Noise and Oscillations on the instruNet Voltage Outputs

instruNet Voltage outputs (i.e. "Vout" screw terminals) are driven by Digital-to-Analog converters (D/A's), and all D/A's exhibit the following noise/oscillations issues:

1) Current Pumping

D/A's pump tiny nuggets of current when they switch (i.e. the d/a output voltage is changed). These nuggets hit capacitance, which charges up, and results in a voltage spike. This voltage spike is then buffered by an output operational amplifier. To the user, this looks like "noise". A resistive load on the output, such as a 2K ohm resistor, between the Vout and GND screw terminals, often helps, since the spikes are very narrow, and the op amp does not have a good drive capability at very high frequencies.

2) Digital Coupling

When a D/A output is changed, tiny spikes (typically 1/2LSB peak-to-peak) are typically coupled from the digital side of the D/A to the analog side. These are similar to "current pumping" spikes, in Note#1 above. A resistive load (e.g. 2K) is often helpful.

3) Oscillations

The instruNet D/A outputs are always buffered with an internal operational amplifier, and op amps sometimes oscillate when capacitively loaded (e.g. a long cable is attached to the vout terminal). Sometimes, resistively loading the cable at the far end, away from the vout terminal, stops this oscillation. Sometimes, resistively loading the cable at the near end (e.g. 2K ohm resistor between Vout terminal and GND), works well. Oscillations are easy to see when viewing the Vout channel in the instruNet Network Window, since the Voltage can be seen "bouncing" around it's expected value. In General, the iNet-100B and iNet-100 outputs are capable of driving 1000pF loads without oscillating, and the iNet-100HC outputs are capable of driving 0.01uF loads without oscillating.