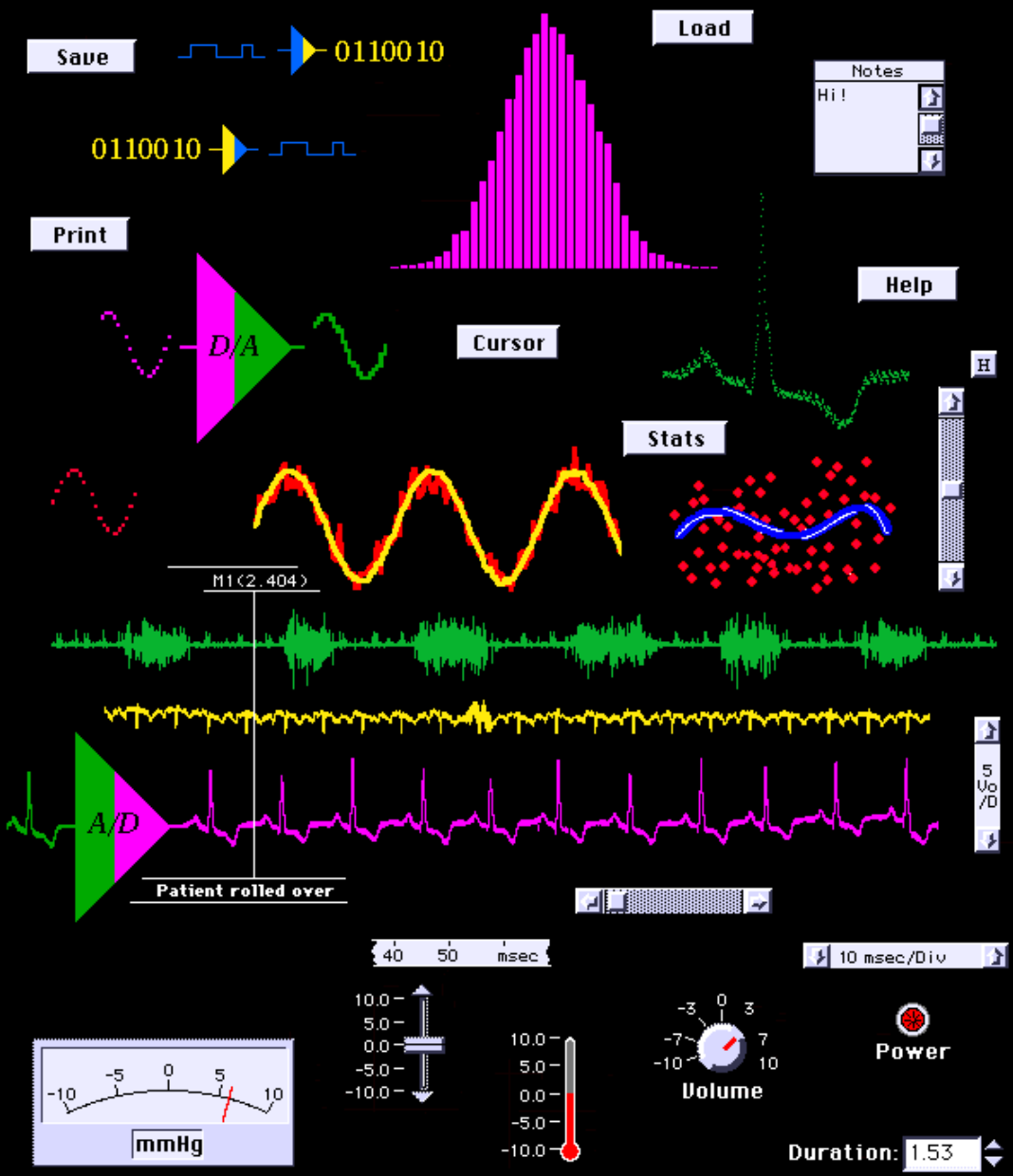
SuperScope II

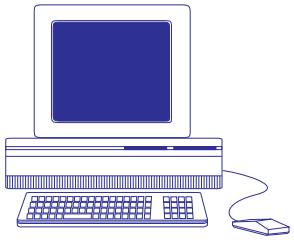
The World's Most Advanced Recording Tool



GW INSTRUMENTS
THE COMPUTER INSTRUMENT COMPANY

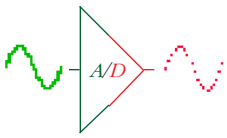
What Is Su

SuperScope II is Software

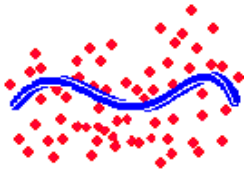


SuperScope II runs on a Macintosh

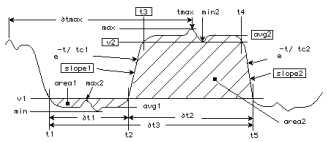
SuperScope II is a waveform processor that can:



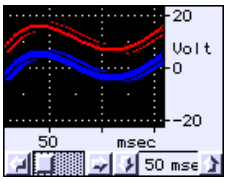
Digitize



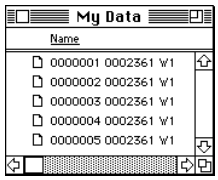
Calculate



Analyze

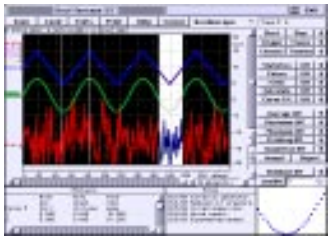


Graph

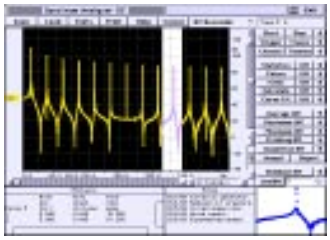


Database

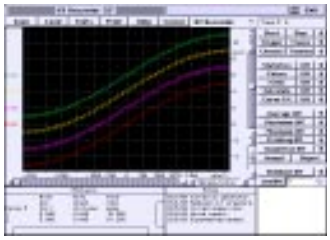
SuperScope II includes standard ready-to-go instruments:



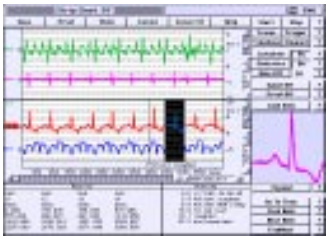
Oscilloscope



Spectrum Analyzer



XY Recorder



Strip Chart

SuperScope II can digitize long continuous waveforms, spool them to disk, plot and analyze every point, allow on-line annotation, and then support post-acquisition viewing -- it's the ultimate strip chart recorder!

Call An Applications Engineer
617/625-4096

PERSCOPE II?

SuperScope II can monitor and control IEEE-488 and RS-232 devices; read analog inputs (A/D), control analog outputs (D/A), and do digital I/O via GWI's MacADIOS Data Acquisition Hardware.

Product	Form	Analog Inputs				Analog Outputs			Digital I/O	
		# of Channels	Resolution	Input Ranges	Max Sample Rate	Outputs	Resolution	Ranges	Digital I/O Lines	Counter/ Timers
MacADIOS II/16	High Resolution A/D & D/A Nubus Board	8DI (56DI)	16bit	±5V, ±.5V ±.05V, 0-5V, 0-.5V, 0-.05V	55KHz (833KHz)	2 (8)	12bit (16bit)	±10V, ±.5V ±2.5V, 0-5V, 0-10V	8 (56)	3
MacADIOS II	A/D & D/A Nubus Board	16SE/8DI (112SE/56DI)	12bit (16bit)	±10V, ±1V ±.1V, 0-10V, 0-1V, 0-.1V	142KHz (833KHz)	2 (8)	12bit (16bit)	±10V 0-10V	8 (56)	3
MacADIOS II Jr	Low Cost A/D & D/A Nubus Board	16SE/8DI	12bit	±10V, ±1V ±.1V, ±.05V, ±.02V	40KHz	2	12bit	±10V	8	3
MacADIOS adio[1]	Low Cost A/D & D/A SCSI Device	2SE	12bit	±10V, ±5V ±2.5V, ±1.25V, ±.6, ±.3, ±.15V	28.8KHz	1	12bit	±5V	2	
MacADIOS 8ain[1]	Low Cost A/D SCSI Device	8DI	12bit	±10V, ±1V ±1V, ±.05V, ±.02V	28.8KHz					
MacADIOS 8dio[1]	Low Cost Digital I/O SCSI Device								8	

