Forestal e-drive system

Diagnostic Tool Manual

FORESTAL

Truly Extraordinary

This manual will cover the following topics:

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With this manual, you can follow detailed instructions on how to diagnose and update Forestal's e-drive system. To perform these actions, you will need a stable internet connection, a PC, and the bicycle placed on the repair stand.

BESST tool and I-Can wire

Diagnosis tool for Forestal pedal assisted models

BESST tool and I-Can wire

Forestal diagnosis tool uses a combination of two tools to fully diagnose the Forestal e-drive unit. The I-Can wire tool is specifically developed by Forestal to bridge the connection between the battery, motor, and BESST tool diagnosis box.

I-Can wire

BESST tool

Tools and materials needed:

- PC
- I-Can wire
- BESST tool
- Update files

With this tool you can diagnose and update:

- Battery health status
- Controller (Motor parameters)
- Update Battery management system (BMS)
- Update Controller (Motor software)

BESST tool software is available only for PC.

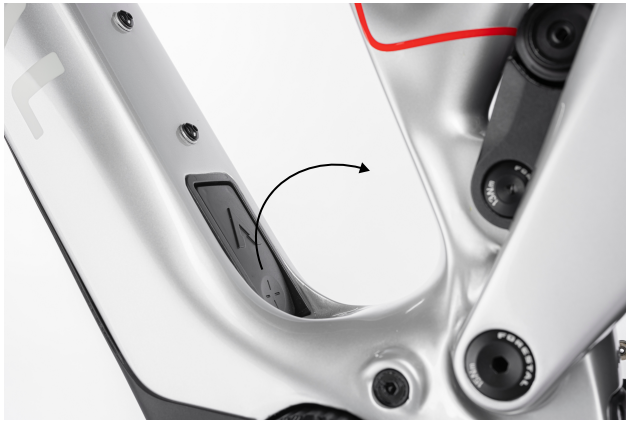
Diagnosis process

How to connect the tools and choose the right diagnosis process

Before starting, firstly charge the bicycle and then connect it to the BESST tool and BESST PC software using I-Can wire following the instructions indicated hereby. After a successful connection, you can access the diagnostic and update the system.

Step 1

Open the charging port.



Step 2

Connect the I-Can wire to the integrated battery and charging port as indicated.

Step 3 Diagnosis process

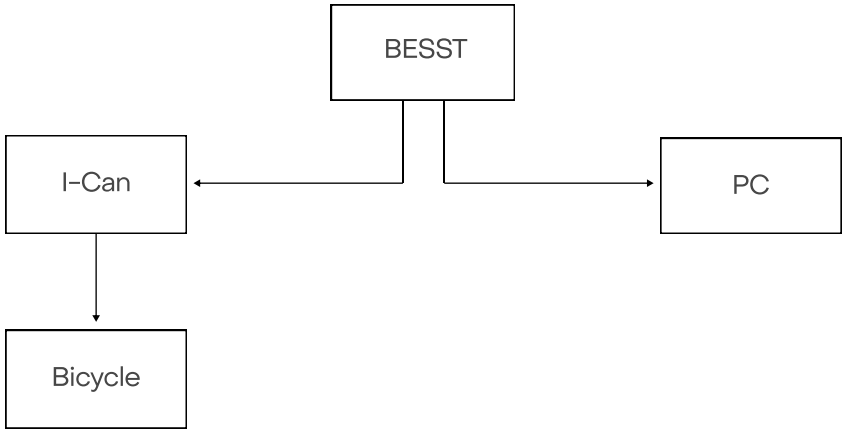
Power ON the bike through the Trigger and wait for the bike to boot completely.

Fully charge the bicycle before connecting the BESST tool!

If the trigger is not working and the bicycle can't be turned on, please proceed to replace the trigger before continuing the diagnosis or update process.

Step 4

Connect the BESST tool to a PC via the USB provided with the tool, and connect it to the I-Can wire as shown on the diagram.



Step 5 Diagnosis process

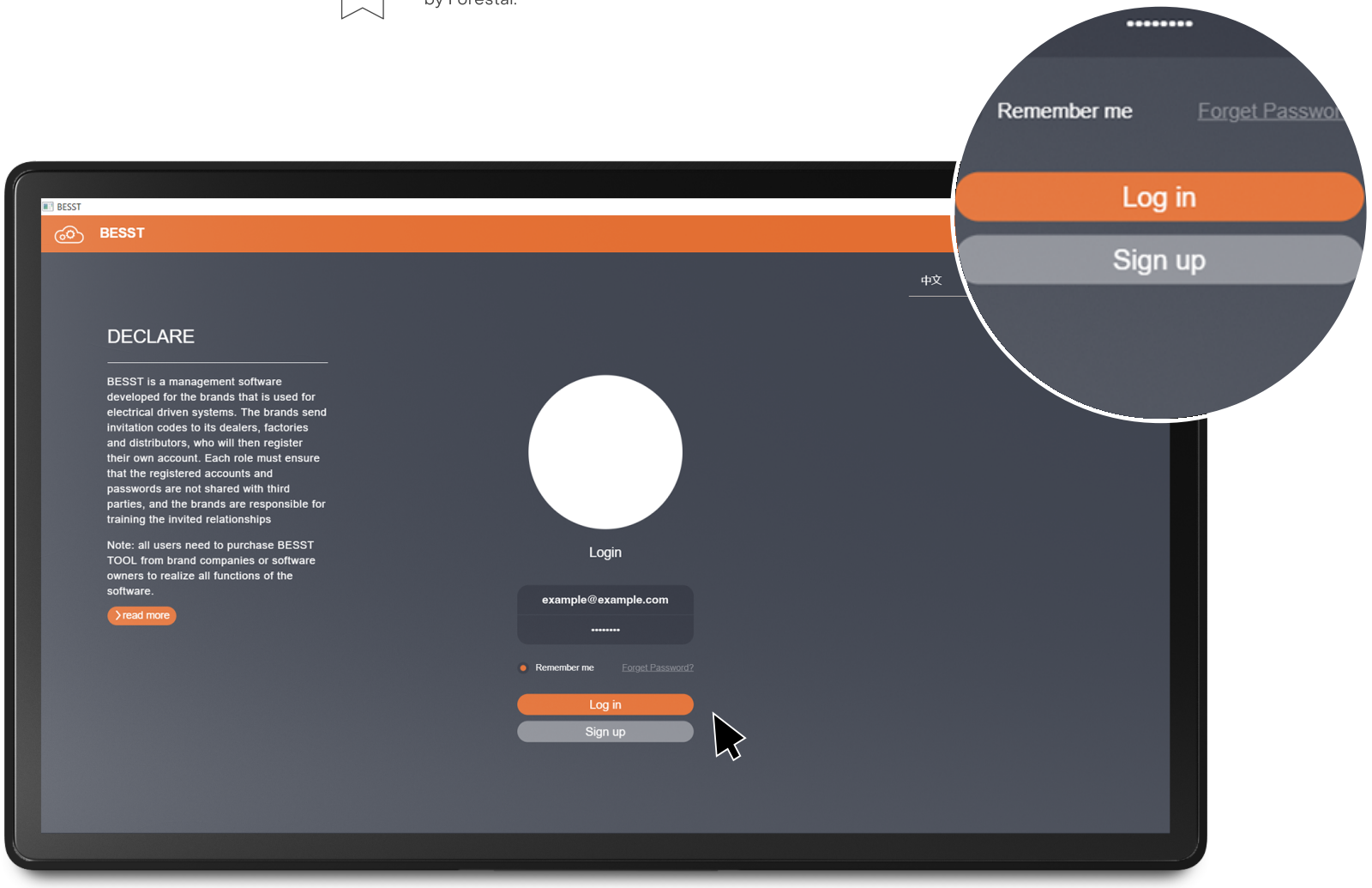
Open BESST tool software on your PC.

Icon of the software

BESST tool software is available only for PC.

Log in to your account.

Every dealer/user has an individual account provided by Forestal.



Step 7

Diagnosis process

Once you are logged in, you can find a menu with different functions on the left side of the screen.

Step 8

Diagnosis process

Find the “Service center” icon and from there enter the “Tools” area.

Step 9 Diagnosis process

In the “Tools” area, you can choose different sections to diagnose: Battery, Controller (Motor), and Sensors; or Update these components with new software versions.

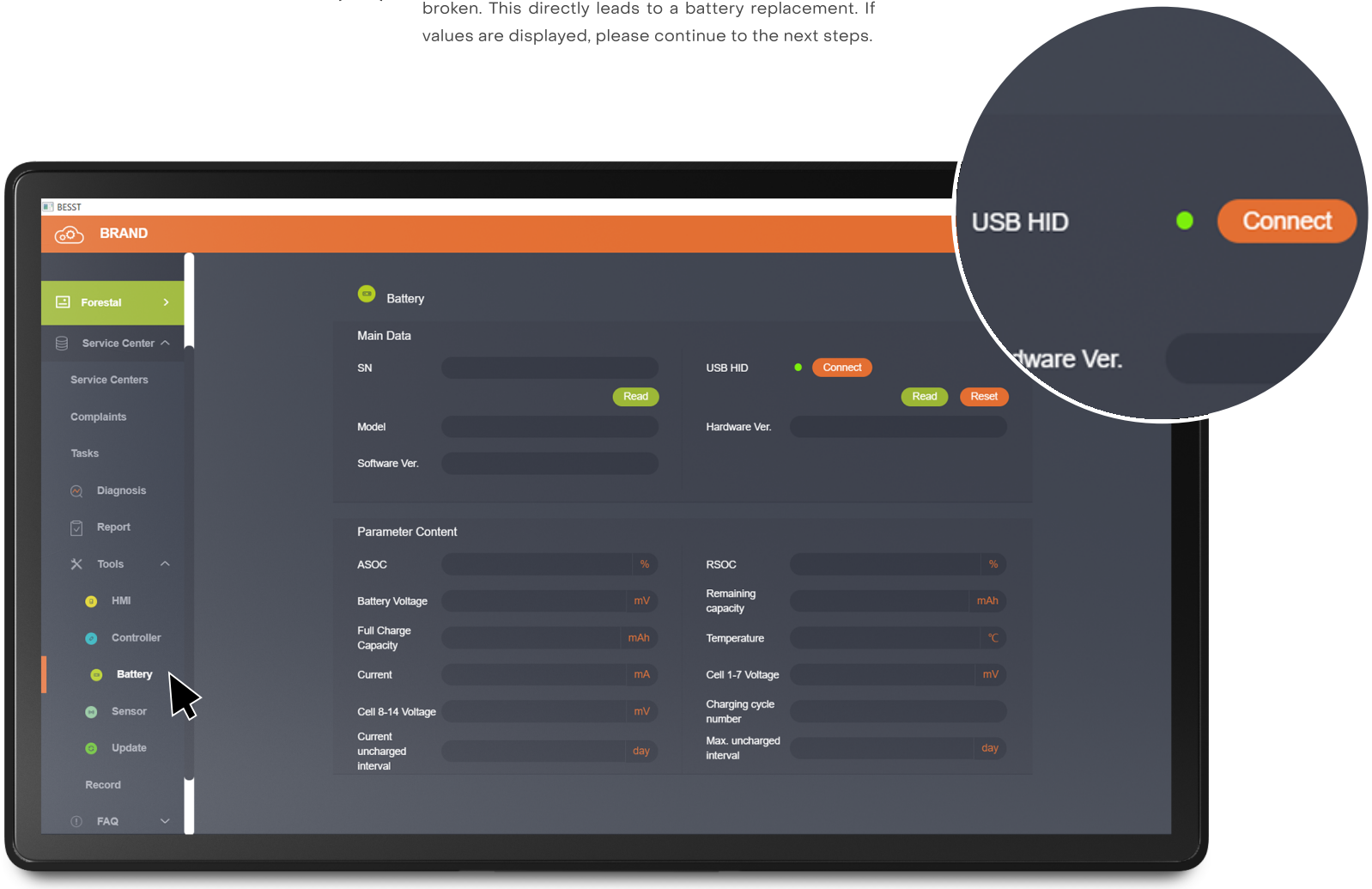
Battery diagnosis

Health status check

Step 1 Battery diagnosis

Click “Connect” on the USB HID field. Values will refresh and you may start reading them.

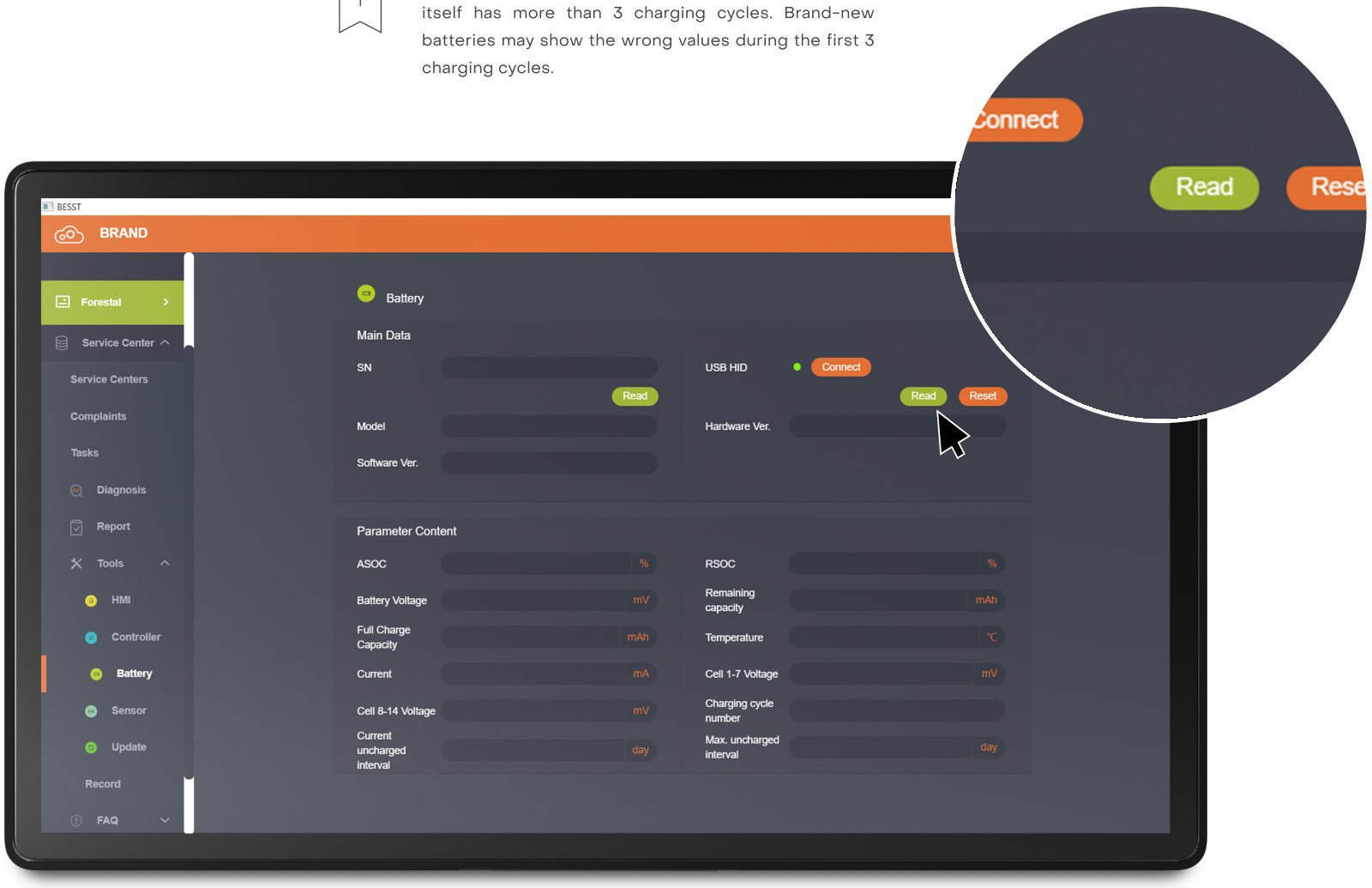
If you are not able to read any of the values after this step, this means that communication with the battery is broken. This directly leads to a battery replacement. If values are displayed, please continue to the next steps.



