DO-160G OPTION

RTCA/DO-160 Section 16 Test Sequences

OPERATION MANUAL

Pacific Power Source, Inc.

Part Number: 149152

VERSION: 1.1

November 18, 2013

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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. DO-160G test sequence option is one of many options associated with Test Manager that Pacific Power Source offers.

The DO-160G test sequence option is based on "RTCA/DO-160 revision G, Environmental Conditions and Test Procedures for Airborne Equipment, section 16: Input Power", and consists of test sequences for single-phase and three-phase equipment in three categories: ACF, ANF and AWF. 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 RTCA/DO-160G 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 RTCA/DO-160G test procedures and setups as well as UPC studio and UPC Test Manager Operation before using DO-160G test sequence packages. Check the RTCA website at http://www.rtca.org for detail content of RTCA/DO-160G; for UPC studio and UPC Test Manager operation, please see both Pacific Power Source UPC Studio and UPC Test Manager operation manuals.

Additional equipment may be required for certain tests while using the DO-160G test sequence option. These additional requirements are detailed in Section 7, Test Sequence Coverage.

1.1   HARDWARE REQUIREMENT

Pacific Power Source units must meet the following requirements to perform the DO-160G 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.

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.

1.2   DC Power Tests

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 DO-160 Software Library.

1.2.1   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 DC 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 14VDC and 28VDC test sequences versus 2.027 for 270VDC 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.

2   SOFTWARE INSTALLATION

The DO-160G test sequence is distributed as a single install program. The following executable file constitutes the DO-160G Option package:
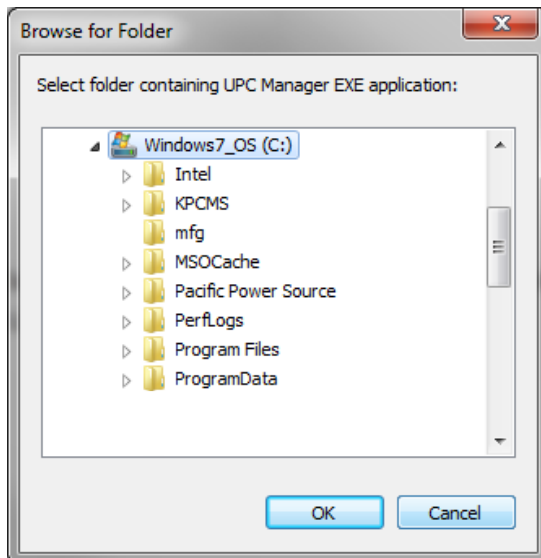
149124-DO-160G Test Suite v1.0.exe

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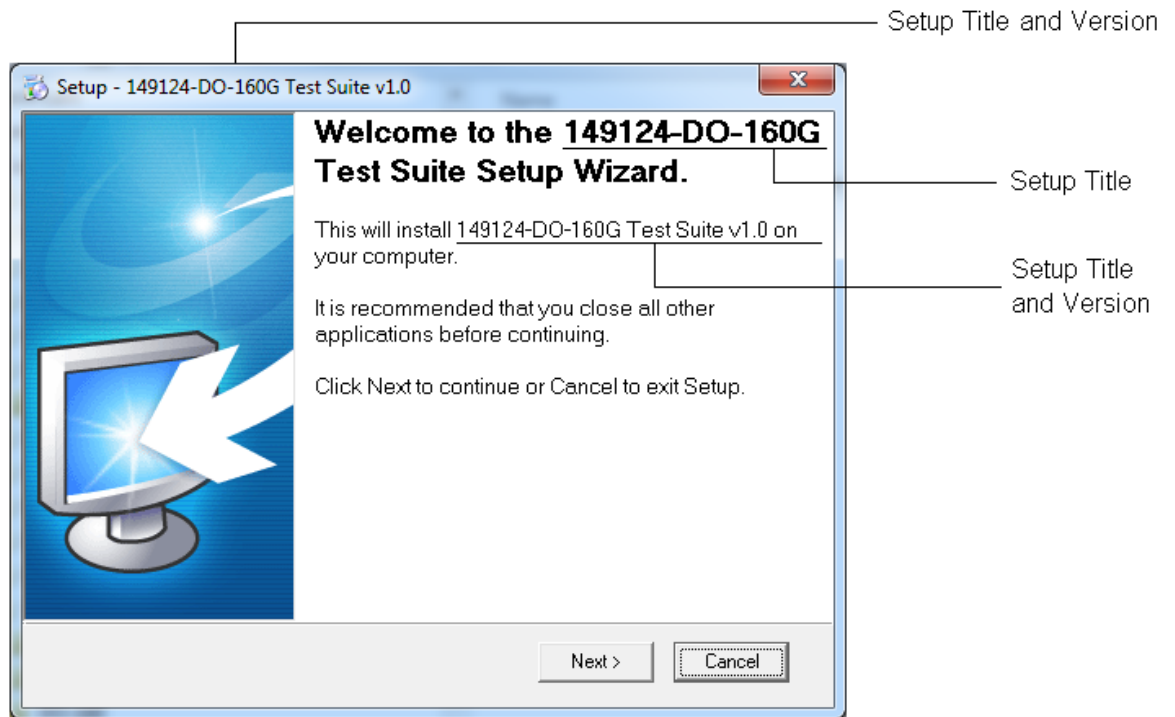
C:\Pacific Power Source\UPC Manager\Test Manager

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.

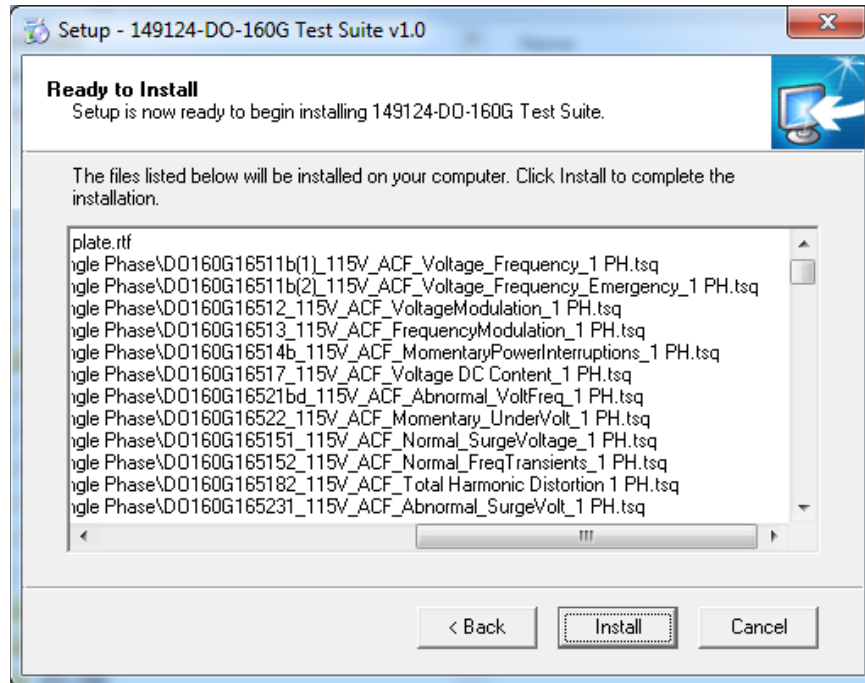## To install the DO-160G Option test sequences:

Double click the executable file:

- 149124-DO-160G 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.

2.1 SOFTWARE REMOVAL

To uninstall DO-160G 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.

3   DO-160G 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.
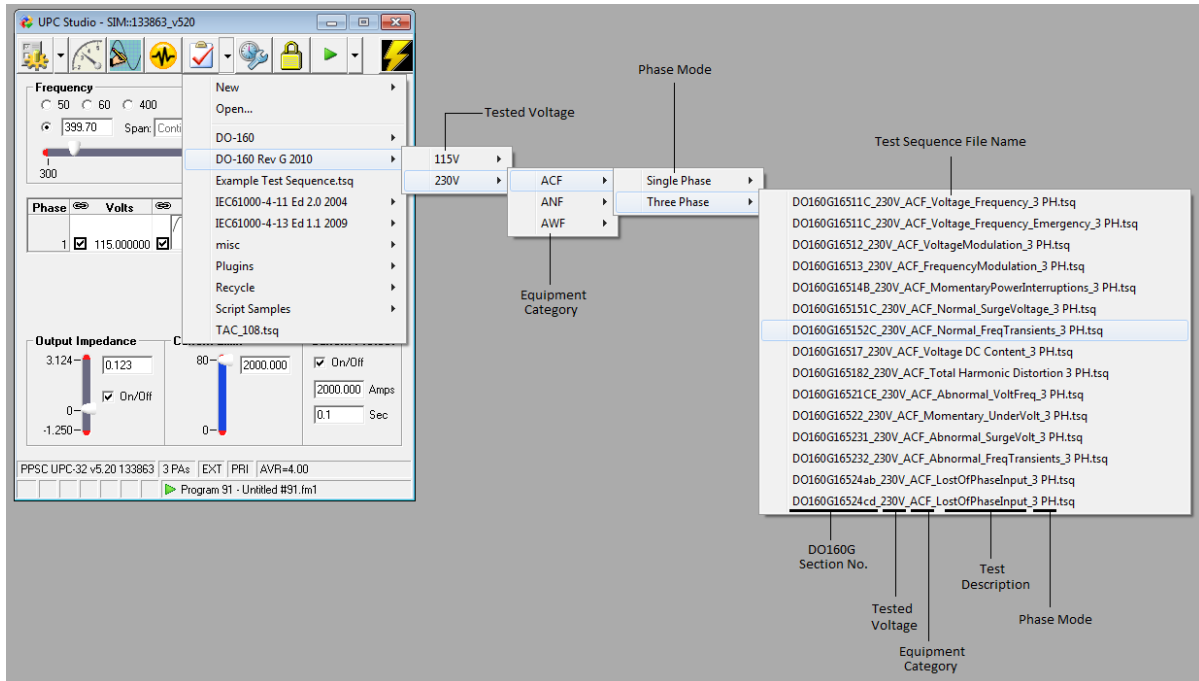
DO-160G test sequences are grouped based on categories of equipment defined in RTC/DO-160: ACF, ANF and AWF. The individual test sequence files are named in the following format:

(RTC/DO-160G section number)_(Tested Voltage)_(Equipment category)_ (Test description)_(Phase Mode).tsq

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.

