NOT MEASUREMENT SENSITIVE

MIL-HDBK-704-7
9 April 2004

# DEPARTMENT OF DEFENSE HANDBOOK

# GUIDANCE FOR TEST PROCEDURES FOR DEMONSTRATION OF UTILIZATION EQUIPMENT COMPLIANCE TO AIRCRAFT ELECTRICAL POWER CHARACTERISTICS 270 VDC ( PART 7 OF 8 PARTS )

**This Handbook is for guidance only.**
**Do not cite this document as a requirement.**

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# FOREWORD

1. This handbook is approved for use by all Departments and Agencies of the Department of Defense.

2. This handbook provides guidance on test procedures for demonstration of 270 VDC utilization equipment to determine compliance with the applicable edition of MIL-STD-704.

3. MIL-HDBK-704-7 is Part 7 in a series of 8 Parts. Part 7 describes the test methods and procedures to demonstrate that 270 VDC utilization equipment is compatible with the electric power characteristics of MIL-STD-704. These series of handbooks and MIL-STD-704 are companion documents.

4. Comments, suggestions, or questions on this document should be addressed to Commander, Naval Air Systems Command, Code 4.1.4, Highway 547, Lakehurst, NJ 08733-5100 or email to thomas.omara@navy.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil/.

CONTENTS

# 1. SCOPE

1.1 Scope. This handbook provides, as guidance, test methods used to demonstrate that 270 VDC utilization equipment is compatible with the electric power characteristics of the applicable edition(s) of MIL-STD-704. This handbook is for guidance only and cannot be cited as a requirement.

# 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed below are not necessarily all of the documents referenced herein, but are those needed to understand the information provided by this handbook.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein.

DEPARTMENT OF DEFENSE STANDARDS

| | |
|---|---|
| MIL-STD-704 | DoD Interface Standard for Aircraft Electric Power Characteristics |

(Copies of these documents are available online at http://assist. daps.dla.mil/quicksearch or www.dodssp.daps.mil/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

# 3. DEFINITIONS

3.1 Acronyms and definitions. The acronyms and definitions of MIL-STD-704 are applicable to this handbook.

# 4. TEST METHODS INFORMATION

4.1 Demonstration of compatibility. This section contains the test methods which will ensure that 270 VDC utilization equipment is compatible with the electric power characteristics of the applicable edition(s) of MIL-STD-704, by testing the Unit Under Test (UUT) in accordance with the test procedures as described in test methods HDC101 through HDC602.

4.1.1 Recording performance. In table HDC-I, record the edition(s) of MIL-STD-704 that defined the aircraft electric power characteristics used for testing and the performance of the UUT for each of the test methods.

4.2 Calibration of test equipment. . Test equipment and accessories required for measurement in accordance with this handbook should be calibrated in accordance with an approved calibration program traceable to the National Institute for Standards and Technology.

The serial numbers, model, and calibration date of all test equipment should be included with the test data.

4.3 Test methods. The test methods listed in table HDC-I are provided in section 5 of this handbook.

TABLE HDC-I. Summary of 270 VDC utilization equipment MIL-STD-704 compliance tests.

| **UUT:** | | | |
|---|---|---|---|
| **Compliance to MIL-STD-704 Edition(s):** | | | |
| **Test Dates:** | | | |
| Test Method | Description | Performance (Pass/Fail) | Comments |
| **Normal, Aircraft Electrical Operation** | | | |
| HDC101 | Load Measurements | | |
| HDC102 | Steady State Limits for Voltage | | |
| HDC103 | Voltage Distortion Spectrum | | |
| HDC104 | Total Ripple | | |
| HDC105 | Normal Voltage Transients | | |
| **Transfer, Aircraft Electrical Operation** | | | |
| HDC201 | Power Interrupt | | |
| **Abnormal, Aircraft Electrical Operation** | | | |
| HDC301 | Abnormal Steady State Limits for Voltage | | |
| HDC302 | Abnormal Voltage Transients (Overvoltage/Undervoltage) | | |
| **Emergency, Aircraft Electrical Operation** | | | |
| HDC401 | Emergency Limits for Voltage | | |
| **Starting, Aircraft Electrical Operation** | | | |
| HDC501 | Starting Voltage Transients | | |
| **Power Failure, Aircraft Electrical Operation** | | | |
| HDC601 | Power Failure | | |
| HDC602 | Polarity Reversal | | |

# 5. TEST METHODS

**METHOD HDC101**
**Load Measurements**

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL
OPERATING CONDITION: Normal

PARAMETER: Load Measurements

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment meets the load limits, inrush limits, current distortion limits and current spectrum limits that may be required by the utilization equipment performance specification document.

2. Validation criteria. If required by the utilization equipment performance specification document, the utilization equipment is considered to have passed if the utilization equipment is within the load limits, inrush current limits, the current distortion limit, and the current spectrum limits specified in the utilization equipment performance specification document. As noted in table HDC101-I, the load limits, inrush current limits, the current distortion limit, and the current spectrum limits are not specified in MIL-STD-704 versions A through F. The utilization equipment must not suffer damage or cause an unsafe condition.

Note: The utilization equipment performance specification document should include requirements that reduce the likelihood of the equipment having an adverse effect on the electrical power characteristics of the aircraft. Load, inrush currents, current distortion and current spectrum limits may be imposed to minimize undesirable effects to the electrical power characteristics. These limits should take into account the utilization equipment power draw, aircraft electrical system capacity and distribution characteristics, trade-offs with weight, volume, cost, and reliability that are specific to each type of equipment and aircraft.

TABLE HDC101-I. MIL-STD-704 limits for load, inrush current, current distortion factor, and current spectrum for 270 volt DC utilization equipment.

| Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Inrush Current | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] |
| Load (VA) | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] |
| Current Distortion Factor | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] |
| Current Spectrum | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] | N/A[1/] |

1/. Limits for load, inrush current, current distortion factor, and current spectrum must be defined in the utilization equipment performance specification document and are unique to each equipment.

3. Apparatus. The test equipment should be as follows:

a. Adjustable DC power supply
b. True RMS voltmeter
c. Power meter
d. Spectrum analyzer
e. Distortion meter
f. Current transformer
g. Oscilloscope

4. Test setup. Configure the test setup as shown in figure HDC101-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT. The current measurement must be taken from the 270 volt DC conductor.

5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC101-1. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. If the utilization equipment performance specification document:

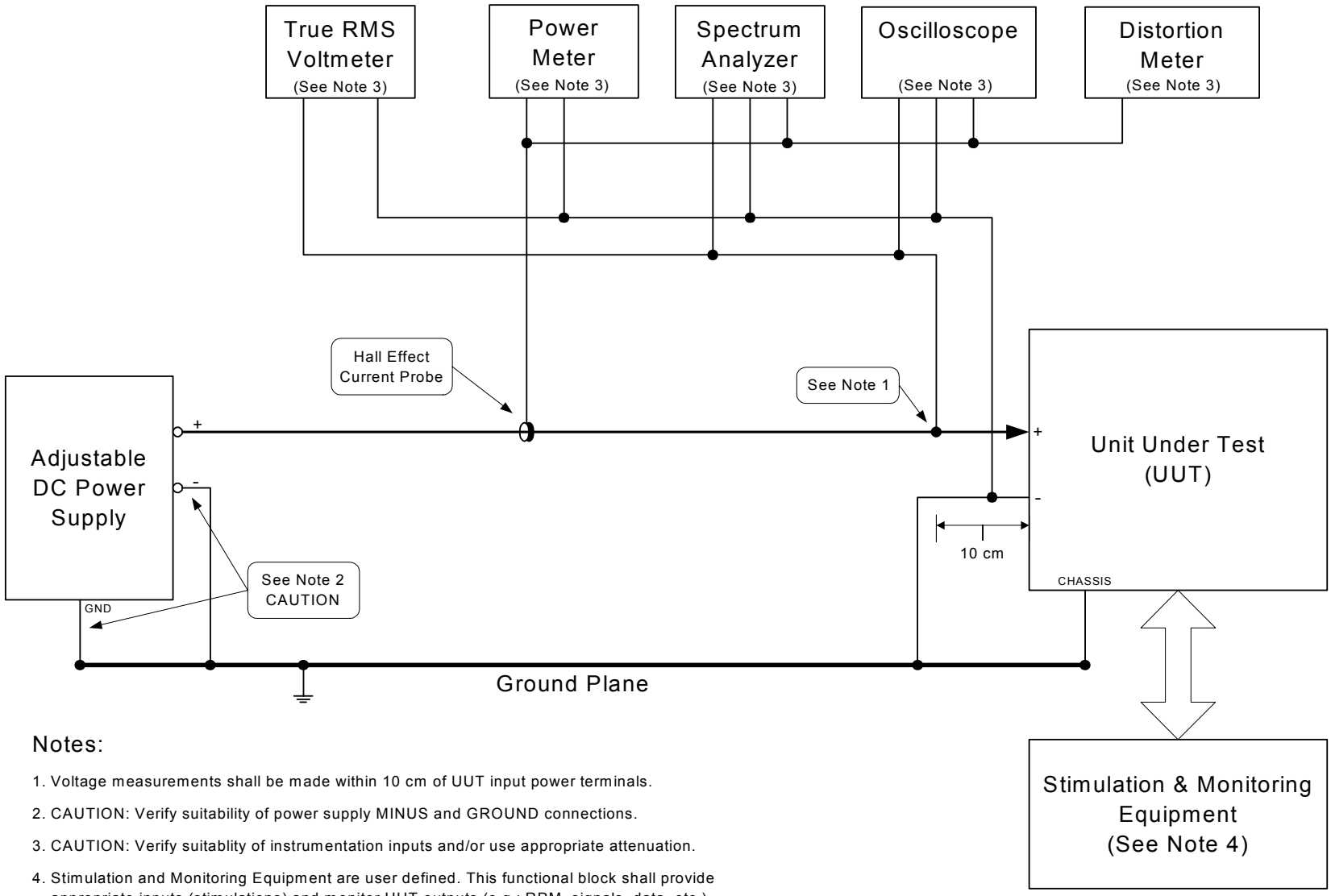
a. Imposes inrush current limits, close the circuit breaker, energizing the UUT. Record the inrush current in the data sheet shown in table HDC101-II and compare with the limits of utilization equipment performance specification document. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Repeat for each mode of operation of the UUT.

b. Imposes load limits, energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Record the load (Volt-Amps) and the voltage in the data sheet shown in table HDC101-II and compare with the limits of utilization equipment performance specification document. Repeat for each mode of operation of the UUT.

c. Imposes current distortion limits, energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Record the current distortion factor in the data sheet shown in table HDC101-II and compare with the limits of utilization equipment performance specification document. Repeat for each mode of operation of the UUT.

d. Imposes current spectrum limits, energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment

performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Record the current spectrum (current amplitude vs. frequency) in the data sheet shown in table HDC101-II and compare with the limits of utilization equipment performance specification document. Repeat for each mode of operation of the UUT.




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC101-1. Normal operation - load and current distortion measurement.

TABLE HDC101-II. Sample data sheet for HDC101 load measurements.

| Parameter | Measurement | Unit | Performance Pass/Fail |
|---|---|---|---|
| Inrush Current | | Amps | |
| Voltage | | VDC | N/A |
| Load (VA) | | VA | |
| Total Current Distortion | | % Current Distortion | |
| Current Spectrum | Attach Spectrum Plot | Amplitude vs. Frequency | |

## METHOD HDC102
## Steady State Limits for Voltage

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL OPERATING CONDITION: Normal

PARAMETER: Steady State Limits for Voltage

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when provided power with voltage at that the Normal Low Steady State (NLSS) limits and the Normal High Steady State (NHSS) limits as specified in the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for normal aircraft electrical conditions when supplied input power of voltage at the specified normal steady state limits of the applicable edition(s) of MIL-STD-704 and as noted in table HDC102-I. The utilization equipment must maintain specified performance for a length of time that confirms the utilization equipment can continuously operate at the steady state voltage and frequency limits and should be, not less than thirty (30) minutes for each of the test conditions. The utilization equipment must demonstrate re-start at the steady state voltage limits. The utilization equipment must not suffer damage or cause an unsafe condition.

Note: If the utilization has exactly the same full performance requirements for abnormal steady state limits and emergency steady state limits as required for the normal aircraft electrical conditions, then performance of test methods HDC301 and HDC401 will constitute performance of HDC102.

TABLE HDC102-I. MIL-STD-704 normal limits for steady state voltage.

| Normal Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Voltage NLSS | N/A | 250 VDC | 250 VDC | 250 VDC | 250 VDC | 250 VDC |
| Voltage NHSS | N/A | 280 VDC | 280 VDC | 280 VDC | 280 VDC | 280 VDC |

3. Apparatus. The test equipment should be as follows:

a. Adjustable DC power supply
b. True RMS voltmeter

4. Test setup. Configure the test setup as shown in figure HDC102-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

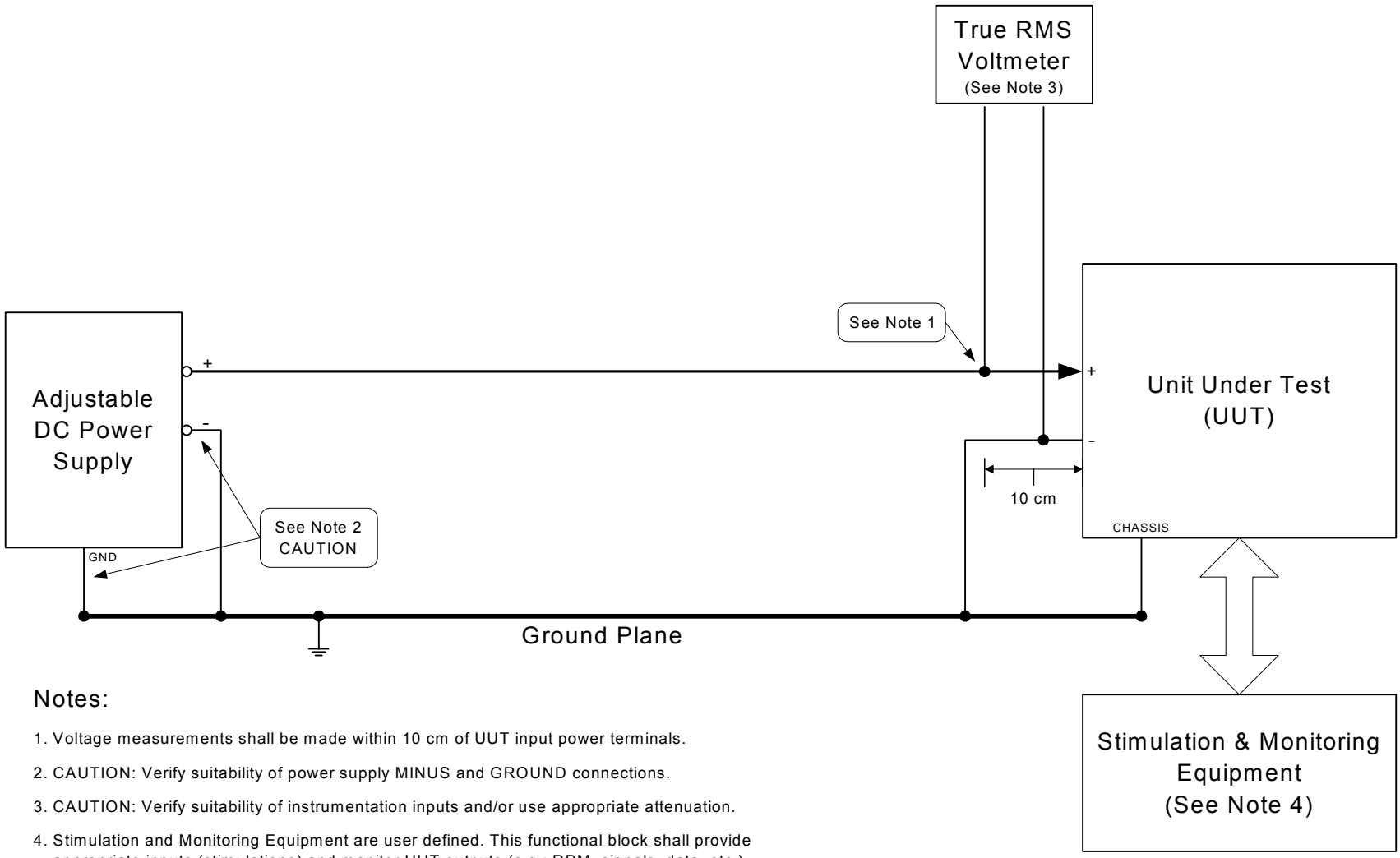
5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC102-1. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

For each test condition A through C noted in table HDC102-II, the UUT must remain for a length of time that confirms the utilization equipment can continuously operate at the steady state voltage limits and should be not less than thirty (30) minutes. At each test condition conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. For each test condition shutdown the UUT and verify that the UUT can be re-started. After re-start conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Record the voltage, frequency, time duration at test condition, successful/unsuccessful re-start and the performance of the UUT for each test condition in the data sheet shown in table HDC102-III. Repeat for each mode of operation of the UUT.

