

Tech - Aero Designs LLC

“Ultra IBEC HV”™ Ignition Battery Eliminator Circuit Users Manual

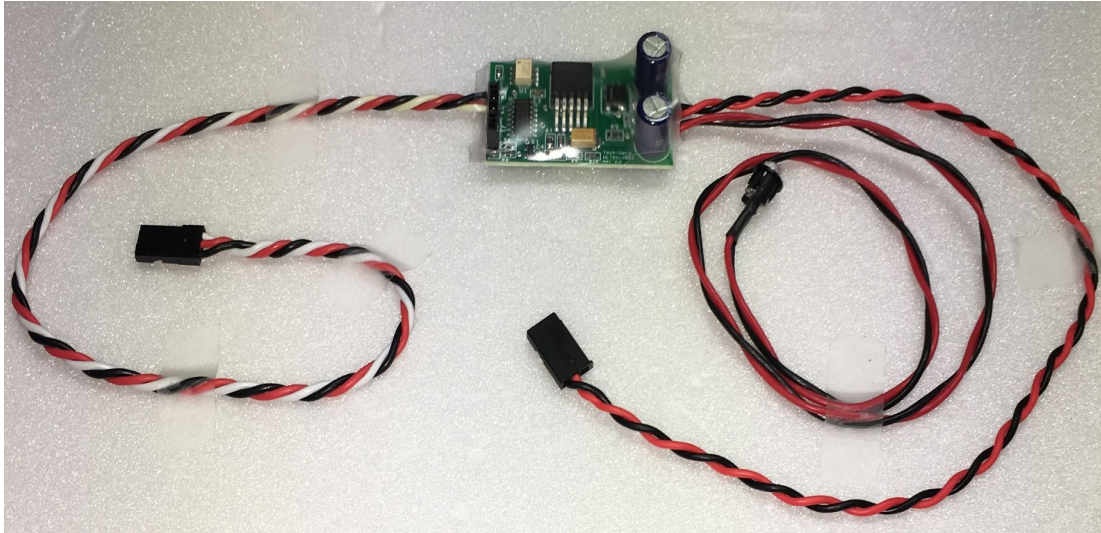


Figure 1 - Tech-Aero Designs LLC “Ultra IBEC HV”™

”Ultra IBEC HV”™ Features

- ✓ Eliminates the need for a separate ignition battery and mechanical on/off ignition switch.
- ✓ Compatible with the power requirements of single and multi-cylinder model CDI ignition modules via jumper selectable 5.9V, 6.3V, 7.3V and 8V voltage outputs.
- ✓ Enhanced flexibility and safety via transmitter control of CDI ignition power from a spare receiver auxiliary channel.
- ✓ Tech-Aero exclusive 4 stage filtering that includes signal lead optical isolation removes interference from CDI ignition noise in the wiring path to the receiver, permitting use with 2.4 GHz Spread Spectrum and 72 MHz FM radio receivers. *
 - **Filter stages 1 & 2:** An advanced 2nd order common mode LC power lead filter.
 - **Filter stage 3:** Triple power filter capacitors form a low pass filter and enhance peak impulse current delivery to the CDI module.
 - **Filter stage 4:** An optical isolator circuit prevents any stray noise from feeding back into sensitive receiver electronics via the signal lead.
- ✓ A high precision, very low dropout power regulator design further assures power receiver bus isolation with superior performance during peak current demand.
- ✓ One IBEC model fits all: compatible with all battery chemistries commonly used for radio control use, with a practical input voltage range from 6V to 8.4V. A 2S LiPo / LiIon receiver battery or equivalent supply voltage is recommended overall and is required for 7.3V and 8V operation. 2S LiFe and 5S NiCad /NiMh batteries are compatible with the 5.9V or 6.3V output settings.
- ✓ Bright 5mm LED CDI power on/off indicator with mounting bezel. Available LED colors are red, green, blue, amber and white.
- ✓ High reliability Surface Mount components reduce weight to under 1 oz and size to 1” x 1 ¾”.
- ✓ Heavy duty 22 gauge twisted wire power extensions.

