MIL-STD-704F OPTION

MIL-STD-704F Aircraft Electric Power Characteristics
Test Sequences

OPERATION MANUAL

Pacific Power Source, Inc.

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1 Introduction

Pacific Power Source has developed various test sequence packages to assist test engineers in performing standard military or industrial compliance tests. The MIL-STD-704F test sequence option is one of many options associated with Test Manager that Pacific Power Source offers.

The MIL-STD-704F test sequence option is based on the Mil-Std-704 Department of Defense Interface Standard for Aircraft Electronic Power Characteristics, and consists of test sequences for single-phase and three-phase equipment in five AC power categories and two DC categories. The Pacific Power Source Inc. MIL-STD-704F option covers all five AC power groups and two DC test groups contained in the test standard.

Power Group	Description	Nominal Voltage	Nominal Frequency	Phase Modes
SAC	Single-Phase, 400 Hz Constant Frequency, 115 V	115Vrms L-N	400Hz	Single Phase
TAC	Three-Phase, 400 Hz Constant Frequency, 115 V	115Vrms L-N	400Hz	Three Phase
SVF	Single-Phase, Variable Frequency, 115 V	115Vrms L-N	360 – 800Hz	Single Phase
TVF	Three-Phase, Variable Constant Frequency, 115 V	115Vrms L-N	360 – 800Hz	Three Phase
SXF	Single-Phase, 60 Hz Constant Frequency, 115 V	115Vrms L-N	60Hz	Single Phase
Table	**Description**			**Phase Modes**
LDC[1]	28VDC utilization equipment MIL-STD-704 compliance tests	28VDC		n/a
HDC[2]	270VDC utilization equipment MIL-STD-704 compliance tests	270VDC		n/a

A test report in Rich Text Format (.rtf) is automatically generated for each test sequence performed in UPC Test Manger. Test steps, parameter measurements, waveforms and pass/fail test results are recorded as appropriate in the test report. Test engineers can also modify any of the pre-built test sequences and reports to better suit their needs.

This manual is neither a handbook to MIL-STD-704F compliance testing nor a step-by-step tutorial for operation of UPC Studio and UPC Test Manager. It is assumed that the test engineer is familiar with MIL-STD-704 test procedures and setups as well as UPC studio and UPC Test Manager Operation before using this MIL-STD-704F test sequence option. Check the Naval Air Systems Command website at http://www.navair.navy.mil for additional information on electronics test standards.

For UPC studio and UPC Test Manager Operation, please refer to the Pacific Power Source UPC Studio and UPC Test Manager Operation manuals.

Other test equipment in addition to a Pacific Power Source AC Source may be required for certain tests while using the MIL-STD-704F test sequence option. These additional requirements are detailed in Section 7, Test Sequence Coverage.

[1] LDC Power group testing requires a 3 Phase AMX model AC power source and the DCR600-20 Option which is sold separately.

[2] HLDC Power group testing requires a 3 Phase AMX model AC power source and the DCR600-20 Option which is sold separately.

2 Hardware Requirements

Pacific Power Source units must meet the following requirements to perform the MIL-STD-704F compliance tests:

- Single-phase test: the power source must have dual-range capability: either single-phase/transformer coupled or split-phase output forms.
- Three-phase test: the power source must have dual-range capability: direct output mode and transformer coupled output mode.
- For LDC and HDC tests:
    - A DCR module is required to perform DC test (Option sold separately from Mil-Std 704F Library.)
    - An AMX Series 3 Phase output Linear AC Power Source model is recommended for DC tests using the DCR Option.

The amount of power or current required will vary according to the demands of the load. For detailed output capabilities on each power source model, refer to the Pacific Power Source Operation Manuals for the preferred power source units.

3 Software Installation

The MIL-STD-704F test sequence is distributed as a single install program. The following executable file constitutes the MIL-STD-704F Option package:

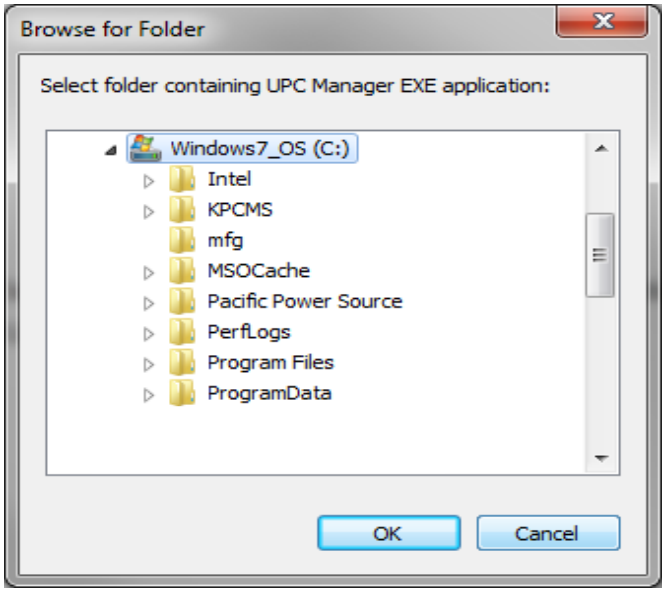
149101-MIL-STD-704F Test Suite v1.0.exe

Note: The version number “v1.0” may vary as new updates are released.

Test Sequence software operation requires that Pacific’s UPC Manager and Test Manager Software products must already be installed on the target PC. During installation, Pacific Power Source’s test sequence files will be extracted into a default directory:

C:\Pacific Power Source\UPC Manager\Test Manager

If the setup installer cannot locate UPC Manager, a dialog appears asking test engineers to browse to the UPC Manager.exe application as shown below.

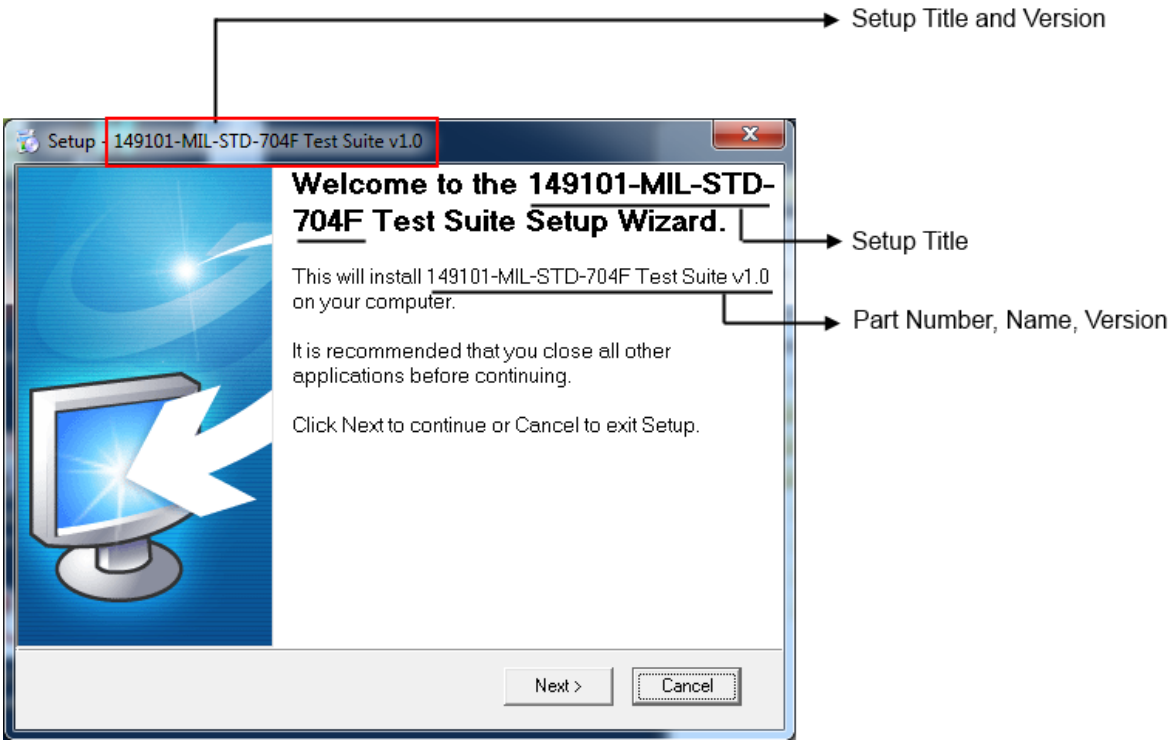


To install the MIL-STD-704F Option test sequences:

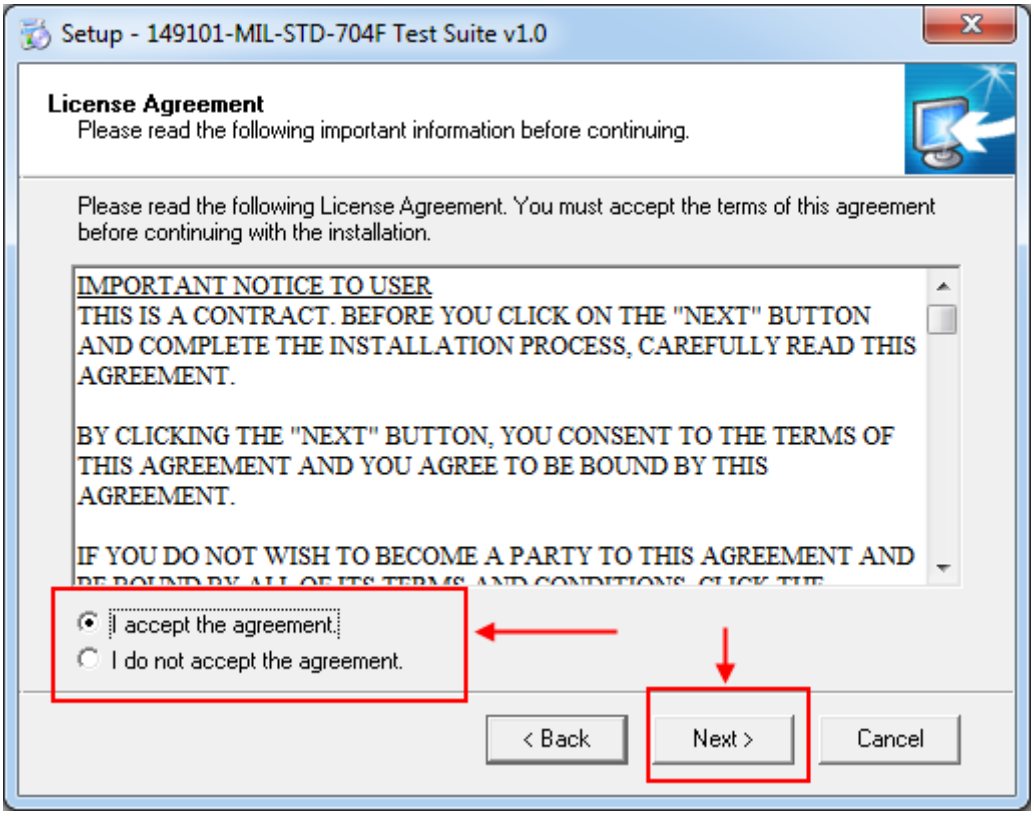
- Double click the executable file:

149101-MIL-STD-704F Test Suite v1.0.exe

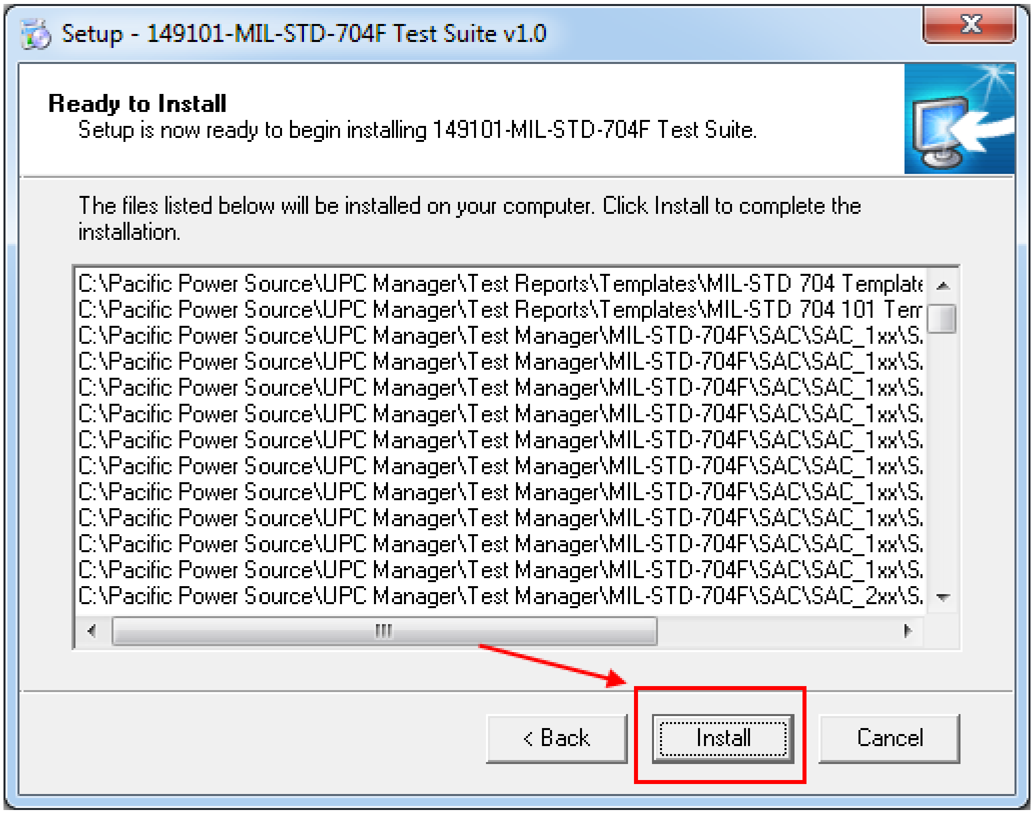
The Setup Wizard window appears as shown below.



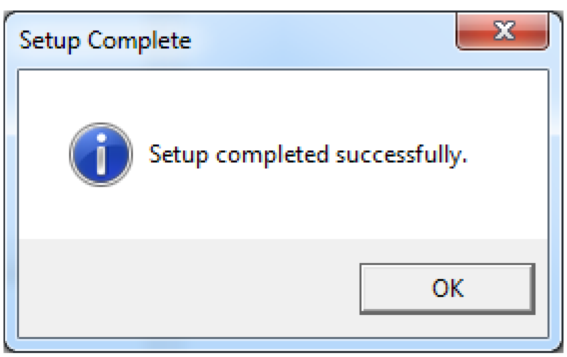
- Click **Next** button to get to the License Agreement window.



- Read the License Agreement and check “I accept the agreement” to continue.
- Click **Next** button to get to Ready to install window as shown below.



- Click **Install** button to finish the installation.
- Depending on the size of the installed file, this process may take some amount of time. No activity is visible on the PC screen during this time but rest assured the installation is progressing in the back ground.
- Wait till the dialog box shown below occurs to indicate the installation process has completed and click OK to complete the setup process.



4 Software Removal

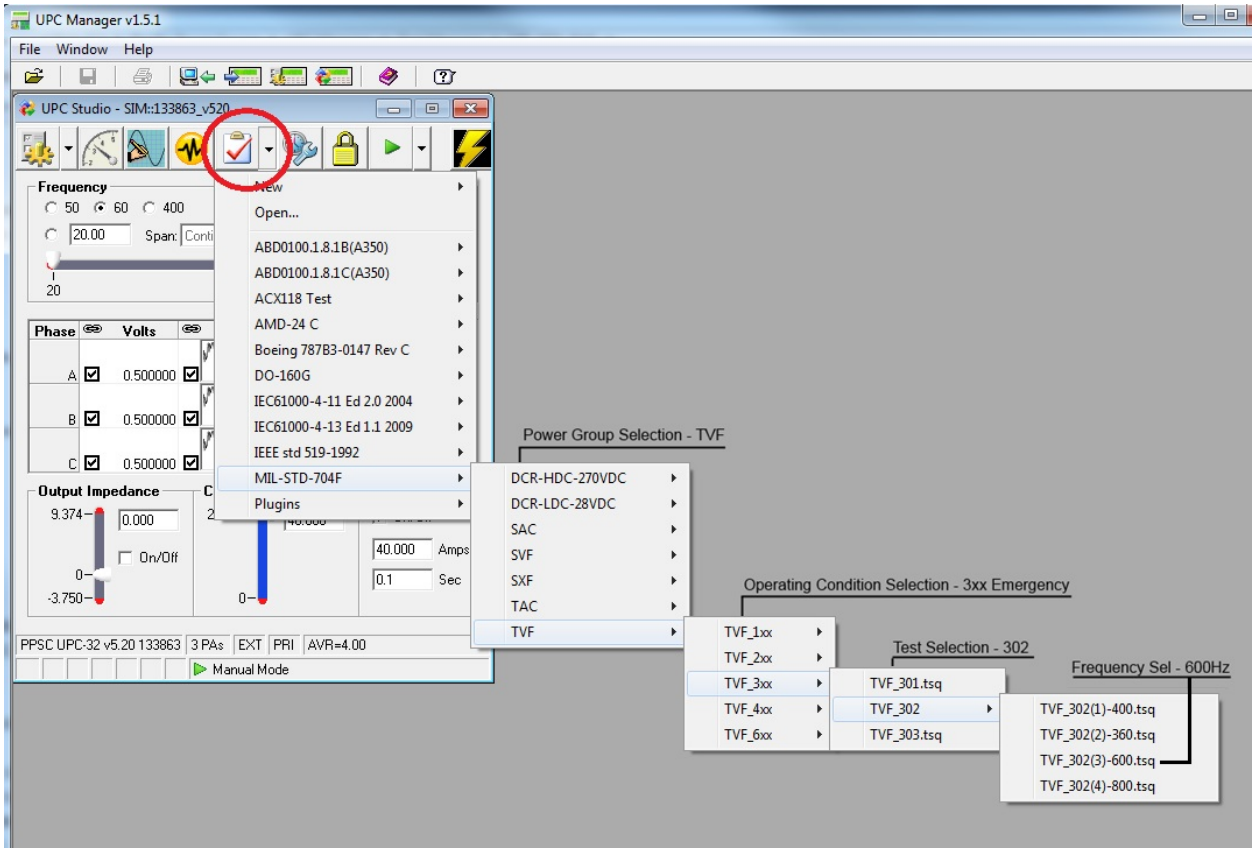
To uninstall MIL-STD-704F test sequence files or packages:

- Navigate to the directory where the test sequence files or folder are saved.
- Delete the desired files or folders from the directory.

Note: There are no Windows® System files or registration entries associated with the test sequences so no uninstall program is required to remove the option files from a PC.

5 MIL-STD-704F Test Manager Window

After the test sequence software is successfully installed, the individual test sequences are accessed from the Test Manager menu in UPC Studio as shown.



MIL-STD-704F test sequences are grouped based on categories of equipment defined in the test standard: SAC, TAC, SVF, TVF and SXF. The individual test sequence files are named using the following naming convention:

Power Group	Aircraft Electrical Operating Condition	Test Number	AC source coupling	File Extension
NNN_	D	DD	Optional	.tsq
SAC, SVF, TAC, TVF or SXF	1 through 6	01 through 10	.. Direct Coupled	
			_FORM2 Split Phase mode	
			_XFMR Transformer coupled	

Thus, file SAC_101.tsq is the test file for single phase, fixed frequency, normal operation, test 01 and is implemented using the low voltage range of the AC Source (Direct coupled output).

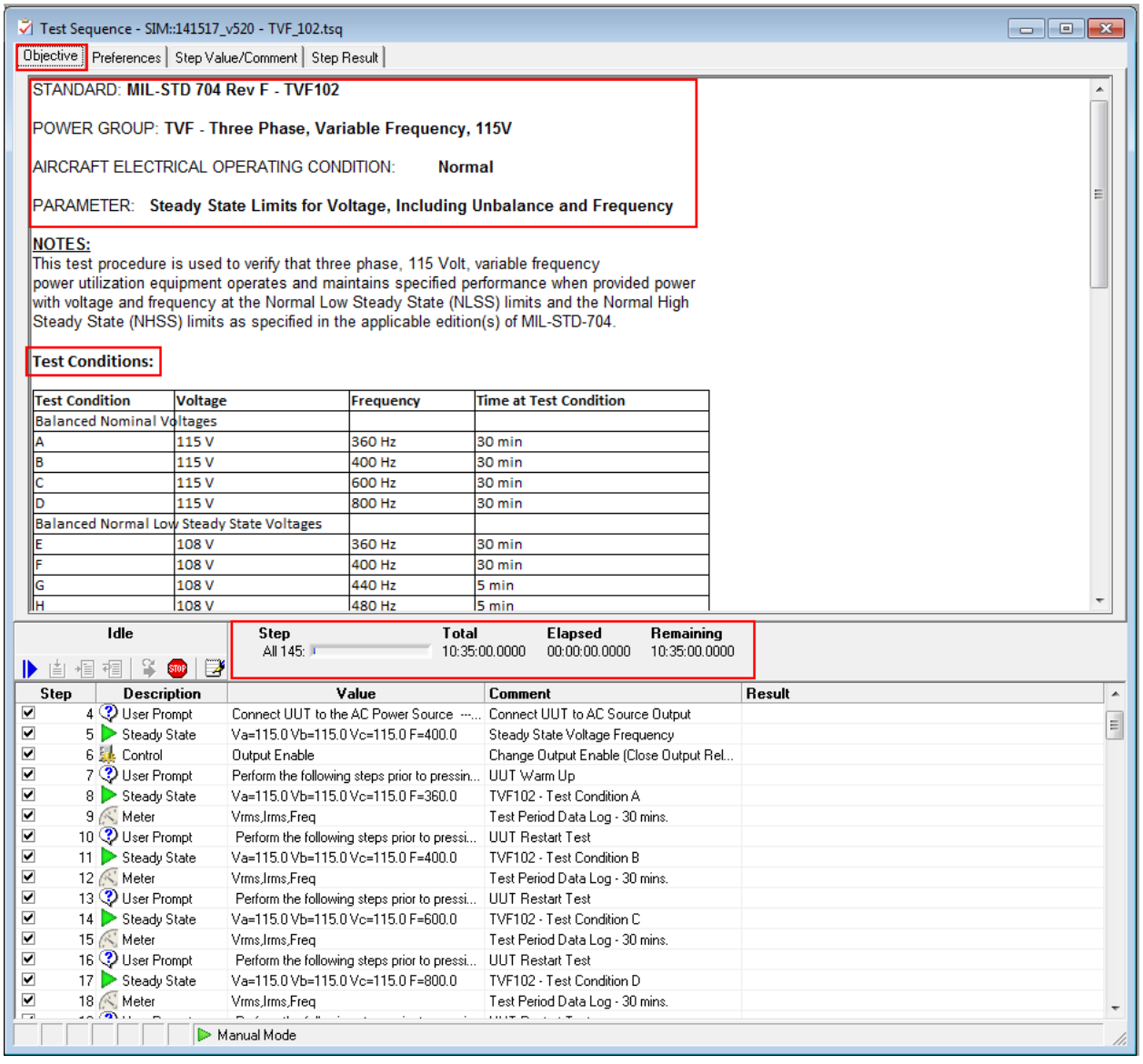
Note: While operation of individual test sequences is described in this document, normally it would be expected that the test engineers would use these test sequences to build a test plan. See Pacific Power Source UPC Test Manager Operation Manual for test plan detail.

6 MIL-STD-704F Test Sequence Windows

A typical test sequence is organized in five windows/ tabs: **Objective, Preferences, Step Value / Comment, Step Result, and Test Report**. The content and purpose of these windows are described in the following sections. For more definition of each field see Pacific Power Source UPC Test Manager Operation Manual.

6.1 Objective Window

In the **Objective** window, illustrated below, the MIL-STD-704F section number, power group, operating condition, test purpose and time period, and parameter setup values are described in detail.



6.2 Preference Window

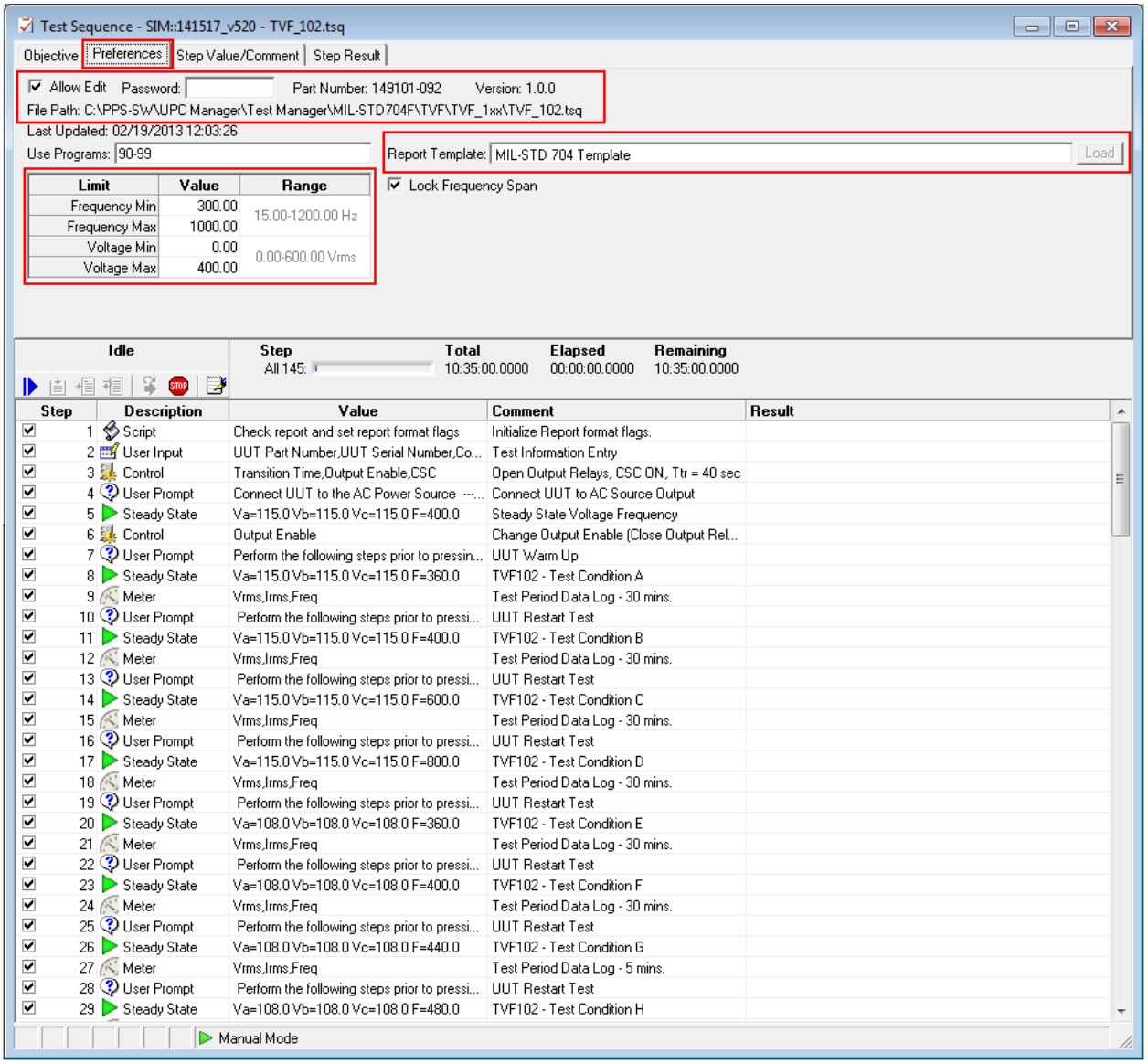
In the Preferences window shown below, “Allow Edit” is checked by default; The Pacific Power Source part number and version associated with the test sequence are indicated.

CAUTION

Test Sequences are distributed unprotected, providing the test engineer with the ability to edit and modify individual test and output sequences. It is recommended that a back-up copy of the output sequences be maintained to prevent inadvertent corruption of the factory supplied sequences.

The Report Template used with active test sequence is named “*MIL-STD-704 Template”,* and is automatically loaded from a default directory: *C:\Pacific Power Source\UPC Manager\Test Reports\Templates;*

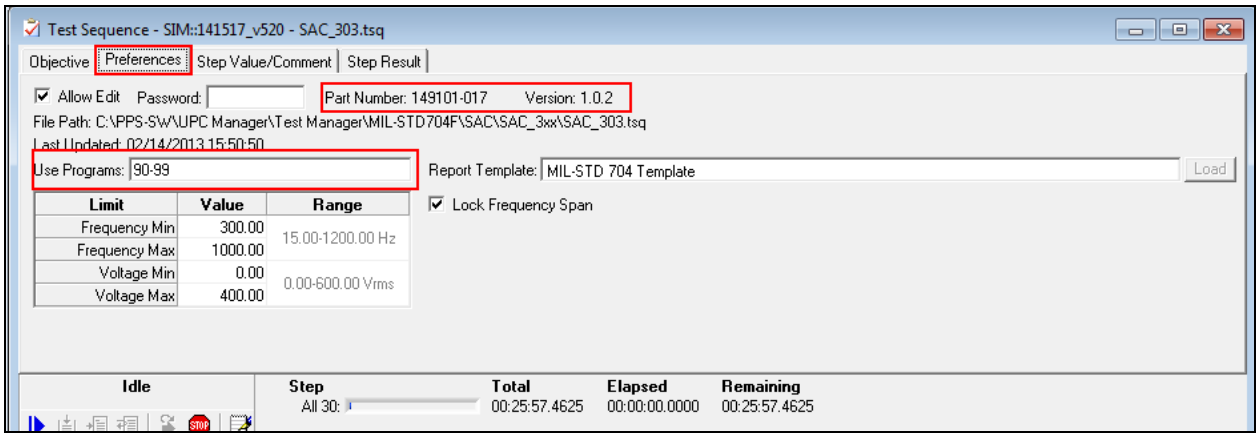
If a "*" appears at the end of the template file name (i.e. *MIL-STD-704 Template*),* It means data has been collected during a test and the test report has been updated but the report file has NOT yet been saved.


