



BW-GI100-Z1

Dual-antenna Intelligent Attitude Determination and Positioning Board

Technical Manual



Introduction

BW-GI100-Z1 is a high-precision dual-antenna intelligent attitude-determining and positioning board independently developed by Beiwei Sensing. It integrates high-precision inclination measurement, satellite navigation positioning and absolute heading output. In terms of hardware, the board deeply incorporates high-precision MEMS IMU chips, dual-channel multi-frequency GNSS baseband chips and 4G wireless communication modules, and is equipped with a built-in high-performance computing unit to realize real-time calculation and synchronous output of full six-degree-of-freedom three-dimensional position and three-dimensional attitude of the carrier. Relying on fully self-developed core GNSS and IMU algorithms, it can maintain the continuity and stability of high-precision positioning and attitude determination even in weak-signal and complex multipath environments such as urban canyons and tree-shaded occlusions. Featuring a lightweight and compact structure, the product offers extensive support for scenarios including intelligent UAVs, autonomous driving, automated agricultural operations, engineering vehicle orientation, and surveying and mapping.

Features

The BW-GI100-Z1 full-system, multi-frequency, dual-antenna intelligent attitude-determination and positioning board features the following characteristics:

- Supports multi-frequency high-precision signals from all constellations including GPS, BDS, GLONASS, Galileo and QZSS
- Supports RTK differential positioning and PPP Precise Point Positioning
- Supports dual-antenna heading determination based on carrier-phase differential technology
- Built-in IMU, supporting high-precision three-axis attitude angle output
- Integrated design of GNSS, IMU, 4G and computing unit, supporting high-frequency synchronous output of position, heading and attitude information
- Fully self-developed core algorithms for GNSS and IMU, delivering superior scalability and adaptability

Application Fields



Surveying



Smart Agriculture



Intelligent Driving



Robot

Parameters



Performance Indicators

Channels	1040 High-performance Multi-GNSS Multi-frequency Baseband Channels	
Signals	BDS	B1I, B1C, B2a, B2b
	GPS	L1C/A, L2C, L5
	GLONASS	G1, G2
	Galileo	E1, E5a, E5b
	QZSS	L1C/A, L2C, L5
Obs. Accuracy (RMS)	Pseudorange	10cm
	Carrier Phase	1cm
Single-Point Positioning	Horizontal	2m
	Vertical	3m
RTK (RMS)	Horizontal	0.8cm+1ppm
	Vertical	1.5cm+1ppm
PPP (RMS)	Horizontal	3dm
	Vertical	5dm
	Convergence Time	15—25min
TTFB	Cold Start	<30s
Attitude Angles	Roll (Static/Dynamic)	$\pm 0.03^\circ / \pm 0.3^\circ$
	Pitch (Static/Dynamic)	$\pm 0.05^\circ / \pm 0.3^\circ$
Measurement Range	Acceleration	$\pm 3g$
	Angular Rate	$\pm 250 \text{ deg/s}$
Heading Acc. (RMS)	0.1° / 1 m Baseline	
Timing Acc. (RMS)	10 ns	
Velocity Acc. (RMS)	0.1 m/s	
Maximum Data Rate	GNSS RTK Positioning	1Hz
	GNSS PPP Positioning	1Hz
	IMU Raw Data Rate	200Hz
Data Format	RTCM 3.3	Input
	NMEA-0183	Output, supports Version 4.10
Board Size	40.0 × 80.0 × 7.8mm	
Bare Board Weight	19 g ±1 g	
Housing	Aluminum Alloy	
Operating Temp.	-30°C ~ +75°C	
Storage Temp.	-40°C ~ +85°C	