Step 2 Battery diagnosis

When everything is connected like in the previous step, click the “Read” button and the tool will refresh the battery and show the values.

Before checking the battery, make sure that the battery itself has more than 3 charging cycles. Brand-new batteries may show the wrong values during the first 3 charging cycles.



Check software and hardware version.

If the software version doesn't match the hardware version, then the battery needs a software update (see page 33 on how to update the battery). If software and hardware versions match, proceed toward checking the battery cells and other parameters.

If the software version doesn't match the hardware version, then the battery needs a software update (see page 33 on how to update the battery). If software and hardware versions match, proceed toward checking the battery cells and other parameters.

Software end number	Corresponding hardware	.BIN file name
104	1.0	APP_F21_20220907V109M_aaa1.bin
108	1.1	APP_F21N_20220907V109M_95c9.bin

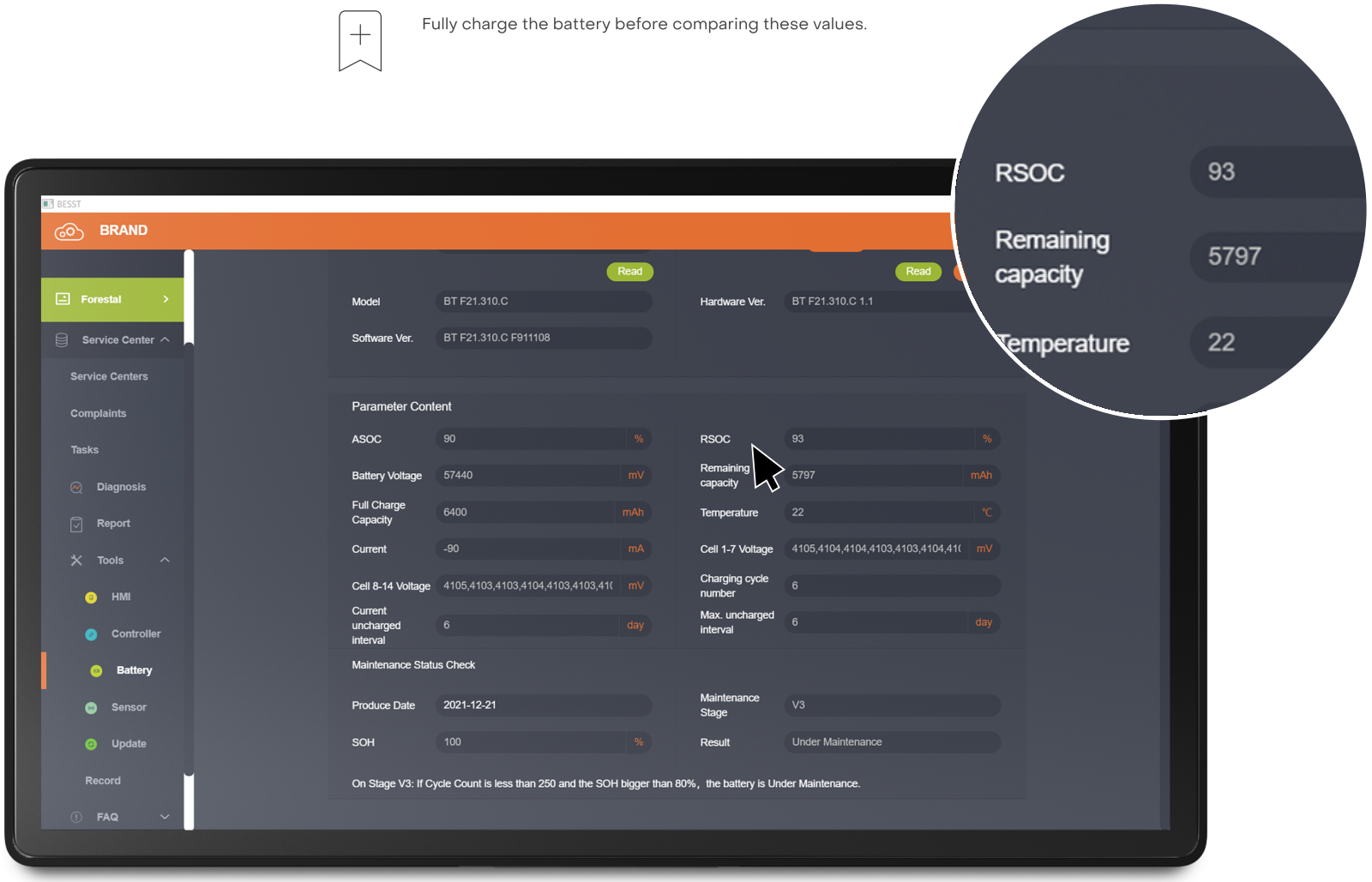
Step 4 Battery diagnosis

Inspect battery cells value in the “Cel 1-7” and “Cell 8-14” rows. Values should be the same for every cell. If the difference is more than ± 50mV, the battery is not fit for use and requires replacement.

Step 5 Battery diagnosis

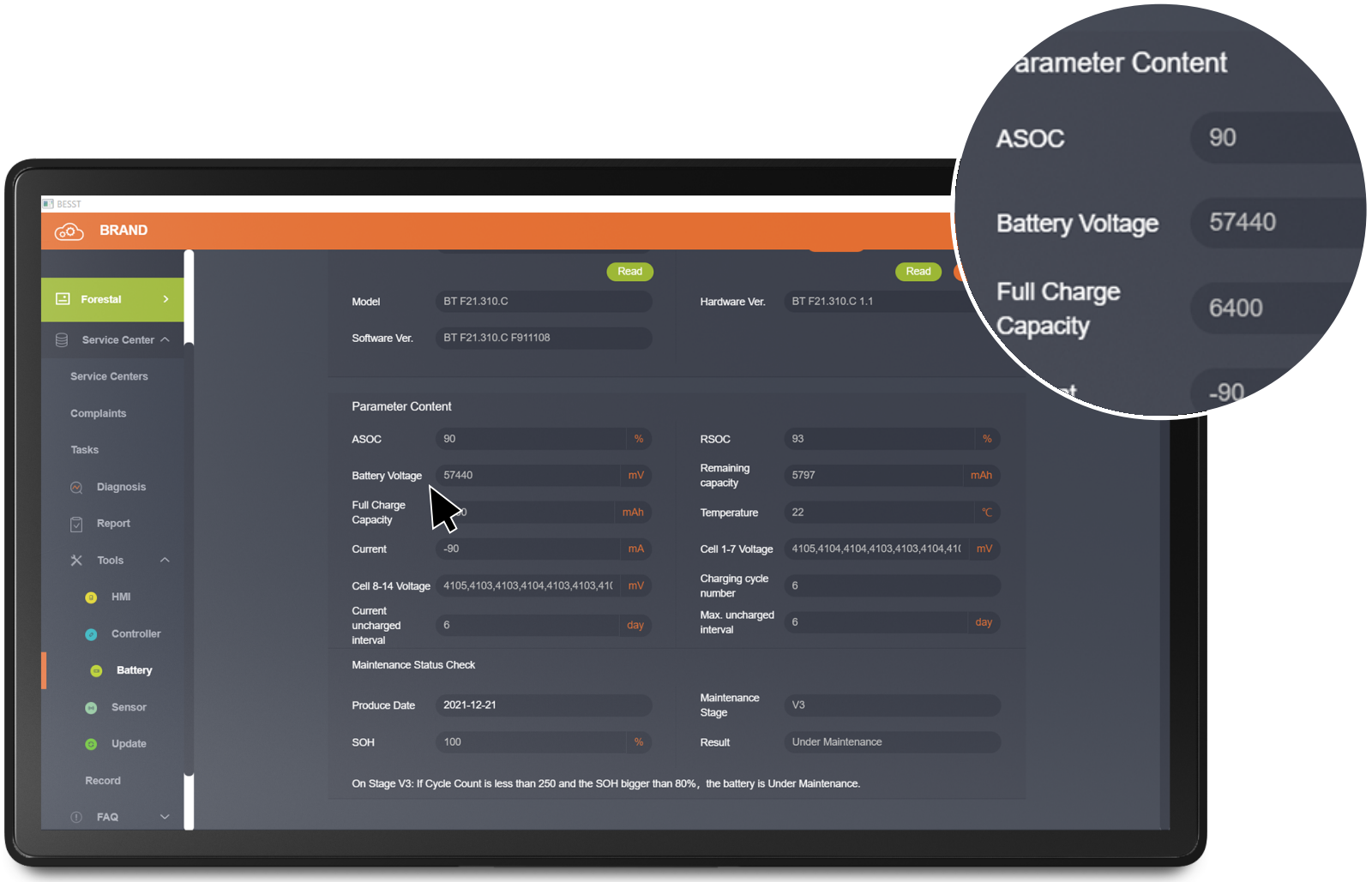
If all cells are balanced, please compare the RSOC “Real State Of Charge” row with the battery level displayed on the Dashboard. If RSOC values are matching, please go to the next step. If not, the battery is not functioning properly and it requires replacement.

Fully charge the battery before comparing these values.



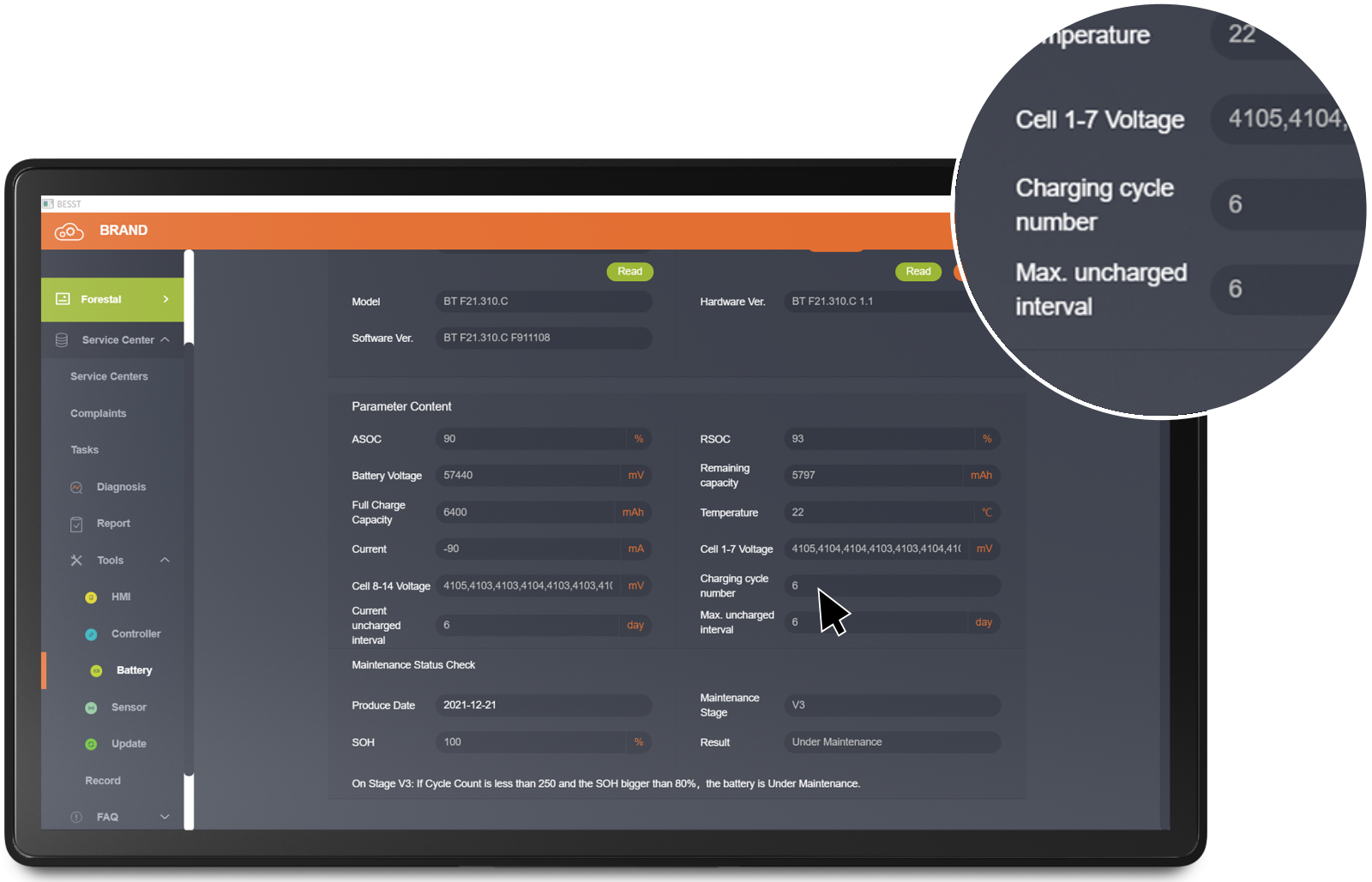
Step 6 Battery diagnosis

If the RSOC values are ok and match the displayed battery level, check the battery voltage. When RSOC = 100%, the voltage should be between 57.4 V and 58.3 V. If values are lower than this, the battery is undervolted and needs replacement. If the voltage is between these values, please proceed to the next steps.



Step 7 Battery diagnosis

Check maintenance status by determining how many charging cycles the battery has. Forestal batteries are covered with a warranty of up to 200 charging cycles or 2 years of use, whichever comes first.



