

# Specifications for Ebikes.ca Infineon Customized Controllers

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Universal Voltage Input; Sensored/Sensorless; CA V3 and LED Compatability

Grin Technologies 

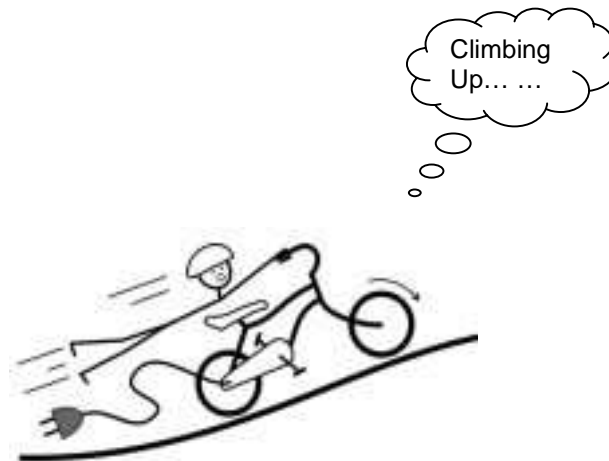
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## Document Reversions Record

Rev. No.	Change	Edited by	Date
V4.0	<ol style="list-style-type: none"><li>1. Use new IC that has dual mode sensed-sensorless behaviour.</li><li>2. Enable jumpers or resistors for user to change the level of regenerative braking</li><li>3. New mosfets (AOT290L) to replace the IRFB4110 in the 25A and 40A models.</li></ol>	Justin Lemire-Elmore	April 1 <sup>st</sup> , 2013
V5.0	<ol style="list-style-type: none"><li>1. Document format.</li><li>2. Take off forward/reverse plugs, and use them for regen mode</li></ol>	Cathy Li	August 8 <sup>th</sup> , 2013



## Objective

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The purpose of this document is to clarify the build specifications for our ebike motor controllers that have dual sensed/sensorless operation, plus compatibility with Version 3 Cycle Analyst along with diagnostic LED.

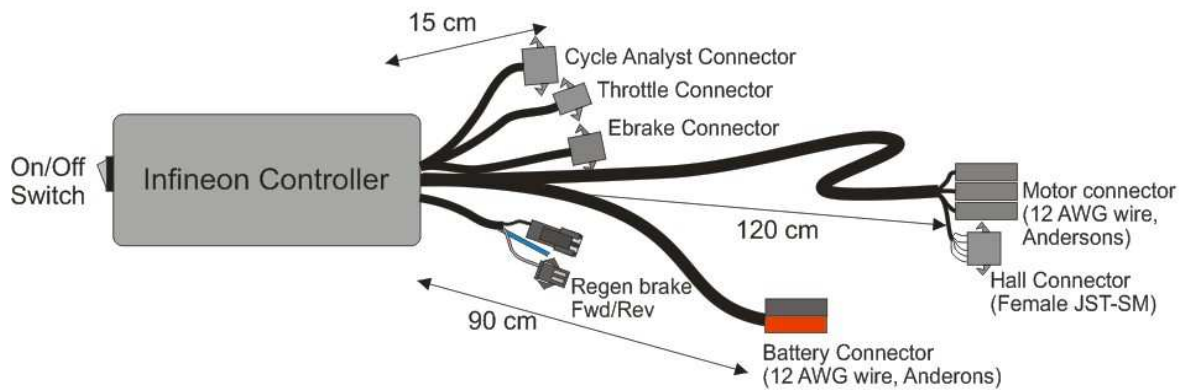


Figure 1 Controller Diagram

## Electrical Specifications for Different Models

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There are FIVE kinds of controllers to meet different power needs.

