

Spacelink^{NGT} TM/TC Interface & Processing Unit (TM/TC IPU)

The Spacelink^{NGT} TM/TC Interface & Processing Unit (TM/TC IPU) is one of the latest additions to the innovative Spacelink^{NGT} product line of Single-module based TM/TC equipment from Satellite Services B.V. of The Netherlands.

The TM/TC IPU can be used for a wide variety of standard (CCSDS/ECSS) TM/TC baseband solutions, as well as customer specific applications. Due to its high capacity FPGA based architecture, the TM/TC IPU provides a large amount of customisable I/O for interfacing at baseband level (RS-422 and/or LVDS). The TM/TC unit includes galvanic isolation, real-time hardware/firmware data processing and integrated LAN (Ethernet, TCP/IP) data exchange.

The amount and type of data processing that is performed can be configured depending on the application required. Typical examples include: raw data, programmable data blocks (with/without a sync code), CADU/VCDU/ frame level data, (image) data patterns, BER/PRBS patterns etc.

From an electrical interface point of view, the TM/TC IPU is equipped with three HD-44 connectors each providing up to 20 I/O signals (differential). The signals can be configured in groups of four signals for receive/transmit for either RS-422 or LVDS interfaces. This allows for a maximum of 60 I/O signals to be supported in any given configuration.

All I/O lines are galvanically isolated directly after the interfacing circuitry, which 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 in operational data interfacing and processing environments for interface adaptation, fault propagation and EMC reasons.

Each of the I/O lines is routed to a large capacity FPGA in which the actual functionality of the TM/TC IPU for a given application/model is determined. Other resources, directly available to the on-board processing electronics, include Dual-Port and SDRAM memory with configurable capacity (up to 112 MB) to support internal data buffering/loading and interfacing.

For customer specific applications and future expansion, the TM/TC IPU also supports the mounting of up to four daughter board modules. Examples of these type of modules are: IRIG-B/PPS timecode interfaces, sub-carrier modulator/demodulator, discrete interfaces and High-speed data transfer interfaces.

The TM/TC IPU also features an on-board LAN interface (10/100 Base-T Ethernet) through which the unit can be controlled, configured and monitored. Also data can be exchanged with sustained rates of up to 20 Mbps. For high-speed applications, the on-board LVDS and optional gigabit serial link/fibre interface daughter board modules can be used.

The TM/TC IPU is implemented based on a single (VME form-factor) module which requires no connection other than DC power for operation. As such, flexible highly reliable and ruggedised system implementations can be made.

A standard TM/TC IPU is implemented as a 3U/19" rack mountable unit which provides all external interfaces and power. The modules are implemented to be removable from the back of the unit. The modules have LCD, LED and monitoring points at the front of the unit.

The standard 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 a second TM/TC IPU module.

For LAN interfacing, a range of software applications and libraries are available from SSBV to allow easy interfacing to the TM/TC IPU. This could be software either provided by SSBV, running on standard computer platforms or other third party/customer software. Next to this, standard LAN applications supported include FTP (server), HTTP (web server) and Telnet (server).

Given the wide variety of applications that can be supported by the TM/TC IPU, not all possible configurations can be described in this datasheet, please consult SSBV for more information



Features

- Single-board, modular implementation
- Integrated 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
- 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
- Compact 3U/19" overall system implementation
- Customised Front-panel lay-out / labelling

Sample applications (SSBV application software may be required)

- TM/TC Front-End
- TM/TC Baseband Simulator
- Network Data Interfacing
- Raw Data acquisition/routing
- Multi-line Gateway/Routing
- SLE Gateway
- RS-422/LVDS to/from Ethernet conversion
- Protocol Conversion
- Bit Error Rate Testing
- Parallel Serial I/O interfacing
- Interface Conversion

Upgrades

- Hardware/firmware is in-system re-programmable
- In-the-field upgrading readily supported

Single-Module implementation

The heart of the TM/TC IPU is based on the SSBV SE-1495 module. This module offers the combination of high I/O count interfacing, galvanic isolation and FPGA based data routing and processing.

