Thank you for choosing the AR10 Robotic Hand.

This assembly guide provides you with information relating to the build of the AR10 robotic hand.

Check the Active8 Robots website for the latest build instructions and documentation. www.active8robots.com

The foam in the box has been shaped to fit a right hand once fully assembled.

To house a left hand simply flip the two layers of foam over.

The kit enables you to build a right or left hand. There are only 4 parts which differ from R or L:

1. Palm plate - H8R & H8L
2. Wrist Support - H7R & H7L
3. Electronics Carrier - ECR & ECL
4. Power Board Carrier – PBR & PBL

EC and PB come ready assembled for a right hand.
To build a left hand the circuit boards need to be fitted to ECL and PBL (see pages 60 & 62)

The first half of the build is identical for both left and right hands.
AR10 Robot Hand

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Assembly Instructions

Ensure these instructions are noted for correct assembly.

Loctite must be used on ALL screw fixings.
A small amount is to be applied on the thread of the screws. Avoid getting any on the bearings.

It is important to firmly tighten each fixing, whilst paying careful attention that all plates remain parallel.
Lock nuts require further force. Tightening should continue after initial resistance is felt.

The Gap Setting Tool (GST):
To set 6mm spacing for parallel plates
For use in between bearings (RB) and the metal plate to ensure proper alignment

A number of spare nuts and bolts have been included within the kit. You may therefore complete the assembly with left over nuts and bolts.
AR10 Robot Hand Parts List
Parts List

AR10 Robot Hand

**Metal Parts**

- **Thumb B**
  - H1 x1

- **Thumb A**
  - H2 x1

- **Thumb Tip**
  - H3 x2

- **Finger Link Tip**
  - H4 x8

- **Finger Link**
  - H5 x8

- **Lower Finger Left**
  - H6L x4

- **Lower Finger Right**
  - H6R x4

- **Wrist Support**
  - H7R x1

- **Wrist Support**
  - H7L x1

- **Palm Right**
  - H8R x1

- **Palm Left**
  - H8L x1

- **Base Plate**
  - H9 x1
### AR10 Robot Hand

#### Parts List

**Electronics**
- **Right Servo Controller**: ECR x1
- **Power Board Right**: PBR x1

**Firgelli Actuator**
- 250mm cable: LA250 x4
- 200mm cable: LA200 x6

**Servo Controller Bracket Left**: ECL x1

**Power Board Bracket Left**: PBL x1

**Miscellaneous Parts**
- **Fingertip**: FT x4
- **Thumb Tip**: TH x1
- **Finger Linkage**: L1 x4
- **Rod End Bearing**: RB x12
- **U Bracket**: B1 x6
- **Flanged Bearing**: FB x32
- **6mm Spacer**: S6 x15
- **40mm Pillar**: P40 x3

**Fixings**
- **Cap Screw M2x4**: x12
- **Cap Screw M2x6**: x20
- **Cap Screw M2x8**: x10
- **Cap Screw M2x12**: x8
AR10 Robot Hand

ingertip Assembly
Fingertip Assembly

Ensure you have read the assembly instructions before beginning the build.

Parts Required

<table>
<thead>
<tr>
<th>Part</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>S6</td>
<td>x1</td>
</tr>
<tr>
<td>H4</td>
<td>x1</td>
</tr>
<tr>
<td>W2</td>
<td>x1</td>
</tr>
<tr>
<td>FB</td>
<td>x1</td>
</tr>
<tr>
<td>M2x6</td>
<td>x1</td>
</tr>
</tbody>
</table>

Assembly

Notes
Insert 2 bearings through the eyelet of the thicker side of the linkage.
Ensure all plates are aligned and parallel. Lock nuts require further force to tighten. Continue tightening M2x12 once initial resistance is felt.
Parts Required

Fingertip Assembly

FT x1

Assembly

Notes
Ensure the CSK2 screws are fitted from the countersunk side of the H6 finger part. Avoid getting Loctite on the bearings.
Only assemble the H6L side as shown.
AR10 Robot Hand

Full Finger Assembly

Parts Required

FB x2

Notes
Only tighten LN2 once the other two bolts have been tightened.

Use the Gap Setting Tool (GST) whilst fastening M2x12 to ensure overtightening does not occur and the plates remain parallel.

Both RB and the fingertip assembly should be parallel to the plate and move freely.
Use motors 19, 17, 15, 13.

Use the Gap Setting Tool (GST) to ensure the plates remain parallel.
Tighten N3a to hold H5L firmly.
Insert M3x16 into the actuator rod end of LA250 (19,17,15,13) whilst placing H5L over both FB as shown.

Hold in place with N3b.
Position H5R over both FB and M3x16. Secure with N3c, whilst holding both H5 in place.
Ensure H5L and H5R sit parallel. Adjust and tighten N3b and N3c so that H5L and H5R are snugly fitted over FB on both sides and stay firmly in place.

This completes one finger.

Repeat for the remaining three fingers.
Construct the highlighted side first.

When adding the opposite side, ensure H3 plates are parallel and RB lips are mounted in the same direction as each other.

Ensure RB move freely.
Thumb Assembly

AR10 Robot Hand

Parts Required

Notes

TH x1

Thumb Assembly
When tightening M2x6 use the Gap Setting Tool (GST) between RB and the plate to prevent twisting RB. Once tightened ensure RB still moves freely.
Once assembled put the thumb to one side to be attached later.
Attach B1 to H8 ensuring they are parallel to the flanges as shown above. Ensure they are fully tightened.
Take careful note of the number on the motors. Ensure the order matches the diagram above.

