Data Sheet

Bullet™ 360 Antenna

KEY FEATURES

- Multi-GNSS – GPS, Galileo, Beidou & GLONASS constellations
- Weatherproof housing
- Extended temperature range (-40°C / +90°C)
- High gain 28 ±3dB
- Filtering for RF Jamming environments
- Available in 3.3V (TNC) or 5V (TNC or F)
- RoHS-II Compliant

Multi-GNSS – GPS, GLONASS, Beidou & Galileo

The Trimble® Bullet™ 360 timing antennas are designed specifically for the congested urban environments.

GNSS timing application will benefit from increased signal availability and multi-constellation redundancy. In challenging urban environments the increased number of visible satellites will significantly improve the performance of GNSS receiver

Put it anywhere

The antenna is housed in weatherproof packaging designed to withstand exposure to shock, vibration, extreme temperatures, rain, snow and sunlight

The dome is all plastic, and the threaded socket in the base of the antenna. The socket accepts either a 1”-14” straight threat (typical marine antenna mount) or a 3/4” pipe thread.

The F-type or TNC antenna connector is located inside the threaded socket, which allows the antenna cable to be routed inside a mounting pole and protects the cable connection.

Strong Performance

The Bullet 360 antenna is an active GPS L1, Galileo E1, Beidou B1 and GLONASS G1 bands antenna with 28dB preamp (5V DC), 26dB preamp (3.3 VDC). The Bullet 360 filtering improves impunity to other RF signals for reliable performance in hostile RF jamming environments.

Proven Reliability

For over 25 years, Trimble has sold GNSS antennas renowned for their survivability in tough environments. The Bullet 360 antenna is the fifth generation of the proven Bullet antenna family and offers all the reliability and performance benefits that are required for mission critical installations.

In unforgiving environments, an antenna failure could be disastrous. Don’t risk it. Select a proven GNSS antenna – the Trimble Bullet 360 antenna.

Trimble

Bullet™ 360 – GPS, Galileo, Beidou & GLONASS Antenna

ENVIRONMENTAL SPECIFIATIONS

Operating Temperature.....-40°C to +90°C
Storage Temperature.....-40°C to +90°C
Vibration..... 10 – 200 Hz Log sweep
3g (Sweep time 30 minutes) 3 axes
Shock.....50g vertical, 30g all axes
Humidity Soak.....+60°C @ 95% RH, 96 hours
Corrosion Salt Resistant.....5% Salt spray tested, 96 hours

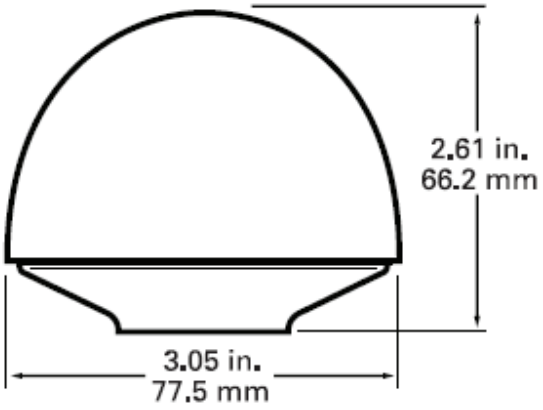
PHYISCAL CHARCTERISTICS – 3.3V & 5V DC ANTENNAS

Dimensions.....3.05”D x 2.61” H (77.5mm x 66.2mm)
Weight.....7.0oz (200grams)
Enclosure.....Off-white plastic
Connector.....F-type & TNC (5V) – TNC (3.3V only)
Mounting.....1” – 14” thread or ¾” pipe thread

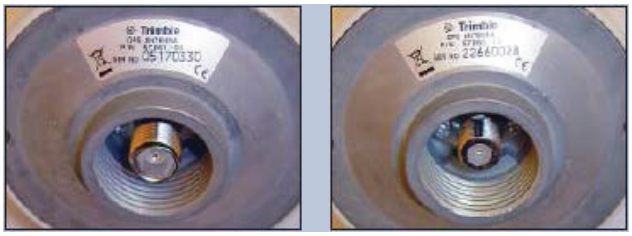
TECHNICAL / PERFORMANCE SPECIFICATIONS

Feature	3.3V	5.0V
Prime Power	3.3V DV (±10%)	5.0V DV (±10%)
Power Consumption	<13mA	<20mA
Gain	26dB ± 3dB (GPS)	28dB ± 3dB (GPS)
Output Impedance	50Ω	
Frequency	GPS L1 1575.42 ±3MHz BDS B1 1561 ±3MHz GLO G1 1602 ±3MHz	
VSWR	2.0 maximum	
Axial ratio	<5dB (GPS) <3dB	
Noise	2.0dB (typical)	
Bandwidth (10dB RL)	70 MHz (min)	
Out of Band rejection	fo= L1, B1, G1 fo ±50 MHz: 30 dB typ fo ±100MHz: 40dB typ	
Azimuth coverage	360° (omni-directional)	360° (omni-directional)
Elevation coverage	0°-90° elevation (hemispherical)	0°-90° elevation (hemispherical)
ESD	IEC 61000-4-2	

