

TUTORIAL: THE BUILD

THE F1/10 TEAM

INTRODUCTION

This Tutorial is a manual you can follow to assemble the race car - a 'to-do list' that will list the steps required, starting from unboxing the Jetson to running code from the f110 repository. It is assumed that you have the following components:

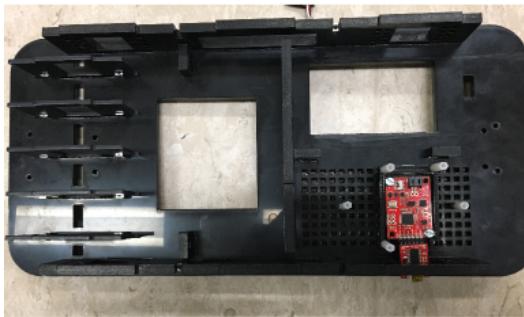
- Chassis with attached Teensy Board
- Traxxas Car
- LIDAR
- Ubiquiti PicoStation
- Jetson
- The 12V custom power cable
- The 16V Energizer power cable
- Energizer Battery Pack
- HDMI Cable,
- Ethernet Cable
- USB keyboard and mouse
- USB Hub

You should also have with you, screwdrivers and appropriate allen keys. This build will cover not only the assembly but will even have a systems check once the all the hardware is mounted.

OVERALL INSTRUCTION SET

- Power on the Jetson and install Grinch Kernel
- Install ROS on the Jetson
- Configure the various sensors with ROS
- Enable wireless communication with Jetson(Ensure you can SSH into the Jetson and operate all the sensors/software)
- Assemble the car - complete with all connections for all components
- Start the Lab Exercises as mentioned on f1tenths.org ↗

The first 4 items on the check list are essentially, Tutorials 1-4 on the f1tenths.org ↗ website. This document will stress on the actual assembly of the car itself.



a)



b)

Figure 1: The lower plate of the chassis. a) Shows the IMU mounted on the upper face and b) Shows the Teensy mounted on the bottom face of the lower chassis

CAR ASSEMBLY

This section walks you through assembling the car itself. Once we have verified the working of all the sensors and the Jetson, we move on to mounting these sensors and Jetson on the chassis.

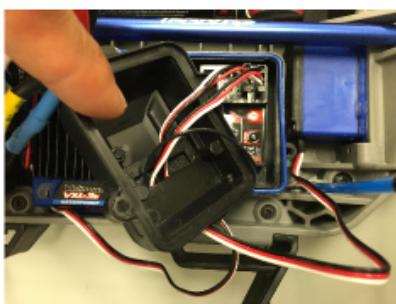
- Attach the IMU to the upper face of the bottom plate of the chassis. (Fig. 1.a)
- Attach the Teensy to the lower side of the bottom plate (Fig.1.b)
- Attach the lower chassis onto the Traxxas body
- Attach the respective wires to the Teensy Board. This can be the most confusing part of the setup.
 - Label the wires coming out of the ESC and Servo(Fig. 3.a,b). Trace these wires into the Transciever box. They should be plugged into the 'CH1' and 'CH2'(or 'CH3') slots of the male headers of the transciever box(Fig. 2).



a)



b)



c)



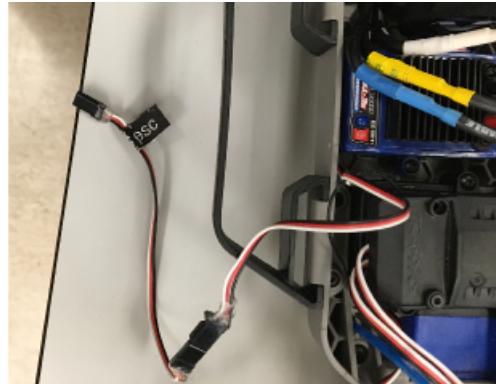
d)

Figure 2: This figure showcases how the traxxas is initially when it is unpacked.a) This is how the lowest tier of the traxxas chassis looks. b) Note the cables coming out of the ESC and the Servo. These cables go directly into the transciever box. c) Note how these cables are fitted into the transciever box in the male headers d) The cable from the ESC should be placed in CH1 by default

