



EBMX App for ASI Bac4000/8000 Motor Controllers running EBMX tunes

Classification: Open document for Dealers and Customers

Procedure Document version: 1.1



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Procedure Document Control

Revision	Status	Date	Author	Description of version
1.0	Final	08-June-22	M. Wauters	Final version for distribution
1.1	Final	17 November 22	N. Nieuwkerk	Update for Android Use



1 Document Objective

This document has been created to assist EBMX customers with navigating and using the EBMX App for ASI Bac4000/8000 controllers on SurRon LBX, SurRon L1E or SurRon Youth. **Using the EBMX app with an EBMX controller on any other bike (e.g., Talaria Sting) will cause the controller to perform not how it is intended.**

The key areas explained in this document are:

- App overview and purpose
- Opening the app and connecting to your controller
- App layout
- Smart Setup of your controller
- Adjustments to your controller
- App monitoring functions
- Throttle calibration
- Motor tuning
- Factory Tune

Use the table of contents as a guide to quickly find the section of this document relevant to the functions of the app you are working with.

2 App Overview and Purpose

The EBMX App has been created to assist EBMX customers with custom tuning and troubleshooting their controllers. The adjustments in the app are made using slide bars to adjust values and the values are set within pre-determined safe limits for each setting.

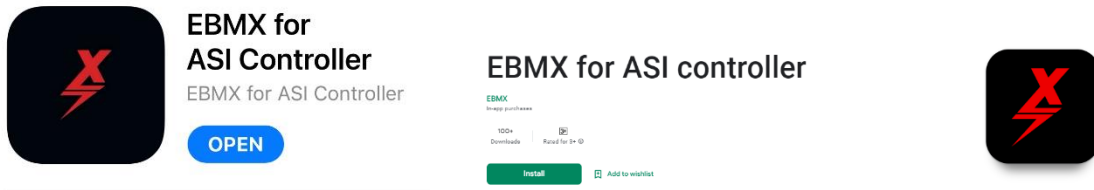
Using the EBMX app you will be able perform the following actions:

- Swap between battery types and voltages (stock bypassed 60v, high power 60v and high power 72v)
- Run a throttle calibration, giving you the ability to use non-OEM throttles
- Run a motor calibration to ensure your rated motor RPM and hall sensor angles are correctly set to ensure optimum performance and less heat buildup in your motor.
- Adjust the performance and handling of your bike.
- Enable a feature to assist with over current errors (mostly present in BAC4000 controllers).
- Flash your controller with a base tune to clear any faults or issues that you may have and then essentially reformat your controllers' values.
- View the monitoring page to see motor temp, controller temp, battery voltage and any errors currently being displayed on your bike.



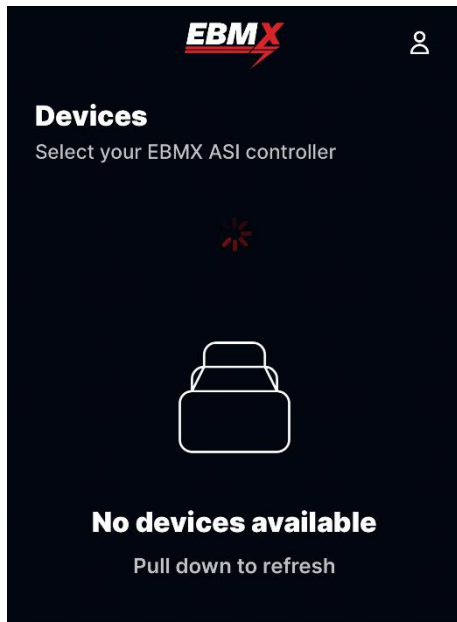
3 Opening the App and connecting to your controller

You will need to find the EBMX app either on the Apple App store or Google Play Store (depending on your device) but searching for “EBMX”. You will see the EBMX X logo show up (see screenshot below). The following document details screenshots from the iOS version; however, the layout within the Android OS is virtually the same.



Download the app and then open it. You will be promoted by the in-app purchases to purchase the app, please purchase the app (\$50 USD) to proceed.

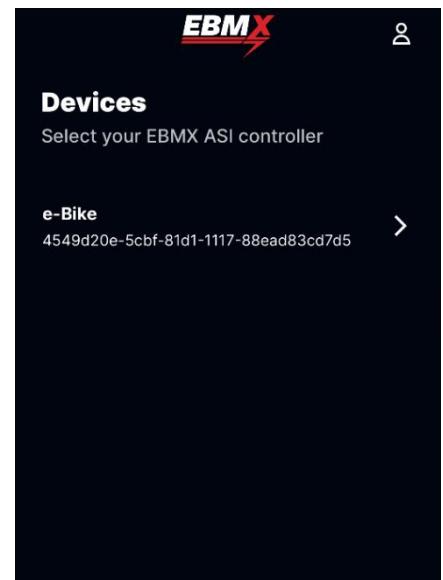
Open the app and you will be prompted with a screen asking for you to select your EBMX ASI Controller. Swipe down on the screen to search for your device.



Hint:

If your controller is not showing up, ensure you have both your “Bluetooth” and “location services” enabled on your phone. If you fail to enable either of these settings, you will not be able to connect to your controller with the app.

