

# Subaru Wiring Supplement

Supplement to Vertical Power VP-100 & VP-200 Installation Manuals

January 7, 2008

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## Change List

Date	Change
12-4-07	Added section about e-bus wiring.
1-7-08	Updated prop controller section

## 1.1 Introduction

The Eggenfellner Subaru E6-Series engine can be used with the Vertical Power VP-100 and VP-200. In order to ensure the two work together safely, you must follow the instructions listed below, in addition to the Installation Manual:

1. *Subaru Wiring Supplement* (this document)
2. *Subaru Wiring* (separate documents for the VP-100 and VP-200)

These have been developed in conjunction with Eggenfellner Subaru and are located at Support -> Documentation on the Vertical Power web site.

**This document assumes you are familiar with the VP-100 or VP-200 Installation Manual and Operating Manual.**

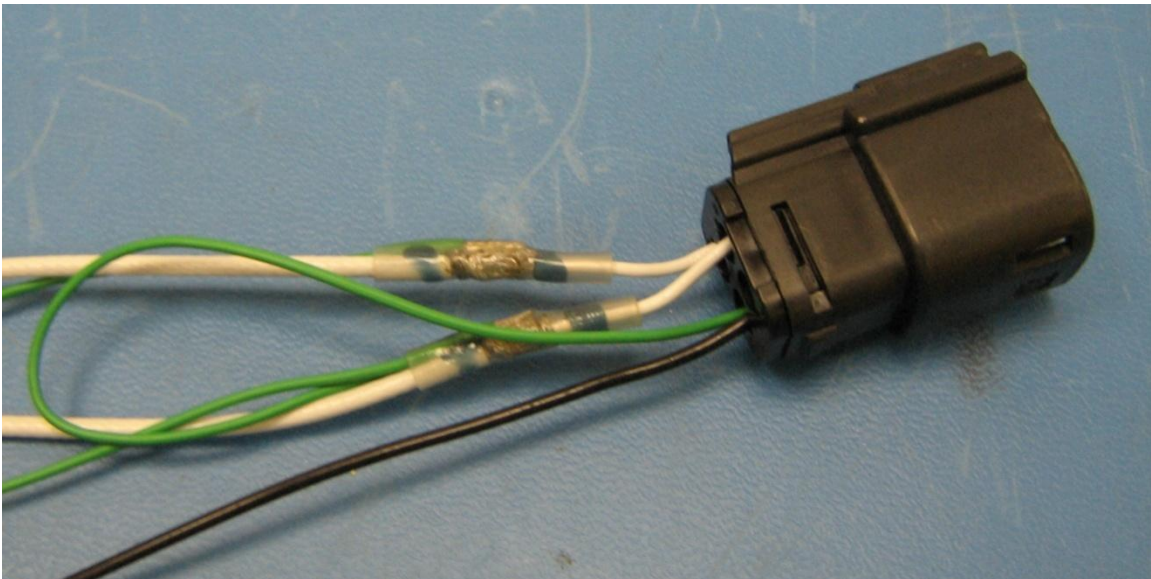
## 1.2 Aux Battery Switch

If you are installing the VP-100 with an Eggenfellner Subaru, you should install an AUX BATT switch external to the system as per the wiring diagram (*Subaru Wiring VP-100*).

If you are installing the VP-200 with an Eggenfellner Subaru, you should be using the modified Switch Panel that replaces the MAG switch with an AUX BATT switch.

The switch panel is modified so that the rotary switch is now the control for the aux battery contactor. Wire it as follows.

1. Verify the switch panel rotary switch is modified for aux battery usage using one of the two methods:
  - a. The front bezel is etched with “Aux Batt” rather than “MAGS”
  - b. For rear-mounted bezels with no front markings, there is a label on the back clearing indicating “aux batt”
2. If you are using the Vertical Power wiring harness, you need to modify the 4-pin Switch Panel harness. There is a small gauge wire (usually green) that goes between each white wire and the black wire.



