EBMX X-9000 APP GUIDE

1 Document Objective

This document has been created to assist EBMX customers with navigating and using the EBMX X-9000 app. Key areas detailed in this document are:

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.

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2 App Overview and Purpose

The EBMX X-9000 App has been created to assist EBMX customers with custom tuning and troubleshooting of their X-9000 controllers. The app allows customers to read information from their controller at a glance using the dashboard or adjust the controller's settings and modes.

It is important that before you use your controller that you read this full document and understand how the app works with the controller. A good understanding of this document will save you time and ensure you are able to get the most of out the X-9000 controller.

3 Connecting to your controller

Disclaimer

When connecting for the first time or adjusting your controller, it is strongly suggested to place the bike on a centre stand before commencing.

The first time you connect to your bike ensure you have all accessories plugged in, including the thumb throttle. You can shut it off and remove after initial setup but it should be installed for the start up process.
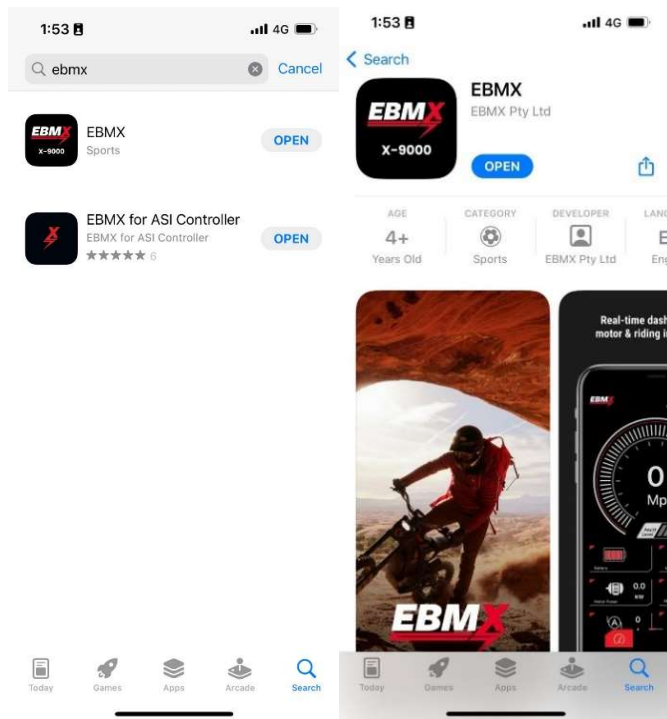
The EBMX X-9000 app is found on the Apple App Store (Android coming soon).

Search "EBMX" in the search bar. Download the app labelled "EBMX" and has "X-9000" in the logo.

Open the app and turn your bike on, the X-9000 controller should show up under the devices available. Ensure you have a Bluetooth enabled on your device. Select the controller you wish to connect to.

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4   App Layout

The layout of the app is quite simple with two main sections: **Dashboard and Settings**. These sections can be switched between by clicking the icons below.

Dashboard

Settings

4.1   Dashboard

The dashboard consists of two main pages and contains useful status information from the controller so that you can tell from a glance what your controller is doing.

Error Indicator - The warning symbol indicates whether any errors are present. If there are errors present, it'll be lit up red, clicking it shall show the current error. Reference the error table at the end of this document if you have any errors.

Bluetooth - Click the Bluetooth symbol to return to the Bluetooth device selection page.

Speedometer - This indicates the current speed of the bike. It is dependent on your gear ratio and wheel diameter both of which must first be configured in general settings. Speed can also be swapped between kph and mph in general settings.

Race / Street Button - Use this button to toggle between the bike's two modes.

Assist Level - This indicates the current assist level of the bike.

Motor Status - The rest of page one consists of other useful information such as battery level, motor temperature, instantaneous motor power, motor rpm, instantaneous battery current and an odometer. This is continued on page 2 of the dashboard. To switch to page 2, simply swipe right.

