

**Integrated Power Backup  
&  
Over Voltage Protection**

for  
**Experimental Aircraft  
Power Systems**

*Installation Instructions*



4343 Crane Ct ☎ Loveland, CO 80537 ☎ 303-241-7884

## Notice

IPB Installation Instructions  
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## IPB Warranty

The Integrated Power Backup system is guaranteed to be free from any defects in materials or workmanship to the extent that any failure due to these causes, except for normal wear, accidental damage, negligence, or tampering will be adjusted by repair or replacement without charge for **one full year** from purchase date if the system is returned, postage prepaid, to our facility. No other warranty, expressed or written, shall apply.

## STC Disclaimer

The IPB was designed specifically for amateur built (experimental) aircraft. As such, this product is not "Type Certified" and the aircraft owner takes full responsibility for its proper employment and installation. Olsen Technologies & Mgt is not responsible for improper installation.

## Theory of Operation

### Integrated Power Backup

The Olsen Technologies & Mgt Integrated Power Backup (IPB) system functions under two primary modes of operation: "NORMAL" and a secondary mode, "TEST". In the NORMAL mode the IPB monitors the main battery system for a voltage of approximately 11.25 Volts DC. Since the normal aircraft system voltage with the alternator operating is between 13.8 and 14.2 Volts DC, the left "MAIN" indicator (if in horizontal mount) will remain GREEN. Since a fully charged battery will normally be between 12.0 to 12.5 Volts DC, the indication will continue to be GREEN if the alternator should cease to operate. The MAIN indicator light (LED) will remain GREEN until the battery is drained to about 11.5 Volts. Once the battery voltage drops below the 11.25 Volts DC point the IPB will take control and smoothly switch to the auxiliary (backup) battery. At this time the left indicator labeled "MAIN" on the panel will turn RED and the remotely located indicator light will also illuminate bright RED. Should the alternator once again start working, the IPB will relinquish control and smoothly switch back to the main aircraft battery.

In the NORMAL mode of operation, and if the backup battery is in good operating condition, the right (AUX) indicator will be bright GREEN. Should the Backup battery not be in good condition, be discharged, or have a wiring fault or open (less than about 10 Volts DC), the right green indicator will be in the OFF state. Since the backup (auxiliary) battery powers the Integrated Power Backup system, both indicators could be OFF if a fully isolated/discharged backup battery condition exists. Normally, the right (AUX) indicator is GREEN before and after switchover (left or "MAIN" indicator is RED at switchover) and slowly dims to going out at about 10 volts. Our analysis indicates this timing should be about one hour under loads we have measured on actual KitFox aircraft equipped with an NSI Subaru engine. This should be true for dual ignition and dual fuel pump systems also, but we feel safe in saying it will be at least 45 minutes with the supplied backup battery. Of course, if other loads are wired to this supply system, then the timing could be significantly different. Olsen Technologies & Mgt **strongly suggests** that you follow the NSI or other conversion wiring procedures/diagrams to ensure there is not excessive load on the IPB, and thereby ensuring at least 30 minutes of opportunity to get the aircraft safely on the ground to initiate repairs.

The IPB system comes with an integral charging circuit. The auxiliary battery charging will occur any time the main system alternator is operating normally in the 13.8 to 14.2 Volt range. This background charging will ensure integrity of the backup battery. Internal circuitry limits the current delivered to the backup battery to approximately 2.0 Amps as a safety feature should a fault occur. The IPB lead-acid backup battery life is expected to be excellent.

The TEST mode allows the system to be tested. The red push to "TEST" button on the indicator panel is for testing the functionality of the IPB. Pushing this button tests the electronic circuitry, indicator lights used to monitor the main battery system, and the charging circuit switchover relay.

### Over Voltage Protection

The Over voltage function of the product protects valuable electronic equipment from failed alternator regulators or external voltage regulator failure. The device circuitry is designed to "lock out" power to the field of the alternator once the voltage surges beyond approximately 16.2 V. This "Latch" or lock out function does not allow the power to cycle on and off. Without this latch function the power would cycle due to the voltage dropping after the field power to the alternator is removed. A manual reset is required on the device trips and locks out the power. The device is reset on the front panel as indicated in the Quick Reference Guide. More information is available upon request.

