



PTP | PROGRAMMABLE TELEMETRY PROCESSOR

The Programmable Telemetry Processor (PTP) is a highly versatile, modular telemetry and command front-end processor for use in remote tracking stations and satellite operations centers. The PTP is also well suited for spacecraft integration and testing at the factory and on the launch pad. To support missions that employ bulk encrypted telemetry and command streams, the PTP provides an integrated control and status interface for encryption/decryption equipment.

Satellite / Ground Gateway

The PTP acts as a gateway between spacecraft uplink/downlink and a distributed satellite control system. It accepts multiple serial telemetry downlinks and performs TDM or CCSDS telemetry processing functions, including frame synchronization, error control decoding, and time tagging. Frame data with quality annotation and time tag is simultaneously logged to disk and routed to the control center via the network. The PTP receives commands from the control center for real-time uplink to the spacecraft or for scheduled transmission (when the PTP is in store-and-forward mode). PTP can perform all CCSDS telecommand processing, including COP-1 functions. PTP also provides local command probe verification and command echoes for command verification at the control center. For Space-Ground Link System (SGLS) applications, it supports ternary command formats.

Broad, Extensible Protocol Support

The PTP offers a wide variety of network encapsulation protocols to facilitate integration with different satellite control systems, and offers support for new protocol standards as they emerge. Leveraging its broad protocol support, the PTP can be configured to act as a dedicated protocol translator between incompatible network segments, transparently ingesting data in one format, converting it, and forwarding it. PTP is also the first front-end system to support CCSDS Space Link Extension services with the AFSCN Adaptation Layer for interoperability between DoD, NASA, NOAA, and commercial tracking stations and control centers.

Easy Local and Remote Configuration

The PTP can be controlled locally or remotely via a highly functional, straightforward Graphical User Interface. A remote control library is also provided for integration with satellite control systems, and a Simple Network Management Protocol (SNMP) agent is provided for integration with enterprise management platforms, such as HP OpenView.

Configurable Platform Architecture

The PTP is based on an enterprise-grade server architecture to provide expandability and multi-mission capabilities. Transmit and receive interfaces can be added and removed for configuration to new missions.



Key Features

- Complete data processing solution from RF to network
- Support for multiple independent channels at data rates up to 30 Mbps per channel
- Demodulation, bit and frame synchronization, and decoding
- CCSDS/TDM telemetry and telecommand processing and simulation
- Space Link Extension (SLE) provider and user services
- Integrated control and status for encryption/decryption devices
- Integrated data quality monitor and bit error rate test tools
- Compatible with major COTS satellite monitoring and control software packages
- Robust industrial-grade hardware platform

Ingenicomm, Inc. is a leading provider of ground and range equipment and enterprise engineering services for civil and commercial aerospace programs, as well as the defense and intelligence communities. To learn more about Ingenicomm's service and product offerings, visit <http://www.ingenicomm.net> or contact Ingenicomm at info@ingenicomm.net or +1-703-943-7236.



Telemetry Processing

- Data rates up to 30 Mbps
- Integrated receiver, demodulator, bit synchronizer, and Viterbi decoder
- Frame synchronization, de-randomization, Reed-Solomon and CRC decoding
- Turbo encoding and decoding
- Time tagging and data quality annotation
- CCSDS virtual channel sorting and packet processing
- IP over CCSDS or IP over HDLC protocol processing
- Disk logging & real-time network transfer

Telecommand Processing

- Accepts telecommand messages from control center
- Support for real-time and store-and-forward commanding
- CCSDS telecommand processing (COP-1)
- IP-over-CCSDS or IP-over-HDLC protocol processing
- Optional command echo

Simulation & Testing

- CCSDS and TDM telemetry simulation at data rates up to 30 Mbps
- CRC encoding, Reed-Solomon encoding, randomization, and convolutional coding
- Integrated data quality monitoring (CCSDS and TDM) and bit error rate test (BERT) tools
- Data logging and playback with high resolution time data correlation (TDC)

Communication Links

- High Performance Ethernet (10/100/1000) & ATM (OC-3) interfaces
- TCP/IP socket interface for network control and monitoring
- Real-time network data transfer (UDP, IP multicast, TCP client/server)
- Support for user encapsulation formats including NASCOM RTP, IPDU, SFDU, LEO-T, and EDOS
- SLE data services (FCLTU, RAF, RCF) with support for AFSCN Interoperability Standards
- IP over Satellite via Ethernet or serial interface