After all test conditions are complete, adjust the voltage to the nominal steady state voltage of 270 VDC. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has not suffered damage and is providing specified performance for normal aircraft electrical conditions.

TABLE HDC102-II. Test conditions for steady state limits of DC voltage.

| Test Condition | Voltage |
|---|---|
| A | Nominal Voltage |
| B | NLSS Voltage |
| C | NHSS Voltage |




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitability of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC102-1. Normal operation - steady state limits for voltage.

TABLE HDC102-III. Sample data sheet for HDC102 steady state limits for voltage.

| Test Condition | Parameters | | | | | | | Performance |
|---|---|---|---|---|---|---|---|---|
| | Voltage | | Frequency | | Time Duration at Condition | | Re-Start (Yes/No) | Pass/Fail |
| A | | $V_{dc}$ | | Hz | | min | | |
| B | | $V_{dc}$ | | Hz | | min | | |
| C | | $V_{dc}$ | | Hz | | min | | |

## METHOD HDC103
## Voltage Distortion Spectrum

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL OPERATING CONDITION: Normal

PARAMETER: Voltage Distortion Spectrum

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when subjected to voltage distortion of frequencies and amplitudes as specified by the voltage distortion spectrum in the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for normal aircraft electrical conditions when subjected to voltage distortions as specified by the voltage distortion spectrum in the applicable edition(s) of MIL-STD-704 and as noted in table HDC103-I. The utilization equipment must maintain specified performance for a length of time that confirms the utilization equipment can operate continuously when provided power having voltage distortion. The utilization equipment must not suffer damage or cause an unsafe condition.

Note: This test method subjects the UUT to voltage distortion having frequencies components from 50 Hz to 10 kHz. These voltage distortions simulate voltage distortions within aircraft due to the cumulative effects of generators, electrical distribution systems equipments, and aircraft loads. MIL-STD-461, (Requirements For The Control of Electromagnetic Interference Characteristics of Subsystems and Equipment), Test Method CS101, (Conducted Susceptibility, Power Leads, 30 Hz to 150 kHz) is a complimentary test. Power levels of the voltage distortions differ for the two test methods. Performance of Test Method HDC103 of this handbook does not relinquish the requirement to perform test Method CS101 of MIL-STD-461, and performance of Method CS101 of MIL-STD-461 does not relinquish the requirement to perform Test Method HDC103 of this handbook.

TABLE HDC103-I. MIL-STD-704 limits for voltage distortion spectrum.

| Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Voltage Distortion Spectrum | N/A | figure 6 MIL-STD-704B | figure 9 MIL-STD-704C | figure 9 MIL-STD-704D | figure 13 MIL-STD-704E | figure 18 MIL-STD-704F |

3. Apparatus. The test equipment should be as follows:

a. Programmable DC power supply
b. Variable frequency power source
c. Coupling transformer
d. True RMS voltmeter
e. Spectrum analyzer
f. (2) Inductors, 50 µH
g. Capacitor, 10 µF
h. Resistor, calibrated load

4. Test setup (10 Hz and 25 Hz). Configure the test setup as shown in figure HDC103-1 voltage distortion spectrum setup for 10 Hz and 25 Hz. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

5. Compliance test (10 Hz and 25 Hz). With the programmable DC power supply off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC103-1. Turn on the programmable DC power supply and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

For test condition A noted in table HDC103-II, set the DC programmable power supply to vary the amplitude of the DC voltage at a 10 Hz rate at an average DC voltage of 270 VDC to create a voltage distortion (ripple) for test condition A of the appropriate edition of MIL-STD-704. Remain for a length of time that confirms the utilization equipment can continuously operate with the voltage distortion and should be, not less than five (5) minutes. At each test condition, conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. For each test condition, record voltage, frequency of voltage distortion, amplitude of voltage distortion, time duration at test condition, and the performance of the UUT in the data sheet shown in table HDC103-III. Repeat for test condition B by setting the DC programmable power supply to vary the amplitude of the DC voltage at a 25 Hz rate at an average DC voltage of 270 Vdc to create a voltage distortion (ripple) specified for test condition B of the appropriate edition of MIL-STD-704. Repeat for each mode of operation of the UUT.

6. Test setup (50 Hz to 10 kHz). Configure the test setup as shown in figure HDC103-2. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

6.1 Calibration (50 Hz to 10 kHz). Install a calibrated resistive load in the test setup shown in figure HDC103-2 in place of the UUT. The calibrated resistive load must be sized to draw the same current as the UUT. Turn on the programmable DC power supply and adjust the voltage to the nominal steady state voltage of 270 VDC. Set the variable frequency power source to output a sine wave and adjust the frequency and amplitude so that the voltage distortion

measured at the input to the calibrated resistive load conforms to each test condition C through K as noted in table HDC103-II of the applicable edition(s) of MIL-STD-704. Record the settings of the variable frequency power source for each test condition.

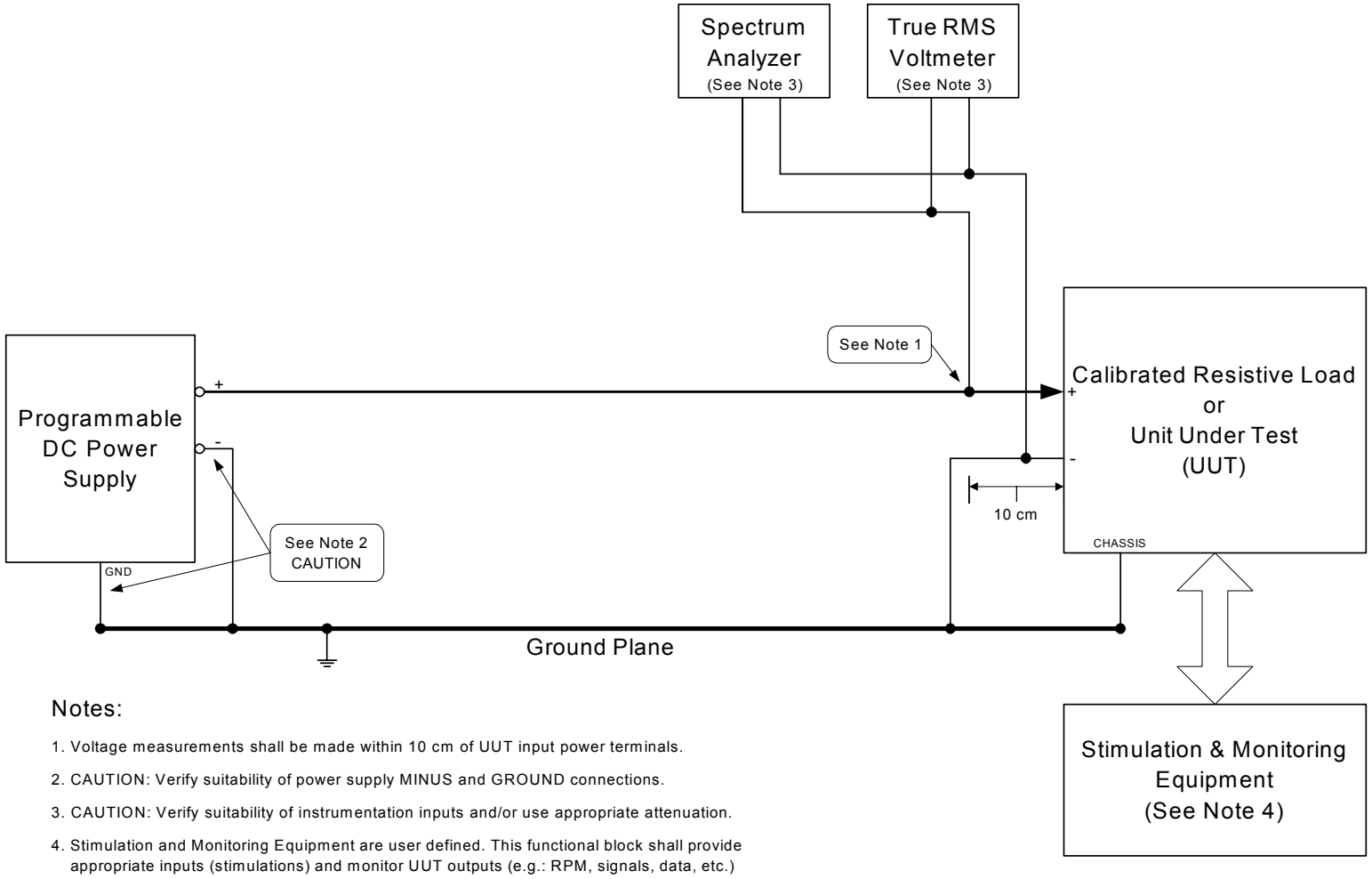
7. Compliance test (50 Hz to 10 kHz). With the programmable DC power supply off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC103-2. Turn on the programmable DC power supply and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

Set the variable frequency power source to the settings recorded for test condition C of the calibration procedure. For each test condition, remain for a length of time that confirms the utilization equipment can continuously operate with the voltage distortion and should be, not less than five (5) minutes. At each test condition, conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. After each test condition, monitor the voltage distortion frequency and amplitude while slowly increasing the variable frequency power source frequency and adjusting the amplitude until the next test condition is reached. Do not exceed the voltage distortion spectrum limits. Repeat for each test condition C through K noted in table HDC103-II. For each test condition, record voltage, frequency of voltage distortion, amplitude of voltage distortion, time duration at test condition, and the performance of the UUT in the data sheet shown in table HDC103-III. Repeat for each mode of operation of the UUT.

After all test conditions are complete, turn the programmable DC power supply off and remove the coupling transformer from the circuit. Turn on the programmable DC power supply. Adjust the voltage to the nominal steady state voltage of 270 VDC. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has not suffered damage and is providing specified performance for normal aircraft electrical conditions.

TABLE HDC103-II. Test conditions for voltage distortion spectrum.

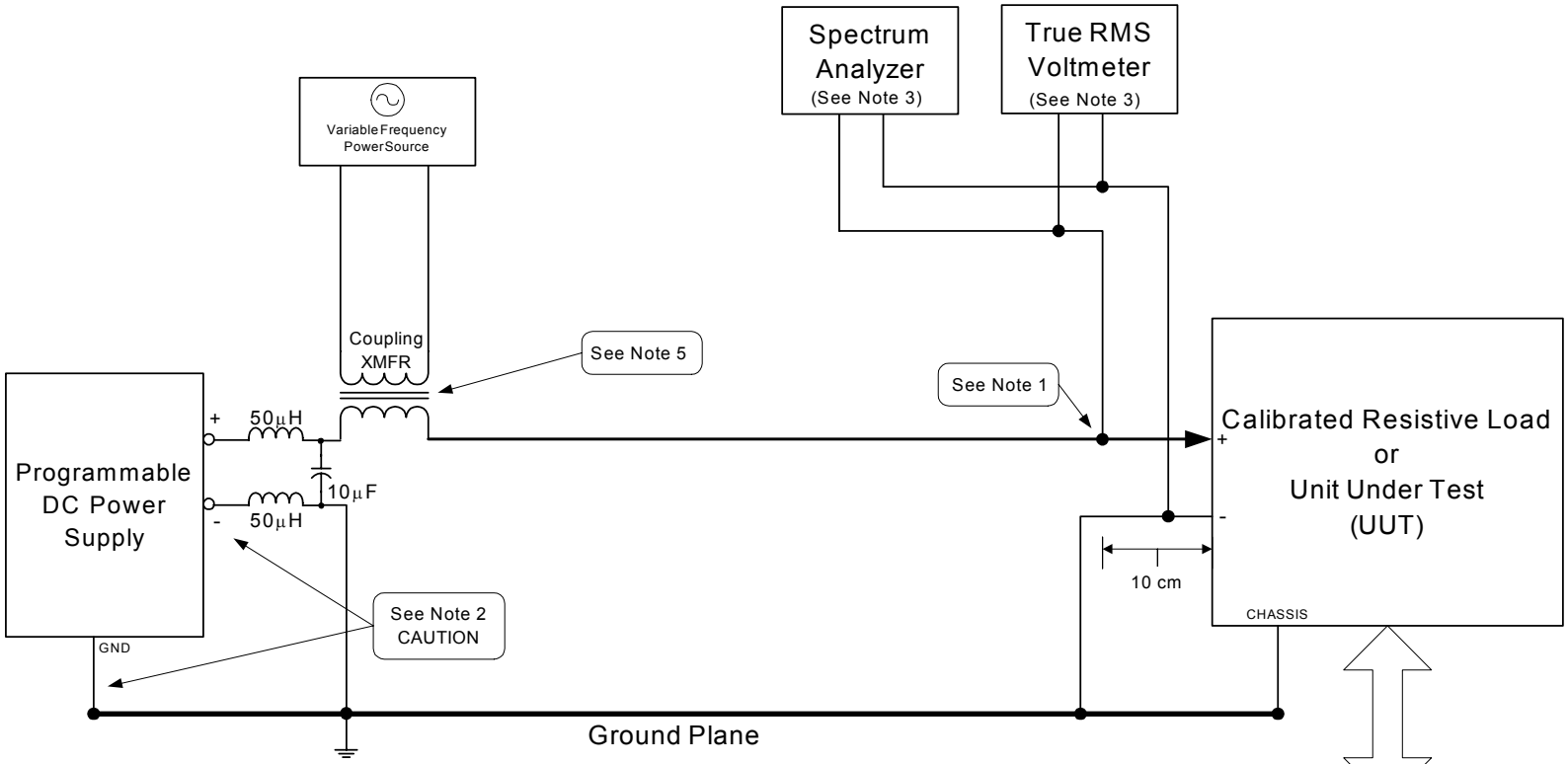
| Test Condition | Frequency of Voltage Distortion | MIL-STD-704B, C, & D Amplitude of Voltage Distortion Voltage rms | MIL-STD-704E & F Amplitude of Voltage Distortion Voltage rms |
|---|---|---|---|
| A | 10 Hz | 0.600 Vrms | 0.316 Vrms |
| B | 25 Hz | 0.893 Vrms | 0.500 Vrms |
| C | 50 Hz | 1.197 Vrms | 0.562 Vrms |
| D | 60 Hz | 1.307 Vrms | 0.775 Vrms |
| E | 250 Hz | 2.430 Vrms | 1.581 Vrms |
| F | 1 kHz | 4.439 Vrms | 3.162 Vrms |
| G | 1.7 kHz | 5.591 Vrms | 3.162 Vrms |
| H | 2 kHz | 6.000 Vrms | 3.162 Vrms |
| I | 5 kHz | 1.844 Vrms | 3.162 Vrms |
| J | 6.5 kHz | 1.315 Vrms | 2.433 Vrms |
| K | 10 kHz | 0.755 Vrms | 1.581 Vrms |




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitability of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC103-1. Normal operation - voltage distortion spectrum (10 Hz and 25 Hz).




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitability of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)
5. CAUTION: Verify suitability of variable frequency power source and coupling transformer for distortion spectrum testing.

FIGURE HDC103-2. Normal operation - voltage distortion spectrum (50 Hz to 10 kHz).

