

4/8/16-Channel High-Precision Vibrating Wire Signal Transmitter

VW-401 / VW-801 / VW-1601 Series

User Manual

V1.2.0



Shenzhen Hu Entropy Tech Co., Ltd

Email: hu@huentropy.com

WhatsApp: +86 183 1943 1978

WeChat: +86 132 6680 1910

Product Introduction

The Vibrating Wire Transmitter utilizes advanced **Fast Fourier Transform (FFT)** and **phase-difference algorithms** to precisely determine the resonant frequency of vibrating wire sensors. Based on the proven vibrating wire frequency measurement principle, the transmitter provides reliable acquisition of key physical parameters for long-term structural health monitoring applications. By accurately detecting variations in the natural frequency of a tensioned vibrating wire, the transmitter enables high-precision monitoring of parameters including pressure, displacement, strain, and temperature. The transmitter features stable performance, high accuracy, and supports standard MODBUS commands.

The VW Series Vibrating Wire Transmitter is designed for automated structural health monitoring systems, widely used in dams, bridges, tunnels, slopes, foundations, and geotechnical engineering projects.

Key Advantages

High-Precision Frequency Measurement

- Accurate frequency acquisition with resolution up to 0.03 Hz.
- Suitable for long-term monitoring applications requiring high reliability and stability.

Multi-Channel Monitoring Capability

- Available in 4-channel, 8-channel, and 16-channel versions.
- Supports multiple vibrating wire sensors through RS485 MODBUS communication.

Industrial-Grade Reliability

- Wide operating voltage range: 7–32 VDC.
- Designed for harsh outdoor environments and unattended monitoring stations.

Specifications

- Wide voltage supply: 7 ~ 32 V
- Temperature sensor type: NTC (default 3 k Ω)
- Power Consumption: $\leq$ 20 mA (default acquisition interval: 2 s)

- Temperature measurement range: $-20\text{ }^{\circ}\text{C} \sim 80\text{ }^{\circ}\text{C}$
- Standard Modbus protocol
- Vibrating wire resolution: 0.03 Hz
- Acquisition capture time: $\leq 100\text{ ms}$
- Vibrating wire accuracy: $\leq 0.1\text{ Hz}$
- Temperature accuracy: $0.5\text{ }^{\circ}\text{C}$
- Vibrating wire frequency range: 300 Hz $\sim$ 6 kHz

MODBUS Command Description

MODBUS is a master-slave serial communication protocol widely used in industrial automation, designed for simplicity, openness, and reliability. As a typical application-layer protocol, MODBUS uses standardized command formats for data exchange between devices, suitable for networked control and monitoring of PLCs, sensors, instruments, and other industrial equipment.

1. Protocol Basic Characteristics

- Transmission Mode: Supports RTU (binary) and ASCII (text) formats; RTU is more commonly used due to its higher efficiency.
- Communication Mode: Based on a request-response model, where the master sends commands and the slave returns data or performs actions.
- Function Code: The core field of a command, defining the operation type (e.g., read coils, write registers), ranging from 1 to 127.

2. Key Fields in Command Structure

- Address Field: Slave device ID (1 $\sim$ 247), used for target addressing in multi-device buses.
- Data Field: Contains register addresses, operation data, etc.; length and format depend on the function code.
- Checksum Field: CRC (for RTU) or LRC (for ASCII) to ensure transmission integrity.

