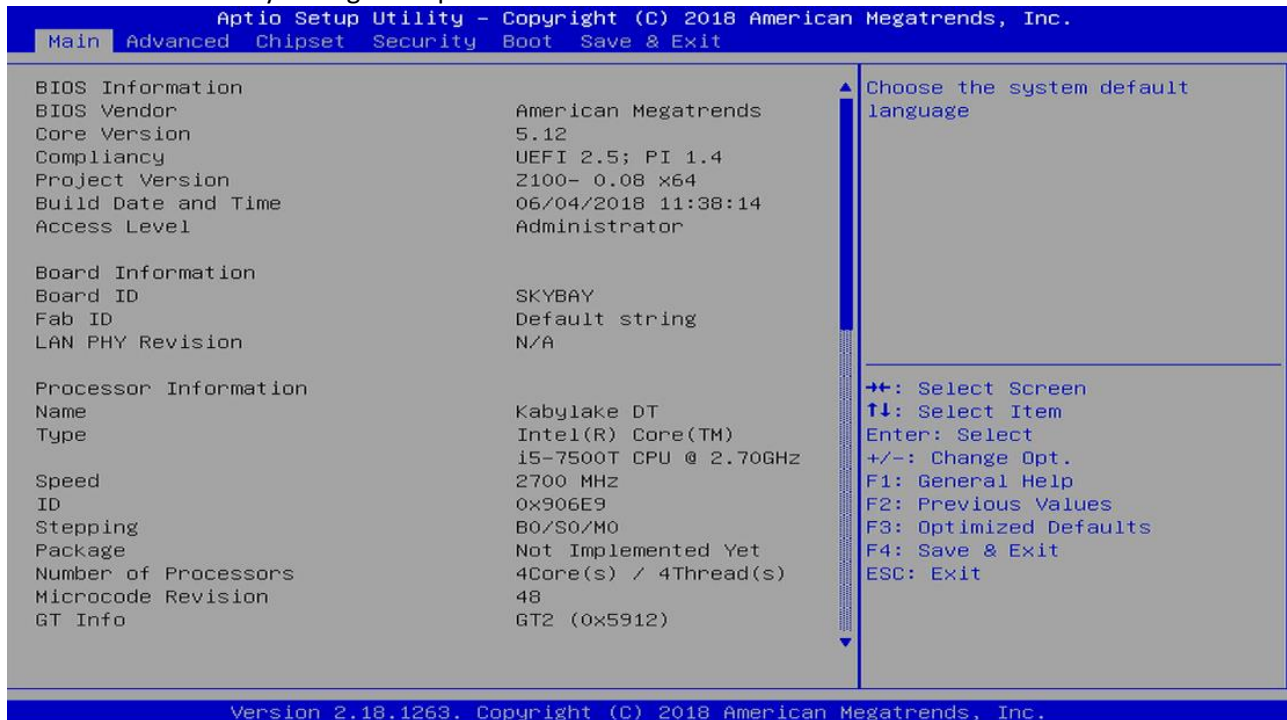
9.1.6 Following screen indicates a successful connection.

```
COM3 - Tera Term VT
File Edit Setup Control Window Help
=== Techman Robot status console ===
Model = IMB (0x02) AC 220V (max 30.000000A)
H/W = 20230301-G5.Hx.0 PID = 0x02081E20
F/W = 20230717-040.0.0 Date = Jul 17 2023
ESC Status :----P0-P1-P2-P3----- ESW
          IF 00 00 00 00 | PU      Init
          RxE 00 00 00 00 | 00     Pre-OP
          FRxE 00 00 00 00 | PDI   Safe-OP
          LL 00 00 00 00 | 00     OP
POWER key : OFF ON
Peripheral Comm. Status : ESC ADC DAC1 DAC2 EEPROM
FAN state : OFF ON
48V Power Status : +exPSU PSU on Limited Full
PSU voltage = 48.252895 V(1st), 47.871837 V(2nd)
ST0 voltage = 0.084678 V Patriot not ready
m48 voltage = 0.155244 V
m48 current = -0.166500 A
s48 voltage = 48.000000 V
s48 current = 0.032351 A
24V Power Status : Internal External
IPC voltage = 24.232601 V
i24 current = 0.030689 A
s24 current = 1.647949 A
Temperature = 34.413806 C
Configurable Digital I/O : Normal Configured Mask = 00000000
Digital Output[15..0] = 0000 (.... ..) enabled
Digital Input[15..0] = 0000 (.... ..) Input filter : disabled
Analog Output[0] = 0000 ( 0.000000 V) enabled ---->
Analog Output[1] = 0000 ( 0.000000 V) enabled ---->
Analog Input[0] = 7FF8 (-0.002656 V)
Analog Input[1] = 8000 (-0.000156 V)
Analog Input[2] = 8001 (-0.000781 V) <-----+
Analog Input[3] = 8000 ( 0.000156 V) <-----+
--- INFORMATION list ---
--- CAUTION list ---
--- WARNING list ---
=== End ===
```

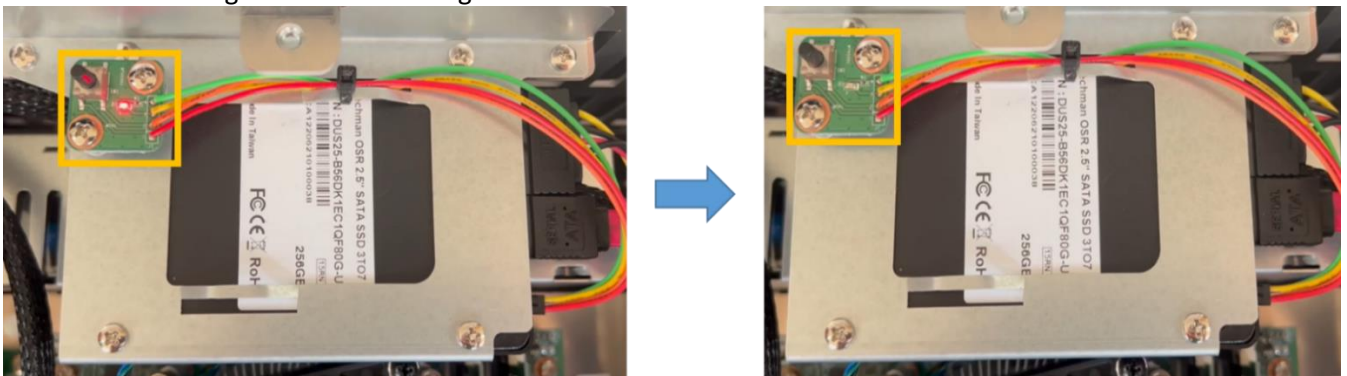

9.2 System recovery

9.2.1 This function is used to restore Disk C to the factory settings, while Disk D (e.g., projects, HMI configurations, etc.) will remain unchanged.

9.2.1 Press the Del key during startup to enter the BIOS.



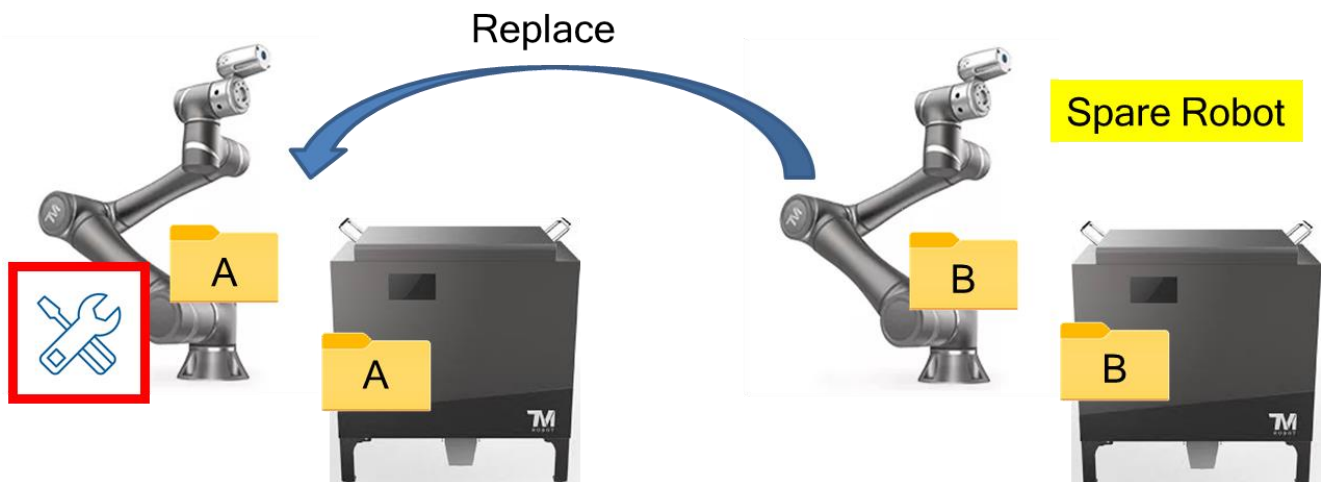
9.2.1 Open the outer casing of the control box, and press and hold the black button on the SSD for more than 5 seconds. The red light will start flashing



9.2.1 After waiting for 15 minutes, the system will complete the restoration, and the red light will become steady. Once the red light is steady, you can exit the BIOS, restart the system, and Disk C will be restored to its factory state.



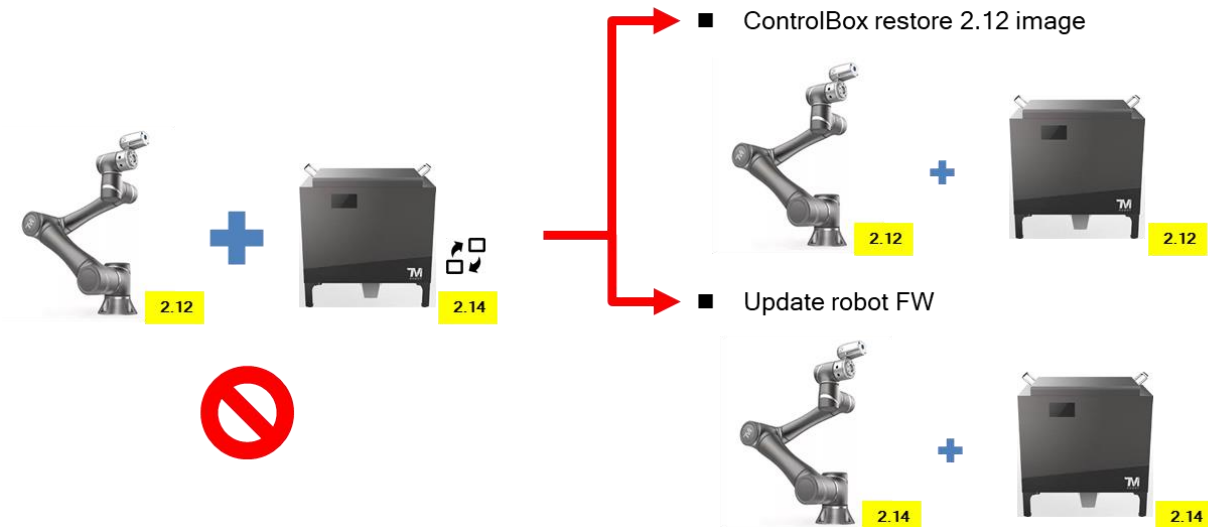
9.3 Arm Exchange: This function is designed for situations where either the arm or the control box experiences abnormalities. In cases of urgency, where the customer needs to quickly resume production on the assembly line, arm exchange can be performed to avoid production line downtime. As illustrated below, if Arm A is damaged, this feature facilitates the exchange of Arm A with the available Arm B in stock, enabling the production line to continue operations.



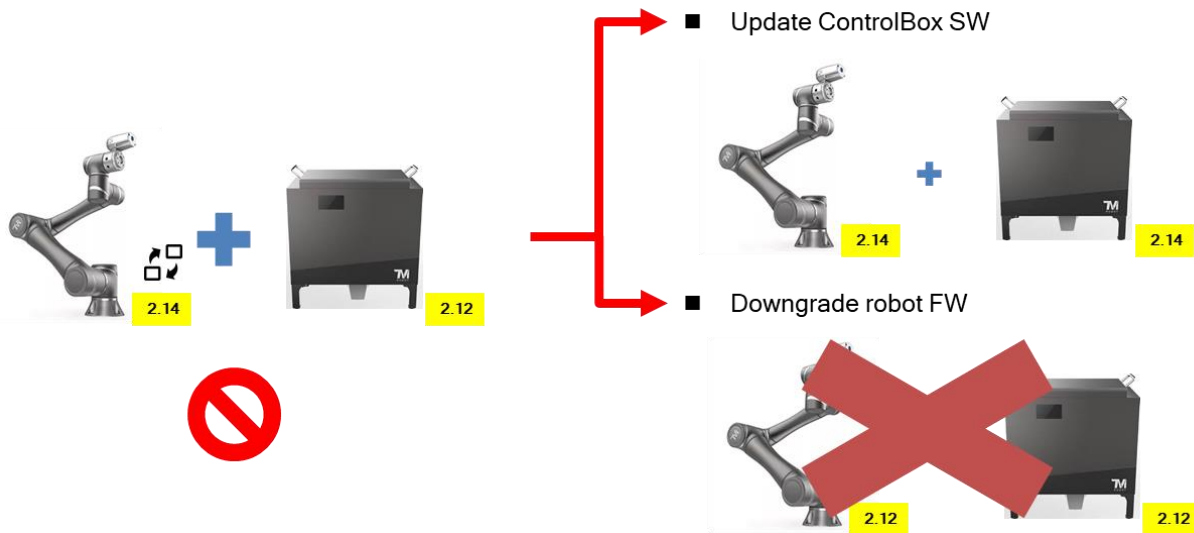
9.3.1 Remove the malfunctioning arm and directly connect the spare arm to the original control box. The calibration data stored in the arm's IO board will overwrite the data in the original control box, so it's crucial to back up the files in the original control box. The software will check whether the data between the arm and control box matches.

The following scenarios will explain the handling when the arm firmware (FW) does not match the control box HMI.

9.3.2 If the arm FW is version 2.12 but the spare control box's HMI version is 2.14, the user can choose to restore the control box's HMI image to version 2.12 or upgrade the arm FW to version 2.14.

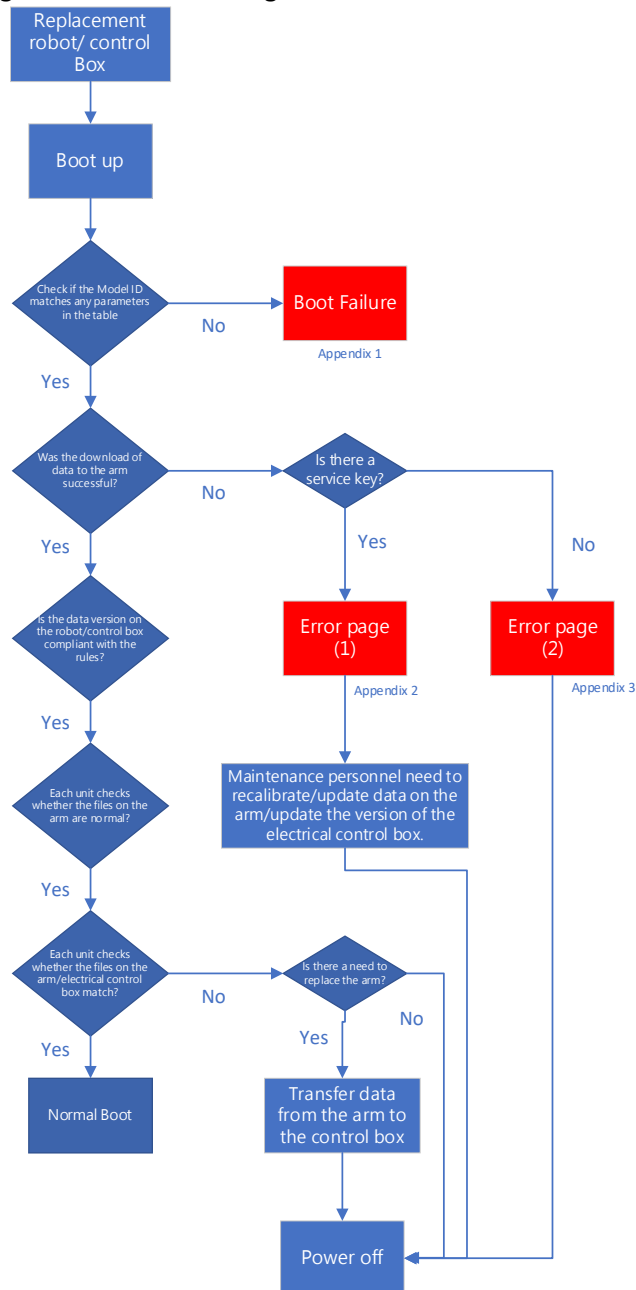


9.3.1 Joint type When the arm FW is version 2.14, but the spare control box's HMI version is 2.12, the user can only upgrade the control box's HMI to match the FW. The main reason is that older versions of software or firmware may not recognize the new Joint type.