TABLE HDC103-III. Sample data sheet for HDC103 voltage distortion spectrum.

| Test Condition | Parameters | | | | | | | | Performance |
|---|---|---|---|---|---|---|---|---|---|
| | Voltage | | Frequency of Voltage Distortion | | Amplitude of Voltage Distortion | | Time Duration at Condition | | Pass/Fail |
| A | | $V_{DC}$ | | Hz | | $V_{rms}$ | | min | |
| B | | $V_{DC}$ | | Hz | | $V_{rms}$ | | min | |
| C | | $V_{DC}$ | | Hz | | $V_{rms}$ | | min | |
| D | | $V_{DC}$ | | Hz | | $V_{rms}$ | | min | |
| E | | $V_{DC}$ | | Hz | | $V_{rms}$ | | min | |
| F | | $V_{DC}$ | | kHz | | $V_{rms}$ | | min | |
| G | | $V_{DC}$ | | kHz | | $V_{rms}$ | | min | |
| H | | $V_{DC}$ | | kHz | | $V_{rms}$ | | min | |
| I | | $V_{DC}$ | | kHz | | $V_{rms}$ | | min | |
| J | | $V_{DC}$ | | kHz | | $V_{rms}$ | | min | |
| K | | $V_{DC}$ | | kHz | | $V_{rms}$ | | min | |

**METHOD HDC104**
**Total Ripple**

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL
OPERATING CONDITION: Normal

PARAMETER: Total Ripple

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when subjected to voltage having a ripple as specified by the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for normal aircraft electrical conditions when subjected to ripple as specified by the applicable edition(s) of MIL-STD-704 and as noted in table HDC104-I. The utilization equipment must maintain specified performance for a length of time that confirms the utilization equipment can operate continuously when subjected to a distorted voltage waveform and should be not less than thirty (30) minutes. The utilization equipment must not suffer damage or cause an unsafe condition.

TABLE HDC104-I. MIL-STD-704 limits for ripple DC voltage distortion.

| Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Voltage Ripple | N/A | 6 Volts Peak to Average And figure 6 MIL-STD-704B | 6 Volts Peak to Average And figure 9 MIL-STD-704C | 6 Volts Peak to Average And figure 9 MIL-STD-704D | 6 Volts Peak to Average And figure 13 MIL-STD-704E | 6 Volts Peak to Average And figure 18 MIL-STD-704F |

3. Apparatus. The test should be as follows.

a. Programmable DC power supply
b. True RMS voltmeter
c. Spectrum analyzer
d. Distortion meter

4. Test setup. Configure the test setup as shown in figure HDC104-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

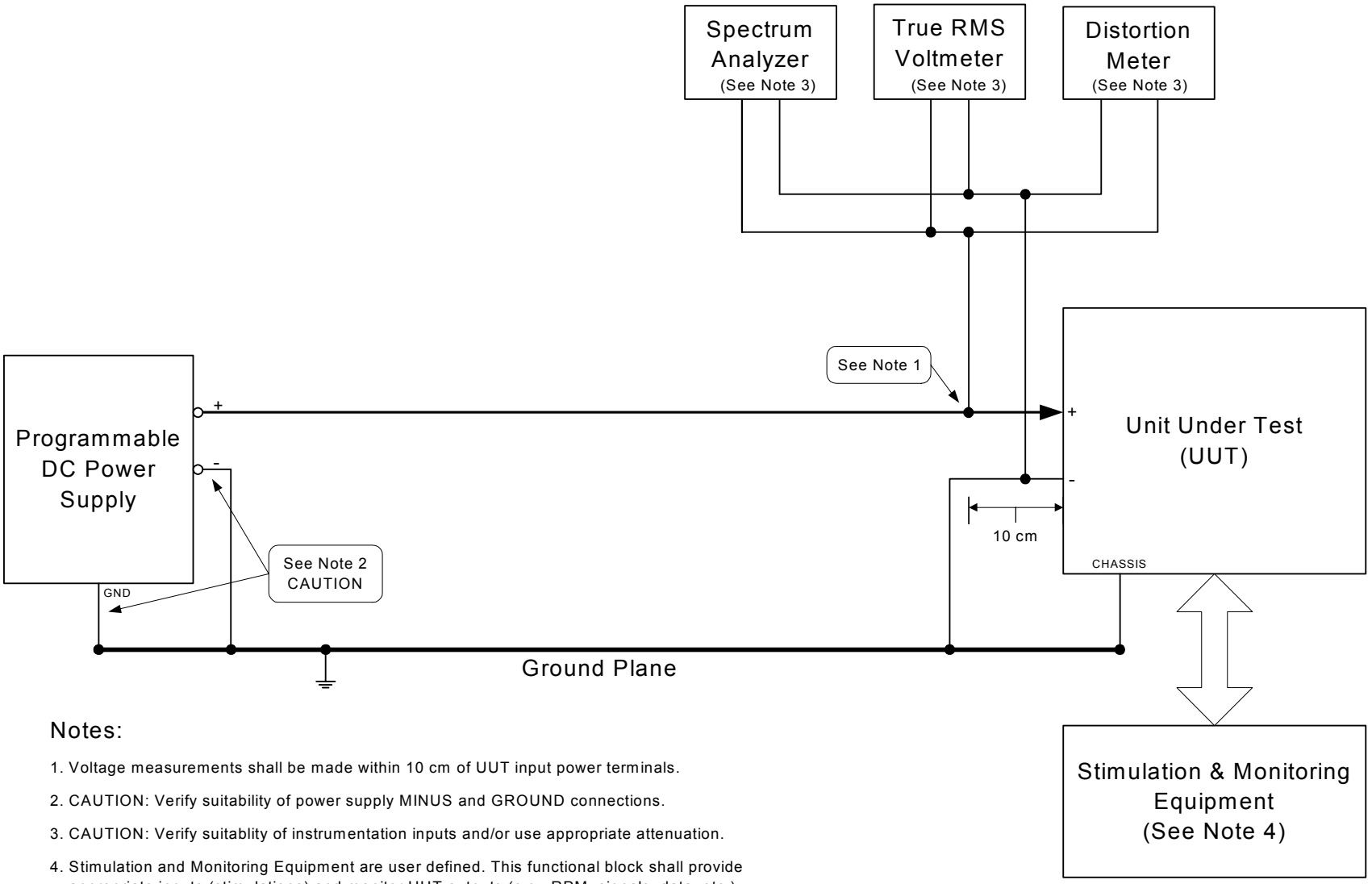
4.1 Calibration. Install a resistive load in the test setup shown in figure HDC104-1 in place of the UUT. The resistive load must be sized to draw the same current as the UUT. Set the programmable power supply to produce a DC voltage waveform having ripple as noted for test condition A in table HDC104-II for the applicable edition(s) of MIL-STD-704. The ripple should include all the frequencies components with amplitudes noted for test condition A. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Confirm that the programmable power supply is producing a voltage waveform having ripple content listed in table HDC104-II. Record the settings of the programmable power supply. Repeat the process for test condition B in table HDC104-II.

5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC104-1. Set the programmable power supply to the settings recorded during the calibration procedure for condition A. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Measure the ripple frequencies spectrum and record the DC ripple frequency components and amplitudes. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Remain for a length of time that confirms the utilization equipment can continuously operate with the ripple voltage, and should be not less than thirty (30) minutes. Repeat for test condition B noted in table HDC104-II. For each test condition, record the voltage, distortion factor, frequency spectrum of ripple, time duration at test condition, and the performance of the UUT in the data sheet shown in table HDC104-III. Repeat for each mode of operation of the UUT.

After all test conditions are complete, set the programmable power supply to produce a DC waveform without ripple. Adjust the voltage to the nominal steady state voltage of 270 VDC. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has not suffered damage and is providing specified performance for normal aircraft electrical conditions.

TABLE HDC104-II. Ripple frequency and amplitude.

| Test Condition | Ripple Frequency Components | MIL-STD-704B, C, D, E, & F Vrms |
|---|---|---|
| A | 1200 Hz | 3.16 Vrms |
| | 2400 Hz | 0.96 Vrms |
| | 3600 Hz | 1.56 Vrms |
| | 4800 Hz | 0.48 Vrms |
| | 6000 Hz | 0.78 Vrms |
| | 7200 Hz | 0.24 Vrms |
| | 8400 Hz | 0.36 Vrms |
| | | |
| B | 2400 Hz | 3.16 Vrms |
| | 4800 Hz | 0.96 Vrms |
| | 7200 Hz | 1.56 Vrms |
| | 9600 Hz | 0.48 Vrms |
| | 12000 Hz | 0.78 Vrms |
| | 14400 Hz | 0.24 Vrms |
| | 16800 Hz | 0.36 Vrms |




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC104-1. Normal operation - total ripple.

TABLE HDC104-III. Sample data sheet for HDC104 total ripple.

| Test Condition | Parameters | | | | | | Performance |
|---|---|---|---|---|---|---|---|
| | Voltage | | Voltage Distortion Factor | | Time Duration at Condition | | Pass/Fail |
| A | | Vdc | | No Units | | min | |
| | Ripple Frequency Component | | Amplitude of Ripple | | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| B | Voltage | | Voltage Distortion Factor | | Time Duration at Condition | | Pass/Fail |
| | | Vdc | | No Units | | min | |
| | Ripple Frequency Component | | Amplitude of Ripple | | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | Vrms | | | |
| | | Hz | | $V_{rms}$ | | | |

**METHOD HDC105**
**Normal Voltage Transients**

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL OPERATING CONDITION: Normal

PARAMETER: Normal Voltage Transients

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when subjected to normal voltage transients as specified in the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for normal aircraft electrical conditions when subjected to voltage transients within the normal limits of the applicable edition(s) of MIL-STD-704 and as noted in table HDC105-I. The utilization equipment must maintain specified performance during and after the voltage transients. The utilization equipment must not suffer damage or cause an unsafe condition.

TABLE HDC105-I. MIL-STD-704 limits for normal voltage transients.

| Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Normal Voltage Transients | N/A | figure 9 MIL-STD-704B | figure 11 MIL-STD-704C | figure 11 MIL-STD-704D | figure 10 MIL-STD-704E | figure 16 MIL-STD-704F |

3. Apparatus. The test equipment should be as follows:

a. Programmable DC power supply
b. True RMS voltmeter
c. Oscilloscope

4. Test setup. Configure the test setup as shown in figure HDC105-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC105-1. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

5.1 Compliance test for MIL-STD-704B, C, and D. The UUT must be subjected to the voltage transients for each test condition A through V noted in table HDC105-II. The voltage must increase or decrease from steady state voltage as noted in table HDC105-II to the voltage transient level within 1 millisecond. The voltage must remain at the voltage transient level for the duration noted in table HDC105-II. The voltage must return to steady state over the time duration noted in table HDC105-II. For test condition E and J, three over-voltage transients of 475 Vdc for 10 milliseconds are performed, separated by 0.5 second. For test condition O and T, three under-voltage transients of 125 Vdc for 10 millisecond are performed, separated by 0.5 second. For test condition U and V, an under-voltage transient of 125 Vdc for 10 milliseconds is immediately followed by an over-voltage transient of 475 Vdc for 10 milliseconds and the voltage returns to steady state over the time duration noted. For each test condition, monitor the performance of the UUT during the voltage transient according to the equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Repeat each test condition 5 times. After the power returns to normal steady state limits, conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Record the steady state voltage, voltage transient (oscilloscope trace), and the performance of the UUT for each test condition in the data sheet shown in table HDC105-IV. Repeat for each mode of operation of the UUT. In addition, for MIL-STD-704B, C, and D test compliance perform the repetitive voltage transient test described in 5.3.

5.2 Compliance test for MIL-STD-704E & F. The UUT must be subjected to the voltage transients for each test condition AA through RR noted in table HDC105-III. The voltage must increase or decrease from steady state voltage as noted in table HDC105-III to the voltage transient level within 1 millisecond. The voltage must remain at the voltage transient level for the duration noted in table HDC105-III. The voltage must return to steady state over the time duration noted in table HDC105-III. For test condition EE and JJ, three over-voltage transients of 330 Vdc for 10 milliseconds are performed, separated by 0.5 second. For test condition MM and PP, three under-voltage transients of 200 Vdc for 10 milliseconds are performed, separated by 0.5 second. For test condition QQ and RR, an under-voltage transient of 200 Vdc for 10 milliseconds is immediately followed by an overvoltage transient of 330 Vdc for 20 milliseconds and the voltage returns to steady state over the time duration noted. For each test condition, monitor the performance of the UUT during the voltage transient according to the equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Repeat each test condition 5 times. After the power returns to normal steady state limits, conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Record the steady state voltage, voltage transient (oscilloscope trace), and the performance of the UUT for each test condition in the data sheet shown in table HDC105-V. Repeat for each mode of operation of the UUT. In addition, for MIL-STD-704E, & F test compliance perform the repetitive voltage transient test described in 5.3.

5.3 Repetitive normal voltage transients test. Program the power supply to provide a continually repeating voltage transient that decreases from 270 Vdc to 215 Vdc in 2.5 msec, then

increases to 315 Vdc over 30 msec, then decreases to 270 Vdc over 2.5 msec. The voltage transient is repeated every 0.5 second, see figure HDC105-2. The UUT must be subjected to the repetitive voltage transient for a length of time that confirms the utilization equipment can continuously operate and should be not less than thirty (30) minutes. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Record the voltage, voltage transient (oscilloscope trace), time duration at test condition, and the performance of the UUT in the data sheet shown in table HDC105-V. Repeat for each mode of operation of the UUT.

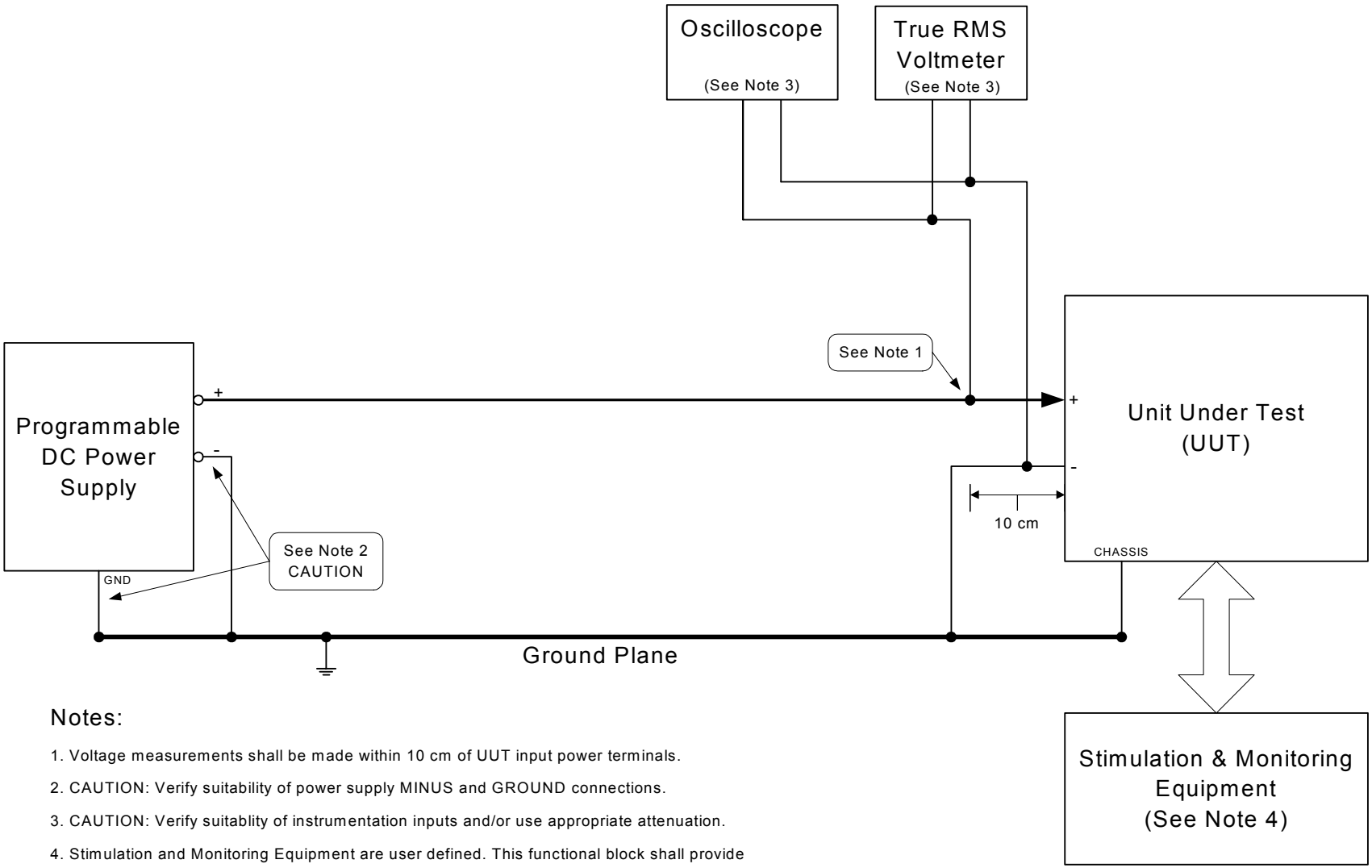
After all test conditions are complete, adjust the voltage to the nominal steady state voltage of 270 VDC. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has not suffered damage and is providing specified performance for normal aircraft electrical conditions.

