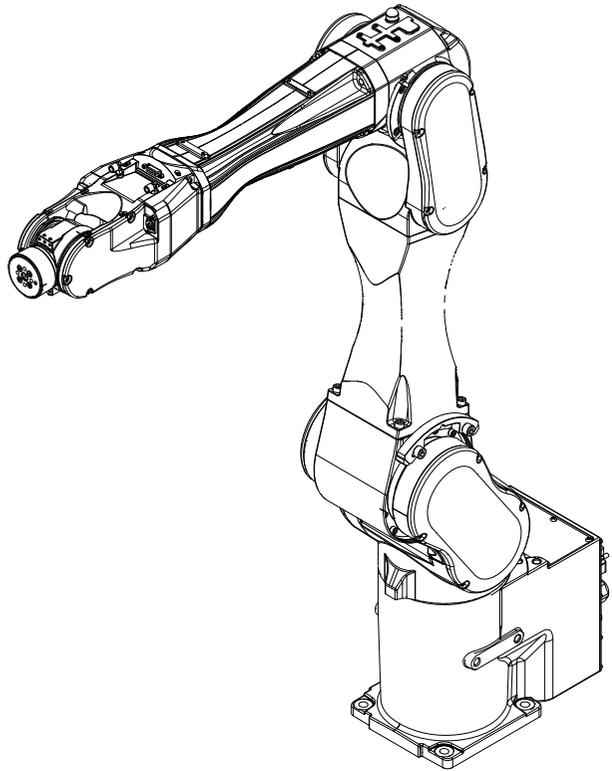


EPSON



6-Axis Robots
C8-B/C12-B
C8-C/C12-C
Service Manual

Rev. 4

ENSM252R0002

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CHAPTER

1

Maintenance Information

1.1 Safety Maintenance

Maintenance of robot system shall always be performed by personnel who has taken safety training.

Personnel who has taken safety training refers to a person who has taken safety training for workers engaged in activities related to industrial robots as stipulated by the laws and regulations of each country (such as the knowledge on industrial robots, knowledge on operations and teaching, knowledge on activities concerning inspection, etc., and training on related laws). Personnel who has taken training held by the manufacturer refers to a person who has completed the introduction training and maintenance training.

 WARNING	<ul style="list-style-type: none">● Do not remove any parts that are not covered in this manual. Follow the maintenance procedure strictly as described in this manual. Do not proceed using any methods other than described in this manual when you do replace a part or maintain the equipment. Improper removal of parts or improper maintenance may not only cause improper function of the robot system but also serious safety problems.● Keep away from the Manipulator while the power is ON if you have not taken the training courses. Do not enter the operating area while the power is ON. Entering the operating area with the power ON is extremely hazardous and may cause serious safety problems as the Manipulator may move even when it seems to be stopped.● When you check the operation of the Manipulator after replacing parts, be sure to check it while you are outside of the safeguarded area. Checking the operation of the Manipulator while you are inside of the safeguarded area may cause serious safety problems as the Manipulator may move unexpectedly.● Before operating the robot system, make sure that both the Emergency Stop switches and safeguard switch function properly. Operating the robot system when the switches do not function properly is extremely hazardous and may result in serious bodily injury and/or serious damage to the robot system as the switches cannot fulfill their intended functions in an emergency.● To shut off power to the robot system, disconnect the power plug from the power source. Be sure to connect the AC power cable to a power receptacle. DO NOT connect it directly to a factory power source.● Before performing any replacement procedure, turn OFF the Controller and related equipment, and then disconnect the power plug from the power source. Performing any replacement procedure with the power ON is extremely hazardous and may result in electric shock and/or malfunction of the robot system.● When maintaining the manipulator, wear at least the following protective gear. Working without protective gear may cause serious safety problems.<ul style="list-style-type: none">· Work clothes suitable for work· Helmet· Safety shoes
---	--



- Do not allow foreign objects to enter the inside of the manipulator or the connection terminals. Energizing the manipulator with foreign objects in it may cause electric shock or malfunction, which is extremely dangerous.



- Be sure to connect the cables properly. Do not allow unnecessary strain on the cables. (Do not put heavy objects on the cables. Do not bend or pull the cables forcibly.) The unnecessary strain on the cables may result in damage to the cables, disconnection, and/or contact failure. Damaged cables, disconnection, or contact failure is extremely hazardous and may result in electric shock and/or improper function of the robot system.
- When operating maintenance of Manipulator, secure about 500 mm of empty space around the Manipulator.
- Carefully use alcohol, liquid gasket, and adhesive following respective instructions and instructions below. Careless use of alcohol, liquid gasket, or adhesive may cause a fire and/or safety problem.
 - Never put alcohol, liquid gasket, or adhesive close to fire.
 - Use alcohol, liquid gasket, or adhesive while ventilating the room.
 - Wear protective gear including a mask, protective goggles, and oil-resistant gloves.
 - If alcohol, liquid gasket, or adhesive gets on your skin, wash the area thoroughly with soap and water.
 - If alcohol, liquid gasket, or adhesive gets into your eyes or mouth, flush your eyes or wash out your mouth with clean water thoroughly, and then see a doctor immediately.
- Wear protective gear including a mask, protective goggles, and oil-resistant gloves during grease up. If grease gets into your eyes, mouth, or on your skin, follow the instructions below.
 - If grease gets into your eyes
Flush them thoroughly with clean water, and then see a doctor immediately.
 - If grease gets into your mouth
If swallowed, do not induce vomiting. See a doctor immediately. If grease just gets into your mouth, wash out your mouth with water thoroughly.
 - If grease gets on your skin
Wash the area thoroughly with soap and water.

1.2 General Maintenance

Performing maintenance inspections properly is essential for preventing trouble and maintaining safety. This chapter describes the schedules for maintenance inspection and procedures.

Be sure to perform the maintenance inspections in accordance with the schedule.

1.2.1 Schedule for Maintenance Inspection

Inspection points are divided into five stages: daily, monthly, quarterly, biannual, and annual. The inspection points are added every stage. If the Manipulator is operated for 250 hours or longer per month, the inspection points must be added every 250 hours, 750 hours, 1,500 hours, and 3,000 hours operation.

	Inspection Point					
	Daily inspection	Monthly inspection	Quarterly inspection	Biannual inspection	Annual inspection	Overhaul (replacement)
1 month (250 h)	Inspect every day	√	-	-	-	-
2 months (500 h)		√	-	-	-	-
3 months (750 h)		√	√	-	-	-
4 months (1,000 h)		√	-	-	-	-
5 months (1,250 h)		√	-	-	-	-
6 months (1,500 h)		√	√	√	-	-
7 months (1,750 h)		√	-	-	-	-
8 months (2,000 h)		√	-	-	-	-
9 months (2,250 h)		√	√	-	-	-
10 months (2,500 h)		√	-	-	-	-
11 months (2,750 h)		√	-	-	-	-
12 months (3,000 h)		√	√	√	√	-
13 months (3,250 h)		√	-	-	-	-
:	:	:	:	:	:	
20,000 h	-	-	-	-	-	√

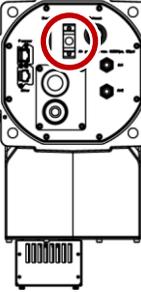
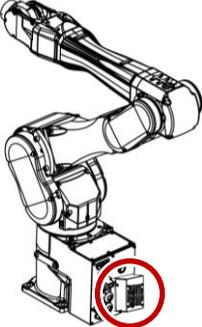
1.2.2 Inspection Point

Inspection Item

Inspection Point	Inspection Place	Daily	Monthly	Quarterly	Biannual	Annual
Check looseness or backlash of bolts/screws.	End effector mounting bolts	√	√	√	√	√
	Manipulator mounting bolts	√	√	√	√	√
Check looseness of connectors.	External connectors on Manipulator (on the Connector Plates etc.)	√	√	√	√	√
Visually check for external defects. Clean up if necessary.	External appearance of Manipulator	√	√	√	√	√
	External cables	-	√	√	√	√
Check for bends or improper location. Repair or place it properly if necessary.	Safeguard, etc.	√	√	√	√	√
Check either the external short connector or the brake release unit connector is connected.	The external short connector on the back side of the Manipulator, or the brake release unit connector.	√	√	√	√	√
Check the Brake operation	Joint #1 to 6 break	√	√	√	√	√
Check whether unusual sound or vibration occurs.	Whole	√	√	√	√	√
Check if the fan is running (C8XL/C12XL only)	Fan	√	√	√	√	√

Inspection Method

Inspection Point	Inspection Method
Check looseness or backlash of bolts/screws.	Use a hexagonal wrench to check that the end effector mounting bolts and the Manipulator mounting bolts are not loose. When the bolts are loose, refer to 1.2.6 Tightening Bolts/Screws and tighten them to the proper torque.
Check looseness of connectors.	Check that connectors are not loose. When the connectors are loose, reattach it not to come off. Check that connectors are not loose.
Visually check for external defects. Clean up if necessary.	Check the appearance of the Manipulator and clean up if necessary. Check the appearance of the cable, and if it is scratched, check that there is no visible internal cable.

Inspection Point	Inspection Method
<p>Check for bends or improper location. Repair or place it properly if necessary.</p>	<p>Check that the safeguard, etc. are located properly. If the location is improper, place it properly.</p>
<p>Check either the external short connector or the brake release unit connector is connected.</p>	<p>Check whether external short connector or break release connector is connected. When neither is connected, connect either one.</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="667 424 920 635"> <p>M/C Cable backward</p>  </div> <div data-bbox="1205 424 1458 751"> <p>M/C Cable downward</p>  </div> </div>
<p>Check the Brake operation</p>	<p>Check that the arm does not fall when in MOTOR OFF. If the arm falls when in MOTOR OFF and the brake is not released, contact the supplier.</p>
<p>Check whether unusual sound or vibration occurs.</p>	<p>Check that there is no unusual sound or vibration during operation, no stiffness or looseness in the sliding parts or moving parts, and that the operation is performed smoothly. If an abnormality is suspected, replace the part in which the abnormality has occurred.</p>
<p>Check if the fan is running (C8XL/C12XL only)</p>	<p>Check that the fan is running when in MOTOR ON. If the fan is not running when in MOTOR ON, contact the supplier.</p> <div style="text-align: right;">  </div>

1.2.3 Overhaul (Parts Replacement)

**CAUTION**

- Overhaul timing is based on an assumption that all joints are operated for equal distance. If a particular joint has a high duty or high load, it is recommended to overhaul all joints (as many as possible) before exceeding 20,000 operation hours with the joint as a basis.

The parts for the Manipulator joints may cause accuracy decline or malfunction due to deterioration of the Manipulator resulting from long term use. In order to use the Manipulator for a long term, it is recommended to overhaul the parts (parts replacement).

The time between overhauls is 20,000 operation hours of the Manipulator as a rough indication.

However, it may vary depending on usage condition and degree of the load (such as when operated with the maximum motion speed and maximum acceleration / deceleration in continuous operation) applied on the Manipulator.

NOTE

For EPSON RC+ 7.0 Ver. 7.2.x or later (firmware Ver. 7.2.x.x or later) and EPSON RC+ 8.0, the recommended replacement time of parts to be maintained (Motor, Reduction Gears, and Timing Belts) can be checked in the [Maintenance] dialog box.

NOTE

The recommended replacement time for the maintenance parts is when it reaches the L10 life (time until 10% failure probability).
In the [Maintenance] dialog box, the L10 life is displayed as 100%.

For the parts subject to overhaul, refer to [Chapter 5 Exploded View/Maintenance Parts List](#).

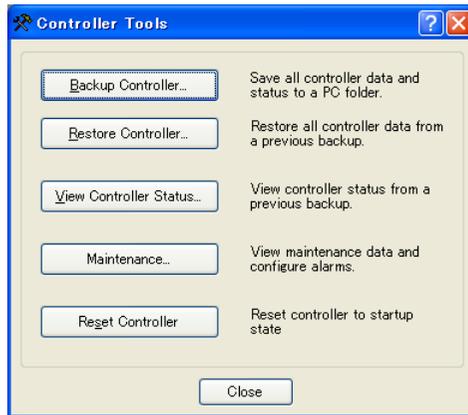
For details of replacement of each part, refer to [Chapter 2 Maintenance](#).

Please contact the supplier of your region for further information.

How to View the Maintenance Information using the EPSON RC+ 7.0

The configured maintenance information can be checked in the EPSON RC+ 7.0 Ver.7.2.x or later.

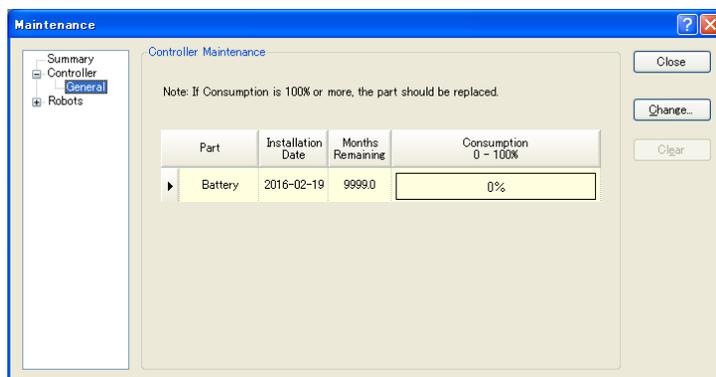
1. Select the EPSON RC+ 7.0 menu-[Tools]-[Maintenance] to display the [Controller Tools] dialog box.



2. To check the Controller maintenance information, click the <Maintenance> button and display the [Maintenance] dialog box.



3. Select “General” or specify the axis from the tree to display information of the target parts.

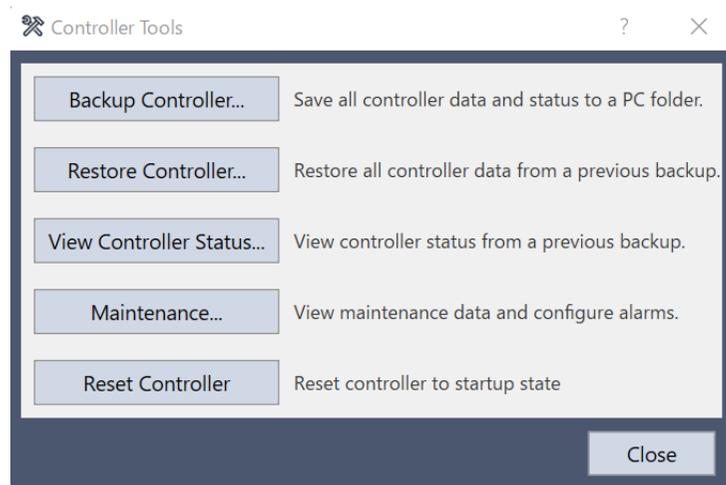


NOTE Remaining months is calculated based on the past operation conditions.

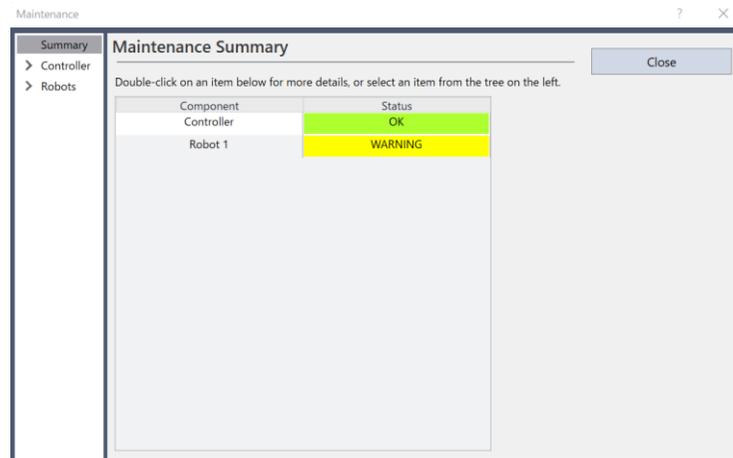
How to View the Maintenance Information using the EPSON RC+ 8.0

The configured maintenance information can be checked in the EPSON RC+ 8.0.

1. Select the EPSON RC+ 8.0 menu-[Tools]-[Maintenance] to display the [Controller Tools] dialog box.



2. To check the Controller maintenance information, click the <Maintenance> button and display the [Maintenance] dialog box.



3. Select “General” or specify the axis from the tree to display information of the target parts.

Robot Maintenance: Joint

Robot 1, 1, Joint 3
Note: If Consumption is 100% or more, the part should be replaced (L10).

Part	Installation Date	Months Remaining	Consumptio...	Status
Belt	2024-06-19	9999.0	0	OK
Motor	2024-06-19	9999.0	0	OK
Ballscrew	2024-06-19	9999.0	0	OK
Grease	2022-09-06	0.0	362	WARNING

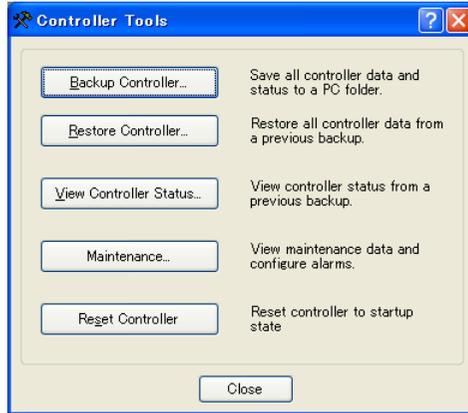
NOTE Remaining months is calculated based on the past operation conditions.

How to Edit the Maintenance Information using the EPSON RC+ 7.0

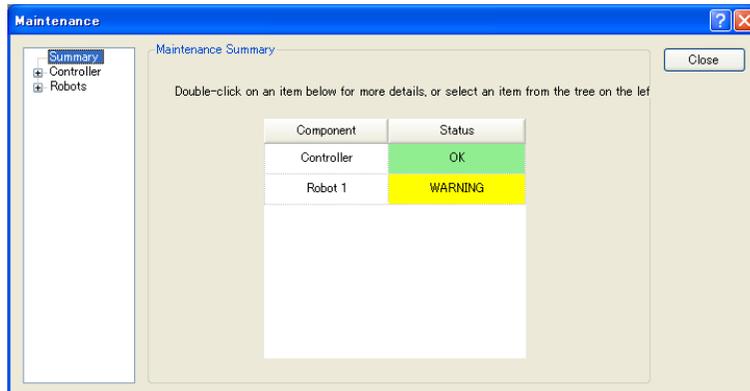
The configured maintenance information can be edited in the EPSON RC+ 7.0 Ver.7.2.x or later.

When replaced the parts subject to maintenance (Motors, Reduction Gears, and Timing Belts), please edit the Maintenance Information.

1. Select the EPSON RC+ 7.0 menu- [Tools] - [Maintenance] to display the [Controller Tools] dialog box.

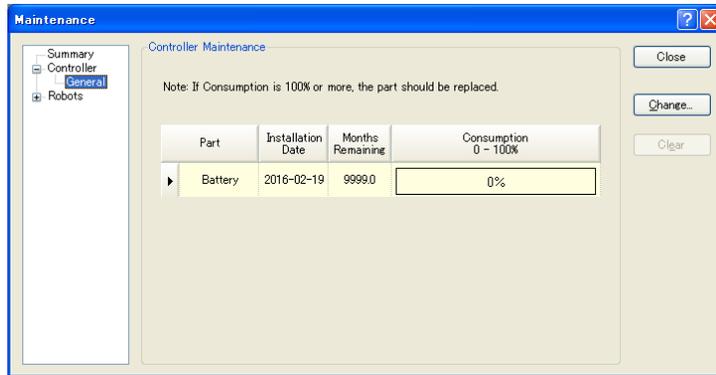


2. To edit the maintenance information, display the [Maintenance] dialog box.



3. Select "General" or specify the axis from the tree to display information of the target parts.

4. Select the alarm to be changed and click the <Change> button.



5. Display the [Change Alarm] dialog box and enter any of the followings.



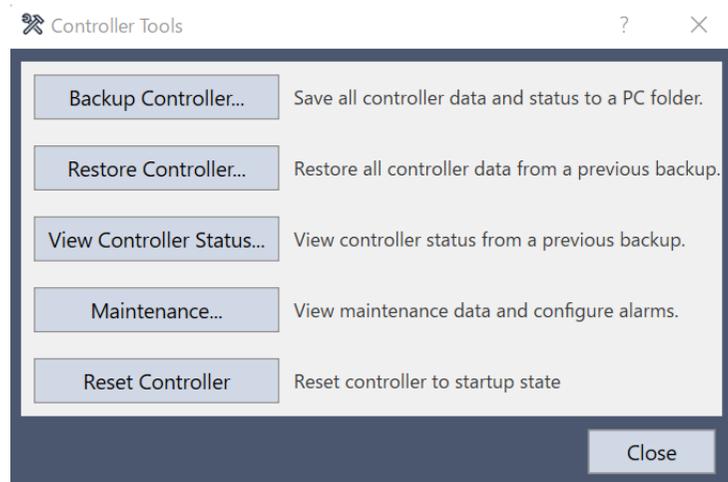
6. Click the <OK> button and change the specified alarm information.

How to Edit the Maintenance Information using the EPSON RC+ 8.0

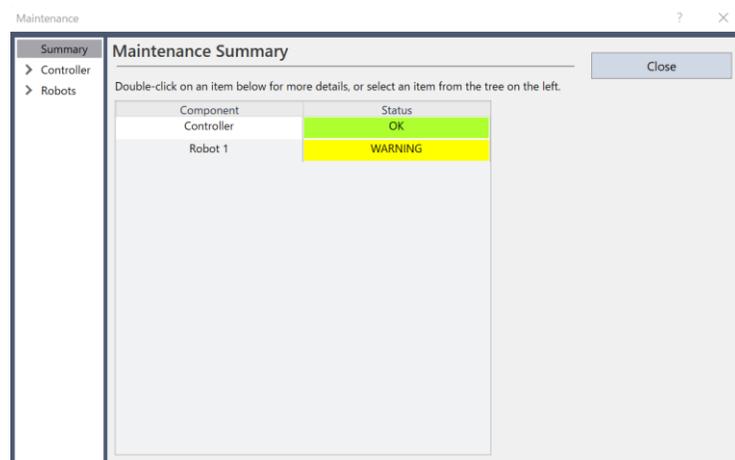
The configured maintenance information can be edited in the EPSON RC+ 8.0.

When replaced the parts subject to maintenance (Motors, Reduction Gears, and Timing Belts), please edit the Maintenance Information.

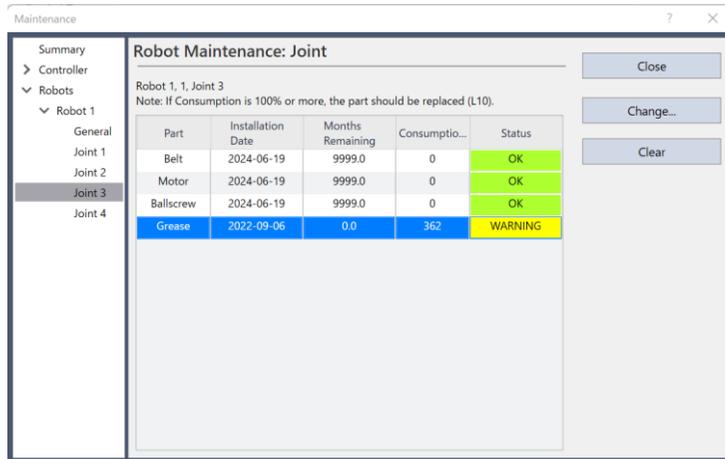
1. Select the EPSON RC+ 8.0 menu- [Tools] - [Maintenance] to display the [Controller Tools] dialog box.



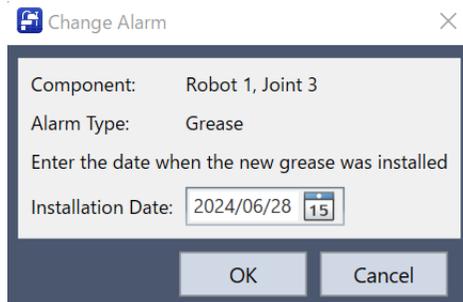
2. To edit the maintenance information, display the [Maintenance] dialog box.



3. Select “General” or specify the axis from the tree to display information of the target parts.
4. Select the alarm to be changed and click the <Change> button.



5. Display the [Change Alarm] dialog box and enter any of the followings.

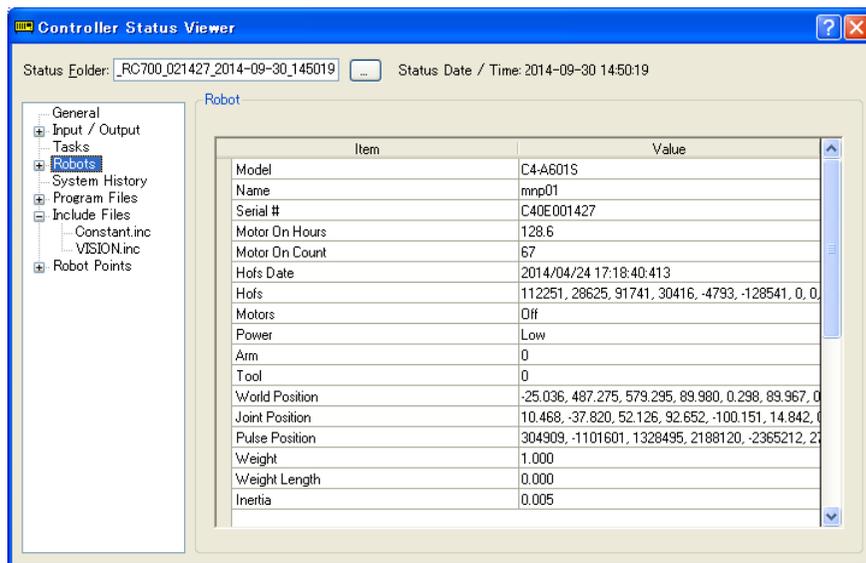


6. Click the <OK> button and change the specified alarm information.

How to check the Manipulator operation hours using the EPSON RC+ 7.0

The Manipulator operation hours can be checked in [Controller Status Viewer] dialog - [Motor On Hours].

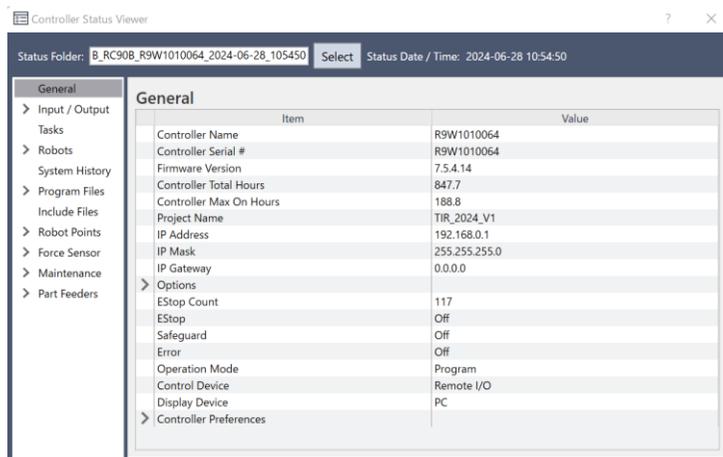
1. Select EPSON RC+ menu- [Tools] - [Controller] to open the [Controller Tools] dialog.
2. Click the <View Controller Status> button to open the [Browse For Folder] dialog.
3. Select the folder where the information is stored.
4. Click <OK> to view the [Controller Status Viewer] dialog.
5. Select [Robots] from the tree menu on the left side.



How to check the Manipulator operation hours using the EPSON RC+ 8.0

The Manipulator operation hours can be checked in [Controller Status Viewer] dialog - [Motor On Hours].

1. Select EPSON RC+ menu- [Tools] - [Controller] to open the [Controller Tools] dialog.
2. Click the <View Controller Status> button to open the [Browse For Folder] dialog.
3. Select the folder where the information is stored.
4. Click <OK> to view the [Controller Status Viewer] dialog.
5. Select [Robots] from the tree menu on the left side.



1.2.4 Greasing

The reduction gear units and the bevel gear need greasing regularly. Only use the grease specified in the following table.

 WARNING	<ul style="list-style-type: none"> ● Before greasing, turn OFF the Controller and related equipment, and then disconnect the power plug from the power source. Performing any replacement procedure with the power ON is extremely hazardous and may result in electric shock and/or malfunction of the robot system.
 CAUTION	<ul style="list-style-type: none"> ● Keep enough grease in the Manipulator. Operating the Manipulator with insufficient grease will damage sliding parts and/or result in insufficient function of the Manipulator. Once the parts are damaged, a lot of time and money will be required for the repairs. ● If grease gets into your eyes, mouth, or on your skin, follow the instructions below. <ul style="list-style-type: none"> · If grease gets into your eyes Flush them thoroughly with clean water, and then see a doctor immediately. · If grease gets into your mouth If swallowed, do not induce vomiting. See a doctor immediately. If grease just gets into your mouth, wash out your mouth with water thoroughly. · If grease gets on your skin Wash the area thoroughly with soap and water.

	Greasing part	Greasing Interval	Grease
Joints #1, 2, 3, 4, 5	Reduction gear units	Overhaul timing	SK-1A
Joint # 6	Reduction gear units		SK-2
Joint # 6	Bevel gear	Overhaul timing	SK-2

Joint #1, 2, 3, 4, 5, 6 Reduction Gears

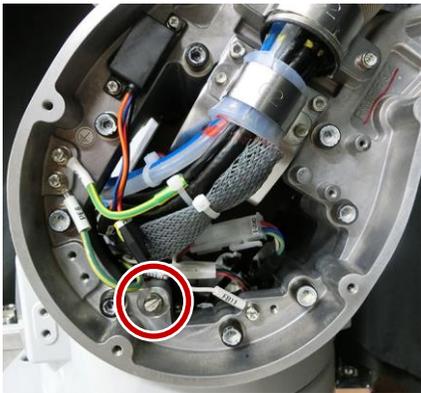
As a rough indication, perform greasing at the same timing as overhaul.

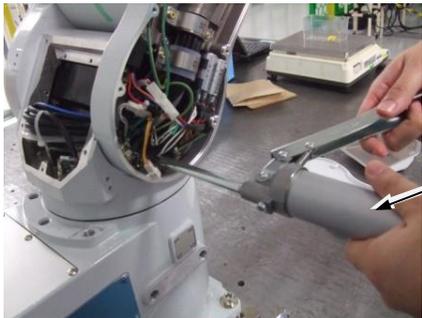
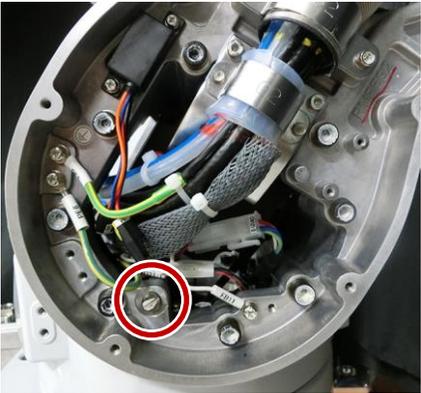
However, it may vary depending on ambient temperature, usage condition and degree of the load (such as when operated with the maximum motion speed and maximum acceleration / deceleration in continuous operation) applied on the Manipulator.

NOTE

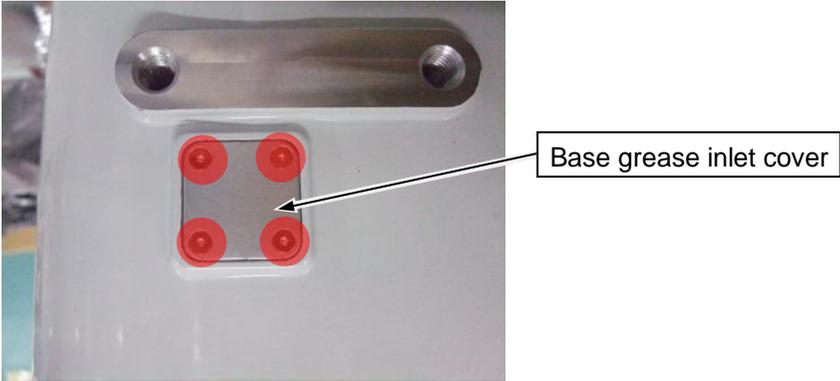
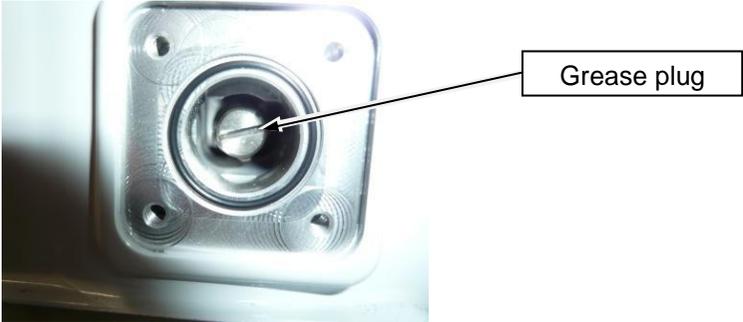
- Before greasing, move the Manipulator so that the grease inlet is not directed down.
Do not remove the grease plug while the grease inlet is directed down. Otherwise the oil content separated from the grease may leak out.
- Do not use any tool to install and remove the grease nipple and grease line extension jig.
Always handle them directly by your hand.
If the grease nipple or grease line extension jig is installed or removed with a tool such as wrench, they may be damaged.

Joint #1 Reduction Gear Unit (Table Top Mounting)

①	Remove the Arm #1 side cover .
②	<p>Remove the grease plug from the Joint #1 grease inlet located inside the Arm #1.</p> 
③	Attach the grease nipple to the Joint #1 grease inlet.

<p>④</p>	<p>Inject grease from the grease nipple using a grease gun.</p> <p> SK-1A: 11 g</p>  <p>Grease Gun</p>
<p>⑤</p>	<p>Remove the grease nipple from the Joint #1 grease inlet.</p>
<p>⑥</p>	<p>Attach the grease plug to the Joint #1 grease inlet.</p> <p>POINT</p> <p>If the grease plug is damaged or deteriorated, replace it with a new one.</p> 
<p>⑦</p>	<p>Install the Arm #1 side cover.</p>

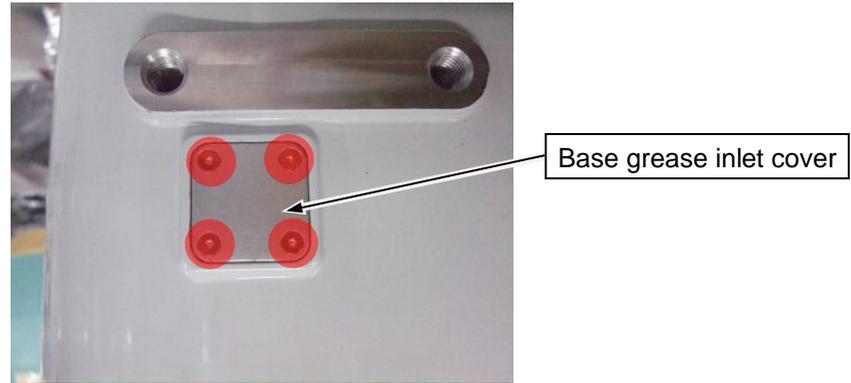
Joint #1 Reduction Gear Unit (Ceiling Mounting, Wall mounting)

<p>①</p>	<p>Remove the base grease inlet cover.</p> <p>A Hexagon socket flat head bolts: 4-M3x6</p> 
<p>②</p>	<p>Remove the O-ring located in the base groove.</p>
<p>③</p>	<p>Remove the grease plug from the Joint #1 grease inlet located inside the base.</p> 
<p>④</p>	<p>Attach the grease line extension jig and grease nipple to the Joint #1 grease inlet.</p>

⑤	<p>Inject grease from the grease nipple using a grease gun.</p> <p> SK-1A: 11 g</p>  <p>Grease Gun</p>
⑥	<p>Remove the grease nipple and grease line extension jig from the Joint #1 grease inlet.</p>
⑦	<p>Attach the grease plug to the Joint #1 grease inlet.</p> <p>POINT If the grease plug is damaged or deteriorated, replace it with a new one.</p>  <p>Grease plug</p>
⑧	<p>Apply a thin coat of grease (SK-1A) to the O-ring.</p> <p>POINT</p> <ul style="list-style-type: none">• Fit the O-ring into the base groove.• Do not allow the O-ring to come out of the groove.• If the O-ring is swollen, damaged, or deteriorated, replace it with a new one.

⑨ Install the base grease inlet cover.

A Hexagon socket flat head bolts: 4-M3x6
(2.0 +/- 0.1 N·m)



Joint #2 Reduction Gear Unit

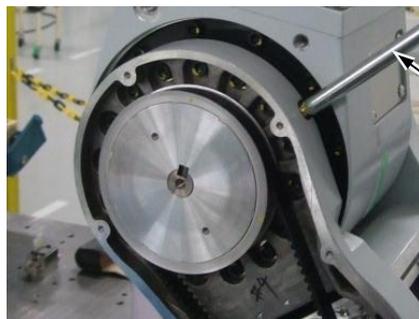
① Remove the grease plug from the Joint #2 grease inlet of the Arm #1.



② Attach the grease nipple to the Joint #2 grease inlet.

③ Inject grease from the grease nipple using a grease gun.

 SK-1A: 6 g (C8L), 12 g (C8XL, C12XL)



Grease Gun

④ Remove the grease nipple from the Joint #2 grease inlet.

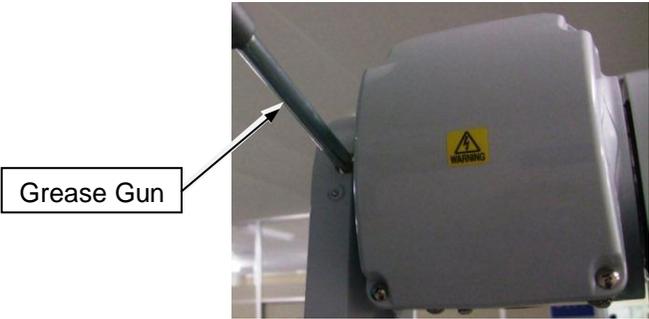
⑤ Attach the grease plug to the Joint #2 grease inlet.

POINT

If the grease plug is damaged or deteriorated, replace it with a new one.



Joint #3 Reduction Gear Unit

<p>①</p>	<p>Remove the grease plug from the Joint #3 grease inlet of the Arm #2.</p> 
<p>②</p>	<p>Attach the grease nipple to the Joint #3 grease inlet.</p>
<p>③</p>	<p>Inject grease from the grease nipple using a grease gun.</p> <p> SK-1A: 3 g</p> 
<p>④</p>	<p>Remove the grease nipple from the Joint #3 grease inlet.</p>

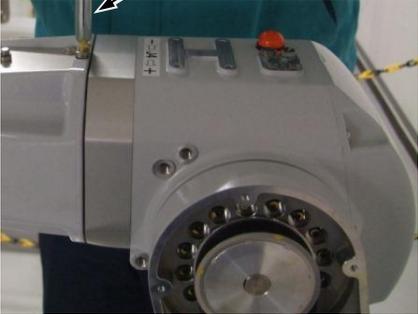
- ⑤ Attach the grease plug to the Joint #3 grease inlet.
POINT
If the grease plug is damaged or deteriorated, replace it with a new one.



Joint #4 Reduction Gear Unit

- ① Remove the grease plug from the Joint #4 grease inlet of the Arm #4.



<p>②</p>	<p>Attach the grease nipple to the Joint #4 grease inlet.</p> <p>CAUTION</p> <p>The grease plug attaching hole located near the label with “4” printed is the Joint #4 grease inlet.</p> <p>The grease inlet position differs depending on the model. Carefully identify the correct position.</p>
<p>③</p>	<p>Inject grease from the grease nipple using a grease gun.</p> <p> SK-1A: 2 g</p> <div data-bbox="728 486 1146 869"><p style="text-align: center;">Grease Gun</p></div>
<p>④</p>	<p>Remove the grease nipple from the Joint #4 grease inlet.</p>

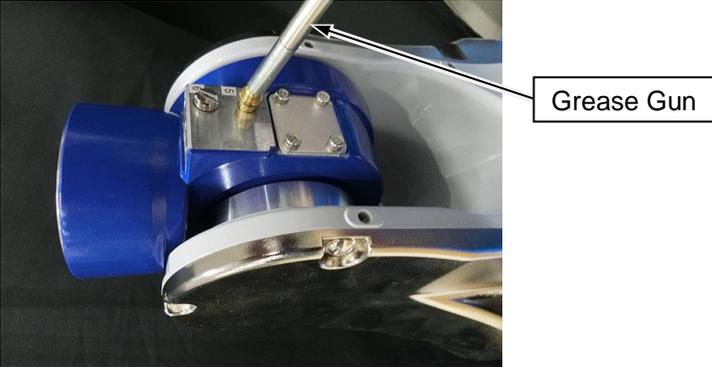
- ⑤ Attach the grease plug to the Joint #4 grease inlet.
POINT
If the grease plug is damaged or deteriorated, replace it with a new one.



Joint #5 Reduction Gear Unit

- ① Remove the grease plug from the Joint #5 grease inlet of the Arm #5.



②	<p>Attach the grease nipple to the Joint #5 grease inlet.</p> <p>CAUTION</p> <p>The grease plug attaching hole located near the label with “5” printed is the Joint #5 grease inlet.</p> <p>Be careful not to confuse it with the Joint #6 grease inlet.</p>
③	<p>Inject grease from the grease nipple using a grease gun.</p> <p> SK-1A: 1 g</p> <p>CAUTION</p> <p>Be careful not to mix with the grease used in the Joint #6 (SK-2).</p> <div data-bbox="685 536 1397 903"></div>
④	<p>Remove the grease nipple from the Joint #5 grease inlet.</p>

- ⑤ Attach the grease plug to the Joint #5 grease inlet.
POINT
If the grease plug is damaged or deteriorated, replace it with a new one.



Joint #6 Reduction Gear Unit

- ① Remove the grease plug from the Joint #6 grease inlet of the Arm #5.



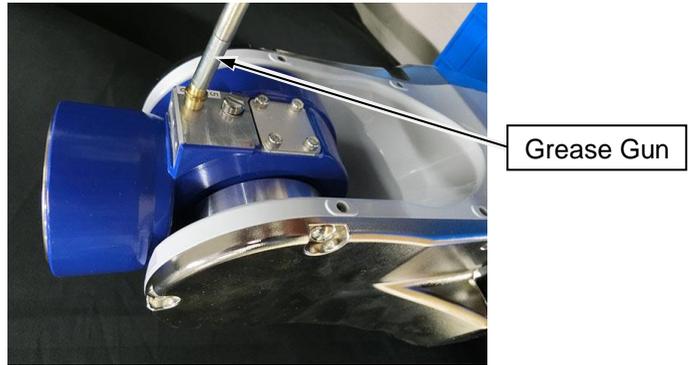
- ② Attach the grease nipple to the Joint #6 grease inlet.
CAUTION
The grease plug attaching hole located near the label with "6" printed is the Joint #6 grease inlet.
Be careful not to confuse it with the Joint #5 grease inlet.

③ Inject grease from the grease nipple using a grease gun.

 SK-2: 0.5 g

CAUTION

Be careful not to mix with the grease used in the Joint #5 (SK-1A).



④ Remove the grease nipple from the Joint #6 grease inlet.

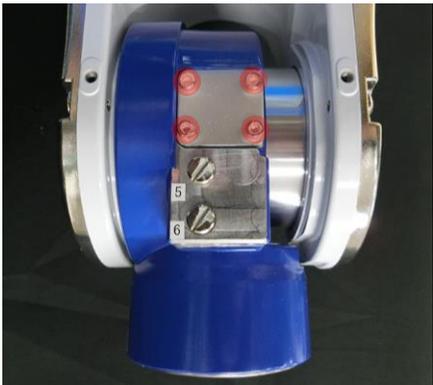
⑤ Attach the grease plug to the Joint #6 grease inlet.

POINT

If the grease plug is damaged or deteriorated, replace it with a new one.



Joint #6 Bevel Gear

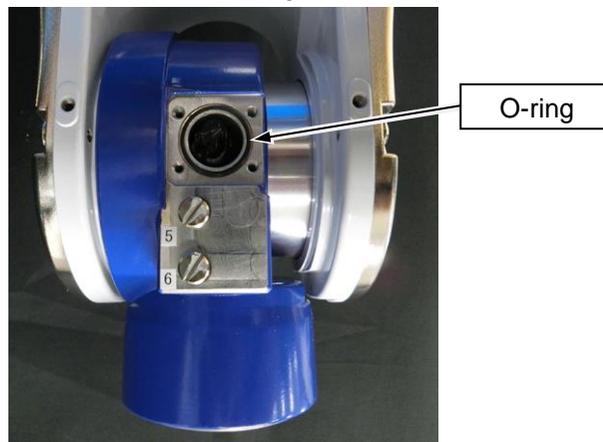
<p>①</p>	<p>Remove the Arm #5 grease inlet cover.</p> <p>A S01: 4-M3x6</p> 
<p>②</p>	<p>Apply grease to the mating surface of the bevel gear inside the Arm #5.</p> <p> SK-2: 2 g</p> 

- ③ If any swelling, damage or deterioration is observed in the O-ring, replace the O-ring using the following procedure.

1. Lightly coat the O-ring with grease (SK-2).
2. Install the O-ring in the groove in the base.

POINT

Make sure the O-ring does not protrude from the groove.



- ④ Install the Arm #5 grease inlet cover.

A S01: 4-M3x6
(2.0 +/- 0.1 N·m)



1.2.5 Tools/Materials

Tools used

	Name	Quantity	Note
Hexagonal wrench	width across flats: 1.5 mm	1	For M3 hexagon socket head set screws
	width across flats: 2 mm	1	For M2.5 silver and black hexagon socket head cap screws, and for M4 hexagon socket head set screws
	width across flats: 2.5 mm	1	For M3 silver and black hexagon socket head cap screws, and for M5 hexagon socket head set screws
	width across flats: 3 mm	1	For M4 silver and black hexagon socket head cap screws
	width across flats: 4 mm	1	For M5 silver and black hexagon socket head cap screws
	width across flats: 5 mm	1	For M6 silver and black hexagon socket head cap screws
	width across flats: 6 mm	1	For M8 silver and black hexagon socket head cap screws
Torque wrench	0.7 N·m to 44.0 N·m	1	For details, refer to 1.2.6 Tightening Bolts/Screws .
Phillips screwdriver	Ph2	1	For covers, and for securing the Ground Wires
Flat head screwdriver		1	For grease plug
Needle-nose pliers		1	For removing the Air Tubes
Feeler gauge (0.5 mm)		2	For adjusting the fixing position of the pulleys and Brake Hubs
Wrench	width across flats: 5 mm	1	2.9.1 Removing the Cable Unit (For removing the D-sub Connectors)
	width across flats: 8 mm	1	For removing and installing the air tube fittings
Box wrench	width across flats: 5 mm	1	2.9.1 Removing the Cable Unit (For removing the D-sub Connectors)
Nipper		1	For cutting wire tie
Spatula		1	For applying grease on the Reduction Gear
Wiping cloth		1	For wiping grease from the Reduction Gear
Sonic Belt Tension Meter		1	3.1 Adjusting the Timing Belt Tension
Force gauge		1	3.1 Adjusting the Timing Belt Tension
Suitable cord (Length about 800 mm)		1	3.1 Adjusting the Timing Belt Tension
Cushioning or rags		1	To prevent the arms from being damaged
Grease up kit (A set of grease gun, nipple, and extension jig)		1	Maintenance Parts Code: 1674592

Materials used

Name		Quantity	Note
Grease		Proper quantity	For details, refer to 1.2.4 Greasing .
Liquid gasket		Proper quantity	For preventing oil leaks and securing parts
Adhesive		Proper quantity	For securing parts
Alcohol		Proper quantity	For wiping grease from the J1/J2 Reduction Gear and the Ball Screw Spline
Wire tie	AB100	Proper quantity	Fixing the cables
	AB150		
	AB200		
	AB250		
	AB350		

Grease, Liquid gasket, Adhesive

The manufacturer and URL details of each grease type are as follows. If there is anything unclear, please contact the supplier of your region.

Name	Product name	Manufacturer	URL
Grease	Harmonic Grease SK-1A	Harmonic Drive Systems Inc.	https://www.harmonicdrive.net/
Grease	Harmonic Grease SK-2		
Grease	Krytox®GPL-224	Chemours	https://www.chemours.com/en/brands-and-products
Liquid gasket	ThreeBond 1207B	ThreeBond Co.,Ltd	https://www.threebond.com
Adhesive	ThreeBond 7738		
Adhesive	LOCTITE® 641	LOCTITE	https://loctite.com/

1.2.6 Tightening Bolts/Screws

In the manual, bolts and screws that are removed or installed for maintenance are shown below.

Unless otherwise specified, when re-tightening these bolts for maintenance tasks described in the manual, use a torque wrench and tighten them to the tightening torques noted in the table below.

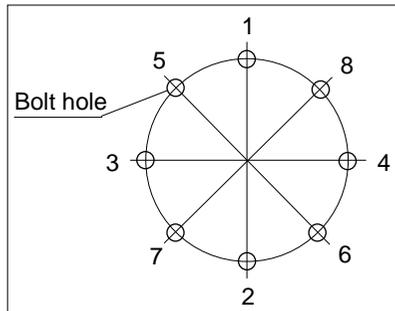
Example) S01: 6-M4x15

S01 indicates the “Type” in the table below. Be sure to tighten with the correct tightening torque after confirming the “Type” and “Size”.

Type	Description	Size	Tightening torque (N·m)
S01	Hexagon socket head cap screw <ul style="list-style-type: none"> • Steel, Nickel plated, silver • Property class 10.9 (JIS B1051, ISO 898-1) 	M2.5	1.0 +/- 0.1
		M3	2.0 +/- 0.1
		M4	4.0 +/- 0.2
		M5	8.0 +/- 0.4
		M6	13.0 +/- 0.6
		M8	32.0 +/- 1.6
S02	Hexagon socket head cap screw <ul style="list-style-type: none"> • Steel, Black dyed, black • Property class 12.9 (JIS B1051, ISO 898-1) • Reduction Gear, etc 	M3	2.5 +/- 0.15
		M4	5.0 +/- 0.25
		M5	10.0 +/- 0.5
		M6	18.0 +/- 0.9
		M8	44.0 +/- 2.2
S03	Cross recessed pan head screw (Circuit boards, etc.)	M2	0.2 +/- 0.03
		M3	0.45 +/- 0.1
		M4	0.45 +/- 0.1
S04	Cross recessed pan head screw (Ground Wires, etc.)	M3	0.45 +/- 0.05
		M4	0.9 +/- 0.1

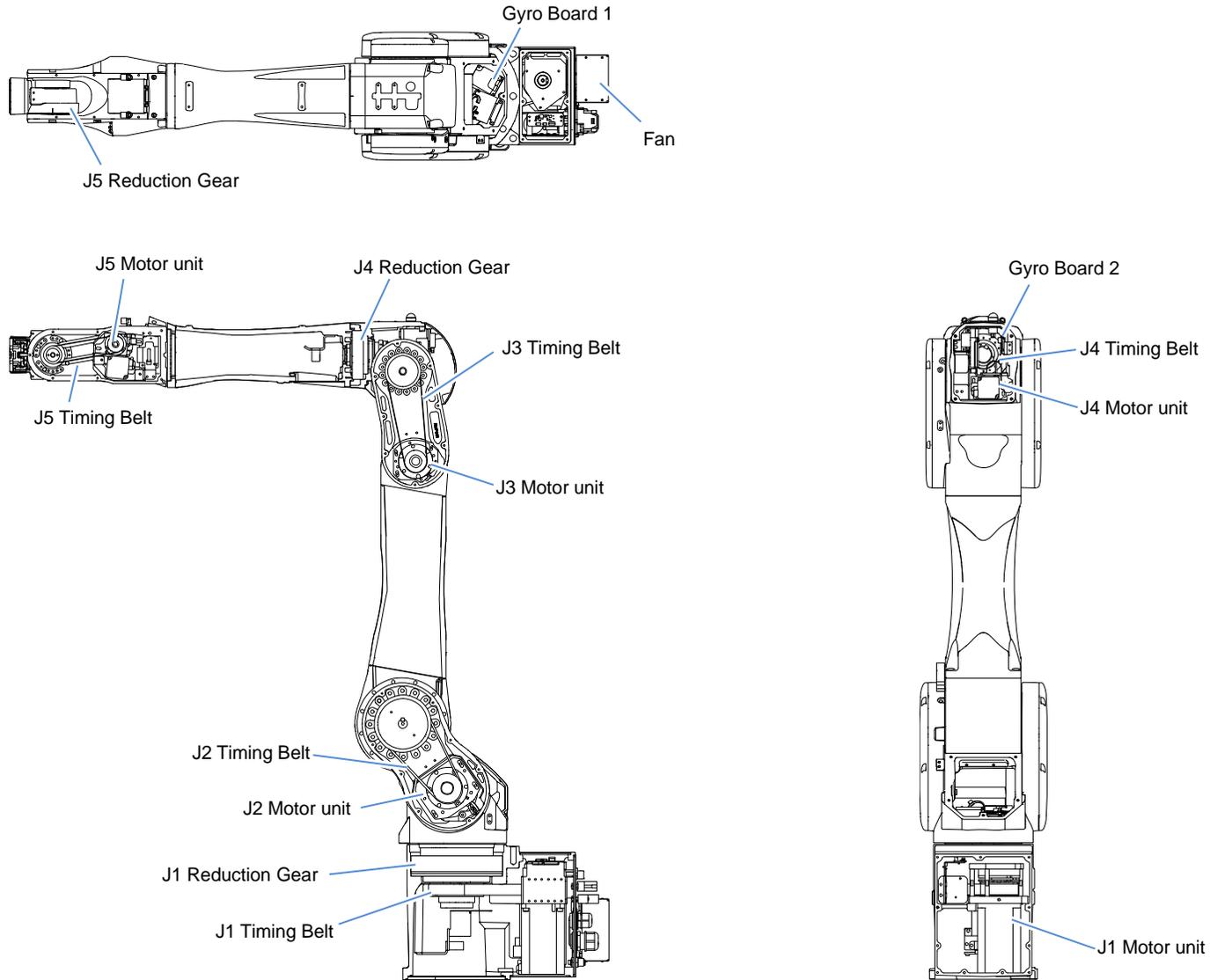
Type	Description	Size	Tightening torque (N·m)
S05	Hexagon socket head set screw <ul style="list-style-type: none"> • Steel, Nickel plated, silver • Property class 45H (JIS B1177, ISO 4026) 	M3	0.9 +/- 0.1
		M4	2.4 +/- 0.1
		M5	4.0 +/- 0.2
S06	Cross recessed truss screw (Covers, etc.)	M4	0.9 +/- 0.1
S07	Cross recessed binding head screw (SUB-B Board (DC/DC Board))	M3	0.45 +/- 0.1

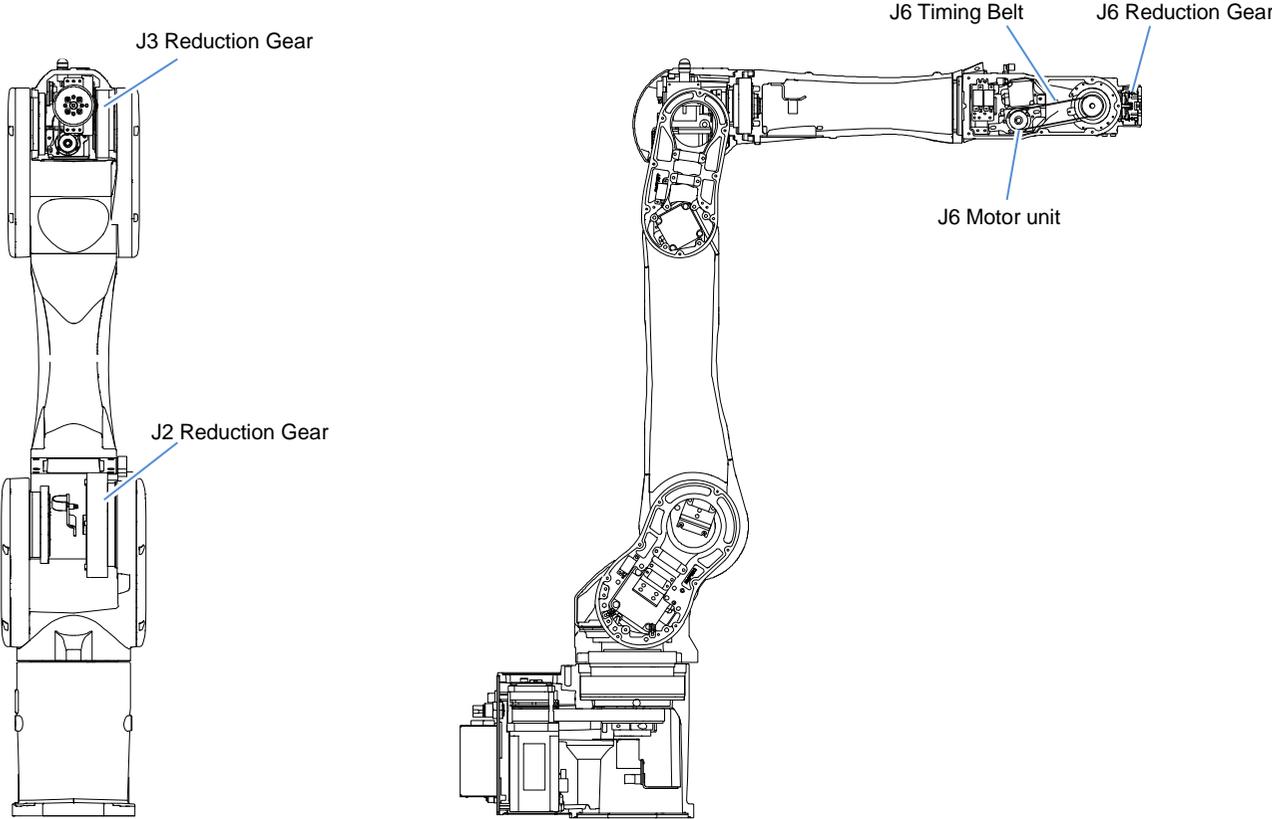
We recommend that the bolts aligned on a circumference should be fastened in a crisscross pattern as shown in the figure below.



Do not fasten all bolts securely at one time. Divide the number of times that the bolts are fastened into two or three and fasten the bolts securely with a hexagonal wrench. Then, use a torque wrench so that the bolts are fastened with tightening torques shown in the table above.

1.3 Parts Layout

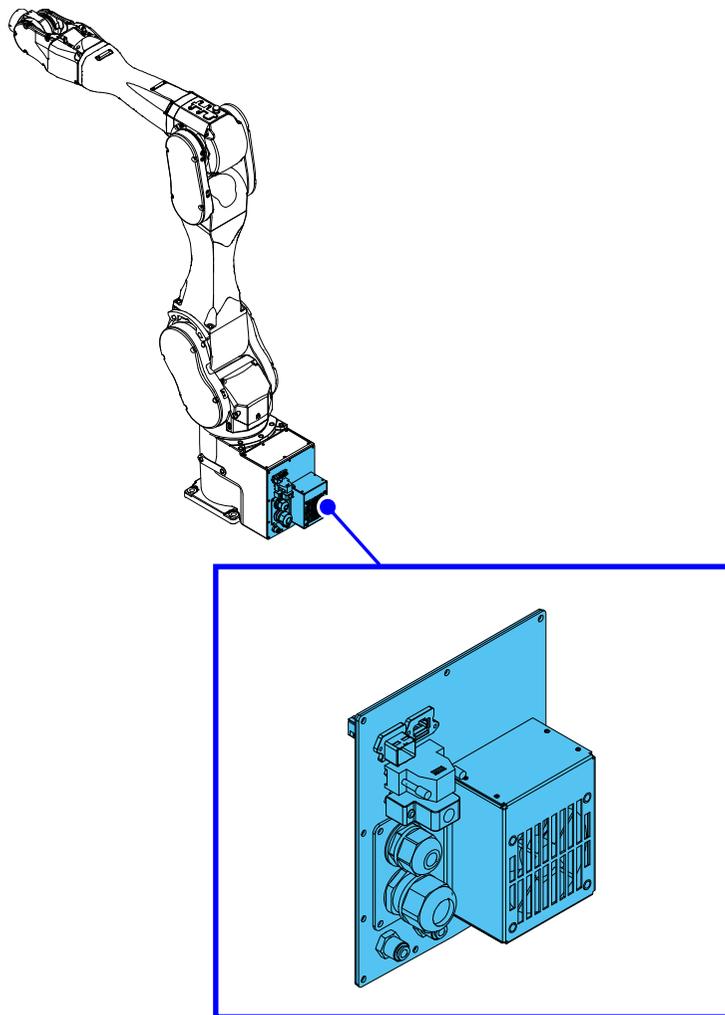




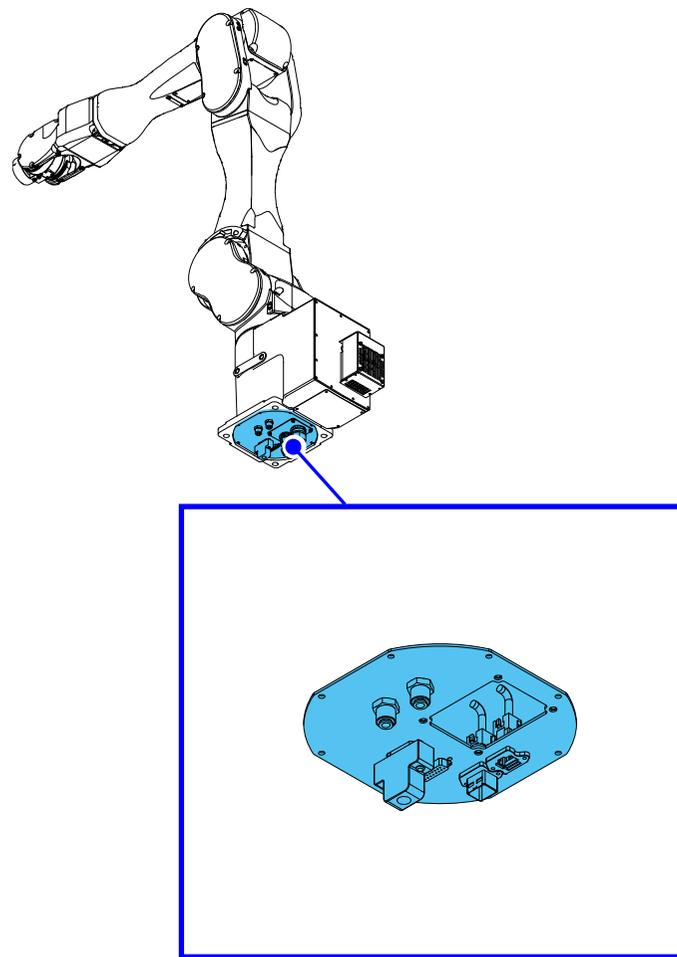
1.4 Difference between M/C Cable Backward model and M/C Cable Downward model

1.4.1 Connector Plate

M/C Cable Backward model

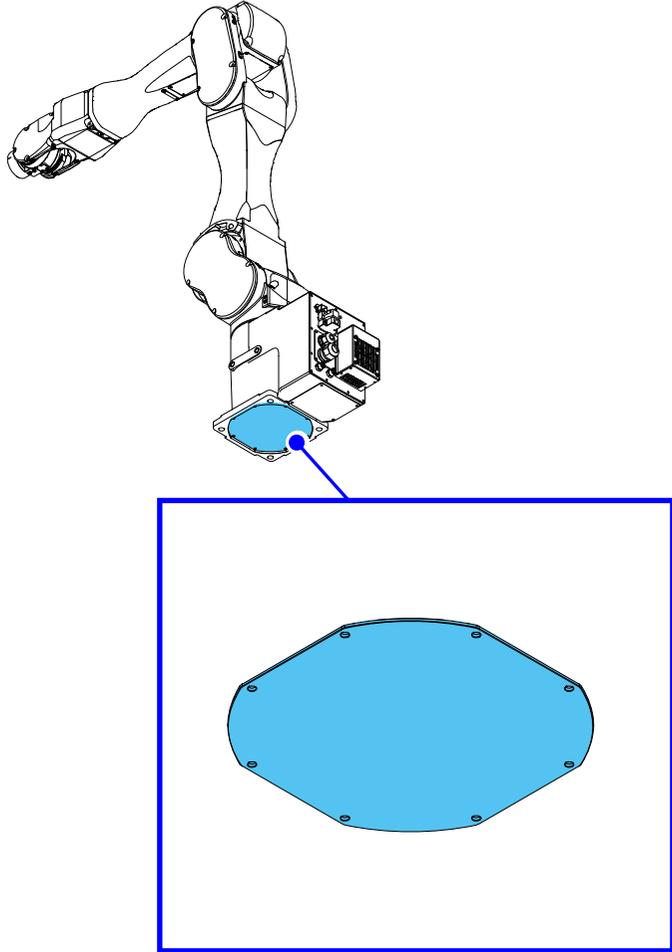


M/C Cable Downward model

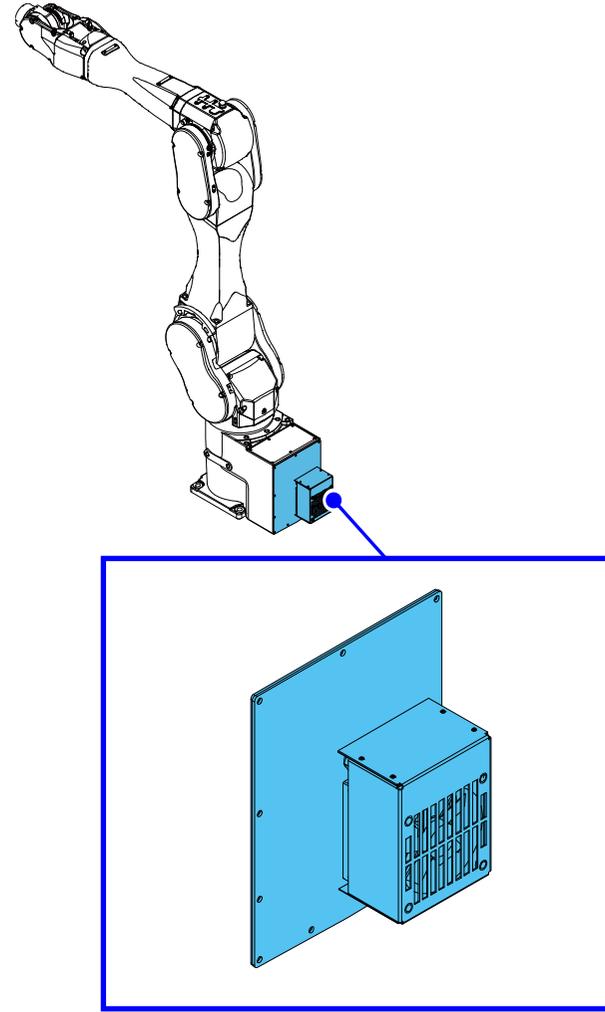


1.4.2 Base Cover

M/C Cable Backward model



M/C Cable Downward model



CHAPTER

2

Maintenance

2.1 Overview

2.1.1 Precautions for Maintenance

- Perform disassembly and assembly according to the procedures described in the manual.
- The parts for the Reduction Gear Unit are managed with serial numbers. Before installing parts, make sure the serial numbers of each match. Combining parts with different serial numbers may result in vibrations, abnormal noise, or other issues that may affect the accuracy of the robot.
- Remove connectors by releasing the latch. When connecting connector, make sure the latch is closed.
- Do not pull the connector or cable with force. Doing so may cause damage.
- When fixing the covers and plates, be careful not to pinch the cables.
- When cutting a wire tie, be careful not to damage the cables.
- Installation of a Silicone Sheet or securing with a wire tie are measures to prevent pulling or grazing of the cable when the robot moves, and also to prevent friction between connectors. Use the Silicone Sheet and wire tie according to the instructions in the manual to fix the cables.
- Make sure that the wire tie is not over-tightened with force.
- When tightening screws, use the correct tightening torque. For details, refer to [1.2.6 Tightening Bolts/Screws](#).
- Fasten the bolts aligned on a circumference in a crisscross pattern. For details, refer to [1.2.6 Tightening Bolts/Screws](#).
- When loosening Motor Plate securing screws, or attaching or removing parts that affect belt tension, make sure to adjust the timing belt tension.
For details, refer to [3.1 Adjusting the Timing Belt Tension](#).
- Before applying grease, wipe off the old grease and anti-rust oil. If any old grease is left behind, the lubrication may deteriorate, the anti-rust oil may harden, and the robot accuracy may be affected.
- Apply the specified amount of grease to the parts specified in the manual.
- When applying grease, take care that the grease does not adhere on to the surrounding parts. Oil separation of the surrounding grease may result in oil leakage. Therefore, be sure to wipe off any adhering grease.

- If the work requires calibration, before starting the work, put the manipulator in the basic posture and make sure that the cables inside the manipulator are not twisted. For the basic posture, refer to the following manuals.

C-B series Manual

C8 Manipulator 3.3.6 Checking the Basic orientation

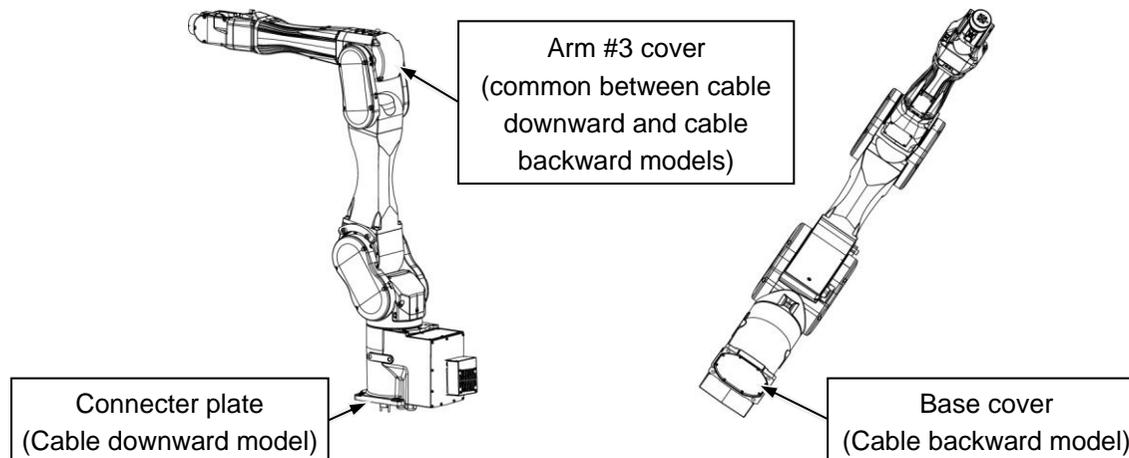
C12 Manipulator 4.3.6 Checking the Basic orientation

C-C series Manual

C8 Manipulator 2.3.6 Checking the Basic orientation

C12 Manipulator 3.3.6 Checking the Basic orientation

- Remove each of the covers to check for twisted cables inside the manipulator.
 Joint #1 : Base cover (Cable backward model), Connector plate (Cable downward model)
 Joint #4 : Arm #3 cover (common between cable downward and cable backward models)

**CAUTION**

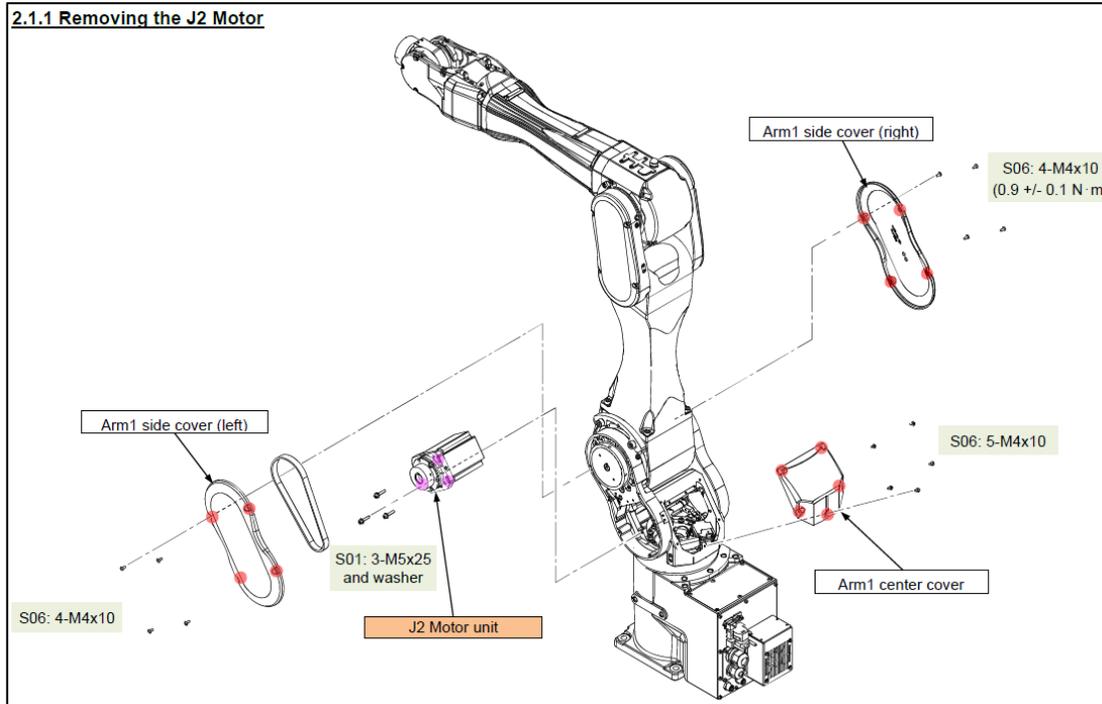
- The Joint #1 and Joint #4 have no mechanical stops and they may be rotated more than 360 degrees. If the encoder initialization is performed with improper posture, the Manipulator moves outside the operation range. If the Manipulator was moved outside the operation range, the internal wiring may be damaged by being twisted or pinched and it may result in Manipulator malfunction.

2.1.2 Viewing the Maintenance Page

Each page is configured as shown below.

Top page of each section

The exploded view shows all parts and units that need to be removed and reinstalled in the section.



Notation of product names in the manual

In this manual, the model name is used to describe where the bolt/screw type or work procedure differs depending on the model number or model name.

Model Number	Model Name
C8-B901***	C8L
C8-C901***	
C8-B1401***	C8XL
C8-C1401***	
C12-B1401**	C12XL
C12-C1401**	

About the bolt and screw type

S01: 3-M4x20

S01 indicates the bolt or screw type.

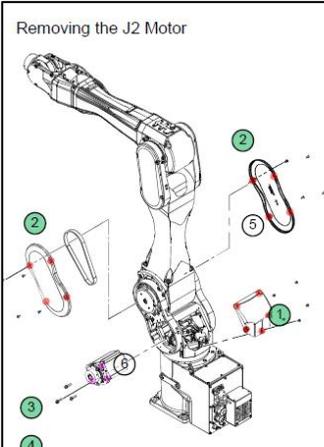
For details on the type, the size, torque value, etc., refer to [1.2.6 Tightening Bolts/Screws](#).

Body page for instructions

Work sequence

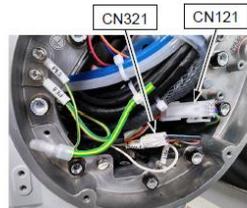
The white circle numbers (e.g. ①) are the step numbers for removing or disassembling the unit or component.

Black circle numbers (e.g. ❶) are step numbers for assembling or installing the unit or component.

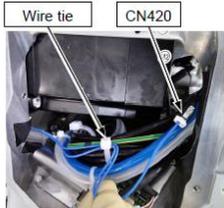


Removing the J2 Motor

①	Turn ON the controller.
②	Release the J2 brake, and manually push and move Arm2 until it comes in contact with the mechanical stopper, and push it against Arm1. CAUTION Arm2 falls by its weight when the J2 Motor unit is removed. Release the brake and tilt Arm2 in advance.
③	Turn OFF the Controller.
④	Remove the <u>J2 Timing Belt</u> .
⑤	Disconnect the J2 Motor Connectors (CN121, CN321, CN420), and cut the wire tie binding CN420.



CN321 CN121



Wire tie CN420

The configuration of parts to be removed/attached is shown by illustrations.

The details of the work, precautions for work, and points, etc., are described.

CAUTION

Indicates information about risks which may cause injury to persons and risks which the Manipulator functions cannot be implemented.

POINT

Indicates a method of proceeding with work in an efficient manner.

NOTE

Indicates information not concerning the work procedures.



SK-1A: 102g

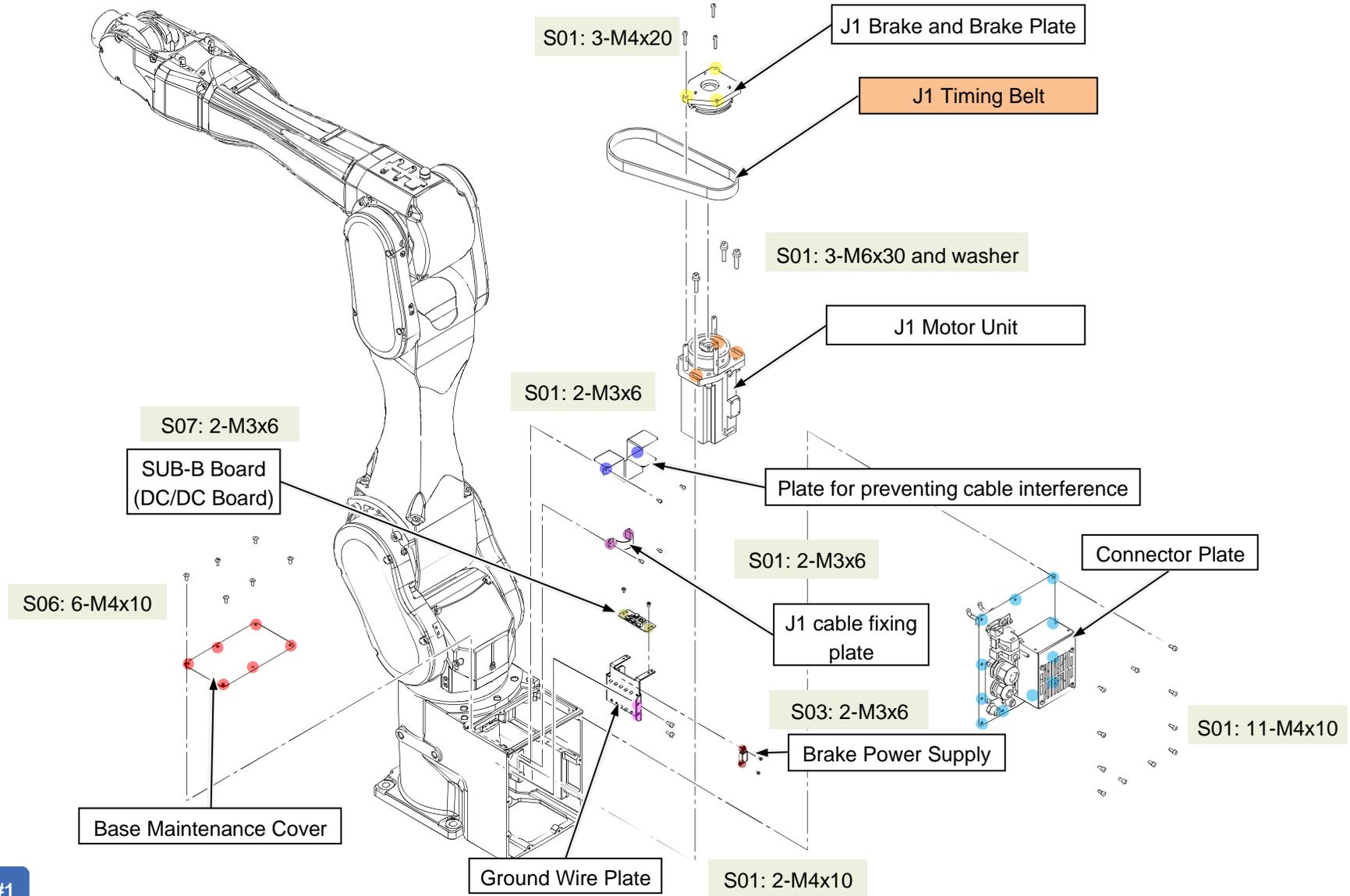
Indicates that lubrication is required.

Refer to [1.2.5 Tools/Materials](#) for grease manufacturer and other details.

Clicking the underlined blue characters will open the corresponding page.
 You can return to the original page by simultaneously pressing the [Alt] key and the [←] key.
 * The operation method may differ depending on the viewer. For details, refer to Help of each viewer.

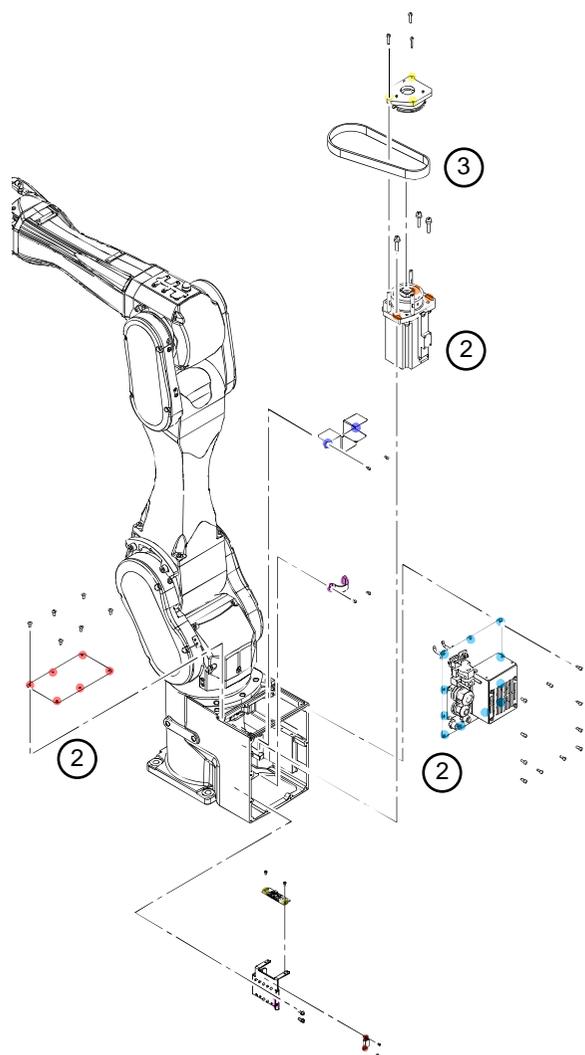
2.2 Joint #1 (M/C Cable Backward)

2.2.1 Joint #1 Replacing the Timing Belt



Joint #1

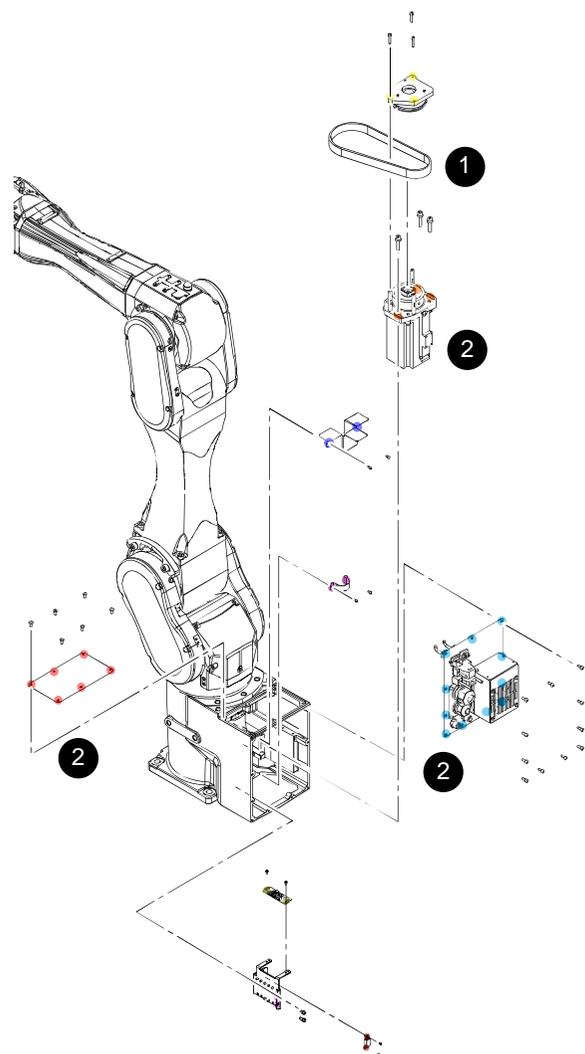
Removing the Timing Belt



①	Turn OFF the Controller.
②	Remove the following parts. <ul style="list-style-type: none"> • Base Maintenance Cover • Connector Plate (M/C Cable Backward: C8L), (M/C Cable Backward: C8XL, C12XL) • J1 Motor unit
③	Perform steps ④ and ⑤ of Removing the Cable Unit , and remove the J1 Timing Belt.

Joint #1

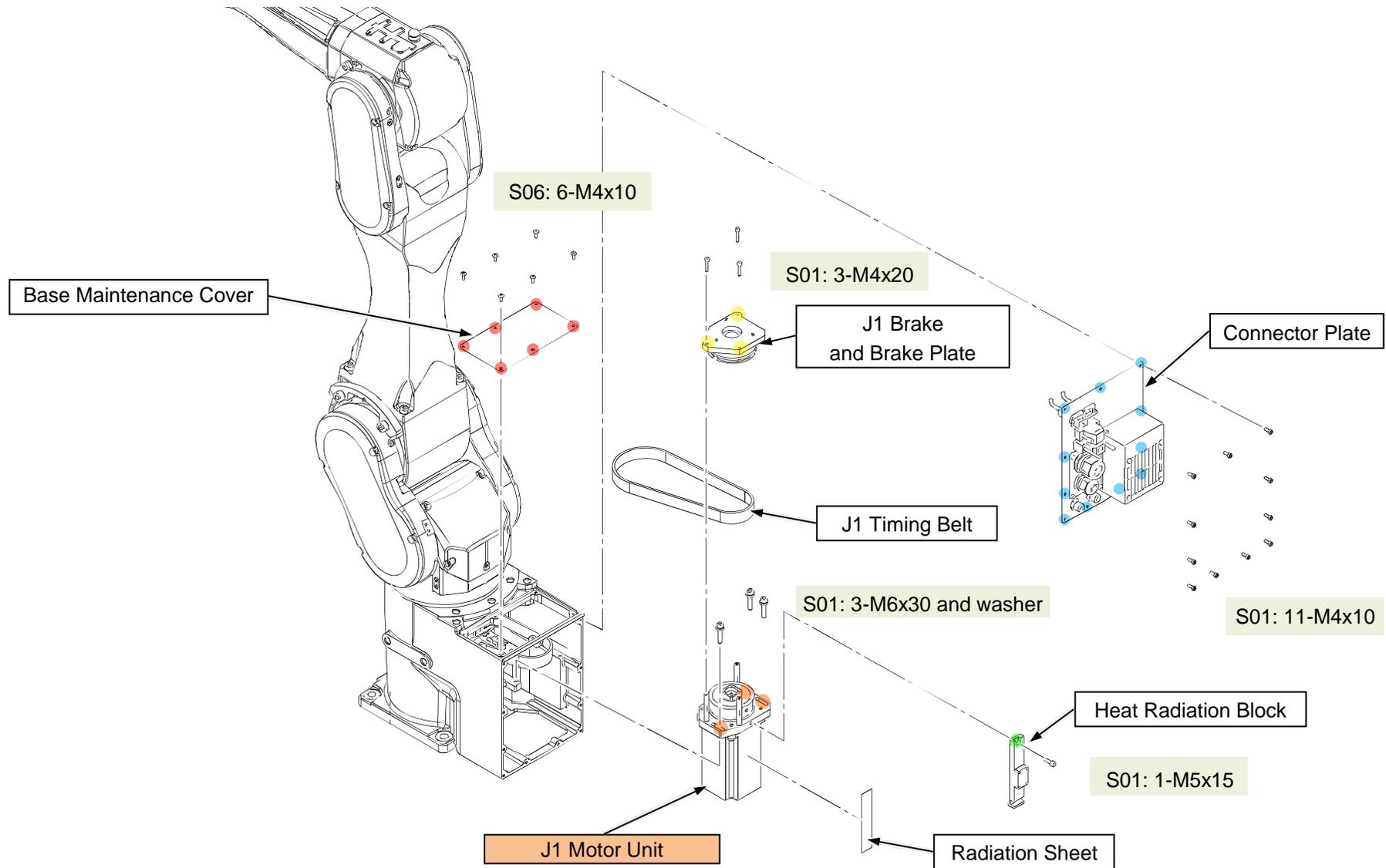
Installing the Timing Belt



<p>1</p>	<p>Assemble the J1 Timing Belt and Cable Unit. Perform step 7 of Installing the Cable Unit.</p>
<p>2</p>	<p>Install the following parts.</p> <ul style="list-style-type: none"> • J1 Motor unit • Connector Plate (M/C Cable Backward: C8L), (M/C Cable Backward: C8XL, C12XL) • Base Maintenance Cover
<p>3</p>	<p>After assembly, perform calibration of Joint #1. 3.2 Calibration</p>

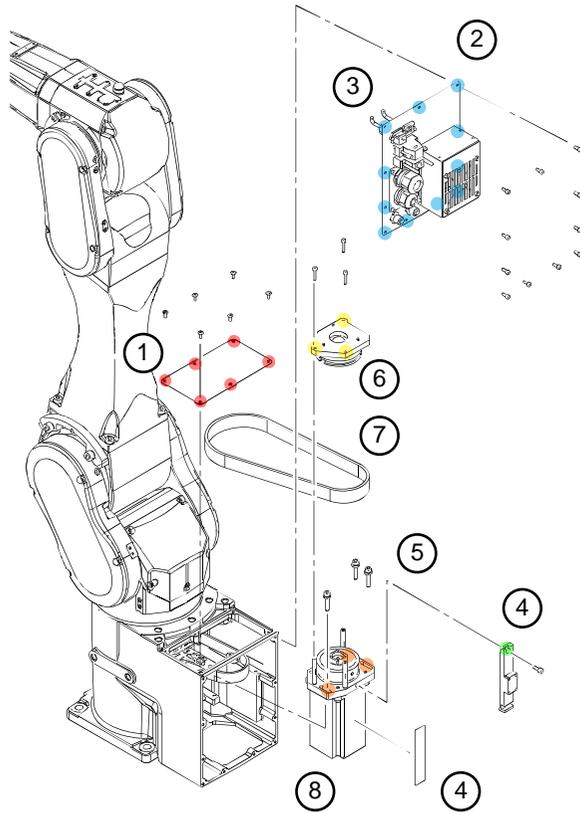
Joint #1

2.2.2 Joint #1 Replacing the Motor Unit



Joint #1

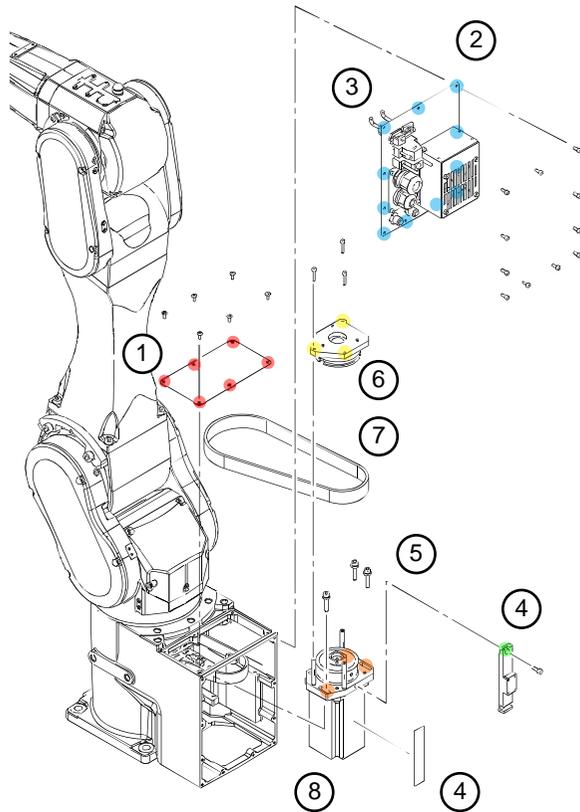
Removing the Motor Unit



①	Remove the Base Maintenance Cover .
②	Remove the Connector Plate. M/C Cable Backward: C8L , M/C Cable Backward: C8XL, C12XL POINT Disconnect the required connectors according to the following procedure. Here, only remove the Connector Plate.
③	Disconnect the Motor Connectors (CN111, CN311, CN410).  C8L

Joint #1

Removing the Motor Unit



④

<C8XL/C12XL only>

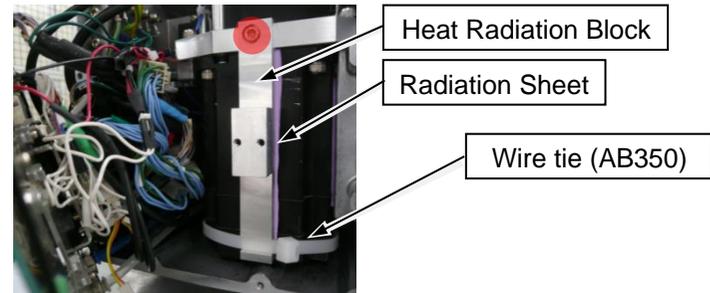
Remove the Heat Radiation Block and the Radiation Sheet.

1. Cut the wire tie (AB350), and remove the Heat Radiation Block.
2. Remove the Radiation Sheet.

CAUTION

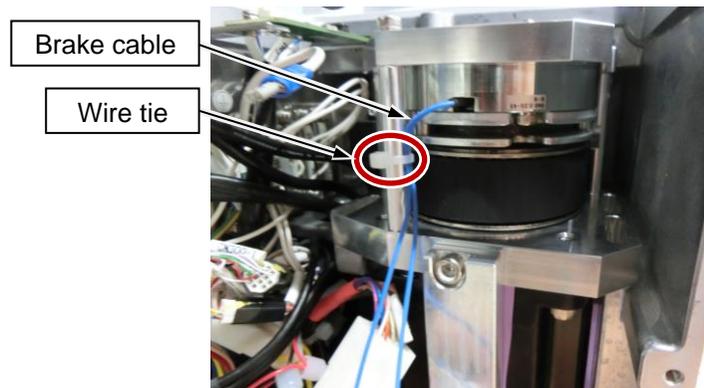
- The Heat Radiation Block, bolts, and Radiation Sheet will be used again during installation. Store it so that you do not lose it.
- The Radiation Sheet is easy to break, so be careful when removing it.

A S01: 1-M5x15

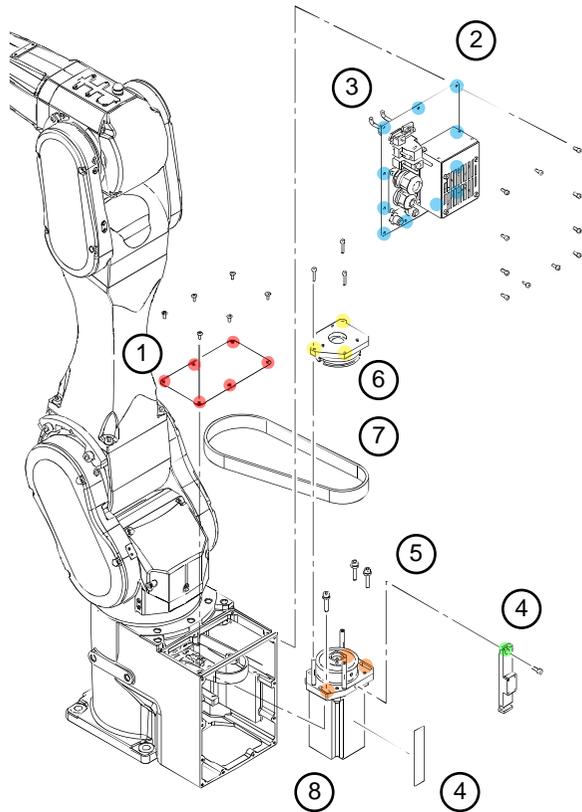


⑤

Cut the wire tie binding the brake cable to the J1 Motor Plate shaft.



Removing the Motor Unit



⑥ Remove the J1 brake plate.

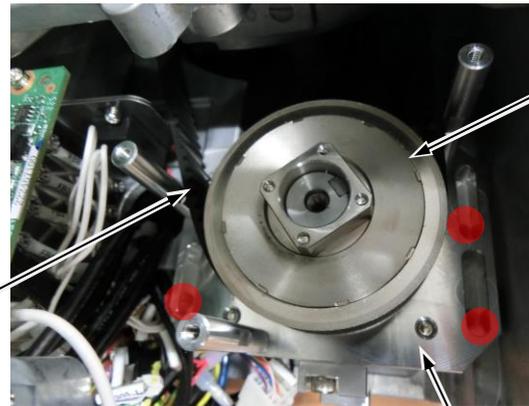
A S01: 3-M4x20



J1 brake plate

⑦ Loosen the screws securing the J1 Motor Plate to the base, and remove the J1 Timing Belt from pulley 1.

A S01: 3-M6x30 and washer



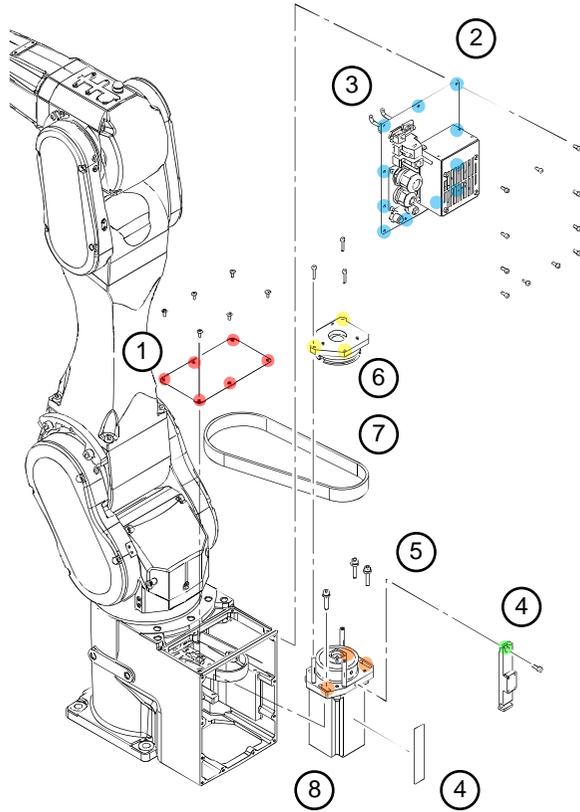
Pulley 1

J1 Timing Belt

J1 Motor Plate

Joint #1

Removing the Motor Unit



⑧ Remove the loosened screws, then remove the J1 Motor unit.

POINT

The J1 Motor unit can be removed from the Connector Plate side.

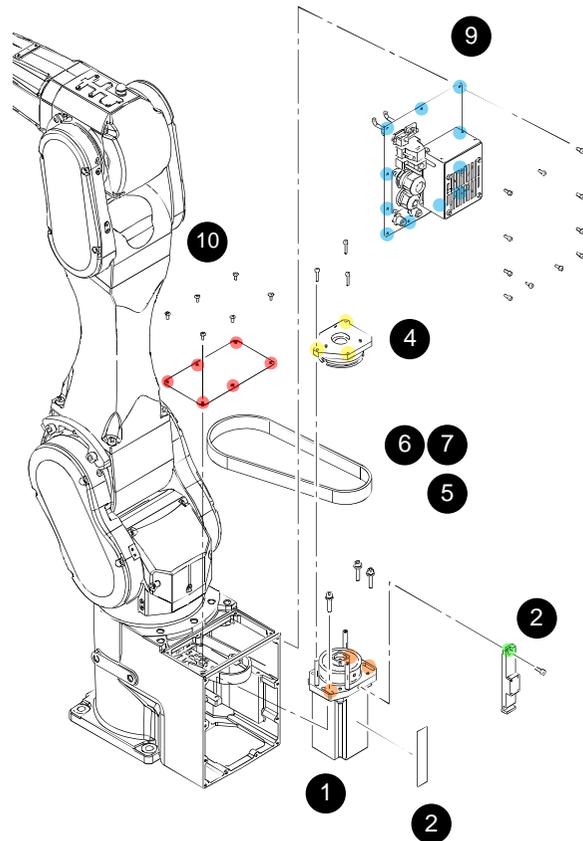
CAUTION

The Radiation Sheet may be left inside the base. It will be used again during installation of the Motor Unit, so remove it from inside the base.



Radiation Sheet

Installing the Motor Unit



1 Install the J1 Motor unit.

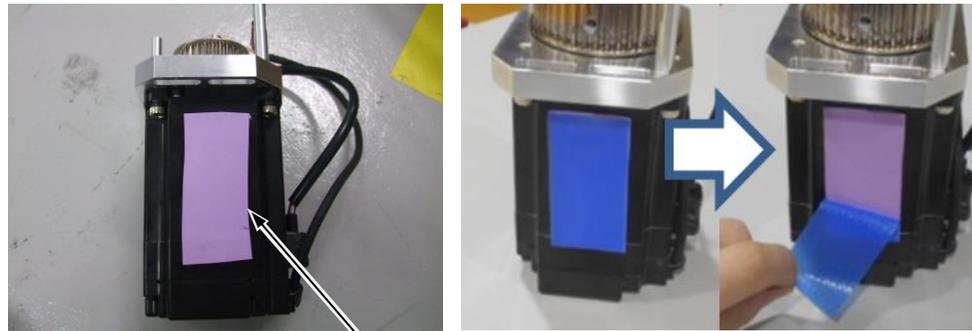
1. Check that the Radiation Sheet is installed in the position shown in the figure.
If a protective film is applied to the Radiation Sheet, remove the film.

POINT

The Radiation Sheet may be left inside the base when replacing the motor. Remove from inside the base, and affix it on the Motor Unit.

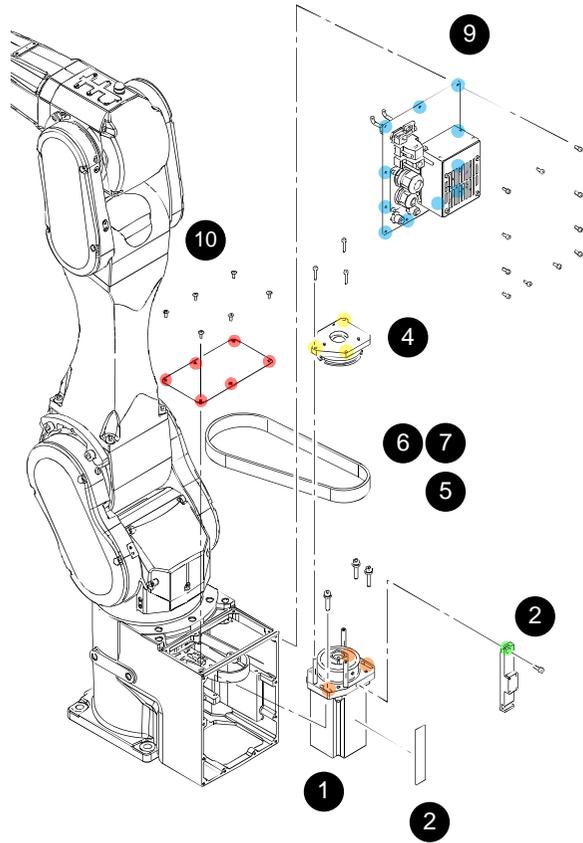
CAUTION

Operating the Manipulator without the Radiation Sheet in place may result in heating of the motor thus generating an error.

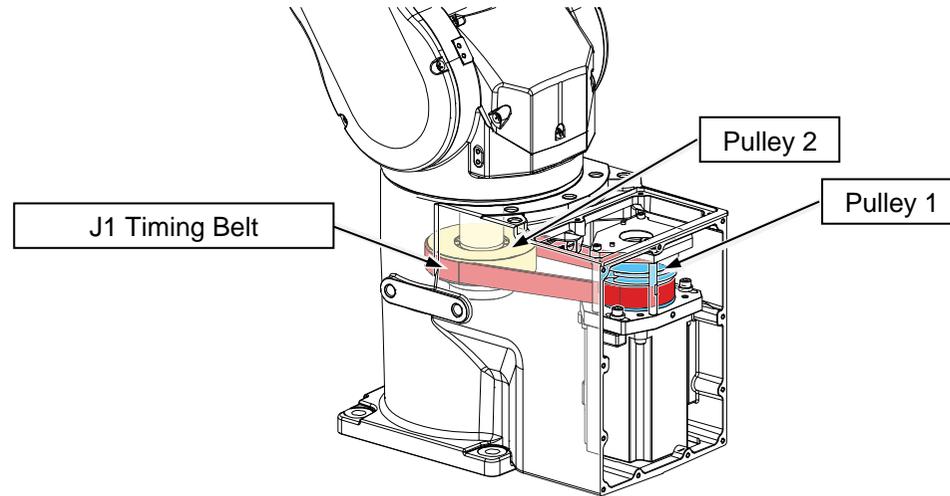


Radiation Sheet

Installing the Motor Unit

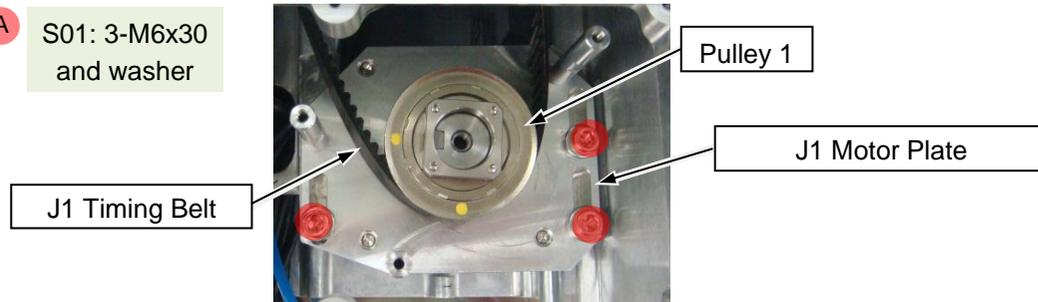


2. Set the J1 Timing Belt around pulley 2, and hold the belt so that it does not fall.



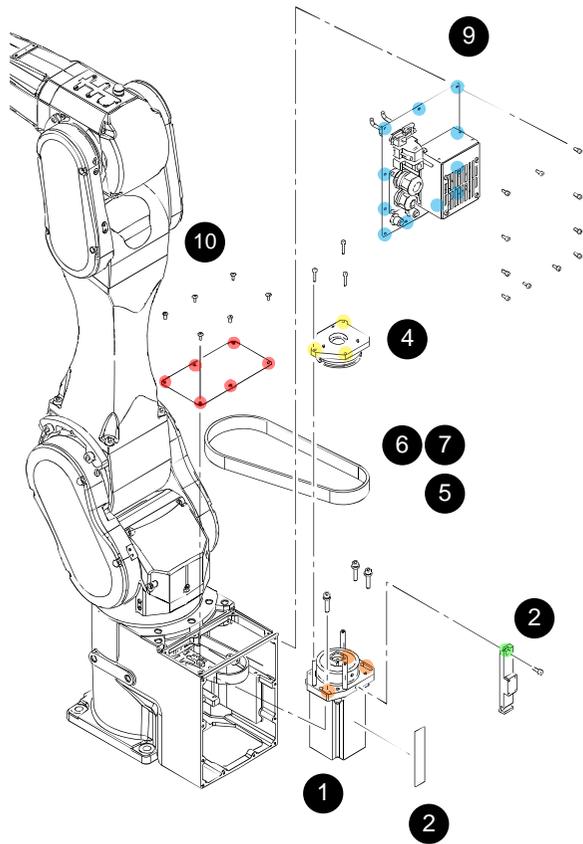
3. Set the J1 Timing Belt around pulley 1, and fix the J1 Motor unit to the base temporarily.

A S01: 3-M6x30 and washer



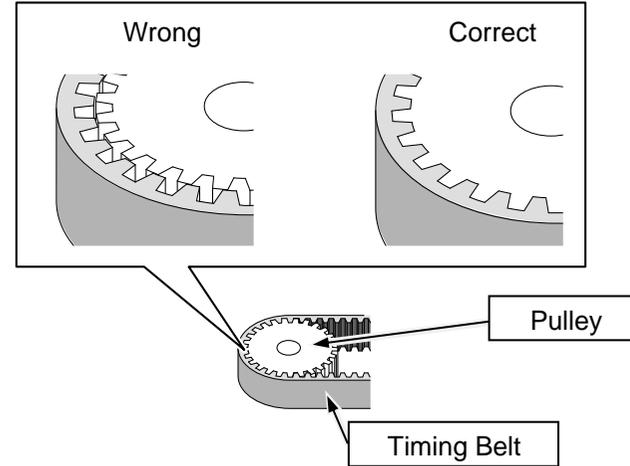
Joint #1

Installing the Motor Unit



POINT

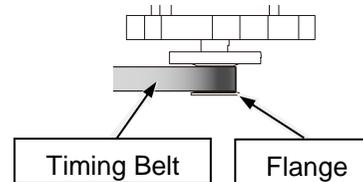
- Make sure that the teeth of the Timing Belt and the pulley are properly engaged.



- The standard for temporary fastening is where the Motor Unit can be moved by hand and will not tilt when pulled. If this is either too loose or too tight, it will not provide the proper tension to the belt.

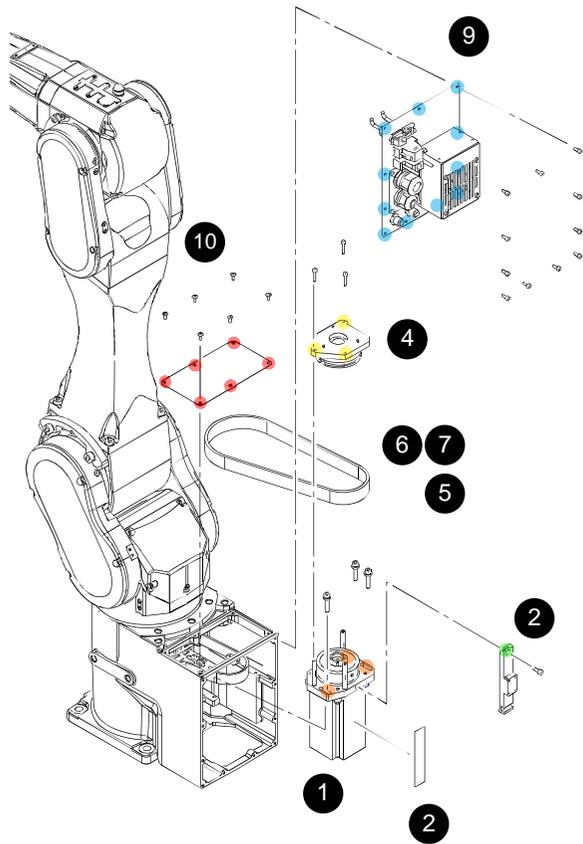
CAUTION

If the Timing Belt is placed on the flange, correct tension will not be obtained during belt tension adjustment.



Set the belt so that it is level with respect to the pulley without it being placed on the flange.

Installing the Motor Unit



2

<C8XL/C12XL only>

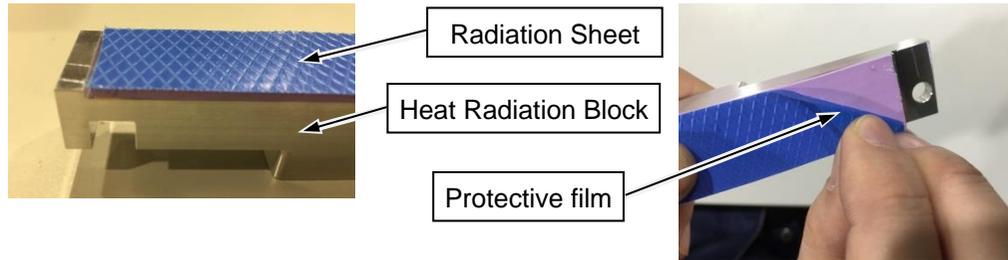
If the Heat Radiation Block has been removed, install using the following procedure.

1. Check that the Radiation Sheet is applied to the Heat Radiation Block.

If a protective film is applied to the Radiation Sheet, remove the film.

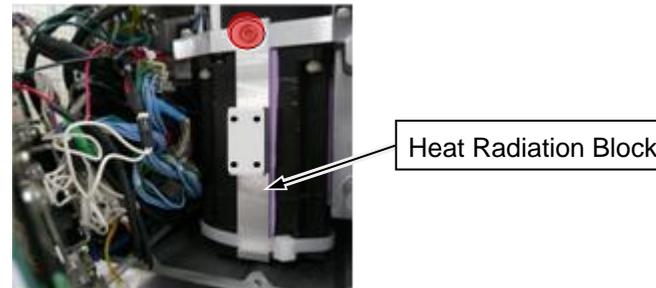
CAUTION

Operating the Manipulator without the Radiation Sheet in place may result in heating of the motor thus generating an error.



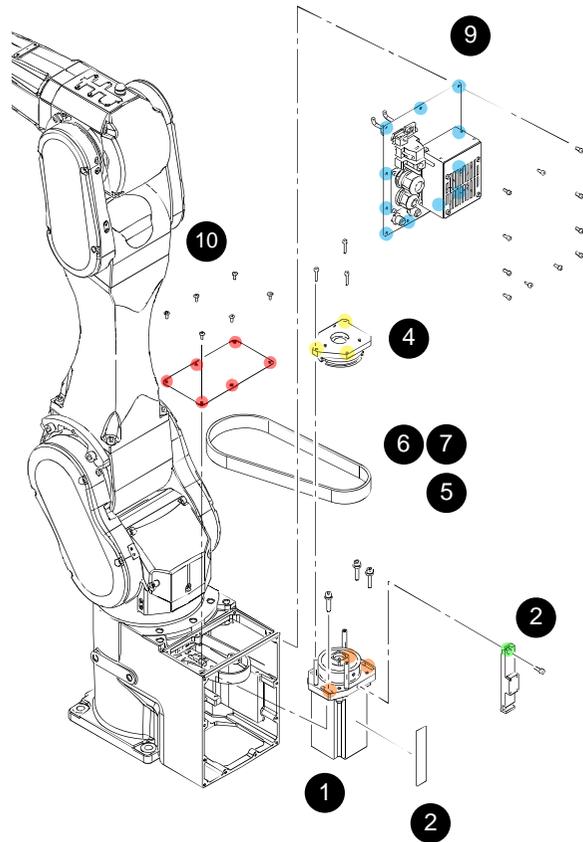
2. Install the Heat Radiation Block.

A S01: 1-M5x15
(8.0 +/- 0.4 N·m)

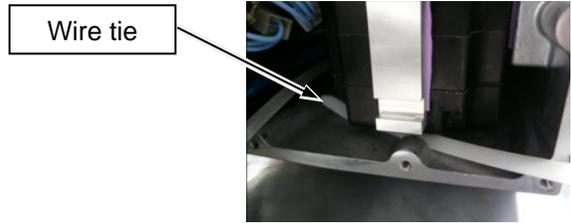


Joint #1

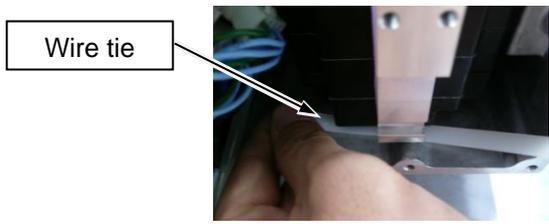
Installing the Motor Unit



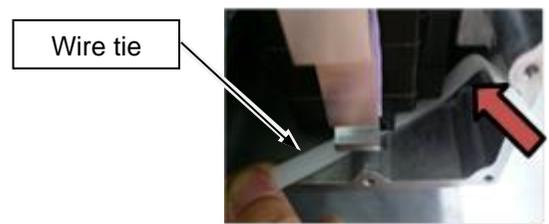
3. Insert the end of the wire tie (AB350) in the gap under the motor.



4. Hold the end of the wire tie.

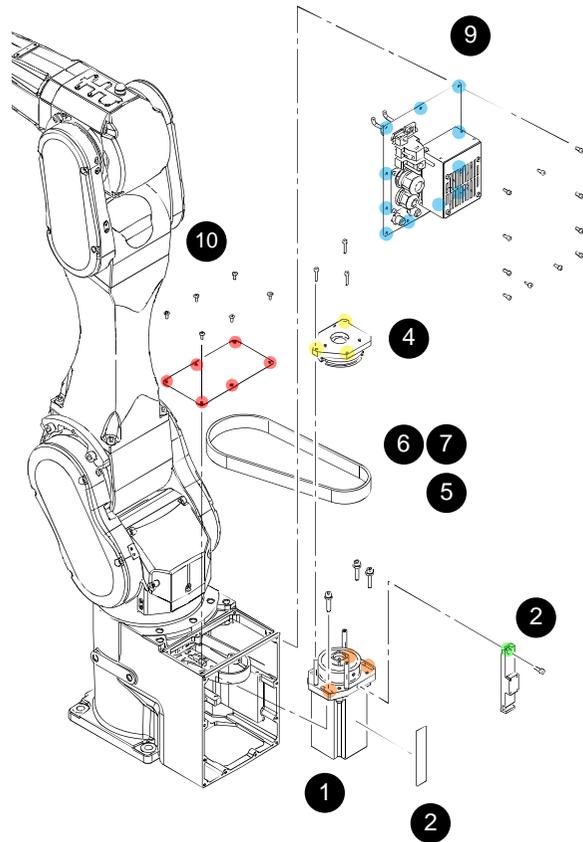


5. While holding the end of the wire tie, push in the wire tie in the direction of the arrow.

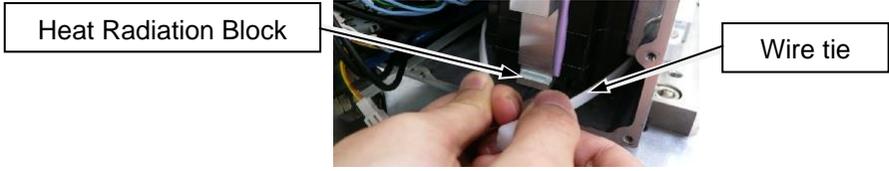


Joint #1

Installing the Motor Unit



6. Wrap the wire tie around the motor, and tighten so that the Heat Radiation Block presses on the Motor Unit.



POINT

Tighten the wire tie to the extent that the Radiation Sheet pressed between the Heat Radiation Block and the Motor Unit is pressed out and protrudes.

CAUTION

Tightening the wire tie with too much force may cause the motor cable to break. Take care to not tighten the wire tie with too much force.

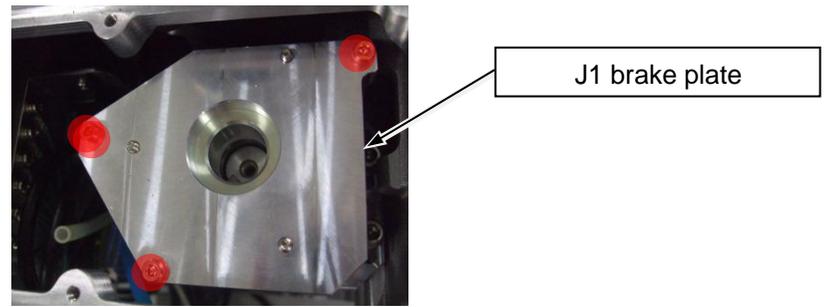
3 Adjust the belt tension.

[3.1 Adjusting the Timing Belt Tension](#)

4 Temporarily secure the J1 brake plate.

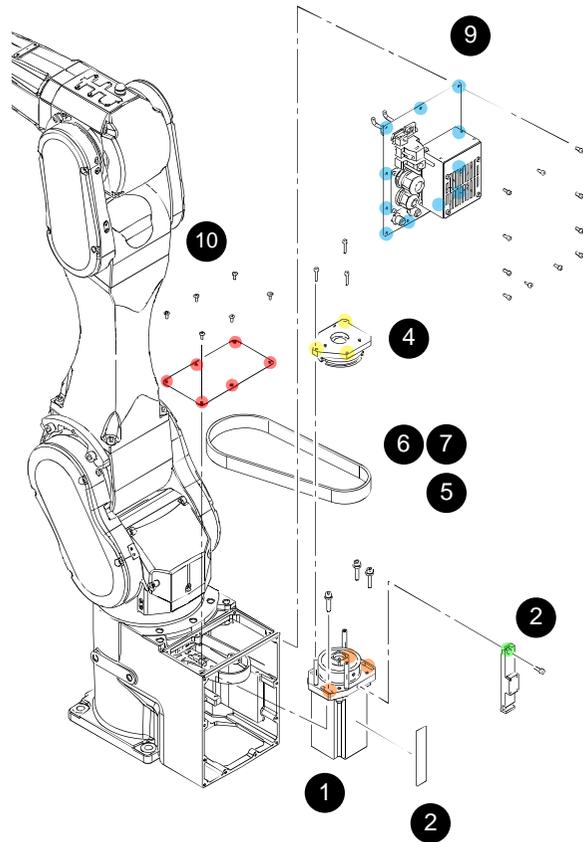
Secure the brake plate to the extent that it can still be moved sideways by hand.

A S01: 3-M4x20



Joint #1

Installing the Motor Unit



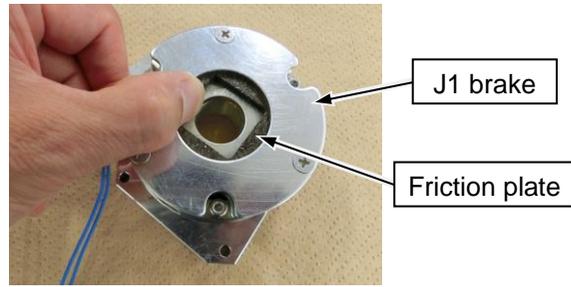
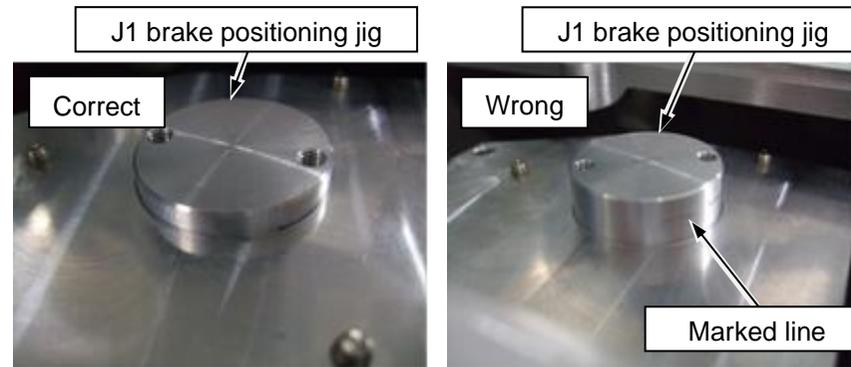
5

Check that the motor and the brake center are aligned.

CAUTION

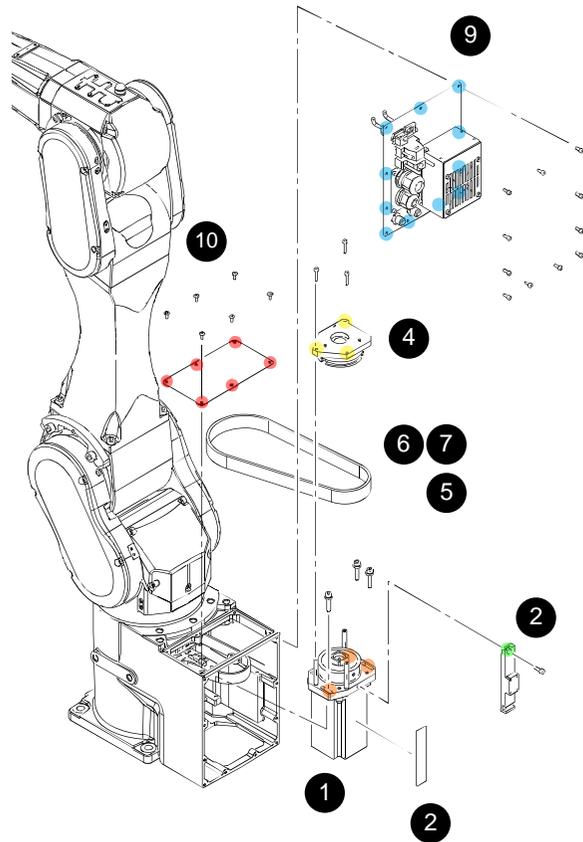
Use dedicated tools to check that the motor and the brake center are aligned. Misalignment of the brake center may cause abnormal sounds or apply abnormal torque on the brake, which may result in malfunction of the brake.

1. Insert the J1 brake positioning jig into the brake plate hole. Check that the jig can be inserted until the line marked on the curved surface of the jig is aligned with the surface of the brake plate. If the line is not aligned with the surface of the brake plate but is above it, the motor and brake are misaligned, and the brake friction plate must be adjusted. Follow the procedure below to make the adjustment.
2. Use the brake release unit (optional part) to release the brake.
3. Adjust the position of the brake friction plate. Insert the jig into the hole in the brake plate, and when the line marked on the curved surface of the jig is aligned with the brake plate surface, the friction plate positioning is complete.
4. Remove the brake release unit.



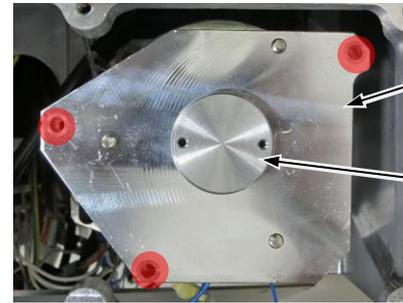
Joint #1

Installing the Motor Unit



6 Secure the J1 brake plate, and remove the J1 brake positioning jig.

A S01: 3-M4x20
(4.0 +/- 0.2 N·m)



J1 brake plate

J1 brake positioning jig

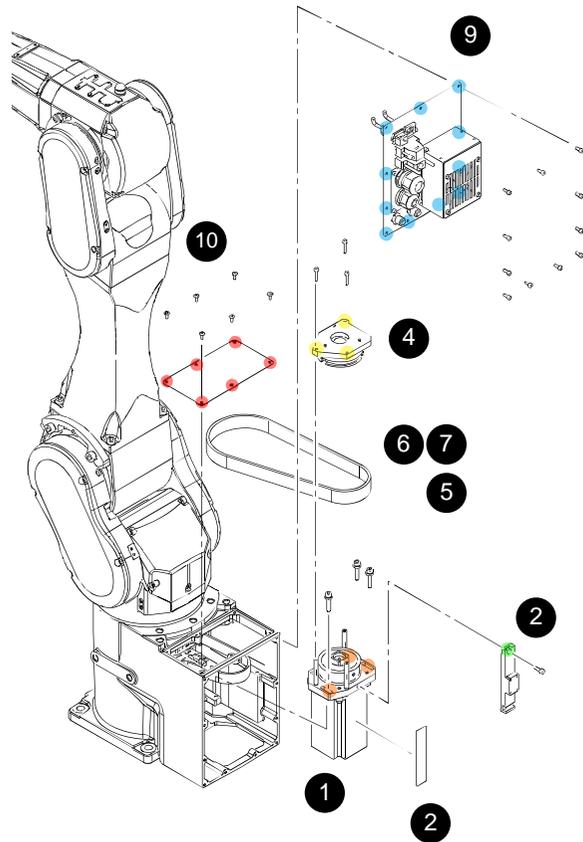
7 Secure the brake cable to the J1 Motor Plate shaft with a wire tie (AB100).

Brake cable

Wire tie



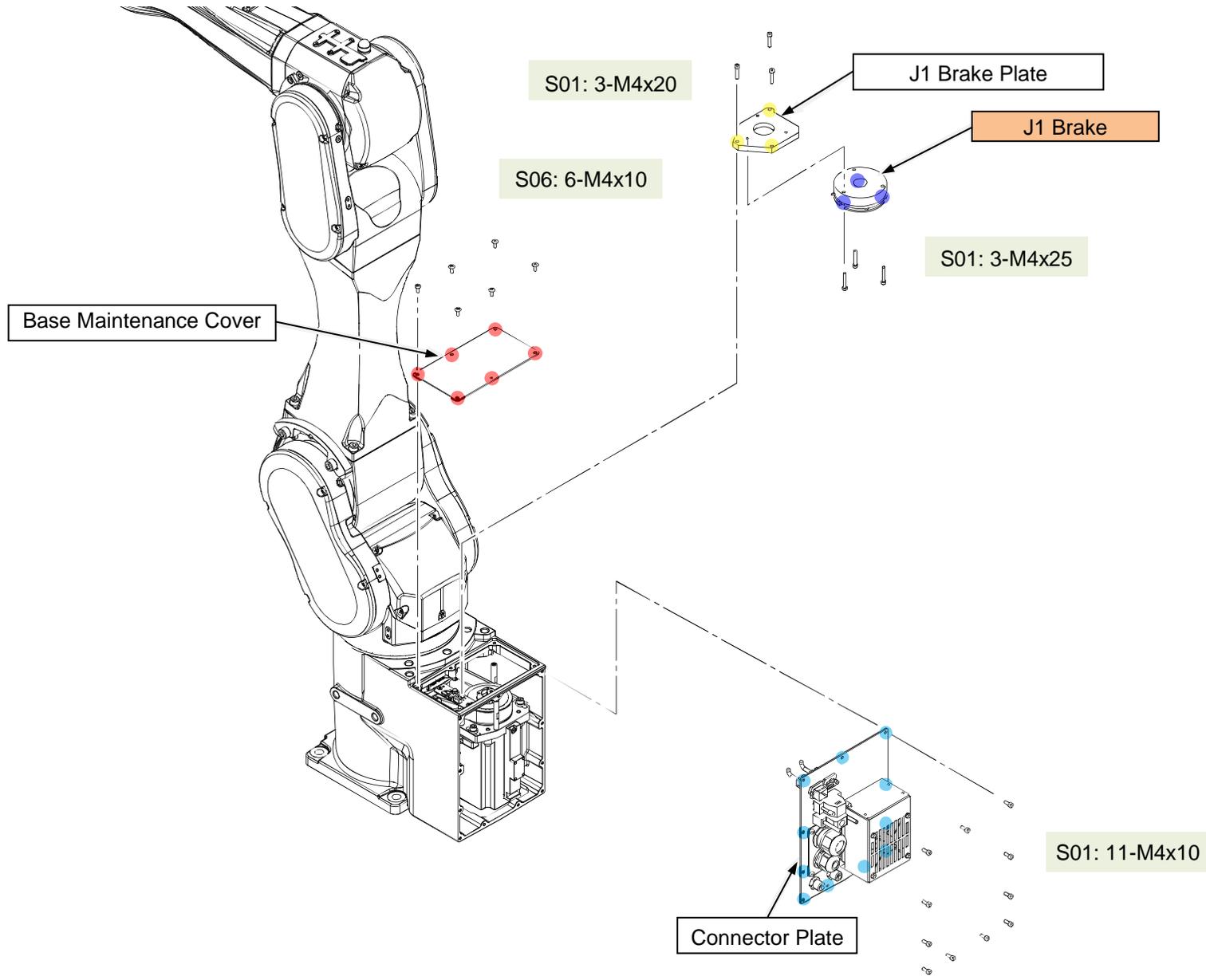
Installing the Motor Unit



<p>8</p>	<p>Connect the J1 Motor Connectors (CN111, CN311, CN410).</p>  <p>C8L</p>
<p>9</p>	<p>Install the Connector Plate. M/C Cable Backward: C8L, M/C Cable Backward: C8XL, C12XL</p>
<p>10</p>	<p>Install the Base Maintenance Cover.</p>
<p>11</p>	<p>After assembly, perform calibration of Joint #1. 3.2 Calibration</p>

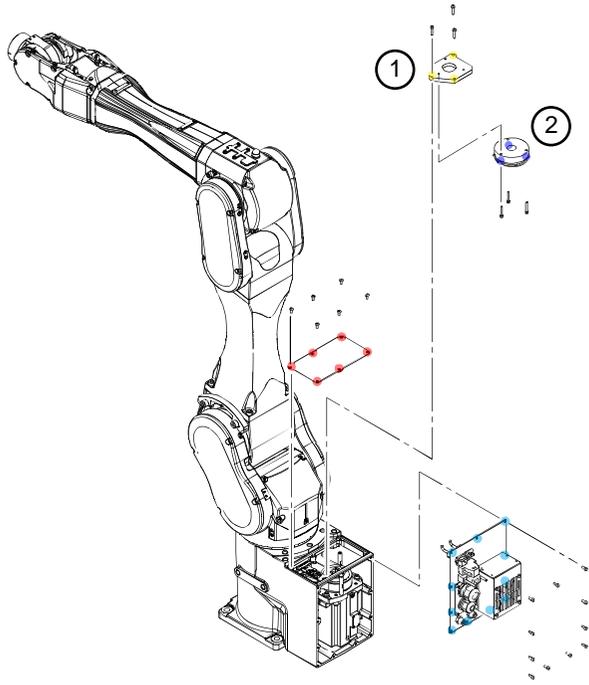
Joint #1

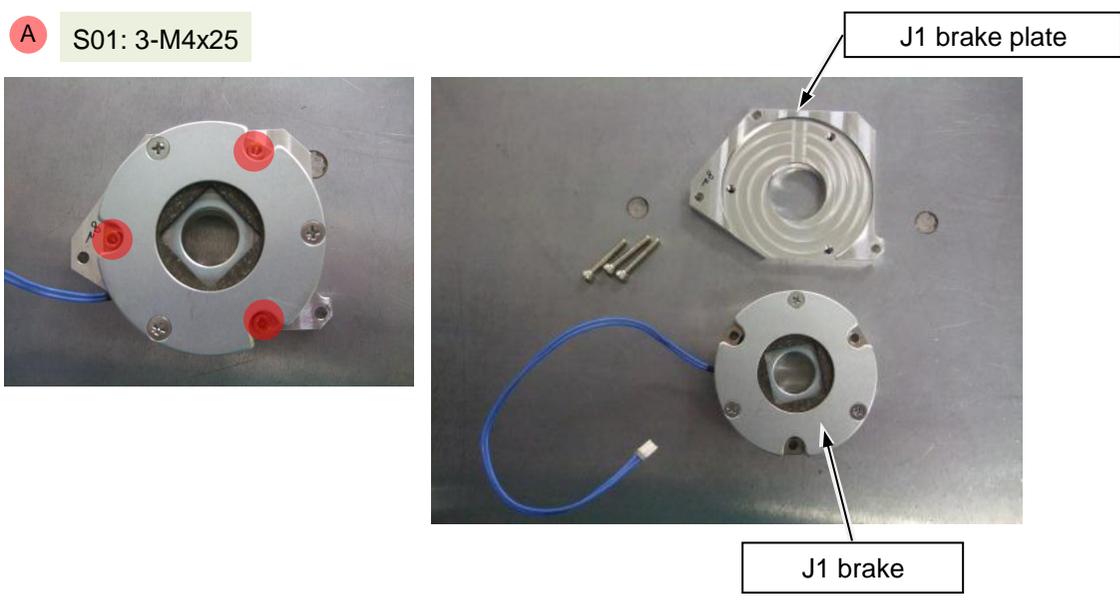
2.2.3 Joint #1 Replacing the Brake



Joint #1

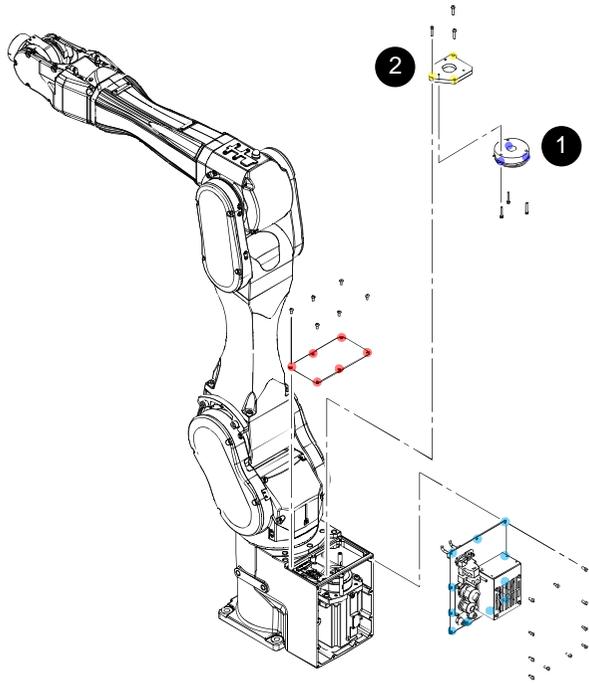
Removing the Brake

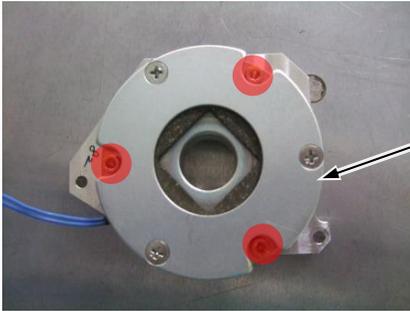
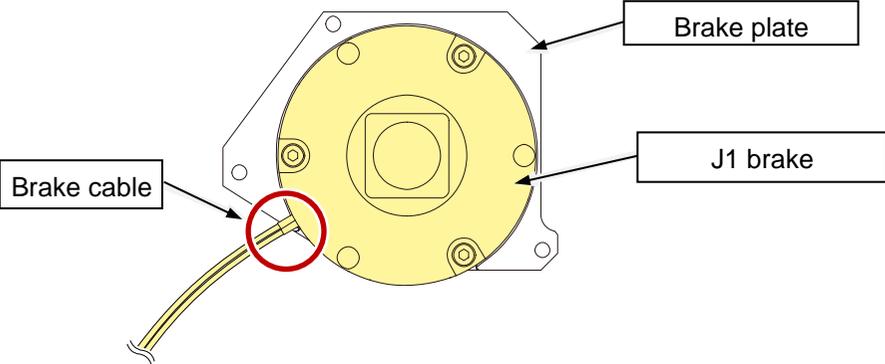


①	Perform steps ① to ③, ⑤ to ⑥ of Removing the J1 Motor Unit .
②	Remove the J1 brake from J1 brake plate. A S01: 3-M4x25  <p>The photograph shows the J1 brake plate and the J1 brake. The J1 brake plate is a circular metal plate with four red caps. The J1 brake is a circular metal component with a blue cable. The callouts 'J1 brake plate' and 'J1 brake' point to their respective parts. The part number 'S01: 3-M4x25' is also shown.</p>

Joint #1

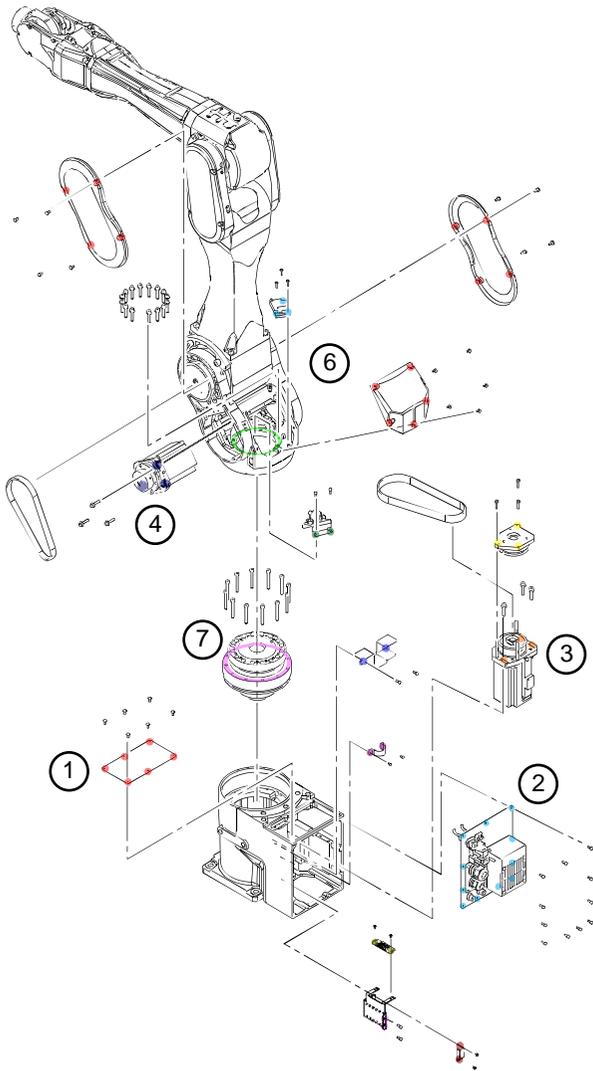
Installing the Brake



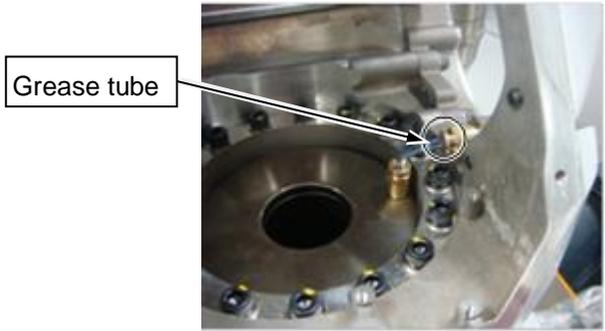
<p>1</p>	<p>Install the J1 brake on the brake plate.</p> <div style="border: 1px solid black; padding: 2px; display: inline-block; margin: 5px 0;"> <p>A S01: 3-M4x25 (4.0 +/- 0.2 N·m)</p> </div>  <p style="text-align: right; margin-right: 20px;">J1 brake</p> <p>POINT Install with the orientation shown in the figure.</p>  <p style="text-align: right; margin-right: 20px;">Brake plate</p> <p style="text-align: right; margin-right: 20px;">J1 brake</p> <p style="margin-left: 20px;">Brake cable</p>
<p>2</p>	<p>Install the J1 brake plate on the J1 Motor unit. Perform steps ④ to ⑩ of Installing the J1 Motor Unit.</p>

Joint #1

Removing the Reduction Gear Unit

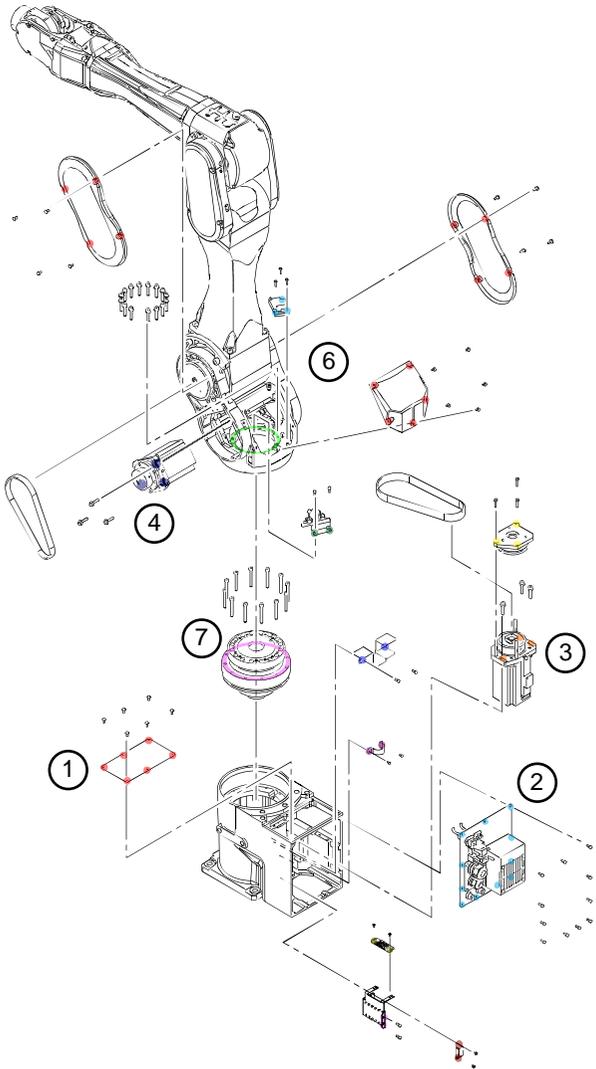


①	Remove the Base Maintenance Cover .
②	Remove the Connector Plate. M/C Cable Backward: C8L , M/C Cable Backward: C8XL , C12XL
③	Remove the J1 Motor unit .
④	Remove the J2 Motor unit .
⑤	Perform steps ④ to ⑥ of Removing the Cable Unit .
⑥	Remove Arm1. 1. Remove the grease tube on the Arm1 side.



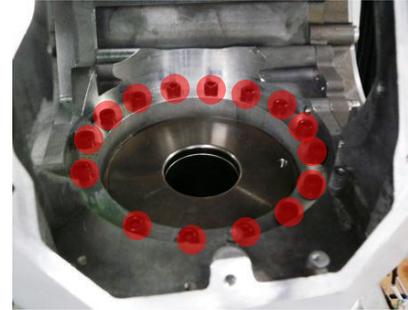
Joint #1

Removing the Reduction Gear Unit



2. Remove Arm1.

- A S02: 15-M6x30 and washer



CAUTION

Have at least two workers perform this work. At least one worker must support the Manipulator to prevent its arm from falling.
Pay special attention to damage resulting from the Manipulator falling or hands or feet being caught in the Manipulator.

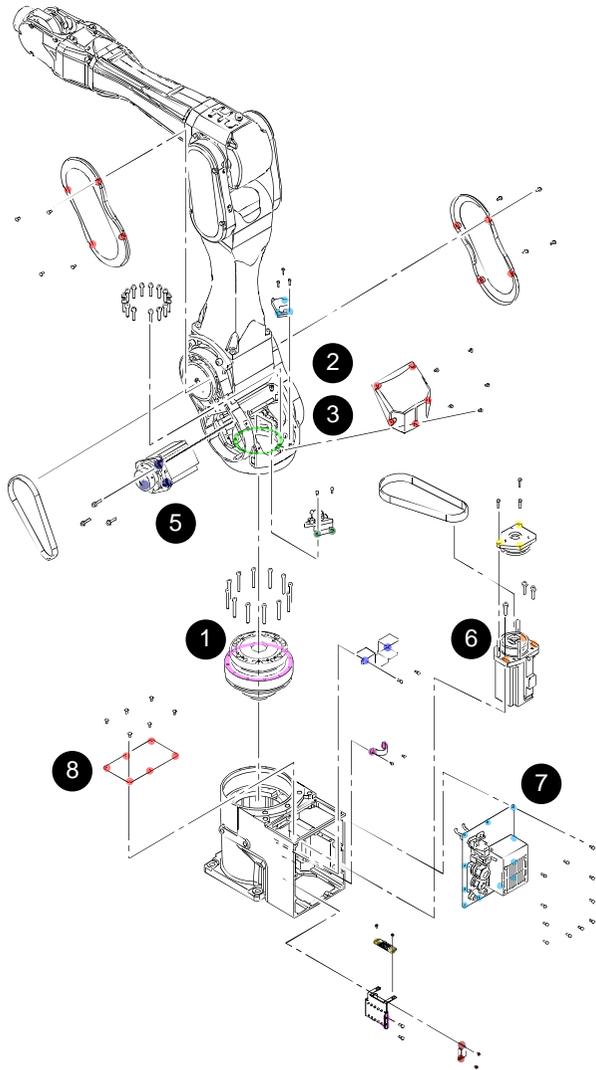
7 Remove the J1 Reduction Gear Unit.

- A S02: 12-M6x50



J1 Reduction Gear Unit

Installing the Reduction Gear Unit



1 Install the J1 Reduction Gear Unit.

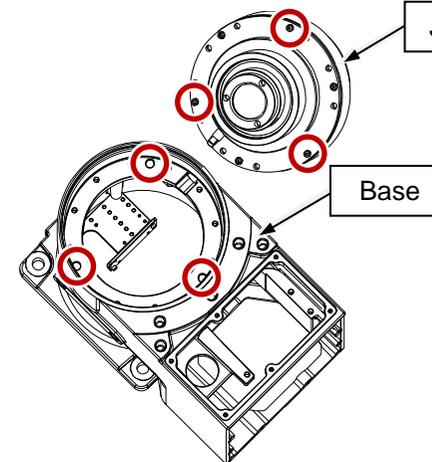
A S02: 12-M6x50 (18.0 +/- 0.9 N·m)



J1 Reduction Gear Unit

POINT

Align the three bolt heads on the bottom of the J1 Reduction Gear Unit with the indentations on the base, and set the Reduction Gear Unit on the base.

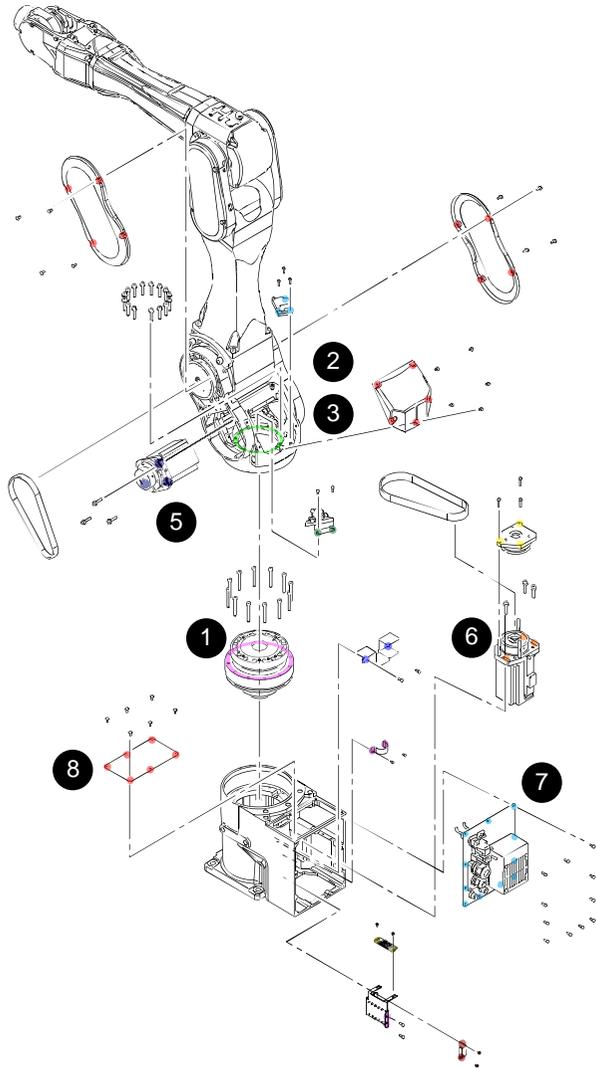


J1 Reduction Gear Unit

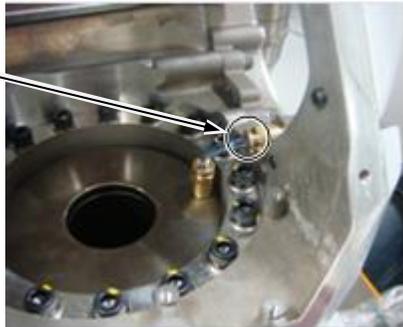
Base

Joint #1

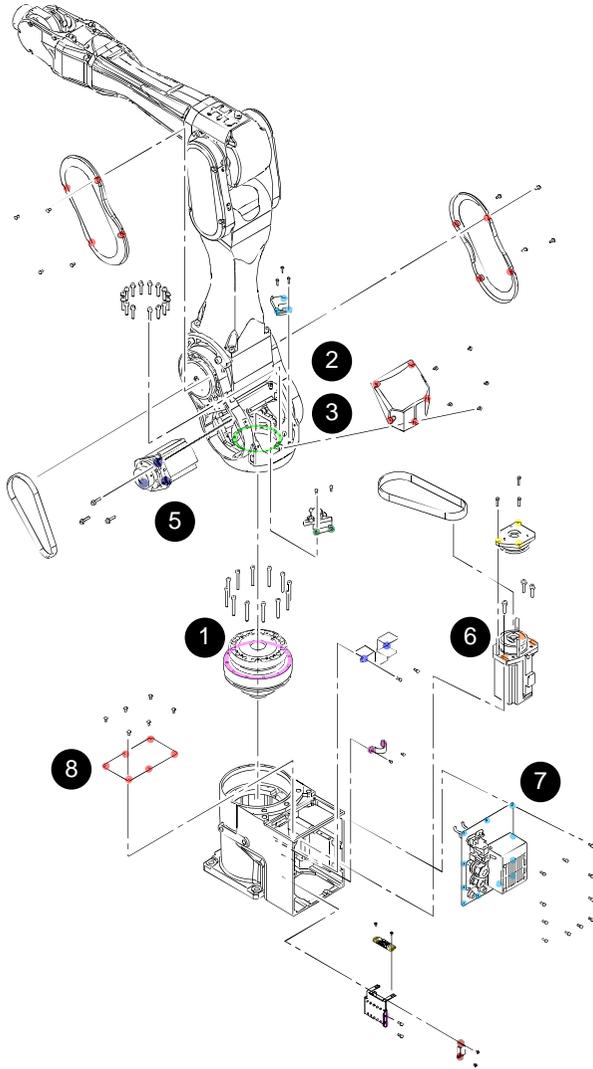
Installing the Reduction Gear Unit



Joint #1

<p>2</p>	<p>Install Arm1.</p> <p>A S02: 15-M6x30 and washer (18.0 +/- 0.9 N·m)</p>  <p>WARNING Have at least two workers perform this work. At least one worker must support the Manipulator to prevent its arm from falling. Pay special attention to damage resulting from the Manipulator falling or hands or feet being caught in the Manipulator.</p>
<p>3</p>	<p>Connect the grease tube to the Arm1-side fitting.</p> 
<p>4</p>	<p>Perform steps 6 to 7 of Installing the Cable Unit.</p>
<p>5</p>	<p>Install the J2 Motor unit.</p>

Installing the Reduction Gear Unit

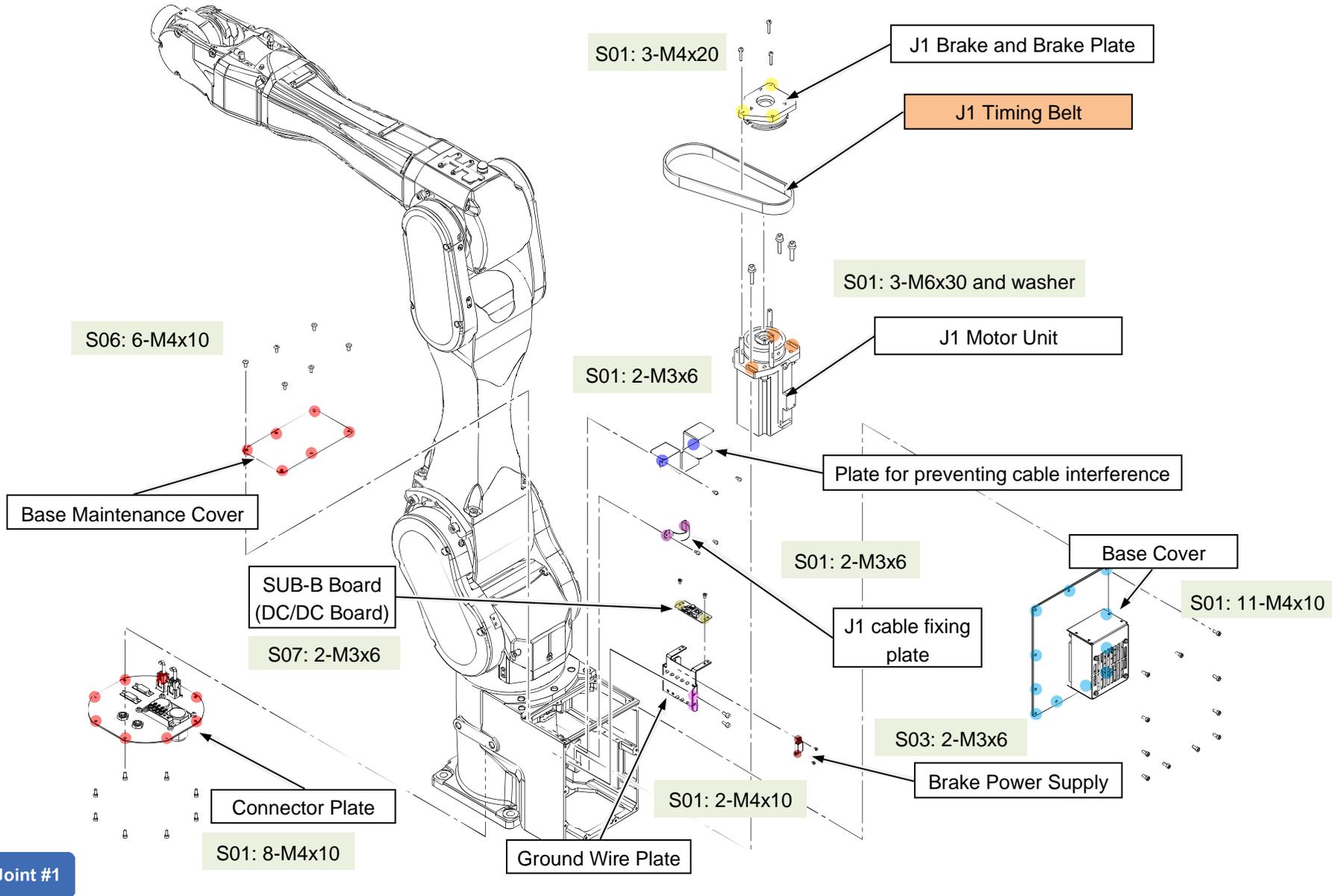


6	Install the J1 Motor unit .
7	Install the Connector Plate. M/C Cable Backward: C8L , M/C Cable Backward: C8XL , C12XL
8	Install the Base Maintenance Cover .
9	After assembly, perform calibration of Joint #1. 3.2 Calibration

Joint #1

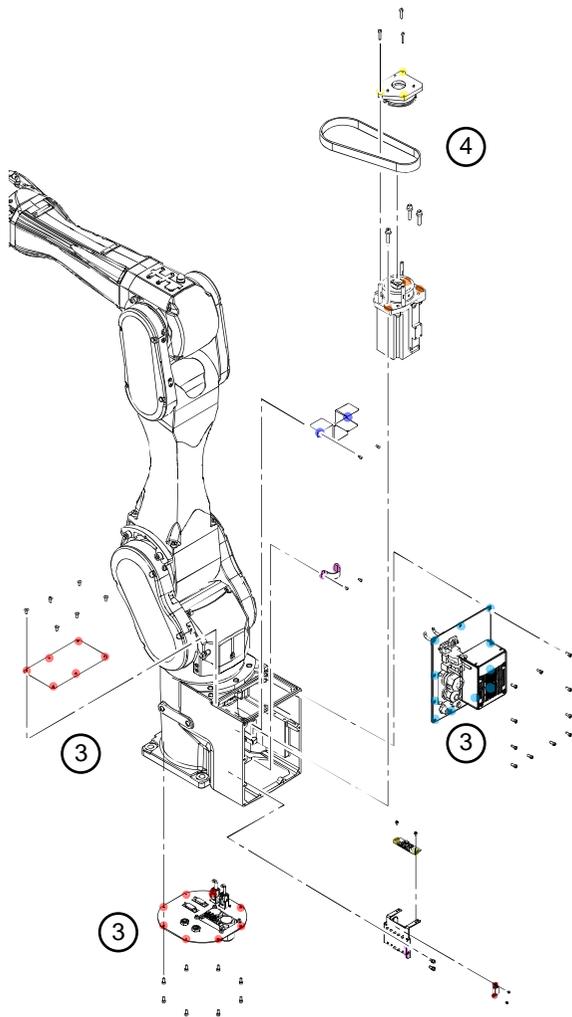
2.3 Joint #1 (M/C Cable Downward)

2.3.1 Joint #1 Replacing the Timing Belt



Joint #1

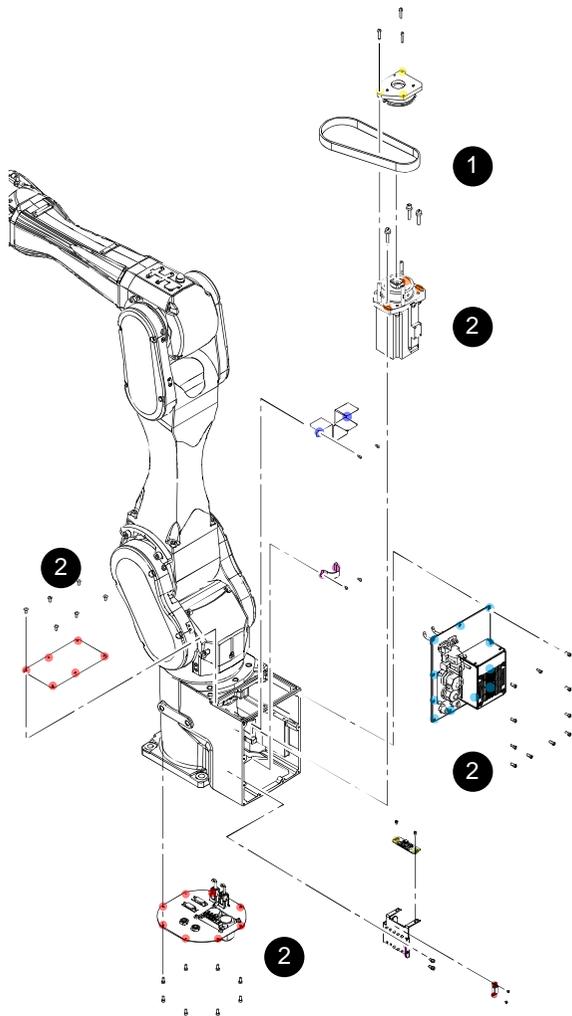
Removing the Timing Belt



①	Turn OFF the Controller.
②	Turn the Manipulator laterally. CAUTION When turning the Manipulator laterally, there must be two or more people to work on it so that at least one of them can support the arm while the others are removing the bolts. Removing the bolts without supporting the arm may result in the arm falling, bodily injury, and/or malfunction of the robot system.
③	Remove the following parts. <ul style="list-style-type: none"> • Base Cover (M/C Cable Downward: C8L), (M/C Cable Downward: C8XL, C12XL) • Connector Plate (M/C Cable Downward) • J1 Motor Unit
④	Remove the J1 Timing Belt. Perform steps ④ and ⑤ of Removing the Cable unit .