A second TEST mode is provided for this circuitry too so that the device functionality can be tested. It is NOT recommended you test this device in flight as failure to then reset the device will disconnect the alternator from the power bus. An amber lamp is provided to indicate when the device is in the Lock Out mode.

## Before You Begin

Before beginning the IPB installation, familiarize yourself with the components included in the kit. Below is a list of the kit contents. We also **strongly recommend** that you review each of the installation steps prior to starting the installation. The IPB components indicated below with a reference number can be located on the wiring diagram (see page 5).

## IPB Function Installation

- **IPB System Module ①.** This is the aluminum box that contains the IPB circuitry. The IPB System Module is connected directly to the IPB Indicator Panel with a gray cable. Five color coded wires lead from the box to a six-position connector. This connector mates with the IPB Main Wiring Harness.
- **IPB Indicator Panel ②.** This is the instrument panel that includes the MAIN and AUX battery lights and a TEST button. The IPB Indicator Panel is connected directly to the IPB System Module via a gray cable.
- **IPB Remote Light ③.** This is a jumbo LED used to indicate when the main battery system is malfunctioning. In a fault condition this LED will illuminate.
- **IPB Backup Battery ④.** This is a sealed, rechargeable 12V lead-acid battery used to supply power to the aircraft ignition switch breaker(s) and fuel pump breaker(s) in the event of a main system power failure.
- **IPB Power Switch Breaker ⑤.** This 5 Amp switch type circuit breaker is used to turn the Integrated Power Backup system on and off. Pilot pre and post flight procedures must activate and deactivate the IPB.
- **IPB Main Wiring Harness ⑥.** One end of this harness has a six-position connector that mates with the connector leading from the IPB System Module. The other end of the harness connects to various points of the aircraft wiring system (see wiring diagram).
- **Separate Black ⑦ and White ⑧ wires.** These wires are used to connect the system to ground (black) and the IPB power switch to the IPB Backup Battery (white).
- **IPB Indicator Panel Labels.** Two labels are provided. Use one label, either vertical or horizontal panel mount. The other label may be used as a hole-drilling template.
- **Miscellaneous hardware.** Blue crimp battery terminals, Red crimp terminals, Blue splice, etc..

## Required Installation Tools

- Electric Drill
- Drill bits (1/8", 5/16", 15/32")
- Nut driver (5/16" for 6-32 nuts)
- Phillips head screwdriver
- Wire stripper
- Terminal crimp tool
- Plastic ties
- Hot glue gun (optional)



### Important points to remember about the IPB installation are:

1. **Placement of the IPB Remote Light.** Place this jumbo LED where it can be easily seen by the pilot in the event of a main power system failure.
2. **ALWAYS double check your wiring before applying power.**

Wiring Diagram

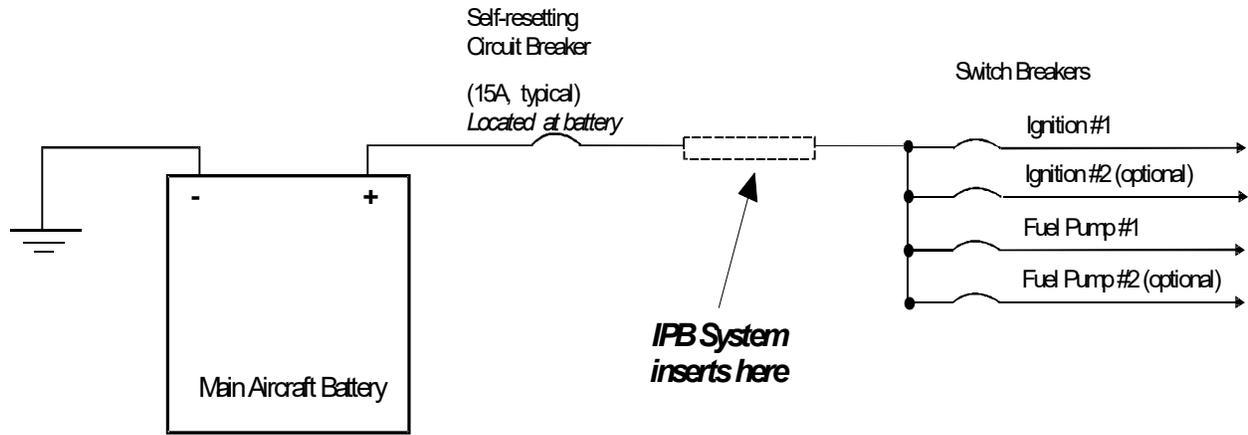


Diagram 1: Typical wiring diagram of system *before* installation of the IPB.

