

Tips for Using ITECH IT6000 Bidirectional Programmable DC Power Supplies for Battery Testing to Increase Safety when Working with Battery Modules and Packs.

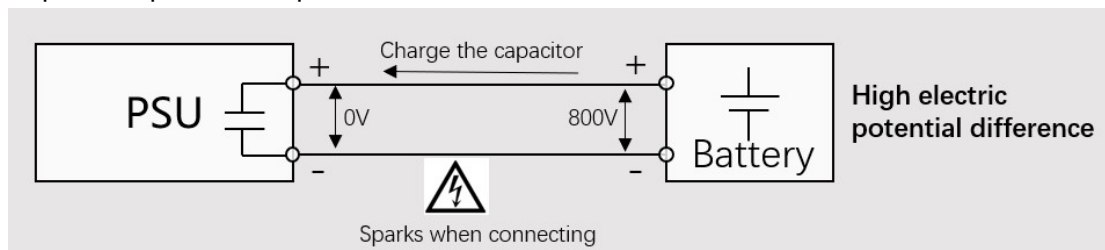
### How to eliminate Hook-up Spark for Battery Test By Optimizing Battery Connection

The demand for plug-in hybrid electric vehicles and battery-electric vehicles continues to grow around the world. Vehicle manufacturers, their suppliers and other manufacturers across the value chain are bringing innovative solutions to the market as global governments commit to putting more electric vehicles (EVs) on the road. The huge demand for the use of renewable energy and the growing concern about environmental pollution pushes manufacturers to design batteries with increased energy density as well as voltage levels. When engineers connect an 800V battery pack to a battery tester, they now need to consider an approach that involves complex wiring and increased safety. Reverse Polarity Protection and eliminating Hook-up Spark for Battery Test By Optimizing Battery Connection, are the two primary challenges. Here are some tips from ITECH when using ITECH IT6000C Bidirectional Programmable DC Power Supplies (PSU) for your Battery Testing applications.

Why Does It Spark When you connect a charged Battery Pack to the IT6000 PSU?

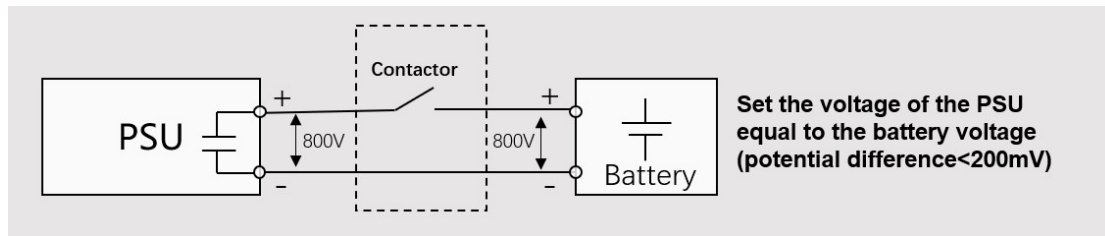
The cause is the capacitor connected in parallel between the positive and negative terminals of the battery tester / IT6000C. The function of the capacitor in the PSU is to rectify and filter voltage, reduce ripple and stabilize the output. When the battery is directly connected to the positive and negative terminals of the battery tester/IT6000C, the battery will charge the capacitor of the PSU and instantly creates a short-circuit state, and the rapid burst of energy will generate sparks and damage the battery and the PSU.

The risk of injury is also increased when the battery has a higher voltage, as a higher voltage makes it easier to ionize a thin layer of air between the two switching contacts, as required to produce a spark.



Physically isolating the battery from the battery tester/IT6000C for wiring is recommended. Adding an additional high-current DC contactor, relay or switch are the typical choices. However, the user is still at risk, as the arc at the moment of closure may cause contactor adhesion. Therefore, in addition to selecting the right contactor and ensuring that the voltage and current rating of the contactor selected meets the test requirements, it is also necessary to reduce the voltage difference between the two sides of the contactor.

Before closing the contactor connected to the battery and the battery tester, you should measure the voltage at both ends of the battery and set the parameter to the battery tester, turn on the output of the battery tester to pre-charge the terminal capacitor, and finally close the DC contactor when the battery tester voltage rises to the battery voltage, or ensure that the voltage difference is less than or equal to 200mV. At this point, as the potential difference between the two ends of the DC contactor is very close to 0, Hook-up Spark will be avoided.