Joint #1

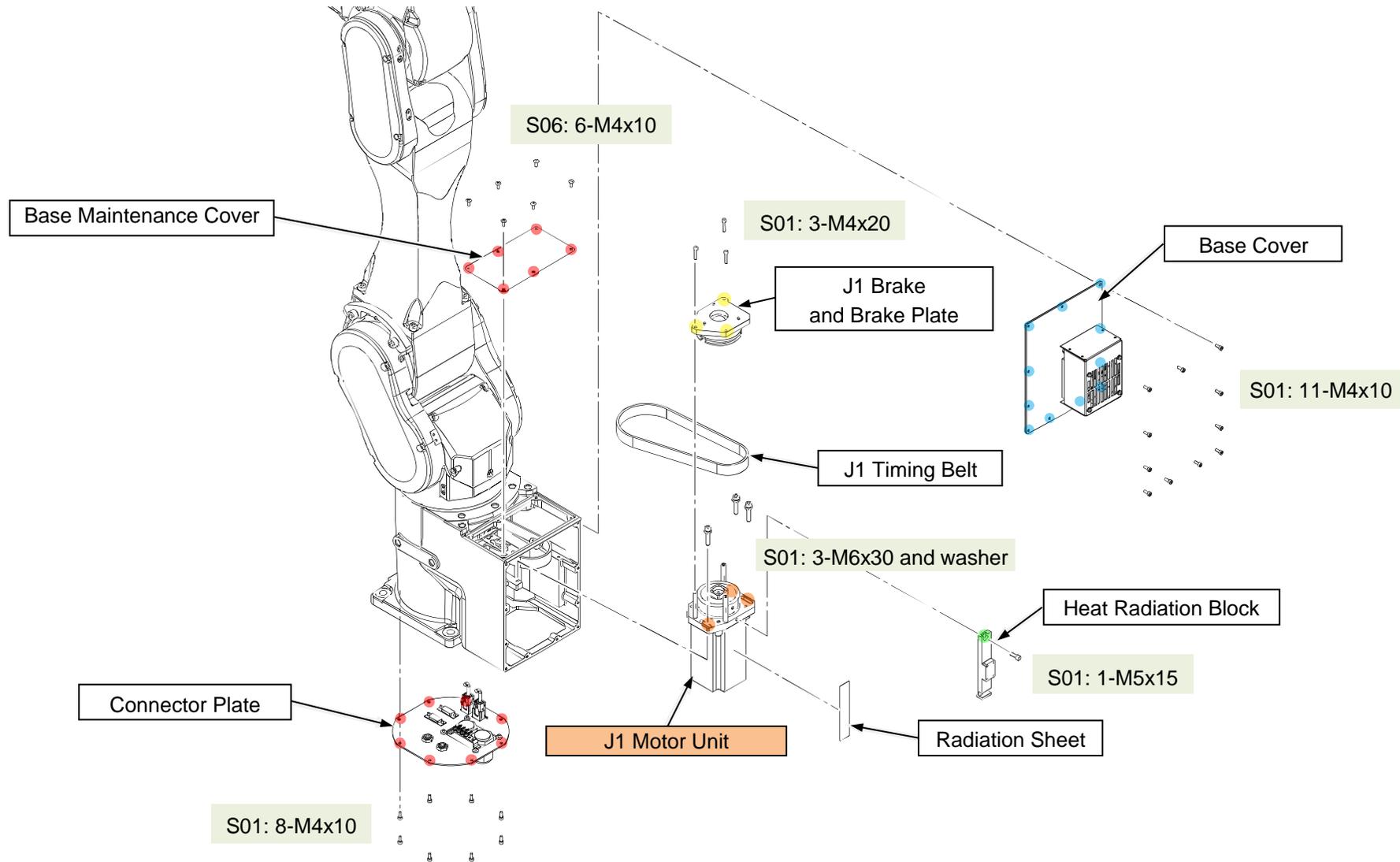
Installing the Timing Belt



1	Assemble the J1 Timing Belt and Cable Unit. Perform step 7 of Installing the Cable Unit .
2	Install the following parts. <ul style="list-style-type: none"> • J1 Motor Unit • Connector Plate (M/C Cable Downward) • Base Cover (M/C Cable Downward: C8L), (M/C Cable Downward: C8XL, C12XL) • Base Maintenance Cover
3	After assembly, perform calibration of Joint #1. 3.2 Calibration

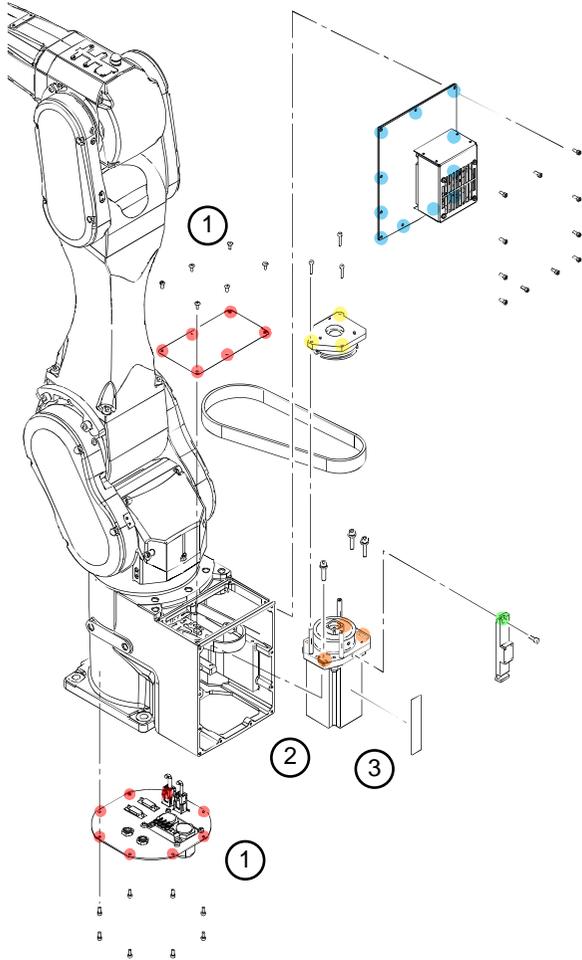
Joint #1

2.3.2 Joint #1 Replacing the Motor Unit



Joint #1

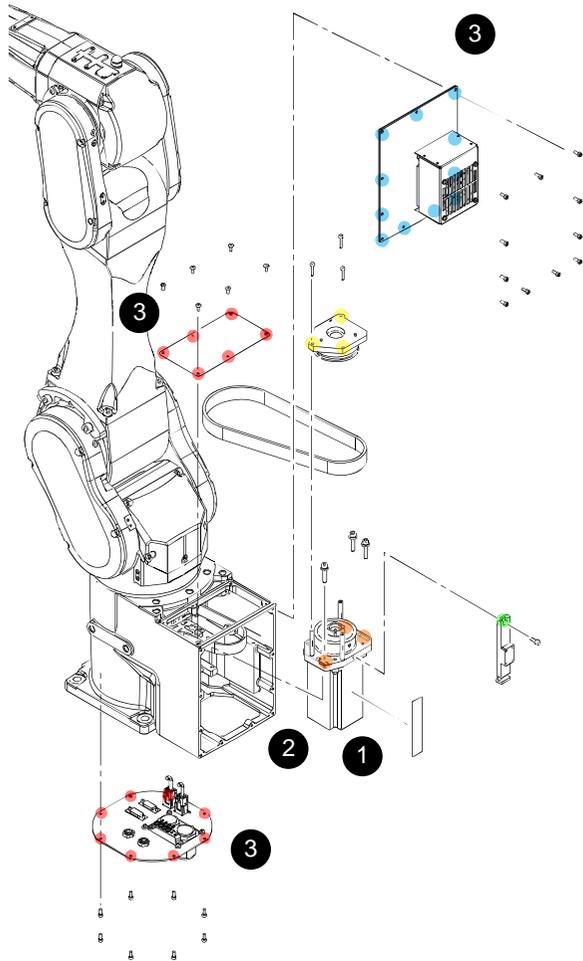
Removing the Motor Unit



- | | |
|---|---|
| ① | <p>Remove the following covers.</p> <ul style="list-style-type: none"> • Base Maintenance Cover • Base Cover (M/C Cable Downward: C8L), (M/C Cable Downward: C8XL, C12XL) • Connector plate (M/C cable downward) |
| ② | <p>Disconnect the cables from the base and disconnect the following connectors.
Connector: CN111, CN311, CN410</p>  |
| ③ | <p>Remove the J1 Motor unit.
Perform steps ④ to ⑧ for Removing the J1 Motor Unit of the "Joint #1 (M/C Cable Backward)".</p> |

Joint #1

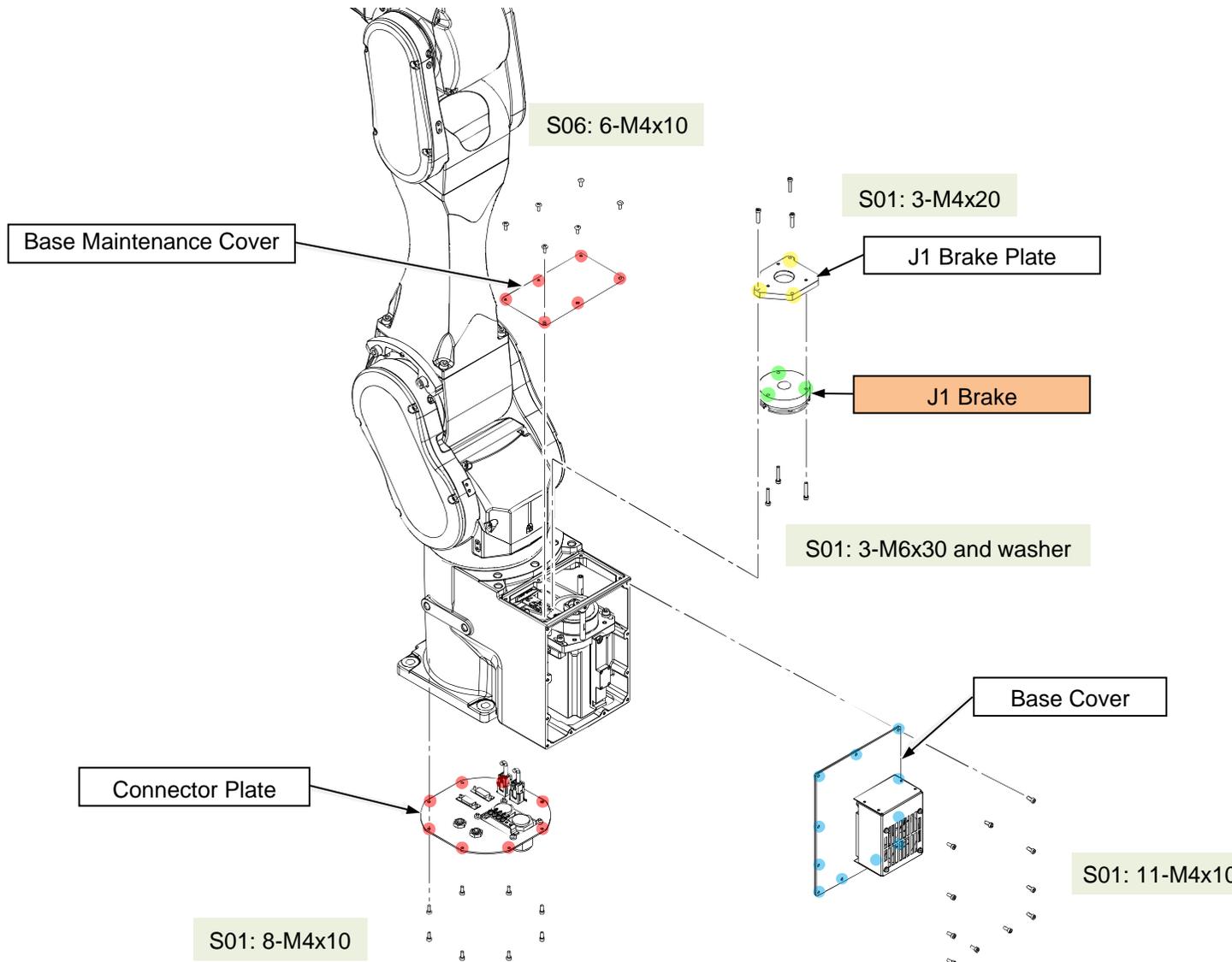
Installing the Motor Unit



1	<p>Install the J1 Motor unit. Perform steps 1 to 7 for Installing the J1 Motor Unit of the "Joint #1 (M/C Cable Backward)".</p>
2	<p>Connect the following connectors. Connector: CN111, CN311, CN410</p> 
3	<p>Install the following covers.</p> <ul style="list-style-type: none"> • Connector plate (M/C cable downward) • Base Cover (M/C Cable Downward: C8L), (M/C Cable Downward: C8XL, C12XL) • Base Maintenance Cover
4	<p>After assembly, perform calibration of Joint #1. 3.2 Calibration</p>

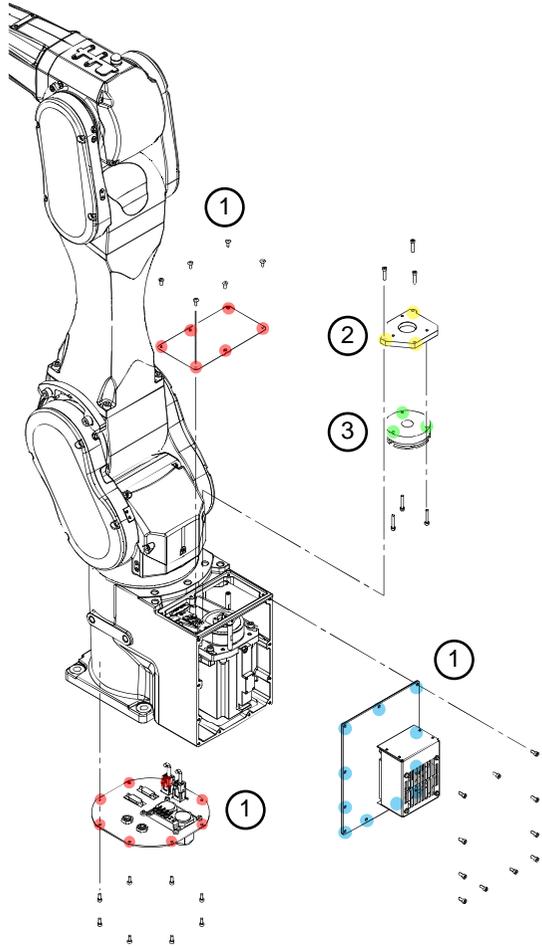
Joint #1

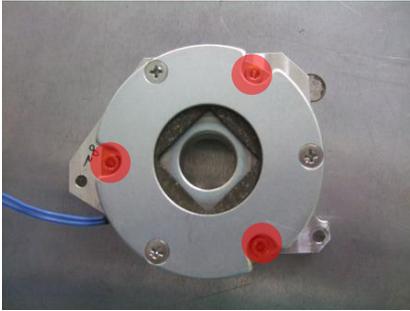
2.3.3 Joint #1 Replacing the Brake



Joint #1

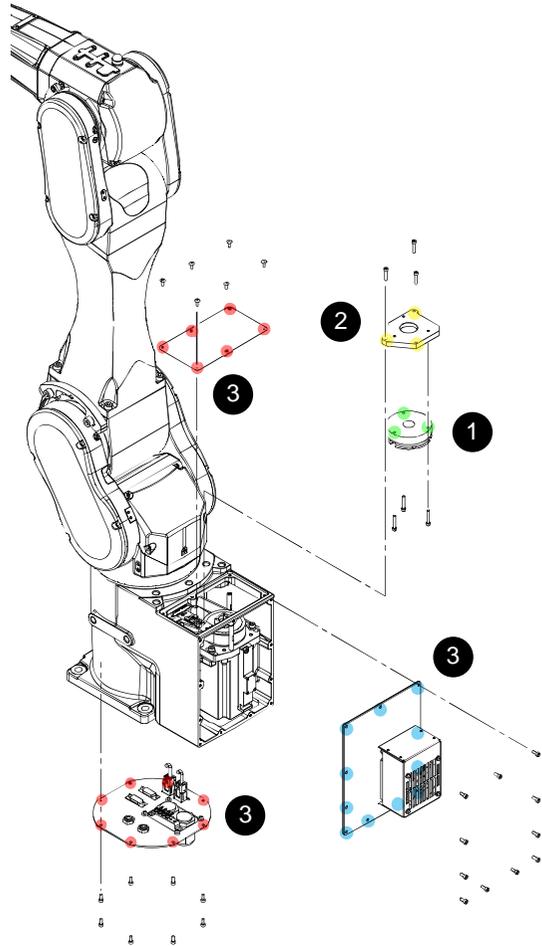
Removing the Brake

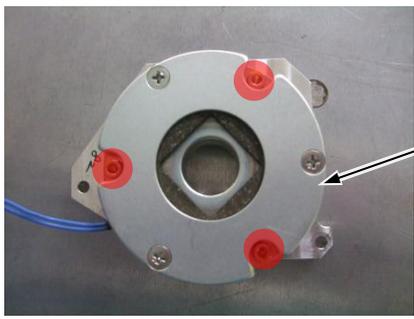
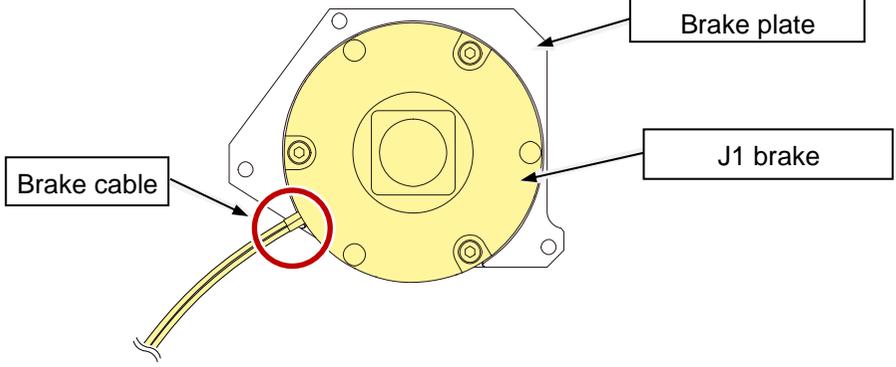


①	Perform steps ① and ② for Removing the J1 Motor Unit of the "Joint #1 (M/C Cable Downward)".
②	Perform steps ⑤ and ⑥ for Removing the J1 Motor Unit of the "Joint #1 (M/C Cable Backward)".
③	<p>Remove the J1 brake from J1 brake plate.</p> <p>A S01: 3-M4x25</p> <div style="display: flex; justify-content: space-around;">   </div> <p style="text-align: right; margin-right: 50px;">J1 brake plate</p> <p style="text-align: center;">J1 brake</p>

Joint #1

Installing the Brake

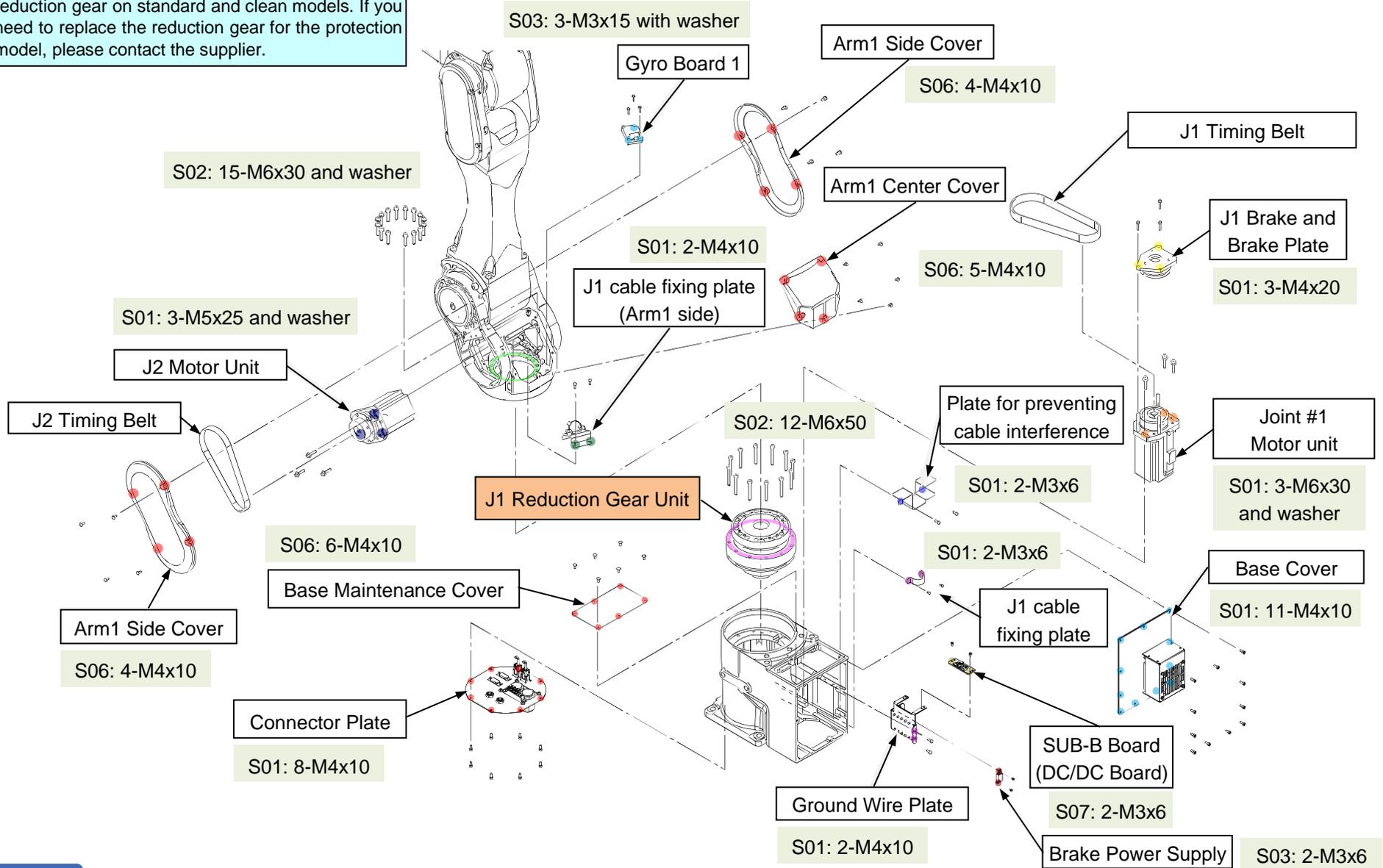


<p>1</p>	<p>Install the J1 brake on the brake plate.</p> <p>A S01: 3-M4x25 (4.0 +/- 0.2 N·m)</p>  <p>J1 brake</p> <p>POINT Install with the orientation shown in the figure.</p>  <p>Brake plate</p> <p>J1 brake</p> <p>Brake cable</p>
<p>2</p>	<p>Perform steps 4 and 7 for Installing the J1 Motor Unit of the "Joint #1 (M/C Cable Backward)".</p>
<p>3</p>	<p>Perform steps 2 and 3 for Installing the J1 Motor Unit of the "Joint #1 (M/C Cable Downward)".</p>

Joint #1

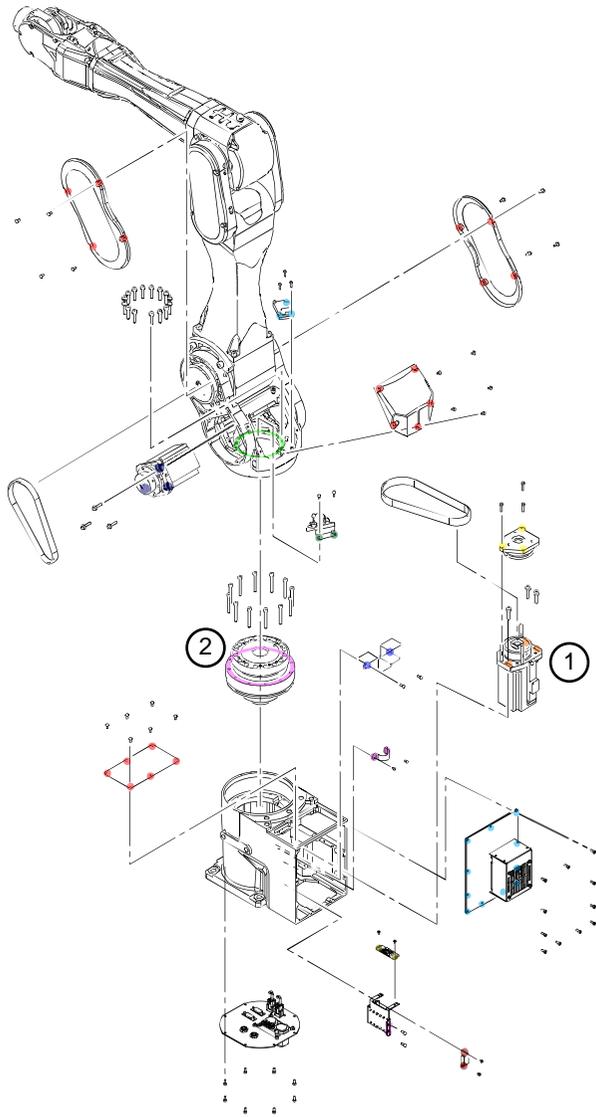
2.3.4 Joint #1 Replacing the Reduction Gear Unit

This section provides procedures for replacing the reduction gear on standard and clean models. If you need to replace the reduction gear for the protection model, please contact the supplier.



Joint #1

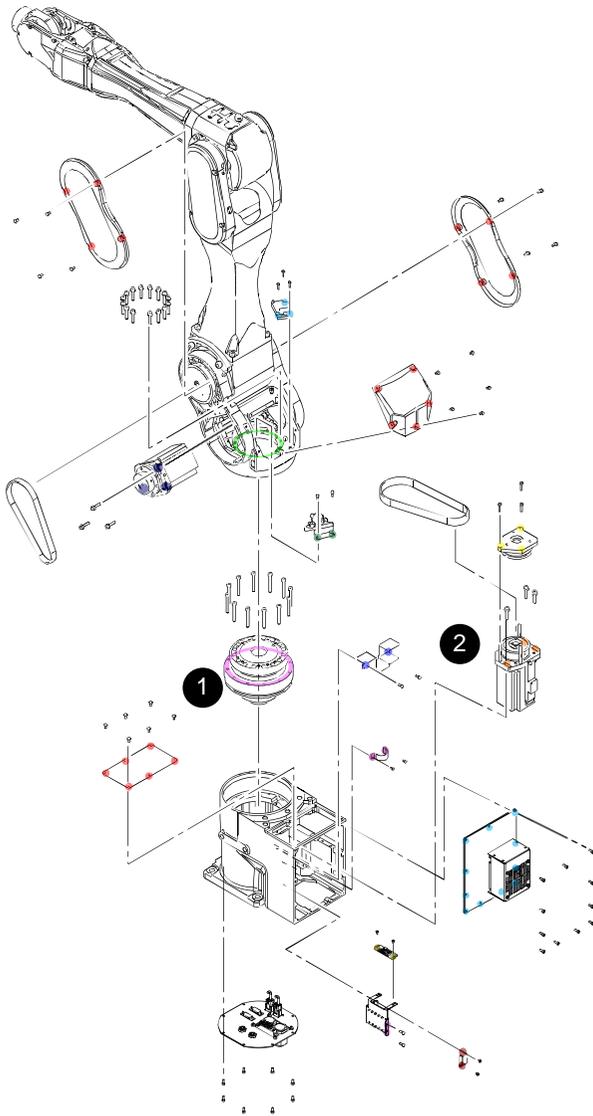
Removing the Reduction Gear Unit



①	Remove the J1 Motor unit .
②	Remove the J1 Reduction Gear Unit. Perform steps ④ to ⑦ for Removing the J1 Reduction Gear Unit of the "Joint #1 (M/C Cable Backward)".

Joint #1

Installing the Reduction Gear Unit

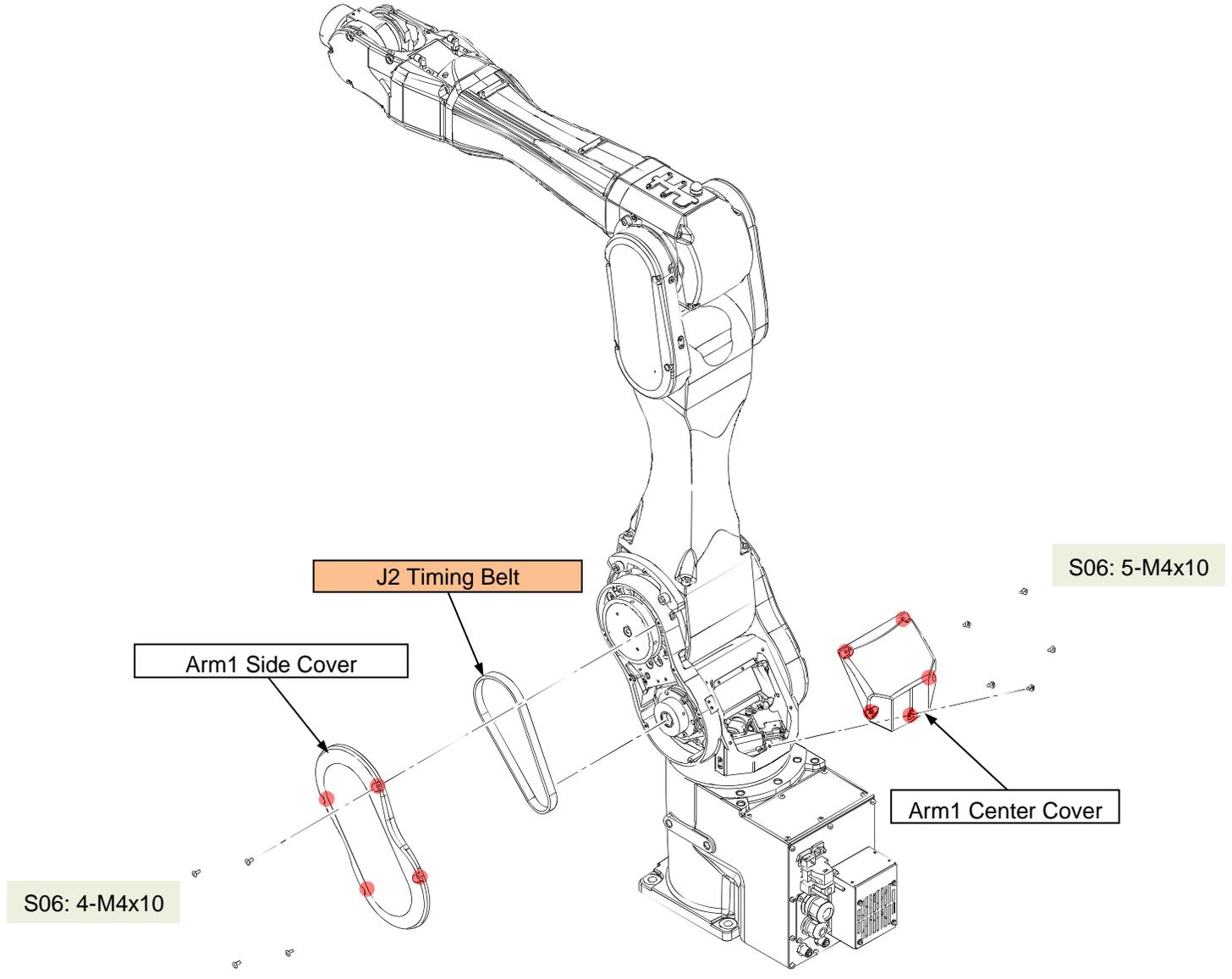


- | | |
|---|--|
| 1 | <p>Install the J1 Reduction Gear Unit.
 Perform steps 1 to 5 for Installing the J1 Reduction Gear Unit of the "Joint #1 (M/C Cable Backward)".</p> |
| 2 | <p>Install the J1 Motor unit.</p> |
| 3 | <p>After assembly, perform calibration of Joint #1.
 3.2 Calibration</p> |

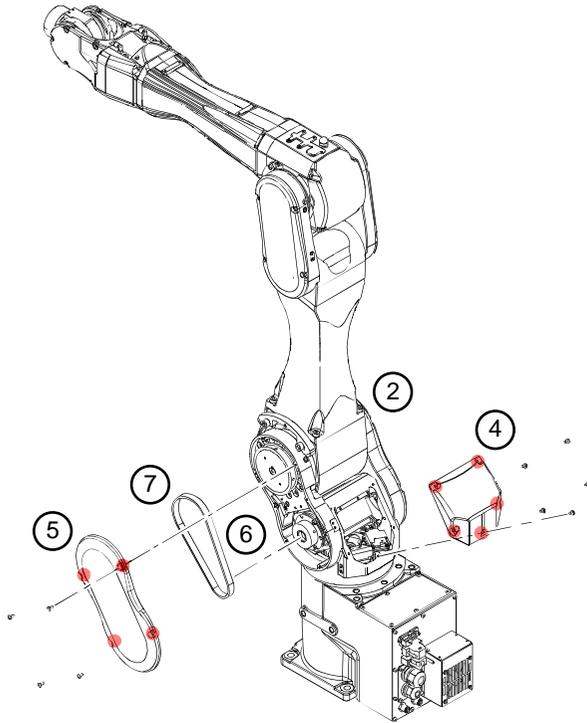
Joint #1

2.4 Joint #2

2.4.1 Joint #2 Replacing the Timing Belt



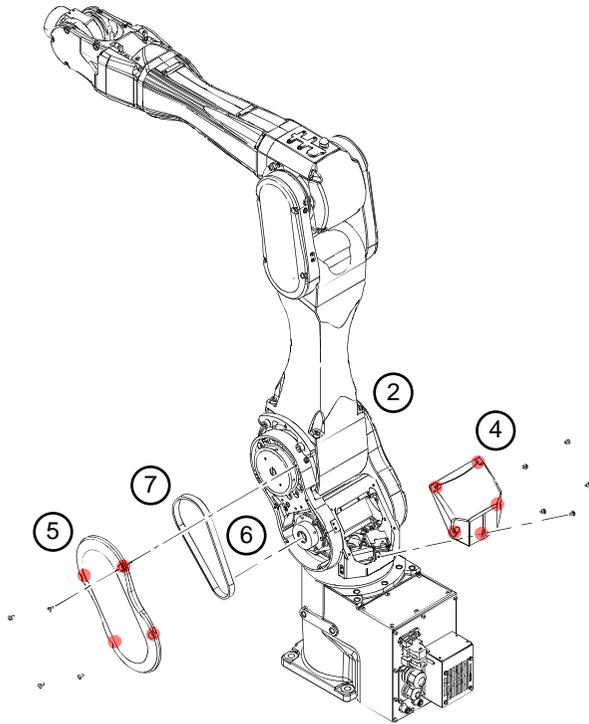
Removing the Timing Belt



①	Turn ON the controller.
②	Release the J2 brake, and manually push and move Arm2 until it comes in contact with the mechanical stopper, and push it against Arm1.
	<p>CAUTION</p> <p>Arm2 falls by its weight when the J2 Motor unit is removed. Release the brake and tilt Arm2 in advance.</p> <div data-bbox="1256 440 1632 916" data-label="Image"> </div>
③	Turn OFF the Controller.
④	Remove the Arm1 center cover .
⑤	Remove the Arm1 side cover .

Joint #2

Removing the Timing Belt



⑥ Loosen the screws securing the J2 Motor unit.

A S01: 3-M5x25 and washer

J2 Motor unit



WARNING

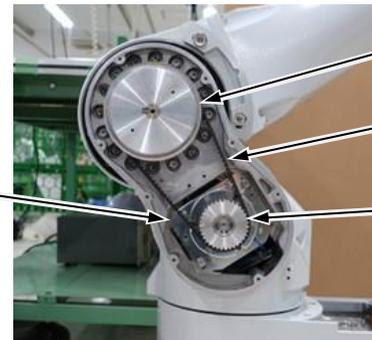
Loosening the screws while Arm2 is not tilted will result in the belt coming off and Arm2 falling, which is very dangerous. Prior to loosening the J2 Motor unit screws, ensure that work in step ② is performed and that Arm2 is tilted.

⑦ Remove the J2 Timing Belt.

POINT

First remove the belt from pulley 1.

J2 Motor unit

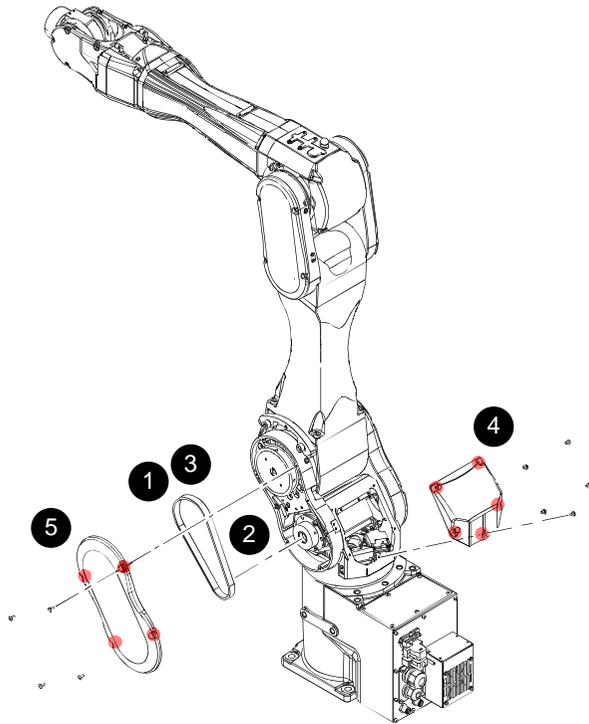


Pulley 2

Timing Belt

Pulley 1

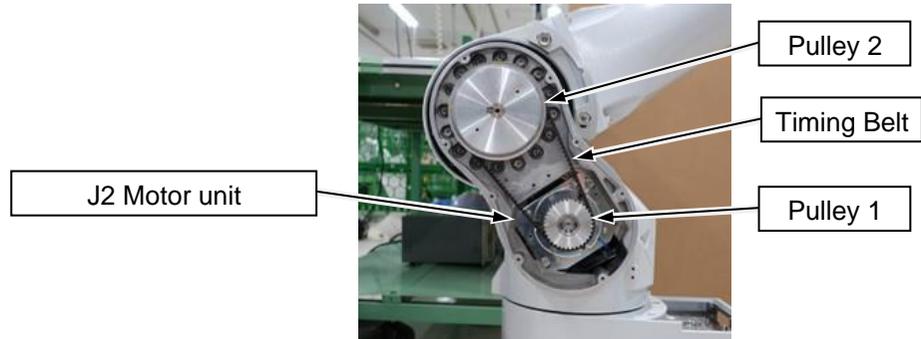
Installing the Timing Belt



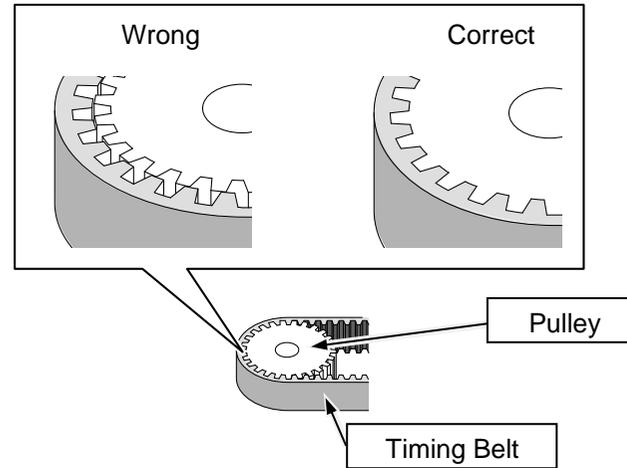
1 Install the J2 Timing Belt.

POINT

- First place the belt on pulley 2.

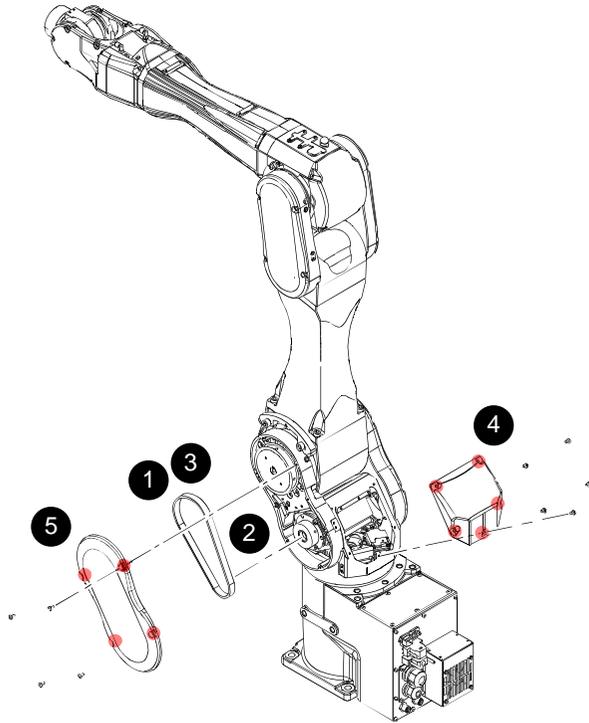


- Make sure that the teeth of the Timing Belt and the pulley are properly engaged.



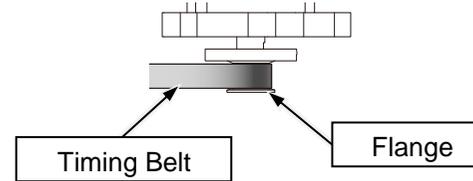
Joint #2

Installing the Timing Belt



CAUTION

If the Timing Belt is placed on the flange, correct tension will not be obtained during belt tension adjustment.



Set the belt so that it is level with respect to the pulley without it being placed on the flange.

2 Temporarily secure the J2 Motor unit.

A S01: 3-M5x25 and washer

J2 Motor unit



POINT

The standard for temporary fastening is where the Motor Unit can be moved by hand and will not tilt when pulled. If this is either too loose or too tight, it will not provide the proper tension to the belt.

3 Adjust the belt tension.
[3.1 Adjusting the Timing Belt Tension](#)

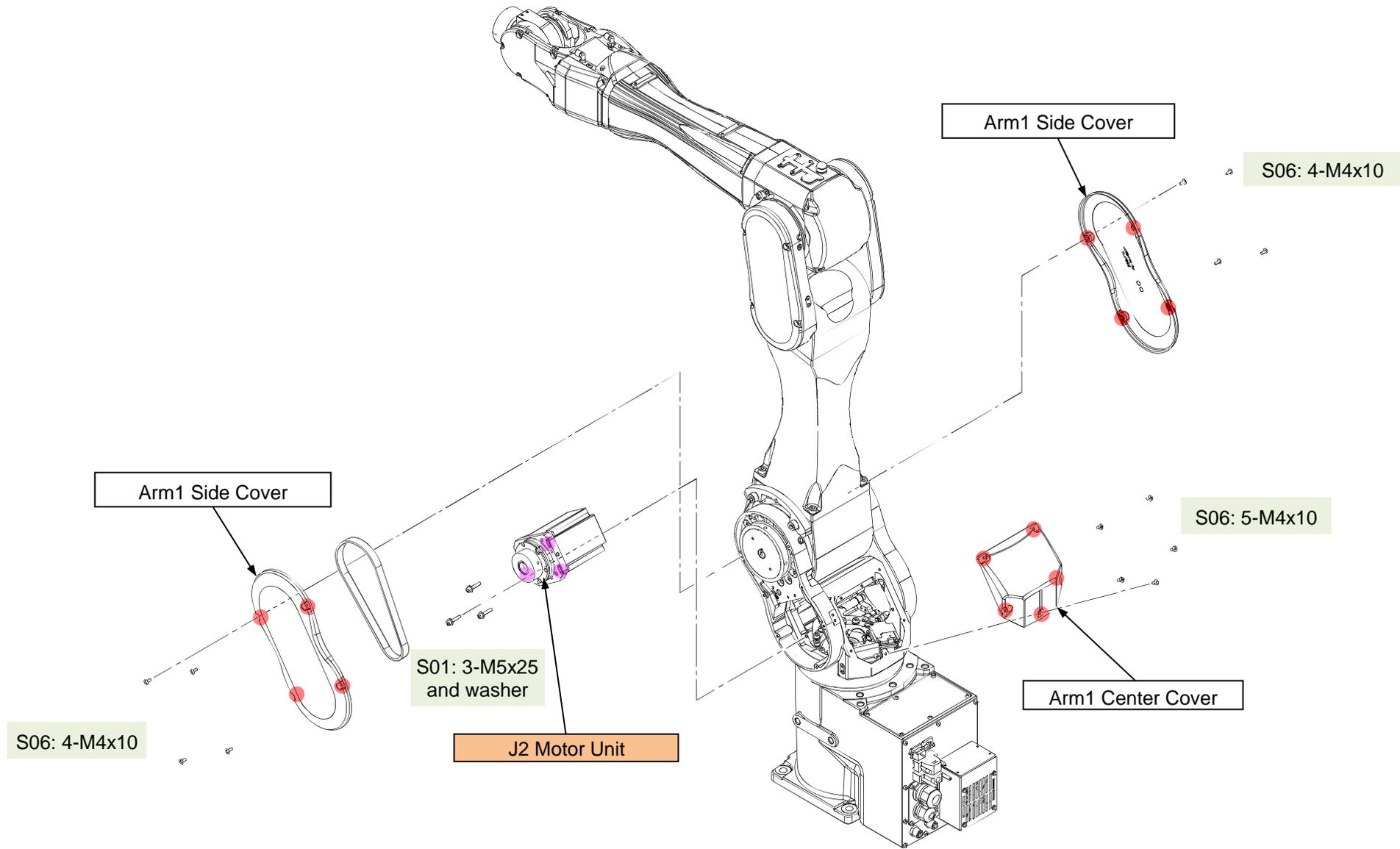
4 Install the [Arm1 center cover](#).

5 Install the [Arm1 side cover](#).

6 After assembly, perform calibration of Joint #2.
[3.2 Calibration](#)

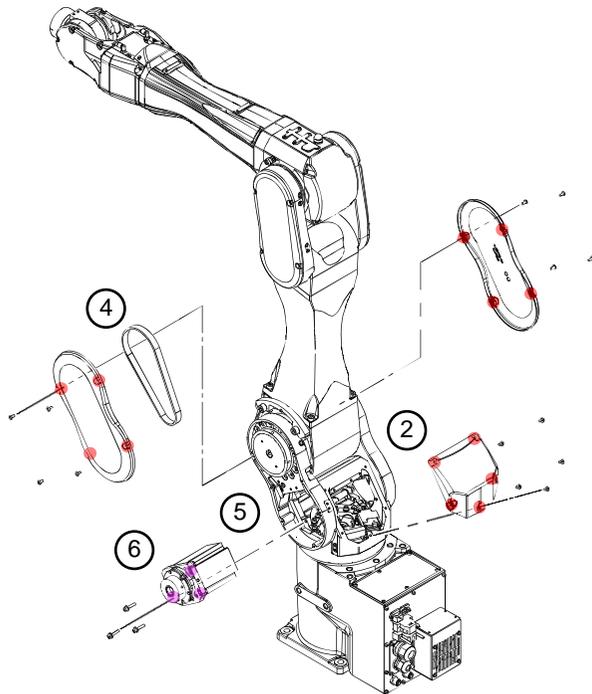
Joint #2

2.4.2 Joint #2 Replacing the Motor Unit



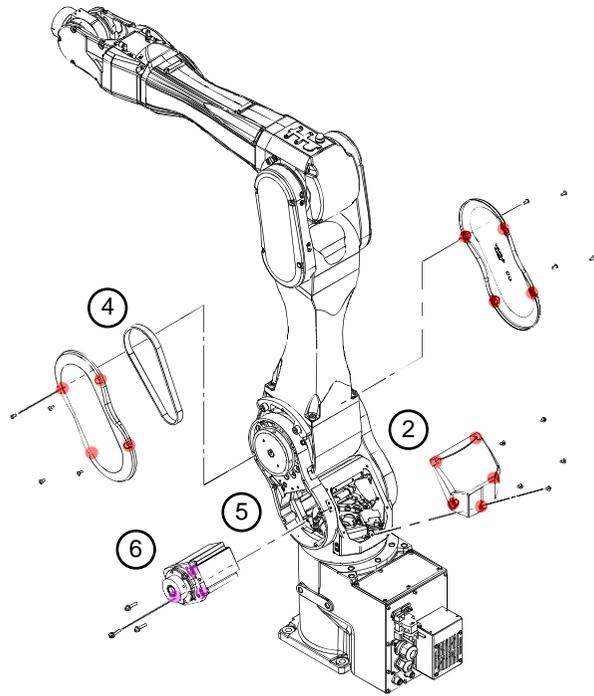
Joint #2

Removing the Motor Unit

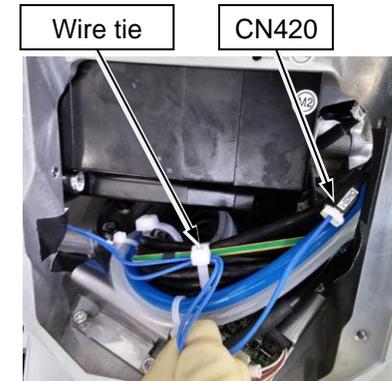
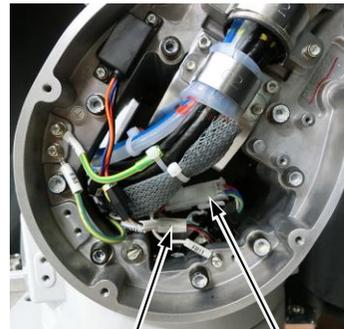


①	Turn ON the controller.
②	<p>Release the J2 brake, and manually push and move Arm2 until it comes in contact with the mechanical stopper, and push it against Arm1.</p> <p>CAUTION Arm2 falls by its weight when the J2 Motor unit is removed. Release the brake and tilt Arm2 in advance.</p> 
③	Turn OFF the Controller.
④	Remove the J2 Timing Belt .

Removing the Motor Unit

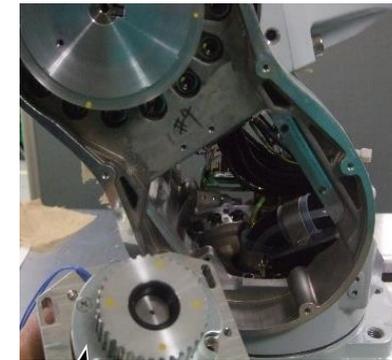
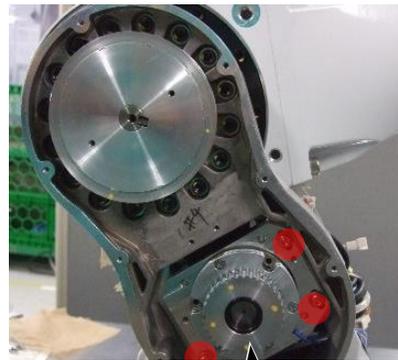


⑤ Disconnect the J2 Motor Connectors (CN121, CN321, CN420), and cut the wire tie binding CN420.

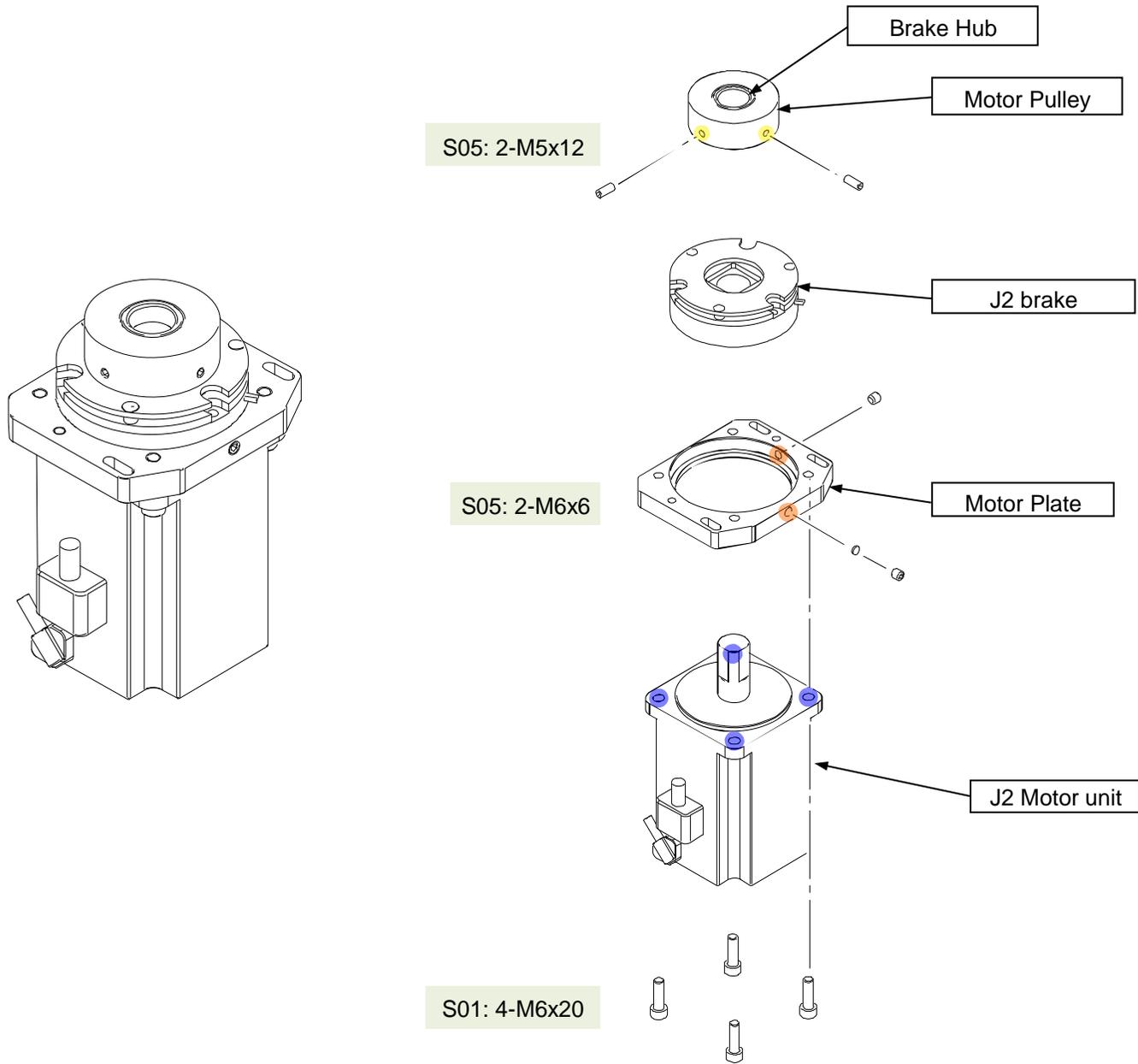


⑥ Remove the loosened screws, then remove the J2 Motor unit.

A S01: 3-M5x25 and washer

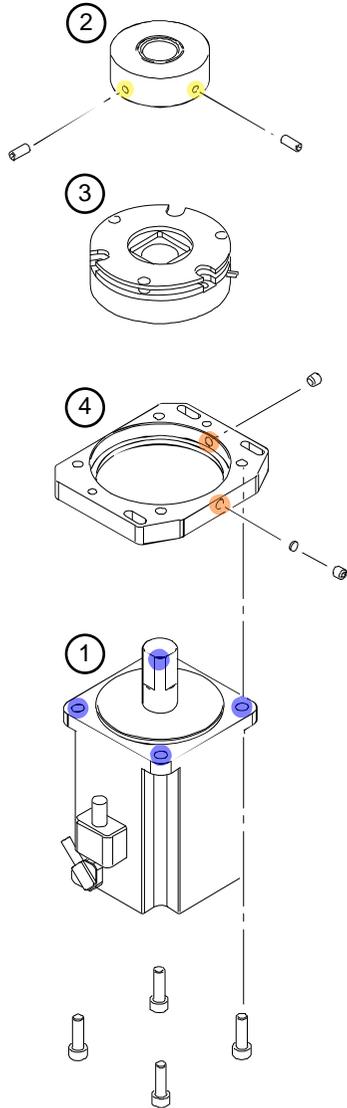


Motor Unit Disassembly



Joint #2

Motor Unit Disassembly



①

Remove the [J2 Motor unit](#).

②

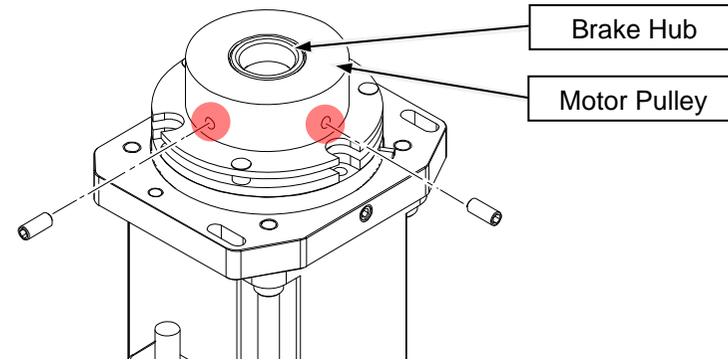
Remove the Motor Pulley unit.

POINT

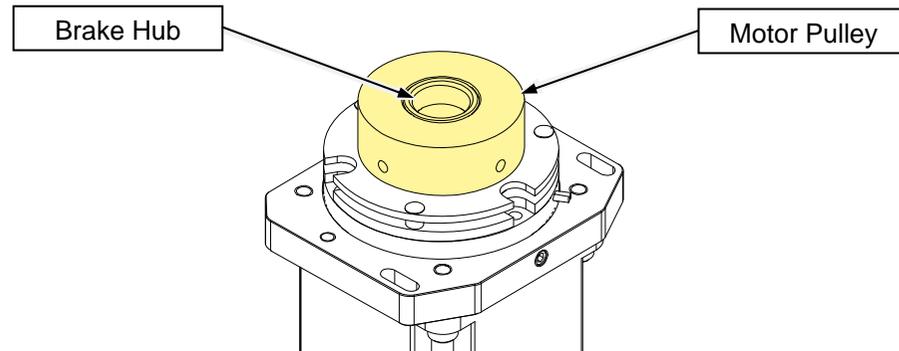
Remove the Motor Pulley and the Brake Hub together.

1. Loosen the two screws on the D-cut surface of the motor shaft when viewing the J2 Motor unit from above.

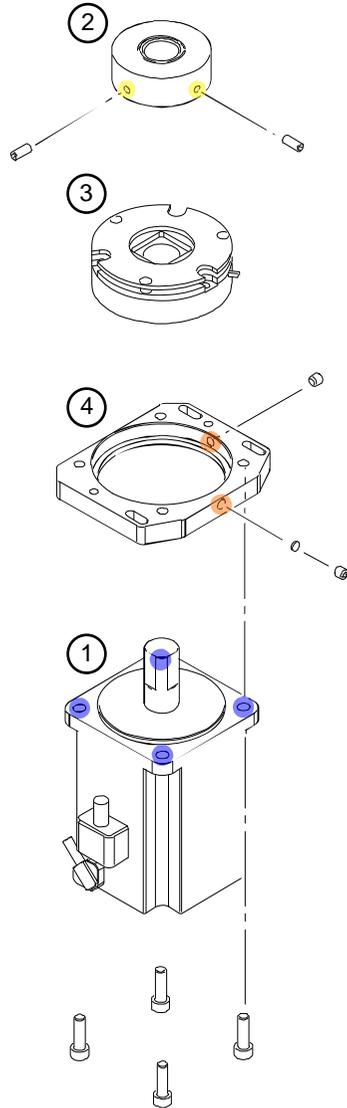
A S05: 2-M5x12



2. Remove the Motor Pulley unit from the motor shaft.

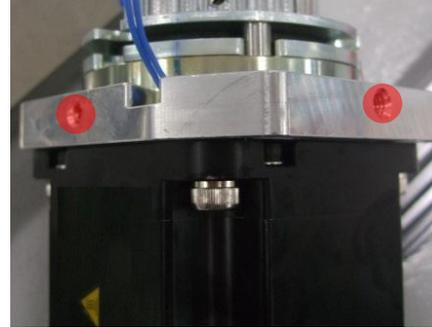


Motor Unit Disassembly



③ Remove the J2 brake.

A S05: 2-M6x6
(Brass bushing x 1)

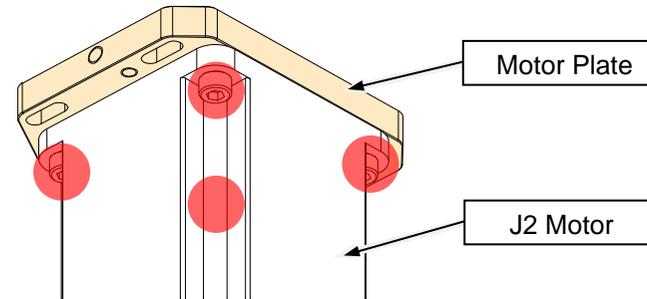


CAUTION

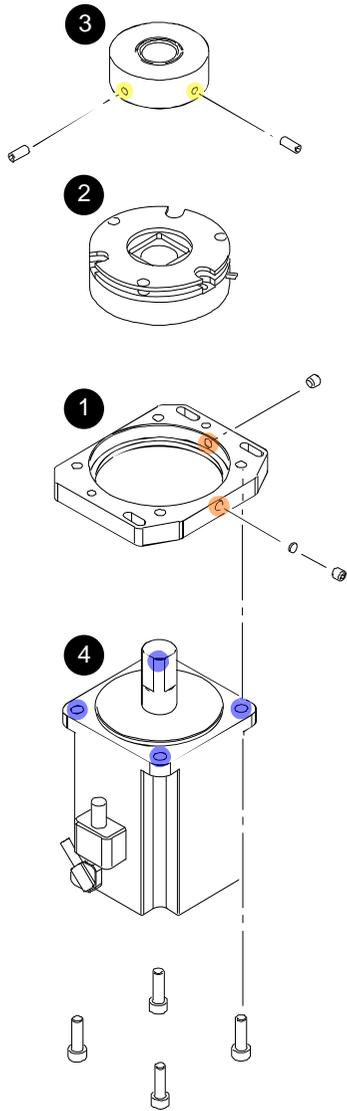
A brass bushing is included on one of the set screws. Be careful not to drop and lose the bushing.

④ Remove the Motor Plate.

A S01: 4-M6x20



Motor Unit Assembly



Joint #2

1 Install the Motor Plate.

A S01: 4-M6x20
(13.0 +/- 0.6 N·m)

Motor Plate

J2 Motor

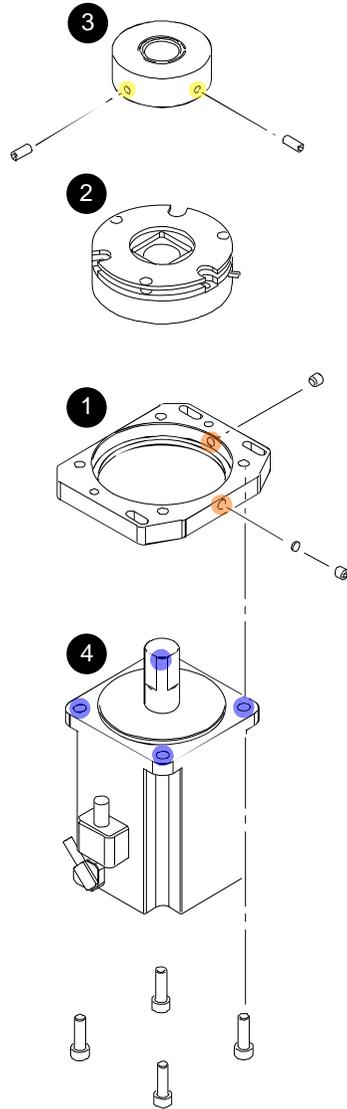
POINT
Attach the Motor Plate according to the orientation shown in the figure.

Motor Plate

J2 Motor

Motor cable

Motor Unit Assembly

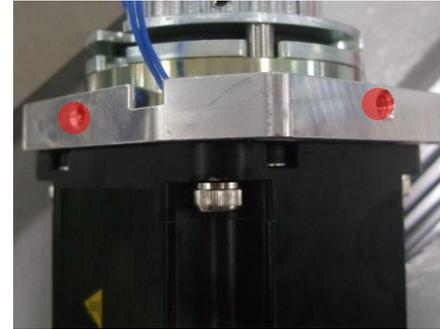


2 Install the J2 brake.

CAUTION

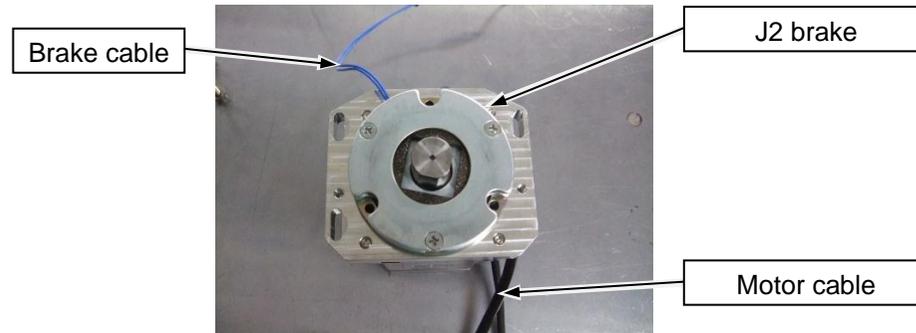
If the screw positions are incorrect or the bushing is not set, this may cause damage on the side, and may result in the part being unable to be removed.

A S05: 2-M6x6
(6.0 +/- 0.4 N·m)



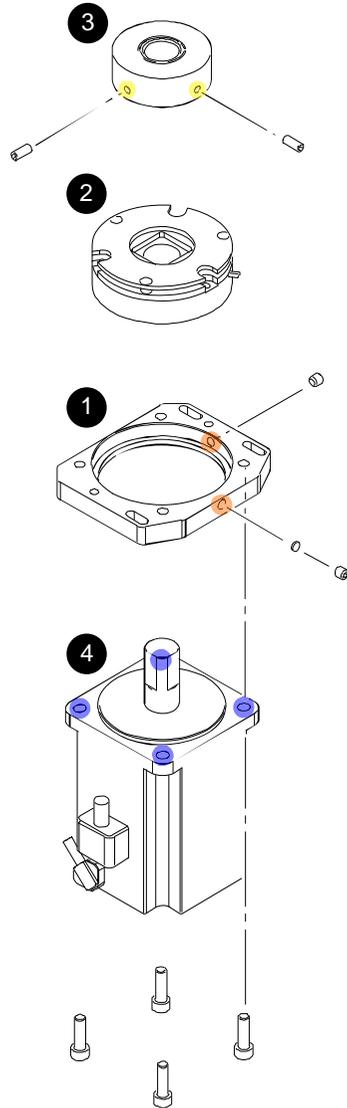
POINT

Install the J2 brake according to the orientation shown in the figure.

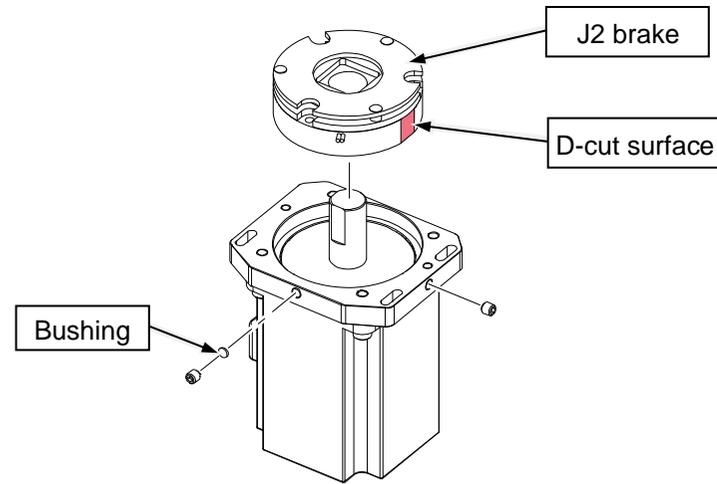


Joint #2

Motor Unit Assembly



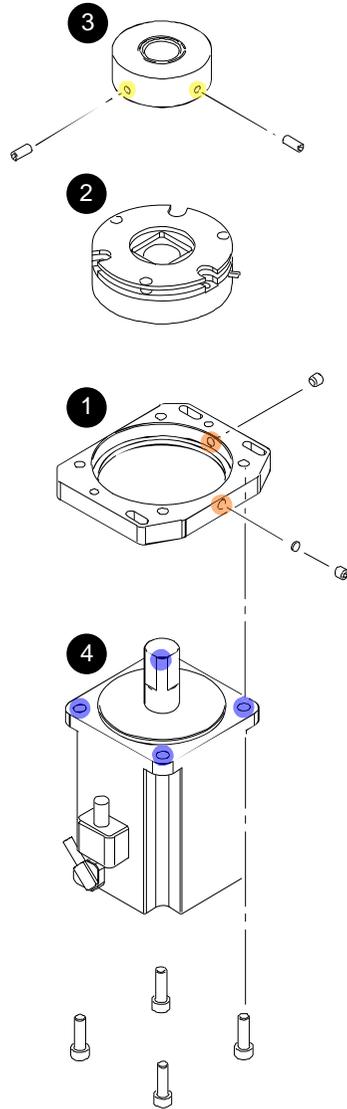
- Install the bushing on the side of the J2 brake without the D-cut surface.



- Tighten the screws while pressing the J2 brake against the Motor Plate.

Joint #2

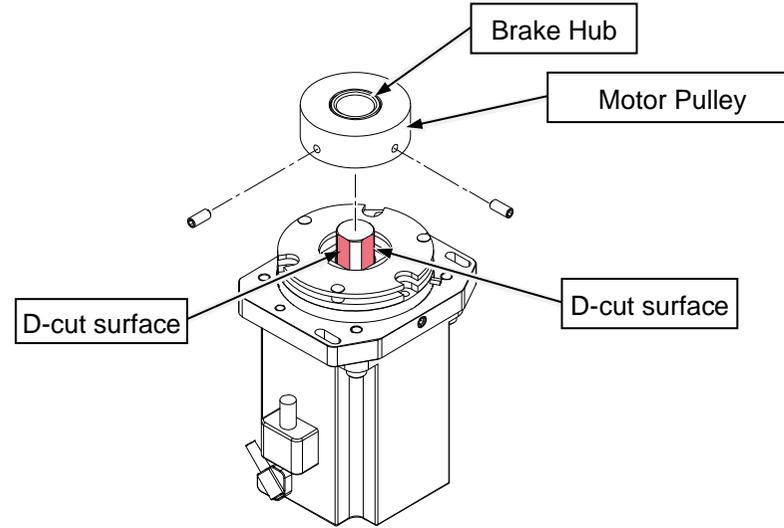
Motor Unit Assembly



3

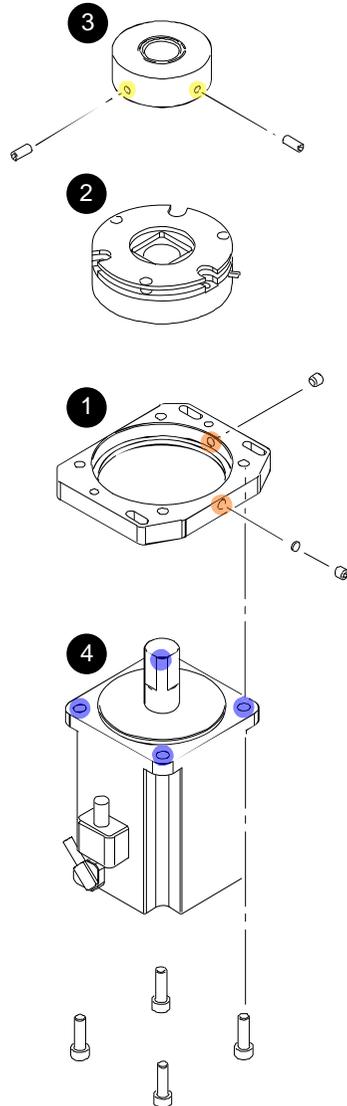
Install the Motor Pulley unit to the J2 Motor unit.

1. Insert the Motor Pulley so that the set screw positions align with the motor shaft D-cut surfaces.



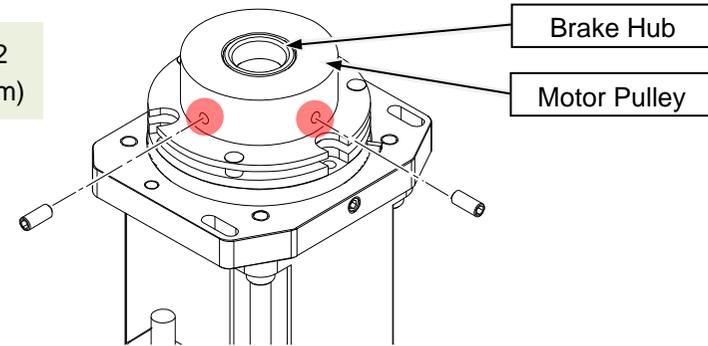
Joint #2

Motor Unit Assembly



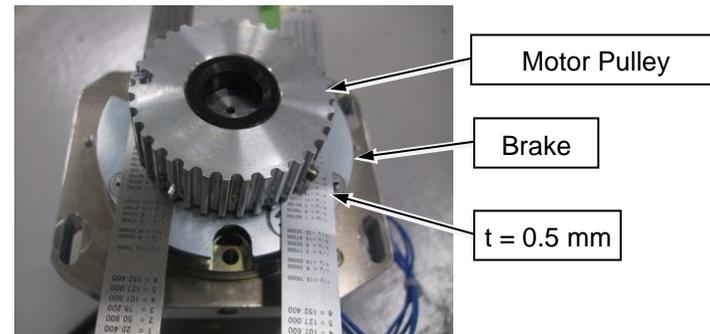
2. Secure the Motor Pulley unit to the shaft.

A S05: 2-M5x12
(4.0 +/- 0.2 N·m)



POINT

Place feeler gauges (0.5 mm) between the Motor Pulley and the brake, to ensure a 0.5-mm gap during installation.

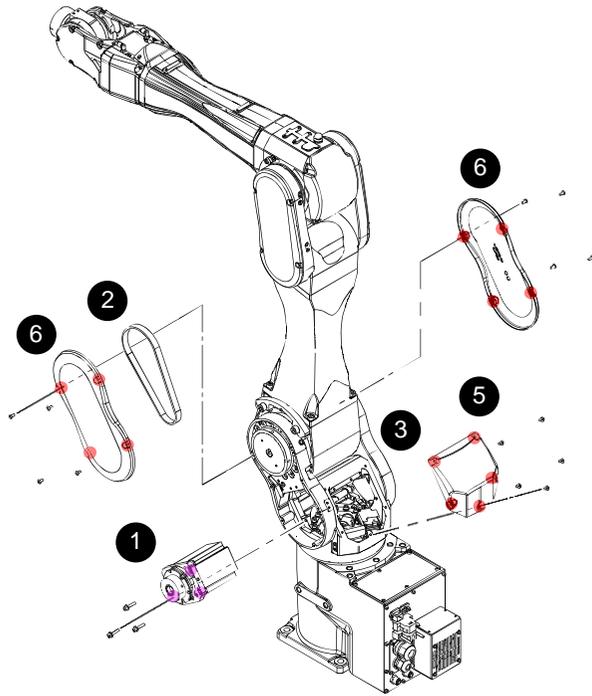


CAUTION

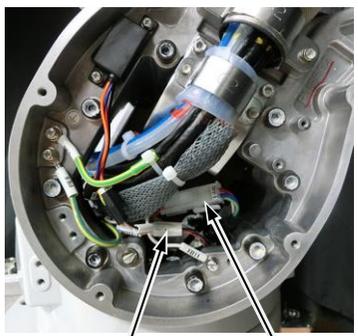
- Failure to create a proper gap between the Motor Pulley and the brake may cause the parts to rub during motor operation, causing a malfunction.
- If the set screw position is incorrect, this may cause damage on the side, and may result in not being able to remove the part.

4 Install the [J2 Motor unit](#).

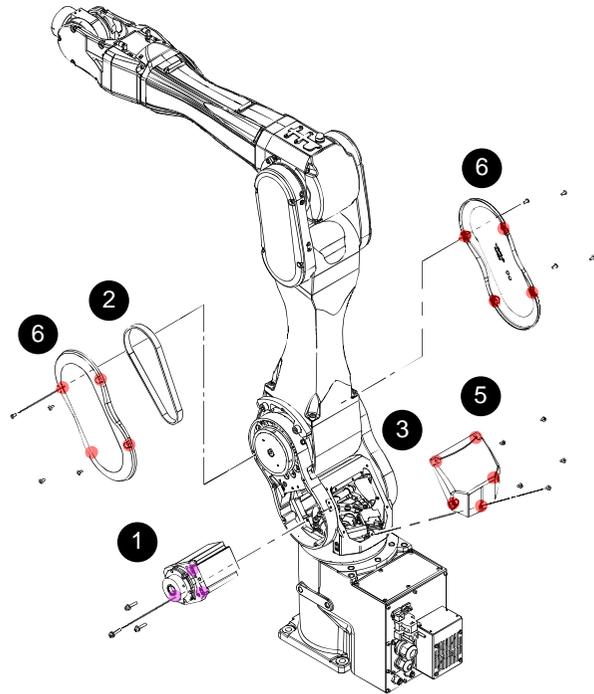
Installing the Motor Unit



Joint #2

1	Insert the J2 Motor unit inside Arm2.
2	Install the J2 Timing Belt . Perform steps 1 to 3.
3	<p>Connect the J2 Motor Connectors (CN121, CN321, CN420).</p> <div style="display: flex; justify-content: space-around;">   </div>
4	<p>Bind CN420 (J2 brake cable), CN3 (gyro cable), and other cables.</p> <p>Binding position CN3: Approx. 65 mm from the connector end CN420-1: Approx. 125 mm from the connector end</p> <div style="text-align: center;">  <p>Wire tie (AB150)</p> </div>

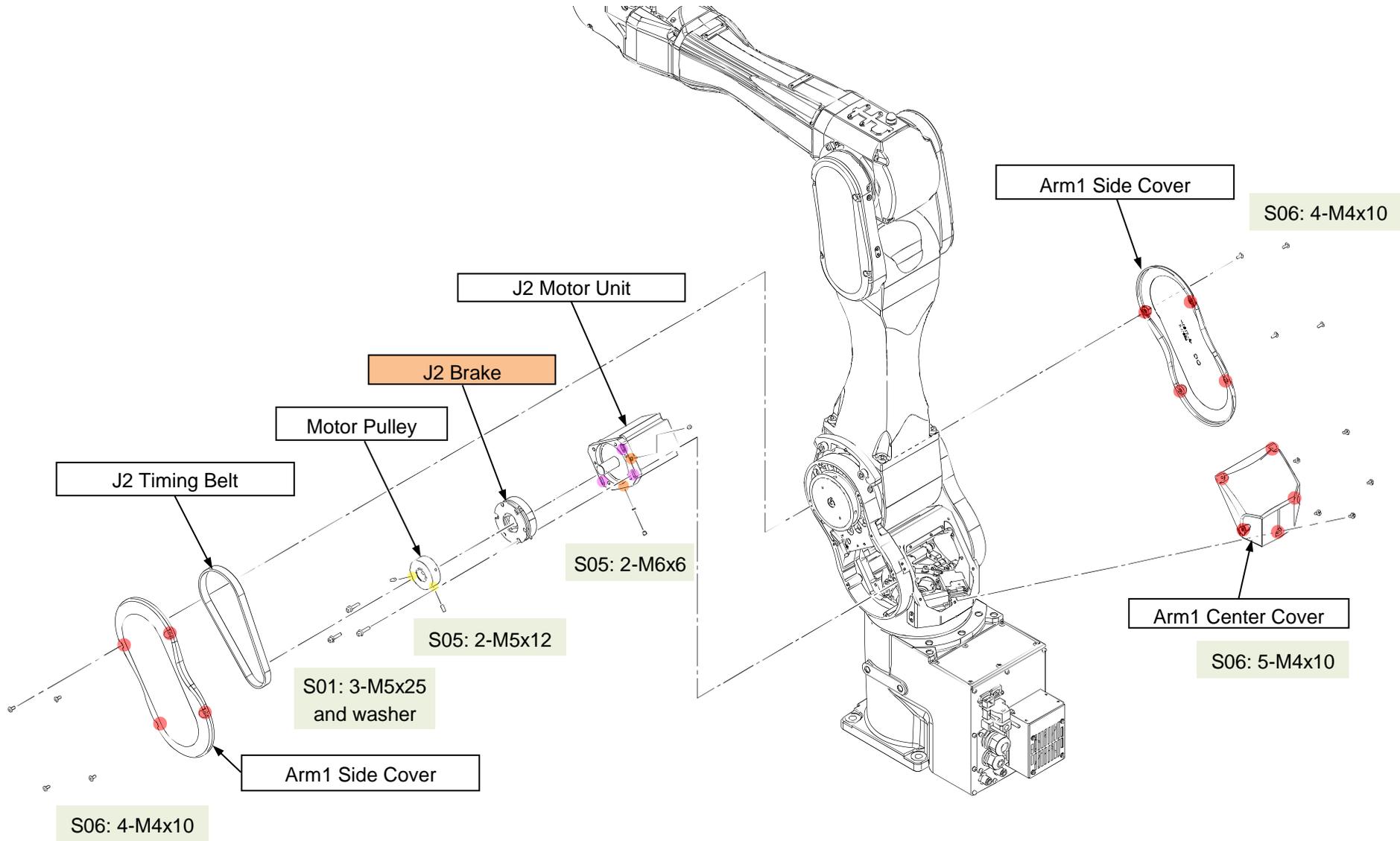
Installing the Motor Unit



5	Install the Arm1 center cover .
6	Install the Arm1 side cover .
7	After assembly, perform calibration of Joint #2. 3.2 Calibration

Joint #2

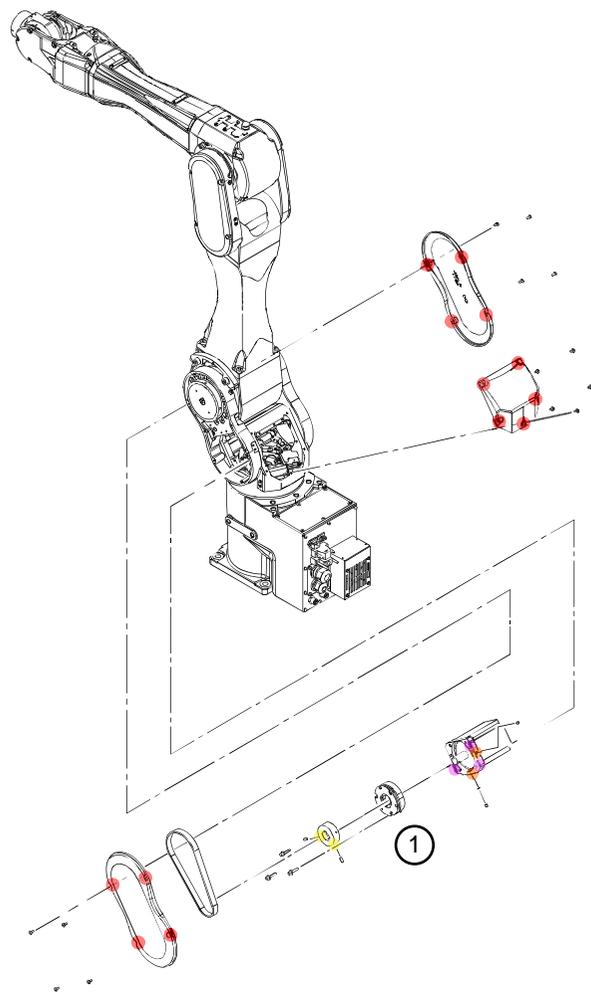
2.4.3 Joint #2 Replacing the Brake



Joint #2

Removing the Brake

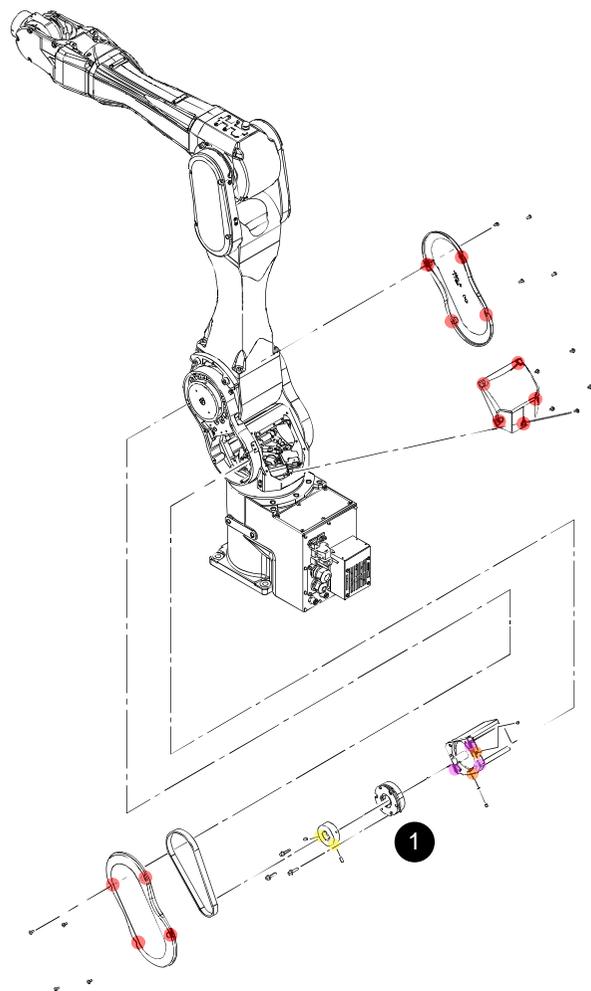
- | | |
|---|---|
| ① | Refer to J2 Motor Unit Disassembly and remove the J2 brake. |
|---|---|



Joint #2

Installing the Brake

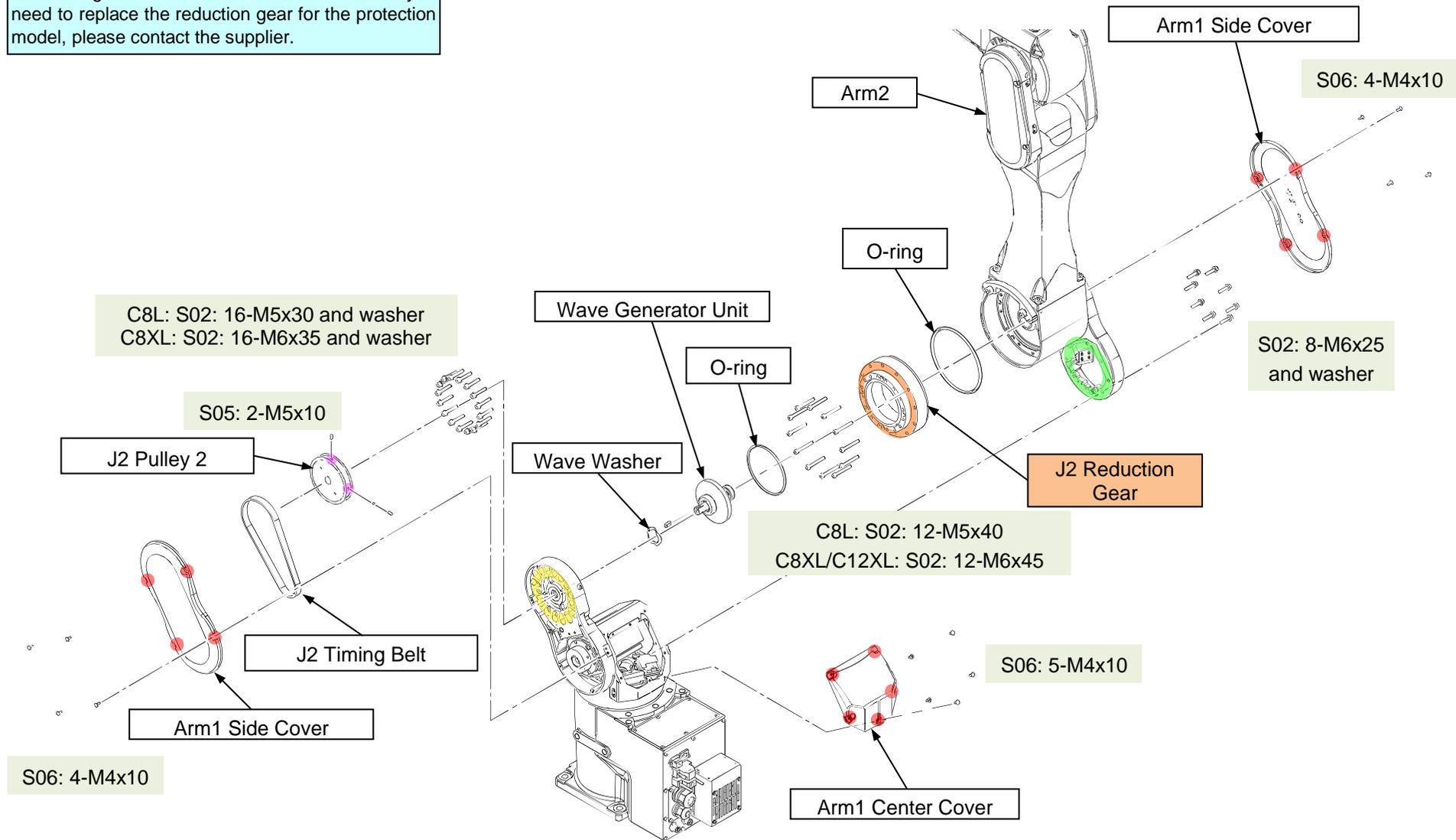
- | | |
|----------|---|
| 1 | Refer to J2 Motor Unit Assembly and install the J2 brake. |
|----------|---|



Joint #2

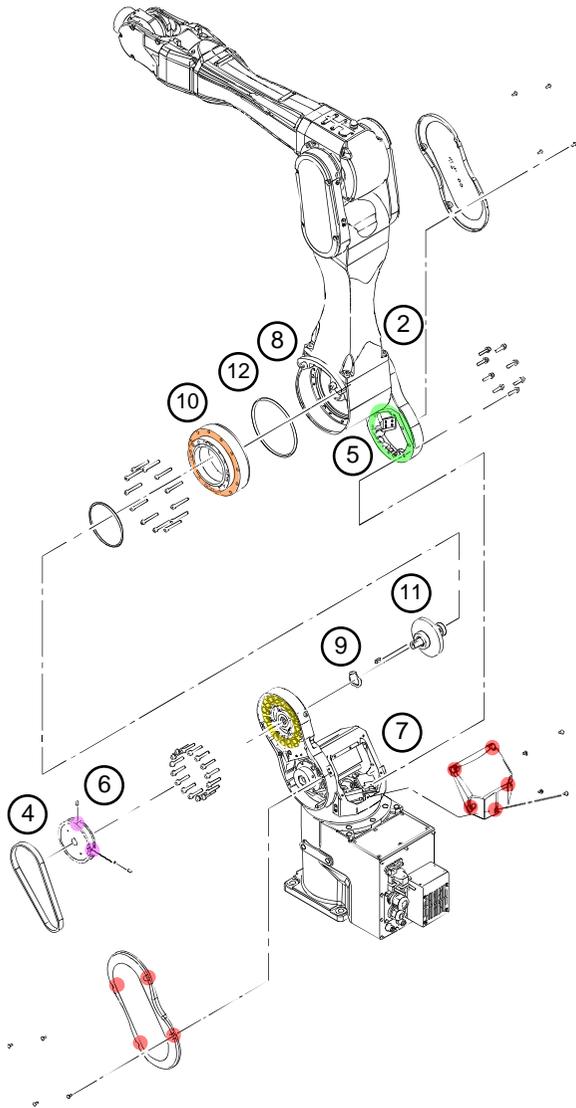
2.4.4 Joint #2 Replacing the Reduction Gear

This section provides procedures for replacing the reduction gear on standard and clean models. If you need to replace the reduction gear for the protection model, please contact the supplier.



Joint #2

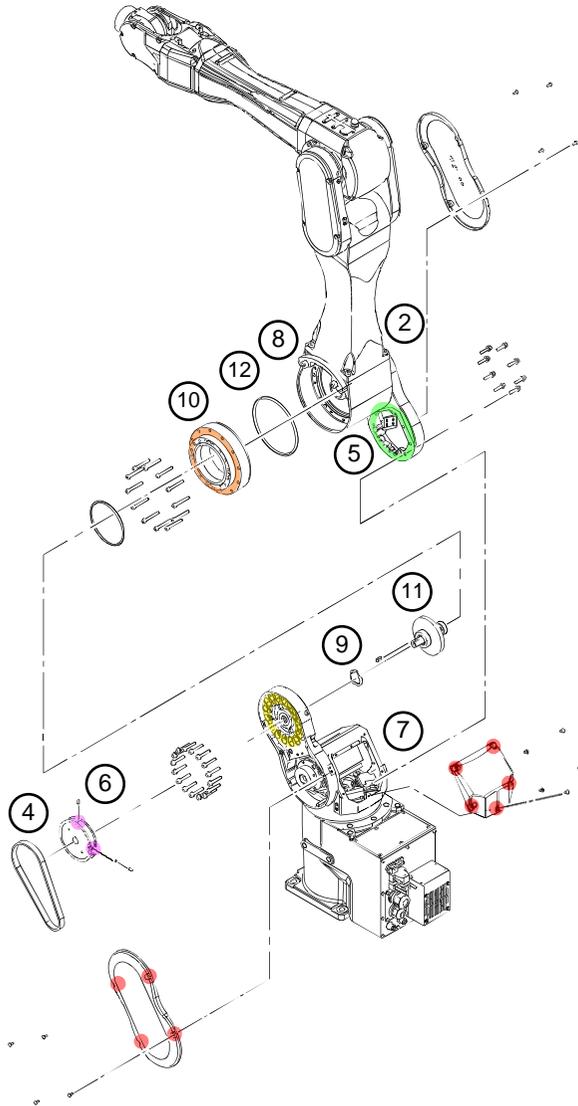
Removing the Reduction Gear



	<p><Preparation> Prepare a work stand upon which to place the arm removed from the Manipulator. Guidelines for work stand Width x Depth: 1.0 x 0.5 m Height: 300 mm to 500 mm from bottom of the Manipulator Load capacity: 10 kg</p>
<p>①</p>	<p>Turn ON the controller.</p>
<p>②</p>	<p>Release the J2 brake, and manually push and move Arm2 until it comes in contact with the mechanical stopper, and push it against Arm1.</p> <p>CAUTION Arm2 falls by its weight when the J2 Motor unit is removed. Release the brake and tilt Arm2 in advance.</p> 
<p>③</p>	<p>Turn OFF the Controller.</p>

Joint #2

Removing the Reduction Gear

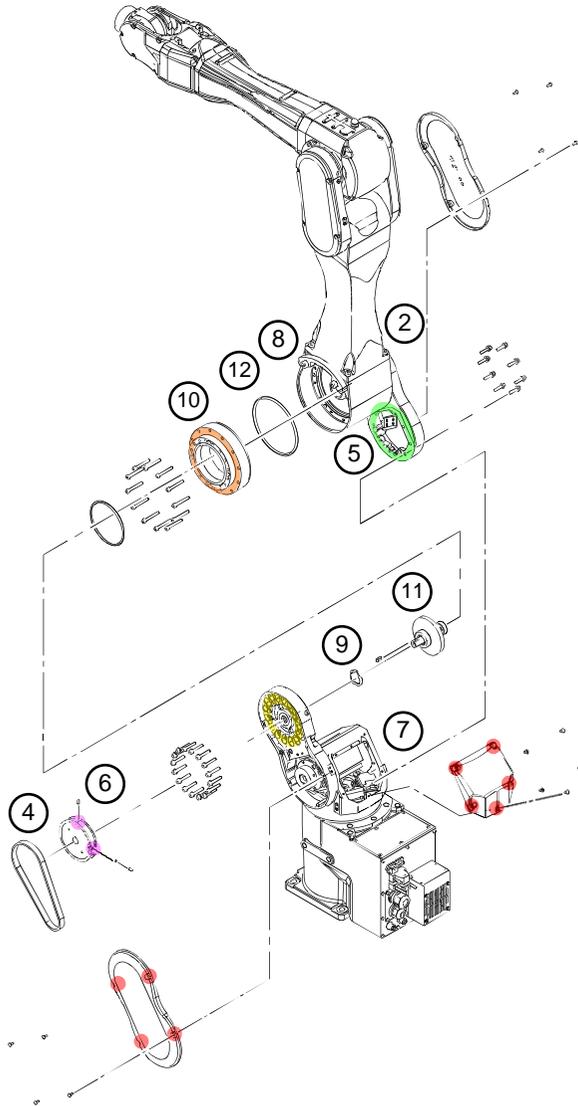


④	Remove the J2 Timing Belt .
⑤	Remove the Arm1 side arm. A S02: 8-M6x25 and washer



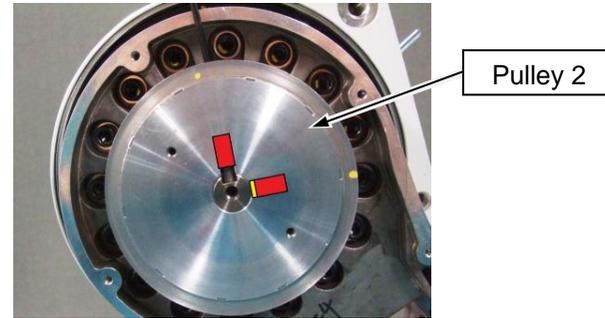
Joint #2

Removing the Reduction Gear



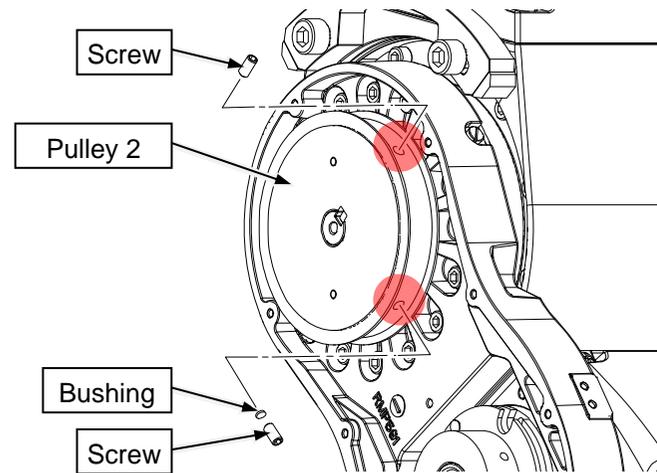
⑥ Remove the J2 pulley 2.

A S05: 2-M5x10



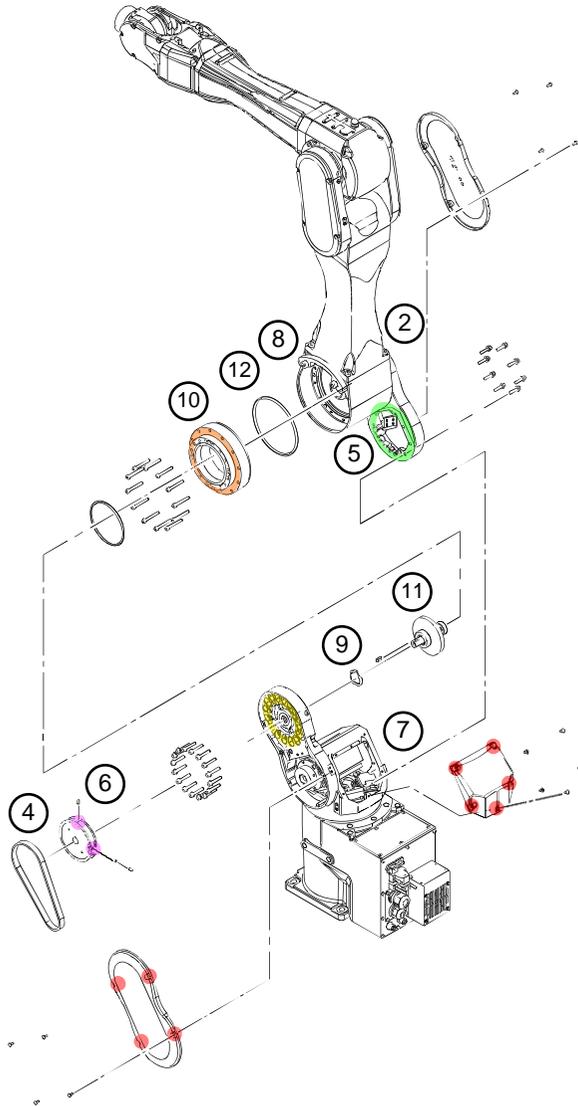
CAUTION

- A brass bushing is included on one of the set screws. When removing the pulley, be careful not to drop and lose the bushing.

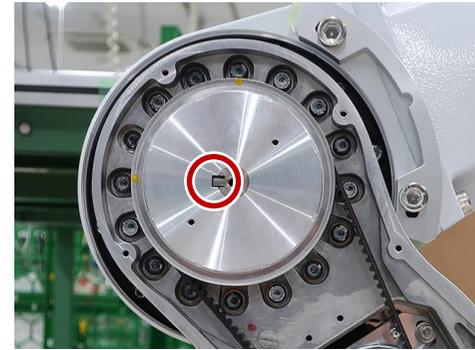


Joint #2

Removing the Reduction Gear

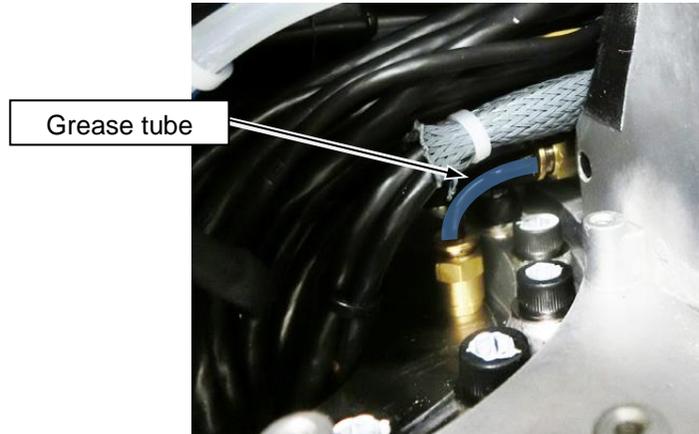


- <C8XL/C12XL only>
Remove the key from the shaft. The key will be used again during installation, so be careful not to lose it when performing the work.



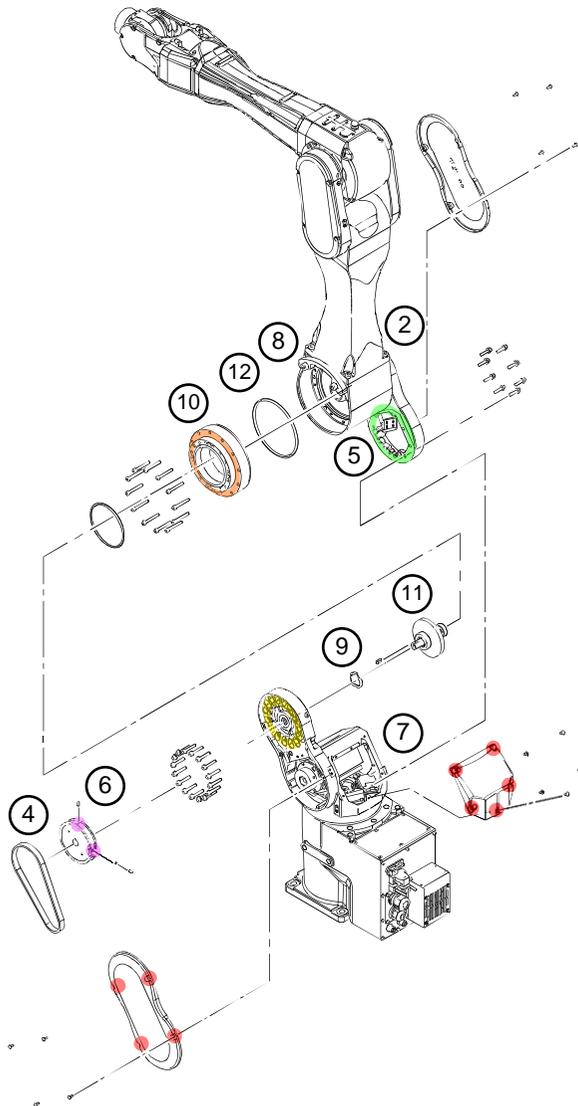
- ⑦ Remove the grease tube on the Arm1 side from the fitting.

POINT
The grease tube connects the base and Arm1.



Joint #2

Removing the Reduction Gear



⑧

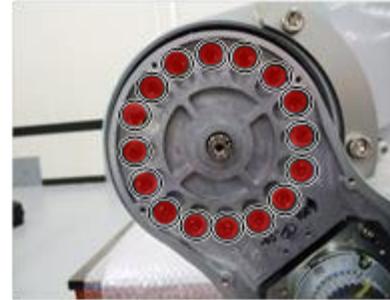
Remove Arm2.

C8L:

- Ⓐ S02: 16-M5x30
and washer

C8XL:

- Ⓐ S02: 16-M6x35
and washer

**CAUTION**

- Remove the bolts to remove the Arm1 side arm and Arms 2, 3, 4, 5, and 6 (end effector).

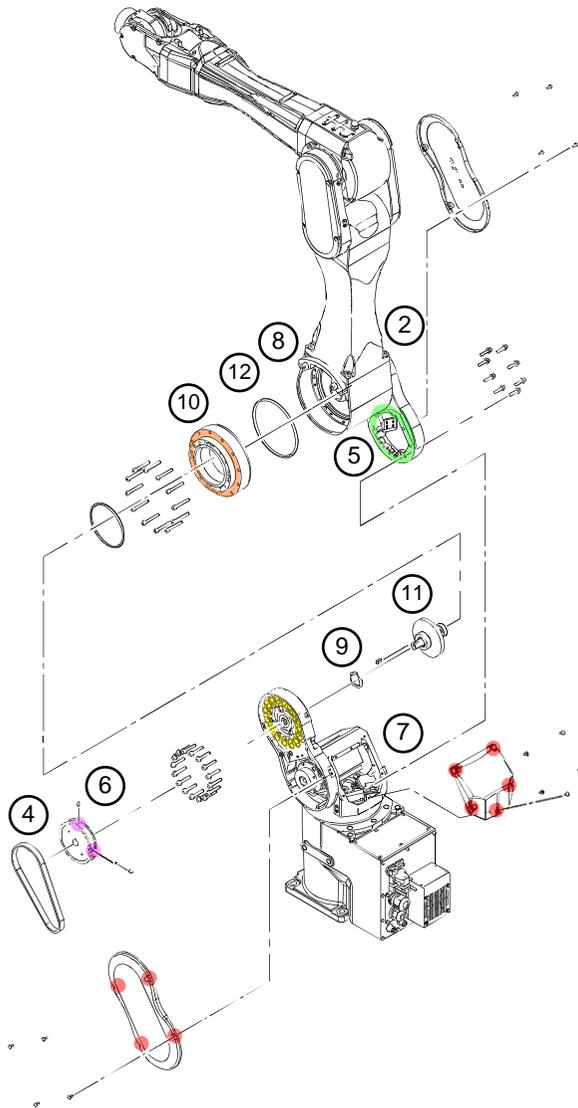
There is a possibility of hands and fingers being caught, and/or damage to or malfunction in the Manipulator. Be very careful when removing the arms. Have at least two workers support the Manipulator while another worker removes the bolts.

- The arms are connected by internal cables. Place the removed arms on the work stand in order to not apply load on the cables. Applying load on the cables may result in cable disconnection.



Joint #2

Removing the Reduction Gear



⑨

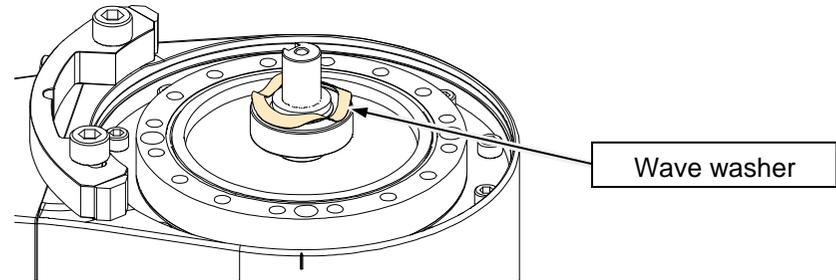
Remove the wave washer.

CAUTION

The wave washer will be used again. Be careful not to lose it when performing the work.

POINT

The part has grease applied. Perform the work while wiping off the grease.



⑩

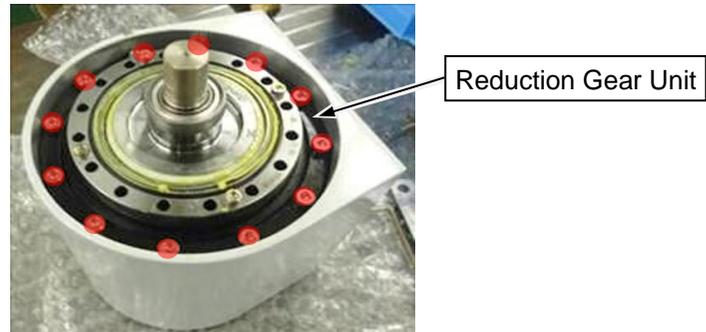
Remove the Reduction Gear Unit with the Wave Generator unit built in.

C8L:

A S02: 12-M5x40

C8XL:

A S02: 12-M6x45

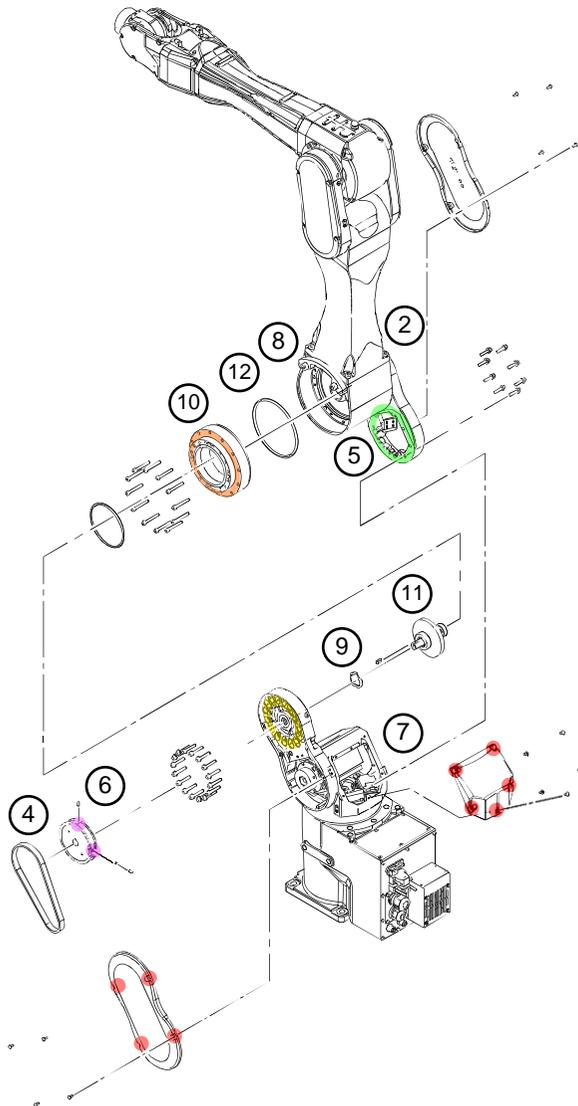


POINT

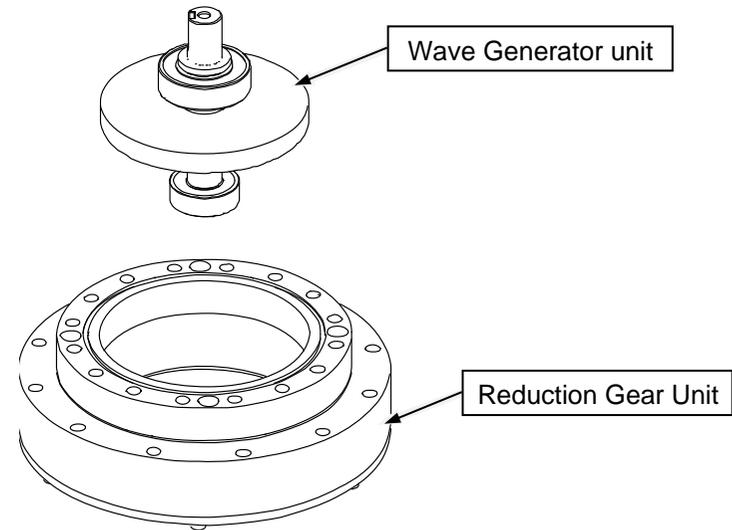
The part has grease applied. Perform the work while wiping off the grease.

Joint #2

Removing the Reduction Gear

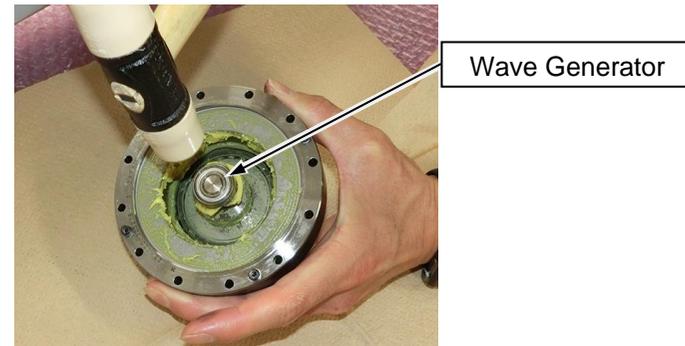


11 Remove the Wave Generator unit.

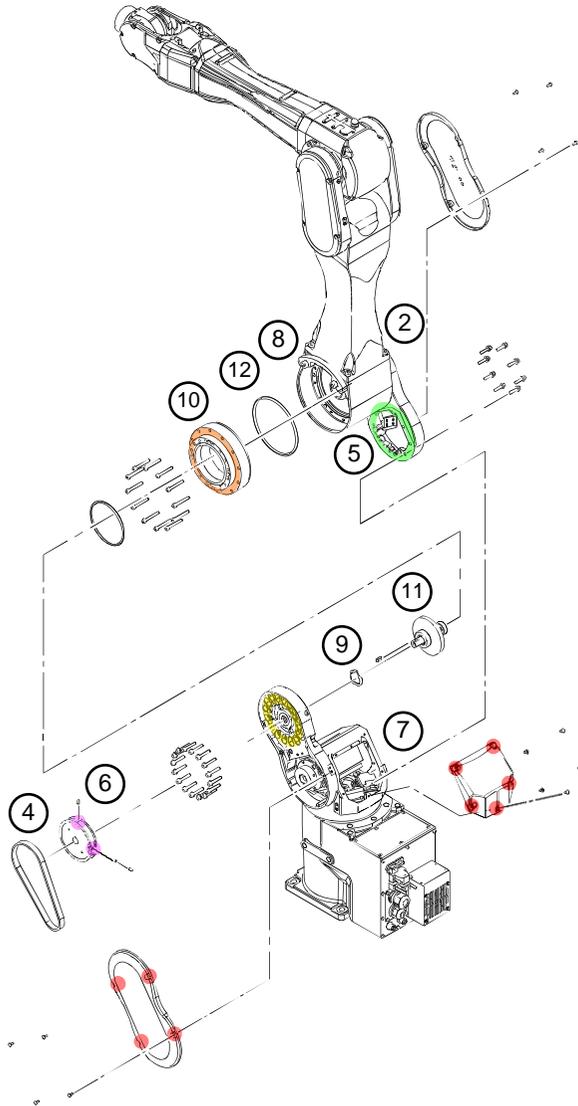


POINT

Turn the Reduction Gear Unit with the Wave Generator unit built in upside down. Remove the Wave Generator unit by tapping it lightly near the center axis with a plastic hammer.



Removing the Reduction Gear



12

Remove the Arm2 O-ring.

POINT

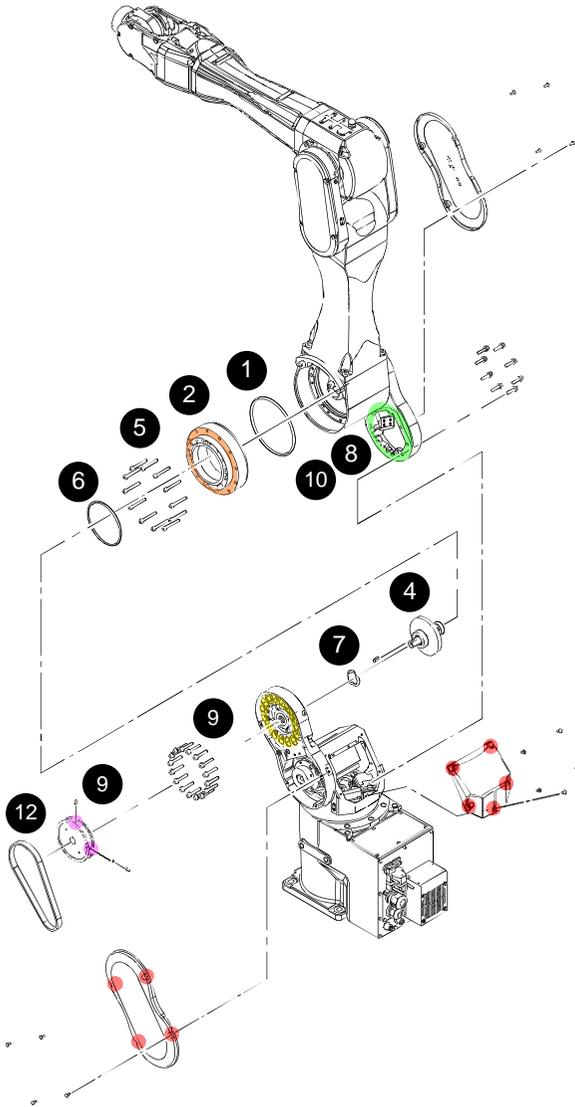
The part has grease applied. Perform the work while wiping off the grease.



O-ring

Joint #2

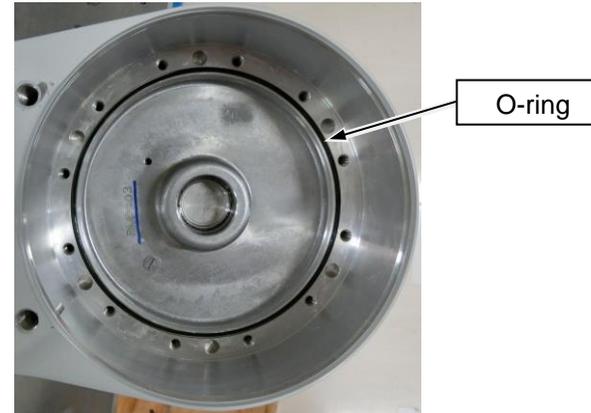
Installing the Reduction Gear



1 Install the O-ring in the O-ring groove.

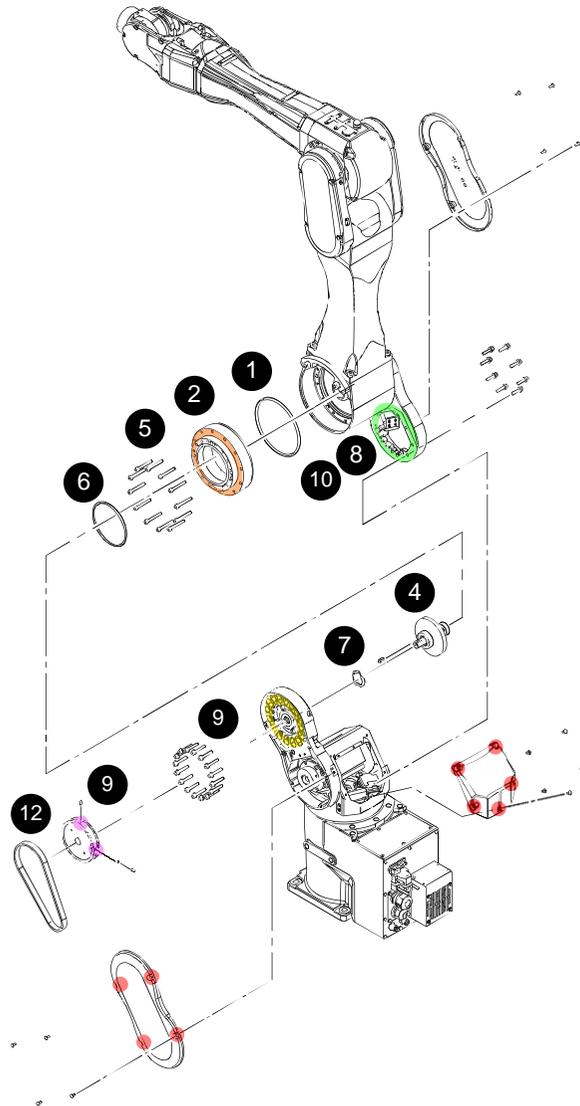
POINT

- Applying a small amount of grease (SK-1A) to the O-ring will make it stick to the arm, facilitating subsequent work.
- Insert the O-ring firmly into the groove.
- If the O-ring is stretched, damaged, or has deteriorated, replace with a new one.



Joint #2

Installing the Reduction Gear



2

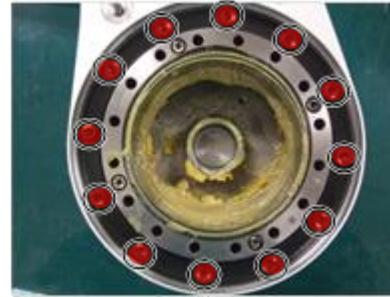
Set the Reduction Gear Unit on Arm2, then secure the fixing bolts temporarily.

C8L:

A S02: 12-M5x40

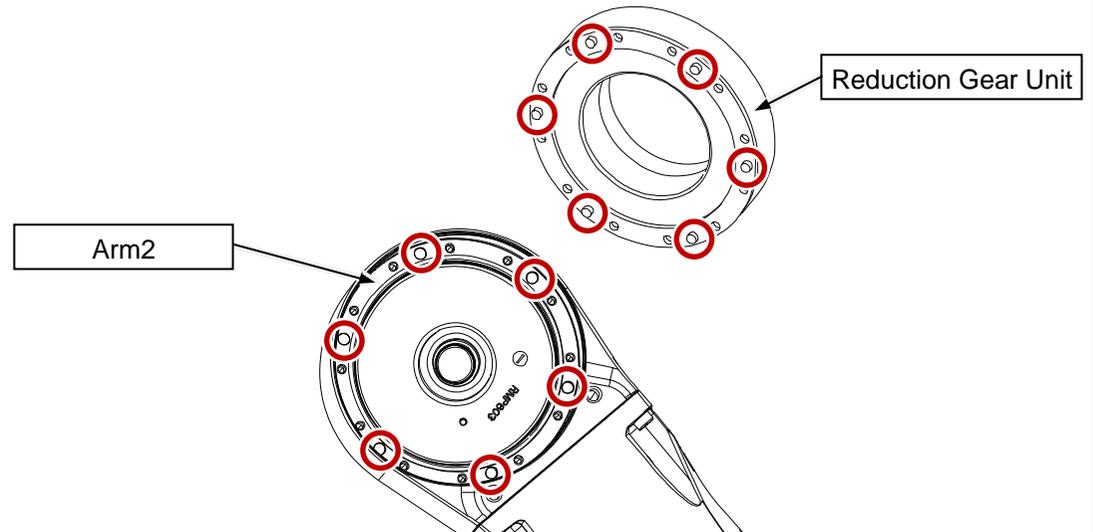
C8XL/C12XL:

A S02: 12-M6x45



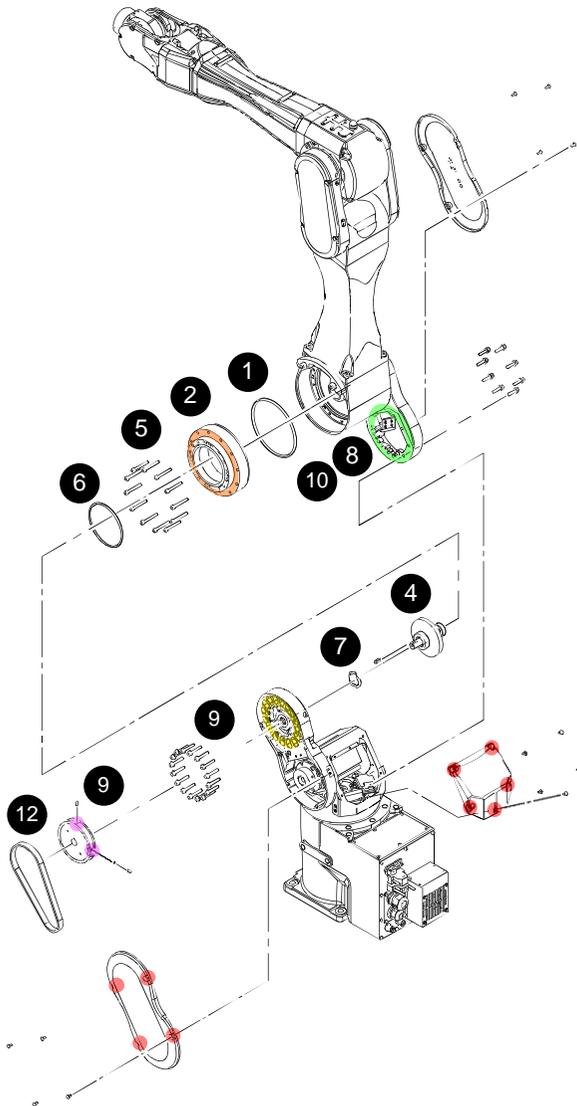
POINT

Align the six bolt heads on the bottom of the J2 Reduction Gear Unit with the indentations on Arm2, and set the Reduction Gear Unit on the arm.



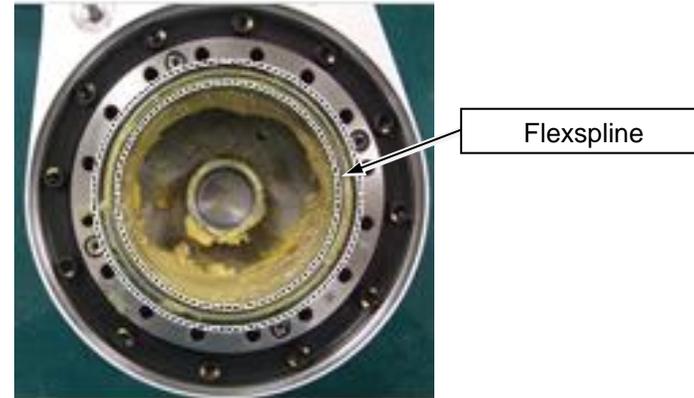
Joint #2

Installing the Reduction Gear



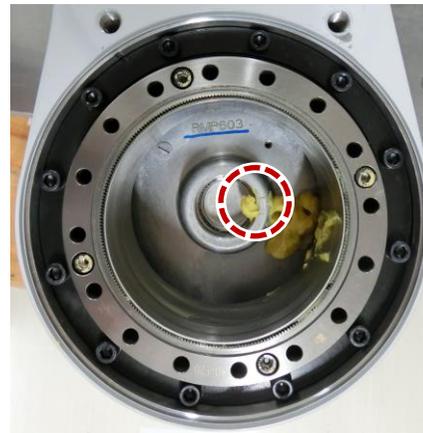
3 Apply grease to the inside of the reduction gear flexspline as shown in the figure.

- C8L:  SK-1A: 55 g
- C8XL/C12XL:  SK-1A: 102 g



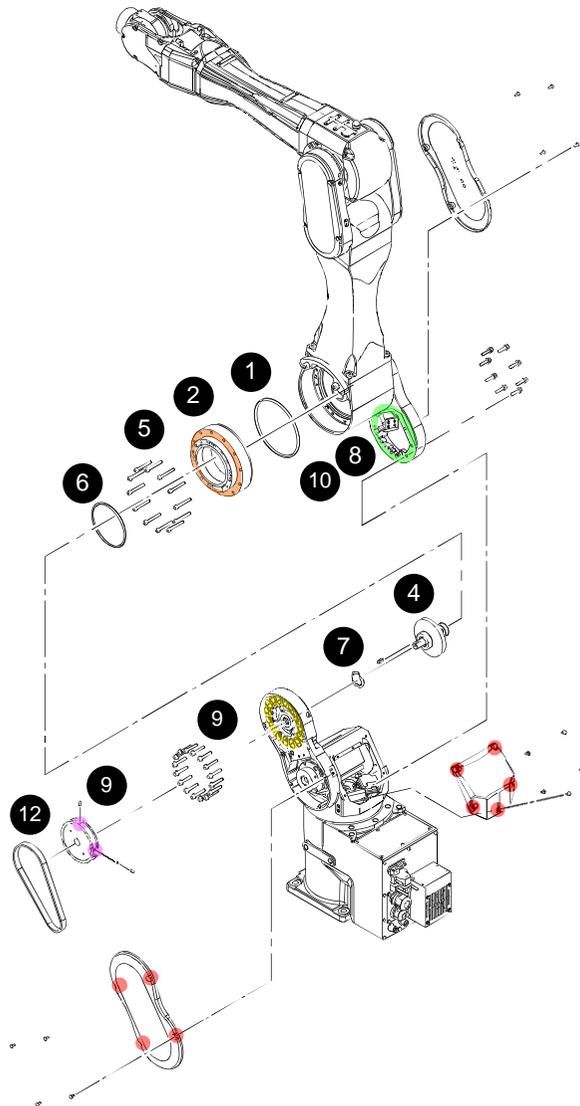
CAUTION

If grease is on the areas shown in the figure, wipe off the grease.



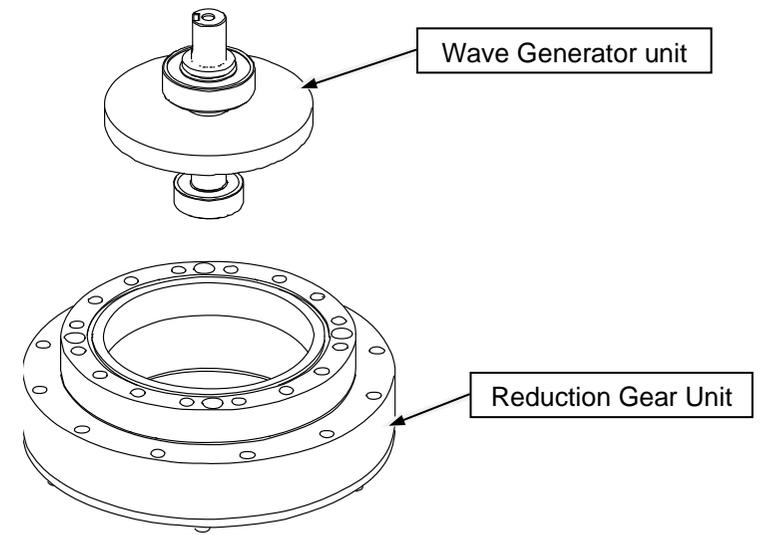
Joint #2

Installing the Reduction Gear



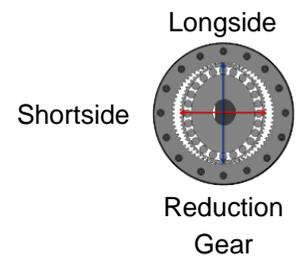
Joint #2

4 Install the Wave Generator unit.

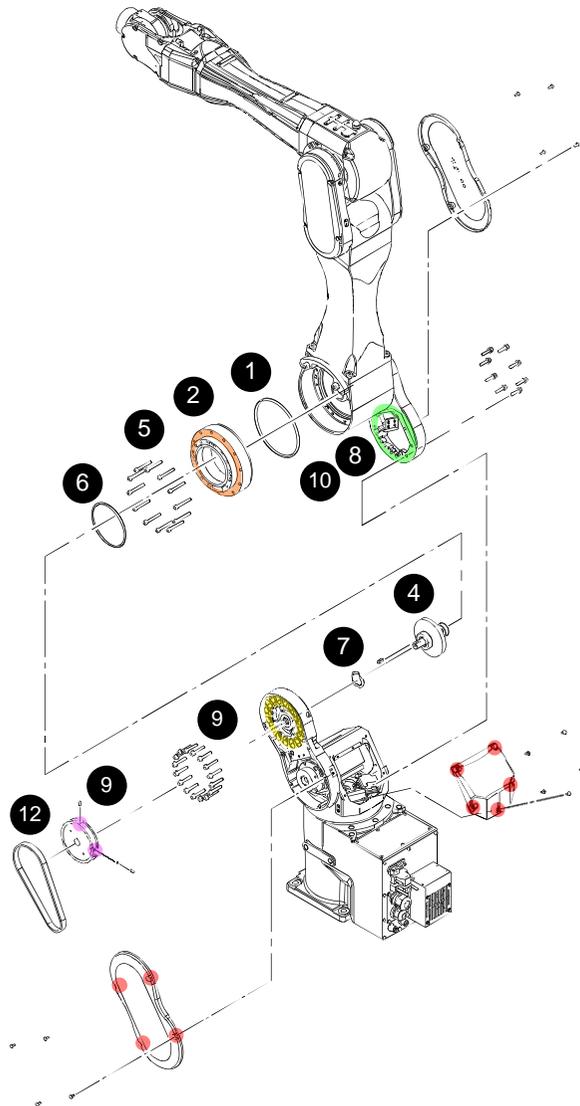


POINT

Install so that the longside of the Flexspline and the Wave Generator match.



Installing the Reduction Gear

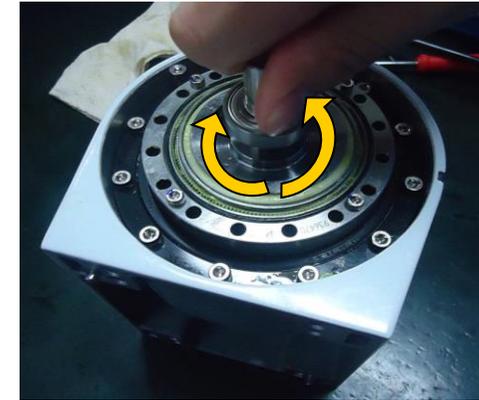
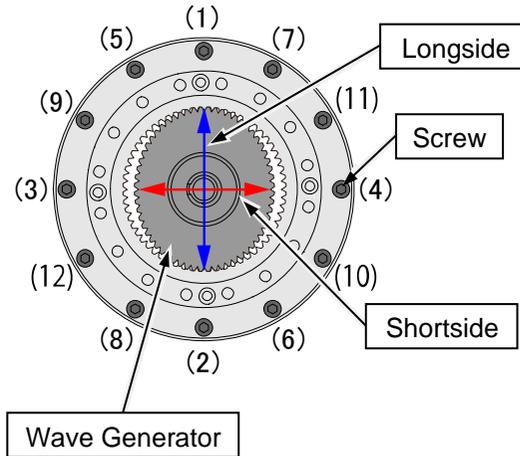


Joint #2

5 Secure the J2 Reduction Gear Unit to Arm2.

C8L: S02: 12-M5x40

C8XL/C12XL: S02: 12-M6x45



Tighten the screws using the following procedure. Refer to the figure above.

CAUTION

- Ensure that diagonally opposite screws are tightened alternately.
- Do not tighten the screws all the way at once. Instead, divide this into four times and tighten to the following torques.

C8L

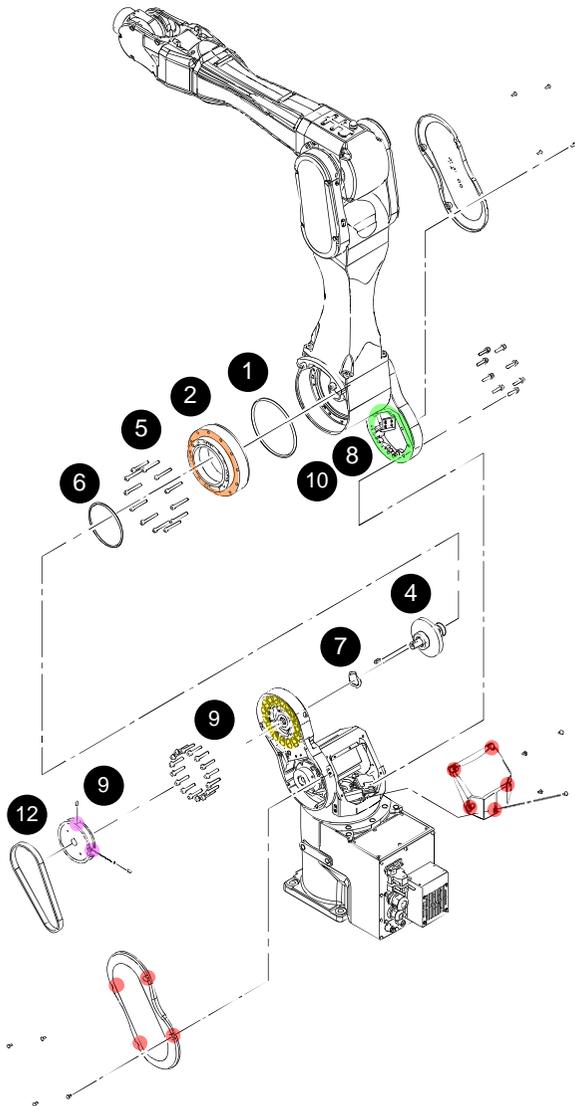
Percentage of the specified torque	Torque value	Unit
20%	2.0 +/- 0.1	N · m
40%	4.0 +/- 0.2	
80%	8.0 +/- 0.4	
100%	10.0 +/- 0.5	

C8XL/C12XL

Percentage of the specified torque	Torque value	Unit
20%	3.6 +/- 0.18	N · m
40%	7.2 +/- 0.36	
80%	14.4 +/- 0.72	
100%	18.0 +/- 0.9	

1. Rotate the Wave Generator so that its longside aligns with the positions of screws (1) and (2).
2. Tighten screws (1) and (2) to 20% of the torque value.
3. Tighten screws (1) and (2) to 40% of the torque value.

Installing the Reduction Gear

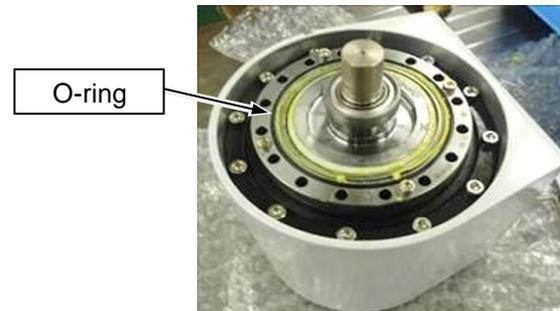


4. Rotate the Wave Generator longside so that it aligns with the positions of screws (3) and (4).
5. Tighten screws (3) and (4) to 20% of the torque value.
6. Tighten screws (3) and (4) to 40% of the torque value.
7. Rotate the Wave Generator longside and tighten screws (5) through (12) to the 20% and 40% of the torque value.
8. Rotate the Wave Generator so that its longside aligns with the positions of screws (1) and (2).
9. Tighten screws (1) and (2) to 80% of the torque value, then tighten screws (1) and (2) to 100% of the torque value.
10. Rotate the Wave Generator longside so that it aligns with the positions of screws (3) and (4).
11. Tighten screws (3) and (4) to 80% of the torque value, then tighten screws (3) and (4) to 100% of the torque value.
12. Rotate the Wave Generator longside and tighten screws (5) through (12) to the 80% and 100% of the torque value.

6 Install the O-ring.

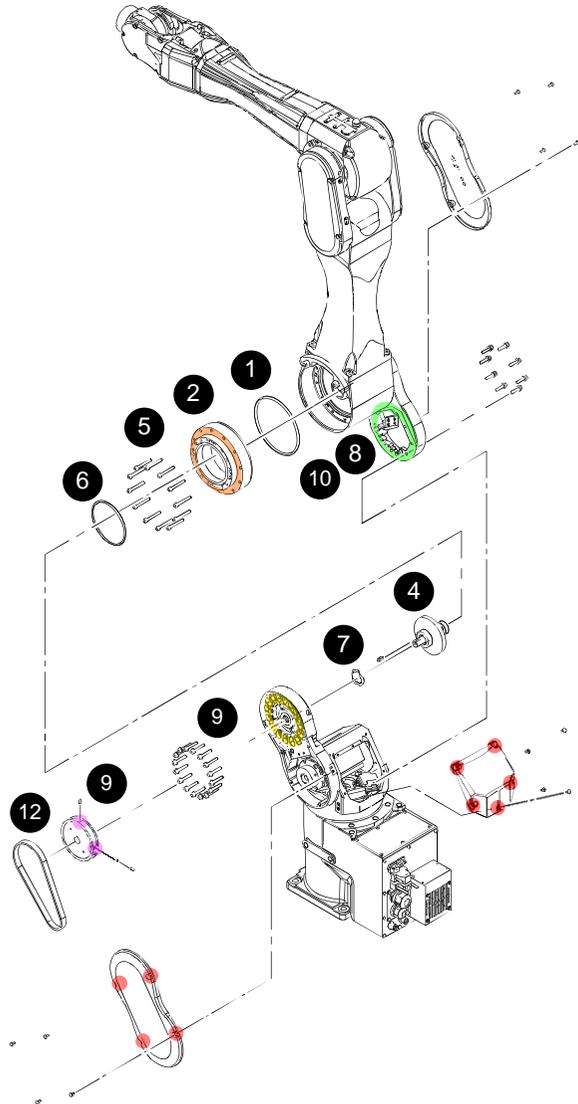
POINT

- Applying a small amount of grease (SK-1A) to the O-ring will make it stick to the arm, facilitating subsequent work.
- Insert the O-ring firmly into the groove.
- If the O-ring is stretched, damaged, or has deteriorated, replace with a new one.

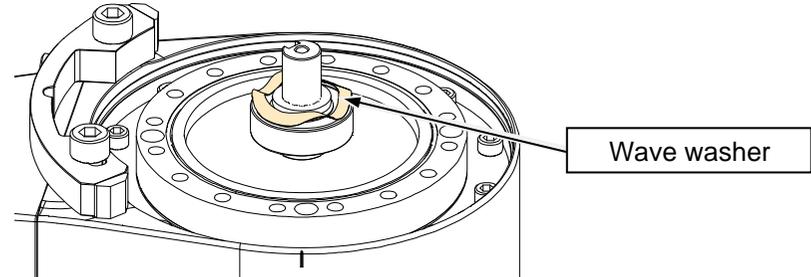


Joint #2

Installing the Reduction Gear



7 Install the wave washer.



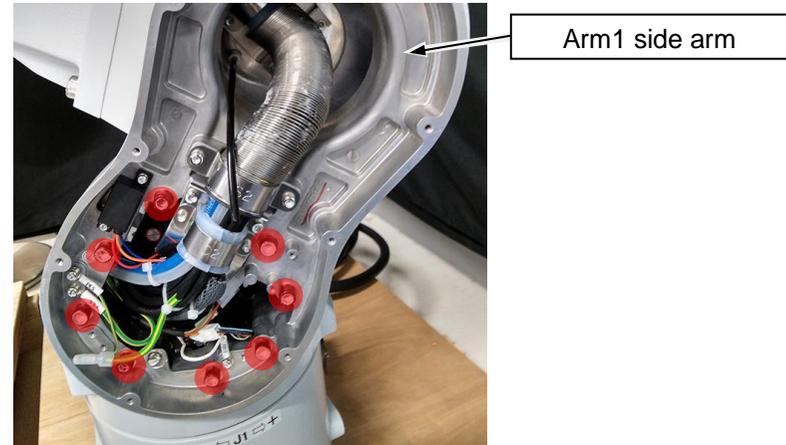
8 Temporarily secure the Arm1 side arm.

CAUTION

Have at least two workers perform this work. At least one worker must support the Manipulator to prevent its arm from falling.

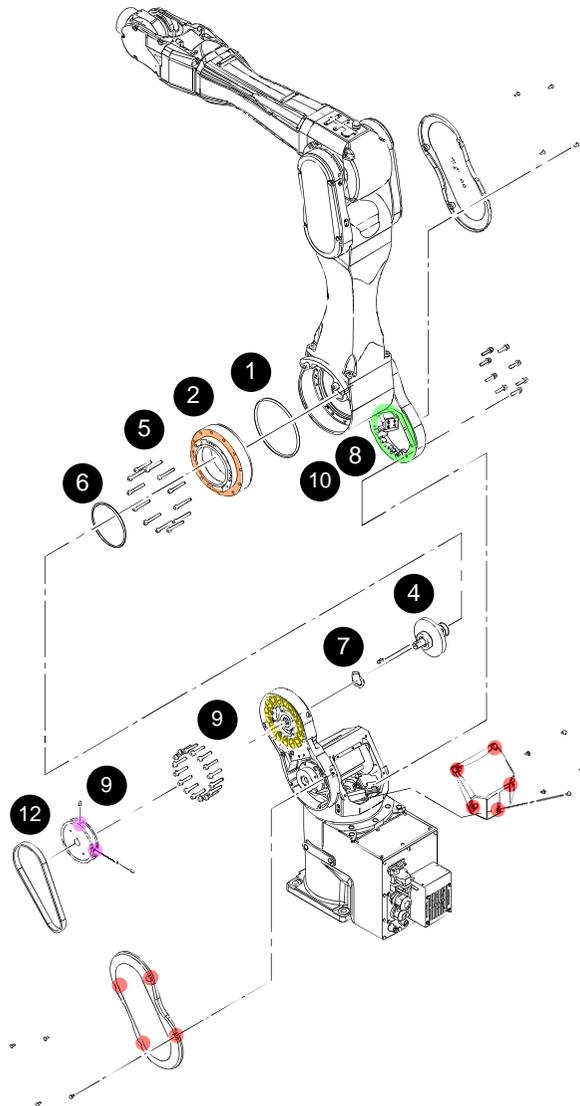
Pay special attention to damage resulting from the Manipulator falling or hands or feet being caught in the Manipulator.

A S02: 8-M6x25 and washer



Joint #2

Installing the Reduction Gear



9

Secure Arm2.

1. Lift up the Arm1 side arm and Arms 2, 3, 4, 5, and 6 (ends) to install and temporarily secure the Arm2.

Have at least two workers perform this work. At least one worker must support the Manipulator to prevent its arm from falling.

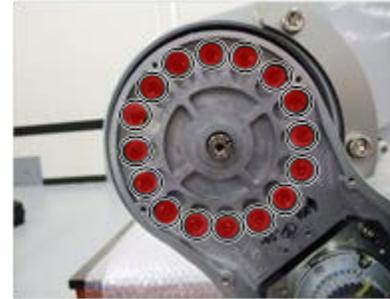
Pay special attention to damage resulting from the Manipulator falling or hands or feet being caught in the Manipulator.

C8L:

A S02: 16-M5x30 and washer

C8XL:

A S02: 16-M6x35 and washer

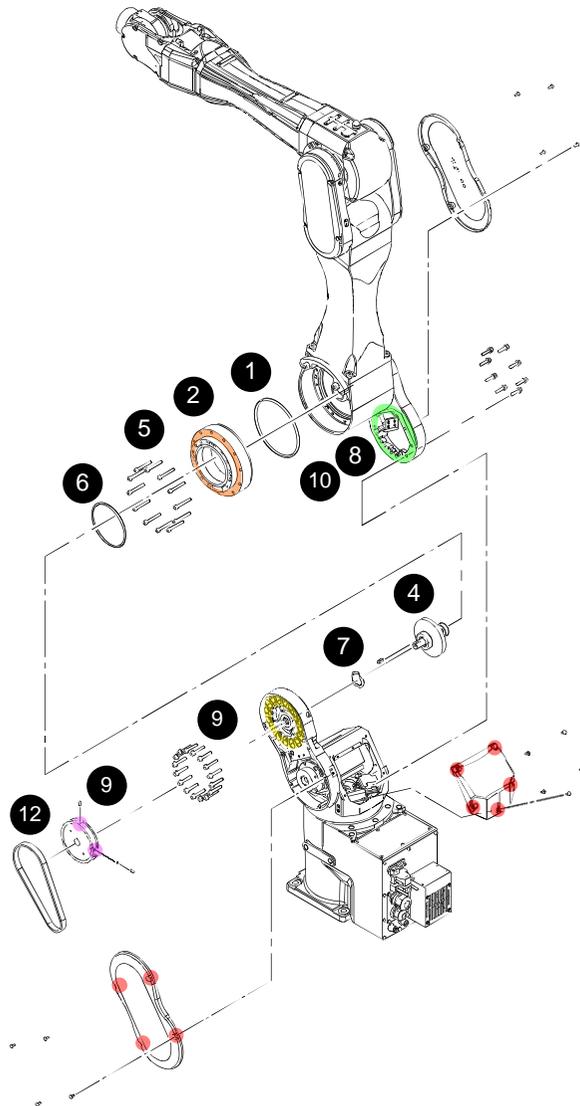


POINT

After this, the reduction gear will be centered, so temporarily secure the Arm2 to the extent that J2 reduction gear rattles.

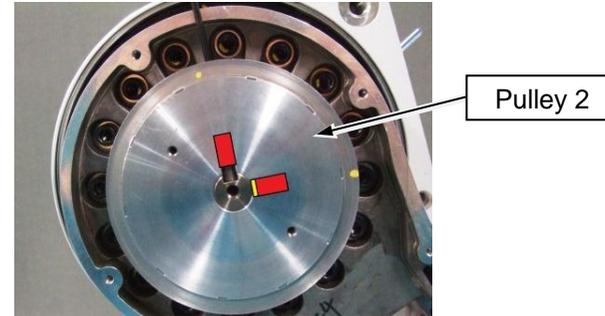
Joint #2

Installing the Reduction Gear



2. Install the J2 pulley 2.

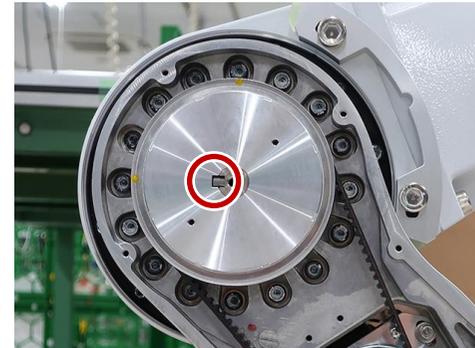
A S05: 2-M5x10
(4.0 +/- 0.2 N·m)



POINT

<For C8XL/C12XL>

Set the key in the shaft and insert the J2 pulley 2 while aligning with the key groove.

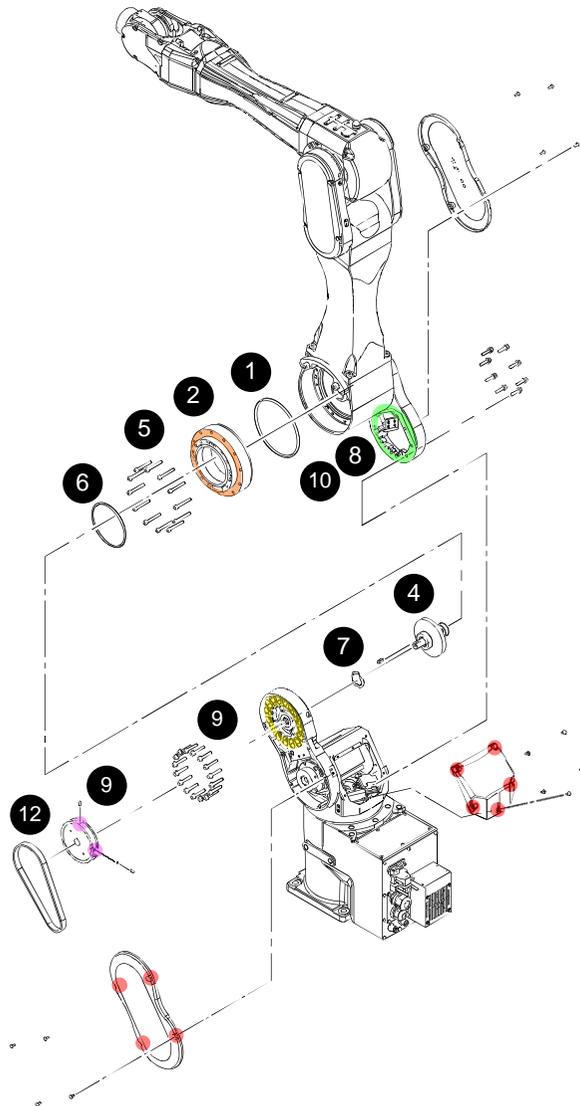


CAUTION

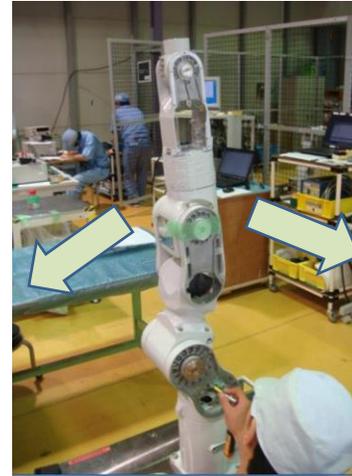
If the screw positions are incorrect or the bushing is not set, this may cause damage on the side, and may result in the part being unable to be removed.

Joint #2

Installing the Reduction Gear

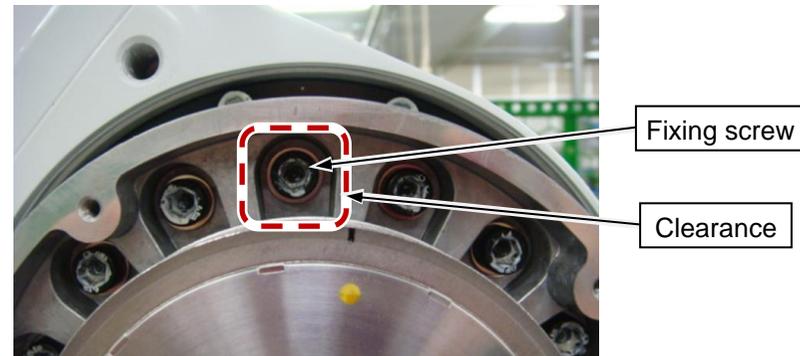


3. Manually move Arm2 back and forth 30°.



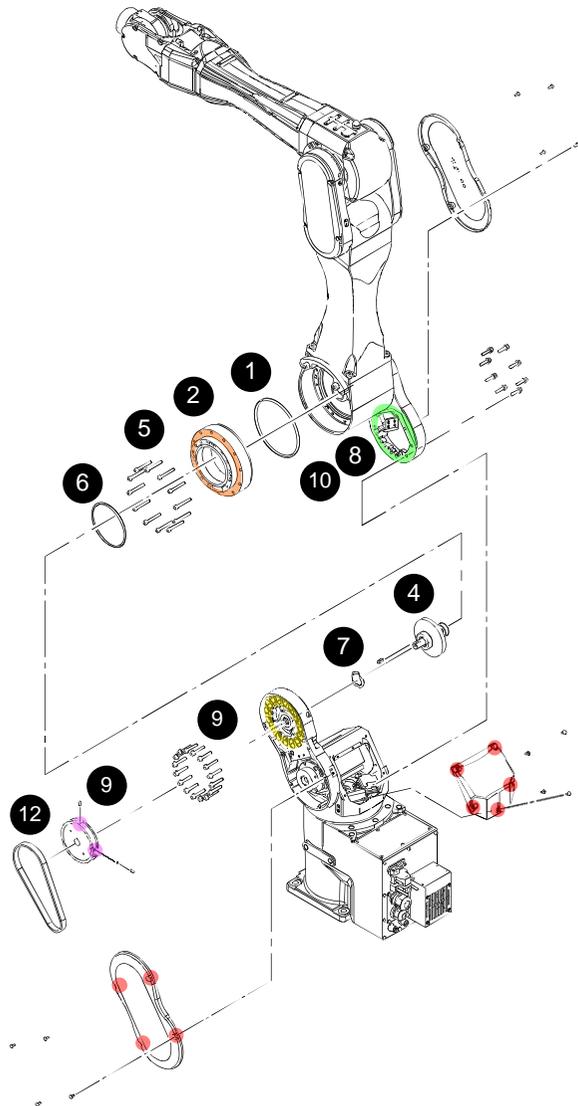
POINT

Adjust so that the fixing screws are centered in the clearance as shown in the figure.

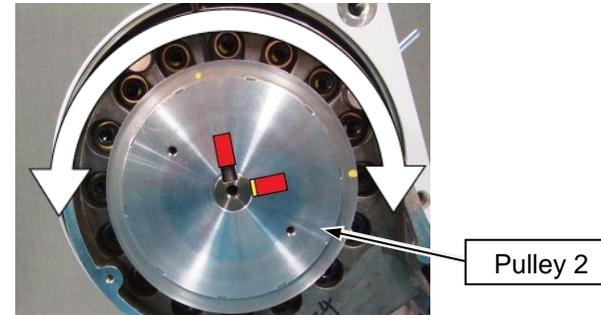


Joint #2

Installing the Reduction Gear



4. Rotate pulley 2 left and right by 180°.



5. Perform the following procedure to secure Arm2.

CAUTION

- Ensure that diagonally opposite screws are tightened alternately.
- Do not tighten the screws all the way at once. Instead, divide this into four (or two) times and tighten to the following torques.

C8L

A S02: 16-M5x30 and washer
(10.0 +/- 0.5 N·m)

C8XL/C12XL

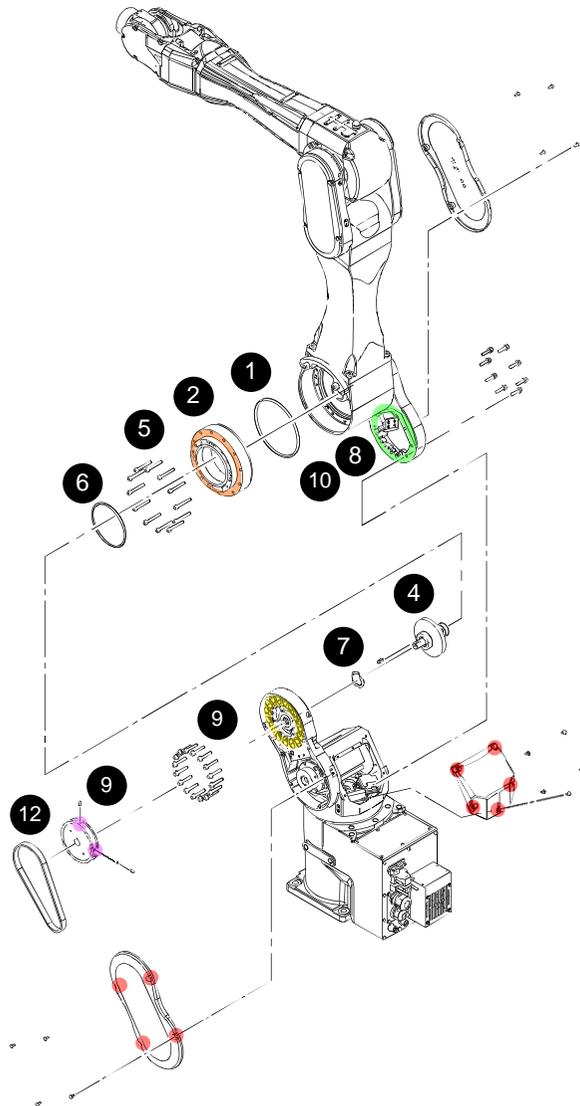
A S02: 16-M6x35 and washer
(18.0 +/- 0.9 N·m)

Percentage of the specified torque	Torque value	Unit
20%	2.0 +/- 0.1	N · m
40%	4.0 +/- 0.2	
80%	8.0 +/- 0.4	
100%	10.0 +/- 0.5	

Percentage of the specified torque	Torque value	Unit
20%	3.6 +/- 0.18	N · m
40%	7.2 +/- 0.36	
80%	14.4 +/- 0.72	
100%	18.0 +/- 0.9	

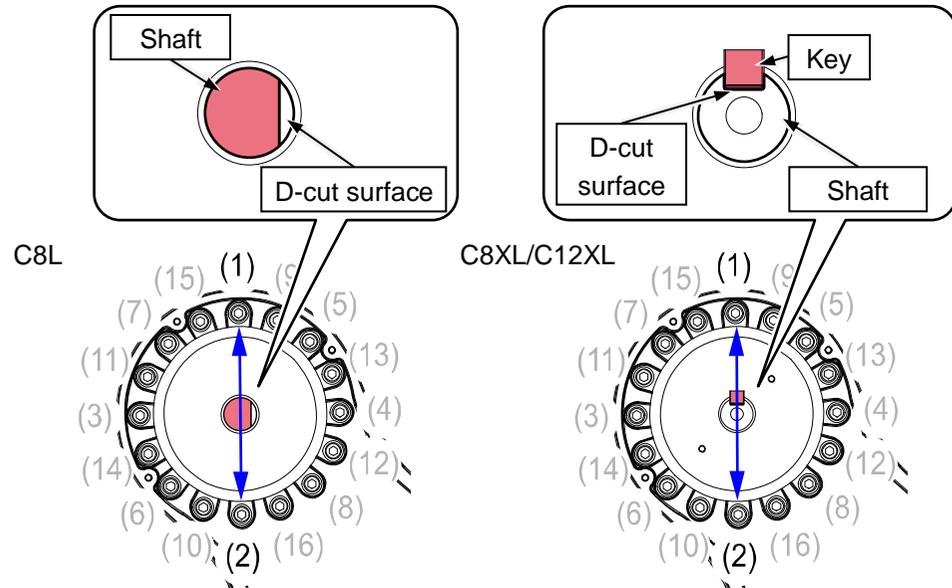
Joint #2

Installing the Reduction Gear

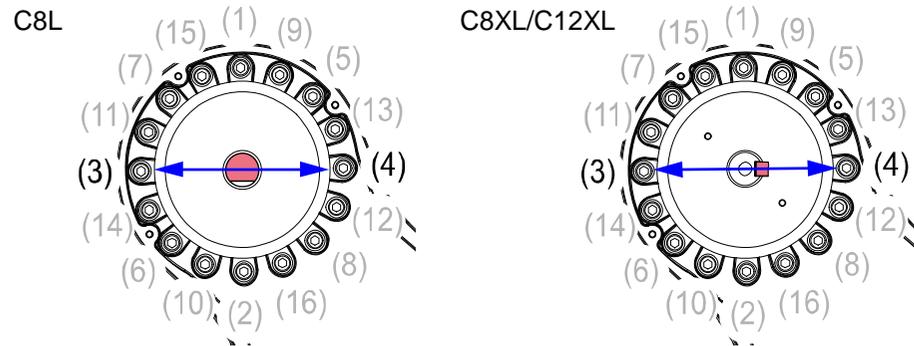


Joint #2

1. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.