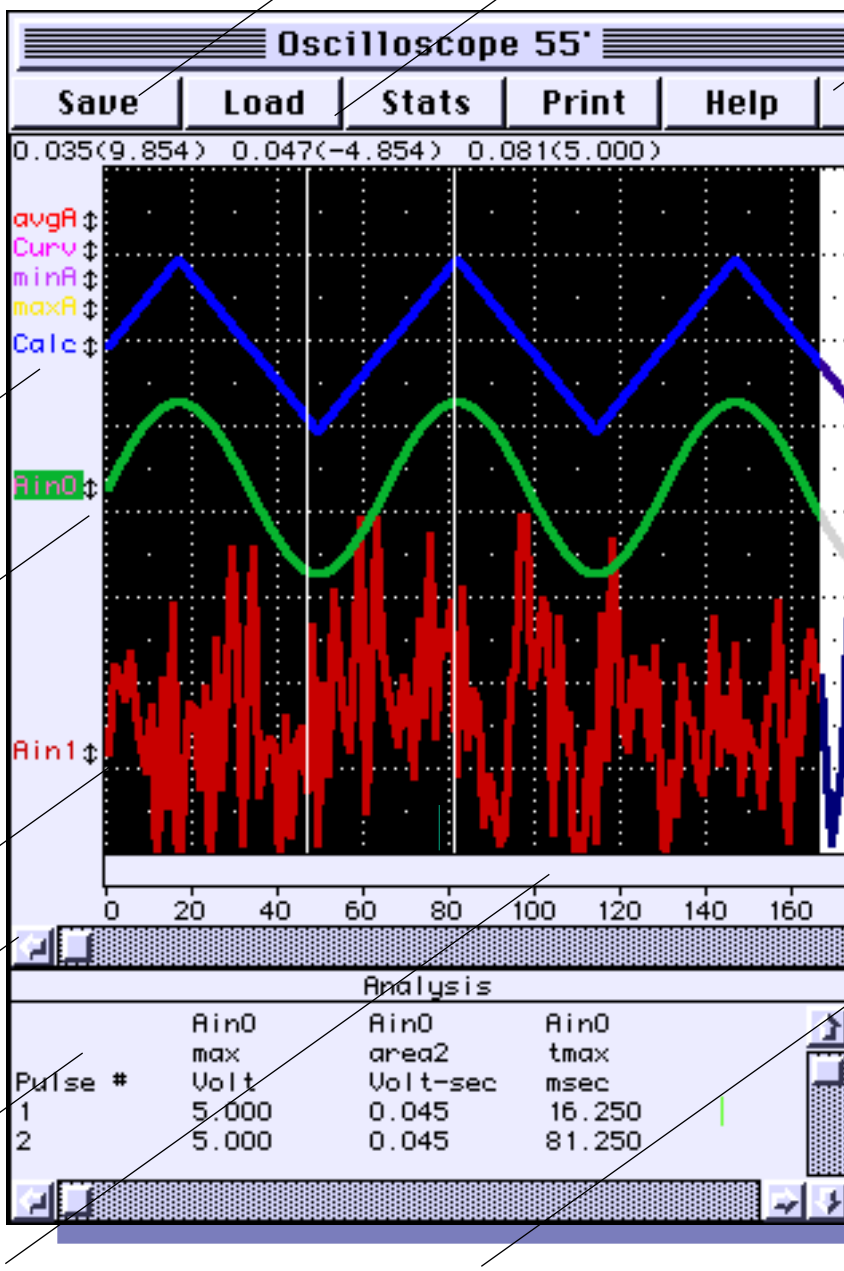
( ) Maximum Expandable Limit With Daughterboards. [1]Not compatible with 68040 or Faster Computers.

SuperScope II can easily export data to a spreadsheet, word processor, database, graphing or math application program.

SuperScope II is a Laboratory Instrumentation Design Environment that can be used to build Virtually any software instrument. Building SuperScope II instruments is as easy as setting up an Excel spreadsheet or a Filemaker database. SuperScope II is a full-featured application program like Excel or Filemaker; and NOT a programming language like C, BASIC, FORTRAN or LabVIEW.

It's A 21st Centu

SuperScope II includes this ready-to-run Oscilloscope, Spectrum Analyzer and XY Recorder Instrument; which is fully compatible with all MacADIOS A/D Hardware.



Wave labels are used to identify and select waves. Only one wave can be selected at a time, and once selected, the end user can Cut, Copy and Paste waveform fragments; redraw portions of a wave; vertically adjust a wave; and log wave coordinates to a journal.

The double arrow indicates a wave has been vertically adjusted with respect to the vertical scale labels at the right of the display. The end user can click on this symbol to snap a wave back into registration.

Plot of analog input #1 voltage vs. time

Horizontal position scrollbar

Analysis results are fed to this journal, (text-editor window) one row per trace at Run-time. Once the experiment is complete (i.e. set of traces is acquired), the tabular data in the journal is stored in a text file, which can be read by a spreadsheet or database.

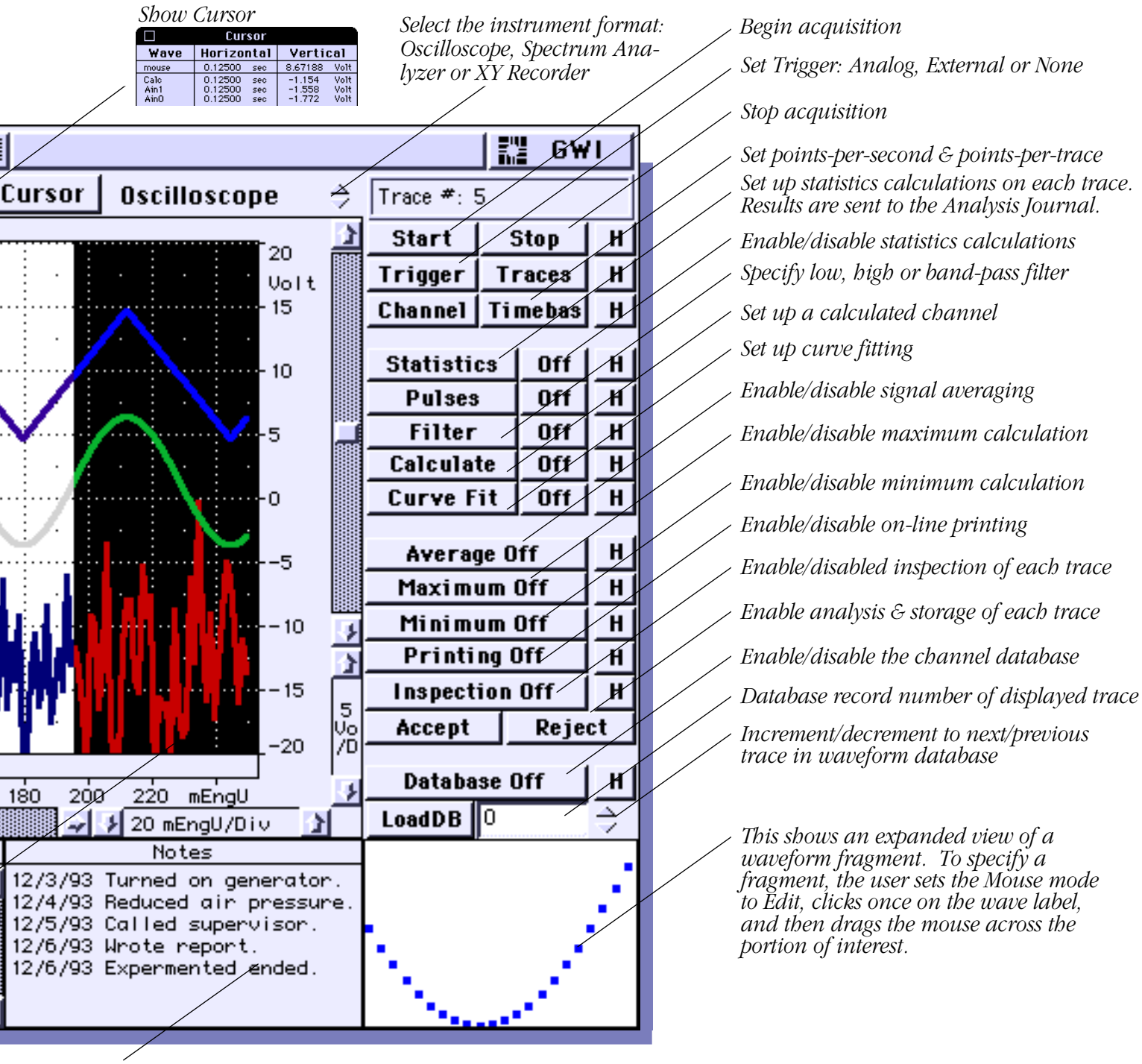
Displays

Displays are used to view and edit waveforms. They are extremely versatile with many customizable attributes such as horizontal and vertical controls, labels, markers and much more. Displays can be positioned on the front panel in any pattern and in any number, space permitting. Each display can contain up to 8 waves and supports mouse-driven Cut, Copy, Paste, and drawing of waveform segments.

Waves

Waves represent real world continuous data as a list of numbers that show a waveform when plotted. Waves are digitized, synthesized for output, viewed, edited, analyzed, used to hold the results of analysis, loaded from disk, and imported/exported to/from other application programs.

RY OSCILLOSCOPE...



Show Cursor

Select the instrument format: Oscilloscope, Spectrum Analyzer or XY Recorder

Begin acquisition

Set Trigger: Analog, External or None

Stop acquisition

Set points-per-second & points-per-trace

Set up statistics calculations on each trace. Results are sent to the Analysis Journal.

Enable/disable statistics calculations

Specify low, high or band-pass filter

Set up a calculated channel

Set up curve fitting

Enable/disable signal averaging

Enable/disable maximum calculation

Enable/disable minimum calculation

Enable/disable on-line printing

Enable/disabled inspection of each trace

Enable analysis & storage of each trace

Enable/disable the channel database

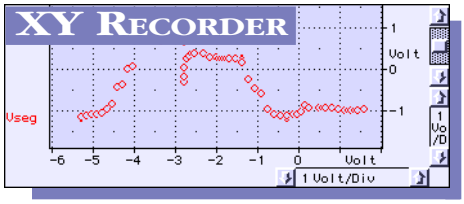
Database record number of displayed trace

Increment/decrement to next/previous trace in waveform database

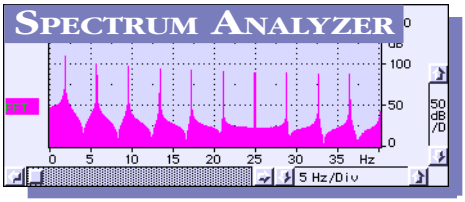
This shows an expanded view of a waveform fragment. To specify a fragment, the user sets the Mouse mode to Edit, clicks once on the wave label, and then drags the mouse across the portion of interest.

JOURNALS

Journals are text-editor regions that are used to enter, view and edit text in a manner similar to that done with a word processor. Journals can be resized and positioned on the front panel in any pattern and in any quantity, space permitting.



Turn the Oscilloscope into an XY Recorder with just one click!

