Directions for assembling the WheeStat 7.

Part 1, Soldering: Place blue headers on the outside pins of the red LaunchPad board as shown in Figure 1. Place blue WheeStat amplifier board on blue headers and solder the headers to the amplifier board. Remove the gray insulation from about 1.5" (3 cm) of the three conductor cable and strip about 3 mm of the insulation from each of the three wires. Insert the stripped end of the red wire into the
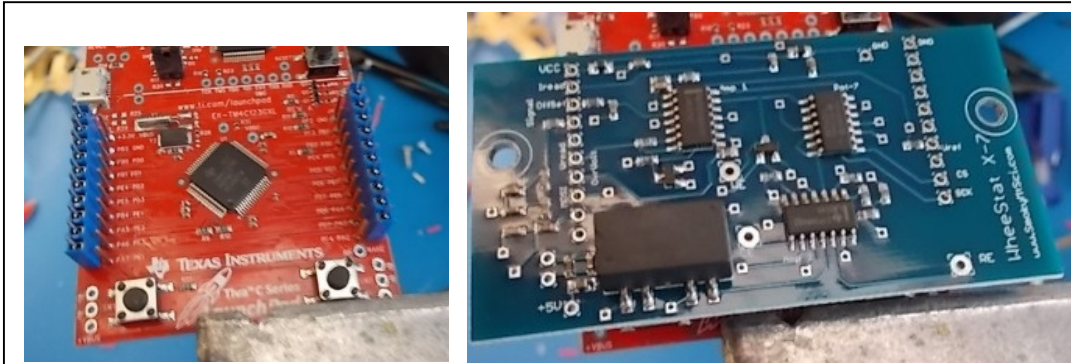

Figure 1. On left, LaunchPad board with blue headers attached to the two outside sets of pins. Notice the wire pad on bottom left labelled +VBUS. On right, amplifier board is placed on headers and is ready to solder. Notice the +5V pad on lower left, just above the VBUS pad on the red board.

wire pad labelled "CE" and solder in place. Insert the black and green wires into the pads labelled "WE" and "RE" respectively and solder them in place. The RE pad is the large circular pad on the lower right on Figure 1. The CE and WE pins are toward the center of the board. NOTE: *DO NOT SOLDER ALIGATOR CLIPS TO THE WIRES UNTIL THE CABLE IS FED THROUGH A HOLE IN THE CASE FRONT as shown in Figure 4.* Cut a 22 gauge jumper wire to about 4 cm and solder one end to the pad on the blue board labelled "+5 V". Solder the other end of this wire to the pad on the red board that is labelled +VBUS. These pads are in the bottom left corners of the boards in Figure 1.

Part 2, Assemble the case: Drill a small hole in the case front and pass the three wire cable through (shown in the foreground of Figure 4). Strip about 6 cm of the gray insulation. Strip about 1 cm from each of the wires in the cable and solder the green wire to one of the alligator clips. Pass the black wire through the black alligator clip hood and solder the wire to one of the alligator clips. Do the same for the red wire, passing it through the red plastic hood.

The two plastic standoffs are screwed to the bottom of the case and the boards are

Figure 2. Standoffs are attached loosely to the bottom of the case with angled edges pointing inward. The boards are slid into place with the red board held under the angled edge. The amplifier board is held to the standoffs using 3/8" #4 sheet metal screws.

attached as shown in Figure 2. Place the back end piece of the housing in place and mark the position of the micro-USB socket. Drill a 15 mm hole in the housing end to allow access to the USB socket. A Forstner style bit works best for this. The left side of Figure 3 shows how the USB socket should line up with the hole (actually it should be in the center, but this far off is not a problem). Place the 3D printed end plate over the USB socket as shown in the right hand panel of Figure 3 and replace the back housing end. The housing end and end plate should be in firm contact and it should be possible to plug the micro-USB cable into the socket with the housing in place.   Be sure that the switch on the top left side of the red board is in the DEBUG position, as shown in the right hand panel of Figure 3 and not in the DEVICE position, as shown in the left hand panel.
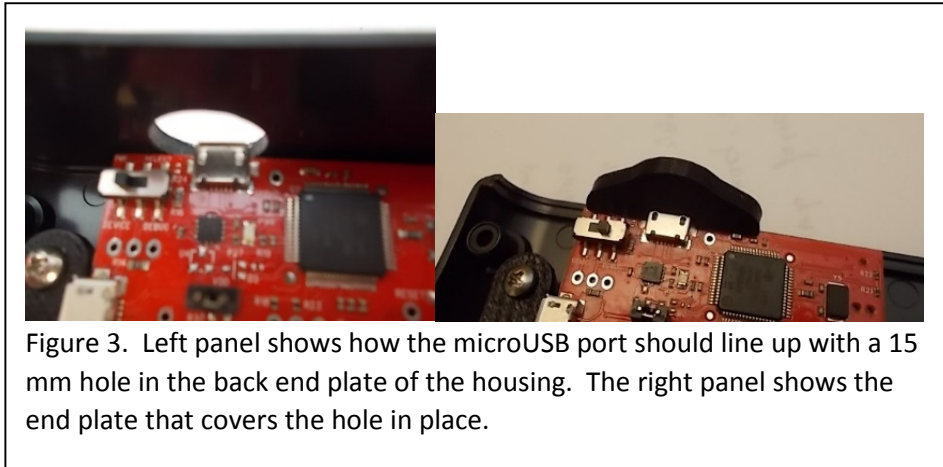