*** Always follow receiver manufacturer range testing guidelines prior to flight!**

Overview

Thank you for purchasing the Tech-Aero Ultra IBEC HV (IBEC). The IBEC eliminates the need to carry the extra weight of a separate ignition battery and mechanical On/Off ignition switch in your model. It offers better flight performance by not only reducing flying weight, but also by assuring that a consistent supply voltage and robust current on demand is provided to the CDI ignition module throughout the flight. The IBEC On/Off “kill switch” capability also enhances safety, allowing control of ignition power to the engine the entire time the model aircraft is being operated. When combined with the fail safe features that most radio control systems have, the IBEC can be configured to kill ignition module power automatically if radio problems are ever experienced.

The IBEC plugs into a spare receiver auxiliary channel and provides power to the CDI ignition module, while protecting the receiver and servos from high frequency ignition noise that may be present on the wiring path between it and the CDI module. It can also be connected to power bus expander products, provided that an auxiliary channel capability is available at that connection point. Please note that power expanders typically regulate the voltage and significantly limit the current flow to the receiver bus, therefore when using such devices, the IBEC should **not** plug into the receiver’s channels directly. Instead it should only be connected through one of the power expander channels that can supply the power demand to the IBEC and the control signal from the transmitter channel assigned to the IBEC.

Although the IBEC is extremely effective at protecting the receiver from ignition noise that may be present in the wiring path between it and the CDI ignition module, it does not eliminate the ignition noise that is always radiated into the surrounding space by the CDI module itself and from the high voltage wiring connection(s) to the engine sparkplug(s). This is the case with any and all ignition battery eliminator and optical kill switch type products. Consequently, it is still necessary to follow the installation guidelines of the CDI ignition module and engine manufacturers to assure that adequate separation exists between the ignition system and all parts of the receiver, servos, batteries and wiring. It is also necessary to assure, as with any model ignition engine installation, that the shielding for the high voltage connections to the engine sparkplug(s) are in good condition and that proper grounding of the shielding to the engine case is properly accomplished. Most modern CDI modules have the grounding built into the design of the spark plug connector cap, but it is wise to assure that these connections are made correctly per the manufacturer’s instructions.

To do its job most effectively, the 2 conductor twisted wire power connection from the IBEC HV to the CDI module is shorter than the 3 conductor twisted wire lead to the receiver to allow installation with adequate physical separation from the receiver. If an extension is needed to complete your installation, it is preferable to extend the receiver side lead instead of the ignition side. Try to take full advantage of the length of wire available on the receiver side connection, to assure adequate separation of any source of radiated ignition noise from the CDI Module power connection side of the IBEC. Think of that as the “dirty side”, whereas the wiring connection from the Ultra IBEC to the receiver is the “clean side”. Note that the use of twisted wire leads helps reduce the antenna effect that exists with all electronics wiring. This reduces the pickup of ignition noise that is radiated by the CDI module high voltage output and spark plug, and also limits the amount of re-radiated ignition noise that is present in the wiring directly between the CDI module and the output power side of the IBEC.

From the radio receiver perspective, the IBEC behaves much as if it were just another high torque servo. It is preset to switch CDI power ON above the midpoint setting for the auxiliary channel it is connected to. Power to the CDI module will be switched OFF below that same midpoint auxiliary channel setting. Adjust the travel direction on the transmitter auxiliary channel configuration to assure that the ON and OFF settings make logical sense for how the CDI module “Kill switch” function will work, based on the direction of the lever or switch movement that you prefer. Adjust the AUX channel ATV (travel endpoints) to its full range (typically 130% to 150%) in each direction of travel, and be sure that its sub trim is zeroed out (neutral).

It is advisable to also set up a failsafe condition for the IBEC auxiliary channel, so that if radio communications are lost for any reason, the Ultra IBEC can automatically perform its “Kill Switch” function to stop the engine. It’s easy to test this while setting up the radio for this configuration, since the IBEC’s LED is illuminated when CDI power is switched ON. Make sure that the engine is not able to start when configuring or working on the model. Also make sure to range check your radio with the completed installation prior to flight, and that the radio range check results meets with the radio manufacturer’s standard while the engine / CDI is being operated while being securely held and observed on the ground by a helper.

