Maintenance guide

V1.1.0

ABOUT THIS DOCUMENT

 Keep these instructions for future reference.

 Follow all instructions.

This document contains information regarding various maintenance procedures that may be done on Kinova's JACO arm. It is intended for:

- Field service, customer support and sales employees of authorized distributors of JACO

Symbols, definitions and acronyms

 Important information regarding the safety of Kinova's products and their operator.

 Tip on the maintenance, operation and manipulation of Kinova's products.

General Information

The maintenance procedures detailed in this document are part of the repair and maintenance procedures that must be assured on a JACO arm. The only maintenance that must be done on a regular basis is the finger lubrication.

 Before beginning any maintenance on a client's JACO arm, please save the actual configuration with the help of the Jacosoft software[1].

[1] Please refer to the Jacosoft User Guide for detailed procedure.

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1. FINGERS – PLASTIC ASSEMBLY

There are two finger versions for the JACO arm. Only the latest version (AM 3240 0003) is covered by this document. The oldest version (AM 3240 0002) is no longer produced.

1.1. Part Identification

For detailed part identification of the JACO arm, please refer to the JACO User Guide, section on Part Identification. The following figure represents numeration of JACO's fingers.

All three fingers have the same part number as they are identical and interchangeable

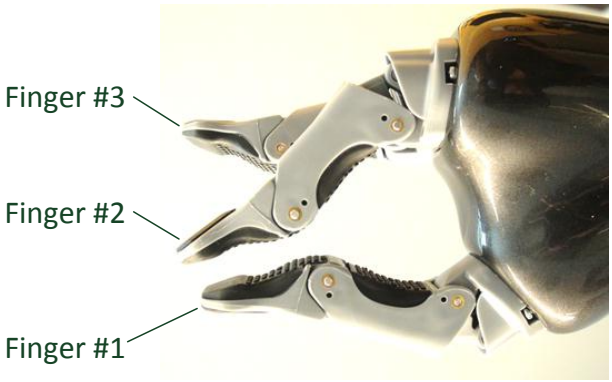


Figure 1 – Finger numeration (right-handed configuration)

In a right-handed configuration (Figure 1), finger #1 represents the "thumb", finger #2 represents the "index" and the other finger (not closing with finger #1) represents finger #3. In a left-handed configuration where the action of finger #2 and #3 has been inverted with the adequate configuration[2], finger #1 represents the "thumb", finger #3 represents the "index" and the other finger (not closing with finger #1) represents finger #2.

The following figure represents the parts identification for JACO's fingers.

[2] See Jacosoft User Guide for detailed information

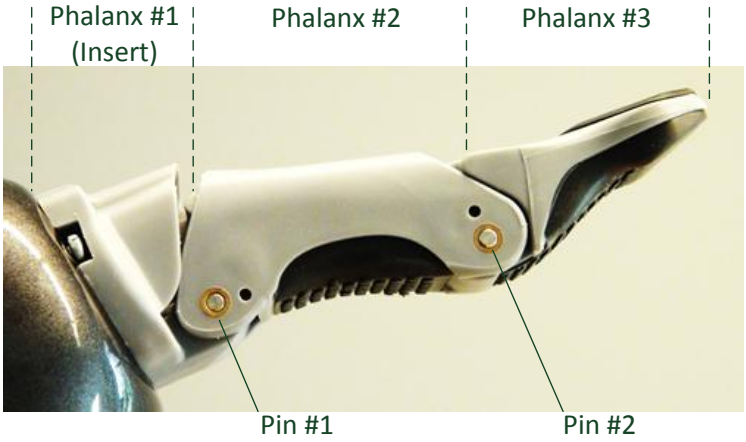


Figure 2 – JACO's finger parts ID

Figure 3 – JACO's finger parts ID once disassembled

1.2. Finger Removal

Purpose: For maintenance, repair or replacement.

Period: When needed.

Estimated time: 5 minutes per finger.

Applicable parts: Finger – Plastic assembly (AM 3240 0003), fingers #1 to #3

TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2 mm

PROCEDURE

JACO must be powered and connected to a joystick to complete procedure.

1) Place JACO's hand at working height, palm up, and open fingers at mid-range;
2) Remove pin #1 of finger by pushing it out with the 2mm Allen Key;

Do not overstress the opposite wing.

3) Remove the 4 corners cap screws holding phalanx #1 with 2mm Allen key;

You will need to move the fingers in a way to access easily each screw.

4) Unscrew the finger from the lead screw.

You may partly unscrew the finger by holding the finger you wish to remove while closing the three fingers simultaneously with the joystick.

1.3. Finger Installation

Purpose: For maintenance, repair or replacement.

Period: When needed.

Estimated time: 5 minutes per finger.

Applicable parts: Finger – Plastic assembly (AM 3240 0003), fingers #1 to #3.

SPECIFIC BILL OF MATERIAL		
Quantity	**Description**	**Manufacturer & P/N**
n/a	Thread locker	Loctite 242
0.025 oz	Lead Screw Lubricant (Bronze Nut)	Thomson, TriGEL-600Sm
TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2 mm

PROCEDURE

JACO must be powered and connected to a joystick to complete procedure.

1) Lubricate the finger (see procedures 2 to 5 of section 1.4, p.4);
2) Place the finger's insert on the finger motor's lead screw and, using joystick, open the fingers until the insert is fully engaged and the lead screw is visible outside the insert;
3) Add a light amount of Loctite 242 on 3 mm at end of each cap screw;
4) Screw finger in place;

Do not apply too much torque as it could deform the finger base or break the brass inserts of the finger actuator.

You may verify the torque by trying to move the finger base. If it moves, add more torque.

5) Realign all holes of pin #1 and gently push it back in;
6) Make 5 open/close cycles to make sure the finger opens and closes properly.

If the finger stops moving before reaching full open range, reboot JACO and try again.

1.4. Finger Lubrication

Purpose: Finger lubrication ensures optimal performance of the gripper and noise reduction.

Period: Fingers should be lubricated every 6 months.

Estimated time: 30 minutes for total procedure (lubrication of the 3 fingers).

Applicable parts: Finger – Plastic assembly (AM 3240 0003), fingers #1 to #3.

SPECIFIC BILL OF MATERIAL		
Quantity	**Description**	**Manufacturer & P/N**
0.025 Oz	Lead Screw Lubricant (Bronze Nut)	Thomson, TriGEL-600Sm
3 Units	Dry tissue	n/a
n/a	Thread locker	Loctite 242
TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2 mm

PROCEDURE

JACO must be powered and connected to a joystick to complete procedure.

