



# Simulation Software for Power System of Aerospace and Ship





In aircraft and ships, there is always a conflict between the power supply system and the electric equipment. The electric equipment require an uninterrupted, transient-free, pure sine wave AC power supply and a pulsation-free, transient-free DC power supply. The power supply system, however, expects the electric equipment to have a constant load and no distortion of the voltage waveform due to load fluctuations. In fact, neither of them can reach idealized conditions, so some compromises are made. In this case, the aircraft power supply characteristics standards are established and continuously improved, defining the permissible limits for the output of the power supply system, and requiring the on-board electrical equipment to meet the corresponding design specifications within the accepted permissible power supply disturbance limits as well.

## Military and civil aviation regulations and standards

Aircraft power supply characteristics standards specify the power supply characteristics of the electrical equipment. There are different standards between military and civil aviation. For example, the U.S. military standard MIL-STD-704 is applicable to military aircraft, which specifies the electrical requirements of the electrical equipment of military aircraft and how the electrical equipment should work under various power supply conditions. Common power supply states include normal operating conditions, abnormal operating conditions, overvoltage and undervoltage, frequency modulation, etc.

Other power supply standards are applicable to civil aircraft, such as the RTCA standard DO-160 "Environmental Conditions and Test Methods for Airborne Electric Equipment". It covers a variety of power supply disturbances such as voltage dips, short interruptions, harmonic distortion, etc. In addition, top commercial aircraft manufacturers often have their own standards, such as Airbus' ABD and AMD standards, and boeing's 787 standard. These standards are very valuable references for the design of electrical systems of large passenger aircraft, and place higher requirements on the ability of electrical equipment to withstand disturbances.

## AC/DC power system

Aircraft power supply system has experienced the development process of low-voltage DC, AC, high-voltage DC, where the AC power supply has experienced constant speed constant frequency (400Hz), variable speed constant frequency and variable speed variable frequency (360Hz-800Hz). The Boeing 787 aircraft power distribution system, for example, uses four power supply systems, 230VAC, 115VAC, 28VDC and 270VDC to supply power to the electric equipment.

## Test challenges for aircraft electric equipment

Power supply suitability testing of avionics equipment is very complex and time consuming. Even experienced engineers may spend weeks researching regulatory test conditions and getting the waveforms to output successfully on a powerful programmable AC/DC power supply. It requires to repeatedly study custom waveform editing and even understand secondary development instructions for automate testing and obtaining perfect test reports. In addition, choosing a high-speed AC/DC power supply with powerful waveform simulation is also important for successful testing.

## APS4000- Optional software for power system of aerospace and ship

To accelerate the verification of power supply adaptability for electrical equipment on aircraft, ITECH presents you with the APS4000 aviation and ship regulations software. Equipped with the IT7800/IT7900P series high performance programmable AC/DC power supplies, it can help to achieve various DC and AC output waveforms as specified in aircraft power supply standards, such as harmonic distortion, non-normal voltage transients, etc. The APS4000 has a user-friendly GUI. It has built-in test items that correspond to the regulations, you only need to select the correct item number to start the correspondent test, which largely saves your time on editing and configuration.

## Features and Advantages of APS4000

APS4000 aviation and ship regulations software can be used with ITECH IT7800/IT7900P high performance programmable AC/DC power supply to provide 5kVA-960kVA and 16Hz~2400Hz power supply output for electric equipment. The software has built-in mainstream military and commercial aircraft power supply characteristics standards, such as MIL-STD-704, DO160, A350, A380, GJB181B, HB20326 and MIL1399, etc., which can realistically reproduce a variety of AC and DC power supply systems in the aviation field, including DC 270Vdc, 28Vdc, single-phase AC 115V/400Hz, three-phase AC 115V/400Hz and wide frequency range 360Hz-800Hz. The APS4000 includes four models, the APS4000-ASTD, APS4000-B787&AMD, APS4000-AVALL and APS4000 1399, which can cover different applications. The user-friendly GUI of the software helps to quickly select test items and complete the test.

