GM-905, GNSS RTK / CLAS Module Supporting DroneCAN or UART

Overview

Featuring an embedded SMA RF connector for L1/L2 or L1/L2/L6 helical antenna, 6-pin wire to board digital connector, RTK/CLAS-capable GNSS engines, backup battery, and integrated circuits, the GM-905 is a plug-and-play GNSS module designed for centimeter-level positioning applications.

By deploying two GM-905 devices in a moving base and rovers configuration, the system provides precise attitude measurements (yaw/pitch/roll) independent of external RTK base calibrations, making it possible for marine drone landing scenarios.

Through RTK base calibration or integration with Japan's complimentary QZSS CLAS (Centimeter-Level Augmentation Service), the module provides cm-level precise positioning.

Built with DroneCAN compatibility for reliable CAN-bus communication, the GM-9050/9055 supports direct connection to the nearest available CAN connector, eliminating extended wiring to flight controllers. The streamlined wiring topology enhances overall system robustness and reliability, and CAN terminating resistance can be configured as an option when placing orders.

With UART interface support, the GM-9051/GM-9056 provide ideal solutions for RTK/CLAS applications.

Offering optional features including compass and LED display, the GM-905 can be customized to meet specific application requirements.

Equipped with four mounting holes, the GM-905 provides secure installation on vibration-exposed platforms.

Applications

- Drones
- Radar systems
- Autonomous vehicles
- Heavy machinery navigation
- Industrial navigation and tracking
- Construction engineering
- Precision farming: planting, irrigation, fertilization, and harvesting

Features

- *All-in-one 4-constellation GNSS module with embedded L1/L2/L6 SMA connector*
- *Communication options*
  - *CAN bus, DroneCAN-compliant*
  - *UART*
- *Ardupilot-compliant centimeter positioning*
  - *RTK base or rover*
  - *CLAS rover*
- *Moving baseline support*
- *Powered by high-performance components*
  - *u-blox ZED-F9P dual-band GNSS receiver*
  - *u-blox NEO-D9C QZSS correction service receiver (CLAS variants only)*
  - *STM32L471RGT (DroneCAN variants only)*
- *Supported GNSS Constellations*

- *GPS: L1C/A, L2C*
- *GLONASS: L1OF, L2OF*
- *Galileo: E1-B/C, E5b*
- *BeiDou: B1I, B2I*

- Supported Augmentation Systems
  - QZSS: *L1 C/A, L1S, L2C, L6*
  - SBAS (WAAS, EGNOS, MSAS, GAGAN)
- High sensitivity[+]:
  - F9P: -167dBm tracking/-148dBm acquisition
  - D9C: Hot start: -154 dBm/Cold start: -137 dBm
- Up to 7Hz update rate for quad-GNSS constellation
- RTK convergence in 10 sec for multi-GNSS.
- **Spoofing detection / monitoring**
  - Multiple constellations should be enabled.
- **Jamming / interference indicator**
  - For continuous wave (narrow-band) jammers/interference only
- Satellite navigation data sub-frame broadcast message available
- Optional CAN bus terminating resistor
- Low speed (250kbps) CAN option available
- Optional compass (±8 Gauss, 3-axis)
- Optional LED indication for RTK (red) and GNSS (green). Allow turning off during formal operations.
  - DroneCAN: MCU controlled (LEDs)
  - UART: F9P controlled (LEDs).
- Optional CAN bus terminating resistor
- 2 holes for fixing

Technical Specifications

Receiver Performance Data[+] -

u-blox ZED-F9P

Supported GNSS Constellations	GPS/SBAS/QZSS: (MHz) L1 C/A (1575.42), L2C (1227.60) GLONASS: L1OF (1602+k*0.5625, k= -7,…,5,6), L2OF (1246+k*0.4375, k= -7,…,5,6), Galileo: E1-B/C (1575.42), E5b (1207.140) BeiDou: B1I (1561.098) B2I (1207.140)
Position Accuracy (24 hours static)	Horizontal: CLAS: 4 cm CEP SBAS: 1 m CEP PVT: 1.5 m CEP Vertical: CLAS: 8 cm R50
Velocity Accuracy	<0.05 m/s (speed) GPS+GLONASS/BDS <0.4° (heading) GPS+GLONASS/BDS (50% @ 30 m/s for dynamic operation)
Time Pulse Signal	0.25Hz...10MHz RMS: 30ns, 99%: 60ns
Time To First Fix (TTFF) Hot start Aided start Cold start	Autonomous (All at -130dBm) 2sec (GPS+Glonass+Galileo+BeiDou) 2sec (GPS+Glonass+Galileo+BeiDou) 25sec (GPS+Glonass+Galileo+BeiDou)
Sensitivity	GPS+Glonass+Galileo+BeiDou Acquisition: -148 dBm Reacquisition: -160 dBm Tracking & navigation: -167 dBm
Max. Update Rate	a. GPS+Glonass+Galileo+BeiDou b. GPS+BeiDou c. GPS CLAS: 5Hz@a&b, 8Hz@c PVT: 9Hz@a, 16Hz@b, 25Hz@c RAW: 15Hz@a, 25Hz@b, 25Hz@c
Convergence	CLAS: < 70 s