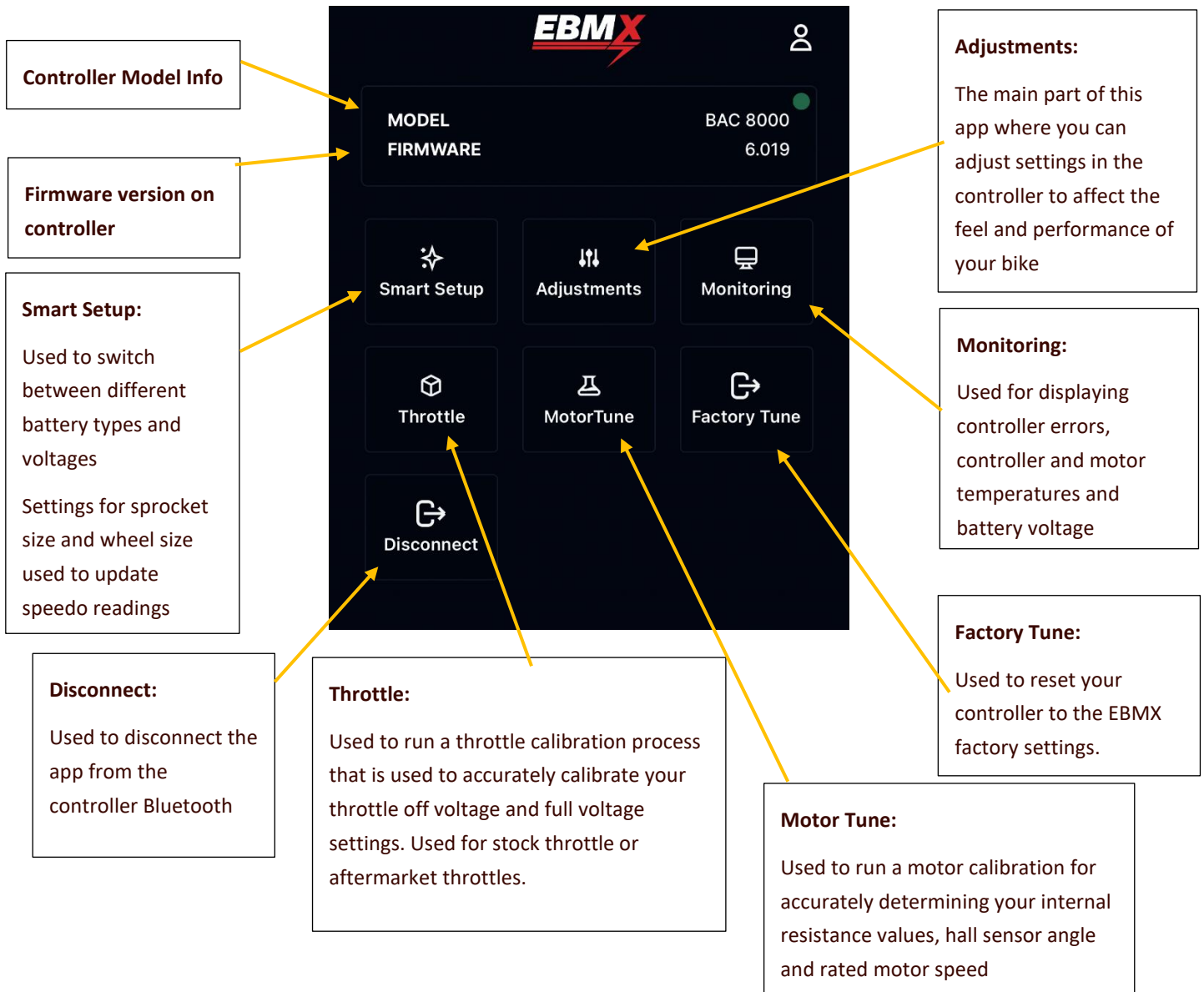
Once you see the Bluetooth signature of your bike show up “e-Bike” click on it to connect!





4 EBMX App Layout

The screenshot below shows the main home page of the EBMX app. A high-level overview of each button is described below, the following sections of this document will give an in-depth overview of how to use each of these functions.