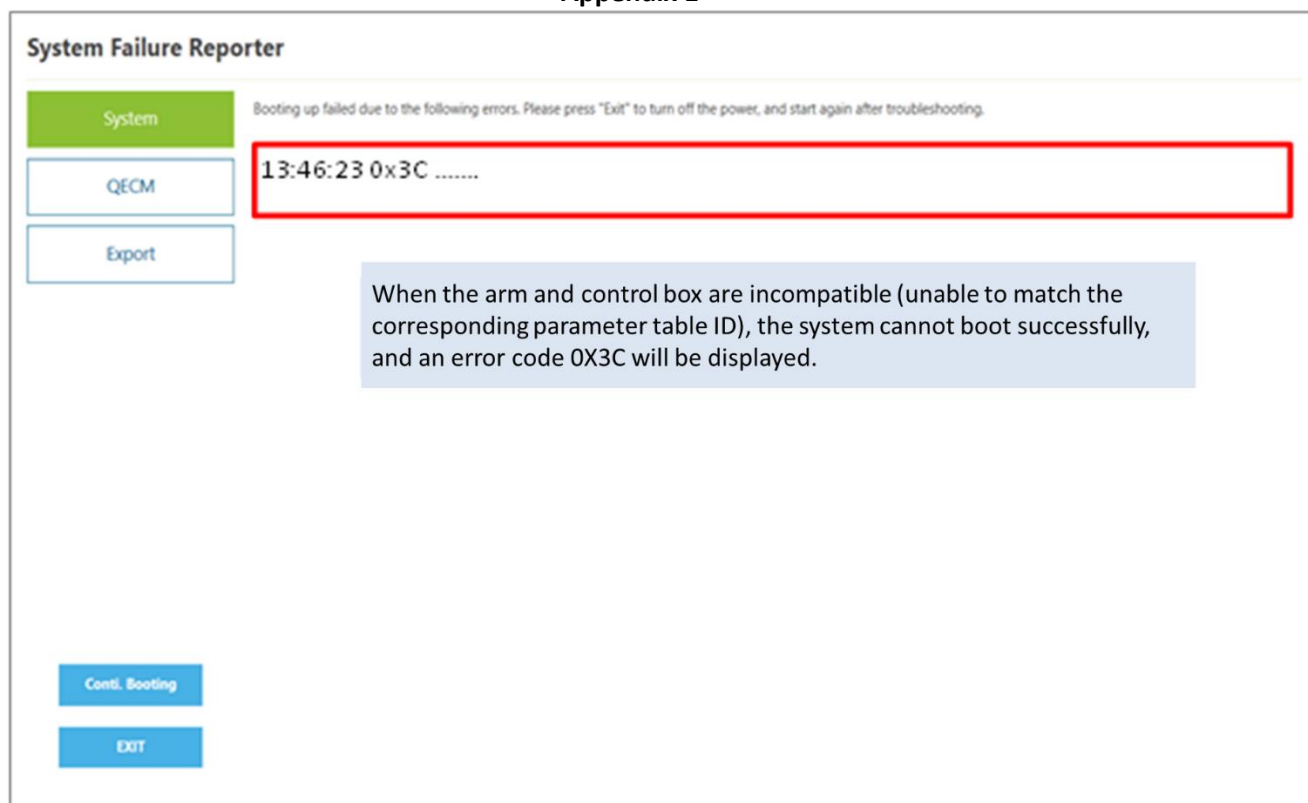


9.3.2 Not every arm and control box can support interchangeability. Exchange can only occur when Arm Model and Control Box Model are mutually compatible. TM25S can only exchange the arm and control box with same model.

9.3.3 The flowchart below showing the process that the system will follow in the background after swapping the arm with the control box. If there are no errors or anomalies during the process, it is considered a successful interchange. For troubleshooting in case of abnormal situations, please refer to the Appendix.

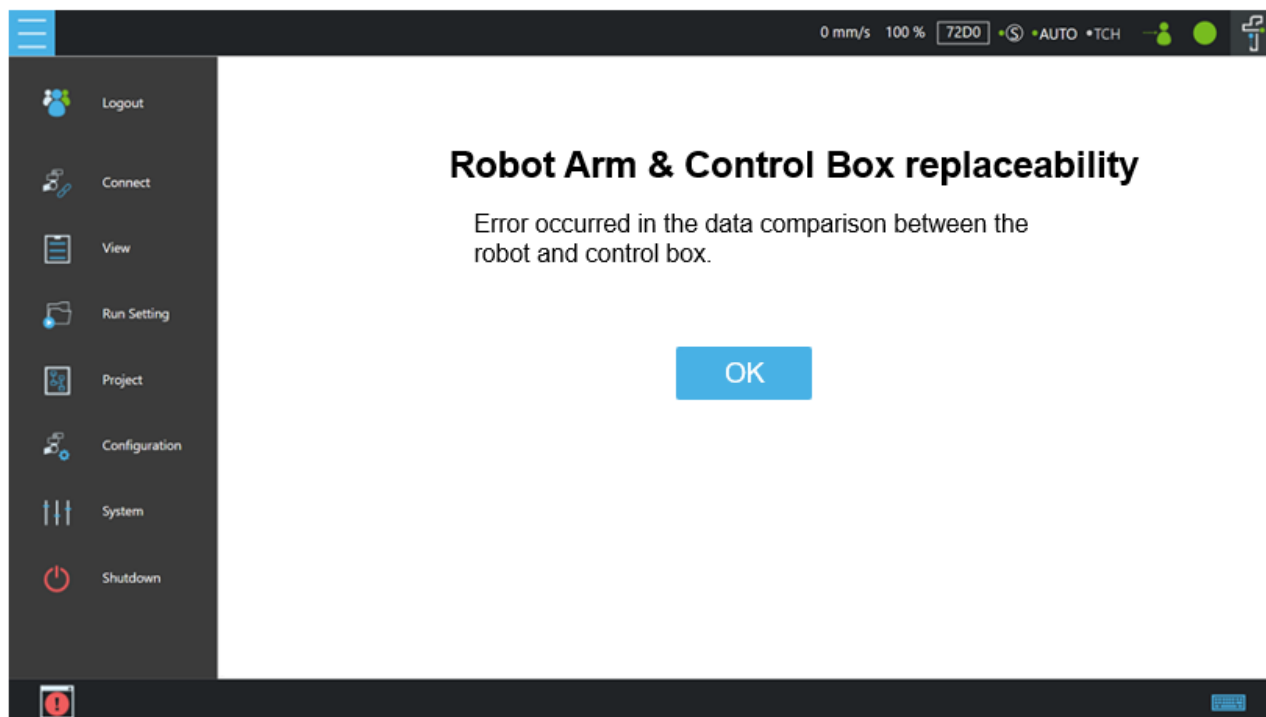


Appendix 1



- This issue indicates that the arm and control box combination may not support interchangeability. Please double-check the compatibility list to ensure that the combination is valid. If it is a valid combination and you still encounter this problem, it is recommended to contact the headquarters' engineers for further assistance.

Appendix 2

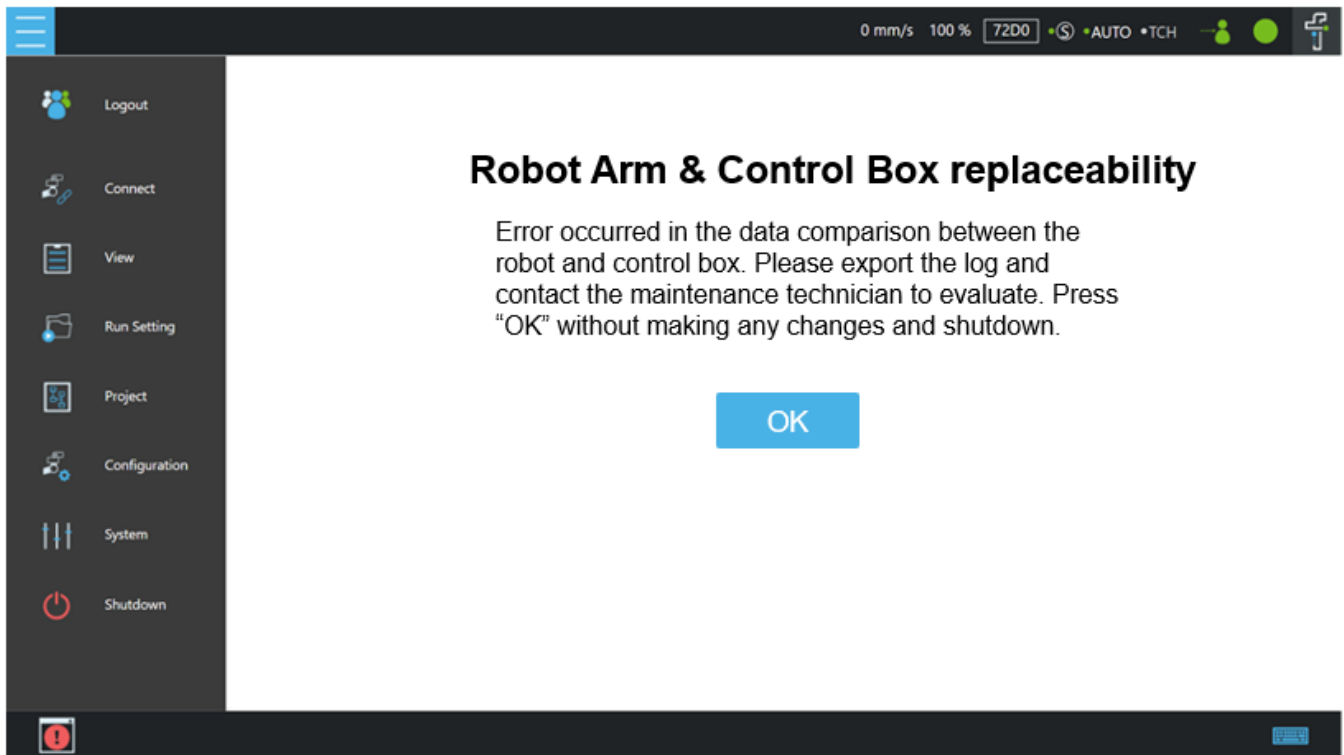


- This error indicates a data comparison issue, and it may trigger a special page with log entries such as 0x00045240 (download failed or data error) or 0xF0000180 (version comparison failed).
- The maintenance personnel need to recalibrate/update arm-end data/update control box version.

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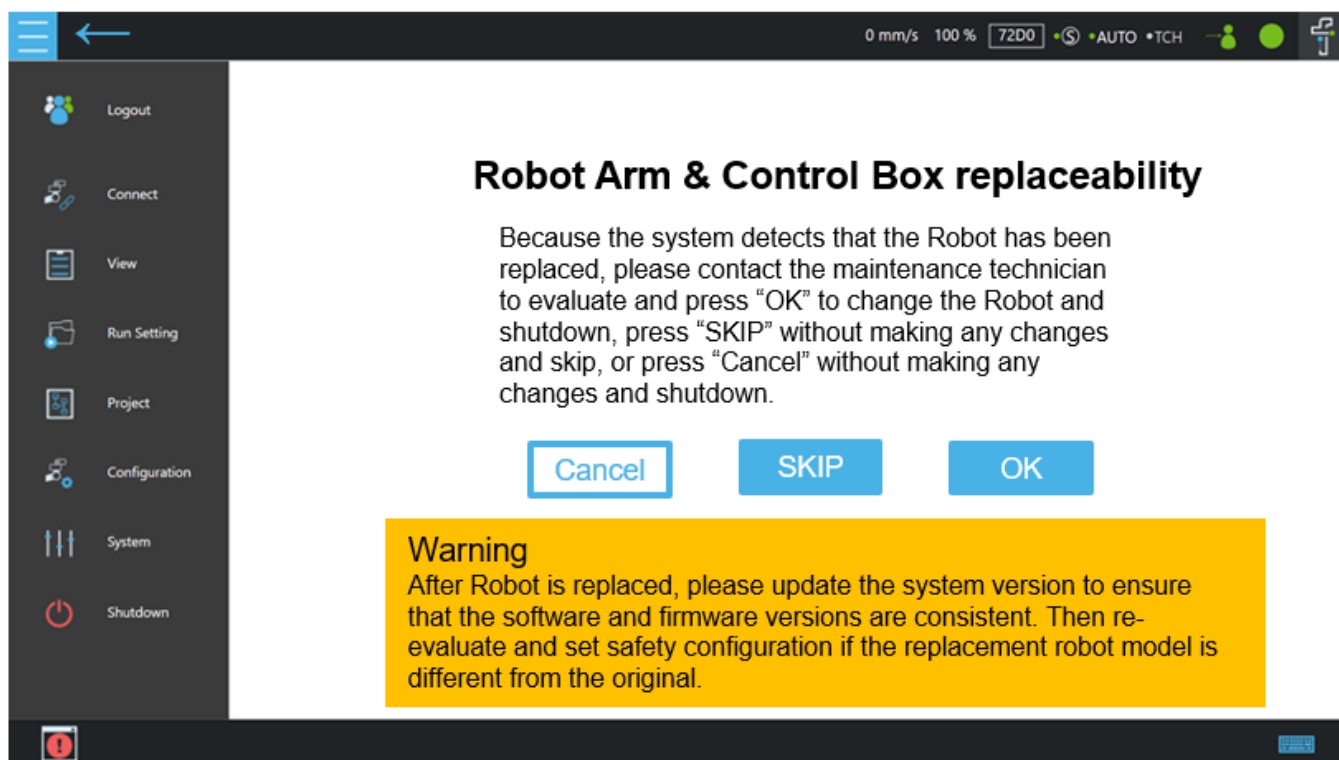
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Appendix 3



- The error message "Data comparison error prompts a special page and logs 0x00045240 (download failed or data error) or 0xF0000180 (version comparison failed). Please export the logs and contact the headquarters maintenance personnel for assistance

Appendix 4



If all the above criteria are met, but the data on the arm side differs from the data on the control box side, switch to this special page after turning on the machine.

Cancel : Do not make any changes. Click to initiate the shutdown procedure.

SKIP : No changes needed. Click to exit this special page. If there is no service key, the button will be greyed out and cannot be clicked.

OK : Overwrite the data of the arm side to the control box side, and switch off the machine, if there is no Service key, the button will be greyed out and cannot be clicked.

Note: The visual connection camera check takes approximately 60 seconds. During Normal power on, the page may jump to this special page after a period of time. The check will first go to the Normal condition, and then jump to this special page when any unit is checked to a different condition.

Please click 'OK' and enter the Safety Password to confirm the arm change. This password is the same as the Safety Configuration Tool Password.

After replacing the arm, update the system version to ensure the firmware version remains the same. If the arm model has been changed, conduct a new safety assessment and modify the safety function settings

10. Calibration guide

Reference the order of images in the following sections for calibration.

Contents

1. [Tools and space](#)
2. [Settings for calibration \(HW5 ONLY\)](#)
3. [Dynamic calibration and Hand-guide calibration](#)
4. [Initial calibration position](#)
5. [Camera calibration](#)
6. [Kinematic calibration](#)
7. [Hand-eye calibration and Verification](#)
8. [Barcode setting](#)
9. [Save the calibration data \(HW5 ONLY\)](#)
10. [Snake dance](#)

Important notes:

1. To avoid collisions, the gripper, external cables, and external equipment must be removed before performing calibration.
2. Before calibration, ensure the robot is securely mounted to the platform, and that the platform remains stable without any shaking during arm movement.
3. Move the robot to the **Home Pose** while powered on and confirm there is no backlash or misalignment in any joint.
4. During calibration, use standard indoor lighting as the primary light source. Additional lighting is unnecessary unless in special environments with insufficient or unstable lighting.
5. To maintain stability in the relative position between the robot and the calibration plate, both must be mounted on the same platform.

□ When to Perform Maintenance Calibration

The maintenance calibration items listed in this document **do not need to be performed periodically** while the robot is operating normally. However, maintenance calibration **must be carried out** when replacing or dismantling parts in any of the following situations:

Robot with camera	Joint	End module	End module PCBA	Camera unit	Flange and F/T sensor
Dynamic & Hand-guide	Need	Need	Not need	Not need	Not need
Camera	Not need	Need	Not need	Need	Not need
Kinematic	Need	Need	Need	Need	Need
Handeye and Verification	Need	Need	Need	Need	Need
Barcode Setting	Need	Need	Not need	Need	Not need


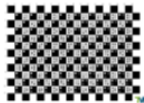
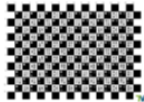

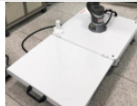
X-type robot (without camera)	Joint	End module	End module PCBA	Flange and F/T sensor
Dynamic & Hand-guide	Need	Need	Not need	Not need
Camera	Not need	Not need	Not need	Not need
Kinematic	Need	Not need	Not need	Not need
Handeye and Verification	Need	Not need	Not need	Not need
Barcode Setting	Need	Not need	Not need	Not need

Note: (a.) For X-type robots (without a camera), when replacing or dismantling a joint or end module or end module PCBA, only Dynamic Calibration and Hand-Guide Calibration need to be performed.

