AVW200-series

2-Channel Vibrating Wire Spectrum Analyzer Modules

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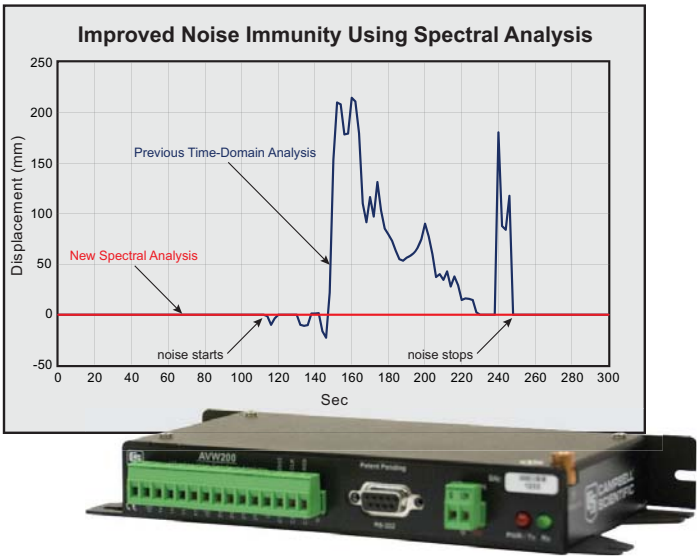
Campbell Scientific's AVW200-series interface modules allow the measurement of vibrating-wire strain gauges, pressure transducers, piezometers, tiltmeters, crackmeters, and load cells. These sensors are used in a wide variety of structural, hydrological, and geotechnical applications because of their stability, accuracy, and durability.

The AVW200 series uses an innovative spectral-interpolation method for measuring the sensor's resonant frequency. With the spectral interpolation method, the module excites the vibrating wire sensor, measures the response, performs a Fourier transform on the response, and returns the result with a resolution better than 0.001 Hz—all within two seconds. Because spectral analysis can distinguish signal from noise on the basis of frequency content, this method offers improved immunity to competing noise.

The AVW200-series modules also provide many self-checking diagnostics such as vibrating element signal strength, signal-to-noise ratio, vibrating-element signal decay ratio, and incorrect signal response. These diagnostics can be running in the background to give continual feedback of the condition for each sensor



Features/Benefits

- Interfaces two vibrating wire sensors; more sensors may be connected if an AM16/32B multiplexer is used
- Resolves the vibrating-wire measurement to less than 0.001 Hz (industry standard is 0.1 Hz)
- Eliminates the problem of incorrect readings due to noise sources
- Retrieves frequency of interest via SDI-12, RS-232, or PakBus network protocol
- Supports standalone capability by using a wireless model (AVW206, AVW211, AVW216)
- Provides low current drain (300 µA quiescent, 40 mA during 2-second measurement)
- Includes dual channel coils plus a thermistor measurement
- Simplified configuration and datalogger programming

Datalogger Connections

When using SDI-12, a three conductor cable is required; Campbell Scientific recommends the CABLE3CBL-L cable. When using RS-232, the module attaches to the datalogger's RS-232 port via the 18663 null modem cable, or attaches to control ports on a CR800, CR850, CR1000, or CR3000 datalogger via the 17855 data cable.

Models/Datalogger Communications

All of the models can communicate with the datalogger using RS-232 or SDI-12. Other communications supported are model dependent:

- AVW200—base model (i.e, communicates with the datalogger via RS-232 or SDI-12).
- AVW206—includes an internal 915 MHz spread spectrum radio that transmits data to the datalogger via an RF401 radio. The 915 MHz frequency is used in the US/Canada.
- AVW211—includes an internal 922 MHz spread spectrum radio that transmits data to the datalogger via an RF411 radio. The 922 MHz frequency is used in Australia/Israel.
- AVW216—includes an internal 2.4 GHz spread spectrum radio that transmits data to the datalogger via an RF416 radio. The 2.4 GHz frequency can be used in many countries worldwide.

Vibrating Wire Interface Module Specifications

Electrical specifications are valid over a -25° to +50°C range unless otherwise specified; non-condensing environment required.

ANALOG INPUTS/OUTPUTS

DESCRIPTION: 2 differential (DF) Vibrating Wire measurements (V+ and V-) and 2 single-ended (SE) ratiometric resistive half-bridge measurements (T+ and T-).

VIBRATING WIRE (V+ AND V-):

Range, Resolution, and Accuracy: 24-bit basic resolution.

