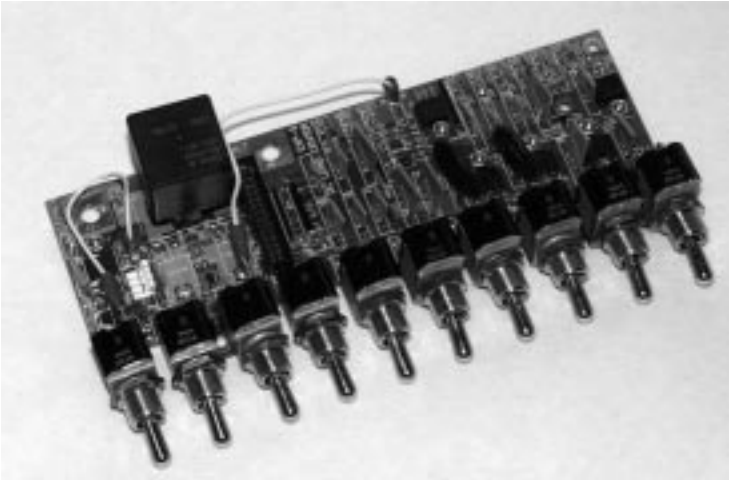
EXP BUS 2 with backup battery option.



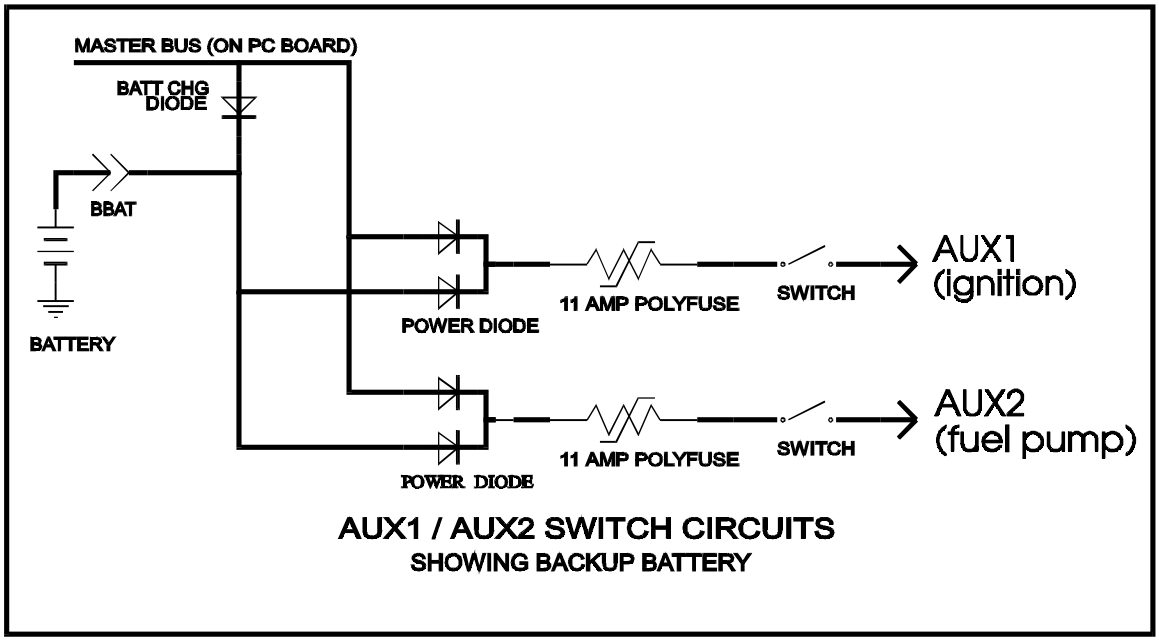
The use of the backup battery option on the EXP2 DC Load centers requires careful consideration and special testing before flight.

The backup battery circuits on outputs AUX1 and AUX2 are each rated at 7 AMPS maximum continuous DC output load. These two output circuits draw power independently from two battery systems, namely the **master bus** and the **backup battery**.

When a backup battery is connected to the BATB input terminal on the EXP2 PC board, a special diode bridge circuit AUTOMATICALLY draws power for each of these two switches from the battery having the highest voltage under load. Normally this would be the primary aircraft electrical system, (the “master bus”). In the event of a master bus failure, these two circuits automatically begin drawing power from the BATB battery (the backup battery) without any interruption. The diode circuits that provide this automatic power switching generate a modest amount of heat during normal use. These circuits are rated at more than 12 amps of maximum continuous load, and in excess of 30 amps of surge current. We have derated these devices to 7 amps, and have protected these circuits with an 11 amp polyfuse solid state circuit breaker, in the belief that it would be very undesirable to have these circuits prone to nuisance tripping of the circuit breakers.