4   DO-160G 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.

4.1   Objective Window

In the **Objective** window, illustrated below, the DO-160G section number, power group, operating condition, test purpose and time period, and parameter setup values are described in detail.
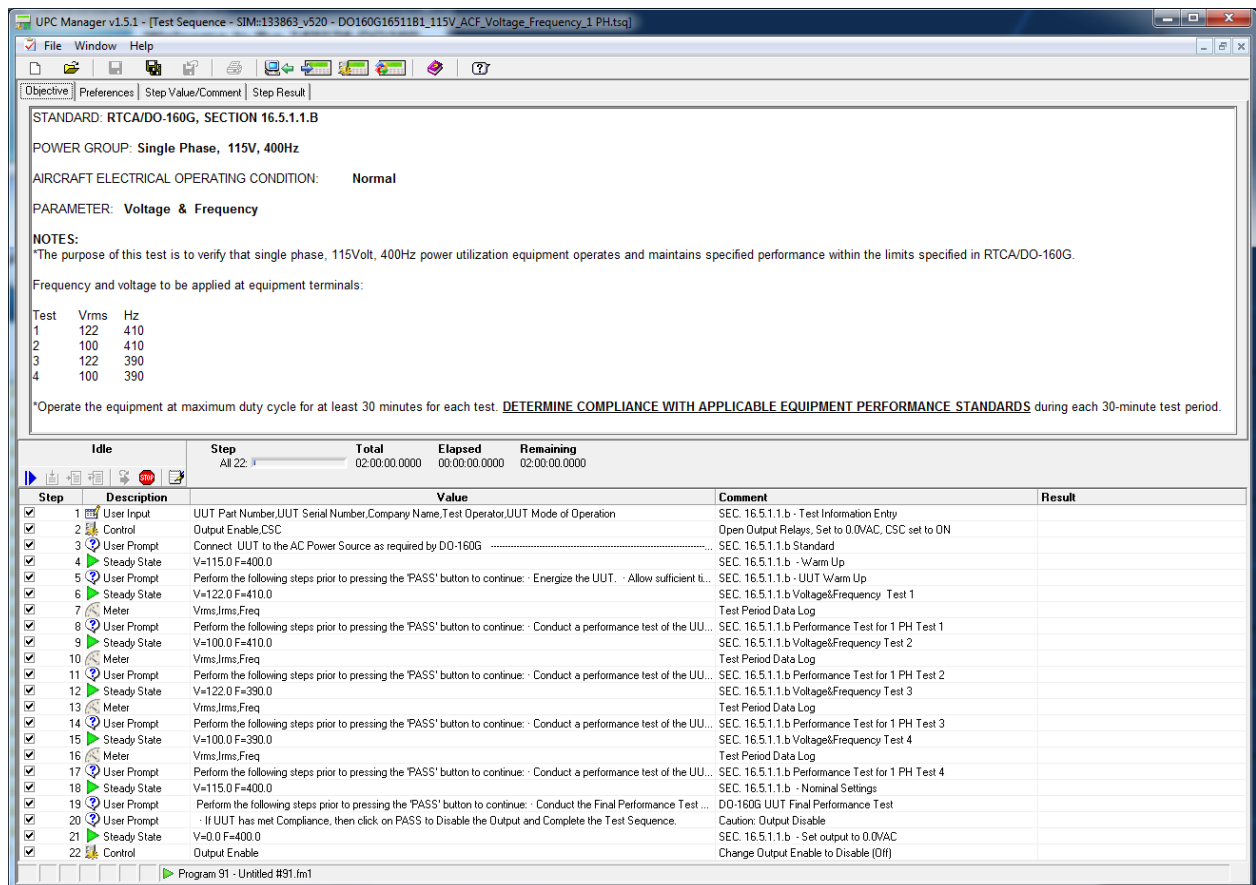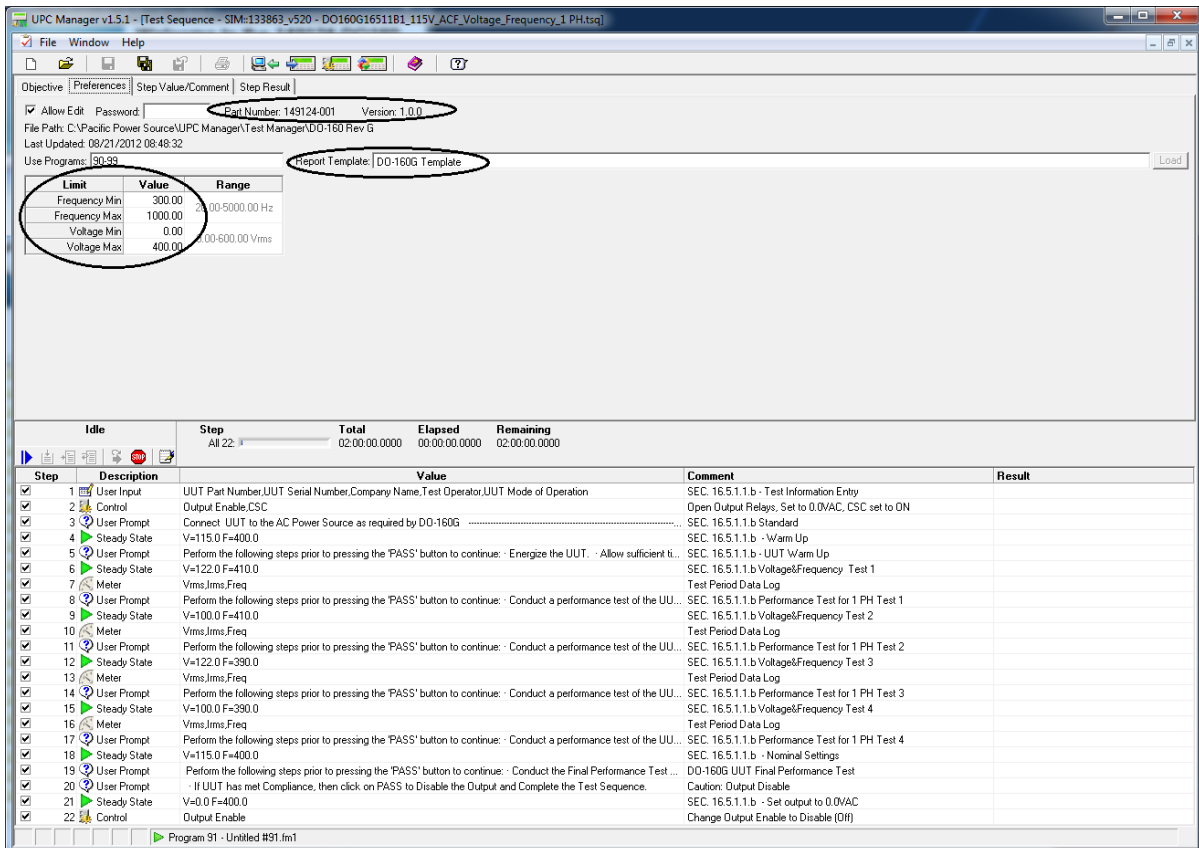
4.2   Preference Window

In the **Preferences** window shown below, "Allow Edit" is checked by default; 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.

"Report Template" used with active test sequence is named *DO-160G Template,* and is automatically loaded from a default directory: *C:\Pacific Power Source\UPC Manager\Test Reports\Templates;* If "*" appears at the end of the template file name (i.e *DO-160G Template*),* It means the data has been collected, and the test report has been updated and but changes have NOT yet been saved.