TABLE HDC105-II. Test conditions for MIL-STD-704B, C, and D normal voltage transients.

| Test Condition | Steady State Voltage Vdc | Time From Steady State Voltage to Voltage Transient Level milliseconds | Voltage Transient Level Vdc | Duration at Voltage Transient Level milliseconds | Time From Voltage Transient Level to Steady State Voltage milliseconds |
|---|---|---|---|---|---|
| Overvoltage Transients | | | | | |
| A | 280 Vdc | < 1 msec | 475 Vdc | 10 msec | < 1 msec |
| B | 280 Vdc | < 1 msec | 475 Vdc | 10 msec | 40 msec |
| C | 280 Vdc | < 1 msec | 375 Vdc | 30 msec | < 1 msec |
| D | 280 Vdc | < 1 msec | 375 Vdc | 30 msec | 20 msec |
| E | 280 Vdc | < 1 msec | 475 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |
| F | 250 Vdc | < 1 msec | 475 Vdc | 10 msec | < 1 msec |
| G | 250 Vdc | < 1 msec | 475 Vdc | 10 msec | 44 msec |
| H | 250 Vdc | < 1 msec | 375 Vdc | 30 msec | < 1 msec |
| I | 250 Vdc | < 1 msec | 375 Vdc | 30 msec | 27 msec |
| J | 250 Vdc | < 1 msec | 475 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |
| Undervoltage Transients | | | | | |
| K | 280 Vdc | < 1 msec | 125 Vdc | 50 msec | < 1 msec |
| L | 280 Vdc | < 1 msec | 125 Vdc | 50 msec | 63 msec |
| M | 280 Vdc | < 1 msec | 175 Vdc | 70 msec | < 1 msec |
| N | 280 Vdc | < 1 msec | 175 Vdc | 70 msec | 43 msec |
| O | 280 Vdc | < 1 msec | 125 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |
| P | 250 Vdc | < 1 msec | 125 Vdc | 50 msec | < 1 msec |
| Q | 250 Vdc | < 1 msec | 125 Vdc | 50 msec | 50 msec |
| R | 250 Vdc | < 1 msec | 175 Vdc | 70 msec | < 1 msec |
| S | 250 Vdc | < 1 msec | 175 Vdc | 70 msec | 30 msec |
| T | 250 Vdc | < 1 msec | 125 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |
| Combined Transient | | | | | |
| U | 280 Vdc then | < 1 msec < 1 msec | 125 Vdc 475 Vdc | 10 msec 10 msec | < 1 msec 40 msec |
| V | 250 Vdc then | < 1 msec < 1 msec | 125 Vdc 475 Vdc | 10 msec 10 msec | < 1 msec 44 msec |

TABLE HDC105-III. Test conditions for MIL-STD-704E and F normal voltage transients.

| Test Condition | Steady State Voltage Vdc | Time From Steady State Voltage to Voltage Transient Level milliseconds | Voltage Transient Level Vdc | Duration at Voltage Transient Level milliseconds | Time From Voltage Transient Level to Steady State Voltage milliseconds |
|---|---|---|---|---|---|
| Overvoltage Transients | | | | | |
| AA | 280 Vdc | < 1 msec | 330 Vdc | 20 msec | < 1 msec |
| BB | 280 Vdc | < 1 msec | 330 Vdc | 20 msec | 20 msec |
| CC | 280 Vdc | < 1 msec | 305 Vdc | 30 msec | < 1 msec |
| DD | 280 Vdc | < 1 msec | 305 Vdc | 30 msec | 37.5 msec |
| EE | 280 Vdc | < 1 msec | 330 Vdc (3 times) | 10 msec Every 0.5 msec | < 1 msec |
| FF | 250 Vdc | < 1 msec | 330 Vdc | 20 msec | < 1 msec |
| GG | 250 Vdc | < 1 msec | 330 Vdc | 20 msec | 33 msec |
| HH | 250 Vdc | < 1 msec | 305 Vdc | 30 msec | < 1 msec |
| II | 250 Vdc | < 1 msec | 305 Vdc | 30 msec | 21 msec |
| JJ | 250 Vdc | < 1 msec | 330 Vdc (3 times) | 10 msec Every 0.5 msec | < 1 msec |
| Undervoltage Transients | | | | | |
| KK | 280 Vdc | < 1 msec | 200 Vdc | 10 msec | < 1 msec |
| LL | 280 Vdc | < 1 msec | 200 Vdc | 10 msec | 49 msec |
| MM | 280 Vdc | < 1 msec | 200 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |
| NN | 250 Vdc | < 1 msec | 200 Vdc | 10 msec | < 1 msec |
| OO | 250 Vdc | < 1 msec | 200 Vdc | 10 msec | 30 msec |
| PP | 250 Vdc | < 1 msec | 200 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |
| Combined Transient | | | | | |
| QQ | 280 Vdc then | < 1 msec < 1 msec | 200 Vdc 330 Vdc | 10 msec 20 msec | < 1 msec 20 msec |
| RR | 250 Vdc then | < 1 msec < 1 msec | 200 Vdc 330 Vdc | 10 msec 20 msec | < 1 msec 33 msec |

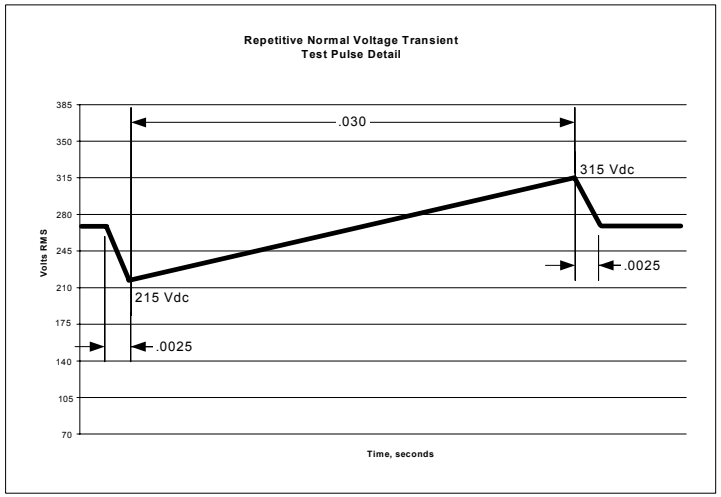



Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC105-1. Normal operation - normal voltage transients.

Repetition Rate (f) for transient pulse is twice per second.




Pulse Detail

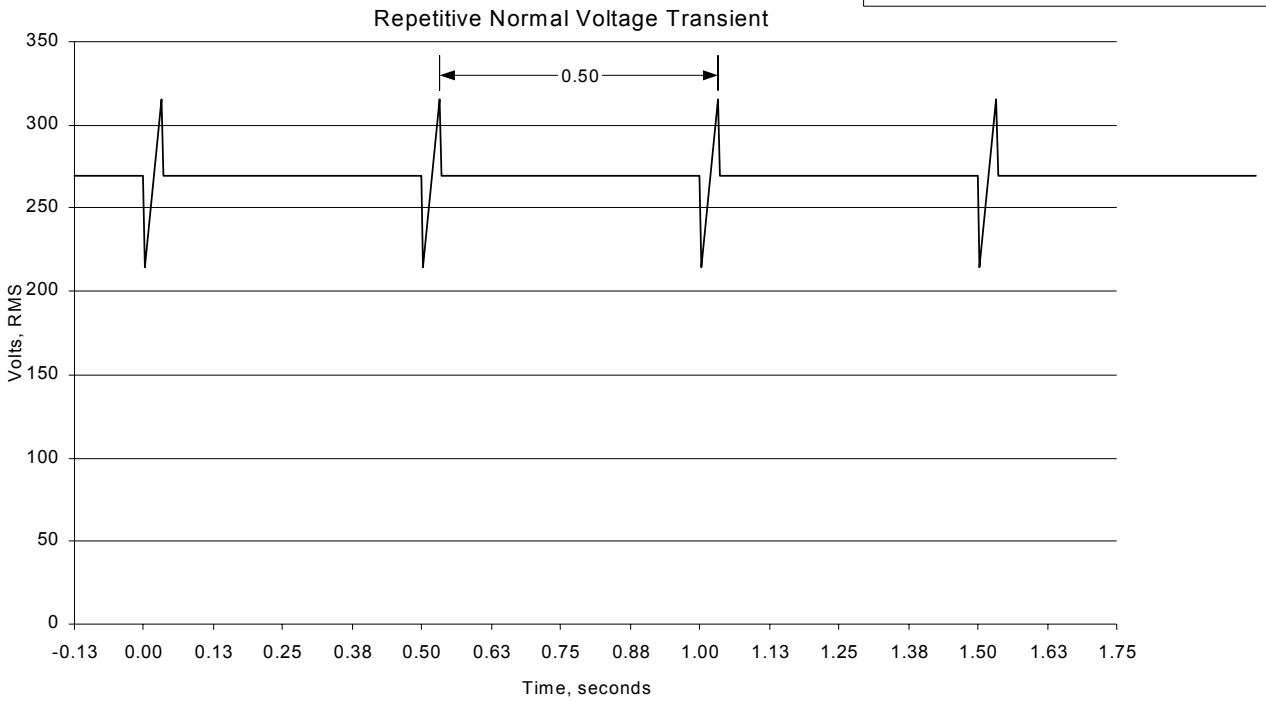



FIGURE HDC105-2. Repetitive normal voltage transient.

TABLE HDC105-IV. Sample data sheet for HDC105 normal voltage transients for MIL-STD-704A, B, C, & D.

| Test Condition | Parameters | | | | | | | | Performance |
|---|---|---|---|---|---|---|---|---|---|
| | Steady State Voltage | | Voltage Transient | | Time at Voltage Transient Level | | Oscilloscope Trace | | Pass/Fail |
| A | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| B | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| C | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| D | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| E | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| F | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| G | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| H | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| I | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| J | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| K | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| L | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| M | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| N | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| O | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| P | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| Q | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| R | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| S | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| T | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| U | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |
| V | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |

TABLE HDC105-IV. Sample data sheet for HDC105 normal voltage transients for MIL-STD-704A, B, C, & D. - Continued

| Test Condition | Parameters | | | | | | | | Performance |
|---|---|---|---|---|---|---|---|---|---|
| | Steady State Voltage | | Voltage Transient | | Time at Voltage Transient Level | | Oscilloscope Trace | | Pass/Fail |
| Repetitive Transient | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |
| | Time Duration At Test Condition | | | | | | | | |
| | | min | | | | | | | |

TABLE HDC105-V. Sample data sheet for HDC105 normal voltage transients for MIL-STD-704E, & F.

| Test Condition | Parameters | | | | | | | | Performance |
|---|---|---|---|---|---|---|---|---|---|
| | Steady State Voltage | | Voltage Transient | | Time at Voltage Transient Level | | Oscilloscope Trace | | Pass/Fail |
| AA | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| BB | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| CC | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| DD | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| EE | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| FF | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| GG | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| HH | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| II | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| JJ | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| KK | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| LL | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| MM | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| NN | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| OO | | $V_{DC}$ | | $V_{DC}$ | | msec | | | |
| PP | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| QQ | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |
| RR | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |

TABLE HDC105-V. Sample data sheet for HDC105 normal voltage transients for MIL-STD-704E, & F. - Continued

| Test Condition | Parameters | | | | | | | | Performance |
|---|---|---|---|---|---|---|---|---|---|
| | Steady State Voltage | | Voltage Transient | | Time at Voltage Transient Level | | Oscilloscope Trace | | Pass/Fail |
| Repetitive Transient | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |
| | Time Duration At Test Condition | | | | | | | | |
| | | min | | | | | | | |

**METHOD HDC201**
**Power Interrupt**

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL
OPERATING CONDITION: Transfer Interrupt

PARAMETER: Power Interrupt

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when subjected to power interrupts as specified in the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for transfer aircraft electrical conditions when subjected to power interrupts as specified by the applicable edition(s) of MIL-STD-704 and as noted in table HDC201-I. The utilization equipment must maintain the specified performance during power interrupts. Unless otherwise specified in the utilization equipment performance specification document, the utilization equipment must automatically return to the performance specified for normal aircraft electrical conditions when the power returns to within normal limits. The utilization equipment must not suffer damage or cause an unsafe condition.

TABLE HDC201-I. MIL-STD-704 power transfer limits.

| Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Power Interrupt | N/A | 50 msec | 50 msec | 50 msec | 50 msec | 50 msec |
| Voltage NLSS | N/A | 250 Vdc | 250 Vdc | 250 Vdc | 250 Vdc | 250 Vdc |
| Voltage NHSS | N/A | 280 Vdc | 280 Vdc | 280 Vdc | 280 Vdc | 280 Vdc |

3. Apparatus. The test equipment should be as follows:

a. Programmable DC power supply
b. True RMS voltmeter
c. Oscilloscope
d. Resistive dummy load

4. Test setup. Configure the test setup as shown in figure HDC201-1. The dummy resistive load placed in parallel to the UUT should be sized to draw three times the steady state current of the UUT up to a maximum 25 kW dummy load. Note: This is done to ensure that the UUT test

does not lose stored energy to other aircraft loads during power interrupts. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