Remove these wires from the black connector as described in the *Connector Service Manual* on the VP web site. Cut the green wires as close to the other wires as possible. Discard the green wires. Cover any stubs with heat shrink tubing. Each wire should be an individual, separate wire and NOT connected to any other wire. Insert the two white wires in the black connector pins 1 and 2. Insert the black wire in connector pin 3. The pin numbers are marked on the back of the connector where the wires enter. The diagram below shows the pin numbers looking at the back of the switch panel, as if the connector

were plugged in to J1.



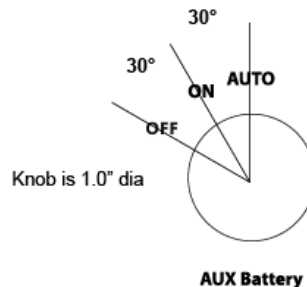
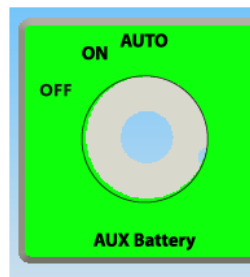
3. Following the Subaru wiring diagram provided by Vertical Power, run the wires as follows:
  - a. SP J1 pin 1 goes to J5 pin 6 on the Control Unit (CU1 if using two control units)
  - b. SP J1 pin 2 goes to the small post on the aux battery contactor
  - c. SP J1 pin 3 goes to the ground terminal

**Note:** you do not need to connect the shielding on either end. It is not used. Strip the shielding back, cut off the excess, and cover the loose shielding with heat shrink tubing.

4. Connect the power connector to J1 on the back of the switch panel. Verify correct operation of the aux battery contactor when in the Off and On positions. The contactor should be off in the auto position, until the VP-200 software supports automatic control.

### 1.3 Rear-mounted switch panel markings

If you are installing a rear-mounted VP-200 Switch Panel, use the following markings on the instrument panel.



### 1.4 Starter Contactor

The normal configuration for the Eggenfellner Subaru is to wire the starter solenoid directly to a 20A starter switch. However, with the Vertical Power system you must install a starter solenoid (typical of the type used for Lycoming or Continental engines) in series with the starter cable. The starter solenoid is available from most aircraft kit manufacturers, B and C Specialty, Aircraft Spruce, and other aviation supply companies.

The *Subaru Wiring* diagram shows how to install the starter contactor. The *Contactor Wiring* document on the VP web site is also helpful.

### 1.5 E-bus wiring

Be sure to wire the e-bus power line (J4 pin 1) to the main battery, and not the aux battery.

### 1.6 Prop Control Power

Wire the prop controller in one of three ways:

1. to any 18A circuit on the Control Unit.
2. to an extra pole on the four-pole Bus Master switch, if open. Change the wiring as per notes on the wiring diagram drawing.
3. wire to the switched side of the battery contactor using an circuit breaker as per the prop controller manual.

Be sure to adjust the stops on the propeller so that a loss of power to the prop control leaves the propeller pitch at an angle that can maintain flight. Contact Eggenfellner Subaru and/or see the prop controller manual for details.

