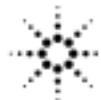


User's Guide

**Agilent Technologies 14761A
Harmonic and Flicker Emissions Tests
for
EN 61000-3-2, EN 61000-3-3,
and EN 60555 Part 2**



Agilent Technologies

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Revisions

Revision codes on the Agilent 14761A HFTS software indicate the current revision. Minor changes to the software such as bug fixes usually do not require a change to the manual. Therefore, the revision number of the software may be higher than the software revision number shown below, yet the information in the manual still applies.

Software changes that require a change to the manual will be accompanied either by a new edition of the manual or an update packet documenting the changes. In that case, the software revision number shown below will be updated to agree with the revision number of the software.

This manual applies to software revision... A.05.03

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Introduction

How to Use this Manual

This manual describes the operation of the Agilent 14761A Harmonic/Flicker Test System (HFTS) software when used in conjunction with the Agilent 6800-Series AC Power Source/Analyzers. Its primary function is as a reference manual. If you have a question about a specific screen or how to perform a certain task, simply turn to the appropriate section of the manual. The manual is organized according to the procedure that you would follow if you were to run a compliance test. This manual assumes that you are familiar with the EN 61000-3-2 and EN 61000-3-3 regulations and their requirements. It also assumes that you are familiar with operating a personal computer in a Microsoft Windows environment.

The manual is organized as follows:

Chapter 1 provides an overview of the regulations and how compliance testing to these regulations is implemented with the Agilent 14761A HFTS software.

Chapter 2 describes how to install the software and get it running. It describes some pitfalls to avoid so that operation of the software will be glitchless and error-free.

Chapter 3 describes what you need to do before you can run a test. There is certain information that you need to provide about the Device Under Test as well as setting up the Agilent 6800-Series AC Power Source/Analyzer.

Chapter 4 explains what happens when the pre-test and the compliance test is run.

Chapter 5 describes how to view the test data both while the test is running and after the test completes.

Chapter 6 describes the software tools available to find and display specific test data.

Chapter 7 explains how to print graphs and test reports.

Appendix A lists the product specifications

Appendix B is a glossary of terms related to the EN 61000-3-2 and EN 61000-3-3 Regulations.

Appendix C is for programmers. It describes the SCPI programming commands that implement the harmonic/flicker tests.

Appendix D explains the class determination logic of the Agilent 14761A HFTS software, and how this logic is used to set test limits.

The Agilent 6800-Series AC Power Source/Analyzers

The Agilent 6800-Series AC Power Source/Analyzers are specifically designed for testing products compliant to the IEC low-frequency emissions regulations for quasi-stationary current harmonics, fluctuating current harmonics, and voltage fluctuations and flicker. The following models provide up to full power coverage of the single-phase regulatory requirements:

Model	rms Voltage	rms Current	peak Current	VA
Agilent 6812B Agilent 6841A	230 Vrms (compliance) 300 Vrms (maximum)	3.3 Arms (compliance) 6.5 Arms (maximum)	40 A	750 VA
Agilent 6813B Agilent 6842A	230 Vrms (compliance) 300 Vrms (maximum)	7.6 Arms (compliance) 13 Arms (maximum)	80 A	1750 VA
Agilent 6843A	230 Vrms (compliance) 300 Vrms (maximum)	16 Arms (compliance) 32 Arms (maximum)	96 A (low range) 48 A (high range)	4800 VA

Each one-box test system contains the capabilities of a stand-alone ac source, power analyzer, flicker meter, and line impedance network. Unlike multiple-box ac source and measurement configurations, the power generation and measurement of the Agilent 6800-Series are controlled by a common internal timebase, and are truly synchronized. This allows precise measurement of harmonics.

In addition to compliance testing, you can also use the Agilent 6800-Series AC Power Source/Analyzers as standard ac sources. The units have a SYSTem:CONFigure command that lets you switch between IEC mode and Normal mode (the default), where the units behave as standard ac sources. When you run the Agilent 14761A HFTS software, the units automatically switch from Normal to IEC mode.

The Agilent 14761A Harmonic/Flicker Test System Software

The Agilent 14761A Harmonic/Flicker Test System (HFTS) software application supports EN 61000-3-2, EN 61000-3-3, and EN 60555 Part 2 compliance testing requirements. The Agilent 14761A HFTS software provides an intuitive graphical user-interface from which you can:

- Set up and run compliance-level tests. The setting up of many IEC details is facilitated through the use of embedded standards expertise.
- Collect real-time test data from the Agilent 6800-Series AC Power Source/Analyzer.
- Display and monitor ongoing test results.
- Save test results.
- Terminate tests based on user-defined criteria.
- Analyze failures or marginal results using advanced test, display, and search options.
- Evaluate the long-term test results compared to pass/fail criteria.
- Print reports and graphs.

See Appendix A for a complete list of supported standards and regulations.

Note A selection in the **Options/Default** menu lets you compliance test to the older EN 60555 Part 2 (IEC 555-2) regulation. The EN 60555-3 (IEC 555-3) regulation is no longer a requirement and has officially been replaced by EN 61000-3-3.

EN 61000-3-2 and EN 60555 Part 2 Regulations

EN 61000-3-2 and EN 60555 Part 2 regulate the magnitude of harmonic currents drawn by products from the ac line. For example, harmonic currents can occur as a result of high peak currents drawn by switch-mode power supplies. Power companies, particularly in Europe, have led a regulatory initiative to limit harmonic current generation at the product level because of a variety of undesirable effects on the mains environment such as: interference with other equipment, overheating of conductors and power factor correction networks, and power transmission losses. Personal computers, peripherals, and variable speed motor drives are examples of the types of products addressed by the regulations.

EN 61000-3-2 and EN 60555 Part 2 actually cover two categories of harmonic currents: quasi-stationary harmonics and fluctuating harmonics. Power supply manufacturers, for example, may be concerned primarily with the first category while product manufacturers may be concerned with both categories. Different measurement techniques are used for determining compliance for the two categories, with more stringent testing requirements applied to testing fluctuating harmonics. In particular, compliance testing for fluctuating harmonics requires non-stop harmonic analysis over extended periods of time. The EN 61000-3-2 regulation applies to class A, B, C, D, and motor-driven equipment.

The EN 60555 Part 2 regulation only applies to class A and class B equipment. This regulation is selected in the **Options/Defaults** menu. See appendix D for information about class determination.

Compliance Testing Implementation

The Agilent 14761A HFTS software compliance tests to EN 61000-3-2 / EN 60555 Part 2 as follows:

- It initializes and programs the Agilent 6800-Series AC Power Source/Analyzer.
- After the pre-test, the software displays one cycle of voltage and current, which represents the average of all half-cycle measurements made during the pre-test, with Class D envelope information superimposed over the waveshapes. Rms voltage, frequency, rms current, peak current, real power, apparent power, power factor, voltage distortion, current distortion, and percent in envelope are displayed as well. An additional display indicates if the harmonic-by-harmonic voltage distortion is either "IN SPEC" or "OUT OF SPEC" as per the regulations for source distortion. This is based on the worst-case results obtained during the pre-test.
- During the compliance test, the software produces a real-time bar graph that represents either the absolute magnitudes of 40 harmonics, or the magnitudes of 40 harmonics expressed as a percentage of the applicable limits. The graph display shows both the maximum measured value and the value of the present data record. The value of the present data record is continually updated while the test is running. A time-series graph is available to display test data for a specific harmonic.
- The software also produces a table that displays either the absolute magnitudes of 40 harmonics, or the magnitudes of 40 harmonics expressed as a percentage of the applicable limits in real-time. The table shows both the peak data values and the present data values. Note that you can also display the data of any **individual** harmonic versus time, either as an absolute magnitude or as a percentage of the allowable limits.
- When testing fluctuating harmonics, the software uses a 2.5 minute sliding window. Within this window harmonic peaks of up to 150% of the steady-state harmonic limits are allowed, provided that these samples do not total more than 10% of the total samples (or 15 seconds of time) within any 2.5 minute observation period. Samples that contribute to a 2.5 minute window failure must fall between 100% and up to 150% of the steady-state harmonic limits. Values greater than 150% of the limits are counted as individual failures.

EN 61000-3-3 Regulation

EN 61000-3-3 regulates the magnitude, rate, and time-duration of **voltage fluctuations** and **flicker** caused by products connected to the ac line. Voltage fluctuations are created by time-varying current drains working against branch circuit impedance that exists in all power distribution networks. Flicker occurs when an incandescent lamp changes in intensity due to the frequency and amplitude of voltage fluctuations in the same branch circuit.

Because flicker is annoying, and for certain individuals presents a health hazard, the regulation seeks to regulate flicker generation to an imperceptible level. A specialized instrument called a flickermeter, which is built into the Agilent 6800-Series AC Power Source/Analyzer, is used to measure flicker in terms of human perceptibility. A perceptibility level of 1 represents the threshold of perception for the average individual.

Note that the EN 60555-3 (IEC 555-3) regulation is no longer a requirement and has officially been replaced by EN 61000-3-3.

Compliance Testing Implementation

The Agilent 14761A HFTS software compliance tests to EN 61000-3-3 as follows:

- It initializes and programs the Agilent 6800-Series AC Power Source/Analyzer.
- After the pre-test, the software shows one cycle of voltage and current, which represents the average of all half-cycle measurements made during the pre-test, with Class D envelope information superimposed over the waveshapes. *Note that the envelope waveshape is provided for information only, the regulation does **not** require Equipment Under Test (EUT) classification.* Therefore, no Percent in Envelope information or Volt THD IN SPEC/OUT of SPEC information is provided. However, information about rms voltage, frequency, rms current, peak current, real power, apparent power, power factor, voltage distortion, and current distortion is provided.
- When the compliance test is run, the software generates a bar graph which displays the short-term flicker (**Pst**) compared to the predetermined test limits at the end of each integration period. The graph shows the maximum measured value and the present value .
- During the compliance test, the software produces a bar graph that displays the selected time range of rms voltage values. This graph effectively shows the time-series of rms voltage variations produced by the varying load currents flowing through the reference impedance.
- Probability and distribution graphs reflect a statistical view of the raw data used to generate the **Pst** graph at the end of each integration period. Note that long term flicker (**Plt**) data is generated during post processing after the test has completed . This information is included in the long form report.
- Summary values for maximum rms voltage deviation (**Dmax**), steady-state voltage change (**Dc**), and the time interval during which the voltage deviation exceeds the prescribed limit (**Dt**), are displayed at the bottom of each display. These are the maximum values for each parameter within the presently displayed integration period.
- The software also displays the time-series for instantaneous flicker, which can be useful for diagnosing faults in the equipment under test.

Installation

Install the Software

NOTE: A README.TXT file is included on the installation disks. It contains product updates or corrections that are not documented in this manual. Use any text editor to read this file.

The Agilent 14761A HFTS software (p/n 5063-2363) comes on two disks. When installed, it requires 5 Mbytes of hard disk space, 8 Mbytes of RAM, and 512 Kbytes of conventional memory. It also requires the correct interface card drivers to be installed on your PC. See “Installing Interface Card Drivers”.

1. Place Disk #1 in the A drive of your computer.
2. In the Windows Program Manager, run A:\SETUP
3. Follow the directions on your screen. During the installation procedure, you will be asked to specify an installation directory on your hard disk (the default is C:\HFTS5).
4. You will also be asked to select default voltage and frequency settings for the equipment that you will be testing (choose either 120 Vac/ 60 Hz or 230 Vac/ 50 Hz). This option may help in avoiding the accidental applications of damaging voltages to the equipment under test. This option may be changed at any time in the Standard Test Options window.

NOTE: Before you run the Agilent 14761A HFTS software, make sure that:

- No LAN software is running
 - No screen savers are running. Press **Ctrl Esc** to check the Windows Task List. Also check the Control Panel Desktop application.
 - If you have Power Management Software running on your PC, make sure that any power management modes such as Sleep or Standby are turned off while the tests are running.
-

Connect the Equipment

To use the Agilent 14761A HFTS software, install or connect the following equipment to your computer.

1. Make sure that an Agilent GPIB or a National GP-IB interface card with the appropriate drivers has been installed in your computer. See “Installing Interface Card Drivers”.
2. Install the Agilent 6800-Series AC Power Source/Analyzer and connect it to the computer.
3. Set up the AC Power Source/Analyzer for **remote sensing** at the input terminals of the equipment under test. Failure to do this will result in inaccurate output voltage programming.
4. Turn on your computer and Agilent 6800-Series AC Power Source/Analyzer. Setup is complete. However, in order for this software to operate, you must install a driver for your GPIB card.

Installing Interface Card Drivers for Windows 3.1 or 3.11 Systems

- If you are using an Agilent 82335 GPIB card, install the driver software from the I/O Libraries CD-ROM (E2094) that came with the card. Open the \win31\disk1 directory on the CD-ROM and run setup.exe. If you do not have this CD-ROM, you may purchase it through a local Agilent Sales and Support office.
- If you are using an Agilent 82340, 82341, or 82350 GPIB card, the CD-ROM that came with the card (Agilent E2094F) may contain driver software only for Windows 95 and Windows NT. In that case you should obtain the latest version of this CD-ROM (Rev F.01.02 or later), which also contains drivers for Windows 3.1. Open the \win31\disk1 directory on the CD-ROM and run setup.exe.
- If you are using a National Instruments GPIB card, install the associated Windows 3.x driver. You may have received a disk containing this driver when you purchased the card. Also, at the time this guide was written, the newest drivers were available from www.ni.com. Install the latest version of NI-488.2.

Installing Interface Card Drivers for Windows 95 Systems

- If you are using an Agilent 82335, 82340, 82341, or 82350 GPIB card, install the driver software from the I/O Libraries CD-ROM that came with the card. If this CD-ROM is an E2094F or later, run setup.exe in the CD-ROM's root directory. If the CD-ROM is an E2094E, open the \win95nt\disk1 directory on the CD-ROM and run setup.exe. If you do not have this CD-ROM, you may purchase it through a local Agilent Sales and Support office.
- If you are using a National Instruments GPIB card, install the associated Windows 95/98 driver. You may have received a disk containing this driver when you purchased the card. Also, at the time this guide was written, the newest driver was available from www.ni.com. Install the latest version of NI-VISA or NI-488.2.

Installing Interface Card Drivers for Windows NT 4.0 Systems

- If you have an Agilent 82335 GPIB card, this card will NOT operate under Windows NT. You should purchase an Agilent 82340, 82341, or 82350 GPIB card through a local Agilent Sales and Support office.
- If you are using an Agilent 82340, 82341, or 82350 GPIB card, install the software from the I/O Libraries CD-ROM that came with the card. If this CD-ROM is an Agilent E2094F or later, run setup.exe in the CD-ROM's root directory. If this CD-ROM is an E2094E, open the \win95nt\disk1 directory on the CD-ROM and run setup.exe. If you do not have this CD-ROM, you may purchase it through a local Agilent Sales and Support office.
- If you are using a National Instruments GPIB card, install the associated Windows NT driver. You may have received a disk containing this driver when you purchased the card. Also, at the time this guide was written, the newest driver was available from www.ni.com. Install the latest version of NI-VISA or NI-488.2.

Verify the Configuration

Once your equipment and software are installed, click on the **Start** button and select **Programs | Regulatory Test Solution | Harmonic and Flicker Emissions**. (For Windows 3.1, click on the HFTS

icon to run the software.) When the software is run, it automatically searches for an interface card and queries the Agilent 6800-Series AC Power Source/Analyzer for its model number. Verify that your configuration is correct as follows:

1. Select the **New** button in the Welcome Window
2. In the **Options** menu, select the **Configure...** command. This displays a Configuration dialog box on the screen. The Configuration Dialog box contains the following fields:

- The **Interface Name** identifies the interface session when using an SICL interface. The application determines the default interface name by checking which interface driver is installed in your system. If “HP” is the interface type, the Interface Name list box displays all of the SICL names presently configured in the Windows 95 system. (SICL interface names are assigned to the ac source in the interface card’s configuration utility.) For Windows NT systems, the list box displays hpib7 as the default interface name. If “National” is the interface type, the Interface Name box displays the following pre-defined GPIB names: GPIB0, GPIB1, GPIB2, or GPIB3.
- The **I/O Address** displays the address of the Agilent 6800-Series AC Power Source/Analyzer. The instrument address can be read or set using the front panel **Address** key.
- The **Interface Type** is either HP, National, or File only.
- The **HFTS Model #** is the instrument model that you are controlling.
- The **HFTS Serial #** is where you enter the serial number of instrument that you are controlling.(this is optional)
- Enter the date the instrument was last calibrated (this is optional)
- Enter the calibration approval name (this is optional)

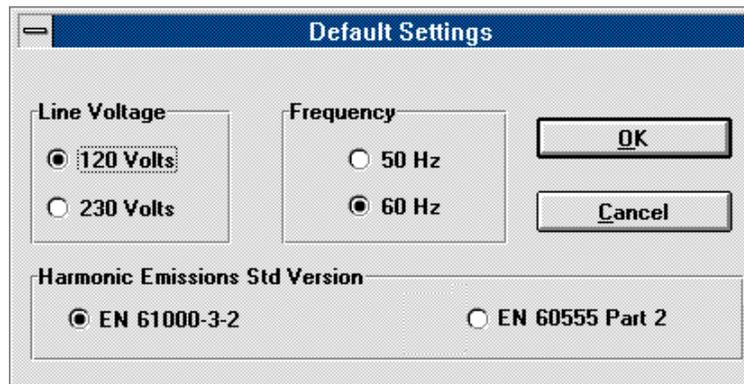
Pressing the **Discover** button causes the software to search for an interface card and query the Agilent 6800-Series AC Power Source/Analyzer for its model number. Any equipment that is located is then displayed in the appropriate fields in the configuration dialog box.

Pressing **Write as Defaults** updates the HFTS.INI file with the information that has been entered in this dialog box either by the user or by the **Discover** feature. These default values are used during subsequent start-ups of the Agilent 14761A HFTS software to confirm system configuration.

Press **OK** to accept the changes, or **Cancel** to cancel the changes and exit the dialog box.

Default Settings

In the Options menu, select Defaults to view the default settings. The following settings are configurable:



- The line voltage and frequency that will be applied to the equipment under test.
- The quasi-stationary/fluctuating harmonics regulations version that you will be testing to. Select either EN 61000-3-2 or the older EN 60555 Part 2 regulation.

Press **OK** to accept the defaults, or **Cancel** to cancel the changes and exit the dialog box.

Getting Around in the Application

There are two ways to access the various functions of this application:

1. From the drop-down menus at the top of the screen, or
2. From the menu tabs at the bottom of the screen.

*The menu tabs at the bottom of the screen are the same as the **View** menu commands.*

Drop-down Menu

The following commands are located in the drop-down menus at the top of the screen.

File	
New...	Lets you select a new test
New From Template...	Lets you select a new test but applies an existing set-up template
Open...	Opens an existing test
Save	Saves the presently opened test
Save As...	Saves the present test under a new name
Lock Test File	Sets the attribute of a completed test file to read only
Edit Template..	Lets you edit a template
Save As Template...	Saves only the template information of the presently opened test
Print Pre-test	Lets you print the currently displayed pre-test screen
Print Report...	Lets you print the currently displayed report
Print Graph/Table...	Lets you print the currently displayed graph or table
Printer Setup...	Lets you change the printer setup
Exit	Exits the application

Edit	
Copy Table	Copies highlighted information from the table to the Clipboard
Copy Graph	Copies the presently displayed graph to the Clipboard
View	
Main	Lets you select the type of test to run
Test Setup >	Lets you select the test set-up parameters
Pre-test	Lets you run the pre-test
Test	Lets you run the test
Display >	Lets you view specific test results
Report >	Lets you view the test report
Options	
Local Lockout	Lets you disable the front panel keys of the Agilent 6800-Series AC Power Source/Analyzer.
Validation Mode	Lets you run a special mode used to validate current harmonics testing methodology.
Configure...	Lets you specify the I/O slot address of the interface, the instrument address, the interface type, and the Agilent 6800-Series AC Power Source/Analyzer model number.
Defaults...	Lets you view and change the default values for line voltage, frequency, and test standards.
Mains	
Auto On/Auto Off	Automatically controls the output of the Agilent 6800-Series AC Power Source/Analyzer while the test is running.
Auto On/Manual Off	Lets you manually turn off the output of the Agilent 6800-Series AC Power Source/Analyzer from the Test window. Provides automatic turn-on at the beginning of pretests and tests.
Manual On/Auto Off	Lets you manually turn on the output of the Agilent 6800-Series AC Power Source/Analyzer from the Test window. Provides automatic turn-off at the completion of pretests and tests.
Manual On/Manual Off	Lets you manually control the output of the Agilent 6800-Series AC Power Source/Analyzer from the Test window.
Help	
Contents	Accesses the Help contents.
Using Help	Explains how to use the on-line help.
About	Displays the Agilent 14761A HFTS software revision.
Mains ON/ Mains Off	Indicates the present state of the ac source output.

Menu Tabs

The menu tabs that are located at the bottom of the screen let you easily access the primary functions of the Agilent 14761A HFTS software. These functions are also available from the file menus. Altogether, there are five groups of menu tabs:

The **Main** level group accesses the following functions:



The > symbol in the tab label indicates a lower-level of tabs, which access a number of additional screens. Once at the lower level, the **^** tab returns you to the Main Level. When active, the [last tab] in the series jumps to the last lower-level tabs that you had previously accessed.

The following tabs appear in the **Test Setup>** group. Each tab accesses its respective function.



The following tabs appear in the **Pre-test>** group. Each tab accesses its respective function.



The following tabs appear in the **Display>** group for Quasi-stationary or Fluctuating Harmonic testing. Each tab accesses its respective function.



The following tabs appear in the **Display>** group for Voltage Fluctuation testing. Each tab accesses its respective function.



The following tabs appear in the **Report>** group. Each tab accesses its respective function.

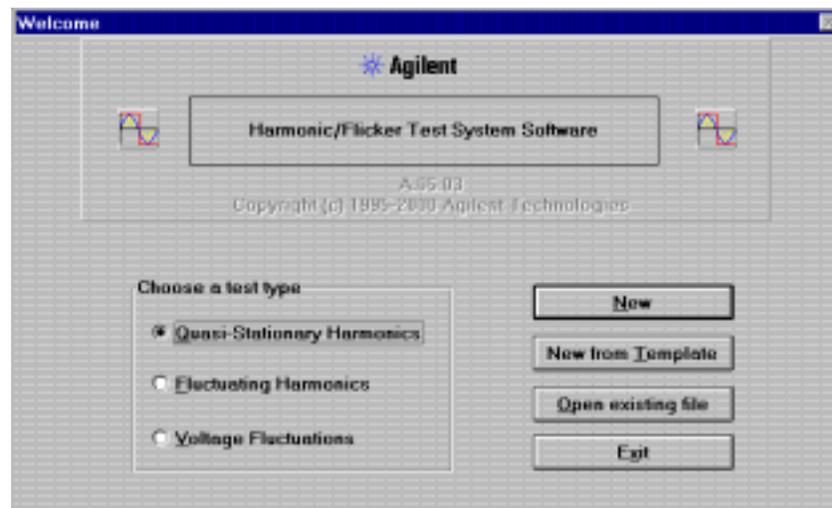


Setting Up the Test

If you have not already done so, click on the Agilent HFTS icon to run the software. Now you can set up your test. If the Agilent HFTS icon does not appear on your computer, go back to chapter 2 and install the Agilent 14761A HFTS software.

Select a Test Type

When you first run the Agilent 14761A HFTS software, the Welcome window appears.



Select a test type from the Welcome Window.

1. Click on either Quasi-stationary Harmonics, Fluctuating Harmonics, or Voltage Fluctuations

Note To select a different test after you get past the Welcome window, use the drop-down **File** menu commands

2. Choose to configure a new test, run an existing test, or configure a new test based on an existing template. *Note that these selections are also available in the File menu.*

- Selecting **New** opens the Main window, in which you start entering test setup information about the test that you will be running. If you want to run other tests of the same type using the same setup information, consider saving this information to a template file once the setup has been established.

3 - Setting Up the Test

- Selecting **New From Template** opens a dialog box that lets you select a template file which contains previously-configured test setup information. This template information will be copied into your new data file. The template itself is not changed unless you make subsequent changes to your setup and save them into the template using “Save as Template.”. When you run the test, the test data will then be added to the information obtained from the template. You can modify the template defaults and set up data as required for the new test or use the values supplied by the template. The following file extensions are used to identify template files:
 - .**stt** template files for quasi-stationary harmonic tests
 - .**flt** template files for fluctuating harmonic tests
 - .**fkt** template files for voltage fluctuation tests

The default directory for template files is `C:\hfts\template`

- Selecting **Open Existing File** opens a dialog box that lets you select a data file which contains setup information and may or may not contain pre-test as well as test data. This lets you examine previously run test data or replace old test data with data obtained from a new test run. The following file extensions are used to identify data files:
 - .**sta** data files for quasi-stationary harmonic tests
 - .**flu** data files for fluctuating harmonic tests
 - .**flk** data files for voltage fluctuation tests

The default directory for data files is `C:\hfts`

Note Running a pre-test or a test after opening an existing file will cause all existing data to be overwritten with new data. You can prevent this from occurring by checking the **Make test data read-only** option in the **Test** window before running a test, or by using the **Lock Test File** command in the File menu.

Create a Template

Template files contain setup information for the test that you will be running. Using templates can save valuable time by eliminating the need to enter repetitive data each time you set up a test.

The screenshot shows the HFTS software interface. The title bar reads "HFTS Quasi-Stationary Harmonics EN61000-3-2 test - TEST.STA". The menu bar includes "File", "Edit", "View", "Options", "Mains", and "Help". The status bar shows "MAINS OFF" and "Main". The main window contains the following fields:

- User Name:** HFTS Design Team
- Company Name:** Hewlett-Packard
- Test Description:** Video display monitor
- Device Under Test ID:** D1194A
- Test ID:** 000101

The navigation bar at the bottom shows tabs for "Main", "Test Setup >", "Pre-test >", "Test", "Display >", and "Report >". The status bar at the very bottom displays "Elapsed: 00:02:00", "Remaining: 00:00:00", "IEC Class A", "Idle: PASSED", and "Failures: 0".

Create a template by entering information into the **Main** and the **Test Setup** windows. Use the Tab key to move among the different fields.

1. Enter the following information into the text boxes of the **Main** window:
 - your name
 - the company name
 - a brief description of the test procedure that you will be running
 - a device ID such as a model number
 - a test ID such as a serial number or test number that uniquely identifies the test
2. Use the menu tabs on the bottom of the screen to access the Test Setup windows. *Note that you can also access the Test Setup windows from the View Menu.*
3. Starting with the **Standard Test Setup** window, select and configure each of the following Test Setup windows as needed: **Standard**, **Advanced**, and **Termination**
4. Select **Save as Template** in the **File** menu to create a template file. Once created, the template file may be used to quickly create new tests by adding or editing only the information that must be changed for each test. This is useful if you are conducting a series of tests or testing similar equipment that is subject to a standardized test.

Select the Test Setup Options for Quasi-stationary or Fluctuating Harmonics

Standard Test Options

Standard options specify the line voltage, line frequency, test time, and device class for compliance tests. They are selected in the Standard window.

The screenshot shows the 'Standard' window of the HFTS Quasi-Stationary Harmonics EN61000-3-2 test software. The window title is 'HFTS Quasi-Stationary Harmonics EN61000-3-2 test - TEST.STA'. The menu bar includes 'File', 'Edit', 'View', 'Options', 'Mains', and 'Help'. The status bar at the top right shows 'MAINS OFF' and 'Setup -> Standard'. The main area contains four sections: 'Line Voltage' with radio buttons for 120V, 230V (selected), and Variable; 'Line Frequency' with radio buttons for 50 Hz (selected) and 60 Hz; 'Time Parameters' with a 'Test Duration' field set to 10.00000 minutes and a '# of Records' field set to 1875; and 'Device Class' with radio buttons for Class A (selected), Class B, Class C, and Class D, and a checkbox for 'Motor Driven Device'. Below these sections, it says 'Advanced Options: Disabled'. At the bottom, there is a navigation bar with tabs for 'A', 'Standard' (selected), 'Advanced', and 'Termination'. The status bar at the very bottom shows 'Elapsed: 00:02:00', 'Remaining: 00:00:00', 'IEC Class A', 'Idle: PASSED', and 'Failures: 0'.