1) Remove finger (see 1.2 Finger Removal, p.2);
2) Using dry tissue, remove old grease from lead screw and remaining grease on the limit switch located at the bottom of finger motor as shown in Figure 4;

Do not use thinner.

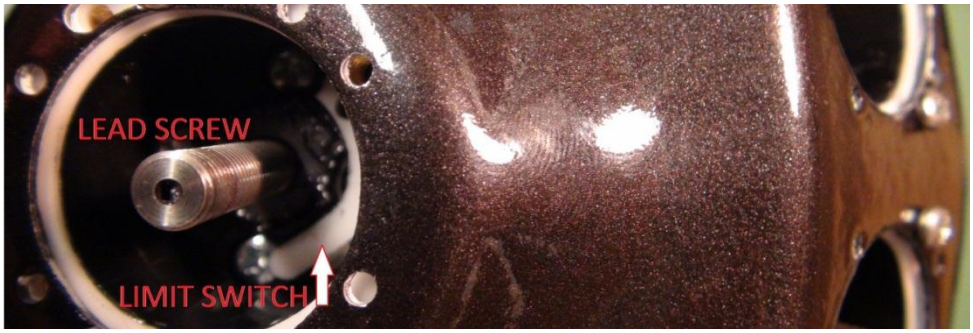


Figure 4 – Location of the limit switch

3) Using dry tissue, remove old grease from phalanx #1 (inside the brass threads of plastic insert);
4) Add new grease (about a grain of rice, see Figure 5) in phalanx #1 (brass threads, plastic insert);
5) Add new grease (about a grain of rice, see Figure 5) on the bottom of the finger motor's lead screw on a 7mm height;

Figure 5 – Amount of grease recommended

6) Reinstall finger (see 1.3 Finger Installation, p.3);
7) Make 5 open/close cycles to make sure grease is well distributed on lead screw;

If the finger stops moving before reaching full open range, reboot JACO and try again.

1.5. Finger Replacement

Purpose: Fingers need replacement if worn out or broken.

Period: When needed.

Estimated time: 10 minutes per finger.

Applicable parts: Finger – Plastic assembly (AM 3240 0003), fingers #1 to #3.

SPECIFIC BILL OF MATERIAL		
Quantity	**Description**	**Manufacturer & P/N**
1	Finger – Plastic assembly	Kinova – AM 3240 0003
0.025 Oz	Lead Screw Lubricant (Bronze Nut)	Thomson, TriGEL-600Sm
3	Dry tissue	n/a
n/a	Thread locker	Loctite 242
TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2 mm

PROCEDURE

JACO must be powered and connected to a joystick to complete procedure.

1) Remove obsolete finger (see 1.2 Finger Removal, p.2);
2) Using dry tissue, remove old grease from finger motor's lead screw and remaining grease on the limit switch located at the bottom of the finger motor as shown in Figure 4 (p.5);

Do not use thinner.

3) With 2mm Allen key, gently push out pin #1 of the new finger;
4) Add new grease (about a grain of rice, see Figure 5, p.5) in phalanx #1 of the new finger (brass threads, plastic insert);
5) Add new grease (about a grain of rice, see Figure 5, p.5) on the bottom of the lead screw on a 7mm height;
6) Install new finger (see 1.3 Finger Installation, p.3).

1.6. Change JACO's handedness

Purpose: Configure JACO's hand to facilitate handling of objects if proper configuration was made in Jacosoft (Fingers #2 and #3 inverted).

Period: At JACO's installation/configuration or every time the arm is switched from user's side.

Estimated time: 15 minutes (excluding configuration with Jacosoft).

Applicable parts: Finger – Plastic assembly (AM 3240 0003), finger #1

SPECIFIC BILL OF MATERIAL		
Quantity	**Description**	**Manufacturer & P/N**
n/a	Thread locker	Loctite 242
TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2 mm
1	Phillips screwdriver	#1

PROCEDURE

JACO must be powered and connected to a joystick to complete procedure.

JACO must be configured properly with Jacosoft.

1) Remove finger #1 (see 1.2 Finger Removal, p.2);
2) With #1 Phillips screwdriver, lightly unscrew the two positioning screws;

Do not remove the positioning screws or the motor will fall into JACO's hand.

3) Rotate the motor to the opposite side of the positioning slots until the holes and the inserts are perfectly aligned (represented by yellow circles in Figure 6);

Right handed configuration Left handed configuration

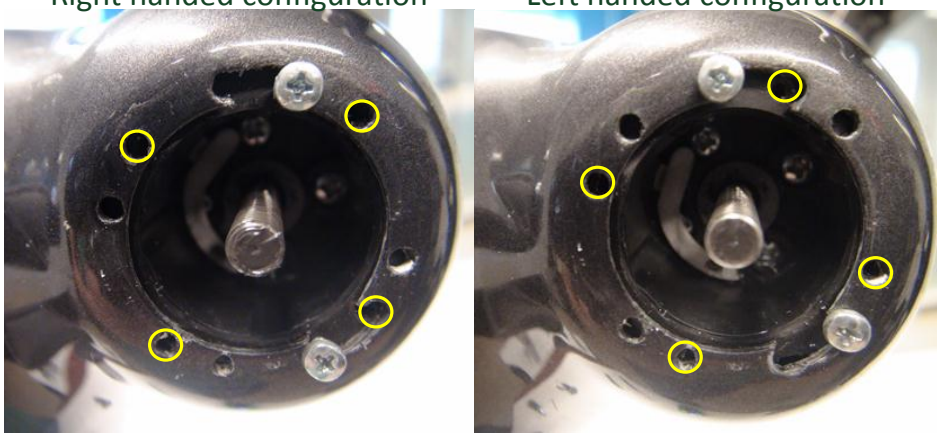


Figure 6 - Shift in finger motor alignment

4) With #1 Phillips screwdriver, tighten the two positioning screws;

Do not apply too much torque as it could break the carbon fiber.

You may temporarily screw half-way the 4 cap screws to prevent the finger motor from moving when screwing the positioning screws.

5) Reinstall finger #1 (see 1.3 Finger Installation, p.3);

6) Reboot JACO and make 5 open/close cycles with 3 fingers, then with 2 fingers.

2. FINGERS – MOTOR COMPONENT

Do not attempt any procedure in this section while JACO is powered. This could result in major failure of JACO's electronic components.

For every procedure listed in this section, wear an antistatic wrist wrap (available at many electronics stores) or be sure to discharge any static electricity. Any disregard to this warning could result in electronic failure.

2.1. Part Identification

The part number of the finger motor assembly is AM 0032 0001. The finger motors are identified following the finger they activate (refer to Figure 1, p.1). The parts of the finger motors are presented in the following figure.