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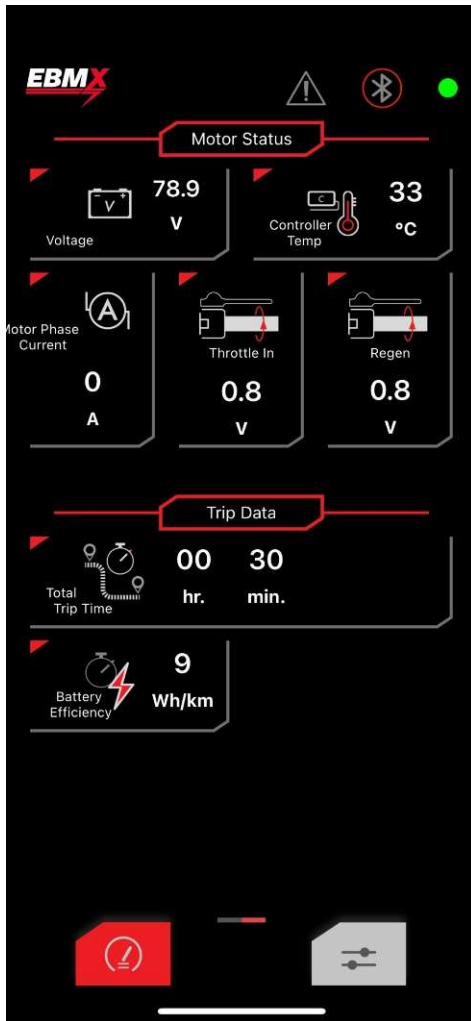
Motor Status - Battery voltage, controller temperature, motor phase current, twist throttle voltage, and thumb throttle voltage are all shown under this heading.

Trip Data - Total trip time indicates the total time since the controller has been last reset. Battery efficiency calculates the total

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4.2   Settings

The second main section of the controller is 'Settings', this is where you can adjust and tune your controller to your heart's content. Use the menu of buttons to navigate to the desired setting.

System Info: The controller's firmware version and serial number is displayed at the top of the screen. This information is useful when troubleshooting.

The options below system info are all menus that are used for setting up your bike, make custom adjustments and enable / disable features. Please review this full document to get a comprehensive understanding of the functionality of this app and the capability of the X-9000 motor controller.

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5 General Adjustments
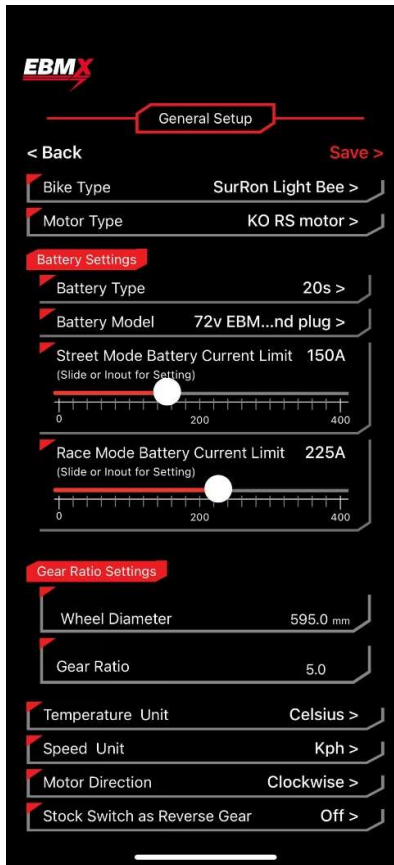
Note: Whenever a change is made in the settings menus and it saves, it will drop you back out to the main menu. If you then go back into the settings, it may seem like your settings did not change. <mark>Ensure every time you make a change and then go back in to witness it, you should pull down on the screen to refresh the current settings.</mark>

Bike Type – Here you will select the type of bike you have.

Motor Type – Here you will select the motor model that you are using (this will push other settings and limits in the tuning automatically).

Battery Settings:
The battery settings area is an important setup area for the controller to ensure you get the max performance from your bike but also to ensure you are safe. The X-9000 has been designed for a wide range of application ranging from 5kW cruisers up to 40kW water cooled racing bikes. We need to ensure you select the appropriate battery to allow for internal limits to be set for the max DC amps that the controller will be limited to. We have used some pre set limits based on the battery type you select, however you are able to then go adjust on your own. Feel free to play with these, they will be limited, so if you raise them too much (for the battery selected) then it will auto correct to the limit aloud.

Battery Type – here you will select the number of series cells in your battery which is corresponding to the nominal voltage of your battery.

<div align="center">

16s = 60v

20s = 72v

22s = 82v

</div>

Selecting the correct battery type will ensure the controller will be able to monitor your battery voltage and ensure you do not exceed cell voltage limits.

