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.

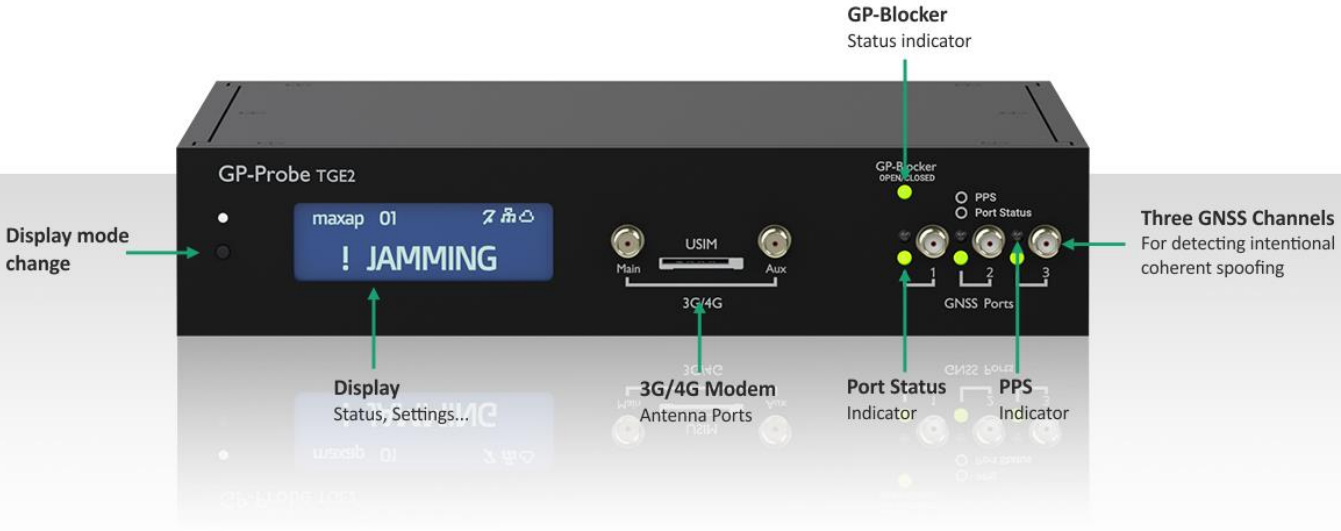
The GP-Probe measures GNSS satellite signals on 3 channels and transmits raw data to the GP-Cloud for real-time processing.

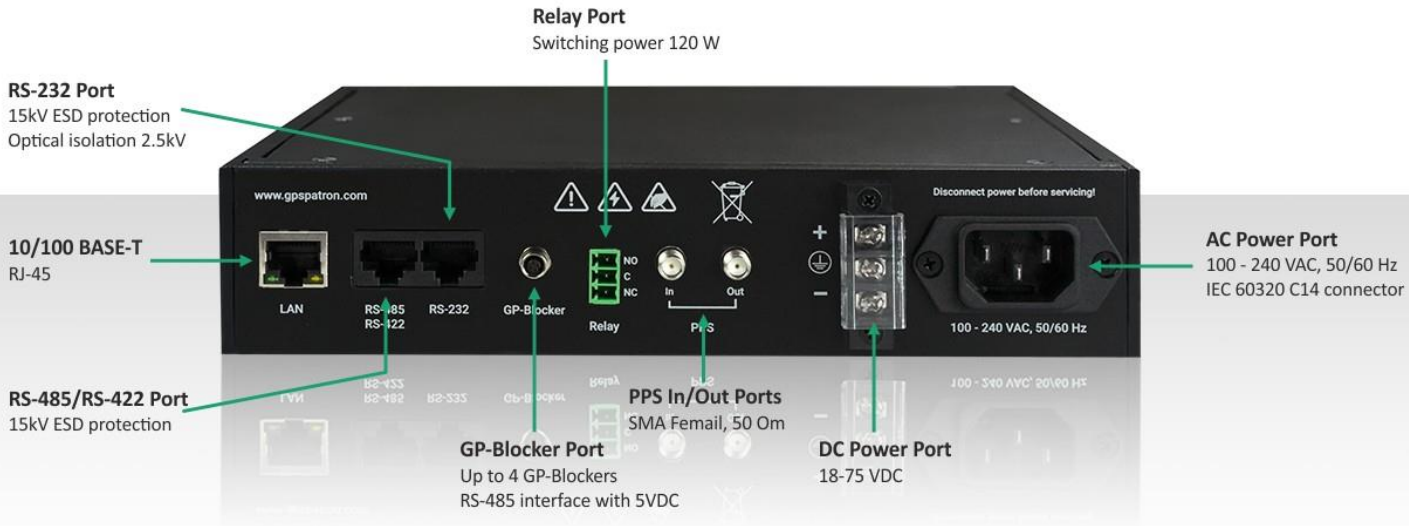
- Three GNSS Channels
- PPS Offset Measurement
- Dual power module: 110/220 AC; 18 – 75 DC
- Optional GP-Blocker
- Real-time RF signal analyzer
- 19-inch rack half-size form factor
- Real-time operating system
- GPS, GLONASS, BeiDou, Galileo

