DCH Requirements

- Process at a rate fast enough to maintain all data storage and command handling tasks.

- Have sufficient storage space to hold the OS, science data, and other command handling software

- Must detect, verify and distribute all commands

- Must withstand a total dose radiation of up to 15Krads

- Must be able to recover from single event upset errors/ hard bit errors

DCH Requirements, cont.

- Maximum Power consumption of 12 watts(transient) and 7 watts (steady state)
- Maximum Volume goal of 7500 cc's
- Must provide internal housekeeping functions for all other satellite subsystems and instruments.

Selecting Processor

- Need a low power embedded processor
- Need a processor that withstands a radiation environment (to within certain tolerances)
- Processor must be able to recover from single event upsets
- Need a processor with various power consumption modes
- Need to have DMA, so that subsystems can write to and read from memory without effecting the CPU's performance.

About the Intel 386EX Processor

- Contains a modular, fully static 386CX CPU
- 16 bit data bus and 26 bit address bus
- 64Mbytes of memory address space
- 64Kbytes of I/O address space
- Available in three clock rates (16, 25, 33 MHz)
- Watchdog timer
- Idle mode and Powerdown mode to conserve power

More about the 386EX

- Normal operation power consumption is 1.125-1.76 Watts (depends on Clock speed)

- University of Surrey and Honeywell have radiation tested this processor.
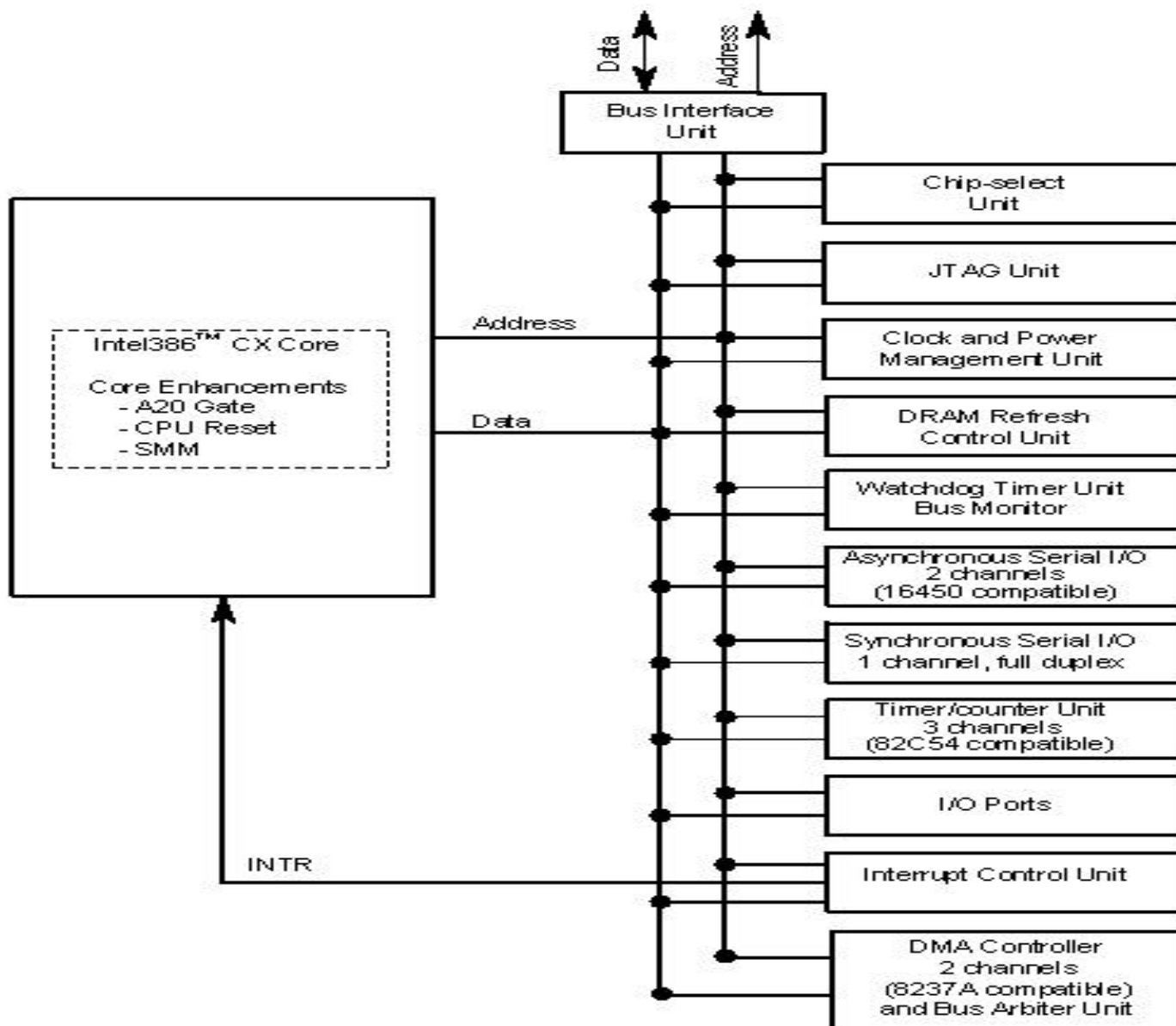
Figure 2-1. Intel386™ EX Embedded Processor Block Diagram

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Software and Data Storage

- OS and any other command handling software will be stored on an EPROM

- Data from Science Team will be buffered while satellite is out of contact with the radio groundstation
  - The data will be saved to Static RAM and then sent to the groundstation.

