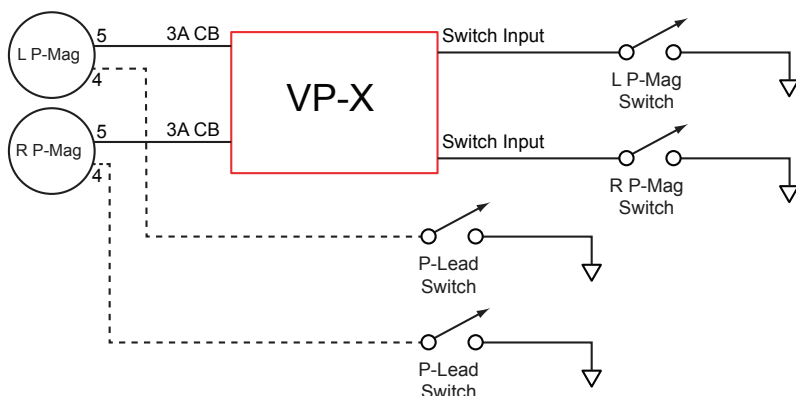




5.23 Lightspeed Ignition wiring

If you are wiring a single LSE ignition system (with a magneto on the other side), we recommend wiring the LSE power wire directly to the VP-X and the ground wire to ground.

If you are wiring a dual LSE ignition system, we recommend using two batteries and wiring each ignition directly from each battery, similar to the method suggested in the LSE installation manual. Please see the section in this manual “Dual Battery/Single Bus Wiring.”

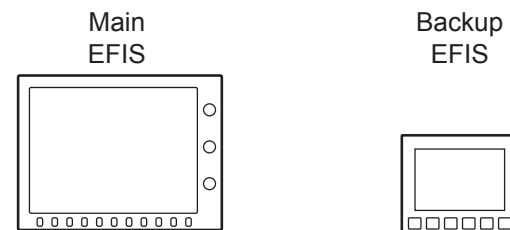
5.24 Planning and Wiring Backup Circuits

Backup circuits allow you to wire backup power directly from the battery, through an external fuse and switch (separate from the VP-X), and then to the device. Each circuit can provide backup power to a device regardless of whether the VP-X is on or off.

Remember, as the aircraft builder, you are the systems engineer for the electrical system design. So it is important to design the systems to support the type of mission you expect to fly. Just because a friend built his plane a certain way does not mean it is necessarily the right way for you to build your plane. With that in mind, our goal here is to provide the information you need to design a backup system that is right for you.

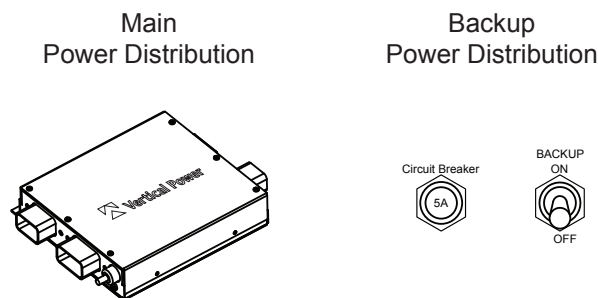
Take for example the EFIS. It’s important to consider what happens when it fails. There’s nothing you can do to prevent it from failing at some point in the future, but you can mitigate the risk when it does fail. You do

that by installing a separate backup EFIS with limited capability but one that can get you back on the ground safely.



Even if a single EFIS fails, the overall system is very safe and reliable.

The same analogy applies to the electrical system. The VP-X is the main power distribution mechanism and you can also install backup circuits for certain critical avionics. In the same way that your backup EFIS has minimal functionality to ensure safety for the mission at hand, the backup circuits are selected to support the essential equipment you need to continue flight safely.



Even if a single component fails, the overall system is very safe and reliable.

5.24a Backup Circuit Considerations

There is a great deal of subjective decision making that goes into determining the number of backup circuits to wire. Backups are not uncommon in other systems on the aircraft. For example, the old vacuum-drive attitude indicator had an electric turn and bank instrument for backup. A modern glass EFIS is often installed with backup altitude, attitude, and airspeed round-dial gauges. You have two magnetos for redundancy, and if one fails in flight you can safely land at a nearby airport. But, if one fails on the ground you would not likely takeoff with only one operating.