The amount of current draw taken from the receiver flight pack battery is dependent on the brand/model of CDI ignition module, the number of engine cylinders and the RPM that the engine is running at. Multi-cylinder engines with more than one CDI module will require one IBEC per CDI module. As a general rule of thumb, for a 10 minute flight, conservatively plan that at least 100 to 120 MAh per spark plug will be drawn from the batteries to power the CDI module. This will vary due to the design of the various CDI modules available, and with your flying style. Higher average RPM’s during flight will always result in greater battery capacity usage than lower average RPM’s. It is recommended that the battery capacity be monitored to determine the true average usage of the combined load of servos and ignition module during a typical flight. As always, pre-flight checks of battery condition are strongly advised. Never begin a flight without knowing that there is adequate battery capacity to complete the flight with some reserve left over!

Please refer to Figure 2 on the next page, showing the IBEC connected to an auxiliary channel of a receiver. The Tech-Aero Ultra IBEC HV provides significant flexibility in your choice of supply voltage and battery configurations. For example, dual redundant regulators and batteries are ideal to assure that the entire flight pack and ignition module will continue to operate in the event of a single battery, wiring, or even a regulator failure. Alternatively, the IBEC may be used in configurations where the receiver and servos are powered by one or more *unregulated* NiCad or NiMh, A123, LiPo or Li-Ion battery packs. NiCad or NiMh packs up to 6 cells may be used if desired, and up to a 3 cell A123, or 2 cell LiPo or Li-Ion battery packs may be used for power with the IBEC. This is provided that the rest of the flight pack (receivers & servos) can tolerate such high voltages. The IBEC will take care of providing the correct voltage to the CDI module via its jumper selectable voltage output feature.

The voltage output from the IBEC is jumper configurable to safely meet the voltage rating requirements of all popular model aircraft CDI modules. Please note however, that the voltage output level of the IBEC will never exceed the voltage level being provided to it by the receiver’s power bus. For example, if you want to power an ignition module that requires 6.5V or more, the jumpers should be configured for the 7.3V or 8.0V setting, and the receiver power bus would require batteries (and perhaps regulators) that would provide a minimum of 6.8V under load. The reason to allow a 0.3V voltage margin at the receiver side vs. the CDI side is due to the small voltage dropout that will exist in the wiring and electronics during normal operation.