OS considerations

- Need a protected mode kernal
- Need a multitasking, real time OS
- Types of operating systems we have considered buying
  - DR-DOS - by Caldera
  - eCos - by Cygnus
  - iRMXII - by Radisys

System I/O Concerns

- **Guidance, Navigation and Control**
  - magnetonmeter - measure magnetic fields
  - sun sensors- Frequency Counter
  - horizon sensors - Analog Input
- **Power Generation and Distribution**
  - monitor power systems -Analog input
- **Mechanical and Structural Analysis**
  - monitor thermal - Analog input
- **Laser Experiment**
  - experimental uplink communicating at 10Mbit/s
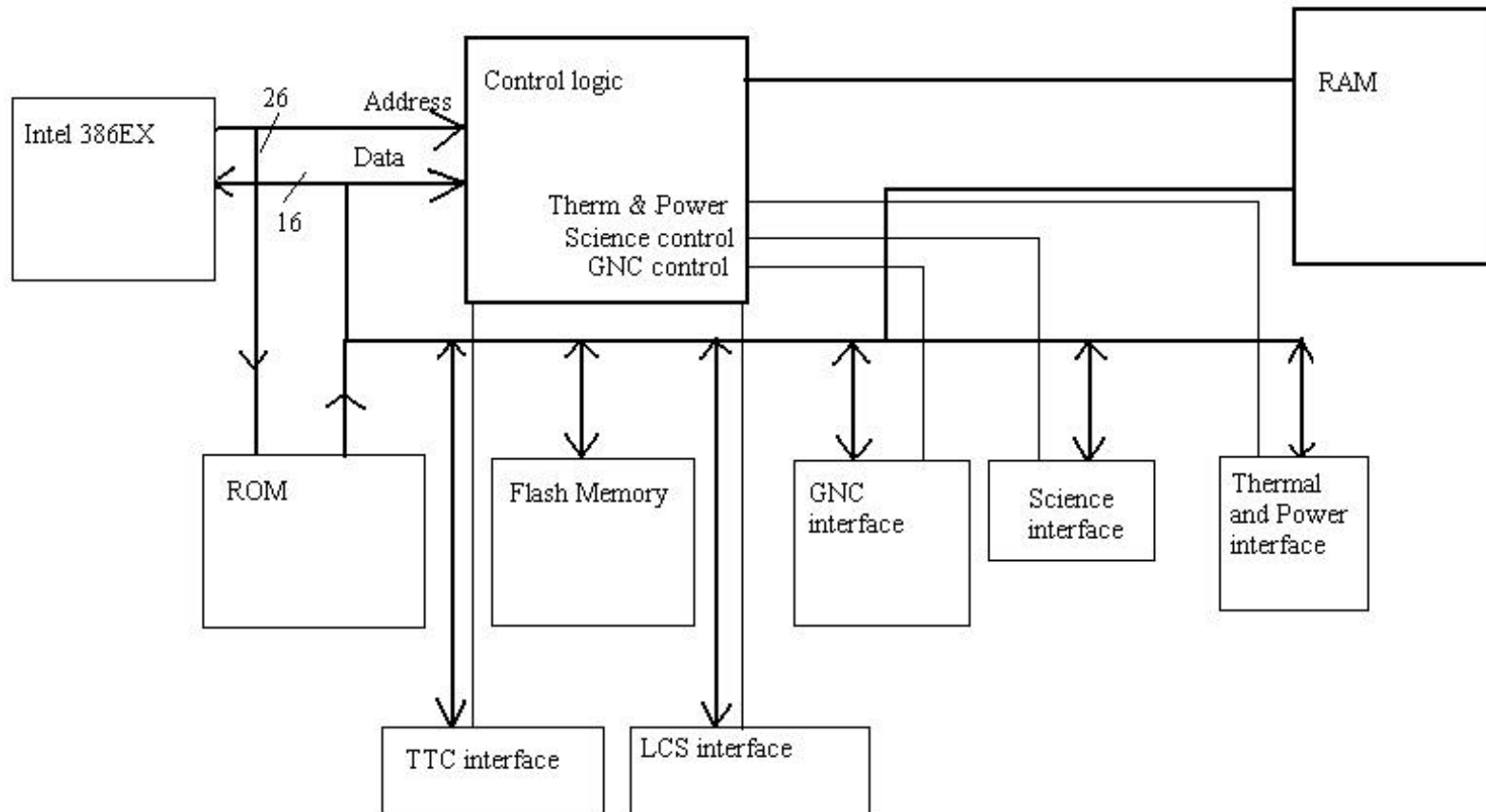
Systems I/O Concerns, cont.

- **Tracking, Telemetry and Command**
  - **communication with groundstation**
    - **2Mbit/s downlink**
    - **9600 bit/s uplink**
- **Science**
  - **buffering science data**
  - **data compression**

DCH Block Diagram

Opportunities with UASat

- We need Electrical Engineers, Computer Engineers, and Computer Science majors.
- Consists of one meeting a week and any assignments designated by team leader
- We have a full version of Layout Plus and Capture(the new PSPICE products)
- Programmers will gain embedded systems software experience.