Receiver

- Freq. range: IF (50-90 MHz), L Band (1435-1545 MHz), and S Band (2200-2300 MHz)
- Demod: FM, Linear PM, AM, BPSK, QPSK
- Data rate: up to 20 Mbps

BPSK Subcarrier Demodulator

- Subcarrier range: 1 kHz to 5 MHz (1 Hz resolution)
- Data bandwidth: 100 Hz to 2.5 MHz
- Loop bandwidth: 1 Hz to 25 kHz
- Acquisition/tracking range: 2 x loop bandwidth

Bit Synchronizer / Viterbi Decoder

- Data rate: 10 bps to 20 Mbps
- PCM codes : NRZ-L/M/S, Biphase-L/M/S
- Loop bandwidth: 0.1% to 2%
- Convul. code: Rate 1/2, Constraint Length (K) = 7, programmable G1/G2 order and polarity
- Symbol quantization: 1-bit hard-decision, 3-bit soft-decision
- Coding gain: >5 dB

Frame Synchronizer / R/S Decoder

- Data rate: 10 bps to 30 Mbps
- Sync pattern: up to 64 bits with programmable mask
- Acquisition strategy: programmable error threshold, check and flywheel frames, and bit slip window
- Derandomizer: $h(x) = x^8 + x^7 + x^5 + 1$
- Reed-Solomon decoder: CCSDS header RS (10,6) and frame RS (255,223) with interleave from 1 to 8
- CRC decoder: $g(x) = x^{16} + x^{12} + x^5 + 1$
- Time tag: IRIG-B, NASA-36, or GPS reference, 1 microsecond accuracy
- Support for TTL, RS-422, SGLS ternary
- QPSK ambiguity resolution

Telemetry Simulator / R/S Encoder

- Data source: CCSDS or TDM simulator, file playback, or network socket
- CCSDS channel coding: CRC, Reed-Solomon, pseudo-randomization, convolutional, and turbo
- PCM codes: NRZ-L/M/S, Biphase-L/M/S
- Data rate: 10 bps to 30 Mbps

BPSK Subcarrier Generator

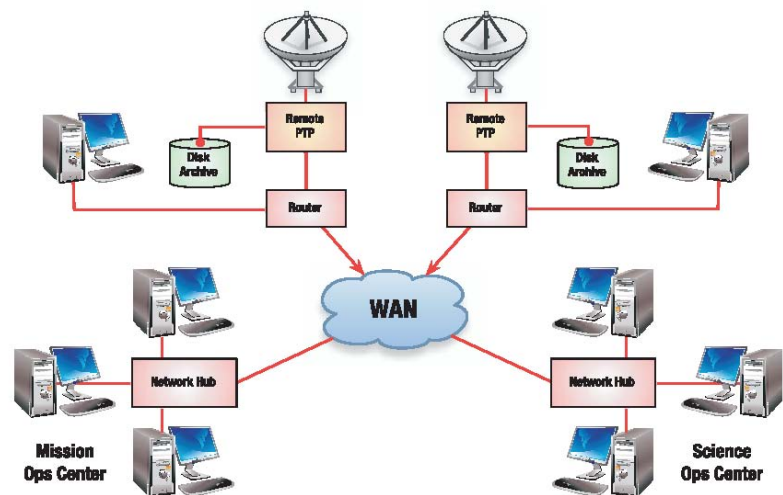
- Subcarrier waveforms: sine or square
- Subcarrier range: up to 2 MHz
- Data rates: 1 bps to 1 Mbps
- Coherent or non-coherent

Signal Generator

- Frequency range: IF, L Band, S Band
- Modulation: FM, PM
- Modulation source: any combination of up to four signals

Physical Specifications

- 4U rackmount chassis
- Core 2 Duo processor at 3.0 GHz
- 4 GB system RAM
- 2x500GB mirrored system array hot-swappable
- 1x1TB Data log drive
- Dual Gigabit Ethernet for status/control and data transfer
- DVD+-RW for program load & data storage



An example PTP deployment. In this configuration, the PTP acts as a gateway between spacecraft uplink/downlink and a distributed satellite control system.

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