

Speed App for Bafang E-bike Systems

By Dave Rumsey



“**Speed**” is an App available for Android phones that allows you to connect your phone to the controller of a Bafang-equipped E-bike, read the program parameters and edit some of the parameters.

It also has a “Display” function, where you can ride the bike with your phone connected and acting as the display.

You can change assist levels, it has a speedo display, but it also displays power output, brake switch activation etc, so is a very useful diagnostic tool.

What would you use it for?:

- Setting up a new controller to work with the hardware fitted to an e-bike (E.g: Wheel diameter, speed sensor type, cadence or torque sensor type etc);
- Adjusting brake switches;
- Reading and changing the program parameters that determine how the bike applies pedal-assist power in each assist level, or power when using the throttle;
- Checking how much power the controller is putting out in different assist levels under different circumstances, and maximum power.

What you need:

1: An Android smartphone or tablet. If you use an Iphone, you can probably get a used Android phone for free or cheap to use for this purpose.. it doesn't need a SIM card in it.

2: An OTG (On-the-Go) cable, that plugs in to the charging / data port of the phone (either USB C or USB Micro) and has a female full size USB socket at the other end. These are available quite cheaply from electronic stores, TradeMe etc.



3: A Bafang Programming cable. Some of you already have these.. it is the same cable that can connect a laptop to the E-bike controller. Available form AliExpress, TradeMe or MeloYelo B2B store.



One end has a male USB connector that plugs in to the OTG cable, the other has a green 6-pin Julet connector that plugs into the display branch of the main cable on the E-bike.

4: The App... Download Speed (3 e's) from Google Play Store. Search "Bafang Speed" and look for the logo with orange lettering on black background.

How to use the App

1: Connect the OTG cable to the smartphone and the programming cable to the OTG cable.

2: Disconnect the bike's display from the main cable.



3: Plug the programming cable into the bike's main cable, ensuring that the arrows align correctly.

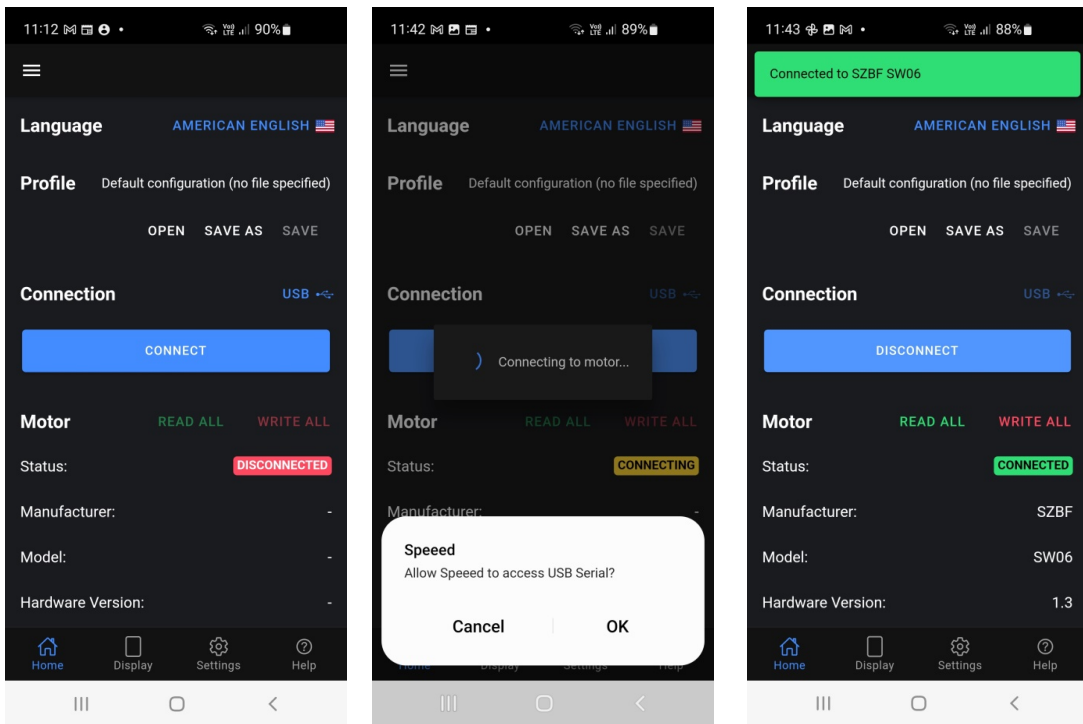
Hint: Using a craft knife or snips, cut a slit in the black outer sheath of the programming cable plug at the front, where it slides over the green part of the main cable plug.. this will reduce friction and allow the programming cable to slide more easily onto the cable plug.

