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TELEMETRY TORQUE MEASUREMENT

SERIES 285

USER MANUAL

Fourth Edition

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SYSTEM OVERVIEW

The M85 Series Telemetry Measurement System measures signals from a full-bridge, strain gage based transducer [0]. It conditions signals to provide high level analog signal for analysis. The transmitter's small size and light weight allows measurements in areas with limited space and/or rotating applications.

The M85 Series Telemetry Measurement System includes three components: transmitter [1], receiver [2], and power source [3]. The transmitter incorporates a single strain gage driver and amplifier. It sends the data signal (measured across S+ to S-) via radio frequency (RF). The data signal is transmitted from the remote or moving location to the stationary receiver via an RF signal. The RF carrier is frequency modulated by the data signal. After detection by a receiving antenna, the signal is demodulated to provide the original torque data. A programmable, low-pass filter in the receiver provides data output bandwidths from 10 to 1000 Hz.

Transmitter power is supplied by a battery [4], or optionally by an induction power system [5]. Each time the power is applied to the transmitter, an automatic zero and shunt calibration sequence is transmitted for approximately 5 seconds *(see Calibration Overview for more information)*.

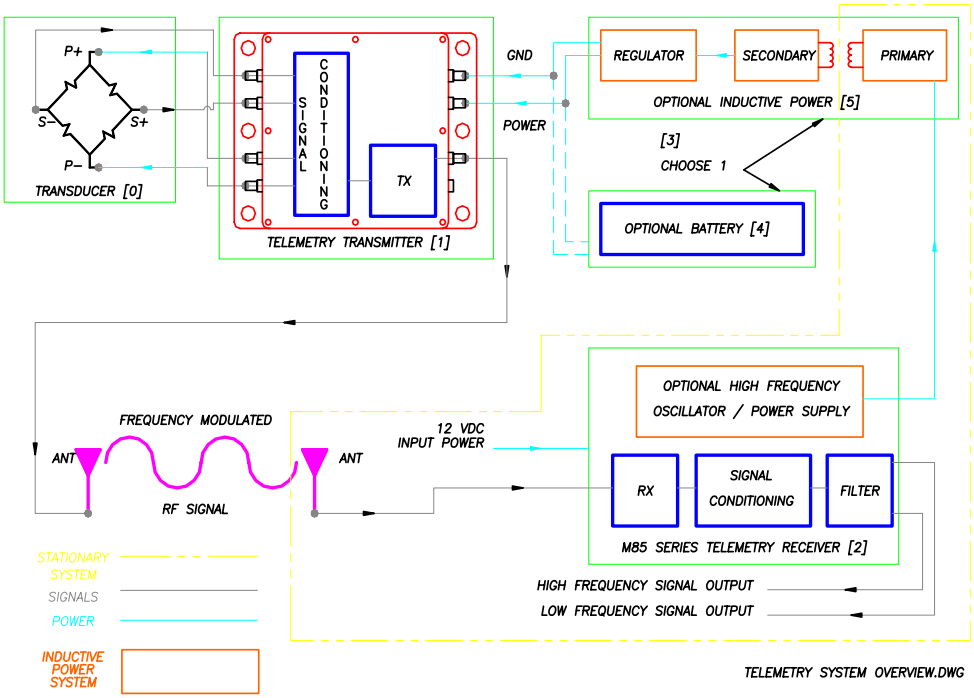

Figure-1
Telemetry System Overview System Diagram

SYSTEM OPERATION

Transmitter

The transmitter provides excitation to the stain gage full-bridge and amplifies the returning signal. The strain gage data is then used to modulate the carrier signal transmitted to the receiver box.

Battery / Battery Pack

The transmitter can be powered with 6 to 12 VDC source. In battery powered applications, typically a 9 Volt battery is used. Standard alkaline batteries will power the transmitter for approximately 8 hours.

Induction Power and Rectifier/Regulator (Optional)

The primary and secondary induction power coils make up a non-contacting transformer. The secondary magnetically couples to the primary coil. The secondary coil produces AC power output that is rectified and regulated. The regulator provides a constant 7V DC to the transmitter. The regulator has optional circuitry that when enabled, senses the output voltage. If the voltage is out of range, the regulated DC power is turned off. This ensures that only adequate power is delivered to the transmitters and transducer strain gage bridge excitation (P+ to P-).

