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**GRAPHICAL SIGNAL GENERATOR AND SIMULATOR**
**POST PROCESSOR SOFTWARE**

# *WaveMAKE*




## Features

- Import filters included for a wide range of popular simulator formats such as SimView®, Verilog®, etc.
- Generate and edit digital signals with a multi-function graphic waveform editor.
- All signals, input stimuli and output response, can be displayed simultaneously in one viewing window.
- Signals may be in any format -- digital, analog, arbitrary or mixed.
- Export SCPI files for use by SR2500/SR5000/SR5500 Digital Test Subsystems.
- Pattern editor for editing digital files.
- Arbitrary waveform editor.
- Fast Fourier Transfer (FFT) analyzer.

interface TECHNOLOGY

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# Powerful Tool For Linking
## Design and Test Environments

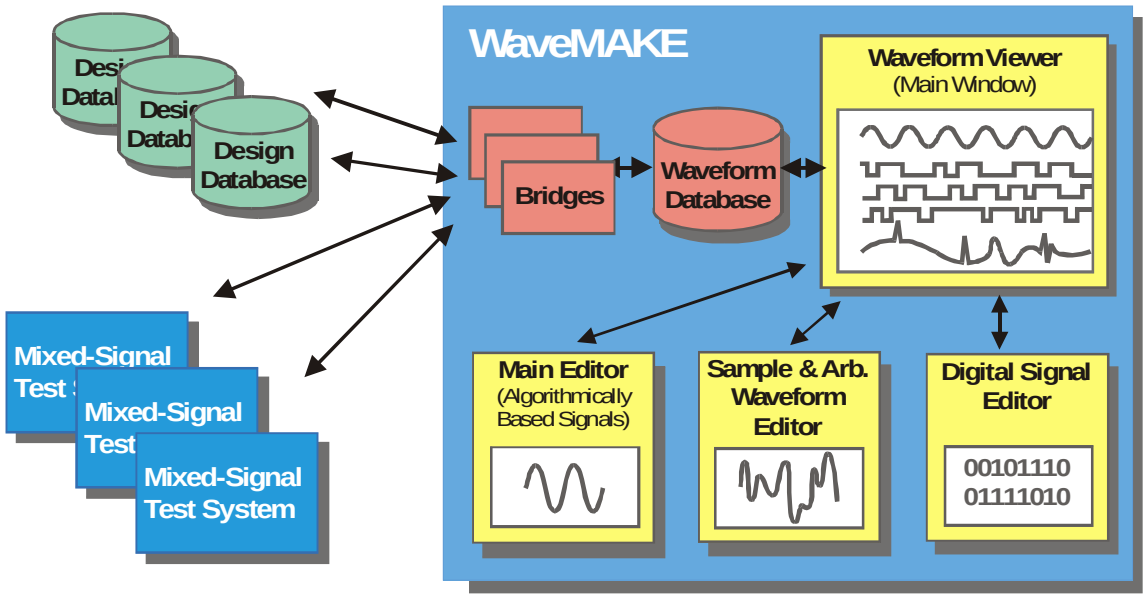



*Figure 1.*
*WaveMAKE serves as an interface between design and test, allowing the user to manually interact with signals obtained from a simulator. Signals for test can also be generated by the user in WaveMAKE, and responses from a test can be visualised. Test hardware may consist of analog as well as digital resources.*

## Software

WaveMAKE can export/import signals to and from a mixed signal environment. WaveMAKE serves as the link between the design environment (simulation) and the physical test environment (test system). Using WaveMAKE, simulation results from the most popular simulators can be downloaded to the SR2500/SR5000/SR5500 Digital Test Subsystems for generation of actual electrical signals. Similarly, WaveMAKE allows the actual response of a device under test (DUT) to be captured and displayed. Industry standard simulators that are currently supported include: AccuSim®, Catalyst®, Edisplay®, ELDO®, Epic®, EpicEvt®, Native®, PWSF®, SimView®, SmartSpice®, VerilogPoc®, and WGL®.