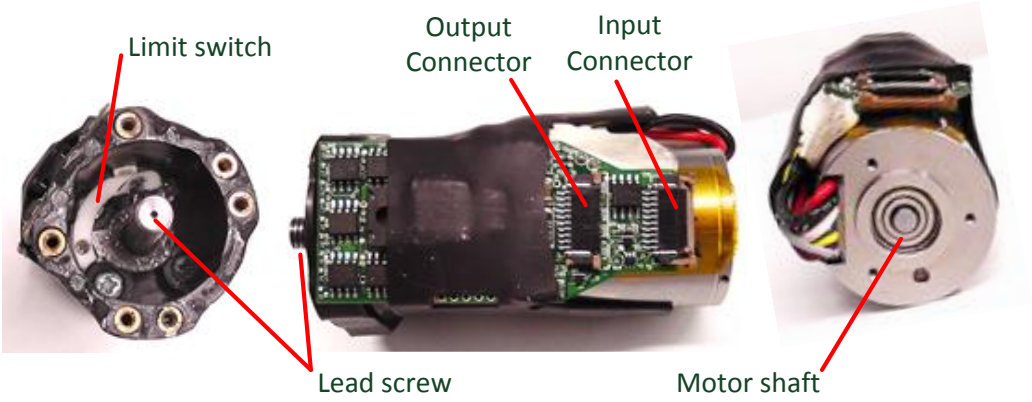


Figure 7 – Finger motor part ID

When connecting the cable to a finger motor, the bright contacts of the cable must be facing up on the connector as show in Figure 8.

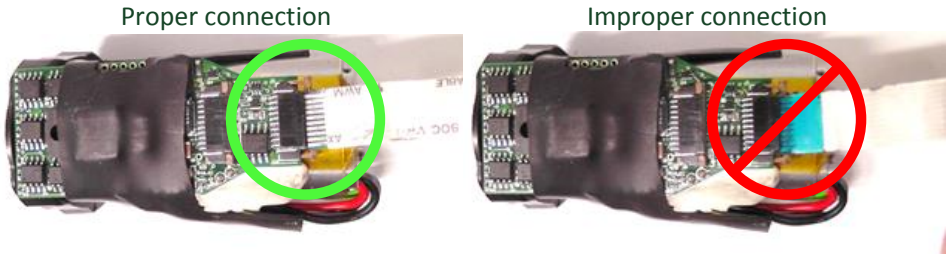
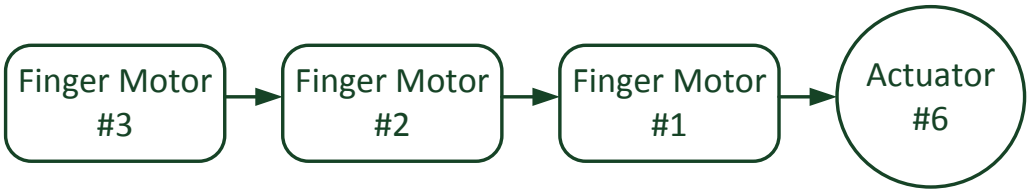


Figure 8 - Cable connection to finger motor

When connecting the finger motors, the following connection order must be respected.



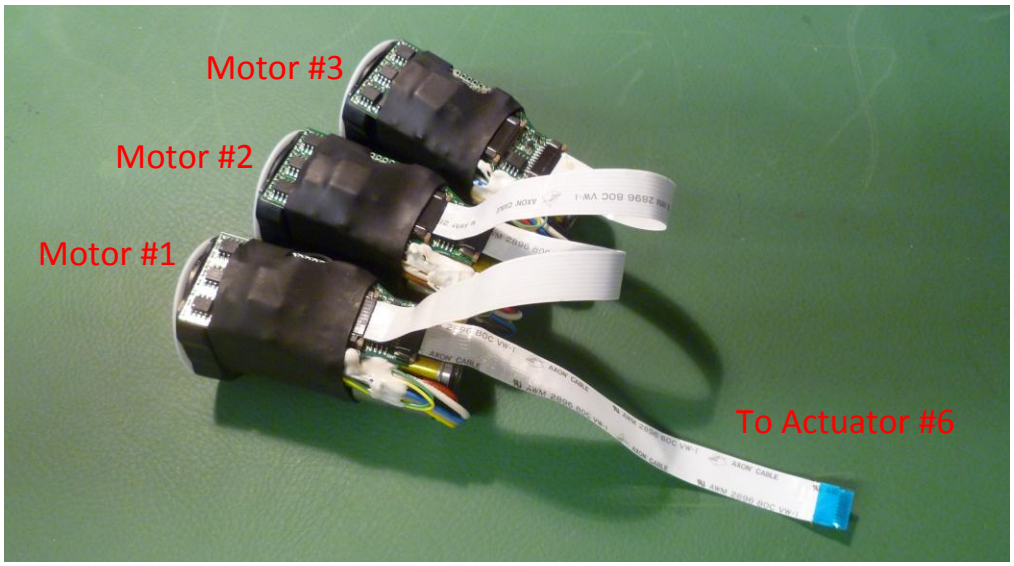


Figure 9 - Finger motor interconnection

2.2. Finger Motor Removal

Purpose: For maintenance, repair or replacement.

Period: When needed.

Estimated time: 30 minutes for removal of 3 finger motors.

Applicable parts: Finger – motor assembly (AM 0032 0001), finger motors #1 to #3
Hand assembly – (AM 0058 0002)

TOOLING		
Quantity	**Description**	**Details**
1	Phillips screwdriver	#1
1	Allen Key	2mm
1	Antistatic wrist wrap or other equivalent discharge system	n/a

PROCEDURE

1) Remove JACO's hand (see 4.2 JACO's Hand Removal, p.23);
2) Place JACO's hand on a smooth surface to prevent any wear of the carbon parts;
3) Remove all three fingers (see 1.2 Finger Removal, p.2);

Keep all parts paired to facilitate re-assembly procedure.

4) Unscrew the positioning screws retaining the motors (2 per motor);

Finger motor #1 must be removed first, followed by finger motor #2 and finger motor #3. To remove finger motor #1, all screws retaining the 3 finger motors must be removed to allow small movements of finger motors #2 and #3.

5) Remove motor #1 by performing a slight twist of the motor to get it out of JACO's hand;
6) Repeat previous steps for motor #2 and #3;
7) Remove the glue from the connector(s) of the motor that must be removed and loose the brown latch(es) to free the cable(s) (refer to Figure 22, p.23).

Verify that the other flex cables did not move while removal of finger motor.

2.3. Finger Motor Installation

Purpose: For maintenance, repair or replacement.

Period: When needed.

Estimated time: 40 minutes for installation of three finger motors.