3. Example of a Typical Command Flow

> [Master Request] `01 03 00 00 00 02 C4 0B`

(Slave 1, read holding registers, start address 00 00, read 2 registers, CRC checksum)

> [Slave Response] `01 03 04 00 00 E5 44 B0 90`

(Returns data values of 4 registers and checksum; `00 00 E5 44` converted to FLOAT_DCBA gives 1832.0)

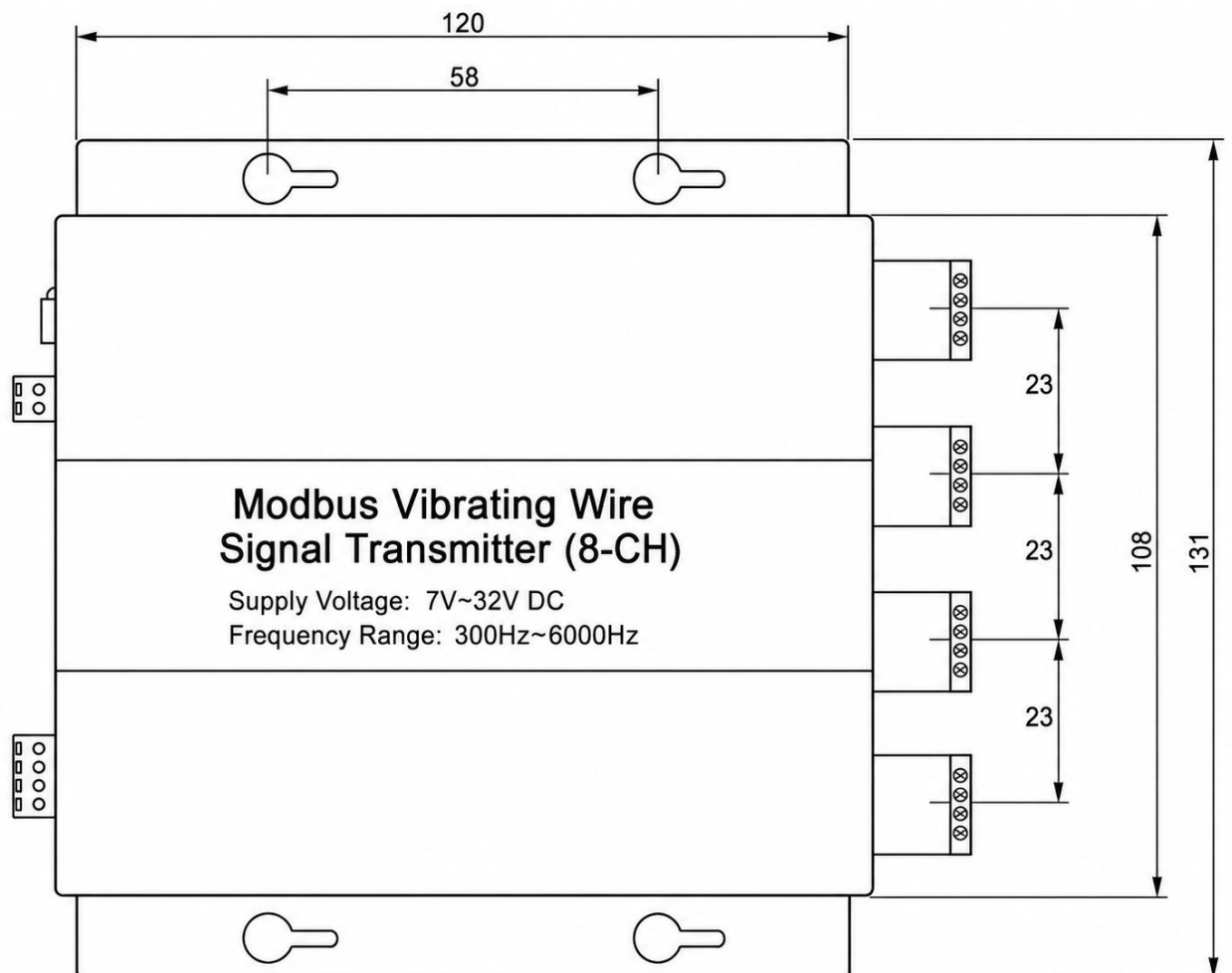
4. Register Map

Channel	Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit
Channel 1	Vibrating Wire Frequency	00 00	R	2	FLOAT_DCBA	Hz

Channel	Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit
	Temperature	00 02	R	2	FLOAT_DCBA	°C
	Pressure Value	00 04	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 06	R	2	FLOAT_DCBA	m

Please refer to the appendix for the complete MODBUS register map.