Installing and Configuring the “Ultra IBEC HV”™

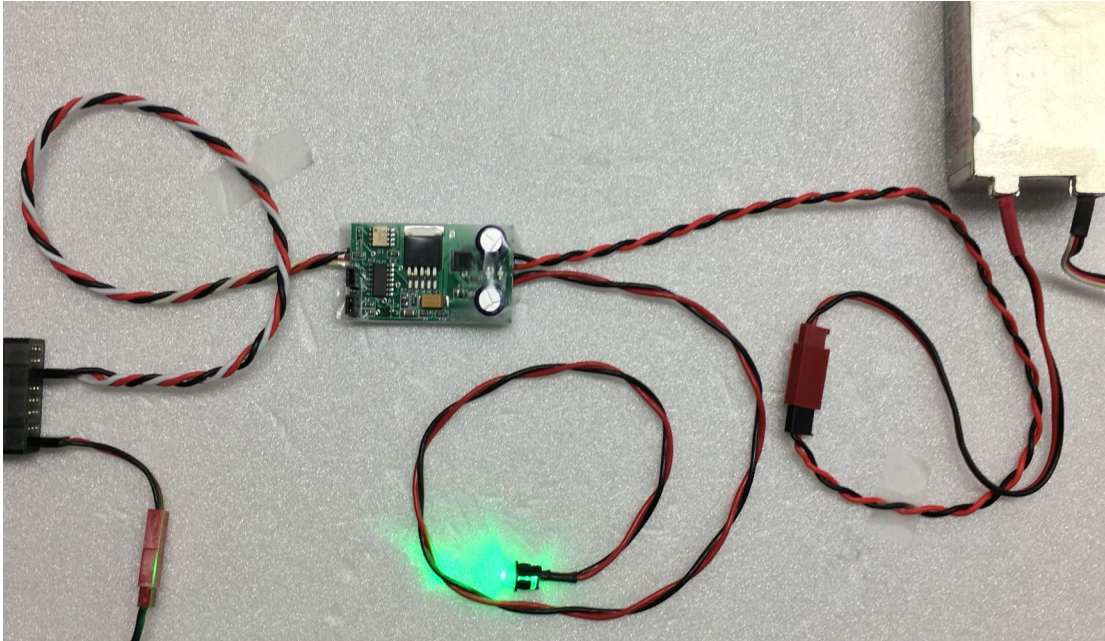


Figure 2 – “Ultra IBEC HV”™ Connection to Receiver and CDI Module

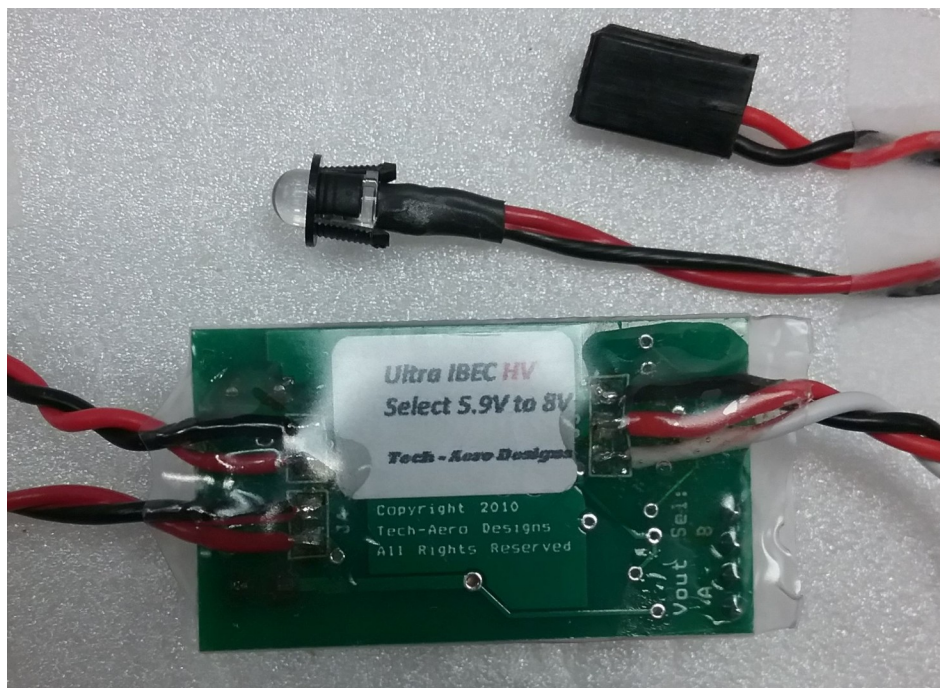


Figure 3: “Ultra IBEC HV”™ Identification

To set the output voltage, please refer to figure 4 below. There is a 4 pin “header” row that allows one or two jumpers to be used to change the voltage output level to the CDI module.