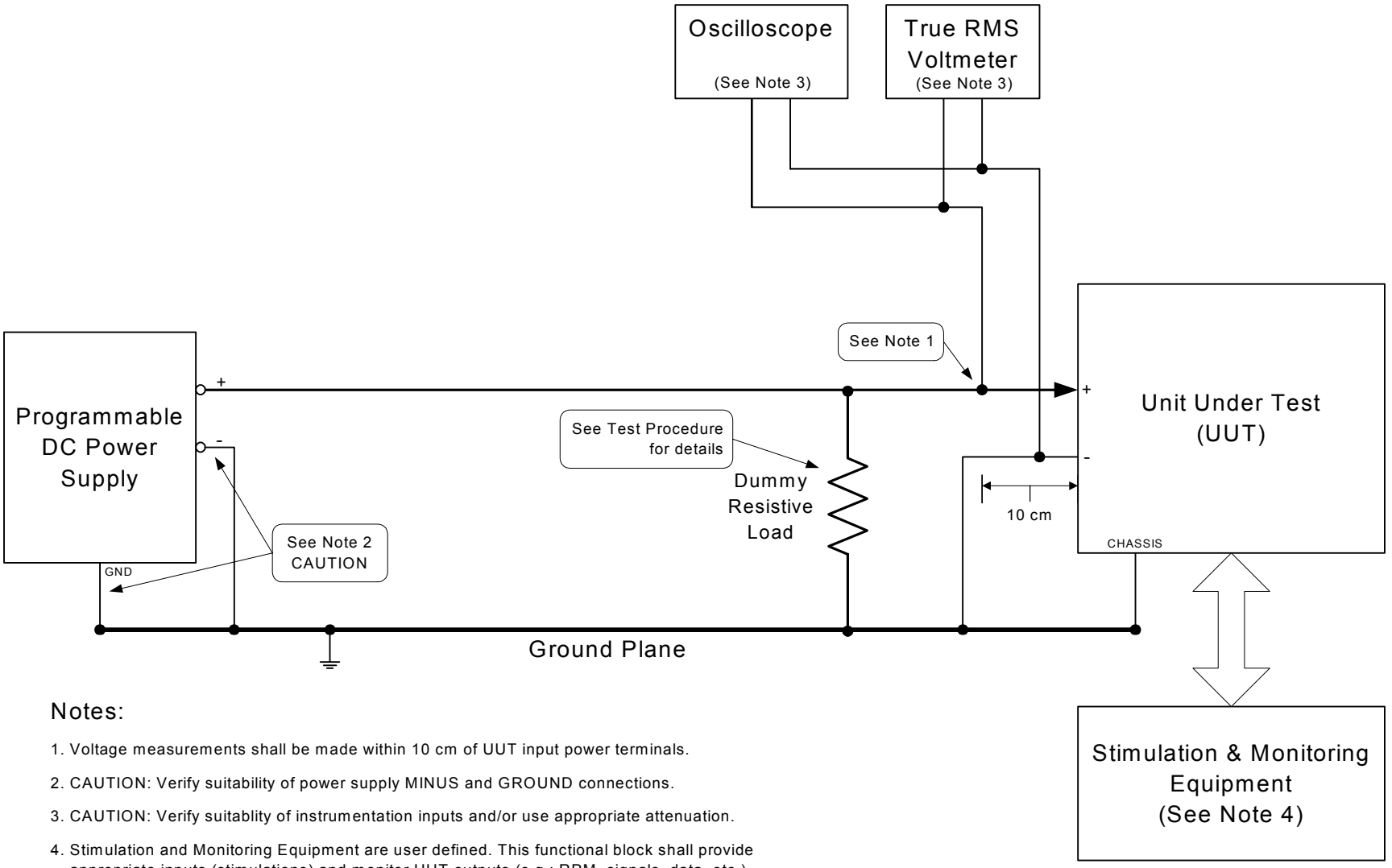
5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC201-1. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 Vdc. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

For each test condition A through K noted in table HDC201-II, adjust the voltage to the steady state voltage listed. Perform a power interrupt (0 V) of the duration listed. The voltage must decrease from the steady state voltage to 0 Volts within 0.25 milliseconds, remain at 0 Volts for the duration listed for the test condition, and return from 0 Volts to the steady state voltage within 0.25 milliseconds. For test condition J, three 50 millisecond power interrupts are performed, separated by 0.5 seconds. For test condition K a normal overvoltage transient follows the power interrupt. The normal voltage transient is 330 Vdc for 20 milliseconds and returns to nominal voltage over the next 20 milliseconds. For test condition L a normal undervoltage transient follows the power interrupt. The normal voltage transient is 200 Vdc for 10 milliseconds and returns to nominal voltage over the next 30 milliseconds. For each test condition, monitor the performance of the UUT according to the utilization equipment performance test procedures for power transfer operation to verify that the UUT is providing specified performance for transfer aircraft electrical conditions. After the power returns to normal limits, conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions. Record the steady state voltage, time duration of power interrupt, and the performance of the UUT for each test condition in the data sheet shown in table HDC201-III. Repeat each test condition 5 times. Repeat for each mode of operation of the UUT.

After all test conditions are complete, adjust the voltage to the nominal steady state voltage of 270 VDC. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has not suffered damage and is providing specified performance for normal aircraft electrical conditions.

TABLE HDC201-II. Test conditions for transfer interrupt.

| Test Condition | Steady State Voltage | Duration of Interrupt |
|---|---|---|
| A | Nominal Voltage | 50 msec |
| B | NLSS Voltage | 50 msec |
| C | NHSS Voltage | 50 msec |
| D | Nominal Voltage | 30 msec |
| E | NLSS Voltage | 30 msec |
| F | NHSS Voltage | 30 msec |
| G | Nominal Voltage | 10 msec |
| H | NLSS Voltage | 10 msec |
| I | NHSS Voltage | 10 msec |
| J | Nominal Voltage | 50 msec (repeated 3 times, separated by 0.5 sec ) |
| K | Nominal Voltage | 50 msec (followed by a normal voltage transient of 330 Vdc for 20 msec and return to steady state voltage in 20 msec) |
| L | Nominal Voltage | 50 msec (followed by a normal voltage transient of 200 Vdc for 10 msec and return to steady state voltage in 30 msec) |




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC201-1. Transfer interrupt - power interrupt.

TABLE HDC201-III. Sample data sheet for HDC201 power interrupt.

| Test Condition | Parameters | | | | Performance |
|---|---|---|---|---|---|
| | Voltage | | Time Duration of Power Interrupt | | Pass/Fail |
| A | | $V_{DC}$ | | msec | |
| B | | $V_{DC}$ | | msec | |
| C | | $V_{DC}$ | | msec | |
| D | | $V_{DC}$ | | msec | |
| E | | $V_{DC}$ | | msec | |
| F | | $V_{DC}$ | | msec | |
| G | | $V_{DC}$ | | msec | |
| H | | $V_{DC}$ | | msec | |
| I | | $V_{DC}$ | | msec | |
| J | | $V_{DC}$ | | msec | |
| K | | $V_{DC}$ | | msec | |
| | Overvoltage Transient | | | | |
| | Voltage Transient | | Time at Voltage Transient Level | | |
| | | $V_{DC}$ | | msec | |
| L | | $V_{DC}$ | | msec | |
| | Overvoltage Transient | | | | |
| | Voltage Transient | | Time at Voltage Transient Level | | |
| | | $V_{DC}$ | | msec | |

## METHOD HDC301
## Steady State Limits for Voltage

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL OPERATING CONDITION: Abnormal Operation

PARAMETER: Steady State Limits for Voltage

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when provided power with voltage at that the Abnormal Low Steady State (ALSS) limits and the Abnormal High Steady State (AHSS) limits as specified in the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for abnormal aircraft electrical conditions when supplied input power of voltage at the specified abnormal steady state limits of the applicable edition(s) of MIL-STD-704 and as noted in table HDC301-I. The utilization equipment must maintain specified performance for a length of time that confirms the utilization equipment can continuously operate at the steady state voltage and should be not less than thirty (30) minutes for each of the test conditions. Unless otherwise specified in the utilization equipment performance specification document, the utilization equipment must demonstrate re-start at the abnormal steady state voltage limits. Unless otherwise specified in the utilization equipment performance specification document, the utilization must automatically return to the performance specified for normal aircraft electrical conditions when the power returns to within normal limits. The utilization equipment must not suffer damage or cause an unsafe condition.

TABLE HDC301-I. MIL-STD-704 abnormal limits for steady state voltage.

| Abnormal Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Voltage NLSS | N/A | 245 Vdc | 245 Vdc | 245 Vdc | 240 Vdc | 240 Vdc |
| Voltage NHSS | N/A | 285 Vdc | 285 Vdc | 285 Vdc | 290 Vdc | 290 Vdc |

3. Apparatus. The test equipment should be as follows:

a. Adjustable DC power supply
b. True RMS voltmeter

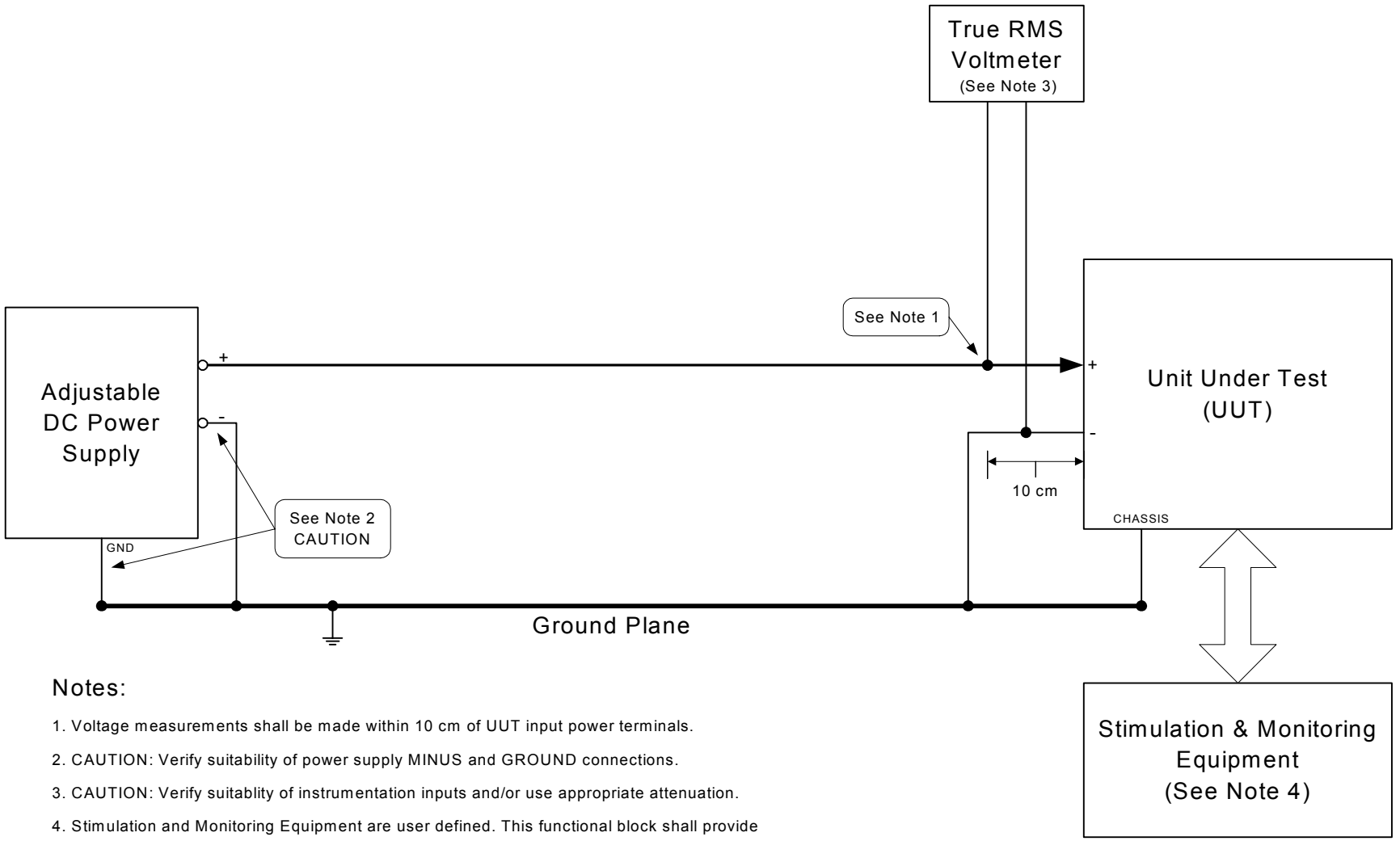
4. Test setup. Configure the test setup as shown in figure HDC301-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC301-1. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

For each test condition A and B noted in table HDC301-II, the UUT must remain for a length of time that confirms the utilization equipment can perform as specified at the abnormal steady state voltage limits and should be not less than thirty (30) minutes. At each test condition conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for abnormal aircraft electrical conditions. For each test condition shutdown the UUT and verify that the UUT can be re-started. After re-start conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for abnormal aircraft electrical conditions. Adjust the voltage to the nominal steady state voltage of 270VDC. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has automatically returned to the performance specified for normal aircraft electrical conditions, and has not suffered damage. Record the voltage, time duration at test condition, successful/unsuccessful re-start and the performance of the UUT for each test condition in the data sheet shown in table HDC301-III. Repeat for each mode of operation of the UUT.

TABLE HDC301-II. Test conditions for abnormal steady state limits of DC voltage.

| Test Condition | Voltage |
|---|---|
| A | ALSS Voltage |
| B | AHSS Voltage |




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC301-1. Abnormal operation - steady state limits for voltage.

TABLE HDC301-III. Sample data sheet for HDC301 abnormal steady state limits for voltage.

| Test Condition | Parameters | | | | | Performance |
|---|---|---|---|---|---|---|
| | Voltage | | Time Duration at Test Condition | | Re-Start (Yes/No) | Pass/Fail |
| A | | $V_{DC}$ | | min | | |
| B | | $V_{DC}$ | | min | | |

## METHOD HDC302
## Abnormal Voltage Transients

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL OPERATING CONDITION: Abnormal Operation

PARAMETER: Abnormal Voltage Transients

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when subjected to abnormal voltage transients as specified in the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for abnormal aircraft electrical conditions when subjected to voltage transients within the abnormal limits of the applicable edition(s) of MIL-STD-704 and as noted in table HDC302-I. Unless otherwise specified in the utilization equipment performance specification document, the utilization equipment must automatically return to the performance specified for normal aircraft electrical conditions when the power returns to within normal limits. The utilization equipment must not suffer damage or cause an unsafe condition.

TABLE HDC302-I. MIL-STD-704 limits for abnormal voltage transients.

| Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Abnormal Voltage Transients | N/A | figure 10 MIL-STD-704B | figure 13 MIL-STD-704C | figure 13 MIL-STD-704D | figure 12 MIL-STD-704E | figure 17 MIL-STD-704F |

3. Apparatus. The test equipment should be as follows:

a. Programmable DC power supply
b. True RMS voltmeter
c. Oscilloscope

4. Test setup. Configure the test setup as shown in figure HDC302-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC302-1. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

5.1 Compliance test for MIL-STD-704B, C, & D. The UUT must be subjected to the voltage transients for each test condition A through N noted in table HDC302-II. The voltage must increase or decrease from steady state voltage as noted in table HDC302-II to the voltage transient level within 1 millisecond. The voltage must remain at the voltage transient level for the duration noted in table HDC302-II. The voltage must return to steady state over the time duration noted in table HDC302-II. For test condition C and F, three over-voltage transients of 475 Vdc for 10 milliseconds are performed, separated by 0.5 seconds. For test condition I and L, three under-voltage transients of 65 Vdc for 10 milliseconds are performed, separated by 0.5 second. For test condition M and N, an under-voltage transient of 65 Vdc for 10 milliseconds is immediately followed by an over-voltage transient of 475 Vdc for 27 milliseconds and the voltage returns to steady state over the time duration noted. For each test condition, monitor the performance of the UUT during the voltage transient according to the equipment performance test procedures to verify that the UUT is providing specified performance for abnormal aircraft electrical conditions. Repeat each test condition 5 times. After the power returns to normal limits, conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT automatically returns to specified performance for normal aircraft electrical conditions when the power returns to within normal limits. Record the steady state voltage, voltage transient (oscilloscope trace), and the performance of the UUT for each test condition in the data sheet shown in table HDC302-IV. Repeat for each mode of operation of the UUT.

5.2 Compliance test for MIL-STD-704E & F. The UUT must be subjected to the voltage transients for each test condition AA through NN noted in table HDC302-III. The voltage must increase or decrease from steady state voltage as noted in table HDC302-III to the voltage transient level within 1 millisecond. The voltage must remain at the voltage transient level for the duration noted in table HDC302-III. The voltage must return to steady state over the time duration noted in table HDC302-III. For test condition CC and FF, three over-voltage transients of 350 Vdc for 50 milliseconds are performed, separated by 0.5 second. For test condition II and LL, three under-voltage transients of 180 Vdc for 50 milliseconds are performed, separated by 0.5 second. For test condition MM and NN, an under-voltage transient of 180 Vdc for 10 milliseconds is immediately followed by an over-voltage transient of 350 Vdc for 50 milliseconds and the voltage returns to steady state over the time duration noted. For each test condition, monitor the performance of the UUT during the voltage transient according to the equipment performance test procedures to verify that the UUT is providing specified performance for abnormal aircraft electrical conditions. Repeat each test condition 5 times. After the power returns to normal limits, conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT automatically returns to specified performance for normal aircraft electrical conditions when the power returns to within normal limits. Record the steady state voltage, voltage transient (oscilloscope trace), and the performance of the UUT for each test condition in the data sheet shown in table HDC302-V. Repeat for each mode of operation of the UUT.