"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 DO-160G 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.
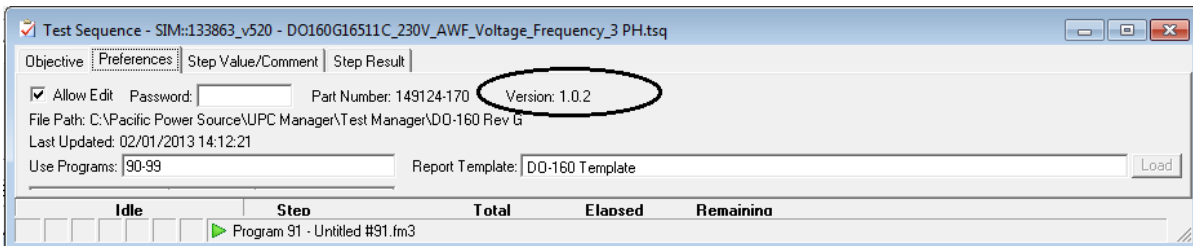
If a test engineer will be modifying a test sequence, it is recommended that a copy of the original file first be saved in a different folder as changes overwrite the existing file. For detail information on test sequence modification, please see UPC Test Manager Operation Manual.

4.3   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.
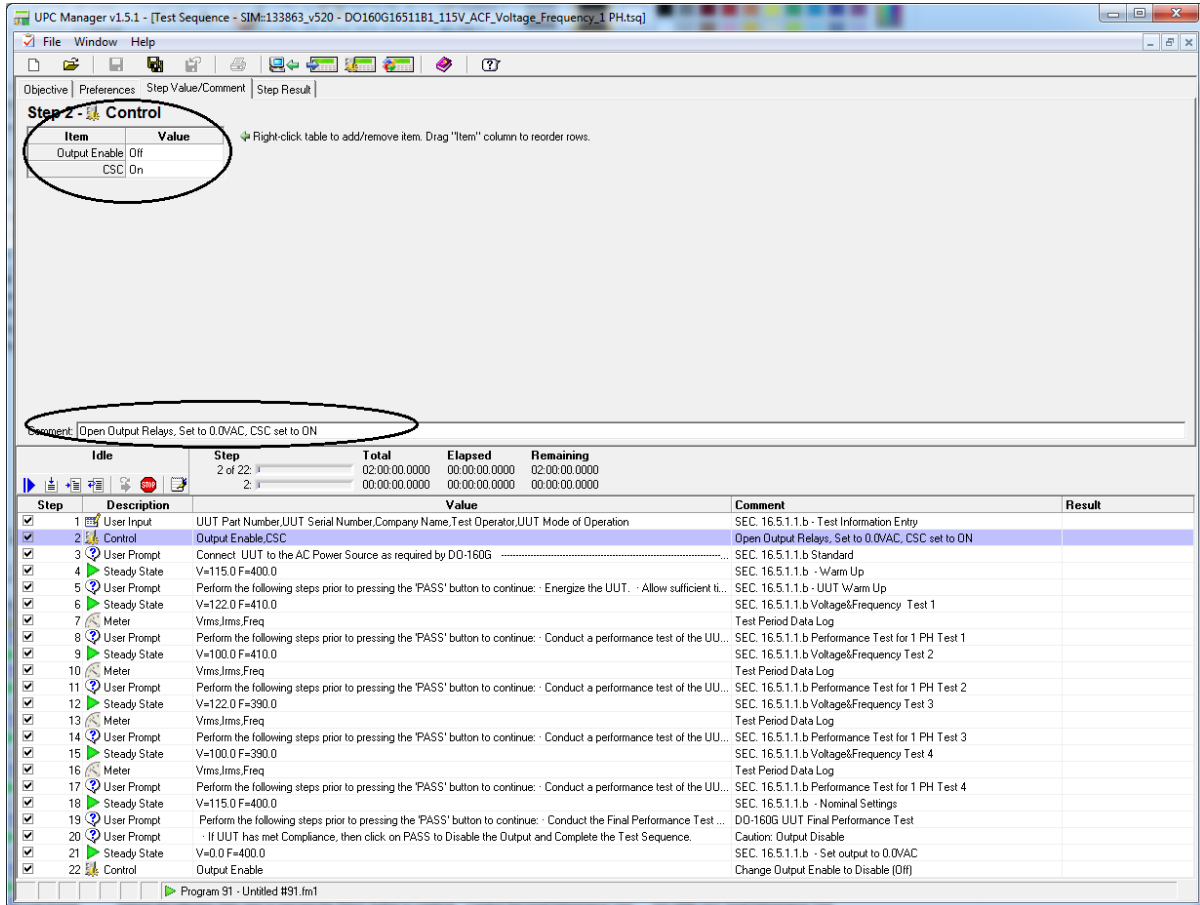
4.4   Step Result Window

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.

5 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.

5.1 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.).

5.2 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 .

5.3   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.

5.3.1   Report Template Headers and Footers

The provided DO-160 Report template files contain a simple footer which contains only basic information and no header.

The footer contains the following information.

Pacific Power Source, Inc.	21 of 39	1/10/2014 2:04:59 PM
DO-160 Template v1.0.0		Irvine CA, USA

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

DO-160 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.
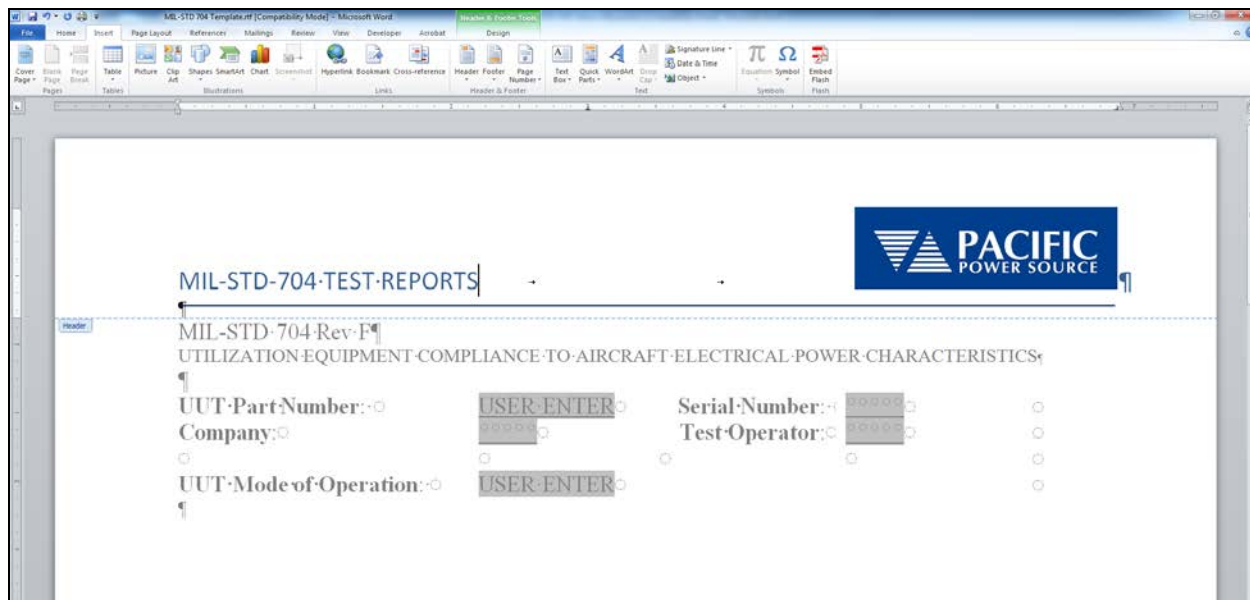
Figure 1: Adding Custom Report Headers to Report Template using MS Word

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 DO-160 option but this will also re-install all test sequences.

5.3.2 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 DO-160 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.

5.3.3   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.
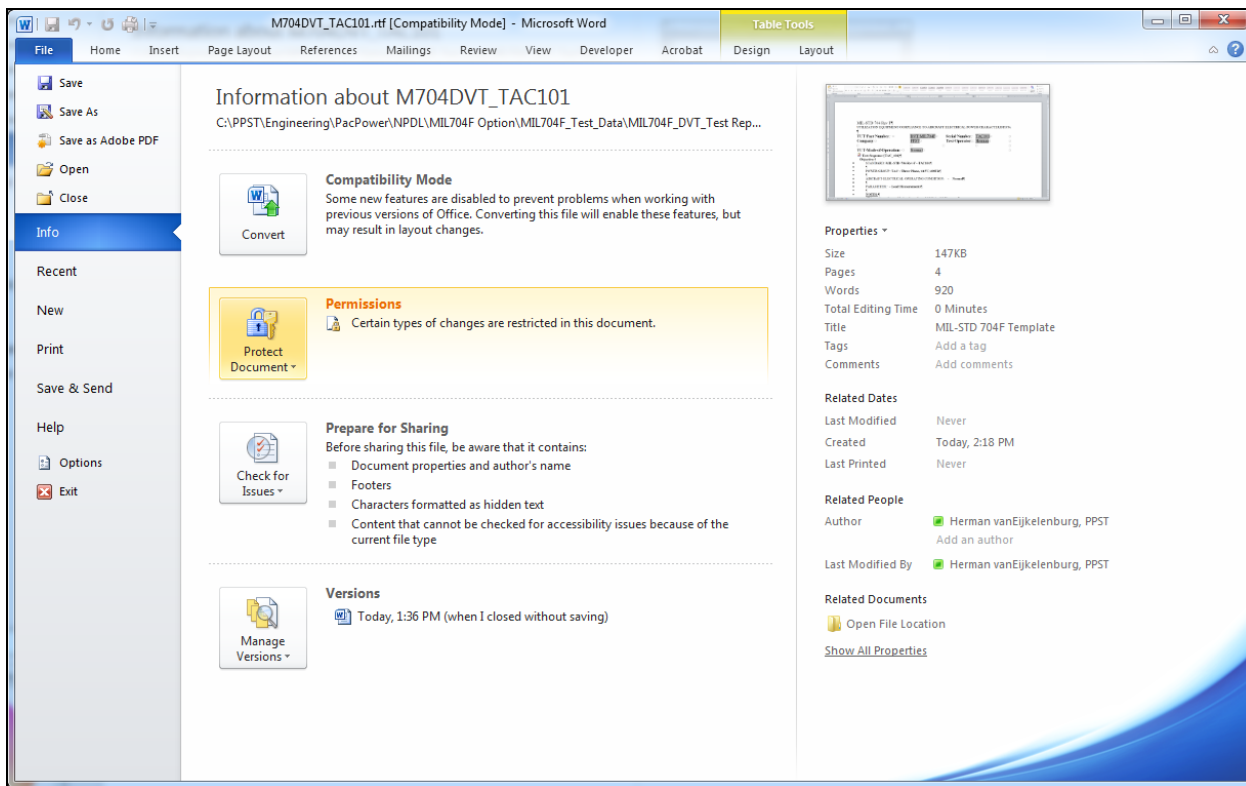
6. To change permissions, select the "Review" ribbon in MS Word and click on the far right Button labeled "Restrict Editing".

