Key Benefits of the GHI WinCAT System

Functions and Features

Found on the GHI WinCAT System

Hardware:

12 bit A/D	Provides quantizing to 0.024% of full scale range. This is the same for all 12 bit A/D systems. However, this does not indicate the true throughput accuracy.
Calibration	Calibration limits throughput inaccuracy to no more than 1.5% of full scale on each of 6 gain ranges. GHI Calibrates it's products using equipment and methods that are traceable to NIST, and conform to requirements of ISO and other quality oriented standards groups. Calibration is done by installing precision resistors which maintain calibration. GHI digitizing cards are known to stay in solid calibration during their life. In side-by-side comparative tests performed at a major hard disk drive manufacturer's test lab in Longmont, CO, other systems were off anywhere from 10% to 20% when monitoring calibrated shocks of 100 g's. In addition, the US Navy in Crane, IN who's calibration labs maintain a number of WinCAT systems has found that the systems are many times withing the error brackets of the calibration test equipment.
6 Gain Ranges	Adjustable gain provides optimum amplitude windows for variable signals, helping maintain system accuracy. Input full scale windows from 0.4 to 20 volts peak to peak are provided by WinCAT. Other less accurate systems rely on a single 10 volt amplitude window. In WinCAT, signal plotting is then done at full resolution without artificial amplitude expansion. Systems with single input windows of 10 volts attempt to compensate for lack of variable gain by doing a pulse amplitude zoom which is performed in software **<u>after</u>** digitizing in order to "fill the window." This simply makes it appear that the signal occupies a large part of the computer display. This technique is not the same as gain prior to the A/D converter and lacks it's accuracy - it's just a display technique. From an engineering perspective, if an A/D system is limited to a single input window of 10 volts full scale, a 10g signal from a 10mV/g accelerometer will have an amplitude of only 0.1V. This would be only 1/100th of the A/D range, or roughly equivalent to a 5 bit A/D conversion with a quantizing error of 3.5%. This is closer to the noise floor than to the noiseless full scale range of the system. This builds a significant amplitude uncertainty into the measurement as much as 10%.
13 Sampling Rates	Thirteen selectable recording time windows optimize the sample period for the signal being monitored. WinCAT provides the overhead for 10:1 oversampling that is critical to maintaining high frequency peaks in the data with no greater than 5% peak amplitude error. The WinCAT setup table allows choices from thirteen recording times to envelope any possible shock event. This feature guarantees that the sample rate will be high enough to maintain accuracy.
Built-in ICP Sensor Bias	The WinCAT provides the necessary integral built-in compliance current source and signal conditioning for the new generation of ICP sensors (those with sensitivities given in mV output per engineering units input. The feature alone saves the buyer several hundred dollars. For those using charge type sensors through charge amplifiers, GHI provides BNC input boxes.

Software:

Measurements. The WinCAT provides the normal time domain measurements of peak amplitude, pulse duration, velocity change integral, as well as partial measurements of both amplitude and time. All of these measurements are easily done through the use of the mouse cursor.

Fairing Cursors. The WinCAT includes both manual and automatic computing 'Fairing Cursors' for those using shock machine trapezoids.

Waveform zooms/compressions/moving. The WinCAT has both ICON buttons for both vertical and horizontal expansion and compression of waveform files and the ability to 'paint' the portion of the waveform to expand and fill the screen (variable zoom). In addition, the system provides 'grab' hand dragging of waveform in order to move them both vertically and horizontally. Scroll bars are also included for quick isolation of portions of longer records.

On-Screen Information Tags. Critical points on a waveform may be tagged with an edited content flag that remains attached to the waveform when saved to disk or printed out. The user may grab a flag with the mouse pointer and move it anywhere on the screen to best fit the report. It will remain at the new position when saved or printed.

Copy-to-the Windows Clipboard This feature allows the user to capture the signal screen for use with installed word processors, network interchange, or E-Mail. This is, of course, in addition to the traditional complete GHI test report that allows editing of content and fonts for report headers.

Print Preview The user can see what the WinCAT test report will look like on the installed Windows printer.

Editing Functions. To insure that bias errors from sensors and intervening electronics are removed from the real signal, the WinCAT offers a range of Zeroing functions to adjust the time history display to correct values. These include Zero Time at Cursor, Zero Amplitude (at Cursor, Absolute, or at Computed Mean Noise Value Prior to Pulse), and Zero Integral at Cursor. The zero amplitude is a powerful tool when there are questions about instrumentation errors that would affect amplitude values and when performing SRS's. This function is one of several intended to save test time and maintain accuracy during analysis.

Digital Filtering. Select automatic filtering or pick your own filter frequency in the Auto Mode. Selection is not limited to three or four widely spaced frequencies, rather the user can select from thousands of possible frequencies within practical limits. In the Auto Mode, the software determines shock pulse width, and then selects a filter frequency that meets the criteria defined in many shock test data analysis procedures, such as the Sandia Procedure. WinCAT also allows unfiltering to restore the signal to it's original condition, or even refiltering at different cut-off frequencies.

Signal Inversion. For those who expect acceleration signals to be positive going but are not, there is an Inversion function that flips the display. This is useful to compare channels from multiple sensors when some signals may be inverted due to 'upside down' accelerometers.

SRS

Program Source. Perhaps GHI is best known for it's 'Smallwood Ramp Invariant Recursive Digital Filter SRS' algorithm. This program, the first commercial program to run on PC's, was developed under the technology transfer program of the US Government in conjunction with Sandia Laboratories during the mid '80's. It was intended to provide a highly accurate and well behaved SRS for government contractors.

