IMAGE FUV HVPS

Power Converter Test Procedure

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UCB/SSL 8246

Revision History:

8246-A	initial release
8246-B	revised post conformal test
8246-C	revised 2.2, 2.3, 4.1.4, 4.1.5, Appendix1 4.1

1. GENERAL

1.1 Scope

The purpose of this procedure is to define the in-process and acceptance inspection requirements as well as the performance criteria for the IMAGE FUV HVPS P/N 8227 to 8231.

1.2 Reference Documents

Unless otherwise specified, the most recent revisions of the following documents apply to this test procedure.

1.2.1. Drawings

8227 Assembly, HVPS Converter, SI END
8228 Assembly, HVPS Converter, SI SIDE
8229 Assembly, HVPS Converter, GEO
8230 Assembly, HVPS Converter, WIC PHOSPHOR
8231 Assembly, HVPS Converter, WIC MCP
XXX Parts List, HVPS Converter Assembly
8011 Schematic, HVPS Converter Assembly
XXX Schematic, DC Supply Tester

1.3. Forms

Required forms are covered in Appendix 1

1.4. Safety

As voltages as high as 10,000 Volts are present, it is necessary to maintain caution whenever power is applied to the supply. To protect from electrostatic damage, it is necessary to wear a properly grounded wrist strap when contact with the supply is required.

1.4.1. Analysis of Hazards

See 1.4 above.

1.5. Controls

1.5.1. Contamination

Test operator and quality assurance personnel shall conform to the contamination control requirements specified for the facility in use. Clean protective gloves shall be worn when handling the supply.

1.5.2. Other Controls

The power supply under test, all test equipment, and the test operator shall be properly grounded to prevent electrostatic discharge (ESD).

1.6. Performance Assurance

1.6.1. General Provisions

Quality assurance personnel shall be appraised of and be able to monitor procedural steps of testing and witness specified measurements. All equipment and fixtures required for inspections and tests shall bear traceable markings and, as applicable current calibration. Recall dates must allow for completion of testing without equipment exchange. Inspections and test records shall be maintained using forms supplied in this document.

1.6.2. Testing Prerequisites

(1) Initially, the power supply to be tested, hereafter referred to as the Unit Under Test (UUT), shall be fully assembled. Select-at-test components may or may not be installed as appropriate to the test procedure.

(2) Final staking and conformal coating shall be performed after satisfactory completion of the test activities through section 4.

2. PREPARATION FOR TEST

2.1. Facilities

Tests shall be performed in an ESD-controlled area meeting cleanliness standard of class 300,000 of better, per the definition of Fed Standard #209.

2.2. Equipment List

The following test equipment or its equivalent is required to test the Image HVPS:

Quantity	Description
2	Bench Power Supply, Power Designs, TP340A (+/- 12 Volts)
1	Oscilloscope, Tektronix 2445B
2	Digital Multimeters, Fluke 85
1	Current Probe, Tektronix AM503
1	Frequency Counter, HP5316B
1	Spectrum Analyzer, Hewlett Packard 3585B
1	Precision Power Supply, Power Designs 2020B

Record equipment serial numbers in Appendix 1.

2.3. Accessories, Fixtures

Standard cables and connectors as required.

2.4. Test Set-ups

Refer to Appendix 1.

3. PRELIMINARY TESTS AND ADJUSTMENTS

3.1. Pre-Power Application Visual Inspection

Visually inspect the unit for loose hardware, foreign materials, workmanship defects, and any other conditions which might result in improper operation or damage to the UUT. Record findings requiring correction by fabrication in NMR (Non-Conforming Material Report).

3.1.1. Preparation For Test

Check for supply to ground and supply - supply shorts using a multimeter
Check thermistor resistance measuring between pins 9 and 6 with a multimeter
Make sure all supply voltages are at zero volts.
Check straps are in correct holes
Connect the unit to the test setup shown in figure 1, appendix 1 except for spectrum analyzer

4. PRE- CONFORMAL COAT TESTS

Section 4. is to be performed on a flight unit prior to conformal coating in flight configuration with all flight hardware installed.

