GP-Probe TGE2
Time Guard Edition 2

Three-channel probe for GNSS signal quality measurements and GNSS threat detection

The GP-Probe TGE2 is designed to protect time servers (PNT) against a GNSS threat such as cutting-edge intentional spoofing, jamming, ionospheric scintillation, system errors, for example. An embedded PPS phase error measurement function enables the reliable monitoring of the time server's health. The GP-Probe, in conjunction with the GP-Cloud, allows developing a robust and resilient clock synchronization system for critical infrastructure.

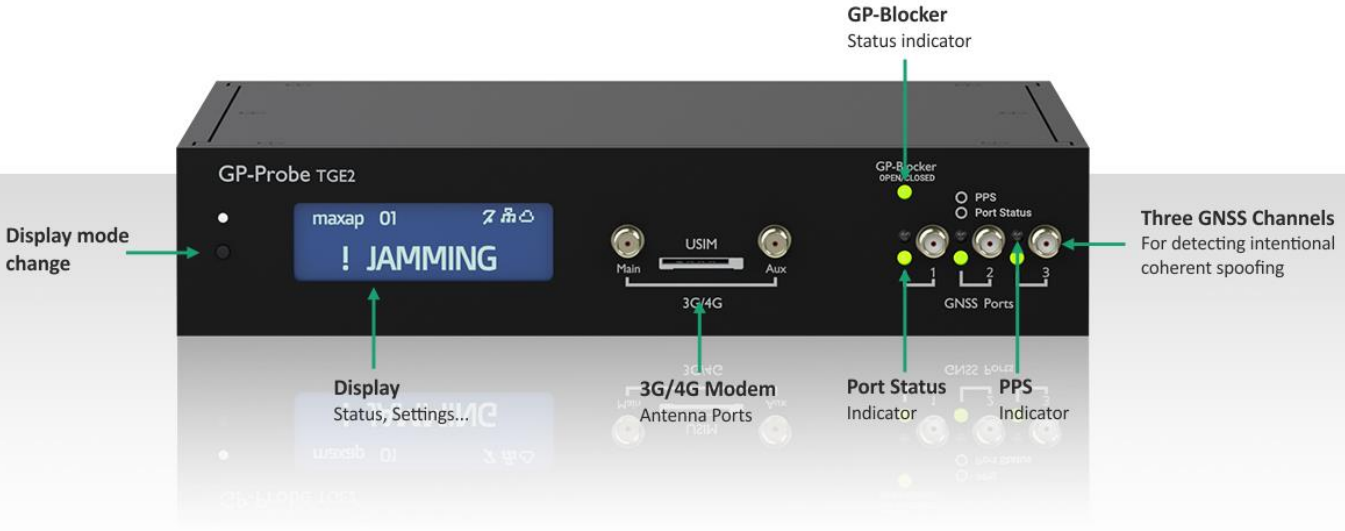
The GP-Probe measures GNSS satellite signals on 3 channels and transmits raw data to the GP-Cloud for real-time processing.

