

### **Bonus Feature: TTL-level serial port**

Like our original Orangutan USB programmer, the USB AVR programmer doubles as a USB-to-serial adapter, but with a few key improvements. The programmer installs as two virtual COM ports: one for communicating with programming software and one for the general-purpose USB-to-serial adapter. This means that you can seamlessly switch between programming an AVR and debugging it through the TTL serial port without having to open and close your terminal program. In addition to the serial transmit (TX), and receive (RX), lines, the programmer lets you use pins A and B as serial handshaking lines. The programmer's configuration utility allows you to select which handshaking line is assigned to which pin, and both input and output handshaking lines are supported. The programmer also gives you access to the USB's regulated 5V power bus through the VBUS pin.

### **Bonus Feature: SLO-scope**

This device can also act as a two-channel, severely limited oscilloscope (SLO-scope) using the A and B pins as analog voltage inputs and the Pololu SLO-scope application for Windows. The SLO-scope can measure voltages between 0 and ~5 V (the maximum is limited by the USB bus voltage), or higher if you use an external voltage divider, and it supports two sampling modes: 10 kHz sampling of two 8-bit analog inputs or 20 kHz sampling of one 7-bit analog input and one digital input. This feature can help you debug your circuits and firmware by seeing what the voltages are doing at various nodes. (Please note that the SLO-scope feedback is quite limited and is not intended as a substitute for a real oscilloscope or a good multimeter, which will have much higher input impedance, better resolution and range, and higher sampling frequency.)