Test Sequence - SIM::141517_v520 - TVF_102.tsq
Objective
Preferences
Step Value/Comment
Step Result
Allow Edit
Password:
Part Number: 149101-092
Version: 1.0.0
File Path: C:\PPS-SW\UPC Manager\Test Manager\MIL-STD704F\TVF\TVF_1xx\TVF_102.tsq
Last Updated: 02/19/2013 12:03:26
Use Programs: 90-99
Report Template: MIL-STD 704 Template
Load
Lock Frequency Span
Limit
Value
Range
Frequency Min
300.00
Frequency Max
1000.00
15.00-1200.00 Hz
Voltage Min
0.00
Voltage Max
400.00
0.00-600.00 Vrms
Idle
Step
All 145:
Total
10:35:00.0000
Elapsed
00:00:00.0000
Remaining
10:35:00.0000
Step
Description
Value
Comment
Result
1 Script Check report and set report format flags Initialize Report format flags.
2 User Input UUT Part Number,UUT Serial Number,Co... Test Information Entry
3 Control Transition Time,Output Enable,CSC Open Output Relays, CSC ON, Ttr = 40 sec
4 User Prompt Connect UUT to the AC Power Source ---... Connect UUT to AC Source Output
5 Steady State Va=115.0 Vb=115.0 Vc=115.0 F=400.0 Steady State Voltage Frequency
6 Control Output Enable Change Output Enable (Close Output Rel...
7 User Prompt Perform the following steps prior to pressin... UUT Warm Up
8 Steady State Va=115.0 Vb=115.0 Vc=115.0 F=360.0 TVF102 - Test Condition A
9 Meter Vrms,Irms,Freq Test Period Data Log - 30 mins.
10 User Prompt Perform the following steps prior to pressi... UUT Restart Test
11 Steady State Va=115.0 Vb=115.0 Vc=115.0 F=400.0 TVF102 - Test Condition B
12 Meter Vrms,Irms,Freq Test Period Data Log - 30 mins.
13 User Prompt Perform the following steps prior to pressi... UUT Restart Test
14 Steady State Va=115.0 Vb=115.0 Vc=115.0 F=600.0 TVF102 - Test Condition C
15 Meter Vrms,Irms,Freq Test Period Data Log - 30 mins.
16 User Prompt Perform the following steps prior to pressi... UUT Restart Test
17 Steady State Va=115.0 Vb=115.0 Vc=115.0 F=800.0 TVF102 - Test Condition D
18 Meter Vrms,Irms,Freq Test Period Data Log - 30 mins.
19 User Prompt Perform the following steps prior to pressi... UUT Restart Test
20 Steady State Va=108.0 Vb=108.0 Vc=108.0 F=360.0 TVF102 - Test Condition E
21 Meter Vrms,Irms,Freq Test Period Data Log - 30 mins.
22 User Prompt Perform the following steps prior to pressi... UUT Restart Test
23 Steady State Va=108.0 Vb=108.0 Vc=108.0 F=400.0 TVF102 - Test Condition F
24 Meter Vrms,Irms,Freq Test Period Data Log - 30 mins.
25 User Prompt Perform the following steps prior to pressi... UUT Restart Test
26 Steady State Va=108.0 Vb=108.0 Vc=108.0 F=440.0 TVF102 - Test Condition G
27 Meter Vrms,Irms,Freq Test Period Data Log - 5 mins.
28 User Prompt Perform the following steps prior to pressi... UUT Restart Test
29 Steady State Va=108.0 Vb=108.0 Vc=108.0 F=480.0 TVF102 - Test Condition H
Manual Mode

6.3 Preference Window (continued)

"Use program" is set to use UPC programs 90-99 as default value; a set of suitable minimum and maximum values for each parameter are defined in the Limits table. "File path" and "Last update" information are updated each time when the test sequence is activated.

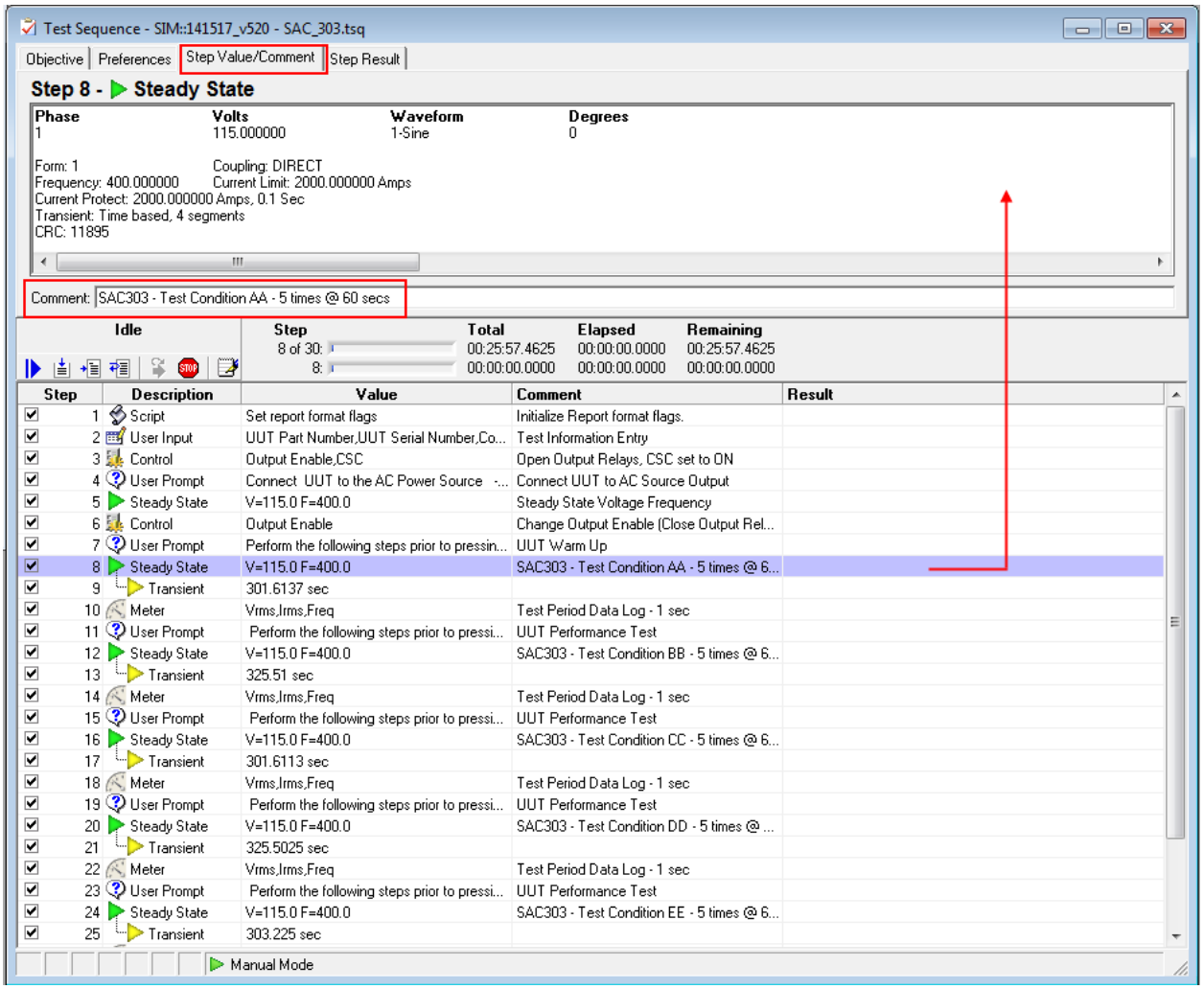
The MIL-STD-704F test sequences are created to allow test engineers to modify test sequence settings based on their preferences and needs, as well as to keep track of how many times a file has been changed and saved. Each time a test sequence file is modified and saved under the original name, the 3rd digit of the version number, appearing in the **Preference** window, will increment by 1(i.e. x.x.1). In the illustration below, the version 1.0.2 means the active test sequence file has been modified and saved twice.



If a test engineer will be modifying a test sequence, it is recommended that a copy of the original file first be saved in a different folder as changes overwrite the existing file. For detail information on test sequence modification, please see UPC Test Manager Operation Manual.

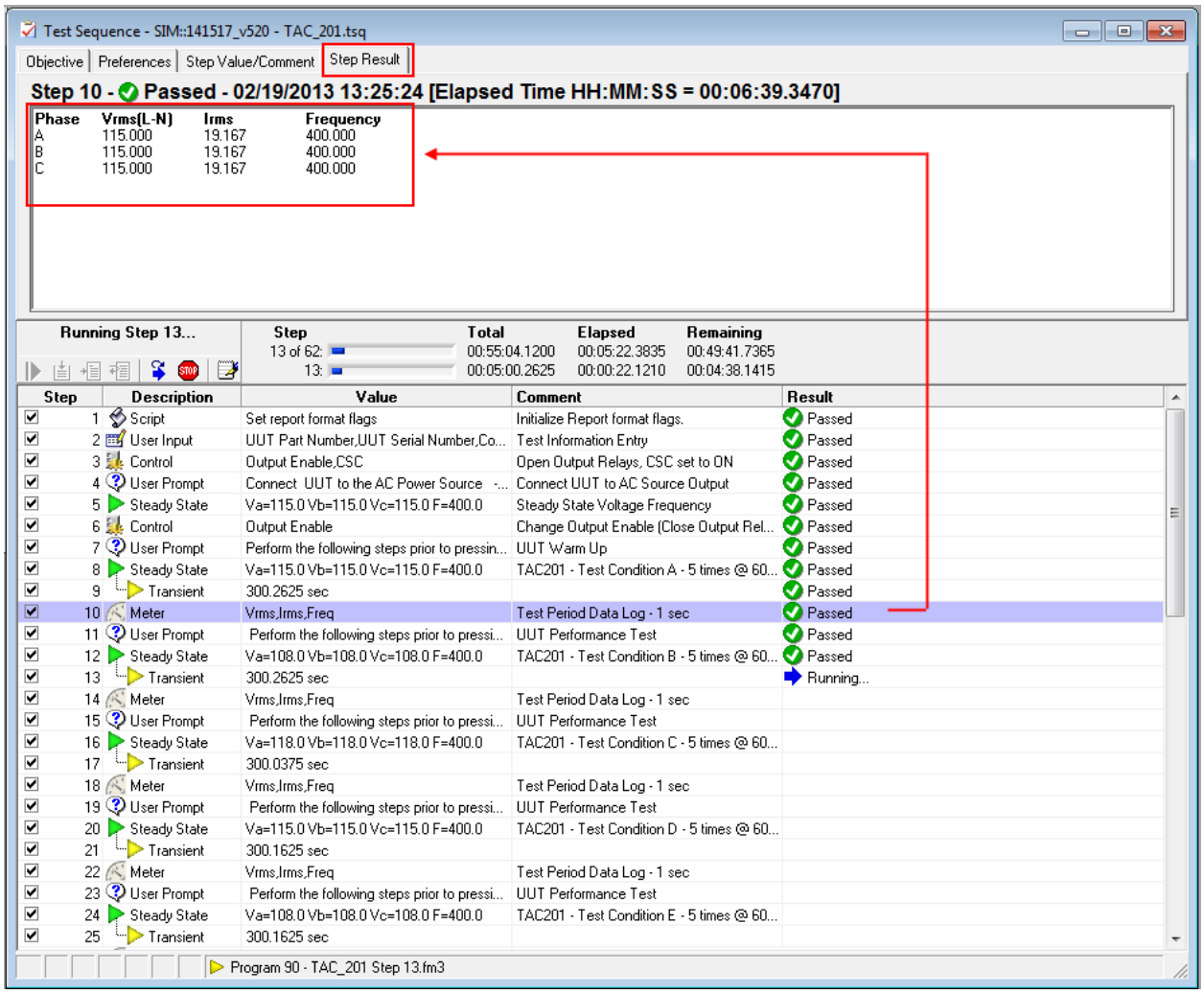
6.4 Step Value/Comment Window

In the **Step Value/Comment** window, the step settings are displayed for each selected item in the Step Table window. Purpose and test descriptions for individual test steps are summarized in the “Comment” text box.



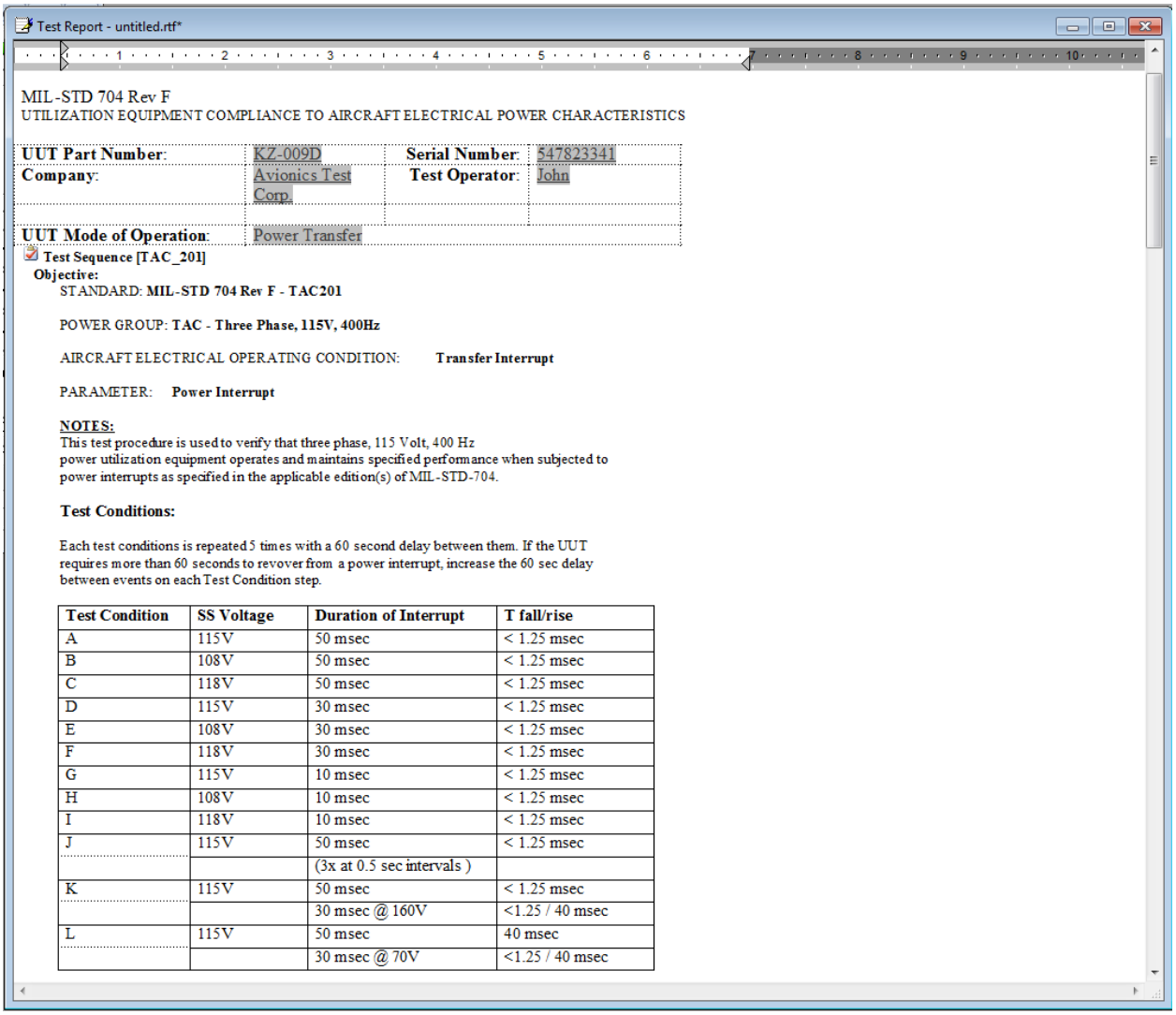
6.5 Step Result Window

In the **Step Result** window, the test result from each selected step is recorded. The results are recorded in the forms of text, numbers or graphs as defined in the active test sequence.



6.6 Test Report Window

After the test sequence execution is completed, a test report is generated using the template file defined in the **Preference** window. All test detail information including file name, objective, preference settings, and test results are recorded in the test report as shown below. For detailed information on viewing and saving test reports, please refer to UPC Test Manager Operation Manual.


Test Report - untitled.rtf*

MIL-STD 704 Rev F
UTILIZATION EQUIPMENT COMPLIANCE TO AIRCRAFT ELECTRICAL POWER CHARACTERISTICS

UUT Part Number:	KZ-009D	**Serial Number**:	547823341
Company:	Avionics Test Corp.	**Test Operator**:	John
UUT Mode of Operation:	Power Transfer		

Test Sequence [TAC_201]

Objective:

STANDARD: **MIL-STD 704 Rev F - TAC201**

POWER GROUP: **TAC - Three Phase, 115V, 400Hz**

AIRCRAFT ELECTRICAL OPERATING CONDITION: **Transfer Interrupt**

PARAMETER: **Power Interrupt**

NOTES:
This test procedure is used to verify that three phase, 115 Volt, 400 Hz power utilization equipment operates and maintains specified performance when subjected to power interrupts as specified in the applicable edition(s) of MIL-STD-704.

Test Conditions:

Each test conditions is repeated 5 times with a 60 second delay between them. If the UUT requires more than 60 seconds to revover from a power interrupt, increase the 60 sec delay between events on each Test Condition step.

Test Condition	SS Voltage	Duration of Interrupt	T fall/rise
A	115V	50 msec	< 1.25 msec
B	108V	50 msec	< 1.25 msec
C	118V	50 msec	< 1.25 msec
D	115V	30 msec	< 1.25 msec
E	108V	30 msec	< 1.25 msec
F	118V	30 msec	< 1.25 msec
G	115V	10 msec	< 1.25 msec
H	108V	10 msec	< 1.25 msec
I	118V	10 msec	< 1.25 msec
J	115V	50 msec	< 1.25 msec
		(3x at 0.5 sec intervals)	
K	115V	50 msec	< 1.25 msec
		30 msec @ 160V	<1.25 / 40 msec
L	115V	50 msec	40 msec
		30 msec @ 70V	<1.25 / 40 msec

7 Test Reports

Test reports are automatically created as each test sequence is executed. Generally, information contained in each step is added to the report as each step is executed. This includes the step type, parameters set, any measurement values recorded, comments and the result of each step (Pass or Fail).

Test reports can be used as is or further customized by the user. This chapter covers some of the possible changes that can be made as needed.

7.1 Template Files

Reports are based on a report template that is installed at the same time as the test sequences in the following directory:

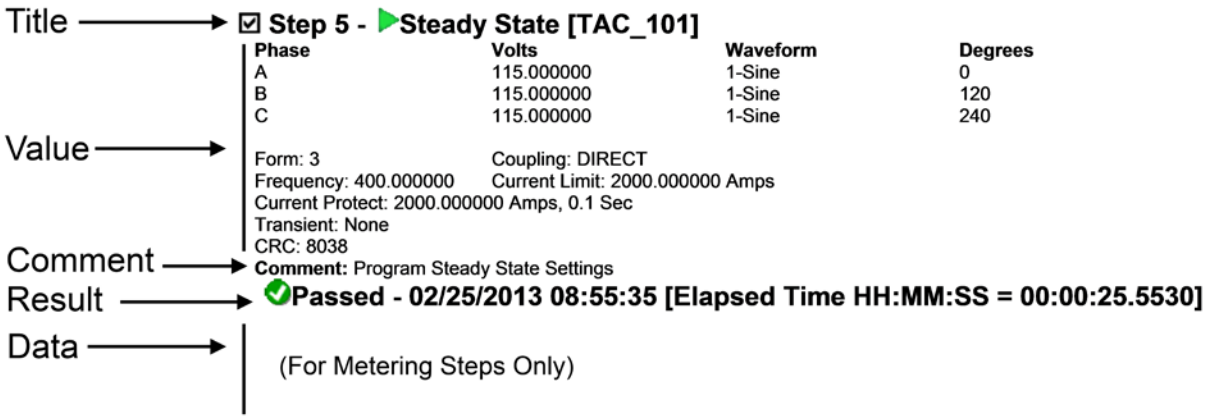
"C:\Pacific Power Source\UPC Manager\Test Reports\Templates"

Template files can be blank or contain introductory text, graphics, form fields, page / paragraph / character formatting, page header and footer (page numbering, date etc.).

7.2 Report Entries

Running a test sequence or test plan appends the results of each step at the end of test report. Running a test sequence from the beginning (using the Start icon in the Run Toolbar) initializes the test report from the selected template file then adds the test sequence Objective and Preferences. This creates a clean report each time the test sequence is run. Running a test sequence using the other controls does not clear the test report or add the Objective or Preferences, making it easier to troubleshoot (single step etc.) a test.

After each step runs, the information about that step is appended to the test report as shown below. This information includes the Title, Value, Comment, Result and Data of each step.



Title includes the enable checkbox, step number, icon, type and test sequence file name. Value and Comment are the test sequence information from the Step Value/Comment tab (design window). Result shows the result icon, title, date/time the step completed and the elapsed time the step completed from the beginning of the test. Note that not all steps produce data. The data also includes any errors that occurred running the step. Result and Data are also shown in the Step Result tab in the test sequence window .

7.3 Customizing Test Reports

There are several ways to customize test reports. Some possibilities are:

1. Change Headers and or Footers
2. Select which test steps to include in a report or how much information from each test step to include or exclude from the report.
3. Reformat layout, format tables and or fonts after the report is saved.

7.3.1 Report Template Headers and Footers

The provided MIL-STD-704F Report template files contain a simple footer which contains only basic information and no header.

The footer contains the following information.

A Header can be added by opening either of the two provided template files using MS Word.

MIL-STD 704 Template.rtf

MIL-STD 704 101 Template.rtf

Open the template file and select the “Insert” Ribbon tab. Click on “Header” in the Header & Footer” section. Select form the available list of header formats. This will insert a header on the first page and every subsequent page. You can insert your company’s logo to create a custom look for your reports.

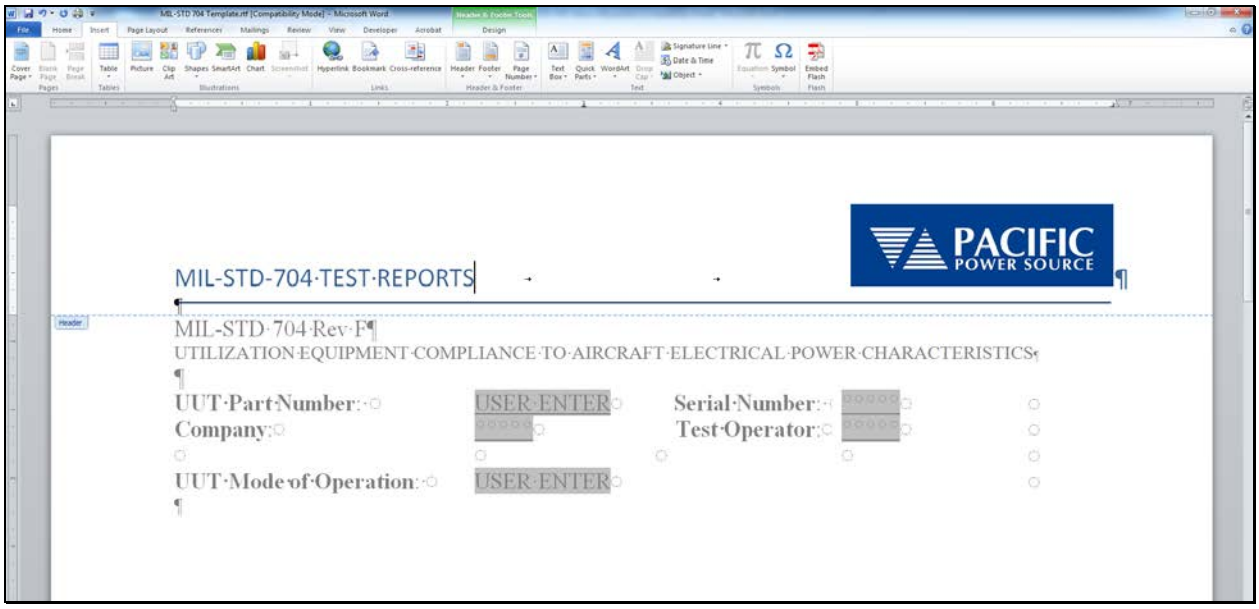


Figure 1: Adding Custom Report Headers to Report Template using MS Word

The same feature can be used to edit the existing report footer as needed.

Once satisfied with the look, save the report template. If you want to preserve the original templates provided, rename them to a different file name before saving your customer version. You can also restore the

original report template files by re-installing the MIL-STD-704F option but this will also re-install all test sequences.

7.3.2 Customizing Report Content using VB Script Steps

The VB Scripting feature of the UPC Test Manager program may be used to selectively exclude all or part of a test report entry. Most of the provided MIL-STD-704F test sequences use this feature in Step #1.

The available flags that can be set or cleared to include or exclude a specific test step report entry are covered by the UPC Studio on-line Help file and are not repeated in this manual. Search the Help file Index tab for "Script" to find the relevant information.

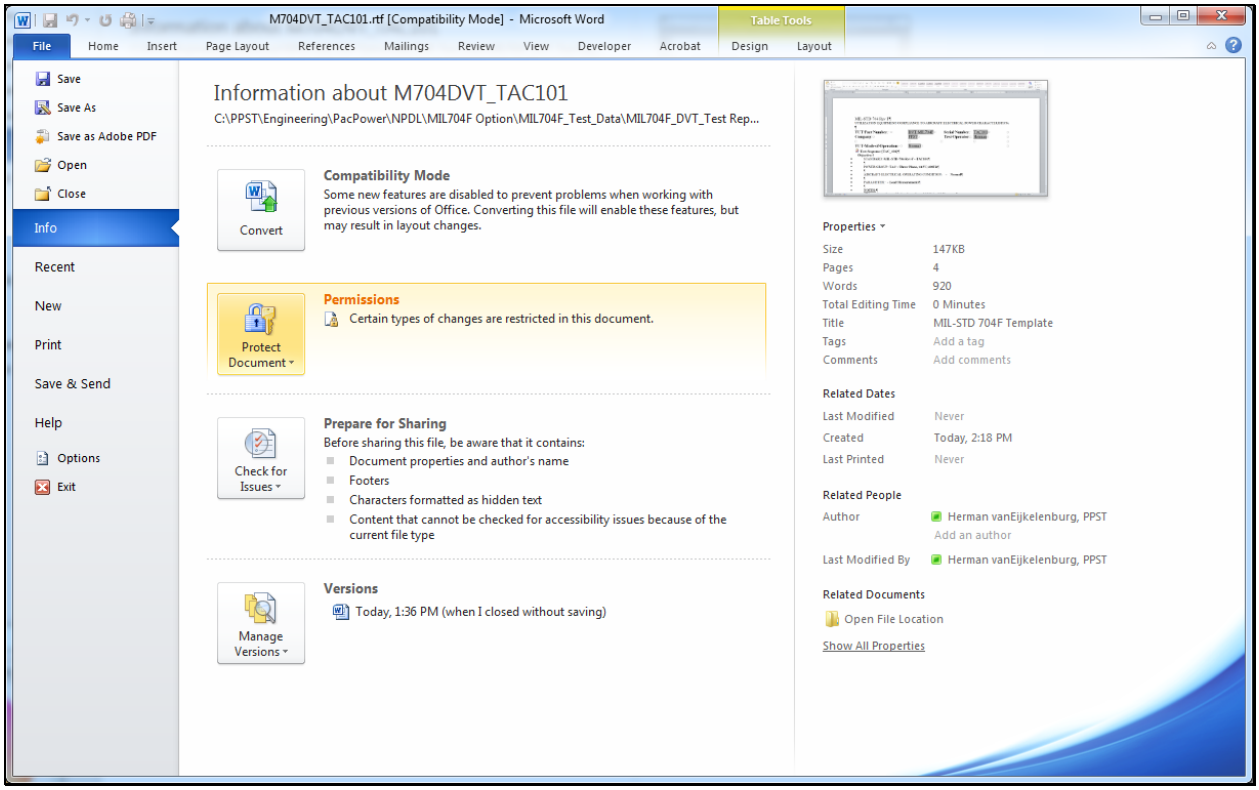
7.3.3 Editing existing Reports

As a rule, test reports generated by executing a test sequence are locked and cannot be edited. If needed, it is possible to unlock a report in order to add additional information or format data is a different way than the standard report provides.