### 15A, 36V Max Model, Size (84x50x30 mm)

Mosfets	Vds≥60V, Rds≤8mOhm. (eg AOT460, IRL3636)
Battery Current Limit	15A
Low Voltage Cutoff	19V
Upper Regen Cutoff	58V*

### 20A, 48V Max Model, Size (105x70x32 mm)

Mosfets	Vds≥60V, Rds≤8mOhm. (eg AOT460, IRL3636)
Battery Current Limit	20A
Low Voltage Cutoff	19V
Upper Regen Cutoff	58V*

### 25A, 72V Max Model, Size (105x70x32 mm)

Mosfets	Vds=100V, Rds≤4mOhm. (eg IRFB4110, AOT290L)
Battery Current Limit	25A
Low Voltage Cutoff	26V
Upper Regen Cutoff	88V**

### 35A, 48V Max Model, Size (154x86x44 mm)

Mosfets	Vds≥60V, Rds≤8mOhm. (eg AOT460, IRL3636)
Battery Current Limit	35A
Low Voltage Cutoff	19V
Upper Regen Cutoff	58V*

### 40 A, 72V Max Model, Size (154x86x44 mm)

Mosfets	Vds=100V, Rds≤4mOhm. (eg IRFB4110, AOT290L)
Battery Current Limit	40A
Low Voltage Cutoff	26-29V
Upper Regen Cutoff	88V**

\*Note, it is important that max regen cutoff is only 58V with AOT460 mosfets,

\*\* For 88V Regen, set to 65V and then replace R12 with 1.69K resistor

## Hardware Specifications for All Models

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### 1. Copper Reinforced Bus Bars

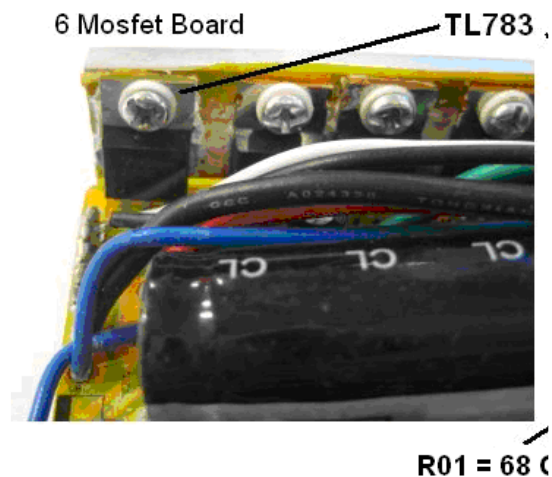
All power traces on controller should have heavy copper wire to handle motor current:



Copper Wire

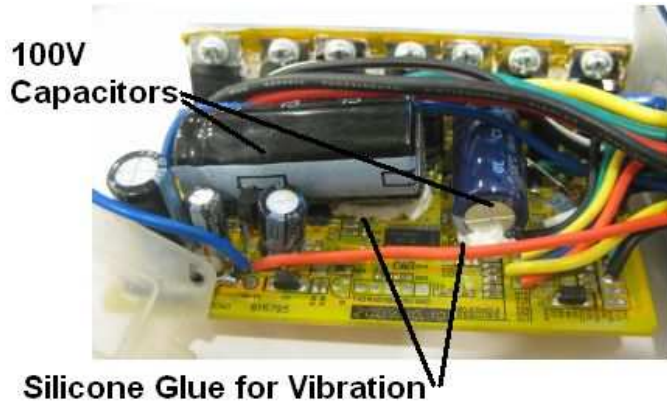
### 2. Regulator TL783 instead of LM317, and Resistor R01 set to 68 Ohm ? *For 6 Mosfet Controllers Only:*

This modification allows for universal operation from 24V to 72V batteries. LM317 (40V max) is replaced with TL783 (125V max) and resistor R01 is set to 68 ohms. For 12 mosfet, it is not important because there is a switching regulator.