- Select the line voltage that will be applied to the equipment under test. Selecting **Variable** lets you enter a value other than 120 Vac or 230 Vac.
- Select the line frequency (50 or 60 Hz) that will be applied to the equipment under test.
- Select the test duration in **seconds, minutes, hours, or days**. The **# of Records** field displays the number of data records that will be taken during the test time that you have specified. Note that the relationship between time and the number of records per second is a function of line frequency and measurement window type. The measurement window type is specified in the **Advanced Test Setup** window, and is set to a default of **Rectangular**.
- Select from one of the following device classes for your equipment under test to which the EN 61000-3-2 regulation applies:
 - Class A:** All equipment except that stated in one of the remaining three classes.
 - Class B:** Portable electrical tools, which are hand held during normal operation and used for a short time (a few minutes) only.
 - Class C:** Lighting equipment, including dimming devices.

Class D: Equipment having an input current with a "special wave shape" (e.g. equipment with off-line capacitor-rectifier ac input circuitry and switch-mode power supplies) and an active input power ≤ 600 W. The active power is defined as Watts. For the Class D mA/W limits to apply, the active power must also be greater than 75 W.

Motor Driven Device: Check this box if the equipment you are testing is a motor-driven device. This will cause class A limits to be used in accordance with EN 61000-3-2 regardless of the input current waveshape.

Note The EN 60555 Part 2 regulation only applies to Class A and Class B equipment. The Agilent 14761A HFTS software will reflect this based on the regulations selection made in the **Options/Defaults** menu. See appendix D for information about class determination.

Advanced Test Options

The advanced test options may be used to modify test conditions outside the range permitted for compliance tests. They are selected in the Advanced window. Generally, you would not change the factory default settings if you are doing compliance testing because the changes may invalidate the test.

As an exception to the above statement, the Current Measurement Range setting and the Current Limit settings may be changed without invalidating the compliance test as long as the changed settings do not cause current limiting to occur **during** the test. Current limiting may occur during the time period when power is initially applied but before the test is run. This time delay may be specified in the Advanced Setup window for tests, and in the Pre-test window for pre-tests. Current limit errors are detected and displayed if they occur during the test. Note that you can also set test limit overrides $< 100\%$ without automatically flagging the test as non-compliant.

The screenshot shows the 'Advanced Options' window for the HFTS Quasi-Stationary Harmonics EN61000-3-2 test. The window title is 'HFTS Quasi-Stationary Harmonics EN61000-3-2 test - TEST.STA'. The menu bar includes File, Edit, View, Options, Mains, and Help. The status bar shows 'MAINS OFF' and 'Setup -> Advanced'.

The main content area contains several sections:

- Use System Defaults for Advanced Options:** A checkbox that is currently unchecked.
- Current Limit:**
 - RMS Limit: 13.1 Amps (with a 'Default' checkbox that is unchecked).
 - Peak Current: 40.0 Amps (with a 'Default' checkbox that is unchecked).
- Window Type:** Radio buttons for Rectangular (selected), Hanning, and Default (checked).
- Current Measurement Range:** Radio buttons for High (selected), Low, and Default (checked).
- Test Limit Overrides:**
 - Harmonic Failure Thresholds: 100.0 % of spec (with a 'Default' checkbox that is checked).
 - Pre-test Data (Class D):
 - Measured: 267.1 Watts
 - Override: 270.0 Watts (with a 'Default' checkbox that is unchecked).
- Measurement Delay:**
 - Apply Power: 10.0 seconds before initiating measurements (with a 'Default' checkbox that is checked).

At the bottom, there is a navigation bar with tabs for 'A', 'Standard', 'Advanced' (selected), and 'Termination'. The status bar at the very bottom shows 'Elapsed: 0:00:10:00', 'Remaining: 0:00:00:00', 'IEC Class D', 'Idle: PASSED', and 'Failures: 0'.

3 - Setting Up the Test

- Select the rms and peak current limit of the Agilent 6800-Series AC Power Source/Analyzer that you will be applying to the equipment under test. (The Agilent Model 6843A only has rms current limit control, therefore, the peak current limit control does not appear.) Generally, it is best to leave these parameters set to their maximum default values. Although the function of the current limit is to protect the equipment under test, if the ac source goes into current limit during a normal test the test will be invalid. Default maximum current limit values are automatically established based on the model number that you entered into the Main window.

Note The Agilent 6800-Series AC Power Source/Analyzer can supply brief peak currents that exceed its current capability. If this occurs for an extended time with Agilent 6812B/6841A and 6813B/6842A models, the units may activate an internal protection circuit (the SOA limit) to turn the output off. If the equipment that you are testing causes the Agilent 6800-Series AC Power Source/Analyzer to turn its output off, you may need to lower the peak current limit setting. This will clip the output current of the Agilent 6800-Series AC Power Source/Analyzer during inrush but if properly set, will not interfere with the normal running of the pre-test and tests.

- Select the measurement **window type** (Rectangular or Hanning)
- Select the peak **current measurement range** of the Agilent 6800-Series AC Power Source/Analyzer

	6812B <u>6841A</u>	6813B <u>6842A</u>	<u>6843A</u>
Low Range	8 A peak	8 A peak	9.6 A peak
High Range	80 A peak	80 A peak	96 A peak

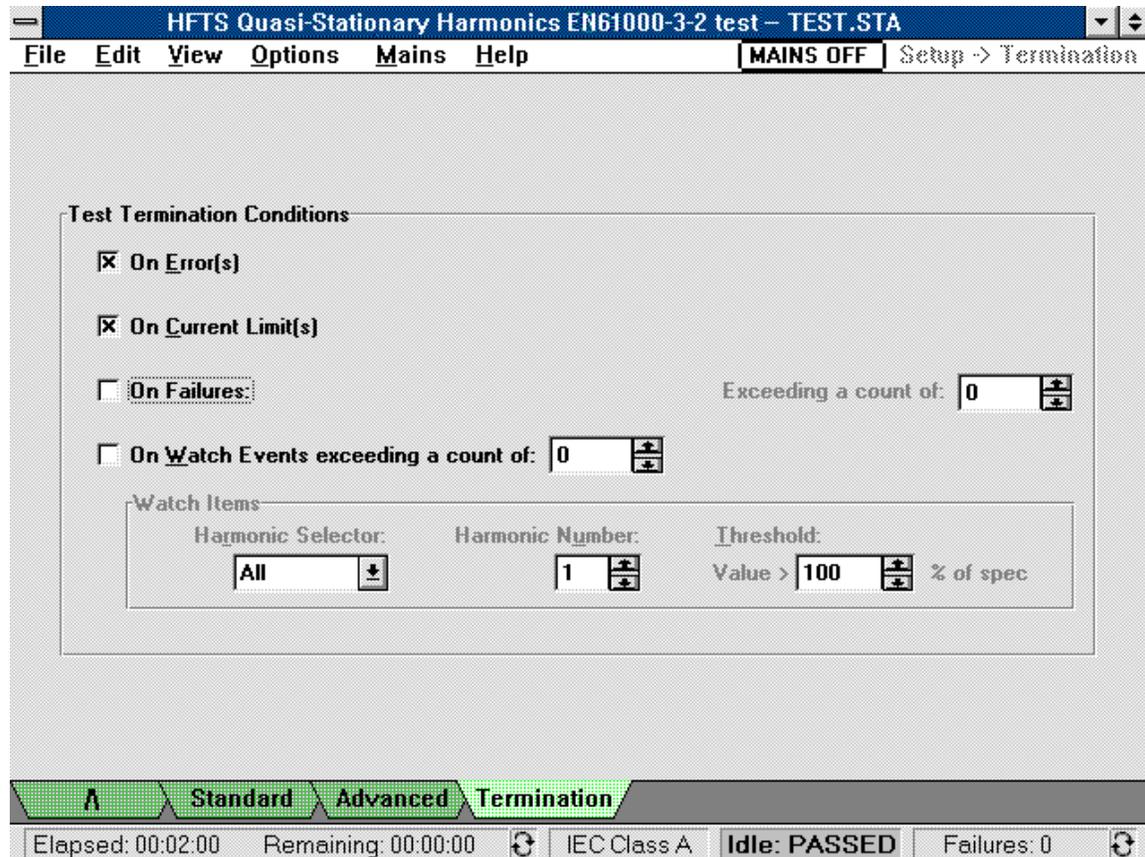
Because of its better measurement resolution, use the low range when testing low power equipment. However, be careful that the equipment under test never exceeds the peak currents indicated in the above chart or the test results will be invalid.

- Select a **test limit override** for the harmonic failure threshold. This is specified as a percent of the limit as defined by the applicable regulation. For Class C, test limits are also a function of the measured (or user-specified) power factor and the line current at the fundamental frequency. If necessary, you can override the power factor measured in the pre-test. For Class D, test limits are also a function of real power (or watts). If necessary you can also override the watts measured in the pre-test. Overrides are useful to prevent minor changes in measured values from changing the test limits each time the test is run.
- Select a **measurement delay** from the time power is applied to the equipment under test until the time that the Agilent 6800-Series AC Power Source/Analyzer starts measuring data. According to EN 61000-3-2, this delay must be 10 seconds or less for compliance level fluctuating harmonic tests. Note that the measurement delay has no consequential impact on test results. This is because during the "delay to start of test" portion of both the pre-test and main test, test results are not recorded and current limiting events are ignored. However, once the actual acquisition of measurement data begins, current limit events are again treated as errors that invalidate the test. Since high inrush currents usually occur only during the first few mains cycles following application of mains voltage, a properly set current limit threshold will not be crossed once the "delay to start of test" period has ended.

Test Termination Options

Termination options let you select the conditions that will terminate the test. They are selected in the Termination window.

Note The following conditions terminate any test automatically if the Agilent 6800-Series AC Power Source/Analyzer operating limits are exceeded: Rail fault condition, Overtemperature, Overvoltage, and SOA. Refer to the applicable ac source User's Guide for an explanation of these conditions.



- Select termination on errors. One error will terminate the test when this is selected:
UNR - when the output becomes unregulated.
- Select termination when the current limit is exceeded. The two current limit conditions that will terminate the test when this occurs are: CL - when the output goes into current limit mode, and CP - when the output current limit protection has tripped.
- Select termination upon exceeding a specified number of failures. When testing **fluctuating harmonics** and this box is checked, you can specify failures:
of any type,
with a 2.5 minute window
without a 2.5 minute window.
- Select termination on exceeding a specified number of watch events. Each event that satisfies the selected criteria is counted as one event occurrence.

3 - Setting Up the Test

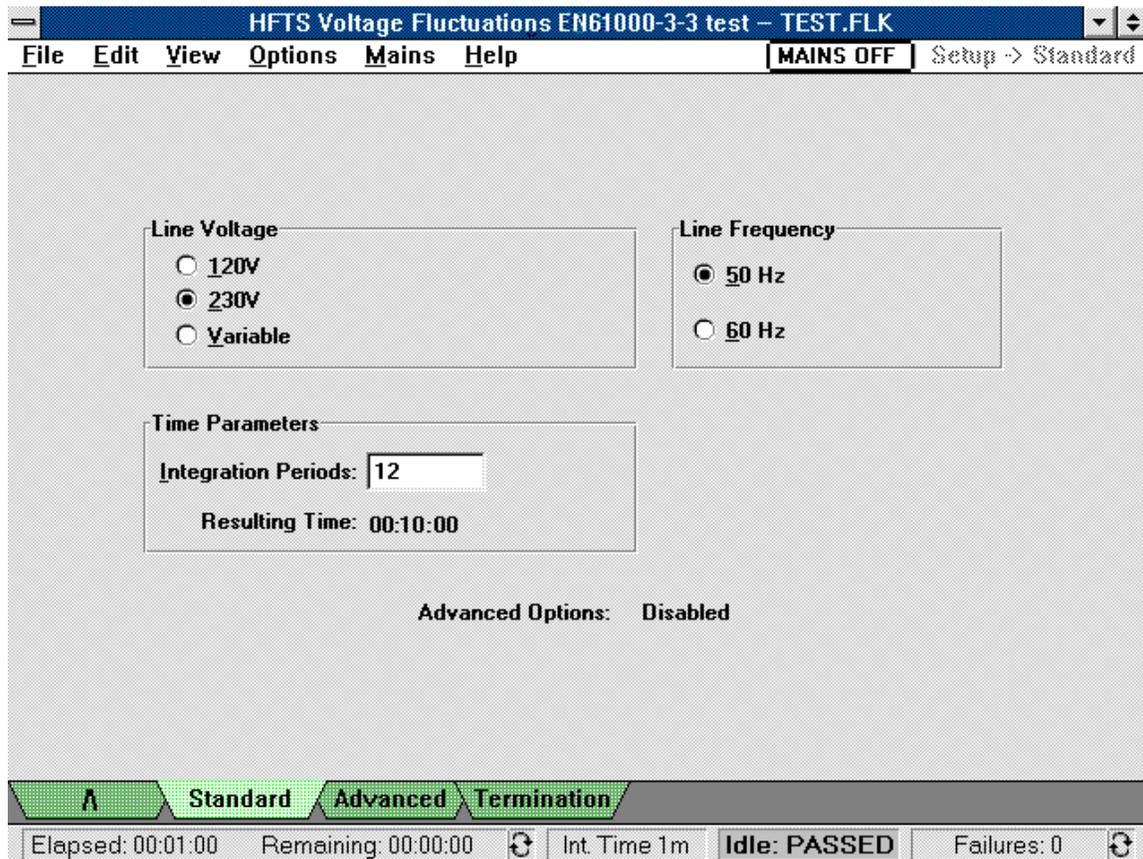
If termination **On Watch Events** is enabled, you can select the following **Watch Items** criteria:

- **All** harmonics greater than the specified percent of threshold
- **Odd** harmonics greater than the specified percent of threshold
- **Odd** ≤ 19 harmonics greater than the specified percent of threshold
- **Even** harmonics greater than the specified percent of threshold
- **Nth**, a specific **Harmonic Number** that is greater than the specified percent of threshold

Select the Test Options for Voltage Fluctuations

Standard Test Options

Standard options specify the line voltage, line frequency, and test time for compliance tests. They are selected in the Standard window.



- Select the line voltage that you will be applying to the equipment under test. Selecting **Variable** lets you enter a value other than 120 Vac or 230 Vac.
- Select the line frequency (50 or 60 Hz) that will be applied to the equipment under test.

- Select the number of integration periods to be acquired during the test. The **Resulting Time** field displays the test duration based on the number of integration periods as well as the Pst integration time that you have specified in the Advanced window. The Pst integration time is set to a default of 10 minutes with the Advanced options disabled.

Advanced Test Options

The screenshot shows the 'Advanced Test Options' window for the 'HFTS Voltage Fluctuations EN61000-3-3 test - TEST.FLK'. The window has a menu bar with 'File', 'Edit', 'View', 'Options', 'Mains', and 'Help'. A status bar at the top right shows 'MAINS OFF' and 'Setup -> Advanced'. The main area contains several sections:

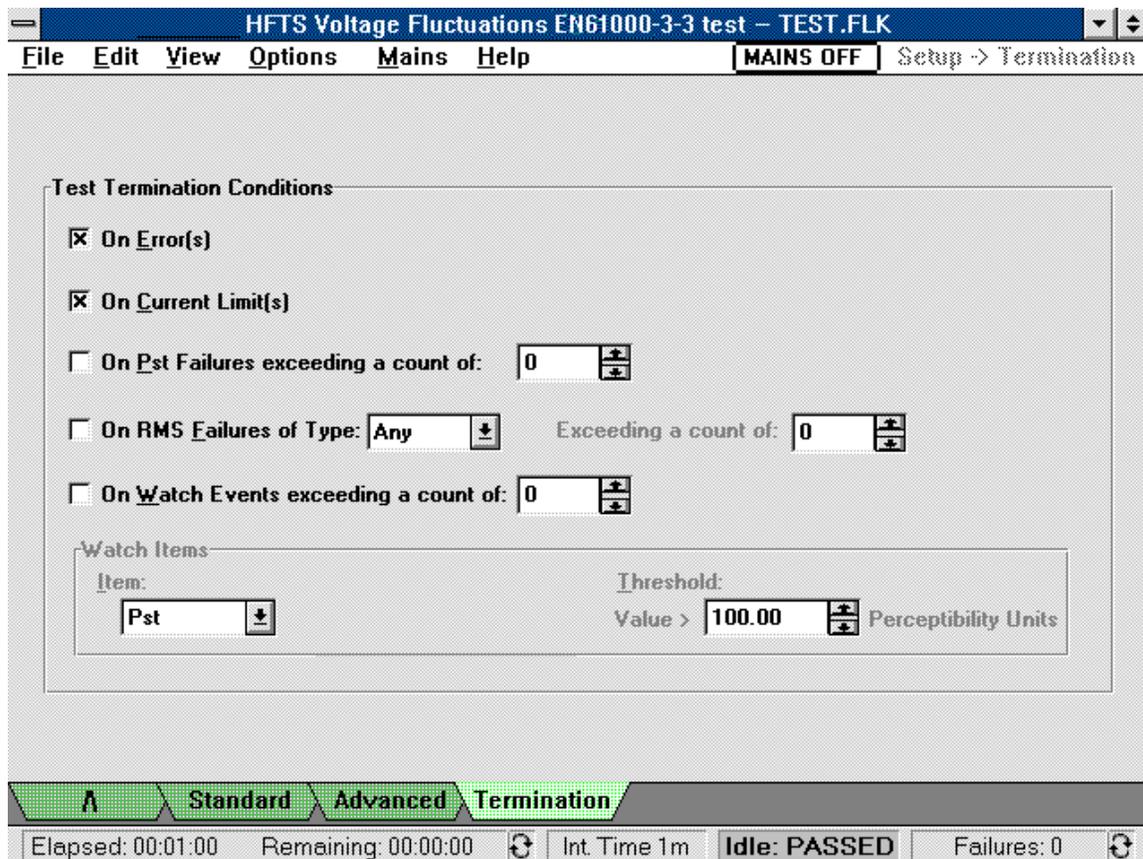
- Use System Defaults for Advanced Options:** A checkbox that is currently unchecked.
- Current Limit:** Two input fields. 'RMS Limit' is set to 7.5 Amps with a 'Default' checkbox checked. 'Peak Current' is set to 40.0 Amps with a 'Default' checkbox checked.
- Returned Data Type:** Three radio button options: 'All' (selected), 'Pst/RMS Summary' (with a 'Default' checkbox checked), and 'BMS/Flicker Time Series'.
- Pst Integration Time:** Four radio button options: '1 minute' (selected), '5 minutes', '10 minutes', and '15 minutes'. A 'Default' checkbox is present but unchecked.
- Test Limit Overrides:** Two input fields. 'Pst/Plt Thresholds' is set to 100.0 % of spec with a 'Default' checkbox checked. 'RMS Thresholds' is set to 100.0 % of spec with a 'Default' checkbox checked.
- Measurement Delay:** An input field for 'Apply Power' is set to 10.0 seconds before initiating measurements with a 'Default' checkbox checked.

At the bottom, there is a navigation bar with tabs for 'A', 'Standard', 'Advanced' (which is highlighted), and 'Termination'. Below this is a status bar showing 'Elapsed: 00:01:00', 'Remaining: 00:00:00', 'Int Time 1m', 'Idle: PASSED', and 'Failures: 0'.

- Select the **rms** and **peak** current limit of the Agilent 6800-Series AC Power Source/Analyzer that you will be applying to the equipment under test. Generally, it is best to leave these parameters set to their maximum default values. Although the function of the current limit is to protect the equipment under test, if the unit does go into current limit during a normal test, the test will be invalid.
- Select the **returned data type** (All, Pst/Rms Summary, or Rms/Flicker Time Series)
- Select the **Pst** (or short-term) flicker **integration time**.
- Select a **test limit override** for the Pst/Plt Thresholds (short-term/long-term flicker) and Rms Thresholds. This is specified as a percent of the specification in the applicable regulation.
- Select a **measurement delay** from the time power is applied to the equipment under test until the time that the Agilent 6800-Series AC Power Source/Analyzer starts measuring data.

Test Termination Options

Note The following conditions terminate any test automatically if the Agilent 6800-Series AC Power Source/Analyzer operating limits are exceeded: Rail fault condition, Overtemperature, Overvoltage, and SOA. Refer to the ac source User's Guide for more information.



- Select termination on errors. One error will terminate the test when this is selected: UNR - when the output becomes unregulated.
- Select termination when the current limit is exceeded. Two current limit conditions will terminate the test when this occurs: CL - when the output goes into current limit mode; CP - when the output current limit protection has tripped.
- Select termination on exceeding a specified number of Pst failures
- Select termination on exceeding a specified number of Rms voltage failures. You can specify Rms voltage failures: of **any** type
 - Dmax** failures
 - Dc** failures
 - Dt** failures.
- Select termination on exceeding a specified number of watch events. Each event that satisfies the selected criteria is counted as one event occurrence.

If termination **On Watch Events** is enabled, you can select the following **Watch Items** criteria:

- **Pst** values greater than the specified perceptibility units
- Instantaneous **Flicker** values greater than the specified perceptibility units

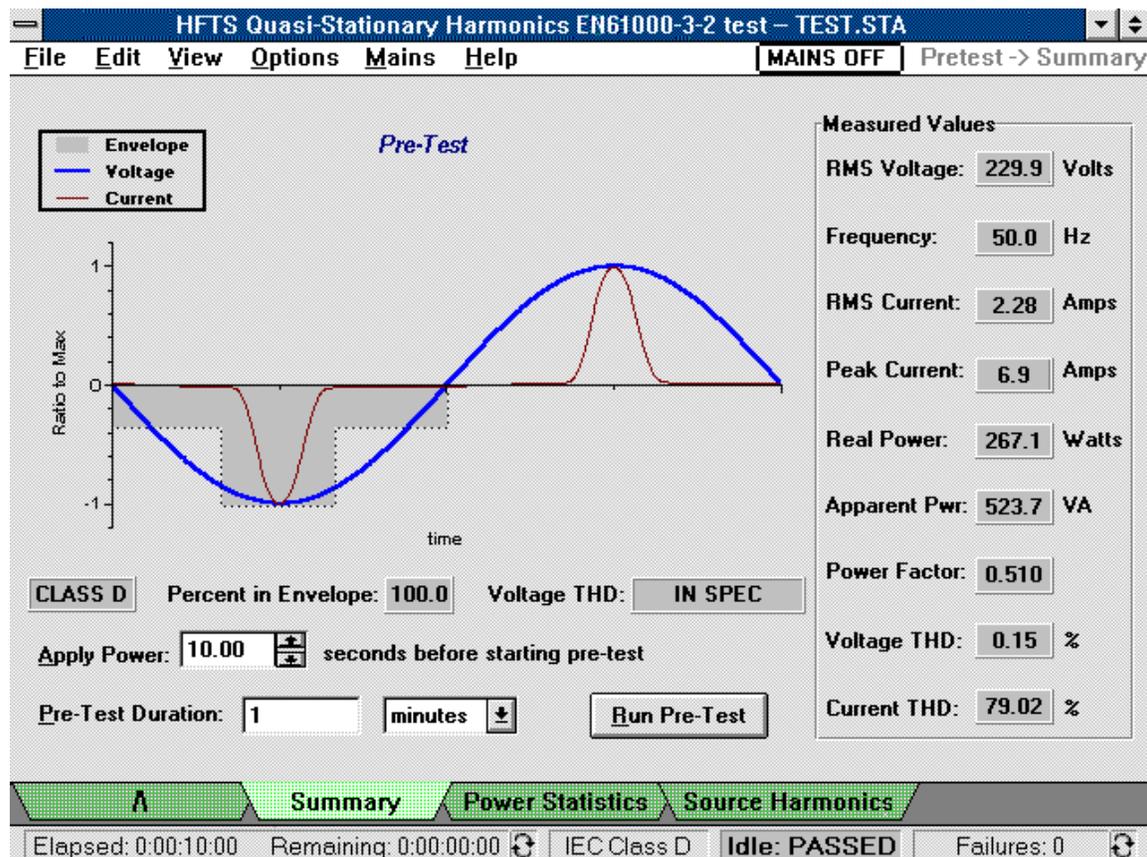
Running the Test

Before actual test data can be acquired, the pre-test must be run. This is accomplished in the **Pre-Test** window. As its name implies, the Pre-Test window centralizes functions that, following test setup, need to be performed prior to running an actual test. This includes running preliminary tests to measure quantities that are subsequently used to set test limits for Class C and Class D devices. Once the pre-test data is available, the main test can be started. This is accomplished in the **Test** window. Test status information is displayed in the Status bar on the bottom of the screen. Note that you must always have pre-test results present before running the main test.

To Run a Pre-test for Quasi-stationary or Fluctuating Harmonics

Pre-Test Summary

1. Select the **Pre-test** menu tab on the bottom of the screen to access the Pre-test Summary window. You can also access the Pre-test window from the **View/Pre-test** menu.



2. If desired, change the time delay from when power is applied until the pre-test is run. The default pre-test time is 10 seconds.

4 - Running the Test

3. It is also possible to increase the duration of the pre-test. One purpose of running a longer pre-test is to obtain more data over which the test results are averaged. Additional data more accurately characterizes the worst-case operation of the equipment under test (see “Pre-test Measurements” for more information).
4. Press the **Run Pre-test** button to run the pre-test.

Note Running a pre-test from a file that already contains data will not only overwrite the pre-test data, but will also delete the existing test data.

5. Use the **Print Screen** command located in the **File** menu to print the Pre-test window.

For Quasi-stationary and Fluctuating Harmonic tests, the pre-test checks if you have correctly classified your equipment as Class D versus any other class in the Standard Test Setup window. It displays the input-current waveshape of the equipment under test, which lets you examine the waveshape for “fit” into the Class D special waveshape window.

- The **Pre-test graph** displays one cycle of voltage and current, superimposed on the Class D waveshape window. The current cycle that is superimposed in the Class D waveshape window is the half-cycle having the highest peak value within a single 16-cycle snapshot taken at the end of the pre-test interval (see “one-shot measurements” later in this chapter for more information). Press the **Power Statistics** tab if you need to configure the active power requirements for determining Class D limits, or if you need to display additional power measurement information.
- The **Class Indicator** displays a green background if the data collected from the equipment under test matches the Class selection. If the data collected from the equipment under test does not match the Class selection, the Class indicator displays a red background. In this case you should return to the Standard Test Setup window, select the correct class, and rerun the pre-test. Refer to appendix D for information about the class determination logic of the Agilent 14761A HFTS software.

NOTE: Class D equipment must have input power $> 75 \text{ W}$ and $\leq 600 \text{ W}$, **and** 95% of its input-current waveshape must fall within the Class D waveshape window. For EN 61000-3-2 testing, devices generating Class D waveforms but NOT meeting all Class D input power criteria will be tested using Class A limit values for odd harmonics. If testing against limits for even harmonics is also desired, select Class A. Testing a device that meets the Class D “special waveshape” with Class A selected, results in compliant test reports if the “Motor Driven Device” checkbox, available for EN 61000-3-2 testing, is also selected.

- The **Percent in Envelope** indicator displays the percentage of waveform data within the Class D waveshape standard if Class A or Class D has been selected.
- The **Voltage THD** “IN SPEC” or “OUT OF SPEC” indicator summarizes the results of testing to determine if the output voltage of the ac source is within the harmonic voltage limits as specified in EN 61000-3-2/EN 60555-2. The voltage THD results are based on measurements of *individual* voltage harmonics up to the 40th harmonic, and a comparison of these measurements to the limits specified in the regulations. Select the **Source Harmonics** tab to display the individual worst-case voltage harmonics that occurred during the pre-test.
- The **Measured Values** area on the right side of the display summarizes nine of the most common mains input characteristics (see “Pre-test Measurements” for more information).

Pre-Test Power Statistics

Use To Set Limits

- Maximum Power 267.1 Watts
- Mean Power 262.5 Watts
- Standard Deviation 0.51 Watts
- Percentile 95 265.3 Watts

Percentiles

	Value(Watts)	
100	267.1	↑
95	265.3	
90	260.2	
85	259.4	
80	258.2	↓

Scale Increment

- 10 Percentile
- 5 Percentile
- 1 Percentile

Navigation tabs: A Summary Power Statistics Source Harmonics

Status bar: Elapsed: 0:00:10:00 Remaining: 0:00:00:00 IEC Class D Idle: PASSED Failures: 0

This screen provides additional information about the active input power of the device under test. It displays the following power measurements, which are calculated at the end of the pre-test:

- Maximum Power in watts (default selection for setting Class D limits)
- Mean Power in watts
- Standard Deviation in watts
- specified Percentile in watts

The Percentiles area displays the results of a statistical evaluation of the active input power during the pre-test. Percentile values are displayed according to the selected scale increment. Scale increments of 10, 5, or 1 may be specified. A scale increment of 1 displays all percentile values.