Performance Verification Testing. The GHI SRS in addition to all other available routines, was subjected to an intensive 'round-robin' test by the IES and the U.S.Navy. The GHI scored at the top in accuracy and proved it's ability to work with the extreme excitations provided by the test group. The results of these tests have been reported in the Journal of the Institute of Environmental Sciences.

The resulting product has been vastly improved from the initial FORTRAN program to include many usability features.

Velocity Integral Correction. Some of these usability features are internal routines for testing and adjustment of the time history baseline '0' level. This is a must to compensate for sensor system '0' drifts during shock. One such routine performs a velocity integral from time 0 to the end of the record. Since most controlled shocks have 0 NET velocity change, when the magnitude of the integral has been computed, the time history data points are adjusted such that the velocity integral at the end of the record is now 0. This removes any velocity change trend which causes large errors in SRS magnitudes at low frequencies.

Statistical Function. Other usability features include statistical functions. A number of shocks may be processed and the magnitudes of the SRS's will be retained either as a maximum envelope that shows the maximum of all SRS's processed (not the same as the Maximax presentation that is standard), or as Statistical Means with Standard Deviations. These functions fully comply with MIL-STD 810-D, E, and F, and give the user the ability to tailor test specifications using SRS.

SRS Model Parameters. The GHI SRS allows a wide range of user damping values from 1 to 0, as well as both positive/negative and maximax displays. The log-log maximax is the universally accepted format for SRS presentation. This format is not offered by other systems that provide only log-linear positive max displays which appear to try to correlate with package drop testing. Even in package drop testing, real shock signals can have major contributions from bipolar components or from residual spectra. It has been shown that a pure haversine shock pulse processed only with a positive max display lacks to account for the primary negative maximum and which is seen with the traditional maximax display.

Quick and Dirty, OR Maximum Accuracy. During the early history of the SRS, PC's operated at very low clock frequencies. Because of the computational intensity of the SRS, doing computations from full 128KB memory blocks was time consuming, often taking several minutes. For this reason, a quick look SRS was provided by using only the 512 data points that comprised the screen. The selection of 'Memory' for maximum accuracy, or 'Screen' for a quick look were provided.

Today, with processors no longer limiting the computation time, there is much less reason to use 'Screen' and to use only the more accurate 'Memory' mode selection. However, for users who grew-up with GHI SRS products, the choice has been retained.

Bars Showing SRS SDOF Filter Frequencies. A choice provided is to show the progression of SRS filter frequency points on the SRS plot.

This takes the form of vertical bars that extend from the baseline upward to the SRS line. They are used to find sharp response points on the SRS. Finer bar spacing increases the ability to find narrow bandwidth excitations in the signal being processed. Choices include 1/3rd, 1/6th, 1/12th Octave and High Resolution. High resolution assigns a filter to each pixel on the CRT and produces a nearly solid, high resolution SRS amplitude plot.

Scaling. The WinCAT SRS provides maximum flexibility in magnitude and frequency values for plot scales. The scales are true industry standard Log-Log format. Evaluation of SRS spectra validity is often done in terms of constant log rate slopes, such as 6dB/Octave. This form of 'chart reading' is not possible with linear amplitude displays. The affect of this is that low frequencies become de-emphasized with respect to the higher frequencies.

Exporting. Like other WinCAT programs, it is possible to export the final SRS plots as ASCII files for uploading into other analysis programs such as MicroSoft Excel. In many cases, a lab's customers find it more convenient in terms of electronic communications to use short ASCII files that can be included in E-Mail or over LAN's. In the case of SRS files, these ASCII lists are properly scaled in engineering units and require no further manipulation.

MIL-SPEC

General. The GHI MilSPEC program was developed to aid customers using shock machines for large numbers of classical environmental test shocks. It operates in compliance with various world-wide test standards which require template tolerance bars for test acceptance. The software generates the required tolerance bars from data entered into the database by the user. When a signal is captured, it is automatically placed within the tolerance bars at the proper location. The morphology of the pulse is then tested against the tolerance bar outlines. The user is allowed to move the waveform around within the tolerance bars to obtain a 'best fit.' In addition, the program supports other test standards that do not require tolerance bars but do use pulse amplitude and duration accuracy criteria for pass/fail. A test database is maintained and stores shock parameters as well as pass/fail criteria. The data base can be listed on screen or printed out.

Test Standards Supported. MIL-STD 810, C,D,E,F, MIL-STD 202, BS 2011, JIS 2011. These test standards specify pulse amplitudes and durations over large ranges, all of which are supported by WinCAT. In addition, the classic pulse shapes are available. These include halfsine, terminal peak sawtooth, and trapezoid.

Customer Support

Since the WinCAT is the principal product of GHI Systems, we have maintained a long legacy of customer support since the GHI's inception of the CAT (Computer Aided Testing) concept in 1978. Customers know they will talk directly to a senior technician when they need answers since there is no 'voice mail' at GHI.

Conclusion

Worldwide, GHI has the largest installed base of CAT type systems. We also sell to two large producers of shock machines. Our products are known in application areas ranging from Protective Package design and testing to space vehicle pyroshock testing. No other supplier has the breadth of applications experience as GHI, and we have been able to focus the feedback from this experience to improve our products. GHI customers include Fortune 500 names such as IBM, HP, Boeing, Lockheed, Texas Instruments, Intel, Loral Space Systems, Raytheon, Honeywell, Seagate, Maxtor, and hundreds more as well as offshore giants such as Matsushita (MKI Japan), Sony, Toshiba, Hitachi, Samsung and many others. The first CAT product was delivered in 1978, and *is still in operation* at Knowls Atomic Power Labs (KAPL) in New York. The prospective customer will be in good company by specifying WinCAT and will receive excellent customer service from the premier supplier in the field.