AUTOSTAR

SOFTWARE GUIDE

601-310D

TESEQ
Advanced Test Solutions for EMC

AUTOSTAR

SOFTWARE GUIDE

CONTENTS

1 SAFETY

The AutoStar software is online connected to the AutoStar test system. So the user must be aware of controlling a hardware with pontential hazards by the AutoStar software. Before installing the test system and putting it into operation, pay attention to the following safety instructions!

Obey also all safety instructions in the manuals of the attached devices!

NOTE! Store this manual for future reference!
Keep this manual in such a way that it is always accessible for the operating personnel.
→ The repository of this manual must be known by each operator.

1.1 Classification of dangers

All the safety Instructions in this manual have the same structure.
A safety instruction consists of the **signal word,** an information of **type and source of the danger,** the procedure for averting the danger, and the standardized **warning symbol.**
The following table provides a description of the meaning for each warning symbol and signal word.

Warning symbol	Signal word	Definition
	DANGER!	Possibly dangerous situation, that may cause damage to persons or heavy damage to the tester and/or the equipment.
	WARNING!	Possibly dangerous situation, which can entail damage to persons and damage to equipment.
	CAUTION!	Situation, that may cause damage to the tester and/or the equipment.
	NOTE!	User tips and other important or useful information and comments.
	TIP!	User tips and other useful information and comments.

1.2 Excess voltage category

SIGNAL!
Type and source of the danger!
Detailed information text explaining in which situation the danger occurs.
→ procedure for averting the danger.

1.3 Safety of operation

Reliable function and safe operation of the test equipment is ensured only if the relevant general precautions as well as all safety instructions are observed. These instructions are given in this manual and especially in the harware guide.

1.4 Range of validity

These instructions are valid for the complete test system. Further safety regulations for components installed in this test system or additional installed devices are not covered by these instructions.

1.5 Personnel

The AutoStar software connected with the AutoStar test system may be operated by qualified personnel only. Teseq or its representative may not be held respon- sible for any damages caused by faulty operation.

1.6 Responsibility for safety precaution

The owner, operation supervisor and/or operator of the equipment are responsible for safety. They are in charge of any safety measures that do not directly concern the tester itself. For details, see the relevant accident prevention regulations. See also the safety instructions in the manufacturer's manual included with any additional instrument or device you intend to use with your Teseq tester.

1.7 Safety rules

According to the EN 50191 standard, this equipment may involve the risk of electric shock. Conductive parts must not be touched, and the test station must have appropriate warning labels and signs. In general, observe the industrial health and safety standards pertaining to electrical test installations in your country.

1.8 Reduction of operational safety

If you have any reasons to suspect that the test equipment is not completely safe, you must shut it down and put it out of operation. Moreover, you must mark or label the equipment appropriately so it will not inadvertently be put in operation again. You should then call authorized service personnel for assistance.

2 INTRODUCTION

AutoStar software is a test-management platform, which controls the NSG 5000/NSG 5500 or NSG 5200/ NSG 5600 and a variety of sources, combining them into one system. In a uniform environment, AutoStar provides predefined test parameters, test sequencing, auto-configuration, reporting in Word and storage of user-defined tests. Test waveforms are displayed graphically and a facility exists for the capture of waveforms from a digital oscilloscope.

2.1 AutoStar features

- Automotive test environment
- Predefined standard tests
- Multiple arb card support
- Oscilloscope support
- Excel or text data importing
- MS Word reporting
- Test sequencing

2.2 Hardware requirements

1 GHz or faster 32-bit (x86) or 64-bit (x64) processor
1 GB RAM
300 MB Hard Disk Space
Windows 2000 SP3 or higher
Windows XP SP3 or higher
Windows 7
Resolution 1280 x 1024 or better

2.3 Test evaluation and reporting

Reports concerning individual tests and test sequences are automatically produced and are in a form which can be used for technical files and quality assurance documents. The user is provided with a range of editable fields for remarks and specification of the task in hand.

2.4 Automotive conducted immunity EMC standard types

AutoStar controls the NSG 5000/NSG 5500 or NSG 5200/NSG 5600 and sources and is designed to meet the four classes of Automotive conducted immunity EMC standard types:

- Supply voltage variation (SVV)
- Conducted sine waves (CSW)
- Conducted transients (CT)
- Power magnetics (PM)

2.4.1 Supply voltage variations (SVV)

Supply voltage variations are voltage variations of the battery supply caused by engine cranking, alternator ripple, battery charging, and jump start etc.
There are several types of supply voltage variation pulses and these are categorised by Teseq as:

→ Pulse 4c

- 4c pulses are those arbitrary waveforms that can be built up using sine, square, triangle, ramp, exponential and clone wave segments.
- The majority of SVV tests are of type 4c.

→ Pulse 4d

- 4d pulses are known as dips and drops.
- A dip is a fast (~1 µs) change form one DC level to another DC level.
- A drop is a dip to 0 V.
- It is difficult to achieve a 1 µs rise and fall time using an amplifier. Thus two DC Sources and a fast semiconductor switch are used to achieve the required rise and fall time specs.

→ Pulse 2b

- Pulse 2b is defined in SAEJ1113/11 and ISO 7637-2.
- Pulse 2b is created using a series of segments, similar to 4c, but often requires additional control over the pulse impedance.
- SAEJ1113/11 requires the pulse to have an impedance of 0.5 to 3 Ω. Before the pulse and after the pulse has fired the impedance should be 0.01 Ω. Pulse 2b is caused by transients from DC motors which act as generators after the ignition is switched off.

→ Pulses CI 260, CI 250A, Fuel pump transient (FPT)

- Some 4c type pulses (special pulses) cannot be generated using the standard waveform segments (sine, square, triangle, ramp or expo), which is generally due to the high speed or short duration of the pulse.
- To generate these pulses the particular wave pattern is created as a bit pattern and clocked out at high speed.

2.4.2 Conducted sine waves (CSW)

Conducted sine waves are low amplitude sinusoids, which are superimposed upon the DC battery.

- Frequencies from 30 Hz to 250 kHz.
- Due to the high frequency nature of the sine waves it may not be possible to generate them using a DC amplifier, instead they are generated separately and transformer coupled to the battery using an Isolation transformer. as required by SEA IM3-2 and others.

2.4.3 Conducted transients (CT)

Conducted transients are generally high voltage pulses on the battery caused by motors, the alternator and various switching devices. There are several types of conducted transient pulses. These are referred to by their ISO name but include several variants. See the applicable hardware guide for details. This manual is meant to be generic and applicable regardless of the hardware that is installed. However the most common pulses are listed below for reference.

→ ISO 7637 Pulse 1

- Known as pulse 1 (as defined in ISO7637)
- Caused by the battery being disconnected from an inductive load
- The pulse is directly coupled to the battery
- Negative pulse
- Rise time (10 to 90%) is approximately 1 µs
- Pulse width (10 to 10%) from 50 µs to 2 ms
- Pulse amplitude from -10 to -600 V
- Impedance is 4 to 200 Ω
- Generated using the NSG 5001A, NSG 5041, MT 5510 or MT 5511

→ ISO 7637 Pulse 2a

- Known as pulse 2a (as defined in ISO 7637)
- Caused by a device (such as a lamp) in parallel with the DUT being switched off The pulse is directly coupled to the battery
- Positive pulse
- Rise time (10 to 90%) is approximately 1 µs
- Pulse width (10 to 10%) is typically 50 µs
- Pulse amplitude from +10 to +600 V
- Impedance is 2 to 200 Ω
- Generated using the NSG 5001A, NSG 5041, MT 5510 or MT 5511

→ ISO 7637 Pulse 6

- Known as pulse 6 (as defined in ISO 7637 1990)
- Caused by current interruption in the ignition coil
- The pulse is directly coupled to the battery
- Negative pulse
- Rise time (10 to 90%) is approximately 60 µs
- Pulse width (10 to 10%) is approximately 300 µs
- Pulse amplitude from -20 to -300 V
- Impedance is 30 Ω
- Generated using the NSG 5001A, NSG 5041, MT 5510 or MT 5511

→ ISO 7637 Pulse 3

- Known as pulses 3a and 3b (as defined in ISO 7637)
- Caused by the various switching processes
- The pulses are capacitive coupled to the battery
- 3a is a negative pulse
- 3b is a positive pulse
- Rise time (10 to 90%) is 5 ns
- Pulse width (10 to 10%) is 100 or 150 ns
- Pulse amplitude from 20 to 800 V

- Impedance is 50 Ω
- Generated using the NSG 5003 or FT 5531

NOTE!
The FT 5531 and FT 5530 are functionally identical and may be used interchangeably in this guide.

→ Load dump

- Known as pulses 5a and 5b (as defined in ISO 7637)
- Caused by the discharged battery being disconnected from the alternator while the alternator is generating charging current
- 5a is a positive pulse
- 5b is a suppressed version of 5a
- Rise time (10 to 90%) is 1 to 10 ms
- Pulse width (10 to 10%) is typically 40 to 400 ms
- Unsuppressed pulse amplitude from 20 to 200 V
- Suppressed pulse amplitude typically 30 to 50 V
- Impedance is 0.5 to 10 Ω
- Generated using the NSG 5005A, LD 5505 or LD 5550

2.4.4 Power magnetics (PM)

Power magnetics are low frequency magnetic fields generated by devices such as electric motors and also from external mains (50/60 Hz) sources.

- Frequency range is generally 10 Hz to 100 KHz.
- Magnetic field density is from 180 dBpT at the fundamental frequency to ~52 dBpT at the highest frequency where 0 dBpT = 1 picoTesla (pT) = 7.96 10-7 A/m.
- The test requirements generally follow the frequency spectrum of a square wave at the fundamental frequency.

There are two test methods used for magnetic fields

1. Helmholtz coil

With this method it is only necessary to know the current through the loop, because a Helmholtz coil sets up a uniform magnetic filed within a defined region for a given current.

2. Radiating loop

- A small loop of wire is used to produce the magnetic field. A loop sensor is fitted to it during calibration and the magnetic field strength read back (in some applications).
- The DUT is marked off into small areas and the radiating loop is moved around the DUT.
- Less expensive than Helmholtz coil and particulary useful if the DUT is large.
- The current control is used in most applications as feedback during the test.

3 SOFTWARE INSTALLATION

NOTE!
Preconditions for installation:
Reboot your computer before you install the new AutoStar software. It is recommended that you exit all Windows programs before running this Setup program.

3.1 Installation Wizard

The installation Wizard will be started automatically after you have inserted your AutoStar software CD. This Wizard will guide you through the setup process. If the autorun function is disabled on your computer you have to double-click the **Setup.exe** provided on the AutoStar Software CD.

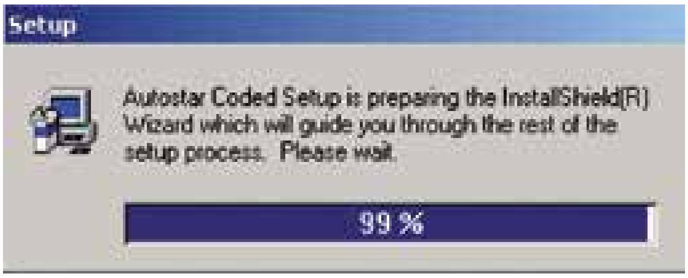


Figure 3-1: Initial setup dialogue

NOTE!
To cancel setup wizard at any time, click the cancel button. An exit setup dialogue box will be displayed on screen, click the exit setup button to exit from the Wizard setup.

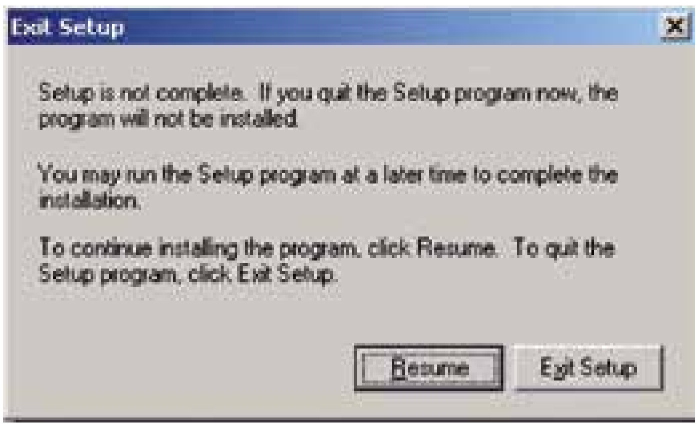


Figure 3-2: Exit setup dialogue

Step 1
The **Welcome** screen recommends that you reboot your computer and close all Windows programs before running the setup program. Click **Next** button to continue AutoStar setup.

Figure 3-3: Welcome dialogue

Step 2
Select the **Yes** button to accept the **Software License Agreement** and to progress to next step of installing the **AutoStar** software.

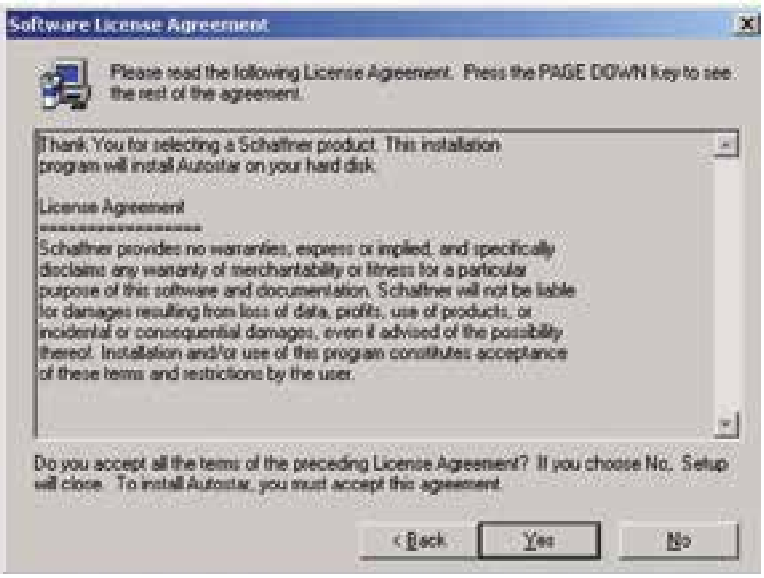


Figure 3-4: Software license agreement dialogue

Step 5
In the **User Information** dialogue box, the user must enter the user name, company name and product serial number to progress to next stage.

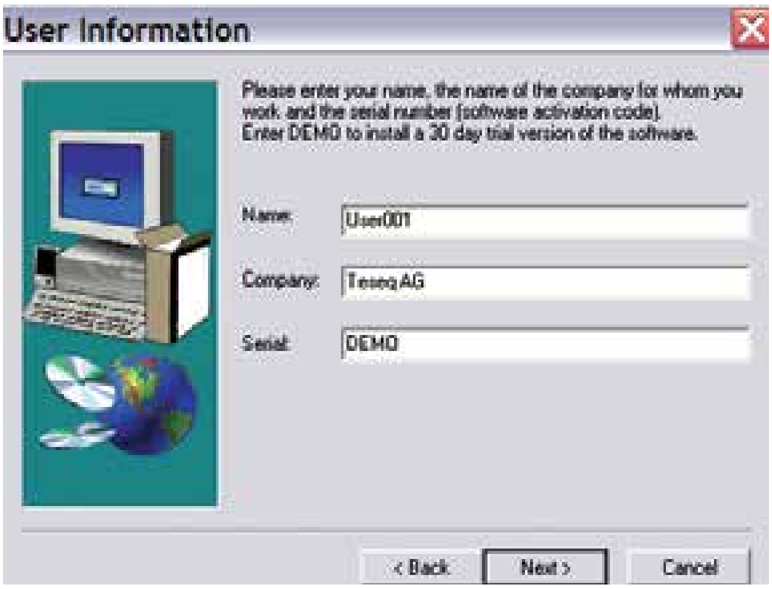


Figure 3-5: User information dialogue

Step 6
Setup Wizard will install the software in the destination folder shown, click next button.

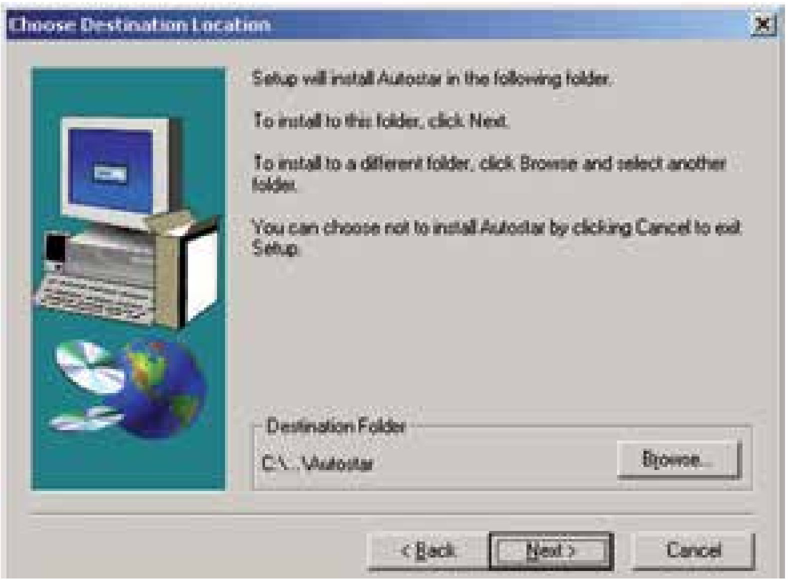


Figure 3-6: Choose destination location dialogue

To install to a different folder, click browse button and select another folder from the choose folder dialogue box. It is advisable to select the default location but is not necessary.

Step 7
An information window will be opened. If you have problems to start AutoStar after installation please read the following documents: AutoStar DBzugriff-D.pdf (German language) or AutoStar DBAccess-E.pdf (English language).

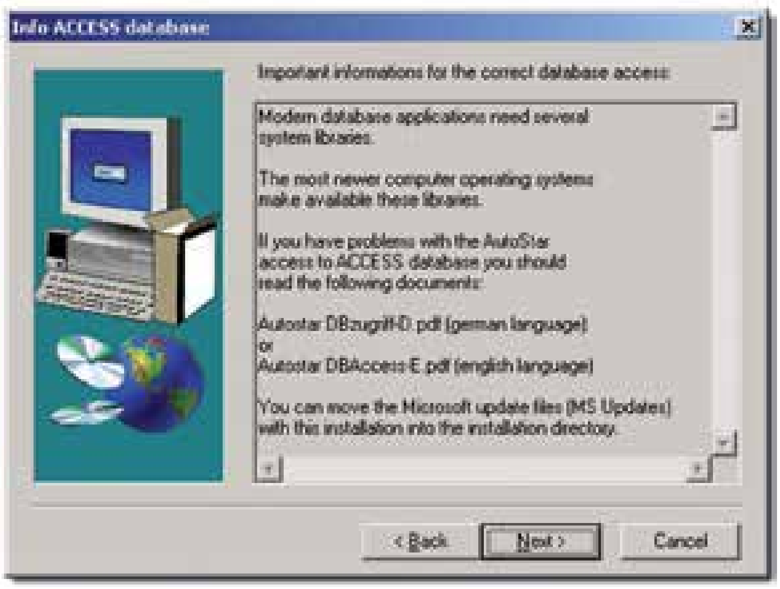


Figure 3-8: Information window

Step 8

There are five components and options.

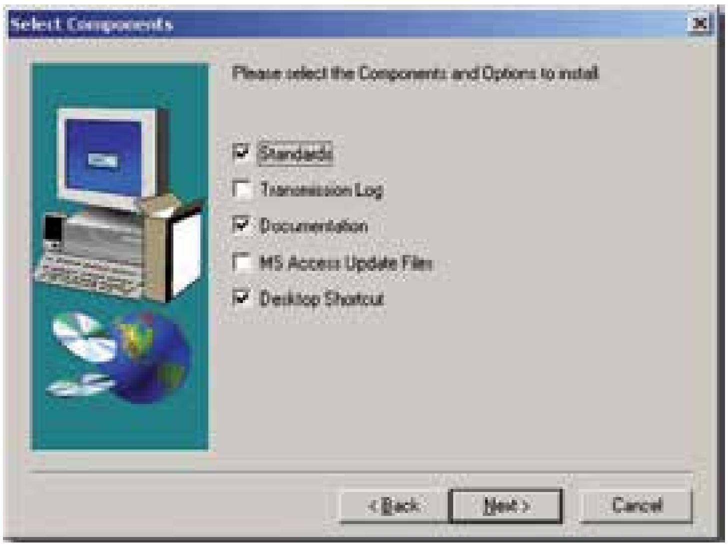


Figure 3-8: Select conditions dialogue

- Standards
  The **standards** installs a list of the most common industry test standards pre-programmed for convenience.

- Transmission log
  Transmission log installs a communication tool for debugging and service questions. The transmission log is a useful feature to use when contacting service personnel, but should not be installed by most users.

- Documentation
  Documentation installs the AutoStar manual as a PDF file.

- MS Access update file
  Select this option if AutoStar does not start correctly. Appropriate to your actually installed windows version, files will be installed to subdirectory ...\MS_Updates that will help to eliminate the start-up problems of AutoStar.
  Refer also to.\Documentation\Autostar DB Access-D.pdf or ...\Documentation\ Autostar DB Access-E.pdf

- Desktop shortcut
  Generates an desktop icon and places it on the desktop.

Select the components you require and click the **next** button.

Step 9

Figure 3-9: Select conditions dialogue

Step 10

This window refers to information about extensions in AutoStar. Please refer to the document AutoStar-Extensions.rtf (english language) or AutoStar-Erweiterungen (German language). To go further, click the next button.

Figure 3-10: Information window

Step 11
AutoStar setup is now complete. To use the AutoStar software program, you must restart the computer. click the **Finish** button to complete setup.

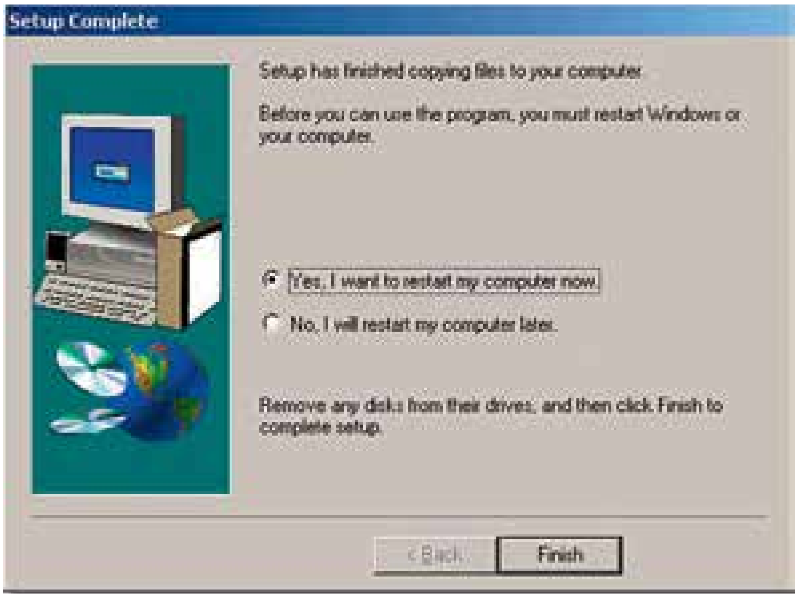


Figure 3-11: Setup complete dialogue

NOTE!
To activate the software, you must be logged in as administrator.

3.2 Getting started
To start AutoStar in a windows environment, click the start menu → programs → conducted EMC suite → AutoStar.

TIP!
If installed, you can start AutoStar by clicking the desktop Icon. (See at “Step 8” on page 29).

Figure 3-12: AutoStar desktop Icon

A splash screen will be displayed while the system initialises.

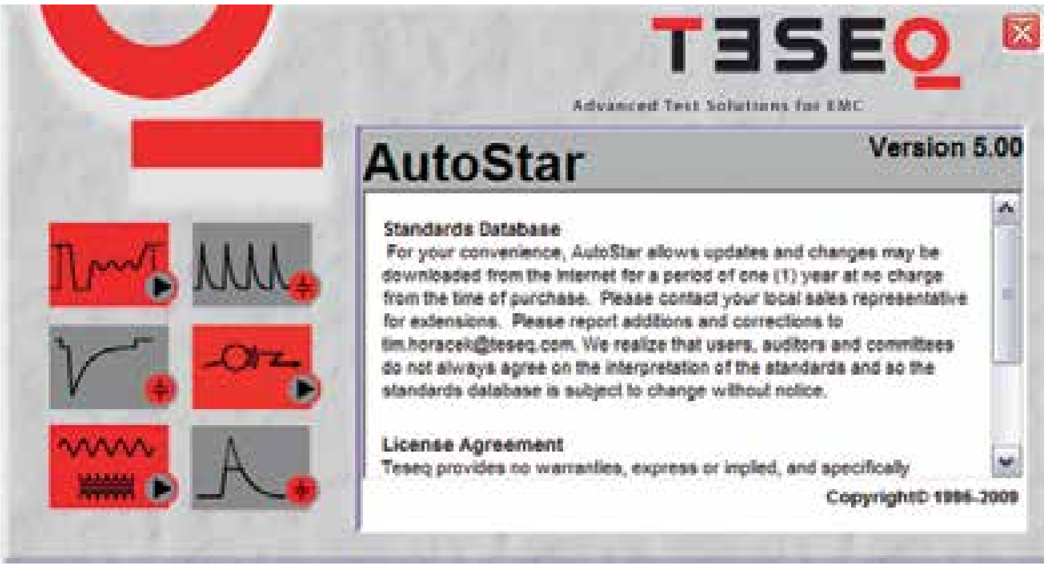


Figure 3-13: AutoStar initialising dialogue

When this Initialising dialogue is disappeared the AutoStar main window will be opened.

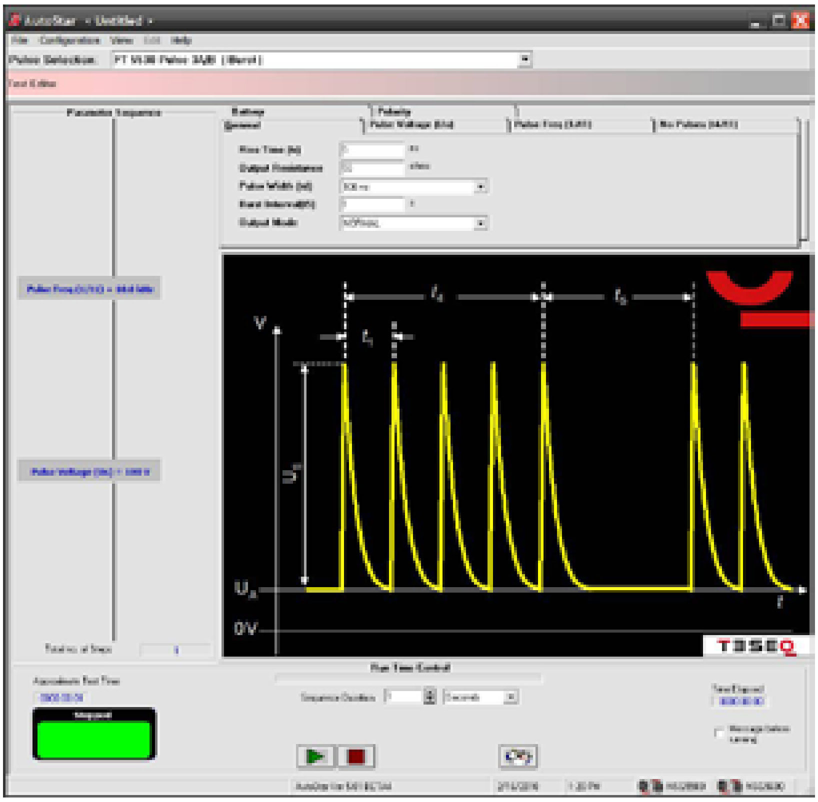


Figure 3-14: Initial screen displayed

After the initial screen is displayed a **Warning** dialogue will be opened. This dialogue comprises a warning that the user first must configure the system before performing a test in order to avoid any damages to the system.

Figure 3-15: Warning dialogue

If you click OK the configuration window will be opend automatically. Here you can configure your system, refer to chapter 4. Configuration & communications.

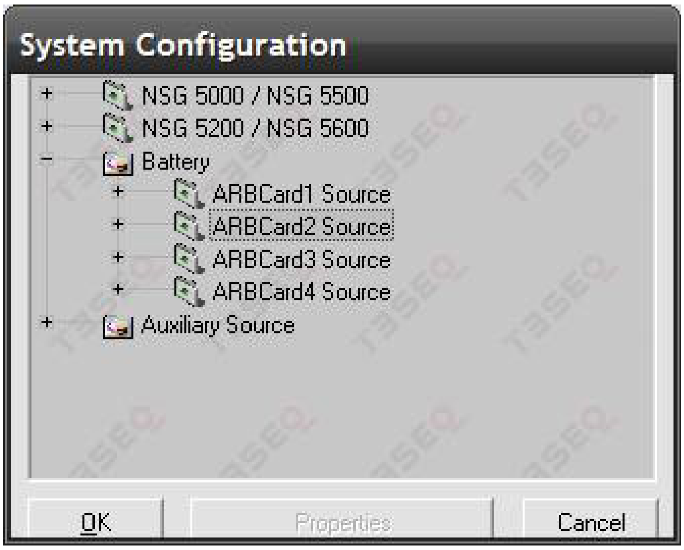


Figure 3-16: System configuration window

NOTE!
See section 4.2.2 Battery configuration for important details!

4 CONFIGURATION & COMMUNICATIONS

At start-up, the software automatically detects and recognises the modules and other elements that are present in the system. A choice of communication mode via either USB, RS 232C or IEEE 488 port is provided (IEEE is recommended). Certain sections cannot be configured automatically i.e sources.

CAUTION!
Autostar supports only genuine National Instruments GPIB interfaces for IEEE 488 communications.

NOTE!
If equipped, the USB port is seen by Windows as an RS 232 high speed port. Therefore, for the purpose of this guide, RS 232 is used exclusively to refer to both communication methods. See the NSG 5500 user manual for details.

Firstly, before running any tests, it is necessary to configure the NSG 5000/NSG 5500 or NSG 5200/NSG 5600 system. This involves adding the correct sources to the software so that the system generates the correct voltage levels. Without initially configuring the system, incorrect voltage gains may be encountered.

The following sections explain each command of the **Configuration** menu in the menu bar of the AutoStar software.

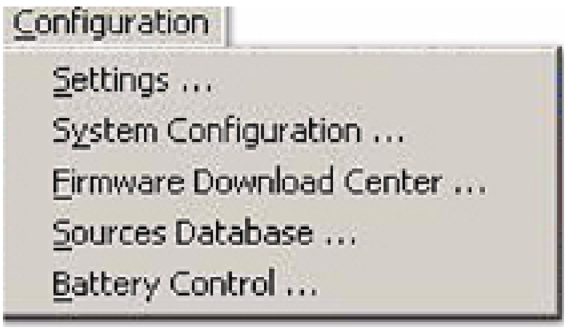


Figure 4-1: Configuration menu in AutoStar

4.1 Settings

This section shows you how to configurate your AutoStar software according to the individual requirements for your tests.

Select the **Configuration** → **Settings...** from the menu bar to open the **settings** dialogue. The settings dialogue consists of two areas. In the **left area** you can choose between several category groups (general, report, NSG 5000/NSG 5500 or NSG 5200/NSG 5600). Depending of your selection, the **right area** displays the according setting parameters.

4.1.1 General

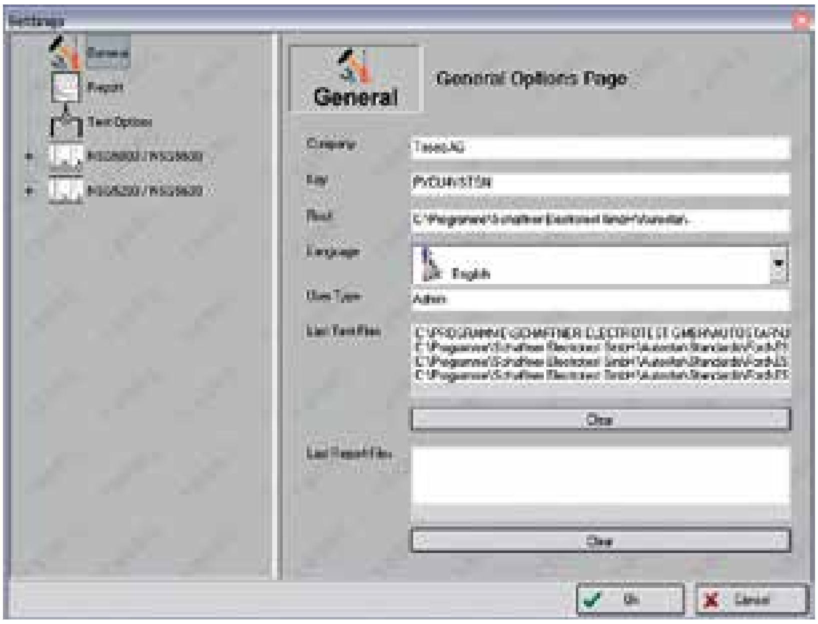


Figure 4-2: The "General" category group of the settings dialogue

- **Company**
  Displays the company name on which the software was registered during installation.

- **Key**
  The Key is the software serial number, entered during installation.

- **Root**
  The root field displays the installation path.

- **Language**
  The language combo box allows to select the software language (currently only English is selectable).

- **User type**
  The user type field displays the user type (Admin, User, Guest, etc.)

> **NOTE!**
> **For activating the software, you must be logged in as an administrator.**

- **Last test-files**
  The last test-files field displays the last used test files. Clicking the clear button below clears all entries in this field and in the file menu.

- **Last report-files**
  The last report-files field displays the last used report files. Clicking the clear button below clears all entries this field and in the file menu.

4.1.2 Report

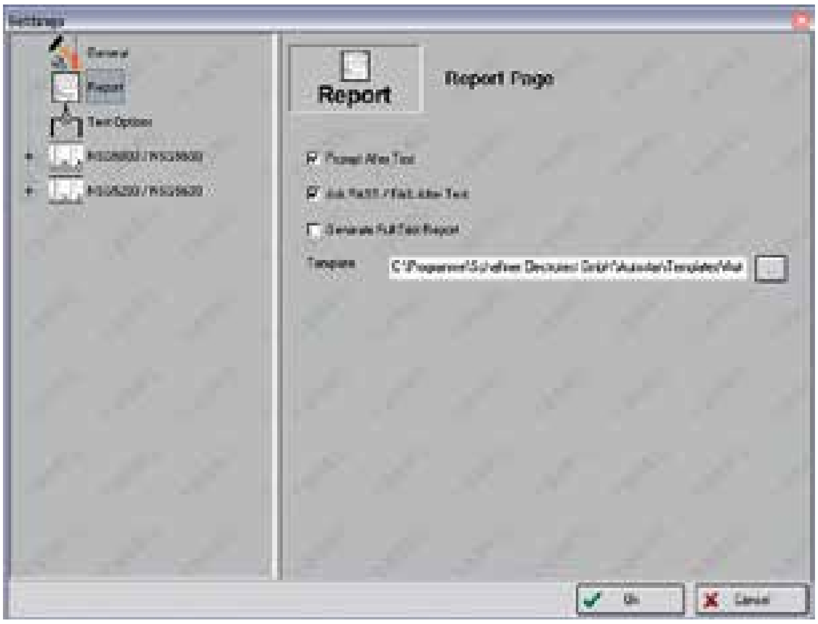


Figure 4-3: The “Report” category group of the settings dialogue

- **Prompt after test**
  If prompt after test is checked, at the end of each test or test sequence a dialogue box appears asking whether to generate a test report.

- **Generate full test report**
  If generate full test report is checked, the production of a detailed test report at the end of the test, is enabled. When checked this will log every parameter for every pulse.

- **Templates**
  The templates browser allows you to select a template for your printout.

4.1.3 Test options

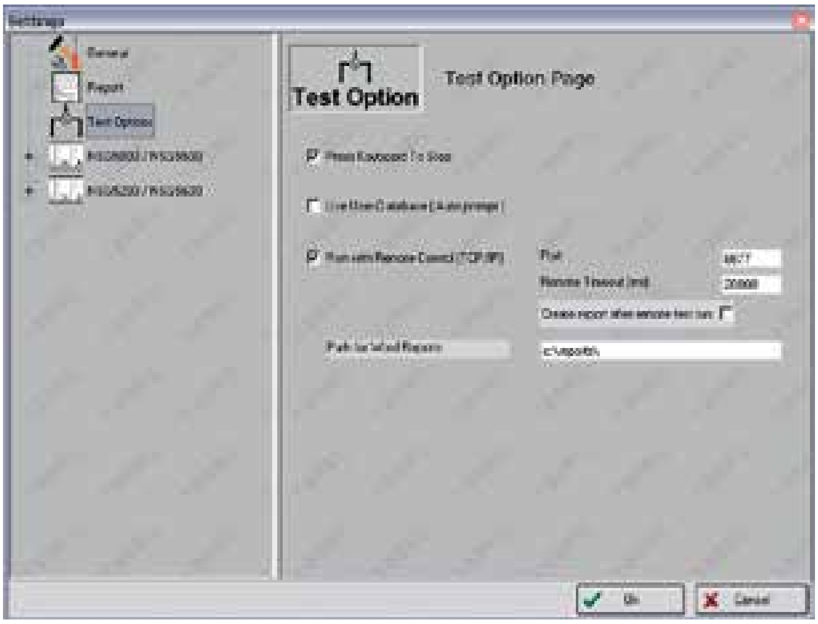


Figure 4-4: The "Test Options" category group of the settings dialogue

- **Press keyboard to stop**
  Selecting this checkbox enables pulse/ test sequences to be halted during operation by pressing any key on the computer keyboard.

- **Use user database (Auto prompt)**
  Selecting this checkbox provides the user with the option of saving pulses/tests into user test database as filename.ust files. If the checkbox is deselected the tests can still be saved into any location as filename.pls files.

  If this option is checked, it is still possible to save files to disk, simply click cancel on the first "save" dialogue after clicking **file → save.**

4.1.4 NSG 5000/NSG 5500

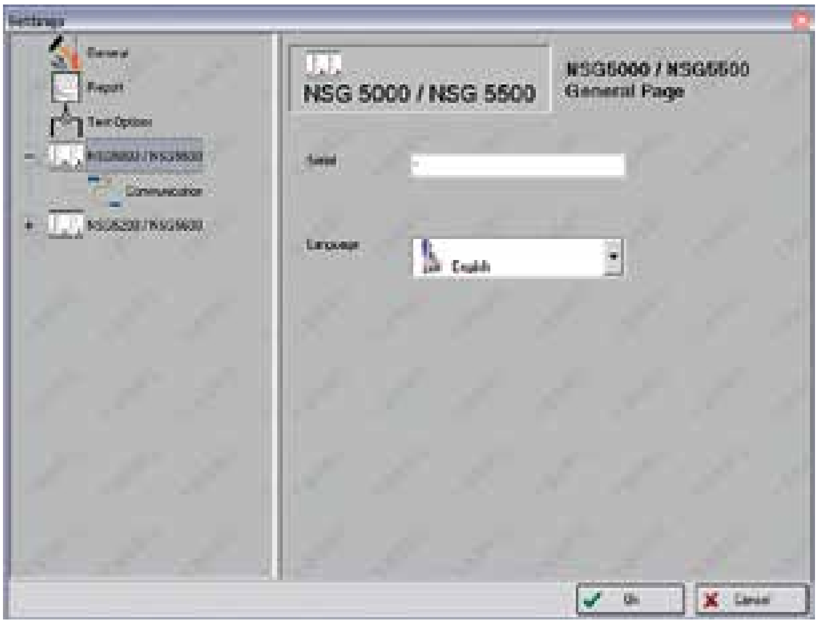


Figure 4-5: The "NSG 5000/NSG 5500" category group of the settings dialogue

- **Serial**
  Allows the user to enter the serial number of the NSG 5000/NSG 5500 instrument. Like the company name this is also shown in test reports.

- **Language**
  Allows the user to select the software language (currently only English selectable).

4.1.4.1 Communication

The communication sub group defines the communication parameters between the software and the NSG 5000/NSG 5500.

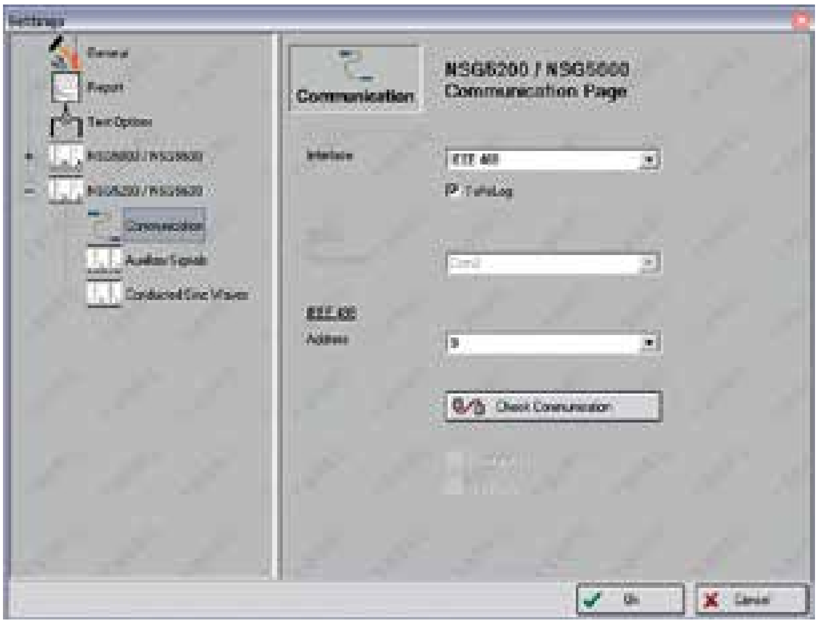


Figure 4-6: The "NSG 5000/NSG 5500" communication page

- **Interface**
  Allows the user to select the Interface either the RS 232 or the IEEE 488 communication. AutoStar automatically identifies the connected module type (NSG 5000 or NSG 5500).

> **NOTE!**
> **To activate the software, you must be logged in as an administrator.**

- **Checkboxes NSG 5000/NSG 5500**
  Appears if none is selected. This selection changes the range of selectable pulses according to the module type, refer to chapter 5.2.1 Creating a new test by adapting a selected pulse.

Figure 4-7: Checkbox TxRxLog

Checkbox TxRXLog

Appears if RS 232 or IEEE 488 is selected. The **Tx/RxLog** is a list of all the transactions between the AutoStar software and the NSG 5200/NSG 5000 instrument. When this option is checked all Tx/Rx communications will be logged to the Tx/Rx Log. The Tx/Rx log can be useful for debugging the system, however communications are slowed down when it is enabled so it is best switched off in normal operation.

For further information on operating the transmission log utility see chapter 11 transmission log utility.

NOTE!
It is recommended that Tx/Rx logging be turned off during normal operation as it can use up valuable system resources.

RS232 - Port number

Here you can choose the port number for the RS232 Interface. It is only active if **RS232** was selected in the **Interface** list box.

IEEE 488 - Address

Here you can choose the address for the IEEE 488 Interface. It is only active if **IEEE 488** was selected in the **Interface** list box.

Wait time

If you use an IEEE 488 Interface the wait time field is active. In case of communication problems you can enlarge the wait time.

TIP!
Here you can input a longer wait time in case you have problems with the communication. The default value is 60 ms.

Check communication - button

This button checks the interface and the devices. It is only active, if either the RS 232 or the IEEE 488 interface is selected in the Interface list box.

4.1.5 NSG 5200/NSG 5600

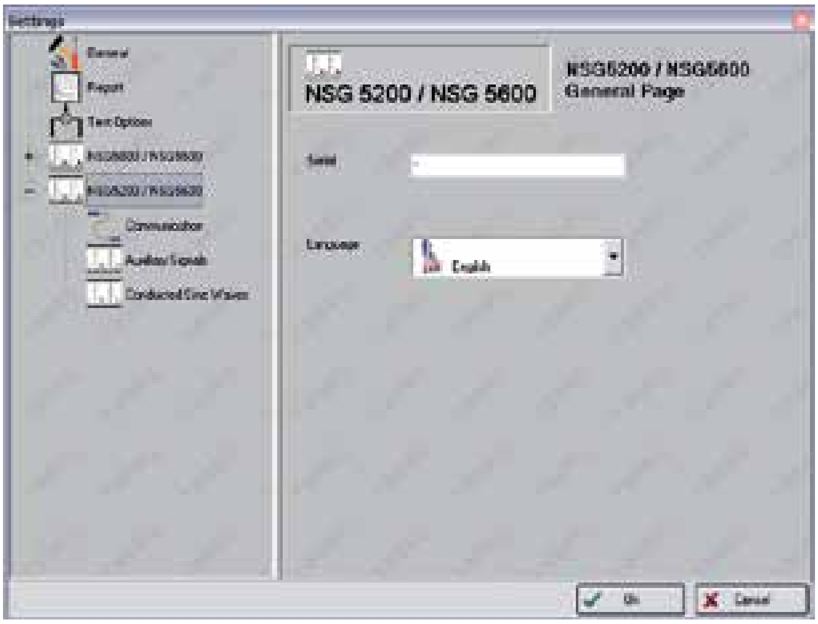


Figure 4-8: The "NSG 5200/NSG 5600" category group of the settings dialogue

- **Serial**
  Allows the user to enter the serial number of the NSG 5200/NSG 5600 instrument. Like the company name this is also shown in test reports.

- **Language**
  Allows the user to select the software language (currently only English selectable).

4.1.5.1 Communication

The communication sub group defines the communication parameters between the software and the NSG 5200/NSG 5600.