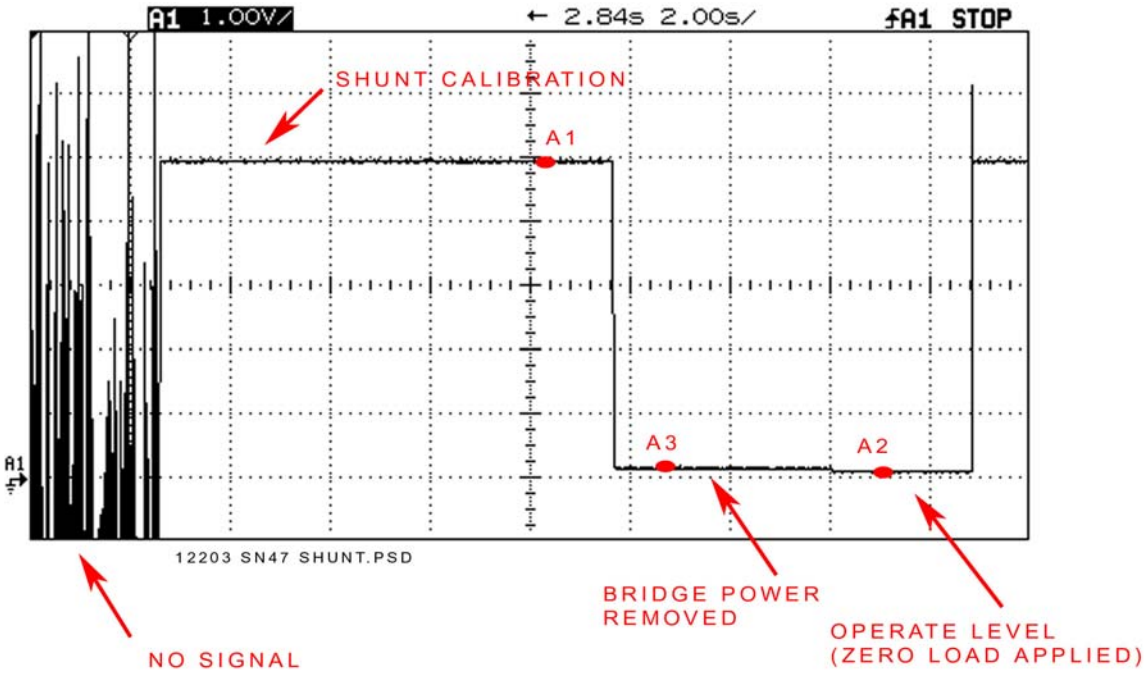

Figure-2
Typical Calibration Sequence

Calibration Overview

The calibration sequence is generated to provide the user with a known reference load and to verify if the transmitter is working properly. The calibration sequence will also help the user determine changes in bridge offset or gain of the transducer and electronics over time.

Figure-2 illustrates a typical calibration sequence. The voltage level during shunt calibration (A1-A2) is dependent on the shunt calibration resistor

installed at the factory, and the bridge resistance (typically 350 Ohms). The shunt calibration resistor value can be found in the Appendix this manual.

When turned on, the transmitter generates a two cycle calibration sequence. Each cycle contains the following information:

Shunt-Calibration Level 1 (A1)	A shunt calibration resistor is applied across the positive excitation (P+) and negative signal (S-) leads of the transducer bridge forcing an output of the transmitter, which represents a torque value that is determined by the initial calibration of the strain gage transducer. The shunt value is determined by the delta (voltage difference) of A1-A2.
Zero-Calibration Level 2 (A3)	The 5V excitation voltage is removed from the torque transducer bridge to allow the user to observe any signal conditioning electronics offset and background noise.
Operate Level 3 (A2)	The 5V excitation voltage is reapplied across the strain gage transducer bridge. This allows an output, which represents the torque across the strain gages, to be measured.