4.1. Basic Functional Test

Record the results in appendix 1.

4.1.1 Apply –17 Volts. Record the current on the meter monitoring the +12 current.

4.1.2 Apply ±12 Volts gradually. Note oscillation of supply between ±1 volt to ±5 volts using a scope probe at collector of Q2. Oscillation should cease by ~ ±6 volts. Raise the ±12 Volts to ±12 Volts. Note the current on the +12 supply.

4.1.3 Connect the oscilloscope to the collector of one of the transistors in the supply, and observe the waveform. There should be only a dc offset.

4.1.4 Set the programmable Vcontrol supply to 1.000 Volts. The collector waveform should be a sinusoid with flattened tops. Here is a table of Vout versus the control voltage for different supplies. There is a ± 2% tolerance on the voltages. Do not exceed 3000 volts on an uncoated supply.

Vcontrol	Vout -6500	Vout 5000	Vout 3500	Vout -2500
1.000	-1300	1000	700	-500
2.000	-2600	2000	1400	-1000
3.000	-3900	3000	2100	-1500
4.000	-5200	4000	2800	-2000
5.000	-6500	5000	3500	-2500

4.1.5 Measure the I mon output voltage. With 2000 volts output and 100 megohm load the value is approximately1.2 volts. This value should always be positive.

4.2. Output Ripple Measurement

Turn off the supply. Configure the ripple test set – up, turn the supply on, and set the control voltage to achieve 1000 Volts out. Measure the peak to peak ripple with both top and bottom covers installed.

4.3. Emissions Measurement

Set the AM503 to AC, 10mA/Div, 5 MHz bandwidth. Degauss the probe tip. Monitor the AM503 output with an oscilloscope or DMM and adjust the DC level until the output reaches 0 volts. Connect the test setup shown in Appendix 1 Figure 1. Set the spectrum analyzer to input from the 50ς jack, autorange, display voltage, and sweep from 100kHZ to 600kHz.

5. POST- CONFORMAL COAT TESTS

Section 5. is to be performed on a completed conformal coated and staked flight unit in flight configuration with all flight hardware installed.

5.1. Weight Measurement

Weigh the completed unit without the input and output connector savers installed and record in Appendix 1. Install connector savers on the input and output connectors.

5.2. Functional Test

Perform 4.1.1, 4.1.4 to the maximum output voltage, 4.1.5 at the maximum output voltage and the tests in this section.

5.2.1. Efficiency

With a 100 Megohm load, as in appendix 1, figure 1, adjust the supply to provide its maximum output. Note the maximum output voltage varies with the unit. Record the 12 volt current, and calculate the efficiency.

5.2.2. Frequency

Using the test set up in figure 1, appendix 1 remove the top cover and lay a probe near the transformer as a “sniffer”. Program the supply to it’s maximum voltage and measure and record its operating frequency

Power down and disconnect the test setup upon conclusion of the test.

APPENDIX 1

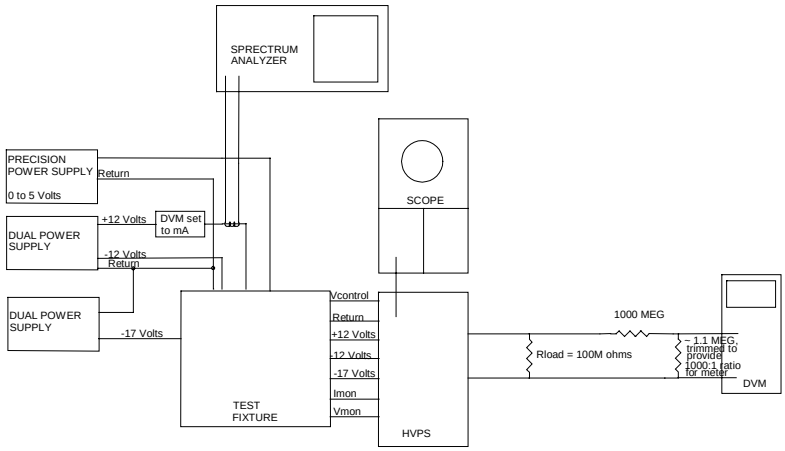

Figure 1 Test Setup

Serial Number (SSL okay)