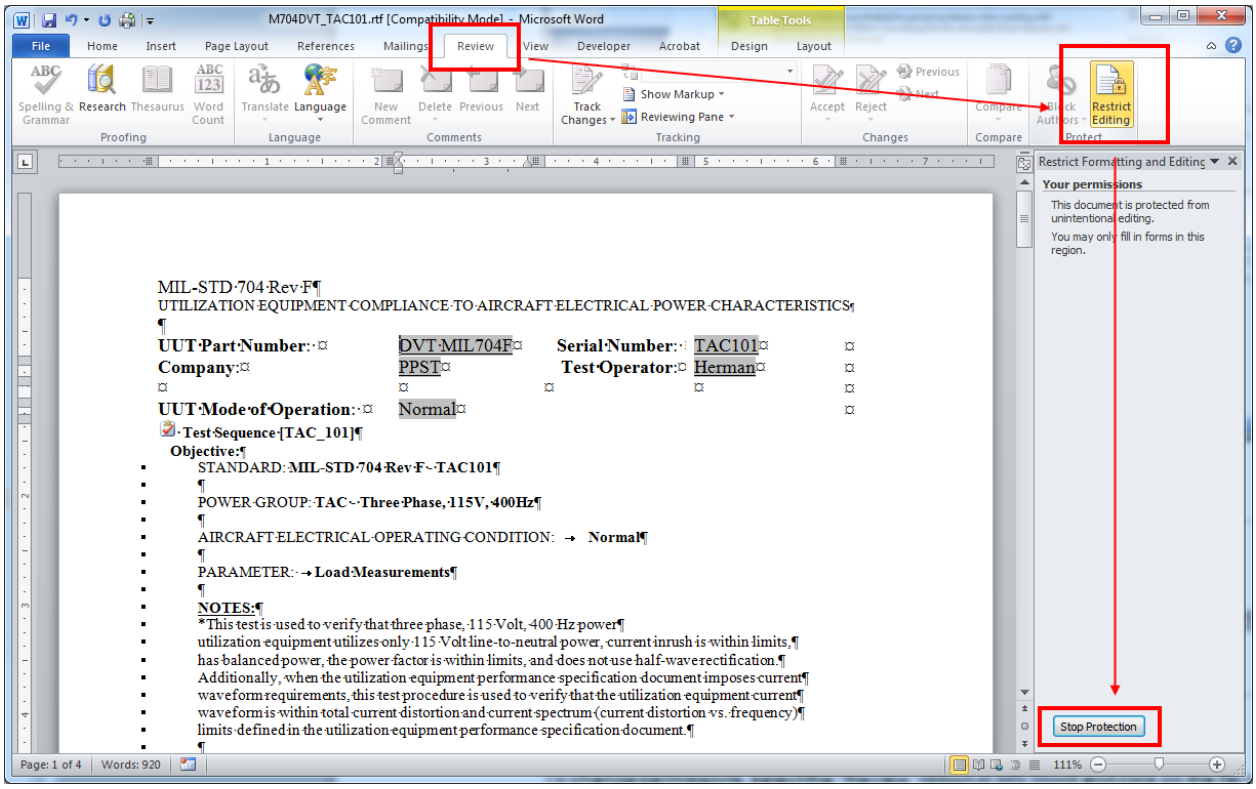
To edit an existing test report, proceed as follows:

1. Complete the test sequence and save the report when prompted as the end of the test sequence.
2. Use MS Word to open the file located in the Reports directory of UPC Studio, typically:

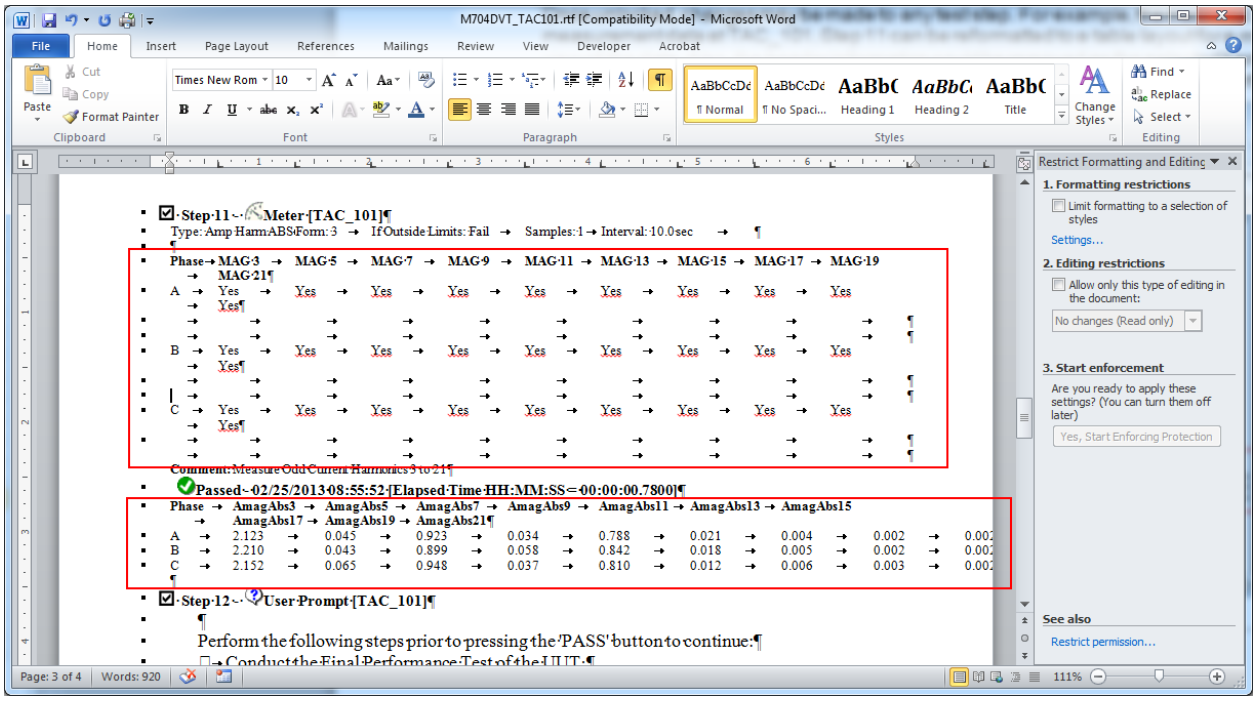
   C:\Pacific Power Source\UPC Manager\Test Reports
3. Clicking with the mouse on any area or page of the test report will take you to the top of the first page of the report. This is due to the fact that all sections of the report are restricted for editing.
4. To verify this, select the File menu tab in MS Word and select “Info” on the left bar.
5. The second tile down is labeled “Protect Document” and shows the Permissions that apply to this document.



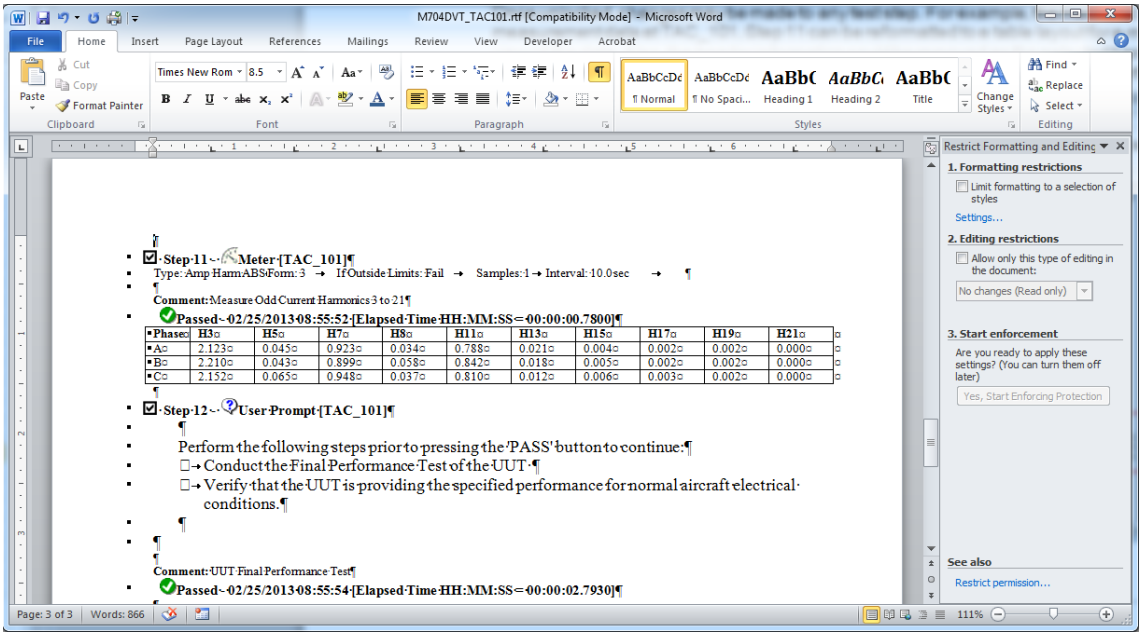
6. To change permissions, select the “Review” ribbon in MS Word and click on the far right Button labeled “Restrict Editing”.
7. This brings up a “Restrict Formatting and Editing” column on the right side of the screen. At the bottom of this bar is a button called “Stop Protection”. Click this button to disable the editing restrictions that are in effect.



8. Once unlocked, changes may be made to any test step. For example, the Harmonic measurement data at TAC_101, Step 11 which runs beyond the page margin can be reformatted to a table layout for a more pleasing view of the data. Also, the header information could be removed as the selected harmonics will be evident from the measurement data. Below is what the step 11 entry in the report.



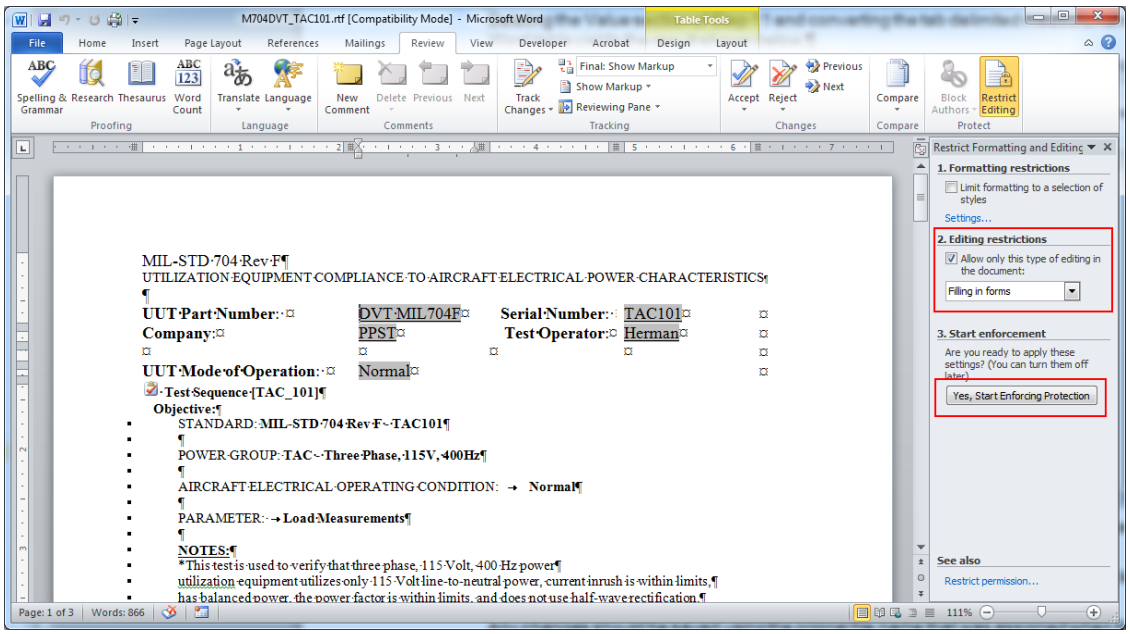
9. Deleting the Value section of Step 11 and converting the tab delimited measurement data to a Word table yields the result shown below.



10. When all formatting changes are completed, you can lock down the file using the same “Restrict Formatting and Editing” column on the right side of the screen.

11. To set back to the original report restrictions, Select 2. Editing restrictions and check the box “Allow only this type of editing in the document:”. Select “Filling in forms” from the dropdown box and click the “Yes, Start Enforcing Protection” button below.

12. When prompted for a password, you can provide one if desired or leave blank and click on the OK button. Leaving password field blank means no password is required to unlock the document.



13. Any changes should be saved using the orignal file name that was assigned when first created.

8 MIL-STD-704F Test Application Considerations

This section explains several implementation and application specific considerations that apply to some of the MIL-STD-704F test sequence implementations.

While most test methods are relatively straightforward in that they apply a sequence of voltage and frequency setting for a set period of time, some test require additional equipment and hardware to set up and run. This chapter describes some of these test methods as defined by their number xxxNNN, where “xxx” stands for the various Power Groups supported and “NNN” for the test number.

8.1 Transition Time Setting – Most xVF Tests

The MIL-STD-704F option test sequences for variable frequency power groups were implemented using the UPC Controller Transient Time function to prevent sudden frequency jumps during testing. In particular when changing from one steady state frequency condition to a different, a delta of up to 400Hz may be executed. Such a large frequency jump could damage UUT’s, especially those that have motors or other electromechanical components. To avoid potential damage to the UUT, frequency change other than those called out specifically in the Mil-Std-704 test standard are executed with a frequency slew rate of no more than 10Hz/sec. Thus when changing between a 800Hz test condition and a 400Hz test condition, the slew time will be 40 seconds. This setting is generally effected in the second test step of each xVF test sequence.

Since the Transient Time setting on the UPC controller is a global setting and remains in effect until changed, at the end of each variable frequency test sequence (SVF and TVF power groups), the transient time on the UPC controller is set back to zero. This means any programmed changes for voltage or frequency made by the user from the front panel or over the bus between test runs will occur instantaneously, which is generally the default setting.

If however a test is aborted prematurely and not allowed to complete through its final test steps, the Transient Time parameter will remain at its set value.

The test Objective Tab message of those test sequences that use a Transition Time setting other than 0.0 secs contains a message to this affect.

UPC Controller Transition Time is set to 40 secs in Step #2 to slew frequency changes no faster than 10Hz/sec. At the end of the test sequence, this setting is reset to 0.0 secs. If you abort this test sequence prematurely, you need to set this parameter back from the UPC control panel or it will remain set to this value.

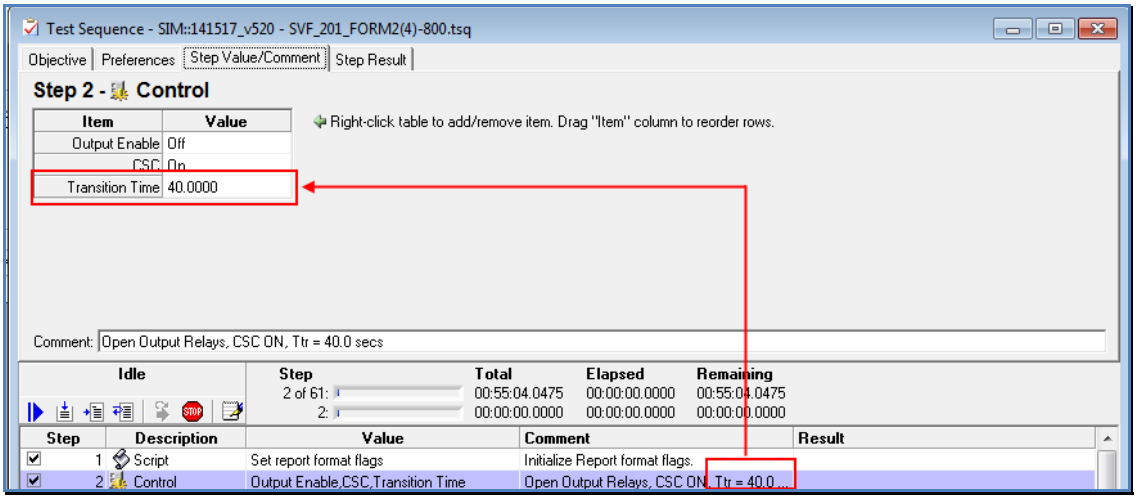


Figure 2: Transition Time Control Setting in xVF Test Files

8.2 Method xxx101 – Load Measurements

This test is performed to characterize the UUT load characteristics. It is done by applying nominal voltage (115Vac RMS L-N / 200Vac RMS L-L) and nominal frequency based on power group:

Power Groups	Test Frequencies
SAC and TAC	400Hz
SXF	60Hz
SVF and TVD	400Hz, 360Hz, 600Hz and 800Hz
LDC and HDC	DC

8.2.1 Additional Measurement Equipment

Because the main focus of this test is to capture voltage and current parameters and waveforms, it is recommended to use additional measurement equipment to augment the measurement functions of the AC Power Source used. In particular, in-rush current may be better documented by capturing it on a digital storage scope of using a dedicated high precision power analyzer that has this functionality built in. Although all measurement data required for this test is acquired by the AC Power Source as part of the xxx101 test, a digital scope with higher resolution than the UPC controller is recommended to verify the current wave shape and check for half wave rectification at the UUT AC input.

8.2.2 Test Setups xxx101

The recommended test setup for single phase UUT testing is shown in Figure 3 below.

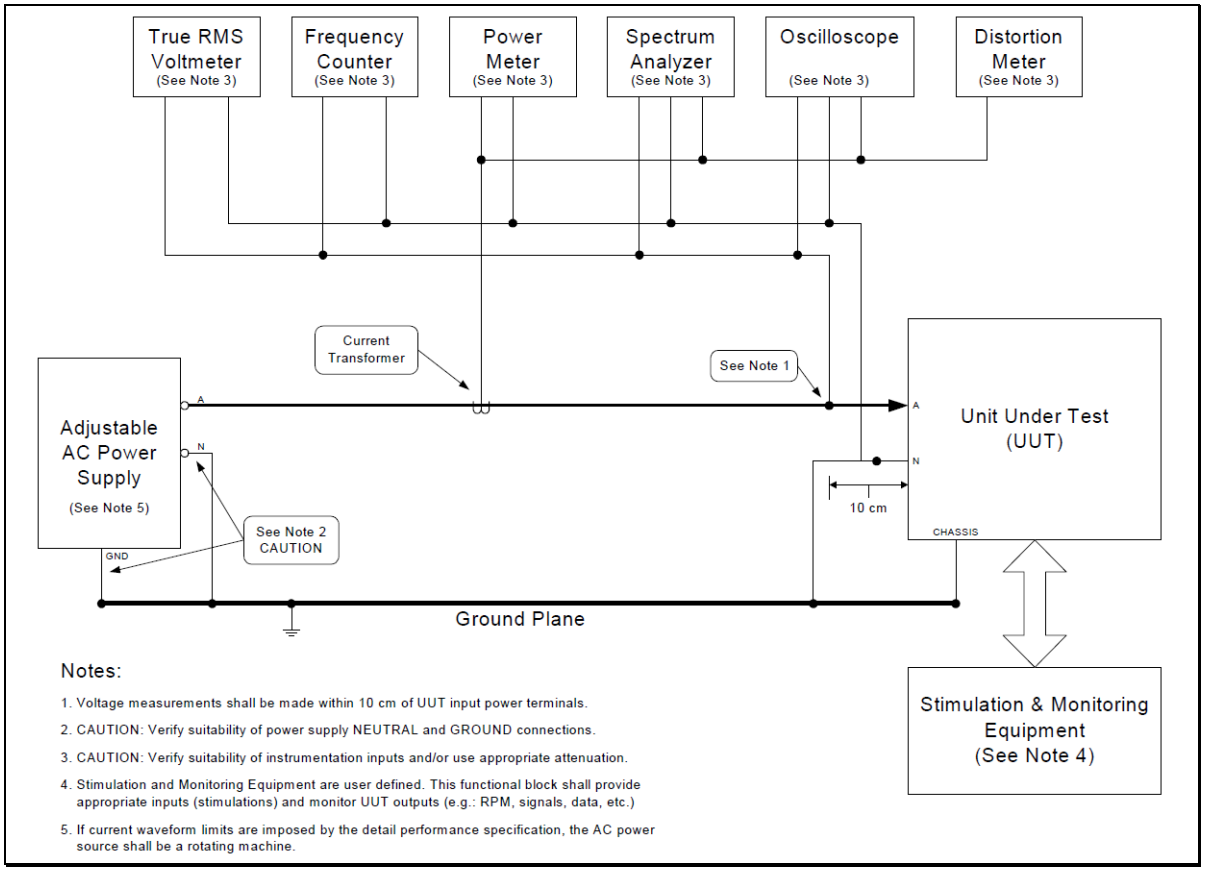


Figure 3: Method xxx101 Single Phase UUT Test Setup

The recommended test setup for single phase UUT testing is shown in Figure x below.

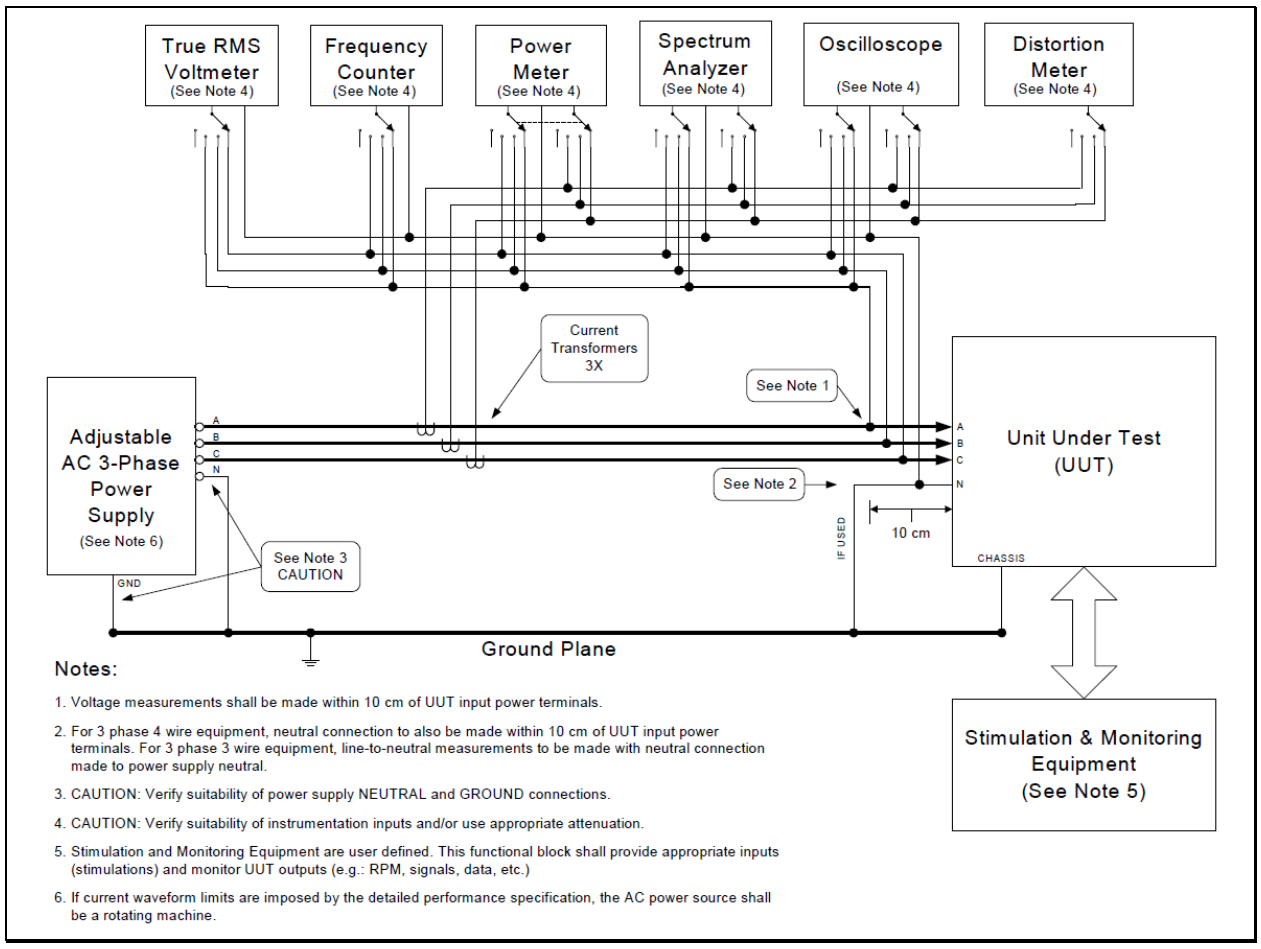


Figure 4: Method xxx101 Three Phase UUT Test Setup

8.2.3 Measurement Data Tables xxx101

The measurement data to be document for single phase AC tests is shown in Table 1. The measurement data requirement table for three phase AC tests is shown in Table 2. For DC tests, Table 3 applies instead.

Test performed at Nominal **steady state frequency**												
Load and Power Factor												
Voltage		Frequency		Volt-Amp		Power Factor		Pass/Fail		Comments		
	Vrms		Hz		VA		PF					
Rectification Type												
								Pass/Fail				
Does not use half-wave rectification.												
Current Waveform Measurements												
Total Current Distortion				Current Spectrum				Pass/Fail		Comments		
				Attach		Amplitude						
	% Distortion			Spectrum Plot		Vs. Frequency						

Table 1: Method xxx101 Measurement Data Table - Single Phase

Test Performed at Nominal steady state frequency												
Inrush Current												
Phase	Inrush Current		Percent of Rated Current		Oscilloscope Trace				Pass/Fail		Comments	
A		Arms		%	Attach Trace		Arms vs. Time					
B		Arms		%	Attach Trace		Arms vs. Time					
C		Arms		%	Attach Trace		Arms vs. Time					
Balanced Load and Power Factor												
Phase	Voltage		Frequency		Volt-Amp		Power Factor		Pass/Fail		Comments	
A		Vrms		Hz		VA		pf				
B		Vrms				VA		pf				
C		Vrms				VA		pf				
Total VA						VA						
Maximum Unbalance (difference between highest and lowest phase load)						VA						
Rectification Type												
									Pass/Fail		Comments	
Does not use half-wave rectification.												
Current Waveform Measurements												
Phase	Total Current		Current Spectrum						Pass/Fail		Comments	
A		% Distortion	Attach		Amplitude							
			Spectrum Plot		Vs. Frequency							
B		% Distortion	Attach		Amplitude							
			Spectrum Plot		Vs. Frequency							
C		% Distortion	Attach		Amplitude							
			Spectrum Plot		Vs. Frequency							

Table 2: Method xxx101 Measurement Data Table - Three Phase

Test Performed at Nominal Voltage				
Parameter			**Pass / Fail**	**Comments**
Inrush Current		Amps		
Voltage		Vdc	N/A	
Load (VA)		VA		
Total Current Distortion		% Current Distortion		
Current Spectrum	Attach Spectrum Plot	Amplitude vs. Frequency		

Table 3: Method xxx101 Measurement Data Table - DC

8.3 Method xxx106 - Voltage Distortion Spectrum Tests

This test applies a series of high frequency, low amplitude voltage component superimposed on the nominal voltage and frequency sine wave to the UUT.

8.3.1 Test Setups xxx106

This typically requires the use of a Variable Frequency Power Source or Function Generator capable of producing these high frequency signals. The output of the Variable Frequency generator is coupled onto the AC Power Source output using a coupling transformer. Notice the required low pass filter inserted at the output of the AC Power Source to prevent the high frequency components from disrupting the AC power source output stage.

The recommended test setup for single phase UUT testing is shown in Figure 5 below. For three phase UUT's, a similar setup is used but the coupling transformer is moved from phase to phase to test all three phases, one at a time. The same is true for the measurement equipment. Refer to Figure 6.

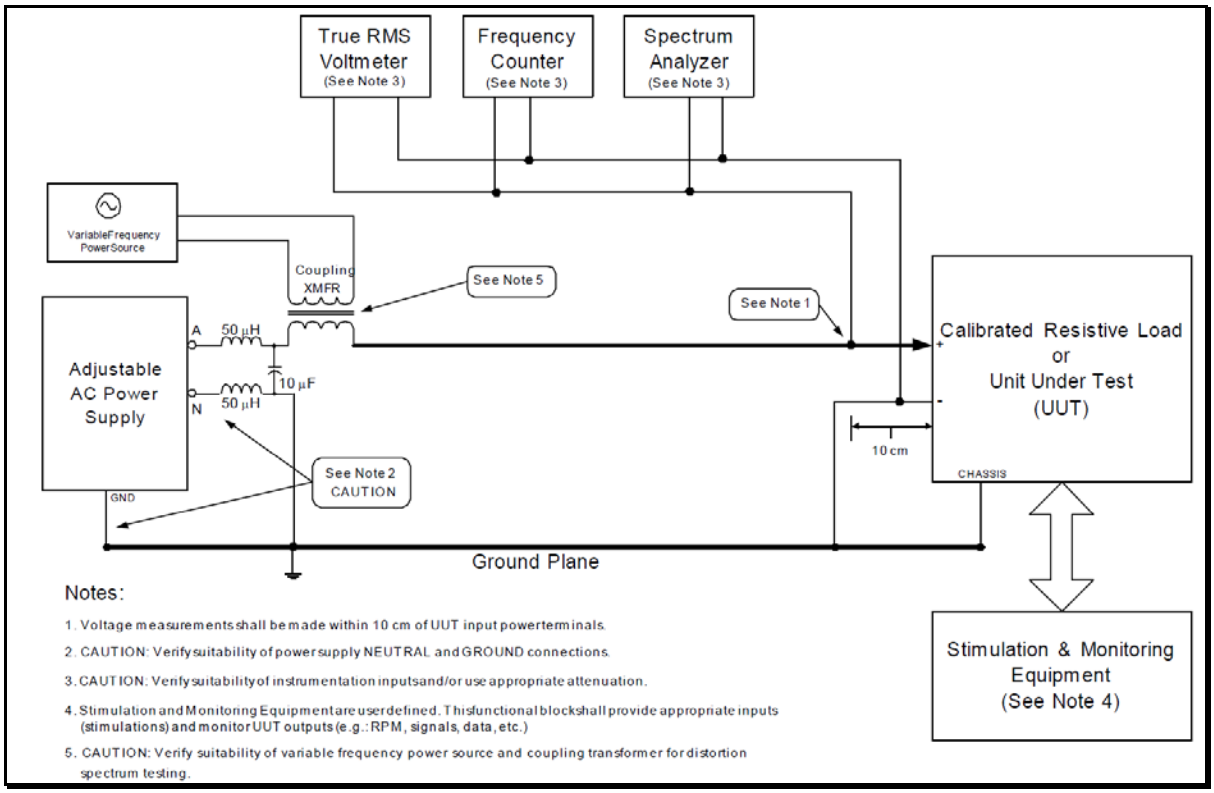


Figure 5: Method xxx106 Single Phase UUT Test Setup

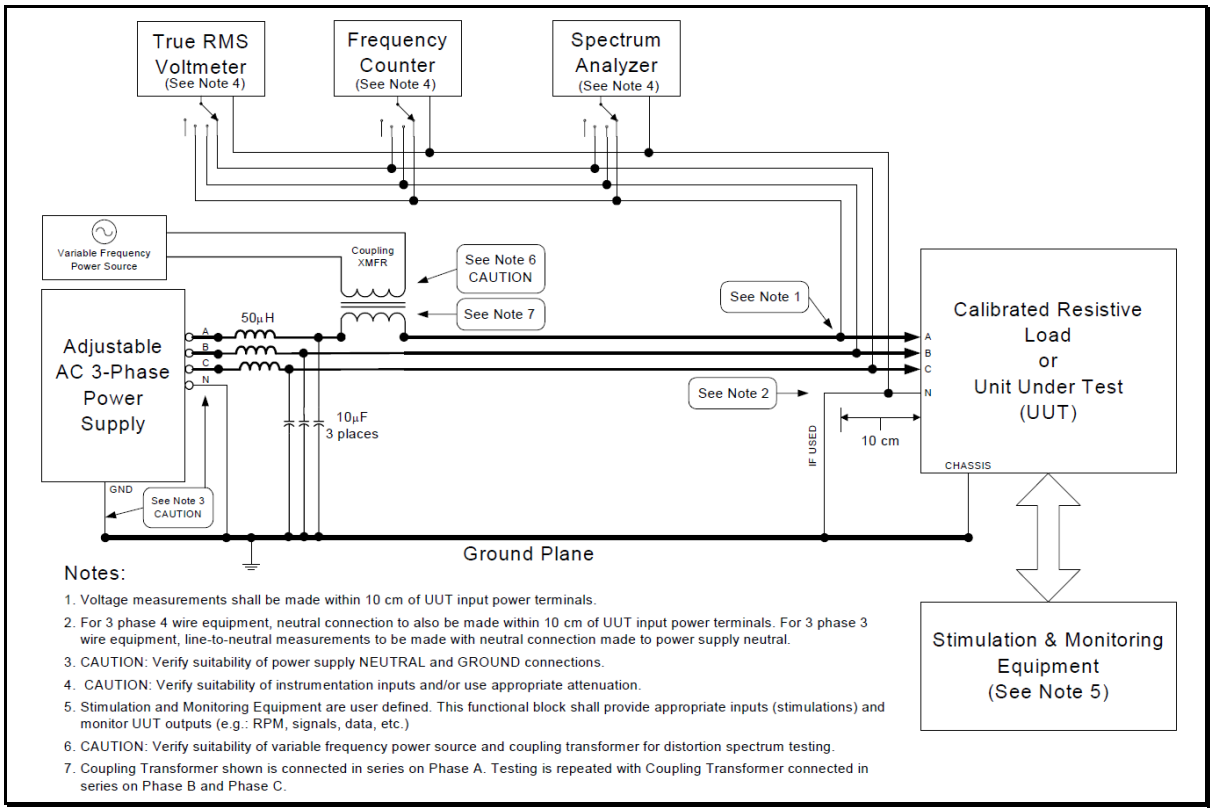


Figure 6: Method xxx106 Three Phase UUT Test Setup

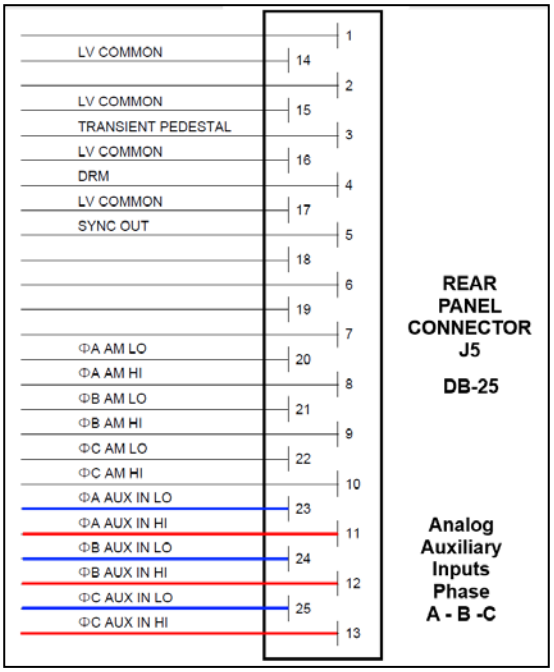
8.3.2 Alternative Setup: UPC Analog Input

Finding a suitable Coupling Transformer that can handle the required maximum UUT load current and still supports the 10 KHz bandwidth required for this test is not trivial.