Applicable parts: Finger – motor assembly (AM 0032 0001), finger motors #1 to #3
Hand assembly – (AM 0058 0002)

SPECIFIC BILL OF MATERIAL		
Quantity	**Description**	**Manufacturer & P/N**
n/a	Hot glue	n/a
n/a	Thread locker	Loctite 242

TOOLING		
Quantity	**Description**	**Details**
1	Phillips screwdriver	#1
1	Allen Key	2mm
1	Hot Glue Gun	n/a
1	Antistatic wrist wrap or other equivalent discharge system	n/a

PROCEDURE

Motor #1 needs to be installed last in JACO's hand. If motor #2 and/or #3 need to be installed, motor #1 should have been removed and should be installed last.

1) Connect adequate cable(s) to the motor;

You must respect the following connection procedure showed in Figure 9 (p.10).

2) Apply a light amount of hot glue on the finger motor connector;

Do not apply any other kind of glue.

3) Insert the motor in JACO's hand. The electronic board must be oriented toward the center of JACO's hand. You can verify that the motor is well positioned by looking at the holes from the outside of the carbon hand. They should align;

Do not attempt to screw the positioning screw right now. The motors must be free to move until all of them are placed in JACO's hand.

Ensure that the cables are not too twisted.

To insert motor #1 into JACO's hand, you'll have to perform a slight twist (see Figure 10). Looking inside JACO's hand while inserting motor #1 will help. Be careful not to push too hard.

The finger motor electronics (PCB) must not touch the aluminum ring at any time.

Figure 10 - Finger motor #1 inclinaison

4) Once the three motors are inside JACO's hand, align the positioning holes and the brass inserts of the motors and then screw all positioning screws. Apply light torque until the rubber gasket sits evenly. Be sure there is no resistance of the motor against the carbon fiber walls. The following figure presents the finger motor screws (big red circles) and the positioning screws (small yellow circles);

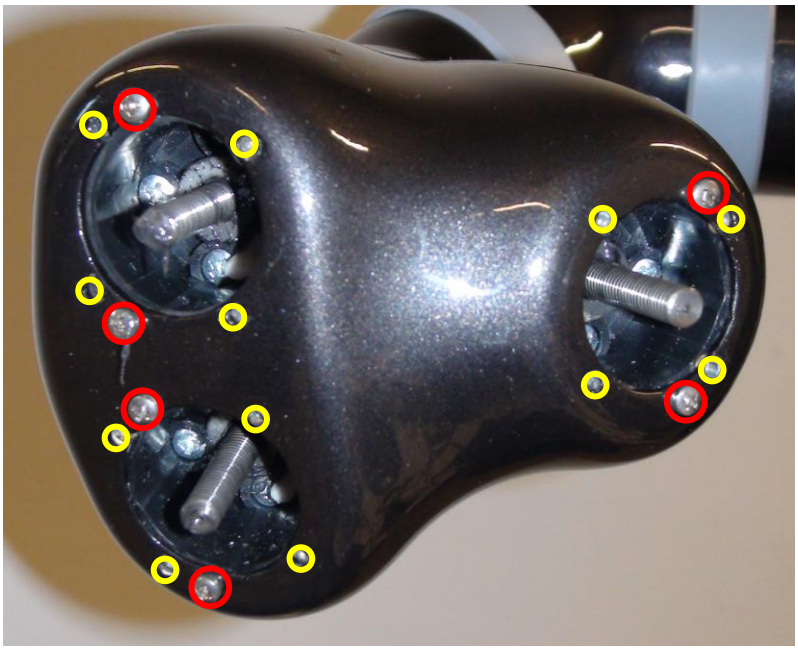


Figure 11 – Finger motor screws (big red circles) vs finger positioning screws (small yellow circles)

Refer to Change JACO's Handedness section for detailed information on motor #1 alignment.

5) Fold the cables so they cannot touch the motor shafts as shown in the following figure;

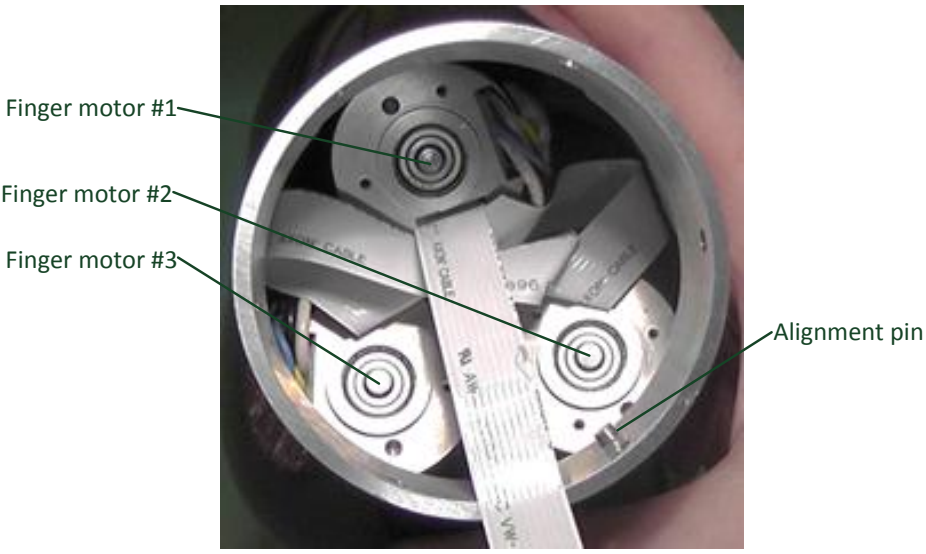


Figure 12 - Inside of JACO's hand with finger motor installed

6) Plug the cable coming from motor #1 on actuator #6 and insert the hand on actuator #6.

Align the pin located in JACO's hand aluminum ring with the notch located on actuator #6 (see Figure 12, p.14).

7) Temporarily screw at least 2 screws to hold JACO's hand in place in order to test the assembly;

8) Place JACO on its base, power it and place it in its HOME position;

9) With the joystick, make 5 open/close cycles with 3 fingers, then with 2 fingers;

If one finger or more will not move, remove the finger motors (see 2.2 Finger Motor Removal, p.10) and verify connection of cables and connection order.

10) Place JACO in its RETRACT position and power it off;

11) Install JACO's hand properly (see 4.2 JACO's Hand Installation, p.25).

12) Install all three fingers (see 1.3 Finger Installation, p.3);

13) Power JACO and place it in its HOME position;

14) Make 5 open/close cycles with 3 fingers, then with 2 fingers.

2.4. Finger Motor Replacement

Purpose: For maintenance, repair or replacement.

