



Digital Telemetry - Overview

BACKGROUND

Design of new mechanical systems and problem solving of existing systems requires accurate information about static and dynamic in-service loads. Transmission Dynamics have developed a comprehensive range of advanced instrumentation, allowing measurements to be taken in demanding environments where low noise, miniature size and easy set-up are critical.

TELEMETRY OVERVIEW

Our latest range of extremely robust yet highly advanced wireless telemetry systems are designed to reliably capture in-service load measurements from the most demanding environments, including rotating and inaccessible industrial machinery.

The system offers fast sampling rates (40 kHz aggregate), high resolution (equivalent to 24-bit), long wireless range (up to 30 m) and extremely low noise ($< 2 \mu V_{RMS}$), all in tiny package sizes (from 37 x 21 x 5.5 mm) with ultra low power consumption and intelligent sleep mode.

Systems are available with one, two or four input channels (plus a dedicated tachometer channel). On-board signal conditioning (including 3 V bridge excitation) allows direct interfacing to strain gauges and pressure sensors (Wheatstone bridge type) as standard, although most transducer types can be accommodated.

The system is optimised for power efficiency; capable of continuous transmission for 100 hours (one 350 Ω gauge), or 2 years in sleep mode, from a single AA-cell. The transmitter enters intelligent sleep mode when the receiver is turned off.

The receiver can operate as a standalone unit, with channels available as live-streamed analogue outputs for any data acquisition or control system, or can be connected to a PC via USB, where streamed data can be viewed on screen and logged directly to hard drive.

Transmission Dynamics provide a range of our own telemetry instrumentation products, which are used by blue-chip technology clients across the globe. Our telemetry systems are currently in use in dozens of critical applications, including 5 MW+ wind turbine gearboxes, mining, marine, defence, automotive and rail applications.



Quality Management System
ISO 9001:2000
Cert No. FS 519255

- machine dynamics, noise and vibration, NVH
- failure analysis, fatigue and accelerated life testing
- specialised instrumentation, data acquisition and analysis
- rotating machinery design and troubleshooting:
gearboxes, shafts, bearings, couplings, belts and chains

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OPERATION

The transceiver offers analogue telemetry output signals for each channel via SMB connections whilst operating in stand-alone mode, which can be interfaced to any data acquisition or control system (0-5 V or 4-20 mA output). The status LED indicates transmitter presence and signal quality, and warns of low battery. The bundled PC application software allows hardware configuration including setting channel offset (zero balancing), on-screen live streaming mode (telemetry) and logging to hard drive in one simple package.

Up to 20 systems can operate independently on separate frequency bands, or multiple transmitters can be used (at different times) with the same receiver.



Fig. 1: One, two, and four channel transmitters



Fig. 2: Four channel receiver showing status LED, power switch, four analogue output and tachometer connectors

SIGNAL CONDITIONING

Transducer supply:	3.0 V fixed—other optional
Input protection:	± 40 V
Output protection:	Continuous short-circuit to GND
Input Gain:	300x (1 - 10,000x optional)
Input filter:	2-pole Butterworth active filter -3 dB @ 20 kHz -40 dB roll off per decade
Input bandwidth:	Gain dependant, typ. 50 kHz @ G=300 - Other available
CMRR:	> 100 dB @ G=1000
Nonlinearity:	$\pm 0.02\%$ of FSR
Gain Tempco:	< ± 25 ppm/ °C

DIGITAL

A/D Converter:	16-bit (300x input amplifier gives > 24-bit effective resolution)
Sampling rate:	40 kHz (aggregate)
Radio transmission:	2.4 GHz ISM (licence free) 30 m signal range

ELECTRICAL

Power Supply:	3.6 to 12V - other (1V to 48V) available using external voltage regulator or DC-DC converter.
	18 mA @ 3.6 V incl. digital radio streaming and one 350 Ω strain gauge
	80 μ A @ 3.6 V in low-power sleep mode
Operation temp.:	-40 °C to +85 °C

PHYSICAL

Size:	37 x 21 x 5.5 mm
Weight:	8 grams
Mechanical Protection:	Encapsulated to withstand 10,000 g shock