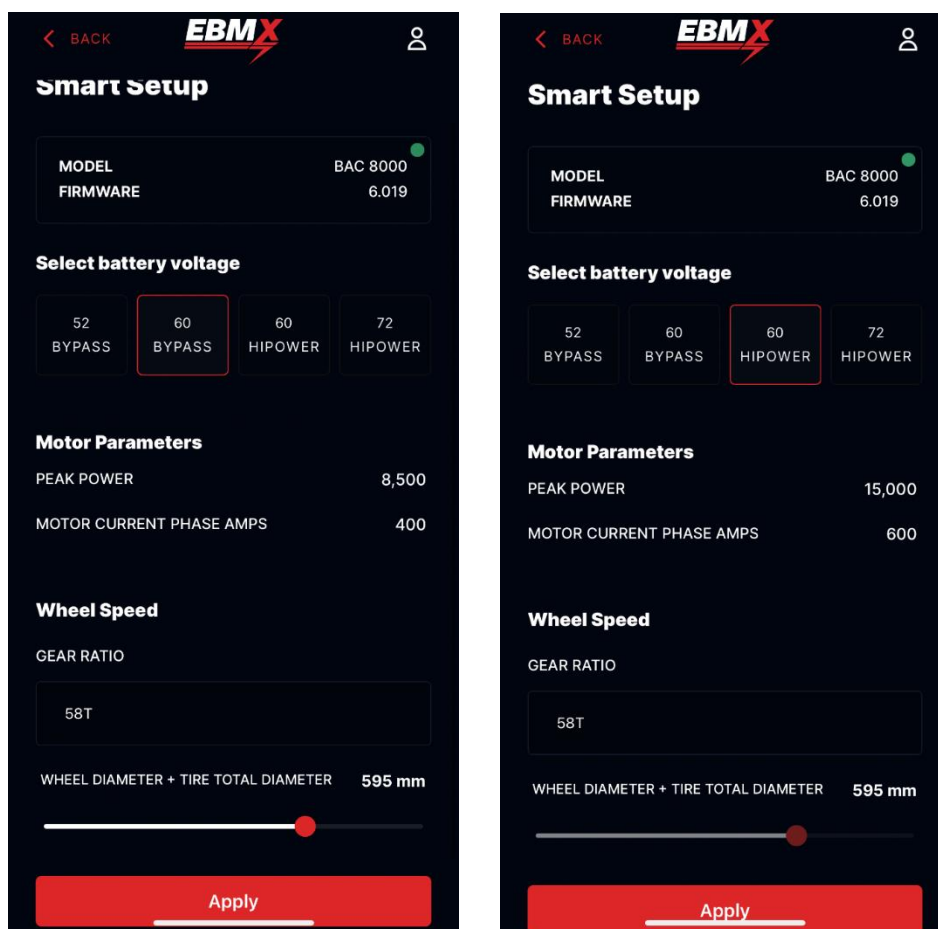




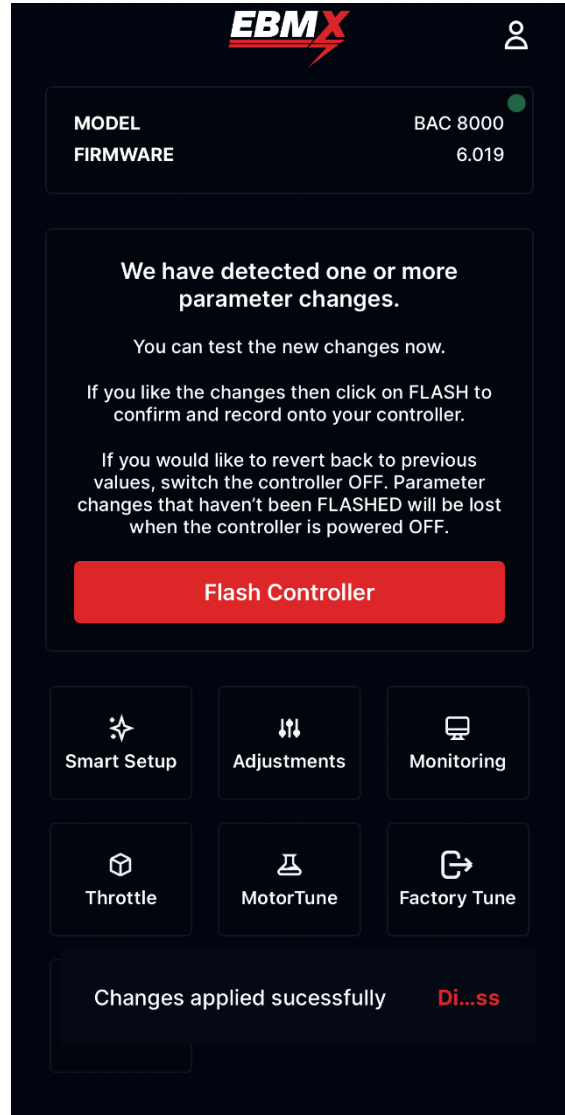
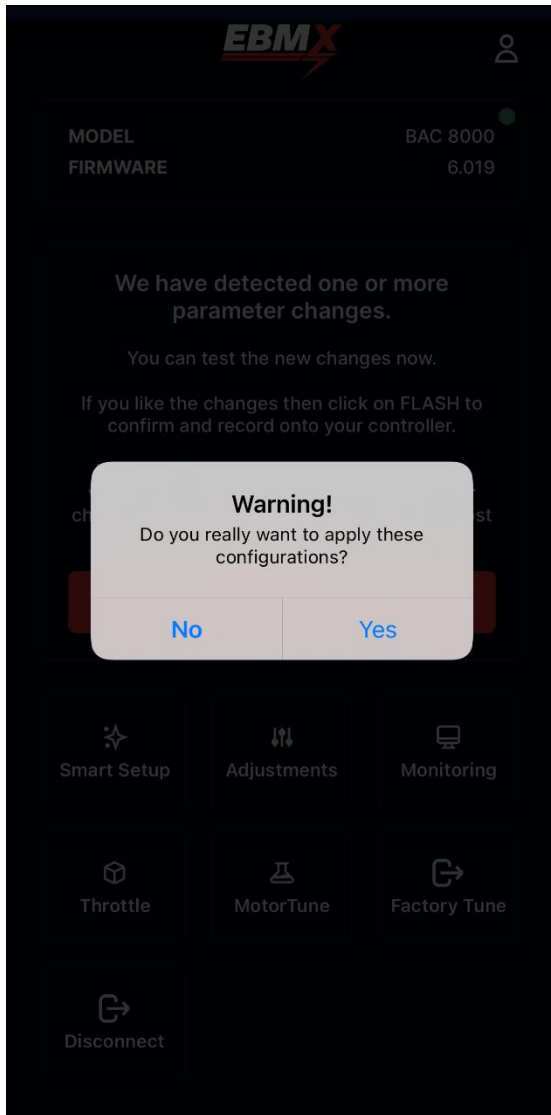
4.1 EBMX Smart Setup

The EBMX Smart Setup is where you can select high level parameters for your system. This is where you will tell the controller what type of battery you are using, and it will automatically adjust the peak power and phase amps for your selection. You will then need to select the sprocket size and your wheel (including tire height) diameter so that your APT display can read your speed accurately.