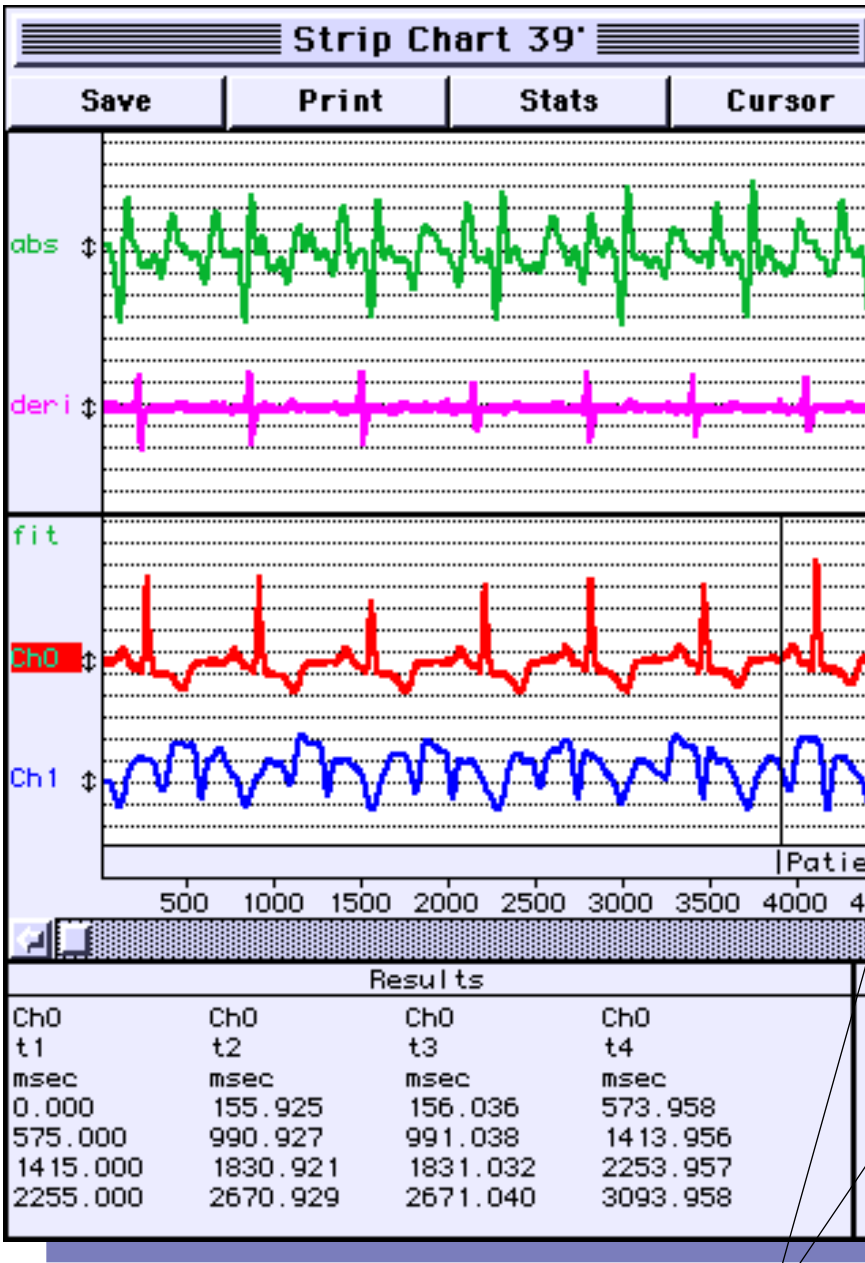


Turn the Oscilloscope into a Spectrum Analyzer with just one click!

It's The Ultimate Str

This Strip Chart Recorder can simultaneously:

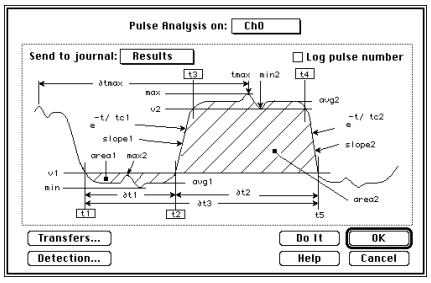
- *Digitize*
- *Plot and scroll*
- *Spool to disk*
- *Calculate*
- *Analyze*
- *Allow on-line annotations*



The Ultimate Recorder

The SuperScope II Strip Chart Recorder is the ultimate recording tool. It can digitize between 1 and 8 waveforms with a MacADIOS II/FIFO or MacADIOS II/16 FIFO digitizer board plugged into a Macintosh Nubus slot. In many cases, waves are analyzed as they are acquired with results being streamed to text windows in real-time. Digitized or computed waves can be spooled to disk, kept in memory, or discarded after being plotted.

Real-time Analysis



To analyze incoming pulses in real-time, the end user simply clicks on the parameters of interest in the above dialog box. Analysis results are streamed to other waves in memory, to disk, or to on-line text windows in real-time.

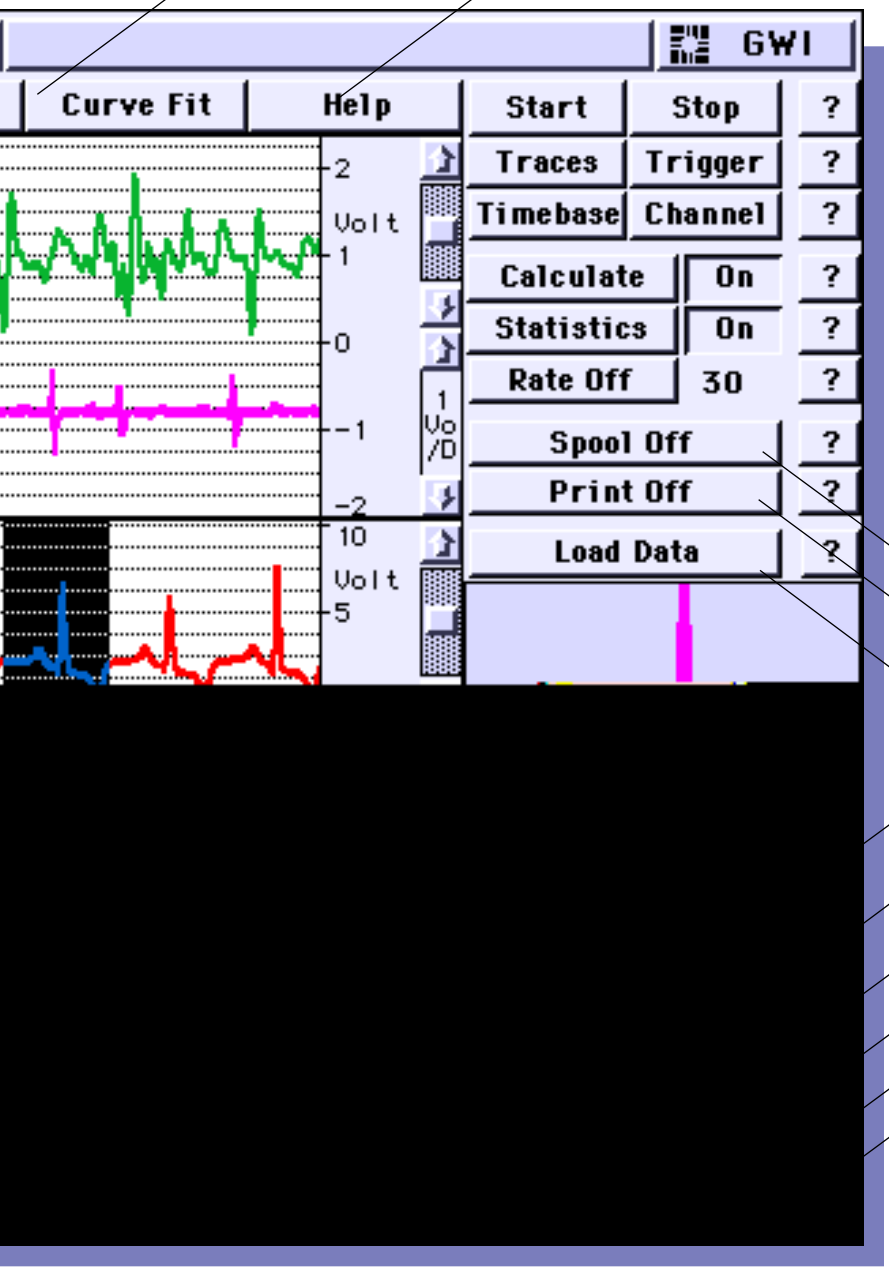
Spool To Disk

In some cases, RAM memory is not large enough to contain the acquired waves (each point consumes 2bytes). Subsequently, SuperScope II must spool them to disk in real-time. After the acquisition, disk-based streams are easily viewed with the horizontal scroll bar, or analyzed with a task.

Real-time Annotation

Observations can be documented at run-time by typing one-line time-stamped notes. Each note is shown under the digitized waves, at the position of its typing, after the acquisition.

IP CHART RECORDER...



Linear, polynomial, sine or exponential least squares curve fit on the selected wave

Opens Help text window

Enable/disable spooling to disk

Enable/disable run-time printing of incoming waves

Select a previously recorded disk-based stream for viewing with the horizontal scroll bar

Expanded view of selected region

Update the above display

Scroll display to specified time

Search for text in run-time note

Scroll to next run-time note

Scroll to next run-time note that contains specified text

Real-time Calculations

SuperScope II can process long streams (e.g. 10^9 points) of both digitized and calculated waves. Calculated waves are functions of digitized and other calculated waves. For example, one could digitize and plot 1 analog input wave, and also plot its derivative. There are over 80 math functions to choose from, as shown to the right. One can create as many calculated waves as desired, memory permitting; create as many displays as desired, front panel space permitting; and view between 1 and 8 waves in each display -- the possibilities of real-time waveform calculations and viewing are virtually infinite!