On one hand, backup circuits add more redundancy, but on the other add more complexity and failure points. Ultimately, you as the builder should do what you are most comfortable with based on your mission and aircraft. Here we will provide a few data points to help in your thinking and planning. They are not absolute or regulatory, only suggestions for thought.

There are two types of failures to consider. One type of failure occurs on the ground and prevents you from flying. The other type of failure occurs while you are flying and may be harmless or could require you land at the next opportunity.

With regard to failures on the ground that keep you from flying: there are many single-points of failure that exist on aircraft today. Would you start the engine or take off if any of the following conditions existed:

- Failed EFIS, AHRS, or engine monitor?
- Failed ignition or magneto?
- Leaky brake o-ring or tire inner tube?
- Starter failure causing you to hand-prop the engine?
- Failed alternator or battery contactor?

The point is there are many single points of failure that can keep you from flying, and the safest thing to do is fix the problem while you are on the ground. It's common sense to always have a Plan B if your plane breaks while you are away from home. With that in mind, the VP-X should not be thought of any differently than any other component that may ground you if it fails. While you can wire backups for the alternator field, for example, to get you home, it may be overkill considering that there are many other components on the plane that are likely to ground you as well. Do you have two sets of engine instruments installed, including dual sensors for everything?

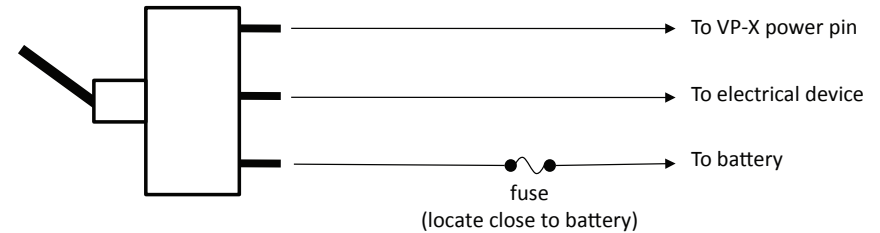
The other failure mode occurs when you are in flight. Perhaps the most critical is a backup for the attitude source. The others will depend on your mission and whether you carry a backup comm radio and/or backup GPS receiver. If you fly only VFR or have battery backups built into the EFIS system, then backup wiring may not be necessary. If you fly IFR,

then critical circuits should be protected by backups.

There are two different methods to wire backup circuits (simply called Method B or C).

5. 24b Backup Method B

Backup capability is the ability to provide power to an electrical device independent of the switching internal to the VP-X.

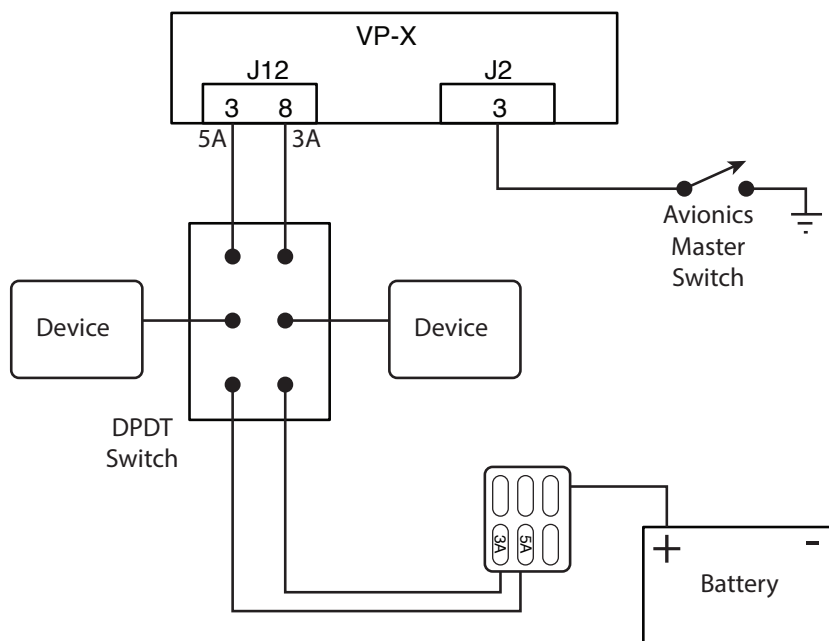


How it works: the switch is normally left in the Auto position, which provides switched power from the VP-X to the electrical device. When the switch is moved to the ON position, uninterrupted power is provided directly from the battery to the electrical device. Make sure the switch and fuse are appropriately rated for the load and wire size. **When battery power is switched on, there is a break in circuit continuity. Whether this causes the connected device to reboot is a function of the switch design and device design.** We recommend testing this on the bench. Certain devices like boost pump and lighting can cycle power without issue.

