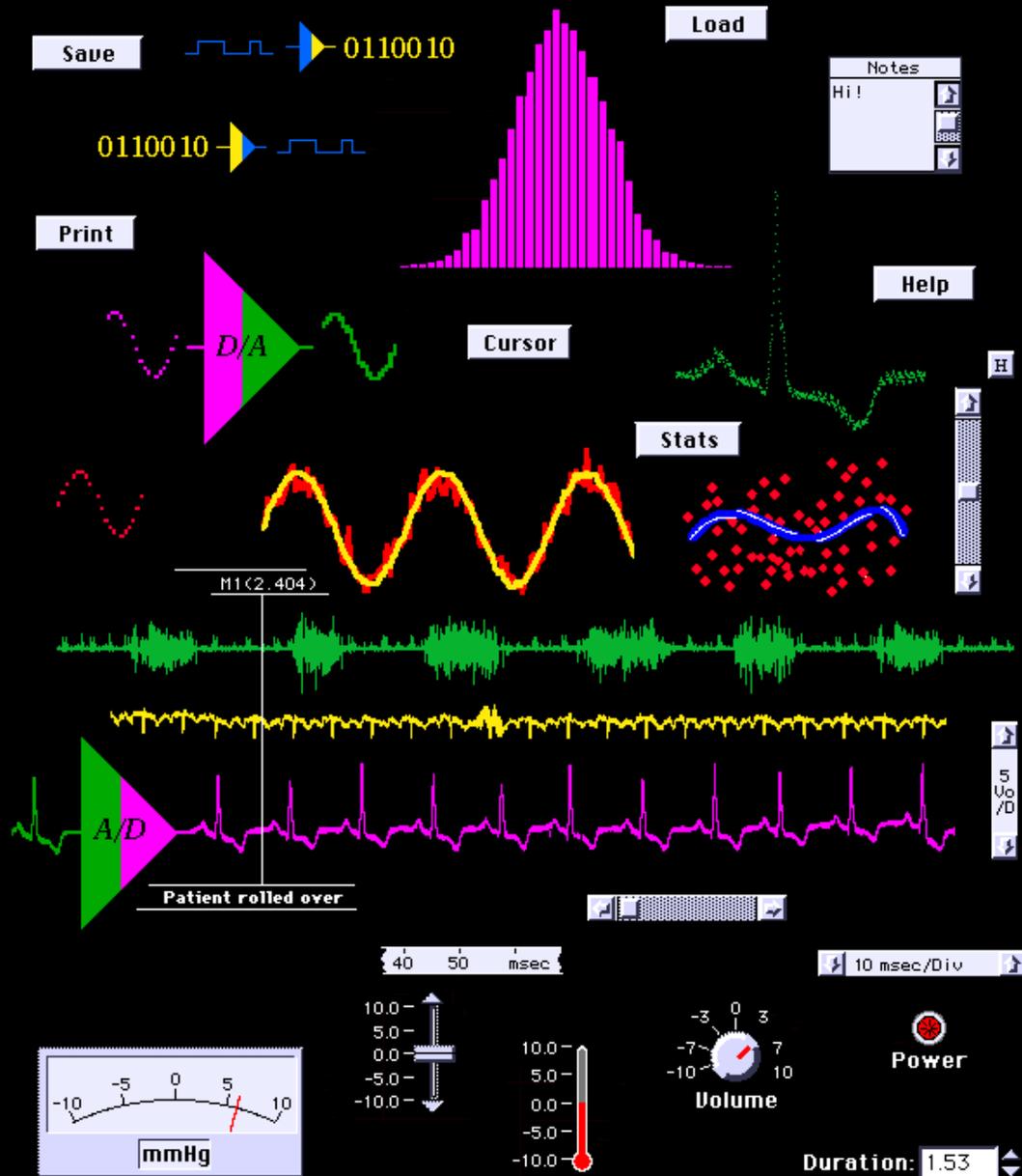


SUPERSCOPE II

*THE WORLD'S MOST ADVANCED
RECORDING TOOL*



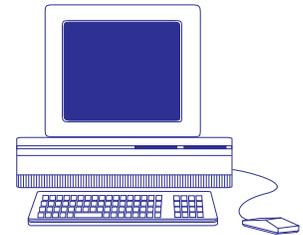
GW INSTRUMENTS
THE COMPUTER INSTRUMENT COMPANY

WHAT IS SU

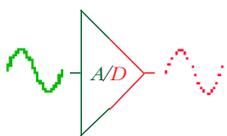
SuperScope II is Software



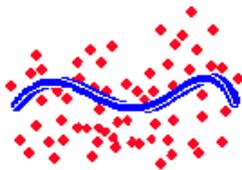
SuperScope II runs on a Macintosh



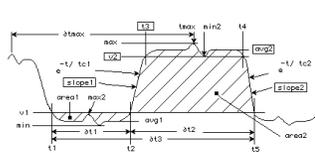
SuperScope II is a waveform processor that can:



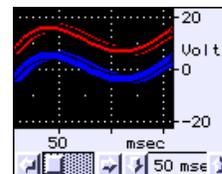
DIGITIZE



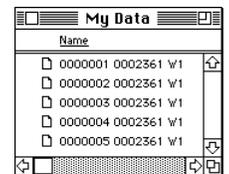
CALCULATE



ANALYZE

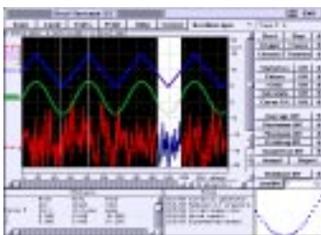


GRAPH

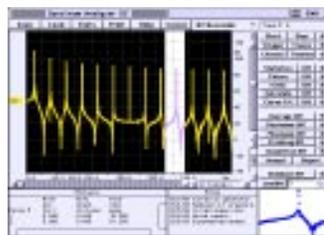


DATABASE

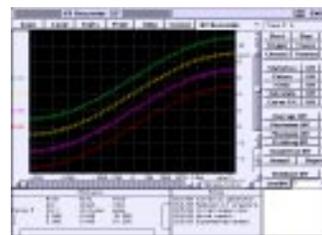
SuperScope II includes standard ready-to-go instruments:



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 GWT'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	$\pm 5V, \pm 5V, \pm 0.5V, 0-5V, 0-0.5V$	55KHz (833KHz)	2 (8)	12bit (16bit)	$\pm 10V, \pm 5V, \pm 2.5V, 0-5V, 0-10V$	8 (56)	3
MacADIOS II	A/D & D/A Nubus Board	16SE/8DI (112SE/56DI)	12bit (16bit)	$\pm 10V, \pm 1V, \pm 1V, 0-10V, 0-1V$	142KHz (833KHz)	2 (8)	12bit (16bit)	$\pm 10V, 0-10V$	8 (56)	3
MacADIOS II Jr	Low Cost A/D & D/A Nubus Board	16SE/8DI	12bit	$\pm 10V, \pm 1V, \pm 1V, \pm 0.5V, \pm 0.1V$	40KHz	2	12bit	$\pm 10V$	8	3
MacADIOS adio ¹	Low Cost A/D & D/A SCSI Device	2SE	12bit	$\pm 10V, \pm 5V, \pm 2.5V, \pm 1.25V, \pm 0.6, \pm 0.3, \pm 0.15V$	28.8KHz	1	12bit	$\pm 5V$	2	
MacADIOS 8ain ¹	Low Cost A/D SCSI Device	8DI	12bit	$\pm 10V, \pm 1V, \pm 1V, \pm 0.5V, \pm 0.2V$	28.8KHz					
MacADIOS 8dio ¹	Low Cost Digital I/O SCSI Device								8	

() Maximum Expandable Limit With Daughterboards. ¹Not 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

