

The dedicated synchronization tester

Now with 5G Over-the-Air measurements



- ➔ Verify Phase, Time and Frequency synchronization
- ⊕ Monitor performance and diagnose synchronization issues on 3G/4G/5G Mobile, Datacenter, Financial, Power and other Telecoms networks

PERFORMANCE AT-A-GLANCE

Sentinel includes the Calnex Analysis Tool (CAT) to provide a comprehensive measurement suite including:

- Time Error (TE)
- Time Interval Error (TIE)
- MTIE
- TDEV
- ESMC Quality Levels
- Max 2way TE
- Dynamic Time error
- Max Packet Selected 2Way TE
- SyncE wander
- Packet Delay Variation (PDV)
- Floor Packet Percentage (FPP)
- Frequency Error

Flexible network connection options:

- As a pseudo T-TSC to measure upstream network synchronization
- As a network monitor measuring live network PDV and TE

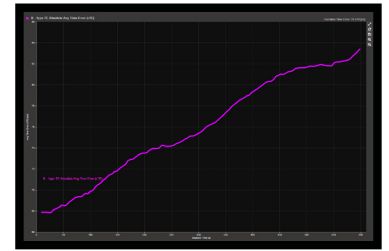
Clear Pass/Fail Metrics for easy analysis:

- ITU-T specified masks
- ITU-T, standards-based, vendor-specific limits
- Detailed measurement report in pdf format

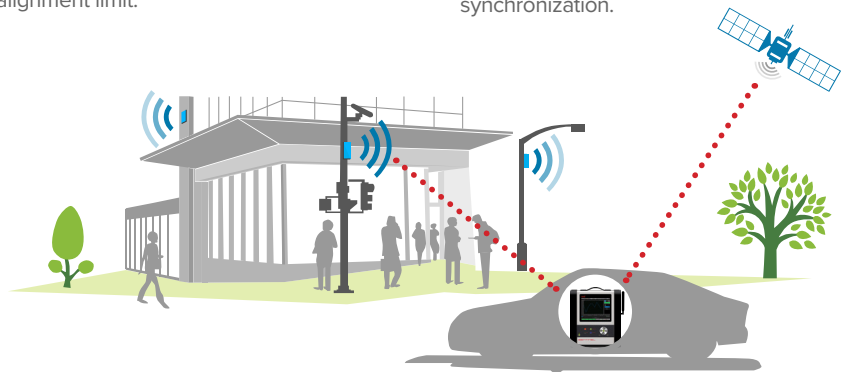
Test Over-the-Air synchronization in 4G and 5G mobile networks

How do you know if your Small Cells conform to 3GPP standards? With TDD and FDD systems implementing newer LTE features such as eICIC and CoMP, measuring the sync accuracy of a Small Cell/eNodeB is crucial. It's also quite a challenge, particularly when these network devices often lack a physical 1 pps output.

However, with Sentinel's non-invasive OTA test capability you can now measure, with precision, the Time Error between eNodeBs or gNodeBs and UTS to ensure they meet the 3GPP's $\leq 3 \mu s$ phase alignment limit.

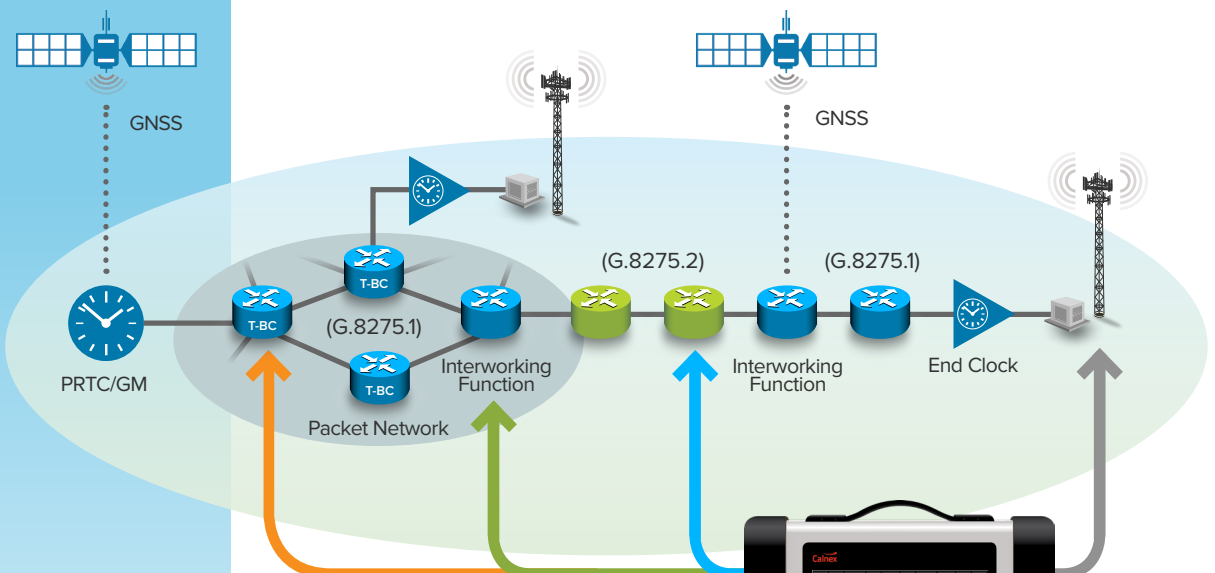


Evaluate OTA measurements using the CAT for detailed insight into static and dynamic time and frequency synchronization.