Example: You want to add backup capability to the boost pump, which in this example requires a 10A circuit. Wire the boost pump to a 10A circuit on the VP-X via a switch as shown above, and bring in a wire with a 10A fuse directly from the battery.

If you are wiring a backup circuit for an alternator, be sure the alternator or voltage regulator has built-in over-voltage protection. The backup circuit bypasses the OV protection built into the VP-X.

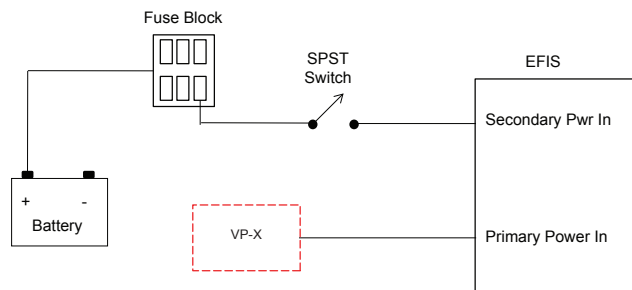
Below is an example of two backup circuits wired to two different devices. Note that each backup circuit has its own fuse, and that the fuse matches the value of the electronic circuit breaker set in the VP-X.



Example backup Method B circuit with two devices.

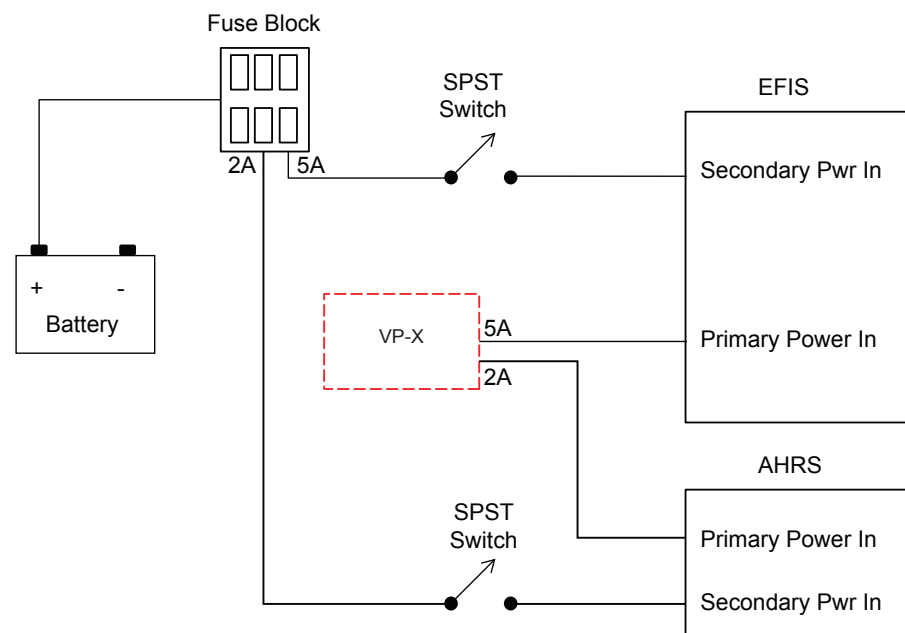
5. 24c Backup Method C

Many modern EFISs have multiple, diode-isolated power inputs – typically a primary and a secondary power input. The diode isolation ensures that each power input is “independent” of the other power inputs. Method C allows you to wire a backup circuit into the secondary power input on the EFIS (or other device if that is the case) directly from the battery through a fuse and a switch. The EFIS will automatically choose between the inputs and select the one with the highest voltage.



Wire a fuse or fuse block near the battery. Size the fuse for the wires and as per recommended by the EFIS manufacturer. Then wire to an SPST switch. The switch should be labeled Auto (down) and On (up). When the switch is off, power will be sourced from the VP-X. When on, power will be sourced either directly from the battery bus or the VP-X.

Below is an example of a two backup circuit wired to two different devices. Note that each backup circuit has its own fuse, and that the fuse matches the value of the electronic circuit breaker set in the VP-X.



Example backup Method C circuit with two devices.