

# WARNING!

BEFORE MAKING ANY CHANGES TO YOUR SETUP PLEASE  
MAKE SURE THAT YOUR DRIVE WHEEL IS OFF THE GROUND TO  
PREVENT A RUN AWAY SITUATION!

PLEASE READ THIS ENTIRE MANUAL, IT WILL SAVE YOU TIME  
AND ALLOW YOU TO UNDERSTAND HOW EVERYTHING  
OPERATES. THOSE WHO FAIL TO READ THIS MANUAL WILL BE  
FED TO THE RANCOR.

The Fine Print... HA! I can see you squinting.

No warranties are expressed or implied, you accept all responsibility from here on. Precautions have been taken in the design to detect and prevent faults.

NOTE: Installing the Throttle Tamer will change the way your throttle operates. It will take you some time to adjust to this new method of operation, but the more you ride the quicker you will adjust. It might appear to be a little laggy until you get it dialed in to your liking, even then it might still feel a little laggy, but you will adjust your throttle control and then there will be no more lag. You will probably find that after riding for a while that you can turn the accel pot counterclockwise even more for even less ramp rate and smoother control because you will have acquired muscle memory. Here is a tip that can help you adapt more quickly. Many e bike riders are used to letting completely off the throttle for a corner or just to slow down a little. We do this because any throttle movement in a corner can produce a major burst of acceleration causing us to lose control. If this is how you ride your e bike, try changing this habit and roll off the throttle slightly for a corner and then back onto it after you complete the corner. This method of operation more closely resembles how a gasoline powered throttle is operated and you will most likely over time adjust to the point you can throttle out of a corner without having to worry about losing control of the bike.

Now on to the fun stuff...

First, thank you for purchasing a Dodecahedron Solutions Inc Throttle Tamer. This device was created by Dodecahedron Solutions Inc to allow end users to adjust their throttle response on the popular Xie Chang (commonly known as Infineon/Lyen/Keywin) e Bike motor controllers

This device is to be installed between your throttle and the controller and modify it. It allows you to set the start / end voltage of your throttle and adjust the curve and ramp rate of the throttle voltage. When set properly this allows for much smoother starts and better overall throttle control, especially on higher powered setups. Extensive testing with inexperienced e bike rider has shown the Throttle Tamer to be effective at improving the throttle control on practically any power level bike, even "Wife/Girlfriend" e Bikes. It can eliminate the over sensitivity of small throttle movements that occur during normal riding by filtering them out.

Many people wonder why the throttles are so sensitive on these controllers. The reason is because unlike a car the throttle on these controllers only controls speed. This means when you change the throttle input you are controlling the speed of the bike/vehicle instead of controlling power like a gasoline engine's throttle does. Many higher powered e bike riders are familiar with starting from a stop and how challenging it can be to do smoothly.

The throttle interface comes assembled with connectors unless you opted for a version without the connectors; in that case you will need to add your own throttle connectors. There is an optional second controller output which may be used for connecting to a second controller for use with two controllers from one throttle. This feature has been tested on Xie Chang controllers and works well. If you did not order a model with dual throttle outputs and need this function, you can add the missing components yourself. They are a PN2222A NPN transistor, a 1000 ohm resistor and of course a second throttle connector.

#### Safety Features:

If you connect the throttle interface to your controller, but do not have a throttle attached, it will output 0.00V and will latch to this voltage. That means even if you connect a throttle to the controller and try to move it, it will still be stuck at 0.00V because it has detected a fault. You may clear this fault in one of two ways. Pressing the red button on the interface to reset it, or cycling the power to the interface. If you choose to cycle power to the interface, you may have to wait for the capacitor to discharge in the controller before it will work properly again, this may take a few seconds.

