2015-2016 *FIRST*® Tech Challenge

PushBot Build Guide

Power Switch Supplement

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Revision History		
Revision	**Date**	**Description**
1	9/12/2014	Initial Release - Content by former FTC Team #2843, Under the Son

Contents

Overview

The Push Bot is a robot that can be built from only the parts in the competition kit: electronics, metal components and technology components (i.e. phones and gamepads). The original Push Bot Guide provided step-by-step instructions for building a four-wheeled, one-armed autonomous and manual robot. This Push Bot Power Switch Guide is an addendum to that document that provides step-by-step instructions for adding an external power switch to a Push Bot built from the original guide.

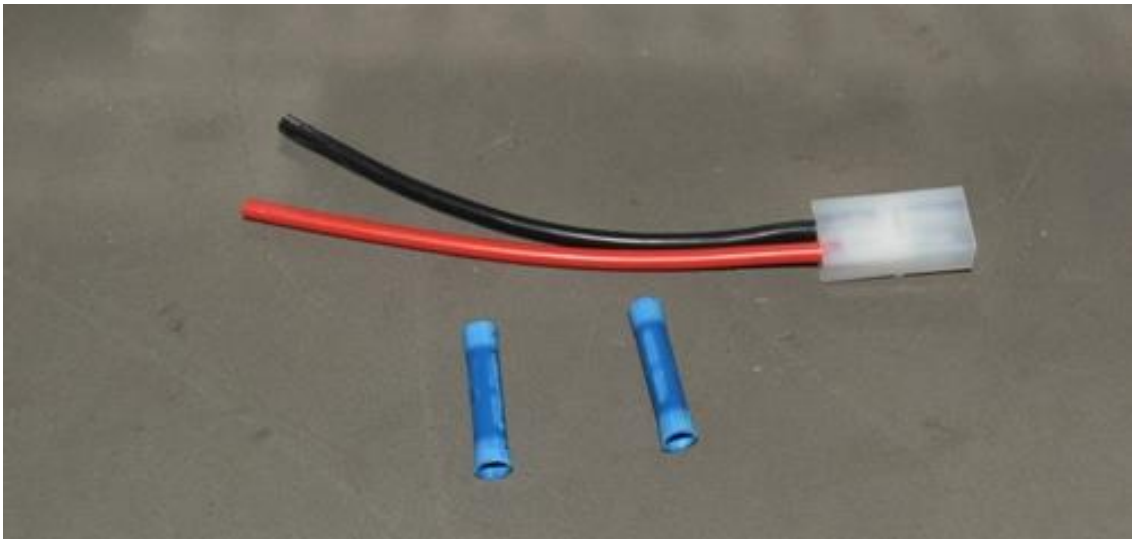
The Game Design Committee recommends that a separate external power switch be added to the robot between the battery and the Core Power Distribution Module (PDM). This is to make it easier to place the power switch in a location that is easily accessible to fiield personnel in the case that a robot needs to be turned off. The parts used for this are NOT included in the kit and need to be ordered from multiple vendors. The switch (part number W39129) and mounting plate (part number W39176) can be ordered from TetrixRobotics.com. The additional connector that connects the switch to the PDM is available from various vendors. The one used in this document was ordered from ServoCity.com and is ServoCity part number E1074. It is a female Tamiya connector with wires attached. The wires are 14 gauge and approximately 6 inches long. In addition, for this document, 3M Splice Connects for use with the 16 to 14 gauge wire (part number 03984NA) were used. These and similar connectors are available from many sources.