Abs
Alarm
Append
ArcCos
ArcSin
AutoCorrelation
AvgToDate
Blackman
Compress
Convolve
CopyTiming
Cos
CrossCorrelation
CrossPower
DeConvolve
Delete
DeMultiplex
✓Deriv
DerivFivePt
Exp
Expand
FFT
Hamm
Hann
Histogram
Imaginary
IndexSort
Insert
Int
Integ
IntegAV
IntegPT
IntegTL
IntegTV
InvFFT
Last
Limit
Ln
Log10
Mag
MakeComplex
MakeIndex
Maximum
MaxToDate
Minimum
MinToDate
Modulo
MvFFT
OnOff
Peak
Phase
PID
PulseEndTimes
PulseMaxTimes
PulseStartTimes
Real
Reciprocal
Reverse
SetBit
Shift
SignalAvg
Silent
Sin
Smooth
Sort
Spectrum
Sqrt
Tan
TC Linearize
TimeHisto
TimeValues
UnVoiced
Voiced
XYtoY

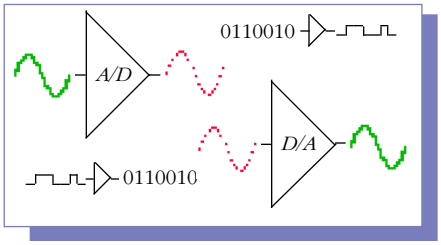
Real-time Hardware

Digitizing is done with a MacADIOS II or II/16 Nubus Board equipped with a module that independently digitizes into it's own 128KByte buffer. While this module acquires, the computer is free to analyze, calculate, plot, spool to disk, accept notes, and operate the menubar.

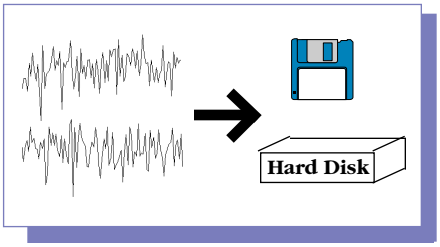
Digitizer	Analog Inputs # of Channels	Resolution	Input Ranges	Max Throughput Rate
MacADIOS II/16 FIFO[2] Part#GWI-625/16-FIFO	8DI	16bit	±5V, ±.5V ±.05V, 0-5V, 0-.5V, 0-.05V	50Ks/Sec[1]
MacADIOS II FIFO[2] Part#GWI-625-FIFO	8DI/8SE	12bit	±10V, ±1V ±.1V, 0-10V, 0-1V, 0-.1V	100Ks/Sec[1]

[1]*This is the maximum possible aggregate throughput rate. Actual results will depend on computer speed, video bits-per-pixel, # of channels, required analysis, and required displays.*
[2]*Requires a Macintosh computer with two empty 12" Nubus slots.*

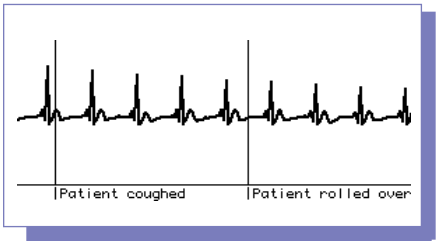
Things You Can Do



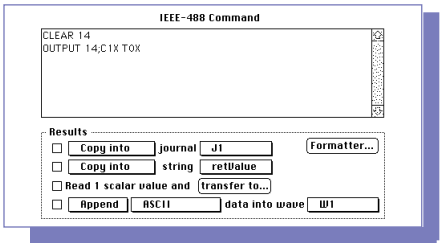
A/D, D/A & Digital I/O



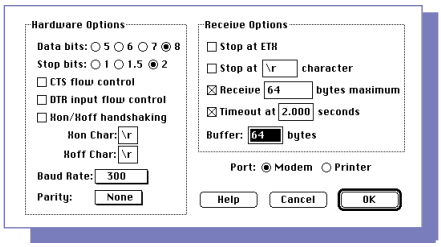
Spool To Disk



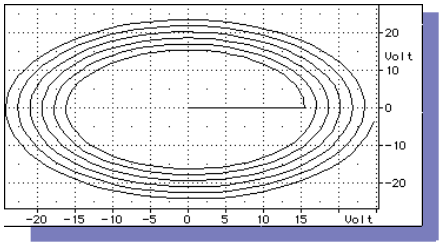
On-line Annotation



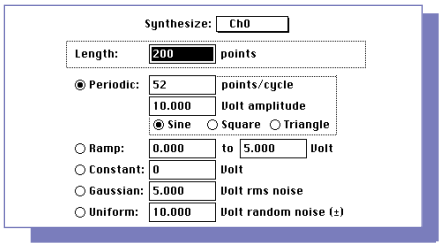
IEEE-488



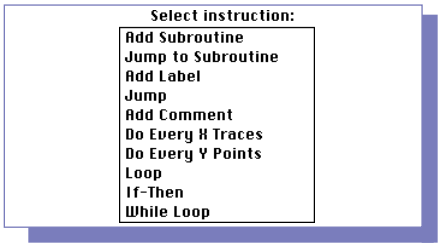
RS-232



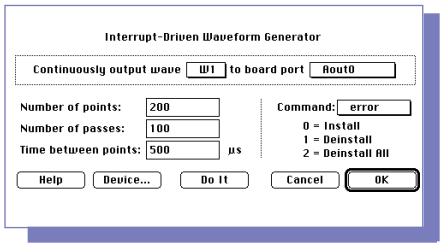
XY Displays



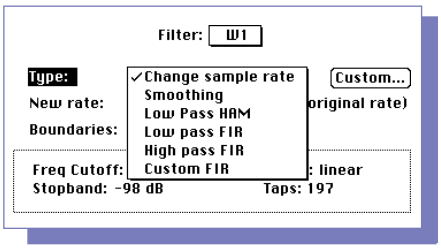
Synthesize Waves



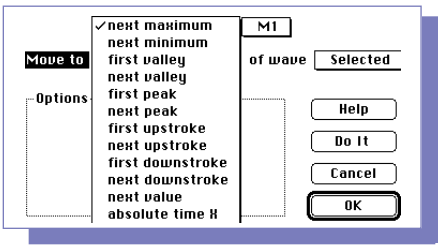
Programming Constructs



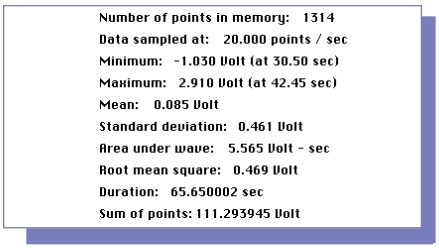
Arbitrary Waveform Gen.