A more practical solution is to use the Auxiliary Inputs on the AUXILIARY DDB25 connector (J5) of the UPC controller. Refer to J5 connector pin out on the right.

This input is summed with the internal oscillator signal of the AC Power Source to produce the required voltage distortion on the output of the Source.

The corresponding Test Setup is shown in Figure 7.



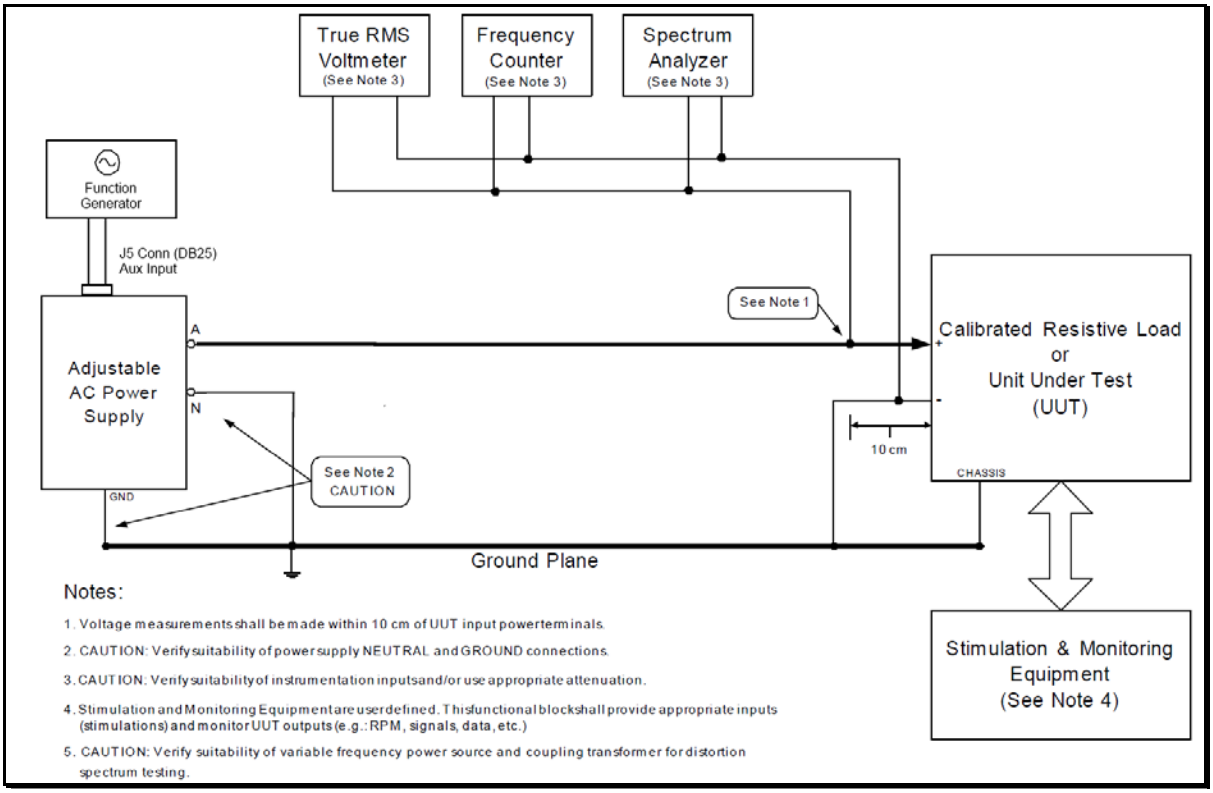


Figure 7: Method xxx106 Test Setup Using Auxiliary Input

Note that the gain of the Analog Input is 25 for FORM1 or FORM3 mode of operation so the output of the Variable Frequency generator must be set to a suitable level as indicated in the last column of the table below for the TVF106 tests. For three phase applications, the voltage distortion is applied one phase at a time so only a single Variable Frequency generator is required.

Test Condition	Frequency of Voltage Distortion	Amplitude of Voltage Distortion (Vrms)	Amplitude of Analog Input Signal (mVrms)
A	50 Hz	0.316	12.64
B	100 Hz	0.316	12.64
C	500 Hz	1.580	63.2
D	1 kHz	3.160	3.160
E	2 kHz	3.160	126.4
F	3 kHz	3.160	126.4
G	5 kHz	1.900	76.0
H	10 kHz	0.950	38.0

8.3.3 Measurements xxx106

The measurement data to be document for single phase (Phase A) is shown in Table 9. For three phase UUT's, measurement data is acquired for each phase (Phase A, B, C).

Test Condition	Parameters										Performance
	Voltage		Frequency		Frequency of Voltage Distortion		Amplitude of Voltage Distortion		Time Duration at test condition		Pass/Fail
Testing performed at Nominal Frequency (SAC, TAC, SXF) or Frequencies (SVF, TVF)											
A		Vrms		Hz		Hz		Vrms		min	
B		Vrms		Hz		Hz		Vrms		min	
C		Vrms		Hz		Hz		Vrms		min	
D		Vrms		Hz		kHz		Vrms		min	
E		Vrms		Hz		kHz		Vrms		min	
F		Vrms		Hz		kHz		Vrms		min	
G		Vrms		Hz		kHz		Vrms		min	
H		Vrms		Hz		kHz		Vrms		min	

Table 4: Method xxx106 Measurement Data Table - Single Phase

8.4 Method xxx107 - Total Voltage Distortion Tests

This test procedure is used to verify that single phase, 115 Volt power utilization equipment operates and maintains specified performance when subjected to voltage waveforms having a distortion factor of 5%. The voltage distortion is generated on the AC Power Source output using the UPC controller arbitrary wave form generator using the harmonic components specified in the Mil-Std-704 test standard. Refer to Table 5.

Harmonic	MIL-STD-704 Rev B - F Percent of Fund.
Fundamental	100%
2nd	0%
3rd	2.75%
4th	0%
5th	2.75%
6th	0%
7th	1.97%
8th	0%
9th	1.53%
10th	0%
11th	1.25%
12th	0%
13th	1.06%
14th	0%
15th	0.92%

Table 5: Method xxx107 Distortion Table

8.4.1 Test Setups xxx107

The recommended test setup for three phase UUT testing is shown in Figure 8 below.

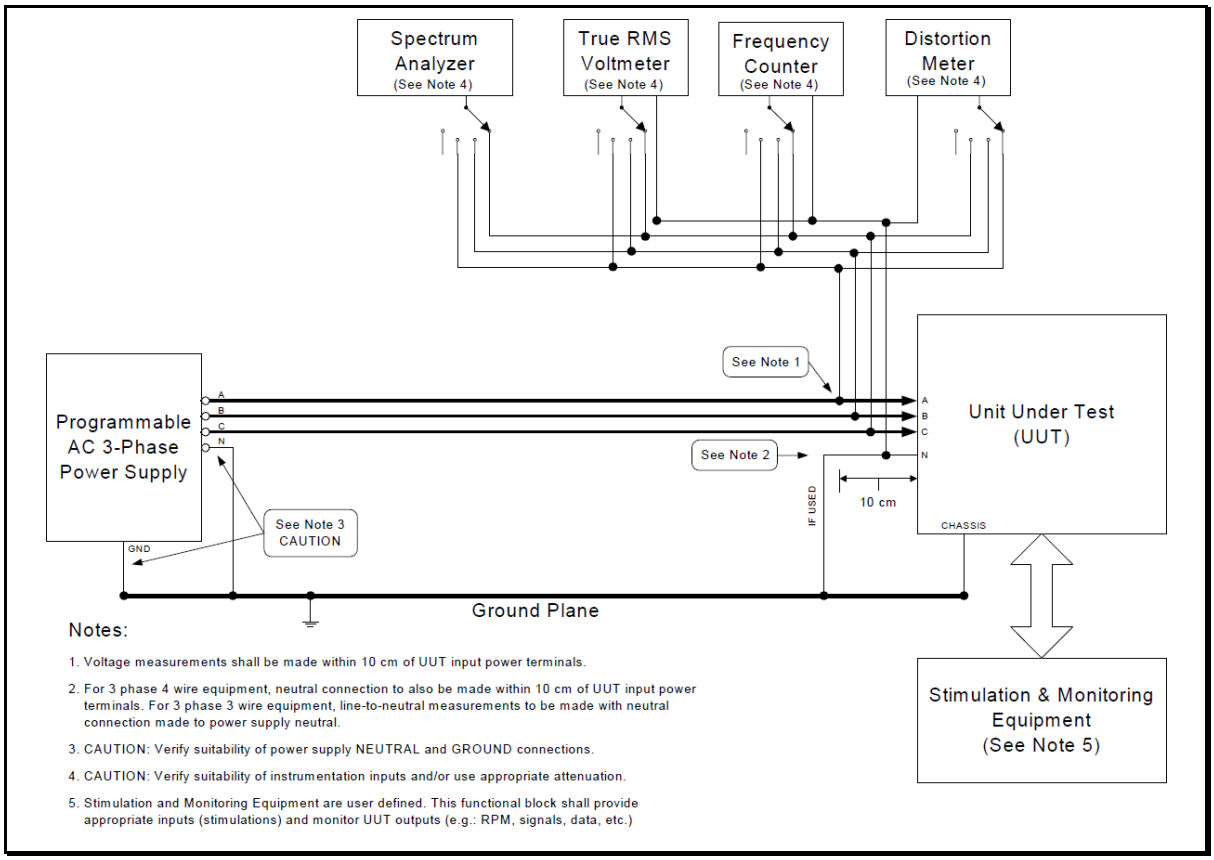


Figure 8: Method xxx107 Test Setup - Three Phase

8.4.2 Measurements

The measurement data to be document for single phase (Phase A) is shown in Table 9. For three phase UUT's, measurement data is acquired for each phase (Phase A, B, C).

Phase	Voltage		Frequency		Voltage Distortion Factor		Time Duration at Test Condition		Performance Pass/Fail
A		Vrms		Hz		No units		min	
B		Vrms				No units			
C		Vrms				No units			

Voltage Harmonics			Voltage Harmonics			Voltage Harmonics		
Phase A			**Phase B**			**Phase C**		
Fund		%	Fund		%	Fund		%
2nd		%	2nd		%	2nd		%
3rd		%	3rd		%	3rd		%
4th		%	4th		%	4th		%
5th		%	5th		%	5th		%
6th		%	6th		%	6th		%
7th		%	7th		%	7th		%
8th		%	8th		%	8th		%
9th		%	9th		%	9th		%
10th		%	10th		%	10th		%
11th		%	11th		%	11th		%
12th		%	12th		%	12th		%
13th		%	13th		%	13th		%
14th		%	14th		%	14th		%
15th		%	15th		%	15th		%

8.5 Method xxx108 - DC Voltage Offset Tests

This test procedure is used to verify that single phase, 115 Volt power utilization equipment operates and maintains specified performance when subjected to a direct current component of AC voltage. As such, a small DC offset voltage is applied to each phase using both positive and negative polarity.

While some AC Power Source models of other manufacturers allow for programming a DC offset, the small DC offset value required for Mil-Std-704 testing - + or – 100 mV - can be difficult to produce on an AC power source with a 0.1V programming resolution.

8.5.1 Test Setup – xxx108

A better alternative is to use a low voltage range DC Power Supply in series with the AC power source output. Since most DC Supplies are uni-polar, a polarity reversal relay may be used to change polarity or the connection terminals can be swapped as needed. To electrically remove the DC Power Supplies when not in use, a bypass relay can be used as shown – as long as the output of the DC Supply is off.

It is important that both positive and negative output terminal of the DC Power Supply used are floating (NOT grounded) as the DC supply will be floating on the AC output. Also, isolation between the DC Supplies output terminals and chassis must be higher than 120Vrms.

NOTE: Check with the manufacturer of the DC Power Supplies used what the maximum AC Ripple Current rating of the bulk output capacitors is as these caps will see the UUT AC load current in addition to any DC current drawn by the UUT.

The relevant test setup for three phase UUT's is shown in Figure 9. For single phase applications, only one DC supply is needed on the Phase A output of the AC Power Source.

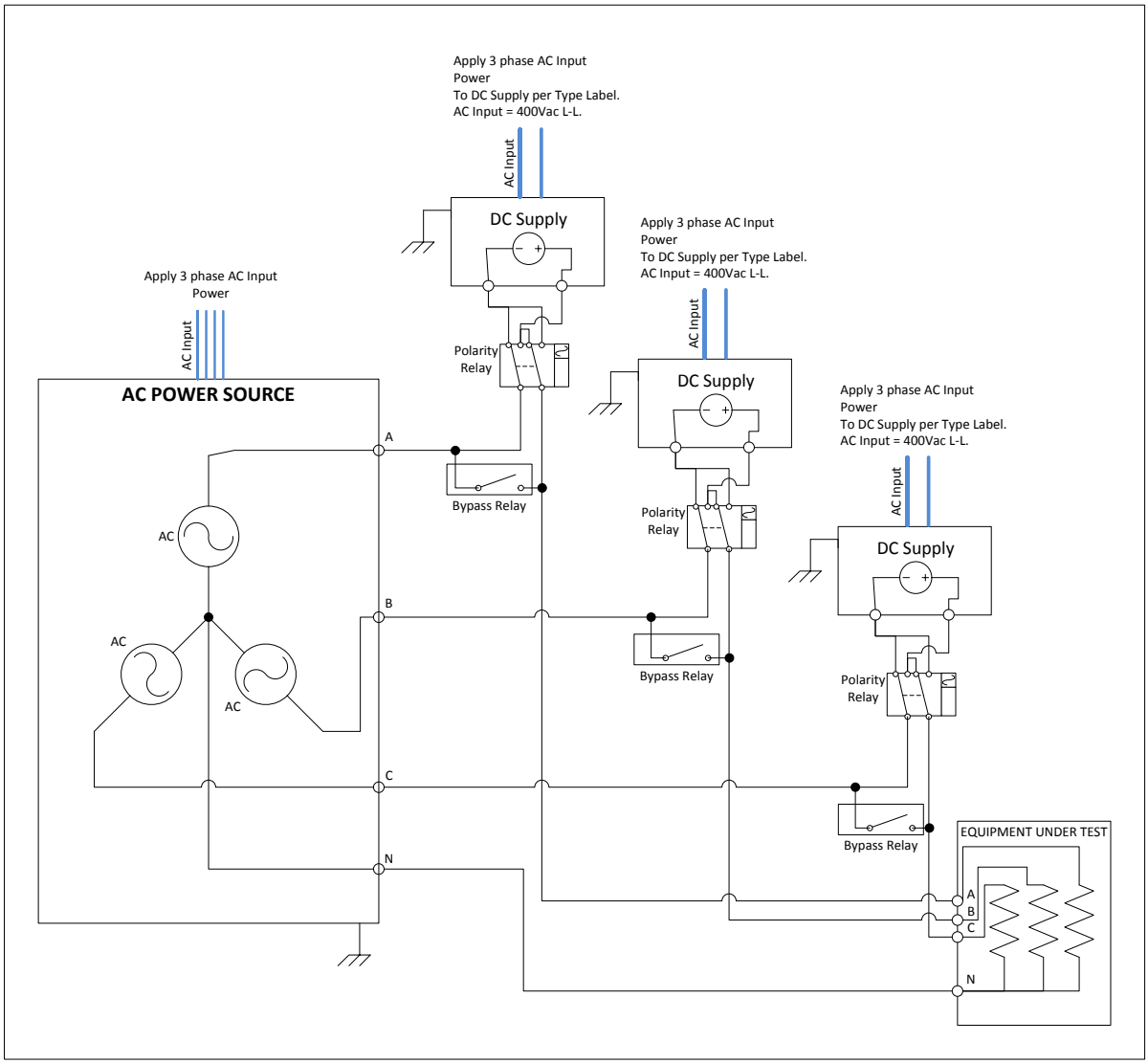


Figure 9: Method xxx108 DC Offset Test Setup - Three Phase

8.6 LDC and HDC DC Power Tests

These test procedures verify MIL-HDBK-704 Section 7 (HDC) and MIL-HDBK-704 Section 8 (LDC) of aircraft electrical power characteristics. Testing DC products is possible through the use of the optional DCR600-20 output module. The DCR module takes three phase AC power and rectifies it do a DC output. By programming the AC voltage, the DC output voltage can be controlled indirectly.

Note: The DCR is sold as a separate hardware option and not included with the Mil-Std704F Software Library.

8.6.1 DCR Option module

The AC/DC rectification performed by the DCR module results in a DC output that not identical in level to the AC RMS value programmed but rather will be about two times higher when using a three phase AC square wave output. Thus, to get 270V DC, program a Line to Neutral voltage of around 135Vac on all three phases in 3 phase mode and select a square wave (Waveform no. 3) instead of a sine wave. This will provide the least amount of AC ripple on the DC output.

The LDC and HDC test sequences were developed with this scaling and waveform selection built in so the correct DC output voltages are obtained. Due to the DCR rectifier's forward voltage drop, the AC to DC scaling ratios are different for 28Vdc testing versus 270Vdc testing and this is also built in to the provided test sequences.

A Vac to Vdc scale factor of 1.99 is used for LDC28VDC test sequences versus 2.027 for HDC270VDC test sequences. This scale factor is determined based on an output load of approximately 5Adc. The formula for calculating the scaling factor is Vdc = (Vac*scaling) - 1.4.

Depending on the current drawn by the EUT, this ration may have to be adjusted slightly for optimal results. Do facilitate this, all LDC and HDC transient levels are programming in percentage of steady state value so only the steady state AC voltage programmed needs to be edited for each test step.

For most applications, the provided ratios in the test sequences should work ok as is.

8.6.2 DC Power Group Test Setup

Test setup between power source and the DCR module is shown in Figure 10. Refer to the DCR600-20 Option Operation Manual, (P/N 150125) for more details on installation and use of the DCR option. This manual is available from the pacificpower.com website under Technical Resources or on the Operation Manual Distribution CD-ROM (P/N 703222) provided with each AC Power Source.

Figure 10: Power Source and DCR module connection

9 MIL-STD-704F Test Sequence Coverage

9.1 Power Group Coverage

The MIL-STD-704F power groups supported by this option are shown in Table 6.

Power Group	Description	Nominal Voltage	Nominal Frequency	Phase Modes
SAC	Single-Phase, 400 Hz Constant Frequency, 115V	115Vrms L-N	400Hz	Single Phase
TAC	Three-Phase, 400 Hz Constant Frequency, 115V	115Vrms L-N	400Hz	Three Phase
SVF	Single-Phase, Variable Frequency, 115 V	115Vrms L-N	360 – 800Hz	Single Phase
TVF	Three-Phase, Variable Constant Frequency, 115V	115Vrms L-N	360 – 800Hz	Three Phase
SXF	Single-Phase, 60 Hz Constant Frequency, 115V	115Vrms L-N	60Hz	Single Phase
Power Group	**Description**			**Phase Modes**
LDC	28VDC utilization equipment MIL-STD-704 compliance tests	28VDC		n/a
HDC	270VDC utilization equipment MIL-STD-704 compliance tests	270VDC		n/a

Table 6: MIL-STD-704F Option Power Group Coverage

9.2 Test Coverage Summary

The MIL-STD-704F test sequence coverage is summarized in Table 7 for AC power groups and Table 8 for DC power groups. Tests marked with “Y” are covered in MIL-STD-704F option. Tests marked with “N/A” are not applicable to the related sections for MIL-STD-704F.

Test	Description	SAC	TAC	SVF	TVF	SXF	Notes
Normal Operation (1xx)							
101	Load and Current Harmonics Measurements	Y	Y	Y	Y	Y	Additional Power Measurement Equipment recommended for capturing for UUT performance.
102	Steady State Limits	Y	Y	Y	Y	Y	
103	Voltage Phase Difference	N/A		N/A		N/A	Not applicable for Single phase UUT’s.
104	Voltage Modulation	Y	Y	Y	Y	Y	
105	Frequency Modulation	Y	Y	Y	Y	Y	
106	Voltage Distortion Spectrum	R	R	R	R	R	Requires Function Generator, Spectrum Analyzer, 50uH inductors, 10uF Cap
107	Total Voltage Distortion	Y	Y	Y	Y	Y	
108	DC Voltage Component	R	R	R	R	R	Required additional DC Supplies
109	Normal Voltage Transients	Y	Y	Y	Y	Y	Requires Transformer (XFMR) for Three phase or Split Phase mode (FORM2) for Single phase UUT’s.

Test	Description	SAC	TAC	SVF	TVF	SXF	Notes
110	Normal Frequency Transients	Y	Y	Y	Y	Y	
Transfer (2xx)							
201	Power Interrupt	Y	Y	Y	Y	Y	Requires Transformer (XFMR) for Three phase or Split Phase mode (FORM2) for Single phase UUT's.
Abnormal Operation (3xx)							
301	Abnormal Limits for Voltage and Frequency	Y	Y	Y	Y	Y	
302	Abnormal Voltage Transients	Y	Y	Y	Y	Y	Requires Transformer (XFMR) for Three phase or Split Phase mode (FORM2) for Single phase UUT's.
303	Abnormal Frequency Transients	Y	Y	Y	Y	Y	
Emergency Operation (4xx)							
401	Emergency Limits for Voltage and Frequency	Y	Y	Y	Y	Y	
Starting (5xx)							
501	Not Typically Required	N/A	N/A	N/A	N/A	N/A	Not applicable to AC powered equipment
Power Failure (6xx)							
601	Power Failure	Y	Y	Y	Y	Y	
602	One Phase and Two Phase Power Failures	N/A	Y	N/A	Y	N/A	
603	Phase Reversal	Y	Y	Y	Y	Y	

Table 7: MIL-STD-704F Test Coverage Summary Table – AC Power Groups

Legend:
R = Requires Additional Equipment
N = Not supported
Y = Full support N/A = Not Applicable – No Test Required
Z = Requires Prog-Z option on AC Source

Test	Description	LDC	HDC	Notes
101	Load Measurements	Y	Y	
102	Steady State Limits for Voltage (Normal)	Y	Y	
103	Voltage Distortion Spectrum	R	R	Requires additional equipment
104	Total Ripple	N	N	Test is not supported
105	Normal Voltage Transients	Y	Y	
201	Power Interrupt	Y	Y	
301	Steady State Limits for Voltage (Abnormal)	Y	Y	
302	Abnormal Voltage Transients	Y	Y	
401	Steady State Limits for Voltage (Emergency)	Y	Y	
501	Starting Voltage Transients	Y	Y	
601	Power Failure	Y	Y	
602	Polarity Reversal	Y	Y	

Table 8: MIL-STD-704F Test Coverage Summary Table – DC Power Groups

Legend:
Y = Full support N/A = Not Applicable – No Test Required
R = Requires Additional Equipment Z = Requires Prog-Z option on AC Source
N = Not supported

9.3 Test Sequence Files by Power Group Tables

For each supported Power Group, the tables in this section show the test numbers, a short description of the test, any comments relating to this test and associated test sequence file names as provided by this option.

NOTE: Depending on the power source used to perform tests with the MIL-STD-704F option, additional equipment may be required if the test or load requirements are beyond the power source capabilities. These additional requirements are specified in the following test section coverage tables, ”Comments” column.