### 3. All Electrolytic Bus Capacitors 100V, with Glue for Anti-Vibration

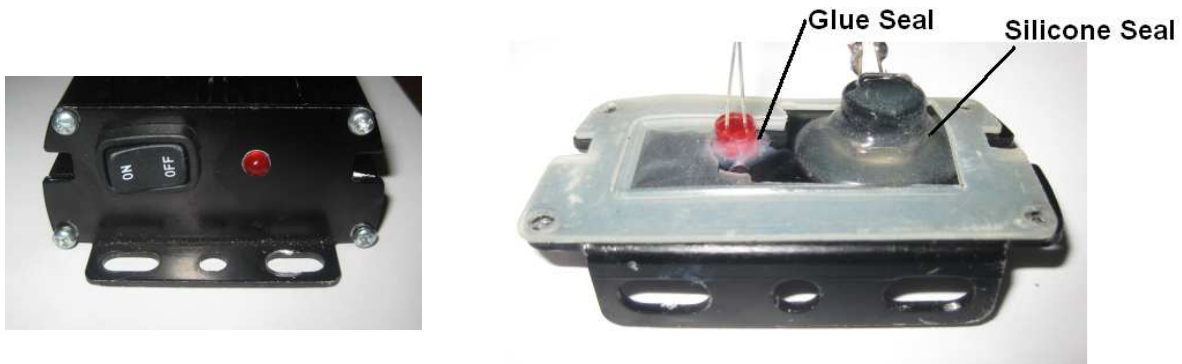
Without silicone glue, vibration can cause capacitor legs to fatigue fail and break off. So please apply glue to large electrolytics capacitors. All capacitors = 100V rated:



### 4. Waterproof Seal around ON/OFF Switch , NEW + LED

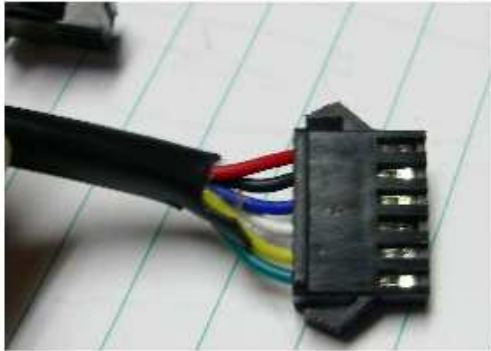
Use supplied ON/OFF toggle switch for power, and apply a COMPLETE sealant around the button nut for waterproofing:

New also include red LED light for diagnostic, also seal with Glue or Silicone. LED should be wire to show diagnostics and flash codes



**5. V3 Cycle Analyst Connector, Cable Length = 15cm**

All controllers have 6-pin connector for V3 Cycle Analyst. New Design for Throttle Over-ride wiring.