Preparing the Switch for Mounting

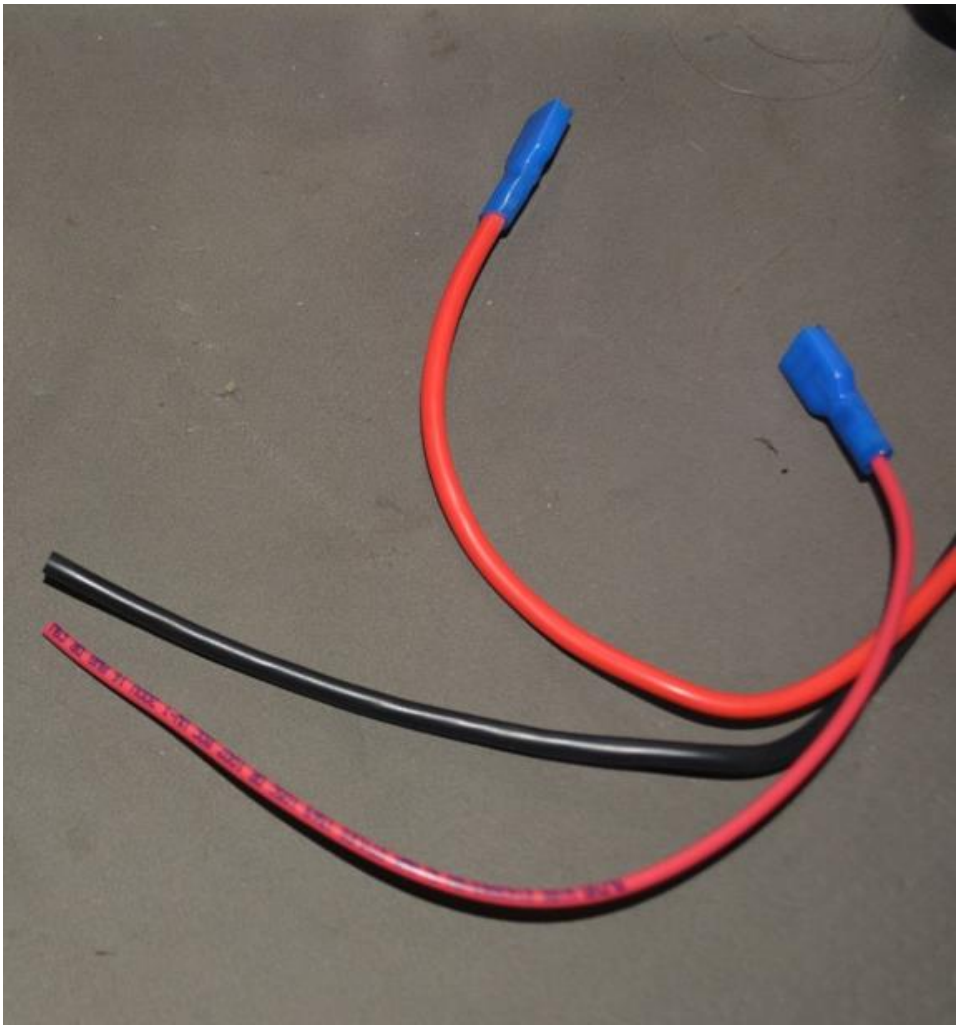
Adding the Connector to the Switch

The following picture shows the parts needed between the battery and the switch: the battery cable (red and black wire with the Tamiya connector), the switch mounting bracket, the switch and the switched DC power wire (the red wire with a quick disconnect terminal).

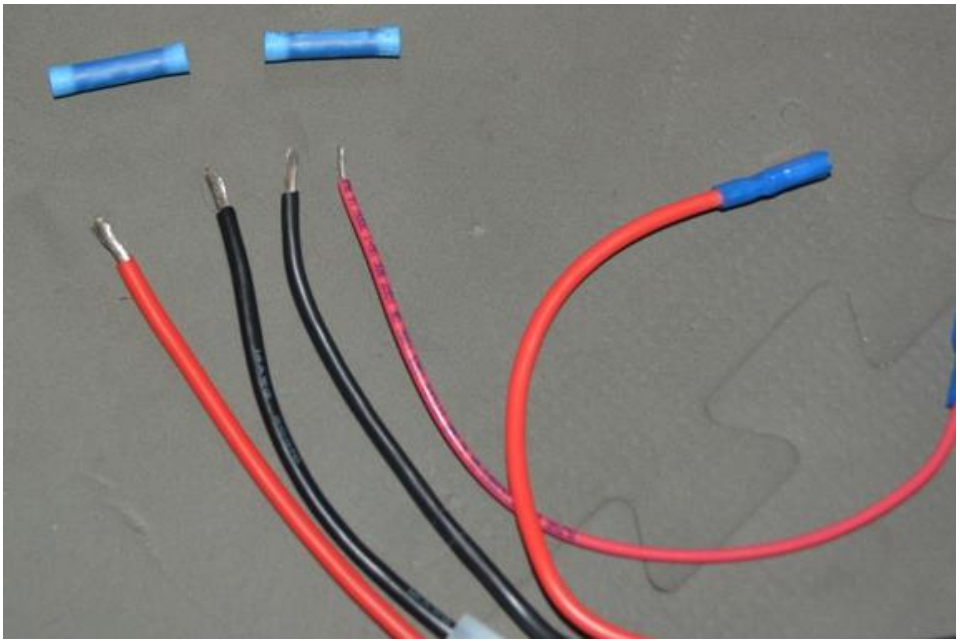
This picture shows the parts that needed between the switch and the PDM.



The connectors crimp to the wires. In order to achieve a good crimp that will stay tight, the soldered ends of the wires (shown in the first picture) included with the switch must be cut off. When the soldered ends are cut off, be sure to cut enough off to make sure the solder that has wicked up under the insulation is removed. The cut wires are shown in the next photo.



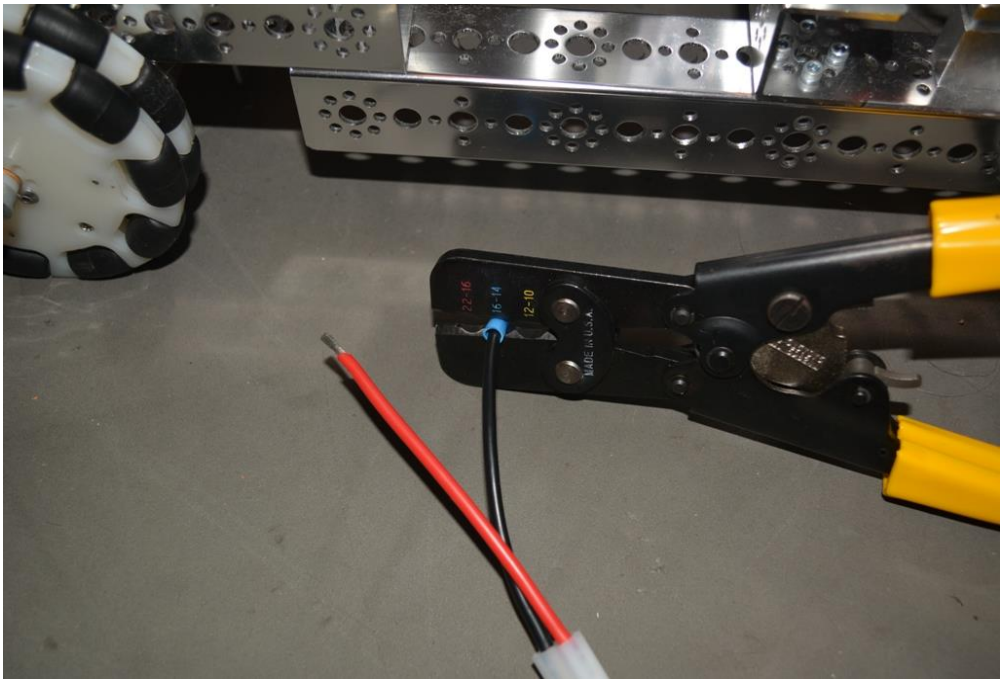
Next, strip the wires for the distance specified by the splice connectors. The packaging specifies 3/8" for this connector. The next photo shows the stripped wires and the splice connectors to be installed.



