



RESILIENT PNT SOLUTIONS

Precise Time & Frequency Systems

Advanced GNSS Simulation

GNSS Interference Detection & Mitigation

Company Profile 26

Table of Contents

Company Profile	2
Topics	3
We are Manufacturer	4
We are Distribution Partner	5
Primary Reference Clocks	6
Clock Combiner	7
Caesium Clocks	8
Time and Frequency Systems	9
NTP/PTP Time Server	10
Manual Time Transfer	12
FO Time Transfer	13
GNSS Simulation Systems	14
CRPA-Guard	16
GIDAS	18

© 2026 Lange-Electronic GmbH



Company Profile

Lange-Electronic GmbH – Resilient PNT Solutions

Founded in 1977 and headquartered in Gernlinden near Munich, Lange-Electronic GmbH provides high-precision Positioning, Navigation and Timing (PNT) solutions with a focus on resilient PNT, GNSS simulation and advanced time and frequency technologies.

Our team combines decades of experience in satellite navigation, timing technologies and technical system integration. We support customers with reliable advice and help identify solutions that best match their technical and operational requirements.

Our technologies are used by research organizations, industry, defense and operators of critical infrastructure. We support projects from system selection to integration and regularly engage with the community through technical conferences, workshops and industry events.

Topics

Our customers work with very precise, time-sensitive signals.

Time laboratories

Testing and Certification Organizations

Data Centers

Research and Development Facilities

Ground Stations and Control Centers

Banks and Insurance Companies

Energy Suppliers, Smart Grids

Telecommunications Companies

Automobile Manufacturers

Military Facilities

Aerospace companies

Airports

- We generate, distribute, monitor, control, and display precise time and frequency signals.
- We enable resilient PNT, even in environments affected by jamming and spoofing.
- We monitor and analyze critical environments for interference affecting GNSS signals.
- We simulate GNSS signals to perform comprehensive testing of navigation receivers.

We are Manufacturer

Since the early 1980s, Lange-Electronic has been developing and manufacturing specialized time and frequency systems for reliable Positioning, Navigation, and Timing (PNT).

Our developments include high-stability clock generation systems derived from clock ensembles, precise time transfer solutions for remote synchronization, and technologies that improve the resilience of GNSS-based timing through interference detection and mitigation.

All systems can be tailored to specific requirements regarding interfaces, accuracy, stability, and environmental conditions, including airborne, maritime, and other demanding operating environments.



We are Distribution Partner:



Advanced GNSS test and simulation solutions for development, validation, and verification of PNT systems



High-precision timing and synchronization systems for telecom networks and critical infrastructure



Time transfer and synchronization solutions for precise timing distribution over fiber-optic networks



Precision time synchronization systems supporting NTP and advanced PTP profiles for critical applications



Advanced systems for monitoring, detecting, and analyzing GNSS interference in the radio spectrum



Time synchronization systems for network timing, time distribution, and precision time display

ePRC+ Primary Reference Clocks

An increasing number of networks and applications need to be precisely synchronized. Inaccurate timing can cause poor performance or even outages of complete systems.

While GNSS provides excellent accuracy, satellite-based timing suffers from vulnerabilities such as jamming and spoofing and so cannot be relied on as the only synchronization technology.

With their high levels of accuracy and outstanding availability, atomic clocks provide the ideal backup for GNSS.



OSCILLOQUARTZ
A division of Adtran



Oscilloquartz super aPNT+™ holdover cesium clock

Ultra-high stability and long lifetime

Higher frequency stability and two times longer lifetime compared to legacy magnetic cesium atomic clocks

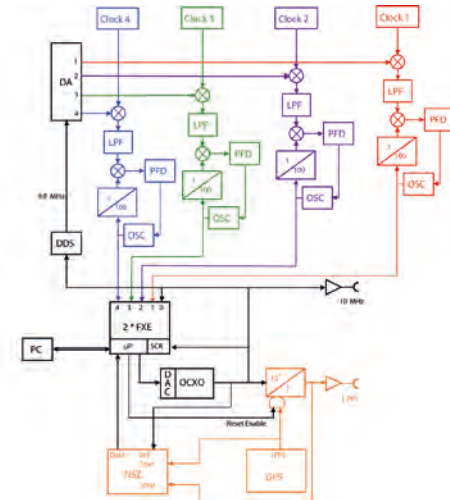
Unique innovation

First commercial ePRC product utilizing optical technology for highly efficient utilization of cesium atoms

Clock Combiner



Lange-Electronic KL-3400 Real Time Clock



Our KL-3400 Ensemble Real Time Clock combines the signals from up to 15 atomic clocks to form an output signal that is more stable and more accurate than any of the individual input signals.

This makes it one of the most precise and stable clocks in the world. It is used in time laboratories and for very precise synchronization tasks.