Battery Model – This is a key setting that will determine the max DC amps that the controller will allow. Before you get upset that someone is trying to limit you here... there is an "unlimited" option that you can use to get full power (500 DC amps) but you will require a password to use this – please contact EBMX and we are happy to give the password out once we understand you know what you are doing 😊. There are a few options for batteries here where the difference is in the battery cables used. The stock power cables in a SurRon and Talaria bike, and especially the power plugs, are not designed for the amount of power that people are starting to push through them. Running past the limits of these cables and connectors can result in melting plugs, wires or damaging the bike. Please ensure you work within the safe limits of the system you have. The stock plug on a SurRon is rated for 240A DC but only for a very, very short period (10 seconds) and going for longer than that will likely result in melting your connection together.

Once you have selected a battery you will have limits pre-set. You will then be able to make further changes within the limited range for the type of battery/wiring harness that you have. If you have questions regarding these settings, please contact EBMX.

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Wheel Diameter: This is the wheel plus tire (total rolling diameter). Because everyone has different tires and wheel, we are unable to advise sizes here. Please take a measurement yourself and enter the value you have.

Gear Ratio Settings:
The gear ratio of your bike is used to calculate the speed of the bike. It will change depending on your driveline type and sprocket/pulley sizing. For single reduction transmissions, the gear ratio is simply the number of teeth on the secondary sprocket divided by the primary sprocket.
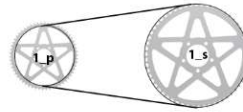
$$Gear\ Ratio = \frac{Teeth_{secondary}}{Teeth_{primary}}$$

If your motor has an inbuilt gear reduction and a single chain reduction, simply multiply the gear ratio calculated above by the internal gear reduction. For the double reduction within the SurRon Light Bee, the gear ratio is simply a multiplication of the gear ratios from each reduction. For simplicity, a table has been made for different types of primary reductions and secondary sprockets (it is assumed that the jackshaft uses the stock 14T sprocket).

Rear Sprocket	Primary Reduction			
	Stock Belt	DB 219 Chain (20T/48T)	DB 219 Chain (20T/49T)	DB 420 Chain
48	7.60	8.23	8.40	7.91
54	8.55	9.26	9.45	8.90
58	9.19	9.94	10.15	9.56
60	9.50	10.29	10.50	9.89
64	10.14	10.97	11.20	10.55
68	10.77	11.66	11.90	11.21

SurRon Gear Ratios

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6 Mode & Level Adjustments
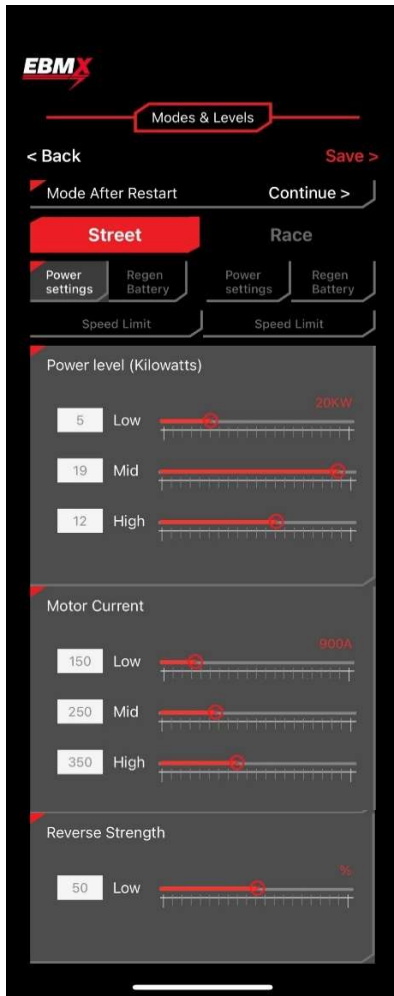
The **Modes & Levels** Menu is a key area of the app. This is where you will set the power levels for you 6 ride modes, speed limits for race and sport mode and adjust the thumb throttle regen brake strength for street and race mode.

Mode After Restart – This function allows the user to choose what mode the bike is started in when the key is turned on. You have three options.