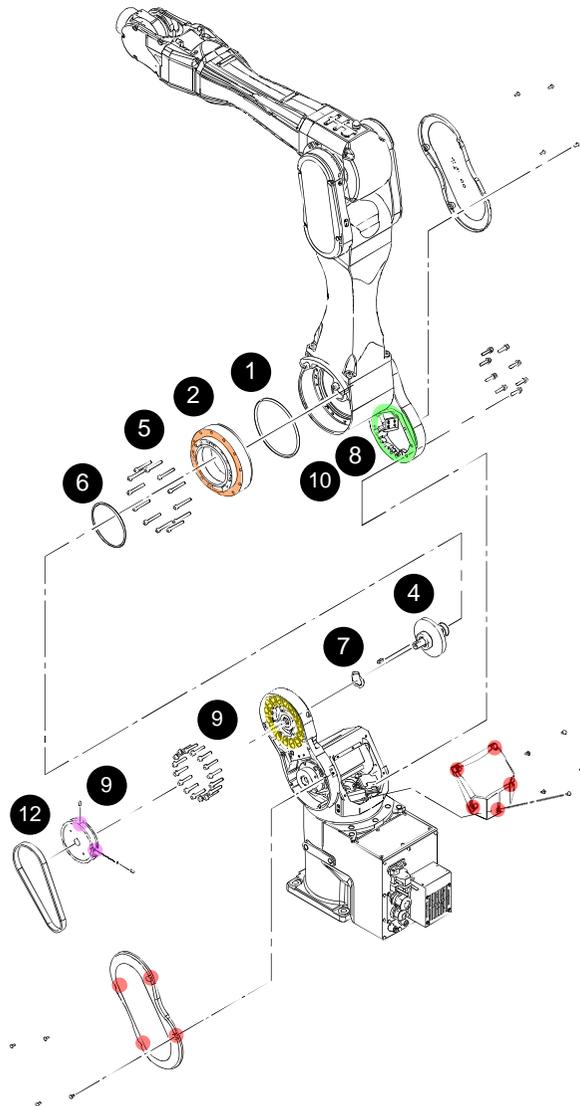


2. Tighten screws (1) and (2) to 20% of the torque value.
3. Tighten screws (1) and (2) to 40% of the torque value.
4. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.

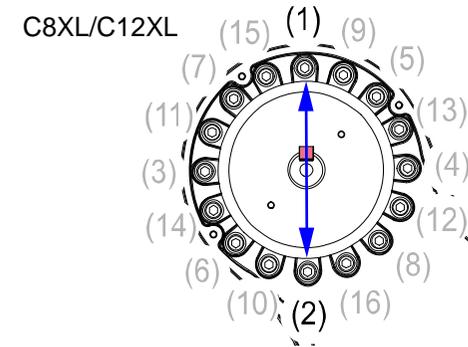
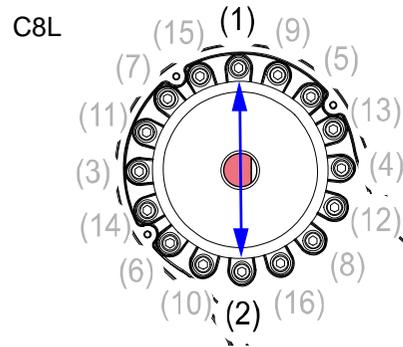


5. Tighten screws (3) and (4) to 20% of the torque value.
6. Tighten screws (3) and (4) to 40% of the torque value.

Installing the Reduction Gear



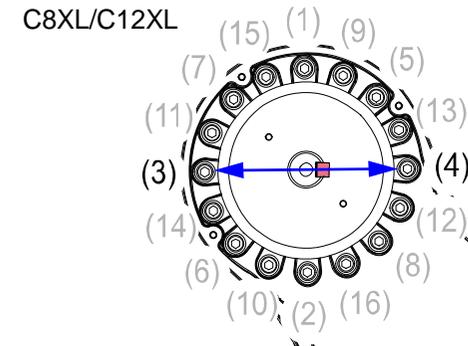
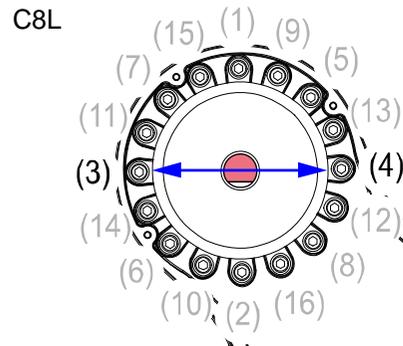
7. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



8. Tighten screws (1) and (2) to 80% of the torque value.

9. Tighten screws (1) and (2) to 100% of the torque value.

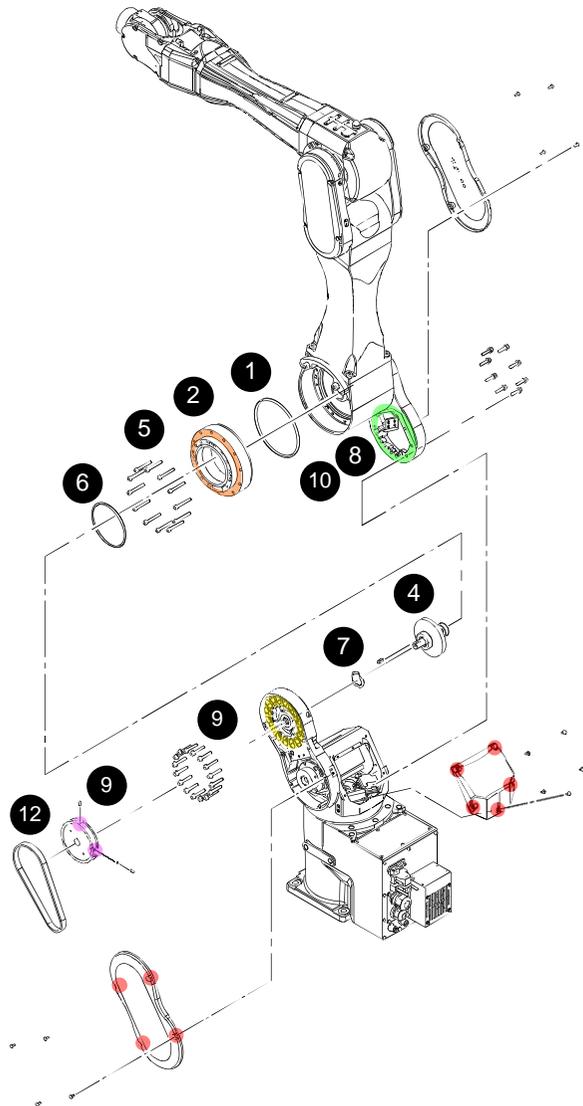
10. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



11. Tighten screws (3) and (4) to 80% of the torque value.

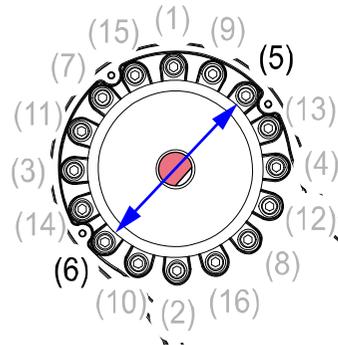
12. Tighten screws (3) and (4) to 100% of the torque value.

Installing the Reduction Gear

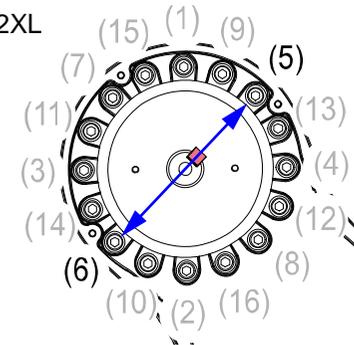


13. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.

C8L



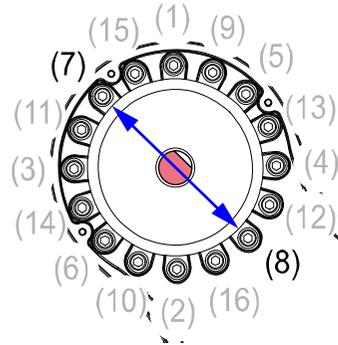
C8XL/C12XL



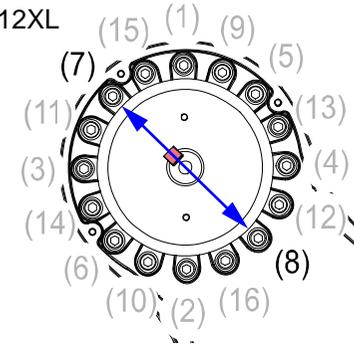
14. Tighten screws (5) and (6) to 40% and 100% of the torque value.

15. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.

C8L

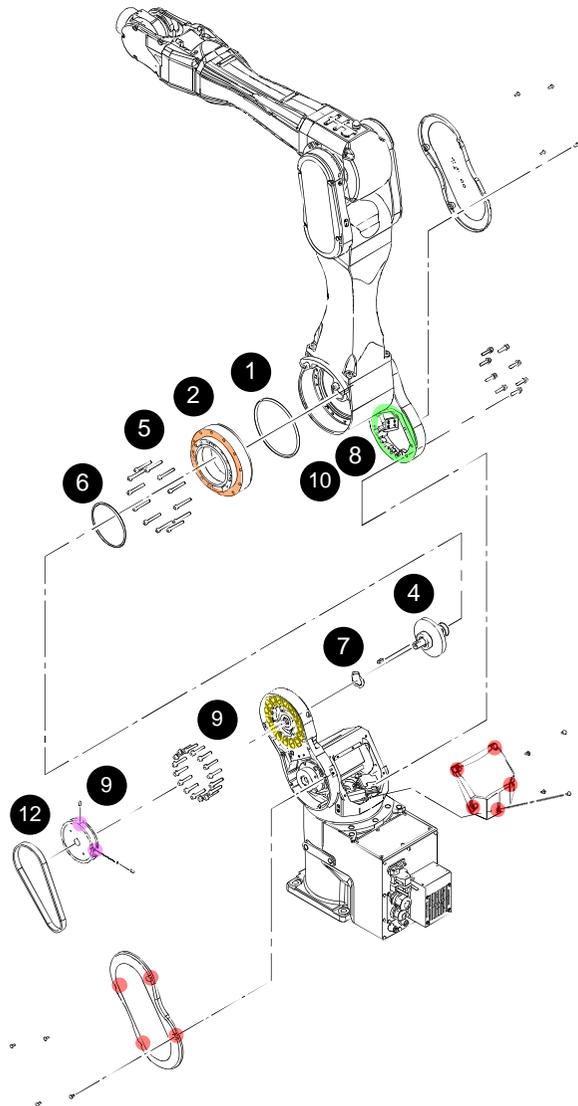


C8XL/C12XL

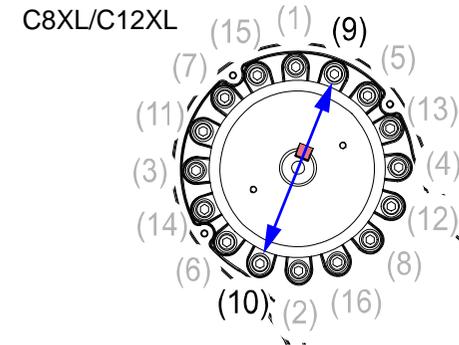
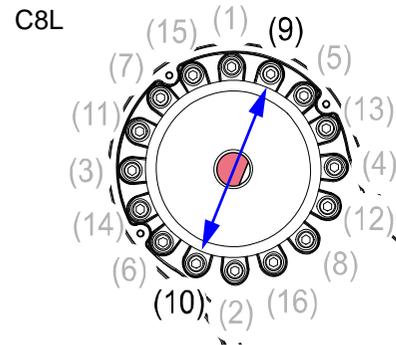


16. Tighten screws (7) and (8) to 40% and 100% of the torque value.

Installing the Reduction Gear

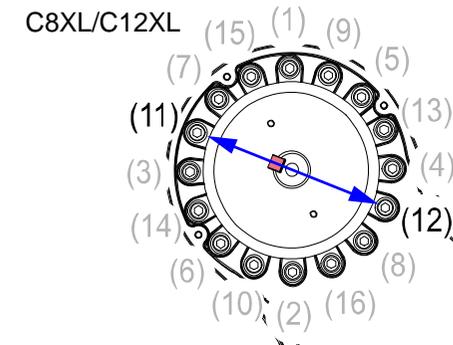
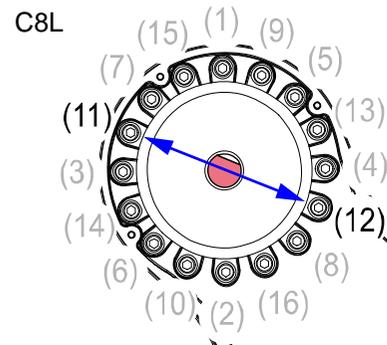


17. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



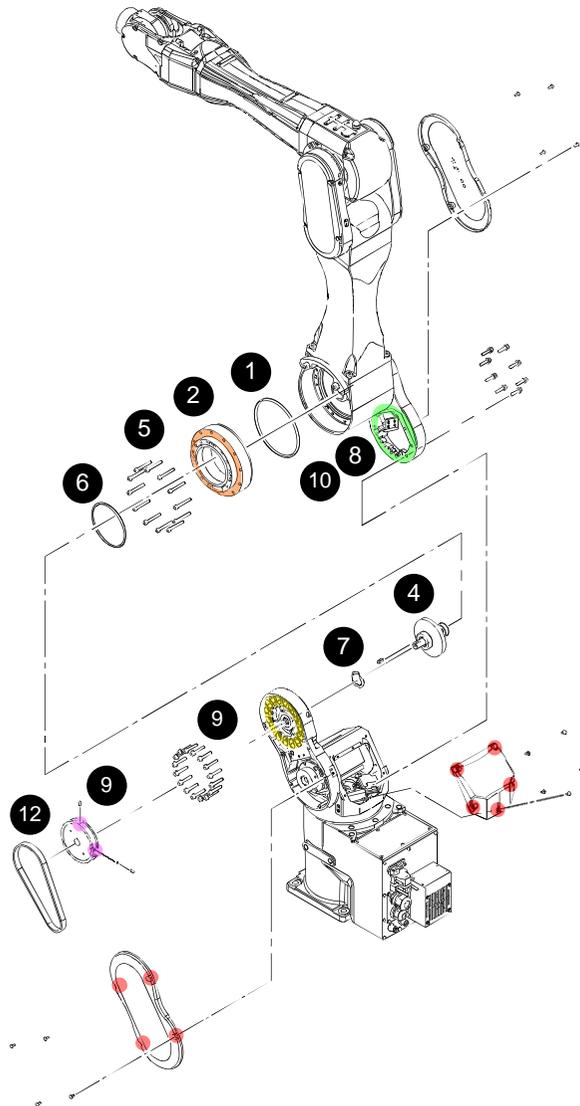
18. Tighten screws (9) and (10) to 40% and 100% of the torque value.

19. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



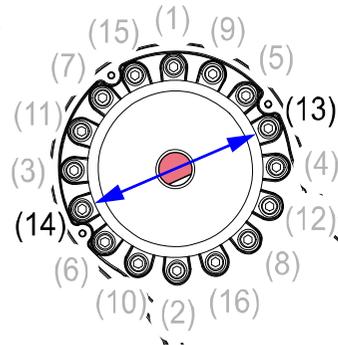
20. Tighten screws (11) and (12) to 40% and 100% of the torque value.

Installing the Reduction Gear

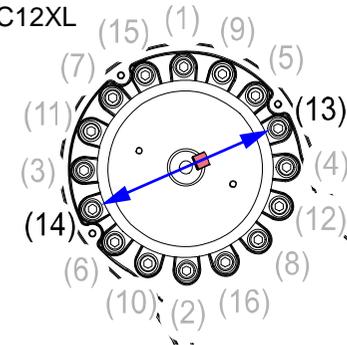


21. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.

C8L



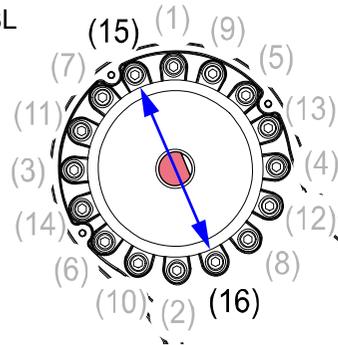
C8XL/C12XL



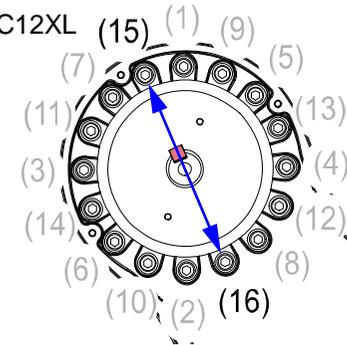
22. Tighten screws (13) and (14) to 40% and 100% of the torque value.

23. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.

C8L



C8XL/C12XL

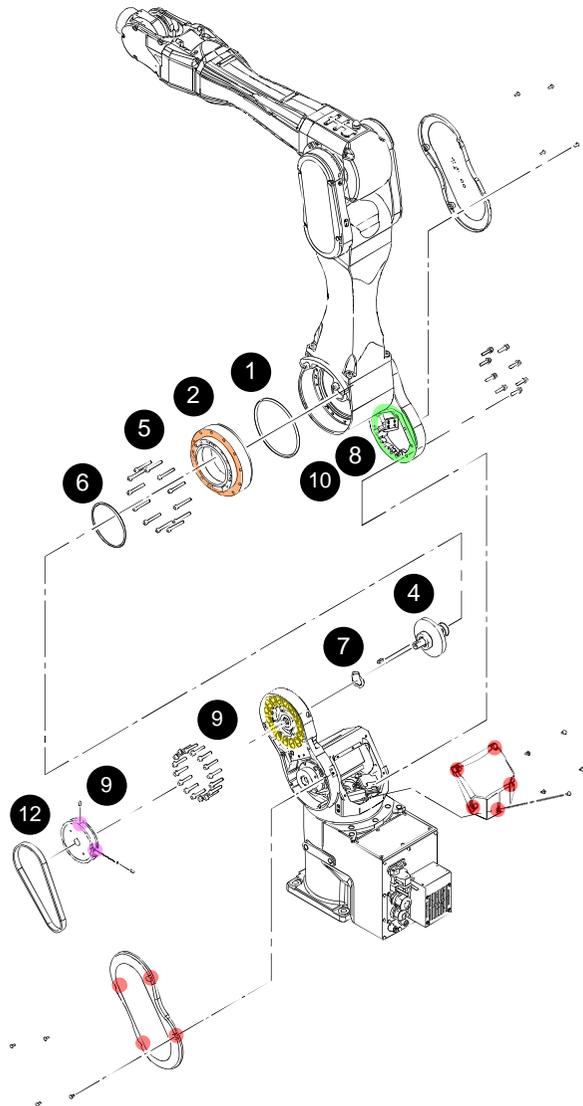


24. Tighten screws (15) and (16) to 40% and 100% of the torque value.

POINT

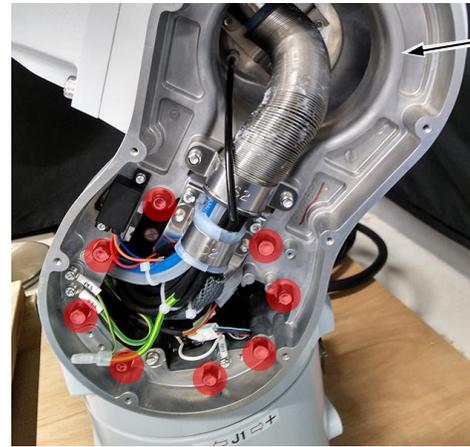
After securing the arm, manually move the arm to check that there is no rattling or misalignment of the Reduction Gear.

Installing the Reduction Gear



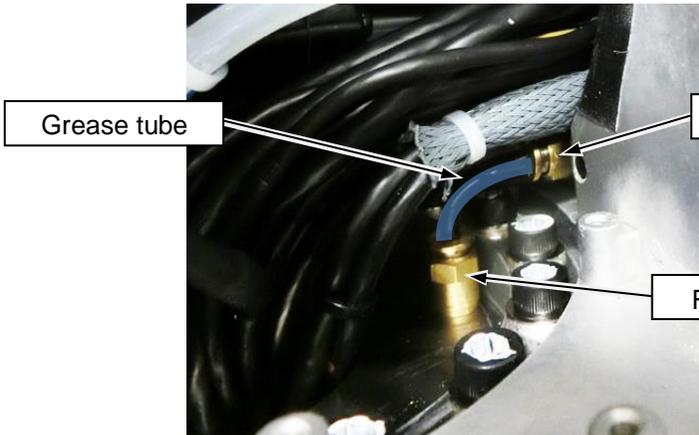
10 Fully tighten the Arm1 side arm screws temporarily secured in step 8.

A S02: 8-M6x25 and washer (18.0 +/- 0.9 N·m)



Arm1 side arm

11 Attach the grease tube to the fittings.



Grease tube

Fitting

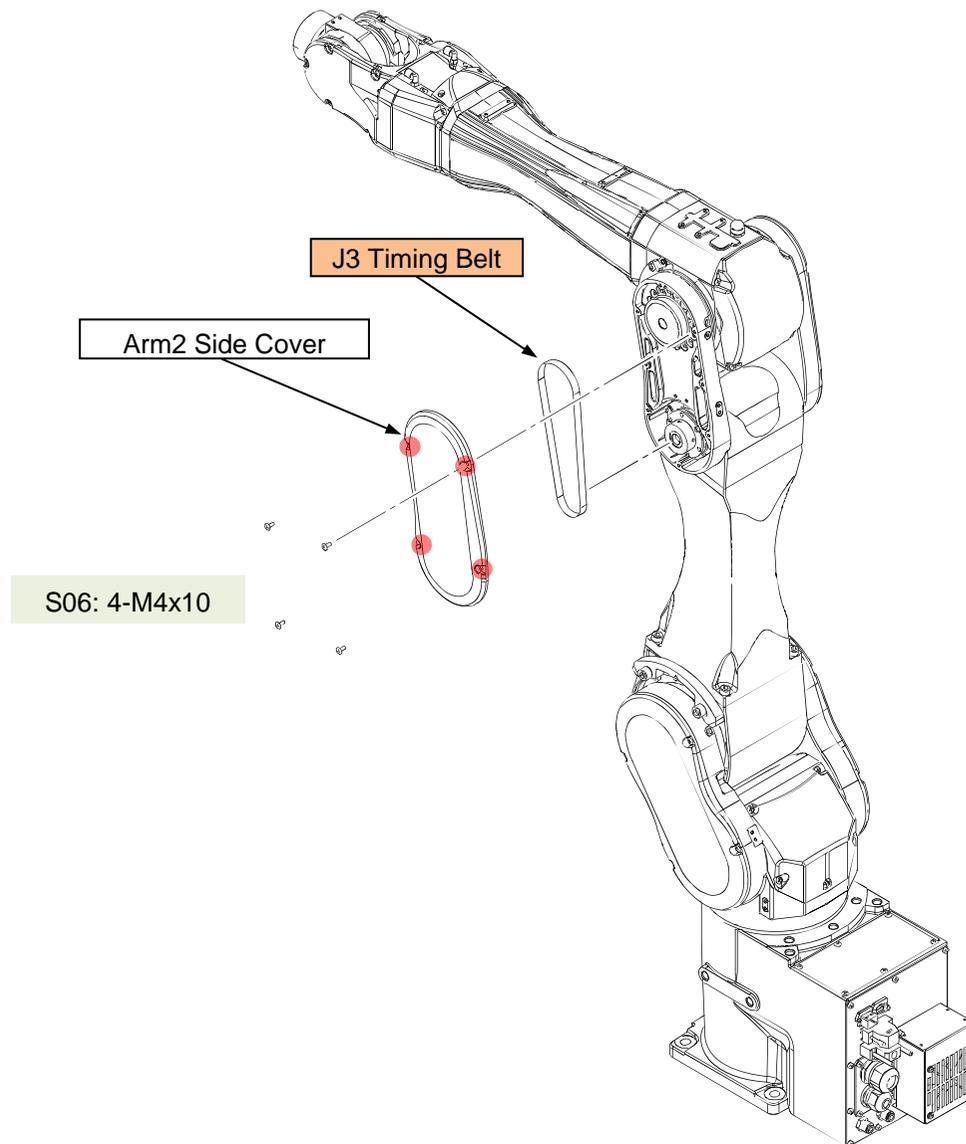
Fitting

12 Install the [J2 Timing Belt](#).

Joint #2

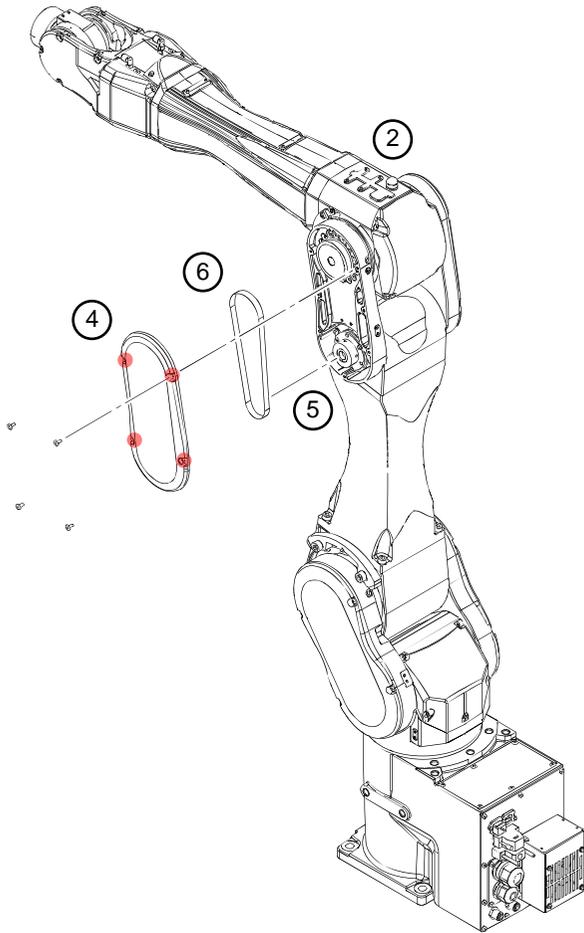
2.5 Joint #3

2.5.1 Joint #3 Replacing the Timing Belt



Joint #3

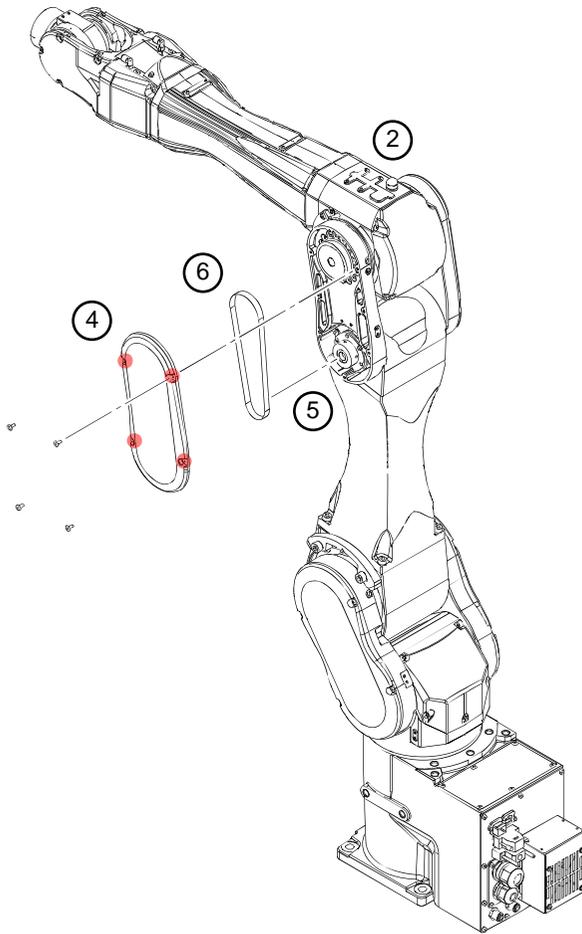
Removing the Timing Belt



①	Turn ON the controller.
②	Release the J3 brake, and manually push and move Arm3 until it comes in contact with the mechanical stopper, and push it against Arm2. CAUTION <ul style="list-style-type: none"> • Arm3 falls by its weight when the J3 Motor unit is removed. Release the brake and tilt Arm3 in advance. • There is a possibility of hands and fingers being caught, and/or damage to or malfunction in the Manipulator. Take care during operation. 
③	Turn OFF the Controller.
④	Remove the Arm2 side cover .

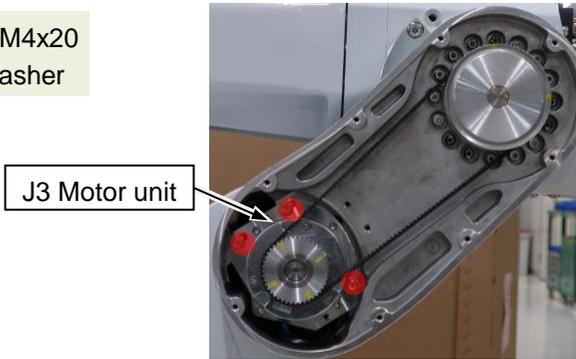
Joint #3

Removing the Timing Belt



⑤ Loosen the screws securing the J3 Motor unit.

A S01: 3-M4x20 and washer



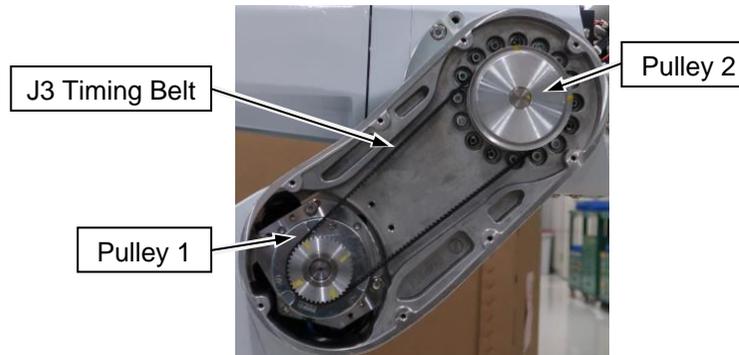
WARNING

Loosening the screws while Arm3 is not tilted will result in the belt coming off and Arm3 falling, which is very dangerous. Prior to loosening the J3 Motor unit screws, ensure that Arm3 is tilted.

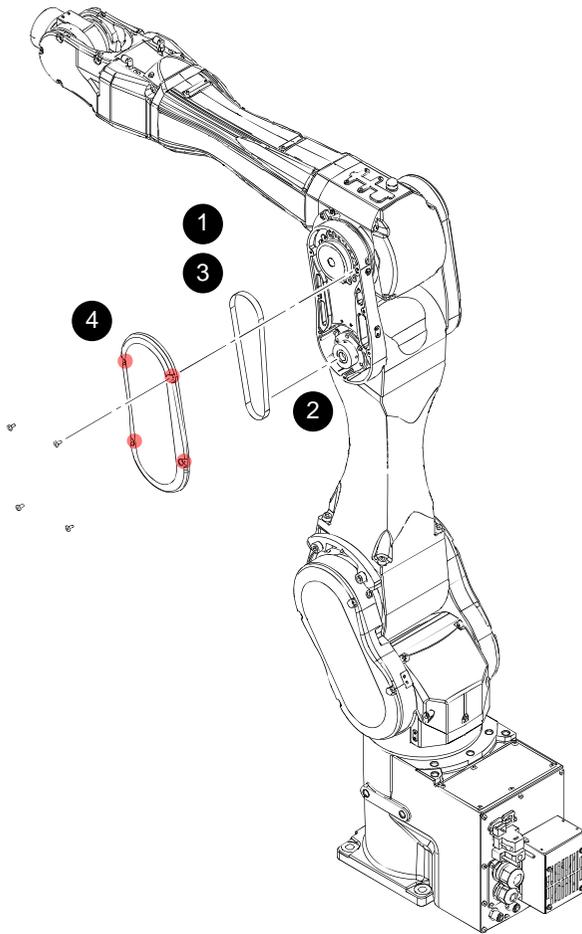
⑥ Remove the J3 Timing Belt.

POINT

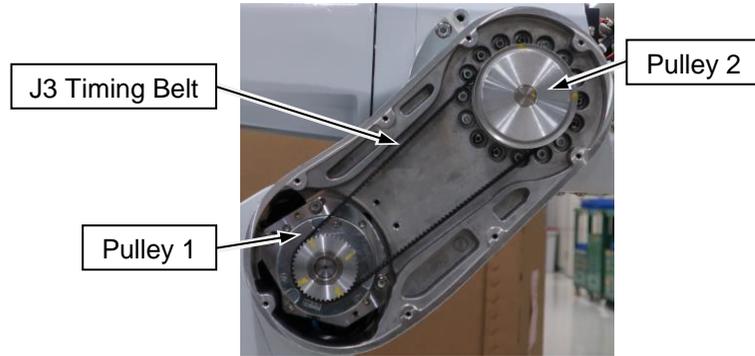
Remove the Timing Belt from pulley 1 and pulley 2.



Installing the Timing Belt

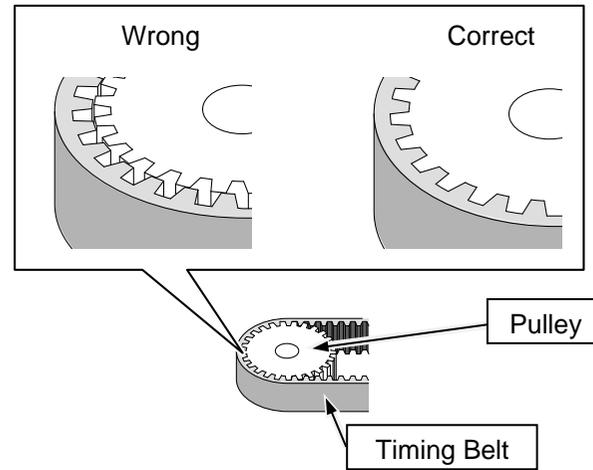


1 Install the J3 Timing Belt.

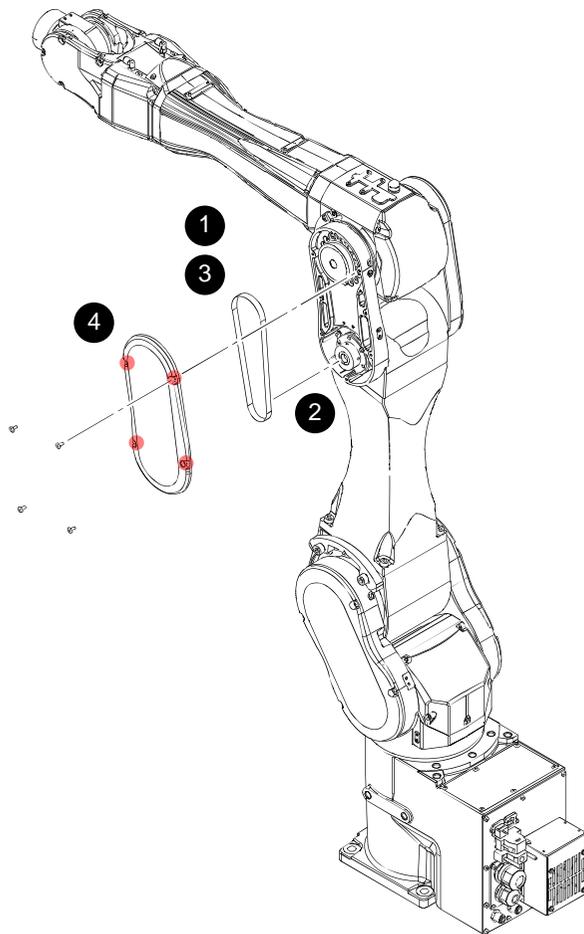


POINT

- First place the belt on pulley 2.
- Make sure that the teeth of the Timing Belt and the pulley are properly engaged.

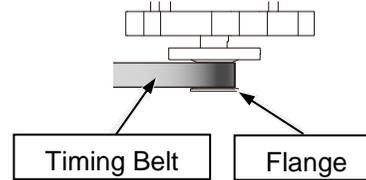


Installing the Timing Belt



CAUTION

If the Timing Belt is placed on the flange, correct tension will not be obtained during belt tension adjustment.

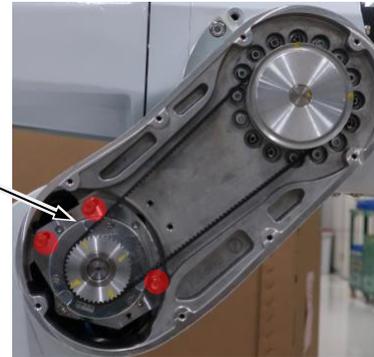


Set the belt so that it is level with respect to the pulley without it being placed on the flange.

2 Temporarily secure the J3 Motor unit.

A S01: 3-M4x20 and washer

J3 Motor unit



POINT

The standard for temporary fastening is where the Motor Unit can be moved by hand and will not tilt when pulled. If this is either too loose or too tight, it will not provide the proper tension to the belt.

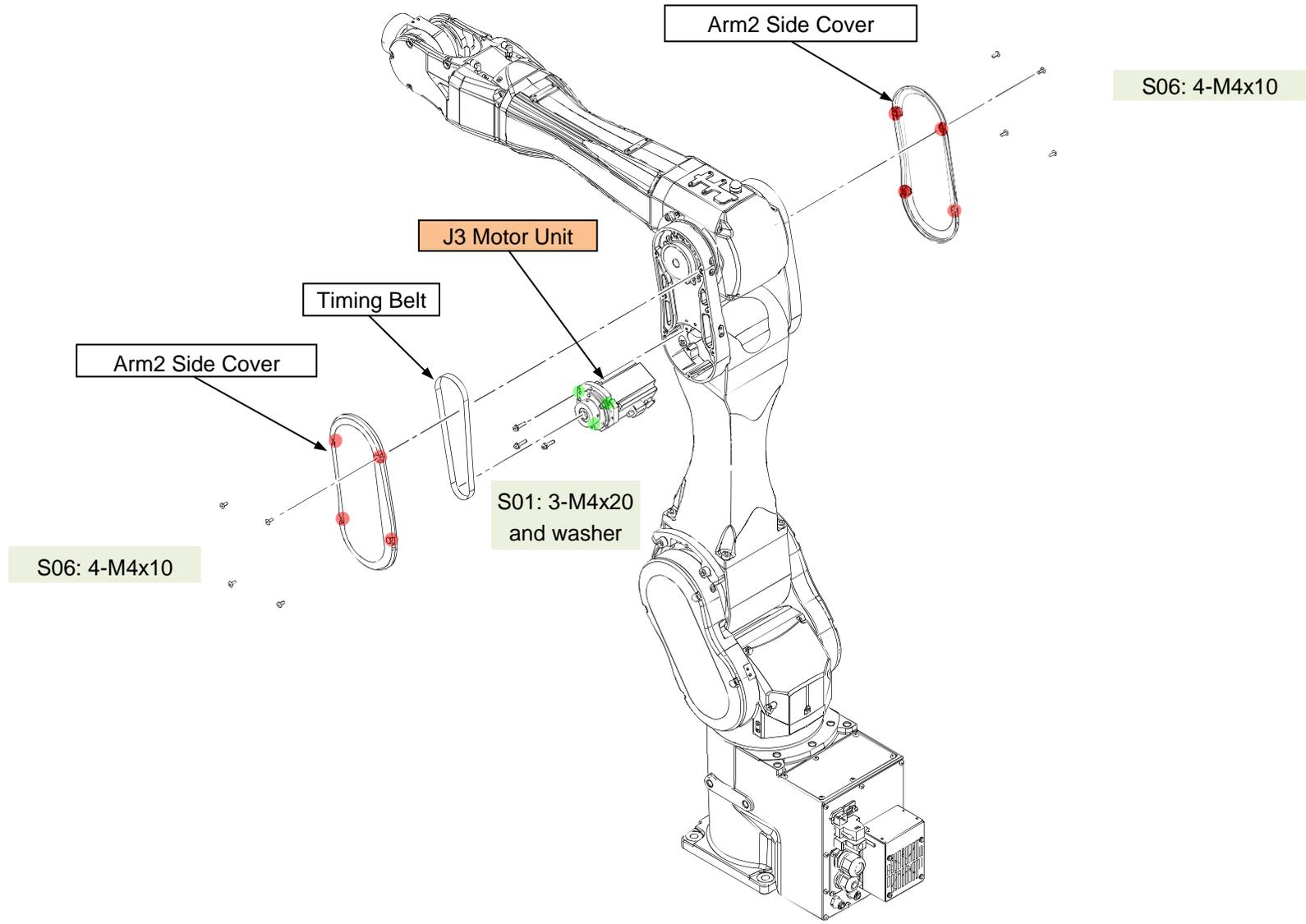
3 Adjust the belt tension.
[3.1 Adjusting the Timing Belt Tension](#)

4 Install the [Arm2 side cover](#).

5 After assembly, perform calibration of Joint #3.
[3.2 Calibration](#)

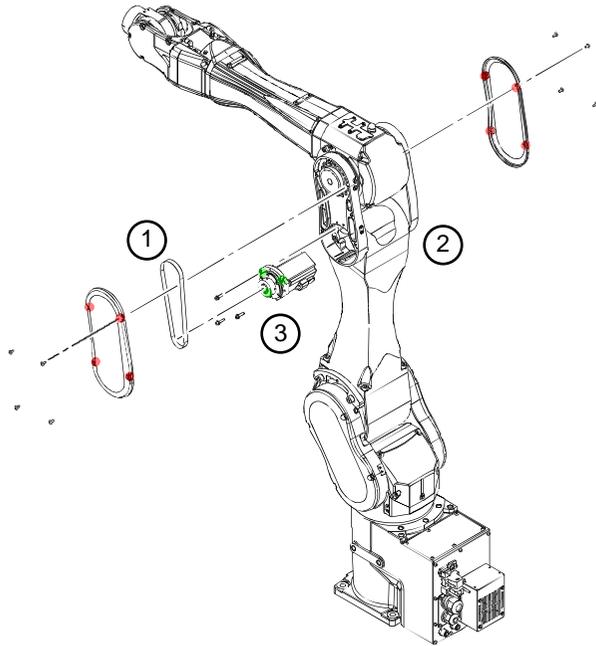
Joint #3

2.5.2 Joint #3 Replacing the Motor Unit



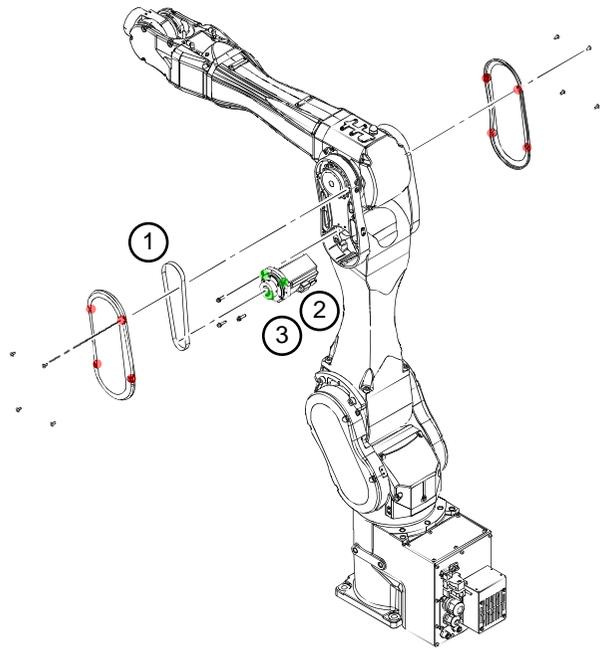
Joint #3

Removing the Motor Unit



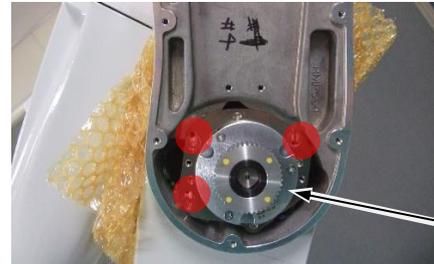
①	Remove the J3 Timing Belt .
②	<p>Disconnect the J3 Motor Connectors (CN131, CN331, CN430) and Ground Wire (FB12).</p> <p>A S04: 1-M4x6</p>

Removing the Motor Unit



③ Remove the loosened screws, then remove the J3 Motor unit.

A S01: 3-M4x20 and washer



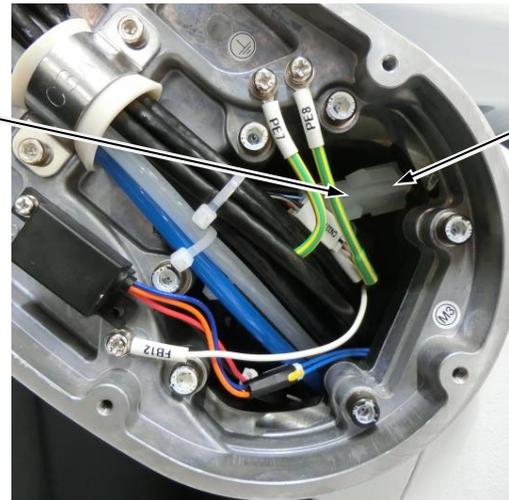
J3 Motor unit



CAUTION

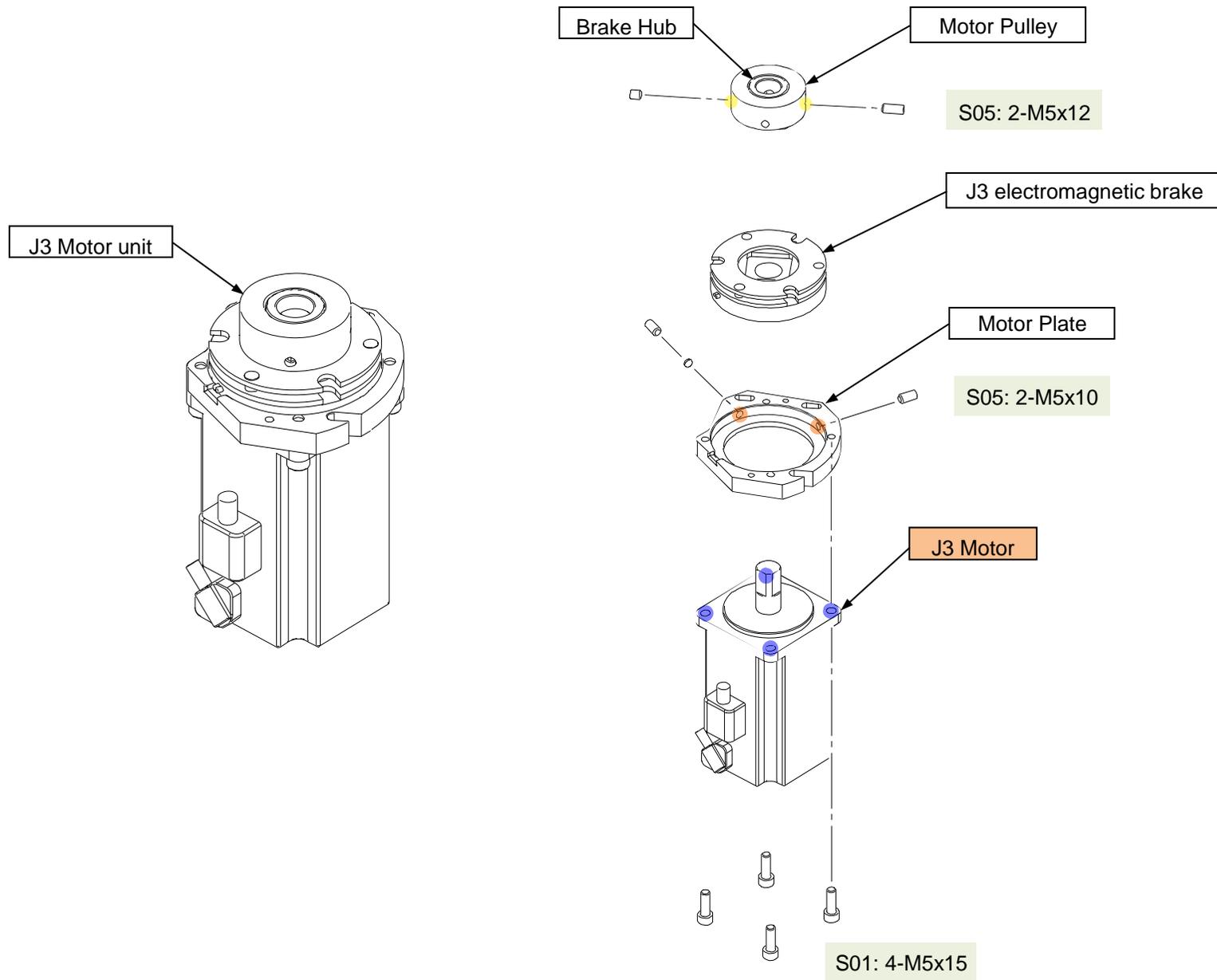
When pulling off the motor unit, the CN131-2 connector clip may catch on the arm and be damaged, or the CN131-1 cable may be pulled inside the arm. Take care during work.

CN131-2



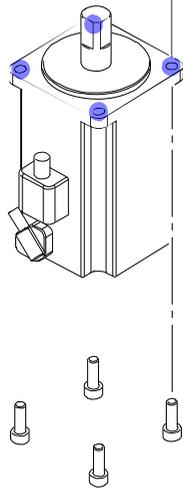
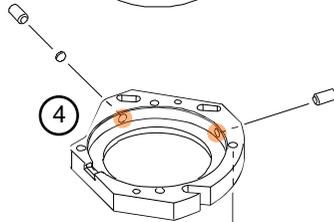
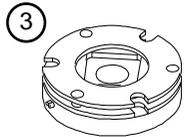
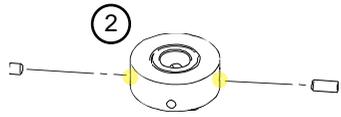
CN131-1

Motor Unit Disassembly

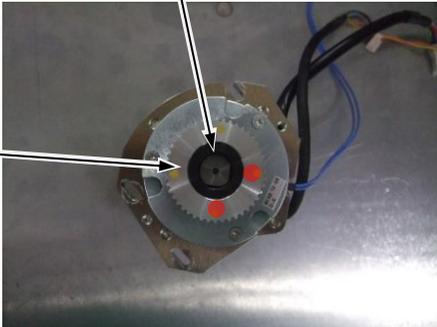
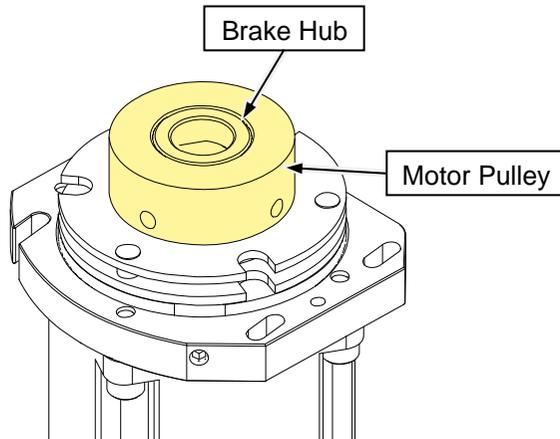


Joint #3

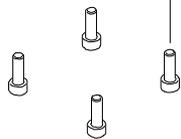
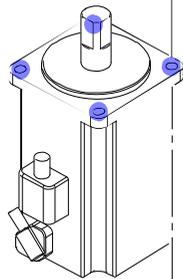
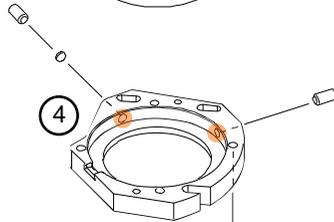
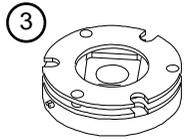
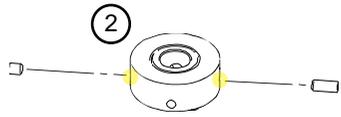
Motor Unit Disassembly



Joint #3

①	Remove the J3 Motor unit.
②	<p>Remove the Motor Pulley unit.</p> <p>POINT Remove the Motor Pulley and the Brake Hub together.</p> <p>1. Loosen the two screws on the D-cut surface of the motor shaft when viewing the J2 Motor unit from above.</p> <div style="display: flex; align-items: center; margin: 10px 0;"> <div style="margin-right: 10px;">A</div> <div style="background-color: #e0f0e0; padding: 2px 5px;">S05: 2-M5x12</div> </div>  <p>2. Remove the Motor Pulley unit from the motor shaft.</p> 

Motor Unit Disassembly



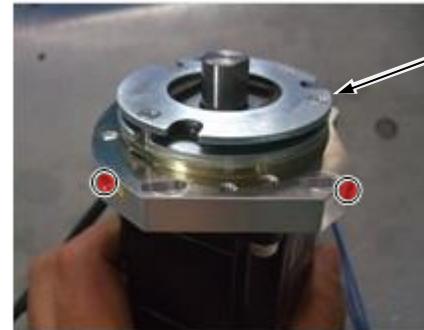
③

Remove the J3 brake.

CAUTION

A brass bushing is included on one of the set screws. Be careful not to lose it when performing the work.

A S05: 2-M5x10

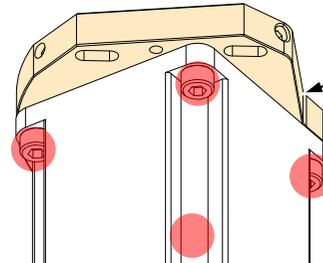


J3 brake

④

Remove the Motor Plate.

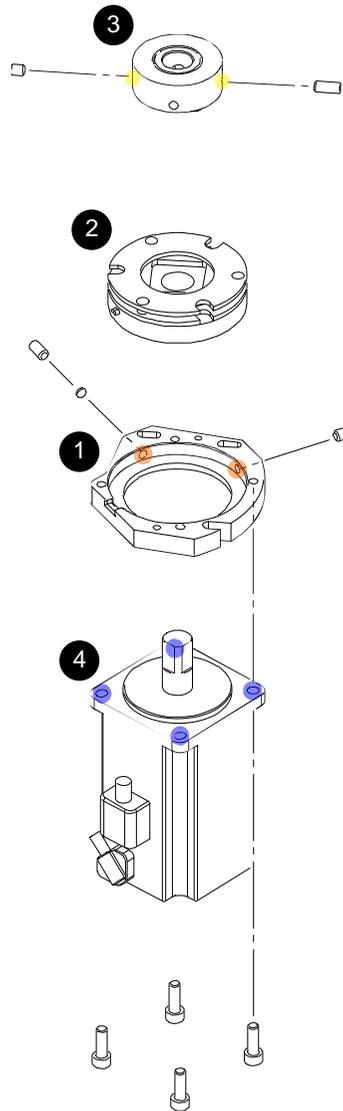
A S01: 4-M5x15



Motor Plate

Joint #3

Motor Unit Assembly



1 Install the Motor Plate.

A S01: 4-M5x15
(8.0 +/- 0.4 N·m)

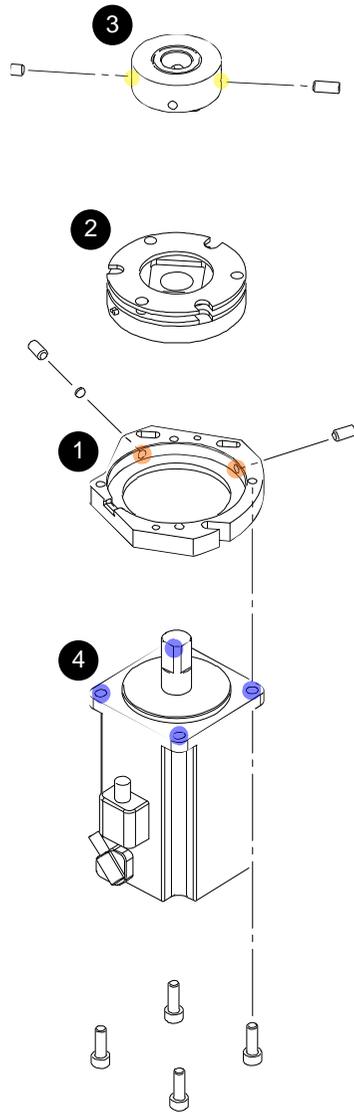
POINT
Attach the Motor Plate according to the orientation shown in the figure.

Motor Plate

Motor Plate

Joint #3

Motor Unit Assembly



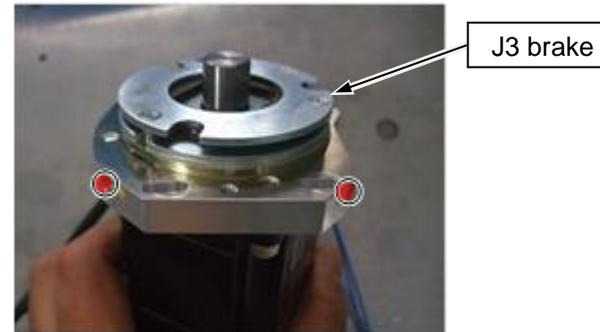
Joint #3

2 Install the J3 brake.

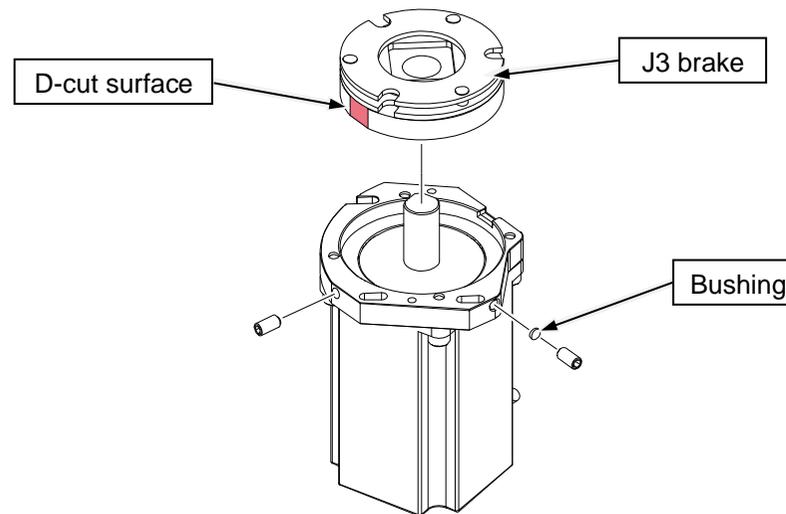
CAUTION

If the screw positions are incorrect or the bushing is not set, this may cause damage on the side, and may result in the part being unable to be removed.

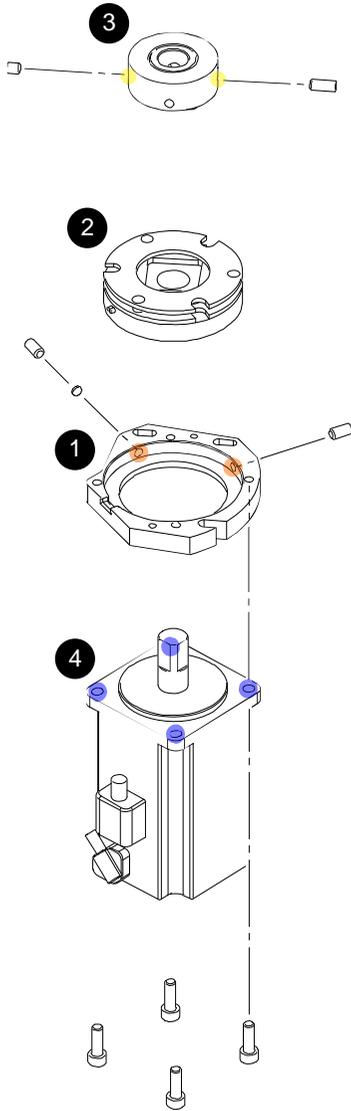
A S05: 2-M5x10
(4.0 +/- 0.2 N·m)

**POINT**

- Install the J3 brake according to the orientation shown in the figure.
- Install the bushing on the side without the D-cut.
- Tighten the screws while pressing the J3 brake against the Motor Plate.



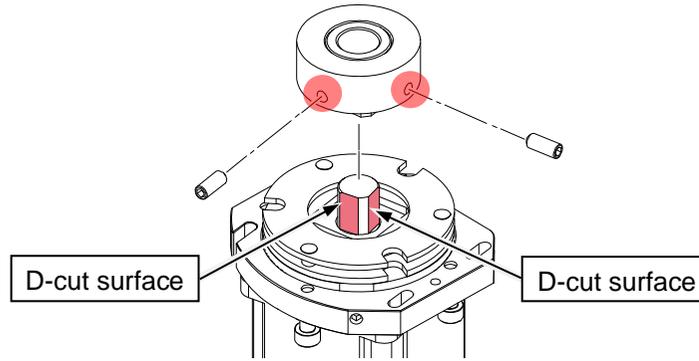
Motor Unit Assembly



3

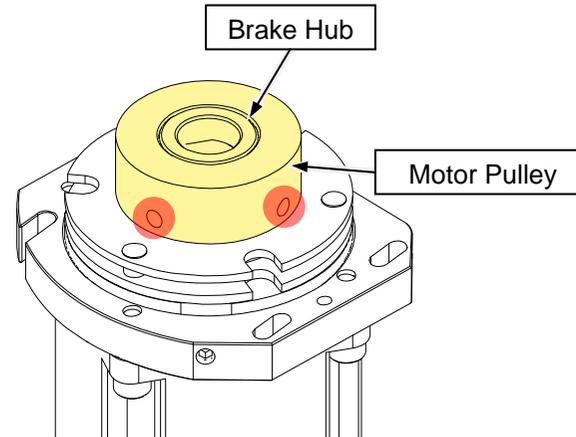
Install the Motor Pulley and Brake Hub on the J3 Motor.

1. Insert the Motor Pulley so that the set screw positions align with the motor shaft D-cut surfaces.



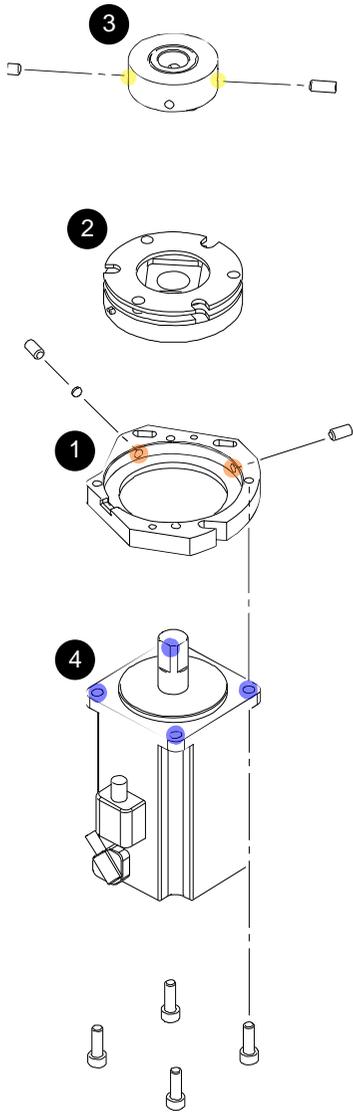
2. Secure the Motor Pulley unit to the shaft.

A S05: 2-M5x12
(4.0 +/- 0.2 N·m)



Joint #3

Motor Unit Assembly



POINT

Leave a 0.5-mm gap between the Motor Pulley and the electromagnetic brake. As the countersunk screw on the electromagnetic brake protrudes, using the feeler gauge (0.5 mm), leave a gap for the protrusion.



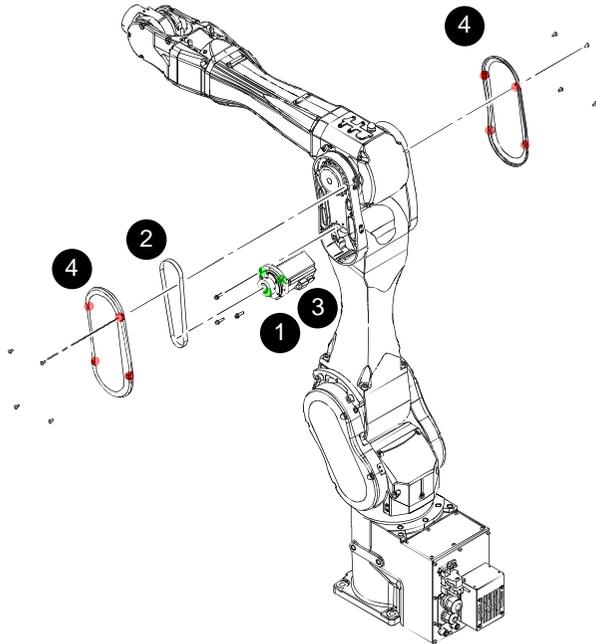
CAUTION

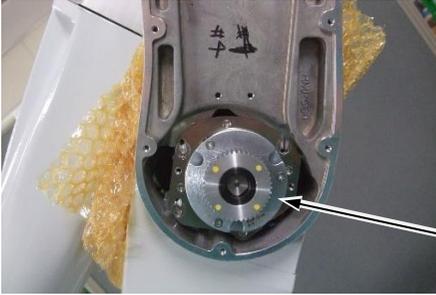
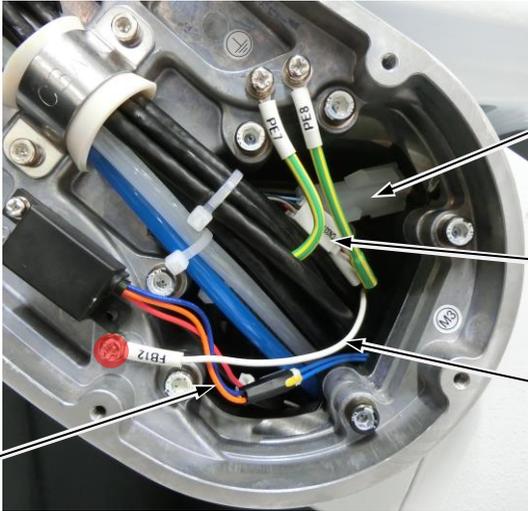
- Failure to create a gap between the Motor Pulley and the electromagnetic brake may cause the parts to rub during motor operation, causing a malfunction.
- If the set screw position is incorrect, this may cause damage on the side, and may result in not being able to remove the part.

4 Install the [J3 Motor unit](#).

Joint #3

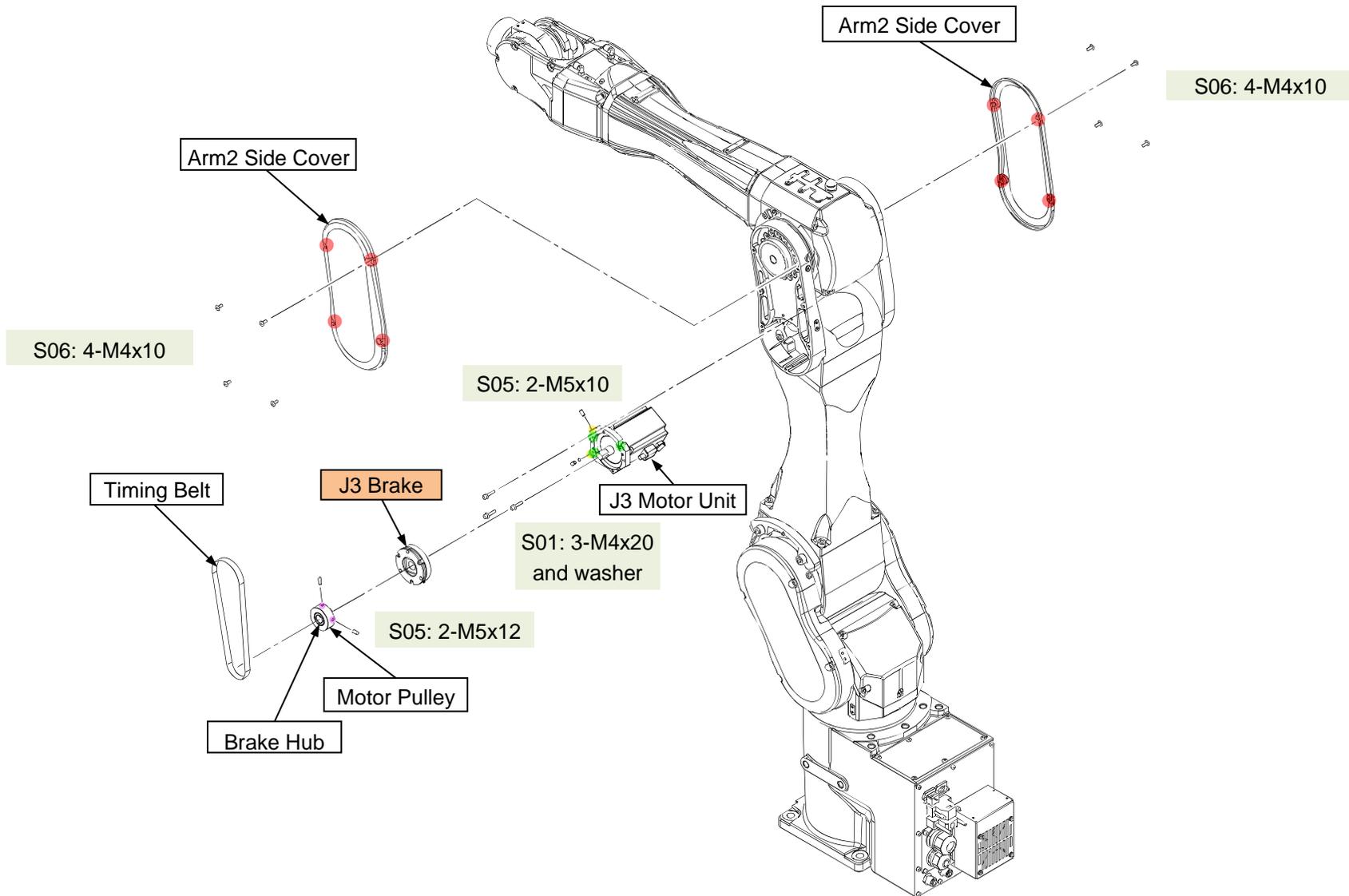
Installing the Motor Unit



<p>1</p>	<p>Insert the J3 Motor unit inside Arm3.</p>  <p>J3 Motor unit</p>
<p>2</p>	<p>Install the J3 Timing Belt. Perform steps 1 to 3.</p>
<p>3</p>	<p>Connect the J3 Motor Connectors (CN131, CN331, CN430) and Ground Wire (FB12).</p> <p>A S04: 1-M4x6 (0.9 +/- 0.1N·m)</p>  <p>CN131</p> <p>CN331</p> <p>FB12</p> <p>CN430</p>
<p>4</p>	<p>Install the Arm2 side cover.</p>
<p>5</p>	<p>After assembly, perform calibration of Joint #3. 3.2 Calibration</p>

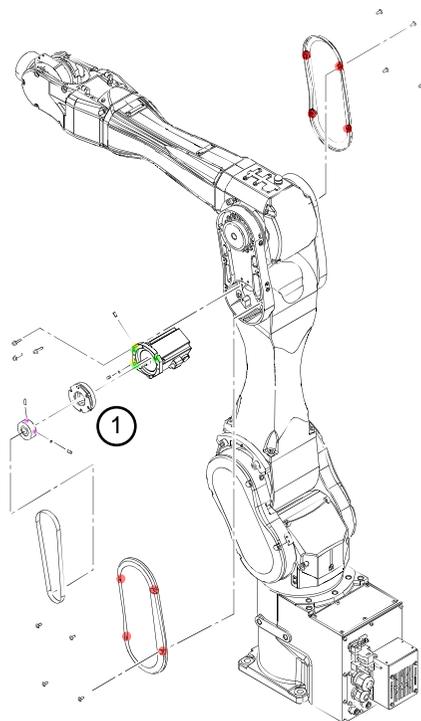
Joint #3

2.5.3 Joint #3 Replacing the Brake



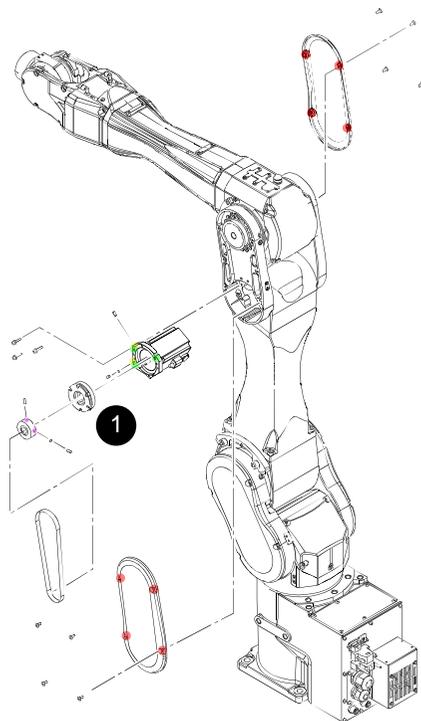
Joint #3

Removing the Brake



① Refer to [J3 Motor Unit Disassembly](#) and remove the J3 brake.

Installing the Brake

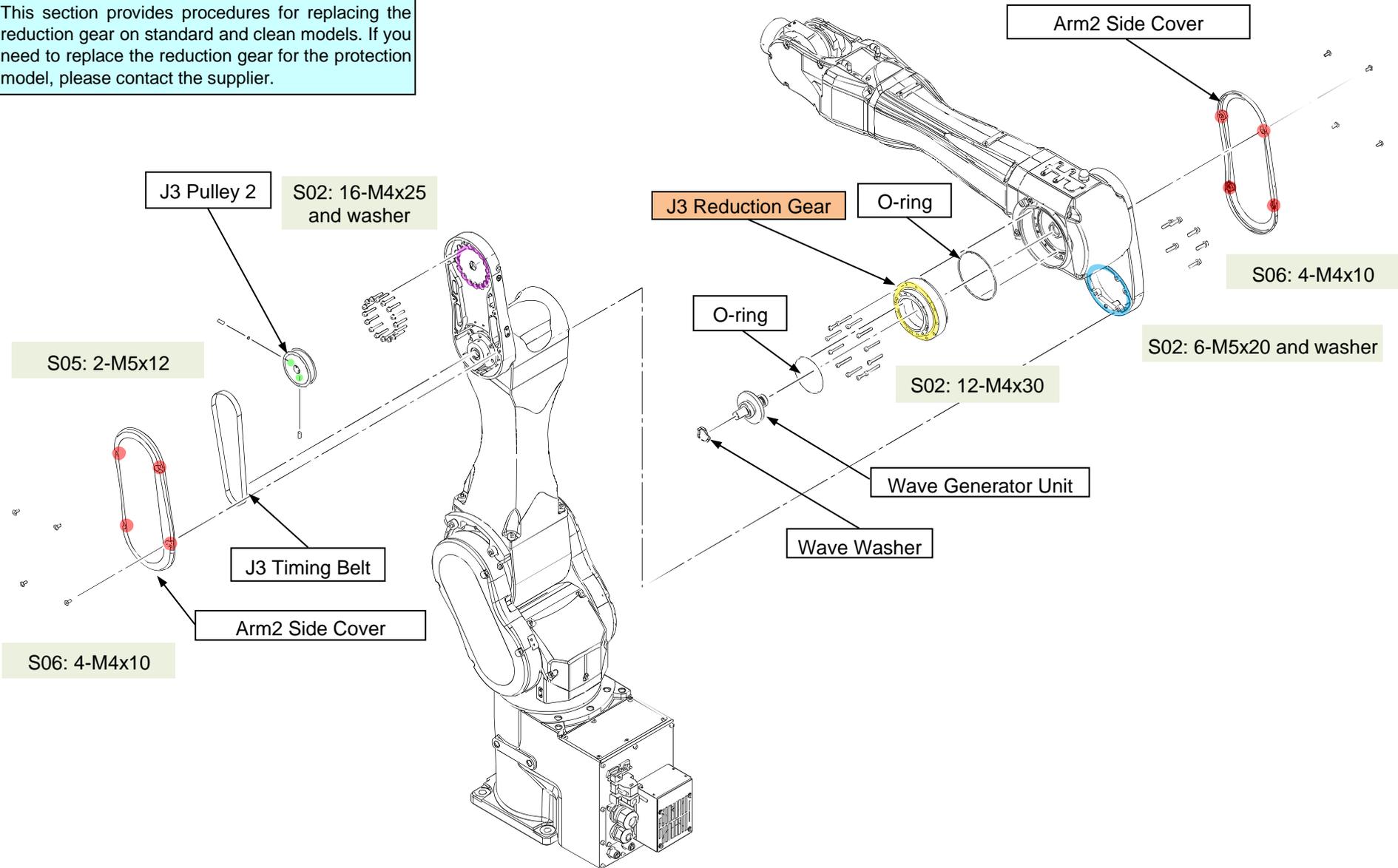


1 Refer to [J3 Motor Unit Assembly](#) and install the J3 brake.

Joint #3

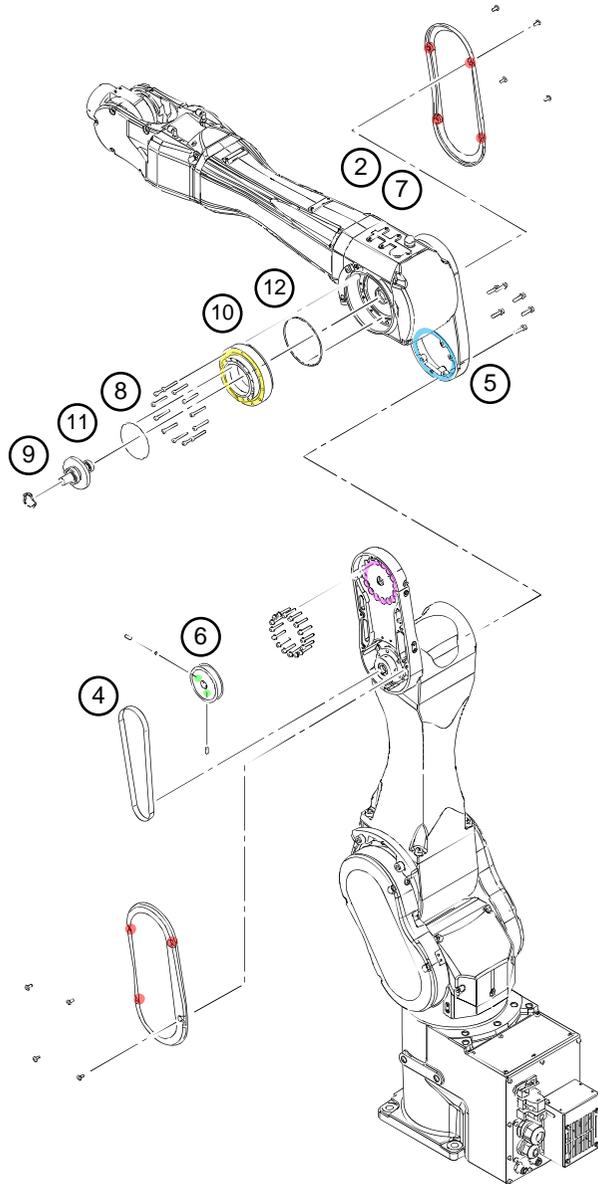
2.5.4 Joint #3 Replacing the Reduction Gear

This section provides procedures for replacing the reduction gear on standard and clean models. If you need to replace the reduction gear for the protection model, please contact the supplier.



Joint #3

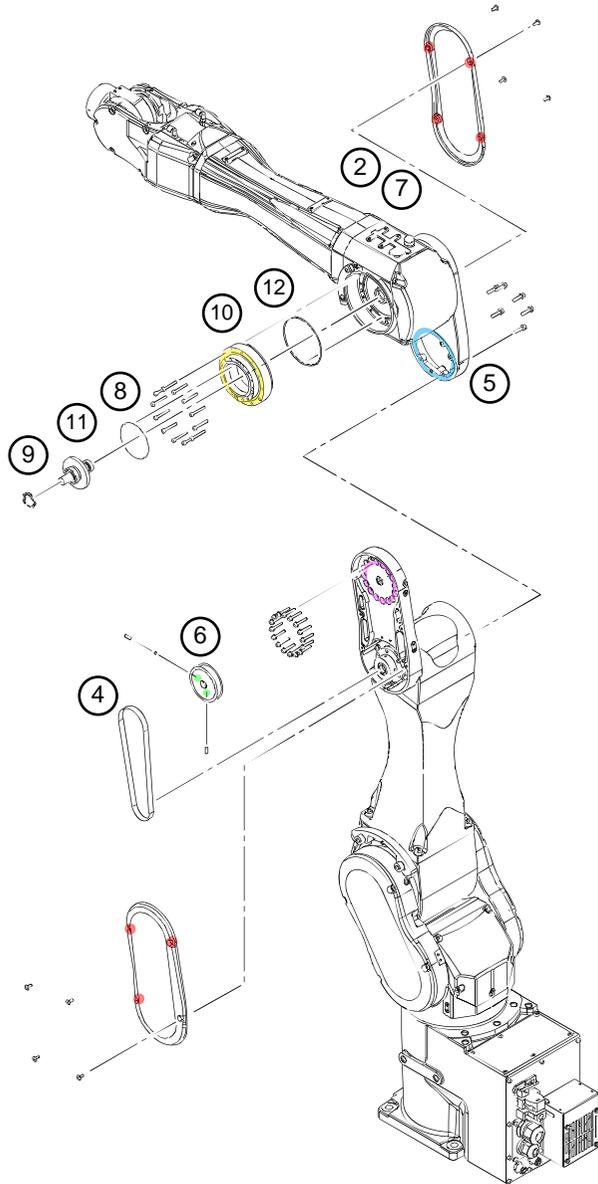
Removing the Reduction Gear



	<p><Preparation> Prepare a work stand upon which to place the arm removed from the Manipulator. Guidelines for work stand Width x Depth: 1.0 x 0.5 m Height: 600 mm to 1200 mm from bottom of the Manipulator Load capacity: 10 kg</p>
①	<p>Turn ON the controller.</p>
②	<p>Release the J3 brake, and manually push and move Arm3 until it comes in contact with the mechanical stopper, and push it against Arm2.</p> <p>CAUTION</p> <ul style="list-style-type: none"> • Arm3 falls by its weight when the J3 Motor unit is removed. Release the brake and tilt Arm3 in advance. • There is a possibility of hands and fingers being caught, and/or damage to or malfunction in the Manipulator. Take care during operation. 
③	<p>Turn OFF the Controller.</p>
④	<p>Remove the J3 Timing Belt.</p>

Joint #3

Removing the Reduction Gear



Joint #3

⑤ Remove the Arm2 side arm.

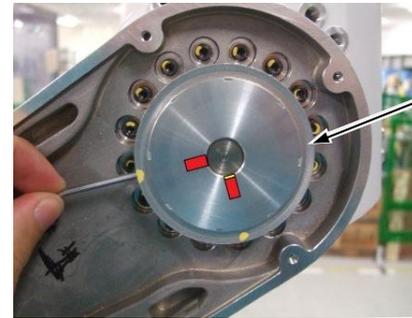
A S02: 6-M5x20 and washer



Arm2 side arm

⑥ Remove the J3 pulley 2.

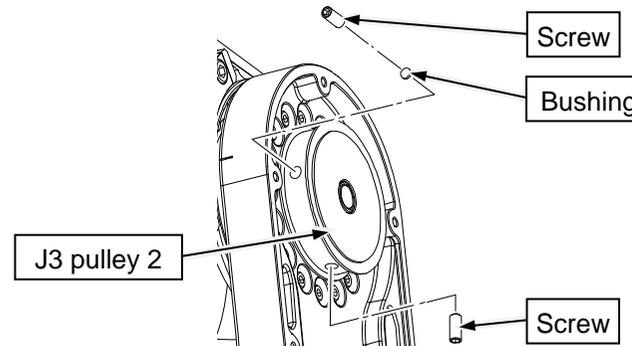
A S05: 2-M5x12



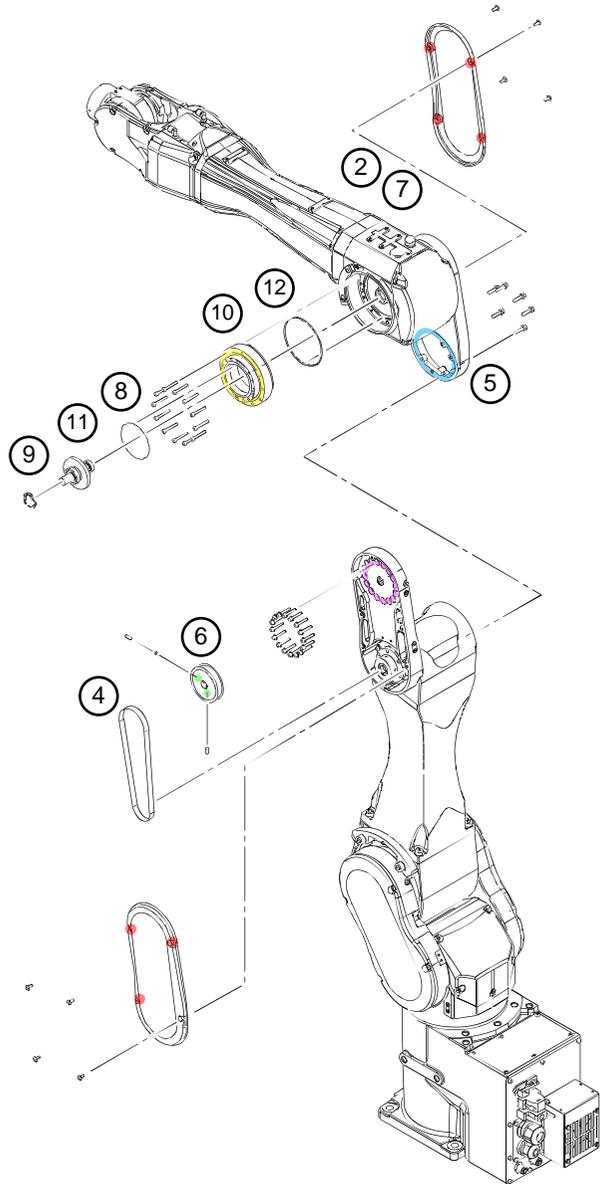
J3 pulley 2

CAUTION

A brass bushing is included on one of the set screws. When removing the pulley, be careful not to drop and lose the bushing.



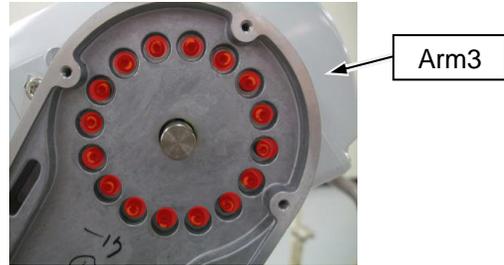
Removing the Reduction Gear



Joint #3

⑦ Remove Arm3.

A S02: 16-M4x25 and washer

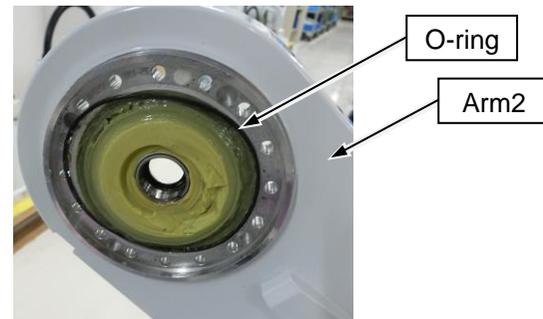


CAUTION

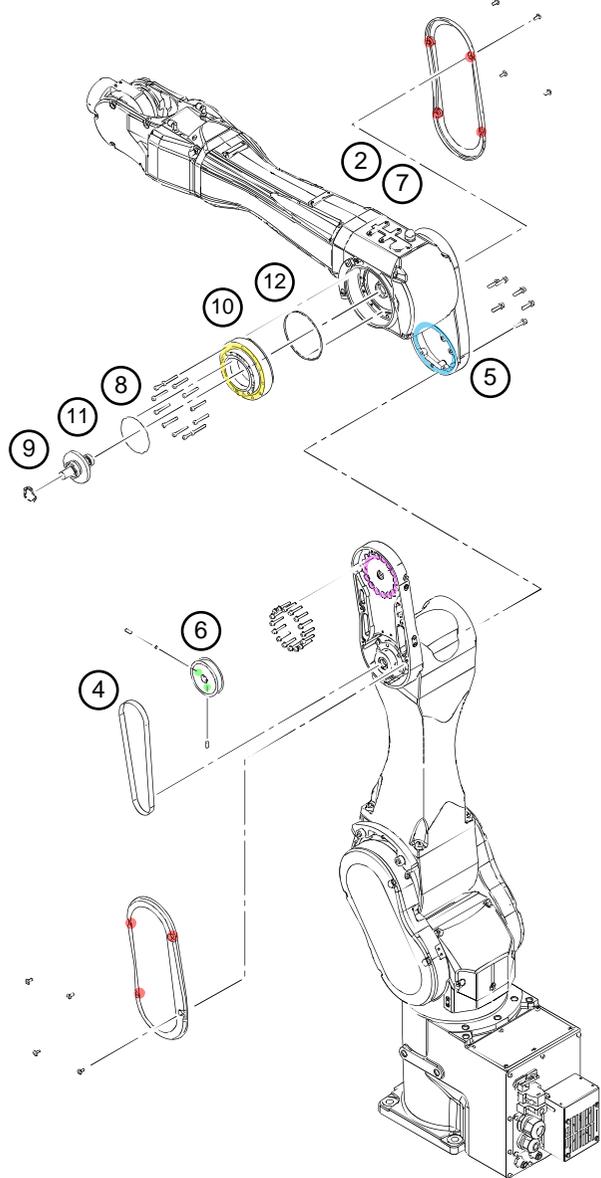
- Remove the bolts to remove the Arm2 side arm and Arms 3, 4, 5, and 6 (end effector). There is a possibility of hands and fingers being caught, and/or damage to or malfunction in the Manipulator. Be very careful when removing the arms. Have at least two workers support the Manipulator while another worker removes the bolts.
- The arms are connected by internal cables. Place the removed arms on the work stand in order to not apply load on the cables. Applying load on the cables may result in cable disconnection.



⑧ Remove the O-ring on Arm2.



Removing the Reduction Gear



9

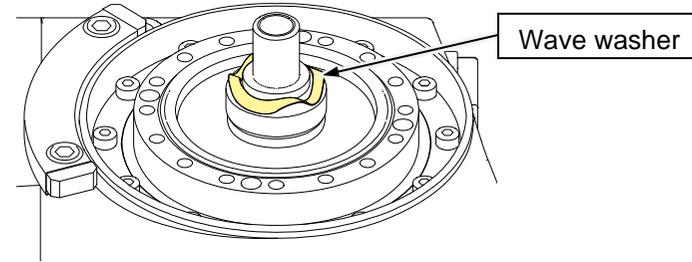
Remove the wave washer.

CAUTION

The wave washer will be used again. Be careful not to lose it when performing the work.

POINT

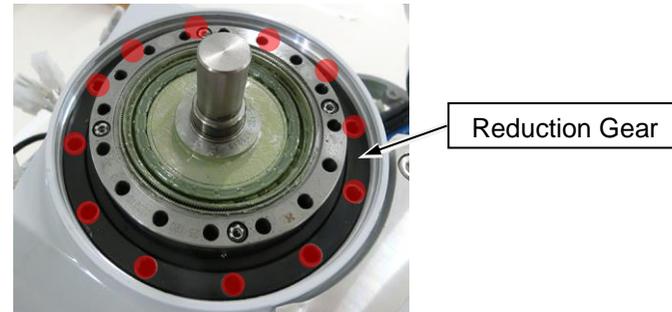
The part has grease applied. Perform the work while wiping off the grease.



10

Remove the Reduction Gear Unit with the Wave Generator unit built in.

A S02: 12-M4x30

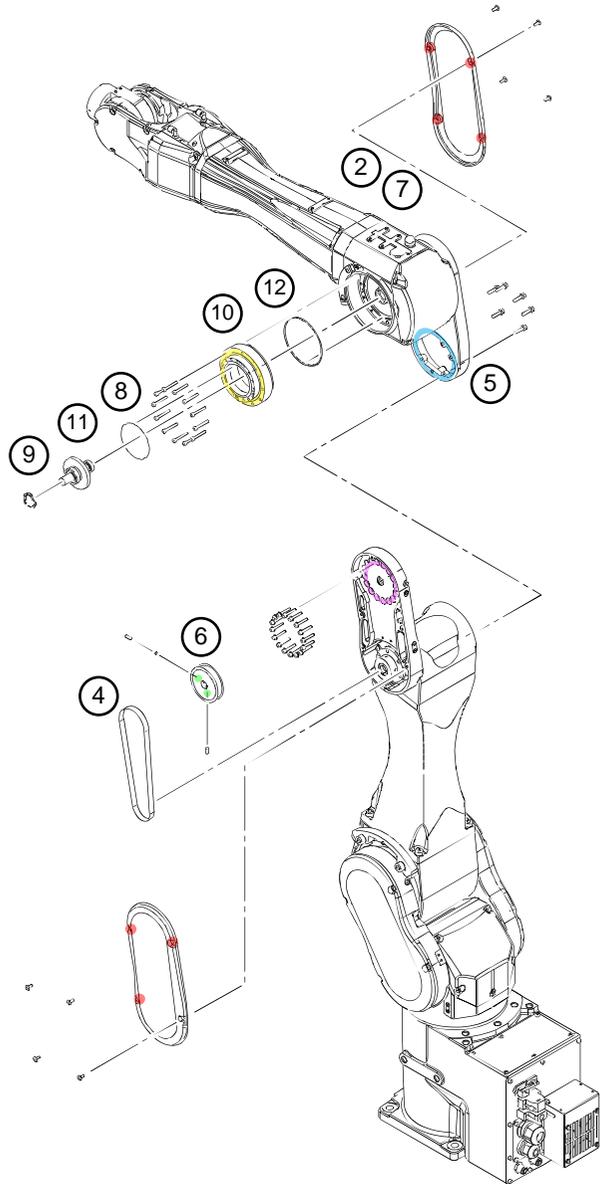


POINT

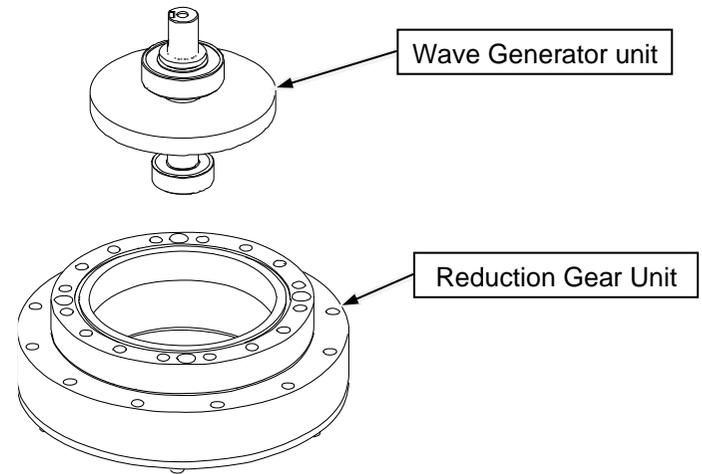
The part has grease applied. Perform the work while wiping off the grease.

Joint #3

Removing the Reduction Gear

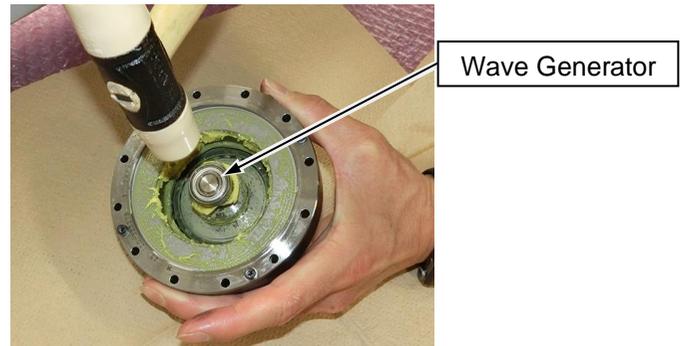


11 Remove the Wave Generator unit.



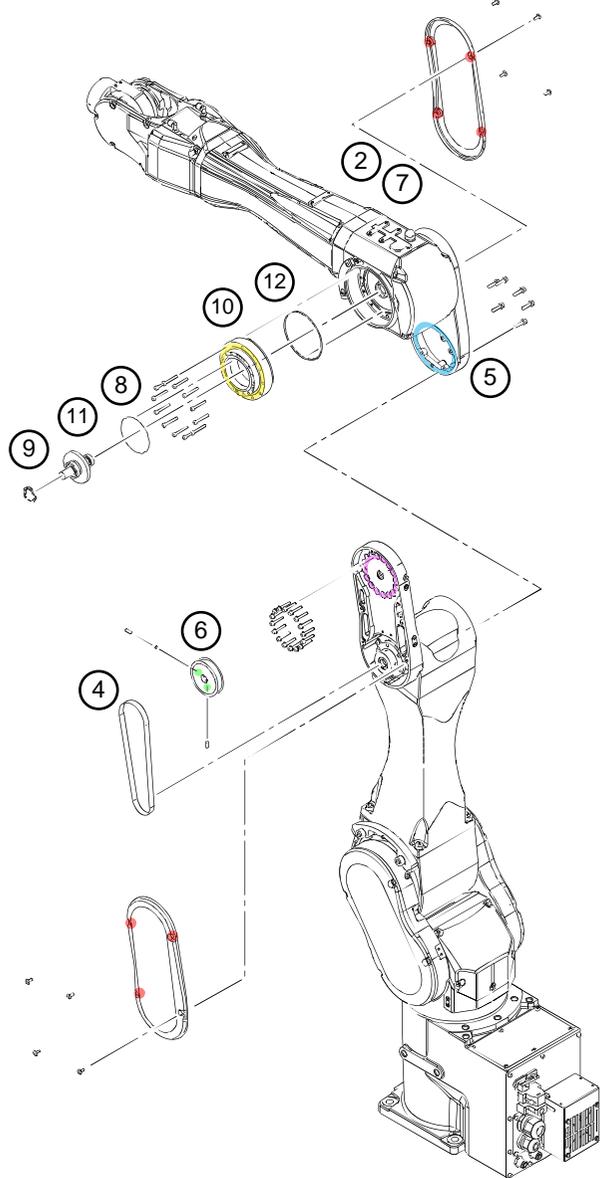
POINT

Turn the Reduction Gear Unit with the Wave Generator unit built in upside down. Remove the Wave Generator unit by tapping it lightly near the center axis with a plastic hammer.



Joint #3

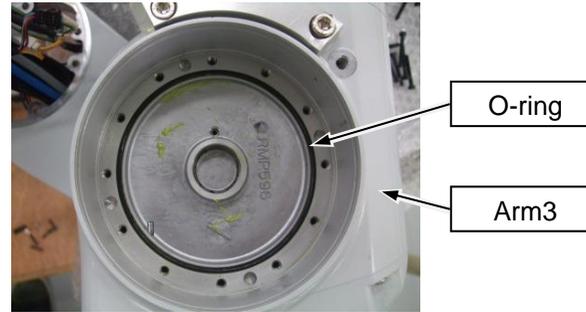
Removing the Reduction Gear



⑫ Remove the Arm3 O-ring.

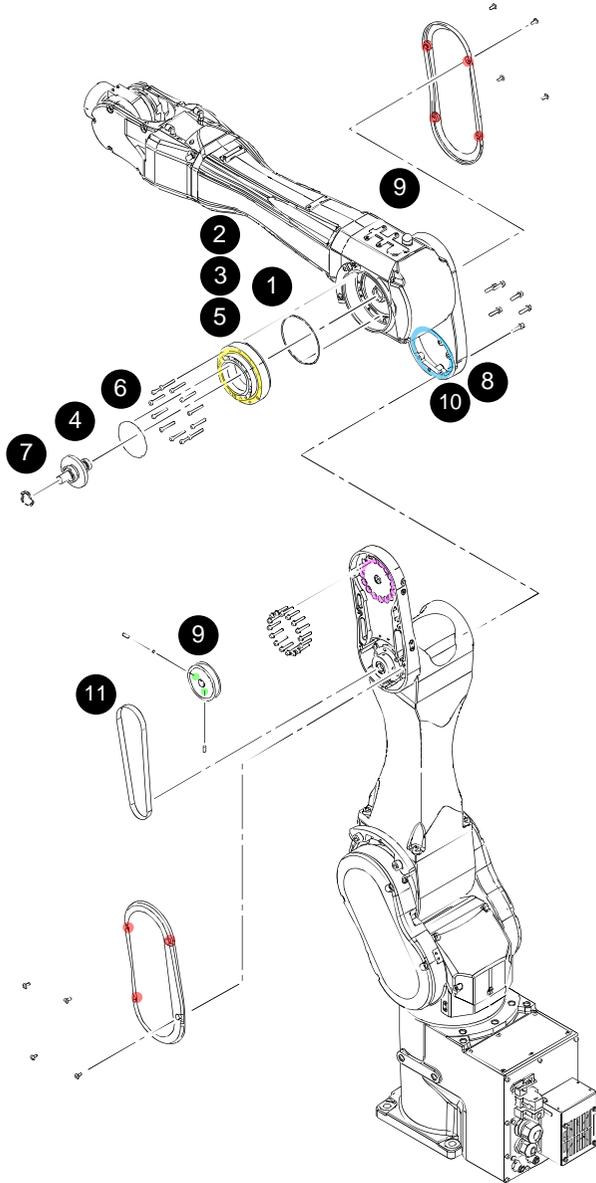
POINT

The part has grease applied. Perform the work while wiping off the grease.



Joint #3

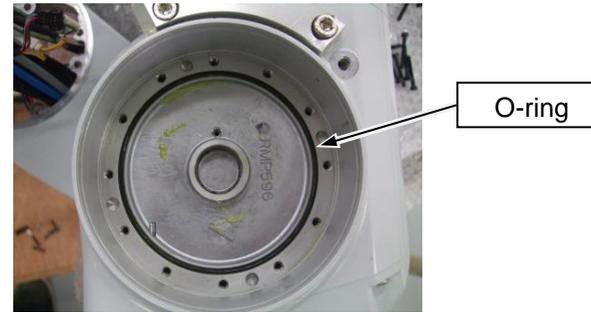
Installing the Reduction Gear



1 Install the O-ring.

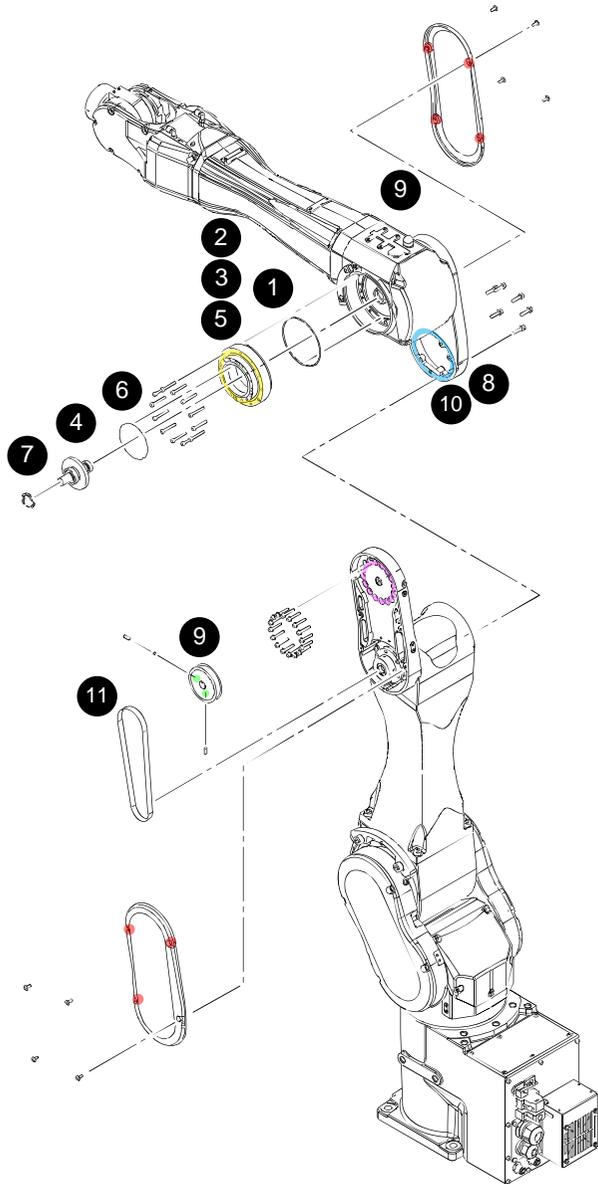
POINT

- Applying a small amount of grease (SK-1A) to the O-ring will make it stick to the arm, facilitating subsequent work.
- Insert the O-ring firmly into the groove.
- If the O-ring is stretched, damaged, or has deteriorated, replace with a new one.



Joint #3

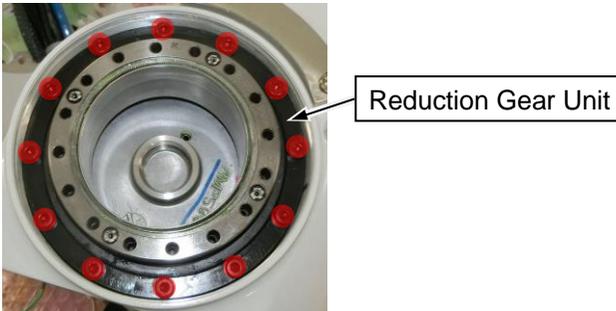
Installing the Reduction Gear



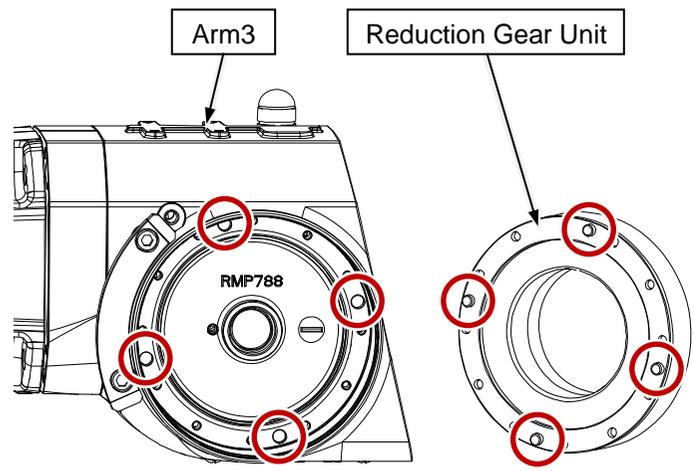
Joint #3

2 Set the Reduction Gear Unit on Arm3, then secure the fixing bolts temporarily.

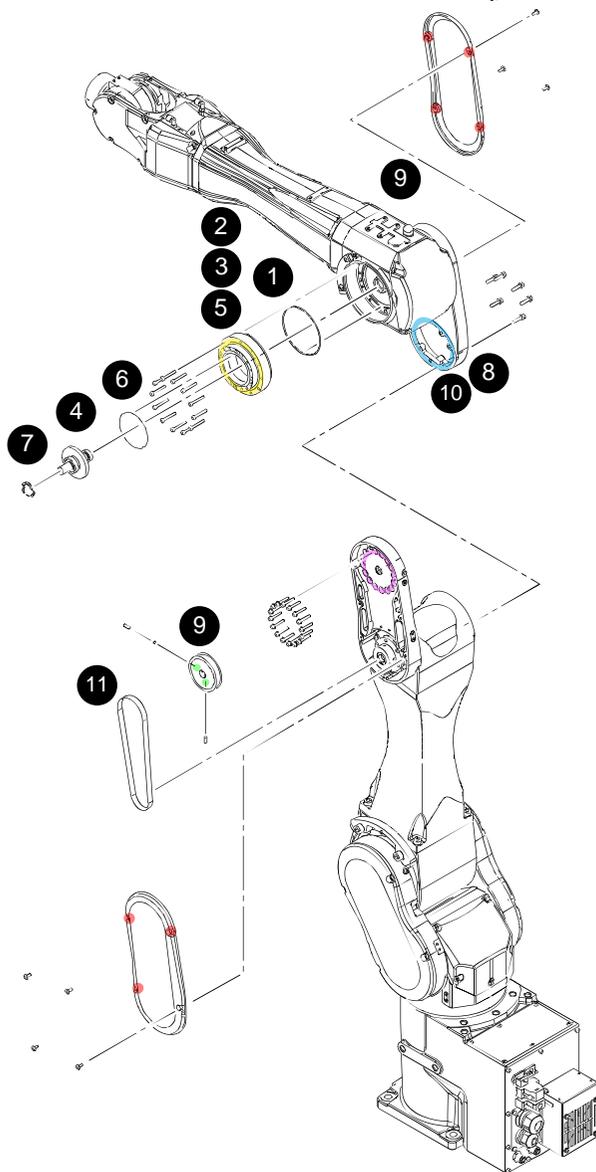
A S02: 12-M4x30



POINT
Align the four bolt heads on the bottom of the J3 Reduction Gear Unit with the indentations on Arm3, and set the Reduction Gear Unit on the arm.



Installing the Reduction Gear



Joint #3

3

Apply grease at the location shown in the figure.

 SK-1A: 26 g

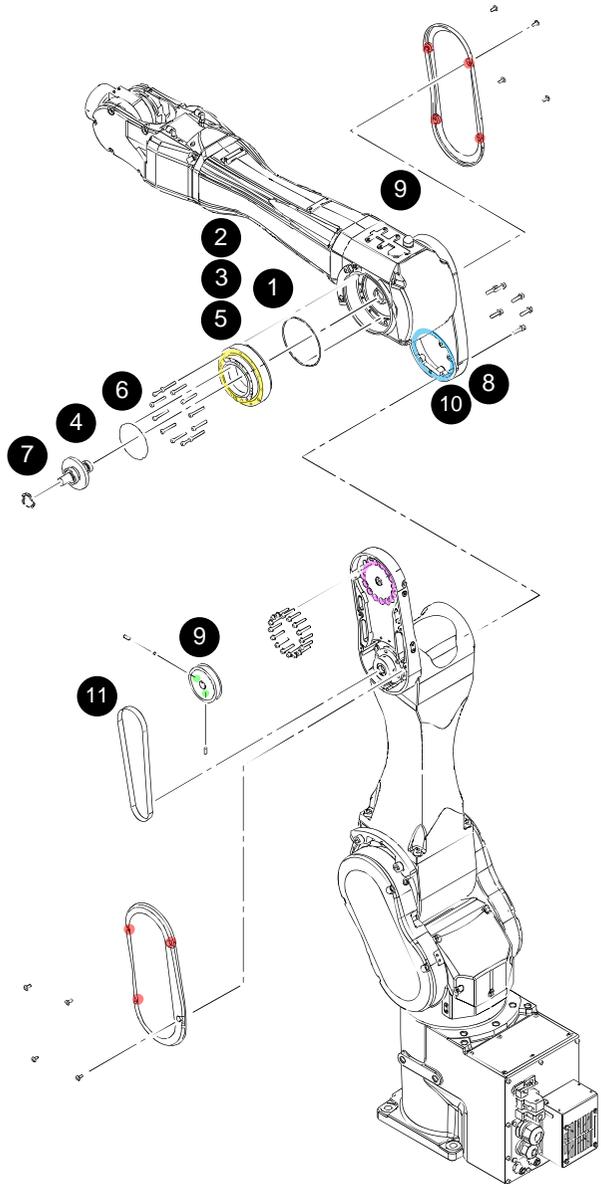


CAUTION

If grease is on the areas shown in the figure, wipe off the grease.

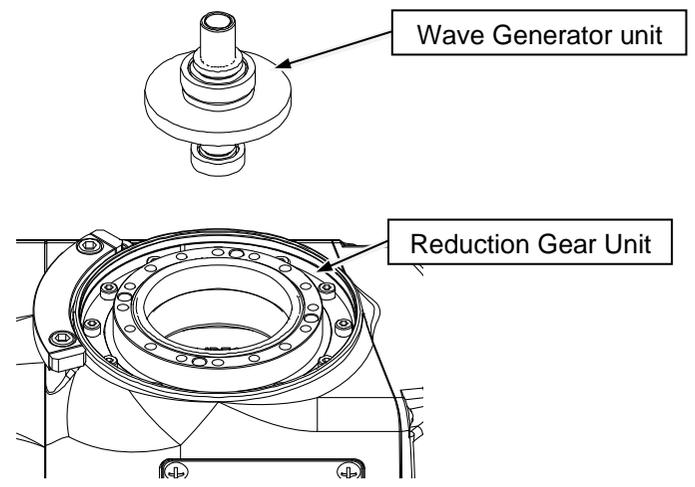


Installing the Reduction Gear

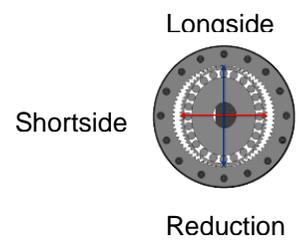


Joint #3

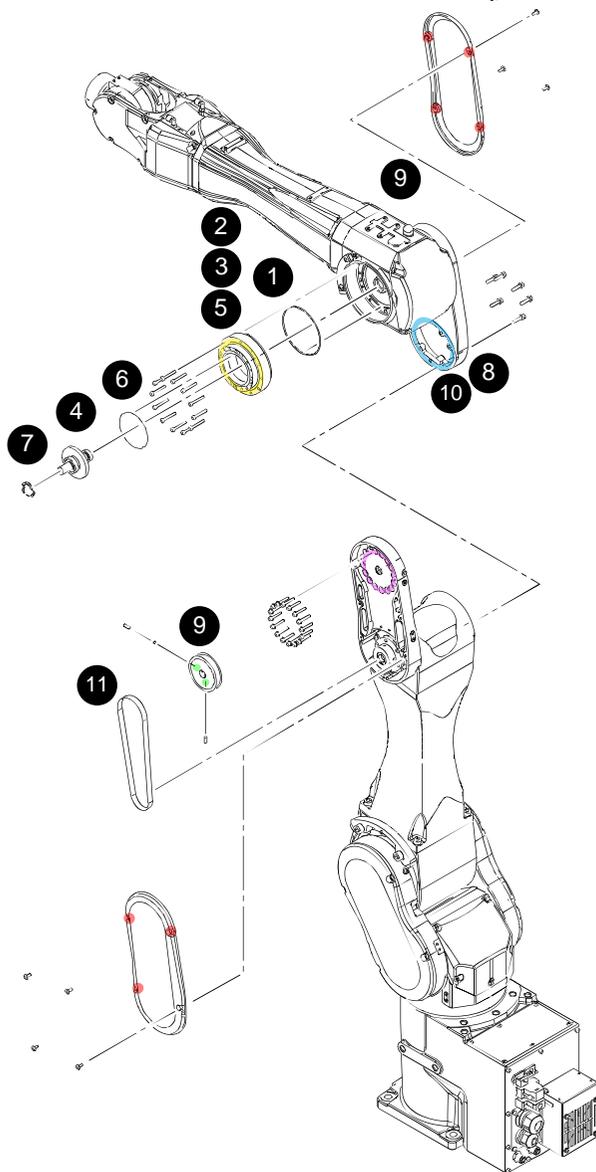
4 Install the Wave Generator unit.



POINT
Install so that the longside of the Flexspline and the Wave Generator match.



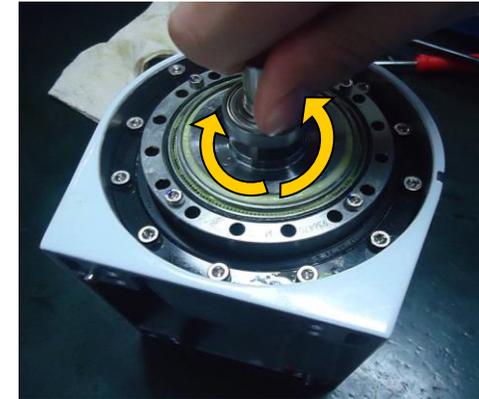
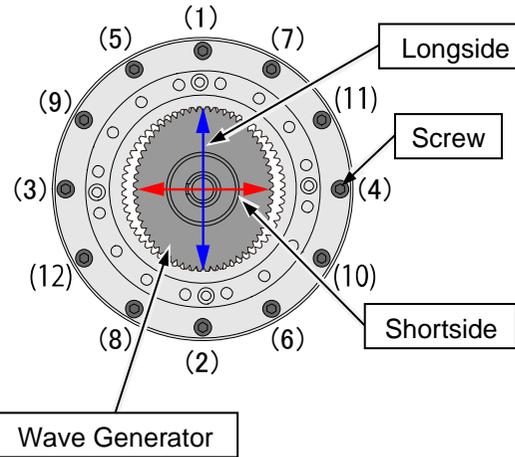
Installing the Reduction Gear



Joint #3

5 Secure the J3 Reduction Gear Unit to Arm3.

S02: 12-M4x30



Tighten the screws using the following procedure. Refer to the figure above.

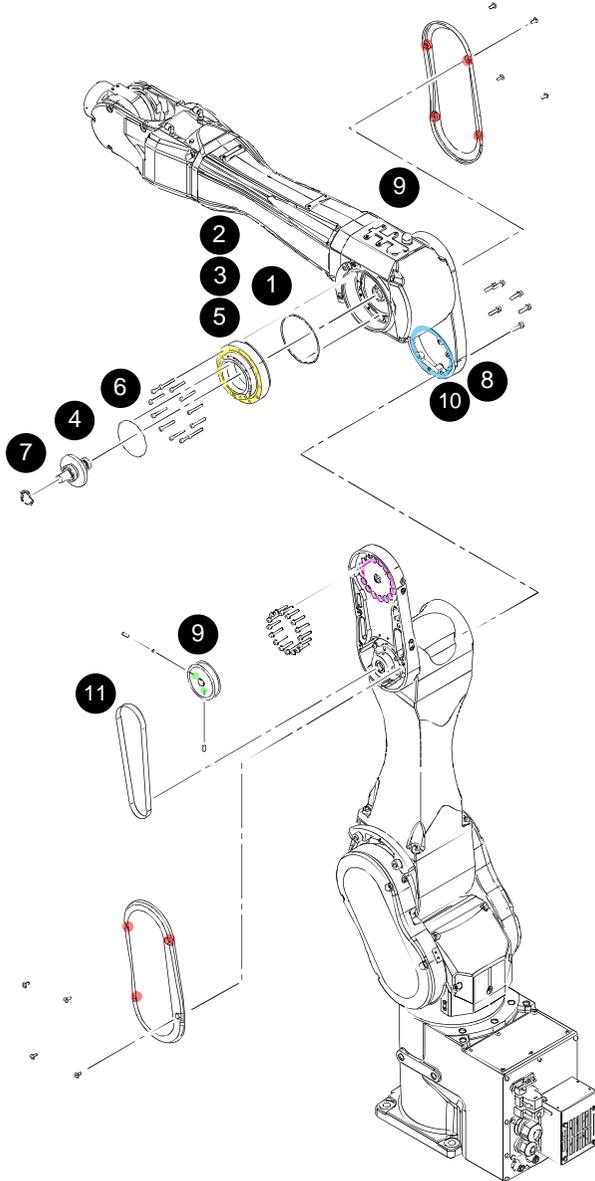
CAUTION

- Ensure that diagonally opposite screws are tightened alternately.
- Do not tighten the screws all the way at once. Instead, divide this into four times and tighten to the following torques.

Percentage of the specified torque	Torque value	Unit
20%	1.1 +/- 0.05	N · m
40%	2.2 +/- 0.11	
80%	4.4 +/- 0.22	
100%	5.5 +/- 0.5	

1. Rotate the Wave Generator so that its longside aligns with the positions of screws (1) and (2).
2. Tighten screws (1) and (2) to 20% of the torque value.
3. Tighten screws (1) and (2) to 40% of the torque value.

Installing the Reduction Gear

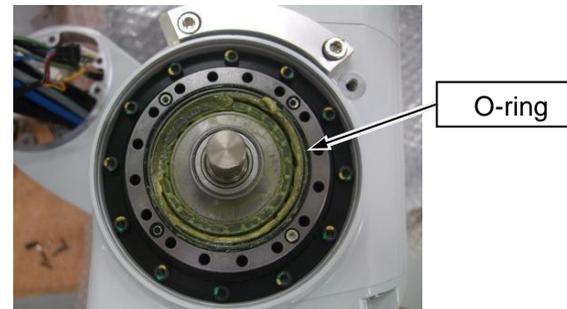


4. Rotate the Wave Generator longside so that it aligns with the positions of screws (3) and (4).
5. Tighten screws (3) and (4) to 20% of the torque value.
6. Tighten screws (3) and (4) to 40% of the torque value.
7. Rotate the Wave Generator longside and tighten screws (5) through (12) to the 20% and 40% of the torque value.
8. Rotate the Wave Generator so that its longside aligns with the positions of screws (1) and (2).
9. Tighten screws (1) and (2) to 80% of the torque value, then tighten screws (1) and (2) to 100% of the torque value.
10. Rotate the Wave Generator longside so that it aligns with the positions of screws (3) and (4).
11. Tighten screws (3) and (4) to 80% of the torque value, then tighten screws (3) and (4) to 100% of the torque value.
12. Rotate the Wave Generator longside and tighten screws (5) through (12) to the 80% and 100% of the torque value.

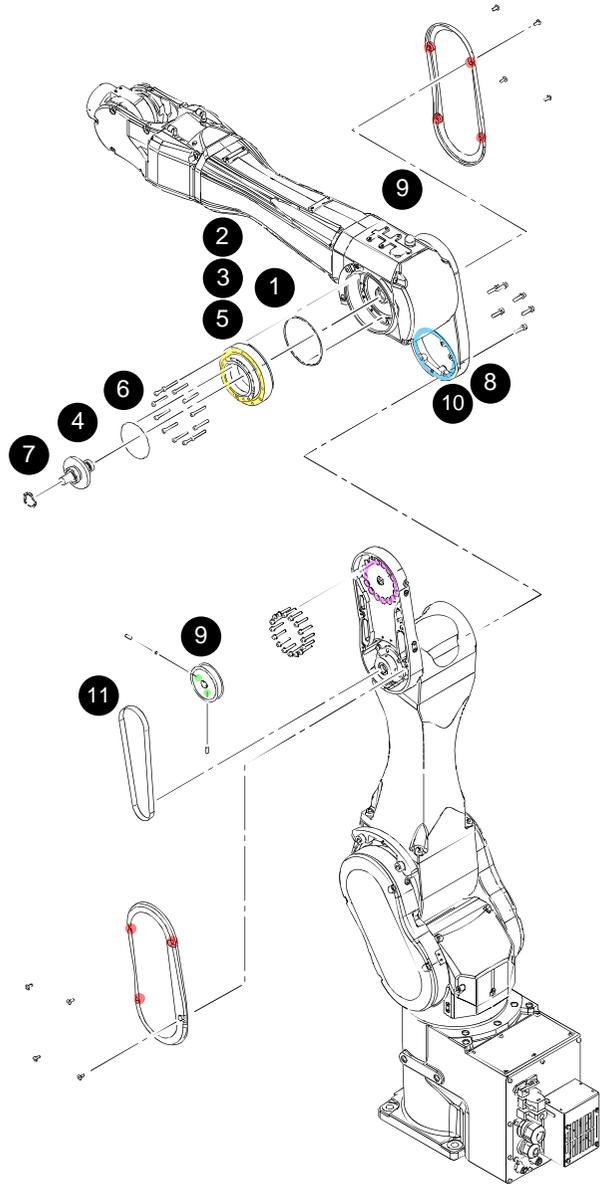
6 Install the O-ring.

POINT

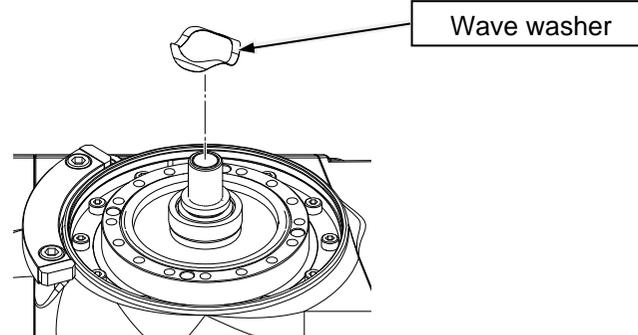
- Applying a small amount of grease (SK-1A) to the O-ring will make it stick to the arm, facilitating subsequent work.
- Insert the O-ring firmly into the groove.
- If the O-ring is stretched, damaged, or has deteriorated, replace with a new one.



Installing the Reduction Gear



7 Install the wave washer.

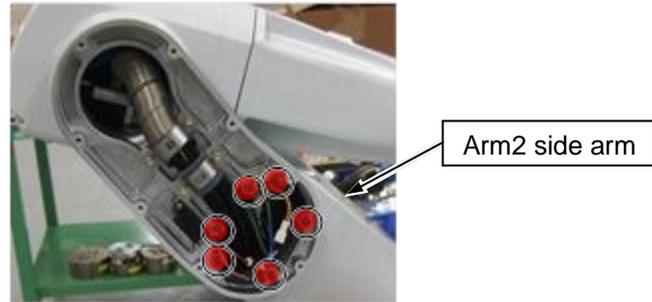


8 Temporarily secure the Arm2 side arm.

CAUTION

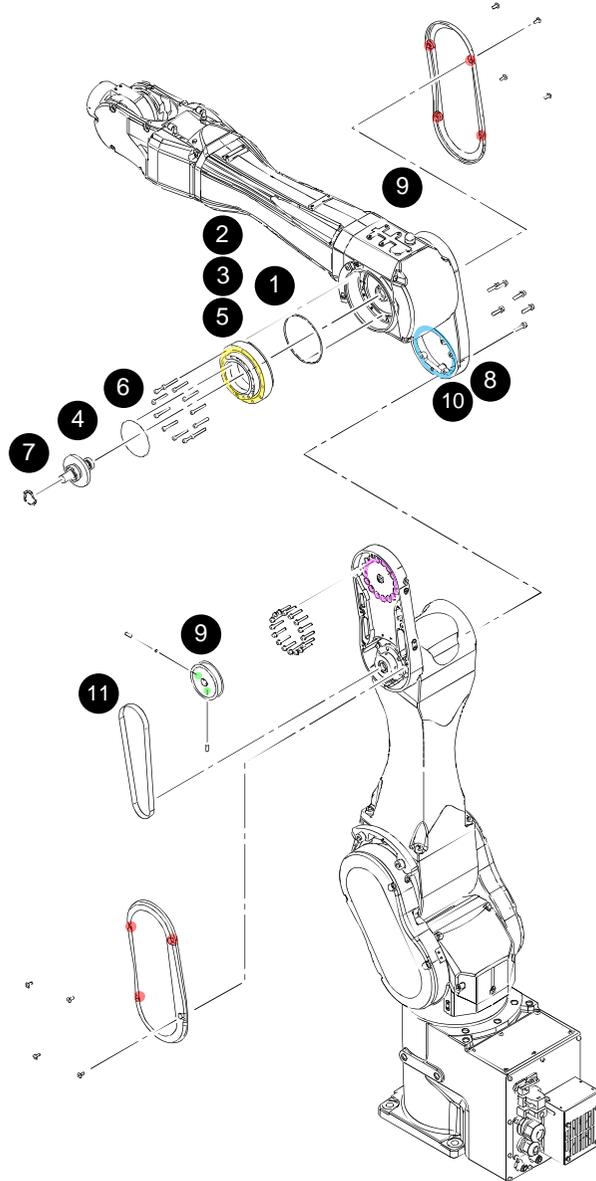
Have at least two workers perform this work. At least one worker must support the Manipulator to prevent its arm from falling. Pay special attention to damage resulting from the Manipulator falling or hands or feet being caught in the Manipulator.

A S02: 6-M5x20 and washer



Joint #3

Installing the Reduction Gear



9

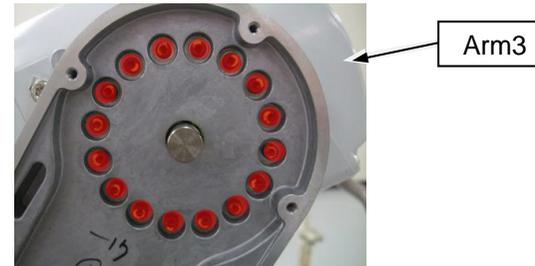
Temporarily secure the Arm3.

1. Lift up the Arm2 side arm and Arms 3, 4, 5, and 6 (ends) to install and temporarily secure the Arm3.

CAUTION

- Have at least two workers perform this work. At least one worker must support the Manipulator to prevent its arm from falling.
- Pay special attention to damage resulting from the Manipulator falling or hands or feet being caught in the Manipulator.

A S02: 16-M4x25 and washer

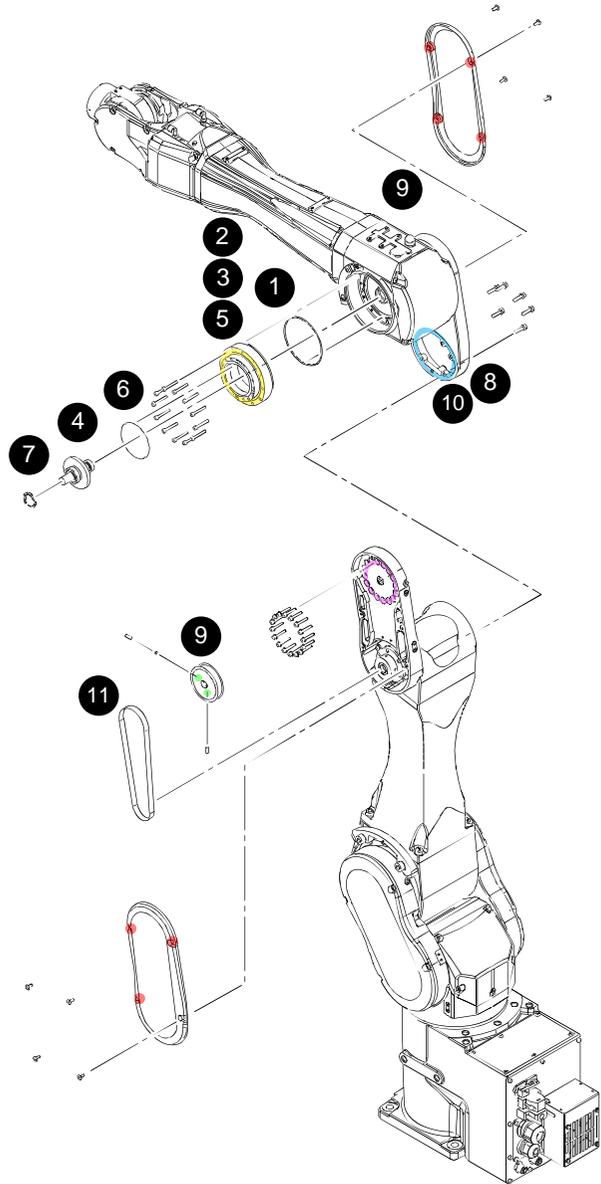


POINT

After securing the arm, manually move the arm to check that there is no rattling or misalignment of the Reduction Gear.

Joint #3

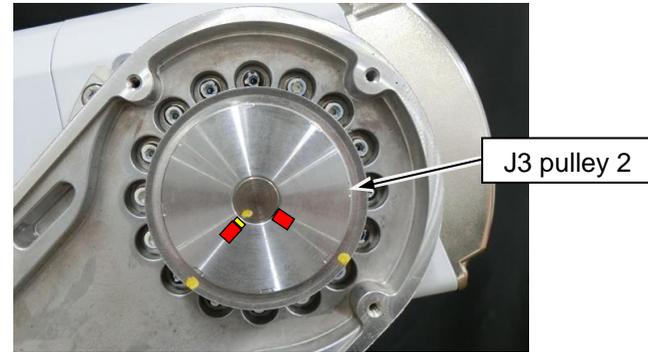
Installing the Reduction Gear



Joint #3

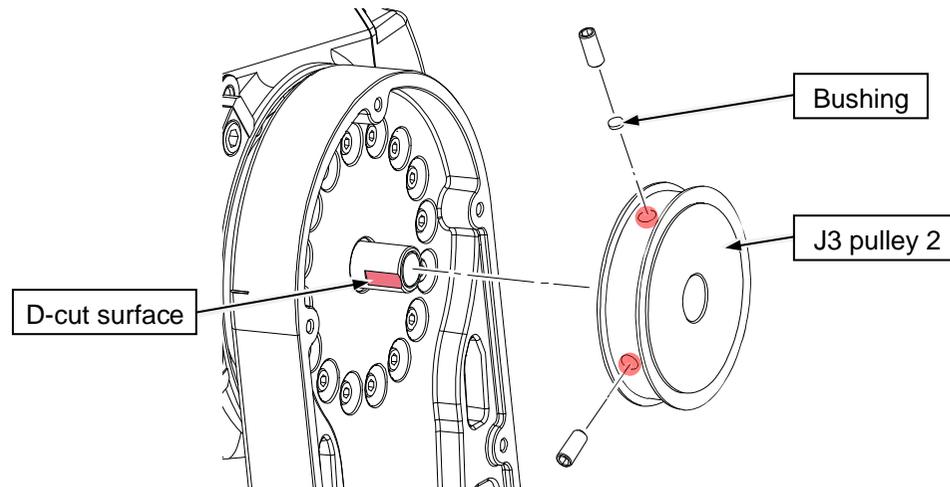
2. Install the J3 pulley 2.

A S05: 2-M5x12
(4.0 +/- 0.2 N·m)



POINT

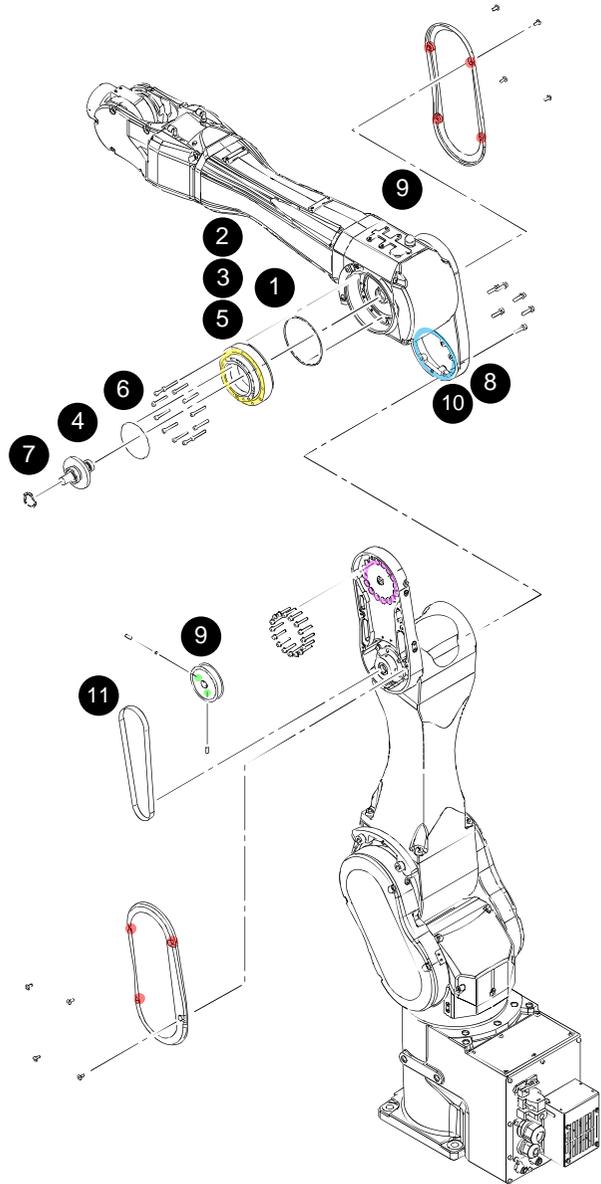
Align the shaft D-cut surface with the screw holes, and install the J3 pulley 2.



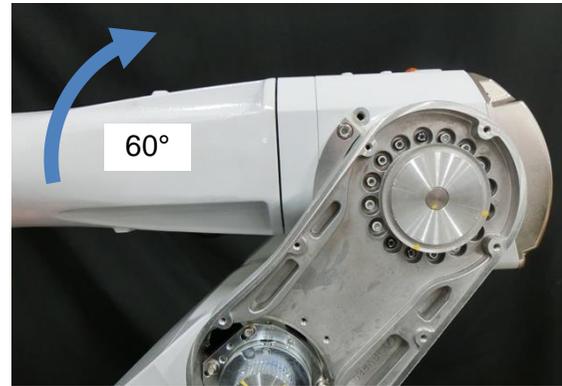
CAUTION

If the screw positions are incorrect or the bushing is not set, this may cause damage on the side, and may result in the part being unable to be removed.

Installing the Reduction Gear

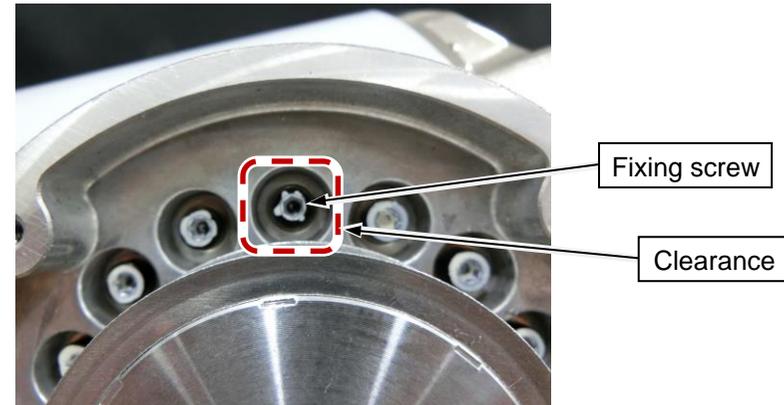


3. Manually lift Arm3 60° upward from this position.



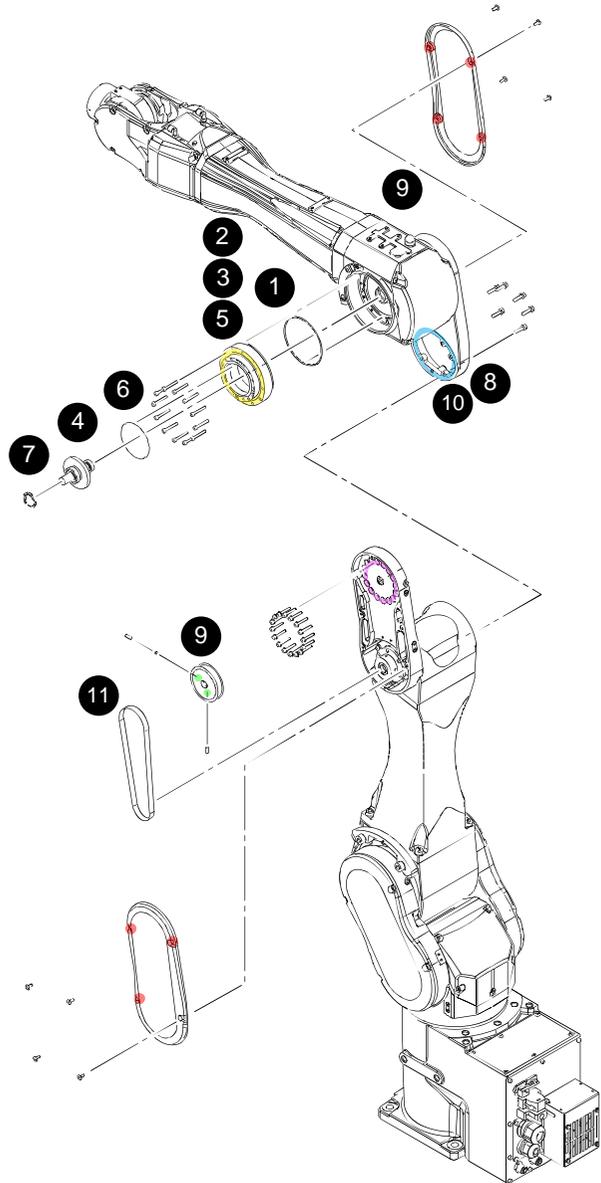
POINT

Adjust so that the fixing screws are centered in the clearance as shown in the figure.

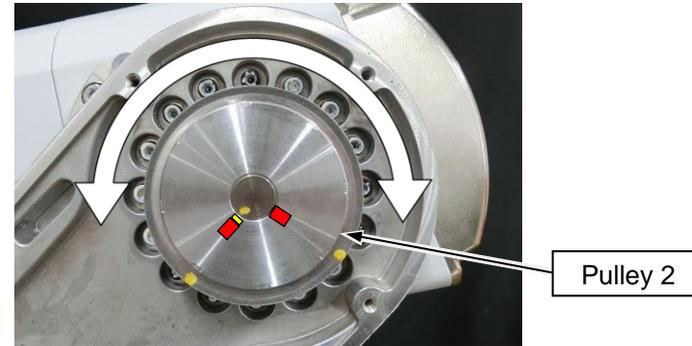


Joint #3

Installing the Reduction Gear



4. Rotate pulley 2 left and right by 180°.



5. Perform the following procedure to secure Arm3.

CAUTION

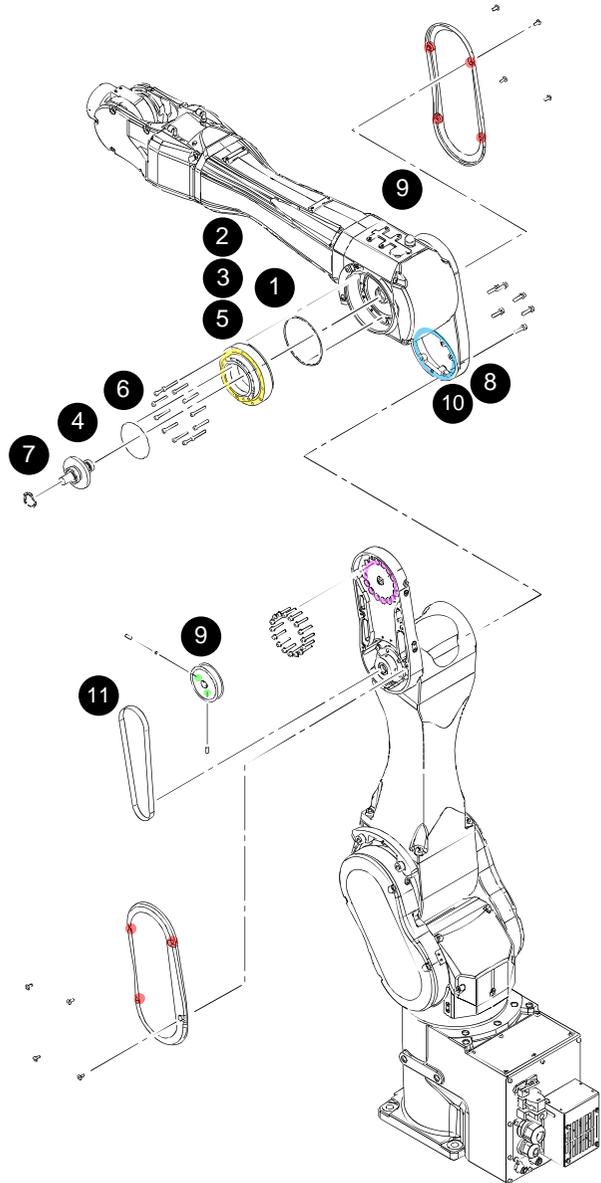
- Ensure that diagonally opposite screws are tightened alternately.
- Do not tighten the screws all the way at once. Instead, divide this into four (or two) times and tighten to the following torques.

A S02: 16-M4x25 and washer
(5.5 +/- 0.5 N·m)

Percentage of the specified torque	Torque value	Unit
20%	1.1 +/- 0.05	N · m
40%	2.2 +/- 0.11	
80%	4.4 +/- 0.22	
100%	5.5 +/- 0.5	

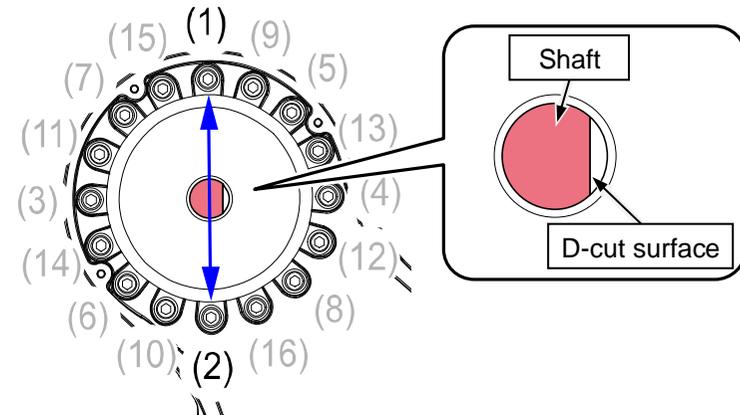
Joint #3

Installing the Reduction Gear



Joint #3

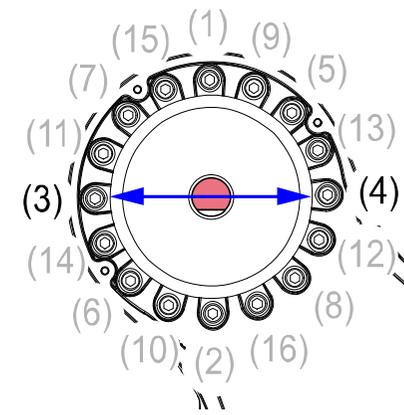
1. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



2. Tighten screws (1) and (2) to 20% of the torque value.

3. Tighten screws (1) and (2) to 40% of the torque value.

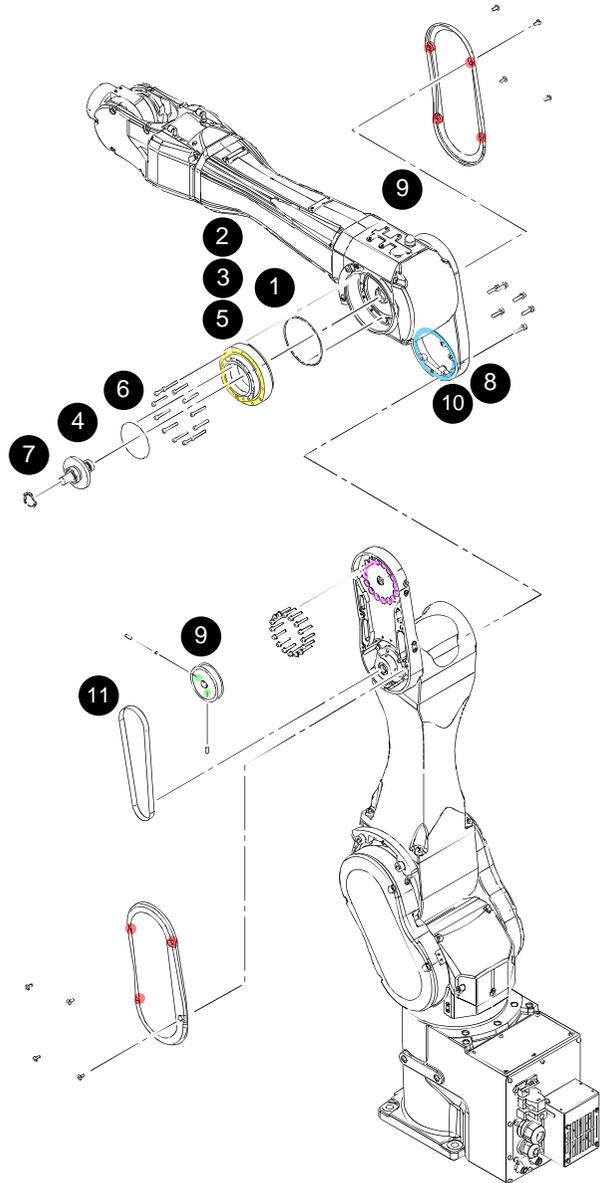
4. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



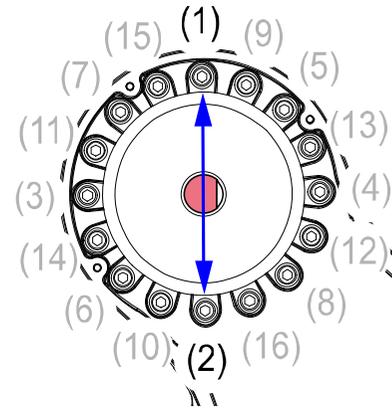
5. Tighten screws (3) and (4) to 20% of the torque value.

6. Tighten screws (3) and (4) to 40% of the torque value.

Installing the Reduction Gear



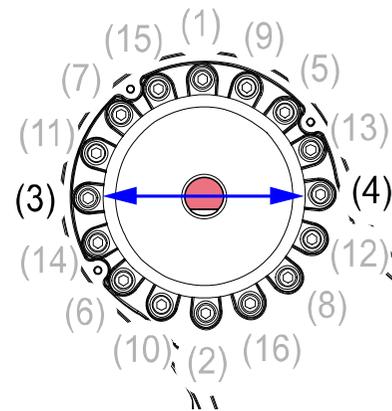
7. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



8. Tighten screws (1) and (2) to 80% of the torque value.

9. Tighten screws (1) and (2) to 100% of the torque value.

10. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.

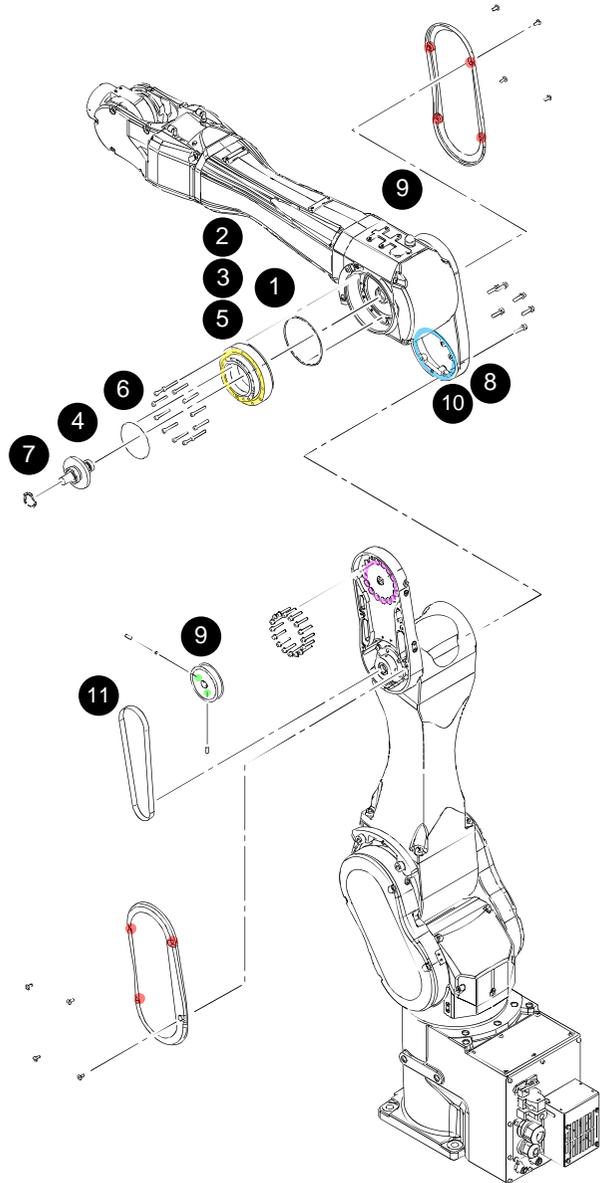


11. Tighten screws (3) and (4) to 80% of the torque value.

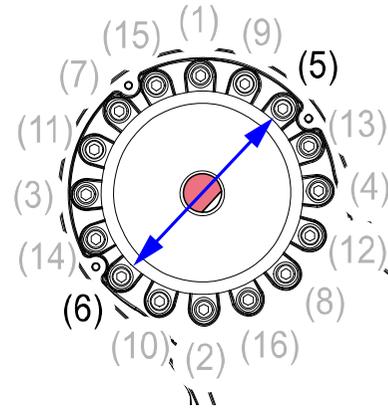
12. Tighten screws (3) and (4) to 100% of the torque value.

Joint #3

Installing the Reduction Gear

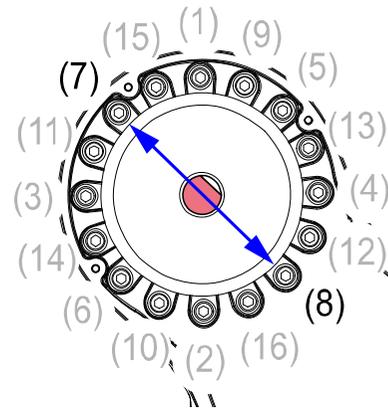


13. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



14. Tighten screws (5) and (6) to 40% and then 100% torque values.

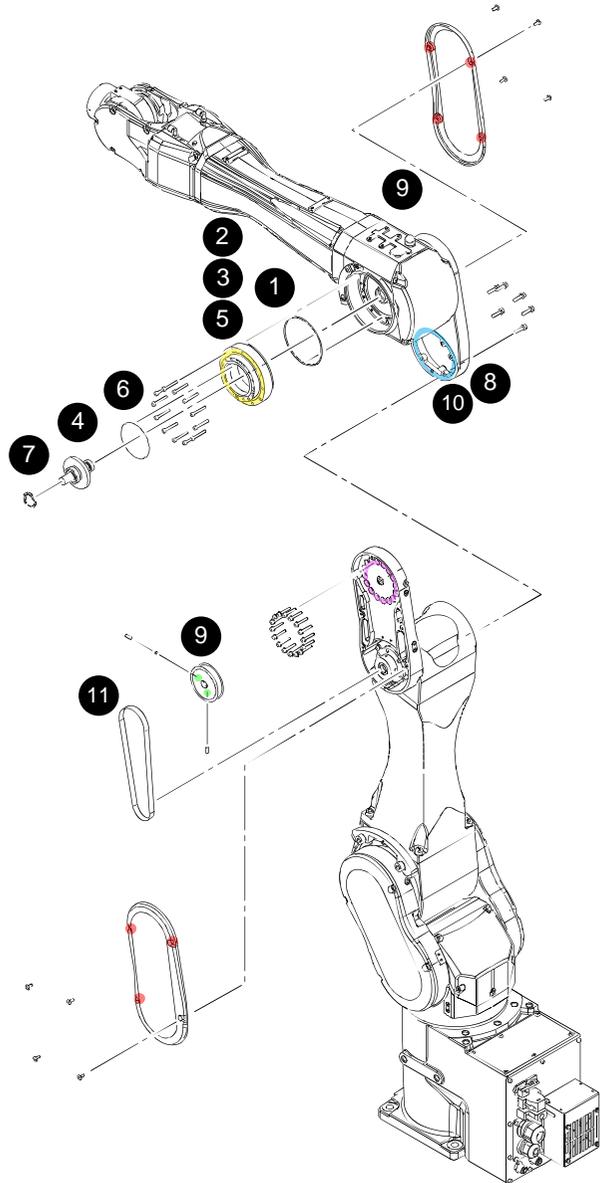
15. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



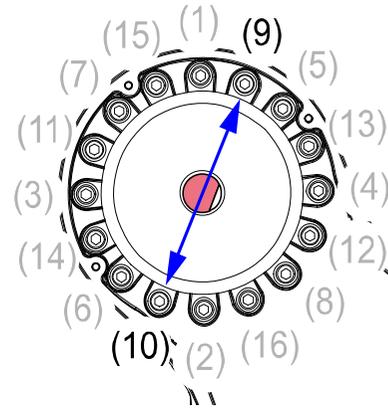
16. Tighten screws (7) and (8) to 40% and then 100% torque values.

Joint #3

Installing the Reduction Gear

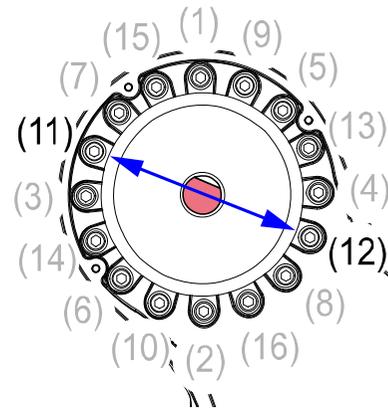


17. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



18. Tighten screws (9) and (10) to 40% and then 100% torque values.

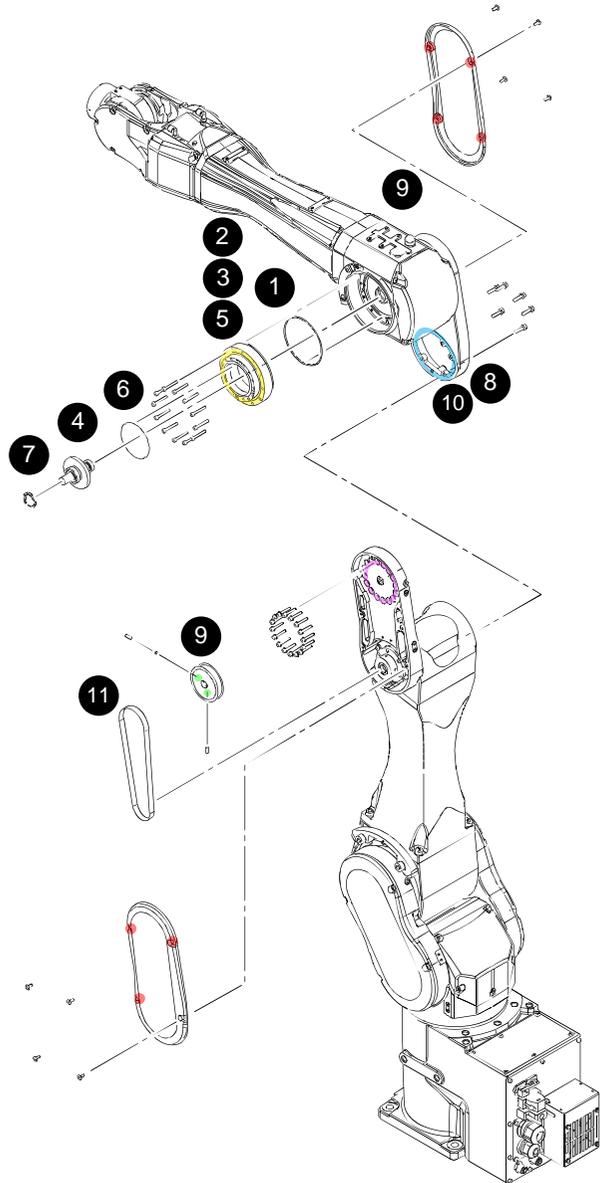
19. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



20. Tighten screws (11) and (12) to 40% and then 100% torque values.

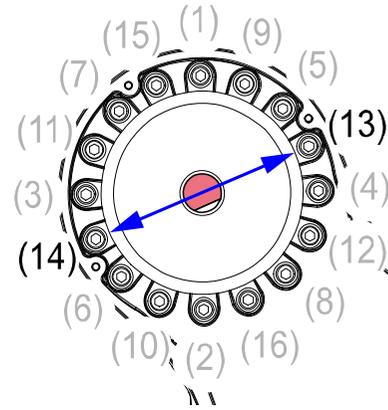
Joint #3

Installing the Reduction Gear



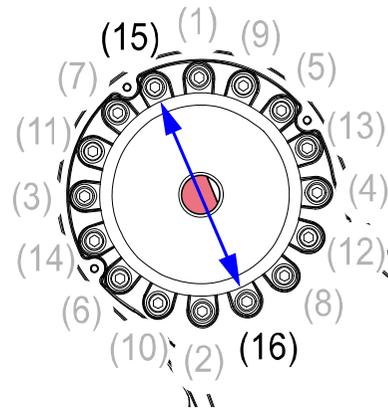
Joint #3

21. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.



22. Tighten screws (13) and (14) to 40% and then 100% torque values.

23. Rotate pulley 2 so that the shaft D-cut is in the position shown in the figure.

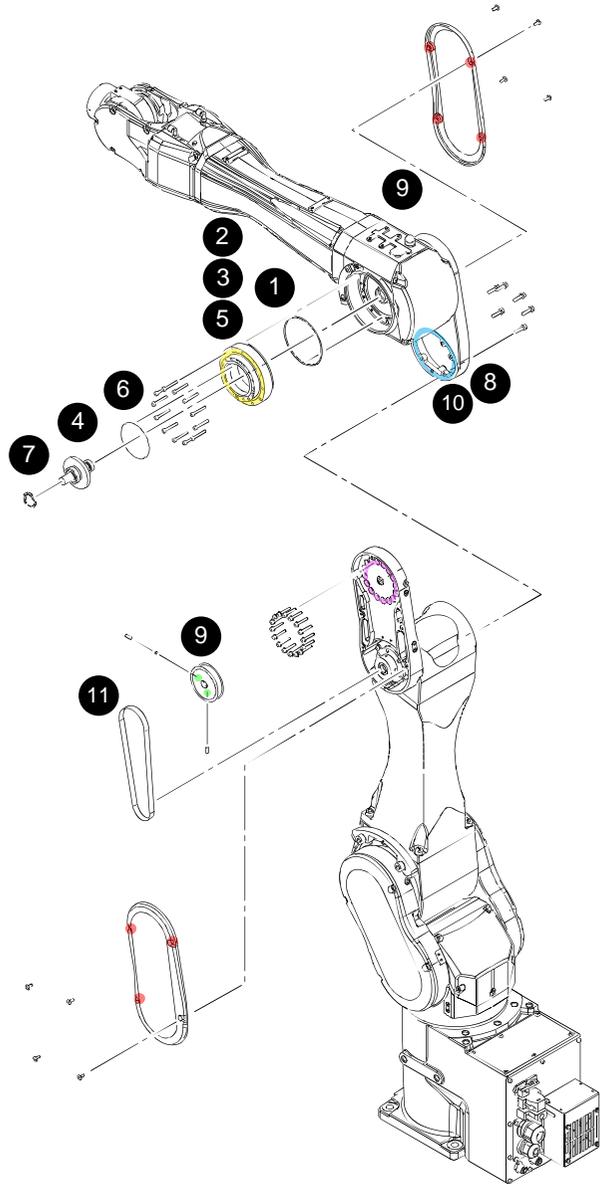


24. Tighten screws (15) and (16) to 40% and then 100% torque values.

POINT

After securing the arm, manually move the arm to check that there is no rattling or misalignment of the Reduction Gear.