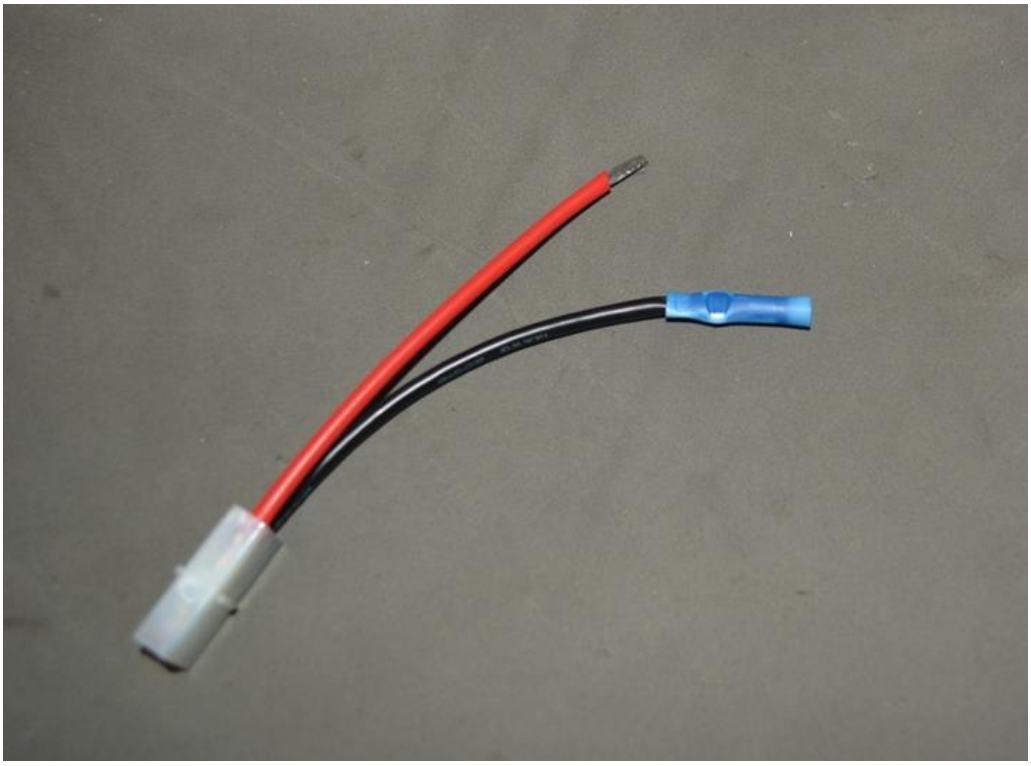
It is not required to use this style of connector. There are various options for connecting the switch wires and the wires for the new Tamiya connector. If a crimp connector like the one shown above is used, then make sure the proper tool is available to make the crimp. The next photo shows 2 different tools that will work with these connectors.

The crimp tool on the left is a more expensive ratcheting style of crimp tool. The one on the right is a less expensive simple pliers type of crimp tool. Both will do the job, but the ratcheting style will produce more consistent crimps.

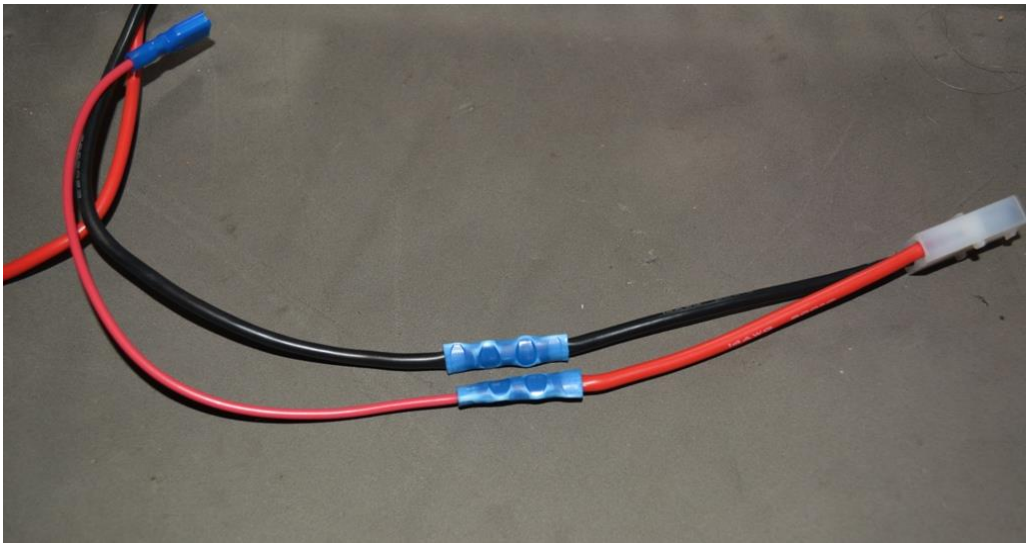
The next photo shows the first splice connector being put on the connector wire. Make sure the wire is fully seated in the splice connector and that none of the wire strands are outside of the splice. Since a blue splice is being used for a 16-14 gauge wire, use the blue 16-14 labelled part of the crimp tool to make the crimp


22-16
16-14
12-10
MADE IN U.S.A.

