The TM/TC Front-End

The TM/TC Front-End provides direct control of spacecraft using baseband interfaces during spacecraft design, development, AIT, and pre-launch.

The TM/TC Front End can be used for a wide variety of standard (CCSDS/ECSS) TM/TC baseband solutions as well as customer-specific applications.

The TM/TC Front End typically connects to the spacecraft on-board computer (OBC) or Central Data Management Unit (CDMU) via the direct Bypass Interfaces or via an RF SOE. Additional interfaces can be used for NDIU, Closed Loop connections as well as RF Suitcase applications.

The TM/TC Front End provides four main functions:

- **TM Acquisition** - physical layers, frame synchronization, frame annotation (time stamping etc), VC and packet extraction. Selectable serial decoding, error correction, and de-randomisation. Idle Frame, VC filtering, reception analysis (counter continues, FECW, packet CRCs etc). CLCW extraction

- **TC Generation** - support at Packet, Segment, Frame, CLTU levels. CLTU serialization with PLOP mode and external or internal clocking.

- **TM Simulation** - Packet, Frame and Physical layer generation for closed loop testing including Transponder/CDMU testing, RF Suitcases and stand-alone operation.

- **TC Acquisition** - Physical, CLTU and Segment/Packet support for Echo TC processing, Transponder/CDMU testing, RF Suitcases and stand-alone operation.

The TM/TC Front End is a combination of a standard 3U/19” Unit (TM/TC Interface and Processing Unit or IPU) and the TM/TC Application Software (Control and Monitor Software or CMS) that runs on a Windows™ computer or User Workstation. The TM/TC IPU is connected directly to flight equipment where FMEA and isolation are key.

The standard TM/TC IPU 3U/19” unit includes one interface module but also has sufficient space reserved to allow the unit to be expanded with either daughterboard modules or more TM/TC IPU Modules. The external interfaces and power are supported in the TM/TC IPU as removable modules at the back of the unit while the LCD, LED and monitoring points are located on the front panel.

All I/O lines are galvanically isolated directly after the interfacing circuitry. This makes the TM/TC IPU highly suitable for controlled Simulation and Test environments as typically found in the spacecraft Assembly, Integration & Test domain. The galvanic isolation can also be useful with interface adaptation, fault propagation prevention and during spacecraft EMC testing.

### Technical Specifications

**Features**

- Single-board, modular implementation
- Integrates baseband processing and direct LAN interfacing into a single unit
- Maximum of 60 differential I/O lines (3x HD44)
- RS-422 and LVDS standard (or mixture)
- All I/O lines can be galvanically isolated
- All I/O routed directly to on-board FPGA
- FPGA based interfacing/routing/processing
- Selectable error correction coding schemes incl. Viterbi/Reed-Solomon/Turbo decoders for TM and BCH for TC
- Selectable serial and parallel processing schemes incl. NRZ-M, SPL, Randomisation
- TC Authentication/Encryption support (option)
- Standard support with TM to 10Msps and TC to 2Msps. Higher data rates available on request.
- On-Board Ethernet interface for baseband <>LAN data routing as well as control/status
- Front-panel LCD and LED status
- Front-panel monitoring points (firmware selectable)
- Daughterboard expansion slots (e.g. CCSDS Turbo codec)
- Compact 3U/19” overall system implementation
- Customised Front-panel lay-out / labeling
- FMEA Report Available

**Sample applications** (C-STS application software may be required)

- TM/TC Front-End
- TM/TC Baseline Spacecraft Simulator
- Network Data Interfacing (NDIU)
- Raw Data acquisition/routing
- SLE Gateway
- RS-422/LVDS to/from Ethernet conversion
- Bit Error Rate Testing
- Interface Conversion

**Upgrades**

- Hardware/firmware is in-system re-programmable
Experience

Building on over 30 years of experience in spacecraft EGSE systems, C-STS provides innovative high-tech solutions for ground-based systems in the domains of spacecraft simulation and testing as well as modem (spacecraft communication) and data processing systems. Supporting all phases of the spacecraft lifetime, from integration to flight and all phases in between.

Contact Details

For further information, contact us at:

Celestia Satellite Test & Simulation B.V.
Huygensstraat 44
2201 DK, Noordwijk ZH
The Netherlands

T: +31 - 71 - 751 51 00
E: info@celestia-sts.com

www.celestia-sts.com

Specification may change without notice. Datasheet version 1.1