Step 8 Battery diagnosis

Check maintenance status by determining how many charging cycles the battery has and what is the SOH (State Of Health). Forestal batteries are covered with a warranty of up to 200 charging cycles or 2 years of use, whichever comes first. Please see the detailed Maintenance stage table on the next page for detailed information.

- The warranty date is counted from the date the bike was sold to the end user
- All of these numbers are read from BESST
- Spec.: Specifications
- DC: Design capacity
- FCC: Full charger capacity
- SOH: State of health

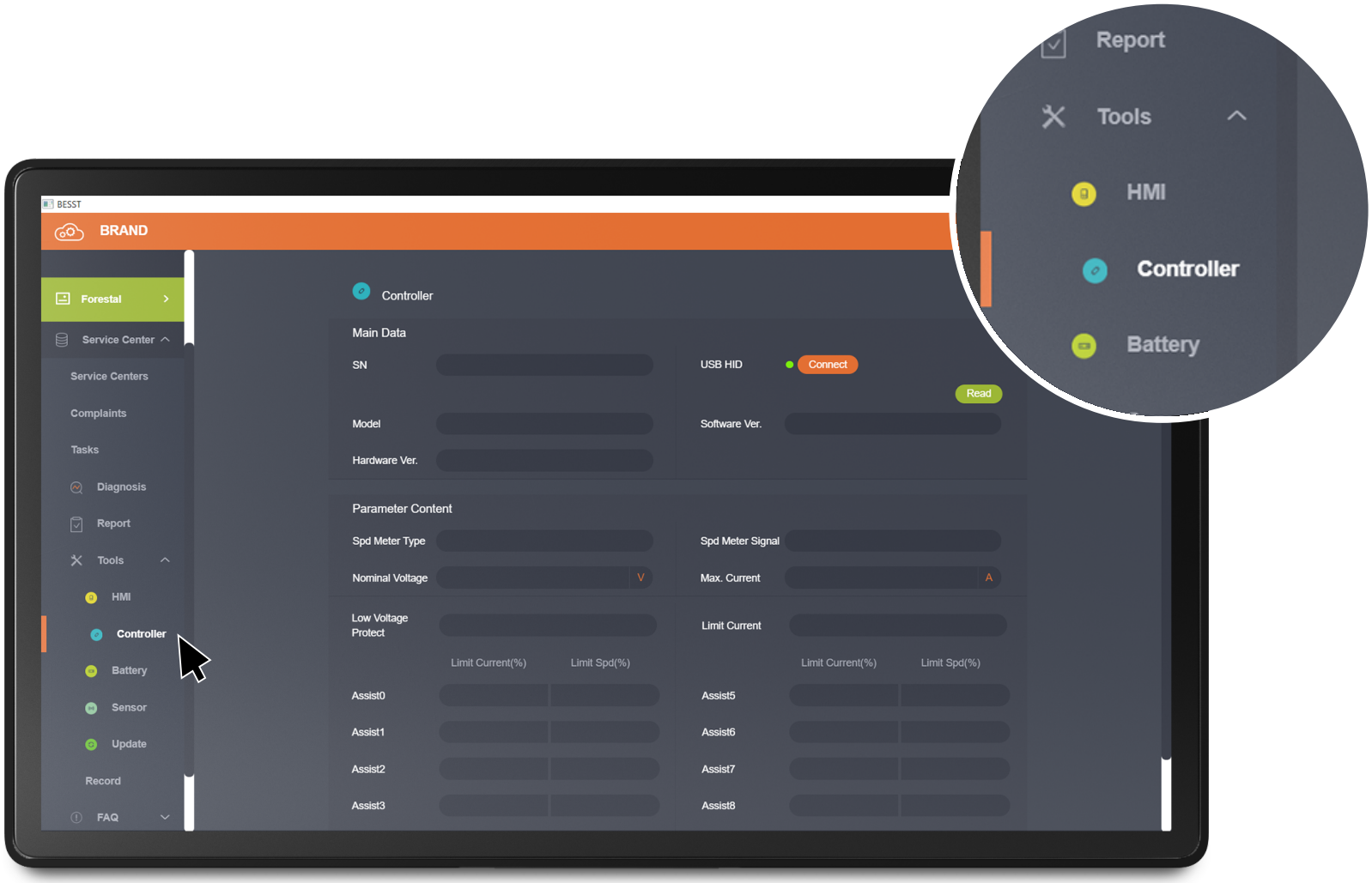
Stage	Warranty	Spec.	DC	FCC	SOH	Cycle	Content
V1	0 Months	All	-	-	< 95%	0	Free replace
V2	0 - 6 Months	310 Wh	6,5 Ah	< 5,9 Ah	< 90%	< 50	Free replace
V3	6 - 18 Months	310 Wh	6,5 Ah	< 5,2 Ah	< 80 %	< 250	After maintenance SOH > 80%
V4	18 - 30 Months	310 Wh	6,5 Ah	< 4,8 Ah	< 60 %	< 500	After maintenance SOH > 60%
V5	> 30 Months	All	-	-	-	-	Paid maintenance or paid renewal

Controller (Motor) diagnosis

Health status check

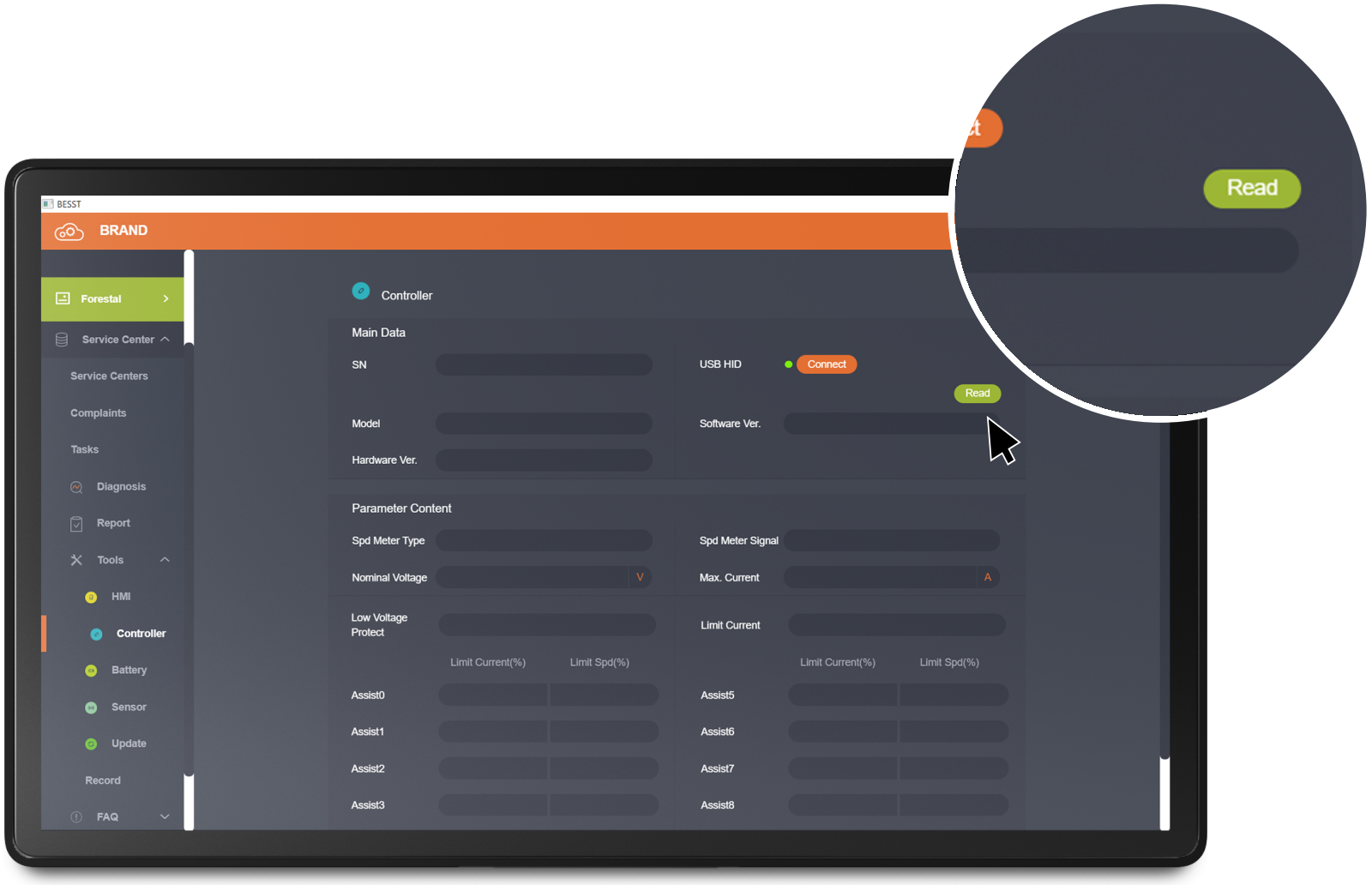
Step 1 Controller (Motor) diagnosis

When everything is connected like shown in pages 5 and 6, from the home screen click “Tools” and then find the “Controller” menu.



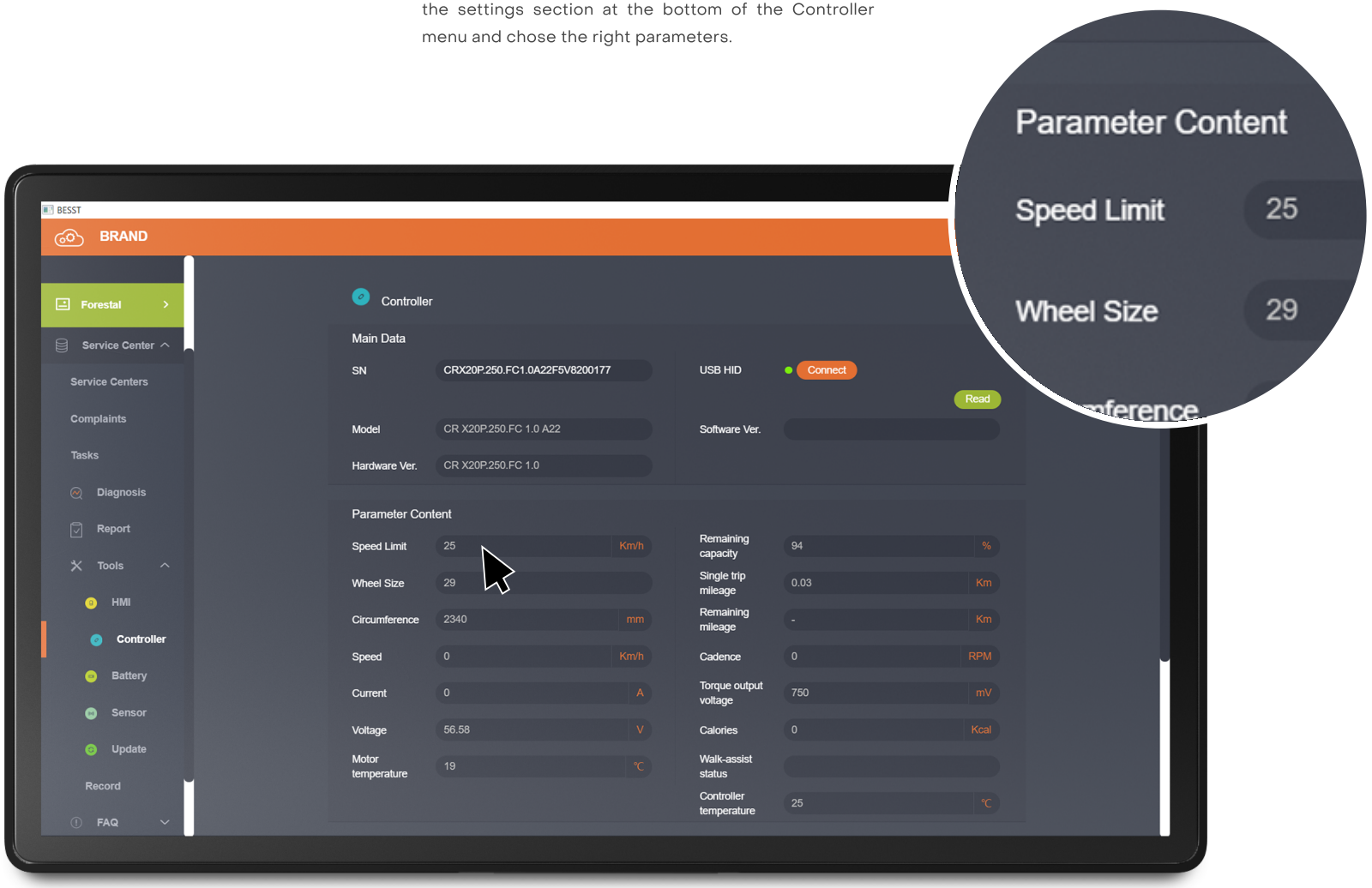
Step 2 Controller (Motor) diagnosis

Click the “Read” button and the values will refresh. If there is no value after a few refresh cycles, the motor controller is broken or damaged and the motor unit needs replacement. If there are values available for reading, please proceed toward the next steps.



Check the speed limit.