SAC	Description	Comments	Test File Name
Normal Operation			
SAC101	Three Phase Load and Current Harmonics Measurements	Additional Power Measurement Equipment recommended for capturing for UUT performance.	SAC_101.tsq
SAC102	Steady state limits for voltage and frequency		SAC_102.tsq
SAC103	No Test Required		
SAC104	Voltage Modulation		SAC_104.tsq
SAC105	Frequency Modulation		SAC_105.tsq
SAC106	Voltage Distortion Spectrum	Requires Function Generator, Spectrum Analyzer, 50uH inductors, 10uF Cap	SAC_106.tsq
SAC107	Total Voltage Distortion		SAC_107.tsq
SAC108	DC Voltage Component	Requires DC Power Supply	SAC_108.tsq
SAC109	Normal Voltage Transients	Split phase mode	SAC_109_FORM2.tsq
	Normal Voltage Transients	Transformer Coupled	SAC_109_XFMR.tsq
SAC110	Normal Frequency Transients		SAC_110.tsq
Transfer Operation			
SAC201	Power Interrupt	Split phase mode	SAC_201_FORM2.tsq
	Power Interrupt	Transformer Coupled	SAC_201_XFMR.tsq
Abnormal Operation			
SAC301	Abnormal Frequency Transients (Overfrequency/Underfrequency)		SAC_301.tsq
SAC302	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Split phase mode	SAC_302_FORM2.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Transformer Coupled	SAC_302_XFMR.tsq
SAC303	Abnormal Frequency Transients (Overfrequency/Underfrequency		SAC_303.tsq
Emergency Operation			
SAC401	Emergency Limits for voltage and frequency		SAC_401.tsq
Starting Operation			

SAC	Description	Comments	Test File Name
SAC501	Not typically required unless specified by EUT performance specification		
Power Failure Operation			
SAC601	Power Failure (Single phase)		SAC_601.tsq
SAC602	No Test Required		
SAC603	Phase Reversal		SAC_603.tsq

Table 9: Section Coverage Table - Power Group - SAC

TAC	Description	Comments	Test File Name
Normal Operation			
TAC101	Three Phase Load and Current Harmonics Measurements	Additional Power Measurement Equipment recommended for capturing for UUT performance.	TAC_101.tsq
TAC102	Steady state limits for voltage and frequency		TAC_102.tsq
TAC103	No Test Required		TAC_103.tsq
TAC104	Voltage Modulation		TAC_104.tsq
TAC105	Frequency Modulation		TAC_105.tsq
TAC106	Voltage Distortion Spectrum	Requires Function Generator, Spectrum Analyzer, 50uH inductors, 10uF Cap	TAC_106.tsq
TAC107	Total Voltage Distortion		TAC_107.tsq
TAC108	DC Voltage Component	Requires DC Power Supply	TAC_108.tsq
TAC109	Normal Voltage Transients		TAC_109.tsq
TAC110	Normal Frequency Transients		TAC_110.tsq
Transfer Operation			
TAC201	Power Interrupt		TAC_201.tsq
Abnormal Operation			
TAC301	Abnormal Frequency Transients (Overfrequency/Underfrequency		TAC_301.tsq
TAC302	Abnormal Voltage Transients (Overvoltage/Undervoltage)		TAC_302.tsq
TAC303	Abnormal Frequency Transients (Overfrequency/Underfrequency		TAC_303.tsq
Emergency Operation			
TAC401	Emergency Limits for voltage and frequency		TAC_401.tsq
Starting Operation			
TAC501	Not typically required unless specified by EUT performance specification		
Power Failure Operation			

TAC	Description	Comments	Test File Name
TAC601	Power Failure (Three phase)		TAC_601.tsq
TAC602	One and Two Phase Power Failures		TAC_602.tsq
TAC603	Phase Reversal		TAC_603.tsq

Table 10: Section Coverage Table - Power Group – TAC

SVF	Description	Comments	Test File Name
Normal Operation			
SVF101	Three Phase Load and Current Harmonics Measurements	Additional Power Measurement Equipment recommended for capturing for UUT performance.	SVF_101.tsq
SVF102	Steady state limits for voltage and frequency		SVF_102.tsq
SVF103	No Test Required		
SVF104	Voltage Modulation	Test @ 400Hz	SVF_104(1)-400.tsq
	Voltage Modulation	Test @ 360Hz	SVF_104(2)-360.tsq
	Voltage Modulation	Test @ 600Hz	SVF_104(3)-600.tsq
	Voltage Modulation	Test @ 800Hz	SVF_104(4)-800.tsq
SVF105	Frequency Modulation	Test @ 400Hz	SVF_105(1)-400.tsq
	Frequency Modulation	Test @ 360Hz	SVF_105(2)-360.tsq
	Frequency Modulation	Test @ 600Hz	SVF_105(3)-600.tsq
	Frequency Modulation	Test @ 800Hz	SVF_105(4)-800.tsq
SVF106	Voltage Distortion Spectrum	Requires Function Generator, Spectrum Analyzer, 50uH inductors, 10uF Cap	SVF_106(1)-400.tsq
	Voltage Distortion Spectrum		SVF_106(2)-360.tsq
	Voltage Distortion Spectrum		SVF_106(3)-600.tsq
	Voltage Distortion Spectrum		SVF_106(4)-800.tsq
SVF107	Total Voltage Distortion		SVF_107.tsq
SVF108	DC Voltage Component	Requires DC Power Supply	SVF_108.tsq
SVF109	Normal Voltage Transients	Test @ 400Hz, Split phase mode	SVF_109_FORM2(1)-400.tsq
	Normal Voltage Transients	Test @ 360Hz, Split phase mode	SVF_109_FORM2(2)-360.tsq
	Normal Voltage Transients	Test @ 600Hz, Split phase mode	SVF_109_FORM2(3)-600.tsq
	Normal Voltage Transients	Test @ 800Hz, Split phase mode	SVF_109_FORM2(4)-800.tsq
	Normal Voltage Transients	Test @ 400Hz, Transformer Coupled	SVF_109_XFMR(1)-400.tsq

SVF	Description	Comments	Test File Name
	Normal Voltage Transients	Test @ 3600Hz, Transformer Coupled	SVF_109_XFMR(2)-360.tsq
	Normal Voltage Transients	Test @ 600Hz, Transformer Coupled	SVF_109_XFMR(3)-600.tsq
	Normal Voltage Transients	Test @ 800Hz, Transformer Coupled	SVF_109_XFMR(4)-800.tsq
SVF110	Normal Frequency Transients		SVF_110.tsq
Transfer Operation			
SVF201	Power Interrupt	Test @ 400Hz, Split phase mode	SVF_201_FORM2(1)-4000.tsq
	Power Interrupt	Test @ 360Hz, Split phase mode	SVF_201_FORM2(2)-360.tsq
	Power Interrupt	Test @ 600Hz, Split phase mode	SVF_201_FORM2(3)-600.tsq
	Power Interrupt	Test @ 800Hz, Split phase mode	SVF_201_FORM2(4)-800.tsq
	Power Interrupt	Test @ 400Hz, Transformer Coupled	SVF_201_XFMR(1)-400.tsq
	Power Interrupt	Test @ 360Hz, Transformer Coupled	SVF_201_XFMR(2)-360.tsq
	Power Interrupt	Test @ 600Hz, Transformer Coupled	SVF_201_XFMR(3)-600.tsq
	Power Interrupt	Test @ 800Hz, Transformer Coupled	SVF_201_XFMR(4)-800.tsq
Abnormal Operation			
SVF301	Abnormal Frequency Transients (Overfrequency/Underfrequency		SVF_301.tsq
SVF302	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 400Hz, Split phase mode	SVF_302_FORM2(1)-400.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 360Hz, Split phase mode	SVF_302_FORM2(2)-400.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 600Hz, Split phase mode	SVF_302_FORM2(3)-600.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 800Hz, Split phase mode	SVF_302_FORM2(4)-800.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 400Hz, Transformer Coupled	SVF_302_XFMR(1)-400.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 360Hz, Transformer Coupled	SVF_302_XFMR(2)-360.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 600Hz, Transformer Coupled	SVF_302_XFMR(3)-600.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 800Hz, Transformer Coupled	SVF_302_XFMR(4)-800.tsq
SVF303	Abnormal Frequency Transients (Overfrequency/Underfrequency		SVF_303.tsq
Emergency Operation			

SVF	Description	Comments	Test File Name
SVF401	Emergency Limits for voltage and frequency		SVF_401.tsq
Starting Operation			
SVF501	Not typically required unless specified by EUT performance specification		
Power Failure Operation			
SVF601	Power Failure (Single phase)		SVF_601.tsq
SVF602	No Test Required		
SVF603	Phase Reversal		SVF_603.tsq

Table 11: Section Coverage Table - Power Group - SVF

TVF	Description	Comments	Test File Name
Normal Operation			
TVF101	Three Phase Load and Current Harmonics Measurements	Additional Power Measurement Equipment recommended for capturing for UUT performance.	TVF_101.tsq
TVF102	Steady state limits for voltage and frequency		TVF_102.tsq
TVF103	No Test Required		TVF_103.tsq
TVF104	Voltage Modulation	Test @ 400Hz	TVF_104(1)-400.tsq
	Voltage Modulation	Test @ 360Hz	TVF_104(2)-360.tsq
	Voltage Modulation	Test @ 600Hz	TVF_104(3)-600.tsq
	Voltage Modulation	Test @ 800Hz	TVF_104(4)-800.tsq
TVF105	Frequency Modulation	Test @ 400Hz	TVF_105(1)-400.tsq
	Frequency Modulation	Test @ 360Hz	TVF_105(2)-360.tsq
	Frequency Modulation	Test @ 600Hz	TVF_105(3)-600.tsq
	Frequency Modulation	Test @ 800Hz	TVF_105(3)-800.tsq
TVF106	Voltage Distortion Spectrum	Requires Function Generator, Spectrum Analyzer, 50uH inductors, 10uF Cap	TVF_106(1)-400.tsq
	Voltage Distortion Spectrum		TVF_106(2)-360.tsq
	Voltage Distortion Spectrum		TVF_106(3)-600.tsq
	Voltage Distortion Spectrum		TVF_106(4)-800.tsq
TVF107	Total Voltage Distortion		TVF_107.tsq
TVF108	DC Voltage Component	Requires DC Power Supply	TVF_108.tsq
TVF109	Normal Voltage Transients	Test @ 400Hz	TVF_109(1)-400.tsq
	Normal Voltage Transients	Test @ 360Hz	TVF_109(2)-360.tsq
	Normal Voltage Transients	Test @ 600Hz	TVF_109(3)-600.tsq
	Normal Voltage Transients	Test @ 800Hz	TVF_109(4)-800.tsq
TVF110	Normal Frequency Transients		TVF_110.tsq

TVF	Description	Comments	Test File Name
Transfer Operation			
TVF201	Power Interrupt	Test @ 400Hz	TVF_201(1)-400.tsq
	Power Interrupt	Test @ 360Hz	TVF_201(2)-360.tsq
	Power Interrupt	Test @ 600Hz	TVF_201(3)-600.tsq
	Power Interrupt	Test @ 800Hz	TVF_201(4)-800.tsq
Abnormal Operation			
TVF301	Abnormal Frequency Transients (Overfrequency/Underfrequency		TVF_301.tsq
TVF302	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 400Hz	TVF_302(1)-400.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 360Hz	TVF_302(2)-360.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 600Hz	TVF_302(3)-600.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Test @ 800Hz	TVF_302(4)-800.tsq
TVF303	Abnormal Frequency Transients (Overfrequency/Underfrequency		TVF_303.tsq
Emergency Operation			
TVF401	Emergency Limits for voltage and frequency		TVF_401.tsq
Starting Operation			
SVF501	Not typically required unless specified by EUT performance specification		
Power Failure Operation			
TVF601	Power Failure (Three phase)		TVF_601.tsq
TVF602	One and Two Phase Power Failures	Test @ 400Hz	TVF_602(1)-400.tsq
	One and Two Phase Power Failures	Test @ 360Hz	TVF_602(2)-360.tsq
	One and Two Phase Power Failures	Test @ 600Hz	TVF_602(3)-600.tsq
	One and Two Phase Power Failures	Test @ 800Hz	TVF_602(4)-800.tsq
TVF603	Phase Reversal		TVF_603.tsq

Table 12: Section Coverage Table - Power Group - TVF

SXF	Description	Comments	Test File Name
Normal Operation			
SXF101	Three Phase Load and Current Harmonics Measurements	Additional Power Measurement Equipment recommended for capturing for UUT performance.	SXF_101.tsq
SXF102	Steady state limits for voltage and frequency		SXF_102.tsq
SXF103	No Test Required		SXF_103.tsq
SXF104	Voltage Modulation		SXF_104.tsq
SXF105	Frequency Modulation		SXF_105.tsq
SXF106	Voltage Distortion Spectrum	Requires Function Generator, Spectrum Analyzer, 50uH inductors, 10uF Cap	SXF_106.tsq
SXF107	Total Voltage Distortion		SXF_107.tsq
SXF108	DC Voltage Component	Requires DC Power Supply	SXF_108.tsq
SXF109	Normal Voltage Transients	Split phase mode	SXF_109_FORM2.tsq
	Normal Voltage Transients	Transformer Coupled	SXF_109_XFMR.tsq
SXF110	Normal Frequency Transients		SXF_110.tsq
Transfer Operation			
	Power Interrupt		SXF_201.tsq
Abnormal Operation			
SXF301	Abnormal Frequency Transients (Overfrequency/Underfrequency		SXF_301.tsq
SXF302	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Split phase mode	SXF_302_FORM2.tsq
	Abnormal Voltage Transients (Overvoltage/Undervoltage)	Transformer Coupled	SXF_302_XFMR.tsq
SXF303	Abnormal Frequency Transients (Overfrequency/Underfrequency		SXF_303.tsq
Emergency Operation			

SXF	Description	Comments	Test File Name
SXF401	Emergency Limits for voltage and frequency		SXF_401.tsq
Starting Operation			
SXF501	Not typically required unless specified by EUT performance specification		SXF_501.tsq
Power Failure Operation			
SXF601	Power Failure (Single phase)		SXF_601.tsq
SXF602	No Test Required		SXF_602.tsq
SXF603	Phase Reversal		SXF_603.tsq

Table 13: Section Coverage Table - Power Group – SXF

LDC	Description	Comments	Test File Name
LDC101	Load Measurements		LDC_101.tsq
LDC102	Steady State Limits for Voltage (Normal)		LDC_102.tsq
LDC103	Voltage Distortion Spectrum	Requires additional equipment	LDC_103.tsq
LDC104	Total Ripples	This test is not supported by DCR	
LDC105	Normal Voltage Transients		LDC_105.tsq
LDC201	Power Interrupt		LDC_201.tsq
LDC301	Steady State Limits for Voltage (Abnormal)		LDC_301.tsq
LDC302	Abnormal Voltage Transients		LDC_302.tsq
LDC401	Steady State Limits for Voltage (Emergency)		LDC_401.tsq
LDC501	Starting Voltage Transients		LDC_501.tsq
LDC601	Power Failure		LDC_601.tsq
LDC602	Polarity Reversal		LDC_602.tsq

Table 14: Section Coverage Table – LDC-28VDC

HDC	Description	Comments	Test File Name
HDC101	Load Measurements		HDC_101.tsq
HDC102	Steady State Limits for Voltage (Normal)		HDC_102.tsq
HDC103	Voltage Distortion Spectrum	Requires additional equipment	HDC_103.tsq
HDC104	Total Ripples	This test is not supported by DCR	
HDC105	Normal Voltage Transients		HDC_105_XFMR.tsq
HDC201	Power Interrupt		HDC_201_XFMR.tsq
HDC301	Steady State Limits for Voltage (Abnormal)		HDC_301_XFMR.tsq
HDC302	Abnormal Voltage Transients		HDC_302_XFMR.tsq
HDC401	Steady State Limits for Voltage (Emergency)		HDC_401_XFMR.tsq
HDC501	Starting Voltage Transients		HDC_501_XFMR.tsq
HDC601	Power Failure		HDC_601_XFMR.tsq
HDC602	Polarity Reversal		HDC_602_XFMR.tsq

Table 15: Section Coverage Table – HDC-270VDC

9.4 Test Level and Duration Tables

For each power group and test number, this section shows a summary table of the voltage and/or frequency test levels and test durations applied to the unit under test. If no test duration is shown, settings are typically applied for 30 minutes per test condition.

For more details on each test, consult the **Objective** window of the related test sequence file in Test Manager.

Power Group	Description
SAC	See Section 9.4.1
TAC	See Section 9.4.2
SVF	See Section 9.4.3
TVF	See Section 9.4.4
SXF	See Section 9.4.5
LDC 28VDC	See Section 9.4.6
HDC 270VDC	See Section 9.4.7

9.4.1 SAC Test Details by Test Number (Single Phase, 115V, 400 Hz)

SAC101

Test Plan	Description
Stimulus:	Apply 115VL-N, 400Hz
	Close CB or contactor to EUT and measure Inrush current
	Allow EUT to warm up before taking additional measurements
	Allow power to run for 15 mins.
Measure	Inrush Current, all phases
	Steady state voltage, current, power
	Verify no half wave rectification is used
	Current Harmonics / All phases using HAS option
Repeat	For each EUT operating mode

SAC102

Test Condition	Voltage L-N	Frequency
Balanced Voltages		
A	115V	400Hz
B	115V	393Hz
C	115V	407Hz
D	108V	400Hz
E	108V	393Hz
F	108V	407Hz
G	118V	400Hz
H	118V	393Hz
I	118V	407Hz

SAC104

Test Conditions	Average Vrms	Modulation Frequency	Amplitude
A	115V	1.0Hz	0.375Vrms
B	115V	1.7Hz	0.375Vrms
C	115V	10Hz	2.5Vrms
D	115V	25Hz	2.5Vrms
E	115V	70Hz	0.375Vrms
F	115V	100Hz	0.375Vrms
G	115V	200Hz	0.375Vrms

SAC105

Test Condition	Average Frequency	Rate of Freq. Change	Amplitude
A-1	400 Hz	1 Hz/sec	± 2Hz
A-2	395 Hz		
A-3	405 Hz		
B-1	400 Hz	5 Hz/sec	
B-2	395 Hz		
B-3	405 Hz		
C-1	400 Hz	10 Hz/sec	
C-2	395 Hz		
C-3	405 Hz		
D-1	400 Hz	25 Hz/sec	
D-2	395 Hz		
D-3	405 Hz		
E-1	400 Hz	100 Hz/sec	
E-2	395 Hz		
E-3	405 Hz		

SAC106

Test Condition	Frequency of Voltage Distortion	Amplitude of Voltage Distortion
A	50 Hz	0.316 Vrms
B	100 Hz	0.316 Vrms
C	500 Hz	1.580 Vrms
D	1 kHz	3.160 Vrms
E	2 kHz	3.160 Vrms
F	3 kHz	3.160 Vrms
G	5 kHz	1.900 Vrms
H	10 kHz	0.950 Vrms

SAC107

Harmonic	MIL-STD-704 Rev B - F Percent of Fund.
Fundamental	100%
2nd	0%
3rd	2.75%
4th	0%
5th	2.75%
6th	0%
7th	1.97%
8th	0%
9th	1.53%
10th	0%
11th	1.25%
12th	0%
13th	1.06%
14th	0%
15th	0.92%

SAC108

Test Condition	Direct Current Component of AC Voltage
A	+ 0.10V
B	- 0.10 V

SAC109

Test Condition	Time from Steady State Voltage to Voltage Transient Level (ms)	Voltage Transient Level (Vrms)	Duration at Voltage Transient Level (ms)	Voltage Transient Level to Steady State Voltage (ms)
Overvoltage Transients				
AA	< 1.25 msec	140 Vrms	60 msec	< 1.25 msec
BB	< 1.25 msec	140 Vrms	60 msec	25 msec
CC	< 1.25 msec	160 Vrms	34 msec	< 1.25 msec
DD	< 1.25 msec	160 Vrms	34 msec	52 msec
EE	< 1.25 msec	180 Vrms	10 msec	< 1.25 msec
FF	< 1.25 msec	180 Vrms	10 msec	77 msec
GG	< 1.25 msec	180 Vrms	10 msec	< 1.25 msec
		(3 times)	every 0.5 sec	
Undervoltage Transients				
HH	< 1.25 msec	90 Vrms	35 msec	< 1.25 msec
II	< 1.25 msec	90 Vrms	35 msec	45 msec
JJ	< 1.25 msec	80 Vrms	10 msec	< 1.25 msec
KK	< 1.25 msec	80 Vrms	10 msec	70 msec
LL	< 1.25 msec	80 Vrms	10 msec	< 1.25 msec
		(3 times)	every 0.5 sec	
Combined Transient				
MM	< 1.25 msec	80 Vrms	10 msec	< 1.25 msec
	then < 1.25 msec	180 Vrms	10 msec	77 msec
Repetitive Normal Test				
	See Figures			

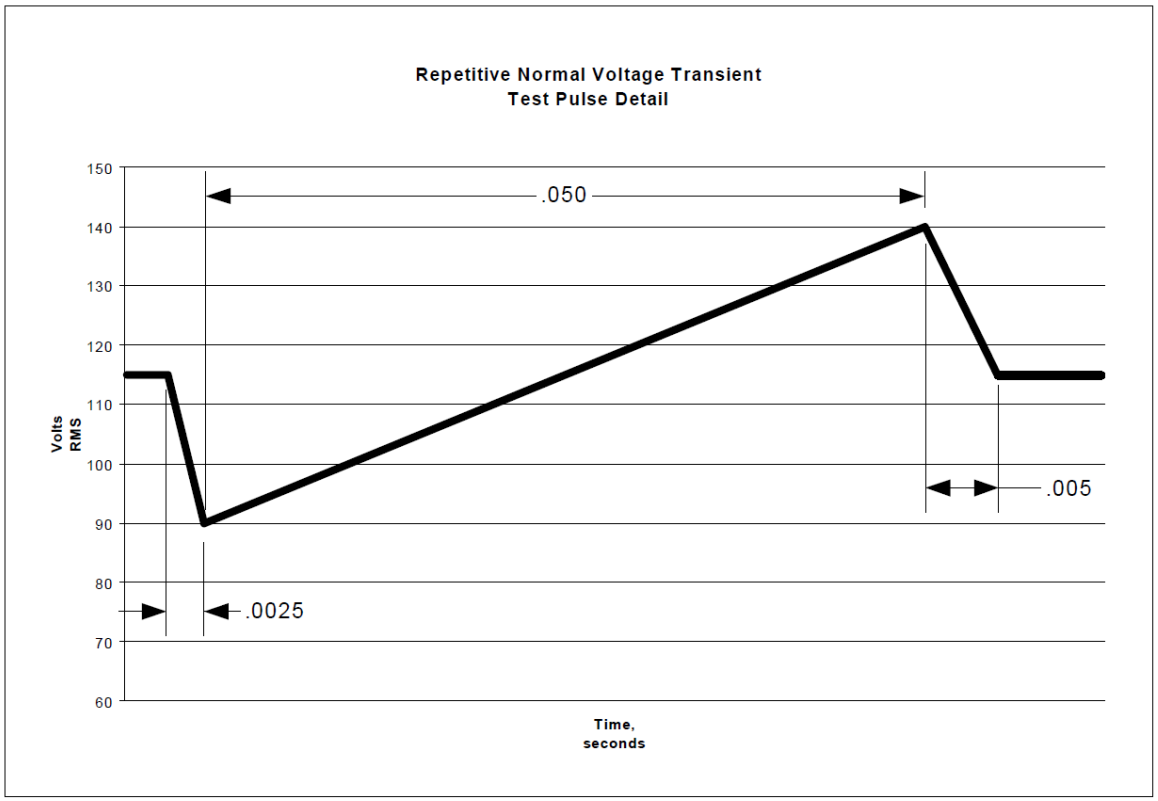


Figure 11: Voltage Transition Pulse Details

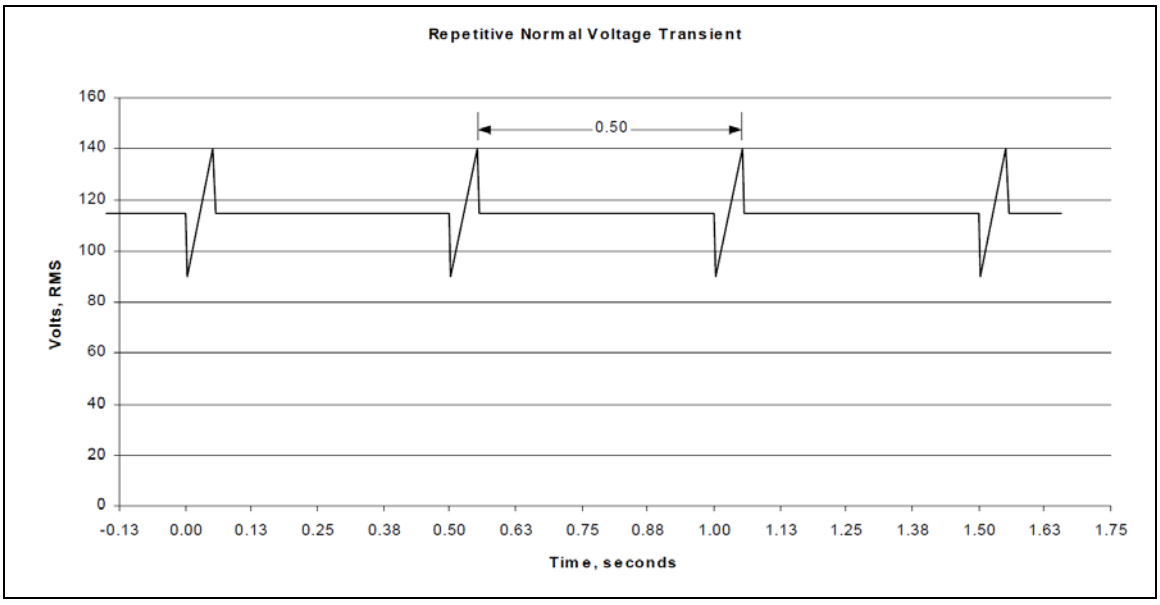


Figure 12: Repetitive Voltage transients.

SAC110

Test Condition	Time from Steady State Freq. to Freq. Transient Level	Freq. Transient Level	Duration at Freq. Transient Level	Time from Freq. Transient Level to Steady State Freq.
Overfrequency Transients				
AA	40 msec	410 Hz	10 seconds	40 msec
BB	80 msec	420 Hz	5 seconds	80 msec
CC	100 msec	425 Hz	1 seconds	100 msec
DD	100 msec	425 Hz	1 seconds	10 msec
	then 10 msec	420 Hz	4 seconds	20 msec
	then 20 msec	410 Hz	5 seconds	40 msec
Underfrequency Transients				
EE	40 msec	390 Hz	10 seconds	40 msec
FF	80 msec	380 Hz	5 seconds	80 msec
GG	100 msec	375 Hz	1 seconds	100 msec
HH	100 msec	375 Hz	1 seconds	10 msec
	then 10 msec	380 Hz	4 seconds	20 msec
	then 20 msec	390 Hz	5 seconds	40 msec
Combined Transient				
II	100 msec	375 Hz	1 seconds	100 msec
	then 100 msec	425 Hz	1 seconds	100 msec

SAC 201

Test Condition	Steady State Voltage	T fall	Duration of Interrupt	T rise
A	115V	< 1.25 msec	50 msec	< 1.25 msec
B	108V	< 1.25 msec	50 msec	< 1.25 msec
C	118V	< 1.25 msec	50 msec	< 1.25 msec
D	115V	< 1.25 msec	30 msec	< 1.25 msec
E	108V	< 1.25 msec	30 msec	< 1.25 msec
F	118V	< 1.25 msec	30 msec	< 1.25 msec
G	115V	< 1.25 msec	10 msec	< 1.25 msec
H	108V	< 1.25 msec	10 msec	< 1.25 msec
I	118V	< 1.25 msec	10 msec	< 1.25 msec
J	115V	< 1.25 msec	50 msec (repeated 3 times, separated by 0.5 sec)	< 1.25 msec
K	115V	< 1.25 msec	50 msec (followed by a normal voltage transient of 160 Vrms for 30 msec and return to steady state voltage in 40 msec)	40 msec
L	115V	< 1.25 msec	50 msec (followed by a normal voltage transient of 70 Vrms for 30 msec and return to steady state voltage in 40 msec)	40 msec

SAC301

Test Condition	Voltage	Frequency
A	115	380
B	115	420
C	100	400
D	100	380
E	100	420
F	125	400
G	125	380
H	125	420

Abnormal Limit	704F
Voltage	100 V
ALSS	
Voltage	125 V
AHSS	
Frequency	380 Hz
ALSS	
Frequency	420 Hz
AHSS	

SAC302

Test Condition	SS Voltage to Voltage Transient Level	Voltage Transient Level	Duration	Time From Voltage Level to SS Voltage or Next Voltage Level
Overvoltage Transients				
AA	< 1.25 msec	140 Vrms	180 msec	< 1.25 msec
BB	< 1.25 msec	140 Vrms	180 msec	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		
CC	< 1.25 msec	160 Vrms	78 msec	< 1.25 msec
DD	< 1.25 msec	160 Vrms	78 msec	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		
EE	< 1.25 msec	180 Vrms	50 msec	< 1.25 msec
FF	< 1.25 msec	180 Vrms	50 msec	11 msec
	then	170 Vrms	decreasing	17 msec
	then	160 Vrms	decreasing	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		
GG	< 1.25 msec	180 Vrms	20 msec	< 1.25 msec
		(3 times)	every 0.5 sec	
Undervoltage Transients				
HH	< 1.25 msec	85 Vrms	180 msec	< 1.25 msec
II	< 1.25 msec	85 Vrms	180 msec	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	>10 sec
		115 Vrms		
JJ	< 1.25 msec	65 Vrms	78 msec	< 1.25 msec
KK	< 1.25 msec	65 Vrms	78 msec	31 msec
	then	75 Vrms	increasing	71 msec
	then	85 Vrms	increasing	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	>10 sec
		115 Vrms		
LL	< 1.25 msec	45 Vrms	50 msec	< 1.25 msec
MM	< 1.25 msec	45 Vrms	50 msec	11 msec
	then	55 Vrms	increasing	17 msec
	then	65 Vrms	increasing	31 msec
	then	75 Vrms	increasing	71 msec
	then	85 Vrms	increasing	87 msec
	then	90 Vrms	increasing	253 msec

Test Condition	SS Voltage to Voltage Transient Level	Voltage Transient Level	Duration	Time From Voltage Level to SS Voltage or Next Voltage Level
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	>10 sec
		115 Vrms		
NN	< 1.25 msec	45 Vrms	20 msec	< 1.25 msec
		(3 times)	every 0.5 sec	
Combined Transient				
OO	< 1.25 msec	45 Vrms then	20 msec	< 1.25 msec
	< 1.25 msec	180 Vrms	50 msec	11 msec
	then	170 Vrms	decreasing	17 msec
	then	160 Vrms	decreasing	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		

SAC303

Test Condition	Transition Time	Transient Level	Duration	Transition2
Overfrequency Transients				
AA	160 msec	480 Hz	½ cycle	160 msec
BB	160 msec	480 Hz	4.78 secs	160 msec
Underfrequency Transients				
CC	160 msec	320 Hz	½ cycle	160 msec
DD	160 msec	320 Hz	4.78 secs	160 msec
Combined Transient				
EE	160 msec	320 Hz then	½ cycle	160 msec
	160 msec	480 Hz	½ cycle	160 msec

SAC401

Test Condition	Voltage	Frequency
A	115	393
B	115	407
C	108	400
D	108	393
E	108	407
F	118	400
G	118	393
H	118	407

Abnormal Limit	704F
Voltage	108V
ELSS	
Voltage	118V
EHSS	
Frequency	393Hz
ELSS	
Frequency	407Hz
EHSS	

SAC601

Test Condition	Duration of Power Failure
A	100 msec
B	500 msec
C	3 secs
D	7 secs

SAC603

Test Condition	Phases	Duration
Physical Means Prevention	Verify/Check	
If Not:		
Reversed Phase Rotation	N-A	30 mins
Correct Phase Rotation	A-N	30 mins

9.4.2 TAC Test Details by Test Number (Three Phase, 115V, 400 Hz)

TAC101

Test Plan	Description
Stimulus:	Apply 115VL-N, 400Hz
	Close CB or contactor to EUT and measure Inrush current
	Allow EUT to warm up before taking additional measurements
	Allow power to run for 15 mins.
Measure	Inrush Current, all phases
	Steady state voltage, current, power
	Verify no half wave rectification is used
	Current Harmonics / All phases using HAS option
Repeat	For each EUT operating mode

TAC102

Test Condition	Voltage L-N	Frequency
Balanced Voltages		
A	115V	400Hz
B	115V	393Hz
C	115V	407Hz
D	108V	400Hz
E	108V	393Hz
F	108V	407Hz
G	118V	400Hz
H	118V	393Hz
I	118V	407Hz
Unbalanced Voltages		
J	Van 108V	400Hz
	Vbn 111V	
	Vcn 111V	
K	Van 118V	400Hz
	Vbn 115V	
	Vcn 115V	

TAC103

Test Conditions	Phase Van	Phase Vbn	Phase Vcn
	Van	Vbn	Vcn
A	0°	116°	240°
B	0°	124°	240°

TAC104

Test Conditions	Average Vrms	Modulation Frequency	Amplitude
A-1	115V	1.0Hz	0.375Vrms
A-2	109.25V		
A-3	116.75V		
B-1	115V	1.7Hz	0.375Vrms
B-2	109.25V		
B-3	116.75V		
C-1	115V	10Hz	2.5Vrms
C-2	109.25V		
C-3	116.75V		
D-1	115V	25Hz	2.5Vrms
D-2	109.25V		
D-3	116.75V		
E-1	115V	70Hz	0.375Vrms
E-2	109.25V		
E-3	116.75V		
F-1	115V	100Hz	0.375Vrms
F-2	109.25V		
F-3	116.75V		
G-1	115V	200Hz	0.375Vrms
G-2	109.25V		
G-3	116.75V		

TAC105

Test Condition	Average Frequency	Rate of Freq. Change	Amplitude
A-1	400 Hz	1 Hz/sec	± 2Hz
A-2	395 Hz		
A-3	405 Hz		
B-1	400 Hz	5 Hz/sec	
B-2	395 Hz		
B-3	405 Hz		
C-1	400 Hz	10 Hz/sec	
C-2	395 Hz		
C-3	405 Hz		
D-1	400 Hz	25 Hz/sec	
D-2	395 Hz		
D-3	405 Hz		
E-1	400 Hz	100 Hz/sec	
E-2	395 Hz		
E-3	405 Hz		