The bike must have the main battery installed so that the controller is powered.

4: Open the Speed App on the phone.

Hint: For some phones the OTG-function needs to be "activated" (in settings / additional settings)

5: Connect the phone App to the controller: Tap the blue bar labelled "Connect" in the middle of the screen.



You will be asked to allow the connection.. Tap “OK”.

You should get confirmation that the connection has been successful.

At this stage, the manufacturer code, controller model and hardware version will be displayed, but the App has not yet read the program stored in the controller.

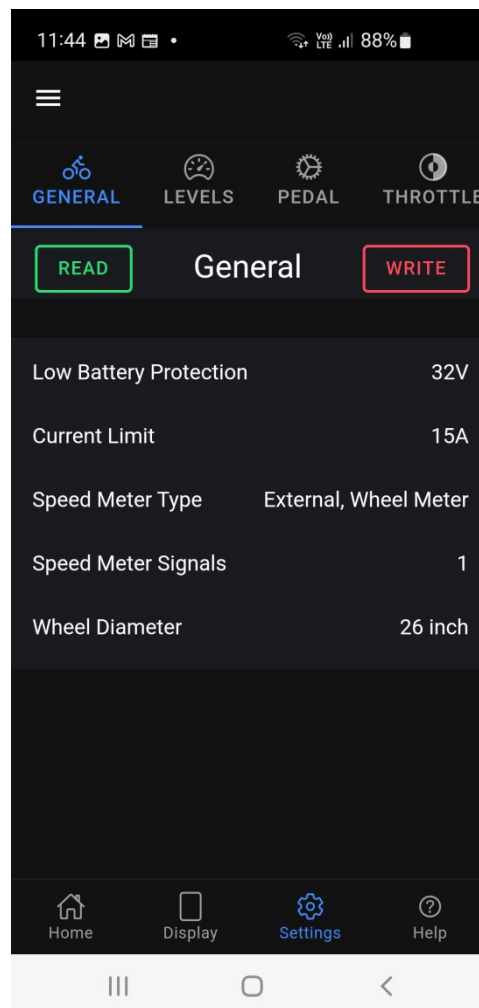
Hint: If you scroll through the various pages of the App at this stage you will see values populating the various fields, not blank fields. This might make you think it has read the program in the controller.. **it hasn't:** there seems to be a Default set of values stored which are overwritten when you Read the controller's program.

6: Read the program... Tap the green “Read All” button on the App’s Home screen.

You will now be able to read the program parameters stored in the controller, and edit most of them.

Settings pages:

General Page:



“Low Battery Protection”: This shows that the controller is set to stop powering the motor when the battery voltage drops to 32 Volts. It may be possible to set this to a lower voltage, but battery life will be reduced.

The **“Current limit”** is the maximum current allowable. Each controller / firmware combination has a maximum current hard programmed, and usually this is what shows on this page. You can reduce the value to make the bike less powerful / more economical, but you cannot use this App to increase the limit current above the firmware setting.

Later, in the “Levels” page you will see currents expressed as a percentage of this value, so changing this value will change the currents allowed in each assist level also.

The **“Speed Meter”** shows what type of speedo signal the controller is expecting (in this case, a magnet on the spokes triggering a switch on the frame), and the number

following “**Speed Meter Signals**” indicates how many signals are generated per wheel revolution.. in this case, one magnet so one signal per rev.

