
Intelligent Oversampling Methods Extend Measurement Flexibility

DATAQ Instruments

DATAQ Instruments has established a tradition of developing data acquisition boards that provide programmable intelligent oversampling (IOS) on a per channel basis. This instrumentation approach is little-known and is only supported by DATAQ Instruments products. The programmable IOS feature enjoys great popularity for the following reasons:

It allows for more concise and meaningful measurements with less storage space

It allows tremendous reductions in acquired noise — especially when making low-level measurements. All DATAQ data acquisition products allow for dual programmable sample rates. One fixes the burst rate of the hardware, and another that fixes the sample rate of the application program. The burst rate defines the rate at which the hardware is always sampling the enabled channels. This activity is independent of the application program rate, which defines the rate at which information from the hardware is extracted and used. The application program rate is always less than or equal to the burst rate.

For example, suppose a single channel is enabled, the hardware burst sample rate is set to 30,000 samples per second, and the software sample rate is defined as once per second. When data acquisition starts, 30,000 samples will be acquired by the hardware every second. However, only one sample (one of the 30,000 acquired) is needed by the software each second. All other data acquisition hardware on the market will discard the first 29,999 samples and report (i.e., record to disk and/or display on your monitor) only the last value. DATAQ Instruments hardware can also operate like this, using its Last Point option. However, DATAQ's digital signal processor (DSP)-based hardware provides three other options. The DSP will statistically evaluate all 30,000 samples then report one value representing the average, maximum or minimum value. And the statistical approach it uses can be programmed differently for each channel.

The advantages of this approach are obvious when sample averaging is selected — clean signals can be extracted from high noise environments as the noise content of a signal averages to zero.

The minimum and maximum approaches can also be used to solve real world instrumentation problems. For example, a DATAQ customer who develops 400 Hz power supplies for aircraft needed to measure peak voltage and current continuously over a 2-day test. Without these intelligent oversampling methods provided by DATAQ Instruments hardware, the application would require a sample rate of at least 4,000 Hz per channel. Sampled continuously over 2 days, the information from both channels would consume over 2.5 gigabytes of storage. Then there would be the daunting task of reducing the data to the simple peak voltage and current required by the test. Instead, the customer chose DATAQ's maximum acquisition method. They selected a burst sample rate of 50,000 Hz spread over two channels (25,000 Hz sample rate per channel) and elected to report the channels once per second where each value represents the maximum of the 25,000 samples acquired by the hardware. Total storage required for the entire 2-day test was only 337 kilobytes, which was less than 0.02% of the continuous sampling methodology.