MECHANICAL



CONNECTORS



GENERAL INFORMATION & ACCESSORIES

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

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Data Sheet

Acutime™360
Multi-GNSS Smart Antenna

KEY FEATURES

- Multi-Constellation
- Simultaneous GPS / GLONASS or GPS / Beidou tracking
- Superior sensitivity
  - ✓ Tracking -160dBm
  - ✓ Acquisition-148dBm (cold)
- Weatherproof and corrosion resistant housing
- Extended temperature range (-40°C / +85°C)

Multi-GNSS Smart Antenna

The Trimble® Acutime™360 Multi-GNSS (GPS, GLONASS, Beidou, Galileo-ready) smart antenna is latest Acutime product of integrated GNSS technology in a rugged and weatherproof self-contained unit.

The Acutime™360 is an integrated pipe thread-mounted multi-GNSS receiver, antenna and power supply solution in a single environmentally sealed easy to install enclosure.

Demonstrated Performance

The Acutime™360 design continues the Trimble line of GNSS smart antennas, which have been in production since 1991. The Acutime™360 is optimized for precise timing and network synchronization needs, including broadband wireless applications.

It provides a cost effective and independent timing source (within the firewall) for any application, such as fault detection systems and synchronization of wireless networks..

Power Efficiency & Performance

The Acutime™360 Multi-GNSS smart antenna requires less than 1 Watt to operate. Once power is applied, the Acutime™360 smart antenna automatically tracks satellites and surveys its position to within meters. It then switches to overdetermined time mode and generates a pulse-per-second (PPS) output synchronized to UTC within 15 nanoseconds (one sigma), outputting a time tag for each pulse

Acutime™360 Starter Kit Option

The Acutime™360 Starter Kit makes it easy to evaluate the exceptional performance of this multi-GNSS smart antenna and integrate advanced technology into your system..

Trimble

ACUTIME™ 360 MULTI-GNSS SMART ANTENNA

GENERAL SPECIFIATIONS

Receiving Signal……..GPS, GLONASS, Galileo[1], Beidou
Positioning System……SPS, Timing
1 PPS Timing Accuracy ……15 ηs (1 sigma)
Update Rate……1 Hz
Typical Min Acq Sensitivity…….-148dBm cold start
Typical Min Tracking Sensitivity …… -160dBm
Time to First Fix[2]……<46s (50%), <50s (90%) cold start
Typical Time to Re-acquisition…… <2s (90%)
Accuracy Horizontal Position……..<6m (50%), <9m (90%)
Accuracy Vertical Position…….. <11m (50%), <18m (90%)

[1] *Hardware ready: a firmware update is required to enable the Galileo constellation.*
[2] *The performance criteria and times given for TTFF & reacquisition are with GPS satellites in the constellation set.*

INTERFACE CHARACTERISTICS

Serial Port……2 serial port
Protocols……TSIP, NMEA 0183
All ports support baud rates 4.8-115.2kbps; 8 data bits; E, O or no parity.

ELECTRICAL CHARACTERISTICS

Power…….+5VDC[3] to +36VDC, reverse polarity protection
Power Consumption……<1.0Watt
[1] *Reduced cable length @+5VDC to +12VDC*

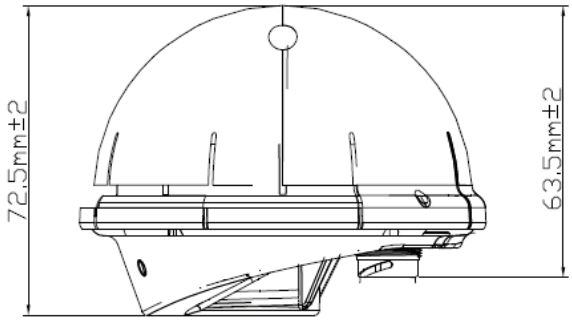
ENVIRONMENTAL SPECIFICATIONS

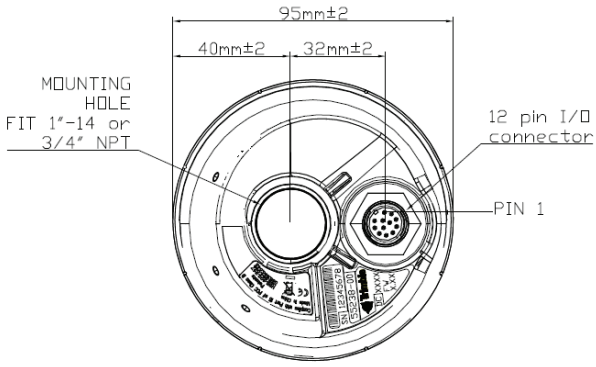
Operating Temperature……-40°C to +85°C
Operating Humidity…..5%-95% RH non-condensing (+60°C)
Storage Temperature……-55°C to +105°C
Ingress Protection……IP67
EMC……CE, FCC Class B

PHYSICAL CHARACTERISTICS

Dimensions ……95mm x 72.5mm (3.74” D x 2.85” H)
Weight……5.4oz (154grams)
Connector……12-pin round, waterproof
Mounting……1”–14 straight thread or ¾” pipe thread

Mechanical Drawing





Visit www.trimble.com/timing for part numbers and information about where to buy.

