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Research on Special Automatic Test Technology of Antenna Subsystem SAR Antenna Secondary Power Supply Based on High Resolution 0.3 m SARGMTI Satellite System

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Research on Special Automatic Test Technology of Antenna Subsystem SAR Antenna Secondary Power Supply Based on High Resolution 0.3 m SAR/GMTI Satellite System

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Abstract. According to high resolution 0.3m SAR/GMTI satellite subsystem antenna subsystem SAR antenna secondary power supply (hereinafter referred to as secondary power supply) multi-channel output, low output voltage, large current pulse load and a series of characteristics, this automatic test system through VEE software to the secondary power program in-depth development and improvement, and through the GPIB line control hardware equipment instrument, the realization of secondary power multi-channel simultaneous monitoring output waveform, multi-frequency special, command automatic switch machine, etc. test efficiency and reliability. Through the analysis and optimization of the test items of the secondary power supply, the automatic test system has designed a general programmable program, and can be applied to a variety of secondary power modules and single machine, the compatibility is very strong. At present, this automatic test system has been applied to the test of multiple types of SAR antenna secondary power supply, the test quality is 100% correct, the efficiency is greatly improved, and the results are remarkable.

Keywords: System; VEE Software; High Resolution 0.3 mSAR; Secondary Power Supply;

1 Overview

The high-resolution 0.3 m SAR/GMTI satellite subsystem antenna subsystem SAR antenna secondary power supply (hereinafter referred to as secondary power supply) is to transform the direct current provided by the satellite battery through the distributor into the normal operation power of the T/R component, wave control and delay line single machine in the array antenna module; receive the switch machine signal from the antenna distributor to realize the switch machine action; send the relevant monitoring signal according to the system requirements. As a major project of Earth observation system, the project breaks the foreign technology blockade, realizes the localization of core power MOS devices, breaks the embargo restrictions, and realizes the independent controllability of key products. At present, the project has been applied to a major national high-score project, which is characterized by small volume, light weight, high power density, conversion efficiency up to 92.5%, single star assembly up to 108 units, has been in the domestic aerospace products leading level.

In order to meet the requirements of the large number of the project, the large amount of test data and the complexity of the test project, aiming at the characteristics of multiple output, low output voltage and large current pulse load of the secondary power supply, this paper puts forward the deep development and improvement of the special automatic test system of the secondary power supply, and modifies the test system through hardware configuration and software system. Among them, the hardware configuration is optimized by improving the test tooling, electronic load, oscilloscope, data collector and other equipment, and the software system improves the efficiency of the test system by HP VEE the visual programming software. The test system has high test efficiency, strong test coverage, The characteristics of high degree of automation, software autonomous development and automatic data interpretation function.

2 Composition of automated testing systems

The automatic test system of satellite power supply is a special test equipment for testing satellite secondary power supply, which is mainly composed of hardware configuration and software system. Nowadays, most of the hardware equipment such as oscilloscope, electronic load, DC power supply and digital collector used in the debugging and testing process of 0.3 m SAR secondary power supply is provided by Agilent Company. Its hardware equipment is characterized by good program control, and each equipment is connected with industrial control computer through special GPIB cable, and finally realizes the program control function of software to each hardware equipment. Debug testers make use of H developed by Agilent based on the characteristics of their hardware

2.1 Hardware configuration of automated test systems

The automatic test system of satellite power supply is a special test equipment for testing satellite secondary power supply, which is mainly composed of hardware configuration and software system. Hardware configuration for 0.3 m SAR secondary power supply mainly includes: power supply, electronic load, oscilloscope, data collector, industrial control computer composition. Because the interface of the tested secondary power supply does not conform to the standard generalization, a universal transfer box is designed to connect the secondary power supply with the hardware equipment, and the hardware equipment is connected with each other through the GPIB bus to reach a closed loop path with the industrial control computer. equipment to achieve the total electrical performance index test of the secondary power supply. Figure 1 is the secondary power automatic test system configuration.