With the two screen shots below, you can see the peak power and phase amps changing when the battery selection is changed from a 60v bypassed battery to a high power 60v battery. Once you have made your selections (based on the battery you have in the bike) then you will proceed to the red “Apply” button



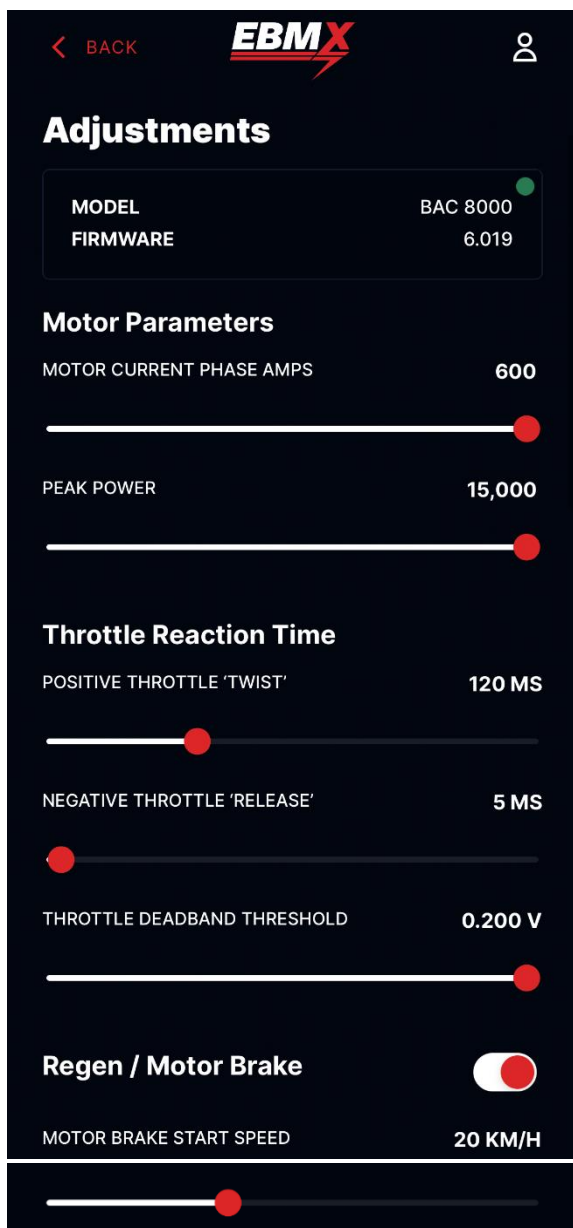
Once you have clicked “Apply” you will get a pop up on the screen saying, “changes have been applied successfully” and then a pop up in the middle of the screen saying that the controller has detected changes (see screenshot below to the left). If you are happy to proceed and update your changes, click the red “Flash Controller” button and you will get one more pop up ensuring you want to proceed (screen shot below to the right), click Yes to proceed.



Your changes have now been input and updated in the controller!

4.2 App Adjustments

The App Adjustments page is where you can really customize the feel of your tune and some key settings on your bike. The screenshots below show all the settings and adjustments that you are able to modify.



Motor Phase Amps (Amps) – Phase amps are like motor torque, the more phase amps you have the harder your bike will accelerate off the line

Peak Power (kW) – Phase amps are like motor horsepower, the higher the kW value, the more peak power you will have in your bike.

Positive throttle “twist” (milliseconds) – This value is the positive motoring torque ramp. Essentially a ramp up value for when you twist your throttle for the power to ramp on ensuring you don’t have a jerky throttle feel while making rapid adjustments to your throttle. If you want a very responsive throttle, keep this value low around 25 – 30ms if you ride rough offroad trails and want the power smoothed out a bit more use a value of around 100-200ms.

Negative throttle “release” (milliseconds) – This just like the value above but is a ramp down delay from when you let off the throttle to ramp power down. We suggest keeping this value low (around 5ms) as if you turn it up, you will be having the bike continue to deliver power to the motor for a longer period after you shut the throttle off.

Throttle deadband threshold – This is a buffer value stacked on top of your “off throttle voltage” which give a little play in the bottom range of your throttle to ensure a small, unintended pump of the throttle will not launch the bike forward. If you want your throttle to be ultra-responsive, lower this value down.

Regen/Motor Brake – Use the toggle to select On/Off if you want to have regen enabled.

Use the slide bar to adjust the speed at which regen starts working when you are off throttle



MOTOR BRAKE TORQUE (0-30%) 12 %

REGEN START (50-1500) 500 MS

REGEN STOP (50-1500) 50 MS

Speed Limit

Power Mode 1 (20-70) 45 KM/H

Motor Over Temperature Protection

Protection Low Power Mode Start Temp (80-105) 90 °C

Complete Motor Power Disable Temp (90-115) 105 °C

WARNING: most of electric motors have a maximum operating temperature between 85°C and 100°C, any hotter, and you run the risk of permanently demagnetising and damaging the rotor's magnets and/or burn the motor windings.

Motor brake torque – This is an adjustment for the strength of the regen braking. Below 5% will hardly be noticeable and up over 25% will be rather significant. Have a play to see what suits your riding style

Regen start (milliseconds) – This is a ramp up for regen starting so that it does not come on instantly and feel abrupt while riding. We suggest around 500ms so it is a smooth transition to the brake coming on

Regen stop (milliseconds) – This is a ramp down for regen stopping once you drop below the regen brake speed value set above.