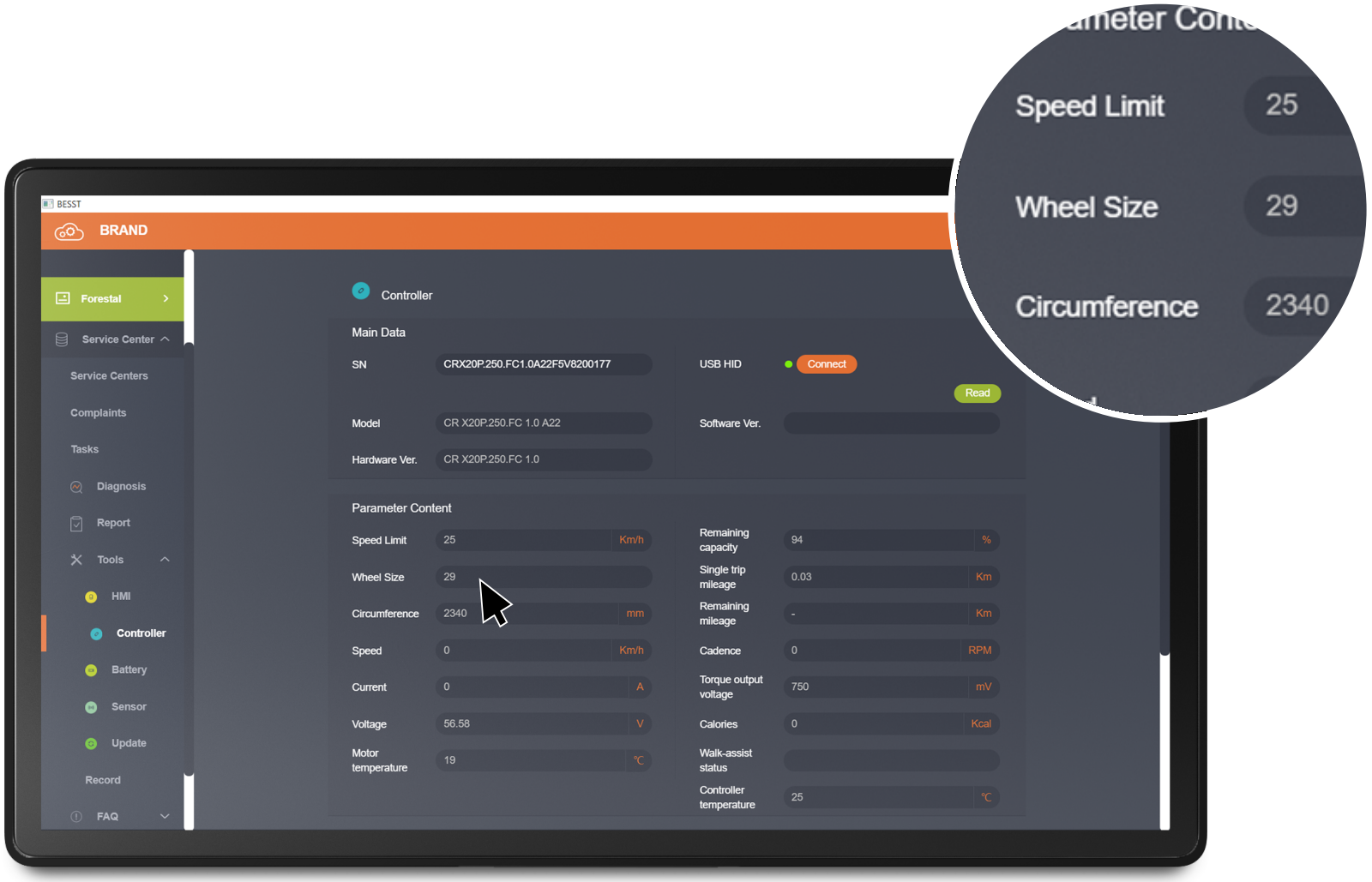
The speed limit should be within the legal speed limit of the area you are riding or selling the bicycles. If you need to modify the speed limit, please scroll down to the settings section at the bottom of the Controller menu and chose the right parameters.



Step 4

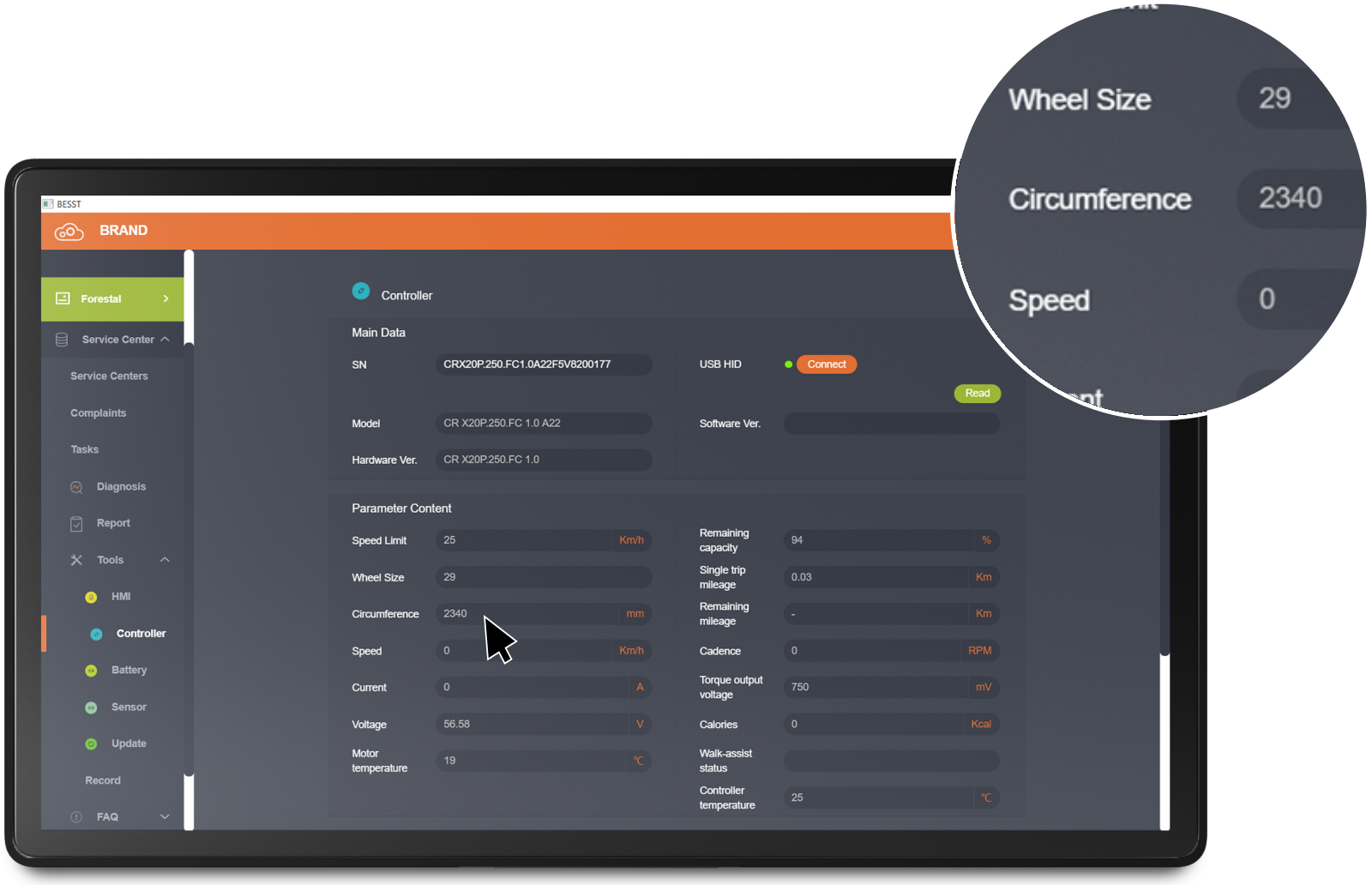
Controller (Motor) diagnosis

Check the wheel size values. It should match the wheel size of your bicycle.



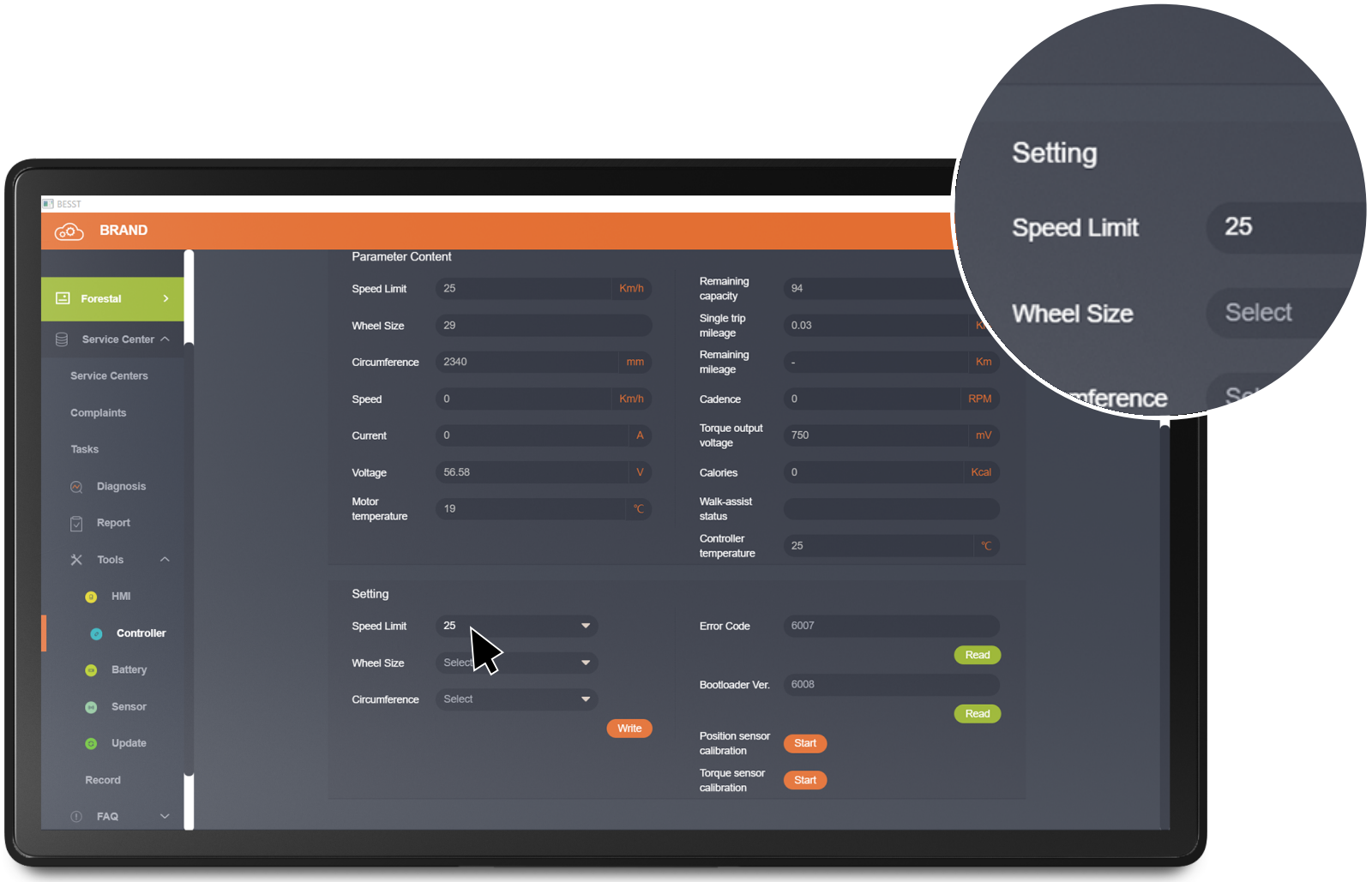
Step 5 Controller (Motor) diagnosis

Check the wheel circumference. It should be 2340 mm for 29” wheels. If the values are different, please scroll down to the settings section at the bottom of the Controller menu and choose the right parameters as shown on the next page.



Step 6 Controller (Motor) diagnosis

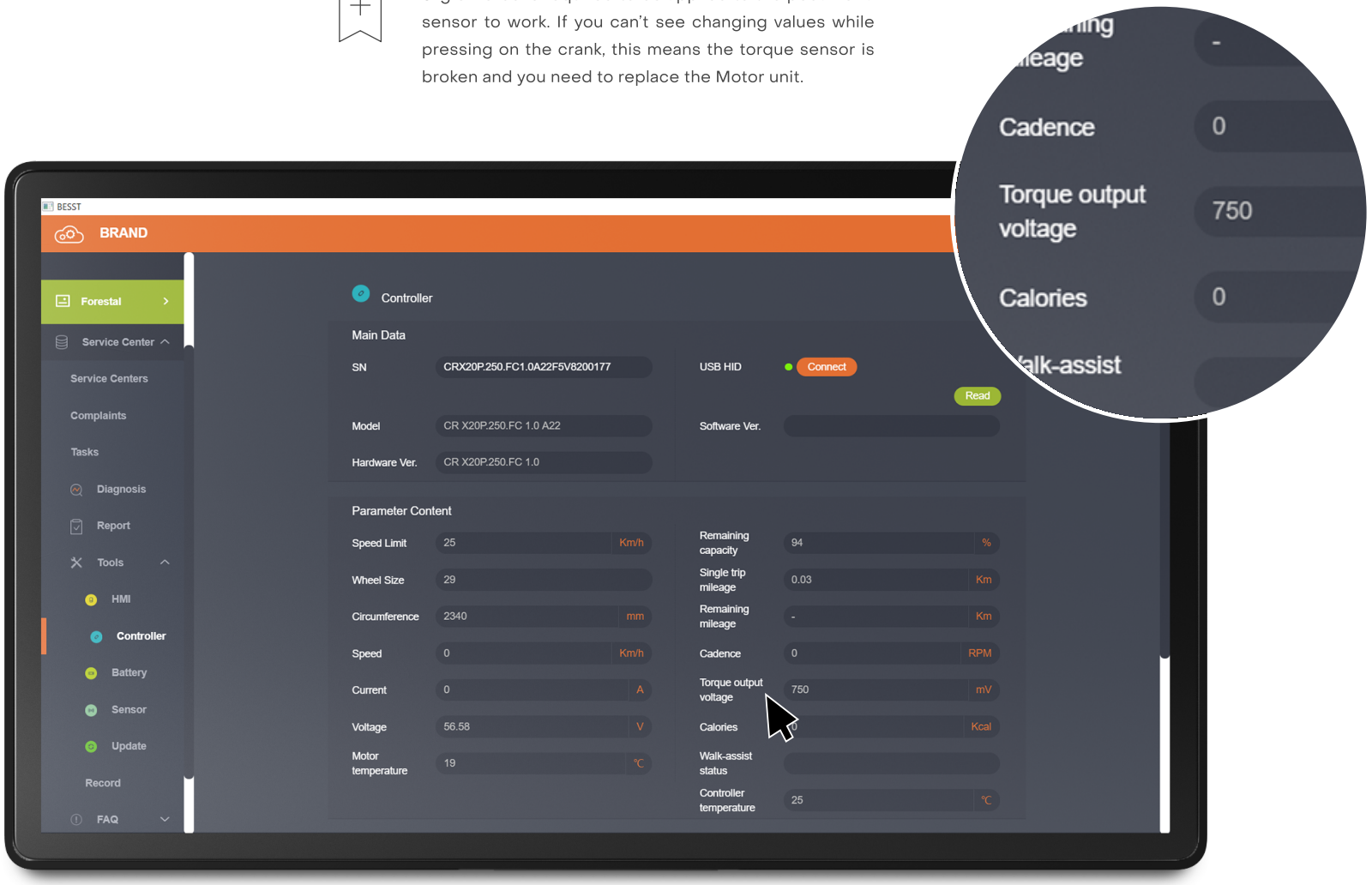
Look at the settings section at the bottom of the Controller menu and adjust to the right parameters.