Installing the Reduction Gear

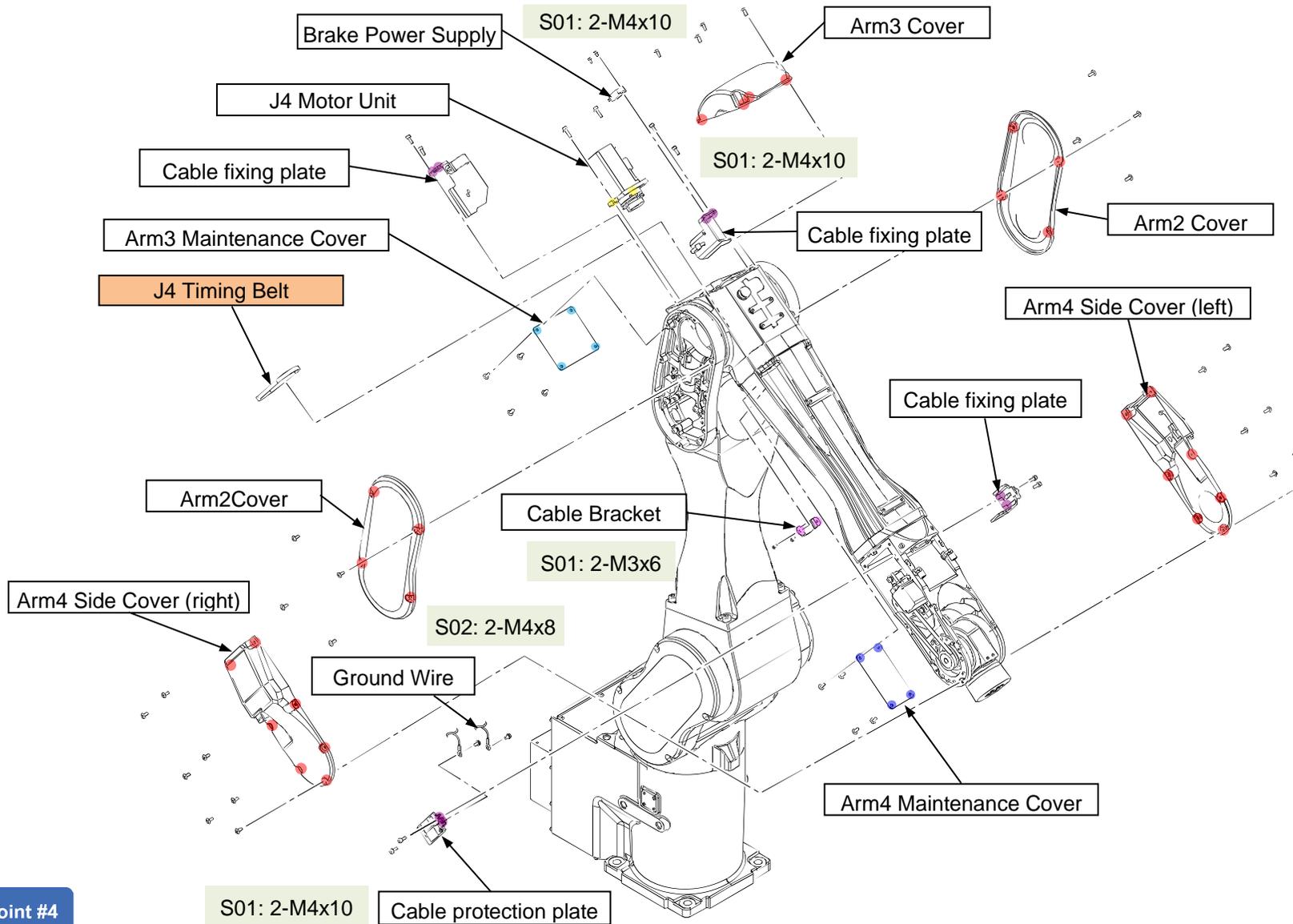


<p>10</p>	<p>Fully tighten the Arm2 side arm screws temporarily secured in step 8.</p> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 10px 0;"> <p>A S02: 6-M5x20 and washer (10.0 +/- 0.5 N·m)</p> </div>  <div style="border: 1px solid black; padding: 2px; display: inline-block; margin-left: 10px;"> <p>Arm2 side arm</p> </div>
<p>11</p>	<p>Install the J3 Timing Belt.</p>

Joint #3

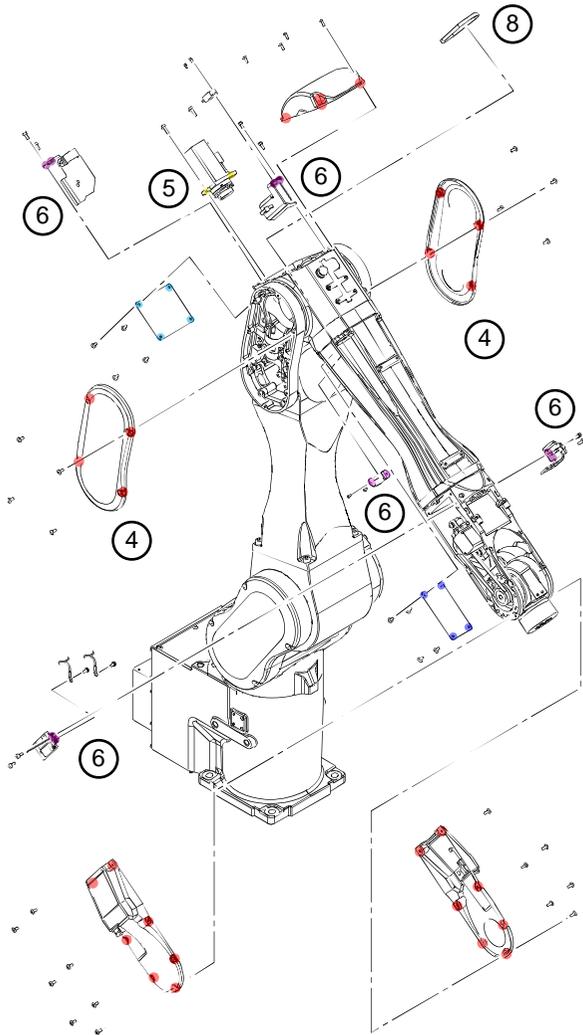
2.6 Joint #4

2.6.1 Joint #4 Replacing the Timing Belt



Joint #4

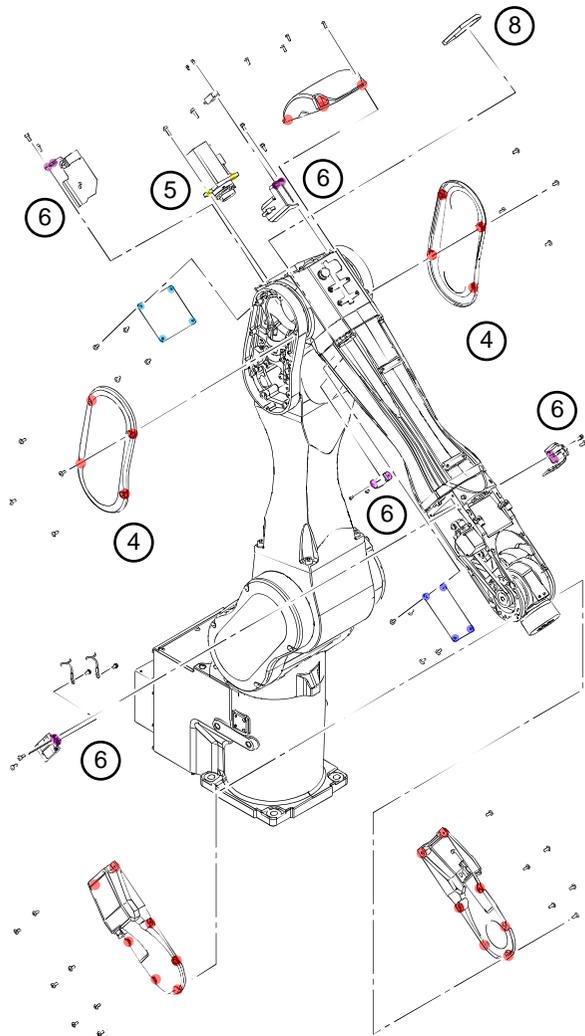
Removing the Timing Belt

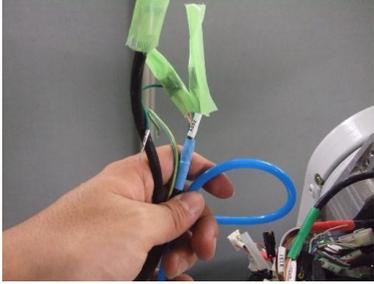
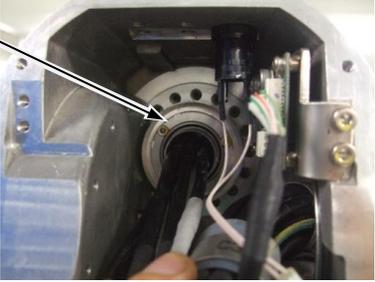


①	Turn ON the controller.
②	<p>Release the J3 brake, and manually push and move Arm3 until it comes in contact with the mechanical stopper, and push it against Arm2.</p> <p>CAUTION</p> <ul style="list-style-type: none"> • Arm3 falls by its weight when the J3 Motor unit is removed. Release the brake and tilt Arm3 in advance. • There is a possibility of hands and fingers being caught, and/or damage to or malfunction in the Manipulator. Take care during operation. 
③	Turn OFF the Controller.

Joint #4

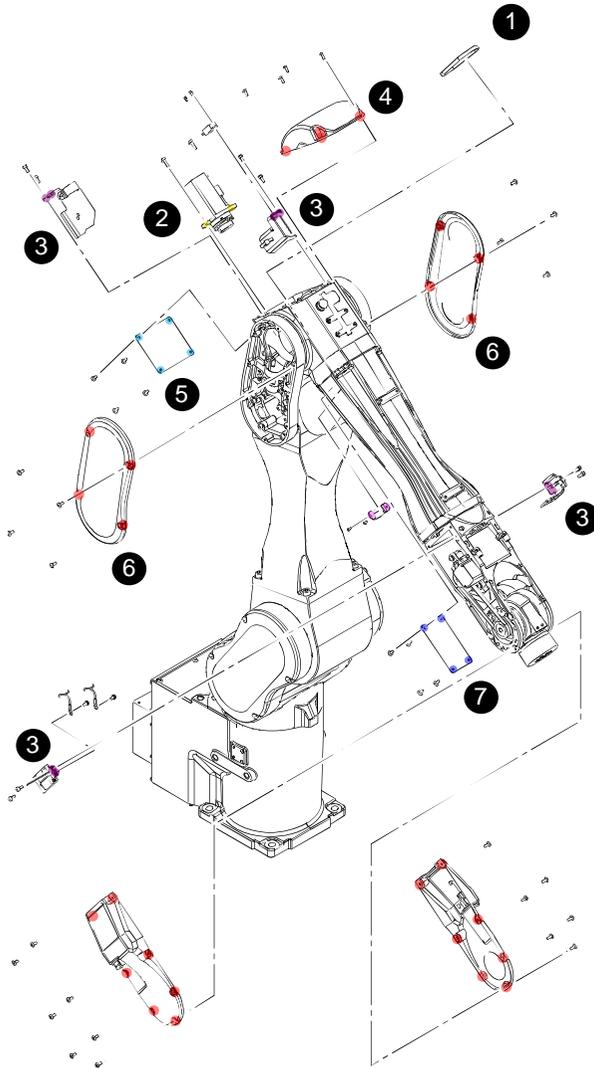
Removing the Timing Belt

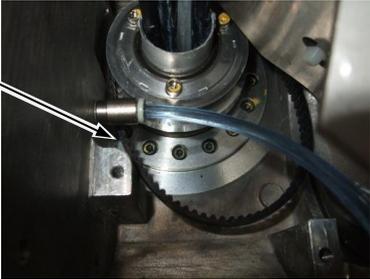
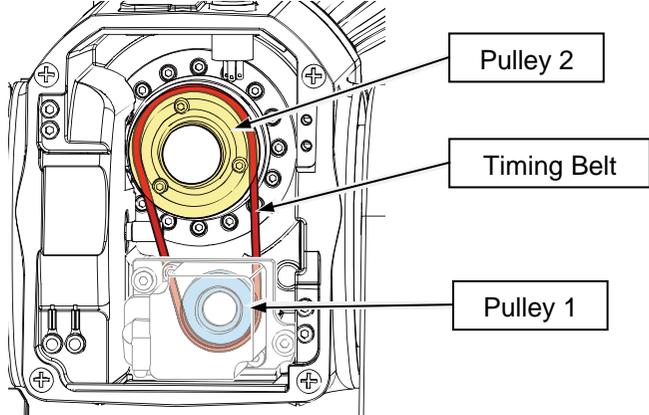


④	Remove the Arm4 side cover (both sides).
⑤	Remove the J4 Motor unit .
⑥	Removing the Cable unit . Perform step ⑧ through 11 of step ⑨.
⑦	<p>Protect pulled-out connectors with masking tape or similar.</p> <p>POINT This protects connector clips from breaking and adherence of grease during subsequent work.</p> 
⑧	<p>Remove the J4 Timing Belt from Arm3.</p> 

Joint #4

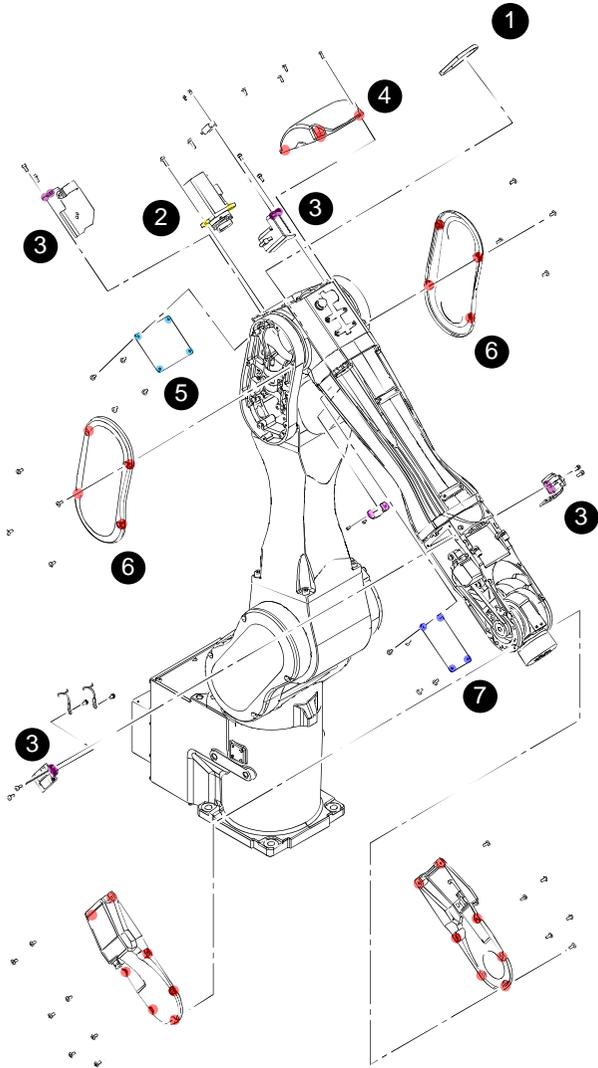
Installing the Timing Belt



<p>1</p>	<p>Set the J4 Timing Belt on pulley 2.</p>  
<p>2</p>	<p>Installing the J4 Motor Unit. Perform steps 3 and 4.</p>
<p>3</p>	<p>Installing the Cable Unit. Perform 3 of step 1 through step 4.</p>
<p>4</p>	<p>Install the Arm3 cover.</p>

Joint #4

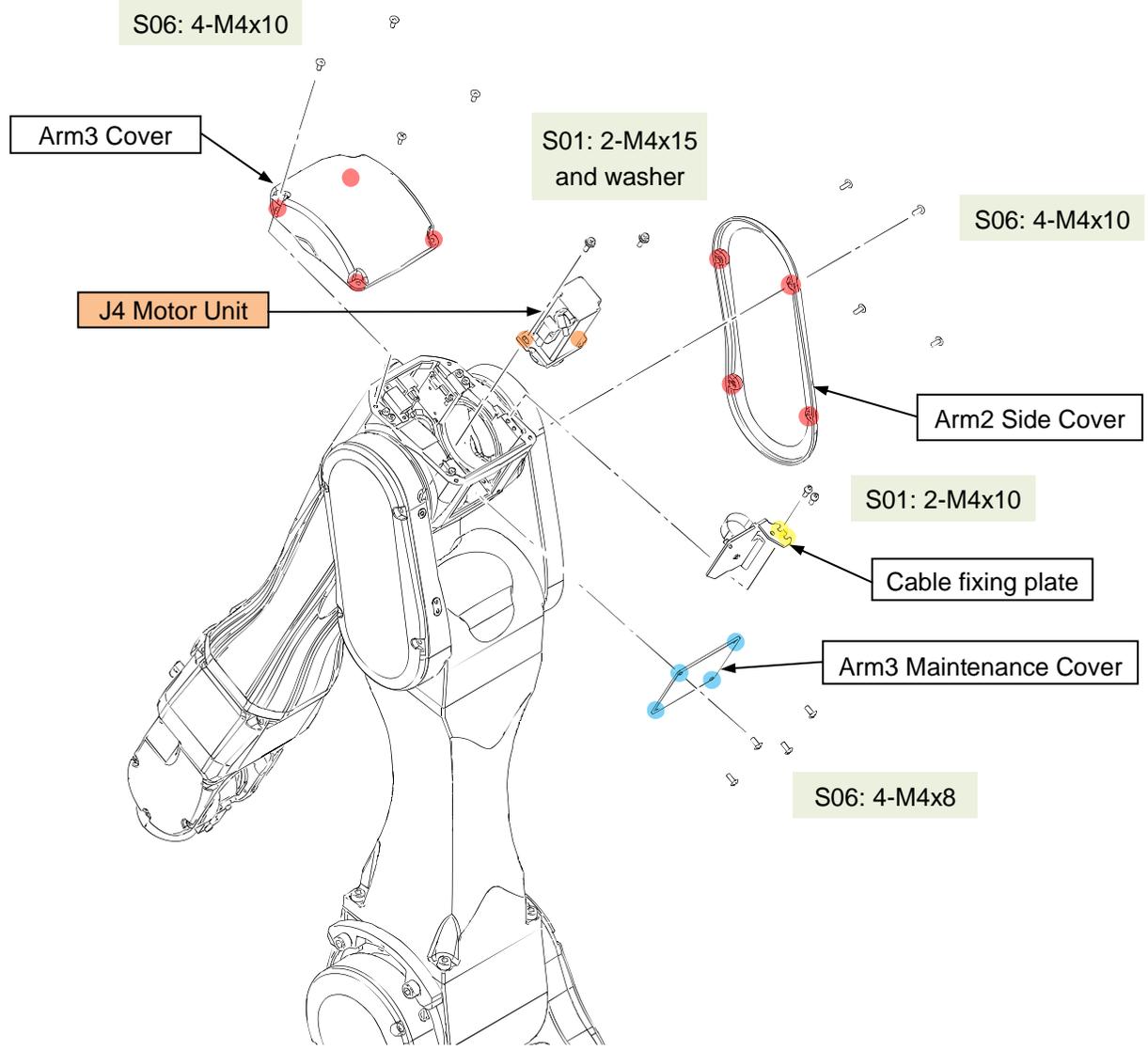
Installing the Timing Belt



5	Install the Arm3 maintenance cover .
6	Install the Arm4 side cover (both sides).
7	Install the Arm4 maintenance cover .
8	After assembly, perform calibration of Joint #4. 3.2 Calibration

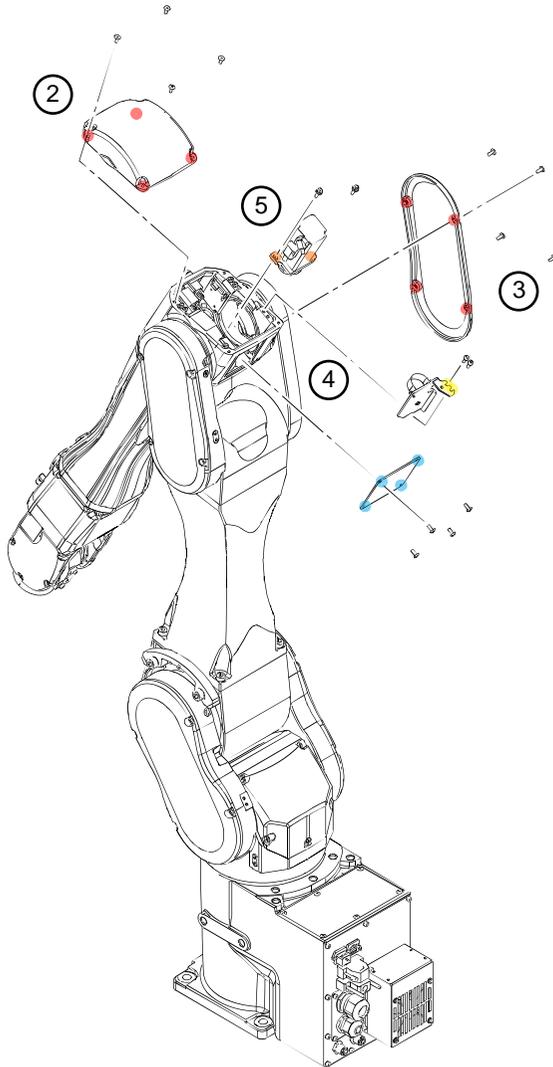
Joint #4

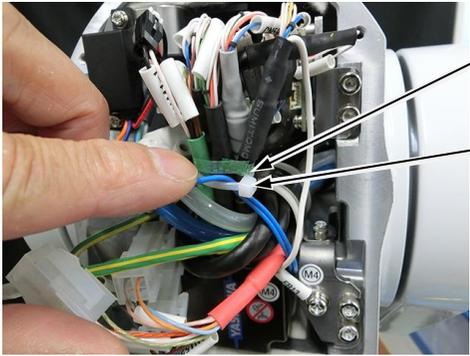
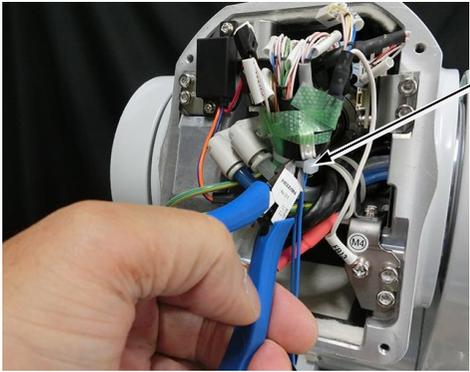
2.6.2 Joint #4 Replacing the Motor Unit



Joint #4

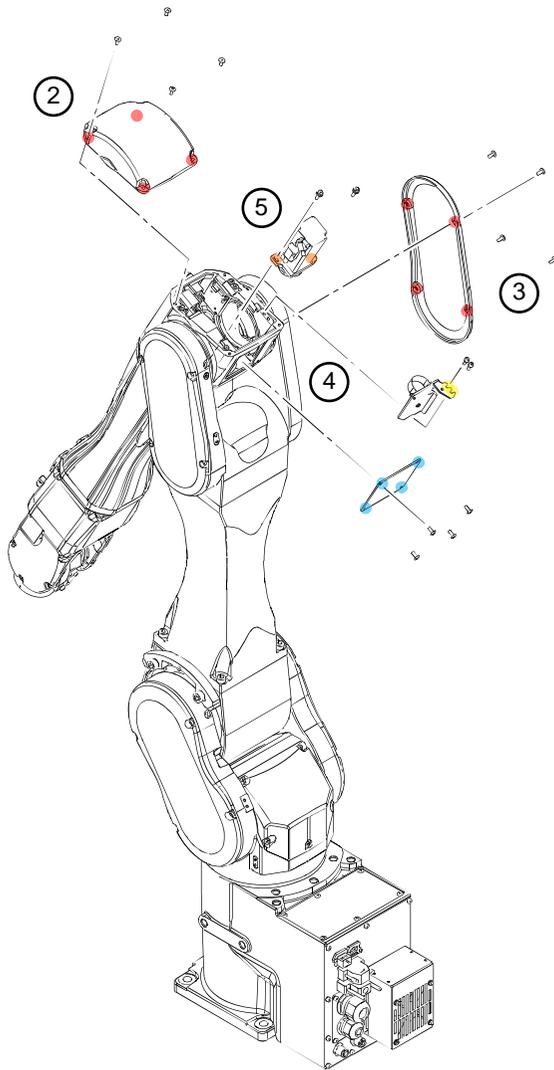
Removing the Motor Unit



①	Turn OFF the Controller.
②	Remove the Arm3 cover .
③	Remove the Arm2 side cover (both sides).
④	<p>Disconnect the J4 Motor Connectors (CN141, CN341, CN440).</p> <p>1. Using a marker pen or tape, mark all of the cables bound with the wire tie as shown in the figure.</p>  <p>2. Cut the wire tie.</p>  <p>3. Remove the connectors (CN440, CN141, CN341).</p>

Joint #4

Removing the Motor Unit

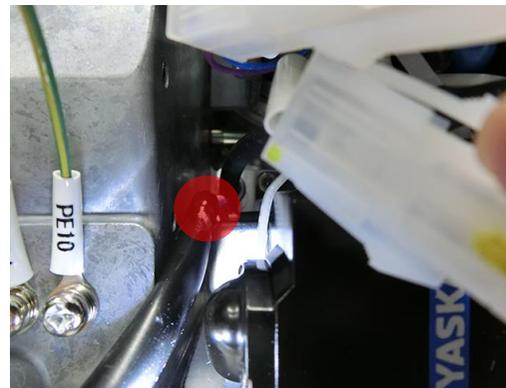
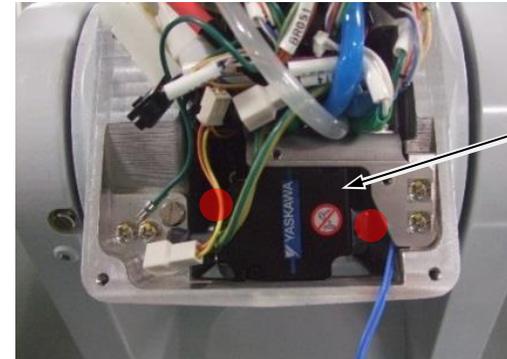


⑤ Remove the screws securing the J4 Motor Plate, and remove the J4 Motor unit from Arm3.

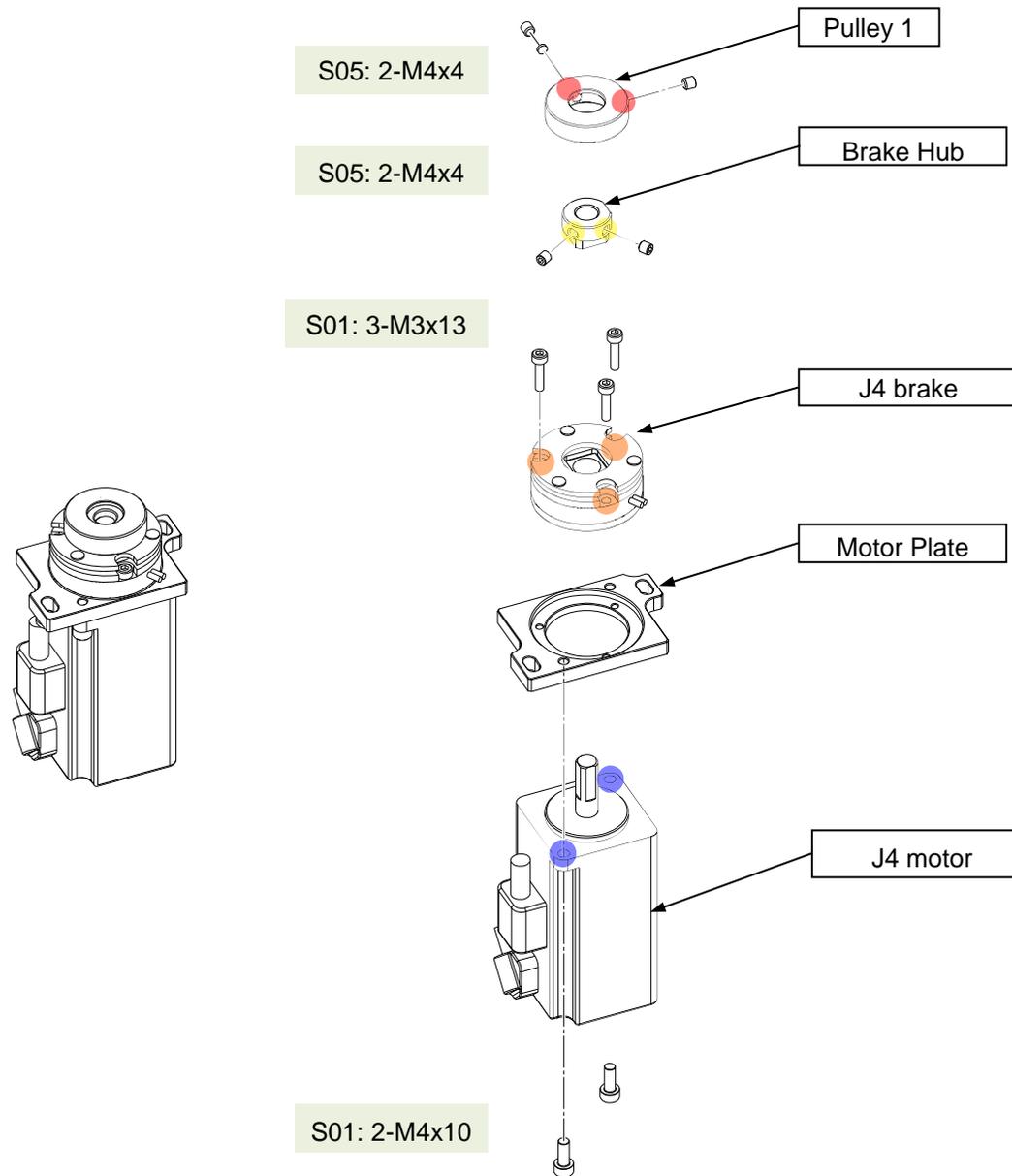
POINT

- The J4 Motor Plate screws are at a position approximately 120 mm in.
- Remove the screws securing the Motor Plate to the arm as shown in the figure. Take care not to remove the screws securing the motor itself to the Motor Plate.

A S01: 2-M4x15 and washer

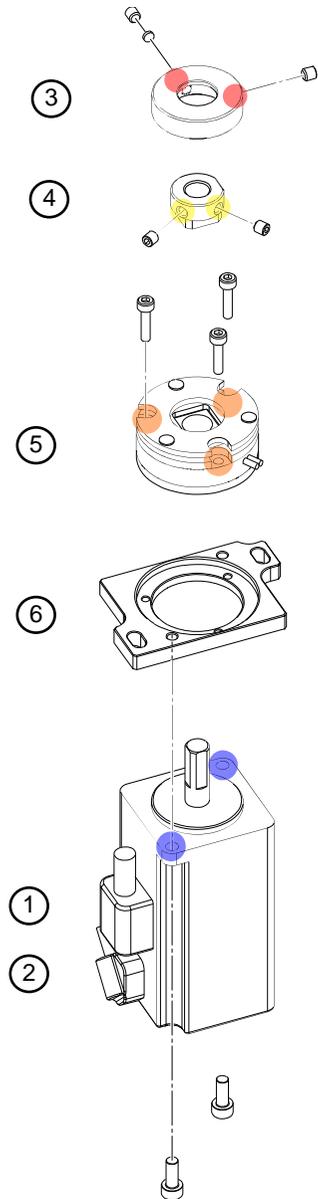


Motor Unit Disassembly



Joint #4

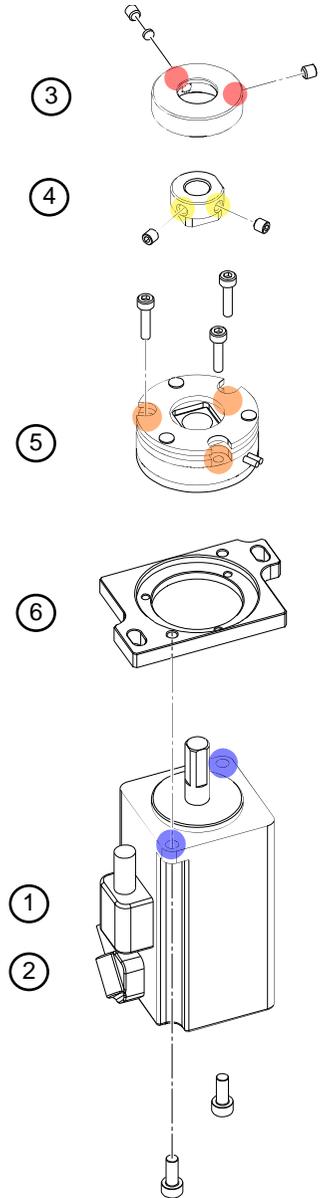
Motor Unit Disassembly



①	Remove the J4 Motor unit .
②	Cut the wire tie (AB100) securing the brake and motor cable to the motor. 

Joint #4

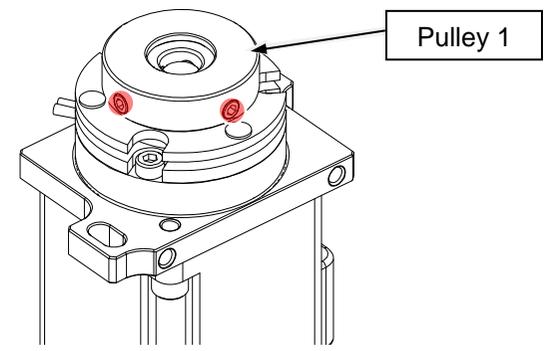
Motor Unit Disassembly



Joint #4

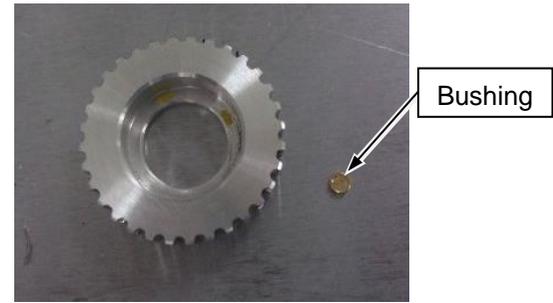
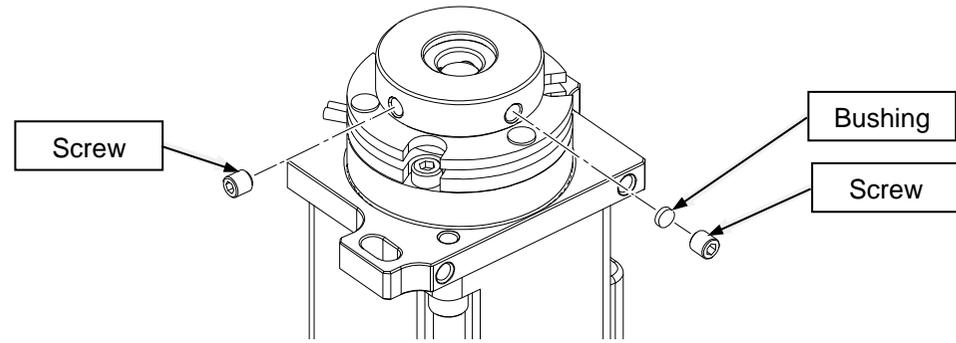
③ Remove pulley 1.

A S05: 2-M4x4

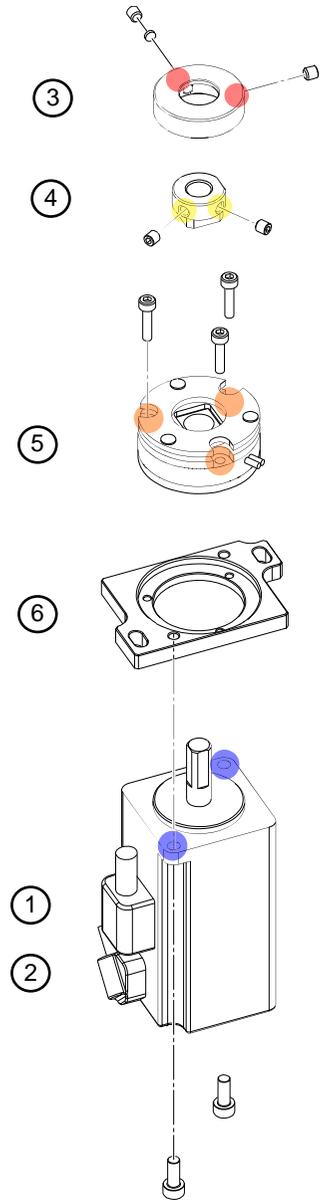


CAUTION

A brass bushing is included on one of the set screws. When removing the pulley, be careful not to drop and lose the bushing.

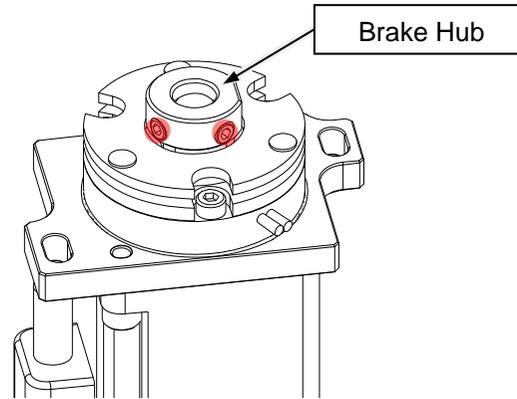


Motor Unit Disassembly



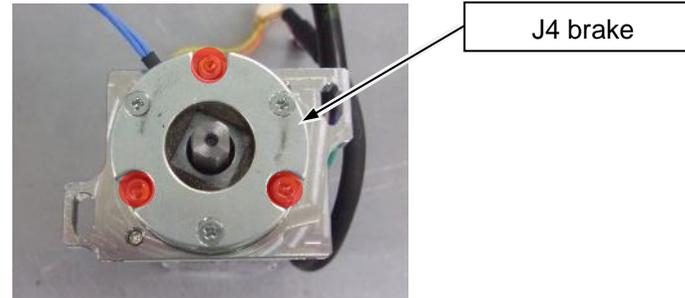
④ Remove the Brake Hub.

A S05: 2-M4x4



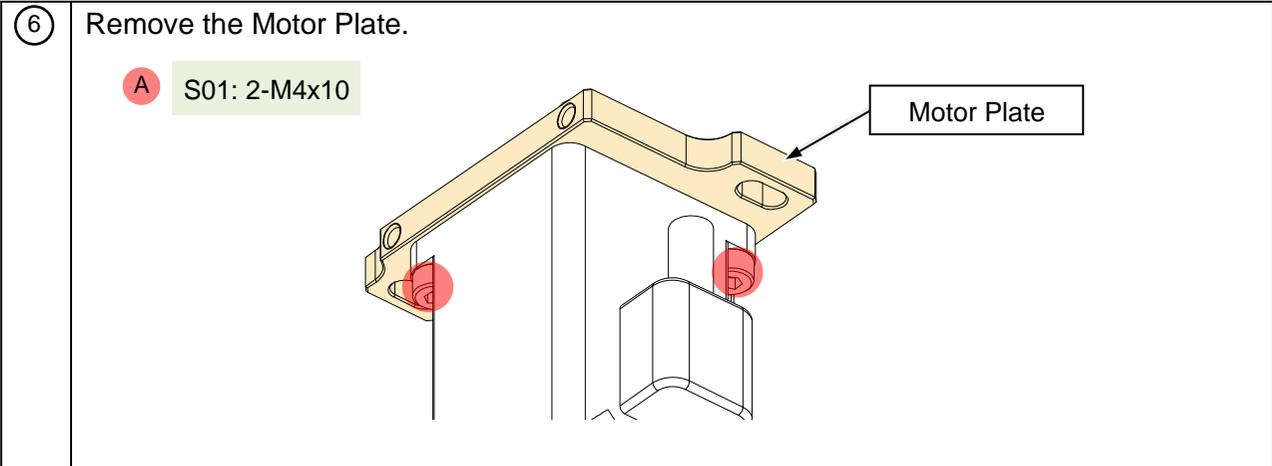
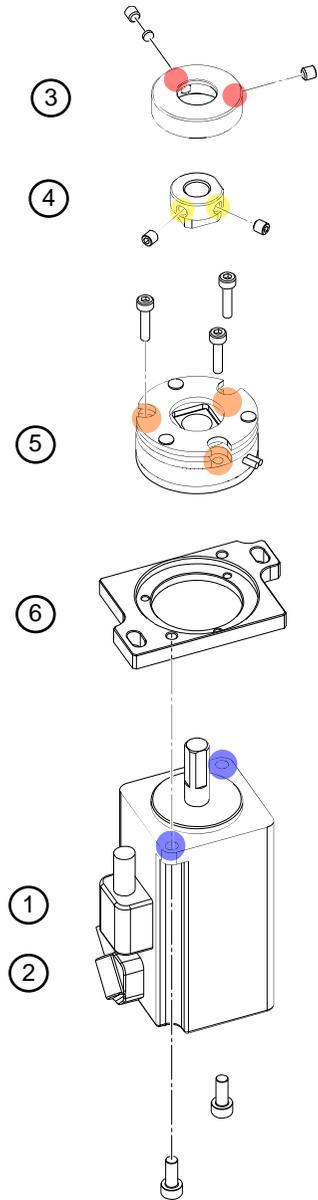
⑤ Remove the J4 brake.

A S01: 3-M3x13



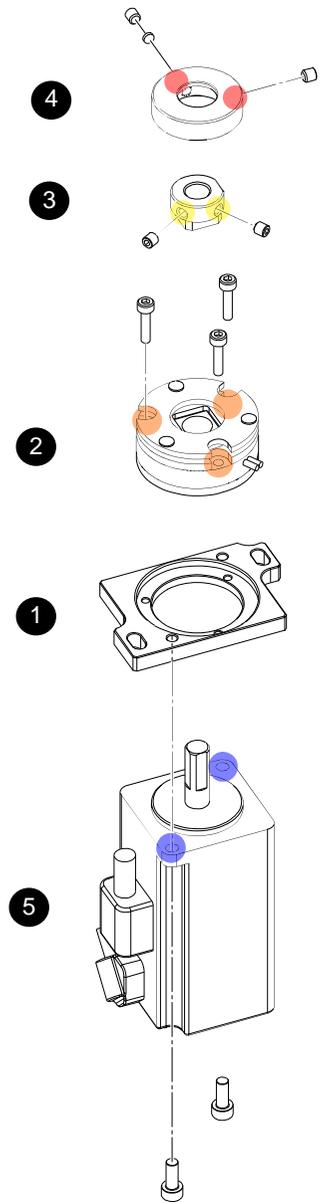
Joint #4

Motor Unit Disassembly



Joint #4

Motor Unit Assembly



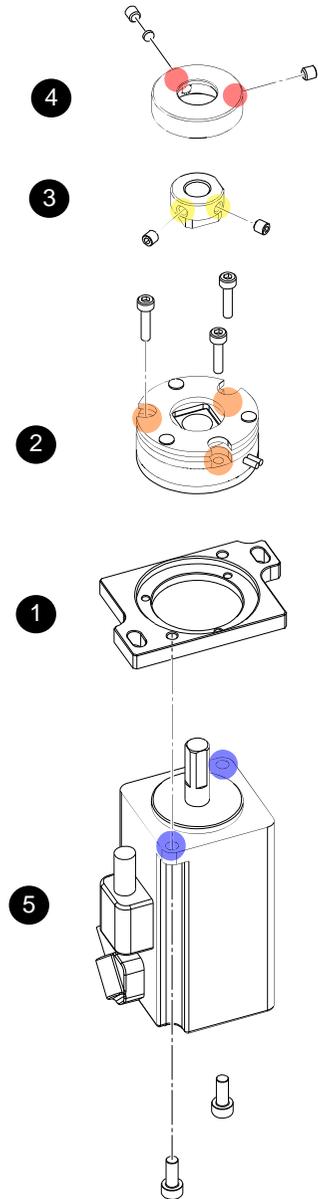
Joint #4

1 Install the Motor Plate.

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)

POINT
Install with the orientation shown in the figure.

Motor Unit Assembly



Joint #4

2 Install the J4 brake.

A S01: 3-M3x13
(2.0 +/- 0.1 N·m)

POINT
Install with the orientation shown in the figure.

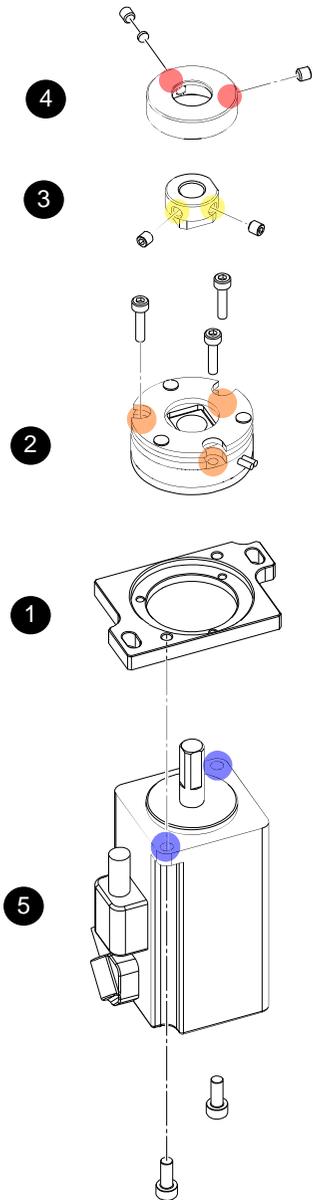
J4 brake

Brake cable

J4 Motor

Motor cable

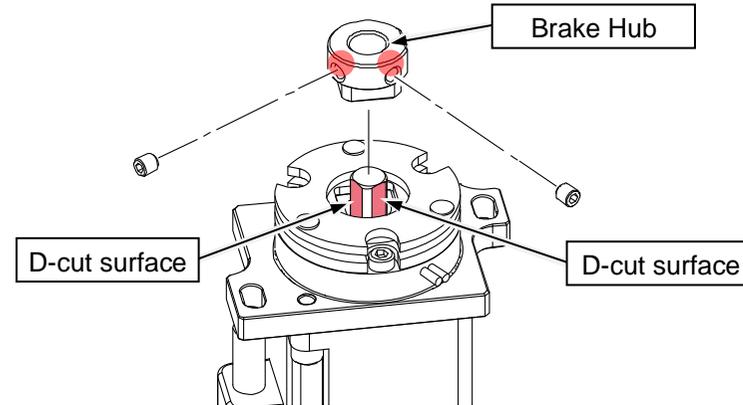
Motor Unit Assembly



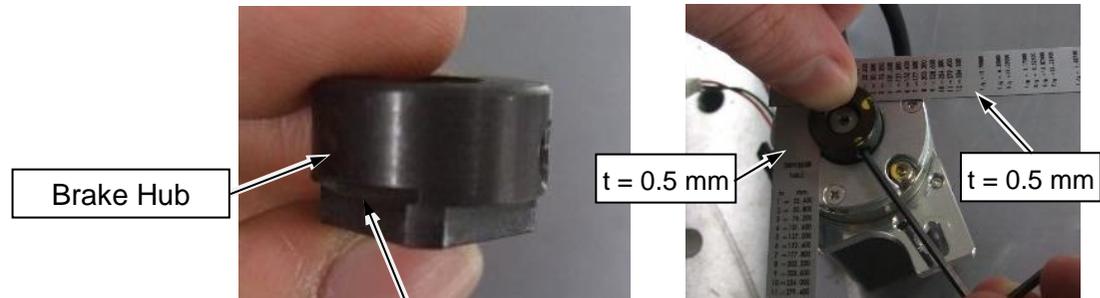
3

Install the Brake Hub.

1. Align the motor shaft D-cut surface with the screw holes, and set the Brake Hub.



2. Place 0.5-mm feeler gauges or scales on the brake to ensure a 0.5-mm gap between the Brake Hub and the brake.



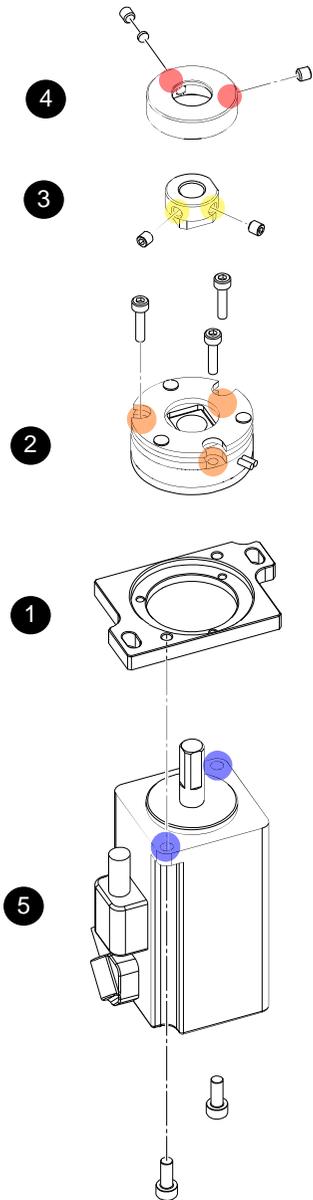
Two uneven parts for the feeler gauge (0.5 mm) at 90° pitch

CAUTION

Failure to create a proper gap between the Brake Hub and the brake may cause the parts to rub during motor operation, causing a malfunction.

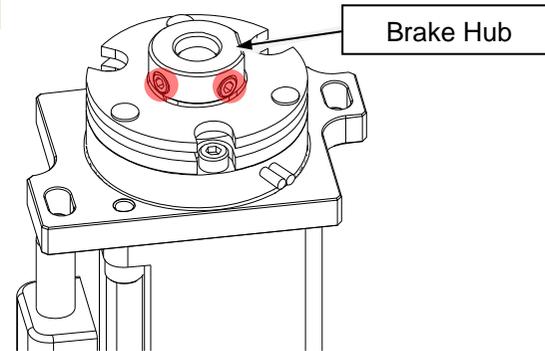
Joint #4

Motor Unit Assembly



3. Secure the Brake Hub with set screws.

A S05: 2-M4x4 (1.6 +/- 0.1 N·m)

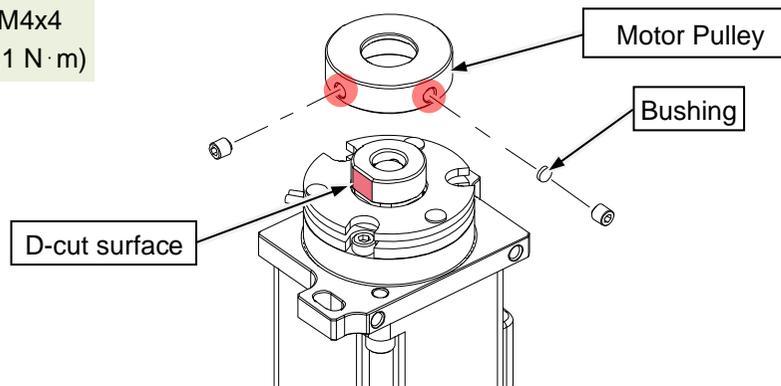


4 Install the Motor Pulley.

POINT

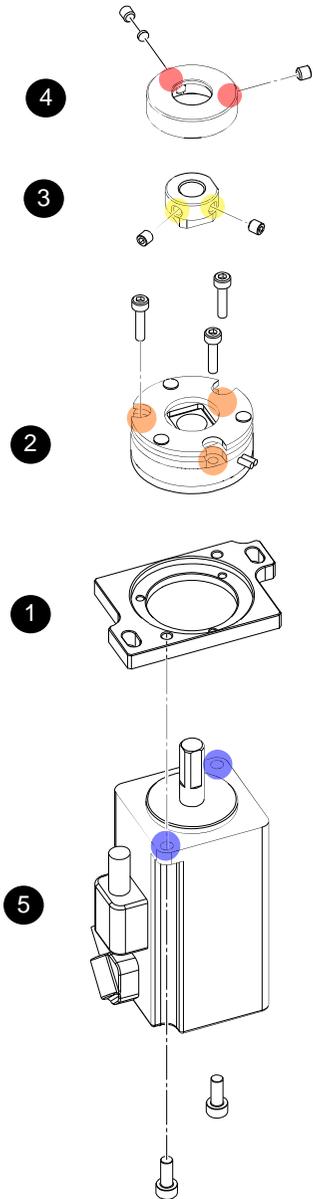
- Align the D-cut surfaces with the screw holes, and install the Motor Pulley.
- Install the bushing on the side without the D-cut.
- Tighten the screws while pressing the Motor Pulley against the Brake Hub.

A S05: 2-M4x4
(1.6 +/- 0.1 N·m)



Joint #4

Motor Unit Assembly



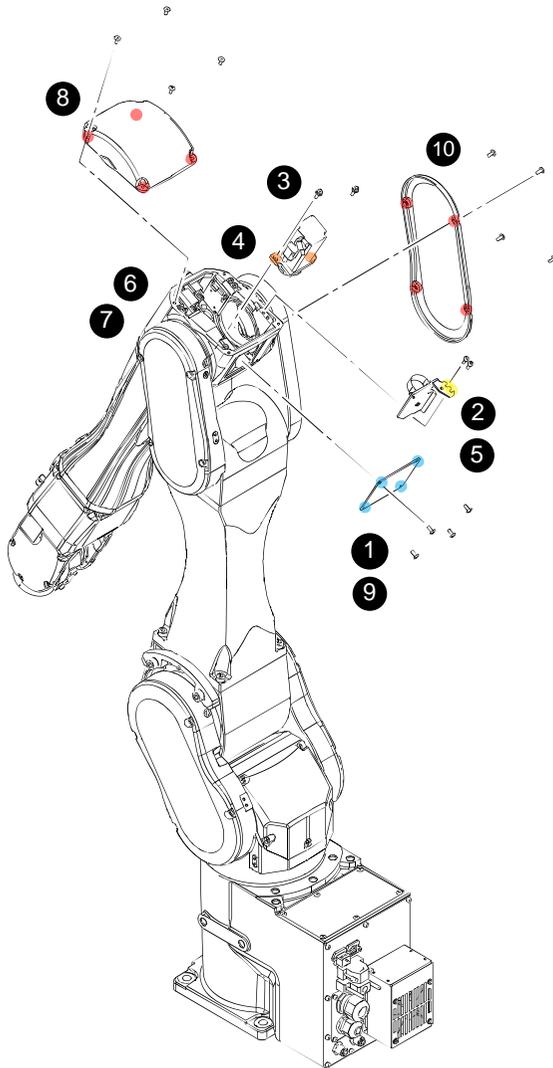
5

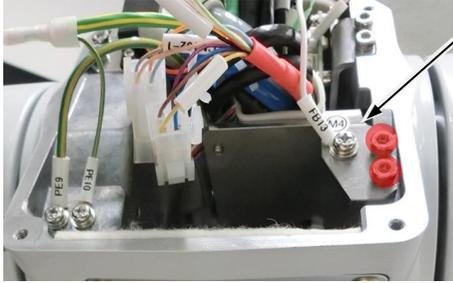
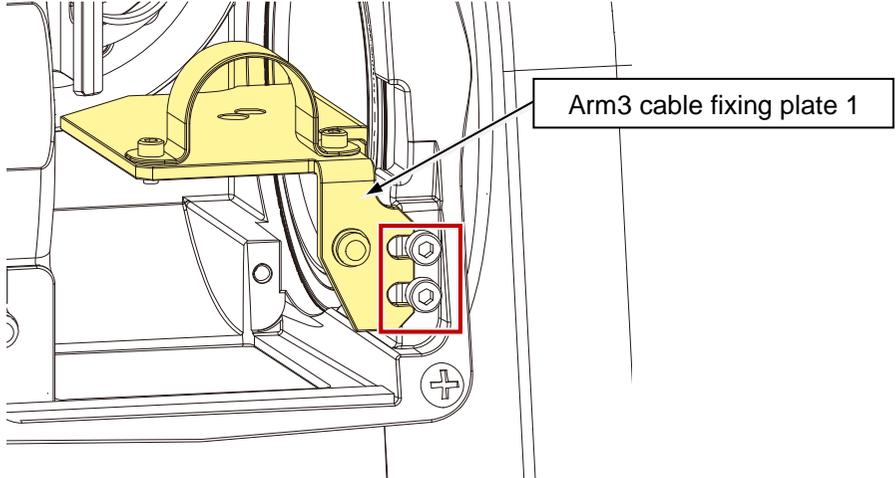
Secure the cables to the Motor Unit with the wire tie (AB200) as shown in the figure.



Joint #4

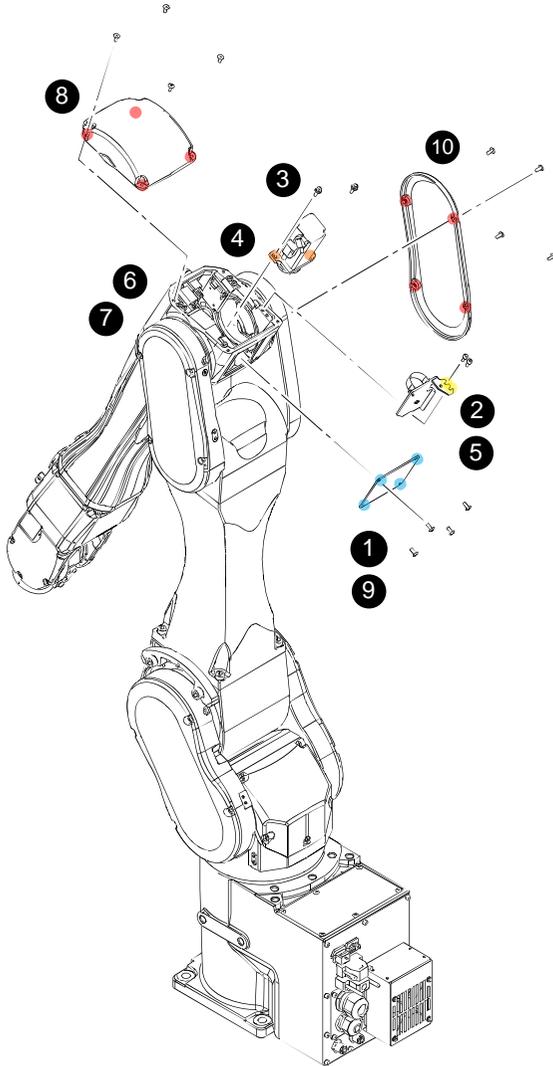
Installing the Motor Unit



1	Remove the Arm3 maintenance cover .
2	Loosen the screws on the Arm3 cable fixing plate 1, and remove the plate. <div style="margin-top: 10px;"> <p>A S01: 2-M4x10</p>  <p style="text-align: right;">Arm3 cable fixing plate 1</p> </div> <p>POINT Slide the cutout section on the Arm3 cable fixing plate 1.</p>  <p style="text-align: right;">Arm3 cable fixing plate 1</p>

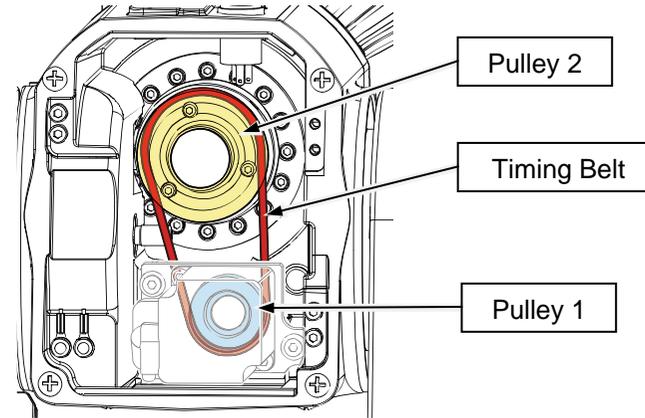
Joint #4

Installing the Motor Unit

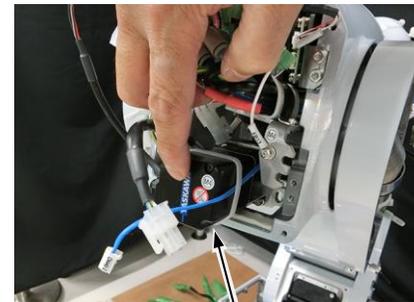


3

Install the J4 Motor unit.
Refer to the figure below for each part name.



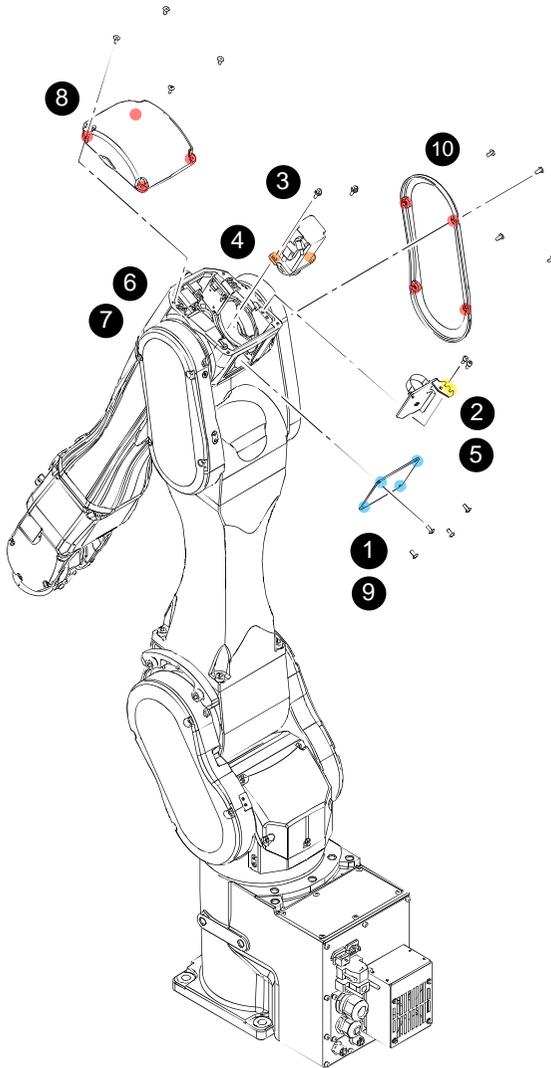
1. With the Timing Belt correctly engaged with pulley 2, insert the J4 Motor into the arm while lifting the Arm3 cable fixing plate 1.



J4 Motor unit

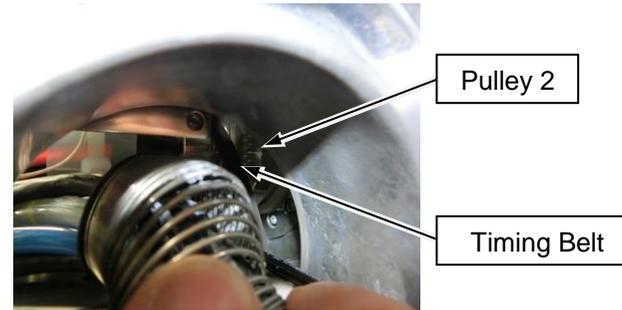
Joint #4

Installing the Motor Unit



POINT

The Timing Belt may not be engaged with pulley 2, as shown in the figure. Check that it is correctly engaged with pulley 2.



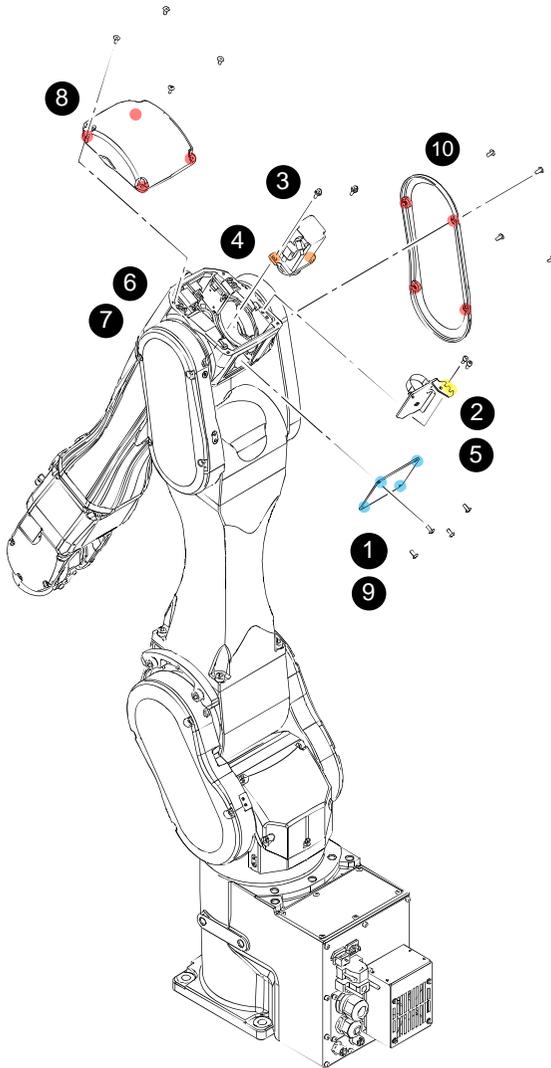
2. Set the Timing Belt on pulley 1.

POINT

Adjustment of the position of the J4 Motor up or down when setting the Timing Belt on pulley 1 can be easily performed from the Arm3 maintenance cover side.

Joint #4

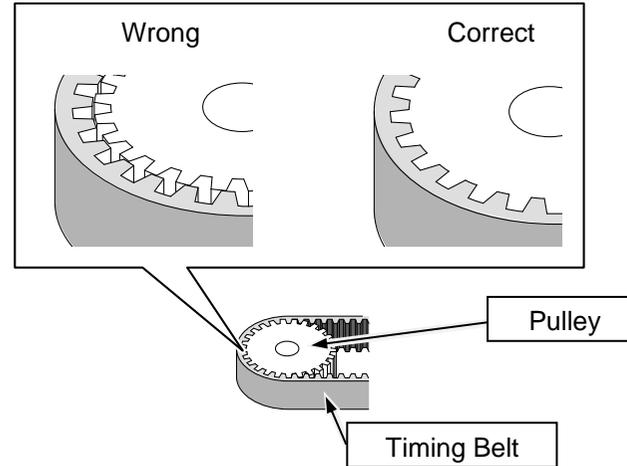
Installing the Motor Unit



Joint #4

POINT

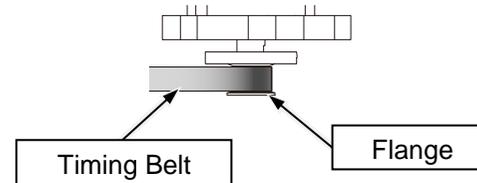
- Make sure that the teeth of the Timing Belt and the pulley are properly engaged. Check from the three locations of the Arm2 side cover, Arm3 maintenance cover, and Arm3 cover.



- The standard for temporary fastening is where the Motor Unit can be moved by hand and will not tilt when pulled. If this is either too loose or too tight, it will not provide the proper tension to the belt.

CAUTION

If the Timing Belt is placed on the flange, correct tension will not be obtained during belt tension adjustment.



Set the belt so that it is level with respect to the pulley without it being placed on the flange.

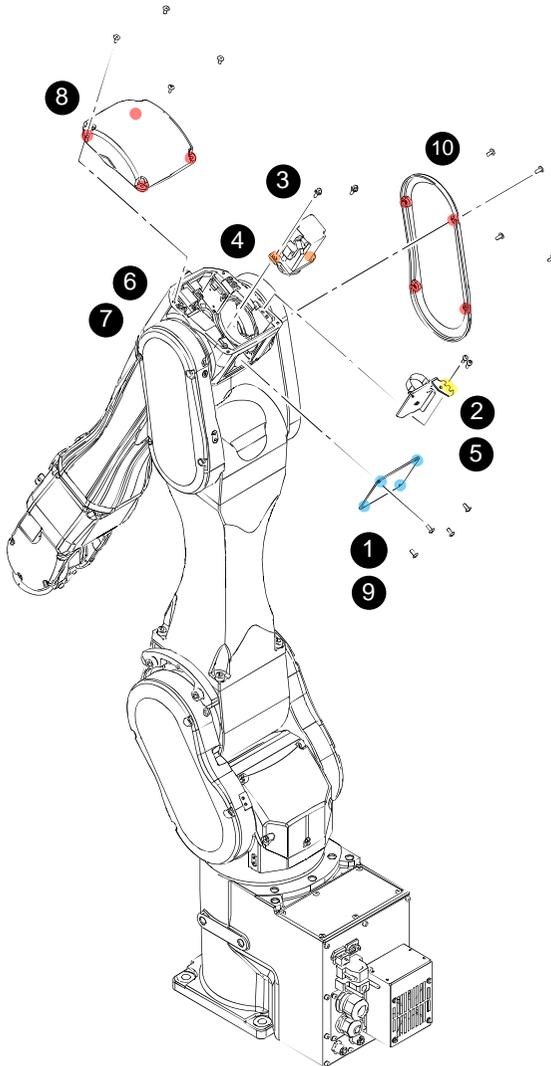
3. Temporarily secure the J4 Motor unit.

A S01: 2-M4x15 and washer

4 Adjust the belt tension.

[3.1 Adjusting the Timing Belt Tension](#)

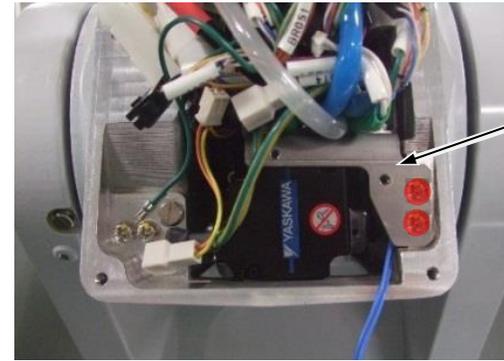
Installing the Motor Unit



5

Secure the cable fixing plate to Arm3.

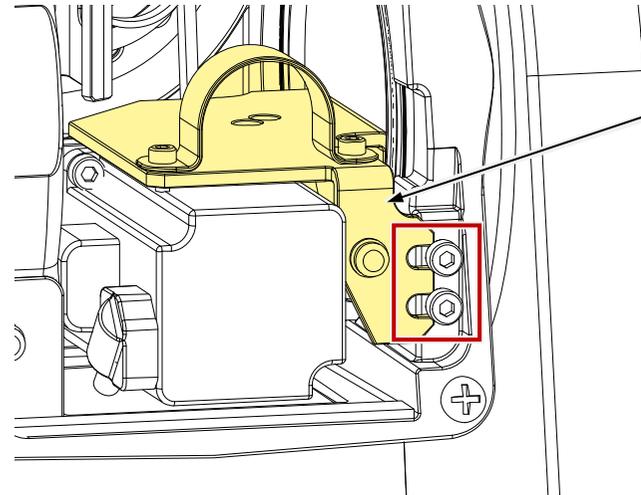
A S01: 2-M4x10 (4.0 +/- 0.2 N·m)



Cable fixing plate

POINT

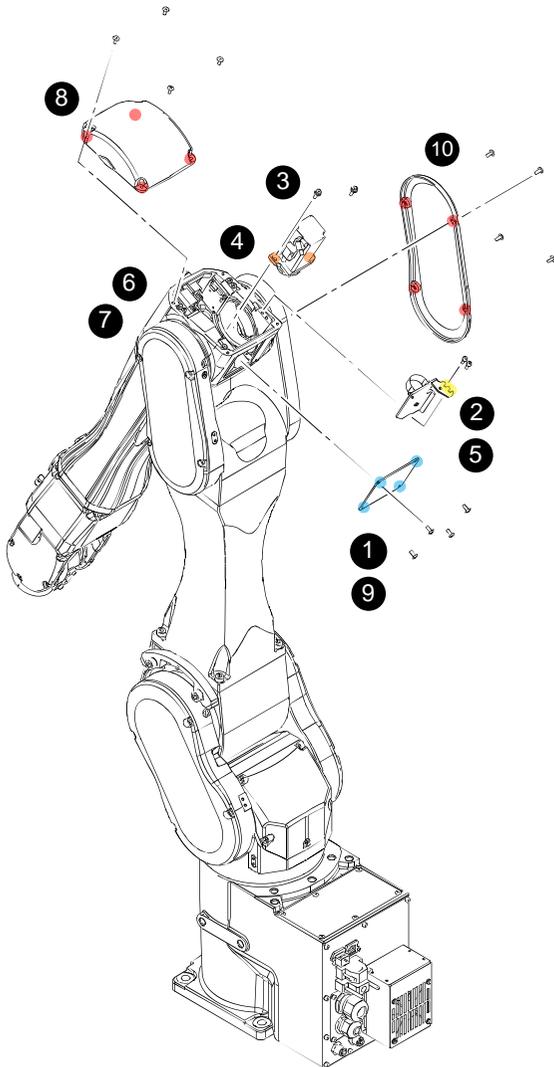
Slide the cutout section on the cable fixing plate, and secure with screws.



Cable fixing plate

Joint #4

Installing the Motor Unit



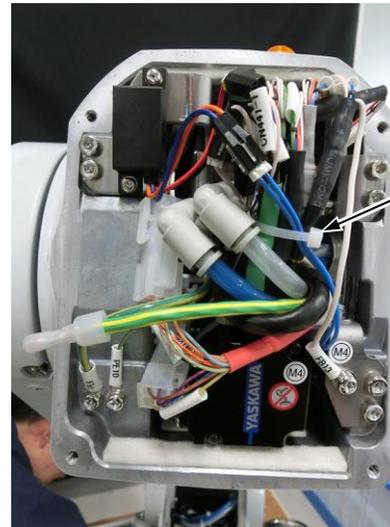
6

Connect the J4 Motor Connectors (CN141, CN341, CN440).



7

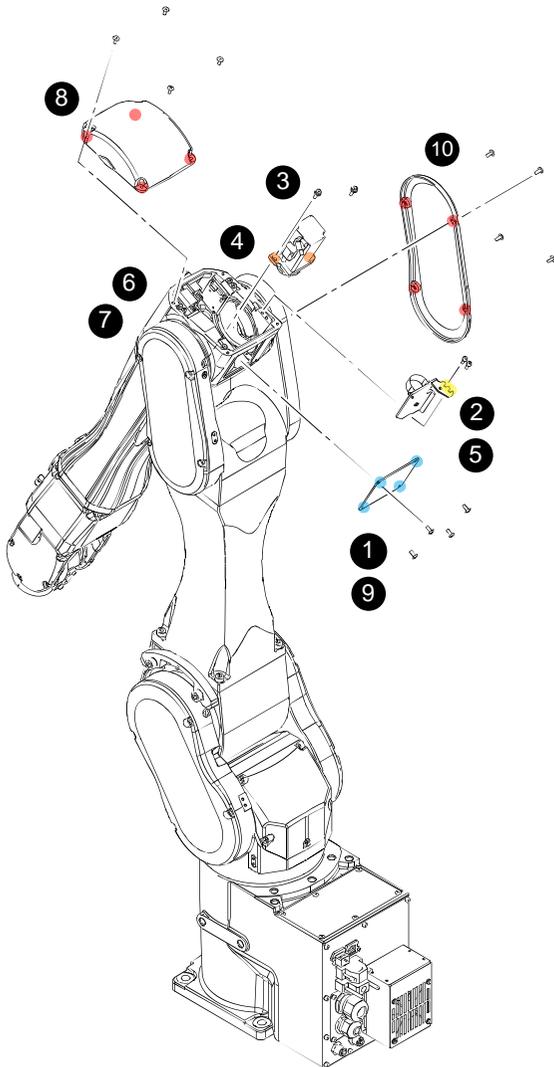
Bind the following connector cables using the wire tie (AB200).
CN341, CN592, CN522, CN521, CN203, LED, CN441, CN440



Wire tie

Joint #4

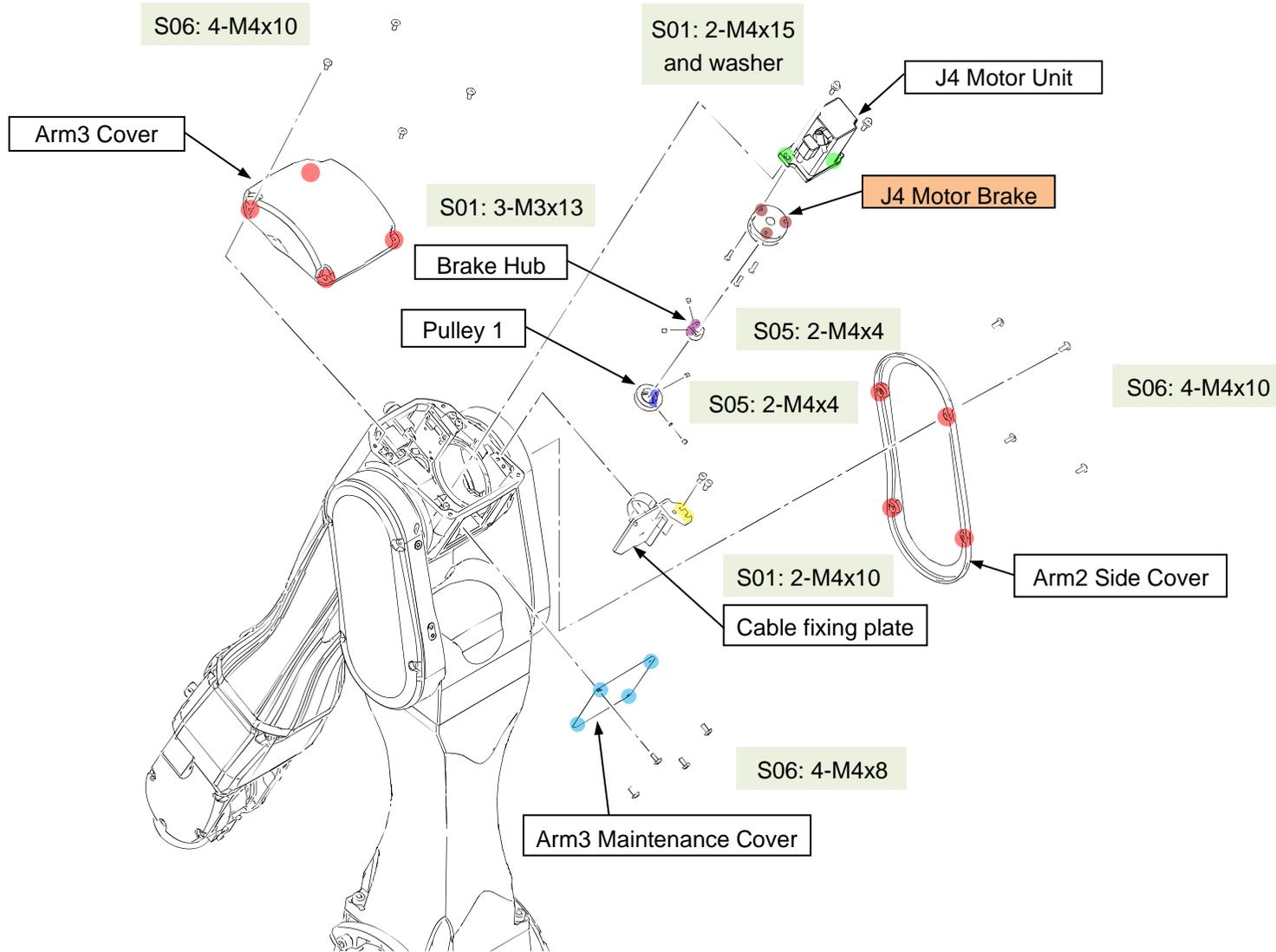
Installing the Motor Unit



8	Install the Arm3 cover .
9	Install the Arm3 maintenance cover .
10	Install the Arm2 side cover .
11	After assembly, perform calibration of Joint #4. 3.2 Calibration

Joint #4

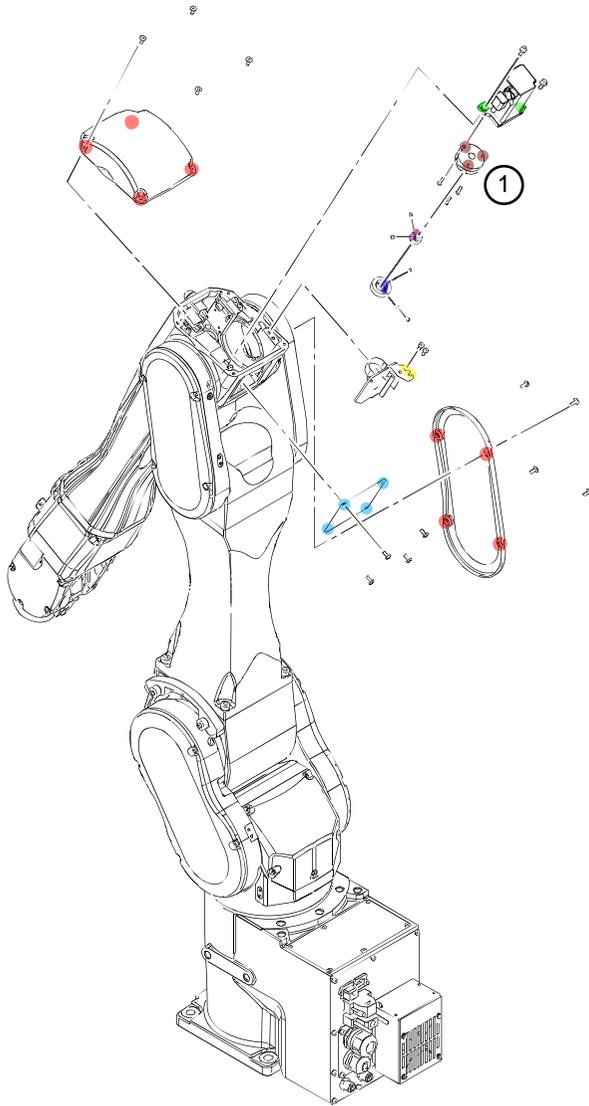
2.6.3 Joint #4 Replacing the Brake



Joint #4

Removing the Brake

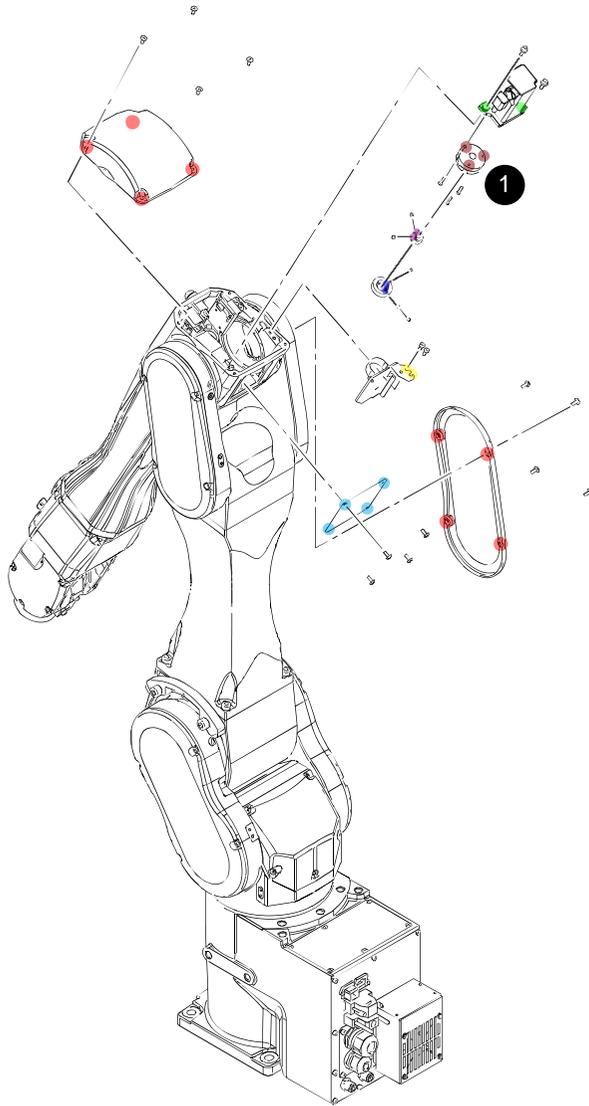
- | | |
|---|---|
| ① | Refer to J4 Motor Unit Disassembly and remove the J4 brake. |
|---|---|



Joint #4

Installing the Brake

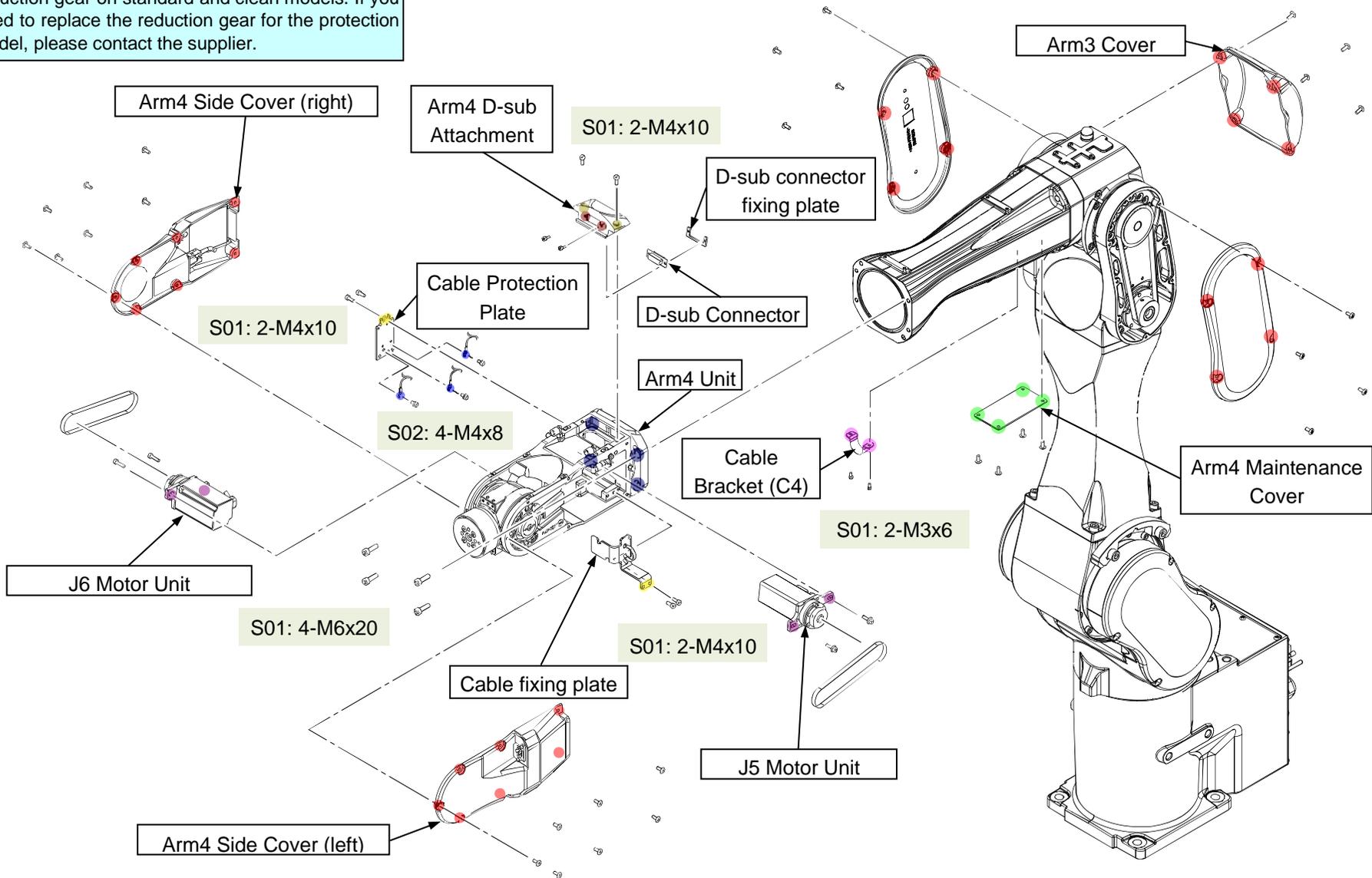
- | | |
|----------|---|
| 1 | Refer to J4 Motor Unit Assembly and install the J4 brake. |
|----------|---|



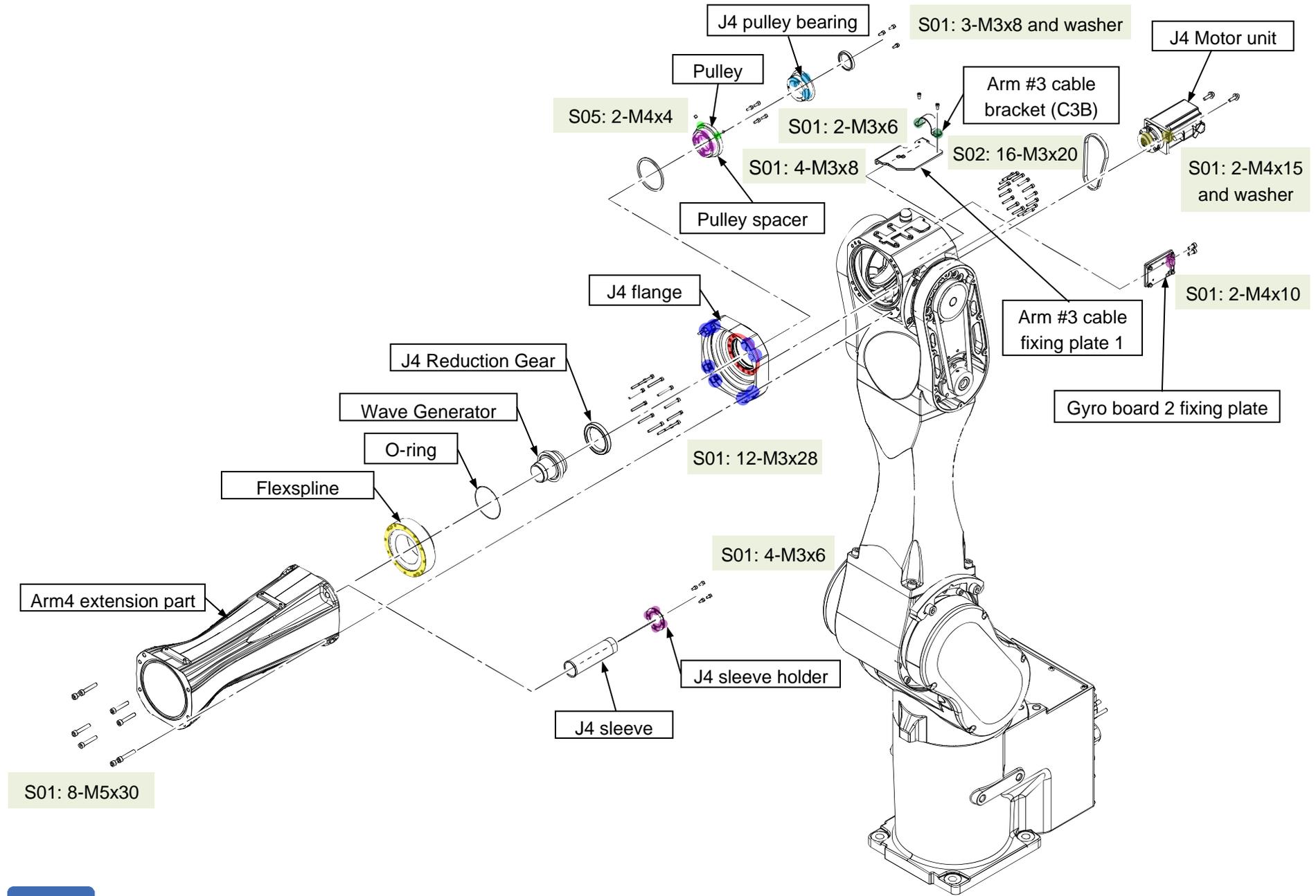
Joint #4

2.6.4 Joint #4 Replacing the Reduction Gear Unit

This section provides procedures for replacing the reduction gear on standard and clean models. If you need to replace the reduction gear for the protection model, please contact the supplier.

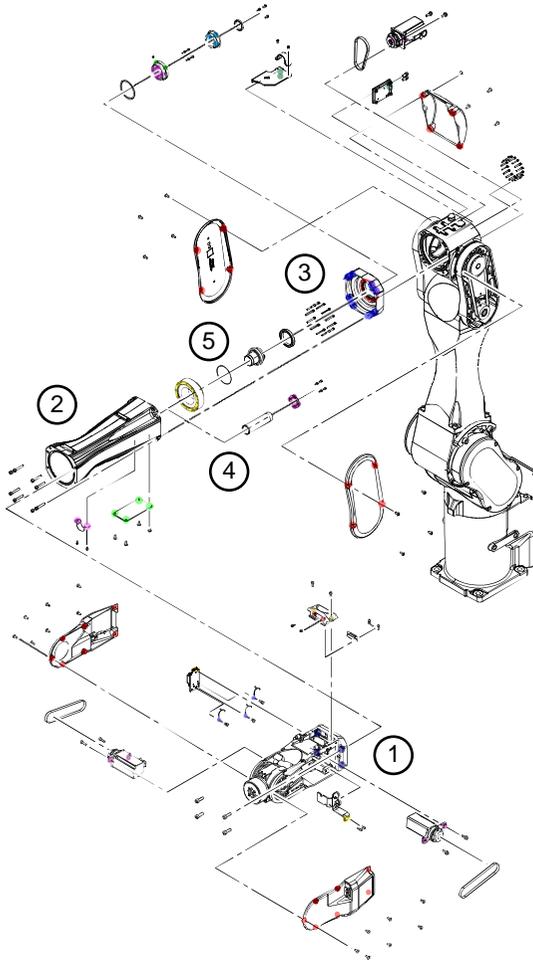


Joint #4



Joint #4

Removing the Reduction Gear Unit

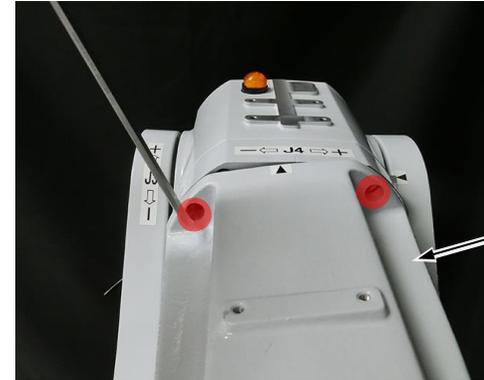


① Refer to [Removing the Arm4 Unit](#) and remove the Arm4 Unit.

② Remove the Arm4 extension part.

1. Rotate the Arm4 extension part and shift its position to make the bolt head visible.
2. Remove the bolt with the exposed head.

A S02: 8-M5x30

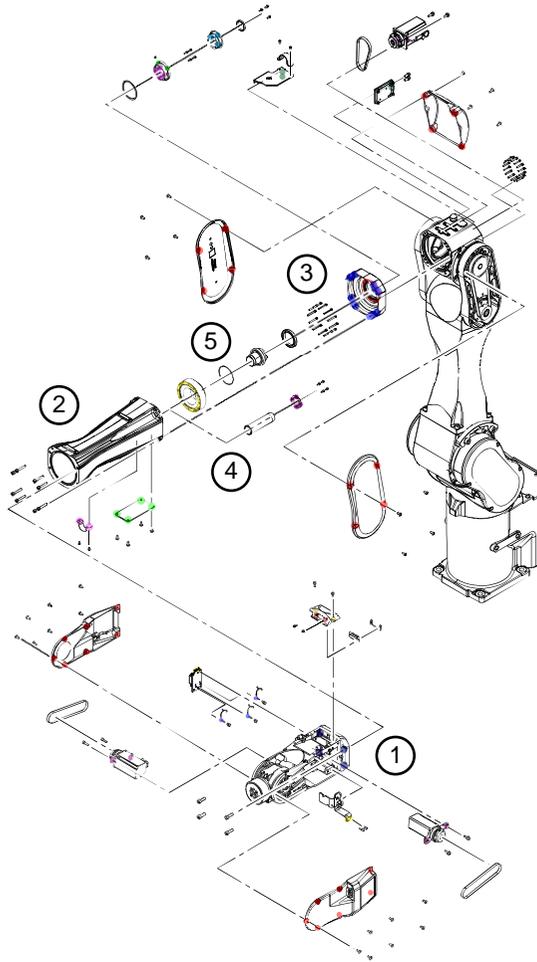


3. Similarly, rotate the Arm4 extension part and shift its position to make the other bolt head visible. Use this same method to remove all the bolts.
4. Pull out the Arm4 extension part from Arm3.

POINT

Arm3 and the Arm4 extension part have a mating surface configuration. Pull out the Arm4 extension part while moving it slightly up and down, and back and forth.

Removing the Reduction Gear Unit



③

Remove the J4 Reduction Gear Unit.

1. Remove the J4 flange and Wave Generator.

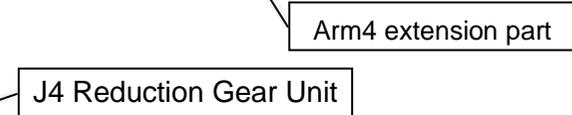
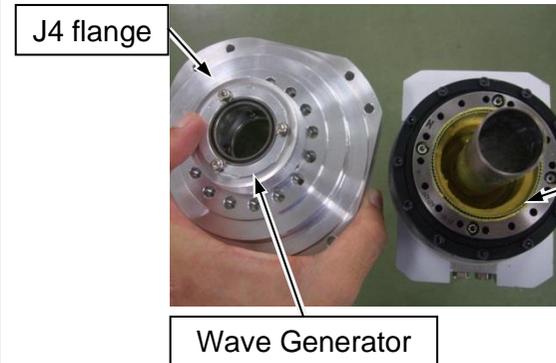
POINT

If it is difficult to remove them, insert a tool between the J4 flange and the arm, and widen the gap between them little by little.

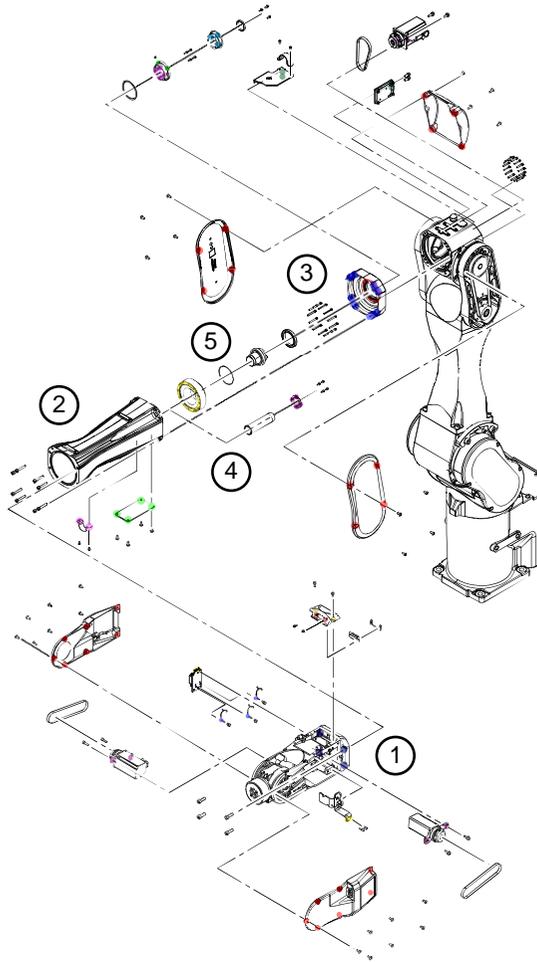
CAUTION

Be careful not to damage the parts.

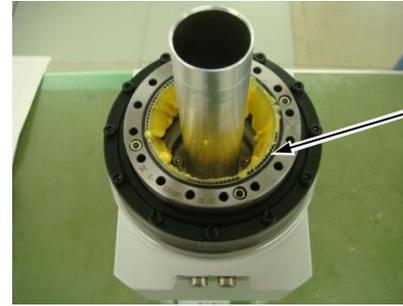
A S02: 16-M3x20



Removing the Reduction Gear Unit

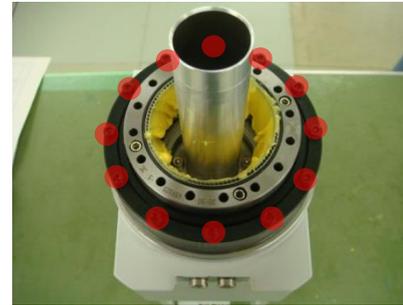


2. Remove the O-ring.

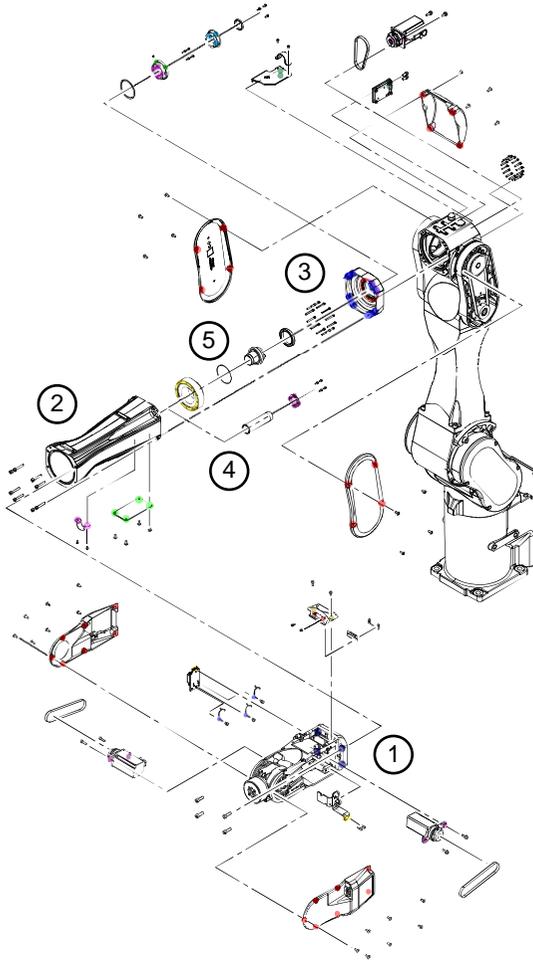


3. Remove the J4 Reduction Gear Unit.

A S02: 12-M3x28



Removing the Reduction Gear Unit



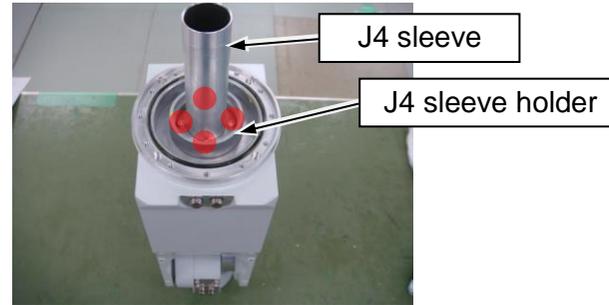
④

1. Remove the J4 sleeve holder.

A

S01: 4-M3x6

2. Remove the J4 sleeve.

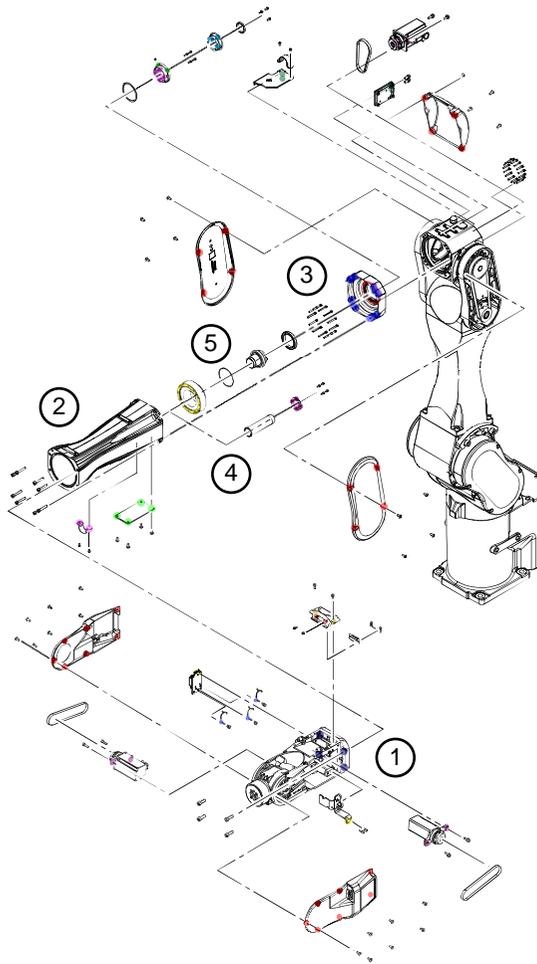
**CAUTION**

Handle the sleeve with care since it is thin and easy to deform.

POINT

The parts are attached together with the liquid gasket, and may be difficult to remove. If difficult to remove, pull out while rotating the sleeve.

Removing the Reduction Gear Unit

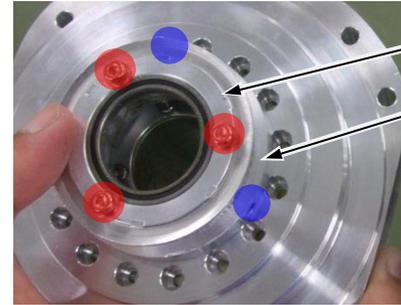


⑤

1. Remove the pulley bearing.
2. Remove the pulley.

A S01: 3-M3x8 and washer

B S05: 2-M4x4

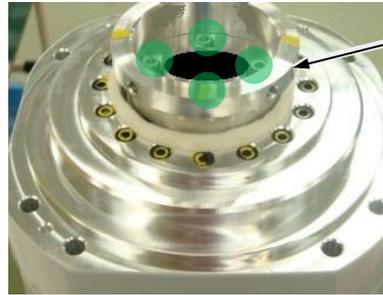


Pulley bearing

Pulley

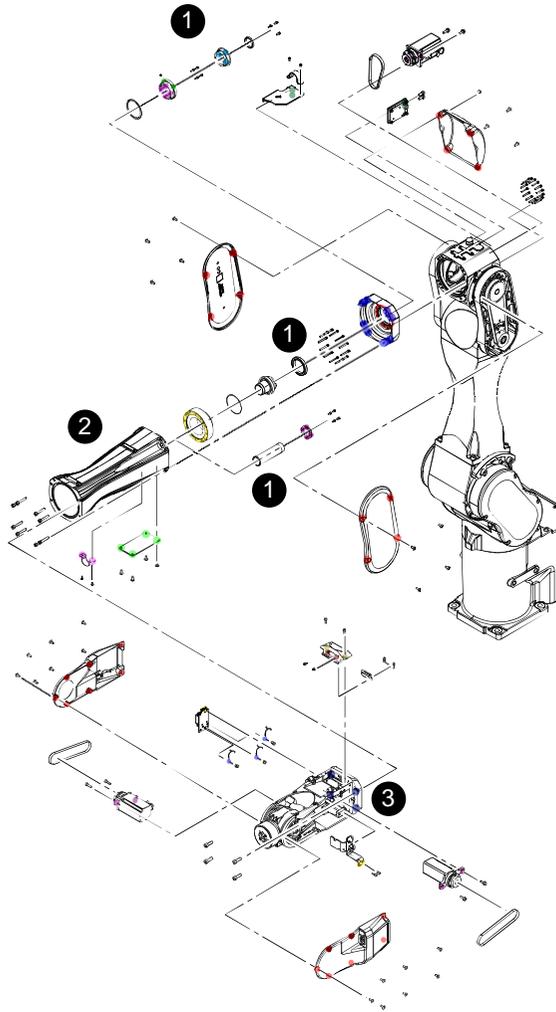
3. Remove the pulley spacer.

C S01: 4-M3x8



Pulley spacer

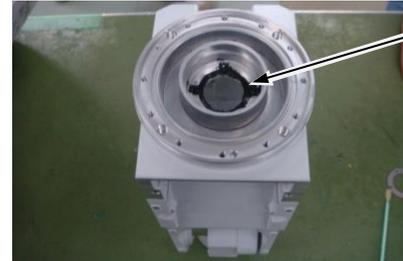
Installing the Reduction Gear Unit



1

Install the J4 Reduction Gear Unit.

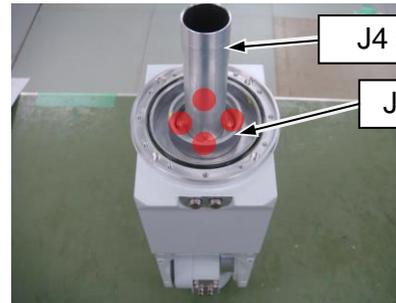
1. Apply the liquid gasket to the mating surface of the sleeve and fixing bolts in order to prevent grease leakage of the Reduction Gear.



Liquid gasket

2. Fit the J4 sleeve and install the J4 sleeve holder.

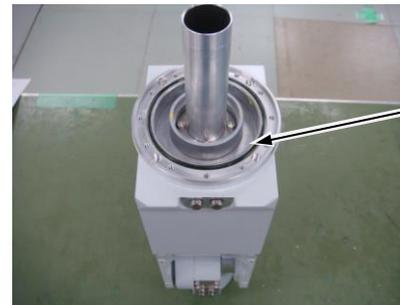
A S01: 4-M3x6
(2.0 +/- 0.1 N·m)



J4 sleeve

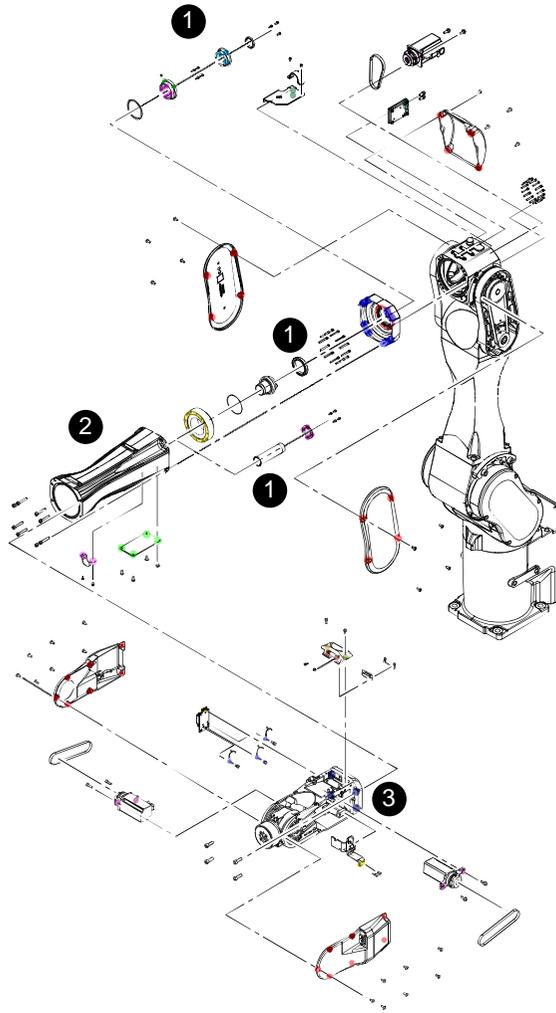
J4 sleeve holder

3. Install the O-ring.



O-ring

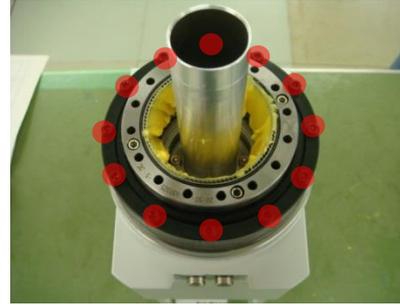
Installing the Reduction Gear Unit



Joint #4

4. Install the J4 Reduction Gear.

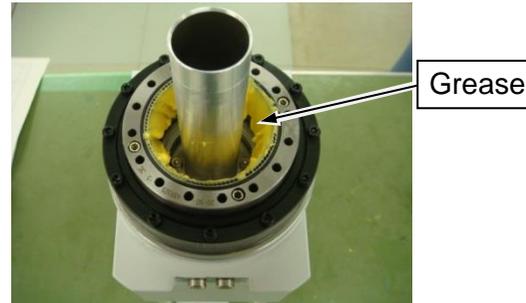
A S02: 12-M3x28



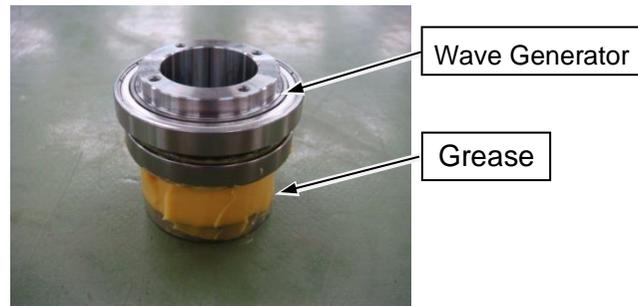
5. Apply grease at the location shown in the figure.

 SK-1A

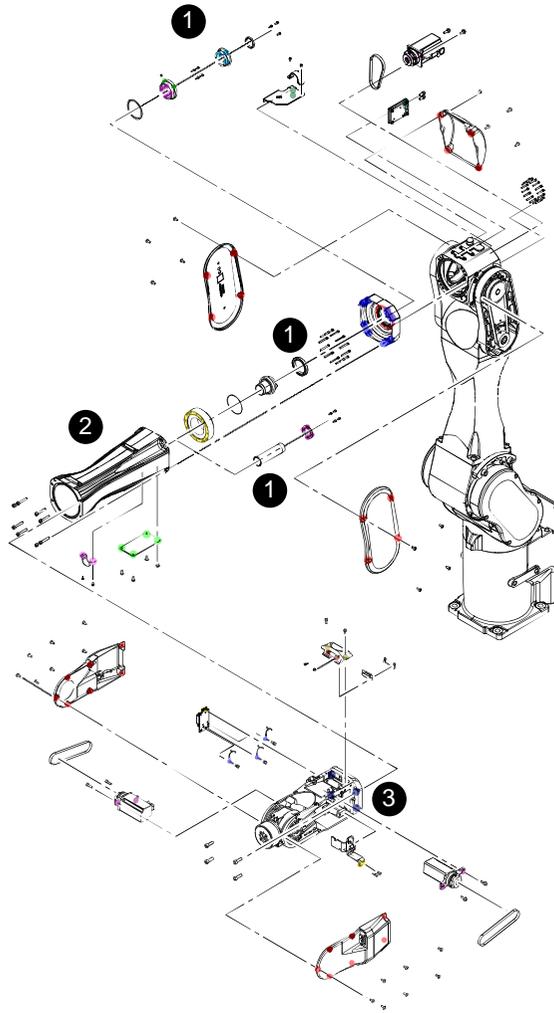
- Inside of Flexspline 10 g



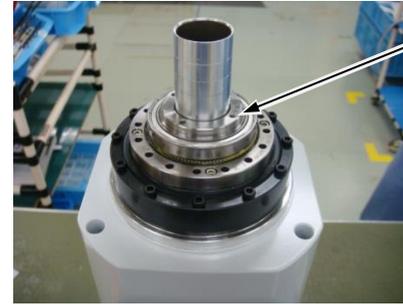
- Wave Generator 10 g



Installing the Reduction Gear Unit

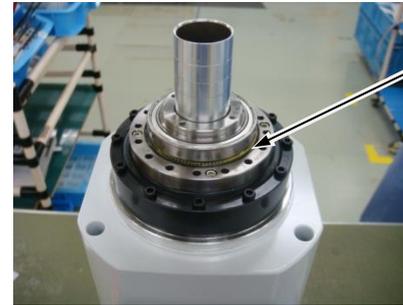


6. Install the Wave Generator.



Wave Generator

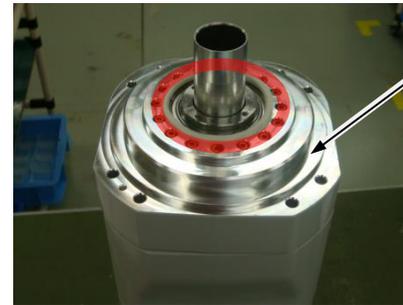
7. Install the O-ring attached to the Reduction Gear on the O-ring groove on the J4 Reduction Gear.



O-ring

8. Install the J4 flange.

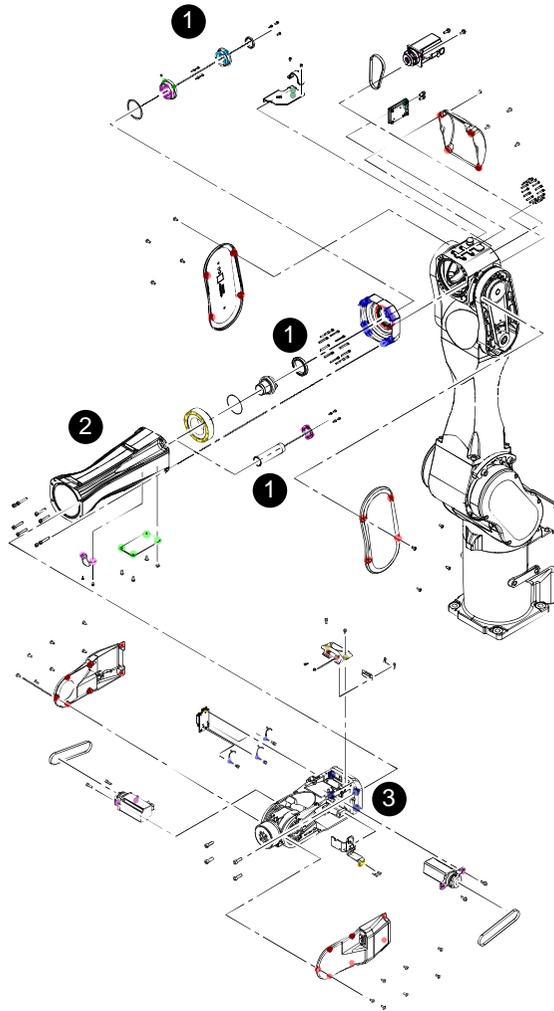
A S02: 16-M3x20
(2.4 +/- 0.1 N·m)



J4 flange

Joint #4

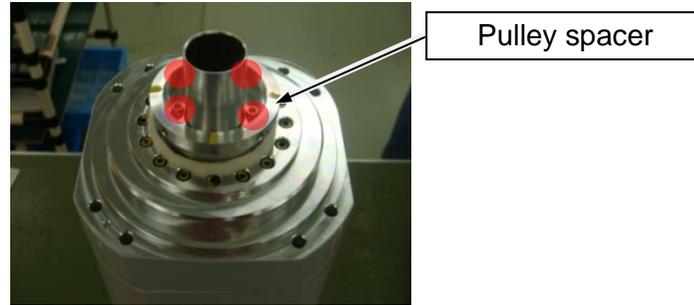
Installing the Reduction Gear Unit



Joint #4

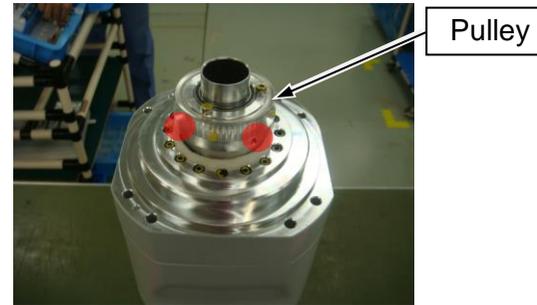
9. Install the pulley spacer.

A S01: 4-M3x8
(2.0 +/- 0.1 N·m)



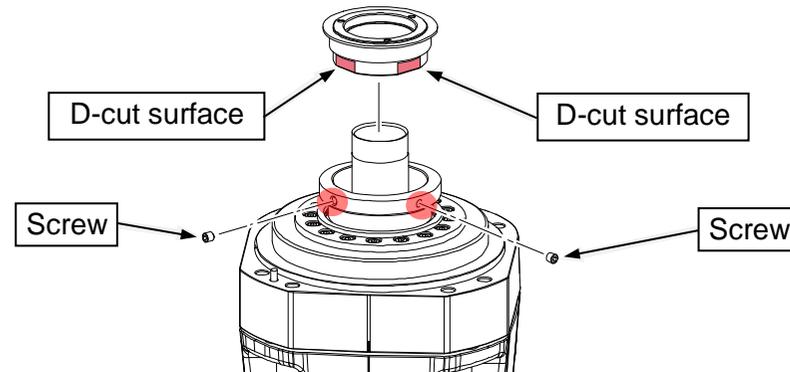
10. Install the pulley.

A S05: 2-M4x4

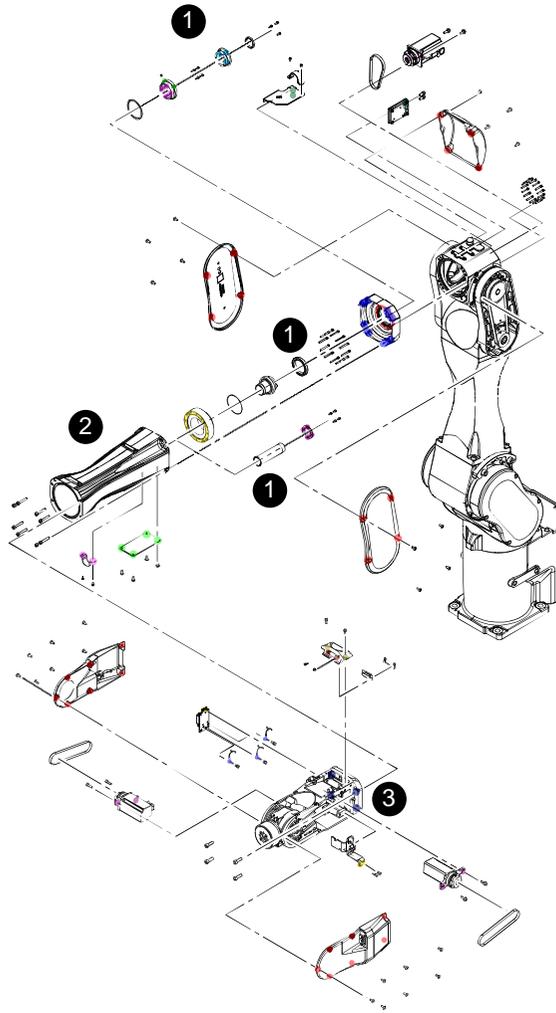


POINT

Align the pulley spacer screw holes with the pulley D-cut surface, and secure with screws.



Installing the Reduction Gear Unit



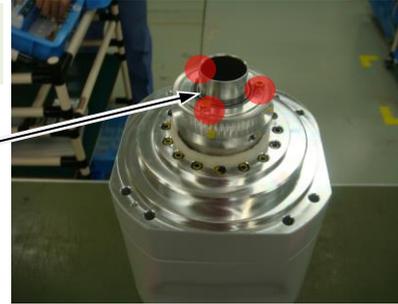
11. Apply adhesive to the following parts of the J4 pulley.
Adhesive: Loctite 641

- Bearing mating surface
- Inner ring (J4 sleeve)
- Outer ring (J4 pulley)

12. Install the J4 pulley bearing, and secure with bearing holder screws.

A S01: 3-M3x8 and washer
(2.0 +/- 0.1 N·m)

J4 pulley bearing



2 Install the Arm4 extension part on Arm3.

POINT

Rotate the Arm4 extension part to shift its position, and install all bolts.

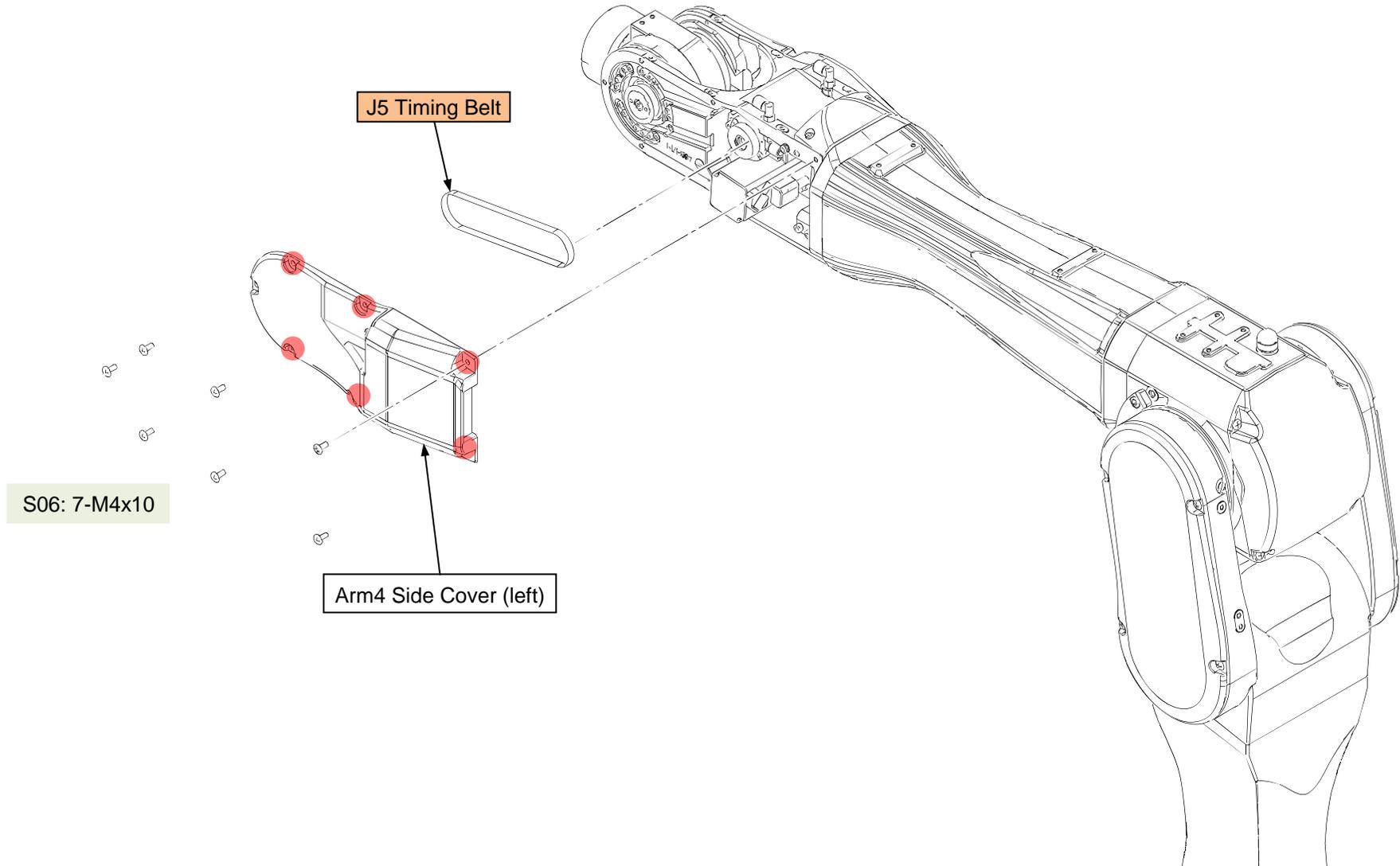
A S02: 8-M5x30
(10.0 +/- 0.5 N·m)



3 Refer to [Installing the Arm4 Unit](#) and install the Arm4 Unit.

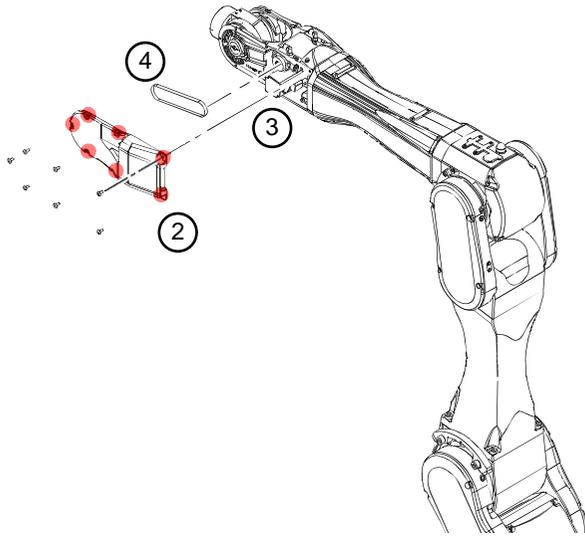
2.7 Joint #5

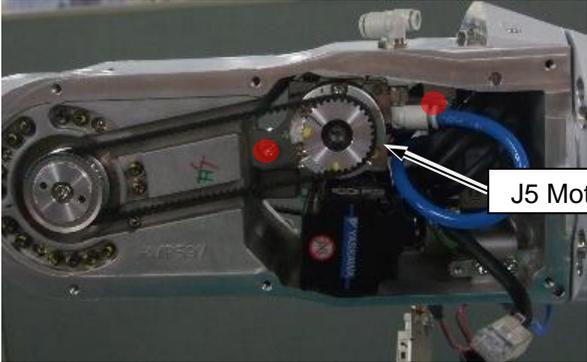
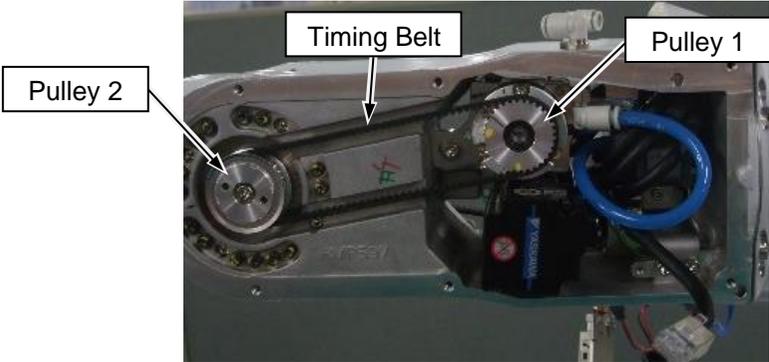
2.7.1 Joint #5 Replacing the Timing Belt



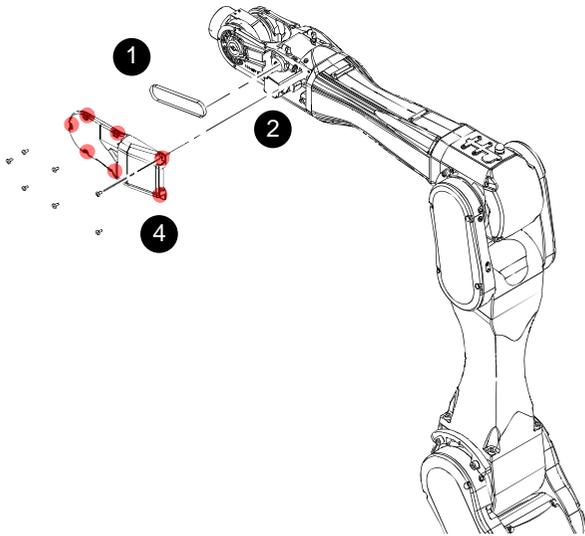
Joint #5

Removing the Timing Belt

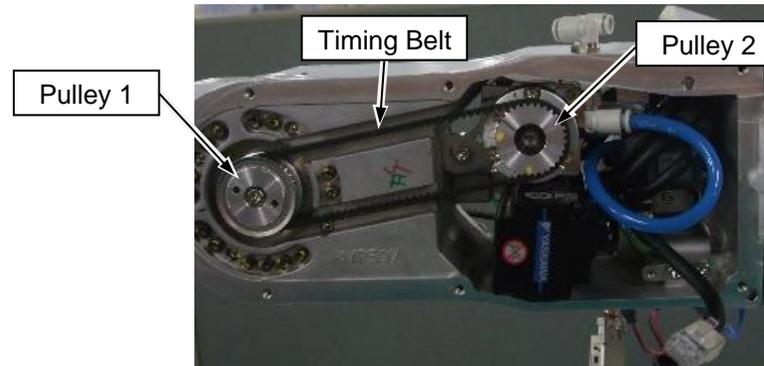


①	Turn OFF the Controller.
②	Remove the Arm4 side cover (left).
③	<p>Loosen the screws securing the J5 Motor unit.</p> <p>A S01: 2-M4x15 and washer</p> 
④	<p>Remove the J5 Timing Belt.</p> <p>POINT First remove the Timing Belt from pulley 1, then from pulley 2.</p> 

Installing the Timing Belt



1 Install the J5 Timing Belt.

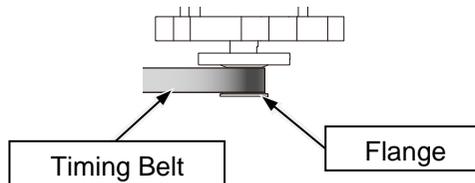
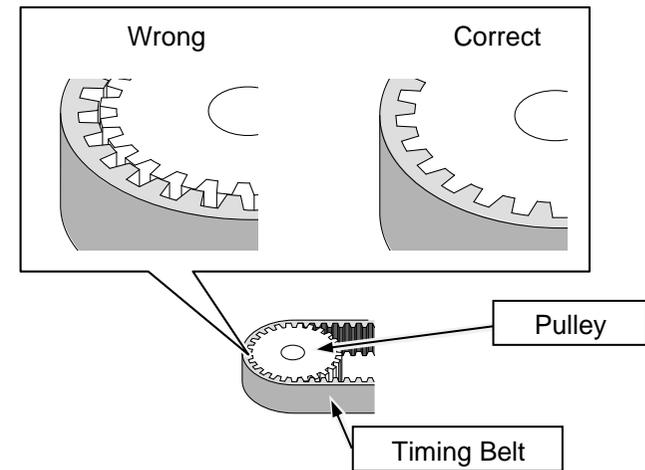


POINT

- First place the belt on pulley 1.
- Make sure that the teeth of the Timing Belt and the pulley are properly engaged.

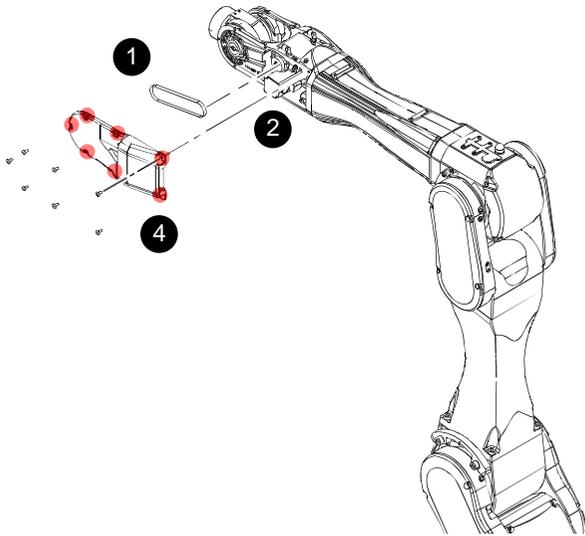
CAUTION

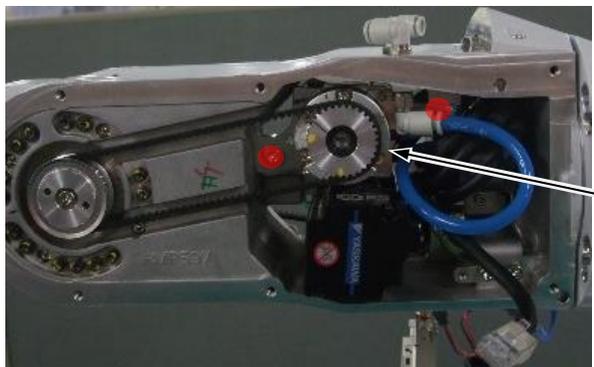
If the Timing Belt is placed on the flange, correct tension will not be obtained during belt tension adjustment.



Set the belt so that it is level with respect to the pulley without it being placed on the flange.

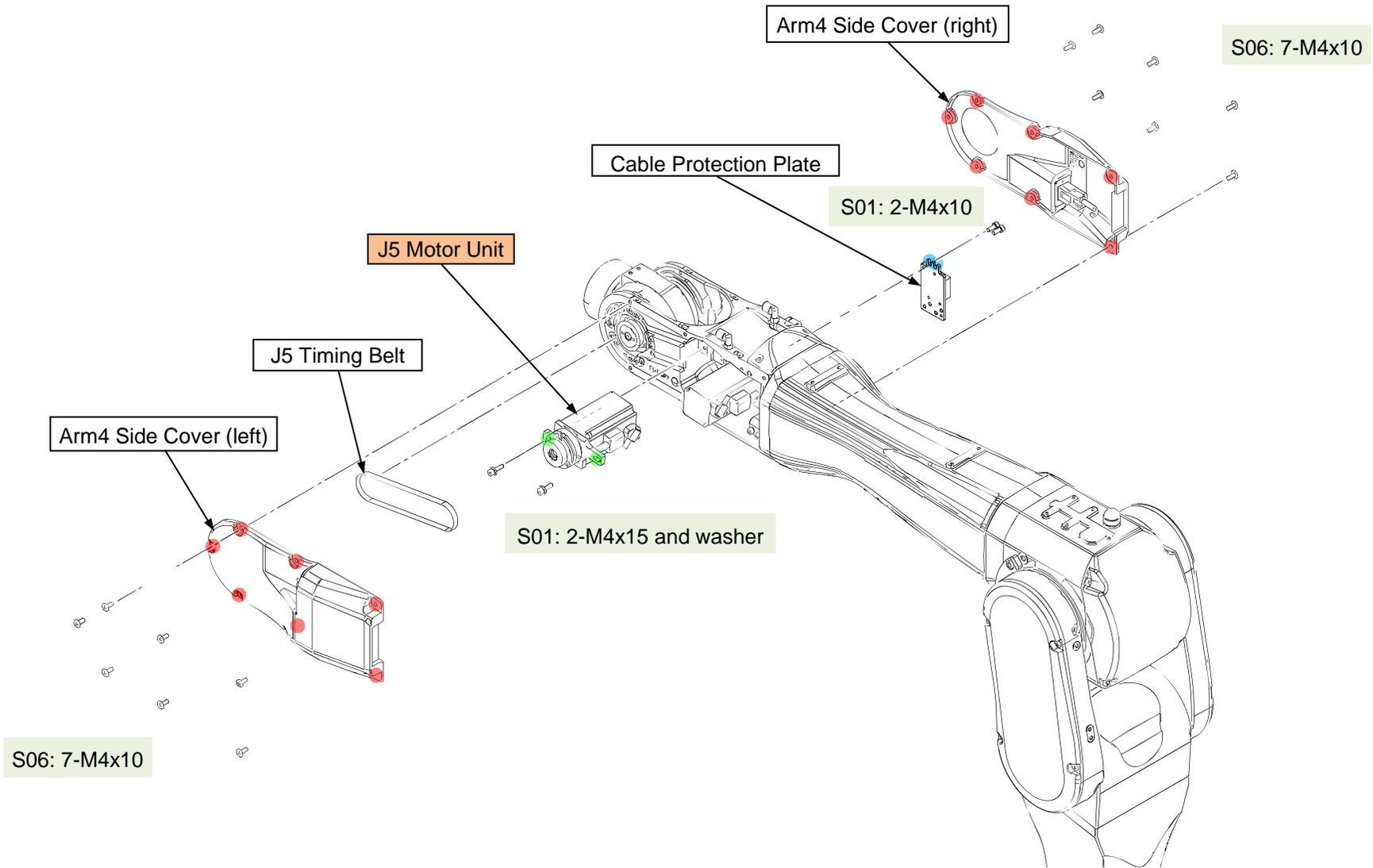
Installing the Timing Belt



<p>2</p>	<p>Temporarily secure the J5 Motor unit.</p> <p>A S01: 2-M4x15 and washer</p>  <p>POINT The standard for temporary fastening is where the Motor Unit can be moved by hand and will not tilt when pulled. If this is either too loose or too tight, it will not provide the proper tension to the belt.</p>
<p>3</p>	<p>Adjust the belt tension. 3.1 Adjusting the Timing Belt Tension</p>
<p>4</p>	<p>Install the Arm4 side cover (left).</p>
<p>5</p>	<p>After assembly, perform calibration of Joint #5. 3.2 Calibration</p>

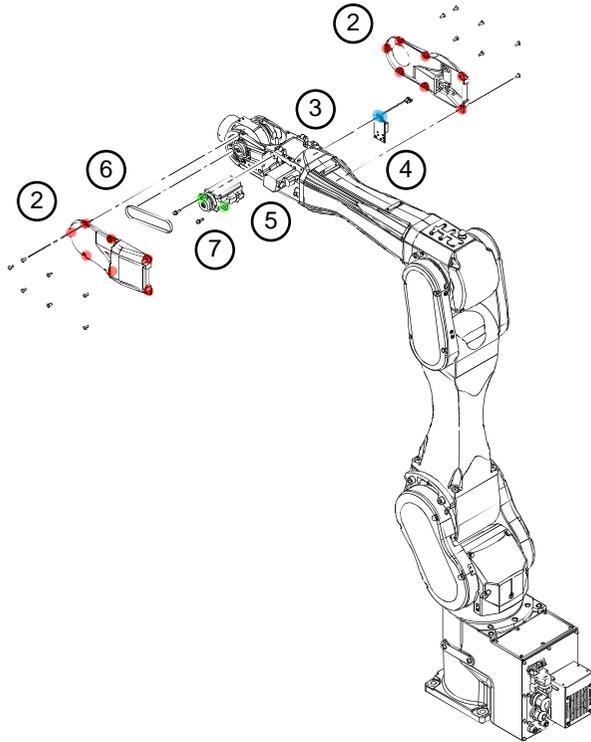
Joint #5

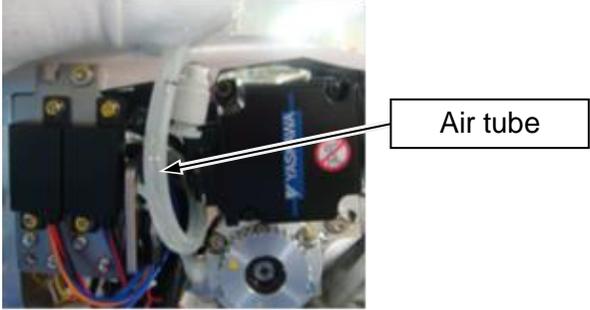
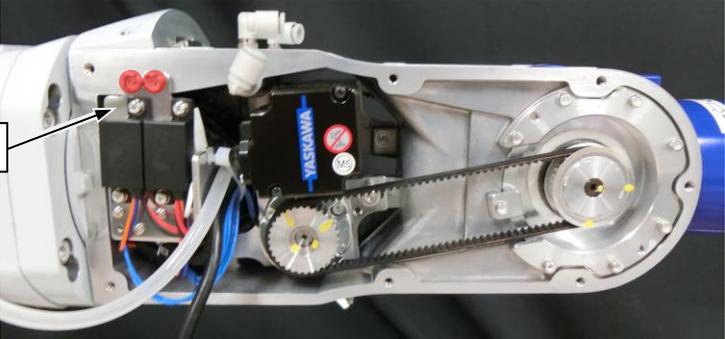
2.7.2 Joint #5 Replacing the Motor Unit



Joint #5

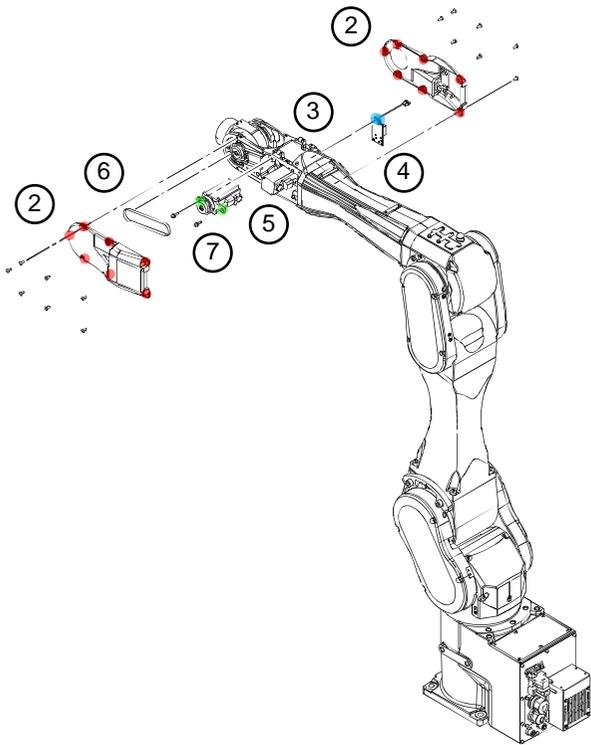
Removing the Motor Unit



①	Turn OFF the Controller.
②	Remove the Arm4 side cover (both sides).
③	<p>Remove the Air tube.</p> 
④	<p>Disconnect the J5 Motor Connectors.</p> <p>1. Loosen the cable protection plate screws, and remove the plate.</p> <p>A S01: 2-M4x10</p> 

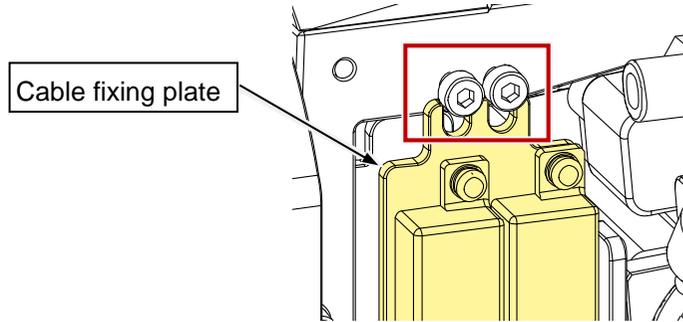
Joint #5

Removing the Motor Unit

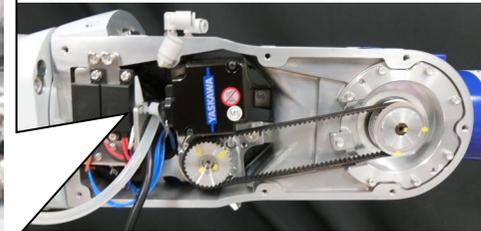
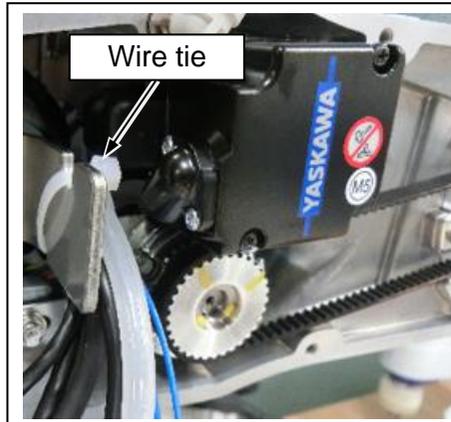


POINT

Slide the cutout section on the cable fixing plate.



2. Cut the wire tie.

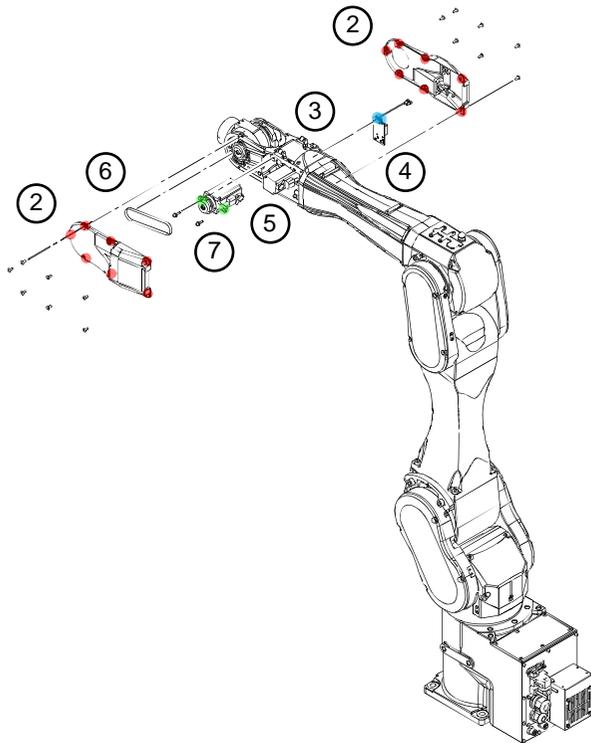


3. Disconnect the J5 Motor Connectors (CN151, CN351, CN450).



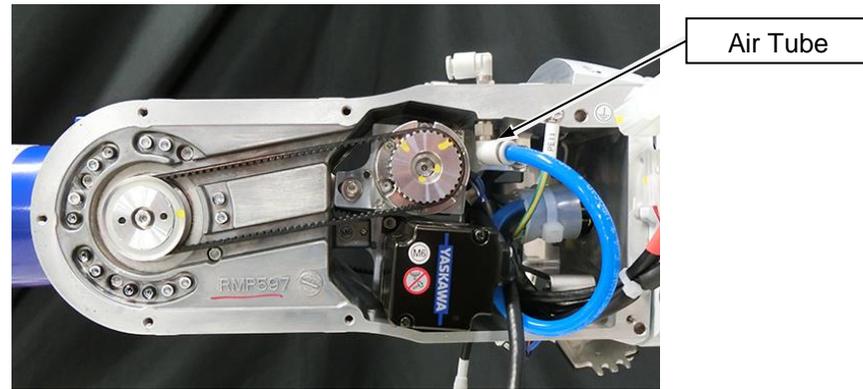
Joint #5

Removing the Motor Unit

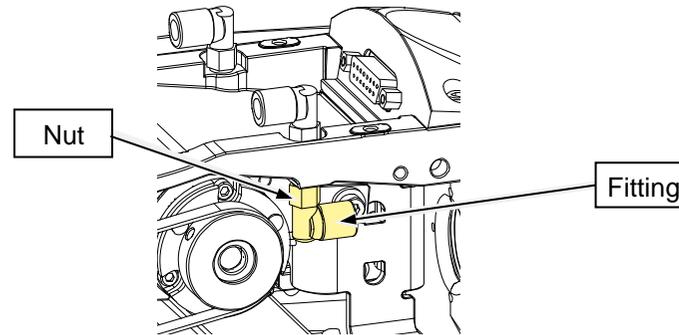


⑤ Disconnect the Air Tube.

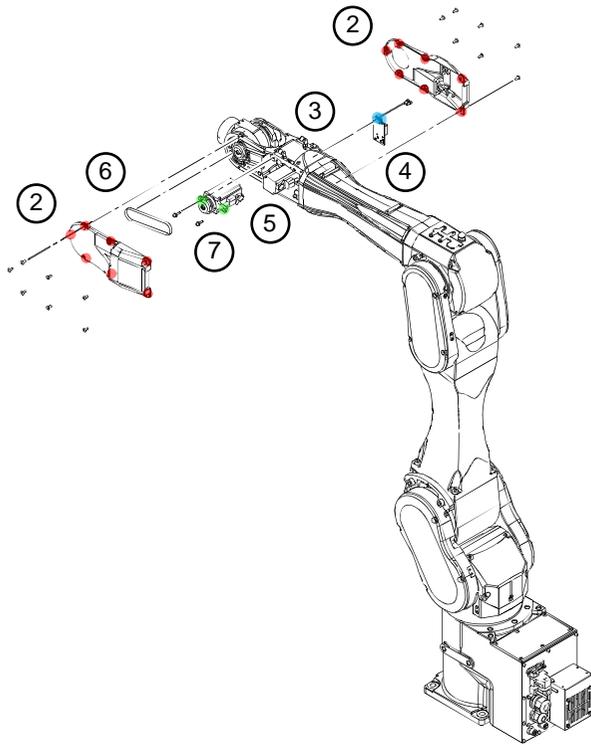
1. Remove the tube from the fitting.



2. Use an 8-mm wrench to rotate the nut, and remove the metal fitting.



Removing the Motor Unit

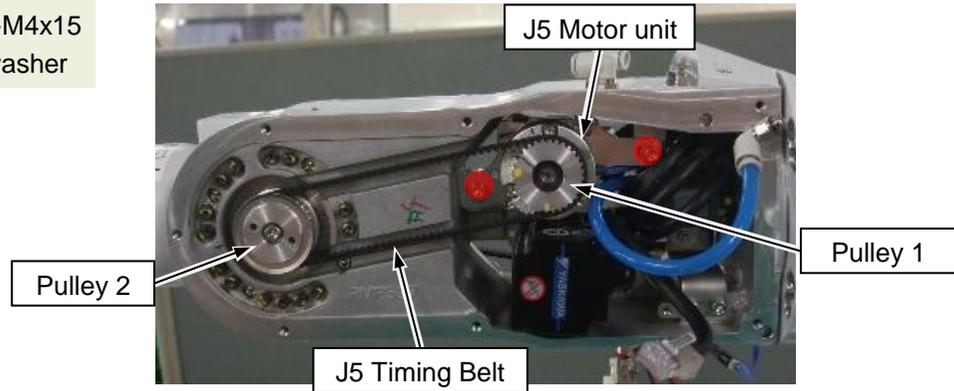


⑥ Loosen the screws securing the J5 Motor unit, and remove the J5 Timing Belt.

POINT

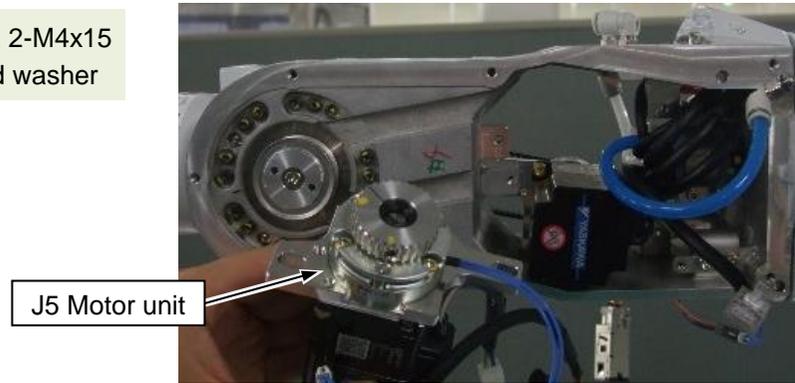
First, remove the belt on pulley 1.

A S01: 2-M4x15 and washer



⑦ Remove the loosened screws, then remove the J5 Motor unit.

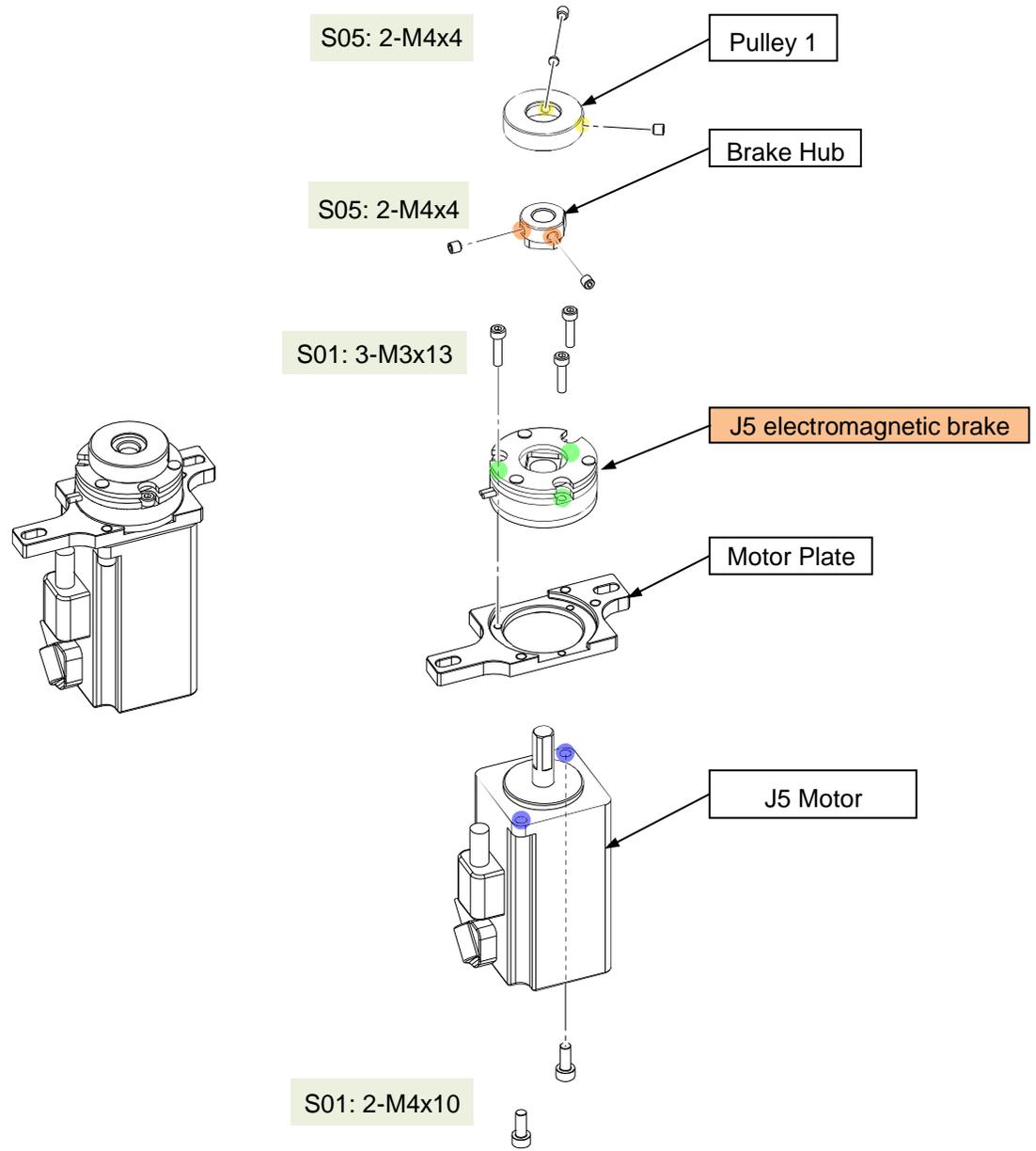
A S01: 2-M4x15 and washer



POINT

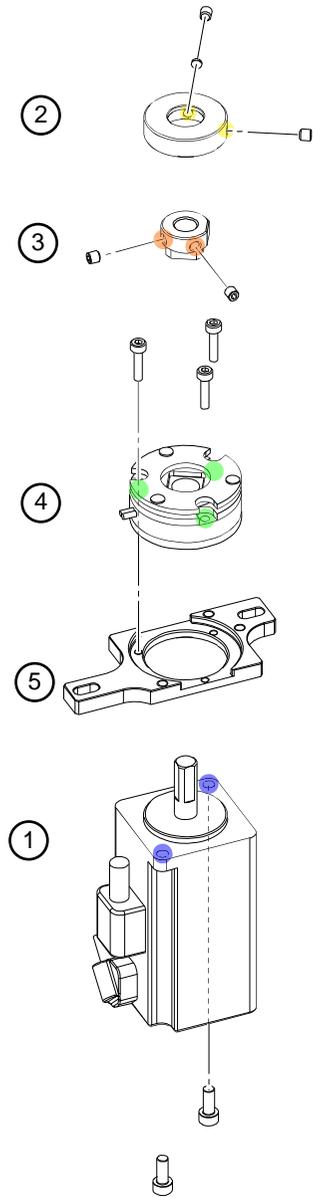
When removing the Motor Unit from the arm, pull from the Motor Pulley side.

Motor Unit Disassembly

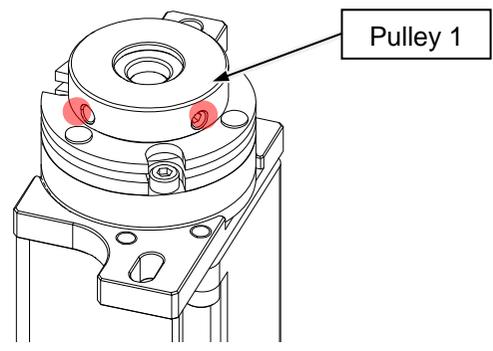
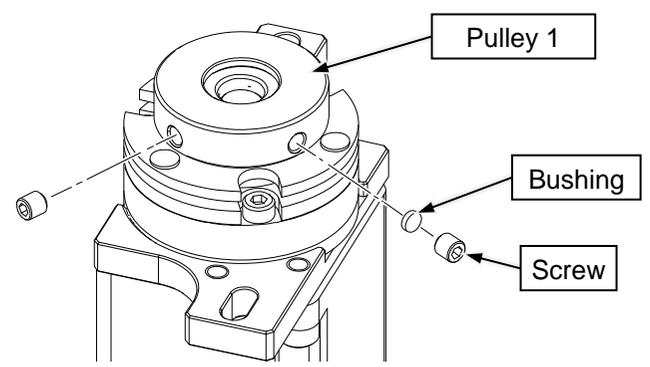
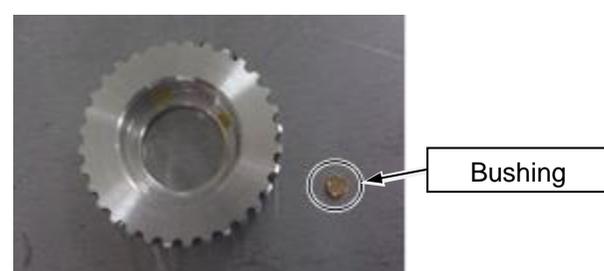


Joint #5

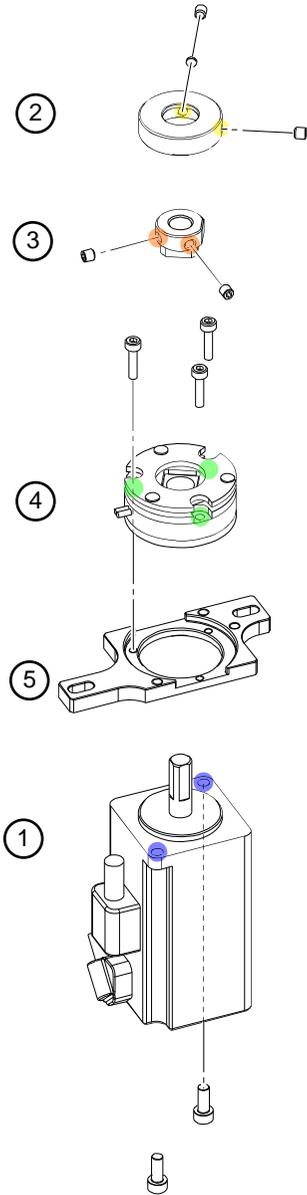
Motor Unit Disassembly



Joint #5

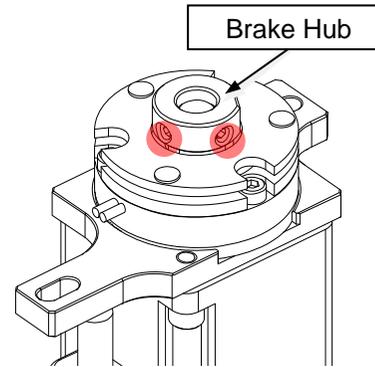
①	Remove the J5 Motor unit .
②	<p>Remove pulley 1.</p> <p>A S05: 2-M4x4</p> <div style="display: flex; justify-content: space-around; align-items: center;">  </div> <p>CAUTION A brass bushing is included on one of the set screws. When removing the pulley, be careful not to drop and lose the bushing.</p> <div style="display: flex; justify-content: space-around; align-items: center;">  </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;">  </div>

Motor Unit Disassembly



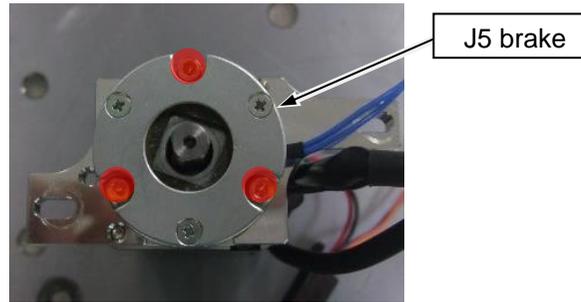
③ Remove the Brake Hub.