If you are testing Class D equipment, the **Use to set limits area** is active, letting you specify what type of Watts measurement will be used by the Agilent 14761A HFTS software as the basis for calculating Class D test limits. Select from: Maximum Power (the default), Mean Power, or specified Percentile. This provides you with greater flexibility for specifying Class D test limits.

Note: Based on your selection, you can see what the Class D test limits will be by accessing the **Display Table** window. The Class D limits are shown in the Limits column. You can also override the pre-test watts measurement later in the **Advanced Test Setup** window in the Test Limit Overrides section.

Pre-Test Source Harmonics

	Limit(%)	Limit(Abs)	Max(%)	Max(Abs)
1			100.0	120.02
2	0.2	0.240	0.004	0.005
3	0.9	1.080	0.040	0.049
4	0.2	0.240	0.006	0.007
5	0.4	0.480	0.048	0.058
6	0.2	0.240	0.001	0.002
7	0.3	0.360	0.065	0.078
8	0.2	0.240	0.001	0.001
9	0.2	0.240	0.059	0.071
10	0.2	0.240	0.005	0.006
11	0.1	0.120	0.057	0.068
12	0.1	0.120	0.002	0.003

This screen displays the pre-test voltage data for harmonics 1-40 on a worst-case basis. The **Limit(%)** column indicates the permissible limits for each harmonic expressed as percentages of the fundamental voltage. For 230 V/50 Hz power distribution systems, these are:

- No limits for the 1st harmonic (the fundamental)
- 0.9% of $V_{\text{fundamental}}$ for 3rd harmonic
- 0.4% of $V_{\text{fundamental}}$ for 5th harmonic
- 0.3% of $V_{\text{fundamental}}$ for 7th harmonic
- 0.2% of $V_{\text{fundamental}}$ for 9th harmonic
- 0.1% of $V_{\text{fundamental}}$ for even harmonics from 2 to 10
- 0.1% of $V_{\text{fundamental}}$ for all harmonics from 11 to 40

The **Limit(Abs)** column indicates the permissible limits for each harmonic expressed as absolutes (in volts). These values are obtained by multiplying the %limits divided by 100 times the measured minimum value for the fundamental component. There are no limits for the fundamental.

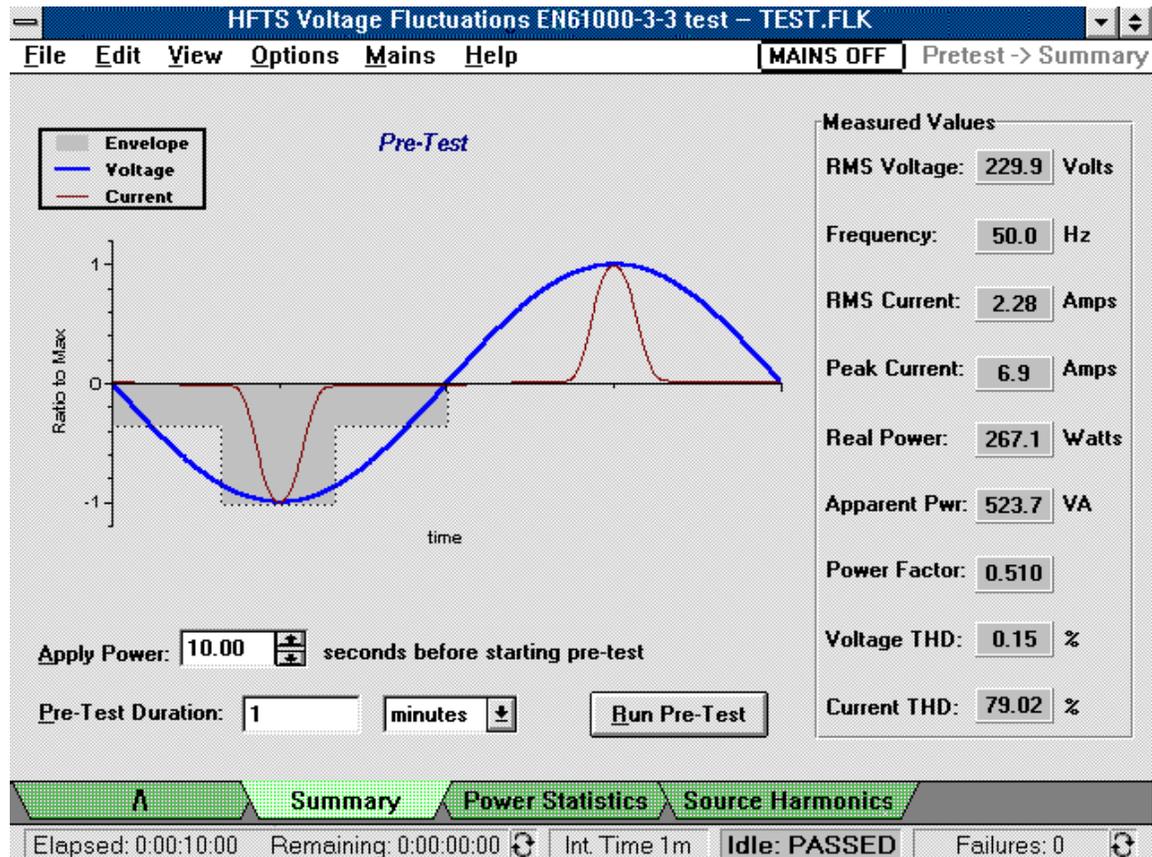
The **Max(%)** column indicates the maximum pre-test values for harmonics 2 through 40 expressed as percentages. These values are obtained by dividing the maximum harmonic values by the minimum fundamental value and multiplying by 100. Failures are indicated in red.

The **Max(Abs)** column indicates the maximum pre-test values for harmonics 2 through 40 expressed as absolutes (in volts). These values are simply the maximum values of the voltage harmonic data returned during the pre-test. Failures are indicated in red.

To Run a Pre-test for Voltage Fluctuations

Pre-Test Summary

1. Select the **Pre-test** menu tab on the bottom of the screen to access the Pre-test Summary window. You can also access the Pre-test window from the **View/Pre-test** menu.



2. If desired, change the time delay from when power is applied until the pre-test is run. The default pre-test time is 10 seconds.
3. It is also possible to increase the duration of the pre-test. One purpose of running a longer pre-test is to obtain more data over which the test results are averaged. Additional data more accurately characterizes the worst-case operation of the equipment under test (see “Pre-test Measurements” for more information).
4. Press the **Run Pre-test** button to run the pre-test.

NOTE: Running a pre-test from a file that already contains data will not only overwrite the pre-test data, but will also delete the existing test data.

5. Use the **Print Screen** command located in the **File** menu to print the Pre-test window.

For the Voltage Fluctuations test, the pre-test waveform display is not required by EN 1000-3-3. It does however, provide information about the input waveform and other measured parameters for the equipment under test. For example, any abnormalities in the input waveform will be apparent in this

4 - Running the Test

display. The tabular data displayed in this window provides a permanent record of the test conditions that existed at the time of the voltage fluctuations test.

- The **Measured Values** area on the right side of the display provide a record of the test conditions at the time the voltage fluctuations pre-test was run.
- The **Output Impedance** of the Harmonic/ Flicker Test System is automatically set to the requirements of IEC 1000-3-3 when testing for Voltage fluctuations. For 230 V/50 Hz power distribution systems, the reference value is $0.4 + j 0.25 \Omega$ (lumped phase and neutral per IEC 725). This corresponds to 796 μH for the inductive component.

NOTE: The output impedance is set to a minimum during the pre-test. This is done to permit evaluation of ac source performance under the worst-case loading condition possible for the equipment under test.

Pre-test Measurements

Pre-test measurement data is collected using the following measurement processes:

<u>Measurement</u>	<u>Method</u>	<u>Measurement</u>	<u>Method</u>
Rms voltage	Rms	Power factor	Watts/VA
Frequency	One-shot	Voltage THD	One-shot
Rms current	Rms	Current THD	One-shot
Peak Current	Estimated	Voltage harmonics	Peak
Real power	Average	Current waveform	One-shot
Apparent power	Vrms x Irms		

Average, rms, and peak measurements are based on a long-term acquisition process that is determined by the duration time specified in the Pre-test window. Varying the test duration time increases the amount of data upon which the measurements are based.

- **Average** measurements are made by acquiring N measurements, totaling the acquired values, and multiplying by 1/N.
- **Rms** measurements are made by acquiring N measurements, totaling the square of the values, multiplying by 1/N, and then taking the square root. Vrms and Irms values returned with the pre-test data are used to calculate Vrms and Irms over integration periods specified by the pre-test duration control.
- **Peak** method measurements are made by returning the highest value obtained during the specified integration period.

- **Voltage THD** is calculated by:
$$THD = \frac{\sqrt{\sum_{n=2to40} (Max_harmonic_n)^2}}{V_{rms}} * 100$$

For voltage harmonics, this is the highest rms value encountered during the pre-test for each individual voltage harmonic.

- The **Estimated peak current** measurement is implemented by multiplying the integrated Irms value by the crest factor of the current waveform. Crest factor is calculated by dividing the peak

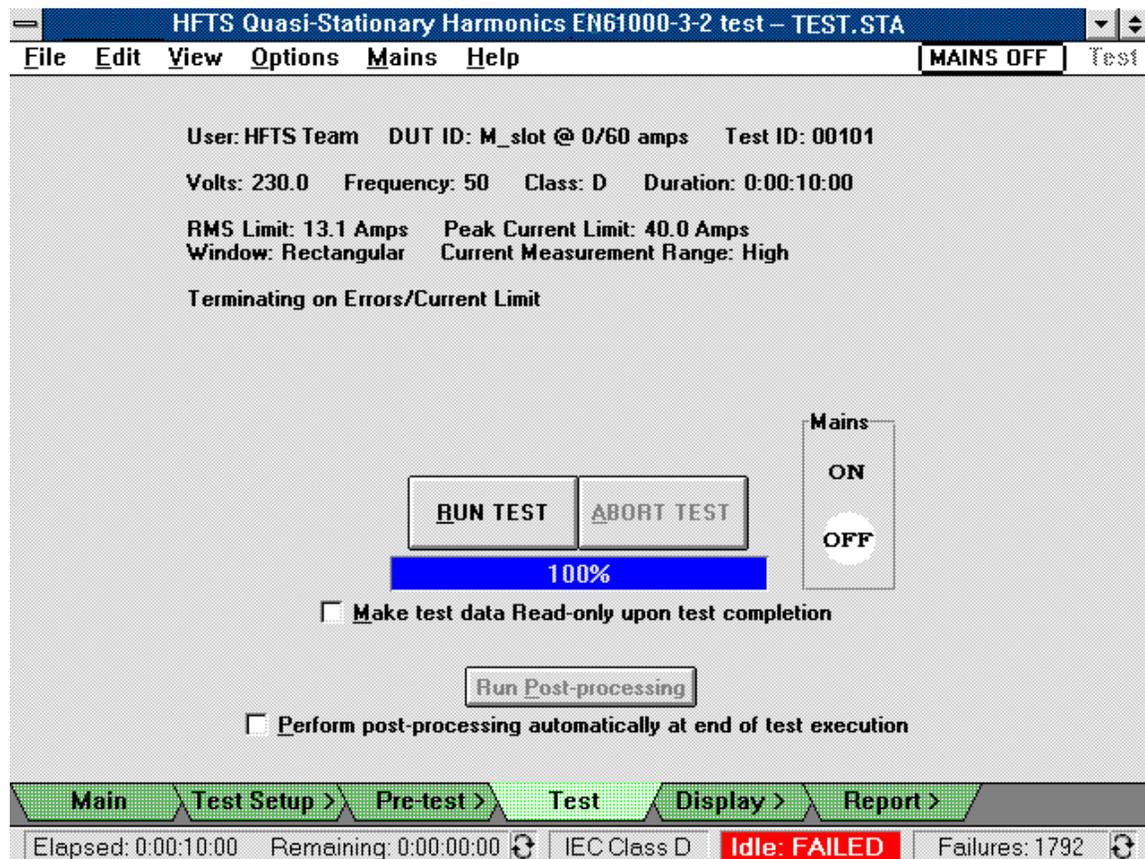
value of the waveform by a one-shot rms current value obtained from the waveform data record. The quality of this measurement is a function of the variability of the current waveform crest factor over the integration period used for the corresponding rms current measurement.

- **VA**, and **Power Factor** measurements are made by using rms and average results in calculations

One-shot measurements are based on the acquisition of a single snapshot measurement, which is acquired from a single acquisition buffer of 4096 data points. The number of cycles of the mains frequency is determined by the mains frequency selection in the Standard Test Setup window, and the measurement window selection in the Advanced Test Setup window. Refer to the discussion of the MEAS:ARRAY:CURR:HARM command in Appendix C for details about the sample rate based on the aforementioned selections. Note that one-shot measurements are not affected by test duration time.

To Run a Test

1. Select the **Test** menu tab on the bottom of the screen to access the Test window. Note that you can also access the Test window from the **View** menu.



2. You can instruct the Agilent 14761A HFTS software to save the test data in a read-only file. Selecting this option will permit subsequent review and analysis of the test results, but will **prevent** running a new test that will overwrite the test data. This action may be taken after the test is run by using the **Lock Test File** command in the File menu.

4 - Running the Test

3. Select **Perform post processing automatically at end of test execution** to process test data immediately after the completion of the test. Post processing is required to generate test reports and to generate data for the Statistics and Probability displays. Depending on the length of the test, the post processing of data may require considerable time. Alternatively, you can post process the test data at a later time by opening the test file and pressing the **Run Post processing** button.
4. Press the **Run Test** button to run the test.

Note The drop-down menu commands are not available while the test is running.

The Test window presents a summary of the test setup for the selected test type. The progress bar on the screen indicates the remaining time until completion of the test. Pressing the **Abort Test** button lets you abort the test at any time. All of the information up to the time that the test is aborted is saved in the data file.

If **Perform post processing automatically** is checked, post processing will automatically be performed on all test data even if the test is aborted.

The **Mains** control lets you control the output from the Agilent 6800-Series AC Power Source/Analyzer. This software control acts the same as the Output On/Off button on the front panel of the unit. Use the Mains menu to configure the Mains control. Pushbuttons appear in the mains control area when it is active. When the control is inactive, the pushbuttons do not appear but are replaced by a round circle that indicates the output state. A white circle indicates the output is off. A red circle indicates the output is on. The Mains field on the menu bar at the top of the screen also indicates the present state of the output.

Note If you use the Output On/Off button on the front panel of the unit to turn the output on or off, the Mains control does not reflect the changed condition on the output until you exit and then re-enter the Test window. This action updates the Mains control display.

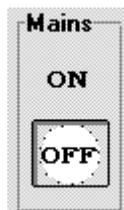
Configure the Mains control using the Mains menu. Note that the configuration of the Mains control is saved when you exit the Agilent 14761A HFTS software. When you run the Agilent 14761A HFTS software again, the unit will wake up with the output set according to the state in which you left the Mains switch .

Auto On/Auto Off



The output of the Agilent 6800-Series AC Power Source/Analyzer is automatically controlled by the Agilent 14761A HFTS software while pre-tests and tests are running. No pushbuttons appear on the control. The pictured control indicates that the output is presently off.

Auto On/Manual Off



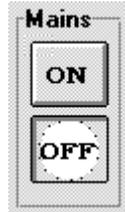
The OFF pushbutton is active, letting the operator manually turn the output of the Agilent 6800-Series AC Power Source/Analyzer *off* from the Test window. The output is never *automatically* removed from the equipment under test if Auto On/Manual Off is selected. The pictured control indicates that the output is presently off.

Manual On/Auto Off
(see caution)



The ON pushbutton is active, letting the operator manually turn the output of the Agilent 6800-Series AC Power Source/Analyzer *on* from the Test window. The pictured control indicates that the output is presently off.

Manual On/Manual Off
(see caution)



Both OFF and ON pushbuttons are active, providing full manual control of the output of the Agilent 6800-Series AC Power Source/Analyzer from the Test window. When Manual On/Manual Off is selected, the operator must use the Mains control to *manually* apply and remove the ac output from the equipment under test. The pictured control indicates that the output is presently off.

CAUTION: To guarantee uninterrupted ac power to the device under test when using Manual On mode, it is essential to place the Agilent 6800-Series AC Power Source/Analyzer in IEC mode **before** applying power to the device under test. In other words, do not apply power to the device under test unless you are already running the Agilent 14761A HFTS software.

Test Status Information

Refer to the Status Bar on the bottom of the screen for more information about the test. The status bar contains the following information:

Elapsed: This field displays the elapsed time of the test and the remaining time of the test. It may also display the number of data records that have accumulated since the start of the test and the number yet to be acquired.

Remaining:
or

Records: Clicking on  switches between Elapsed/Remaining time and Records/Remaining.

Remaining:

IEC Class or **INT:Time** During compliance testing for Quasi-stationary or Fluctuating harmonics, this field displays the device class that you selected in the Standard test-setup window. During compliance testing for Voltage fluctuations, this field displays the Pst integration time that is specified in the Advanced test-setup window .

Idle or **Running** This field displays whether the test is idle or running. It also indicates if a test has been aborted.

Errors or **Failures** This field displays a running total of errors and failures that occur when the test is running. Clicking *inside* this field with the mouse brings up a dialog box that displays a more complete report of failure types and errors.

Clicking on  switches the status bar field between the number of Errors and the number of Failures.

Validation Mode

Validation Mode is a special mode used to validate the software, hardware, and test method used to test to the harmonic current emissions regulation. It is not intended to be a formal proof of performance. Validation Mode should only be used with the Quasi-Stationary Harmonics test type selected. It cannot be used with Voltage Fluctuations. Additionally, validation of Voltage Fluctuations can be accomplished without running Validation Mode.

Note Validation Mode is intended to be used with a high-power resistive load connected to the 6800-Series AC Power Source/Analyzer output, and should never be used with typical equipment under test connected to the output. The 6800-Series AC Power Source/Analyzer must have firmware revision A.00.07 or later.

To access Validation Mode:

1. Click on the Options drop-down menu at the top of the screen.
2. Click on “Validation Mode” to place a check mark next to the menu item. The checkmark indicates that Validation Mode is on.
3. Run the harmonic current Pre-test or Test with Validation Mode turned on. Validation Mode limits the Pre-Test and Test duration to a maximum of 30 seconds.

The intent of Validation Mode is to provide a controlled output current of known harmonic content, which is subsequently measured during a harmonic current test. This is accomplished by applying the Gibbs Phenomenon to an output voltage squarewave. In this case, the resulting validation waveform is a squarewave function with all harmonic content above the 39th harmonic removed. The waveform has overshoots and ringing near the square wave transitions. This output voltage is used to drive a high-power resistive load, resulting in an output current of known harmonic content.

The harmonic current test methodology can be validated by comparing the measured test results from a 30 second harmonic current test with the known theoretical values of the validation waveform. The measured test results must be evaluated to ensure the measurements do not exceed the total error allowed by the harmonic current emissions regulation. Contact your local Agilent Sales and Support Office for more information.

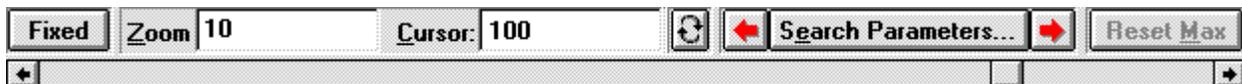
Viewing Test Data

During test runs, data is continuously acquired and displayed in the various Display windows. Use the menu tabs on the bottom of the screen or the **View** menu to access the various displays. Use the Navigator toolbar on the top of the screen to scroll through the test record or search for specific test data in the test record.

Note Refer to chapter 7 for information on printing graphs, tables and reports. Chapter 7 also explains how to print reports to a file.

Navigator Toolbar

The toolbar on the top of the screen, referred to as the Navigator toolbar, contains the following controls:



Rolling | Fixed

This control toggles between Rolling and Fixed. **Rolling** indicates that the display is continually being updated with the latest data. **Fixed** indicates that either the test has completed, or the display is not presently being updated with new data. If a test is underway, the test is still busy collecting data in the background although the display has stopped updating.

Clicking on **Rolling** stops updating the display and sets the control to “Fixed”.

If a test is presently underway, clicking on **Fixed** returns the display to “Rolling“, where the display resumes being updated with the latest data. When the test has completed the control remains set to “Fixed”.

Zoom | Span

This field is only active when the display is set to Fixed.

Span lets you specify the range of test data that you want to examine. The span can be specified in units of time (seconds, minutes, or hours) or by data record. Refer to the Glossary for more information about the information contained in each data record according to test type.

Zoom lets you zoom in on individual data values in the time-series test data displays.

Clicking on  switches between units of time and record number.

Cursor

This field is only active when the display is set to Fixed. It lets you position the cursor at a specific location in the test data. You can position the cursor by time or at a specific data record. Refer to the Glossary for more information about the information contained in each data record according to test type.

5 - Viewing Test Data

Search Parameters	This control is only active when the display is set to Fixed. It puts up a dialog box that lets you search for specific items in the test data that you are presently viewing. Clicking on the red ◀ button initiates a search backward in time from the present cursor location. Clicking on the red ▶ button initiates a search forward in time from the present cursor location.
Reset Max	This control only applies to the harmonic Graph and Table displays. It is only active when the display is set to Rolling. It resets the maximum values in the Graph and Table displays to the to the present value, which eliminates any previous peak hold settings. Note that this button only affects the display; it does not change any of the test data that is being stored in the database by the present test.
Scroll Bar	The scroll bar is only active when the display is set to Fixed. It lets you access all of the data in the test. Clicking on the black ◀ and ▶ buttons slides the scroll button □ through the data. Each time the ◀ and ▶ buttons are clicked, the cursor moves one data record. You can also click on the scroll bar to move the button through the data, or drag the □ button directly. Each time the scroll bar is clicked, the cursor moves one span width.

For **Quasi-stationary** or **Fluctuating harmonic** tests, the following data display formats are available: Graph, Table, Time-Series, Statistics, and Probability. *Information appears in the Statistics and Probability windows only after the test has completed and post processing has been performed.*

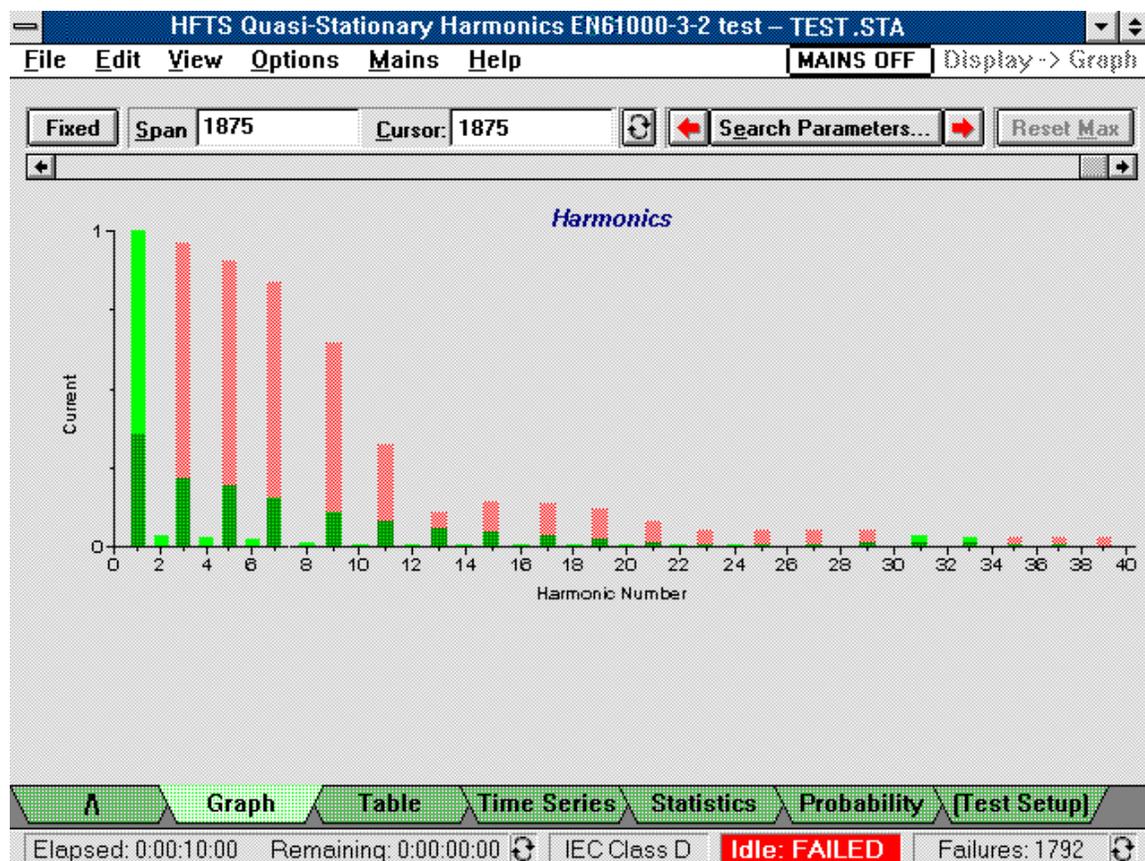
For **Voltage Fluctuations** tests, the following data display formats are available: Pst, Probability, Distribution, RMS, and Flicker. *Data in the Pst, Probability, and Distribution windows is updated only at the end of each integration period or at the end of the test.*

Viewing Quasi-stationary and Fluctuating Harmonics

Graph Display

The Graph display is used to view quasi-stationary or fluctuating harmonic data. Note that the amount of test data displayed in the graph may be limited by the Span control. See “Using the Span Control” in chapter 6 for details.

Note	To edit the graph , click with the right mouse button on any area of the graph. This puts up the Edit Graph Attributes dialog box, which lets you configure items such as the graph axes and the graph span. Refer to “Editing the Graph Attributes” later in this chapter for details.
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The Graph display presents the following test data in a graphical format:

- **40 harmonics** including the fundamental, along the X axis.
- the **harmonic magnitude** along the Y axis in absolute values. You can edit the graph to display the data according to % of limit on the Y-axis as described in the next section.
- the **maximum measured value** of each harmonic is indicated by the height of each bar. When the test is running (Rolling mode), the top of the bar is the maximum peak-hold value. When the test has finished or if Fixed mode is selected during a test run, this value is the maximum value within the selected span.

Light green indicates that the maximum value is within the regulation's specification. Light red indicates that one or more measured values are outside the specification.

- the **present value** of each harmonic is indicated by the solid part of each bar. When the test is running (Rolling mode), this value is always the latest measured value. After the test has finished, or if Fixed mode is selected during a running test, this value is the value at the present cursor location.

Green indicates that the present value is within the regulation's specification.