Most of our bikes use 1 signal per rev, but a few of our older hub motor bikes used 6 signals per rev.. if fitting a new controller to one of these bikes, that number has to be changed to 6 (or 5 of the magnets must be removed from inside the hub motor...)

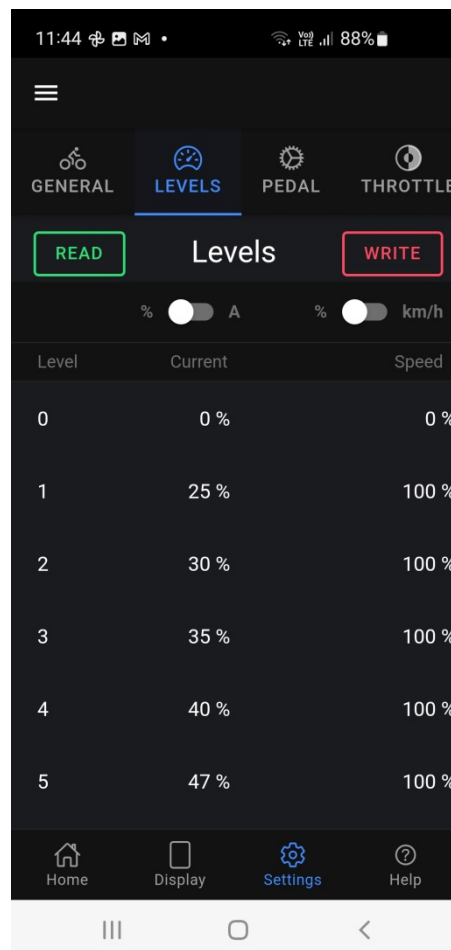
The **Wheel Diameter** must match the wheels of the bike, or the speedo will read incorrectly.

To edit a value, tap on it, scroll through the possible values then tap on the value you want.

To save the changes, tap the “Write” button at the top of the page before leaving the page.

Levels Page:

This is the page where you can set how much power is applied in each of the assist levels.



If you scroll down the page you will see that there are 9 levels as well as level Zero.

The display can be set for 3 assist levels, 5 levels (our default setting) or 9 levels. We feel that 3 levels does not give enough control, and 9 levels involves too much button-pushing, but if a particular owner wants, we can reset to either 3 or 9 levels.

When set to 5 levels, the controller looks at levels 1, 3, 5, 7 and 9 on this page.

The “Current” column shows how much current (and therefore motor torque) will be applied in the corresponding assist level, expressed as a percentage of the maximum current set on the previous page.

Level 9 will always be set to 100%, Level 1 will be set to a level that gives subtle but definite assistance (varies from bike to bike), and the levels between should give a smooth progression as higher levels are selected.

The Speed column shows what maximum speed is allowed in each assist level before the power is cut off, expressed as a percentage of the maximum speed (Set through the display or on the “Pedal” page of this App).

All Torque sensor bikes are set to 100% speed in all assist levels, as it is easy to ride slowly by putting less force on the pedals.

Some Cadence sensor bikes have upper limits set in each assist level to stop them “running away”, as full power for each assist level is applied just because you are turning the pedals.

Some cadence sensor bikes are set to 100% speed in all levels.. these screenshots are taken from a MeloYelo Tranzit, which is a mid-drive cadence sensor bike.

If Level 0 is set to 0% current, the throttle will not work in level 0 (which is our default), but if current is set to 1% and the speed limit is set, than the throttle will work in level 0.

Editing the current percentage in an assist level will make the bike feel “stronger” or “weaker” in that assist level. We sometimes get asked by owners to modify the program.

For example, the Tranzit, which is a cadence sensor bike with a fairly “strong” assist in level 1, can be difficult to ride slowly, and we have reduced the current from 25% down to 18% or even lower in level 1 for some owners.