A S05: 2-M4x4



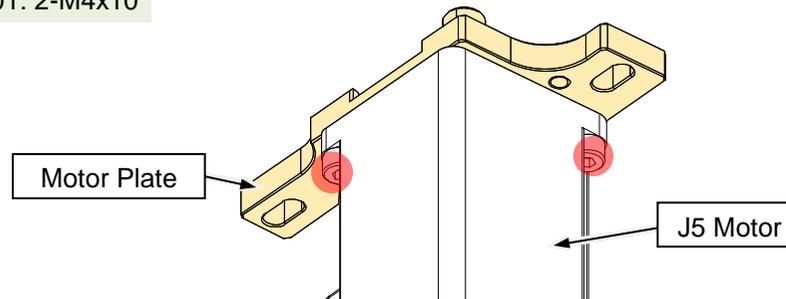
④ Remove the J5 brake.

A S01: 3-M3x13



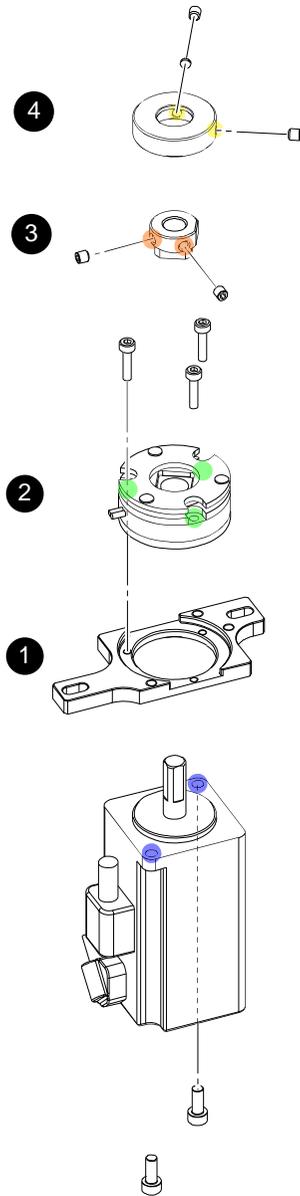
⑤ Remove the Motor Plate.

A S01: 2-M4x10



Joint #5

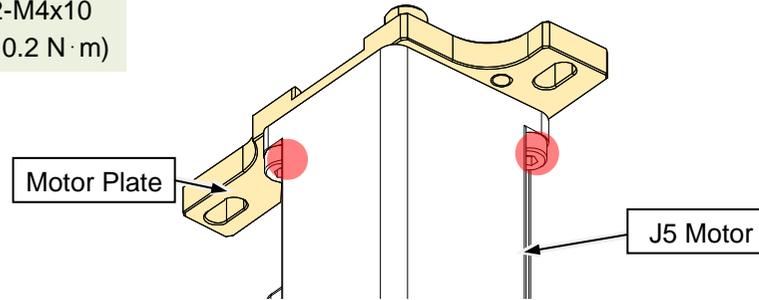
Motor Unit Assembly



1

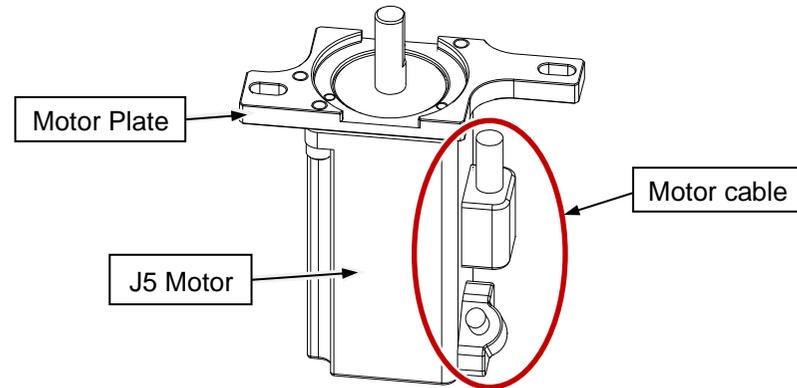
Install the Motor Plate.

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)



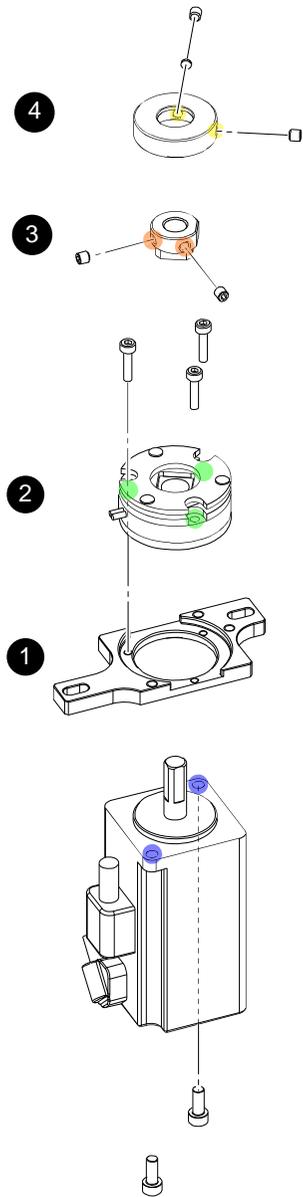
POINT

Install with the orientation shown in the figure.



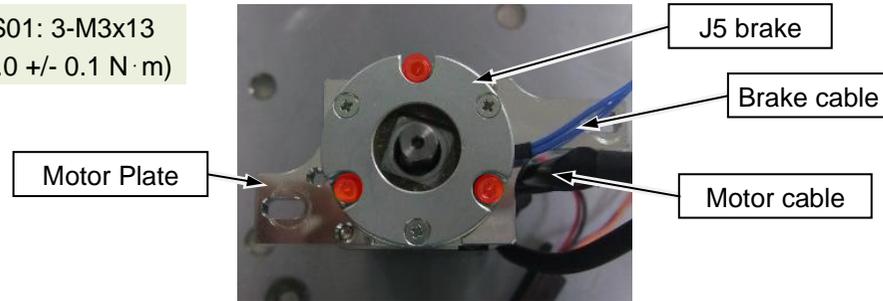
Joint #5

Motor Unit Assembly



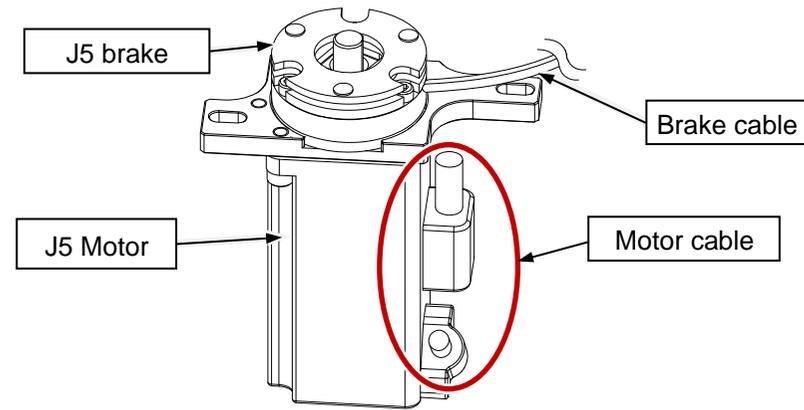
2 Install the J5 brake.

A S01: 3-M3x13
(2.0 +/- 0.1 N·m)



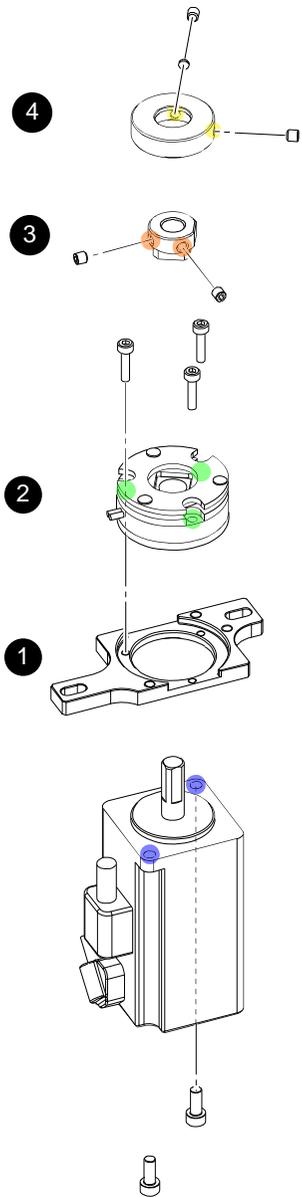
POINT

Install with the orientation shown in the figure.



Joint #5

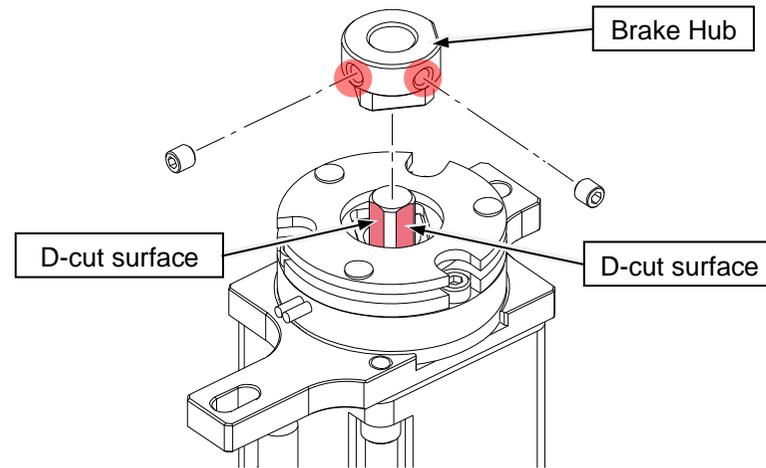
Motor Unit Assembly



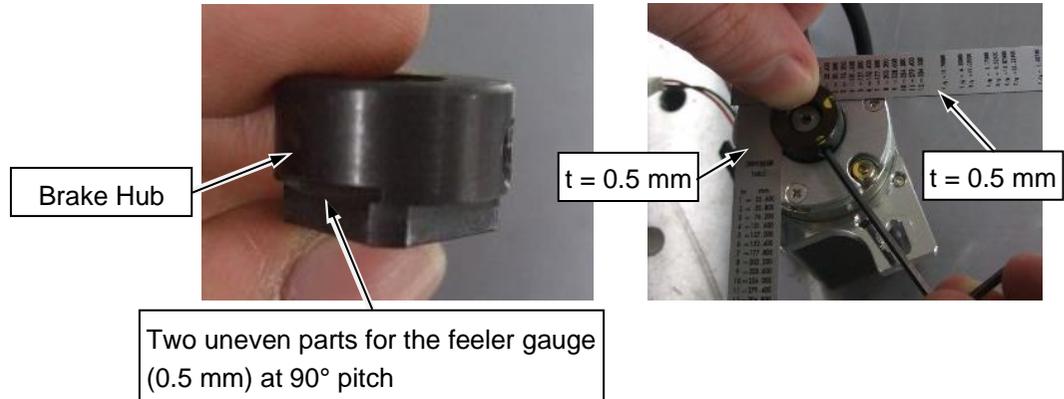
3

Install the Brake Hub.

1. Align the motor shaft D-cut surface with the screw holes, and set the Brake Hub.



2. Place 0.5-mm feeler gauges or scales on the brake to ensure a 0.5-mm gap between the Brake Hub and the brake.

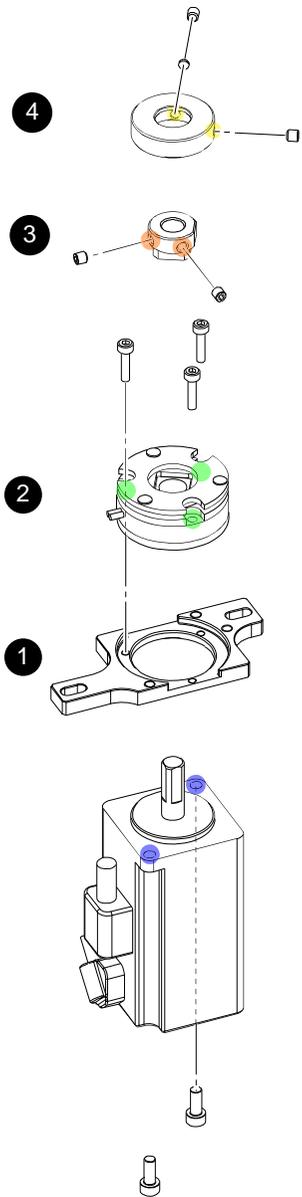


CAUTION

Failure to create a proper gap between the Brake Hub and the brake may cause the parts to rub during motor operation, causing a malfunction.

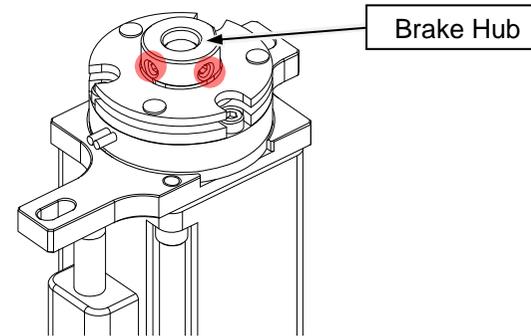
Joint #5

Motor Unit Assembly



3. Secure the Brake Hub with set screws.

A S05: 2-M4x4
(1.6 +/- 0.1 N·m)

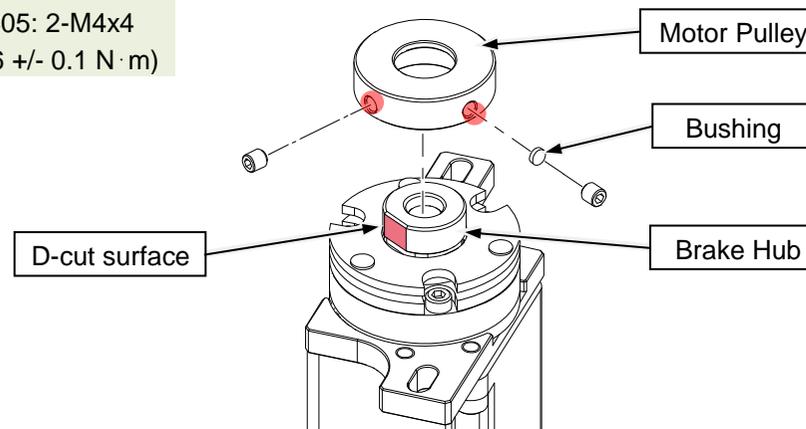


4 Install the Motor Pulley.

POINT

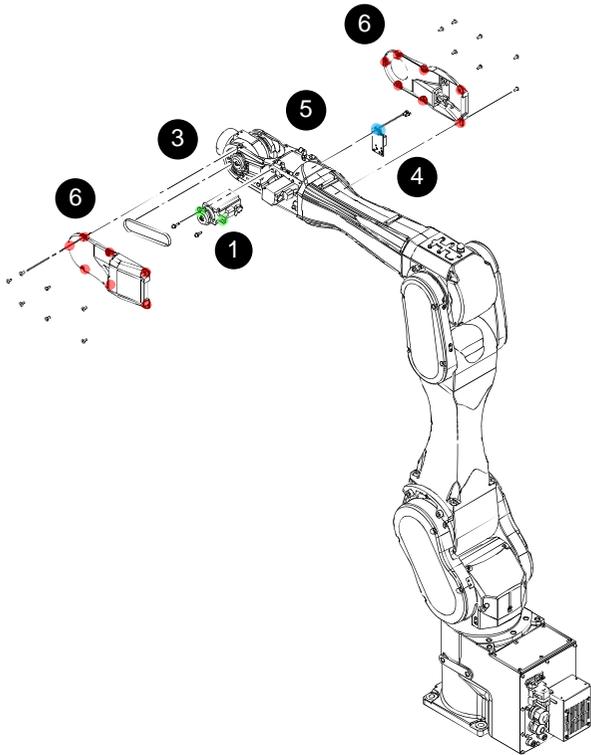
- Align the D-cut surfaces with the screw holes, and install the Motor Pulley.
- Install the bushing on the side without the D-cut.
- Tighten the screws while pressing the Motor Pulley against the Brake Hub.

A S05: 2-M4x4
(1.6 +/- 0.1 N·m)



Joint #5

Installing the Motor Unit



Joint #5

1 Install the J5 Motor unit.

1. Insert the J5 Motor unit inside Arm4.

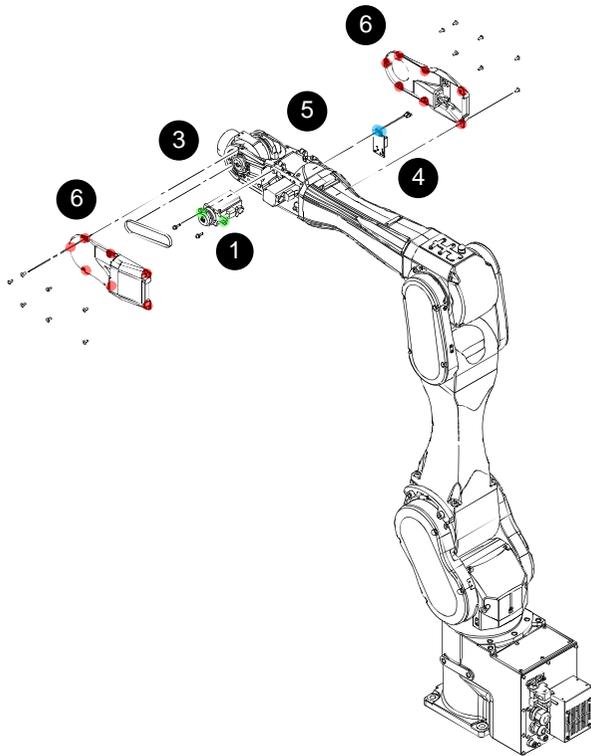
POINT
Insert into the arm from the bottom of the motor.

2. Set the Timing Belt around pulley 1 and pulley 2, and temporarily secure the J5 Motor unit.

POINT
First place the belt on pulley 2.

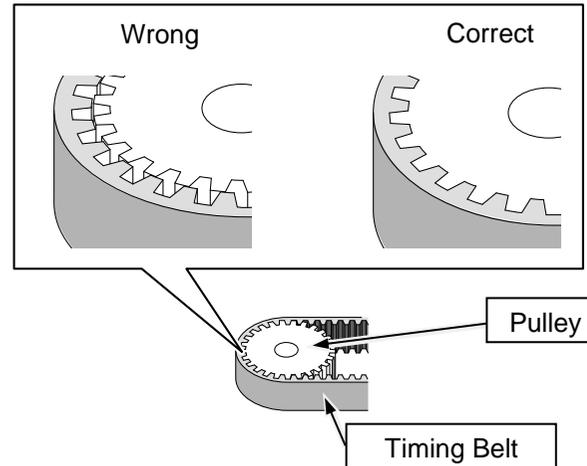
A S01: 2-M4x15 and washer

Installing the Motor Unit



POINT

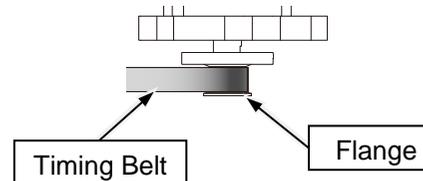
- Make sure that the teeth of the Timing Belt and the pulley are properly engaged.



- The standard for temporary fastening is where the Motor Unit can be moved by hand and will not tilt when pulled. If this is either too loose or too tight, it will not provide the proper tension to the belt.

CAUTION

If the Timing Belt is placed on the flange, correct tension will not be obtained during belt tension adjustment.



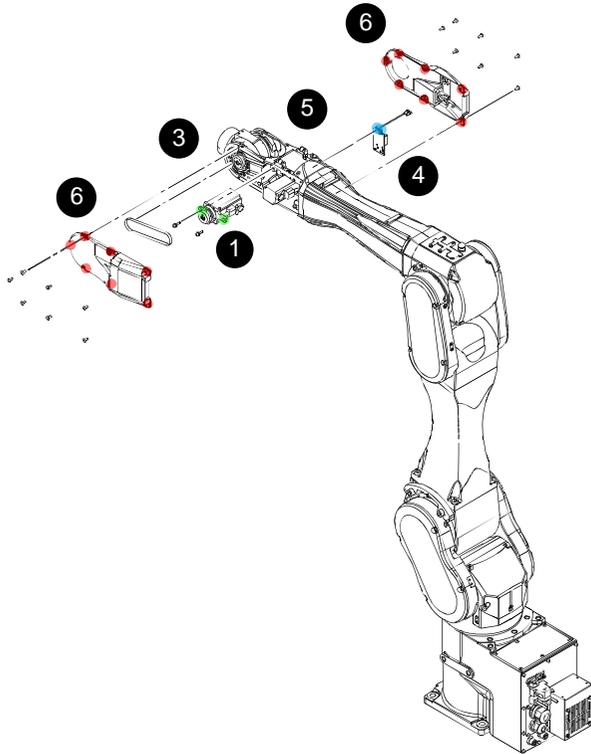
Set the belt so that it is level with respect to the pulley without it being placed on the flange.

2

Adjust the belt tension.

[3.1 Adjusting the Timing Belt Tension](#)

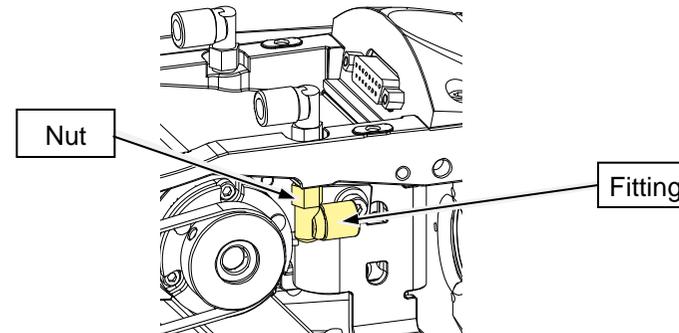
Installing the Motor Unit



Joint #5

3 Install the Air Tube.

1. Use an 8-mm wrench to rotate the part shown in the figure, and install the metal fitting.



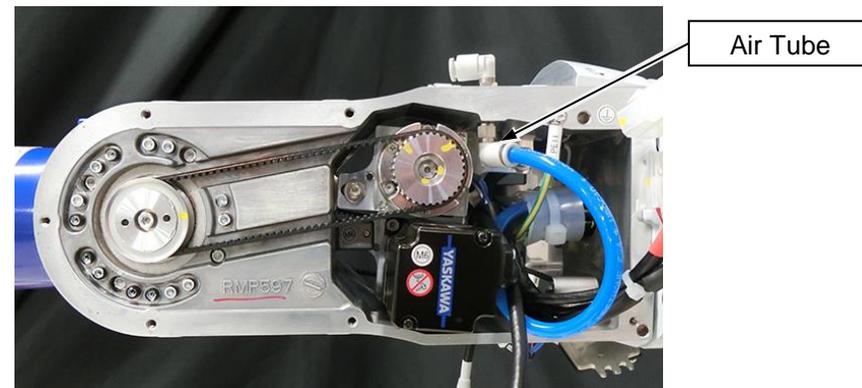
POINT

- Install in front of the Motor Unit.
- After tightening by hand, further tighten one sixth to quarter of a turn.

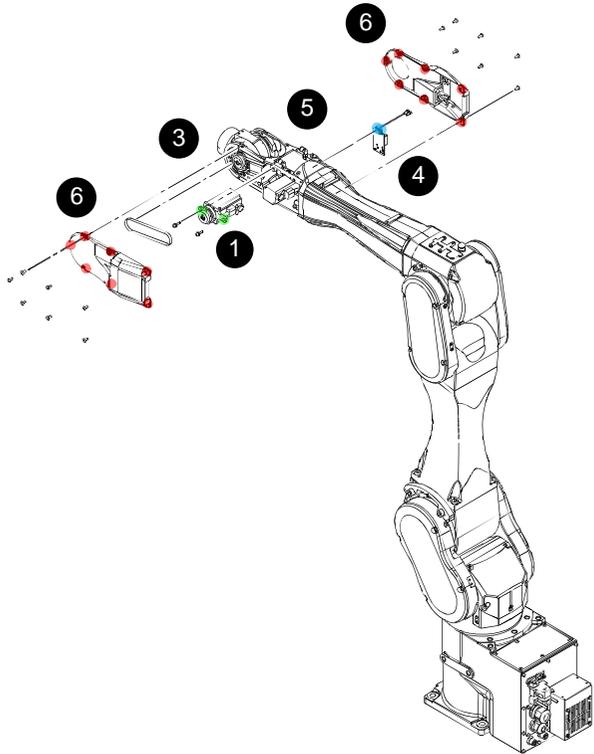
CAUTION

- Excessive tightening may result in air leakage due to connector breakage or gasket deformation.
- Insufficient tightening may result in air leakage due to connector breakage or gasket deformation.

2. Install the Air Tube.

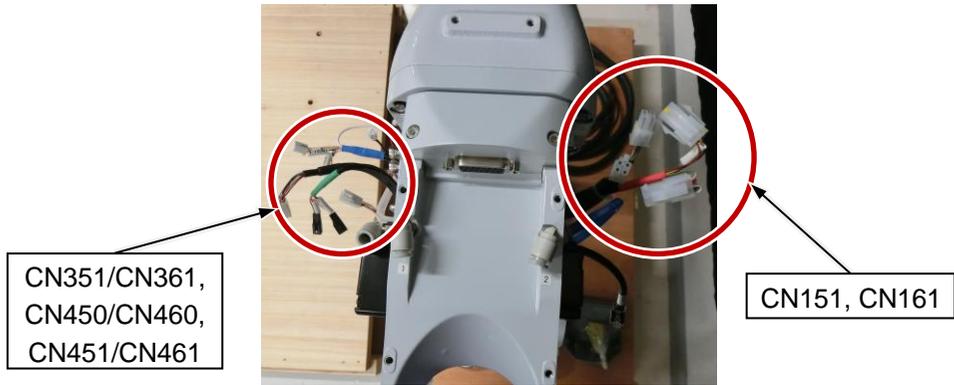


Installing the Motor Unit

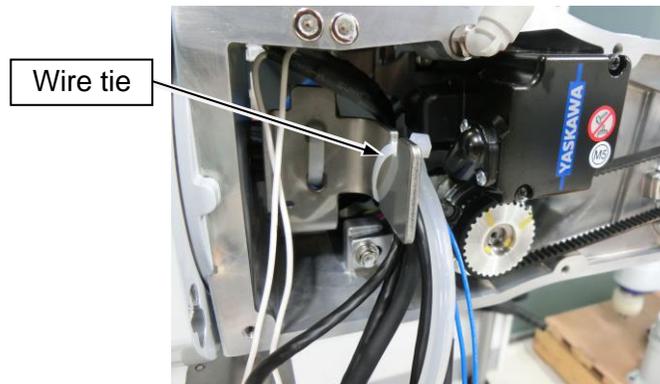


4

Connect the J5 Motor Connectors, and secure the cables protection plate to Arm4.
1. Pull out each connector as shown in the figure below.

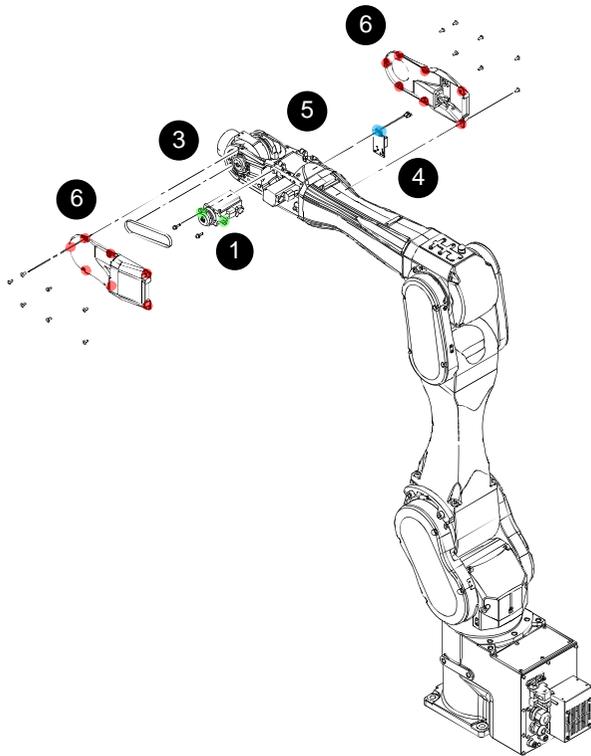


2. Secure the following cables to the cable fixing plate using the wire tie (AB200).
Force sensor connector, Air Tube, CN351/CN361, CN450/CN460, CN451/CN461



3. Connect the following connectors.
CN351, CN361, CN450, CN460, CN451, CN461, CN151, CN161

Installing the Motor Unit



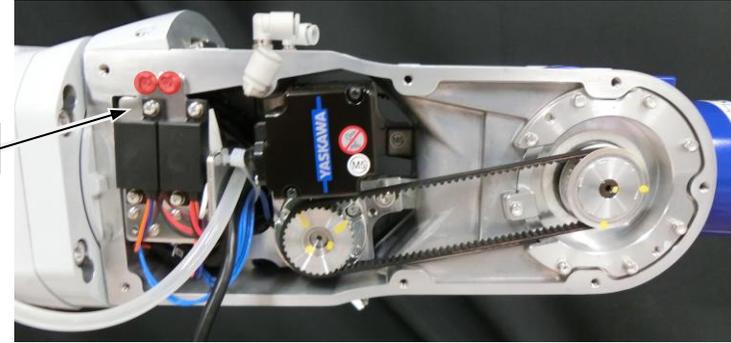
4. Install the cable protection plate.

CAUTION

Be careful not to let the cables get pinched.

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)

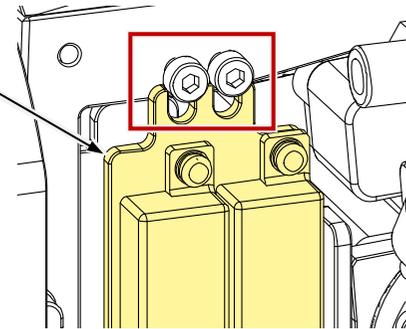
Cable protection plate



POINT

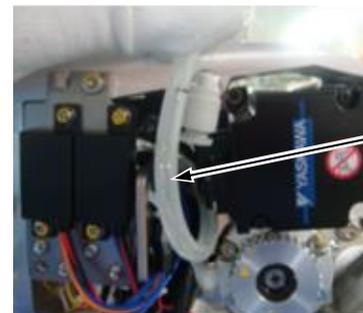
Slide the cutout section on the cable protection plate, and secure with screws.

Cable fixing plate



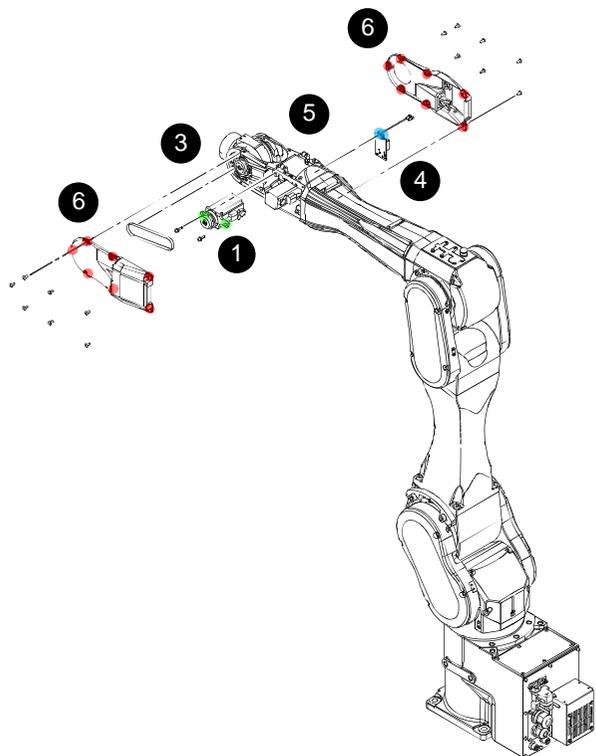
5. Install the Air tube.

Air tube



Joint #5

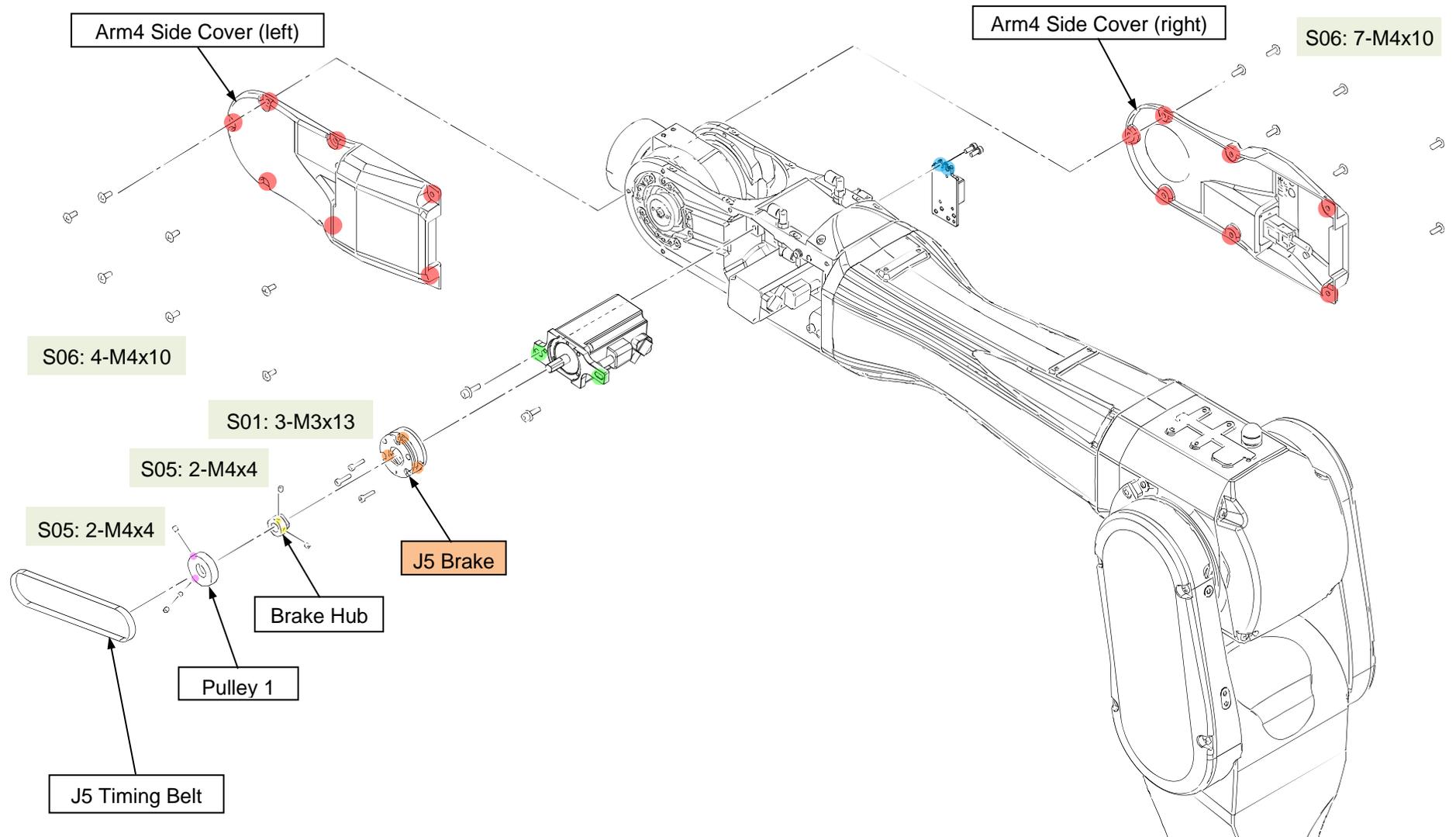
Installing the Motor Unit



6	Install the Arm4 side cover (both sides).
7	After assembly, perform calibration of Joint #5. 3.2 Calibration

Joint #5

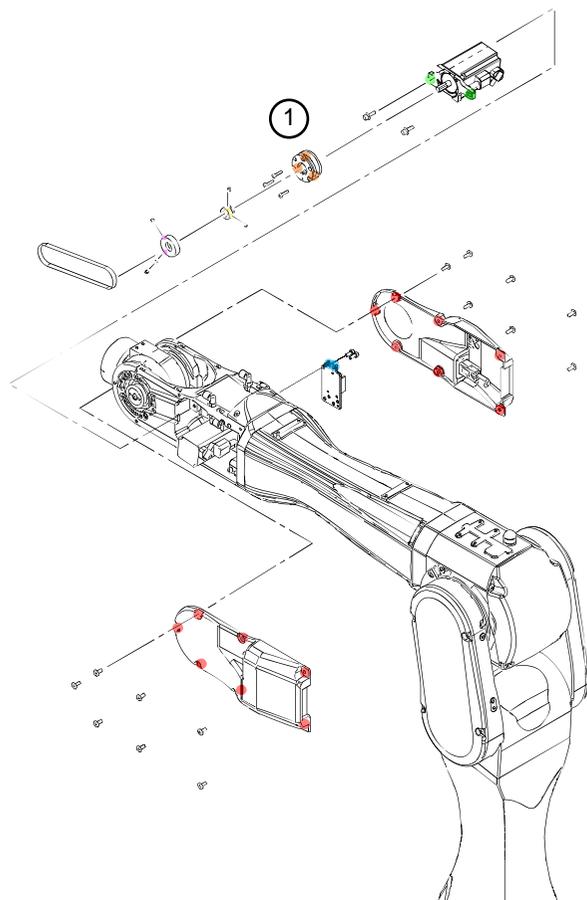
2.7.3 Joint #5 Replacing the Brake



Joint #5

Removing the Brake

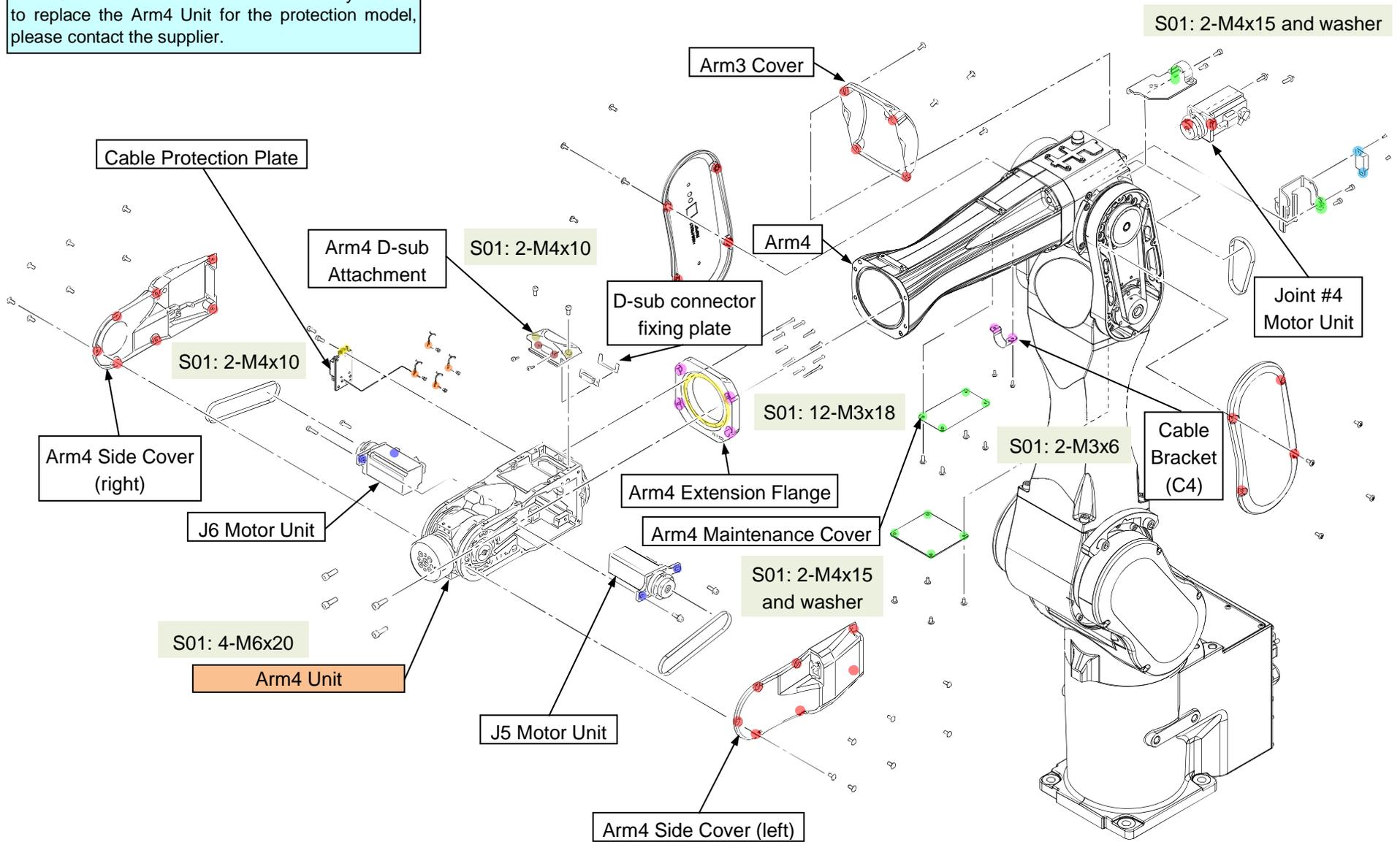
- | | |
|---|---|
| ① | Refer to J5 Motor Unit Disassembly and remove the J5 brake. |
|---|---|



Joint #5

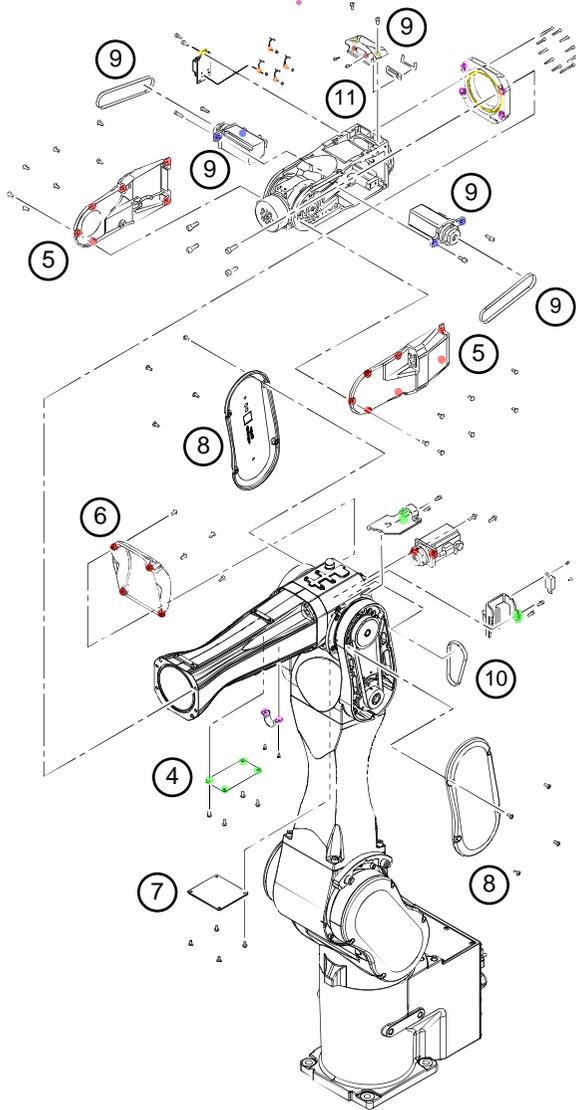
2.7.4 Joint #5 Replacing the Arm4 Unit

This section provides procedures for replacing the Arm4 Unit on standard and clean models. If you need to replace the Arm4 Unit for the protection model, please contact the supplier.



Joint #5

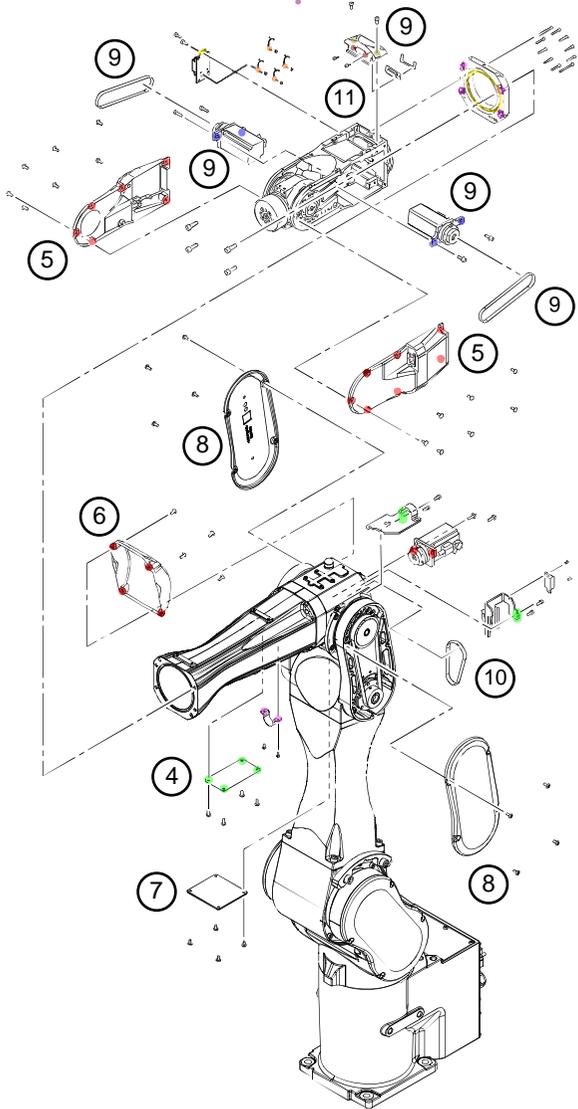
Removing the Arm4 Unit

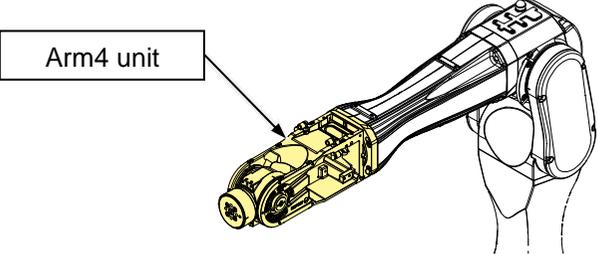
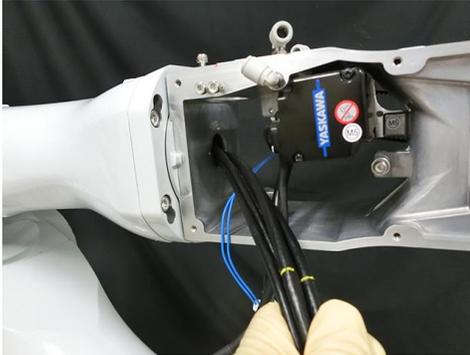


Joint #5

①	Turn ON the controller.
②	<p>Release the J3 brake, and manually push and move Arm3 until it comes in contact with the mechanical stopper, and push it against Arm2.</p> <p>CAUTION</p> <ul style="list-style-type: none"> • Arm3 falls by its weight when the J3 Motor unit is removed. Release the brake and tilt Arm3 in advance. • There is a possibility of hands and fingers being caught, and/or damage to or malfunction in the Manipulator. Take care during operation. 
③	Turn OFF the Controller.
④	Remove the Arm4 maintenance cover .
⑤	Remove the Arm4 side cover (both sides).
⑥	Remove the Arm3 cover .
⑦	Remove the Arm3 maintenance cover .

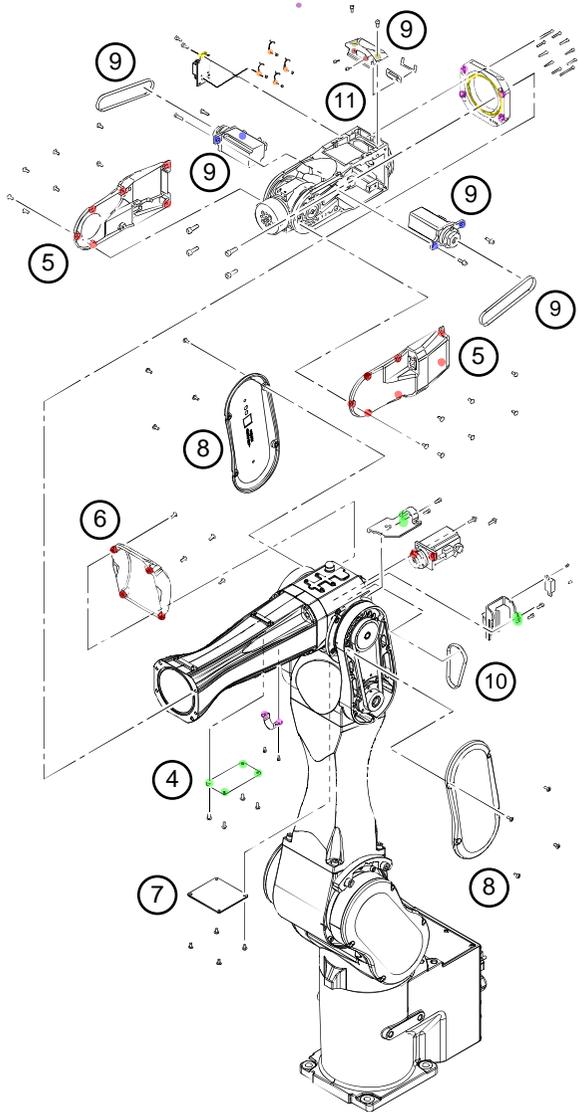
Removing the Arm4 Unit



⑧	Remove the Arm2 side cover (both sides).
⑨	Removing the Cable unit . Perform step ⑧ through 12 of step ⑨.
⑩	Removing the J4 Timing Belt . Perform steps ⑦ and ⑧.
⑪	Remove the Arm4 unit. <div style="text-align: center;">  </div> <p>1. Pull out all cables passing through the Arm4 extension part from the Arm4 unit side.</p> <div style="text-align: center;">  </div>

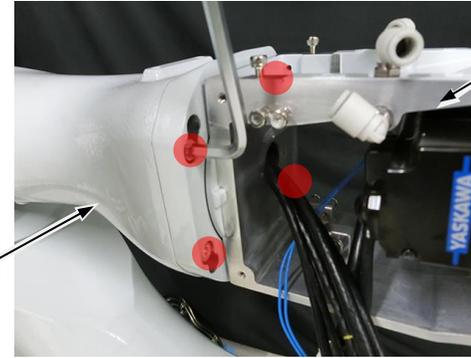
Joint #5

Removing the Arm4 Unit



2. Remove the screws shown in the figure, then remove the Arm4 unit.

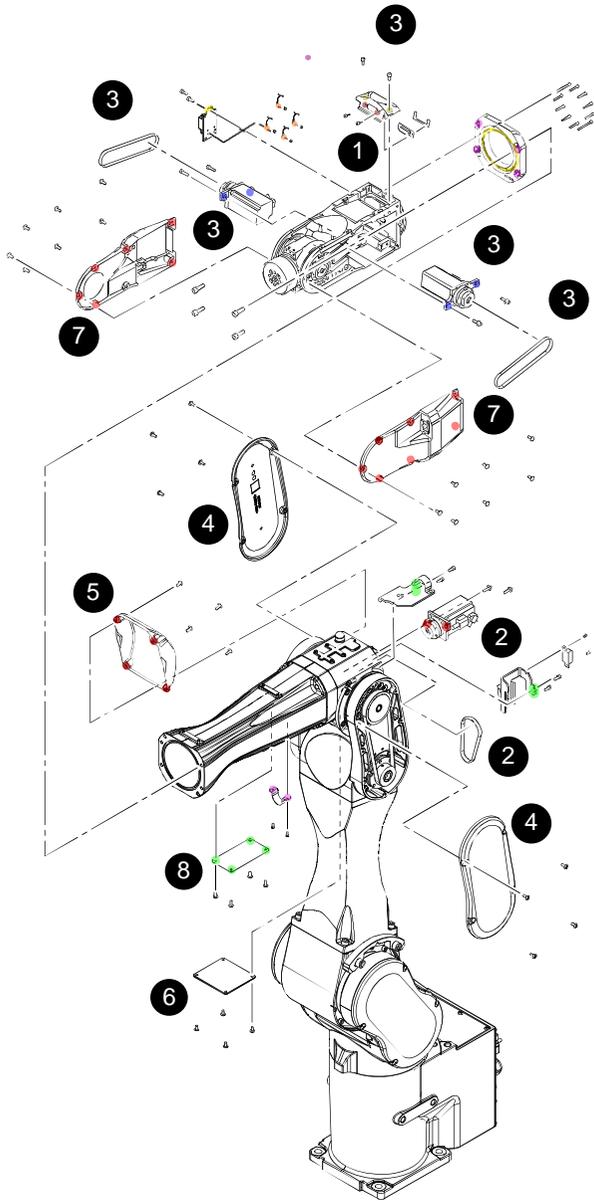
A S01: 4-M6x20

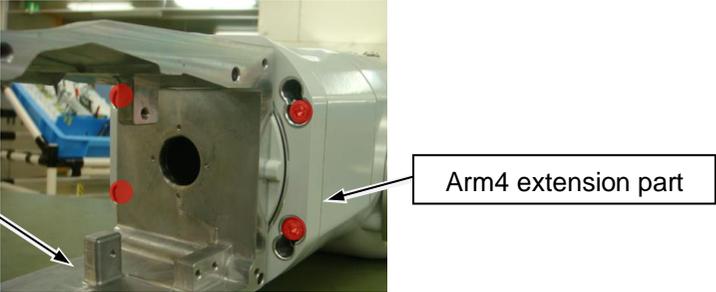


Arm4 unit

Arm4 extension part

Installing the Arm4 Unit

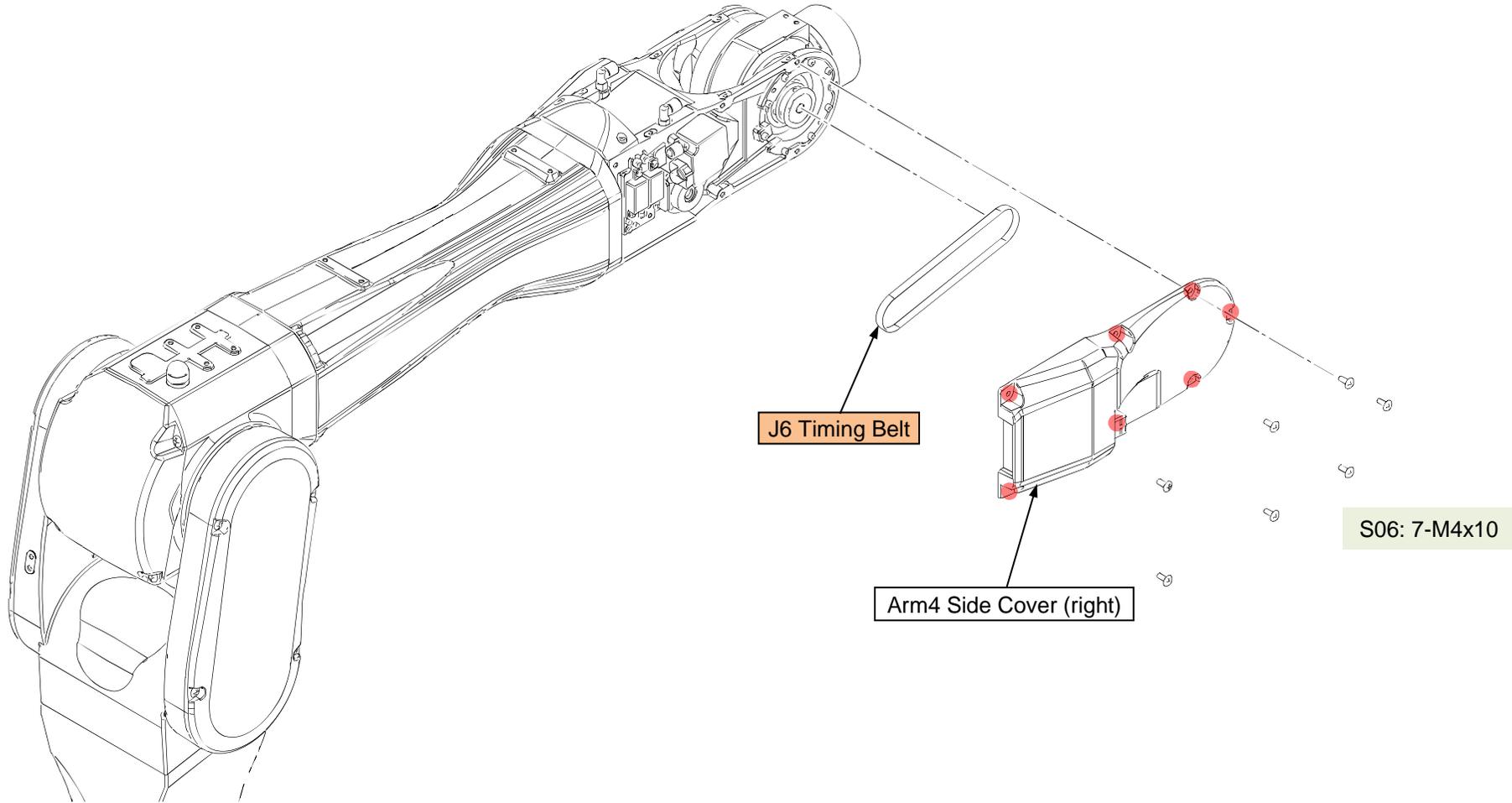


<p>1</p>	<p>Install the Arm4 Unit on the Arm4 extension part.</p> <p>A S01: 4-M6x20 (18.0 +/- 0.9 N·m)</p> 
<p>2</p>	<p>Install the J4 Timing Belt. Perform steps 1 and 2.</p>
<p>3</p>	<p>Perform 3 of step 1 through step 4 of Installing the Cable Unit.</p>
<p>4</p>	<p>Install the Arm2 side cover (both sides).</p>
<p>5</p>	<p>Install the Arm3 cover.</p>
<p>6</p>	<p>Install the Arm3 maintenance cover.</p>
<p>7</p>	<p>Install the Arm4 side cover (both sides).</p>
<p>8</p>	<p>Install the Arm4 maintenance cover (both sides).</p>
<p>9</p>	<p>After assembly, perform calibration of Joint #4, Joint #5, and Joint #6. 3.2 Calibration</p>

Joint #5

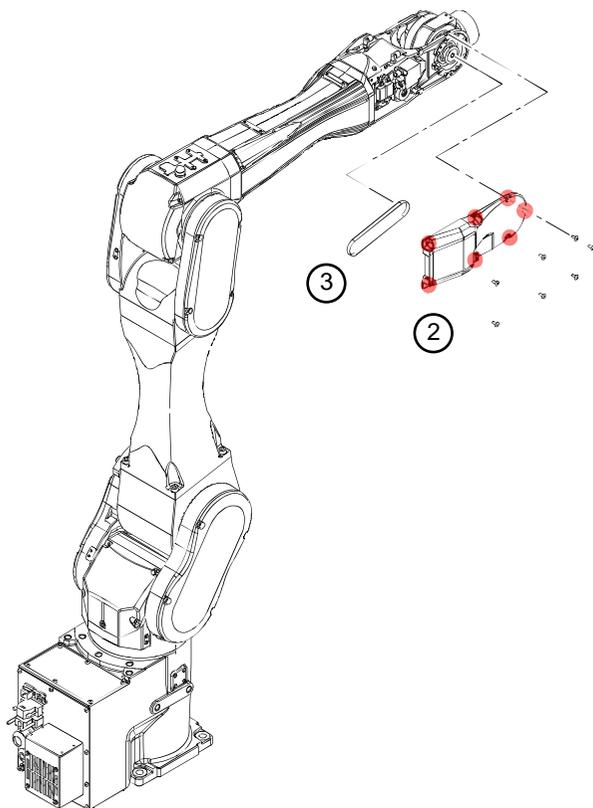
2.8 Joint #6

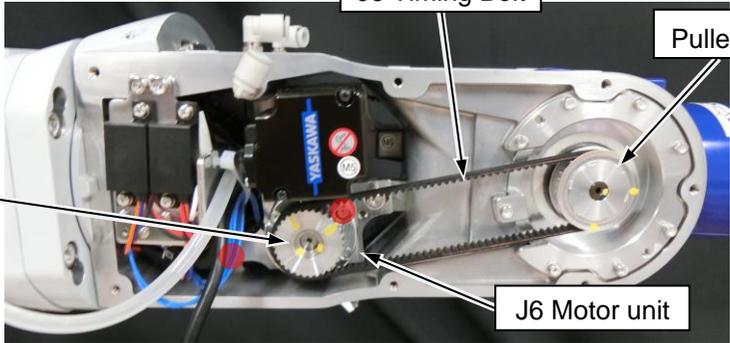
2.8.1 Joint #6 Replacing the Timing Belt



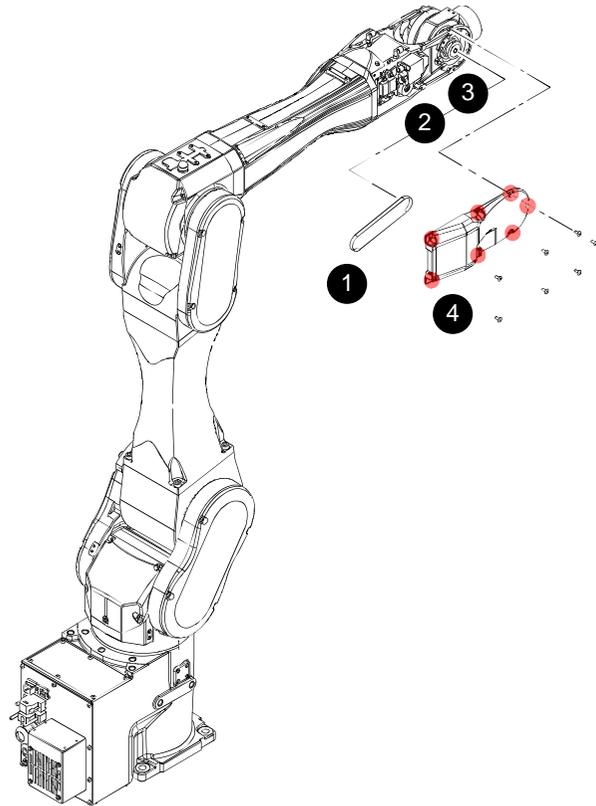
Joint #6

Removing the Timing Belt



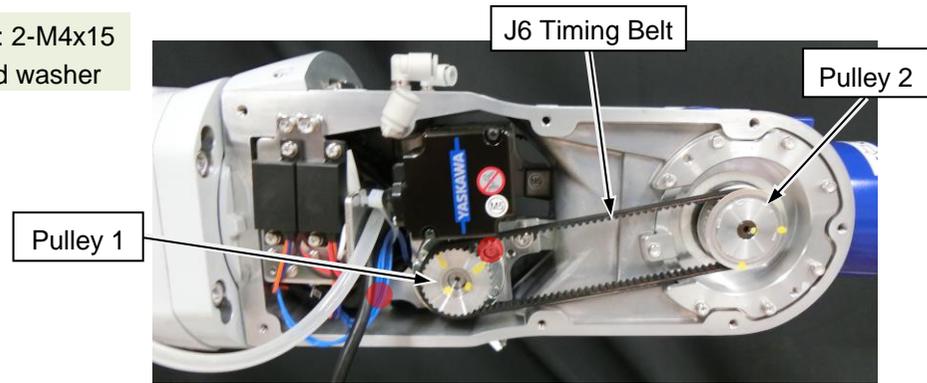
①	Turn OFF the Controller.
②	Remove the Arm4 side cover (right).
③	<p>Loosen the screws securing the J6 Motor unit, and remove the J6 Timing Belt.</p> <p>POINT First, remove the belt on pulley 1.</p> <p>A S01: 2-M4x15 and washer</p> 

Installing the Timing Belt



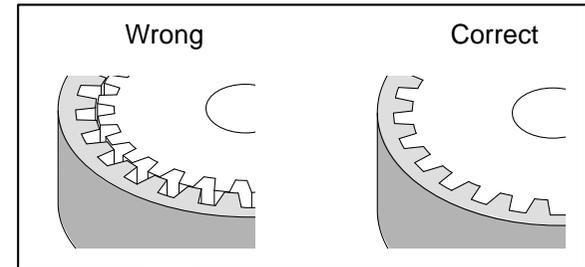
1 Install the J6 Timing Belt.

A S01: 2-M4x15 and washer



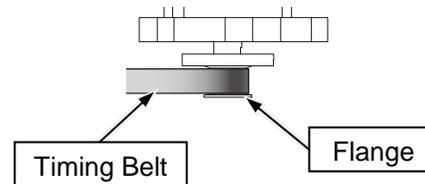
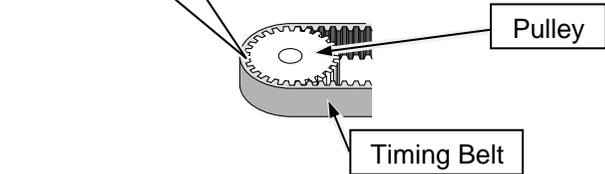
POINT

- First place the belt on pulley 1.
- Make sure that the teeth of the Timing Belt and the pulley are properly engaged.



CAUTION

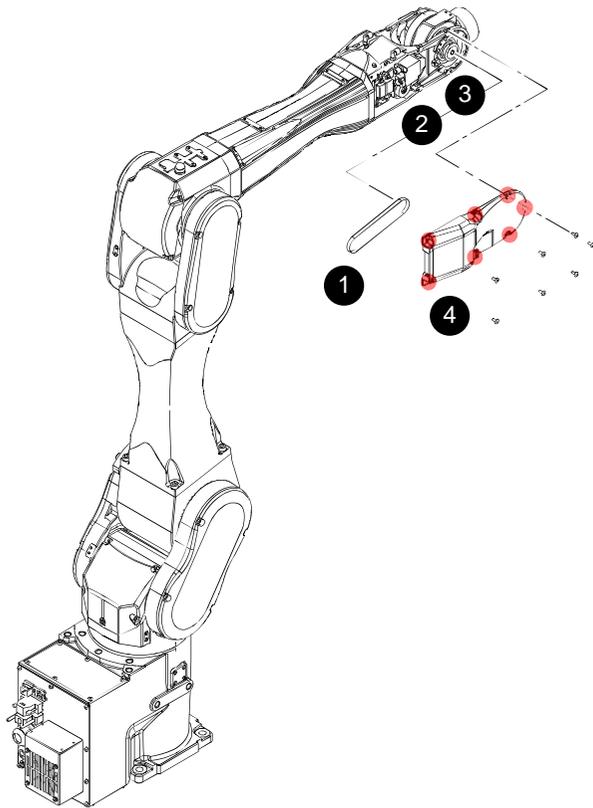
If the Timing Belt is placed on the flange, correct tension will not be obtained during belt tension adjustment.

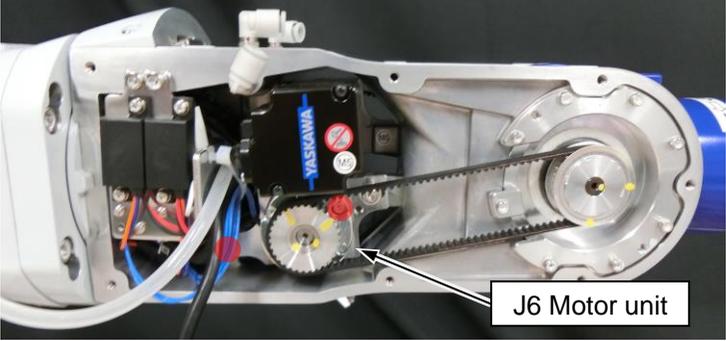


Set the belt so that it is level with respect to the pulley without it being placed on the flange.

Joint #6

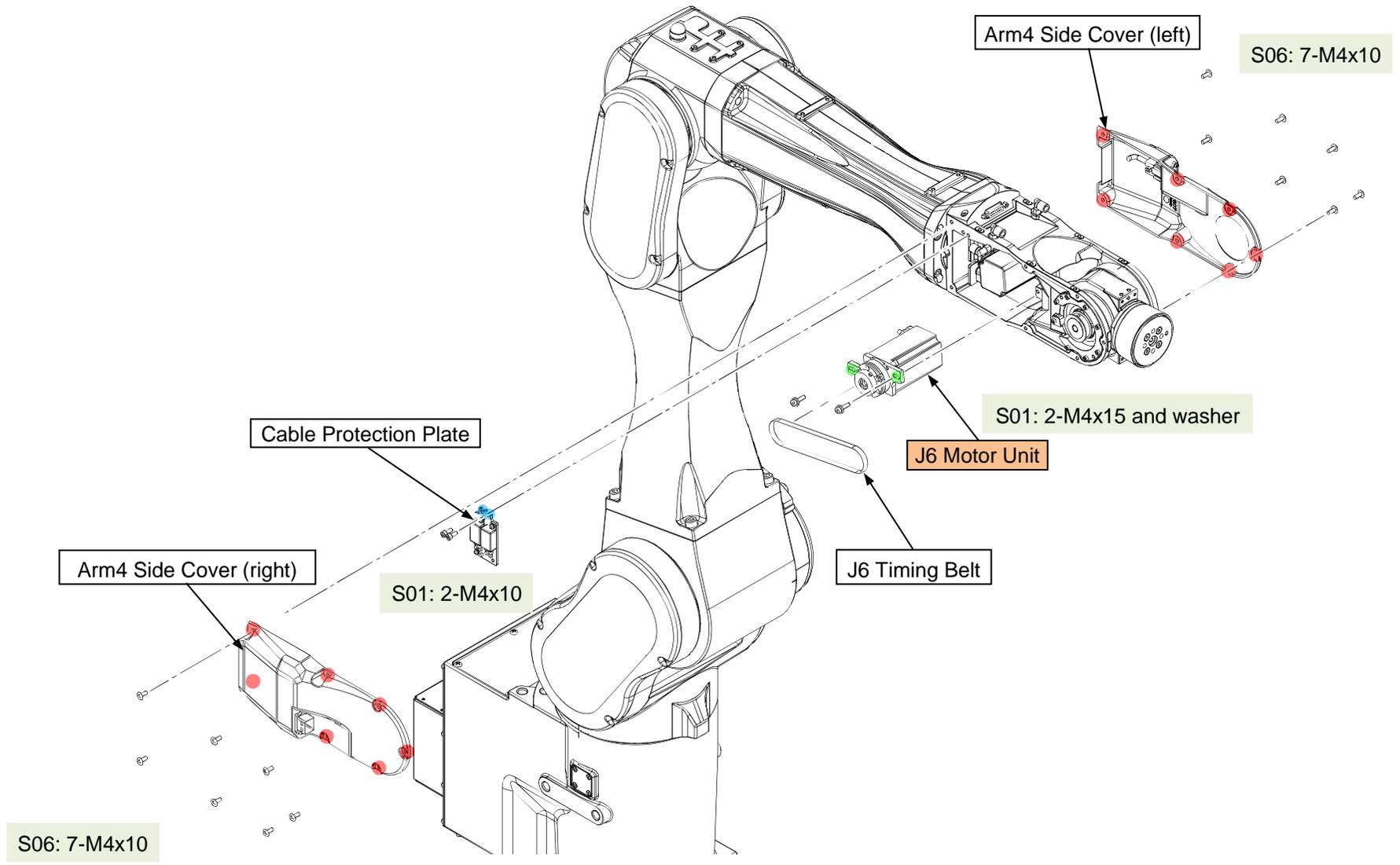
Installing the Timing Belt



<p>2</p>	<p>Temporarily secure the J6 Motor unit.</p> <p>A S01: 2-M4x15 and washer</p>  <p>POINT The standard for temporary fastening is where the Motor Unit can be moved by hand and will not tilt when pulled. If this is either too loose or too tight, it will not provide the proper tension to the belt.</p>
<p>3</p>	<p>Adjust the belt tension. 3.1 Adjusting the Timing Belt Tension</p>
<p>4</p>	<p>Install the Arm4 side cover (right).</p>
<p>5</p>	<p>After assembly, perform calibration of Joint #6. 3.2 Calibration</p>

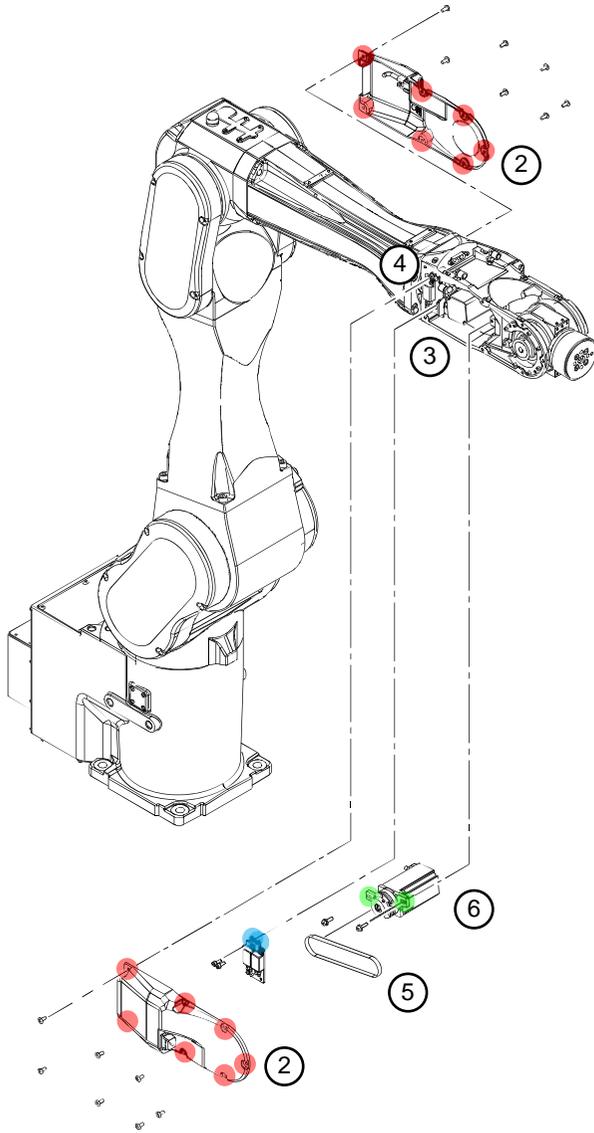
Joint #6

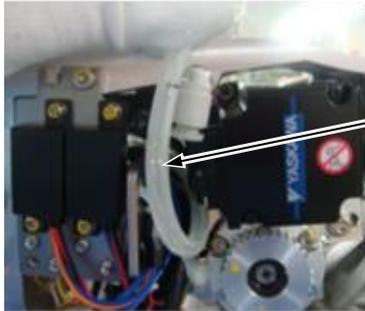
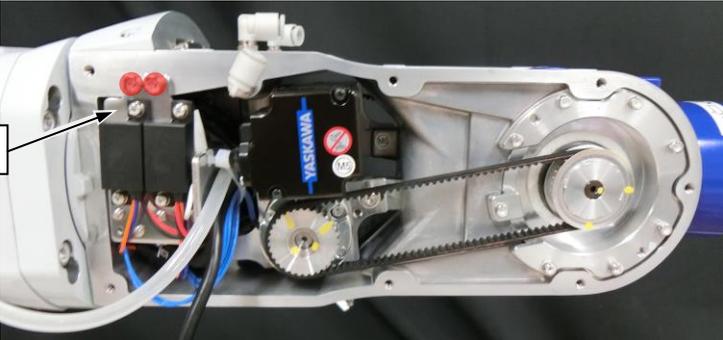
2.8.2 Joint #6 Replacing the Motor Unit



Joint #6

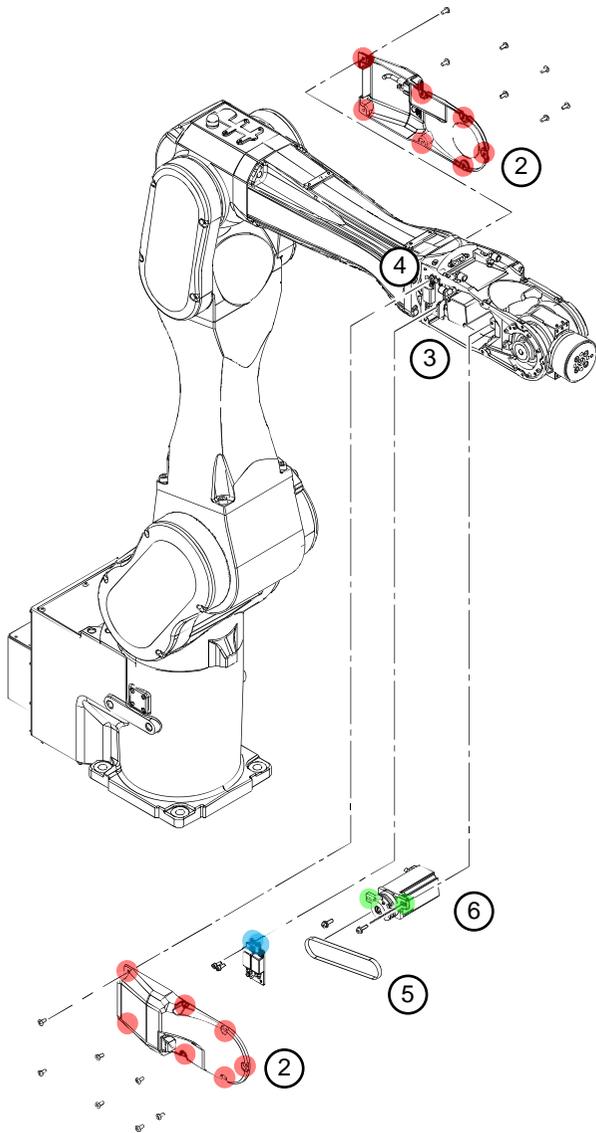
Removing the Motor Unit



①	Turn OFF the Controller.
②	Remove the Arm4 side cover (both sides).
③	Disconnect the Air Tube. <div data-bbox="1256 416 1794 727" style="text-align: right; margin-top: 20px;">  <p>Air Tube</p> </div>
④	Disconnect the J6 Motor Connectors. <ol style="list-style-type: none"> 1. Loosen the cable protection plate screws, and remove the plate. <div data-bbox="898 874 1144 922" style="margin-left: 20px;"> A S01: 2-M4x10 </div> <div data-bbox="875 999 1167 1046" style="margin-left: 20px;">  <p>Cable protection plate</p> </div>

Joint #6

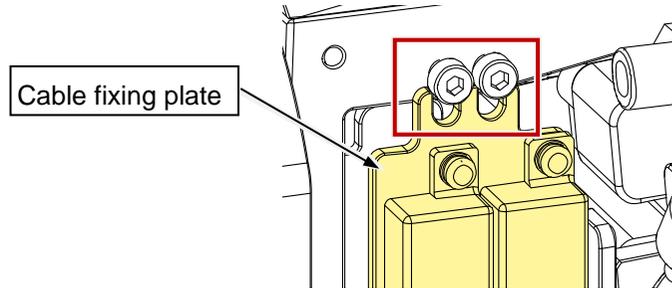
Removing the Motor Unit



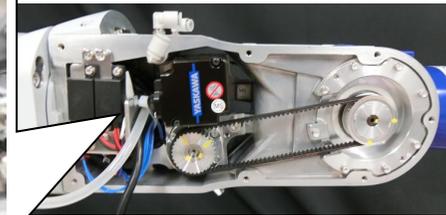
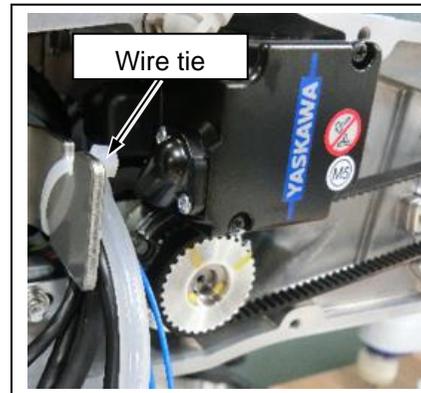
Joint #6

POINT

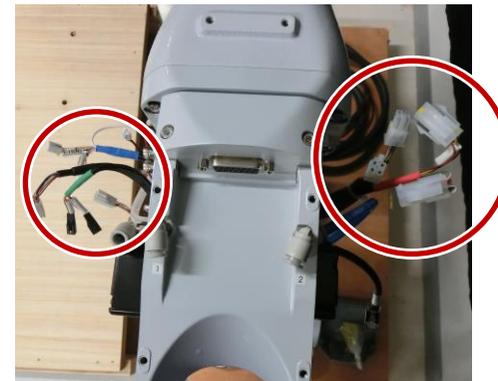
Slide the cutout section on the cable fixing plate.



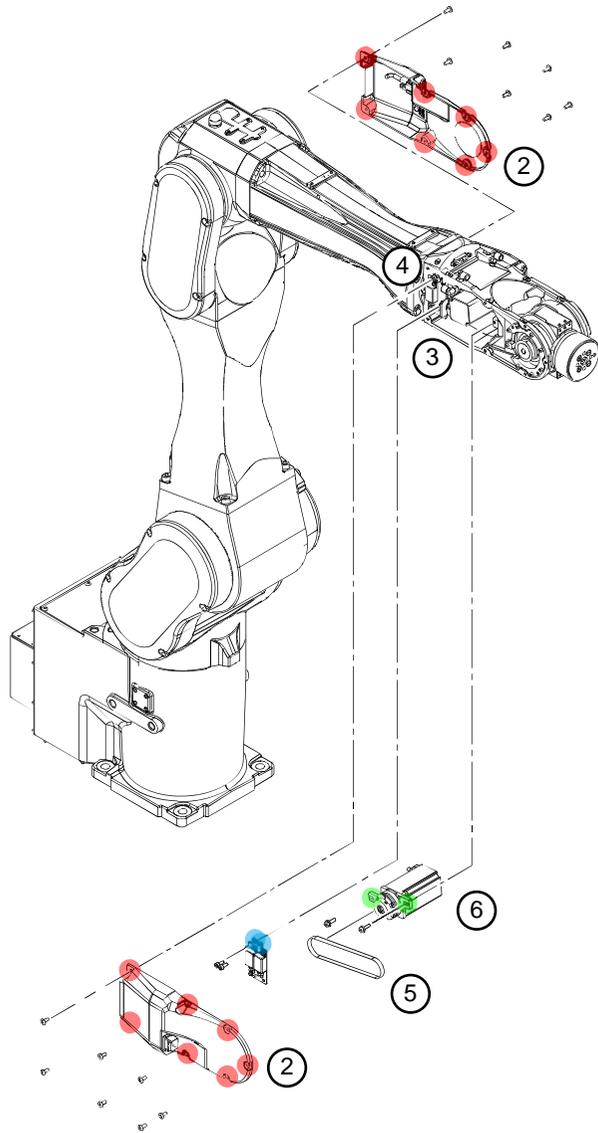
2. Cut the wire tie.



3. Disconnect the connectors (CN361, CN461, CN161).



Removing the Motor Unit

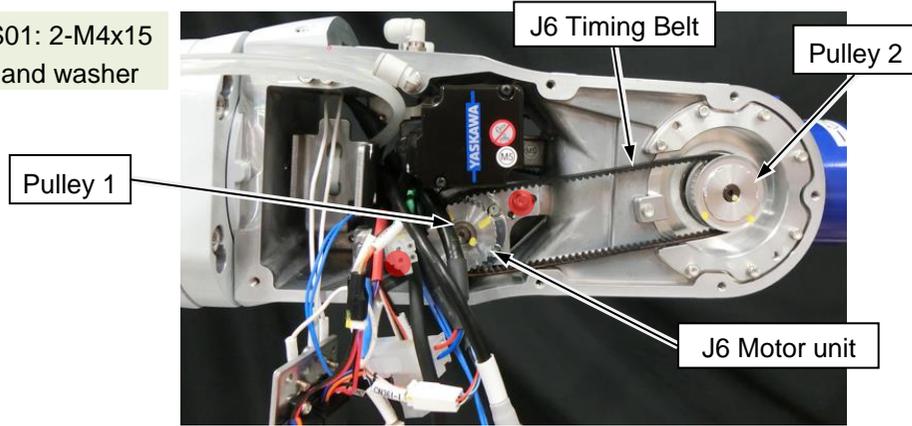


⑤ Loosen the screws securing the J6 Motor unit, and remove the J6 Timing Belt.

POINT

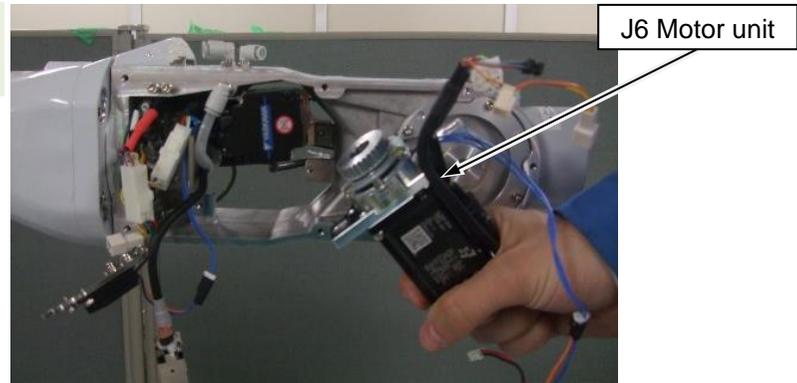
First, remove the belt on pulley 1.

A S01: 2-M4x15 and washer

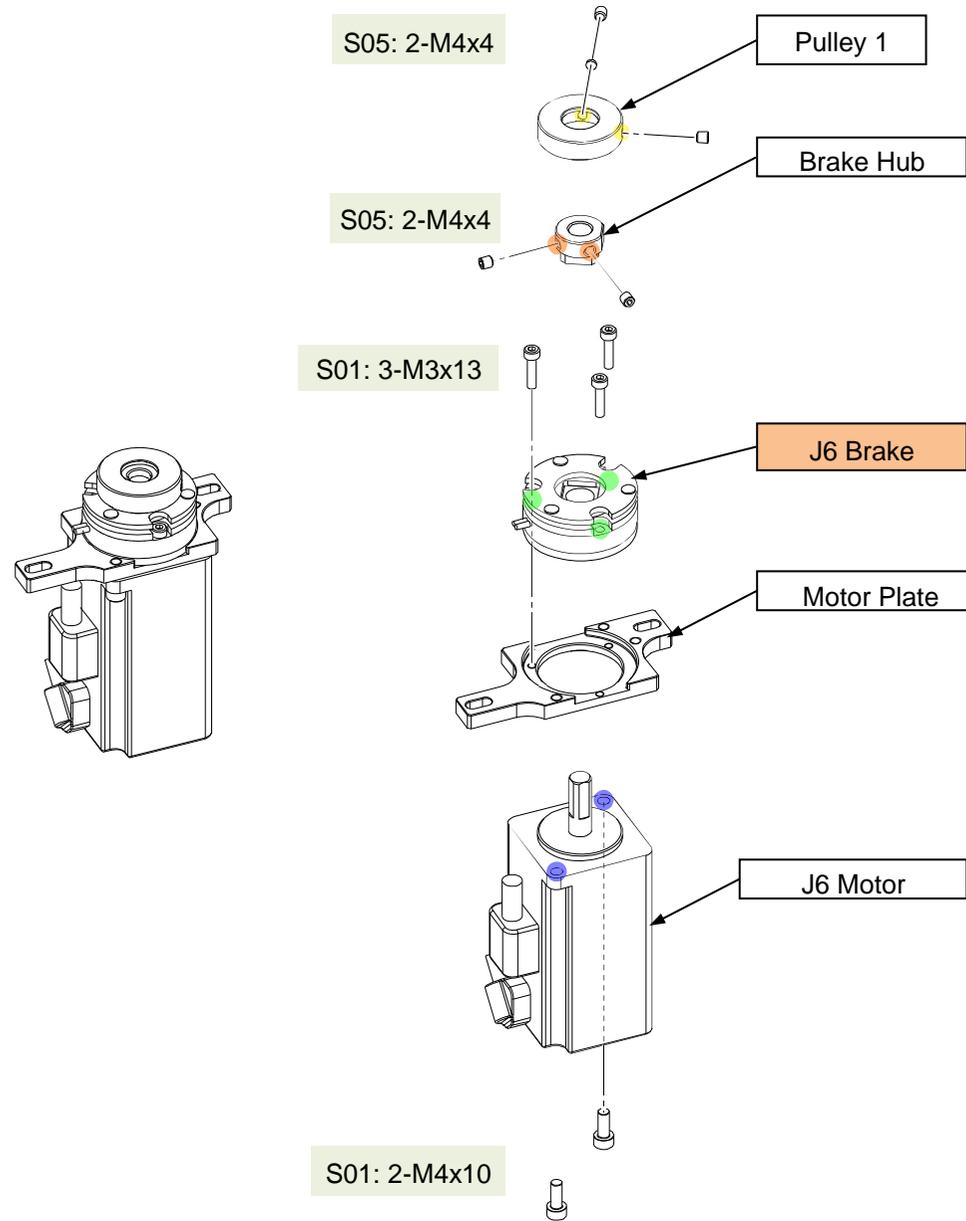


⑥ Remove the loosened screws, then remove the J6 Motor unit.

A S01: 2-M4x15 and washer

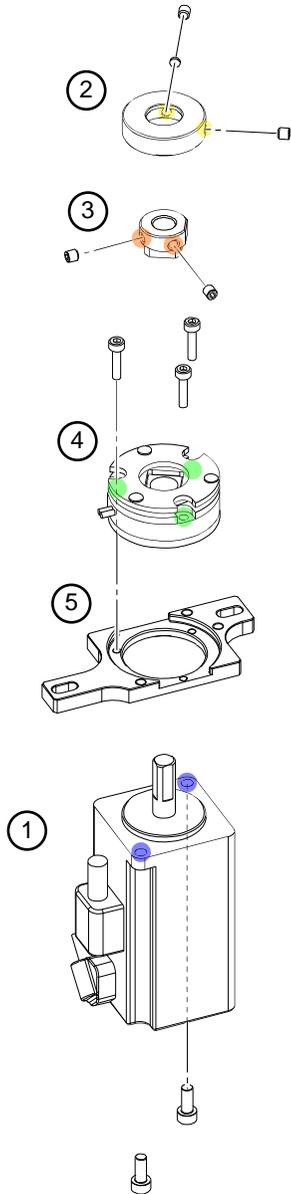


Motor Unit Disassembly



Joint #6

Motor Unit Disassembly

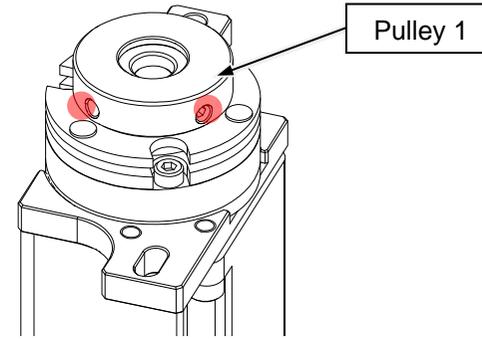


Joint #6

① Remove the [J6 Motor unit](#).

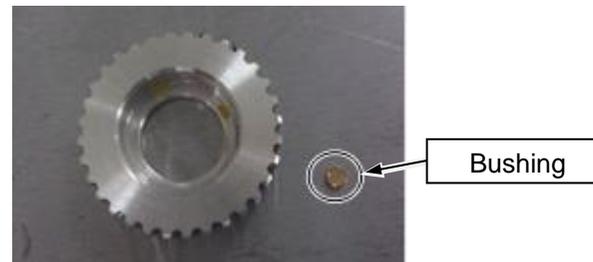
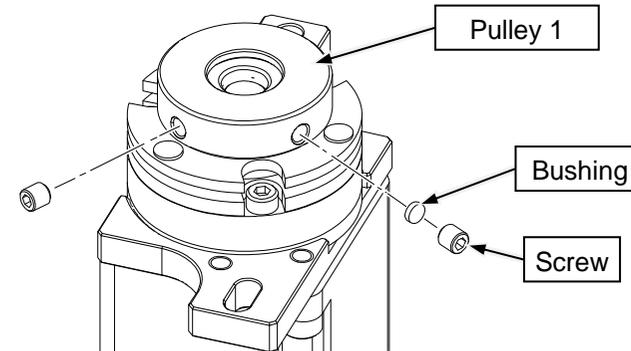
② Remove pulley 1.

A S05: 2-M4x4

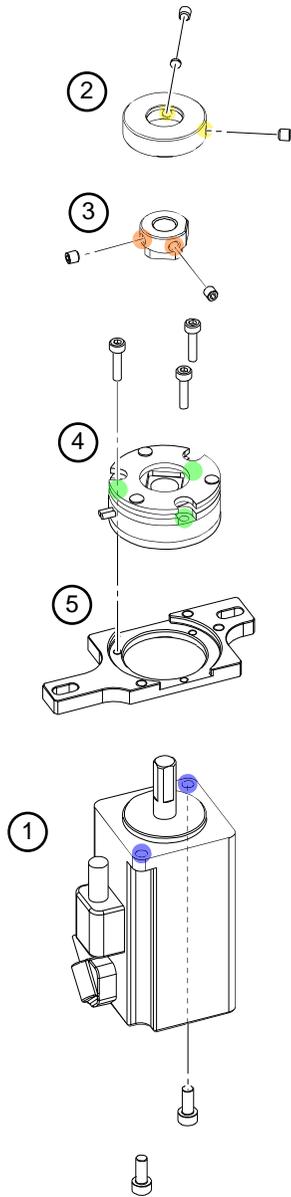


CAUTION

A brass bushing is included on one of the set screws. When removing the pulley, be careful not to drop and lose the bushing.

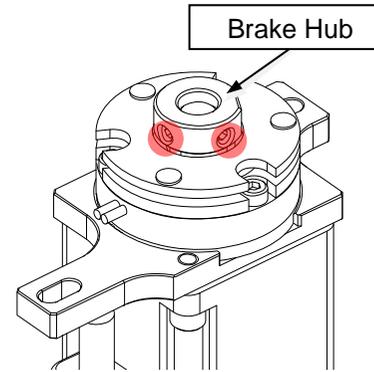


Motor Unit Disassembly



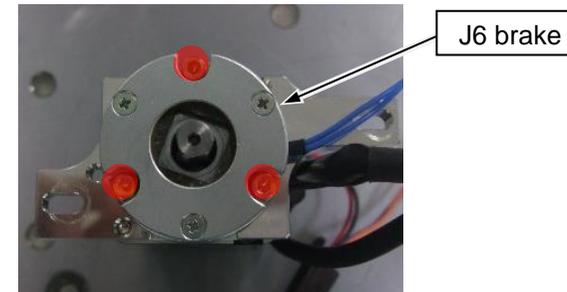
③ Remove the Brake Hub.

A S05: 2-M4x4



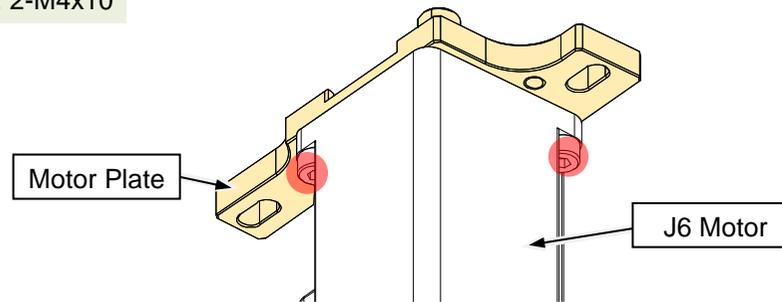
④ Remove the J6 brake.

A S01: 3-M3x13



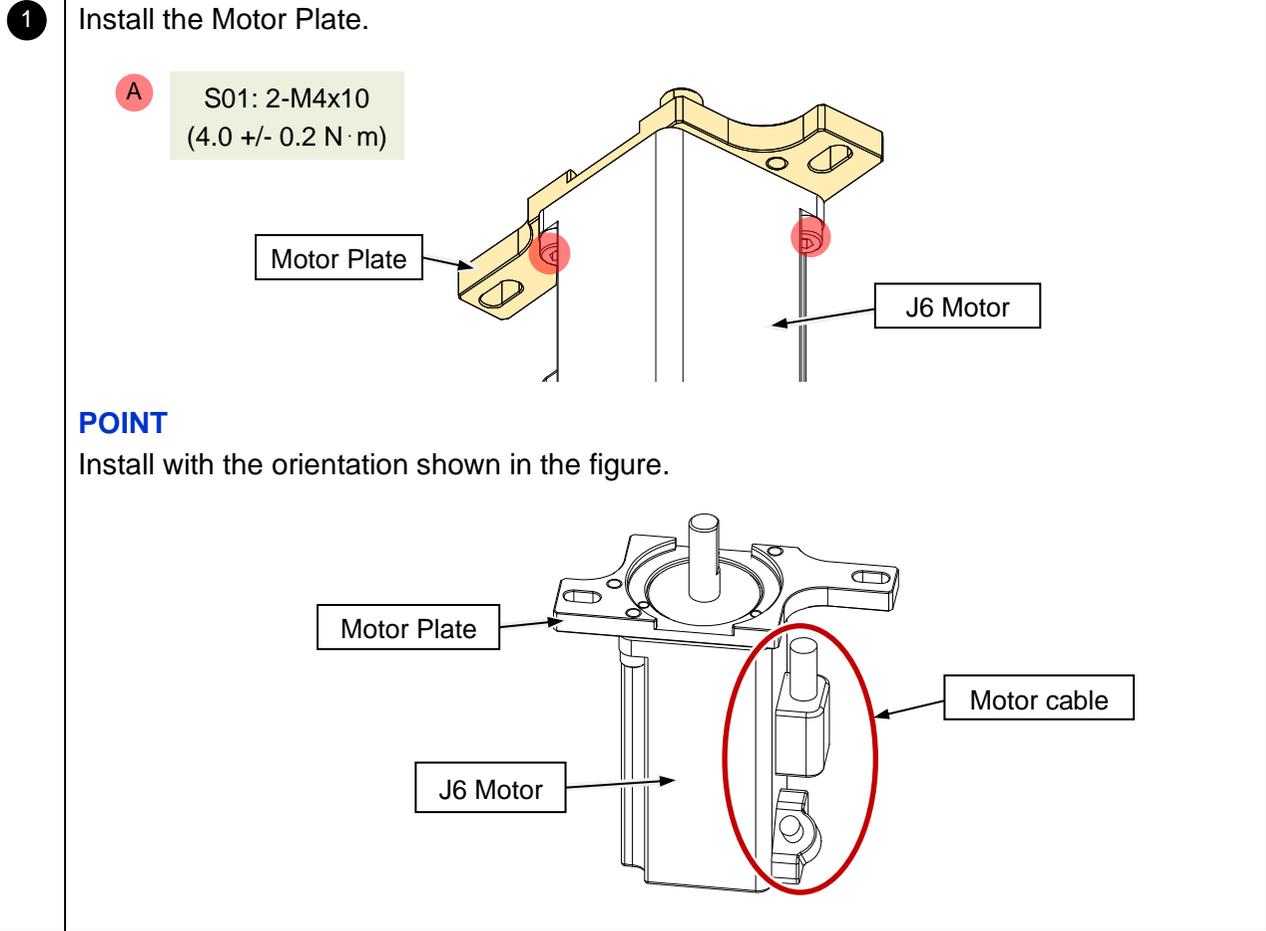
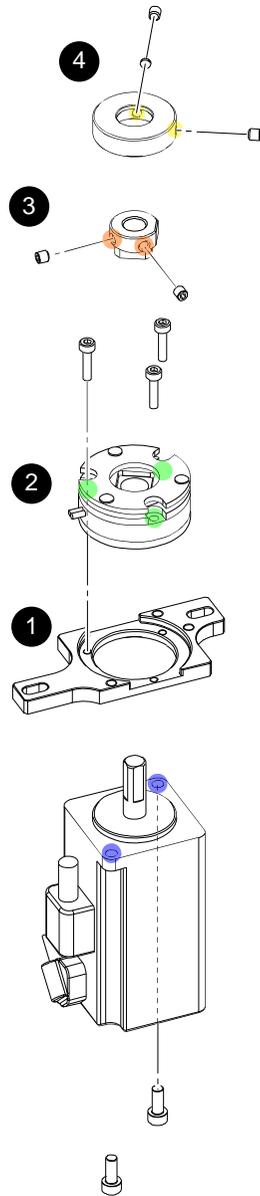
⑤ Remove the Motor Plate.

A S01: 2-M4x10



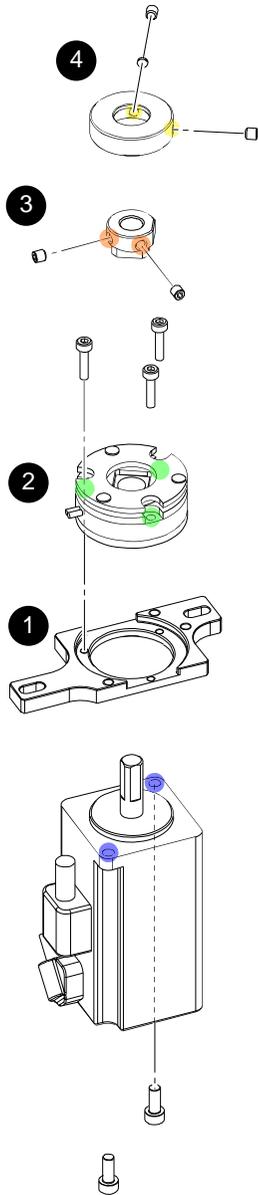
Joint #6

Motor Unit Assembly



Joint #6

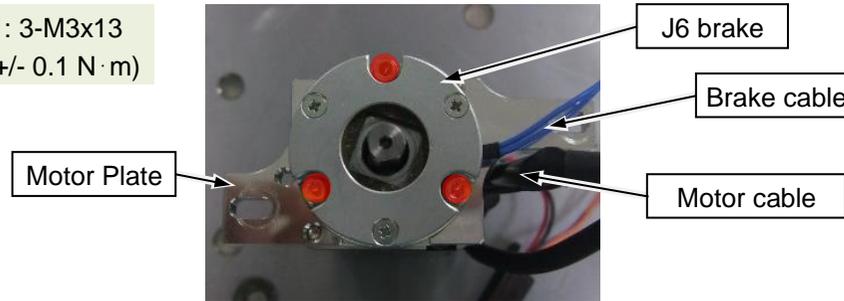
Motor Unit Assembly



Joint #6

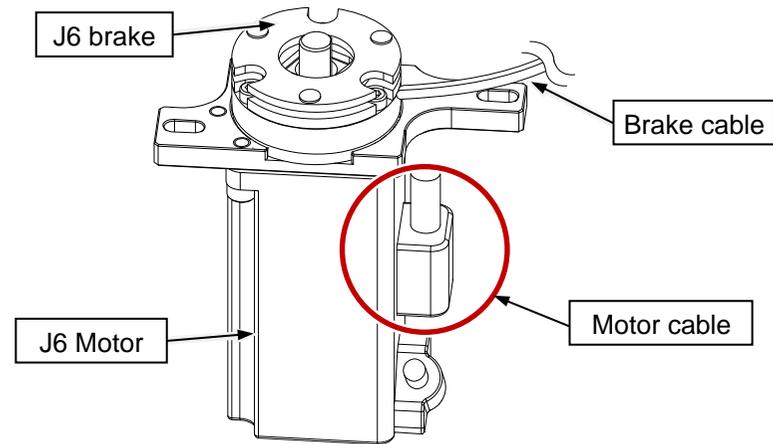
2 Install the J6 brake.

A S01: 3-M3x13
(2.0 +/- 0.1 N·m)

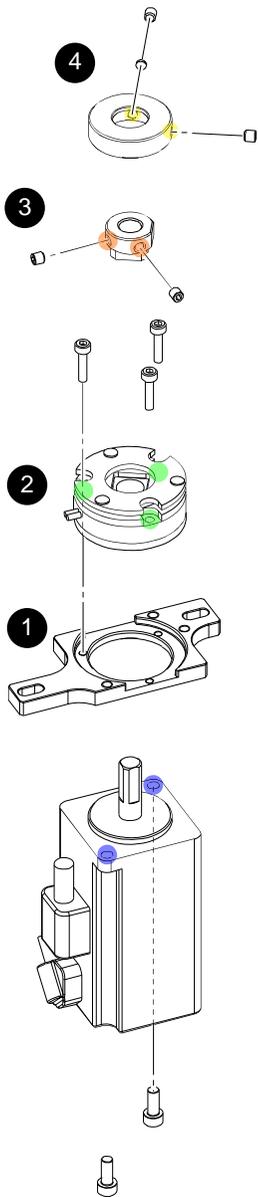


POINT

Install with the orientation shown in the figure.



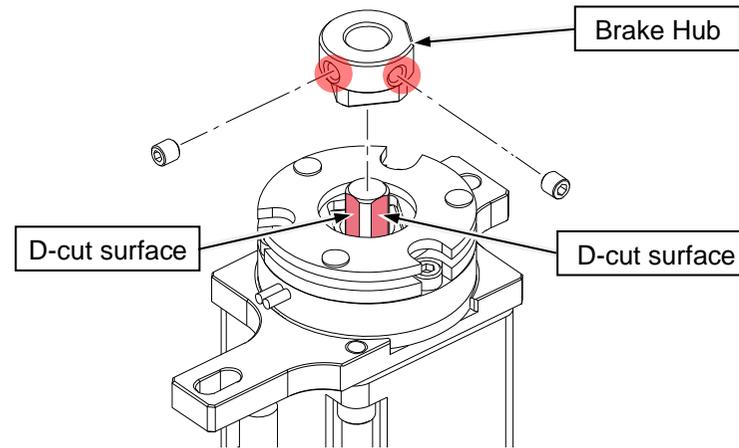
Motor Unit Assembly



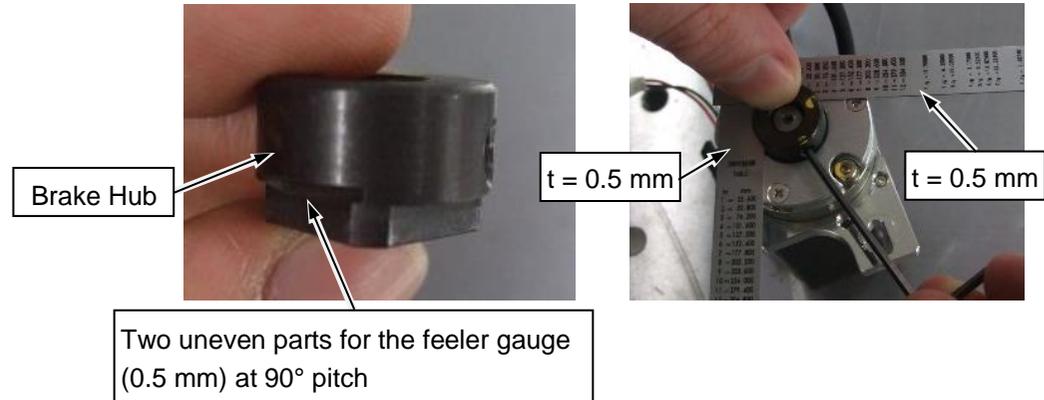
3

Install the Brake Hub.

1. Align the motor shaft D-cut surface with the screw holes, and set the Brake Hub.



2. Place 0.5-mm feeler gauges or scales on the brake to ensure a 0.5-mm gap between the Brake Hub and the brake.

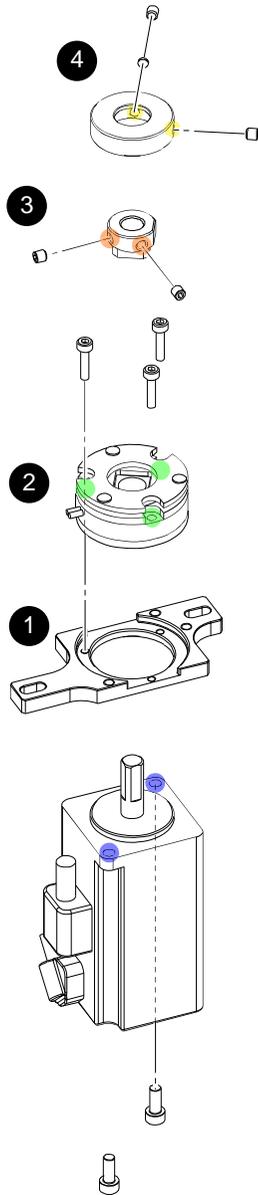


CAUTION

Failure to create a proper gap between the Brake Hub and the brake may cause the parts to rub during motor operation, causing a malfunction.

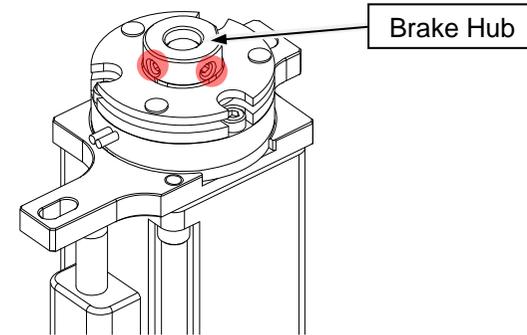
Joint #6

Motor Unit Assembly



3. Secure the Brake Hub with set screws.

A S05: 2-M4x4
(1.6 +/- 0.1 N·m)

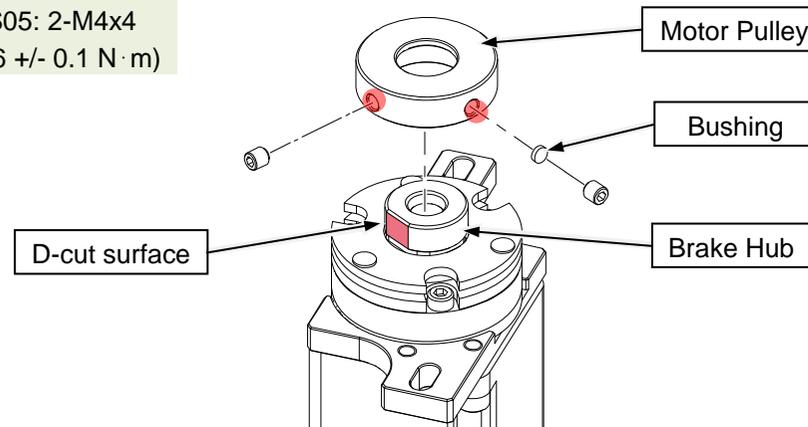


4 Install the Motor Pulley.

POINT

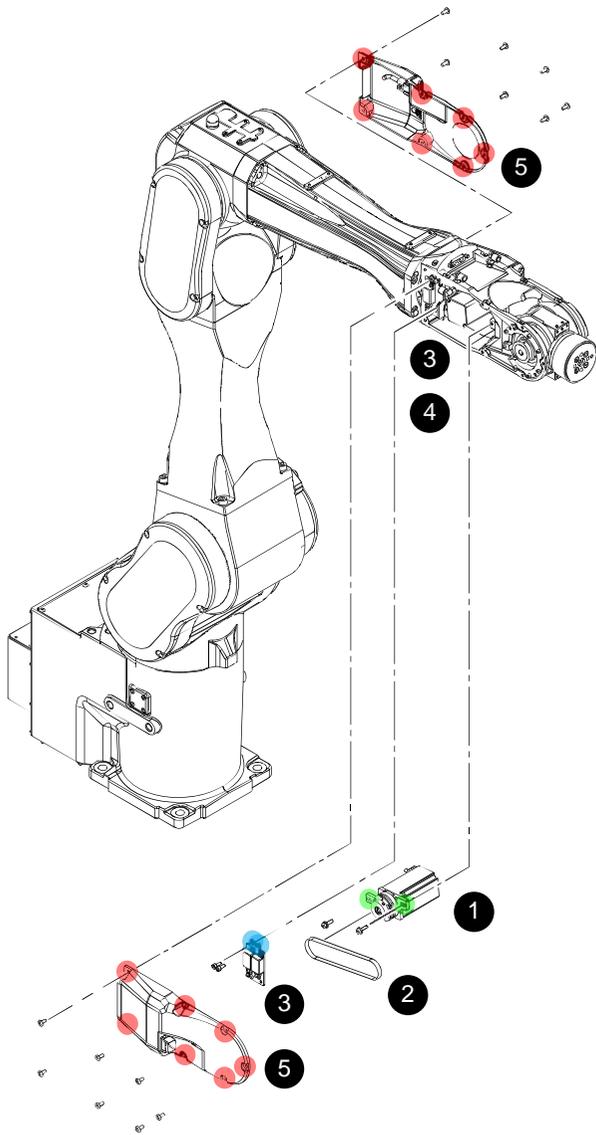
- Align the D-cut surfaces with the screw holes, and install the Motor Pulley.
- Install the bushing on the side without the D-cut.
- Tighten the screws while pressing the Motor Pulley against the Brake Hub.

A S05: 2-M4x4
(1.6 +/- 0.1 N·m)



Joint #6

Installing the Motor Unit



Joint #6

1 Install the J6 Motor unit.
 1. Insert the J6 Motor unit inside Arm4.

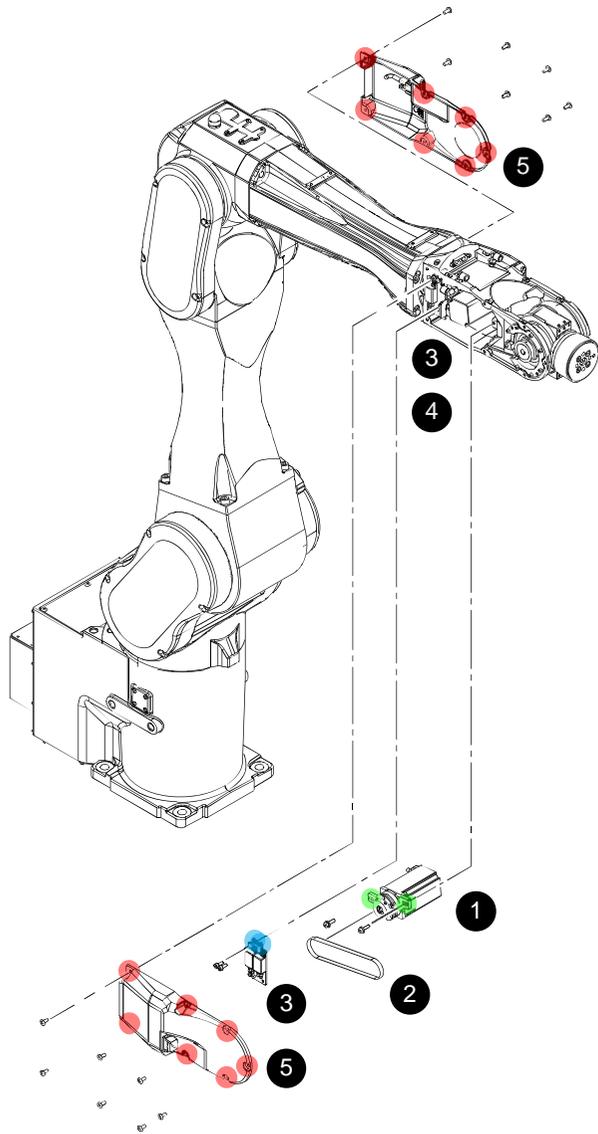
POINT
 First pass the CN161 cable, and insert into the arm from the bottom of the motor.

2. Set the Timing Belt around pulley 1 and pulley 2, and temporarily secure the J6 Motor unit.

POINT
 First place the belt on pulley 2.

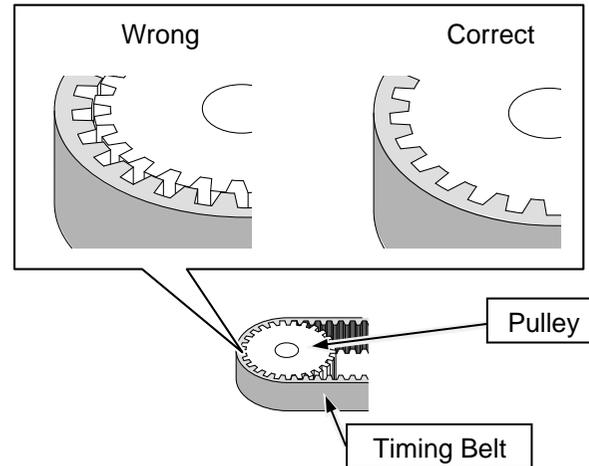
A S01: 2-M4x15 and washer

Installing the Motor Unit



POINT

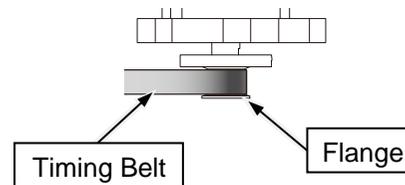
- Make sure that the teeth of the Timing Belt and the pulley are properly engaged.



- The standard for temporary fastening is where the Motor Unit can be moved by hand and will not tilt when pulled. If this is either too loose or too tight, it will not provide the proper tension to the belt.

CAUTION

If the Timing Belt is placed on the flange, correct tension will not be obtained during belt tension adjustment.



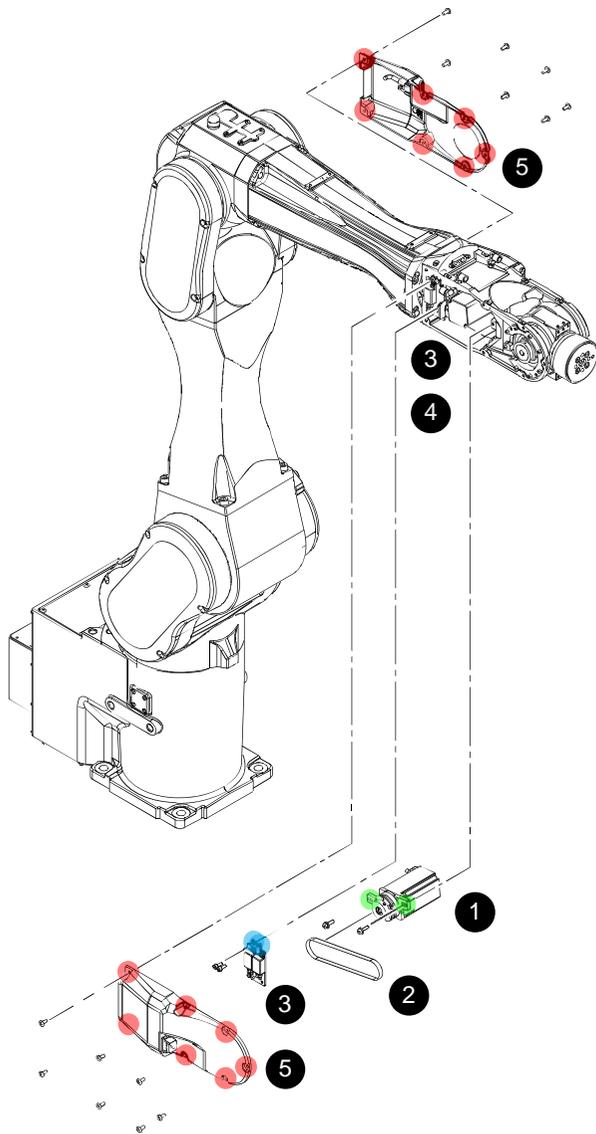
Set the belt so that it is level with respect to the pulley without it being placed on the flange.

2

Adjust the belt tension.

[3.1 Adjusting the Timing Belt Tension](#)

Installing the Motor Unit

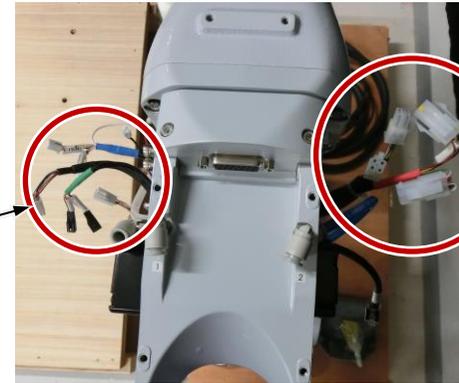


3

Connect the J6 Motor Connectors, and secure the cables protection plate to Arm4.

1. Pull out each connector as shown in the figure below.

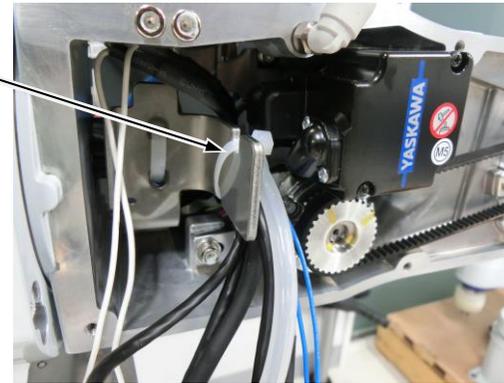
CN351/CN361,
CN450/CN460,
CN451/CN461



CN151, CN161

2. Secure the following cables to the cable fixing plate using the wire tie (AB200).
Force sensor connector, Air Tube, CN351/CN361, CN450/CN460, CN451/CN461

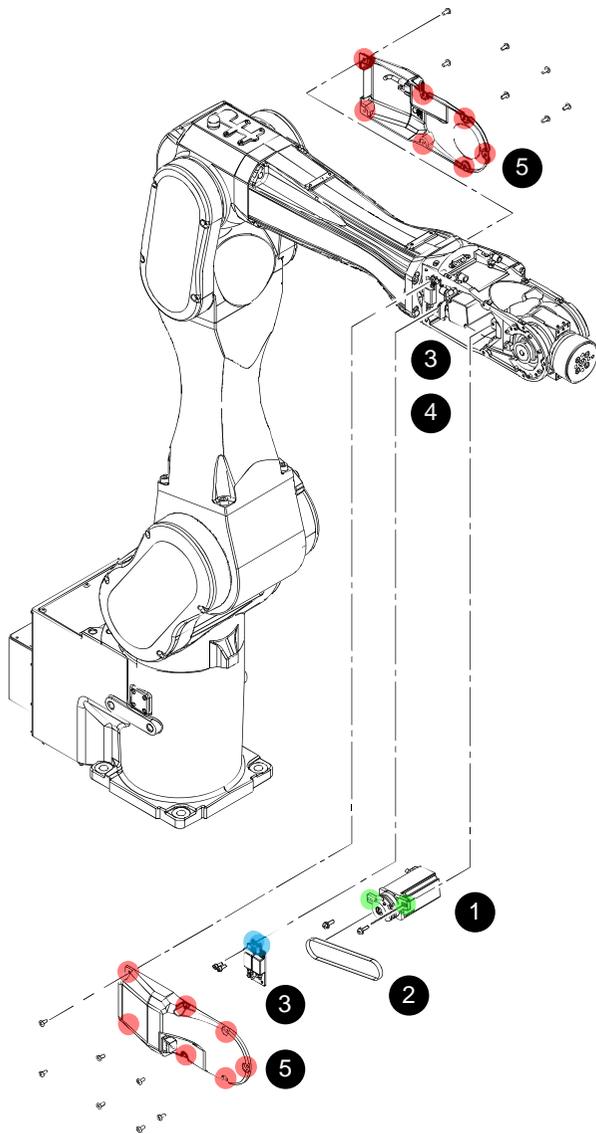
Wire tie



3. Connect the following connectors.
CN351, CN361, CN450, CN460, CN451, CN461, CN151, CN161

Joint #6

Installing the Motor Unit



4. Install the cable protection plate.

CAUTION

Be careful not to let the cables get pinched.

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)

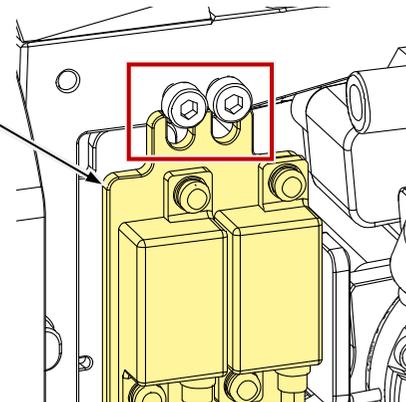
Cable protection plate



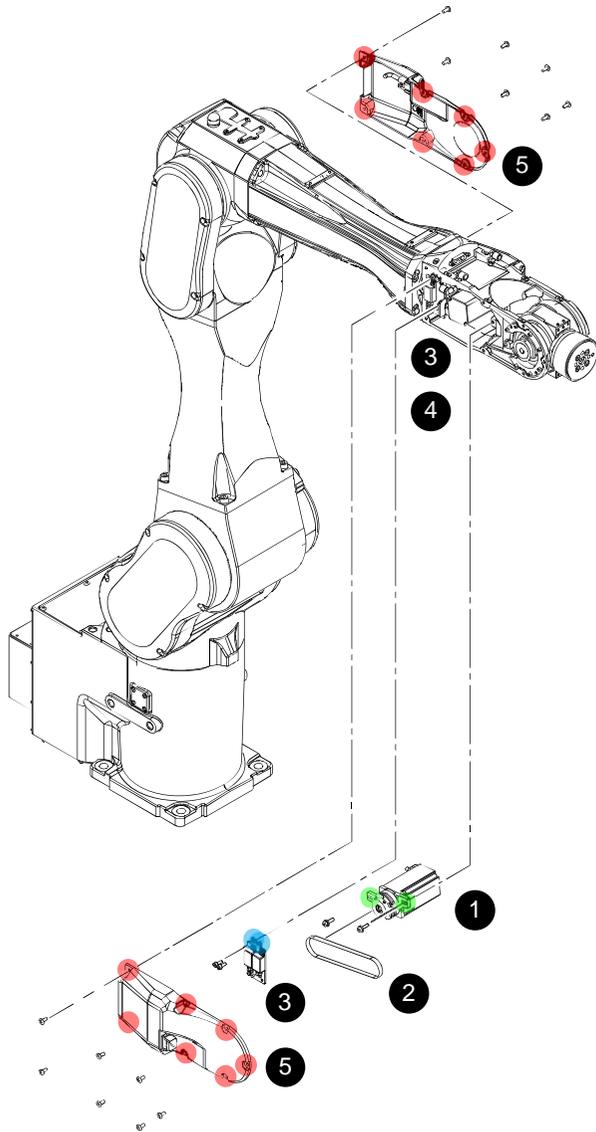
POINT

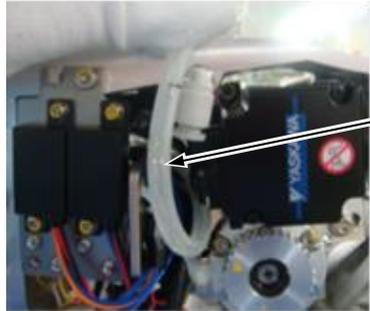
Slide the cutout section on the cable protection plate, and secure with screws.

Cable fixing plate



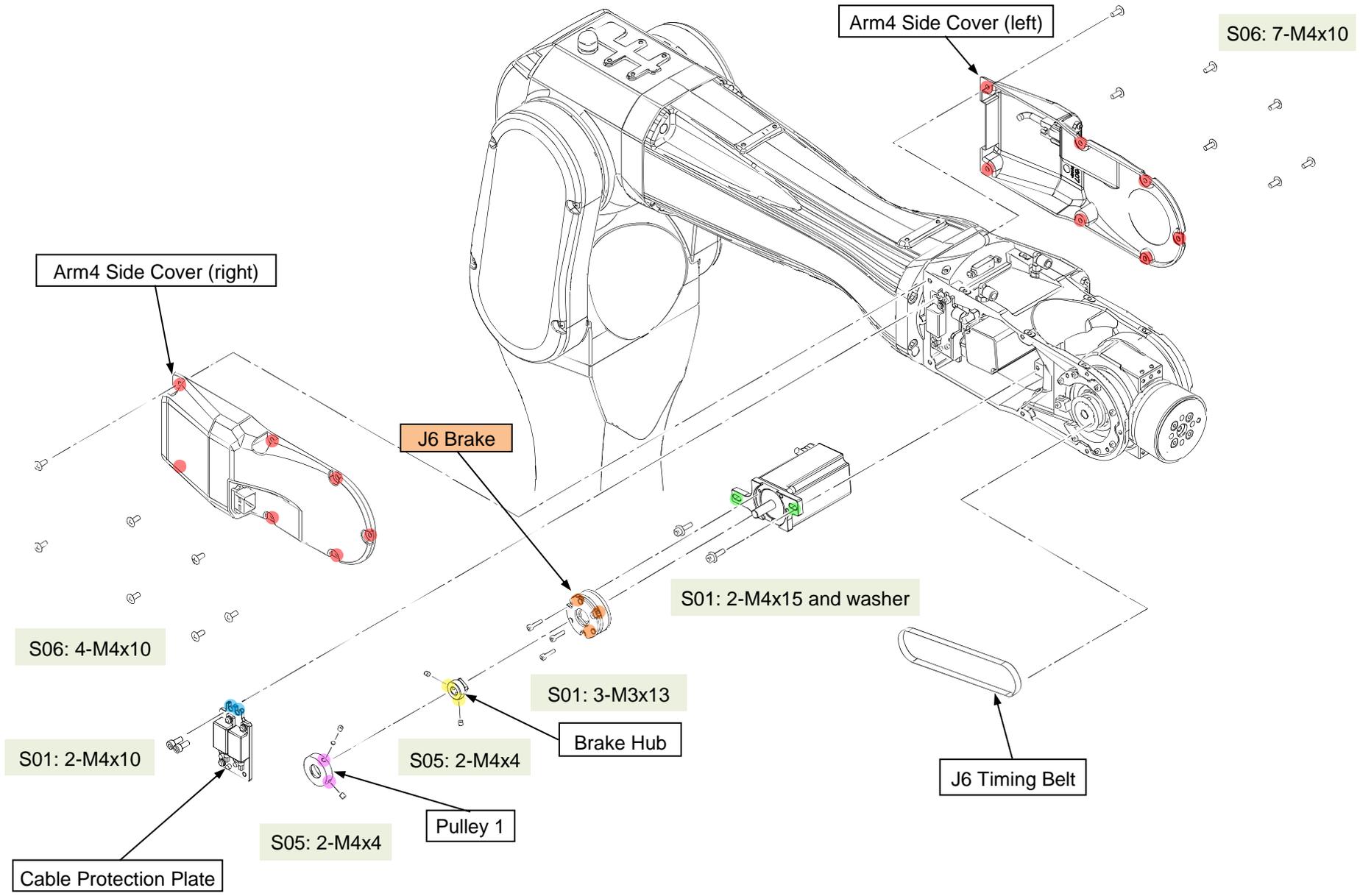
Installing the Motor Unit



4	Install the Air Tube.	
5	Install the Arm4 side cover (both sides).	
6	After assembly, perform calibration of Joint #6. 3.2 Calibration	

Joint #6

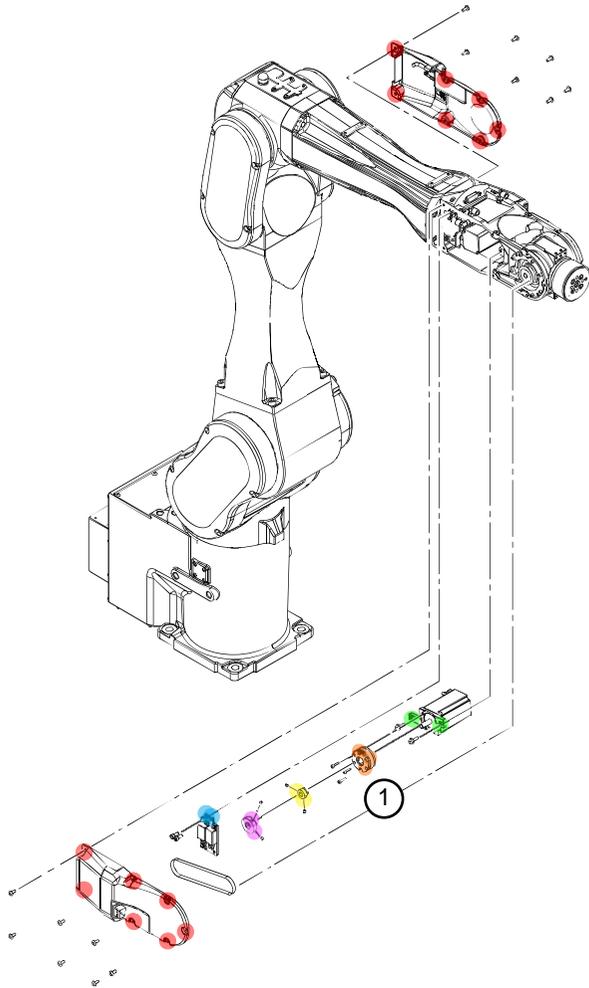
2.8.3 Joint #6 Removing the Brake



Joint #6

Removing the Brake

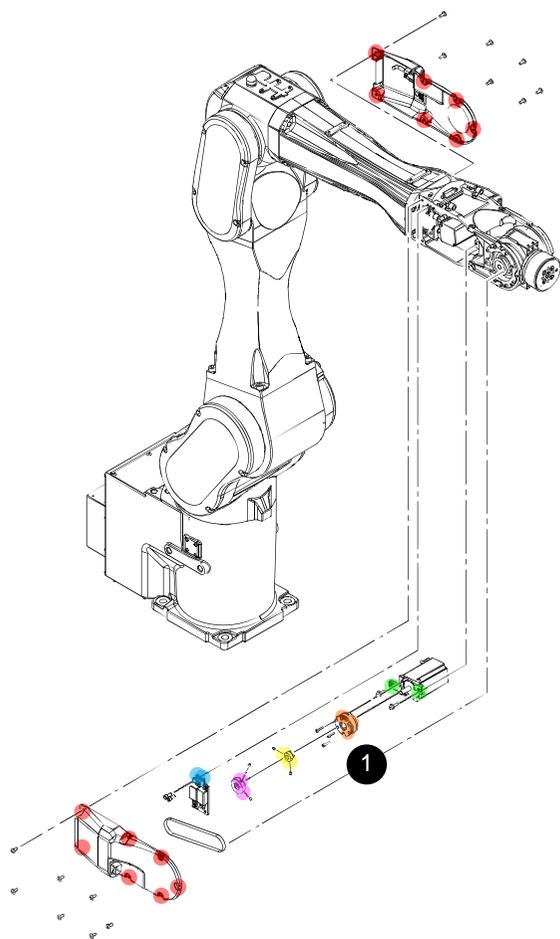
- | | |
|---|---|
| ① | Refer to J6 Motor Unit Disassembly and remove the J6 brake. |
|---|---|



Joint #6

Installing the Brake

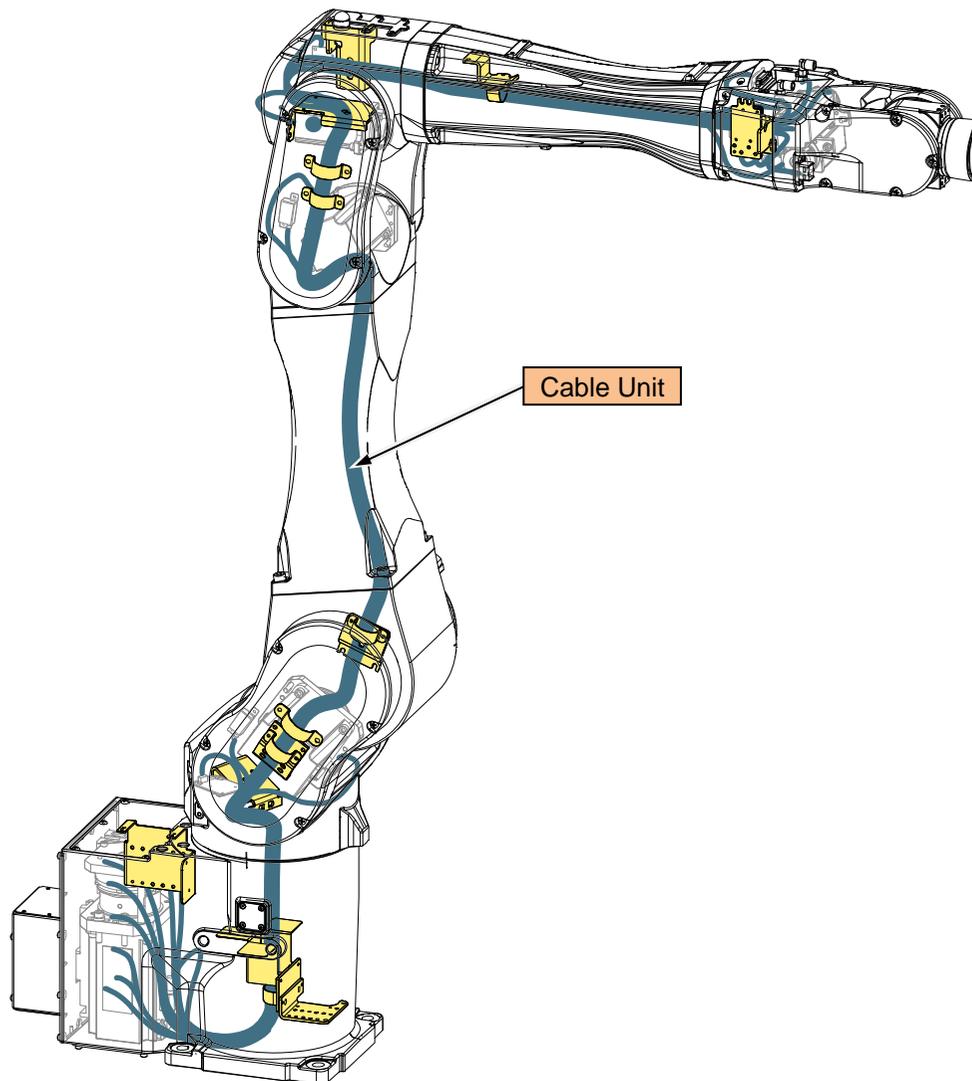
- | | |
|----------|---|
| 1 | Refer to J6 Motor Unit Assembly and install the J6 brake. |
|----------|---|



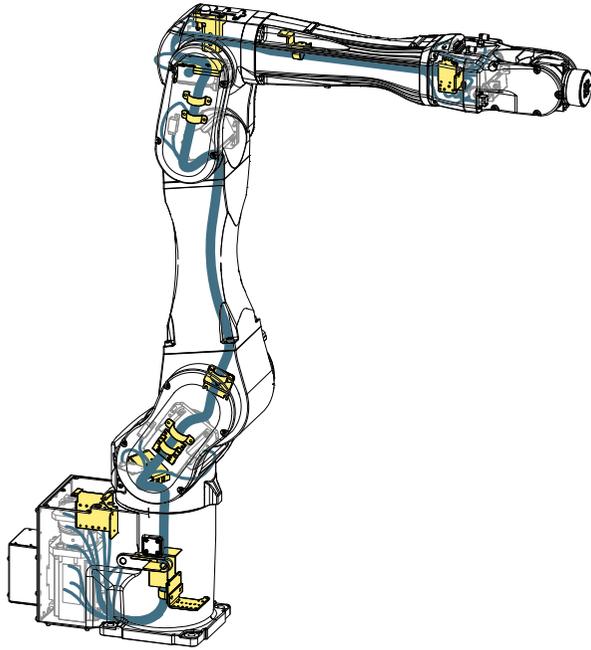
Joint #6

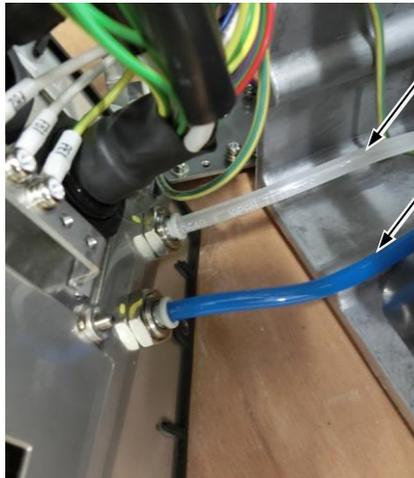
2.9 Replacing the Cable Unit

2.9.1 Removing the Cable Unit

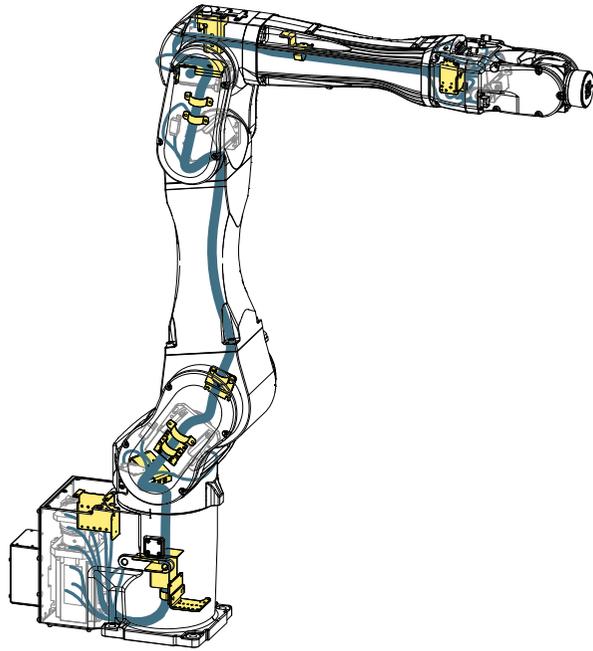


Removing the Cable Unit



①	Move the Manipulator to the origin posture (0 pulse position).
②	Turn OFF the Controller.
③	<p>Remove the following parts.</p> <ul style="list-style-type: none"> • Arm4 side cover (both sides) • Arm4 maintenance cover • Arm3 cover • Arm3 maintenance cover • Arm2 side cover (both sides) • Arm1 side cover (both sides) • Arm1 center cover • Base Maintenance Cover • Connector Plate (M/C Cable Backward: C8), (M/C Cable Backward: C8XL, C12XL), (M/C Cable Downward) • J1 Motor unit (M/C Cable Backward), (M/C Cable Downward) • Gyro board 1
④	<p>Disconnect the cables from the Connector Plate.</p> <p>1. Disconnect the Air Tubes (blue/white).</p> <div data-bbox="1232 734 1904 1212" style="text-align: right;">  <p>Air Tube (white)</p> <p>Air Tube (blue)</p> </div>

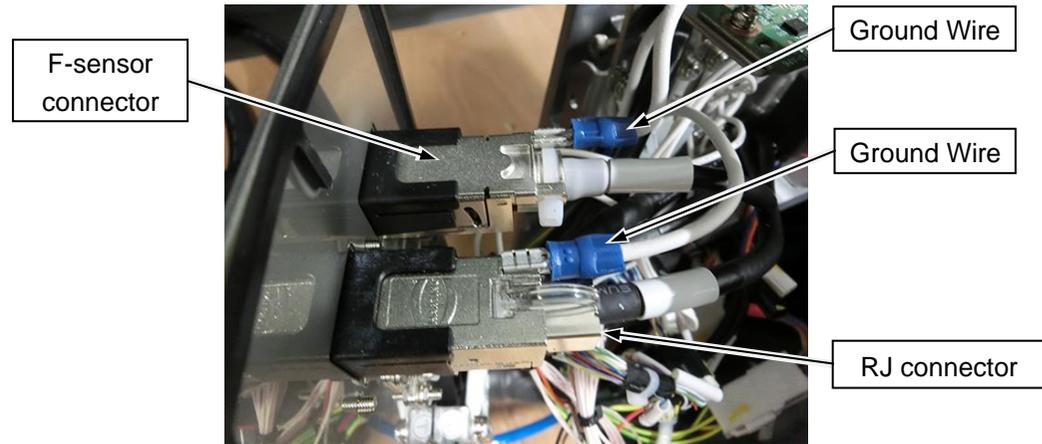
Removing the Cable Unit



2. Disconnect the Ground Wires of the RJ45 connector and the F-sensor connector.

POINT

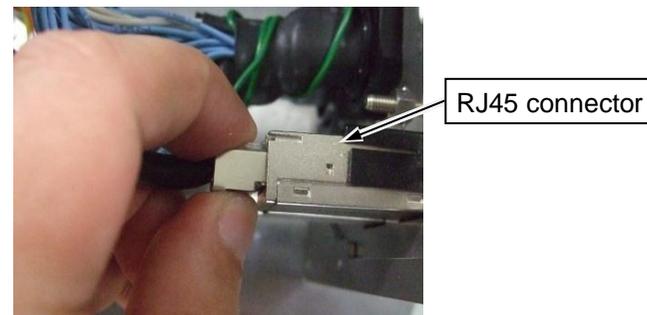
Holding down the connector by hand pull the Ground Wire.



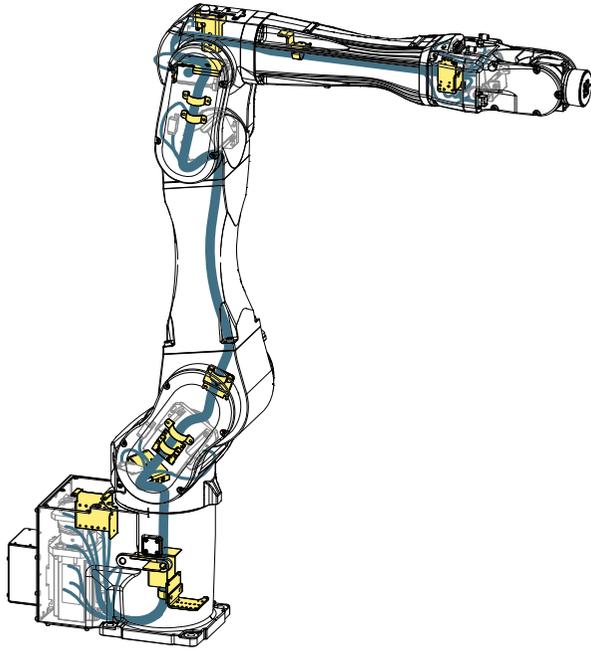
3. Disconnect the RJ45 connector.

POINT

Press the connector clip, and pull out.



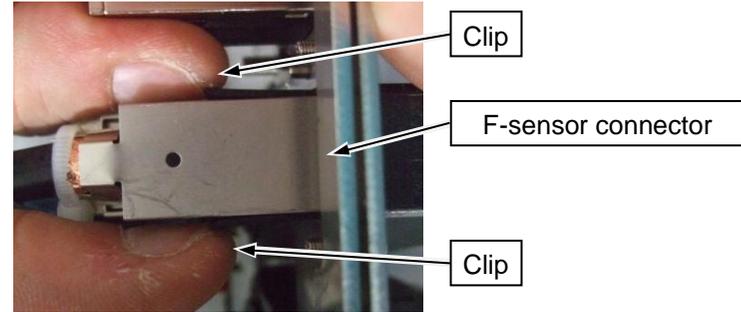
Removing the Cable Unit



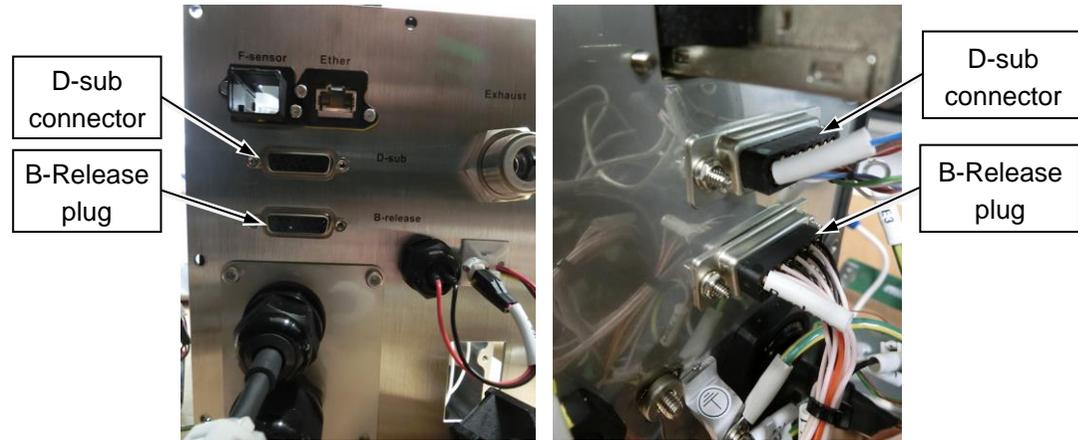
4. Disconnect the F-sensor connector.

POINT

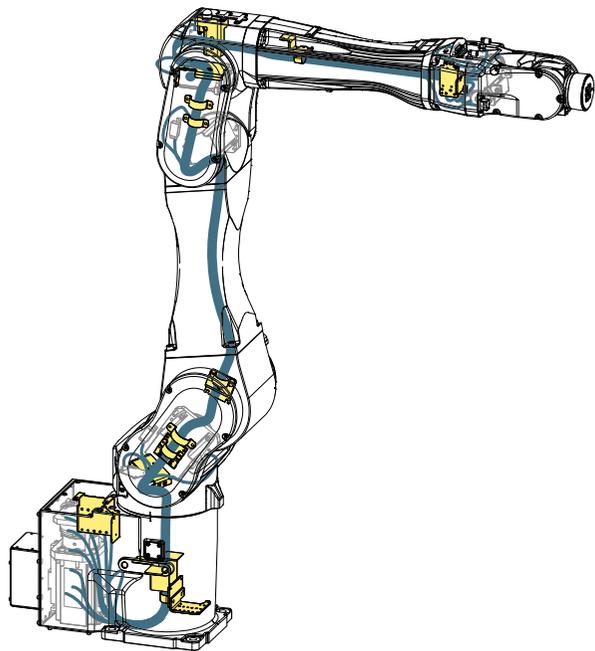
Open the clips on both ends of the connector and pull it out.



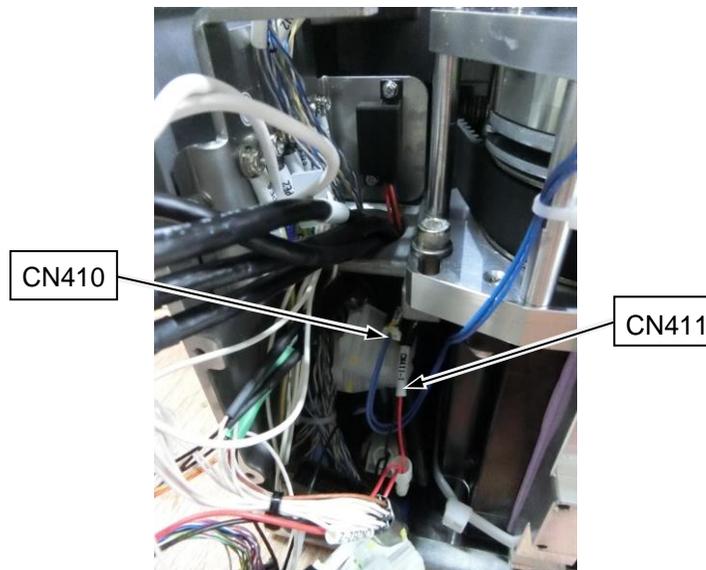
5. Disconnect the B-Release plug and D-sub connector.



Removing the Cable Unit

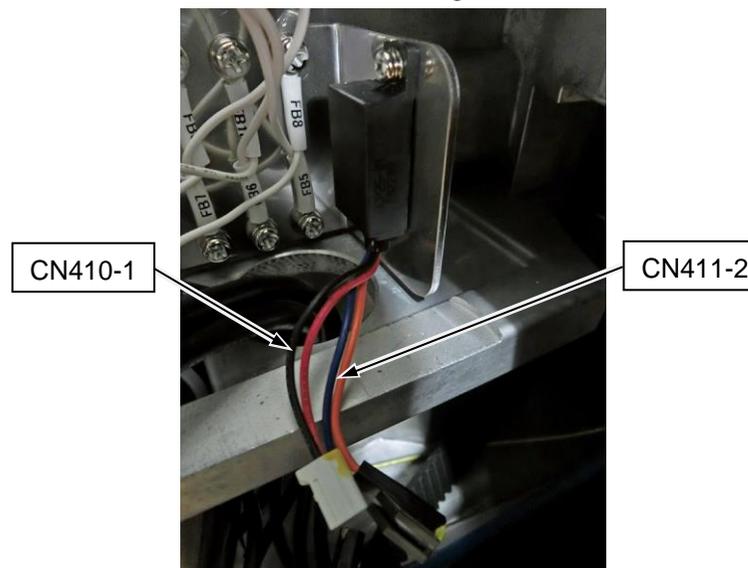


7. Disconnect the brake power supply connectors (CN410 and CN411).

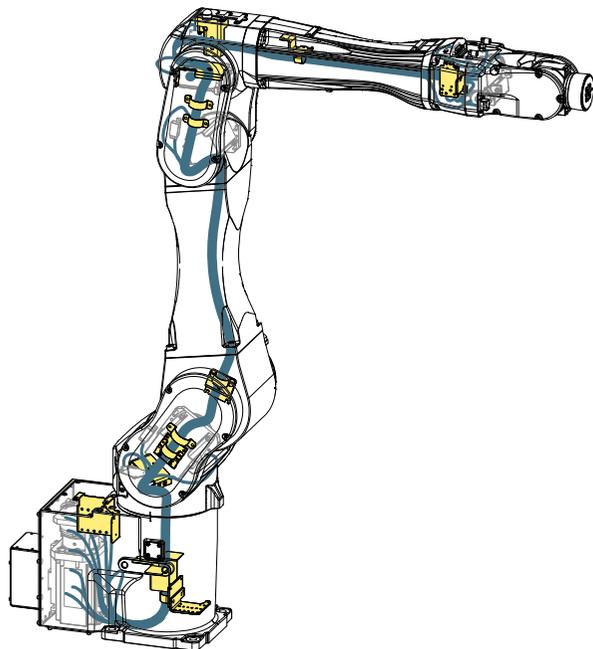


POINT

Pull the cables with CN410-1 and CN411-2 through the hole as shown in the figure.



Removing the Cable Unit



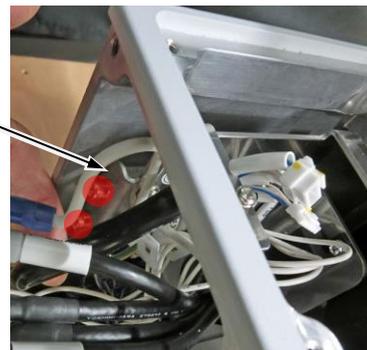
8. Remove the ground wire plate.

CAUTION

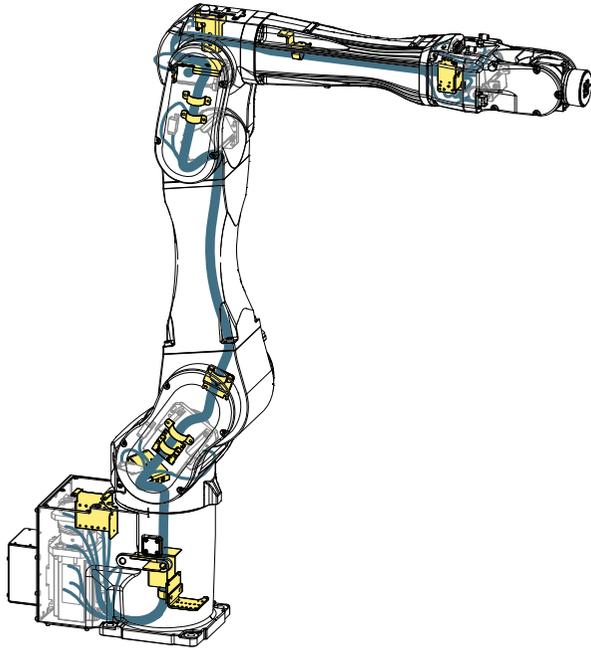
When removing the plate, take care not to damage the SUB-B Board (DC/DC Board), such as by contacting the base.

A S01: 2-M4x10

Ground wire plate

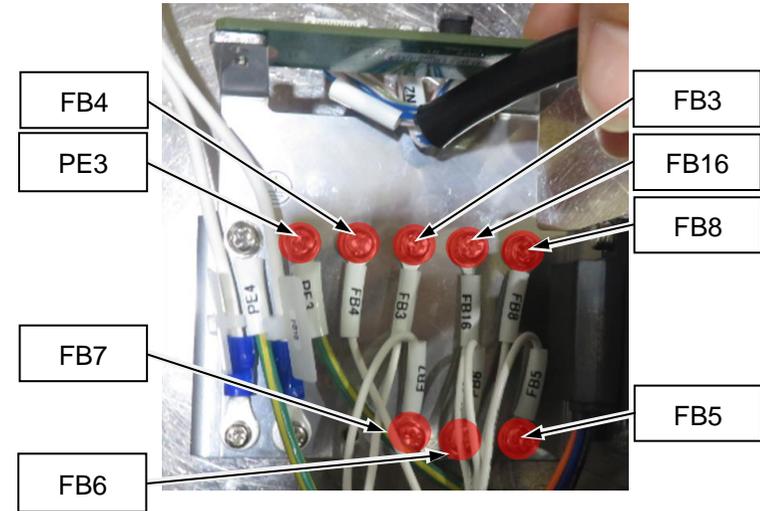


Removing the Cable Unit



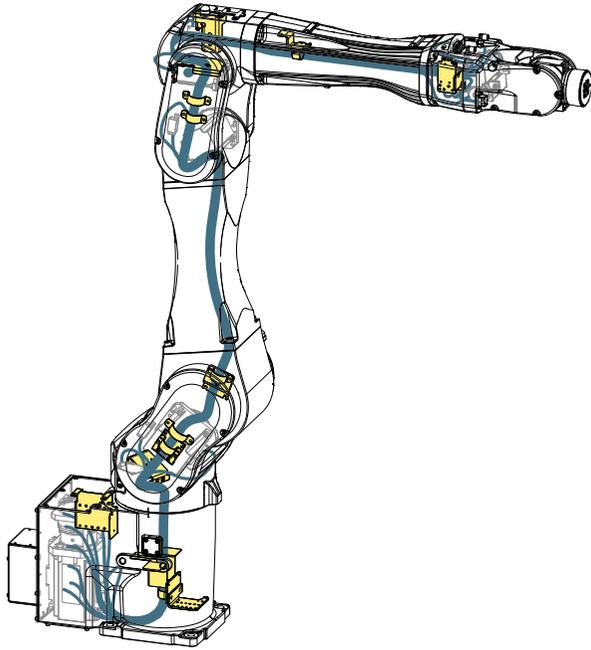
9. Pull out the ground wire plate from the base, and disconnect the following Ground Wires.
For C8-B/C12-B: PE3, FB4, FB3, FB16, FB8, FB7, FB6, FB5

A S04: 8-M4x6

**POINT**

The Ground Wires may be attached in positions different to what is shown in the figure.
Record the attachment positions before disconnecting, so that they can be returned to their positions during installation.

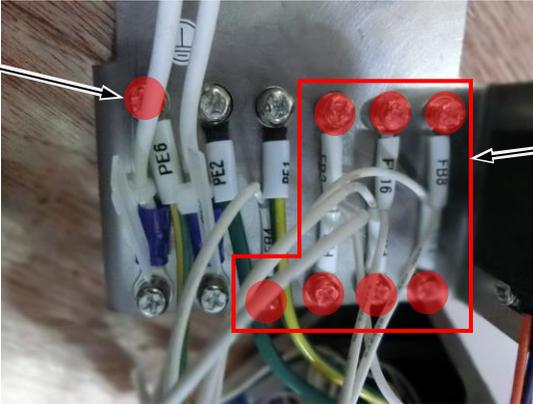
Removing the Cable Unit



For C8-C/C12-C: PE3, FB3, FB4, FB5, FB6, FB7, FB8, FB16

A S04: 8-M4x6

PE3

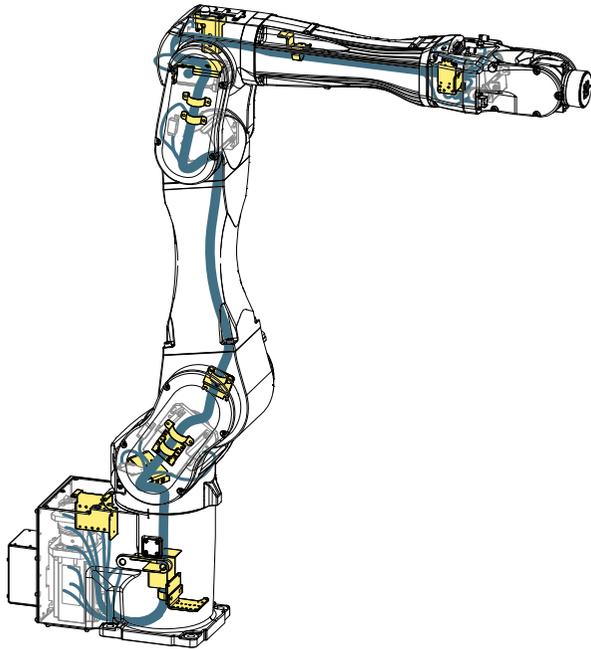


FB wires

POINT

The Ground Wires may be attached in positions different to what is shown in the figure. Record the attachment positions before disconnecting, so that they can be returned to their positions during installation.

