

Bellerophon

Flight Test Data Platform | Version 1.3.0

Overview

Bellerophon Enterprise reads IRIG 106 Chapter 10 recordings on servers the customer controls, decodes them into engineering units from the program's parameter dictionaries, and gives the test team one shared, searchable flight library with time history plots, limit monitoring, data quality ratings, test point evaluation, post-flight reports and engineering analysis. It makes no outbound connections and runs on closed and air-gapped networks.

Supported Data

Data Type	Chapter 10	Support in Version 1.3.0
TMATS setup record	0x01	Decoded in the code name and XML forms, including PCM formats and the recorder channel map
Recording events	0x02	Decoded: event number, count and time, named from the setup record
Time Format 1	0x11	Decoded in the IRIG day-of-year and month-and-year formats
MIL-STD-1553 Format 1	0x19	Word level; 16-bit and 32-bit values; bit fields
PCM Format 1	0x09	Packed, unpacked and throughput modes; words of different lengths; subcommutated parameters
ARINC 429 Format 0	0x38	Labels in octal; BNR and discrete fields; SDI and bus selection
Discrete Format 1	0x29	Individual bits or multi-bit fields
Analog Format 1	0x21	Subchannels sharing one sample rate, sample length (up to 32 bits) and packing mode
Ethernet Format 0 and 1	0x68, 0x69	Flow summary; parameters from IENA positional and fixed-layout iNET-X packets in UDP
UART Format 0	0x50	Values at fixed byte positions and NMEA 0183 sentences, with parity errors
CAN Bus Format 0	0x78	Standard and extended identifiers; signals by start bit as a CAN database gives them, with multiplexing
Video, image and other types	Various	Counted per channel; not decoded

Parameter Dictionaries

Import Sources	TMATS setup record of a recording or a TMATS file (code name or XML form), XidML 3.0, CAN databases (DBC) and CSV, each with a preview of every item before anything is saved
Conversions	Linear and polynomial conversions to engineering units, limits and valid ranges
Derived Parameters	Expressions with arithmetic, comparison and logic, a low-pass filter, rate of change, integral and delay; searched, plotted and exported like recorded parameters
Assignment	Applied automatically when its program name matches the recording's TMATS, or assigned by hand

Analysis

Time Histories	Stacked charts on IRIG time at the full recorded rate, zoom, limit lines, exceedance bands, notes and recorder events; ground track on a grid or on offline map tiles
Library Search	Up to four conditions combined with AND, held for a minimum duration, across every recording in the library
Spectral and Dynamics	Power spectral density, spectrograms and Campbell diagrams; frequency response with coherence and half-power damping; shock response spectrum
Loads and Fatigue	Rainflow cycle counting (ASTM E1049) and level crossing load spectra, for one flight or across flights
Test Points	Test cards imported from CSV, pass or fail criteria evaluated against every recorded sample, test matrix coverage, steady points and crossplots
Across Flights	Flight comparison, trends of a statistic across flights and flight envelope coverage

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Data Quality and IRIG 106 Compliance

Data Quality Rating	Checks on time, packets, PCM sync and subframes, MIL-STD-1553 errors and dropouts, and each parameter (no data, stuck values, values outside the valid range), with thresholds set by the administrator
IRIG 106 Rules	Nine rules of IRIG 106 Chapters 10 and 11: setup record first, a time packet after it, time packets at least once a second, valid headers, sequence numbers without a gap, steady data type versions at or below the setup record's release, a root index packet last when indexes are enabled, and an original recording stated
Recorder Information	Make, model and software from the setup record; time steps of whole seconds, such as a leap second correction, marked

Export and Data Access

Chapter 10 Export	Any time window as a modified recording file (IRIG 106 Chapter 10, Section 10.11.2): setup record marked, a new recording index when indexes or events are enabled, packet bodies copied as recorded
Data Export	Selected parameters as CSV at the full recorded rate; post-flight report to PDF on Letter or A4 paper
Data Access Interface	Read-only interface with personal access tokens; a Python client saves CSV and MATLAB files, and HDF5 or Parquet files with standard Python packages

Security

Network	No outbound connections; no external resources
Sign-In	Smart card (CAC/PIV), SAML 2.0, OpenID Connect or password
Access	Administrator, engineer and viewer roles; audit log export
Cryptography	Optional FIPS mode with the customer's FIPS 140 validated module
Assessment	Security approval package: NIST SP 800-53 Rev. 5 mapping, hardened deployment guide, software bill of materials

System Requirements

Runtime	Node.js 22.5 or later; no other software or third-party packages
Operating System	Linux (recommended), Windows Server or macOS
Hardware	Four CPU cores and 8 GB of memory for most programs
Storage	Recordings plus about 16 bytes per decoded sample
Deployment	System service or container behind a TLS reverse proxy, including air-gapped networks

Performance and Validation

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Independent Reader Checks

40 MB/s

Chapter 10 Processing

654 MB

Peak Memory, 5 GB File

246 Hours

Longest Recording Tested

Independent Readers	Decoding compared with the open-source pychapter10 and irig106lib readers on published sample recordings
Public Government Flight Data	NTSB public docket DCA16CA001: all 2,822,176 flight recorder values match. NASA DASHlink Sample Flight Data, tail 687: all 1,775,232 ARINC 429 values match an independent decoding
Standards	IRIG 106-23 (Range Commanders Council), Chapters 9, 10 and 11; RCC 123 Chapter 10 Programming Handbook

Results were obtained by LNB Federal on the current release and depend on hardware; each deployment is validated on the program's own data. References to Government sources do not constitute certification, approval or endorsement by any agency of the United States Government.

Not Supported in Version 1.3.0

Video and image decoding; asynchronous and tagged embedded PCM formats; CAN FD and extended multiplexing; Ethernet payloads other than IENA and iNET-X; fatigue damage calculation.

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