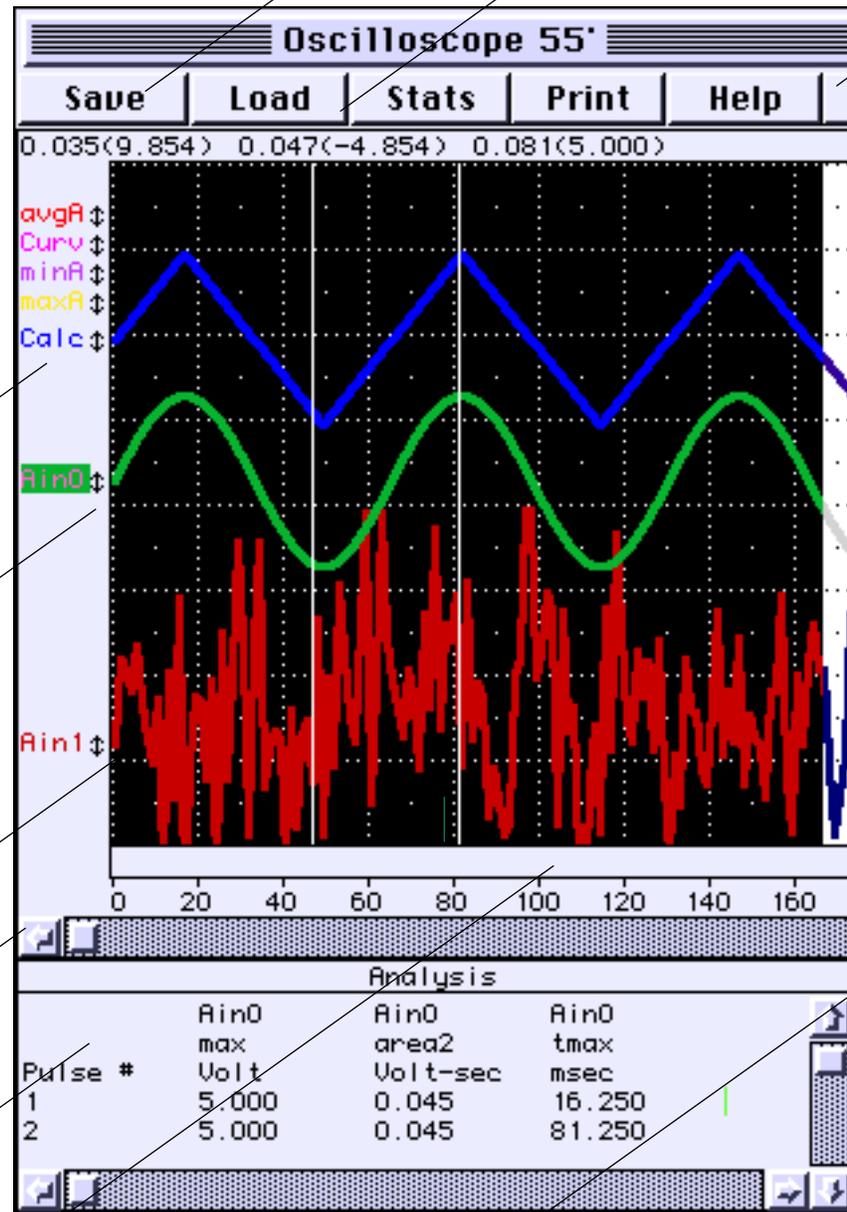
Horizontal position scrollbar

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.

Save Waves & Journals to disk

Load Waves & Journals from disk



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

Cursor			
Wave	Horizontal	Vertical	
mouse	0.12500 sec	8.67188 Volt	
Calc	0.12500 sec	-1.154 Volt	
Ain1	0.12500 sec	-1.558 Volt	
Ain0	0.12500 sec	-1.772 Volt	

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

The screenshot shows the 'Oscilloscope' window with a main display area containing a blue waveform and a red spectrum plot. A cursor is positioned on the waveform. To the right is a control panel with various settings. At the bottom left is a 'Notes' section with a list of events. At the bottom right is a small expanded view of a waveform fragment.

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/disable inspection of each trace

Enable analysis & storage of each trace

Enable/disable the channel database

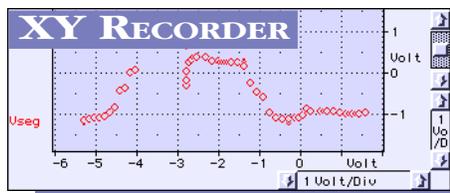
Database record number of displayed trace

Increment/decrement to next/previous trace in waveform database

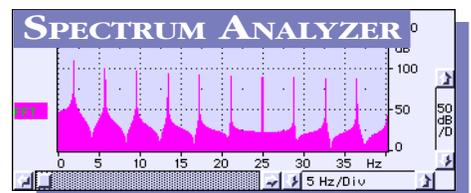
This shows an expanded view of a waveform fragment. To specify a fragment, the user sets the Mouse mode to Edit, clicks once on the wave label, and then drags the mouse across the portion of interest.

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:

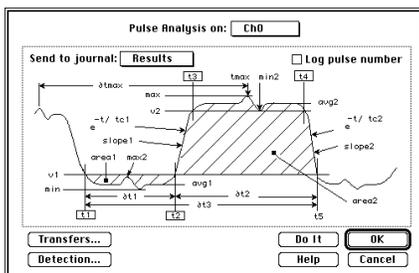
- *Digitize*
- *Plot and scroll*
- *Spool to disk*
- *Calculate*
- *Analyze*
- *Allow on-line annotations*

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.