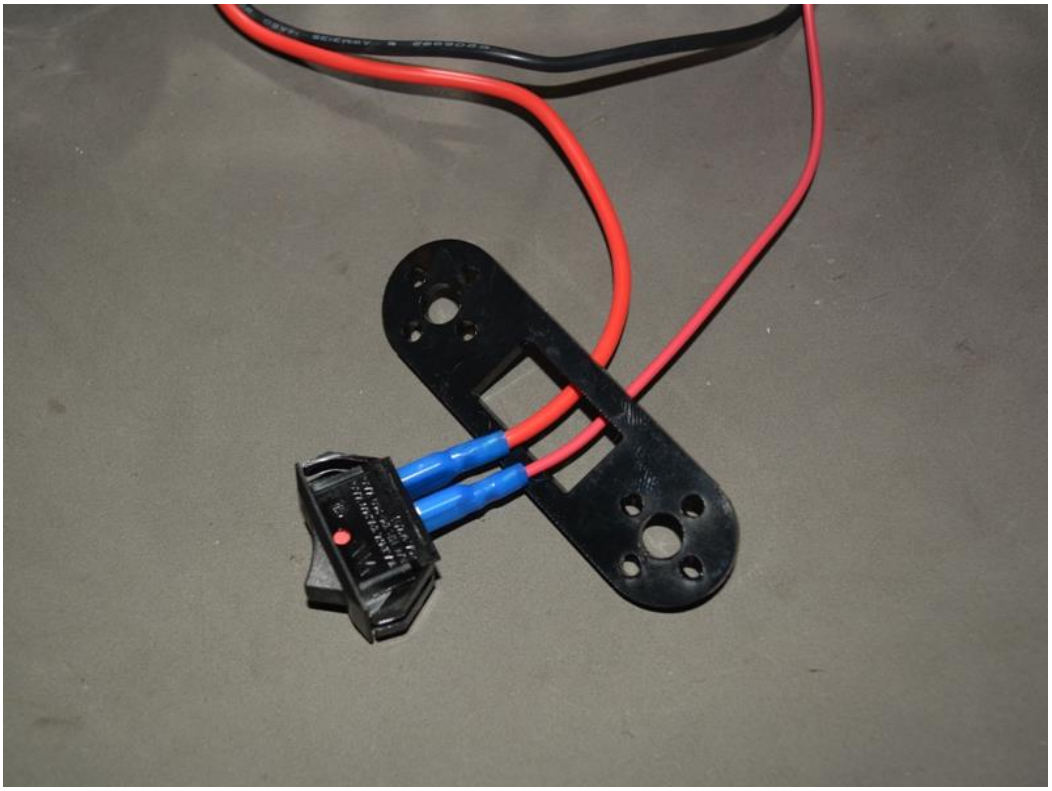
Make a crimp over the metal part of the splice to hold the wire in place. Make a second crimp to clamp the splice on the insulation. The next photo shows the splice crimped in place.



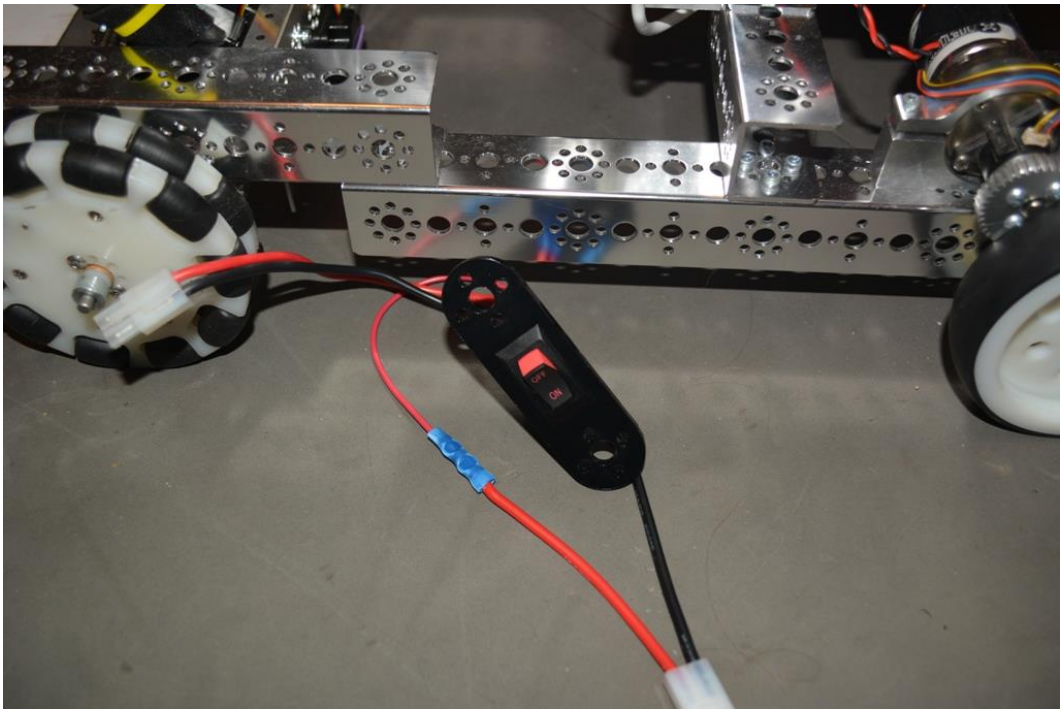
Continue with the remaining crimps. Make sure the black switch wire is spliced to the black connector wire and the red switch wire is spliced to the red connector wire. The following photo shows the finished crimps.