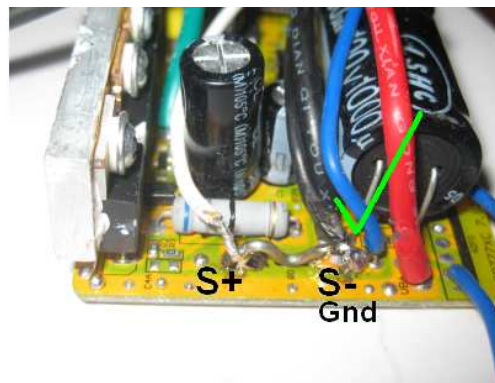
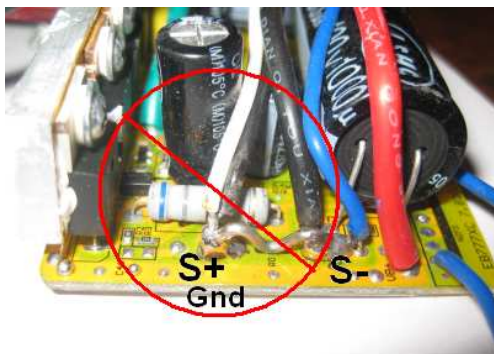
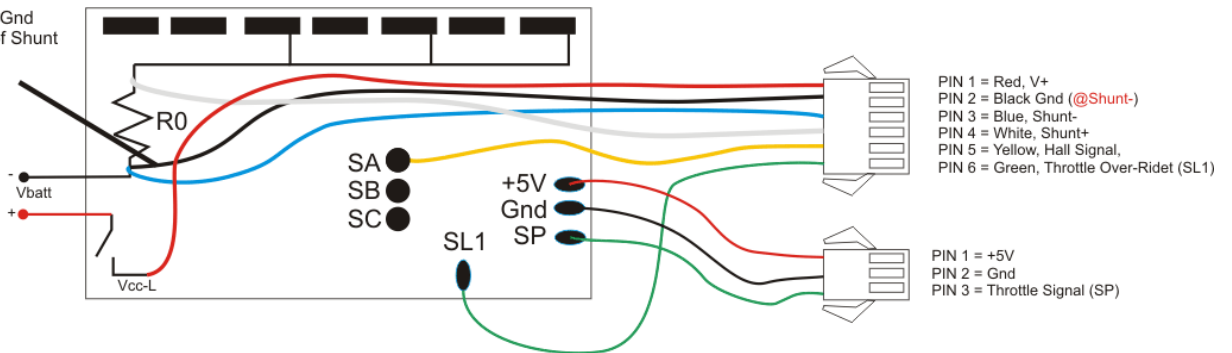


1. Red = Vbatt.
2. Black = Ground
3. Blue = Shunt -
4. White = Shunt+
5. Yellow = Speedo
6. Green = Throttle Over-ride

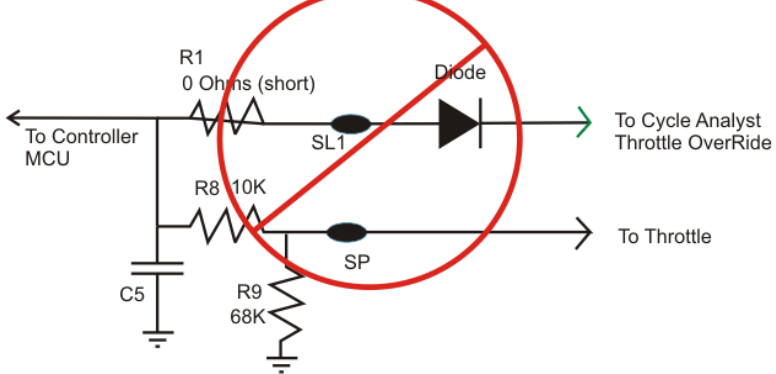
Schematic of Cycle Analyst connector Throttle Over-ride Wiring. No Diode Required. Set R1 = 1kOhm, and R8 = 10kOhm. Then attach Throttle Over-ride to pad SL1. NOTE: Black Gnd Wire now on Batt- Side of Shunt:

**Wiring of Controller for Throttle and CA V3 Compatibility**

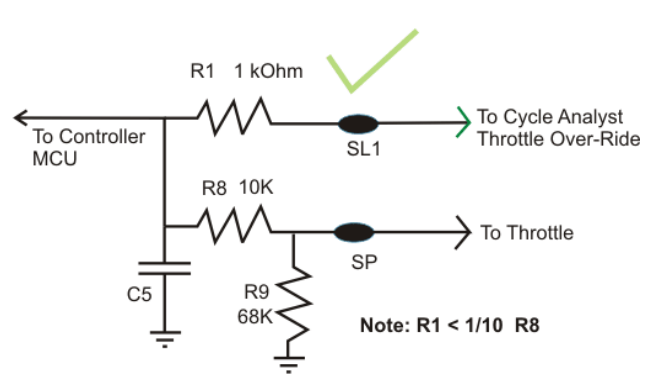
Note, Black Cycle Analyst Gnd wire moved to Batt- Side of Shunt beside Blue Wire



