

SMRT Probe 4000™

Resonant Frequency Sensor & Data Acquisition (DAQ) Module



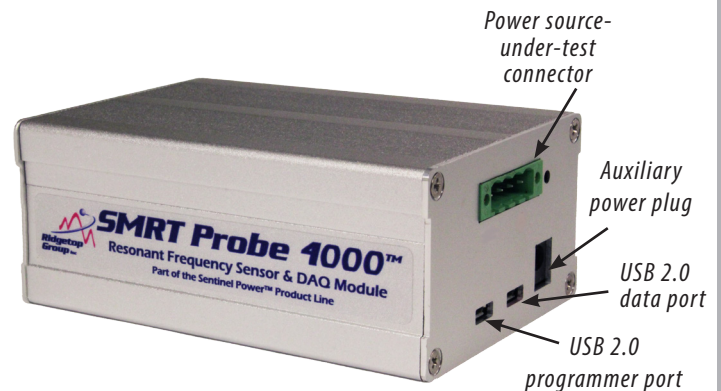
Part of the Sentinel Suite™ Family

Features and Benefits

- Shows change in system response as power devices degrade with age or stress
- Effective extraction of degradation signatures on highly damped and “stiff” systems
- Applicable to a wide range of power systems
- Compact form factor
- Networked device communicates with host via USB cable
- Optional Sentinel Power features and algorithms to support advanced diagnostics and prognostics

General Description

Ridgetop’s SMRT Probe (Sample Mode Response Technique™ Probe) 4000 is a resonant frequency sensor and data acquisition module, shown at right, that is attached to an electrical assembly to extract prognostic degradation signatures. SMRT Probe 4000 monitors power systems by injecting a voltage stimulus to measure characteristic frequency response, enabling prognostic and degradation analysis. The system response will change due to loss of filter capacitance, changes in equivalent series resistance (ESR) of the power system being monitored, MOSFET switch degradation, or other electrical degradation. SMRT Probe processes the sampled data and outputs the results



SMRT Probe 4000 resonant frequency sensor

SMRT Probe specifications include:

Capacitance range:	132 µF to 13,200 µF	Output connector:	Micro USB
Input voltage range:	2.5 to 33 V	Output data protocol:	ASCII
Temperature range:	0 to 40 °C	Power supply:	24 VDC/1.25 A
Dimensions:	L = 4.38 in. (11.1 cm)	Characteristic frequency response:	16-bit resolution
	W = 3 in. (7.6 cm)	Frequency response range:	850 Hz to 4.1 kHz
	H = 1.75 in. (4.5 cm)		
ADC sample rate:	250 kHz		

to the controlling host (such as a computer or embedded controller). The SMRT Probe software performs a digital signal processing (DSP) analysis of the captured frequency response, including anomaly detection, and produces a prognostic signature.

Optional Prognostic Features

The Sentinel Power family includes features and algorithms to support advanced diagnostics and prognostics. The optional ARULE™ (Adaptive Remaining Useful Life Estimator) algorithm can be applied to the normalized frequency data and maintain a rolling average captured at one-second intervals to provide real-time prognostic and health management (PHM) results such as, but not restricted to, actual state of health (SoH) and remaining useful life (RUL). Ridgetop prognostics are independent of noise effects.

Serial Data Protocol

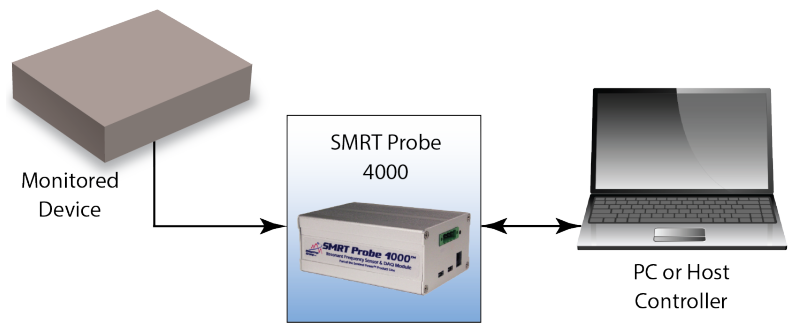
Input: The SMRT Probe 4000's data input is the result of a stimulus request from the host controller/serial device.

Output: SMRT Probe's time-stamped ASCII data output (the response to the input) indicates resonant frequency in Hz and 1000 ADC values. The output is received on the host controller/serial device.

About Ridgetop Prognostics

Ridgetop specializes in the development of prognostic methods that are used to improve the reliability of deployed systems by analyzing components that have high failure rates and critical impact on performance.

Detectors, or sensors, monitor these systems and help isolate failure precursors that indicate when the high-failure-rate



System diagram of SMRT Probe 4000 operation

components are degrading toward failure. By knowing the progression of failure dynamics for a monitored device, an accurate prediction of RUL can be made and an appropriate evidence-based maintenance action, such as removing and replacing the device, can be initiated only when actually required, thus reducing the cost of maintenance.

Fault-to-failure progression (FFP) signature detection developed by Ridgetop is an effective method to detect and report a precursor to failure or incipient fault condition of an assembly containing a degraded component. Such detection is the basis for a notification capability, supplied by the Sentinel Power software, to provide a prognostic early warning of impending failure.

Applications

- Power converters and inverters
- Power supplies
- Electromechanical power drive stages such as electromechanical actuators
- Heating elements, like those of aerospace total air temperature probes

Need modified or custom design? Contact Ridgetop at +1 520-742-3300 to discuss your ideal solution!

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