TAC106

Test Condition	Frequency of Voltage Distortion	Amplitude of Voltage Distortion
A	50 Hz	0.316 Vrms
B	100 Hz	0.316 Vrms
C	500 Hz	1.580 Vrms
D	1 kHz	3.160 Vrms
E	2 kHz	3.160 Vrms
F	3 kHz	3.160 Vrms
G	5 kHz	1.900 Vrms
H	10 kHz	0.950 Vrms

TAC107

Harmonic	MIL-STD-704 Rev B - F Percent of Fund.
Fundamental	100%
2nd	0%
3rd	2.75%
4th	0%
5th	2.75%
6th	0%
7th	1.97%
8th	0%
9th	1.53%
10th	0%
11th	1.25%
12th	0%
13th	1.06%
14th	0%
15th	0.92%

TAC108

Test Condition	Direct Current Component of AC Voltage
A	+ 0.10V
B	- 0.10 V

TAC109

Test Condition	Time from Steady State Voltage to Voltage Transient Level (ms)	Voltage Transient Level (Vrms)	Duration at Voltage Transient Level (ms)	Voltage Transient Level to Steady State Voltage (ms)
Overvoltage Transients				
AA	< 1.25 msec	140 Vrms	60 msec	< 1.25 msec
BB	< 1.25 msec	140 Vrms	60 msec	25 msec
CC	< 1.25 msec	160 Vrms	34 msec	< 1.25 msec
DD	< 1.25 msec	160 Vrms	34 msec	52 msec
EE	< 1.25 msec	180 Vrms	10 msec	< 1.25 msec
FF	< 1.25 msec	180 Vrms	10 msec	77 msec
GG	< 1.25 msec	180 Vrms	10 msec	< 1.25 msec
		(3 times)	every 0.5 sec	
Undervoltage Transients				
HH	< 1.25 msec	90 Vrms	35 msec	< 1.25 msec
II	< 1.25 msec	90 Vrms	35 msec	45 msec
JJ	< 1.25 msec	80 Vrms	10 msec	< 1.25 msec
KK	< 1.25 msec	80 Vrms	10 msec	70 msec
LL	< 1.25 msec	80 Vrms	10 msec	< 1.25 msec
		(3 times)	every 0.5 sec	
Combined Transient				
MM	< 1.25 msec	80 Vrms	10 msec	< 1.25 msec
	then < 1.25 msec	180 Vrms	10 msec	77 msec
Repetitive Normal Test				
	See Figures			

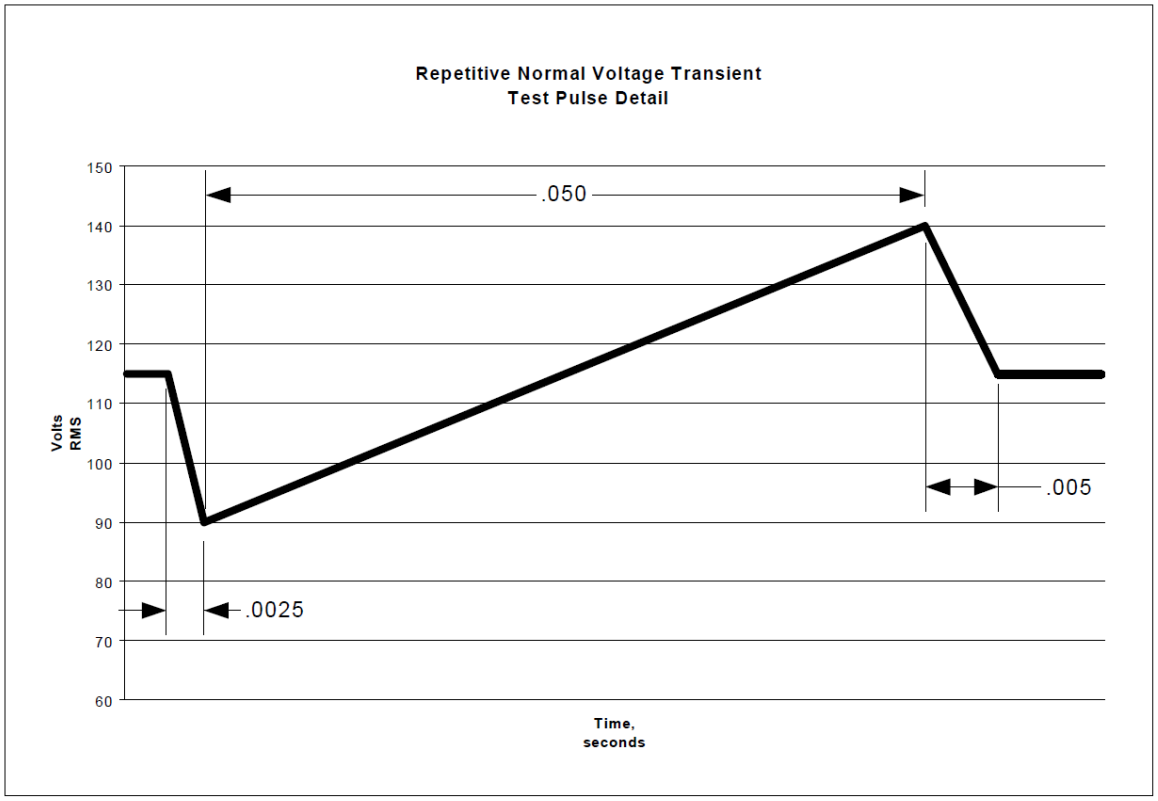


Figure 13: Voltage Transition Pulse Details

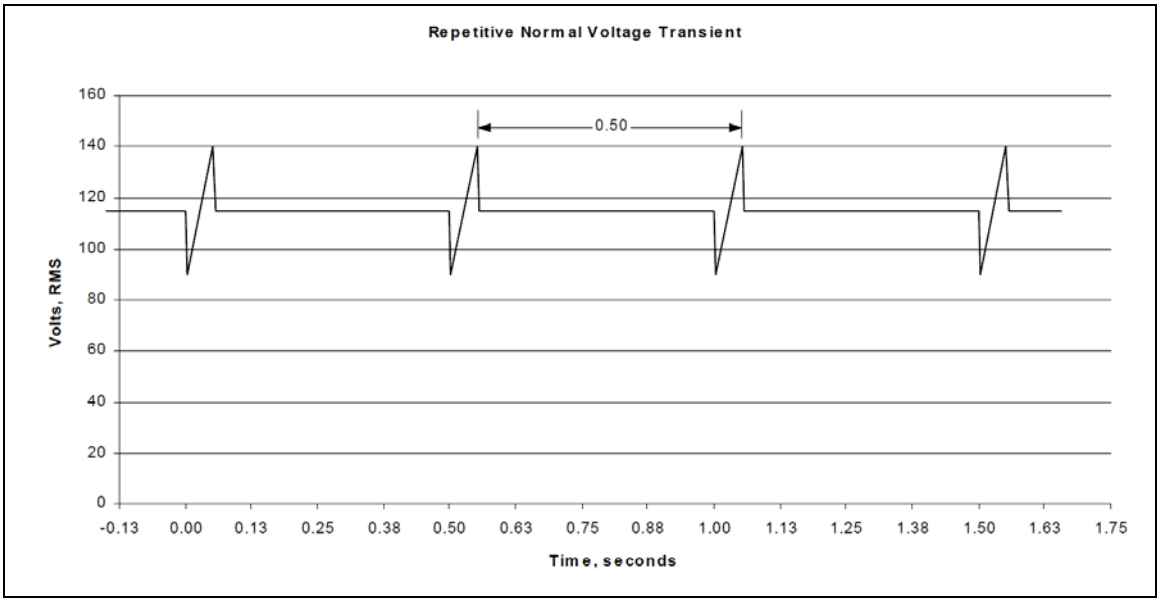


Figure 14: Repetitive Voltage transients.

TAC110

Test Condition	Time from Steady State Freq. to Freq. Transient Level	Freq. Transient Level	Duration at Freq. Transient Level	Time from Freq. Transient Level to Steady State Freq.
Overfrequency Transients				
AA	40 msec	410 Hz	10 seconds	40 msec
BB	80 msec	420 Hz	5 seconds	80 msec
CC	100 msec	425 Hz	1 seconds	100 msec
DD	100 msec	425 Hz	1 seconds	10 msec
	then 10 msec	420 Hz	4 seconds	20 msec
	then 20 msec	410 Hz	5 seconds	40 msec
Underfrequency Transients				
EE	40 msec	390 Hz	10 seconds	40 msec
FF	80 msec	380 Hz	5 seconds	80 msec
GG	100 msec	375 Hz	1 seconds	100 msec
HH	100 msec	375 Hz	1 seconds	10 msec
	then 10 msec	380 Hz	4 seconds	20 msec
	then 20 msec	390 Hz	5 seconds	40 msec
Combined Transient				
II	100 msec	375 Hz	1 seconds	100 msec
	then 100 msec	425 Hz	1 seconds	100 msec

TAC201

Test Condition	Steady State Voltage	T fall	Duration of Interrupt	T rise
A	115V	< 1.25 msec	50 msec	< 1.25 msec
B	108V	< 1.25 msec	50 msec	< 1.25 msec
C	118V	< 1.25 msec	50 msec	< 1.25 msec
D	115V	< 1.25 msec	30 msec	< 1.25 msec
E	108V	< 1.25 msec	30 msec	< 1.25 msec
F	118V	< 1.25 msec	30 msec	< 1.25 msec
G	115V	< 1.25 msec	10 msec	< 1.25 msec
H	108V	< 1.25 msec	10 msec	< 1.25 msec
I	118V	< 1.25 msec	10 msec	< 1.25 msec
J	115V	< 1.25 msec	50 msec (repeated 3 times, separated by 0.5 sec)	< 1.25 msec
K	115V	< 1.25 msec	50 msec (followed by a normal voltage transient of 160 Vrms for 30 msec and return to steady state voltage in 40 msec)	40 msec
L	115V	< 1.25 msec	50 msec (followed by a normal voltage transient of 70 Vrms for 30 msec and return to steady state voltage in 40 msec)	40 msec

TAC301

Test Condition	Voltage	Frequency		Abnormal Limit	704F
A	115	380		Voltage	100 V
B	115	420		ALSS	
C	100	400		Voltage	125 V
D	100	380		AHSS	
E	100	420		Frequency	380 Hz
F	125	400		ALSS	
G	125	380		Frequency	420 Hz
H	125	420		AHSS	

TAC302

Test Condition	SS Voltage to Voltage Transient Level	Voltage Transient Level	Duration	Time From Voltage Level to SS Voltage or Next Voltage Level
Overvoltage Transients				
AA	< 1.25 msec	140 Vrms	180 msec	< 1.25 msec
BB	< 1.25 msec	140 Vrms	180 msec	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		
CC	< 1.25 msec	160 Vrms	78 msec	< 1.25 msec
DD	< 1.25 msec	160 Vrms	78 msec	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		
EE	< 1.25 msec	180 Vrms	50 msec	< 1.25 msec
FF	< 1.25 msec	180 Vrms	50 msec	11 msec
	then	170 Vrms	decreasing	17 msec
	then	160 Vrms	decreasing	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		
GG	< 1.25 msec	180 Vrms	20 msec	< 1.25 msec
		(3 times)	every 0.5 sec	
Undervoltage Transients				
HH	< 1.25 msec	85 Vrms	180 msec	< 1.25 msec
II	< 1.25 msec	85 Vrms	180 msec	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	>10 sec
		115 Vrms		

Test Condition	SS Voltage to Voltage Transient Level	Voltage Transient Level	Duration	Time From Voltage Level to SS Voltage or Next Voltage Level
JJ	< 1.25 msec	65 Vrms	78 msec	< 1.25 msec
KK	< 1.25 msec	65 Vrms	78 msec	31 msec
	then	75 Vrms	increasing	71 msec
	then	85 Vrms	increasing	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	>10 sec
		115 Vrms		
LL	< 1.25 msec	45 Vrms	50 msec	< 1.25 msec
MM	< 1.25 msec	45 Vrms	50 msec	11 msec
	then	55 Vrms	increasing	17 msec
	then	65 Vrms	increasing	31 msec
	then	75 Vrms	increasing	71 msec
	then	85 Vrms	increasing	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	>10 sec
		115 Vrms		
NN	< 1.25 msec	45 Vrms	20 msec	< 1.25 msec
		(3 times)	every 0.5 sec	
Combined Transient				
OO	< 1.25 msec	45 Vrms then	20 msec	< 1.25 msec
	< 1.25 msec	180 Vrms	50 msec	11 msec
	then	170 Vrms	decreasing	17 msec
	then	160 Vrms	decreasing	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		

TAC303

Test Condition	Transition Time	Transient Level	Duration	Transition2
Overfrequency Transients				
AA	160 msec	480 Hz	½ cycle	160 msec
BB	160 msec	480 Hz	4.78 secs	160 msec
Underfrequency Transients				
CC	160 msec	320 Hz	½ cycle	160 msec
DD	160 msec	320 Hz	4.78 secs	160 msec
Combined Transients				
EE	160 msec	320 Hz then	½ cycle	160 msec
	160 msec	480 Hz	½ cycle	160 msec

TAC401

Test Condition	Voltage	Frequency
A	115	393
B	115	407
C	108	400
D	108	393
E	108	407
F	118	400
G	118	393
H	118	407

Abnormal Limit	704F
Voltage	108V
ELSS	
Voltage	118V
EHSS	
Frequency	393Hz
ELSS	
Frequency	407Hz
EHSS	

TAC601

Test Condition	Duration of Power Failure
A	100 msec
B	500 msec
C	3 secs
D	7 secs

TAC602

Test Condition	Phases	Duration	Rep
One Phase Power Failure			
A	Phase A	7 seconds	5
B	Phase B	7 seconds	5
C	Phase C	7 seconds	5
D	Phase A	Indefinitely	1
E	Phase B	Indefinitely	1
F	Phase C	Indefinitely	1
Two Phase Power Failures			
G	Phase A & B	7 seconds	5
H	Phase B & C	7 seconds	5
I	Phase A & B	Indefinitely	1
J	Phase B & C	Indefinitely	1

TAC603

Test Condition	Phases	Duration
Physical Means Prevention	Verify/Check	
If Not:		
Reversed Phase Rotation	C-B-A	30 mins
Correct Phase Rotation	A-B-C	30 mins

9.4.3 SVF Test Details by Test Number (Single Phase, 115V, Variable Frequency)

SVF101

Test Plan	Description	Run at F =
Stimulus:	Apply 115VL-N, 360-800 Hz	
	Close CB or contactor to EUT and measure Inrush current	
	Allow EUT to warm up before taking additional measurements	
	Allow power to run for 15 mins.	
Measure	Inrush Current, all phases	400, 360, 600, 800 Hz
	Steady state voltage, current, power, Load Balance	400, 360, 600, 800 Hz
	Verify no half wave rectification is used	400Hz only
	Current Harmonics / All phases using HAS option	400Hz only
Run at:	400Hz, 360Hz, 600Hz, 800Hz Note: Frequency jumps between tests done over 40 secs	
Repeat	For each EUT operating mode	

SVF102

Test Condition	Voltage	Frequency	Time at Test Condition
Nominal Voltages			
A	115 V	360 Hz	30 min
B	115 V	400 Hz	30 min
C	115 V	600 Hz	30 min
D	115 V	800 Hz	30 min
Normal Low Steady State Voltages			
E	108 V	360 Hz	30 min
F	108 V	400 Hz	30 min
G	108 V	440 Hz	5 min
H	108 V	480 Hz	5 min
I	108 V	520 Hz	5 min
J	108 V	560 Hz	5 min
K	108 V	600 Hz	30 min
L	108 V	520 Hz	5 min
M	108 V	540 Hz	5 min
N	108 V	560 Hz	5 min
O	108 V	570 Hz	5 min
P	108 V	580 Hz	5 min
Q	108 V	600 Hz	30 min
R	108 V	640 Hz	5 min
S	108 V	680 Hz	5 min
T	108 V	720 Hz	5 min
U	108 V	760 Hz	5 min
V	108 V	800 Hz	30 min
Normal High Steady State Voltages			
W	118 V	360 Hz	30 min
X	118 V	400 Hz	30 min
Y	118 V	440 Hz	5 min
Z	118 V	480 Hz	5 min
AA	118 V	520 Hz	5 min

Test Condition	Voltage	Frequency	Time at Test Condition
BB	118 V	560 Hz	5 min
CC	118 V	600 Hz	30 min
DD	118 V	520 Hz	5 min
EE	118 V	540 Hz	5 min
FF	118 V	560 Hz	5 min
GG	118 V	570 Hz	5 min
HH	118 V	580 Hz	5 min
II	118 V	600 Hz	30 min
JJ	118 V	640 Hz	5 min
KK	118 V	680 Hz	5 min
LL	118 V	720 Hz	5 min
MM	118 V	760 Hz	5 min
NN	118 V	800 Hz	30 min

SVF104: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Conditions	Average Vrms	Modulation Frequency	Amplitude
A-1	115V	1.0Hz	0.375Vrms
A-2	109.25V		
A-3	116.75V		
B-1	115V	1.7Hz	0.375Vrms
B-2	109.25V		
B-3	116.75V		
C-1	115V	10Hz	2.5Vrms
C-2	109.25V		
C-3	116.75V		
D-1	115V	25Hz	2.5Vrms
D-2	109.25V		
D-3	116.75V		
E-1	115V	70Hz	0.375Vrms
E-2	109.25V		
E-3	116.75V		
F-1	115V	100Hz	0.375Vrms
F-2	109.25V		
F-3	116.75V		
G-1	115V	200Hz	0.375Vrms
G-2	109.25V		
G-3	116.75V		

SVF105

Test Condition	Average Frequency	Rate of Freq. Change	Amplitude
A	400 Hz	1 Hz/sec	± 2Hz
B	400 Hz	5 Hz/sec	
C	400 Hz	10 Hz/sec	
D	400 Hz	25 Hz/sec	
E	400 Hz	100 Hz/sec	
A	362 Hz	1 Hz/sec	± 2Hz
B	362 Hz	5 Hz/sec	
C	362 Hz	10 Hz/sec	
D	362 Hz	25 Hz/sec	
E	362 Hz	100 Hz/sec	
A	600 Hz	1 Hz/sec	± 2Hz
B	600 Hz	5 Hz/sec	
C	600 Hz	10 Hz/sec	
D	600 Hz	25 Hz/sec	
E	600 Hz	100 Hz/sec	
A	798 Hz	1 Hz/sec	± 2Hz
B	798 Hz	5 Hz/sec	
C	798 Hz	10 Hz/sec	
D	798 Hz	25 Hz/sec	
E	798 Hz	100 Hz/sec	

SVF106: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Frequency of Voltage Distortion	Amplitude of Voltage Distortion
A	50 Hz	0.316 Vrms
B	100 Hz	0.316 Vrms
C	500 Hz	1.580 Vrms
D	1 kHz	3.160 Vrms
E	2 kHz	3.160 Vrms
F	3 kHz	3.160 Vrms
G	5 kHz	1.900 Vrms
H	10 kHz	0.950 Vrms

SVF107: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Harmonic	MIL-STD-704 Rev B - F Percent of Fund.
Fundamental	100%
2nd	0%
3rd	2.75%
4th	0%
5th	2.75%
6th	0%
7th	1.97%
8th	0%
9th	1.53%
10th	0%
11th	1.25%
12th	0%
13th	1.06%
14th	0%
15th	0.92%

SVF108: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Direct Current Component of AC Voltage
A	+ 0.10V
B	- 0.10 V

SVF109: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Time from Steady State Voltage to Voltage Transient Level (ms)	Voltage Transient Level (Vrms)	Duration at Voltage Transient Level (ms)	Voltage Transient Level to Steady State Voltage (ms)
Overvoltage Transients				
A	< ½ cycle	140 Vrms	60 msec	< ½ cycle
B	< ½ cycle	140 Vrms	60 msec	25 msec
C	< ½ cycle	160 Vrms	34 msec	< ½ cycle
D	< ½ cycle	160 Vrms	34 msec	52 msec
E	< ½ cycle	180 Vrms	10 msec	< ½ cycle
F	< ½ cycle	180 Vrms	10 msec	77 msec
G	< ½ cycle	180 Vrms	10 msec	< ½ cycle
		(3 times)	every 0.5 sec	
Undervoltage Transients				
H	< ½ cycle	90 Vrms	35 msec	< ½ cycle
I	< ½ cycle	90 Vrms	35 msec	45 msec
J	< ½ cycle	80 Vrms	10 msec	< ½ cycle
K	< ½ cycle	80 Vrms	10 msec	70 msec
L	< ½ cycle	80 Vrms	10 msec	< ½ cycle
		(3 times)	every 0.5 sec	
Combined Transient				
M	< ½ cycle	80 Vrms	10 msec	< ½ cycle
	then < ½ cycle	180 Vrms	10 msec	77 msec
Repetitive Normal Test				
	See Figures			

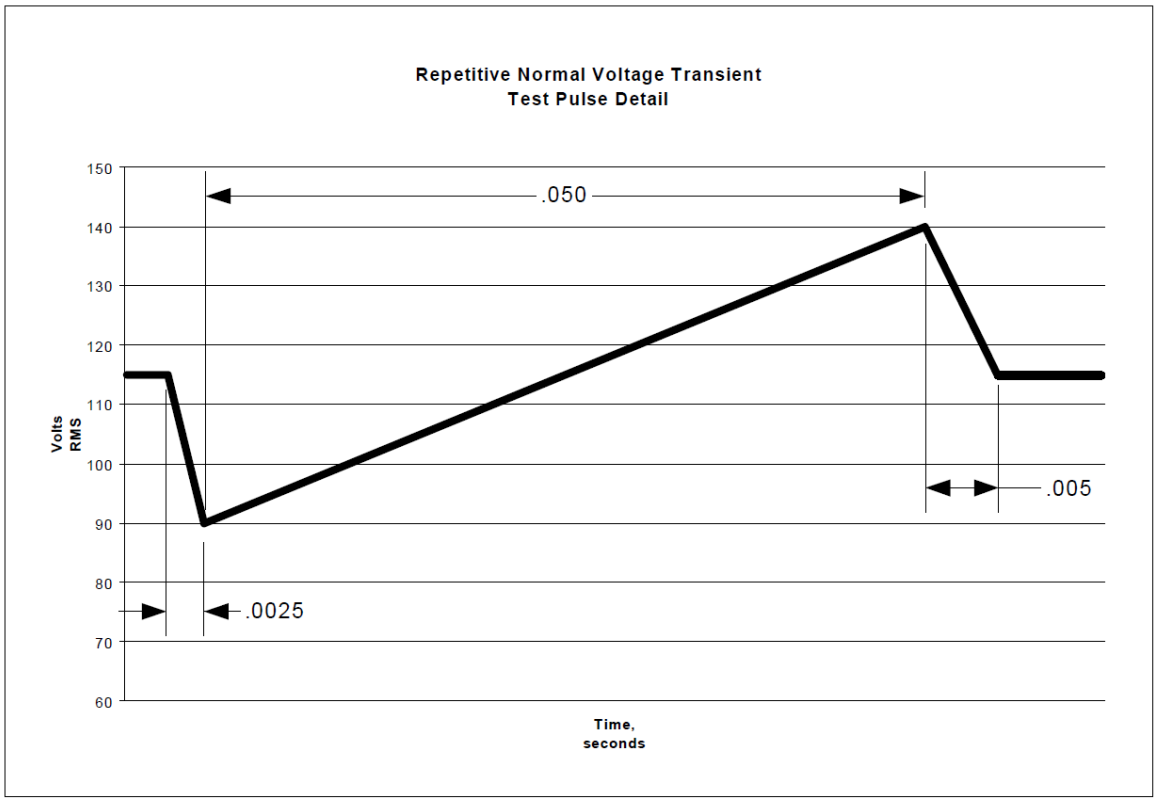


Figure 15: Voltage Transition Pulse Details

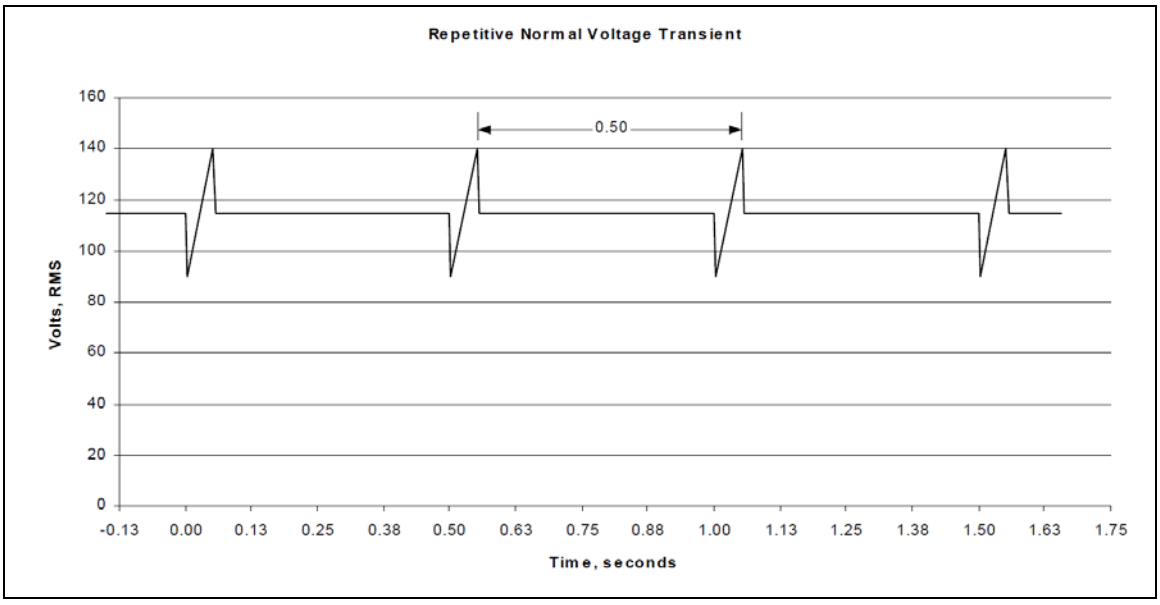


Figure 16: Repetitive Voltage transients.

SVF110

Test Condition	Start Frequency	Time from Steady State Freq. to Freq. Transient Level	Freq. Transient Level	Duration at Freq. Transient Level	Time from Freq. Transient Level to Steady State Freq.
Overfrequency Transients					
A	360 Hz	1.76 seconds	800 Hz	1/2 cycle	1.76 seconds
B	360 Hz	1.76 seconds	800 Hz	1 seconds	1.76 seconds
C	360 Hz	0.96 seconds	600 Hz	1/2 cycle	0.96 seconds
D	360 Hz	0.96 seconds	600 Hz	1 seconds	0.96 seconds
Underfrequency Transients					
E	800 Hz	1.76 seconds	360 Hz	1/2 cycle	1.76 seconds
F	800 Hz	1.76 seconds	360 Hz	1 seconds	1.76 seconds
G	800 Hz	0.80 seconds	600 Hz	1/2 cycle	0.80 seconds
H	800 Hz	0.80 seconds	600 Hz	1 seconds	0.80 seconds
Combined Transient					
I	600 Hz	0.96 seconds	360 Hz	1/2 cycle	0.96 seconds
		then 0.80 seconds	800 Hz	1/2 cycle	then 0.80 seconds

SVF201: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Steady State Voltage	T fall	Duration of Interrupt	T rise
A	115V	< ½ cycle	50 msec	< ½ cycle
B	108V	< ½ cycle	50 msec	< ½ cycle
C	118V	< ½ cycle	50 msec	< ½ cycle
D	115V	< ½ cycle	30 msec	< ½ cycle
E	108V	< ½ cycle	30 msec	< ½ cycle
F	118V	< ½ cycle	30 msec	< ½ cycle
G	115V	< ½ cycle	10 msec	< ½ cycle
H	108V	< ½ cycle	10 msec	< ½ cycle
I	118V	< ½ cycle	10 msec	< ½ cycle
J	115V	< ½ cycle	50 msec (repeated 3 times, separated by 0.5 sec)	< ½ cycle
K	115V	< ½ cycle	50 msec (followed by a normal voltage transient of 160 Vrms for 30 msec and return to steady state voltage in 40 msec)	40 msec
L	115V	< ½ cycle	50 msec (followed by a normal voltage transient of 70 Vrms for 30 msec and return to steady state voltage in 40 msec)	40 msec

Note: For FORM2 (Split Phase) test files, Test conditions A through J and L are executed on the Low Voltage range in Single Phase mode (FORM1). Test condition K is executed last after changing to split phase mode (FORM2). This requires the UUT Connection to be changed from A-N to A-B.