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# Main Editor/Viewer

## Shows All Input/Output Signals Simultaneously




*Figure 2.*
*The* **Main Editor/Viewer** *serves as a viewing window for all signals and permits editing of the main properties of both digital and analog signals.*

## Main Editor/Viewer

***WaveMAKE*** provides a unique environment where all signals -- input stimuli as well as output response -- can be viewed simultaneously in a single window with a common time reference. Patterns can be represented as analog, digital, arbitrary or a mix of any combination thereof. The viewing of all types of signals in one window is significantly more convenient than viewing digital and analog signals in separate windows (see Fig 2).



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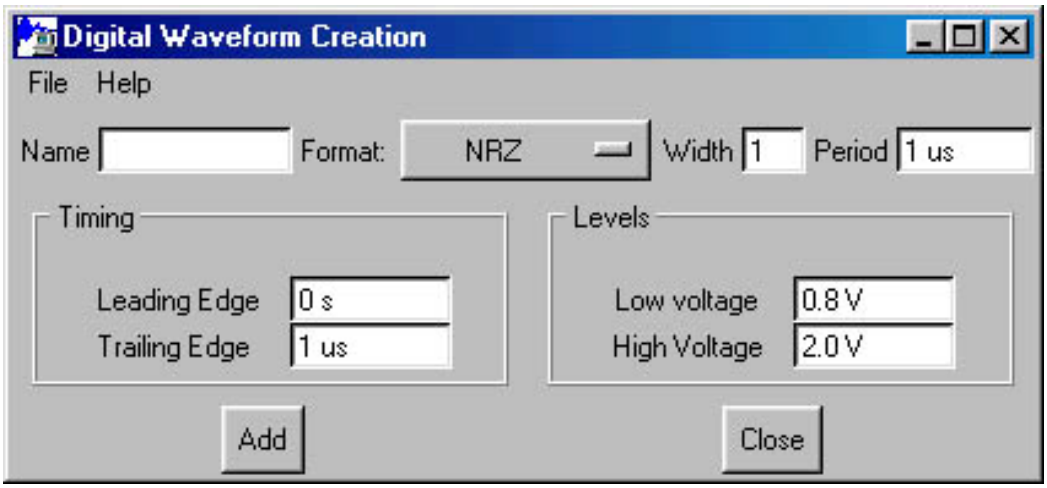



*Figure 3.*
*Default setup of a new waveform. All parameters can be modified by the user.*

## Digital Waveform Creator

In ***WaveMAKE,*** each Digital waveform is divided into frames, or a sequence of frames — each frame, in turn, is composed of a primitive, which can be created using algorithmic operators. An algorithmic signal may also be generated using the ***Expression Editor***. Each frame is defined by means of the ***Frame Editor,*** from where complex analog expressions can be written. To ease the generation of digital signals, a ***Digital Waveform Creator*** and ***Pattern Editor*** are included to create and manipulate the digital waveforms. The ***Digital Waveform Creator*** provides a default setup of a 1-bit waveform, but the settings can easily be changed to a user-defined setup. An NRZ (non-return-to-zero) format and TTL levels are the default settings. The user can select other formats as the test may require, including RZ (return-to-zero), R0 (return-to-one), R1 (return-to-inhibit), SBC (surround-by-complement), plus Window and Edge. The user can modify all settings and name the waveforms as desired.



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# Digital Pattern Editor;
## Edit One Waveform or Many Simultaneously




*Figure 4.*
*The* **PatternEditor** *can show as many channels as specified by the user. Byte-wide data will appear with 8 characters per vector position.*

## Digital Pattern Editor

The Pattern Editor is used to generate and edit patterns for one or more digital waveforms. It operates on the currently selected digital waveforms. To edit a waveform, it must be selected first using the “Tree-Selector” visible in the left side of the ***Main Editor/Viewer.*** One or more waveforms can then be selected using the Ctrl-key. Following this, the ***PatternEditor*** is selected from the ***Plugins*** menu.