Parameters

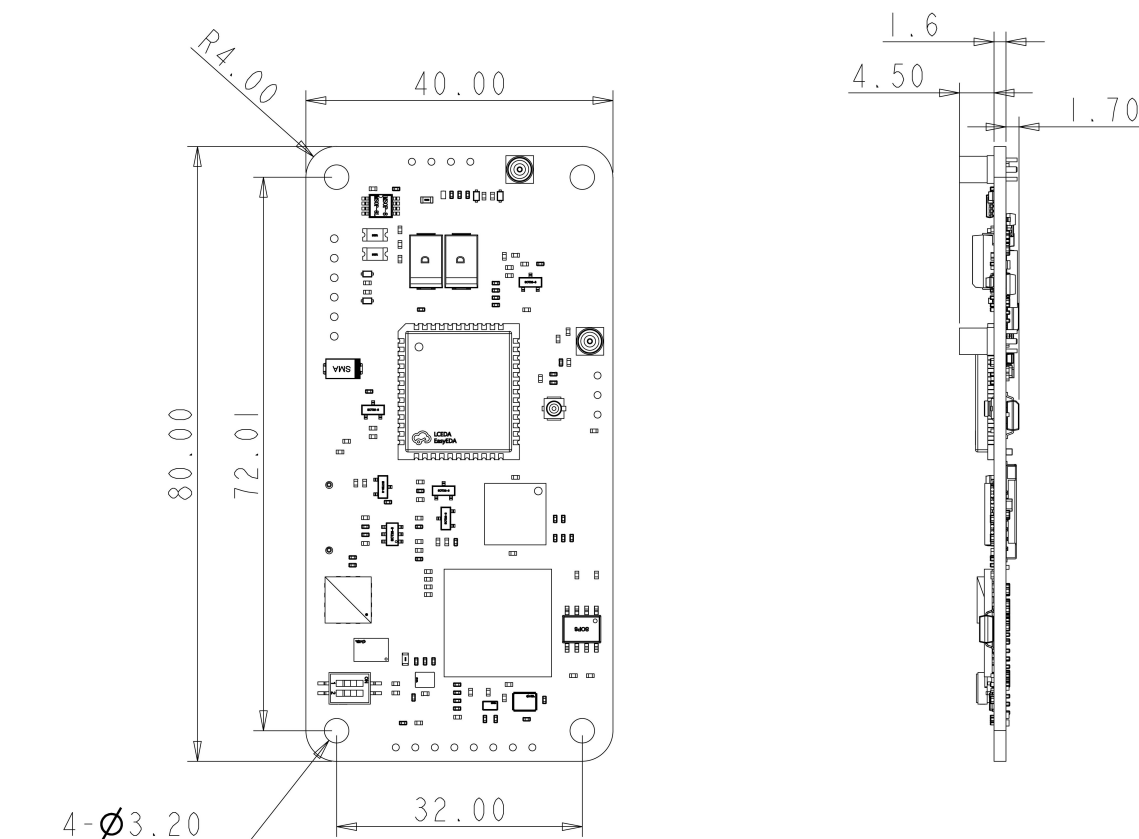
Electrical Indicators

Supply Voltage	5.0 V DC; Supported Range 4.75 V - 5.25 V
Operating Current	Typical: 600 mA
Power Consumption	3.0W

Communication Interface

Main Interface	1×6P XH2.54 Single-row Pin Header, 2.54 mm Pitch
Comm. Interface	UART (3.3V LVTTL); RS485 Differential Bus
4G-RTK Ant. Port	I-PEX 20279 (MHF)
GNSS Main Ant. Port	MMCX Female Connector
GNSS Slave Ant. Port	MMCX Female Connector

