FIRST® Tech Challenge

PushBot Build Guide

Part VI: Testing the Robot

Revision History		
Revision	**Date**	**Description**
1	8/15/2014	Initial Release – by FTC Team #003 Australia, The Southport School
2	9/1/2014	Replaced MATRIX with TETRIX content by former FTC Team #2843, Under the Son
3	8/6/2015	Updated using the new kit of parts and new programming environment.

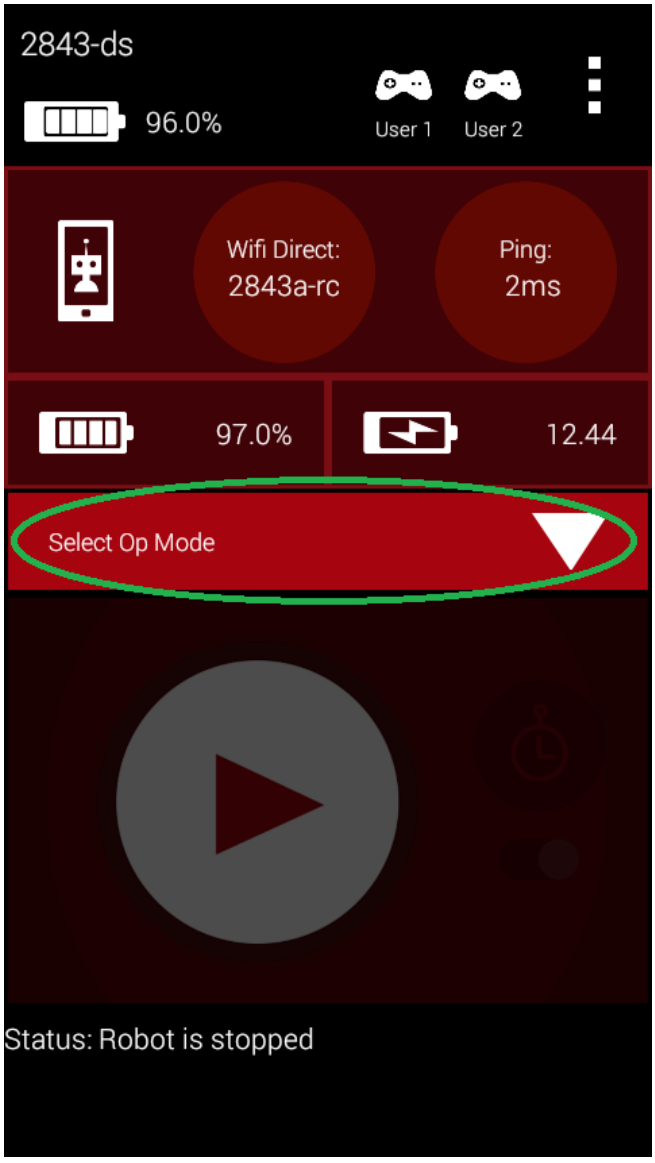
Contents

Testing the Robot

After the Robot is built, the programming is complete, and the electronics are installed, testing must be done to ensure everything came together as planned. This section assumes that the core power distribution module is powered on, the cell phones are powered on and the FTC apps are running.

Running an Op mode

Step 1: Operational Modes or *Op Modes* are program modules that cause the Robot to perform specific behaviors. The Robot Controller app should include some pre-installed op modes. If the Robot Controller has been successfully paired to the driver station, and if the Robot is running, then the Op mode buttons on the FTC Driver Station app should now be enabled.



Note that if the Driver Station app is connected successfully to the Robot Controller app, then some ping statistics should be visible at the top left hand corner of the Driver Station screen. In the image above the ping statistics reads “4 ms”. This means it took 4 milliseconds for the driver station to send a packet to the Robot controller and for the Robot controller to acknowledge the packet and send its acknowledgement back to the driver station.

