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TNG-USB Features

- USB interface. This allows a greater maximum sample rate (1000 Hz), interface power budget (100 mA), and bidirectionality.

- 8 ADC inputs with 10-bit resolution. All these inputs are on the left side of the device. 4 inputs are accessed via single 3.5mm stereo jacks. The other 4 inputs are in a single RJ45 modular connector. Power and ground are also supplied on both of these connectors.

- 8 Digital I/O lines. Each line can be independently configured as an input or output. Initially, all these lines are configured as inputs. As with the analog inputs, 4 lines are accessable via 4 3.5mm stereo jacks, and 4 are grouped into a single RJ45 jack. All the digital I/O connectors are on the right side of the box.

- 2 SPI ports with separate control lines. There is a RJ45 jack on either side of the box for these ports. These ports support the operation of more complicated devices. For example, there is a thermocouple readout IC we use that is SPI-compatible. Another example is an IC that's a combined temperature and pressure sensor. Our hobby servo controller also uses SPI.

- External power supply input to allow power budgets of up to 500 mA.

OK. That's hardware. There are now a multitude of software-related issues to resolve. Most of these arise from differences between the legacy of TNG-3B and this new device. There are two issues that do not involve hardware or software. Namely, a new front label, and what we call the fool thing. I guess these could be classified as wetware issues.

I vote for TNG-4, as in “What's a TNG-4?” Relatively few people know of the other TNG-4 (or 5). TNG-x (thinks) also has merit. U-TNG? (Thank you, Thing.) TNG-y? Maybe we should come up with a new acronym. Although, TNG has a track record, and we could use “Wild TNG” as a song (Love is a many splendored TNG?). I leave this marketing/branding stuff to those

more talented and inclined.

Major differences from TNG-3B that need to be addressed in NeatTools:

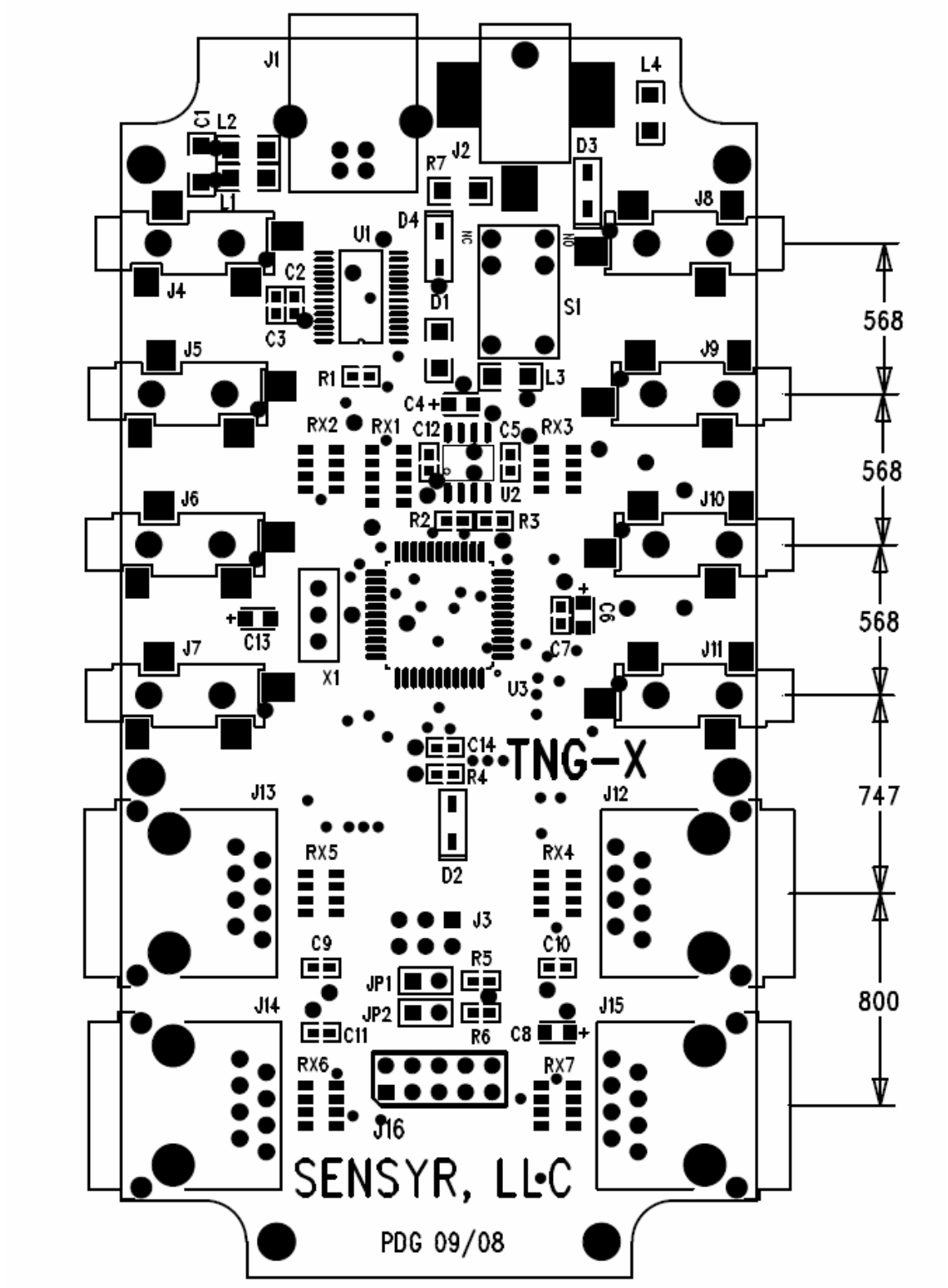
1. 10-bit analog converter resolution. Obviously, these extra bits need to be accommodated some way. There are choices about packing or not packing the bits (the extra two bits of each of 8 channels could be packed into two extra bytes). If the bits are not packed, then there's justification withing the two bytes to consider. There is merit to left justifying the bits in a 16-bit word. That way, if additional resolution becomes available, the extra bits would be relatively transparent to other software.

2. Configurability. TNG-3B just did what it did without direction from the computer side. Now, ports are configurable and data can flow from the computer to the digital and SPI ports. Configuration information and output data only needs to be sent on changes. The original, streaming-mode version of TNG-4 featured output streaming, sending all output data all the time.

3. SPI. This is a bidirectional protocol. Also, from experience, it's usually better to operate more in a command mode than constant streaming. Message lengths are variable, depending on the device(s) being accessed. SPI data is read every time data is written. The returned data is not always of interest. Sometimes the outgoing data is the uninteresting portion and is just being used to clock in the incoming data. Perhaps some reliable method can be devised for either a true data stream implementation or some sort of pseudo-streaming. Often SPI communication requires transmission and receipt of a series of messages. Plus, there may be timing issues. This is why a command-mode approach may be superlative.

4. Command mode vs. Streaming mode. Like the chicken/egg problem, there's no overwhelming argument for either being the best. What I call a pseudo-streaming mode may be the more flexible approach. In psuedo-streaming, input data packets can be defined along with the packet rate. The iGlove device used this method to good success, although there wasn't much in the way of output to contend with. The question is whether we should have a default (streaming/non-streaming) startup condition. There are two jumper selectors on the board. They could be used to specify start conditions.

The estimated production cost of this new TNG is about $85 in batches of 20. It'll cost only about $10 more to make as TNG-4 used to cost. FCC and USB compliance testing have not been factored into these cost estimates.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