### Reverse Polarity Protection

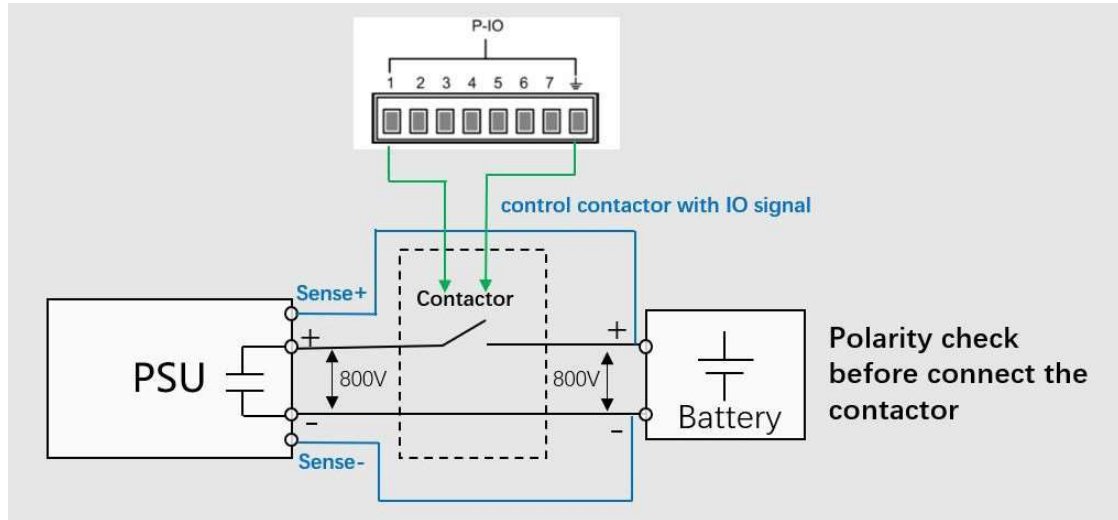
In order to ensure safe and reliable battery connection, you also need to verify the correct polarity of the battery connection before closing the contactor. The suggested steps are:

1. Check the battery polarity
2. Monitor the battery voltage
3. Pre-charge the terminal capacitor of the battery tester so that the voltage difference between the battery tester and the battery is less than 200mV
4. Finally close the contactor to connect the battery to the battery tester reliably after ensuring the correct battery polarity.

### Using the IT6000C to Increase Safety

The IT6000C series bi-directional DC source is the ideal battery charge/discharge tester and provides built-in remote measurement capability. The battery voltage is measured through the remote measurement terminal without the need to add an additional DVM meter. The Sense function for battery charge/discharge testing also serves to compensate for voltage drop on the line and to monitor real-time voltage at the battery end. Therefore, you can use a four-wire wiring scheme and indirectly drive the contactor through the IO pins on the back panel of the IT6000C, which can provide high or low output signals.

In the end, the perfect control wiring diagram for the battery anti-spark and anti-reverse connection is shown below.



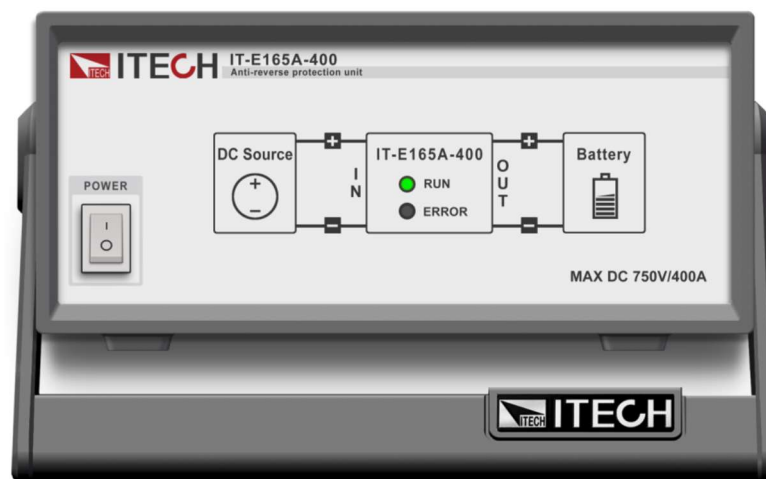
**Optional Accessory:**

To increase personnel and equipment safety and save engineers time, ITECH offers an optional accessory called the IT-E165A Reverse Polarity Protection module. It meets the high voltage/current testing protection requirements when physically connecting a battery to the ITECH bidirectional DC power supplies/battery tester. This option helps prevent sparks and damage to the battery and the PSU as a result of connecting the battery with reversed polarity.

IT-E165A-250	Anti-reverse protection module 750V/250A
IT-E165A-400	Anti-reverse protection module 750V/400A
IT-E165A-400	Anti-reverse protection module 900V/400A

The IT-E165A is in standard half 2U, 19"

The front panel is shown in the figure below.



The rear panel is shown in the figure below.



## How to Use

1. Make sure that the power of the battery, IT-E165A, and IT6000 is turned off.
2. Refer to the following diagram to connect the IT6000 series instrument and the DUT (battery).



Note: The green terminals Sense and IO on the rear panel are reserved terminals and do not need to be connected.

3. Connect the power cord of IT-E165A.
4. Start the battery and turn on the IT6000 power switch.
5. Turn on the Power switch of the IT-E165A.

If IT6000 (IN) and DUT (OUT) are not reversed, and the voltage difference between IT6000 (IN) and DUT (OUT) is less than 2V, the indicator will display RUN (green light);

If there is a reverse connection between IT6000 (IN) and DUT (OUT), or the voltage difference between IT6000 (IN) and DUT (OUT) is greater than 2V, the indicator will display ERROR (red light).

Please recheck whether IT6000 (IN) and DUT (OUT) are reversely connected, and make sure that the voltage difference between IT6000 (IN) and DUT (OUT) is less than 2V.

## **Conclusion**

ITECH IT6000C programmable bidirectional DC power supply is the ideal battery test solution to meet the diverse needs of stand-alone or integrated systems, and provides safe and reliable wiring, battery monitoring and watchdog functions in any mode of operation to protect the battery under test, the test equipment and ensure the safety of the user by cutting the circuit in time in case of system abnormalities.

We look forward to talk with you about your test applications and requirements! Should you have any questions, or need additional information, please don't hesitate to contact us.