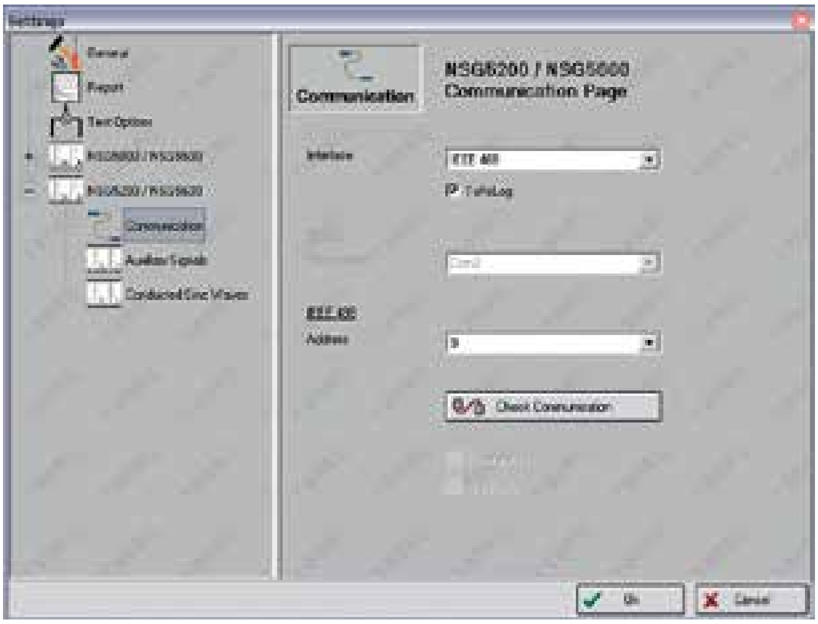


Figure 4-9: The "NSG 5200/NSG 5600" communication page

- **Interface**
  Allows the user to select the Interface either the RS 232 or the IEEE 488 communications. AutoStar identifies automatically if it is connected to a NSG 5200 or a NSG 5600.

> **NOTE!**
> **If no device is connected, you should select None to avoid an error message.**

- **Checkboxes NSG 5200/NSG 5600**
  Appears if None is selected. This selection changes the range of selectable pulses according to the module type, refer to chapter 5.2.1 Creating a new test by adapting a selected pulse.

- **Checkbox TxRxLog**
  The Tx/RxLog is a list of all the transactions between the AutoStar software and the NSG 5200/NSG 5000 instrument. When this option is checked all Tx/Rx communications will be logged to the Tx/Rx Log. The Tx/Rx log can be useful for debugging the system, however communications are slowed down when it is enabled so it is best switched off in normal operation.

  For further information on operating the transmission log utility see chapter 11 transmission log utility.

NOTE!
It is recommended that Tx/Rx logging be turned off during normal operation as it can use up valuable system resources.

- **RS232 - Port number**
  Here you can choose the port number for the RS232 Interface. It is only active if RS232 was selected in the Interface list box.

- **IEEE 488 - Address**
  Here you can choose the address for the IEEE 488 Interface. It is only active if IEEE 488 was selected in the Interface list box.

- **Check communication - button**
  This button checks the Interface and the devices. It is only active, if either the RS232or the IEEE 488 interface is selected in the Interface list box.

4.1.5.2 Auxillary signals

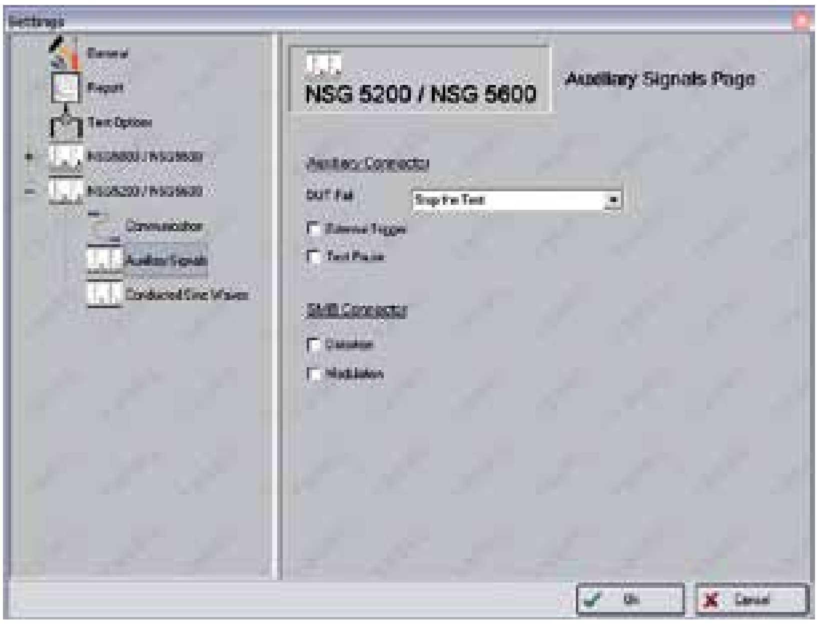


Figure 4-11: The “Auxiliary signals” Category group of the settings dialogue

DUT fail

Allows the user to select the action to be taken when a DUT Fail is activated from the auxiliary signal input on the rear of the NSG 5200/NSG 5600 chassis. The actions available are as follows

Stop the test:	Upon a DUT fail signal the test will stop (default)
Pause the test:	Upon a DUT fail signal the test will be paused
Do nothing:	Ignore the DUT fail signal

External trigger

Allows the user to select the action to be taken when an external trigger is activated from the auxiliary signal input on the rear of the NSG 5200/NSG 5600 chassis. The test will initialise but not execute until the external trigger is activated. The actions available are as follows:

Unchecked:	Disable external triggering (default)
Checked:	Enable external triggering

Test pause

Allows the user to select the action to be taken when a test pause is activated from the auxiliary signal input on the rear of the NSG 5200/NSG 5600 chassis. The test will pause when this signal is enabled. The actions available are as follows:

Unchecked:	Disable test pause (default)
Checked:	Enable test pause

Distortion

Allows the user to sum the signal being input into the SMB, on the front of the arb card, with the output signal of the arb card. This is only applicable to the master arb card. The actions available are as follows:

Unchecked:	Disable signal distortion (default)
Checked:	Enable signal distortion

Modulation

Allows the user to modulate the amplitude of the arb card out signal. This feature is only available to the master arb card. The actions available are as follows:

Unchecked:	Disable signal modulation (default)
Checked:	Enable signal modulation

4.1.5.3 Conducted sine waves

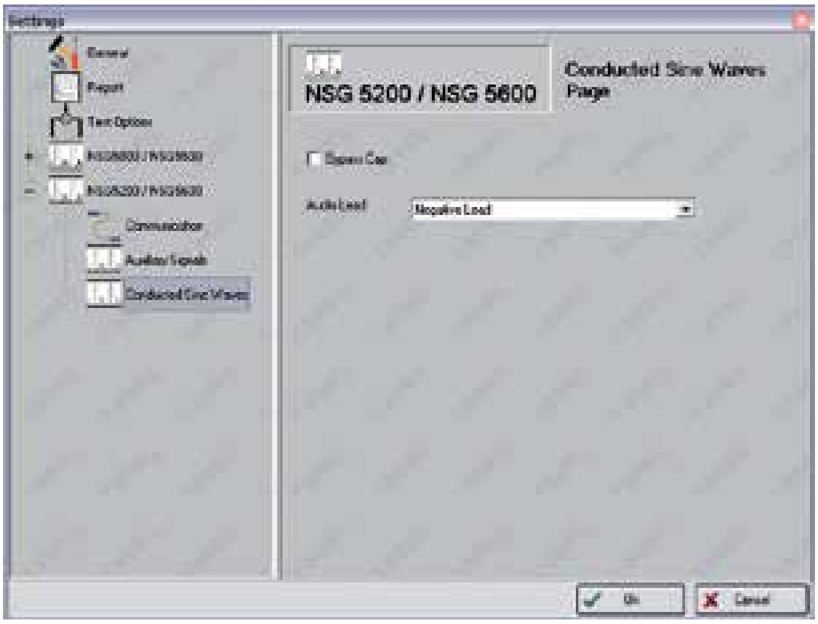


Figure 4-12: The "Conducted sine waves" category group of the settings dialogue

The **conducted sine waves** dialogue provides the user with various options during conducted sine waves testing.

- **Bypass cap**
  The bypass capacitor is a 100 µF bipolar capacitor, which can be connected across the DC source by closing a relay. Placing it across the dc source will lower the output impedence of the source and provide greater source drive capability.

- **Audio transformer**
  The secondary of the audio transformer is placed in series with the DC source.
  For **Positive lead** it is placed in series with the positive terminal of the DC source.
  For **Negative lead** it is placed in series with the negative terminal of the DC source.

- **DC calibration**
  If DC calibration checkbox is selected; it allows the system to measure the actual voltage and current, which is produced by the DC source.

  These measurements are DC only - the AC components are blocked. This information can then be used for calibration.

4.2 System configuration

AutoStar software configuration should correspond with the hardware setup. It is possible to connect almost any battery source (power amplifier) to the **ARB 5220** or **FG 5620** module output. The battery simulators do not tend to have microprocessor control and therefore have no means of being identified by AutoStar. Different battery sources will have different voltage gains and different output voltage capabilities.

AutoStar uses these battery source specifications interactively i.e. depending upon what battery source is connected, it will adjust the voltage and current parameter limits to suit that particular source. For example, if the battery source is an **NSG 5004A-12** (±30 V 12.5 A) then AutoStar will limit the programmed voltage to 30 V and the maximum current limit to 12.5 A. However, if an **PA 5840-75** (60 V, 25 A constant) is the battery source then the maximum current limit will be 25 A.

It is necessary then to inform AutoStar what sources is connected and to which arb cards. An **NSG 5200/NSG 5600** system can have up to four arb cards (two per ARB 5221/FG 5621 module) all running synchronously. Furthermore, each arb card has a second auxiliary output for use in “dips and drops” tests.

4.2.1 Configuration of NSG 5000/NSG 5500 or NSG 5200/NSG 5600

The software detects which modules are present and displays as follows:

Figure 4-13: System configure dialogue box for NSG 5000/NSG 5500 or NSG 5200/NSG 5600

4.2.2 Battery configuration

Double-clicking the battery folder, will display the number of arb cards detected within the system. In figure 4-14, there are four arb cards; the master (arb card 1) and three slaves (arb card 2/ 3/ 4). A source for each card can be selected.

Figure 4-14: Battery system configure dialogue box danger

CAUTION!
Danger of electrical shock or damages at the DUT!
Incorrect gain settings may result in damage to the auxilliary equipment or generate voltages that are dangerous to the user or to the DUT.

→ **It is important to check your power amplifier/battery configuration before starting the test!**

→ **The user has to use the correct power amplifier/battery appropriate to the voltage wanted.**

The arb card 1 source option has a drop-down list showing the sources available. In figure 4-14 for the master arb card, there are two options, **none** and **power amplifier** (AMP 5240 or PA 5640 module). Other sources may also be added via the sources database icon, refer to chapter 4.4.1 Adding a source to the **sources database**.

Selecting **none** tells AutoStar that there is no external source and that running a test of e.g. 0 to 10 V ramp, results in the master Arb card generating an output from 0 to 10 V.

Selecting power amplifier (PAM) will tell the system to re-direct the main output along the system backplane to the AMP 5240/PA 5640 and output it at the 4 mm power amplifier banana sockets. In this case, the AMP 5240/PA 5640 has an internal gain of 2, a request for a 0 to 5 V ramp will result in the Arb card generating a 0 to 2.5 V ramp along the internal backplane and thus a 0 to 5 V at the banana sockets.

The user may highlight the source and view its properties by selecting the properties button.

Figure 4-15: Properties dialogue

4.2.3 Auxiliary source configuration

Figure 4-16: Auxiliary system configure dialogue box

The auxiliary source only applies to the master arb card and is selected when the user requires a second DC source, e.g. dips and drops. In figure 4-16 above, as no external source has yet been added, the only remaining choice is **none.** The AMP 5240/PA 5640 power amplifier selection is not available, as this output cannot be fed to it along the system backplane.

The auxiliary output is only a programmable DC output i.e. it cannot be used for generating arbitiary wave-forms.

4.3 Firmware download center

Select the configuration → **Firmware download center...** from the menu bar to open the **firmware Download center** dialogue box.

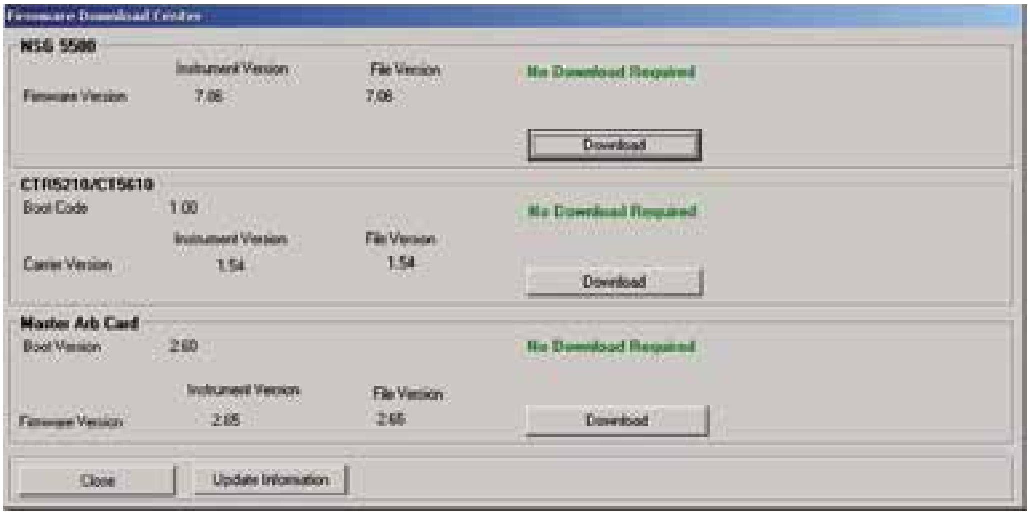


Figure 4-17: Firmware download center

The **firmware download center** screen enables the user to identify the firmware versions and allows the user to upgrade the firmware. The figure above shows the download center for a system containing an NSG 5000/NSG 5500 or NSG 5200/NSG 5600 instrument and one arb card. If the system contains a different configuration then shown in figure 4-17 the screen will include a frame for slave 1, slave 2, slave 3, as appropriate.

4.3.1 Details indicated for a module

Figure 4-18: Firmware download center

The figure above shows the frame for the CTR 5210/CT 5610 (controller). This frame displays the boot code version in the card, the firmware version in the instrument and the firmware version on file. The software will indicate to you if your module requires an upgrade.

Message	Description
No download required	Is diplayed when the intsrument has the latest revision of firmware (or if the system is 'off line' for ARB cards).
Unable to determine	Is displayed when the software is unable to determine the version of software or firmware. This may be due to the following conditions: 1. No communication with the instrument. 2. An old firmware version exists in the instrument. Contact your local support office, you may require a hardware update.(See cection: Firmware recovery)
Download recommended	The software has detected your firmware requires upgrading.

TIP!
If you get a download recommended message then select the download button to update the module. The system and software will need to be restored after downloading.

4.3.2 Downloading firmware

1. Select the **Download** button
2. A message is displayed warning the user NOT to interrupt the download procedure. It is important to procede with caution.
3. Do not turn off the instrument during a download otherwise you will corrupt the firmware in the instrument and render your instrument inoperable. If this occurs consult the firmware recovery section below or contact your local support office.

Figure 4-19: Firmware download warning

4. AutoStar will guide you as you download the firmware.

NOTE!
After a succesfull firmware download a message will apear promting the user to reboot the computer.

- **Firmware recovery**
  If the firmware on the ARB 522x/FG 562x is corrupted (most likely by halting the download process) then the following process may allow the user to download complete firmware.

1 Remove the ARB 522x/FG 562x carrier module from the chassis. Note the dipswitch settings on the ARB card that holds the corrupt firmware (i.e. the master will have dipswitch 4 ON and all others OFF, slave 1 will have 3 ON all others OFF, etc.). Further information about these dipswitch settings is available in the NSG 5200/NSG 5600 Hardware manual.

2. Set all of the dipswitches to the **OFF** position.

3. Plug the ARB carrier module back into the chassis and switch on the NSG 5200/NSG 5600. This will remove the corrupt ARB firmware from the EEPROM.

4. After approx. 20 seconds switch off the NSG 5200/NSG 5600, remove the ARB carrier module and set the dipswitches back to their original setting (noted in step 1).

5. Open the AutoStar software package and goto the firmware download center. Note the status of the corrupt arb card. It should be highlighted as requiring a download, i.e. download recommended.

6. Press download for the previously corrupted ARB card.
   At the end of the download process the card should contain the proper version of the firmware. Switch off the instrument and shutdown AutoStar then switch on the instrument and restart AutoStar once the NSG 5200/NSG 5600 is fully initialised.

4.4 Sources database

This menu item enables you to configure a database that contains all sources you will use for your tests. All sources configured in the **sources database** are then available in the **system configuration.**

4.4.1 Adding a source to the sources database

Select **configuration → Sources database** from the menu bar to open the add source dialogue box. This option allows the user to keep a database of sources and the necessary information associated with the sources.

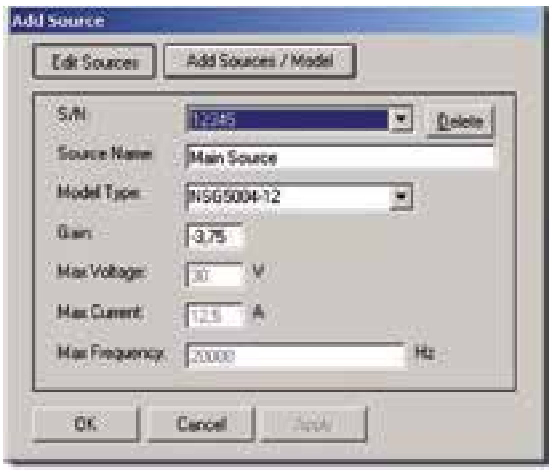


Figure 4-20: Edit sources database

The screen is made up of two sections, **Edit sources** and **Add Sources/Model.** The best way to describe these sections is by example.

Example: Adding sources to the sources database
You have two sources you want to use in the system. One source is a Teseq NSG 5004A-12 and another source is a general source corp GSCX90.

Adding a predefined source (e.g. NSG 5004A-12 source)

1. Click add sources/model button

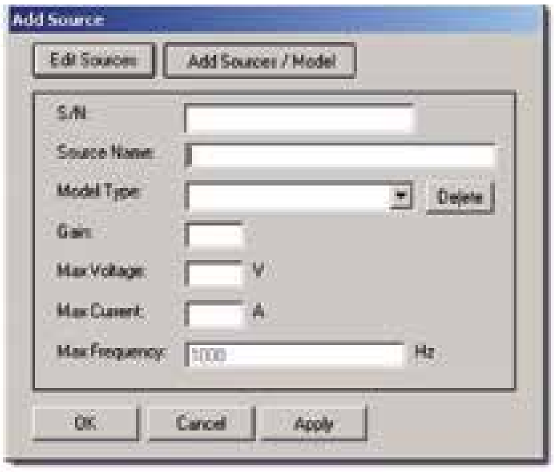


Figure 4-21: Add a source/model to the database

2. Enter a serial number to S/N. This number is used to uniquely identify the source in the database.

> **TIP!**
> **It may be useful to use the serial number on the back of the source.**

3. Enter a source name. When selecting a source in the system setup the source name and the serial number are used to identify the source.

4. Enter the **model type.** In this case you may select the source type from the dropdown list. When you select the model type of a previously defined source the values for **gain, max voltage** and **min voltage** appear automatically.

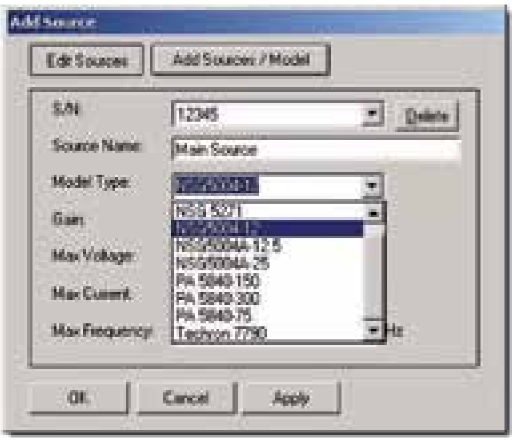


Figure 4-22: Selecting model type

5. Select apply.

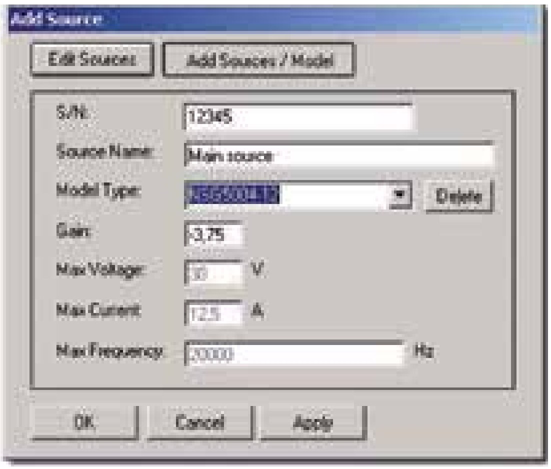


Figure 4-23: Applying the changes to the source database

6. Select the edit sources button and select the serial number 12345 to verifiy that the module is added to the database..

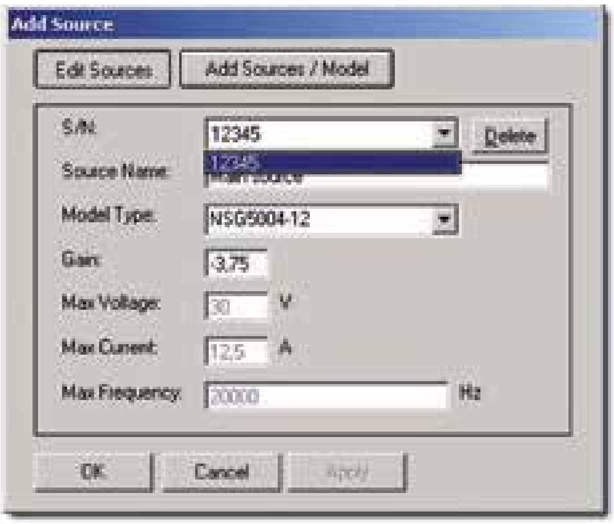


Figure 4-24: Verifying the new source information

7. Verify the source by selecting system configure. This source is now available to be configured with any arb card.

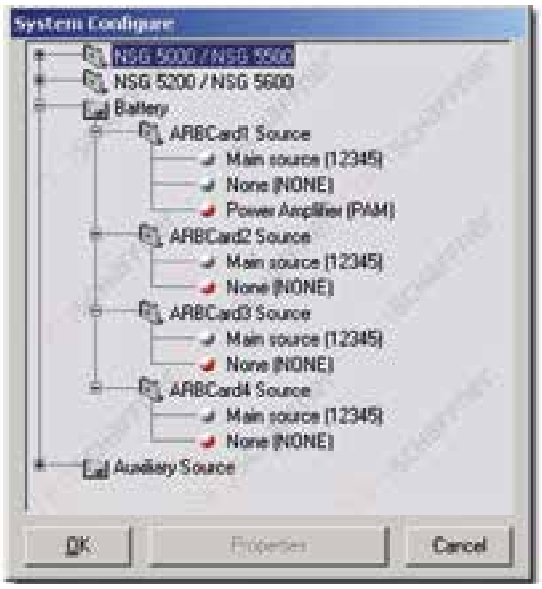


Figure 4-25: System configure showing source added

Adding an undefined source type source (e.g GSCX90)
In this example I will demonstrate adding your own model type

1. Select add sources/model button

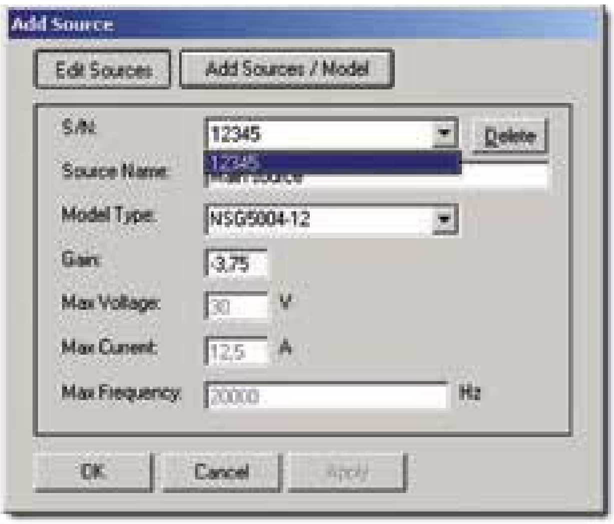


Figure 4-26: Add a source/model to the database

2. Enter the serial number to S/N. This number is used to uniquely identify the source n the database.

> **TIP!**
> **It may be useful to use the serial number on the back of the source.**

3. Enter a source name. When selecting a source in the system setup the source name and the serial number are used to identify the source.

4. Enter the model type. In this case you will directly type in the source details type. e.g GSCX90.

5. Enter the gain of the source, the max voltage, max current and frequency. This information should be available in the specifications of the source.

> **NOTE!**
> **Please ensure that you enter the correct information for the source types since you may damage your equipment otherwise. The output of the arb card is ±10 V. If the user adds a source with an output voltage of 100 V but only a gain of 5, for example, the source will not provide more than 50 V. Furthermore AutoStar will prevent more than 50 V being programmed as this is the maximum possible for this particular configuration. However if the incorrect information for a particular source type is entered then AutoStar will have incorrect information for the particular system being configured.**

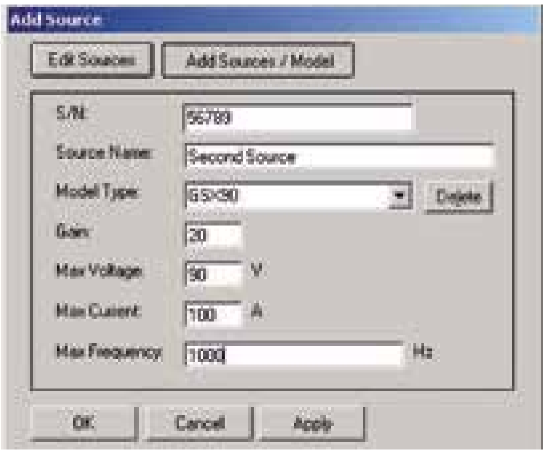


Figure 4-27: Applying the changes to the source database

6. A dialogue box prompts the user with the option of adding the new source to the list of template sources in the model type list. If the user selects the Yes option, the new source is saved to the model type list. The source is now available as a standard source type. If the user selects the no option, then the model type is not saved.

Figure 4-28: Notification of new source type

4.5 Battery control

Select the **Configuration→Battery Control**... from the menu bar to open the **Battery Control** dialogue box.

This option allows the user to have immediate control over the main battery in the system without the need to create a test. The battery control dialogue is useful for checking DC setup and setting up the DUT. upon exiting of the battery control dialogue, the parameter settings generally do not influence the tests being run.

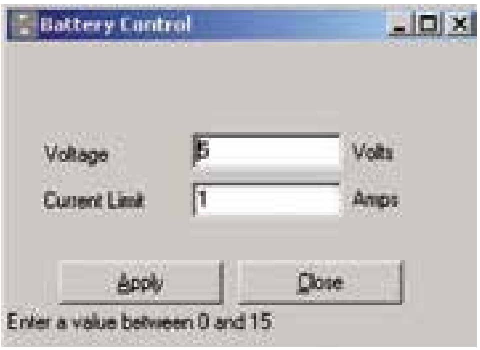


Figure 4-29: Battery control dialogue box

5 EDITOR VIEWS

When AutoStar is started the screen shows the AutoStar window. This window provides control over the setup and configuration of the different NSG 5000/NSG 5500 and NSG 5200/NSG 5600 respectively and battery sources. It provides access to the different functions of the individual modules and tests. Figure 5-1 displays the basic layout of the AutoStar software.

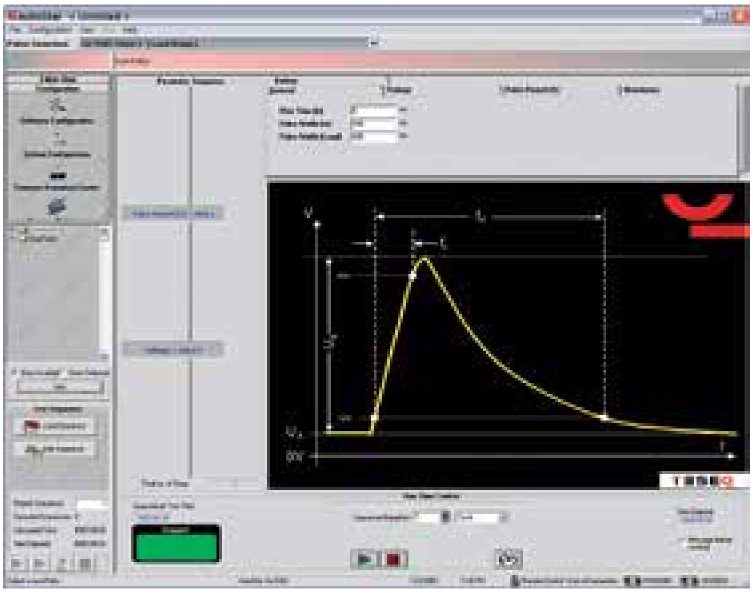


Figure 5-1: Initial screen displayed

The AutoStar window allows access to all views and dialogues.

- Menu bar (file, configuration, view and help)
- Parameter sequence
- Pulse type selection
- AutoStar bar
- Standards Window (allows acess to standards database and user test database)
- Test sequence (allows to configure a sequence of predefined tests)
- Status bar
- Parameter tabs (allow to configure the test parameters)
- Graphical display
- Run time control (allows to run the test)

5.1 View menu

If you open the View Menu in the menu bar, refer to figure 5-2, you have several possibilities to change the view:

- Change from test editor view to the report editor view
- Open the AutoStar bar
- Open the standards window
- Open the test sequence window

If minimum one of the lower items is checked an additional narrow frame will be opened on the left side of the screen, refer to figure 5-3 and figure 5-4. In the following sections this frame will be called side frame, refer to section 5.1.1 Side frame.

Figure 5-2: View menu

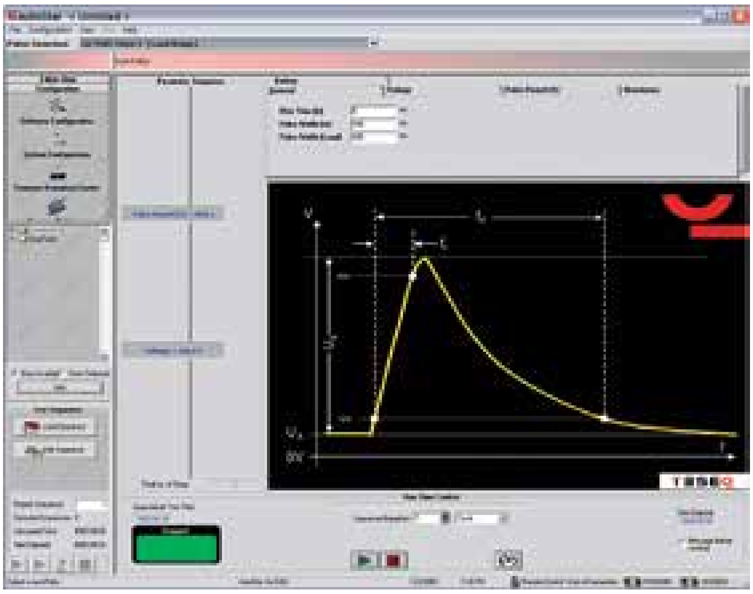


Figure 5-3: Test editor view with opened side frame

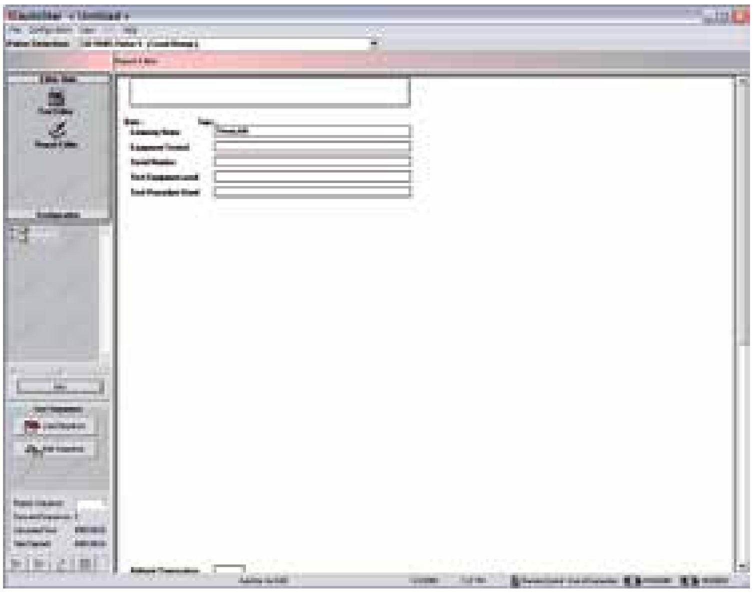


Figure 5-4: Report editor view with opened side frame

> **NOTE!**
> **These windows and views will be explained in detail within the next sections.**

5.1.1 Side frame

5.1.1.1 AutoStar bar

If you check the menu item AutoStar bar in the view menu you can choose between two different views:

- **Editor view**
  Clicking on the icons allows the user a quick change between test editor view and report editor view.

Figure 5-5: AutoStar bar in editor view

5.1.1.2 Standards window

The standards window allows the user to access to the **standards database** or the **user test database.**

When the **standards window** is opened it shows a tree comprising of two folders, the standards and user tests.

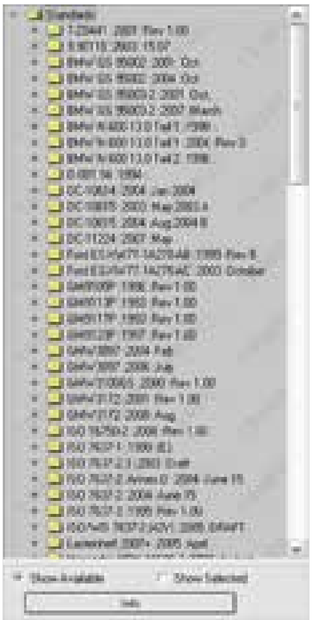


Figure 5-6: Standards window

The folder **standards** contains the standards database with hundreds of predefined tests as defined by International standards and certain manufacturer's. Thus enabling the user to start testing immediately without the necessity to create their own test.

Figure 5-7: Standards tree

The folder **User Tests** is intended to save/load modified standard tests or your selfcreated tests to/from the user test database.

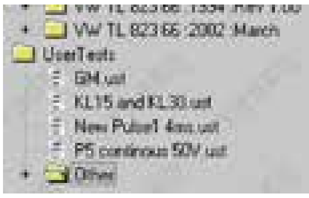


Figure 5-8: User tests

- **Choice of selectable tests**
  The standards window includes two options for the view of selectable tests with the radio buttons in the lower frame of the standards window.

→ **Show available** shows all standard tests that can be executed with the actual module configuration*.

→ **Show selected** shows all standard tests belonging to the actually selected pulse in the pulse selection list box.

Figure 5-9: Choice of selectable tests

- **Information window**
  If you click on the Info button in the standards window below an Information window will be opened. This information window includes links for download of new standard tests and an e-mail adress to ask for more information.

Figure 5-10: Information window

For further information refer also to section 5.2.2 Loading predefined tests.

5.1.1.3 Test sequence

The test sequence window enables the user to create sequences of pulses. It is possible to use different pulse types from the different NSG 5000/NSG 5500 or NSG 5200/NSG 5600 modules within one sequence. The test sequence can be operated from the test sequence window.

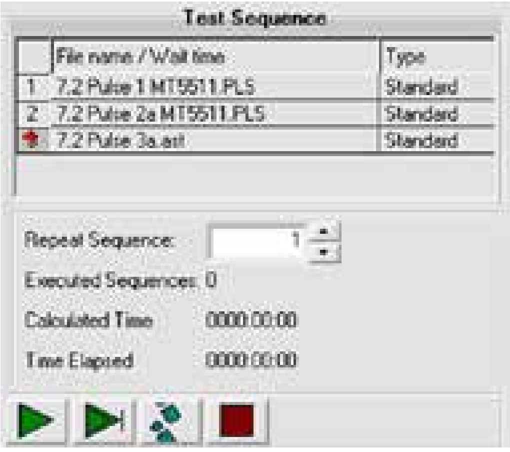


Figure 5-11: Test sequences

For details regarding the operation of the test sequence refer to section 5.5 Test sequence.

5.2 Creating, loading and saving tests

For creating a new test you can select a standard pulse, adapt the parameters according your requirements and save it as a new test. If you want to use previously defined tests you can load these tests from the capacious standards database or load it from other data sources.

5.2.1 Creating a new test by adapting a selected pulse

For creating a new test select **File Menu → New Test** option, which opens a sub-menu for selecting the pulse type.

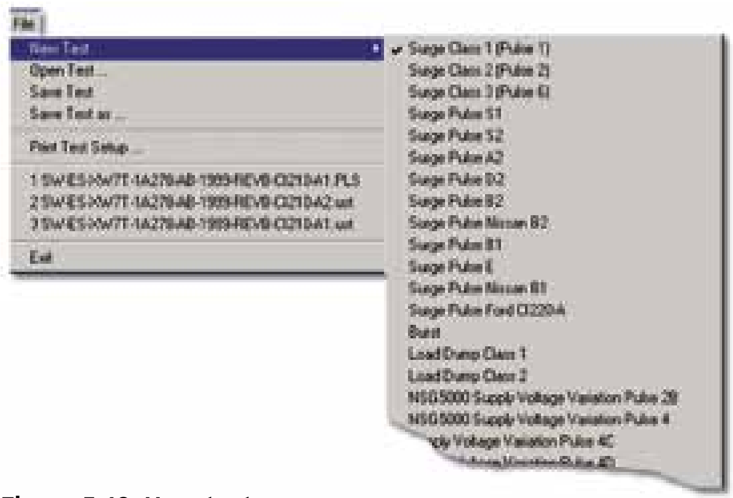


Figure 5-12: User tests

By clicking on a pulse type, a new graphical display according to the pulse type will be opened. The test parameters are set to their default values.

The pulse type can also be selected from the test selection drop down list, refer to figure 5-14.

The **Pulse Selection List Box** provides a quick means of selecting a new or different type of pulse, which is equivalent to selecting new test from the file menu. By selecting the arrow, a drop-down list is displayed containing the tests available to the user.

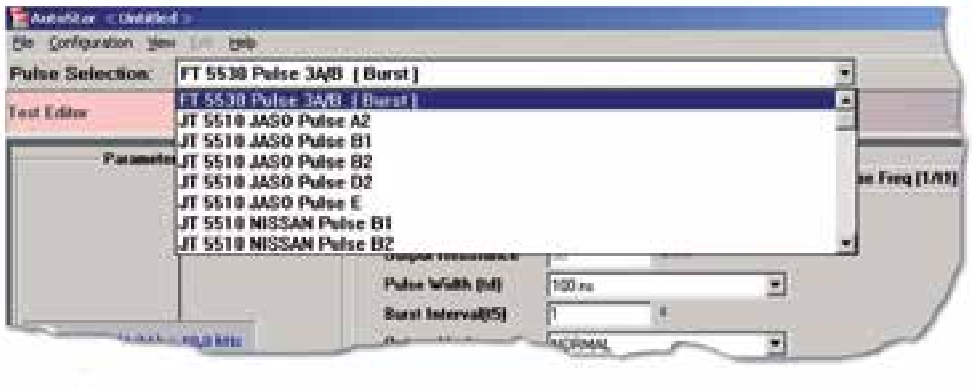


Figure 5-13: Pulse selection list box from main toolbar

When changes (e.g. a test parameter has been changed) have been made in the current pulse a dialogue box will be displayed, asking the user to save this pulse as a user test file before opening a new pulse or a test.

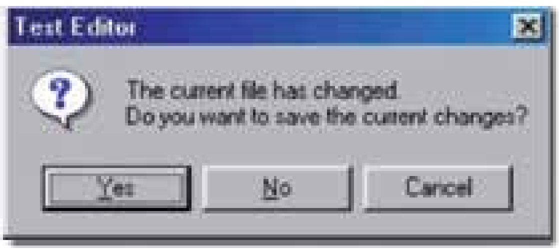


Figure 5-14: Test editor dialogue box

NOTE!
The pulse types available depend on the currently connected devices and modules. If no devices are connected you can define the modules in configuration → Settings, refer to section 4.1.4.1 Communication or section 4.1.5.1 Communication.

5.2.2 Loading predefined tests

If the user wants to execute predefined tests in accordance with international standards such as ISO and SAE or test conditions that conform to certain manufacturer's standards he can load such tests from the standards database.

To access to the standards database please select view menu → standards. The standards window will be opened in the side frame left besides the test editor. Please refer to figure 5-3 and section 5.1.1.2 Standards window.

- **Loading tests from the standards or user test database**

  For loading a test from the database the user has to carry out the following steps:

  Step 1: Select a pulse type, simplest from the selection list box, refer to section 5.2.1 Creating a new Test by adapting a selected Pulse.
  Step 2: Open the Standards window by selecting view menu → standards.
  Step 3: To open the tree in the standards window either click on the '+'-boxes or double-click on the folders. Now you will find a choice of predefined tests. The choice of pulses varies depending on the selection of the radio buttons show available ore show selectable (refer to section 5.1.1.2 Standards Window).
  Step 5: Select a test by clicking on the test file. The test will be displayed in the test editor.

5.2.3 Saving tests

The user can save the tests either to the user test database or outside the user database to any directory.

> **NOTE!**
> **It is not possible to save tests to the standards database.**

5.2.3.1 Loading predefined tests

The steps are as follows:

Step 1: Create a new test as previously described.
Step 2: Ensure that in software configuration → Settings under test options the option **Save into user test database** is selected (see section 4.1.3 Test options)
Step 3: Select file… → **Save test as.** The saving test to user database dialogue is displayed.
Step 4: You can save a test to the root folder or add subfolders (by right clicking in the window) and then save the test to that folder. The test file will be saved with the extension **.ust..**

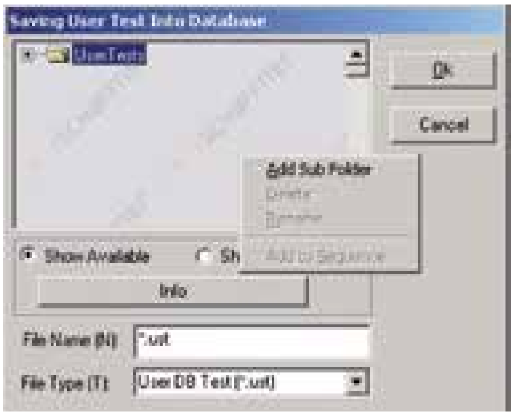


Figure 5-15: Saving user test dialogue

5.2.3.2 Saving a test outside the user test database

For saving tests outside the user test database (e.g. to save the test to an external data carrier) there are two ways:

1. Select file … → save test as. The saving test to user database dialogue is displayed. Instead of clicking OK click now cancel. The normal file save dialogue will be opened. Now you can save your test file to any folder.
2. If you permanently want to save tests outside the database go to software configuration → Settings under test options and unselect the option save into user test database (see section 4.1.3 Test options. If you then select file … → Save test as the file save dialogue will be opened directly.

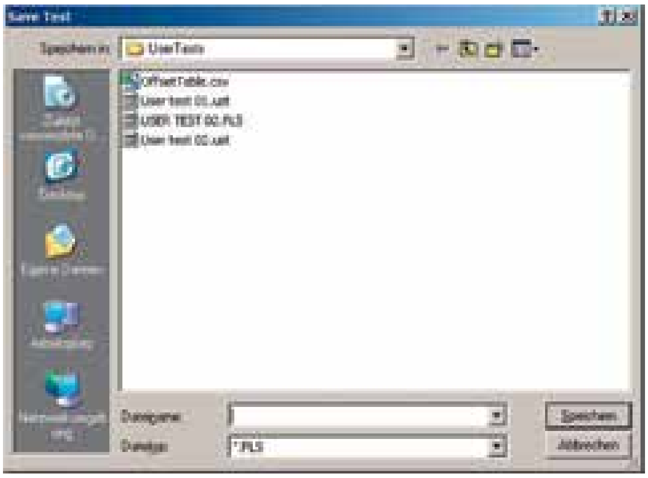


Figure 5-16: File save dialogue

The tests will be saved with the extension **.PLS.**

5.3 Test editor view

5.3.1 File menuSelect

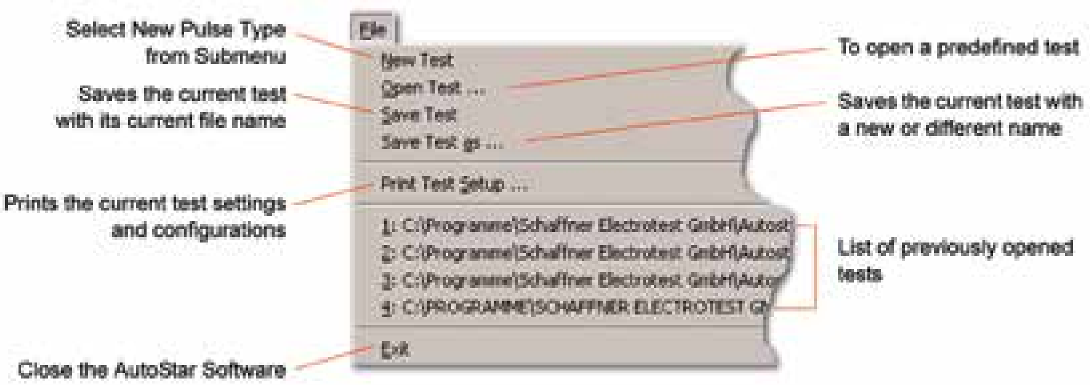


Figure 5-17: File menu in the test editor view

NOTE!
View the file menu for the test report view is different, refer to figure 5-39.

