DEFENCE AND SPACE
Spacecraft Equipment

Amethyst
Centralized Avionics

P u r e L i n e

About PureLine - **The PureLine series was initially developed for constellation applications with large quantities, paving the way to offer disruptive unit prices while keeping high quality products. This approach can now be extended to global satellite applications.**

PureLine is aimed at markets that can embrace the following key features: models are produced in large batches, with automotive quality grade parts and justification files based on constellation heritage. The main advantage of this product line is that it offers very cost-effective products without compromising reliability and quality. This new value proposition is a pivotal enabler for commercial space-based applications, and is made possible solely thanks to the innovative business approach of Airbus Spacecraft Equipment.

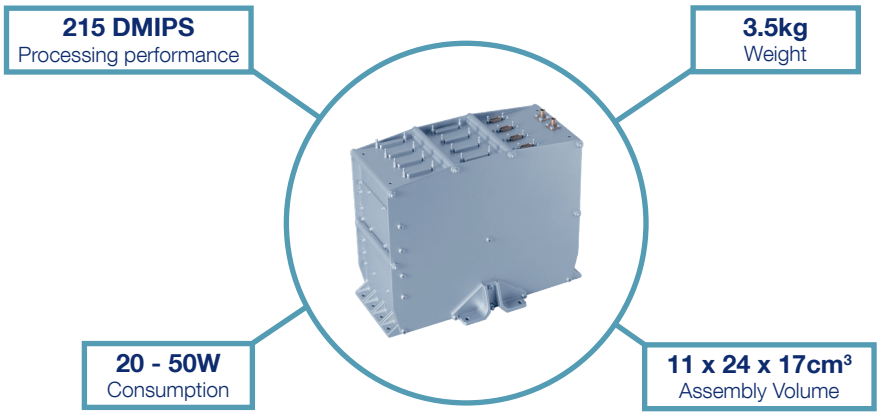
AIRBUS

The PureLine Amethyst centralized avionics offers the best of essential functionalities in our most compact, lightweight and low-power design ever. Amethyst is a fully redundant unit providing the following main functions:

- On-Board Computer
- TM / TC
- GPS receiver
- Secondary voltages delivery
- Interface to AOCS sensors & actuators (STR/SADM/MTQ…)
- Software Time and Space Partitioning capability

Amethyst is based on a high-performance processing core designed for safety critical applications associated with an innovative software architecture, allowing complete avionic processing to be performed in a single chip. Innovations introduced on our PureLine products allow us to offer to the global space market cost-effective centralized avionics equipment featuring a typical 10-year lifetime in LEO.

All components of Amethyst have been intensively radiation-tested to ensure flawless in-orbit operations.



FUNCTIONS

- Full Redundant On-Board Computer with reconfiguration
- GPS Receiver
- CCSDS TM/TC with TM/TC RF in option
- Interfaces with AOCS sensors and actuators, including Magnetorquers & Solar Array Step Motors
- Provides secondary voltages and discrete commands to external units

KEY FEATURES

- Single-point-of-failure-free centralized architecture
- Reconfiguration mechanism (50 scenarios)
- GPS Receiver: L1C/A, 10m accuracy in LEO
- CCSDS TM with ciphering & TC with deciphering (AES256)

PROCESSING

- ARM processor designed for safety critical applications, fully compatible with ARM ecosystem
- 215 Dhrystone MIPS & Floating Point Unit
- L1 Cache Instruction with ECC / L1 Cache Data with ECC
- Internal RAM, FLASH & EEPROM with ECC
- Time & Space Partitioning hosting several SW applications in a single core implementing RTEMS OS: Central Flight SW, GPS SW, TM/TC SW and STR SW (STR Head in option)
- Avionics delivered with Basic SW: BIOS, Boot SW
- JTAG / Ethernet links for SW development, trace and debug

MEMORY

- Volatile: 192MBytes SDRAM CPU with Error Detection
- Volatile: 64MBytes SDRAM IO with ECC
- Non Volatile: 4GBytes FLASH with ECC

BUDGETS

- Mass: 3.5kg
- Volume: 110 x 240 x 170mm³
- Power: 20-50W

INTERFACES

- Unregulated Input Power Bus 22-38V
- Secondary Voltages (regulated 5V) for external units (x4)
- GPS Rx LNA I/F
- CAN bus I/F (x2), SpaceWire I/F (x2), RS422 I/F (x8)
- Analog TM (x23), Battery Current TM (x1)
- Discrete Commands (x6)
- Magnetorquers I/F (x3) (L=2.7H; R=66Ω)
- Solar Array Step Motors I/F (x2) (22-38V, 290Ω, 260mH)

ENVIRONMENT / RELIABILITY

- Temperature: [-20°C; +60°C]
- Vibration level: // 18.3g Rms ⊥ 9.5g Rms
- Shock level: 1 000g (10 000Hz)
- EMI/EMC: tailored ECSS-E-ST-20-07C

RADIATION

- Latch-Up Free parts
- ARM Processor in Dual Core Lockstep for error detection
- All memories protected with ECC (Reed Solomon or EDAC)
- Total Dose TID compatible with typical 10 years LEO

RELIABILITY

- Reliability better than 950 FIT (FIDES standard)
- Availability better than 99.999%

HERITAGE

- Airbus Spacecraft Equipment quality legacy
- Automotive COTS process
- On orbit since February 2019

Supported by:

Airbus Defence and Space
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