(b.) In this context, replacing the 'end module PCBA' refers to opening the end-module flange to perform the replacement directly, rather than separating Joint 6 from the end module.

10.1 Tools and space

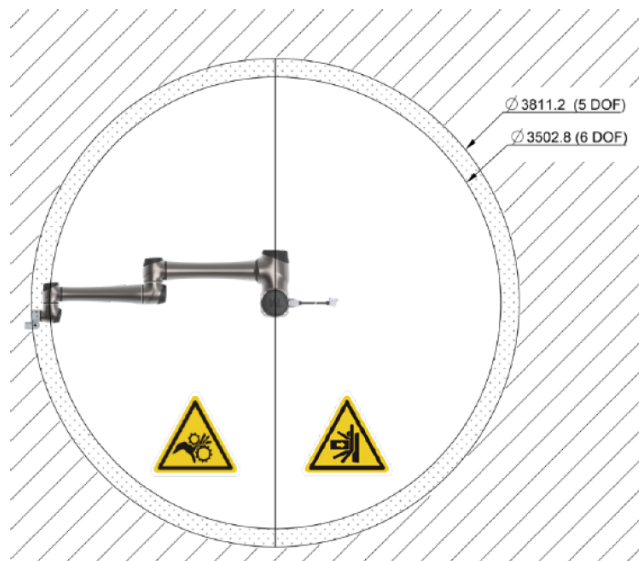
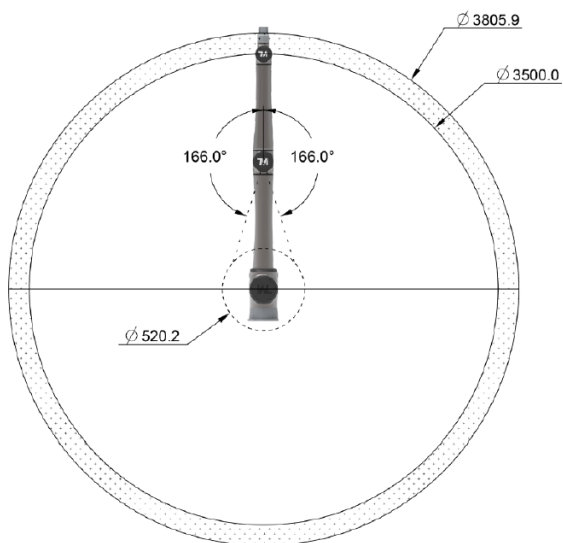
Tools and space

1	Maintenance dongle	
2	1cm calibration plate (small dice board) *Only the new calibration plate can be used (the new version has a smooth touch, whereas the old version has noticeable printed texture when touched).	
3	2cm calibration plate (big dice board) *Only the new calibration plate can be used (the new version has a smooth touch, whereas the old version has noticeable printed texture when touched).	
4	TM Landmark 2.0 *Peel the protective wrap off before use.	
5	Calibration platform	

Tools and space

Ensure that there is enough space to perform the calibration.

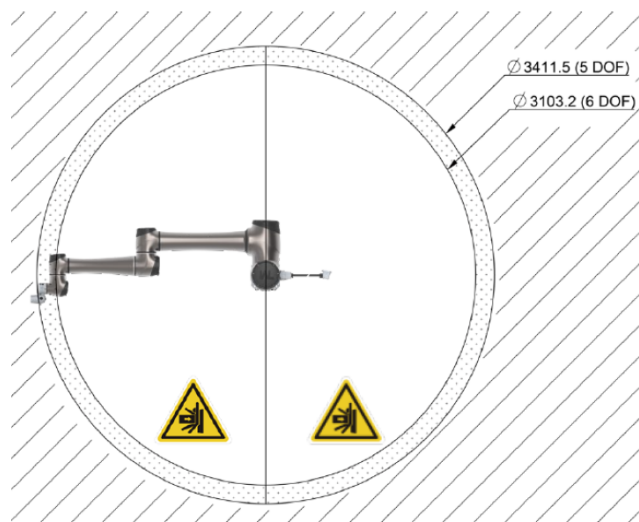
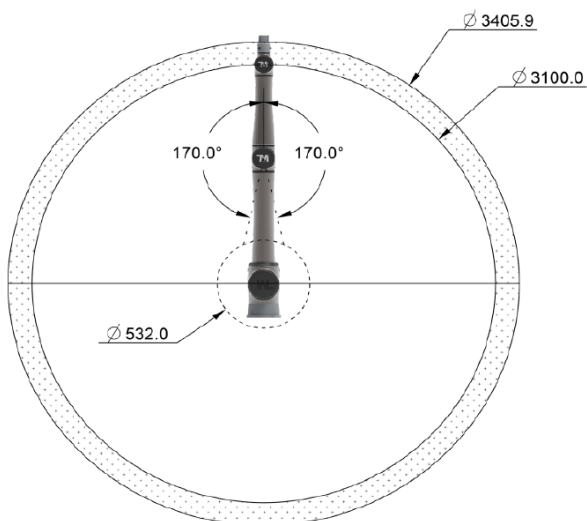
TM25S



Tools and space

Ensure that there is enough space to perform the calibration.

TM30S



10.2 Settings for calibration

Settings for calibration

- *Please restore the following settings after the calibration process is completed.
- *Insert the maintenance dongle before perform following steps and calibration.

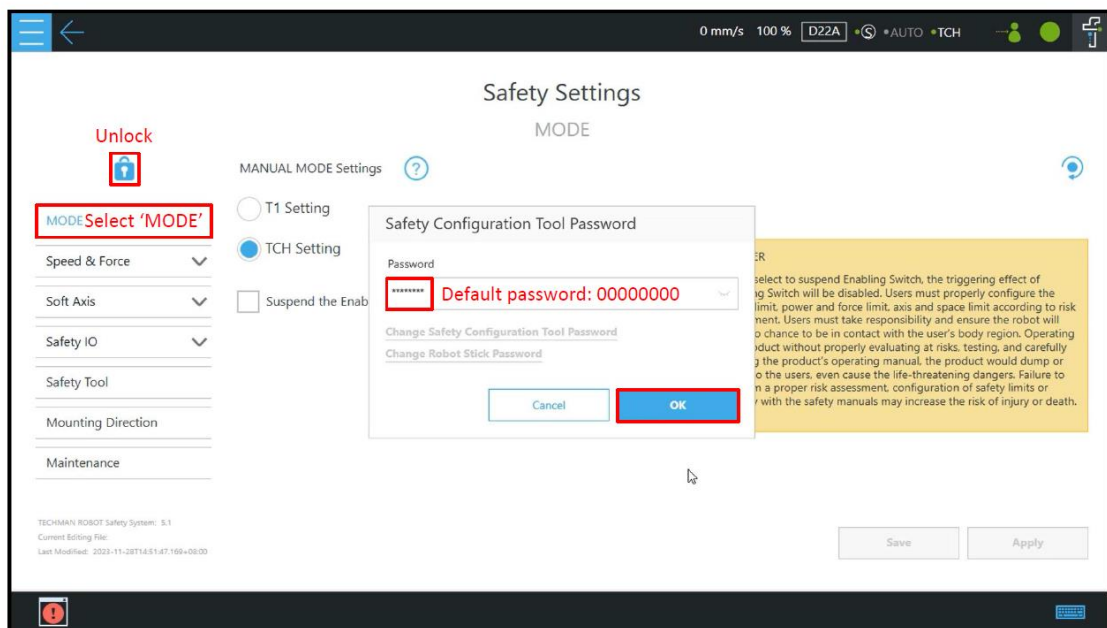
1. Select menu



2. Select

3. Select Safety

Settings for calibration



Settings for calibration

Safety Settings

MODE

MANUAL MODE Settings ?

☐ T1 Setting

☒ TCH Setting

☒ Suspend the Enabling Switch

DANGER

When select to suspend Enabling Switch, the triggering effect of Enabling Switch will be disabled. Users must properly configure the speed limit, power and force limit, axis and space limit according to risk assessment. Users must take responsibility and ensure the robot will have no chance to be in contact with the user's body region. Operating the product without properly evaluating at risks, testing, and carefully reading the product's operating manual, the product would dump or pinch to the users, even cause the life-threatening dangers. Failure to perform a proper risk assessment, configuration of safety limits or comply with the safety manuals may increase the risk of injury or death.

Save
Apply

TECHMAN ROBOT Safety System: 5.1

Current Editing File:

Last Modified: 2023-11-28T14:51:47.169+08:00

Settings for calibration

0 mm/s 100 % D22A
AUTO TCH

MODE

Speed & Force

Soft Axis

Safety IO

Safety Tool

Mounting Direction

Maintenance

Apply Safety Configuration

Last modified time: 2023-12-26T14:06:47.924+08:00
 Safety System version: 5.1
 Safety Checksum: D22A
 Robot Name: CC2324034
 Robot model: TM55

Mode Settings
 MANUAL MODE Settings: TCH Setting
 Suspend the Enabling Switch: True

Speed & Force Setting
 General Setting
 Hand Guide TCP Speed
 T1 Hand Guide TCP Speed Limit: 250 mm/sec
 TCH Hand Guide TCP Speed Limit: 450 mm/sec
 End-Point Reduced Speed
 End-Point Reduced Speed Limit: 250 mm/sec
 Force & Torque Limit function
 Robot in the fenceless workspace
 Human-Machine Safety

☒ I have confirmed all the safety parameters according to my settings.

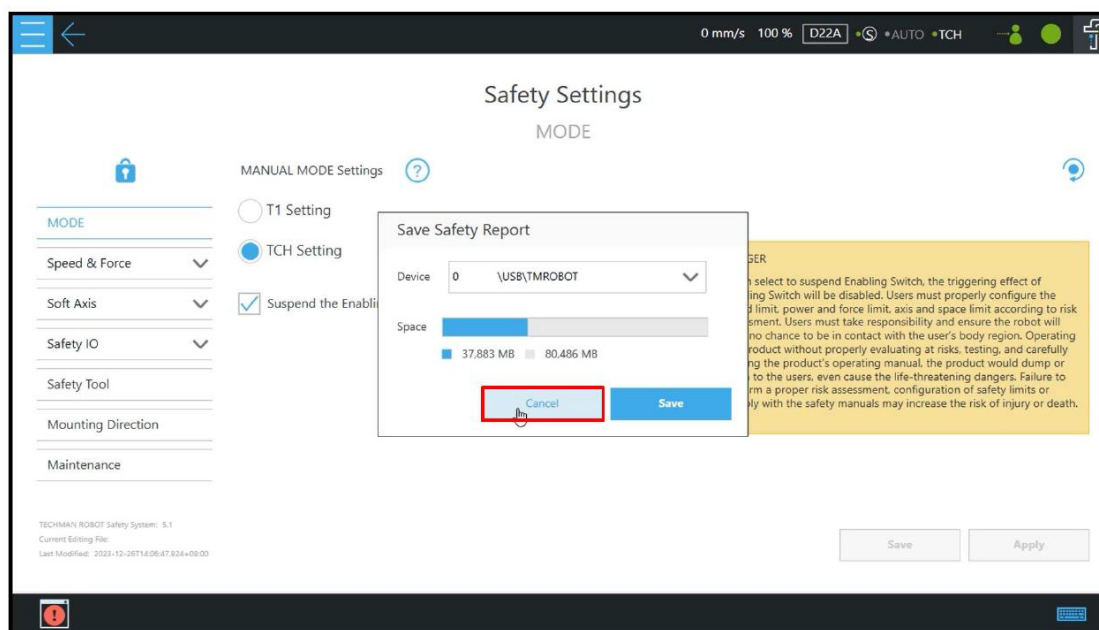
Cancel
OK

TECHMAN ROBOT Safety System: 5.1

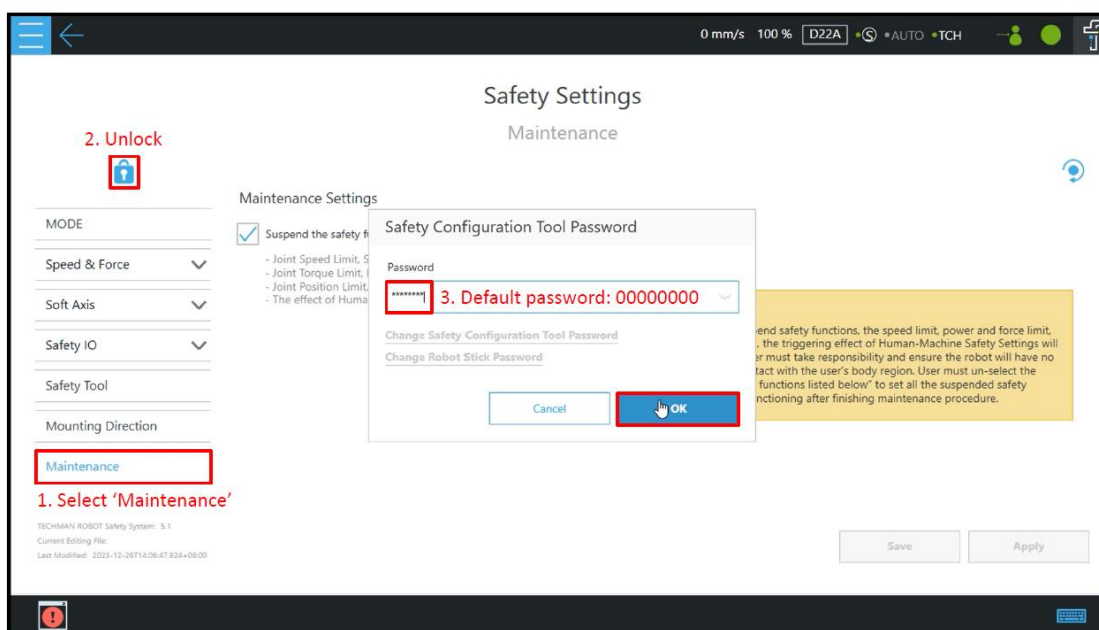
Current Editing File:

Last Modified: 2023-11-28T14:51:47

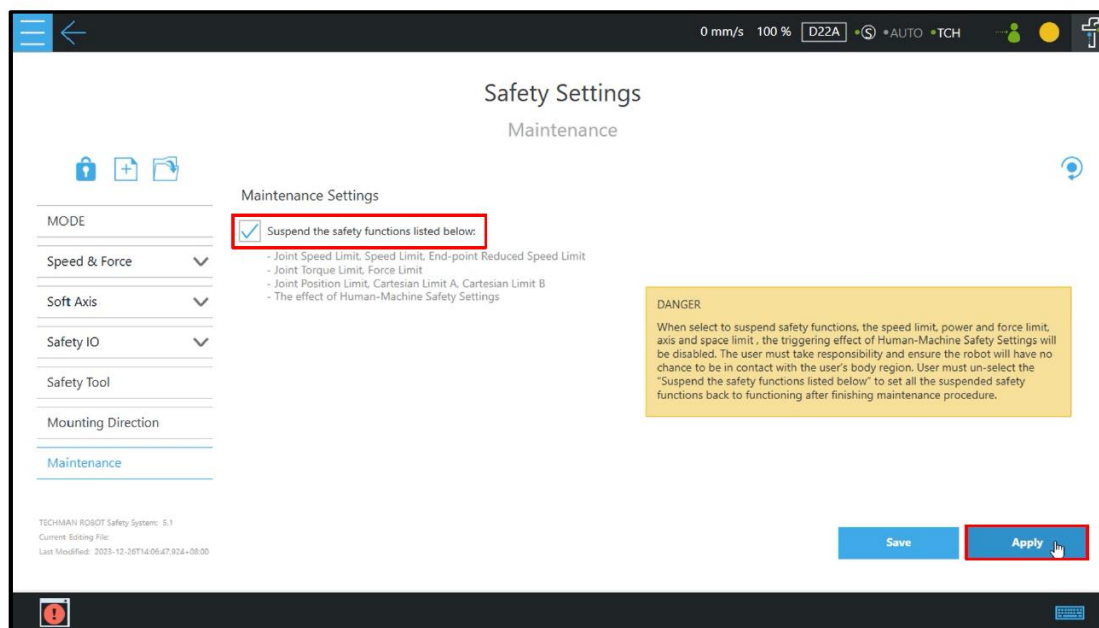
Settings for calibration



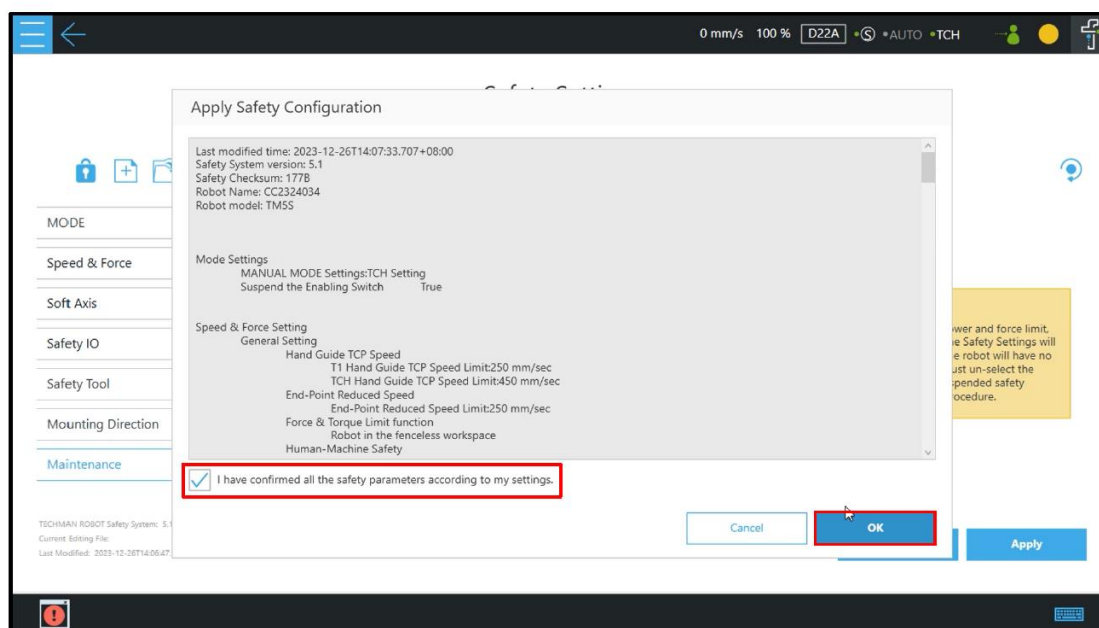
Settings for calibration



Settings for calibration



Settings for calibration



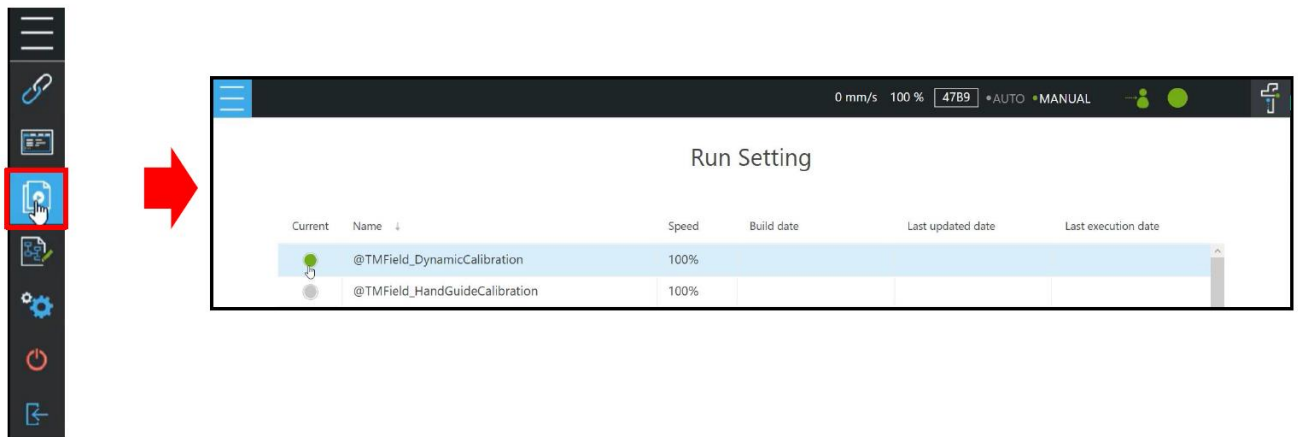
10.3 Dynamic calibration and Hand-guide calibration

Hardware Version : 5.02 Document Version : 2

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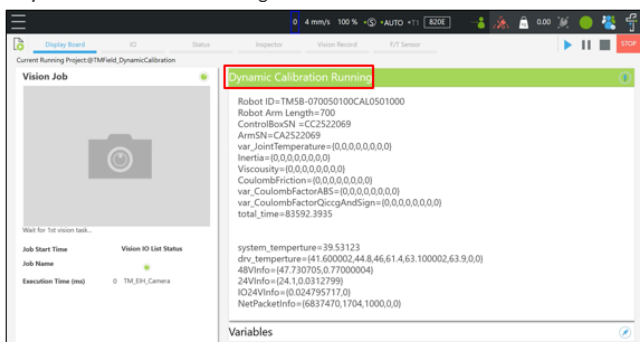
Dynamic calibration and Hand-guide calibration – Dynamic calibration

1. Select the @TMField_DynamicCalibration
2. Switch the robot into auto mode and run the project.

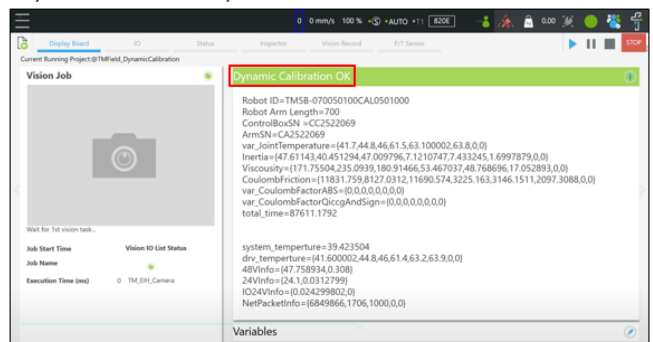


Dynamic calibration and Hand-guide calibration – Dynamic calibration

Dynamic calibration is running

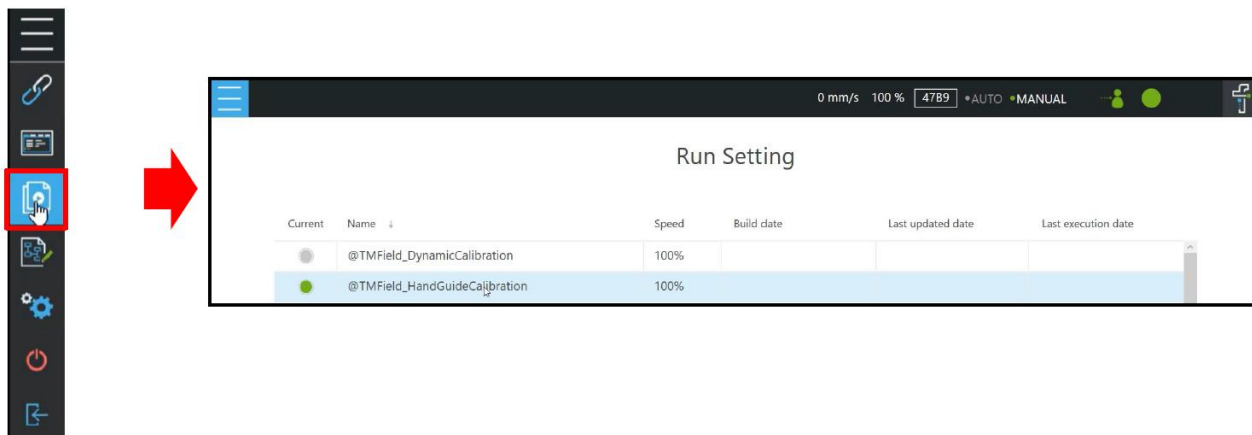


Dynamic calibration completed



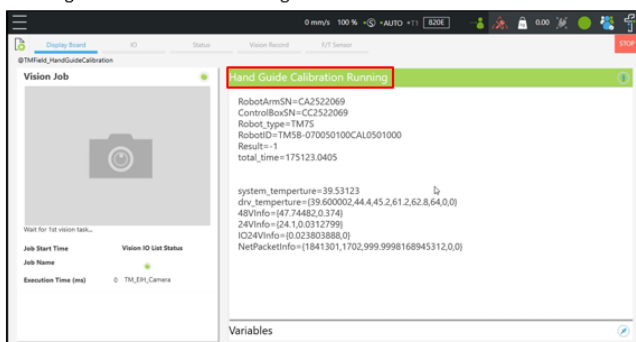
Dynamic calibration and Hand-guide calibration – Hand-guide calibration

1. Select the @TMField_HandGuideCalibration
2. Switch the robot into auto mode and run the project.

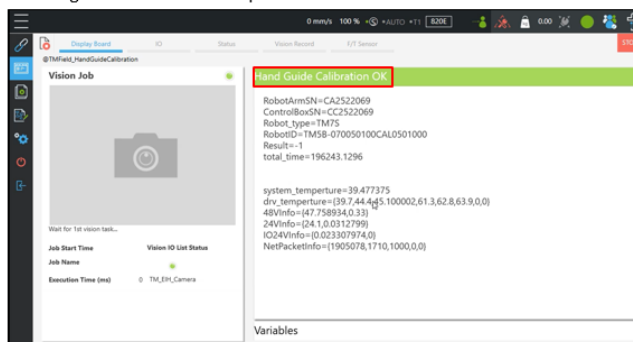


Dynamic calibration and Hand-guide calibration – Hand-guide calibration

Hand-guide calibration is running



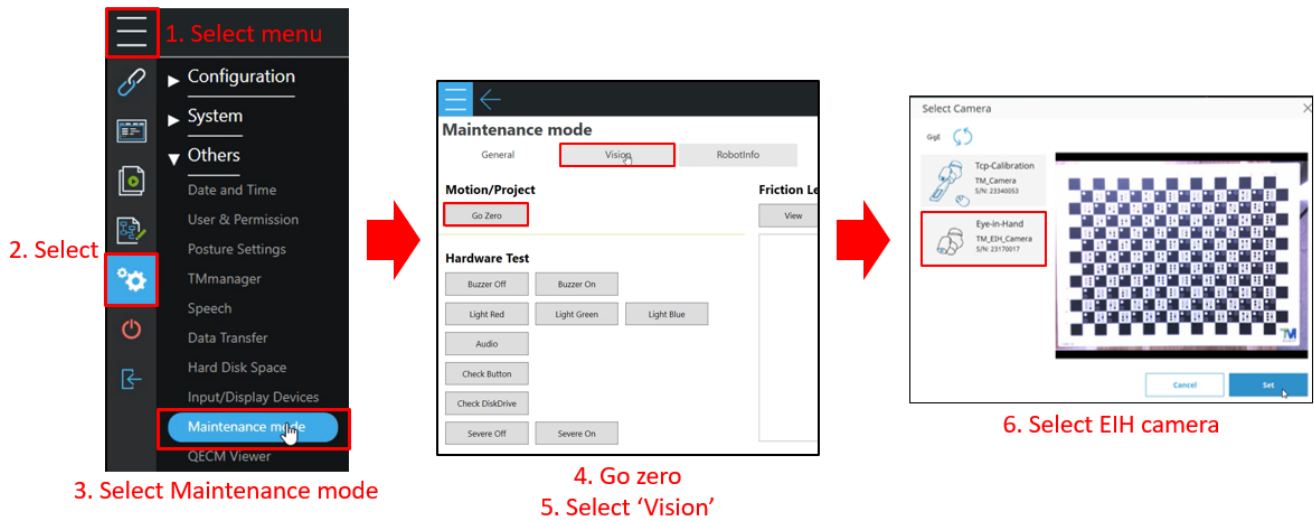
Hand-guide calibration completed



10.4 Initial calibration position

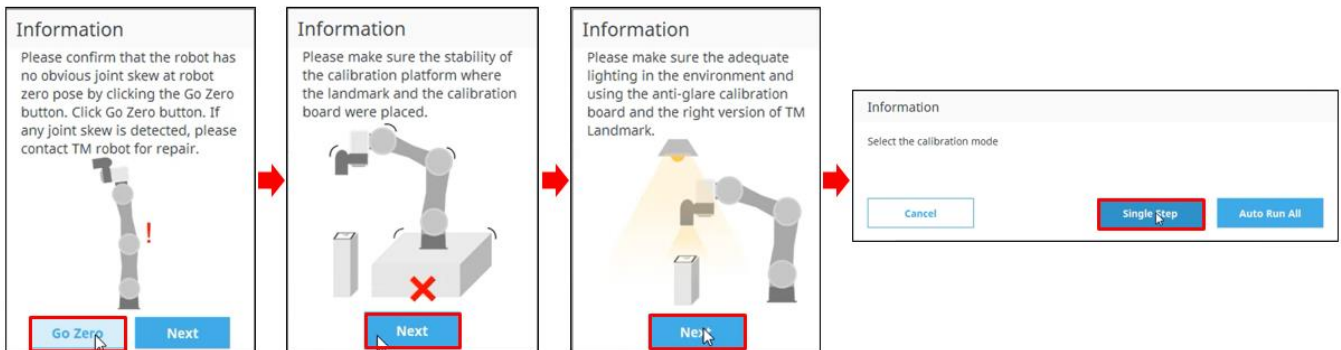
Initial calibration position

1. Starting from HMI 2.20, the initial calibration positions have been adjusted. However, they can still be modified. Follow the steps below to set the initial position and select the calibration.
2. This function only applies to *Vision Calibration*, *Kinematic Calibration*, *Hand-Eye Calibration*, and *Verify*.



Initial calibration position

1. When selecting the EIH, the Information window will pop up. Select 'Go Zero' to move the robot to its home pose, then follow the on-screen instructions to check the platform's stability, the robot's condition, and the light source.
2. After checking these items, select 'Single Step' to proceed with the calibration process. Do not select 'Auto Run All', as this option is intended for Techman factory use only.



Initial calibration position _ Default initial position

To calibrate the robot using the **default initial position**:

1. Choose '**① All Use Default Position**'.
2. Select the desired calibration item.
3. Click '**② Move**' and follow the guidance to move the robot.
4. Ensure the camera can detect the dice board or landmark.
5. Click '**③ Action**' to proceed.

[Click here for more information.](#)

Decide robot's initial position

Customized initial position
70.5, 2.7, 117, -30, 90, 25.5

Default initial position
70.5, 2.7, 117, -30, 90, 25.5

☒ All Use Default Position ①

☐ Calibration Plate 10cm/ Verify

☐ Calibration Plate 20cm

☐ Kinematics

☐ Handeye

Score: 0.00; SquareNum:33

Move ②

Reset

Record

Auto Camera

Import

Export

Cancel

Action ③

Initial calibration position _ Customized initial position

To calibrate the robot using the Customized initial position:

1. Uncheck '**① All Use Default Position**'
2. Select the desired calibration item.
3. Use the controller to move the robot to the preferred position and ensure the camera can detect the dice board or landmark.
4. Click '**② Record**' to use the current posture as the initial posture for calibration.
5. Click '**③ Action**' to proceed.

[Click here for more information.](#)

Decide robot's initial position

Customized initial position
16.36, -21.17, 132.48, -21.41, 90.09, 16.49

Default initial position
70.5, 2.7, 117, -30, 90, 25.5

☐ All Use Default Position ①

☒ Calibration Plate 10cm/ Verify

☐ Calibration Plate 20cm

☐ Kinematics

☐ Handeye

Score: 0.00; SquareNum:0

Move

Reset

Record ②

Auto Camera

Import

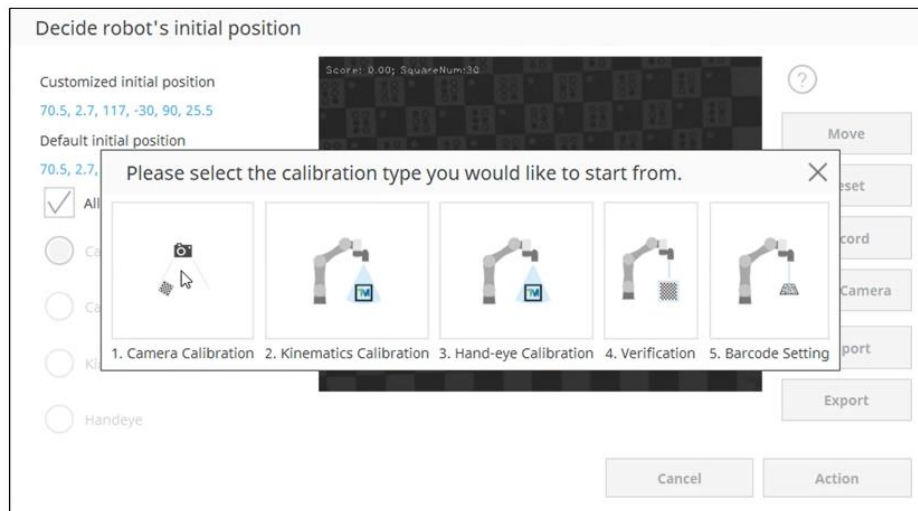
Export

Cancel

Action ③

Initial calibration position

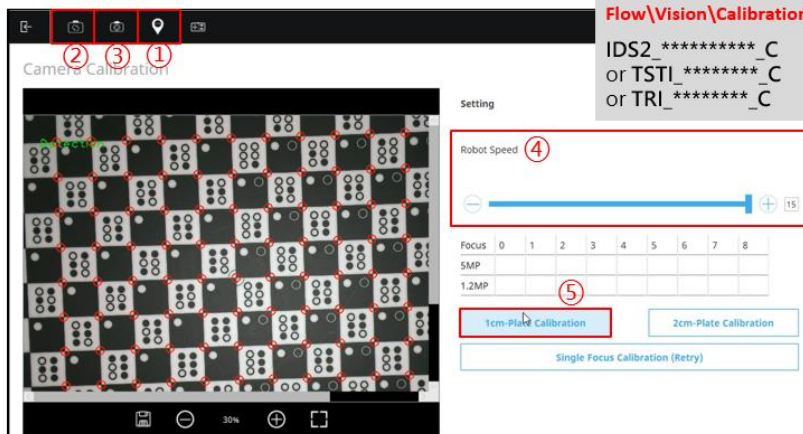
Choose the calibration process after completing initial position setup.



