Building the Philo Gripper

Before start, carefully read this User Guide and retain it for future reference.

* If your Gripper is the assembled version, you may skip the procedures of assembling the gripper.

Parts to assemble Gripper

**Servos**
- Servo SV2031 x 2 pcs
  (Length of wire: 240mm)

**Plastic Parts**
- PLR200004 x 1 pc
- PLR200005 x 1 pc
- PLR200002 x 1 pc
- PLR200003 x 1 pc
- PLR200001 x 1 pc

**Metallic Parts**
- PB2x31MM x 2 pcs
- PWA2.3x8MM x 3 pcs
- PA2x5MM x 5 pcs
- PB1.7x4MM x 2 pcs
- PLR100004 x 1 pc

- Servo Horn
- Brass Tube
- Silicon Tube
- Self-Tapping Screw
- Self-Tapping Screw With Shoulder
- Machine Screw
- Ring
Building the Philo Gripper

Before assembling the gripper

Install the new Motion Creator in your PC. (Windows XP or Vista Operation System)
1. Put in the GRIPPER CD and open the folder for installation. Copy the “Gripper.exe”, “Gripper-motion.txt”, “philo.ehex” and “LoadPhilo.exe” to the local disk folder. This gripper-motion file contains the initial settings and limits for the gripper.
   The initial offset and ATV need to use the ones from gripper-motion.txt file otherwise it may burn out the gripper servos.
2. Open your own Philo-motion file, update the values for RWRIST, RHAND, LWRIST, LHAND with those values from the gripper-motion.txt.
3. Run “LoadPhilo.exe” to reinstall the new “philo.ehex”, the updated user motion file and update configuration.

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Assembling the Gripper

1. Connect jumper to slot 7 of PCB. Then connect the battery for tuning. Switch on the power. The servo SV2031 will rotate to its default position, 0°.
   ① It will take a few seconds to complete the process.

2. Insert the servo wire as shown.
   ① Please cut off the front and tap of servo SV2031 before assembling.

3. Insert the servo wire as shown.
   ① The servo wire go through PLR200001 then PLR200003 as shown.

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Assemble the parts as follow.

1. Insert the servo wire as shown.
   ① Please cut off the front and tap of servo SV2031 before assembling.

2. Insert the plastic parts PLR200002 with PLR200003.
Building the Gripper

Assembling the parts of gripper

1. Plug the jumper on slot 1 for coarse tuning.
2. Connect servo cord to slot 7 of PCB. Then connect the battery for tuning. Switch on the power. The wrist servo will rotate to its default position, 0°.
3. Left Gripper plug to slot on left; Right Gripper plug to slot on right.
4. It will take a few seconds to complete the process. If the gripper got stuck, turn off the power at once to avoid burning out the servo.

Tuning the servo before tighten up the screw PA1.7x4.

6. Tighten the screw PA1.7x4 after finish the coarse tuning for the servo SV2031.
7. Make sure the PLB20001 assembled onto the servo properly.

7. Insert the servo and pull the servo wire as shown.
8. Tighten screw PWA 2.3x8 through the hole to fix the servo.
9. Slide to the gripper bracket carefully. Then fasten the PA2x5 with the washer.
10. Make sure the large hole go over servo pinion.
11. Adjust the silicone tubing properly as shown.
12. Insert brass tube through the plastic.“

COARSE TUNING of SERVO SV2031

Tuning is required for the grip servo before assemble the servo horn in Step 14.
Building the Gripper

1. Plug the jumper on slot 1 for coarse tuning.

2. Connect servo cord to slot 8 of PCB. Then connect the battery for tuning. Switch on the power. The gripper servo will rotate to its default position, 0°.

3. Left Gripper plug to slot on left; Right Gripper plug to slot on right.

4. It will take a few seconds to complete the process. If the gripper got stuck, turn off the power at once to avoid burning out the servo.

Remove forearm and replace with Gripper

1. Loosen the screws as shown, unscrew the PA2x5 screw at the back too.

2. Gently release the arm away from the servo bracket.

3. Loosen the PM2x27 as shown.

4. Loosen the KA2x6 then remove the forearm as shown.
Building the Gripper

1. Remove forearm and replace with Gripper

2. Tighten the KA2x6 onto Philo Gripper as shown.

3. Assemble the servo again and tighten the PM2x27 for forearm as shown.

4. Carefully slide the servo back into the servo bracket and tighten up all the screws again.

5. Do not manually turn the gripper or wrist, it may damage the mini servo gear. Use fine tuning to adjust the offset setting for 0° and increase the angle gradually from 0° to check out the range and then adjust ATV setting for 90°.
Fine Tuning procedures

1. Put the Robot on the hanger.
   - The jumper on upper right hand corner of the PCB should be placed to 2-pin slot 5 for normal operation and fine tuning.
   - Securely put PHILO on the stand by slightly press the hooks to pass through the shoulder rings.

2. Connect the serial cable between the PC and RoboPhilo.
   - Note: To remove the serial cable from RoboPhilo, you need to press the plug to release it from the PCB socket.

3. Run Gripper.exe
   (Philo Motion Creator 1.2).

4. Select Configuration tab.

5. Select Port # to setup serial COM port.

6. Enter motion file name:
   - Gripper-motion
   - click 'Open'
7. Select Fine tuning tab.

8. Enter different position value for a servo.  
   e.g. right wrist -- the wrist should move. If not, change the COM port # in configuration 
   tab and retry.

9. There are 3 values to tune for each joint.
   
   - **Position** – change the servo position.  
   - **Offset** – define the servo position at 0 degree.  
   - **ATV** – adjust the physical travel angle for the input position degree.

10. Common Fine Tuning step for joints allow 0 degree.

    a. Enter 0 to position to move the joint at 0 degree.  
    b. Increase or decrease the offset value to the positions as shown on p.8.  
    c. Fine tuning the gripper to tune for 45 degree first before 90 degree. This will avoid the hand 
       and wrist servo overshoot to 90 degree with incorrect ATV value and may damage the servo.  
    d. Enter position 90° degree.  
    e. If the angle from 0 to 90° is less than 90° degree, increase ATV by clicking the up 
       arrow of ATV. Otherwise, click the down arrow of ATV.

11. Click “Save” button to save the tuning setting for the wrist and gripper servos.

12. You need to use “Save Motion” in configuration tab to save the tunings to a file, otherwise, 
    the tunings will be lost after the program exits.
13. You can click 'Save Motion' to save to the same file after each joint tuning.
14. Save to a different motion file name “My Gripper” to keep the original default motion file.
15. Open the new file “My Gripper” for subsequent motion work.

**Fine Tune Wrist**

1. Enter 0 to left and right wrist position. Adjust offset to align approximate level.
2. Enter 90 to left and right wrist position. Adjust ATV to align approximate level.

**Fine Tune Gripper**

1. Enter 0 to left and right gripper. Adjust offset to align full open position.
2. Enter 90 to left and right gripper. Adjust ATV to align closed position.

For the gripper servo, make sure not to hold things too tight as that will cause servos to burn out. Add about 30 degrees after the grippers are in contact with objects is the maximum grip force that can be exerted on the servos.

**User can try out the gripper-motion file routines by using loadphi0.exe with “generate new motion file” option using gripper-motion file as input. The option will generate a new motion file with the gripper routines and the fine tuned servo settings from the user’s own robot.**

**Factory warranty will not be extended to burnt out gripper servos due to inappropriate adjustment of gripping force.**