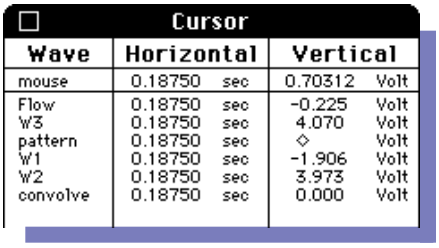
Filter



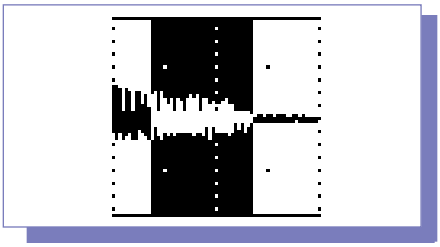
Move Markers



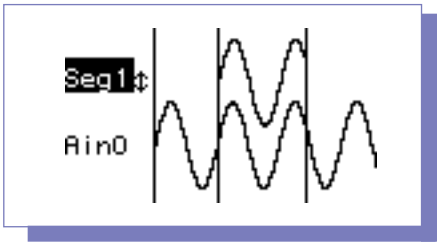
Waveform Statistics



Waveform Cursor



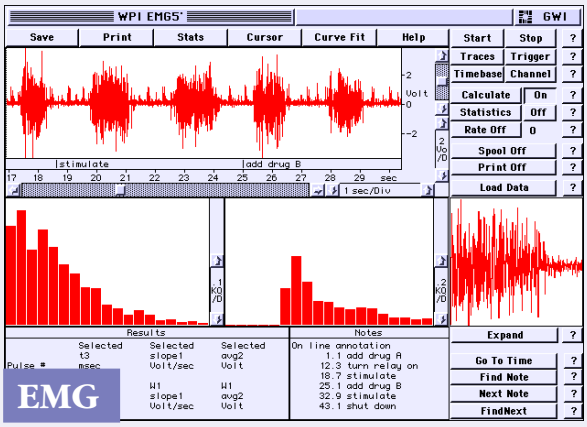
Cut, Copy & Paste Waves

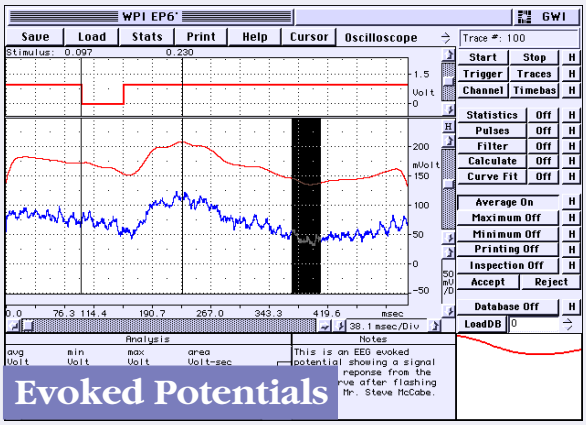


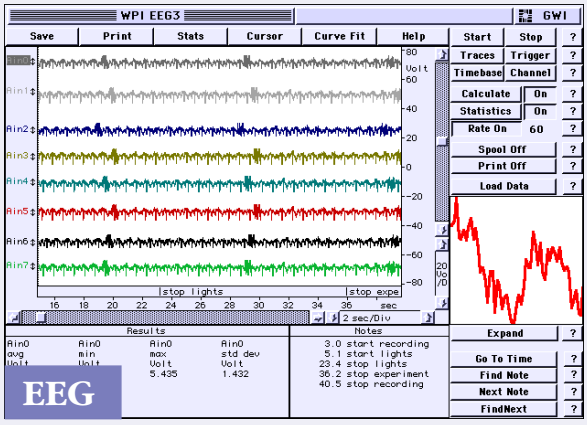
Analyze Wave Segments

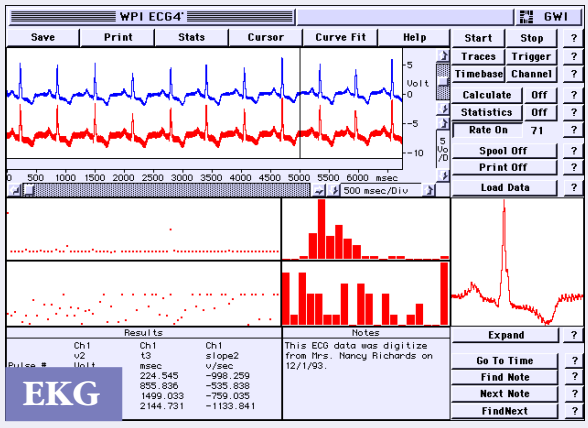
With SuperScope II

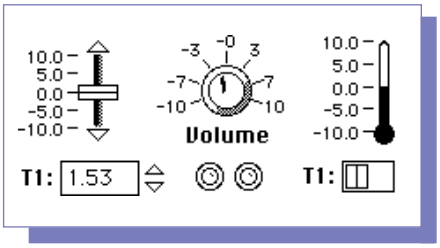
Example Physiology Instruments



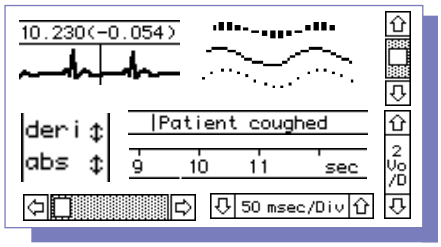




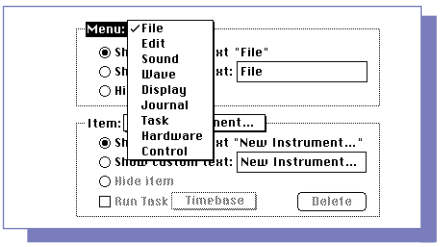




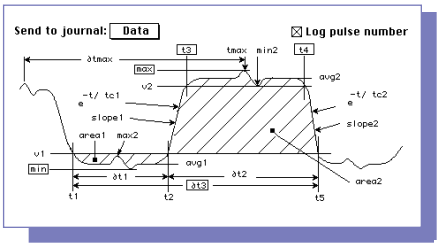
Virtual Instrumentation



Customize Displays



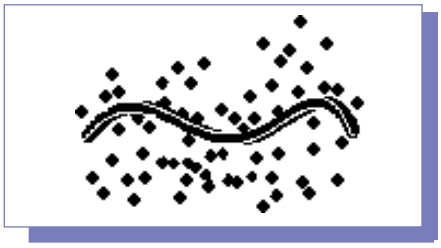
Customize Menubars



Pulse Analysis

+, -, *, /, <, >, <=, >=, ==, !=, modulo, square root, exponential, absolute value, natural logarithm, base 10 logarithm, round to integer, therm V to °C, sine, cosine, tangent, inverse sine, inverse cosine, inverse tangent, autocorrelation, increase sample rate, decrease sample rate, average value to date, max value to date, min value to date, waveform average, shift wave horizontally, return last trace, histogram, time histogram, find peaks, pulse positions, values given times, sort given indices, sort wave elements, indices for a sort, reverse elements, smooth by n pts, IIR filter, convolution, de-convolution, cross power, cross correlation, magnitude FFT, frequency spectrum, FFT, inverse FFT, Hamming window, Hanning window, Blackman window, complex to phase, complex to mags, complex to reals, complex to imag, real to complex, append waves, insert a segment, delete segment, derivative, 5 pt Lagrange deriv, integrate, integrate rst area = A, integrate rst time = T, integrate rst t1 t2, integrate rst X > V, beep if exceeds bds, apply high/low bds, compare two values, on/off control loop

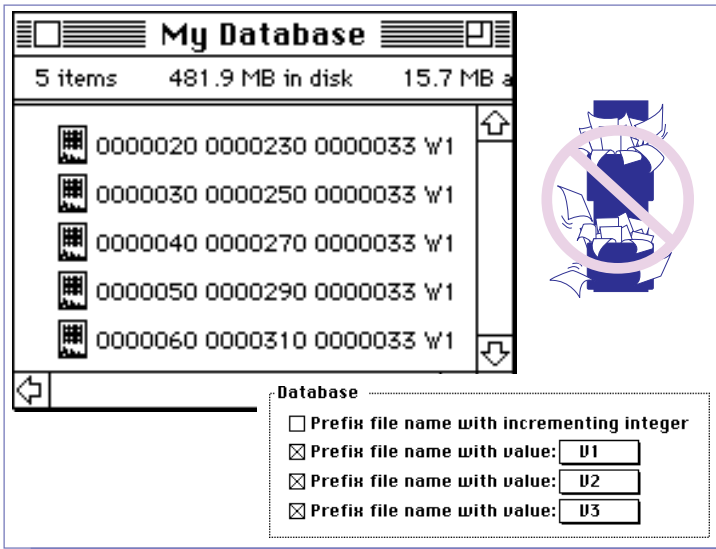
Waveform Math



Curve Fitting

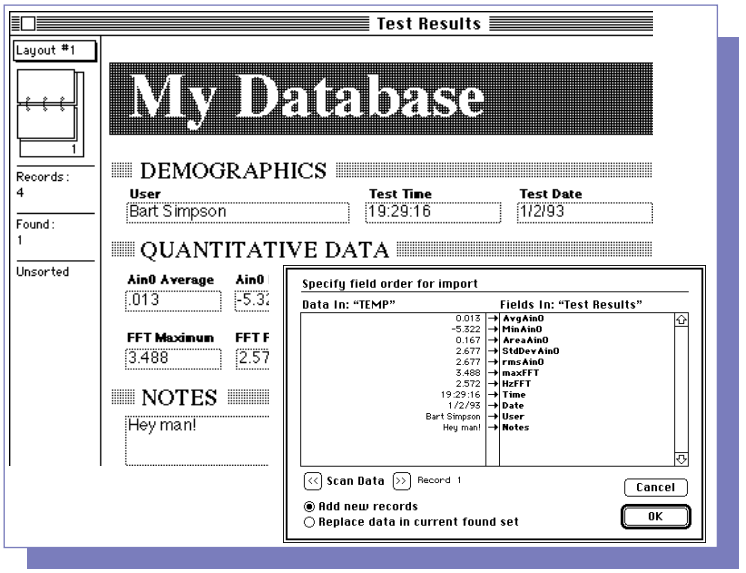
It Has Capabilities

Waveform Database



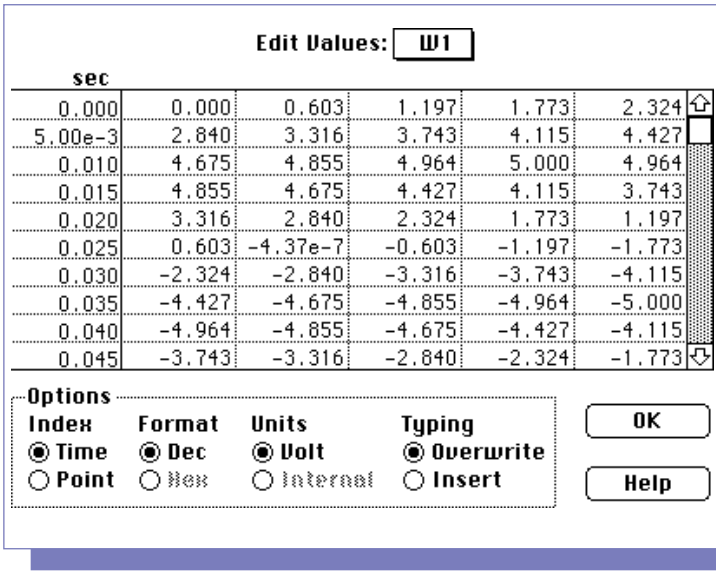
SuperScope II supports 1, 2 or 3 dimensional databases of wave and/or journal files, as illustrated above. The Disk I/O instruction appends 1, 2 or 3 indices to each filename, providing the ability to save and recover a large array of files on disk. Each database is kept in one folder, providing the ability to create and maintain independent databases.

Export To Database



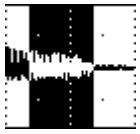
Textual data is easily transferred from SuperScope II to a database, spreadsheet, graphics, math, or word processing application program. Waves are often transferred as a column of numbers in text form. In the above illustration, 11 items are being imported into one FileMaker record.

View & Edit Waves



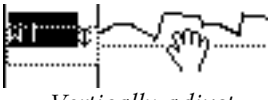
The **Value Editor**, illustrated above, is a spreadsheet-like environment that shows individual wave points in a 5 point-per-row matrix. Cells can be selected, cut, copied and pasted with the mouse. Wave segments are easily copied to the clipboard as a column of numbers.