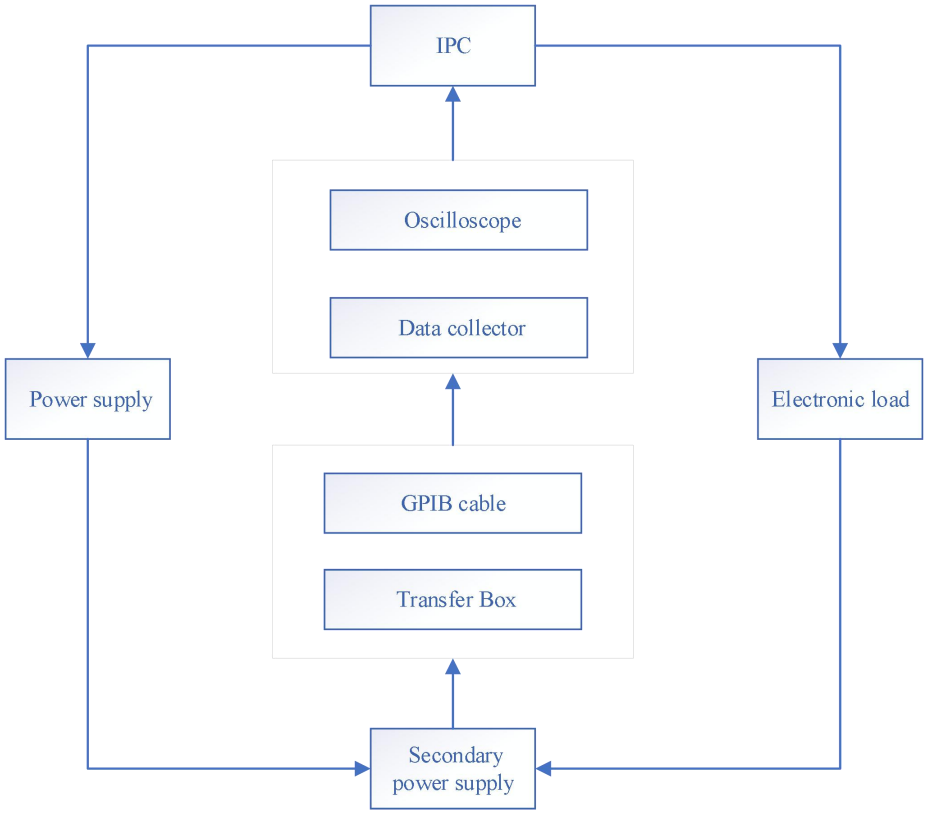

Fig .1. Configuration of secondary power automatic test system

2.2 Design and implementation of automated test system software system

2.2.1 Design of Test System Software System

Based on the special requirements of 0.3 m SAR secondary power supply, the system improves and optimizes the implementation of instruction and automatic multi-channel output and special step respectively, thus realizing the system one-bond test.

(1) Implementation of instruction and automated multiplex output

According to the characteristics of multiple output and large current pulse load of secondary power supply, this software designs a fully automated test method, that is, the whole process one-key test. For secondary power multi-channel output, this software realizes automatic multi-channel output by writing instruction program and adapting the statement selected by oscilloscope channel, such as figure 2 instruction program and figure 3 multi-channel output channel selection statement.