Motor over temp protection settings – This is where you can adjust the motor temperature limits. If you are riding hard for a long time or strenuous uphill track you may have noticed a loss in power. This is likely due to motor temperature limits being reached. You now have the ability to raise those limits above what our base tune settings have. The first slide bar is the temperature at which the power reduction will start and the second temperature is the limit at which the controller will cut power to the bike. Read the warning and be mindful of not overworking your motor. You can check the motor temp any time you want in the “Monitoring” tab of the app



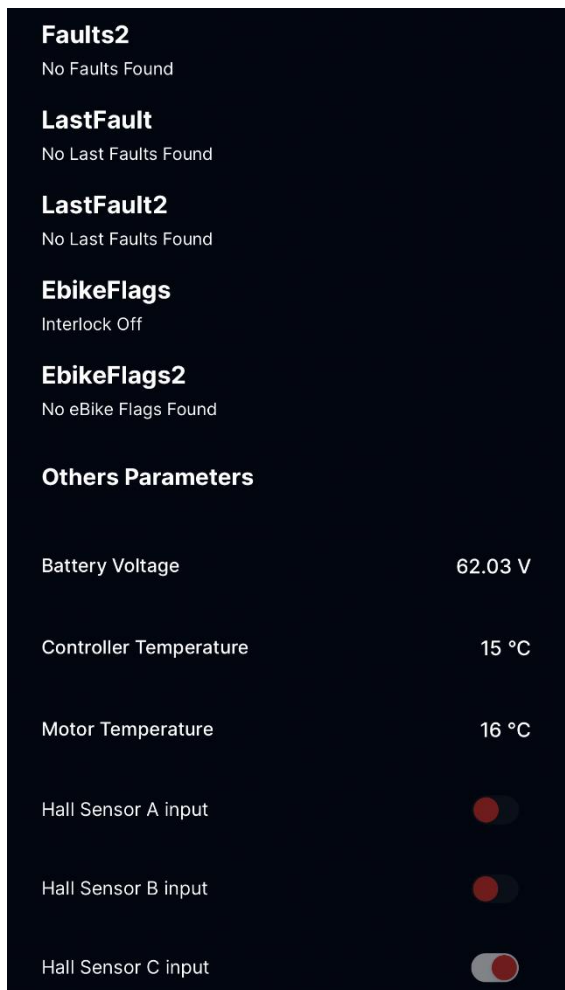
<p>Motor Field Weakening</p> <p>MAXIMUM FIELD WEAKENING (0 to 25%) 25 %</p> <p>WARNING: do not attempt to 'test' revving motor (spinning wheel up in the air) field weakening can cause the controller to lose motor position and go to an infinite loop at extremely high-RPM which can explode your motor internals and/or damage your controller and void your warranty</p> <p>Virtual Freewheel <input checked="" type="checkbox"/></p> <p>Error Bypass <input checked="" type="checkbox"/></p> <p>Apply</p>	<p>Motor field weakening – Field weakening allows the motor to spin up faster than the rated RPM which can give you a higher top speed. Setting the value up all the way (25%) will give you the highest to speed. Lowering the value down or turning it to (0%) will reduce your top speed but can help to keep motor temps down. You should consider running with a low value if you are racing and do not need a very high top speed on the course you are running.</p>
	<p>Virtual Freewheel – Virtual freewheel is a feature that allows the motor to continue to give a small amount of power to the rear wheel after you have started to move forward to overcome the internal resistance in the motor. As the name indicates, it gives the feeling of freewheeling or rolling without resistance. It can be handy to use this feature for lubricating your chain as when the bike is on a stand and freewheel is enabled you can spin the rear wheel with your hand, and it will keep spinning slowly while you lube the chain.</p>
	<p>Error Bypass – This is a EBMX Special Feature that has been enabled on the ASI Controller to assist with over current errors (mostly on BAC4000 units). We suggest everyone enables this feature to ensure you will have a better riding experience and less possibility for an over current cut out when jumping or riding on rough terrain.</p>

4.3 EBMX App Monitoring Functions

The EBMX App Monitoring page is set up to assist customers with viewing crucial system info about your bike and controller.



Using this page, you will be able to view **warnings and faults** that you bike currently has. This is info that can then be sent on to your local EBMX dealer to help you trouble shoot issues you may have, if you are unable to diagnose and solve the issues yourself.



The **battery voltage** is displayed

The **controller temperature** is displayed

The **motor temperature** is displayed – this is a very important value and while you ride you should check the motor temperature to understand how hard you are pushing your bike. As noted in the “Adjustments” section above, you are able to raise your motor temp limits if you require.

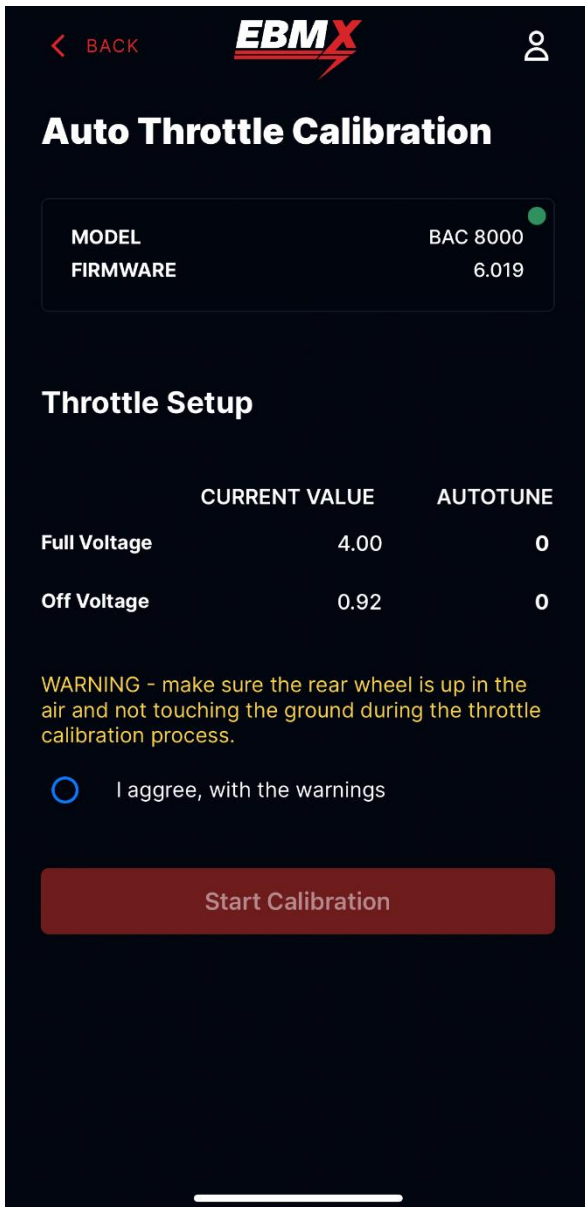
If you have having issues with motor temperatures getting too high, we always suggest only riding in lowest power mode you need for the riding you are doing. Riding in higher power modes will more easily introduce more heat into the motor.