Parts of the product are patent protected.

Trimble has relied on representations made by its suppliers in certifying this product as RoHS-II compliant.

Specifications subject to change without notice.

Trimble Navigation Limited is not responsible for the operation or failure of operation of GPS satellites or the availability of GPS satellite signal.

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Data Sheet

RES SMT 360™
Multi-GNSS Timing Module

KEY FEATURES

- Multi-Constellation
- Simultaneous GPS / GLONASS or GPS / Beidou tracking
- Ideal for populated urban and indoor environments with limited sky-view
- PPS and PP2S outputs, synchronized to GNSS / UTC within 15ns (1 sigma)
- Extended temperature range (-40°C / +85°C)

Miniature Multi-GNSS Timing Module with Super-Sized Features

Ideal for Low Signal Environment
Trimble® designed the RES SMT 360™ Timing Module to work in the most demanding weak signal environments, including femtocells and in-building systems.

With its robust performance in low signal environments, users can save on expensive cabling and externally mounted antennas. In addition, the RES SMT 360™ timing module accepts aiding data for environments requiring the highest levels of enhanced sensitivity.

Timing Signal Outputs
The RES SMT 360™ timing module outputs a precise1 pulse-per-second (1PPS) and an even second pulse to maximize your network performance and synchronize systems at a global level.

Standard Timing Features
The RES SMT 360™ timing module includes many of Trimble's standard timing features, including Time-Receiver Autonomous Integrity Monitoring (T-RAIM) algorithm, automatic self-survey, and GNSS disciplining of the oscillator to provide an accurate frequency reference

Carrier Board and Starter Kit Options
The RES SMT 360™ timing module can be loaded directly onto the customer's application board.

The Starter Kit provides everything you need to evaluate the RES SMT 360™ timing module, including the RES SMT 360™ on a carrier board, AC/DC power converter, antenna and USB interface cable.

Trimble

RES SMT 360™ Multi-GNSS TIMING MODULE

GENERAL SPECIFIATIONS

Receiving Signal.....GPS, GLONASS, Galileo[1], Beidou
Supports GNSS incl. ..... QZSS
Positioning System.....SPS, Timing
1 PPS Timing Accuracy .....15 ηs (1 sigma)
Update Rate.....1 Hz
Typical Min Acq Sensitivity.....-148dBm cold start
Typical Min Tracking Sensitivity ..... -160dBm
Time to First Fix[2].....<46s (50%), <50s (90%) cold start
Typical Time to Re-acquisition..... <2s (90%)

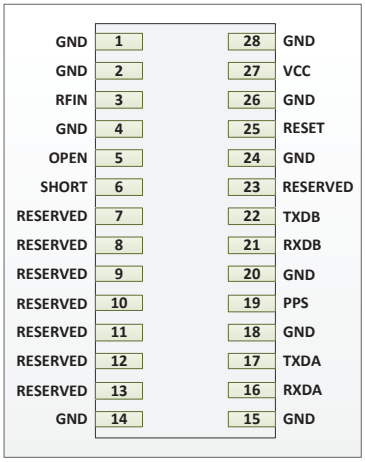
INTERFACE CHARACTERISTICS

Connections. . . . .. . .28 surface-mount edge castellations
Serial Port.....2 serial port
PPS / Even Second.....CMOS-compatible
LVTTL-level pulse, once per second
Protocols.....TSIP, NMEA 0183

[1] *Hardware ready: a firmware update is required to enable the Galileo constellation.*
[2] *The performance criteria and times given for TTFF & reacquisition are with GPS satellites in the constellation set.*

PINOUT ASSIGNMENTS

RES SMT 360 PINOUTS



PHYSICAL CHARACTERISTICS

Enclosure.....Metal Shield
Dimensions .....19 mm W x 19 mm L x 2.54 mm H
(0.75” W x 0.75” L x 0.1” H)
Weight.....1.8 grams (0.06 ounce) including shield

ELECTRICAL CHARACTERISTICS

Supply Voltage Range.....3.3VDC to ±5%
Power Consumption.....0.5W max.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature.....-40°C to +85°C
Operating Humidity.....5%-95% RH non-condensing (+60°C)
Storage Temperature.....-50°C to +105°C

GENERAL INFORMATION & ACCESSORIES

Module.....available in 20 piece trays for evaluation
Production quantities on tape on reel (500 pieces)
Reference Board.....GNSS module mounted on a carrier board with I/O and RF connectors, including RF circuitry with the antenna open detection, as well as antenna short detection and protection.
Starter Kit .....Includes Reference Board mounted on interface motherboard in a durable metal enclosure, AC/DC power converter, Bullet 360 antenna, USB interface cable, TSIP and NMEA protocols
Antenna..... Bullet 360

Visit www.trimble.com/timing for part numbers and information about where to buy.

