

GR-U01W, u-blox M10-based

Concurrent 4 GNSS &

Precision Timing

Smart Antenna

Overview

Following the GR-601W, GR-701W, and GR-801W, the GR-U01W is the latest Macx-1 USB GNSS receiver, delivering high-precision positioning together with a 1PPS timing reference synchronized to GNSS system time — delivered directly over the USB interface with no dedicated PPS wire required.

The GR-U01W is an easy-to-use, low-power, industrial-grade GNSS smart antenna offering both high-precision positioning and precise timing. It delivers exceptional sensitivity and fast acquisition time across all L1 GNSS signals.

The GR-U01W can concurrently track four GNSS constellations (GPS, Galileo, GLONASS, BeiDou), along with QZSS and SBAS. This capability maximizes the number of visible satellites, improving position availability and accuracy even in environments where GPS signals are typically weak or obstructed. This plug-and-play smart antenna is housed in a compact, space-saving form factor.



Applications

- Timing (precise clock, traffic lights etc.)
- Navigation (autos, trucks, trains, boats, etc.)
- ELD (Electronic Logging Device)
- Speeding (trace analysis)
- Tracking (person, assets, trucks, trains, boats etc.)
- FCC AFC for Wi-Fi 6E AP

Features

- Powered by u-blox M10 chip
- Concurrent tracking of multi-satellite navigation systems
 - GPS/GALILEO/GLONASS/BEIDOU/QZSS
 - SBAS (WAAS, EGNOS, MSAS, GAGAN)
- Augmentation support:
 - SBAS (WAAS, EGNOS, MSAS, GAGAN),
 - QZSS (L1S SLAS, Sub-meter Level Augmentation Service)
- Higher update rate option (default 1Hz), up to
 - 5 Hz for GPS+GAL+GLO+BDS B1C
 - 8 Hz for GPS+GAL+BDS B1C
 - 5 Hz for GPS+GAL+BDS B1I
 - 7 Hz for GPS+GAL+GLO
 - 10 Hz for GPS+GAL
 - 18 Hz for GPS only
- Sensitivity
 - Acquisition: -148dBm (GPS + others)

- Tracking: -167dBm (GPS + others)
- Anti-jamming, RF interference and jamming detection and reporting
- Anti-spoofing, Spoofing detection and reporting
- Backup battery support for faster position fix
- LED for position fix indication
- IPX7 Waterproof
- Built-in magnet
- Precision 1PPS timing output, 0.5ms accuracy over USB
- Compatible with GPSD PPS support
- Linux/Android/Windows support
- Fully EMI shielded
- Industrial operating temperature range: -40 ~ 85°C

(Autonomous)	-148dBm (acquisition) -167dBm (tracking)
Max. Navigation. Update Rate	5 Hz for GPS+GAL+GLO+BDS B1C 8 Hz for GPS+GAL+BDS B1C 5 Hz for GPS+GAL+BDS B1I 7 Hz for GPS+GAL+GLO 10 Hz for GPS+GAL 18 Hz for GPS only Default 1Hz
Max. Altitude	80,000 m
Max. Velocity	< 500m/sec (1,800 km/hr)
Protocol Support	UART: N,8,1; bauds 4800, 9600 19200, 38400 (default), 57600, 115200, 230400, 460800, 921600bps; NMEA 0183 v2.1, v2.3, v4.0, v4.10 and v4.11 (default) GGA, GLL, GSA, GSV, RMC, VTG, TXT
Augmentation Support	SBAS: WAAS, EGNOS, MSAS, GAGAN QZSS
Dynamics	<4g