5.3.2 Graphical display

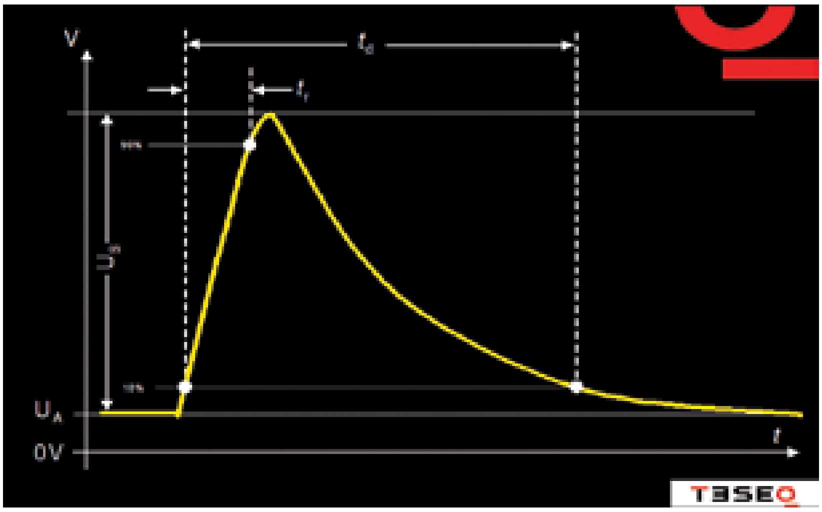


Figure 5-18: Graphical display

The graphical display shows a graphical representation of the selected test. For each pulse available an appropriate curve is displayed. Most of the graphs display voltage plotted against time. Secondary the display shows the configurable values like U_s or t_d. These values you can configure in the parameter tabs, refer to the next section.

> **NOTE!**
> **The various displays for the different types of pulses will be shown in detail in the later chapters.**

5.3.2 Graphical display

With the parameter tabs you can adapt the predefined pulses precisely to your test requirements. By clicking on the different tabs you can change to the various test parameters, refer to figure 5-20.

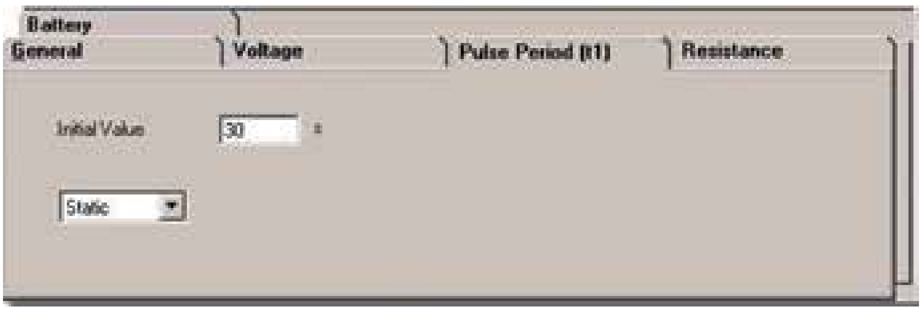


Figure 5-19: Parameter tabs

The following types of parameters are available:

- There are edit boxes where you can input values. The range of allowed values depends on the connected module. If you extend this range the colour of the number will turn from black to red.

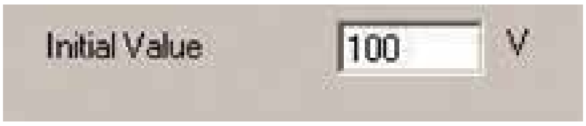


Figure 5-20: Edit box

NOTE!
The range of values is shown in the left side of the status bar. Refer to figure 5-21 and section 5.6 Status bar.

Figure 5-21: Edit box

- List boxes give you a defined choice of several values

Figure 5-22: List box

- Radio buttons give you a quick access for the choice between two values

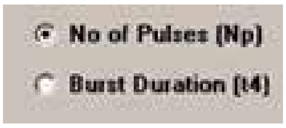


Figure 5-23: Radio buttons

- List box **static/linear:** If you choose **static** the pulse will be executed with a fixed value for e.g. voltage or period time. If you choose **linear** your pulse will be ramped in steps with an defined increment from an initial value up or down to a final value. This is available eg. for **voltage, pulse period** and/or for the **pulse frequency.** Refer in addition to the next section 5.3.4 Parameter sequence.

Figure 5-24: List box static/linear

5.3.4 Parameter sequence

As described in the previous section 5.3.3 Configuring test parameters you can ramp certain parameters. It is possible to ramp up to three parameters for one pulse. The number of parameters available is depending on the test type. The actual values are shown in the parameter sequence field, refer to.

In the parameter sequence field the actual values of the ramped parameters are arranged in a very simple flowchart diagram with an outer and interior loop. You can follow the values being ramped during the test by watching the actual values. They are shown as numerical value as well as a bar graph.

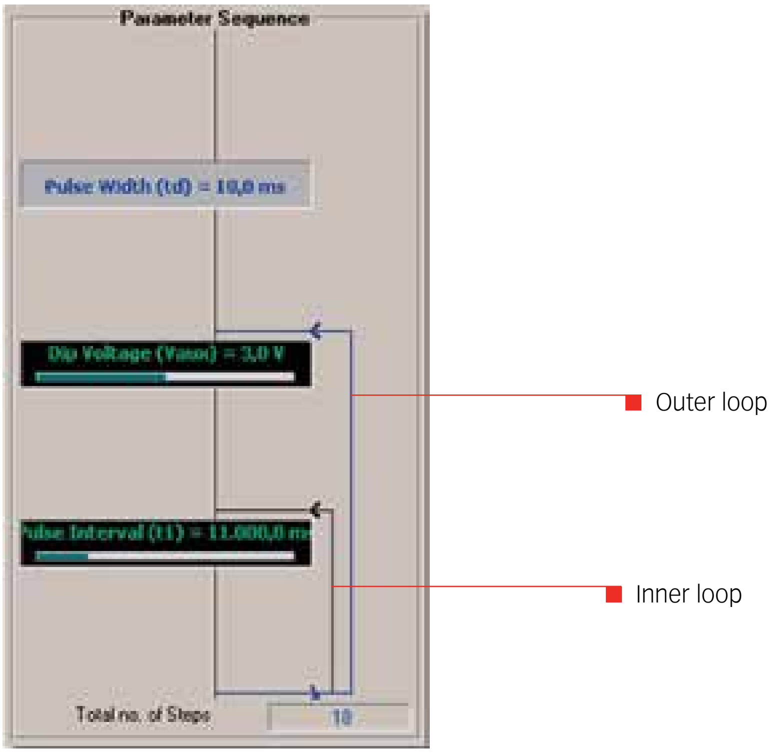


Figure 5-25: Parameter sequence field

> **NOTE!**
> **Complex tests may take a long time to execute, so to make the setting up and debugging easier, the order of the parameters can be quickly changed. Simply click on the required parameter and drag it to the new position within the sequence, it will then swap places with the parameter previously occupying that position.**

5.3.5 Running a test

You can run a test from the run time control frame, please refer to figure 5-29. In the sections below all elements of the run time control frame are explained in detail.

5.3.5.1 Run time control frame progress

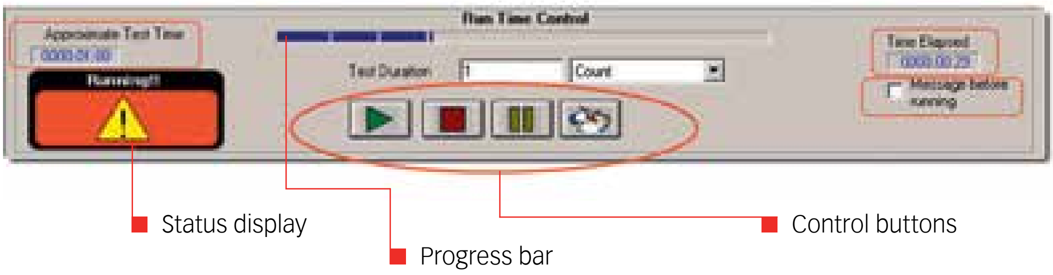


Figure 5-27: Run time control frames

- **Approximate test time**
  As the waveform is created the approximate test time is calculated and displayed.

- **Status display**
  Shows the actual status of the run time control.

Figure 5-28: Status display

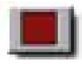
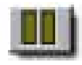
- **Progress bar**
  The progress bar gives the user an indication of how far a test has progressed. The instrument continuously indicates to the software the progress and the software displays this accordingly. In continuous mode the progress bar will update complete every waveform and restart again.

- **Time elapsed**
  The time elapsed counter displays how long a test has been running.

- **Message before running**
  By activating this feature you can define a message that appears before the user runs a test. For details refer to section 5.3.5.4 Message box.

- **Run-time control buttons**
  There are four run-time control buttons, as shown in figure 5-27.

These buttons are:

The Test Execution button	Upon clicking the test execution button a test is started.	
The Test stop button	When a test is executing, clicking the test stop button stops a test.	
The Test Pause button	When a test is executing, clicking the test pause button pauses a test. When the test is paused, clicking the test pause button starts the test from the point it was paused.	
The Test Description / Comment button	The test description/comment button allows the user to describe a test that is being executed or to insert comments about a particular test while it is being executed. For details refer to section 5.3.5.5 Test description.	

5.3.5.2 Run time control frame for static mode

Static mode means that all test parameters in the parameter tabs are set as static. For details refer to section 5.3.3 Configuring test parameters.

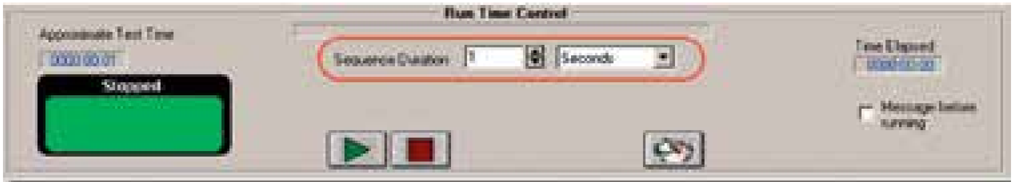


Figure 5-29: Parameter sequence field

Parameter fields

The run time control frame for static mode in most cases comprises one parameter field. The type of the parameter depends on the selected pulse type. In the following all parameter types that can be found are described.

- **Sequence repetition**
  The sequence repetition is the number of times that the sequence is repeated

- **Sequence duration**
  This is the total test time that the test will run for and can be selected as seconds, minutes, hours, and continuous. When not continuous the maximum time allowed is 9999. In continuous mode the waveform repeats continuously until stopped by the user.

- **Test duration**
  There are two possible options for test duration, count or continuous. In count mode the entire waveform is repeated a number of times, which depends upon the value of count. The count value can vary from 1 to 9999. In continuous mode the waveform repeats continuously until stopped by the user.

- **Delay before first step**
  If available this is the length of time that the instrument will wait before the first test.

Range of values

Static of values

Parameter name	Mode	Min value	Max value	Step value	Default value
Sequence repetition	Count	1	99999	1	1 Default setting
	Continuous	–	–	–	–
Sequence duration	Seconds	1	99999	1	1 Default setting
	Minutes	1	99999	1	
	Hours	1	99999	1	
	Continuous	–	–	–	–
Test duration	Count	1	99999	1	1 Default setting
	Continuous	–	–	–	–
Delay before first step	Seconds	0	99999	1	0 Default setting
	Minutes	0	99999	1	0
	Hours	0	99999	1	0

5.3.5.3 Run time control frame for linear mode

Linear mode means that one of the test parameters in the parameter tabs is set as linear. For details refer to section 5.3.3.

For the linear mode the run time control frame gets one or two additional fields.

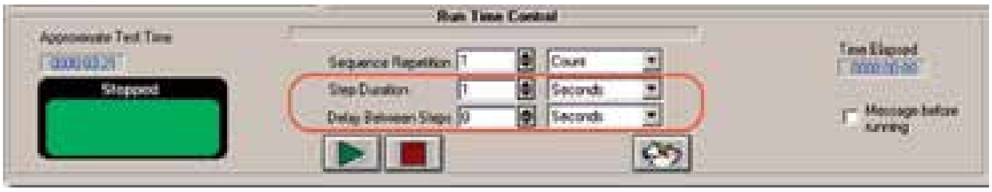


Figure 5-30: Run time control frame in linear mode

Parameter fields

The run time control frame for linear mode in most cases comprises two or three parameter fields. The type of these parameters depend on the selected pulse type. In the following all parameter types that can be found are described.

- **Sequence repetition**
  The sequence repetition is the number of times that the sequence is repeated
- **Step repetition**
  This is the number of times that each step in the sequence is repeated.
- **Step duration**
  During a ramping cycle the length of time of any single step in the ramp is referred as step duration.

- **Delay between steps**
  In linear mode the user may wish to stop firing pulses for a period of time after completion of each step. This automatically defaults to 0 but the user has the facility to set a delay in time for any purpose.

- **Delay before first step**
  If available this is the length of time that the instrument will wait before the first test.

- **Range of values**

Linear mode

Parameter name	Mode	Min value	Max value	Step value	Default value
Sequence repetition	Count	1	99999	1	1 Default setting
	Continuous	–	–	–	–
Step duration	Seconds	1	99999	1	1 Default setting
	Minutes	1	99999	1	
	Hours	1	99999	1	
Step repetition	Count	1	99999	1	1 Default setting
Delay between steps	Seconds	0	99999	1	0 Default setting
	Minutes	0	99999	1	0
	Hours	0	99999	1	0
Delay before first step	Seconds	0	99999	1	0 Default setting
	Minutes	0	99999	1	0
	Hours	0	99999	1	0

5.3.5.4 Message box

Sometimes the user may wish to check something or do something before a test actually starts. If **message before running** is checked, the **enter message** button appears. By clicking this button, a message box appears which allows you to enter a message of your choice. Hit **OK** after entering the message.

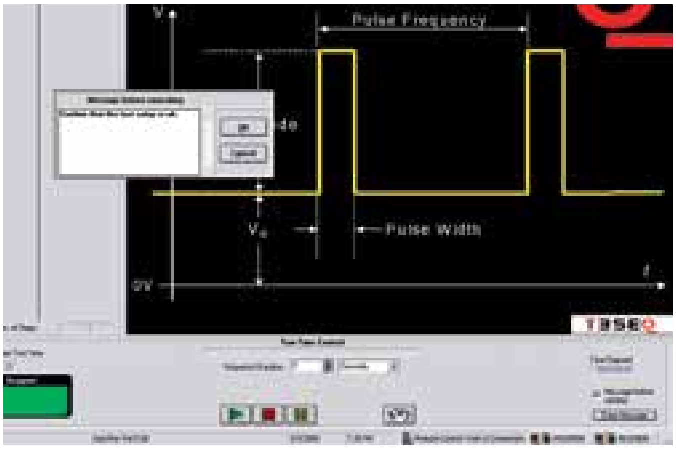


Figure 5-31: Selecting the message box to enter a message

Upon test execution the message box will appear before the test commences.

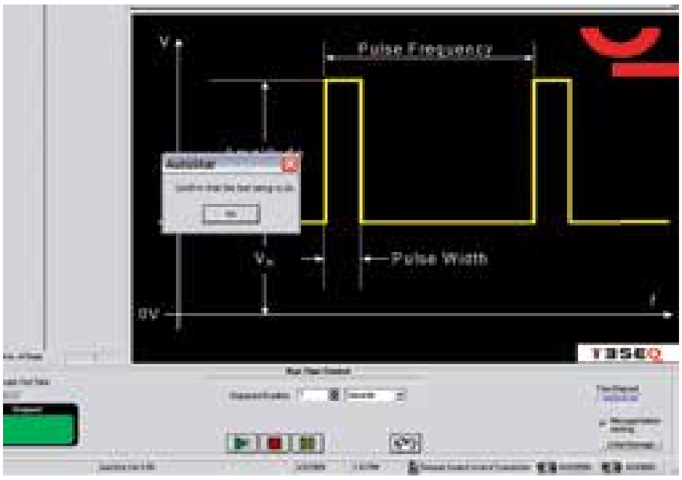


Figure 5-32: The message is displayed during test execution

When you hit **OK** the test will run. Note that this message does not appear in the test report.

5.3.5.5 Test description

The test description can be entered before starting a test or during a test

- **Before starting**
  If the user enters the test description before starting a test it becomes a persistent description, i.e. it will appear on the report every time for that particular file.

  Upon clicking the test description button the message box shown in figure 5-33 will appear. A description message can then be entered and saved to the file.

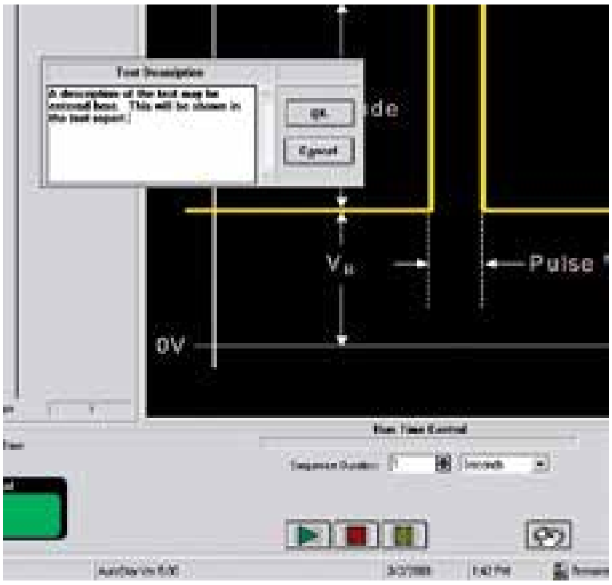


Figure 5-33: "Test description message" box

During a test

The test comment can also be entered during a test. The user can do this by pausing the test and entering the comment. This comment is not a persistent description, i.e. it will only appear on the report for that particular test.

Upon clicking the button the message box shown in figure 5-34 will appear. A comment message can then be entered.

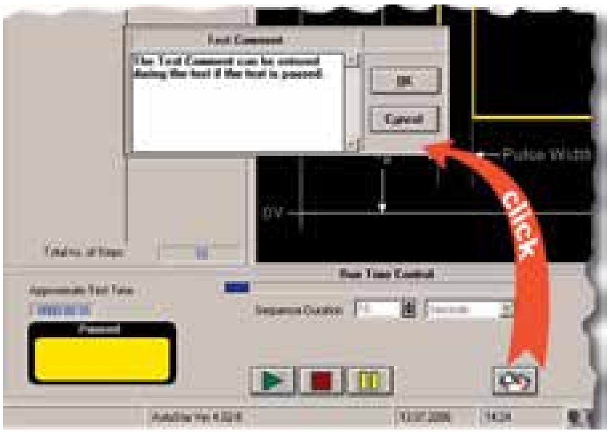


Figure 5-34: “Test comment” message box

5.4 Report editor view

5.4.1 Generating a test report

On completion of a test the user is prompted whether or not to run a test report based upon the results obtained (provided that the appropriate option is set, refer to figure 4.1.2 section 4.1.3 Test options.).

Select YES to open the report view.

When the report generator is opened it automatically creates a report based on the test results and details the test settings, test sequence and results. Other fields such as equipment tested, serial number etc. can be filled in manually.

The test report consists of the following:

Title	Editable in report view
Date, time, company name	Non-Editable in report view
Headers	Equipment tested, serial number, test equipment used, test procedure used. Editable in report view.
Test parameters	List of all the numeric state and general parameters and their modes. Non-Editable in report view.
Test status	Pass or fail. Editable in report view.
Comments	Any comments entered during a test run or test descriptions for the test file being used are shown here. Editable in report view.
Footer	Ambient temperature, humidity, pressure, tested by and title. Editable in report view.

Figure 5-35 on the next page shows the AutoStar test report

AutoStar Test Report :

Date : 14.07.2003 Time : 17:41:20 Company :

Equipment Tested

Serial Number

Test Equipment used

Test Procedure Used

Test Name : Untitled

Test Type : Surge Class 1 (Pulse 1) Time Elapsed 0000:00:03

Sequence Repetiton : 1 Count

PARAMETER	OPERATION	FROM	TO	STEP SIZE	FAIL VALUE	UNITS
Pulse Voltage (Us)	Static	-100	-- - -	-- - -	-N/A	V
Pulse Period (t1)	Static	2.5	- - -	- - -	N/A	Secs

Rise Time (tr)	1 uS
Output Resistance (Ri)	2 ohms
Pulse Width (td)	50 us
t2	200ms
Battery State	Under Program Control
Voltage	12V
Current Limit	5A
End of Test Voltage	12V

Test Status PASS

Comments

Ambient Temperature

Humidity

Pressure

Tested by

Title

Signed :

TESEQ

Advanced Test Solutions for EMC

5.4.2 Generating a test report in word

Go to **file menu → View report in word.** The test report will be opened in Microsoft word, refer to figure 5-36.

Autostar Test Report

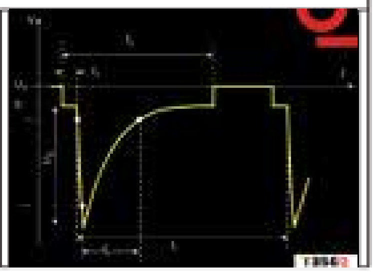
TESEQ

Teseq AG
Nordstrasse 11F
4542 Luterbach
Switzerland
www.teseq.com

Date : 07-14-2006 Time : 14:01:04

Company Name :	KH
Equipment Tested :	
Serial Number :	
Test Equipment used :	
Test Procedure Used :	

Test Number 1	
Test Name	Untitled
Test Type	NSG 5001A Pulse 1 2Ohms (Surge)
Sequence Repetition	Count 1
Test Status	PASS



Parameter	**Operation**	**From**	**To**	**Step Size**	**Fail Value**
Pulse Voltage (Us)	Linear	-100 V	-150 V	-1 V	-N/A V
Pulse Period (t1)	Static	2,5 s	---	---	---

General	**Value**
Rise Time (tr)	1 us
Output Resistance (Ri)	2 ohms
Pulse Width (td)	50 us
t2	200ms

Battery	
Battery State	Under Program Control
Voltage	10 V
Current Limit	5 A
End of Test Voltage	10 V

Comments

General Conditions					
Ambient Temperature :		Humidity :		Pressure :	
Tested by :					
Signature					

Figure 5-36: AutoStar test report in word

> **NOTE!**
> **Do not click into Word during the test report is being build up. Otherwise columns may be shifted**

5.4.3 Editing the test report

5.4.3.1 Editing the test report in AutoStar

- **After running a test**

  When the user opens the test report after running a test the fields in the header are empty. Now he can enter the data into these fields manually.

  In addition he can input data to fields like test status, comments, ambient temperature, etc.

- **Before running a test**

  If you want to run a series of tests with the same test equipment you can enter data to the fields in the header previously to a common test report template, refer to figure 5.4.3.2. Then these data appear in the automatically generated test report after each test. So you do not have to enter the equipment data each time manually to the test reports.

  To reach this **Common Test Report template** select the report editor icon when the AutoStar bar is opened or select view menu → Report editor. Now you can enter the equipment data.

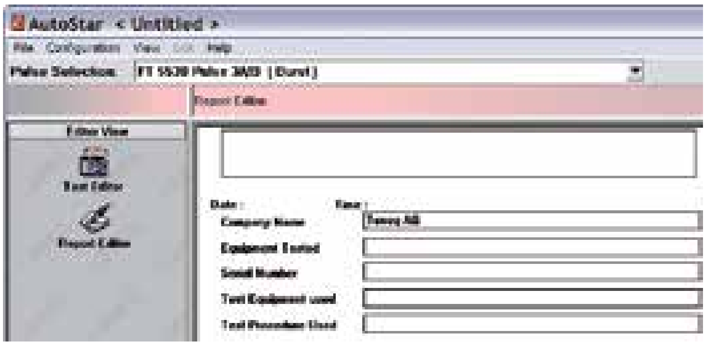


Figure 5-37: Common test report template

> **NOTE!**
> **The inputs to the common test report template will be deleted when theAutoStar software is closed.**

5.4.3.2 Editing the test report in word

The test report in Microsoft word is generated by an automatic transfer of the data of the AutoStar test report to a word template. This word template contains defined bookmarks for each field.

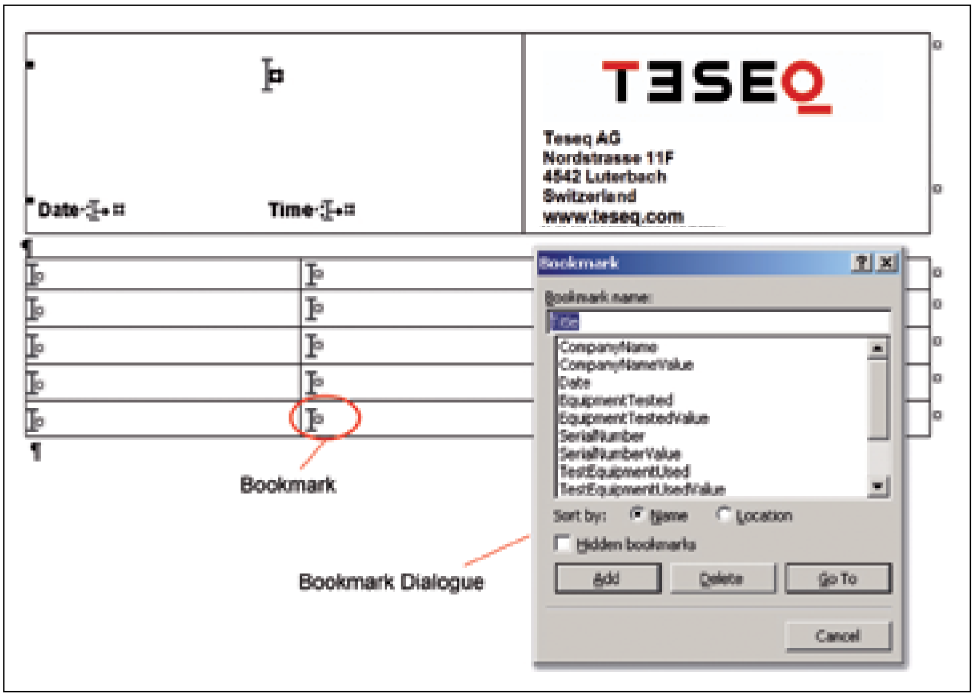


Figure 5-38: Header of the word test report template

The header of the template is free configurable. So the user can create his own test report templates and save these templates permanently for further use.

You can move or delete the bookmarks according to your requirements. The bookmarks available you can find in the bookmark dialogue (select insert → Bookmark in word). In addition you can input your own company logo and your company data.

- Save your template to any directory as a word template with the extension .dot.
- AutoStar uses the template that is configured in the test report settings, refer to section 4.1.2 Report.

5.4.4 File menu

For opening, saving or printing test reports go to the file menu. The file menu in the report editor view differs from the file menu in the test editor view, refer to figure 5-39.

A useful feature is that you can open the test report in Microsoft word. Than you can edit the report there according to your requirements and use all word features, refer to figure 5-36.

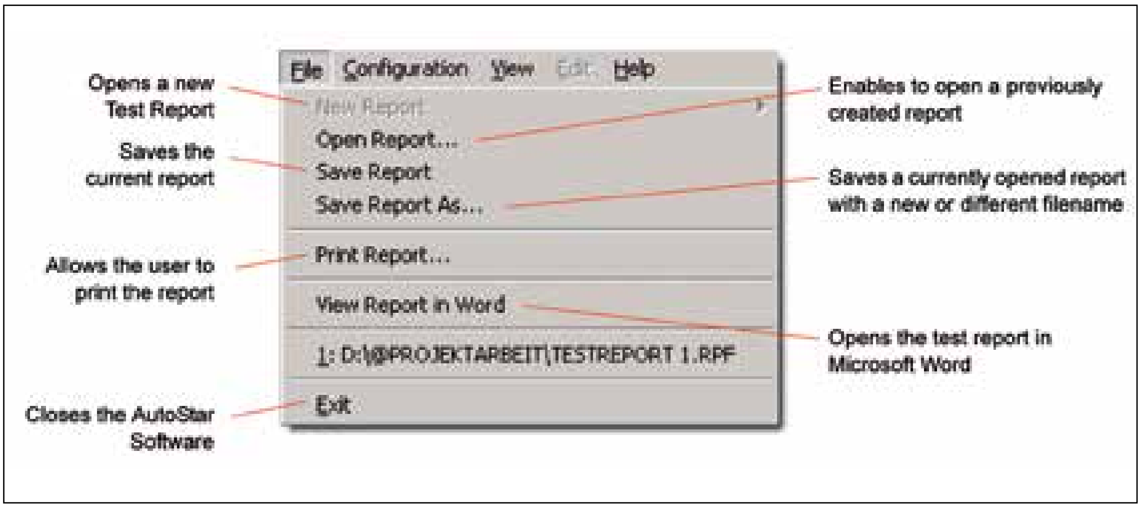


Figure 5-39: File menu in the report editor view

5.5 Test sequence

The test sequence window enables the user to create sequences of pulses. It is possible to use different pulse types from the different **NSG 5200/NSG 5600 and NSG 5000/NSG 5500** modules within one sequence. Additional the test sequence can be operated from the test sequence window.

Figure 5-40: Test sequence window

Load file

Click on the load file button in the test sequence window. This option allows the user to load any test file to create a test sequence.

Figure 5-41: Test file select

Loading files from the standards and user tests database

Tests can be added to the sequencer from the standards and user tests database by right mouse clicking on the test and selecting add to sequence.

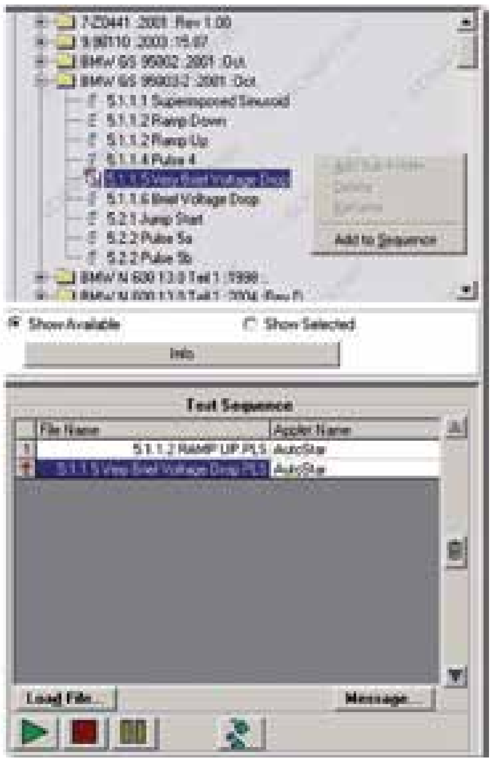
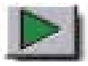
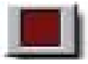
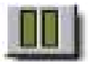
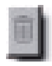


Figure 5-42: Test file select

These buttons are:

The Test Execution button	Upon clicking the test execution button a test sequence is started.	
The Test Stop button	When a test sequence is executing, clicking the test stop button stops a test sequence.	
The Test Pause button	When a test sequence is executing, clicking the test pause button pauses a test sequence. When the test sequence is paused, clicking the test pause button starts the test sequence from the point it was paused.	
The Single Step button	Pressing this button before a sequence is run (pressing the play button) causes the Sequence Description box to be displayed. Pressing this button while the sequence is paused causes the sequence comment box to be displayed.	
The Trash-Can button	To delete a file from the sequence, click on its filename within the sequence and click the trashcan button. Click on this button to delete the currently highlighted test in the sequence list.	
Move Up button	Clicking on this button allows the user to move the selected test up in the sequence	
Move Down button	Clicking on this button allows the user to move the selected test down in the sequence	

Message

To create a new message, select the **Message...** button in the test sequence window. The message dialogue window will be opened, refer to figure 5-43.

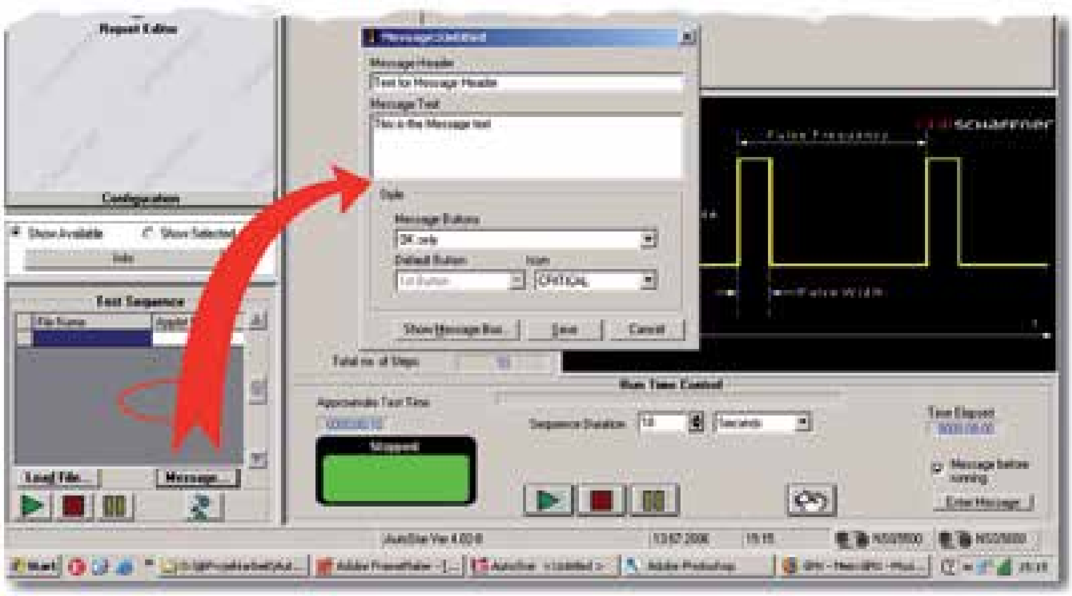


Figure 5-43: Sequence messages

You can configure a new **popup message window** as follows:

Message header		This text appears in the titlebar
Message text box		This text appears as message text
Message buttons	**OK, only**	The OK button is for messages that merely notify the user. This type of message box has no effect on the sequence.
	Restart, stop, continue	Creates three buttons to restart, stop or continue the sequence from the point at which the message is inserted in the test
Icon		Select an Icon that shall appear in the message box
Show message box		Clicking on this button will display a preview of the message box

With the settings shown in figure 5-43 the preview would look like:

Figure 5-44: Preview of popup message

Click **Save** to save the message box you have designed. **Cancel** closes the dialogue without saving.

Test sequence popup menu

The test sequence menu is available by moving the mouse pointer over the sequencer and clicking on the right-mouse button.

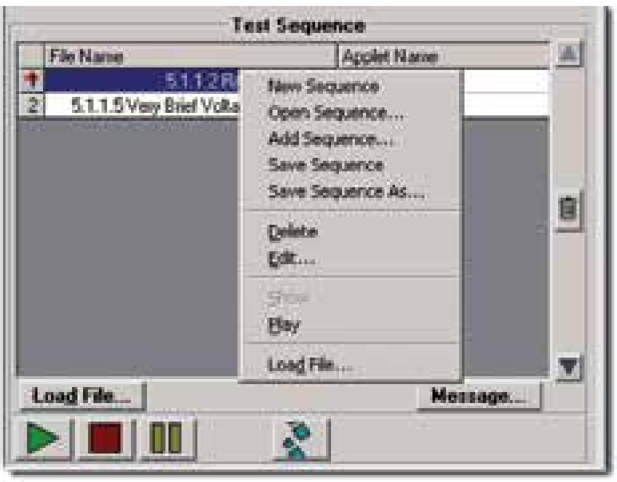


Figure 5-45: Test sequence menu

The following are available:

New sequence	Allows the user to create a new sequence
Open sequence	Allows the user to load a sequence
Add sequence	Allows the user to append multiple sequences
Save sequence	Allows the user to save a sequence
Save as sequence	Allows the user to save a sequence under a different name
Delete	Delete the selected test from the sequence
Edit…	Edit the selected test
Play	Play the selected test

5.6 Status bar

At the lower border of the AutoStar frame you can find the status bar.

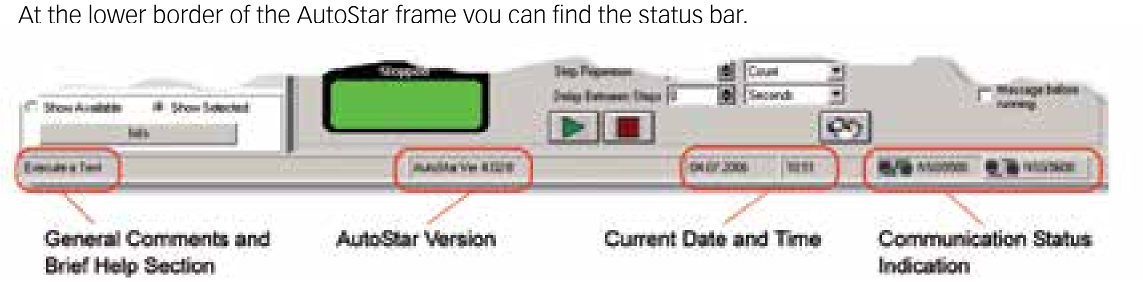
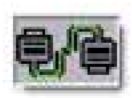
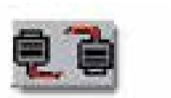


Figure 5-46: Status bar



Communication active



Communication inactive

NOTE!
It may be necessary to refresh the communication status indication by clicking on the icons.

5.7 Help menu

Each command of the help menu will be explained within the following sections.

Figure 5-48: The commands of the “Help” menu

5.7.1 Support

Select **Help** → **Support** from the menu bar to open the **Customer Support Offices** dialogue. Select the country next to your companys location from the **Service Offices** list box. After selection the address and phone/fax of the choosen sevice office will be displayed.

Figure 5-49: Customer support offices dialogue box

NOTE!
Address and phone/fax of the sevice offices will also be displayed if you move the mouse pointer across the world map and go to the red buttons each representing a service office.

5.7.2 Debug

Select **Help** → **Debug** from the menu bar to open the **Debug** dialogue box.

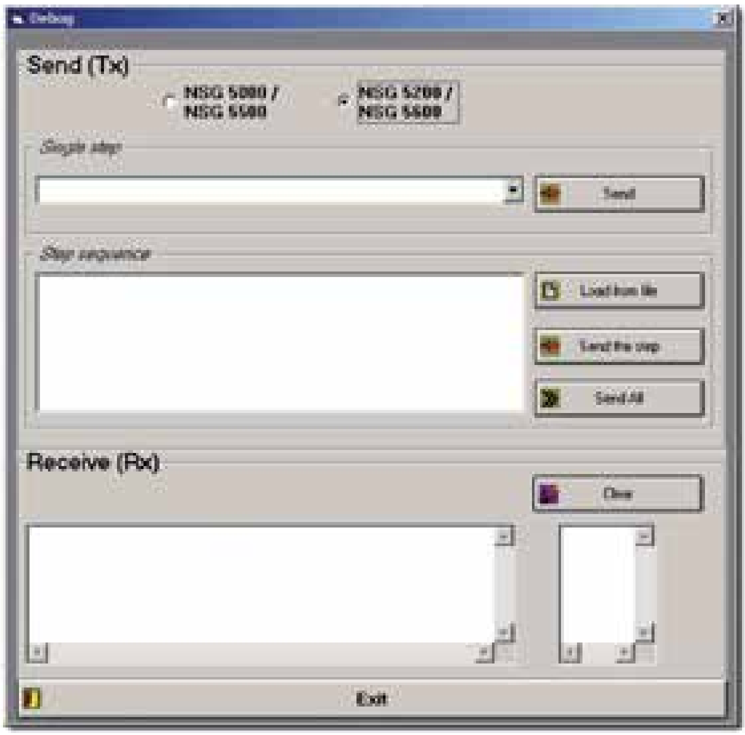


Figure 5-50: Customer support offices dialogue box

5.7.3 Documentation

Figure 5-51: Select a manual from documentation menu

Select **Help** → **Documentation** from the menu bar to select a manual e.g. software manual, hardware manual, etc.

5.7.4 Teseq in the web

A mouse click on this command opens the Teseq website.

5.7.5 About

Select **Help → About** from the menu bar to get information about the version of the currently used AutoStar software.

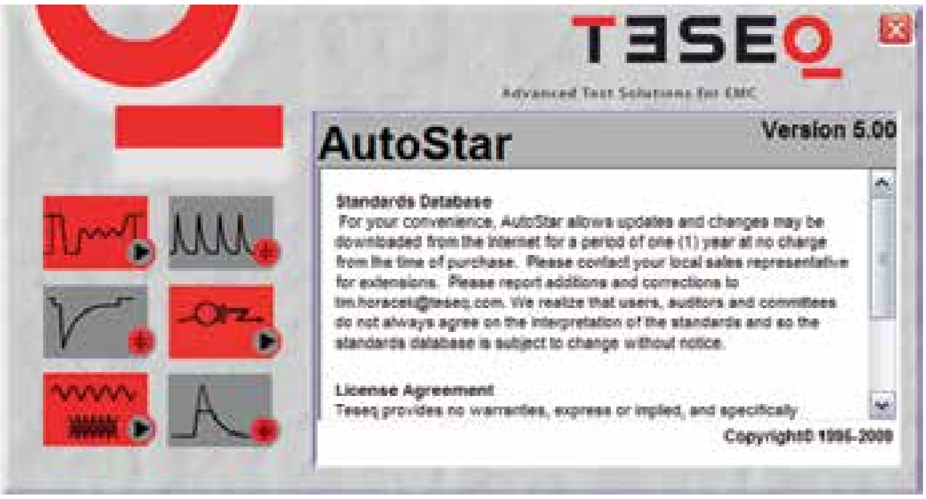


Figure 5-52: AutoStar information box

6 SUPPLY VOLTAGE VARIATIONS

Supply voltage variations are generally voltage variations of the battery supply caused by engine cranking, alternator ripple, battery charging, jump start etc.

6.1 Supply voltage variation pulse 4C

The supply voltage variations pulse 4C test screen allows the user to create arbitrary waveforms consisting of sine waves, square waves, triangle waves, exponential curves and voltage ramps, refer to figure 6-1. Additionally the clone function enables the user to add waveforms that have been captured from an oscilloscope (ref. to chapter 9. The scope.or any waveform created e.g in excel, mathcad or notepad.

6.1.1 Master screen layout overview

This master screen comprises of the following sections:

- The **Waveform Window** frame, which displays the generated waveform and allows the user to control how it's viewed.
- The **Parameter** frames
- The **Segment Editing** frame which allows the user to create tests
- The **Battery** frame which controls the battery current limit
- The **End of Test** frame
- The **Run Time Control** frame

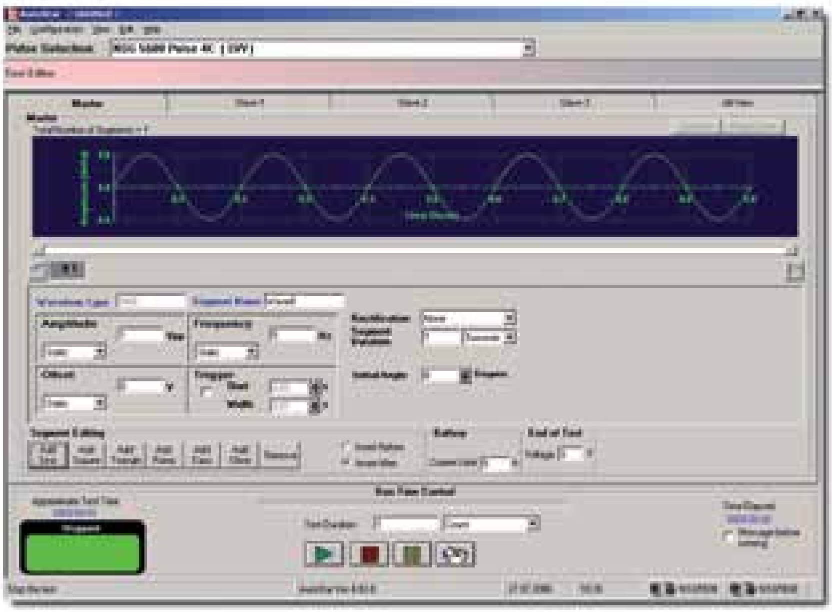


Figure 6-1: Supply voltage variations pulse 4C screen

The number of arb cards that are present in the **NSG 5200/NSG 5600** will result in one master arb card tab and between one and three slave arb card tabs

The layout for each slave "template" is the same as for the master template. The fifth tab shown in figure 6-41 is **All View** which shows all present arb cards simultaneously. The run-time control section of the test screen is below the master screen layout shown in figure 6-1, which is described later in this section.

6.1.1.1 Segment editing frame

Figure 6-2 shows the segment-editing frame. The frame consists of seven command buttons and two radio buttons.

Figure 6-2: Arbitrary supply voltage variations "segment editing" frame

This frame allows the user to add 6 types of wave segments to their test:
⇨ Sine wave
⇨ Square wave
⇨ Triangle wave
⇨ Ramp (including DC)
⇨ Exponential curve
⇨ Clone

Clicking on one of these buttons creates a default wave according to the selected wave form.

The **remove** button allows you to remove a selected segment.

The **radio buttons** allow to insert a segment either before or after the selected segment. The default option is always Insert after as shown in figure 6-37.

NOTE!
Add expo and add clone are only available when using the NSG 5600. These are not features of the NSG 5200!

6.1.1.2 Waveform window

Figure 6-3 shows the waveform window frame. This window displays the waveform as it is created. The horizontal axis is time (in seconds) and the vertical axis is the amplitude.

The waveform window consist of several tabs: Master and slave 1 to slave 3. Each tab corresponds to one of the arb cards. So up to four arb cards can be connected.

If you add several waveforms to one arb card the waveform window shows the curve divided in sections.

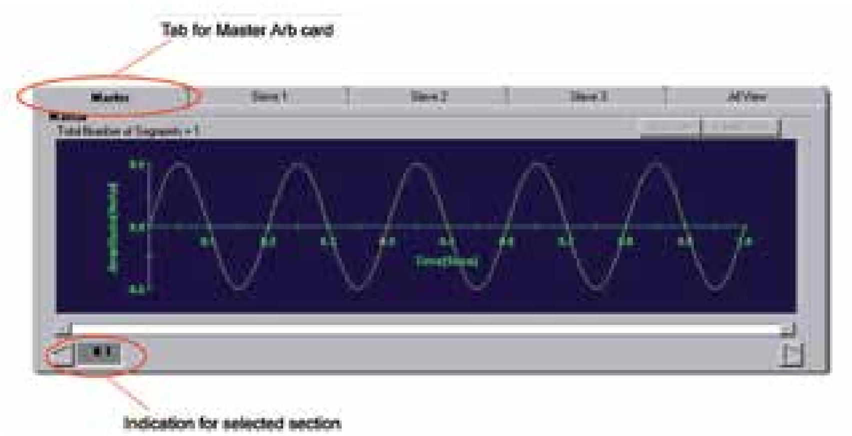


Figure 6-3: Waveform window frame

The parameter frame always shows the parameters of the active section. As the test parameters are changed the waveform alters, giving the user a real indication of what the test looks like. According to the type of wave segment different parameters will be available.