Use the Gap Setting Tool (GST) between the rod end bearing (RB) and the finger plate. This ensures the RBs remain parallel thus enabling the fingers to hinge freely.
Take careful note of the number on the LA200 actuators. Ensure they match the diagram above.

Tighten fully making sure the actuator can still pivot freely.

**Repeat this for all 4 motors.**
Use the Gap Setting Tool (GST) to ensure RB do not twist and can move freely.
Check the actuator used is labelled as no. 10.

Tighten fully making sure the actuator can still pivot freely.
Check the actuator used is labelled as no. 11.
Palm Assembly - Right

Parts Required

<table>
<thead>
<tr>
<th>Part</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>H7R</td>
<td>1</td>
</tr>
<tr>
<td>P40</td>
<td>1</td>
</tr>
<tr>
<td>M3x6D</td>
<td>1</td>
</tr>
</tbody>
</table>

Assembly

Notes
Palm Assembly - Right

Parts Required

- N3 x1
- M3x5D x1

Assembly

Notes
Use the Gap Setting Tool (GST) whilst fastening to ensure overtightening does not occur and the plates remain parallel.

**Repeat this for all 4 fingers.**
Route the actuator cables tidily under LA10 before securing the top of LA10.
Ensuring the cables below LA10 actuator run smoothly before fixing LA11 at the base.
Board Assembly - Right

Parts Required

- P40 x2
- M3x6D x2

Assembly

Notes
AR10 Robot Hand

Parts Required

- EC x1
- M3x6D x1

Assembly

- M3x6D
- ECR

Notes

Carrier houses nut for M3.
AR10 Robot Hand

Board Assembly - Right

Parts Required

PBR
x1

Assembly

Notes
AR10 Robot Hand

Board Assembly - Right

Parts Required

H9  x1

CSK3  x5

Assembly

Notes
Connect LA plugs to ECR pins, taking care the numbers on the plugs match the numbers on the board. Ensure the purple wire is plugged in nearest the board numbers.

Connect the wire from the power board (PB) to the terminal on EC ensuring correct polarity.
Attach B1 to H8 ensuring they are parallel to the flanges as shown above. Ensure they are fully tightened.
Take careful note of the number on the motors. Ensure they match the diagram above.

Use the Gap Setting Tool (GST) between the rod end bearing (RB) and the finger plate. This ensures the fingers remain parallel and, enabling them to hinge smoothly.
Take careful note of the number on the LA200 actuators. Ensure they match the diagram above.

Tighten fully making sure the actuator can still pivot freely.

Repeat this for all 4 motors.
Use the Gap Setting Tool (GST) to ensure RB do not twist and can move freely.
Check the actuator used is labelled as no. 10.

Tighten fully making sure the actuator can still pivot freely.
Check the actuator used is labelled as no. 11
AR10 Robot Hand

Palm Assembly - Left

Parts Required

- H7L x1
- P40 x1
- M3x6D x1

Assembly

- H7L
- M3x6D
- P40

Notes
AR10 Robot Hand

Parts Required

- N3 x1
- M3x5D x1

Notes

Assembly

M3x5D

N3
Use the Gap Setting Tool (GST) whilst fastening to ensure overtightening does not occur and the plates remain parallel.

**Repeat this for all 4 fingers.**
Route the actuator cables tidily under LA10 before securing the top of LA10.
Ensure the cables below LA10 actuator run smoothly before fixing LA11 at the base.
AR10 Robot Hand

Board Assembly – Left

Parts Required

- P40 x2
- M3x6D x2

Assembly

Notes
Remove the circuit board from ECR by unscrewing A and B. 
Turn it around by 180 degrees. 
Insert it into ECL. 
Replace bolts A and B.
Slide ECL over P40.
N3 should already be in ECL.
Attach ECL using M3x6D.
Unscrew A and B to remove PBR.
Place the power board onto PBL.
Rotate the board 180 degrees.
Replace bolts A and B.

Notes
Board Assembly - Left

Parts Required

PBL x1

Assembly

Notes
AR10 Robot Hand

Board Assembly - Left

Parts Required

- CSK3 (x5)
- H9 (x1)

Assembly

CSK3
CSK3
CSK3
CSK3
CSK3

Notes
1. Connect LA plugs to ECL pins, taking care the numbers on the plugs match the numbers on the board. Ensure the purple wire is plugged in nearest the board numbers.
2. Connect the wire from the power board (PB) to the terminal on EC ensuring correct polarity.

Notes:
1. Connect LA plugs to ECL pins, taking care the numbers on the plugs match the numbers on the board. Ensure the purple wire is plugged in nearest the board numbers.
2. Connect the wire from the power board (PB) to the terminal on EC ensuring correct polarity.
Concluding Notes
Your hand should now be fully assembled. Check all assemblies are firmly secured with minimal movement.

Now refer to the *Getting Started Guide*

The contents of the guide include:

- The correct way to power the hand
- Details of the electronics components
- The use of the Pololu Maestro Control Centre
- Programming the hand in Python

In order to house the hand in the case, the thumb will need to be moved to the correct position. This can be done by connecting the hand to a workstation and using *Pololu Maestro Control Center* software (refer to the *Getting Started Guide*).

The *Case Position* file (located on the USB stick) can then be loaded into the *Pololu Maestro Control Center* to ensure the hand will fit in its case.
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