SVF301

Test Conditions	Voltage L-N	Frequency
A	100V	400Hz
B	100V	360Hz
C	100V	600Hz
D	100V	800Hz
E	125V	400Hz
F	125V	360Hz
G	125V	600Hz
H	125V	800Hz

Abnormal Limit	704F
Voltage	100 V
ALSS	
Voltage	125 V
AHSS	
Frequency	360Hz
ALSS	
Frequency	800Hz
AHSS	

SVF302: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	SS Voltage to Voltage Transient Level	Voltage Transient Level	Duration	Time From Voltage Level to SS Voltage or Next Voltage Level
Overvoltage Transients				
A	< ½ cycle	140 Vrms	180 msec	< ½ cycle
B	< ½ cycle	140 Vrms	180 msec	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	30 sec
		115 Vrms		
C	< ½ cycle	160 Vrms	78 msec	< ½ cycle
D	< ½ cycle	160 Vrms	78 msec	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	30 sec
		115 Vrms		
E	< ½ cycle	180 Vrms	50 msec	< ½ cycle
F	< ½ cycle	180 Vrms	50 msec	11 msec
	then	170 Vrms	decreasing	17 msec
	then	160 Vrms	decreasing	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	30 sec
		115 Vrms		
G	< ½ cycle	180 Vrms	20 msec	< ½ cycle
		(3 times)	every 0.5 sec	
Undervoltage Transients				
H	< ½ cycle	85 Vrms	180 msec	< ½ cycle
I	< ½ cycle	85 Vrms	180 msec	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	30 sec
		115 Vrms		
J	< ½ cycle	65 Vrms	78 msec	< ½ cycle
K	< ½ cycle	65 Vrms	78 msec	31 msec

Test Condition	SS Voltage to Voltage Transient Level	Voltage Transient Level	Duration	Time From Voltage Level to SS Voltage or Next Voltage Level
	then	75 Vrms	increasing	71 msec
	then	85 Vrms	increasing	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	30 sec
		115 Vrms		
L	< ½ cycle	45 Vrms	50 msec	< ½ cycle
M	< ½ cycle	45 Vrms	50 msec	11 msec
	then	55 Vrms	increasing	17 msec
	then	65 Vrms	increasing	31 msec
	then	75 Vrms	increasing	71 msec
	then	85 Vrms	increasing	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	30 sec
		115 Vrms		
N	< ½ cycle	45 Vrms	20 msec	< ½ cycle
		(3 times)	every 0.5 sec	
Combined Transient				
O	< ½ cycle	45 Vrms then	20 msec	< ½ cycle
	< ½ cycle	180 Vrms	50 msec	11 msec
	then	170 Vrms	decreasing	17 msec
	then	160 Vrms	decreasing	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	30 sec
		115 Vrms		

SVF303

Test Condition	Start Frequency	Transient Time	Level	Duration	Transient
Over Frequency Transients					
A	360 Hz	0.88 secs	800 Hz	½ cycle	0.88 secs
B	360 Hz	0.88 secs	800 Hz	1second	0.88 secs
C	360 Hz	0.48 secs	600 Hz	½ cycle	0.48 secs
D	360 Hz	0.48 secs	600 Hz	1second	0.48 secs
Under Frequency Transients					
E	800 Hz	0.88 secs	360 Hz	½ cycle	0.88 secs
F	800 Hz	0.88 secs	360 Hz	1second	0.88 secs
G	600 Hz	0.48 secs	600 Hz	½ cycle	0.40 secs
H	600 Hz	0.48 secs	600 Hz	1second	0.40 secs
Combined Transient					
I	600 Hz	0.48 secs	360 Hz	½ cycle	0.48 secs
		then 0.40 secs	800 Hz	½ cycle	0.40 secs

SVF401

Test Condition	Voltage	Frequency	Time at Test Condition
Nominal Voltages			
A	115 V	360 Hz	30 min
B	115 V	400 Hz	30 min
C	115 V	600 Hz	30 min
D	115 V	800 Hz	30 min
Normal Low Steady State Voltages			
E	108 V	360 Hz	30 min
F	108 V	400 Hz	30 min
G	108 V	440 Hz	5 min
H	108 V	480 Hz	5 min
I	108 V	520 Hz	5 min
J	108 V	560 Hz	5 min
K	108 V	600 Hz	30 min
L	108 V	520 Hz	5 min
M	108 V	540 Hz	5 min
N	108 V	560 Hz	5 min
O	108 V	570 Hz	5 min
P	108 V	580 Hz	5 min
Q	108 V	600 Hz	30 min
R	108 V	640 Hz	5 min
S	108 V	680 Hz	5 min
T	108 V	720 Hz	5 min
U	108 V	760 Hz	5 min
V	108 V	800 Hz	30 min
Normal High Steady State Voltages			
W	118 V	360 Hz	30 min
X	118 V	400 Hz	30 min
Y	118 V	440 Hz	5 min
Z	118 V	480 Hz	5 min
AA	118 V	520 Hz	5 min
BB	118 V	560 Hz	5 min
CC	118 V	600 Hz	30 min
DD	118 V	520 Hz	5 min
EE	118 V	540 Hz	5 min
FF	118 V	560 Hz	5 min
GG	118 V	570 Hz	5 min
HH	118 V	580 Hz	5 min
II	118 V	600 Hz	30 min
JJ	118 V	640 Hz	5 min
KK	118 V	680 Hz	5 min
LL	118 V	720 Hz	5 min
MM	118 V	760 Hz	5 min
NN	118 V	800 Hz	30 min

SVF601: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Duration of Power Failure
A	100 msec
B	500 msec
C	3 secs
D	7 secs

SVF603: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Phases	Duration
Physical Means Prevention	Verify/Check	
If Not:		
Reversed Phase Rotation	C-B-A	30 mins
Correct Phase Rotation	A-B-C	30 mins

9.4.4 TVF Test Details by Test Number (Three Phase, 115V, Variable Frequency)

TVF101

Test Plan	Description	Run at F =
Stimulus:	Apply 115VL-N, 360-800 Hz	
	Close CB or contactor to EUT and measure Inrush current	
	Allow EUT to warm up before taking additional measurements	
	Allow power to run for 15 mins.	
Measure	Inrush Current, all phases	400, 360, 600, 800 Hz
	Steady state voltage, current, power, Load Balance	400, 360, 600, 800 Hz
	Verify no half wave rectification is used	400Hz only
	Current Harmonics / All phases using HAS option	400Hz only
Run at:	400Hz, 360Hz, 600Hz, 800Hz Note: Frequency jumps between tests done over 40 secs	
Repeat	For each EUT operating mode	

TVF102

Test Condition	Voltage	Frequency	Time at Test Condition
Nominal Voltages			
A	115 V	360 Hz	30 min
B	115 V	400 Hz	30 min
C	115 V	600 Hz	30 min
D	115 V	800 Hz	30 min
Normal Low Steady State Voltages			
E	108 V	360 Hz	30 min
F	108 V	400 Hz	30 min
G	108 V	440 Hz	5 min
H	108 V	480 Hz	5 min
I	108 V	520 Hz	5 min
J	108 V	560 Hz	5 min
K	108 V	600 Hz	30 min
L	108 V	520 Hz	5 min
M	108 V	540 Hz	5 min
N	108 V	560 Hz	5 min
O	108 V	570 Hz	5 min
P	108 V	580 Hz	5 min
Q	108 V	600 Hz	30 min
R	108 V	640 Hz	5 min
S	108 V	680 Hz	5 min
T	108 V	720 Hz	5 min
U	108 V	760 Hz	5 min
V	108 V	800 Hz	30 min
Normal High Steady State Voltages			
W	118 V	360 Hz	30 min
X	118 V	400 Hz	30 min
Y	118 V	440 Hz	5 min
Z	118 V	480 Hz	5 min
AA	118 V	520 Hz	5 min

Test Condition	Voltage		Frequency	Time at Test Condition
BB	118 V		560 Hz	5 min
CC	118 V		600 Hz	30 min
DD	118 V		520 Hz	5 min
EE	118 V		540 Hz	5 min
FF	118 V		560 Hz	5 min
GG	118 V		570 Hz	5 min
HH	118 V		580 Hz	5 min
II	118 V		600 Hz	30 min
JJ	118 V		640 Hz	5 min
KK	118 V		680 Hz	5 min
LL	118 V		720 Hz	5 min
MM	118 V		760 Hz	5 min
NN	118 V		800 Hz	30 min
Unbalanced Voltages				
OO	Van	108 V	360 Hz	30 min
	Vbn	115 V		
	Vcn	115 V		
PP	Van	118 V	360 Hz	30 min
	Vbn	115 V		
	Vcn	115 V		
QQ	Van	108 V	800 Hz	30 min
	Vbn	115 V		
	Vcn	115 V		
RR	Van	118 V	800 Hz	30 min
	Vbn	115 V		
	Vcn	115 V		

TVF103

Test Conditions	Phase Van	Phase Vbn	Phase Vcn
	Van	Vbn	Vcn
A	0°	116°	240°
B	0°	124°	240°

TVF104: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Conditions	Average Vrms	Modulation Frequency	Amplitude
A-1	115V	1.0Hz	0.375Vrms
A-2	109.25V		
A-3	116.75V		
B-1	115V	1.7Hz	0.375Vrms
B-2	109.25V		
B-3	116.75V		
C-1	115V	10Hz	2.5Vrms
C-2	109.25V		
C-3	116.75V		
D-1	115V	25Hz	2.5Vrms
D-2	109.25V		
D-3	116.75V		
E-1	115V	70Hz	0.375Vrms

Test Conditions	Average Vrms	Modulation Frequency	Amplitude
E-2	109.25V		
E-3	116.75V		
F-1	115V	100Hz	0.375Vrms
F-2	109.25V		
F-3	116.75V		
G-1	115V	200Hz	0.375Vrms
G-2	109.25V		
G-3	116.75V		

TVF105

Test Condition	Average Frequency	Rate of Freq. Change	Amplitude
A	400 Hz	1 Hz/sec	± 2Hz
B	400 Hz	5 Hz/sec	
C	400 Hz	10 Hz/sec	
D	400 Hz	25 Hz/sec	
E	400 Hz	100 Hz/sec	
A	362 Hz	1 Hz/sec	± 2Hz
B	362 Hz	5 Hz/sec	
C	362 Hz	10 Hz/sec	
D	362 Hz	25 Hz/sec	
E	362 Hz	100 Hz/sec	
A	600 Hz	1 Hz/sec	± 2Hz
B	600 Hz	5 Hz/sec	
C	600 Hz	10 Hz/sec	
D	600 Hz	25 Hz/sec	
E	600 Hz	100 Hz/sec	
A	798 Hz	1 Hz/sec	± 2Hz
B	798 Hz	5 Hz/sec	
C	798 Hz	10 Hz/sec	
D	798 Hz	25 Hz/sec	
E	798 Hz	100 Hz/sec	

TVF106: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Frequency of Voltage Distortion	Amplitude of Voltage Distortion
A	50 Hz	0.316 Vrms
B	100 Hz	0.316 Vrms
C	500 Hz	1.580 Vrms
D	1 kHz	3.160 Vrms
E	2 kHz	3.160 Vrms
F	3 kHz	3.160 Vrms
G	5 kHz	1.900 Vrms
H	10 kHz	0.950 Vrms

TVF107: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Harmonic	MIL-STD-704 Rev B - F Percent of Fund.
Fundamental	100%
2nd	0%
3rd	2.75%
4th	0%
5th	2.75%
6th	0%
7th	1.97%
8th	0%
9th	1.53%
10th	0%
11th	1.25%
12th	0%
13th	1.06%
14th	0%
15th	0.92%

TVF108: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Direct Current Component of AC Voltage
A	+ 0.10V
B	- 0.10 V

TVF109: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Time from Steady State Voltage to Voltage Transient Level (ms)	Voltage Transient Level (Vrms)	Duration at Voltage Transient Level (ms)	Voltage Transient Level to Steady State Voltage (ms)
Overvoltage Transients				
A	< ½ cycle	140 Vrms	60 msec	< ½ cycle
B	< ½ cycle	140 Vrms	60 msec	25 msec
C	< ½ cycle	160 Vrms	34 msec	< ½ cycle
D	< ½ cycle	160 Vrms	34 msec	52 msec
E	< ½ cycle	180 Vrms	10 msec	< ½ cycle
F	< ½ cycle	180 Vrms	10 msec	77 msec
G	< ½ cycle	180 Vrms	10 msec	< ½ cycle
		(3 times)	every 0.5 sec	
Undervoltage Transients				
H	< ½ cycle	90 Vrms	35 msec	< ½ cycle
I	< ½ cycle	90 Vrms	35 msec	45 msec
J	< ½ cycle	80 Vrms	10 msec	< ½ cycle
K	< ½ cycle	80 Vrms	10 msec	70 msec
L	< ½ cycle	80 Vrms	10 msec	< ½ cycle
		(3 times)	every 0.5 sec	
Combined Transient				
M	< ½ cycle	80 Vrms	10 msec	< ½ cycle
	then < ½ cycle	180 Vrms	10 msec	77 msec
Repetitive Normal Test				
	See Figures			

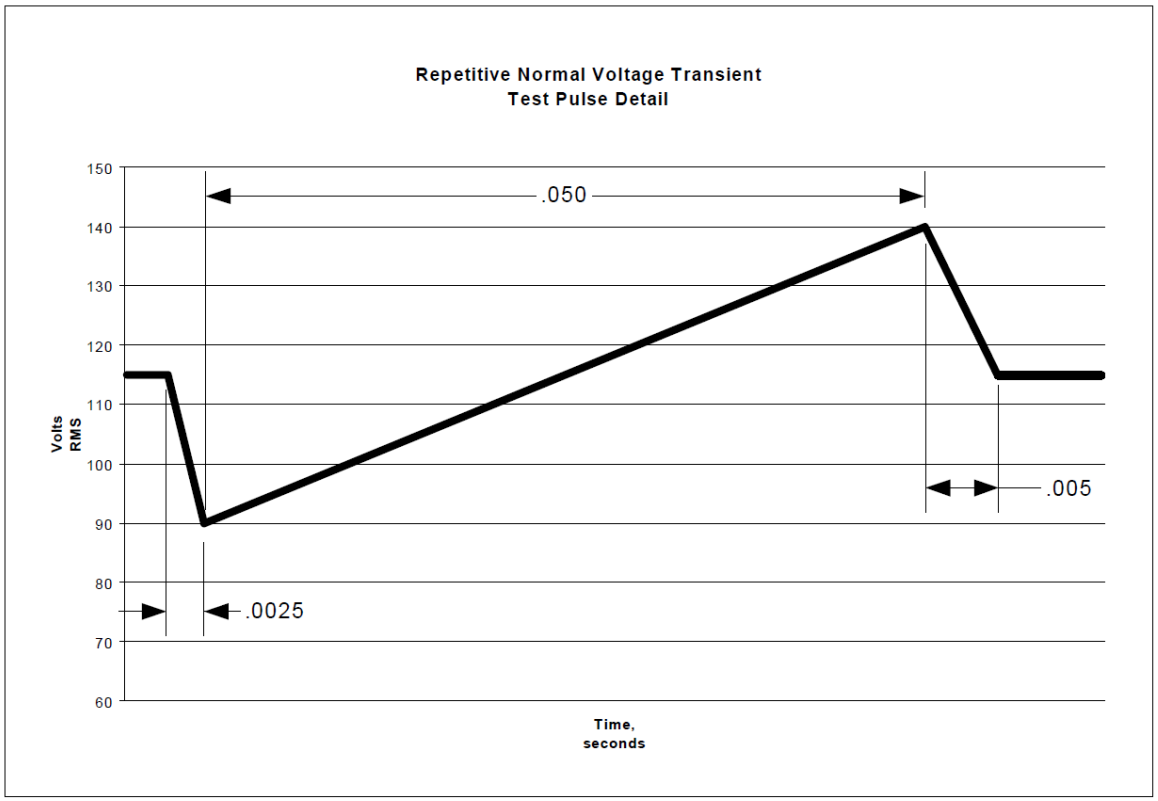


Figure 17: Voltage Transition Pulse Details

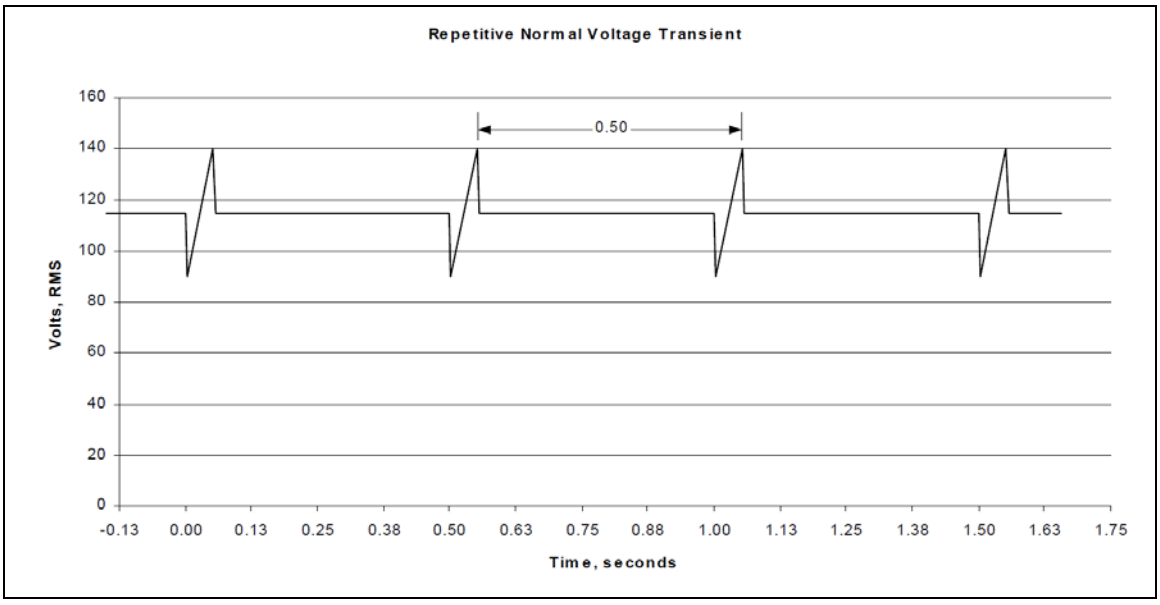


Figure 18: Repetitive Voltage transients.

TVF110

Test Condition	Start Frequency	Time from Steady State Freq. to Freq. Transient Level	Freq. Transient Level	Duration at Freq. Transient Level	Time from Freq. Transient Level to Steady State Freq.
Overfrequency Transients					
A	360 Hz	1.76 seconds	800 Hz	1/2 cycle	1.76 seconds
B	360 Hz	1.76 seconds	800 Hz	1 seconds	1.76 seconds
C	360 Hz	0.96 seconds	600 Hz	1/2 cycle	0.96 seconds
D	360 Hz	0.96 seconds	600 Hz	1 seconds	0.96 seconds
Underfrequency Transients					
E	800 Hz	1.76 seconds	360 Hz	1/2 cycle	1.76 seconds
F	800 Hz	1.76 seconds	360 Hz	1 seconds	1.76 seconds
G	800 Hz	0.80 seconds	600 Hz	1/2 cycle	0.80 seconds
H	800 Hz	0.80 seconds	600 Hz	1 seconds	0.80 seconds
Combined Transient					
I	600 Hz	0.96 seconds	360 Hz	1/2 cycle	0.96 seconds
		then 0.80 seconds	800 Hz	1/2 cycle	then 0.80 seconds

TVF201: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Steady State Voltage	T fall	Duration of Interrupt	T rise
A	115V	< ½ cycle	50 msec	< ½ cycle
B	108V	< ½ cycle	50 msec	< ½ cycle
C	118V	< ½ cycle	50 msec	< ½ cycle
D	115V	< ½ cycle	30 msec	< ½ cycle
E	108V	< ½ cycle	30 msec	< ½ cycle
F	118V	< ½ cycle	30 msec	< ½ cycle
G	115V	< ½ cycle	10 msec	< ½ cycle
H	108V	< ½ cycle	10 msec	< ½ cycle
I	118V	< ½ cycle	10 msec	< ½ cycle
J	115V	< ½ cycle	50 msec (repeated 3 times, separated by 0.5 sec)	< ½ cycle
K	115V	< ½ cycle	50 msec (followed by a normal voltage transient of 160 Vrms for 30 msec and return to steady state voltage in 40 msec)	40 msec
L	115V	< ½ cycle	50 msec (followed by a normal voltage transient of 70 Vrms for 30 msec and return to steady state voltage in 40 msec)	40 msec

Note: For XFMR test files, Test conditions A through J and L are executed on the Low Voltage range. Test condition K is executed last after switching to the high voltage range.

TVF301

Test Conditions	Voltage L-N	Frequency
A	100V	400Hz
B	100V	360Hz
C	100V	600Hz
D	100V	800Hz
E	125V	400Hz
F	125V	360Hz
G	125V	600Hz
H	125V	800Hz

Abnormal Limit	704F
Voltage	100 V
ALSS	
Voltage	125 V
AHSS	
Frequency	360Hz
ALSS	
Frequency	800Hz
AHSS	

TVF302: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	SS Voltage to Voltage Transient Level	Voltage Transient Level	Duration	Time From Voltage Level to SS Voltage or Next Voltage Level
Overvoltage Transients				
A	< ½ cycle	140 Vrms	180 msec	< ½ cycle
B	< ½ cycle	140 Vrms	180 msec	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		
C	< ½ cycle	160 Vrms	78 msec	< ½ cycle
D	< ½ cycle	160 Vrms	78 msec	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		
E	< ½ cycle	180 Vrms	50 msec	< ½ cycle
F	< ½ cycle	180 Vrms	50 msec	11 msec
	then	170 Vrms	decreasing	17 msec
	then	160 Vrms	decreasing	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		
G	< ½ cycle	180 Vrms	20 msec	< ½ cycle
		(3 times)	every 0.5 sec	
Undervoltage Transients				
H	< ½ cycle	85 Vrms	180 msec	< ½ cycle
I	< ½ cycle	85 Vrms	180 msec	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	>10 sec
		115 Vrms		
J	< ½ cycle	65 Vrms	78 msec	< ½ cycle
K	< ½ cycle	65 Vrms	78 msec	31 msec

Test Condition	SS Voltage to Voltage Transient Level	Voltage Transient Level	Duration	Time From Voltage Level to SS Voltage or Next Voltage Level
	then	75 Vrms	increasing	71 msec
	then	85 Vrms	increasing	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	>10 sec
		115 Vrms		
L	< ½ cycle	45 Vrms	50 msec	< ½ cycle
M	< ½ cycle	45 Vrms	50 msec	11 msec
	then	55 Vrms	increasing	17 msec
	then	65 Vrms	increasing	31 msec
	then	75 Vrms	increasing	71 msec
	then	85 Vrms	increasing	87 msec
	then	90 Vrms	increasing	253 msec
	then	95 Vrms	increasing	6.41 sec
	then	100 Vrms	increasing	>10 sec
		115 Vrms		
N	< ½ cycle	45 Vrms	20 msec	< ½ cycle
		(3 times)	every 0.5 sec	
Combined Transient				
O	< ½ cycle	45 Vrms then	20 msec	< ½ cycle
	< ½ cycle	180 Vrms	50 msec	11 msec
	then	170 Vrms	decreasing	17 msec
	then	160 Vrms	decreasing	31 msec
	then	150 Vrms	decreasing	71 msec
	then	140 Vrms	decreasing	87 msec
	then	135 Vrms	decreasing	253 msec
	then	130 Vrms	decreasing	6.41 sec
	then	125 Vrms	decreasing	>10 sec
		115 Vrms		

TVF303

Test Condition	Start Frequency	Transient Time	Level	Duration	Transient
Over Frequency Transients					
A	360 Hz	0.88 secs	800 Hz	½ cycle	0.88 secs
B	360 Hz	0.88 secs	800 Hz	1second	0.88 secs
C	360 Hz	0.48 secs	600 Hz	½ cycle	0.48 secs
D	360 Hz	0.48 secs	600 Hz	1second	0.48 secs
Under Frequency Transients					
E	800 Hz	0.88 secs	360 Hz	½ cycle	0.88 secs
F	800 Hz	0.88 secs	360 Hz	1second	0.88 secs
G	600 Hz	0.48 secs	600 Hz	½ cycle	0.40 secs
H	600 Hz	0.48 secs	600 Hz	1second	0.40 secs
Combined Transient					
I	600 Hz	0.48 secs	360 Hz	½ cycle	0.48 secs
		then 0.40 secs	800 Hz	½ cycle	0.40 secs

TVF401

Test Condition	Voltage	Frequency	Time at Test Condition
Nominal Voltages			
A	115 V	360 Hz	30 min
B	115 V	400 Hz	30 min
C	115 V	600 Hz	30 min
D	115 V	800 Hz	30 min
Normal Low Steady State Voltages			
E	108 V	360 Hz	30 min
F	108 V	400 Hz	30 min
G	108 V	440 Hz	5 min
H	108 V	480 Hz	5 min
I	108 V	520 Hz	5 min
J	108 V	560 Hz	5 min
K	108 V	600 Hz	30 min
L	108 V	520 Hz	5 min
M	108 V	540 Hz	5 min
N	108 V	560 Hz	5 min
O	108 V	570 Hz	5 min
P	108 V	580 Hz	5 min
Q	108 V	600 Hz	30 min
R	108 V	640 Hz	5 min
S	108 V	680 Hz	5 min
T	108 V	720 Hz	5 min
U	108 V	760 Hz	5 min
V	108 V	800 Hz	30 min
Normal High Steady State Voltages			
W	118 V	360 Hz	30 min
X	118 V	400 Hz	30 min
Y	118 V	440 Hz	5 min
Z	118 V	480 Hz	5 min
AA	118 V	520 Hz	5 min
BB	118 V	560 Hz	5 min
CC	118 V	600 Hz	30 min
DD	118 V	520 Hz	5 min
EE	118 V	540 Hz	5 min
FF	118 V	560 Hz	5 min
GG	118 V	570 Hz	5 min
HH	118 V	580 Hz	5 min
II	118 V	600 Hz	30 min
JJ	118 V	640 Hz	5 min
KK	118 V	680 Hz	5 min
LL	118 V	720 Hz	5 min
MM	118 V	760 Hz	5 min
NN	118 V	800 Hz	30 min
Unbalanced Voltages			
OO	Van 108 V	360 Hz	30 min
	Vbn 115 V		
	Vcn 115 V		
PP	Van 118 V	360 Hz	30 min
	Vbn 115 V		
	Vcn 115 V		
QQ	Van 108 V	800 Hz	30 min

Test Condition	Voltage		Frequency	Time at Test Condition
	Vbn	115 V		
	Vcn	115 V		
RR	Van	118 V	800 Hz	30 min
	Vbn	115 V		
	Vcn	115 V		

TVF601: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Duration of Power Failure
A	100 msec
B	500 msec
C	3 secs
D	7 secs

TVF602: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Phases	Duration	Repeat
One Phase Power Failure			
A	Phase A	7 seconds	5
B	Phase B	7 seconds	5
C	Phase C	7 seconds	5
D	Phase A	Indefinitely	1
E	Phase B	Indefinitely	1
F	Phase C	Indefinitely	1
Two Phase Power Failures			
G	Phase A & B	7 seconds	5
H	Phase B & C	7 seconds	5
I	Phase A & B	Indefinitely	1
J	Phase B & C	Indefinitely	1

TVF603: *All Test Conditions Executed at 400Hz, 360Hz, 600Hz and 800Hz*.

Test Condition	Phases	Duration
Physical Means Prevention	Verify/Check	
If Not:		
Reversed Phase Rotation	C-B-A	30 mins
Correct Phase Rotation	A-B-C	30 mins

9.4.5 SXF Test Details by Test Number (Single Phase, 115V, 60 Hz)

SXF101

Test Plan	Description
Stimulus:	Apply 115VL-N, 60Hz
	Close CB or contactor to EUT and measure Inrush current
	Allow EUT to warm up before taking additional measurements
	Allow power to run for 15 mins.
Measure	Inrush Current, all phases
	Steady state voltage, current, power
	Verify no half wave rectification is used
	Current Harmonics / All phases using HAS option
Repeat	For each EUT operating mode

SXF102

Test Condition	Voltage L-N	Frequency
Balanced Voltages		
A	115V	60.0Hz
B	115V	59.5Hz
C	115V	60.5Hz
D	108V	60.0Hz
E	108V	59.5Hz
F	108V	60.5Hz
G	118V	60.0Hz
H	118V	59.5Hz
I	118V	60.5Hz

SXF104

Test Conditions	Average Vrms	Modulation Frequency	Amplitude
A	115V	1.0Hz	0.375Vrms
	109V		
	117V		
B	115V	1.5Hz	2.5Vrms
	109V		
	117V		
C	115V	4Hz	2.5Vrms
	109V		
	117V		
D	115V	10Hz	0.375Vrms
	109V		
	117V		
E	115V	15Hz	0.375Vrms
	109V		
	117V		
F	115V	30Hz	0.375Vrms
	109V		
	117V		

SXF105

Test Condition	Average Frequency	Rate of Freq. Change	Amplitude
A-1	60.00 Hz	0.1 Hz/sec	± 0.25Hz
A-2	59.75 Hz		
A-3	60.75 Hz		
B-1	60.00 Hz	0.5 Hz/sec	
B-2	59.75 Hz		
B-3	60.75 Hz		
C-1	60.00 Hz	4 Hz/sec	
C-2	59.75 Hz		
C-3	60.75 Hz		
D-1	60.00 Hz	25 Hz/sec	
D-2	59.75 Hz		
D-3	60.75 Hz		
E-1	60.00 Hz	15 Hz/sec	
E-2	59.75 Hz		
E-3	60.75 Hz		

SXF106

Test Condition	Frequency of Voltage Distortion	Amplitude of Voltage Distortion
A	50 Hz	1.000 Vrms
B	150 Hz	3.162 Vrms
C	450 Hz	3.162 Vrms
D	1 kHz	1.333 Vrms
E	3 kHz	0.473 Vrms
F	5 kHz	0.282 Vrms
G	10 kHz	0.150 Vrms

SXF107

Harmonic	MIL-STD-704 Rev B - F Percent of Fund.
Fundamental	100%
2nd	0%
3rd	2.75%
4th	0%
5th	2.75%
6th	0%
7th	1.97%
8th	0%
9th	1.53%
10th	0%
11th	1.25%
12th	0%
13th	1.06%
14th	0%
15th	0.92%

SXF108

Test Condition	Direct Current Component of AC Voltage
A	+ 0.10V
B	- 0.10 V

SXF109

Test Condition	Time from Steady State Voltage to Voltage Transient Level (ms)	Voltage Transient Level (Vrms)	Duration at Voltage Transient Level (ms)	Voltage Transient Level to Steady State Voltage (ms)
Overvoltage Transients				
A	N/A	152 Vrms	0.5 cycle	N/A
B	< ½ cycle	130 Vrms	1 cycle	< ½ cycle
C	< ½ cycle	130 Vrms	1 cycle	250 msec
D	< ½ cycle	130 Vrms	1 cycle	< ½ cycle
		(3 times)	every 0.5 sec	
Undervoltage Transients				
E	N/A	31 Vrms	0.5 cycle	N/A
F	< ½ cycle	70 Vrms	1 cycle	< ½ cycle
G	< ½ cycle	70 Vrms	1 cycle	107 msec
H	< ½ cycle	70 Vrms	1 cycle	< ½ cycle
		(3 times)	every 0.5 sec	
Combined Transient				
I	< ½ cycle	70 Vrms	1 cycle	< ½ cycle
	then < ½ cycle	130 Vrms	1 cycle	250 msec
Repetitive Normal Test				
	See Figures			