Period: When needed.

Estimated time: 70 minutes for replacement of 3 finger motors.

Applicable parts: Finger – motor assembly (AM 0032 0001), finger motors #1 to #3
Hand assembly – (AM 0058 0002)

SPECIFIC BILL OF MATERIAL		
Quantity	**Description**	**Manufacturer & P/N**
1	Finger motor assembly	Kinova - (AM 0032 0001)
1	Flex cable 10 pins	Kinova - (CO 0501 0001)
n/a	Hot glue	n/a
n/a	Thread locker	Loctite 242
TOOLING		
Quantity	**Description**	**Details**
1	Phillips screwdriver	#1
1	Allen Key	2mm
1	Hot Glue Gun	n/a
1	Antistatic wrist wrap or other equivalent discharge system	n/a

PROCEDURE

1) Identify the defective motor;
2) Remove the defective motor (see 2.2 Finger Motor Removal, p.10);
3) Discard obsolete motor;
4) Install new motor with new cable (see 2.3 Finger Motor Installation, p.11).

3. ACTUATOR

3.1. Part Identification

There are two types of actuators on the JACO arm:

- Big actuators (AM 0075 0001) – actuators #1 to #3;
- Small actuators (AM 0058 0001) – actuators #4 to #6.

The following figure shows the actuator numeration.

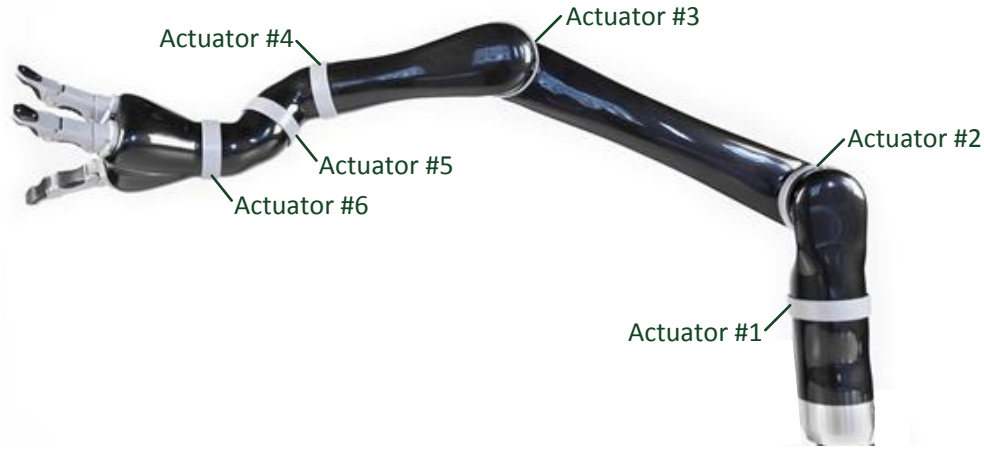


Figure 13 - Actuator numeration

Each actuator is fixed to JACO by two aluminum rings which are visible once the rubber rings are removed. The lower aluminum ring refers to the ring closest to JACO's fixed base while the upper aluminum ring refers to the ring closest to JACO's fingers. The following figure identifies lower and upper aluminum rings for actuators #1 and #2.

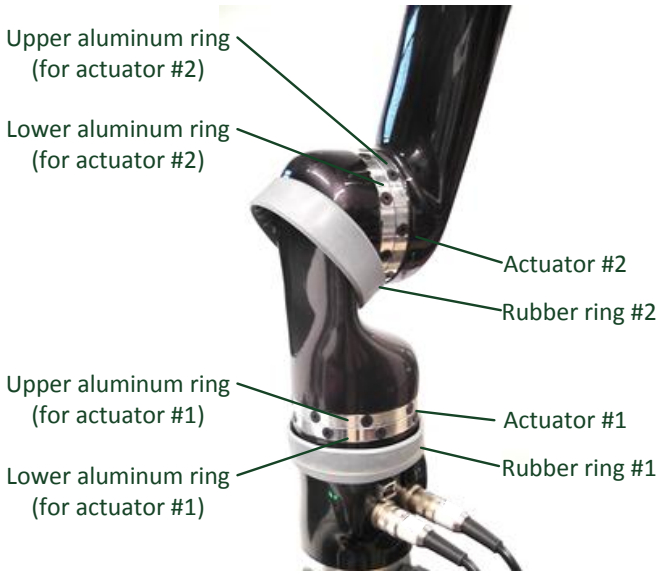


Figure 14 - Identification of lower and upper aluminum rings

3.2. Actuator Removal

Purpose: For maintenance, repair or replacement.

Period: When needed.

Estimated time: 10 minutes per actuator.

Applicable parts: Big actuator (AM 0075 0001), actuator #1 to #3
Small actuator (AM 0058 0001), actuator #4 to #6

TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2mm for AM 0058 0001 2.5mm for AM 0075 0001
1	Plastic scrubbing pad	3M Scotch Bright

To access screws of actuator #2, the shortest part of 2.5 mm Allen Key must not exceed 19mm (3/4") in length (see following figure).

Figure 15 - Length requirement for 2.5mm Allen Key to access actuator #2 screws

PROCEDURE


JACO must be installed on a table base.


JACO must remain unplugged.


Protect JACO from falling while unplugged.

1) Gently slide the rubber ring to reveal the screws holding the actuator that needs to be removed.


Be careful to lift up the ring in a circular pattern in order to prevent the retaining pins from breaking off when sliding.

2) Unscrew all screws located on the upper aluminum ring and keep them in a safe place;


Protect the upper part of JACO from falling when screws are removed.

3) Separate the upper aluminum ring from the actuator that must be removed by gently pulling it out from its place;


Do not use any tool to pry the parts


There is a cable located between each actuator and if you pull too hard, it might break the cable.

4) Remove the glue on the connector of the actuator and release the brown latch to free the cable;

5) Unscrew all screws located on the lower aluminum ring and keep them in a safe place;

6) Remove the actuator by gently pulling it out of its place. Please respect the warnings stated in step 3;


An actuator that is hard to remove may be caused by an accumulation of thread locker between the actuator and the aluminum ring. To ease separation of the two parts, you may reinstall the other aluminum ring on the actuator with a few screws and use the carbon part as a lever to help free the other side.

7) Remove the glue on the connector of the actuator and release the brown latch to free the cable;

8) Clean the dried thread locker located inside the aluminum ring as well as inside the holes of the carbon fiber using the scrubbing pad;


Do not use any metal tool or sandpaper.

3.3. Actuator Installation

Purpose: For maintenance, repair or replacement.

Period: When necessary.

Estimated time: 15 minutes per actuator.