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# Vector Generator
## For Algorithmic Pattern Selection

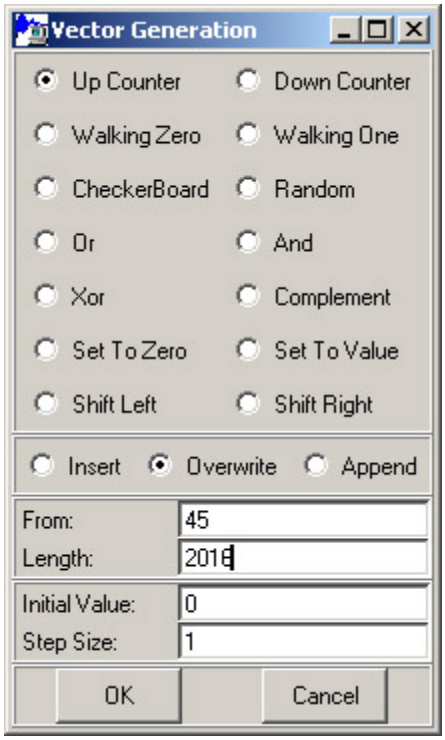



*Figure 5.*
*The Vector Generator supports easy generation of algorithmic-based patterns. The starting point and length of the pattern is defined as well as the initial value and step size.*

## Vector Generator

Data can be manually entered in the ***Pattern Editor***, plus copy and paste functions for block copy are also supported. In addition, data can be imported from a file -- e.g. from a simulator. To allow for fast data generation a ***Vector Generation*** can be initiated from the ***Pattern Editor*** menu. This provides for generation of data content like Up and Down Counter, Walking Ones and Zeros, Checkerboard, etc. It is followed by a set of options specifying how the generated pattern should be merged with the existing pattern. When pattern editing is finished, the patterns are written back to the main viewer by selecting the “Update” or “Close” from the File menu.



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## Converting Waveforms to SR-series Format

To convert the ***WaveMAKE*** waveforms to a SR2500 setup, for example, you need to use an SR2500 export filter. When using ***WaveMAKE*** as a standalone tool, a filter is invoked by activating the ***File>Export*** menu entry of the ***Main Editor/Viewer.*** This displays a list of available filters, and allow you to select a filter and a file to contain the converted waveforms. When the selection has been made, the filter is executed. The filter may ask you for additional information, such as the name of the tester pins to which the waveforms should be exported. When this information has been provided, the filter converts the waveforms, and places the results in the specified file or files.

When using ***WaveMAKE*** as a standalone tool, the following steps are necessary to export the waveforms to a set of files in SR2500 format:

