

Single-Channel Vibrating Wire Data Acquisition Module (VW-201)

Product overview and technical guide
V1.3.0



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Product Introduction

The VW-201 is a high-precision vibrating wire measurement module designed for geotechnical and structural health monitoring applications. It is designed for integration into automated monitoring systems where accurate, stable and long-term vibrating wire measurements are required.

Based on advanced digital signal processing technology, including FFT-based frequency analysis and phase processing algorithms, the module accurately identifies the resonant frequency of vibrating wire sensors.

It supports standard Modbus RTU communication and can be easily integrated into automated monitoring systems, RTUs and remote data acquisition platforms.

The module is widely used for monitoring applications including dams, tunnels, bridges, slopes, foundations and other infrastructure projects.

OEM / System Integration Capability

The VW-201 can be integrated into customized monitoring solutions. OEM options are available, including communication protocols, mechanical design, firmware customization and functional expansion according to customer requirements.

Key Advantages

- **High accuracy and resolution:** Vibrating wire frequency measurement provides high resolution and excellent repeatability, enabling detection of small changes in measured parameters.
- **Excellent stability:** Uses FFT-based frequency analysis and phase processing algorithms to accurately identify frequency variations. It can detect frequency variations as small as 0.1 Hz in vibrating wire sensors, and by dynamically adjusting the output resonant frequency, the transmitter achieves excellent sensitivity.
- **Strong anti-electromagnetic interference:** The vibrating wire sensor output is frequency-based (Hz/kHz), which is inherently less affected by cable length, resistance variation, contact resistance and voltage fluctuation.

Specifications

- Recommended supply voltage: 9–30 VDC
- Absolute operating voltage: 5–30 VDC
- Typical current consumption: 30 mA (default acquisition interval: 2 s)
- Standard Modbus protocol
- Measurement acquisition time: ≤ 100 ms
- Temperature measurement accuracy: 0.5°C
- Temperature sensor type: NTC (default 3 k Ω)
- Temperature measurement range: –20°C to 80°C

- Vibrating wire measurement resolution: 0.03 Hz
- Frequency measurement accuracy: ≤ 0.1 Hz
- Vibrating wire measurement range: 300 Hz to 6000Hz
- Sensor Compatibility: Compatible with most vibrating wire sensors, including piezometers, strain gauges, load cells and displacement sensors.
- Temperature measurement and compensation support (optional)
- Communication Interface: RS485 communication with Modbus RTU protocol. Custom communication interfaces are available upon request.

MODBUS Instruction Description

MODBUS is a master-slave serial communication protocol widely used in industrial automation, designed with simplicity, openness, and reliability at its core. As a typical application-layer protocol, The device supports standard Modbus RTU communication protocol for integration with RTUs, PLCs and automated monitoring platforms.

1. Basic Protocol Characteristics

- **Transmission modes:** Supports RTU (binary encoding) and ASCII (text encoding) formats; RTU mode is more common due to its higher efficiency.
- **Communication method:** Based on a request-response model, where the master initiates commands and the slave returns data or performs actions.
- **Function Code:** The core field of the instruction, defining the operation type (e.g., read coils, write registers, etc.), with a range of 1–127.

2. Key Fields in Instruction Structure

- **Address field:** Slave device ID (1–247), used for target addressing in multi-device buses.
- **Data field:** Contains register addresses, operation data, etc.; length and format are determined by the function code.
- **Check field:** CRC (RTU) or LRC (ASCII) check to ensure transmission integrity.