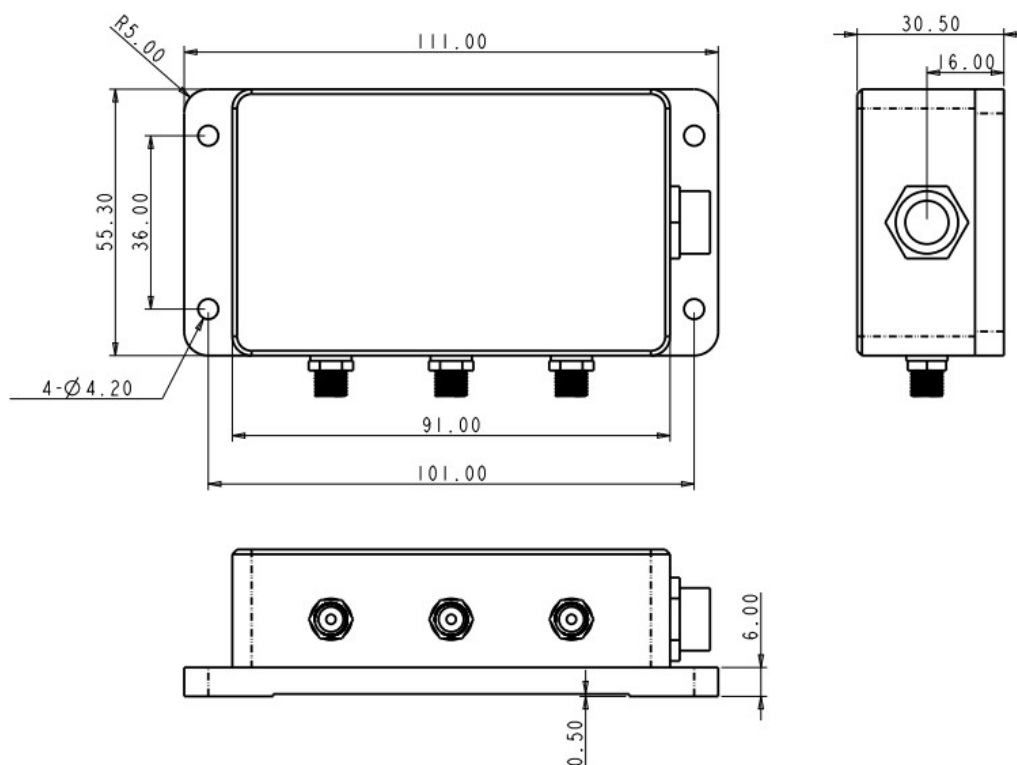
Motherboard Dimension Drawing



Size



Housing Dimension Drawing



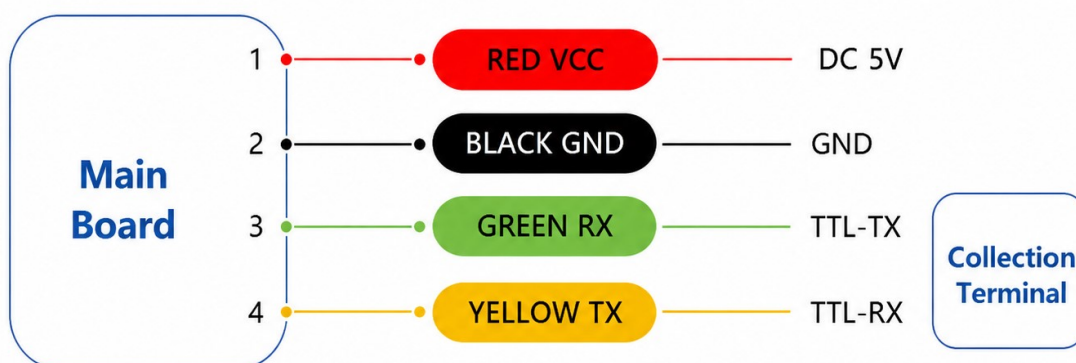
Configuration

1. BW-GI100-Z1 board
2. Signal output cable with pins: VCC, GND, TX, RX, RS485_A and RS485_B
3. 2 × GNSS antennas (optional, available models: THA-C03 or THA-Q01)
4. MMCX connector for main GNSS antenna
5. MMCX connector for main GNSS antenna
6. 4G antenna and adapter cable (optional)
7. SIM card (optional)

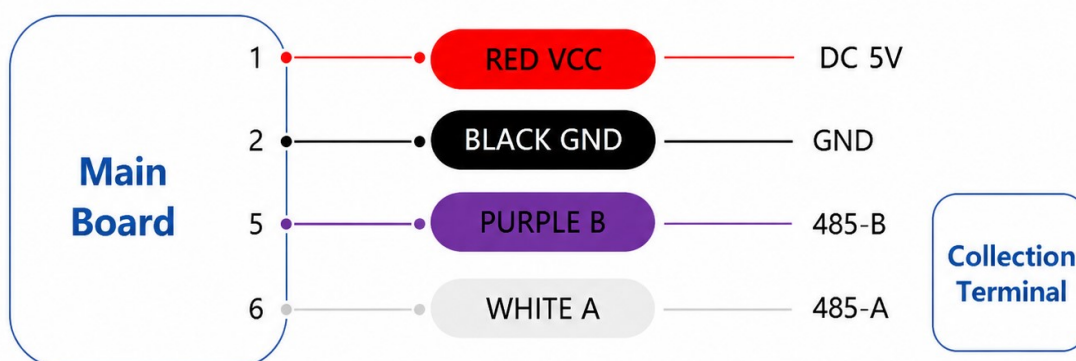
Connection

Wiring Definition

RED	BLACK	GREEN	YELLOW	PURPLE	WHITE
1	2	3	4	5	6
VCC	GND	Receive RXD	Transmit TXD	RS485-B	RS485-A
5-V					