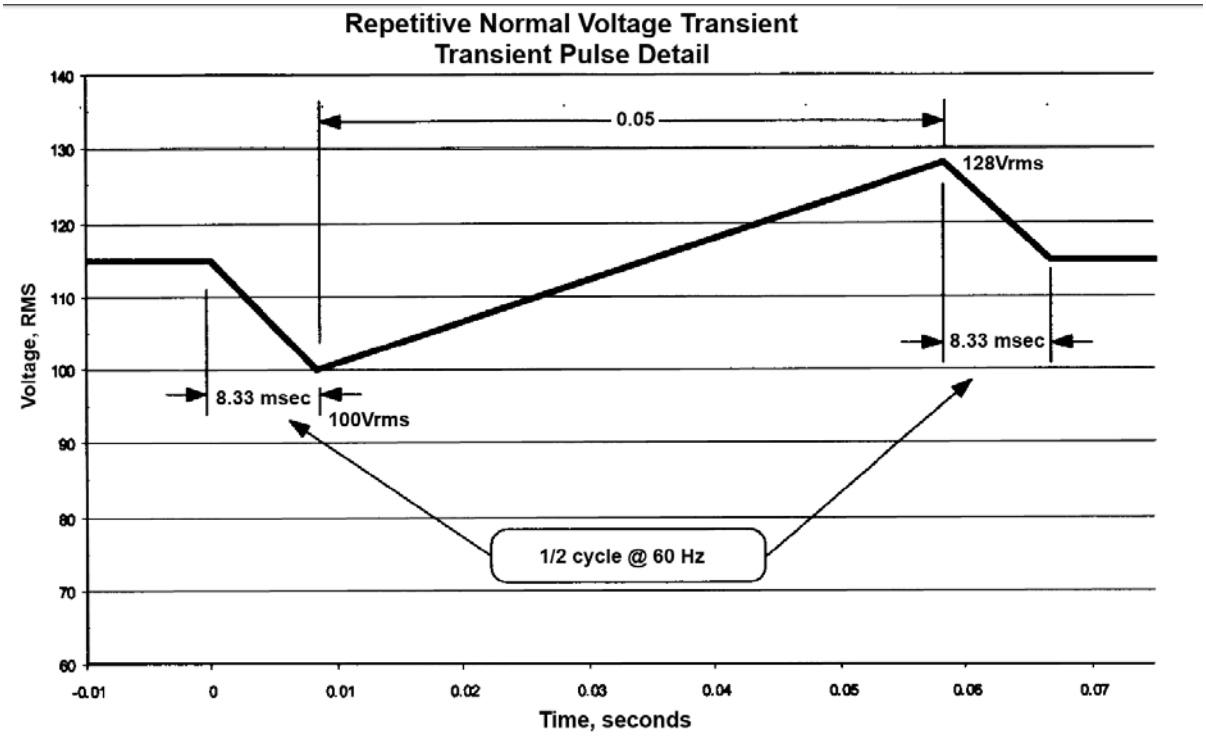


Figure 19: Voltage Transition Pulse Details - SXF

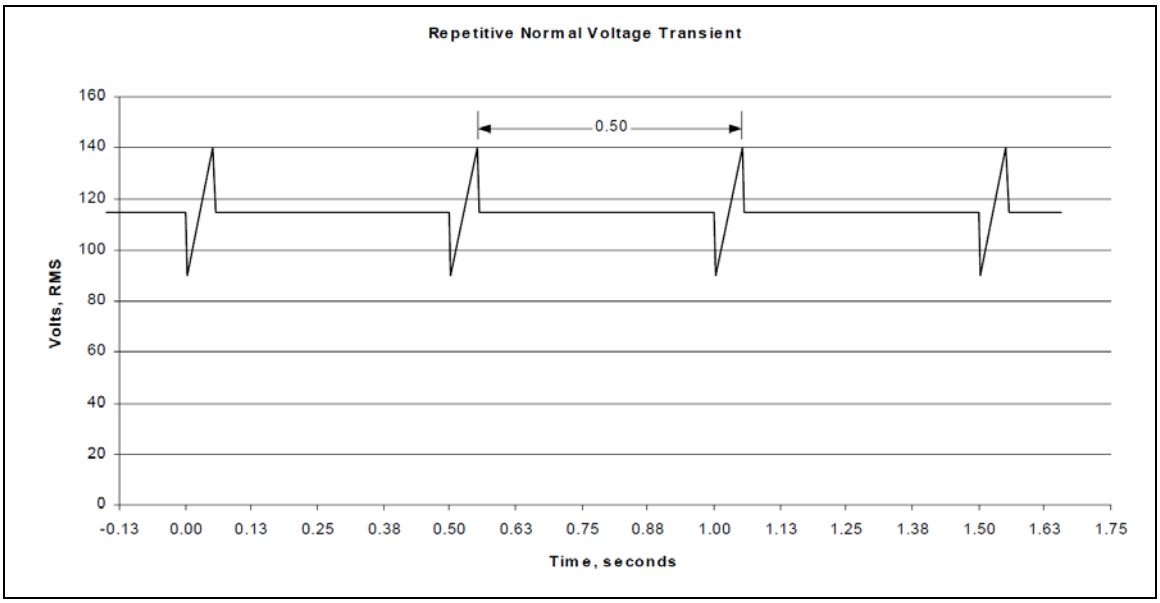


Figure 20: Repetitive Voltage transients.

SXF110

Test Condition	Time from Steady State Freq. to Freq. Transient Level	Freq. Transient Level	Duration at Freq. Transient Level	Time from Freq. Transient Level to Steady State Freq.
Overfrequency Transients				
A	10 msec	61 Hz	0.5 cycle	10 msec
B	10 msec	61 Hz	5 seconds	10 msec
Underfrequency Transients				
C	10 msec	59 Hz	0.5 cycle	10 msec
D	10 msec	59 Hz	5 seconds	10 msec
Combined Transient				
E	10 msec	59 Hz	0.5 cycle	10 msec
	then 10 msec	61 Hz	0.5 cycle	10 msec

SXF 201

Test Condition	Steady State Voltage	T fall	Duration of Interrupt	T rise
A	115V	< ½ cycle	50 msec	< ½ cycle
B	105V	< ½ cycle	50 msec	< ½ cycle
C	125V	< ½ cycle	50 msec	< ½ cycle
D	115V	< ½ cycle	30 msec	< ½ cycle
E	105V	< ½ cycle	30 msec	< ½ cycle
F	125V	< ½ cycle	30 msec	< ½ cycle
G	115V	< ½ cycle	10 msec	< ½ cycle
H	105V	< ½ cycle	10 msec	< ½ cycle
I	125V	< ½ cycle	10 msec	< ½ cycle
J	115V	< ½ cycle	50 msec (repeated 3 times, separated by 0.5 sec)	< ½ cycle
K	115V	< ½ cycle	50 msec (followed by a normal voltage transient of 130 Vrms for 30 msec and return to steady state voltage in 250 msec)	250 msec
L	115V	< ½ cycle	50 msec (followed by a normal voltage transient of 70 Vrms for 1 cycle and return to steady state voltage in 107 msec)	107 msec

SXF301

Test Condition	Voltage	Frequency
A	115	59.5
B	115	60.5
C	100	60.0
D	100	59.5
E	100	60.5
F	125	60.0
G	125	59.5
H	125	60.5

Abnormal Limit	704F
Voltage	100 V
ALSS	
Voltage	125 V
AHSS	
Frequency	59.5 Hz
ALSS	
Frequency	60.5 Hz
AHSS	

SXF302

Test Condition	Time From Steady State Voltage to Voltage Transient Level milliseconds	Voltage Transient Level Vrms	Duration at Voltage Transient Level milliseconds	Time From Voltage Transient Level to Steady State Voltage or Next Voltage Level
Overvoltage Transients				
A	< ½ cycle	180 Vrms	½ cycle	< ½ cycle
B	< ½ cycle	180 Vrms	½ cycle	1 cycle
	then	147 Vrms	Decreasing	1 cycle
	then	140 Vrms	Decreasing	2.0 sec
		115 Vrms		
C	< ½ cycle	160 Vrms	1 cycle	< ½ cycle
D	< ½ cycle	160 Vrms	1 cycle	1 cycle
	then	140 Vrms	Decreasing	2.0 sec
		115 Vrms		
E	< ½ cycle	180 Vrms	½ cycle	< ½ cycle
		(3 times)	every 0.5 sec	
Undervoltage Transients				
F	< ½ cycle	50 Vrms	½ cycle	< ½ cycle
G	< ½ cycle	50 Vrms	½ cycle	1 cycle
	then	83 Vrms	Increasing	1 cycle
	then	90 Vrms	Increasing	2.0 sec
		115 Vrms		
H	< ½ cycle	70 Vrms	1 cycle	< ½ cycle
I	< ½ cycle	70 Vrms	1 cycle	1 cycle
	then	90 Vrms	Increasing	2.0 sec
		115 Vrms		
J	< ½ cycle	50 Vrms	½ cycle	< ½ cycle
		(3 times)	every 0.5 sec	
Combined Transient				
K	< ½ cycle	50 Vrms	½ cycle	< ½ cycle
	< ½ cycle	180 Vrms	½ cycle	1 cycle
	then	147 Vrms	Decreasing	1 cycle
	then	140 Vrms	Decreasing	2.0 sec
		115 Vrms		

SXF303

Test Condition	Transition Time	Transient Level	Duration	Transition2
Overfrequency Transients				
A	½ cycle	61 Hz	½ cycle	½ cycle
B	½ cycle	61 Hz	6.968 secs	½ cycle
Underfrequency Transients				
C	½ cycle	50 Hz	½ cycle	½ cycle
D	½ cycle	50 Hz	6.968 secs	½ cycle
Combined Transient				
E	½ cycle	50 Hz then	½ cycle	½ cycle
	½ cycle	61 Hz	½ cycle	½ cycle

SXF401

Test Condition	Voltage	Frequency
A	115	59.5
B	115	60.5
C	105	60.0
D	105	59.5
E	105	60.5
F	125	60.0
G	125	59.5
H	125	60.5

Abnormal Limit	704F
Voltage	105V
ELSS	
Voltage	125V
EHSS	
Frequency	59.5Hz
ELSS	
Frequency	60.5Hz
EHSS	

SXF601

Test Condition	Duration of Power Failure
A	100 msec
B	500 msec
C	2 secs

SXF603

Test Condition	Phases	Duration
Physical Means Prevention	Verify/Check	
If Not:		
Reversed Phase Rotation	N-A	30 mins
Correct Phase Rotation	A-N	30 mins

9.4.6 LDC 28VDC

LDC101

Test Plan	Description	DCR AC Setting	Scaling
Stimulus:	Apply 28Vdc	14.8Vac	1.99
	Close CB or contactor to EUT and measure Inrush current		
	Allow EUT to warm up before taking additional measurements		
	Allow power to run for 15 mins.		
Measure	Inrush Current, all phases		
	Steady state voltage, current, power		
	Verify no half wave rectification is used		
	Current Harmonics / All phases using HAS option		
Repeat	For each EUT operating mode		

LDC102

Test Condition	Voltage DC	DCR AC Setting	Scaling
A	28 Vdc	14.8Vac	1.99
B	22 Vdc	11.8Vac	1.99
C	29 Vdc	15.3Vac	1.99

LDC103 DCR AC Setting = 14.8Vac, Scaling = 1.99

Test Condition	Frequency of Voltage Distortion	Amplitude of Voltage Distortion Rev B, C, D	Amplitude of Voltage Distortion Rev E, F
A	10 Hz	0.100 Vrms	0.100 Vrms
B	25 Hz	0.158 Vrms	0.158 Vrms
C	50 Hz	0.200 Vrms	0.223 Vrms
D	60 Hz	0.224 Vrms	0.245 Vrms
E	250 Hz	0.398 Vrms	0.500 Vrms
F	1 kHz	0.707 Vrms	1.000 Vrms
G	1.7 kHz	0.891 Vrms	1.000 Vrms
H	2 kHz	1.000 Vrms	1.000 Vrms
I	5 kHz	0.316 Vrms	1.000 Vrms
J	6.5 kHz	0.707 Vrms	0.707 Vrms
K	10 kHz	0.125 Vrms	0.500 Vrms

LDC104 - NOT SUPPORTED BY DCR

Test Condition	Ripple Frequency Components	MIL-STD-704B, C, D, E, & F Vrms
A	1200 Hz	0.80 Vrms
	2400 Hz	0.16 Vrms
	3600 Hz	0.26 Vrms
	4800 Hz	0.08 Vrms
	6000 Hz	0.13 Vrms
	7200 Hz	0.04 Vrms
	8400 Hz	0.06 Vrms
B	2400 Hz	0.80 Vrms
	4800 Hz	0.16 Vrms
	7200 Hz	0.26 Vrms
	9600 Hz	0.08 Vrms
	12000 Hz	0.13 Vrms
	14400 Hz	0.04 Vrms
	16800 Hz	0.06 Vrms

LDC105

Test Cond.	SS Voltage Vdc	Rel. (%)	Time From SS Voltage to Voltage Transient Level milliseconds	Voltage Transient Level Vdc	Relative to Steady State	Duration at Voltage Transient Level milliseconds	Time From Voltage Transient Level to SS Voltage milliseconds	DCR Steady State Setting Vac	Scaling
Overvoltage Transients									
AA	29	100.000%	< 1 msec	50	172.414%	12.5 msec	< 1 msec	15.3	1.99
BB	29	100.000%	< 1 msec	50	172.414%	12.5 msec	70 msec	15.3	1.99
CC	29	100.000%	< 1 msec	40	137.931%	45 msec	< 1 msec	15.3	1.99
DD	29	100.000%	< 1 msec	40	137.931%	45 msec	37.5 msec	15.3	1.99
EE	29	100.000%	< 1 msec	50 (3 times)	172.414%	10 msec Every 0.5 msec	< 1 msec	15.3	1.99
FF	22	100.000%	< 1 msec	50	227.273%	12.5 msec	< 1 msec	11.8	1.99
GG	22	100.000%	< 1 msec	50	227.273%	12.5 msec	95 msec	11.8	1.99
HH	22	100.000%	< 1 msec	40	181.818%	45 msec	< 1 msec	11.8	1.99
II	22	100.000%	< 1 msec	40	181.818%	45 msec	62.5 msec	11.8	1.99
JJ	22	100.000%	< 1 msec	50 (3 times)	227.273%	10 msec Every 0.5 msec	< 1 msec	11.8	1.99
Undervoltage Transients									
KK	29	100.000%	< 1 msec	18	62.069%	15 msec	< 1 msec	15.3	1.99
LL	29	100.000%	< 1 msec	18	62.069%	15 msec	234 msec	15.3	1.99
MM	29	100.000%	< 1 msec	18 (3 times)	62.069%	10 msec	< 1 msec	15.3	1.99
NN	22	100.000%	< 1 msec	18	81.818%	15 msec	< 1 msec	11.8	1.99
OO	22	100.000%	< 1 msec	18	81.818%	15 msec	85 msec	11.8	1.99
PP	22	100.000%	< 1 msec	18 (3 times)	81.818%	10 msec Every 0.5 msec	< 1 msec	11.8	1.99
Combined Transient									
QQ	29	100.000%	< 1 msec	18	62.069%	10 msec	< 1 msec	15.3	1.99
	then	100.000%	< 1 msec	50	172.414%	12.5 msec	70 msec	15.3	1.99
RR	22	100.000%	< 1 msec	18	81.818%	10 msec	< 1 msec	11.8	1.99
	then		< 1 msec	50	227.273%	12.5 msec	62.5 msec	11.8	1.99

Repetitive levels

Vdc	28.0	29.0	22.0
Vac L-N	14.8	15.3	11.8
%		103.571%	78.571%

Scale Factor = 1.99

LDC201

Abnormal Limit	704F	DCR Setting Vac	Scaling
Voltage			
NLSS	22 Vdc	11.8	1.99
Voltage			
NHSS	29 Vdc	15.3	1.99
Power Int.	50 msec		

Test Condition	Voltage (DC)	Vac Set for DCR	Duration of Interrupt
A	28	14.8	50 msec
B	22	11.8	50 msec
C	29	15.3	50 msec
D	28	14.8	30 msec
E	22	11.8	30 msec
F	29	15.3	30 msec
G	28	14.8	10 msec
H	22	11.8	10 msec
I	29	15.3	10 msec
J	28	14.8	50 msec (repeated 3 times, separated by 0.5 sec)
K	28	14.8	50 msec (followed by a normal voltage transient of 50 Vdc for 12.5 msec and return to steady state voltage in 70 msec)
L	28	14.8	50 msec (followed by a normal voltage transient of 200 Vdc for 15 msec and return to steady state voltage in 85 msec)

LDC301

Test Condition	Voltage (DC)	Duration
A	20	30 mins min.
B	31.5	30 mins min.

Abnormal Limit	704F	DCR Setting Vac	Scaling
ALSS	20 Vdc	10.8	1.99
AHSS	31.5 Vdc	16.5	1.99

LDC302

Test Condition	Steady State Voltage Vdc	Time From SS V to V Transient Level msec	Voltage Transient Level Vdc	Relative to Steady State	Duration at Voltage Transient Level	Time From V Transient Level to SS Voltage or Next V Level	DCR AC Setting	Scaling
Overvoltage Transients								
AAA	29	< 1 msec	50	172.414%	50 msec	< 1 msec	15.3	1.99
BBB	29	< 1 msec	50	172.414%	50 msec	15 msec	15.3	1.99
		then	45	155.172%	decreasing	30 msec	15.3	1.99
		then	40	137.931%	decreasing	60 msec	15.3	1.99
		then	35	120.690%	decreasing	4.85 sec	15.3	1.99
		then	30	103.448%	decreasing	1 sec	15.3	1.99
		then	29	100.000%			15.3	1.99
CCC	29	< 1 msec	50 (3 times)	172.414%	50 msec Every 0.5 sec	< 1 msec	15.3	1.99
DDD	22	< 1 msec	50	227.273%	50 msec	< 1 msec	11.8	1.99
EEE	22	< 1 msec	50	227.273%	50 msec	15 msec	11.8	1.99
		then	45	204.545%	decreasing	30 msec	11.8	1.99
		then	40	181.818%	decreasing	60 msec	11.8	1.99
		then	35	159.091%	decreasing	4.85 sec	11.8	1.99
		then	30	136.364%	decreasing	8 sec	11.8	1.99
		then	22	100.000%			11.8	1.99
FFF	22	< 1 msec	50 (3 times)	227.273%	50 msec Every 0.5 sec	< 1 msec	11.8	1.99
Undervoltage Transients								
GGG	29	< 1 msec	7	24.138%	50 msec	< 1 msec	15.3	1.99
HHH	29	< 1 msec	7	24.138%	50 msec	15 msec	15.3	1.99
		then	12	41.379%	increasing	30 msec	15.3	1.99
		then	17	58.621%	increasing	60 msec	15.3	1.99
		then	22	75.862%	increasing	4.85 sec	15.3	1.99
		then	28	96.552%	increasing	1 sec	15.3	1.99
		then	29	100.000%			15.3	1.99
III	29	< 1 msec	7 (3 times)	24.138%	50 msec Every 0.5 sec	< 1 msec	15.3	1.99
JJJ	22	< 1 msec	7	31.818%	50 msec	< 1 msec	11.8	1.99
KKK	22	< 1 msec	7	31.818%	50 msec	15 msec	11.8	1.99
		then	12	54.545%	increasing	30 msec	11.8	1.99
		then	17	77.273%	increasing	60 msec	11.8	1.99
		then	22	100.000%			11.8	1.99
LLL	22	< 1 msec	7 (3 times)	31.818%	50 msec Every 0.5	< 1 msec	11.8	1.99

Test Condition	Steady State Voltage Vdc	Time From SS V to V Transient Level msec	Voltage Transient Level Vdc	Relative to Steady State	Duration at Voltage Transient Level	Time From V Transient Level to SS Voltage or Next V Level	DCR AC Setting	Scaling
					sec			
Combined Transient								
MMM	29	< 1 msec	7	24.138%	10 msec	< 1 msec	15.3	1.99
		< 1 msec	50	172.414%	50 msec	15 msec	15.3	1.99
		then	45	155.172%	decreasing	30 msec	15.3	1.99
		then	40	137.931%	decreasing	60 msec	15.3	1.99
		then	35	120.690%	decreasing	4.85 sec	15.3	1.99
		then	30	103.448%	decreasing	1 sec	15.3	1.99
		then	29	100.000%			15.3	1.99
NNN	22	< 1 msec	7	31.818%	10 msec	< 1 msec	11.8	1.99
		< 1 msec	50	227.273%	50 msec	15 msec	11.8	1.99
		then	45	204.545%	decreasing	30 msec	11.8	1.99
		then	40	181.818%	decreasing	60 msec	11.8	1.99
		then	35	159.091%	decreasing	4.85 sec	11.8	1.99
		then	30	136.364%	decreasing	8 sec	11.8	1.99
		then	22	100.000%			11.8	1.99

LDC401

Test Condition	Voltage (DC)	Duration
A	18	30 mins
B	29	30 mins

Abnormal Limit	704F	DCR Setting	Scaling
ELSS	18	9.7	1.99
EHSS	29	15.3	1.99

LDC501

Test Condition	SS Voltage Vdc	DCR Setting	Scaling	Time From Steady State Voltage to Voltage Transient Level milliseconds	Voltage Transient Level Vdc	% Vdc	Time From Voltage Transient Level to Steady State Voltage
AA	29	15.3	1.99	< 1 msec	12.0	41.379%	30 sec

LDC601

Test Condition	Duration of Power Failure
A	100 msec
B	500 msec
C	3 secs
D	7 secs

LDC602

Test Condition	Phases	Duration
Physical Means Prevention	Verify/Check	
If Not:		
Reversed Phase Rotation	N-A	30 mins
Correct Phase Rotation	A-N	30 mins

9.4.7 HDC 270VDC

HDC101

Test Plan	Description	DCR AC Setting	Scaling
Stimulus:	Apply 270Vdc	133.9Vac	2.027
	Close CB or contactor to EUT and measure Inrush current		
	Allow EUT to warm up before taking additional measurements		
	Allow power to run for 15 mins.		
Measure	Inrush Current, all phases		
	Steady state voltage, current, power		
	Verify no half wave rectification is used		
	Current Harmonics / All phases using HAS option		
Repeat	For each EUT operating mode		

HDC102

Test Condition	Voltage DC	DCR AC Setting	Scaling
A	270 Vdc	133.9Vac	2.027
B	250 Vdc	240.0Vac	2.027
C	280 Vdc	138.8Vac	2.027

HDC103 DCR AC Setting = 133.9Vac, Scaling = 2.027

Test Condition	Frequency of Voltage Distortion	Amplitude of Voltage Distortion Rev B, C, D	Amplitude of Voltage Distortion Rev E, F
A	10 Hz	0.6 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	0.775Vrms
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	0.755Vrms	1.581 Vrms

HDC104 - NOT SUPPORTED BY DCR

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

HDC105

Test Condition	SS Voltage Vdc	Rel. (%)	Time From SS V to V Transient Level msec	V Transient Level Vdc	Relative to SS V	Duration at V Transient Level msec	Time From V Transient Level to SS Voltage msec	DCR Setting Vac	Scaling
Overvoltage Transients									
AA	280	100.000%	< 1 msec	330	117.857%	20 msec	< 1 msec	138.8	2.027
BB	280	100.000%	< 1 msec	330	117.857%	20 msec	20 msec	138.8	2.027
CC	280	100.000%	< 1 msec	305	108.929%	30 msec	< 1 msec	138.8	2.027
DD	280	100.000%	< 1 msec	305	108.929%	30 msec	37.5 msec	138.8	2.027
EE	280	100.000%	< 1 msec	330 (3 times)	117.857%	10 msec Every 0.5 msec	< 1 msec	138.8	2.027
FF	250	100.000%	< 1 msec	330	132.000%	20 msec	< 1 msec	124.0	2.027
GG	250	100.000%	< 1 msec	330	132.000%	20 msec	33 msec	124.0	2.027
HH	250	100.000%	< 1 msec	305	122.000%	30 msec	< 1 msec	124.0	2.027
II	250	100.000%	< 1 msec	305	122.000%	30 msec	21 msec	124.0	2.027
JJ	250	100.000%	< 1 msec	330 (3 times)	132.000%	10 msec Every 0.5 msec	< 1 msec	124.0	2.027
Undervoltage Transients									
KK	280	100.000%	< 1 msec	200	71.429%	10 msec	< 1 msec	138.8	2.027
LL	280	100.000%	< 1 msec	200	71.429%	10 msec	49 msec	138.8	2.027
MM	280	100.000%	< 1 msec	200 (3 times)	71.429%	10 msec Every 0.5 sec	< 1 msec	138.8	2.027
NN	250	100.000%	< 1 msec	200	80.000%	10 msec	< 1 msec	124.0	2.027
OO	250	100.000%	< 1 msec	200	80.000%	10 msec	30 msec	124.0	2.027
PP	250	100.000%	< 1 msec	200 (3 times)	80.000%	10 msec Every 0.5 sec	< 1 msec	124.0	2.027
Combined Transient									
QQ	280	100.000%	< 1 msec	200	71.429%	10 msec	< 1 msec	138.8	2.027
	then	100.000%	< 1 msec	330	117.857%	20 msec	20 msec	138.8	2.027
RR	250	100.000%	< 1 msec	200	80.000%	10 msec	< 1 msec	124.0	2.027
	then		< 1 msec	330	132.000%	20 msec	33 msec	124.0	2.027

Repetitive levels

Vdc	270.0	280.0	250.0
Vac L-N	133.9	138.8	124.0
%		103.704%	92.593%

HDC201

Abnormal Limit	704F	DCR Setting Vac	Scaling
Voltage			
NLSS	250 Vdc	124.0	2.027
Voltage			
NHSS	280 Vdc	138.8	2.027
Power Int.	50 msec		

Test Condition	Voltage (DC)	Vac Set for DCR	Duration of Interrupt
A	270	133.9	50 msec
B	250	124.0	50 msec
C	280	138.8	50 msec
D	270	133.9	30 msec
E	250	124.0	30 msec
F	280	138.8	30 msec
G	270	133.9	10 msec
H	250	124.0	10 msec
I	280	138.8	10 msec
J	270	133.9	50 msec (repeated 3 times, separated by 0.5 sec)
K	270	133.9	50 msec (followed by a normal voltage transient of 330 Vdc for 20 msec and return to steady state voltage in 20 msec)
L	270	133.9	50 msec (followed by a normal voltage transient of 200 Vdc for 15 msec and return to steady state voltage in 85 msec)

HDC301

Test Condition	Voltage (DC)	Duration
A	240	30 mins min.
B	290	30 mins min.

Abnormal Limit	704F	DCR Setting Vac	Scaling
NLSS	240 Vdc	119.1	2.027
NHSS	290 Vdc	143.8	2.027

HDC302

Test Condition	SS Voltage DC	SS V to V Transient Level	V Transient Level (Vdc)	% of Vnom	Duration	Time From V Level to SS V or Next V Level
Overvoltage Transients						
AA	280	< 1 msec	350	125.000%	50 msec	< 1 msec
BB	280	< 1 msec	350	125.000%	50 msec	10 msec
		then	340	121.429%	decreasing	15 msec
		then	330	117.857%	decreasing	25 msec
		then	320	114.286%	decreasing	190 msec
		then	300	107.143%	decreasing	1.71 sec
			280	100.000%		
CC	280	< 1 msec	350 (3 times)	125.000%	50 msec Every 0.5 sec	< 1 msec
DD	250	< 1 msec	350	140.000%	50 msec	< 1 msec
EE	250	< 1 msec	350	140.000%	50 msec	10 msec
		then	340	136.000%	decreasing	15 msec
		then	330	132.000%	decreasing	25 msec
		then	320	128.000%	decreasing	190 msec
		then	300	120.000%	decreasing	6.7 sec
			250	100.000%		
FF	250	< 1 msec	350 (3 times)	140.000%	50 msec Every 0.5 sec	< 1 msec
Undervoltage Transients						
GG	280	< 1 msec	180	64.286%	50 msec	< 1 msec
HH	280	< 1 msec	180	64.286%	50 msec	10 msec
		then	190	67.857%	decreasing	15 msec
		then	200	71.429%	decreasing	25 msec
		then	210	75.000%	decreasing	190 msec
		then	230	82.143%	decreasing	6.7 sec
			280	100.000%		

Test Condition	SS Voltage DC	SS V to V Transient Level	V Transient Level (Vdc)	% of Vnom	Duration	Time From V Level to SS V or Next V Level
II	280	< 1 msec	180 (3 times)	64.286%	50 msec Every 0.5 sec	< 1 msec
JJ	250	< 1 msec	180	72.000%	50 msec	< 1 msec
KK	250	< 1 msec	180	72.000%	50 msec	10 msec
		then	190	76.000%	decreasing	15 msec
		then	200	80.000%	decreasing	25 msec
		then	210	84.000%	decreasing	190 msec
		then	230	92.000%	decreasing	1.71 sec
			250	100.000%		
LL	250	< 1 msec	180 (3 times)	72.000%	50 msec Every 0.5 sec	< 1 msec
Combined Transient						
MM	280	< 1 msec < 1msec	180 350	64.286% 125.000%	10 msec 50 msec	< 1 msec 10 msec
		then	340	121.429%	decreasing	15 msec
		then	330	117.857%	decreasing	25 msec
		then	320	114.286%	decreasing	190 msec
		then	300	107.143%	decreasing	1.71 sec
			280	100.000%		
NN	250	< 1 msec < 1msec	180 350	72.000% 140.000%	10 msec 50 msec	< 1 msec 10 msec
		then	340	136.000%	decreasing	15 msec
		then	330	132.000%	decreasing	25 msec
		then	320	128.000%	decreasing	190 msec
		then	300	120.000%	decreasing	6.7 sec
			250	100.000%		

HDC401

Test Condition	Voltage (DC)	Duration
A	250	30 mins min.
B	280	30 mins min.

Abnormal Limit	704F	DCR Setting	Scaling
ELSS	250 Vdc	124.0	2.027
EHSS	280 Vdc	138.8	2.027

HDC501

Test Condition	Steady State Voltage Vdc	DCR Setting	Scaling	Time From Steady State Voltage to Voltage Transient Level milliseconds	Voltage Transient Level Vdc	% Vdc	Time From Voltage Transient Level to Steady State Voltage
AA	280 Vdc	138.8	2.027	< 1 msec	115 Vdc	41.071%	30 sec

HDC601

Test Condition	Duration of Power Failure
A	100 msec
B	500 msec
C	3 secs
D	7 secs

HDC602

Test Condition	Phases	Duration
Physical Means Prevention	Verify/Check	
If Not:		
Reversed Phase Rotation	N-A	30 mins
Correct Phase Rotation	A-N	30 mins

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