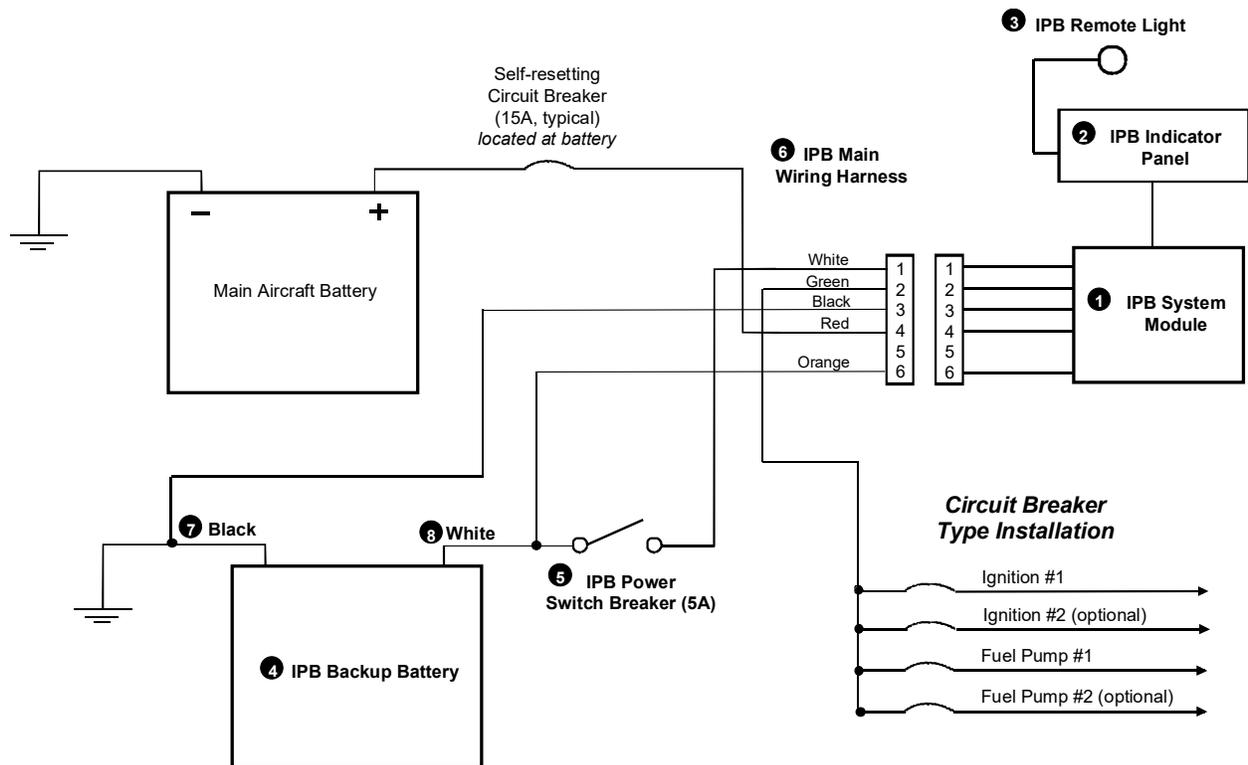


Diagram 2: Typical wiring diagram of system *After* installation of the IPB.