**Original Throttle Over-Ride Wiring with Diode**

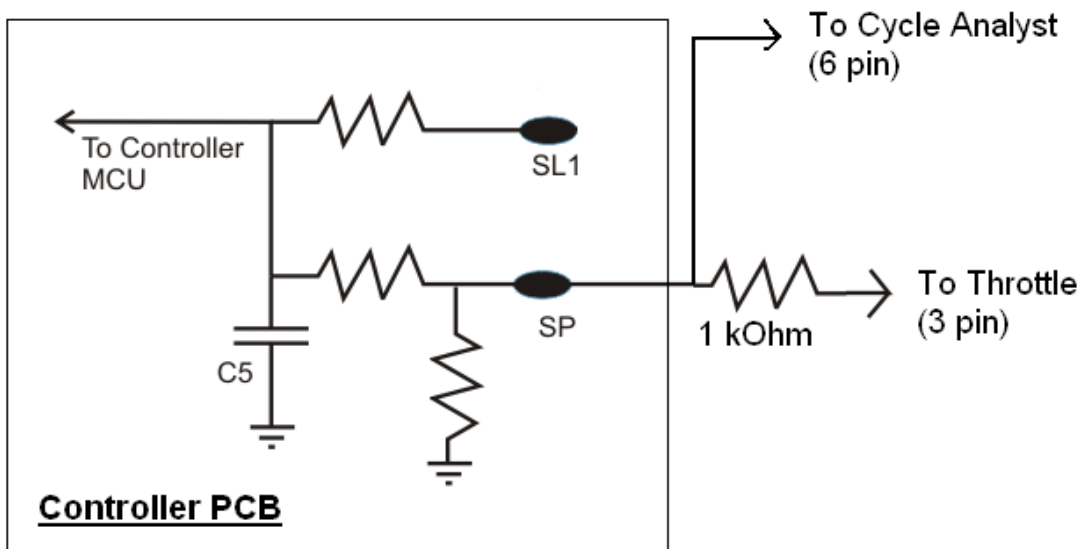


**New Cycle Analyst V3 design. No Diode.  $R1 \ll R8$**



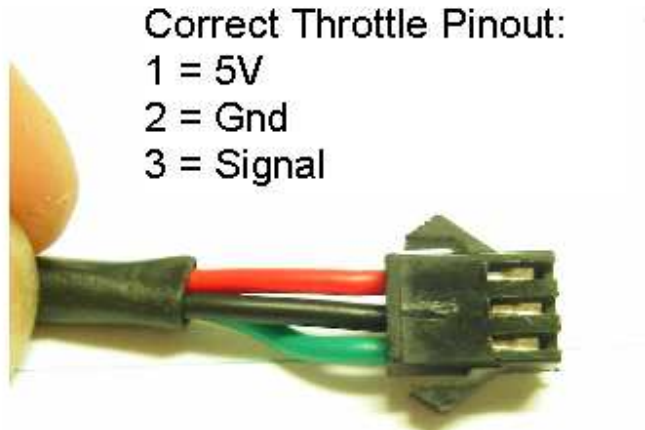
If the above wiring modification is not possible because of a change to the PCB layout, then the following alternative arrangement will work as well, with a 1kOhm resistor inline with the 3-pin throttle signal:

**Alternate Arrangement for CA and Throttle Signal**





**6. Throttle Connector, Cable Length = 15cm**



**7. Ebrake Connector, Cable Length = 15cm – PLEASE INCLUDE 5V**

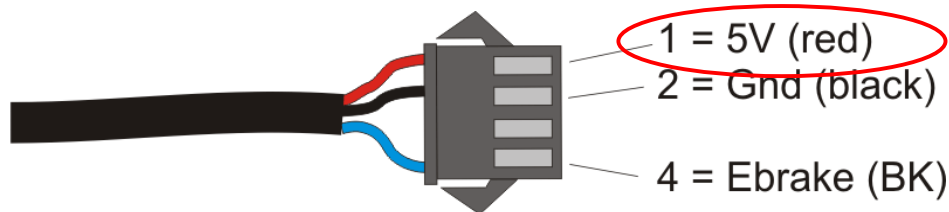
Connector for ebrake lever is still 4-pin female JST-SM. Pinout should be:

Pin 1 = 5V (Please don't forget this!)