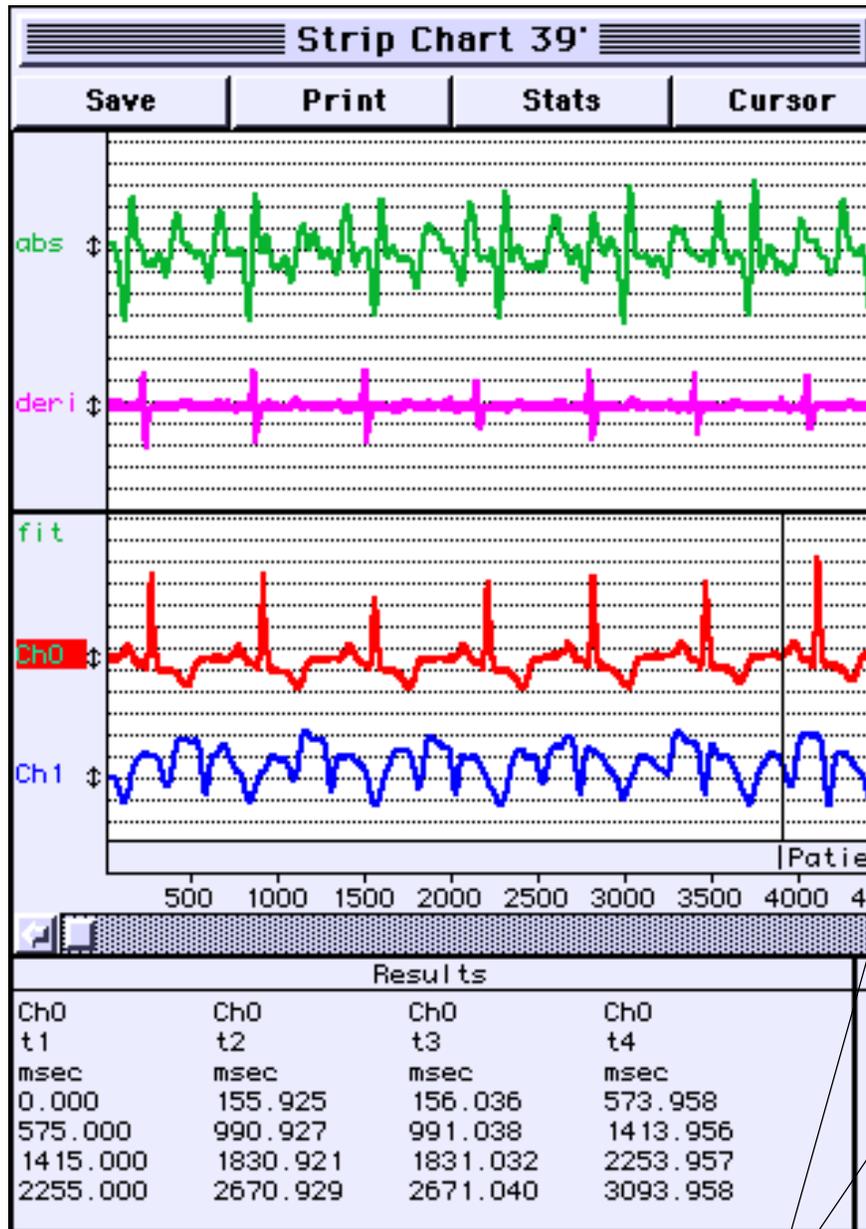
REAL-TIME ANALYSIS

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

The screenshot shows the GWI software interface. At the top is a menu bar with 'Curve Fit', 'Help', 'Start', 'Stop', and '?'. Below the menu bar is a display area with three channels of waveforms (green, magenta, and red) plotted on a grid. The y-axis is labeled 'Volt' and ranges from -2 to 2. To the right of the display are several control buttons: 'Traces', 'Trigger', 'Timebase', 'Channel', 'Calculate', 'On', 'Statistics', 'On', 'Rate Off', '30', 'Spool Off', 'Print Off', and 'Load Data'. A horizontal scroll bar is visible at the bottom of the display area. A vertical pink bar is positioned over the 'Load Data' button.

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
- AugToDate
- Blackman
- Compress
- Convolve
- CopyTiming
- Cos
- CrossCorrelation
- CrossPower
- DeConvolve
- Delete
- DeMultiplex
- Deriv
- DerivFivePt
- Exp
- Expand
- FFT
- Hamm
- Hann
- Histogram
- Imaginary
- IndexSort
- Insert
- Int
- Integ
- IntegAU
- IntegPT
- IntegTL
- IntegTV
- InuFFT
- Last
- Limit
- Ln
- Log10
- Mag
- MakeComplex
- MakeIndex
- Maximum
- MaxToDate
- Minimum
- MinToDate
- Modulo
- MuFFT
- OnOff
- Peak
- Phase
- PID
- PulseEndTimes
- PulseMaxTimes
- PulseStartTimes
- Real
- Reciprocal
- Reverse
- SetBit
- Shift
- SignalRug
- Silent
- Sin
- Smooth
- Sort
- Spectrum
- Sqrt
- Tan
- TC Linearize
- TimeHisto
- TimeValues
- UnVoiced
- Voiced
- XYtoY

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

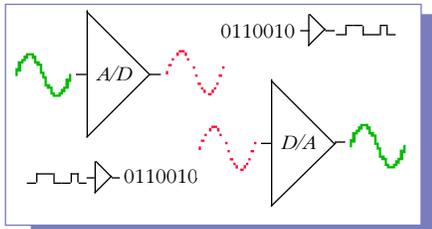
REAL-TIME HARDWARE

Digitizing is done with a MacADIOS II or II/16 Nibus 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.

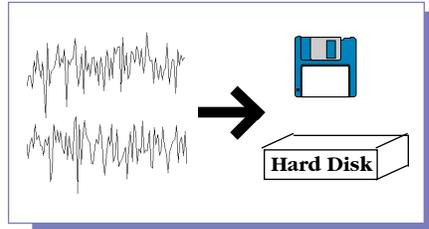
DIGITIZER	ANALOG INPUTS		
	# of Channels	Resolution	Input Ranges
MacADIOS II/16 FIFO ² Part#GWI-625/16-FIFO	8DI	16bit	±5V, ±5V ±0.5V, 0-5V, 0-5V, 0-0.5V
MacADIOS II FIFO ² Part#GWI-625-FIFO	8DI/8SE	12bit	±10V, ±1V ±1V, 0-10V, 0-1V, 0-1V

¹This 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.
²Requires a Macintosh computer with two empty 12" Nibus slots.

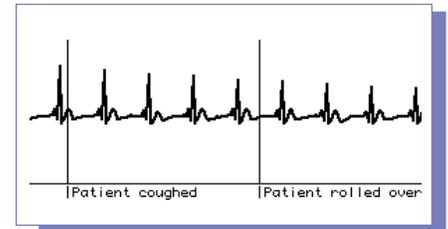
THINGS YOU CAN DO



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



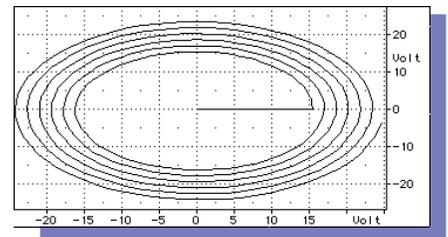
Spool To Disk



On-line Annotation

IEEE-488

RS-232



XY Displays

Synthesize Waves

Programming Constructs

Arbitrary Waveform Gen.

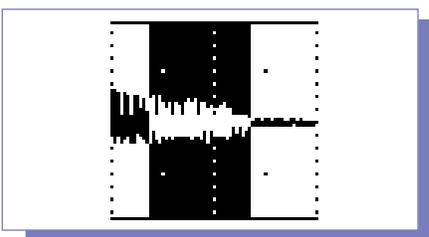
Filter

Move Markers

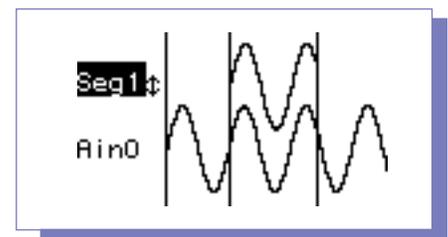
Waveform Statistics

Cursor			
Wave	Horizontal	Vertical	
mouse	0.18750 sec	0.70312 Volt	
Flow	0.18750 sec	-0.225 Volt	
W3	0.18750 sec	4.070 Volt	
pattern	0.18750 sec	◇	
W1	0.18750 sec	-1.906 Volt	
W2	0.18750 sec	3.973 Volt	
convolve	0.18750 sec	0.000 Volt	

Waveform Cursor



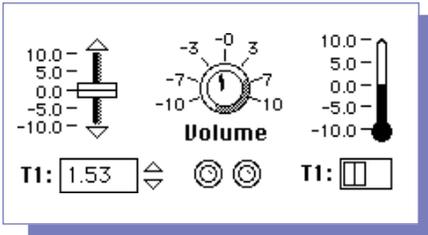
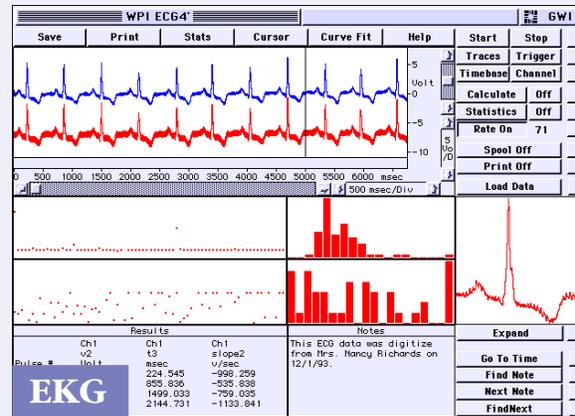
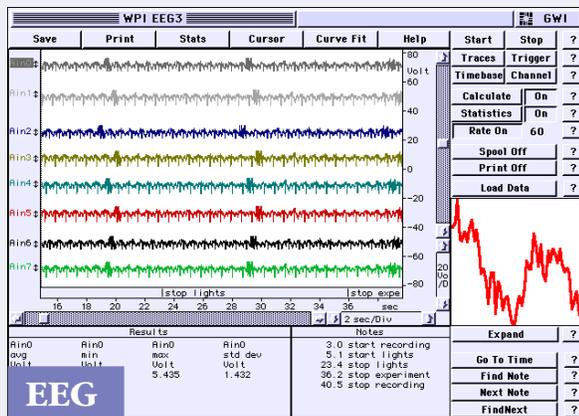
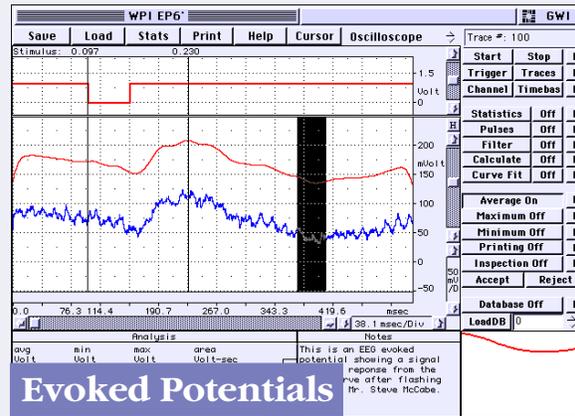
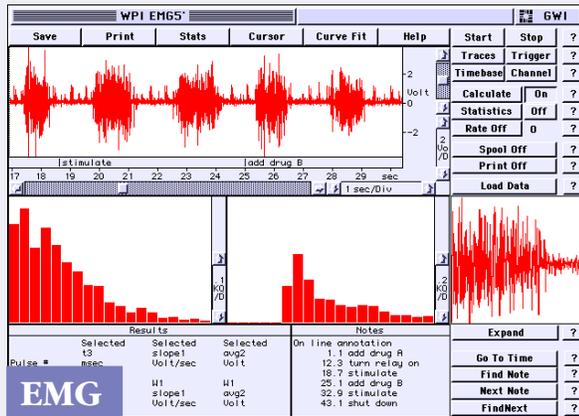
Cut, Copy & Paste Waves



