

What is Integration?

Within the world of instruNet, the term "Integration" refers to when the i100 averages an incoming analog signal over a specified period of time (e.g. 16ms). This is used to reduce noise, which is a fast up and down random signal added to the signal of interest. Integration, in some cases, enables one to average this random additional signal to a zero contribution, when the noise has an equal number of variations below and above the signal of interest.

Your noise goes up when your integration time goes down. To see this, set different integration times (e.g. 0.016, 0.001, 0.0) and watch how much the displayed reading varies when the incoming signal is constant. Please see AN #112 for details on noise Vs. integration. In many cases, you don't need Integration.

Integration limits Sample Rate

For each instruNet i2x0 pci/pcmcia card, the sample rate (samples per second per channel) is limited by the sum of the Integration times used by the analog input channels. More specifically, the maximum sample period per channel (sample period = $1 / \text{sample rate}$) is the sum of the integration times 1.2 (computer needs additional 20% time to manage other activities).

For example, 4 channels digitized at 100s/sec/ch would have a sample period of 10msec/ch (0.01 seconds inbetween each point within one digitized channel), and the maximum total integration time (i.e. the sum of the integrations for each of the 4 channels) minus 20% would be 8ms. Therefore, if each of the 4 channels had the same integration time, the maximum integration time for this sample rate would be 2ms (8ms/4) per channel.

Here's another example. If you want to digitize 8 channels at 10 sample per second per channel (s/sec/ch), set your integration time to 0.01 seconds for each of the 8 channels to establish an 100ms/ch minimum sample period (same as 10s/sec/ch max sample rate). One could then reduce integration 8x to get a sample rate that is 8x faster.

How to View/Adjust Integration Times

To view/adjust channel integration times, open the instruNet World NETWORK page, click on an analog input channel, select HARDWARE settings, and view/adjust the Integrate field (units are seconds). Typical values are 0.01666 (one 60Hz power line cycle), 0.02 (one 50Hz power line cycle), 0.001 (1ms), and 0 (no integration).