

How to Select Power Supply In The Aerospace Test

Various kinds of electrical equipment with different functions are jointly applied to ensure the normal operation of the airplane, aircraft, satellite, etc., thereby making contribution to the long-term development of aerospace. The research, development, production and testing of such electrical equipment should be subject to multiple tests, including the reliability test, function test, protective action test, electromagnetic interference test, which mostly depend on the high-precision and high-performance programmable DC power supply. **In the aerospace field, the programmable DC power supply is mainly used in testing of DC-DC power supply modules, batteries, flight simulators and other DC electrical equipment.**

Reliability Test

The reliability test of electrical equipment generally includes the voltage drop test, temperature rise test, ON/OFF test, aging test. The electrical equipment for aerospace should be conducted with more strict tests than conventional ones, which requires the equipment to work steadily in condition of abnormal power supply besides normal condition. For example, the power supply system of the airplane, which supplies power to DC electrical equipment, may be subject to over-voltage or under-voltage sometimes, and the normal operation of such electrical equipment in case of any abnormality can guarantee the functions and safety of the airplane. Therefore, the over-voltage and under-voltage test is necessary. The DC power supply can simulate the power supply system in the test. The voltage changes of the airplane power supply system can be simulated by outputting a continuous voltage variation waveform, to supply the power to electrical equipment and test whether the electrical equipment can normally work under the over-voltage, under-voltage and normal voltage conditions. Fig. 1 shows the voltage waveform output by the airplane power supply system simulated by the DC power supply in the over-voltage and under-voltage test of electrical equipment on the airplane.

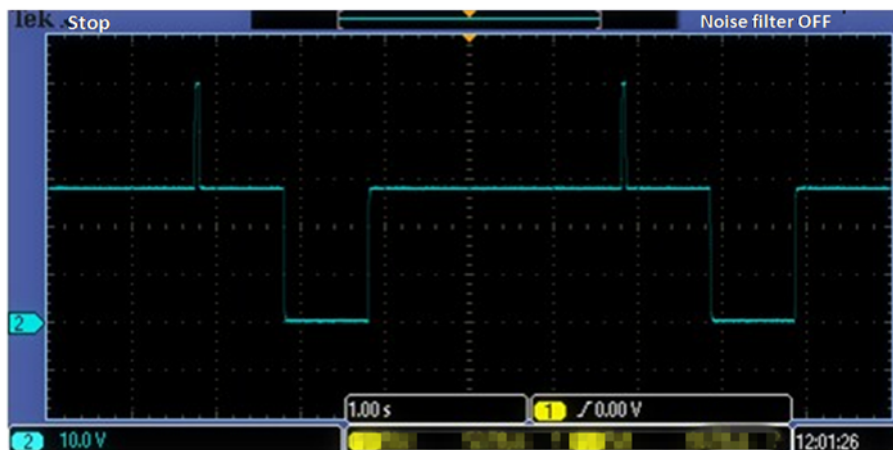


Fig. 1

The voltage of most airplane power supply systems is 28V. Therefore, the voltage of the output waveform of the DC power supply is 28V, kept for 5min. The 50V over-voltage surge is kept for

50ms, the normal power supply voltage for 10s and the 0V under-voltage surge for 7s. The cycle test should be done three times.

The waveform should be output by editing programming DC power supply. The programmable DC power supply series products of ITECH have the List function, which enables engineers to set the voltage and time through the number keys on the panel, simplifying waveform editing. In addition to the programming feature, the DC power supply used in the test must have the characters of high speed and short time of voltage rise; otherwise, the voltage cannot be changed in an extremely short time, and the working status of the airplane power supply system cannot be truly simulated. For example, the voltage rise time from 28V to 50V is only 50ms in the voltage waveform shown in Fig. 1, and then the voltage will drop to 28V. The voltage rise time of the ordinary DC power supply is approximately 150ms. Fig. 2 shows the voltage waveform output by the low-speed power supply.