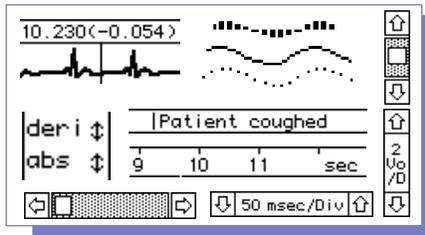
Analyze Wave Segments

WITH SUPERSCOPE II

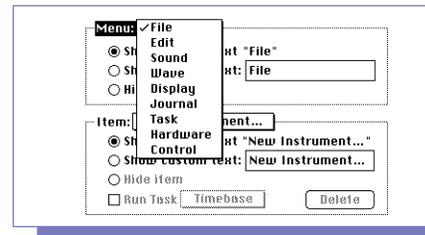
EXAMPLE PHYSIOLOGY INSTRUMENTS



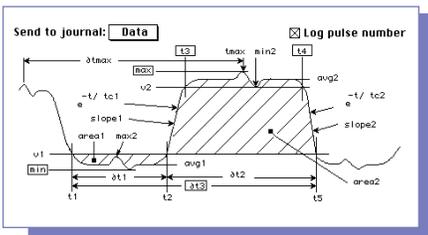
Virtual Instrumentation



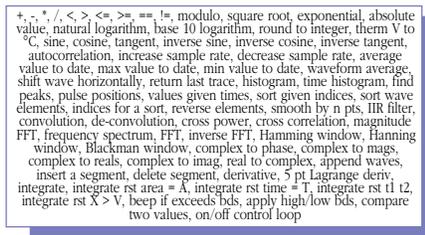
Customize Displays



Customize Menubars



Pulse Analysis



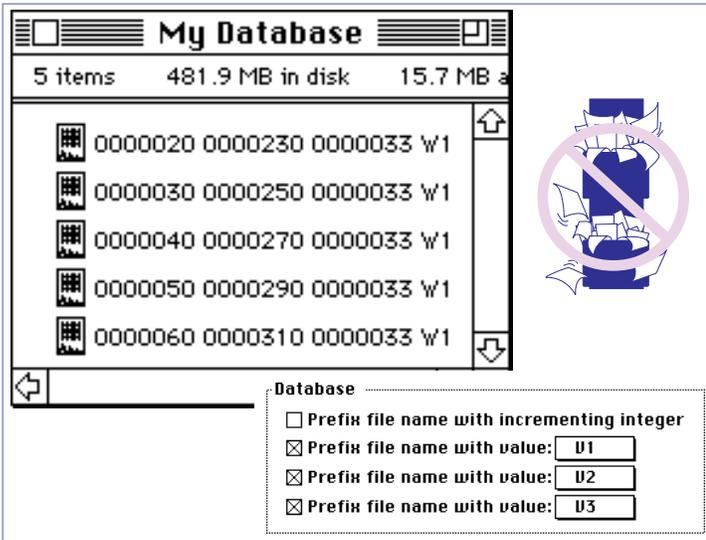
Waveform Math



Curve Fitting

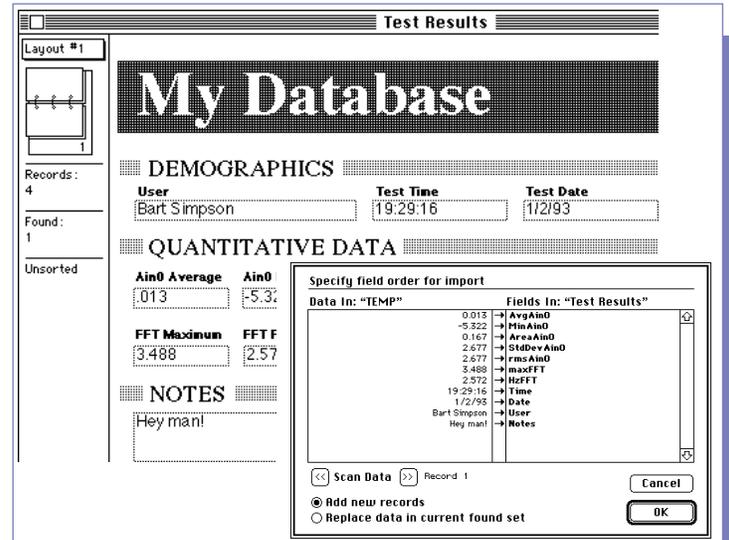
IT HAS CAPABILITIES

WAVEFORM DATABASE



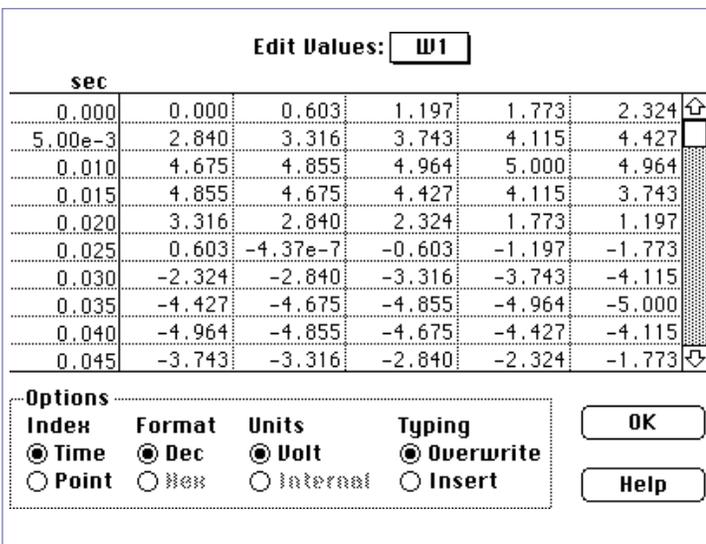
SuperScope II supports 1, 2 or 3 dimensional databases of wave and/or journal files, as illustrated above. The Disk I/O instruction appends 1, 2 or 3 indices to each filename, providing the ability to save and recover a large array of files on disk. Each database is kept in one folder, providing the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

EXPORT TO DATABASE



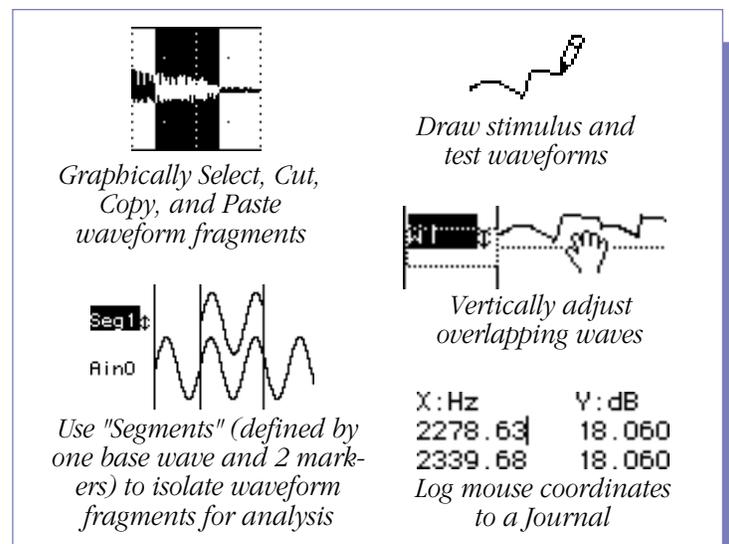
Textual data is easily transferred from SuperScope II to a database, spreadsheet, graphics, math, or word processing application program. Waves are often transferred as a column of numbers in text form. In the above illustration, 11 items are being imported into one FileMaker record.