10.5 Camera calibration

Camera calibration

1. Click ① to move the robot to the initial position, then place the small dice board within the camera's field of view (FOV).
2. Click ② to automatically set the camera parameters, or ③ to adjust them manually. (Recommended settings: enable the built-in light, set shutter time to 5000, gain to 0, and leave other settings on Auto.)
3. Make sure the camera can clearly detect the dice board.
4. Set the desired ④ Robot Speed.
5. Click ⑤ '1 cm-plate calibration' to begin the calibration process.

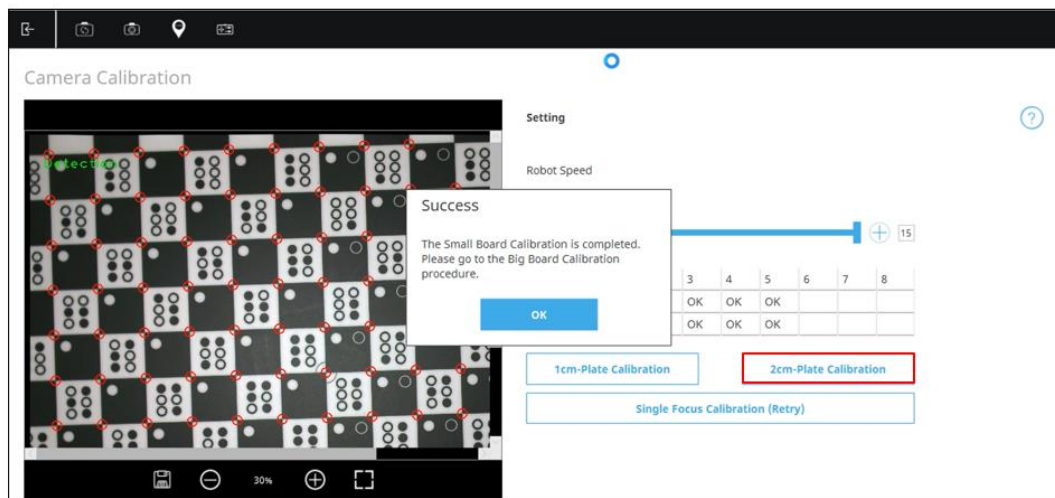


***When the camera is not replaced, camera calibration is not required. If camera calibration must be performed, please back up the following files in advance: D:\Techman Robot\TM Flow\Vision\Calibration**

IDS2_*****_C
or TSTI_*****_C
or TRI_*****_C

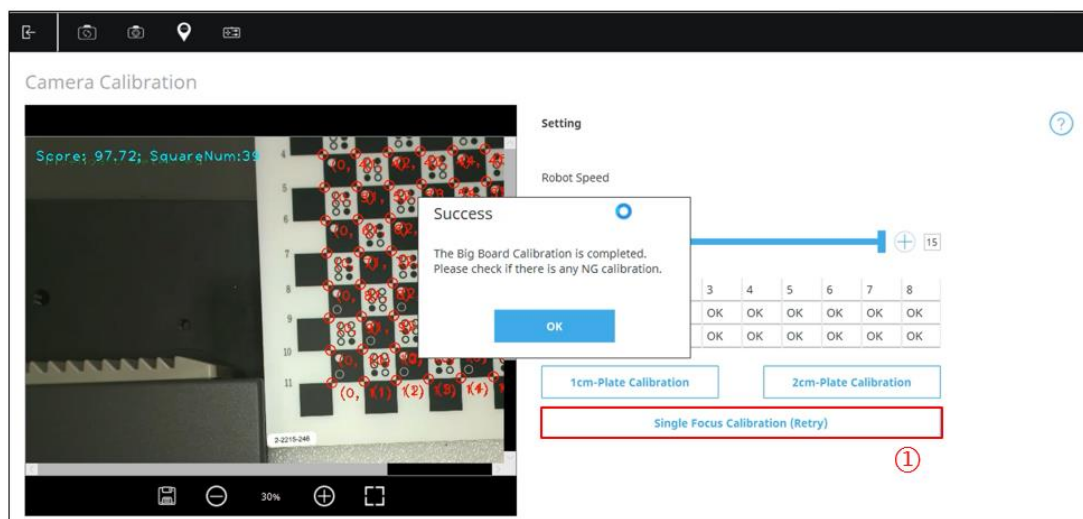
Camera calibration

1. Setting up the big dice board properly after 1-cm Plate Calibration(small dice board) is completed.
2. Run 2-cm Plate Calibration.



Camera calibration

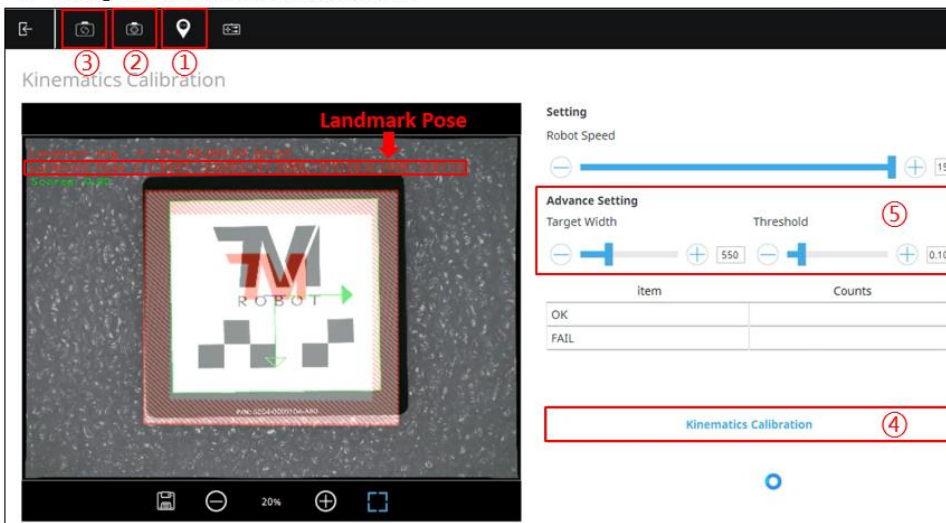
1. The screenshot below shows that the calibration has been completed.
2. If any status is still marked 'Not Finished' after completing the 2 cm Plate Calibration, run a ① Single Focus Calibration to re-calibrate.



10.6 Kinematic calibration

Kinematic calibration

1. Click ① to move the robot to its initial position.
2. Place the landmark at the center of the FOV and make sure the distance between the landmark and the camera lens is close to 100 mm (Landmark pose = 0, 0, 100, ...). Then remove the landmark and place the small dice board, and click ② or ③ to adjust the camera parameters.
3. After the parameter setup, remove small dice board and put the Landmark back at position. (Landmark Pose = 0, 0, 100, ...)
4. Click ④ to begin the Kinematics Calibration.



DO NOT ALTER ⑤ ADVANCED SETTINGS WHICH ARE FOR TECHMAN FACTORY USE ONLY

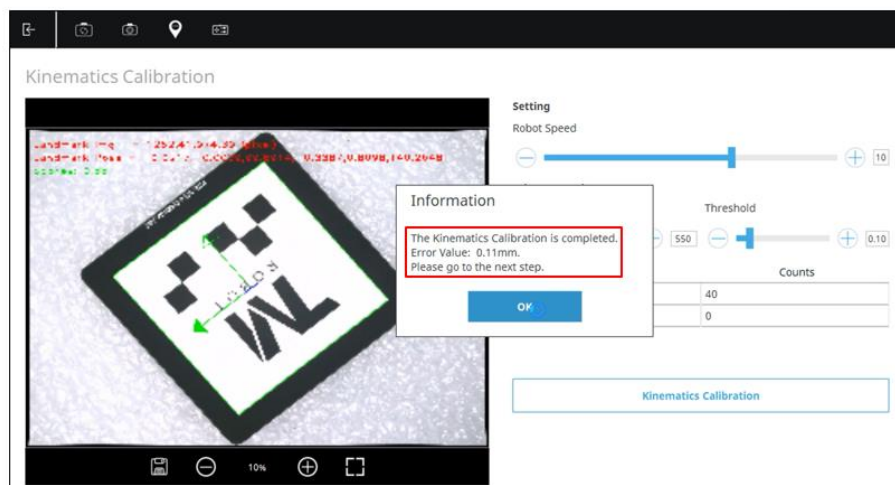
Changing the Target Width or Threshold values may change the robot's posture and cause unexpected errors or collisions.

Recommended camera parameter

1. Built-in lighting: Enable and set the value to 255
2. Shutter Time: Set to 5000. Increase the value only if the light source is unstable or insufficient.
3. Gain: Set to 0
4. White balance: Press "Auto" once
5. Focus: Set to 3

Kinematic calibration

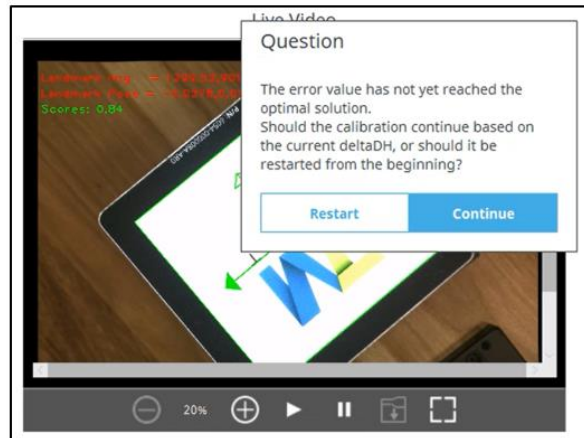
1. Calibration will terminate after completing 40 successful calibrations (OK) or 15 failed calibrations (FAIL).
2. After calibration, if the error value is below 0.3, the calibration is considered successful. If the error value exceeds 0.3 or the calibration fails, provide the following to Techman: **Camera view images, photos of the environment, video of the calibration process, Logs from the same day.**



Kinematic calibration

When Kinematic Calibration reaches 40 'FinishTimes' but still fails at the final stage, the following message may appear. Users can choose one of the following options to retry the calibration:

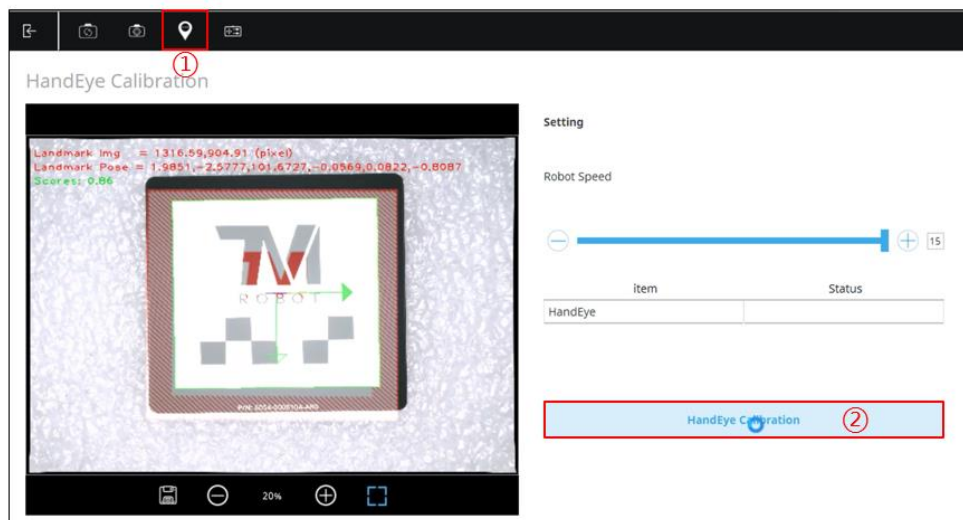
- ◆ **Restart:** Deletes the collected 40 positions and restarts Kinematic Calibration.
- ◆ **Continue (Recommended):** Retains the collected 40 positions and reattempts Kinematic Calibration. If the calibration still fails after selecting 'Continue', provide the following to Techman: Camera view images, photos of the environment, video of the calibration process, Logs from the same day.



10.7 Hand-eye calibration and verification

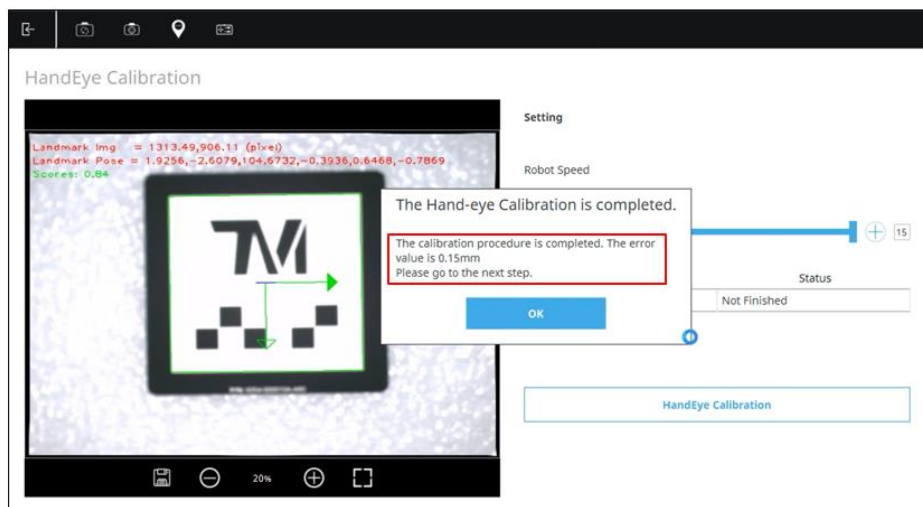
Hand-eye calibration & Verification

1. Click ① to move the robot to its initial position.
2. Continue using camera parameters from the Kinematic Calibration.
3. Click ② to begin the HandEye Calibration.



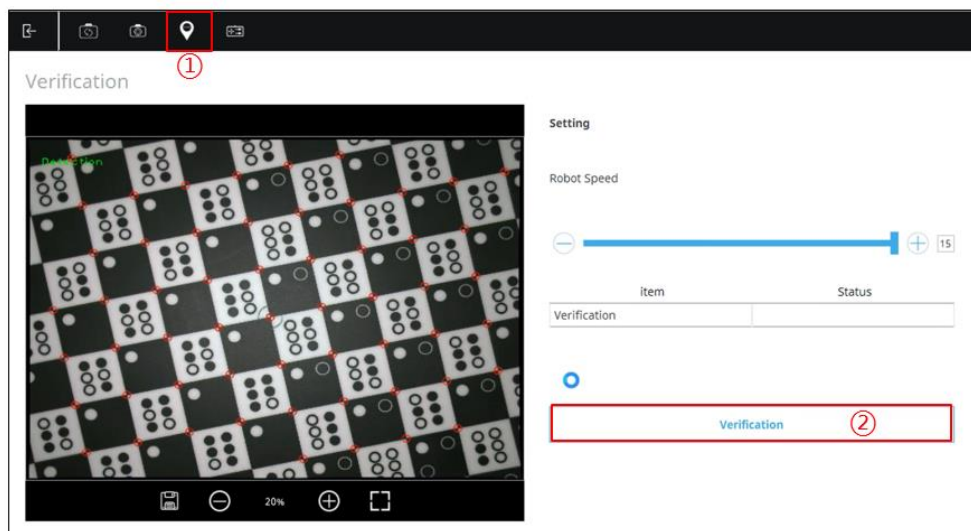
Hand-eye calibration & Verification

1. After completing the calibration, if the error value is below 0.3, the calibration is considered successful.
2. If the error value exceeds 0.3 or the calibration fails, send the following to Techman: **Camera view images, photos of the environment, video of the calibration process, Logs from the same day**



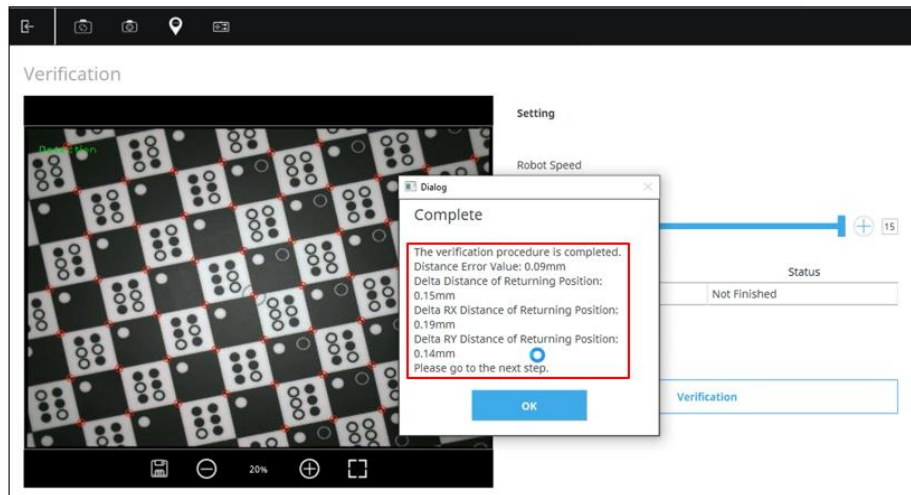
Hand-eye calibration & Verification

1. Click ① to move the robot to its initial position after completing the handeye calibration.
2. Place the **small dice board**, turn on the camera light, and adjust camera parameters to ensure the small dice board can be detected. Click ② to begin the Verification.