Parts of the product are patent protected.

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Data Sheet

ICM SMT 360™
Multi-GNSS Timing Module

KEY FEATURES

- Multi-Constellation
- Simultaneous GPS / GLONASS or GPS / Beidou tracking
- Ideal for populated urban and indoor environments with limited sky-view
- Holdover:
  ±7us over 5 minute period (min. 1 hour learning)
  100ppb over 24 hours
- PPS, PP2S and 10MHz output (custom frequencies available)
- Extended temperature range (-40°C / +85°C)

Miniature Multi-GNSS Timing Module with Super-Sized Features

Ideal for Low Signal Environment
Trimble® designed the ICM SMT 360™ Timing Module to work in the most demanding weak signal environments, including femtocells and in-building systems.

With its robust performance in low signal environments, users can save on expensive cabling and externally mounted antennas. In addition, the ICM SMT 360™ timing module accepts aiding data for environments requiring the highest levels of enhanced sensitivity.

PPS and Frequency Outputs
The ICM SMT 360™ timing module outputs a precise1 pulse-per-second (1PPS) and 10 MHz frequency to maximize your network performance and synchronize systems at a global level.

Custom frequencies are also available for volume sale.

Standard Timing Features
The ICM SMT 360™ timing module includes many of Trimble's standard timing features, including Time-Receiver Autonomous Integrity Monitoring (T-RAIM) algorithm, automatic self-survey, and GNSS disciplining of the oscillator to provide an accurate frequency reference

Carrier Board and Starter Kit Options
The ICM SMT 360™ timing module can be loaded directly onto the customer's application board.

The Starter Kit provides everything you need to evaluate the ICM SMT 360™ timing module, including the ICM SMT 360™ on a carrier board, AC/DC power converter, antenna and USB interface cable.

Trimble

ICM SMT 360™ Multi-GNSS DISCIPLINED CLOCK MODULE

GENERAL SPECIFIATIONS

Receiving Signal.....GPS, GLONASS, Galileo, Beidou
Supports GNSS incl. ..... QZSS
Positioning System.....SPS, Timing
1 PPS Timing Accuracy .....15 ηs (1 sigma) @ room temp
Holdover Stability.....<±7us over 5 min period
(Min. 1hr learning)
(100ppb over 24hrs.)
Update Rate.....1 Hz
Typical Min Acq Sensitivity.....-148dBm cold start
Typical Min Tracking Sensitivity ..... -162dBm
Time to First Fix[1].....<46s (50%), <50s (90%) cold start
Typical Time to Re-acquisition..... <2s (90%)

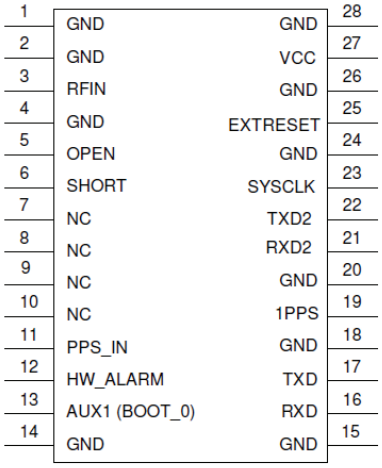
INTERFACE CHARACTERISTICS

Serial Port.....2 serial port
PPS / Even Second.....CMOS-compatible
LVTTL-level pulse, once per second
Protocols.....TSIP, NMEA 0183

[1] The performance criteria and times given for TTFF & reacquisition are with GPS satellites in the constellation set.

PINOUT ASSIGNMENTS

ICM-SMT 360 PINOUTS



PHYSICAL CHARACTERISTICS

Enclosure.....Metal Shield
Dimensions .....19 mm W x 19 mm L x 2.54 mm H
(0.75" W x 0.75" L x 0.1" H)
Weight.....1.8 grams (0.06 ounce) including shield

ELECTRICAL CHARACTERISTICS

Supply Voltage Range.....3.3VDC to ±5%
Power Consumption.....0.5W max.

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature.....-40°C to +85°C
Operating Humidity.....5%-95% RH non-condensing (+60°C)

PHASE NOISE

Maximum, over temperature range:
-100dBc/Hz @ 100Hz
-120dBc/Hz @ 1KHz
-135dBc/Hz @ 10KHz
-140dBc/Hz @ 100KHz
Typical:
-105dBc/Hz @ 100Hz
-125dBc/Hz @ 1KHz
-140dBc/Hz @ 10KHz
-145dBc/Hz @ 100KHz

Visit www.trimble.com/timing for part numbers and information about where to buy.