Time	Depends on atmospheric conditions, baseline length, GNSS antenna, multipath conditions, satellite visibility and geometry
Max. Altitude	80,000 m
Max. Velocity	500 m/s
Protocol Support Default Settings	NMEA 0183 up to v 4.11, ASCII GGA, GLL, GSA, GSV, RMC, VTG, TXT UBX: u-blox proprietary, binary RTCM 3.3: binary UART1 & 2: 38400bps, N-8-1 UART1: NMEA, UBX, RTCM 3.3 enabled Only NMEA output UART2: UBX
Augmentation System Support	QZSS: Support L1S SLAS Correction data broadcasted on L1 SBAS: WAAS, EGNOS, MSAS, GAGAN DGNSS: RTCM 10403.3 ● RTK rover mode messages: (RTCM) 1001~1007, 1009~1012, 1033, 1074, 1075, 1077, 1084, 1085, 1087, 1094, 1095, 1097, 1124, 1125, 1127, 1230, 4072.0 ● RTK base mode messages: (RTCM) 1005, 1074, 1077, 1084, 1087, 1094, 1097, 1124, 1127, 1230, 4072.0, 4072.1 ● SPARTN 2.0.1 rover messages SM 0-0, 0-1, 0-2, 1-0, 1-1, 1-2, 2-0
Dynamics	< 4g

u-blox NEO-D9C

Receiver Type	u-blox D9 engine QZSS L2C and L6 receiver: L2C (1227.60 ± 5) (MHz) L6 (1278.75 ± 5) (MHz)
Time to First Frame	Hot start 3 s, Cold start 18 s
Decoding Sensitivity	90% frame rate at -136 dBm
Acquisition Sensitivity	Hot start: -154 dBm, Cold start: -137 dBm
Specification Compliance	PS-QZSS-001
Number of Concurrent L6 Reception Channels	2
Vehicle Dynamics	Dynamics ≤ 4 g Velocity 500 m/s

+ **Note. According to IC Spec**

Compass MMC5983MA

Full Range (Each Axis)	Total applied field: ±8 Gauss
Heading Accuracy	±1.0 degrees (using MEMSIC's proprietary software or algorithm)
Sensitivity Accuracy	16384 counts/Gauss With 18 bits operation

CAN

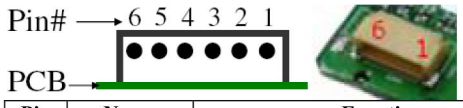
CAN 2.0	1 Mbps (default) or 250kbps

Environmental Data

Operating temperature	-40 ~ 85℃ (GNSS backup battery: -10~60℃)
Storage temperature	-40 ~ 85℃

Mechanical Data: 30 x 50 x 11.9 (mm)

6-pin Interface, pitch 1.0mm



Pin	Name	Function	I/O
1	GND	Ground	Input
2	VCC	Power supply of 5V	Input
3	CAN_H/ TXD	CAN bus +/ TTL serial data output (from GNSS)	I/O Output
4	CAN_L/ RXD	CAN bus -/ TTL serial data input (to GNSS)	I/O Input
5	NC/ I2C_SCL	For CAN bus variant/ I2C clock of compass	Input
6	NC/ I2C_SDA	For CAN bus variant/ I2C data of compass	I/O

Applications

- Heading receivers (Moving Baseline, external calibration data is not needed)
  - DroneCAN (MB: Moving Base, R: Rover)
    - RTK: GM-9050(MB)+GM-9050(R)
    - CLAS: GM-9055(MB)+GM-9050(R)
  - UART
    - RTK: GM-9051(MB)+GM-9051(R)
    - GM-9056(MB)+GM-9051(R)
  - In addition to heading, installed at different locations, these attitude receivers could also be used for roll and/or pitch sensing.
- Moving baseline is also useful for following moving objects.
- Accurate navigation
  - For RTK models, RTCM calibration data needs to be input for accurate positioning.
  - For CLAS models working in Japan, calibration data are received from QZSS satellites in the sky and thus no need of additional calibration data input.

Ordering Information

GM-905XY:

X=\	RTK	CLAS
CAN	0	5
UART	1	6

GM-9050 RTK, DroneCAN compliant

GM-9051 RTK, Ardupilot compliant, UART

GM-9055 CLAS, DroneCAN compliant

GM-9056 CLAS, Ardupilot compliant, UART

Y options	N
Compass	-
CAN Resistor	-
Low Speed CAN	-
LED	-

For Y option other than N, please specify when ordering.

*This document is subject to change without notice.