Next to the FPGA technology, the module includes various types of data storage and embedded Linux based software. This software is used to implement control/status, data routing and Ethernet LAN interfacing.

The SE-1495 module can be built and configured for many different purposes ranging from 1 bps to >500 Mbps. Reconfiguration of the firmware can be performed in-the-field through the LAN interface, without the need for the removal/exchange of hardware modules.

TM/TC Applications

The TM/TC IPU can be configured for a number of TM/TC application scenarios. One of the most common and readily available configurations is that of a TM/TC Front-End.

Within this configuration for TM, the hardware performs all baseband functions from interfacing to frame synchronisation, de-scrambling, Convolutional and/or Reed-Solomon decoding/correction, time/quality tagging and frame level transfer via the LAN interface. For TC, the hardware receives CLTU's from the application software (via LAN) and performs the required PLOP interfacing, buffering and emission/serialisation of the bitstream.

Added functions include the capability to perform TC echo reception/decoding from the outgoing bitstream (or a dedicated input) as well as TM simulation and Bit Error Rate Testing.

In this respect, the TM/TC IPU replaces the Spacelink^{NGT} SE-985 single-board TM/TC processor and offers the same baseband processing functions as the Spacelink^{NGT} IMBU. (excl. modem functions) For these cases the baseband optimised architecture of the TM/TC IPU offers additional advantages due to its large I/O interfacing/routing and galvanic isolation capabilities.

When used in raw data acquisition/serialisation mode, the TM/TC IPU is also compatible with other SSBV software processing products that are able to provide real-time data processing and simulation.



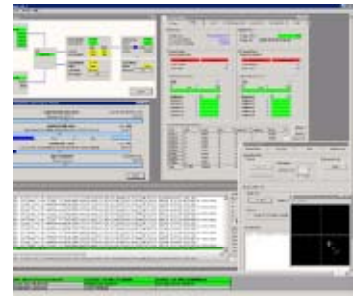
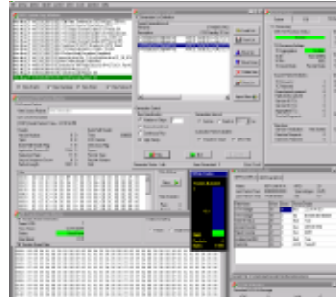
Overall Environmental and Physical Specifications

Characteristics:	
Dimensions HxWxD (mm)	133x448x443 mm
Weight	< 6 kg
Power	100-240V AC 50/60 Hz
Operating Temperature Range (°C)	5 – 35 °C
Storage Temperature	-20 °C to +60°C
Storage Relative Humidity	Up to 85 %

Software support

Since the TM/TC IPU enables direct software to physically link implementations, software applications can be developed on any platform supporting Ethernet-TCP/IP network connectivity. The standard LAN interface protocol of the TM/TC IPU (compatible with that of the SLNGT-IMBU) is based on binary message exchange, which also readily supports multi-link/unit implementations where applicable. An ICD and software interface library is available to aid in system integration. Alternatively, specific user protocols can be implemented as well.

As part of turn-key systems, the well proven SSBV TM/TC baseband processing software and Control & Monitor Software (CMS) as deployed with TM/TC systems since 1996, is available under WindowsTM XP-Pro/2003 ServerTM. This enables the users to create an AIT/Test or operational ground station Front-End including frame/CLTU and packet layer support, integrated archiving, logging and standard remote interface/gateway protocols. (such as SLE)



Experience

Building on over 20 years of experience related to TM/TC systems, Satellite Services B.V. has developed the Spacelink^{NGT} product range as a standardised range of complimentary products which fulfil the promise of true multi-purpose and multi-phase system deployments from simulation to operation.

All Satellite Services B.V. products are based on using the latest technology to provide cost-efficient, flexible and long-term supportable systems.

Contact information

For further information, please consult our website. You can also contact us at:

Satellite Services B.V.
Scheepmakersstraat 40
2222 AC Katwijk aan Zee
The Netherlands

T: +31 71 - 402 8120
F: +31 71 - 402 7934

info@satserv.nl

<http://www.satserv.nl> (corporate website)
<http://www.spacelinkngt.com> (product website)