Removing the Cable Unit



10. Pull the following cables and connectors down through the hole in the base.

- D-sub cable
- Ground Wire
- RJ45 connector
- F-sensor connector



11. Disconnect the following connectors.

For C8-B/C12-B: CN111, CN311, CN3L, CN202, CN312, CN200, CN300, CN201, CN301, CN3G0

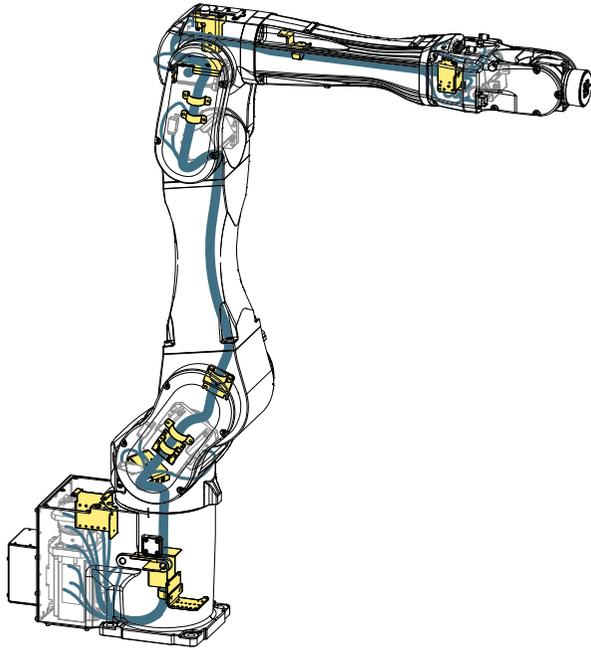
For C8-C/C12-C: CN111, CN311, CN2A1, CN2A2, CN2A3, CN2B1, CN2B2

POINT

Press the connector clip, and pull out.



Removing the Cable Unit

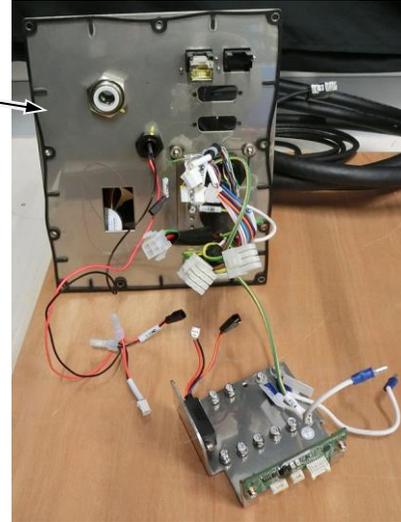


POINT

These procedures remove the Connector Plate from the Manipulator.

(The photo is of C8-B/C12-B)

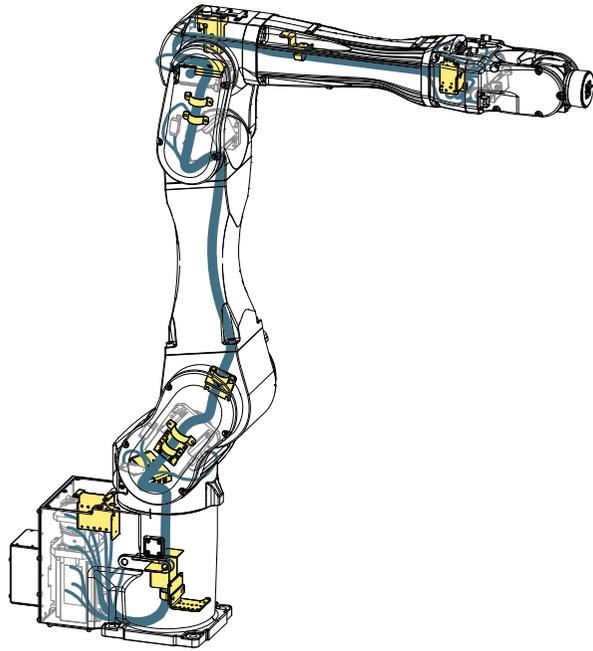
Connector Plate



(The photo is of C8-B/C12-B)



Removing the Cable Unit



⑤

Remove the J1 Timing Belt.

1. Loosen the screws securing the plate for preventing cable interference, and remove the plate.

A S01: 2-M3x6

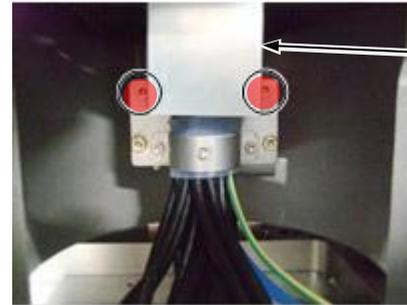


Plate for preventing cable interference

POINT

Slide the cutout section on the plate for preventing cable interference.

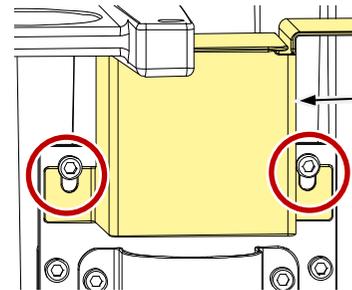
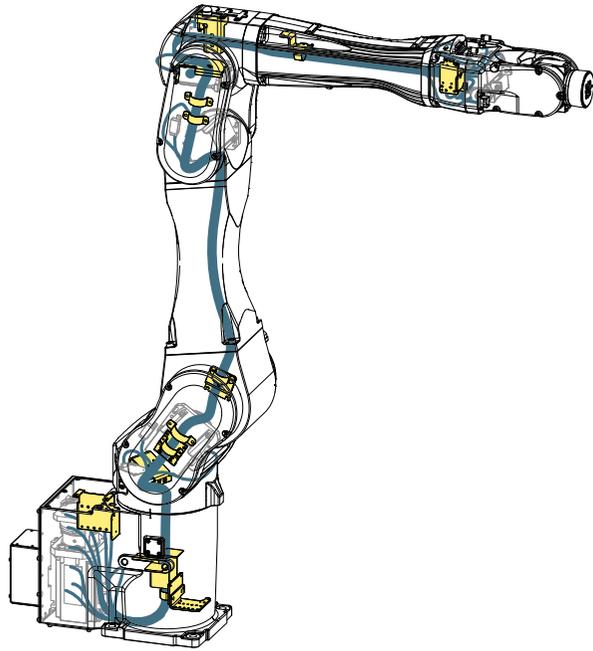


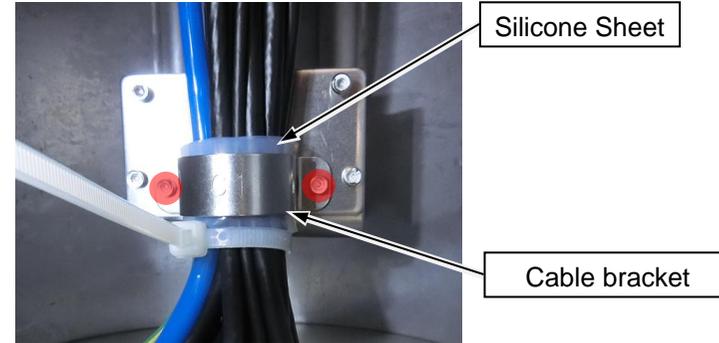
Plate for preventing cable interference

Removing the Cable Unit



2. Remove the cable bracket and Silicone Sheet.

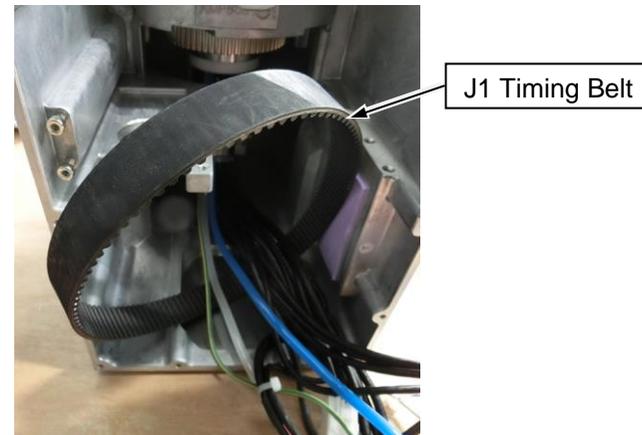
A S01: 2-M3x6



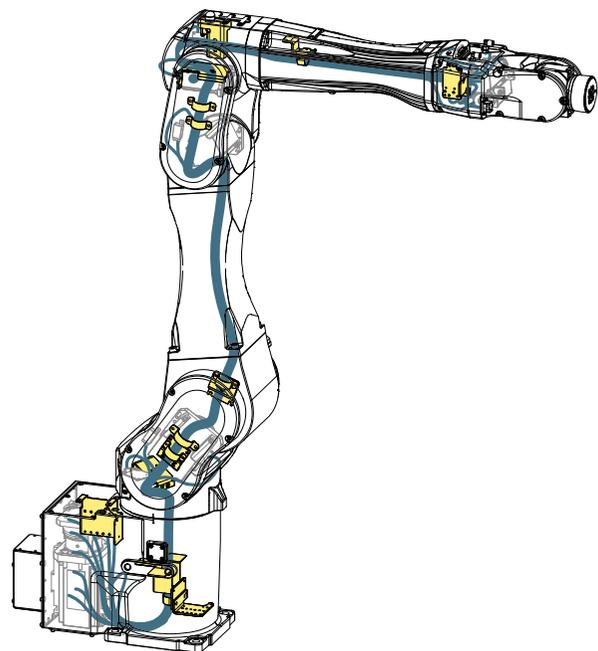
CAUTION

In preparation for reassembly, mark the cable bundle positions so that you can see the positional relationship, or attach wire ties for markers as shown in the photo.

3. Remove the J1 Timing Belt.



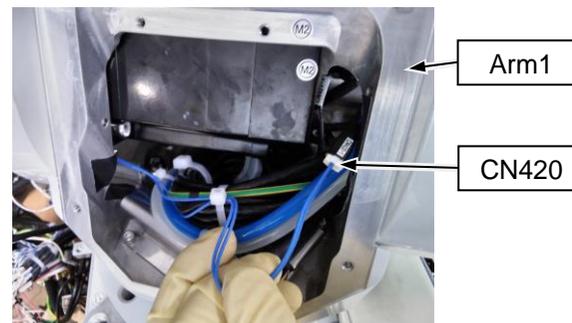
Removing the Cable Unit



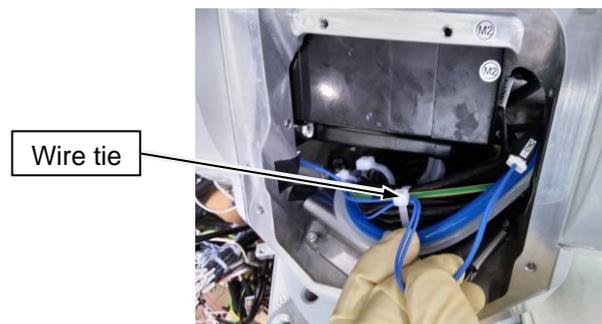
⑥

Remove the Cable Unit from Arm1.

1. Disconnect the connector (CN420-1).



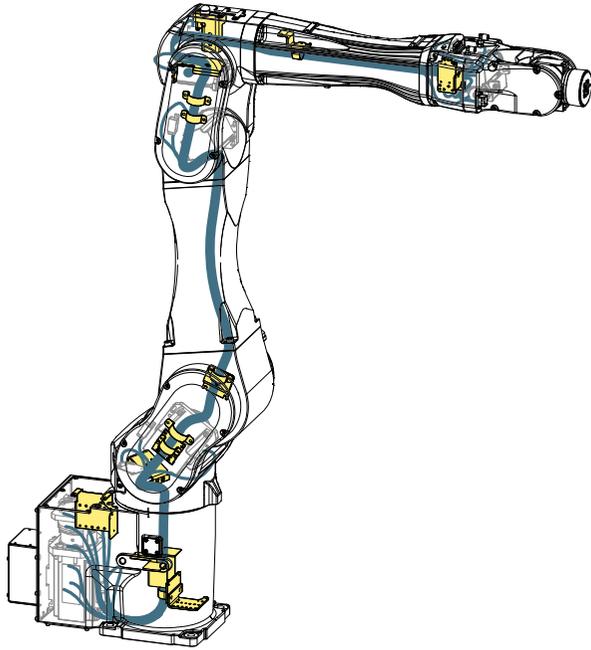
2. Cut the wire tie.



CAUTION

Mark the cable binding positions so that their positions are obvious during reassembly.

Removing the Cable Unit



3. Remove the J1 cable fixing plate.

A S01: 2-M4x10

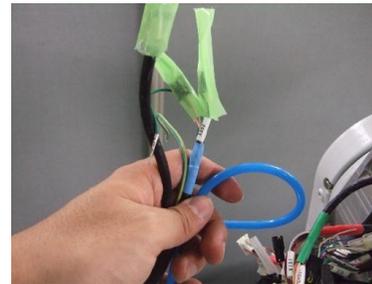
J1 cable fixing plate



4. Protect the connectors disconnected from parts such as the Connector Plate with masking tape or similar.

POINT

This protects connector clips from breaking and adherence of grease during work.



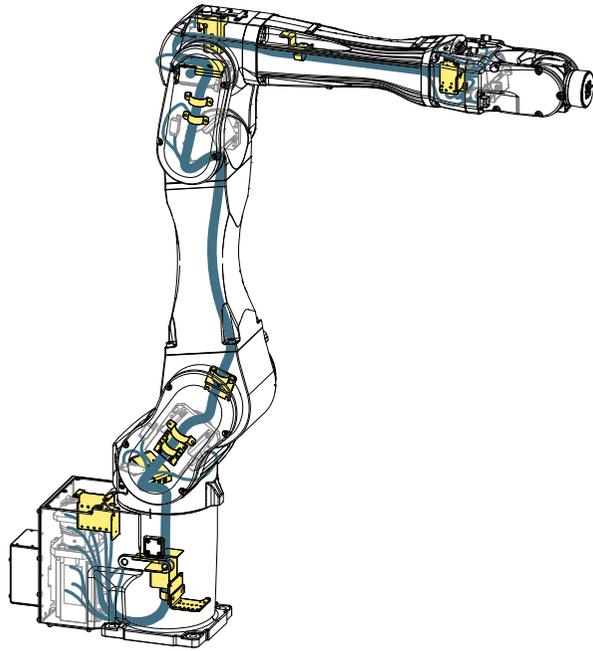
5. Pull out the internal cables from the base side toward the Arm1 side.

CAUTION

Attempting to pull out all the cables at once may break the cables, so disconnect the cables one by one in order from the one with the smallest connector to the largest one.



Removing the Cable Unit



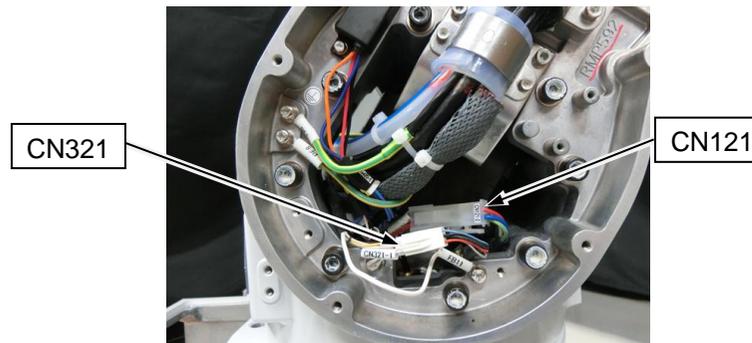
6. Mark the cables so that the wire tie position is obvious.



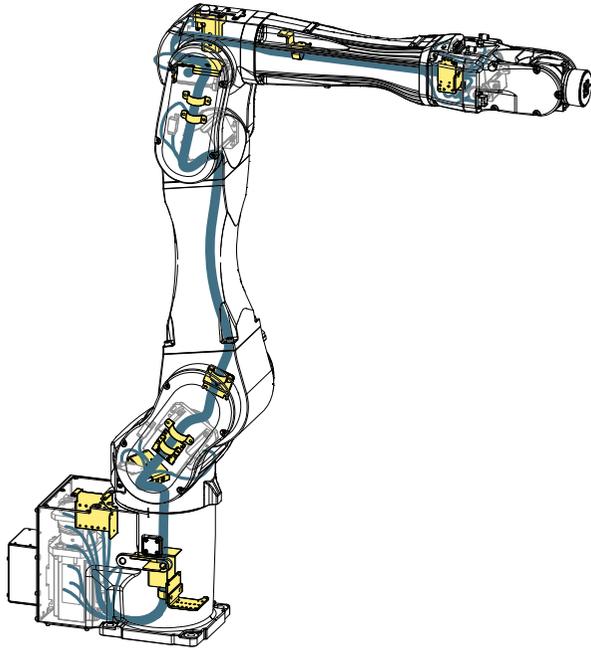
7. Cut the four wire ties, and remove the cable fixing plate.



8. If the J2 Motor unit is not removed, disconnect the following connectors.
CN121, CN321, CN420, CN421



Removing the Cable Unit



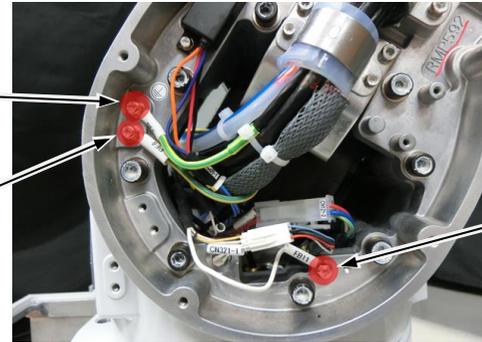
9. Remove the screws securing the Ground Wires.

A S04: 3-M4x6

PE5

PE6

FB11



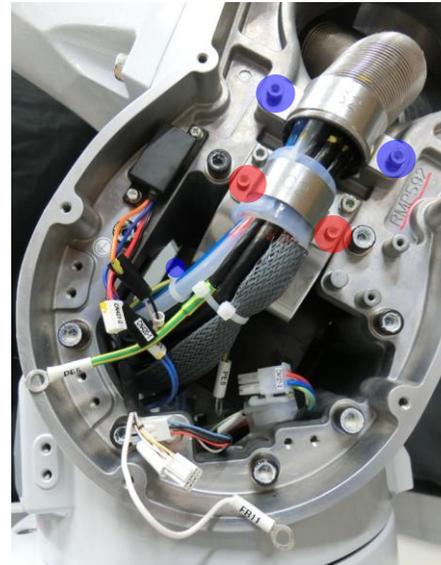
10. Remove the Arm1 cable brackets (C2, S2) and silicone tube.

C2:

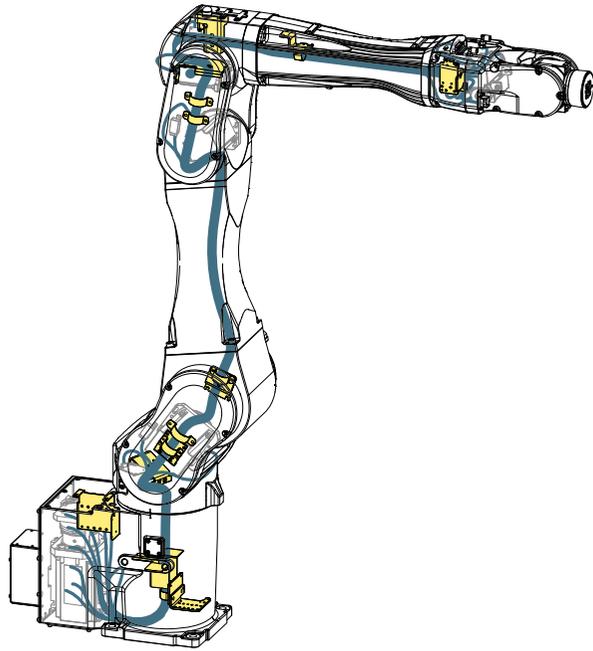
A S01: 2-M3x6

S2:

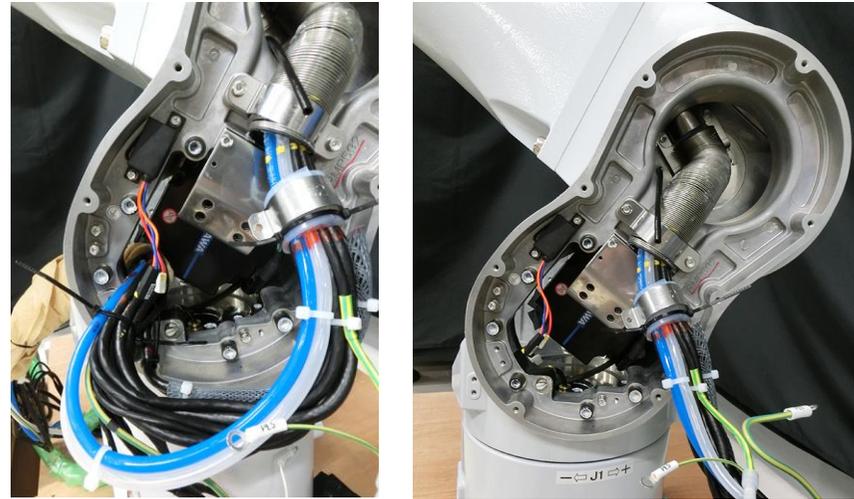
B S01: 2-M4x10



Removing the Cable Unit



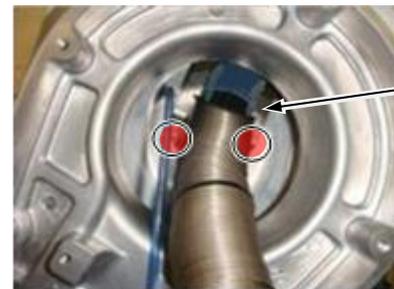
11. Pull the bundle of cables to the Arm2 side.



⑦ Remove the Cable Unit from Arm2.

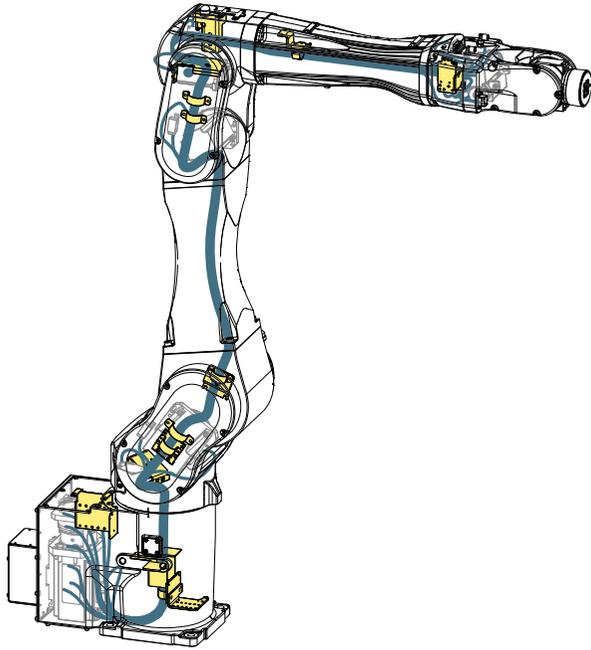
1. Loosen the screws securing the Arm2 cable fixing plate, and remove the plate.

A S01: 2-M4x10



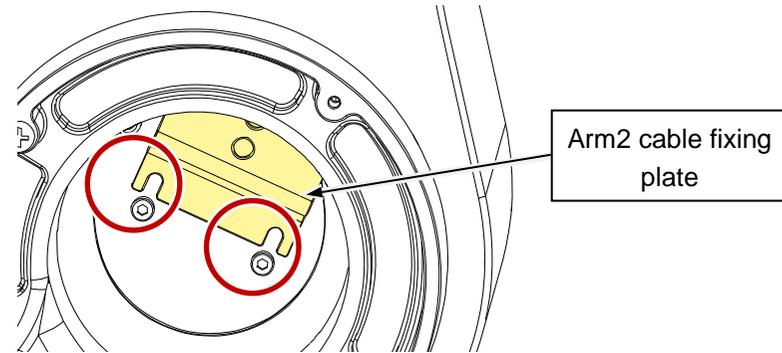
Arm2 cable fixing plate

Removing the Cable Unit



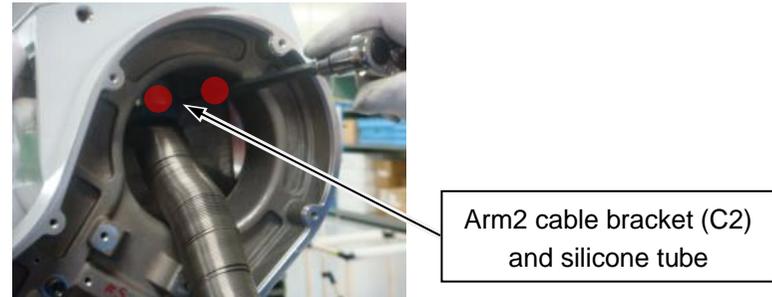
POINT

Slide the cutout section on the Arm2 cable fixing plate.

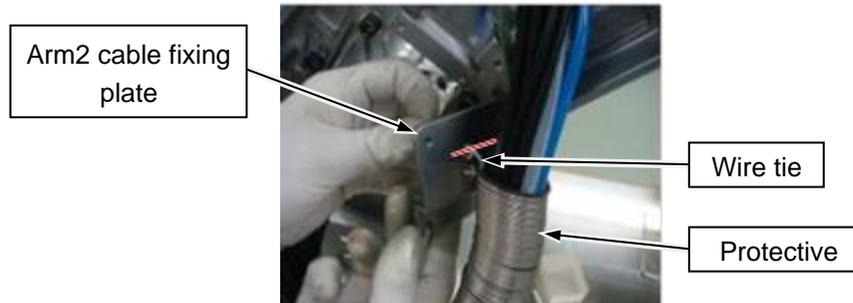


2. Remove the Arm2 cable bracket (C2) and silicone tube.

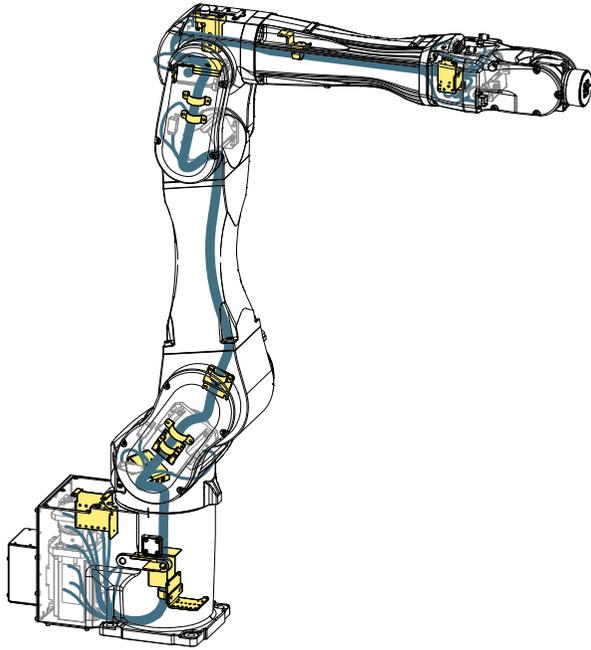
A S01: 2-M3x6



3. Cut the wire tie securing the protective spring to the Arm2 cable fixing plate.

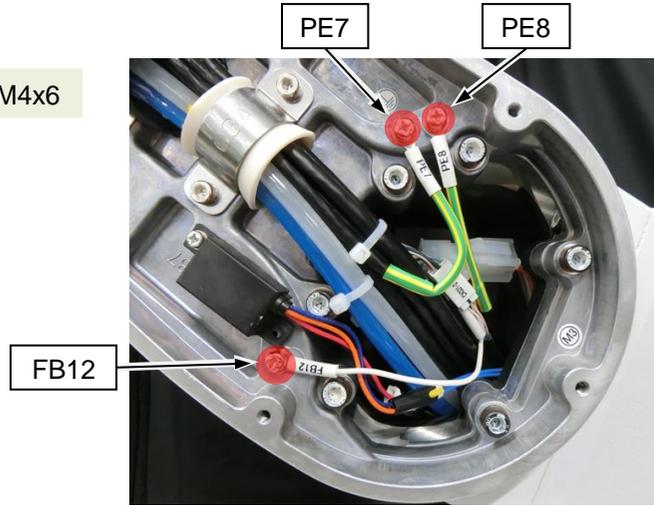


Removing the Cable Unit



4. Disconnect the Arm2 Ground Wires (PE7, PE8, FB12).

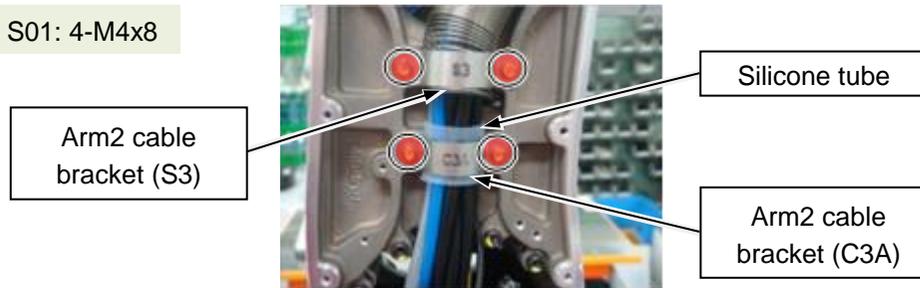
A S04: 3-M4x6



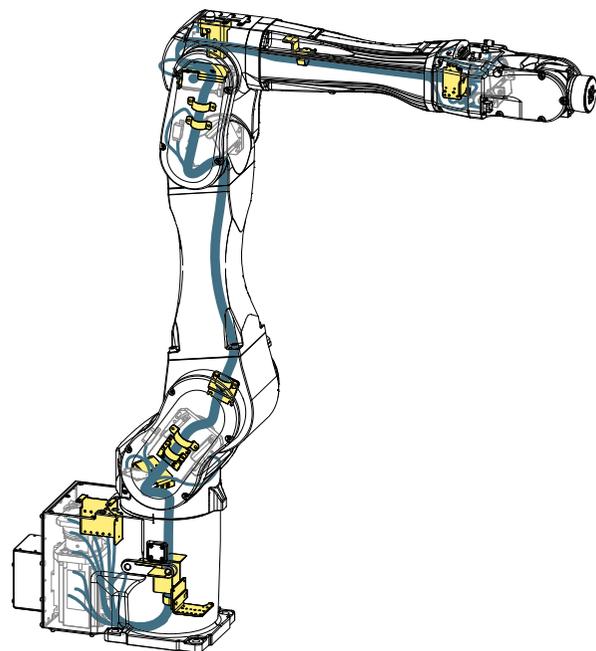
5. Remove the [J3 Motor unit](#).
Perform steps ① to ③.

6. Remove the Arm2 cable brackets (C3A, S3) and silicone tube.

A S01: 4-M4x8



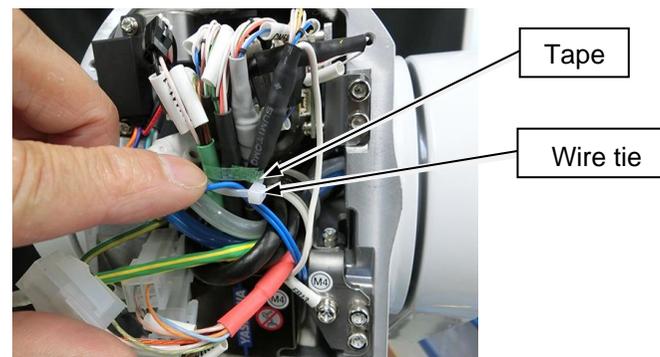
Removing the Cable Unit



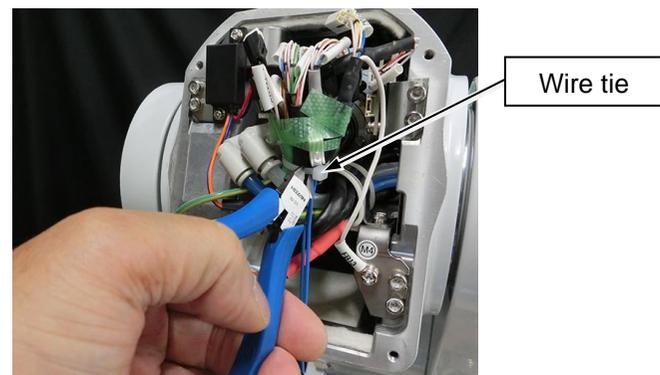
⑧

Remove the Cable Unit from Arm3.

1. Using a marker pen or tape, mark all of the cables bound with the wire tie as shown in the figure.

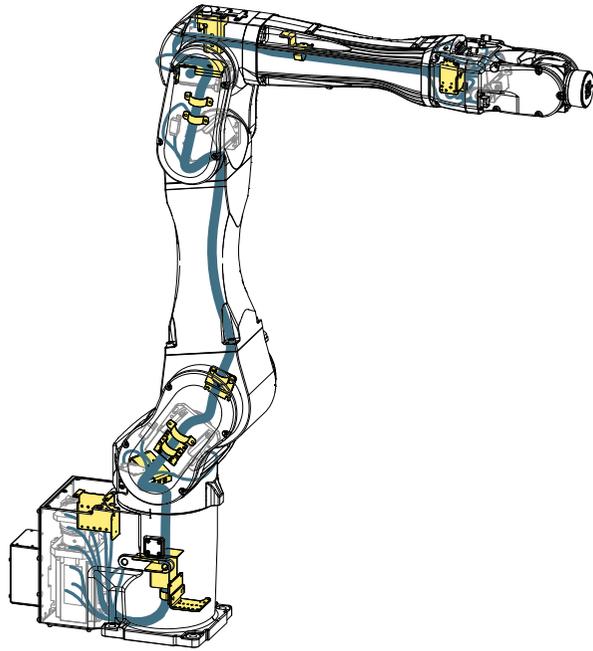


2. Cut the wire tie.



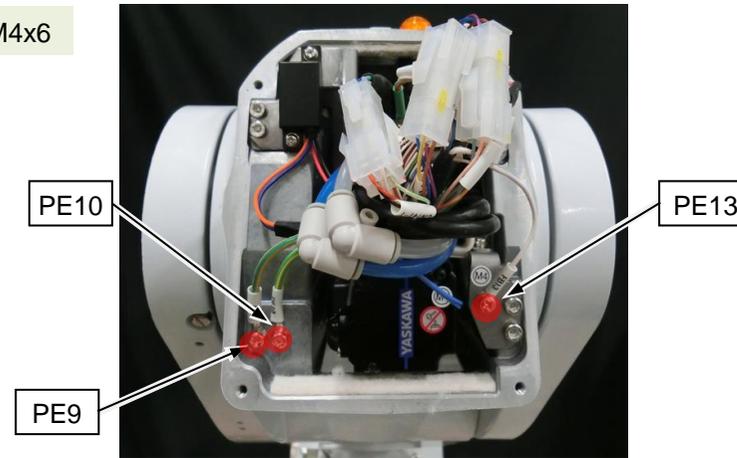
3. Remove the connectors (CN440, CN141, CN341).

Removing the Cable Unit



4. Disconnect the Arm3 Ground Wires (PE9, PE10, FB13).

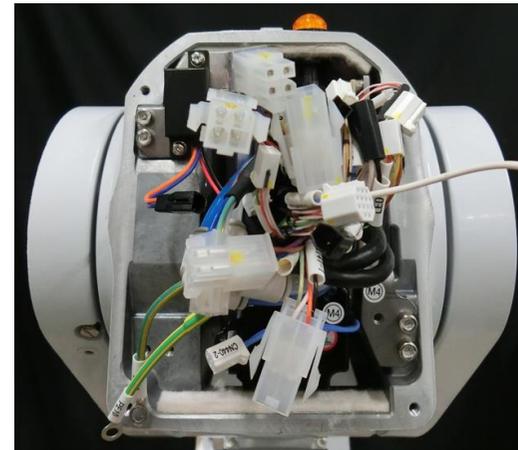
A S04: 3-M4x6



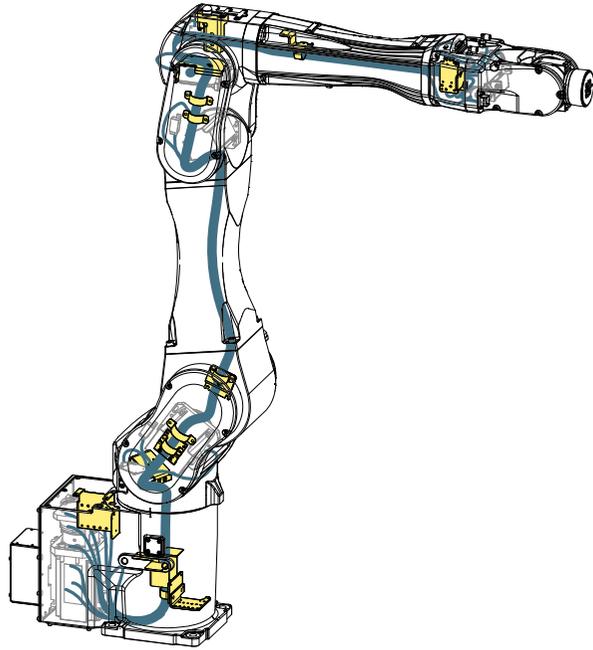
5. Disconnect the connectors (CN141, CN152, CN162, CN203, CN341, CN440, CN441, CN521, CN522, CN592, LED) inside Arm3.

POINT

Press the connector clip, and pull out.



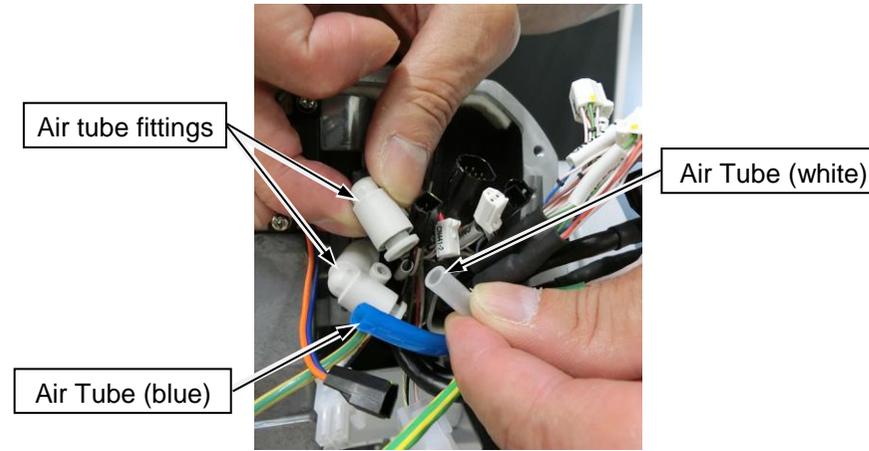
Removing the Cable Unit



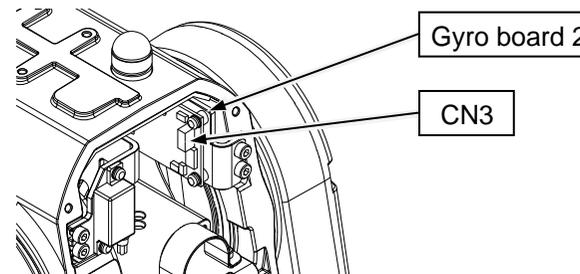
6. Disconnect the Air Tubes (blue/white) inside Arm3.

POINT

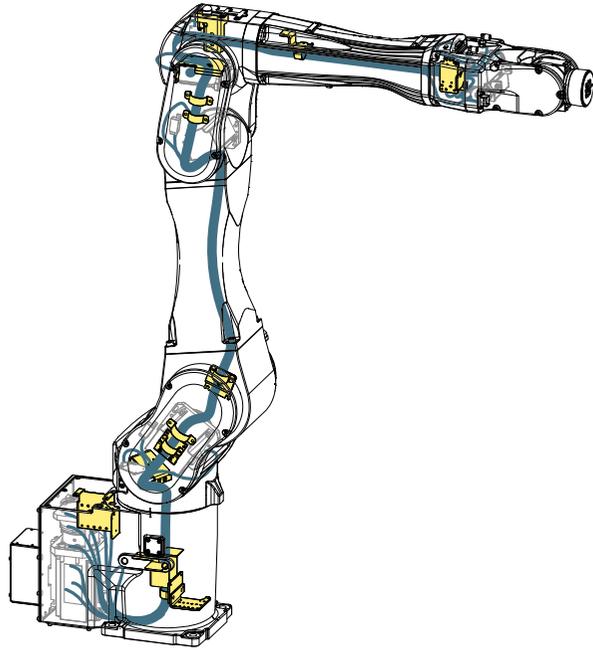
- Remove the air tube fittings from the air tubes.
- The air tube fittings will be used again during installation. Store them and do not dispose of them.



7. Disconnect the connector (CN3) from gyro board 2.

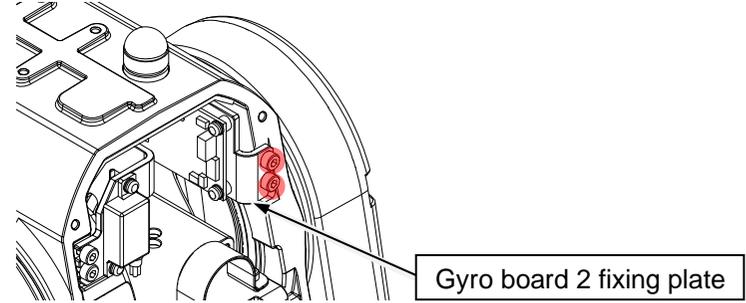


Removing the Cable Unit



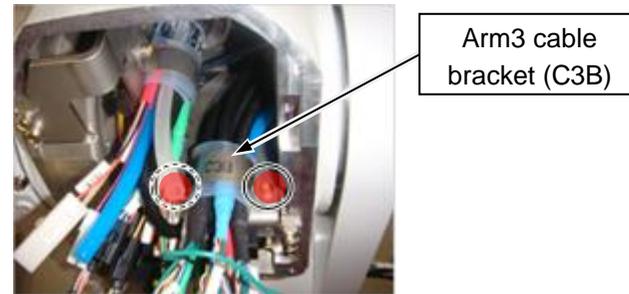
8. Remove the gyro board 2 fixing plate.

A S01: 2-M4x10



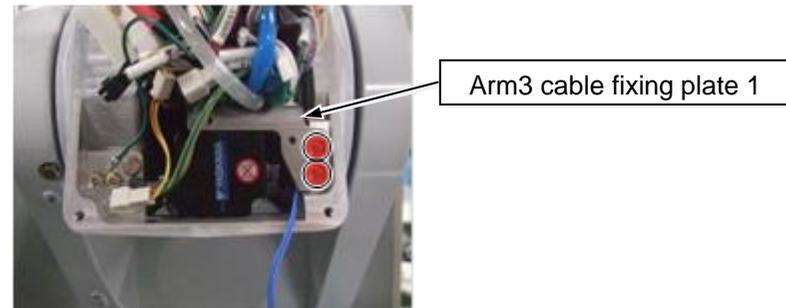
9. Remove the Arm3 cable bracket (C3B).

A S01: 2-M3x6

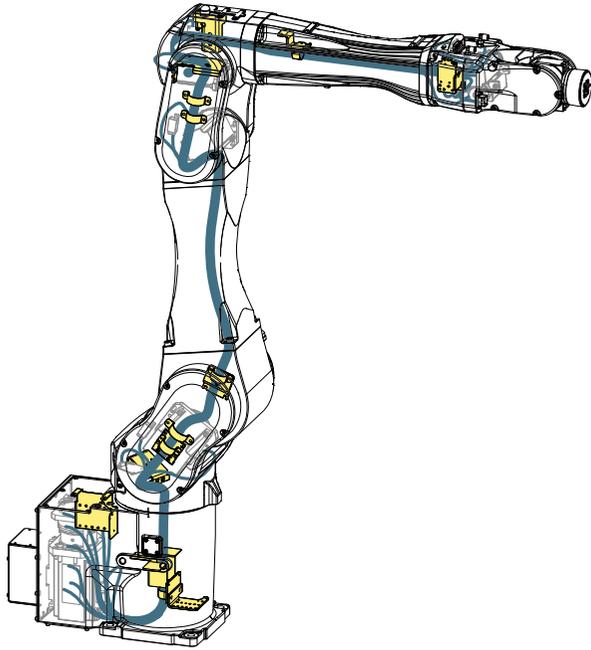


10. Loosen the screws on the Arm3 cable fixing plate 1, and remove the plate.

A S01: 2-M4x10

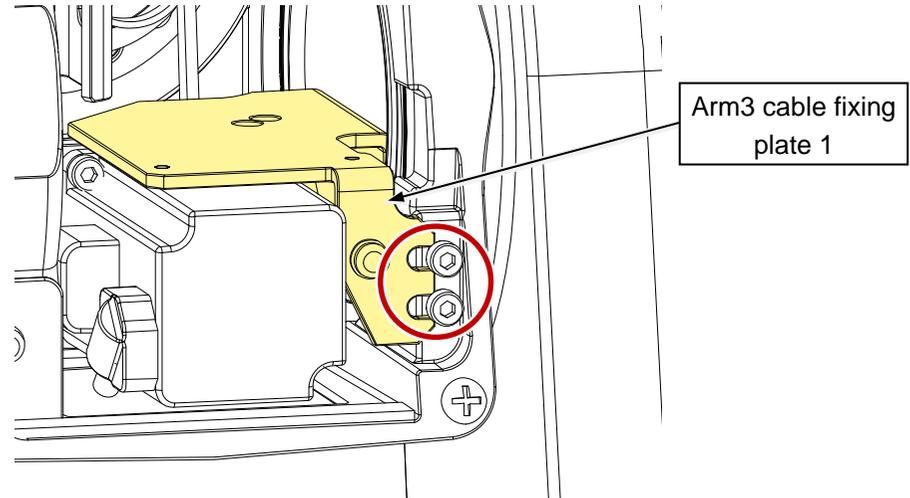


Removing the Cable Unit

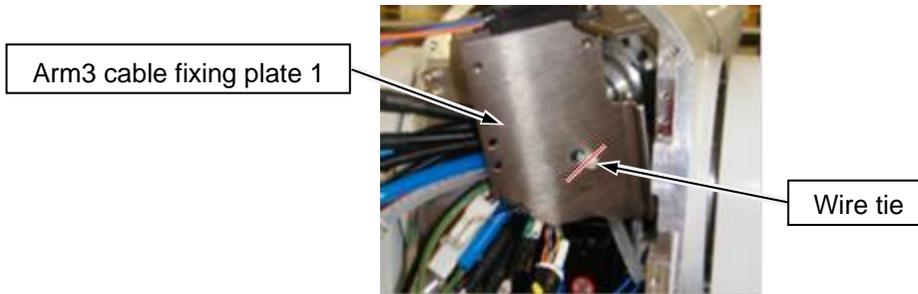


POINT

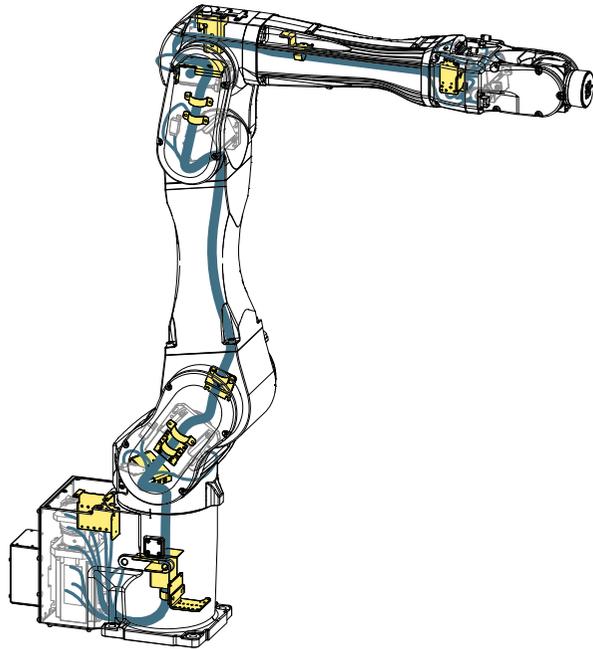
Slide the cutout section on the Arm3 cable fixing plate 1.



11. Cut the wire tie securing the cable protective spring.

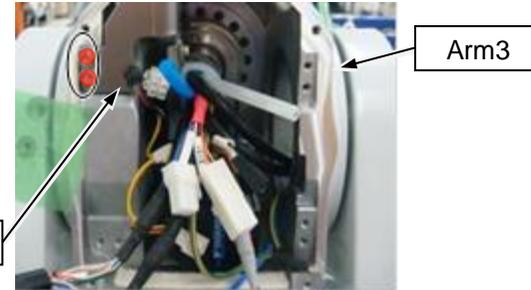


Removing the Cable Unit



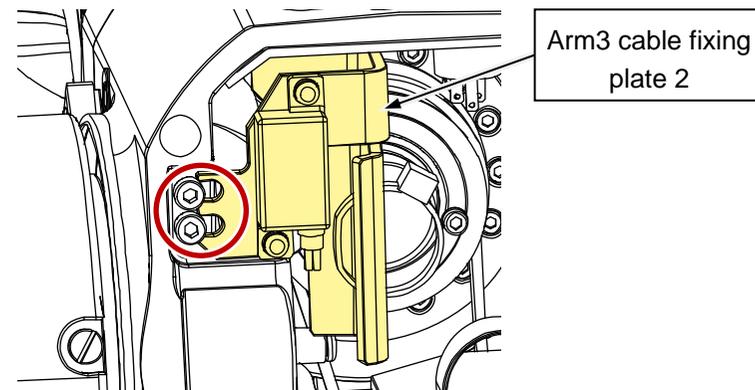
12. Loosen the screws on Arm3 cable fixing plate 2, and remove the plate from Arm3.

A S01: 2-M4x10

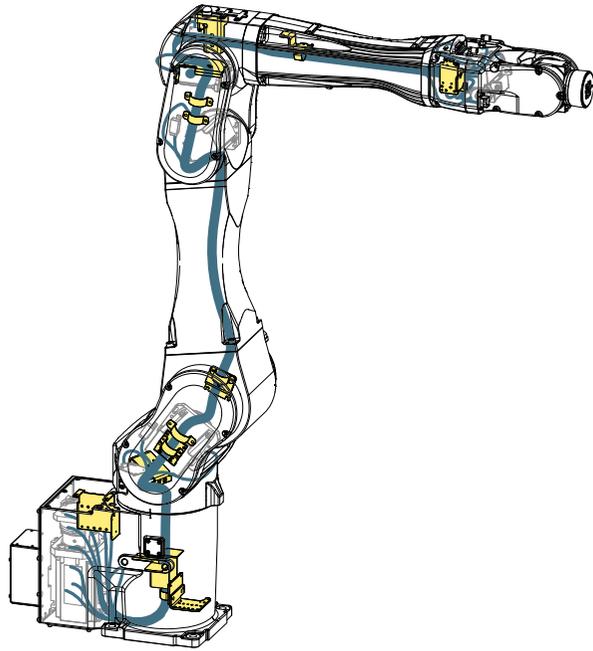


POINT

Slide the cutout section on the Arm3 cable fixing plate 2.



Removing the Cable Unit

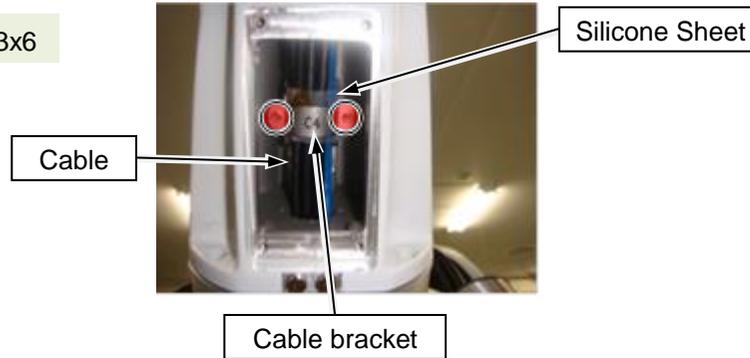


⑨

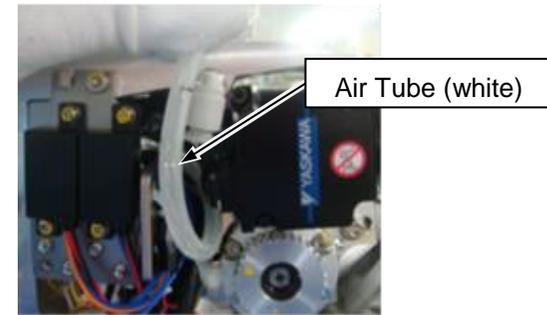
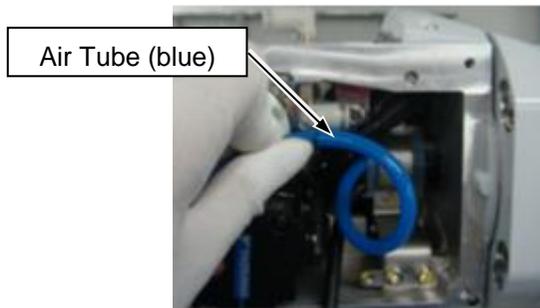
Remove the Cable Unit from Arm4.

1. Remove the cable bracket at the Arm4 maintenance cover, and remove the Silicone Sheet from the cable.

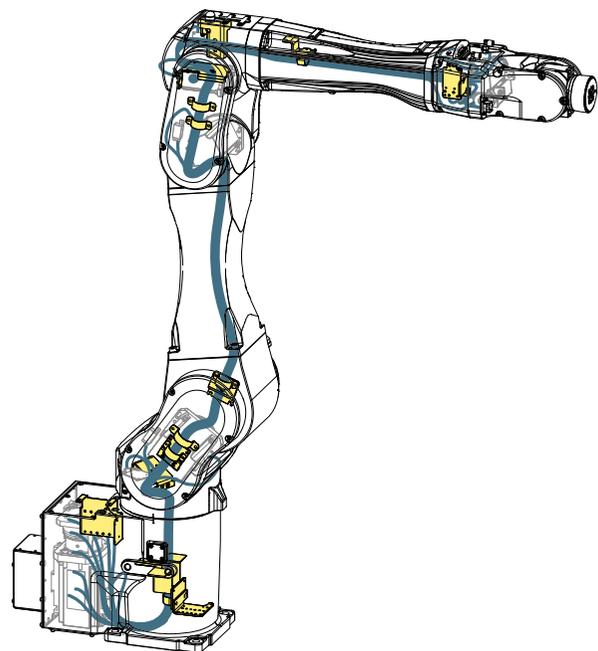
A S01: 2-M3x6



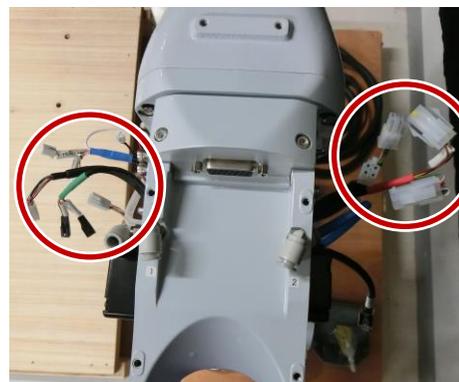
2. Disconnect the Air Tubes (blue/white).



Removing the Cable Unit



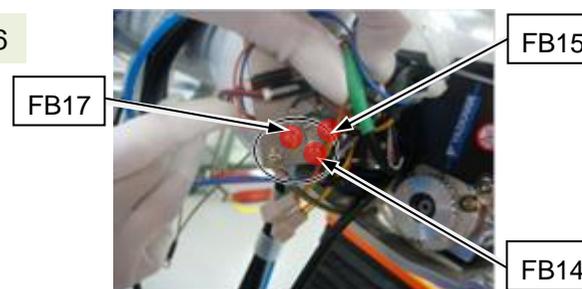
3. Disconnect the J5 Motor Connectors (CN151, CN351, CN451, CN460).



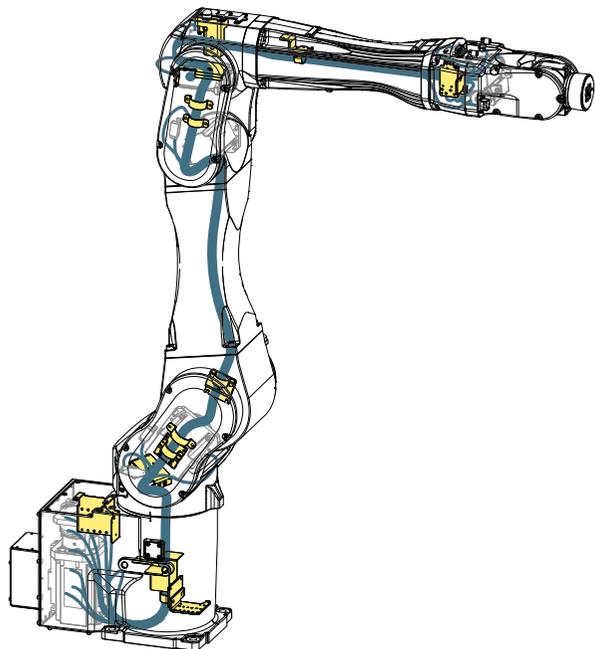
4. Remove the [J6 Motor unit](#).
Perform steps ③ to ⑥.

5. Disconnect the Ground Wires (FB14, FB15, FB17) from the cable protection plate.

A S04: 3-M4x6



Removing the Cable Unit



6. Remove the [Arm4 D-sub attachment](#).

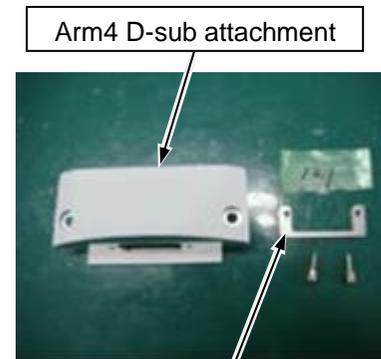
POINT

Remove the following parts from the Arm4 D-sub attachment.

- Standard model/Cleanroom model: D-sub connector, D-sub connector fixing plate
- Protection model: D-sub connector



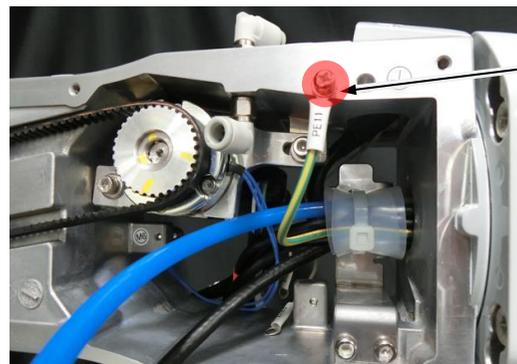
D-sub connector



Arm4 D-sub attachment

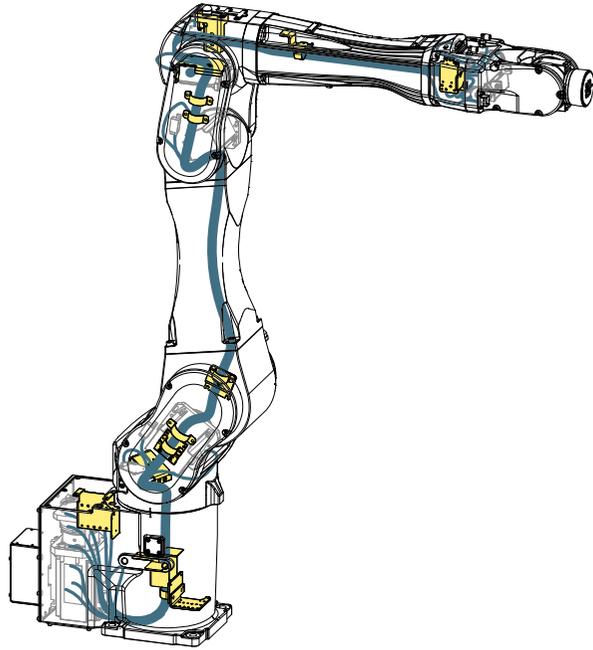
D-sub connector fixing plate

7. Disconnect the Ground Wire (PE11).



PE11

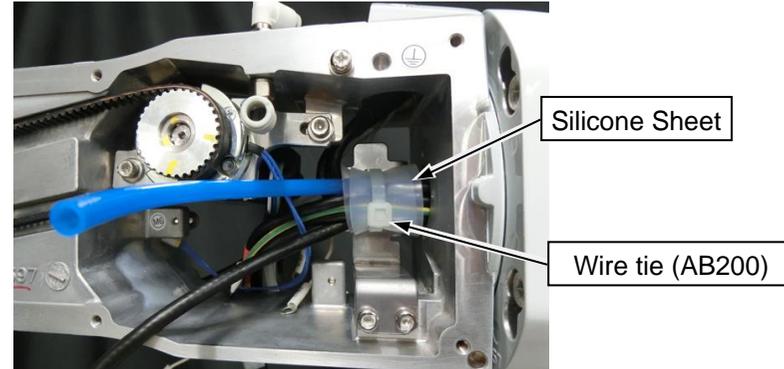
Removing the Cable Unit



8. Cut the wire tie (AB300) from the Arm4 cable fixing plate, and remove the Silicone Sheet.

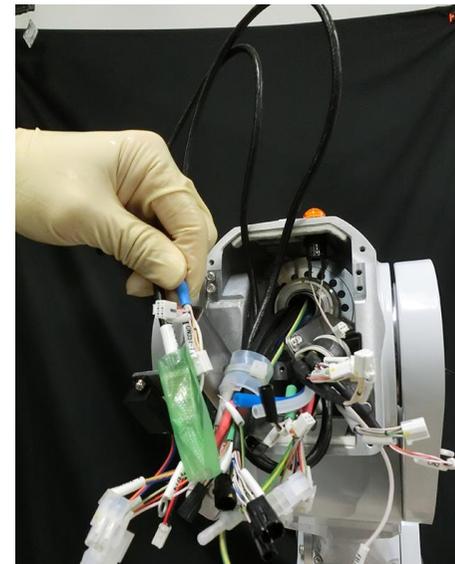
POINT

The Silicone Sheet will be used again during installation. Store it and do not dispose of it.

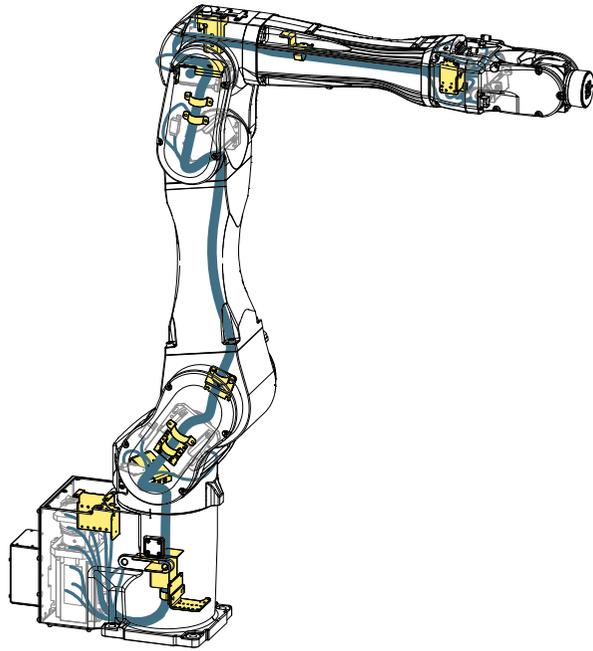


9. Pull out the following cables in order from the Arm4 side to the Arm3 side.

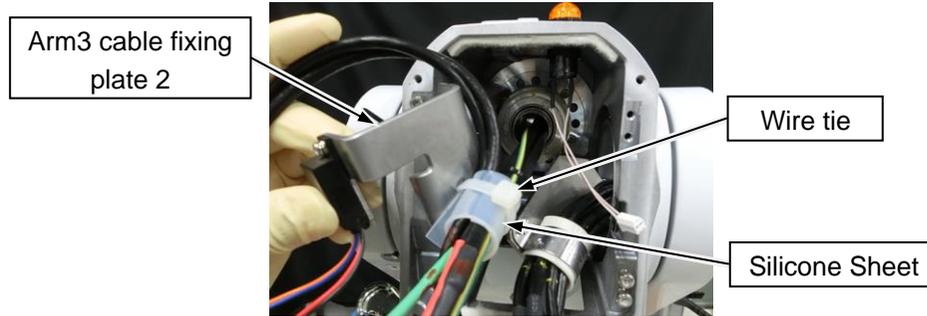
- 1. Air Tubes (blue/white)
- 2. LAN cable (CN581-3)
- 3. CN351/CN361/FB14 cable



Removing the Cable Unit



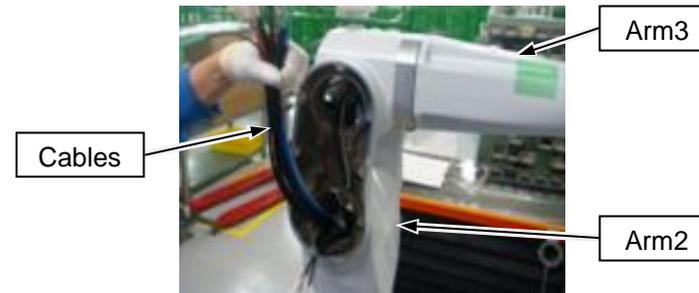
- 10. Cut the wire tie, and disconnect the cables from Arm3 cable fixing plate 2.
- 11. Remove the Silicone Sheet from the cables.



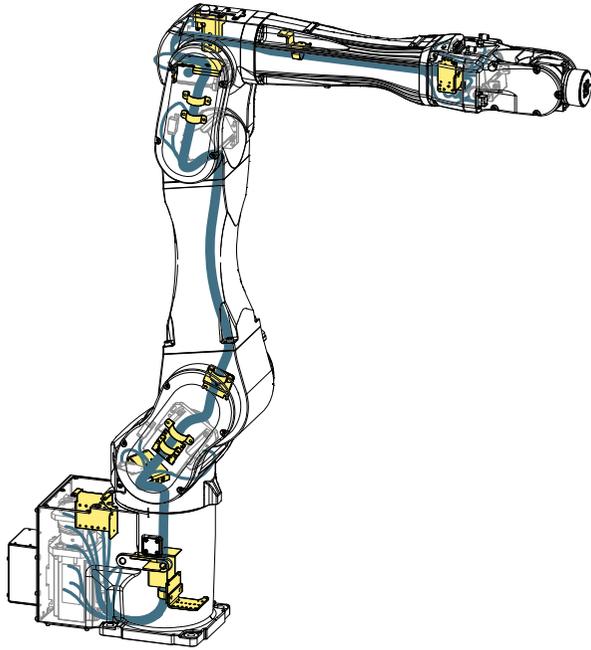
POINT

The Silicone Sheet will be used again during installation. Store it and do not dispose of it.

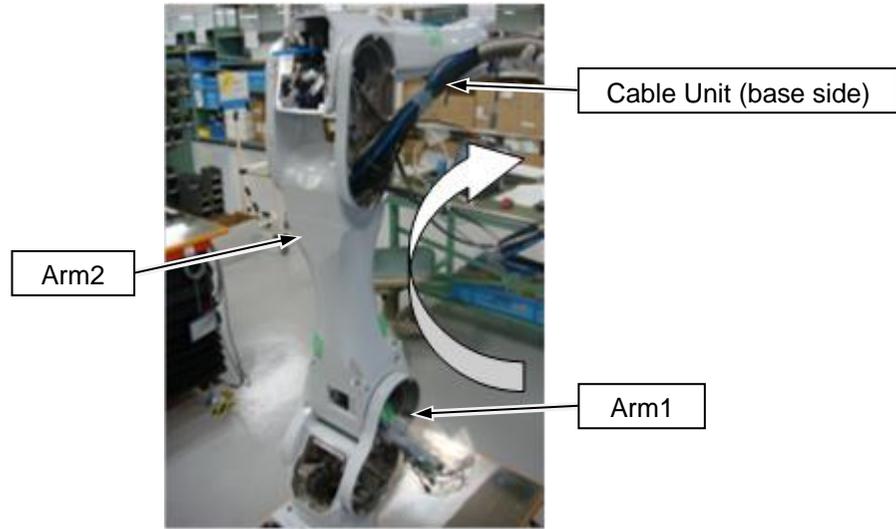
- 12. Pull out the cables from the Arm3 side to the Arm2 side.



Removing the Cable Unit



13. Pull out the separated Cable Unit (base side) from the Arm1 side to the Arm2 side.

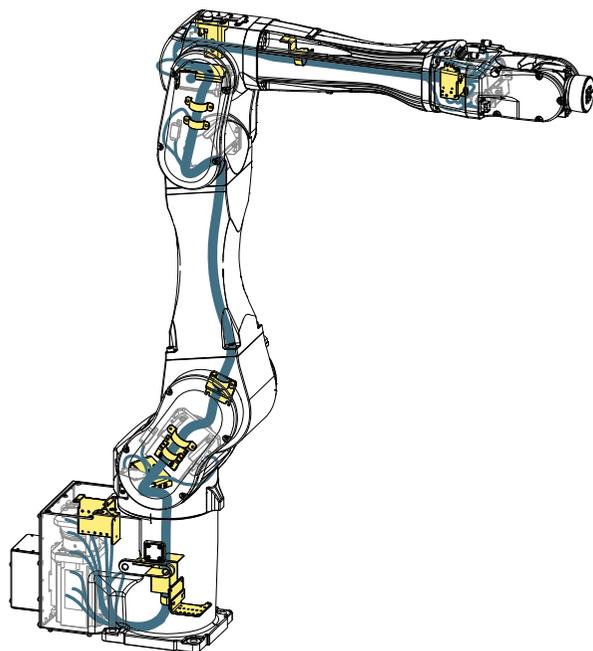


POINT

To protect the connectors and facilitate the work, first cover the connectors with a plastic bag.



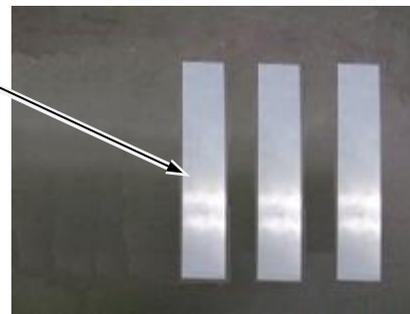
2.9.2 Installing the Cable Unit



<Preparation>

1. Check that the Cable Unit contains the following parts.
Silicone Sheet: 3 (25 mm x 120 mm)
F-sensor connector housing: 2

Silicone Sheet
25 mm x 120 mm x 3

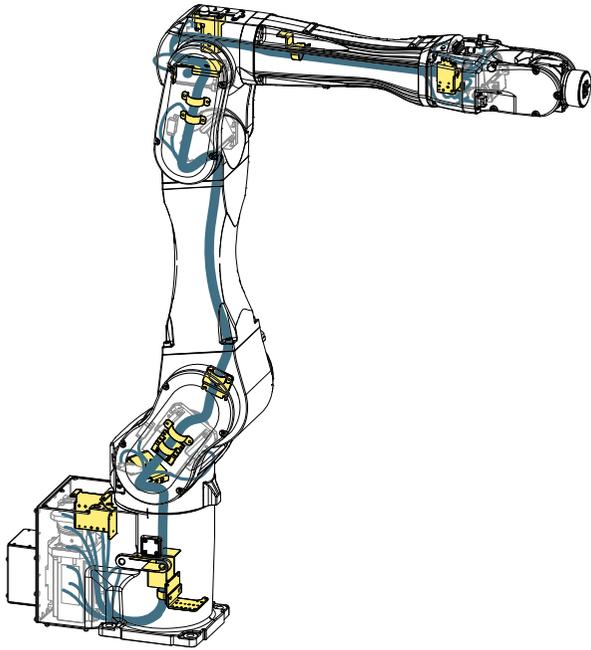


2. Disconnect the connectors (CN203, CN152, CN162, CN521, CN522, CN592), and separate the Cable Unit.

Cable Unit

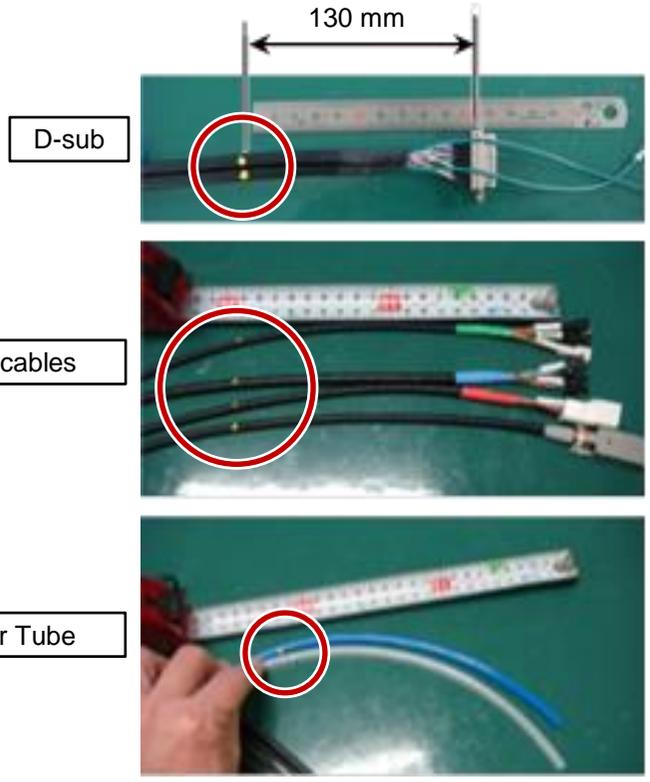


Installing the Cable Unit



3. Place a mark at the fixing position of each cable you are going to pass through Arm4.

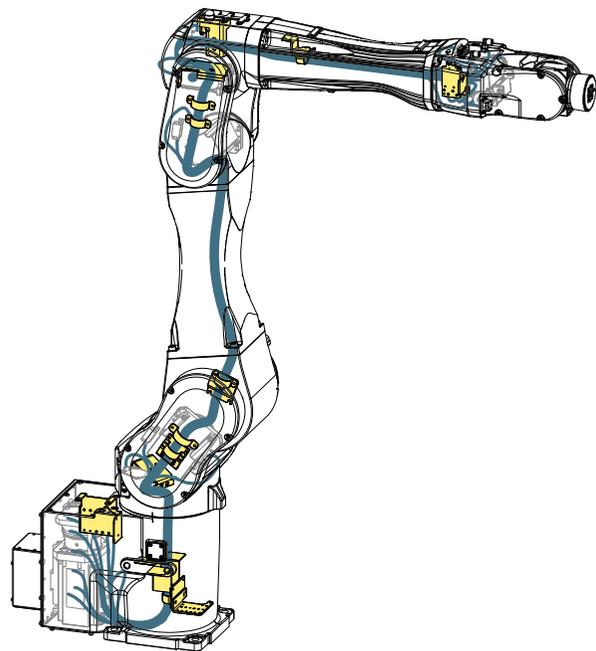
- D-sub: 130 mm from the connector end
- Other cables: 190 mm from the connector end
- Air Tube: 210 mm from the end



4. To protect the connectors and facilitate the work, cover the connectors with a plastic bag.



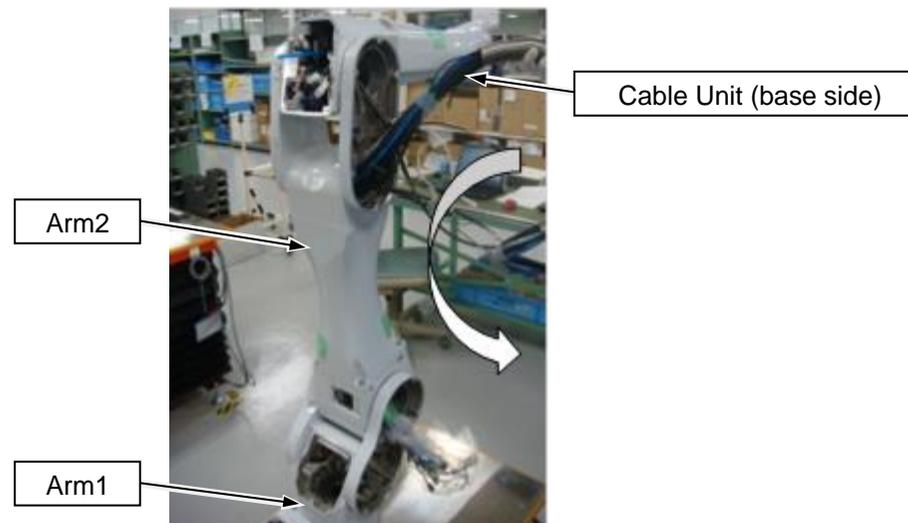
Installing the Cable Unit



1

Insert the Cable Unit.

1. Pass the separated Cable Unit (base side) through Arm2 to Arm1.

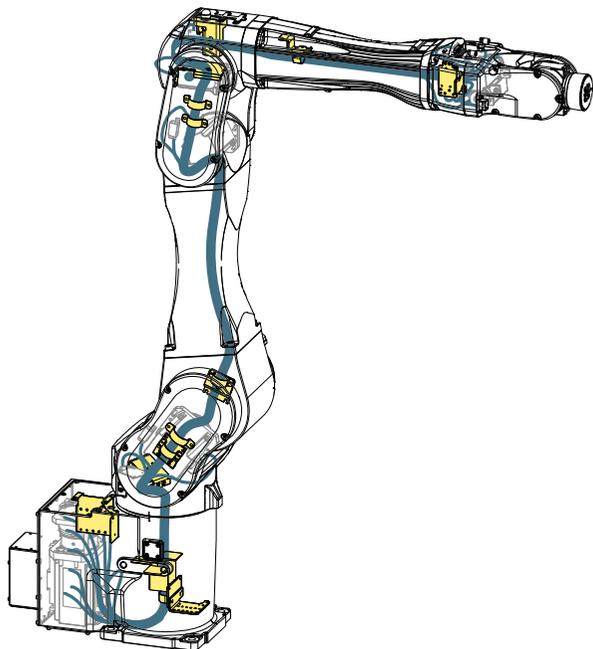


2. Pass the following cables that have no relay connectors through to the Arm3 side.

- CN351/CN361/FB14 cable
- LAN cable (CN581-3)
- Air Tubes (blue/white)



Installing the Cable Unit

**POINT**

Leave out the other connector cables for a certain length, as shown in the figure, in order to store them in Arm3.



3. Pass the following cables from the Arm3 side to the Arm4 side.

CAUTION

Forcibly pulling on the cables may cause the connectors to disconnect, damage the connectors, or break the cables.

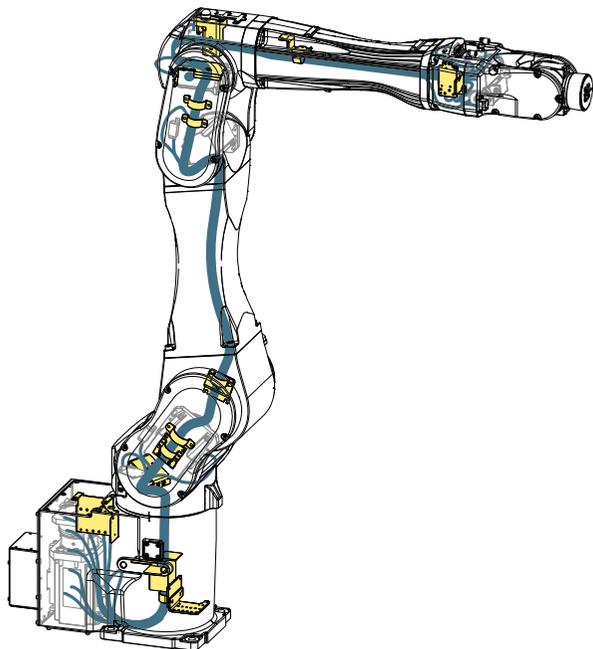
- CN351/CN361/FB14 cable
- LAN cable (CN581-3)
- Air Tubes (blue/white)

POINT

1. Pass the braid tube from the Arm4 side to the Arm3 side. Insert the connectors through the braid tube, as shown in the figure, and secure the tube with the wire tie so that connectors are not pulled out.
Use a braid tube.



Installing the Cable Unit



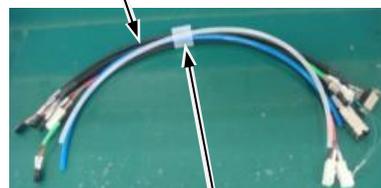
2. While feeding cables from the Arm3 side, pull the braid tube from the Arm4 side to pass the cables through the tube.

If it is difficult to pass the cables through the tube, pass the cables one by one in the order below. When doing so, securing the connector to the tip of a long wire makes the work easier to perform.

CN351-1 cable, CN361-1 cable, LAN cable, Ground Wire, Air Tubes (blue/white)

4. Pass the Cable Unit (Arm4 side) separated in <Preparation> Step 2 through Arm4 to Arm3.

Cable Unit (Arm4 side)



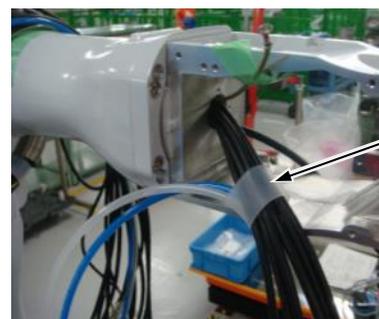
Silicone tube (C8XL only)

POINT

<C8XL only>

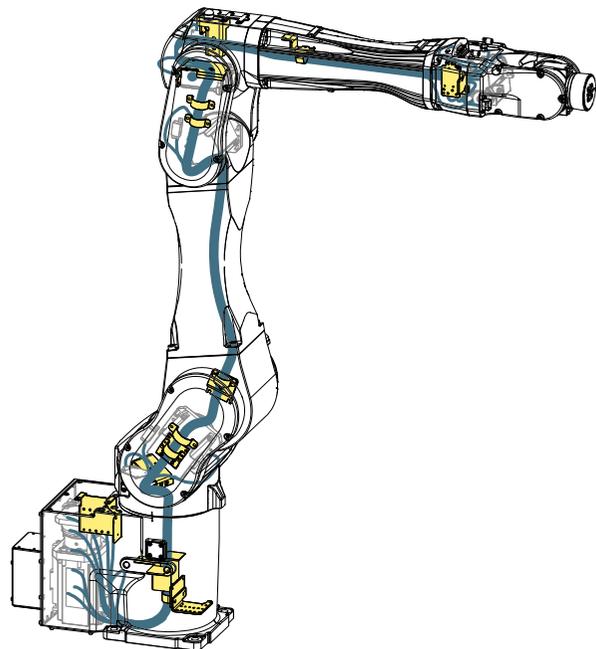
Pass the following cables passed from the Arm3 side through the silicone tube.

- CN351/CN361/FB14 cable
- LAN cable (CN581-3)
- Air Tubes (blue/white)



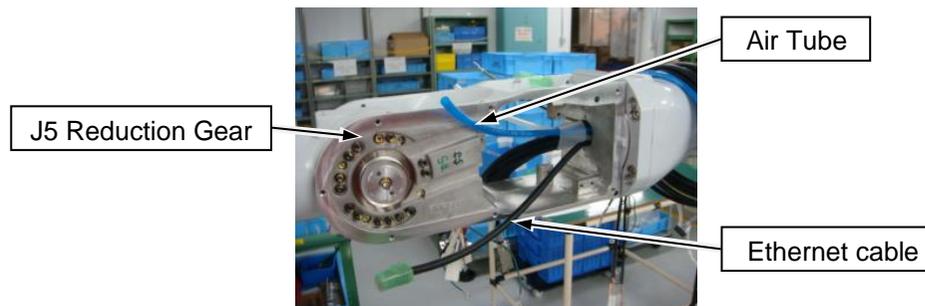
Silicone tube

Installing the Cable Unit

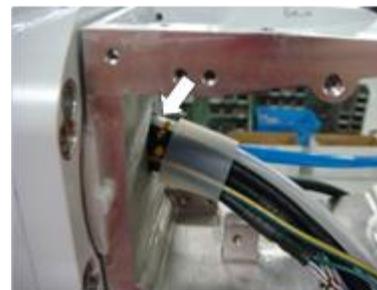


POINT

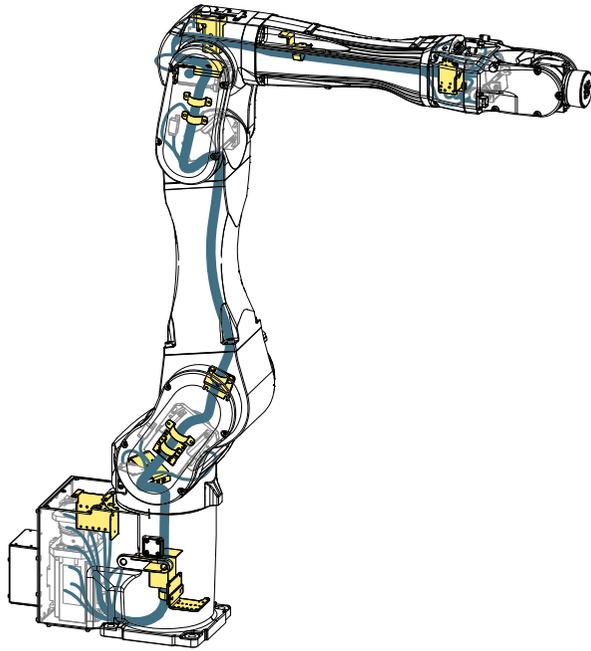
Bring the Ethernet cable and Air Tube out of the Arm4 J5 Reduction Gear side, as shown in the figure, and bring the remaining cables out of the J6 Reduction Gear side.



5. Align the mark on the cable with the arrow on Arm4.



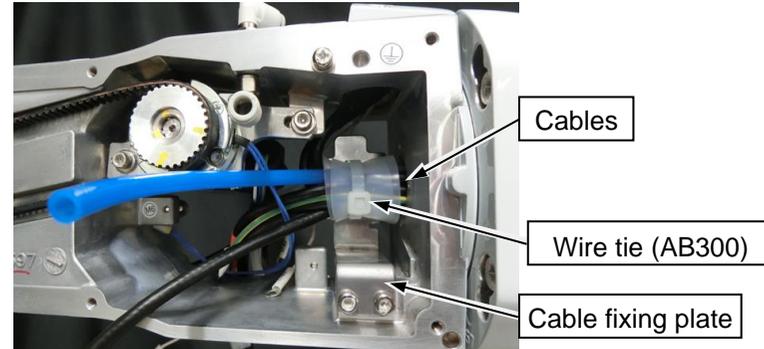
Installing the Cable Unit



2

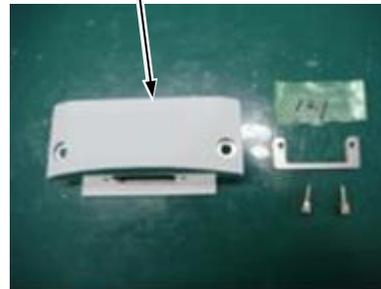
Secure the Cable Unit to Arm4.

1. Secure the cables to the cable fixing plate using wire ties.

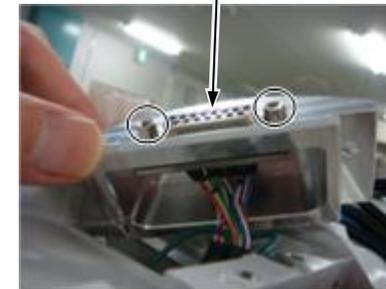


2. Install the D-sub connector on the Arm4 D-sub attachment.

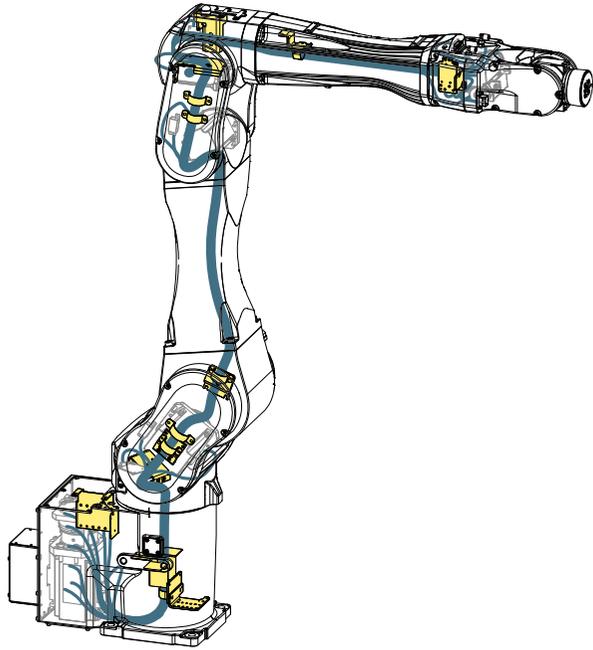
Arm4 D-sub attachment



D-sub connector



Installing the Cable Unit

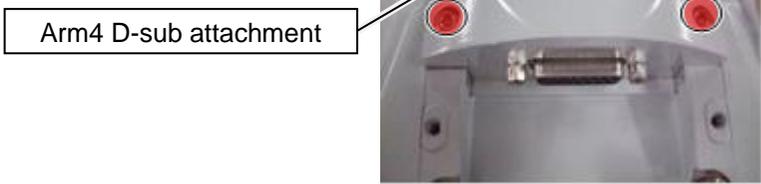


3. Install the Arm4 D-sub attachment.

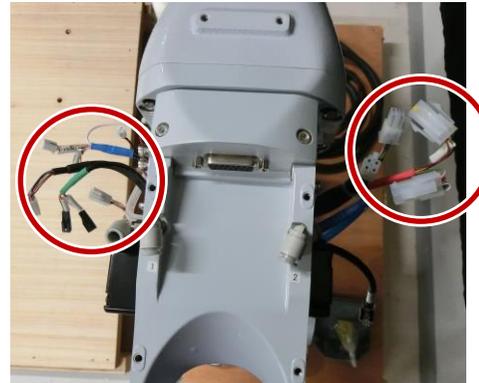
CAUTION

Be careful not to let the cables get pinched in the attachment.

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)

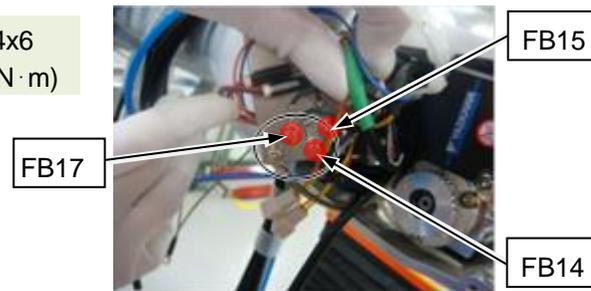


4. Connect the J5 Motor Connectors (CN151, CN351, CN451, CN460).



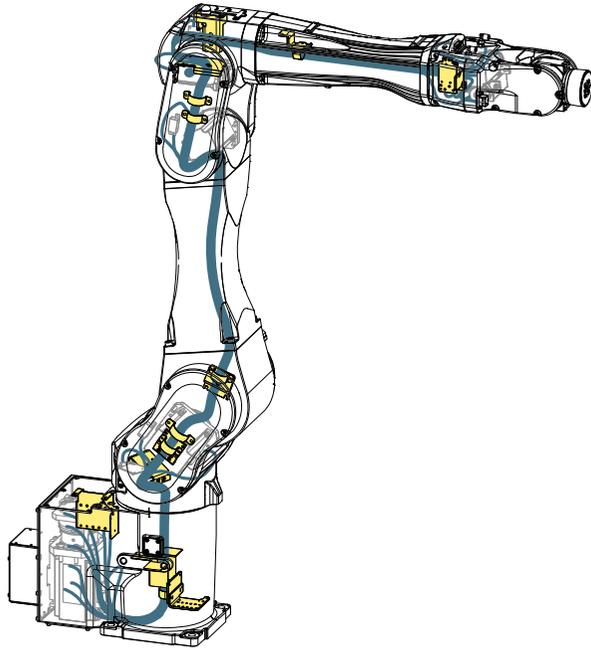
5. Attach the Ground Wires (FB14, FB15, FB17) inside Arm4 to the cable protection plate.

A S04: 3-M4x6
(0.9 +/- 0.1 N·m)



6. Install the [J6 Motor unit](#).
Perform steps ❶ to ❸.

Installing the Cable Unit



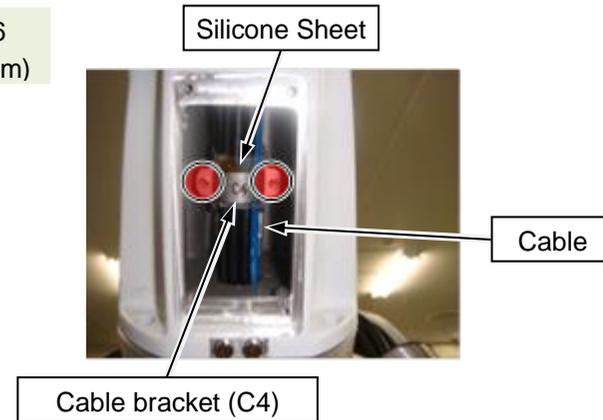
3

Secure the Cable Unit to the Arm4 extension part.

1. Wrap the Silicone Sheet around the cables.
2. Install the cable bracket (C4) so that it presses down on the Silicone Sheet.

A

S01: 2-M3x6
(2.4 +/- 0.1 N·m)



3. Apply grease at the location shown in the figure.



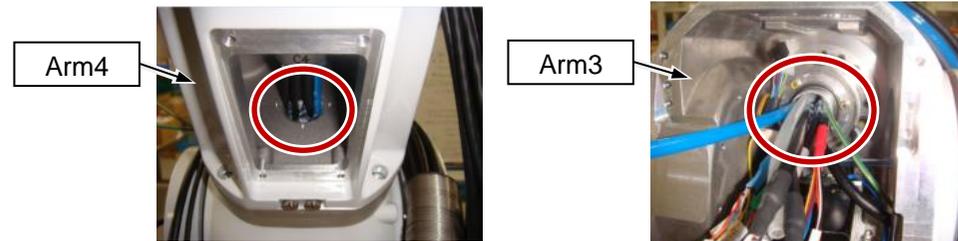
Krytox: Approx. 3 g

POINT

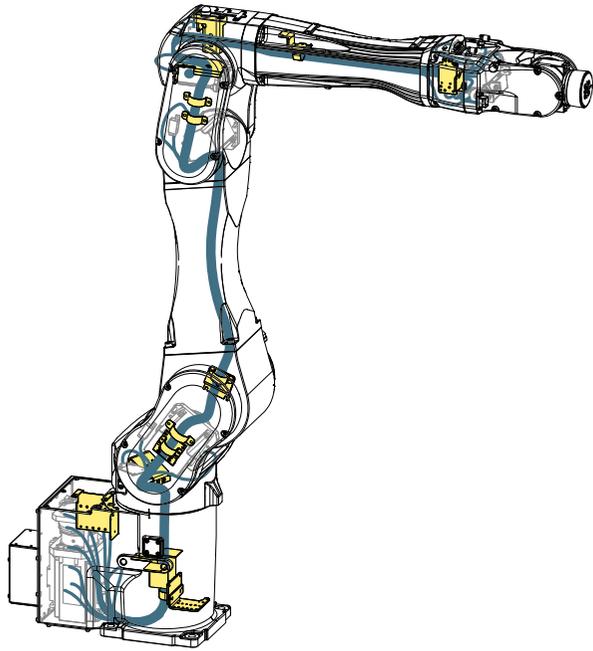
Apply half of the specified amount from the Arm4 side, and the remaining half from the Arm3 side.

CAUTION

Take care that the grease does not adhere to the cable fixing area and connectors inside Arm3.



Installing the Cable Unit

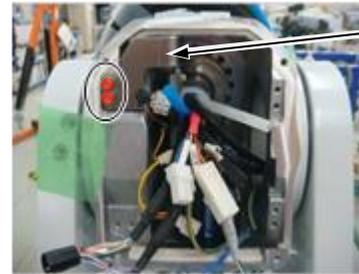


4

Secure the Cable Unit to Arm3.

1. Secure Arm3 cable fixing plate 2 to Arm3.

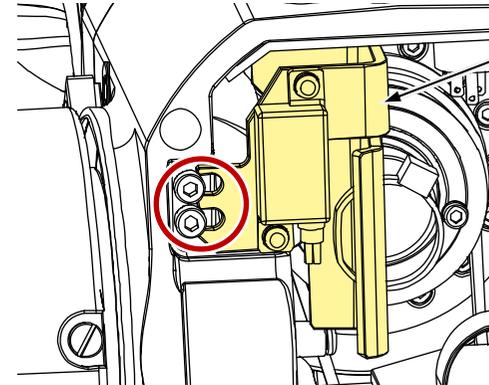
A S01: 2-M4x10
(4.0 +/- 0.2 N·m)



Arm3 cable fixing plate 2

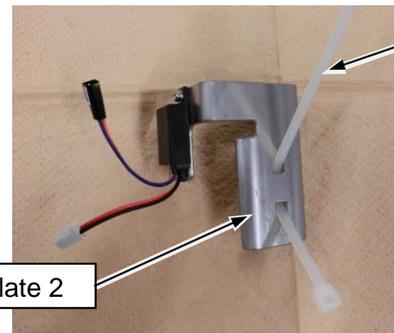
POINT

- Slide the cutout section on the Arm3 cable fixing plate 2, and secure with screws.



Arm3 cable fixing plate 2

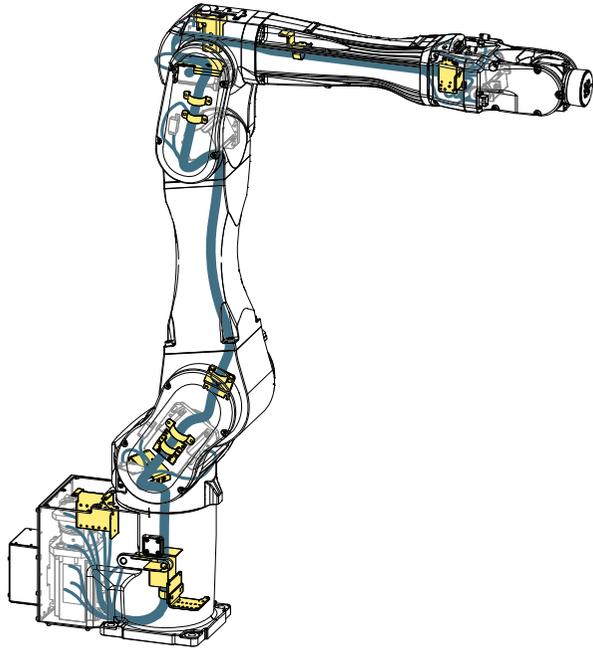
- After passing through the wire tie, install Arm3 cable fixing plate 2.



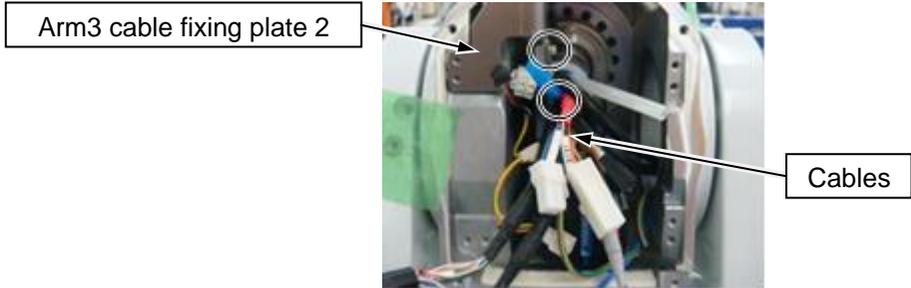
Wire tie (AB300)

Arm3 cable fixing plate 2

Installing the Cable Unit



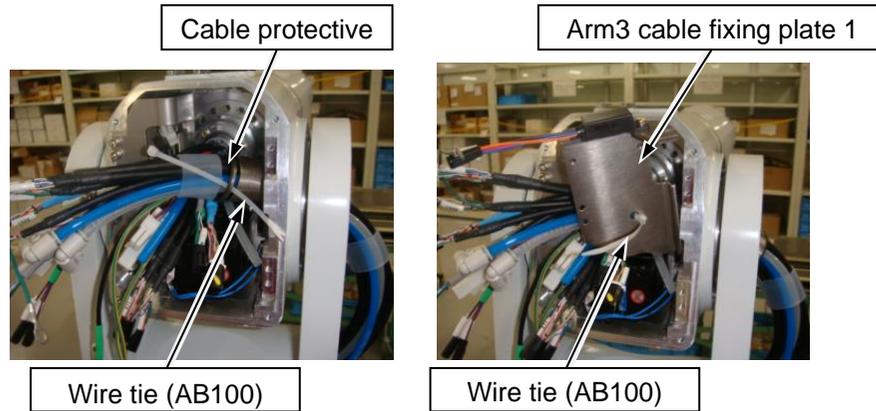
2. Wrap the cables with the Silicone Sheet, and secure the cables to Arm3 cable fixing plate 2 with the wire tie passed through the plate.



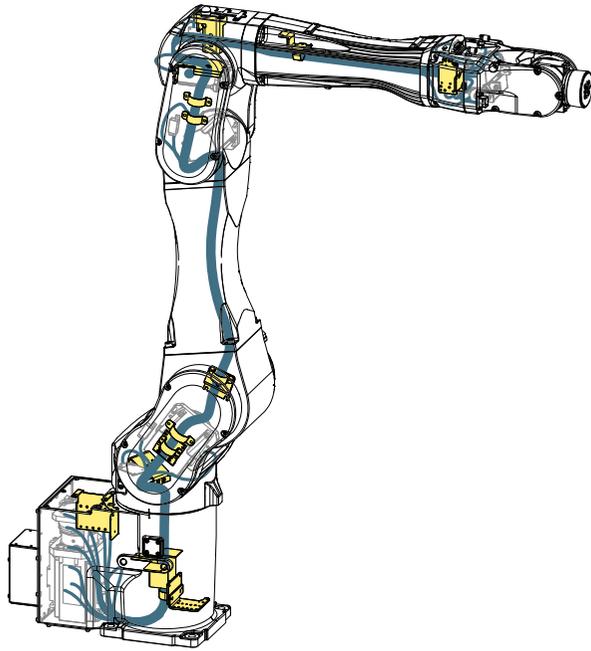
3. Bind the cable protective spring to Arm3 cable fixing plate 1.

Wire tie: AB100

Number of turns of spring to fix: 4 turns

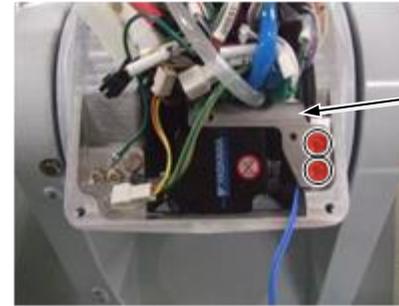


Installing the Cable Unit



4. Secure Arm3 cable fixing plate 1 to Arm3.

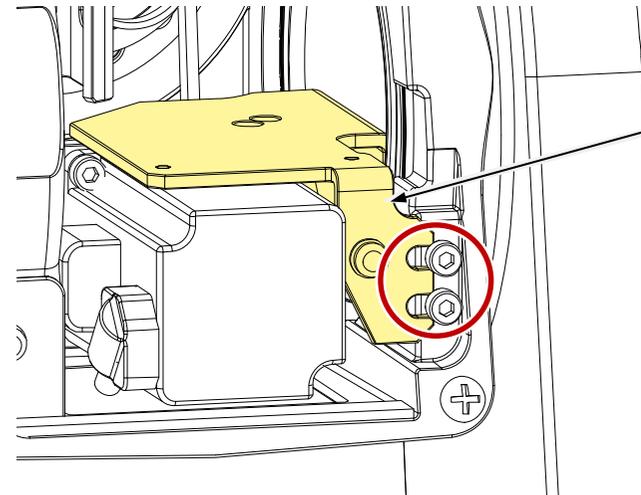
A S01: 2-M4x10
(4.0 +/- 0.2 N·m)



Arm3 cable fixing plate 1

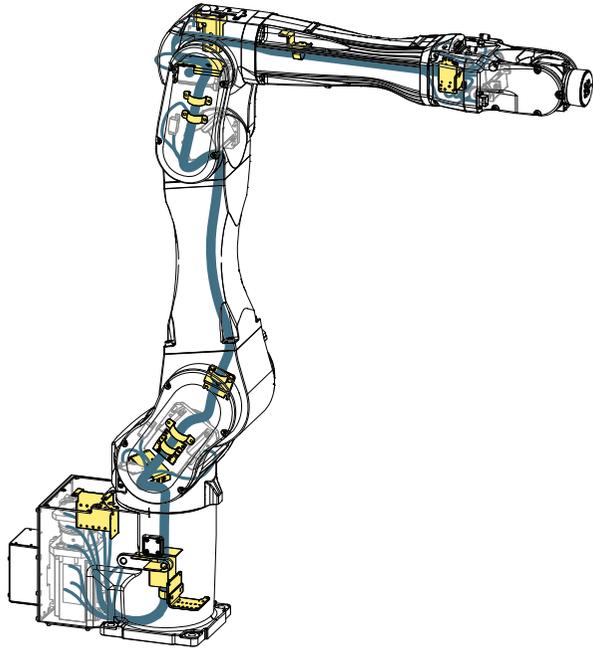
POINT

Slide the cutout section on the Arm3 cable fixing plate 1, and secure with screws.



Arm3 cable fixing plate 1

Installing the Cable Unit



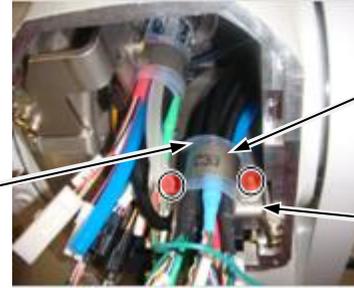
5. Secure the cables to Arm3 cable fixing plate 1 using the cable bracket (C3B).

POINT

Align the silicone tube and cable bracket (C3B) positions and install.

A S01: 2-M3x6
(2.4 +/- 0.1 N·m)

Silicone tube

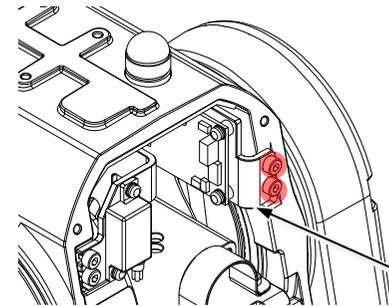


Cable bracket (C3B)

Arm3 cable fixing plate 1

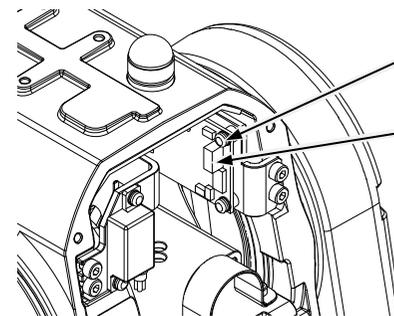
6. Install the gyro board 2 fixing plate.

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)



Gyro board 2 fixing plate

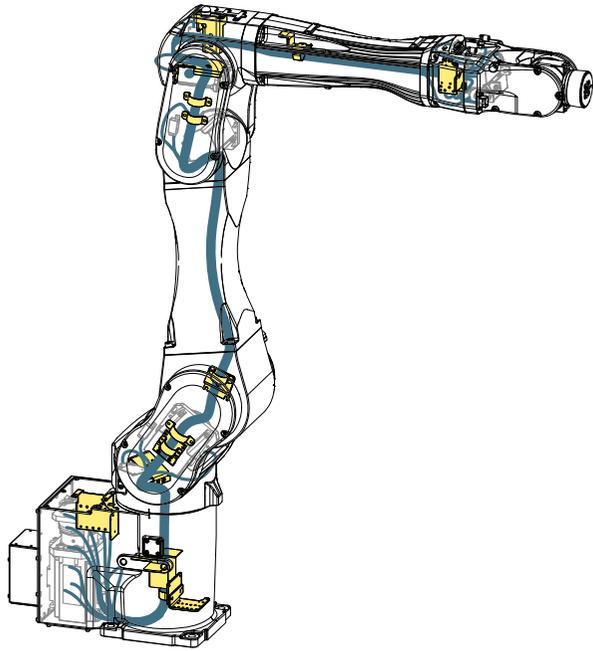
7. Connect the connector (CN3) to gyro board 2.



Gyro board 2

CN3

Installing the Cable Unit

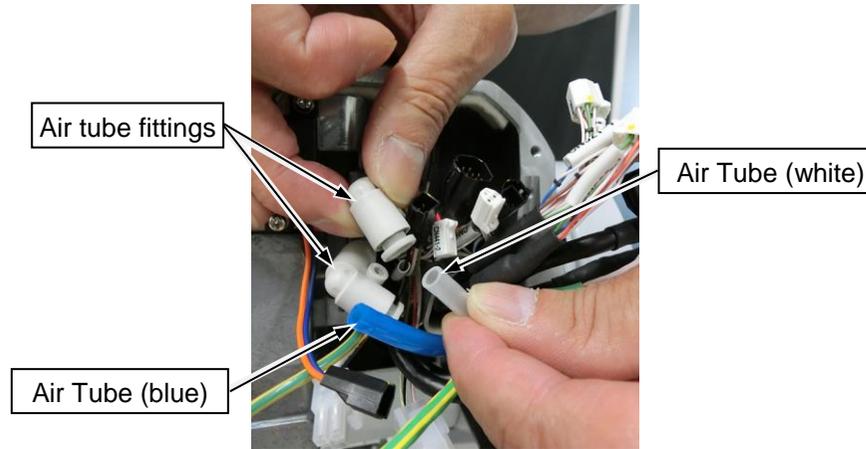


8. Connect the connectors (CN203, CN152, CN162, CN521, CN441, CN522, CN592, LED) inside Arm3.

9. Connect the Arm4-side and base-side Air Tubes with air tube fittings.

POINT

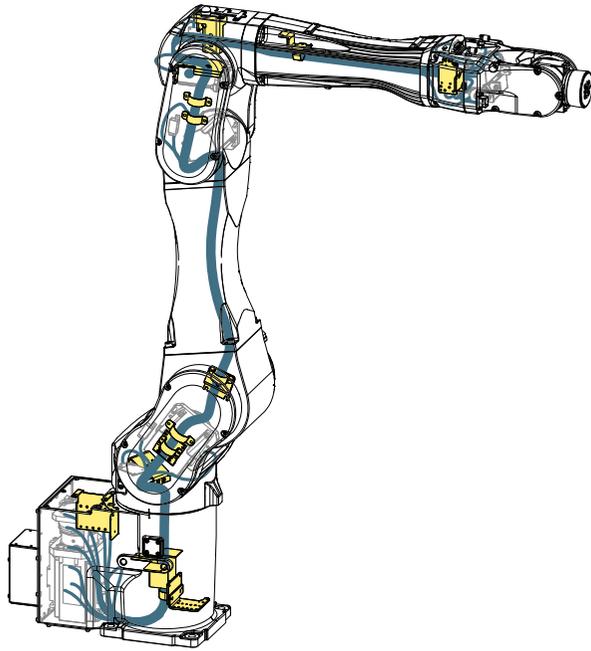
- Connect Air Tubes of the same color.
- The air tube fittings removed from the Cable Unit before replacement will be used again.



10. Connect the J4 Motor Connectors (CN141, CN341, CN440).

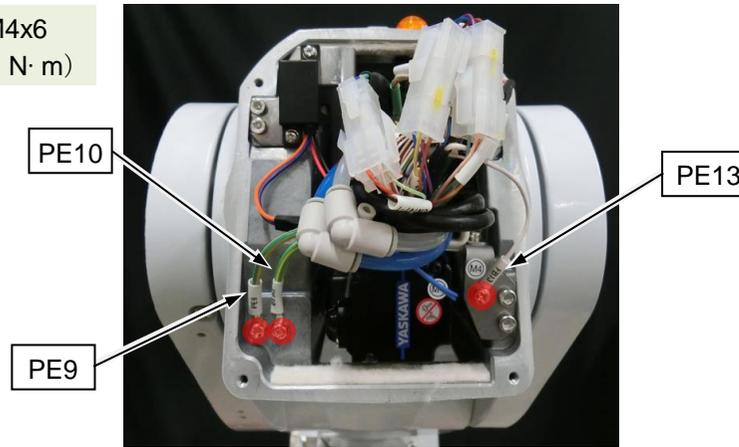


Installing the Cable Unit

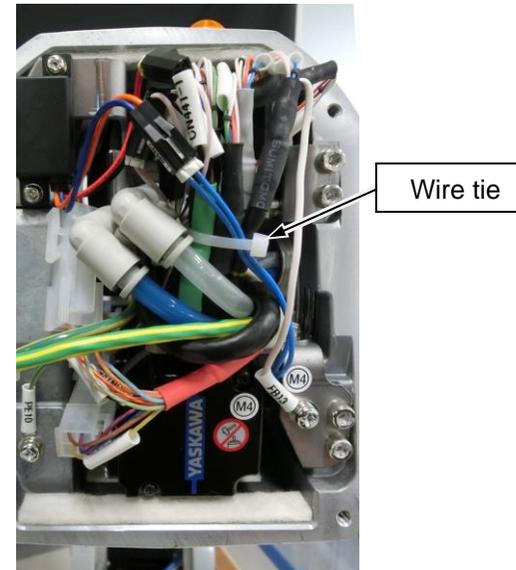


11. Connect the Ground Wires (PE9, PE10, FB13).

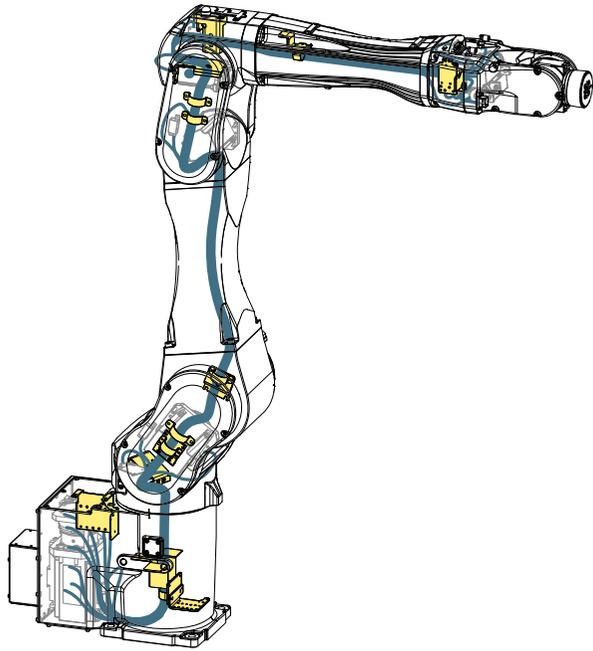
A S04: 3-M4x6
(0.9 +/- 0.1 N·m)



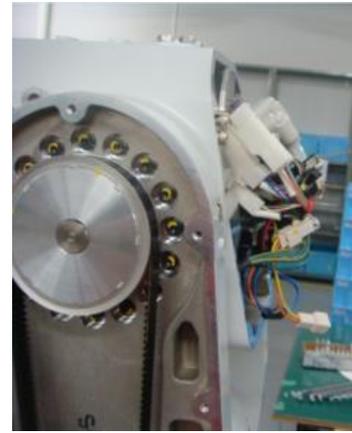
12. Bind the following connector cables using the wire tie (AB200).
CN341, CN592, CN522, CN521, CN203, LED, CN441, CN440



Installing the Cable Unit



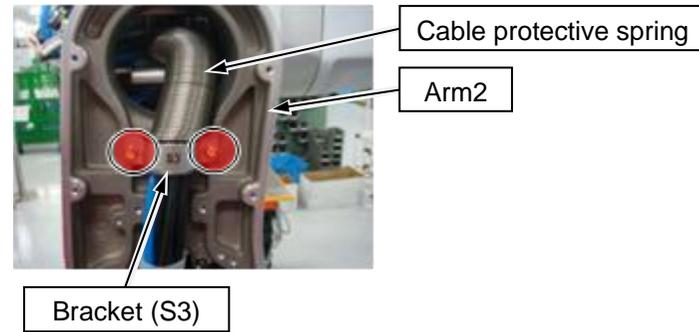
13. Place the connectors inside the arm so that the cover can be installed.



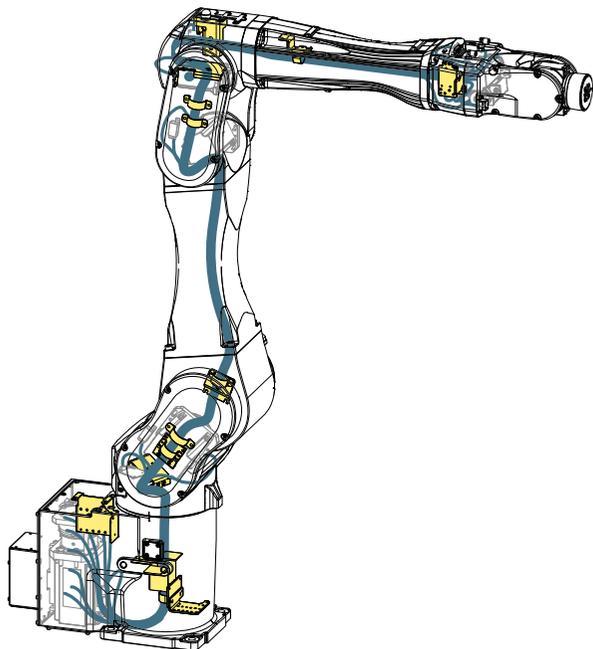
5 Secure the Cable Unit to Arm2.

1. Secure the cable protective spring to Arm2 with the bracket (S3).

A S01: 2-M4x8
(4.0 +/- 0.2 N·m)



Installing the Cable Unit

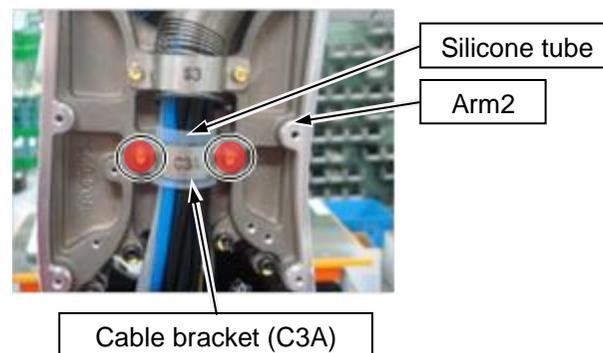


2. Temporarily secure the cables to Arm2 using the cable bracket (C3A).

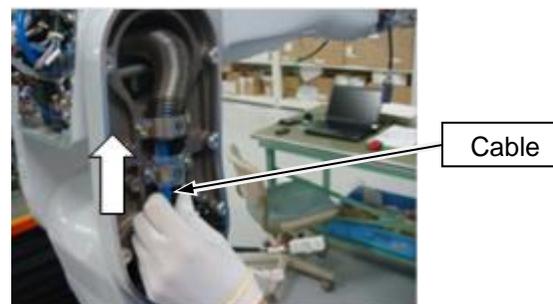
POINT

- Secure so that the cables can still be pushed up.
- Align the silicone tube and cable bracket (C3A) positions.

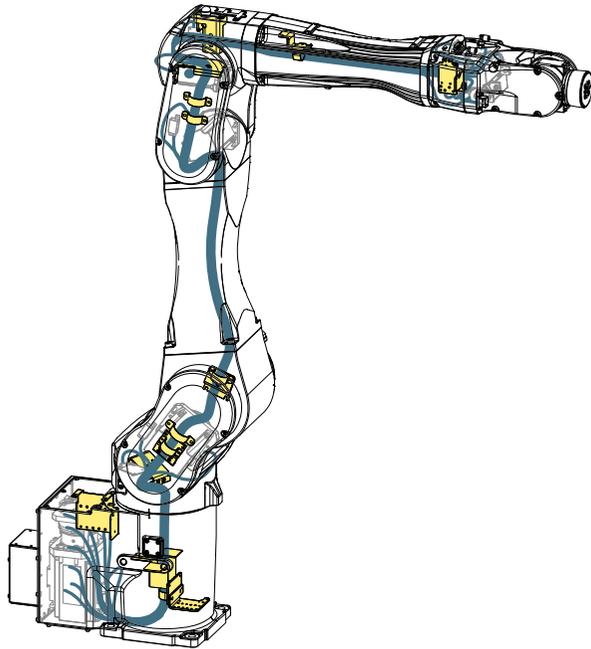
A S01: 2-M4x8



3. Push up the whole of the cables by 10 mm in the direction indicated with the arrow to allow for some space.



Installing the Cable Unit

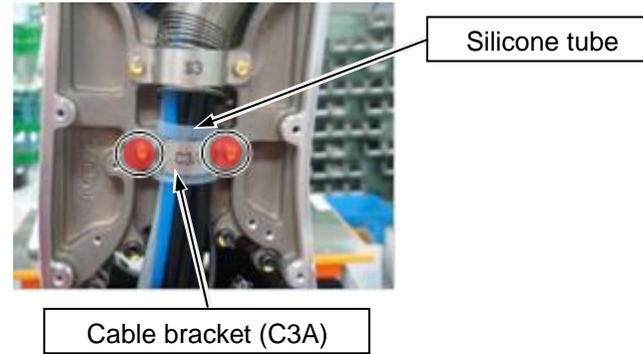


4. Fully tighten the cable bracket (C3A) fixing screws.

POINT

Check that the silicone tube has not come off from the cable bracket (C3A).

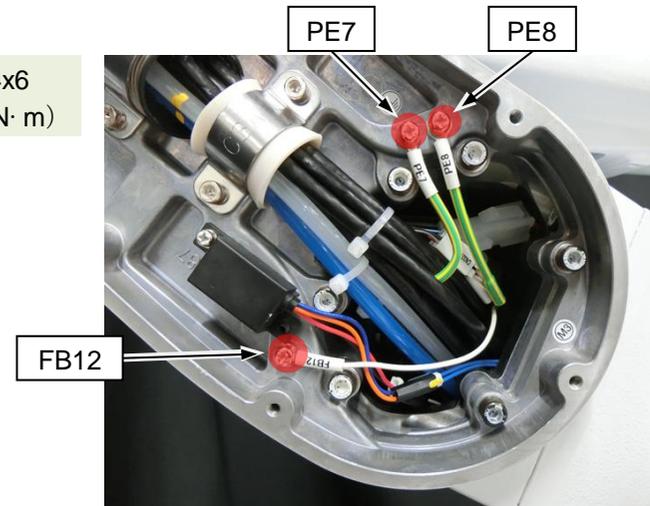
A S01: 2-M4x8
(4.0 +/- 0.2 N·m)



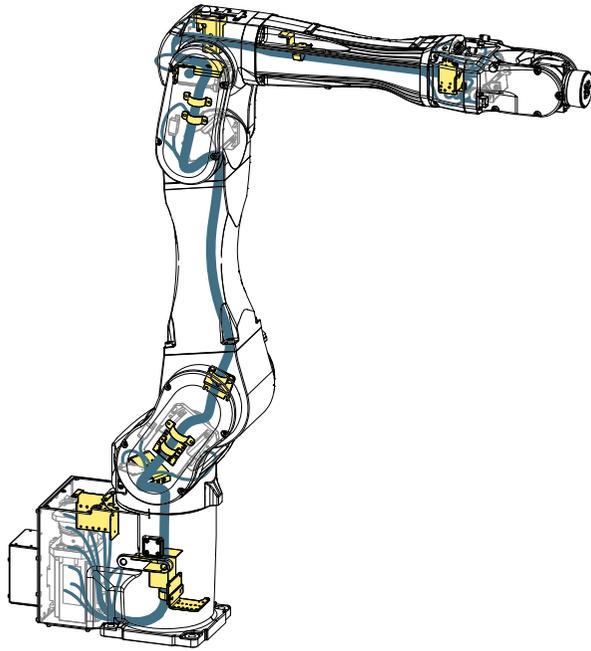
5. Install the [J3 Motor unit](#).

6. Connect the Ground Wires (PE7, PE8, FB12).

A S04: 3-M4x6
(0.9 +/- 0.1 N·m)



Installing the Cable Unit

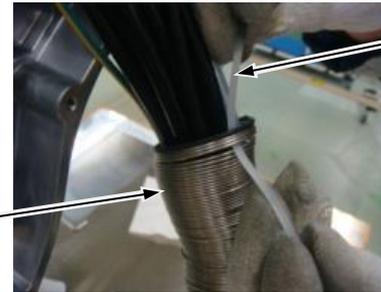


7. Bind the cable protective spring to the Arm2 cable fixing plate.

Wire tie: AB100

Number of turns of spring to fix: 4 turns

Cable protective spring

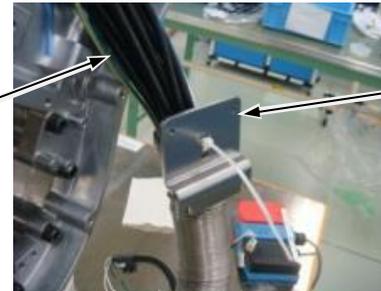


AB100

POINT

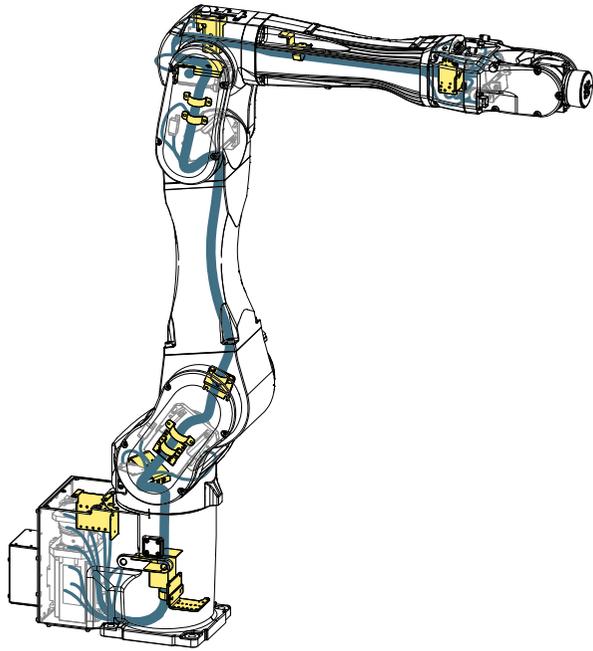
Install the Arm2 cable fixing plate on the Cable Unit with the orientation as shown in the figure.

Cable Unit



Arm2 cable fixing plate

Installing the Cable Unit

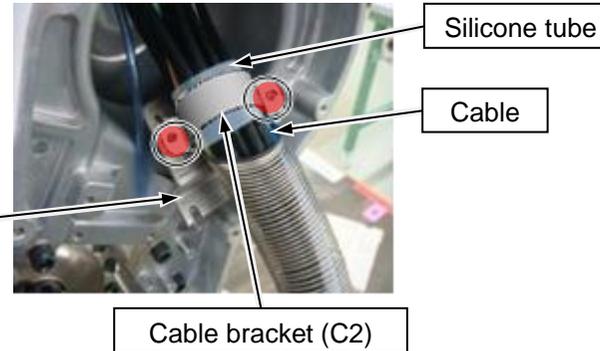


8. Temporarily secure the cables to the Arm2 cable fixing plate using the cable bracket (C2).

POINT

- Secure so that the cables can still be pushed up.
- Align the silicone tube and cable bracket (C2) positions.

A S01: 2-M3x6



Arm2 cable fixing plate

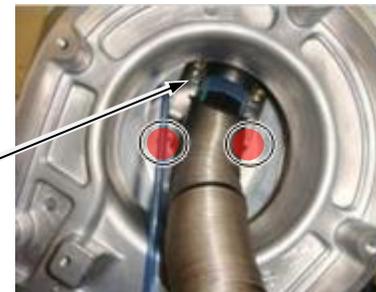
Silicone tube

Cable

Cable bracket (C2)

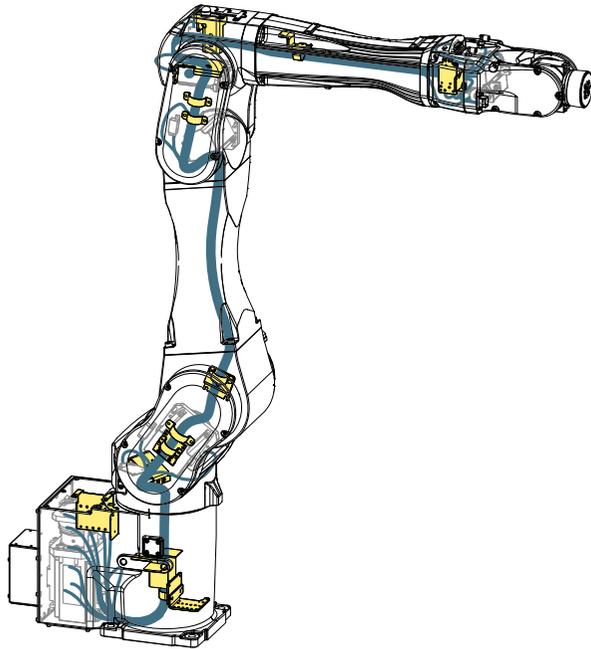
9. Install the Arm2 cable fixing plate.

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)



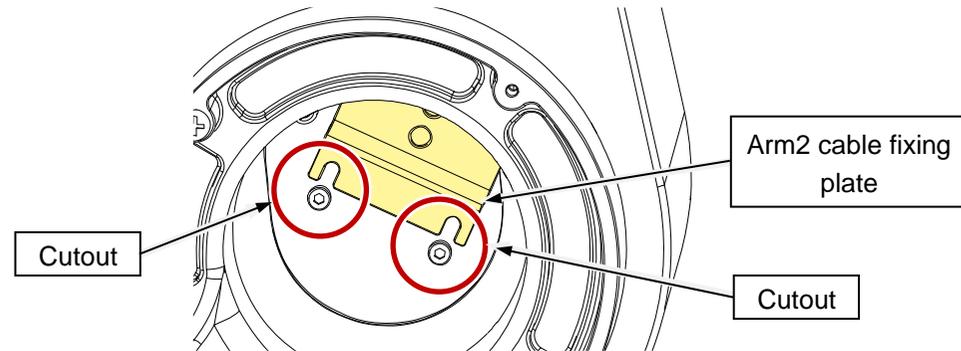
Arm2 cable fixing plate

Installing the Cable Unit



POINT

Secure the Arm2 cable fixing plate by hooking the cutouts onto the fixing bolts.

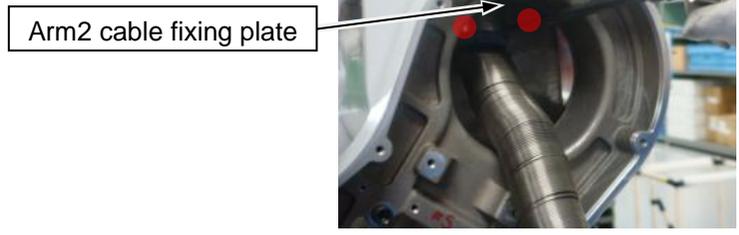


10. Fully tighten the cable bracket (C2) fixing screws.

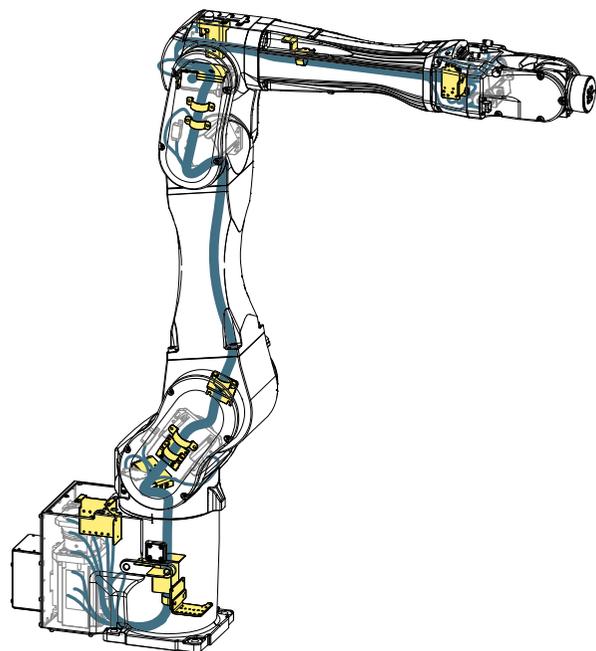
POINT

Check that the silicone tube has not come off from the cable bracket (C2).

- A S01: 2-M3x6
(2.4 +/- 0.1 N·m)



Installing the Cable Unit



6

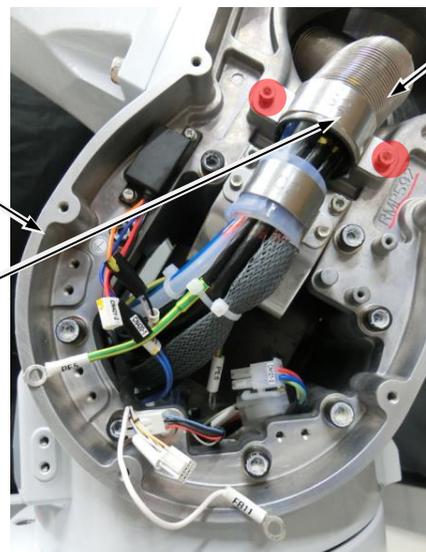
Secure the Cable Unit to Arm1.

1. Secure the cable protective spring to Arm1 with the bracket (S2).

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)

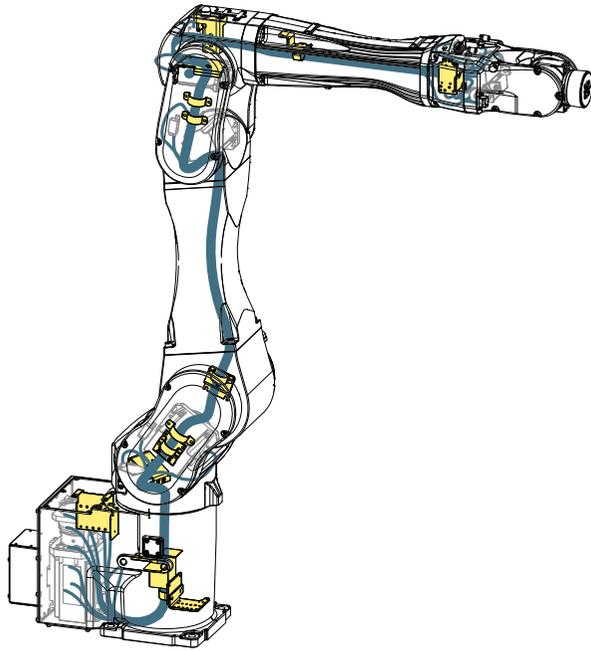
Arm1

Bracket (S2)



Cable protective spring

Installing the Cable Unit

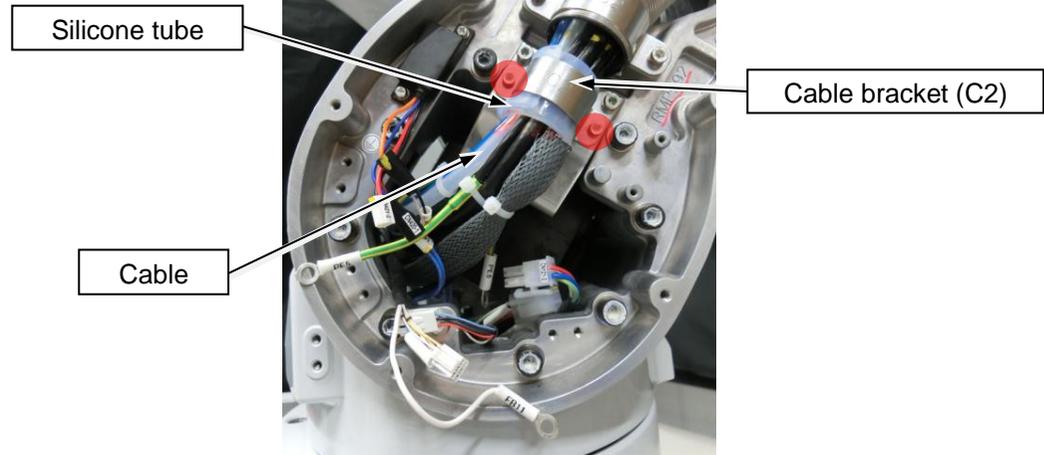


2. Temporarily secure the cables to Arm1 using the cable bracket (C2).

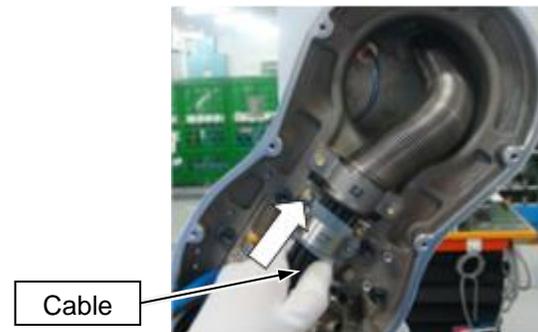
POINT

- Secure so that the cables can still be pushed up.
- Align the silicone tube and cable bracket (C2) positions.

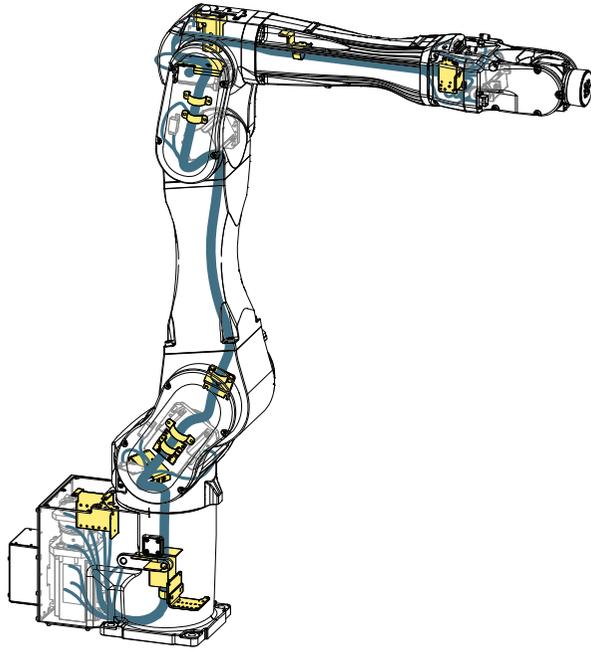
A S01: 2-M3x6



3. Push up the whole of the cables by 10 mm in the direction indicated with the arrow to allow for some space.



Installing the Cable Unit

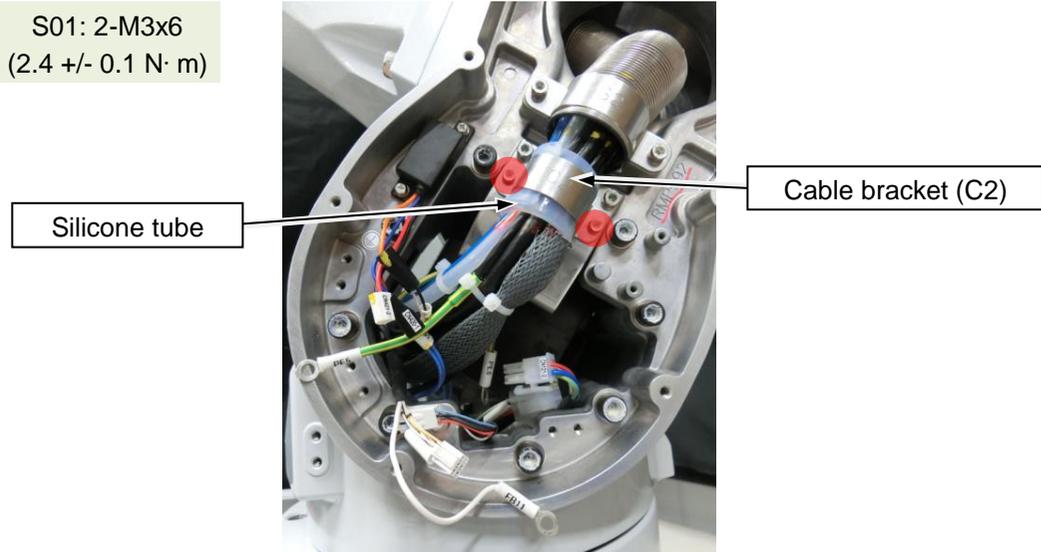


4. Fully tighten the cable bracket (C2) fixing screws.

POINT

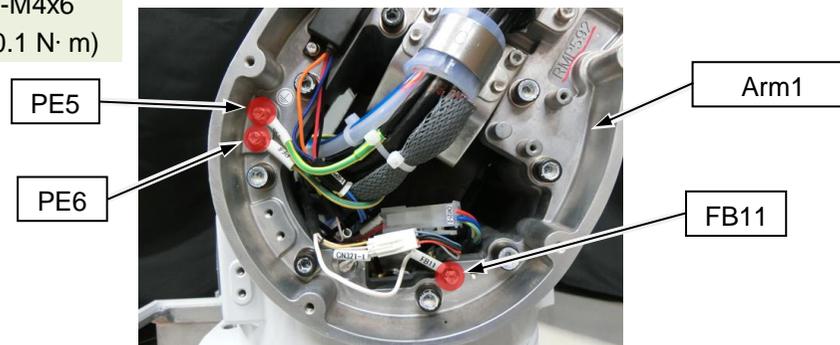
Check that the silicone tube has not come off from the cable bracket (C2).

- A S01: 2-M3x6
(2.4 +/- 0.1 N·m)

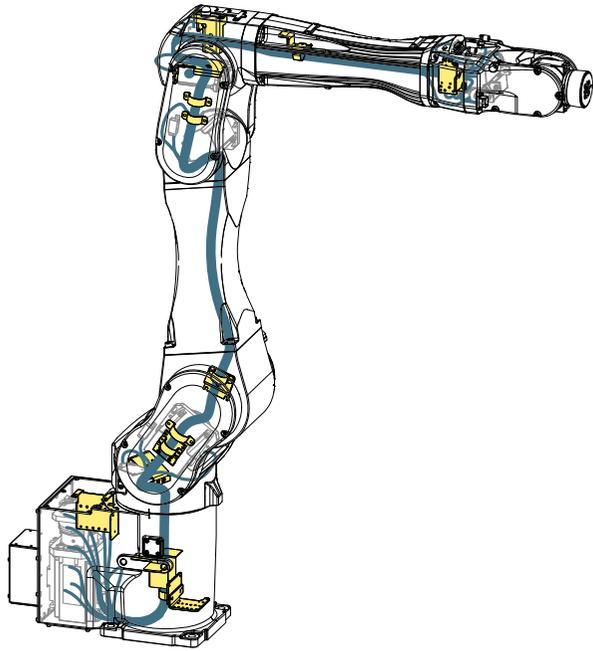


5. Connect the Ground Wires (PE5, PE6, FB11) to Arm1.

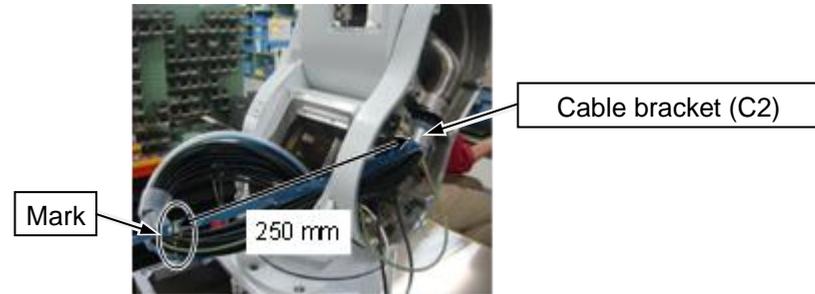
- A S04: 3-M4x6
(0.9 +/- 0.1 N·m)



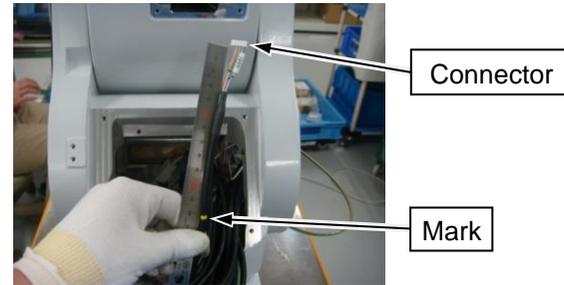
Installing the Cable Unit



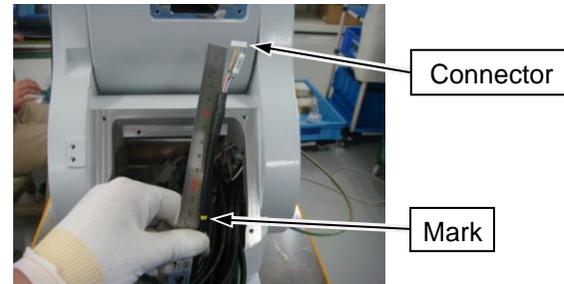
6. Mark a position 250 mm from the Cable Unit cable bracket (C2).



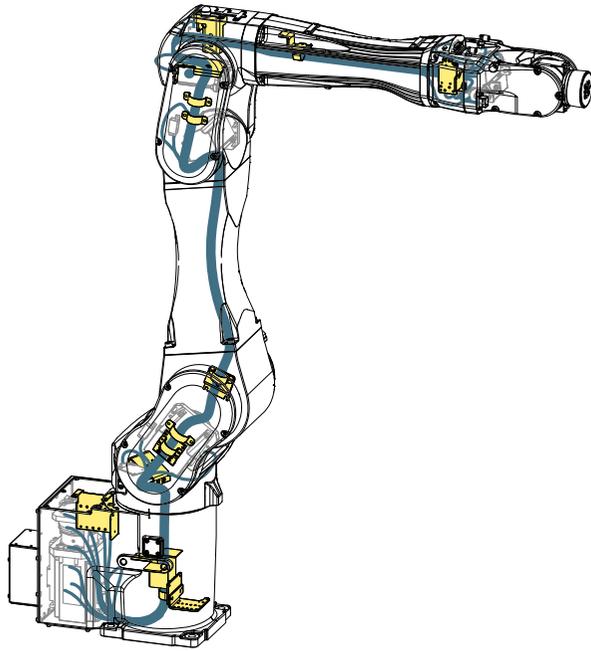
7. Mark a position 130 mm from the CN6 cable connector.



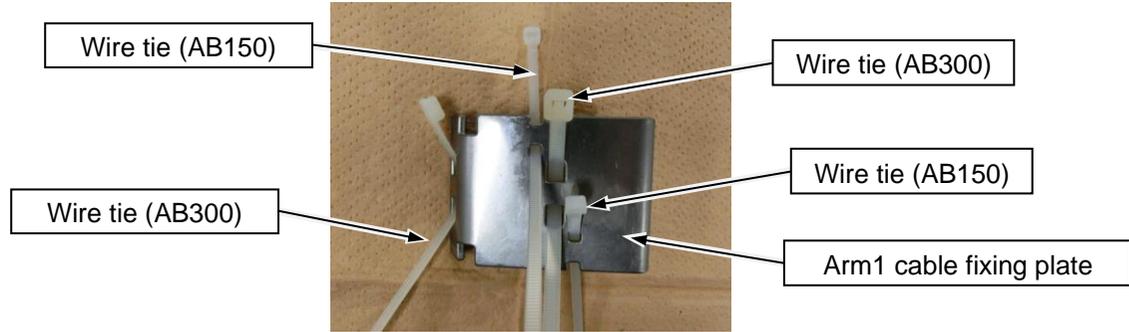
8. Mark a position 160 mm from the CN421, CN121, and CN321 cable connectors.



Installing the Cable Unit



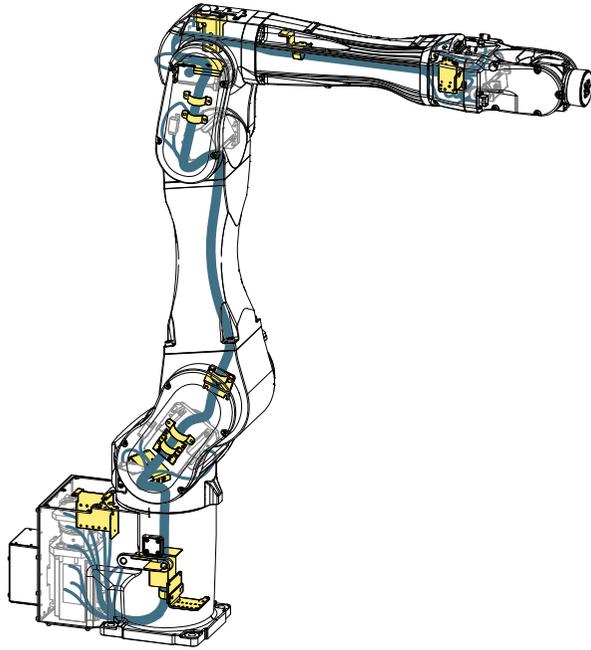
9. Pass four wire ties through the Arm1 cable fixing plate as shown in the figure. At this point, temporarily fasten the wire ties just tight enough that the cables can move.



10. Pull out the internal cables from the Arm1 side toward the base side.



Installing the Cable Unit

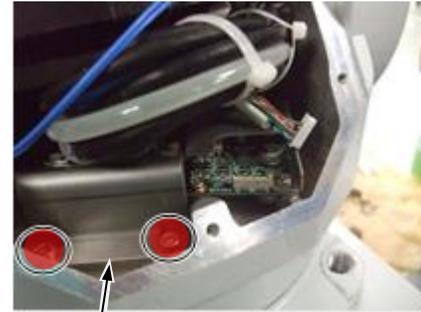


11. Temporarily secure the Arm1 cable fixing plate to Arm1.

POINT

Secure it enough that the plate does not move.

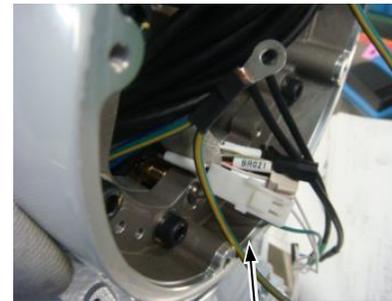
A S01: 2-M4x10



Arm1 cable fixing plate

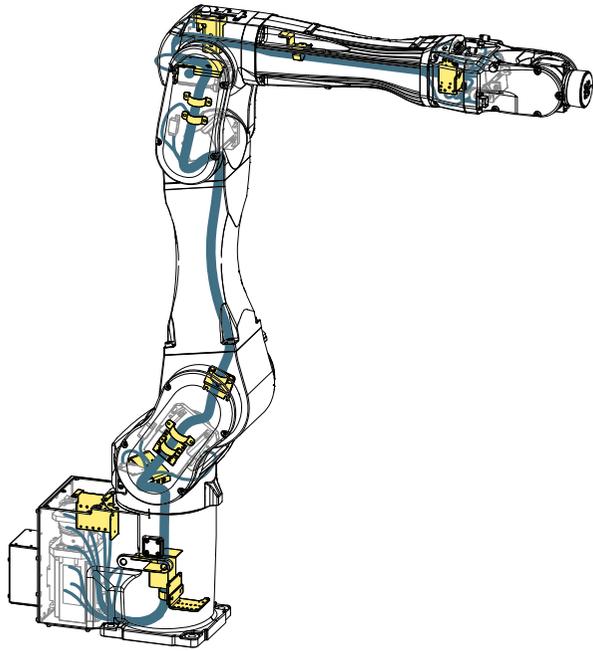
12. Adjust the cable length with attention paid to the following.

- No excess looseness or tension on the cables.
- The cables should not be pressed strongly against the arm edge.
- The CN421, CN121, and CN321 connectors should reach the end face of Arm1 when they are pulled out. The cables should not be too long.

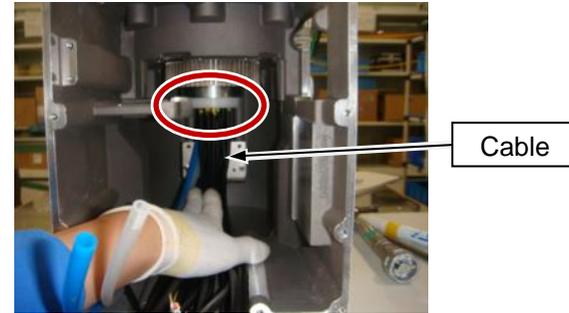


Arm1 end face

Installing the Cable Unit



13. Place a mark on the cables at the sleeve outlet on the base side.



14. Bind the cables using the wire ties passed through the Arm1 cable fixing plate.
(4 locations)

POINT

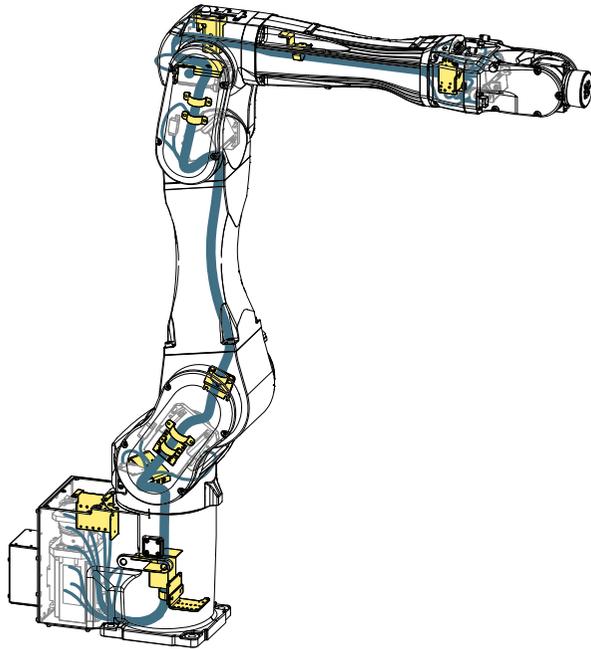
Branch and secure the cables.

CAUTION

Bind the cables so that the cable positions do not change.

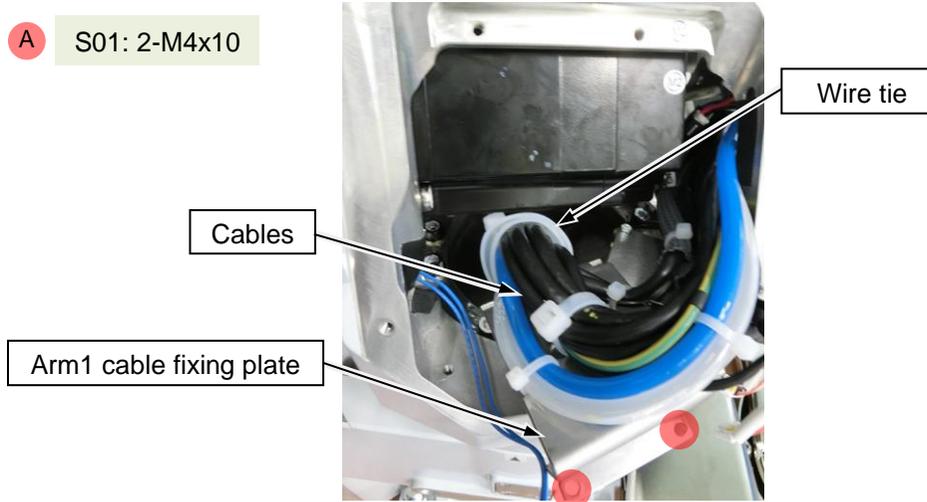


Installing the Cable Unit



15. Remove the temporarily secured Arm1 cable fixing plate, and bind the cables with a wire tie at the position shown in the figure.

A S01: 2-M4x10

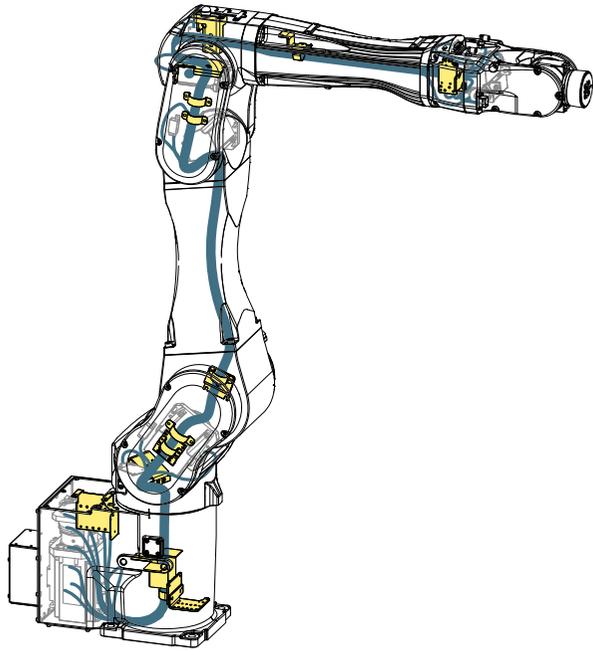


16. Apply grease to the cables inside the J1 sleeve.

 Krytox: Approx. 7.5 g

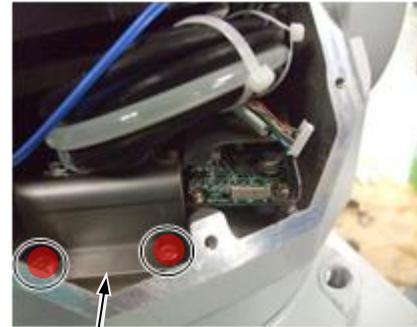


Installing the Cable Unit



17. Secure the Arm1 cable fixing plate to Arm1.

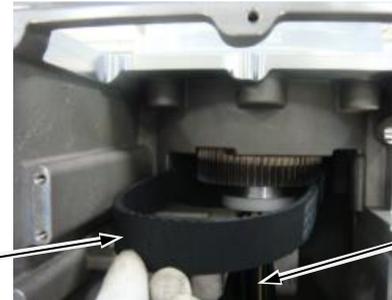
- A S01: 2-M4x10
(4.0 +/- 0.2 N·m)



Arm1 cable fixing plate

7 Secure the Cable Unit to the base.

1. Pass the J1 Timing Belt through the cables.



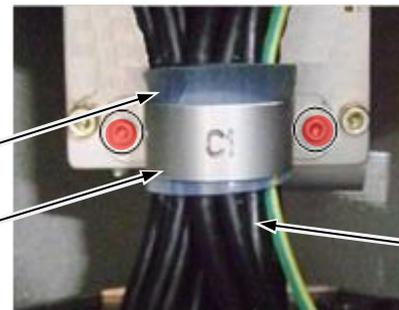
J1 Timing Belt

Cables

2. Wrap the attached Silicone Sheet around the cables.

3. Install the cable bracket (C1) so that it presses down on the Silicone Sheet.

- A S01: 2-M3x6
(2.0 +/- 0.1 N·m)

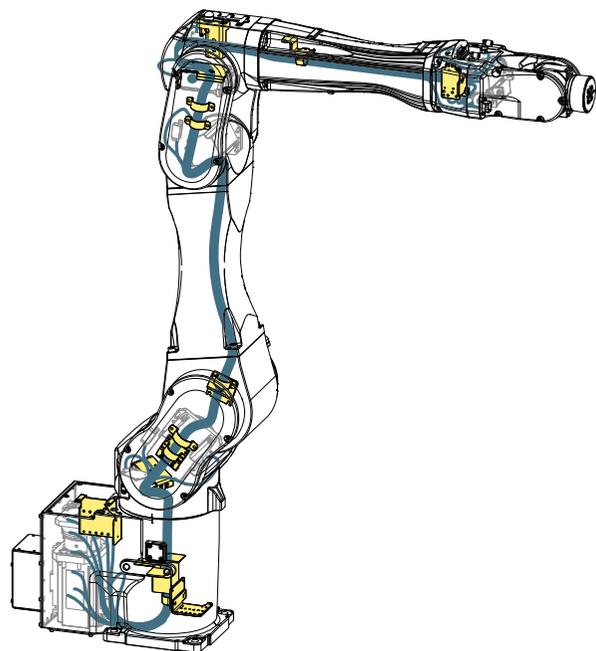


Silicone Sheet

Cable bracket (C1)

Cables

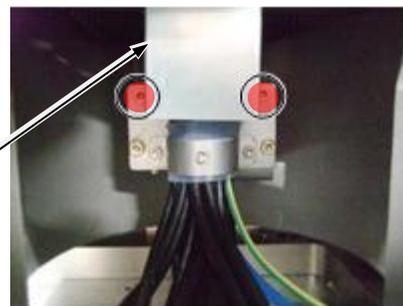
Installing the Cable Unit



4. Install the plate for preventing cable interference.

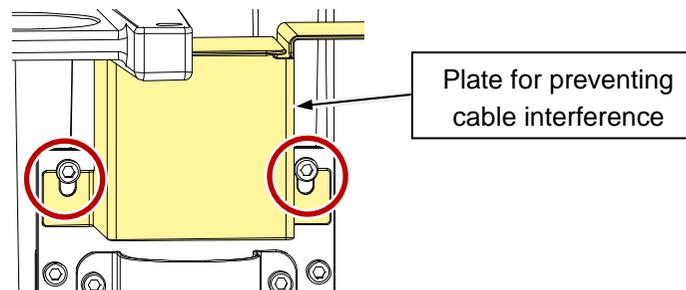
A S01: 2-M3x6
(2.0 +/- 0.1 N·m)

Plate for preventing cable interference

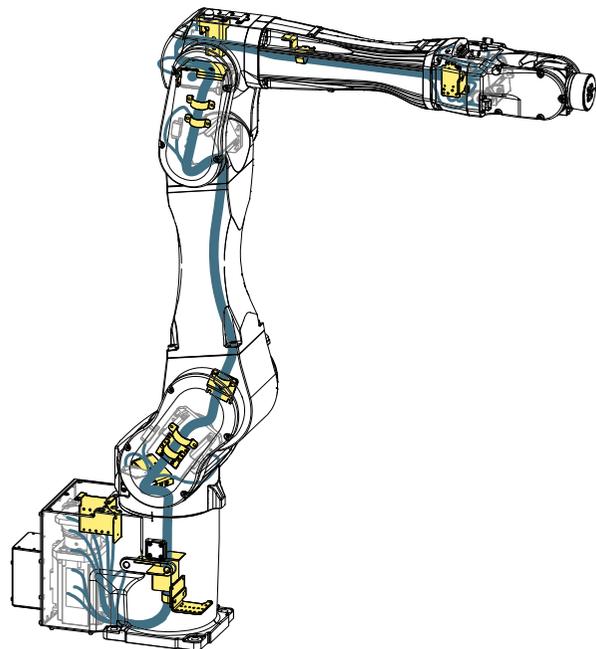


POINT

Slide the cutout section on the plate for preventing cable interference, and secure with screws.