### 1.7 EIS Settings

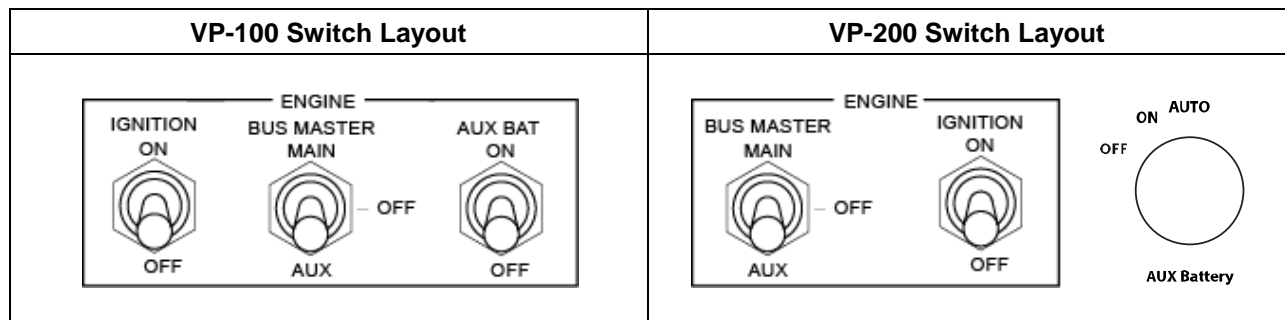
The Aux inputs on the EIS (Eggenfellner Subaru version) should be configured as follows:

- Aux 1: Manifold Pressure
- Aux 2: Not used
- Aux 3: Gearbox temp
- Aux 4: Fuel Pressure
- Aux 5: Left fuel tank
- Aux 6: Right fuel tank

TIT on a turbo-charged Subaru engine is not monitored.

### 1.8 Operating Procedures

There are three electrical switches required to operate the electrically-dependent Subaru engine. These are:



BUS MASTER	Sources power for the ECU, ignition coils, main fuel pump and turbo scavenge pump from either the main battery or aux battery bus. The middle position is OFF.
IGNITION	Turns power on an off to the ignition coils. The Bus Master must be set to Main or Aux to provide power to the Ignition switch.
AUX Battery	Turns the aux battery on, off, or under control of the VP-200 (auto). Automatic control is described below.

**The following procedures are recommendations, and the final decision regarding operating procedures rests with the builder and pilot of the aircraft.**

### **1.8.1 Powering the engine on and off**

Turn on the VP-100 or VP-200. To turn the engine on, set the Bus Master to Main, the ignition switch to On, and the Aux Battery switch to Auto.

To turn the engine off, turn the ignition switch to off, then turn then the Bus Master to OFF. Turn the AUX Battery switch to Auto or Off. Turn off the VP-100.

### **1.8.2 Alternator Failure**

If the alternator fails, land as soon as practical at the nearest suitable field. Start the alternator failure emergency on the VP-200 to load shed unneeded electrical devices. You also want to open the aux battery contactor to isolate the aux battery from the main battery. This is done automatically by the VP-200 when the alternator failure emergency is initiated, or you can do it manually by moving the Aux Battery switch to Off.

Run engine power from the main battery (Bus Master set to Main) until voltage drops and causes the engine to stumble (you can determine this with testing). At that point, or sooner, move the Bus Master to AUX to switch engine power to the Aux battery. The main thing to remember is to keep the aux battery as a fully-charged backup to the main battery. If you draw down both batteries together, you won't have a backup source of power.

### **1.8.3 Engine Failure**

If the engine fails, follow the engine failure procedures recommended by Eggenfellner Subaru. When the engine failure emergency is initiated on the VP-200 (configured for a Subaru), the following happens:

- Turns on the aux boost pump
- Opens the aux battery contactor (if Aux Battery switch is in Auto)
- Load sheds to reduce electrical loads on the battery (just in case the engine failure is caused by a low battery)

If the engine is still not running, select the aux battery bus by moving the Bus Master switch to Aux.

#### **1.8.4 Aux Battery Contactor operation in Automatic (VP-200)**

When any emergency is initiated using the VP-200, the aux battery contactor is opened automatically to isolate the two power busses that power the engine. When you restore from an emergency (by pressing the Restore soft key), the aux battery is left open. You can manually override the aux battery by selecting it from the device list, or simply moving the Aux Battery switch to On or Off.

The aux battery contactor is automatically closed when going into Start Mode on the VP-200, and opened when in Post-flight Mode. This keeps the aux battery “in the loop” during normal operations, and in this configuration both batteries are seen as one large battery by the alternator and electrical devices.