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Mechanism & Heater Controller (MHC)

Unit mounted on the spectrometer providing control for the mechanisms, and those critical heaters where extreme temperature resolution is necessary. Overcomes problems of feeding multiple high power motor and noise-sensitive control signals down 5m cable.

- Simple serial low speed command & telemetry link to ICU, and one main bus (28V) feed.
- Need to identify critical heater requirements, and also negotiate with system side in Japan on the number of control nodes and their resolution.
- A resolution of 0.1C for temperature control is probably required for some optical parts.
- If the mechanisms had a standard interface - eg USB - then most of the requirement for this unit would disappear (just a thought..).

Noise Management

Probable 14 bit digitisation of CCD information implies 1 bit = 305µV in a 5V system.

The aim is to achieve a performance in the analogue chain equivalent to 16bits resolution - a signal to noise ratio of 76µV in 5V, or 96dB. This will give a clean 14 bit digitising performance with no quantisation noise problems.

Critical Areas:

- CCD connections - must be very short and away from noise sources
- Camera Power - 5m cable to Instrument Control Unit requires local regulation of about 6 camera power supplies. Fortunately most are low power.
- Synchronous logic operation all from one master clock if possible.
- Radiation screening of the CCD chip - need orbital radiation study to estimate dose.

Power System

- Probable 28V feed from spacecraft. Difficult to proceed with design though until tolerances on this are known.
- Request to the system side in Japan is for 37 ± 7W average, 55 ± 5W peak power excluding the heaters.
- Concept is for main power converter in ICU giving +3.3V, +5.1V, +12.1V, -12.1V regulated power, bus isolation, and noise filtering to MIL-STD-461.
- +12V line is also camera supply where further regulation and conversion give about 6 voltages from 3V to ~ 36V. Some of these may need to be programmable to allow trim of CCD operation in flight.
- On - off control of EIS is by a dedicated command line from the MDP to EIS, with switching happening in EIS. In practice this allows the concept of a low power keep-alive mode.
- Acceptable noise levels - both ways - are critical to the detail of the design.

Processor Choice

Four candidates

- Analog Devices 21020 from Temic, DSP, 100krad, ESA certified
- Analog Devices ADSP21060 (SHARC) - DSP, possible future certification
- Motorola PowerPC 603e, 60krad version from STM, 100krad from Honeywell
- SPARC (Sun Microsystems) chipset from Temic, >100krad

Potential requirement for significant image processing for data reduction and compression encourages use of DSP rather than conventional processor.