Now mount the switch in the mounting plate. Run the wire ends with the quick disconnect terminals through the rectangular hole in the plate. Connect each of the terminals to the terminals on the switch. The following picture shows the wires connected to the switch.

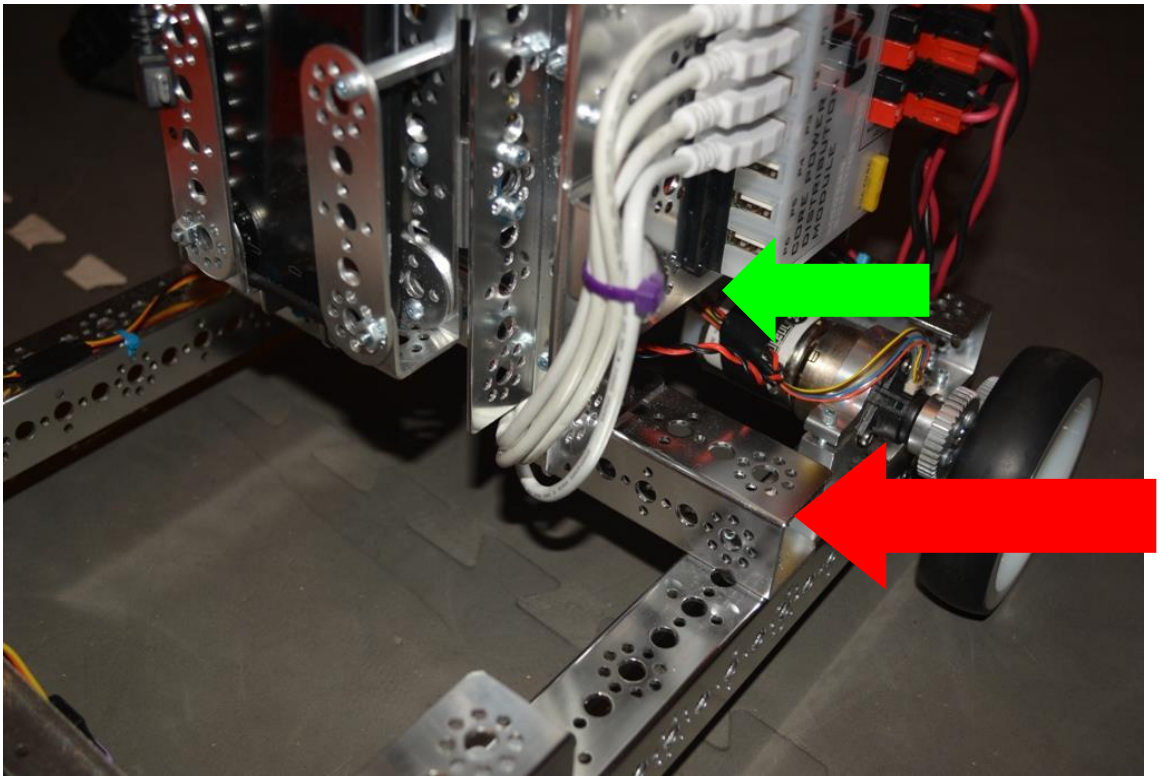


Carefully push the switch into the plate. The switch is now ready to mount on the robot.