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.
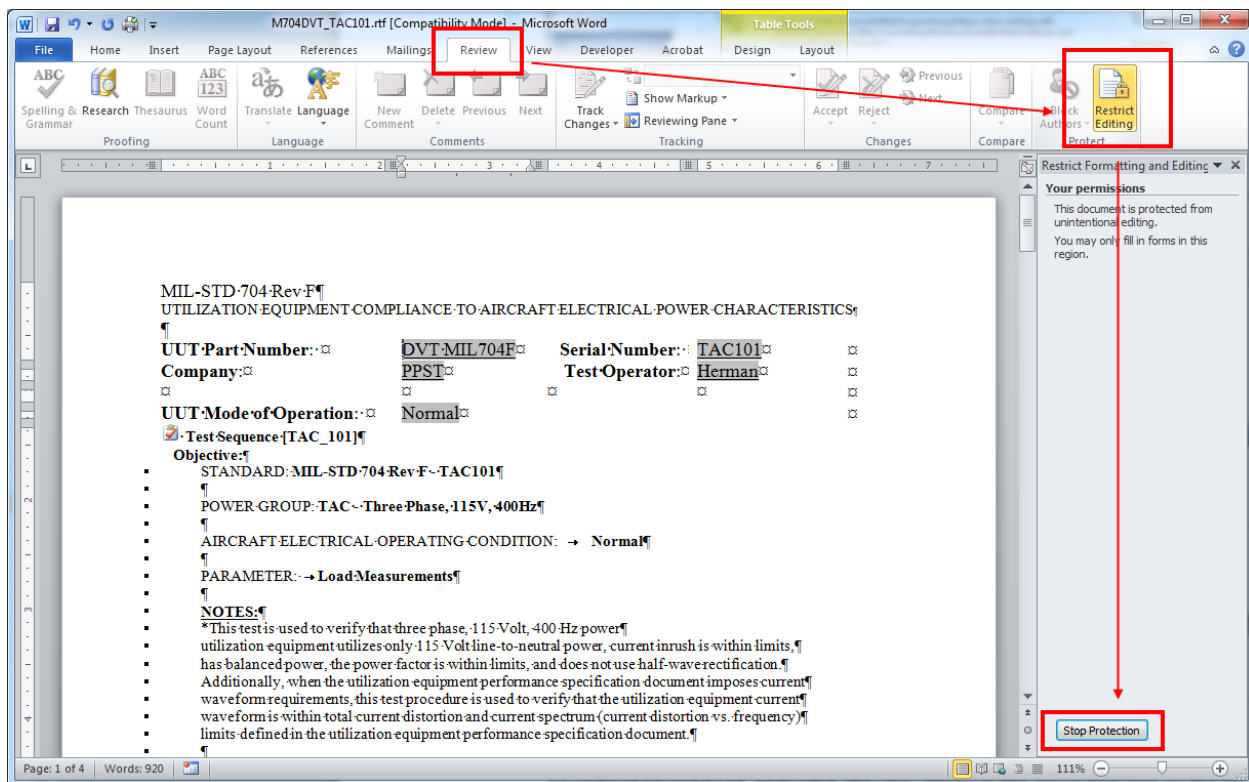
8. Once unlocked, changes may be made to any test step. For example, the Harmonic measurement data at TAC_101, Step 11 which runs beyond the page margin can be reformatted to a table layout for a more pleasing view of the data. Also, the header information could be removed as the selected harmonics will be evident from the measurement data. Below is what the step 11 entry in the report.
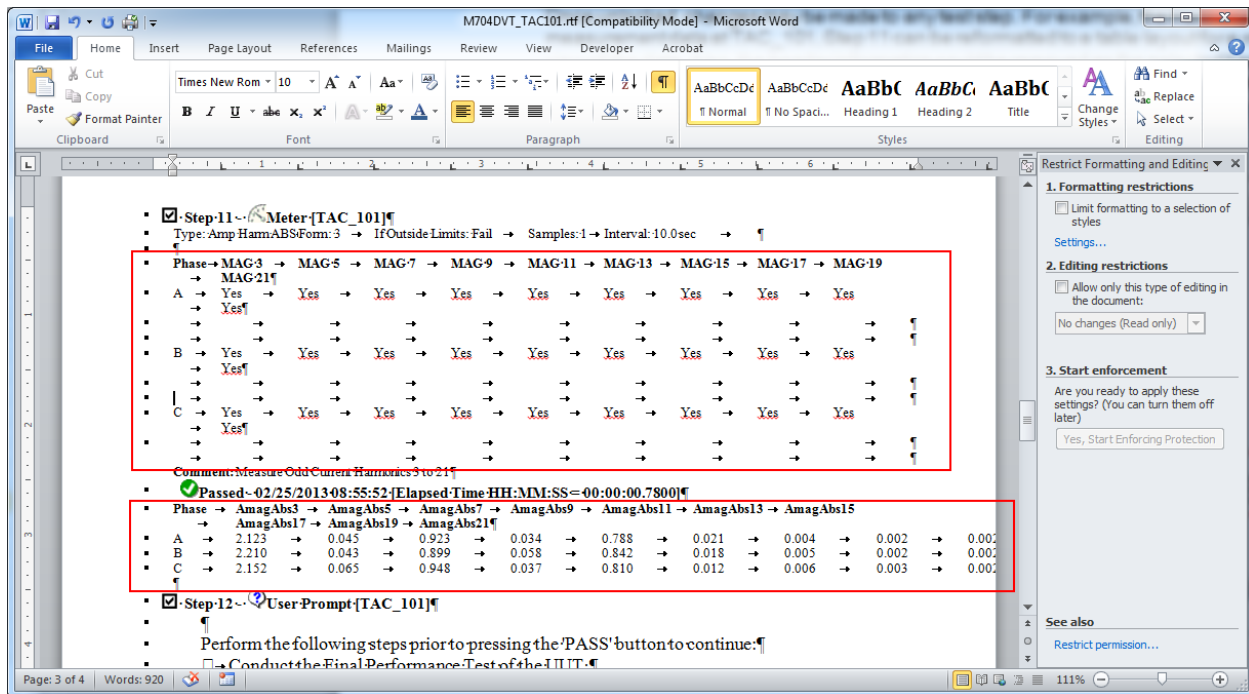
9. Deleting the Value section of Step 11 and converting the tab delimited measurement data to a Word table yields the result shown below.
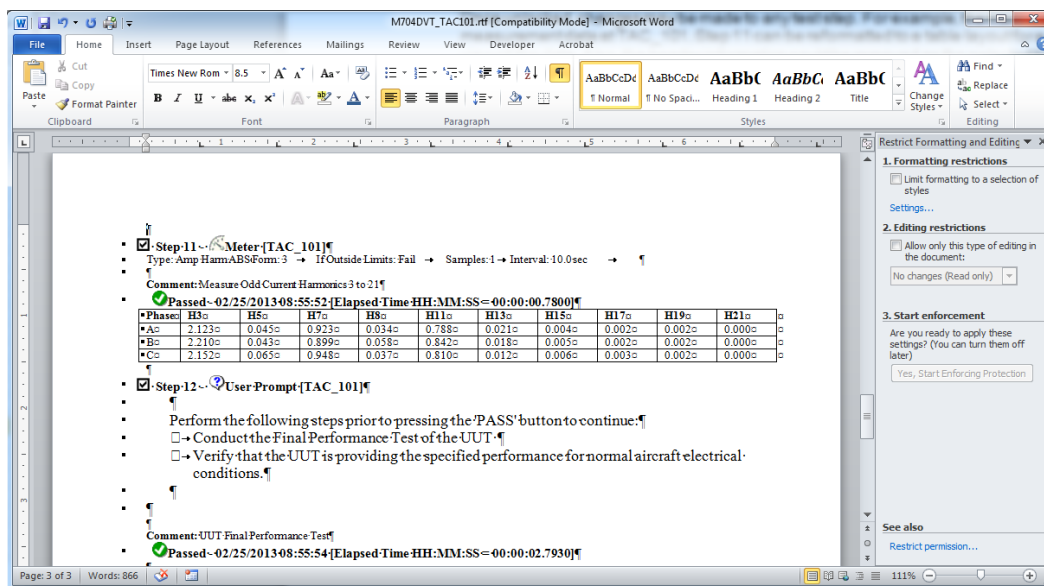
10. When all formatting changes are completed, you can lock down the file using the same "Restrict Formatting and Editing" column on the right side of the screen.