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



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 XCMD/HFCN

QTMovie "OpenMovie", Direct, fileName, L_Snap_D, FastIdle,loop

Think C Source Code.c

```
pascal void main (XCMDPtr paramPtr)
{
    float *dataPFR, *lastDataPFRpt;
    unsigned long validPFR;
    RememberR0();
    SetUpR4();

    // -----
    // Get parameters
    gXCMD_Error = 0;
    gParamPtr = paramPtr;

    if (!CheckNumOfParameters(NUML_PARAMS))
        goto Exit;

    if (!GetFloatIavePtr(&dataPFR, &validPFR))
        goto Exit;

    // Body:
    {
        register float *dataPFR_ = dataPFR, *lastD
        lastDataPFRpt = dataPFR_ + validPFR - 1L;
        while (dataPFR_ <= lastDataPFRpt) {
            *dataPFR_++;
            *dataPFR_++ = -*dataPFR_++;
        }
    }

    Exit:
    PrepareTheReturnString (NUML_PARAMS);
    RestoreR4();
}
```

Available Objects:

- Displays: Time_D 6, 386, 635.
- Journals: Date 6/10/92
- Markers: A1 0.12006
- Strings: message 1.08
- Variables: error 1.00000
- Waves: Calc 0217940 f

String 'returnValue':

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

Displayed Precision

Digits to right of decimal: 2

Internal Value Range

Minimum: -10.000000

Maximum: 10.000000

Increment: 0.010000

Text Format

Font: Geneva

Size: 12

Style: Bold Italic Underline Outline Shadow

Volume

4.36

Hide Label Show Digital Readout Data Range... Hide Ruler Show Border Options...

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

analysis utilities.c

analysis utilities.c Companion: analysis utilities.h

ABSTRACT

This file contains useful routines that work with arrays of n

ROUTINES

The following routines either reside in this file (in source in the corresponding .h file (in prototype-only form).

SIGNAL PROCESSING

- fft() Calculate FFT on shor
- fftOnFloats() Calculate FFT on 32bi
- fftOnDoubles() Calculate FFT on 96bi
- DerivNew() Apply derivative (5dB
- DoSmoothing() Smooth with rectangular
- ExpandViaInterpolation() Expand array via inte
- GetHam() Create a hamming wind
- RunScanner() Convolve two arrays

ARRAY STATISTICS

- min_val_open() Find minimum in a file
- max_val_open() Find maximum in a file
- min_val_shc() Find minimum in a shc
- max_val_shc() Find maximum in a shc
- sum_val_open() Find sum of float arr
- sum_val_shc() Find float sum of shc
- SumInt16Values() Find long sum of shor
- sumsq_val_open() Find sum of squares c
- sumsq_val_shc() Find sum of squares c
- FindValueAboveBelowThresh() Determine where wave

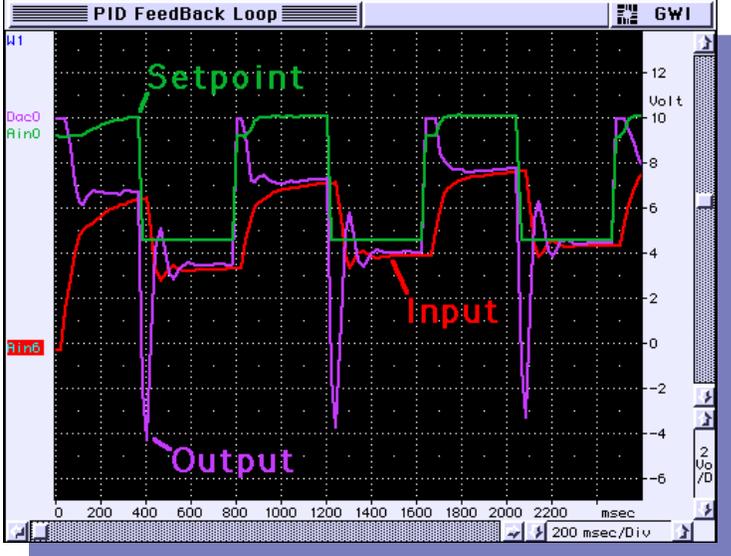
ARRAY MATH

- plus_val_open() Add two float arrays
- minus_val_open() Subtract two float ar
- times_val_open() Multiply two float ar
- div_val_open() Divide two float arr

Name	obj size
Development Status.c	0
Hidden features.c	0
ISoundScope Notes.c	0
TO DO A BUILD...c	0
Defensive Code.c	13596
MathDispatchInit.c	160
MiniTemplate.c	16
New Math fp.c	0
Segment Manager.c	2118
SoftPanelsInit.c	44
SS2 Headers.c	0
SS2 Mac #includes.c	0
SS2 preHeaders.c	0
SS2Help.c	2954
SystemControl.c	3984
Doc For C Developers.c	0
9513 MicroTic Ctr.c	4426
analysis utilities.c	3058
C developer interface.c	78
complex example.c	4242
misc examples.c	7074
simple example.c	344

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!

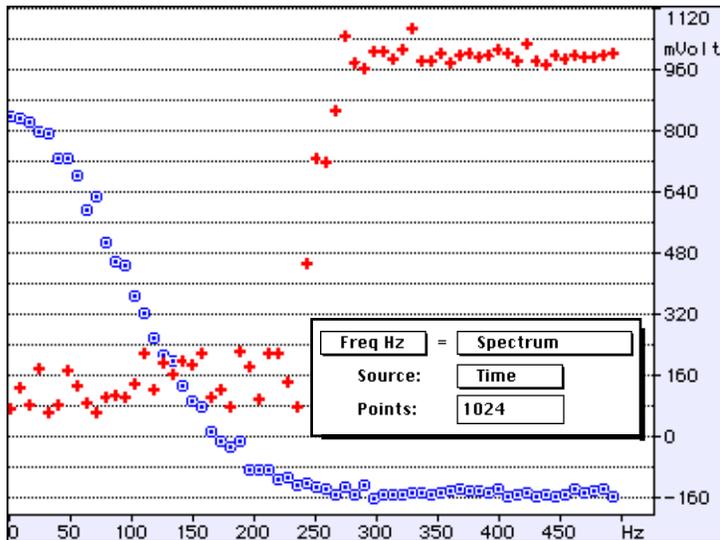
PID & ON/OFF CONTROL



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.