Test 3G/4G/5G and Small Cell deployments at various points in the network, including near to the GrandMaster (GM), and validate network performance to ITU-T limits.

Deliver the fast, stable services your customers can rely on



Use Sentinel to make long-duration, unattended measurements to identify slow variations in timing or sporadic transient behaviours.

Measurements are graphed in real time allowing you to easily check the status of an ongoing measurement, and gives you confidence of the measurement integrity before you commit to a long term test.

Easily test the performance of your network's synchronization. Sentinel captures all data simultaneously enabling you to correlate timing performance at different points in the network, even between different timing architectures.

- PTP 2WayTE, SyncE, 1 pps TE
- 1 pps TE
- PTP pktSelected2wayTE, 1 pps TE
- Over-the-Air, TE



[illegible]

Capture and decode Signalling, Sync, Del-Req, Del-Resp and Announce messages to help identify:

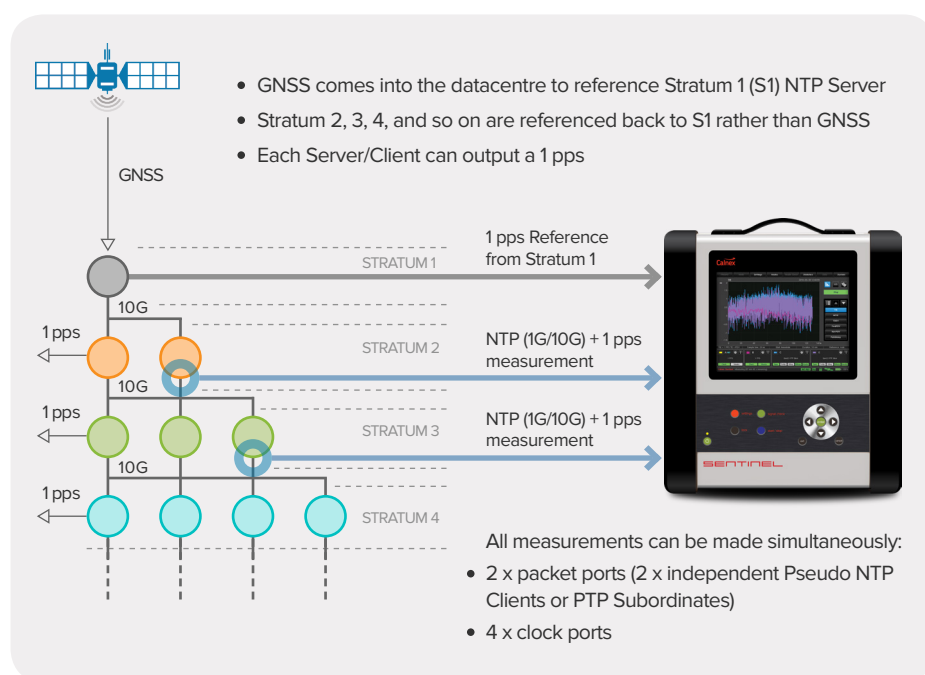
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Analyze PTP protocol for conformance to standards or user-defined profiles.

- ## Test PTP and NTP synchronization in datacenters

Sentinel allows you to easily and thoroughly verify and monitor the synchronization within your datacenter, and prove time/phase accuracy with microsecond precision.

What's more, Sentinel's holdover performance and transport mode allows you to move around your facility and test synchronization without having to maintain a reference GNSS or 1 pps signal. This makes Sentinel an indispensable tester for deployment, troubleshooting and network maintenance.

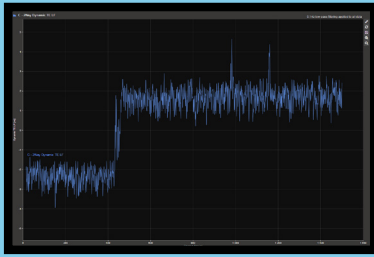


Whatever your application, start testing in 3 easy steps

- Advanced capabilities and intuitive operation means engineers at all skill levels can use Sentinel with total confidence.



Use the CAT for a clearer picture ...



