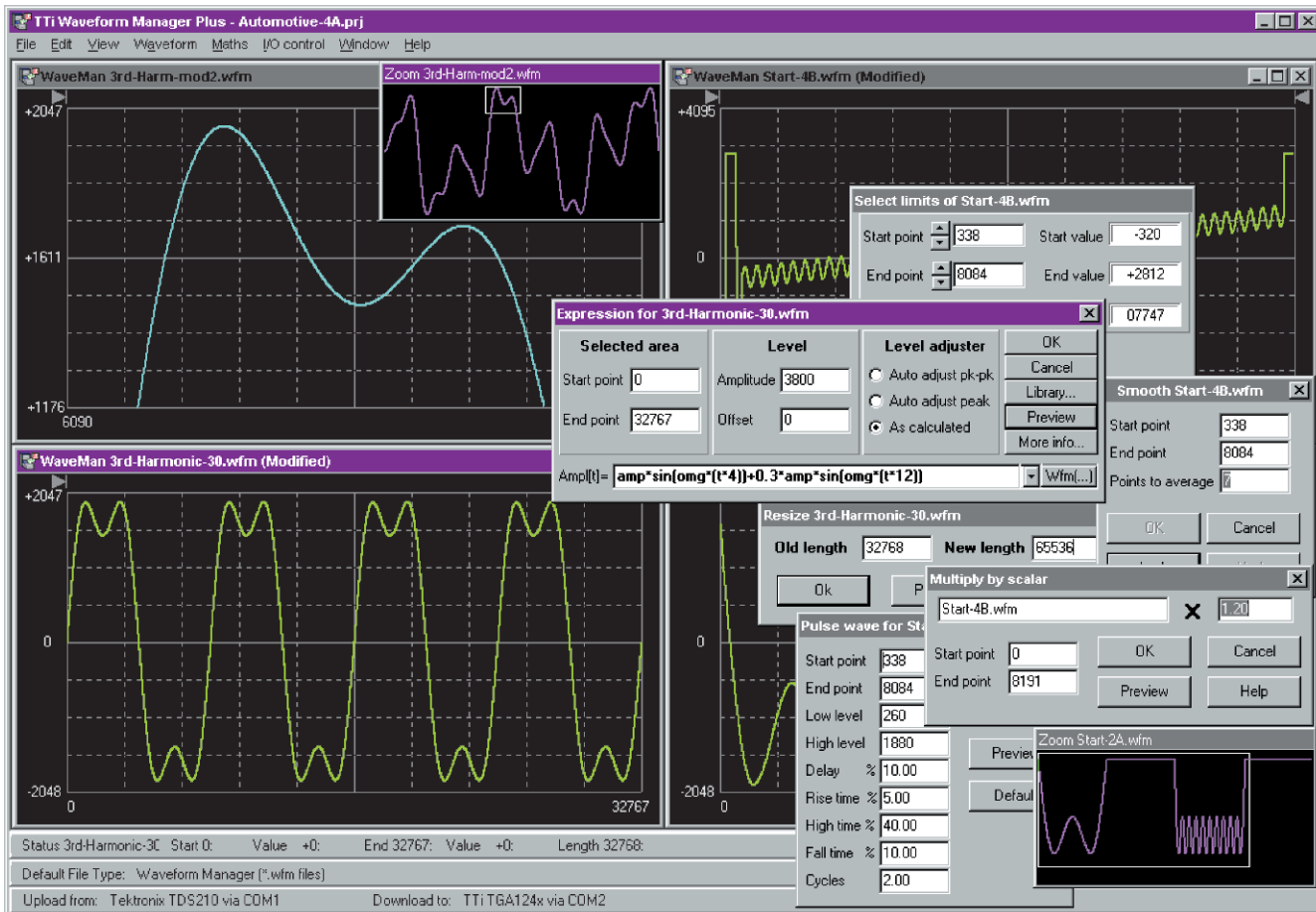# TTi

THURLBY THANDAR INSTRUMENTS

Waveform Manager Plus v4

Advanced waveform creation, editing and management

Supports all TTi products with arbitrary waveform capability

Full waveform building tools including maths expression editor

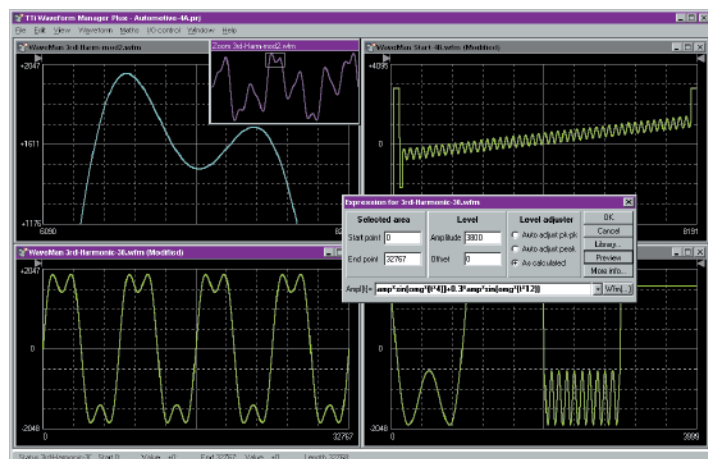Supports up to 1M points at up to 16 bit vertical resolution

Direct waveform import from CSV files and via clipboard

Supports OS from Windows 2000® through to Windows 7®

tti-test.com

Aim TTi

Waveform Manager Plus - version 4

ADVANCED WAVEFORM CREATION, EDITING & MANAGEMENT

Version 4 of this highly regarded Windows program includes support for the latest TTi generators and for LAN interfaces where fitted.
Direct import from CSV files has been added along with improved I/O functions and support for the latest Windows operating systems.

