SPACE PHYSICS RESEARCH LABORATORY

TIDI

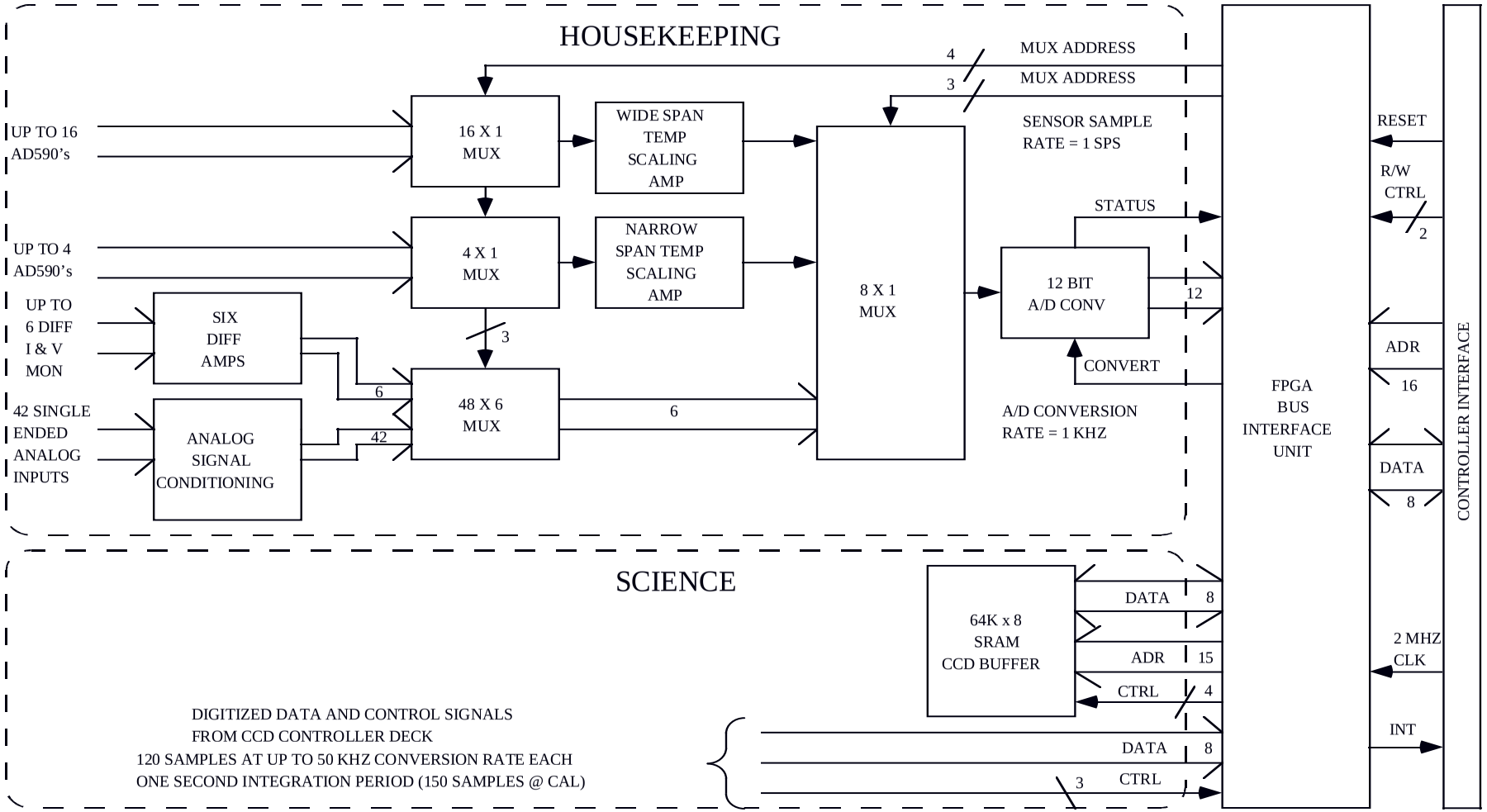
Data Acquisition Deck

Peter Hansen

734-763-6241

pehansen@umich.edu

DA Deck Block Diagram



SPACE PHYSICS RESEARCH LABORATORY

TIDI

Telemetry Measurement Points

- **Telescope Temps (4)**
  - Optics Housing*
  - Pedestal Mount
  - LVDT Preamp
- **Profiler Temps**
  - Profiler base plate
  - Filter wheel housing*
  - CCD Substrate*
  - CCD Preamp
  - Sensor Window*
  - Profiler Rod*
  - Profiler Leaf*
  - Profiler Post*
- **Stack Temps**
  - PS Deck
  - Flight Computer Deck
  - Data Acquisition Deck
- **Spacecraft Interface**
  - Primary Voltage
  - Primary Instrument Current
  - Primary Op. Htr. Current
- **Telescope Position (4)**
  - Position
  - Position Error
- **Telescope Servo (4)**
  - Telescope holding current

* Indicates Heater Control Point

Telemetry Measurement Points (contd)

- **CCD Controller**
  - **Drive Level D-A's (14)**
- **Power Supply Secondary**
  - **Voltages**