After all test conditions are complete, adjust the voltage to the nominal steady state voltage of 270 VDC. Conduct a performance test of the UUT according to the utilization equipment

performance test procedures to confirm that the UUT has not suffered damage and is providing specified performance for normal aircraft electrical conditions.

TABLE HDC302-II. Test conditions for MIL-STD-704B, C, and D abnormal voltage transients.

| Test Condition | Steady State Voltage Vdc | Time From Steady State Voltage to Voltage Transient Level milliseconds | Voltage Transient Level Vdc | Duration at Voltage Transient Level milliseconds | Time From Voltage Transient Level to Steady State Voltage or Next Voltage Level |
|---|---|---|---|---|---|
| Overvoltage Transients | | | | | |
| A | 280 Vdc | < 1 msec | 475 Vdc | 27 msec | < 1 msec |
| B | 280 Vdc | < 1 msec | 475 Vdc | 27 msec | 9 msec |
| | | then | 430 Vdc | decreasing | 10 msec |
| | | then | 400 Vdc | decreasing | 25 msec |
| | | then | 360 Vdc | decreasing | 30 msec |
| | | then | 340 Vdc | decreasing | 50 msec |
| | | then | 320 Vdc | decreasing | 150 msec |
| | | then | 300 Vdc | decreasing | 400 msec |
| | | then | 280 Vdc | | |
| C | 280 Vdc | < 1 msec | 475 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |
| D | 250 Vdc | < 1 msec | 475 Vdc | 27 msec | < 1 msec |
| E | 250 Vdc | < 1 msec | 475 Vdc | 27 msec | 9 msec |
| | | then | 430 Vdc | decreasing | 10 msec |
| | | then | 400 Vdc | decreasing | 25 msec |
| | | then | 360 Vdc | decreasing | 30 msec |
| | | then | 340 Vdc | decreasing | 50 msec |
| | | then | 320 Vdc | decreasing | 150 msec |
| | | then | 300 Vdc | decreasing | 2.7 sec |
| | | then | 250 Vdc | | |
| F | 250 Vdc | < 1 msec | 475 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |

TABLE HDC302-II. Test conditions for MIL-STD-704B, C, and D abnormal voltage transients. - Continued

| Test Condition | Steady State Voltage Vdc | Time From Steady State Voltage to Voltage Transient Level milliseconds | Voltage Transient Level Vdc | Duration at Voltage Transient Level milliseconds | Time From Voltage Transient Level to Steady State Voltage or Next Voltage Level |
|---|---|---|---|---|---|
| Undervoltage Transients | | | | | |
| G | 280 Vdc | < 1 msec | 65 Vdc | 27 msec | < 1 msec |
| H | 280 Vdc | < 1 msec | 65 Vdc | 27 msec | 9 msec |
| | | then | 110 Vdc | increasing | 10 msec |
| | | then | 140 Vdc | increasing | 25 msec |
| | | then | 180 Vdc | increasing | 30 msec |
| | | then | 200 Vdc | increasing | 50 msec |
| | | then | 220 Vdc | increasing | 150 msec |
| | | then | 240 Vdc | increasing | 2.7 sec |
| | | then | 280 Vdc | | |
| I | 280 Vdc | < 1 msec | 65 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |
| J | 250 Vdc | < 1 msec | 65 Vdc | 27 msec | < 1 msec |
| K | 250 Vdc | < 1 msec | 65 Vdc | 27 msec | 9 msec |
| | | then | 110 Vdc | increasing | 10 msec |
| | | then | 140 Vdc | increasing | 25 msec |
| | | then | 180 Vdc | increasing | 30 msec |
| | | then | 200 Vdc | increasing | 50 msec |
| | | then | 220 Vdc | increasing | 150 msec |
| | | then | 240 Vdc | increasing | 400 msec |
| | | then | 250 Vdc | | |
| L | 250 Vdc | < 1 msec | 65 Vdc (3 times) | 10 msec Every 0.5 sec | < 1 msec |

TABLE HDC302-II. Test conditions for MIL-STD-704B, C, and D abnormal voltage transients. - Continued

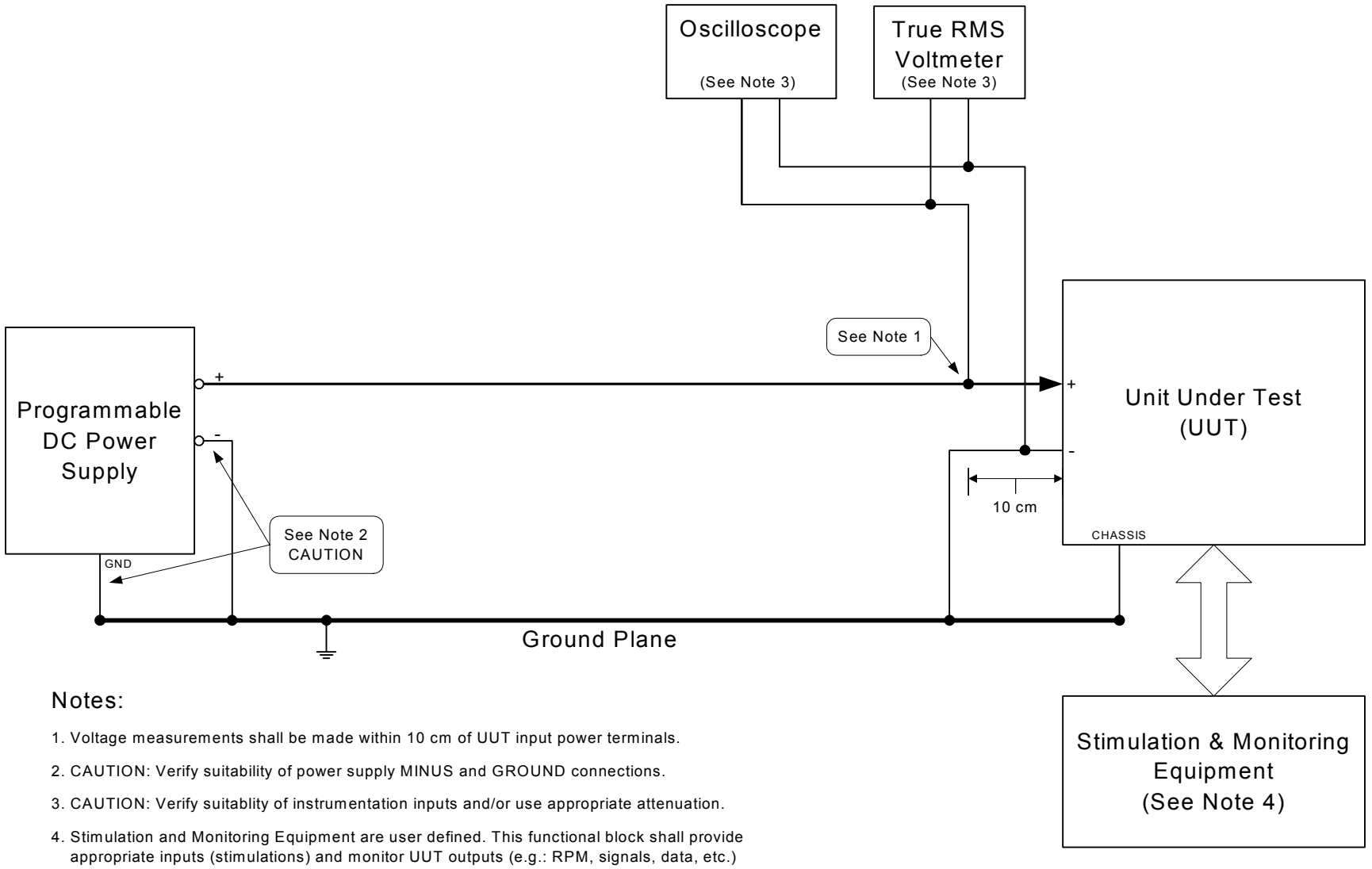
| Test Condition | Steady State Voltage Vdc | Time From Steady State Voltage to Voltage Transient Level milliseconds | Voltage Transient Level Vdc | Duration at Voltage Transient Level milliseconds | Time From Voltage Transient Level to Steady State Voltage or Next Voltage Level |
|---|---|---|---|---|---|
| Combined Transient | | | | | |
| M | 280 Vdc | < 1 msec<br>< 1 msec | 65 Vdc<br>475 Vdc | 10 msec<br>27 msec | < 1 msec<br>9 msec |
| | | then | 430 Vdc | decreasing | 10 msec |
| | | then | 400 Vdc | decreasing | 25 msec |
| | | then | 360 Vdc | decreasing | 30 msec |
| | | then | 340 Vdc | decreasing | 50 msec |
| | | then | 320 Vdc | decreasing | 150 msec |
| | | then | 300 Vdc | decreasing | 400 msec |
| | | then | 280 Vdc | | |
| N | 250 Vdc | < 1 msec<br>< 1 msec | 65 Vdc<br>475 Vdc | 10 msec<br>27 msec | < 1 msec<br>9 msec |
| | | then | 430 Vdc | decreasing | 10 msec |
| | | then | 400 Vdc | decreasing | 25 msec |
| | | then | 360 Vdc | decreasing | 30 msec |
| | | then | 340 Vdc | decreasing | 50 msec |
| | | then | 320 Vdc | decreasing | 150 msec |
| | | then | 300 Vdc | decreasing | 2.7 sec |
| | | then | 250 Vdc | | |

TABLE HDC302-III. Test conditions for MIL-STD-704E and F abnormal voltage transients.

| Test Condition | Steady State Voltage Vdc | Time From Steady State Voltage to Voltage Transient Level milliseconds | Voltage Transient Level Vdc | Duration at Voltage Transient Level milliseconds | Time From Voltage Transient Level to Steady State Voltage or Next Voltage Level |
|---|---|---|---|---|---|
| Overvoltage Transients | | | | | |
| AA | 280 Vdc | < 1 msec | 350 Vdc | 50 msec | < 1 msec |
| BB | 280 Vdc | < 1 msec | 350 Vdc | 50 msec | 10 msec |
| | | then | 340 Vdc | decreasing | 15 msec |
| | | then | 330 Vdc | decreasing | 25 msec |
| | | then | 320 Vdc | decreasing | 190 msec |
| | | then | 300 Vdc | decreasing | 1.71 sec |
| | | | 280 Vdc | | |
| CC | 280 Vdc | < 1 msec | 350 Vdc (3 times) | 50 msec Every 0.5 sec | < 1 msec |
| DD | 250 Vdc | < 1 msec | 350 Vdc | 50 msec | < 1 msec |
| EE | 250 Vdc | < 1 msec | 350 Vdc | 50 msec | 10 msec |
| | | then | 340 Vdc | decreasing | 15 msec |
| | | then | 330 Vdc | decreasing | 25 msec |
| | | then | 320 Vdc | decreasing | 190 msec |
| | | then | 300 Vdc | decreasing | 6.7 sec |
| | | then | 250 Vdc | | |
| FF | 250 Vdc | < 1 msec | 350 Vdc (3 times) | 50 msec Every 0.5 sec | < 1 msec |
| Undervoltage Transients | | | | | |
| GG | 280 Vdc | < 1 msec | 180 Vdc | 50 msec | < 1 msec |
| HH | 280 Vdc | < 1 msec | 180 Vdc | 50 msec | 10 msec |
| | | then | 190 Vdc | increasing | 15 msec |
| | | then | 200 Vdc | increasing | 25 msec |
| | | then | 210 Vdc | increasing | 190 msec |
| | | then | 230 Vdc | increasing | 6.7 sec |
| | | then | 280 Vdc | | |
| II | 280 Vdc | < 1 msec | 180 Vdc (3 times) | 50 msec Every 0.5 sec | < 1 msec |
| JJ | 250 Vdc | < 1 msec | 180 Vdc | 50 msec | < 1 msec |
| KK | 250 Vdc | < 1 msec | 180 Vdc | 50 msec | 10 msec |
| | | then | 190 Vdc | increasing | 15 msec |
| | | then | 200 Vdc | increasing | 25 msec |
| | | then | 210 Vdc | increasing | 190 msec |
| | | then | 230 Vdc | increasing | 1.71 sec |
| | | then | 250 Vdc | | |
| LL | 250 Vdc | < 1 msec | 180 Vdc (3 times) | 50 msec Every 0.5 sec | < 1 msec |

TABLE HDC302-III. Test conditions for MIL-STD-704E and F abnormal voltage transients. - Continued

| Test Condition | Steady State Voltage Vdc | Time From Steady State Voltage to Voltage Transient Level milliseconds | Voltage Transient Level Vdc | Duration at Voltage Transient Level milliseconds | Time From Voltage Transient Level to Steady State Voltage or Next Voltage Level |
|---|---|---|---|---|---|
| Combined Transient | | | | | |
| MM | 280 Vdc | < 1 msec<br>< 1 msec | 180 Vdc<br>350 Vdc | 10 msec<br>50 msec | < 1 msec<br>10 msec |
| | | then | 340 Vdc | decreasing | 15 msec |
| | | then | 330 Vdc | decreasing | 25 msec |
| | | then | 320 Vdc | decreasing | 190 msec |
| | | then | 300 Vdc | decreasing | 1.71 sec |
| | | | 280 Vdc | | |
| NN | 250 Vdc | < 1 msec<br>< 1 msec | 180 Vdc<br>350 Vdc | 10 msec<br>50 msec | < 1 msec<br>10 msec |
| | | then | 340 Vdc | decreasing | 15 msec |
| | | then | 330 Vdc | decreasing | 25 msec |
| | | then | 320 Vdc | decreasing | 190 msec |
| | | then | 300 Vdc | decreasing | 6.7 sec |
| | | then | 250 Vdc | | |




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC302-1. Abnormal operation - abnormal voltage transients.

TABLE HDC302-IV. Sample data sheet for HDC302 abnormal voltage transients for MIL-STD-704 B, C, & D.

| Test Condition | Parameters | | | | | | | | Performance |
|---|---|---|---|---|---|---|---|---|---|
| | Steady State Voltage | | Voltage Transient | | Time at Voltage Transient Level | | Oscilloscope Trace | | Pass/Fail |
| A | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| B | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| C | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| D | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| E | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| F | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| G | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| H | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| I | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| J | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| K | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| L | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| M | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |
| N | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |

TABLE HDC302-V. Sample data sheet for HDC302 abnormal voltage transients for MIL-STD-704E, & F.

| Test Condition | Parameters | | | | | | | | Performance |
|---|---|---|---|---|---|---|---|---|---|
| | Steady State Voltage | | Voltage Transient | | Time at Voltage Transient Level | | Oscilloscope Trace | | Pass/Fail |
| AA | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| BB | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| CC | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| DD | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| EE | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| FF | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| GG | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| HH | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| II | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| JJ | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| KK | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| LL | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| MM | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |
| NN | | $V_{DC}$ | | $V_{DC}$ | | msec | Attach Trace | $V_{DC}$ vs. Time | |
| | | | | $V_{DC}$ | | msec | | | |

## METHOD HDC401
## Steady State Limits for Voltage

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL OPERATING CONDITION: Emergency Operation

PARAMETER: Steady State Limits for Voltage

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when provided power with voltage at that the Emergency Low Steady State (ELSS) limits and the Emergency High Steady State (EHSS) limits as specified in the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for emergency aircraft electrical conditions when supplied input power of voltage at the specified emergency steady state limits of the applicable edition(s) of MIL-STD-704 and as noted in table HDC401-I. The utilization equipment must maintain specified performance for a length of time that confirms the utilization equipment can continuously operate at the steady state voltage and should be not less than thirty (30) minutes for each of the test conditions. Unless otherwise specified in the utilization equipment performance specification document, the utilization equipment must demonstrate re-start at the emergency steady state voltage limits. Unless otherwise specified in the utilization equipment performance specification document, the utilization must automatically return to the performance specified for normal aircraft electrical conditions when the power returns to within normal limits. The utilization equipment must not suffer damage or cause an unsafe condition.