## Installation Steps



**1. IMPORTANT! Disconnect the positive side of the main aircraft battery.**

### **2. Drill holes for the IPB Indicator Panel, Remote Light and IPB Power Switch-Breaker.**

**Indicator Panel:** The indicator panel is secured to the aircraft's instrument panel with two mounting screws and self-locking nuts. Also, a nut with lock washer is used to secure the test button in the center of the panel. The Indicator Panel can either be horizontally or vertically mounted. Labels are provided for both installation types. Choose the configuration you want, then use the other label as a drill guide. The drilling sizes are as follows:

- Outer 2 mounting holes 1/8"
- Inner three indicator (LED) holes 5/16"

**Remote Light:** The Remote Light should be mounted in a position that allows it to be easily viewed. The Remote Light is the first indication that the system has switched from the main battery power to the backup battery. Therefore, you want to be sure you will notice this light in any given lighting situation. The hole dimension for the Remote Light is 15/32". *Do not drill a hole larger than 15/32" as the Remote Light is a "snap-in" device and must fit snugly.* If the light is loose after, use hot glue gun to fasten in place.

**Power Switch-Breaker:** The IPB Power Switch-Breaker should be mounted next to your existing fuel pump and ignition switches, or consider mounting it next to the IPB Indicator Panel. If you mount the switch such that the trigger direction is vertical, put the LOAD side up and the LINE side down. Using this installation configuration, the switch is down when the system off and up when the system is on. Prior to takeoff, you can simply check to be sure the switch is up. The hole dimension for the Power Switch is also 15/32".

### **3. Disconnect the Main Battery Feed Wire from the Ignition and Fuel Pump switches**

Locate the Main Battery Feed Wire from the battery (or power bus) leading to the Fuel Pump and Ignition switches. The wire may feed to a single bus bar connecting these switches together or it may feed up to four switches in a series configuration. Disconnect this single feed wire from these switches. This wire will be used as an input to the IPB System Module.

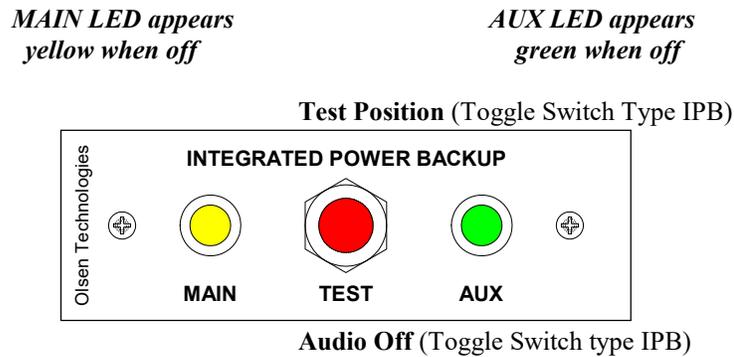


**Note:** *Some aircraft wiring uses a bus-bar configuration to supply power to other instruments in addition to the fuel pumps and ignition systems. Isolate the fuel pump and ignition switches as the IPB system is not designed to supply constant power beyond 5 amps. A higher current (10 Amp) model is available, call for details.*

### **4. Mount the IPB Indicator Panel**

BEFORE mounting the panel, remove the nut and washer on the test button. Place the stick-on label over the five holes drilled in the aircraft instrument panel (step 2). The panel then mounts from behind the main instrument panel.

It is important to install the panel such that the yellow LED (this multi-colored LED appears yellow when off) and green LED are correctly placed into their respective places (yellow for MAIN and green for AUX). See figure 1, below. If you selected the horizontal installation configuration for the IPB Indicator Panel, install the panel such that the yellow LED (MAIN) is on the *left* side of the test button. If you selected the vertical installation, install the panel such that the yellow LED is *above* the test button.



**Figure 1:** Correct horizontal installation configuration of the IPB Indicator Panel.

Secure the panel using the two supplied (6-32) screws and self-locking nuts, then reinstall the nut and lock washer around the TEST button on the aircraft panel side.

**Note:** The IPB Remote Panel comes in two versions. One with a push button as indicated in Figure 1, and one with a toggle switch, not shown. For the toggle version, the up and momentary position is “Test” and the down position disables the audio functionality.

## 5. Install the IPB System Module (aluminum box)

Locate a suitable installation area for the IPB System Module. The module must be placed within two feet of the IPB Indicator Panel.



Be sure that you mount the module where it will not interfere with other controls!