Input Range	*Measurement Resolution (-55° to 85°C)*	*Accuracy Basic (-55° to 85°C)*
±250 (mV) DF	0.001 (Hz RMS)	±0.013% of reading

Input Resistance: 4.75 kOhms for the Vibrating Wire Measurement inputs (V+ and V-).

Vibrating Wire Measurement: Differential Coil+ (V+) and Coil- (V-) outputs/inputs for direct connection excite and resonant frequency measure of vibrating wire transducers. ±2.5 V (5 V peak-to-peak) or ±6 V (12 V peak-to-peak), logarithmic sine wave frequency excitation programmable from 100 Hz to 6.5 kHz, followed by frequency domain measurements via digital signal processing for excellent noise rejection.

RESISTIVE THERMISTOR (T+ AND T-):

Range, Resolution, and Accuracy: 24-bit basic resolution.

Input Range	*Measurement Resolution (-55° to 85°C)*	*Accuracy Basic (-55° to 85°C)*
±2500 (mV) SE	0.001 (Ohms RMS)	±0.25% of reading)[1]

[1] *Thermistor interchangeability, resistance of the wire and thermistor linearization errors should also be considered.*

Input Resistance: 5 kOhms for the thermistor input T- (5 kOhm 0.1% completion resistor).

Thermistor Measurement: A half-bridge ratiometric measurement. The value returned is in Ohms. This can be used for temperature correction of the vibrating wire measurement.

COMMON MODE RANGE: ±25 V

SUSTAINED INPUT VOLTAGE W/O DAMAGE: ±16 Vdc max.

MEASUREMENT SPEED: The AVW200 Vibrating Wire measurement (DF measurement) and the Half Bridge thermistor measurement (SE measurement) combined take less than 2 seconds per measurement. The DF measurement time depends on the beginning and ending frequency range selected and will take between 1.4 to 1.6 seconds. The Half Bridge thermistor measurement (SE) takes 60 milliseconds or 70 milliseconds depending on the integration time selected. The thermistor measurement integrates for 20 milliseconds (50 Hz) or 16.66 milliseconds (60 Hz) with a positive excite and then 20 milliseconds or 16.66 milliseconds with a negative excite.

DIGITAL CONTROL PORTS

DESCRIPTION: 3 digital control ports (C1 – C3). C1 functions as an SDI-12 I/O communication port. C2 functions as a Clk output for Mux control C3 functions as a Reset output for Mux Control.

INPUT STATE: high 2.5 to 5.3 V; low -0.3 to 1.0 V

INPUT HYSTERESIS: 1.32 V

INPUT RESISTANCE: 100 kOhms

OUTPUT VOLTAGES (no load): high 5.0 V ±0.1 V; low <0.1

OUTPUT RESISTANCE: 330 Ohms

COMMUNICATION

RS-232: Non Isolated

BAUD RATES: Selectable from 1200 to 38.4 kbps. ASCII protocol is one start bit, one stop bit, eight data bits, and no parity.

SDI-12: Control Ports 1 is configured for SDI-12 Sensor asynchronous communication. Meets SDI-12 Standard version 1.3

SYSTEM

PROGRAM EXECUTION INTERVAL: 1 second

PROCESSOR: Hitachi H8S 2324 (16-bit CPU with 32 bit internal core)

MEMORY: Either 128 or 512 kbytes of SRAM; 2 Mbyte of OS Flash

CLOCK ACCURACY: ±10 minute per month. The clock is not compensated over temperature.

Note: The AVW200-series module synchronizes with the datalogger clock every execution interval (datalogger instruction AVW200).

CE COMPLIANCE

STANDARD(S) TO WHICH CONFORMITY IS DECLARED: IEC61326:2002

POWER REQUIREMENTS

VOLTAGE: 9.6 to 16 Vdc

TYPICAL CURRENT DRAIN @ 12 Vdc:

Quiescent (no radio or radio off): ~0.3 mA

Radio duty cycling ½ second: ~5 mA (includes quiescent current)

Radio duty cycling 1 second: ~3 mA (includes quiescent current)

Radio duty cycling 8 second: ~0.75 mA (includes quiescent current)

Radio always on: ~26 mA (radio transmit current 100 mA)

Active RS-232 communication: ~6 mA (3 seconds after communication stops the current will drop to the quiescent current)

Measurement: ~25 mA (averaged over the 2 seconds measurement)

PHYSICAL SPECIFICATIONS

SIZE: 8.5" x 4.4" x 1.25" (21.6 x 11.18 x 3.18 cm)

WEIGHT: 0.95 lbs (0.43 kg)

WARRANTY

One year against defects in materials and workmanship.

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