6.1.1.3 Battery frame

Figure 6-4 shows the battery frame. The battery frame allows the user to control the battery source current limit. The value that may be typed into this box depends upon the source selected. For example, for a PA 5740, the current limit range is 0.1 to 10 A and AutoStar will reflect this.

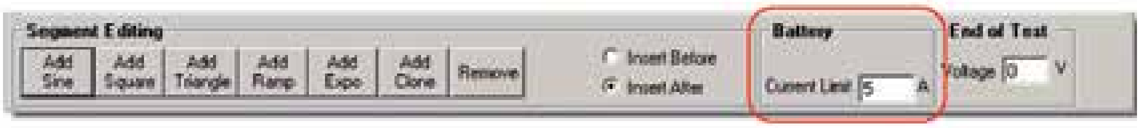


Figure 6-4: The battery frame

If the source chosen is an PA 5840-75 then the limits for the battery will be 0.1 to 25 A, as the maximum output current is now 25 A. AutoStar reads this value from the sources database (refer to section 4.2.2 Battery configuration). Thus, if a new source is added with different current output capabilities then the software will automatically adjust itself to this sources parameters.

6.1.1.4 End of test frame

Figure 6-5 shows the end of test frame. This allows the user to control the battery source voltage when the test ends or is stopped. The default value is 0 volts. The value that may be typed into this box depends upon the source that is chosen from the sources database.

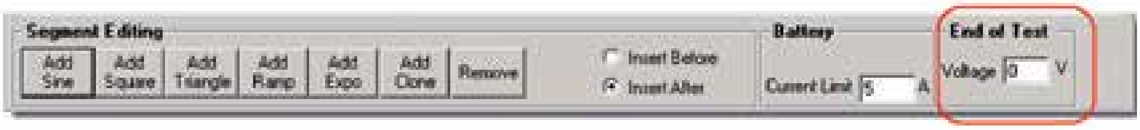


Figure 6-5: End of test frame

6.1.1.5 Run-time control

The run-time control section controls how long to perform a test. Figure 6-6 shows the run-time control section.

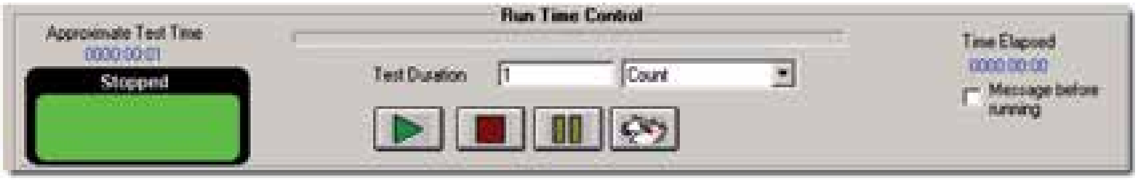


Figure 6-6: Run time control section

This section consists of a progress bar, a test duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details refer to section 6.1.9.2 Running a test.

6.1.2 Adding a sine wave

To add a sine wave to the test the user must first click on the add sine command button. This brings up the screen shown in figure 6-7 below.

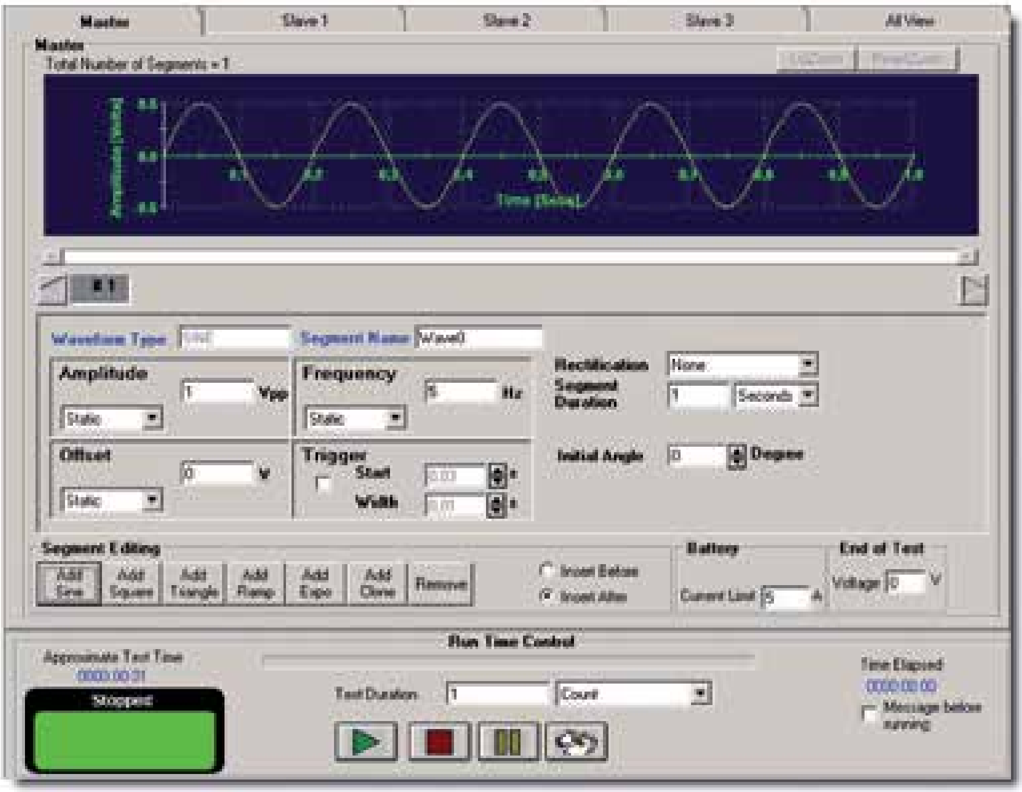


Figure 6-7: Adding a sine wave

The default sine wave segment screen, shown in figure 6-7, comprises of a 1 Vpp 5 Hz sine wave, with no ramping or rectification, an initial phase angle of 0 degrees and a duration of 1 second.

The waveform type shown is a Sine wave and a default segment name is given to it (wave 0 in this case). This name may be edited by the user to aid segment identification.The user can alter each parameter to suit the particular test. As the test parameters are changed, the waveform alters, giving the user a real indication of what the test looks like.

Figure 6-8: Sine wave parameters

6.1.2.1 Amplitude

Figure 6-9 shows the amplitude box. The user can choose between a static amplitude (default) and linear ramped amplitude.

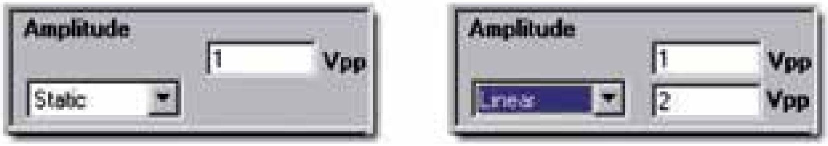


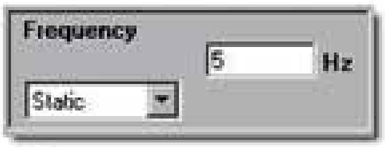
Figure 6-9: Sine wave amplitude parameters

The amplitude unit is Volts peak to peak and the voltage range depends upon the source that is selected in the sources database.

The linear ramp is continuous and thus there are no step sizes to choose from. If the user wishes to have series of stepped sine waves then it can easily be achieved using multiple segments. The voltage range for both the initial and final amplitudes is the same, with the initial amplitude defined in the upper box shown in figure 6-9 (ramping amplitude) above. The default final amplitude depends upon the selected source.

6.1.2.2 Sine wave frequency

Figure 6-10 shows the sine wave frequency box. The user can choose between a static frequency (default) or either a linear ramped frequency or a logarithmically (base 10) ramped frequency.



Static frequency

Linear frequency ramping

Log frequency ramping

Figure 6-10: Frequency parameters

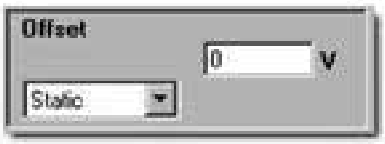
The frequency unit is Hertz (Hz) and the frequency range depends upon segment duration. For duration mode (ms, seconds, minutes and hours) the frequency range is 0.01 Hz to 320 KHz. For cycle mode the frequency range is 0.01 Hz to 4 KHz.

The linear frequency ramp is continuous and thus there are no step sizes to choose from. If the user wishes to have series of stepped frequency sine waves then it can easily be achieved using multiple segments. The frequency range for both the initial and final frequencies is the same, with the initial frequency defined in the upper box shown in figure 6-10 **(Linear Frequency Ramping)** above. The default final frequency is 300 Hz. In a linear frequency ramp, the frequency after half the duration will be halfway between the initial and final frequencies.

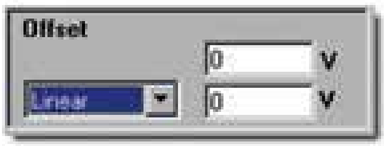
The log frequency ramp is continuous and thus there are no step sizes to choose from. If the user wishes to have series of stepped frequency sine waves then it can easily be achieved using multiple segments. The frequency range for both the initial and final frequencies is the same, with the initial frequency defined in the upper box shown in figure 6-10 **(Log Frequency Ramping)** above. The default final frequency is 300 Hz. In a log frequency ramp, the log frequency after half the duration will be halfway between the log of both the initial and final frequencies.

6.1.2.3 Offset voltage

Figure 6-11 shows the offset voltage box. The user can choose between a static offset (default) or a linear ramped offset voltage.



Static offset voltage



Ramping offset voltage

Figure 6-11: Offset voltage parameters

The offset unit is volts and the voltage range depends upon the source that is selected in the sources database.

The linear ramp is continuous and thus there are no step sizes to choose from. If the user wishes to have series of stepped offset sine waves then it can easily be achieved using multiple segments. The voltage range for both the initial and final offsets is the same, with the initial offset defined in the upper box shown in figure 6-11 (ramping offset voltage) above. The default final offset depends upon the selected source.

6.1.2.4 Trigger

If you set this function it is possible to set a trigger signal, eg. to the end of a curve. For current and voltage of the trigger signal refer to the hardware guide.

Figure 6-12: Trigger parameters

The trigger parameters have the following meaning (refer also to figure 6-13).

Start: This value defines the time distance t_S of the trigger start to the end of the curve

Width: This value t_{Tr} defines the duration of the trigger signal.

NOTE!
The user must consider the following limitations:
⇨ The time distance t_E of the trigger end must exeed 0.02s.
⇨ The minimum value for Width is 0.01s.

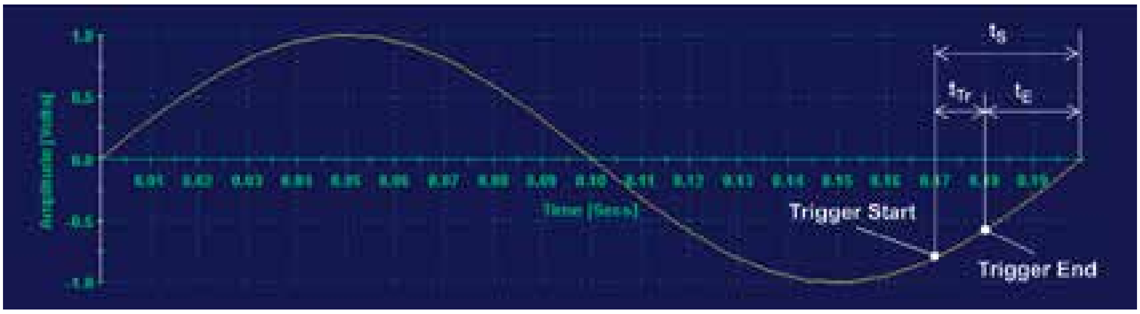


Figure 6-12: Trigger parameters

NOTE!
The trigger function is available for all segment types except of add clone. It can be used only with the master arb card.

6.1.2.5 Rectification

For each segment the user can choose between no rectification, positive rectification and negative rectification. With positive rectification, positive voltages are output as normal and negative voltages become zero. With negative rectification, negative voltages are output as normal and positive voltages become zero.

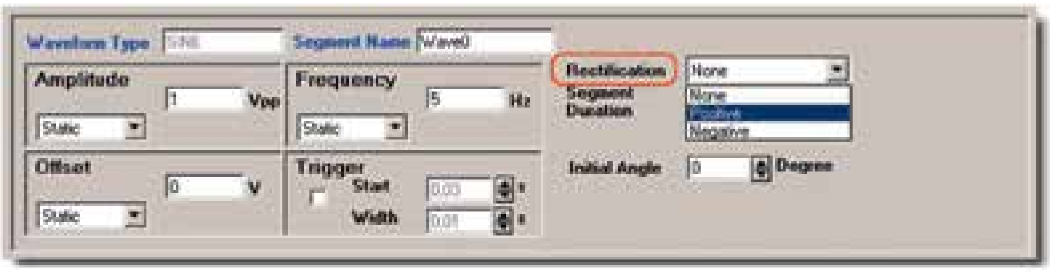


Figure 6-12: Trigger parameters

NOTE!
The rectification function is only availavble for sinus, square and triangle curves.

6.1.2.6 Phase angle

The initial phase angle of a wave segment can be specified, as shown in figure 6-15 and figure 6-16. At low frequencies the value of this initial phase angle is variable from 0 degrees to 360 degrees in 15 degree steps.

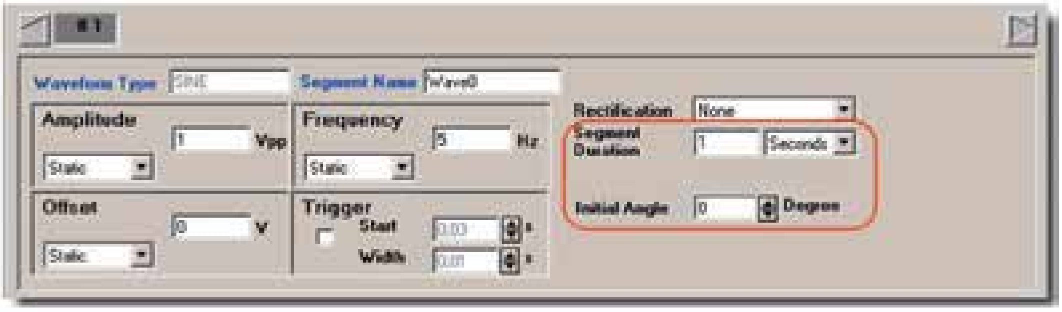


Figure 6-15: Phase angle parameters, duration mode

In duration mode (ms, seconds, minutes, hours) only the initial phase angle is programmable as shown in figure 6-15. This is because once a test starts it will run for the specified duration, regardless of the final angle of the test. In cycle mode however, both the initial and final phase angle of the test can be specified. This is shown in figure 6-16.

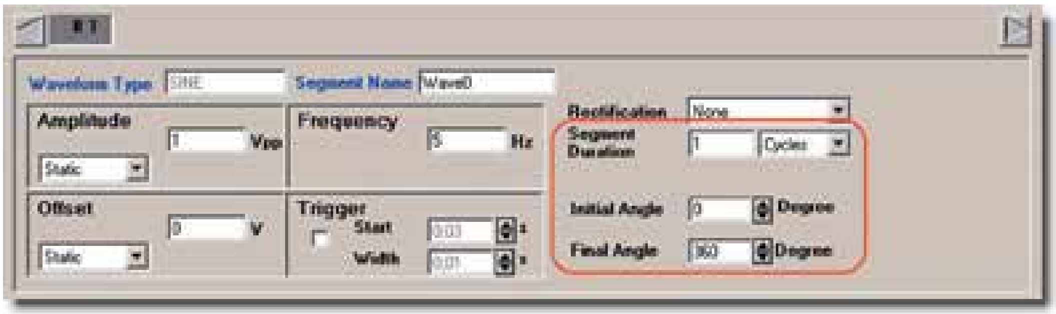


Figure 6-16: Phase angle parameters, cycle mode

At low frequencies the final phase angle is programmable from 15 degrees to 360 degrees. If only one cycle is chosen then obviously the final angle cannot be less than the initial angle.

The initial and final angle values are frequency dependent. At higher frequencies it is not possible to achieve the resolution that can be achieved at lower frequencies. The user should consult the hardware specifications for the **ARB 5220/FG 5620** module to determine the allowed initial and final phase angles for the various frequency ranges.

6.1.2.7 Segment duration

The duration of the sine wave segment can be specified in ms, seconds, minutes, hours and cycles. Select the unit from the **Segment Duration** list box as shown in figure 6-17.

Figure 6-17: Different duration units offered for each segment

In ms duration, the minimum duration for a sine wave is 5 ms and the resolution is also 5 mS. All other duration types have a minimum of one unit. The user should consult the hardware specifications for the **ARB 5220/ FG 5620** module to determine the specifications for each unit.

6.1.3 Adding a square wave

To add a square wave to the test, the user must first click on the **Add Square** command button. This brings up the screen shown in figure 6-18 below.

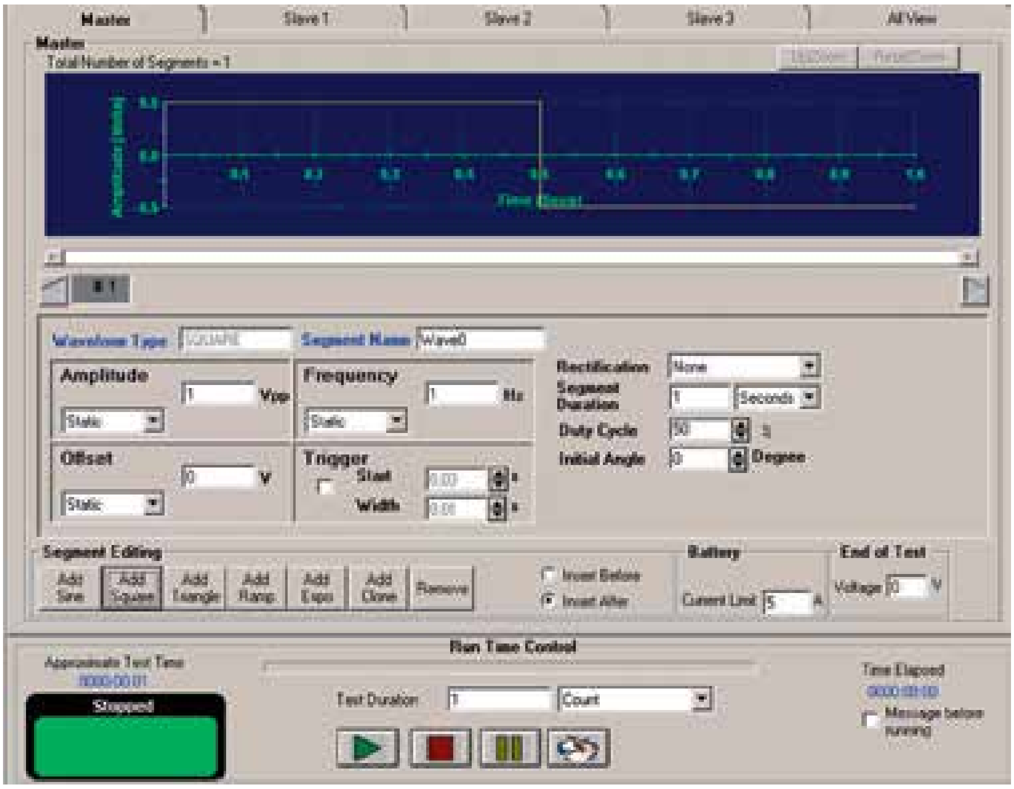


Figure 6-18: Adding a square wave

The default square wave segment screen, shown in figure 6-18, comprises of a 1 pp 1 Hz square wave, with no ramping or rectification, an initial phase angle of 0 degrees, a duty cycle of 5% and a duration of 1 second.

The waveform type shown is a square wave and a default segment name is given to it (wave 0 in this case). The name may be edited by the user to aid segment identification.

Figure 6-19: Square wave parameters

The operation of the parameters amplitude, offset, frequency, rectification, phase angle and segment duration is similar to that for a sine wave. The extra parameter for square waves is duty cycle.

6.1.3.1 Duty cycle

Figure 6-20 shows the duty cycle text box. The user can choose a duty cycle of 5 to 95% with a resolution of 5%.

Figure 6-20: Duty cycle parameter

6.1.4 Adding a triangle wave

To add a triangle wave to the test the user must first click on the add triangle command button. This brings up the screen shown in figure 6-21 below.

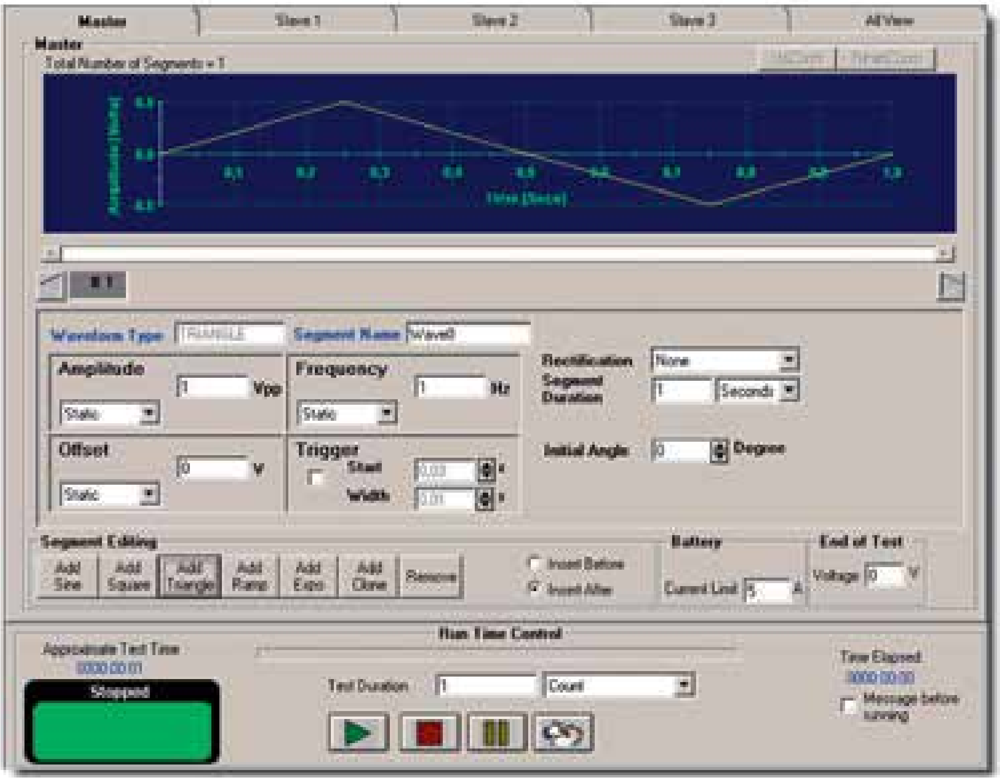


Figure 6-21: Adding a triangle wave

The default triangle wave segment screen, shown in figure 6-22, comprises of a 1 pp 1 Hz triangle wave, with no ramping or rectification, an initial phase angle of 0 degrees and a duration of 1 second.

The waveform type shown is a triangle wave and a default segment name is given to it (wave 0 in this case). The name may be edited by the user to aid segment identification.

Figure 6-22: Triangle wave parameters

The operation of the parameters amplitude, offset, frequency, rectification, phase angle and segment duration is similar to that for a sine wave.

6.1.5 Adding a ramp segment (including DC)

To add a ramp segment to the test the user must first click on the **Add Ramp** command button. This brings up the screen shown in figure 6-23 below.

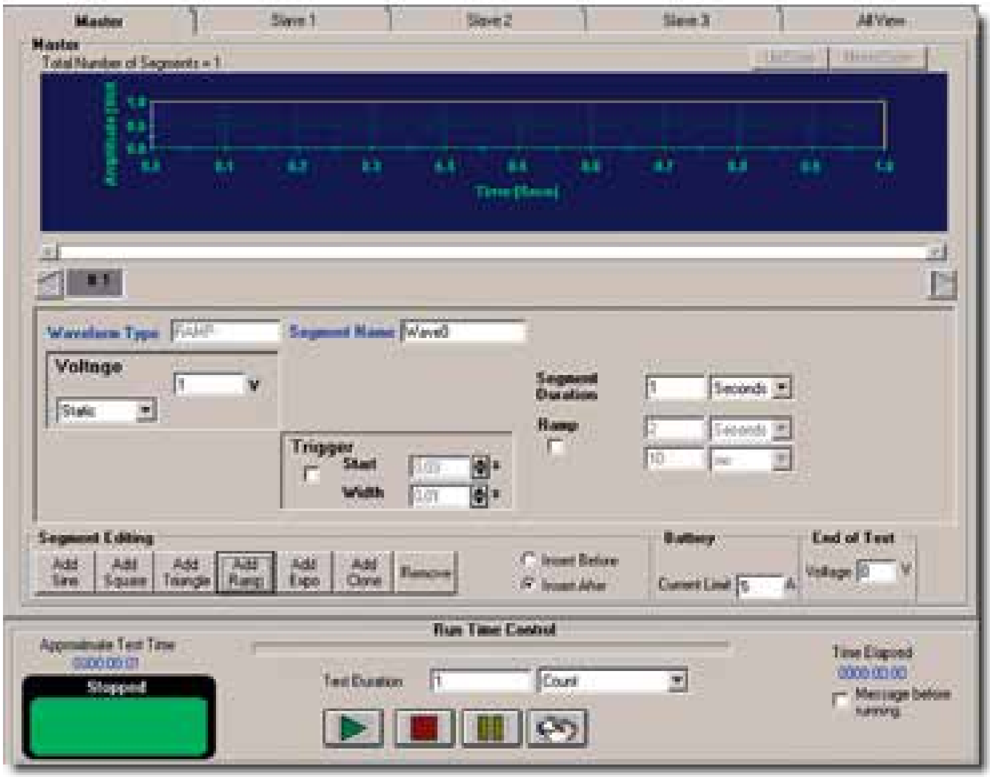


Figure 6-23: Adding a ramp segment

The default ramp segment wave segment screen, shown in figure 6-23, comprises of a 1 Volt DC segment with a duration of 1 second. A DC level can be considered to be a particular type of ramp segment with a 0 degree (horizontal) slope.

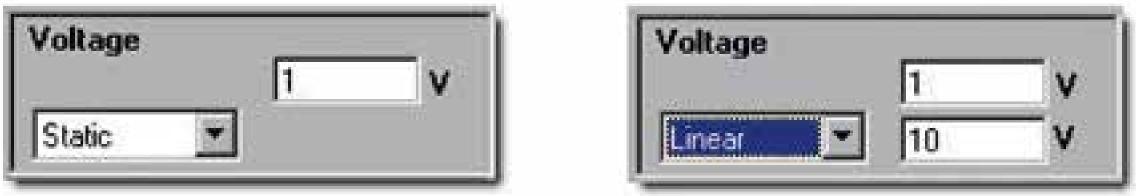
The waveform type shown is a ramp segment wave and a default segment name is given to it (wave 0 in this case). The name may be edited by the user to aid segment identification.

Figure 6-24: Ramp segment wave parameters

There are only three possible parameters with a ramp, voltage level, trigger and segment duration. Note however that the minimum ramp duration in mSecs mode is 0.5 ms and the resolution is 0.1 ms.

6.1.5.1 Voltage

Figure 6-24 shows the voltage box. The voltage level is not peak-to-peak for a ramp. The user can choose between a static voltage level (default) and a linear ramped voltage.



Static ramp (DC)

Ramping the voltage of a ramp segment

Figure 6-25: Ramp voltage parameters

The voltage range depends upon the source that is selected in the Sources database. Negative voltages may be entered for a ramp segment e.g. - max. source voltage → + max. source voltage.

The linear ramp is continuous and thus there are no step sizes to choose from. If the user wishes to have series of stepped ramps then it can easily be achieved using multiple segments. The voltage range for both the initial and final voltages is the same, with the initial voltage defined in the upper box shown in figure 6-24 **(Ramping voltage of a ramp segment)** above. The default final voltage depends upon the selected source.

6.1.5.2 Segment duration

The duration of the sine wave segment can be specified in ms, seconds, minutes, hours and cycles.

Figure 6-26: Static segment duration

Contrary to the other wave segments the ramp segment duration can be ramped. This means the whole wave form will be repeated until segment duration is counted stepwise from the initial value to the final value. Due to activate this functionality, the user must check the ramp check box. You can input the values as shown in figure 6-27.

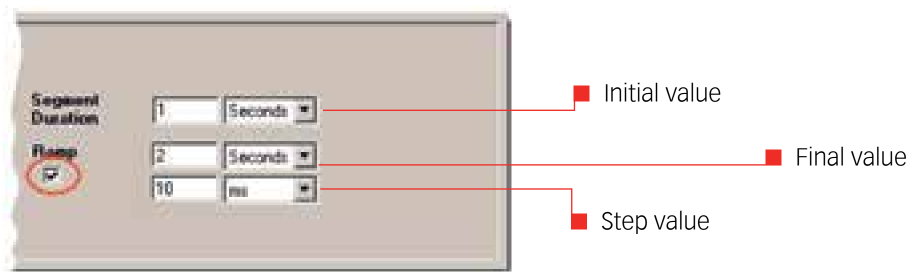


Figure 6-26: Static segment duration

NOTE!
The following conditions must be considered:
- ⇨ **Segment duration can only be ramped if minimum two wave segments are created.**
- ⇨ **Segment duration can only be ramped on the master arb card.**
- ⇨ **Segment duration can only be ramped once.**

6.1.6 Adding an exponential curve

To add an exponential curve to the test the user must first click on the add Expo command button. This brings up the screen shown in figure 6-28 below.

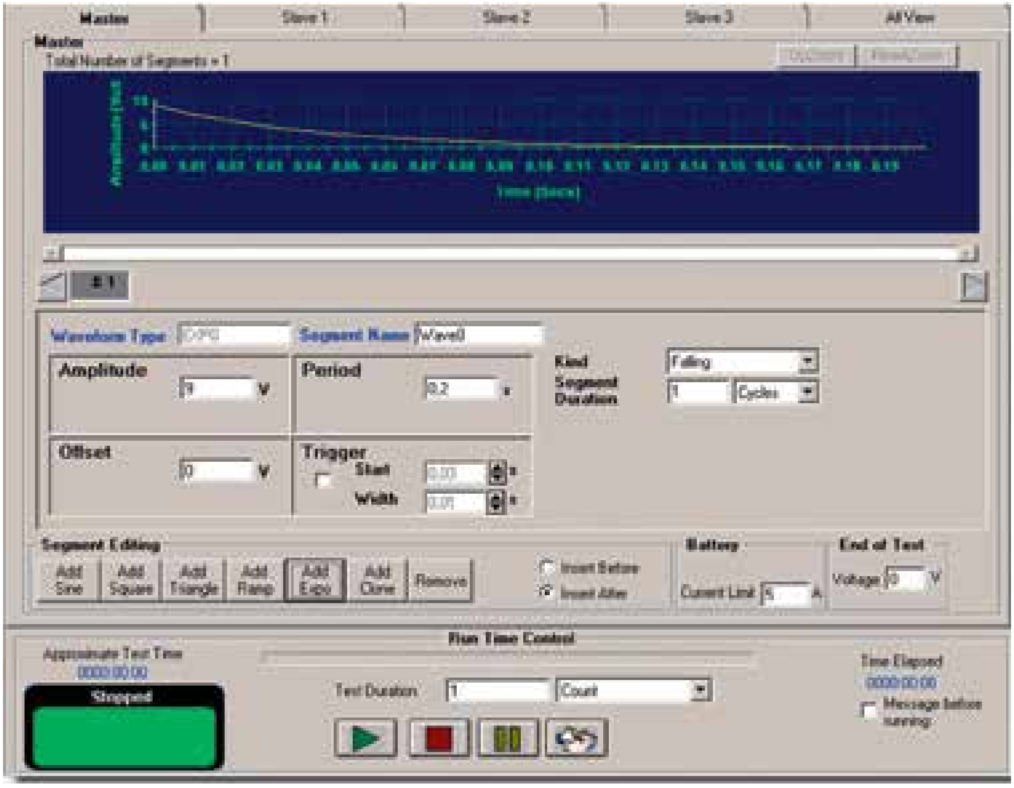


Figure 6-28: Adding an exponential curve

The default exponential curve segment screen, shown in figure 6-28, comprises an exponential curve falling from 9 V within 0.2 seconds to 0 V.

The waveform type shown is a exponential curve segment and a default segment name is given to it (wave 0 in this case). The name may be edited by the user to aid segment identification.

Figure 6-29: Exponential curve parameters

The operation of the parameters for the exponential curve segment amplitude, offset trigger and segment duration is similar to that for a sine wave. The additional parameters period and kind are described in the next sections.

NOTE!
The parameters amplitude, offset and period can not be ramped. For segment duration only the unit cycles is available.

NOTE!
Limit values for the parameters:
⇨ Voltage offset + Amplitude < Maximum battery voltage
⇨ Amplitude < 10 x Absolute value of battery gain*

** To check the battery gain select configuration menu →System configuration and open the battery section and click on the properties button, refer to chapter 4.2.2 Battery configuration.*

Figure 6-30: Properties dialogue

6.1.6.1 Kind of exponential curve

For each segment the user can choose between falling (default) and rising.

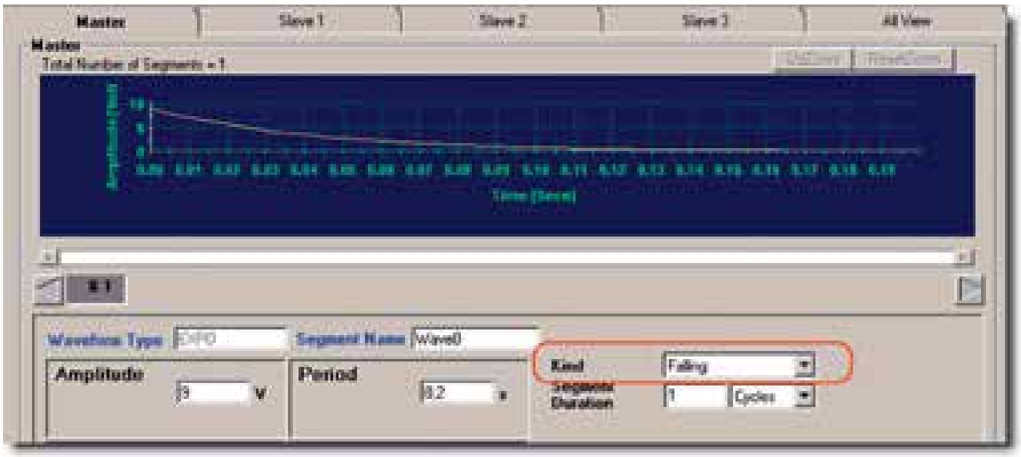


Figure 6-31: Falling exponential curve

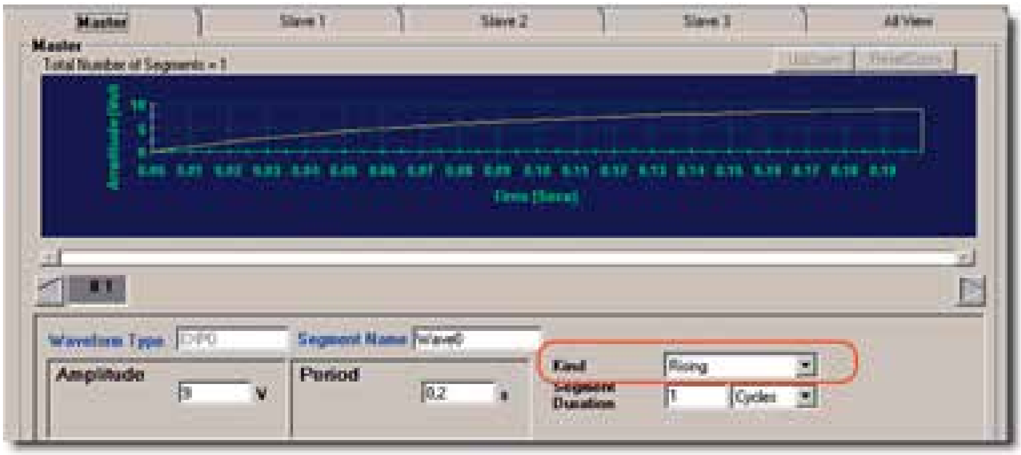


Figure 6-32: Rising exponential curve

6.1.6.2 Period

Figure 6-33 shows the period box. Period means the duration of the exponential curve until it reaches its final value.

Figure 6-33: Amplitude parameter

6.1.7 Adding a clone

The clone function enables the user to add waveforms that have been captured from an oscilloscope (ref. to chapter 9. The scope) or any waveform created e.g in Excel, Mathcad or Notepad.

To add a clone to the test the user must first click on the **Add Clone** command button. This brings up the clone function open dialogue shown in figure 6-34 below.

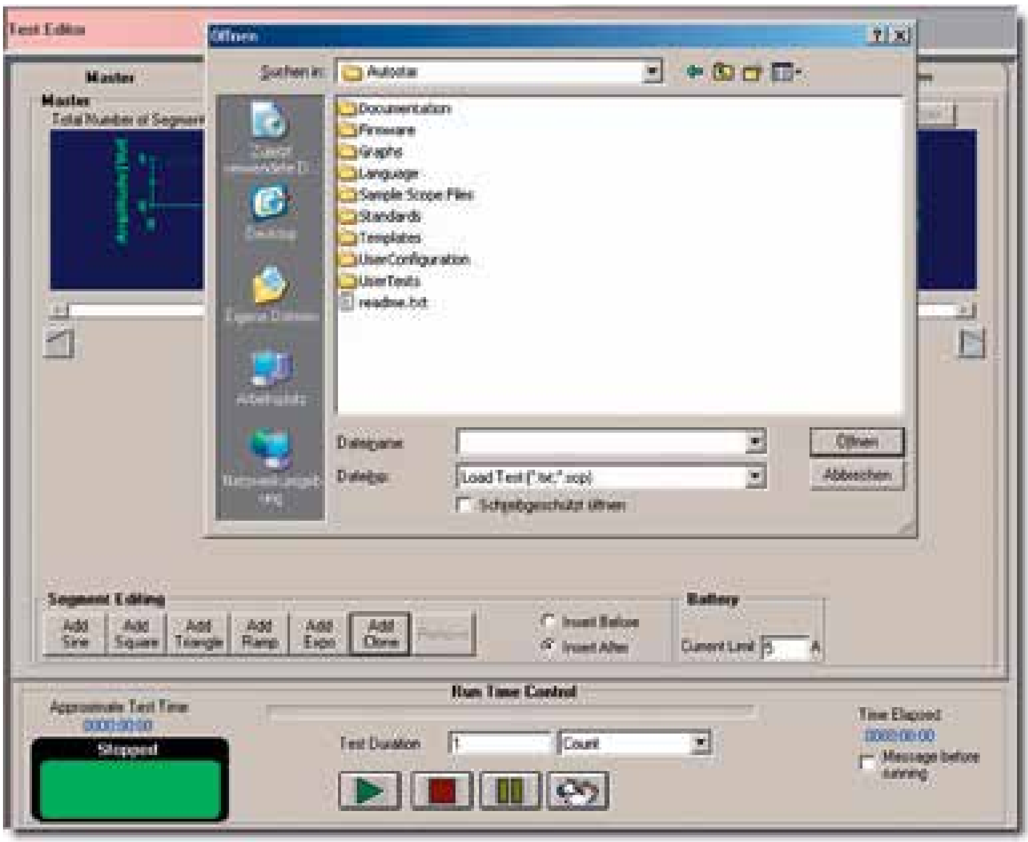


Figure 6-34: Clone function open dialogue

Now you can select a waveform file from the open dialogue. By opening this file the function will be added as a new section.

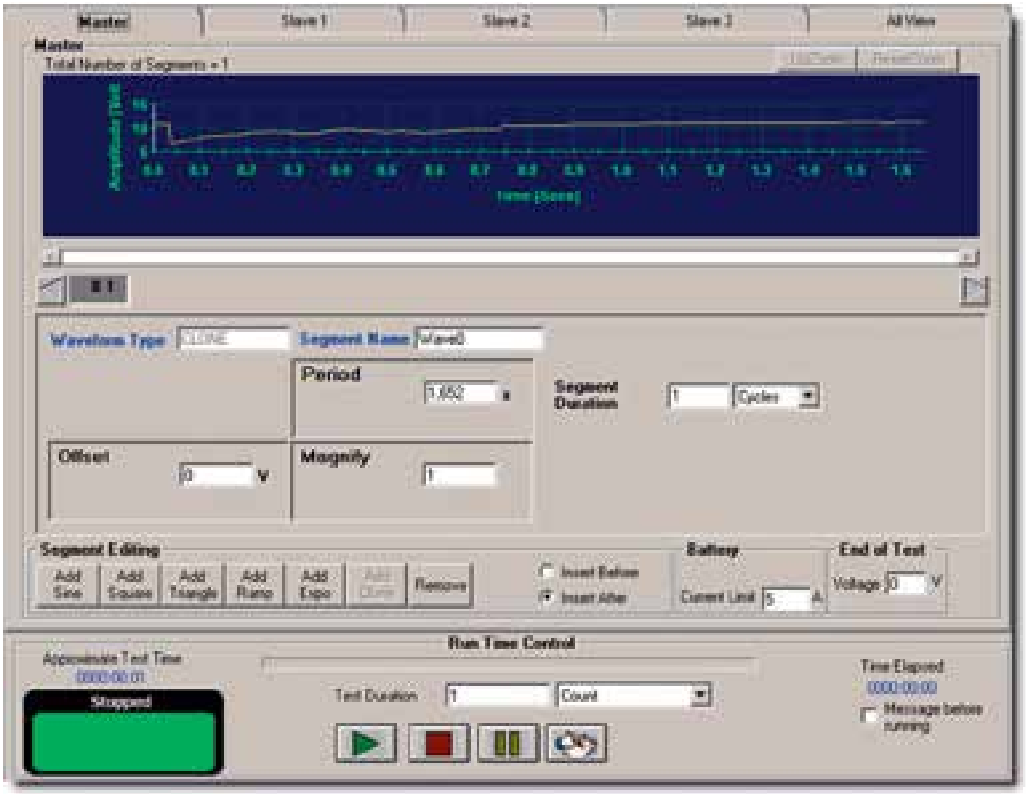


Figure 6-35: Clone function screen

The clone function screen comprises the parameters period, offset, magnify and segment duration. These parameters enable the user to adapt the imported function subsequently.

The parameters period, offset and segment duration have the same functionality as for the exponential curve.

NOTE!
⇨ **The mimimum value for the period is 0.5 ms. A shorter periode can not be output by the arb card.**

6.1.7.1 Magnify

This parameter was not explained in the previous sections. The magnify parameter is a multiplier for the amplitude values. The magnify range depends upon the source that is selected in the sources database.

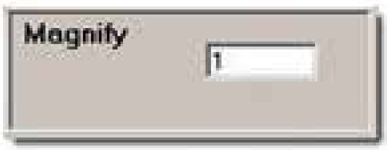


Figure 6-36: Magify parameter

NOTE!
The add expo and the add clone function is only available for NSG 5600 and not for NSG 5200.

6.1.8 Multiple segment tests

A test can consist of between 1 and 100 segments of any of the six wave segment types described previously. There is no direct relationship between any two segments. Thus, the first segment may have a duration of several minutes while the second segment may have a duration of several cycles. Thus, all segments are effectively independent components.

Waveforms are generated not by initially calculating each point and storing it in memory but rather by calculating the waveform mathematically. The software sends the segment parameters to the instrument, which then uses mathematical functions to calculate how to generate the waveform. Creating and generating a test is thus quick and easy. The scope section of AutoStar deals with waveforms that may be difficult to describe mathematically and thus it loads the memory with the points of the waveform. Although this can take longer to download, it does provide the user with a true Arb generation facility.

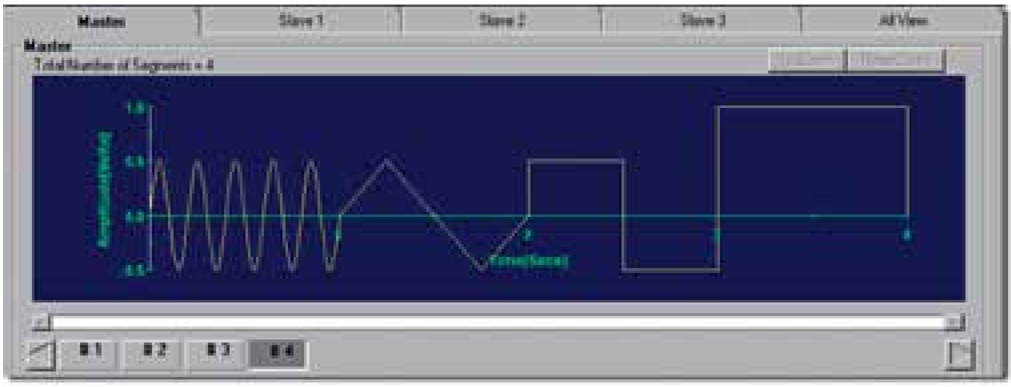


Figure 6-37: Arbitrary supply voltage variations with four segments

6.1.9 Zooming into a part of the waveform

Highlighting a region on the screen allows the user to zoom into one part of the waveform created, as shown in figure 6-38 and figure 6-39. This is done by holding the mouse over the segment and dragging it over the zoom area. The region becomes highlighted in yellow and, upon release of the mouse, the screen zooms to the area highlighted.