Caesium Clocks



OSA 3300-HP Oscilloquartz super aPNT+™ frequency cesium clock Front view



OSA 3030B EUDICS
European digital cesium frequency standard



An ultra-stable and precise frequency source is now required in most critical applications, from metrology labs to satellite navigation, from time-keeping institutes to satellite communication. While global navigation satellite systems (GNSS) provide excellent accuracy, they are subject to outages and cannot serve as the sole synchronization technology. Atomic clocks are the perfect complement to GNSS, combining high accuracy with outstanding availability.



OSA 3300-HP Rear View

Versatile Time and Frequency Systems



LL-8200 Time Code System



OSA 5400 TimeCard™
Half-size PCIe card, PTP grandmaster,
NTP server, boundary/slave clock

Our time and frequency systems are available with multiple options. They generate, translate, distribute or control time and frequency. They sync to GNSS or other external time and frequency sources. Their internal time base, TCXO, OCXO or Rubidium, ensures high holdover quality.



LL-3760 GNSS Timing Receiver

IRIG time codes - HaveQuick time code - BCD time code - 1PPS and other pulses - 10MHz
Distribution sinusoidal - Further Frequency outputs - NTP / PTP IEEE-1588 - Sysplex Timer Output -
GNSS Synchronization - RS232 Interfaces - Optional internal OCXO or Rubidium

Compact Time Server

We offer NTP and PTP time servers in different sizes and with a variety of options for the synchronization of networks and intelligent power grids.



OSA 5405-P SyncGrid™
Compact substation PTP grandmaster, NTP server, multi-interfaces



OSA 5401 SyncPlug™
SFP-based PTP grandmaster, NTP server, boundary/slave clock, GNSS receiver



ELPROMA NTS-Pico
The ultra-miniature Network Time Server NTS-pico3 provides high-precision GNSS-based time synchronization to LAN networks via NTP and PTP / IEEE 1588 protocols.



Masterclock GMR1000
NTP, PTP, IRIG-B, and SMPTE – synchronization optionally via OCXO, Rubidium, or GPS/GNSS.

Stratum 1 NTP Server - PTP Grandmaster



ELPROMA
 NTS-5000
 Telecom ITU-T G.8275.1 G.8275.2 G.8265.1
 Power & Utility IEEE C.37.238 v1 v2
 gPTP, TSN 802.1AS, Broadcast AES67, SMPTE 2059.2



OSCILLOQUARTZ
 OSA 5412
 Compact highspeed PTP grandmaster, NTP server,
 SB/MB-GNSS receiver

OSCILLOQUARTZ
 A division of Astron



Masterclock
 GMR5000
 customizable with multiple available Out-
 puts

Masterclock



OSCILLOQUARTZ
 OSA 5440
 Modular, redundant, high-capacity PTP grandmaster,
 SB/MB-GNSS receiver, SSU+

Manual Time Transfer



In some places no cable can be laid, and no radio signal can be received. For example, in the interior of ships or underground.

This problem can be solved with our time transfer units. Their precise clock - a rubidium on the right - is synchronized to GNSS.

The Time Transfer Unit is then carried to where the time is required as an IRIG or Havequick time code, as a pulse or frequency.



LL-3525 Time Transfer Units



Fiber Optic Time Transfer

The local module of the system accepts reference frequency and time signals (typically 10 MHz and 1 PPS) and transfers them via optical fiber to a remote module. In contrast to conventional two-way transfer systems, the solution delivers a stabilized and calibrated replica of the source signals. This effectively provides a highly accurate virtual atomic clock at the remote end of the fiber link.

The system enables precise time and frequency transfer over long distances while maintaining excellent stability and traceability. Typical applications include metrological clock comparisons as well as the distribution of accurate timing to sites that do not maintain their own reference clocks, such as telecommunication networks, power grid infrastructure, and financial systems including banking and stock exchange environments.



OSTT-4 FIBER-OPTIC TIME AND FREQUENCY DISTRIBUTION SYSTEM

PIK TIME SYSTEMS®



TIME TRANSFER

Simulation of GNSS Signals

Spirent
Is Now Part of Keysight

Signals from satellite navigation systems such as GPS, Galileo, GLONASS, or BeiDou are generated and transmitted to the GNSS receiver under test.

Receiver behavior can be evaluated along defined routes or within complex scenarios, at precisely controlled times and under a wide range of simulated signal conditions and error sources.

All tests are performed in a controlled laboratory environment, ensuring repeatability, full documentation, and safe testing without operational risk.



