RAD750™ SpaceWire Enabled Flight Computer for Lunar Reconnaissance Orbiter

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LRO Command and Data Handling (C&DH) / Spacecraft Architecture

- **LROC**: LROC
- **LOLA**: LOLA
- **Mini-RF**: BAE SpaceWire ASIC
- **1553B**: SpaceWire
- **SpaceWire FPGA**: BAE SpaceWire ASIC
- **LSB**: Data Storage Board (DSB)
- **cPCI**: LABC
- **S-Comm**: Ka-Comm
- **Comm Card**: Ka-Xmtr
- **HGA Gimbals**: HGA
- **USO 9500**: 9600 cPCI signals
- **USO 9600**: USO 9600 cPCI signals
- **POR**: POR
- **LVPC**: LVPC
- **MAC**: MAC
- **RAD750 SBC**: RAD750 SBC
- **Data Storage Board (DSB)**: Data Storage Board (DSB)
- **cPCI**: cPCI
- **cPCI**: cPCI signals

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RAD750 CompactPCI LRO
Single Board Computer

BAE Systems 132 MHz RAD750 PowerPC Microprocessor
BAE Systems Enhanced Power PCI Bridge ASIC
SPIF Actel FPGA
BAE Systems SRAM (36 MB) for processor
BAE Systems SpaceWire ASIC

MIL-STD-1553 Connectors (2)
Aeroflex SuMMIT ASIC
BAE Systems SRAM (64KB) for 1553
SpaceWire Connectors (4)
BAE Systems SRAM (8 MB) for SpaceWire

CompactPCI 6U-220 Board Format
RAD750 Computer In the LRO C&DH Enclosure

Single Board Computer Deliveries:
- Breadboards – 2006
- Engineering Units – Early 2007
- Flight Units – June 2007

C&DH Unit now inserted into LRO FlatSat testbed
SpaceWire Data Transfer: LROC to Storage Memory

1. RAD750 sets up Space Wire to Receive LROC Data (allocates memory, creates Router I/F [RIF] DMAs).
2. Data Arrives and 750 is notified (either at end of block or end of packet TBR).
3. RAD750 sets up a SpaceWire Memory Controller DMA to move data to Data Storage Board (DSB) memory.
SpaceWire Data Transfer: Memory to Downlink

1. RAD750 issues a Read (usually 1Mbyte) to a target buffer in SpaceWire Memory.
2. Device Driver uses the SpaceWire Memory controller to move the data from the DSB Memory to the target buffer in SpaceWire memory.
3. RAD750 notifies the EMC that downlink data is available.
4. EMC formats the data for downlink and sends it to the Ka-Comm.
Next Generation RAD750 Single Board Computer

- BAE Systems 1MB L2 Cache Memory
- BAE Systems Next Generation Bridge ASIC with embedded SpaceWire Router and 1553 I/F
- BAE Systems 80Mb SRAM stack