Interactive Displays

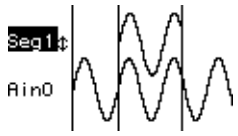


Graphically Select, Cut, Copy, and Paste waveform fragments

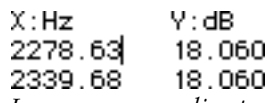
Draw stimulus and test waveforms



Vertically adjust overlapping waves



Use "Segments" (defined by one base wave and 2 markers) to isolate waveform fragments for analysis

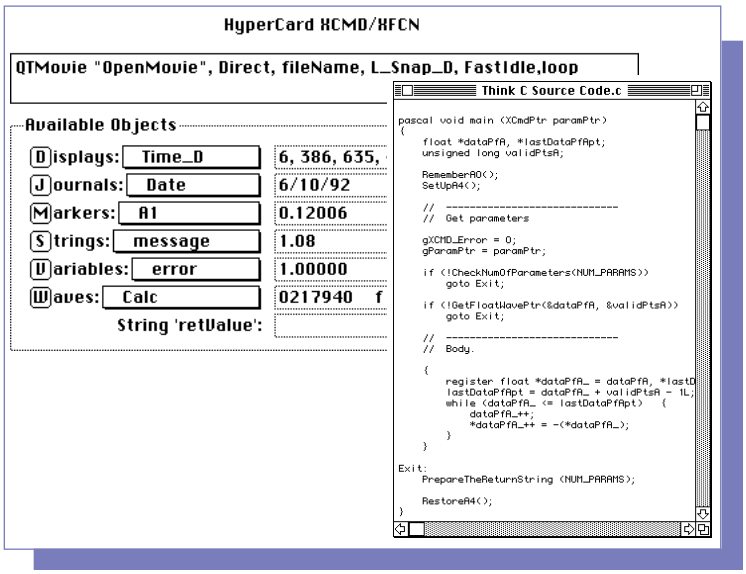


Log mouse coordinates to a Journal

SuperScope II Displays are extremely versatile with many customizable attributes such as horizontal and vertical scroll and position controls, labels, waves, markers and much more. Additionally, the mouse can be used to select waveform fragments for editing, vertically adjust overlapping waves, draw stimulus waves, log mouse coordinates to a journal, and horizontally shift vertical markers.

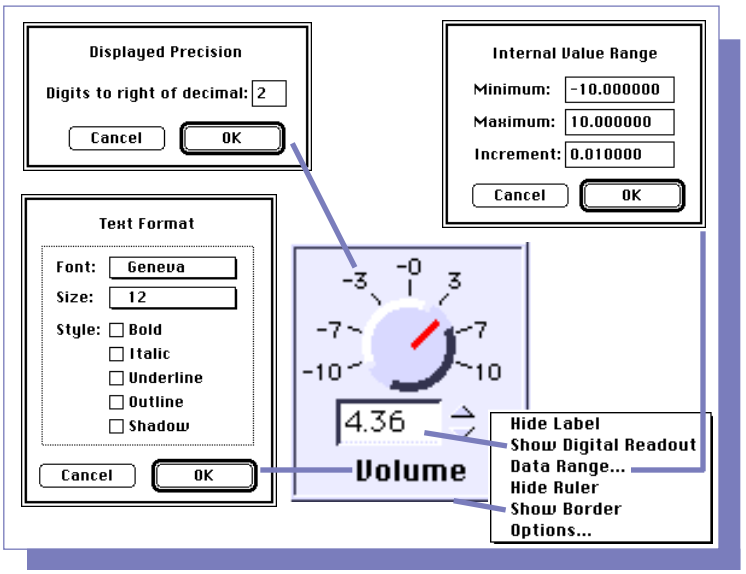
Beyond Compare...

HyperCard XCMD



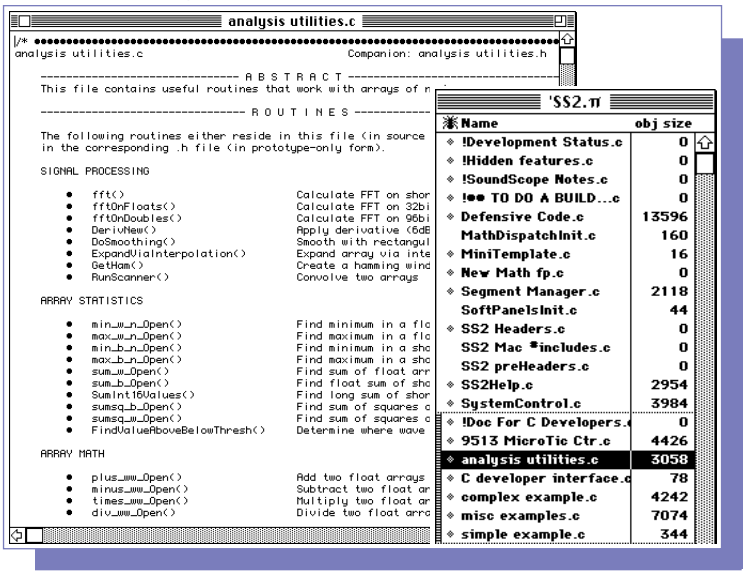
HyperCard 1.x XFCN functions are easily called from SuperScope II, providing access to multimedia devices such as tape recorders and frame grabbers; yet more exciting are the thousands of public domain XCMD/XFCN routines. Additionally, one can expand SuperScope II with end user written C, BASIC, FORTRAN or PASCAL XFCN routines. The above C source code implements a waveform complex conjugate.

Customizeable Controls



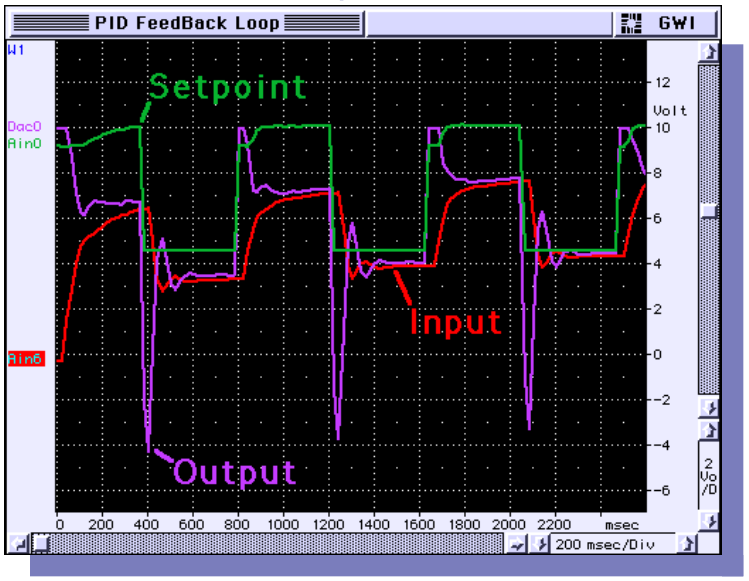
SuperScope II **Controls** and **Indicators** are extremely versatile with many customizable attributes such as LABEL show/hide, edit, font, size, and style; DIGITAL READOUT show/hide, font, size, style, range, and precision; BORDER show/hide and placement. Additionally, controls can be set up to trigger a Task.

C Object Code Version



SuperScope II is available in open form where the end user can add their own C source code to the SuperScope II ThinkC object code. This is a C programmer's dream since SuperScope II handles the user interface while the end user is free to call any of the ANSI library, 1800 toolbox, GWI analysis, or TurboDrivers routines. Most importantly, the ThinkC debugger enables the end user to step through his/her code one line at a time and view variables -- which is crucial!

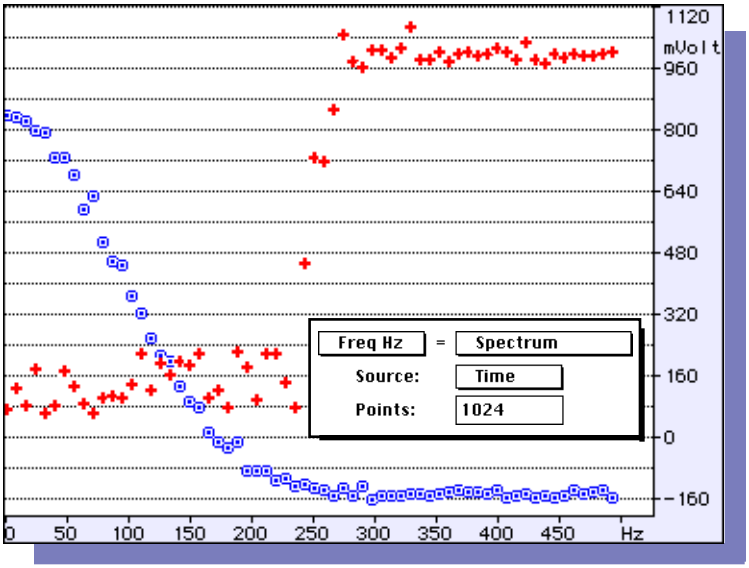
PID & On/Off Control



SuperScope II supports a variety of feedback control loops including PID, Alarm, and OnOff. Additionally, one can use waveform math to develop complex driving functions that are based on inputs and outputs (analog & digital). Feedback control loops are implemented with an interrupt driven point-by-point I/O mode; where inputs, outputs and calculations are done on a point-wise basis.