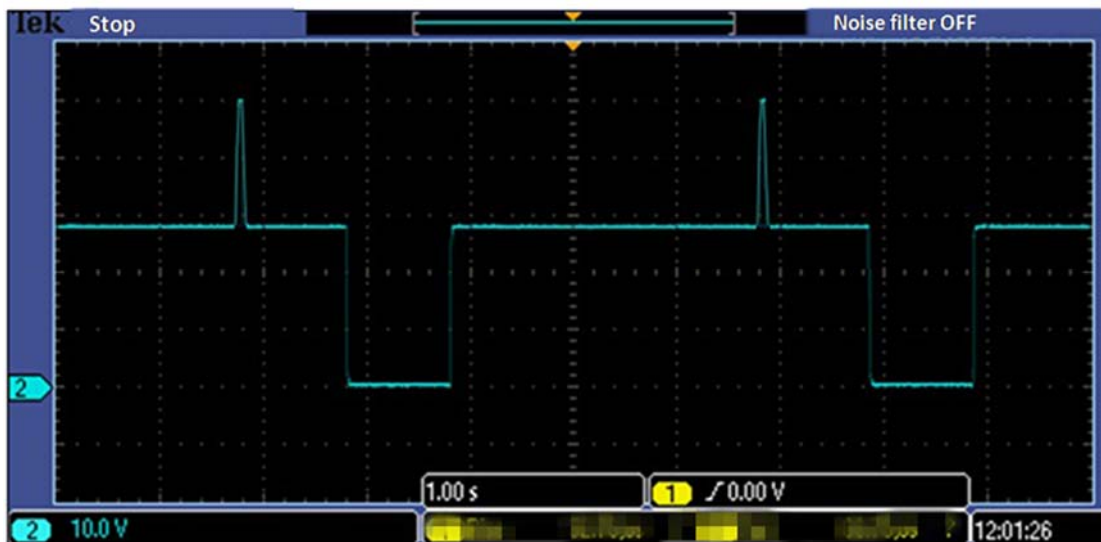


Fig. 2

According to the comparison of Fig. 2 and Fig. 1, it can be found that the voltage of the ordinary power supply rises or drops slowly and cannot meet the waveform requirement of the test. The voltage rise time of the programmable DC power supply of ITECH is less than 10ms; therefore, the DC power supply can be applied in precision tests of the aerospace field.

Aging Test

The aging test is necessary for electronic equipment, particularly for electric equipment in the aerospace field. As the aircraft and spacecraft generally run a long time in the atmosphere or space, the aging test of electrical equipment is important. In the aging test, the DC power supply is mainly used for continuously supplying power to the tested equipment in a long time. Therefore, the capability of long-time steady operation is a necessary factor of the power supply for the aging test. Fig. 3 is the schematic diagram of aging of the DC-DC power supply module.

