Electronics systems design on CP2

CP2 Innovations:
• Software TNC
• Redundant Communication Systems
• Maximum Power Point Tracking
• Power Distribution Failure Isolation
• Robust I²C Architecture
Maximum Power Point Tracking

- Solar Panel Characteristics
  - GaAs Dual Junction, 21.5% eff. From Spectrolab
Maximum Power Point Tracking

Solar Panel → DC-DC Converter (input voltage regulation) → Batteries and loads

Voltage set point

Main processor → Voltage and current sensing
Load Power Conditioning

- Under-Voltage Shutoff (with hysteresis)
  - Uses a uP Supervisor IC
  - Low voltage set point set by uP Supervisor
  - Hysteresis set by resistors that reduce voltage “seen” by the uP Supervisor
Load Power Conditioning

• Smart fuse
  – Designed around the MAX890L
  – Limits current flow to the load devices
  – Shuts off power if current flow reaches limit for a given period of time
  – Re-enables power for a brief period to test for continued fault condition
Energy Storage

• Li-ion vs. Ni-Mh
  – Energy density
  – Space Shuttle requirements

• For maximum power density and Space Shuttle compatibility, CP2 will be able to accommodate both types of batteries

• For redundancy, 2 batteries and battery protection circuits will be used
Energy Storage

• Batteries selected:
  – Li-ion: PolyStor Corp. 3.7V, 1200mAh
  – Ni-Mh: GP Batteries, 3.6V, 700mAh
Energy Storage

- Battery monitor and protection circuitry
I²C Protocol

- Only 2 wires required
- Many devices use it
- Multiple masters can use the bus
- Address limitations
- Single point failure!!!!!!
I²C MUX system

- Allows selection between 8 I²C bus branches
- Each side of CP2 is given a different branch
- Prevents failure on any branch from crippling entire system
- Several devices with the same I²C address can be used
I²C Bridge and Contingency Mode

• Enabled in the event of a main bus or C+DH processor failure
• Isolates all but the communications system and the payload for minimal functionality
Design Questions?