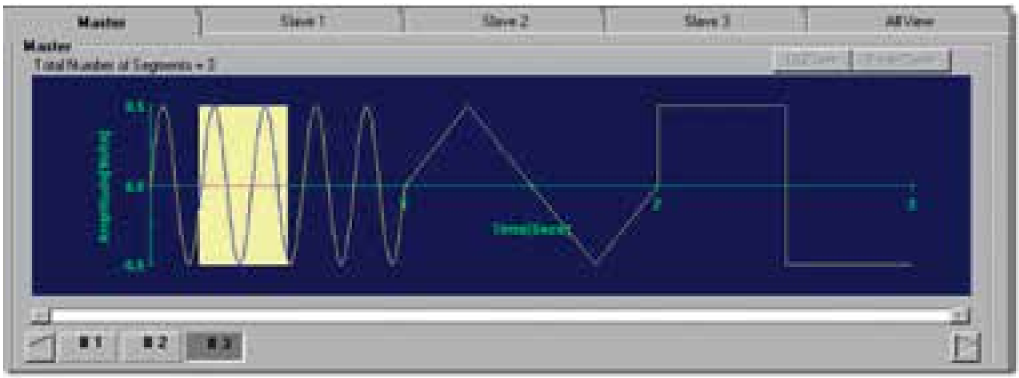


Figure 6-38: Highlighting a region to zoom in to

The zoom in process can be repeated several times if required, allowing close inspection of the created waveform. Note however that some wave segment types (e.g. ramp) may be limited regarding how far in the user can zoom, this is because there are less points on the screen in a ramp than in a sine wave. Once this limit is reached further zooming is not possible.

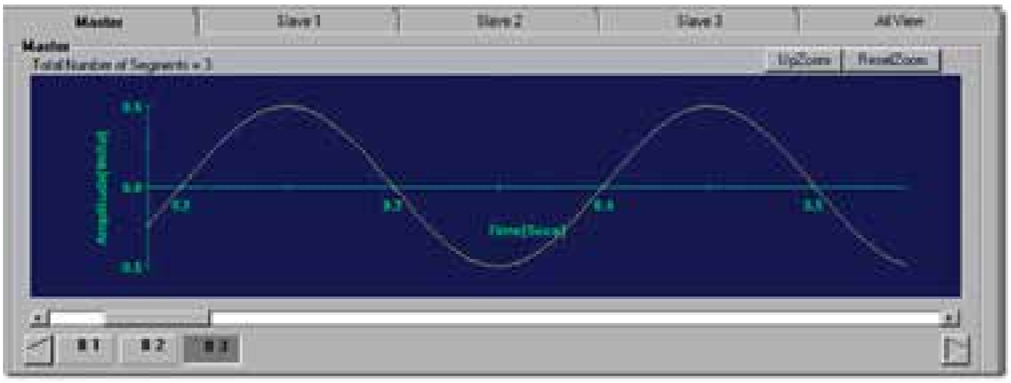


Figure 6-39: The result of zooming in

When the waveform has been zoomed in the upZoom and resetZoom buttons become active. The upZoom button sets the zoom level to the previous zoom level, if multiple zooming has occurred or full screen if only one zoom in has occurred. The resetZoom command sets the zoom back to full screen.

The scroll bar allows the user to scroll across the waveform, regardless of the zoom level. Below the scroll bar are the waveform segments that comprise the waveform. Clicking on any segment highlights it on the screen and also displays the segments parameters. The arrows on the sides of the waveform window frame allow the user to step back and forth through the waveform. The software counts and displays the number of segments in the test.

6.1.9.1 Edit menu

The edit menu allows the user to manipulate segments and waveforms. You can copy and paste segments and waveforms within the same arb card or from one arb card to another.

Figure 6-40: The “Edit” menu

6.1.9.2 Running a test

There are several things to be aware of when running an arbitrary supply voltage variations test.

Because a waveform may consist of multiple segments there may be a short delay between the start of one segment and the beginning of the next. This time is given in the applicable hardware manual. This delay will occur even if the user has only one segment but with a run-time control count of more than one or else continuous.

If the user wishes, for example, to generate a sine wave for an hour, it is better to create a segment of duration 1 hour and a count of 1 than a sine wave of duration 1 second and a count of 3600. Although both will generate a 1 hour sin wave, the second test will experience the short delay every second while the first test will not experience this problem.

The software will only generate the waveform for the particular view selected. Thus, if multiple arb cards are available but the user is in the master screen, only the master arb card will produce an output, regardless of what is set-up on the Slaves. This is not an error in the software but rather a design feature.

To ensure all arb cards generate a waveform (if switched ON) it is necessary to be in the All View screen. To aid the user determining which arb card is being controlled a led on the Arb module flashes for a few seconds every time that arb cards screen is selected in software. The top LED in the module corresponds to the top arb card.

All LEDs flash continuously during the running of a test, providing the arb card screen is set to ON in **All View** mode and condition 2 above is met.

During the running of a test the waveform window enlarges and the test parameters are hidden. The larger window gives the user a better view of the graphic. During the test a line traverses the waveform giving the user an approximate indication of the progress of the test.

The RMS voltage and RMS current of the arbitrary waveform is read-back and displayed during the test. This can give the user confidence that his test is set-up correctly (only from the master card).

The read-backs originate from measurement circuitry in the **DCS 5230/DS 5630** module and are fed back to AutoStar via the **ARB 5220/FG 5620** and then the **CTR 5210/CT 6510.** For other test types (e.g. Power magnetics) the read-backs may originate on other modules. This will depend entirely on what test is being performed.

NOTE!
The ARB does not read back the current from an amplifier, or battery simulator.
This function is accurate only when running through a DS 5630 or DCS 5230

NOTE!
The recommended minimum value for the period is 2 s. For a period shorter than 2 s the marker showing the actual value in curve during the test can not be displayed.

This is valid for all types of curves!

6.1.9.3 All view

The All View tab displays all available system arb cards together. Figure 6-25 shows this view, tiled vertically. Each arb card waveform is shown in four individual windows. Each individual slave can be turned OFF, preventing the particular Arb card from generating an output waveform. The master cannot be turned OFF as this provides synchronisation for all of the arb cards. An NSG 5200/NSG 5600 system always has a master arb card.

If preferred the user can choose to tile the windows horizontally by choosing view → Tile horizontally from the menu bar of the AutoStar window. This will set up the screen as shown in figure 6-42.

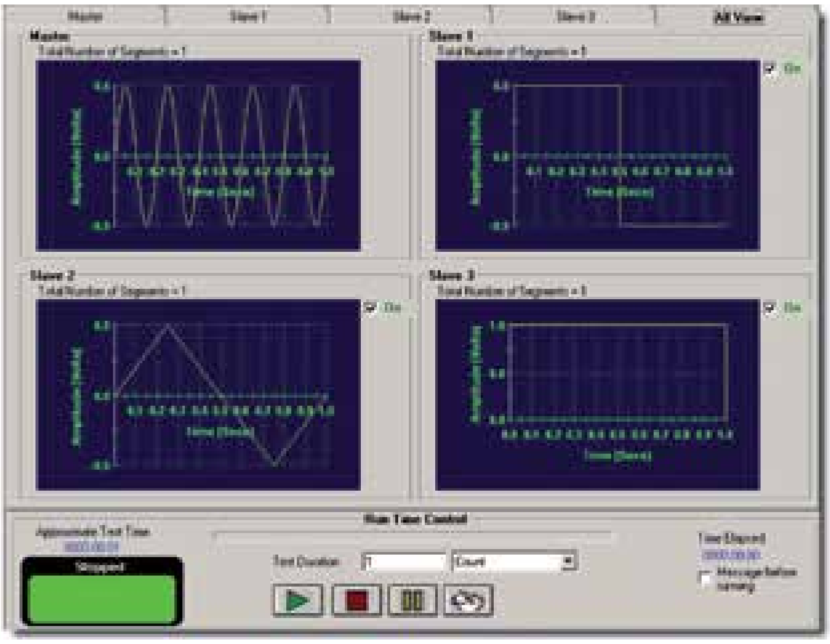


Figure 6-41: All view display, tiled vertically

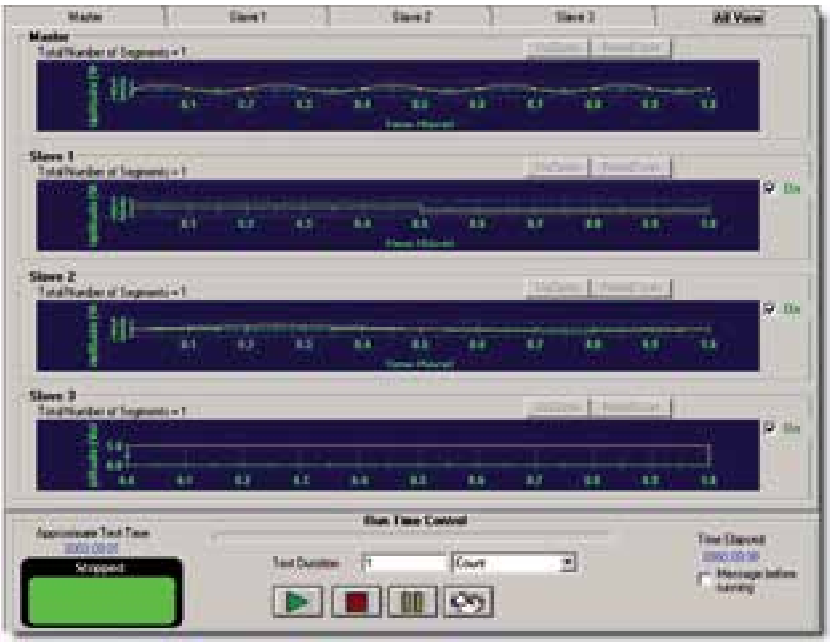


Figure 6-42: All view display, tiled horizontally

6.2 Supply voltage variation pulse 4D (dips and drops)

Supply voltage variation pulse type pulse 4D is also known as dips and drops. A dip is a fast (~1 µS) change from one DC level to another DC level. A drop is a dip to 0 V. It is difficult to achieve a 1 µs rise & fall time using an amplifier due to the band width required. Thus, two DC sources and a fast semiconductor switch are used to achieve the required rise and fall time specifications. The NSG 5200/NSG 5600 system uses the DCS 5230/DS 5830 module to achieve this high speed switching.

6.2.1 Test editor screen layout overview

This screen is comprised of the following sections:

- The parameter **Tabs frame** which allows the user to create tests
- The **Graphical Display** shows a graphical representation of the selected wave form
- The **Run Time Control** frame.

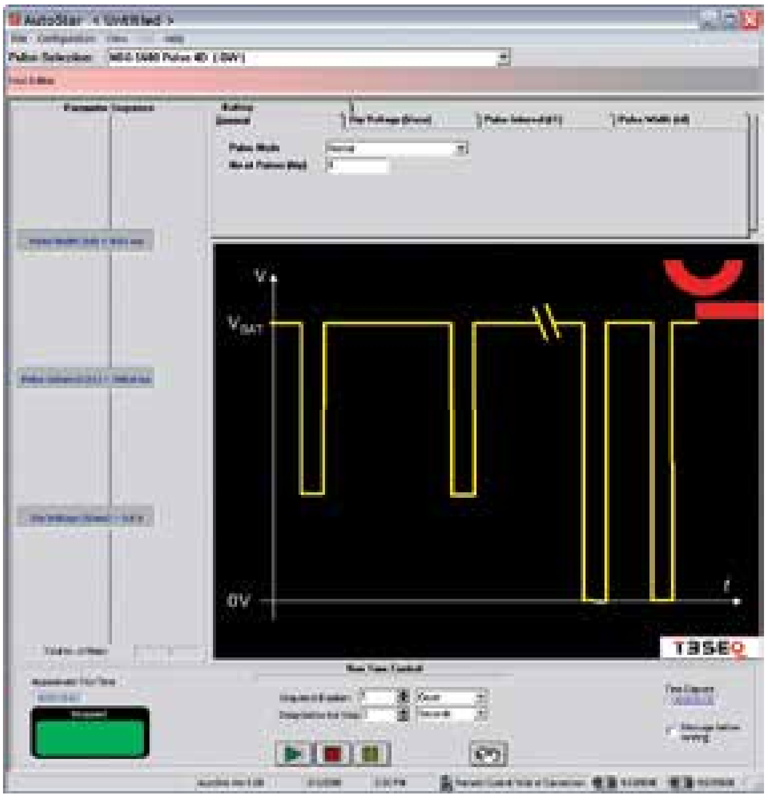


Figure 6-43: Supply voltage variations pulse 4D screen

6.2.1.1 Parameter tabs

Test parameter values can be assigned by clicking on the appropriate parameter tab in the top right corner of the Test editor window and by editing the individual text boxes.

- General

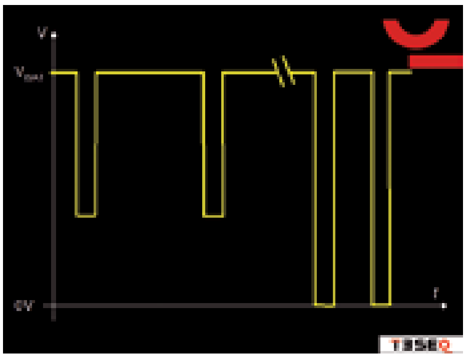
Figure 3-1: General tab

The general tab allows the user to select the pulse mode and the no. of pulses (N_p) within a packet.

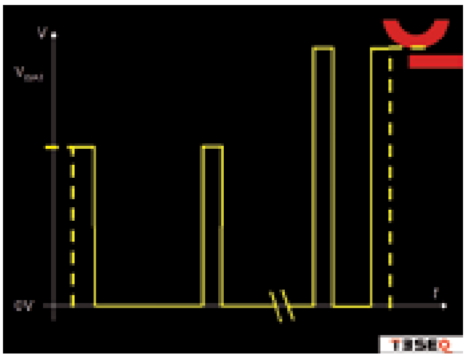
When the pulse mode is set to normal the pulse output mimics figure 3-2 (a). At the start of the test the battery voltage is set to V_b, it then drops to V_{aux} for time t_d, returns to the battery voltage for time t1 and repeats the dips NP times. At the end of the test the output voltage is set to the battery voltage level.

When the pulse mode is set to Inverted, the pulse output mimic's figure 3-2 (b). Again the voltage varies between V_b and V_{aux} with the time spent at V_b now equal to t_d. Note though that, as the voltage is still initially set to the battery voltage and also finishes at the battery voltage, the first and last pulse are "hidden". Thus, if the user sets up a 100 µS pulse width, with N_P = 5 pulses, the output will only appear to generate 3 pulses in Inverted mode.

Parameter	Min	Max	Units
Pulse mode	Normal or inverted		N/A
No. of pulses (N_p)	1	1000	



Normal mode



Inverted mode

Figure 3-2: Normal & inverted pulse graphical displays

Dip voltage (V_{aux})

Figure 3-3: Dip voltage tab

The dip voltage V_{aux} is the DC value that the battery is dipped down to during DC switching using the **DCS 5230/ DS 5630** module. The minimum value of V_{aux} is 0 while the maximum value is dependent upon the type of auxiliary source chosen by the user, up to a maximum of 70 V DC. The maximum voltage must also be less than the battery voltage, V_b. AutoStar checks what auxiliary source is selected and allows the user to program from 0 to the limits specified above.

The auxiliary voltage may be static throughout the test or be linearly ramped from one value to another. The step size itself is programmable within the test constraints.

Parameter name	Parameter attribute	Min Value	Max value	Units
Dip voltage (V_{aux})	Initial value	0	Auxiliary and battery Source value dependent	Volts
	Final value	0		
	Step value	0.1	Final value dependent	

Pulse width (t_d)

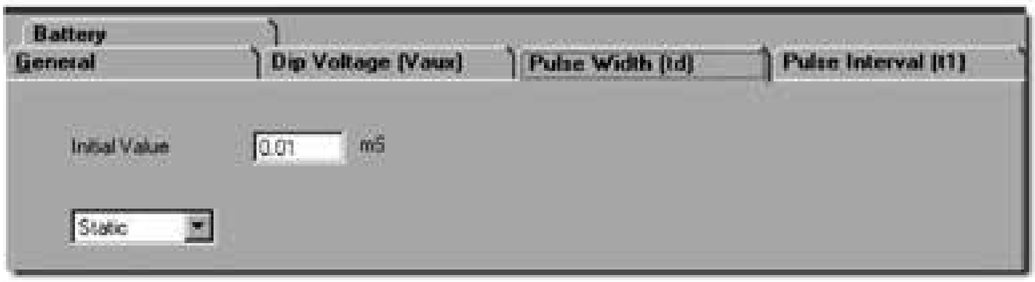


Figure 3-3: Dip voltage tab

The pulse width t_d is the duration of a pulse dip or drop. during td the output voltage is switched from V_b to V_{aux} (Normal mode) or from V_{aux} to V_b (inverted mode).

The pulse width may be static throughout the test or be linearly ramped from one value to another. The step size itself is programmable within the test constraints.

Parameter name	Parameter attribute	Min Value	Max value	Units
Pulse width (t_d)	Initial value	0.003	20000	mS
	Final value	0.003	20000	
	Step value	0.001	Final value dependent	

Pulse interval (t_1)

Figure 3-5: Pulse interval tab

The pulse interval t_1 is the time between two pulse dips. during t_1 the output voltage is set to V_b (normal mode) or V_{aux} (Inverted mode).

The pulse interval may be static throughout the test or be linearly ramped from one value to another. The step size itself is programmable within the test constraints.

Parameter name	Parameter attribute	Min value	Max value	Units
Pulse interval (t_1)	Initial value	1	20000	mS
	Final value	1	20000	
	Step value	1	Final value dependent	

Battery settings

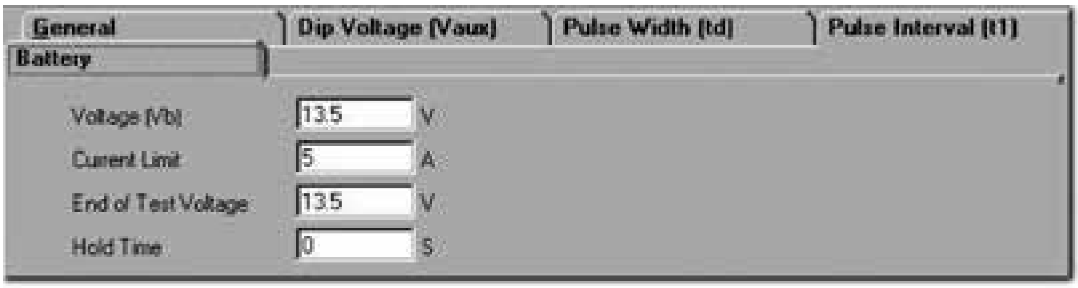


Figure 3-6: Battery tab

The battery voltage V_b is the DC value that the battery is set to during the test. The minimum value of V_b is 0 while the maximum value is dependent upon the type of battery source chosen by the user, up to a maximum of 70 V DC. AutoStar checks what battery source is selected and allows the user to program from 0 to the limits specified above.

The battery current Limit is programmable from the minimum to the maximum limit that the selected battery source is capable of. For example, an **PA 5840-75** is capable of 0.1 to 25 A output current limit. If this is selected as the battery source then AutoStar will allow the user to program a battery current limit from 0.1 to 25 A.

The end of test voltage allows you to specify the voltage at the end of the test.

The hold time allows you to specify how long the end of test voltage is applied before dropping to zero. If Zero seconds is specified the end of test voltage will be immediately applied. If for example 10 seconds is specified then the end of test voltage is applied for 10 seconds and then drops to zero.

Parameter name	Parameter attribute	Min value	Max value	Units
Battery voltage (V_b)	Value	Battery source dependent		Volts
Battery current limit	Value	Battery source dependent		Amps
End of test voltage	Value	Battery source dependent		Volts
Hold time	Value	0	3600	Seconds

6.2.1.2 Run-time control

The run-time control section controls the operation of the test. Figure 6-44 shows the run-time control section graphic.

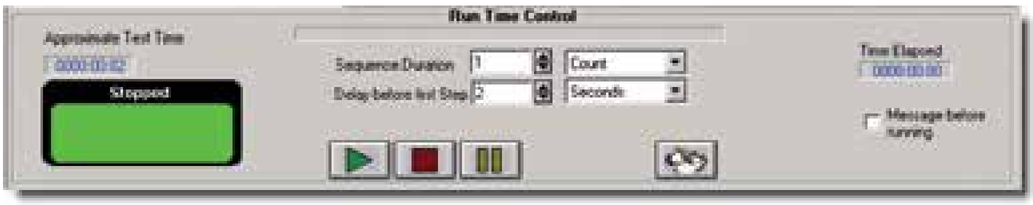


Figure 6-44: Run time control section

This section consists of a progress bar, a test duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details refer to section 6.1.9.2 Running a test.

> **NOTE!**
> **The NSG 5600 (only) also features a pulse named NSG 5600 Pulse 4d (increment t_i) that is identical to the description in this chapter but with more advanced timings. General guidlines outlined in this chapter can be used to understand these additional features for advanced users.**

6.3 Supply voltage variations pulse 2B (NSG 5200/NSG 5600)

Supply voltage variations pulse 2b is defined in **SAEJ1113/11** and **ISO 7637-2 2004. Pulse 2b** occurs as a result transients from the DC motor, which acts as a generator after the ignition is switched off.

Pulse 2b is created using a series of segments similar to **pulse 4c** but may also require additional control over the pulse impedance. **SAEJ1113/11** requires the pulse to have an impedance of 0.5 to 3 Ω. The Impedance should be 0.01 Ω before the pulse and after the pulse has fired. The DCS 5230/DS 5630 contains a 2 Ω internal impedance which is switched in and out during the test as per the standard.

6.3.1 Test editor screen layout overview

This screen is comprised of the following sections:

- The **Parameter Tabs** frame which allows the user to create tests
- The **Graphical Display** shows a graphical representation of the selected wave form
- The **Run Time Control** frame

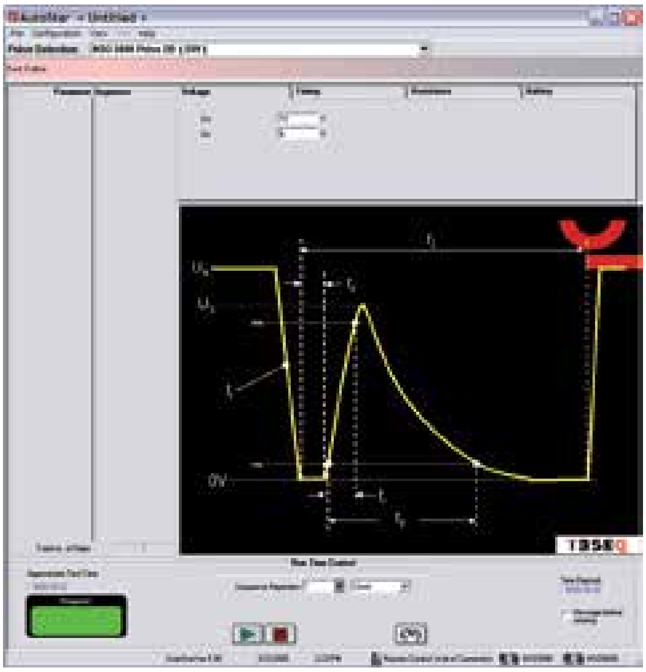


Figure 3-7: Supply voltage variations pulse 2B screen

6.3.1.1 Parameter tabs

Test parameter values can be assigned by clicking on the appropriate parameter tab in the top right corner of the test editor window and by editing the individual text boxes.

- **Voltage**

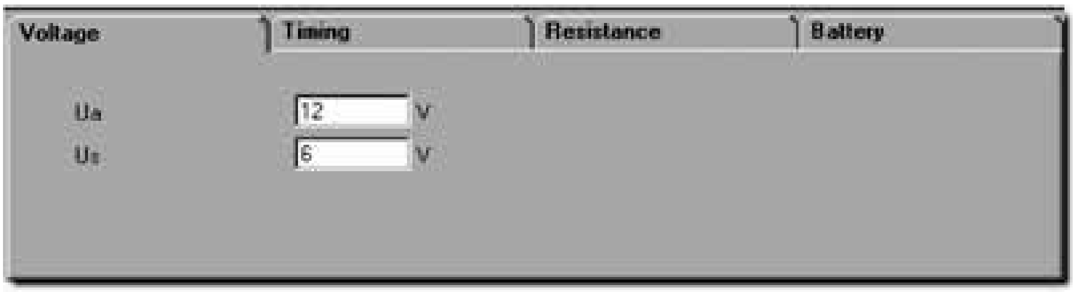


Figure 3-8: Voltage tab

The voltage U_a is the value of the battery during the test. The voltage US is the value of the pulse fired during the test. The minimum value of U_a and US is 1 while the maximum value is dependent upon the type of battery source chosen by the user, up to a maximum of 70 V DC. AutoStar checks what battery source is selected and allows the user to program from 1 to the limits specified above.

Parameter	Min	Max	Units
Voltage U_a	1	Battery source dependent	Volts
Voltage U_s	1	Battery source dependent	Volts

Timing

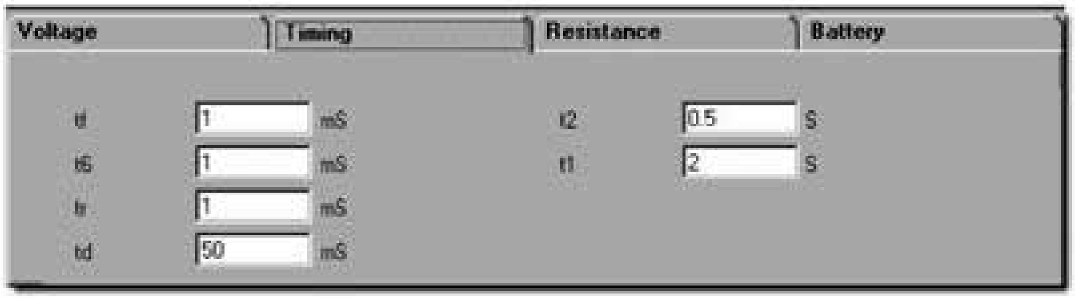


Figure 3-9: Timing tab

The fall time t_f is the time for the battery to fall from U_a to 0 during the test. The pulse then remains at 0 for time t_6, rises to US in time t_r and generates an exponential pulse decay back to 0. The 10% width of the pulse is time t_d. During the pulse the output impedance changes from 10 to 2 Ω. The battery turns back on again some time later, the complete OFF to ON time being given as t_2. In the real world only one pulse would be generated and this would not occur. However, for test purposes it is usually required to generate several pulses. The time t_1 is the pulse repetition rate.

Parameter	Min	Max	Units
Timing t_f	0.5	10	ms
Timing t_6	0.5	10	ms
Timing t_r	0.5	10	ms
Timing t_d	50	5000	ms
Timing t_2	1.5*)	30	s
Timing t_1	1.2*)	1000	s

*) Because of the internal impedance during the pulse, there are limitations on the time t_1. Specifically, t_1 must be at least 25 times td and also, obviously, be greater than t_2. t_2 itself must be greater than $(2t_d + t_f + t_6 + t_r)$.

Resistance

Figure 3-10: Resistance tab

Some standards require a 2 Ω Ri impedance during the pulse. To facilitate this, the **DCS 5230/DS 5630** contains a 2 Ω resistor switched during the pulse. This tab allows control over this option.

NOTE!
For use with DCS 5230 / DS 5630 only!

Battery

Figure 3-11: Battery tab

The battery current limit is programmable from the minimum to the maximum limit that the selected battery source is capable of. For example, an **NSG 5273** is capable of 0.1 to 50 A output current limit. If this is selected as the battery source then AutoStar will allow the user to program a battery current limit from 0.1 to 50 A.

The end of test voltage is programmable from 0 V to the maximum voltage that the battery source is capable of.

Parameter name	Parameter attribute	Min value	Max value	Units
End of test voltage	Value	0	Battery source dependent	Volts
Battery current limit	Value	Battery source dependent		Amps

NOTE!
ISO 7637-2 (2004) requires pulse verification with a 0.5 Ω load. For this reason, an PA 5840 or PA 5140-300 is recommended for 24 V or higher pulse 2b testing.

6.3.1.2 Run-time control

The run-time control section controls how long a complete test. Figure 6-45 shows the run-time control section.

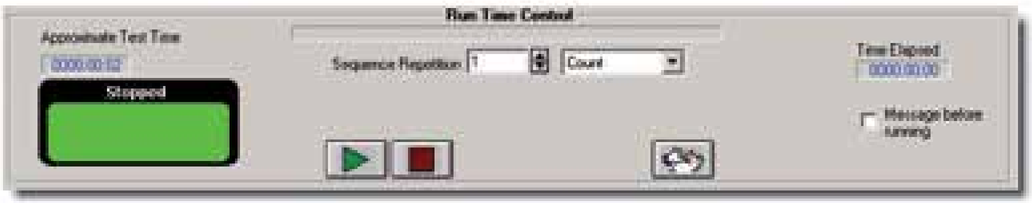


Figure 6-45: Run time control section

This section consists of a progress bar, a sequence repetition section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details refer to section 6.1.9.2 Running a test.

6.4 Supply voltage variation pulse CI 260

Supply voltage variations pulse CI 260 is a particular pulse pattern originally defined in the Ford automotive standard **ES-XW7T-1A278-AB.** As the time T in the pulse can be as low as 100 µs, a bit pattern was created and stored as a standard waveform in the Arb card. To generate this pulse, the wave pattern is clocked out at the correct frequency by the arb card.

6.4.1 Test editor screen layout overview

This screen is comprised of the following sections:

- The **Parameter Tabs** frame which allows the user to create tests
- The **Graphical Display** shows a graphical representation of the selected wave form
- The **Run Time Control** frame

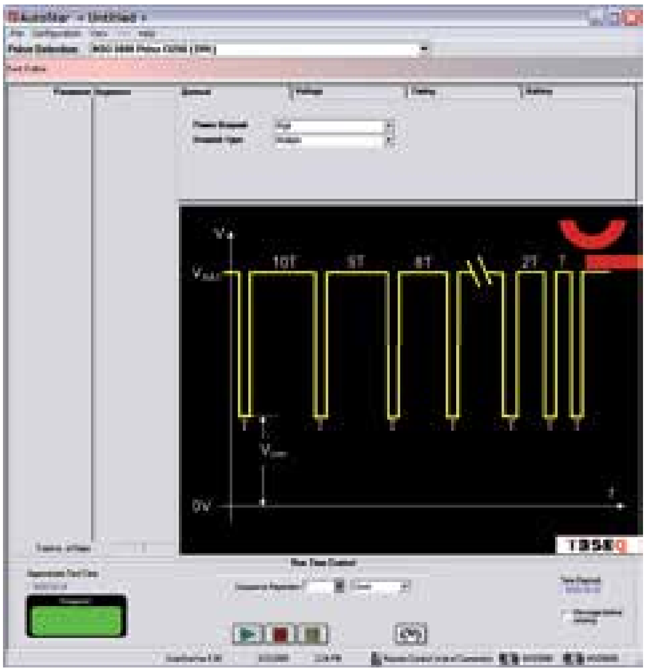


Figure 3-12: Supply voltage variations pulse CI 260 screen

6.4 Supply voltage variation pulse CI 260

Supply voltage variations pulse CI 260 is a particular pulse pattern defined in the Ford automotive standard **ES-XW7T-1A278-AB.** As the time T in the pulse can be as low as 100 µs, a bit pattern was created and stored as a standard waveform in the Arb card. To generate this pulse, the wave pattern is clocked out at the correct frequency by the arb card.

6.4.1.1 Parameter tabs

Test parameter values can be assigned by clicking on the appropriate parameter tab in the top right corner of the test editor window and by editing the individual text boxes.

General

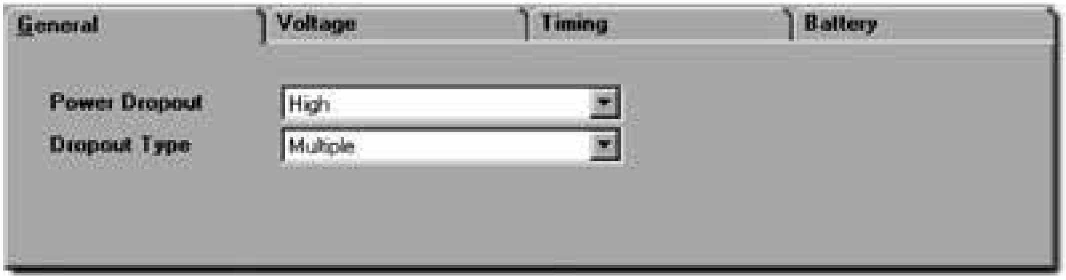


Figure 3-13: General tab

The power dropout type may be either high or low. A High dropout is where the battery is normally high while the low dropout is where the battery is normally low. Refer to section **CI 260** in **ES-XW7T-1A278-AB** for more details.

As well as the dropout varying high or low, the dropout type may be either a multiple pulse train or a single pulse.

Parameter	Min	Max	Units
Power dropout	High or low	N/A	
Dropout type	Multiple or single		

Voltage

Figure 3-14: Voltage tab

The dip voltage is the value that the Battery dips to during the test. The minimum dip value is 0 V while the maximum value is dependent upon the maximum value of the battery source but must also be less than the set battery voltage.

Parameter	Min	Max	Units
Dip voltage	0	Battery source dependent	Volts

Timing

Figure 3-15: Timing tab

The time T is the duration of the dip.

Parameter	Min	Max	Units
T	0.1	50	ms

Timing

Figure 3-16: Battery tab

The battery voltage is the value of the battery during the test. The minimum dip value is 0 V while the maximum value is dependent upon the maximum value of the battery source.

The battery current limit is programmable from the minimum to the maximum limit that the selected battery source is capable of. For example, an **NSG 5272** is capable of 0.1 to 25 A output current limit. If this is selected as the battery source then AutoStar will allow the user to program a battery current limit from 0.1 to 25 A.

The end of test voltage is programmable from 0 V to the maximum voltage that the battery source is capable of.

Parameter	Min	Max	Units
Voltage	0	Battery source dependent	Volts
Current limit	0	Battery source dependent	Amps
End of test voltage	0	Battery source dependent	Volts

NOTE!
An NSG 5004A is not recommended for Ford standard testing due to slow rise times. The PA 5840 series should be used instead as a battery source.

6.4.1.2 Run-time control

The run-time control section controls how long a complete test. Figure 6-46 shows the run-time control section.

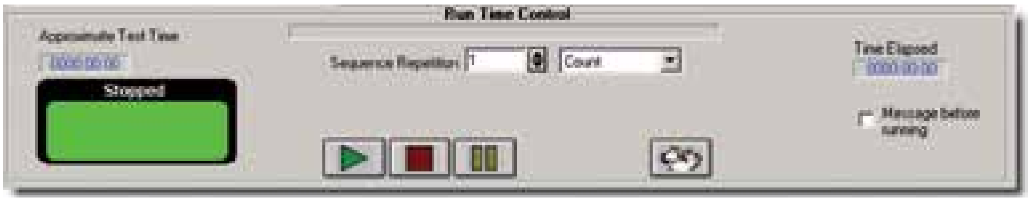


Figure 3-14: Voltage tab

6.5 Supply voltage variation pulse CI 250-A

Supply voltage variations pulse CI 250-A is a particular pulse pattern originally defined in the Ford automotive standard **ES-XW7T-1A278-AB.** As the pulse width can be as low as 2 µs, a bit pattern was created and stored as a standard waveform in the arb card. To generate this pulse, the wave pattern is clocked out at the correct frequency by the arb card.

6.5.1 Test editor screen layout overview

This screen is comprised of the following sections:

- The parameter tabs frame which allows the user to create tests.
- The graphical display shows a graphical representation of the selected wave form.
- The run time control frame

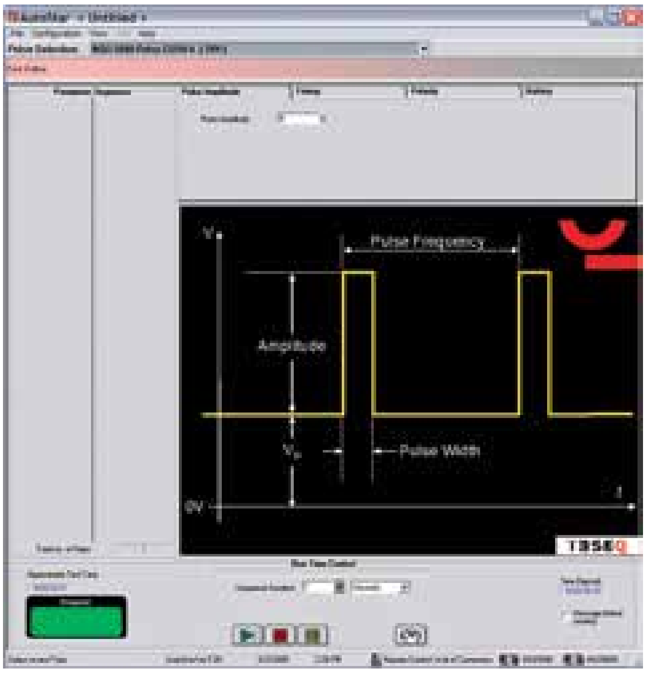


Figure 3-17: Supply voltage variations pulse CI 250-A screen

6.5.1.1 Parameter tabs

Test parameters can be assigned by clicking on the appropriate parameter tab in the top right corner of the test editor window.

Pulse amplitude

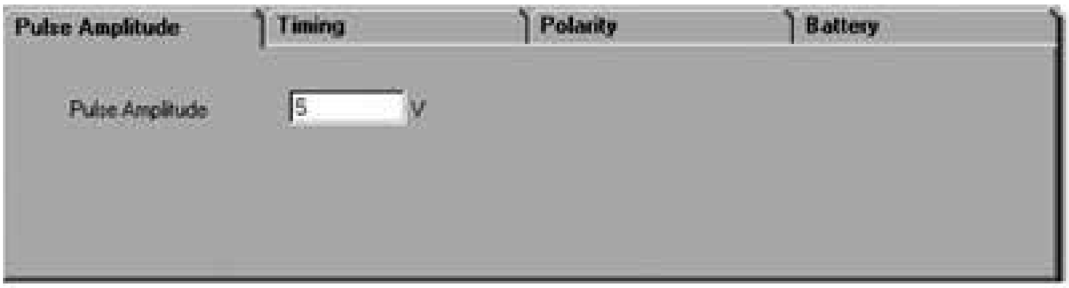


Figure 3-18: Pulse amplitude tab

The pulse amplitude is superimposed upon the battery voltage and can vary from 0 to the maximum capability of the battery source.

Parameter	Min	Max	Units
Pulse amplitude	0	Battery source dependent	Volts

Pulse amplitude

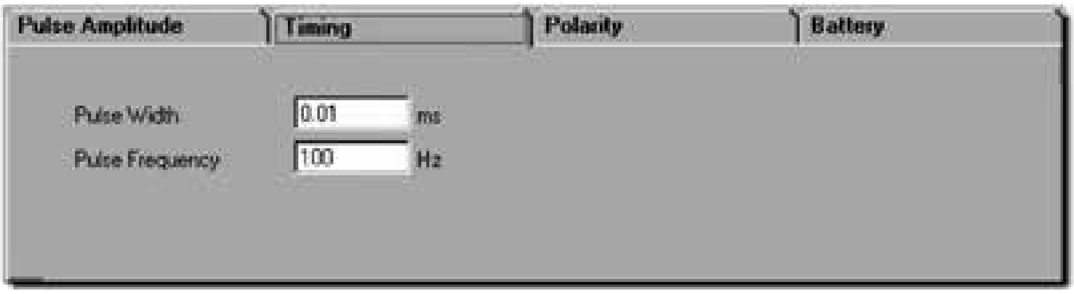


Figure 3-19: Timing tab

The pulse width can vary from 2 µs to 1000 ms, with 10 µs the default width as per the Ford standard. The 10 µs pulse width may not be achievable if the source is not fast enough to respond. In this case the pulse width may be increased to achieve a 10 ms width with a triangular shaped pulse. For this reason, an NSG 5270 series of battery simulator is recommended.

The pulse frequency is how often the pulses occur. The maximum frequency depends upon the pulse width, as it obviously cannot be higher than the width of the pulse. The minimum frequency is 0.1 Hz.

Parameter	Min	Max	Units
Puls width	.002	1000	4 ms
Pulse frequency	0.1	998	Hz

Polarity

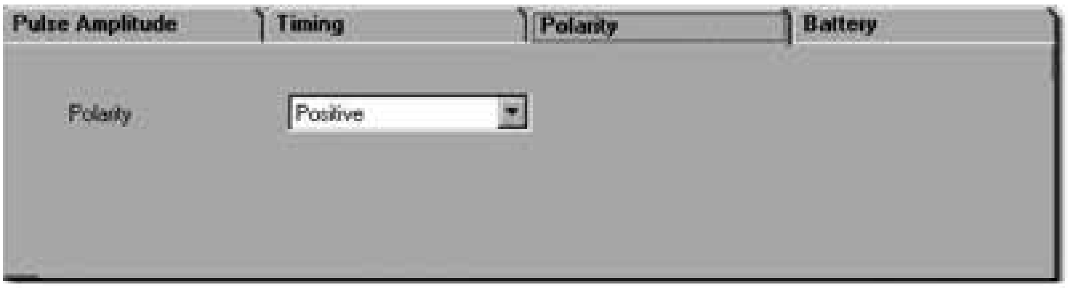


Figure 3-20: Polarity tab

The pulse polarity can be either positive or negative. For positive pulses the pulse sits on top of the battery while for negative pulses the pulse dips from the battery level by the value of the pulse amplitude.

Parameter	Min	Max	Units
Polarity	Positive or negative	N/A	

Battery

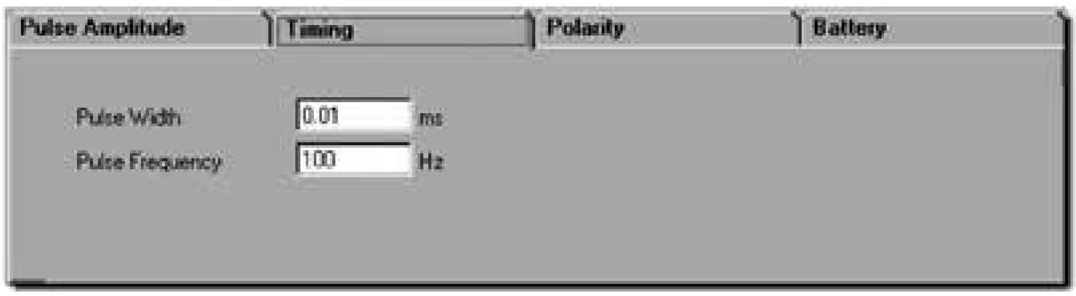


Figure 3-21: Battery tab

The battery voltage is the value of the battery during the test. The minimum dip value is 0 V while the maximum value is dependent upon the maximum value of the battery source.

The battery current limit is programmable from the minimum to the maximum limit that the selected battery source is capable of. For example, an NSG 5272 is capable of 0.1 to 25 A output current limit. If this is selected as the battery source then AutoStar will allow the user to program a battery current limit from 0.1 to 25 A.

The end of test voltage is programmable from 0 V to the maximum voltage that the battery source is capable of.

Parameter	Min	Max	Units
Voltage	0	Battery source dependent	Volts
Current limit	0.1	Battery source dependent	Amps
End of test voltage	0	Battery source dependent	Volts

6.5.1.2 Run-time control

The run-time control section controls how long a complete test. Figure 8.6 shows the run-time control section.

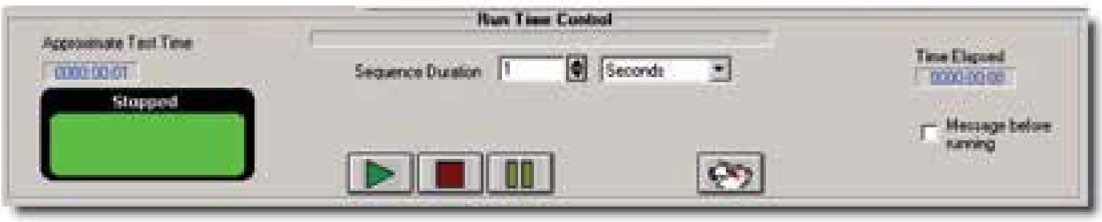


Figure 6-47: Run time control section

This section consists of a progress bar, a sequence duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details refer to section 6.1.9.2 Running a test.

6.6 Supply voltage variation fuel pump transient

Supply voltage variations pulse fuel pump transient is a particular pulse pattern originally defined in the General Motors automotive standard GM9123P. As the pulse is quite fast, a bit pattern was created and stored as a standard waveform in the arb card. To generate this pulse, the wave pattern is clocked out at the correct frequency by the arb card.

6.6.1 Test editor screen layout overview

This screen is comprised of the following sections:

- The parameter tabs frame which allows the user to create tests
- The graphical display shows a graphical representation of the selected wave form
- The run time control frame figure

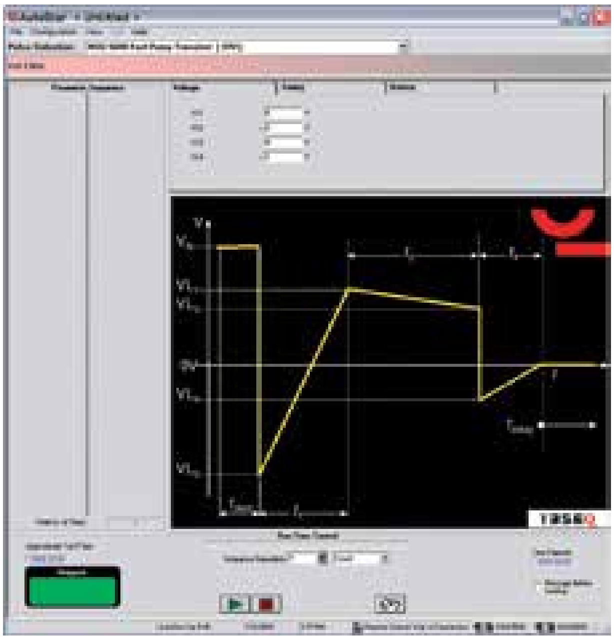


Figure 3-22: Supply voltage variation fuel pump transient screen

6.6.2 Parameter tabs

Test parameters can be assigned by clicking on the appropriate parameter tab in the top right corner of the test editor window.

