SSR

Solid State Recorders for space applications

The Solid State Recorder Line is a series of Products providing an on-board data recording and playback capability for satellite and spacecraft platforms and payloads. Airbus DS has been supplying recorders based on Solid State technology for over 30 years.

Present generation products are based on ESA qualified SD-RAM or Flash memory technology. Such SSRs can provide storage capacities up to 20 Tbit and can handle data rates up to 20 Gbps.

A key feature of the mass memory line is its modular highly reliable architecture which can be readily scaled and adapted to satisfy a broad spectrum of customer needs with a minimum of non-recurring cost. Modularity is based on qualiflied building blocks supporting a variety of input/output formats, file management, compression, re-ordering and encryption functions.

Short delivery times are made possible through an in-house stock policy for long lead items and qualifed memory components.

Key Features

- Adaptable modular highly reliable architecture with processor based Memory System Supervisor
- File Management
- Highest data integrity through real-time detection and correction of soft errors
- Available with either volatile SD-RAM or non-volatile Flash technology
- Supports multiple input channels
- Component class 1 and class 2 versions available

Main application fields

- Earth observation satellites, scientific instruments and spacecraft data storage and playback
- Storage of optical, radar and scientific instrument data

Customers / Application

- A wide range of European and International customers including ESA, JAXA, KARI and DLR
- Currently 34 satellites launched and successfully operating with Airbus DS mass memories since 1990

Interfaces

- Data Interface: SpaceWire, SpaceFibre, LVDS link, MIL-STD-1553, Wizard Link, Channel Link, GigaLink, RS-422 UART, Parallel

Budgets

- Mass — 6 - 20 kg
- Width — ca 250 mm
- Height — ca 250 mm
- Length — 80 - 600 mm
- Power — 10 - 100 W
- Reliability — 0.99 over 7 years in-orbit

Performance

Solid State Recorders based on SD-RAM technology
- Up to 3 Tbit capacity
- Up to 20 Gbps input data rate and 4 Gbps downlink datarate
- Volatile Storage

Solid State Recorders based on Flash technology
- 1 Tbit to 20 Tbit capacity
- Up to 20 Gbps input data rate and 4 Gbps downlink datarate
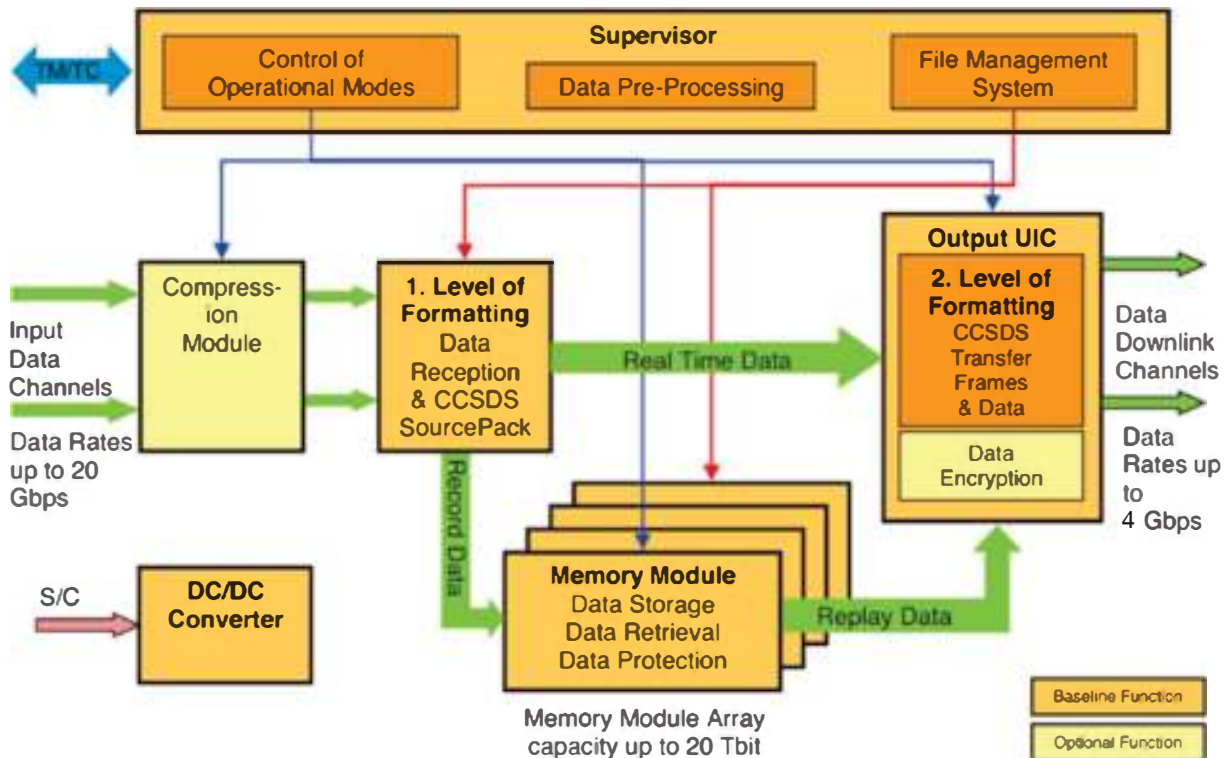- Non-Volatile Storage
- Maximum 5% degradation EOL

Environments

- Temperature: Operating -25 °C to +60 °C
  Non-operating -40 °C to +75 °C
- Radiation — compliant with 15 years LEO
- Life time — up to 15 years in LEO

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Key mass memory features

Data storage and retrieval
- Data protection against radiation induced failures (based on over 30 years' experience) through real-time error detection algorithms and correction procedures
- Reconfigurable in-orbit with spare capacity/functionality in case of permanent failures

Formatting
- Raw data can be formatted into CCSDS conform source packets or any other specified format
- Downlink data into CCSDS conform transfer frames (CADU) including RS encoding and scrambling

Real-time downlink
- Accommodates multiple differing input data rates to common fixed data rate downlink (up to 4 Gbps)

Mass memory control
- Solutions varying from microprocessor with software to simple hardware state machine
- Real-time data record and replay
- Simultaneous data compression, record and replay
- On-line diagnostics and correction through background memory scrubbing
- Off-line self-test

Real-time File Management System 'FMS'
- Software (internal or external) based FMS control and table management
- Hardware execution of FMS high speed functions
- Support for ESA Packet Utilisation Standard (PUS) services

Additonal functions
- Compression algorithms: JPEG, WAVELET, CCSDS 122 BPE, BAQ, FFT BAQ, advanced BAQ
- High speed and real-time encryption (e.g. TRIPLE-DES, AES) of downlink data (up to 600 Mbps)

Example configurations

SSR Type	SSR Type	Capacity	Input I/F	Data Rate	Mass	power (Max)
Basic	SD-RAM	512 Gbit	SpaceWire	500 Mbps	15 kg	45 W
High Capacity	Flash	4 Tbit	Channel Link	1 Gbps	14 kg	35 W
Compression	SD-RAM	512 Gbit	Wizard Link	7 Gbps	30 kg	250 W