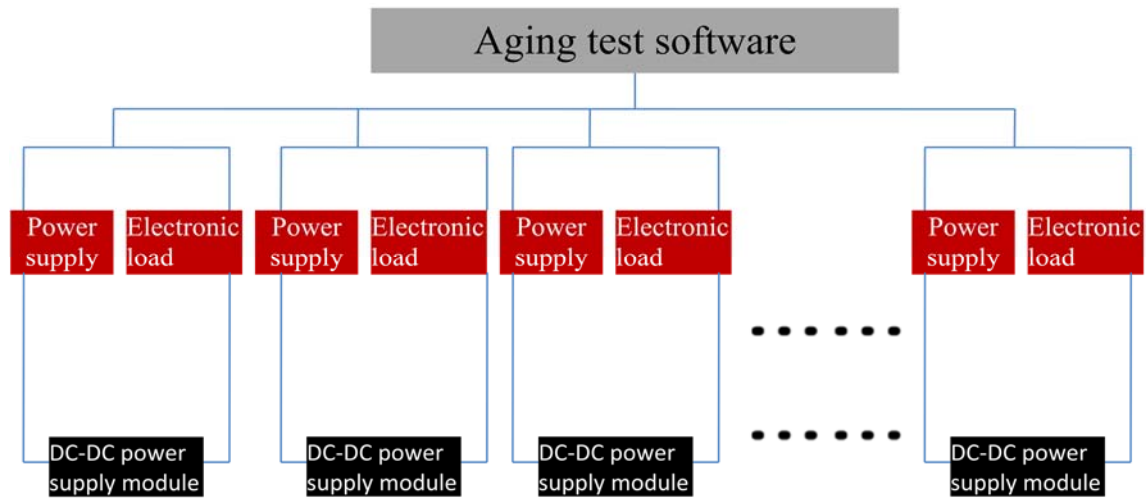


Fig. 3

As shown in Fig. 3, as the aging test time is long, an aging cabinet consisting of multiple power supplies and electronic loads should be provided. The simultaneous aging of hundreds of DC-DC power supply modules can be realized by means of software monitoring.

Considering the convenience of installation on the rack and the conservation of space in the cabinet, the DC power supply series products of ITECH are manufactured with the standard size and high power density. Considering the energy consumption of power supplies, electronic loads and other testing equipment in the long-time aging test, the products of ITECH are designed with the intelligent fan, which can not only achieve good cooling performance but also can save power. Considering the communication of the testing equipment and aging test software, the DC power supplies of ITECH are provided with a number of built-in interfaces as the best choice, thereby saving the costs for interface purchase and configuration. Besides, the built-in interfaces can help to improve the communication speed and stability, with general communication speed of less than 30ms. In addition, the temperature drift coefficient of the DC power supply series products of ITECH is small, which can ensure the stable voltage and current in the long-time aging test and the continuity and accuracy of the test.

Electromagnetic Interference Test

The electronic devices of airplanes, satellites and other aerospace equipment are respectively used to realize different functions to complete flight tasks. However, almost all of electronic devices can produce electromagnetic waves during operation, causing interference to other devices. For example, the cockpit of the airplane is equipped with a number of electronic communication devices, and once such devices fail to work normally as a result of electromagnetic interference, serious consequences will occur. Therefore, the electromagnetic interference test of the aerospace field has been concerned by engineers for a long time. Note that the power supply to energize the tested object in the electromagnetic interference test will be affected by electromagnetic interference. In case of poor anti-interference capability, the power supply may fail to normally energize the tested object, and the test will fail. The output of the ordinary power supply will be

subject to serious ripple interference in this environment and even failure of normal output. Therefore, the anti-interference capability of the power supply in the test should be taken into account in the aerospace field. The power supply series products of ITECH are provided with the complete shielding protection, which can effectively prevent all kinds of interference.