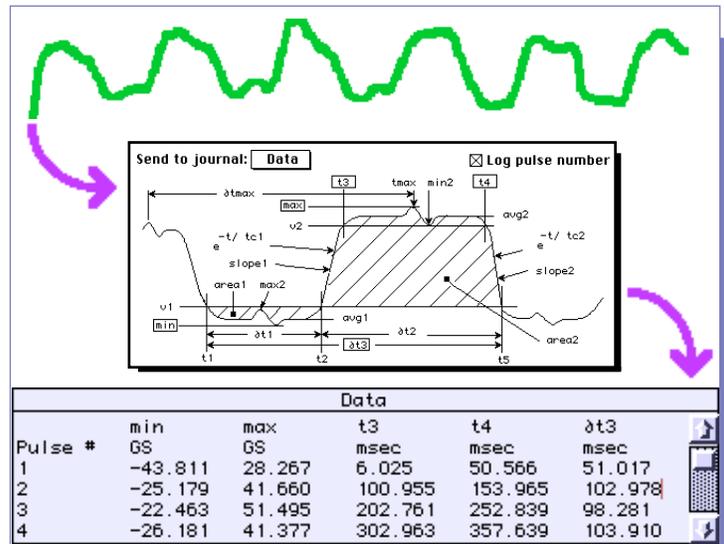
IT'LL HELP YOU UNDER

SPECTRUM ANALYSIS



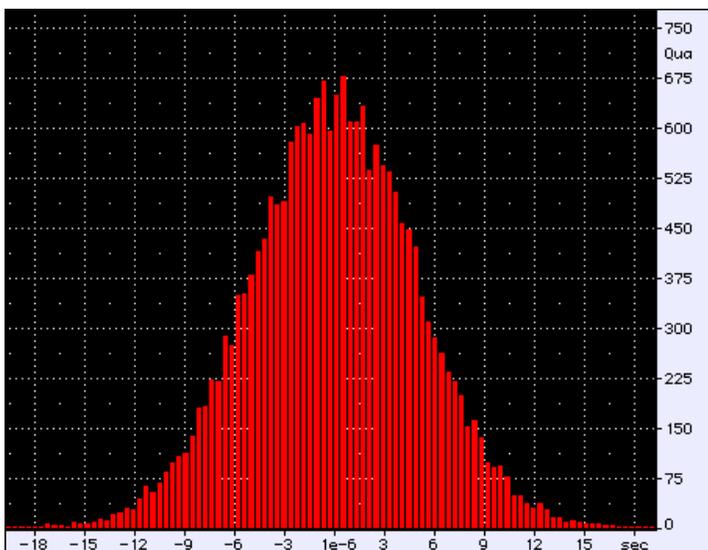
Frequency spectra are easily calculated and presented in a variety of formats including voltage magnitudes, dB magnitudes, phase, real and imaginary. Window options include Hamming, Hanning, Blackman, and Rectangular.

PULSE ANALYSIS



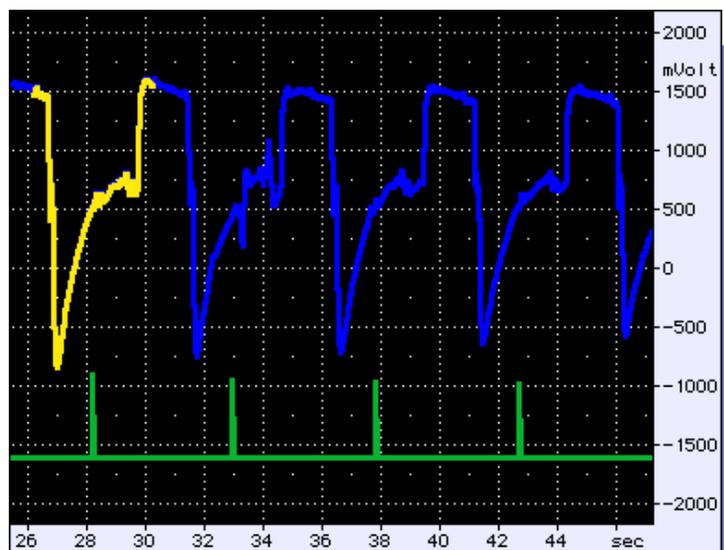
Analyzing pulses is as easy as specifying a threshold and then clicking on the parameters of interest (e.g. min, max, period, etc.) in the pulse analysis instruction dialog, shown above. Waveforms are then scanned and the attributes of each detected pulse is transferred to journals (illustrated above),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

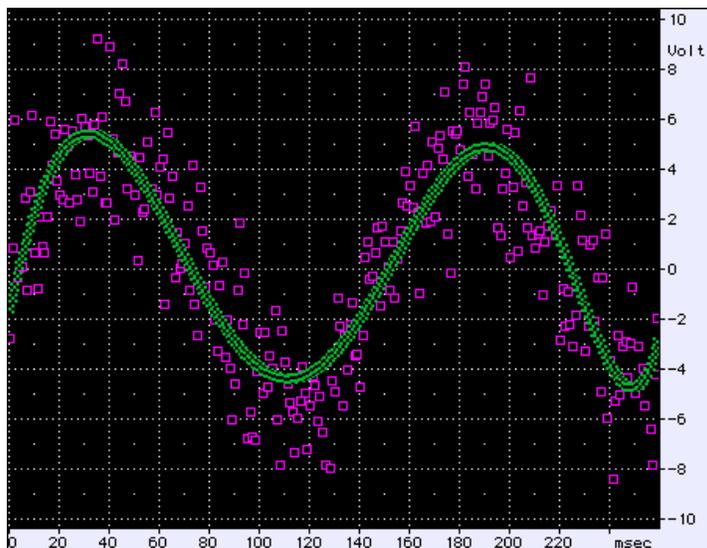
STAND YOUR WORLD...

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 elements
- ◆ smooth by n pts
- ◆ IIR filter
- ◆ convolution
- ◆ de-convolution
- ◆ cross power
- ◆ cross correlation
- ◆ magnitude FFT
- ◆ 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

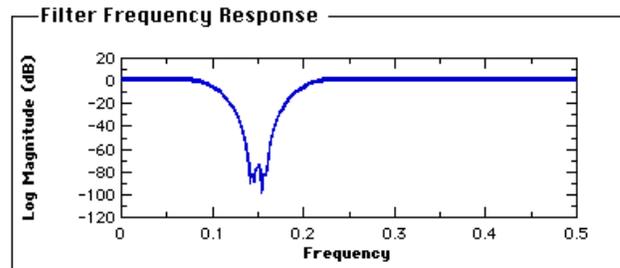
SuperScope II supports over 80 waveform functions and operators that are used to perform calculations on input channels, create stimulus waves, set up feedback/control loops, and teach waveform math. In many cases, waveform functions can operate on continuous streams (e.g. 10^9 points) of incoming data,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

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.

FILTERING

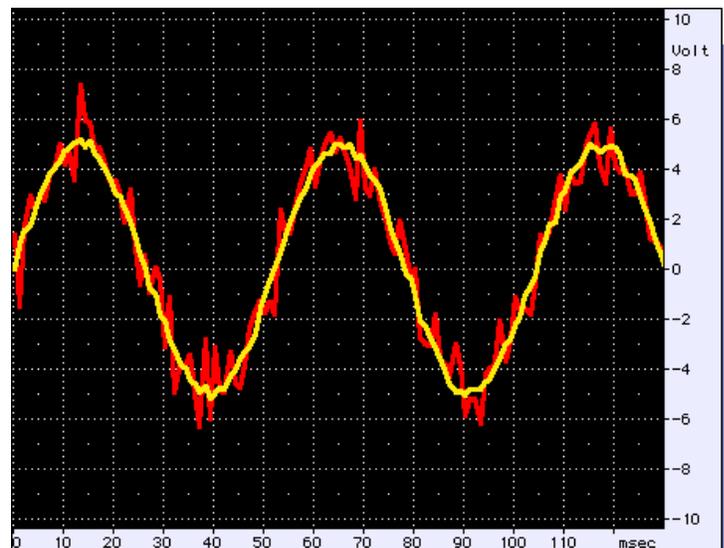


<input type="radio"/> Lowpass	Filter Length	63
<input type="radio"/> Highpass	Stopband Atten (dB)	80
<input type="radio"/> Bandpass	Sampling Frequency	1
<input checked="" type="radio"/> Bandstop	Lower Cutoff	0.1
	Upper Cutoff	0.2

Design

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 WLFDAF 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.

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.

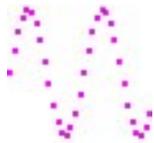
IT'S VIRTUALLY ANYTHING

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 ($\pm 32,768$) 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).



