Tech - Aero Designs LLC

"Ultra IBEC" Ignition Battery Eliminator Circuit Users Manual

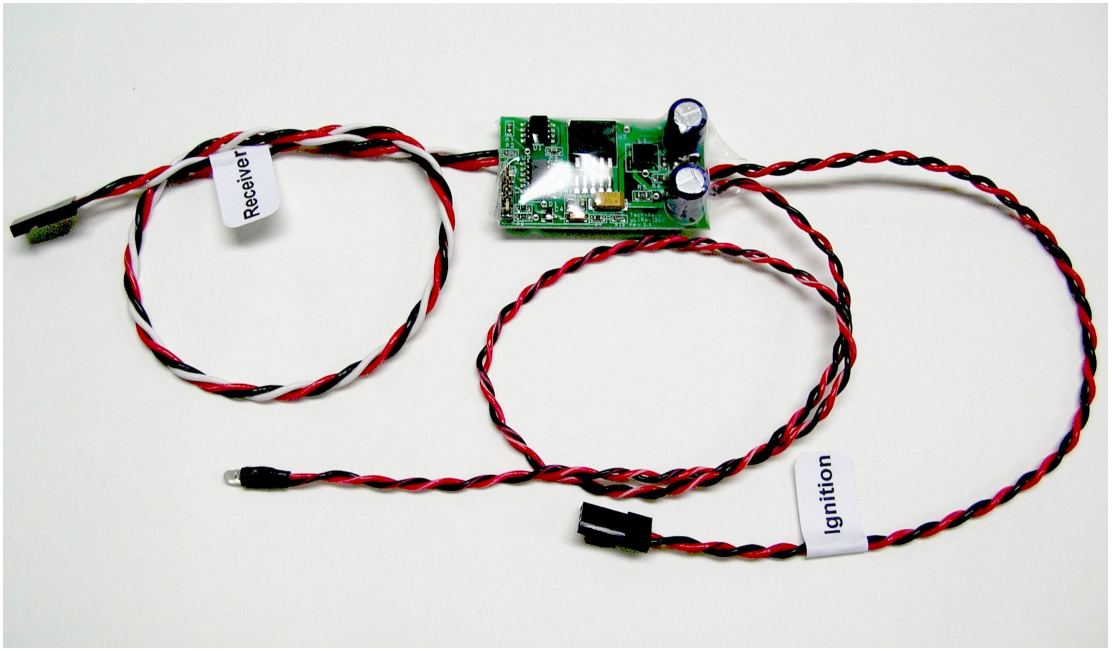

Figure 1 - Tech-Aero Ultra IBEC

"Ultra IBEC" Features

- ✓ Eliminates the need for a separate ignition battery and mechanical on/off switch.
- ✓ Compatible with the power requirements of single and multi-cylinder model CDI ignition modules via jumper selectable 5V, 5.3V, 6.1V and 6.6V 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 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 any battery technology commonly used for radio control use, with a usable input voltage range from 4.8V to 10V.
- ✓ Bright 3mm LED CDI power on/off indicator.
- ✓ High reliability Surface Mount components reduce weight to only 0.6 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!***

"Ultra IBEC" Ignition Battery Eliminator Users Manual

Overview

Thank you for purchasing the Tech-Aero "Ultra IBEC". The Ultra 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 Ultra 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 "failsafe" features that most radio control systems now provide, the Ultra IBEC can be configured to kill ignition module power automatically if radio problems are ever experienced.

The Ultra IBEC plugs into a spare receiver auxiliary channel and provides power to the CDI ignition module, while safely isolating 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 although the Ultra IBEC is extremely effective at isolating 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 undamaged, 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 twisted wire power connection from the Ultra IBEC to the CDI module is purposely short. It has a long, 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 and *not* the ignition side. Particularly in the case of use with 72 MHz FM receivers, it is advisable 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 Ultra 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 minimizes 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 Ultra IBEC.

From the radio receiver perspective, the Ultra IBEC behaves much as if it were just another high torque servo. It is preset to switch CDI power ON at approximately the midpoint and higher "travel" 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 auxiliary channel ATV (travel endpoints) to 100% or more in each direction of travel, and be sure that its sub trim is zeroed out (neutral).