Technical Specifications

Receiver Performance Data⁺

Receiver Type	u-blox M10 engine GPS, SBAS: L1 C/A: 1575.42MHz, QZSS: L1 C/A, L1S: 1575.42MHz Galileo: E1-B/C: 1575.42MHz, GLONASS: L1OF:1598.0625~1605.375MHz BeiDou (or BD): B1I: 1561.098 MHz B1C: 1575.42 MHz SBAS: WAAS, EGNOS, MSAS, GAGAN
Horizontal Position Accuracy	1.5m, including SBAS & QZSS; (CEP, 50% 24hr static, -130dBm, >6 SVs for each GNSS)
Velocity Accuracy	0.05 m/s (speed) <0.3° (heading) (50%@30m/s)
Time Pulse Signal Accuracy	0.5ms for PPS over USB
Time Pulse Frequency	1PPS
Time To First Fix	Autonomous, (50% -130dBm) 1 s 28 s: GPS+GAL 23s: GPS+GAL+GLO 27s: GPS+GAL+BDS B1I (default) 28s: GPS+GAL+BDS B1C 23s: GPS+GAL+GLO+BDS B1C
Hot start Cold start	
Sensitivity	GPS+GAL or +more

⁺: according to GNSS IC spec

Electrical Data

Power Supply	5 VDC
Power Consumption Acquisition/Tracking	(29 GNSS SVs fixed for tracking) USB: 59/56 mA
Protocols	NMEA, u-blox proprietary

Environmental Data

Operating temperature	-40 ~ 85°C except battery: -20~60°C
Storage temperature	-40 ~ 85°C except battery: -20~60°C
Operating humidity	5% ~ 95% non-condensing
Waterproof	IP67

Other Data

Cable Length	1.5m for GR-U01W
Dimension	40 x 45 x 16 (mm)
Weight	68.8 g, GR-U01W with 1.5m cable and USB A connector

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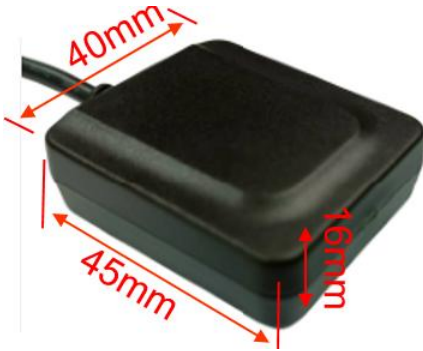
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Interfaces

GR-U01W


USB type A, Male Plug

Pin	Description
1	VDD 5V
2	D-
3	D+
4	GND

Timing Applications

GR-U01W provides a 1PPS timing reference synchronized to GNSS system time, delivered over the USB interface itself — PPS events are presented as DCD state transitions to the host's PL2303 driver, eliminating the need for a dedicated PPS wire. Time transfer precision at the host is bounded by the USB polling interval, typically 0.5ms.

Timing Performance Summary

Parameter	Value
Output Frequency	1PPS
Host Time Transfer Precision	0.5ms (via USB DCD / PL2303)

This makes GR-U01W suitable for the following timing applications:

1. Open-source GPSD & NTP timing ecosystem
Recognized in the GPSD project's hardware compatibility documentation as a recommended USB GPS receiver for building low-cost Stratum-1 NTP time servers, with 1PPS-over-USB-DCD handling documented across the gpsd-users and gpsd-dev mailing lists. The GR-601W/701W/801W series is also referenced in the Bufferbloat and CeroWrt communities for sub-millisecond network delay measurement on Linux edge routers, and discussed in Netgate/pfSense forums and the NTP Pool community for DIY GNSS-disciplined NTP servers.
2. Precision timestamping for time-critical operations
Provides a GNSS-disciplined time reference for applications that must timestamp or trigger an event at a known instant — such as capturing a sensor reading or camera snapshot — enabling accurate correlation of captured data with real-world time.
3. Multi-device time synchronization
Distributes a common, GNSS-traceable time base to multiple distributed devices or systems, keeping their clocks aligned without relying on network-based time distribution alone.

Ordering Information

GR-U01W	PPS events over USB interface, USB type A connector
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*This document is subject to change without notice.