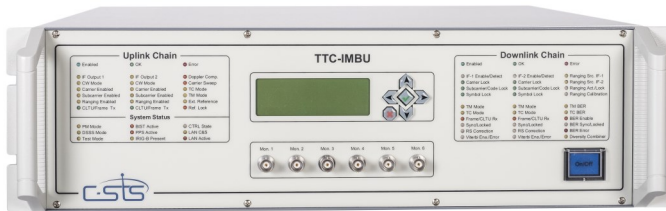


TTC-IMBU (TTC Modem)



The Telemetry, Tracking and Command Integrated Modem and Baseband Modem (TTC-IMBU) is a stand-alone TTC Modem for use in operational ground stations and EGSE configurations. The modem uses FPGA based signal processing to provide real time modulation, demodulation and radiometric processing in association with software that allows the system to be used locally via the system GUI or remotely via LAN.

The system is highly configurable and allows the system to be deployed as a pure modulation/demodulation system (e.g. for RF SCOE use, where it is connected to an external TM/TC DFE) or as an integrated system including TM/TC error correction coding, time stamping, packet processing etc.



The TTC-IMBU can be used as a “black-box” system, controlled and monitored via LAN with the data inputs/outputs either being via LAN or via conventional interfaces such as RS422 and LVDS. Alternatively, an intuitive Graphical User Interface is provided by the C-STS Control and Monitor Software (CMS) that includes options for logging, data archiving etc.

The TTC-IMBU supports a number of remote interfaces protocols, including SLE, EDEN, C&C and more.

The TTC-IMBU has two IF inputs and two IF outputs (typically 70MHz) in addition to subcarrier monitoring point outputs from the modulation and demodulation paths. Standard timing interfaces are available such as 10MHz external reference, PPS and IRIG-B/G. In addition, software configurable signal routing selects internal signals for the front panel monitoring points.

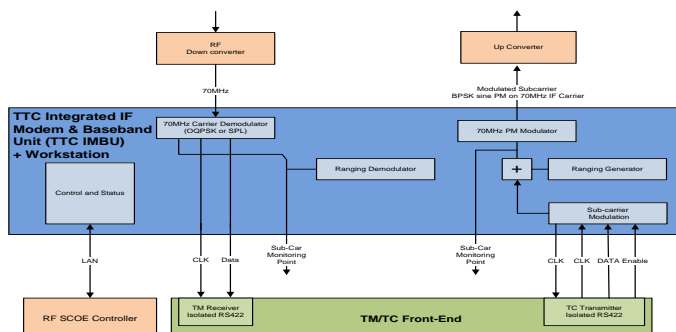
The internal processing allows the modulation to be fed by external signals (e.g. via RS422) or internal sources such as an ITU compatible PRBS generator, Telecommand generator or Telemetry Simulator with or without ranging uplink signals. Likewise the Demodulation output can output to external equipment (e.g. via RS422) or further processed within the TTC-IMBU including Telemetry data acquisition, frame synchronization, Viterbi/Reed-Solomon error correction etc.

Standard functions include BER transmission/reception, Doppler simulation, uplink sweeps, Radiometric processing (ranging and Doppler measurements).

Specific custom functions can also be incorporated if required such as interfaces to third-party encryption/decryption units.

The TTC-IMBU is provided in a 3U/19” enclosure and can be used in a table top setup or integrated into a 19” rack. The system is typically accompanied by a 1U industrial PC.

The TTC-IMBU includes galvanically isolated RS422/LVDS IO that allows the system to be used for direct connection to flight equipment. As such, the modem can also be used for applications such as transponder/RF subsystem closed-loop testing. Special variants available e.g. Galileo TTCF (TTC with DSSS uplink/downlink), Galileo C-Band generation/acquisition with internal C-Band upconverter.



Technical Specifications

General

- Flexible TTC Modem
- 2 IF inputs (typically 70MHz)
- 2 IF outputs (typically 70MHz)
- Suppressed carrier schemes—BPSK, QPSK, OQPSK, GMSK
- Remnant carrier schemes— SPL/PM, BPSK/PM (sine/square)
- ESA Standard, ESA Tone and PN Ranging (T2B, T4B)
- DSSS modulation and demodulation (configuration dependent)
- Ranging and Doppler measurements
- Doppler Simulation and Uplink sweeping
- Data interfaces via RS422, LVDS or LAN
- Gigabit LAN for Control and Monitoring via TCP/IP (using RJ45)
- External Time/Reference inputs, such as 10MHz, PPS and IRIG
- Optional baseband processing including Viterbi and R-S
- TC Plop mode support
- Remote interfaces such as SLE, EDEN and C&C available.
- Typical data rates 10Mbps down to 7.8125bps

Applications

- TTC Ground Stations
- EGSE (e.g. RF SCOE)
- Specialised EGSE e.g. Coms Tests
- RF Suitcase end-to-end verification
- Spacecraft Simulation

Project Specific Customisations (upon request)

- Custom protocols and data processing can be supported

Environmental and Physical Specifications

Dimensions H x W x D	133 x 448 x 500 mm
Weight	<15kg
Input Power Range	100-240VAC 50-60Hz
Operating Temperature Range	+10°C to +40°C
Operating Humidity	30% to 85% (non-condensing)
Storage Temperature	-10°C to +60°C
Storage Humidity	Up to 85% (non-condensing)

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.

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