If the ground wire on the throttle becomes disconnected, the interface output will latch to 0.00V because the throttle's signal wire goes higher than the allowed input. This voltage is 78% of the voltage supplied by the controller. The typical controller supplies the throttle with around 4.25V, so if the throttle signal wire to the Throttle Tamer exceeds 3.3V (or 78% of the supply voltage) from the throttle it will trigger a fault condition which causes the Throttle Tamer output to latch to 0.00V. This is used to detect a fault condition if the ground wire is accidentally disconnected from the Throttle Tamer. If the positive wire from the throttle were to short to the throttle signal wire, it too will cause an over voltage condition causing the output to latch to 0.00V. To protect any wiring from the controller to the throttle interface, it would be wise to enable the "Brake Protect" or "Drive Saving" feature in the controller programming software which provides the same kinds of fault detection between the Throttle Tamer and the controller.

In summary, the following conditions trigger a fault on the throttle interface which require a reset:

- Ground wire from the throttle to the interface.
- Positive wire contacting the signal wire.
- No throttle connected to the input.
- Any voltage on the throttle signal line exceeding 78% of the supply voltage powering the Throttle Tamer.

For some types of controllers or throttles it may be necessary to bypass the throttle safety features. To do this you will need to solder a 10k ohm resistor from the B7 connection to a V+ connection. A good place to find the V+ connection is on the second throttle output if it's unused. The Square pad of Output 2 is the one you want.

**DANGER: Bypassing the safety features is done at your own risk and not recommended!**

Output range of the interface is from 0.00V to 0.5V less than the supply voltage to the interface. For Xie Chang controllers this limits the maximum output to 3.75V with a supply of 4.25V. This works out well because most of the controllers have a throttle input range from 1.4V to 3.5V

## SETTING UP YOUR INTERFACE

Finally, the part you have been waiting for.

### Setup Steps:

The following steps will be performed with the four blue 25 turn adjustment potentiometers labeled MinV, Accel, Buffer and MaxV. These labels are pretty tiny so if you are looking at the Throttle Tamer with the potentiometers at the bottom they read left to right, starting with MinV. These potentiometers (called pots from now on) do not have stops at their ends and you can continue to turn them so you will not know when you reach the end of their travel unless you measure the voltage on the middle pin. It should be between 0 and the throttle supply voltage from the controller which is most likely 4.25V. The ground lead of your multimeter is attached to any negative wire coming from the controller, but preferably the throttle ground wire.

The Throttle Tamer comes preset with values that should help get you started with your controller. Only small adjustments to the MinV and MaxV pots should be needed unless we missed this step during assembly... if we did, sorry about that. The Accel pot and Buffer pot are also pre set, but these will need to be adjusted to your liking. When you start your tuning process after setting the MinV and MaxV correctly it is suggested to only work with one pot at a time. Adjusting the Accel pot has the greatest effect on how your bike will accelerate so it is best to start tuning with this pot. The Buffer pot helps filter out small quick throttle movements (jitter) to allow for smoother throttle control over rough surfaces. If at any point you want put everything back to the factory settings the values needed are specified on the last page of this manual.

To setup the Throttle Tamers you need to do the following:

1. Set the MinV pot
2. Set the MaxV pot
3. Set the Accel pot
4. Set the Buffer pot

### **Potentiometer Settings**

MinV – Sets the minimum output voltage – Clockwise increases voltage

Accel – Sets the acceleration rate – Clockwise increases acceleration rate

Buffer – Sets the amount of throttle filtering – Clockwise increases buffering

MaxV – Sets the maximum output voltage – Clockwise increases voltage

Step 1 - Setup your bike so the powered wheel is off the ground, then without the throttle interface installed, write down your maximum unloaded speed. If you have a Cycle analyst this is usually a simple process. If you do not have a way to measure the speed of the powered wheel then it will take some guesswork and trial/error on your part when setting the MaxV pot. Once you have this information, power down your bike (unplug the battery) and install the throttle interface.

### Step 2 - Adjust the MinV potentiometer

**MinV:** It is set on the bike with the powered wheel off the ground. It is adjusted with the bike in high power mode if you have a 3 speed switch until the rear wheel just barely turns with no throttle input, then turn the MinV pot counter clockwise half a turn to keep the wheel from creeping. If you experience any creeping in the future, turn this pot counter clockwise about a quarter turn and it is set and should not need to be adjusted again.