1. **Race mode** – Use this for start-up mode if you mostly ride off road and want to use the high-power modes.
2. **Street mode** – Use this if you want to ensure the bike will always start in your "street" settings were you may have chosen to apply a speed limit and or power limits to settings.
1. **Continue** – use this if you want the bike to start in the last mode you used.

Power Settings – Here you can adjust the Power (kW) and Motor Current (Phase Amps) for each of the 3 modes in both Street and Sport modes. Depending on the battery and motor you are using we have built "factory tune settings" however you will be able to adjust the power levels to suit you and save to lock them in.

You may notice that you have limits imposed on power settings in the app. For example, you set the power to 25kW and save but then it drops down to 20kW. We have pre-programmed some limits depending on the battery and motor you are using. We have left the range very wide to accommodate users, however, we don't want to see anyone trying to run 40kW and 900 Phase amps with a battery that cannot support it and a motor that will just heat up within seconds. If you have questions about this, please contact EBMX.

Motor Current – it is okay to keep your motor current (Phase Amps) high on your settings. The controller is able to generate high phase amps without the need for high battery (DC) amps, so as long as you have your "Battery Current" in the General Settings --> Battery settings adjusted within your BMS limits, you can ramp the Motor Current up as much as you like.

Please also keep in mind that running high Motor Current will introduce more heat more quickly into your motor, so if you are having issues with overheating (usually stock motor) then you may want to try to find a sweet spot between high Motor Current and how quickly head is building up during your riding.

Regen Battery – This is where you will adjust the strength of the variable thumb throttle regen. Be careful as you will be able to lock up your rear tire by adjusting this up high enough. You can set this differently for Street Mode and Sport Mode depending on your personal preferences.

Speed Limit – Here you will adjust the Speed Limit of your bike. There will be a slight ramp down once top speed is reached. The Speed Limit can be adjusted differently for both Street and Sport modes. It is important to note that this speed limit will only be accurate if you have correctly calculated the gear ratio and tire size
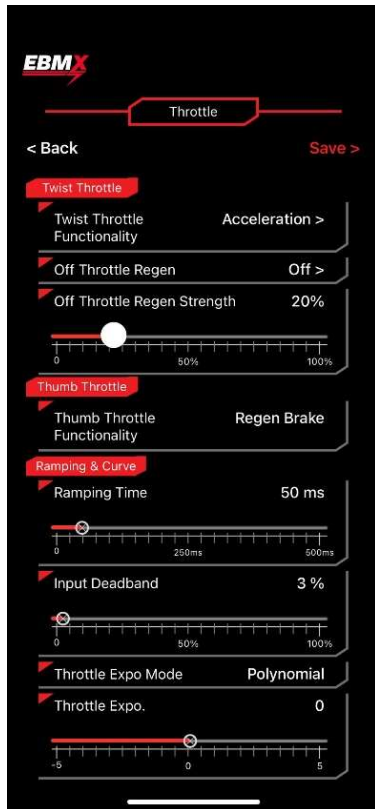
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and put these settings into the app in the "General Setup" menu. We also strongly advise you to check your speed with a GPS phone app to verify your settings are correct and that the speed on the GPS matched your speedometer.
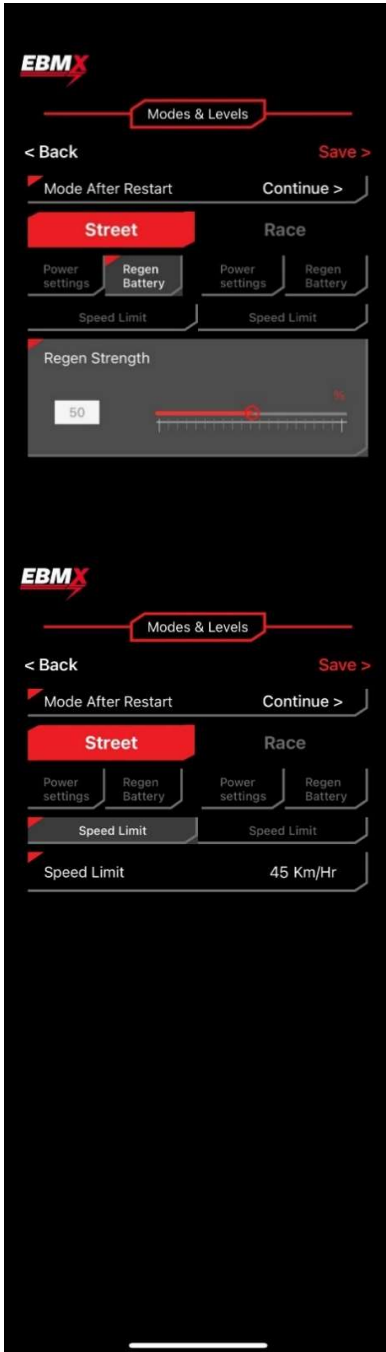
7   Throttle Adjustments