- **Voltage**

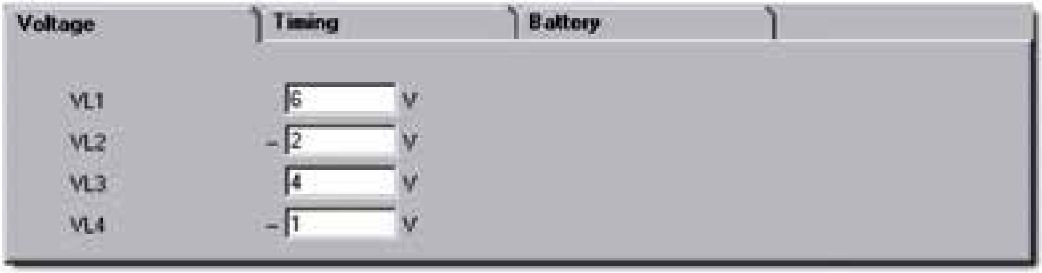


Figure 3-23: Voltage tab

The voltages VL1, VL2, VL3 and VL4 can vary from 0 to the maximum value of the battery source. Note that VL2 and VL4 are negative voltages, as per the GM standard, and cannot go positive. As such, the battery source must be capable of providing negative voltages.

Parameter	Min	Max	Units
VL1	0	Battery source dependent	Volts
VL2	Battery source dependent	0	Volts
VL3	0	Battery source dependent	Volts
VL4	Battery source dependent	0	Volts

- **Timing**

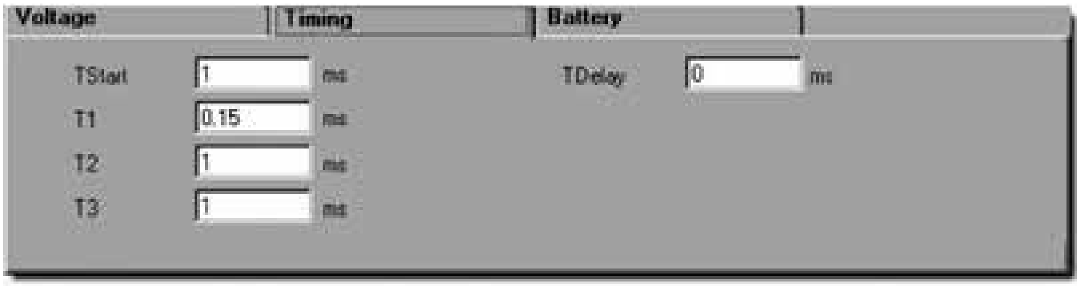


Figure 3-24: Timing tab

The time T_{start} is the time before the voltage drops from VB to VL2. The pulse then rises to VL1 in time T1 and drops to VL3 in time T2. It then drops immediately to VL4 and then goes to 0 V in time T3. The time T_{Delay} is the time until the next pulse cycle occurs.

Parameter	Min	Max	Units
TStart	1	1000	ms
T1	0.15	10000	ms
T2	1	10000	ms
T3	1	10000	ms
TDelay	0	10000	ms

Battery

Figure 3-25: Battery tab

The battery voltage is the value of the battery during the test. The minimum dip value is 0 V while the maximum value is dependent upon the maximum value of the battery source.

The battery current limit is programmable from the minimum to the maximum limit that the selected battery source is capable of. For example, an **NSG 5004A-25** is capable of 0.1 to 25 A output current limit. If this is selected as the battery source then AutoStar will allow the user to program a battery current limit from 0.1 to 25 A.

The end of test voltage is programmable from 0 V to the maximum voltage that the battery source is capable of.

Parameter	Min	Max	Units
Voltage	0	Battery source dependent	Volts
Current limit	0.1	Battery source dependent	Amps
End of test voltage	0	Battery source dependent	Volts

6.6.2.1 Run-time control

The run-time control section controls how long a complete test. Figure 6-48 shows the run-time control section.

Figure 6-48: Run time control section

This section consists of a progress bar, a sequence repetition section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details refer to section 6.1.9.2 Running a test.

7 CONDUCTED SINE WAVES

Conducted sine waves are low amplitude sinusoids, which are superimposed upon the DC battery.

- Frequencies from 10 Hz to 250 kHz.
- Due to the high frequency nature of the sine waves, it may not be possible to generate them using a DC amplifier, instead they are generated separately and transformer coupled to the battery using an isolation transformer.

7.1 Master screen layout overview

This master screen is comprised of the following sections:

⇨ The **Segment Editing** frame which allows the user to create tests

⇨ The **Waveform window** frame, which displays the generated waveform and allows the user to control how it's viewed
⇨ The **Parameter** frames
⇨ The **Battery** frame which controls the battery current limit
⇨ The **End of Test** frame
⇨ The **Run Time Control** frame

Figure 3-1: Conducted sine waves screen

7.1.1 Segment editing frame

Figure 7-1 shows the segment editing frame. The frame consists of two active command buttons and two radio buttons.

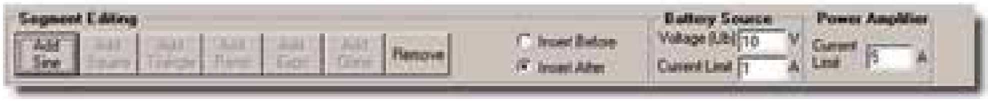


Figure 7-1: Conducted sine waves segment editing frame

- The add sine button allows the user to add a sine wave to the test.
- The remove button allows you to remove a selected segment.
- The radio buttons allow the user to insert a segment either before of after another segment. The default option is always Insert after as shown in figure 7-1.

7.1.2 Waveform window

Figure 7-2 shows the waveform window frame. This window displays the waveform as it is created. The horizontal axis is time (in seconds) and the vertical axis is the amplitude (in volts).

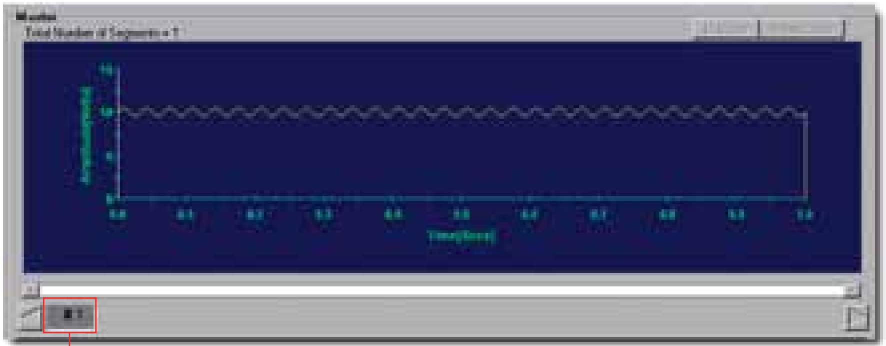


Figure 7-2: Conducted sine waves waveform window frame

If you add several sine waves the waveform indow shows the curve divided in **sections.**

The parameter frame always shows the parameters of the active section. As the test parameters are changed the waveform alters, giving the user a real indication of what the test looks like.

7.1.2.1 Zooming into a part of a waveform

Highlighting a region on the screen allows the user to zoom in on part of the waveform created, as shown in figure 7-3 and figure 7-4. This is done by holding the mouse over the segment and dragging it over the zoom area. The region becomes highlighted in yellow and, upon release of the mouse, the screen zooms to the area highlighted.

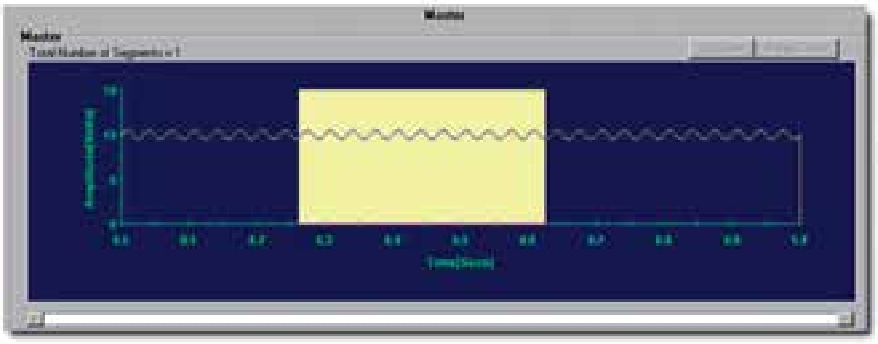


Figure 7-3: Conducted sine waves screen

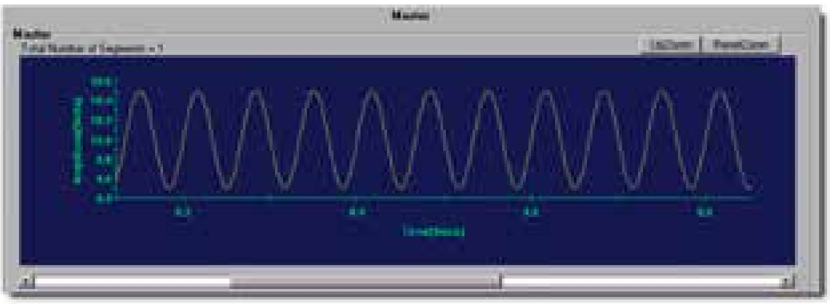


Figure 7-4: Conducted sine waves screen

When the waveform has been zoomed in the **UpZoom** and **ResetZoom** buttons become active. The UpZoom button sets the zoom level to the previous zoom level, if multiple zooming has occurred or full screen if only one zoom in has occurred. The ResetZoom command sets the zoom back to full screen.

The scroll bar allows the user to scroll across the waveform, regardless of the zoom level. Below the scroll bar are the waveform segments that comprise the waveform. Clicking on any segment highlights it on the screen and also displays that segments parameters. The arrows on the sides of the waveform window frame allow the user to step back and forth through the waveform.

The software counts and displays the number of segments in the test.

7.1.3 Edit menu

The edit menu allows the user to manipulate segments and waveforms. You can copy and paste segments and waveforms.

Figure 7-5: The edit menu

7.1.4 Battery frame

Figure 7-6 shows the battery frame. This allows the user to control the battery source current limit voltage. The value that may be typed into these boxes depends upon the source selected. For example, for an NSG 5004A-12, the current limit range is 0.1 to 12.5 A and AutoStar will reflect this.

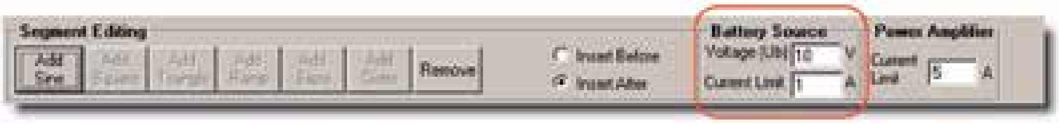


Figure 7-6: The battery frame

If the source chosen is an **PA 5840-75** then the limits for the battery will be 0.1 to 25 A, as the maximum output current is now 25 A. AutoStar reads this value from the sources database. Thus, if a new source is added with different current output capabilities then the software will automatically adjust itself to this sources parameters. Refer to section 4.4.1 Adding a source to the sources database.

NOTE!
Danger of damages at the DUT!
The DUT may be damaged if a DC offset voltage is used in many cases!

⇨ **Please study your application carefully to determine if a DCoffste voltage is advisable! Specifically 'ground shift' applications usually do not need a DC offset voltage**

7.1.5 Power amplifier frame

Figure 7-7 shows the power amplifier frame. This allows the user to control the power amplifier current limit. The value that may be typed into these boxes depends upon the power amplifier selected.

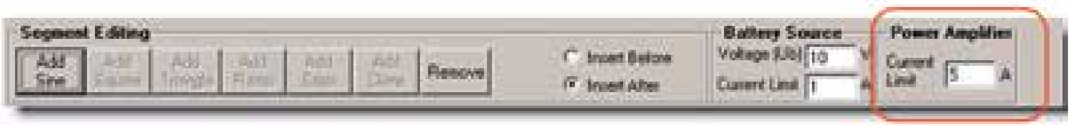


Figure 7-7: Conducted sine waves screen

7.1.6 Run-time control

The run-time control section controls how long a complete test. Figure 7-8 shows the run-time control section.

Figure 7-8: Run time control section

This section consists of a progress bar, a test duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details refer to section 5.3.5 Running a test.

7.2 Adding a sine wave

To add a sine wave to the test the user must first click on the add sine command button. This brings up the screen shown in figure 7-9 below.

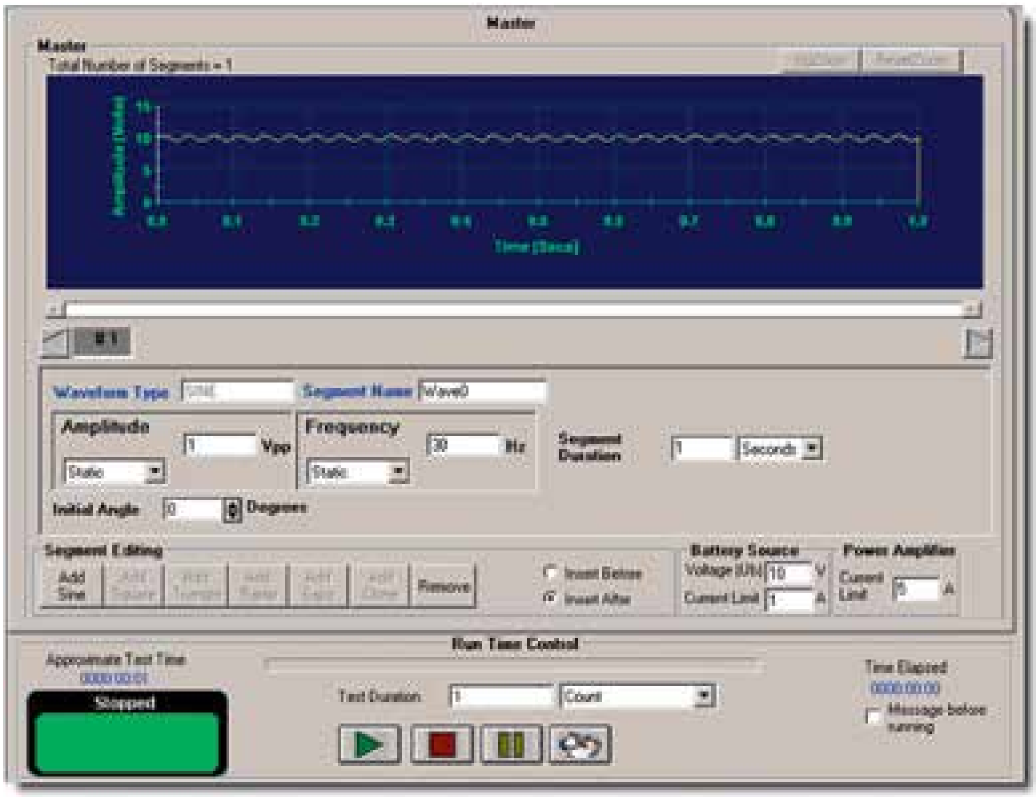


Figure 7-9: Run time control section

The default sine wave segment screen, shown in figure 7-9, comprises of a 1 Vpkpk 5 Hz sine wave, with no ramping or rectification, an initial phase angle of 0 degrees and a duration of 1 second.

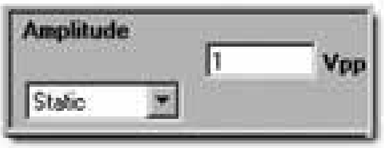
The waveform type shown is a sine wave and a default segment name is given to it (Wave0 in this case). This name may be edited by the user to aid segment identification.

Figure 7-10: Sine wave parameters

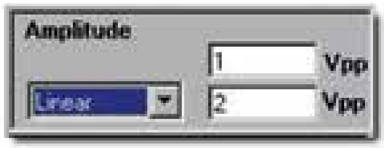
The user can select each of the following parameters parameter to suit his particular test.

7.2.1 Amplitude

Figure 7-11 shows the amplitude box. The user can choose between a static amplitude (default) and linear ramped amplitude.



Static amplitude



Ramping amplitude

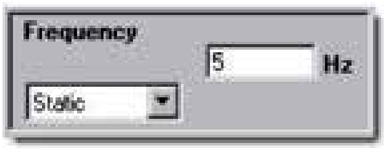
Figure 7-11: Sine wave amplitude parameters

The amplitude unit is Volts peak to peak and the voltage range depends upon the source that is selected in the Sources database. Refer to section 4.4.1 Adding a source to the sources database for more details on this.

The linear ramp is continuous and thus there are no step sizes to choose from. If the user wishes to have series of stepped sin waves then it can easily be achieved using multiple segments. The voltage range for both the initial and final amplitudes is the same, with the initial amplitude defined in the upper box shown in figure 7-11 (ramped amplitude) above. The default final amplitude depends upon the selected source.

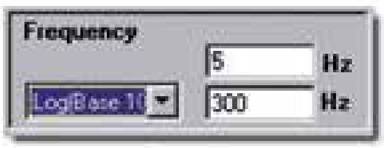
7.2.2 Sine wave frequency

Figure 7-12 shows the sine wave frequency box. The user can choose between a static frequency (default) or either a linear ramped frequency or a logarithmically (base 10) ramped frequency.



Static frequency

Linear frequency ramping



Log frequency ramping

Figure 7-12: Frequency parameters

The frequency unit is Hertz (Hz) and the frequency range depends upon segment duration. For duration mode (ms, seconds, minutes and hours) the frequency range is 0.01 Hz to 320 KHz. For cycle mode the frequency range is 0.01 Hz to 5 KHz.

The linear frequency ramp is continuous and thus there are no step sizes to choose from. If the user wishes to have series of stepped frequency sin waves then it can easily be achieved using multiple segments. The frequency range for both the initial and final frequencies is the same, with the initial frequency defined in the upper box shown in figure 7-12 (linear frequency ramping) above. The default final frequency is 300 Hz. In a linear frequency ramp, the frequency after half the duration will be halfway between the initial and final frequencies.

The log frequency ramp is continuous and thus there are no step sizes to choose from. If the user wishes to have series of stepped frequency sin waves then it can easily be achieved using multiple segments. The frequency range for both the initial and final fequencies is the same, with the initial frequency defined in the upper box shown in figure 7-12 (log frequency ramping) above. The default final frequency is 300 Hz. In a log frequency ramp, the log frequency after half the duration will be halfway between the log of both the initial and final frequencies.

7.2.3 Phase angle

The initial phase angle of a wave segment can be specified, as shown in figure 7-13 and figure 7-14. At low frequencies the value of this initial phase angle is variable from 0 degrees to 345 degrees in 15 degree steps.

Figure 7-13: Phase angle parameters, duration mode

In duration mode only the initial phase angle is programmable, as shown in figure 7-13. This is because once a test starts it will run for the specified duration, regardless of the final angle of the test. In cycle mode however, both the initial and final phase angle of the test can be specified. This is shown in figure 7-14.

Figure 7-14: Phase angle parameters, cycle mode

At low frequencies the final phase angle is programmable from 15 degrees to 360 degrees. If only one cycle is chosen then obviously the final angle cannot be less than the initial angle.

The initial and final angle values are frequency dependent. At higher frequencies it is not possible to achieve the resolution that can be achieved at lower frequencies. You should consult the hardware specifications for the **ARB 5220/FG 5620** module to determine the allowed initial and final phase angles for the various frequency ranges.

7.2.4 Segment duration

The duration of the sine wave segment can be specified in ms, seconds, minutes hours and cycles. This is shown in figure 7-14.

Figure 7-15: 5 Different duration units offered for each segment

n ms duration, the minimum duration for a sine wave is 5 ms and the resolution is also 5 ms. All other duration types have a minimum of one unit. The user should consult the hardware specifications for the **ARB 5220/ FG 5620** module to determine the specifications for each unit.

7.3 Conducted sine waves pulse CI 250-A

Pulse CI 250-A is a particular pulse type defined originally in the Ford automotive standard **ES-XW7T-1-A278-AB**. As the standard requires the pulse width to be 10 ms, a transformer may optimally be used to couple the pulse onto a DC supply. This is effectively the same type of test as the conducted sine waves test in section 7.1 Master screen layout overview, but with a pulse being coupled rather than a sin wave. As a result, it has been labelled conducted sine waves pulse CI 250-A.

7.3.1 Test editor screen layout overview

This screen is comprised of the following sections

⇨ The **Parameter Tabs** frame which allows the user to create tests.
⇨ The **Graphical Display** shows a graphical representation of the selected wave form.
⇨ The **Run Time Control** frame

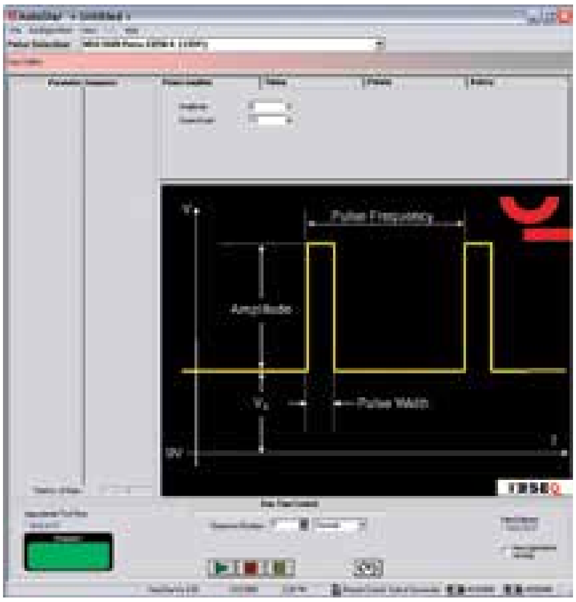


Figure 7-16: Conducted sine waves screen

7.3.2 Parameter tabs

Test parameters can be assigned by clicking on the appropriate parameter tab in the top right corner of the test editor window.

- **Power amplifier**

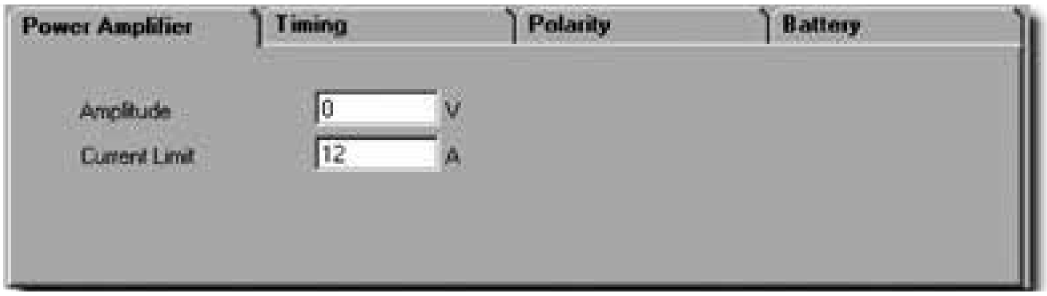


Figure 7-17: Power amplifier tab

The amplitude of the pulse can vary from 0 to 7.5 V and is restricted by the maximum capability of the power amplifier. Although the amplifier can deliver 15 V maximum, the coupling transformer is a 2:1 step down device and so the actual output is correspondingly reduced by a factor of 2. However, this is invisible to the user. A programmed value of 7.5 V will result in a pulse amplitude of 7.5 V.

The power amplifier has a maximum current capability of 5 A and can be limited from 0.5 to 5 A. Note that 5 A in the power amplifier will result in 10 A output current, due to the 1:2 step up effect of the transformer.

Parameter	Min	Max	Units
Amplitude	0	7.5	Volts
Current limit	0.5	5	Amps

- **Timing**

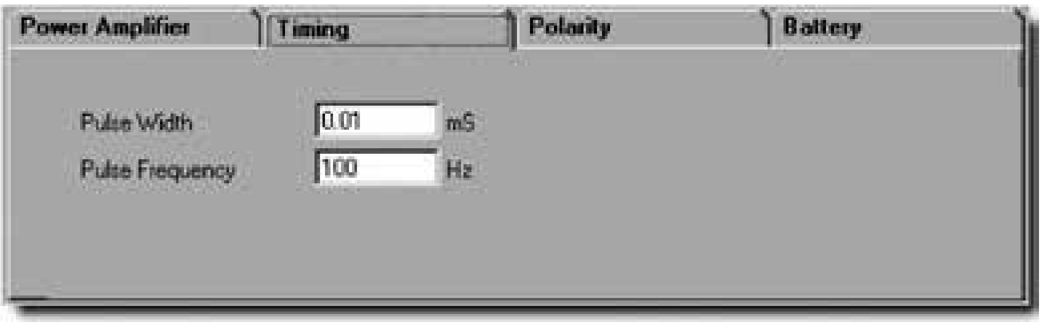


Figure 7-18: Timing tab

The pulse width can vary from 2 µs to 1000 ms, with 10 µs the default width as per the Ford standard. The maximum frequency depends upon the pulse width, as it obviously cannot be higher than the width of the pulse. The minimum frequency is 0.1 Hz.

Parameter	Min	Max	Units	Description
Pulse width	0.002	1000	ms	
Pulse frequency	0.1	998	Hz	

Polarity

Figure 7-19: Polarity tab

The pulse polarity can be either positive or negative. For positive pulses the pulse sits on top of the battery while for negative pulses the pulse dips from the battery level by the value of the pulse amplitude.

Parameter	**Min**	**Max**	**Units**
Polarity	Positive or negative		N/A

Battery

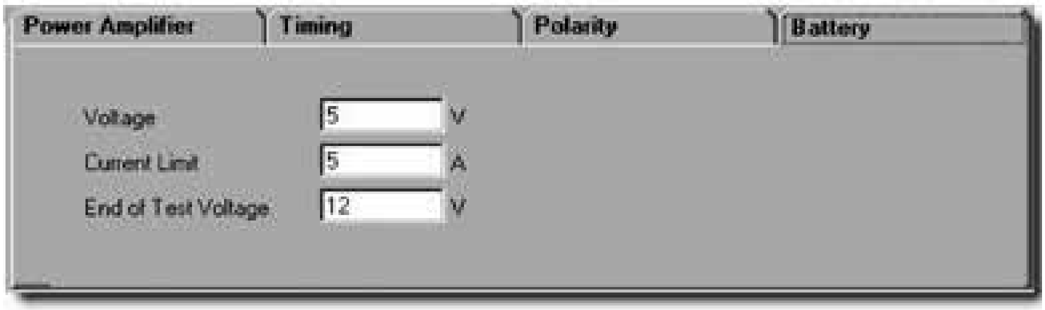


Figure 7-20: Battery tab

The battery voltage is the value of the battery during the test. The minimum dip value is 0 V while the maximum value is dependent upon the maximum value of the battery source.

The battery current limit is programmable from the minimum to the maximum limit that the selected battery source is capable of. For example, an NSG 5004A-25 is capable of 0.1 to 25 A output current limit. If this is selected as the battery source then AutoStar will allow the user to program a battery current limit from 0.1 to 25 A.

The end of test voltage is programmable from 0 V to the maximum voltage that the battery source is capable of.

Parameter	**Min**	**Max**	**Units**
Voltage	0	Battery source dependent	Volts
Current limit	0.1	Battery source dependent	Amps
End of test voltage	0	Battery source dependent	Volts

7.3.3 Run-time control

The run-time control section controls how long a complete test. Figure 7-16 shows the run-time control section.

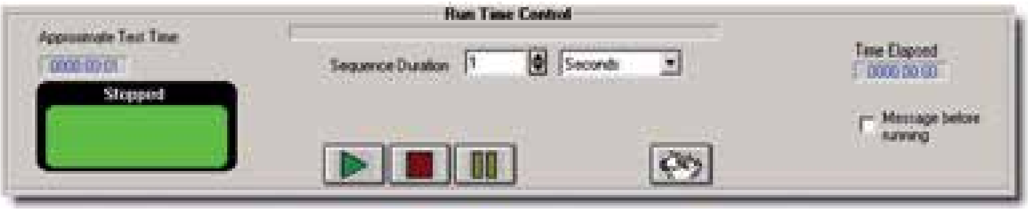


Figure 7-21: Run time control section

This section consists of a progress bar, a sequence duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details refer to section 5.3.5 Running a test.

Conducted transients are generally high voltage pulses on the battery caused by motors, the alternator and various switching devices.

There are several types of conducted transient pulses. These are referred to by their ISO name but include several variants. See the applicable hardware guide for details.

8.1 Generic transients (µs and ms pulses)

Generally, this section refers to the MT 5511 for pulse 1, 2 and 6. However there are different ways of creating these pulses. For other modules, refer to supplemental documentations for usage and limits in the hardware guide.

Section 6.1 shows pulse 1 as an example.

8.1.1 Test editor screen layout overview

This screen is comprised of the following sections:

⇨ The **Parameter Tabs** frame which allows the user to create tests.
⇨ The **Graphical Display** shows a graphical representation of the selected wave form.
⇨ The **Run Time Control** frame

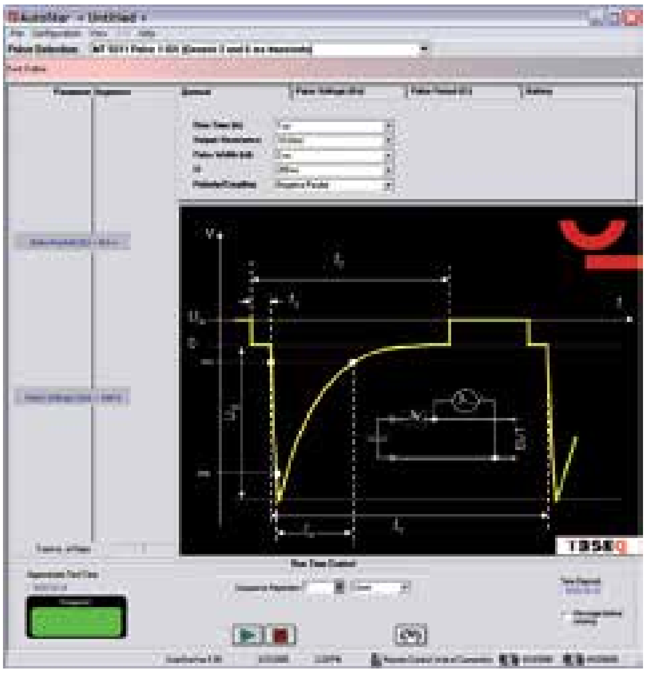


Figure 8-1: Test editor screen for generic transients (example: Pulse 1)

Using this software screen the user can perform generic transients tests. Sequences of pulses of varying amplitude or period can be generated by ramping either the pulse voltage or pulse period.

Tests can be saved for future use and using the AutoStar test sequence functionality, they may be used to perform tests made up of different pulses from different modules.

8.1.2 Test parameters

Test parameters can be assigned by clicking on the appropriate parameter tab in the top right corner of the test editor window. For other pulses you will find different parameters within these tabs.

- **General**

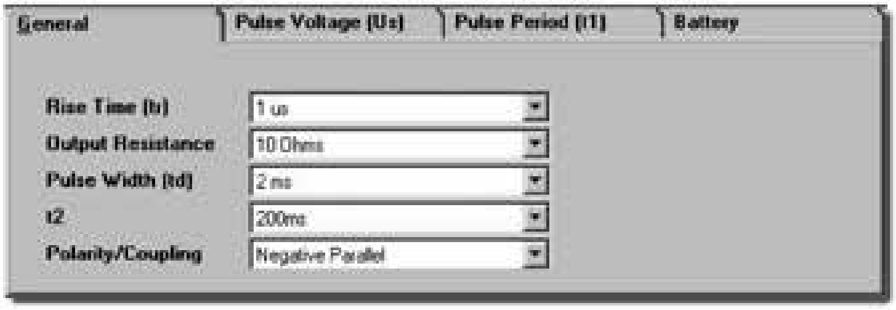


Figure 8-2: General tab

The rise time, output resistance, pulse width and polarity/coupling are programmable within the values given in the hardware guide of the module. Note that the battery OFF time, t2 is only applicable for when the battery state is under program control.

- **Pulse voltage (U_s)**

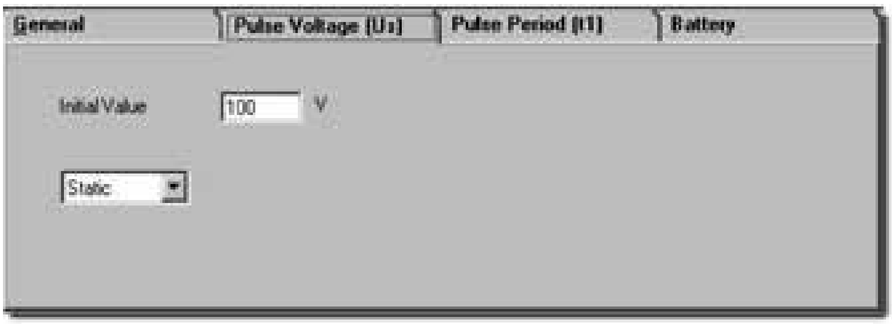


Figure 8-3: Battery tab

The pulse voltage is the peak amplitude of the pulse. It can be either static during the test or else ramped linearly from one value to another by a fixed step value.

Pulse periode (t_1)

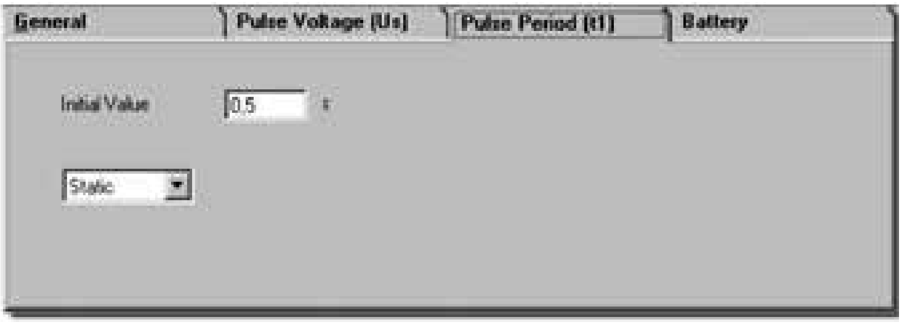


Figure 8-4: Pulse period tab

The pulse period is the time at which a pulse is repeated. This time may be static or can be varied linearly during the test. If you use Linear then the pulse will be repeatted until the final time is reached from one value to another in fixed steps. The pulse period is voltage dependent due to the high power dissipation possible at very low values of t_1. The period t_1 is also dependent upon the pulse width td and the battery OFF time t_2. Obviously t_1 has to be greater than t_2 so if t_2 is set to 200 ms, t_1(min) = 400 ms.

Battery

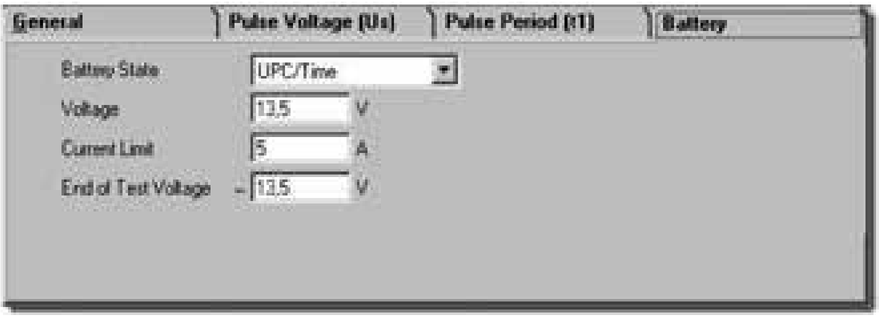


Figure 8-5: Battery tab

8.1.3 Run-time control

The run-time control section controls how long a complete test. Figure 8-1 shows the run-time control section.

Figure 8-6: Run time control section

This section consists of a progress bar, a sequence duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details please refer to section 5.3.5 Running a test.

8.2 Electrical fast transients (ISO pulse 3 and variants)

Burst pulse 3 (known as 3a & 3b) is caused by various switching processes e.g. relay arcing during opening. Additionally, this screen is used to generate ISO 7637-3 pulse a and b using a capacitive coupling clamp.

The pulses are capacitive coupled to the battery. The pulse parameters are:

- 3a is a negative pulse
- 3b is a positive pulse

8.2.1 Test editor screen layout overview

This screen is comprised of the following sections:

⇨ The **Parameter Tabs** frame which allows the user to create tests
⇨ The **Graphical Display** shows a graphical representation of the selected wave form
⇨ The **Run Time Control** frame

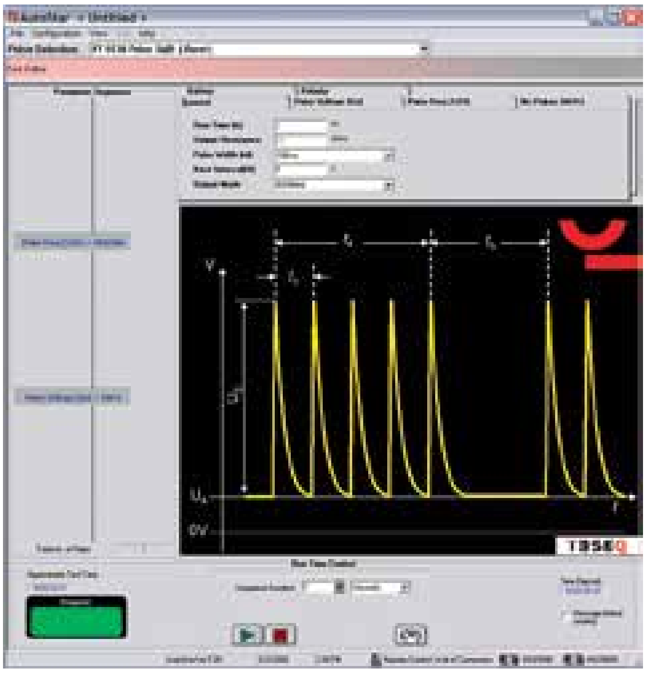


Figure 8-7: Test editor screen for generic transients (example: Pulse 1)

Using this software screen the user can perform burst pulse 3 type test. Sequences of pulses of varying amplitude frequency or period can be generated by ramping these parameters.

Tests can be saved for future use and using the AutoStar sequence, they may be used to perform tests made up of different pulses from different modules.

8.2.1.1 Test parameters

Test parameters can be assigned by clicking on the appropriate parameter tab in the top right corner of the test editor window. For other pulses you will find different parameters within these tabs.

- **General**

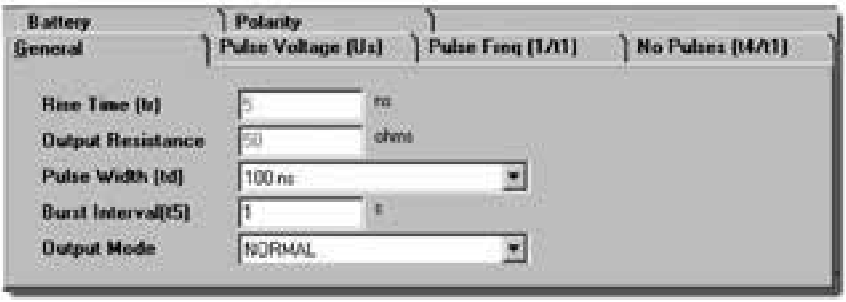


Figure 8-8: General tab

The rise time, pulse width and output impedance are fixed while the burst Interval t5can be varied. Additional pulse width may also be available, depending on your hardware.

- **Pulse voltage (U_s)**

Figure 8-9: Pulse voltage tab

The pulse voltage is the peak amplitude of the pulse. It can be either static during the test or else ramped linearly from one value to another by a fixed step value.

Pulse frequency (1/t_1)

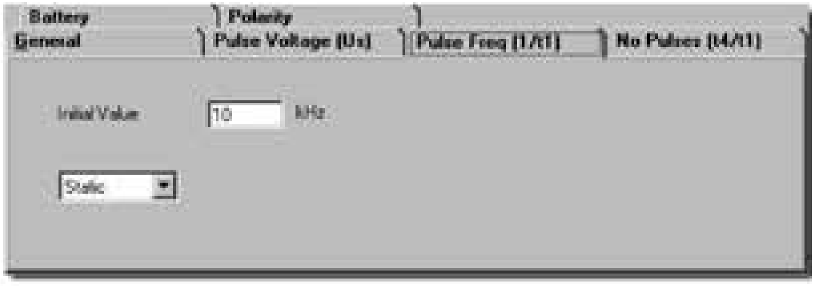


Figure 8-10: Pulse frequency tab

The pulse frequency is the inverse of the pulse repetition rate and can vary from 1 to 100 KHz.

NOTE!
Frequency ramping: A firmware upgrade may be required to perform frequency ramping on older NSG 5000 hardware. NSG 5500 hardware has this feature built in.

Polarity

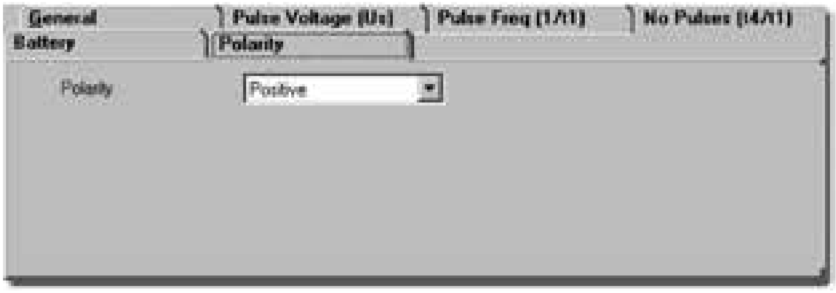


Figure 8-11: Polarity tab

The pulse polarity can be either negative (pulse 3a) or positive (pulse 3b).

No. Pulses (t_4)

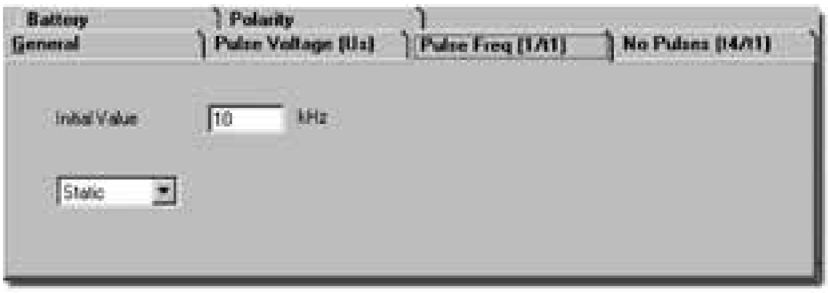


Figure 8-12: No. of pulses tab

The burst duration t_4 is equal to the number of pulses in a burst, NP, multiplied by the repetition rate t_1 between the pulses. As NP or t_1 is varied within AutoStar, t4 will adjust accordingly.

Battery

Figure 8-13: Battery tab

The battery state for **Pulse 3** can be either, **OFF** or ON. If **OFF** then the battery is switched OFF throughout the test. If ON then the pulse sits on top of the battery throughout the test.

The battery voltage is the value of the battery during the test. The minimum value is 0 V while the maximum value is dependent upon the maximum value of the battery source.

The battery current limit is programmable from the minimum to the maximum limit that the selected battery source is capable of.

The end of test voltage is programmable from 0 V to the maximum voltage that the battery source is capable of.

8.2.1.2 Run-time control

The run-time control section controls how long a complete test. Figure 8-2 shows the run-time control section.

Figure 8-14: Run time control section

This section consists of a progress bar, a sequence duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details please refer to section 5.3.5 Running a test.

8.3 Load dump (ISO pulse 5 and variants)

ISO Pulse 5 (load dump) is caused by the discharged battery being disconnected from the alternator while the alternator is generating charging current.

- 5a is a positive pulse
- 5b is a suppressed version of 5a

8.3.1 Test editor screen layout overview

This screen is comprised of the following sections:

⇨ The **Parameter Tabs** frame which allows the user to create tests
⇨ The **Graphical Display** shows a graphical representation of the selected wave form
⇨ The **Run Time Control** frame

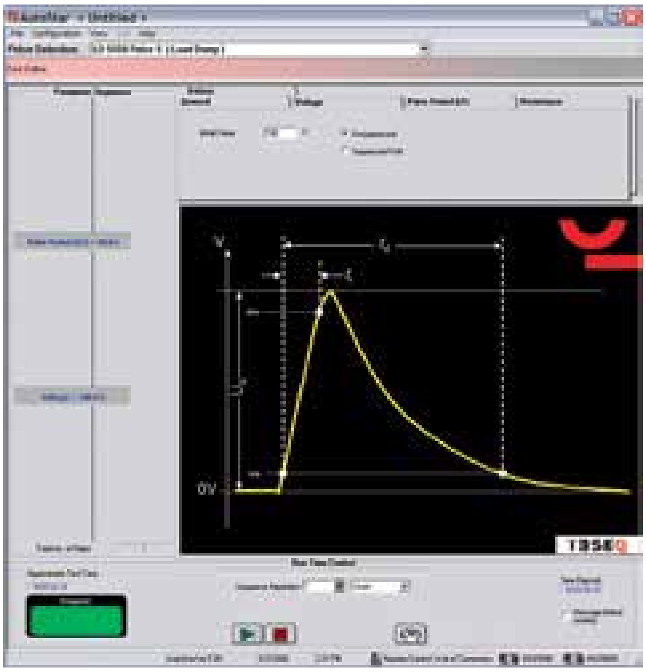


Figure 8-15: Load dump test editor screen

Using this software screen the user can perform load dump pulse 5 type test. Sequences of pulses of varying amplitude or period can be generated by ramping either the pulse voltage or pulse period. Tests can be saved for future use and using the Auto-Star test sequence. They may be used to perform tests made up of different pulses from different modules.

8.3.1.1 Test parameters

Test parameters can be assigned by clicking on the appropriate parameter tab in the top right corner of the test editor window.