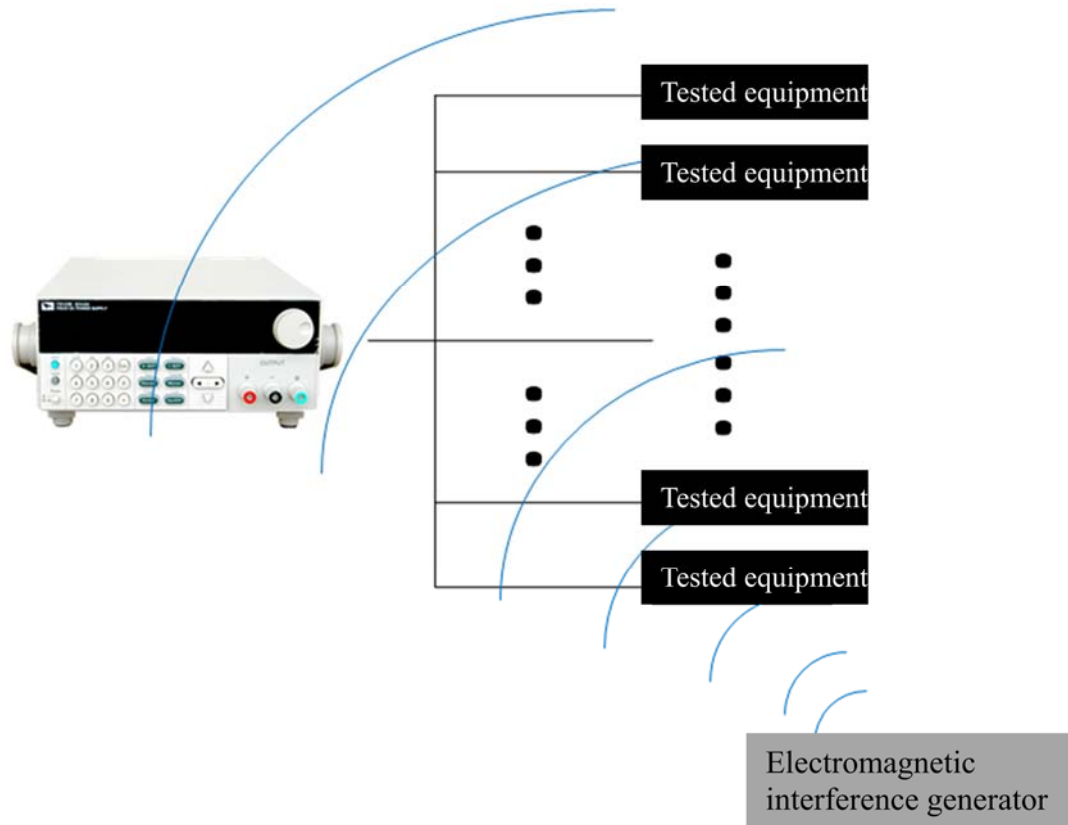


Fig. 4

Function Test

The value of electrical equipment in the aerospace field lies in their functions. The DC power supply should meet more stringent requirements in the function test. Due to the diversity and complexity of electrical equipment of the airplane and the irregular opening or closing of multiple devices, the load regulation rate and response time of the power supply should comply with the stringent requirements. In case of low response speed, the power supply may be subject to outage and other faults when the tested electrical equipment is opened and closed irregularly, resulting in failure of the test. Therefore, attention should be paid to the load regulation rate and response time of the power supply.

Protective Action Test

The electronic devices of the aircraft or spacecraft are set in parallel in the circuit of the power supply system; therefore, engineers should consider the influence on other devices in case of abnormality of one device. In the protective action test, the circuit should be cut off promptly in case of abnormality of any electronic device, to prevent the power line from burning and the other



devices from being affected. Therefore, the normal operation of the power supply should be ensured in case of abnormality of one or more electronic device(s) to avoid the influence on other devices. In the test, multiple electronic devices are driven by one DC power supply, and one or more tested device(s) are made abnormal to test the influence on other circuits. The power supply should meet certain requirements. As for the ordinary power supply, all the circuits may be directly cut off in case of abnormality of one device (such as short-circuiting), and the test will fail. The power supply of ITECH has the delay protection function, which can ensure the normal power supply and test continuity in case of failure of one tested device.

Generally, the programmable DC power supply is necessary in the reliability, function, protection, electromagnetic interference and aging test of electronic equipment of the aerospace field. It is mainly used for energizing the tested equipment and simulating the operating environment to output different kinds of voltage waveform and achieve the testing purposes. In summary, the programmable DC power supply should be selected according to the following requirements:

1. Programming function
2. Short time of voltage rise
3. High stability
4. Standard size
5. Good cooling performance
6. High communication speed
7. Good anti-interference capability
8. Good load regulation rate and response time
9. Delay protection function

Based on comprehensive considerations, the DC power supply series of ITECH are the best choices, including the following options:

[IT6100/IT6100B high-precision DC power supply series](#)

[IT6500 wide-range high-power DC power supply series](#)

Optional power supplies for the aging test:

[IT6900A multi-functional programmable DC power supply series](#)



Via Acquanera, 29 22100 COMO
tel. 031.526.566 (r.a.) fax 031.507.984
info@calpower.it www.calpower.it