

Last Updated: 2025-09-15

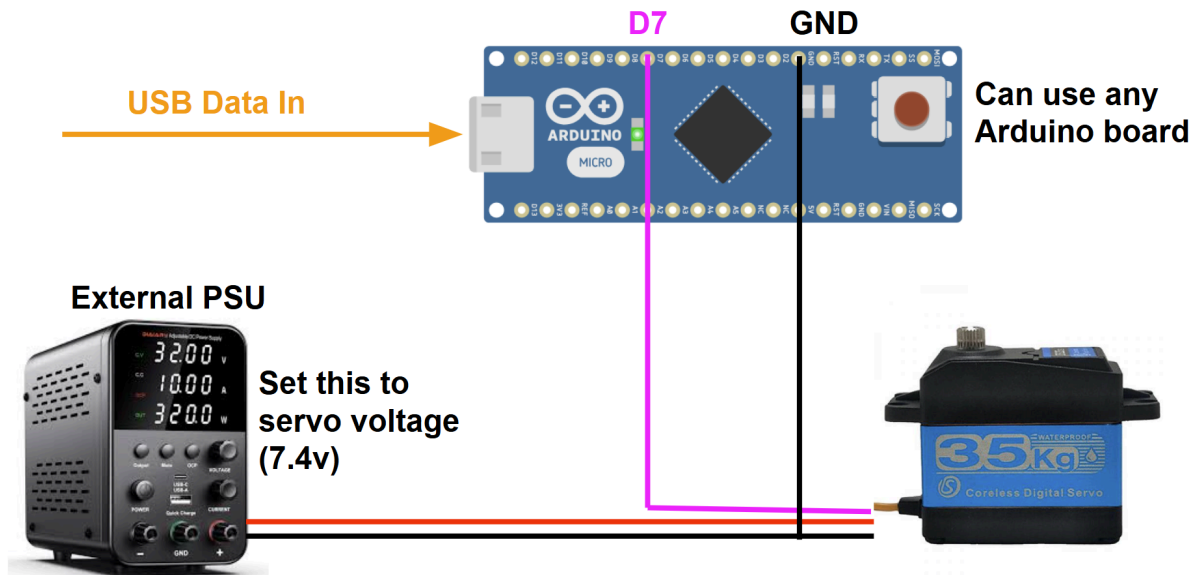
Servo Calibration Instructions

For the Endeavor Humanoid Robot by ProtoDane Robotics

Required Materials:

- Servo Calibration Jig (Servo Dial / Servo Mount)
- DS3235 Servo + Metal Disc
- 2x M3 Screws
- Arduino (Uno, Nano, etc.)
- Power Station

1: Prepare the Electronics Setup

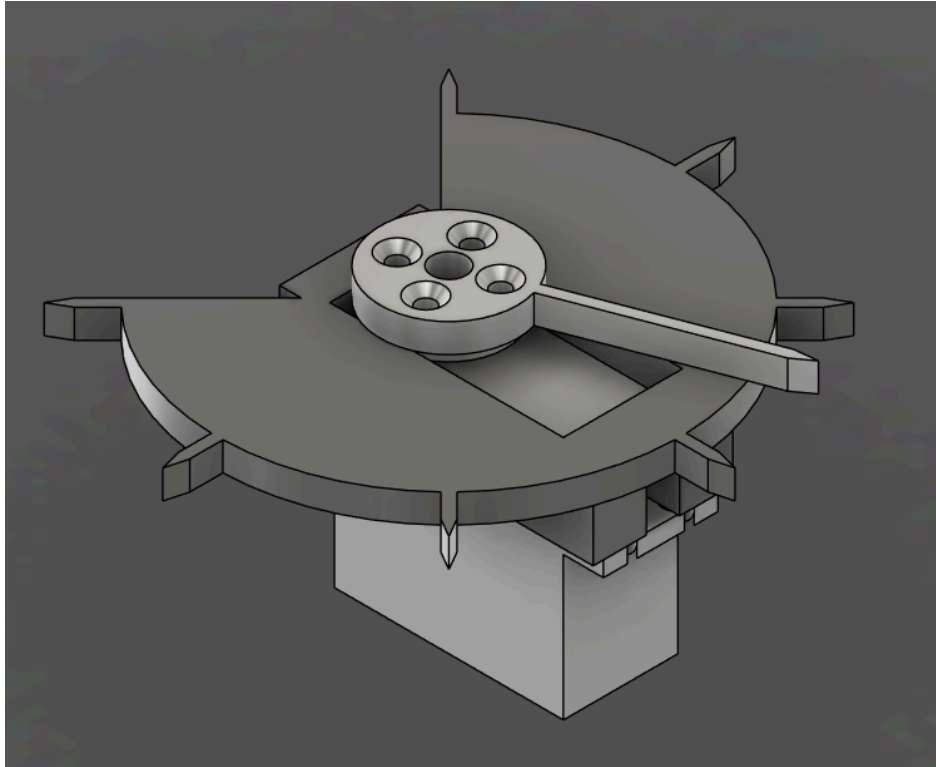


- Flash an Arduino board with the `servo_calibration.ino` sketch
- Open up a serial monitor (PuTTY preferred) and connect to the Arduino at 9600 baud rate. You should see a set of instructions on how to continue.