3.3V TTL Wiring Diagram



RS 485 Wiring Diagram

Description

Function	Command	Parameters
Soft Restart	RESET	-
Factory Reset	FREST	-
Query Version	VERSION	-
Query Config.	CONFIG [COM]	[COM] Port. Options: COM1/COM2; default = current port.
Save Config.	SAVECONFIG	-
Set Baud Rate	CONFIG [COM] <baudrate>	<baudrate> Baud rate. Options: 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600. Recommended: 460800.
Set Antenna Type	CONFIG ANTENNA <type>	<type> Antenna type. Options: M/QH.
Set Solution Rate	CONFIG MEASRATE <frequency>	<frequency> Solution rate in Hz. Options: 1/5.
Set Position Mode	CONFIG MODE <mode>	<mode> Mode. Options: PPP/RTK.
Set dynamic and static modes	CONFIG DYNAMICS <enable>	<enable> Dynamic/Static Mode. Optional parameter: 0 - Static; 1 - Dynamic.
Set Qianxun Account	CONFIG NTRIP <username> <password>	<username>/<password>: Qianxun CORS credentials.
Set base length	CONFIG BASELINE <baseline_len> Or CONFIG BASELINE AUTO	<baseline_len> Baseline length. Unit: cm. Minimum value: 30. Set to AUTO to disable fixed baseline length.
Port Data Output	<NMEA> [COM] <second>	<NMEA> NMEA-0183 output sentence type. Optional parameters: GGA, GSA, GSV, RMC, TRA. <second> Output interval (Unit: seconds). Optional parameters: 0 / 1 / 0.5 / 0.2 / 0.1. [COM] Parameter configuration is the same as above.[COM] Same as above.
Disable	UNLOG [COM] <NMEA>	Same as above.

Instruction

1. Hardware Connection

Before powering on the device, complete the installation of the GNSS main antenna, GNSS slave antenna, 4G antenna and SIM card, and connect the 6-pin signal cable to the main board interface. If debugging via UART communication, connect the board's TX, RX and GND to the corresponding interfaces of the USB-to-TTL module respectively, paying attention to cross-wiring. If using RS485 communication, connect RS485_A and RS485_B to terminals A and B of the corresponding device. After all connections are finished, supply power to the device. An independent power supply is recommended.

Note: The UART interface uses 3.3V TTL level. Do NOT connect it to RS232 or other high-voltage serial devices, otherwise the board may be damaged.

2. 4G-RTK Account and Password Configuration

After connecting the device to a computer, launch a serial debugging tool (e.g. SSCOM), select the corresponding COM port and set the baud rate to 460800. Send configuration commands sequentially through the serial port. Below is an example of standard general command sequence:

```
CONFIG NTRIP <username> <password> //1. Set the Qianxun CORS network differential account and password
SAVECONFIG // 2. Save the current configuration to the board flash memory to prevent loss after power-off
RESET // 3. Soft-restart the device to activate all configurations
```

3. View real-time data

Once the device successfully connects to the RTK correction server, it will automatically enter the RTK calculation state. After the device finishes booting, you can verify the working status by checking the standard NMEA data output via the serial port.

Example: \$GPGGA,062457.00,3128.4450025,N,12015.8771916,E,4,26,1.0,.....

Check the positioning status indicator (the 7th field):

4 = Fixed Solution: Centimeter-level accuracy achieved. Deployment successful.

1 or 2 = Float or Single Point Solution: Please check for antenna obstructions or verify your RTK account balance.

To adjust the output frequency or filter specific data types, refer to the "Port Data Output" command in the command manual for flexible configuration. Example: GGA COM1 1

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Determination and Positioning Board

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