3. Typical Instruction Flow Example

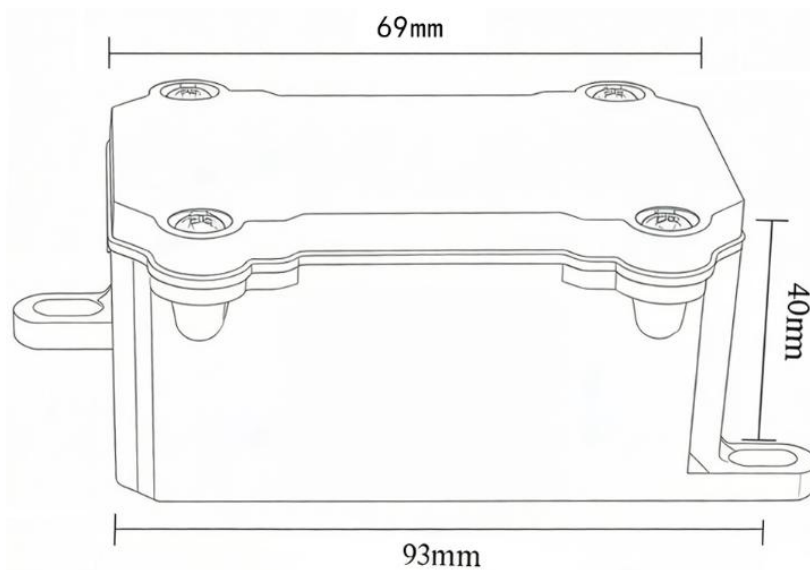
- **Master request:** `01 03 00 00 00 02 C4 0B` (Slave 1, read holding registers, start address 0000, read 2 registers, CRC check)
- **Slave response:** `01 03 04 00 00 E5 44 B0 9` (returns data values for 4 registers and check)
Where `000E544` is the read data; converted to FLOAT_DCBA gives 1832.0

4. Register Description

Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit
Vibrating wire frequency	00 00	R	2	FLOAT_DCBA	Hz
Temperature	00 02	R	2	FLOAT_DCBA	°C

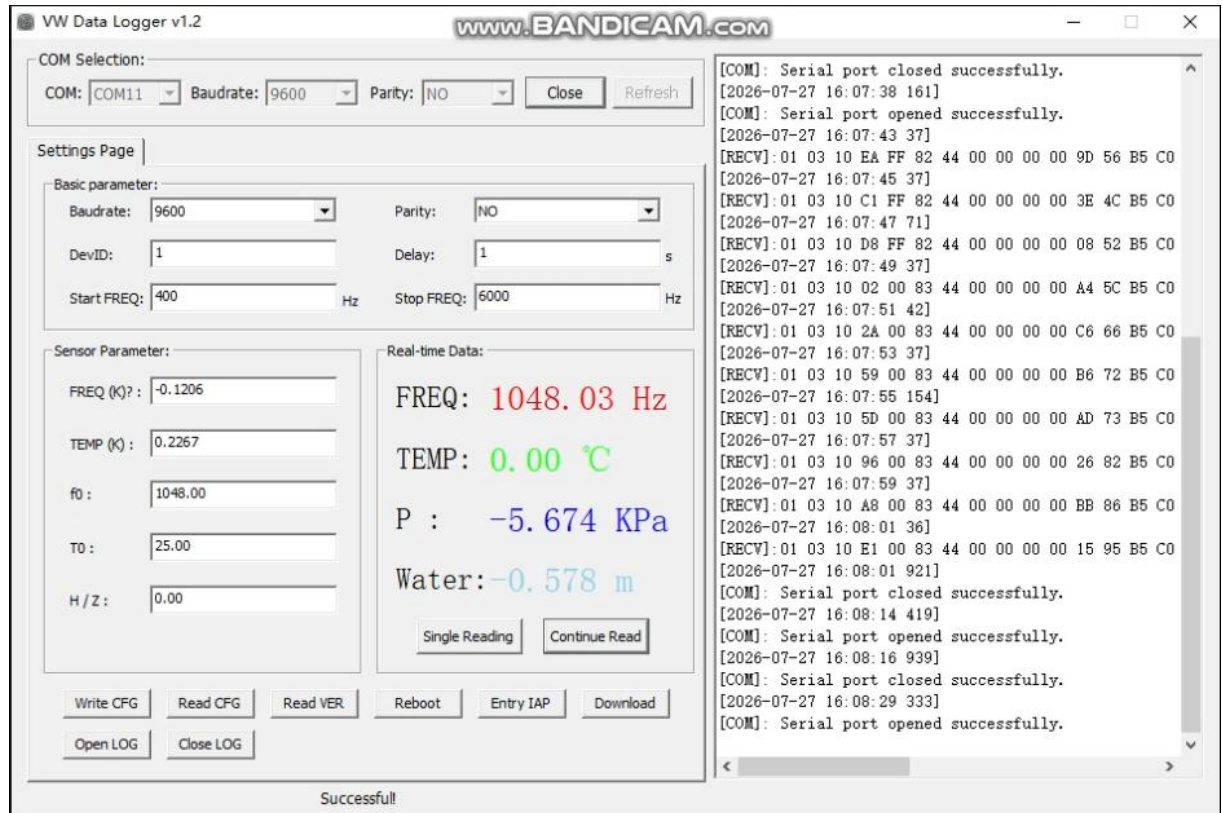
Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit
Pressure value	00 04	R	2	FLOAT_DCBA	-
Water level value	00 06	R	2	FLOAT_DCBA	m
Reserved registers	0008–007F	-	-	-	-
Device address	00 80	W/R	1	UINT_AB	-
Acquisition cycle	00 81	W/R	1	UINT_AB	s
Start frequency	00 82	W/R	1	UINT_AB	Hz
Stop frequency	00 83	W/R	1	UINT_AB	Hz
Frequency coefficient	00 84	W/R	1	UINT_AB	multiply by 1000 wVW writing
Reference frequency	00 85	W/R	1	UINT_AB	multiply by 1000 wVW writing
Temperature coefficient	00 86	W/R	1	UINT_AB	multiply by 1000 wVW writing
Temperature reference	00 87	W/R	1	UINT_AB	multiply by 1000 wVW writing
Elevation value	00 88	W/R	1	UINT_AB	multiply by 1000 wVW writing