Dimensions

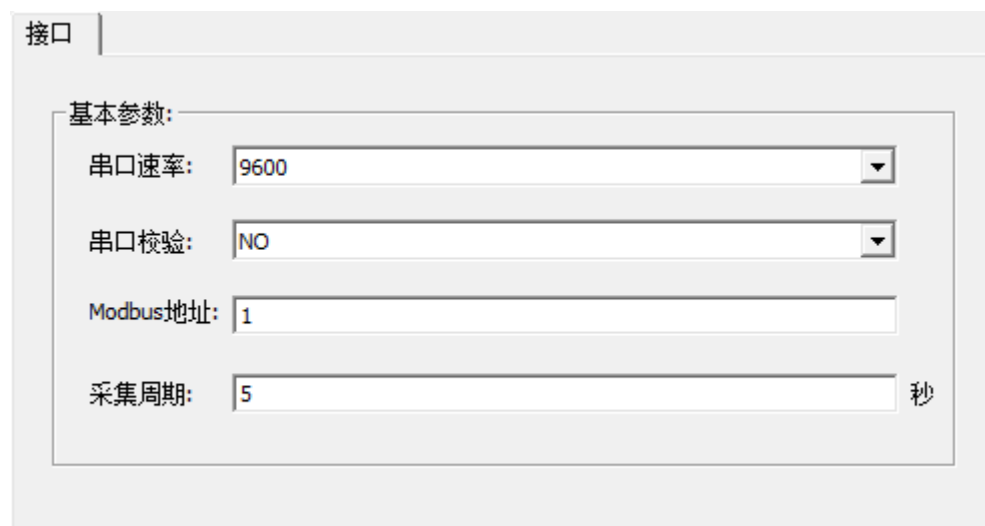


Parameter Configuration Instructions



Default factory settings: MODBUS slave address 01H (broadcast address FFH supported); serial parameters: 9600 bps, None, 8, 1. Configuration can be done via the TYPE-C port, RS485 bus with the host computer configuration tool, or by sending MODBUS commands.

1. Interface Settings



1. Serial Baud Rate: RS485 interface baud rate: 1200 – 115200 bps (configurable)
2. Serial Parity: None / Even / Odd (selectable)
3. MODBUS Slave Address: 1 – 247 (default: 01H); FFH is the broadcast address
4. Acquisition Cycle: Time interval for vibrating wire sensor data acquisition, range: 1 – 65535 s (configurable)