Applicable parts: Big actuator (AM 0075 0001), actuator #1 to #3
Small actuator (AM 0058 0001), actuator #4 to #6

SPECIFIC BILL OF MATERIAL		
Quantity (Units)	**Description**	**Manufacturer & P/N**
n/a	Thread locker	Loctite 242
n/a	Hot glue	n/a
TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2mm for AM 0058 0001 2.5mm for AM 0075 0001
1	Hot Glue Gun	n/a
1	Plastic scrubbing pad	3M Scotch Bright
1	Torque wrench or Torque screwdriver	0 to 5 Nm

To access screws of actuator #2, the shortest part of 2.5 mm Allen Key must not exceed 19mm (3/4") in length (see Figure 15, p.17).

PROCEDURE

1) Identify the side of the actuator that will be facing JACO's base and the one that will be facing JACO'S hand (see following figure).

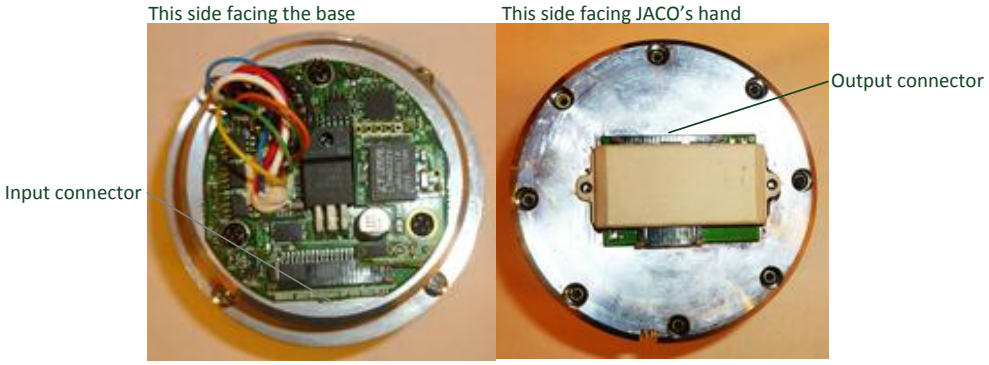


Figure 16 – Actuator's side identification

2) Connect the cable coming from the base (or another actuator) in the input connector of the new actuator, contacts up. Close the brown latch and add hot glue;

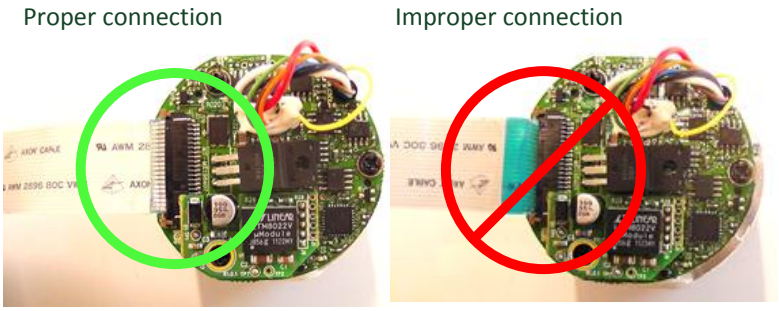


Figure 17 - Cable connection to actuator (top side view)

3) Locate the pin inside the aluminum ring of the arm (see Figure 12 for alignment pin, p.14). Align the pin with the notch on the actuator (see following figure) and insert the actuator in the aluminum ring;

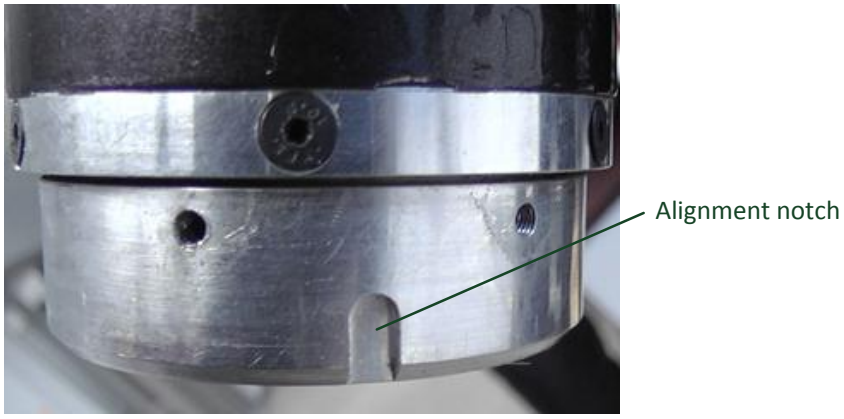


Figure 18 - Alignment notch located on the actuator

4) Add thread locker on each screw before loosely screwing them around the ring;

5) Once all the screws are in place, torque all screws with the appropriate torque value following a star pattern as shown on Figure 19. Respect the torque specified in Figure 20.

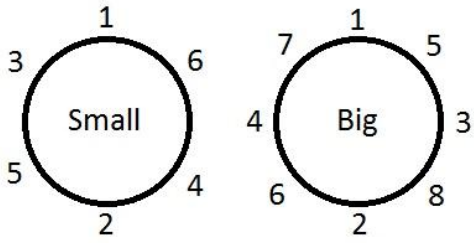


Figure 19 - Star pattern for screw torque

PART DESCRIPTION	PART NUMBER	SPECIFIED TORQUE
Small actuator	AM 0058 0001	0.5 Nm
Big actuator	AM 0075 0001	1 Nm

Figure 20 - Required torque for screws retaining actuators

6) Connect the cable coming from the JACO's hand in the output connector of the actuator, contacts up (see Figure 17, p.20). Close the brown latch and add hot glue;
7) Locate the pin inside the aluminum ring of the arm (see Figure 12 for alignment pin, p.14). Align the pin with the notch on the actuator (see Figure 18, p.20) and insert the actuator in the aluminum ring;
8) Add thread locker on each screw before loosely screwing them around the ring;
9) Once all the screws are in place, torque all screws with the appropriate torque value following a star pattern as shown in Figure 19 (p.20). Respect the torque specified in Figure 20 (p.21);
10) Slide back the rubber ring back on the actuator. Do it following a circular pattern to evenly align the retaining pins inside the screws;

3.4. Actuator Replacement

Purpose: For replacement of actuator.

Period: When necessary.

Estimated time: 30 minutes per actuator.