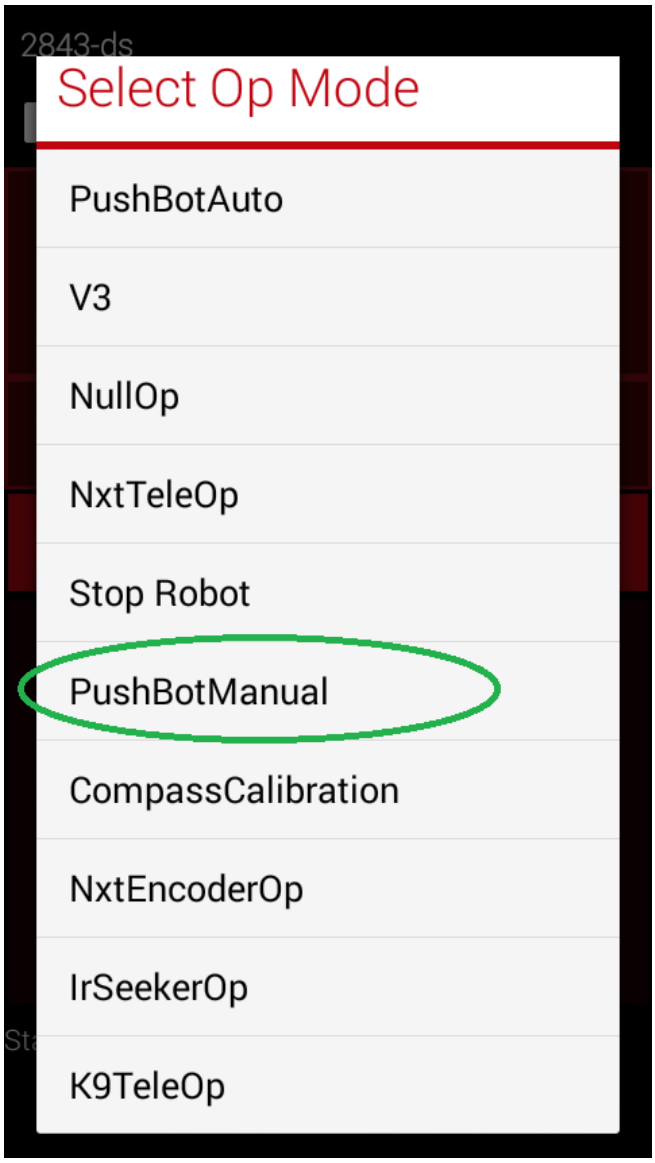
The ping round trip time is a rough measure of network quality. As the round trip time increases, the network performance usually degrades. In our testing, an ideal round trip time is anything on the order of 10 milliseconds or lower. Sometimes the ping time period increases if there is a surge in network traffic or interference. If the period starts to increase to the order of or greater than 100 milliseconds, then there might be excessive network traffic or noise on the wireless channel that cell phones are using.

Step 2: Touch the **Select Op Mode** button to display a list of the available Op Modes sent to the Driver Station app from the Robot Controller app. Select “PushBotManual” from the list and the round play button should become brighter.

Note that any of the other Op modes will fail to work as the names and number of controllers are different from the PushBot.

Step 3: Once the PushBotManual Op mode is selected, the FTC Driver Station screen should change. The name of the selected Op mode should appear where the words “Select Op Mode” once was. Also, the **Start** button should be enabled.

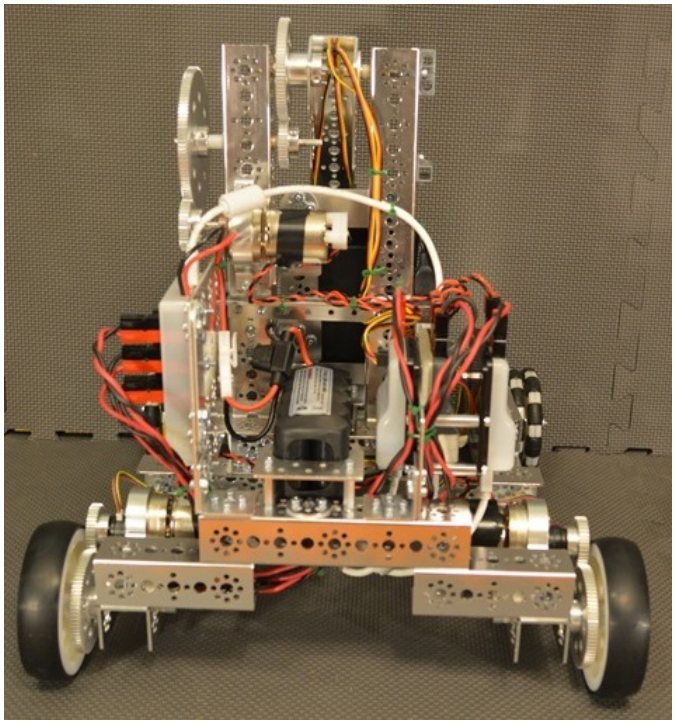
If the **Start** button is pressed, then the Op mode will run indefinitely until the program terminates or until the **Stop** button is pressed. Press the start button and proceed to the next section.



Using the gamepads

This section describes how the two gamepad controls control the function of the Robot – make the Robot drive forward/backward, lift/lower the arm and open/close the hand.

The left joystick controls the 'left' drive motor and the right joystick controls the 'right' drive motor. The image above shows the back of the Robot.



Push both joysticks away from your body and the Robot drives forwards. Pull both joysticks toward your body and the Robot drives backwards. Push one joystick up and the other down and the Robot turns.

The programming sections show the programming necessary to use a second Logitech controller (F310) to raise and lower the arm and open and close the 'hand'. This section describes how to use the controls on the gamepad to move the arm up and down and how to open and close the hand.

The 'arm' allows the Robot to lift items from the floor to at least 33" above the ground. The arm uses a 1:6 gear-ratio to enable the arm to lift moderately heavy items. Push the left joystick away from the body to raise the arm; toward the body to lower the arm.