Parts of the product are patent protected.

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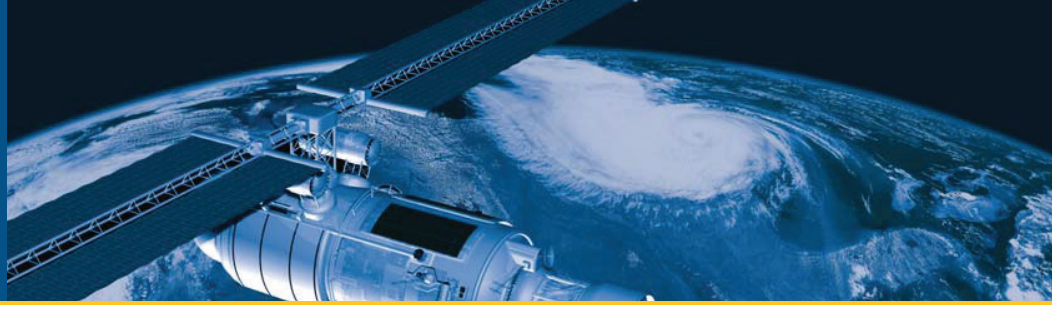
The right one.™



THUNDERBOLT E GPS DISCIPLINED CLOCK

KEY FEATURES

- Double-ovenized quartz oscillator provides stable 10 MHz and 1 PPS output to maximize bandwidth
- Combined GPS receiver and 10 MHz oscillator on one board
- High volume manufacturing provides reliable low-cost products
- Meets holdover specifications of 8 µs over 24 hours

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.

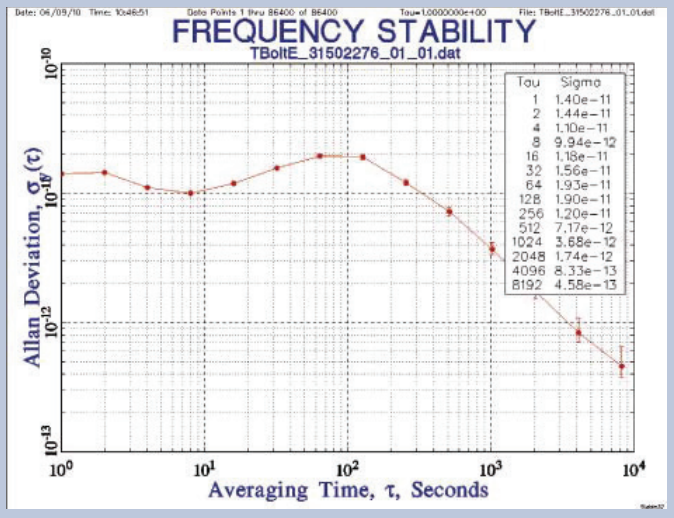
The high level of integration and volume production techniques make the Thunderbolt E GPS Disciplined Clock an extremely cost-competitive timing solution for volume synchronization applications.

Trimble

THUNDERBOLT E GPS DISCIPLINED CLOCK

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 x 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

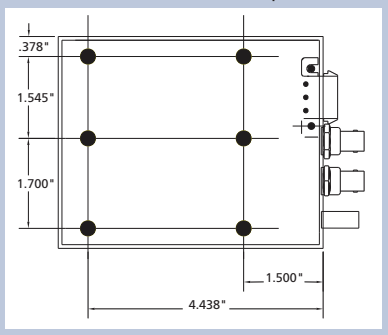
Operating temp . . . . . –20 °C to +75 °C
Storage temp . . . . . –40 °C to +85 °C
Operating humidity . . . . . 95% (non-condensing)

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.

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Data Sheet

Mini-T™ GG Multi-GNSS Disciplined Clock

KEY FEATURES

- Multi-Constellation
- Simultaneous GPS and GLONASS tracking
- Extended temperature range (-40°C / +85°C)
- Holdover stability of ±5us over 24 hour period @ 25°C
- Small foot print and low profile, suited for digital broadcast and small cells
- PPS and 10MHz output
- T-RAIM (Disciplined Clock Autonomous Integrity Monitoring) provides high PPS integrity

Multi-GNSS Disciplined Clock

The Trimble® Mini-T™ GG is a multi-GNSS (GPS, GLONASS) Disciplined Clock, optimized to generate precise timing signal. Designed specifically for compact, high-volume applications. When operating in Over Determined Timing Mode the accuracy of pulse per second (PPS) is within 15 nanoseconds of GNSS/UTC.