General

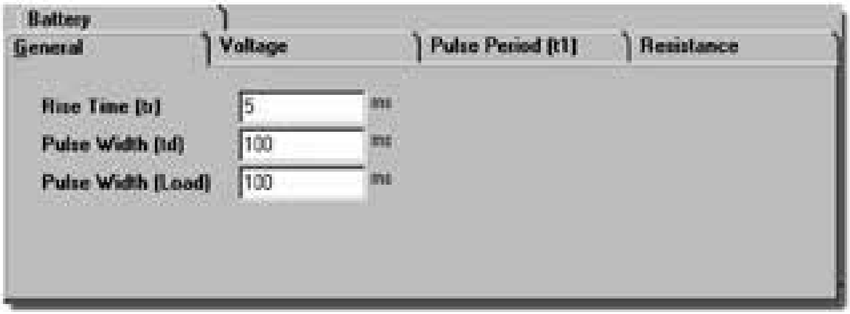


Figure 8-16: General tab

The rise time is programmable, in this example, from 0.1 to 10 ms in 0.1 ms steps while the pulse width open circuit and under load are programmable from 30 to 700 ms (maximum allowed by the hardware) in 1 ms steps. Both the open circuit and under load pulse width need to be defined. This is because the LD 5505 uses an active pulse shaping network to produce the desired pulse shape. This gives the user superb flexibility in defining the pulse shape, as any combination of rise time and pulse width are possible.

Voltage

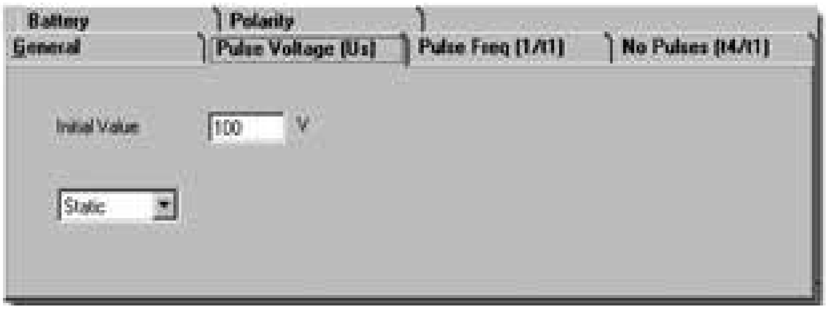


Figure 8-17: Voltage tab

The unsuppressed pulse voltage is the peak amplitude of the pulse. It can be either static during the test or else ramped linearly from one value to another by a fixed step value.

The suppressed voltage may be varied from the minimum allowed in the hardware to the unsuppressed voltage value. If selected then the amplifier will clamp the output pulse at the suppressed voltage. This pulse, known widely as Pulse 5b, usually defines the unsuppressed voltage and the pulse width.

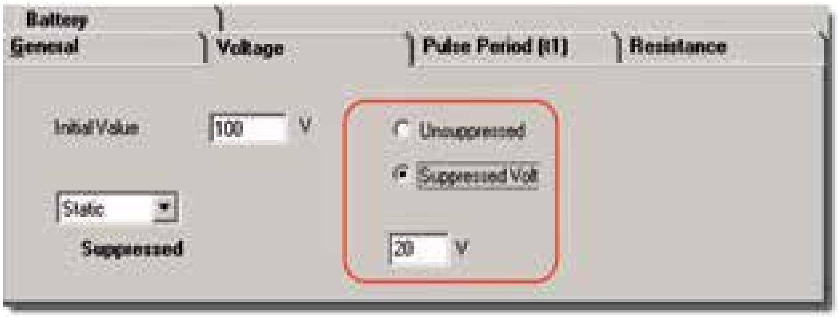


Figure 8-18: Setting the suppressed voltage

Pulse period (t_1)

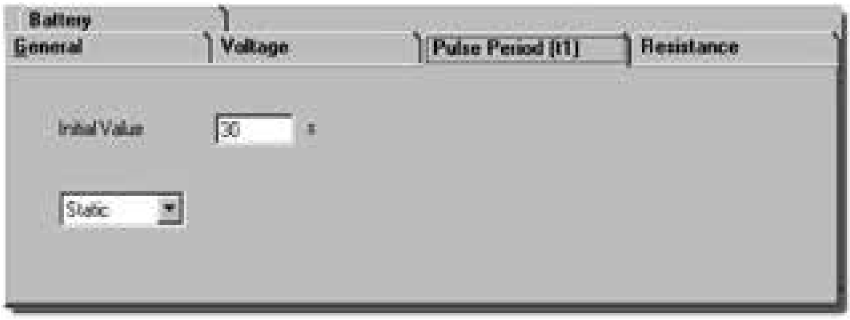


Figure 8-19: Pulse period tab

The pulse period is the time at which a pulse is repeated. This time may be static or can be varied linearly during the test. The pulse period is voltage dependent due to the time it takes to charge up the high energy capacitors within the generator.

Resistance

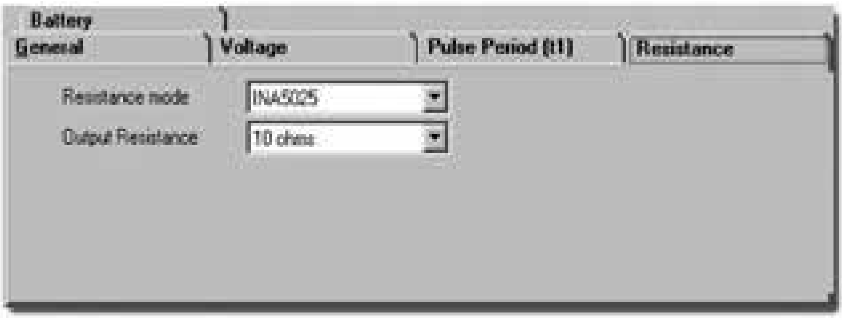


Figure 8-20: Resistance tab

The output impedance of the pulse can be varied by either using a plug-in resistor or by using an external or built-in resistance. For details please consult the hardware guide of your system.

If the resistor is user defined then the user should plug in the required output impedance for the standard test that is being generated.

Battery

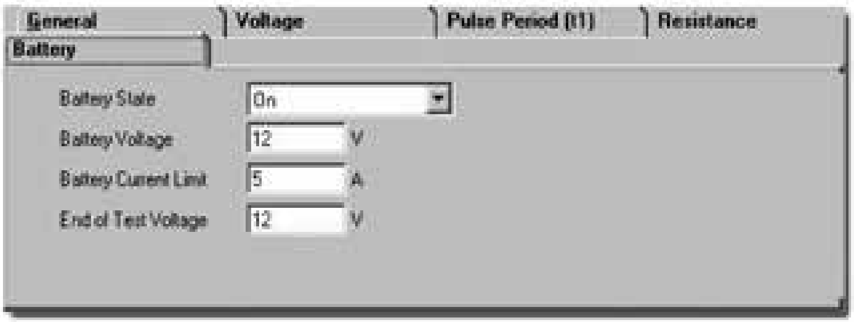


Figure 8-21: Battery tab

The battery state for pulse 5 can be either OFF or ON. If OFF then the battery is switched OFF throughout the test. If ON then the pulse sits on top of the battery throughout the test.

The battery voltage is the value of the battery during the test. The minimum value is 0 V while the maximum value is dependent upon the maximum value of the battery source.

The battery current limit is programmable from the minimum to the maximum limit that the selected battery source is capable of.

The end of test voltage is programmable from 0 V to the maximum voltage that the battery source is capable of.

8.3.1.2 Run-time control

The run-time control section controls how long a complete test. Figure 8-3 shows the run-time control section.

Figure 8-22: Run time control section

This section consists of a progress bar, a sequence duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details please refer to section 5.3.5 Running a test.

8.4 Field decay (negative load dump pulses)

Many load dump generators have a negative pulse that is often called field decay, refer to the related harware guide. The use of decay pulses in AutoStar is described herein.

8.4.1 Test editor screen layout overview

This screen is comprised of the following sections:

⇨ The **Parameter Tabs** frame which allows the user to create tests
⇨ The **Graphical Display** shows a graphical representation of the selected wave form
⇨ The **Run Time Control** frame

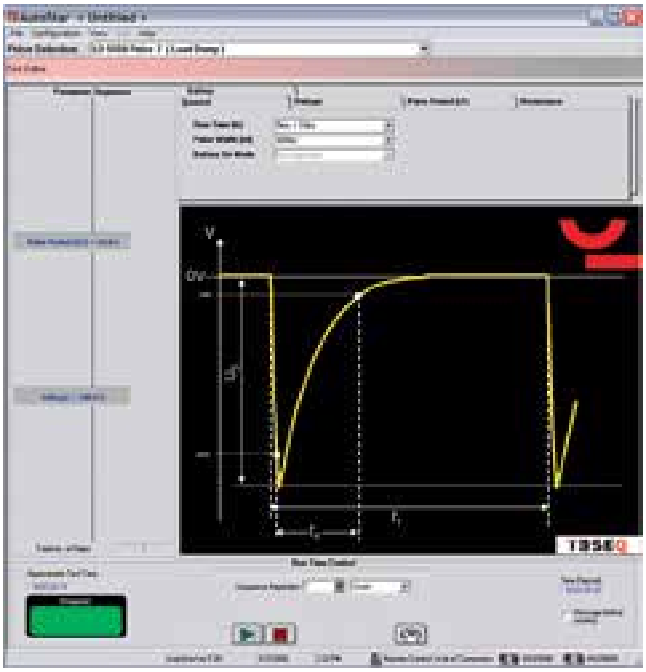


Figure 8-23: Pulse 7 (classic) screen

Using this software screen the user can perform a negative load dump type test. Sequences of pulses of varying amplitude or period can be generated by ramping either the pulse voltage or pulse period. Tests can be saved for future use and using the Auto-Star test sequence. They may be used to perform tests made up of different pulses from different modules.

8.4.1.1 Test parameters

Test parameters can be assigned by clicking on the appropriate parameter tab in the top right corner of the test editor window..

General

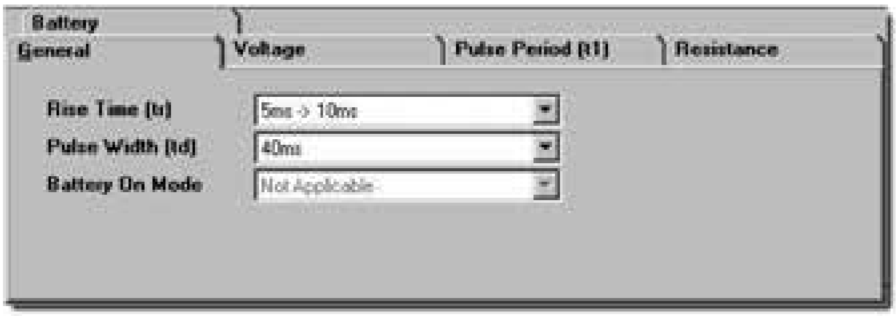


Figure 8-24: General tab

The rise time is between 5 and 10 ms while the pulse width can be programmed from 40 to 400 ms in a number of steps. Limits of the module will be found in these fields. The battery on mode may be either time or voltage controlled. If time controlled then the battery OFF time will be equal to half the pulse period. If voltage controlled then the battery OFF time will approximately equal the pulse width (the battery will turn back on when the voltage is within 3 V of 0).

Voltage

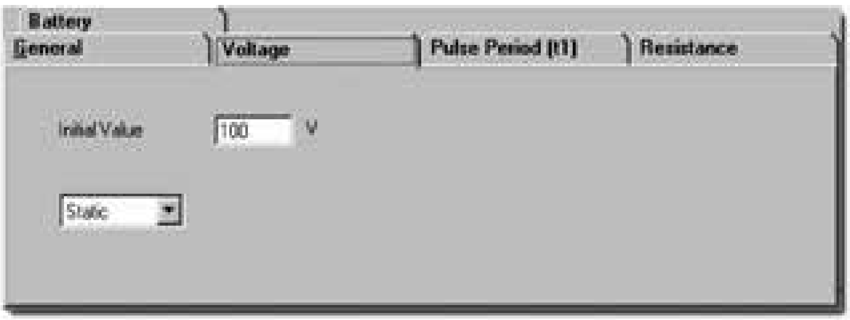


Figure 8-25: Voltage tab

The pulse voltage is the peak amplitude of the pulse. It can be either static during the test or else ramped linearly from one value to another by a fixed step value

Pulse period (t_1)

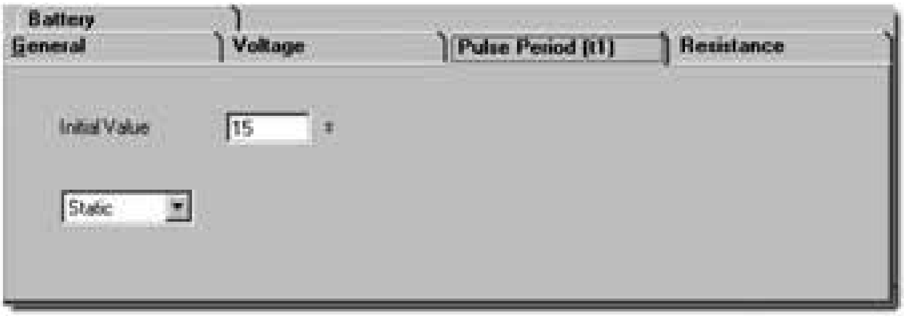


Figure 8-26: Pulse period tab

The pulse period is the time at which a pulse is repeated. This time may be static or can be varied linearly during the test. The pulse period is voltage dependent due to the time it takes to charge up the high energy capacitors within the generator.

Voltage

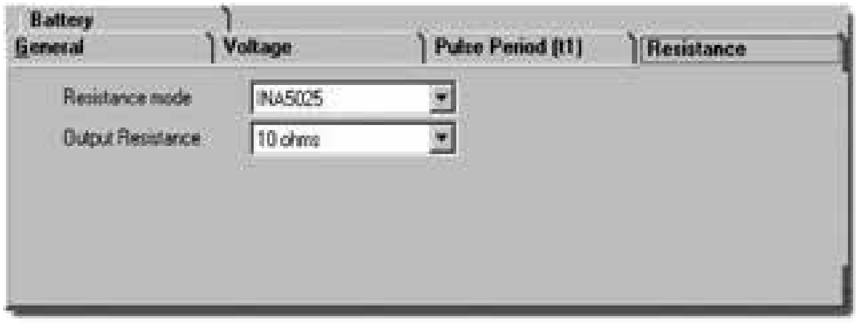


Figure 8-27: Resistance tab

The output impedance of the pulse can be varied by either using a plug-in resistor or by using an external or built-in resistance. For details please consult the hardware guide of your system.

If the resistor is user defined then the user should plug in the required output impedance for the standard test that is being generated.

Battery

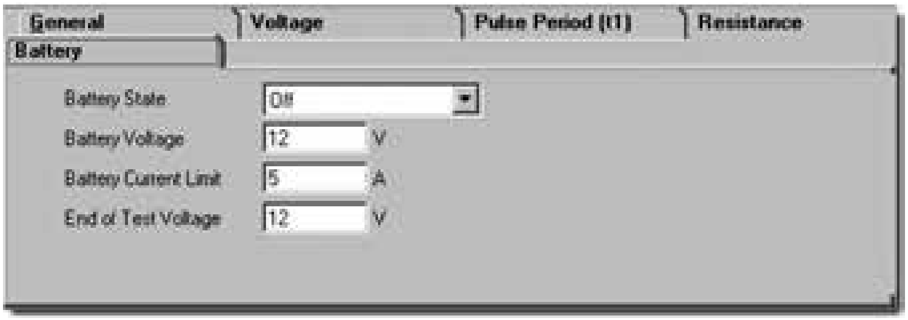


Figure 8-28: Battery tab

The battery state for load dump class 2 can be either **Under Program Control (UPC)** of **OFF**. If UPC then the battery turns OFF before the pulse is fired and back ON again after the pulse is fired, the battery OFF time being determined by the battery on mode. If OFF then the battery is switched OFF throughout the test.

The battery voltage is the value of the battery during the test. The minimum dip value is 0 V while the maximum value is dependent upon the maximum value of the battery source.

The battery current limit is programmable from the minimum to the maximum limit that the selected battery source is capable of.

The end of test voltage is programmable from 0 V to the maximum voltage that the battery source is capable of.

8.4.1.2 Run-time control

The run-time control section controls how long a complete test. Figure 17.7 shows the Run-time control section.

Figure 8-29: Run time control section

This section consists of a progress bar, a sequence duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details please refer to section 5.3.5 Running a test.

9 THE SCOPE

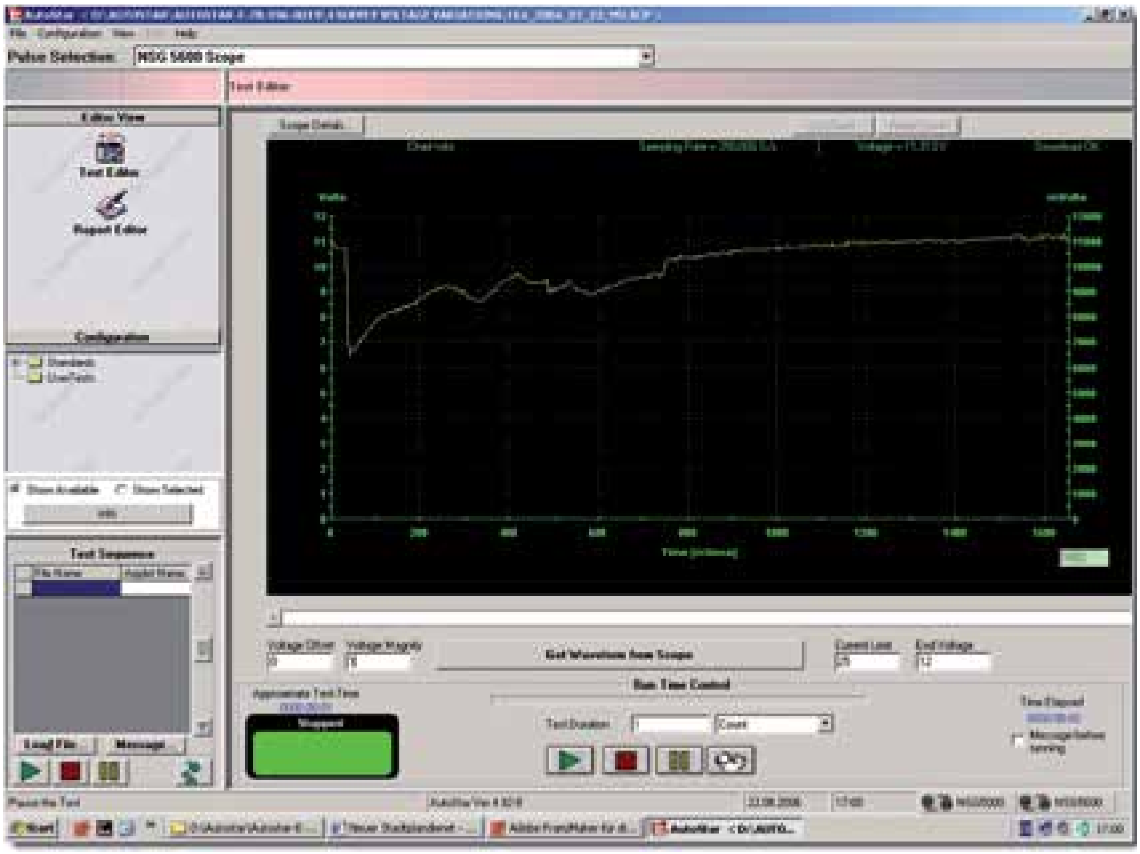


Figure 9-1: Scope utility screen

The scope utility allows the user capture waveforms from an oscilloscope or a text file and replay them through the Arb card. The user may also modify the waveform by varying the Voltage offset, **magnifying** the voltage and varying the overall duration of the waveform. The scope utility currently only replays the waveform on the master arb card.

A waveform may be created in any package that can convert the waveform into a text file. Thus, a waveform may be created in Excel, Mathcad, Notepad etc., exported and read into AutoStar. The waveform can then be downloaded to the master Arb card for replay.

9.1 Screen overview

The scope screen is shown in figure 9-1. The screen consists of the following components.

9.1.1 Scope details

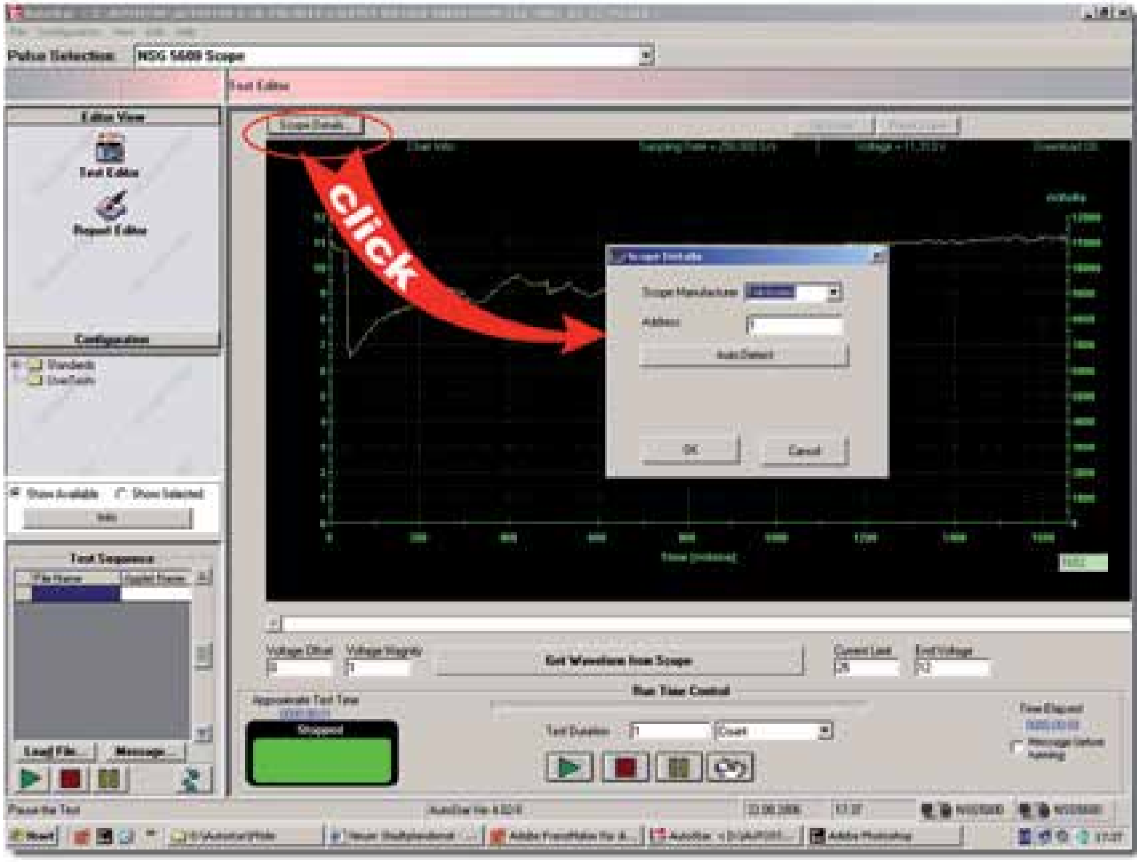


Figure 9-2: Scope details dialogue

The **scope details** dialogue allows the user to configure and connect to the scope.

Scope manufacturer: The software currently supports Tektronics and Le Croy scopes.

Address: Allows the user to specify the IEEE address of the scope.

Auto detect: Selecting auto detect the software will attempt to connect to the selected manufacturers scope.

9.2 Waveform editor

Figure 9-3: Waveform editor

The waveform editor consists of the following areas:
⇨ **Waveform information area**

a. The **time** and **voltage** display the current cursor position

.

b. **Sampling rate**
Indicates the sampling rate of the waveform. This value can be increased or decreased by varying the end time of the overall waveform. This value affects whether the waveform can be replicated using the arb card. If you exceed the alowed range of values a information window will be opened.

> **NOTE!**
> ⇨ **The maximum sampling rate is 12.5 MS/s (corresponding to 0.08 µs time between two test points). The minimum Sampling Rate is 0.1 S/s (corresponding to 10 s time between two test points).**
>
> ⇨ **The number of test points has to lie between 10 and 30000 points.**

c. **Voltage**
Displays the maximum voltage of the displayed waveform. This value can be manipulated by varying the voltage offset and voltage magnify value.

d. **Download OK**
Gives an indication whether the waveform can be replicated using your current system.

⇨ **Waveform**
Displays the waveform. The user can zoom in on certain areas of the waveform. The software will replay exactly what is displayed on screen. Thus, if a zoomed waveform is displayed then only that section of the waveform will be replicated.

⇨ **Overall test time**
Allows the user to specify the overall test time of the waveform. This value is not available while in zoom mode. This value affects the sampling rate of the waveform and thus affects whether the arb card can replicate the waveform correctly.

⇨ **Waveform editing**

a. **Voltage offset**
Modifies the voltage offset of the currently displayed waveform

b. **Voltage magnify**
Modifies the voltage magnification of the currently displayed waveform.

c. **Get waveform from scope**
Connects to the configured scope as set-up in scope details and downloads the waveform information from the scope.

d. **Current limit**
Sets the current limit of the configured source.

9.3 Capturing and replaying a waveform from an oscilloscope

The following section shall give a step by step guide on capturing a waveform from a scope.

Step 1: Configuring the scope
Select **Scope Details…**
Select the **Scope Manufacturer** (currently supports only Tektronics and Le Croy.)
Enter the scope address or select auto detect for the software to assess the address of your scope.
Select **OK**.

Step 2: Capturing the waveform
Once you have configured your scope, click the Get waveform from scope button.
The software will start downloading the waveform from the scope.

Step 3: Modifying the waveform
Check that the voltage and test time are correct.
You can zoom in on sections of the waveform.

Figure 9-4: Waveform zoom

You can modify the voltage offset or the voltage magnitude.

Figure 9-5: Voltage offset and magnitude

If you zoom out after modifying a zoomed section of the waveform the software will maintain that particular area of the modified zoomed section.

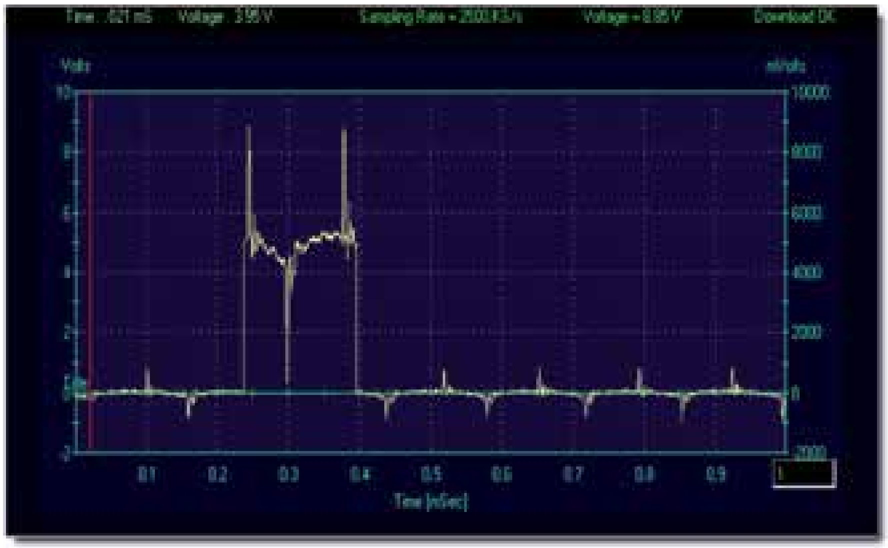


Figure 9-6: Post modification zoom reset

NOTE!
If you modify the voltage offset and/or voltage magnify it will affect the section currently displayed. Thus if you modify the offset and/or voltage magnify on the zoomed out section you will loose the modified information on the zoomed in section.

Step 4: Replaying the waveform

The Software will replay the downloaded waveform as displayed on the screen. The download time depends on the number of points in the waveform.

NOTE!
Check that the waveform can be replayed correctly. This is indicated on the waveform information section.

If **Download OK** is displayed then the currently configured system should be able to replay the waveform correctly.

9.4 Loading and replaying a waveform defined in Excel

Step 1: Entering the data in Excel
Open **Excel** and enter the waveform points.

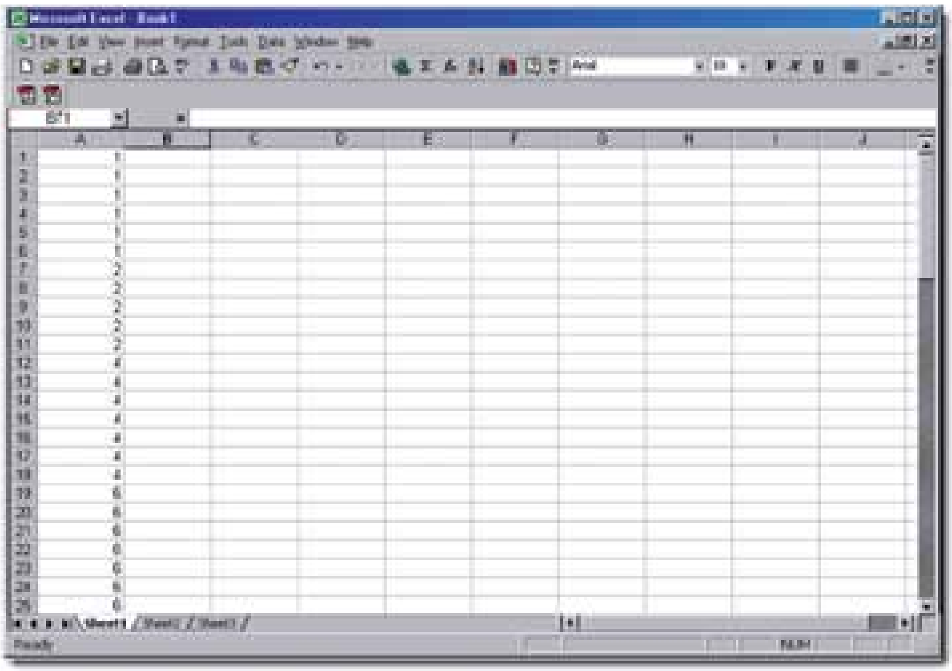


Figure 9-7: Excel editing

Step 2: Saving the data in Excel
Select **Save As...**
Select save as type: Text (tab delimited) (*.txt)

Figure 9-8: "Save" dialogue

Enter the file name and select save

Figure 9-9: Confirmation dialogue

Select **OK** to the above dialogue

Figure 9-10: Save message

Step 3: Opening the file in AutoStar
Select **File … ⇨ Open Test**

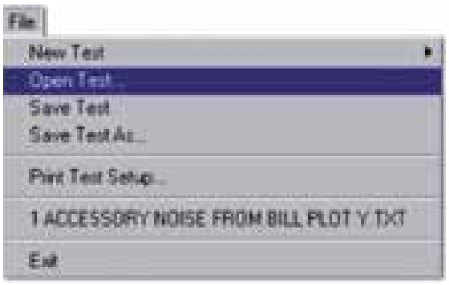


Figure 9-11: File menu

Select the waveform you saved and open it.

The software will load and display the waveform.

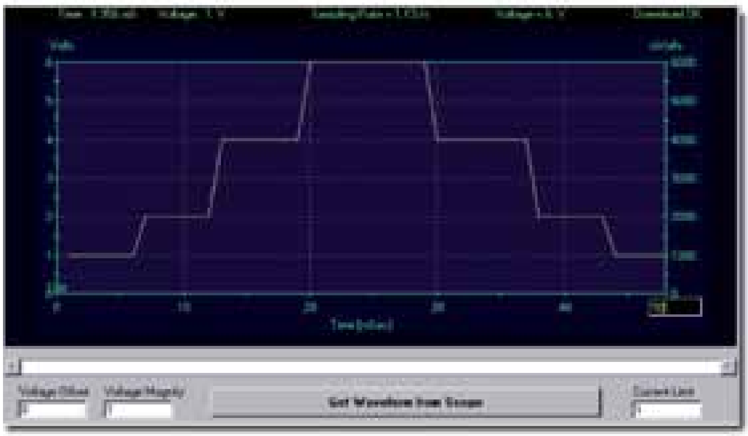


Figure 9-12: Scope waveform

Step 4: Check parameters
Check that the voltage and test time are correct. You can now modify the waveform as outlined in 9.3 step 3.

Step 5: Replaying the waveform
Check that the waveform can be replayed correctly. If **Download OK** is displayed then the currently configured system should be able to replay the waveform correctly.

The download time depends on the number of points in the waveform.

> **NOTE!**
> **The software will replay the waveform as displayed on the screen. However, the wave form is clocked out in a digital way meaning that too few data points will result in a blocky output.**

9.5 Loading and replaying a waveform defined in Notepad

Step1: Define waveform in Notepad
Open Notepad and enter a value on each line.

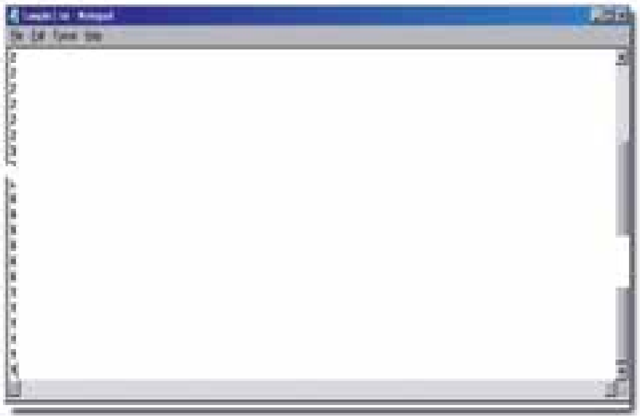


Figure 9-13: Notepad

Step 2: Saving the data in Notepad
Select **Save As...**
Enter the test name and select Save

Step 3: Opening the File in AutoStar
Select **File ... ⇨ Open Test**

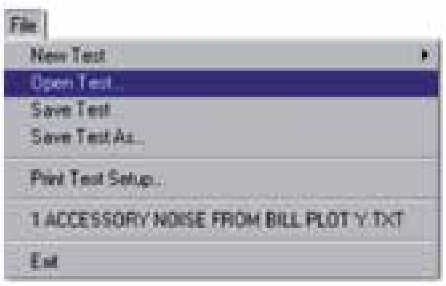


Figure 9-14: "File" menu

Select the waveform you saved and open it.

The software will load and display the waveform

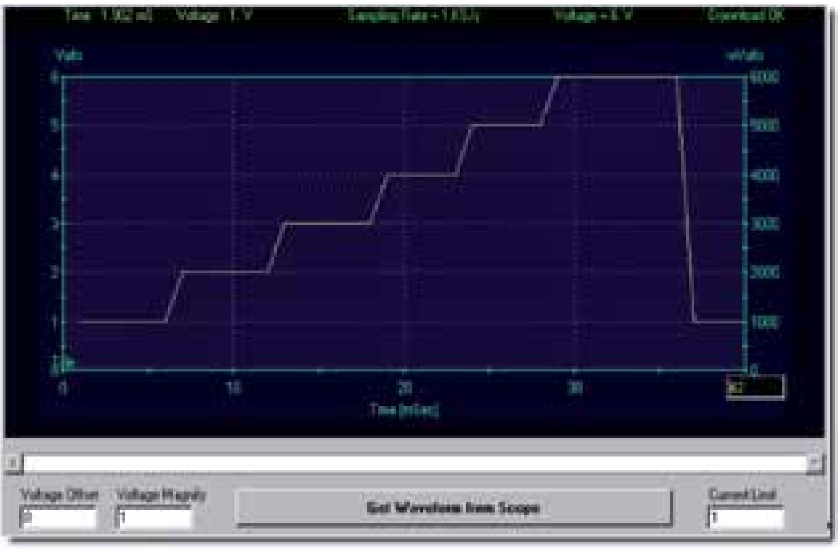


Figure 9-15: Waveform defined in Notepad

Step 4: Check parameters
Check that the voltage and test time are correct. You can now modify the waveform as outlined in section 9.2 Waveform editor **"Step 3:".**

Step 5: Replaying the waveform
Check that the waveform can be replayed correctly. If **Download OK** is displayed then the currently configured system should be able to replay the waveform correctly.

The download time depends on the number of points in the waveform.

NOTE!
The software will replay the waveform as displayed on the screen. However, the wave form is clocked out in a digital way meaning that too few data points will result in a blocky output.

9.5.1 Run time control

The run time control section controls how long a complete test. Figure 9-4 shows the run time control section.

Figure 9-16: Run time control section

This section consists of a progress bar, a test duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details please refer to section 5.3.5 Running a test.

10 POWER MAGNETICS

The AutoStar software contains a power magnetics module that works in conjunction with the ARB 5220/FG 5620 firmware and power-amp hardware. This software allows the user to specify a set of test points consisting of (dBpTrms, frequency) pairs.

Each pair of test points will ultimately determine the voltage and the frequency of the waveform that will be applied to the coil. The user enters the coil characteristics into the database. The software then calculates the voltage that must be applied to the coil to produce the desired magnetic field strength for each pair of test points.

There is a particular order of calculations that the software must apply, when determining the voltage that is applied to the coil.

The user inputs are:

- Test points ((dBpTrms, frequency) pairs)
- Coil characteristics

The software calculations are:

- Calculate the current that must flow through the coil to produce the required dBpTrms value
- Calculate the voltage Vc that must be applied to the coil to produce the current
- Determine the impedance, Z of the coil

10.1 Test editor layout overview

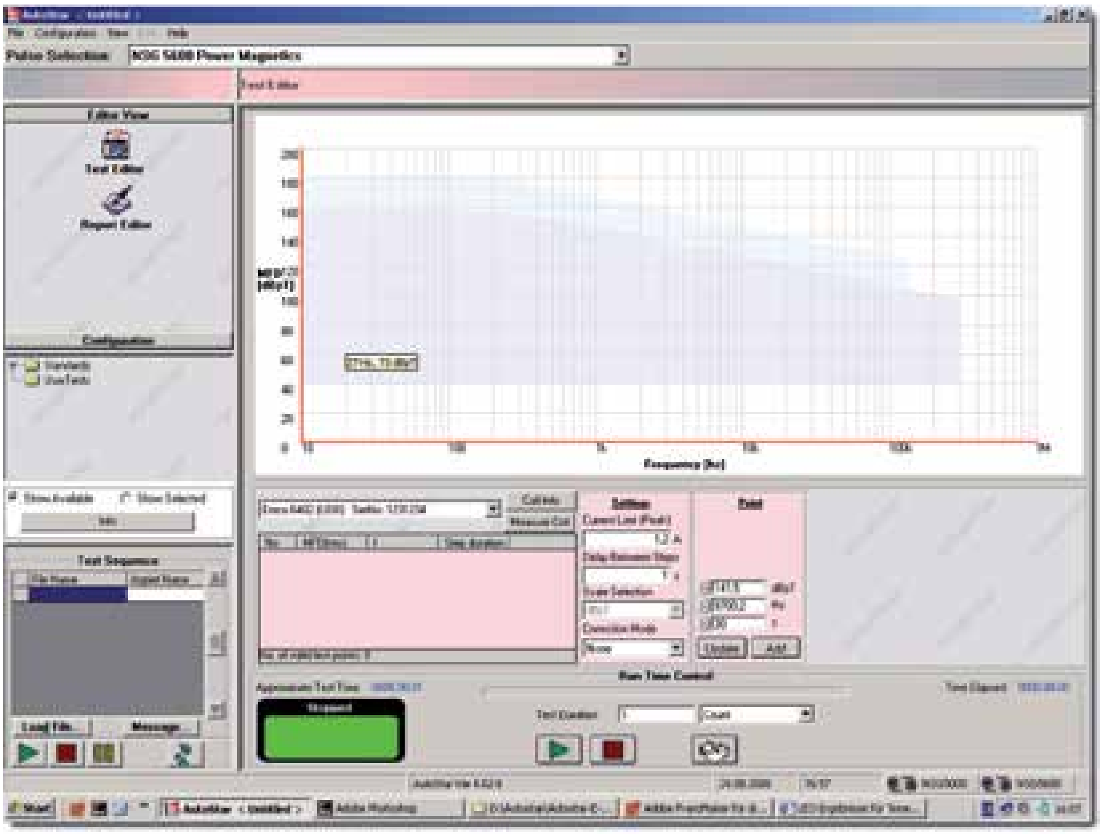


Figure 10-1: Power magnetics test editor screen

The power magnetic test editor screen comprises of:

➩ **Graphical Display** of the test points ((dBpTrms, frequency) pairs)

➩ **Dialogue Frames** which allow the user to configurate tests

➩ **Run Time Control** frame

To perform power magnetic testing the user must accomplish the following steps.

- Configuring the coil that shall be used for testing
- Creating the test points
- Calibrating the system

These steps are described in detail within the following sections.

10.1.1 Graphical display and dialogue frames

Figure 10-2 shows the graphical display of the power magnetics test editor.

⇨ The horizontal axis is frequency (in Hz), shown in a logarithmic scale.

⇨ The vertical axis is magnetic field density (MFD). The unit is dBpT (decibels relative to one pico Tesla)

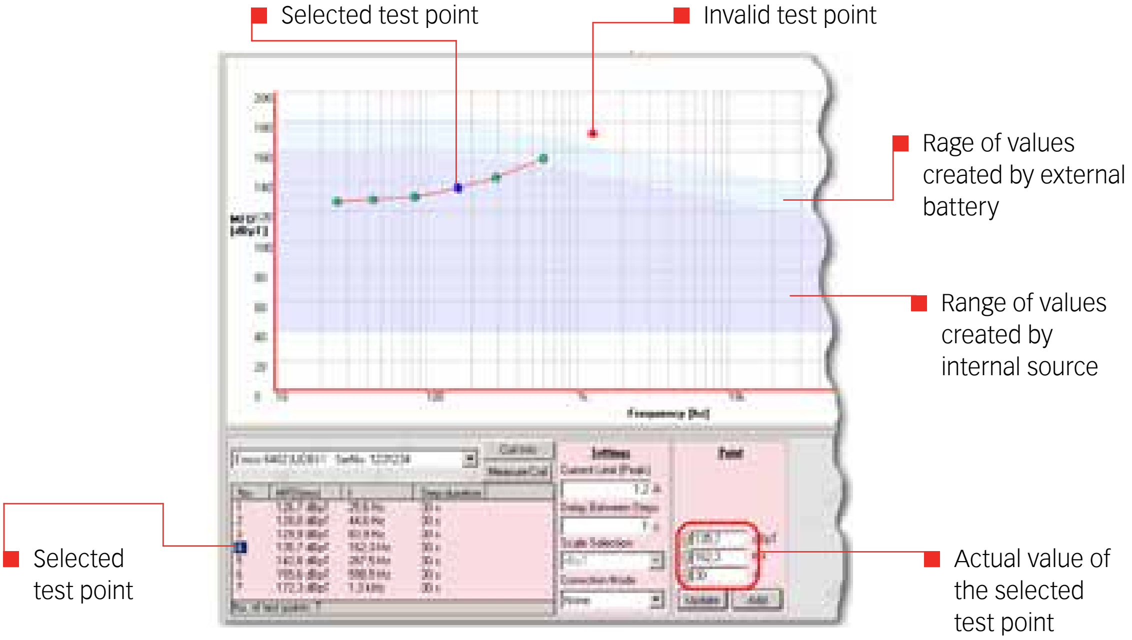


Figure 10-2: Graphical display and dialogue frames

Coloured areas

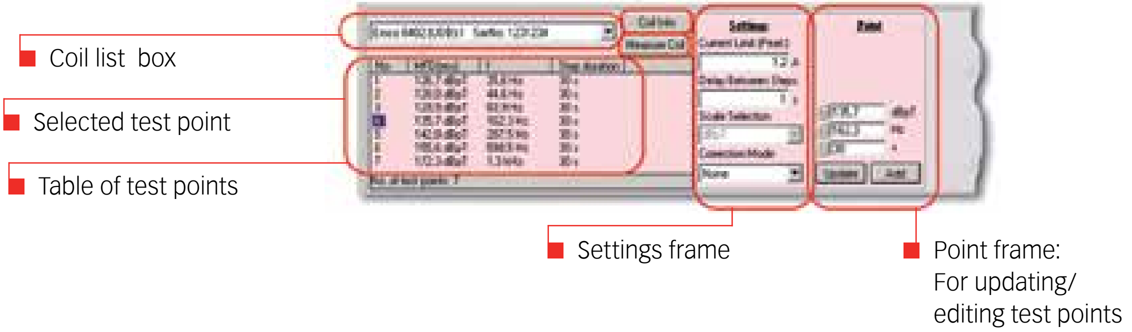
The lower more coloured area shows the range of values that can be generated by the internal PAM (e.g. PA 5640). In addition the shape of this area depends on the selected coil. The upper brighter coloured area shows the range of values that can be generated by an external battery. In addition the shape of this area depends on the selected coil.

NOTE!
The coloured areas show the maximum possible range of values. If the user limits the maximum current (ref. to settings frame in the next section) the real range of possible values is also limited.

Display of test points:

Green dot: Valid test point. The test setup is able to generate this test point.
Blue dot: Selected Test Point. If the user selects a test point in the test point list the colour of this test point in the graphical display changes to blue.
Red dot: Invalid test point. Lies outside the range of possible values.

10.1.2 Dialogue frames



- **Coil list box:**
  Comprises a choice of selectable coils. The user first must configure the coils, refer to section 10.2 Configuring the coil.

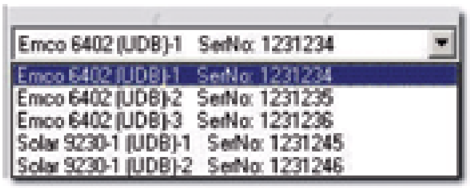


Figure 10-3: Graphical display and dialogue frames

- **Coil info**
  If you click on the coil Info button the coil configuration dialogue, refer to figure 10-4, is shown. It shows the configuration of the actually selected coil.

  The configuration can not be edited here. For that refer to section 10.2 Configuring the coil.

- **Measure coil**
  With the measure coil button you can manually start the measurement/calculation of the current coil resistance. AutoStar calculates this value by measuring the coil current and includes the coil characteristic.

  After the measurement is finished a dialogue will be opened showing the coil resistance value in the database and the currently measured value. It is recommended to take over the new measured value in order to use optimized test points. This is especially recommended if you want to use later current control for your test, refer to section 10.4 Calibrating the system).