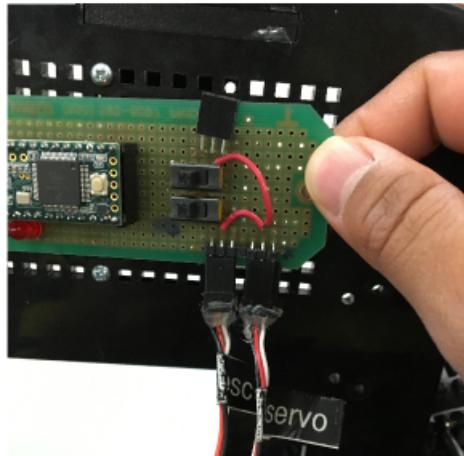
- Attach your own cables coming out of the Transciever box - at CH1(generally corresponds to the ESC - label this wire, say 'top'), similarly label the wire coming out of CH2/CH3 as 'bot' and plug them into the Teensy as shown (Fig. 3.c,d)
- Plug in the Servo and ESC cables into the Teensy as well.(Fig. 3.c,d)
- Place the Amazon 3.0 Hub in the space provided (Fig. 4.b)



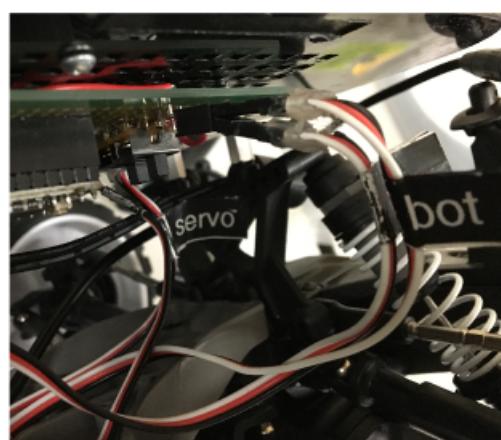
a)



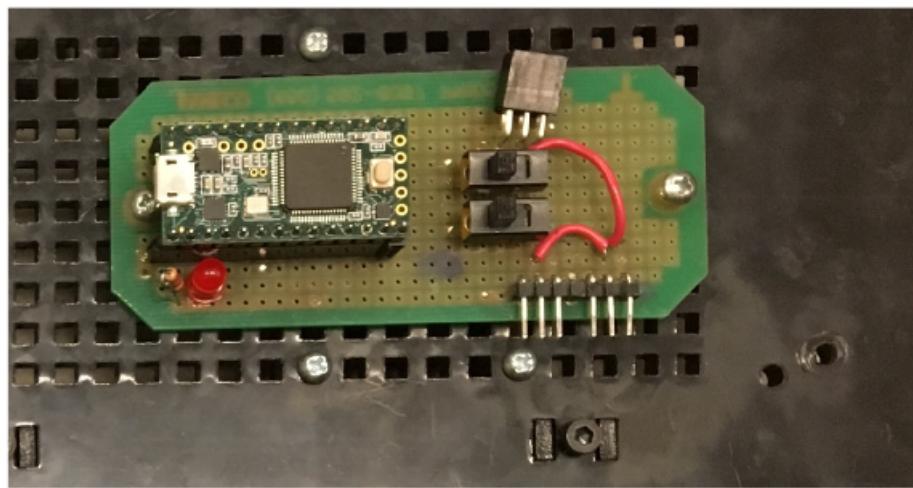
b)



c)



d)

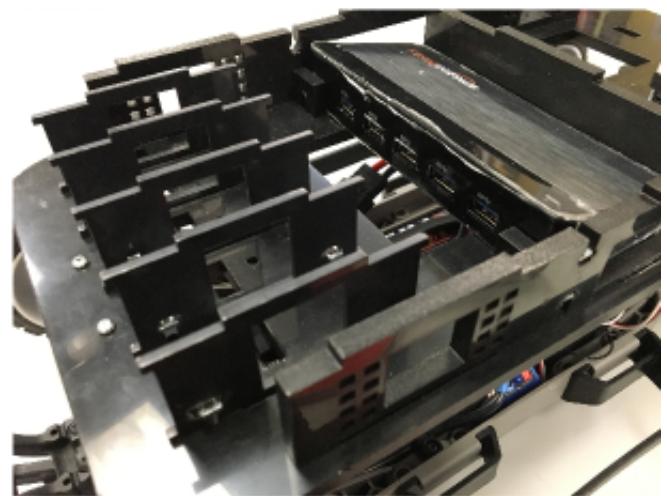


e)