Conversely, the M400 motor in the Traverse and Ascent has a very economical (“weak”) setting in level 1, and we have sometimes raised this from 15% to 20%.

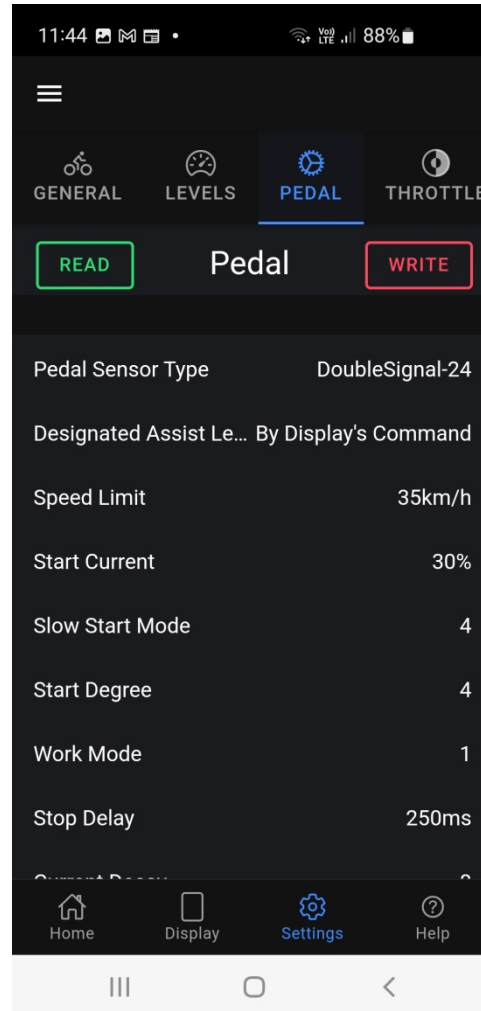
If you change level 1 significantly, please also change the other levels a bit so there is a smooth progression as you change up through the levels.

Even though only levels 1, 3, 5, 7 and 9 are used with a “5 assist level” setup, it is good practice to change the numbers in all the levels so if anyone changes the display to 9 assist levels, the bike will perform well.

To change a parameter, tap on it: A list of possible values will be displayed. Scroll through the list and tap on the value you want to set. That value will be inserted and you will be returned to the main Levels page.

You can adjust one, several or all the values without saving each one individually, but tap the red “Write” button before you exit the page, or your changes will not be saved.

Pedal Page:



This page has settings that control how the pedal-assist works within each assist level.

The “**Pedal sensor type**” has to match the unit fitted to the bike.. in this case a specific cadence sensor that gives 24 signals per revolution of the pedals.

The “**Designated Assist Level**” could be set to one of the assist levels, but is usually set to “By Display’s Command”, meaning that the assist level can be changed by the rider using the buttons on the handlebar that are connected to the display.

The “**Speed Limit**” is the highest speed the bike can go while still having power applied by pedal assist.

(In some countries there is a hard 25kph limit, and some E-bikes sold in NZ have this maximum speed programmed, and it cannot be altered. There is no maximum speed limit in NZ law, only a power limit).

It can be set in the controller to a specific speed, or set to “By Display’s Command” meaning that the limit can be changed by accessing the menu in the display.

Our standard setting is “By Display’s Command”, with 35kph set in the display, but the bike that I took these screenshots had 35kph set in the controller, meaning that the limit speed could not be changed from the display. (This can be changed to “By Display’s Command” using this App).

The maximum setting using this App is 40kph, but “By Display’s Command” allows up to 50kph.

“**Start Current**”: When you start pedalling the power assist is fed in gently rather than immediately. The Start current is the power level that is fed in immediately you start pedalling, then it ramps up gently from that figure to the maximum in that assist level.

“**Slow Start Mode**”: This determines how quickly the current ramps up from the Start Current.