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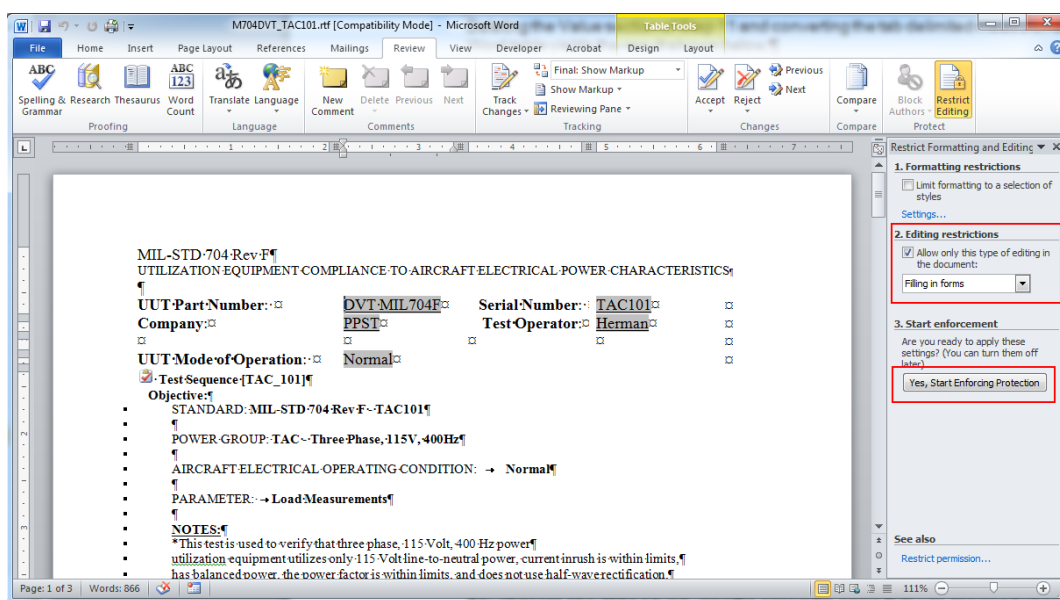
13. Any changes should be saved using the orignal file name that was assigned when first created.

6 DO-160G TEST SEQUENCE COVERAGE

6.1 Test Coverage Summary

The DO-160G AC/DC test sequence coverage is summarized in Table 1. Tests marked with "Y" are covered in DO-160G option. Tests marked with "N/A" are not applicable to the related sections for RTC/DO-160G.

Table 1: DO-160G Option Coverage Table (AC/DC)

RTCA/DO-160G SECTION No.	AC - 115/230V TEST DESCRIPTION	EQUIPMENT CATEGORY		
		ACF	ANF	AWF
16.5.1.1	Voltage & Frequency	Y	Y	Y
16.5.1.2	Voltage Modulation	Y	Y	Y
16.5.1.3	Frequency Modulation	Y	Y	Y
16.5.1.4	Momentary Power Interruptions - Test 1	Y	Y	Y
16.5.1.5.1	Normal Surge Voltage	Y	Y	Y
16.5.1.5.2	Normal Frequency Transients	Y	Y	Y
16.5.1.6	Normal Frequency Variations	N/A	Y	Y
16.5.1.7	Voltage DC Content	Y	Y	Y
16.5.1.8.2	Total Harmonic Distortion	Y	Y	Y
16.5.2.1	Abnormal Volt/Freq Limit Steady State	Y	Y	Y
16.5.2.2	Momentary Under Voltage Operation	Y	Y	Y
16.5.2.3.1	Abnormal Surge Voltage	Y	Y	Y
16.5.2.3.2	Abnormal Frequency Transients	Y	Y	Y
16.5.2.3.4	Lost of Phase Input (Three Phase Only)	Y	Y	Y

RTCA/DO-160G SECTION No.	DC - TEST DESCRIPTION (Category A, B, D, Z)	EQUIPMENT CATEGORY				
		B14V	A28V	B28V	Z28V	D270V
16.6.1.1	Voltage (Average Value dc)	Y	Y	Y	Y	Y
16.6.1.2	Ripple Voltage (dc)	Y	Y	Y	Y	Y
16.6.1.3	Momentary Power Interruptions (dc)	Y	Y	Y	Y	Y
16.6.1.4	Normal Surge Voltage (dc)	Y	Y	Y	Y	Y
16.6.1.5	Engine Starting Under Voltage Operation (dc)	Y	N/A	Y	Y	N/A
16.6.1.6	Exposed Voltage decay Time (dc)	N/A	N/A	N/A	N/A	Y
16.6.2.1	Voltage Steady State (dc)	Y	Y	Y	Y	Y
16.6.2.2	Low Voltage Conditions (dc)	Y	N/A	Y	N/A	N/A
16.6.2.3	Momentary Under-voltage Operation (dc)	Y	Y	Y	Y	Y
16.6.2.4	Abnormal Surge Voltage (dc)	Y	Y	Y	Y	Y

6.2   Test Section Coverage Tables

Depending on the power source used to perform tests with DO160G 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, "Additional Requirement" column. The test limits and parameter settings of each test are described in the **Objective** window of the related test sequence in Test Manager.

A DCR option is required to work in conjunction with the Pacific Power AC source to perform the DO160G DC power test. A DCR module basically rectifies the three phase 400Hz square wave signals to produce a DC output voltage. The DCR module is capable of generating a DC voltage from 0 to 600V and a maximum current up to 20 Amps. The DCR output voltage is controlled indirectly by programming the Pacific Power AC source. In meeting some of the transient requirement, an external load may be needed to connect in parallel with the UUT to achieve this fast slew rate.

Below picture depicts Category "A" 14VDC momentary power interruption test.

Table 2: Section Coverage Table – ACF (115V)

Phase Mode	Section No.	115V Test Description	Additional Requirement	File Reference
Single Phase	16.5.1.1.b1	Normal Voltage & Frequency		DO160G16511B1_115V_ACF_Voltage_Frequency_1 PH
	16.5.1.1.b2	Emergency Voltage & Frequency		DO160G16511B2_115V_ACF_Voltage_Frequency_Emergency_1 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_115V_ACF_VoltageModulation_1 PH
	16.5.1.3	Normal Frequency Modulation		DO160G16513_115V_ACF_FrequencyModulation_1 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_115V_ACF_MomentaryPowerInterruptions_1 PH
	16.5.1.5.1.c	Normal Surge Voltage	High voltage spikes up to 160VAC, requires "Transformer Coupled" AC Source capability	DO160G165151C_115V_ACF_Normal_SurgeVoltage_1 PH
	16.5.1.5.2.c	Normal Frequency Transients		DO160G165152C_115V_ACF_Normal_FreqTransients_1 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_115V_ACF_Voltage DC Content_1 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Test Sequence uses clipped waveform. Spec allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_115V_ACF_Total Harmonic Distortion 1 PH
	16.5.2.1.b&d	Abnormal Volt/Freq Limit Steady State		DO160G16521BD_115V_ACF_Abnormal_VoltFreq_1 PH
	16.5.2.2	Momentary Undervoltage Operation		DO160G16522_115V_ACF_Momentary_UnderVolt_1 PH
	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_115V_ACF_Abnormal_SurgeVolt_1 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_115V_ACF_Abnormal_FreqTransients_1 PH
Three Phase	16.5.1.1.c1	Normal Voltage & Frequency		DO160G16511C1_115V_ACF_Voltage_Frequency_3 PH
	16.5.1.1.c2	Emergency Voltage & Frequency		DO160G16511C2_115V_ACF_Voltage_Frequency_Emergency_3 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_115V_ACF_VoltageModulation_3 PH
	16.5.1.3	Normal Frequency Modulation		DO160G16513_115V_ACF_FrequencyModulation_3 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_115V_ACF_MomentaryPowerInterruptions_3 PH
	16.5.1.5.1.c	Normal Surge Voltage	High voltage spikes up to 160VAC, requires "Transformer Coupled" AC Source capability	DO160G165151C_115V_ACF_Normal_SurgeVoltage_3 PH
	16.5.1.5.2.c	Normal Frequency Transients		DO160G165152C_115V_ACF_Normal_FreqTransients_3 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_115V_ACF_Voltage DC Content_3 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Specification allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_115V_ACF_Total Harmonic Distortion 3 PH
	16.5.2.1.c&e	Abnormal Volt/Freq Limit Steady State		DO160G16521CE_115V_ACF_Abnormal_VoltFreq_3 PH
	16.5.2.2	Momentary Undervoltage Operation		DO160G16522_115V_ACF_Momentary_UnderVolt_3 PH
	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_115V_ACF_Abnormal_SurgeVolt_3 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_115V_ACF_Abnormal_FreqTransients_3 PH

