PRECISE GPS CLOCK FOR WIRELESS INFRASTRUCTURE

The Trimble® Thunderbolt® E GPS Disciplined Clock is Trimble’s latest offering for GPS synchronization devices targeting the wireless infrastructure. This fifth-generation GPS clock combines a 12-channel GPS receiver, control circuitry, and a high-quality double-ovenized oscillator on a single board, providing increased integrity and reliability at a lower size and cost.

The Thunderbolt E’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 providing precise time and frequency for WiMax and LTE-TDD applications, along with digital broadcast applications.

The architecture is comparable to systems currently used to maintain the tough CDMA, WiMax, and LTE-TDD holdover specification. The Thunderbolt E is available in its enclosure, or as an OEM board.

The Thunderbolt E 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 PPS output accommodates applications requiring sub-microsecond timing.

The Trimble T-RAIM (Time-Receiver Autonomous Integrity Monitor) algorithm is used to monitor satellites to ensure signal integrity.

Matching the Thunderbolt E GPS Clock with the Trimble Bullet™ antenna creates a system that provides reliable performance in hostile R/F environments. The system can be easily calibrated for different cable lengths.

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

General ........................................ L1 frequency, CA/code (SPS), 12-channel continuous tracking receiver
Update rate ........................................ 1 Hz
PPS accuracy ........................................ UTC 15 nanoseconds (one sigma)
10 MHz accuracy ......................... $1.16 \times 10^{-12}$ (one day average)
10 MHz stability .......................... See graph below

Harmonic level ........................................ $-40$ dBc/Hz max
Spurious ........................................... $-70$ dBc/Hz max
Phase noise ........................................
10 Hz ........................................ $-115$ dBc/Hz
100 Hz ........................................ $-130$ dBc/Hz
1 kHz ............................................ $-135$ dBc/Hz
10 kHz ........................................... $-145$ dBc/Hz
100 kHz .......................................... $-145$ dBc/Hz

ENVIRONMENTAL SPECIFICATIONS

Operating temp ........................................ $-20$ °C to +75 °C
Storage temp ........................................ $-40$ °C to +85 °C
Operating humidity .......................... 95% (non-condensing)

INTERFACE SPECIFICATIONS

Prime power ........................................ $+24$ V and return using DC to DC power supply (19 V–34 V)
Mechanical connection uses a two-pin locking connector.
1 PPS Interface Specification
- BNC Connector 0 V to 2.4 V ±10% into 50 Ω 10 microseconds-wide pulse with the leading edge synchronized to UTC within 15 nanoseconds (one sigma) 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 ±2 into 50 Ω
5 dBm .............................. 1.125 Vpp
7 dBm ................................ 1.416 Vpp
9 dBm ................................ 1.783 Vpp
Serial interface ...................... RS-232 through a DB-9/M connector
RF antenna connector .................... BNC
Serial protocol .................. Trimble Standard Interface Protocol (TSIP) binary protocol @ 9600, 8-None-1

PHYSICAL CHARACTERISTICS

Power consumption .......................... 12 watts cold; 8 watts steady state
Dimensions ......................... 5 in L x 4 in W x 2 in H (127 mm x 102 mm x 40 mm)
Mounting ..................................... Six mounting holes for M3 screws. Max. depth 3/8”
Weight .............................................. 0.628 lb (0.285 kg)
Power connector ........................ Molex 39-30-1020

ORDERING INFORMATION & ACCESSORIES

Please go to www.trimble.com/timing for the latest documentation, software, tools, part numbers and ordering information.