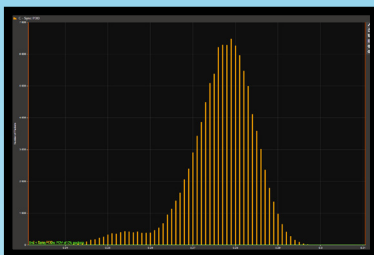
LTE-A/TDD LTE

- PTP/1 pps MaxITel
- PTP/1 pps dTE
- pktSelected2wayTE (APTS/PTS)



LTE-FDD/3G

- PDV FPP
- 16 ppb frequency wander
- MTIE/TDEV



Financial/Power Networks

- NTP PDV distribution
- NTP 2wayTE



SyncE

- E1/T1 wander
- MTIE/TDEV
- ESMC



TDM/Legacy

- E1/T1 wander
- MTIE/TDEV
- SSM

Get greater measurement insight with the Calnex Analysis Tool (CAT)



The CAT provides powerful insight into network and device performance. All your measurement results are now in one place, and you can view multiple graphs simultaneously for easier correlation of your results.

Enhanced graphics makes it easy to evaluate ITU-T metrics such as Time Error (cTE, dTE), MTIE and TDEV against ITU-T masks. While

the customizable multi-graph window lets you rapidly select measurements and channels for detailed analysis.

CAT also provides one button generation of reports in PDF format including Pass/Fail statistics and details of failures. This allows you to share captures and results with vendors for fast, efficient and accurate troubleshooting.

Lab quality performance in an easy-to-use, portable package



No test port? Use OTA measurements

Perform synchronization tests without physical connection to the network.

- 4G LTE-A
- 5G NR



No GNSS signal? Use internal high-stability Rubidium (Rb) clock

Sentinel's built-in Rb clock is both highly stable and precise. Once disciplined, it has exceptional holdover performance allowing you to get to where you need to be and to make accurate measurements even when no reference 1 pps or satellite signal is available.



Problem in the network? Use Capture and Replay

Measure the network and send measurements back to the lab/vendor to replay and fix issues. Data can be transferred from Sentinel via a memory stick or via ftp to a remote PC. Plus, you can ftp results from ongoing measurements.

Actual network performance can also be downloaded to the Calnex Paragon to test individual network components.

Ordering Information

Calnex Sentinel Sync Analyzer with built-in GNSS receiver. Needs minimum of one measurement option (module/port).

Included with shipment: Calnex Analysis Tool (CAT), GNSS antenna, antenna cable (20 m), hard transport case, user manual on USB, line power cord, 1-year warranty and support.

Configurable Options

- Option 610: Clock module 1 pps/E1/T1, any clock from 0.5 Hz up to 200 MHz with 0.5 Hz step. (maximum two per instrument)
- Option 615: 100M/1G packet port (PTP/NTP/SyncE). Can order maximum of 2 x Opt. 615. Includes SyncE/ESMC analysis for 100M/1G optical and electrical rates. (maximum two – Opt. 615 and/or 616 per instrument)
- Option 616: 100M/1G/10G packet port (PTP/NTP/SyncE). Can order maximum of 2 x Opt. 616. Includes SyncE/ESMC analysis or 100M/1G/10G optical and electrical rates. (maximum two – Opt. 615 and/or 616 per instrument)
- Option 705: Over-the-Air (OTA) Time Error measurement module (maximum one per instrument)

Additional Options

- Option 620: PTP and NTP PDV measurement software (one license per instrument).
- Option 630: Internal battery backup for Rubidium.
- Option 812: One year extension of product warranty.
- Option 813: Two years extension of product warranty.

Optional Accessories

- Option 75: 120 Ω balanced RJ45 to 75 Ω unbalanced BNC impedance converter (balun).
- Option 133: External 1 pps/ToD/frequency converter accessory.
- Option 511: Carry-on bag.



Calnex Solutions is a global leader in Test and Measurement solutions for next-generation telecom networks. For more information on the Calnex test equipment, and to take advantage of Calnex's extensive experience in Packet Sync and OAM testing technologies, contact Calnex Solutions today:

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calnexsol.com

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Related Products

Tempo and Tempo-c



- Provides canned tests for quick testing
- Test PTP, SyncE and legacy networks
- Verify Ethernet performance in either loop-back or peer-to-peer mode
- Simulate realistic traffic conditions
- Rugged and lightweight (< 2 kg)

Calnex Paragon-X



- Test PTP (1588), SyncE, NTP, CES and OAM up to 10GbE
- Stress-test equipment with real network profiles from field tests to debug network issues
- Complete standards compliance testing to ITU-T G.826x/827x
- Test PTP Ordinary Clocks, Boundary Clocks and Transparent Clocks

Calnex Paragon-neo



- Delivers high accuracy sub-nanosecond timing measurements at rates up to 100GbE
- Capture and decode PTP packets for analysis and Time Error testing
- Prove SyncE jitter and wander performance to ITU-T G.8262.1/G.8262
- Evaluate MTIE/TDEV pass/fail results to ITU-T G.8262.1/G.8262 masks
- Control ESMC (SSM) message generation for testing to ITU-T G.8264