

Software Specification

The satTRAC Modem/BBU provides telemetry, ranging, and commanding on a next-gen software radio platform consisting of a high-availability commercial off-the-shelf server, a high-performance signal converter, and one or more software applications.

The tables below summarize the specifications for the Tracking and Data Relay Satellite System (TDRSS) application. Please refer to the satTRAC top-level data sheet for an overview of the innovative capabilities of satTRAC. Refer to the hardware data sheet for a summary of the signal converter specifications.

This application supports NASA's Tracking and Data Relay Satellite System.

Transmit Specification

TDRSS Spread Forward (Transmit)	Specification
Modulation	Spread Unbalanced QPSK (Command and Range) Spread BPSK (Command Only)
Command Symbol Rate	0.1 to 300 ksps
QPSK Power Ratio (I/Q)	10:1
PN Code Spreading	Command Code on I Range Code on Q (QPSK)
Spreading Codes	As specified in 451-PN CODE-SNIP
Code Rate	2.9 to 3.2 Mcps Coherent with Carrier F*31/(221*96) S-Band or F*31/(1469*96) Ku-Band
Data - Code Combining	Data Modulo-2 Added Asynchronously to PN Code
PCM Encoding	NRZ-L/M/S
Sweeping	Triangle About Compensated
Command Data Input	Network RS-422 Internal BERT

TDRSS Spread Return (Transmit)	Specification
Modulation	Spread SQPN (Stagger on PN Codes) Spread BPSK
Telemetry Symbol Rate	Mode 1 & 2: 0.1 to 300 ksps (I&Q) Mode 3: 0.1 to 300 ksps (I) 1 ksps - 3 Msps (Q)
QPSK Power Ratio (I/Q)	4:1 to 1:4
PN Code Spreading	Mode 1 & 2: Code on I & Q Mode 3: Code on I No Code on Q
Spreading Codes	As Specified in 451-PN CODE-SNIP
Code Rate	2.9 to 3.2 Mcps Coherent with Carrier F1*31/(240*96) S-Band or F1*31 (1600*96) Ku-Band
Data - Code Combining	Data Modulo-2 Added Asynchronously to PN Code
Convolutional Encoding	Rate 1/2; K=7
PCM Encoding	NRZ-L/M/S
Telemetry Data Input	Network RS-422 Internal BERT

* This application is ITAR controlled

Receive Specification

TDRSS Spread Return (Receive)	Specification
Modulation	Spread SQPN (Stagger on PN Codes) Spread BPSK
Telemetry Symbol Rate	Mode 1&2: 0.1 to 300 ksps (I or Q) Mode 3: 0.1 to 300 ksps (I) 1 ksps - 3 Msps (Q)
PN Code Spreading	Mode 1 & 2: Code on I & Q Mode 3: Code on I No Code on Q
Spreading Codes	As Specified in 451-PN CODE-SNIP
Code Rate	2.9 to 3.2 Mcps
Data - Code Combining	Data Modulo-2 Added Asynchronously to PN Code
Carrier Recovery Bandwidth	Fully Programmable per Symbol Rate
Symbol & Code Recovery Bandwidth	Fully Programmable per Symbol Rate
Viterbi Decoding	Rate 1/2; K=7 Rate 1/3; K=7 (Optional)
PCM Decoding	NRZ-L/M/S
Implementation Loss	< 1dB
Command Data Output	Network RS-422, Internal BERT

TDRSS Spread Forward (Receive)	Specification
Modulation	Spread Unbalanced QPSK (Command & Range) Spread BPSK (Command Only)
Command Symbol Rate	0.1 to 300 ksps
PN Code Spreading	Command Code on I Range Code on Q (QPSK)
Spreading Codes	As Specified in 451-PN CODE-SNIP
Code Rate	2.9 to 3.2 Mcps
Data - Code Combining	Data Modulo-2 Added Asynchronously to PN Code
Carrier Recovery Bandwidth	Fully Programmable per Symbol Rate
Symbol & Code Recovery Bandwidth	Fully Programmable per Symbol Rate
PCM Decoding	NRZ-L/M/S
Implementation Loss	< 1dB
Command Data Output	Network RS-422 Internal BERT

TDRSS Ranging	Specification
Modes	Forward Link with Ranging Return Link Mode 1 or 3
Range Measurement Resolution	< 1 ns

(Ranging bandwidths are not separate from Code bandwidths specified above)

- **Built-In Software Capabilities** - Each satTRAC application includes an integrated full-time Spectrum Analyzer, Oscilloscope, editable GUIs to streamline operations, Automated Test Script Runner and secure Linux operating system.
- **Optional Software Features** - satTRAC's ever-increasing list of optional integrated capabilities include: Data Recorder/Reproducer, Front End Processor (FEP), Network Gateway, Channel Emulation, and custom security policies.

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