Step 7 Controller (Motor) diagnosis

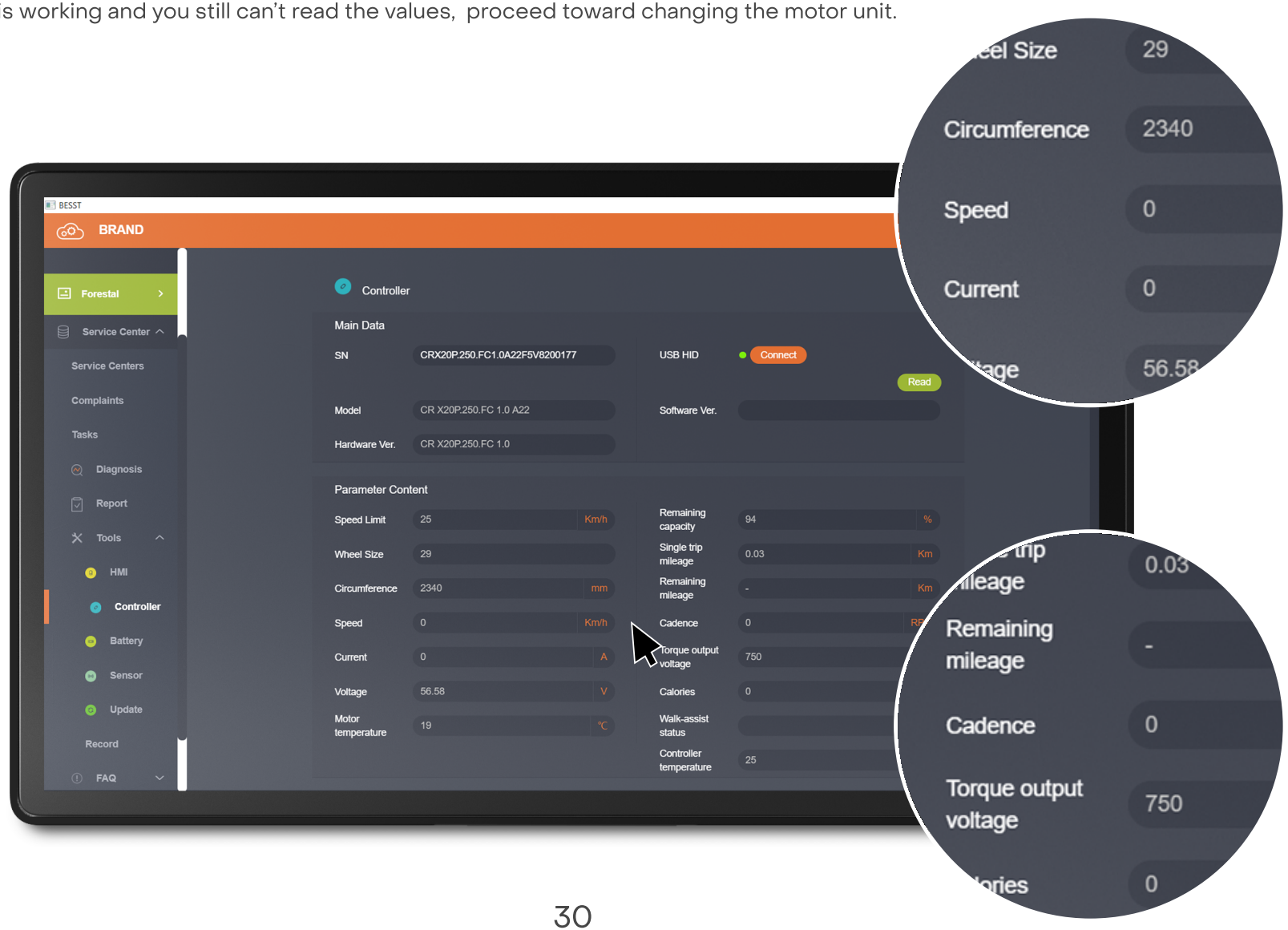
Check the torque sensor. Apply force to one pedal and read/follow the values in the “torque output voltage” window. If the values are present, the torque sensor is working correctly. The values range from 750 mV to 3000 mV.

5kg of force is required to be applied to the pedal for a sensor to work. If you can’t see changing values while pressing on the crank, this means the torque sensor is broken and you need to replace the Motor unit.



Step 8 Controller (Motor) diagnosis

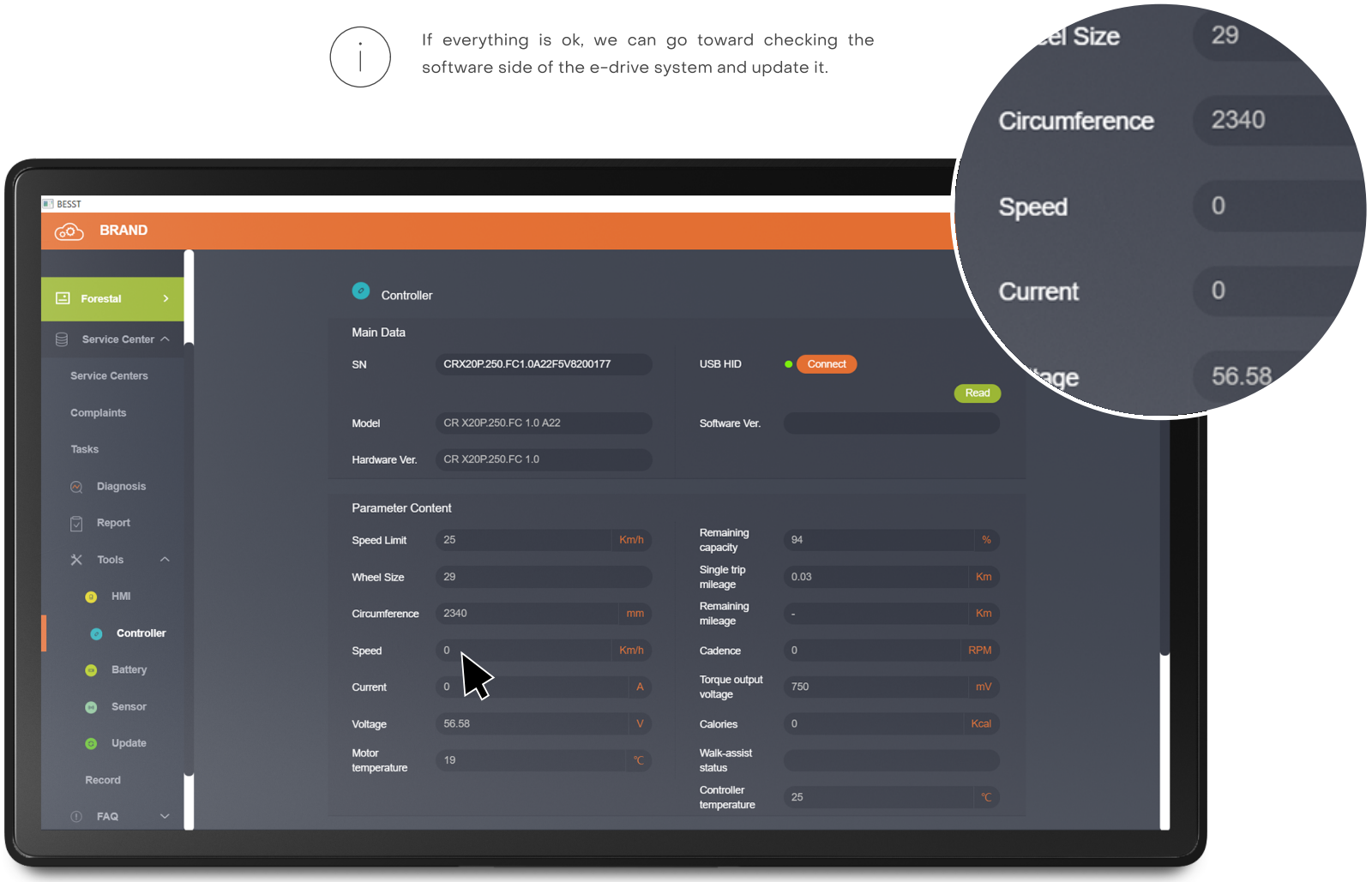
Check cadence and speed sensor: Mount the bicycle to the bicycle repair stand and start spinning the pedals. Simultaneously follow the values in the "cadence" and "speed" sections. If the Speed is the same as the speed value shown on the display of the bicycle and if you can read the current cadence, mentioned sensors are working correctly. If you can't read speed or cadence, make sure that a physical speed sensor or magnet is present and working. If that is working and you still can't read the values, proceed toward changing the motor unit.



Step 9 Controller (Motor) diagnosis

Check the Walk assist: While the bicycle is on the repair stand, switch the assist mode to the "Walk assist" mode and follow the results in the walk assist section. Press the “-” button for a few seconds and check that the walk assist is responding. At the same time, the speed shall be displayed on the “speed” field. Walk assist must cut the assistance at 5 km/h.

If everything is ok, we can go toward checking the software side of the e-drive system and update it.



Updates

How to update Forestal’s e-drive system software

After the bicycle is connected to the BESST tool and you are in the "update" menu, you will be able to upload the latest file and update the software to the latest version either for Battery or Motor/controller.

Go to Service center / Tools / Update.

From there you can update:

- Battery
- Controller/Motor
- Service Tool

Battery update

How to update Forestal’s e-drive system software

Step 1

Battery update

In the “Tools” menu, select “Update”.

Step 2

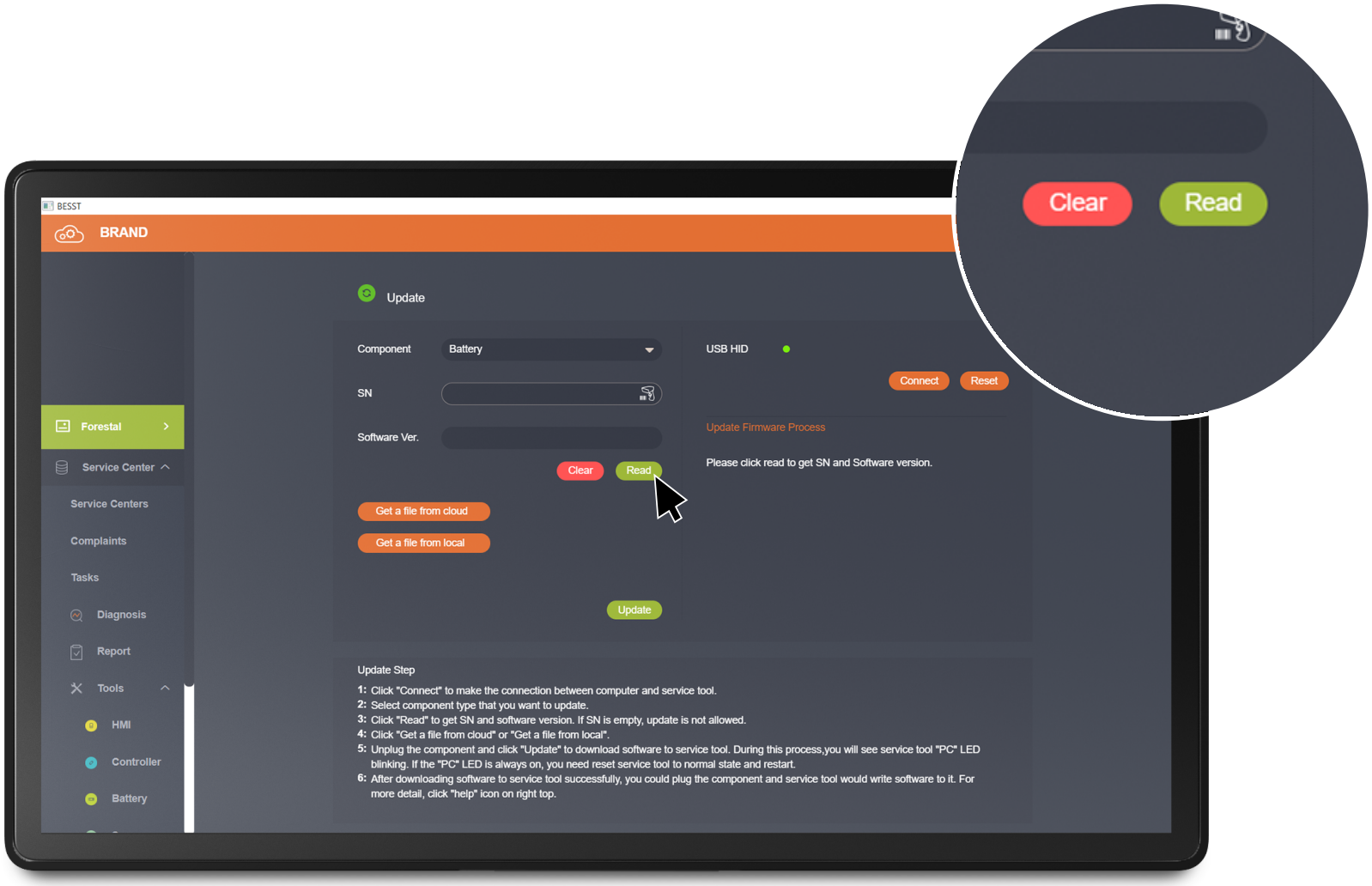
Battery update

From the "component" section choose “Battery”.

