Servo Motor Gripper Assembly

These instructions describe the procedure for assembling the micro gripper kit with the servo motor.

You will need the following items:

- Servo motor from "Inventor's kit" (non-continuous, 160°)
- Gripper kit
- Screwdriver with small Phillips head
- Micro:bit
- USB cable for programming and power
- Breadboard
- Microbit breakout board
- Three wires M/M (Dupont wires)

Servo motors some in several sizes and two types. The gripper kit in your classroom equipment fits the sub-micro size servo shown in Figure 1. This servo is the non-continuous type. Servo motors can be continuous or non-continuous. The continuous type has a motor shaft that turns all the way around. The non-continuous servo motors have a limited range of motion. The servo included in your kit is non-continuous with a 160° range of motion.

Figure 1: Generic sub-micro servo motor

#1 Wire and program the servo to determine the gripper's open position.

Unpack your servo motor kit. You will have the following parts:

- Servo motor
- Servo horns
  - Single arm horn
  - Double arm horn
  - Four point horn
  - Circle horn
- Two 2×8 mm Phillips screws (silver in the picture, yours may be black)
- One 3×6 mm Phillips screw (black in the picture, yours may be silver)

Figure 1 shows the servo motor and Figure 2 shows the servo parts.

Figure 2: Servo parts

The servo motor is pre-wired with a connector. The three wires are:

- Black - ground
- Red - power (4.8 - 6.0 Volts DC)
- White - control

Attach the Micro:bit breakout to the breadboard, insert the Micro:bit face-up, and wire the servo motor using three wires. One end of each wire will connect to the servo motor's connector and the other end of the wire will connect to the breakout via the breadboard. The servo motor's black wire attaches to "GND", the red wire attaches to "3V3" and the white wire attaches to pin zero ("P0"). Figure 3 shows the servo motor connections to the Micro:bit breakout. Figure 4 shows the wires connected to the servo motor.

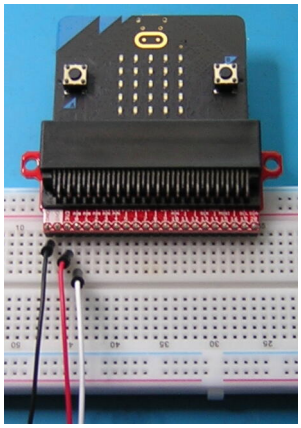

Figure 3: Servo wiring - Breakout

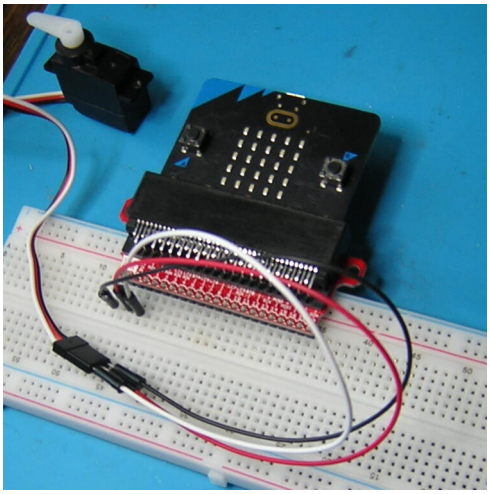

Figure 4: Servo wiring - Connector

Next, create and download the program shown in Figure 5 to the Micro:bit.

Figure 5: Setup program

Place the single arm horn on the servo shaft and press the “A” and “B” buttons to verify

the servo moves. Note, the Micro:bit must be plugged in with the USB cable to reliably turn the servo shaft (batteries may not work reliably). Do **NOT** grab the servo shaft or horn and manually turn the shaft, this will damage the servo motor.

After you've confirmed the servo motor is turning, press button "B" and the re-position the single arm horn to be parallel to the long side of the servo enclosure as shown in Figure 6. "B" is the closed position of the gripper and "A" is the open position of the gripper. Leave the servo in the open "B" position for the next step.