“**Start Degree**” controls how far the pedals have to rotate before the power assist starts... It would be dangerous if the assist started as soon as the pedals rotated slightly, because simply repositioning the pedals could make the bike move before the rider was ready. This parameter controls how far the pedals have to rotate before power is applied.

“**Work Mode**”... I haven’t seen a clear description of what this achieves. Everybody that has played with programming seems to leave it alone...

“**Stop Delay**”: The assist power stops when you stop pedalling, but there has to be an allowable time delay between signals from the cadence sensor to the controller when you are pedalling slowly, or the power would be turning off then back on continually.

If this delay is set too short, the power will get jerky / intermittent at low pedalling speeds.

If it is set too high, the power will continue for too long when you stop pedalling.

“**Current Decay**” and “**Stop Decay**” relate to how suddenly the power drops off once you have stopped pedalling and the Stop Delay time has been exceeded.

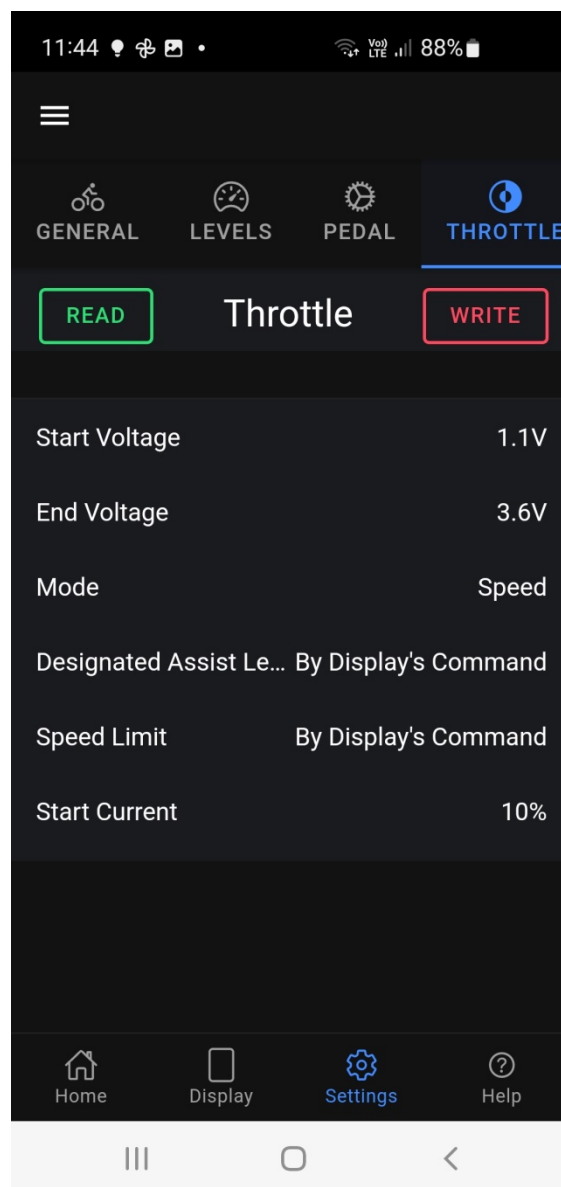
“Keep Current”: The controller is set to give the relevant “full power” in each assist level when you start off and are accelerating, then drop back to a lower setting once you reach a steady speed. This gives more range and keeps controller and motor temperatures low while still giving good assistance while you are accelerating.

The “Keep Current” is the continuous power level for steady speed riding. If it is set higher the rider gets more assistance at steady speeds, at the expense of higher battery drain.

Typical values are 60% to 75%.

(This is the reason that you can feel extra assistance from using full throttle even when pedalling hard uphill in level 5.. the pedal assist will drop back to the Keep Current value, but full throttle will give you full power).

Throttle Page:



This page gives settings for how the throttle works.

“Start Voltage” and “End Voltage”: The throttle receives power from the controller (5 Volts DC) and sends a variable voltage back to the controller depending on its position.

Unactivated it typically sends around 0.8V, and fully activated it sends around 4.3V.