Step 3

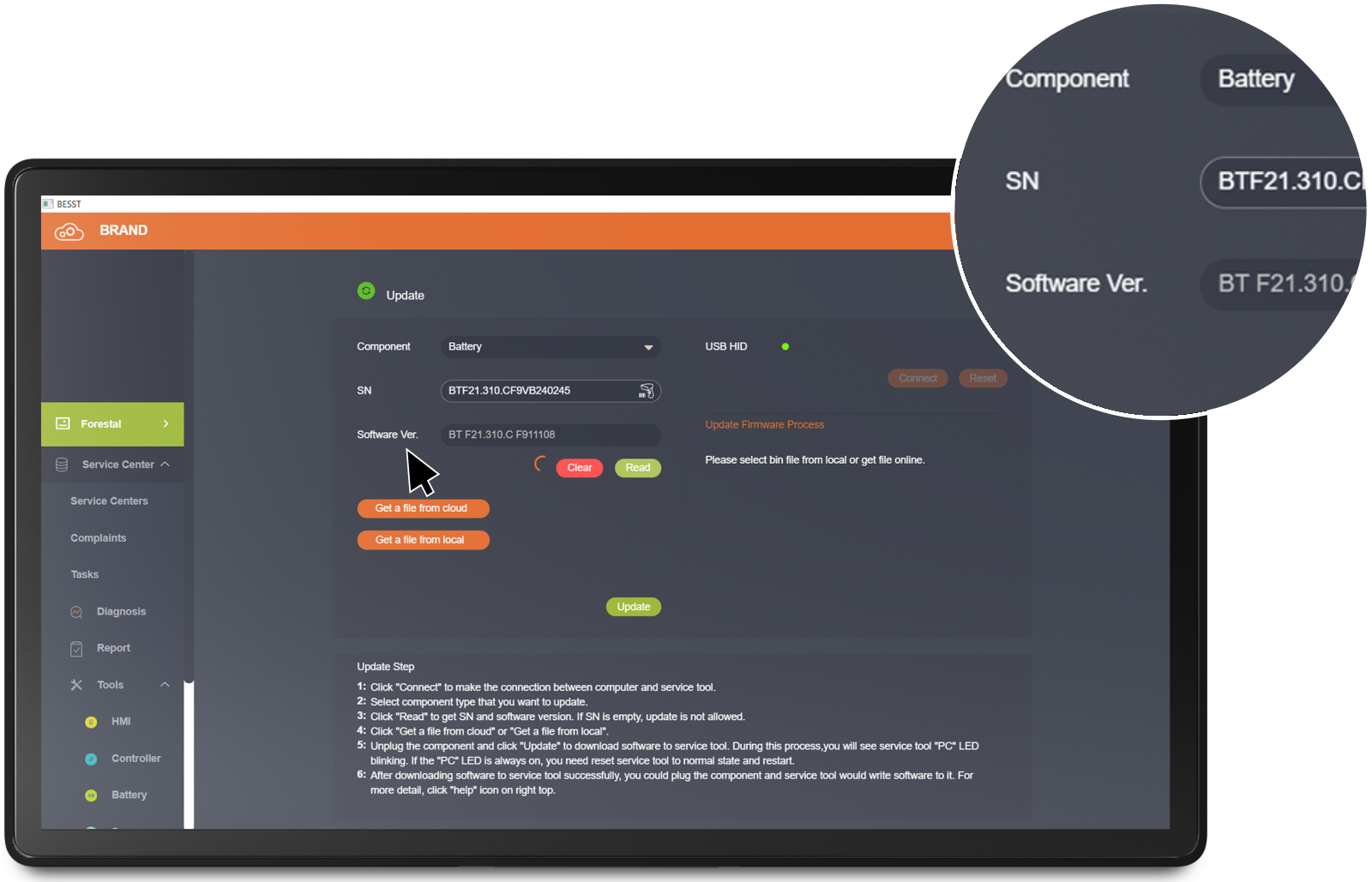
Battery update

Click the “read” button. In this step, you will see Battery SN (Serial Number) and software version.



Step 4 Battery update

Inspect the software and hardware version. If the software version doesn't suit the hardware version or if the software version is outdated, it will be required an update to maintain proper function.



Check software and hardware version.

If the software version doesn't match the hardware version, then the battery needs an update and you can proceed toward the next steps. If the software and hardware versions are matching, you can quit the process or finish with the update anyway.

Software end number	Corresponding hardware	.BIN file name
104	1.0	APP_F21_20220907V109M_aaa1.bin
108	1.1	APP_F21N_20220907V109M_95c9.bin

Step 6

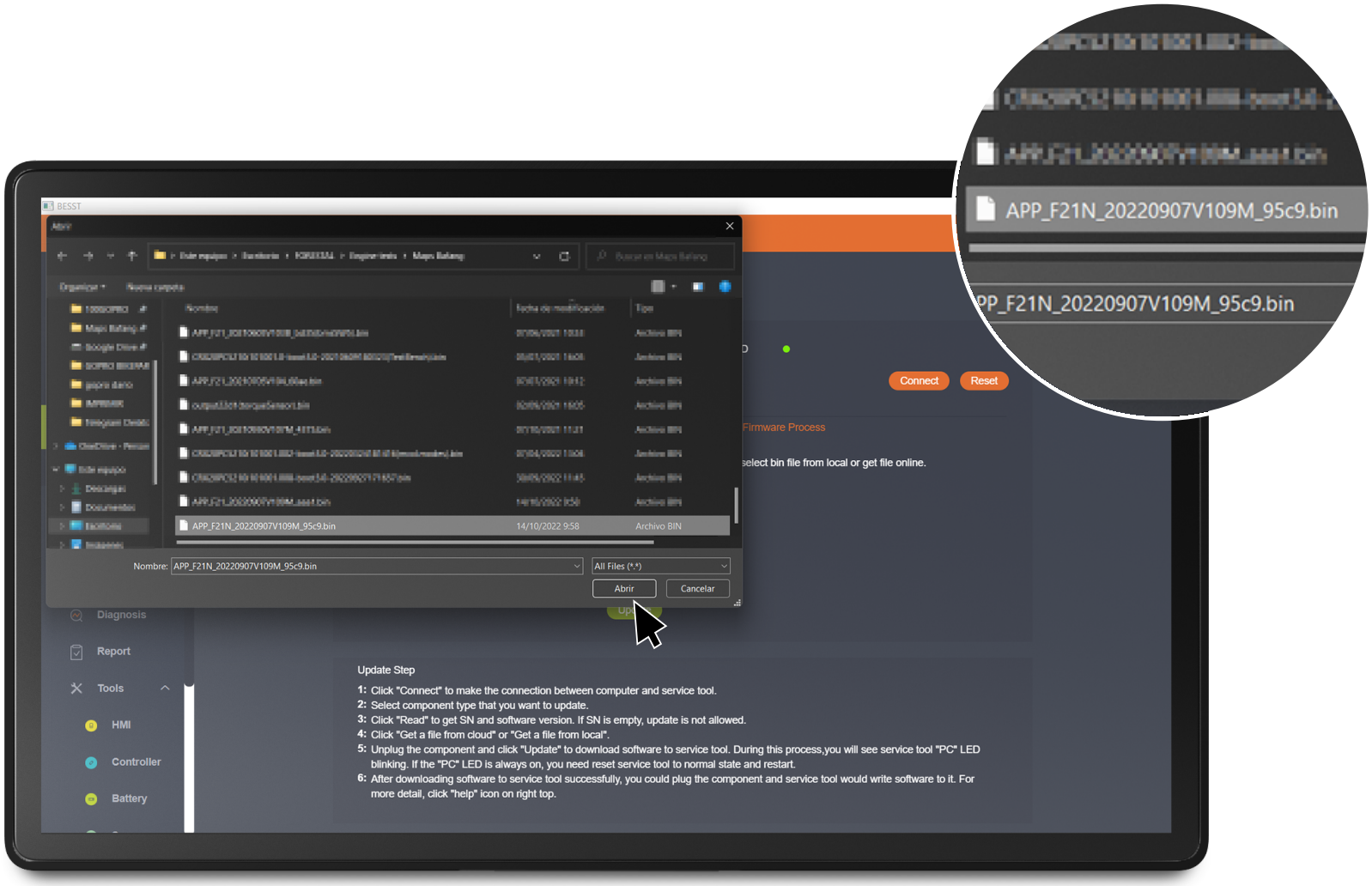
Battery update

Click the “get a file from local” and choose the correct file version that suits the corresponding hardware version.

Step 7

Battery update

Select the .bin file from the folder where you have saved the software versions.



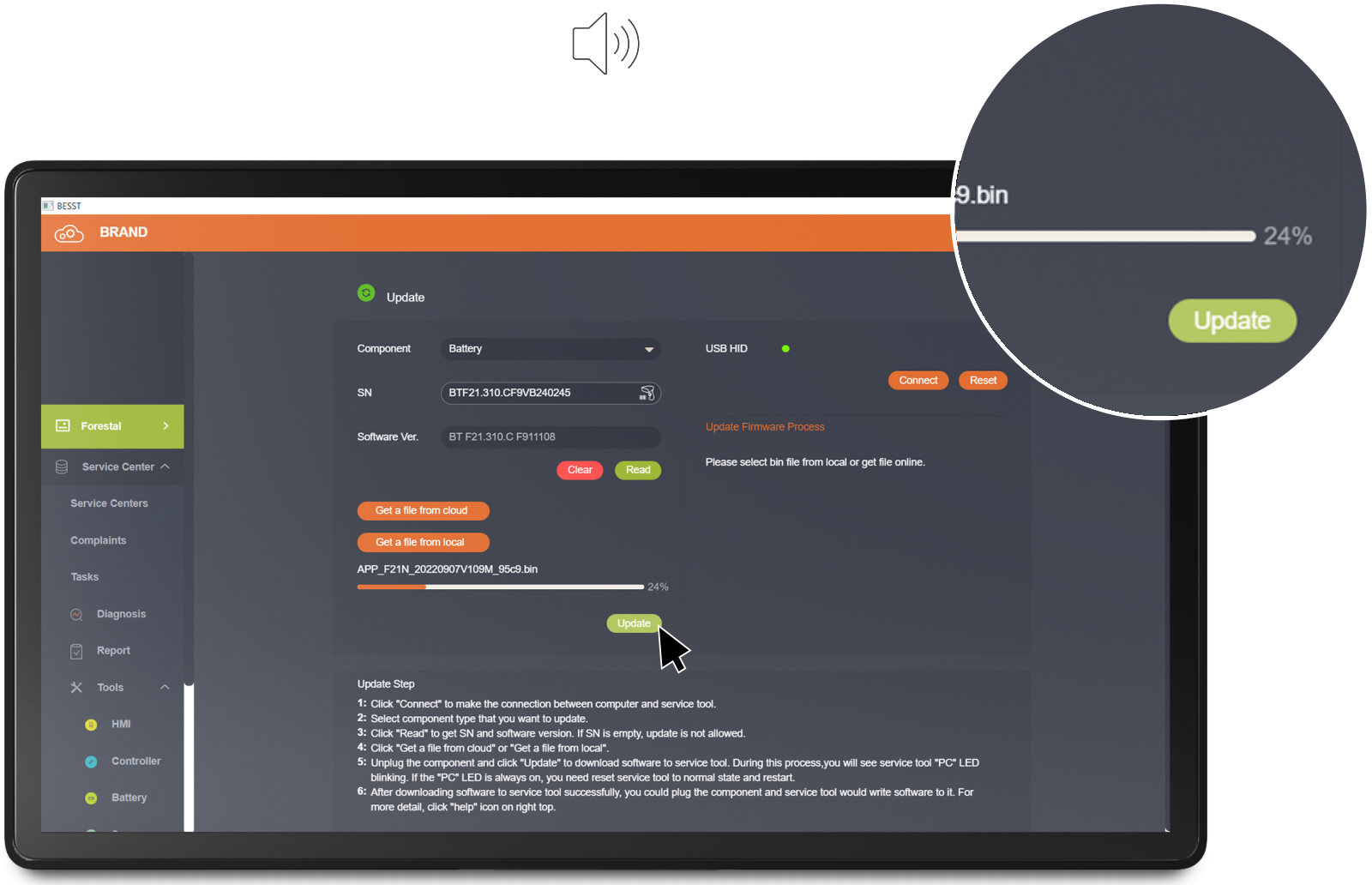
Step 8

Battery update

Check that the file is the same as you have chosen.

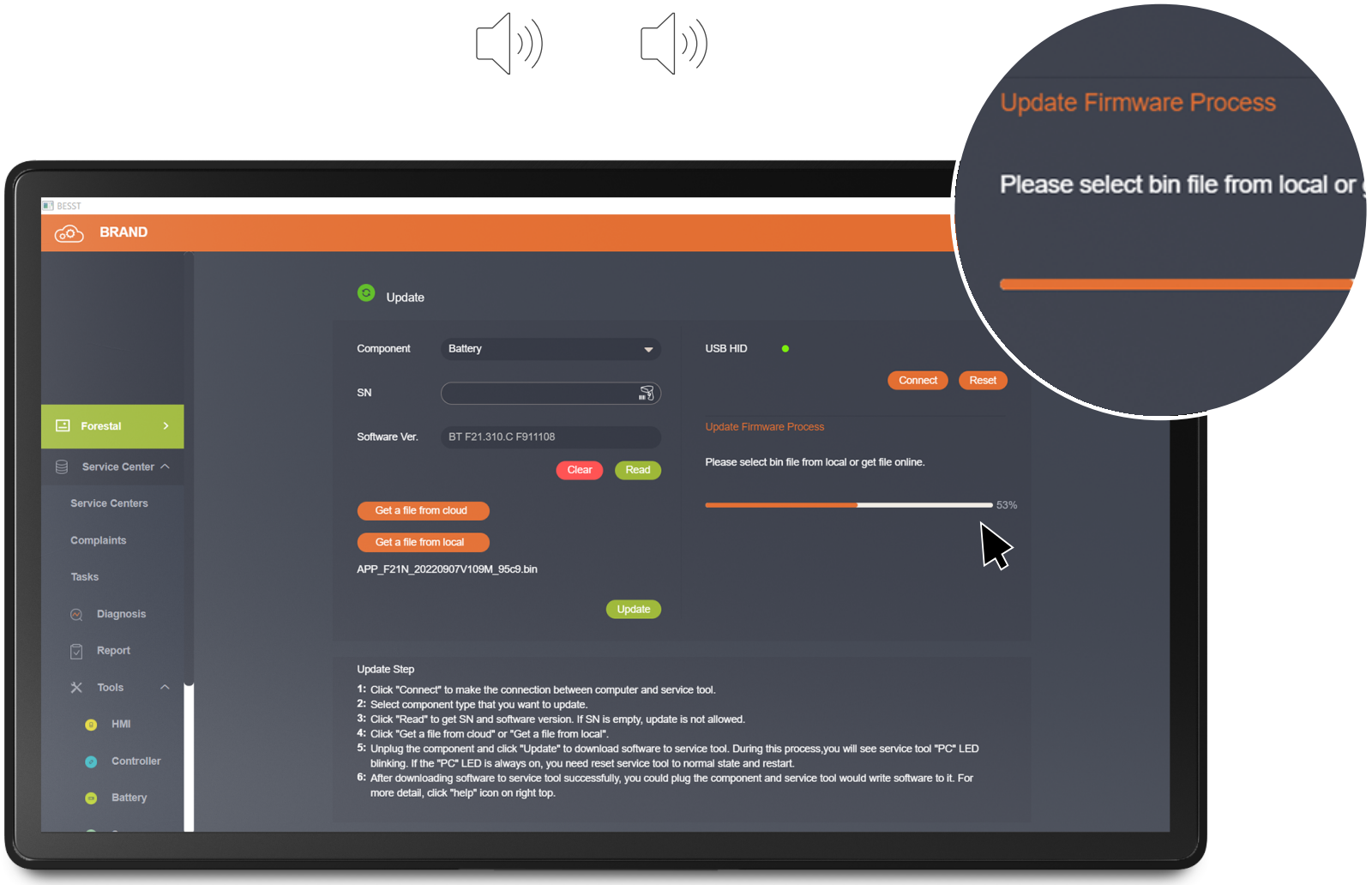
Step 9 Battery update

Once a file is selected and verified, you can click the “Update” button. A progress bar will appear underneath the file name. Once it reaches 100% you will hear one “beep” sound signal which means the software is uploaded to the BESST box tool.