### Step 3 – Adjust the MaxV potentiometer

**MaxV:** Sets the maximum voltage the interface will output. It sets a scaling factor for the throttle input. To set it properly you need to have the powered wheel off the ground and should know the maximum unloaded speed of the motor. Turn the throttle to the full speed setting and start slowly adjusting the MaxV pot until you reach your unloaded speed. It is best to wait about 2 seconds between making any adjustments to the POT to allow the maximum speed to register properly. Once you reach the target speed it is suggested to give the POT another 1/2 turn. If this POT is adjusted too high it is possible you can trigger the fault protection in the controller or experience a short delay in the controller removing power from the wheel when letting off the throttle from the WOT position. If you experience this delay it is likely you have this POT adjusted too high.

**Notes about adjusting the Accel and Buffer potentiometers.** These two settings Delay and Buffer have some interaction on each other but should be adjusted individually one at a time. Being able to tune these both of these settings is important so you may tailor the throttle to your own bike and riding style. A high powered motor in a 20" tire being fed 6-15kW rides nothing like a low power motor in a 26" wheel at 1kW, but both can be compensated for with the Throttle Tamer with a little patience. Yes, you will need to do some trial and error adjustments to get the settings just right for your setup, but all you need is a small flat head screwdriver, no hammers allowed!

### Step 4 – Adjust the Accel setting

**Accel:** This sets how fast the throttle will ramp up based on how quickly you turn the throttle to it's next position. Very slowly twisting the throttle = very slow throttle ramp rate and can be set to allow you to walk next to a 10KW bike and manipulate the throttle. Quickly twisting the throttle = fast throttle ramp rate and or optional catapult mode depending on how powerful your setup is (just like without the interface). This setting is one of the most important to get right, you must find the correct setting for you. It is very hard to adjust this setting without actually riding your bike because without load the wheel will accelerate too quickly to notice what might be a large change. If this setting is too low it can feel laggy, too high and the throttle is too touchy. Once you feel you are close to the correct setting, start making changes in 1/4 turn increments and test riding. It is best to get this pot adjusted closely to your liking before changing the buffer pot from it's factory setting.

### Step 5 – Adjusting the Buffer setting

**Buffer:** This setting adjusts the amount of throttle filtering through averaging. It is settable from 1 to 32. At the setting of 1 there is no averaging occurring on the throttle and it is 1:1. At the max setting of 32 the throttle is averaged over 32 samples. This allows you to choose a setting that matches your bike, riding style and terrain. At higher settings it will filter out throttle jitter created by riding on rough terrain to help you maintain speed even with the throttle position changing rapidly by very small amounts. The setting you choose will vary greatly on your motor/wheel setup. A 9C 2808 in a 26" tire at 4KW does not need a lot of filtering compared to a Greyborg Cromotor in a 20" tire. While this setting has some effect on the throttle ramp rate it is minimal and only comes into effect at very slow throttle movements.

## Technical Info

For EB3XX controllers the starting point for MinV is around 1.40 volts and the MaxV is around 3.40 volts.

For EB2XX controllers should be similar.

On the controller settings this will correspond to the following potentiometer voltages when measured on the middle pin.

MinV = 1.85V

Accel = 0.65V

Buffer = 1.43V

MaxV = 2.63V

If you do not have a volt meter and need to reset the pots to the minimum, just give them 25 turns counter clockwise and you should be at 0V. From there you can count turns to get back somewhat close to the settings it was shipped at for the pots.

MinV = 10.75 turns clockwise

Accel = 3.75 turns clockwise

Buffer = 8.0 turns clockwise

MaxV = 8.5 turns clockwise

Pin 1 on all connectors is the square pad, this is the supply voltage from the controller

Pin 2 on all connectors is the signal input/output

Pin 3 on all connectors is the ground connection from the controller

Regards,

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