TABLE HDC401-I. MIL-STD-704 emergency limits for steady state voltage.

| Emergency Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Voltage ELSS | N/A | 240 Vdc | 240 Vdc | 240 Vdc | 250 Vdc | 250 Vdc |
| Voltage EHSS | N/A | 290 Vdc | 290 Vdc | 290 Vdc | 280 Vdc | 280 Vdc |

3. Apparatus. The test equipment should be as follows:

a. Adjustable DC power supply
b. True RMS voltmeter

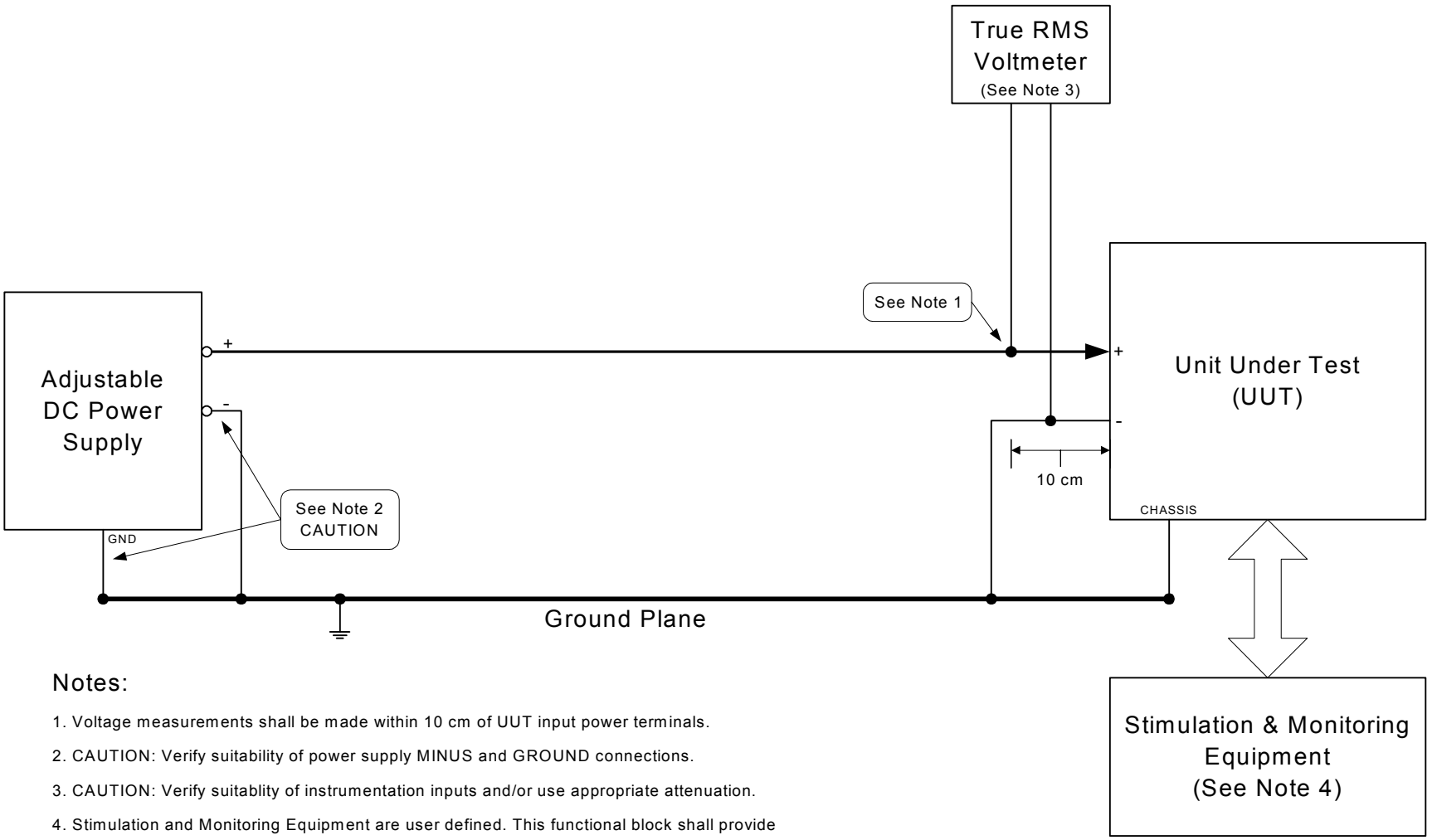
4. Test setup. Configure the test setup as shown in figure HDC401-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC401-1. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

For each test condition A and B noted in table HDC401-II, the UUT must remain for a length of time that confirms the utilization equipment can perform as specified at the emergency steady state voltage limits and should be not less than thirty (30) minutes. At each test condition conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for emergency aircraft electrical conditions. For each test condition shutdown the UUT and verify that the UUT can be re-started. After re-start conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for emergency aircraft electrical conditions. Adjust the voltage to the nominal steady state voltage of 270VDC. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has automatically returned to the performance specified for normal aircraft electrical conditions, and has not suffered damage. Record the voltage, time duration at test condition, and the performance of the UUT for each test condition in the data sheet shown in table HDC401-III. Repeat for each mode of operation of the UUT.

TABLE HDC401-II. Test conditions for emergency steady state limits of DC voltage.

| Test Condition | Voltage |
|---|---|
| A | ELSS Voltage |
| B | EHSS Voltage |




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC401-1. Emergency operation - steady state limits for voltage.

TABLE HDC401-III. Sample data sheet for HDC401 emergency steady state limits for voltage and frequency.

| Test Condition | Parameters | | | | Performance |
|---|---|---|---|---|---|
| | Voltage | | Time Duration at Test Condition | | Pass/Fail |
| A | | $V_{DC}$ | | min | |
| B | | $V_{DC}$ | | min | |

## METHOD HDC501
## Starting Voltage Transients

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL OPERATING CONDITION: Starting Operation

PARAMETER: Starting Voltage Transients

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when subjected to starting voltage transients as specified in the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for starting aircraft electrical conditions when subjected to starting voltage transients for the applicable edition(s) of MIL-STD-704 and as noted in table HDC501-I. Unless otherwise specified in the utilization equipment performance specification document, the utilization equipment must automatically return to the performance specified for normal aircraft electrical conditions when the power returns to within normal limits. The utilization equipment must not suffer damage or cause an unsafe condition.

TABLE HDC501-I. MIL-STD-704 limits for starting voltage transients.

| Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Starting Voltage Transients | N/A | Use Limits of 704 C | 155 Vdc to 280 Vdc | 115 Vdc to 280 Vdc | 115 Vdc to 280 Vdc | 115 Vdc to 280 Vdc |

3. Apparatus. The test equipment should be as follows:

a. Programmable DC power supply
b. True RMS voltmeter
c. Oscilloscope

4. Test setup. Configure the test setup as shown in figure HDC501-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC501-1. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

5.1 Compliance test for MIL-STD-704B and C. The UUT must be subjected to the starting voltage transients described in table HDC501-II (test condition A). The voltage must decrease from steady state voltage to 155 Vdc within 1 millisecond. The voltage must return to steady state at a constant rate over 30 seconds. Monitor the performance of the UUT during the starting voltage transient according to the equipment performance test procedures to verify that the UUT is providing specified performance for starting aircraft electrical conditions. Repeat the test condition 5 times. After the power returns to normal limits, conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT automatically returns to specified performance for normal aircraft electrical conditions when the power returns to within normal limits. Record the steady state voltage, voltage transient (oscilloscope trace), and the performance of the UUT in the data sheet shown in table HDC501-IV. Repeat for each mode of operation of the UUT.

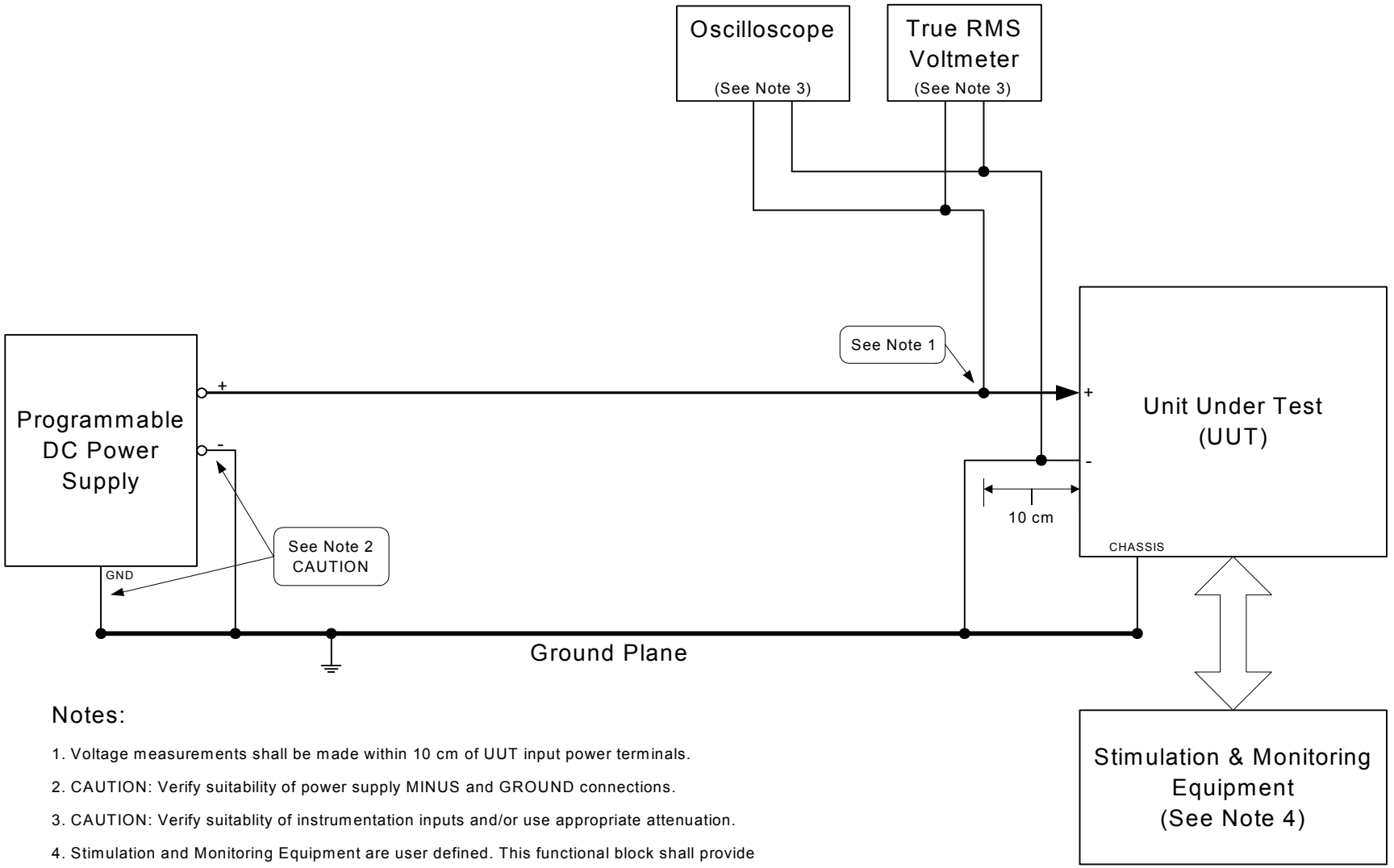
5.2 Compliance test for MIL-STD-704D, E, and F. The UUT must be subjected to the starting voltage transients described in table HDC501-III (test condition AA). The voltage must decrease from steady state voltage to 115 Vdc within 1 millisecond. The voltage must return to steady state at a constant rate over 30 seconds. Monitor the performance of the UUT during the starting voltage transient according to the equipment performance test procedures to verify that the UUT is providing specified performance for starting aircraft electrical conditions. Repeat the test condition 5 times. After the power returns to normal limits, conduct a performance test of the UUT according to the utilization equipment performance test procedures to verify that the UUT automatically returns to specified performance for normal aircraft electrical conditions when the power returns to within normal limits. Record the steady state voltage, voltage transient (oscilloscope trace), and the performance of the UUT in the data sheet shown in table HDC501-IV. Repeat for each mode of operation of the UUT.

TABLE HDC501-II. Test conditions for MIL-STD-704B and C starting voltage transients.

| Test Condition | Steady State Voltage Vdc | Time From Steady State Voltage to Voltage Transient Level milliseconds | Voltage Transient Level Vdc | Time From Voltage Transient Level to Steady State Voltage |
|---|---|---|---|---|
| A | 280 Vdc | < 1 msec | 155 Vdc | 30 sec |

TABLE HDC501-III. Test conditions for MIL-STD-704D, E, and F starting voltage transients.

| Test Condition | Steady State Voltage Vdc | Time From Steady State Voltage to Voltage Transient Level milliseconds | Voltage Transient Level Vdc | Time From Voltage Transient Level to Steady State Voltage |
|---|---|---|---|---|
| AA | 280 Vdc | < 1 msec | 115 Vdc | 30 sec |




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC501-1. Starting operation - starting voltage.

TABLE HDC501-IV. Sample data sheet for HDC501 starting voltage transients for MIL-STD-704B, C, D, E, & F.

| Test Condition | Parameters | | | | | | | | Performance |
|---|---|---|---|---|---|---|---|---|---|
| | Steady State Voltage | | Voltage Transient | | Time to Return to Steady State Voltage | | Oscilloscope Trace | | Pass/Fail |
| | | $V_{DC}$ | | $V_{DC}$ | | sec | Attach Trace | $V_{DC}$ vs. Time | |

**METHOD HDC601**
**Power Failure**

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL
OPERATING CONDITION: Power Failure

PARAMETER: Power Failure

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment operates and maintains specified performance when subjected to Power Failures as specified in the applicable edition(s) of MIL-STD-704.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment operates and maintains performance as specified in the utilization equipment performance specification document for power failure aircraft electrical conditions when subjected to power failures as specified by the applicable edition(s) of MIL-STD-704 and as noted in table HDC601-I. The utilization equipment must maintain the specified performance during power failures. Unless otherwise specified in the utilization equipment performance specification document, the utilization equipment must automatically return to the performance specified for normal aircraft electrical conditions when the power returns to within normal limits. The utilization equipment must not suffer damage or cause an unsafe condition.