  The measurement of the coil resistance will be also started (a dialogue will be opened before) when you run the a test the first time or after changing the coil.

- **Table of test points**
  Comprises a list of all test point values: No., MFD, frequency and step duration.

- **Settings frame**
  Comprises the following fields:

Current limit:	In this field the user can limit the maximum current that the coil can be charged with. The mamimum value depends on the current setup of the battery.
Delay between steps:	This is the time for which the system pauses between consecutive test points.
Scale selection:	Only dBpT is possible so far.
Correction mode:	Choice of correction modes during the test, refer to section 10.4 Calibrating the system.

- **Point frame**
  Comprises fields and buttons for updating and editing test points. For details refer to section 10.3.3 Creating test points by input of values..

10.2 Configuring the coil

Before performing a power magnetic test with a new coil the user has to configure this coil in the AutoStar software.

The steps are as follows:

Step 1: Select **Configuration ⇨ System Configuration.** The system configuration dialogue will be displayed.

Figure 10-4: System configuration dialogue

Step 2: Open the NSG 5200/NSG 5600 tree and click on coil. The middle button in the lower bar of the system configuration dialogue will be activated (Add/Edit/Del Coil).

Step 3: Click on the Add/Edit/Del Coil button. The coil manager dialogue will be opened.

Figure 10-5: Coil manager dialogue

> **NOTE!**
> - **During installation of AutoStar software a database containing two standard coils is installed. (Emco 6402-Helmholz and Solar 9230-1-Radiating coil). So directly after installation of AutoStar these two coils are selectable.**
> - **In addition a User Data Base (UDB) is applied. All user defined coils will be stored in this database. Only the coils added to the UDB will be selectable in the power magnetics test editor screen**

Step 4: Select one of the standard coils and click on the '+'-button top left in the coil manager dialogue. Now the coil properties dialogue will be displayed. For details of the coil properties dialogue refer to section 10.2.3 Coil properties dialogue.

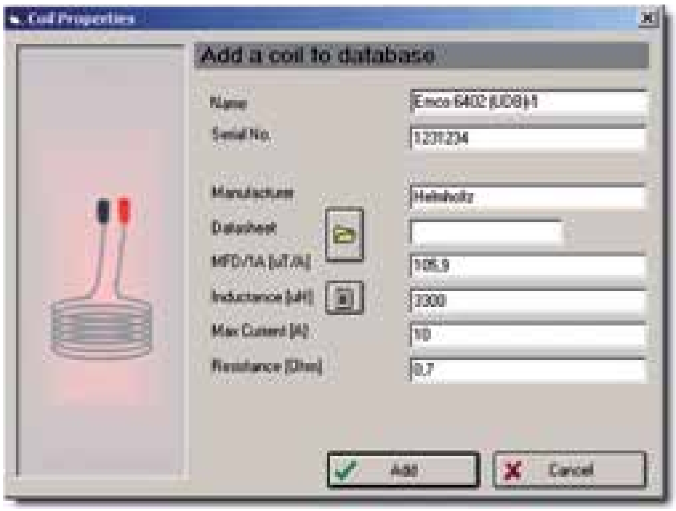


Figure 10-6: Coil properties dialogue

Step 5: Edit the data of your coil. The serial number is mandatory. The serial number must be a unique number.

Step 6: Click on the Add button. The coil properties dialogue will be closed.

Now the new coil is added to the user data base and is displayed in the list of the coil manager dialogue.

10.2.1 System configuration dialogue

All coils that are added to the User Data Base (UDB) are displayed in the opened NSG 5200/NSG 5600 tree, refer to figure 10-7.

Figure 10-7: System configuration dialogue

If you select one of the coils and click on the properties button the coil oroperties dialogue, refer to figure 10-9 will be opened. But you can not edit the data.

10.2.2 Coil manager dialogue

For opening the coil Manager dialogue refer to step 2 and step 3 in section 10.2 Configuring the coil.

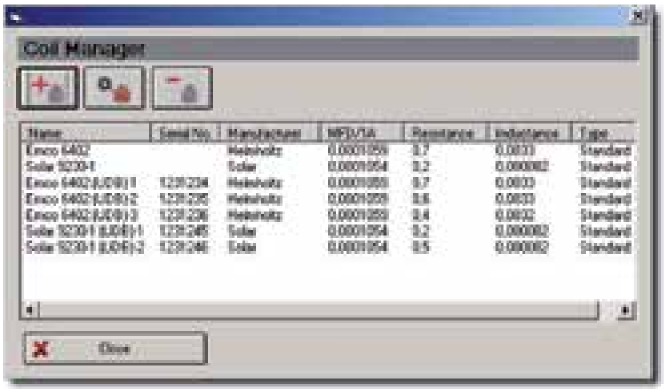
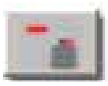


Figure 10-8: Coil manager dialogue

	Add a new coil to the user data base. Opens the coil properties dialogue.
	Edit/view coil properties from database (only available for coils in the user data base). Opens the coil properties dialogue.
	Delete the selected coil from the data base (only available for coils in the user data base).

10.2.3 Coil properties dialogue

The coil properties dialogue can be opened via the Add- or the edit/view button of the coil manager dialogue.

Figure 10-9: Coil properties dialogue

The user must enter the appropriate characteristics for the coil the user is using. These characteristics are:

- **Name**
  The name of the coil (required for the report).

- **Serial number**
  The user should enter a number that identifies the coil type clearly within his company. The serial number is mandatory and must be unique.

- **Manufacturer**
  Manufacturer of the coil.

- **Datasheet**
  Clicking on the button with the file symbol opens a file open dialogue.

- **MFD/1A**
  MFD/1A means magnetic field density per ampere (in µT/A).

- **Inductance**
  The inductance of the coil (in µH). This value should be measured as it may vary from coil to coil.

- **Maximum current**
  The maximum current that the coil can withstand while operating normally.

- **Resistance**
  The path resistance from the DC source to the coil itself. This includes the actual resistance of the coil to a DC current. This value can be measured with AutoStar (see section 10.4 Calibrating the system on) and it may vary depending on the type of set-up (e.g. coil type, length of cables etc.).

- **Add button:**
  By clicking the add button the coil will be saved in the user data base (only visible after clicking .

- **Apply button**
  By clicking the apply button the canges for this coil will be saved in the user data base. (Only visible after clicking ).

10.3 Creating/editing test points

10.3.1 Selecting a coil

First the user has to select a coil from the coil list box, refer to figure 10-10. This list box contains all coils that previously have been added to the user data base, refer to section 10.2 Configuring the coil.

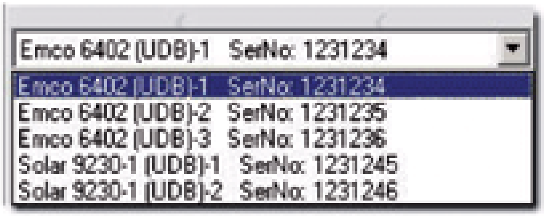


Figure 10-11: Coil list box

The range of possible value pairs is depending on the internal battery, external power amplifier or the selected coil. It is shown as coloured areas in the graphical display, refer to figure 10-2.

There are several ways how the user can create test points.

⇨ By mouse click
⇨ By input of values
⇨ By the sweep utility

10.3.2 Creating test points by mouse click

The easiest way how to create test points is just clicking in the graphical display. If you move the mouse pointer over the graphical display and stop moving for a second a hint will be displayed showing the values for magnetic field density and frequency. This hint helps the user to set the new test point correctly. Each test point is displayed as a green dot.

In addition you will find this test point in the table of test values left below the graphical display, refer to figure 10-11.

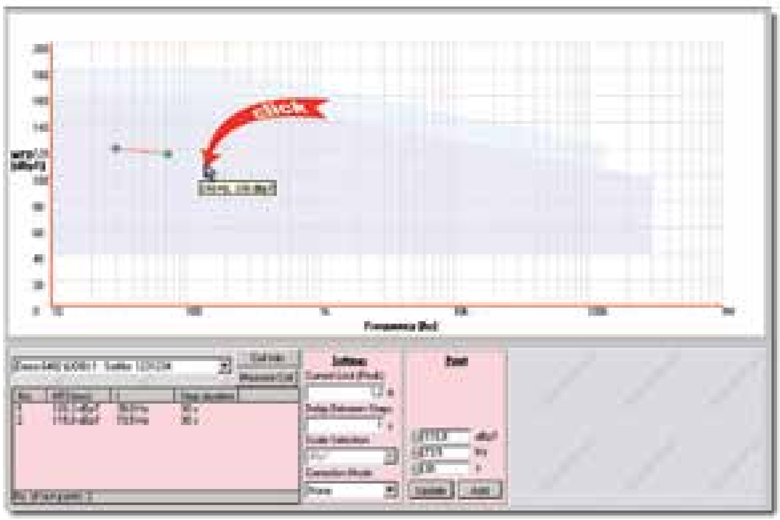


Figure 10-12: Creating test points

> **TIP!**
> **For changing the step duration edit the value of the third field in the point frame, ref. to the next section. This value will be hold for all following test points you create by mouse clicking. The default value is 30 s.**

10.3.3 Creating test points by input of values

For creating/editing accurately defined test points the user has the possibility to input values into the fields of the point frame.

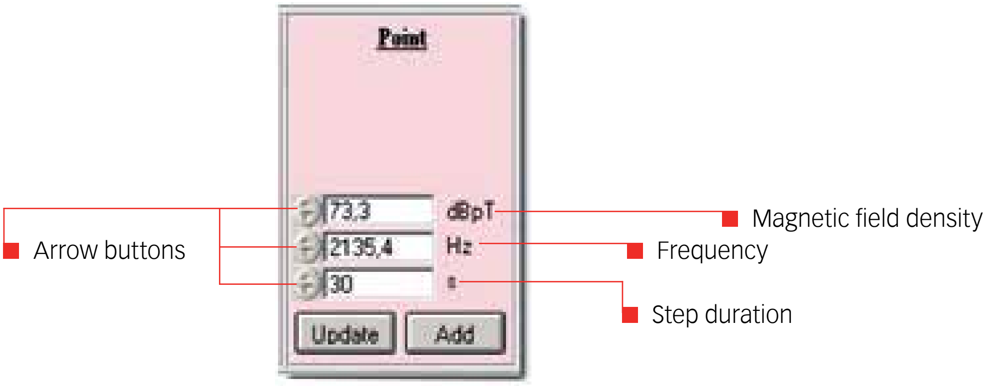


Figure 10-13: Point frame

- **Update**
  Select a test point in the test point list by clicking on the appropriate number of the test point. The selected number will be marked blue. Than edit the data and click on update. The existing test point will be changed according to your input data.

- **Add**
  For adding test points just type your data for the test point into the appropriate fields and click on the add button. The new test point will appear in the graphical display and in the list of test points.

- **Arrow buttons**
  Each arrow button comprises of an up and an down button. Each click on it increases respectively decreases the value in steps of 1.

10.3.4 Creating test points by the sweep utility

The sweep utility enables the user to generate automatically a row of test points.

By right clicking on the graphical display or the test point list a context sensitive menu will be opened. Now go to test **Point ⇨ Sweep,** refer to figure 10-13.

Figure 10-14: Context sensitive menu

The create sweep dialogue will be opened.

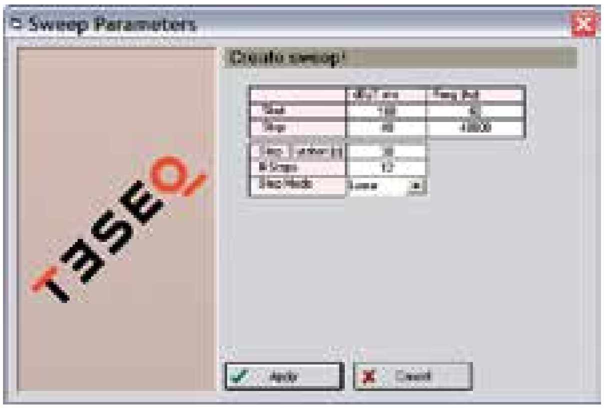


Figure 10-15: Create sweep dialogue

10.3.4.1 Step mode linear

In step mode linear AutoStar generates automatically a row of test points. These test points lie on a straight line in the display.

The number of test points corresponds with the value of the field # steps.

Figure 10-16: Example for step mode linear: Input data

In this example for step mode linear Autostar generates 12 test points:

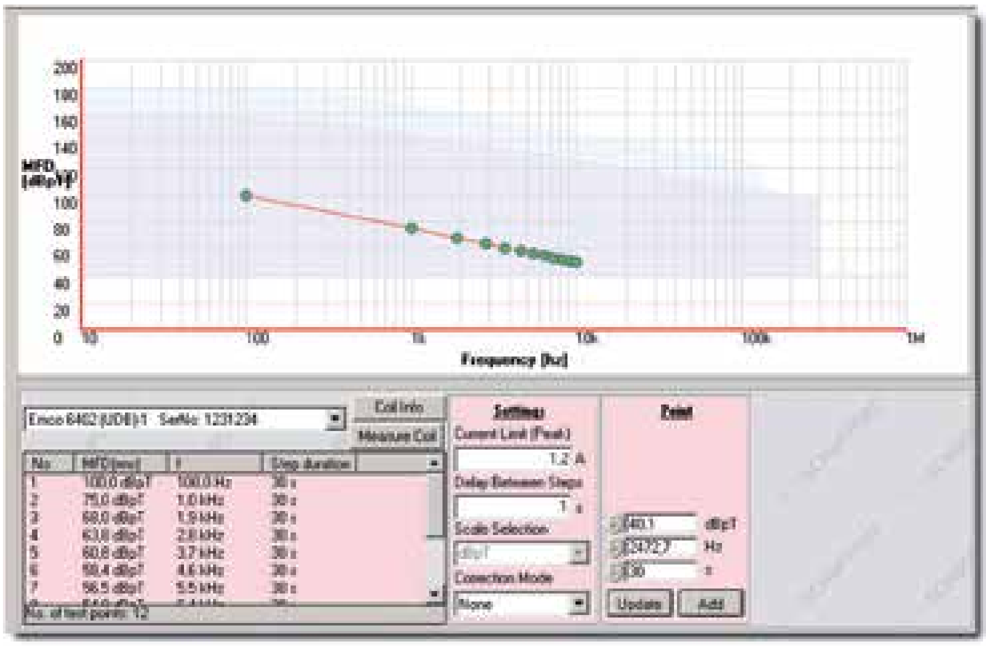


Figure 10-17: Example for step mode linear: Generated test points

10.3.4.2 Step mode octave

In step mode octave AutoStar generates the following test points:

⇨ Number of test points per octave correspond to the value in # steps
⇨ Definition of octave: Division of the frequency range into segments (octaves)

	Common		**Example (Frequ.)**	
1. Octave	Start frequency	2x Start frequency	10 Hz	20 Hz
2. Octave	2x Start frequency	2x 2x Start frequency	20 Hz	40 Hz
3. Octave	2x 2x Start frequency	2x 2x 2x Start frequency	40 Hz	80 Hz
....	....	....		
n. Octave	2^{n-1}x Start frequency	2^{n}x Start frequency (= Stop frequency)	n^{n-1} x 10 Hz	2^{n} x 10 Hz

Below you can find an example with 5 test points per octave and a start frequency of 10 Hz. AutoStar generates test points as shown in the table above from the start frequency up to the stop frequency.

Figure 10-18: Example for step mode octave: Input data

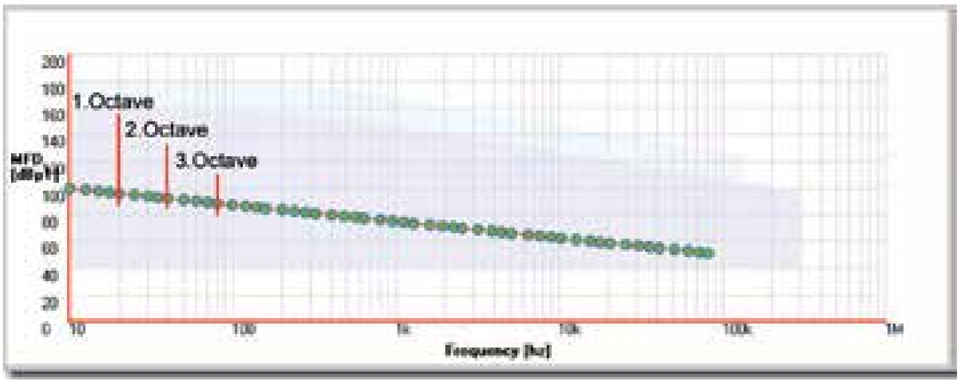


Figure 10-19: Example for step mode octave: Generated test points

10.3.4.3 Step mode decade

In step mode decade AutoStar generates the following test points:

⇨ Number of test points per decade correspond to the value in # steps
⇨ Definition of decade: Division of the frequency range into segments (decades)

	Common		**Example (Frequ.)**	
1. Decade	Start frequency	10x Start frequency	10 Hz	100 Hz
2. Decade	10x Start frequency	10x 10x Start frequency	100 Hz	1 kHz
3. Decade	10x 10x Start frequency	10x 10x 10x Start frequency	1 kHz	10 kHz
....	....	....		
n. Decade	10^{n-1}x Start frequency	10^{n}x Start frequency (= Stop Frequency)	10^{n-1} x 10 Hz	10^{n} x 10 Hz

Below you can find an example with 5 test points per decade and a start frequence of 10 Hz. AutoStar generates test points as shown in the table above from the start frequency up to the stop frequency.

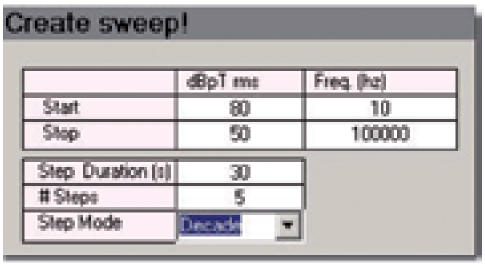


Figure 10-20: Example for step mode decade: Input data

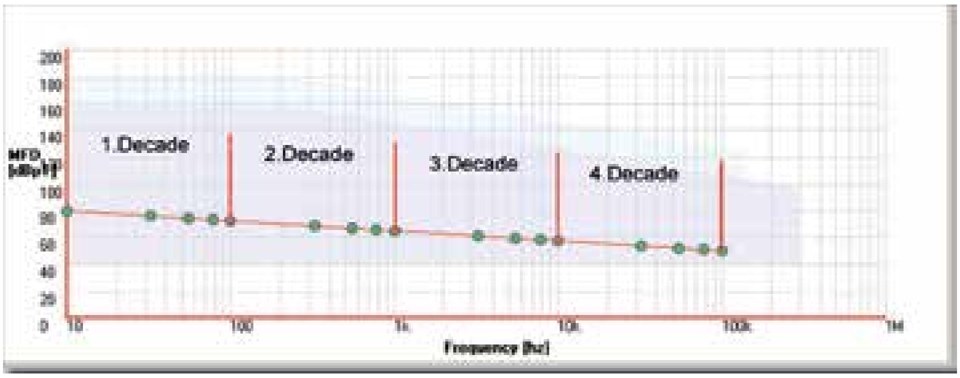


Figure 10-21: Example for step mode decade: Generated test points

10.3.5 Editing test points

To edit test points the power magnetic tool offers a number of ways as described in the following sections.

10.3.5.1 Editing test points by the point frame

For editing test points the user has the possibility to input the new values into the fields of the point frame.

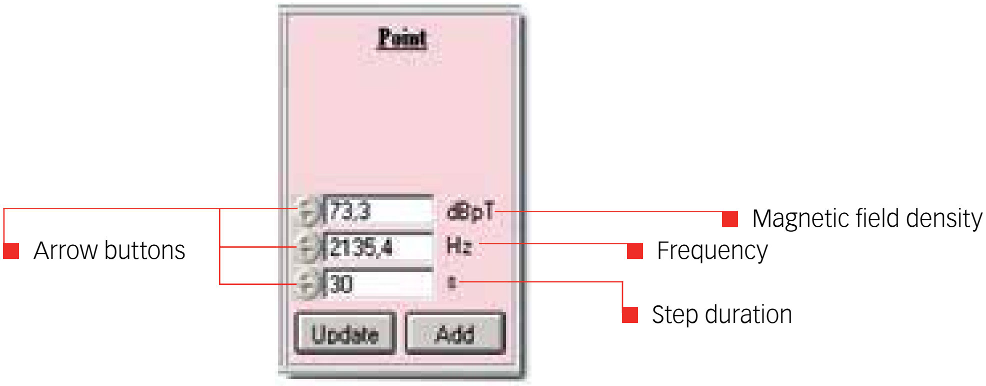


Figure 10-22: Point frame

- **Update**
  Select a test point in the test point list by clicking on the appropriate number of the test point. The selected number will be marked blue. Than edit the data and click on Update. The existing test point will be changed according to your input data.

- **Add**
  For adding test points just type your data for the test point into the appropriate fields and click on the Add button. The new test point will appear in the graphical display and in the list of test points.

- **Arrow buttons**
  Each arrow button comprises of an up and an down button. Each click on it increases respectively decreases the value in steps of 1.

10.3.5.2 Editing test points by the context menu

By right clicking on the graphical display or the test point list a context menu will be opened, refer to figure.

Figure 10-23: Context menu

This context menu comprises the following items:

- **IEdit (Interactive edit mode) or ISelect (Interactive select mode)**
  The user interface has two modes: IEdit and ISelect mode. When you are in IEditmode, clicking on the graph adds a new test point. When in ISelect mode, clicking on the graph moves the currently selected test point to the cursor position.

- **Select**
  For selecting a single test point click on the no. of this test point in the test point list. The selected test point No. is marked blue in the list and also the corresponding dot in the graph becomes blue. For multi selecting use the Shift or Ctrl button of your keyboard.

  With the select commands the user can:
  – Select all test points by once
  – Inverse the selection
  – Deselect all (by none)

- **Test point**
  Test point comprises the following items:
  – The sweep utility enables the user to generate automatically a row of test points, refer to section 10.3.4 Creating test points by the sweep utility.
  – The delete option deletes the selected test points.
  – Remove all deletes all test points of the test completely.
  – Delete invalid deletes all invalid test points (shown as red dots in the graphical display).

10.3.6 Saving/loading a test

- **Saving a test**
  For saving a test select **File ⇨ Save Test**. The saving user test into database dialogue will be opened (only if checked in the test options, refer to section 4.1.3 Test options, otherwise the normal save as dialogue will appeare). Edit the file name and confirm. The test file will be added to the user database. For detail about the user database refer to section 5.2.2 Loading predefined tests.

TIP!

⇨ **Measured values for multipoint- and singlepoint calibration will be saved with the test.**

⇨ **Invalid test point will be also be saved with the test.**

- **Loading a test**

  There are three ways for loading a test.
  - Go to the Standards window and select a predefined test from the standards database. For details refer to section 5.2.2 Loading predefined tests
  - Go to the standards window and select a user test from the user database. For details refer to section 5.2.2 Loading predefined tests.
  - Select **File ⇨ Open Test.** The load test dialogue will be opened. Here you can load a test file from all available data sources

10.4 Calibrating the system

The power magnetics test setup is very sensitive. So in order to generate the preset test points accurately it is necessary to calibrate the system. Before calibrating the system it is necessary to measure the coil resistance, refer to section “Dialogue frames, item measure coil”.

AutoStar offers three methods for calibrating the system. For selecting the calibration method go to the correction mode list box in the settings frame as shown in figure 10-23.

Figure 10-24: Context menu

- **Current control**

  Current control is an **method** that calibrates the system for real-time each test point automatically during the test. The AutoStar software controls the output voltage in order to achieve the calculated current. Before the software calculates the current that corresponds to the magnetic field density (below called MFD) for each test point.

- **Multipoint calibration**

  Multipoint calibration is a method where each test point has to be calibrated **prior to** the test. For that the user must measure the MFD via a **sensor** or with an **external** device for each test point.

  During a test AutoStar adds the measured difference between set value (MFD of the test point) and actual value.

- **Singlepoint calibration**

  With singlepoint calibration AutoStar creates automatically one test point representative for all other test points. Than the calibration has to be performed in the same way as for the multipoint calibration but only for the single representative test point.

  During a test AutoStar adds the difference measured for this single representative test point to each user created test point.

NOTE!
The current control method is very reliable and can be used for the most applications. Multipoint- and singlepoint calibration is used only for specific requirements.

NOTE!
AutoStar uses only the sensor that is supplied with the Solar 9230-1 coil for single and multi point calibration. Other sensors are not supported. External sensors may still be used separatly and externally from the built-in feature of the PA 5640 or PAM 5240.

10.4.1 Current control

If you select current control the current control frame will appear. There you can adjust the accuracy of the current control by moving the sliders for '+'- and '-' tolerance, refer to figure 10-24.

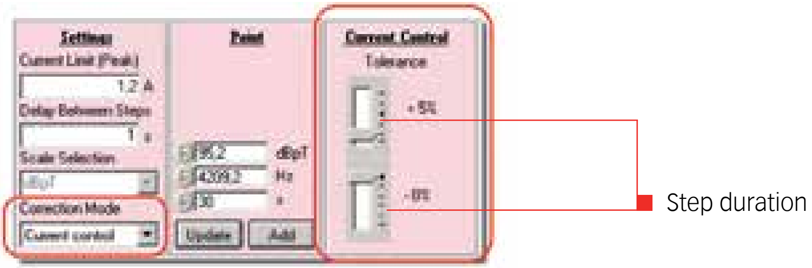


Figure 10-25: Current control frame

After selecting current control the user can start the test. As described above the system calibrates on-line each test point. The active test point is marked by a red dot that lies behind the green test point. So if the active test point meets the specified test point exactly it looks like a red outline around the green point, refer to figure 10-25.

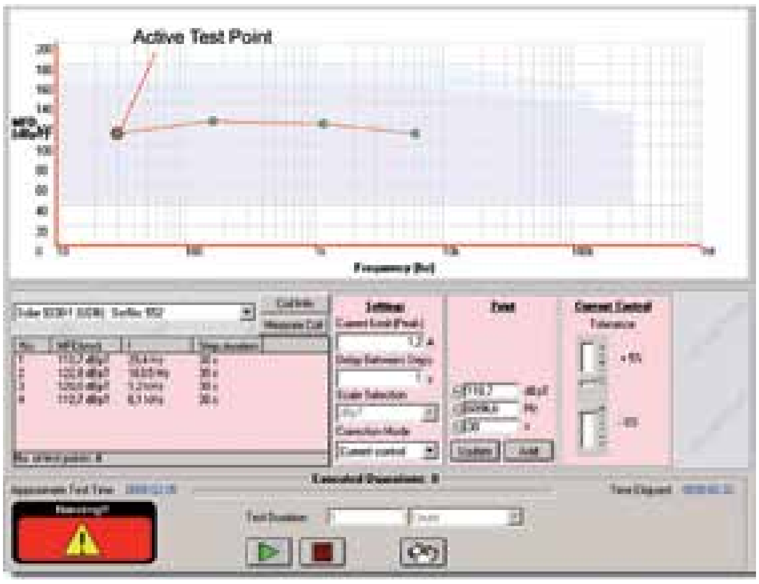


Figure 10-26: Test running with current control

Current ranges

As described above the AutoStar system generates a certain current to reach the related MFD depending on the connected coil. To realise the wide range of current values the internal battery works with three different internal resistances (Rint), refer to the table below. For a current greater than 1.2 A an external power amplifier is necessary. The result from that is that the current range is divided in up to four ranges.

> **NOTE!**
> **If the required current for a test point lies very close to the limit between two current ranges it may take some time for calibrating this test point.**

Irange	Internal resistance, R_{int} (W)	External source required?
1.2 A ≤ I_{max} A	n/a	Y
30mA ≤ 1.2 A	5 Ω	N
1 mA ≤ 30 mA	166 Ω	N
0 mA ≤ 1 mA	5 kΩ	N

10.4.2 Multipoint calibration

If you select multipoint calibration the multipoint calibration frame will be openened.

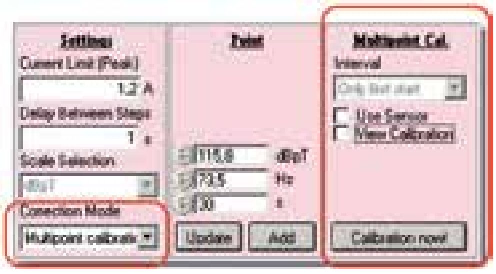


Figure 10-27: Multipoint calibration frame

In this correction mode you have to perform a calibration previous to the test. For that you must accomplish the following steps:

Step 1: Create your test points or load a predefined test.

Step 2: Click on the calibration now button. A dialogue will be opened prompting the user to start the calibration.

Figure 10-28: Calibration dialogue

Step 3: Click on the OK button. Now a voltage is impressed on the coil and the MFD has to be measured by a sensor. There are two measurement methods that can be applied, refer to section 10.4.4 Measurement of MFD.

Step 4: After a short delay the external calibration dialogue will be opened. This dialogue comprises a field where you can input the measured MFD value.

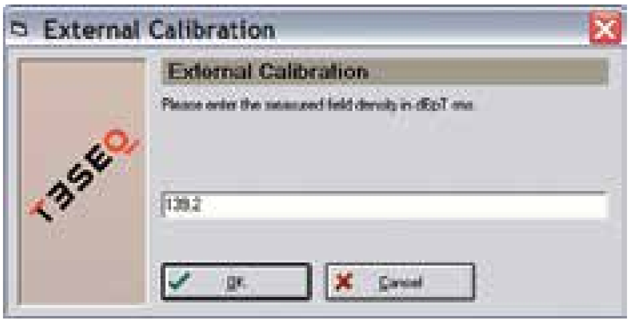


Figure 10-29: External calibration dialogue

Step 5: Confirm your input. After a short delay the external dalibration dialogue will be opened for the next test point. Now you have to repeat the steps as described before for each test point.

If you select the check box view calibration in the multipoint calibration frame the measured values will be displayed as black dots in the graphical display, refer to figure 10-29.

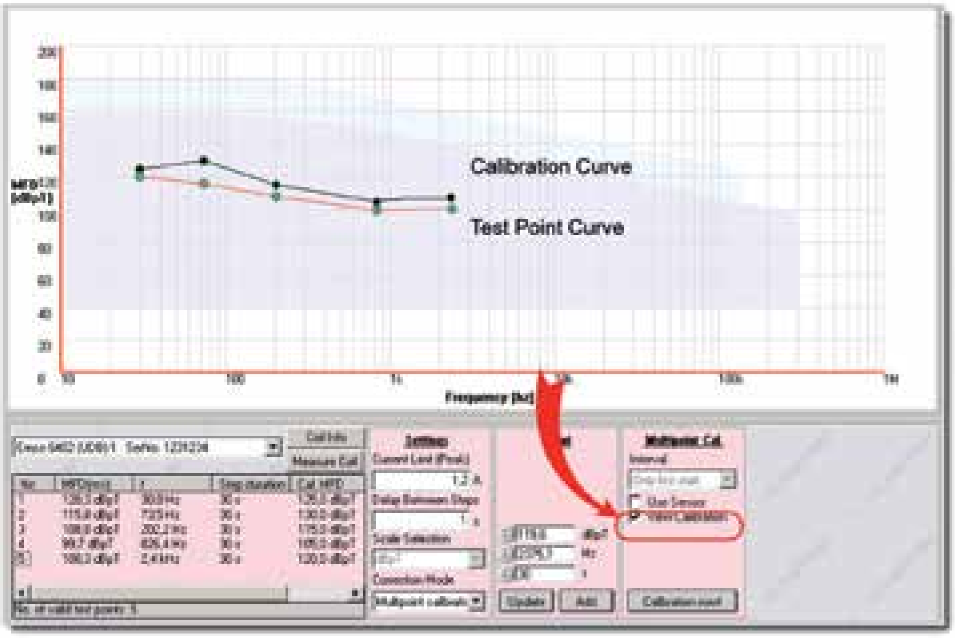


Figure 10-30: External calibration dialogue

Now the calibration is finished and the user can start the test.

NOTE!

⇨ **The calibration is only correct as long as the test setup is not changed (e.g. the use of different cables).**

⇨ **If you change one of the test points the whole calibration has to be repeated.**

10.4.3 Singlepoint calibration

If you select singlepoint calibration the singlepoint calibration frame will be openened.

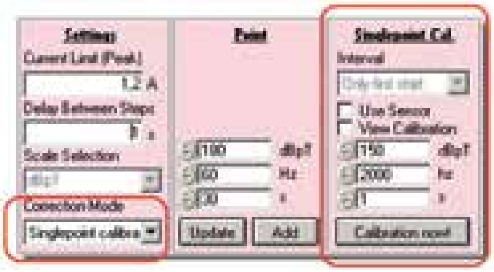


Figure 10-31: Singlepoint calibration frame

In the middle of the graphical display you will find a blue dot, refer to figure 10-33. This is the representative test point the system will calibrate on.

In this correction mode you have to perform a calibration previous to the test. For that you must accomplish the following steps:

Step 1: Create your test points or load a predefined test.
Step 2: Click on the calibration now button. A dialogue will be opened prompting the user to start the calibration.

Figure 10-32: Calibration dialogue

Step 3: Click on the OK button. Now a voltage is impressed on the coil and the MFD has to be measured by a sensor. There are two measurement methods that can be applied, refer to section 10.4.4 Measurement of MFD.

Step 4: After a short delay the external calibration dialogue will be opened. This dialogue comprises a field where you can input the measured MFD value.

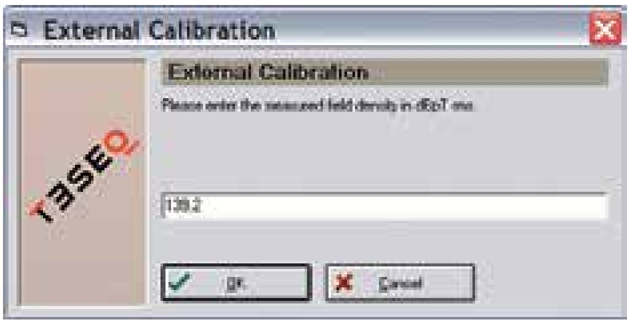


Figure 10-33: External calibration dialogue

Step 5: Confirm your input.

If you select the check box view calibration in the multipoint calibration frame the measured value will be displayed in the graphical display, refer to figure 10-33.

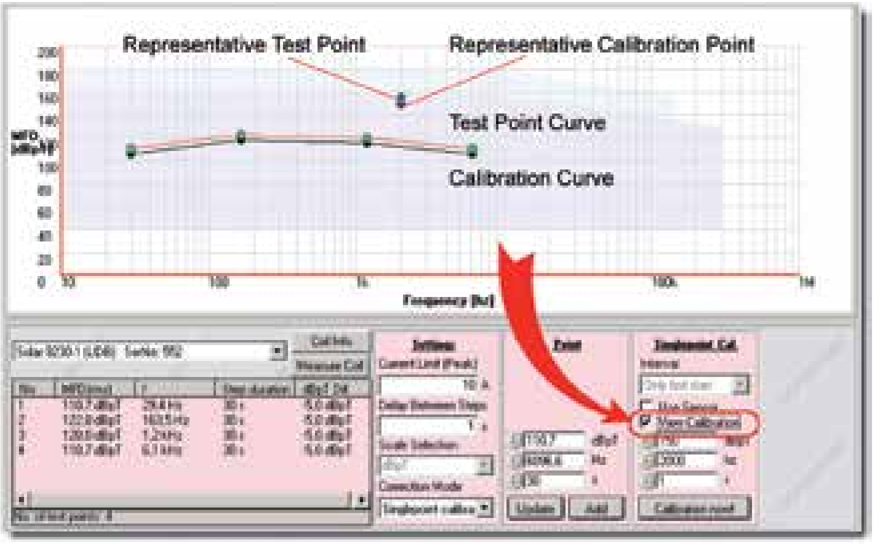


Figure 10-34: View of calibration points

Now the calibration is finished and the user can start the test.

NOTE!
The calibration is only correct as long as the test setup is not changed (e.g. the use of different cables).

10.4.4 Measurement of MFD

There are two measurement methods that can be applied:

➩ You can use your own field density meter to measure the magnetic field density (MFD).

NOTE!
It is important to ensure that the measured values are entered in dBpT. For example, if the user has a field density meter that measures in µT the user must convert to dBpT. That is,

dBpT = 20 log µT + 120 dB

At the end of a calibration the user may view/print or save a calibration report.

➩ You can use the **sensor 9229** that optionally can be delivered with the AutoStar system. This senor can be connected to the AutoStar system and you can read the measured MFD values directly from the screen. For that click on the check box UseSensor. The sensor 9229 frame will be opened, refer to figure 10-34.

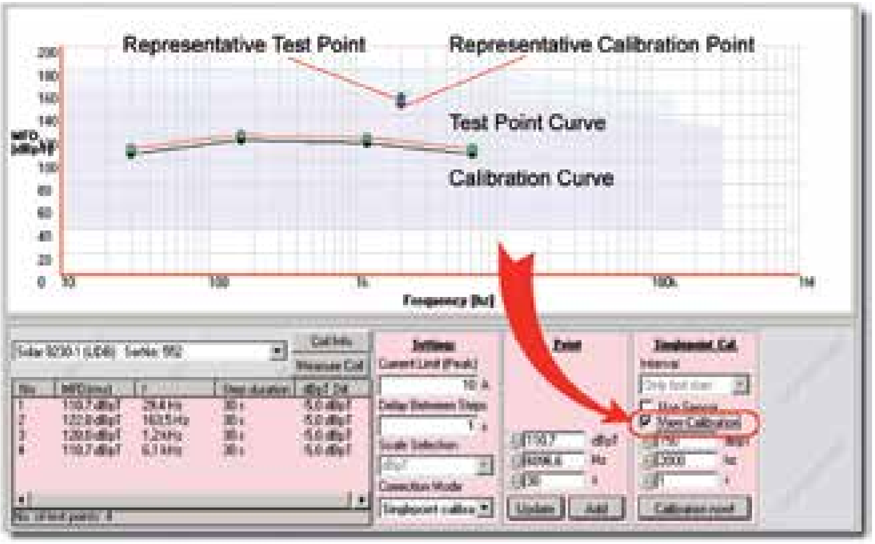


Figure 10-35: MFD Measurement display

This frame contains a slider where you can adjust the accuracy and it shows the actually measure MFD value.

Measurable values. Test points below this green line can not be measured accurately enough and will treated as invalid.

If you move the slider in the sensor 9229 frame down the green limiting line will also move down. This means that now more inaccurate values will be allowed.

10.5 Run time control

The run time control section controls how long a complete test. Figure 10-35 shows the run time control section.

Figure 10-36: Run time control section

This section consists of a progress bar, a test duration section, a time elapsed counter, an approximate test time message, control buttons and an option to insert a message before running a test. For details please refer to section 5.3.5 Running a test.

11 TRANSMISSION LOG UTILITY

NOTE!
If your AutoStar Software is running with Win NT 4.0, the transmission log utility does not work.

The transmission log utility is a very useful debugging tool.

When the transmission log is open and connected all Tx or Rx transactions are registered. The diagram below shows the complete Tx and Rx transactions for a demo test. The window will show the last 200 transactions.

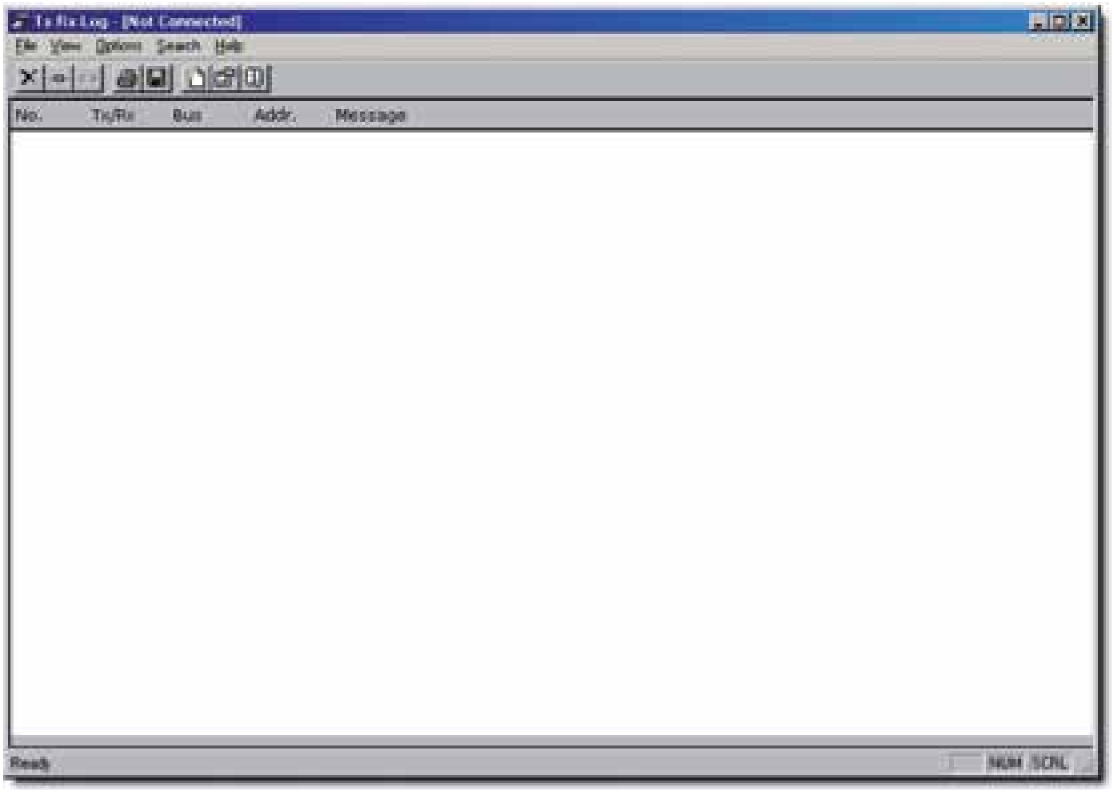


Figure 11-1: Scope utility screen

The list shows the transaction number, whether it was Tx or Rx, which bus was used (if other than the IEEE bus the address is shown) and the message sent or received. When the 200th transaction is logged it will cycle back to number 1.

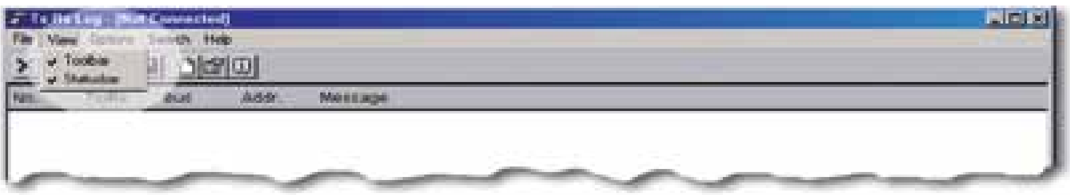
Opening the transmission log during a test it is possible to view the transactions in real time.

11.1 Transmission log menu bar

File menu

Select the appropriate menu command to perform the following function.
– Connect to TX/RX log server
– Disconnect from TX/RX log server
– Print the log
– Save log to file as…
– Quit the application

View menu



Select the appropriate menu command to perform the following function.
– View the transmission log toolbar
– View the transmission log statusbar

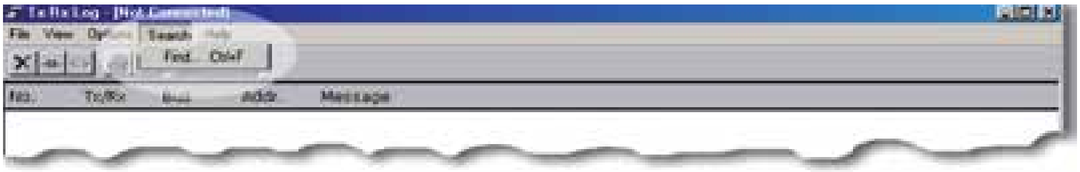
Options menu

Select the **always on top command** to view the transmission log in front of all other open windows.

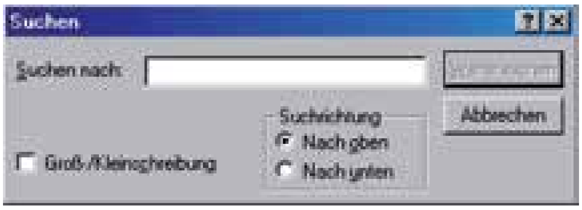
Select the **Clear Syslog** command to clear the transmission log of all transactions.

Select the **Configuration** command to open the remote connection set-up Window as shown below.

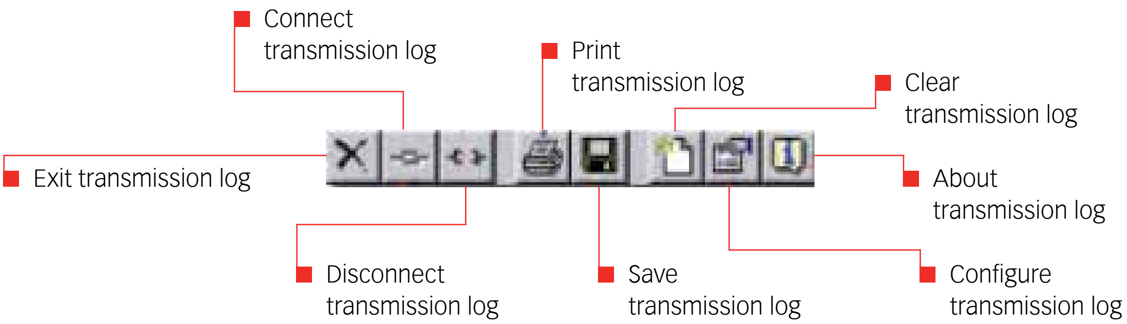
Options menu



Select the file command to open the file window as shown below. Use this window to search all transactions up and down for required information. Type the search details in the text entry box. Click the check box to match the case of the search to the transmission log text.



Transmission log toolbar



AutoStar
Software guide
Doc.no 601-310D, released March 2011

Note:
The description in this manual refers to the software version: 5.0 (and higher) and version 6.0 (and higher) as the two versions are functionally identical for the purposes of this guide.

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