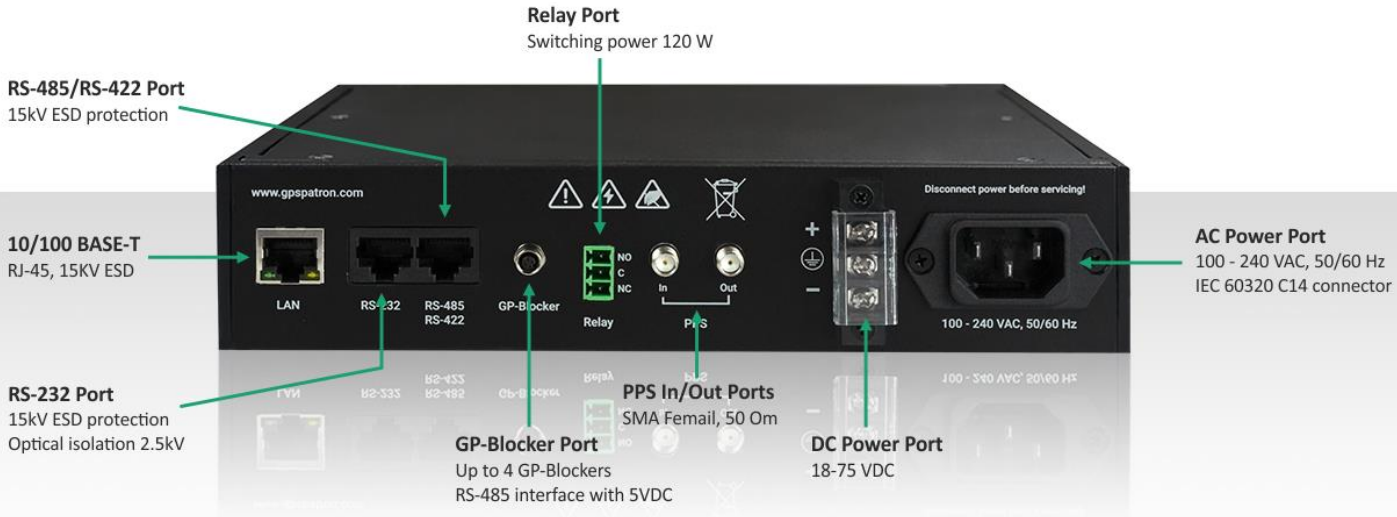
- 3 RF Channels
- PPS Offset Measurement
- Dual power module: 110/220 AC; 18 – 75 DC
- Optional GP-Blocker
- Real-time RF signal analyzer
- 19-inch rack half-size form factor
- Real-time operating system
- GPS, GLONASS, BeiDou, Galileo

Key Features

- Three RF channels for intentional, synchronous, multiple-TX GNSS spoofing detection.
- 60 MHz real-time RF signal analyzer for spectrum monitoring, interference classification and localization with TDOA.
- GNSS signal quality measurements: pseudorange errors, carrier phase, SNR, etc.
- Support GNSS: GPS/QZSS L1 C/A, GLONASS L10F, BeiDou B1I, Galileo E1B/C, SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN.
- The embedded real-time operating system FreeRTOS guarantees high availability and cybersecurity.
- PPS input for the external time server health checking. The GP-Probe measures the time offset between internal and external PPS. PPS input supports low-current signals.
- Optional GP-Blocker with an embedded GNSS jammer suppresses the most powerful counterfeit RF signals.

- Secure firmware auto-update engine.
- Embedded self-diagnostic and dispatching all error messages to the cloud.
- PPS output for synchronization of external equipment.
- Optional RF power divider - GP-Divider enables to utilize one GNSS antenna for two receivers. The GP-Divider supports the GNSS antenna preamplifier current simulation.
- Form factor: 19-inch rack, half-size.
- Dual power module: 110 – 220 AC, 18 – 75 DC.
- Active/passive GNSS antenna support.
- 4G modem and 100BASE-TX Ethernet for data transferring to the GP-Cloud.
- Web interface for configuration (HTTP or HTTPS).
- External devices can be controlled via remote interfaces: RS-232/RS-485/RS-422/Telnet/SNMP with embedded Lua scripting language. GP-Probe can send commands to the connected time server for switching to holdover, etc. This facilitates integration with existing client infrastructure.





Specifications

Supported GNSS:	• GPS/QZSS L1 C/A • GLONASS L10F • BeiDou B1 • SBAS L1 C/A: WAAS, EGNOS, MSAS, GAGAN • Galileo E1B/C
Traceable GNSS:	• GPS/Galileo/GLONASS • GPS/Galileo/BeiDou • GLONASS/BeiDou • GPS/GLONASS • GPS • GLONASS • Galileo • BeiDou
GNSS Channels:	Three GNSS RF channels for assured detection of intentional sophisticated synchronous spoofing attacks
Recommended Horizontal GNSS Antenna Spacing:	Min – 0.25 m Max – 5 m
Detected Threat Types:	All types of jamming 1 ch. – asynchronous spoofing 2 ch. – synchronous spoofing 3 ch. – synchronous multiple-TX spoofing
GP-Probe Configuration:	Browser-based configuration and monitoring, GP-Cloud
Display:	GP-Probe status Server connection settings and status GNSS channels status: satellites in view, RMS CN0
LEDs:	GNSS Antenna Power PPS