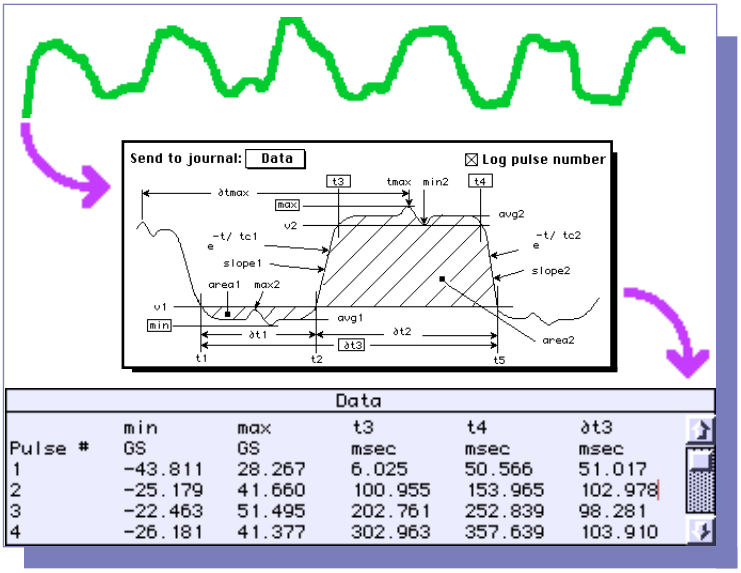
It'll Help You Under

Spectrum Analysis



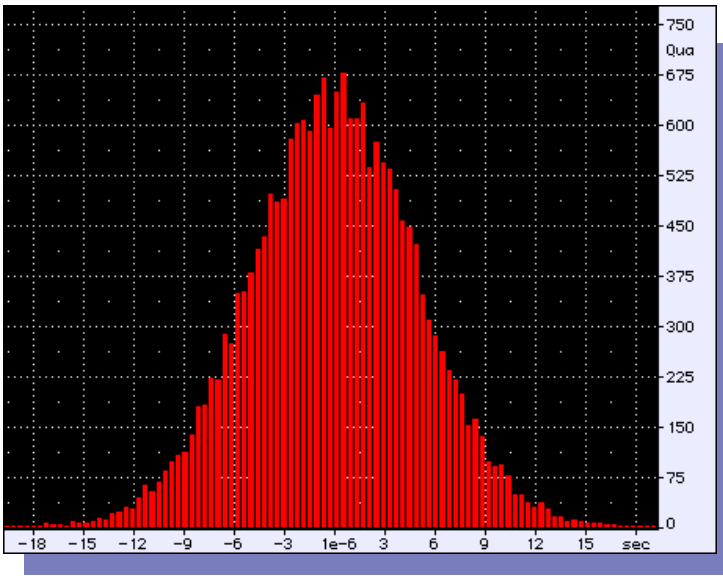
Frequency spectra are easily calculated and presented in a variety of formats including voltage magnitudes, dB magnitudes, phase, real and imaginary. Window options include Hamming, Hanning, Blackman, and Rectangular.

Pulse Analysis



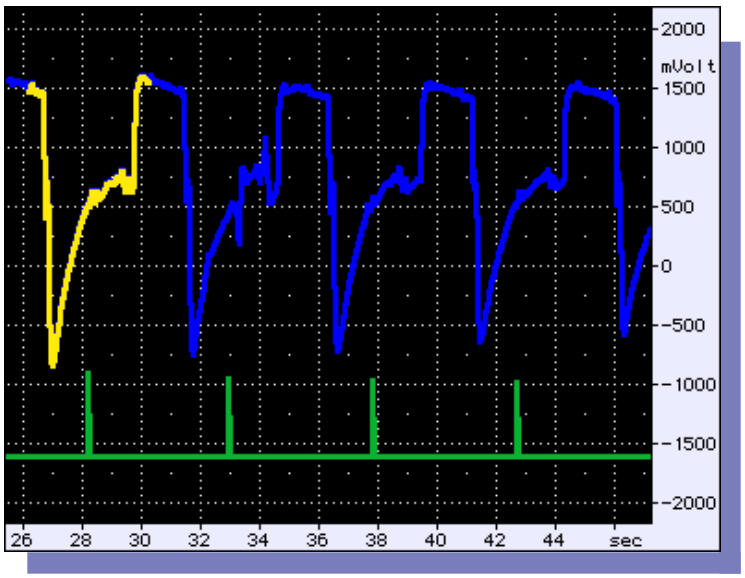
Analyzing pulses is as easy as specifying a threshold and then clicking on the parameters of interest (e.g. min, max, period, etc.) in the pulse analysis instruction dialog, shown above. Waveforms are then scanned and the attributes of each detected pulse is transferred to journals (illustrated above), waves, controls, strings or markers.

Histogram



SuperScope II easily calculates both value and pulse time histograms. Results are plotted as either bars, dots, lines or symbols. The above illustration shows a histogram of gaussian noise.

Pattern Recognition



Convolution analysis shows where a pattern wave occurs within a source wave. The local maxima in the convolution output wave indicates precisely where the pattern occurs. In the above illustration, the pattern wave is yellow, the source wave is blue, and the convolution output (cleaned up with the PEAK function) is green.

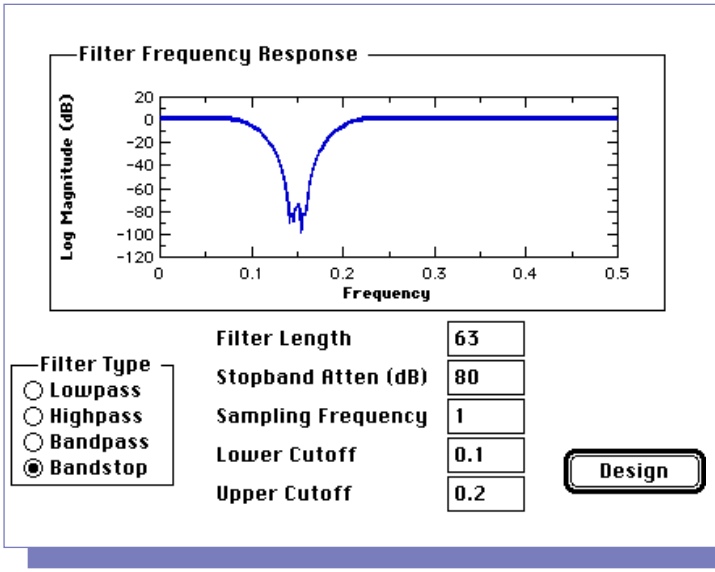
STAND YOUR WORLD...

WAVEFORM MATH

- +, -, *, /
- <, >, <=, >=, ==, !=
- modulo
- square root
- exponential
- absolute value
- natural logarithm
- base 10 logarithm
- round to integer
- therm V to °C
- sine
- cosine
- tangent
- inverse sine
- inverse cosine
- inverse tangent
- autocorrelation
- increase sample rate
- decrease sample rate
- average value to date
- max value to date
- min value to date
- waveform average
- shift wave horizontally
- return last trace
- histogram
- time histogram
- find peaks
- pulse positions
- values given times
- sort given indices
- sort wave elements
- indices for a sort
- reverse elelments
- smooth by n pts
- IIR filter
- convolution
- de-convolution
- cross power
- cross correlation
- magnitude FFT
- frequency spectrum
- FFT
- inverse FFT
- Hamming window
- Hanning window
- Blackman window
- complex to phase
- complex to mags
- complex to reals
- complex to imag.
- real to complex
- append waves
- insert a segment
- delete segment
- derivative
- 5 pt Lagrange deriv.
- integrate
- integrate, rst area = A
- integrate, rst time = T
- integrate, rst t1, t2,
- integrate, rst X > V
- beep if exceeds bds
- apply high/low bds
- compare two values
- on/off control loop

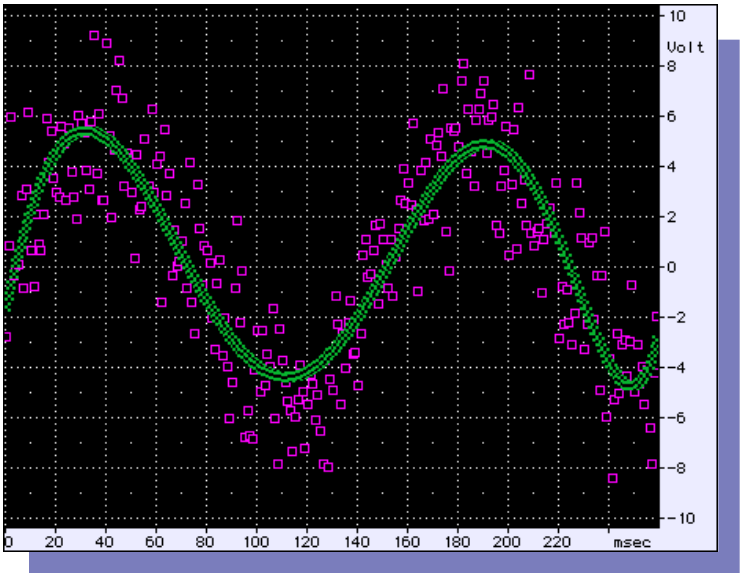
SuperScope II supports over 80 waveform functions and operators that are used to perform calculations on input channels, create stimulus waves, set up feedback/control loops, and teach waveform math. In many cases, waveform functions can operate on continuous streams (e.g. 10^9 points) of incoming data, in real-time, making SuperScope II an extremely powerful recording tool.

FILTERING



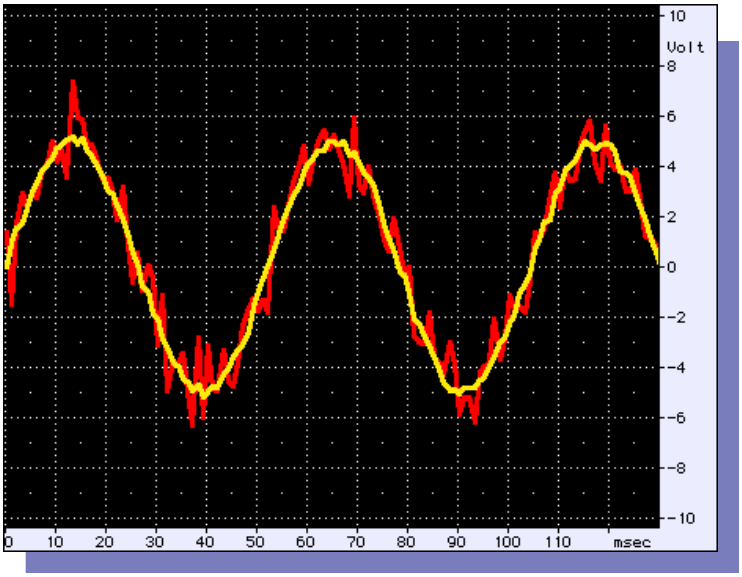
SuperScope II includes low pass, high pass, hamming window, and rectangular window FIR filters. In many cases, the resident filters will not suit your needs, in which case you need the very simple and easy to use WLFDAP Filter Design Application program, illustrated above. This generates SuperScope II compatible filters and is available for $99 from Zola Technologies (Tele 404/843-2972, Fax 404/843-0116), a GWI Partner.