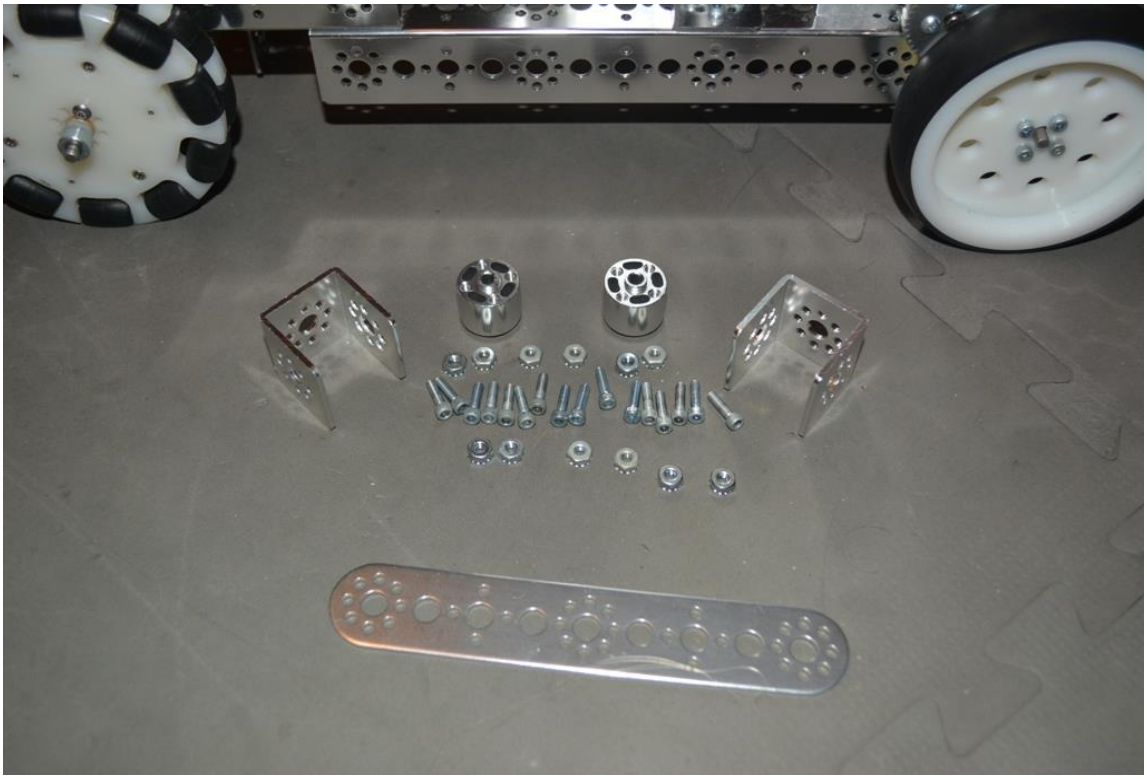


Mounting the Switch to the PushBot

Mount the switch to the side of the robot near the PDM as shown by the red arrow in the following photo. In order to make installation easier, cut the zip tie holding the USB cables shown by the green arrow. Once the switch is installed, then the USB cables can be tied back down.



The following photo shows all the parts that will be used for the switch installation.

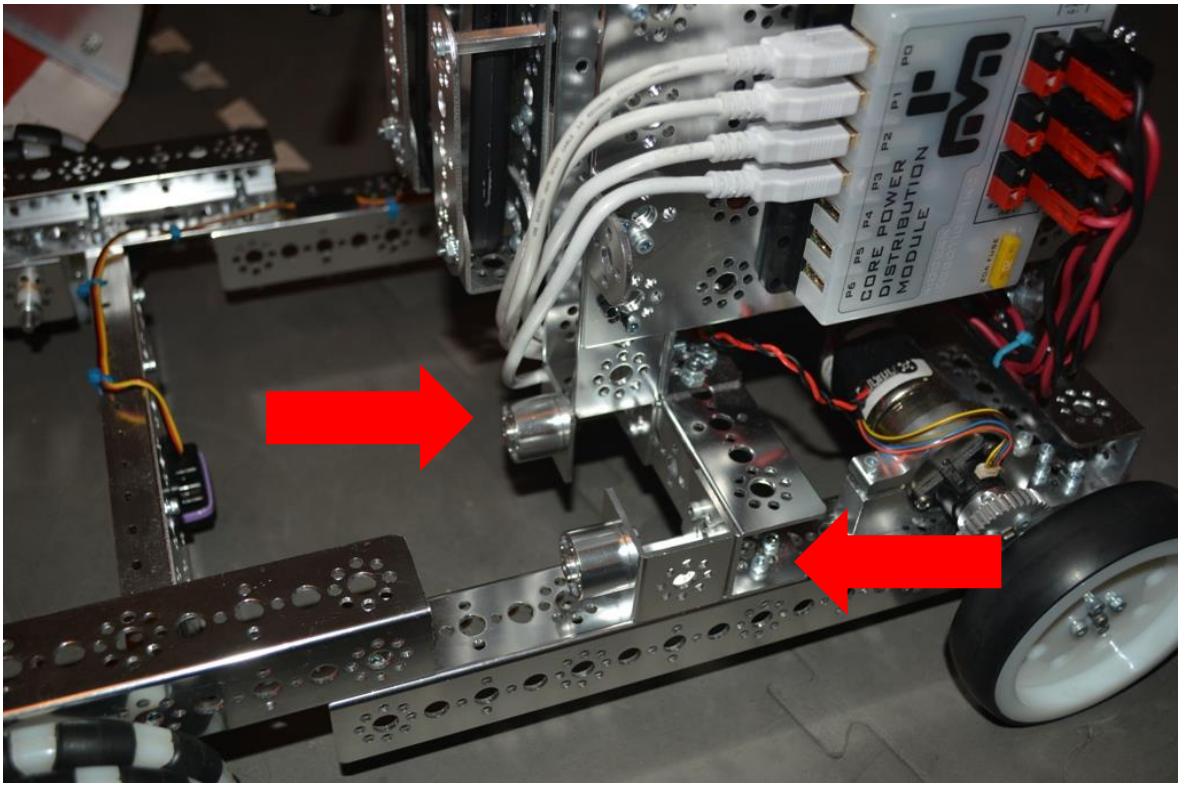


Step 1: 32mm channel (2), 1/2” socket head cap screws (4), threaded round spacer (2)

Assemble a threaded round spacer to each of the 32mm channels using 1/2" socket head cap screws as shown in the following photo.