Dimensions & Structure

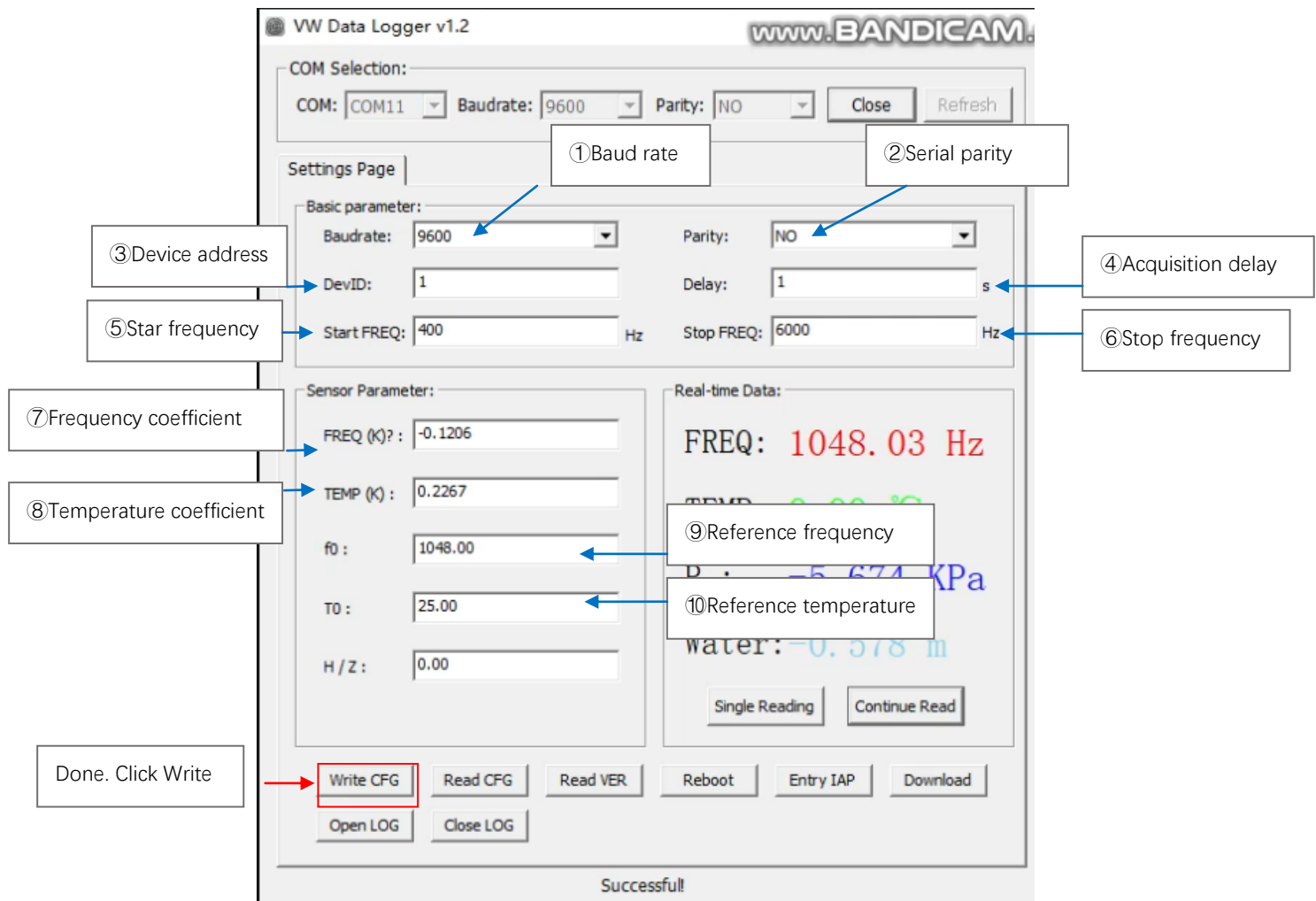


Parameter Configuration Instructions

The vibrating wire transmitter's factory-default address is 01 (supports 0xFF broadcast addressing), and serial parameters are 9600, N, 8, 1. To change other parameters, you can use our configuration tool or MODBUS commands.



- ①**Baud rate**: Communication speed between the transmitter and RTU or host, settable from 1200 to 115200.
- ②**Serial parity**: Optional NO, EVEN, ODD.
- ③**Device address**: MODBUS communication address, default 01; FF is for broadcast addressing.
- ④**Acquisition delay**: The interval time between two consecutive measurements; maximum 2 bytes.
- ⑤**Start frequency**: The initial scan frequency for the transmitter; must not be higher than the sensor's natural frequency.
- ⑥**Stop frequency**: The end frequency for scanning.
- ⑦**Frequency coefficient**: For piezometers or other vibrating wire sensors, enter the coefficient provided.
- ⑧**Temperature coefficient**: Enter the sensor's temperature coefficient.
- ⑨**Reference frequency**: The sensor's natural frequency, or the frequency measured by the transmitter in air.
- ⑩**Reference temperature**: The current sensor temperature, or the temperature measured by the transmitter in air.



Wiring Instructions



黑色		灰色	
名称	描述	名称	描述
红 (VCC)	电源正极	红 (S+)	传感器正极
黑 (GND)	电源负极	黑 (S-)	传感器负极
黄 (A)	485_A	黄 (T+)	温度正极
白 (B)	485_B	白 (T-)	温度负极

Black/Left		Gray/Right	
Color	Description	Color	Description
Red (VCC)	Power positive	Red (S+)	Sensor positive
Black (GND)	Power negative	Black (S-)	Sensor negative
Yellow (A)	485_A	Yellow (T+)	Temperature positive
White (B)	485_B	White (T-)	Temperature negative

Warranty Terms

To ensure our customers can use our products with confidence and satisfaction, we strictly abide by relevant national laws and regulations and maintain reasonable after-sales service policies.

Service Period

- Within 7 days of purchase, if a fault occurs under normal use, the customer may choose a refund, exchange, or repair.
- Within one year of purchase, faults not caused by human damage are covered by free repair.
- For customers not eligible for free replacement or repair, we still provide technical support; if parts replacement is needed, only the component cost will be charged.