Step 10 Battery update

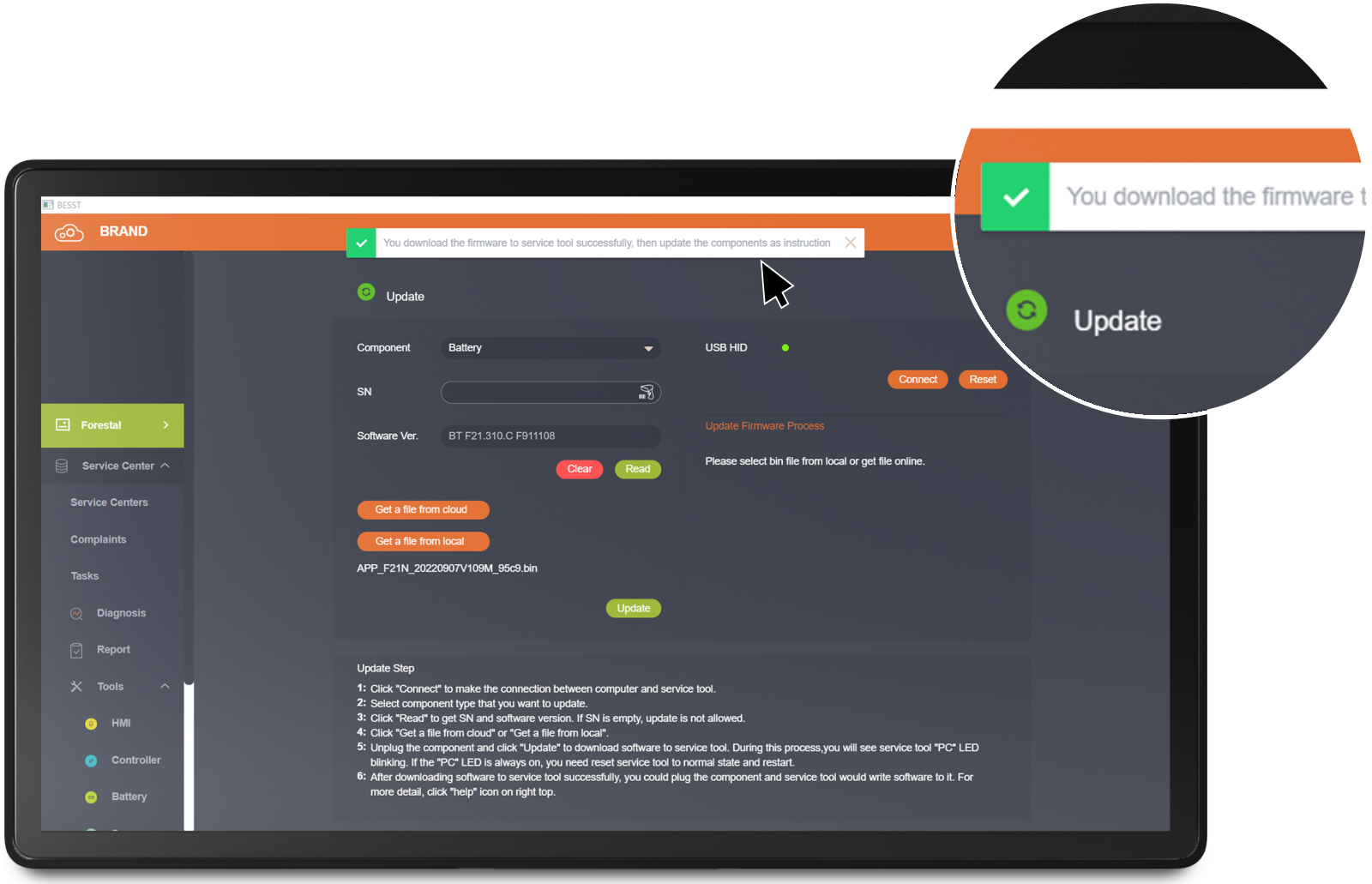
From this point, another loading bar will appear on the right side under “Update firmware process”. Once it’s finished you will hear a 2x “beep” sound signal which means the update process is finished.



Step 11

Battery update

As soon as the battery is updated, a green confirmation message will appear on the top of the BESST tool software.



Step 12

Disconnect the I-Can wire and BESST tool and close the charging port.

Step 13 Battery update

Reset the bicycle through the trigger on the handlebar.

With this last step, the update process is finished and the system should run in optimal conditions.

If the update process fails for any reason, it's required to press the reset button on the BESST tool and repeat the full process for updating the given component.

Controller (Motor) update

How to update Forestal’s e-drive system software

Step 1

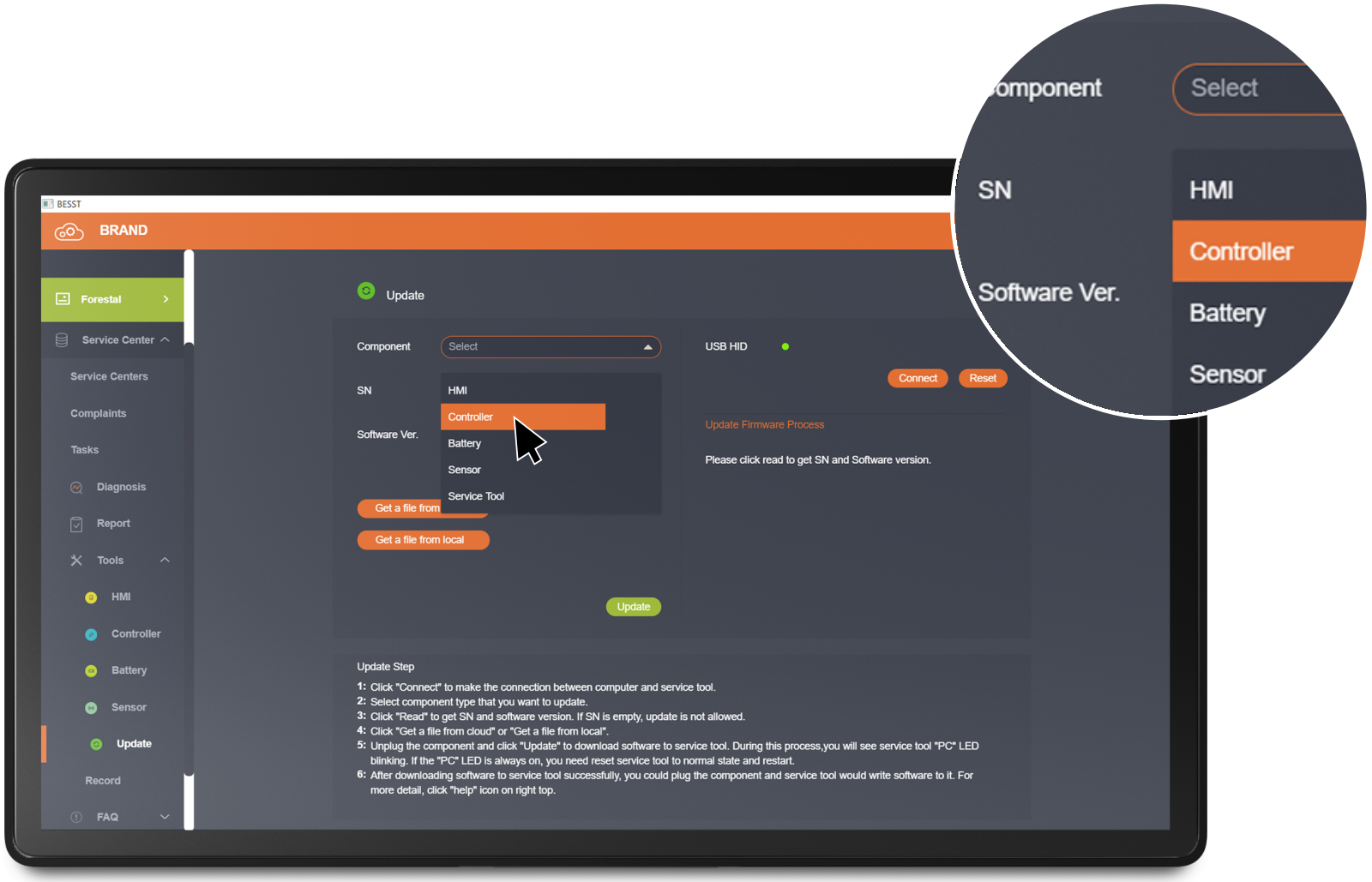
Controller (Motor) update

In the “Tools” menu, select “Update”.

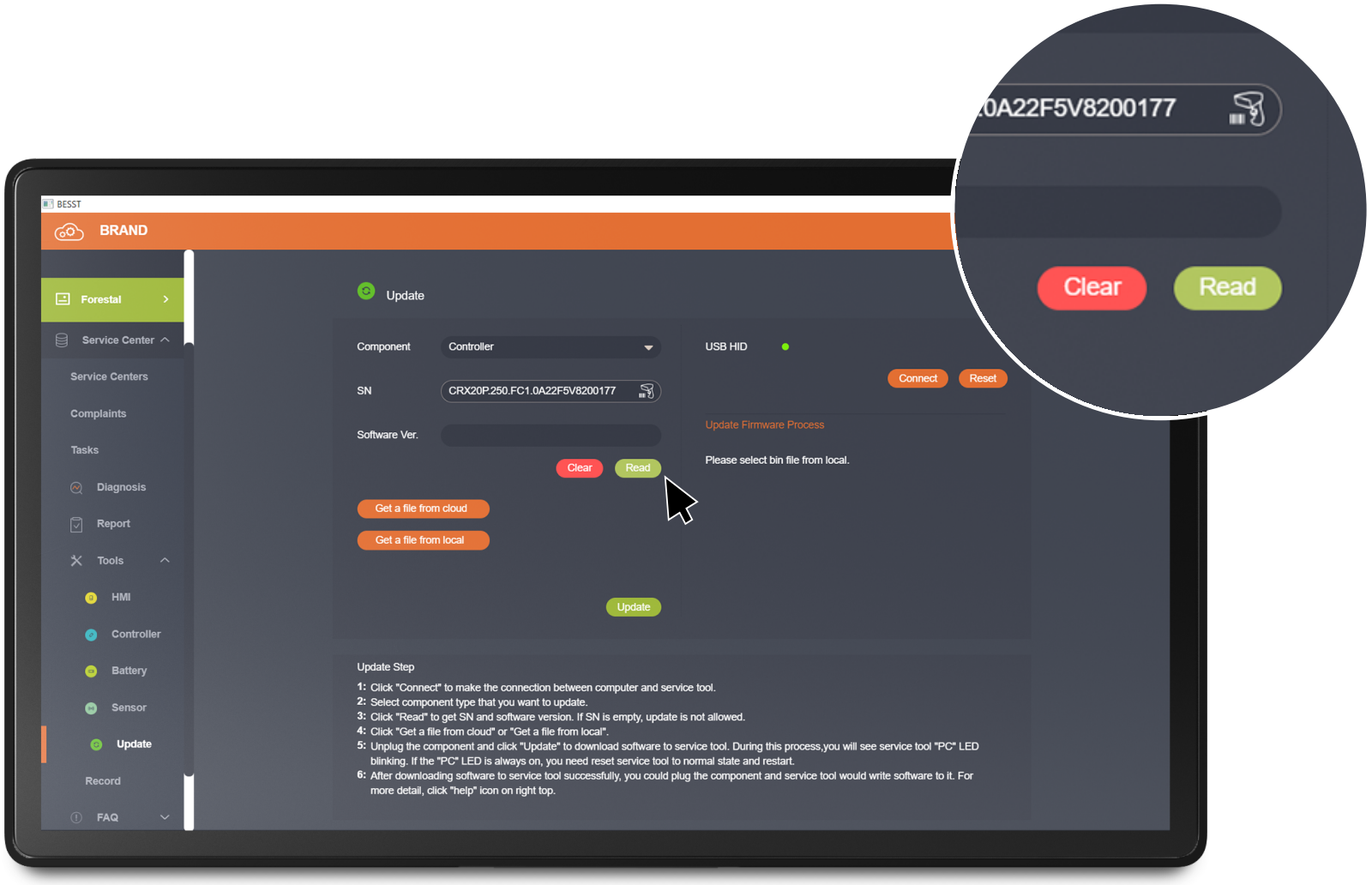
Step 2

Controller (Motor) update

From the component section choose “Controller”.



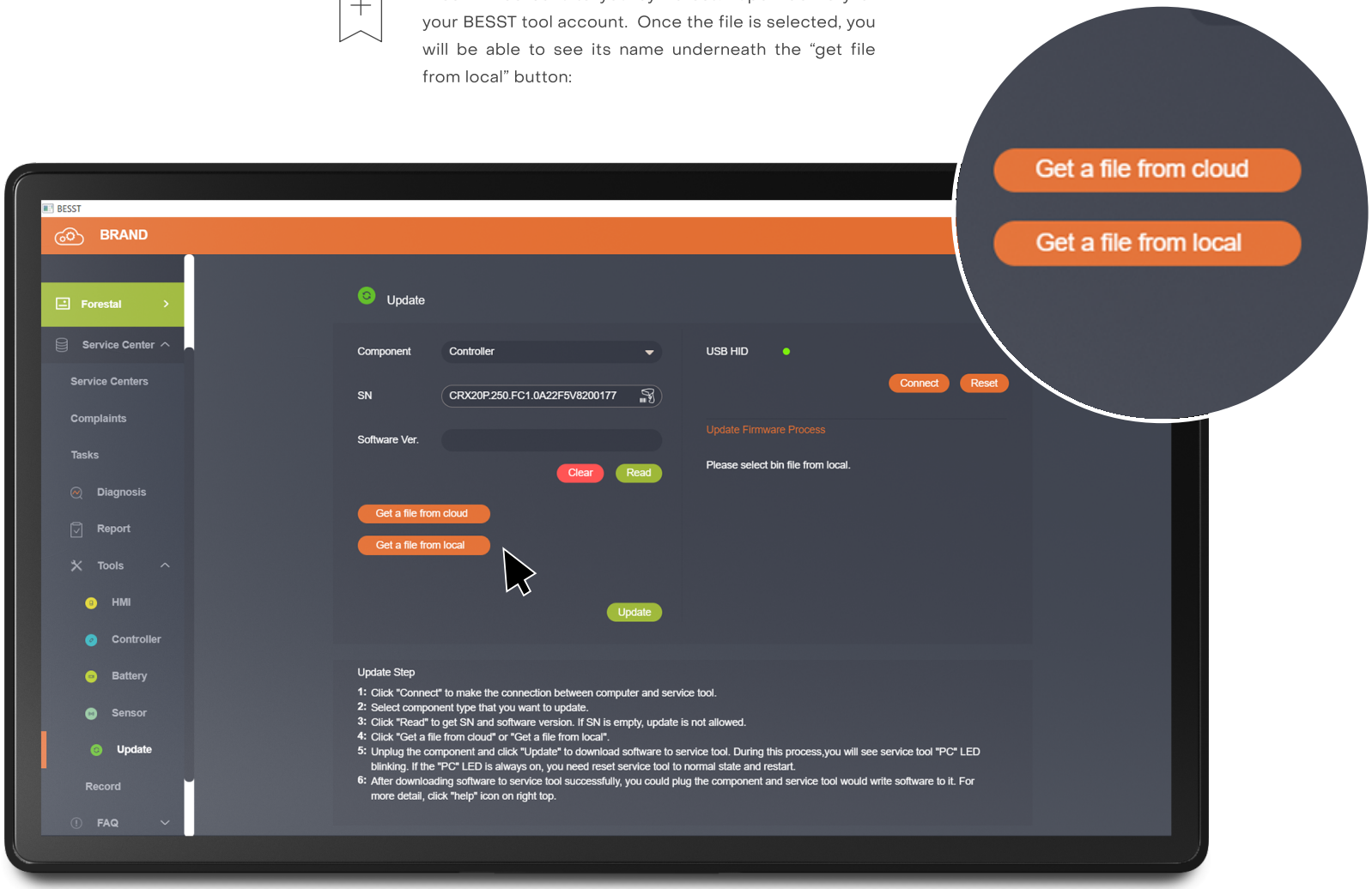
Click the “Read” button. In this step, you will see Motor SN and Software version.