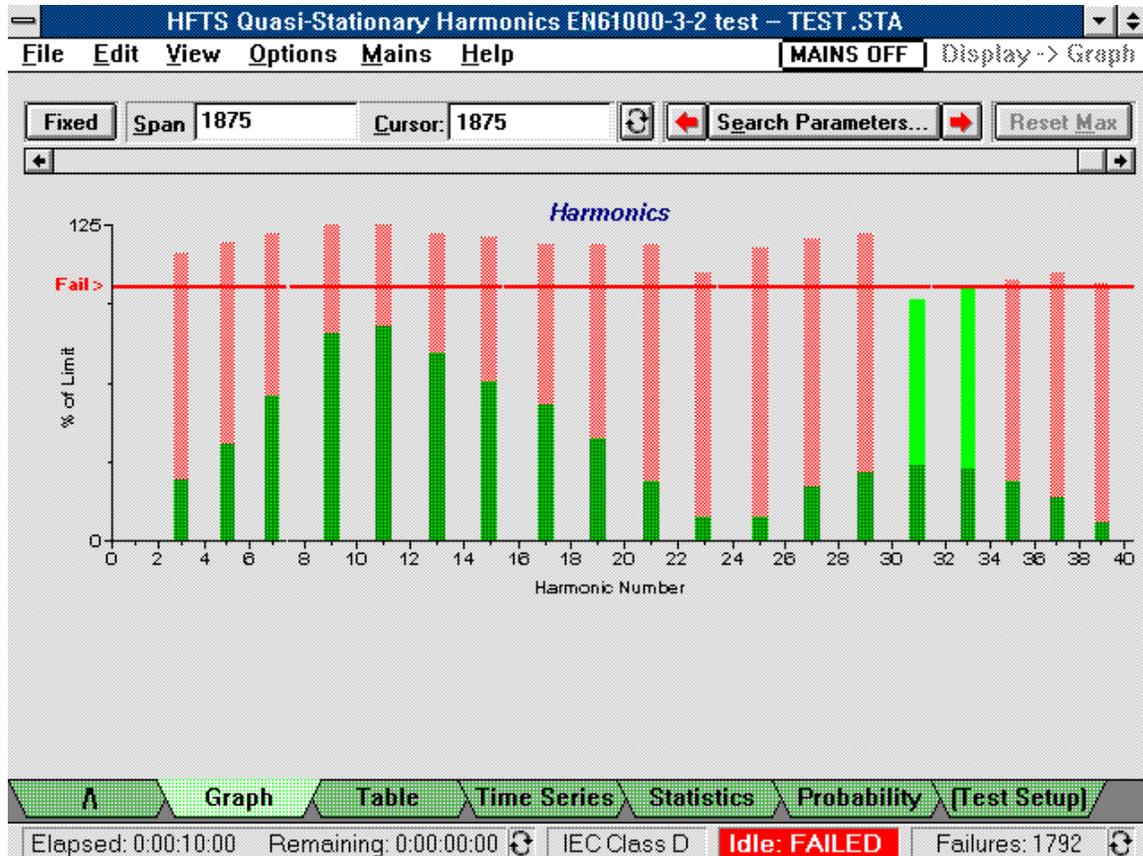
Red indicates that the present value is outside the specification.

- **detailed information** on any bar can be obtained by holding down the **Shift** key and double-clicking on a bar. This highlights the selected bar in white and puts up a dialog box which displays a complete report of data points, failure types, and errors for the selected harmonic.

5 - Viewing Test Data

Displaying Data According to % of Limit on the Y-Axis

Click with the **right** mouse button on any area of the graph. This puts up the Edit Graph Attributes dialog box, in which you can reformat the y axis to display the data in percent of the specification limits rather than in absolute values. In this case the display appears as follows:



The red line that appears across the display indicates the specification's limits. All values above the line are outside the specification's limits.

Search Parameters

When the display is set to **Fixed**, you can perform search functions on specific test data. Search options let you

- **Search for** specific items such as:
 - **single** failures
 - **2.5 minute** failures (only applies to fluctuating harmonics)
 - **all** failures (only applies to fluctuating harmonics)
 - **harmonic magnitudes** > than the specified value (specify **AMPS** or **% of Spec.** in the Edit Graphs dialog box)
- specify **Harmonic Selection** criteria for the following harmonics:
 - **Odd** harmonics
 - **Even** harmonics
 - **Odd ≤ 19** harmonics
 - **All** harmonics
 - **Nth** harmonic (specify a harmonic number)

Table Display

The Table display is used to view Quasi-stationary or Fluctuating harmonic data. Note that the amount of test data displayed in the table may be limited by the Span control. See “Using the Span Control” in chapter 6 for details.

Note: You must have run post-processing in the Test window to generate data for the **standard deviation** column as well as the **50%, 75%, 90%, and 95%** failure count columns of the table. This information is calculated from **all** of the test data after the test completes.

	Limits	Amperes	%	Mean Amperes	Mean %	Max Amperes
1		0.3546		0.1462		2.0115
2		0.0001		0.0001		0.0326
3	0.9082	0.2160	23.8	0.0890	9.8	(1.6863)
4		0.0004		0.0002		0.0281
5	0.5075	0.1949	38.4	0.0803	15.8	(1.3957)
6		0.0007		0.0003		0.0215
7	0.2671	0.1528	57.2	0.0630	23.6	(1.0223)
8		0.0007		0.0003		0.0140
9	0.1336	0.1098	82.2	0.0453	33.9	(0.6436)
10		0.0011		0.0005		0.0080
11	0.0935	0.0795	85.0	0.0327	35.0	(0.3218)
12		0.0011		0.0004		0.0049

Elapsed: 0:00:10:00 Remaining: 0:00:00:00 IEC Class D Idle: FAILED Failures: 1792

The Table display presents the following test data for each of the 40 harmonics in a tabular format:

- the harmonic number is indicated in the left-most column.
- the regulation’s harmonic **limits**.
- the **magnitude** of the most recently measured harmonic in amperes **and** as a percent of either the regulation’s harmonic limits or the limits derived from the user-specified limit overrides.
- the **mean** value of data within the span in amperes **and** as a percent of the regulation’s limits.
- the **standard deviation** of each harmonic within the span in amperes **and** as a percent of the regulation’s limits.
- the **maximum peak** value of each harmonic within the span in amperes **and** as a percent of the regulation’s limits.

5 - Viewing Test Data

- the **number of failures** for individual harmonics in the test to-date, as well as the number of failures for individual harmonics in the 2.5 minute window criteria.
- the failure count that exceeds **50%, 75% , 90%, and 95%** of the regulation's limits.

Failures are indicated in red and are enclosed in parentheses. When the data is sent to a printer, failures are enclosed in parentheses. Color printers will also print errors in red.

Search Parameters

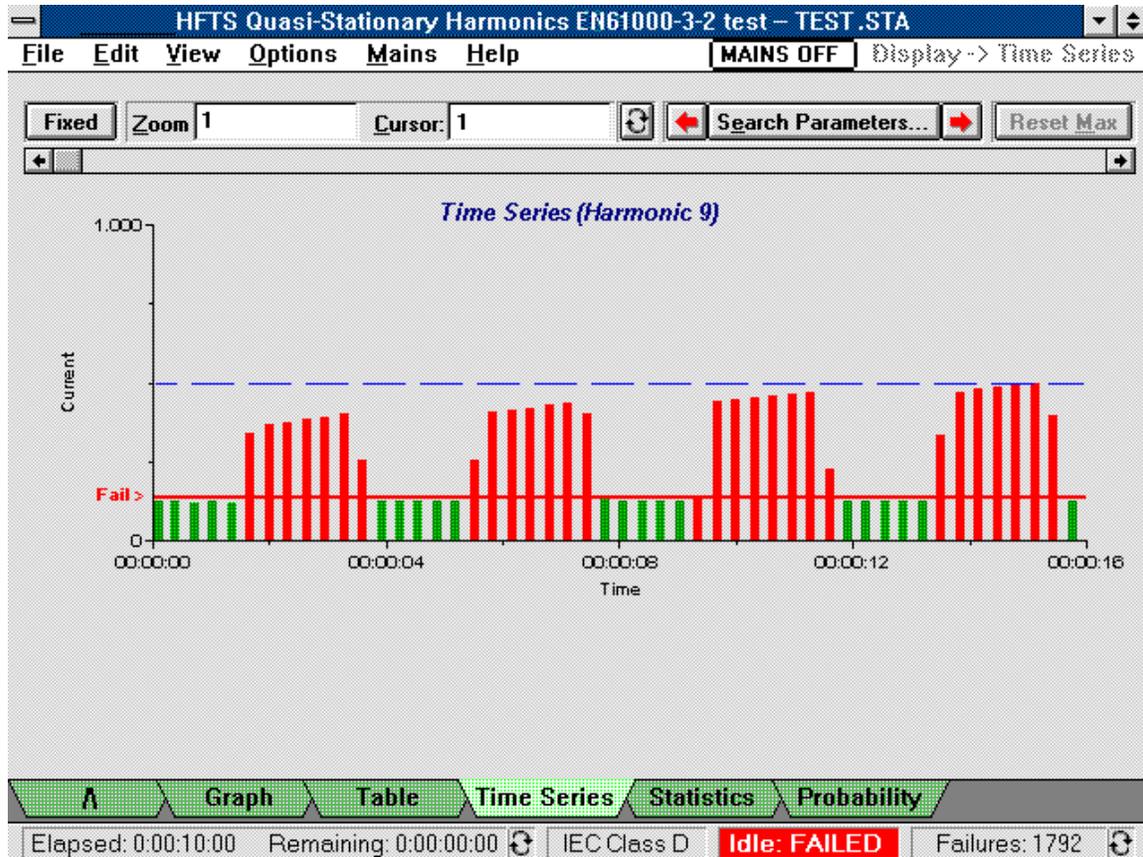
When the display is set to **Fixed**, you can perform search functions on specific test data. Search options let you:

- **Search for** specific items such as:
 - single** failures
 - 2.5 minute** failures (only applies to fluctuating harmonics)
 - all** failures (only applies to fluctuating harmonics)
 - harmonic magnitudes** > than the specified value (specify **AMPS** or **% of Spec.** in the Edit Graphs dialog box)
- specify **Harmonic Selection** criteria for the following harmonics:
 - Odd** harmonics
 - Even** harmonics
 - Odd ≤ 19** harmonics
 - All** harmonics
 - Nth** harmonic (specify a harmonic number)

Time-Series Display

The Time-series display is used to view quasi-stationary or fluctuating harmonic data of a specific harmonic. Depending on the selected zoom factor, each bar may represent a single data point, or multiple data points. For example, if the zoom factor is 1:10 (shown as 10 in the zoom field), each bar represents 10 data points.

Note **To edit the graph**, click with the **right** mouse button on any area of the graph. This puts up the Edit Graph Attributes dialog box, which lets you configure items such as the graph axes, the zoom factor, and lets you select a specific harmonic to review. Refer to “Editing the Graph Attributes” later in this chapter for details.



The Time-series display presents the following data for the **selected** harmonic:

- the **total time** of the selected span along the X axis.
- the **magnitude** of the specified harmonic along the Y axis in absolute values. You can edit the graph to display the data according to % of limit on the Y-axis as described in the following section.

If the bar is green, it means that the present value is within the regulation's specification. If the bar is red, it means that the present value is outside the regulation's specification.

- You can **zoom** in on any area of the graph by drawing a zoom area with the left mouse button and then double-clicking inside the area. The zoom has a minimum range of one data point per bar, and a maximum range of 10 minutes within the total display window.

The red line that appears across the display indicates the specification's limits. All values above the line are outside the specification's limits.

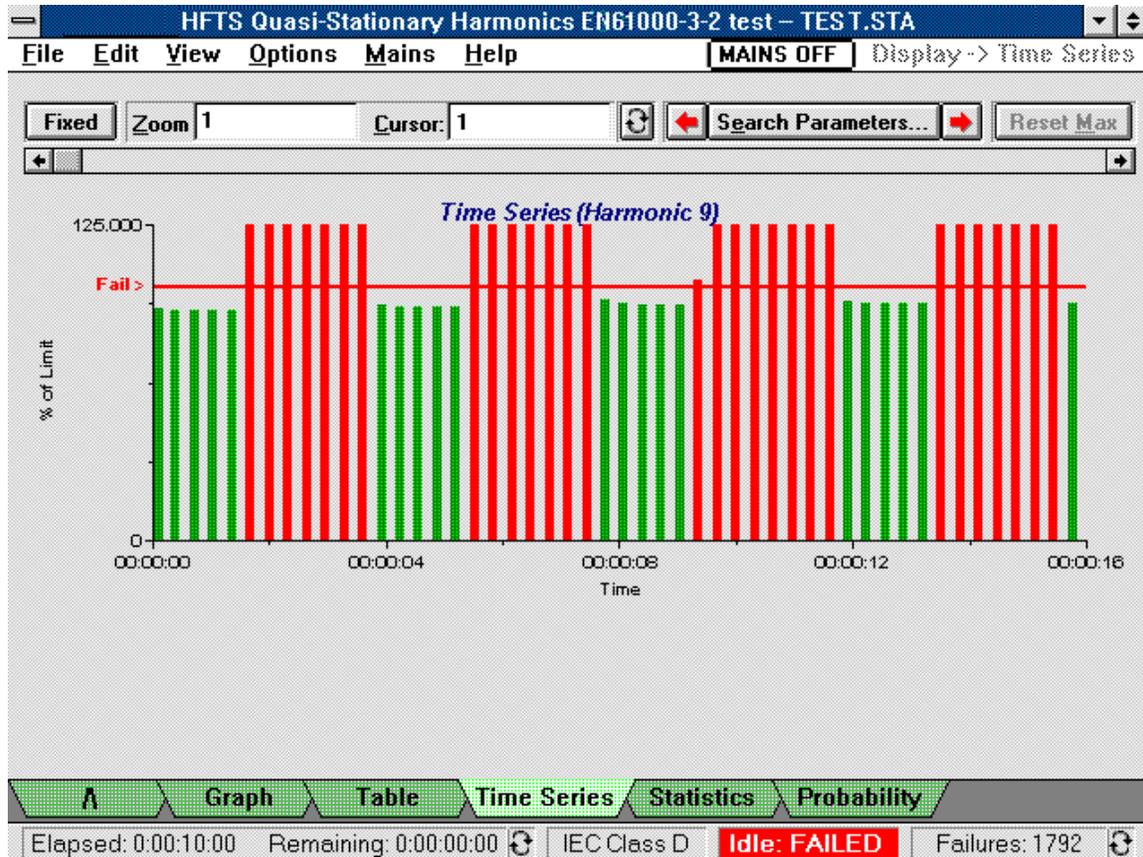
The blue line indicates the maximum measured value within the range selected by the zoom control.

Note By definition, there are no limits for Harmonic #1 (the fundamental). All bars will be green, and the red line indicating the specification limits will not appear.

5 - Viewing Test Data

Displaying Data According to % of Limit on the Y-Axis

Click with the **right** mouse button on any area of the graph. This puts up the Edit Graph Attributes dialog box, in which you can reformat the y axis to display the data in percent of the specification limits rather than in absolute values. In this case the display appears as follows:



The red line that appears across the display indicates the specification's limits. All values above the red line are outside the specification's limits.

Note By definition, there are no limits for Harmonic #1 (the fundamental). No data will appear in the graph when viewing harmonic #1 according to % of limit on the Y-axis.

Search Parameters

When the display is set to **Fixed**, you can perform search functions on specific test data. Search options let you:

- **Search for** specific items such as:
 - single** failures
 - 2.5 minute** failures (only applies to fluctuating harmonics)
 - all** failures (only applies to fluctuating harmonics)
 - harmonic magnitudes** > than the specified value (specify **AMPS** or **% of Spec.** in the Edit Graphs dialog box)

Statistics Display

The Statistics display presents a summary of the Quasi-stationary or Fluctuating harmonic data for the **entire** test.

Note: If no data appears in this display, go back to the Test window and press the **Run Post processing** button to generate the statistics data. Statistics are generated from **all** of the test data when the test run is complete.

	Mean Amperes	Mean %	Std. Deviation	Std. Deviation %	Max Amperes	Max %
1	0.1463		0.4615		2.0115	
2	0.0001		0.0032		0.0326	
3	0.0890	9.8	0.3776	41.6	(1.6863)	(185.7)
4	0.0002		0.0028		0.0281	
5	0.0804	15.8	0.3081	60.7	(1.3957)	(275.0)
6	0.0003		0.0022		0.0215	
7	0.0630	23.6	0.2195	82.2	(1.0223)	(382.7)
8	0.0003		0.0015		0.0140	
9	0.0453	33.9	0.1338	100.2	(0.6436)	(481.9)
10	0.0005		0.0013		0.0080	
11	0.0328	35.0	0.0702	75.1	(0.3218)	(344.2)
12	0.0004		0.0010		0.0049	

The following data is presented for each of the 40 harmonics including the fundamental:

- the **mean** in both absolute amperes **and** as a percent of the regulation’s limits for each harmonic.
- the **standard deviation** of each harmonic in both absolute amperes **and** as a percent of the regulation’s limits.
- the **maximum peak value** of each harmonic in both absolute amperes **and** as a percent of the regulation’s limits.
- the **number of failures** for individual harmonics as well as the number of failures for individual harmonics in the 2.5 minute window criteria.
- the failure count that exceeds **50%, 75% , 90%, and 95%** of the regulation’s limits.

Failures are indicated in red and are enclosed in brackets. When the data is sent to a printer, failures are enclosed in parentheses. Color printers will also print errors in red.

Probability Display (for Quasi-stationary or Fluctuating harmonics)

The Probability display shows the cumulative failure probability (or percentile) of the quasi-stationary or fluctuating harmonic data for the **entire** test.

Note: If no data appears in this display, go back to the Test window and press the **Run Post processing** button to generate the probability data.. Probability calculations are performed from **all** of the test data.

	Mean Amperes	Mean %	Std. Deviation	Std. Deviation %	50th Amperes	50th %
1	0.1463		0.4615		0.3548	
2	0.0001		0.0032		0.0005	
3	0.0890	9.8	0.3776	41.6	0.2173	23.9
4	0.0002		0.0028		0.0008	
5	0.0804	15.8	0.3081	60.7	0.1957	38.6
6	0.0003		0.0022		0.0010	
7	0.0630	23.6	0.2195	82.2	0.1538	57.6
8	0.0003		0.0015		0.0009	
9	0.0453	33.9	0.1338	100.2	0.1112	83.3
10	0.0005		0.0013		0.0013	
11	0.0328	35.0	0.0702	75.1	0.0806	86.2
12	0.0004		0.0010		0.0012	

The following data is presented for each of the 40 harmonics:

- the **mean** in amperes **and** as a percent of the regulation's limits for each harmonic.
- the **standard deviation** of each harmonic in amperes **and** as a percent of the regulation's limits.
- magnitudes for the **50th, 90th, 95th, 99th, and 100th** percentiles in amperes **and** as a percent of the regulation's limits.

Failures are indicated in red and are enclosed in brackets. When the data is sent to a printer, failures are enclosed in parentheses. Color printers will also print errors in red.

Viewing 2.5 Minute Window Failures

For fluctuating harmonic tests, limit values are more complex than those for quasi-stationary harmonics. The regulation for fluctuating harmonics allows values up to 1.5 times the limits for quasi-stationary harmonics during a maximum of 10% of any observation period of 2.5 minutes. This corresponds to 15 seconds.

A 2.5 minute sliding window is used to check that values between 100% and 150% of the regulation's limits do not persist for more than 15 seconds in any 2.5 minute window. If this limit is exceeded, then that particular harmonic has failed the test.

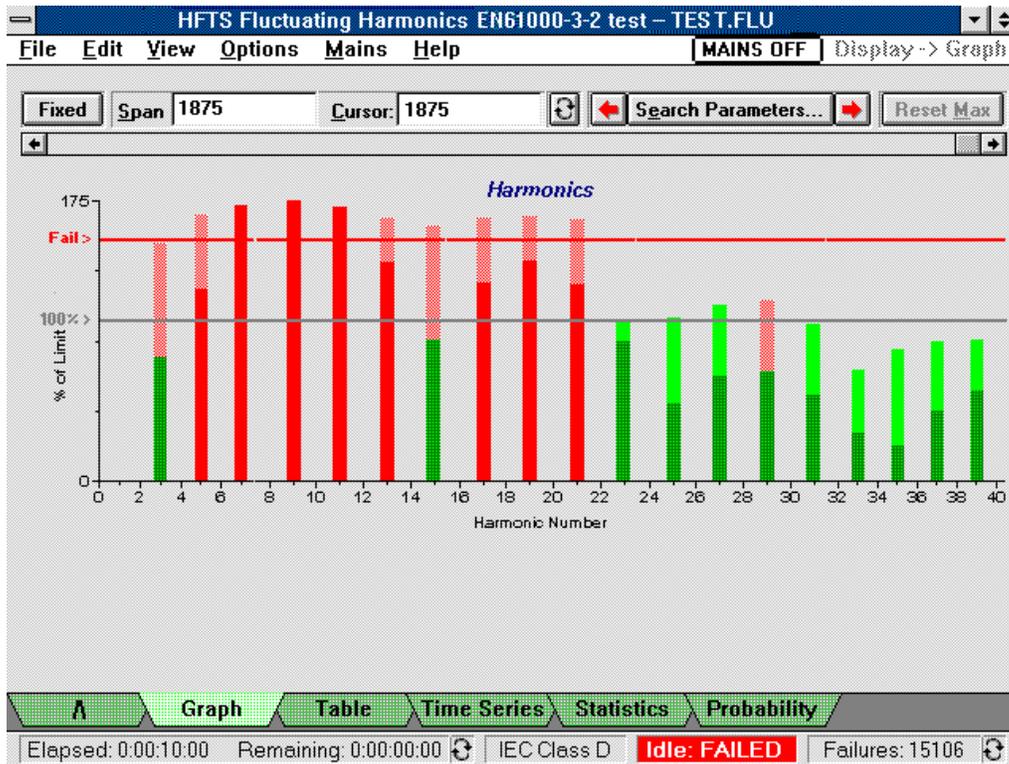
The 2.5 minute window applies to both the Graph and the Time Series displays. The failure band is defined by the area between the yellow line, which indicates 100% of the regulation's limits; and the red line, which indicates 150% the regulation's limits. The following conditions are valid for the 2.5 minute window failure band:

- Bars that stop below the yellow line (100% of the regulation's limits) are always green.
- Bars that appear between the yellow line and the red line (150% of the regulation's limits) may be either red or green. A bar is green if the total number of values within the two lines occur during a time period of 15 seconds or less within the 2.5 minute window prior to the present cursor location. A bar is red if the total number of values within the two lines occur during a time period greater than 15 seconds within a 2.5 minute window prior to the present cursor location.
- Bars that continue above the red line are always red. These values have exceeded 150% of the regulation and represent individual failures by themselves.

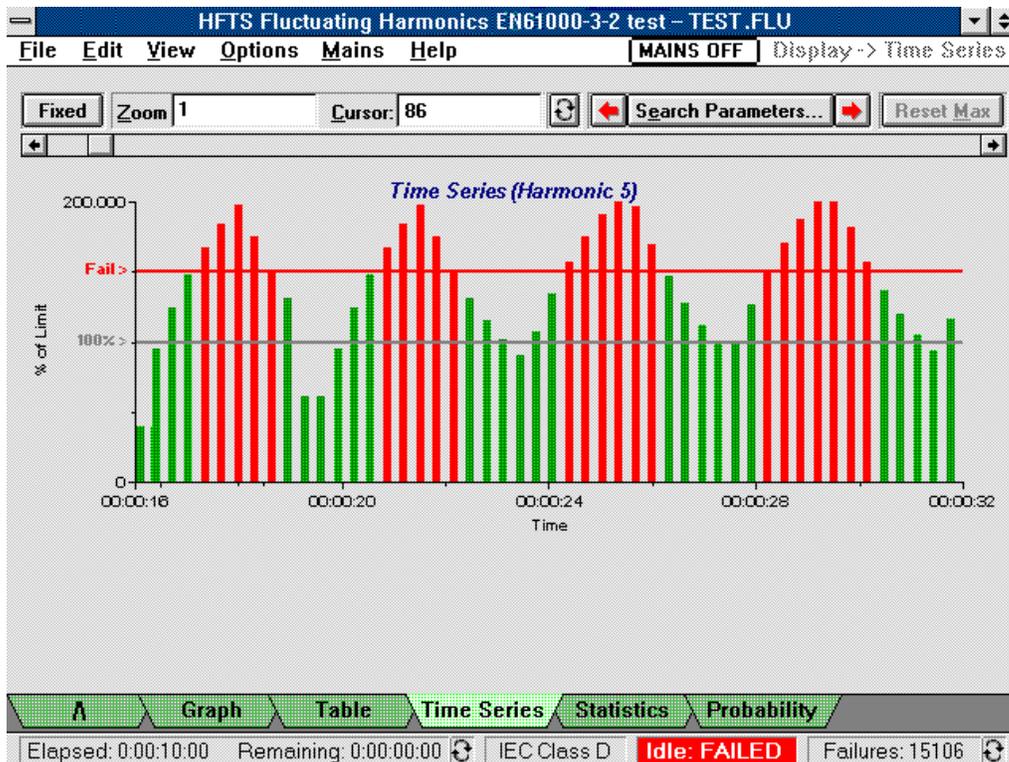
Important Values that exceed 150% of the regulation are **not** included in the calculations that determine the maximum event count that cannot exceed 10% of any 2.5 minute window.

5 - Viewing Test Data

2.5 Minute Failures On the Graph Display



2.5 Minute Failures On the Time-Series Display

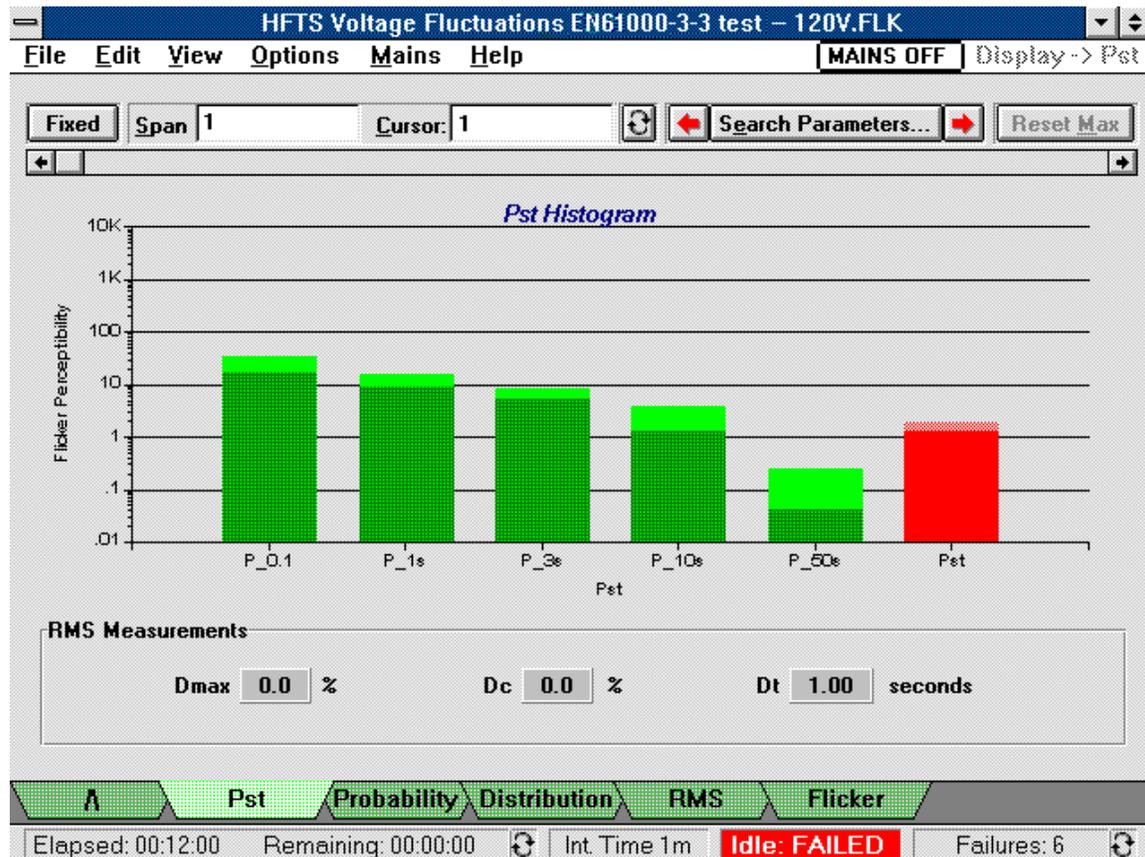


Viewing Voltage Fluctuations

Pst Display

The Pst display is used to view voltage fluctuations and flicker data. When the test is running, the Pst display is updated at the completion of each integration period. Note that the amount of test data displayed may be limited by the Span control. See “Using the Span Control” in chapter 6 for details.

Note To edit the graph, click with the **right** mouse button on any area of the graph. This puts up the Edit Graph Attributes dialog box, which lets you configure items such as the graph axes and the graph span. Refer to “Editing the Graph Attributes” later in this chapter for details.



The Pst display presents the following test data:

- **Pst**, and the five component percentile values used to derive Pst, for the selected integration period along the X axis.
- the **magnitude** of Pst and the component percentiles in flicker perceptibility units along the Y axis (Pst=1 is the threshold of irritability)
- the **maximum measured value** of each component by integration period is indicated by the height of each bar. When the test is running (Rolling mode), this value is the maximum peak-hold value. After the test has finished, or when Fixed mode is selected during a running test, this value is the maximum value within the selected span. The span control indicates how many integration periods are represented in the display.

5 - Viewing Test Data

Light green indicates that the maximum value is within the regulation's specification. Light red indicates that one or more measured values are outside the regulation's specification. The maximum component percentiles are always light green, since no failure criteria is specified for these by the regulation.