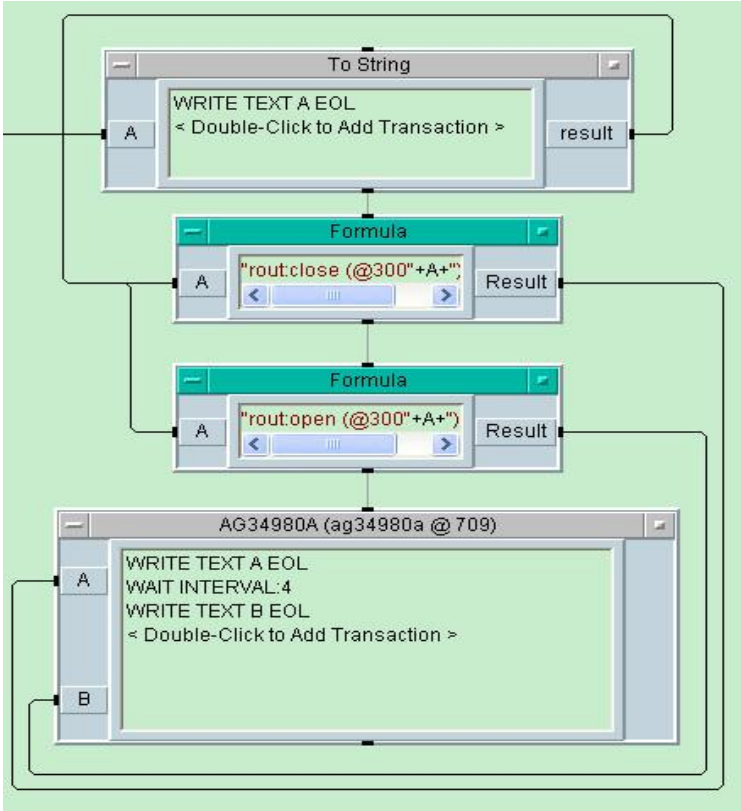

Fig. 2. Instructional Procedures

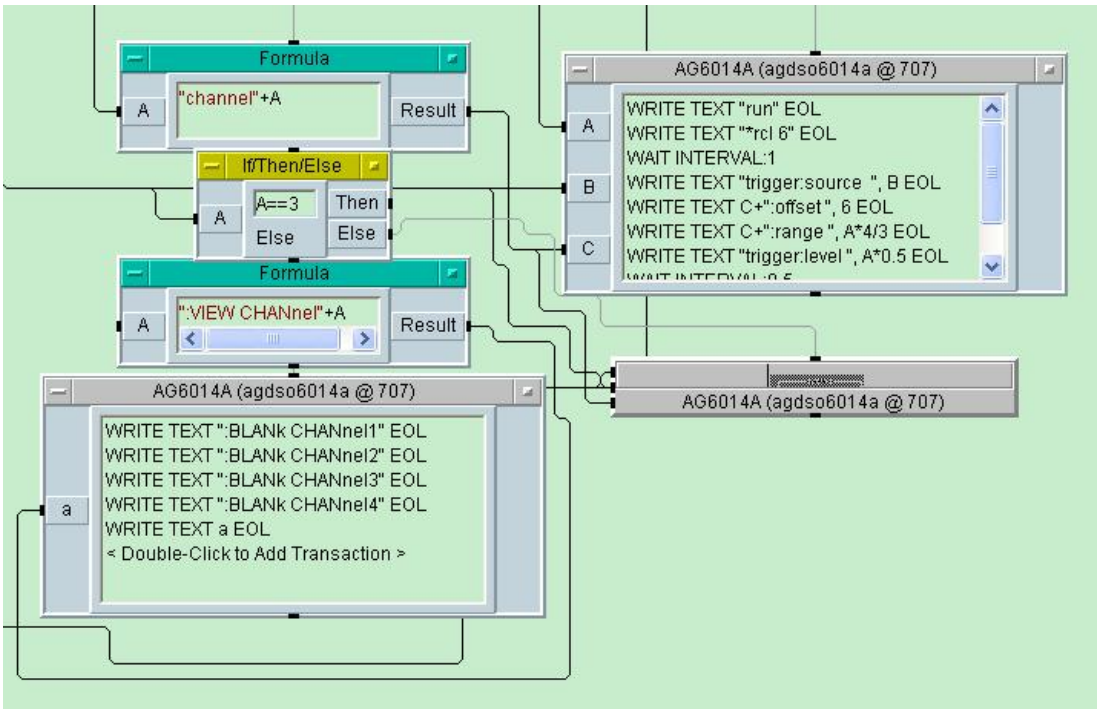

Fig .3. Multiple Output Channel Selection Statement

(2) Implementation of special steps

According to the requirement of the special step of 0.3 m SAR secondary power supply, three functional modules are connected in series to realize the special step, as shown in figure 4, where each functional module needs to change the frequency to realize the special step, as shown in figure 5.

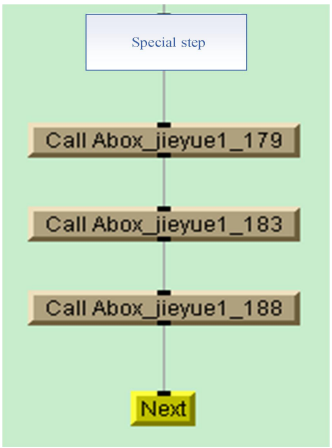

Fig .4. Implementation of special step

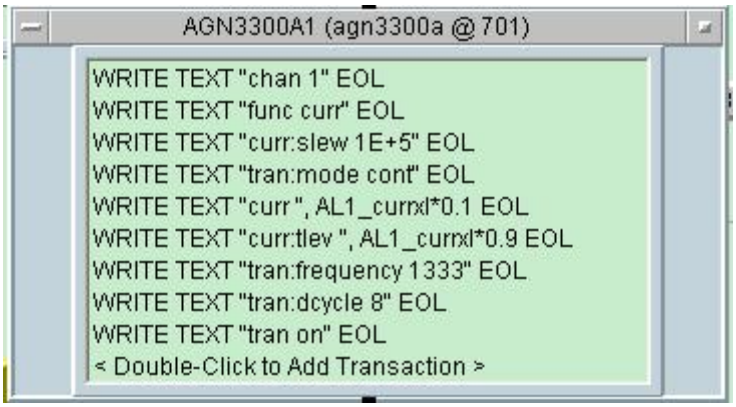

Fig .5. Realization of Special Step of Single Function Module

3 Characteristics of automated test systems

The test object of this test system is 0.3 m SAR secondary power supply. the main parameters of the test include: stability test, telemetry and telemetry impedance test, overcurrent test, input surge test, input reflection ripple test, dynamic test, etc. The main functions of the test system are:

(1) High test efficiency

Taking 0.3 m SAR secondary power supply as an example, the traditional manual test of 1 power supply takes 2.5 hours, while the actual test time of the automated test system is 20 minutes, and the test efficiency is increased by 87%, which lays a solid foundation for the batch production, commissioning, testing and acceptance delivery of subsequent products.