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Controls:
Q/A: +/- 100 us
W/S: +/- 10 us
E/D: +/- 1 us
R: Reset to neutral
SPACE: Confirm calibration value

Press any key to continue...
```

2: Set up Servo in Jig



1. Pop in the ServoMount piece, which should plug into the holes on the mounting tabs of the servo motor.
2. Install the servo disk and fasten the ServoDial piece to the disk using 4x M3x8 Screws (Flathead preferred).

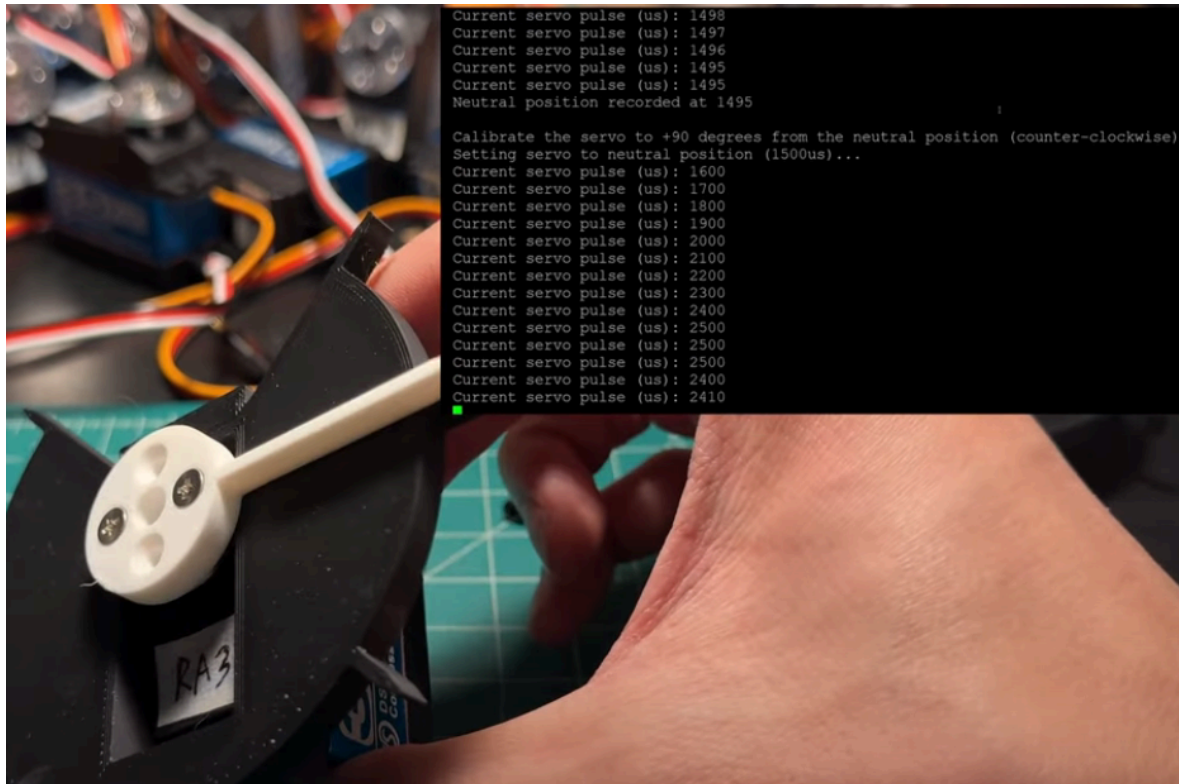
3: Calibrate the Servo

The following steps are to be done for the 17 servos prior to installation on the robot:

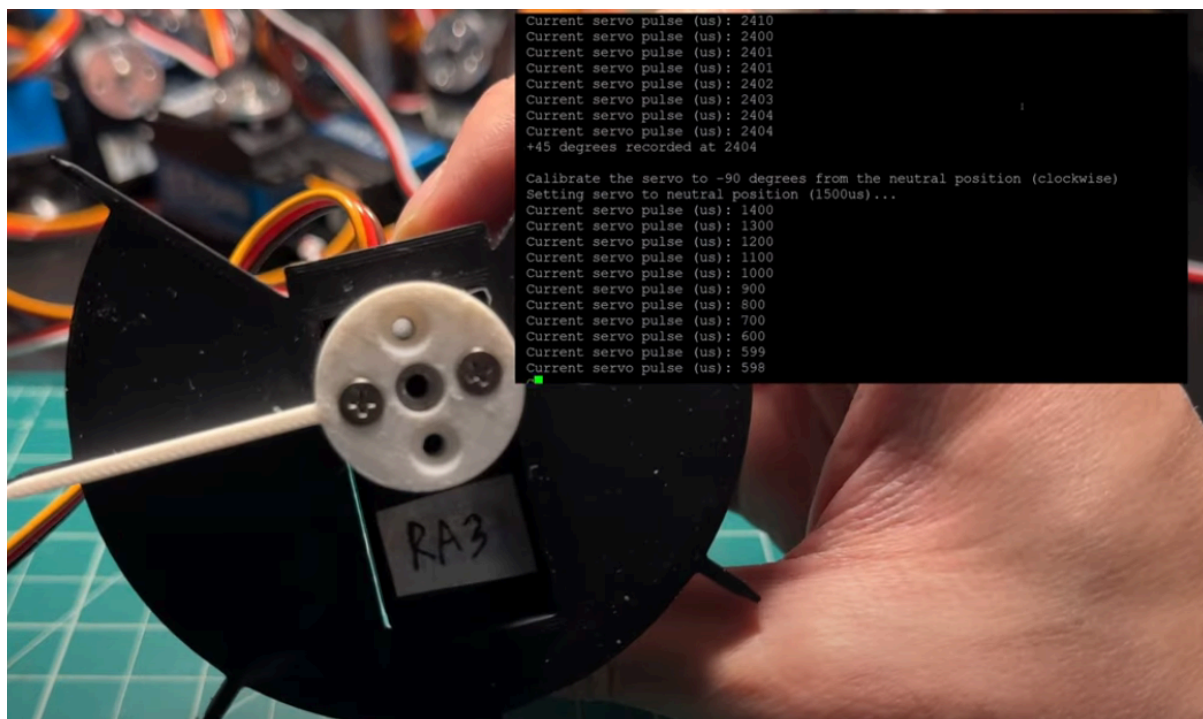
1. Start the calibration process on the serial terminal. The servo should move to the middle position (1500 usec). Remove and reposition the dial/disk from the servo shaft so that it is as close to the middle mark as possible. **Beyond this step the dial and horn should not be detached from the servo.**
2. Using the terminal, adjust the dial over the middle mark on the jig. This value will be between 1400 and 1600 usec. Press SPACE to confirm.



3. Using the terminal, move the dial to the maximum position (counter-clockwise from neutral). This value will be between 2300 and 2500 usec. Press SPACE to confirm.
Note: The markings on the jig are at 45-degree increments. The max point for 180-degree servos is 90-degrees, and that for 270-degree servos is 135-degrees. Please keep this in mind!



