How to prepare your bike so that you can use this wonderful firmware or in other words: How could a dummy like me do this with success.

Most of the information here is a result of learning from excellent videos by jbalat and the wiki on github. I am just attempting to put this together to a kind of operating manual and I will link to the requested parts whenever useful as to not to reinvent the wheel here.

If you do not own the TSDZ2 yet you have 2 decisions to make: there are 4 versions: 36V or 48V/52V and both with or without throttle.

This project here takes account of all 4 variations. If you go for the throttle version you will not only have the obvious option to use a throttle, but you will also be able to use a temperature sensor instead of the throttle if you want to make sure that your motor will not overheat. This is also part of the project here. I am not sure that many people have installed it so far, but it is good to know that it exists. NOTE already now: If you have installed the temperature sensor (and only then) you will need the “throttle” versions of the firmware releases.

The decision whether to go for 36V or 48V: it seems that the trend is going to higher voltage versions. This will allow for higher power, since the maximum current is the same in both cases.

The installation of the motor is normally a matter of minutes rather than hours: remove the complete crankset and replace it with the TSDZ2 unit, attach the speed sensor close to the spokes of the rear wheel, attach the magnet to a spoke so that the distance between magnet and sensor is around 2 mm, connect the LCD and the battery, done.

How to remove a crankset, what you need for that etc etc: all this information and all other upcoming technical knowledge not specifically addressed here is easily available on youtube, where, by the way, you can also find an installation video by Tongsheng themselves.

SHOPPING LIST:

In order to use the Open Source (OS) Firmware, you will have to use a display that does not come with the TSDZ2, the reason being that it allows for all the programming necessary and was selected by casainho, the initiator of this project.

This display is currently a monochrome display, Kunteng KT-LCD3.

Casainho is currently working on making the whole project work on a color display. As of now, he picked the 850C from Bafang. This may still be subject to change.

In order to be able to flash the display and the controller of the motor you will need a small USB device called ST-Link v2, you get clones of it for a couple of dollars/Euros on ebay.

You will also need a piece of software called “ST-Link visual programmer” (not the “ST-Link utility” which is mentioned in the wiki). You can download it from here: <https://www.st.com/en/development-tools/stvp-stm32.html> free of charge. You will need to register, but this should not have any consequences for you.

In order to be able to flash the motor, you will need a cable that can connect to it. You will need to unplug the speed sensor from the motor and replace it with the ST-Link. This means: you need a cable with a plug identical to the one of the speed sensor to start with. Best/easiest source for such a connector is a spare speed sensor…I experienced various types of speed sensor cables in the motor package. Not all of them were usable, because the speed sensor needs only 2 wires and there are cables with 6 pin connectors that contain only 2 wires…., while the ST-Link will need 4 wires on the right pins…so you will want to have a cable with 6 wires to be on the safe side…this can be found on a speed sensor with yellow connector that I got as a spare part from here: <http://recycles-ebike.com/home/84-tsdz2-new-speed-sensor-with-y-splitter-for-headlight-and-taillight-connections-for-6v-lamp.html?search_query=speed+sensor&results=64> (if you see a black connector, it is because the photo shows the old version. Also the sensor itself looks different on the new model).

One more item that can be of interest is a brake sensor: the TSDZ2 and the LCD3 display support the use of a brake sensor. This sensor comes with a small magnet. The sensor is attached to the fix part of a brake lever (one on the right brake lever should be enough) and the magnet on a spot of the lever that will be moved away from the sensor when braking. This will change the status of the magnetic interrupter in the sensor and this will initialize a signal in the controller/display unit, as a result of which the motor will go out and thus save energy. There are several types of sensors available depending on the type of brake that you have. Google for it and you will find what you need.

So, this concludes your shopping list: KT-LCD3 Display, ST-Link module, ST-Link visual programmer and spare speed sensor with YELLOW plug (you should ask before you order). And optionally the brake sensor and also a temperature sensor (only if you have a throttle version). For this you would have to open the motor housing and glue the sensor to the motor. Jbalat has made a video how to install the temperature sensor.