(2) Strong test coverage

0.3 m SAR The main parameters of the secondary power supply test include: stability test, telemetry and telemetry impedance test, overcurrent test, input surge test, input reflection ripple test, dynamic test, etc. he test system can automatically measure all electrical performance indicators and save the test data automatically in the EXCEL table. Figure 6 0.3 m SAR Power test interface

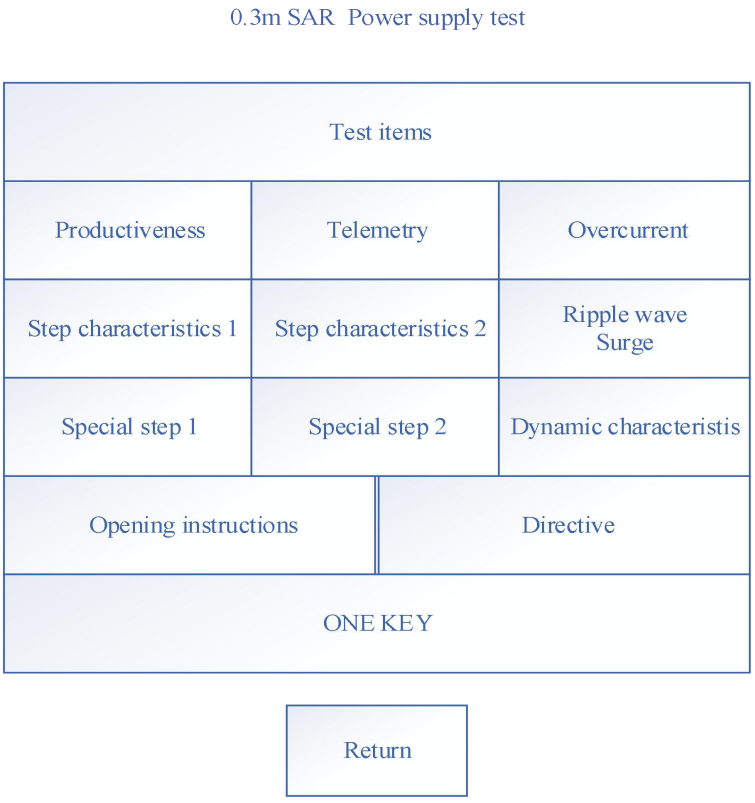

Fig .6. 0.3 m SAR Power Test Interface

(3) High degree of automation

The whole test process is completely controlled by the test system, and the one-click test does not need the tester to operate the test system manually during the running of the program, so as to put an end to the risk hidden danger caused by human error in operation.

(4) Autonomous software development

The implementation core of the automated test system is to write the test program, according to the test program issued different instructions to call each device, and the data detected by the device is automatically stored in the table to achieve automatic processing. HP VEE language is the bridge to realize the combination of software and hardware, and the debugging tester writes the test software independently, which not only saves the cost, but also improves the development efficiency of the subsequent module power test system, and is also easy to maintain.

(5) Automatic data interpretation function

Automatic test system tries to save the data of the measured secondary power supply to the specified EXCEL table automatically. In order to ensure the validity of the data, the automatic data interpretation function is added, and the highlight of the error data is added. It can quickly judge whether the test data of the product meets the requirements of the index, avoid artificial misjudgment, and ensure the validity of the final test data.

4 Concluding remarks

To meet the technical requirements of high-resolution 0.3 m SAR/GMTI satellite subsystem antenna subsystem bus isolator, this test system has carried out the special software design of secondary power supply products, and carried out programming and testing work according to the requirements of each test item and some special requirements. This special test scheme is carried out on the basis of fully inheriting the mature test technology, and realizes the test system one-key test, which can meet the high power, large current, multi-output, high reliability index and use requirements of 0.3 m SAR subsystem antenna subsystem bus isolator.

At present, through the development and expansion of the test system, this test scheme has been applied to the testing of various SAR satellite background models, which makes the testing efficiency of batch products significantly improved, giving full play to the ability of automation equipment and digital technology, and laying a solid foundation for the subsequent batch aerospace products.

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