2. MCU Module

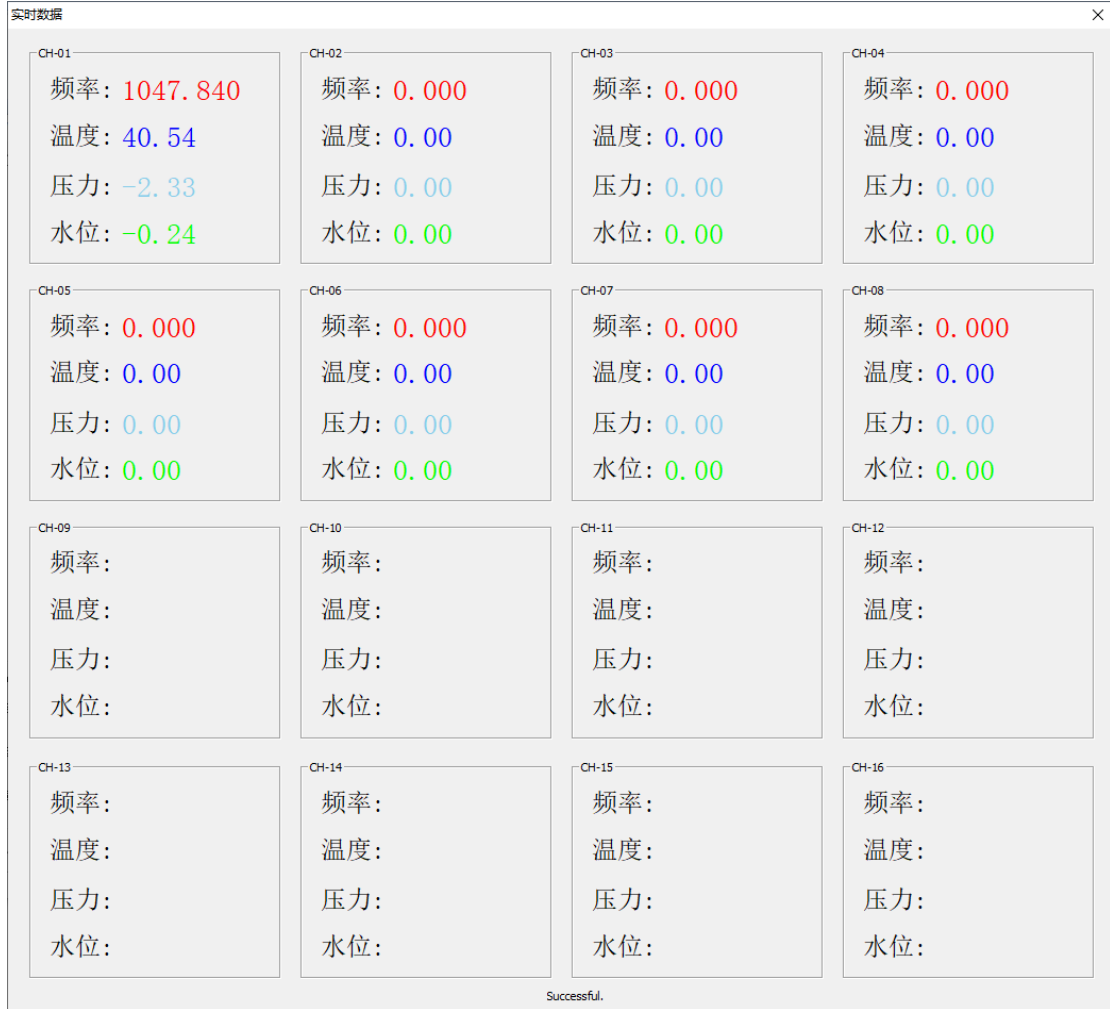
MCU模块

	频率系数	温度系数	基准频率	基准温度	高程值
通道1:	-0.2345	-0.1234	1047.00	25.00	0.00
通道2:	-0.2345	-0.1234	2233.00	25.00	0.00
通道3:	-0.2345	-0.1234	2233.00	25.00	0.00
通道4:	-0.2345	-0.1234	2233.00	25.00	0.00
通道5:	-0.2345	-0.1234	2233.00	25.00	0.00
通道6:	-0.2345	-0.1234	2233.00	25.00	0.00
通道7:	0.0000	0.0000	0.00	0.00	0.00
通道8:	0.0000	0.0000	0.00	0.00	0.00
通道9:	0.0000	0.0000	0.00	0.00	0.00
通道10:	0.0000	0.0000	0.00	0.00	0.00
通道11:	0.0000	0.0000	0.00	0.00	0.00
通道12:	0.0000	0.0000	0.00	0.00	0.00
通道13:	0.0000	0.0000	0.00	0.00	0.00
通道14:	0.0000	0.0000	0.00	0.00	0.00
通道15:	0.0000	0.0000	0.00	0.00	0.00
通道16:	0.0000	0.0000	0.00	0.00	0.00

Supports setting the Frequency Coefficient, Temperature Coefficient, Reference Frequency, Temperature Reference, and Elevation Value for each channel. The configuration range corresponds to the actual number of physical channels on the device (e.g., for a 4-channel device, only channels 1–4 need to be configured; the rest are invalid).

