iNet-200 PCI Controller Counter/Timer Features

Application Note #113, 7/27/2002

instruNet supports the following counter/timer features with each of the 10 digital channels on the iNet-200 pci controller card. These 10 channels are independently programmable to one of:

1. Digital Input: Read logic 1 (>2V) or logic 0 (<.8V) at input pin.

2. Digital Ouput: Set connector pin to logic 1 (>2V) or logic 0 (<.8V).

3. Clock Output: Output a continuous clock, or a fixed number of pulses {1...2e9}. Set high time and period of clock. If period > 10ms, then we generate clock with a 1ms timebase that drives two 0 to 32K timers; otherwise, we use a .25us timebase. Periods must be >100us when fixing the # of pulses.

4. Pulse Counter: Read a 64bit counter that counts incoming >100us pulses since reset.

5. Period Measurement: Measure the duration of 1 to 2e9 periods by counting a .25us or 1ms timebase with a 64bit counter via the following options:
a) "Cycles" - aggregate number of periods to measure (between 1 and 255, or multiple of 10 if between 256 and 2e9). e.g. 100 cycles of 10Hz yields 10sec. Minimum pulse duration is 100us when measuring < 10 periods; and >10us otherwise.
b) "Measure" sum of entire cycle or just sum of high durations.
c) Count high "Resolution" 0.25us or lower resolution 1ms timebase.
d) "Modes":
+ Wait & Continue: Wait till measurement completes, start another measurement after read result.
+ Wait & Reset: Wait till measurement completes, start another measurement when next read.
+ No Wait & Continue: Read 0 if not done, , start another measurement after read result.
+ No Wait & Reset: Read 0 if not done, start another measurement when next read.

6. Frequency Measurement: Same as Period Measurement, except it returns the frequency of the input signal after measuring the period for "Clk Period" seconds. It checks to see if it passed the "Clk Period" second duration every "Cycles" (1...255) input pulses. For example, if you set "Cycles" to 100, and are measuring a ~10KHz signal, and set the "Clk Period" to 0.1sec, w/ a 0.25us resolution, then it will count the 4MHz timebase w/ a 64bit counter (overflows after 146,000 years). It will check to see if it passed the .1sec mark every 100 pulses (e.g. 10ms for 10KHz input). So it might stop after .11secs and see a timebase count of ~440,000 for ~1100 cycles. It will then divide these 2 numbers and return to you a VERY accurate frequency measurement (e.g. 10,000.00). Notice that traditional frequency measurement devices count a timebase for an specific duration, and error by the fraction of the input cycle that has transpired since its last trigger edge. The minimum pulse duration is 100us when measuring < 10 periods; and >10us otherwise.

7. Quadrature Measurement
Returns the 4x position of a quadrature sensor with a +/-32K counter. Connect wire A to Channel N, connect wire B to Channel N+1, and program Channel N for Quadrature, and away you go. For details, see Application Note #110.

NOTE: High speed >1Ks/sec/ch digitizing of analog signals by the instruNet Controller ties up the dsp processor, and therefore inhibits it from doing the following during that time: pulse counter, output a specific number of clock pulses, period measurement, and frequency measurement.