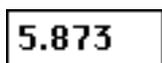
Menubars

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.



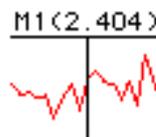
Journals

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.

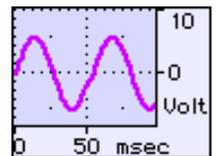
Strings

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.

abcdefg

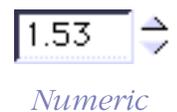
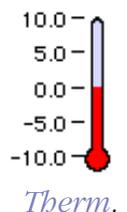
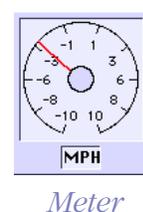
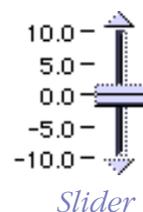
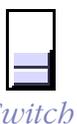
Displays

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.



YOU WANT IT TO BE...

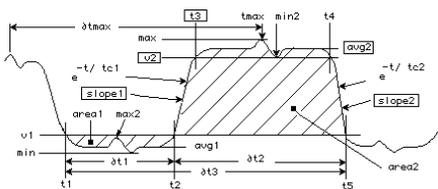
Tasks

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!

Task Begin
 Clear at beginning of task
 Clear, Calculate and Redraw
 Voiced = Voiced (time)
 Move M1 to absolute time X
 Move M2 to absolute time X
 Loop 3 times
 Pulse analysis on Voiced
 Sound Statistics on Segm
 Loop end
 Move M1 to first peak of Uo
 Move M1 to relative time X

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.



Pulse Analysis

<input type="radio"/> W1	=	PulseStartTimes	
<input type="radio"/> W1	=	Real	
<input type="radio"/> W1	=	Reciprocal	
<input type="radio"/> W1	=	Reverse	0.000000
<input type="radio"/> W1	=	SetBit	
<input type="radio"/> W1	=	Shift	W3
<input type="radio"/> W1	=	SignalAvg	
<input type="radio"/> W1	=	Silent	
<input checked="" type="radio"/> W1	=	Sin	
Source:		Smooth	
		Sort	
		Spectrum	
		Sqrt	

Waveform Math

Curve Fit: W1

Method

Model: Linear
 Polynomial
 Exponential
 Sine

Results

Transfers Replace source wave with result

Curve Fitting

Filter: W1

Type: Change sample rate (Custom...)
 Smoothing (original rate)
 Low Pass FIR
 High Pass FIR
 Custom FIR

Boundaries: Linear
 Freq Cutoff: dB
 Stopband: -98 dB
 Taps: 197

Filter

Data Transfer

Save wave W1 to disk
 Load wave W1 from disk
 Transfer wave W1 to journal Notes
 Transfer journal Notes to wave W1
 Delete last saved file
 Delete last loaded file

Disk I/O

Choose Menu

Menu: File
 Edit
 Command:
 Key press:
 * Key:
 Open instru: in task T1

Choose Menu

Instrument: Keithley 2001 DMM

Options

Function: DC Volts
 AC Volts
 DC Current
 AC Current
 Resistance
 Frequency
 Temperature

Resolution:
 Coupling:
 Type:
 Send to:

External Instrument

Analog & Digital I/O

Transfer...

Ain0
 Ain1
 Ain2
 Ain3
 Ain4
 Ain5
 Ain6
 Ain7
 DinPort
 DinBit0

Ain2 to...

Wave: W1 (Options...)
 Variable: error (Options...)
 Journal: Notes (Options...)
 String: retValue (Options...)
 Control: C1 (C)
 Marker: M1 (M) time

Analog & Digital I/O

Statistics on: W1

Transfer...

Wave: W5 (Options...)
 Variable: error (Options...)
 Journal: Notes (Options...)
 String: retValue (Options...)
 Control: C1 (C)
 Marker: M1 (M) time

Statistics

User Prompt

Message

Do you cook with gas?

Response:

No, I cook electric. Right Button: Yes
 Left Button: No

Variable "error" is loaded with 1 if Right button is pressed; 2 otherwise. String "retValue" is loaded with response text.

User Prompt

Do Every 5 Traces

Starting At Trace 1

...

...

End Do

Programming

Runtime Notes

Journal: Date

Scroll to the A1 position
 Insert note message at time A1
 Move marker A1 to the next note
 Move marker A1 to the next note that contains message text

Run-time Notes

Synthesize: Calc

Length: 200 points

Period: 52 points/cycle
 10.000 dB amplitude

Sine Square Triangle

Ramp: 0.000 to 5.000 dB
 Constant: 0 dB
 Gaussian: 5.000 dB rms noise
 Uniform: 10.000 dB random noise (s)

Synthesize

IEEE-488 Command

CLEAR 14
 OUTPUT 14:C1X TO4

Results

Copy into Journal Notes (Formatter...)
 Copy into string retValue
 Read 1 scalar value and transfer to...
 Copy ASCII data into wave W1

IEEE-488/RS-232

Move Marker: A1

Move to

next maximum
 next minimum
 first valley
 next valley
 first peak
 next peak
 first upstroke
 next upstroke
 first downstroke
 next downstroke
 next value
 absolute time H
 relative time H

Options

of wave Calc

Help
 Do It
 Cancel
 OK

Move Marker

HyperCard RCMB/BFCN

Open "OpenMouse", Direct, fileName, L_Snap_D, FastIdle,Loop

Available Objects

D:Displays: Time_D 6, 586, 655, 459
 J:Journals: Date 6/10/92
 M:Markers: A1 0.12006
 S:Strings: message 1.08
 V:Variables: error 1.00000
 W:Waves: Calc 0217940 f 0 0 0.000000
 String retValue:

HyperCard XFCN

YES! I WANT TO LEARN MORE

Please FAX, phone or send to GW Instruments:



- Macintosh Data Acquisition Hardware Catalog, 56pgs FREE
- SuperScope II Demonstration Version (5 disks) & User's Guide, 100pgs \$10
- SuperScope II Reference Manual, 300pgs \$10
- SuperScope II Open C Source Code, 300pgs of C code on 800K floppy \$10
- SoundScope Sound Analysis Hardware & Software Brochure, 8pgs FREE
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Ordering Information

SuperScope II *Base Package*
 SuperScope II Software, User's Manual, and Reference Manual.
 Part #GWI-SS2

SuperScope IIe *Entry Level System*
 SuperScope IIe Software, User's Manual, and Reference Manual.
 SuperScope IIe is identical to SuperScope II, except it does not support pulse analysis, filtering and advanced waveform math. It does, however, run all instruments created with SuperScope II.
 Part #GWI-SS2e

SuperScope II Open *C Programmer's Dream*
 SuperScope II Software, ≥40MB External Hard Disk, User's Manual, Reference Manual, and ThinkC project file (i.e. object code). ThinkC is available from Symantec and is not included.
 Part #GWI-SS2-C

SuperScope II Five-Pack *Multiple Systems*
 Five additional SuperScope II security keys. At least one base system (SS2 or SS2e) must be purchased in order to qualify for a Five-Pack purchase.
 Part #GWI-SS2-5x

Product Compatibility

SuperScope II is compatible with Macintosh Computers (e.g. Classic, LC, PowerBook, Quadra 840av) running System 6.0.7 or newer. A minimum of 4MB RAM is required (5MB with System 7), yet 8MB is recommended. SuperScope II is 32-bit and System 7 compatible.