- the **present value** of each component is indicated by the solid part of each bar. When the test is running (Rolling mode), this value is always the latest measured value. After the test has finished, or if Fixed mode is selected during a running test, this value is the value at the present cursor location within the selected span. The cursor indicates the presently displayed integration period or test time.

Green indicates that the present value is within the regulation's specification. Red indicates that one or more measured values are outside the regulation's specifications. The component percentiles are always green, since no failure criteria is specified for these by the regulation.

- **detailed pst information** can be obtained by holding down the **Shift** key and double-clicking on the Pst bar. This puts up a dialog box which indicates the number of Pst failures in the selected span, the Perceptibility Unit value at the present cursor location, and the minimum and maximum Perceptibility Unit values in the selected span.
- the **Rms Measurement** area on the bottom of the screen provides a summary value of **Dmax**, **Dc**, and **Dt** failures. Summary values are the maximum value for each type within the presently displayed integration period. If dashes are displayed in the Rms Measurement area, it means that the test either never achieved or never exited the "steady-state" required by the regulation. Refer to the Glossary for information about steady-state.

Search Parameters

When the display is set to **Fixed**, you can perform search functions on specific test data. Search options let you:

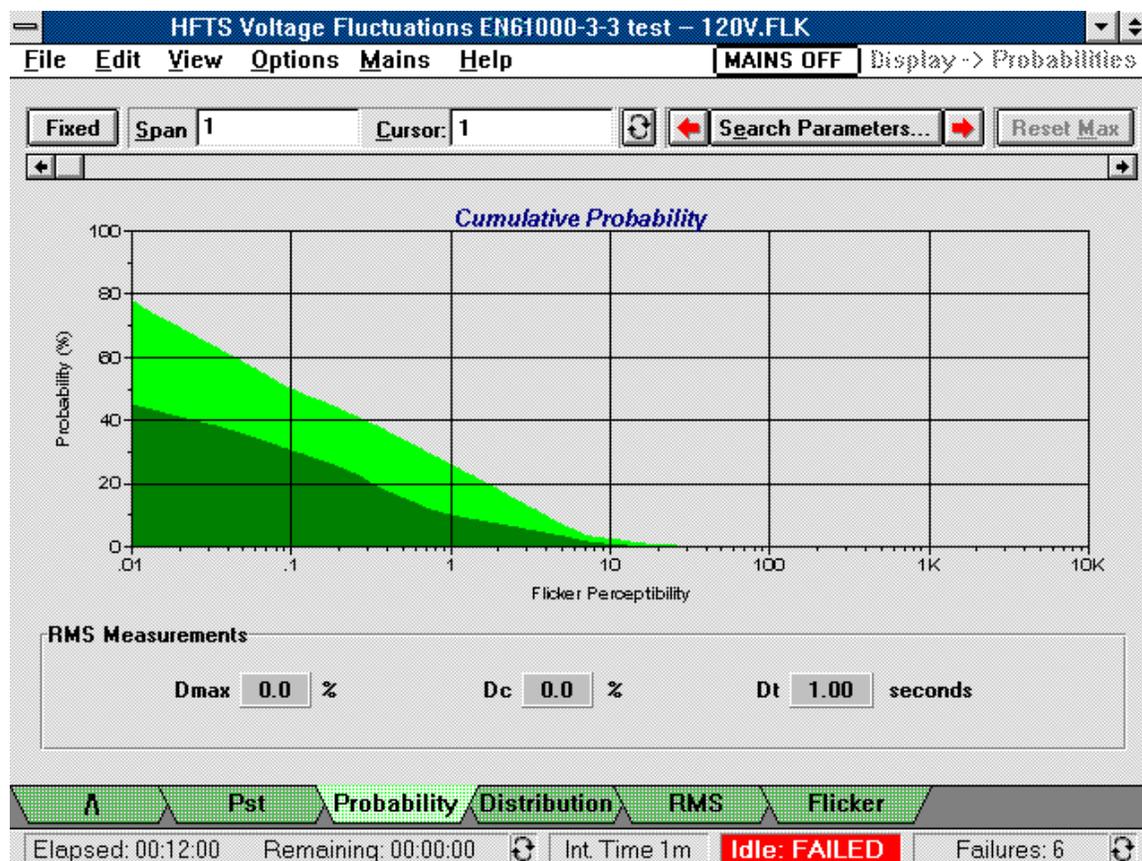
- **Search for** specific summary items such as:
 - Pst** according to perceptibility units
 - Dmax** as a percent of the nominal voltage
 - Dc** as a percent of the nominal voltage
 - Dt** by time threshold (seconds).

You can specify searches by **Failures**, or by **Magnitudes** > than the specified value.

Probability Display (for Voltage Fluctuations and Flicker)

The Probability display presents a summary of the cumulative probability of the voltage fluctuations data. When the test is running, the Probability display is updated at the completion of each integration period. Note that the amount of test data displayed may be limited by the Span control. See "Using the Span Control" in chapter 6 for details. The **Search Parameters** control is not active in this display.

Note **To edit the graph**, click with the **right** mouse button on any area of the graph. This puts up the Edit Graph Attributes dialog box, which lets you configure items such as the graph axes and the graph span. Refer to "Editing the Graph Attributes" later in this chapter for details.



The Probability display presents the following test data:

- the **magnitude** of flicker perceptibility along the X axis (Pst = 1 is the threshold of irritability). The value is the flicker perceptibility level that is exceeded for x% of the samples as indicated by the corresponding Y-axis values.
- the **cumulative probability** in percent along the Y axis. This data represents the flicker level associated with a given probability of occurrence. Stated another way, the data represents the percentile magnitudes for the total population of measured flicker levels in each Pst integration period. The span control can span multiple integration periods. The cursor indicates the present integration period or time.

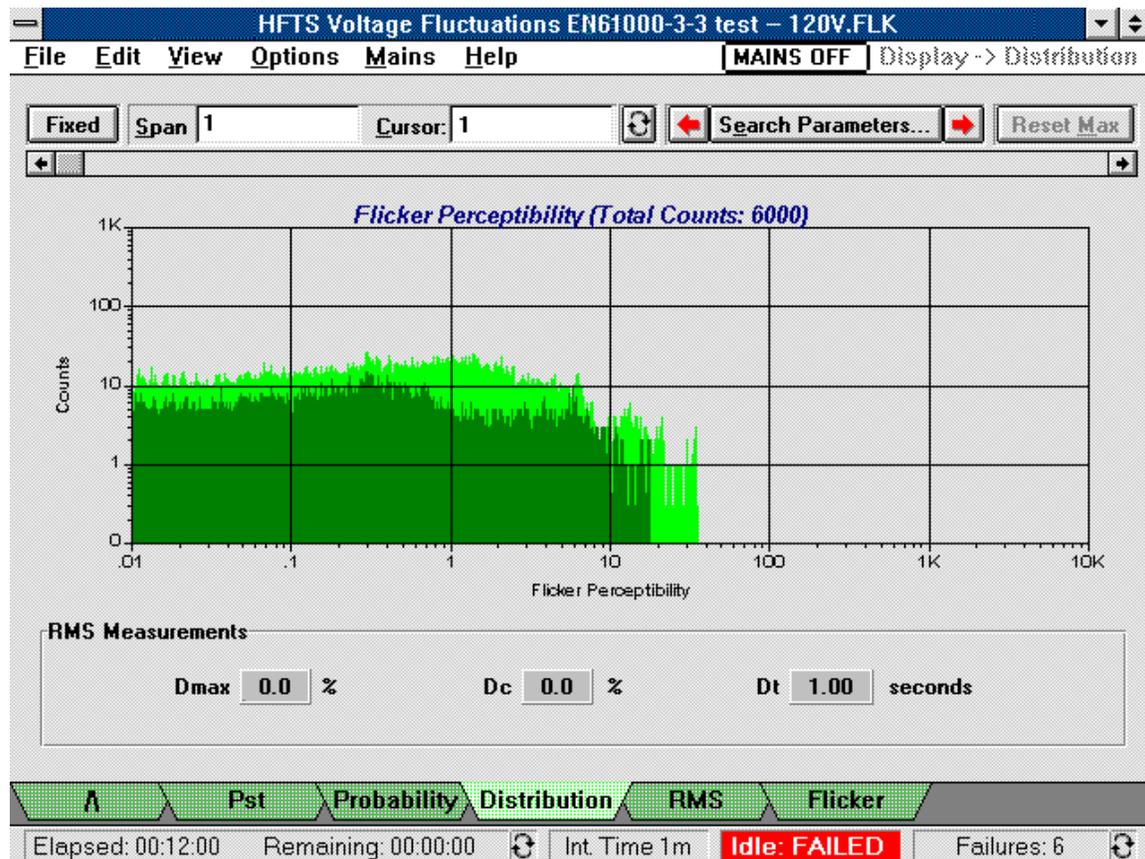
The dark green area represents the present value. The light green area is the peak value in the span. This graph does not display failures.

- the **Rms Measurement** area on the bottom of the screen provides a summary value of **Dmax**, **Dc**, and **Dt** voltage fluctuation failures. Summary values are the maximum value for each type within the presently displayed integration period. If dashes are displayed in the Rms Measurement area, it means that the test either never achieved or never exited the “steady-state” required by the regulation. Refer to the Glossary for information about steady-state.

Distribution Display

The Distribution display presents a summary of the Voltage fluctuations and Flicker test data. When the test is running, the Distribution display is updated at the completion of each integration period. Note that the amount of test data displayed may be limited by the Span control. See “Using the Span Control” in chapter 6 for details. Also, the **Search Parameters** control is not active in this display.

Note To edit the graph, click with the **right** mouse button on any area of the graph. This puts up the Edit Graph Attributes dialog box, which lets you configure items such as the graph axes and the graph span.



The Distribution display presents the following test data:

- the **magnitude** of flicker perceptibility along the X axis (Pst = 1 is the threshold of irritability)
- the number of **counts** along the Y axis. This data represents the distribution of instantaneous flicker levels associated with the 1024 logarithmically weighted bins that are accumulated for each Pst integration period. The span control can span multiple integration periods. The cursor indicates the present integration period or time.

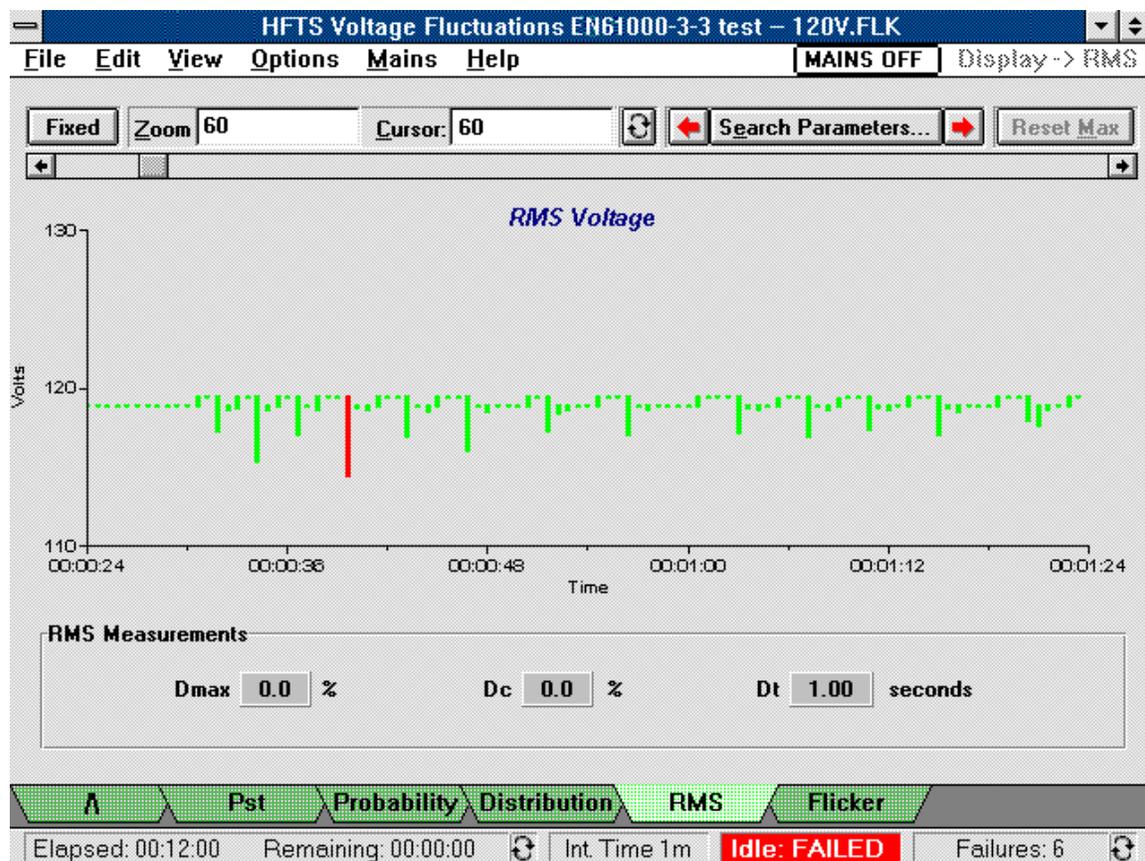
The dark green area represents the present value. The light green area is the peak value in the span. This graph does not display failures.

- the **Rms Measurement** area on the bottom of the screen provides a summary value of **Dmax**, **Dc**, and **Dt** voltage fluctuation failures. Summary values are the maximum value for each type within the presently displayed integration period. If dashes are displayed in the Rms Measurement area, it means that the test either never achieved or never exited the “steady-state” required by the regulation. Refer to the Glossary for information about steady-state.

RMS Display

The Rms display is used to view the minimum and maximum values of summarized rms voltage data. When the test is running, the Rms display is updated at the completion of time periods equal to one half of the x-axis span. Depending on the selected zoom factor, each bar may represent a single data point, or multiple data points. For example, if the zoom factor is 1:10 (shown as 10 in the zoom field), each bar represents 10 data points.

Note To edit the graph, click with the **right** mouse button on any area of the graph. This puts up the Edit Graph Attributes dialog box, which lets you configure items such as the graph axes and the zoom factor. Refer to “Editing the Graph Attributes” later in this chapter for details.



The Rms display presents the following test data:

- the **total time** of the selected range along the X axis.
- the **minimum** and **maximum** rms voltage values along the Y axis.

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A green bar means that all values summarized by the bar are within the regulation's specification. A red bar means that one or more values summarized by the bar are outside the regulation's specification.

- **detailed rms information** can be obtained by holding down the **Shift** key and double-clicking on a bar. This highlights the selected bar in white and puts up a dialog box which displays a report of the Dc failures, Dmax failures, or Dt failures represented by the bar. The minimum and maximum rms voltage is also given.
- the **Rms Measurement** area on the bottom of the screen provides a summary value of **Dmax**, **Dc**, and **Dt** failures. Summary values are the maximum value for each type within the presently displayed integration period. If dashes are displayed in the Rms Measurement area, it means that the test either never achieved or never exited the "steady-state" required by the regulation. Refer to the Glossary for information about steady-state.
- You can **zoom** in on any area of the graph by drawing a zoom area with the left mouse button and then double-clicking inside the area. Zoom factors are incremented in steps of five's, for example 1, 5, 10, and so on. Note that the zoom has a minimum range of one data point/bar (or one second of the total span), and a maximum range of one Pst integration time. Integration times of 1, 5, 10, or 15 minutes can be specified in the Advance Test Options window before the test is run. The cursor indicates the present data record or time. Each data record corresponds to one second of the total test time.

To determine in which integration period the present data record is located, click on Pst, Probability, or Distribution and see which integration period is indicated in the Cursor field.

Search Parameters

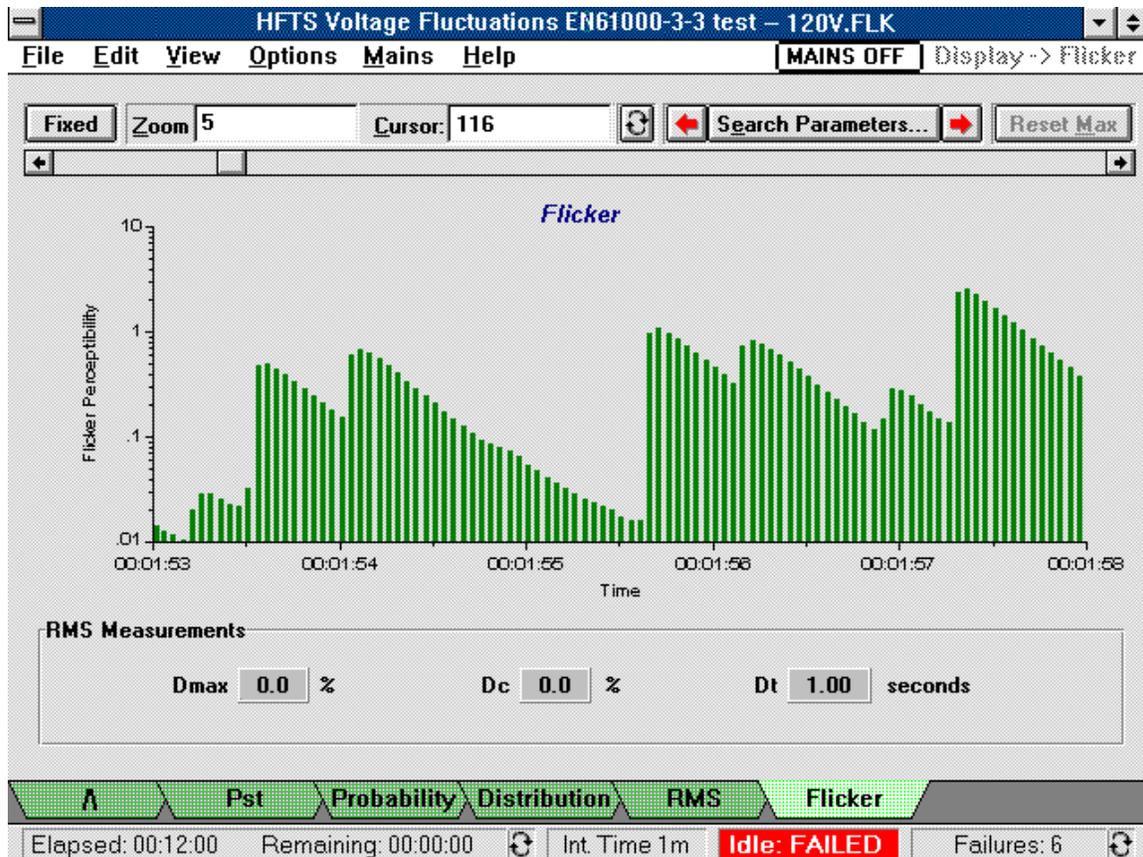
When the display is set to **Fixed**, you can perform search functions on specific test data. Search options let you:

- **Search for** specific items such as:
 - Dmax** failures as a percent of the nominal voltage
 - Dc** failures as a percent of the nominal voltage
 - Dt** failures by time threshold
 - Any** failures.

Flicker Display

The Flicker display is used to view the values of instantaneous flicker data. When the test is running, the Flicker display is updated at the completion of time periods equal to one half of the x-axis span. Depending on the selected zoom factor, each bar may represent a single data point, or multiple data points. For example, if the zoom factor is 1:10 (shown as 10 in the zoom field), each bar represents 10 data points. Note that this graph does not display failures.

Note **To edit the graph**, click with the **right** mouse button on any area of the graph. This puts up the Edit Graph Attributes dialog box, which lets you configure items such as the graph axes and the zoom factor.



The Flicker display presents the following data:

- the **total time** of the selected range along the X axis.
- the **magnitude** of flicker perceptibility units along the Y axis. This graph does not display failures.
- the **Rms Measurement** area on the bottom of the screen provides a summary value of **Dmax**, **Dc**, and **Dt** voltage fluctuation failures. Summary values are the maximum value for each type within the presently displayed integration period. If dashes are displayed in the Rms Measurement area, it means that the test either never achieved or never exited the “steady-state” required by the regulation. Refer to the Glossary for information about steady-state.
- You can **zoom** in on any area of the graph by drawing a zoom area with the left mouse button and then double-clicking inside the area. Note that the zoom has a minimum range of one data point/bar (or one second of the total span), and a maximum range of one Pst integration time. Integration times of 1, 5, 10, or 15 minutes can be specified in the Advance Test Options window. The cursor indicates the present data record or time. Each data record corresponds to one second of the total test time.

To determine in which integration period the present data record is located, click on Pst, Probability, or Distribution and see which integration period is indicated in the Cursor field.

Search Parameters

When the display is set to **Fixed**, you can perform search functions on specific test data. Search options let you:

- **Search for** specific items such as **Flicker** according to perceptibility units.

Editing the Graph Attributes

To change the attributes or the settings of any of the graphs,

- Click with the **right** mouse button on any area of the graph.

This puts up the Edit Graph Attributes dialog box.

From this dialog box you can select:

- the **Maximum** values of the x and the y axes. These are specified in the units that are presently displayed on the axes. The X axis is not configurable in all graphs. In the Rms graph for example, only the Y axis is configurable for minimum and maximum voltage.
- the **Y Axis Values** as either a percent of the specification's limits, or as an absolute value in the units that apply to the presently displayed graph.
- either the **Span** of the data, from which you can specify:
Entire Test; the data range of the entire test
Custom; a range of time or data records
- or the **Zoom** factor of the graph. You can zoom in on any selected area of the graph by drawing an area with the left mouse button and double-clicking inside the area.
- a time-series harmonic, which is specific to the time series graph.

Copying Graphs and Tables to the Clipboard

Using the Print Screen keyboard key

The easiest way to put screen information into the clipboard is to use the **Print Screen** keyboard key. This puts all of the information that is displayed on the screen into the Clipboard. From the Clipboard you can then paste the captured screen information into any application that accepts Clipboard graphics such as Freelance Graphics or Windows Paintbrush.

This method of capturing information has two limitations:

- When capturing graphs, the **Print Screen** keyboard key captures the entire screen. You cannot capture just the graph by itself.
- When capturing table data, not all of the data in the table is displayed on screen at the same time. The information not shown is not captured. Also, you may want to capture table data in text format and import the information into a spreadsheet. Print Screen only captures data in graphical format.

Using the **Copy** commands located in the Edit menu overcomes both of these limitations.

Using the Copy Commands

Edit	
Copy Table	<p>Selecting this command copies highlighted information from the table to the Clipboard. You can use the mouse to select a specific column or row to copy to the Clipboard. Click on the column or row headings to do this. You can select the entire table by clicking on the blank rectangle in the upper left-hand corner of the table.</p> <p><i>Note that the information in the headings is not copied to the Clipboard.</i></p>
Copy Graph	<p>Selecting this command copies the presently accessed graph to the Clipboard. All of the information in the graph as well and the X and Y axis information is copied to the Clipboard.</p>

Note: The **Print Screen** command located in the **File** menu does not copy screen information to the clipboard. It prints the currently displayed screen graphics on the default printer.

Viewing Reports

Reports are available in either Short form or Long form, and can be previewed in the Report window. User remarks can be added to a test file by selecting the **Remarks** menu tab. Menu tabs on the bottom of the screen let you quickly access each area. The **Printer** button sends your report to the default printer.

NOTE: You must run Post processing to generate data for the long form reports.

If your test report indicates that your test was non-compliant, it may be due to one of the following conditions:

Causes for Non-compliant EN 61000-3-2 or EN 60555-2 Tests

- The results of a pre-test indicate that the voltage distortion of the ac source is "OUT OF SPEC".
- The user set the test limit override to a value > 100%.
- The user specified a Class A device, but a Class D waveform is detected, the active power is within Class D boundaries, and the "Motor Driven Device" checkbox is NOT checked.
- A data collection error was detected.
- A current limit was detected.
- A "Protection" error such as OVP was detected.

Causes for Non-compliant EN 61000-3-3 Tests

- The user set the integration time (or Observation Period) to a value other than 10 minutes
- The user set any or all Pst/Plt or RMS thresholds to a value > 100%
- A data collection error was detected.
- A current limit was detected.
- A "Protection" error such as OVP was detected.

Short Form Report

The Short Form report includes summary information about the current test. This information fits on one page. The following is a sample short form report of a Fluctuating Current Harmonics test:

```

      IEC 1000-3-2/EN 61000-3-2 Fluctuating Current Harmonics Test
      Date Performed: 06/15/97

      Test Executed By: A.C. Testright
      Company Name: True Test Laboratories
      Device Under Test ID: Model 12345 Modular Power Supply
      Test ID: 00123

Approved by: QA
Signature: _____ Date: _____

Final Test Result: FAIL

Settings and Test Conditions Compliant to the Standard: Yes

Test Equipment Used:

      Agilent 6842A Harmonic/Flicker Test System with serial number 3440A-00101

      Agilent 14761A HFTS software Version: A.00.05

      Date Last Calibrated: June 6, 1997

Test Equipment Settings:
-----
Line Voltage: 230.00 V          Current Measurement Range: High
Line Frequency: 50 Hz          Measurement Delay: 10.0 seconds
Device Class: D                Fluctuating Harmonics Test Duration: 2.00 minutes
Class Determination Pre-test Duration: 10.00 seconds

Overrides:
-----
Test Limit Source (Power Measurements/Statistics): Maximum
Power Overrides: None
Test Limit Overrides: None

Pre-test Results for Class Determination:
-----
      Percent in Envelope: 100.0%          Fundamental Current: 1.343 A
      Class D Equipment?: Yes              Real Power: 148.8 W
      Voltage THD Out-of-Specification?: No Power Factor: 0.387
      Maximum Power: 148.8 W               Mean Power: 146.7 W

Total Number of Failures:          Total Number of Errors:
-----
      4505 Failures                        None

Remarks
-----

```

5 - Viewing Test Data

Long Form Report

The long form report presents all of the information as the short-form report but also includes all of the final test data, which appears on subsequent pages of the report. The following is a sample long form report of a Fluctuating Current Harmonics test:

Long-Form Report page #1

IEC 1000-3-2/EN 61000-3-2 Fluctuating Current Harmonics Test		
Date Performed: 05/10/96		
Test Executed By: A.C. Testright		
Company Name: True Test Laboratories		
Device Under Test ID: Model 12345 Modular Power Supply		
Test ID: 00123		
Approved by: QA		
Signature: _____		Date: _____
Final Test Result: FAIL		
Settings and Test Conditions Compliant to the Standard: Yes		
Test Equipment Used:		
Agilent 6842A Harmonic/Flicker Test System with serial number 3440A-00101		
Agilent 14761A HFTS software Version: A.00.05		
Date Last Calibrated: June 6, 1997		
Test Equipment Settings:		

Line Voltage: 230.00 V	Current Measurement Range: High	
Line Frequency: 50 Hz	Measurement Window Type: Rectangular	
Device Class: D	Measurement Delay: 10.0 seconds	
RMS Current Limit: 13.1 A	Fluctuating Test Duration: 2.00 minutes	
Peak Current Limit: 80.8 A	Class Determination Pre-test Duration: 10.00 seconds	
Number of Records: 375		
Overrides:		

Test Limit Source (Power Measurements/Statistics): Maximum		
Power Overrides: None		
Test Limit Overrides: None		
Pre-test Results for Class Determination:		

Percent in Envelope: 100.0%	Voltage THD Out-of-Specification?: No	
Class D Equipment?: Yes	Fundamental Current: 1.343 A	
RMS Voltage: 229.8 V	RMS Current: 1.7 A	Real Power: 148.8 W
Frequency: 50.0 Hz	Peak Current: 5.2 A	Apparent Power: 384.2 VA
Voltage THD: 0.10%	Current THD: 80.68%	Power Factor: 0.387
Maximum Power: 148.8 W	Mean Power: 146.7 W	
Active Power Statistics:		

100th percentile: 148.8 W	99th Percentile: 147.3 W	95th Percentile: 147.3 W
90th Percentile: 147.3 W	50th Percentile: 146.2 W	
Total Number of Failures:		Total Number of Errors:
-----		-----
4505 Failures		None

Long-Form Report page #2

Pre-Test Source Harmonics Data:

Harmonic Number	Limit (%)	Limit (Abs)	Max (%)	Max (Abs)
Fund.			100	120.020
2	0.2	0.240	0.004	0.005
3	0.9	1.080	0.040	0.049
4	0.2	0.240	0.006	0.007
5	0.4	0.480	0.048	0.058
6	0.2	0.240	0.001	0.002
7	0.3	0.360	0.065	0.078
8	0.2	0.240	0.001	0.001
9	0.2	0.240	0.059	0.071
10	0.2	0.240	0.005	0.006
11	0.1	0.120	0.057	0.068
12	0.1	0.120	0.002	0.003
13	0.1	0.120	0.038	0.046
14	0.1	0.120	0.003	0.003
15	0.1	0.120	0.032	0.038
16	0.1	0.120	0.004	0.004
17	0.1	0.120	0.014	0.017
18	0.1	0.120	0.004	0.005
19	0.1	0.120	0.016	0.019
20	0.1	0.120	0.002	0.002
21	0.1	0.120	0.020	0.024
22	0.1	0.120	0.002	0.002
23	0.1	0.120	0.020	0.024
24	0.1	0.120	0.002	0.003
25	0.1	0.120	0.019	0.022
26	0.1	0.120	0.001	0.001
27	0.1	0.120	0.011	0.013
28	0.1	0.120	0.001	0.002
29	0.1	0.120	0.011	0.013
30	0.1	0.120	0.002	0.002
31	0.1	0.120	0.011	0.014
32	0.1	0.120	0.002	0.002
33	0.1	0.120	0.010	0.012
34	0.1	0.120	0.002	0.002
35	0.1	0.120	0.012	0.014
36	0.1	0.120	0.002	0.003
37	0.1	0.120	0.011	0.013
38	0.1	0.120	0.002	0.003
39	0.1	0.120	0.007	0.009
40	0.1	0.120	0.002	0.002

5 - Viewing Test Data

Note For **Voltage Fluctuations** reports, depending on the number and length of the integration periods, the Final Test Data section of the report may include up to several dozen pages.