The **Throttle Menu** is used for multiple different fine tuning changes and calibrations. This menu is used for multiple types of motors so not every setting may apply to your bike.

Twist Throttle – Under these settings you will be able to turn the twist throttle function On/Off and adjust the "Off throttle regen" On/Off.

Off Throttle Regen is regen (engine braking feeling) that comes on automatically when the throttle is in the off position. You are also able to adjust the strength of the off throttle regen using the slide bar adjustment.

Thumb Throttle – Using this setting, you are able to choose three settings for the thumb throttle.

1. **Off** – use this setting if you are not using the thumb throttle (you may get an Error – 24 if you don't turn it off and leave it unplugged), or if you have it plugged in but just don't want it to be live.
2. **Regen Brake** – use this setting to use the thumb throttle as a variable regen brake. Like off throttle regen, this will provide engine breaking (rear wheel braking) and will send power back into your battery. It is variable so the harder you press, the stronger the braking will feel. **IMPORTANT** – the overall settings for the max strength of this variable regen throttle are adjusted in the "Modes & Levels" --> "Regen Battery" settings. This is located there as you are able to set different regen strengths for both Street and Sport modes.
3. **Acceleration Throttle** – Your thumb throttle can also be utilised as an acceleration throttle (just like your twist throttle). This has been set up to allow for a trail fix for a crash where you damage your twist throttle.

Ramping & Curve – This is the area where you can adjust the "feel" of your throttle to fine-tune it to your riding style.

Ramping Time – Adjusting the ramping time will put a ramping effect in your throttle input signal. This is measured in milliseconds. If you want a very responsive throttle (very snappy feeling) keep this value low (25-50), if you are riding hard enduro and are worried about whisky throttle or unintended throttle inputs from pumps, keep this number higher (100-150).

Input Deadband – This adjustment adds a "dead spot" in the start of the throttle where voltage will be registered but it will not power the motor. This is an adjustment that is most often used for rough trail riding where you are giving small twists of the throttle but don't want to have that provide power to the motor.

Throttle Expo Mode – This allows you to select from three different throttle modes.

1. Natural
2. Polynomial
3. Exponential

The **Throttle Expo.** adjustment slide bar allows you to change the curve of the mode you have selected. Please watch this video to better understand and see a visual representation of how these

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settings affect the throttle inputs and play on your bike to find settings that suit your personal riding style.
https://www.youtube.com/watch?v=HfjgwhYi8IE

8 Controller Calibration
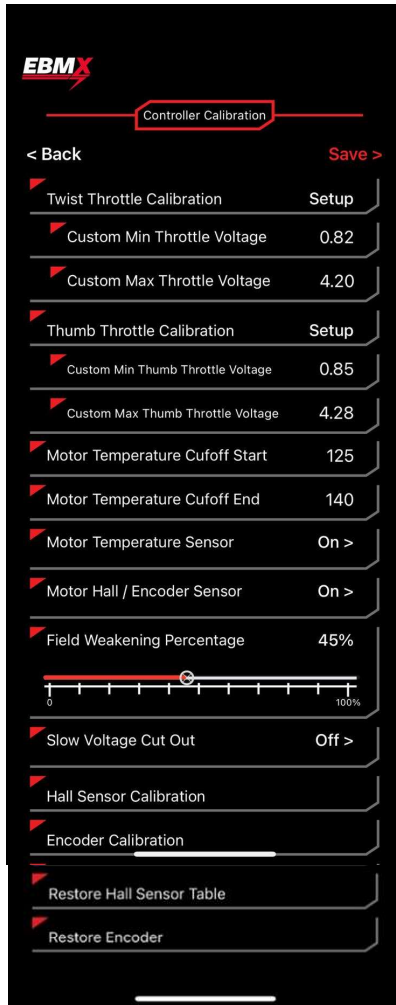
The **Controller Calibration Menu** is used for multiple different fine tuning changes and calibrations. This menu is used for multiple types of motors so not every setting may apply to your bike.