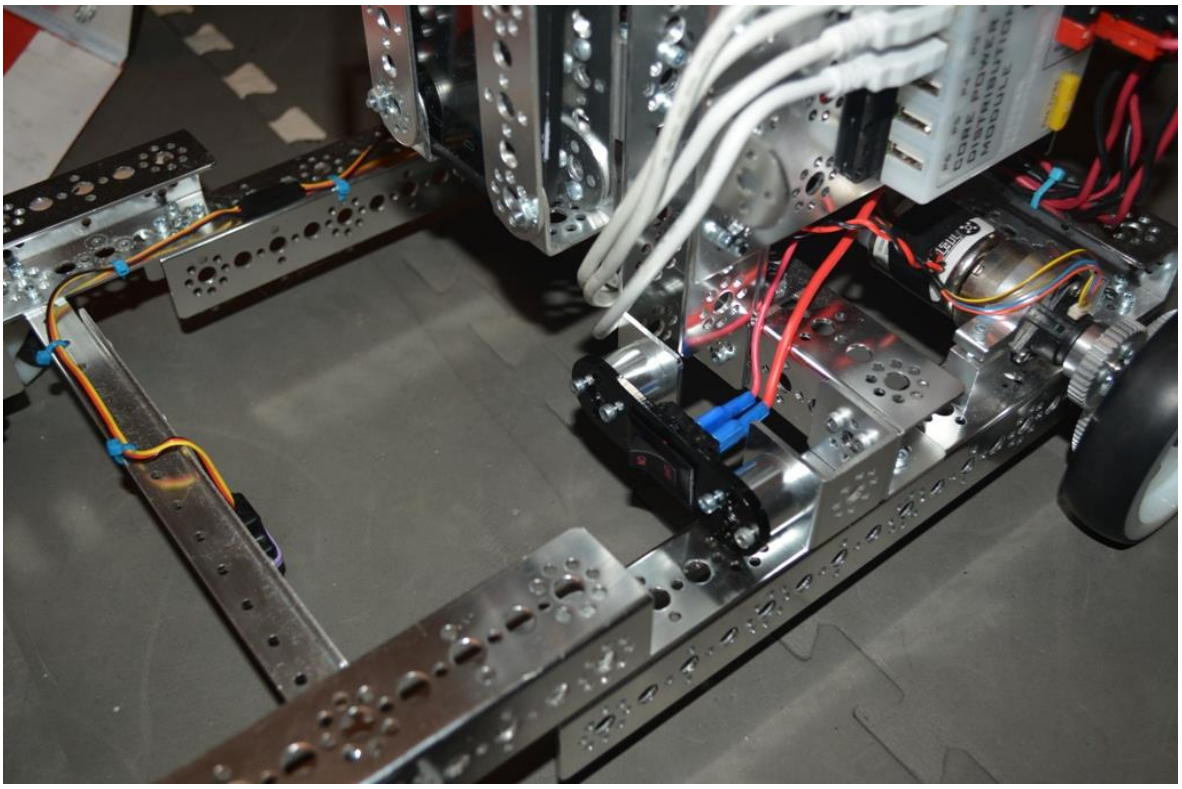
Step 2: assemblies from step 1, 1/2" socket head cap screws (4), keps nuts (4).

Attach the assemblies from step 1 to the PushBot as shown in the following photo.



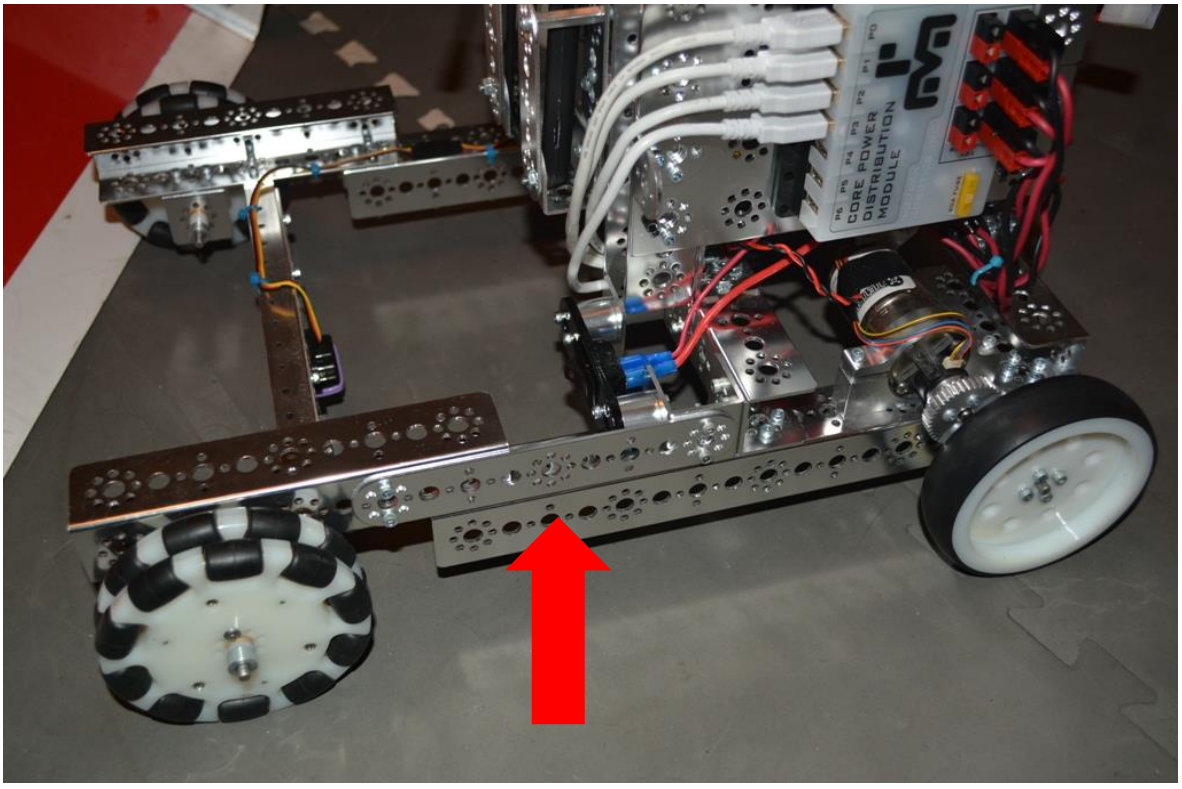
Step 3:1/2" socket head cap screws (4), the completed switch assembly.