The 'hand' is capable of opening and closing gradually. Button 'X opens the hand; button 'B' closes the hand. The term gradually is used, because when the button is released, the servo stops at its last position – it doesn't close or open all the way when the button is pressed.

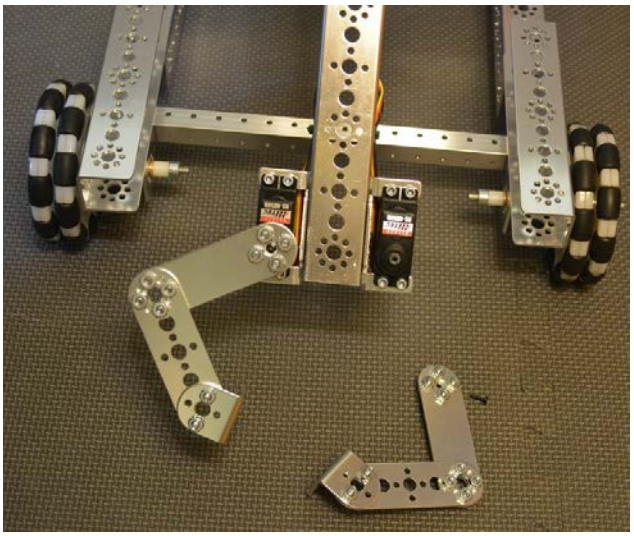
Adjusting the Servos

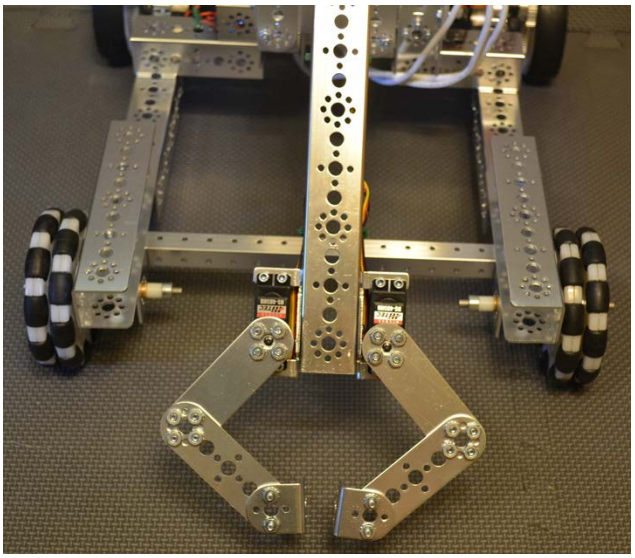
If the servos don't close all of way or they chatter, perform the following steps to correct them.

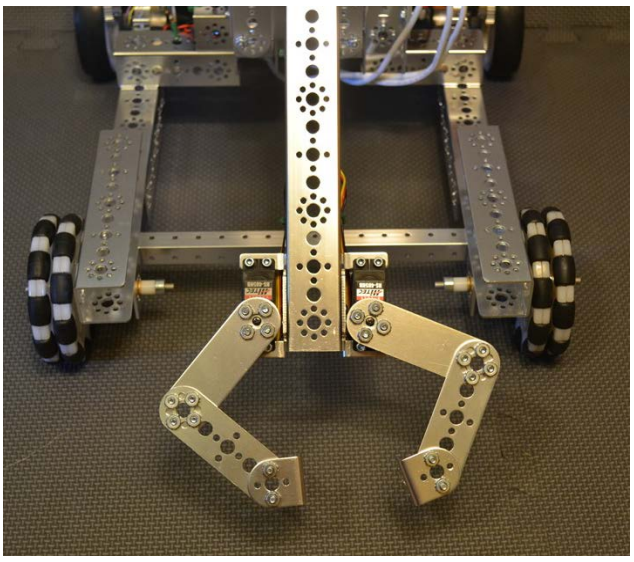
Step 1: Unplug one servo.

Step 2: Run servos to fully closed position using button X on gamepad 2.

Step 3: Remove the black screw from the servo. Remove the hand assembly. Replace the hand assembly such that the L bracket is as close to parallel to the arm as possible. Replace the black screw. See the pictures for an example. First picture is closed by software. Second picture is hand removed. Third picture is hand reattached in closed position.







Repeat step 1-3 for the other servo.

Final steps

- Now that testing has shown that all of the wires are connected properly, use zip ties or some other approved material to secure loose wires.
- It is recommended that an approved material such as non-skid be layered in the back of the phone holder to prevent damage to the phone.
- It is recommended that the phone be secured in the holder using a zip tie or some other mechanism to prevent it from being separated from the Robot during competition.
- Place non-skid around the gripper to provide extra grip…so hockey pucks, wiffle balls, pipes, racquetballs, crates, rings, blocks or practice golf balls, or red herrings can be collected with ease!