It is a wise practice to direct some cooling air to the EXP2 PC board if you are using the backup battery circuitry to power fight critical devices that draw more than 5 amps of current. If the load on either output is more than 5 amps, direct a modest air current towards the EXP board in the vicinity of the backup battery spade terminal. A slight amount of airflow, approximately equivalent to the airflow used to cool soup in a spoon will insure that these circuits will operate under all ambient temperature conditions. While a fan could be used, vent system air would probably be more reliable. If the board is mounted without any airflow at all, and in very close quarters, all the outputs should be derated by

20%. With normal convection behind the aircraft panel, it is not necessary to derate the outputs. It is the builder's responsibility to test each installation to insure that the system is working reliably, and getting enough cooling air.



AUX1 / AUX2 SWITCH CIRCUITS
SHOWING BACKUP BATTERY

Most electronic ignition modules only draw a few amps of current. Typically they will draw more power when the engine is producing full power, due to the increased frequency of spark plug firings. Typical fuel pumps also draw only a few amps of current also. The builder should check these accessories to confirm that these values are valid in their installations.

Contact Magazine tested a Suburu Engine conversion and found that the ignition and injection system including the computer drew 1.2 amps at engine idle, and 3.9 amps at full throttle. The fuel pump drew 2.6 amps at either power setting. Since the 3.9 amp load would be on AUX1 and the 2.6amp fuel pump would be on AUX2, this would be a very conservative application of the EXP2 backup power system, requiring no cooling air for normal operation.

In a Suburu Engine installation with dual fuel pumps, the primary pump could be hooked up to the AUX2 switch, and the secondary pump hooked up to the AUXFP output. The computer and ignition system could be hooked up to the AUX1 switch. If a 6 amp hour gell cell battery were connected to the BATB lug on the EXP, this battery would theoretically provide enough power to run the aircraft for about one hour with the master switch off, and therefore the main battery disabled. For a margin of safety, one should probably count on 30 minutes of reliable backup power. In the case of an alternator failure, with the master switch still on, the AUX1 & 2 outputs would draw power from both the backup battery and the main battery, greatly extending this time. Remember that the EXP2 backup battery system automatically charges the backup battery from

the master bus, as long as the alternator is charging. This eliminates the need for dual alternators and saves weight.

The pilot must develop a system for testing the backup power system prior to each flight. The engine should be run on the backup battery briefly on the ground, prior to each flight. The easiest way to do this would be to turn off the master switch for a few minutes as a routine part of the preflight engine run-up, while insuring that the engine continues to produce power. This should probably be done with the engine at 50% power.

Control Vision is developing a backup battery monitor unit that will mount on the panel, providing a positive indication of the status of the backup battery. Contact us for more information on this accessory.

~~~~~~~~~~~~~~~ WARNING ~~~~~~~~~~~~~~~

DO NOT POWER ANY FLIGHT CRITICAL EQUIPMENT OFF OF EITHER THE AUX1 OR AUX2 OUTPUTS IF THAT EQUIPMENT DRAWS IN EXCESS OF 7 AMPS CONTINUOUS DC CURRENT LOAD. WHILE THE FUSES ARE RATED AT 11 AMPS, THE CIRCUITS MAY SHUT DOWN AT ANY CURRENT ABOVE 7 AMPS, DEPENDING ON COOLING AIRFLOW AND AMBIENT TEMPERATURE.

IT IS CRITICAL THAT ALL FUEL PUMPS AND ELECTRONIC IGNITION MODULES POWERED BY THESE CIRCUITS BE TESTED EXTENSIVELY IN THE WORST CASE CONFIGURATIONS PRIOR TO FLIGHT. A MILDLY OVERLOADED CIRCUIT MAY SHUT DOWN AFTER A DELAY OF UP TO ONE HOUR.

During the flight test phase (at a minimum), and in the interest of safety and very conservative design practices, we recommend that you provide an emergency power switch to operate the engine ignition/computer. This switch should bypass the entire electrical system, and provide a direct connection to either the primary or secondary battery through a large (perhaps 20-30 amp) fuse. It is recommended that the wires from this switch go directly to the ignition/computer module, in addition to any wire(s) from the load center. This way, a poor crimp on either single power source (for instance) could not ruin your day. Normally, this switch would be left in the OFF position for all operations, and could be switched on immediately in the event of a loss of power. Such a bypass switch would be invaluable insurance in the event of an inflight problem. The switch should be tested at widely spaced intervals, perhaps annually, or every 25 hours. The EXP2 design provides two redundant power supplies for the AUX1 and AUX2 outputs. We recommend that this switch be added, providing for a third backup.