4. Using the terminal, move the dial to the minimum position (clockwise from neutral). This value will be between 500 and 700 usec. Press SPACE to confirm.



5. Run a sanity check by using the terminal to control the servo angle (the angle will be mapped to the calibrated pulse). Check with the jig markings to make sure the readings are accurate and press SPACE. **Note: RC servos tend to have non-linear pulse-to-angle relation, so expect some deviations especially with the 45-degree tick marks. At the very least make sure that the min/max/mid positions are correct.**
6. Record the results of the calibration, which should be printed to the serial terminal after completing the sanity check. It is recommended to assign the servo a unique ID and label it on the top surface. See Page [X] for a sample worksheet.
7. Move the servo dial back to the neutral position. Remove the servo from the jig, careful not to remove the metal disk from the servo. With the servo disk still at the neutral position, mark the top surface in case the disk rotates out of position.

Servo Calibration Worksheet

ID	Position	Mid	Max	Min
TORSO	Torso			
RA1	Right Shoulder Pitch			
RA2	Right Shoulder Roll			
RA3	Right Forearm Swivel			
RA4	Right Elbow			
RL1	Right Thigh			
RL2	Right Upper Leg			
RL3	Right Lower Leg			
RL4	Right Ankle			
LA1	Left Shoulder Pitch			
LA2	Left Shoulder Roll			
LA3	Left Forearm Swivel			
LA4	Left Elbow			
LL1	Left Thigh			
LL2	Left Upper Leg			
LL3	Left Lower Leg			
LL4	Left Ankle			