

Thunderbolt GPS Disciplined Clock

GPS Clock for the Wireless Infrastructure

KEY FEATURES AND BENEFITS

- Ovenized quartz oscillator provides clean 10 MHz (1PPS) signal that maximizes bandwidth
- Self-survey mode reduces effects of Selective Availability
- Combined GPS receiver and ovenized oscillator minimizes size and cost
- High volume manufacturing provides reliable low-cost products
- Architecture matches rigorous CDMA holdover specification

The Thunderbolt™ GPS Disciplined Clock is Trimble's latest offering for GPS synchronization devices targeting the wireless infrastructure. This fourth-generation GPS clock combines an 8-channel GPS receiver, control circuitry and a high-quality ovenized oscillator on a single board, providing increased integrity and reliability at a lower size and cost.

Thunderbolt's level of integration makes it a perfect solution for precise timing applications in the wireless industry. Among its uses are synchronizing the E911 positioning infrastructure and maximizing bandwidth for wireless local loop. Thunderbolt's architecture is comparable to systems currently used to maintain the tough CDMA holdover specification. This makes Thunderbolt a natural for a CDMA clock, the digital standard for cellular phones.

Trimble's approach is unique. The Thunderbolt GPS Clock outputs a 10 MHz reference signal and a 1 PPS signal with an over-determined solution synchronized to GPS or UTC time. The 10 MHz reference accommodates customers requiring sub-microsecond timing. A single micro-processor performs both the GPS navigation and oscillator



Trimble's Thunderbolt™ GPS Disciplined Clock in enclosure, in board form, and 24V power supply.

disciplining functions. The GPS receiver is driven directly by the 10 MHz output signal of the oscillator. This is calibrated against the incoming GPS signal, with the resulting clock and frequency measurements fed into the oscillator frequency control algorithm.

The Thunderbolt GPS Clock leverages Trimble's GPS experience by using a self-survey mode that reduces the effect of Selective Availability. The T-RAIM (Time-Receiver Autonomous Integrity Monitor) algorithm is used to monitor satellites to ensure signal integrity.

Matching the Thunderbolt GPS Clock with Trimble's Bullet™ II HE antenna creates a system that provides reliable performance in hostile environments. The system can be easily calibrated for different cable lengths.

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.

Trimble

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PERFORMANCE SPECIFICATIONS

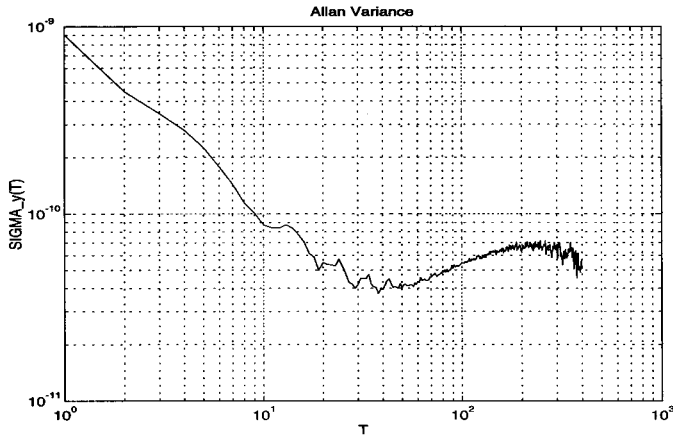
General: L1 frequency, CA/code (SPS), 8-channel continuous tracking receiver

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

Some customers, such as CDMA manufacturers, have historically mandated tighter holdover requirements than specified on this datasheet. For increased holdover performance, please contact your local Trimble representative.

ENVIRONMENTAL SPECIFICATIONS

Operating temp: -40°C to +70°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 microsec onds-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

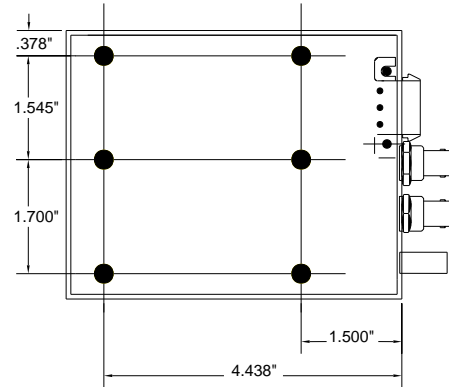
Serial interface: RS-232 through a DB-9 connector

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 36204-61
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

Visit our website at www.trimble.com/oem.

All GPS receivers are subject to degradation of position and velocity accuracies under Department of Defense imposed Selective Availability (S/A).

Specifications subject to change without notice.