WAVEFORM BUILDING TOOLS

TOOLKIT
Waveforms can be built in any number of sections using any combination of the following: Standard waveforms, mathematical expressions, drawn waveforms, uploaded waveforms, imported waveforms, existing stored waveforms.
Note: Waveform section limits can be defined via moveable cursors which can be dragged or positioned numerically.

STANDARD WAVEFORMS
The following waveforms are available directly from the Waveforms dialogue box: Sine, square, triangle, pulse, ramp, sinc [sin(x)/x], gaussian, exponent, noise, and cardiac*.
Note: The mathematical expression for any standard waveform can be examined by opening the expression editor window.

EXPRESSION EDITOR FUNCTIONS
The following mathematical operators are available within the expression editor: Add, subtract, multiply, divide, x^n, sin, cos, arcsin, arccos, abs, $\log_{10}$, $\log_e$, e^n, square root, floor, ceiling, random, pulse, in conjunction with constants and waveforms.
Note: The expressions used for each section of a waveform are retained and can be displayed in a drop-down window.

EXPRESSION LIBRARIES
The mathematical expressions used for waveform creation can be stored in libraries. A default library is created for each project which includes a number of useful examples including waveshapes and modulations.

WAVEFORM DRAWING FUNCTIONS

Waveforms can be created or edited using freehand drawing and/or point to point line drawing.

SMOOTH
Waveforms can be smoothed using a running average filter. Start and end points can be specified as well as the number of points to average.

WAVEFORM EDITING/CONVERSION

TOOLKIT
All of the waveform building tools previously mentioned can be used to edit existing waveforms. In addition waveforms can be manipulated directly using the following functions:

RESIZE WAVEFORM
Allows a waveform to be resized horizontally to any length between 4 and 1M horizontal points.
Note: The vertical resolution of a waveform is automatically adjusted when it is downloaded to the target. Thus an 8-bit waveform from a DSO will be expanded to 12-bits if it is downloaded to a 12-bit generator (and vice versa).

WAVEFORM MATHEMATICS
The Waveforms Maths function allows waveforms to be combined and manipulated independently of the expression editor. Waveforms can be scaled, offset, added, subtracted or multiplied using dialogue boxes.
Note: Waveforms can also be combined and manipulated within the expression editor giving access to the full range of mathematical functions.

INPUT/OUTPUT FUNCTIONS

FILE FORMATS
Waveforms can be read from and saved as any of the following formats: WFM (binary), NRM (normalised data in ASCII), WAV (WaveCAD), ASC (WaveCAD), DSF (Tektronix DSO).

WAVEFORM DOWNLOAD/UPLOAD
Waveforms can be downloaded/uploaded to/from TTi arbitrary generators using either an RS232, GPIB (IEEE-488), USB or LAN interfaces dependant on which interfaces are fitted to the target generator.
Where COM ports are used, version 4 allows the use of any port from COM1 to COM256. On TGA1210x and TGxx11 generators, a Flash memory device can be used for the transfer instead of the digital interfaces.

DIRECT .CSV IMPORT
A general purpose csv parser is incorporated which allows import of any detected column of data in a csv (comma separated variables) file.
This is the most widely used format for storing data that can be represented graphically. A graphical preview is offered before confirmation.

CLIPBOARD FUNCTIONS
Waveforms can be imported to the program and exported from the program using the Windows Clipboard.
Waveform import uses the "Text" clipboard format (i.e. numeric lists). This enables waveforms to be imported from spreadsheets such as Excel and from mathematical programs such as MathCad. Values are automatically normalised and re-scaled.
Waveform export creates multiple clipboard formats of Text (normalised numeric values between ±1), Bitmap (as per on-screen display) and Picture (metafile retaining waveform vector properties).
Note: Pictures or bitmaps can be pasted into programs such as Word for documentation purposes.

DISPLAY AREA AND PRINTING
Multiple waveform windows can be open simultaneously. Each window is fully scaleable.
Variable zoom is provided with panning from a "navigator" sub-window.
Waveform section limits can be defined via moveable cursors which can be dragged or positioned numerically.
Waveforms can be printed with automatic annotation and scaling.

MANAGEMENT AND UTILITIES

PROJECTS
To maintain good housekeeping, waveforms can be organised into "projects" with separate directory structures. Each project maintains its own library of expressions. Waveforms and expressions can be imported and exported from other projects.

INSTRUMENT SETUP
The instrument setup screen enables options for the waveform generator to be set from the program. Examples of settable options are output amplitude, clock frequency and trigger source.

HELP
Full on-screen Help is available with a hyperlinked contents table.

OPERATING SYSTEMS

Waveform Manager Plus version 4 is compatible with all version of Windows from Windows 2000 through to Windows 7, and including 64 bit versions.

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* Notes re Cardiac waveforms (version 4.01 onwards) :
Cardiac waveforms can be specified in terms of P, Q, R, S and T wave amplitudes, PR interval and segment, QRS duration, Ventricular activation time, QT interval and ST segment.

Designed and built in Europe by:

TTi

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