Figure 6: Position of the single arm horn when "B" is clicked

Put away the horns and the two 2×8 mm screws (longer screws). Keep the shorter 3×6 mm screw out because it will be used in the next step.

#2 Assemble the gripper.

Unpack the micro gripper kit. Figure 7 shows the parts in the gripper kit.

Figure 7: Gripper kit parts

The gripper kit includes the following parts:

- Base plate
- Gripper arm for shaft
- Gripper arm for base plate
- Two 3×10 mm Phillips screws
- Two white plastic spacers
- One 3×8 mm Phillips screw
- Two 5 mm flat washers

With the servo shaft in position "B", remove the single arm horn.

Fit the base plate on to the servo motor. Note the "keyhole" shaped cutout to orient the base plate. The base plate should fit flush to the servo motor.

Next, screw the base plate to the servo motor with two 3×10 mm screws and two plastic spacers. The spacer is inserted between the tab on the servo motor and the base plate as shown with the yellow arrow in Figure 8. The screw is inserted from the bottom of the servo motor as shown with the blue arrow in Figure 8. Repeat to attach the other side of the servo motor to the base plate. The base plate should fit flush to the servo motor when fully attached.

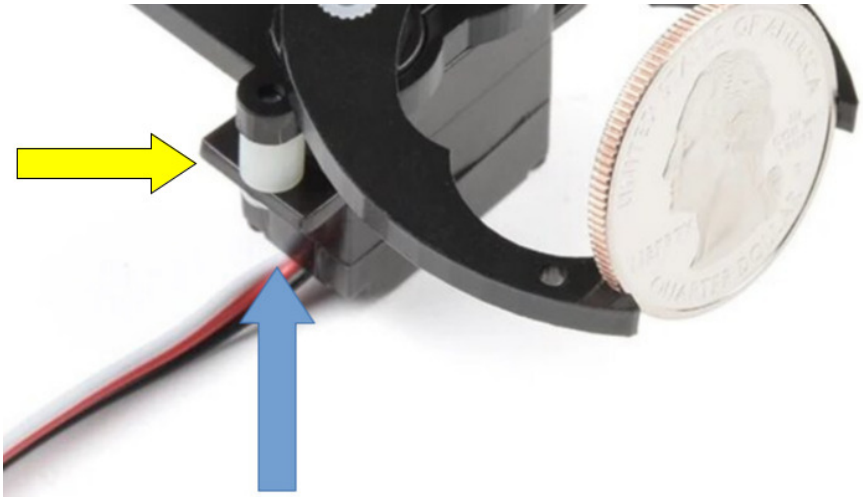

Figure 8: Screw the servo to the base plate

Attach the gripper arm for the shaft (arm with the larger hole) so that the gripper is in the closed position. The tips of the gripper arms will touch in this position. Use the 3×6 mm screw from the servo kit (shorter one) to secure the arm. The screw goes into the open end of the shaft. Do **NOT** overtighten the screw, it only needs to prevent the gripper arm from slipping off the servo shaft.

Finally, use the 3×8 mm screw and washer to attach the other gripper arm. The tips of the gripper arms will touch in this position. The gears of the gripper arms must mesh and

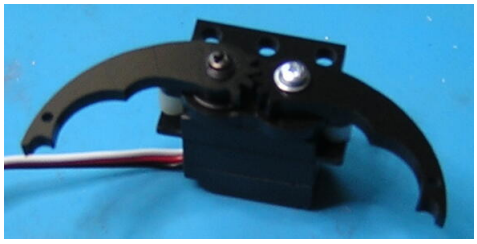

Figure 9: Assembled gripper arm on the servo

both arms should fit parallel to the plane of the base plate. Do **NOT** overtighten the screw, it only needs to prevent the gripper arm from slipping off. Figure 9 shows the assembled gripper in the open position.

Additional lessons and materials are available at https://www.csmakers.org.

CS Makers
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