

TCP

Time Code Processor



Miniature
TCP-AM



Standard
TCP-AS

Brandywine's Time Code Processor provides a rugged, airborne qualified, SWaP-conscious timing solution designed to serve as the central timing hub for applications requiring precise synchronization across sensors, communications, navigation systems, mission computers, and payloads.

The TCP continuously monitors multiple timing references—including GNSS, IRIG, PPS, PTP, NTP, NMEA, and HaveQuick—configurable for automatic selection of the highest-priority valid source. If a reference becomes unavailable, the TCP maintains accurate timing through the selected OCXO or CSAC for timing holdover capability.

Simplify timing distribution by converting and distributing multiple timing formats from a single synchronized source. With configurable outputs including PTP, NTP, IRIG, 1PPS, 10 MHz, NMEA, and HaveQuick, the TCP helps ensure every subsystem receives the timing format it needs.

Why it matters:

- Supports resilient airborne aPNT architectures
- Reduces mission impact from GNSS disruptions
- Maintains synchronization across distributed payloads
- Enables continued operation during temporary reference loss
- Supports autonomous mission continuity

Features

- Flight Qualified
- 10/100/1000BASE-T
- Time Code (IRIG, HQ, PTTI, NMEA)
- Reduced-SWaP
- Standalone

Options

- Power Holdover
- Timing Holdover
- Position Holdover
- IEEE 1588-2019 (PTP)
- RFC 5905 (NTP)
- Low Phase Noise

Applications

- Aerospace & Flight Test
- UxS
- Defense & Mission Computers
- 5G Small Cells
- Telemetry Systems
- Ground Command and Control Systems

Key Benefits

- Low Phase Noise RF Output
- Multiple Output signal formats for maximum flexibility
- Flight Qualified to 60,000'

Specifications

Analog Time Code Output

Connector	SMA (HD-BNC optional)
Time Formats	BCD, HQ, IRIG, NMEA, PTTI
Output Amplitude	<10VPP, IRIG {3:1VPP}

Ancillary Signals

Five Configurable Digital Signals, can be:

Output	Programmable Pulse 1 Programmable Pulse 2 Programmable Pulse 3 Programmable Pulse 4 PPS Reference Time Mark HQ / PTTI IRIG-DCLS
Input	Event 1 to Event 4 Debounced switch closure input Logic level input (accuracy ± 10 ns) NMEA messages (Time/Location) M12, SMA, HD-BNC
RS-232 (RS-422 optional) Connectors	

Power

Input	9 to 36 VDC, 3 W (standard config)
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Internal Time Base

Stability vs Temp, OCXO	± 50 ppb
Aging, OCXO	± 10 ppb / day
Accuracy, Uncalibrated	± 1 ppm
Accuracy, Calibrated	± 5 ppb

Synchronization

PPS	$< \pm 10$ ns
IRIG	$< \pm 1$ μ s
GNSS	$< \pm 30$ ns

Environmental

Temperature	Operational: -40 to +85 °C Non-operational: -50 to +95 °C
Humidity	Non-condensing: 95%

Physical

[TCP-AS option]	
Size	15.0 cm x 10.8 cm x 5.9 cm (5.9" x 4.3" x 2.3")
Weight	0.7 to 1.4 kg (1.5 to 3 lb)
[TCP-AM option]	
Size	14.9 cm x 10.3 cm x 3.7 cm (5.9" x 4.0" x 1.5")
Weight	0.5 kg (1 lb)

Options

* Applies to TCP-AS Option only

LCD Display*	Display of Time on front panel
IRIG Distribution*	up to 8 buffered IRIG code outputs
Battery, LiFePO4 *	2-hour power holdover Charge: 0 to +45°C Discharge: -10 to +60°C
Battery, Super-Cap *	20-minute power holdover
GNSS Receiver	GPS L1C/A, SBAS L1C/A, QZSS L1C/A, QZSS L1 SAIF, GLONASS L1OF, BeiDou B1, Galileo E1B/C
Oscillator	OCXO or CSAC
Ethernet	10/100/1000 Mbps
NTP Server	[Requires Ethernet option] Operate as GPS synchronized NTP Source
PTP Master	[Requires Ethernet option] IEEE 1588-2019
PTP Slave	[Requires Ethernet option] IEEE 1588-2019
IRIG Time Code:	B (standard), A, E, G

GPS Antenna Input

Bands	L1/L2 (L5 optional)
Power	5V active antenna power output Short circuit and open detection
Connector	SMA (standard)
Custom front/rear panel connector configurations available. eg. Special connector requirements	