RF Signal Analyzer

ADC:	12 bit, 60 MSPS
Frequency Range:	1555 MHz – 1615 MHz
Noise Figure:	6 dB, Max
AGC Dynamic Range:	122 dB, from -31 to +91 dB gain
IIP3:	-29 dBm, typical (@ max Rx gain)
IIP2:	28 dBm, typical (@ max Rx gain)
Local Oscillator Leakage:	-120 dBm, typical
EVM:	-42 dB, typical
Local Oscillator:	OCXO, 50 ppb Phase Noise: -154 dBc/Hz @ 10 kHz
Input Filter Out of Band Rejection:	65 dB
Measuring Parameters:	• Power in Band (dBm/Hz) for GPS, Galileo, GLONASS, BeiDou • Power Spectrum (dBm), 128 frequency points • Power Spectrum (dBm), 1024 frequency points • Spectrogram, 128x509 points, 273 us

Data Transfer:	The signal analyzer continuously measures the power level of the input signal and selects a 273 µs interval with maximum power per second. The following data is sent to the GP-Cloud every second: • Power in Band • Power Spectrum (dBm/Hz), 128 frequency points The following data is sent to the GP-Cloud when an incident is detected: • Spectrogram • Power Spectrum (dBm/Hz), 1024 frequency points

Mechanical

Housing:	Aluminum, IP20
Size:	1 U half-size, rack mount, 211.0 x 203.0 x 44.0 mm
Weight:	1.5 kg

Environmental

Operational Temperature:	0°C to +50°C
Storage Temperature:	-20°C ~ +85°C
Humidity:	0% – 95% RH non-condensing @ 40°C
Vibration and Shock:	15g/0.53oz, 11ms half-sine wave
Vibration:	10 – 55 Hz/0.07g, 55 – 500 Hz/1.0g

GNSS Antenna Inputs

Connector:	SMA(F)
Max Input Power Level:	10 dBm
Impedance:	50 Ω
Antenna bias voltage:	3.3 VDC
ESD protection:	15 KV

PPS Input

Connector:	SMA(F)
Impedance:	50 Ω, TTL compliant
High-Voltage Level (50 Ω):	1.3 Min 5.5 Max

PPS Output

Connector:	SMA(F)
Impedance:	TTL into 50Ω
Typical Accuracy (clear sky):	< ±20 ns RMS to UTC (USNO), typical

I/O Connections

Network Interface:	10/100BASE-T RJ45, 15KV ESD protection
RS-232 interface:	HOST port for remote control of external equipment. 15KV ESD protection. Optical isolation 2.5KV.
RS-485/RS-422 interface:	HOST port for remote control of external equipment. 15KV ESD protection.

Relay Output

Relay Type:	1 Form C (SPDT); NO-C-NC
Contact Material:	Silver Alloy with Gold Alloy Overlay
Switching Power:	60 W, 125 VA
Switching Voltage DC:	220 V
Switching Voltage AC:	250 VAC
Switching Current:	2 A
Contact Resistance:	75 mOhms

GP-Blocker Port

Interface:	RS-485
Bit Rate:	9600 bps
Power Supply:	5 VDC, 0.5 A
Max Number of Connected GP-Blockers:	4

Power Supply

AC:	100 - 240 VAC, 50/60 Hz IEC 60320 C14 connector
DC:	18 – 75 VDC
Power Consumption:	< 20 W

Supported Protocols

GP-Cloud interaction:	HTTPS
Firmware Upgrade Server:	HTTPS
Ethernet Protocol:	IPv4, DHCP (RFC 2131)

3G/4G modem

Data transfer:	• LTE CAT4 Uplink up to 50Mbps / Downlink up to 150Mbps • HSPA+ Uplink up to 5.76Mbps / Downlink up to 42 Mbps • UMTS Uplink/Downlink up to 384Kbps • EDGE Uplink/Downlink up to 236.8Kbps • GPRS Uplink/Downlink up to 85.6Kbps
Available bands:	• EH – for EMEA/Korea/Thailand regions LTE-TDD B38/B40/B41 LTE-FDDB1/B3/B5/B7/B8/B20 UMTS/HSPA+ B1/B5/B8 GSM/GPRS/EDGEB3/B8 • AH – for North America LTE-FDDB2/B4/B12 UMTS/HSPA+ B2/B5 • SA – for Australia/New Zealand/South America LTE-TDDB40 LTE-FDDB1/B2/B3/B4/B5/B7/B8/B28 UMTS/HSPA+ B1/B2/B5/B8 GSM/GPRS/EDGE850/900/1800/1900MHz • JC – for Japan