Long-Form Report page #3

Final Test Data:

Harmonic Number	Standard Limit (A rms)	Maximum Value (A rms)	Maximum Value (% Limit)	Mean Value (A rms)	Mean Value (% Limit)	Standard Deviation (A rms)	Standard Deviation (% Limit)	Pass(P) or Fail(F)
Fund.		1.1096		0.8333		0.1817		
2		0.0074		0.0045		0.0011		
3	0.5058	(0.9661)	(191.0)	(0.7151)	(141.4)	0.1640	32.4	F
4		0.0062		0.0038		0.0009		
5	0.2826	(0.8228)	(291.1)	(0.6165)	(218.1)	0.1354	47.9	F
6		0.0052		0.0033		0.0007		
7	0.1488	(0.6409)	(430.9)	(0.4920)	(330.8)	0.0990	66.5	F
8		0.0033		0.0022		0.0004		
9	0.0744	(0.4427)	(595.2)	(0.3543)	(476.3)	0.0605	81.3	F
10		0.0019		0.0013		0.0002		
11	0.0521	(0.2586)	(496.7)	(0.2245)	(431.3)	0.0265	51.0	F
12		0.0015		0.0011		0.0002		
13	0.0440	(0.1278)	(290.2)	(0.1158)	(263.0)	0.0099	22.4	F
14		0.0010		0.0005		0.0002		
15	0.0382	(0.0846)	(221.4)	(0.0630)	(164.7)	0.0121	31.6	F
16		0.0011		0.0006		0.0002		
17	0.0336	(0.0836)	(248.8)	(0.0729)	(216.9)	0.0072	21.5	F
18		0.0010		0.0005		0.0002		
19	0.0302	(0.0828)	(274.1)	(0.0637)	(210.8)	0.0112	37.0	F
20		0.0008		0.0004		0.0001		
21	0.0272	(0.0559)	(205.2)	(0.0403)	(148.1)	0.0093	34.3	F
22		0.0008		0.0005		0.0001		
23	0.0248	0.0211	84.8	0.0139	55.8	0.0043	17.4	P
24		0.0007		0.0004		0.0001		
25	0.0229	0.0137	59.7	0.0125	54.4	0.0011	4.7	P
26		0.0006		0.0003		0.0001		
27	0.0213	(0.0331)	(155.4)	(0.0270)	(127.0)	0.0035	16.6	F
28		0.0007		0.0004		0.0001		
29	0.0198	(0.0377)	(190.4)	(0.0307)	(155.0)	0.0041	20.8	F
30		0.0007		0.0003		0.0001		
31	0.0184	(0.0292)	(158.2)	(0.0251)	(135.9)	0.0026	14.2	F
32		0.0006		0.0003		0.0001		
33	0.0174	0.0173	99.4	0.0143	82.1	0.0016	9.2	P
34		0.0004		0.0002		0.0001		
35	0.0164	0.0119	73.0	0.0102	62.5	0.0011	6.9	P
36		0.0004		0.0002		0.0001		
37	0.0155	(0.0176)	(113.8)	(0.0135)	(87.5)	0.0027	17.2	F
38		0.0004		0.0002		0.0001		
39	0.0147	(0.0188)	(127.6)	(0.0123)	(83.8)	0.0041	27.8	F
40		0.0006		0.0002		0.0001		

Long-Form Report page #4

Final Test Statistics:

Harmonic Number	Standard Limit (A rms)	Maximum Value (A rms)	Maximum Value (% Limit)	>50% of Limit (Count)	>75% of Limit (Count)	>90% of Limit (Count)	>95% of Limit (Count)	>100% of Limit (Count)	2.5-min Failures (Count)
Fund.		1.1096							
2		0.0074		0	0	0	0	0	0
3	0.5058	(0.9661)	(191.0)	369	369	368	367	161	124
4		0.0062		0	0	0	0	0	0
5	0.2826	(0.8228)	(291.1)	371	370	369	369	367	0
6		0.0052		0	0	0	0	0	0
7	0.1488	(0.6409)	(430.9)	374	372	371	371	369	0
8		0.0033		0	0	0	0	0	0
9	0.0744	(0.4427)	(595.2)	374	374	373	373	371	0
10		0.0019		0	0	0	0	0	0
11	0.0521	(0.2586)	(496.7)	375	374	374	374	372	0
12		0.0015		0	0	0	0	0	0
13	0.0440	(0.1278)	(290.2)	375	374	374	374	372	0
14		0.0010		0	0	0	0	0	0
15	0.0382	(0.0846)	(221.4)	374	374	373	373	232	80
16		0.0011		0	0	0	0	0	0
17	0.0336	(0.0836)	(248.8)	374	373	373	372	368	0
18		0.0010		0	0	0	0	0	0
19	0.0302	(0.0828)	(274.1)	373	370	369	369	364	0
20		0.0008		0	0	0	0	0	0
21	0.0272	(0.0559)	(205.2)	369	368	368	364	186	109
22		0.0008		0	0	0	0	0	0
23	0.0248	0.0211	84.8	228	60	0	0	0	0
24		0.0007		0	0	0	0	0	0
25	0.0229	0.0137	59.7	335	0	0	0	0	0
26		0.0006		0	0	0	0	0	0
27	0.0213	(0.0331)	(155.4)	372	369	368	368	21	285
28		0.0007		0	0	0	0	0	0
29	0.0198	(0.0377)	(190.4)	373	370	369	369	220	87
30		0.0007		0	0	0	0	0	0
31	0.0184	(0.0292)	(158.2)	373	371	369	368	47	260
32		0.0006		0	0	0	0	0	0
33	0.0174	0.0173	99.4	372	318	82	26	0	0
34		0.0004		0	0	0	0	0	0
35	0.0164	0.0119	73.0	369	0	0	0	0	0
36		0.0004		0	0	0	0	0	0
37	0.0155	(0.0176)	(113.8)	369	280	176	142	0	45
38		0.0004		0	0	0	0	0	0
39	0.0147	(0.0188)	(127.6)	326	223	166	148	0	65
40		0.0006		0	0	0	0	0	0

Remarks Report

The Remarks report can be used to enter descriptive information about the test to the data file. These remarks are appended to both the short form and the long form report when they are printed.

After entering or editing the remarks, click on **Save** to save the remarks to the present file.

Searching for Specific Test Data

The toolbar on top of the display screen, which is referred to as the Navigator toolbar and is described in the beginning of chapter 5, is used to search for specific data in the test record. There are two ways to search for specific test data.

Searching for Data While the Test is Running

Using the Navigator toolbar while the test is running may prove to be slow unless you have a very fast PC with lots of memory. This is caused by the constant processing of incoming data from your Agilent 6800-Series AC Power Source/Analyzer. If this processing proves to be too slow on your PC, you may choose to wait until *after* the test has completed before using the Navigator toolbar.

1. Click on the **Rolling** button to stop updating the display. Clicking on “Rolling” changes the button to “Fixed”.
2. Search for specific data by one of the following methods:
 - Click on the **Search Parameters** button. Select a specific item to search for in the dialog box that appears on the screen and click OK. Use the red ◀ and ▶ buttons to search either direction in time for the specified item.
 - For the Harmonics graph and table displays, the Pst display, the Probability display, and the Distribution display, enter a **span** and a cursor location to examine the portion of the test record that is of interest.
 - For the Time Series, Rms, and Flicker displays, hold down the **left** mouse button to **zoom in** on a specific area of the graph (see Using the Zoom Control).
3. Click on the **Fixed** button to return the display to “Rolling“, where it resumes being updated with the latest data.

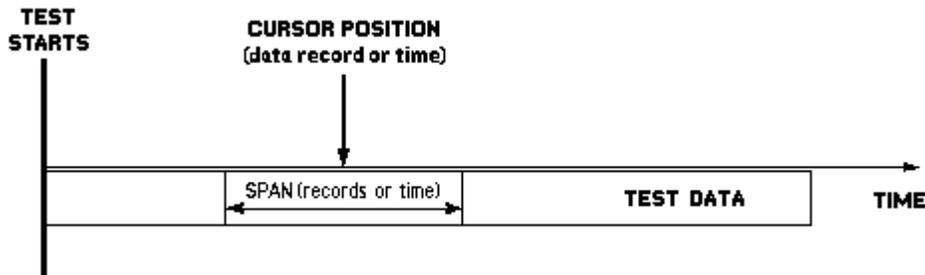
Searching for Data After the Test has Completed

Search for specific data by one of the following methods:

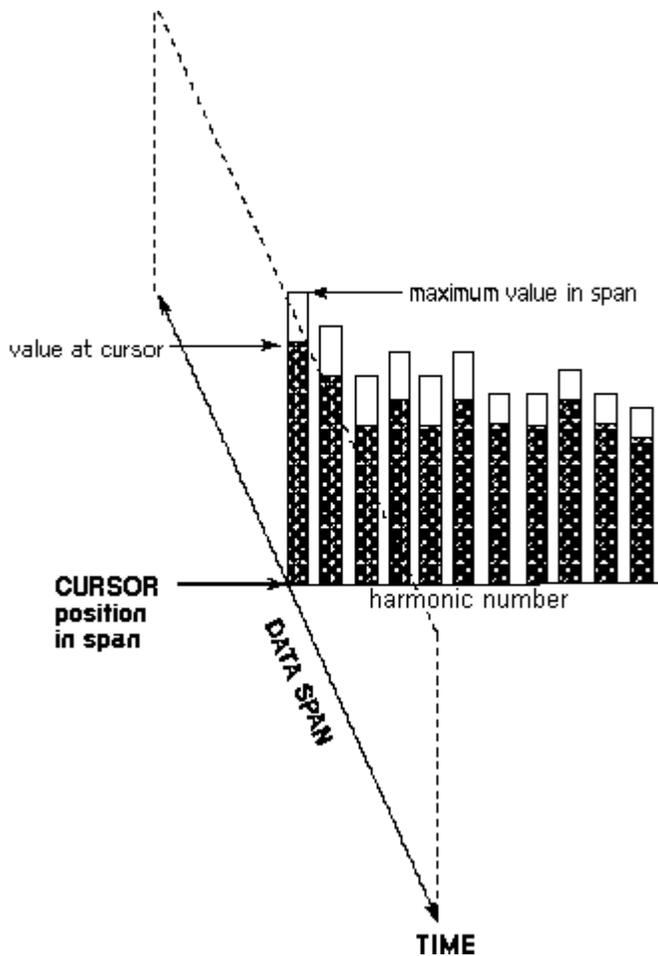
- Click on the **Search Parameters** button. Select a specific item to search for in the dialog box that appears on the screen and click OK. Use the red ◀ and ▶ buttons to search either direction in time for the specified item.
- For the Harmonics graph and table displays, the Pst display, the Probability display, and the Distribution display, enter a **span** and a cursor location to examine the portion of the test record that is of interest.
- For the Time Series, Rms, and Flicker displays, hold down the **left** mouse button to **zoom in** on a specific area of the graph (see Using the Zoom Control).

Using the Span Control

The span control applies to the Harmonics graph and table displays, the Pst display, the Probability display, and the Distribution display. It determines the range of test data that you want to examine in relation to the present cursor location. This is illustrated in the following figure.



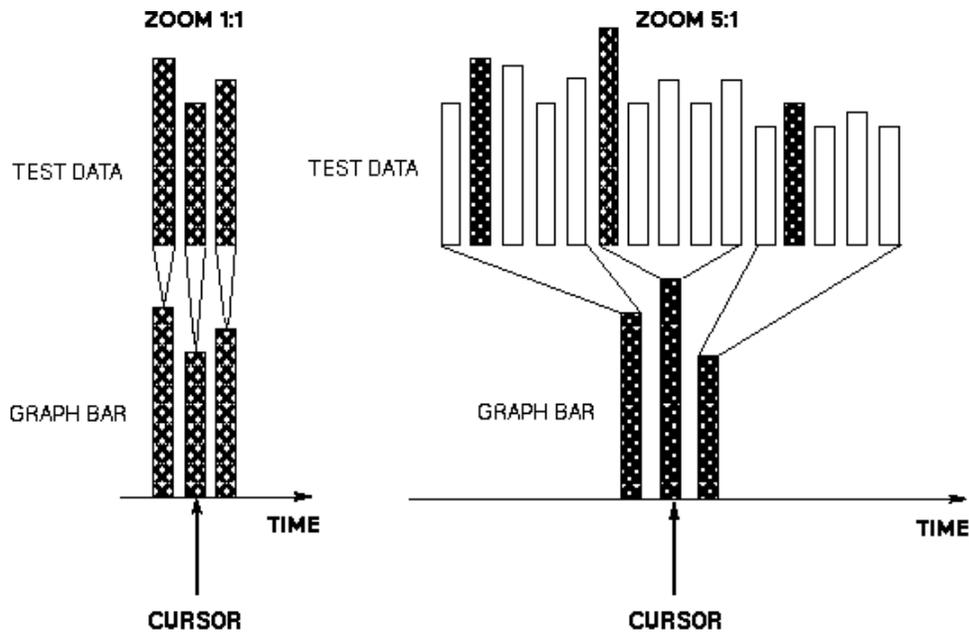
As shown in the following figure, the solid-colored part of each bar (either green or red), indicates the value at the present cursor position. The top of each bar indicates the maximum measured value of the entire data span. When you increase or decrease the span, you affect the range of data for which the maximum value is displayed. Note that changing the span does not affect the value at the present cursor position.



Using the Zoom Control

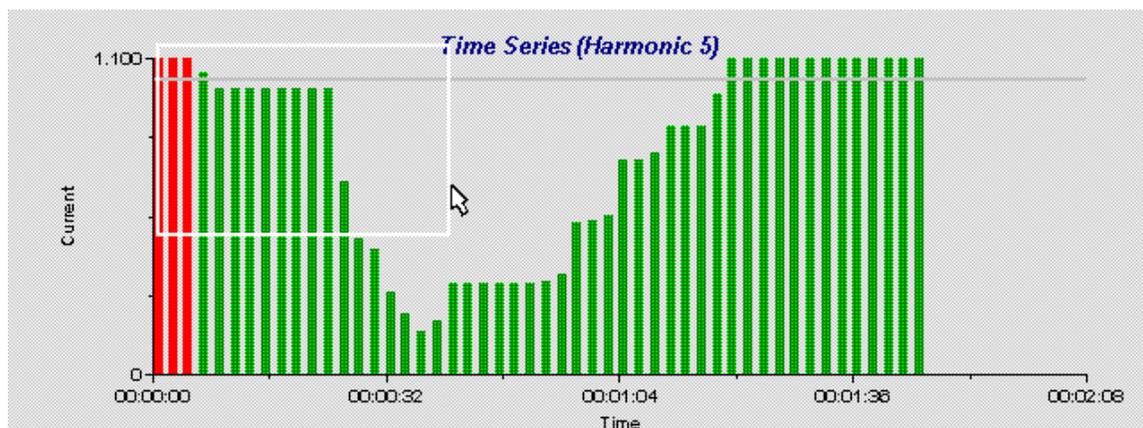
The zoom control applies to the Time Series display, the Rms display, and the Flicker display. The time-series display only shows a limited number of data bars. Zooming in lets you view individual data points in the time series. Zooming out lets you view summarized information for larger blocks of measurement data.

When the zoom factor is greater than 1:1, each bar represents the maximum value of two or more data points. This is illustrated in the following figure



To use the zoom control,

1. Hold down the **left** mouse button and drag the cursor to define an area on the graph in which to **zoom** in on.
2. Draw a rectangle outlining the area that you want to zoom in on, as shown in the following screen.
3. When you double-click **inside** the rectangle you just drew, the area inside it will zoom in and fill the display area.
4. To zoom back out, double-click on any area of the graph. Each time you double-click you will zoom out by a factor of ten until you reach the maximum zoom limit.

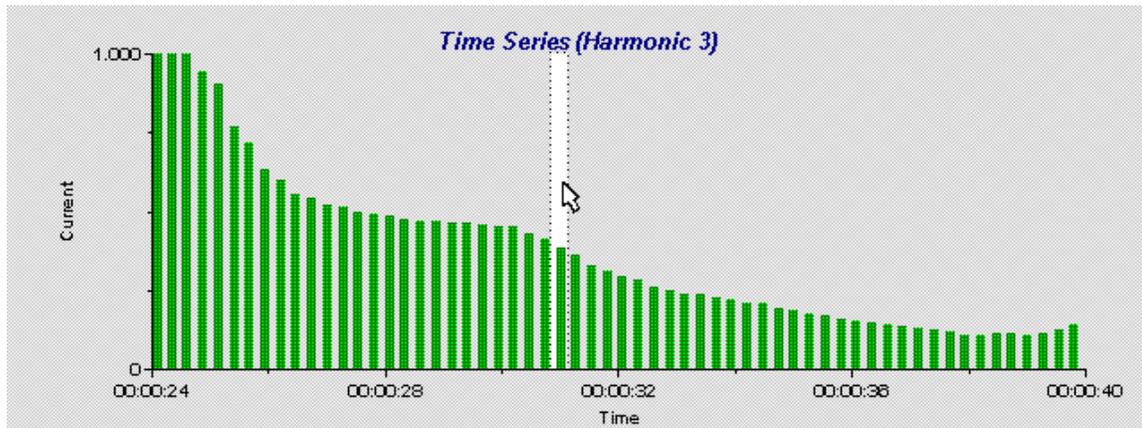


Obtaining Detailed Failure and Error Information

Note: This feature is not available for the Flicker Display.

For detailed failure and error information about a specific bar in a graphical display, proceed as follows:

1. Press the **Shift** key



2. While holding down the shift key, click on the bar for which you desire more information with the left mouse button. The following figure shows how a data bar is highlighted after it has been selected.

3. While still holding down the shift key, double-click on the highlighted bar with the left mouse button. An information dialog box will appear, containing information such as:

- the type and total number of failures
- the value at the present cursor location as well as the minimum and maximum values in the data span
- the size of the data span by records and by time

Failures and Errors	
Type	Number
Harmonic Failures	1025
2.5-minute Failures	642
Current Value: 0.605509	
Min: 0.035502	Max: 1.135358
Records: 1 to 1875	
Time: 0:00:00:00.00 to 0:00:10:00.00	
<input type="button" value="OK"/>	

Printing

Printing Graphs and Tables

Using the Print Pre-test command

The **Print Pre-test** command prints the currently displayed Pre-test screen to the default printer. The printout is slightly reformatted from what you see on the display. Note that the Print Pre-test command does not copy any information to the Clipboard.

1. Select the Pre-test menu tab on the bottom of the screen and access the Pre-test Summary window. If no information appears in the display, run the pretest or open an existing test.
2. Select the **Print Pre-test** command from the **File** menu.
3. In the Print Reports dialog box, select the document properties, page range, number of copies, or if you want collated copies. If you have access to more than one printer, click on the downarrow to choose a different printer.

Using the Print Graph/Table command

All display graphs except the pre-test graph can be printed using the **Print Graph** or **Print Table** command in the **File** menu. These commands print all of the data that comprises each graph or table. Note however, that the printout is not in the same format as the data on the display.

1. Display the graph or table that you want to print using either the **View** menu keys or the appropriate menu tabs on the bottom of the screen.
2. Select the **Print Graph/Table** command from the **File** menu.
3. In the Print Reports dialog box, select the document properties, page range, number of copies, or if you want collated copies. If you have access to more than one printer, click on the downarrow to choose a different printer.

Printing Reports

Reports can be printed in one of two ways as explained below. You can also transfer a report to a file, which can then be accessed by a word processor. This allows printing to be done at a later time, stores test reports in a file format for repeated printing, and allows test reports to be easily sent electronically.

From the File menu

1. Select the **Print Report** command from the **File** menu.
2. Select the type of report in the Choose Report dialog box (Short form or Long form).

7 - Printing

3. In the Print Report dialog box, select the document properties, page range, number of copies, or if you want collated copies. If you have access to more than one printer, click on the downarrow to choose a different printer.

From the Report window

1. Select a Report window from either the **View** menu, or the Report menu tabs. (Short form or Long form).
2. In the Report window, click on the **Print** button. The entire report will automatically be sent to your default printer.

Printing Reports to a File

Note Do not use this feature for any graphics output. Select your regular printer for any graphics output or for directly printing reports to your printer.

To print reports to a file, you must use the Windows “Generic / Text only” printer driver. The following instructions explain how to install this driver and after it is installed, how to print reports to a file.

1. Run the Control Panel application and select “Printers”.
2. Click on the **Add** button, which will bring up a list of available printers.
3. Select the “Generic / Text only” and click on the **Install** button. This will place the Generic driver in your list of available printers on LPT1. (In Windows 3.1, the “Generic / Text only” driver is second in the list., after “Install Unlisted or Updated Printer”.)

Note Adding the Generic driver WILL NOT affect your normal printing, provided you do not make it your default printer. If the Generic driver is not already on your hard disk, follow the instructions to load it from your Windows floppies or CD.

4. Once it has been installed to LPT1, you must move it to the destination of “FILE:” To do this select the **Connect** button. This brings up a choice of printer ports.
5. Use the scroll bars to select “FILE:” Once this has been done, exit the Control Panel application.

Now that you have added the Generic driver, you will be able to select it as the target printer in the Agilent 14761A HFTS software.

1. Select the **Print Report** command from the File menu. Then select either the Short form or the Long form report. If you are already viewing a report in the Report window, simply click on the **Print** button
2. The “Generic / Text only” printer should appear at the top of the Print Report dialog box. If “Generic / Text only” does not appear, click on **Setup** and select it from the list of Specific Printers that appears in the Print Setup dialog box.
3. In Windows 3.1, click on the **Options** button and check the “Wide Carriage” option. You need to do this to prevent clipping of text columns when printing the reports.

4. Click on **OK** to print the report.
5. Enter a filename in the dialog box that appears on the screen. The report will be saved in ASCII format in the file you specified. Until you change your printer selection to a different printer, the request for a filename dialog box will come up whenever you use any printing feature of the Agilent 14761A HFTS software.

If you want to print your report file, you may use any standard text editor such as Windows Notepad to load the file and then print it on your default system printer. In some cases, an **MS-DOS Copy** or **Print** command can also be used. If these commands do not work, use the text editor method.

Specifications

Supported or Referenced EN 61000-3-2 and EN 60555 Part 2 Standards

IEC 555-2	EN 61000-3-2
EN 60555 Part 2	IEC 1000-3-2
IEC 1000-4-7	

Supported or Referenced EN 61000-3-3 Standards

IEC 725	EN 61000-3-3
IEC 868	IEC 1000-3-3
IEC 868 Amendment 1	

PC Requirements

Minimum: 486DX 33 Mhz
 512 Kbytes of conventional memory
 8 Mbytes of RAM
 210 Mbyte IDE Hard Disk¹ (4 Mbytes required for installation)
 Windows 3.1, or Windows for Workgroups 3.11
 Networking disabled

Recommended: 486DX4 100 Mhz or Pentium
 512 Kbytes of conventional memory
 16 Mbytes of RAM
 1.2 Gbyte IDE PCI Hard Disk¹ (4 Mbytes required for installation)
 Windows 95 workstation², or Windows NT 4.0 workstation
 Networking disabled

¹Accommodates data storage for the maximum possible test length of 7 days.

²For Windows 95, plug and play I/O cards are recommended.

Supported GPIB Interfaces

Agilent 82335B, 82340B, 82341C/D, 82350A GPIB Interface

National Instruments AT-GPIB/TNT, AT-GPIB/TNT PnP (Windows 95 only), AT-GPIB/TNT PCMCIA

Supported Equipment

Agilent 6812B AC Power Source/Analyzer (300 V, 6.5 Arms max., single-phase)

Agilent 6813B AC Power Source/Analyzer (300 V, 13 Arms max., single-phase)

Agilent 6841A Harmonic/Flicker Test System (300 V, 6.5 Arms max., single-phase)

Agilent 6842A Harmonic/Flicker Test System (300 V, 13 Arms max., single-phase)

Agilent 6843A Harmonic/Flicker Test System (300 V, 16 Arms max., single-phase)

A - Specifications

Equipment Specifications (IEC Mode)

IEC mode specifications are warranted over the ambient temperature range of 0 to 40° C.

Model	Agilent 6812B, 6841A	Agilent 6813B, 6842A	Agilent 6843A
Number of Phases	1	1	1
Maximum Output Ratings			
Output Power	750 VA	1750 VA	4800 VA
rms Voltage	300 V	300 V	150 V (low range) 300 V (high range)
rms Current	6.5 A	13 A	32 A (low range) 16 A (high range)
Peak Current	40 A	80 A	96 A (low range) 48 A (high range)
Output Frequency	50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz
Load Regulation	0.5% of full scale	0.5% of full scale	0.5% of full scale
Line Regulation	0.1% of full scale	0.1% of full scale	0.3% of full scale
Maximum Voltage THD	0.25%	0.25%	1%
Reference Impedance Accuracy	3% @ 0.4 Ω and 796 mH 1% @ 0.4 Ω, 796 mH, and 25° C		
Ripple & Noise (20 kHz - 10 Mhz)			
Vrms relative to full scale	- 60 dB		
Vrms	300 mV		
Output Voltage Harmonic Content	Compliant with IEC 868 and IEC 1000-3-2		
Programming Accuracy			
rms Voltage	0.15% + 0.3 V		
Frequency	0.01% + 10 mHz		
Measurement Accuracy			
Current Fundamental			
low range	0.03% + 1.5 mA	0.03% + 1.5 mA	0.03% + 3 mA
high range	0.05% + 5 mA	0.05% + 5 mA	0.05% + 6 mA
Current Harmonics 2-40			
low range	0.03% + 1 mA + 0.2%/kHz	0.03% + 1 mA + 0.2%/kHz	0.03% + 2 mA + 0.2%/kHz
high range	0.05% + 3 mA + 0.2%/kHz	0.05% + 3 mA + 0.2%/kHz	0.05% + 3 mA + 0.2%/kHz
rms Voltage	0.03% + 100 mV	0.03% + 100 mV	0.05% + 250 mV
Power (VA) low range	0.1% + 1.5 VA	0.1% + 1.5 VA	0.15% + 1.8 VA
Power (VA) high range	0.1% + 3.5 VA	0.1% + 3.5 VA	0.15% + 9 VA
Power (W) low range	0.1% + 0.3 W	0.1% + 0.3 W	0.15% + 1.8 W
Power (W) high range	0.1% + 0.3 W	0.1% + 0.3 W	0.15% + 9 W
Measurement/Generation Synchronization Error	< 1 ppm		
Flicker and Flicker perceptibility (Pst)	compliant with IEC 868		
Current Shunt Burden	0 volts		
Harmonic Smoothing Filter Time Constant	1.5 seconds		
Pst Integration Time	1, 5, 10, or 15 minutes		

Ac Input Ratings and supplemental information

Model	Agilent 6841A	Agilent 6842A	Agilent 6843A
Voltage Range (Vac)	87 - 106 Vac 104 - 127 Vac* 174 - 220 Vac 191 - 254 Vac	174 - 220 Vac* 191 - 254 Vac	180 - 254 V _{L-L} (3 Φ)* 342 - 456 V _{L-L} (3 Φ)
Maximum Input Current (rms)	24 A (at 120 Vac) 28 A (at 100 Vac) 15 A (at 200/208 Vac) 13 A (at 230 Vac)	22 A (at 200/208 Vac) 20 A (at 220/230/240 Vac)	25 A per phase 15 A per phase
Input Power (max)	2500 VA/1400 W	3800 VA/2600 W	8900 VA/6550 W
Input Frequency	47 - 63 Hz	47 - 63 Hz	47 - 63 Hz
Net Weight	28.2 kg (62 lb)	32.7 kg (72 lb)	87.7 kg (193 lb)
Shipping Weight	31.8 kg (70 lb)	36.4 kg (80 lb)	127.3 kg (280 lb)

*input power configuration for the standard unit

IEC Mode Measurement System Characteristics for Agilent 6841A, 6842A, 6843A

Measurement Window	Sample Rate	Acquisition Window	Acquisition Overlap
50 Hz operation RECTangular HANNing	12.8 kHz 8.533 kHz	320 ms (16 cycles) 480 ms (24 cycles)	None 50%
60 Hz operation RECTangular HANNing	15.360 kHz 7.680 kHz	266.7 ms (16 cycles) 533.3 ms (32 cycles)	None 50%

Glossary

Quasi-stationary Harmonics

Quasi-stationary or steady-state harmonic currents are produced by electronic equipment that generates non-varying levels of current distortion, where the amplitude of each harmonic remains constant over time. This equipment appears as an unchanging load on the ac mains. Examples include test and measurement instrumentation such as oscilloscopes and multimeters, electronic ballasts, and video display equipment.