Figure 3. Left panel shows how the microUSB port should line up with a 15 mm hole in the back end plate of the housing. The right panel shows the end plate that covers the hole in place.

With all parts in place, the instrument should look like the photo in Figure 4. It is now ready to screw the top on and apply the sticker.
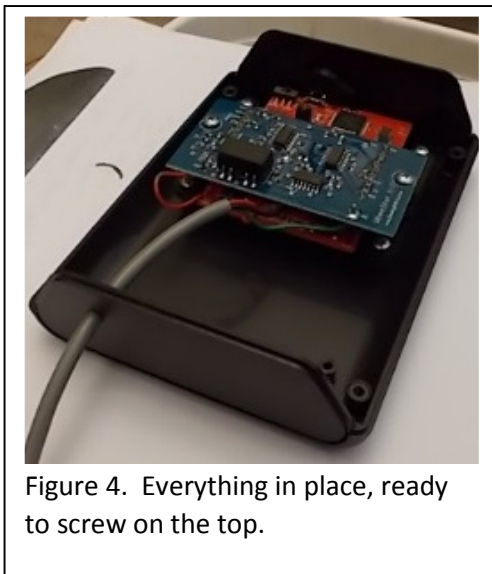

Figure 4. Everything in place, ready to screw on the top.

Part 3, Software:

Part 3A, drivers. To communicate with the instrument, you will need to download and install the drivers from the following Texas Instruments web site: http://www.ti.com/tool/stellaris_icdi_drivers. Instructions for installing the drivers are provided at that same web site.

Part 3B, User Interface: The WheeStat software is open-source and should have come on a flash drive with your kit. It is also available for download from our GitHub page (https://github.com/SmokyMountainScientific). While all of the source code for the project is provided on the flash drive, you should be able to operate the instrument using only the user interface executable file.

If you decide that you want to poke around in the user interface, you can do so. To do this, download Processing from www.processing.org. You will need to include a library called controlP5. Please note that recent versions of Processing will not compile WheeStat6_0d. This version contains functions that were deprecated. Version 6_0e or later will compile with Processing 3..

Part 3C, Microcontroller firmware: The software on the flash drive includes firmware for the microcontroller. Your microcontroller boards should have come with the firmware already flashed on it. To check this, you can open a serial port program and send it the character "*". If the firmware is installed it will respond by transmitting the "&" character. If no software has been installed, it will be flashing the rgb led with alternating colors. If this the firmware is not installed, you will need the program Energia, which can be downloaded for free from energia.nu. Once you open Energia, you need to specify the board you are using. Under tools, select boards, then board manager. This will open a dialog box that will allow you to select the TM4C 123 microcontroller running at 80 MHz. You will also need to install the altSPI library, which you can get from our GitHub page. The altSPI library must be in a folder called "libraries" in your sketchbook folder. You can find your sketchbook by opening the preferences dialog box under File.

The first time you plug your instrument into a USB port on your computer, it can take a while for the computer to recognize it. Patience is necessary. If the user interface stops recognizing the instrument, unpug it from the usb port and reconnect. This will reset the firmware.

Part 4, Bill of Materials
Your WheeStat 7.0 kit should contain the following:

One blue WheeStat 7.0 circuit board	one each box end with large hole
One red LaunchPad microcontroller board	one each box end without hole
	one each left side standoff
Two each blue headers	one each right side standoff
One each three conductor cable	one each usb end plate
three each aligator clips	one each micro usb cable
one each black aligator clip hood	six each 3/8" #4 sheet metal screws
one each red aligator clip hood	four each black screws for box
One each box bottom	one each red wire for power
one each box top	one each usb memory with code

Good luck with your new instrument and please let us know of any problems you encounter.