Applicable parts: Big actuator (AM 0075 0001), actuator #1 to #3
Small actuator (AM 0058 0001), actuator #4 to #6

SPECIFIC BILL OF MATERIAL		
Quantity (Units)	**Description**	**Manufacturer & P/N**
n/a	Thread locker	Loctite 242
n/a	Hot glue	n/a

TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2mm for AM 0058 0001 2.5mm for AM 0075 0001
1	Hot Glue Gun	n/a
1	Plastic scrubbing pad	3M Scotch Bright
1	PC with Jacosoft	n/a
1	Torque wrench or Torque screwdriver	0 to 5 Nm

To access screws of actuator #2, the shortest part of 2.5 mm Allen Key must not exceed 19mm (3/4”) in length (see Figure 15, p.17).

PROCEDURE

1) Locate the actuator that needs replacement;
2) Remove the obsolete actuator (see 3.2 Actuator Removal, p.17);
3) Install new actuator (see Actuator Installation, p.19);
4) Install JACO on its base, power it and plug a USB cable to a computer;
5) Open Jacosoft and confirm that every actuator is connected using the JACO Health Center tab (see Jacosoft User Guide for detailed information on the use of the software);
6) With the joystick, move the arm in every possible position to ensure that the new actuator is working.

4. JACO'S HAND

Do not attempt any procedure in this section while JACO is powered. This could result in major failure of JACO's electronic components.

For every procedure listed in this section, wear an antistatic wrist wrap (available at many electronics stores) or be sure to discharge any static electricity. Any disregard to this warning could result in electronic failure.

4.1. Part Identification

JACO's hand (AM 0058 0002) is referred to as an assembly of component. The following figure presents JACO's hand major components.

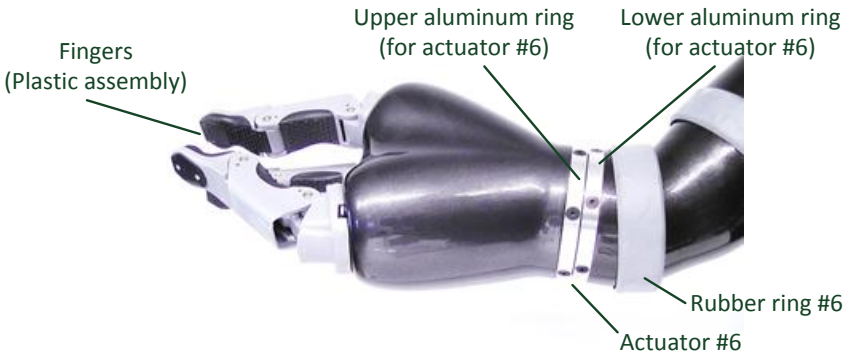


Figure 21 - JACO's hand part ID

Note that the rubber rings are named after the actuator on which they sit (see Figure 13, p.16, and Figure 14, p.17).

4.2. JACO's Hand Removal

Purpose:	For maintenance, repair or replacement.
Period:	When necessary.
Estimated time:	10 minutes.
Applicable parts:	Hand assembly (AM 0058 0002) Small actuator (AM 0058 0001), actuator #6

TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2mm
1	Antistatic wrist wrap or other equivalent discharge system	n/a

PROCEDURE

1) Remove JACO from its base;
2) Place JACO on a soft base to prevent any wear of the carbon fiber parts;
3) Gently slide rubber ring #6 to reveal the screws holding actuator #6;

Be careful to lift up the ring in a circular pattern to prevent the retaining pins from breaking off when sliding.

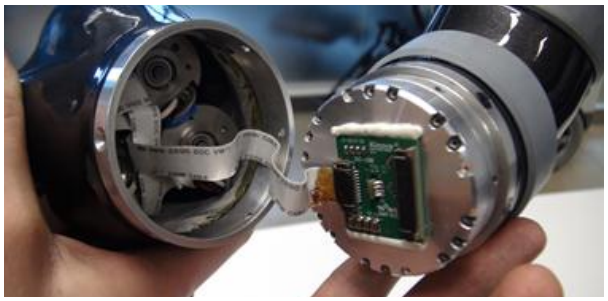
4) Unscrew all 6 screws located on the upper aluminum ring and keep them in a safe place;
5) Pull the hand off the wrist while applying side-to-side force to ease the operation.

Do not use any tool to pry the parts.

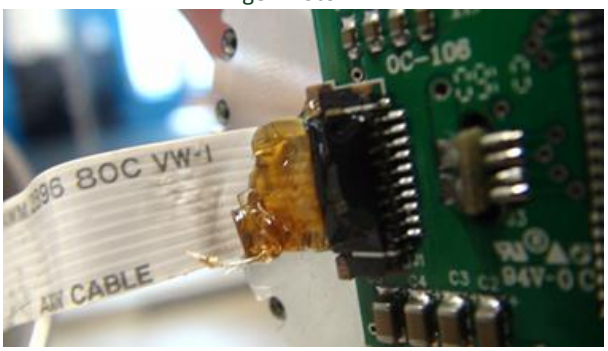
There is a cable located between each actuator and if you pull too hard, it might break the cable. (See Figure 22, p.25)

6) Remove the glue on the connector of actuator #6 and loose the brown latch to free the cable;

View of actuator #6 once JACO's hand is removed



Close-up view of cable connecting actuator #6 and finger motor #1



To disconnect cable, insert finger nails under brown latch and pull gently

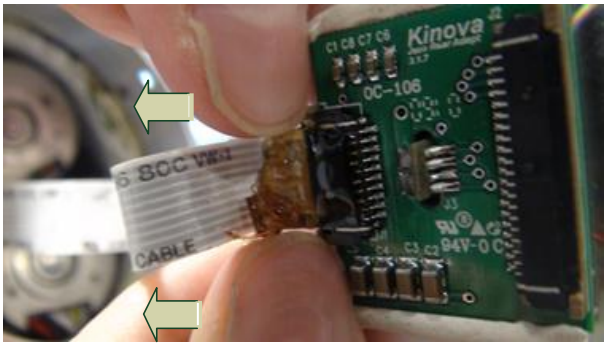


Figure 22 - Removal of cable connected to actuator #6

4.3. JACO's Hand Installation

Purpose:	For maintenance, repair or replacement.
Period:	When necessary.
Estimated time:	15 minutes.
Applicable parts:	Hand assembly (AM 0058 0002) Small actuator (AM 0058 0001), actuator #6

SPECIFIC BILL OF MATERIAL		
Quantity	**Description**	**Manufacturer & P/N**
n/a	Thread locker	Loctite 242
n/a	Hot glue	n/a
TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2mm
1	Antistatic wrist wrap or other equivalent discharge system	n/a

PROCEDURE

1) Connect the cable coming from finger motor #1 and connect it on actuator #6. The bright contacts of the cable must be facing up on the connector as show in Figure 17 (p.20);
2) Secure the cable by tightening the brown latch and apply a thin amount of hot glue;

DO NOT use other kind of glue.