Now that you have all the parts needed you can start the

INSTALLATION OF THE HARDWARE:

First you will need to prepare the LCD3 and then attach the ST-Link so that you can flash it:

What you need to do can be found here:

<https://github.com/OpenSource-EBike-firmware/TSDZ2_wiki/wiki/How-to-flash-the-Flexible-OpenSource-firmware-on-KT-LCD3>

One thing to watch out for: the ST-LINK v2 comes in 2 versions for whatever reason: some have SWIM above GND and some are the other way around. So watch out for that and remember to keep in mind that it can be a source of error reports. So sometimes all you may have to do is invert the order of the 2 center pins of your cable in case flashing does not work.

What I did to make the LCD3 easily accessible for future updates: I cut the cable that came with the ST-Link in two halves and increased the hole of one of the screws that hold the case of the LCD3 together, sacrificing one screw out of 6. I inserted the cable in the hole and soldered it directly onto the board of the LCD3. As a result of this I have a short piece of cable with pin connectors sticking out of the case…This was quick and dirty, but you can find your own solution 😊

Now that you have prepared the LCD 3, you can mount it on your handle bar and connect it to the (controller of the) motor. (the controller is integrated into the motor housing).

How to connect it can be seen here:

<https://github.com/OpenSource-EBike-firmware/TSDZ2_wiki/wiki/Wire-KT-LCD3-to-TSDZ2>

you will find instructions for both 6 pin and 8 pin (throttle) motors.

Whether you prefer to cut the cables from the two displays close to the display or close to the connector or somewhere in between is a matter of taste. I decided to cut it about 15 cm from the display which allowed me to connect the brake sensor’s cable into this area without having to drag two long cables… If you opted for a speed sensor, now is the time to mount and connect it as per the wiring instructions mentioned above.

After that, you will need to prepare the flash cable for the motor.

You will cut the spare speed sensor off the cable and leave a rather short piece of cable with the yellow connector (short, because it is recommended to keep the cables as short as possible in order to avoid error messages while programming)

Next you will solder this piece of cable to the 2nd half of the ST-LINK cable (the one that was left after you soldered the other half to the LCD3…. 😉 ) according to the wiring instructions from here:

<https://github.com/OpenSource-EBike-firmware/TSDZ2_wiki/wiki/Flash-the-firmware-on-TSDZ2>

if you want to double-check: this is what the connections should be looking at the yellow connector from the front:



Believe it or not: hardware wise you now are all set! Now you can move over to the

FLASHING OF THE FIRMWARE:

You will need the .hex files for both the LCD3 and the TSDZ2. And remember: you need the throttle version only if you have installed the temperature sensor.

You will find the latest releases here:

<https://github.com/OpenSource-EBike-firmware/TSDZ2-Smart-EBike/releases>

The firmware is compiled by endlesscadence.

Open your ST-LINK Visual Programmer and go to the “configure” menu. Select: ST-LINK, USB, SWIM and STM8S105x6

Connect the ST-LINK cable to the display and plug it into the USB port of your PC.

Select “Read all tabs” in the “Read” menu. This will load the stock firmware of the LCD3. Since this cannot be overwritten by default you will need to enable this by clicking the “option byte” tab on the bottom of the screen and changing “read out protection” to “off”. Then you select “program all tabs”. this will change the firmware of the LCD3 to make it accessible. You will then unplug the ST-LINK from the USB and plug it back in.

Now you are ready: you “open” the LCD3 hex-file and after that you hit “program current tab”. If you are luckier than jbalat you will get a success prompt right away:

You can see his experience and his step by step guide on how to flash the LCD 3 on his great video on youtube from minute 2:30 <https://www.youtube.com/watch?v=bxEHDFCaKH8&t=408s>

You should be more lucky than he was, right away! 😊

The next step then is already simpler since you now are already a flash expert:

You will unplug the speed sensor from the motor and replace it with the prepared ST-LINK cable. Plug it into the PC, load the TSDZ2 file and flash it to the motor by “programming the current tab”.

If you were successful: VOILA, you’re done. You now have one of the best e-bikes around! Unplug the ST-LINK and plug the speed sensor back in. All you need to do now is to configure the LCD3 according to “endlesscadence”’s instructions and you are ready to go!