TABLE HDC601-I. MIL-STD-704 Power failure limits.

| Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Power Failure | N/A | 7 sec figure 10 MIL-STD-704B | 7 sec figure 13 MIL-STD-704C | 7 sec figure 13 MIL-STD-704D | 7 sec figure 12 MIL-STD-704E | 7 sec figure 17 MIL-STD-704F |

3. Apparatus. The test equipment should be as follows:

a. Programmable DC power supply
b. True RMS voltmeter
c. Oscilloscope

4. Test setup. Configure the test setup as shown in figure HDC601-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

5. Compliance test. With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC601-1. Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. Allow sufficient time for the UUT to warm up. Conduct a performance test of the UUT according to

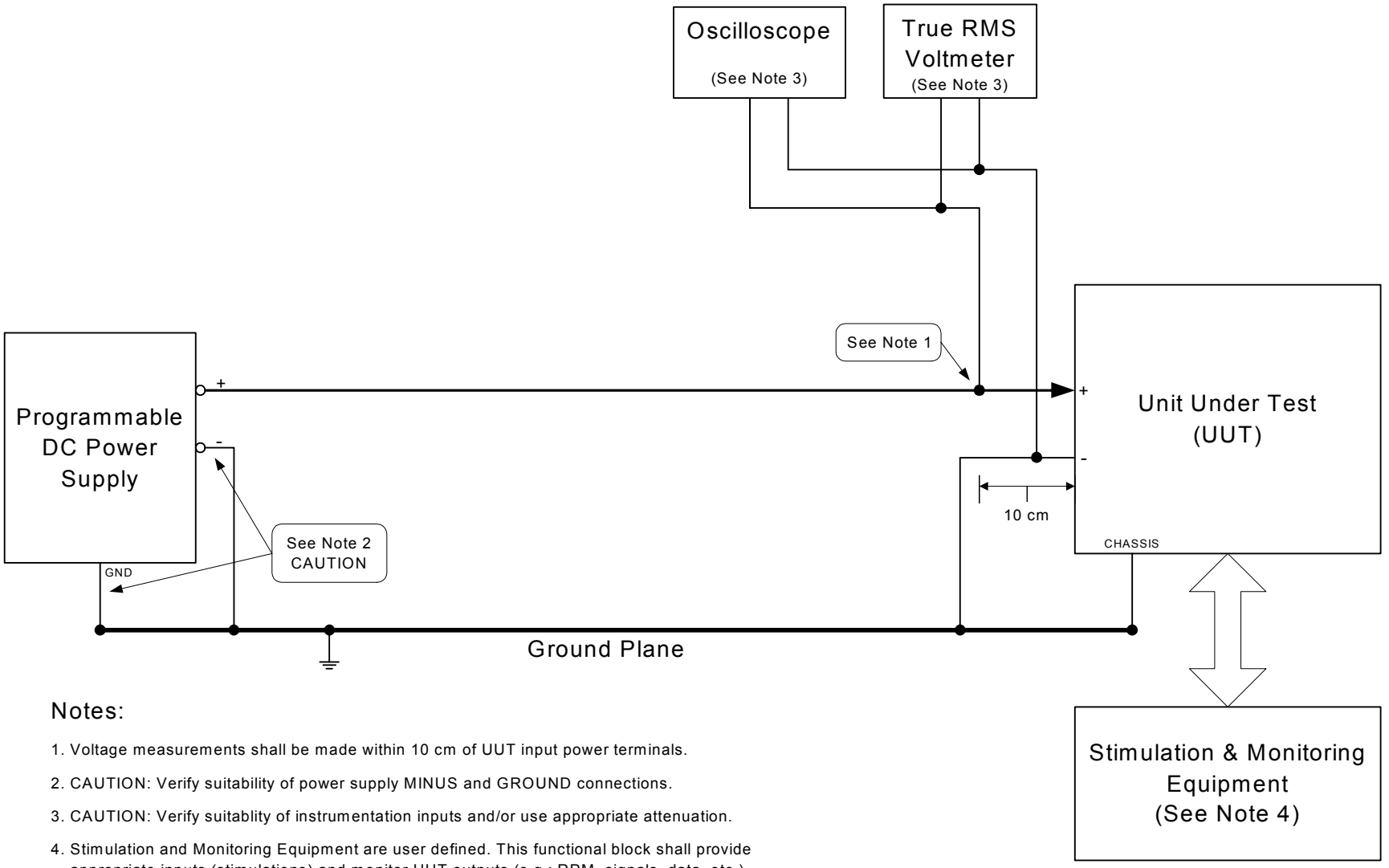
the utilization equipment performance test procedures to verify that the UUT is providing specified performance for normal aircraft electrical conditions.

For each test condition A through D noted in table HDC601-II, perform a power failure (0 V) of the duration listed. The voltage must decrease from the steady state voltage to 0 volts within 0.25 milliseconds, remain at 0 volts for the duration listed for the test condition, and return from 0 volts to the steady state voltage within 0.25 milliseconds. For each test condition, monitor the performance of the UUT according to the utilization equipment performance test procedures for power failure operation to verify that the UUT is providing specified performance for power failure aircraft electrical conditions. After the power returns to normal limits, conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has automatically returned to the performance specified for normal aircraft electrical conditions, and has not suffered damage. Record the steady state voltage, time duration of power failure, and the performance of the UUT for each test condition in the data sheet shown in table HDC601-III. Repeat each test condition 5 times. Repeat for each mode of operation of the UUT.

After all test conditions are complete, adjust the voltage to the nominal steady state voltage of 270 VDC. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has not suffered damage and is providing specified performance for normal aircraft electrical conditions.

TABLE HDC601-II. Test conditions for power failures.

| Test Condition | Duration of Power Failure |
|---|---|
| A | 100 msec |
| B | 500 msec |
| C | 3 seconds |
| D | 7 seconds |




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC601-1. Power Failure.

TABLE HDC601-III. Sample data sheet for HDC601 power failure.

| Test Condition | Parameters | | | | Performance |
|---|---|---|---|---|---|
| | Voltage | | Time Duration of Power Failure | | Pass/Fail |
| A | | $V_{DC}$ | | msec | |
| B | | $V_{DC}$ | | msec | |
| C | | $V_{DC}$ | | sec | |
| D | | $V_{DC}$ | | sec | |

**METHOD HDC602**
**Phase Reversal**

POWER GROUP: 270 Volt DC

AIRCRAFT ELECTRICAL
OPERATING CONDITION: Power Failure

PARAMETER: Phase Reversal

1. Scope.

1.1 Purpose. This test procedure is used to verify that 270 volt DC power utilization equipment is not damaged by phase reversal or a positive physical means is employed to prevent phase reversal.

2. Validation criteria. The utilization equipment is considered to have passed if the utilization equipment is not damaged and does not cause an unsafe condition when the positive and negative connection are reversed for the applicable edition(s) of MIL-STD-704 and as noted in table HDC602-I. A positive physical means to prevent phase reversal may be used to fulfill this requirement.

TABLE HDC602-I. MIL-STD-704 phase reversal requirement.

| Limit | 704A | 704B | 704C | 704D | 704E | 704F |
|---|---|---|---|---|---|---|
| Phase Reversal | N/A | N/A | N/A | N/A | N/A | Phase Reversal Does not Cause Damage |

3. Apparatus. The test equipment should be as follows:

a. Adjustable DC power supply
b. True RMS voltmeter

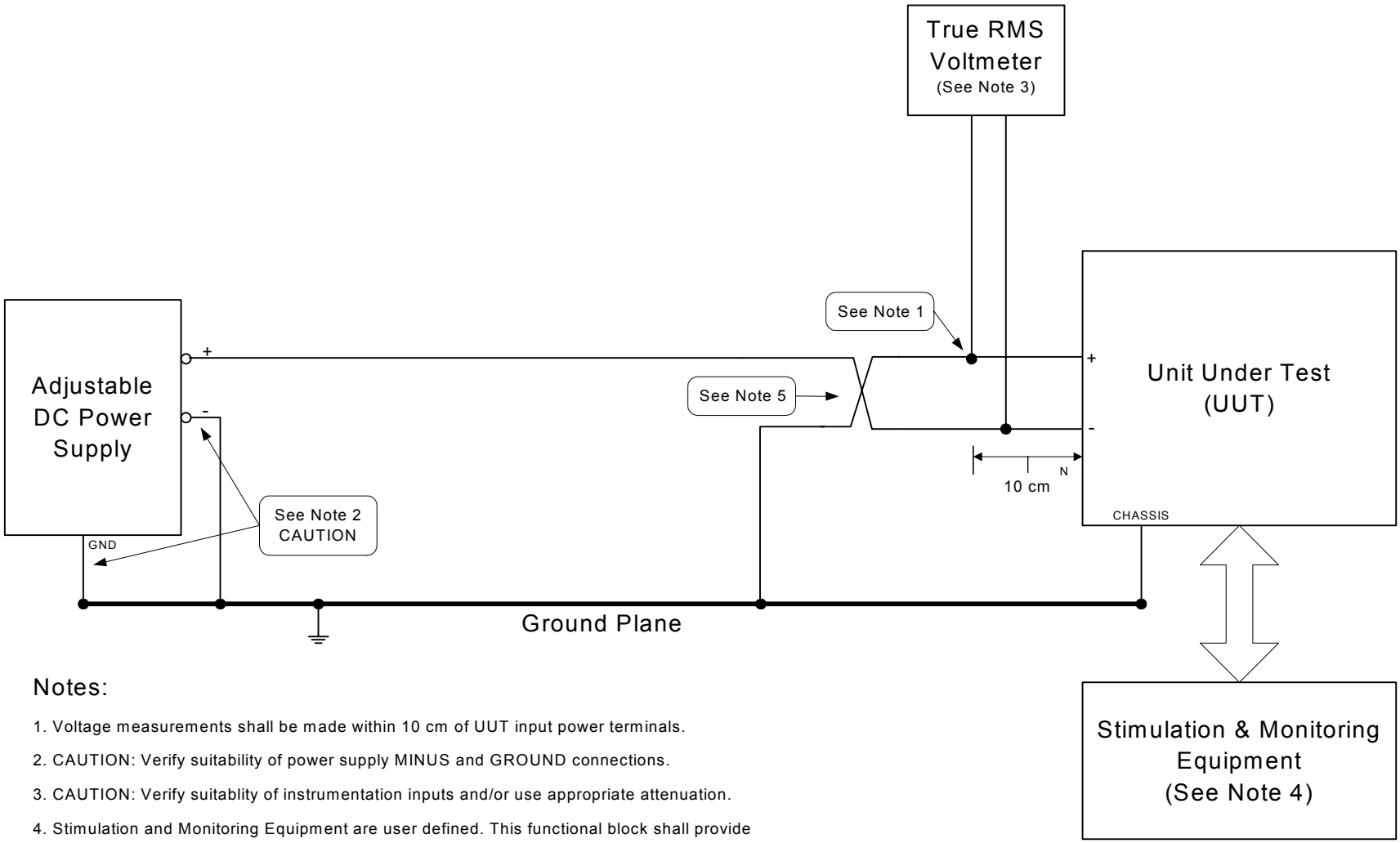
4. Test setup. Configure the test setup as shown in figure HDC602-1. Measurements, except current, must be made within 10 cm of the input power terminals of the UUT.

5. Compliance test. If a positive physical means is employed to prevent phase reversal, confirm that the positive and negative conductors cannot be reversed.

If the positive and negative conductors can be reversed, with the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC602-1 (positive and negative conductors reversed). Turn on the power source and adjust the voltage to the nominal steady state voltage of 270 VDC. Energize the UUT. The UUT must remain for a length of time that confirms the utilization equipment is not damaged and does not cause an

unsafe condition due to phase reversal and should be not less than thirty (30) minutes. Record the steady state voltage, time duration at phase reversal test condition, and the performance of the UUT in the data sheet shown in table HDC602-II. Repeat for each mode of operation of the UUT.

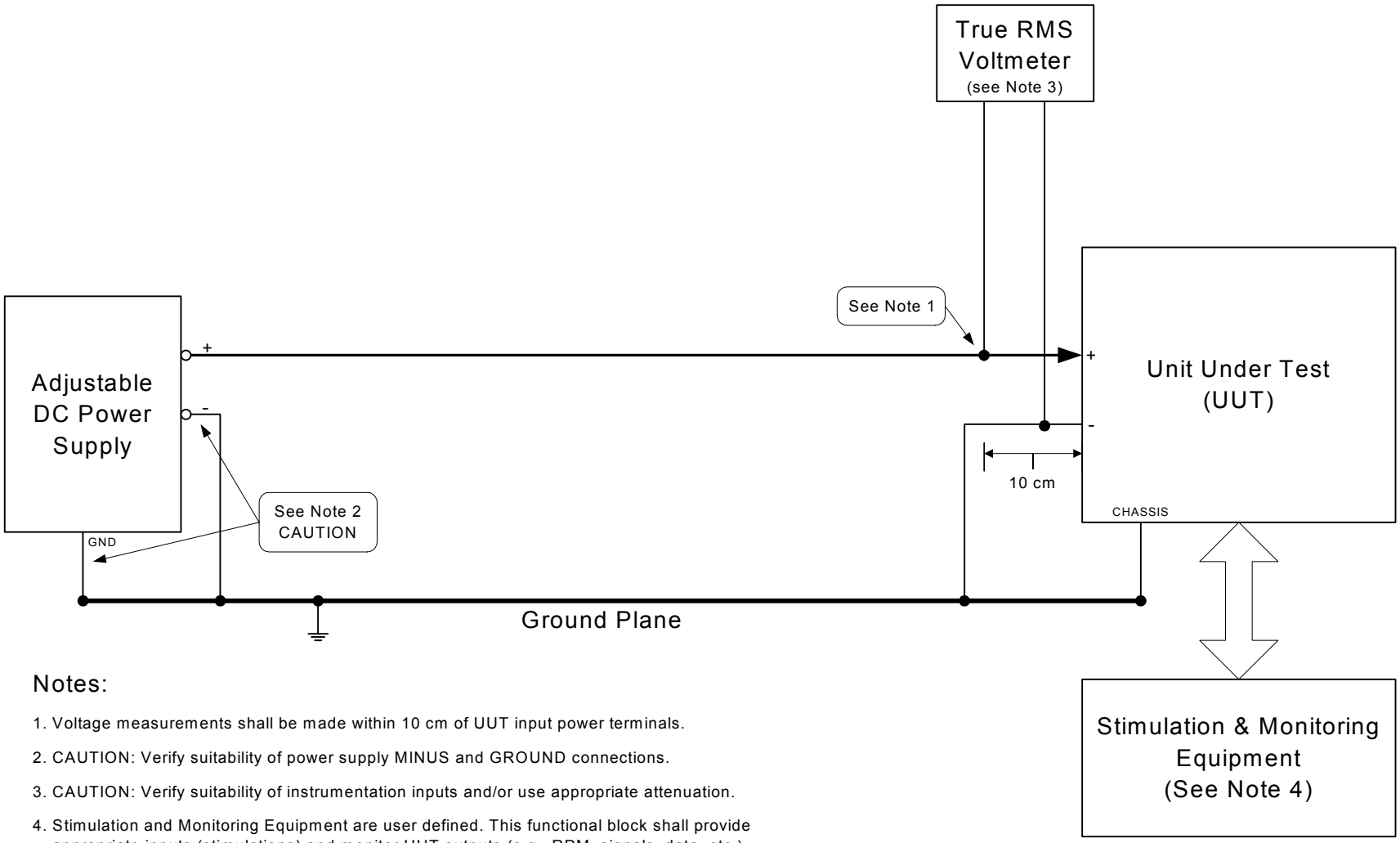
With the power source off, install the UUT and the stimulation and monitoring equipment into the test setup of figure HDC602-2 (positive and negative conductors connected properly). Turn on the power source and adjust the voltage to the nominal steady state voltage of 270VDC. Energize the UUT. The UUT must remain for a length of time that confirms the utilization equipment was not damaged and does not cause an unsafe condition after the phase reversal and should be not less than thirty (30) minutes. Conduct a performance test of the UUT according to the utilization equipment performance test procedures to confirm that the UUT has returned to the performance specified for normal aircraft electrical conditions and has not suffered damage. Record the steady state voltage, time duration at test condition, and the performance of the UUT in the data sheet shown in table HDC602-II. Repeat for each mode of operation of the UUT.




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitablity of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)
5. Phase Polarity is reversed.

FIGURE HDC602-1. Phase reversal.




Notes:

1. Voltage measurements shall be made within 10 cm of UUT input power terminals.
2. CAUTION: Verify suitability of power supply MINUS and GROUND connections.
3. CAUTION: Verify suitability of instrumentation inputs and/or use appropriate attenuation.
4. Stimulation and Monitoring Equipment are user defined. This functional block shall provide appropriate inputs (stimulations) and monitor UUT outputs (e.g.: RPM, signals, data, etc.)

FIGURE HDC602-2. Correct phase connection.

TABLE HDC602-II. Sample data sheet for HDC602 phase reversal.

| Test Condition | Parameters | | | | Performance |
|---|---|---|---|---|---|
| | | | | | Yes/No |
| Phase Reversal Prevented by Positive Physical Means | | | | | |
| If No | | | | | |
| | Voltage | | Time Duration at Condition | | Pass/Fail |
| Phase Reversal | | $V_{dc}$ | | min | |
| Correct Phase Connection | | $V_{dc}$ | | min | |

6. NOTES

6.1 Intended use. This handbook should be used as guidance when establishing test requirements, for inclusion in performance specifications developed for the procurement of utilization equipment, to ensure compliance with the aircraft electrical power characteristics as specified by MIL-STD-704.

6.2 Subject term (keyword) listing.

Aircraft, electrical power
Aircraft, electrical test
Electrical operating areas
Equipment, utilization
Power groups
Specification, utilization equipment

CONCLUDING MATERIAL

Custodians:
Army - AV
Navy - AS
Air Force - 11

Preparing Activity:
Navy - AS

(Project No. SESS-0053)

Review Activities:
Army - CR, MI, TE
Navy - EC, MC, SA, SH, YD

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