After configuration, click "One-Click Write" to save the parameters to the device (retained after power-off). The current configuration can be exported to a file for later reuse. To reuse, simply import the configuration file and click "One-Click Write" to complete parameter download without repeated setup.

Once connected, the "Real-time Data" interface can be used to monitor acquired data, as shown below:



Warranty Policy

Shenzhen Hu Entropy Tech Co., Ltd. provides a one-year warranty for manufacturing defects under normal operating conditions.

The warranty does not cover damage caused by improper installation, unauthorized modification, misuse, abnormal environmental conditions, or force majeure events.

MODBUS register map

Channel	Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit
Channel 1	Vibrating Wire Frequency	00 00	R	2	FLOAT_DCBA	Hz
	Temperature	00 02	R	2	FLOAT_DCBA	°C
	Pressure Value	00 04	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 06	R	2	FLOAT_DCBA	m
Channel 2	Vibrating Wire Frequency	00 08	R	2	FLOAT_DCBA	Hz
	Temperature	00 0A	R	2	FLOAT_DCBA	°C
	Pressure Value	00 0C	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 0E	R	2	FLOAT_DCBA	m
Channel 3	Vibrating Wire Frequency	00 10	R	2	FLOAT_DCBA	Hz
	Temperature	00 12	R	2	FLOAT_DCBA	°C
	Pressure Value	00 14	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 16	R	2	FLOAT_DCBA	m
Channel 4	Vibrating Wire Frequency	00 18	R	2	FLOAT_DCBA	Hz
	Temperature	00 1A	R	2	FLOAT_DCBA	°C
	Pressure Value	00 1C	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 1E	R	2	FLOAT_DCBA	m

Channel	Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit
Channel 5	Vibrating Wire Frequency	00 20	R	2	FLOAT_DCBA	Hz
	Temperature	00 22	R	2	FLOAT_DCBA	°C
	Pressure Value	00 24	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 26	R	2	FLOAT_DCBA	m
Channel 6	Vibrating Wire Frequency	00 28	R	2	FLOAT_DCBA	Hz
	Temperature	00 2A	R	2	FLOAT_DCBA	°C
	Pressure Value	00 2C	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 2E	R	2	FLOAT_DCBA	m
Channel 7	Vibrating Wire Frequency	00 30	R	2	FLOAT_DCBA	Hz
	Temperature	00 32	R	2	FLOAT_DCBA	°C
	Pressure Value	00 34	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 36	R	2	FLOAT_DCBA	m
Channel 8	Vibrating Wire Frequency	00 38	R	2	FLOAT_DCBA	Hz
	Temperature	00 3A	R	2	FLOAT_DCBA	°C
	Pressure Value	00 3C	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 3E	R	2	FLOAT_DCBA	m
Channel 9	Vibrating Wire Frequency	00 40	R	2	FLOAT_DCBA	Hz

Channel	Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit
	Temperature	00 42	R	2	FLOAT_DCBA	°C
	Pressure Value	00 44	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 46	R	2	FLOAT_DCBA	m
Channel 10	Vibrating Wire Frequency	00 48	R	2	FLOAT_DCBA	Hz
	Temperature	00 4A	R	2	FLOAT_DCBA	°C
	Pressure Value	00 4C	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 4E	R	2	FLOAT_DCBA	m
Channel 11	Vibrating Wire Frequency	00 50	R	2	FLOAT_DCBA	Hz
	Temperature	00 52	R	2	FLOAT_DCBA	°C
	Pressure Value	00 54	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 56	R	2	FLOAT_DCBA	m
Channel 12	Vibrating Wire Frequency	00 58	R	2	FLOAT_DCBA	Hz
	Temperature	00 5A	R	2	FLOAT_DCBA	°C
	Pressure Value	00 5C	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 5E	R	2	FLOAT_DCBA	m
Channel 13	Vibrating Wire Frequency	00 60	R	2	FLOAT_DCBA	Hz
	Temperature	00 62	R	2	FLOAT_DCBA	°C