3) Locate the pin inside the aluminum ring of the arm (see Figure 12 for alignment pin, p.14). Align the pin with the notch on the actuator (see Figure 18, p.20) and insert the actuator in the aluminum ring;
4) Add thread locker on each screw before loosely screwing them around the ring;
5) Once all the screws are in place, torque the screws with the appropriate torque value following a star pattern as shown on Figure 19 (p.20). Respect the torque specified in Figure 20 (p.21);
6) Slide back the rubber ring back on the actuator. Do it following a circular pattern to evenly align the retaining pins inside the screws;
7) Put JACO on its base, connect power and control cables;
8) Power JACO and test the new hand by moving the wrist in every direction and make 5 open/close cycles with 3 fingers, then with 2 fingers.

5. JACO'S BASE

Do not attempt any procedure in this section while JACO is powered. This could result in major failure of JACO's electronic components.

For every procedure listed in this section, wear an antistatic wrist wrap (available at many electronics stores) or be sure to discharge any static electricity. Any disregard to this warning could result in electronic failure.

5.1. JACO's Base Removal

Purpose: For maintenance, repair or replacement.

Period: When necessary.

Estimated time: 10 minutes.

Applicable parts: Base assembly (AM 4075 0001)

TOOLING		
Quantity	**Description**	**Details**
1	Allen Key	2.5mm
1	Antistatic wrist wrap or other equivalent discharge system	n/a
1	PC with Jacosoft	n/a

PROCEDURE

1) Using a USB cable, connect JACO to a computer;
2) Open Jacosoft and backup actual configuration;
3) Set JACO in RETRACT position and turn it off;
4) Gently slide rubber ring #6 to reveal the screws holding actuator #6;

Be careful to lift up the ring in a circular pattern to prevent the retaining pins from breaking off when sliding.

5) Unplug Joystick, USB Cable and Power cable;
6) Place JACO on a soft base to prevent any wear of the carbon fiber parts;
7) Unscrew all 6 screws located on the lower aluminum ring and keep them in a safe place;

Figure 23 - JACO's base removal procedure

8) Gently pull the base off actuator #1 while watching for the communication cable inside

Do not use any tool to pry the parts.

There is a cable located between each actuator and if you pull too hard, it might break the cable. (See Figure 24)

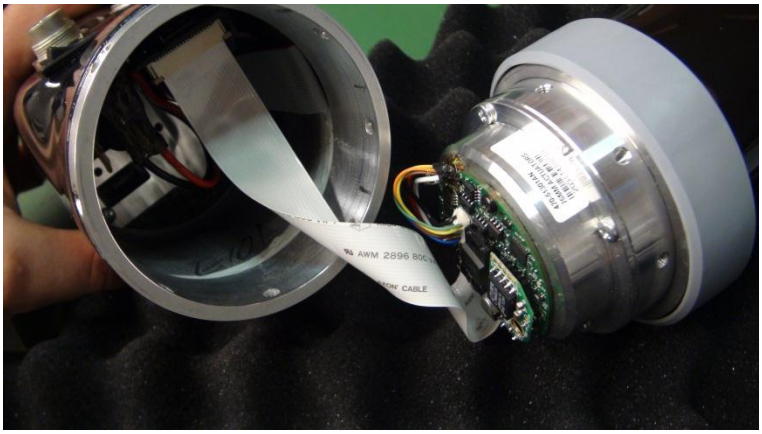


Figure 24 - JACO's base disconnected from actuator #1

9) Remove the glue on the connector in JACO's Base;

10) Release the brown latch located in JACO's base to free the communication cable (see following figure).

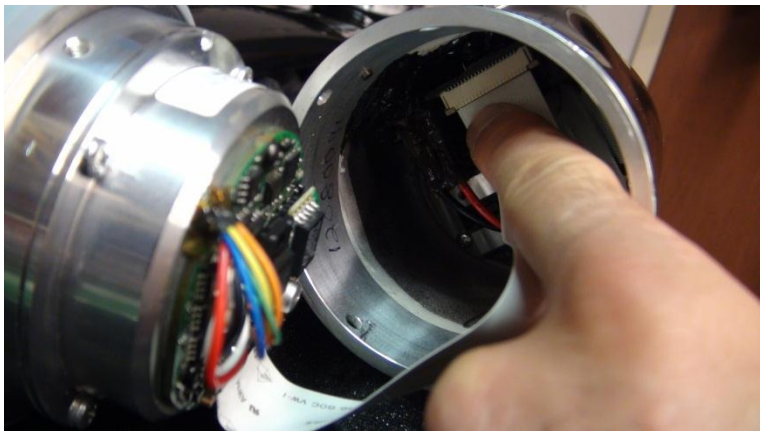


Figure 25 - Latch located in JACO's base

5.2. JACO's Base Installation

Purpose: For maintenance, repair or replacement.

Period: When necessary.

Estimated time: 15 minutes.

Applicable parts: Base assembly (AM 4075 0001)

SPECIFIC BILL OF MATERIAL		
Quantity	**Description**	**Manufacturer & P/N**
n/a	Thread locker	Loctite 242
n/a	Hot glue	n/a
TOOLING		
Quantity	**Description**	**Details**
1	Allen key	2.5mm
1	Hoy glue gun	n/a
1	Antistatic wrist wrap or other equivalent discharge system	n/a
1	PC with Jacosoft	n/a

PROCEDURE

1) Release the brown latch located in JACO's base.
2) Connect the cable coming from actuator #1 and connect it in the latch of JACO's base. The bright contacts of the cable must be facing up on the connector as show in Figure 16 (p.19);
3) Secure the cable by tightening the brown latch and apply a thin amount of hot glue;

DO NOT use other kind of glue.

4) Place the communication cable to avoid contact to the spiky connectors at the bottom of the base;
5) Locate the pin inside the aluminum ring of the arm (see Figure 12 for alignment pin, p.14). Align the pin with the notch on the actuator (see Figure 18, p.20) and insert the actuator in the aluminum ring;
6) Add thread locker on each screw before loosely screwing them around the ring;
7) Once all the screws are in place, torque all screws with the appropriate torque value following a star pattern as shown on Figure 19 (p.20). Respect the torque specified in Figure 20 (p.21).
8) Slide back the rubber ring back on the actuator. Do it following a circular pattern to evenly align the retaining pins inside the screws;
9) Put JACO on its base, connect power, control and USB cables;
10) Power JACO and open Jacosoft.
11) Load the previously saved configuration and reboot your JACO.

CONTACTING SUPPORT

If you need help or have any questions about this product, this guide or the information detailed in it, please contact a Kinova representative at:

- Support@KinovaRobotics.com

We value your comments!

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