Data Acquisition Board for Environmental Measurements

Several manufacturers offer small computer on module (COM) systems that find places in various consumer electronics applications. Such systems are, for example Gumstix, Toradex Colibri, Variscite and others. These COMs are focused on processing power, video graphics, audio processing, and offer various interfaces for cameras and screens, connectivity options and other functions that are not needed for environmental applications.

We have designed a DAQ board specifically for radiometer data acquisition and control. The design goal was a data acquisition system that would be small, consume low power, and provide a number of analog to digital (A/D) input channels with very good resolution, with a multitude of digital inputs and outputs, data storage, Ethernet and other connectivity options.

The DAQ has 24 A/D with 18 bit resolution. Each channel can be sampled at 20 kS/s (kilosamples per second) and its input voltage range is between 0 and 3.3 V. The DAQ consumes about 1.6 W of power. It is, however, a conservative estimate assuming that the microprocessor is constantly writing to a µSD card with 200 mA current and all other board components are consuming their nominal power. The input voltage can be anywhere from 4.5 to 14 VDC. This input voltage is controlled by a switch on the DAQ and it is passed to the output connector. Thus it is available to power, for example, a radiometer receiver. The DAQ can be remotely powered up or down with a one-bit logical signal control. The board can communicate via Ethernet or a serial interface. Two synchronization signal GPIO (general purpose inputs/outputs) are available too. Operational temperature range is -40°C to +80°C.

Data Acquisition Board (DAQ) block diagram

DAQ layout

DAQ board layout. The board size is 80 x 50 mm (for a comparison: a credit card size is 85 x 55 mm) and it is shown in an enlarged scale (2:1)