1. Specify the filter and target file for the export operation using the File->Export dialog (see Fig 6).

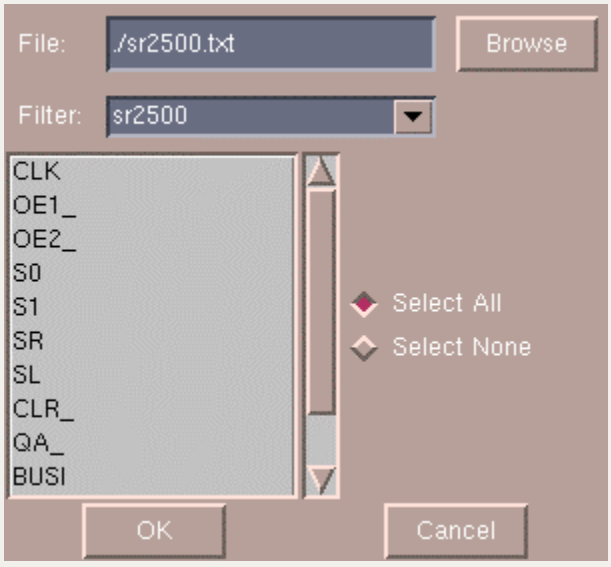



*Figure 6.*
*Specifying the target file and export fields*



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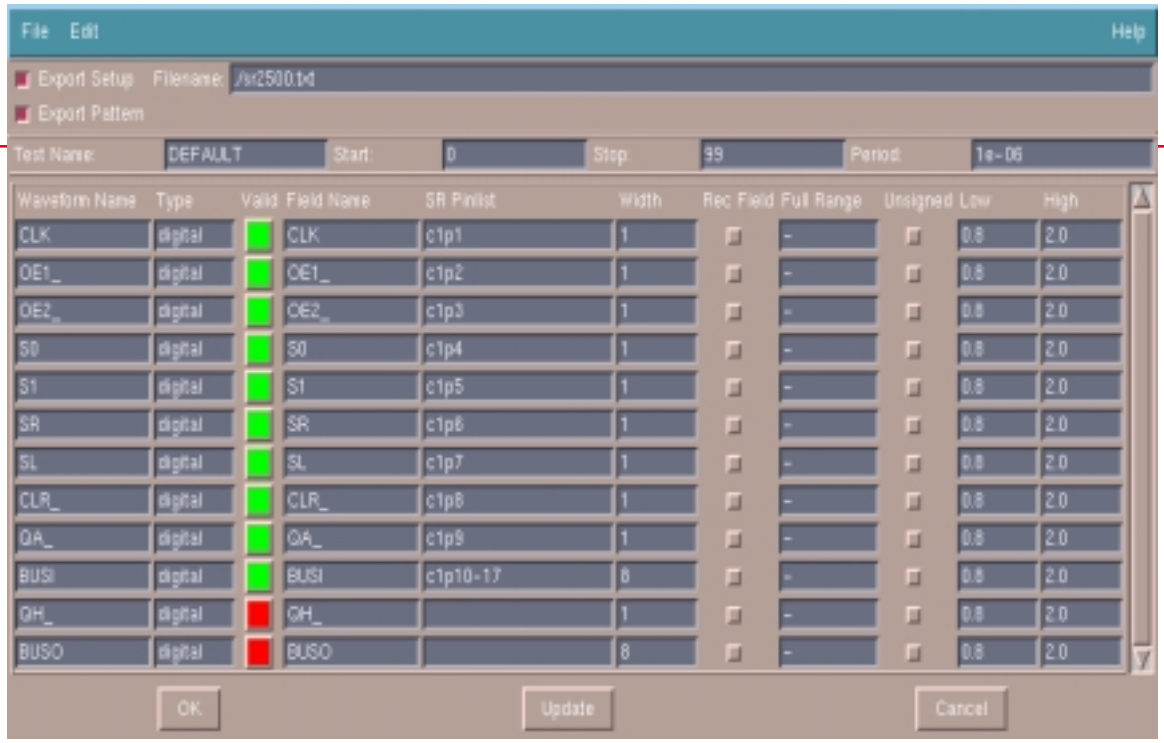



*Figure 7.*
*The Export filter from* **WaveMAKE** *to the SR2500 Digital Test Subsystem.*

2. Select the name of the filter to use (SR2500), the waveforms to export (default all), and the target filename to which the waveforms should be exported, and press the OK button.

3. The SR2500 filter is executed. This filter pops up a window (Fig 7), containing a parameter line for each waveform to be exported.

   Most of the parameters have been filled out with default values, that should require no changes. One field that needs to be filled out however is the mapping between waveforms and tester channels. The notation for specifying tester channels is the standard CxPy SR2500 channel notation. In Fig 7, the tester channel fields (SR Pinlist) has been filled out, except for the last two waveforms. When all tester channel fields have been filled out, press the “Update” button at the bottom of the window to check the validity of the tester channel assignments. Now, the two red buttons should change to green, indicating that the setup is valid.

4. Next, press the “OK” button to export the waveforms. When the export operation has finished, the window will be removed from the screen.

   The export operation results in a number of files being generated, depending on the export mode chosen.