Use plastic ties or other adequate method to secure the module to the aircraft. Nylon retainers are installed on the IPB System Module to facilitate attachment with nylon ties (included). Velcro can also be effective.

## 6. Install and Connect the IPB Remote Light

Mount the IPB Remote Light in the 15/32” hole you drilled in step 2. The light mounts from the front of the main instrument panel. The light locks into place when you insert it through the hole drilled in the instrument panel. The wires leading from the light will be attached later. If the light is loose, use a hot glue gun on the rear of the panel to ensure a solid mount.

Using the included red splices, attach the red and black wires from the IPB Remote Light to the red and black wires from the IPB Indicator Panel (normally, one would want to match red to red and black to black!).

## 7. Install the IPB Backup Battery

Install the IPB Backup battery forward of the instrument panel and using an appropriate methods to firmly secure the battery in place. Place the battery where you will have easy access to it during these installation steps and in a place where it will not interfere with the aircraft controls. This battery weighs approximately 4.2 pounds, so mounting is important. The battery may also be mounted AFT. Ensure overload protection device is attached for aft installations (module attached to battery).

## 8. Connect the IPB Main Wiring Harness to the IPB System Module

The connector leading from the IPB System Module mates with the connector on the IPB Main Wiring Harness. Connect these two at this time.

## 9. Attach the Ground Wires

Your IPB kit includes a black wire that is used to connect the IPB Backup Battery to the aircraft ground. Use one of the supplied red (or larger yellow) wire terminals to attach this wire to a suitable aircraft ground location. Route the opposite end of the ground wire to the Backup Battery but **DO NOT** connect it at this time.

Locate the other black wire leading from the IPB Main Battery Harness. Route this wire to the negative side of the IPB Backup Battery. Strip and wrap the wire together with the ground wire installed above and use one of the blue spade terminals to attach both wires to the NEGATIVE (black) terminal of the IPB Backup Battery. For AFT installations, one can attach the wire to an aircraft ground locally. A good ground is important!

## 10. Mount the IPB Power Switch-Breaker

Install the IPB Power Switch-Breaker in the 15/32" hole drilled in step 2. Mount the switch behind the main instrument panel with the LOAD side facing upward for vertical installations or to the right for horizontal installations. Secure the switch using the supplied washer and nut. We suggest that you mount the switch in or near the circuit breaker row.

## 11. Connect the IPB Power Switch-Breaker to the IPB Wiring Harness

Locate the single white wire included with the IPB kit. Strip one end of this wire and attach it to the LINE side of the IPB Power Switch using one of the red crimp-terminals provided in the kit. Route the opposite end of this wire to the POSITIVE (red) terminal of the IPB Backup Battery but do NOT connect it at this time.

Locate the white wire from the IPB Wiring Harness. Strip this wire and connect it to the LOAD side of the IPB Power Switch using one of the red crimp-terminals provided in the kit.

## 12. Connect the IPB Wiring Harness to the Main Battery Feed Wire and Bus Bar

Route and connect the RED wire of the IPB Wiring Harness to the main battery feed wire that you disconnected in step 3. Use the blue in-line splice provided in the kit. Be sure to strip the wire before inserting in into the splice!

Route and connect the GREEN wire from the IPB Wiring Harness to the bus bar on the ignition and fuel pump switches identified in step 3 using one of the red crimp-terminals included in your kit. After checkout, you will want to secure all wires using nylon ties or other adequate method.

## 13. Check Your Wiring

Use the wiring diagram on page 5 to verify that you have properly connected all wires indicated in the table below. As you check each wire in the aircraft, you may want to mark the diagram with a highlighter pen.