Twist Throttle Calibration – This wizard is used for auto throttle calibration of the twist throttle. This should not be required on stock throttles, but can be used to ensure your exact throttle range is recorded. This is required for any aftermarket throttle or you may get a throttle voltage error showing on the display (Error – 23). Click on the line item and follow the instructions that come up.

If you need to manually set the throttle range, you can do this but will require a password to set the values, please contact EBMX for this password.

Thumb throttle Calibration – This wizard is used for auto-throttle calibration of the thumb throttle. Same notes as above. If there is an error with the thumb throttle it will display (Error - 24).

**If you not initially install the thumb throttle you will get an Error-24 and will be unable to ride. Please install the thumb throttle and then go in the app and disable it if you do not want to use it – then remove the thumb throttle from your setup.

Motor Temp Cut-off Start – This is the temperature at which the motor will start to limit power due to reaching the lower temperature limit. This value will automatically update based on the motor you are using. If you intend on changing the temperature limit, you will require a password, please contact EBMX for this.

Motor Temp Cut-off End – This is the temperature at which your controller will stop providing power to your motor due to excessive heat. There is a gradual ramp down between the start and end cut-offs so it will not be an abrupt power cut. If you are manually adjusting temp limits, ensure the cut-off end temp is always above the cut-off temp start value.

Motor Temp Sensor – This allows the motor temp sensor to be overwritten in the event it fails during a ride and you need to make it home. We never suggest turning off motor temp protection on your bike as this can result in lasting motor damage from overheating.

Motor Hall/Encoder Sensor - this allows the hall/encoder sensor to be overwritten in the event it fails during a ride and you need to make it home. We do not suggest disabling the feature outside of this scenario.

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Slow Voltage Cut out – This is a feature that can be enabled to assist with stock bypassed batteries. This changes the time limit for cells to be running under voltage limits before the controller will cut power. This will also stock batteries (with bad voltage sag) to run a bit better and experience less cut outs. Ultimately you will need to upgrade your battery to get optimum performance.

Field Weakening Percentage – This is an important feature. We have determined a safe range for Field Weakening and you are able to use the full range 0-100%. We have set the stock value at 45% for off road riding where a high top speed is not required. If you feel you want a higher top speed on your bike, ramp this value up closer to 100%. Note that the more FW you use, you will also be increasing heat more quickly in your motor as well.

Hall Sensor Calibration – We have set base hall tables (for motors with hall sensors) that should ensure your bike runs well. However, if you are experiencing any funny noises, excessive heat build-up, or want to customise your tune values, you can run this wizard. Please note this should only be used for stock SurRon motors and KO motors that utilise hall sensors. Ensure that you have your bike up on a center stand to run this calibration as it will spin your rear wheel.

Encoder Sensor Calibration – We have set base encoder settings based on a stock Talaria encoder settings to ensure your stock bike will run well. However if you are experiencing any funny noises, excessive heat build-up or want to customise your tune values, you can run this wizard. Please note this should only be used for stock Talaria motors (or other encoder motors) that utilise encoder sensors. Ensure that you have your bike up on a center stand to run this calibration as it will spin your rear wheel.

Restore Hall Sensor Table – This will reset the factory SurRon Light Bee hall table. Use this if you have run a hall sensor calibration and it has resulted in unfavourable changes, please also contact EBMX.

Restore Encoder - This will reset the factory Talaria Sting encoder settings. Use this if you have run a encoder sensor calibration and it has resulted in unfavourable changes, please also contact EBMX.