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# Extra Bonus Utilities Include
## PDM Converter, FFT Analyzer and More

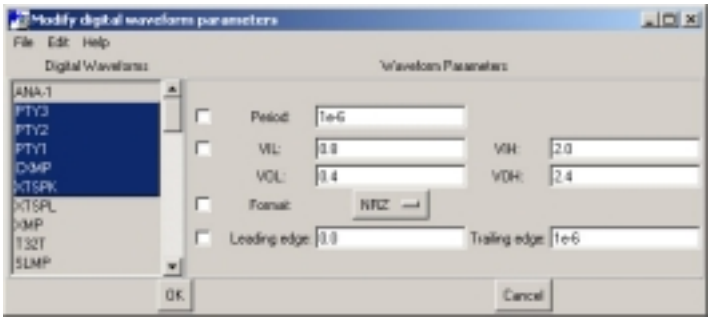



*Figure 8.*
*A utility is provided for quick modification of general parameters like input or output levels, format, timing, etc.*

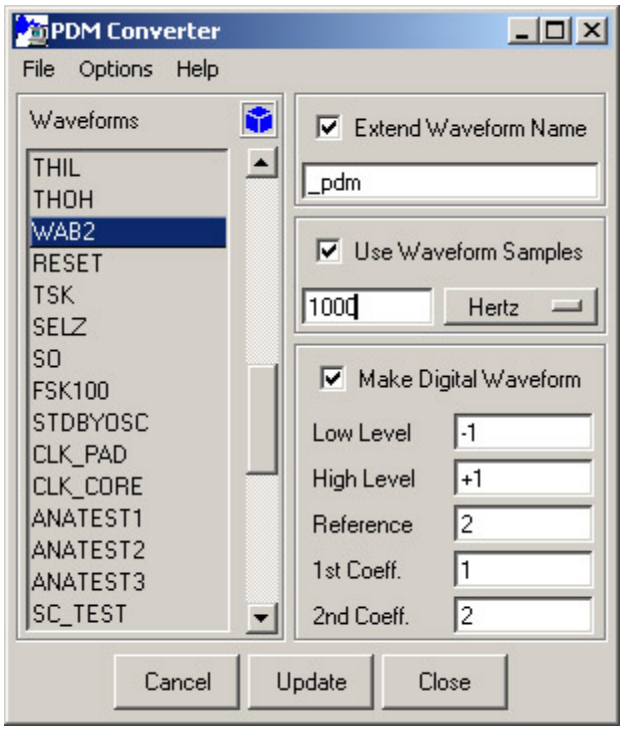



*Figure 9.*
*Utility for conversion of analog data to PDM.*

## Bonus Utilities Speed Test Program Development

***WaveMAKE*** provides a number of dedicated support functions in addition to the features already described, e.g. a ***Modify Digital Waveform Parameter*** utility, This allows quick modification of general parameters like I/O levels, format, timing, etc.

FFT analysis tools (fast fourier transformation) is provided with ***WaveMAKE***. It supports traditional FFT analysis based upon powers of two, and also a multi-radix based FFT that allows the use of any number as the radix for the FFT lengths. Hence it is possible to have FFTs based upon 1.000 points or 2.000 points, 5.000 points, 10.000 points, 20.000 points and 50.000 points (not shown).

Utilities for converting signals from analog-to-PDM are also available. Using these, a conversion can be obtained in an easy manner, just specify a few characteristics of the PDM conversions (see Fig 9).



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## Summary

***WaveMAKE*** simplifies defining and entering Digital patterns for the SR2500/5000/5500 using a Graphical User Interface and intuitive templates. This is in contrast to many test systems where programming is a complex and time consuming task, typically calling upon the user to program long sequence of low-level driver commands. ***WaveMAKE*** has automated this process by incorporating high-level drivers in conjunction with digital signal processing, providing maximum functionality with a minimum of programming.

Import filters for the most common digital simulators augment the easy to use digital pattern editors and extend the usefulness of ***WaveMAKE*** by bridging the world of digital design and digital test.

Packaged together, ***WaveMAKE*** and the SR2500, SR5000 or SR5500 Digital Test Subsystems make a powerful, yet flexible platform for testing a variety of digital and mixed-signal devices.

## SR Series of Digital Test Subsystems



SR2500



SR5000



SR5500

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- *VXI Digital Pattern Generators*
- *VXI Digital I/O Modules*
- *VXI Digital Pulse Generators*
- *VXI Development Products*
- *Benchtop ARINC 429 Bus Analyzer*
- *Hand-Held ARINC 429 Bus Analyzer*
- *Benchtop MIL-STD-1553 Bus Analyzer*
- *Benchtop Digital Word Generators*
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