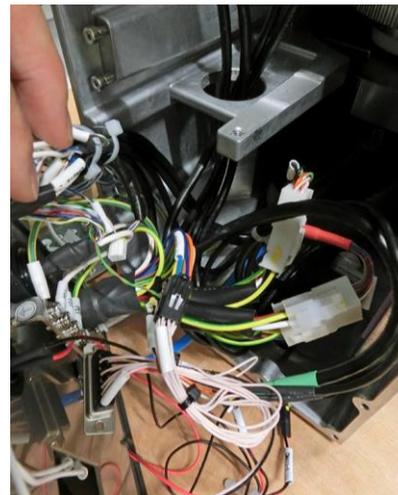
Installing the Cable Unit



5. Connect the M/C cable connectors.

For C8-B/C12-B: CN111, CN311, CN3L, CN202, CN312, CN200, CN300, CN201, CN301, CN3G0

For C8-C/C12-C: CN111, CN311, CN2A1, CN2A2, CN2A3, CN2B1, CN2B2

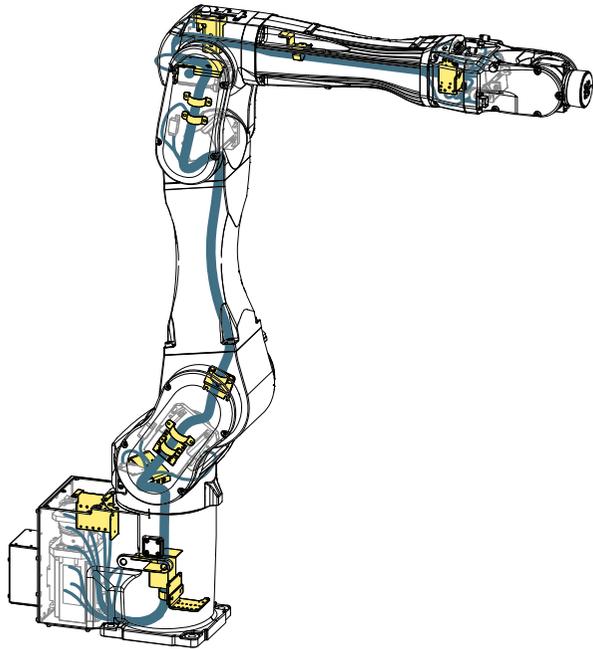


6. Pass the following cables and connectors through the hole in the base.

- D-sub cable
- Ground Wires
- RJ45 connector
- F-sensor connector



Installing the Cable Unit



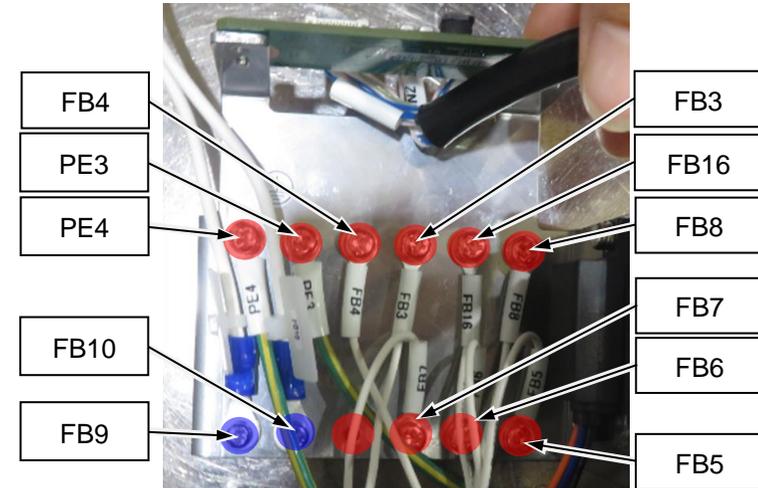
7. Install the ground wire terminals to the ground wire plate.

POINT

The Ground Wires may be attached in positions different to what is shown in the figure. Refer to the records you took when removing them and return them to the same state as they were before removal.

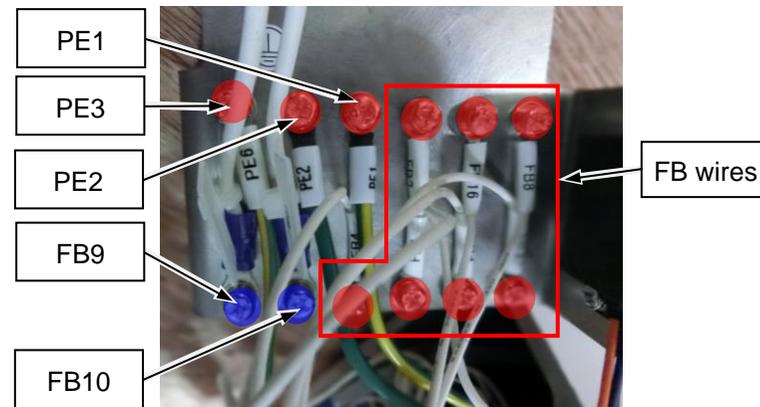
For C8-B/C12-B: PE3, FB4, FB3, FB16, FB8, FB7, FB6, FB5

- A** S04: 10-M4x6
(0.9 +/- 0.1 N·m)
- B** S04: 2-M3x6
(0.45 +/- 0.05 N·m)

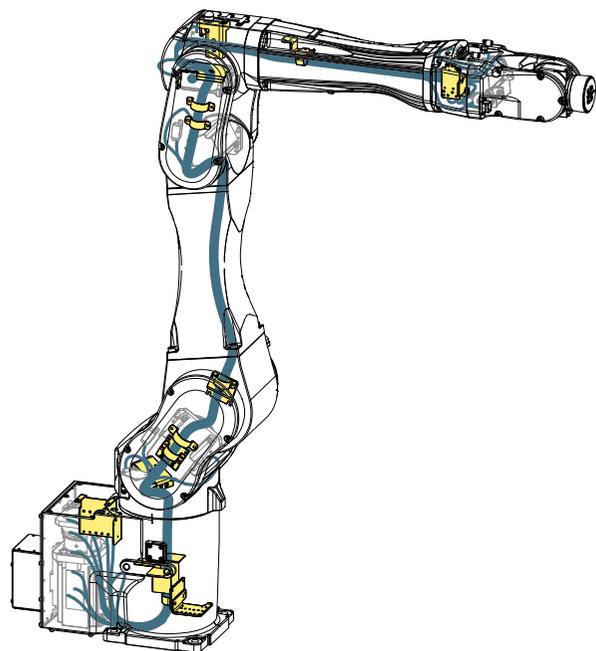


For C8-C/C12-C: PE3, FB3, FB4, FB5, FB6, FB7, FB8, FB16

- A** S04: 10-M4x6
(0.9 +/- 0.1 N·m)
- B** S04: 2-M3x6
(0.45 +/- 0.05 N·m)



Installing the Cable Unit



8. Install the ground wire plate.

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)

Ground wire plate

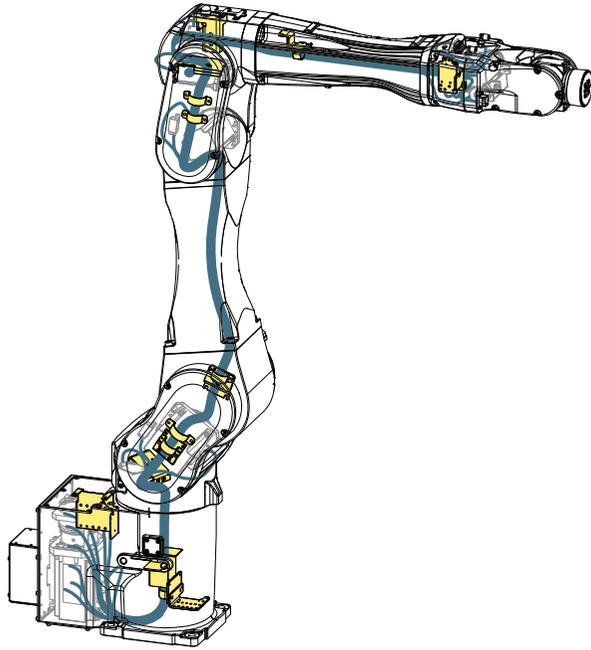


9. Connect the Brake power supply connector (CN410 and CN411).



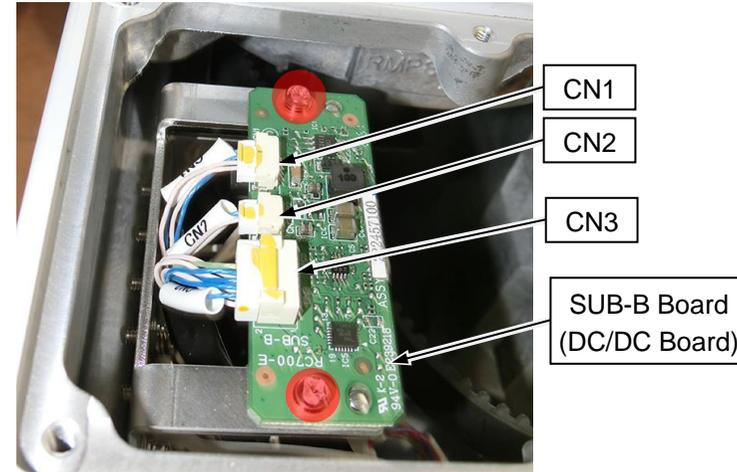
CN410 and CN411

Installing the Cable Unit

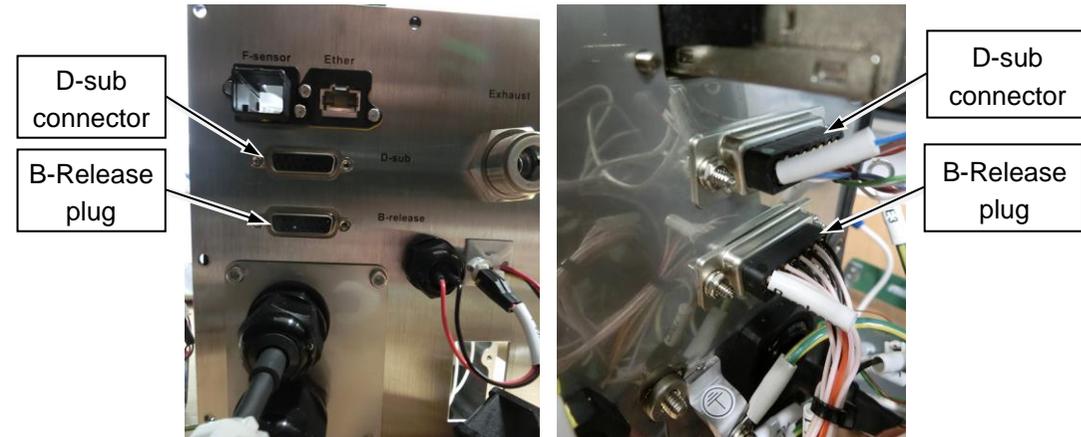


10. Install the SUB-B Board (DC/DC Board), and connect the connectors (CN1, CN2, CN3) of the board.

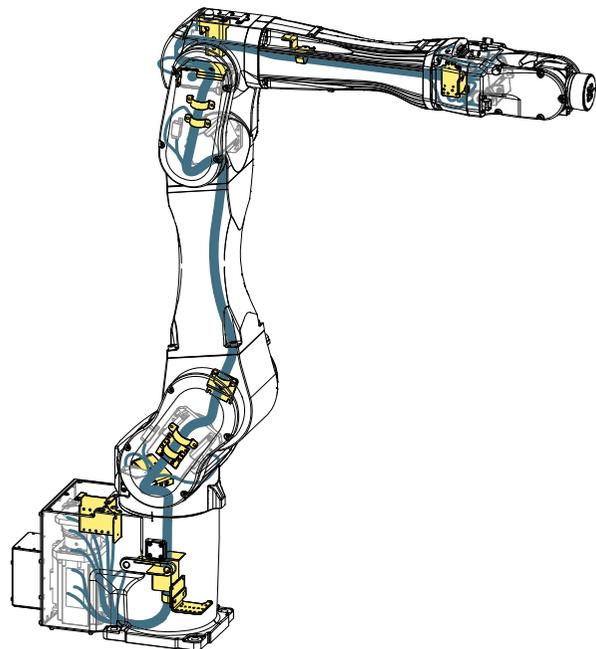
A S07: 2-M3x6



11. Install the B-Release plug and the D-sub connector in accordance with the indications on the Connector Plate.

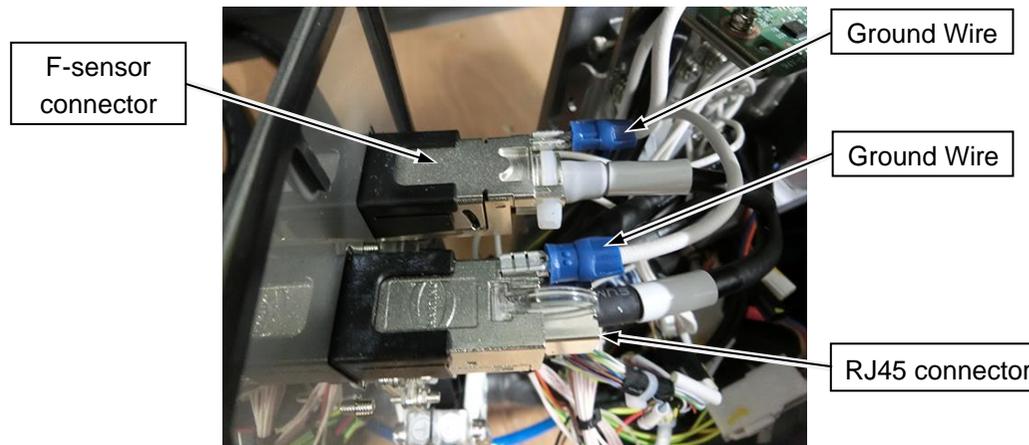


Installing the Cable Unit



12. Connect the following connectors in accordance with the indications on the Connector Plate.

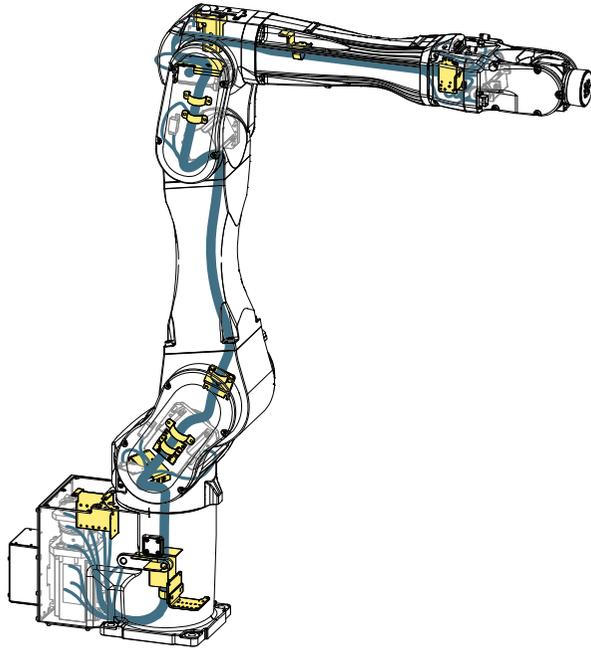
- RJ45 connector: Ether
- F-sensor connector: F-sensor



POINT

After connecting the connectors, attach the Ground Wire to each connector.

Installing the Cable Unit

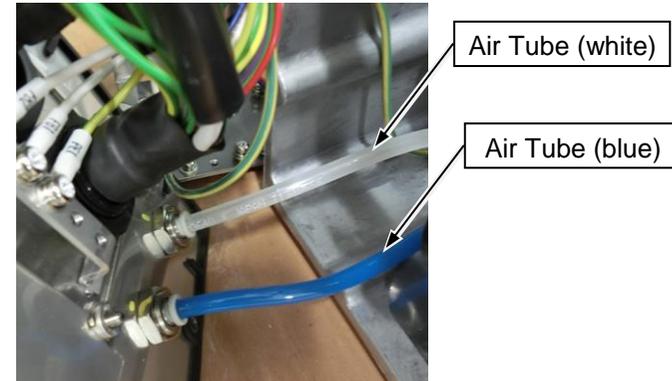


13. Connect the Air Tubes (blue/white) in accordance with the indications on the Connector Plate.

CAUTION

Check the Air Tube colors before connecting.

White: Air1, Blue: Air2



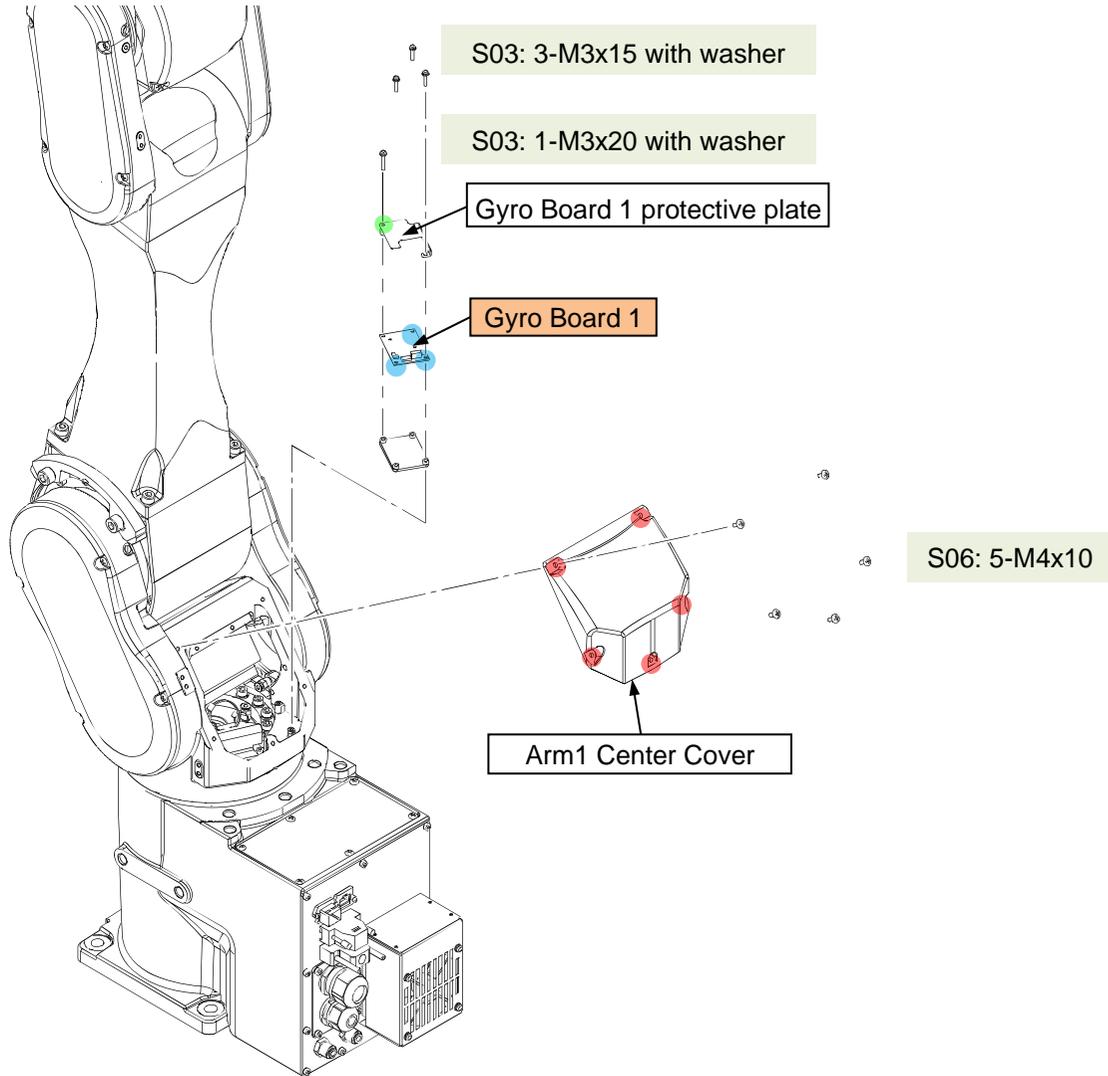
8 Install the following parts.

- [Gyro board 1](#)
- J1 Motor unit
(M/C Cable Backward),
(M/C Cable Downward)
- [Arm4 side cover](#) (both sides)
- [Arm4 maintenance cover](#)
- [Arm3 cover](#)
- [Arm3 maintenance cover](#)
- [Arm2 side cover](#) (both sides)
- [Arm1 side cover](#) (both sides)
- [Arm1 center cover](#)
- [Base Maintenance Cover](#)
- Connector Plate
(M/C Cable Backward: C8L),
(M/C Cable Backward: C8XL, C12XL),
(M/C Cable Downward)

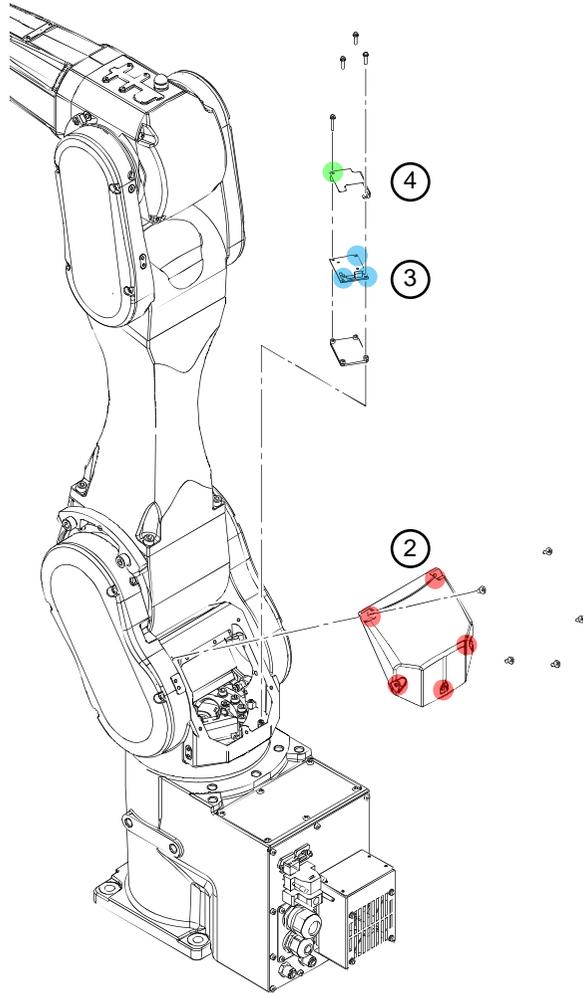
9 After assembly, perform calibration of each joint.
[3.2 Calibration](#)

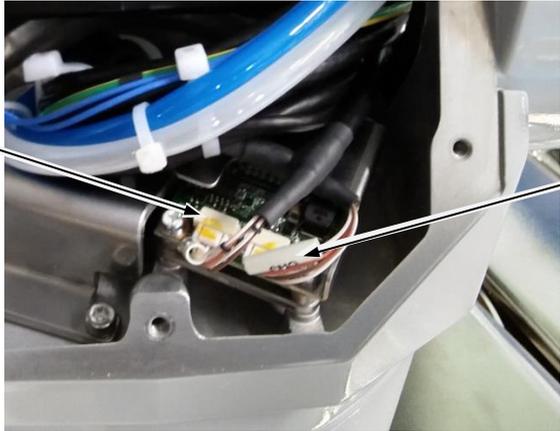
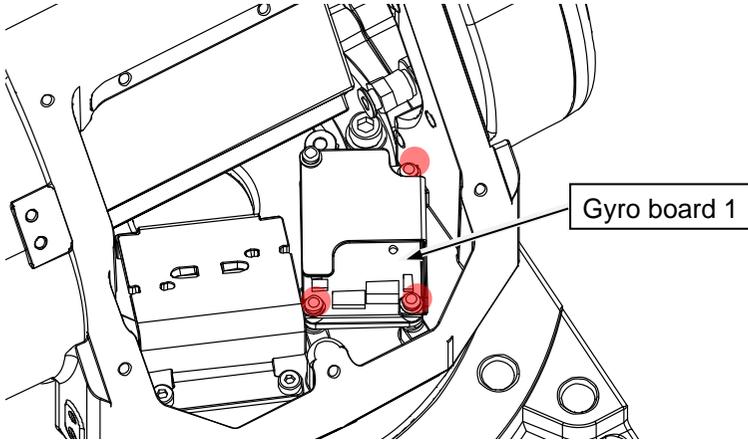
2.10 Replacing the Board

2.10.1 Replacing Gyro Board 1

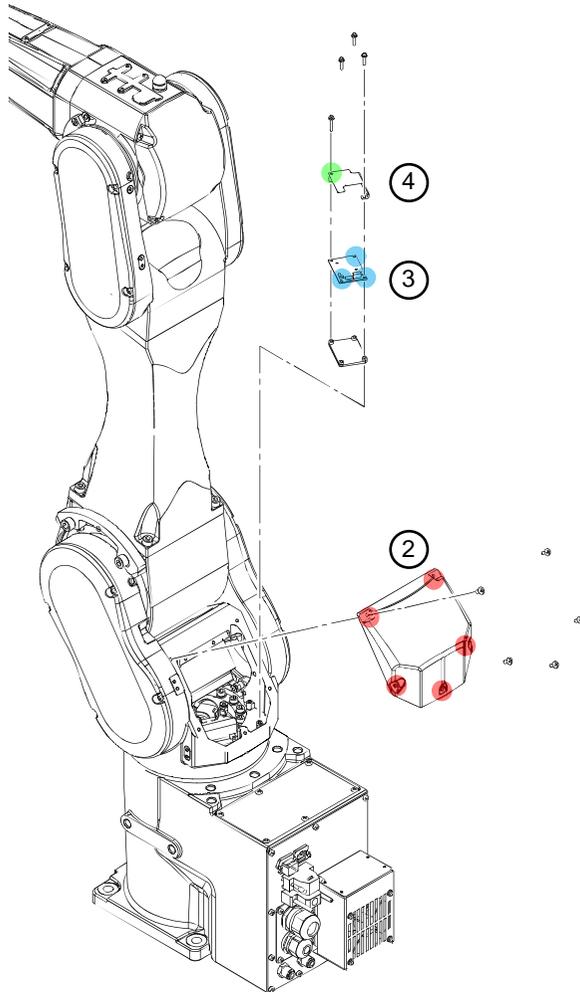


Removing Gyro Board 1



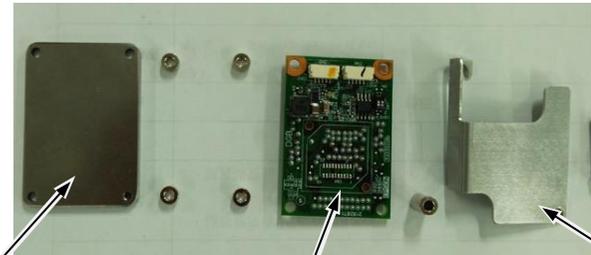
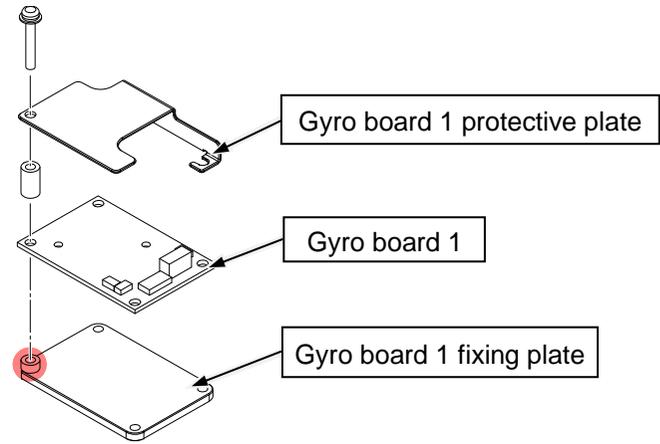
①	Turn OFF the Controller.
②	Remove the Arm1 center cover .
③	<p>Disconnect the connectors (CN3, CN6), and remove gyro board 1.</p> <p>CAUTION Be careful not to drop the screws inside the Manipulator.</p> <p>A S03: 3-M3x15 with washer</p>  

Removing Gyro Board 1



④ Remove the gyro board 1 protective plate.

A S03: 1-M3x20 with washer

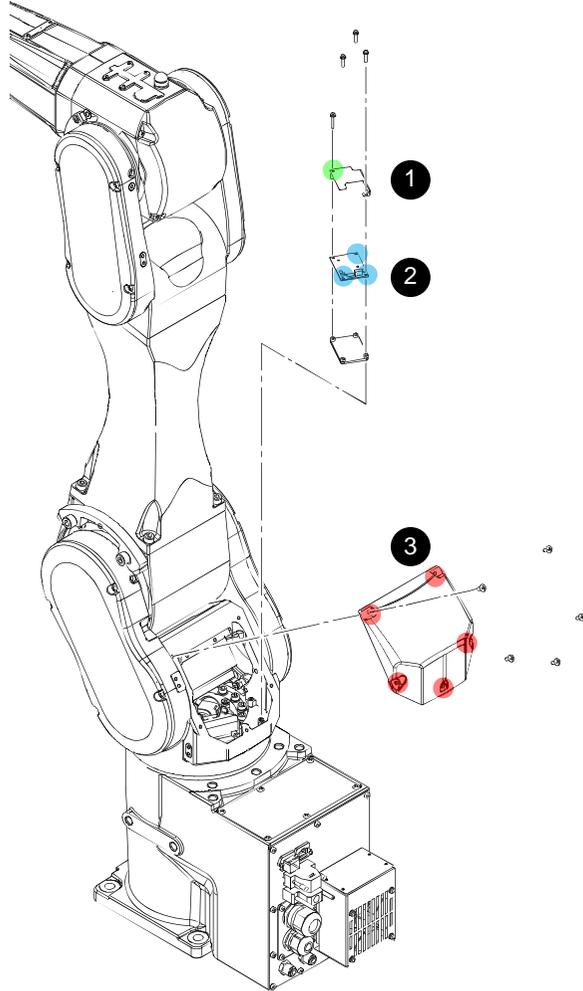


Gyro board 1 fixing plate

Gyro board 1

Gyro board 1 protective plate

Installing Gyro Board 1



1 Install the gyro board 1 protective plate on gyro board 1.

POINT
Install the gyro board 1 protective plate to the board with the orientation as shown in the figure. Any orientation is acceptable for installation of the gyro board 1 fixing plate.

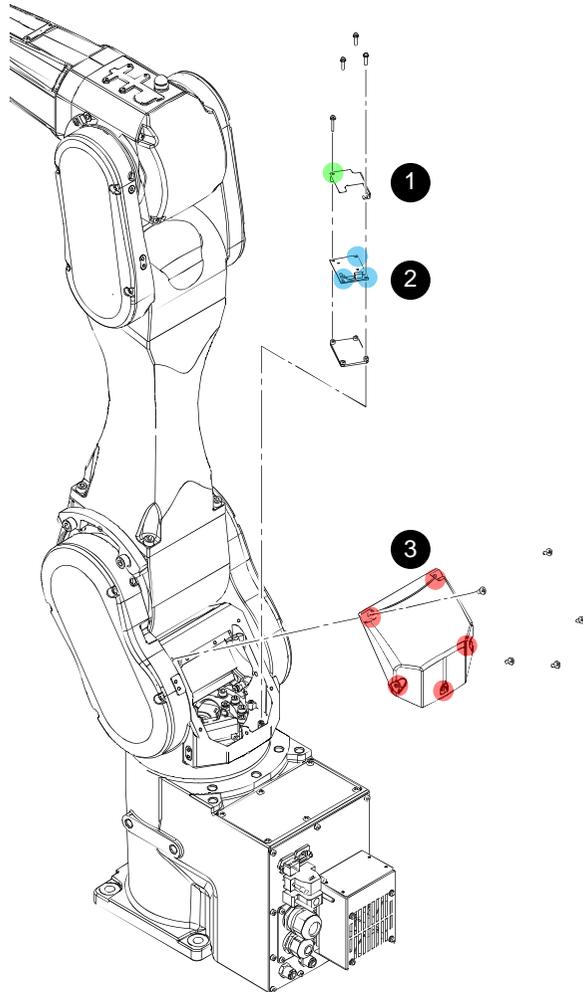
A S03: 1-M3x20 with washer (0.45 +/- 0.1 N·m)

Gyro board 1 protective plate

Gyro board 1

Gyro board 1 fixing plate

Installing Gyro Board 1



2

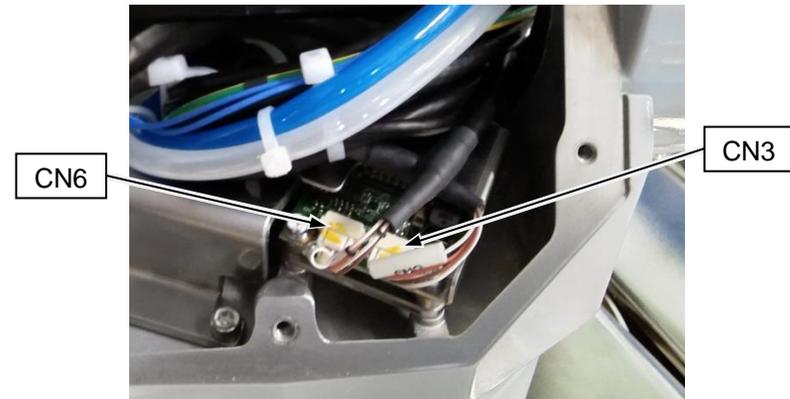
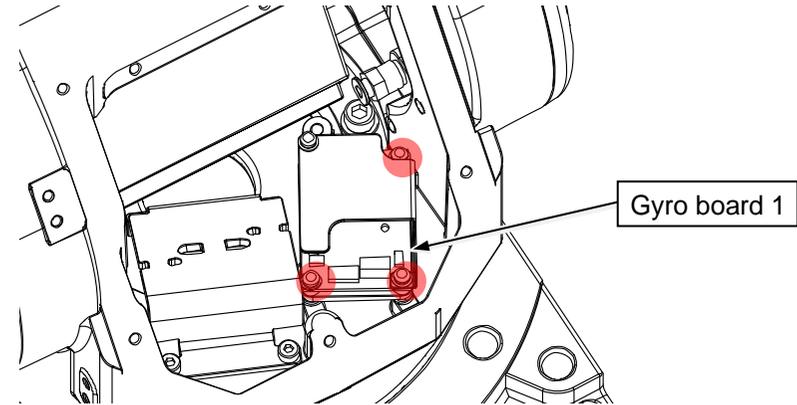
Install gyro board 1 on Arm1, and connect the connectors (CN3, CN6).

CAUTION

Be careful not to drop the screws inside the Manipulator.

A

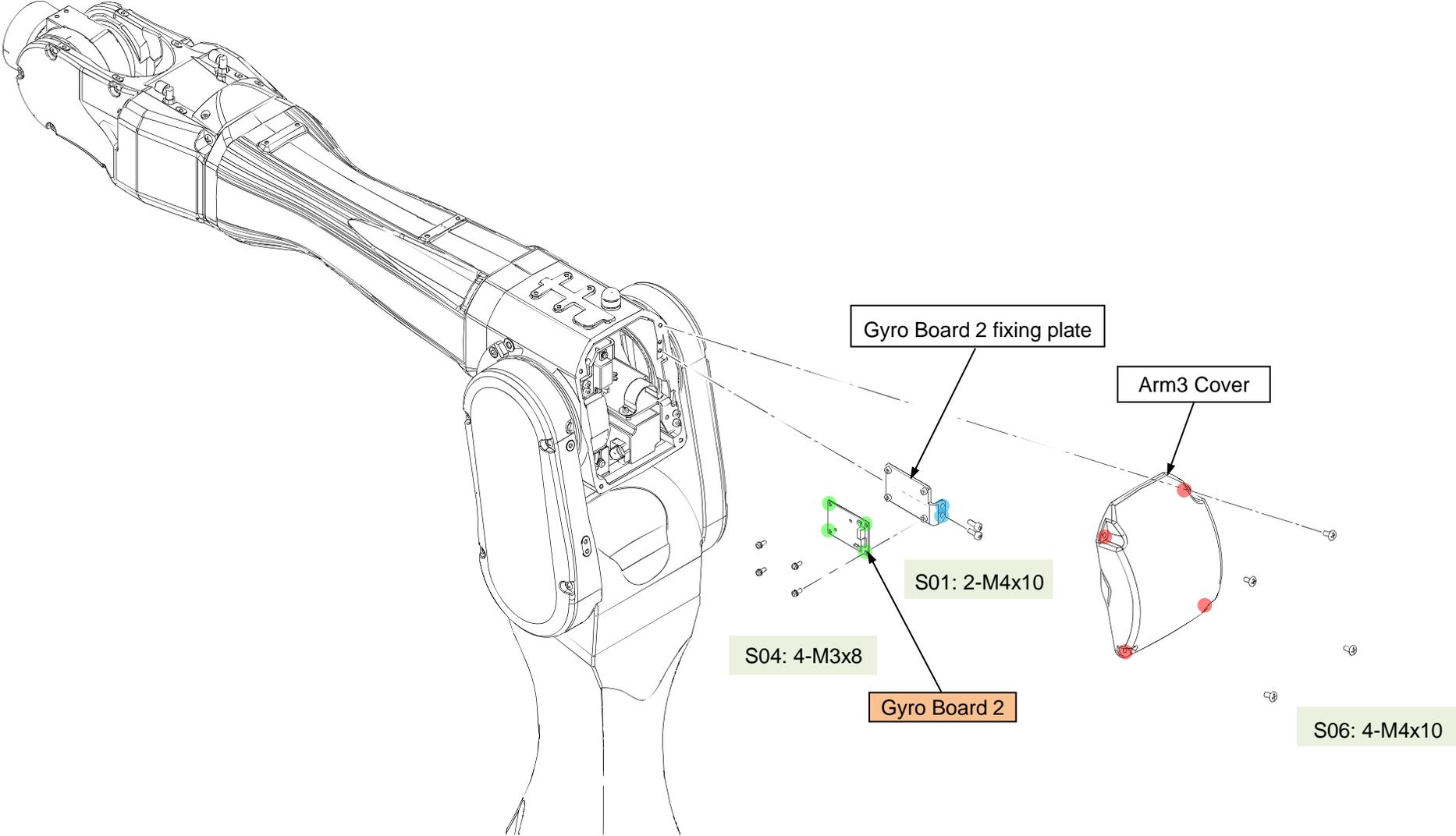
S03: 3-M3x15
with washer
(0.45 +/- 0.1 N·m)



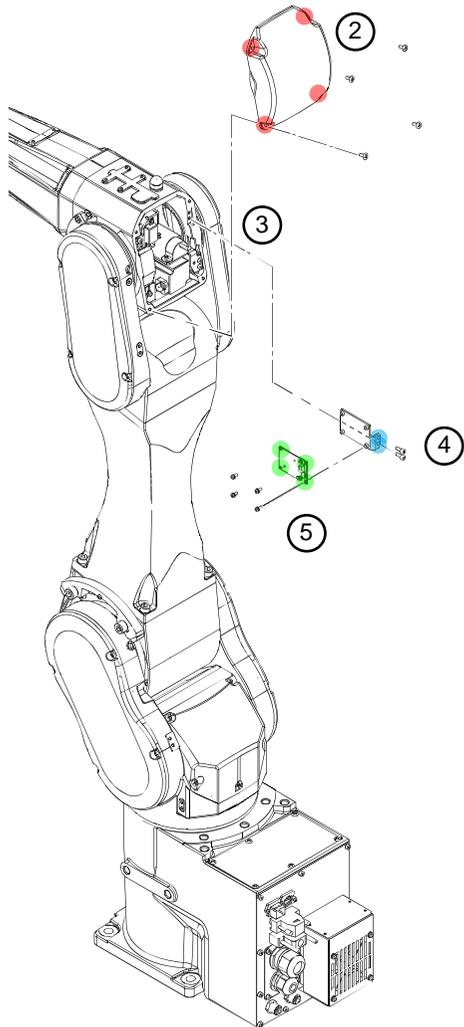
3

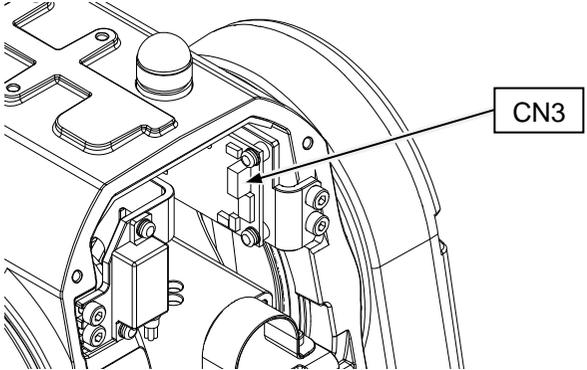
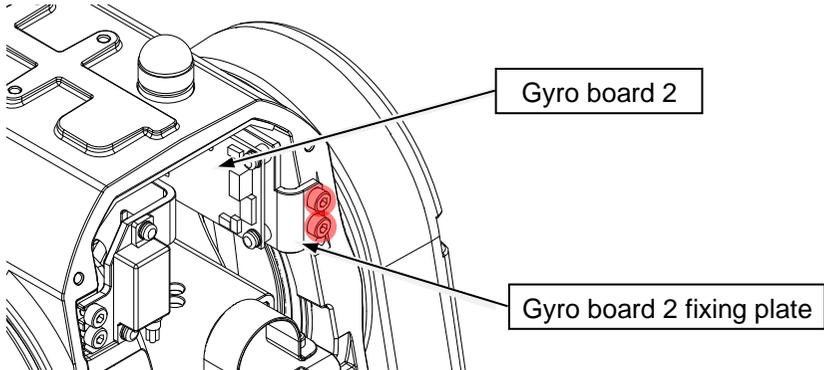
Install the [Arm1 center cover](#).

2.10.2 Replacing Gyro Board 2

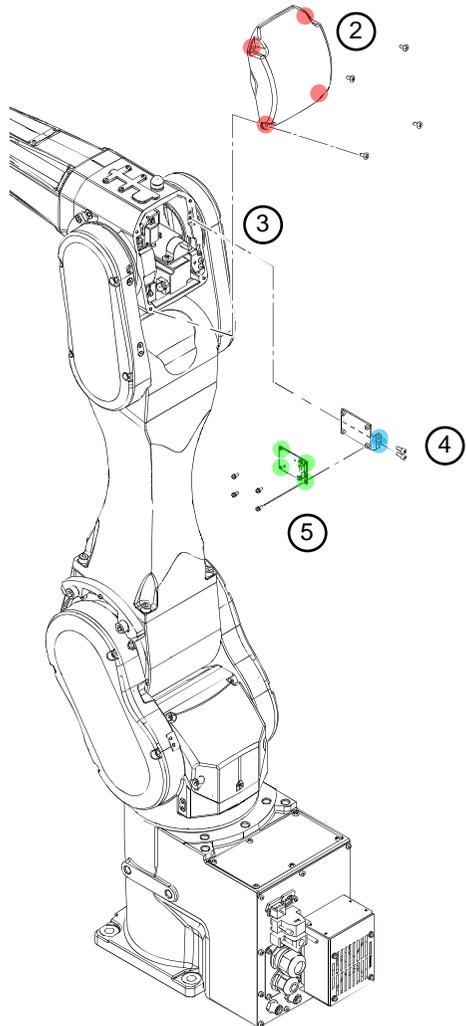


Removing Gyro Board 2



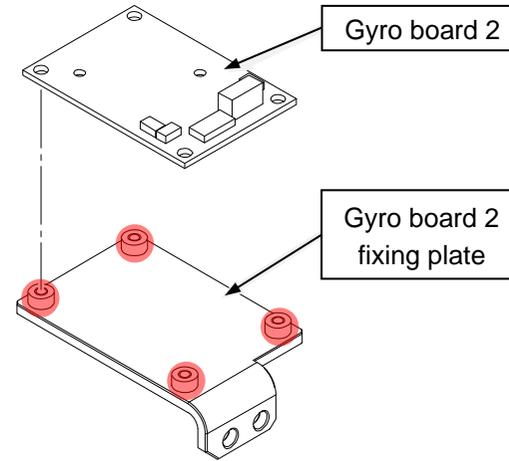
①	Turn OFF the Controller.
②	Remove the Arm3 cover .
③	Disconnect the connector (CN3). 
④	Remove the screws fixing the plate, and pull out gyro board 2 and the plate from Arm3. A S01: 2-M4x10 

Removing Gyro Board 2

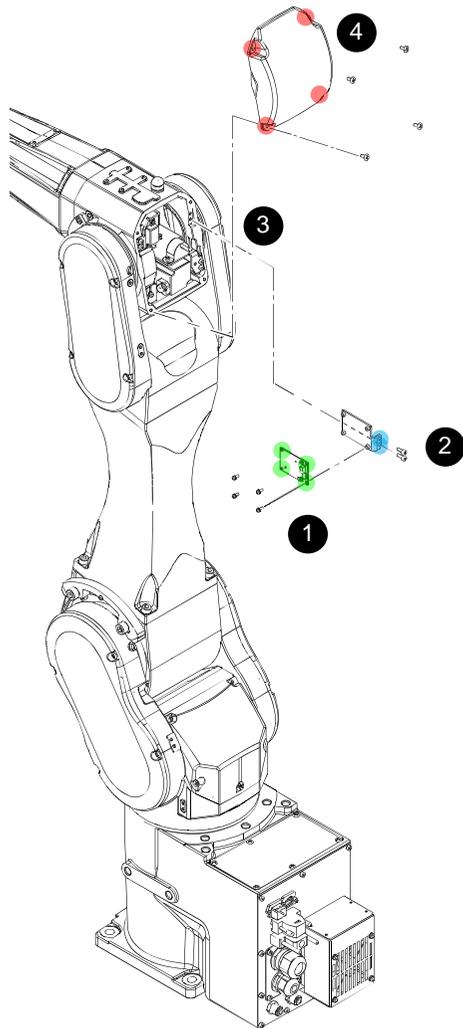


⑤ Remove gyro board 2 from the plate.

A S03: 4-M3x8
with washer

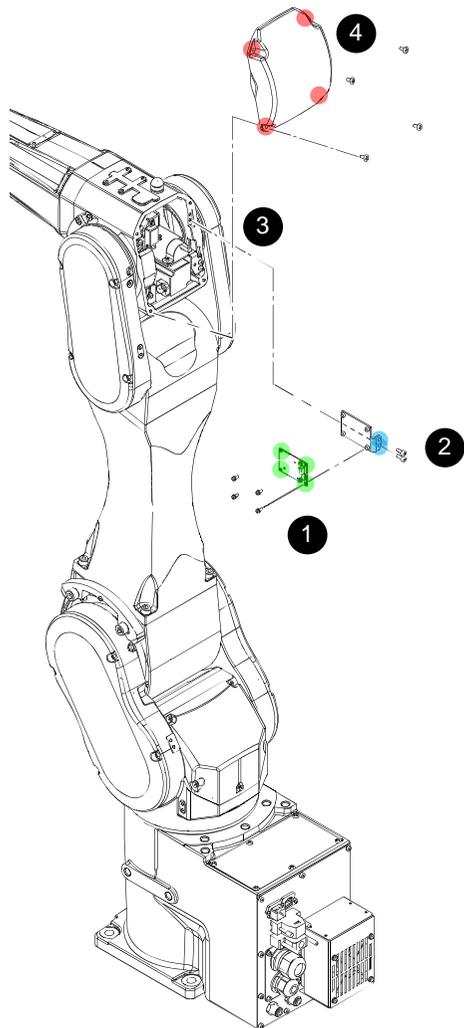


Installing Gyro Board 2



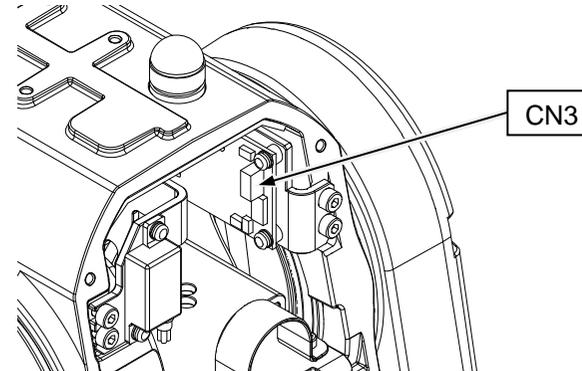
<p>1</p>	<p>Install gyro board 2 on the plate.</p> <p>CAUTION Gyro board 2 installation has an assembly orientation. Be careful with the installation position.</p> <div data-bbox="907 443 1191 560" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>A S03: 4-M3x8 with washer (0.45 +/- 0.1 N·m)</p> </div> <div data-bbox="1294 406 1809 861"> <p>Gyro board 2</p> <p>Gyro board 2 fixing plate</p> </div>
<p>2</p>	<p>Install the plate with gyro board 2 installed on Arm3.</p> <div data-bbox="891 970 1153 1054" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>A S01: 2-M4x10 (4.0 +/- 0.2 N·m)</p> </div> <div data-bbox="1182 957 2004 1332"> <p>Gyro board 2</p> <p>Gyro board 2 fixing plate</p> </div>

Installing Gyro Board 2



3

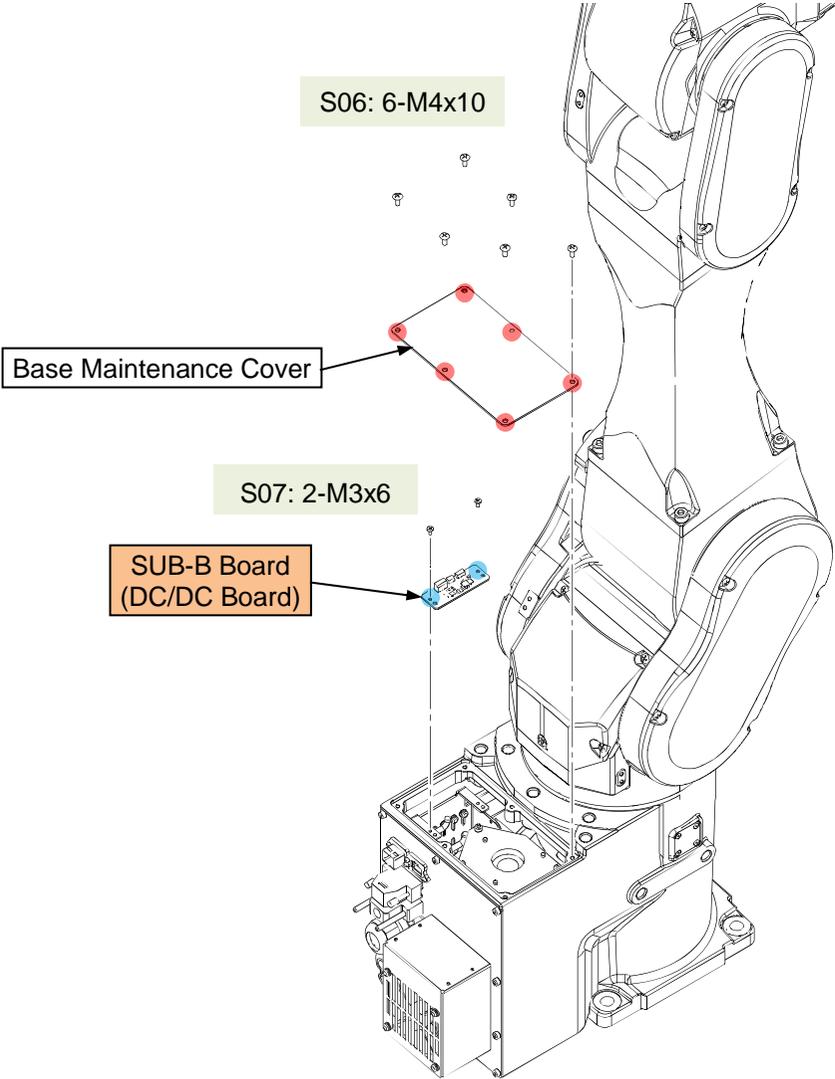
Connect the connector (CN3) to gyro board 2.



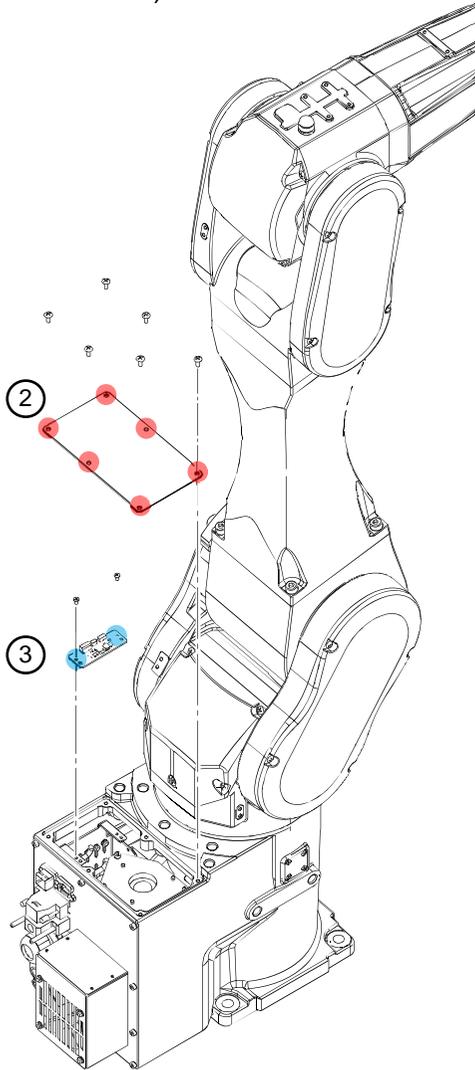
4

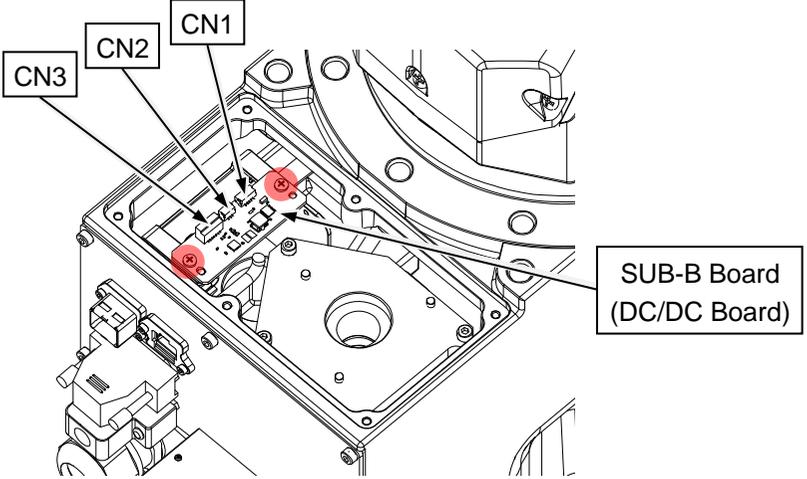
Install the [Arm3 cover](#).

2.10.3 Replacing the SUB-B Board (DC/DC Board)



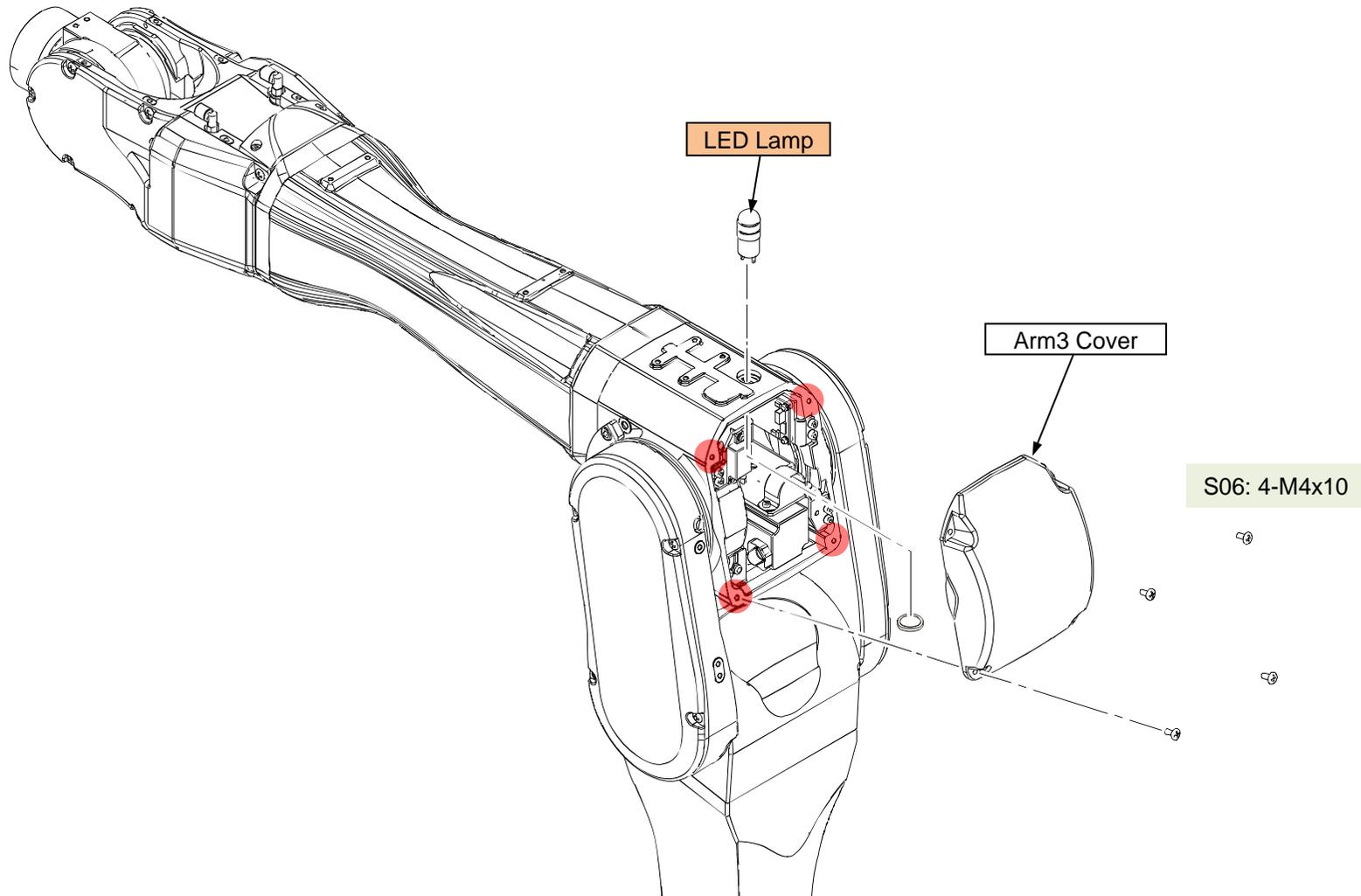
Replacing the SUB-B Board
(DC/DC Board)



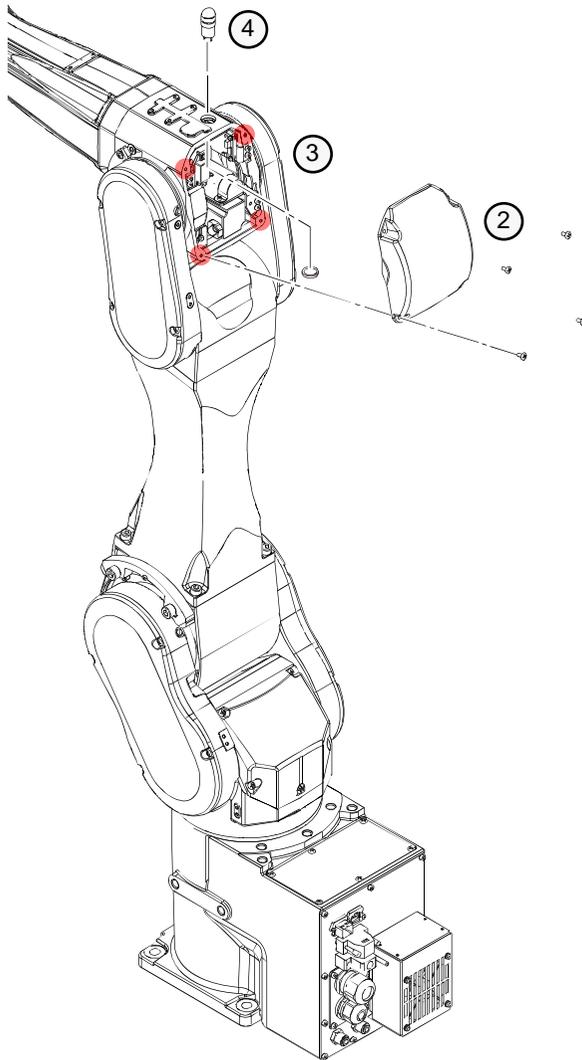
①	Turn OFF the Controller.
②	Remove the Base Maintenance Cover .
③	<p>Disconnect the connectors (CN1, CN2, CN3), and remove the SUB-B Board (DC/DC Board).</p> <p>A S07: 2-M3x6 (0.45 +/- 0.1 N·m)</p>  <p>CAUTION When installing the SUB-B Board (DC/DC Board), align so that the side without connectors is toward the Motor Unit.</p>

2.11 Replacing the LED Lamp

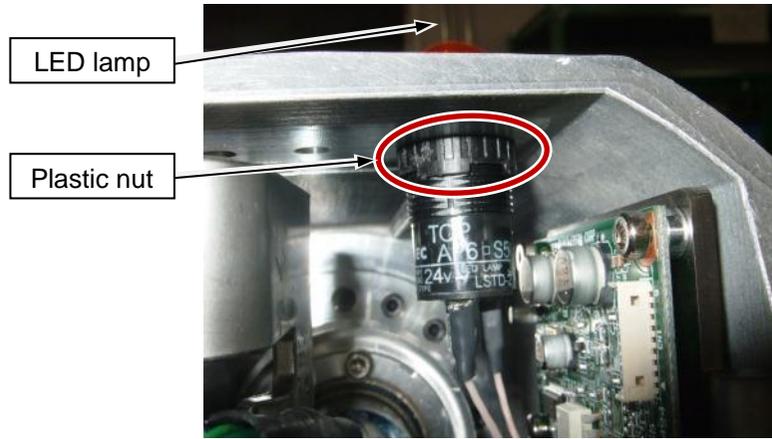
This section provides procedures for replacing the LED Lamp on standard and clean models. If you need to replace the LED Lamp for the protection model, please contact the supplier.



Replacing the LED Lamp

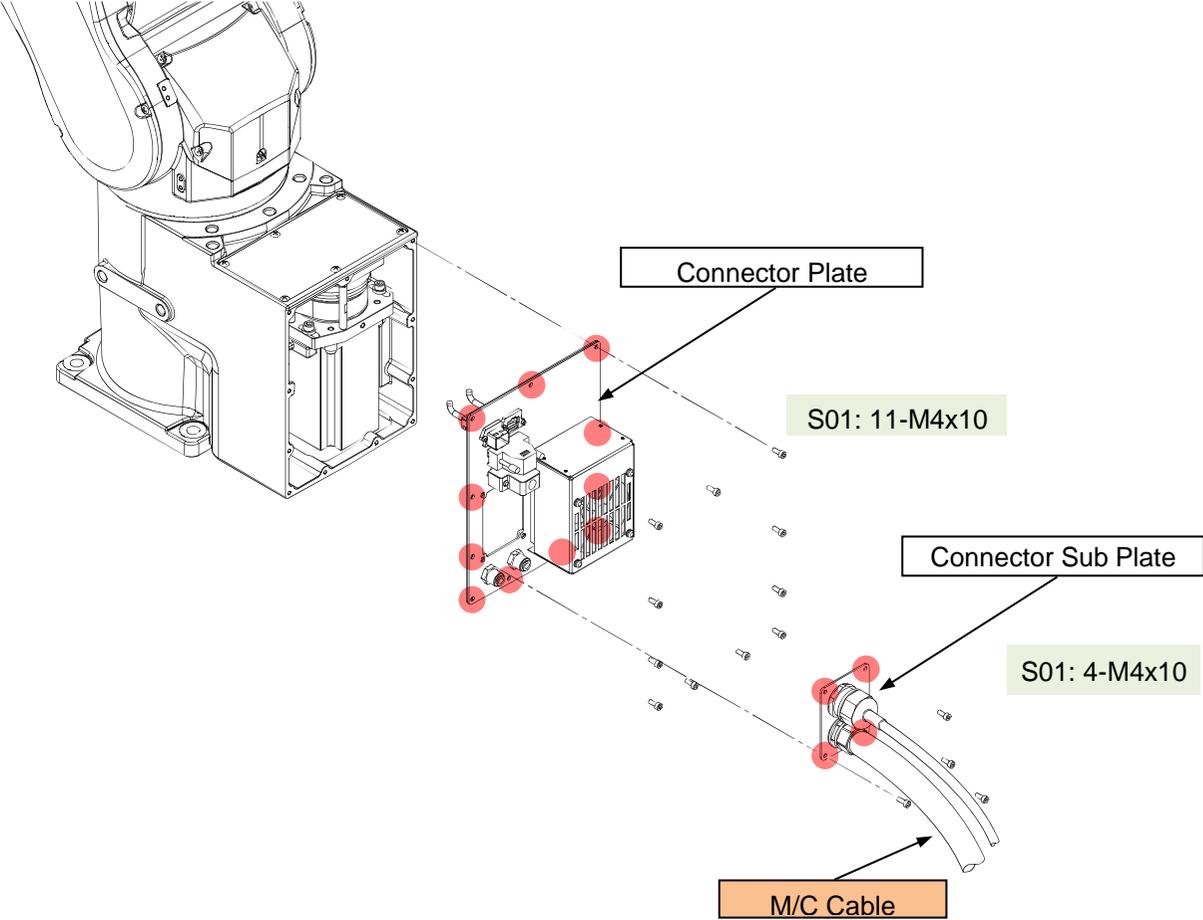


①	Turn OFF the Controller.
②	Remove the Arm3 cover .
③	Disconnect the connector (LED) for the LED lamp. POINT The connector (LED) for the LED lamp is under the Arm3 cover when it is open.
④	Remove the LED lamp. POINT Turn the plastic nut securing the LED lamp in Arm3 counterclockwise.

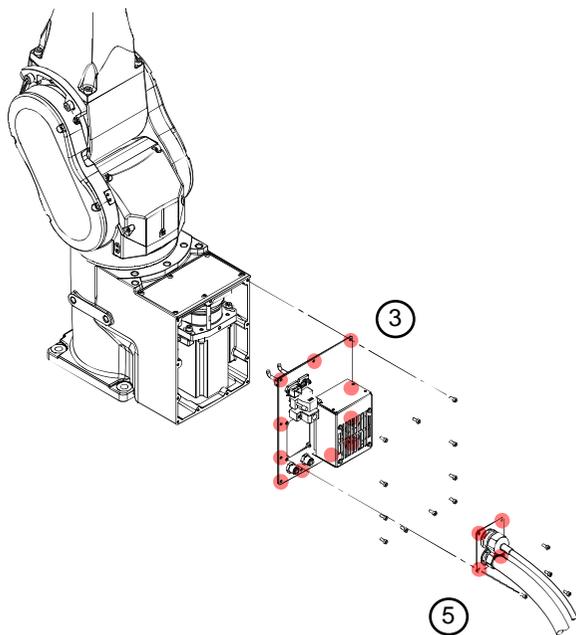


2.12 Replacing the M/C Cable

2.12.1 Removing the M/C Cable

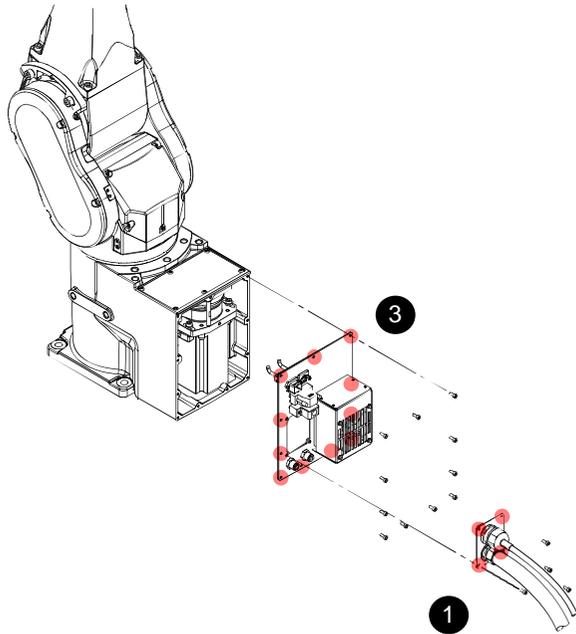


Removing the M/C Cable



①	Turn OFF the Controller power.
②	Disconnect the following connectors from the Controller. Power cable connector, Signal cable connector
③	Remove the Connector plate. M/C Cable Backward: C8L , M/C Cable Backward: C8XL,C12XL , M/C Cable Downward
④	Remove the connectors. For C8-B/C12-B: CN111, CN200, CN201, CN202, CN300, CN301, CN3G0, CN312, CN3L1  For C8-C/C12-C: CN2B2, CN2A1, CN2A2, CN2A3, CN2B1
⑤	Remove the Connector sub plate .

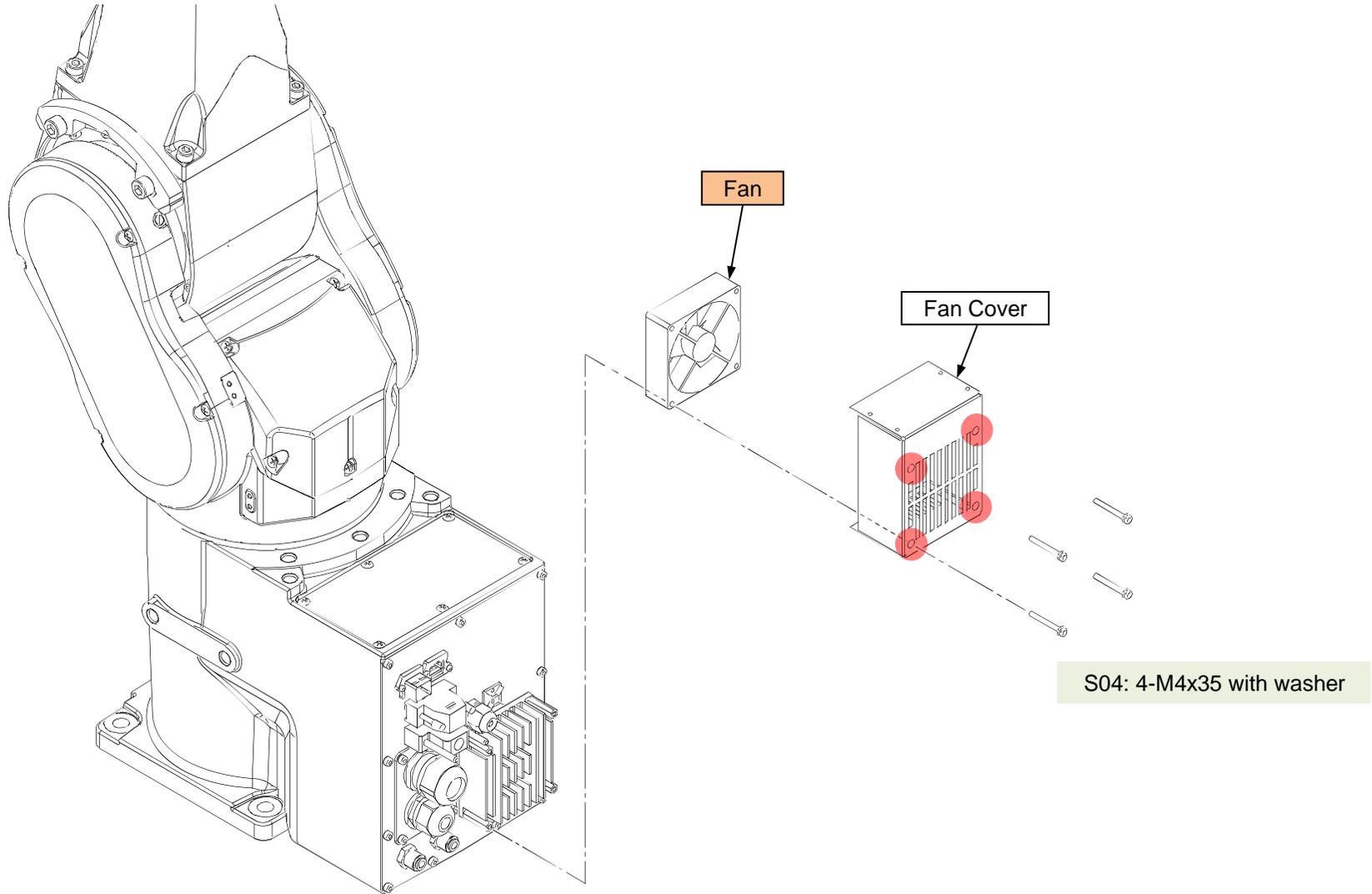
2.12.2 Installing the M/C Cable



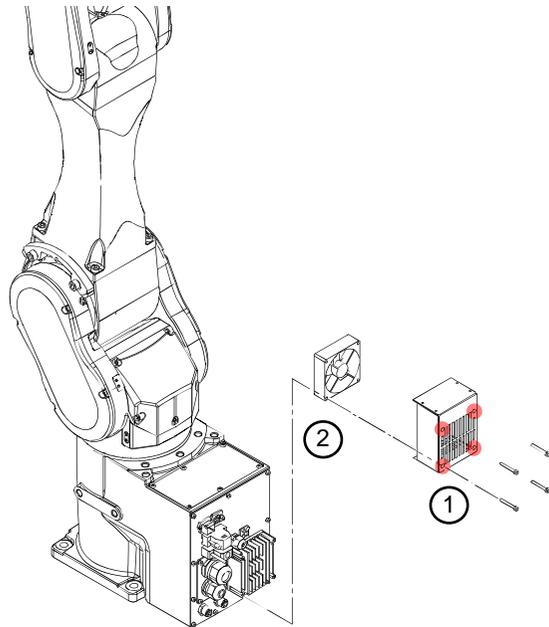
<p>1</p>	<p>Install the Connector sub plate.</p>
<p>2</p>	<p>Connect the connectors of the new M/C cable to these of the cable unit. For C8-B/C12-B: CN111, CN200, CN201, CN202, CN300, CN301, CN3G0, CN312, CN3L1</p>  <p>For C8-C/C12-C: CN2B2, CN2A1, CN2A2, CN2A3, CN2B1</p>
<p>3</p>	<p>Install the Connector plate. M/C Cable Backward: C8L, M/C Cable Backward: C8XL,C12XL, M/C Cable Downward</p>
<p>4</p>	<p>Connect the following connectors to the Controller. Power cable connector, Signal cable connector</p>
<p>5</p>	<p>Turn ON the Controller power.</p>

2.13 Replacing the Fan (C8XL/C12XL only)

2.13.1 Removing the Fan



Removing the Fan



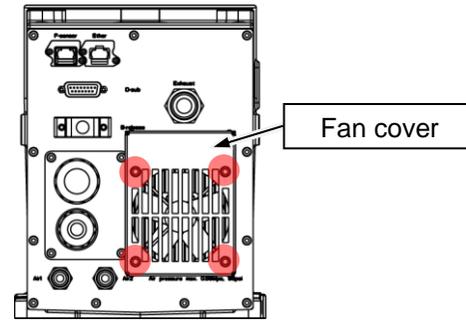
①

Remove the fan cover.

POINT

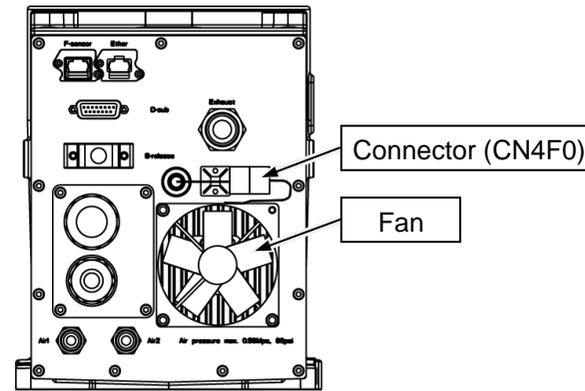
Removing the screws will cause the fan cover to drop, so remove the screws while supporting the fan cover.

A S04: 4-M4x35 with washer

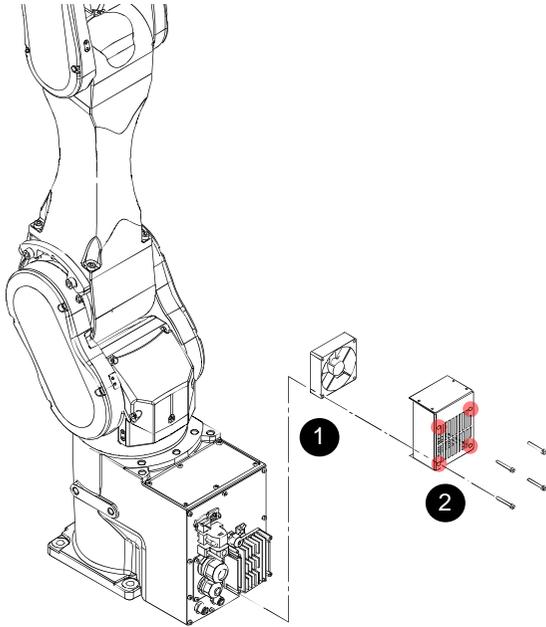


②

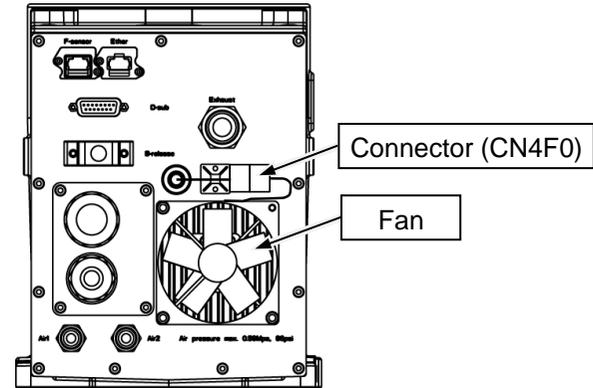
Disconnect the connector (CN4F0), and remove the fan.



2.13.2 Installing the Fan

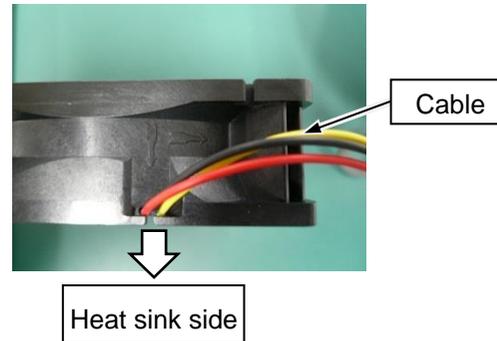


1 Install the fan, and connect the connector (CN4F0).

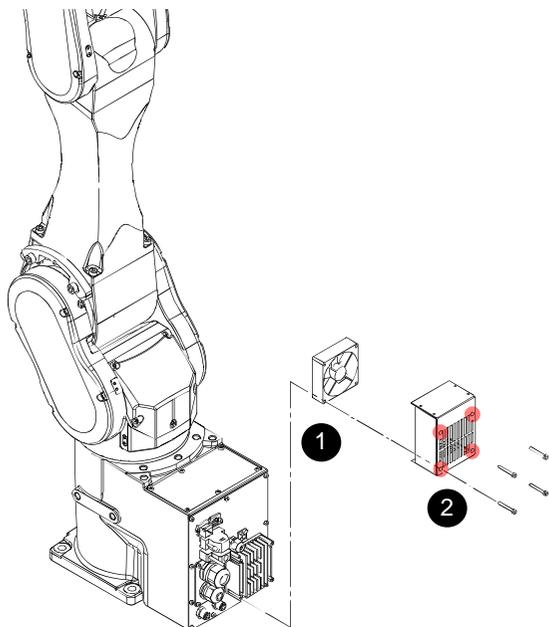


POINT

Ensure that the fan cables are at the top, and install so that the cables are toward the heat sink.



Installing the Fan

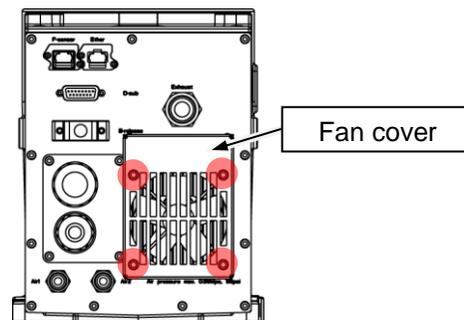


2 Install the fan cover.

POINT

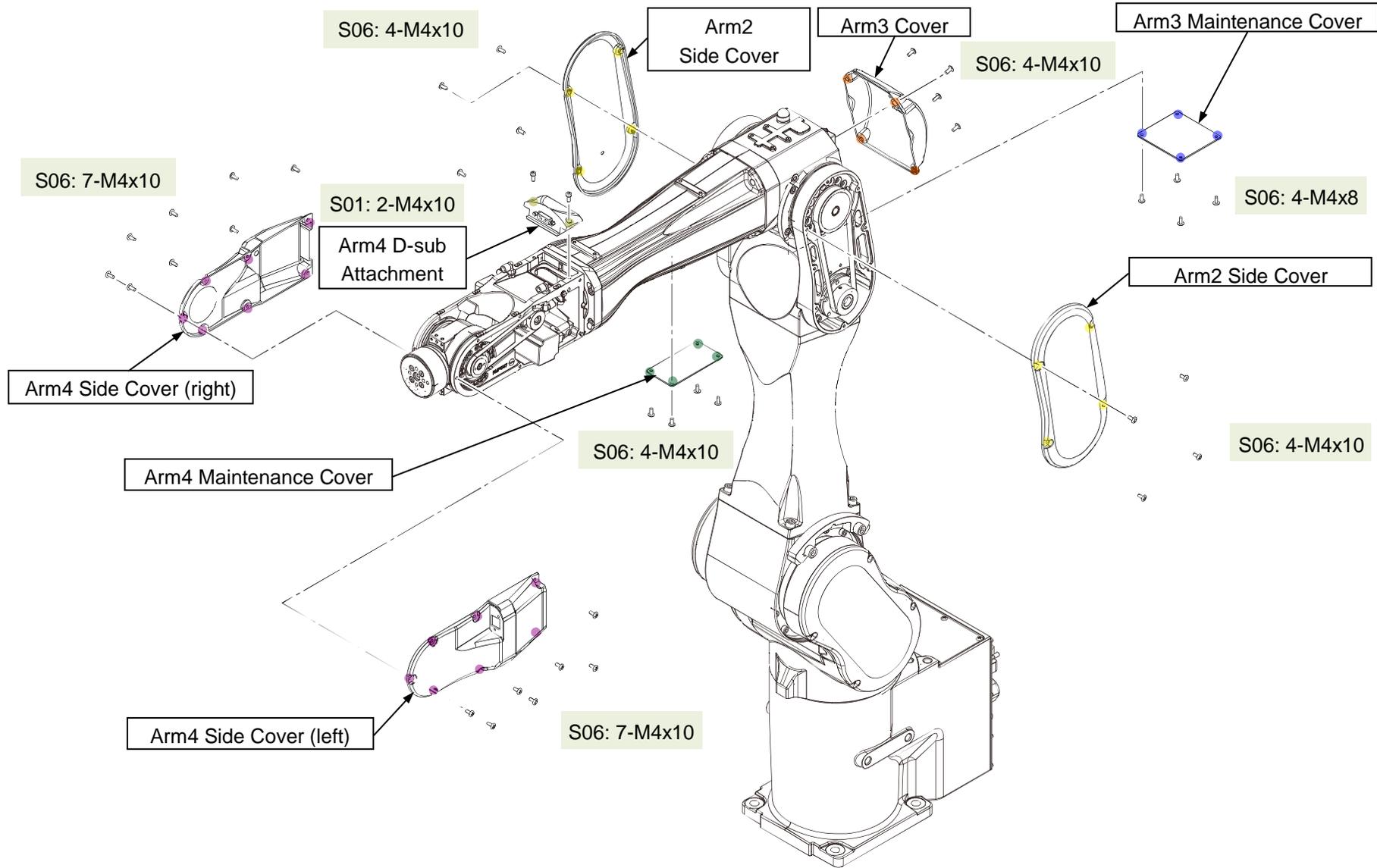
Fix the screws while supporting the fan cover.

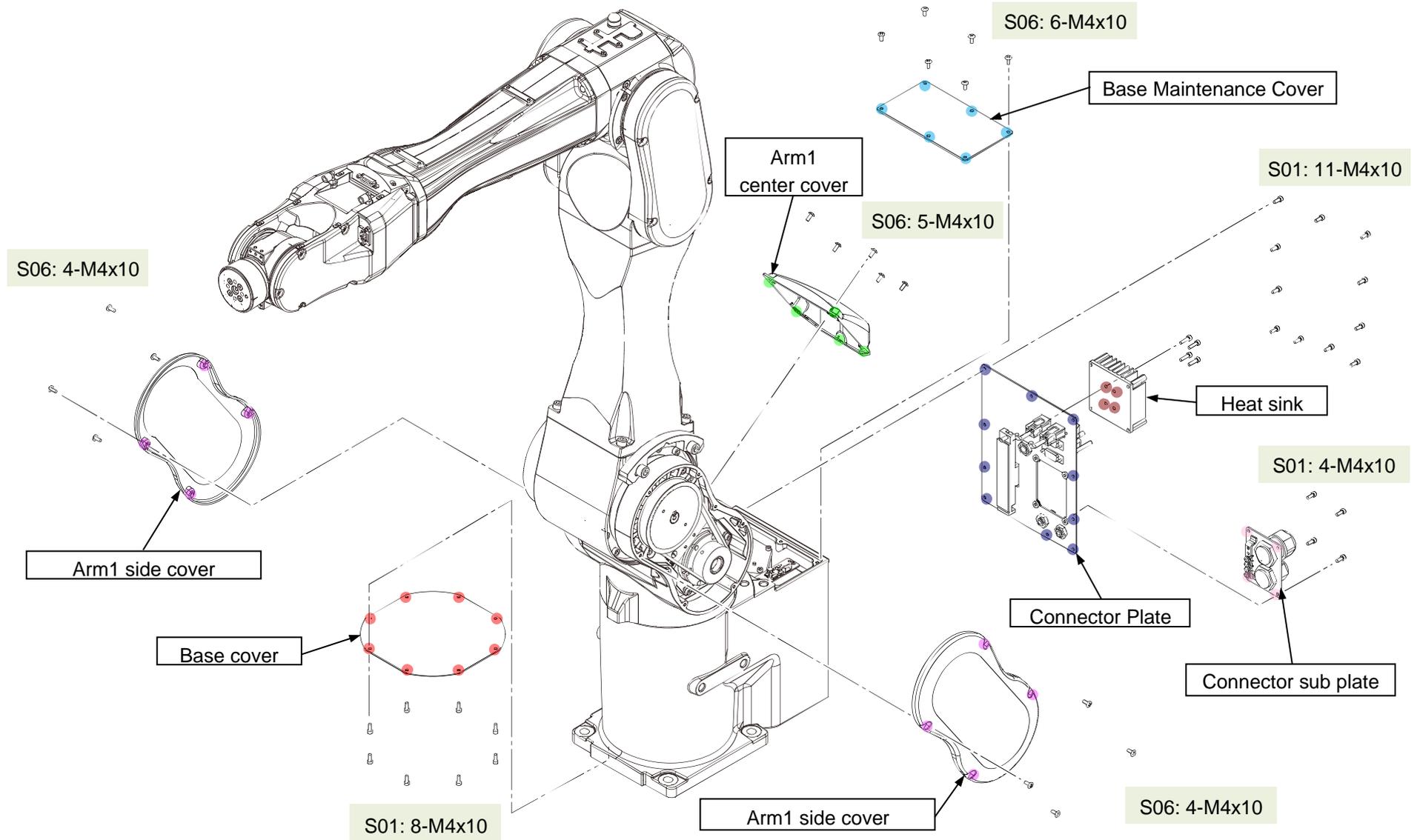
- A S04: 4-M4x35 with washer
(0.9 +/- 0.1 N·m)



2.14 Cover

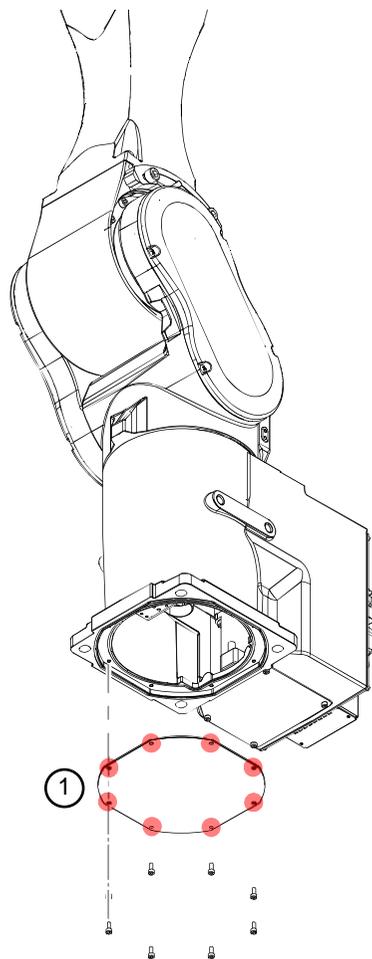
Here, this explains the names of the covers using the typical "M/C Cable Backward Model (Standard Model/Cleanroom Model)".

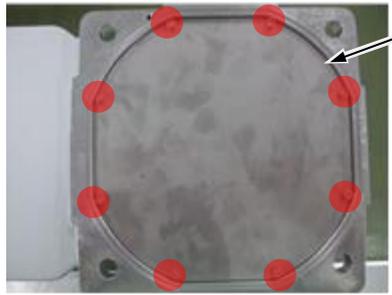




2.14.1 Base Cover (M/C Cable Backward)

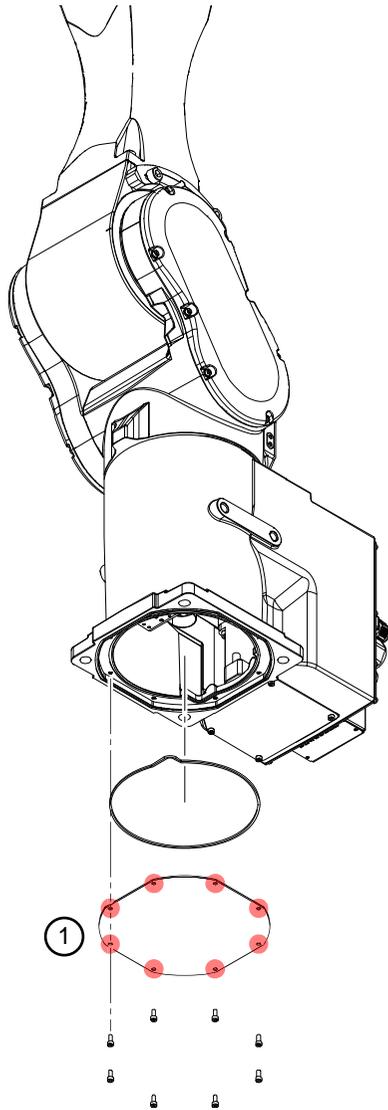
Standard Model/Cleanroom Model

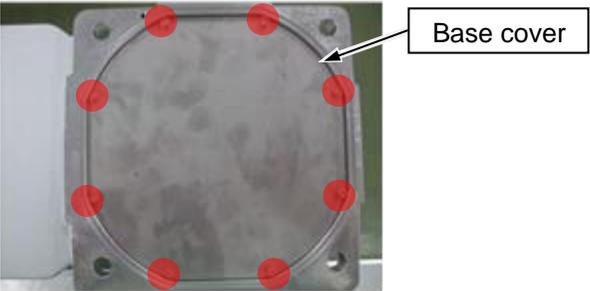


①	Remove the base cover.	<p data-bbox="896 319 1164 367">A S01: 8-M4x10</p>  <p data-bbox="1657 327 1836 375">Base cover</p>
---	------------------------	--

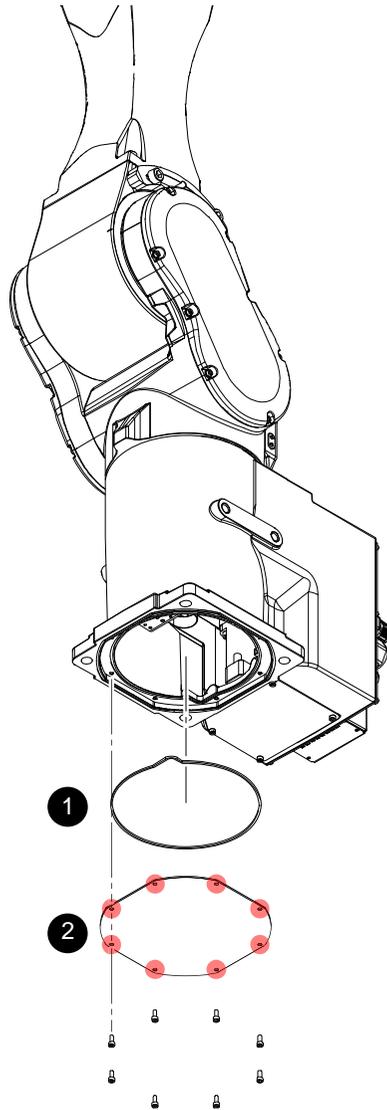
Protection Model

A. Removal



<p>① Remove the base cover.</p> <p>POINT</p> <p>When removing the base cover, also remove the base bottom gasket.</p> <p>A S01: 8-M4x10</p>	
---	---

B. Installation

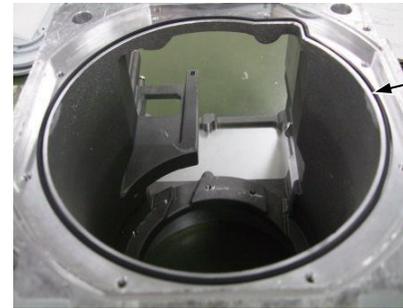


1

Install the base bottom gasket in the groove on the base bottom.

POINT

If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.



Base bottom gasket

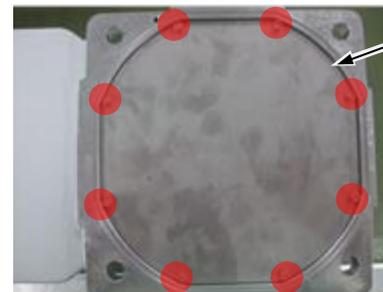
2

Install the base cover.

CAUTION

- If bolts other than the hexagon socket head cap screws are used, the bolt heads may protrude from the end face of the base and the cover may not be fixed stably.
- When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.

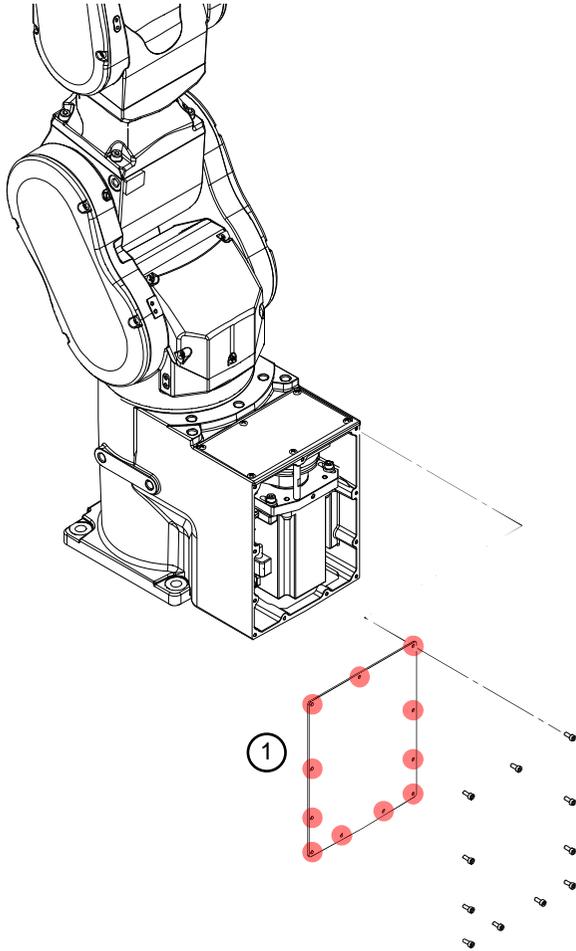
A S01: 8-M4x10
(4.0 +/- 0.2 N·m)



Base cover

2.14.2 Base Cover (M/C Cable Downward) (C8L)

Standard Model/Cleanroom Model



① Remove the base cover.

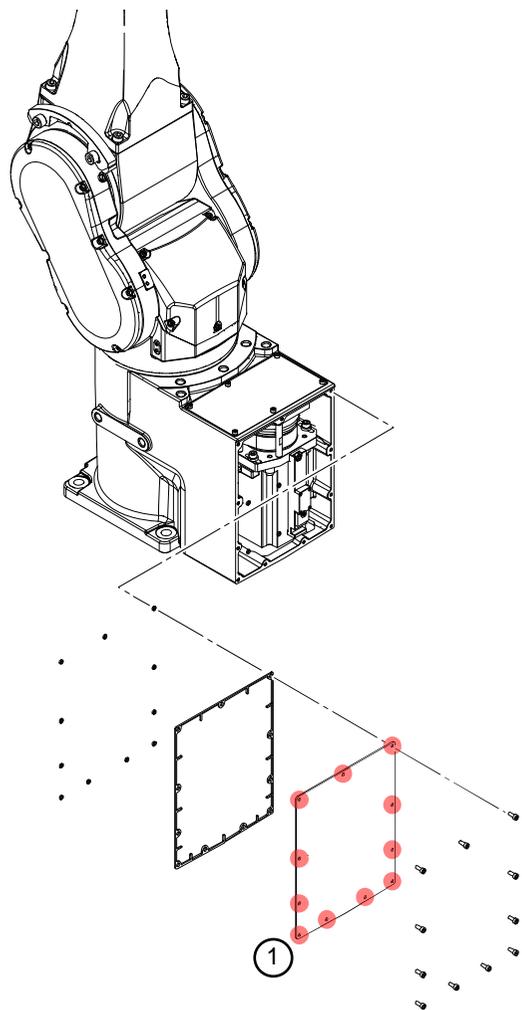
A S01: 11-M4x10

Base cover

This block contains a step-by-step instruction and a visual reference. The instruction '① Remove the base cover.' is followed by a callout 'A S01: 11-M4x10' in a green box, indicating the type and quantity of screws. To the right is a photograph of the base cover, a dark rectangular plate, with 11 red circles marking the screw locations. An arrow points from the text 'Base cover' to the photograph.

Protection Model

A. Removal

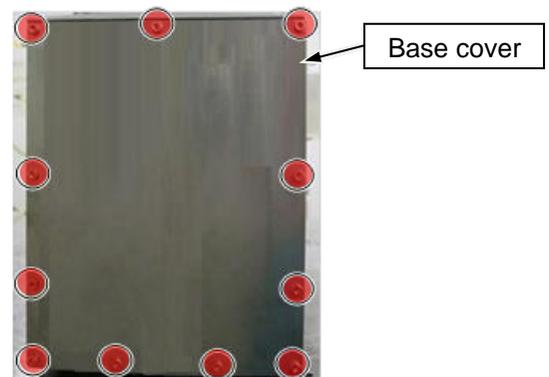


① Remove the base cover.

POINT

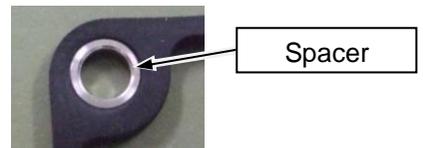
When removing the base cover, also remove the base rear gasket.

A S01: 11-M4x10

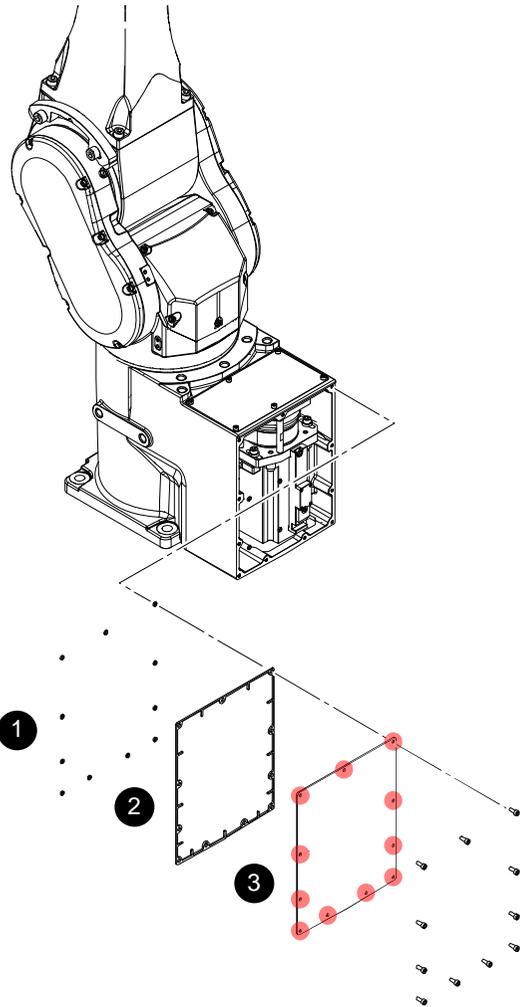


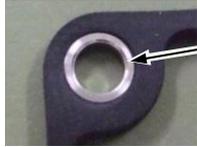
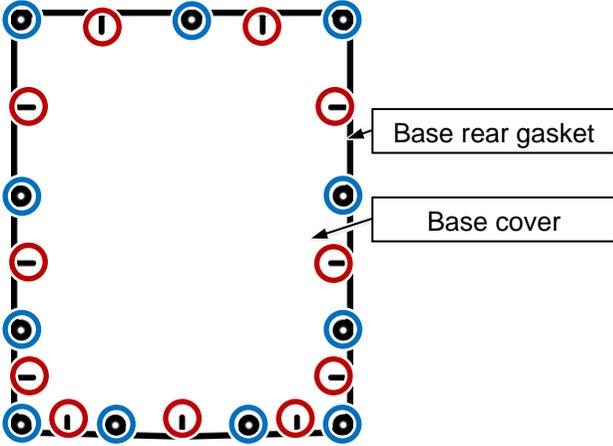
CAUTION

The Rubber Gasket has spacers. Be careful not to lose these spacers.

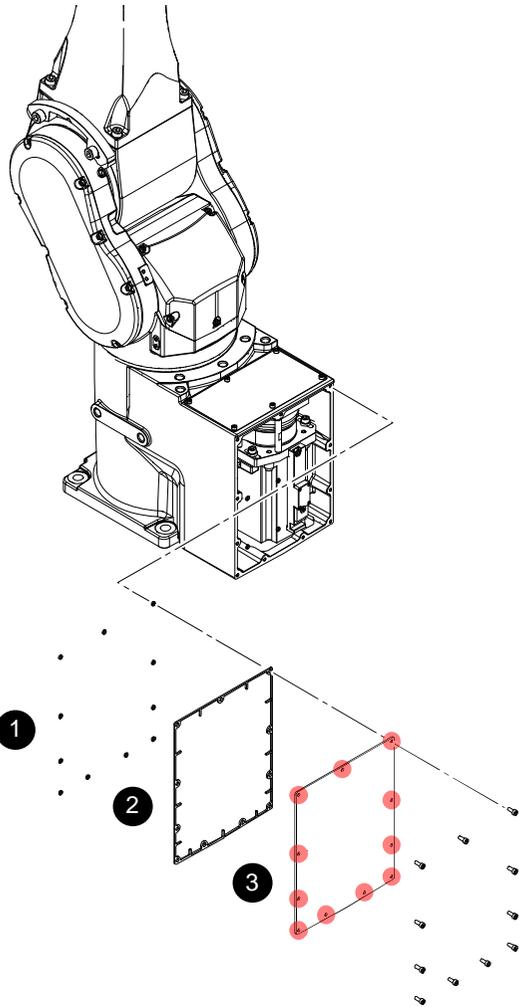


B. Installation



1	<p>Install the spacers on the holes in the Rubber Gasket. (11 places)</p> <div style="text-align: right;">  <div style="border: 1px solid black; padding: 2px; margin-left: 10px;">Spacer</div> </div>
2	<p>Apply the adhesive ThreeBond 7738 to the base rear gasket, and secure the base rear gasket to the base cover.</p> <p>POINT</p> <ul style="list-style-type: none"> • After installing the adhesive-applied gasket, leave it for about one minute until the adhesive hardens and the gasket is firmly fixed. • If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket. <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="margin-right: 10px;"> <div style="border: 1px solid red; border-radius: 50%; width: 15px; height: 15px; display: flex; align-items: center; justify-content: center; margin-bottom: 5px;"> </div> <div style="border: 1px solid blue; border-radius: 50%; width: 15px; height: 15px; display: flex; align-items: center; justify-content: center;"> </div> </div> <div style="margin-right: 10px;"> <div style="background-color: #e0f0e0; padding: 2px; border: 1px solid #ccc; margin-bottom: 5px;">Adhesive application point</div> <div style="background-color: #e0f0e0; padding: 2px; border: 1px solid #ccc;">Spacer</div> </div> <div style="flex-grow: 1;">  </div> </div>

Installation



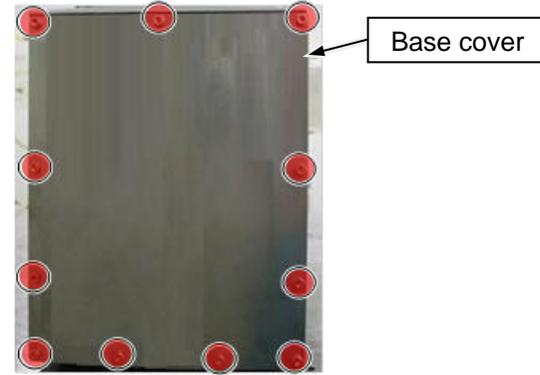
3

Install the base cover.

CAUTION

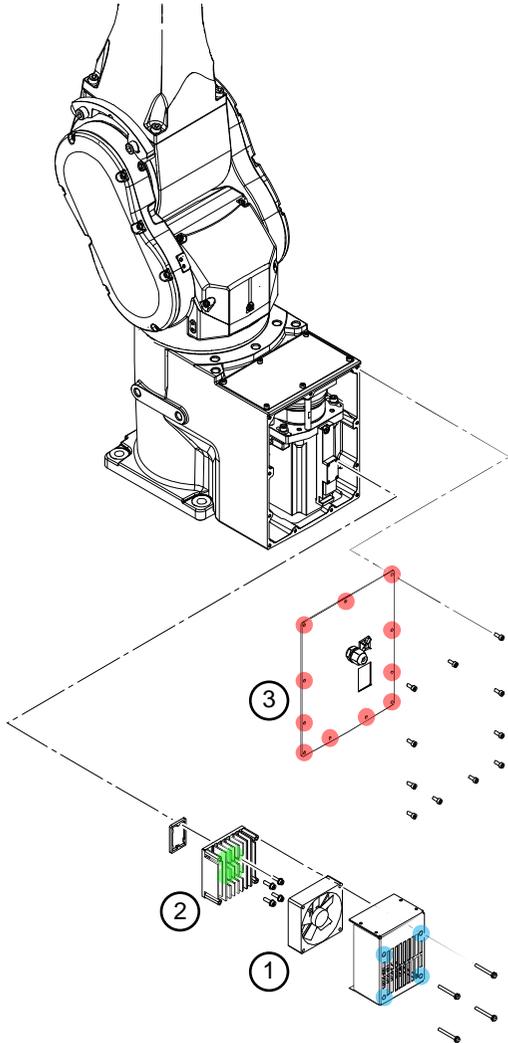
When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.

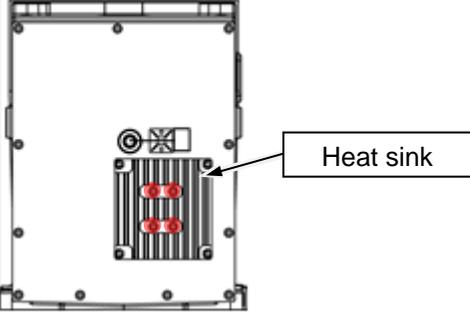
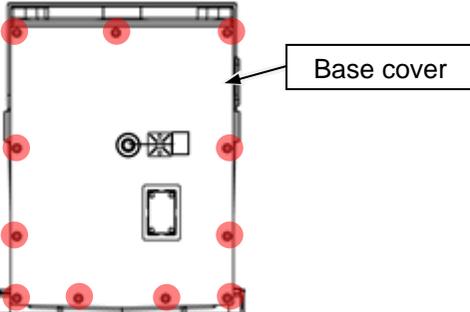
A S01: 11-M4x10
(4.0 +/- 0.2 N · m)



2.14.3 Base Cover (M/C Cable Downward) (C8XL, C12XL)

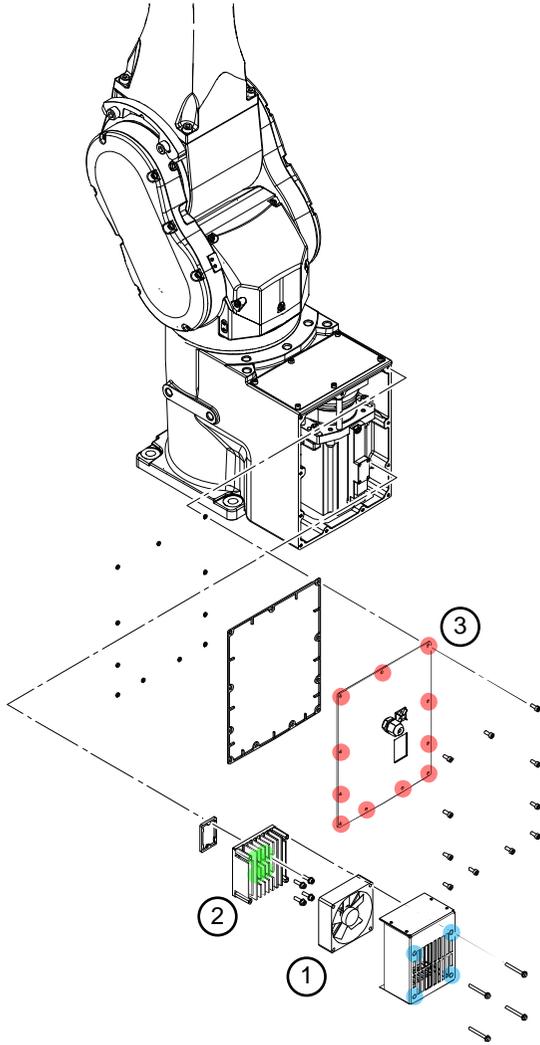
Standard Model/Cleanroom Model

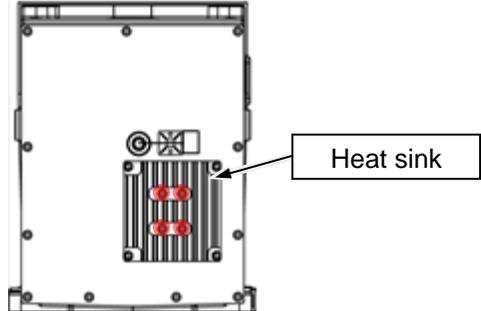
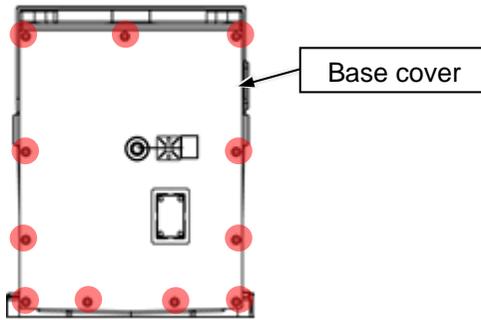
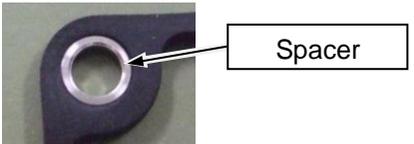


①	Remove the fan .
②	Remove the heat sink and a Rubber Gasket. <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>A S01: 4-M4x15</p> </div>  </div>
③	Remove the base cover. POINT For the cleanroom model, install a Rubber Gasket between the heat sink and the base cover. <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>A S01: 11-M4x10</p> </div>  </div>

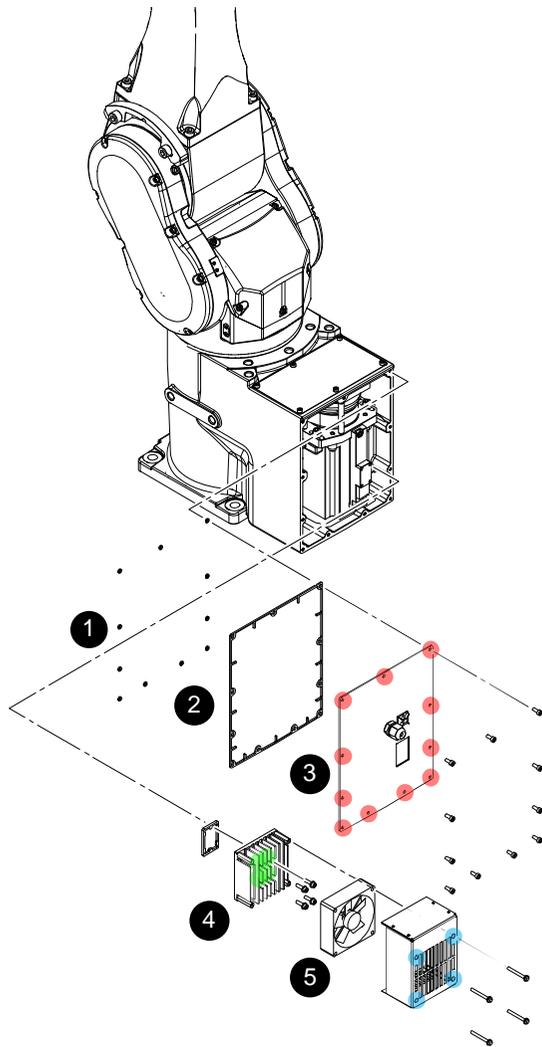
Protection Model

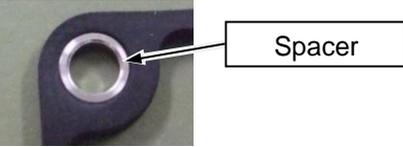
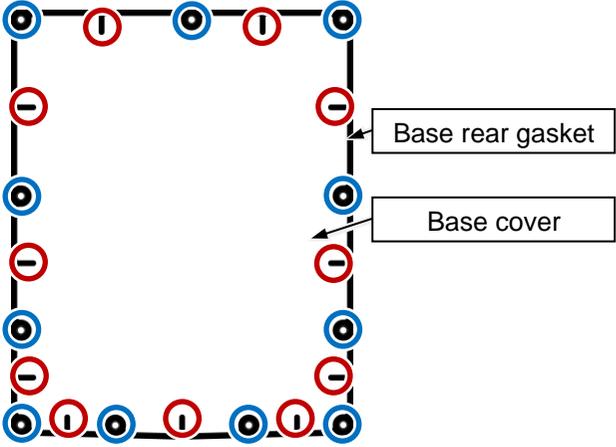
A. Removal



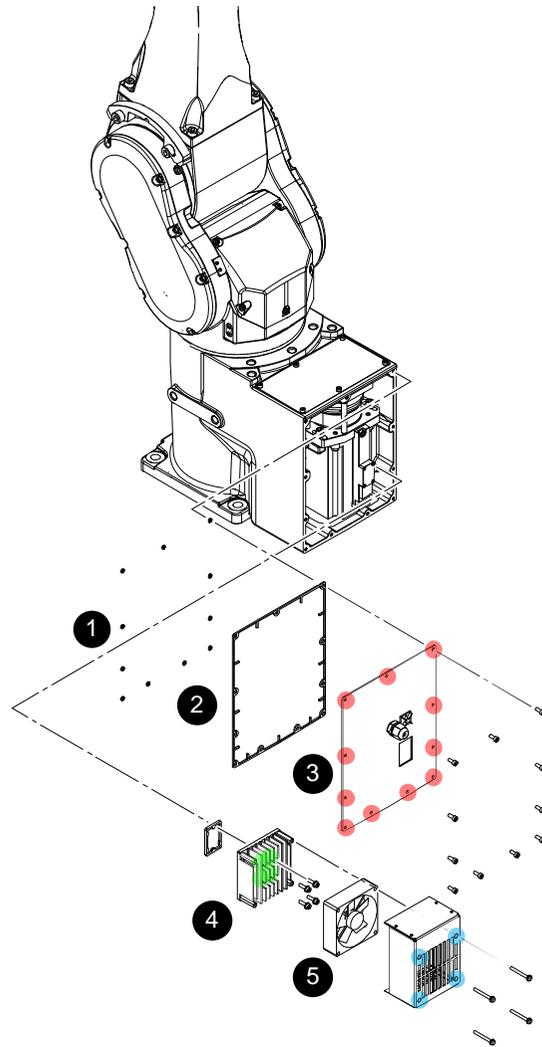
①	Remove the fan .
②	Remove the heat sink. A S01: 4-M4x15 
③	Remove the base cover. POINT When removing the base cover, also remove the base rear gasket. A S01: 11-M4x10  CAUTION The Rubber Gasket has spacers. Be careful not to lose these spacers. 

B. Installation



1	<p>Install the spacers on the holes in the Rubber Gasket. (11 places)</p> <div style="text-align: right; margin-top: 10px;">  </div>
2	<p>Apply the adhesive ThreeBond 7738 to the base rear gasket, and secure the base rear gasket to the base cover.</p> <p>POINT</p> <ul style="list-style-type: none"> • After installing the adhesive-applied gasket, leave it for about one minute until the adhesive hardens and the gasket is firmly fixed. • If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket. <div style="margin-top: 10px;"> <p>○ Adhesive application point</p> <p>○ Spacer</p> </div> <div style="text-align: right; margin-top: 10px;">  </div>

Installation



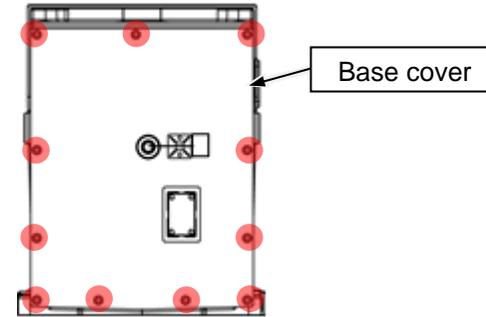
3

Install the base cover on the Manipulator.

CAUTION

When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.

A S01: 11-M4x10
(4.0 +/- 0.2 N·m)



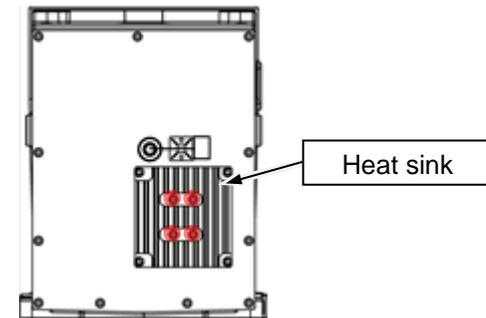
4

Install the heat sink.

POINT

Install a Rubber Gasket between the heat sink and the base cover.

A S01: 4-M4x15
(4.0 +/- 0.2 N·m)

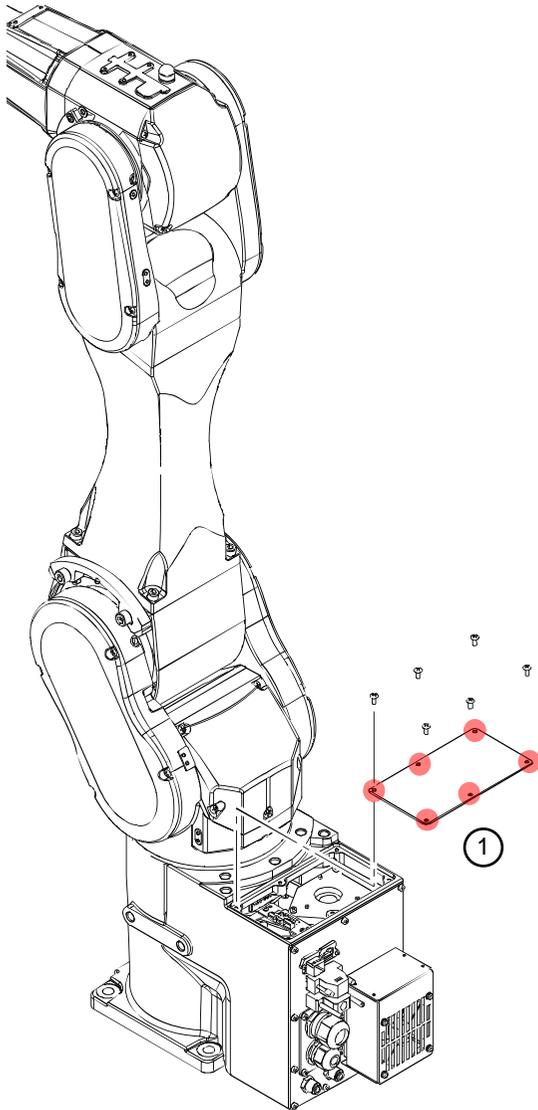


5

Install the [fan](#).

2.14.4 Base Maintenance Cover

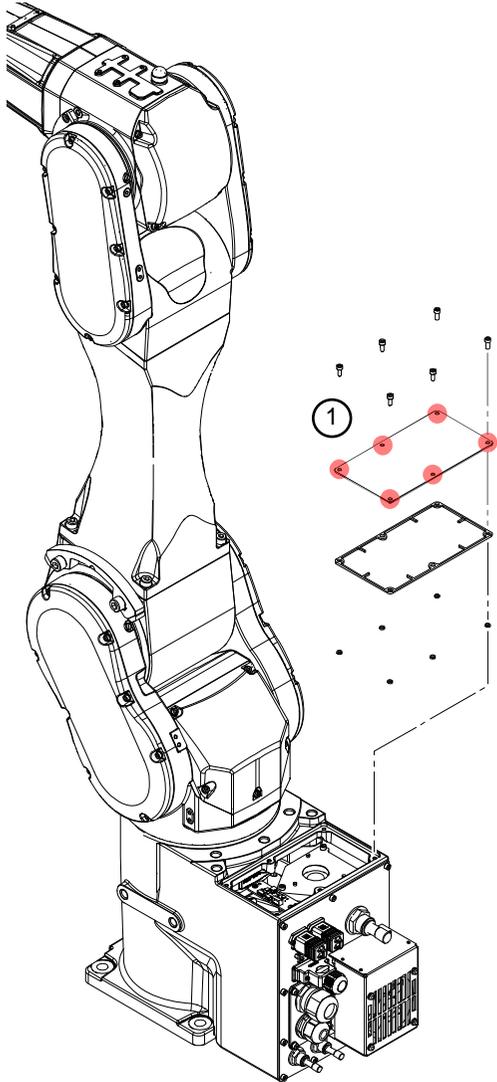
Standard Model/Cleanroom Model



①	<p>Remove the Base Maintenance Cover.</p> <p>A S06: 6-M4x10</p>  <p>Base Maintenance Cover</p>
---	--

Protection Model

A. Removal



① Remove the Base Maintenance Cover.

POINT

When removing the Base Maintenance Cover, also remove the base maintenance gasket.

A S01: 6-M4x10



Base Maintenance Cover

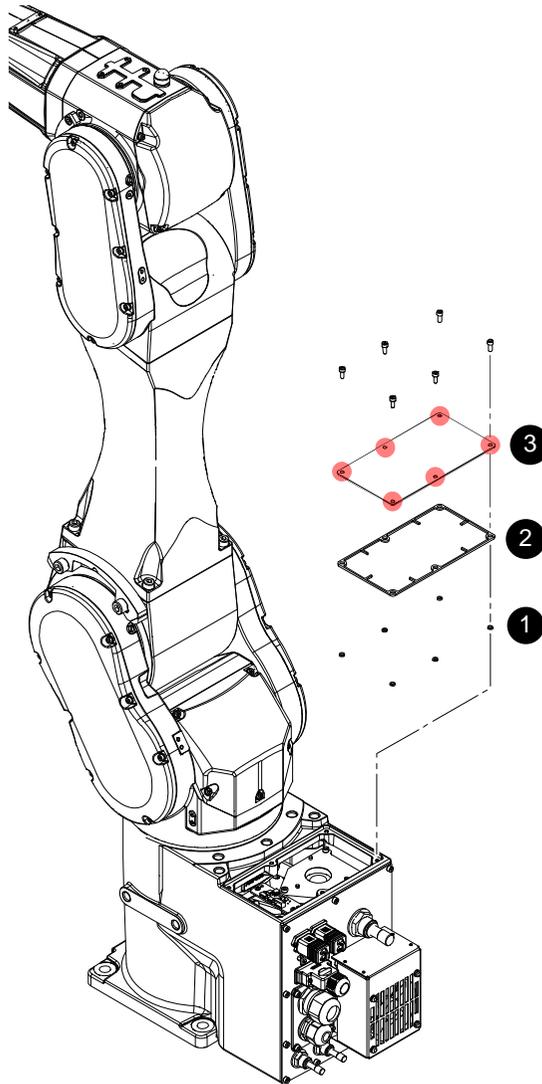
CAUTION

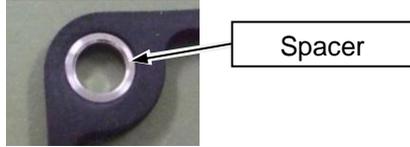
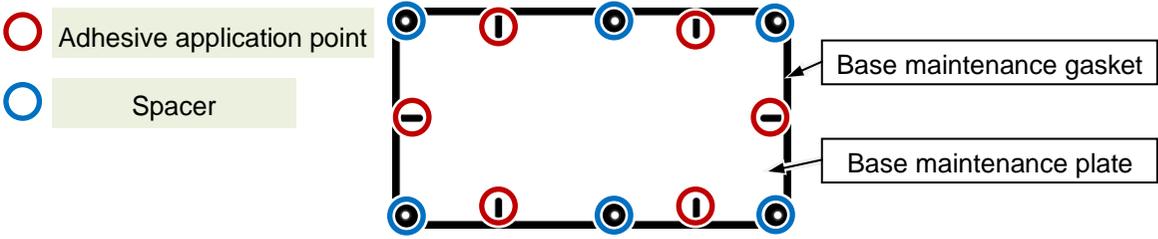
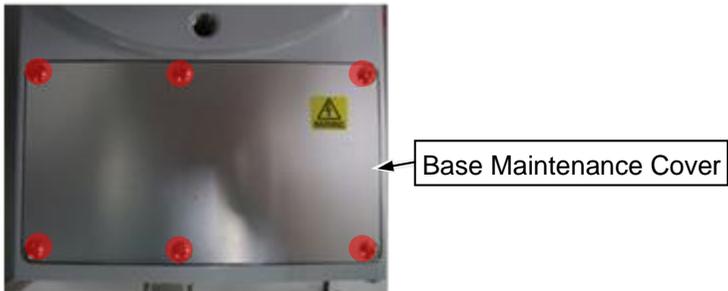
The Rubber Gasket has spacers. Be careful not to lose these spacers.



Spacer

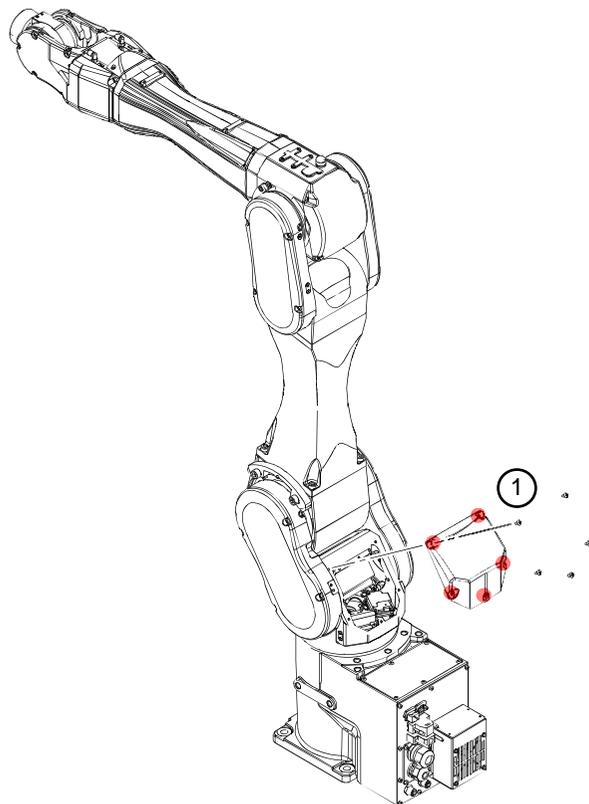
B. Installation

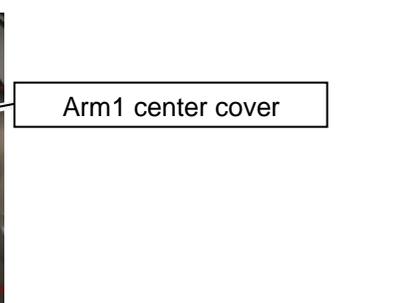


<p>1</p>	<p>Install the spacers on the holes in the Rubber Gasket. (6 places)</p>  <p>Spacer</p>
<p>2</p>	<p>Apply the adhesive ThreeBond 7738 to the base maintenance gasket, and secure the base rear gasket to the base cover.</p> <p>POINT</p> <ul style="list-style-type: none"> • After installing the adhesive-applied gasket, leave it for about one minute until the adhesive hardens and the gasket is firmly fixed. • If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket. <p>○ Adhesive application point</p> <p>○ Spacer</p>  <p>Base maintenance gasket</p> <p>Base maintenance plate</p>
<p>3</p>	<p>Install the Base Maintenance Cover.</p> <p>CAUTION</p> <p>When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.</p> <p>A S01: 6-M4x10 (4.0 +/- 0.2 N·m)</p>  <p>Base Maintenance Cover</p>

2.14.5 Arm1 Center Cover

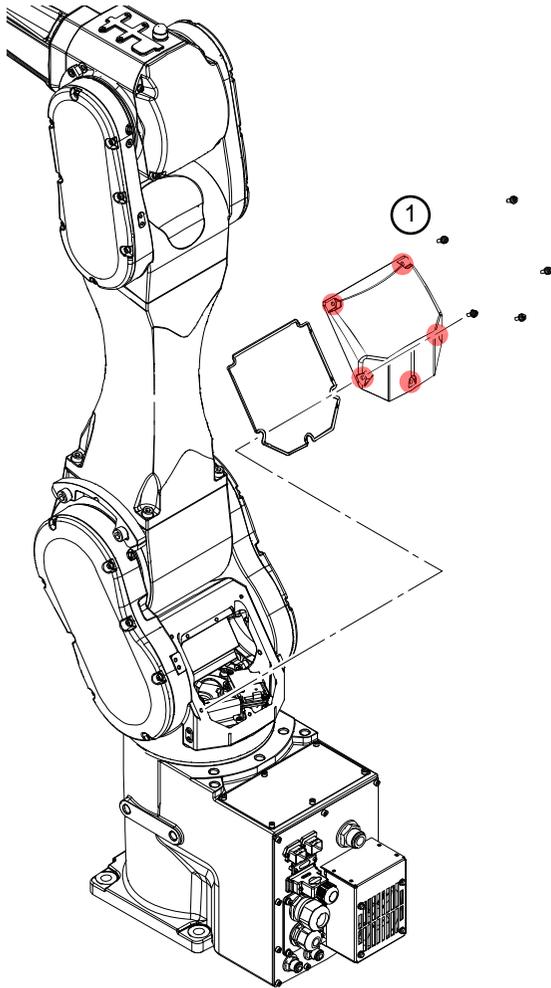
Standard Model/Cleanroom Model



①	Remove the Arm1 center cover.
A	S06: 5-M4x10
	

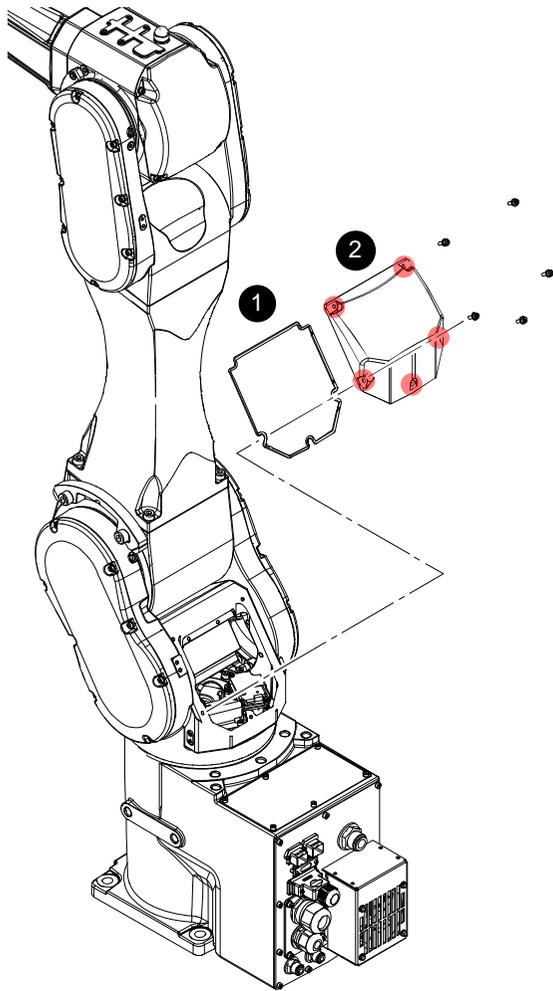
Protection Model

A. Removal



①	<p>Remove the Arm1 center cover.</p> <p>POINT</p> <p>When removing the Arm1 center cover, also remove the Arm1 center gasket.</p> <p>A</p> <p>S01: 5-M4x12 with washer</p>  <p>Arm1 center cover</p>
---	---

B. Installation



1 Install the Arm1 center gasket in the groove on the Arm1 center cover.

POINT
If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.

Arm1 center cover

→

Arm1 center gasket

→

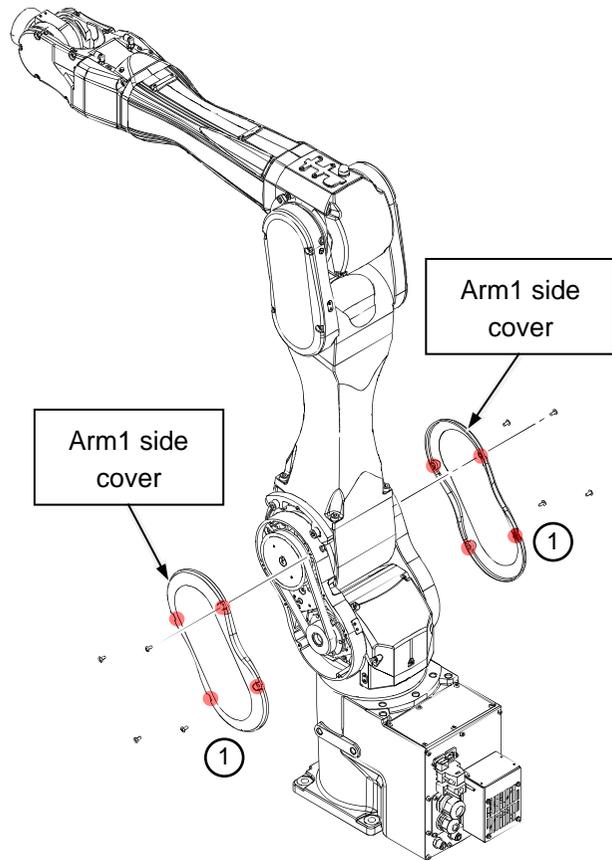
2 Install the Arm1 center cover.

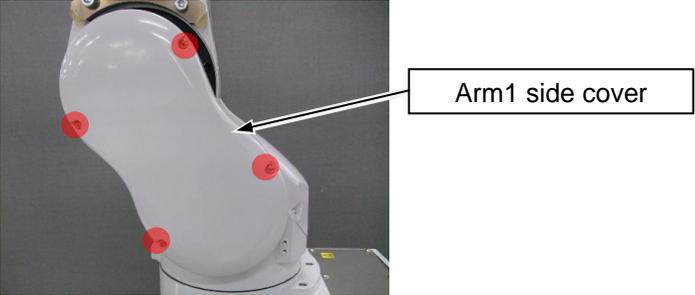
CAUTION
When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.

A S01: 5-M4x12
with washer
(4.0 +/- 0.2 N·m)

2.14.6 Arm1 Side Cover

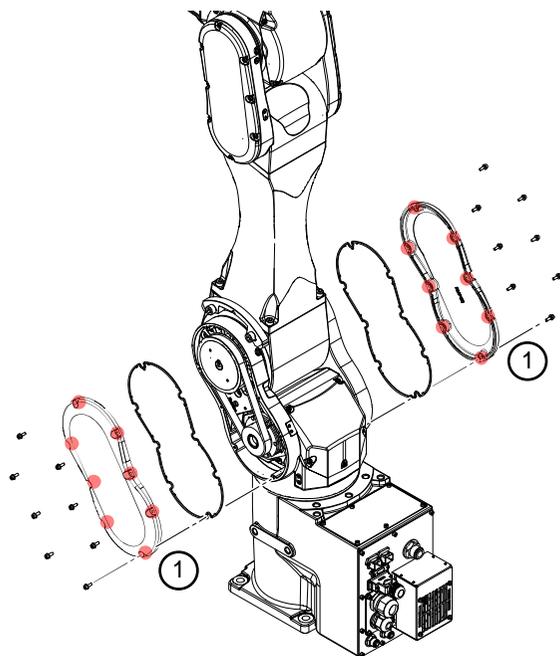
Standard Model/Cleanroom Model

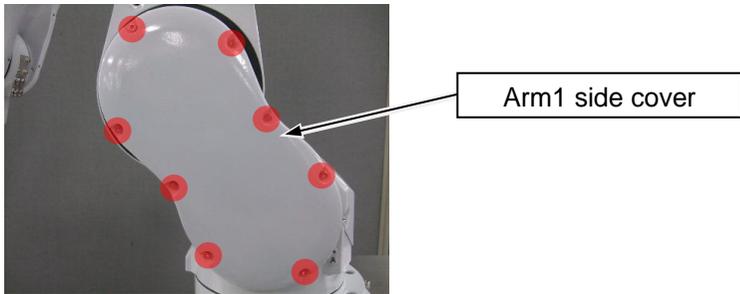


①	Remove the Arm1 side cover. A S06: 4-M4x10 
---	--

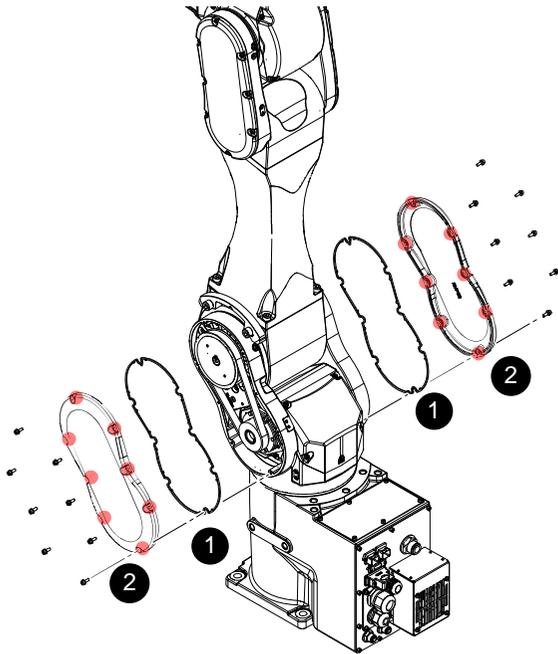
Protection Model

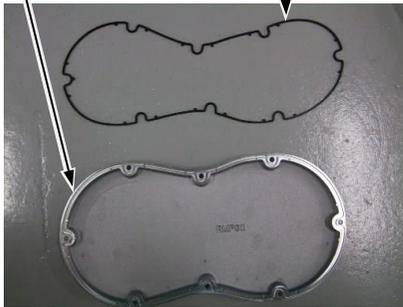
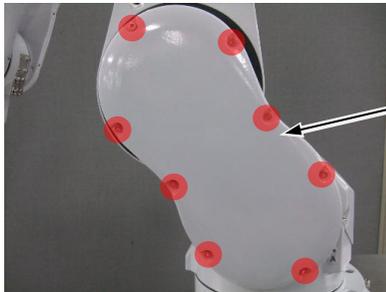
A. Removal



①	<p>Remove the Arm1 side cover.</p> <p>POINT When removing the Arm1 side cover, also remove the Arm1 side gasket.</p> <p>A S01: 8-M4x12 with washer</p> 
---	--

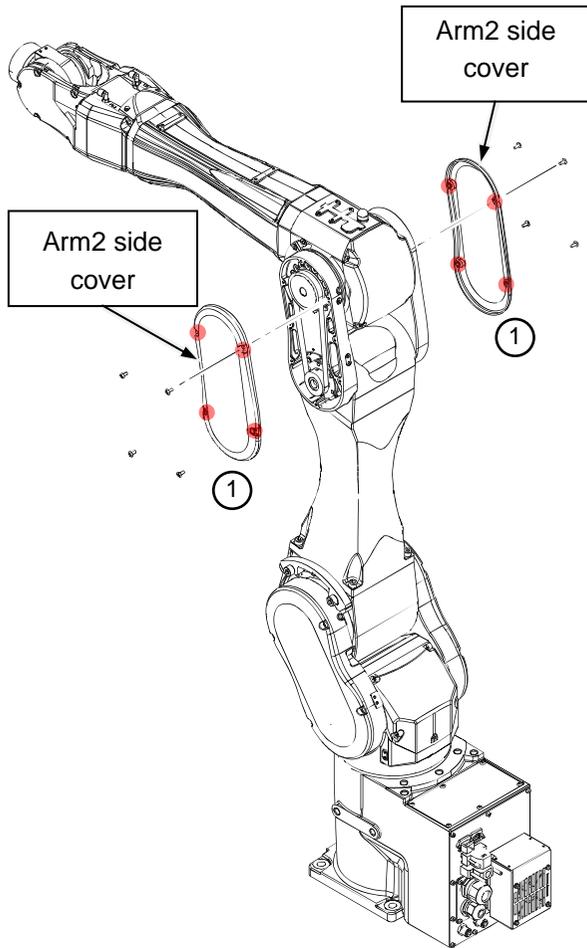
B. Installation

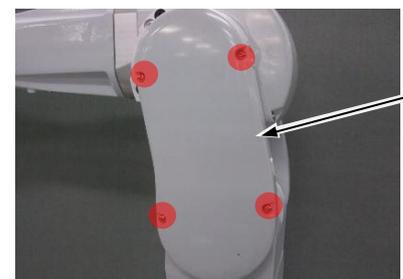


<p>1</p>	<p>Install the Arm1 side gasket in the groove on the Arm1 side cover.</p> <p>POINT If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Arm1 side cover</p>  </div> <div style="text-align: center;"> <p>Arm1 side gasket</p>  </div> </div>
<p>2</p>	<p>Install the Arm1 side cover on the Manipulator.</p> <p>CAUTION When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 20px;"> <p>A S01: 8-M4x12 with washer (4.0 +/- 0.2 N·m)</p> </div> <div style="text-align: center;">  <p>Arm1 side cover</p> </div> </div>

2.14.7 Arm2 Side Cover

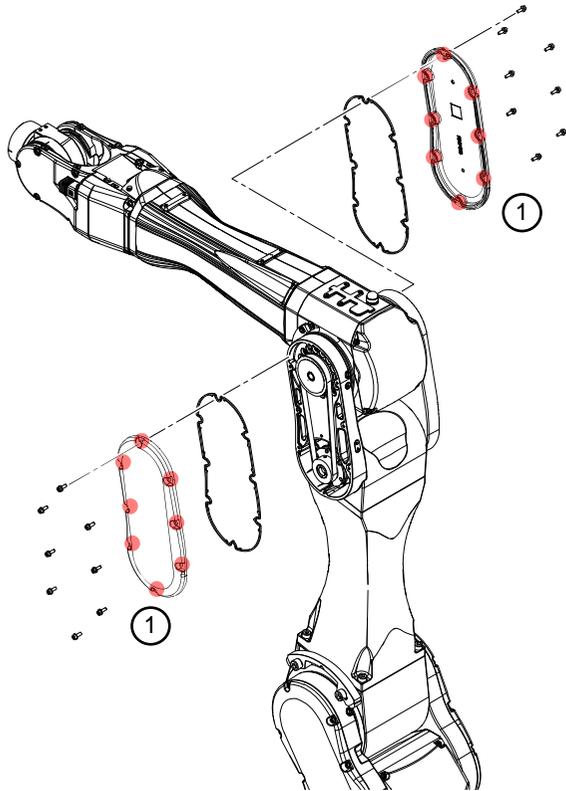
Standard Model/Cleanroom Model

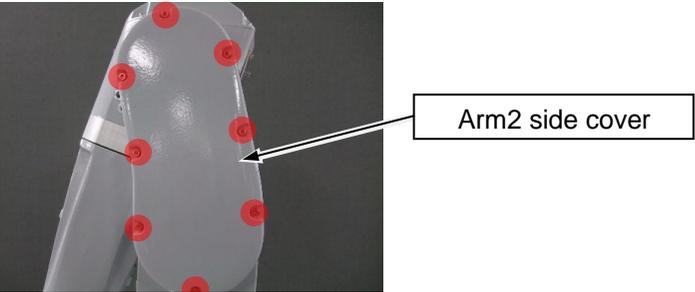


①	Remove the Arm2 side cover.
A	S06: 4-M4x10
	Arm2 side cover

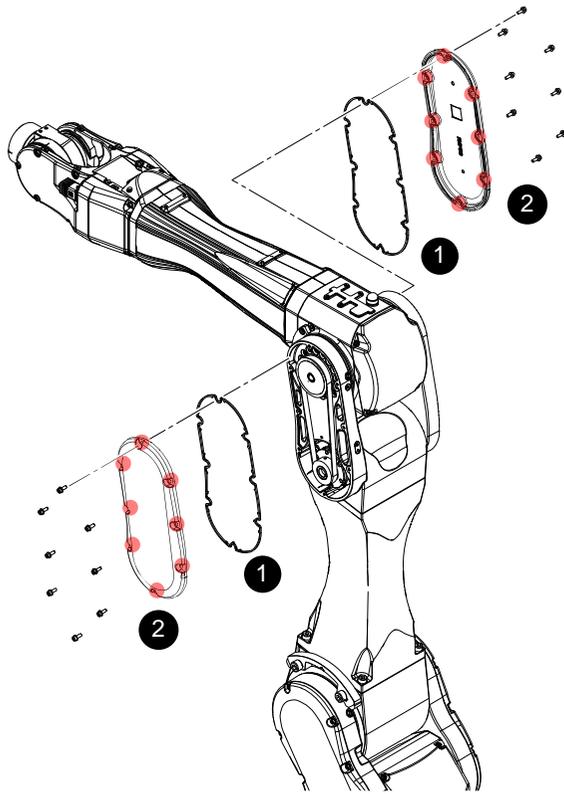
Protection Model

A. Removal



①	<p>Remove the Arm2 side cover.</p> <p>POINT When removing the Arm2 side cover, also remove the Arm2 side gasket.</p> <p>A S01: 8-M4x12 with washer</p> 
---	--

B. Installation



1 Install the Arm2 side gasket in the groove on the Arm2 side cover.

POINT
If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.

Arm2 side cover

Arm2 side gasket

2 Install the Arm2 side cover on the Manipulator.

CAUTION
When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.

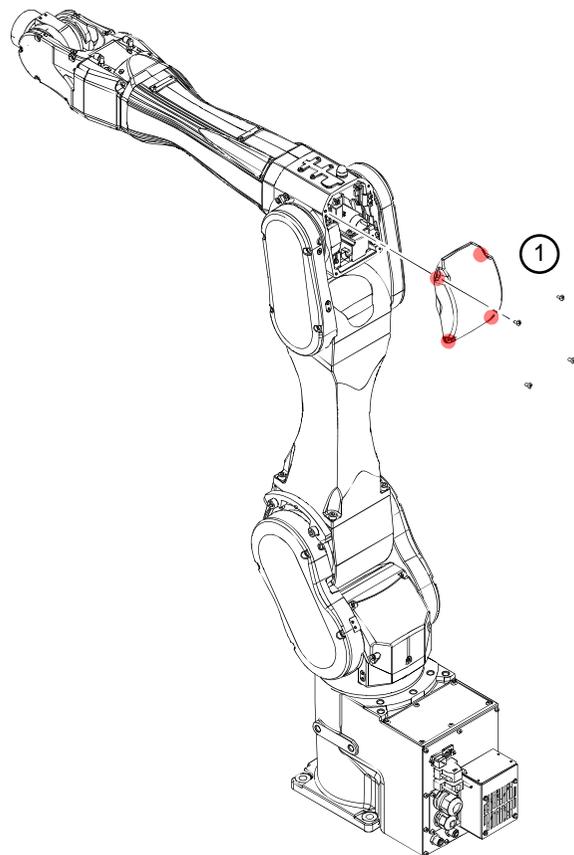
A

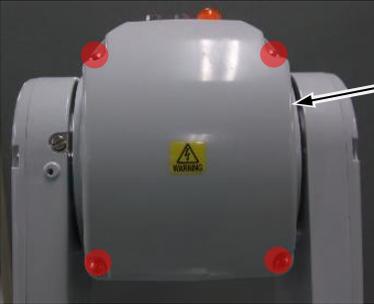
S01: 8-M4x12
with washer
(4.0 ± 0.2 N·m)

Arm2 side cover

2.14.8 Arm3 Cover

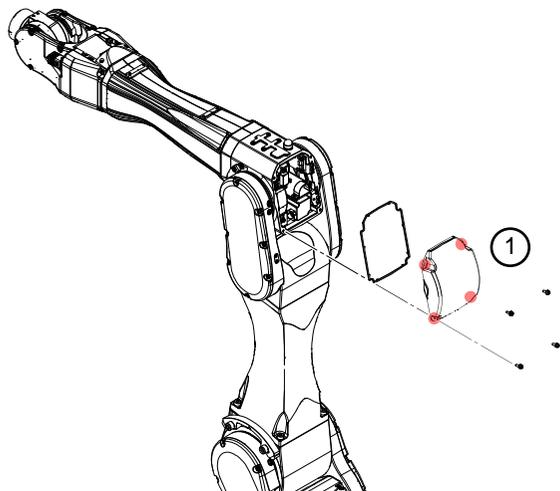
Standard Model/Cleanroom Model

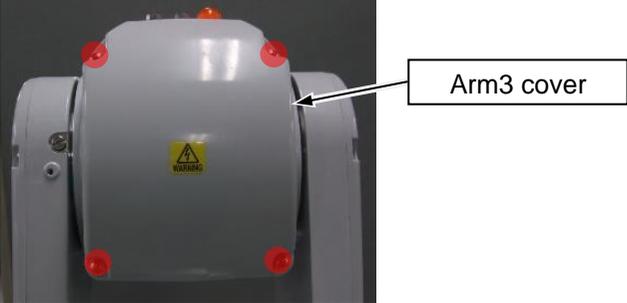


①	Remove the Arm3 Cover.
A	S06: 4-M4x10
	

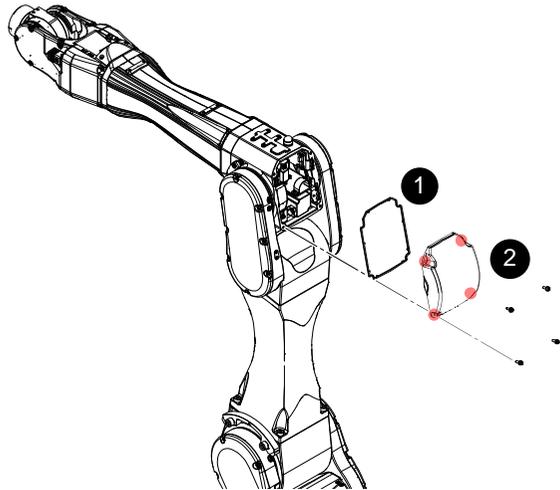
Protection Model

A. Removal



<p>① Remove the Arm3 Cover.</p> <p>POINT</p> <p>When removing the Arm3 Cover, also remove the Arm3 gasket.</p> <p>A S01: 4-M4x12 with washer</p>	
--	---

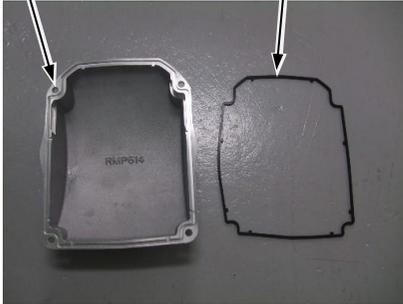
B. Installation



1 Install the Arm3 gasket in the groove on the Arm3 Cover.

POINT
If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.

Arm3 cover



Arm3 gasket



➔



2 Install the Arm3 Cover on the Manipulator.

CAUTION
When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.

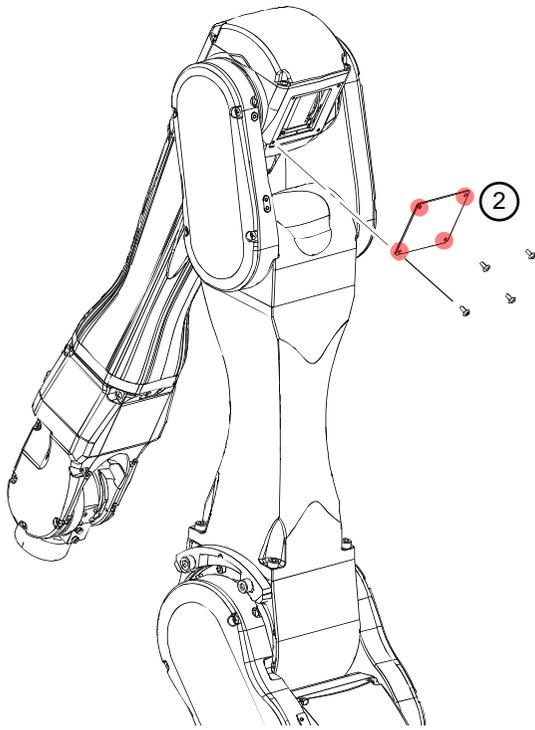
A S01: 4-M4x12
with washer
(4.0 ± 0.2 N·m)

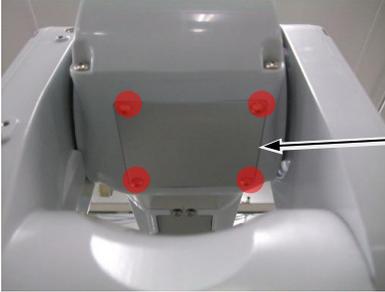


Arm3 cover

2.14.9 Arm3 Maintenance Cover

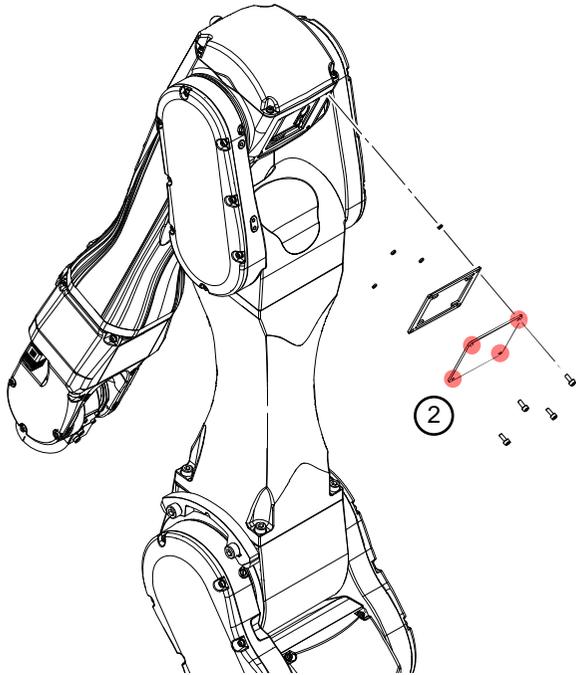
Standard Model/Cleanroom Model

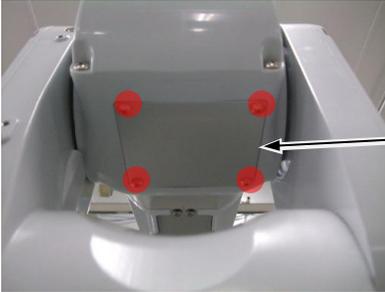


①	Move the arm to a position where the cover can be easily removed.
②	<p>Remove the Arm3 maintenance cover.</p> <p>A S06: 4-M4x8</p>  <p>Arm3 maintenance cover</p>

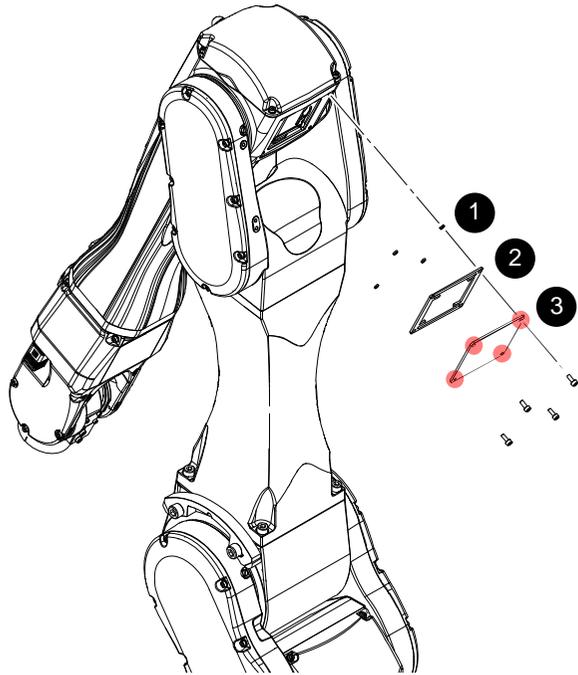
Protection Model

A. Removal



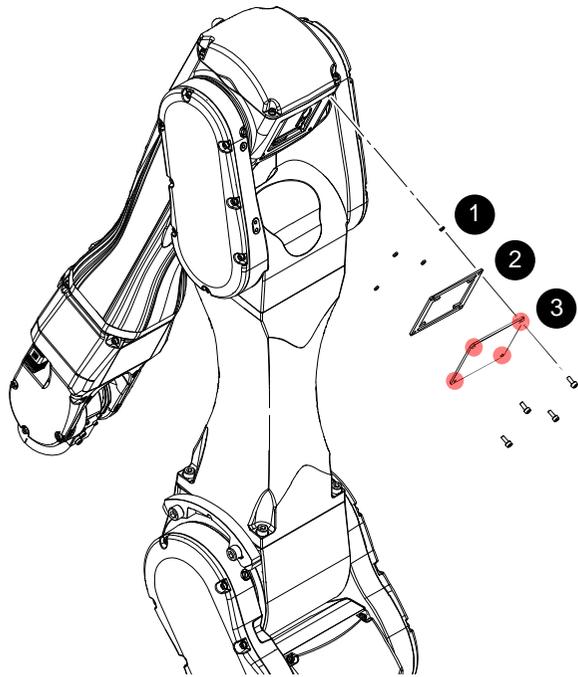
①	Move the arm to a position where the cover can be easily removed.
②	<p>Remove the Arm3 maintenance cover.</p> <p>POINT When removing the Arm3 maintenance cover, also remove the Arm3 maintenance gasket.</p> <p>A S01: 4-M4x10</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Arm3 maintenance cover</p> </div> </div> <p>CAUTION The Rubber Gasket has spacers. Be careful not to lose these spacers.</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Spacer</p> </div> </div>

B. Installation



<p>1</p>	<p>Install the spacers on the holes in the Rubber Gasket. (4 places)</p> <div data-bbox="1339 242 1749 391" data-label="Image"> </div>
<p>2</p>	<p>Apply the adhesive ThreeBond 7738 to the Arm3 maintenance gasket, and secure the Arm3 maintenance gasket to the Arm3 maintenance cover.</p> <p>POINT</p> <ul style="list-style-type: none"> • After installing the adhesive-applied gasket, leave it for about one minute until the adhesive hardens and the gasket is firmly fixed. • If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket. <div data-bbox="875 710 1256 831" data-label="List-Group"> <ul style="list-style-type: none">  Adhesive application point  Spacer </div> <div data-bbox="1323 710 2033 1045" data-label="Diagram"> </div>

Installation



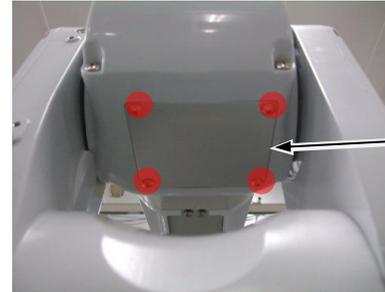
3

Install the Base Maintenance Cover.

CAUTION

When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.