2	Bench Power Supply, Power Designs, TP340A (+/- 12 Volts)	
1	Oscilloscope, Tektronix 2245B	
2	Digital Multimeters, Fluke 85	
1	Current Probe, Tektronix AM503	
2	Frequency Counter, HP5316B	
1	Spectrum Analyzer, Hewlett Packard 3585B	
1	Precision Power Supply, Power Designs 2020B	

3.1.1. Preparation For Test

+12 to –12
+12 to return
-12 to return
+12 to –17
-12 to –17
-17 to return

Thermistor resistance 9.8<R<10.2 _____Kohms
Check strapping:

Part Number, Voltage	R8	R14	XFMR	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14
8011-R7-I-1 -6500V	yes	383K	8179 - 04	E2	E1	-	E5	E4	E7	E6	-	E11	E14	E9	E13	E12	E10
8011-R7-I-2 +5000V	no	499K	8179 – 05	E3	E4	E1	E2	E6	E5	-	E12	E13	E11,E14	E10	E8	E9	E10
8011-R7-I-3 +3500V	no	715K	8179 – 06	E3	E4	E1	E2	E6	E5	-	E12	E13	E11,E14	E10	E8	E9	E10
8011-R7-I-4 -2500V	yes	1.00M	8179 - 05	E2	E1	-	E5	E4	E7	E6	-	E11	E14	E9	E13	E12	E10

Figure 2 Strapping Table

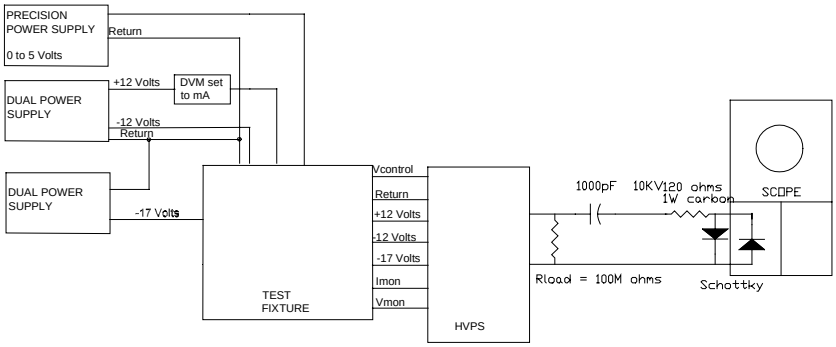

Figure 3 Ripple Setup

4.1. Basic Functional Test

-17 Volt Current 1.5<I17<2.5 mA _____
Oscillation Cessation _____
Current on the +12 supply _____

Vcontrol	Vout -6500	Vout 5000	Vout 3500	Vout –2500	Current, mA
1.000					
2.000					
3.000	x				
4.000	x	x			
5.000	x	x			

Imon output voltage with 2000 volts output and 100 meg load _____1.1<V<1.3

Note Vcontrol _____Volts

4.2 Ripple Measurement _____mVolts

Note Vcontrol _____Volts

4.3. Emissions

Fundamental _____
First harmonic _____
Second Harmonic _____

5.0

-17 Volt Current 1.5<I17<2.5 mA _____

Vcontrol	Vout -6500	Vout 5000	Vout 3500	Vout –2500	Current, mA
1.000					
2.000					
3.000					
4.000					
5.000					

5.1 Weight is less than 200g _____

5.2.2 Efficiency

$$Efficiency = \left[\frac{(V_{MAX})^2 / 100 \times 10^6}{24 \times I_{12}} \right] \times 100\%$$

Where I_{12} is in amps, V_{MAX} is in volts _____

5.2.2. Frequency _____