BCM Rack Check | 11/24/10

Looking for any source of noise / spikes:

Signal on scope (1MΩ)	Width (1 msec samples but BW much lower)
BCM1 rms-to-DC output	2.5mV (rms)
rms-to-DC + preamp input	2.5mV (rms)
rms-to-DC + preamp input + upstairs cable run [normal ops]	2.4mV (rms)
pre-amp input only [scope in 50Ω]	0.69mV (rms)

So the pre-amps is doing a great job buffering us from V/F chatter.

BCM2 [normal ops setup] as above — 0.9mV (rms)

This is much smaller than the equivalent BCM1 noise. Could be due to quieter electronics, or BW could be ~7x smaller.

DVM measurements	R (Ω)
preamp input	∞
upstairs cable run to ADC	12kΩ ✓

Estimating BCM1 Resolution

From scope, rms measurement feature

$$\sigma_{BCM1} \approx 2.5\,mV\ (rms)$$

The scope took 1 usec samples, but I'll assume the BW is limited to only ≈ 10 kHz by the rms-to-DC filter.

Thus,

$$\frac{\sigma_{BCM1}}{\sqrt{Hz}} = 2.5\,mV \times \sqrt{\frac{1/10{,}000\ sec}{1\ sec}} = \frac{25\,\mu V}{\sqrt{Hz}}$$

This is way above the ~1 $\frac{\mu V}{\sqrt{Hz}}$ of the ADC's, even allowing for a factor of 2 error on the BW.

What is that for 1/960 sec quadr?

$$\sigma_{BCM1}\ (\text{parity deg, volts}) = \frac{25\,\mu V}{\sqrt{Hz}} \times \sqrt{\frac{1\ sec}{1/960\ sec}} = 387\,\mu V$$

What is that in ppm?

From helog 197,136

$$V_{BCM1} = 23.2\,\frac{mV}{\mu A} \times 140\,\mu A = 3.2\,V$$

hence

$$\sigma_{BCM1}\ (ppm) = \frac{387\,\mu V}{3.2 \cdot 10^6\,\mu V} = 121\ ppm$$

which doesn't seem crazy given the factor of 2 uncertainty.