### IPB WITHOUT Over Voltage Protection

Wire color	IPB Main Wiring Harness Connects to...
Red	The main feed wire from the aircraft previously connected to the ignition and fuel pump switch-breakers (see wiring diagram page 5)
Green	The IPB OUTPUT side to bus bar of the ignition and fuel pump switch-breakers
Orange	The LINE side of IPB Power Switch-Breaker fed from the AUX battery (white wire)
White	The LOAD side of the IPB Power Switch-Breaker – Feeds the IPB System
Black	Negative side of the IPB Backup Battery, or other aircraft ground (with AFT battery)

## IPB WITH Over Voltage Protection

Wire color	IPB Main Wiring Harness Connects to...
Red	The main feed wire from the aircraft previously connected to the ignition and fuel pump switch-breakers (see wiring diagram page 5)
Green	The IPB OUTPUT side to bus bar of the ignition and fuel pump switch-breakers
Yellow	Power to alternator FIELD
Orange	The LINE side of IPB Power Switch-Breaker fed from the AUX battery (white wire)
White	The LOAD side of the IPB Power Switch-Breaker
Black	Negative side of the IPB Backup Battery, or other aircraft ground (with AFT battery)

### 14. Install the Over Voltage Switch and Indicator Light (If featured)

Locate and install the OV switch and light. Label the switch per “Quick Reference Guide”. Labels of TEST and RESET should be applied to the panel at installation point.

### 15. Connect the IPB Power Switch to the Backup Battery

Once all the previous wiring is verified, route the WHITE wire from the LINE side of the IPB Power Switch to the POSITIVE (red) terminal of the IPB Backup Battery. Attach one of the blue spade terminals supplied with the kit to the end of the wire. Attach the wire to the POSITIVE (red) terminal of the Backup Battery.

### 16. Check the Lights for Proper Operation

Turn the IPB Power Switch on. At this time, the AUX battery light on the IPB Indicator Panel should be on (green) indicating that the ignition and fuel pumps are currently being powered by the IPB Backup Battery. The MAIN battery light should be red indicating that the main aircraft battery is not supplying power (because you disconnected it in step 1!).

The IPB Remote light should also be on (red).

### 17. Reconnect the Main Aircraft Battery

Reconnect the main battery lead that you disconnected in step 1.

Provided the batteries are functional, both the MAIN and AUX lights should be green (and... provided the IPB Power Switch is in the ON position!).

### 18. Test the System

Press the red push to TEST button on the IPB Indicator Panel. The MAIN battery light should turn red while you hold down the test button. This tests the IPB’s internal circuitry.

### 19. Generate a checklist (See Below)

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## Suggested Pilot's CHECKLIST:

### Pre-Flight

- ◇ Prior to any aircraft power being applied (i.e. battery contactor switch)
- ◇ Turn on the IPB Power Switch-Breaker
  - ◇ MAIN LED on IPB indicator panel should be RED, indicating the main power is not present
  - ◇ AUX LED should be GREEN, indicating the AUX battery is in good condition
- ◇ Apply main aircraft power (battery contactor switch)
  - ◇ MAIN LED should be GREEN, if main battery is in good condition
  - ◇ AUX LED remains GREEN, if AUX battery is in good condition
- ◇ Push TEST button on IPB indicator panel
  - ◇ MAIN LED changes to RED, indicating main battery is not functioning correctly, a “click” may be heard further indicating the IPB is operating properly (charging circuitry is via relay)
  - ◇ Red remote light will blink as long as the test button is depressed
- ◇ You are clear to proceed with flight with confidence the IPB is operating properly!

### Post-Flight

- ◇ Don't forget to power down the IPB as the last operation before exit!



**REMEMBER:** The IPB powers the ignition!!! So... the engine may run with the IPB alone, **BE CAREFUL!** Call us if you have any questions or feedback. And... THANKS!

## Over Voltage Protection Test

### Pre-Flight

- ◇ While the aircraft is running prior to flight, note charge voltage is present on the voltmeter. Normal charging voltage is about 13.8-14.2 V.
- ◇ Press the OV switch to the “test” position and release.
  - ◇ The OVPD Amber Led (light) should light and begin to blink
  - ◇ The voltmeter should drop to nominal battery voltage approximately 12.2-12.7 Volts. This indicates the alternator charging is disconnected from the power bus. If equipped with a Charging Ammeter, you can clearly see the battery charging current drop off.
- ◇ Push the OV “reset” button and the system should return to normal
  - ◇ Voltmeter 13.8-14.2 Volts, and/or Charging Ammeter current returns.
  - ◇ Amber remote light OFF
- ◇ You are clear to proceed with flight with confidence the OVPD is operating properly!

### Post-Flight

- ◇ Don't forget to power down the IPB as the last operation before exit!