



Thunderbolt GPS Disciplined Clock

GPS Clock for the Wireless Infrastructure

*Software
& Component
Technologies*

Introducing Trimble's new generation of GPS synchronization devices, the Thunderbolt™ GPS Disciplined Clock. This clock combines a GPS receiver, control circuitry and a high quality ovenized oscillator on a single board. Eliminating the need for a separate receiver minimizes size and cost. This level of integration provides superior performance for precise timing applications, such as enabling E911 positioning and maximizing bandwidth for wireless local loop. This same architecture is used for maintaining the tough CDMA holdover specification. It features a 10 MHz reference signal and a 1 PPS output with an overdetermined solution synchronized to GPS or UTC time.

The Thunderbolt™ clock's excess processor capability in the 8-channel Scorpion DSP is used to steer the oscillator thus removing the need for a separate microprocessor. The 10 MHz signal from the oven oscillator is fed back into the GPS's RF chip eliminating the need for an additional tricky steering algorithm; the bias and bias rate are used to steer the oscillator. The board is manufactured on Trimble's in-house SMT line using high volume techniques. All this makes for a simpler, more reliable unit with a cost advantage for high volume customers.

The Thunderbolt™ GPS clock also leverages Trimble's GPS experience by using a self-survey mode that reduces the

effect of Selective Availability (SA) and monitoring satellites with a T-RAIM (Time-Receiver Autonomous Integrity Monitor) algorithm that ensures signal integrity. Output is Trimble's proprietary TSIP interface protocol along with the 10 MHz signal and PPS. Match the Thunderbolt™ clock with Trimble's Bullet™ II HE antenna for a system that will provide reliable performance in a hostile RF environment.

The high level of integration and volume production techniques make the Thunderbolt™ GPS Disciplined Clock an extremely cost-competitive timing solution for volume synchronization applications.



Shown above: Thunderbolt in enclosure, Thunderbolt in board form, and Thunderbolt's 24V power supply.

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Performance Specifications

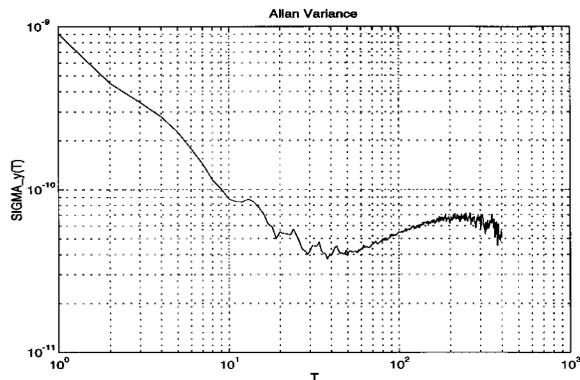
General: L1 frequency, CA/code (SPS),
8-channel continuous tracking receiver

Update rate: 1 Hz

1 PPS accuracy: UTC ± 50 nanoseconds

10 MHz accuracy: 1.16×10^{-12} after one day (three sigma)

10 MHz stability: See graph below



Harmonic level: -40 dBc max

Spurious: -70 dBc max

Phase noise:

10 Hz	-120 dBc/Hz
100 Hz	-135 dBc/Hz
1 kHz	-135 dBc/Hz
10 kHz	-145 dBc/Hz
100 kHz	-145 dBc/Hz

Holdover: $\pm 1.0E-8$ from -40°C to 70°C
Part number 34374-61 will not support the IS-95 holdover specification. For tighter holdover requirements please contact your local Trimble representative.

Environmental Specifications

Operating temp: -40°C to +85°C

Storage temp: -40°C to +85°C

Operating humidity: 95% non-condensing

Maximum altitude: 18,000 m

Interface Specifications

Prime power: +24V and ground using DC to DC power supply (19V-34V). Mechanical connection uses a three pin locking connector. Board alone uses +12V, -12V, +5V and ground.

1 PPS: BNC Connector TTL levels into 50 Ω 10 microseconds-wide pulse with the leading edge synchronized to UTC within ± 50 nanoseconds in static, time only mode. The rising time is <20 nanoseconds and the pulse shape is affected by the distributed capacitance of the interface cable/circuit.

10 MHz: BNC connector. Waveform is sinusoidal + 7 dBm into 50 Ω

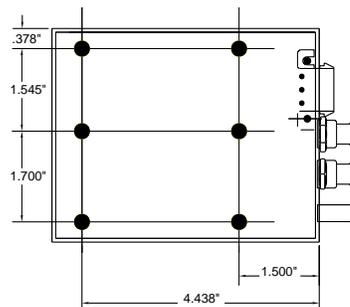
Serial interface: RS-232 through a DB-9 connector

Serial protocol: Trimble Standard Interface Protocol (TSIP) binary protocol @ 9600, 8-Odd-1

Physical Characteristics

Power consumption: 15 watts cold; 10 watts steady state

Dimensions: 5" L x 4" W x 2" H
(127mm x 102mm x 51mm)



Mounting: Six mounting holes for #6-32 screws.
Max. depth 3/8"

Weight: Under 20 oz. (567g)

Ordering Information

Thunderbolt™
GPS Clock: P/N 34374-61

GPS Antenna: Bullet™ II HE P/N 25045-10
Bullet™ II P/N 25045-00

Cable: Recommended 75 Ω cable: RG-59 to 30 meters, RG-8 or RG-213 to 60 meters

Specifications subject to change without notice.

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