Fluctuating Harmonics

Fluctuating harmonic currents are caused by electronic equipment that represents time-varying loading on the ac mains. This equipment generates varying levels of current consumption or drain where the amplitude of individual harmonics change over time. Examples include microwave ovens, dishwashers, laser printers and photocopiers.

Voltage Fluctuations and Flicker

When loads that have automatic turn on/turn off controls such as thermostats and timers cycle on and off, they cause frequent changes of the load to the supply. Kitchen appliances, space heaters, air conditioners, copiers and other equipment include these type of controls. When such a fluctuating load is in a branch circuit with other loads, these changes cause rms voltage fluctuations that affect all of the loads in the branch. In particular, variations in voltage amplitude cause changes in the light output of any filament lamps in the branch circuit. Because the output of a filament lamp is proportional to the square of the applied voltage, changes in light intensities can be significant even for small changes in voltage.

This effect of variation in light output as perceived by the human observer is referred to as **flicker**. Flicker can be random, or it can be a regular modulation of light intensity. Because flicker is annoying, and for some individuals presents a health hazard (persons that have epilepsy for example), the regulation seeks to regulate flicker generation to an acceptable level.

Data Files

Data files may contain the following types of data:

- test setup (or template) information only
- test setup and pre-test data
- test setup, pre-test data, test data, and report data

Data files are created or selected at the beginning of each test. Template or setup data is entered or copied into the data file before the test is run. This information may be saved and the file re-opened at a later time to run the pre-test or the test. Test result data is entered into these files when the pre-test and the test is running. Report data is entered into the data files at the completion of the test. Completed test files may be opened at any time to review or print test results.

Template Files

Template files contain test-setup data that may be used in multiple tests. By eliminating a portion of the setup task, using template files can streamline the test process. Template information is included with the test data when the test is run. At the beginning of each test you can elect to use an existing template file when running your test, or you can create a new template for the test by entering new setup information in the Main and Test Setup screens. You may also choose not to use template files and enter entirely new information when setting up a test.

Integration Period

The integration period specifies the time during which instantaneous flicker values are accumulated for subsequent evaluation as short-term flicker or Pst. The integration period is determined by the selected Pst integration time. The Pst integration time can be specified as 1, 5, 10, or 15 minutes. The **resulting time** (total test time) equals the number of integration periods multiplied by the Pst integration time. For example if the Pst integration time is specified as 10 minutes, and 12 integration periods have been selected, the total time of the test will be 2 hours.

Data Records

The number of data records acquired by the Agilent 14761A application. Records are numbered sequentially beginning with one at the start of each test. The number of completed data records may be displayed in the status bar on the bottom of the screen. Data records contain the following information:

For Quasi-stationary or Fluctuating harmonics

- Each Rectangular-window record contains data from 16 cycles of the fundamental frequency at 50 and 60 Hz. 40 current harmonic values, rms current, rms voltage, and real power is calculated for each data record.
- Each Hanning-window record contains data from 24 cycles of the fundamental frequency at 50 Hz, and data from 32 cycles of the fundamental frequency at 60 Hz. 40 current harmonic values, rms current, rms voltage, and real power is calculated for each data record.

For Voltage Fluctuations

- Each Rms/Instantaneous Flicker record contains rms data and instantaneous flicker data acquired at a rate of one record per second. Each Rms voltage record contains 100 data points at 50 Hz (120 data points at 60 Hz), integrated over half-cycle periods. Each Instantaneous Flicker record contains 100 data points at 50 Hz (120 data points at 60 Hz), sampled once every 10 ms at 50 Hz (once every 8.33 ms at 60 Hz).
- Each Pst/Probability/Distribution data record contains “time-at-level” occurrences for instantaneous flicker data acquired during one integration period (which may be specified as 1, 5, 10, or 15 minutes in length). The data is accumulated into 1024 logarithmically scaled bins, which are log-weighted by flicker level in the range of 0.01 to 10000 perceptibility units. Based on this data, Pst values are calculated for each integration period.

Watch Events

Watch events are test parameters that you can specify to trigger the termination of the test. Watch events may or may not result in failures. For example, when testing Quasi-stationary Harmonics, you may configure the test to terminate when a specific harmonic approaches 95% of the regulation. In this way you can examine the test results that existed at the time the test terminated.

Failures

Failures are those conditions that will cause a test to fail the regulations. The number of failures are displayed in the status bar on the bottom of the screen. You can override the failure criteria by specifying an override percent in the Test Setup Advanced Options window. Test limits may be adjusted above or below the values specified by the regulation, but any adjustment above 100% will flag the test as invalid in the test report.

Errors

These are the instrument-specific errors that are returned by the Agilent 14761A application. Errors are displayed in the status bar on the bottom of the screen. Errors can also be displayed on the front panel of the unit by pressing the **Shift** and the **Error** key. Typical errors include current limit errors, or saturation of the current measurement circuits when operating a high power load in the low current range. These error messages may require you to refer to the Agilent 6800 Series Programming Guide or the 6800 Series User's Guide for additional information.

Error messages that are not instrument specific may appear on the screen when you are using the Agilent 14761A application. These error messages are accompanied by an explanation that describes what has occurred, and in some cases the appropriate action to take.

Percent of Threshold

Specifies a threshold as a percent of the regulatory specification. For example, if the regulation specifies that any measurement of a third harmonic current above 2.3 amperes is a failure, a 90% threshold may be used to specify that values greater than 2.07 amperes may either be evaluated as failures or used to generate a watch event.

2.5 Minute Window

A sliding 2.5 minute observation period that is applied to the entire test data. For fluctuating (or transitory) even harmonics from 2 through 10 and odd harmonics from 3 through 19, harmonic amplitudes can be 1.5 times the regulation's limits for a maximum of 15 seconds during any 2.5 minute period.

Pst (Short-term Flicker)

The flicker severity evaluated over a short period of time (10 minutes). Pst = 1 is the conventional threshold of irritability, and therefore the limit.

Plt (Long-term Flicker)

The flicker severity evaluated over a long period (typically 2 hours) using successive Pst values. Plt = 0.65 is the conventional threshold of irritability, and therefore the limit.

Dc (Relative Steady-state Voltage Change)

The difference between two adjacent steady-state voltages relative to the nominal voltage. Dc must be $\leq 3\%$.

D(t) (Relative Voltage Change Characteristic)

The change in rms voltage, relative to the nominal voltage, as a function of time and between periods when the voltage is in a steady-state condition for at least 1 second. D(t) must not be > 3% for more than 200 milliseconds continuously during a voltage change event.

Dmax (Maximum Relative Voltage Change)

The difference between maximum and minimum rms values of the voltage change characteristic relative to the nominal voltage. Dmax must be $\leq 4\%$.

Steady-state

According to EN 1000-3-3, successive half-cycle rms voltage measurements must meet some criteria for at least one second to qualify as "steady-state". What is not given in IEC 1000-3-3 is a definition of the amplitude characteristic of "steady-state".

Agilent Technologies' inferred definition is $\pm 0.15\%$ of the nominal line voltage (U_n). This was chosen for the following reason: The error allocation for measuring instrumentation is 5% while the stated limit for Dc is 3%. Taking both specifications into account (i.e. 5% of 3%) suggests that a tolerance band for a "steady-state" of 0.15% is a reasonable guess at the regulation's intent. This band is also consistent with the output noise performance of ac sources and readily permits detection of steady-state equipment-under-test behavior.

Since setting this tolerance band is critical to detection of voltage change events, and to avoid imposing a specific interpretation of steady-state, the Agilent 14761A application uses an entry in the hfts.ini file that contains initialization information for the application to set the tolerance band. The entry is factory set to 0.003 (i.e. 0.3% for the total tolerance band), but may be easily changed to another value in this file.

Agilent Technologies has made two additional interpretive inferences that are directed towards meeting the intent of the regulation while permitting a practical implementation:

1. Steady-state conditions may never be achieved during a test, in which case values for Dmax, Dc, and Dt will not be reported.
2. In the situation where steady-state conditions are established, Agilent Technologies' solution reports the maximum Dmax, Dc, and Dt events occurring within each Pst integration period. These values are then compared to the specifications stated in IEC 1000-3-3 to determine pass/fail.

IEC Mode Command Summary

Introduction

The Agilent 6800-Series AC Power Source/Analyzer is designed to operate in Normal as well as IEC mode. In Normal mode, the ac source responds to all of the commands that program ac source operation. Normal mode commands are documented in the Agilent 6800 Series Programming Guide. In IEC mode, the Agilent 6800-Series AC Power Source/Analyzer provides full EN 61000-3-2/EN 60555 Part 2 and EN 61000-3-3 compliance test capability. The SYSTem CONFigure command details the differences between Normal and IEC mode.

When the Agilent 6800-Series AC Power Source/Analyzer is being used in IEC mode, the Agilent 14761A HFTS software handles all of the communication between the user and the Agilent 6800-Series AC Power Source/Analyzer. The Agilent 14761A HFTS software must be loaded and running in Microsoft Windows on a personal computer that is connected to the Agilent 6800-Series AC Power Source/Analyzer.

The IEC commands that are described in this appendix are for those users who need to directly program the IEC functions of the Agilent 6800-Series AC Power Source/Analyzer without using the Agilent 14761A HFTS software. Be aware that these commands will return “raw” IEC data from the Agilent 6800-Series AC Power Source/Analyzer. It is the programmer’s responsibility to interpret the data according to the IEC standards.

Using the SENSE:CURRENT:ACDC:RANGE command

The SENSE:CURRENT:ACDC:RANGE command is documented in the Agilent 6811B/12B/13B/14B/34B/43A Programmer’s Guide. When using this command in IEC mode, you must always initialize it before making any Array measurements by sending a Meas:Curr? command. For example:

```
SENSe:CURRENT:ACDC:RANGe  
MEASure:CURRENT?  
ENTER
```

C - Command Summary

Command Syntax

CALCulate

:INTEgral
:TIME <Nrf+> selects the Pst integration time for flicker measurements
:LIMit
:UPPer sets various limits associated with rms voltage
[:DATA] <Nrf+> fluctuation testing for IEC 1000-3-3
:SMOothing <bool> turns the 1.5 second smoothing filter on or off

FORMat

[:DATA] <type> specifies the response data format (ASCii | REAL)
:BORDER <type> sets the byte order of the floating point values returned
(NORMal | SWAPped)

MEASure

:ARRay
:CURRent
:HARMonic? <NRf+> returns an array of current harmonic magnitudes
:VOLTage
:FLUCtuations
:FLICKer? <NRf+> returns rms and instantaneous flicker values
:PST? <NRf+> returns Pst summary values
:ALL? <NRf+> returns both rms/flicker and Pst summary values

SENSE

:CURRent sets the phase reference for current harmonic phase
:PREFerence <type> measurements (VOLTage | CURRent)
:WINDow
[:TYPE] <type> selects the window function used in the harmonic
measurements (HANNing | KBESsel | RECTangular)

SYSTEM

:CONFigure <mode> selects the operating mode of the HFTS system
(NORMal | IEC)

CALCulate:INTegral:TIME

This command selects the Pst integration time for IEC Flicker measurements. The parameter may only assume values of 1, 5, 10, and 15 minutes in accordance with IEC 868. The command will be accepted and may be queried, but will have no meaningful function unless the ac source is placed in IEC mode using the SYSTem:CONFigure command.

Command Syntax	CALCulate:INTegral:TIME <NRf+>
Parameters	1, 5, 10, & 15 minutes
*RST Value	10 minutes
Examples	CALC:INT:TIME 10
Query Syntax	CALCulate:INTegral:TIME?
Returned Parameters	<NR3>
Related Commands	SYSTEM:CONF MEAS:ARR:VOLT:FLUC:FLIC? MEAS:ARR:VOLT:FLUC:PST? MEAS:ARR:VOLT:FLUC:ALL?

CALCulate:SMOothing

This command turns on or off a smoothing filter for current harmonic measurements. The filter transfer function is equivalent to a single pole lowpass function with a 1.5 second time constant and is applied only to current harmonic measurements made when IEC mode is selected with SYSTem:CONF.

Command Syntax	CALCulate:SMOothing <Bool>
Parameters	0 1 ON OFF
*RST Value	OFF
Examples	CALC:SMO ON
Query Syntax	CALCulate:SMOothing?
Returned Parameters	<CRD>
Related Commands	MEAS:ARR:CURR:HARM? SYST:CONF MEAS:CURR:HARM?

CALCulate:LIMit:UPPer

This command sets various limits associated with rms voltage fluctuations testing for IEC 1000-3-3, as described in the following table. All five parameters are type NRf. The order in which the five parameters are entered must correspond to the order in the table.

vss delta	Sets the maximum peak-to-peak variation of relative voltage ¹ that defines “steady-state”. At *RST this value is set to 0.003 ² . Note that this number is not specified by IEC 1000-3-3.
dmax limit	Sets the maximum relative voltage ¹ change allowed before a dmax error is flagged. At *RST this value is set to 0.04 (see note ²).
dc limit	Sets the maximum relative steady-state voltage change allowed before a dc error is flagged. At *RST this value is set to 0.03 (see note ²).
dt limit	Sets the maximum time in seconds that the relative voltage ¹ can exceed the dt limit before a dt error is flagged. At *RST this value is set to 0.2 seconds.
dt limit	Sets the maximum relative voltage ¹ that must be exceeded for dt limit seconds before a dt error is flagged. At *RST this value is set to 0.03 (see note ²).

¹The expression “relative voltage” as used above is the measured rms voltage divided by the programmed voltage.

²This value is the ratio with respect to U_n (the European nominal line voltage). For example, a value of .03 represents 6.9 volts if $U_n = 230$ volts. (Ratio * 100 = % of U_n)

Command Syntax CALCulate:LIMit:UPPer[:DATA] <NRf>,<NRf>,<NRf>,<NRf>,<NRf>
Parameters see table
***RST Value** see table
Examples CALC:LIM:UPP .003, .04, .03, .2, .03
Returned Parameters <NR3>

FORMat

This command specifies the response data format for the following queries:

```
MEASure:ARRay:CURRent:DC?
MEASure:ARRay:VOLTag:DC?
MEASure:ARRay:CURRent:HARMonic[:AMPLitude]?
MEASure:ARRay:VOLTag:FLUCutations:ALL?
MEASure:ARRay:VOLTag:FLUCutations:FLICKer?
MEASure:ARRay:VOLTag:FLUCutations:PST?
```

When ASCii is selected, the response format for these queries is NR3 Numeric Response Data. This format is selected at *RST. The only valid argument for <length> is 0, which means that the ac source selects the number of significant digits to be returned.

When REAL is selected, the response format is Definite Length Arbitrary Block Response Data. The data within the Arbitrary Block is coded as IEEE single precision floating point, with 4 bytes per value. The second argument to the FORMat:DATA command specifies the number of bits in the returned data. Only the value 32 is permitted in ac source instruments. The byte order within a single value is determined by the FORMat:BORDER command. Definite Length Arbitrary Block Response Data format begins with a header that describes the number of data bytes in the response. The header begins with a pound sign, followed by a single non-zero digit that defines the number of digits in the block length, followed by the digits contained in the block.

For example: The response to the query "MEAS:ARR:CURR:HARM? 1" which returns 45 numeric values when SYSTem:CONFigure is set to IEC would be as follows:

```
'#' '3' '1' '8' '0' <byte1> <byte2> ... <byte180> <newline>
```

When a query requests a number of response blocks, each block is separated by the Response Data Separator (comma). For example: The response to the query "MEAS:ARR:CURR:HARM? 2" given under the same conditions described in the example above would be as follows:

```
'#' '3' '1' '8' '0' <byte1> <byte2> ... <byte180> ',' '#' '3' '1' '8' '0' <byte1> <byte2> ... <byte180> <newline>
```

Command Syntax	FORMat[:DATA] <CRD>
Parameters	ASCii REAL
*RST Value	ASCii
Examples	FORM REAL
Query Syntax	FORMat?
Returned Parameters	<CRD>
Related Commands	FORM:BORD MEAS:ARR:CURR:DC? MEAS:ARR:VOLT:DC? MEAS:ARR:CURR:HARM[:AMPL]? MEAS:ARR:VOLT:FLUC:ALL? MEAS:ARR:VOLT:FLUC:FLIC? MEAS:ARR:VOLT:FLUC:PST?

FORMat:BORDer

This command sets the byte order of IEEE floating point values returned within Arbitrary Block Response Data. When NORMal is selected, the first byte sent is the sign bit and seven most significant bits of the exponent, and the last byte sent is the least significant byte of the mantissa. This ordering is most useful for big-endian controllers such as those that use Motorola processors.

When SWAPped is selected, the least significant byte of the mantissa is sent first and the sign bit and seven most significant bits of the exponent are sent last. This ordering is most useful for little-endian controllers such as those that use Intel processors.

Command Syntax	FORMat:BORDer <CRD>
Parameters	NORMal SWAPped
*RST Value	NORMal
Examples	FORM:BORD SWAP
Query Syntax	FORMat:BORDer?
Returned Parameters	<CRD>
Related Commands	FORM[:DATA] MEAS:ARR:CURR:DC? MEAS:ARR:VOLT:DC? MEAS:ARR:CURR:HARM[:AMPL]? MEAS:ARR:VOLT:FLUC:ALL? MEAS:ARR:VOLT:FLUC:FLICKer? MEAS:ARR:VOLT:FLUC:PST?

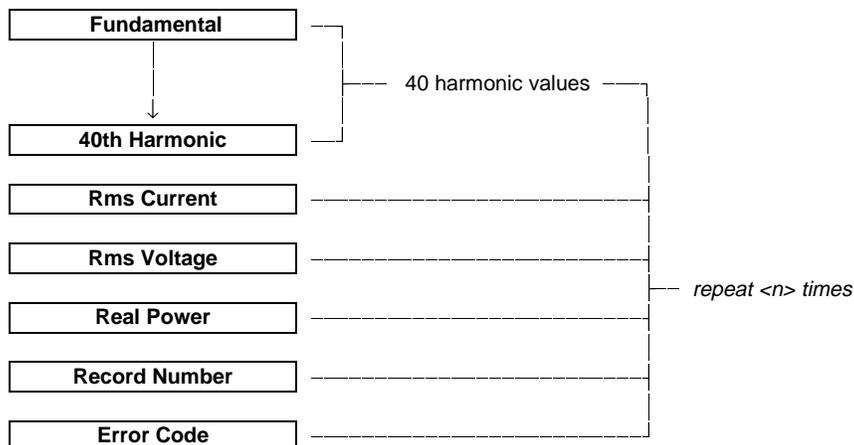
MEASure:ARRay:CURRent:HARMonic?

This query returns an array of current harmonic magnitudes. Operation of the query is modified by the SYSTem:CONF command (see summary table under SYSTem:CONFigure). The parameter specifies the number of harmonic arrays to be returned in response to the query. If SYSTem:CONFigure specifies NORMal operation, the parameter is ignored (ie it is forced to 1). If SYSTem:CONFigure specifies IEC operation, the SOURce:FREQuency and SENSE:WINDow commands are coupled to modify operation of the measurement underlying the query as shown in the following table:

SOURce:FREQ	SENSe:WINDow	Sample Rate	Acquisition Window	Acquisition Overlap
50 Hz	RECTangular	12.8 KHz	320 ms	None
50 Hz	HANNing	8.533 KHz	480 ms	50%
60 Hz	RECTangular	15.360 KHz	266.7 ms	None
60 Hz	HANNing	7.680 KHz	533.3 ms	50%

SYSTem:CONFigure also impacts availability of the RMS Current, RMS Voltage, Real Power values. If SYSTem:CONFigure is set to NORMal, these values are not available. If SYSTem:CONFigure is set to IEC, the values are returned with the harmonic data. The integration time for these values equals the acquisition window period.

IEC mode operation conforms to IEC and EN requirements for compliance testing of harmonic currents (EN 60555 Part 2 and related regulations). The ac source will accept parameters in the range shown below, however, values greater or equal to $(2^{31})-1$ will be interpreted as infinity. Record numbering begins with one. The figure below defines the structure of the data returned by this query:



Command Syntax MEASure:ARRay:CURRent:HARMonic? <NRf+>
Parameters 1 to 9.9E37
Examples MEAS:ARR:CURR:HARM? 1024
Related Commands ABORt SYST:CONF INST:NSEL SENS:WIND
 SOUR:FREQ

MEASure:ARRay:VOLTage:FLUCtuations:ALL?

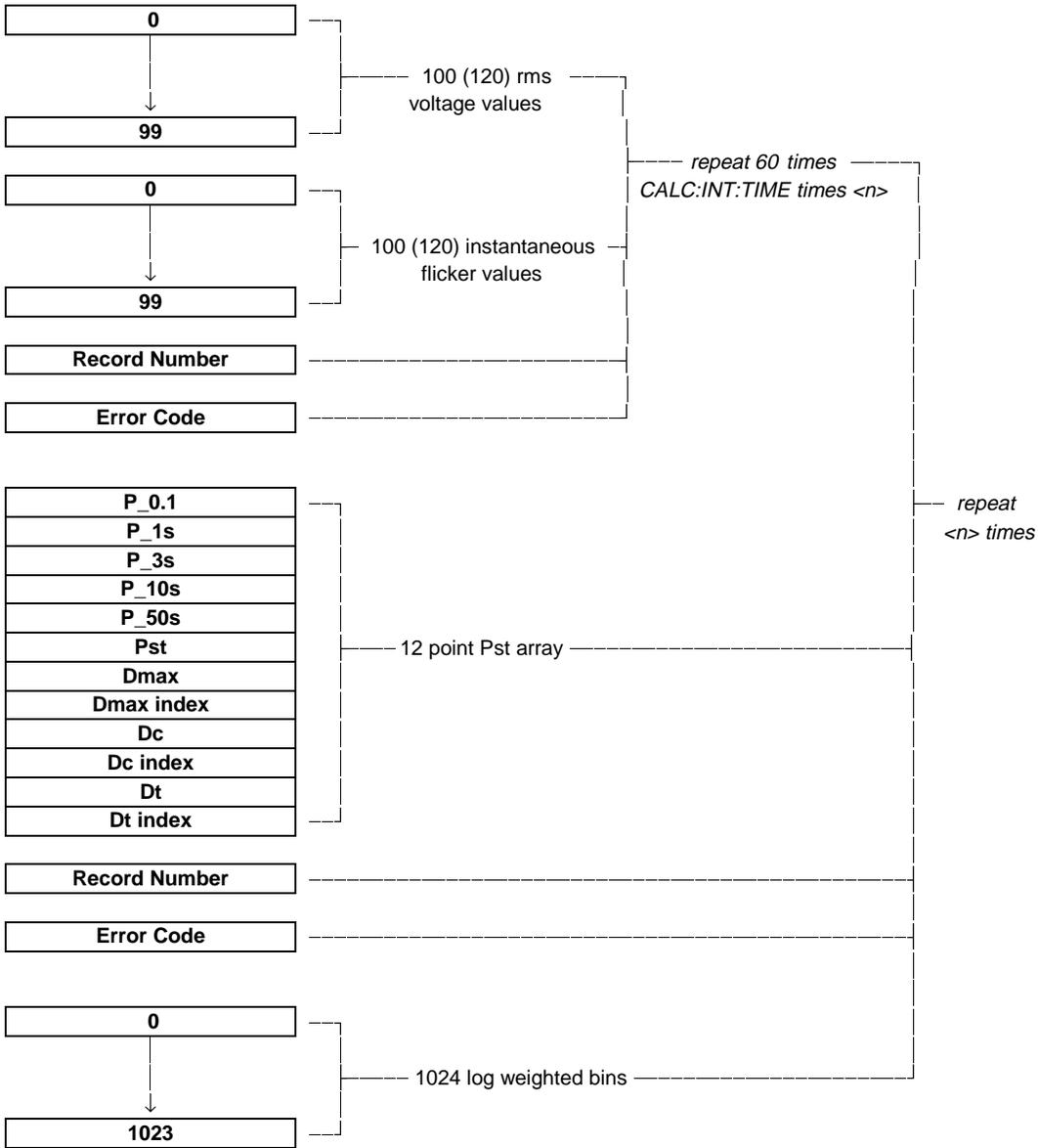
This query measures voltage fluctuations in accordance with the IEC 868 standard. It is only available when IEC mode is selected with `SYSTEM:CONFigure`. The parameter specifies the number of Pst integration periods during which data will be returned in response to the query.

This query returns the data structures associated with both the `MEAS:ARR:VOLT:FLUC:FLIC` query and the `MEAS:ARR:VOLT:FLUC:PST` query. The Pst structure includes flicker perceptibility values for the component percentiles making up Pst, the Pst value itself, various RMS voltage values (Dmax, Dc, and Dt), together with indices for these RMS values that give their approximate location in the RMS time series for the corresponding integration period.

An additional structure consisting of a 1024 point array of bins whose indices correspond to a set of logarithmically weighted ranges of instantaneous flicker is returned for each Pst integration period. The array covers a flicker perceptibility range of 0.01 to 10000 and the individual bins contain counts equal to the accumulated number of occurrences of flicker within the bin range during the Pst integration period. RMS voltage and instantaneous flicker values are returned once a second, while Pst data and the 1024 point arrays are returned once per Pst integration period. The data is always returned in order (i.e. the Pst summary data immediately follows the last array of RMS voltage and flicker values for a given integration period).

The total quantity of data returned by this query is demonstrated by the following example (assuming 50Hz operation): If `CALCulate:INTEgral:TIME` specifies 10 minutes and `<n>` is set to 12, a 2 hour measurement is initiated (10 minutes times 12) and a total of 1,466,856 data points are returned (202 times 60 times 10 plus the 14 item Pst summary record plus 1024 log points all times 12 Pst integration periods).

This command is closely related to two similar commands that return different data (see `MEAS:ARR:VOLT:FLUC:FLIC` and `MEAS:ARR:VOLT:FLUC:ALL`). The figure below defines the structure of the data returned by this query:



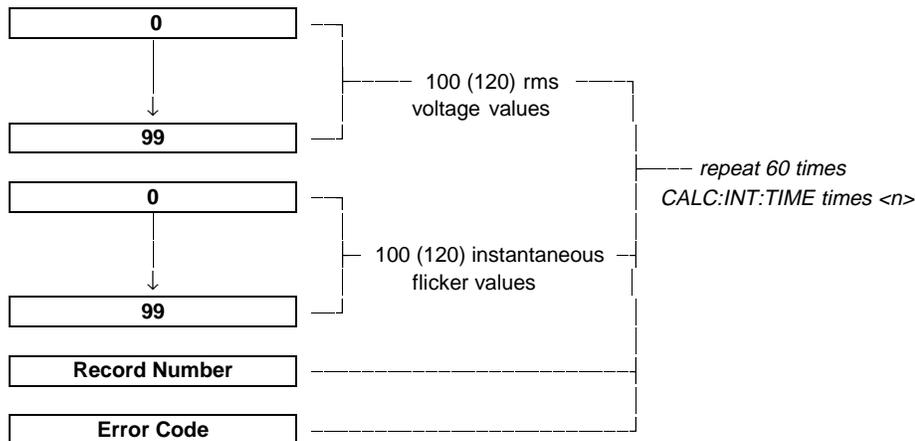
Command Syntax MEASure:ARRay:VOLTage:FLUCtuations:ALL? <NRf+>
Parameters 1 to 1008
Examples MEAS:ARR:VOLT:FLUC:ALL? 12
Returned Parameters 13,158 to 220,588,704 values
Related Commands ABORt SYSTEM:CONF INST:NSEL
 MEAS:ARR:VOLT:FLUC:PST?
 MEAS:ARR:VOLT:FLUC:ALL?