It is highly advisable to also set up a failsafe condition for the Ultra 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 Ultra 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. As a general rule of thumb, for a 10 minute flight, conservatively plan that at least 100 to 120 MAh per spark plug/cylinder 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 Ultra IBEC connected to an auxiliary channel of a receiver. The Tech-Aero Ultra IBEC 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 Ultra 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. Unregulated NiCad or NiMh packs up to 7 cells may be used if desired, and up to a 3 cell A123, or 2 cell LiPo or Li-Ion unregulated battery packs may be used for power with the Ultra IBEC, provided that the rest of the flight pack (receivers & servos) can tolerate such high voltages. The Ultra IBEC will take care of providing the correct voltage to the CDI module via its jumper selectable voltage output feature. This is a powerful feature that protects against obsolescence with the advent of high voltage (HV) technology servos that are becoming more popular.

The voltage output from the Ultra 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 6.6V setting, and the receiver power bus would require batteries (and perhaps regulators) that would provide a minimum of 6.7V under load. The reason for allowing a 0.2V margin of extra voltage at the receiver side vs. the CDI side is due to the very small voltage dropout that will exist in the wiring and electronics during normal operation.

Installing and Configuring the Ultra IBEC

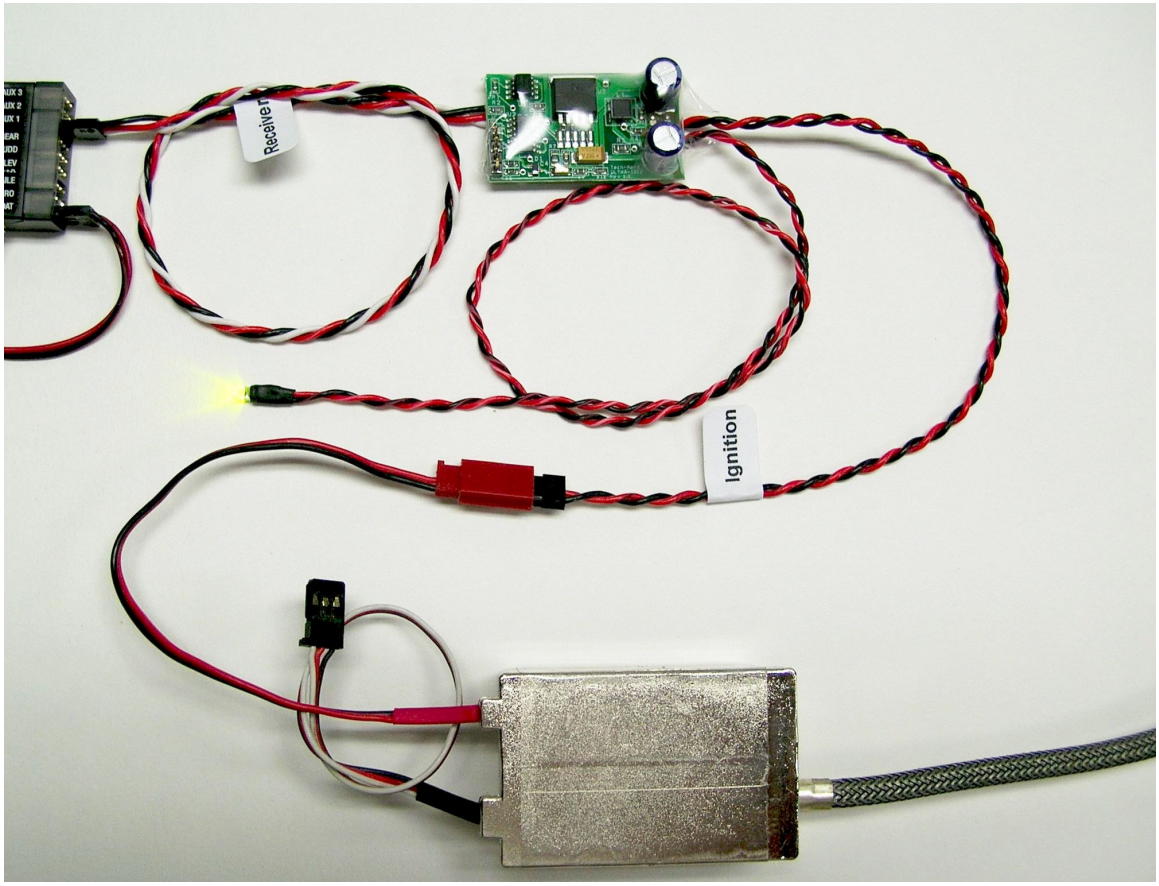

Figure 2 – Ultra IBEC Connection to Receiver and CDI Module

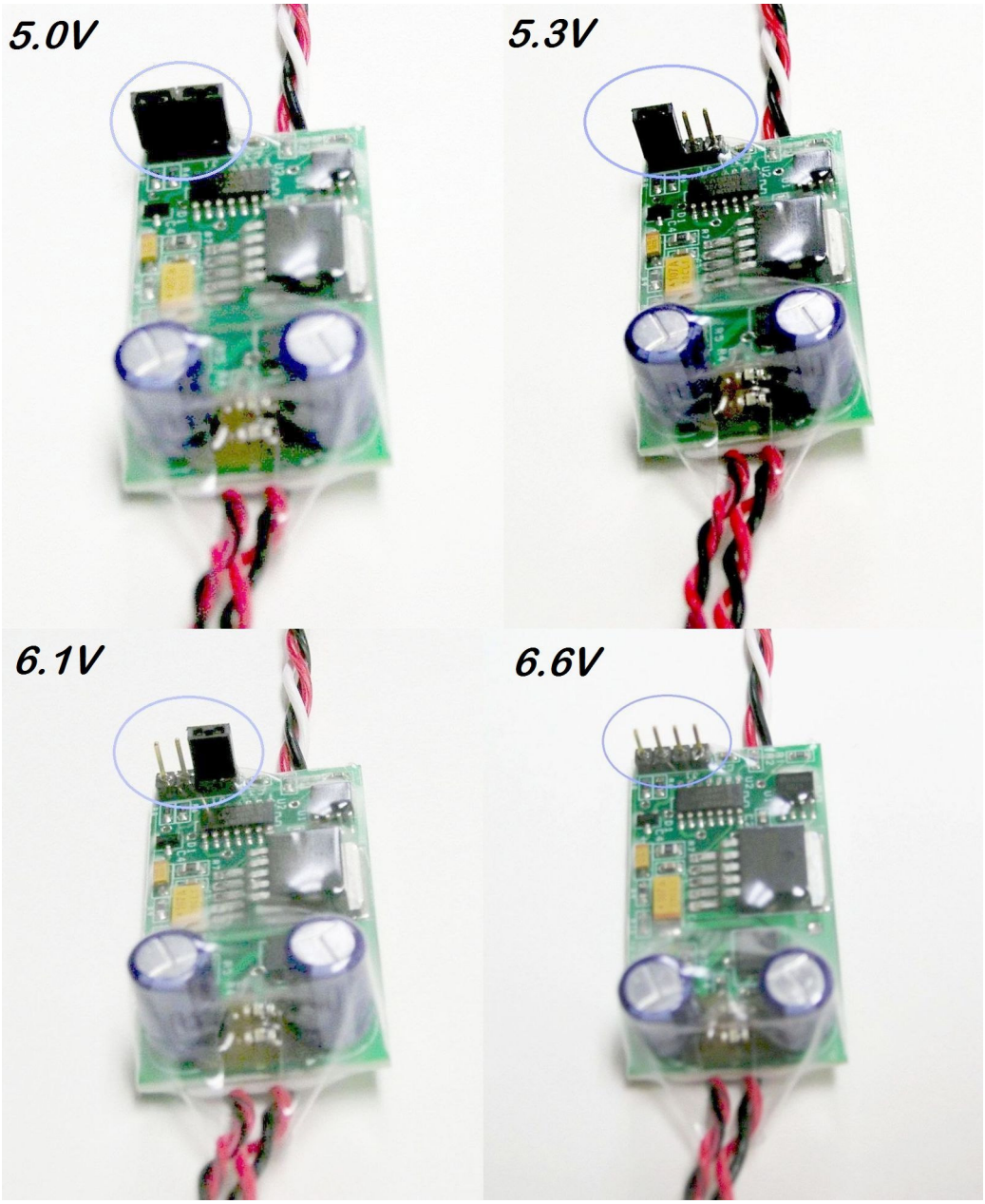

Figure 3 - Output Voltage Jumper Configurations

To set the output voltage, please refer to figure 3 above. There is a 4 pin "header" row that allows one or two jumpers to be used to change the voltage output to the CDI module.

Additional Usage Guidelines

Mounting the Ultra IBEC 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® can be used on the bottom side of the circuit board. Alternatively, a thin Velcro® strap around the mid-section can be used with a piece of ¼" or thicker 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 Ultra IBEC in foam or padding, since it needs access to cooling air. The 3mm 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 is covered by a 1 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 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 personal injury can result from 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.