Synchronization for next generation

The Mini-T™ GG gives OEMs the opportunity to embed a low-cost precise time and frequency reference, in our smallest form-factor yet.
Trimble created the Mini-T™ GG using clock technology proven in generations of deployed units used in 4G networks (LTE, WiMAX, HSPA+) and digital broadcasting applications. It utilizes the latest in GNSS technology, combined with a precision ovenized oscillator for near atomic clock precision timing

Standard timing feature

The Mini-T™ GG includes many of Trimble's standard timing features, including the Disciplined Clock Autonomous Integrity Monitoring (T-RAIM) algorithm, and automatic self-survey. The Mini-T™ GG is factory default with the TSIP protocol that follows specific timing products and applications

Proven Reliability

The Mini-T™ GG offers proven reliability and performance, will exceed your expectations, and enable you to provide your customers with the highest quality GNSS solution available today

The Mini-T™ GG GNSS Clock Board is offered with a standard 10 MHz output, but it is also available in custom frequencies.

Trimble

MINI-T™ GG MULTI-GNSS DISCIPLINED CLOCK

GENERAL SPECIFIATIONS

Receiving Signal.....GPS L1 & GLONASS G1
Positioning System.....SPS, Timing
Acquisition Channels.....24 Channels
Tracking Channels.....24 Channels
1 PPS Timing Accuracy .....15 ηs (1 sigma)
Holdover Stability.....<±5us over 24Hr period @ 25°C
Horizontal Position Accuracy.....<6m (50%), <9m (90%)
Vertical Position Accuracy.....<11m (50%), <18m (90%)
Update Rate.....1 Hz
Data Format.....TSIP or NMEA
Typical Min Acq Sensitivity.....-150dBm cold start
Typical Min Tracking Sensitivity ..... -160dBm
Time to First Fix.....<46s (50%), <50s (90%) cold start
Typical Time to Re-acquisition..... <2s (90%)

INTERFACE CHARACTERISTICS

Serial Port.....1 serial port
PPS / Even Second.....CMOS-compatible
TTL-level pulse, once per second
Protocols.....TSIP, NMEA 0183
GNSS Input Connector.....SMA
PPS Out.....SMA
Frequency Out.....SMA
I/O Connector.....2x15 Pin

OSCILLATOR SPECIFICATIONS

Frequency Output.....10MHz
Phase Noise.....-90dBc/Hz @ 1Hz
-120dBc/Hz @ 10Hz
-135dBc/Hz @ 100Hz
-145dBc/Hz @ >1KHz

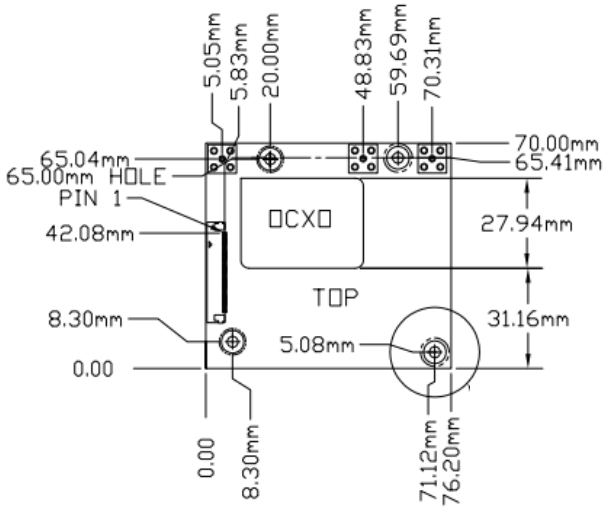
ELECTRICAL CHARACTERISTICS

Supply Voltage Range..... 5.5V DC ±5%

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature.....-40°C to +85°C
Vibration 0 008 g^2/Hz..... 5 Hz to 20 Hz
0 05 g^2/Hz..... 20 Hz to 100 Hz
-3 dB/octave.....100 Hz to 900 Hz
Operating Humidity.....5%-95% RH non-condensing (+60°C)

MECHANICAL DRAWING



GENERAL INFORMATION & ACCESSORIES

Bullet GG, 5V DC with 32 dB gain

Visit www.trimble.com/timing for part numbers and information about where to buy.

Parts of the product are patent protected.

Trimble has relied on representations made by its suppliers in certifying this product as RoHS-II compliant.

Specifications subject to change without notice.

Trimble Navigation Limited is not responsible for the operation or failure of operation of GPS satellites or the availability of GPS satellite signal.

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Thunderbolt NTP TS200

NTP Network Time Server for high reliability applications

Thunderbolt NTP TS200 Time Server

The Trimble Thunderbolt® NTP TS200 Time Server is designed for demanding applications that require high accuracy NTP time stamping. The TS200 supports synchronization of thousands of workstations, routers, switches and other network elements for logging and security forensics. VOIP IPBX systems also require very accurate NTP timestamps to ensure CDR events are correctly registered and reported.

The Thunderbolt NTP TS200 supports multiple constellations GNSS, which enables tracking of GPS, GLONASS, and Beidou satellites enhancing redundancy and satellite availability.

Industrial applications

Automation systems and industrial environments that use SCADA or other network monitoring, measurement and control systems require high precision NTP reference to ensure reliable and accurate operations.