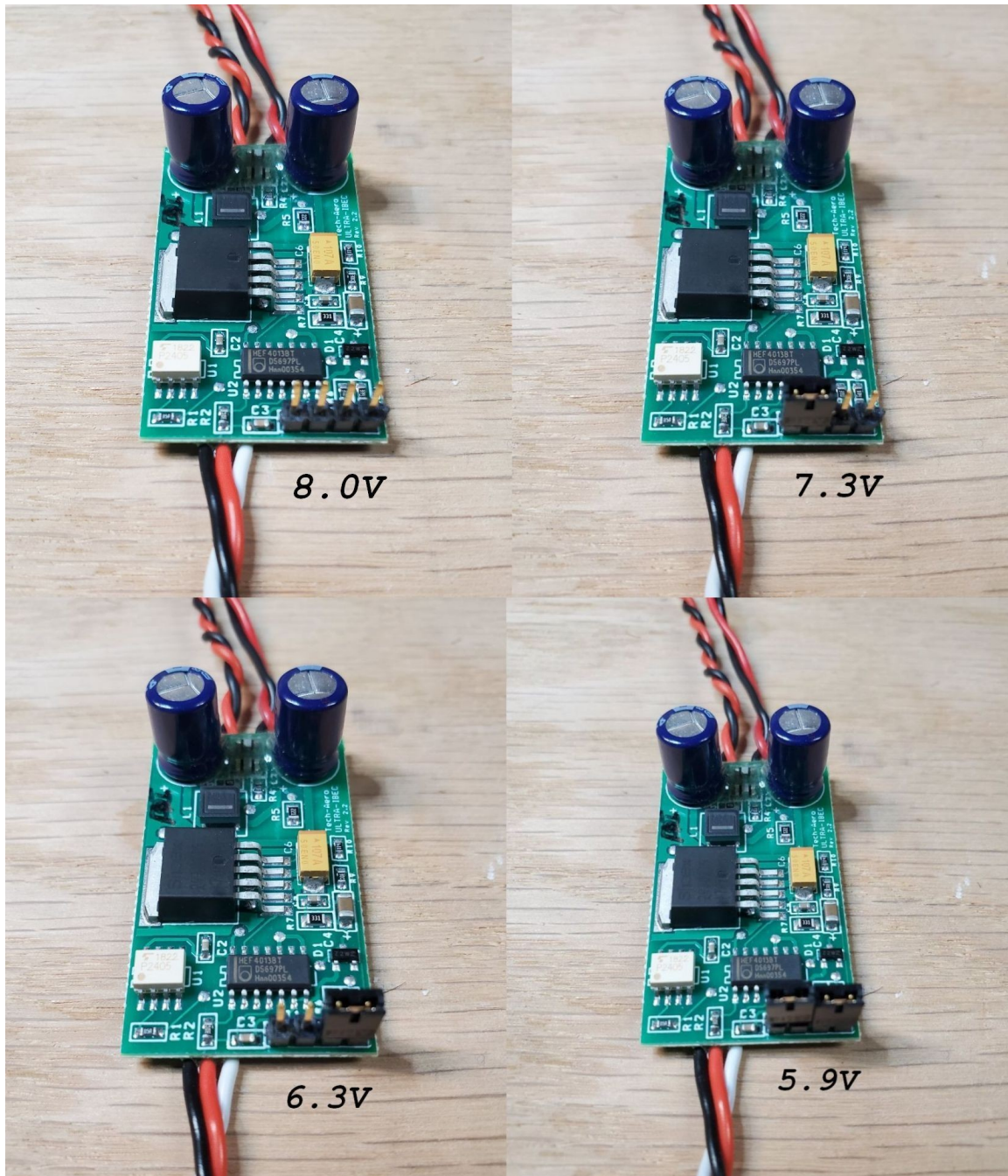


Figure 4: “Ultra IBEC HV”™ Output Voltage Configurations

Additional Usage Guidelines

Mounting the Ultra IBEC HV should be done with similar care as is needed for other airborne electronics that are subject to engine vibrations, such as the receiver in the model. A piece of adhesive backed Velcro® on the bottom side of the circuit board is the preferred mounting method. Alternatively, a thin Velcro® strap around the mid-section can be used with a piece of ¼” foam padding placed underneath the unit. Make the strap just snug enough to press the unit lightly into the foam padding beneath it. Do not wrap or enclose the IBEC in foam or padding, since it needs access to cooling air. The 5 mm LED can be mounted by gluing in a location that makes it easy to observe during engine starting operations. To allow easy removal to remount in a different model, an adhesive such as Goop or non-acidic silicon rubber can be used. Use care to avoid getting any glue on the LED lens!

Warranty and Liability Limitation

The Tech-Aero Ultra IBEC HV is covered by a 2 year limited warranty. If it is found to have malfunctioned due to a product defect or failure, it will be repaired or replaced during the warranty period. Tech-Aero Designs LLC liability is strictly limited to the replacement cost of the Ultra IBEC HV if it is found to be defective. Tech-Aero Designs LLC assumes no other responsibility or liability for product use or misuse, neglect or crash damage, or for the careless or reckless operation of the model aircraft in which it is installed.

Proper installation, care and maintenance of your model aircraft configuration is required for its reliable and safe operation. Property damage and/or severe personal injury may result from operating model aircraft if their control systems malfunction, or from operating them in a reckless way. It is *your* responsibility to follow these instructions, as well as those provided with all other parts of your model aircraft that you have selected for its use, and to operate your model aircraft and accessories in a safe and responsible manner.

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