Step 4 Controller (Motor) update

To update Controller software you need to click the “Get file from local” button.

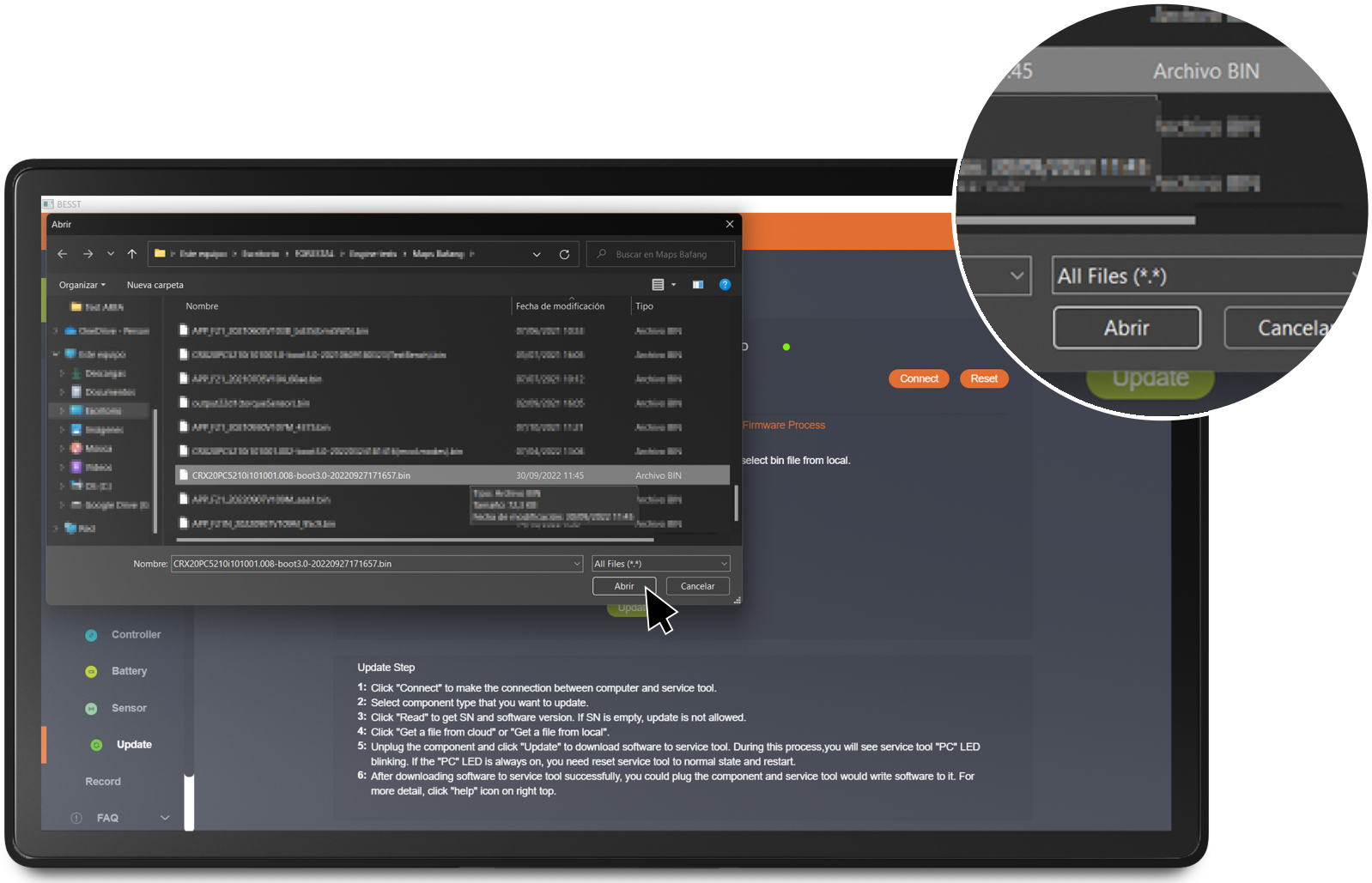
Files will be sent to you by Forestal upon delivery of your BESST tool account. Once the file is selected, you will be able to see its name underneath the “get file from local” button:



Step 5

Controller (Motor) update

Chose the corresponding Controller file from your PC.

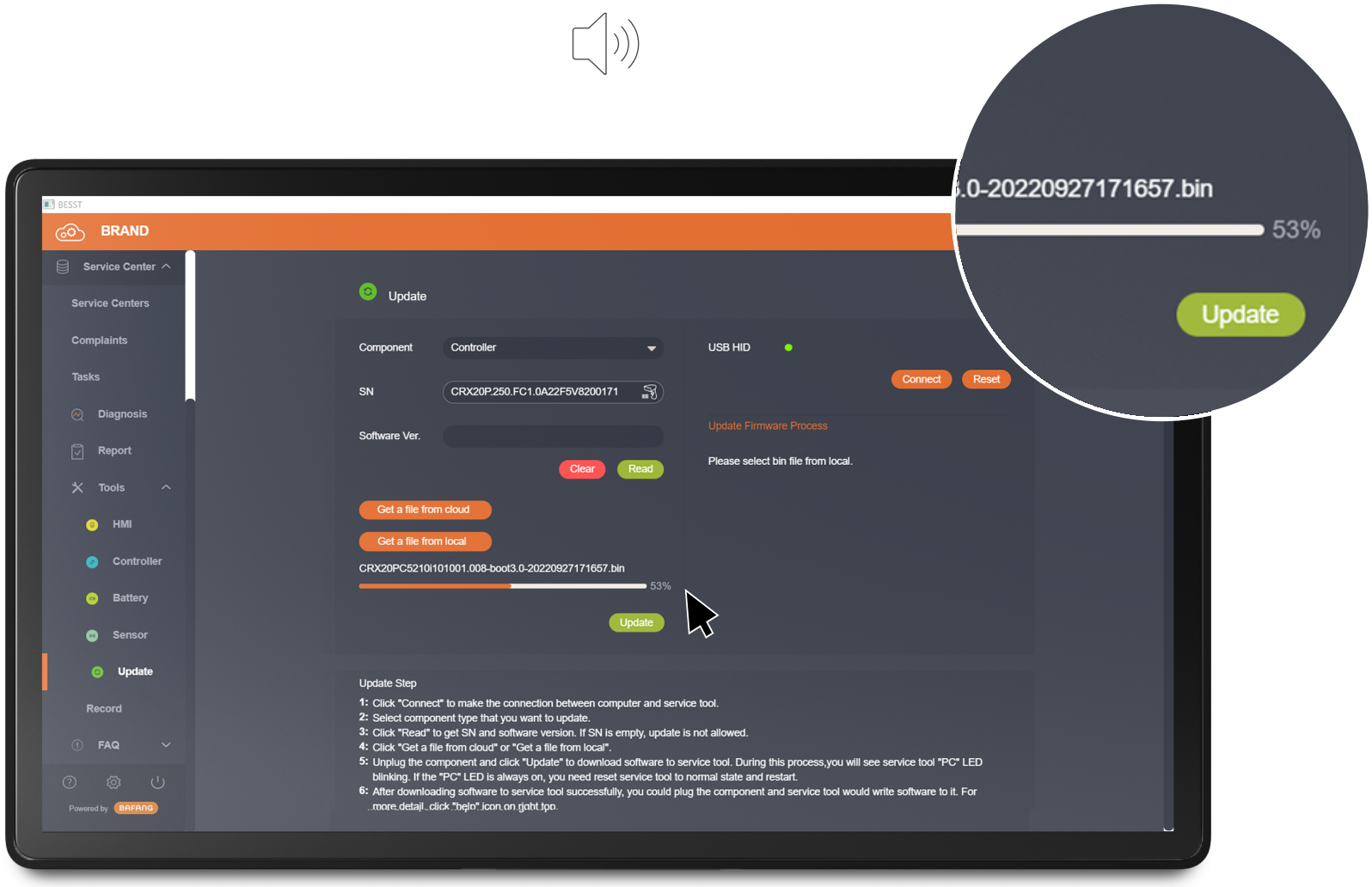


As soon as you have checked the software version click on the “Update” button.

Files will be sent to you by Forestal upon delivery of your BESST tool account. Once the file is selected, you will be able to see its name underneath the “get file from local” button:

Step 7 Controller (Motor) update

Once a file is selected and verified and you clicked the “Update” button, a progress bar will appear underneath the file name. Once it reaches 100% you will hear one “beep” sound signal which means the software is uploaded to the BESST box tool.



Step 8

Controller (Motor) update

Disconnect the I-can wire from the Rosenberger battery port and connect it again.

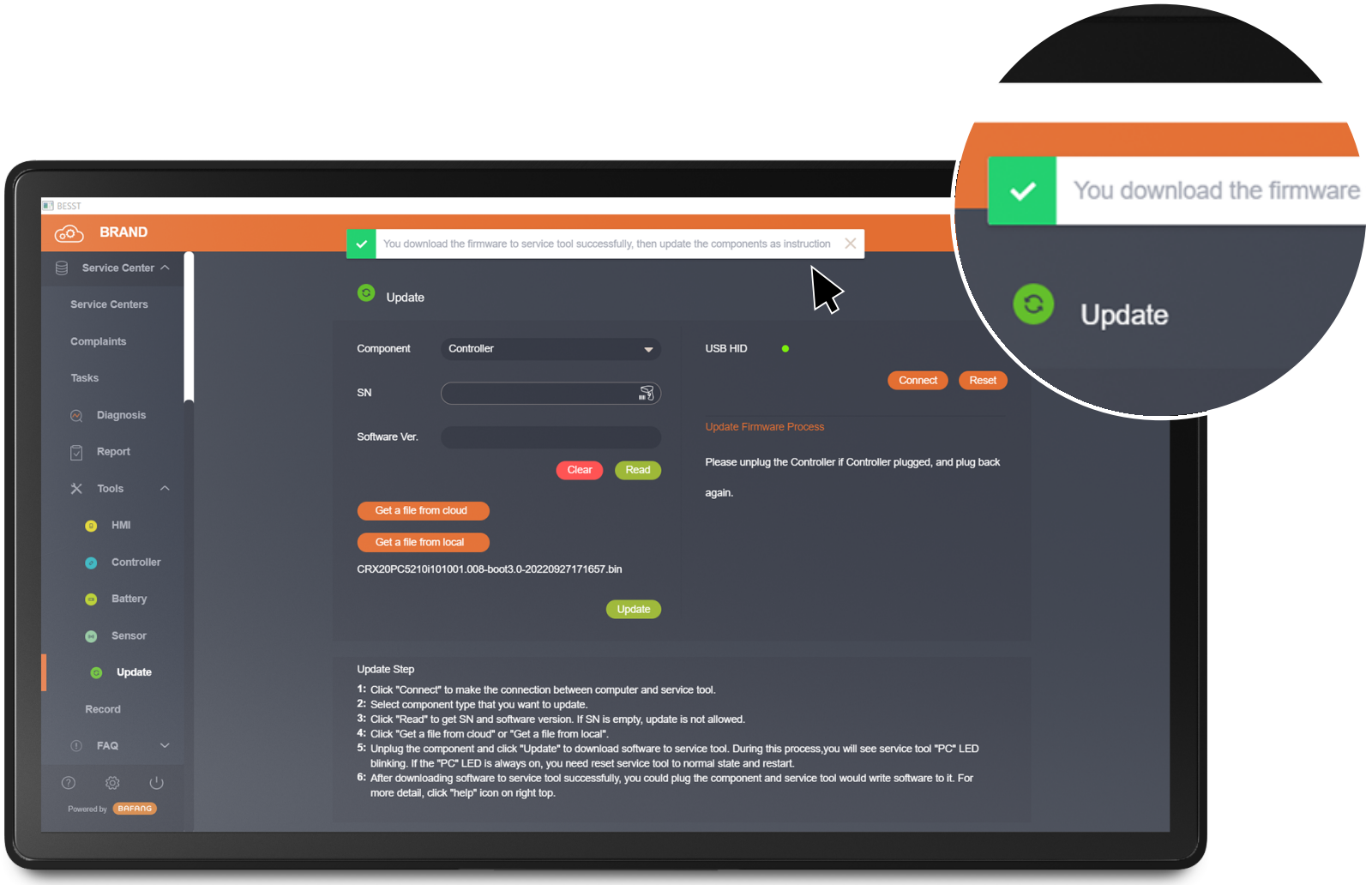
Disconnect the I-can wire only from the Rosenberger connector lid, not the battery or bicycle itself!

Step 9 Controller (Motor) update

From this point, another loading bar will appear on the right side under the “Update firmware process” area. Once it’s finished you will hear a 2x “beep” sound signal which means the update process is finished.

Step 10 Controller (Motor) update

As soon as the battery is updated green confirmation message will appear on the top BESST tool software.



Step 11

Disconnect the Motor from the I-Can wire and BESST tool and close the charging port.

Step 12 Battery update

Reset the bicycle through the trigger on the handlebar.

With this last step, the update process is finished and the system should run in optimal conditions.

If the update process fails for any reason, it's required to press the reset button on the BESST tool and repeat the full process for updating the given component.

If you have any questions,
please do not hesitate to contact us.

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FORESTAL

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