CURVE FITTING



SuperScope II uses linear regression to fit raw data to a sine, exponential, line, or nth {1...20} order polynomial. The output of the curve fitter is the actual fit wave and/or the coefficients. The above illustration shows raw data in purple and its best fit 5th order polynomial in green.

SIGNAL AVERAGING



SuperScope II uses the signal averaging technique to calculate a characteristic periodic response wave buried in noise. All that is needed is a trigger that indicates when each period begins. Noise is reduced by the square root of the number of cycles that are averaged.

It's Virtually Anything

SuperScope II Objects

The SuperScope II user creates and customizes objects with pull-down menus and dialog boxes — no previous programming experience is necessary. There are several types of objects, each with their own dialogs for viewing and editing attributes. Users can create as many of each type as needed to build the application of their dreams. The objects are described below.

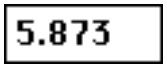
Waves

Waves are used to represent real world continuous data as a list of values, which, when plotted, produce a waveform. Waves can be digitized, synthesized, analyzed, edited, viewed, used to hold the results of analysis, loaded from disk, saved to disk, sent to the clipboard as a column of numbers in text format, and sent to the clipboard as a graphical image. Typical instruments have 3 to 10 (or more) waves and wherever you see a squiggle in SuperScope II, you are looking at a Wave object. Waves are stored in memory as a list of 16-bit integer (±32,768) or 32-bit floating point values and their maximum lengths are limited by memory (each point consumes two or four bytes depending on the storage format).

Menubars

Menubars are easily created, edited, and deleted. Each menubar consists of a set of menus and a set of items for each menu. Each menu and item can be renamed, hidden, or set up to run a Task when chosen. In some cases, it is desirable to have a very simple menubar to limit a user's options.

Variables

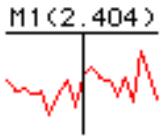


Variables are used to hold one 32-bit floating point value (e.g. 16, 2.3, 1.34e6). They are easily created, renamed, and deleted; and their values are easily viewed and edited. Many task instructions transfer values to and from variables.

Journals

Journals are text regions that are used to enter, view and edit text in a manner similar to that done with a word processor. With commands in the menubar, the user can Clear, Save, View, Save to Clipboard, Print, Delete and Create Journals. The contents of Journals can easily be saved to disk and then loaded by a word processor, graphics, or spreadsheet program. Journal windows can be resized and positioned on the front panel in any pattern and in any number, space permitting. Many task instructions transfer text to and from journals.

Markers

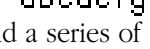


Markers are used to mark a time in a wave or display. The user can create as many markers as he/she desires and can place any marker in any display. In displays, they appear as vertical lines that can be moved with the mouse.

Datapipes

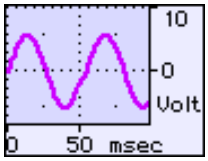
A datapipe is a reference to a folder on disk (i.e. a pathname). Think of it as a pipe, through which you push data between SuperScope II and a folder on disk.

Strings



Strings are used to hold a series of characters of any length, memory permitting (e.g. "hi", "1.2"). They are easily created, renamed, and deleted; and their text is easily viewed and edited. Many task instructions transfer text to and from strings.

Displays



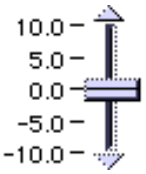
Displays reside on the front panel and are used to view waveforms and show calculation results. They are extremely versatile with many customizable attributes such as horizontal/vertical scroll/position controls, labels, waves, markers and much more. Displays can be positioned on the front panel in any pattern and in any number, space permitting. Each display can contain up to 8 waves and supports mouse-driven cut/copy/paste of waveform segments, drawing of waves, and logging of wave values to a journal.

Controls & Indicators

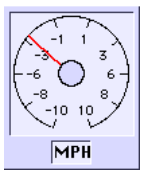
Front panel Controls and Indicators allow the adjustment of, Boolean true/false values, scalars, lists, and text. These objects appear in a variety of styles, sizes, fonts, and colors; and their states are easily read and updated with tasks.

Light

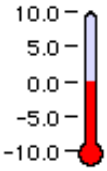
Switch



Slider



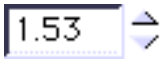
Meter



Therm.

Button

Knob

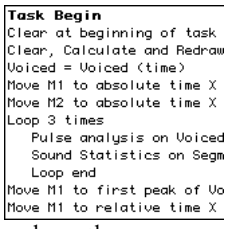


Numeric

You Want It To Be...

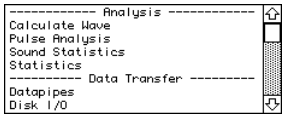
Tasks

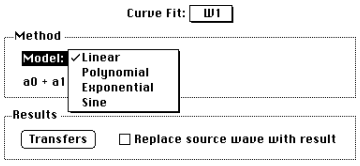
Tasks are sequences of instructions that perform a series of operations. For example, one could write a task to record data, analyze the acquired data, update the screen, and then print the results. Tasks are easily created, viewed, edited, and debugged; and can be set up to run when a marker moves, when a wave changes, when a specific menu item is chosen or when the user chooses Run Task. One "programs" tasks using a simple mouse/dialog user interface. The neat thing about programming SuperScope II is you do not need to know a syntax — the mouse-driven dialog boxes take care of you!



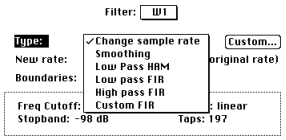
Instructions

Instructions are the building blocks used to create tasks. There are different kinds of instructions, each dedicated to a specific function (e.g. save a wave to disk, move a marker, choose a menu item, etc.). A task contains a list of instructions that are executed in the order that they appear in the task; and each instruction can be viewed in its own dialog box, edited, cut, copied, and pasted. Many of the instructions are illustrated below.

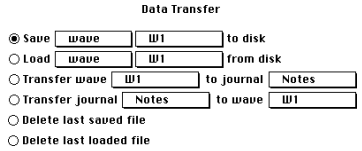




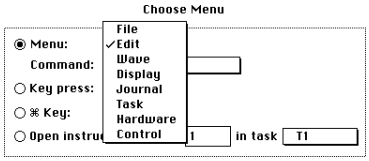
Curve Fitting



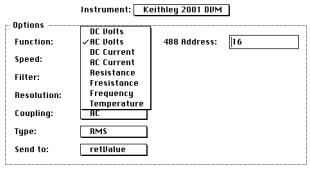
Filter



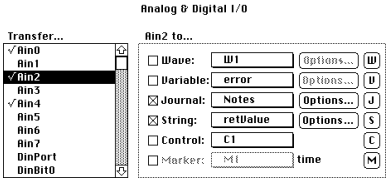
Disk I/O



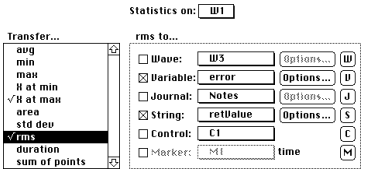
Choose Menu



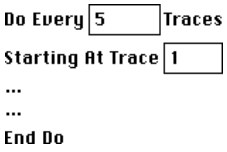
External Instrument



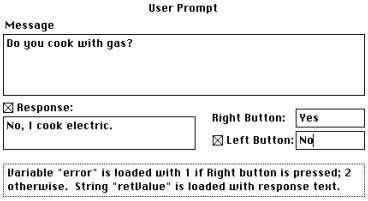
Analog & Digital I/O



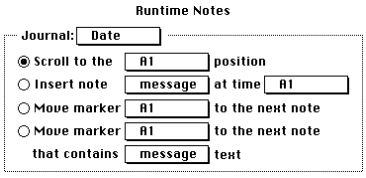
Statistics



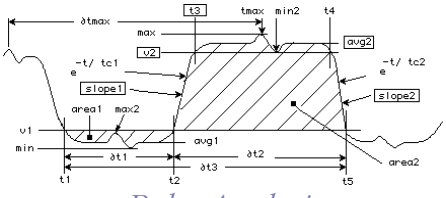
Programming



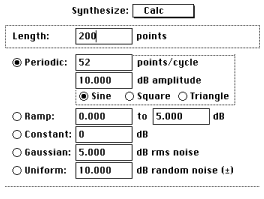
User Prompt



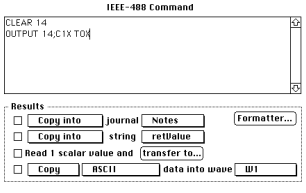
Run-time Notes



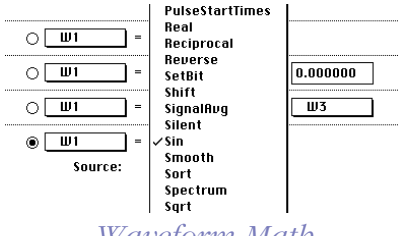
Pulse Analysis



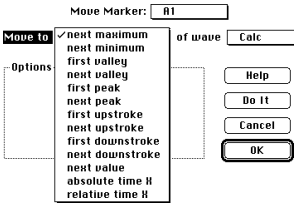
Synthesize



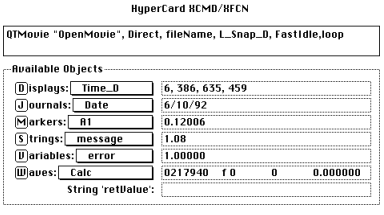
IEEE-488/RS-232



Waveform Math



Move Marker



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