Table 3: Section Coverage Table – ACF (230V)

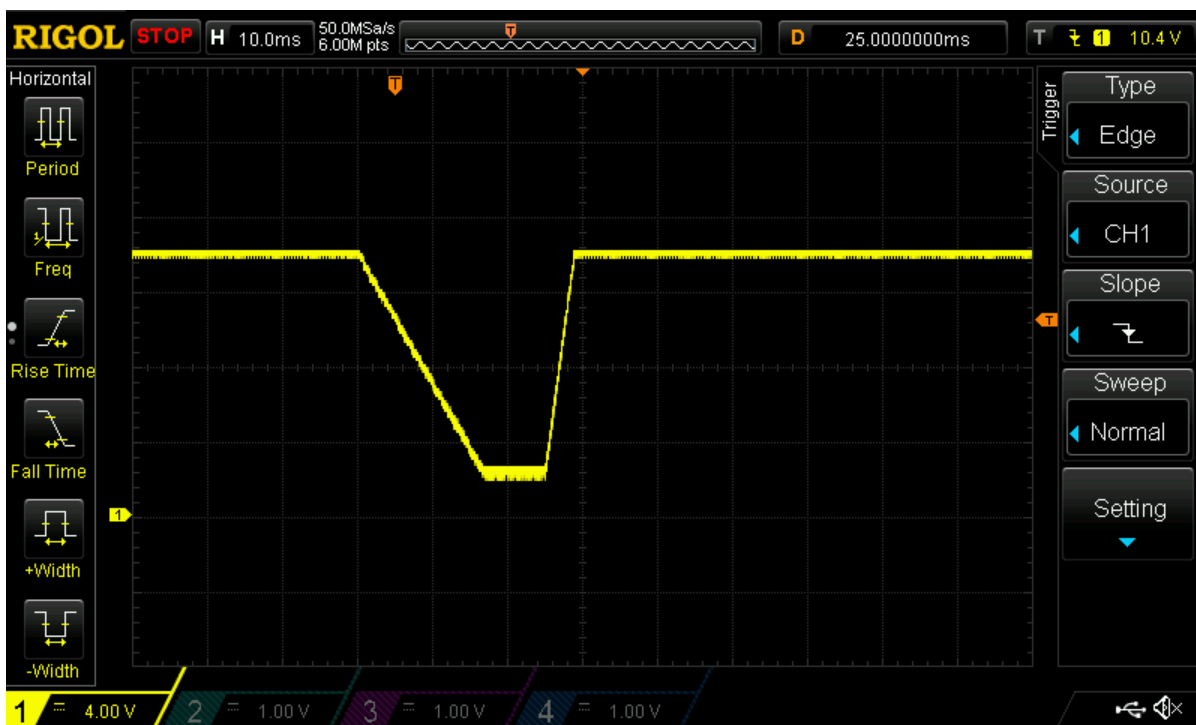| Phase Mode	Section No.	230V Test Description	Additional Requirement	File Reference
Single Phase	16.5.1.1.b1	Normal Voltage & Frequency		DO160G16511B1_230V_ACF_Voltage_Frequency_1 PH
	16.5.1.1.b2	Emergency Voltage & Frequency		DO160G16511B2_230V_ACF_Voltage_Frequency_Emergency_1 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_230V_ACF_VoltageModulation_1 PH
	16.5.1.3	Normal Frequency Modulation		DO160G16513_230V_ACF_FrequencyModulation_1 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_230V_ACF_MomentaryPowerInterruptions_1 PH
	16.5.1.5.1.c	Normal Surge Voltage	High voltage spikes up to 160VAC, requires "Transformer Coupled" AC Source capability	DO160G165151C_230V_ACF_Normal_SurgeVoltage_1 PH
	16.5.1.5.2.c	Normal Frequency Transients		DO160G165152C_230V_ACF_Normal_FreqTransients_1 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_230V_ACF_Voltage DC Content_1 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Test Sequence uses clipped waveform. Spec allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_230V_ACF_Total Harmonic Distortion 1 PH
	16.5.2.1.b&d	Abnormal Volt/Freq Limit Steady State		DO160G16521BD_230V_ACF_Abnormal_VoltFreq_1 PH
	16.5.2.2	Momentary Undervoltage Operation		DO160G16522_230V_ACF_Momentary_UnderVolt_1 PH
	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_230V_ACF_Abnormal_SurgeVolt_1 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_230V_ACF_Abnormal_FreqTransients_1 PH
Three Phase	16.5.1.1.c1	Normal Voltage & Frequency		DO160G16511C_230V_ACF_Voltage_Frequency_3 PH
	16.5.1.1.c2	Emergency Voltage & Frequency		DO160G16511C_230V_ACF_Voltage_Frequency_Emergency_3 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_230V_ACF_VoltageModulation_3 PH
	16.5.1.3	Normal Frequency Modulation		DO160G16513_230V_ACF_FrequencyModulation_3 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_230V_ACF_MomentaryPowerInterruptions_3 PH
	16.5.1.5.1.c	Normal Surge Voltage	High voltage spikes up to 160VAC, requires "Transformer Coupled" AC Source capability	DO160G165151C_230V_ACF_Normal_SurgeVoltage_3 PH
	16.5.1.5.2.c	Normal Frequency Transients		DO160G165152C_230V_ACF_Normal_FreqTransients_3 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_230V_ACF_Voltage DC Content_3 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Specification allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_230V_ACF_Total Harmonic Distortion 3 PH
	16.5.2.1.c&e	Abnormal Volt/Freq Limit Steady State		DO160G16521CE_230V_ACF_Abnormal_VoltFreq_3 PH
	16.5.2.2	Momentary Undervoltage Operation		DO160G16522_230V_ACF_Momentary_UnderVolt_3 PH
	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_230V_ACF_Abnormal_SurgeVolt_3 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_230V_ACF_Abnormal_FreqTransients_3 PH

Table 4: Section Coverage Table – ANF (115V)

Phase Mode	Section No.	115V Test Description	Additional Requirement	File Reference
Single Phase	16.5.1.1.b1	Normal Voltage & Frequency		DO160G16511B1_115V_ANF_Voltage_Frequency_1 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_115V_ANF_VoltageModulation_1 PH
	16.5.1.3	Normal Frequency Modulation (360Hz)		DO160G16513_115V_ANF_360Hz_FrequencyModulation_1 PH
	16.5.1.3	Normal Frequency Modulation (650Hz)		DO160G16513_115V_ANF_650Hz_FrequencyModulation_1 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_115V_ANF_MomentaryPowerInterruptions_1 PH
	16.5.1.4.c	Normal Momentary Power Interruptions Test 2		DO160G16514C_115V_ANF_MomentaryPowerInterruptions_1 PH
	16.5.1.5.1.b	Normal Surge Voltage	High voltage spikes up to 160VAC, requires "Transformer Coupled" AC Source capability	DO160G165151B_115V_ANF_NormalSurgeVoltage_1 PH
	16.5.1.6.b	Normal Frequency Variations		DO160G16516B_115V_ANF_NormalFreqVariation_1 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_115V_ANF_Voltage DC Content_1 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Specification allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_115V_ANF_Total Harmonic Distortion 1 PH
	16.5.2.1.b	Abnormal Volt/Freq Limit Steady State		DO160G16521B_115V_ANF_AbnormalVoltFreq_1 PH
	16.5.2.2	Momentary Undervoltage Operation		DO160G16522_115V_ANF_MomentaryUnderVolt_1 PH
	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_115V_ANF_AbnormalSurgeVolt_1 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_115V_ANF_Abnormal_FreqTransients_1 PH
Three Phase	16.5.1.1.c	Normal Voltage & Frequency		DO160G16511C_115V_ANF_VoltFreq_Emergency_3 PH
	16.5.1.1.ce	Emergency Voltage & Frequency		DO160G16511CE_115V_ANF_Voltage_Frequency_3 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_115V_ANF_VoltageModulation_3 PH
	16.5.1.3	Normal Frequency Modulation (360Hz)		DO160G16513_115V_ANF_360Hz_FrequencyModulation_3 PH
	16.5.1.3	Normal Frequency Modulation (650Hz)		DO160G16513_115V_ANF_650Hz_FrequencyModulation_3 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_115V_ANF_MomentaryPowerInterruptions_3 PH
	16.5.1.4.c	Normal Momentary Power Interruptions Test 2		DO160G16514C_115V_ANF_MomentaryPowerInterruptions_3 PH
	16.5.1.5.1.b	Normal Surge Voltage	High voltage spikes up to 160VAC, requires "Transformer Coupled" AC Source capability	DO160G165151B_115V_ANF_NormalSurgeVoltage_3 PH
	16.5.1.6.b	Normal Frequency Variations		DO160G16516B_115V_ANF_NormalFreqVariation_3 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_115V_ANF_Voltage DC Content_3 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Specification allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_115V_ANF_Total Harmonic Distortion 3 PH
	16.5.2.1.c	Abnormal Volt/Freq Limit Steady State		DO160G16521C_115V_ANF_AbnormalVoltFreq_3 PH
	16.5.2.2	Momentary Undervoltage Operation		DO160G16522_115V_ANF_MomentaryUnderVolt_3 PH