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-voltage 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.
- External devices can be controlled via remote interfaces: RS-232/RS-485/RS-422 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:	GP-Blocker Status: enabled, disabled, error, closed, open. GNSS Port Status: enabled, disabled, error, normal. 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 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 • Raw IQ data
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 ~ +70°C
Humidity:	0% – 90% RH non-condensing @ 40°C
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 Air discharge mode IEC 61000-4-2
PPS Input	
Connector:	SMA(F)
Impedance:	50 Ω, TTL compliant
High-Voltage Level (50 Ω):	1.3 Min 5.5 Max
ESD protection:	±15-kV Air discharge mode IEC 61000-4-2
PPS Output	
Connector:	SMA(F)
Impedance:	TTL into 50Ω
Typical Accuracy (clear sky):	< ±20 ns RMS to UTC (USNO), typical
ESD protection:	±15-kV Air discharge mode IEC 61000-4-2
I/O Connections	
Network Interface:	10/100BASE-T RJ45
RS-232 interface:	HOST port for remote control of external equipment. ESD Protection: ±15-kV IEC 61000-4-2, Air-Gap Discharge. Optical isolation
RS-485/RS-422 interface:	HOST port for remote control of external equipment. ESD Protection: ±15-kV IEC 61000-4-2, Air-Gap Discharge. Optical isolation

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
ESD protection:	±15-kV Air discharge mode IEC 61000-4-2
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)
4G modem	
Data transfer:	• LTE CAT1 Uplink up to 5Mbps Downlink up to 10Mbps • 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:	• LTE-FDD B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/B19/B20/B25/B26/B28/B66 • LTE-TDD B34/B38/B39/B40/B41 • UMTS/HSDPA/HSPA+ B1/B2/B4/B5/B6/B8/B19 • GSM/GPRS/EDGE 850/900/1800/1900MHz

(U)SIM:	Mini-SIM (2FF) ISO/IEC 7810:2003, ID-000 Standard 3V/1.8V user card interface. ESD Protection: ±15-kV IEC 61000-4-2, Air-Gap Discharge
Antenna connectors:	Main, Aux. SMA (f)

Regulatory Compliance

Complies with the requirements:	CE | FCC | ROHS Contains FCC ID: 2AJYU-8PYA008
EMC:	ETSI EN 301 489-1 ETSI EN 301 489-19 ETSI EN 301 489-52 FCC Part 15B
RF:	ETSI EN 303 413 ETSI EN 301 511 ETSI EN 301 908-1 ETSI EN 301 908-2 ETSI EN 301 908-13
Safety:	EN 62368-1

Warranty & Support

Warranty:	1 year Extended warranty is available
Support:	1 year of complimentary technical support

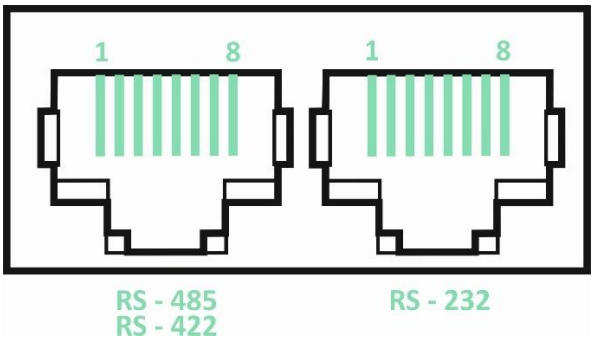
Package Content

GP-Probe:	1 pc. Rack mount hardware included (assembly required)
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.

RS-232 & RS-485 Ports

RS-232 and RS-485/422 ports are intended for controlling external equipment according to custom LUA script. Each time the status of the probe changes, the built-in LUA interpreter executes a custom script. The script can implement commands for controlling external devices via RS-232, RS-422/485 interfaces.

Interface pinout:

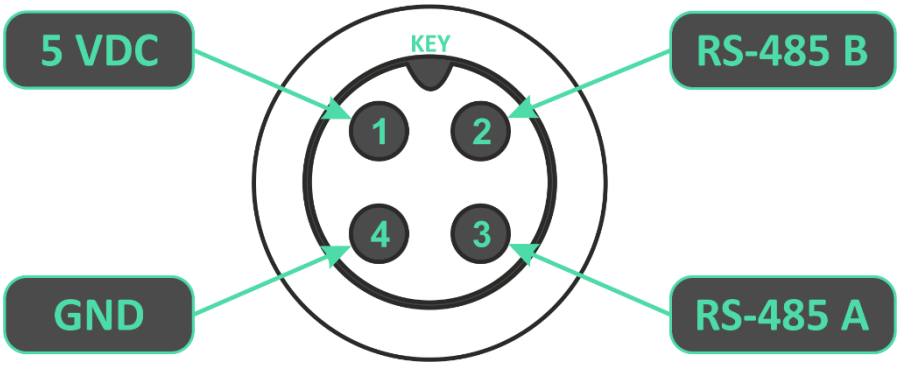


Pin Number	RS-485	RS-422	RS-232
1	NC	TX+	NC
2	NC	TX-	NC
3	B-	RX-	NC
4	NC	NC	GND
5	NC	NC	RX
6	A+	RX+	TX
7	NC	NC	NC
8	NC	NC	NC

GP-Blocker Connection Port

The probe can control up to four connected GP-Blockers. When an interference is detected, the probe sends a command to the GP-Blocker to close the port. The connected time server loses satellite tracking and goes into holdover.

Connector pinout:



Use only the supplied cable to connect the GP-Blocker.

Ordering Information

GP-Probe TGE2 model number definition

GP-Probe	TGE2	–	CH3	4G	RFSA
Product	Product series		Number of channes	4G modem	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

4G modem

Built-in 3G/4G modem option for connecting to GP-Cloud via UMTS, LTE networks

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.
GP-Probe LUA	Develop custom scenarios for external equipment remote control via RS232/Telnet/SNMP with the embedded LUA scripting engine.
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.

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


GP-Probe TGE2
GP-Blocker
OPEN/CLOSED
PPS
Port Status
USIM
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3G/4G
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