The NTP TS200 is optimized to deliver extremely stable and accurate time of day (TOD) synchronization for a variety of time sensitive applications such as datacenters, SCADA systems and PMU synchronization.

Ideal for demanding environments

The Thunderbolt NTP TS200 leverages Trimble's decades of experience in GNSS systems with millions of timing devices integrated into telecommunications, digital broadcasting, computer networks and other industrial applications.

The NTP TS200 Time Server offers extended operating temperature ranges to ensure suitability for use in demanding environments.

The NTP TS200 supports a large number of clients making it suitable for medium and large scale deployment. The low cost per client of the TS200 helps reduce the total cost of deployment while maintaining superior reliability

Integration and Installation

The Trimble Thunderbolt NTP TS200 Clock offers AC and DC power options for easy deployment in all types of network environments.

Matching the NTP TS200 with Trimble rugged antennas such as the Trimble Bullet™ 360 provides reliable reference acquisition in challenging RF signal environments.

Bullet 360 rugged antennas provide multi-GNSS capabilities so that critical applications can obtain high precision timing signals with the best reliability in the industry.

Key Features

- NTP v4 Time Server
- Supports 2.5K transaction/second
- Multi-Constellation *(GPS, GLONASS, Beidou & Galileo)*
- 15ns time accuracy (GPS locked)
- Holdover of ±1.5us over 4hours *(constant temperature and when locked to GPS for 7 days)*
- IPv4 and IPv6 Support
- Dedicated management port *(1xRJ45)*
- Network Management: SNMP, Web UI, CLI

Benefits

- Extended environmental capabilities allow for installation in difficult industrial environments where other NTP servers cannot be deployed
- Dual power input provides power redundancy
- Superior holdover performance via Trimble proprietary algorithm gives extra time error budget for network design and dimensioning.
- Low cost helps reduce total cost of NTP deployment
- Small form factor allows for easy installation
- Side by side capabilities facilitate redundancy implementation

GENERAL SPECIFIATIONS

Inputs:.....GNSS (GPS, GLONASS, Galileo & Beidou)
Outputs:.....NTP, PPS, 10MHz
Ethernet Ports: 1x Mgmt RJ45
1x 1G SFP
1x 1G RJ45
GNSS Antenna .....SMA

Protocols:
NTP, SNTP, IPv4, IPv6, Telnet, SFTP, SSH, RADIUS, TACACS+, SNMP, DAYTIME, TIME
Network Management.....SNMPv2, HTTPS, CLI

User Interfaces:
CLI.....Monitoring and Management
Web UI.....Monitoring and Management

PERFORMANCE

Time of day accuracy.....15ns (1-sigma) from UTC
Frequency accuracy.....1.16x10^{-12} (one day ave.)
Holdover.....<1x10^{-10} /24hrs

Time accuracy
Tracking to PRC.....<15ns (locked)
Holdover.....< ±1.5µs/4hrs (7 days locked)

NTPv4 Stratum-1 server configuration.....2500 tps
Surveyed accuracy.....<3m Horizontal, <5m Vertical

PHYSICAL CHARACTERISTICS

Dimensions in cm (L x W x H):.....20.8 x 20 x 4.4
(19" half-rack x 1U)
Weight.....< 3Kg (6 lb)

POWER

DC Power, dual feed.....-36VDC to -72VDC
AC Power.....110V / 220 V (adapter incl.)
Current consumption.....330mA (max)
Power consumption.....5W average, 10W maximum

REGULATORY & STANDARDS

Operating Conditions
Temperature.....-40°C to +85°C
Humidity.....5%-95% RH non-condensing (+60°C)

Storage Temperature.....-55°C to +105°C

Safety & Environmental:
UL / CSA 60950-1
EN: 60950-1, 300019
CE, CISPR22 class A
GR-63; Level 3
ETSI (EN55022/EN55024) EN 300019, Class T3.2

Electrical.....EMC, ESD Immunity & susceptibility
FCC Part 15 Class B / ICES 003 Class-B
Korea KN32 / KN35 Class A
EN.....301 489-1, EN 301 489-19 EN 303 413
IEEE.....1613-1
Telcordia.....GR-1089

Synchronization
IETF.....NTPv4

Product Compliant with following directive:
2014/53/EU (RED Directive)
2011/65/EU (RoHS2 Directive)
2012/19/EU (WEEE Directive)

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Thunderbolt PTP GM200

PTP Grandmaster designed for small cell, 4G and LTE-A deployments

Thunderbolt GMC GM200 Grandmaster Clock

The Trimble Thunderbolt® PTP Grandmaster Clock is designed for wireless networks requiring phase synchronization. The GM200 provides continuous availability of UTC traceable time for phase synchronization, a must for LTE-Advanced networks and services.

The Thunderbolt PTP GM200 employs industry leading Trimble GNSS solution & holdover technology.

The PTP GM200 can tolerate harsh environmental conditions supporting both indoors & outdoors deployments with extended operating temperature range.