The Start and End voltage settings tell the controller when to start adding power and what voltage is considered full throttle.

The Start Voltage must be set a bit higher than the throttle delivers at rest, or slight bumps or moisture might cause unwanted throttle activation.

In general, don't edit these values.

“Mode”: There are two options, Speed and Current.

“Speed” will make the throttle act a bit like cruise control.. steady throttle will make the bike try to maintain a steady speed;

“Current” will apply current (and therefore motor torque) proportional to the throttle position regardless of speed.

Which is “better” depends on personal preference.. our default is Speed, my personal preference is Current as it seems to give smoother and more predictable operation.

“Designated Assist Level”: This defines the amount of power that full throttle delivers in each assist level.

If it is set to “By Display's Command”, then the throttle will provide full power in the highest assist level, but reduced power in lower assist levels, based on the current % figure set for each level.

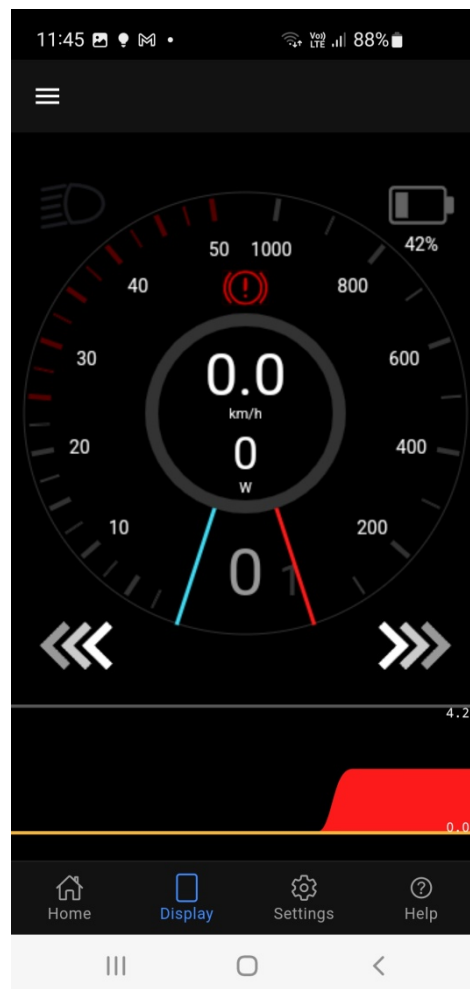
If it is set to a specific assist level (by inserting a number from 1 to 9), it will always provide the maximum power that that assist level is set to, regardless of which assist level is selected on the display at the time.

Our default setting is “9”, meaning that full throttle will provide full power regardless of what assist level is set on the display (except level 0, where the throttle will not work).

“Speed Limit”: As per the speed limit on the Pedal page. Usually set to “By Display's Command” but can be set to a specific value in the controller.

“Start Current”: Sets the amount of power that the controller will deliver once the Start Voltage is exceeded. If set too high the throttle will give a jerky response.

Display Page



When the Display page is selected, the bike can be activated on a work stand or ridden as normal, using your phone as the display.

There is an analogue speedo display on the left plus a digital speed figure in the centre, and an analogue power display on the right, plus a digital power figure in the centre.

The Assist level is displayed under the power figure, and is changed using the large arrows on either side of the screen.

There is also an indication that a brake switch is activated, above the speed figure, and a battery graph with percentage figure as well as the usual indicator.

Scrolling slowly across the bottom of the screen is a graph of the speed and power, plus a red sector (as in the screenshot above) indicating when a brake switch is active.

So as you can see, there is a lot of information shown on this screen that is not available on a normal display, which can be useful for diagnostic work, setting brake switches, tuning the program parameters etc.

Hint: With the bike on a work stand, if you disconnect the back brake switch you can run the bike on throttle (spin the back wheel by hand to over 6kph to get it started if a mid-drive bike) and load the motor up by applying the back brake. In this way you can read the maximum power in each assist level without riding the bike.

Remember to reconnect the brake switch when finished!