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tiff:storm --- fully loaded 3MB tiff
page 1 item b) Tiff from SS2 16pg Ap Guide.TIFF:Pg1 SS2
Apl Guide.studio8.tiff5 -- fully loaded .03MB tiff5.0
page 1 item c) Tiff from SS2 16pg Ap Guide.TIFF:Logo In
White.tiff5 -- fully loaded .1MB tiff 5.0

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.1MB tiff 5.0
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tiff 5.0
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Guide.TIFF:Oscilloscope 55'.studio8.tiff5 -- fully loaded
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Reocrder 55'.tiff5 -- fully loaded .1MB tiff 5.0
page 2/3 item d) Tiff from SS2 16pg Ap Guide.TIFF:Spect
Analyzer 55'.tiff5 -- fully loaded .1MB tiff 5.0
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In Black.tiff5 -- fully loaded .1MB tiff 5.0

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tiff: navaho --- fully loaded .5MB FPO tiff --
rotated 90° and copied symetically
page 4/5 item b) Tiff from SS2 16pg Ap
Guide.TIFF:Oscilloscope 55'.studio8.tiff5 -- fully loaded
.1MB tiff 5.0
page 4/5 item c) Tiff from SS2 16pg Ap Guide.TIFF:XY
Recorder 1disp.tiff5 -- fully loaded .1MB tiff 5.0
page 4/5 item d) Tiff from SS2 16pg Ap Guide.TIFF:Spect
Analy 1disp.tiff5 -- fully loaded .1MB tiff 5.0
page 4/5 item e) Tiff from SS2 16pg Ap
Guide.TIFF:Cursor.tiff5 -- fully loaded .1MB tiff
5.0

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page 6/7 item a) marble paper textures:disk2:phoe FPO
tiff: pineapple --- fully loaded .5MB FPO tiff --
rotated 90° and copied symetically
page 6/7 item b) Tiff from SS2 16pg Ap Guide.TIFF:Strip
Chart 39'.tiff5 -- fully loaded .1MB tiff 5.0

page 8/9 -- 100% tiffed 12/4/93

page 8/9 item a) marble paper textures:disk2:phoe FPO
tiff: sea leaf -- fully loaded .5MB FPO tiff --
rotated 90° and copied symetically
page 8/9 item b) Tiff from SS2 16pg Ap
Guide.TIFF:EEG.tiff5 -- fully loaded .1MB tiff 5.0

page 8/9 item c) Tiff from SS2 16pg Ap
Guide.TIFF:EMG.tiff5 -- fully loaded .1MB tiff 5.0
page 8/9 item d) Tiff from SS2 16pg Ap
Guide.TIFF:EP.tiff5 -- fully loaded .1MB tiff 5.0
page 8/9 item e) Tiff from SS2 16pg Ap
Guide.TIFF:EKG.tiff5 -- fully loaded .1MB tiff 5.0

page 10/11 -- 100% tiffed 12/4/93

page 10/11 item a) marble paper textures:disk1:ameth
FPO tiff: gothic window --- fully loaded .5MB
FPO tiff -- rotated 90° and copied symetically
page 10/11 item b) Tiff from SS2 16pg Ap
Guide.TIFF:PID.tiff5 -- fully loaded .1MB tiff 5.0
page 10/11 item c) Tiff from SS2 16pg Ap
Guide.TIFF:CustomContKnob.tiff5 -- fully loaded
.1MB tiff 5.0

page 12/13 -- 100% tiffed 12/4/93

page 12/13 item a) marble paper textures:disk1:ameth
FPO tiff: midnight --- fully loaded .5MB FPO tiff --
rotated 90° and copied symetically
page 10/11 item b) Tiff from SS2 16pg Ap
Guide.TIFF:spect analyz.tiff5 -- fully loaded .1MB
tiff 5.0
page 10/11 item c) Tiff from SS2 16pg Ap
Guide.TIFF:pulseAnal data.tiff5 -- fully loaded
.1MB tiff 5.0
page 10/11 item d) Tiff from SS2 16pg Ap
Guide.TIFF:pulseAnal wave.tiff5 -- fully loaded
.1MB tiff 5.0
page 10/11 item e) Tiff from SS2 16pg Ap
Guide.TIFF:top-right arrow.tiff5 -- fully loaded
.1MB tiff 5.0
page 10/11 item f) Tiff from SS2 16pg Ap Guide.TIFF:left-
bot arrow.tiff5 -- fully loaded .1MB tiff 5.0
page 10/11 item g) Tiff from SS2 16pg Ap
Guide.TIFF:filter.tiff5 -- fully loaded .1MB tiff 5.0
page 10/11 item h) Tiff from SS2 16pg Ap
Guide.TIFF:histogram.tiff5 -- fully loaded .1MB tiff
5.0
page 10/11 item i) Tiff from SS2 16pg Ap
Guide.TIFF:pattern rec.tiff5 -- fully loaded .1MB tiff
5.0
page 10/11 item j) Tiff from SS2 16pg Ap
Guide.TIFF:curveFit.tiff5 -- fully loaded .1MB tiff 5.0
page 10/11 item k) Tiff from SS2 16pg Ap
Guide.TIFF:signalAvg.tiff5 -- fully loaded .1MB tiff
5.0

page 14/15 -- 100% tiffed 12/4/93

page 14/15 item a) marble paper textures:disk1:ameth
FPO tiff: bordeaux --- fully loaded .5MB FPO tiff -
- rotated 90° and copied symetically
page 14/15 item b) Tiff from SS2 16pg Ap Guide.TIFF:14/
15:wave.tiff5 -- fully loaded .1MB tiff 5.0
page 14/15 item c) Tiff from SS2 16pg Ap Guide.TIFF:14/
15:notes hi!.tiff5 -- fully loaded .1MB tiff 5.0

page 14/15 item d) Tiff from SS2 16pg Ap Guide.TIFF:14/15:tiny display.tiff5 -- fully loaded .1MB tiff 5.0
page 14/15 item e) Tiff from SS2 16pg Ap Guide.TIFF:14/15:marker blurb.tiff5 -- fully loaded .1MB tiff 5.0
page 14/15 item f) Tiff from SS2 16pg Ap Guide.TIFF:14/15:light.tiff5 -- fully loaded .1MB tiff 5.0
page 14/15 item g) Tiff from SS2 16pg Ap Guide.TIFF:14/15:switch.tiff5 -- fully loaded .1MB tiff 5.0
page 14/15 item h) Tiff from SS2 16pg Ap Guide.TIFF:14/15:meter.tiff5 -- fully loaded .1MB tiff 5.0
page 14/15 item i) Tiff from SS2 16pg Ap Guide.TIFF:14/15:thermometer.tiff5 -- fully loaded .1MB tiff 5.0
page 14/15 item j) Tiff from SS2 16pg Ap Guide.TIFF:14/15:button.tiff5 -- fully loaded .1MB tiff 5.0
page 14/15 item k) Tiff from SS2 16pg Ap Guide.TIFF:14/15:knob.tiff5 -- fully loaded .1MB tiff 5.0
page 14/15 item l) Tiff from SS2 16pg Ap Guide.TIFF:14/15:numeric.tiff5 -- fully loaded .1MB tiff 5.0

page 16 -- 100% tiffed 12/4/93

page 16 item a) marble paper textures:disk1:ameth FPO
tiff: fuchsia --- fully loaded .5MB FPO tiff --
rotated 90°
page 14/15 item b) Tiff from SS2 16pg Ap
Guide.TIFF:LogoInBlack.tiff5 -- fully loaded .1MB
tiff 5.0

- **4-COLOR**
 - **8 1/4" X 10 5/8" WITH BLEED**
 - **GLENN WEINREB**
- 617/625-4096**
GW INSTRUMENTS
35 MEDFORD ST.
SOMERVILLE, MA 02143

1 - COVER

2/3 - WHAT IS SS2?

4/5 - OSC

6/7 - STRIP CHART

8/9 - PHYSIOLOGIST'S 8

10/11 - 8 CAPABILITES

12/13 - 8 ANALYSISES

14/15 - VIRTUAL INSTR DESIGN

16 - ADV

6/7 - STRIP CHART

Display Features

Markers, Marker Labels, Segments

Do anything with Selected

CUT, COPY & PASTE WAVES

PRINTING, Run-time notes

*things You can do with waves
printing*

10/11 - EIGHT CAPABILITES

EXPORT TO DATABASE

WAVEFORM DATABASE

ZOOM & PAN

TABLE EDITOR

HYPERCARD XFCN

C,BASIC XFCN EXTENSIONS

OPEN VERSION FOR C PROG.

PID & ON/OFF CONTROL