Hand-eye calibration & Verification

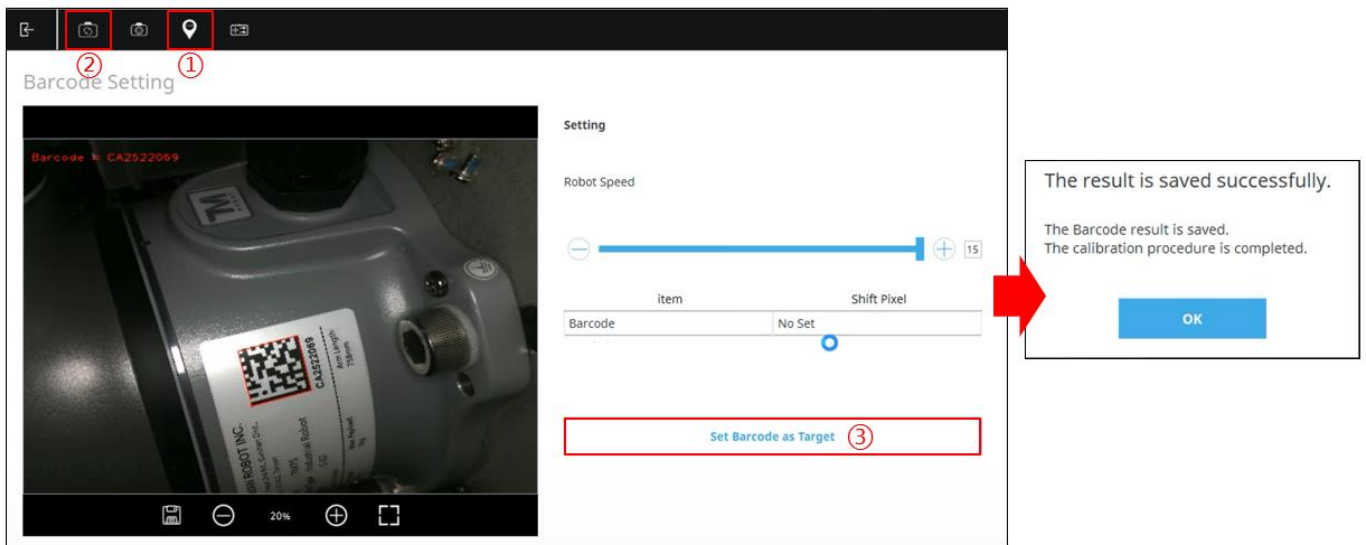
1. After calibration is complete, ensure that the first and second values are below 0.5, and the third and fourth values are below 1.
2. If any value exceeds these limits, repeat the Handeye calibration and Verification.
3. If the error value exceeds stipulated value or the calibration fails, send the following to Techman: **Camera view images, photos of the environment, video of the calibration process, Logs from the same day**



10.8 Barcode setting

Barcode setting

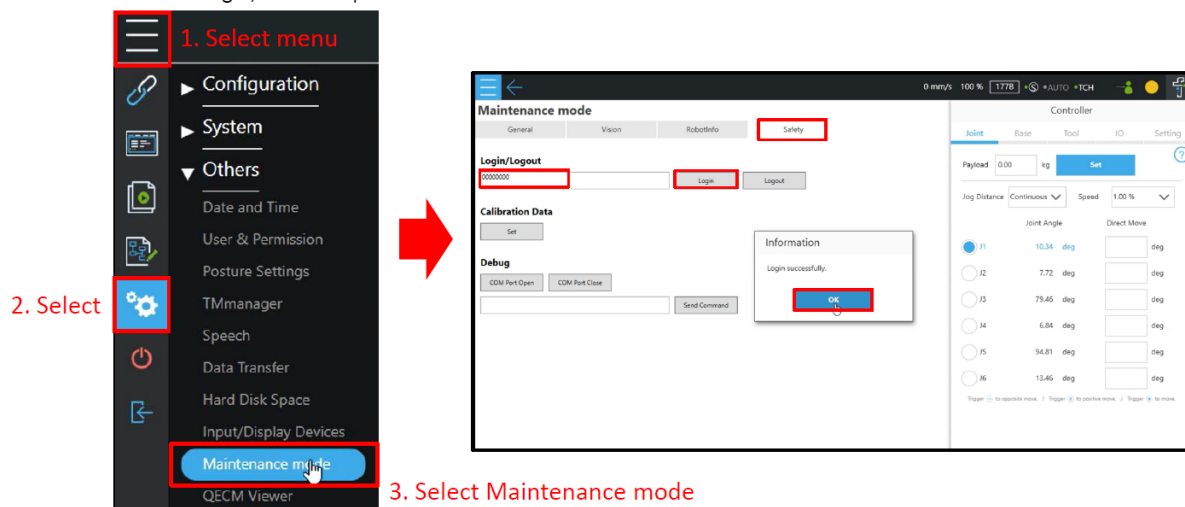
1. Click ① to move the robot to its initial position.
2. Click ② to set the camera parameter automatically if needed.
3. Click ③ to begin the Set Barcode as Target. When the window pops up, it means the process is completed.



10.9 Save the calibration data

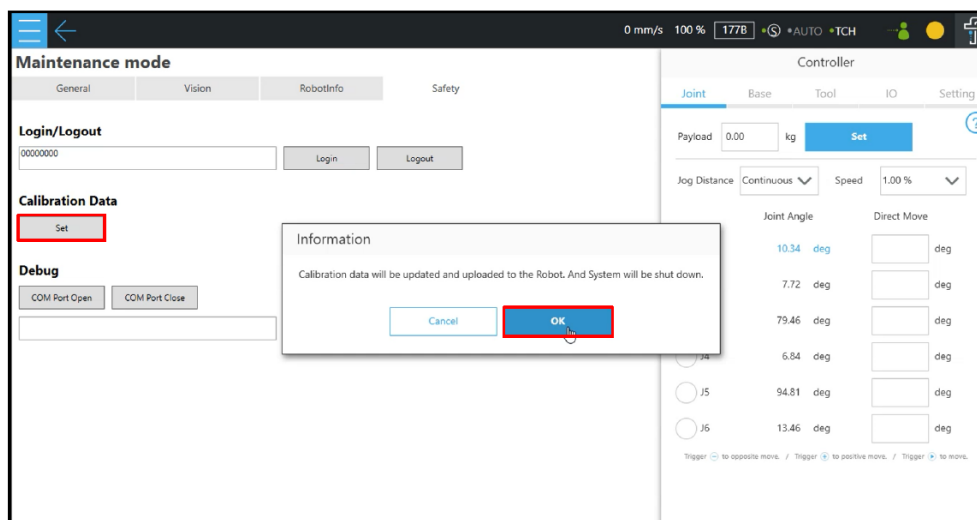
Save the calibration data

1. Go to 'Maintenance mode', select 'Safety'
2. Enter 00000000 and select Login, and then press 'OK'



Save the calibration data

1. Press 'Set' to upload the calibration data from control box to arm
2. Press 'OK' and the TMflow will shut down automatically



10.10 Snake dance

Snake dance

Method 1_For robot type: TM5A, TM5S, TM6S, TM7S, TM12, TM12S, TM14, TM14S, TM16, TM20, TM20S


1. Create 2 nodes, each with following joint angles:

	Node 1	Node 2
J1	260	-260
J2	90	-90
J3	-150	150
J4	90	-90
J5	170	-170
J6	110	-110

2. Make the 2 nodes run in a loop, run at 60% speed for 30 minutes.
3. If there is no abnormality after the test, the robot is ready for use.

Method 2_For robot type: TM5A, TM5S, TM6S, TM7S, TM12, TM12S, TM14, TM14S, TM16, TM20, TM20S, TM25S, TM30S

1. Run the **TrialRun** from Run setting for 30 minutes.

	@TMField_TrialRun	100%
---	-------------------	------

2. If there is no abnormality after the test, the robot is ready for use.

11. Trouble shooting

11.1 Camera disconnection

Symptom description

EIH camera disconnected while using / EIH camera can not be detected

Possible causes

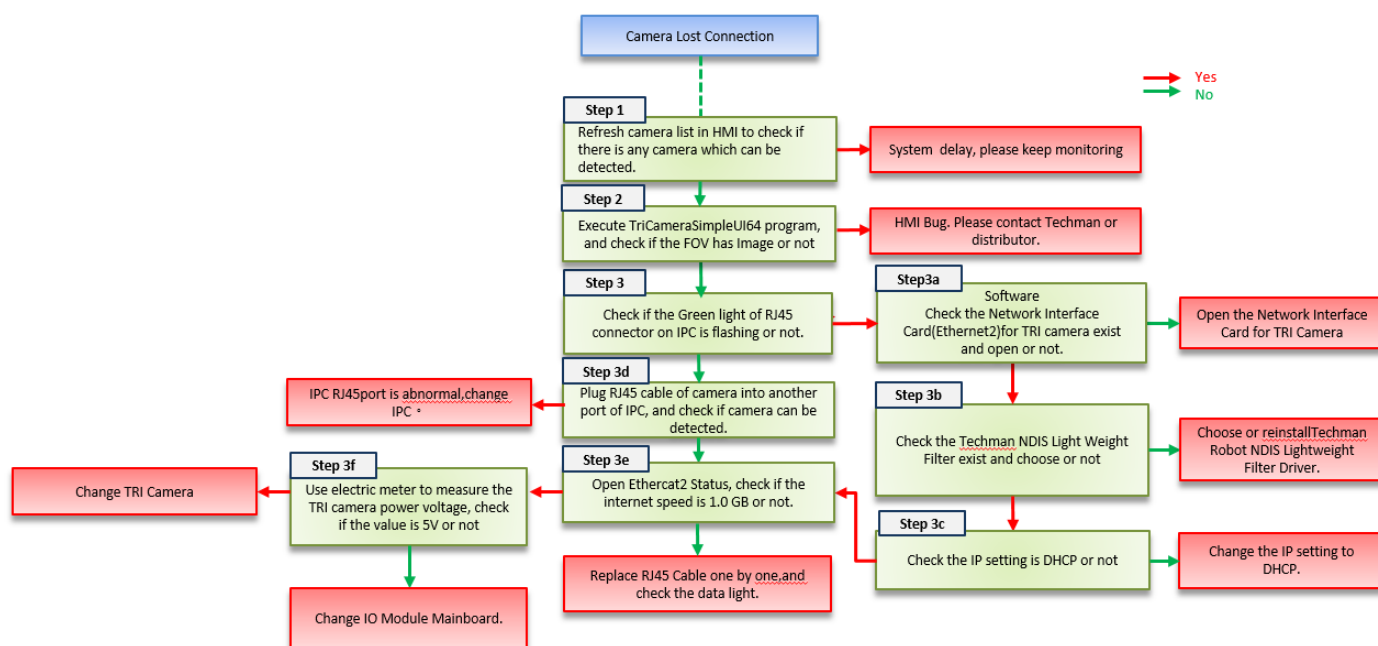
This issue may be caused by following reasons/components:

1. IPC
2. Internal complex cables
3. Robot cable
4. Camera cables inside the robot arm
5. TRI camera
6. System or driver

Symptom photos Or Error codes

0x00020000
0x00020003

Notices



TriCameraSimpleUI64

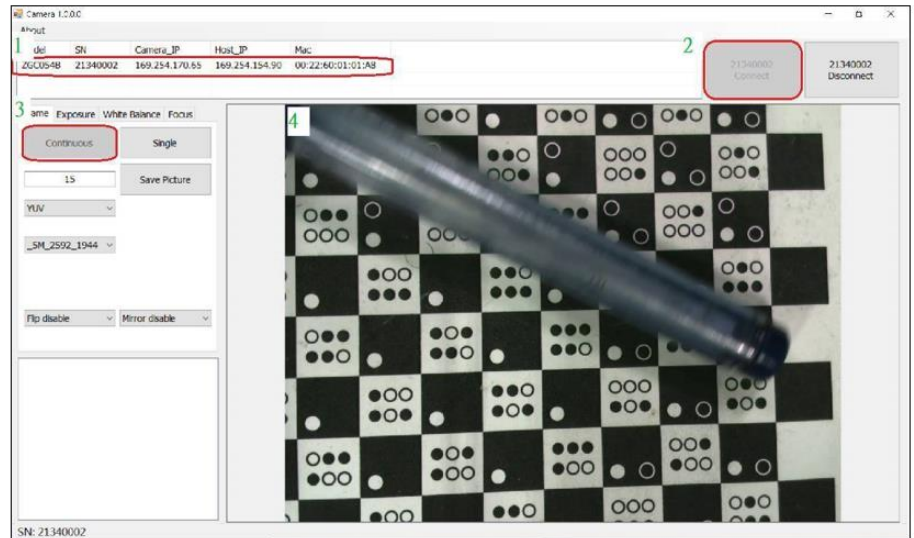
The TriCameraSimpleUI64 executable file is on the Control Box above HMI Vesion2.0.

Execute the following path file

D:\TRI_Camera\TriCameraSimpleUI64.exe

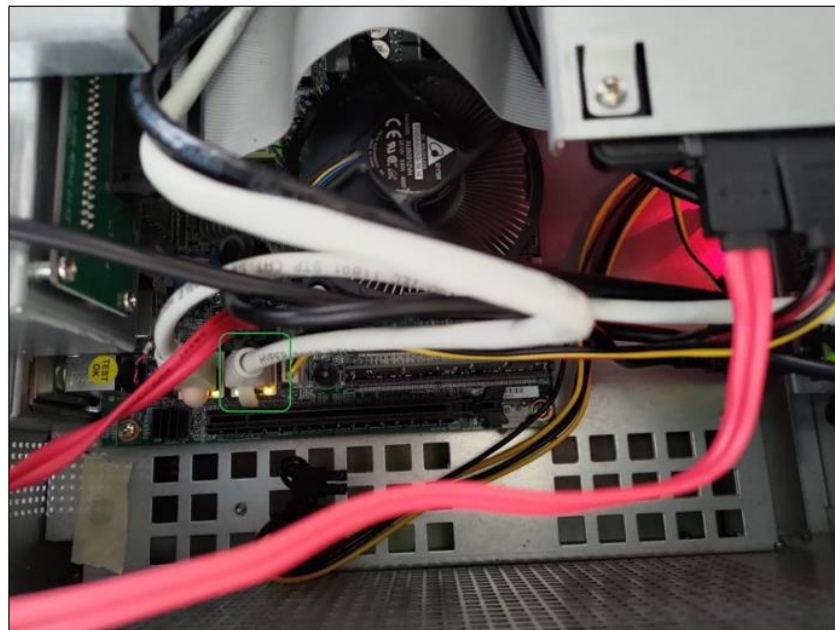
Step

1. Showing the camera
2. Connect (click)
3. Continuous(click)
4. Check if there is image on FOV



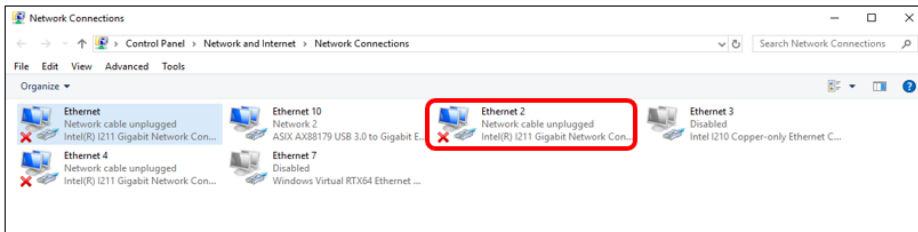
Check camera port on IPC

Check if the RJ45 Cable port on IPC flashes or not

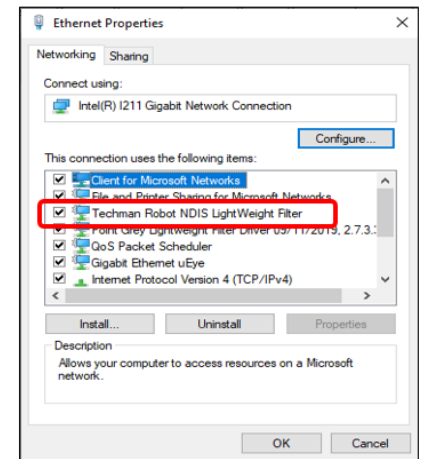


Check Network setting_1

1. Go to Control Panel -> Network and Internet -> Network and Sharing Center -> Change adapter settings
2. Check whether the Network Interface Card(Ethernet2)for TRI camera exists or not, and it should be activated.