Figure 3: a,b) Label the servo and ESC wires as shown in these figures. c,d) Attach the wires to the teensy as shown. e) The Teensy mounted on the lower chassis plate



a)



b)

Figure 4: a) The USB Hub is placed as shown in the space provided in the lower chassis. b) Wrap the USB cables around the supports to the needed length

- Connect the Teensy and the IMU, along with any other sensors to the Hub. Ensure that you use the supports provided to wrap the USB cables to the desired length (Fig. 4.a)
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- We now move on to attaching the top plate (Fig. 5)

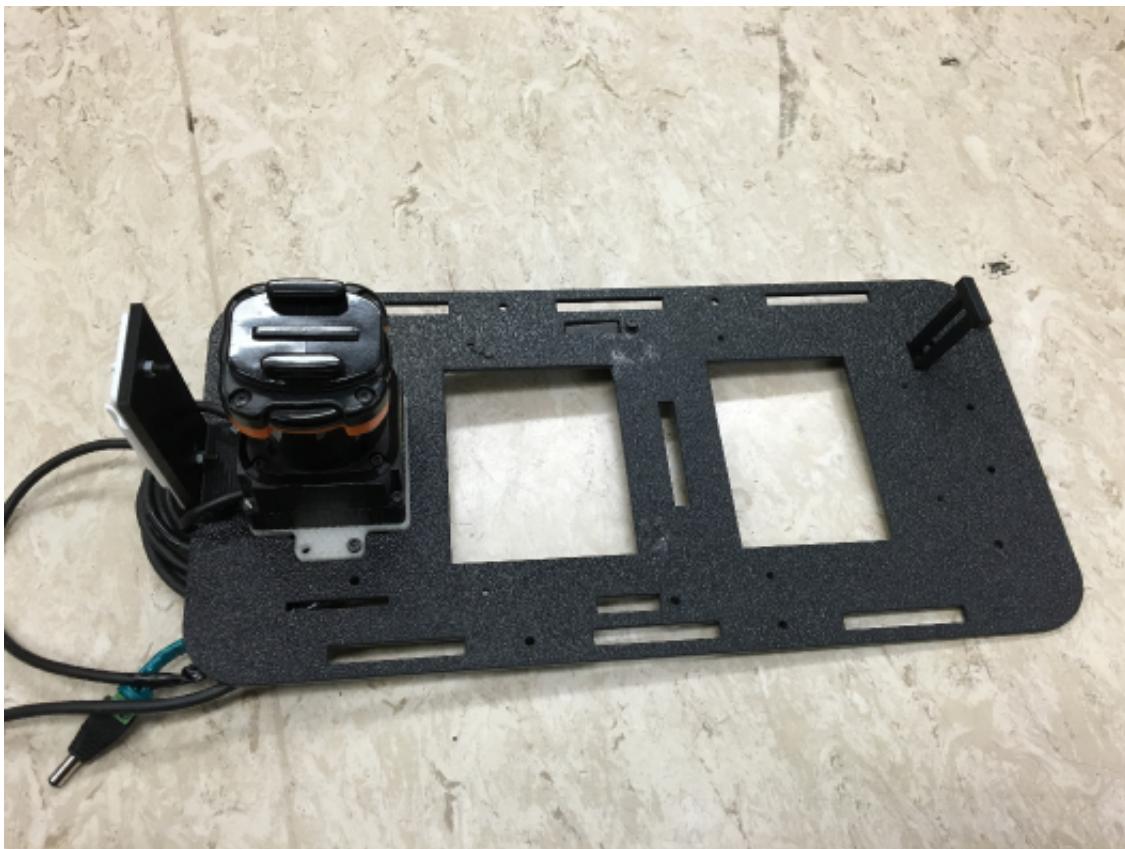
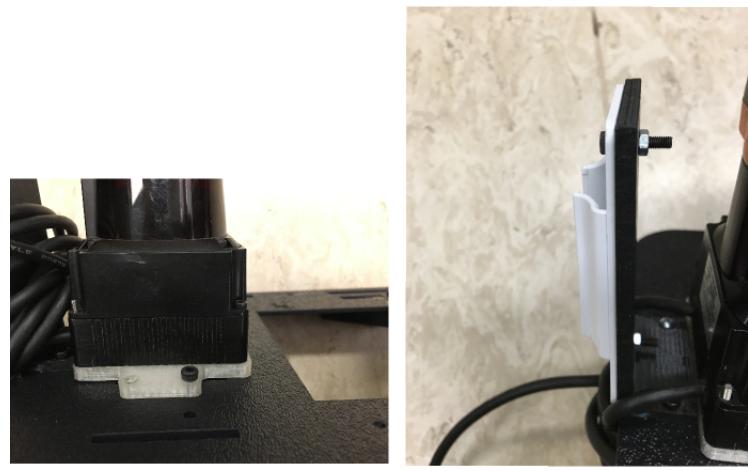