16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_115V_ANF_AbnormalSurgeVolt_3 PH
16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_115V_ANF_Abnormal_FreqTransients_3 PH
16.5.2.4.ab	Loss Of Phase Input (360Hz)		DO160G16524ab_115V_ANF_360Hz_LostOfPhaseInput_3 PH
16.5.2.4.ab	Loss Of Phase Input (650Hz)		DO160G16524ab_115V_ANF_650Hz_LostOfPhaseInput_3 PH
16.5.2.4.cd	Loss Of Phase Input (360Hz)		DO160G16524cd_115V_ANF_360Hz_LostOfPhaseInput_3 PH
16.5.2.4.cd	Loss Of Phase Input (800Hz)		DO160G16524cd_115V_ANF_360Hz_LostOfPhaseInput_3 PH

Table 5: Section Coverage Table – ANF (230V)

Phase Mode	Section No.	230V Test Description	Additional Requirement	File Reference
Single Phase	16.5.1.1.b1	Normal Voltage & Frequency		DO160G16511B1_230V_ANF_Voltage_Frequency_1 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_230V_ANF_VoltageModulation_1 PH
	16.5.1.3	Normal Frequency Modulation (360Hz)		DO160G16513_230V_ANF_360Hz_FrequencyModulation_1 PH
	16.5.1.3	Normal Frequency Modulation (650Hz)		DO160G16513_230V_ANF_650Hz_FrequencyModulation_1 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_230V_ANF_MomentaryPowerInterruptions_1 PH
	16.5.1.4.c	Normal Momentary Power Interruptions Test 2		DO160G16514C_230V_ANF_MomentaryPowerInterruptions_1 PH
	16.5.1.5.1.b	Normal Surge Voltage	High voltage spikes up to 160VAC, requires "Transformer Coupled" AC Source capability	DO160G165151B_230V_ANF_NormalSurgeVoltage_1 PH
	16.5.1.6.b	Normal Frequency Variations		DO160G16516B_230V_ANF_NormalFreqVariation_1 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_230V_ANF_Voltage DC Content_1 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Specification allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_230V_ANF_Total Harmonic Distortion 1 PH
	16.5.2.1.b	Abnormal Volt/Freq Limit Steady State		DO160G16521B_230V_ANF_AbnormalVoltFreq_1 PH
	16.5.2.2	Momentary Undervoltage Operation		DO160G16522_230V_ANF_MomentaryUnderVolt_1 PH
	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_230V_ANF_AbnormalSurgeVolt_1 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_230V_ANF_Abnormal_FreqTransients_1 PH
Three Phase	16.5.1.1.c	Normal Voltage & Frequency		DO160G16511C_230V_ANF_VoltFreq_Emergency_3 PH
	16.5.1.1.ce	Emergency Voltage & Frequency		DO160G16511CE_230V_ANF_Voltage_Frequency_3 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_115V_ANF_VoltageModulation_3 PH
	16.5.1.3	Normal Frequency Modulation (360Hz)		DO160G16513_230V_ANF_360Hz_FrequencyModulation_3 PH
	16.5.1.3	Normal Frequency Modulation (650Hz)		DO160G16513_230V_ANF_650Hz_FrequencyModulation_3 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_230V_ANF_MomentaryPowerInterruptions_3 PH
	16.5.1.4.c	Normal Momentary Power Interruptions Test 2		DO160G16514C_230V_ANF_MomentaryPowerInterruptions_3 PH
	16.5.1.5.1.b	Normal Surge Voltage	High voltage spikes up to 160VAC, requires "Transformer Coupled" AC Source capability	DO160G165151B_230V_ANF_NormalSurgeVoltage_3 PH
	16.5.1.6.b	Normal Frequency Variations		DO160G16516B_230V_ANF_NormalFreqVariation_3 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_230V_ANF_Voltage DC Content_3 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Specification allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_230V_ANF_Total Harmonic Distortion 3 PH
	16.5.2.1.c	Abnormal Volt/Freq Limit Steady State		DO160G16521C_230V_ANF_AbnormalVoltFreq_3 PH
	16.5.2.2	Momentary Undervoltage Operation		DO160G16522_230V_ANF_MomentaryUnderVolt_3 PH

	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_230V_ANF_AbnormalSurgeVolt_3 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_230V_ANF_Abnormal_FreqTransients_3 PH
	16.5.2.4.ab	Loss Of Phase Input (360Hz)		DO160G16524ab_230V_ANF_360Hz_LostOfPhaseInput_3 PH
	16.5.2.4.ab	Loss Of Phase Input (650Hz)		DO160G16524ab_230V_ANF_650Hz_LostOfPhaseInput_3 PH
	16.5.2.4.cd	Loss Of Phase Input (360Hz)		DO160G16524cd_230V_ANF_360Hz_LostOfPhaseInput_3 PH
	16.5.2.4.cd	Loss Of Phase Input (800Hz)		DO160G16524cd_230V_ANF_650Hz_LostOfPhaseInput_3 PH

Table 6: Section Coverage Table – AWF (115V)

Phase Mode	Section No.	115V Test Description	Comment	File Reference
Single Phase	16.5.1.1.b1	Normal Voltage & Frequency		DO160G16511B1_115V_AWF_Voltage_Frequency_1 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_115V_AWF_VoltageModulation_1 PH
	16.5.1.3	Normal Frequency Modulation (360Hz)		DO160G16513_115V_AWF_360Hz_FrequencyModulation_1 PH
	16.5.1.3	Normal Frequency Modulation (800Hz)		DO160G16513_115V_AWF_800Hz_FrequencyModulation_1 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_115V_AWF_MomentaryPowerInterruptions_1PH
	16.5.1.4.c	Normal Momentary Power Interruptions Test 2		DO160G16514C_115V_AWF_MomentaryPowerInterruptions_1 PH
	16.5.1.5.1	Normal Surge Voltage	High voltage spikes up to 170VAC, requires "Transformer Coupled" AC Source capability	DO160G165151_115V_AWF_NormalSurgeVoltage_1 PH
	16.5.1.6	Normal Frequency Variations		DO160G16516_115V_AWF_NormalFreqVariation_1 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_115V_AWF_Voltage DC Content_1 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Test Sequence uses clipped waveform. Spec allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_115V_AWF_Total Harmonic Distortion_1 PH
	16.5.2.1.b	Abnormal Volt/Freq Limit Steady State		DO160G16521B_115V_AWF_AbnormalVoltFreq_1 PH
	16.5.2.2	Abnormal Momentary Undervoltage Operation		DO160G16522_115V_AWF_MomentaryUnderVolt_1 PH
	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_115V_AWF_AbnormalSurgeVolt_1 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_115V_AWF_Abnormal_FreqTransients_1 PH
Three Phase	16.5.1.1.b	Normal Voltage & Frequency		DO160G16511C_115V_AWF_Voltage_Frequency_3 PH
	16.5.1.1.c.2	Emergency Voltage & Frequency		DO160G16511C2_115V_AWF_Voltage_Frequency_Emergency_ 3 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_115V_AWF_VoltageModulation_3 PH
	16.5.1.3	Normal Frequency Modulation (360Hz)		DO160G16513_115V_AWF_360Hz_FrequencyModulation_3 PH
	16.5.1.3	Normal Frequency Modulation (800Hz)		DO160G16513_115V_AWF_800Hz_FrequencyModulation_3 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_115V_AWF_MomentaryPowerInterruptions_3 PH
	16.5.1.4.c	Normal Momentary Power Interruptions Test 2		DO160G16514C_115V_AWF_MomentaryPowerInterruptions_3 PH
	16.5.1.5.1	Normal Surge Voltage	High voltage spikes up to 170VAC, requires "Transformer Coupled" AC Source capability	DO160G165151_115V_AWF_NormalSurgeVoltage_3 PH
	16.5.1.6	Normal Frequency Variations		DO160G16516_115V_AWF_NormalFreqVariation_3 PH
	16.5.1.7	Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_115V_AWF_Voltage DC Content_3 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Specification allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_115V_AWF_Total Harmonic Distortion_3 PH
	16.5.2.1.c	Abnormal Volt/Freq Limit Steady State		DO160G16521C_115V_AWF_AbnormalVoltFreq_3 PH
	16.5.2.2	Abnormal Momentary Undervoltage Operation		DO160G16522_115V_AWF_MomentaryUnderVolt_3 PH
	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC	DO160G165231_115V_AWF_AbnormalSurgeVolt_3 PH

			Source capability	
16.5.2.3.2	Abnormal Frequency Transients			DO160G165232_115V_AWF_Abnormal_FreqTransients_3 PH
16.5.2.4.ab	Loss Of Phase Input (360Hz)			DO160G16524ab_115V_AWF_360Hz_LostOfPhaseInput_3 PH
16.5.2.4.ab	Loss Of Phase Input (650Hz)			DO160G16524ab_115V_AWF_800Hz_LostOfPhaseInput_3 PH
16.5.2.4.cd	Loss Of Phase Input (360Hz)			DO160G16524cd_115V_AWF_360Hz_LostOfPhaseInput_3 PH
16.5.2.4.cd	Loss Of Phase Input (800Hz)			DO160G16524cd_115V_AWF_800Hz_LostOfPhaseInput_3 PH