MEASure:ARRay:VOLTage:FLUCtuations:FLICkEr?

This query measures voltage fluctuations in accordance with the IEC 868 standard. It is only available when IEC mode is selected with SYSTem:CONFIgure. The parameter specifies the number of Pst integration periods during which voltage fluctuation arrays will be returned in response to the query. The data contained within the arrays represents RMS voltage values integrated over successive half line cycles and the corresponding instantaneous flicker values. This query returns structured data at a rate of one packet per second, with each packet contained 202 (50Hz) or 242 (60Hz) data points, for a period of time determined by the specified CALCulate:INTegral:TIME and the parameter specifying the number of Pst integration periods.

For example (assuming 50Hz operation): If CALCulate:INTegral:TIME specifies 10 minutes and <n> is set to 12, a 2 hour measurement is initiated (10 minutes times 12) and 1,454,400 (202 points/sec times 60 times 10 minutes times 12) data points are returned.

This command is closely related to two similar commands that return different types of data (see MEAS:ARR:VOLT:FLUC:PST and MEAS:ARR:VOLT:FLUC:ALL). Record numbering begins with one. The figure below defines the structure of the data returned by this query:



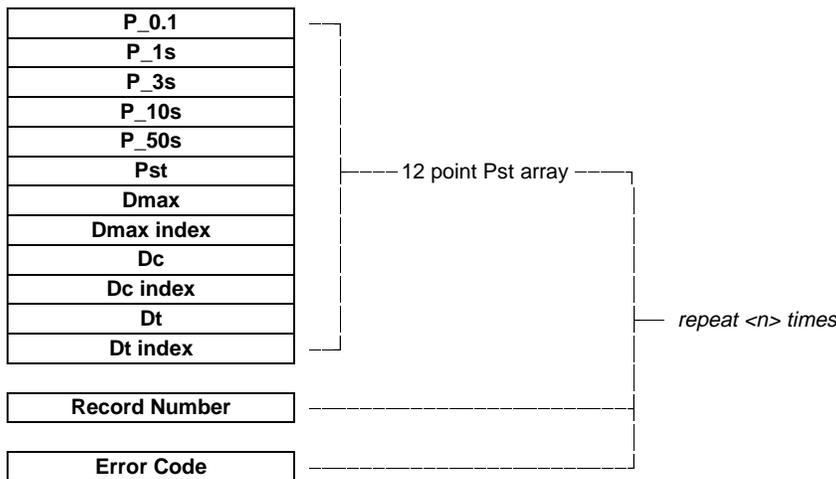
Command Syntax	MEASure:ARRay:VOLTage:FLUCtuations:FLICkEr? <NRf+>
Parameters	1 to 1008
Examples	MEASure:ARRay:VOLTage:FLUCtuations:FLICkEr? 12
Returned Parameters	12120 to 219,542,400 values
Related Commands	ABORt SYSTem:CONF INST:NSEL MEAS:ARR:VOLT:FLUC:PST? MEAS:ARR:VOLT:FLUC:ALL?

MEASure:ARRay:VOLTage:FLUCtuations:PST?

This query measures voltage fluctuations in accordance with the IEC 868 standard. It is only available when IEC mode is selected with SYSTem:CONFigure. The parameter specifies the number of Pst integration periods for which data will be returned in response to the query. This query returns 1 data structure per specified integration period for a total of <n> structures.

For example: If CALCulate:INTEgral:TIME specifies 10 minutes and <n> is set to 12, a 2 hour measurement is initiated (10 minutes times 12) and 12 structures are returned. Since there are 14 data points per structure, a total of 168 points are returned. The structure includes flicker perceptibility values for the component percentiles making up Pst, the Pst value itself, various RMS voltage values (Dmax, Dc, and Dt), together with indices for these RMS values that give their approximate location in the RMS time series for the corresponding integration period.

This command is closely related to two similar commands that return different types of data (see MEAS:ARR:VOLT:FLUC:FLIC and MEAS:ARR:VOLT:FLUC:ALL). Record numbering begins with one. The figure below defines the structure of the data returned by this query:



Command Syntax MEASure:ARRay:VOLTage:FLUCtuations:PST? <NRf+>
Parameters 1 to 1008
Examples MEAS:ARR:VOLT:FLUC:PST? 12
Returned Parameters 14 to 14,112 values
Related Commands ABORt SYSTem:CONF INST:NSEL
 MEAS:ARR:VOLT:FLUC:FLIC?
 MEAS:ARR:VOLT:FLUC:ALL?

SENSe:CURRent:PREFereNce

This command sets the phase reference for current harmonic phase measurements. If VOLTage is selected, the reference is the fundamental component of the measured output voltage. If CURRent is selected, the reference is the fundamental component of the measured output current.

Command Syntax	SENSe:CURRent:PREFereNce <CRD>
Parameters	VOLTage CURRent
*RST Value	CURRent
Examples	SENS:CURR:PREF CURR
Query Syntax	SENSe:CURRent:PREF?
Returned Parameters	<CRD>
Related Commands	ABORt MEAS:ARR:CURR:PHAS

SENSe:WINDow

This command sets the window function which is used in harmonic measurements. The choice of parameters is affected by the SYSTem:CONF command. If NORMal is selected, HANNing, KBESsel, or RECTangular may be selected. IF IEC mode is selected, only HANNing and RECTangular may be selected. KBESsel is the preferred window and should be used for most measurements in NORMal mode. HANNing and RECTangular are available for making harmonic current measurements that comply with the regulatory requirements.

Command Syntax	SENSe:WINDow [:TYPE] <window>
Parameters	HANNing KBESsel RECTangular
*RST Value	KBESsel (RECTangular is the default setting when the HFTS software is run)
Examples	SENS:WIND RECT
Query Syntax	SENSe:WINDow?
Returned Parameters	<CRD>
Related Commands	MEASure:ARRay:CURRent:HARMonic? SYSTem:CONF MEASure:CURRent:HARMonic? MEASure:ARRay:VOLTage:HARMonic? MEASure:VOLTage:HARMonic?

SYSTem:CONFigure

This command sets the overall operating mode for the Agilent 6800-Series AC Power Source/Analyzers. The choices are normal mode, which causes the product to operate as a standard ac source, or IEC mode, which modifies the basic behavior of the transient and measurement systems to facilitate IEC measurements. SYSTem:CONFigure has a variety of global consequences that are summarized below:

	NORMAL MODE	IEC MODE
Base Sampling Rate	39.920792 kHz	38.400000 kHz
Output Frequency	DC - 1000 Hz	50 Hz & 60 Hz Only
Freq/Window/Fs Mode	Independent	Coupled
Transient System	FIXEd/STEP/PULSe/LIST Modes	FIXEd Mode Only
Slew Operation	AC & DC Voltage; Frequency	AC Voltage Only
MEASure:ARRay:CURRent :HARM?	DC, Fundamental, and Harmonics to 50th	Fundamental and Harmonics to 40th plus RMS Current, RMS Voltage & Real Power
CALCulate:SMOothing	Not/Available	1.5 Second Smoothing on/off
MEASure:ARRay:VOLTage :FLUCtuations	Not/Available	FLICKer PST ALL?
CALCulate:INTegral:TIME	Not/Available	1 5 10 15 MINutes

Transmission of a SYSTem:CONFigure command implies ABORt and terminates any transient or measurement actions previously initiated.

Command Syntax SYSTem:CONFigure <CRD>
Parameters NORMal | IEC
***RST Value** NORMal
Examples SYST:CONF NORM
Query Syntax SYSTem:CONFigure?
Returned Parameters <CRD>
Related Commands ABORt MEAS:ARR:CURR MEAS:ARR:VOLT CALC:SMO
 CALC:INT SENS:WIND

Class Determination

The following flowcharts document the class determination used by the Agilent 14761A HFTS software. Class determination is a function of the Pre-test. The flowcharts illustrate

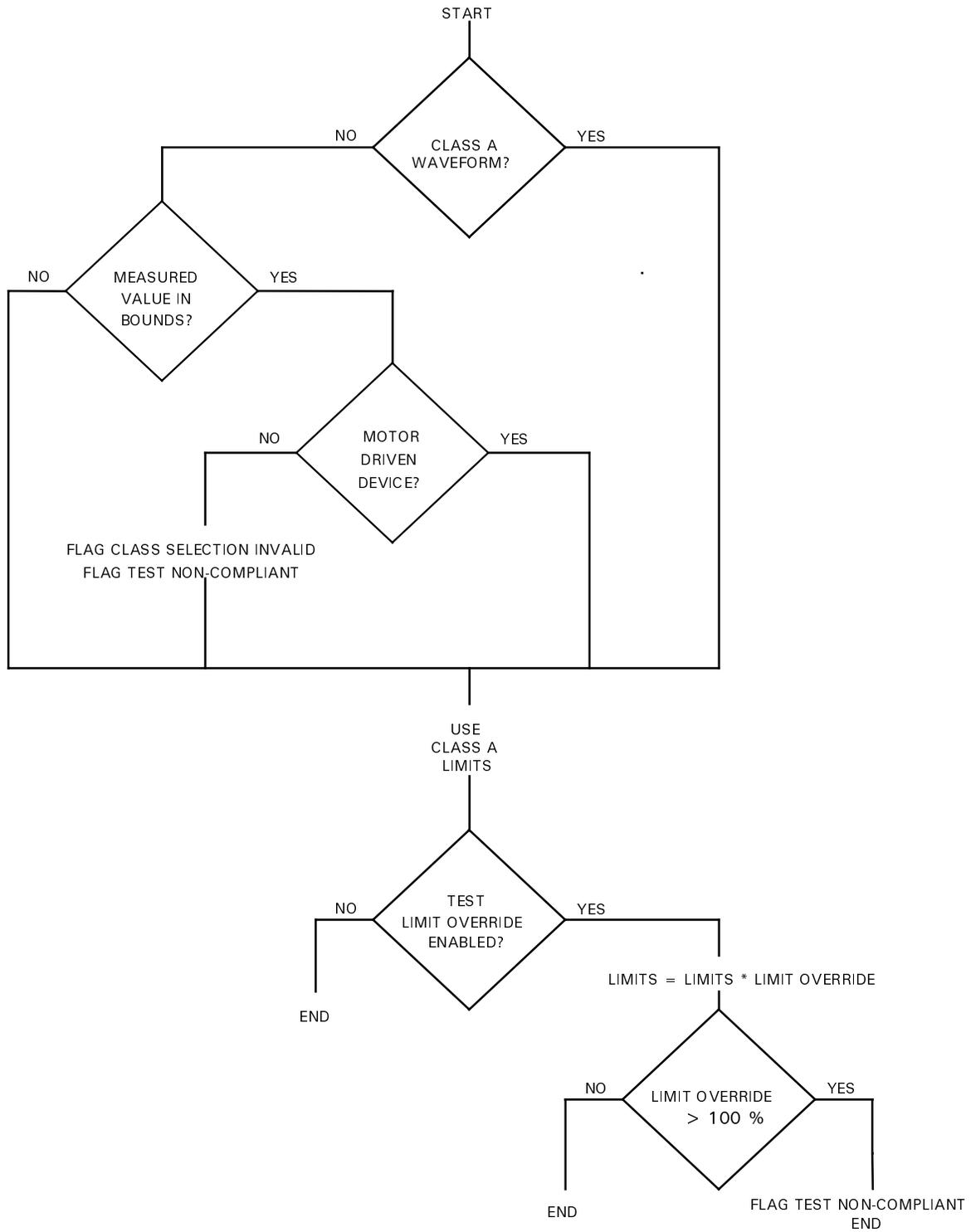
- the class determination process according to the device class that was selected in the Standard Options window
- how a test is flagged as non-compliant based on class selection
- how the pre-test limits are calculated.

The A, B, C, and D class determination flowcharts are only valid for IEC 1000-2-2/EN 61000-2-2 Quasi-stationary harmonics.

The last flowchart in the series documents the class determination used for the older EN 60555 Part 2 (IEC 555-2) regulation. This regulation is selected in the **Options** menu, under **Defaults**.

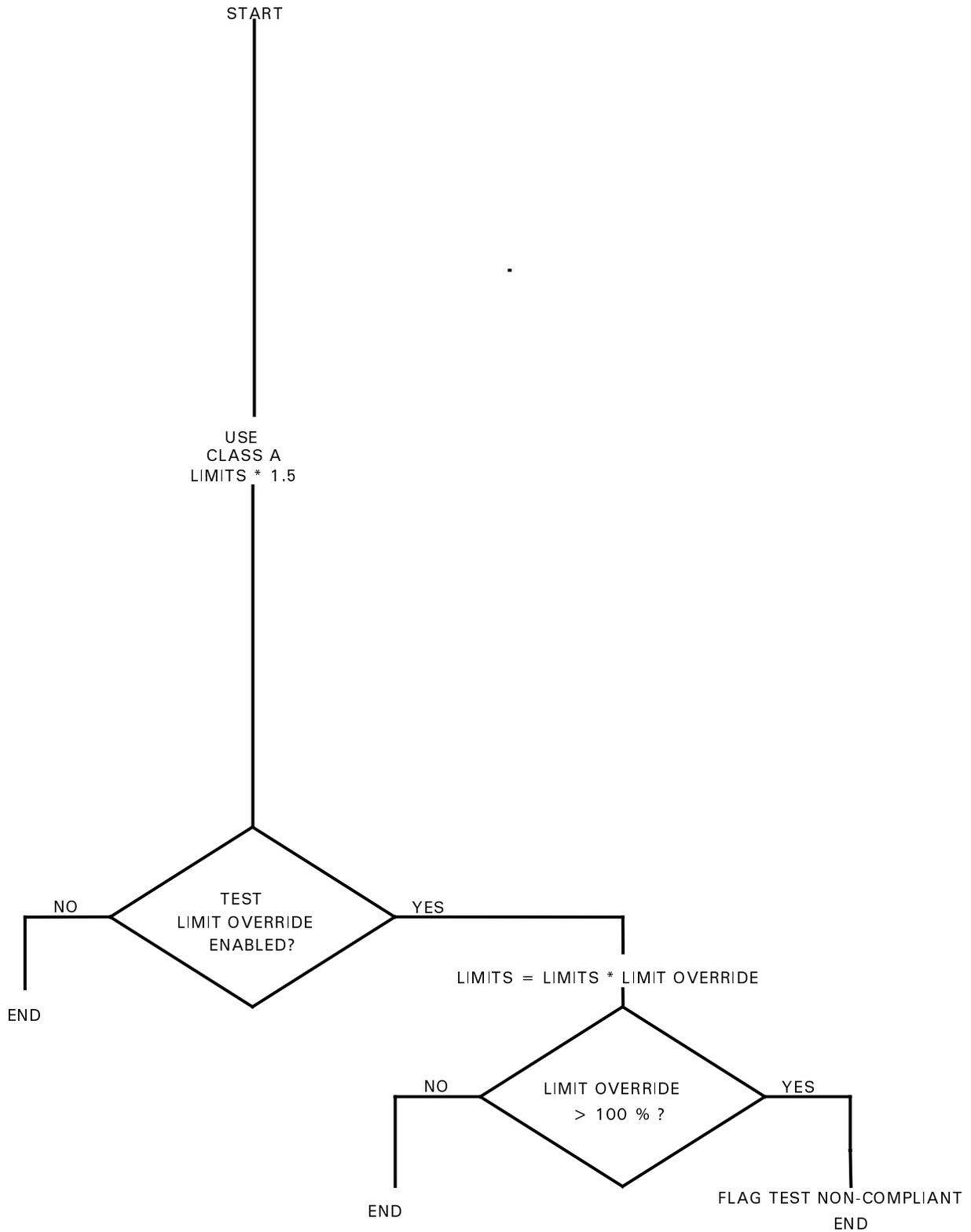
D - Class Determination

Class A Device Selected



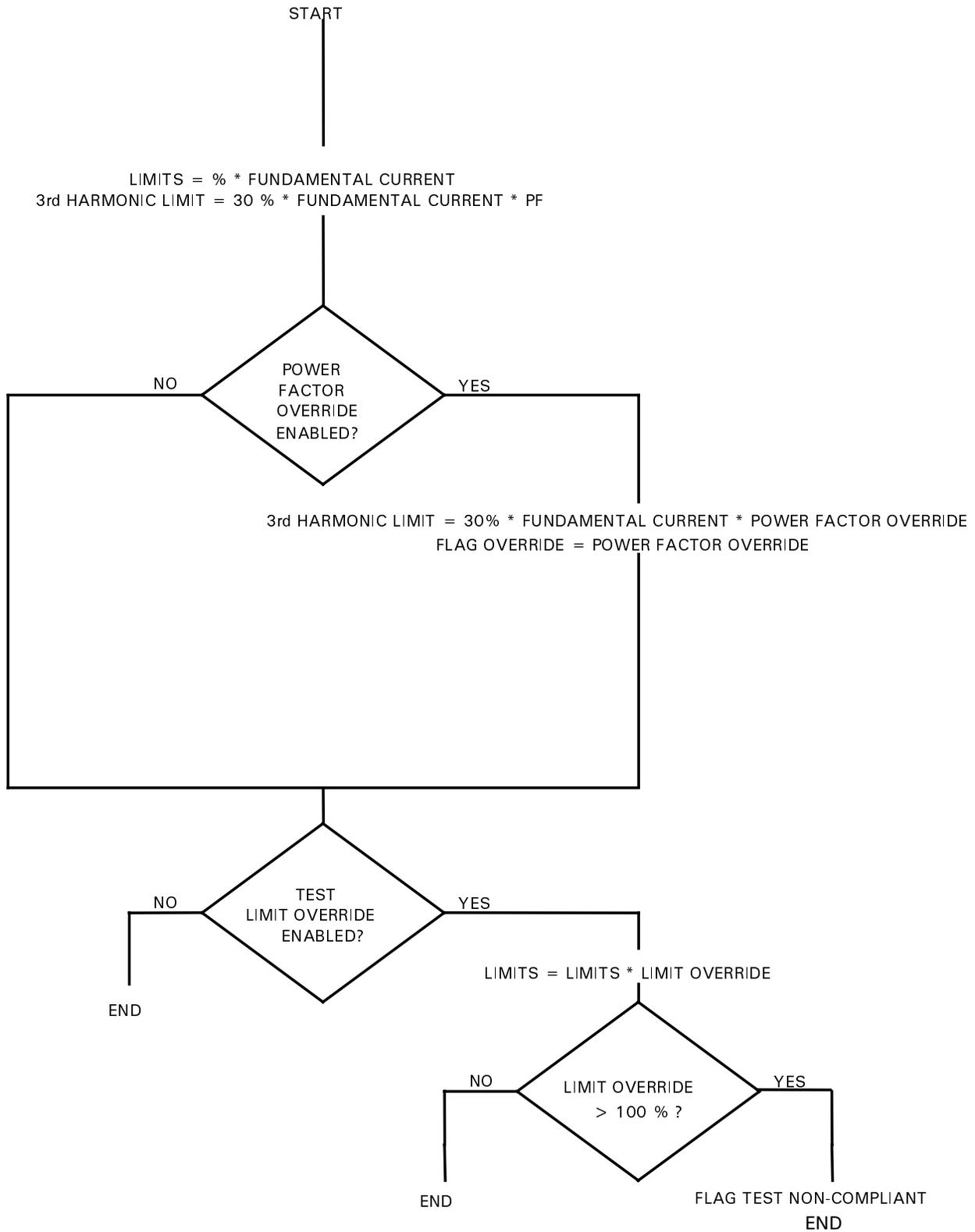
Class A Limits Logic (EN 61000-3-2)

Class B Device Selected



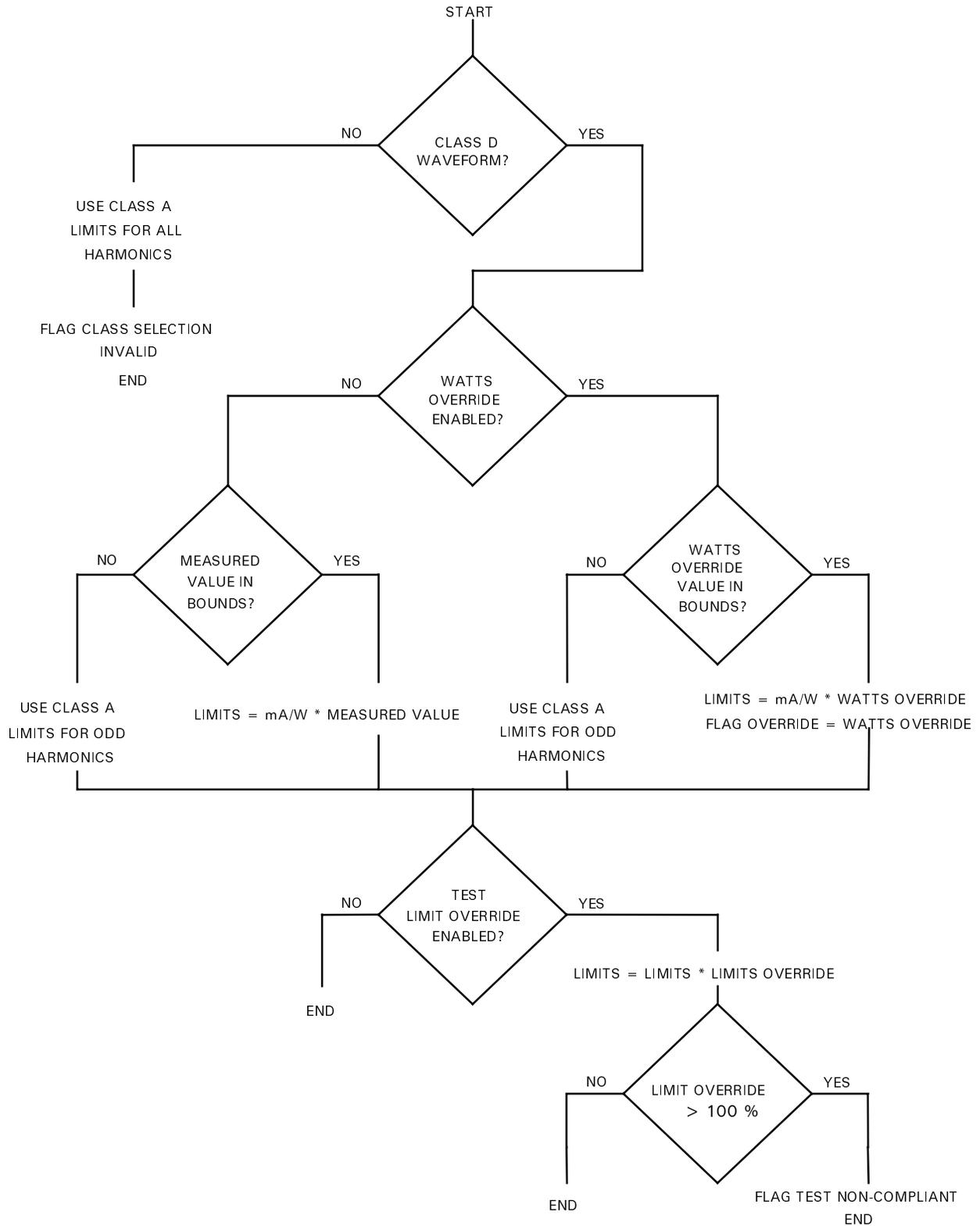
Class B Limits Logic (EN 61000-3-2)

Class C Device Selected



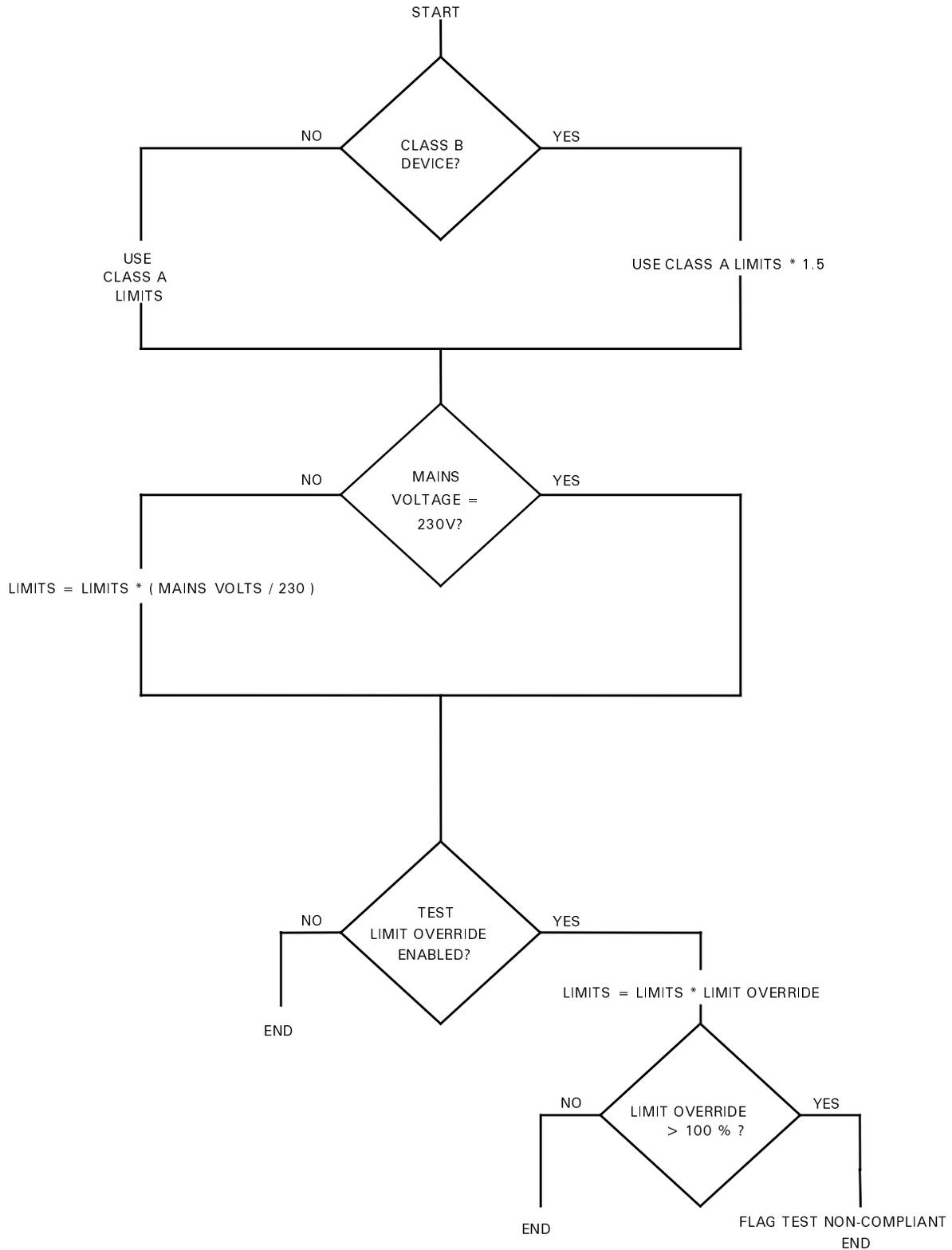
Class C Limits Logic (EN 61000-3-2)

Class D Device Selected



Class D Limits Logic (EN 61000-3-2)

EN 60555 Part 2 Regulation Selected



Limits Logic (EN 60555 Part 2)

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Technical data is subject to change.

Manual Updates

The following updates have been made to this manual since the print revision indicated on the title page.

5/30/00

All references to HP have been changed to Agilent.

All references to HP-IB have been changed to GPIB.

Information about Validation Mode has been added to page 36.