Mount the switch assembly to the threaded round spacer using the screws as shown in the following photo.



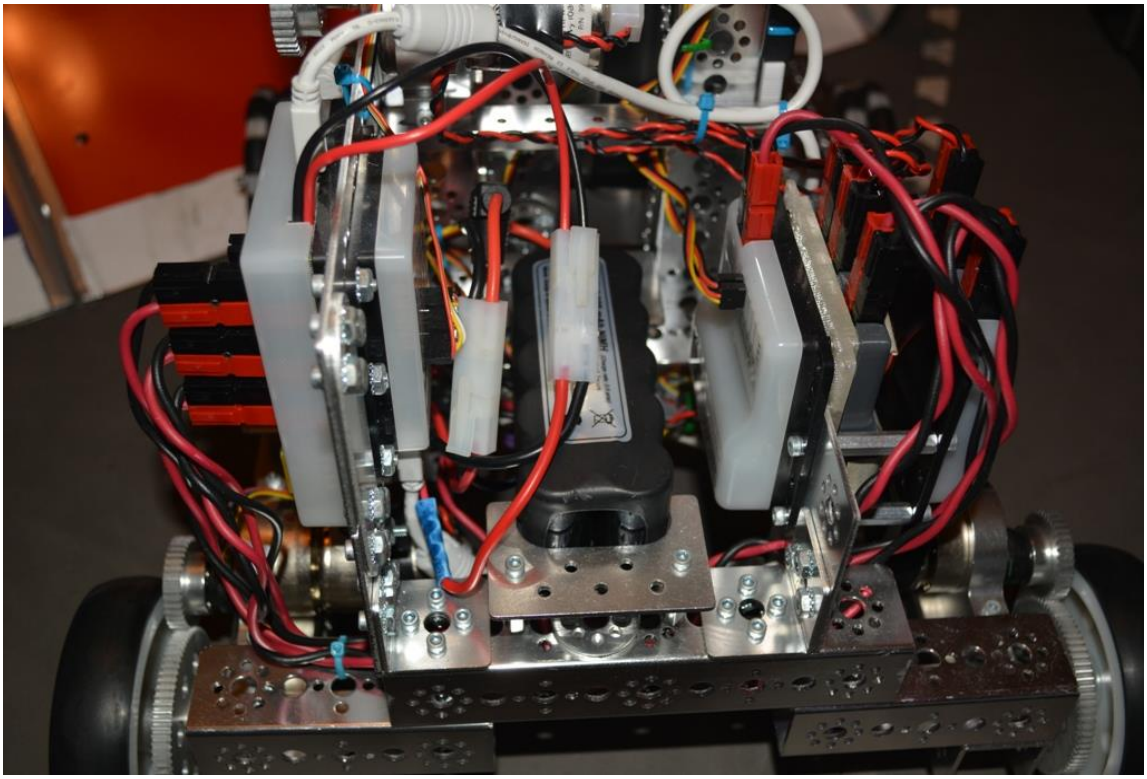
Step 4:1/2" socket head cap screws (4), keps nuts (4), 160mm flat (1)

Attach the flat to the side of the PushBot as shown in the following photo. The purpose of the flat is to make it harder for another robot to accidently turn the PushBot off during a match.



Step 6: Finally, thread the wires up to the battery compartment. The battery is plugged into the connector that goes to the switch. The other connector plugs into the PDM.

IMPORTANT: Verify the wiring from the battery to the PDM. Make sure that red connects to red through each connector and that black connects to black. If wires are crossed anywhere and then the PDM is turned on, then most likely the PDM will be destroyed.



At this point you can add a zip tie to tie down the USB cables from the PDM to keep them from moving and potentially coming loose during a match.

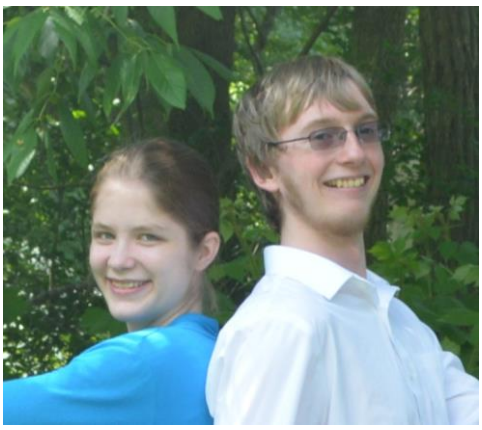
Appendix A: Bill of Materials List for Additions to the Push Bot

This list only includes the items needed to build components shown in this document. All changes relate to adding sensors to the original Push Bot.

Quantity	Name	Common Name
1	Tetrix MAX On/Off Switch	Power Switch
1	Switch Mounting Bracket	Switch Mounting Bracket
1	E1704	Female Tamiya Connector Wired
2	03984NA	Splice Connects
2	W39592	Threaded Round Spacer
2	TETRIX_739065_2012	32mm Channel
8	TETRIX_739094_2013	Kep Nut
16	TETRIX_739097_2012	1/2” Socket Head Cap Screw
1	TETRIX_739272_2013	160mm Flat

Appendix B: Project Team Profiles

Our team would like to thank two very special people who spent hours reviewing the team's documentation. One is an alumna of Team 2843, Renee Spangler. The other is an alumnus of FRC 3361, Nathaniel Lahn.



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Appendix C – Resources

Game Forum Q&A - *http://ftcforum.usfirst.org/forum.php*

FTC Game Manuals – Part I and II - *http://www.usfirst.org/roboticsprograms/ftc/Game*

FIRST Headquarters Support

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