4.4 Throttle Calibration

The throttle calibration page is a very useful tool to use for ensuring your stock throttle is calibrated correctly to the controller but is also used if you want to use an aftermarket throttle and calibrate it to your controller.

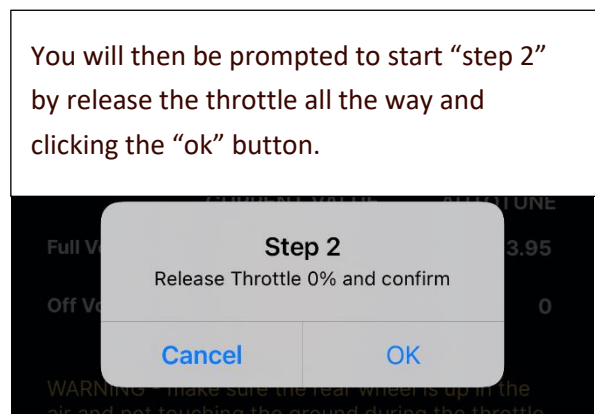
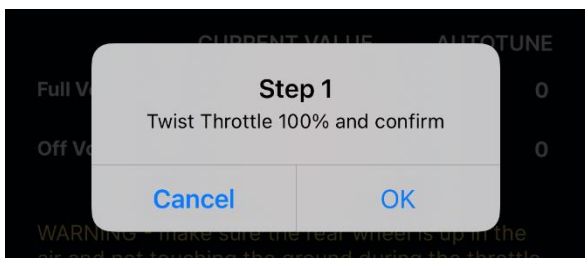
To use the throttle calibration feature, you will need to follow the steps shown in the screen shots below.

Please note the warning about having the bike on a stand where the rear wheel is off the ground in case you get any unexpected rear wheel movement.



First agree with the warning by clicking the blue tick box and then press the red “Start Calibration” button

You will be prompted to start “step 1” by twisting the throttle all the way and holding it while then clicking the “ok” button.





[← BACK](#) **EBMX**

Auto Throttle Calibration

MODEL BAC 8000
FIRMWARE 6.019

Throttle Setup

	CURRENT VALUE	AUTOTUNE
Full Voltage	4.00	3.95
Off Voltage	0.92	0.89

WARNING - make sure the rear wheel is up in the air and not touching the ground during the throttle calibration process.

I agree, with the warnings

[Test again](#) [Apply](#)

Now you will see the new “autotune” throttle values show up for your throttle values.

To accept these, click on the red “Apply” button.

We have detected one or more parameter changes.

You can test the new changes now.

If you like the changes then click on FLASH to confirm and record onto your controller.

If you would like to revert back to previous values, switch the controller OFF. Parameter changes that haven't been FLASHED will be lost when the controller is powered OFF.

[Flash Controller](#)

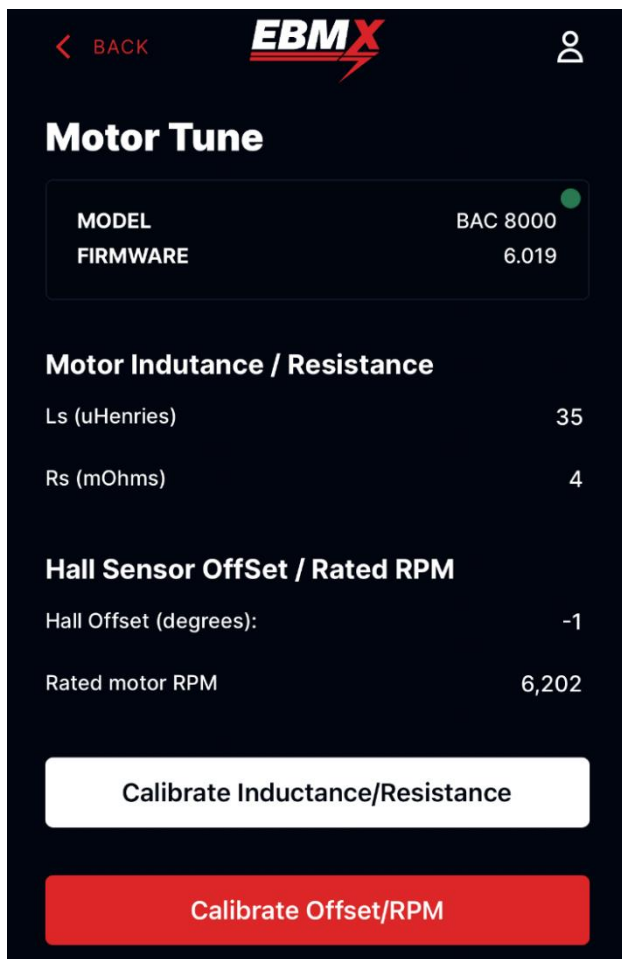
You will then get a pop-up window acknowledging the changes you have made and a request to flash the controller. To proceed with finishing the throttle calibration, click on the RED “flash Controller” button.