    +5, +15, -15, +6, -6, +26, +28
  - **Currents**

    +6 Total Avg Servo Current

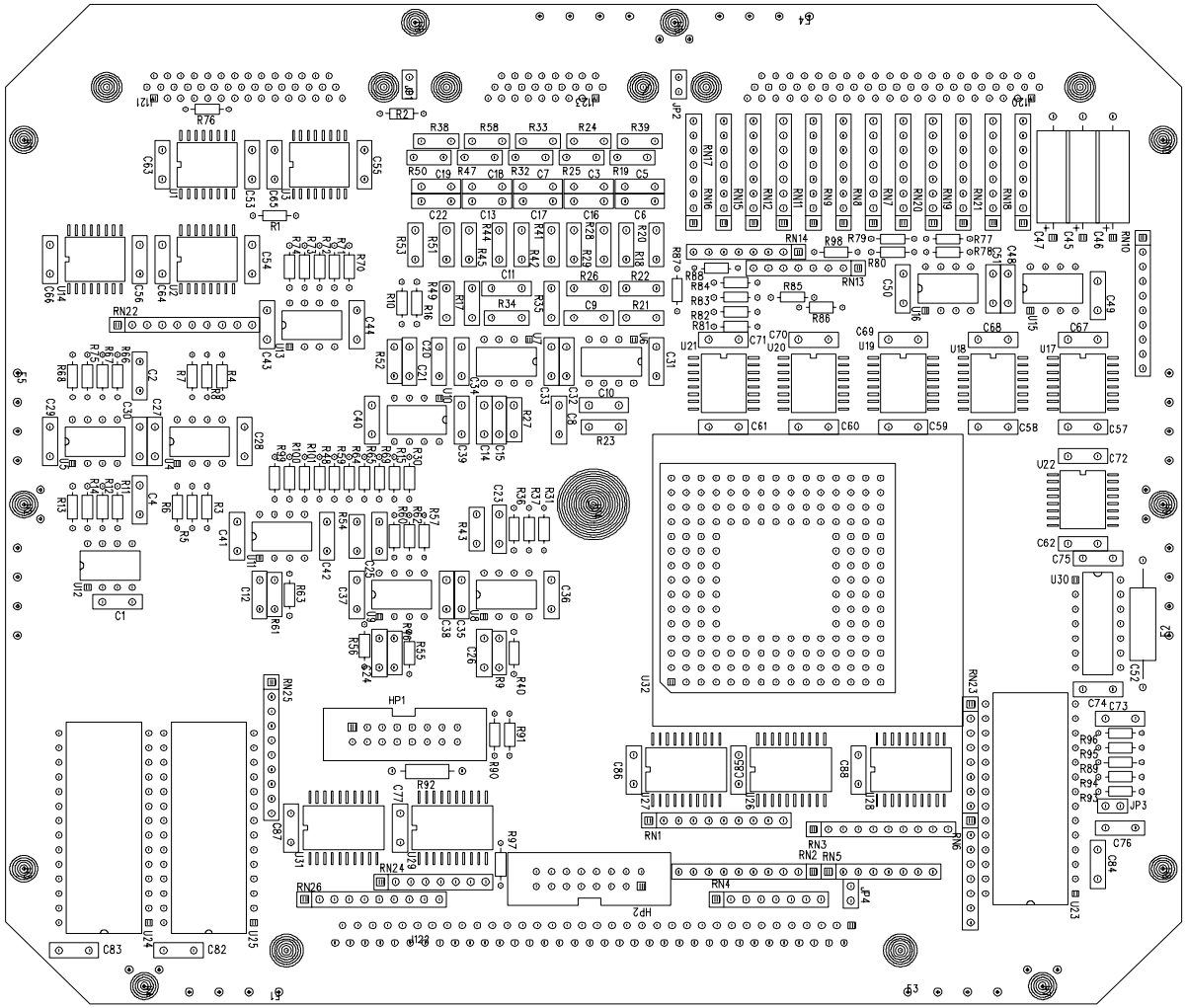
    -6 Total Avg Servo Current

    +28 Cal Lamp Total Current

SPACE PHYSICS RESEARCH LABORATORY

TIDI

DA Deck PCB Layout



Performance Requirements & Goals

- **Maintain 1 Megohm Isolation for the 3 Spacecraft Primary current and voltage measurements**
  - **Provided by 3 differential amplifiers, each having a common mode input impedance of 5 Megohms**
- **Filter critical measurements as close to Nyquist criteria as possible (Sensor sample rate = 1 Hz)**
  - **1 KHz burst rate multiplexing requires that all 1 Hz Nyquist filtering be performed at the input to the multiplexer**
  - **Reasonable physical size capacitance values limited to 0.1uF**
  - **Differential amplifiers for servo total current and S/C primary measurements will achieve 0.09Hz BW, 3 pole roll off**
  - **Other critical measurements are filtered at the source**

    Telescope servo position errors are heavily filtered at the servo deck output

Performance Requirements & Goals contd.

- **Analog signal conditioning will not degrade temperature performance of A-D converter.**
  - **Analysis of all interface circuits indicates less than 1 LSB error contribution to A-D conversion process**
  - **Specified absolute accuracy (combined span and zero) for Analog Devices AD674B converter is 7 LSB over full -55 to +125 C mil temperature range**
  - **Measurement of data acquisition board temperature at or near the A/D converter will be provided to permit calibration of systematic error**
- **Provide 64K of SRAM buffer memory for the CCD data**

SPACE PHYSICS RESEARCH LABORATORY

TIDI

Remaining Design Tasks

- Add 4 additional temperature monitors for telescopes
- Add internal temperature monitor near A/D
- Complete the FPGA design
- Derating Inspection and Calculations
- Update Software Interface Document
- Conduct internal final design review