### Advantage of AC/DC power supply:

- Adopt next generation SiC technology, high power density design
- 15kVA in 3U, master-slave parallel up to 960kVA
- Voltage range: 0-350V L-N, reverse mode up to 700V L-N
- Up to 50th harmonic simulation and analysis function
- Four output modes: AC/DC/AC+DC/DC+AC
- Single-phase/three-phase output
- Powerful power supply waveform simulation function: LIST / user-defined waveform
- Built-in EC61000-4-11/4-13/4-14/4-28 regulation waveform
- Built-in USB/CAN/LAN/Digital IO communication interface

### Advantage of APS4000:

- User-friendly GUI, easy to operate
- Provide MIL-STD-704, DO160, A350, A380, GJB181B, HB20326, B787 and AMD regulatory standards
- Provide MIL 1399 power supply adaptability test standard for marine electrical equipment
- Provide single/three-phase output parameter setting and measurement interface
- Flexibility to run all test items or specified number of test items
- Automatic generation of test reports



## APS4000 Models

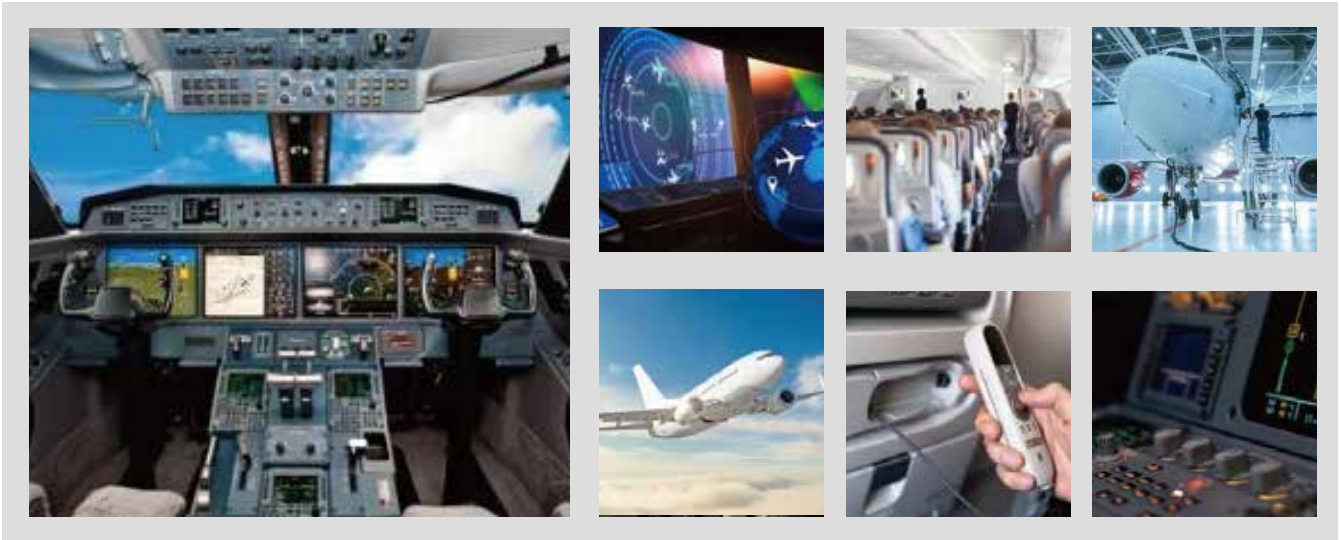
Model	Regulatory Standards	Revision
APS4000-ASTD	MIL-STD-704、DO160、ABD0100.1.8 (A380)、ABD0100.1.8.1 (A350)、GJB181B、HB20326	MIL-STD-704: Rev A/B/C/D/E/F DO160: Rev E/F/G
APS4000-B787&AMD	B787、AMD24C (A400M)	A380: Rev D/E
APS4000-AVALL	MIL-STD-704、DO160、ABD0100.1.8 (A380)、ABD0100.1.8.1 (A350)、GJB181B、HB20326、B787、AMD24C (A400M)	A350: Rev B/C GJB181B: Rev B
APS4000-1399	MIL-STD-1399-300	HB20326: Rev 2016

\* APS4000-B787&AMD, APS4000-AVALL Stay tuned



## Application

- Cabin entertainment systems
- Aircraft lighting system
- Airborne radar system
- Communication and navigation Systems
- Flight recording system
- Cockpit display system
- Aircraft control systems
- Atmospheric data and inertial reference systems



## GUI of APS4000

Install the optional software APS4000 and connect it to ITECH AC/DC power supply, you just need several simple procedures to complete various avionics tests.