Channel	Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit
	Pressure Value	00 64	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 66	R	2	FLOAT_DCBA	m
Channel 14	Vibrating Wire Frequency	00 68	R	2	FLOAT_DCBA	Hz
	Temperature	00 6A	R	2	FLOAT_DCBA	°C
	Pressure Value	00 6C	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 6E	R	2	FLOAT_DCBA	m
Channel 15	Vibrating Wire Frequency	00 70	R	2	FLOAT_DCBA	Hz
	Temperature	00 72	R	2	FLOAT_DCBA	°C
	Pressure Value	00 74	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 76	R	2	FLOAT_DCBA	m
Channel 16	Vibrating Wire Frequency	00 78	R	2	FLOAT_DCBA	Hz
	Temperature	00 7A	R	2	FLOAT_DCBA	°C
	Pressure Value	00 7C	R	2	FLOAT_DCBA	KPa
	Water Level Value	00 7E	R	2	FLOAT_DCBA	m
—	Device Address	00 80	W/R	1	UINT_AB	—
—	Acquisition Cycle	00 81	W/R	1	UINT_AB	seconds

Channel	Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit
—	Reserved	00 82 ~ 00 83	—	1	UINT_AB	—

Channel	Register Name	Register Address	Register Type (R/W)	Count	Data Type	Unit Multiply by X when writing
Channel 1	Frequency Coefficient	00 84	W/R	1	UINT_AB	1000
	Reference Frequency	00 85	W/R	1	UINT_AB	100
	Temperature Coefficient	00 86	W/R	1	UINT_AB	1000
	Temperature Reference	00 87	W/R	1	UINT_AB	100
	Elevation Value	00 88	W/R	1	UINT_AB	1000
Channel 2	Frequency Coefficient	00 89	W/R	1	UINT_AB	1000
	Reference Frequency	00 8A	W/R	1	UINT_AB	100
	Temperature Coefficient	00 8B	W/R	1	UINT_AB	1000
	Temperature Reference	00 8C	W/R	1	UINT_AB	100
	Elevation Value	00 8D	W/R	1	UINT_AB	1000
Channel 3	Frequency Coefficient	00 8E	W/R	1	UINT_AB	1000
	Reference Frequency	00 8F	W/R	1	UINT_AB	100

	Temperature Coefficient	00 90	W/R	1	UINT_AB	1000
	Temperature Reference	00 91	W/R	1	UINT_AB	100
	Elevation Value	00 92	W/R	1	UINT_AB	1000
Channel 4	Frequency Coefficient	00 93	W/R	1	UINT_AB	1000
	Reference Frequency	00 94	W/R	1	UINT_AB	100
	Temperature Coefficient	00 95	W/R	1	UINT_AB	1000
	Temperature Reference	00 96	W/R	1	UINT_AB	100
	Elevation Value	00 97	W/R	1	UINT_AB	1000
Channel 5	Frequency Coefficient	00 98	W/R	1	UINT_AB	1000
	Reference Frequency	00 99	W/R	1	UINT_AB	100
	Temperature Coefficient	00 9A	W/R	1	UINT_AB	1000
	Temperature Reference	00 9B	W/R	1	UINT_AB	100
	Elevation Value	00 9C	W/R	1	UINT_AB	1000
Channel 6	Frequency Coefficient	00 9D	W/R	1	UINT_AB	1000
	Reference Frequency	00 9E	W/R	1	UINT_AB	100
	Temperature Coefficient	00 9F	W/R	1	UINT_AB	1000
	Temperature Reference	00 A0	W/R	1	UINT_AB	100
	Elevation Value	00 A1	W/R	1	UINT_AB	1000