Purchase date: Calculated according to the product sales contract or purchase order date (some products may have an extended or lifetime warranty).

Exclusions from the "Three Guarantees" Service

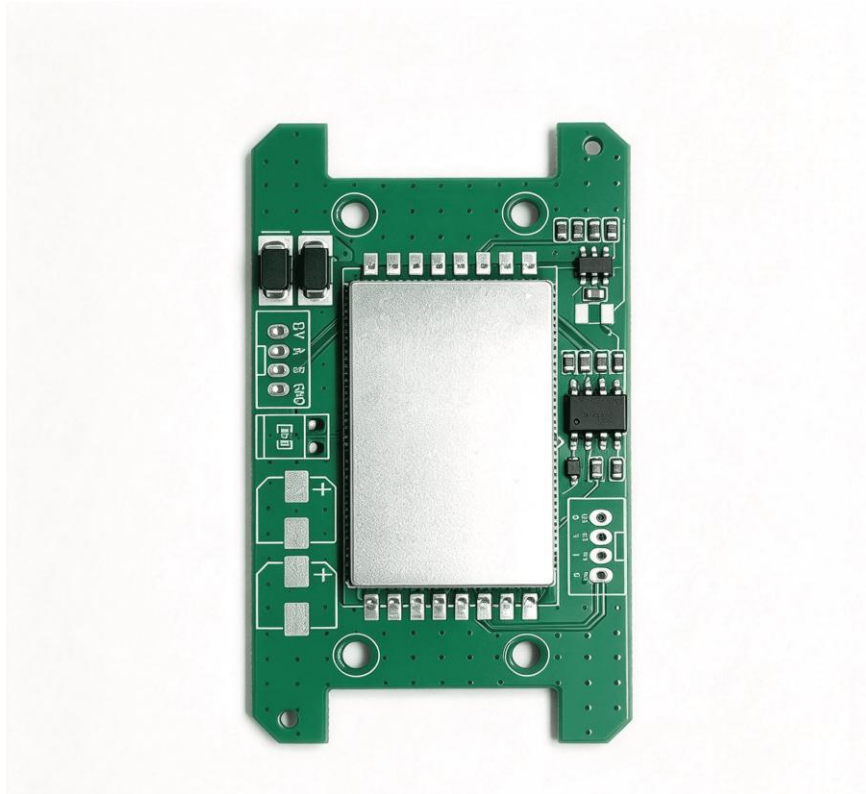
1. Damage caused by human factors, operation outside normal working conditions, failure to follow the manual, or use not in accordance with the specified environment.
2. Unauthorised disassembly, repair, or modification of the product.
3. Damage during improper transportation after purchase (we ensure product safety during our own shipping).
4. Damage caused by force majeure (e.g., flood, lightning, earthquake, abnormal voltage).

Product Exchange and Warranty Procedure

If a fault occurs during use, please contact our sales representative promptly, who will arrange after-sales service (new purchases qualify for exchange within 7 days).

About Shenzhen Hu Entropy Technology

Shenzhen Hu Entropy Technology focuses on the development of monitoring hardware for geotechnical and structural health monitoring applications. Our engineering team has nearly 10 years of experience in sensor interface design,



Vibrating Wire Data Acquisition Module – PCB Version

Sensor Interface

Pin Name	Description
SINE	VW+ (Vibrating wire signal positive)
GND	VW- (Vibrating wire signal negative)
TEMP	T+ (Temperature sensor positive)
GND	T- (Temperature sensor negative)
IO1	Busy indicator: High = acquisition in progress; Low = idle. Leave floating if not used.
IO2	Channel detection: High = no sensor connected; Low = sensor connected.
IO3	NC (Not connected)
GND	Ground

Power & Communication Interface

Pin Name	Description
VIN	Power input, 5–7 V DC
GND	Ground
EN	Module power enable: High = enable; Low = disable
TXD	UART transmit (module output)
RXD	UART receive (module input)
485_EN	RS485 direction control pin
GND	Ground
LED	LED indicator (e.g., status light)