	LTE-FDDB1/B3/B8/B18/B19/B26 • WO – without built-in modem
(U)SIM:	Mini-SIM (2FF) ISO/IEC 7810:2003, ID-000 Standard 3V/1.8V user card interface, 15KV ESD protection
Antenna connectors:	Main, Aux. SMA (f)
Regulatory Compliance	
EMC:	EN 61000-3-2: 2014 EN 61000-3-3: 2013 EN 55022 EN 55024 ETSI EN 301 489-1
RF:	EN 301 511 EN 301 908 ETSI EN 301 489-52 ETSI EN 301 489-19
Safety:	EN 60950-1: 2006+A2: 2013
RoHS:	EN 50581: 2012
Warranty & Support	
Warranty:	1 year Extended warranty is available
Support:	1 year of complimentary technical support
Package Content	
GP-Probe:	1 pc. Rack mount hardware included (assembly required)
GNSS antenna:	3 pcs. BeiDou, Galileo, GLONASS, GPS magnet-mount antennas
3G/4G antenna:	2 pcs. Multiband antennas: 700 MHz, 800 MHz, 850 MHz, 900 MHz, 1.8 GHz, 1.9 GHz, 2.1 GHz, 2.3 GHz, 2.5 GHz, 2.6 GHz
Manuals:	Quick start guide
Power Lead:	1 pc. 1.7 m IEC power lead
Ethernet cable:	1 pc. 3 m length

Ordering Information

GP-Probe TGE2 model number definition

GP-Probe	TGE2	–	CH3	EH	RFSA
Product	Product series		Number of channes	3G/4G modem bands	RF signal analyzer

Number of channels:

CH1 – asynchronous spoofing detection

CH2 – synchronous spoofing detection

CH3 – detection of synchronous multiple-TX spoofing. Uncompromising protection against all types of attacks

3G/4G modem bands:

EH – for EMEA/Korea/Thailand regions

AH – for North America

SA – for Australia/New Zealand/South America

JC – for Japan

WO – without a built-in modem

RFSA

Embedded 60 MHz real-time RF signal analyzer for spectrum monitoring, interference classification and localization with TDOA

Software Options	
GP-Probe OSP	Onboard signal processing for spoofing detection. The GP-Probe can work without connecting to the GP-Cloud servers.
GP-Probe TDOA	Option for sending raw IQ data to GP-Cloud for interference localization by TDOA method.

Optional Accessories	
GP-Probe Case	IP67 rated waterproof protective case for GP-Probe outdoor usage with built-in 36v 17.6Ah Lipo batteries
GP-Blocker	An optional GNSS threat blocker. High isolation RF switch and an embedded noise generator can suppress the most powerful counterfeit RF signals. The ideal solution for protecting time servers against spoofing.
GP-Divider	GNSS power divider with GNSS antenna preamplifier current simulation. It allows you to use one GNSS antenna for two receivers at once.
GP-A-DOME	Dome antenna. BeiDou, Galileo, GLONASS, GPS. Panel Mount, IP67
GP-C-010	10 m RG58 Cable
GP-C-030	30 m RG58 Cable
GP-C-050	50 m LMR195 Equivalent Cable
GP-C-100	100 m LMR400 Equivalent Cable (*Custom cable lengths available on request)*
GP-SPP	A multi-strike maintenance-free surge suppressor
GP-AMP-20	GNSS Amplifier – 20db

Gallery


GP-Probe TGE2
GP-Blocker
OPEN/CLOSED
PPS
Port Status
USIM
Main
Aux
3G/4G
1
2
3
GNSS Ports


www.gpspatron.com
Disconnect power before servicing!
LAN
RS-232
RS-485
RS-422
GP-Blocker
NO
C
NC
Relay
In
Out
PPS
100 - 240 VAC, 50/60 Hz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