Figure 5: The top plate of the chassis

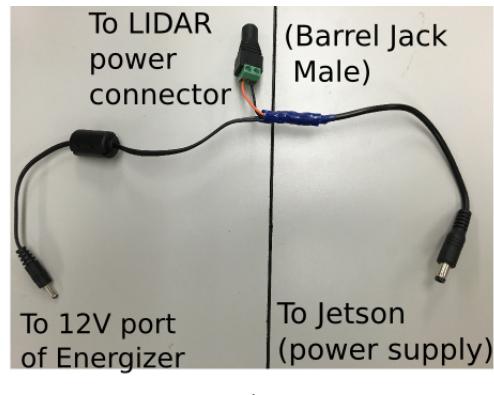
- Fix the Ubiquiti and LIDAR mounts on the top plate of the chassis(Fig. 6).
- Once the top plate is mounted, we start cabling the power connections. The Jetson and the LIDAR both need 12V and we supply this power through the energizer's 12V supply. Refer to Fig. 7
- The other power connection that has to be taken care of is the Ubiquiti Pico Station. This pico station accepts POE(Power over Etheret) and we use a POE injector to inject the required voltage into a standard Ethernet cable. Refer to Fig. 8



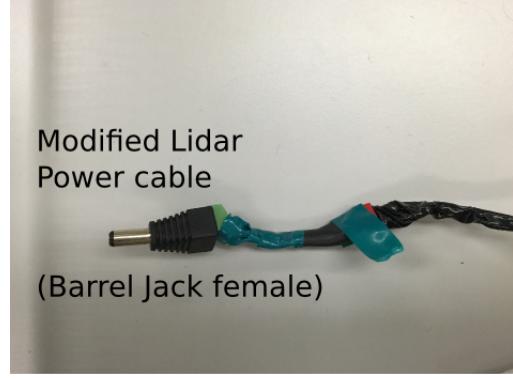
a)

b)

Figure 6: a) The Lidar Mount and b) The Ubiquiti mount



a)



b)

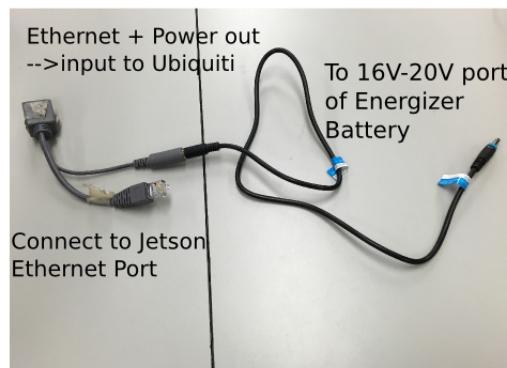
Figure 7: This figure shows the relevant power supply cables for the Jetson and the LIDAR. a) The custom power cable that takes in 12V from the Energizer and splits it into 12V for the LIDAR(male barrel jack) and 12V for the Jetson. b)The custom female barrel jack connection of the LIDAR



a)



b)



c)

Figure 8: a) This is the passive POE injector. b) This is the 16-20V power cable of the Energizer. c) The POE circuitry

- Insert the Energizer in the slot provided between the two plates and secure it with the clip.
- Before turning on the power, double check the circuitry
- Once all components are safely powered, move on to do the lab exercises described at fitenth.org ↗

REFERENCES
