Glossary

A/D Converter or ADC: analog-to-digital converter is a device that accepts an analog input voltage and converts it to a digital, binary number. The output of an ADC is always a binary integer that must be converted to real voltage units in accordance with the system gain and converter resolution. The on-board ADC has 12 bits of resolution, meaning that it can resolve input voltage with a resolution of 1 part in 2^{12}, or 1 part in 4096.

Aliasing: frequency components above the Nyquist limit (see below) will falsely show up as lower frequency components. Therefore, signals should be filtered with an analog filter before A/D conversion to reduce errors.

AM9513: this is the counter/timer chip from Advanced Micro Devices used in the MacADIOS II board to generate accurate digital pulses and perform timing and counting operations.

ASCII: a standard code for representing text data, where one byte represents one character.

Boolean: a data type with two possible values, TRUE or FALSE.

D/A Converter or DAC: digital-to-analog converter is a device that accepts a binary integer as input and converts it to an analog output voltage. The on-board DAC has 12 bits of resolution, meaning that it can output a voltage with a resolution of 1 part in 2^{12}, or 1 part in 4096 (= 4.88 mV when configured for ±10 volt full scale output range).

dpi: dots per inch.

External: short for *external command* (XCMD) or *external function* (XFCN). A custom module of executable code that expands the standard HyperCard instruction set. WaveTrak makes heavy use of externals for real-time data acquisition and signal processing.

FFT: the Fast Fourier Transform is an efficient algorithm for converting waves from the time to the frequency domain. The FFT requires that the number of points in a wave be an integral power of 2.

FIR: Finite Impulse Response digital filter. This is a non-recursive filter (that is, the output values depend only on input values and not on previous outputs) that, unlike the FFT, does not require that the number of points in a wave be an integral power of 2.

FPU: floating point unit, the 68881/2 math coprocessor that greatly speeds up numerically intensive operations.

Handler: a series of HyperTalk instructions that intercepts a message, executing the instructions (i.e. a handler *handles* a message). Handlers always begin with `on handlerName` and end with `end handlerName`.

Multiplexer: a device that selects which analog input channel will be fed to the A/D converter. This allows a converter with a single input to digitize up to 16 channels, although it cannot digitize several channels simultaneously.

MUX: short for multiplexer.

Nyquist frequency: the highest theoretical frequency that can be faithfully digitized at a given sampling rate = 1/2 the sampling frequency i.e. if you sample at 100 kHz, the highest frequency that will be accurately captured is 50 kHz. In fact, frequencies above the Nyquist limit will falsely show up as lower frequency components (this is called aliasing, see above). Therefore, signals should be filtered with an analog filter before sampling to prevent errors.

Parameter: a variable or constant passed to a command or function e.g. the XCMD `WriteTTLbit bitNumber,theLevel` has two parameters.

PICT: a Macintosh graphics object, or the signature identifying a Macintosh graphics object or graphics file.

RAM: Random Access Memory, the physical memory in a computer made up of silicon memory chips. RAM can be written to and read from very fast, but loses its contents when the power is turned off.

ROM: Read Only Memory, also made up of silicon memory chips, but information is permanent and cannot be altered. Unlike RAM, ROM remembers its contents when the power is turned off.

Root: the first card of every experiment is the root card, serving as an introduction for the experiment and a synopsis of results.

Scrap: another name for the clipboard.

Trace: a wave with additional information, such as sampling rate, gain, time stamp, user comments and any other pertinent data. A trace is usually stored on a trace card.

TTL: Transistor-Transistor-Logic, a standard digital technology which defines a logical 1 as a level of +5 volts, and a logical 0 as a level of zero volts.

Vertex: each point in a polygon is called a vertex, because it causes the direction of the next line segment to change. When waves are exported as polygons, *points* in a wave are analogous to *vertices* in a polygon.

Wave: a series of values, either digitized or computed, equally spaced in time or any other horizontal dimension.

XCMD/XFCN: external command or function, also called external. A unit of executable code written in a compiled language such as C, Pascal or assembly. You can create extensions to the standard HyperTalk language by writing your own XCMDs. All of WaveTrak's real-time and digital signal processing functions are implemented as optimized XCMDs and XFCNs.

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