Pin 2 = Gnd

Pin 3 = NC

Pin 4 = Ebrake Switch Input (BK)

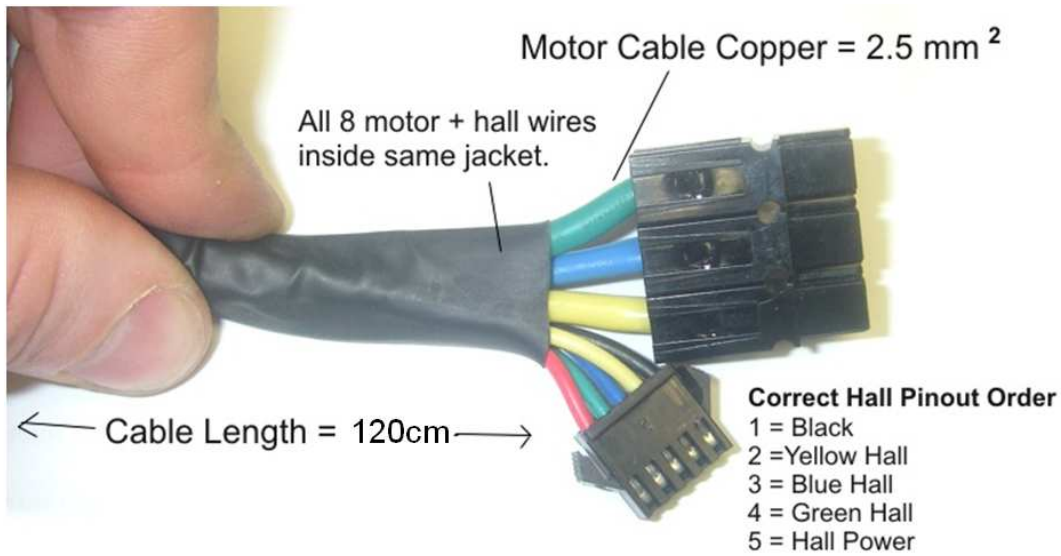


**8. FWD/REV/Regen brake harness, Cable Length = 15cm**

2-pin connector for Regen brake level I/II. Male connector (Pin 1) = Gnd, Female connector (Pin 1) = Regen brake. The extra blue wire is for direction signal. If customer wants to ride in reverse, short the extra wire to ground, wheel will spin in reverse with 100% max RPM.



**9. Motor Cable, 2.5mm<sup>2</sup> Copper, Motor+Hall in 1 Jacket, Length = 120cm**



**10. Battery Power, 2.5mm<sup>2</sup> Copper, Cable Length = 90cm**



## Software Features for All Models

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- Work with both sensorless and sensor motors
- Motor can run in reverse at full speed
- Regen level is depending on whether circuit is open or not, see Table 1 below. (It would be better if the regen level can be programmable. Also, if regen can be enabled at  $V\_throttle=0$ )

**Table 1 Regen level definition**

Controller Model	Regen current at Level I (when connectors are plugged in)	Regen current at Level II (when connectors are unplugged)
6 MOSFETs	8A	16A
12 MOSFETs	10A	20A

- Regen Mode = ON by default, but removed by desoldering pad
- Auto Cruise = OFF

## **Test Requirements and Manufacturing Inspection**

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- Waterproof level IP65(?), splash proof, no need for water immersion test
- Vibration test report required
- Manufacturing QC report required
- Black anodized color for all controllers, UV resistance required