Channel 7	Frequency Coefficient	00 A2	W/R	1	UINT_AB	1000
	Reference Frequency	00 A3	W/R	1	UINT_AB	100
	Temperature Coefficient	00 A4	W/R	1	UINT_AB	1000
	Temperature Reference	00 A5	W/R	1	UINT_AB	100
	Elevation Value	00 A6	W/R	1	UINT_AB	1000
Channel 8	Frequency Coefficient	00 A7	W/R	1	UINT_AB	1000
	Reference Frequency	00 A8	W/R	1	UINT_AB	100
	Temperature Coefficient	00 A9	W/R	1	UINT_AB	1000
	Temperature Reference	00 AA	W/R	1	UINT_AB	100
	Elevation Value	00 AB	W/R	1	UINT_AB	1000
Channel 9	Frequency Coefficient	00 AC	W/R	1	UINT_AB	1000
	Reference Frequency	00 AD	W/R	1	UINT_AB	100
	Temperature Coefficient	00 AE	W/R	1	UINT_AB	1000
	Temperature Reference	00 AF	W/R	1	UINT_AB	100
	Elevation Value	00 B0	W/R	1	UINT_AB	1000
Channel 10	Frequency Coefficient	00 B1	W/R	1	UINT_AB	1000
	Reference Frequency	00 B2	W/R	1	UINT_AB	100
	Temperature Coefficient	00 B3	W/R	1	UINT_AB	1000

	Temperature Reference	00 B4	W/R	1	UINT_AB	100
	Elevation Value	00 B5	W/R	1	UINT_AB	1000
Channel 11	Frequency Coefficient	00 B6	W/R	1	UINT_AB	1000
	Reference Frequency	00 B7	W/R	1	UINT_AB	100
	Temperature Coefficient	00 B8	W/R	1	UINT_AB	1000
	Temperature Reference	00 B9	W/R	1	UINT_AB	100
	Elevation Value	00 BA	W/R	1	UINT_AB	1000
Channel 12	Frequency Coefficient	00 BB	W/R	1	UINT_AB	1000
	Reference Frequency	00 BC	W/R	1	UINT_AB	100
	Temperature Coefficient	00 BD	W/R	1	UINT_AB	1000
	Temperature Reference	00 BE	W/R	1	UINT_AB	100
	Elevation Value	00 BF	W/R	1	UINT_AB	1000
Channel 13	Frequency Coefficient	00 C0	W/R	1	UINT_AB	1000
	Reference Frequency	00 C1	W/R	1	UINT_AB	100
	Temperature Coefficient	00 C2	W/R	1	UINT_AB	1000
	Temperature Reference	00 C3	W/R	1	UINT_AB	100
	Elevation Value	00 C4	W/R	1	UINT_AB	1000
Channel	Frequency Coefficient	00 C5	W/R	1	UINT_AB	1000

14	Reference Frequency	00 C6	W/R	1	UINT_AB	100
	Temperature Coefficient	00 C7	W/R	1	UINT_AB	1000
	Temperature Reference	00 C8	W/R	1	UINT_AB	100
	Elevation Value	00 C9	W/R	1	UINT_AB	1000
Channel 15	Frequency Coefficient	00 CA	W/R	1	UINT_AB	1000
	Reference Frequency	00 CB	W/R	1	UINT_AB	100
	Temperature Coefficient	00 CC	W/R	1	UINT_AB	1000
	Temperature Reference	00 CD	W/R	1	UINT_AB	100
	Elevation Value	00 CE	W/R	1	UINT_AB	1000
Channel 16	Frequency Coefficient	00 CF	W/R	1	UINT_AB	1000
	Reference Frequency	00 D0	W/R	1	UINT_AB	100
	Temperature Coefficient	00 D1	W/R	1	UINT_AB	1000
	Temperature Reference	00 D2	W/R	1	UINT_AB	100
	Elevation Value	00 D3	W/R	1	UINT_AB	1000