GSS6450
RF Record & Playback System



PNT X
High level GNSS
Simulation System

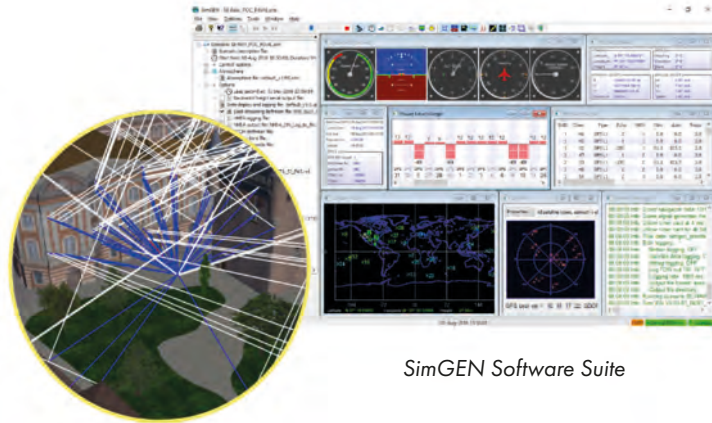
Lange
electronic

Identify GNSS Problems

With a Spirent GNSS simulator, you can generate realistic GNSS signals, and a lot more. Complete operating scenarios can be recreated in a controlled laboratory environment, including a wide range of signal impairments and failure conditions, such as:

- Satellite constellation failures
- Outages of individual satellites
- Atmospheric effects and propagation errors
- Signal blockage caused by buildings or terrain
- Multipath reflections and distorted signal reception
- Intentional interference such as spoofing or jamming

Because these scenarios are generated in a laboratory environment, tests can be precisely controlled, repeated under identical conditions, and fully documented.



SimGEN Software Suite

Spirent™
Is Now Part of Keysight

CRPA-Guard

CRPA-based interference suppression significantly increases the resilience of GNSS receivers in environments affected by jamming, spoofing, or other RF interference.

By spatially filtering unwanted signals, the system improves the signal quality presented to the receiver and enables reliable positioning, navigation, and timing even in challenging electromagnetic environments.

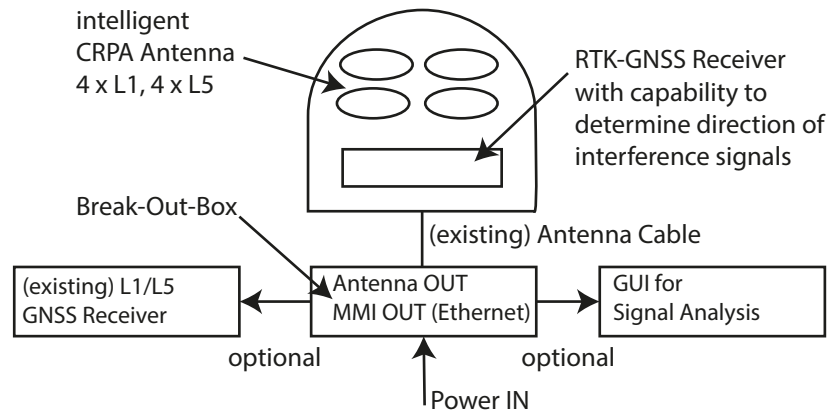
This capability is particularly important for critical applications that rely on continuous and trustworthy GNSS signals, such as navigation systems, communication networks, and time synchronization infrastructures. By mitigating interference before the signal reaches the receiver, the system enhances operational availability, reduces the risk of loss of positioning or timing, and improves the robustness of GNSS-dependent systems.



GNSS preprocessing unit with integrated multi-antenna receiver for jamming and spoofing suppression

The system employs a controlled reception pattern antenna with multiple antenna elements to analyze the spatial characteristics of incoming RF signals. Signals arriving from different directions are processed simultaneously, allowing the system to distinguish between legitimate satellite signals and interfering sources.

Using adaptive digital beamforming techniques, interfering signals are detected and spatially suppressed by placing directional nulls toward the sources of interference, while signals arriving from the directions of GNSS satellites are preserved. The processed RF signal is then forwarded to the connected GNSS receiver, which can operate with significantly reduced interference and improved signal conditions.



GNSS Interference Detection

GIDAS monitors critical environments for intentional or unintentional interference affecting GNSS signals. It detects jamming and spoofing events, reports and documents their occurrence, and supports further analysis of the interference.



Rackmount Version



Portable Version



GNSS Interference Detection & Analysis System

Monitoring and Analysis



GIDAS continuously monitors GNSS signal quality across up to three frequency bands. GPS L1 and Galileo E1 are included by default, with options to monitor additional signals and frequencies as required. The system provides near real-time processing with a turnaround time of less than six seconds ($TTA < 6$ s).

Beyond real-time monitoring, the rack-mounted system captures and records detailed interference event data, including power spectral density, carrier-to-noise ratio, and raw signal snapshots from before, during, and after an interference event.

**Lange-Electronic GmbH provides advanced solutions
for Positioning, Navigation, and Timing (PNT).**

Our focus is on resilient PNT technologies that ensure reliable navigation and precise timing even in challenging signal environments. The portfolio includes GNSS simulation systems, interference detection and mitigation technologies, time and frequency synchronization systems, and precise time transfer solutions.

Lange-Electronic GmbH - Rudolf-Diesel-Str. 29a - 82216 Gernlinden
+49 8142 284582 0 - info@lange-electronic.com - www.lange-electronic.com