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9   Peripheral Setup
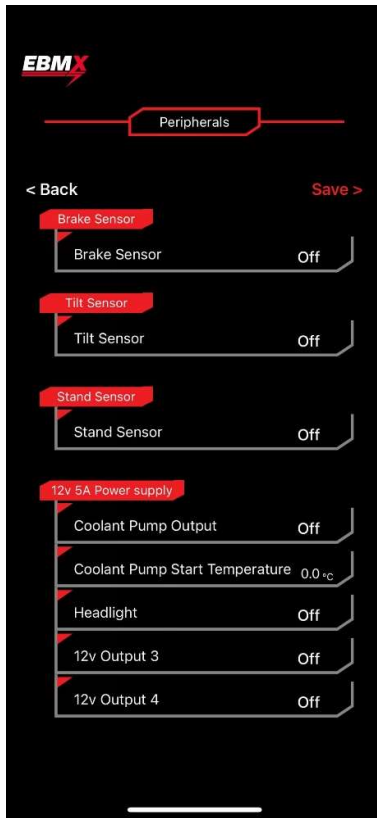
The Peripherals menu is used to enable or disable the stock switches on the bike (brake sensor, tilt sensor and kickstand sensor).

It is also used for controlling the functionality of the built-in 12v DCDC converter in the controller.

The 12v wiring harness is included in every EBMX X-9000 power kit and is an additional feature that will need custom work to install additional items to be powered. If you have questions regarding the 12v power harness, please contact EBMX.

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10 Troubleshooting

Display Error Code	X-9000 App Error Code	What to check
Any fault code	Any fault code or issues with the bike, settings not saving or funny things happening`	Ensure you are running the latest version of Firmware on the Display and on the Controller. Please contact EBMX or seek help on the X-9000 FaceBook page to get updates.
1	FAULT_CODE_OVER_VOLTAGE	Check you have the correct battery type (16s, 20s, 22s) selected for the battery you are using. Reference section 5.
2	FAULT_CODE_UNDER_VOLTAGE	Check you have the correct battery type (16s, 20s, 22s) selected for the battery you are using. Reference section 5. Have you drained your battery past its lower limit? Charge battery and see if the error is fixed.
4	FAULT_CODE_ABS_OVER_CURRENT	Over current error
5	FAULT_CODE_OVER_TEMP_FET	Controller over temp limit – screenshot display page showing controller temp and contact EBMX
6	FAULT_CODE_OVER_TEMP_MOTOR	Motor over temperature – This will happen often running high power on stock motors. Try reducing Motor Current values to reduce heat Ensure you are not riding in higher power modes when not needed as this created excess heat. Upgrade to a EBMX motor and never worry about it again (coming soon contact us for details).
9	FAULT_CODE_MCU_UNDER_VOLTAGE	Screenshot and contact EBMX
10	FAULT_CODE_HALL_SENSOR	Hall sensor error – try running the hall sensor calibration, see section 8.
14	FAULT_CODE_FLASH_CORRUPTION	Screenshot and contact EBMX
15	FAULT_CODE_HIGH_OFFSET_CURRENT_SENSOR_1	Error with current sensor – screen shot error and contact EBMX
16	FAULT_CODE_HIGH_OFFSET_CURRENT_SENSOR_2	Error with current sensor – screen shot error and contact EBMX
17	FAULT_CODE_HIGH_OFFSET_CURRENT_SENSOR_3	Error with current sensor – screen shot error and contact EBMX
18	FAULT_CODE_UNBALANCED_CURRENTS	Screenshot and contact EBMX

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| 23 | FAULT_CODE_THROTTLE_VOLTAGE | Twist throttle voltage error – most likely caused by using an aftermarket throttle and not yet having calibrated it. see section 8 for the Throttle Calibration guide. |
| 24 | FAULT_CODE_REGEN_VOLTAGE | Thumb throttle voltage error – most often caused by having the thumb throttle enabled (section 7) and then not having the throttle plugged in. If you do not want to use the thumb throttle, ensure the thumb throttle function is turned off in the Throttle Settings tab. |

Other Troubleshooting Help:

1. If you have started making changes, or **if for any reason your bike is feeling rough or running incorrectly** and you want to reset it to the factory settings, please follow this process:
    a. Assuming you are starting with a SurRon Light Bee X and Stock motor: In General Setup → Select Talaria bike → select Talaria motor → save. Then go back in and resect the correct settings: in General Setup → Surron light bee → SurRon motor → save. By doing this, you will be able to reset the stock tune settings (and motor settings) on your bike.
    b. Note that running a hall calibration (for stock SurRon motors) and encoder calibration (for stock talaria motors) is not always required and if you do run these, you may get worse performance. As noted in the sections above, please only run the calibrations if you are first experiencing issues (before running a calibration). These issues may be things like a jerky feeling motor or rough sounds coming from the motor.

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