Table 7: Section Coverage Table – AWF (230V)

Phase Mode	Section No.	230V Test Description	Comment	File Reference
Single Phase	16.5.1.1.b1	Normal Voltage & Frequency		DO160G16511B1_230V_AWF_Voltage_Frequency_1 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_230V_AWF_VoltageModulation_1 PH
	16.5.1.3	Normal Frequency Modulation (360Hz)		DO160G16513_230V_AWF_360Hz_FrequencyModulation_1 PH
	16.5.1.3	Normal Frequency Modulation (800Hz)		DO160G16513_230V_AWF_800Hz_FrequencyModulation_1 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_230V_AWF_MomentaryPowerInterruptions_1PH
	16.5.1.4.c	Normal Momentary Power Interruptions Test 2		DO160G16514C_230V_AWF_MomentaryPowerInterruptions_1 PH
	16.5.1.5.1	Normal Surge Voltage	High voltage spikes up to 170VAC, requires "Transformer Coupled" AC Source capability	DO160G165151_230V_AWF_NormalSurgeVoltage_1 PH
	16.5.1.6	Normal Frequency Variations		DO160G16516_230V_AWF_NormalFreqVariation_1 PH
	16.5.1.7	Normal Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_230V_AWF_Voltage DC Content_1 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Test Sequence uses clipped waveform. Spec allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_230V_AWF_Total Harmonic Distortion_1 PH
	16.5.2.1.b	Abnormal Volt/Freq Limit Steady State		DO160G16521B_230V_AWF_AbnormalVoltFreq_1 PH
	16.5.2.2	Abnormal Momentary Undervoltage Operation		DO160G16522_230V_AWF_MomentaryUnderVolt_1 PH
	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_230V_AWF_AbnormalSurgeVolt_1 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_230V_AWF_Abnormal_FreqTransients_1 PH
Three Phase	16.5.1.1.b	Normal Voltage & Frequency		DO160G16511C_230V_AWF_Voltage_Frequency_3 PH
	16.5.1.1.c.2	Emergency Voltage & Frequency		DO160G16511C2_230V_AWF_Voltage_Frequency_Emergency_ 3 PH
	16.5.1.2	Normal Voltage Modulation		DO160G16512_230V_AWF_VoltageModulation_3 PH
	16.5.1.3	Normal Frequency Modulation (360Hz)		DO160G16513_230V_AWF_360Hz_FrequencyModulation_3 PH
	16.5.1.3	Normal Frequency Modulation (800Hz)		DO160G16513_230V_AWF_800Hz_FrequencyModulation_3 PH
	16.5.1.4.b	Normal Momentary Power Interruptions - Test 1		DO160G16514B_230V_AWF_MomentaryPowerInterruptions_3 PH
	16.5.1.4.c	Normal Momentary Power Interruptions Test 2		DO160G16514C_230V_AWF_MomentaryPowerInterruptions_3 PH
	16.5.1.5.1	Normal Surge Voltage	High voltage spikes up to 170VAC, requires "Transformer Coupled" AC Source capability	DO160G165151_230V_AWF_NormalSurgeVoltage_3 PH
	16.5.1.6	Normal Frequency Variations		DO160G16516_230V_AWF_NormalFreqVariation_3 PH
	16.5.1.7	Voltage DC Content	Requires DC Power Supply to fully test UUT	DO160G16517_230V_AWF_Voltage DC Content_3 PH
	16.5.1.8.2	Normal Total Harmonic Distortion	Specification allows either clipped waveform or full-wave bridge rectifier load	DO160G165182_230V_AWF_Total Harmonic Distortion_3 PH
	16.5.2.1.c	Abnormal Volt/Freq Limit Steady State		DO160G16521C_230V_AWF_AbnormalVoltFreq_3 PH
	16.5.2.2	Abnormal Momentary Undervoltage Operation		DO160G16522_230V_AWF_MomentaryUnderVolt_3 PH

	16.5.2.3.1	Abnormal Surge Voltage	High voltage spikes up to 180VAC, requires "Transformer Coupled" AC Source capability	DO160G165231_230V_AWF_AbnormalSurgeVolt_3 PH
	16.5.2.3.2	Abnormal Frequency Transients		DO160G165232_230V_AWF_Abnormal_FreqTransients_3 PH
	16.5.2.4.ab	Loss Of Phase Input (360Hz)		DO160G16524ab_230V_AWF_360Hz_LostOfPhaseInput_3 PH
	16.5.2.4.ab	Loss Of Phase Input (650Hz)		DO160G16524ab_230V_AWF_800Hz_LostOfPhaseInput_3 PH
	16.5.2.4.cd	Loss Of Phase Input (360Hz)		DO160G16524cd_230V_AWF_360Hz_LostOfPhaseInput_3 PH
	16.5.2.4.cd	Loss Of Phase Input (800Hz)		DO160G16524cd_230V_AWF_800Hz_LostOfPhaseInput_3 PH

Table 8: Section Coverage Table – Category B – 14VDC

Cat. B	Section No.	Test Description	Additional Requirement	File Reference
14VDC	16.6.1.1b(1-2)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.1.1b(1-2)
	16.6.1.1b(3)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.1.1b(3)
	16.6.1.2	Ripple Voltage (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.1.2
	16.6.1.3b	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.1.3b
	16.6.1.3c	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.1.3c
	16.6.1.3d	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.1.3d
	16.6.1.4b	Normal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.1.4b
	16.6.1.5	Engine Starting Under Voltage Operation (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.1.5
	16.6.2.1	Voltage Steady State (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.2.1
	16.6.2.2b	Low Voltage Conditions (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.2.2b
	16.6.2.3b	Momentary Undervoltage Operation (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.2.3b
	16.6.2.4d	Abnormal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_B14DC_16.6.2.4d

Table 9: Section Coverage Table – Category A – 28VDC

Cat. A	Section No.	Test Description	Additional Requirement	File Reference
28VDC	16.6.1.1b(1-2)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.1.1b(1-2)
	16.6.1.1b(3)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.1.1b(3)
	16.6.1.2	Ripple Voltage (dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.1.2
	16.6.1.3b	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.1.3b
	16.6.1.3c	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.1.3c
	16.6.1.3d	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.1.3d
	16.6.1.4b	Normal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.1.4b
	16.6.2.1	Voltage Steady State (dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.2.1
	16.6.2.3b	Momentary Undervoltage Operation (dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.2.3b
	16.6.2.4d	Abnormal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_A28DC_16.6.2.4c

Table 10: Section Coverage Table – Category B – 28VDC

Cat. B	Section No.	Test Description	Additional Requirement	File Reference
28VDC	16.6.1.1b(1-2)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.1.1b(1-2)
	16.6.1.1b(3)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.1.1b(3)
	16.6.1.2	Ripple Voltage (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.1.2
	16.6.1.3b	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.1.3b
	16.6.1.3c	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.1.3c
	16.6.1.3d	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.1.3d
	16.6.1.4b	Normal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.1.4b
	16.6.1.5	Engine Starting Under Voltage Operation (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.1.5
	16.6.2.1	Voltage Steady State (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.2.1
	16.6.2.2b	Low Voltage Conditions (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.2.2b
	16.6.2.3b	Momentary Undervoltage Operation (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.2.3b
	16.6.2.4d	Abnormal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_B28DC_16.6.2.4d

Table 11: Section Coverage Table – Category Z – Other 28VDC

Cat. Z	Section No.	Test Description	Additional Requirement	File Reference
28VDC	16.6.1.1b(1-2)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.1.1b(1-2)
	16.6.1.1b(3)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.1.1b(3)
	16.6.1.2	Ripple Voltage (dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.1.2
	16.6.1.3b	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.1.3b
	16.6.1.3c	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.1.3c
	16.6.1.3d	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.1.3d
	16.6.1.4b	Normal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.1.4b
	16.6.1.5	Engine Starting Under Voltage Operation (dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.1.5
	16.6.2.1	Voltage Steady State (dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.2.1
	16.6.2.3b	Momentary Undervoltage Operation (dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.2.3b
	16.6.2.4d	Abnormal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_Z28DC_16.6.2.4b

Table 12: Section Coverage Table – Category D – Other 270VDC

Cat. D	Section No.	Test Description	Additional Requirement	File Reference
270VDC	16.6.1.1b(1-2)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.1.1b(1-2)_XFMR
	16.6.1.1b(3)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.1.1b(3)_XFMR
	16.6.1.1b(4)	Voltage (Average Value dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.1.1b(4)_XFMR
	16.6.1.2	Ripple Voltage (dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.1.2_XFMR
	16.6.1.3b	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.1.3b_XFMR
	16.6.1.3c	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.1.3c_XFMR
	16.6.1.3d	Momentary Power Interruptions (dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.1.3d_XFMR
	16.6.1.4c	Normal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.1.4c_XFMR
	16.6.1.6	Exposed Voltage Decay Time (dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.1.6_XFMR
	16.6.2.1	Voltage Steady State (dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.2.1_XFMR
	16.6.2.3c	Momentary Undervoltage Operation (dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.2.3c_XFMR
	16.6.2.4e	Abnormal Surge Voltage (dc)	Requires DCR Option & external load	DO160G_D270DC_16.6.2.4e_XFMR