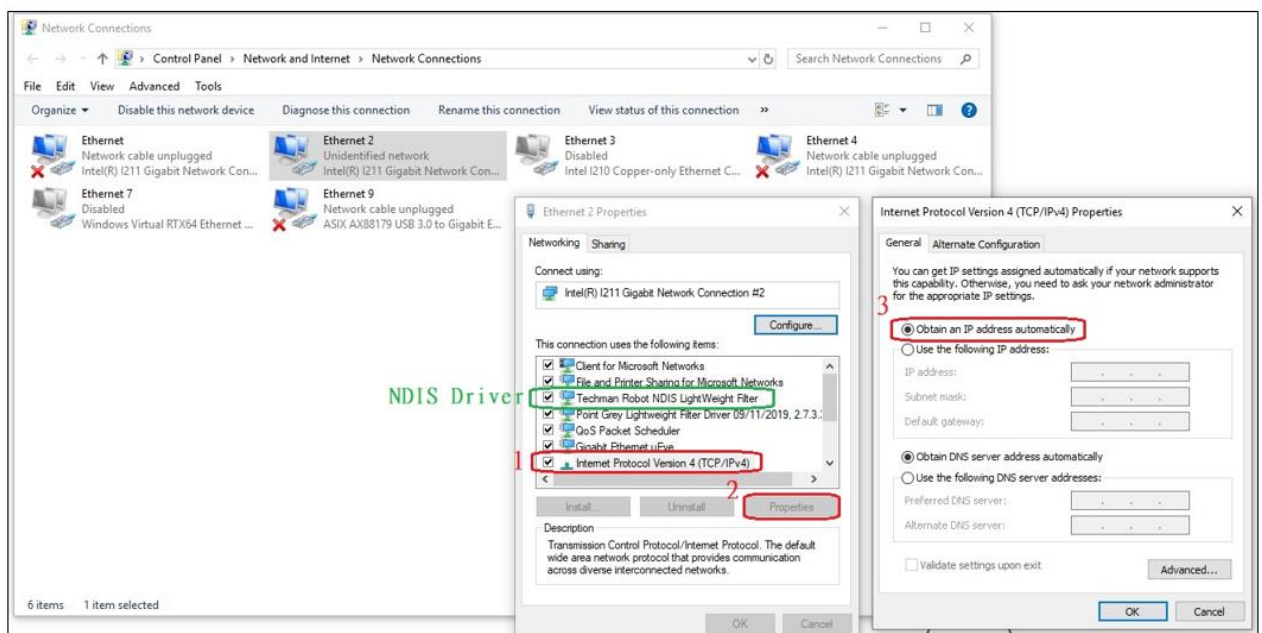


3. Right click the Ethernet2 and choose properties, check whether the Techman NDIS Light Weight Filter exists or not.



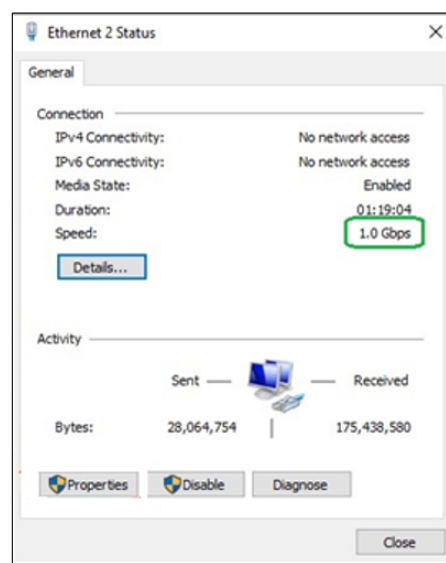
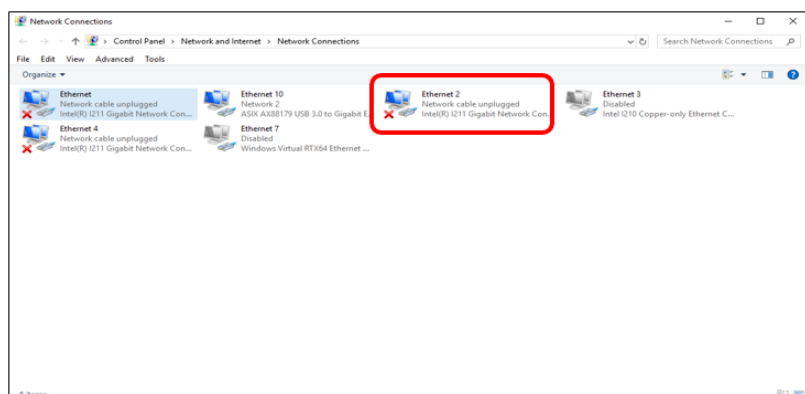
Check Network setting_2

1. Choose Internet Protocol version4 and then choose properties. Check whether the IP setting is DHCP, set it as DHCP.



Check Network setting_3

1. Choose Ethernet2, and check whether the Ethernet Speed is 1.0 Gbps or not; if not, it means the problem could be caused by hard ware components.



Check TRI camera

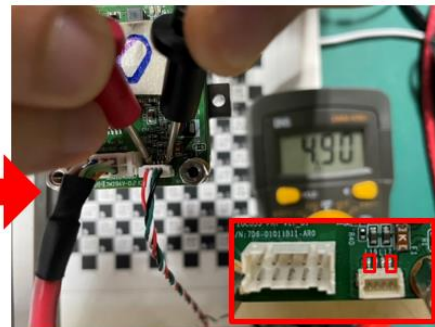
1. Follow Picture 1 to remove the Camera housing.
2. Use multi-meter to measure the TRI camera power voltage, check if the value is 5V or not as picture 2 & 3



Picture 1 - Remove camera housing screw



Picture 2 - Measure TRI camera Power



Picture 3 - Measure pins

Check TRI Camera_LED indicators

1. The orange light on the left indicates link status, signifying that the RJ45 signals on both sides (IPC and TRI camera) are connected.
2. The yellow light on the right represents data, and it illuminates when data is being transmitted.
3. When capturing a picture, the blinking frequency will be faster. In principle, please use the data light to verify whether the TRI camera Ethernet is active or not.



11.2 Camera won't focus

Symptom description

EIH camera can not focus by HMI adjustment

Possible causes

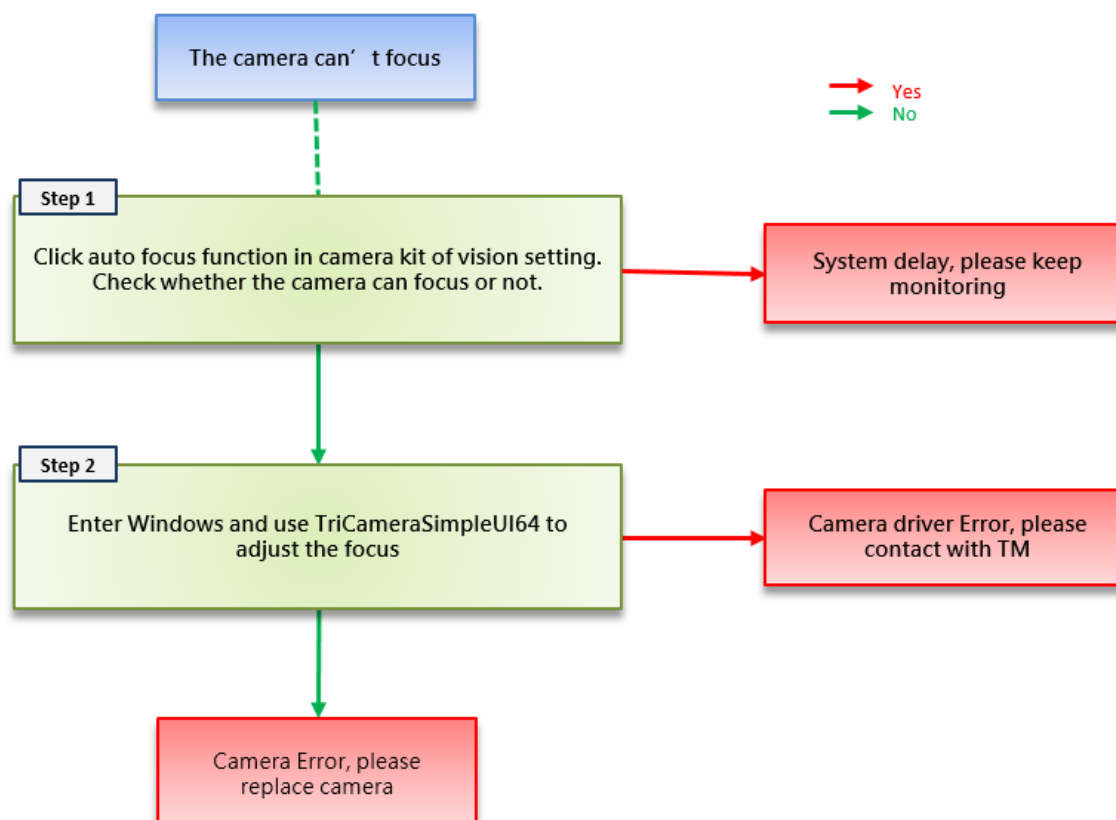
This issue may be caused by following reasons/components:

1. HMI
2. Camera

Symptom photos Or Error codes

N/A

Notices



11.3 Point offset

Symptom description

The robot cannot reach the previous position after a collision or for an unknown reason. This issue typically arises following a collision or relocation.

Possible causes

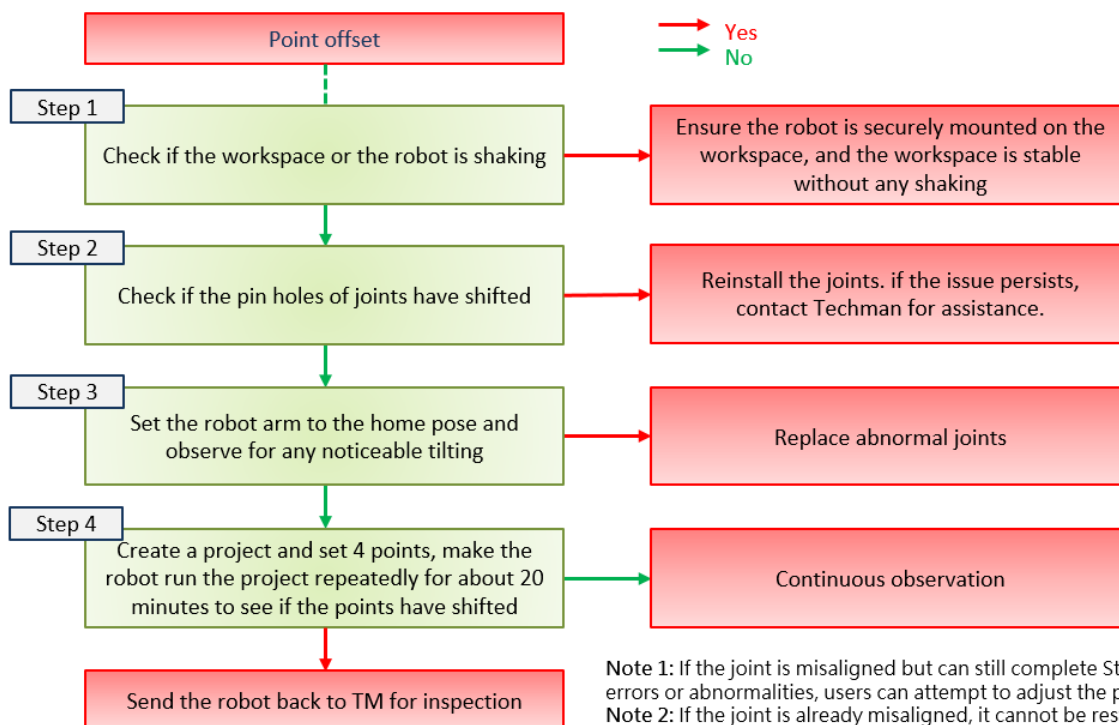
This issue may be caused by following reasons/components:

1. Joint
2. End module
3. Surrounding equipment

Symptom photos Or Error codes

N/A

Notices



Note 1: If the joint is misaligned but can still complete Step 4 without triggering other errors or abnormalities, users can attempt to adjust the position and continue using it.
Note 2: If the joint is already misaligned, it cannot be restored by any calibration steps.

11.4 Control box fails to boot up

Symptom description

Control box fails to boot up after pressing the power key on the stick

Possible causes

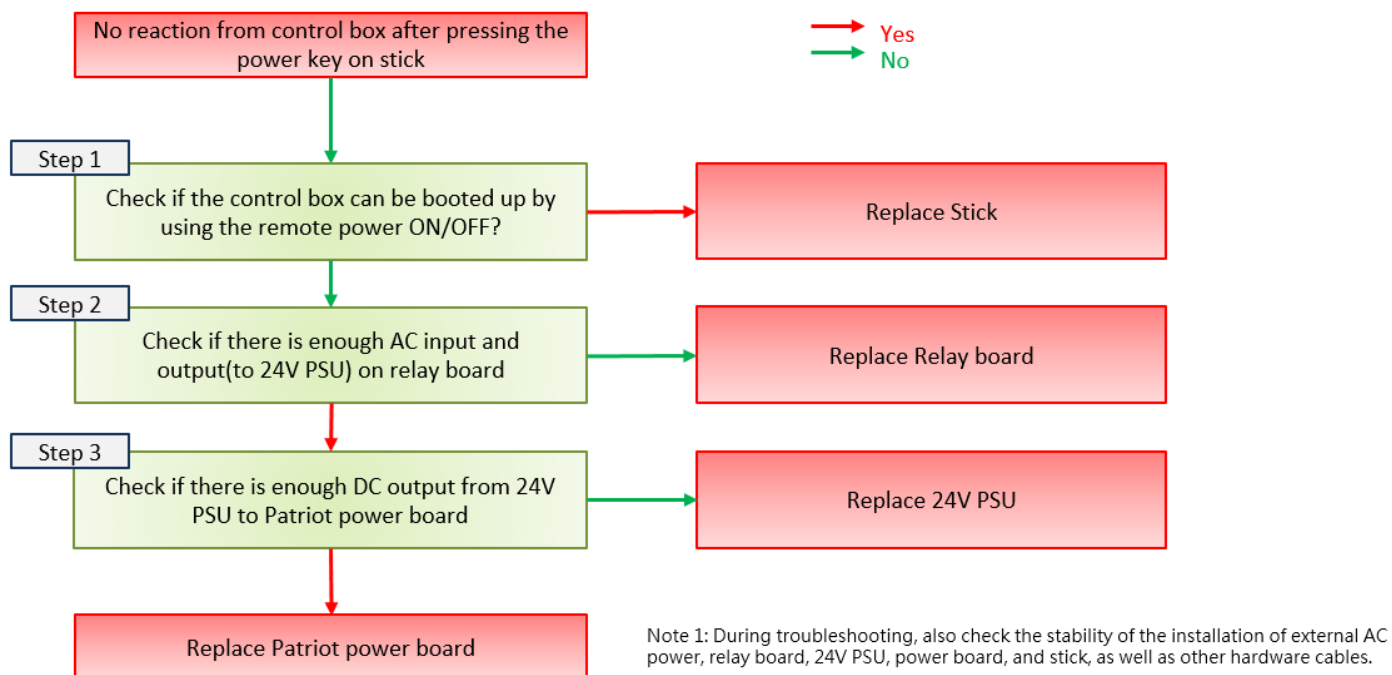
This issue may be caused by following reasons/components:

1. Stick
2. Relay board
3. 24V PSU
4. Patriot power board

Symptom photos Or Error codes

N/A

Notices



11.5 Encoder Error

Symptom description	TMflow shows messages relating to encoder error or encoder compensation error
Possible causes	This issue may be caused by following reasons/components: 1. Joint
Symptom photos Or Error codes	0xFFCE / 0xFFED / 0xFFE4
Notices	When encountering Encoder-related anomalies, determine which joint is causing the issue based on the Error code displayed in TMFlow, and request replacement for the affected joint.

11.6 Robot arm does not activate

Symptom description

There is no power supply from the control box to the robot arm, and the indicator light ring on the end module does not illuminate even after the control box has been booted up.