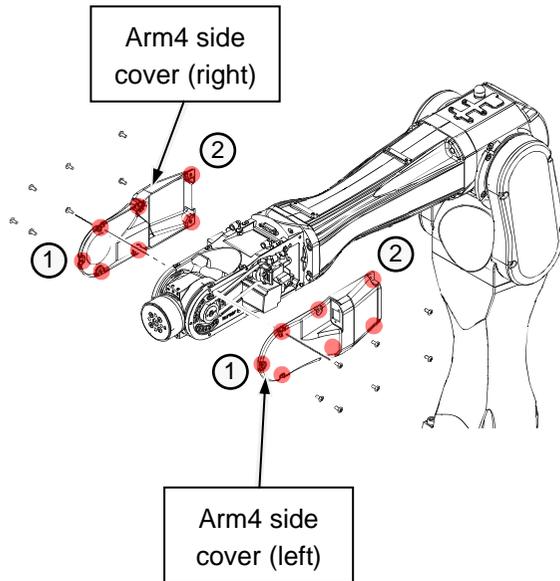
A S01: 4-M4x10
(4.0 +/- 0.2 N·m)

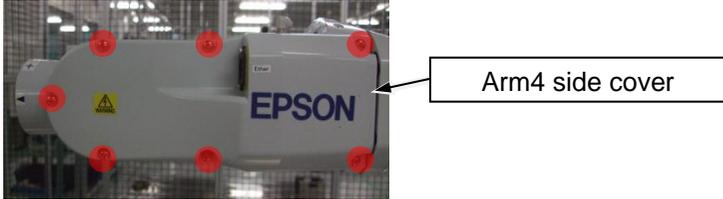
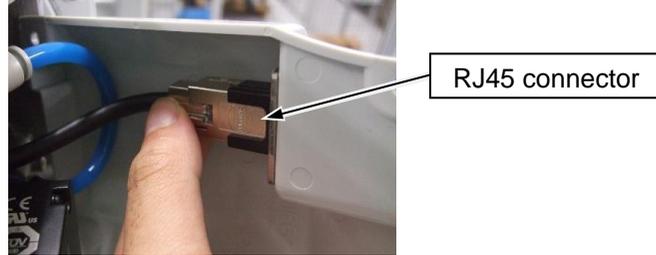
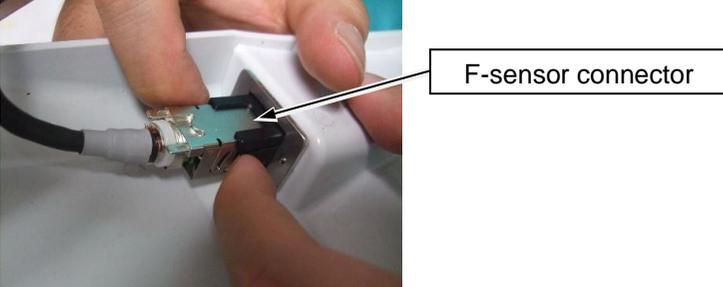


Arm3 maintenance cover

2.14.10 Arm4 Side Cover

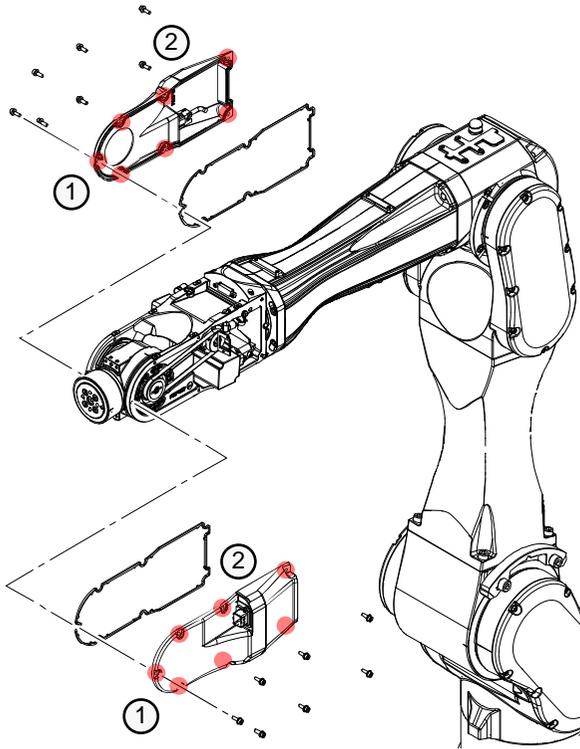
Standard Model/Cleanroom Model

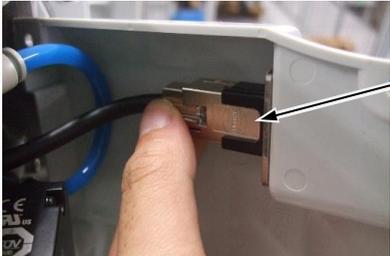


<p>①</p>	<p>Remove the Arm4 side cover.</p> <p>A S06: 7-M4x10</p> 
<p>②</p>	<p>Disconnect the connector.</p> <ul style="list-style-type: none"> • Cover (left): RJ45 connector  <ul style="list-style-type: none"> • Cover (right): F-sensor connector <p>Open the two plastic clips of the connector on the cover and pull out the metallic connector.</p> 

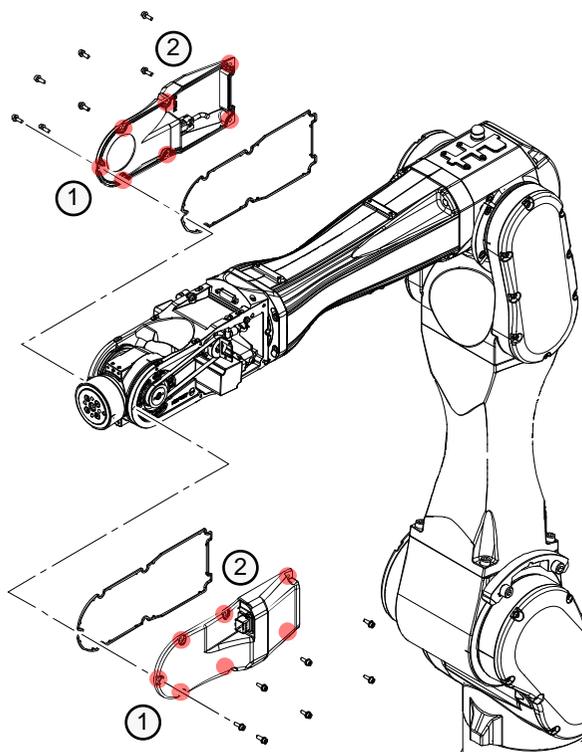
Protection Model

A. Removal

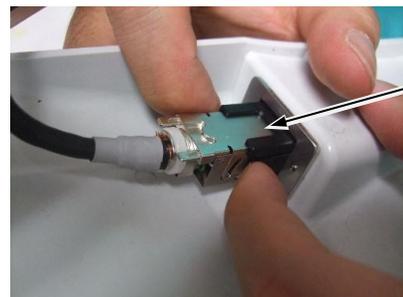


<p>①</p>	<p>Remove the Arm4 side cover.</p> <p>POINT</p> <p>When removing the Arm4 side cover, also remove the Arm4 side gasket.</p> <div style="display: flex; align-items: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;"> <p>A</p> <p>S01: 7-M4x12 with washer</p> </div>  <div style="margin-left: 10px;"> <p>Arm4 side cover</p> </div> </div> <p>CAUTION</p> <p>The Rubber Gasket has spacers. Be careful not to lose these spacers.</p> <div style="display: flex; align-items: center; margin-top: 10px;">  <div style="margin-left: 10px;"> <p>Spacer</p> </div> </div>
<p>②</p>	<p>Disconnect the connector.</p> <ul style="list-style-type: none"> • Cover (left): RJ45 connector <div style="display: flex; align-items: center; margin-top: 10px;">  <div style="margin-left: 10px;"> <p>RJ45 connector</p> </div> </div>

Removal

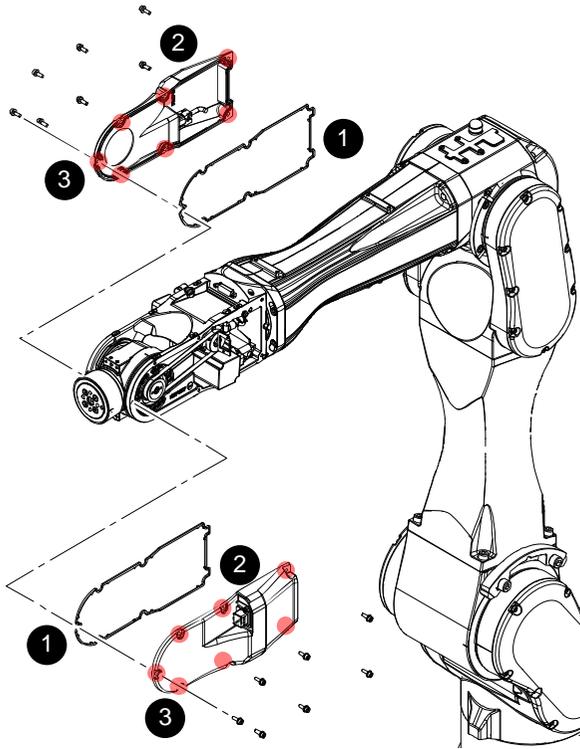


- Cover (right): F-sensor connector
Open the two plastic clips of the connector on the cover and pull out the metallic connector.



F-sensor connector

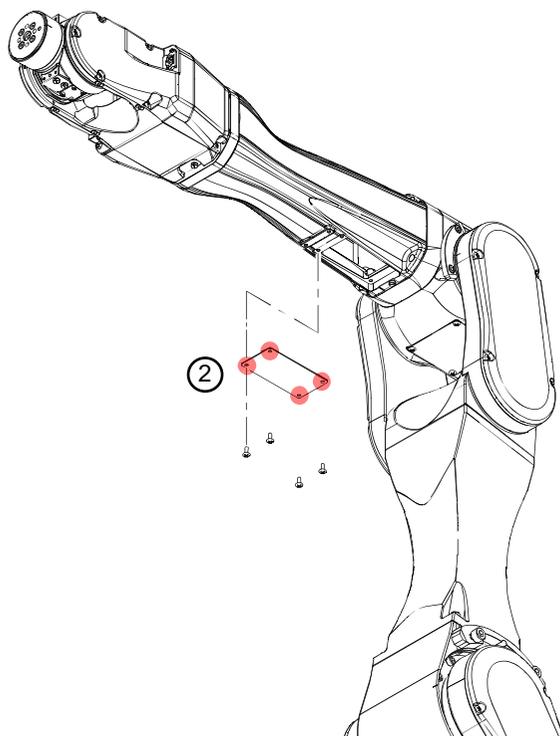
B. Installation

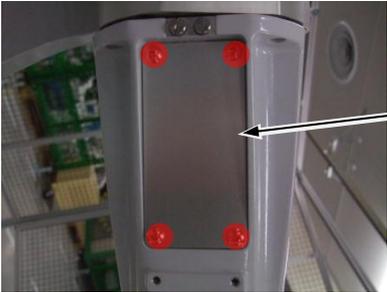


<p>1</p>	<p>Install the Arm4 side gasket in the groove on the Arm4 side cover.</p> <p>POINT If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.</p> <div data-bbox="882 347 1917 722" data-label="Image"> </div>
<p>2</p>	<p>Insert the connectors (RJ45 connector/F-sensor connector).</p>
<p>3</p>	<p>Install the Arm4 side cover on the Manipulator.</p> <p>CAUTION When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.</p> <div data-bbox="904 1018 1160 1142" data-label="Text"> <p>A S01: 7-M4x12 with washer (4.0 ± 0.2 N·m)</p> </div> <div data-bbox="1245 1018 1966 1217" data-label="Image"> </div>

2.14.11 Arm4 Maintenance Cover

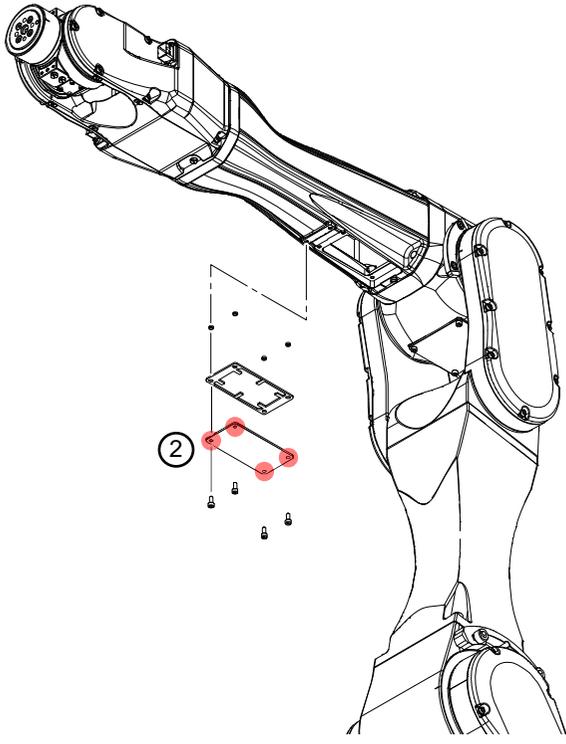
Standard Model/Cleanroom Model

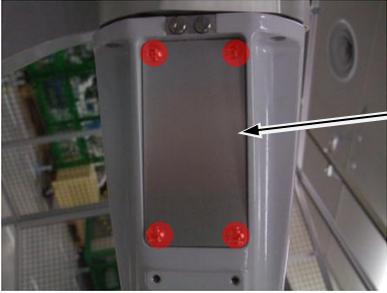


①	Move the arm to a position where the cover can be easily removed.
②	<p>Remove the Arm4 maintenance cover.</p> <p>A S06: 4-M4x10</p>  <p>Arm4 maintenance cover</p>

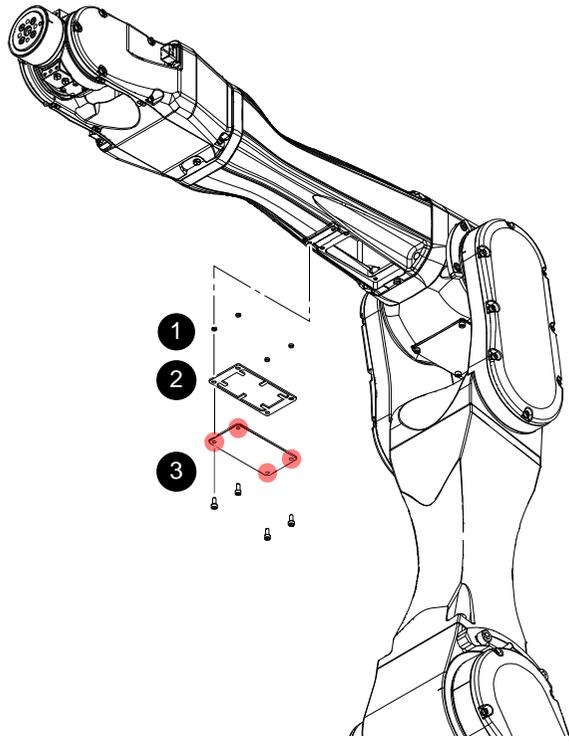
Protection Model

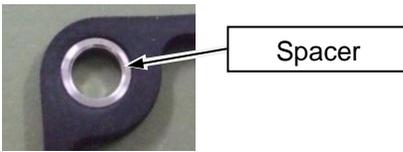
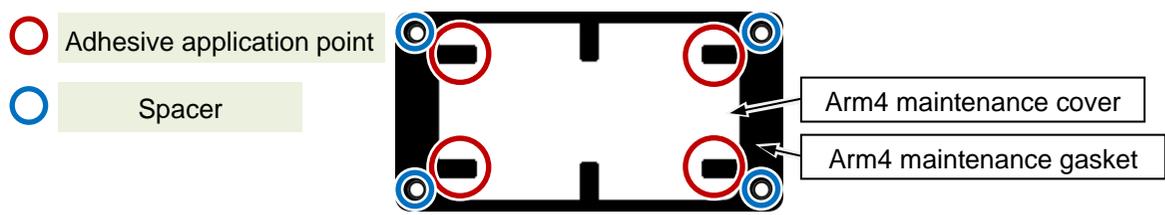
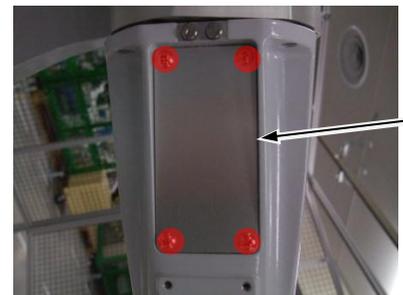
A. Removal



①	Move the arm to a position where the cover can be easily removed.
②	<p>Remove the Arm4 maintenance cover.</p> <p>POINT When removing the Arm4 maintenance cover, also remove the Arm4 maintenance gasket.</p> <p>A S01: 4-M4x10</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Arm4 maintenance cover</p> </div> </div> <p>CAUTION The Rubber Gasket has spacers. Be careful not to lose these spacers.</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Spacer</p> </div> </div>

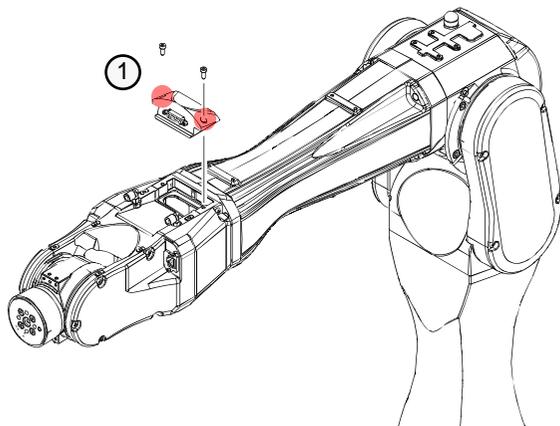
B. Installation

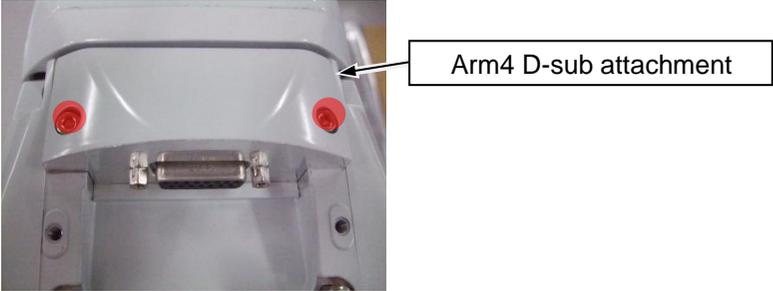


<p>1</p>	<p>Install the spacers on the holes in the Rubber Gasket. (4 places)</p>  <p>Spacer</p>
<p>2</p>	<p>Apply the adhesive ThreeBond 7738 to the Arm4 maintenance gasket, and secure the Arm4 maintenance gasket to the Arm4 maintenance cover.</p> <p>POINT</p> <ul style="list-style-type: none"> • After installing the adhesive-applied gasket, leave it for about one minute until the adhesive hardens and the gasket is firmly fixed. • If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.  <p>Adhesive application point</p> <p>Spacer</p> <p>Arm4 maintenance cover</p> <p>Arm4 maintenance gasket</p>
<p>3</p>	<p>Install the Arm4 maintenance cover.</p> <p>CAUTION</p> <p>When installing the cover, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.</p> <p>A S01: 4-M4x10 (4.0 +/- 0.2 N·m)</p>  <p>Arm4 maintenance cover</p>

2.14.12 Arm4 D-sub Attachment

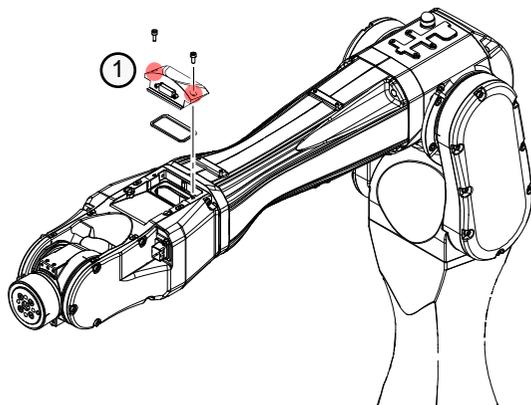
Standard Model/Cleanroom Model



<p>① Remove the Arm4 D-sub attachment.</p> <p>CAUTION</p> <ul style="list-style-type: none">• Cables are connected internally, so do not pull with force when removing.• When installing the attachment, be careful not to pinch the cables. Also, do not bend or push the cables in using excessive force. <p>A S01: 2-M4x10</p>	
--	---

Protection Model

A. Removal



①

Remove the Arm4 D-sub attachment.

CAUTION

Cables are connected internally, so do not pull with force when removing.

POINT

When removing the D-sub attachment, also remove the D-sub attachment gasket.

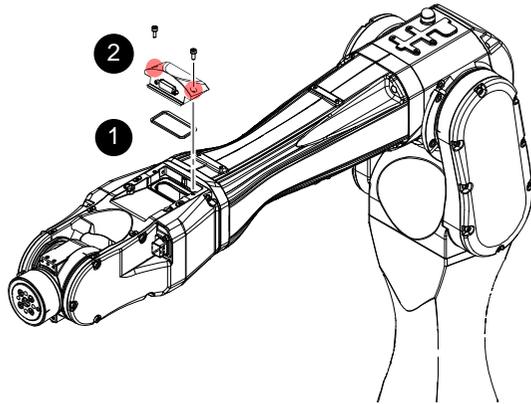
A

S01: 2-M4x10



Arm4 D-sub attachment

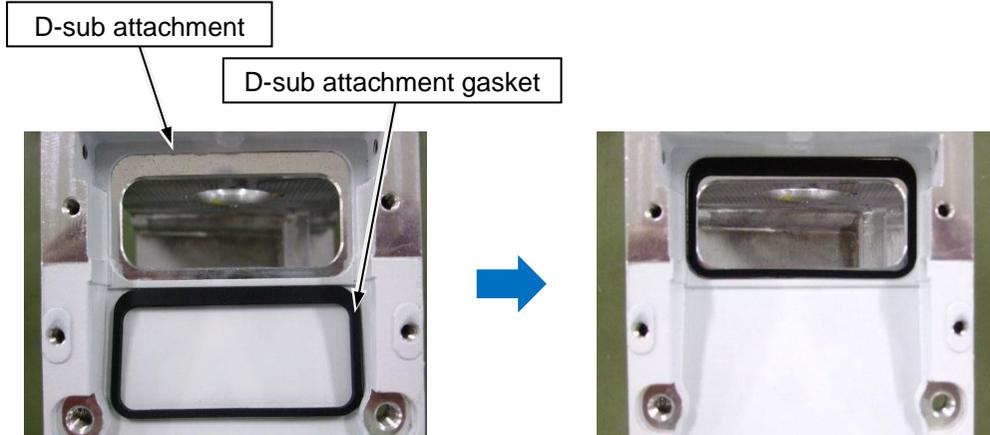
B. Installation



1 Install the D-sub attachment gasket in the groove on the D-sub attachment.

POINT

If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.

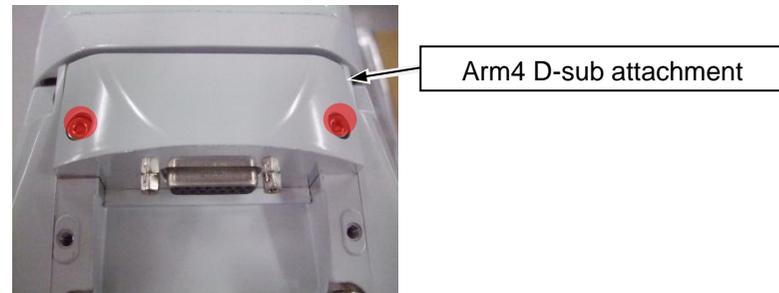


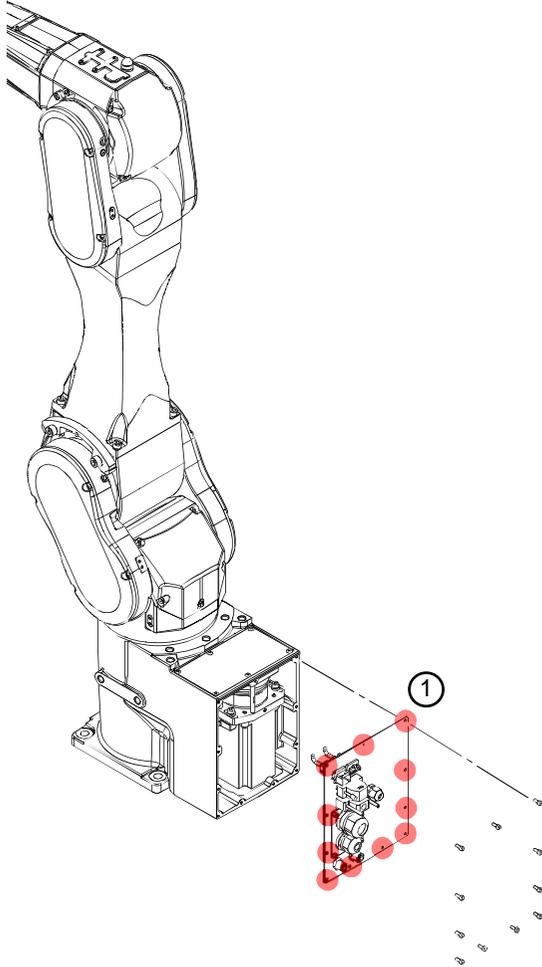
2 Install the D-sub attachment.

CAUTION

When installing the attachment, be careful not to pinch the Rubber Gasket or cables. Also, do not bend or push the cables in using excessive force.

A S01: 2-M4x10
(4.0 +/- 0.2 N·m)

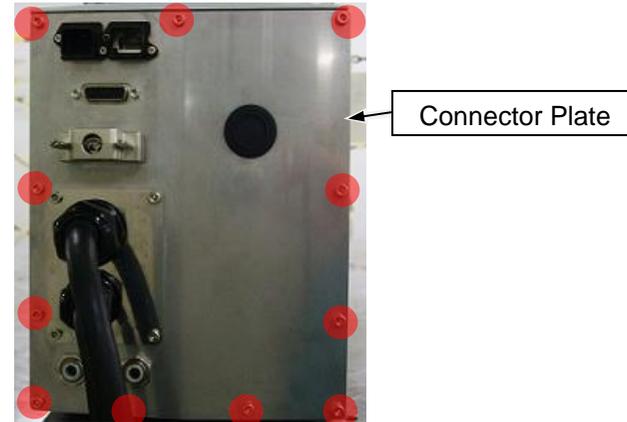


2.14.13 Connector Plate (M/C Cable Backward) (C8L)**Standard Model/Cleanroom Model****CAUTION**

- Do not pull the Connector Plate with force. It may result in damage to the cables, disconnection, and/or contact failure. These are extremely hazardous and may result in electric shock and/or improper function of the robot system.
- At reassembly, check the cable arrangement when removing the Connector Plate in order to return to a reasonable wiring arrangement.
- When installing the Connector Plate, do not nip the Rubber Gasket or cables, or bend and push them in using excessive force. It may result in damage to the cables, disconnection, and/or contact failure. These are extremely hazardous and may result in electric shock and/or improper function of the robot system.

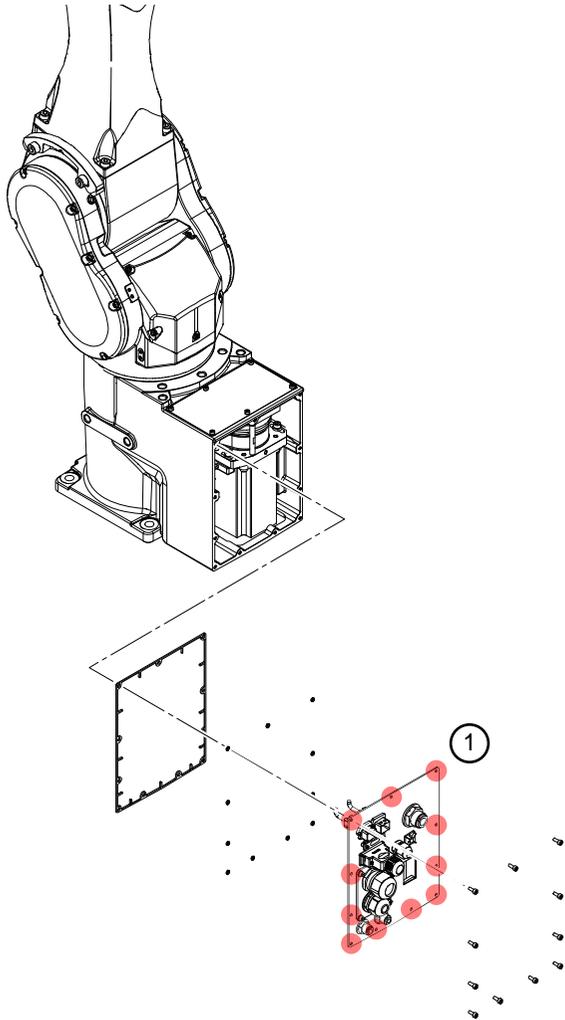
① Remove the Connector Plate.

A S01: 11-M4x10



Protection Model

A. Removal



CAUTION

- Do not pull the Connector Plate with force. It may result in damage to the cables, disconnection, and/or contact failure. These are extremely hazardous and may result in electric shock and/or improper function of the robot system.
- At reassembly, check the cable arrangement when removing the Connector Plate in order to return to a reasonable wiring arrangement.

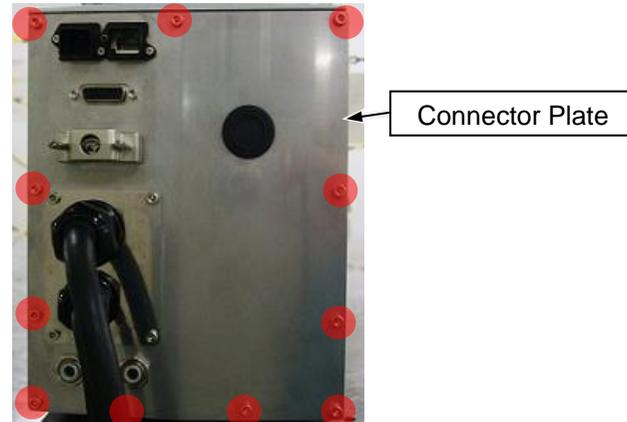
①

Remove the Connector Plate.

POINT

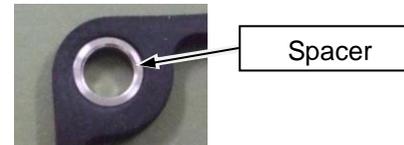
When removing the Connector Plate, also remove the base rear gasket.

A S01: 11-M4x10

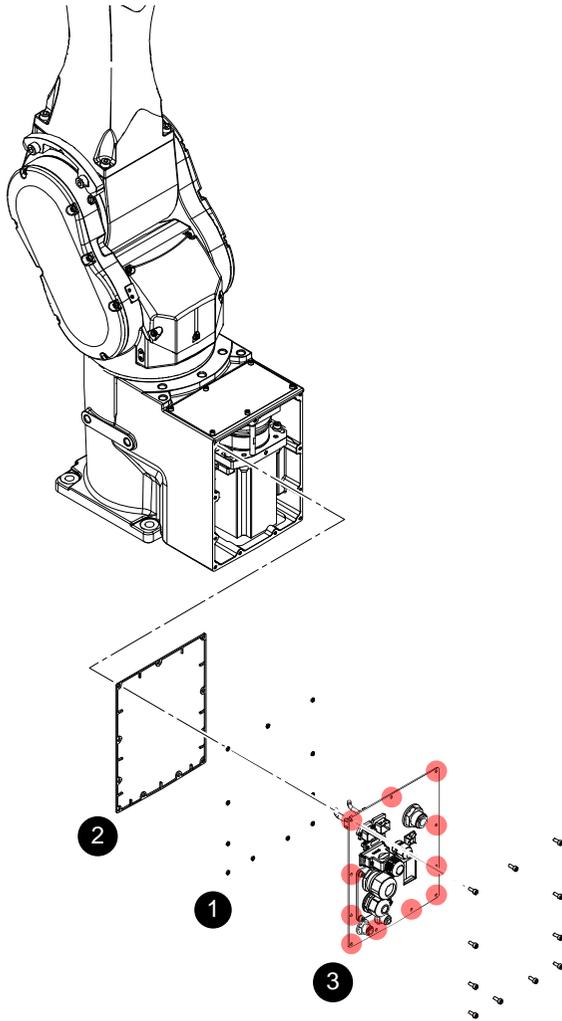


CAUTION

The Rubber Gasket has spacers. Be careful not to lose these spacers.



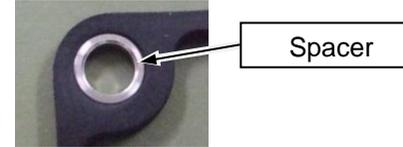
B. Installation



CAUTION

When installing the Connector Plate, do not nip the Rubber Gasket or cables, or bend and push them in using excessive force. It may result in damage to the cables, disconnection, and/or contact failure. These are extremely hazardous and may result in electric shock and/or improper function of the robot system.

- 1 Install the spacers on the holes in the Rubber Gasket. (11 places)



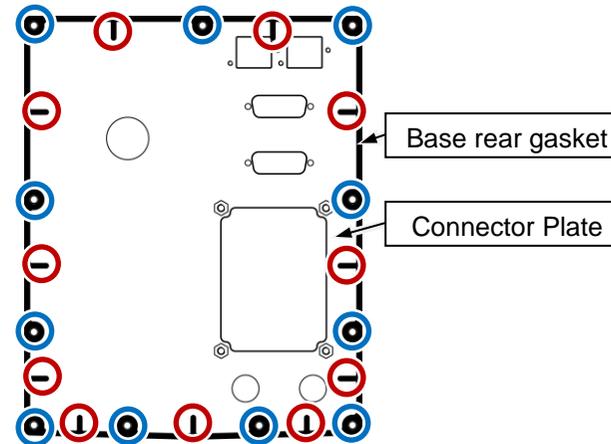
- 2 Apply the adhesive ThreeBond 7738 to the base rear gasket, and secure the base rear gasket to the Connector Plate.

POINT

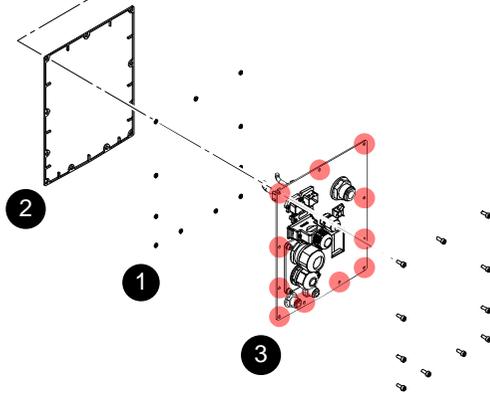
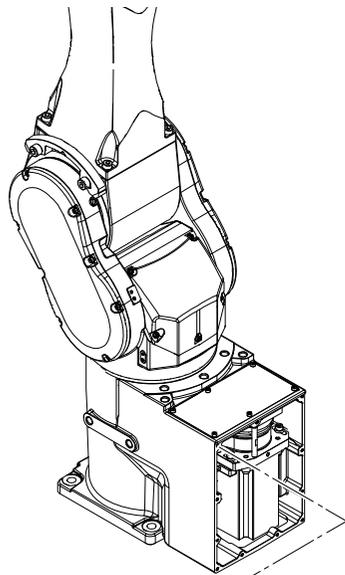
- After installing the adhesive-applied gasket, leave it for about one minute until the adhesive hardens and the gasket is firmly fixed.
- If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.

○ Adhesive application point

○ Spacer



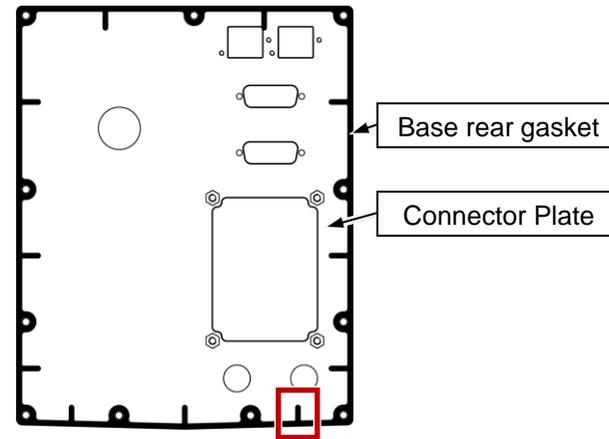
Installation



POINT

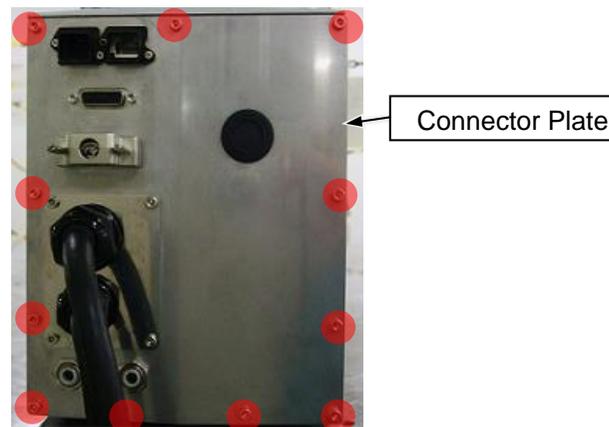
For C8-C/C12-C

The gasket in the red frame in the figure interferes with the air tube fitting. Cut the gasket by about 5 mm before use.



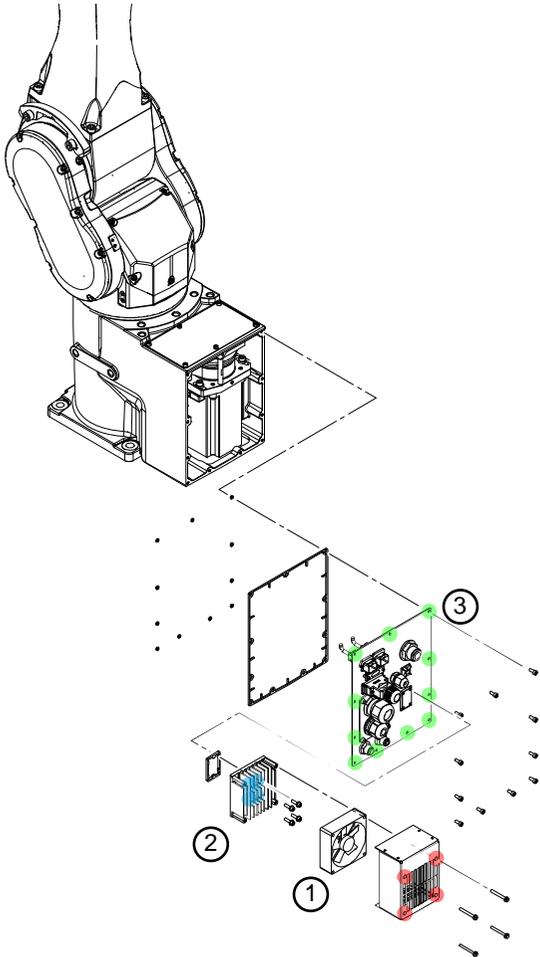
3 Install the Connector Plate.

A S01: 11-M4x10
(4.0 +/- 0.2 N·m)



2.14.14 Connector Plate (M/C Cable Backward) (C8XL, C12XL)

Removal



CAUTION

- Do not pull the Connector Plate with force. It may result in damage to the cables, disconnection, and/or contact failure. These are extremely hazardous and may result in electric shock and/or improper function of the robot system.
- At reassembly, check the cable arrangement when removing the Connector Plate in order to return to a reasonable wiring arrangement.
- When installing the Connector Plate, do not nip the Rubber Gasket or cables, or bend and push them in using excessive force. It may result in damage to the cables, disconnection, and/or contact failure. These are extremely hazardous and may result in electric shock and/or improper function of the robot system.

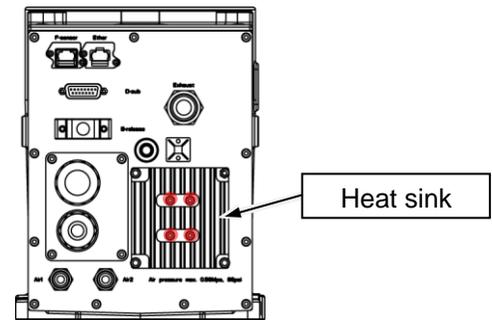
① Remove the fan.

② Remove the heat sink.

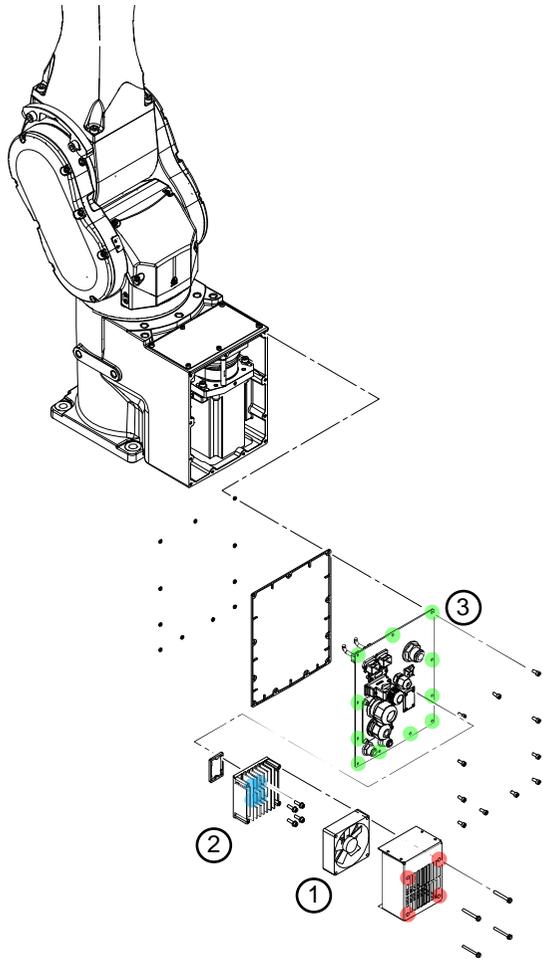
POINT

When removing the heat sink, remove the Rubber Gasket on the heat sink and Connector Plate.

A S01: 4-M4x15



Removal

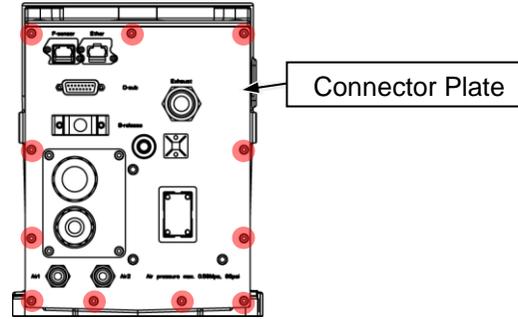


③ Remove the Connector Plate.

POINT

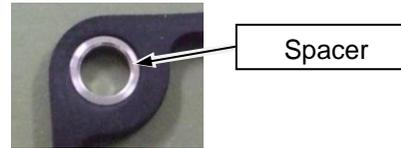
When removing the Connector Plate, also remove the base rear gasket.

A S01: 11-M4x10

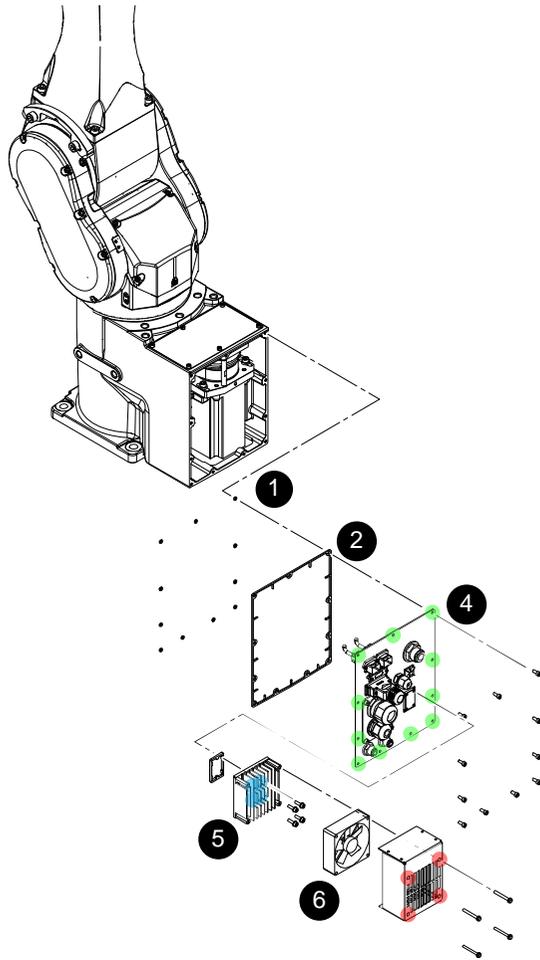


CAUTION

The Rubber Gasket has spacers. Be careful not to lose these spacers.



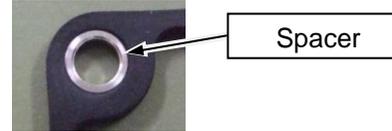
Installation



CAUTION

When installing the Connector Plate, do not nip the Rubber Gasket or cables, or bend and push them in using excessive force. It may result in damage to the cables, disconnection, and/or contact failure. These are extremely hazardous and may result in electric shock and/or improper function of the robot system.

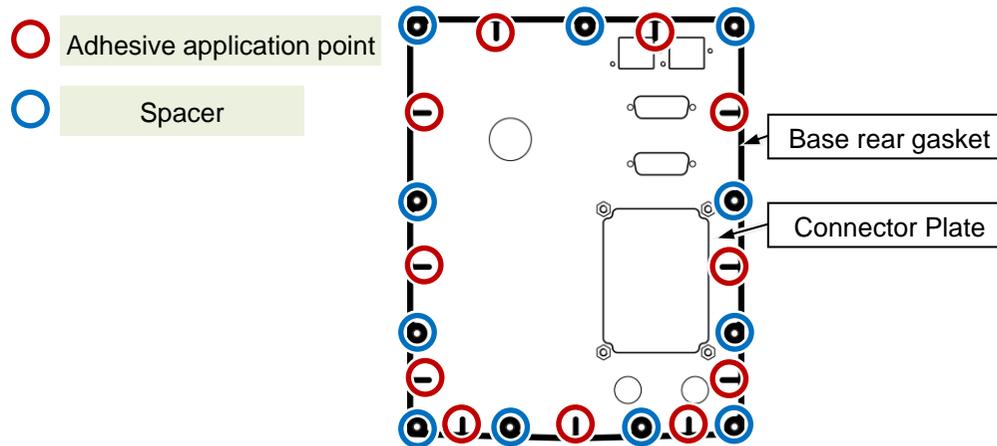
- 1 Install the spacers on the holes in the Rubber Gasket. (11 places)



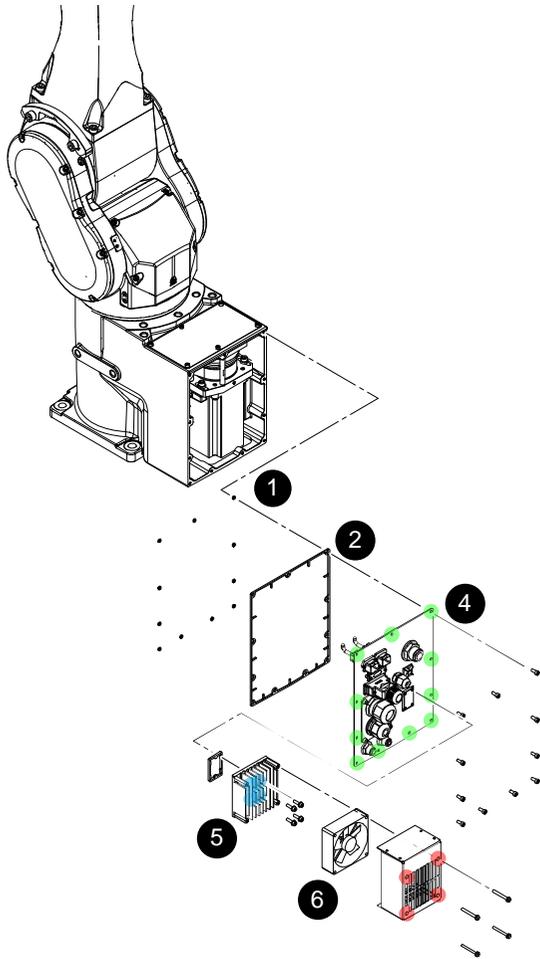
- 2 Apply the adhesive ThreeBond 7738 to the base rear gasket, and secure the base rear gasket to the Connector Plate.

POINT

- After installing the adhesive-applied gasket, leave it for about one minute until the adhesive hardens and the gasket is firmly fixed.
- If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.



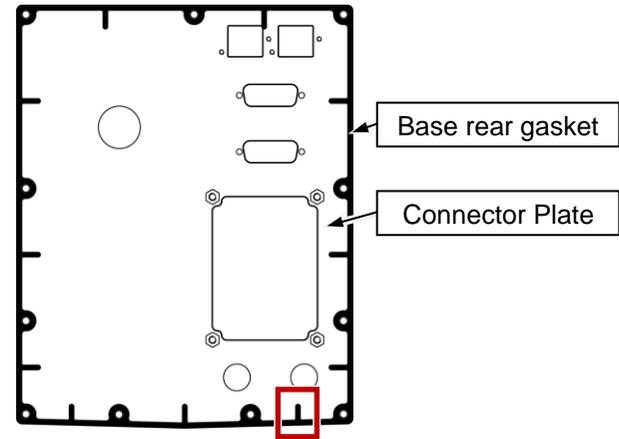
Installation



POINT

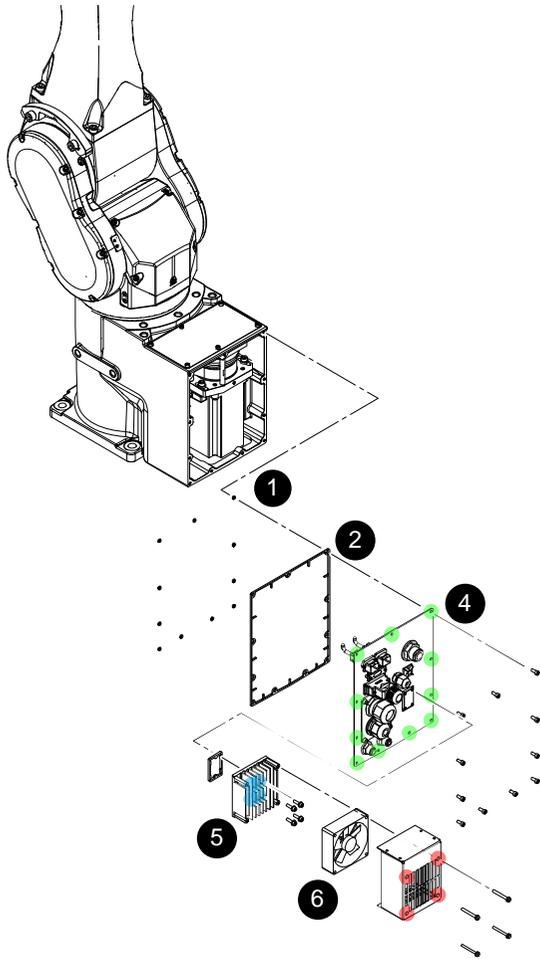
For C8-C/C12-C

The gasket in the red frame in the figure interferes with the air tube fitting. Cut the gasket by about 5 mm before use.



3 Connect cables to the Connector Plate.

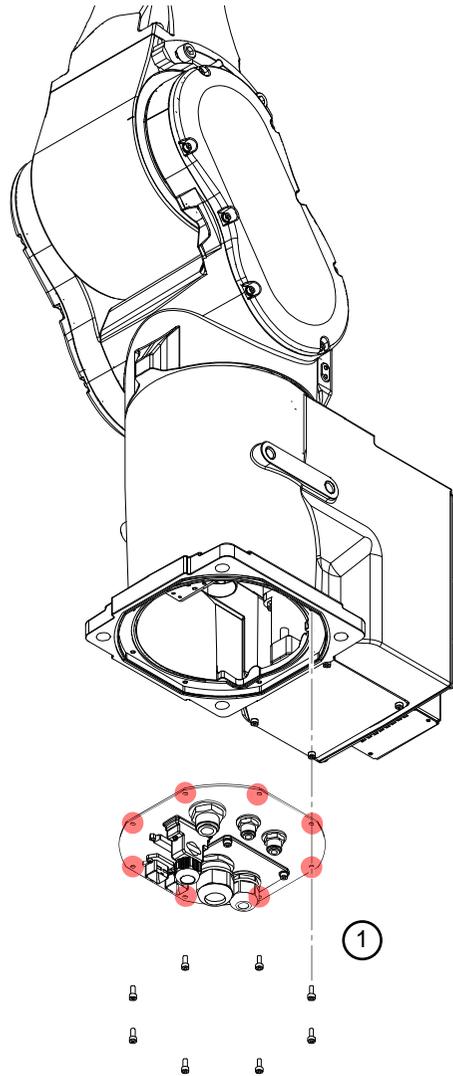
Installation



<p>4</p>	<p>Install the Connector Plate.</p> <p>A S01: 11-M4x10 (4.0 +/- 0.2 N·m)</p>	
<p>5</p>	<p>Install the heat sink.</p> <p>POINT Install a Rubber Gasket between the heat sink and connector plate.</p> <p>A S01: 4-M4x15 (4.0 +/- 0.2 N·m)</p>	
<p>6</p>	<p>Install the fan.</p>	

2.14.15 Connector Plate (M/C Cable Downward)

Standard Model/Cleanroom Model



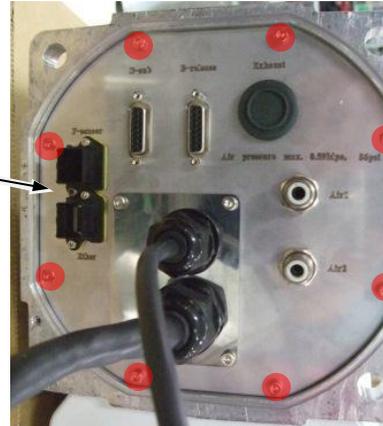
CAUTION

- Cables are connected internally, so do not pull with force when removing.
- At reassembly, check the cable arrangement when removing the Connector Plate in order to return to a reasonable wiring arrangement.
- When installing the Connector Plate, do not nip the Rubber Gasket or cables, or bend and push them in using excessive force. It may result in damage to the cables, disconnection, and/or contact failure. These are extremely hazardous and may result in electric shock and/or improper function of the robot system.

① Remove the Connector Plate.

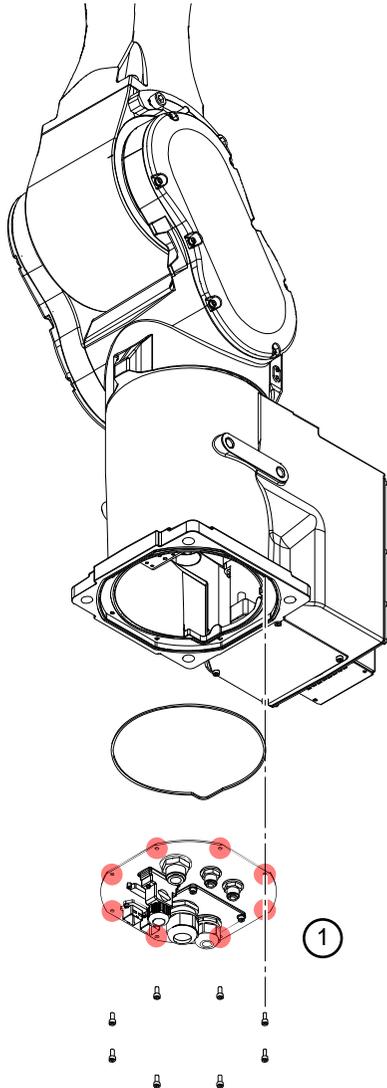
A S01: 8-M4x10

Connector Plate



Protection Model

A. Removal



CAUTION

- Cables are connected internally, so do not pull with force when removing.
- At reassembly, check the cable arrangement when removing the Connector Plate in order to return to a reasonable wiring arrangement.

①

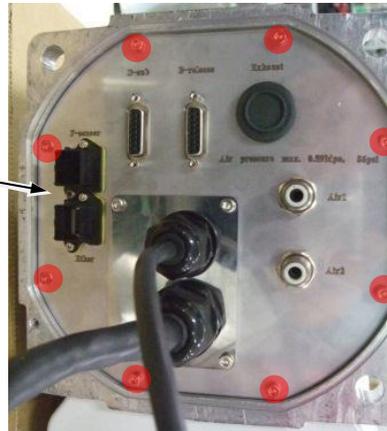
Remove the Connector Plate.

POINT

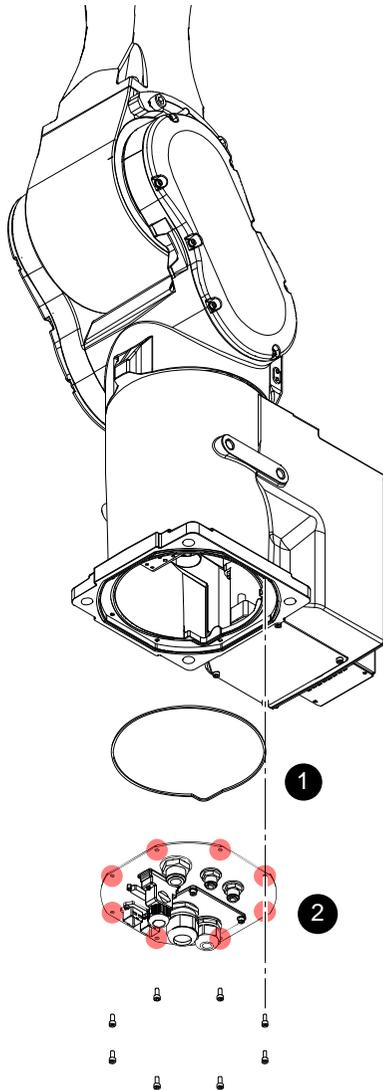
When removing the Connector Plate, also remove the base bottom gasket together.

A S01: 8-M4x10

Connector Plate



B. Installation



CAUTION

When installing the Connector Plate, do not nip the Rubber Gasket or cables, or bend and push them in using excessive force. It may result in damage to the cables, disconnection, and/or contact failure. These are extremely hazardous and may result in electric shock and/or improper function of the robot system.

1

Install the base bottom gasket in the groove on the base bottom.

POINT

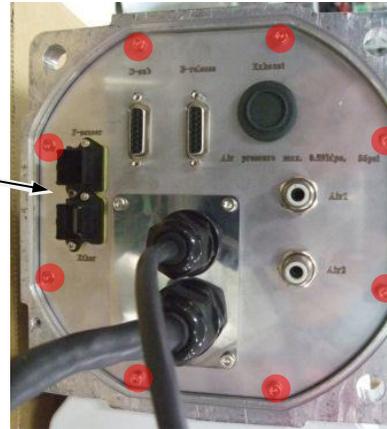
If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.

2

Install the Connector Plate.

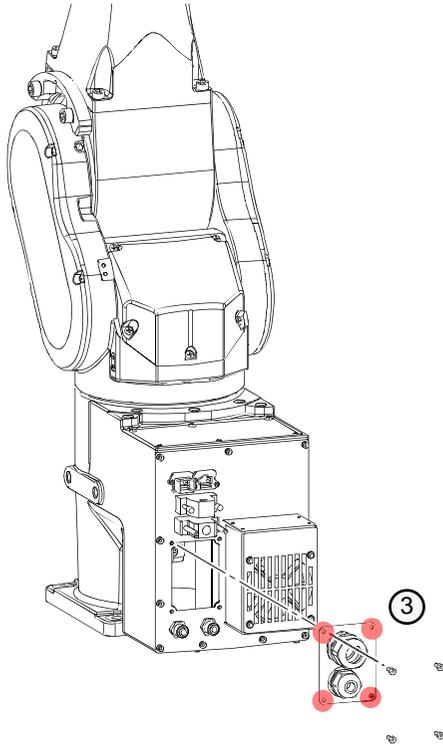
A S01: 8-M4x10
(4.0 +/- 0.2 N·m)

Connector Plate



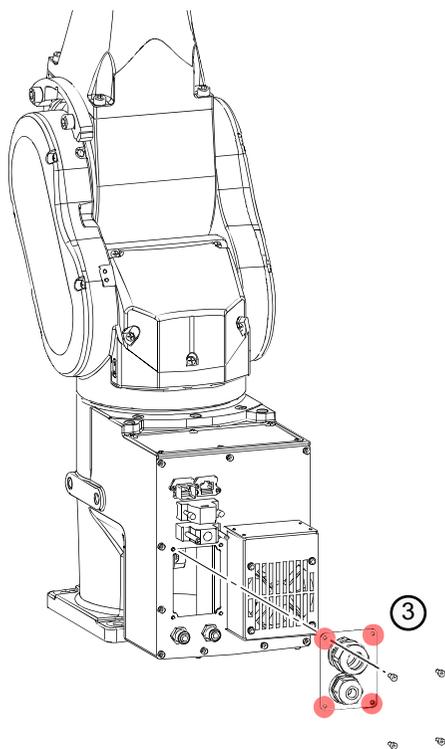
2.14.16 Connector Sub Plate

Standard Model/Cleanroom Model



<p>①</p>	<p>Remove the Connector Plate. M/C Cable Backward: C8L, M/C Cable Backward: C8XL, C12XL, M/C Cable Downward CAUTION Attempting to remove the connector sub plate alone while the connectors are still connected may damage the cables.</p>
<p>②</p>	<p>For C8-B/C12-B, disconnect the Ground Wires (PE2).</p> <p>A S04: 1-M4x6 (The photo is of C8-B/C12-B)</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>Connector Plate</p> <p>Connector sub plate</p> </div> </div> <p>POINT For C8-C/C12-C, it is not necessary to disconnect any Ground Wire.</p>

Standard Model/Cleanroom Model



3

Remove the connector sub plate.

CAUTION

Cables are connected internally, so do not pull with force when removing.

C8-B/C12-B

A S01: 4-M4x10

C8-C/C12-C

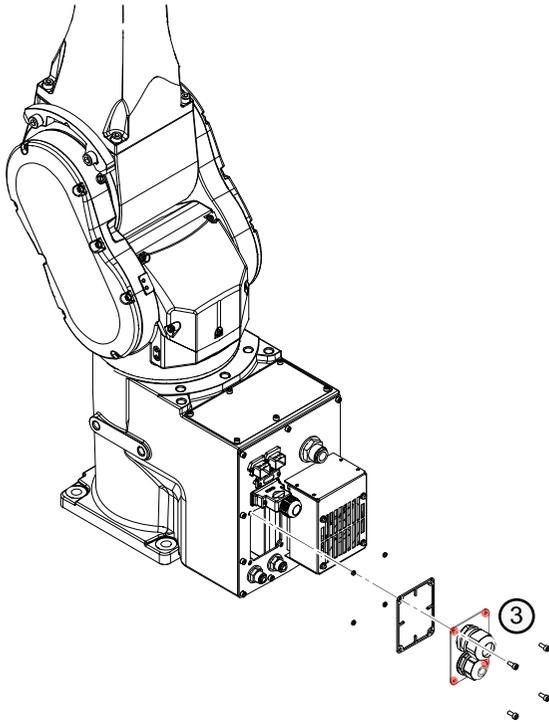
A S01: 4-M3x8

Connector sub plate



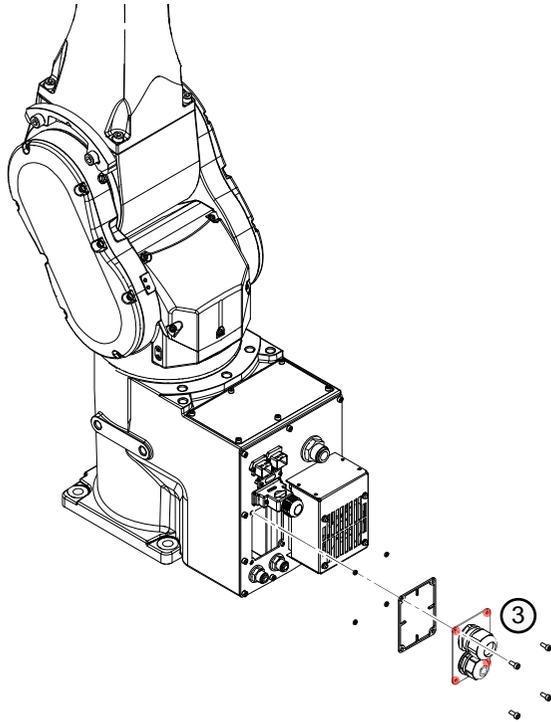
Protection Model

A. Removal



①	<p>Remove the Connector Plate. M/C Cable Backward: C8L, M/C Cable Backward: C8XL, C12XL, M/C Cable Downward</p> <p>CAUTION Attempting to remove the connector sub plate alone while the connectors are still connected may damage the cables.</p>
②	<p>For C8-B/C12-B, disconnect the Ground Wires (PE2).</p> <p>A S04: 1-M4x6 (The photo is of C8-B/C12-B)</p> <div style="display: flex; align-items: center;"> <div style="margin-right: 20px;"> <p>Connector Plate</p> <p>Connector sub plate</p> </div> </div> <p>POINT For C8-C/C12-C, it is not necessary to disconnect any Ground Wire.</p>

Removal



③

Remove the connector sub plate.

CAUTION

Cables are connected internally, so do not pull with force when removing.

POINT

When removing the connector sub plate, also remove the base sub plate gasket together.

C8-B/C12-B

- A S01: 4-M4x10
with seal washer

C8-C/C12-C

- A S01: 4-M3x8
with seal washer

Connector sub plate



CAUTION

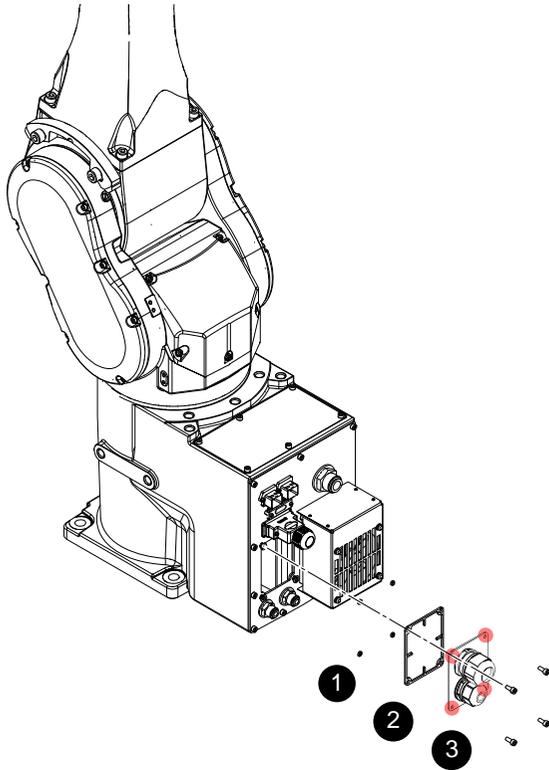
- The Rubber Gasket has spacers. Be careful not to lose these spacers.



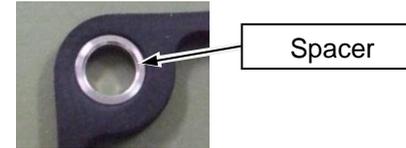
Spacer

- Be careful not to lose the seal washers.

B. Installation



1 Install the spacers on the holes in the Rubber Gasket. (4 places)



2 Apply the adhesive ThreeBond 7738 to the base sub plate gasket, and secure the base sub plate gasket to the connector sub plate.

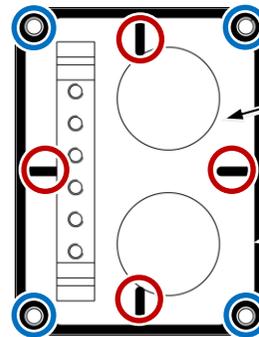
POINT

- After installing the adhesive-applied gasket, leave it for about one minute until the adhesive hardens and the gasket is firmly fixed.
- If any damage or deterioration is observed in the Rubber Gasket, replace the Rubber Gasket.

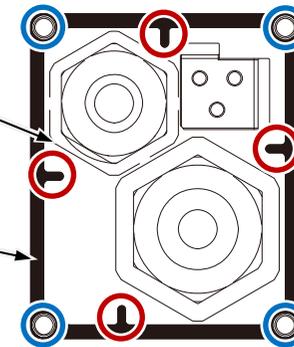
○ Adhesive application point

○ Spacer

For C8-B/C12-B



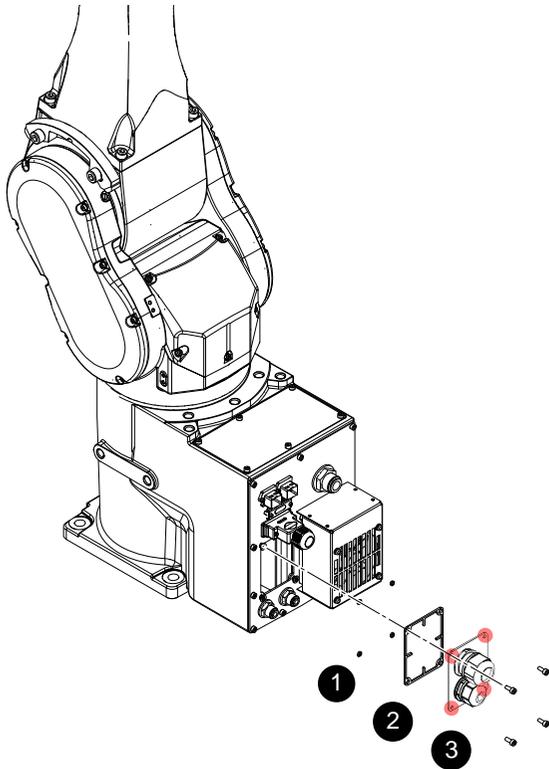
For C8-C/C12-C



Connector sub plate

Sub plate gasket

Installation



3

Install the connector sub plate.

CAUTION

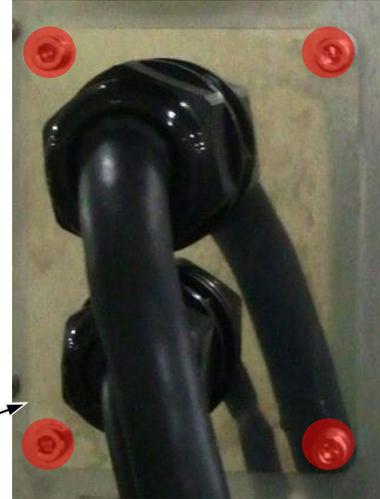
When installing the plate, be careful not to pinch the Rubber Gasket and cables. Also, do not bend or push the cables in using excessive force.

C8-B/C12-B

- A S01: 4-M4x10
with seal washer
(4.0 +/- 0.2 N·m)

C8-C/C12-C

- A S01: 4-M3x8
with seal washer
(2.0 +/- 0.1 N·m)



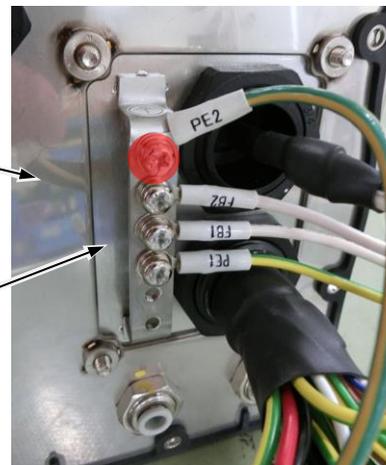
Connector sub plate

4

For C8-B/C12-B, connect the Ground Wires (PE2).

- A S04: 1-M4x6
(0.9 +/- 0.1 N·m)

(The photo is of C8-B/C12-B)



Connector plate

Connector sub plate

CHAPTER

3

Adjustment

3.1 Adjusting the Timing Belt Tension

The Manipulator uses six types of Timing Belts.

When removing or replacing parts related to the belt, be sure to adjust the tension of the Timing Belt.

 CAUTION	<ul style="list-style-type: none"> ● If the belt tension falls below the lower limit, the belt may jump off the teeth and cause positioning failure. If the belt tension exceeds the upper limit, it may cause oscillation (abnormal noise) and reduce the service life of parts. ● When the belt is replaced with a new one, the belt may stretch and lose tension at first. Be sure to check the belt tension again after operating the robot for a few days.
---	---

3.1.1 Items to be prepared

- Force gauge
- Sonic Belt Tension Meter
Recommended: U-508 (Gates Unitta)
- Suitable cord (Length about 800 mm)
- Belt Tensioner JIG (Maintenance Parts Code: 1674582)

3.1.2 Belt Tension Values

Tension Meter setting values

	J1	J2	J3	J4	J5	J6
Unit mass (g/mm width x m span)	4.0	4.0	2.5	2.5	2.5	2.5
Belt width (mm)	20	14	10	6	6	6
Belt span (mm)	160	146	168	61	117	122

Tension standard values

	J1	J2	J3	J4	J5	J6
Belt tension (Minimum to maximum) (N)	89 to 149	58 to 95	25 to 85	15 to 30	15 to 30	15 to 30

3.1.3 Adjustment Method



- Make sure that the belt is set to be level with respect to the pulley without it being placed on the flange.
- Temporarily tighten the parts used to adjust the belt tension. After adjusting the tension, tighten the bolts with the correct tightening torque.
- Take care not to apply excessive tension to the belt.
- Measure the tension near the center of the belt.

Joint #1 Timing Belt

1. Apply the proper tension to the Joint #1 timing belt and secure the Joint #1 motor unit.

When securing the motor unit, attach the heat dissipation sheet to the right side of the base (when seeing from the rear side of the Manipulator).

Joint #1 timing belt tension: 89 to 149 N

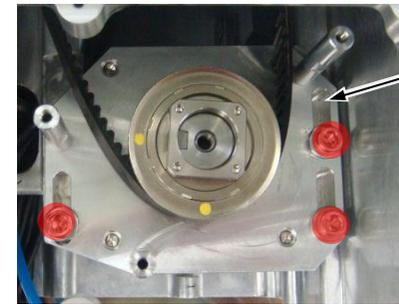
Belt tension meter setting values

Weight: 4.0 g/mm width x m span, Width: 20 mm, Span: 160 mm

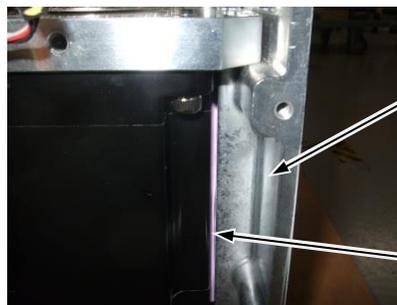
A

S01: 3-M6x30
and washer
(13.0 +/- 0.6 N·m)

Joint #1 timing belt



Joint #1 motor unit



Base

Heat dissipation sheet

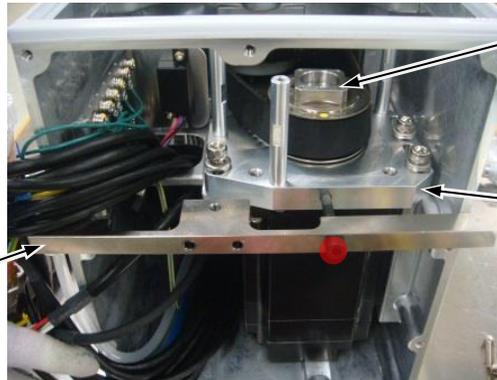
NOTE**<When using the Belt tensioner jig (maintenance part)>**

Use the specified screws to temporarily secure the Belt tensioner jig (for J1, J2, J3) to the Joint #1 motor plate.

As the screw is tightened, the Joint #1 motor unit will be pulled and tension will be applied.

A S01: 1-M5x45

Belt tensioner jig
(for J1, J2, J3)



Joint #1 motor unit

Joint #1 motor plate

<For C8XL/C12XL>

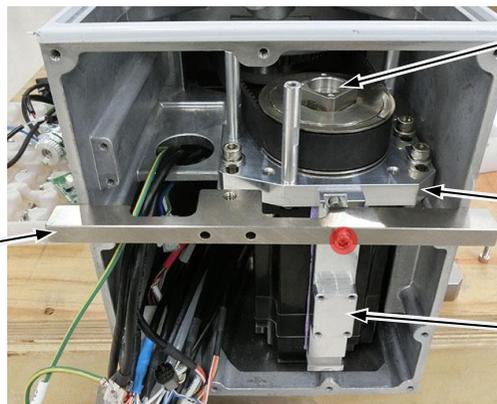
The Belt tensioner jig can be used even when the heat radiation block is assembled together with the motor.

Remove the screws (S01: 1-Mx15) securing the heat radiation block to the motor plate, and use the specified screws (S01: 1-M5x45).

When belt adjustment is complete, secure the heat radiation block to the motor plate using the screws (S01: 1-M5x15 (8.0 +/- 0.4 N · m)).

A S01: 1-M5x45

Belt tensioner jig
(for J1, J2, J3)



Joint #1 motor unit

Joint #1 motor plate

Heat radiation block

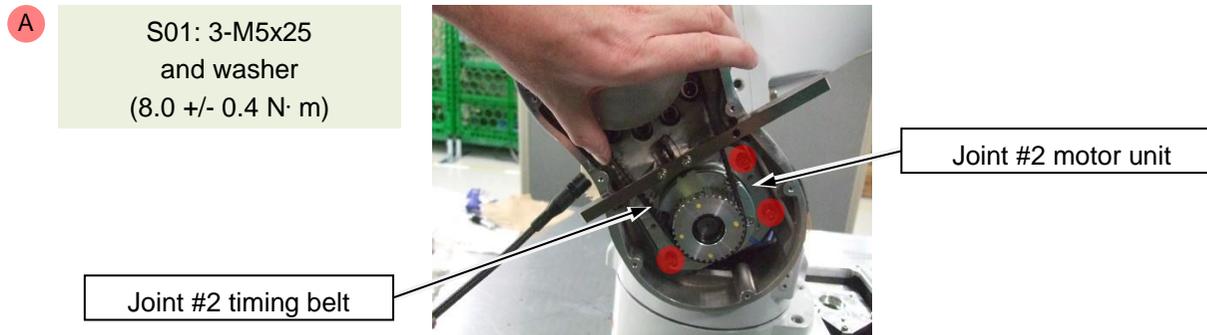
Joint #2 Timing Belt

1. Apply the proper tension to the Joint #2 timing belt and secure the Joint #2 motor unit.

Joint #2 timing belt tension: 58 to 95 N

Belt tension meter setting values

Weight: 4.0 g/mm width x m span, Width: 14 mm, Span: 146 mm

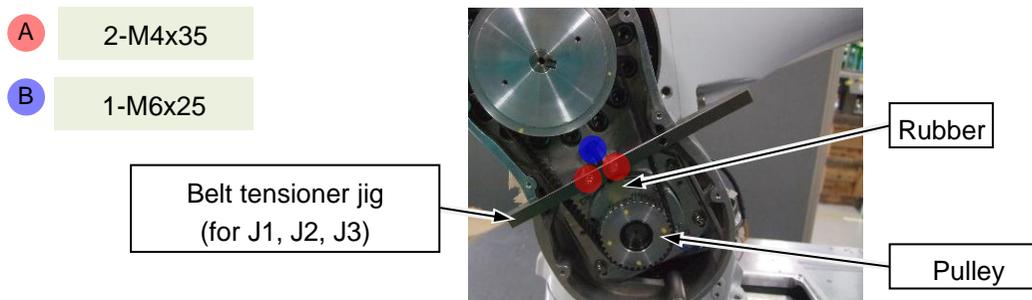


NOTE

When using the Belt tensioner jig (maintenance part):

Fix the Belt tensioner jig (for J1, J2, and J3) with the screws (2-M4x35) and push the rubber against the pulley.

Tension can be applied by pushing the rubber with the set screw (M6x25).



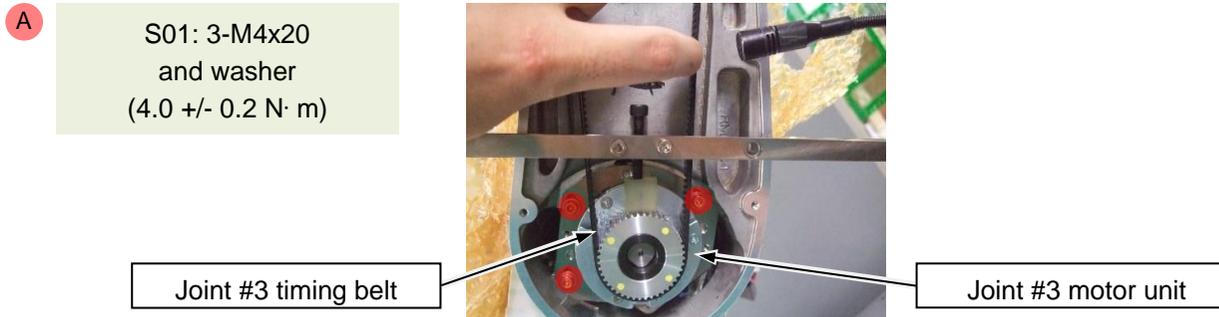
Joint #3 Timing Belt

1. Apply the proper tension to the Joint #3 timing belt and secure the Joint #3 motor unit.

Joint #3 timing belt tension: 25 to 85 N

Belt tension meter setting values

Weight: 2.5 g/mm width x m span, Width: 10 mm, Span: 168 mm

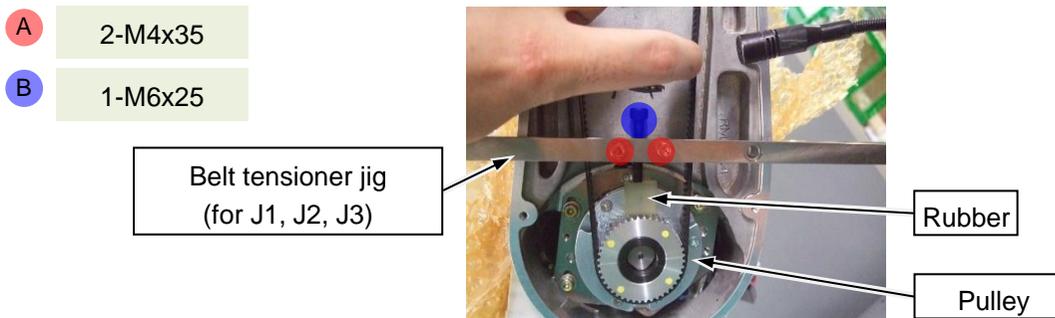


NOTE

When using the Belt tensioner jig (maintenance part):

Fix the Belt tensioner jig (for J1, J2, J3) with the screws (2-M4x35) and push the rubber against the pulley.

Tension can be applied by pushing the rubber with the set screw (M6x25).



Joint #4 Timing Belt

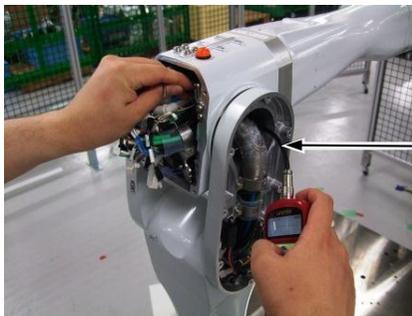
1. Apply the proper tension to the Joint #4 timing belt and secure the Joint #4 motor unit.

Joint #4 timing belt tension: 15 to 30 N

Belt tension meter setting values

Weight: 2.5 g/mm width x m span, Width: 6 mm, Span: 61 mm

A S01: 2-M4x15
and washer
(4.0 +/- 0.2 N·m)

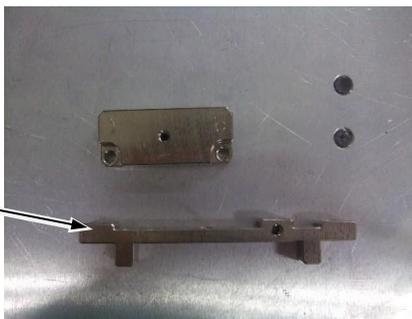


Joint #4 timing belt

NOTE

When using the Belt tensioner jig (maintenance part):
Fix the Belt tensioner jig (for J4, J5, J6) to the Joint #4 motor plate.

Belt tensioner jig
(for J4, J5, J6)



Push the Belt tensioner jig (for J4, J5, and J6) against the Arm #3 as shown in the photo. Insert the screw to the through hole at the center and fix it lightly to the hole for the Belt tensioner jig. As the screw is tightened, the Joint #4 motor unit will be pulled and tension will be applied.

A S01: 1-M4x15

Joint #4 motor unit

Belt tensioner jig
(for J4, J5, J6)



Arm #3

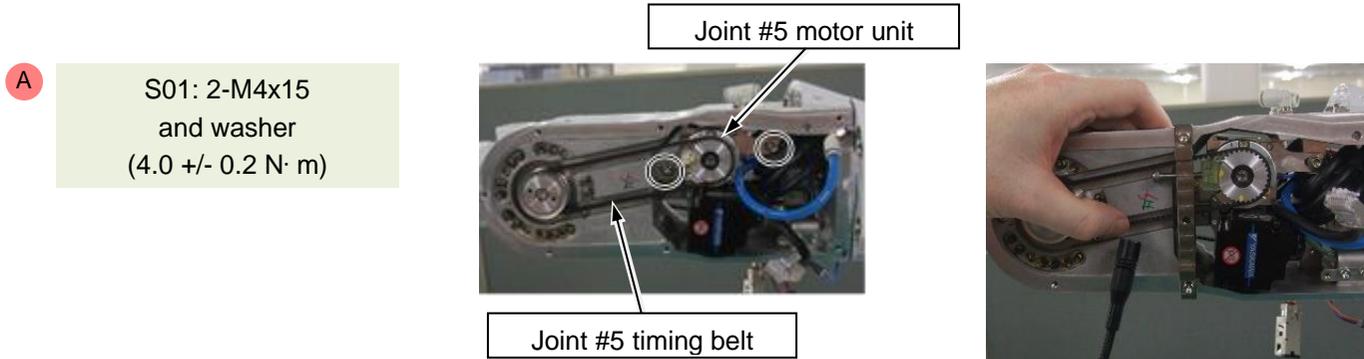
Joint #5 Timing Belt

1. Apply the proper tension to the Joint #5 timing belt and secure the Joint #5 motor unit.

Joint #5 timing belt tension: 15 to 30 N

Belt tension meter setting values

Weight: 2.5 g/mm width x m span, Width: 6 mm, Span: 117 mm

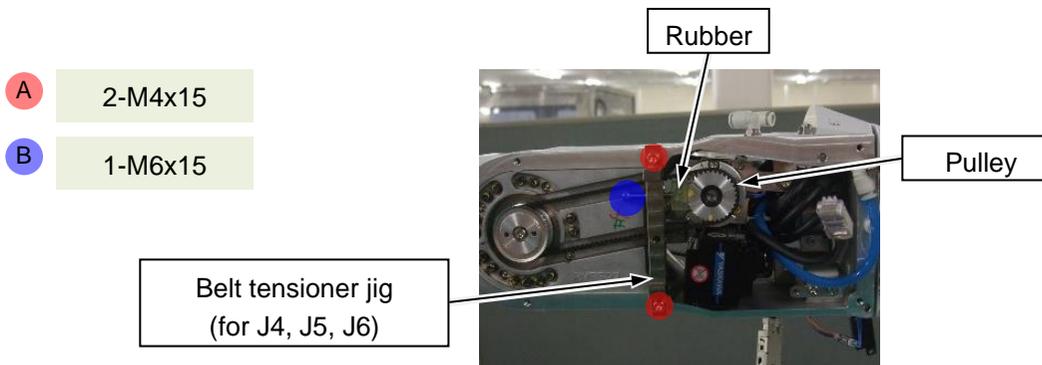


NOTE

When using the Belt tensioner jig (maintenance part):

Fix the Belt tensioner jig (for J4, J5, and J6) with the screws (2-M4x15) and push the rubber against the pulley.

Tension can be applied by pushing the rubber with the set screw (M6x15).



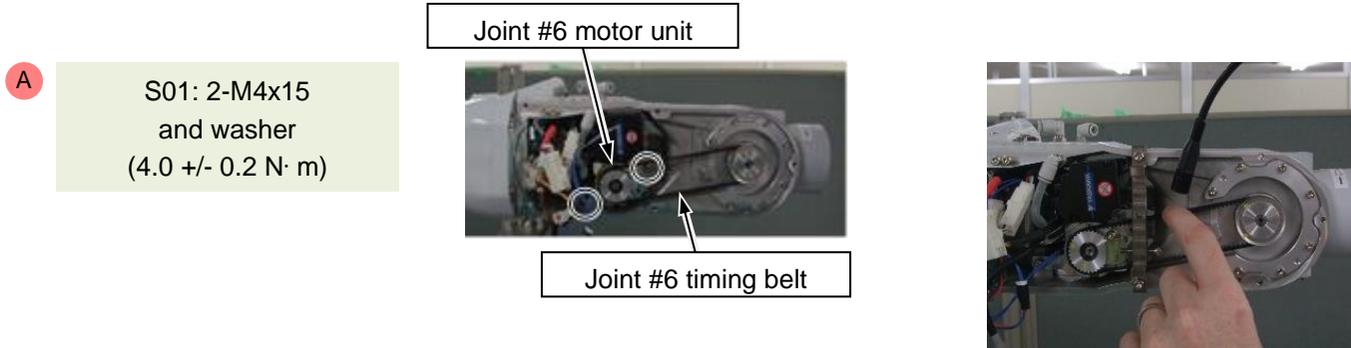
Joint #6 Timing Belt

1. Apply the proper tension to the Joint #6 timing belt and secure the Joint #6 motor unit.

Joint #6 timing belt tension: 15 to 30 N

Belt tension meter setting values

Weight: 2.5 g/mm width x m span, Width: 6 mm, Span: 122 mm

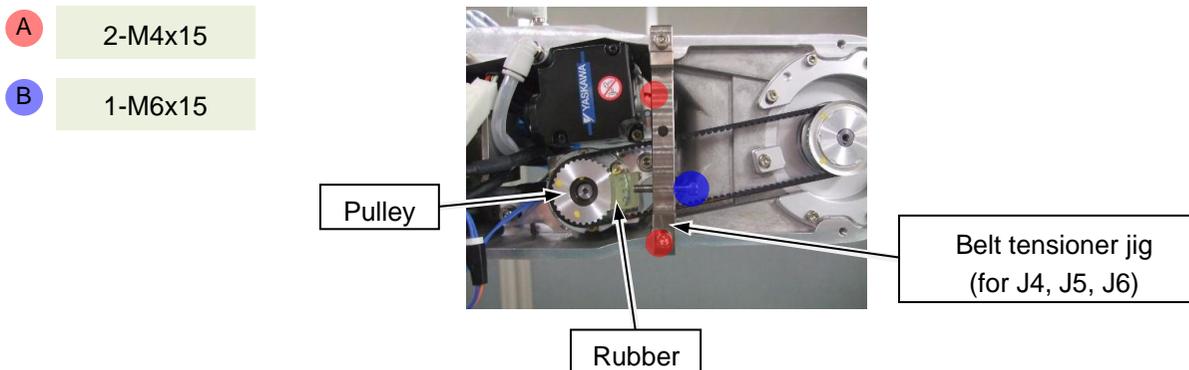


NOTE

When using the Belt tensioner jig (maintenance part):

Fix the Belt tensioner jig (for J4, J5, and J6) with the screws (2-M4x15) and push the rubber against the pulley.

Tension can be applied by pushing the rubber with the set screw (M6x15).



3.2 Calibration

3.2.1 What is Calibration?

Removal or replacement of the motors, reduction gears, or timing belt will cause a mismatch between the origin stored on the motor side and the origin stored on the controller side, and the manipulator will not be able to perform correct positioning.

Therefore, it is necessary to align the origins after attaching, detaching, or replacing the motors, reduction gears or timing belt.

NOTE

The calibration is different from teaching.

Teaching is the process of instructing the manipulator on arbitrarily set coordinate points (including posture) within the manipulator's operating area.

3.2.2 Precautions for Calibration (for 6-axis robots)

- Be sure to perform the motor, reduction gear, and timing belt removal/replacement work and subsequent calibration for each joint. Calibrating multiple joints simultaneously at one time may require re-teaching the manipulator to restore the points set by the customer.
However, due to the structure of the manipulator, the joint #5 cannot be calibrated alone. It must be calibrated at the same time as the joint #6.
- After calibration, be sure to check the accuracy at the points set by the customer. See the section below on how to check the accuracy.
[3.2.6 Performing the Calibration \(4\) Accuracy Testing](#)
- There are two methods to move the Manipulator during calibration.

A) Moving the Manipulator using Jog & Teach

For detailed instructions, please refer to the following manuals.

EPSON RC+ User's Guide

B) Releasing the electromagnetic brake and moving the arms manually.

 CAUTION	<ul style="list-style-type: none"> • Normally, release the brake of joints one by one. Take extra care if you need to release the brakes of two or more joints simultaneously. Releasing the brakes of two or more joints simultaneously may cause hands and fingers to be caught and/or equipment damage to or malfunction of the Manipulator as the arms of the Manipulator may move in unexpected directions. • Be careful of the arm falling when releasing the brake. While the brake is being released, the Manipulator's arm falls by its own weight. The arm falling may cause hands and fingers to be caught and/or may cause equipment damage to or malfunction of the Manipulator.
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For detailed instructions, please refer to the following manuals.

C-B series Manual

C8 Manipulator 3.1.6 How to Move Arms with the Electromagnetic Brake

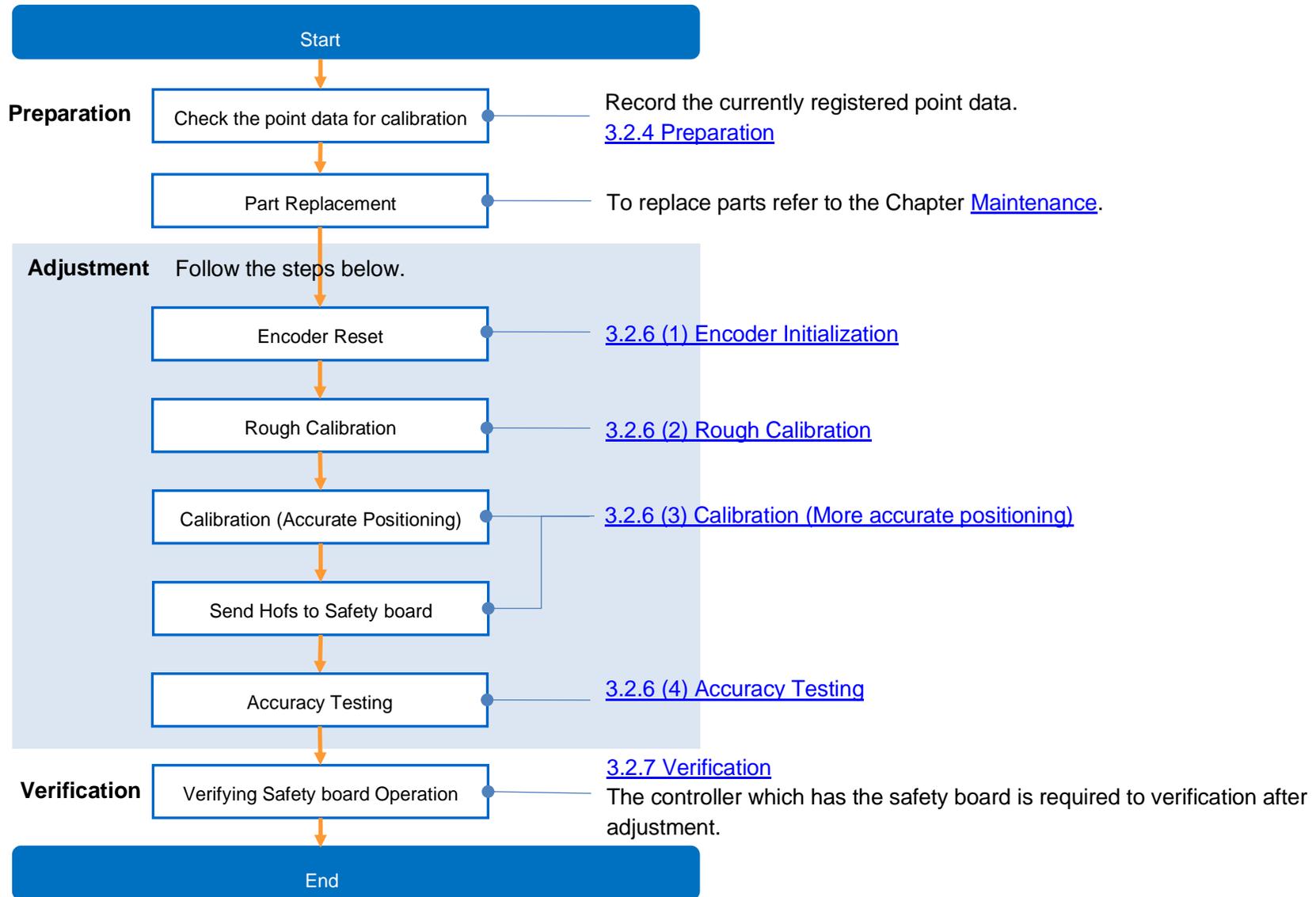
C12 Manipulator 4.1.6 How to Move Arms with the Electromagnetic Brake

C-C series Manual

C8 Manipulator 2.1.6 How to Move Arms with the Electromagnetic Brake

C12 Manipulator 3.1.6 How to Move Arms with the Electromagnetic Brake

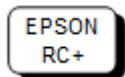
3.2.3 Calibration Flowchart



3.2.4 Preparation

To reproduce the exact manipulator position, check the point data for calibration before starting the calibration.

Before replacing parts, select point data in the currently registered point (pose) data where accuracy can be easily checked, and display the pulse value using the following procedure to record it.



Execute the following command from the [Command Window].

```
>PULSE
```

```
PULSE: [Joint #1 Pulse value] pls [Joint #2 Pulse value] pls [Joint #3 Pulse value] pls [Joint #4 Pulse value] pls [Joint #5 Pulse value] pls [Joint #6 Pulse value] pls
```

(Example)

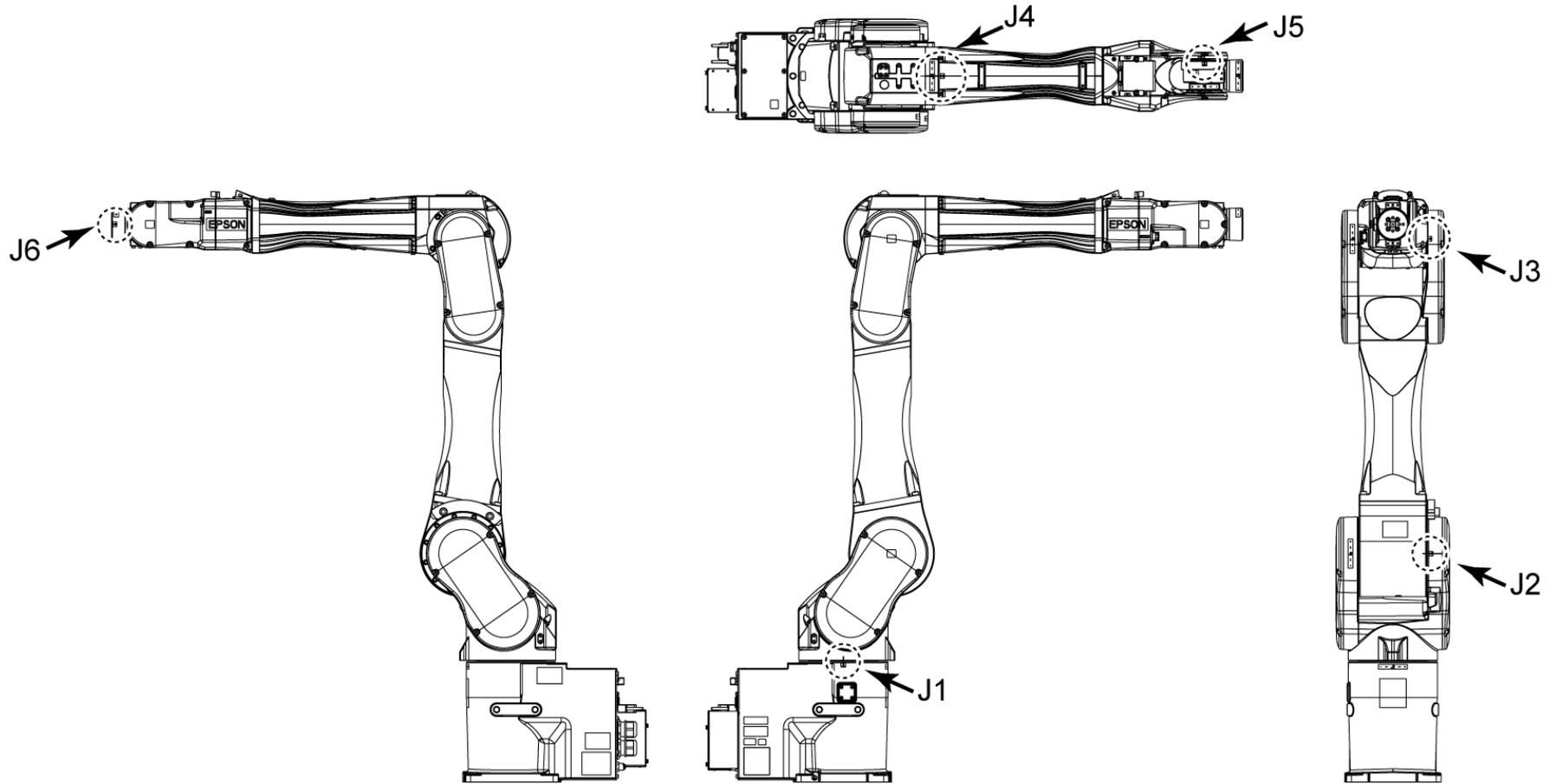
```
> PULSE: 1: 129 pls 2: 2952229 pls 3: -2311842 pls 4: 101 pls 5:-357478 pls 6: -14 pls
```

Record the pulse value of each joint with a sign (if there is a "-").

3.2.5 0-pulse Position of Each Joint

To calibrate at the 0-pulse position, refer to the figures below.

The 0-pulse position of each joint is the position where the marks at the positions shown in the figure below are approximately aligned with each other.



(C8XL)

3.2.6 Performing the Calibration

**WARNING**

- To ensure safety, a safeguard must be installed for the robot system. For details on the safeguard, refer to the *Installation and Design Precautions* in the *Safety* chapter of the *EPSON RC+ User's Guide*.
- Before operating the robot system, make sure that no one is inside the safeguarded area. The robot system can be operated in the mode for teaching even when someone is inside the safeguarded area. The motion of the Manipulator is always in restricted (low speeds and low power) status to secure the safety of an operator. However, operating the robot system while someone is inside the safeguarded area is extremely hazardous and may result in serious safety problems in case that the Manipulator moves unexpectedly.

Command Input

The calibration procedure includes steps to enter commands using the command window.

To use the command window, select the EPSON RC+ menu [Tools] - [Command Window].

Jog Motion

The calibration procedure includes a procedure to make the manipulator perform jog and other operations using the [Jog & Teach] page of the Robot Manager. To use the [Jog & Teach] panel, select the EPSON RC+ menu [Tools] - [Robot Manager] and select the [Jog & Teach] page.

In the calibration procedure that follows, where the [Jog & Teach] operation is required, it is simply stated as [Jog & Teach], and the specific operation method is omitted.

Performing the Calibration

The calibration procedure is the same for all the joints. This section describes the procedure for calibrating the joint #3 as an example. To calibrate other joints, change the number entered in the command window to the number of the target joint.

(1) Encoder Initialization

1. Move the joint to be calibrated to the 0-pulse position.

NOTE	<ul style="list-style-type: none">• For details on the 0-pulse position, refer to 3.2.5 0-Pulse Position of Each Joint.• For details on how to move the joint, see 3.2.2 Precautions for Calibration (for 6-axis robots).• When moving the joint with [Jog & Teach], a pulse out-of-range error may occur. If this occurs, do the following. Open the command window. Execute the following command. <code>> Encreset 3</code> Reboot the controller. After the reboot, the jog operation will be available.
-------------	---

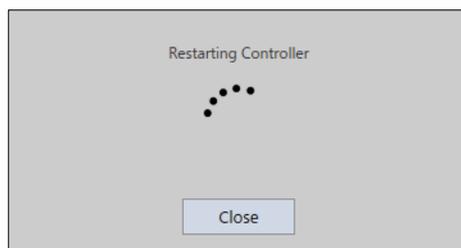
2. Execute the encoder initialization command.

Open EPSON RC+ Menu - [Tools] - [Command Window].
Type the following in the [Command Window] and execute.

```
> Encreset 3
```

3. Complete the encoder initialization.

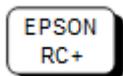
Select EPSON RC+ menu- [Tools] - [Controller] and click the <Reset Controller> button.



This window will disappear when the Controller starts up.

(2) Rough Calibration

1. Input the command in the Command window and execute it.

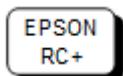


Execute one of the following commands to reset the encoder of the joint you want to calibrate from the menu-[Tool]-[Command Window].

```
>calpls 0,0,0,0,0,0
```

* Manipulator does not move.

2. Perform the calibration.



Execute one of the following commands to reset the encoder of the joint you want to calibrate from the menu-[Tool]-[Command Window].

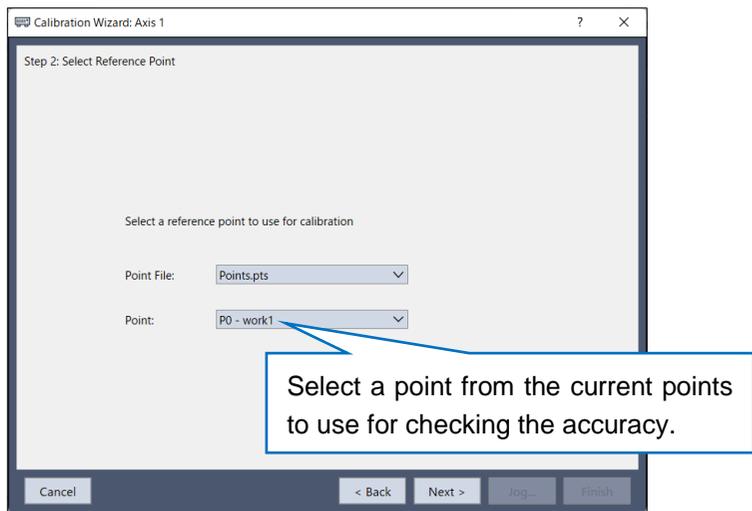
```
>calib 3
```

NOTE

- Warning 590 (Detect the different of the calibration settings in the controller and Safety Board) occurs when the Calib command are executed.

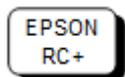
3. Send the Hofs value to the safety board.

Select the reference point to use for calibration, and click the <Next> button.



NOTE	<ul style="list-style-type: none">• The Hofs value is the joint origin correction value. It is automatically calculated in the controller when the Calib command is executed.
-------------	---

(3) Calibration (More accurate positioning)



Move the Manipulator to the selected point data by jogging in [Jog & Teach].

Move the joint* which is not calibrated to the specified point by motion command.

* When the Joint #5 is being calibrated, move the Joints #1 - #4 to the home positions.

For example, when the selected point data is "P1", execute "Motor On" in [Control Panel] and execute "Go P1" in [Jog & Teach].

Position the calibrating joint* to the selected point data position accurately by jog command.

* When the Joint #5 is being calibrated, move the Joint #5 and #6 to the home positions.

Select the "Joint" jog mode from [Jog & Teach] to operate in the jog motion.

Enter the command below in the command window and execute it.

Execute the command below in the menu -[Tools]-[Command Window].

```
>calpls pppls(P1,1), pppls(P1,2), pppls(P1,3), pppls(P1,4), pppls(P1,5), pppls(P1,6)
```

* The Manipulator will not move.

Perform the calibration. Input one of the following commands according to the joint being calibrated.

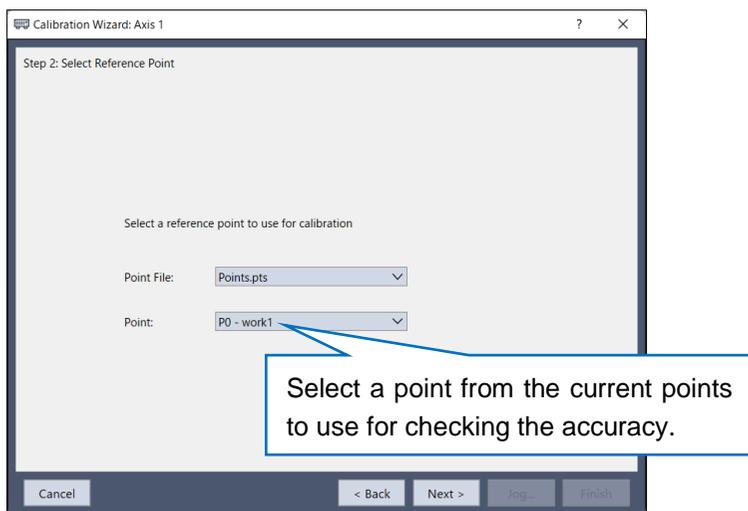
```
>Calib 3
```

NOTE

- Warning 590 (Detect the different of the calibration settings in the controller and Safety Board) occurs when the Calib command are executed.

Send the Hofs value to the safety board.

Select the reference point to use for calibration, and click the <Next> button.

**NOTE**

- The Hofs value is the joint origin correction value. It is automatically calculated in the controller when the Calib command is executed.

(4) Accuracy Testing

Move the manipulator to another point and confirm that it moves to the taught position. If the manipulator does not move to the taught position, it must be calibrated again at another point. If the manipulator still does not move to the taught position, it is necessary to reset the point.

3.2.7 Verification

For the C-B series and C-C series, it is necessary to check the operation of the Safety Board installed in the controller after completing the calibration.

For the procedure to check the operation of the Safety Board, refer to the following manuals.

C-B series

RC700-E Series Service Manual 3.4 Setup Procedure After Parts Replacement (Safety Board)

C-C series

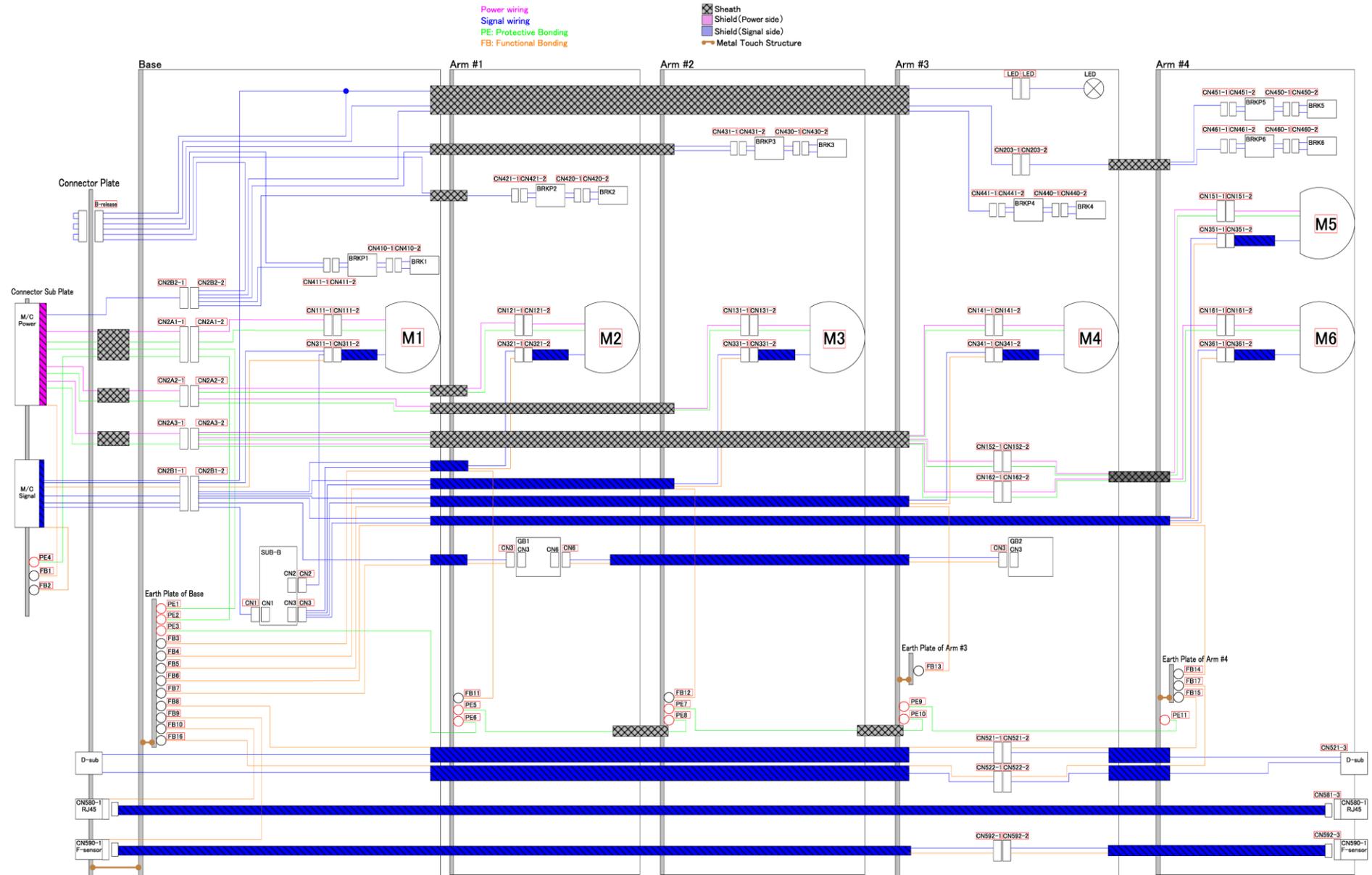
RC800-A Series Service Manual 3.4 Setup Procedure After Parts Replacement (Safety Board)

CHAPTER

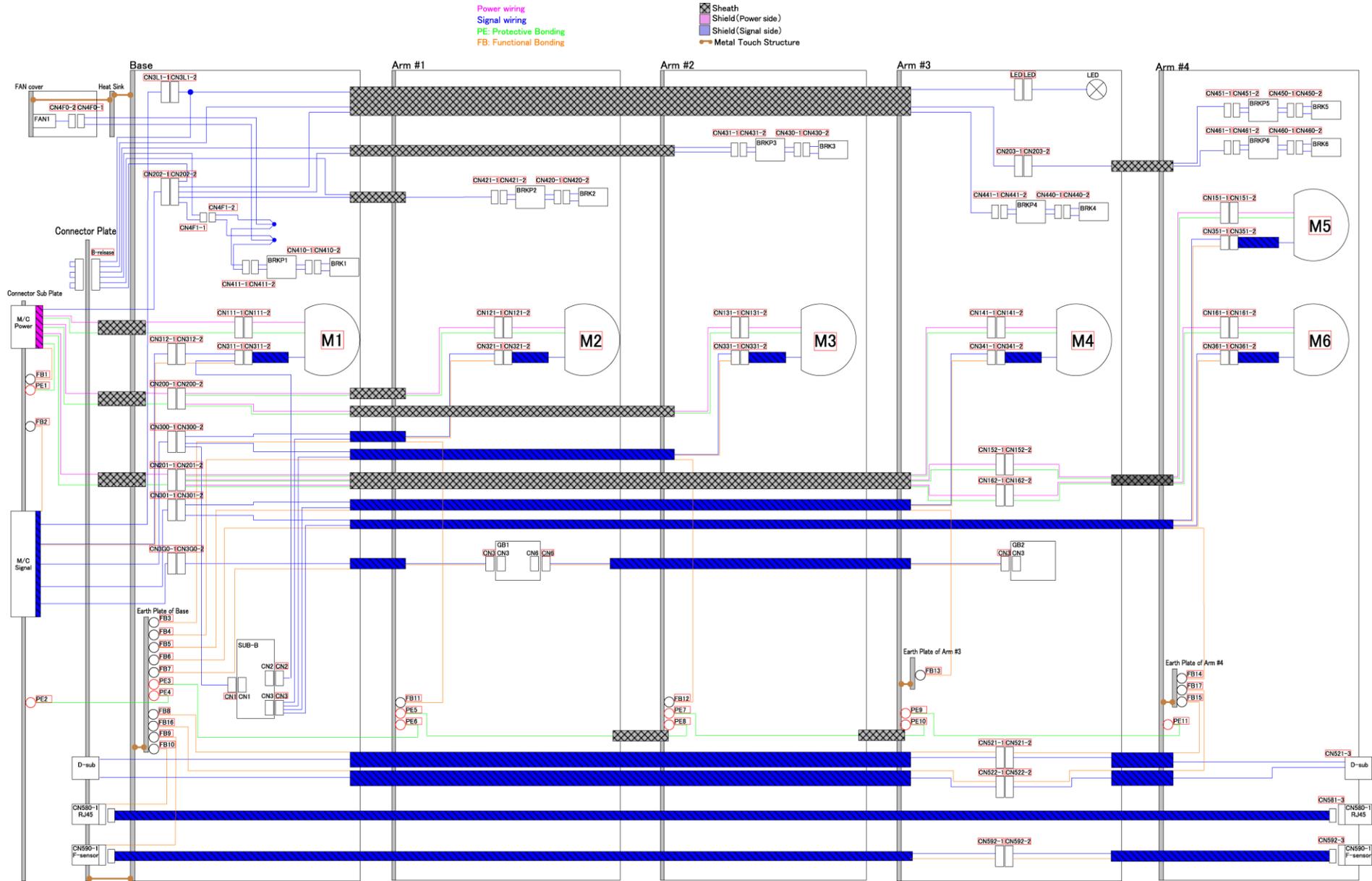
4

Block Diagram

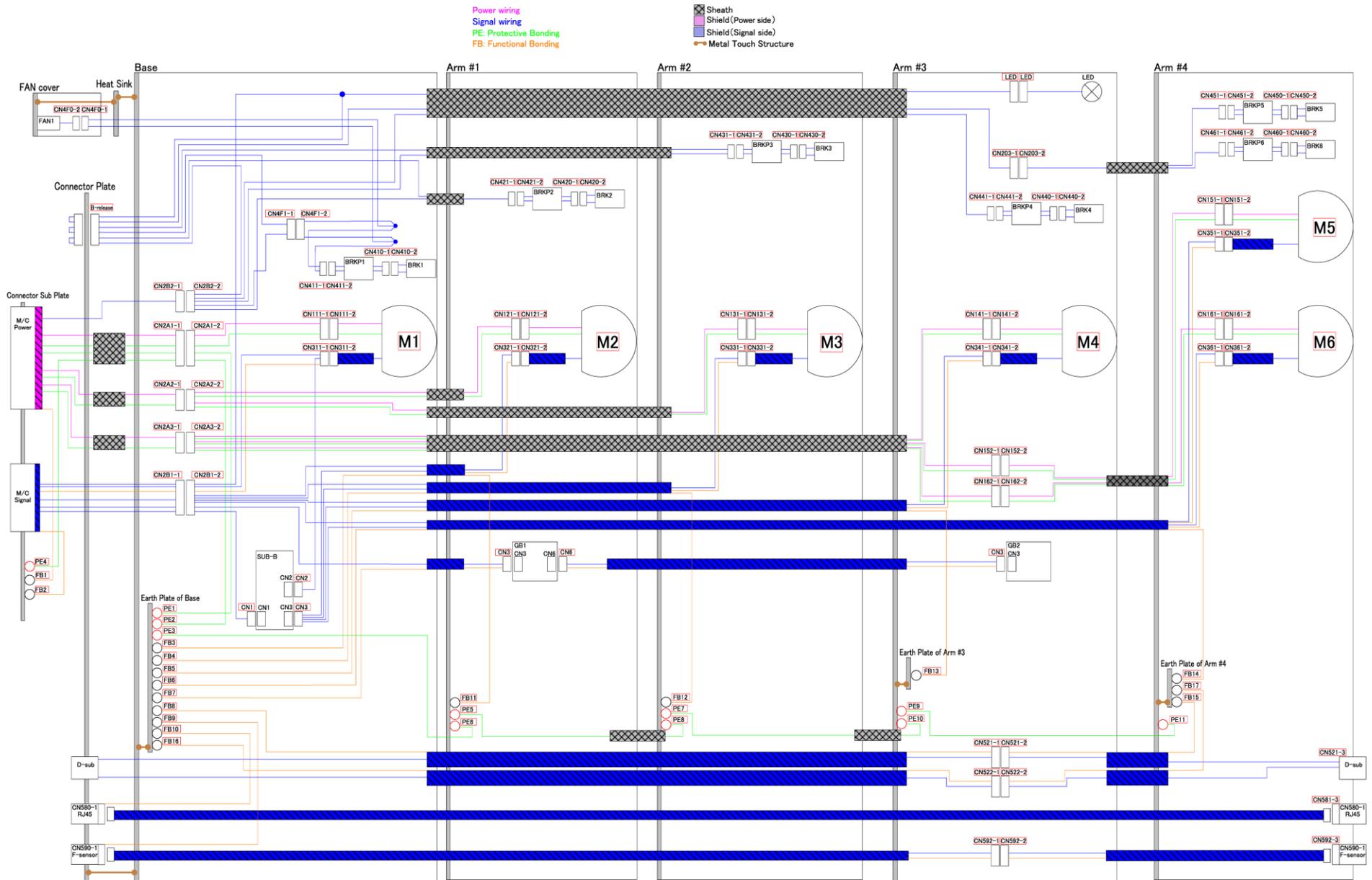
4.2 C8-C



4.3 C12-B



4.4 C12-C



CHAPTER

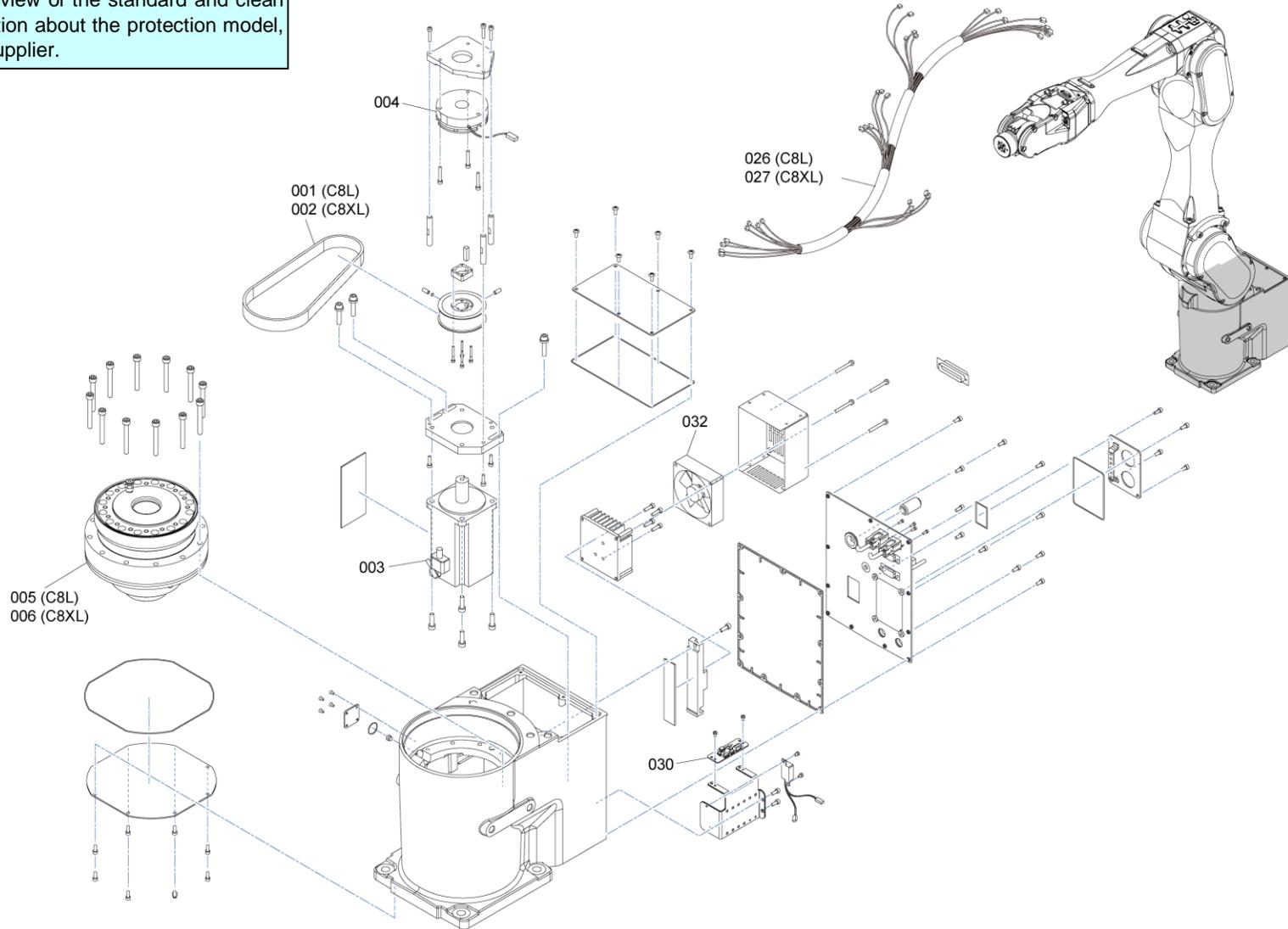
5

Exploded View/Maintenance Parts List

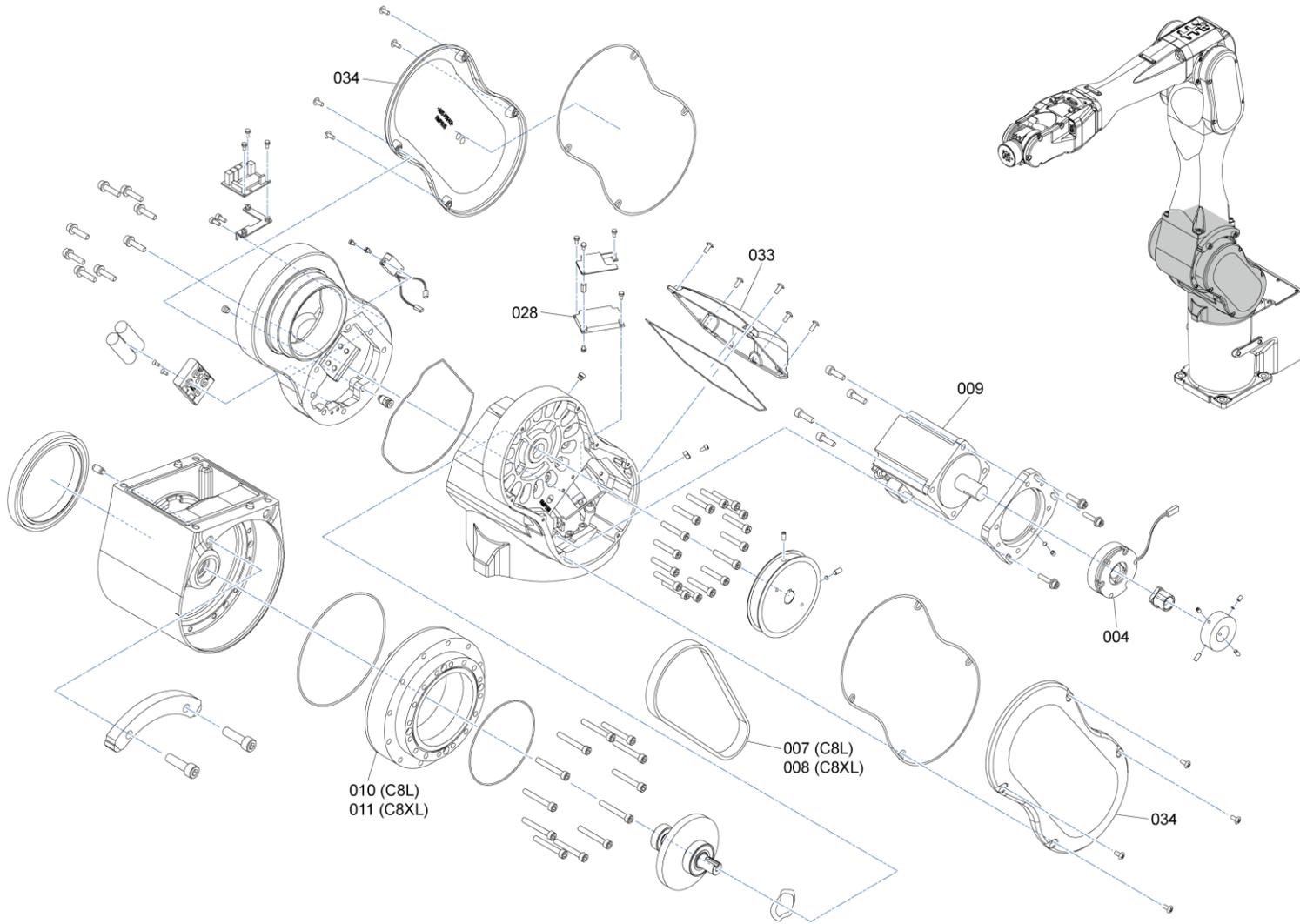
5.1 Exploded View

5.1.1 C8-B/C8-C

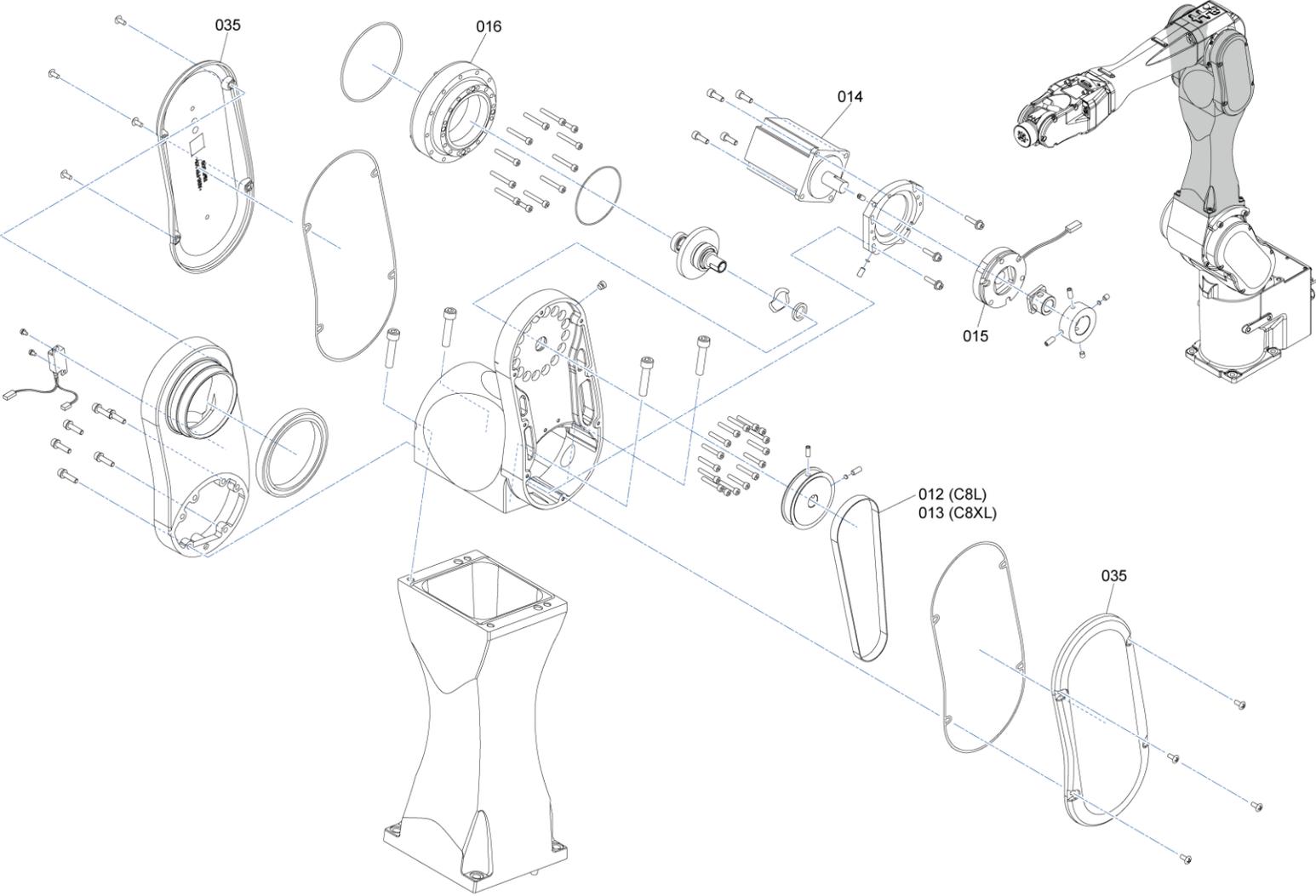
This is an exploded view of the standard and clean models. For information about the protection model, please contact the supplier.



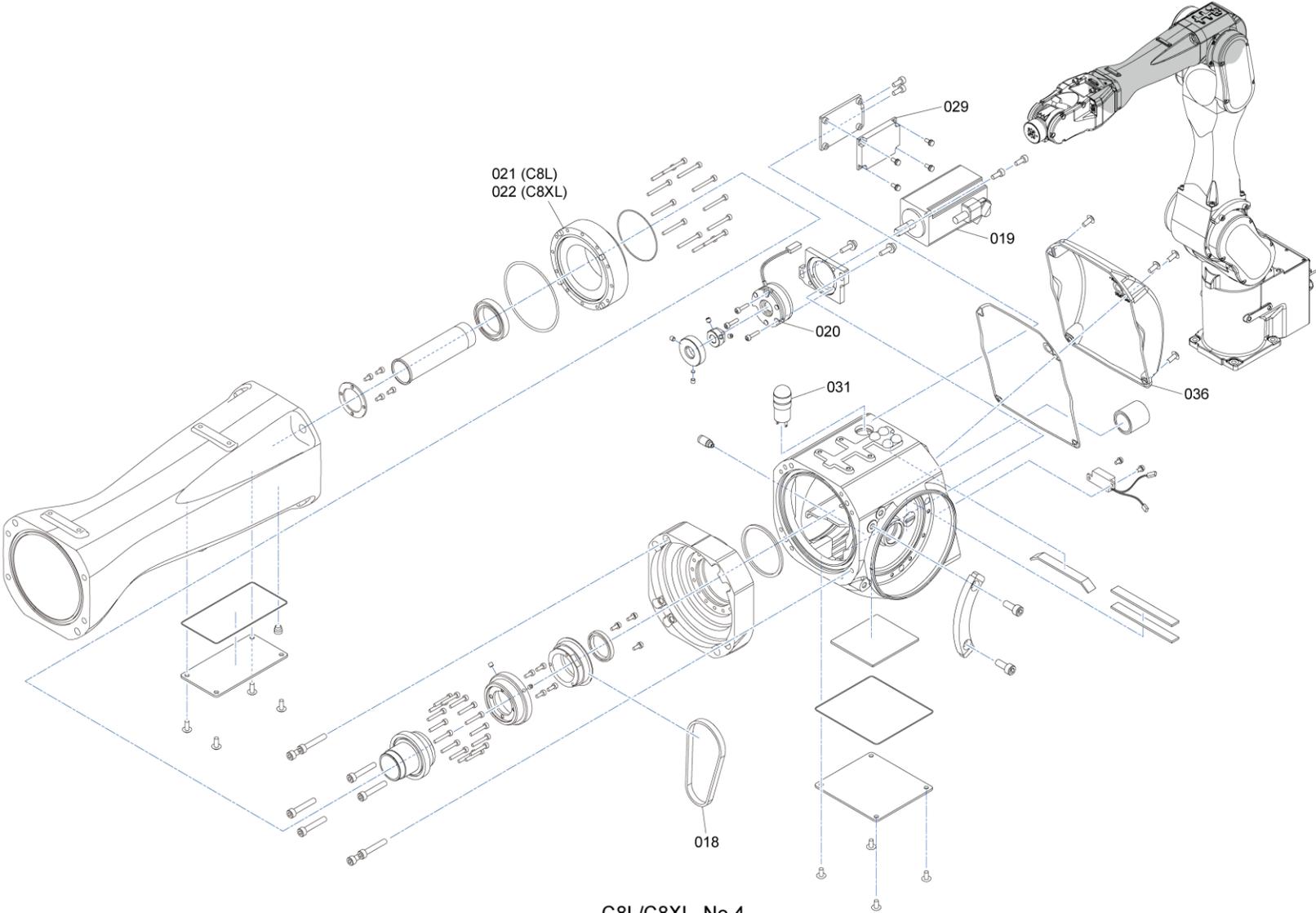
C8L/C8XL No.1

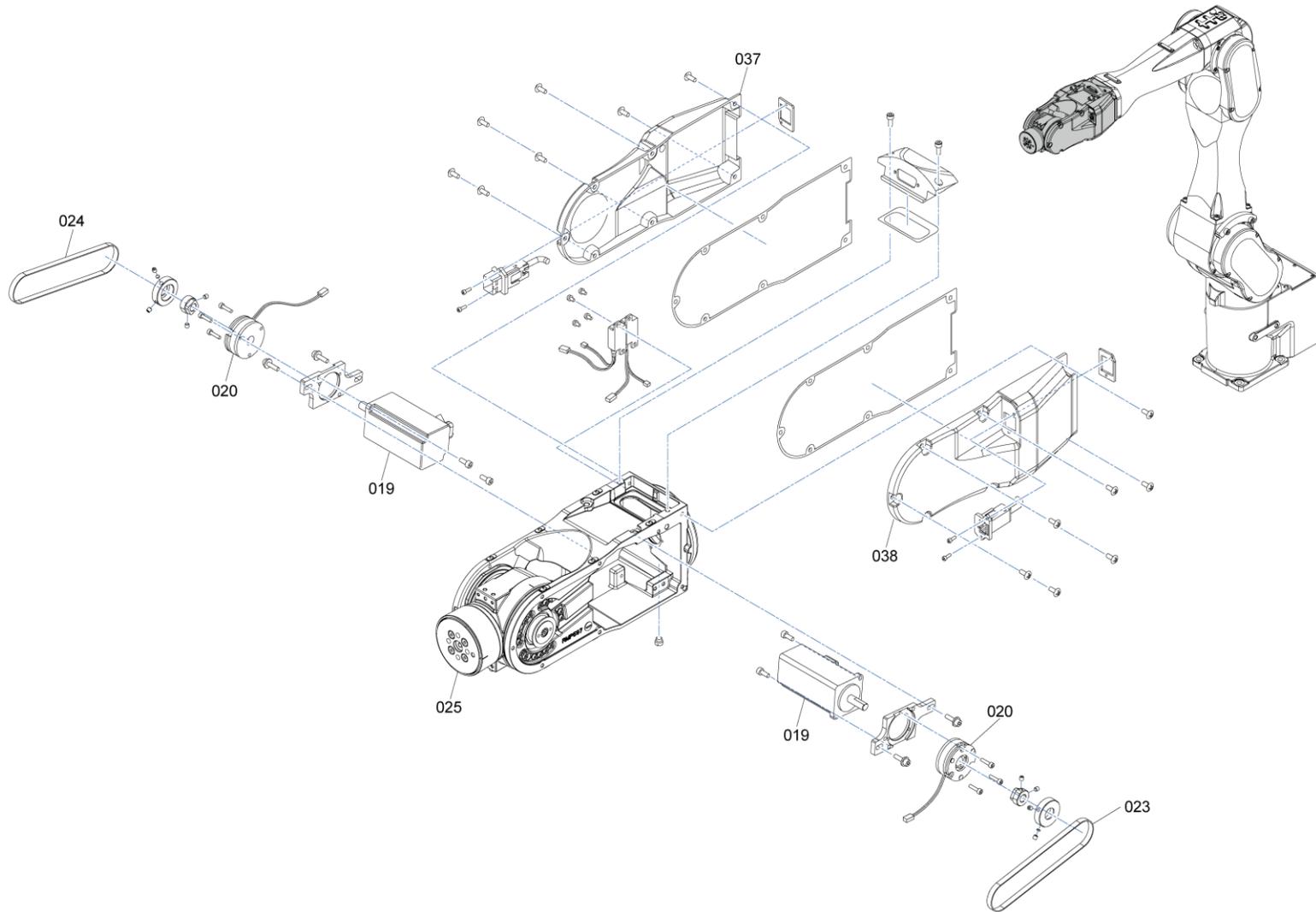


C8L/C8XL No.2



C8L/C8XL No.3

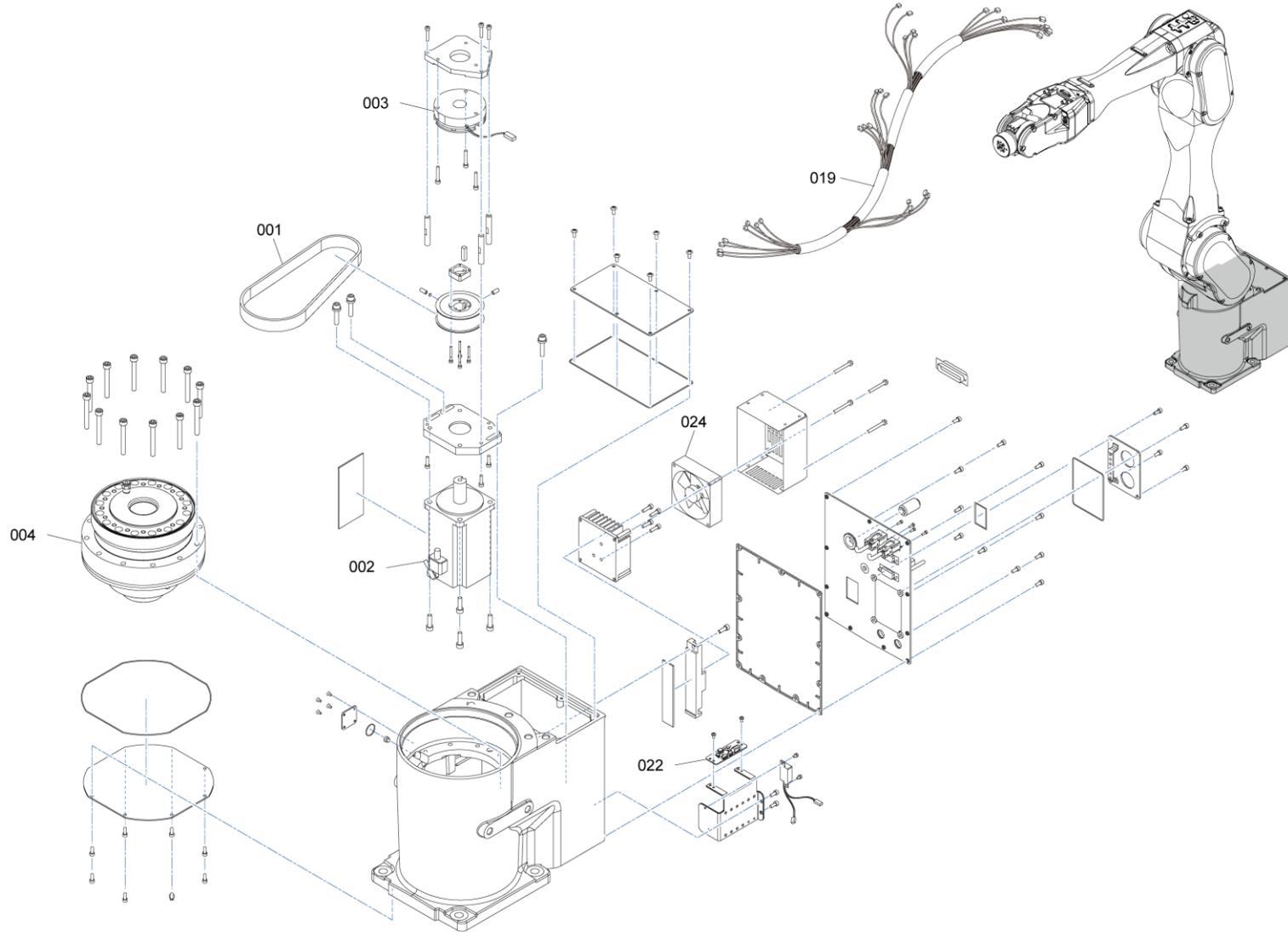




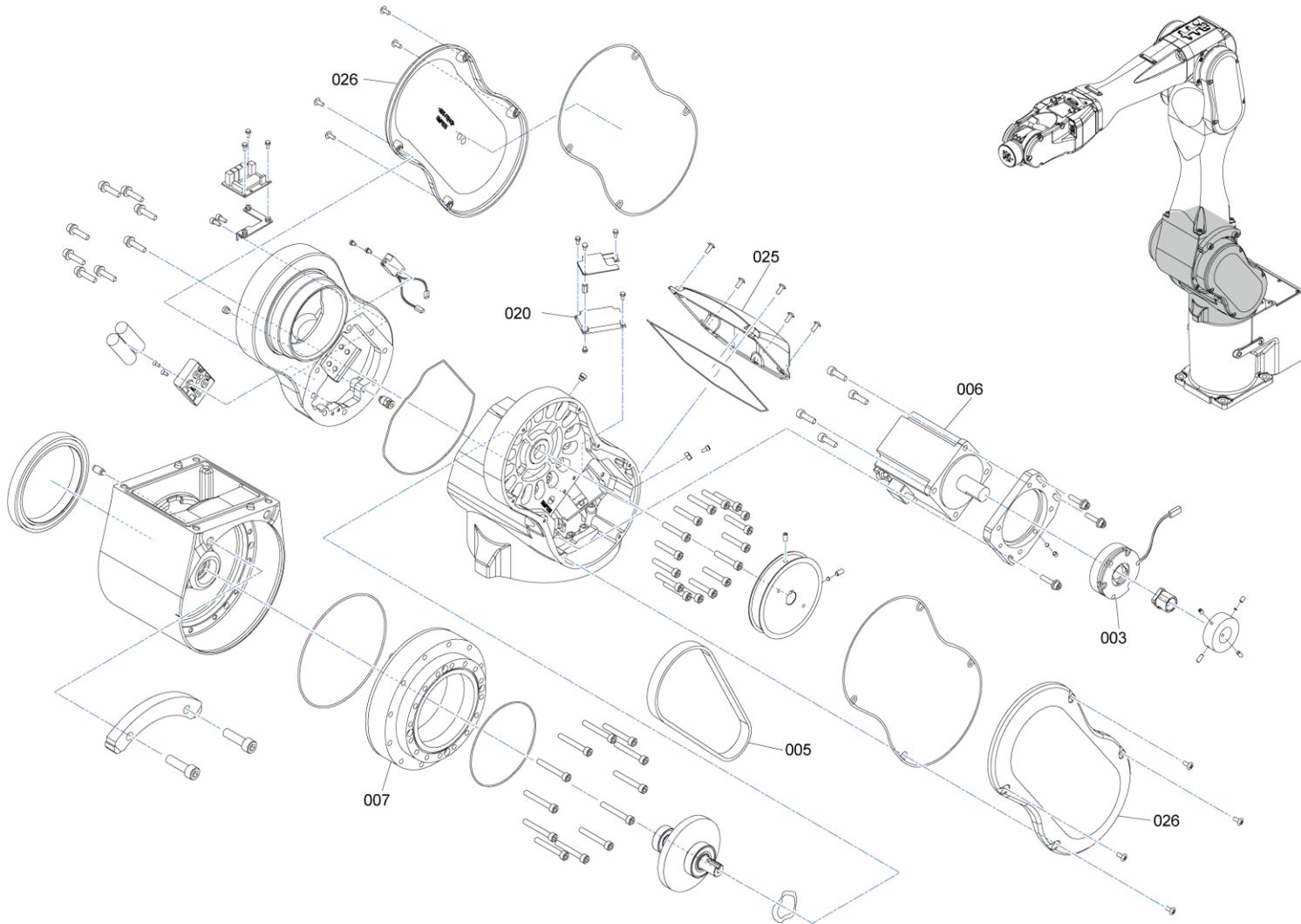
C8L/C8XL No.5

5.1.2 C12-B/C12-C

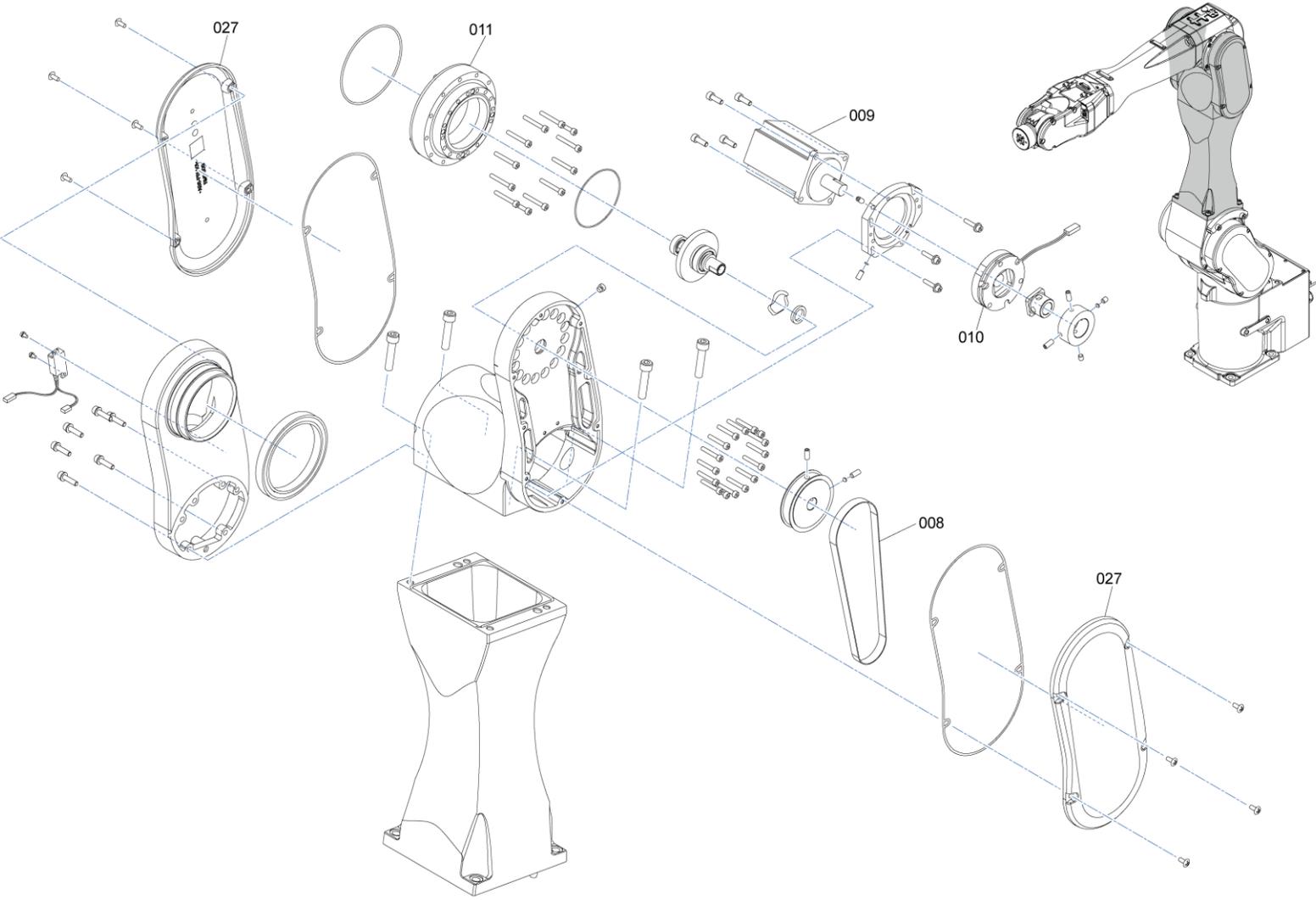
This is an exploded view of the standard and clean models. For information about the protection model, please contact the supplier.



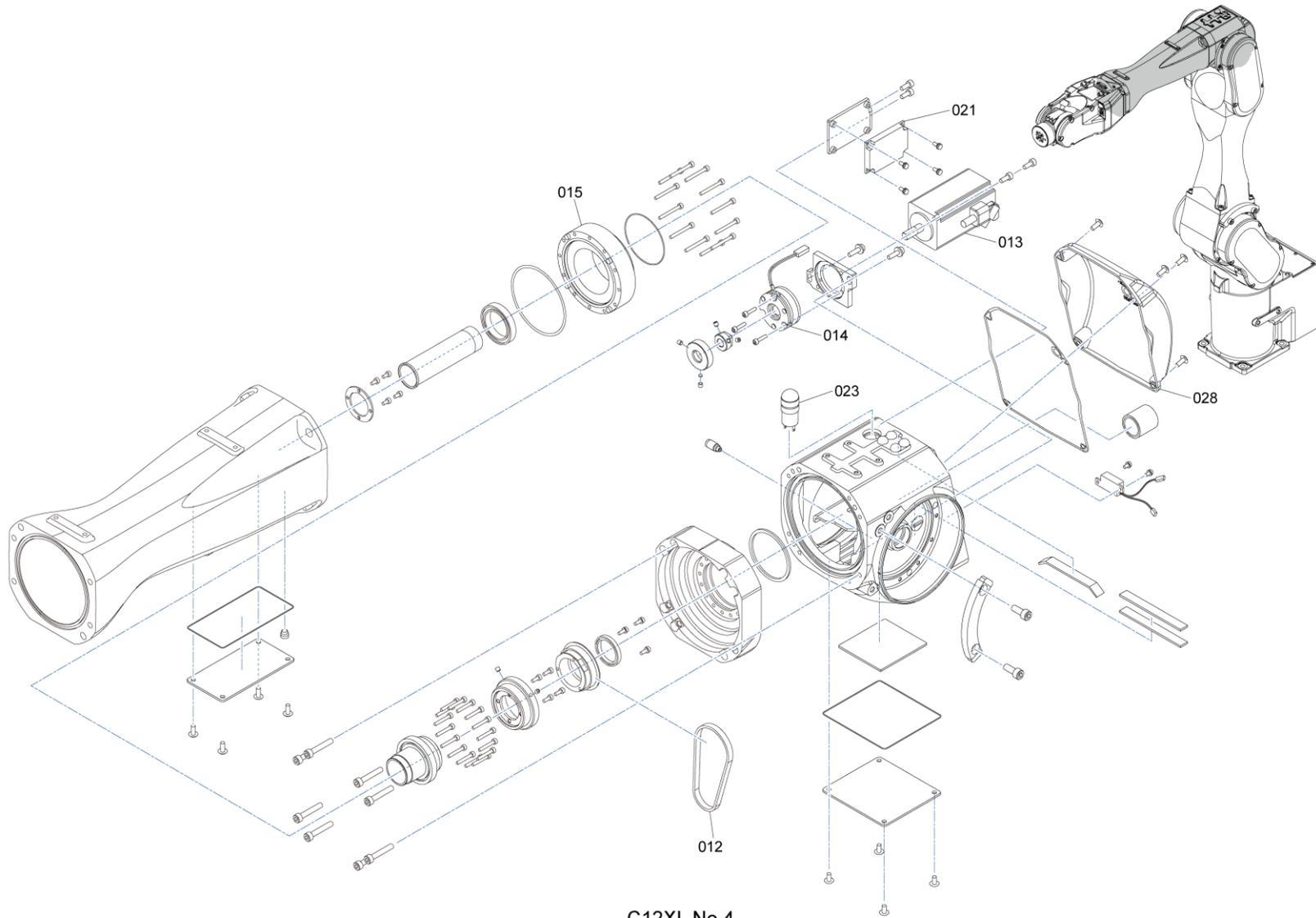
C12XL No.1



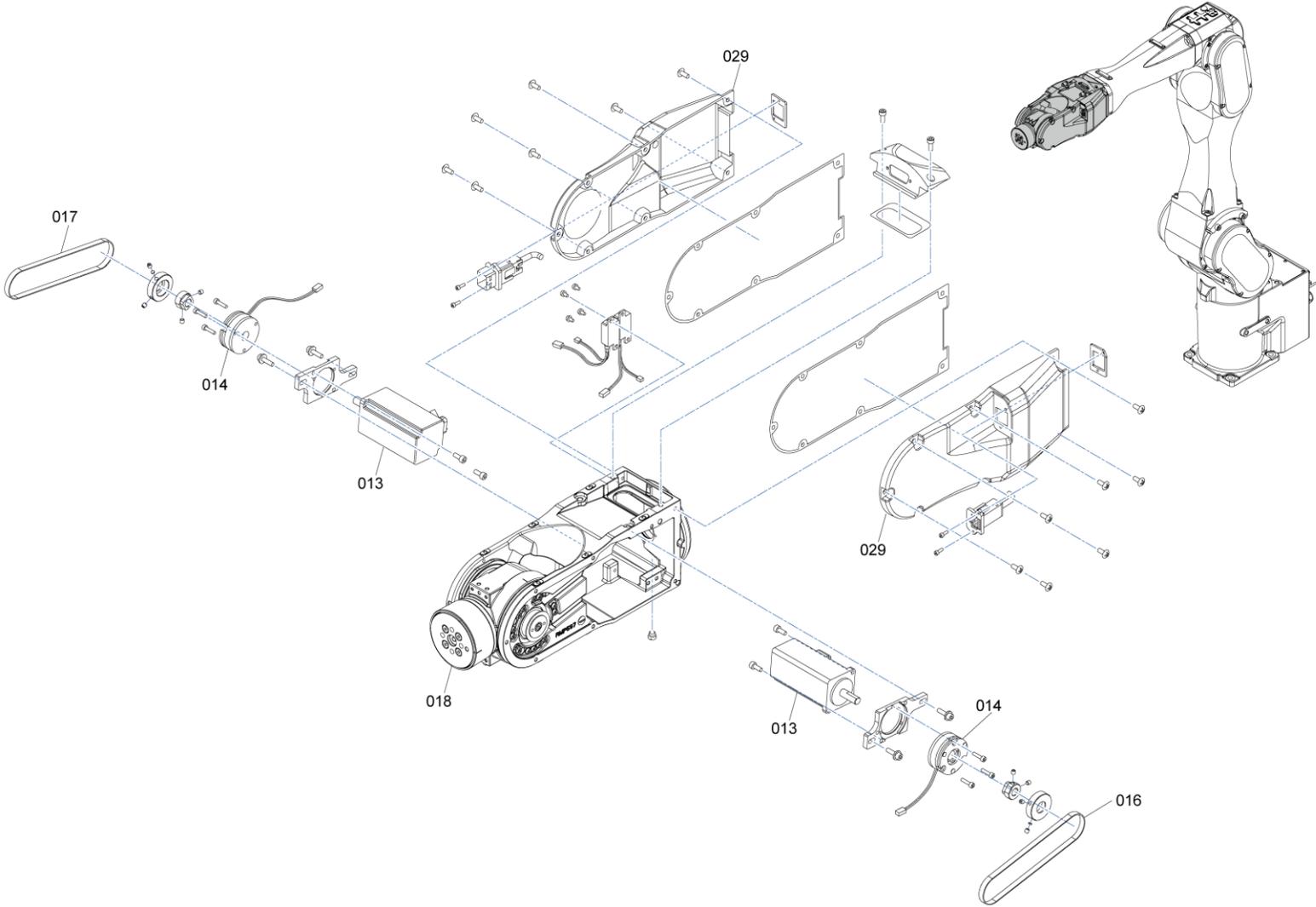
C12XL No.2



C12XL No.3



C12XL No.4



C12XL No.5

5.2 Maintenance Parts List

5.2.1 C8-B/C8-C

This is a maintenance parts list for standard/clean models. For information about the protection model, please contact the supplier.

Ref. No.	Parts Name	Parts Code	Target Models and Joints												Overhaul	
			C8-B901*** / C8-C901***						C8-B1401*** / C8-C1401***							
			J1	J2	J3	J4	J5	J6	J1	J2	J3	J4	J5	J6		
001	Timing Belt	1655929	√													√
002	Timing Belt	1655930								√						√
003	Motor	2232752	√							√						√
004	Brake	2172926	√	√						√	√					√
005	Reduction Gear Unit	1940467	√													√
006	Reduction Gear Unit	1674604								√						√
007	Timing Belt	1655924		√												√
008	Timing Belt	1655927									√					√
009	Motor	2230547		√							√					√
010	Reduction Gear Unit	1674605		√												√
011	Reduction Gear Unit	1674606									√					√
012	Timing Belt	1655918			√											√
013	Timing Belt	1655919										√				√
014	Motor	2230549			√							√				√
015	Brake	2172927			√							√				√

Ref. No.	Parts Name	Parts Code	Target Models and Joints												Overhaul
			C8-B901*** / C8-C901***						C8-B1401*** / C8-C1401***						
			J1	J2	J3	J4	J5	J6	J1	J2	J3	J4	J5	J6	
016	Reduction Gear Unit	1933056			√										√
017	Reduction Gear Unit	1674608									√				√
018	Timing Belt	1655931				√						√			√
019	Motor	2232753				√	√	√				√	√	√	√
020	Brake	2172928				√	√	√				√	√	√	√
021	Reduction Gear Unit	1674609				√									√
022	Reduction Gear Unit	1675434										√			√
023	Timing Belt	1655932					√						√		√
024	Timing Belt	1655933						√						√	√
025	Gyro Board 1	2228302													
026	Gyro Board 2	2228303													
027	SUB-B Board (DC/DC Board)	2224571													

5.2.2 C12-B/C12-C

This is a maintenance parts list for standard/clean models. For information about the protection model, please contact the supplier.

Ref. No.	Parts Name	Parts Code	Target Models and Joints						Overhaul
			C12-B1401*** / C12-C1401***						
			J1	J2	J3	J4	J5	J6	
001	Timing Belt	1655930	√						√
002	Motor	2232752	√						√
003	Brake	2172926	√	√					√
004	Reduction Gear Unit	1674604	√						√
005	Timing Belt	1655927		√					√
006	Motor	2230547		√					√
007	Reduction Gear Unit	1674606		√					√
008	Timing Belt	1655919			√				√
009	Motor	2230549			√				√
010	Brake	2172927			√				√
011	Reduction Gear Unit	1674608			√				√
012	Timing Belt	1655931				√			√
013	Motor	2230550				√	√	√	√
014	Brake	2172928				√	√	√	√
015	Reduction Gear Unit	1821978				√			√
016	Timing Belt	1655932					√		√
017	Timing Belt	1655933						√	√

Ref. No.	Parts Name	Parts Code	Target Models and Joints						Overhaul
			C12-B1401*** / C12-C1401***						
			J1	J2	J3	J4	J5	J6	
020	Gyro Board 1	2228302							
021	Gyro Board 2	2228303							
022	SUB-B Board (DC/DC Board)	2224571							