Small cell phase synchronization

The Thunderbolt PTP GM200 is designed with small cells in mind but also it meets Marco base station requirements for synchronization.

The Thunderbolt PTP GM200 supports small cells networks that require phase synchronization. The most efficient way to implement phase synchronization for LTE & LTE-A services is to deploy the grandmaster clock close to target eNodeBs to ensure 1.5 us of phase alignment.

By reducing network hops between the grandmaster and LTE base stations, the risk of network re-configuration and load variance on IEEE-1588 signal quality is reduced. The Trimble GM200 suits this strategy perfectly due to its small size, low cost, superior accuracy & reliability and flexibility of deployment options.

Ideal for LTE-A services

CoMP, eICIC, eMBMS and Carrier Aggregation services require that synchronization networks be requalified and redesigned to support phase synchronization. Non-compliance with phase sync specifications will result in low or no service from LTE-A equipment and degraded bandwidth leading to potential service outages.

By engineering current networks to support phase synchronization, LTE-A services downtime can be mitigated. Phase synchronization can easily be supported by current sync networks with the GM200 by adding it where needed. Given its low cost, it can be added to any network requiring support for the stringent phase synchronization specifications that LTE-A services require performing at their optimal levels.

High reliability assures that the GM200 can be deployed in edge and/or aggregation networks.

Key Features

- IEEE-1588 PTP Grandmaster Clock
  - *Multiple PTP Profiles (G.8265.1, G.8275.1, G.8275.2, Telecom-2008 Profile, Enterprise Profile, Power Profile, Broadcast Profile SMPTE)*
- Multi-Constellation *(GPS, GLONASS, Beidou & Galileo)*
- 15ns (1-sigma) time accuracy relative to GNSS reference
- Holdover of ±1.5us over 4hours *(constant temperature and when locked to GPS for 7 days)*
- Inputs: GNSS, 1588-PTP and SyncE
- Outputs: 1588-PTP, NTP, SyncE, PPS, and 10MHz
- Dedicated management port *(1xRJ45)*
- Network Management: SNMP, Web UI, CLI
- VLAN support
- IPv4 and IPv6

Benefits

- Low cost reduces CAPEX of LTE TDD, LTE-A & small cell projects
- Extended environmental capabilities enable deployment in difficult locations where small cells and LTE-A base stations are deployed
  Superior holdover performance via Trimble proprietary technology gives extra time error budget for network design and dimensioning.

GENERAL SPECIFICATIONS

Inputs:.....GNSS, 1588-PTP, SyncE
Outputs:.....PPS, 10MHz, NTP, PTP, SyncE
Ethernet Ports: 1x Mgmt RJ45
1x 1G SFP
1x 1G RJ45
Protocols.....PTP, NTP & SyncE
GNSS Antenna .....SMA

Protocols:
IEEE-1588 (PTP), NTPv4, SyncE, IPv4, IPv6, TELNET, SFTP, SSH, RADIUS, TACACS+, SNMP, DAYTIME, TIME

Network Management.....SNMPv2, HTTPS, CLI

User Interfaces:
CLI.....Monitoring and Management
Web UI.....Monitoring and Management

PERFORMANCE

Time of day accuracy.....15ns (1-sigma) reference GNSS
Time stamp accuracy.....<10 ns rms
Frequency accuracy.....$1.16x10^{-12}$ (one day ave.)
Holdover.....$<1x10^{-10}$ /24hrs

Time accuracy
Tracking to GPS.....<15ns (locked)
Holdover.....< ±1.5µs/4hrs (7 days locked)

Power consumption.....5W average, 10W maximum

PHYSICAL CHARACTERISTICS

Dimensions in cm (L x W x H):.....20.8 x 20 x 4.4
(19" half-rack x 1U)
Weight.....< 3Kg (6 lb

POWER

DC Power, dual feed.....-36VDC to -72VDC
Current consumption.....330mA (max)
Power-over-Ethernet (POE).....Optional

REGULATORY & STANDARDS

Operating Conditions
Temperature.....-40°C to +85°C
Humidity.....5%-95% RH non-condensing (+60°C)
Storage Temperature.....-55°C to +105°C

Safety & Health:
UL EN 62368-1
CE, CISPR32 class A
GR-63; Level 3
ETSI (EN55032/EN55024) EN 300019, Class T3.2

Electrical.....EMC, ESD Immunity & susceptibility
FCC Part 15 Class B / ICES 003 Class-B
Korea KN32 / KN35 Class A
EN.....301 489-1, EN 301 489-19 EN 303 413
IEEE.....1613-1
Telcordia.....GR-1089

Synchronization
ITU.....G.8265.x, G.8275.x (PRTC/T-GM)
IEEE.....PTP (IEEE 1588v2)
IETF.....NTPv4 (RFC5905)

Product Compliant with following directive:
2014/53/EU (RED Directive)
2011/65/EU (RoHS2 Directive)
2012/19/EU (WEEE Directive)

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