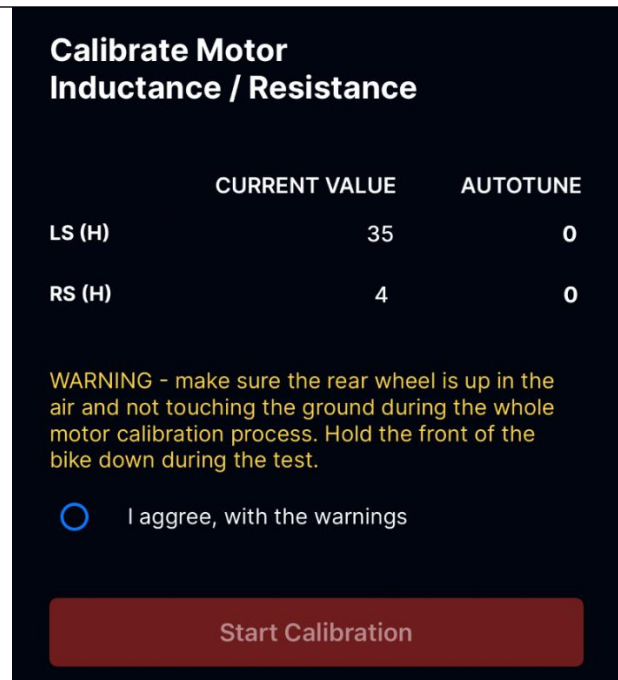
4.5 Motor Tuning

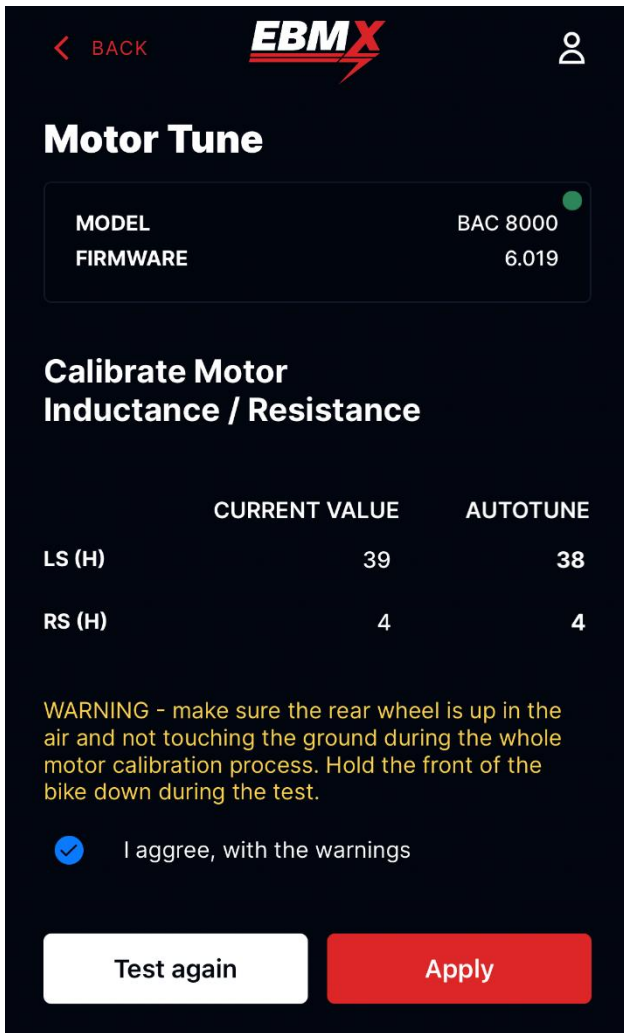
The motor tuning function of the EBMX App is one of the most important features of the App. This feature gives you the ability to properly calibrate your phase cable resistance values, your motor RPM speed and correctly determine the angle of the hall sensor in the motor.

Many people have issues with their motors due to misaligned hall sensors. These issues are most often displayed by motors reaching temperature limits much faster than they should if the hall sensor was calibrated correctly. EBMX have checked hundreds of SurRon hall sensors alignment and our base tune is set to be at a value that is the best fit for as many people as possible. However, we know that the range of hall angle values coming from the SurRon factory continue to vary so it is very important that everyone runs this calibration on their bike!



To start the calibration tests, you will run the Inductance/resistance test first. Click on the white “Calibrate Inductance/Resistance” button. Follow the instructions in the warning and then proceed to click on the Red “start calibration” button.





Once you start the test, you will see the rear wheel do a small movement and the bike will make a small jolt accompanied with a beeping / buzzing noise. Your newly calibrated “autotune” Ls and Rs values will now be displayed in the app. Regular ranges for these values are:

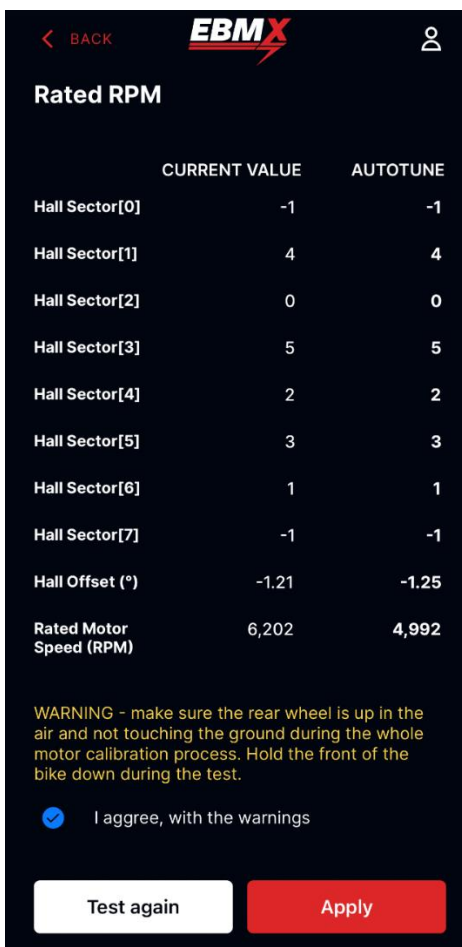
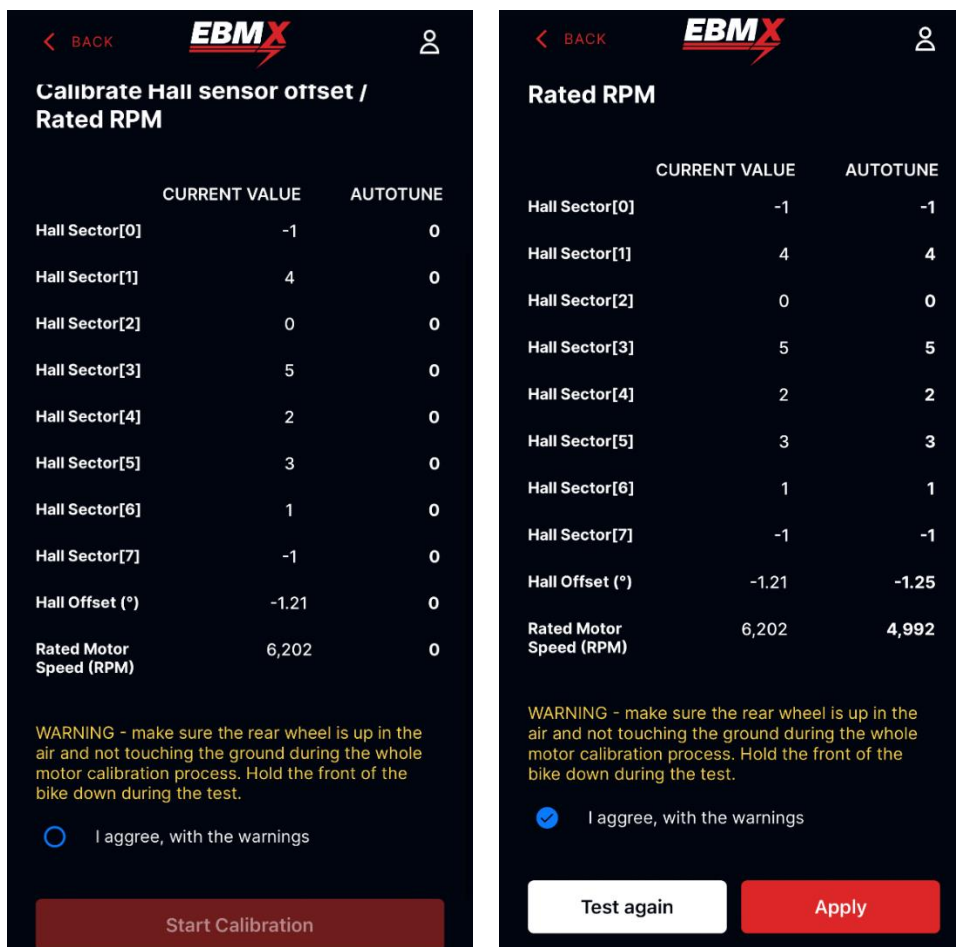
Ls from 33 to 48

Rs from 3 to 5

If your values are outside of this range (likely higher?) then your motor is likely showing signs of damage or aging and may not be suitable for running an aftermarket controller or high-power tune. Please contact your EBMX dealer if you experience these issues.

Apply the settings and follow the flashing process as described in the other steps in this document.

Then move onto the Motor Calibration step.



Please ensure you follow the warnings and ensure bike is securely on a centre stand with the rear wheel free to spin. Once the warnings have been followed you may proceed with pressing the red “Start Calibration” button.

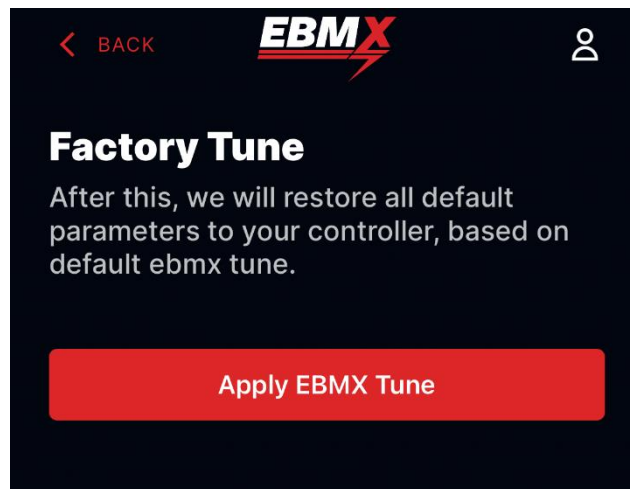
You will see your rear wheel spin up to a reasonably high speed and hold that speed for some time before then coming to a stop on its own. Once the rear wheel has stopped, the app will update the new values in the “autotune” column. It is important that all the Hall Sector values (1 through 7) from the Current Value and Autotune columns are equal. If they are not, there is a potential issue with your hall sensor.

The Hall offset value will be updated to match the needs of your motor and the RPM will be updated. Note that 60v batteries will run a lower RPM than 72v Batteries. Complete the calibration by clicking apply and then following through with the next “flashing” step that follows



5 EBMX Factory Tune

The EBMX Factory Tune feature is in place to allow users to return a bike's settings to the stock settings provided by EBMX. This is a great way to get back to a safe baseline after you have been making adjustments and no longer remember what you changed, and you are not liking how the bike is performing after changes you have made.



Once the Factory Tune has been installed you will then need to go back to the Smart Setup steps and select the correct settings for what battery you are using on your bike.

You should then also go redo the motor calibration steps listed above as when a new base tune is flashed, it will reset your hall angle and RPM to the base values that are in the tune, these are likely not the values that are best for your bike's optimum performance.