Possible causes

This issue may be caused by following reasons/components:

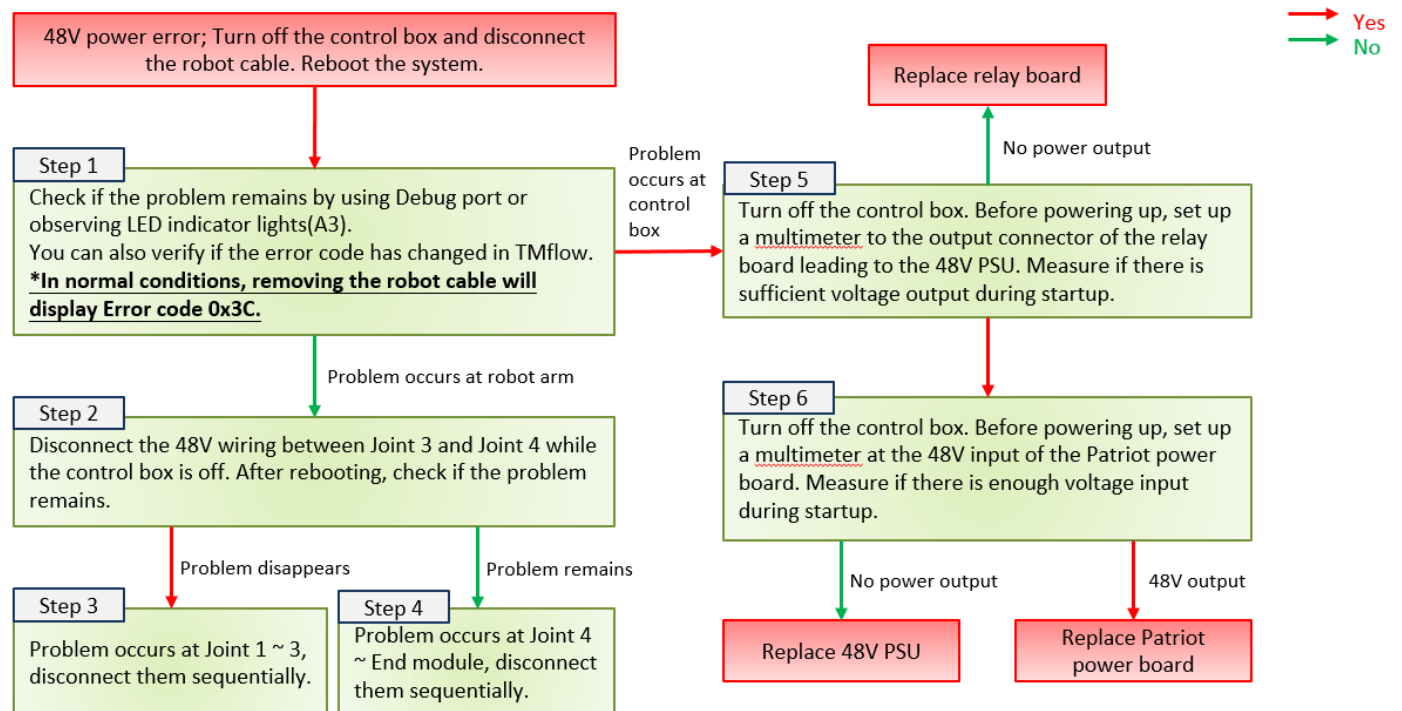
1. Power relay board
2. 48V PSU(Power supply)
3. Patriot power board
4. Power eater
5. Joints
6. End module

Symptom photos Or Error codes

0x3E / 0x53 ...

Notices

When addressing this 48V circuit issue, we recommend starting by disconnecting the robot and control box. This step will help you identify and narrow down the range of components that need to be checked.



11.7 TM Safe error

Symptom description

Can not access TMflow normally, showing error codes below.

Possible causes

The error may be caused by following reasons/components:

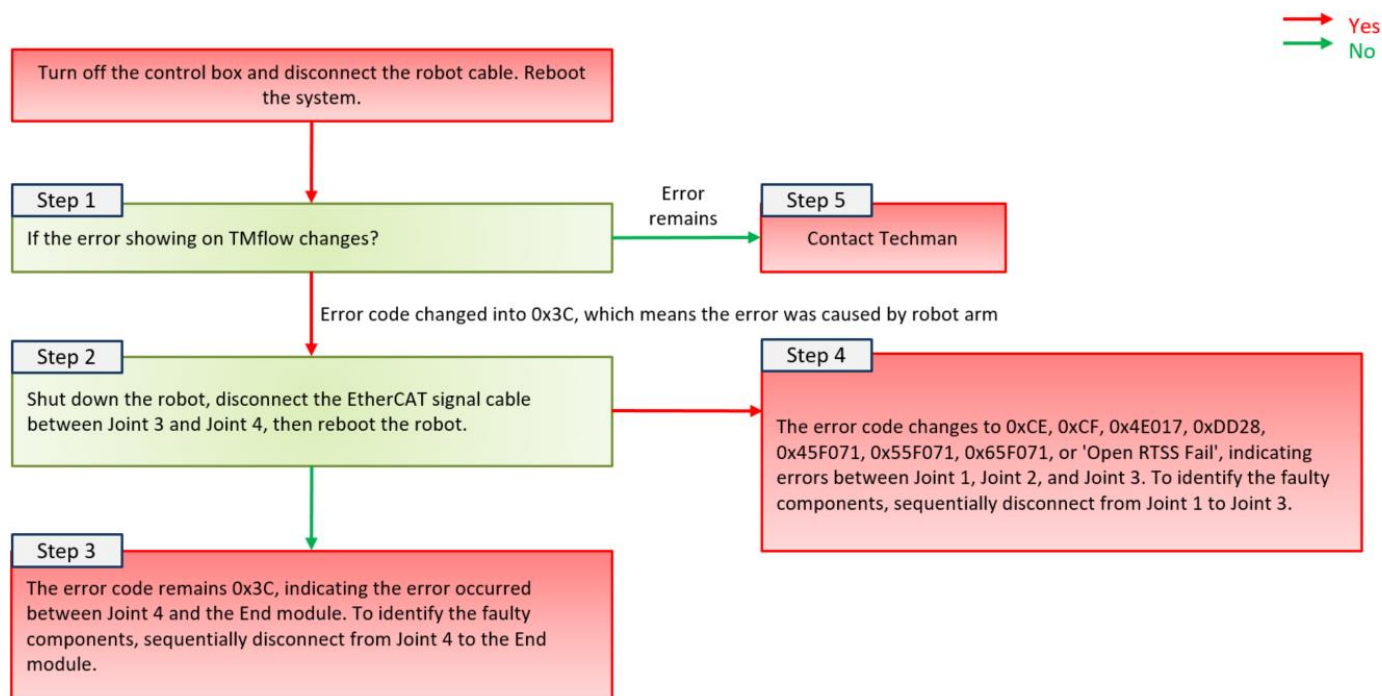
1. Joint
2. Patriot power board

Symptom photos Or Error codes

0xCE, 0xCF, 0x4E017, 0xDD28, 0x45F071, 0x55F071, 0x65F071, Open RTSS Fail

Notices

When addressing this trouble shooting, we recommend starting by disconnecting the robot and control box, and check if the error code changes. This step will help you identify and narrow down the range of components that need to be checked.



11.8 Torque error

Symptom description

During robot operation, it displays that torque limits exceed the standard.

Possible causes

The error may be caused by following reasons/components:

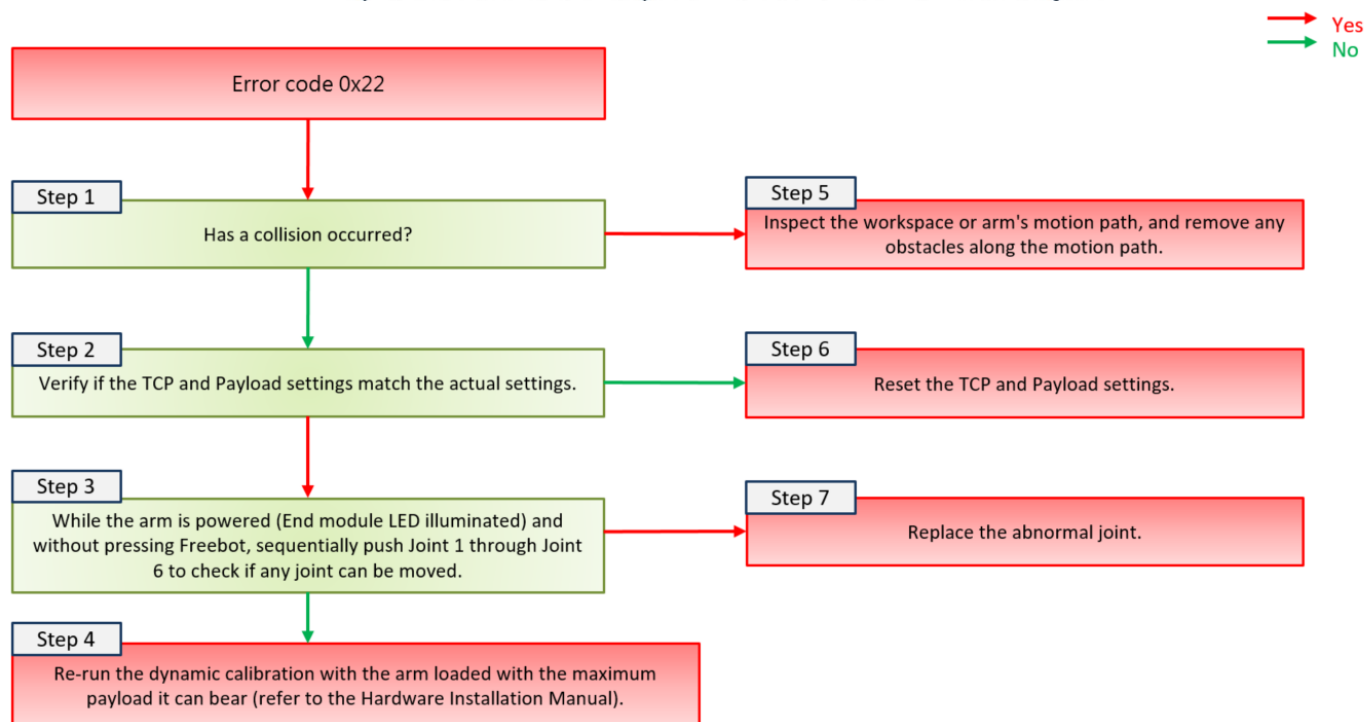
1. TCP settings do not match reality
2. Obstacle or interference detected along the arm's motion path
3. Abnormality in joint
4. Safety parameter abnormality

Symptom photos Or Error codes

0x22, 0xFF08, 0xFF0B, 0xFF0E, 0xFF11, 0xFF14, 0xFF17, 0xFFCF

Notices

When addressing this trouble shooting, it is recommended to first check whether there is any interference with other objects along the arm's motion path. Prolonged interference or collisions may lead to a shortened lifespan of the Harmonic Drive within the joint."



11.9 Kinematic calibration failed

Description

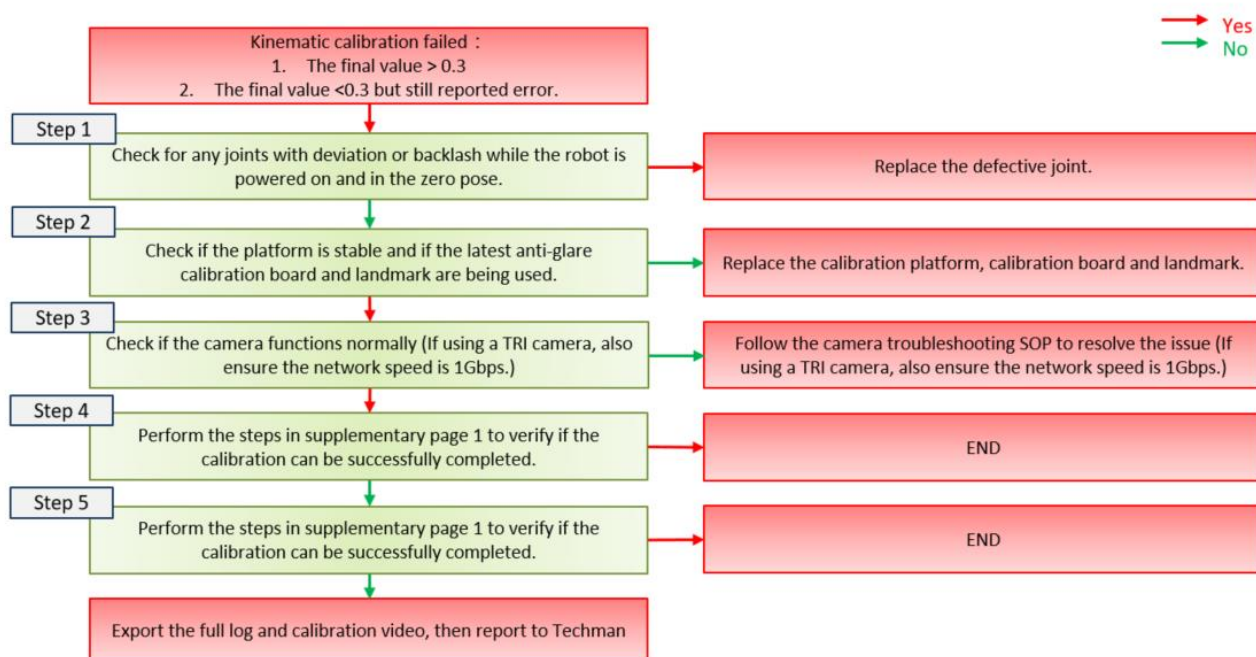
Kinematic calibration failed

Possible causes

1. Camera malfunction.
2. Landmark abnormality.
3. Joint malfunction or incorrect joint assembly.

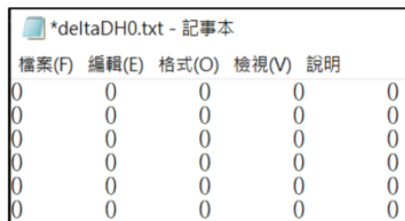
Error code

NA



9. Kinematic calibration failed _ supplementary page 1

1. Navigate to the path: D:\Robotfile
2. Back up the following files and delete them: deltaDH0.bin, deltaDH0.txt, Driveroffset0.bin, Driveroffset0.txt
3. In the D:\Robotfile directory, create the following files: EEPROMUPDATE1.txt & EEPROMUPDATE0.txt
4. Create a new file named DeltaDH0.txt, and enter the required values:

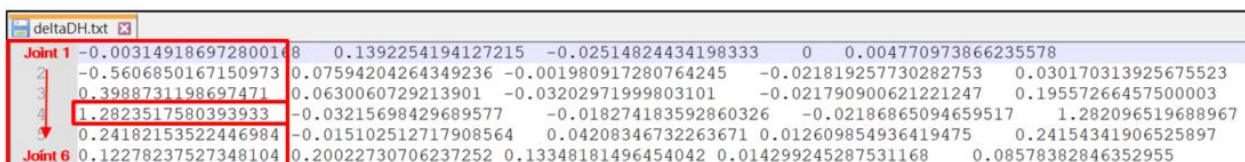


檔案(F)	編輯(E)	格式(O)	檢視(V)	說明
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

5. Create a new Driveroffset0.txt and input the following values:
HW1 – HW3.2: -45.00000000,0.00000000,0.00000000,0.00000000,0.00000000,0.00000000
HW5: 90.00000000,0.00000000,0.00000000,0.00000000,0.00000000,0.00000000,
6. Reboot the system and perform the calibration again.

9. Kinematic calibration failed _ supplementary page 2

1. Navigate to the path: D:\CalibrationData
2. Open deltaDH.txt and check if any values are greater than 1. If any values are greater than 1, reassemble the corresponding joint. (For example, in the case of following image, Joint 4 needs to be reassembled.)



Joint 1	-0.003149186972800168	0.1392254194127215	-0.02514824434198333	0	0.004770973866235578
2	-0.5606850167150973	0.07594204264349236	-0.001980917280764245	-0.021819257730282753	0.030170313925675523
3	0.3988731198697471	0.0630060729213901	-0.03202971999803101	-0.021790900621221247	0.19557266457500003
4	1.2823517580393933	-0.03215698429689577	-0.018274183592860326	-0.02186865094659517	1.282096519688967
	0.24182153522446984	-0.015102512717908564	0.04208346732263671	0.012609854936419475	0.24154341906525897
Joint 6	0.12278237527348104	0.20022730706237252	0.13348181496454042	0.014299245287531168	0.08578382846352955

1. If the calibration still fails after reassembling, and the value at that position is still greater than 1, replace the joint.

11.10 Hand-eye calibration failed

Description

Hand-eye calibration failed

Possible causes

1. Landmark abnormality.
2. Camera parameter abnormality

Error code

NA