1. Select the regulatory standard, such as MIL-STD 704.
2. Select the appropriate revision number, such as MIL704 RevF or RevE
3. Select the correct operating mode, DC or AC.
4. Select test serial number, such as HD101 , HD102...
5. Select running mode: Run all steps/ Run single step/Loop single step.
6. Click and start the test.



# Test Items

Take MIL-STD 704 military aircraft test standard as an example, APS4000-ASTD provides 6 test versions from RevA~RevF. You can choose any one of them and configure the corresponding power supply voltage. For example, when you select the RevF version, multiple voltage options below will appear in the voltage column of the software.

Power supply mode	Specification	Rated voltage	Rated frequency	Phase
SAC	single-phase constant frequency 115Vac/400Hz	115Vrms L-N	400Hz	1 $\phi$
TAC	three-phase constant frequency 115Vac/400Hz	115Vrms L-N	400Hz	3 $\phi$
SVF	single-phase constant frequency 115Vac	115Vrms L-N	360Hz-800Hz	1 $\phi$
TVF	three-phase constant frequency 115Vac	115Vrms L-N	360Hz-800Hz	3 $\phi$
SXF	single-phase constant frequency 115Vac/60Hz	115Vrms L-N	60Hz	1 $\phi$
LDC	MIL-STD-704 standard compliance test of 28V DC electric equipment	28Vdc	N/A	N/A
HDC	MIL-STD-704 standard compliance test of 270V DC electric equipment	270Vdc	N/A	N/A

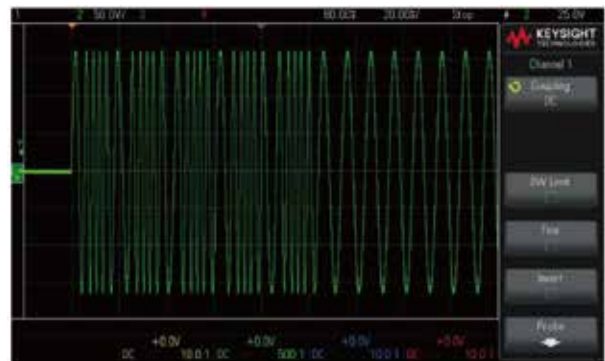
Just select the type of output, such as SAC (Single Phase Constant Frequency 115Vac), the software will automatically switch to the test item number under the SAC power supply system, containing SAS101-SAC603. The APS4000 allows you to select the test sequence to be performed and click the Run button to make the test easier and save configuration time.

Regulations Category RevF SAC Execution Mode Run all steps Run/Stop

Method	Subject	Test Condition	Comment
	Normal Voltage Transients (Repetitive)	90V RMS to 140V RMS	Not less than ^
SAC110	Normal Frequency Transients (Overfrequency)	High Frequency 425Hz	TABLE SAC1
	Normal Frequency Transients (Underfrequency)	Low Frequency 375Hz	TABLE SAC1
	Normal Frequency Transients (Combined)	375Hz to 425Hz	TABLE SAC1
SAC201	Power Interrupt	0V RMS for 50msec	TABLE SAC2
SAC301	Abnormal Steady State Limits for Voltage and Frequency	100V RMS to 125V RMS, 380Hz to 420Hz	TABLE SAC3 v



LDC302 28V abnormal voltage transients (overvoltage)



SAC303 115Vac abnormal frequency transients (over frequency)



This information is subject to change without notice. For more information, please contact ITECH.

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