Receiver

Adjusting Zero Torque Output	After the transmitter has completed the calibration sequence, the zero torque output (A2) can be adjusted. First verify that there is zero load applied to the transducer. Adjust the voltage output level by turning the potentiometer located on the receiver front panel. Connect a voltmeter to either the high or low bandwidth output BNCs and adjust the voltage level to 0.000V DC. This adjustment should be checked as often as possible, and readjusted when necessary. *Note: The transmitter has no provision for adjusting the zero balance of the transducer (A2-A3). If the transducer zero balance is too far from zero, the signal level may be clipped if excessive load is applied to the transducer.* ***For reliable operation, it is recommended that the zero balance of the transducer be within 5% or less of the rated load.*** *The zero is adjusted by balancing the bridge with resistors.*
Signal Level Indicators	The purpose of the Light Emitting Diode (LED) indicators is to allow the user to monitor the strength of the radio frequency (RF) signal being received from the transmitter. As the transducer is operating, the signal strength may vary due to the change in position of the transmitting and receiving antennas. Each LED represents a ten-fold scale of signal strength.

Receiver Outputs

The receiver box has two different analog output BNC connectors that can be used; each with a unique filter. Two different outputs are available to filter the transducer signal to meet specific requirements.

The HIGH OUTPUT signal uses a five pole low-pass Butterworth programmable filter that can be set at 20, 50, 100, 200, 500, or 1000 Hz. This is easily programmable by changing jumpers on the receiver's printed circuit board.

In order to evaluate high frequency transducer signals that occur during dynamic events, it is necessary to set the programmable filter higher and use the HIGH BANDWIDTH OUTPUT signal. (Factory default setting is 1000Hz.)

For measuring average transducer signals, then the programmable filter should be set at 50 Hz or lower, or the 10 HZ output can be used.

The 10 HZ output has a single pole RC Low Pass filter which is fixed.

TELEMETRY SYSTEM COMPONENT IDENTIFICATION

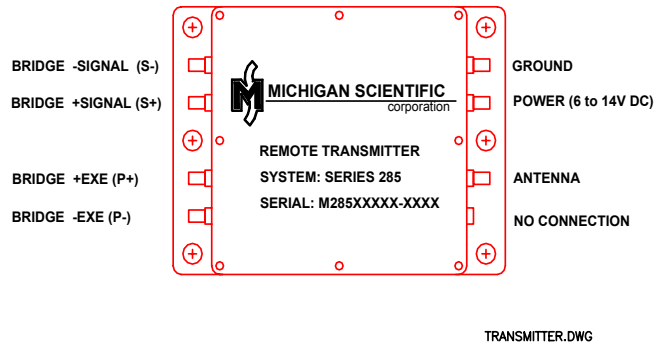

Figure-3
Transmitter Terminal Identification

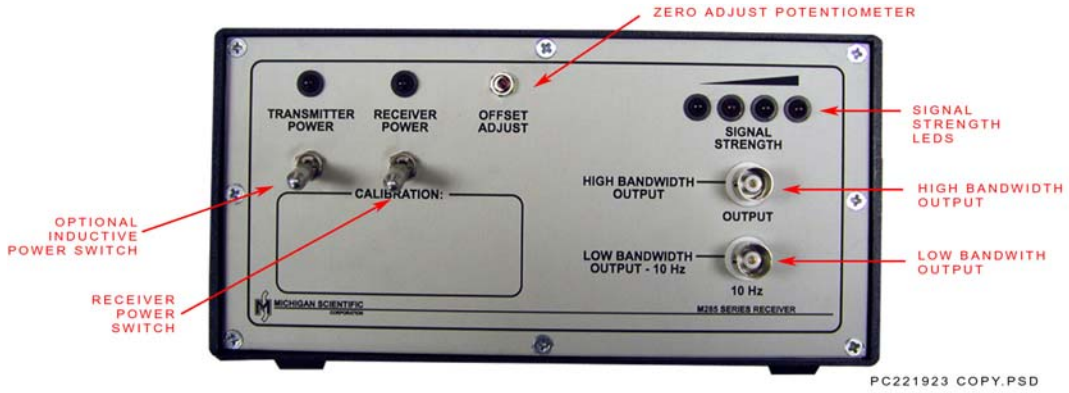

Figure-4
Single Channel Receiver Box Front Panel

Figure-5
Single Channel Receiver Box Rear Panel

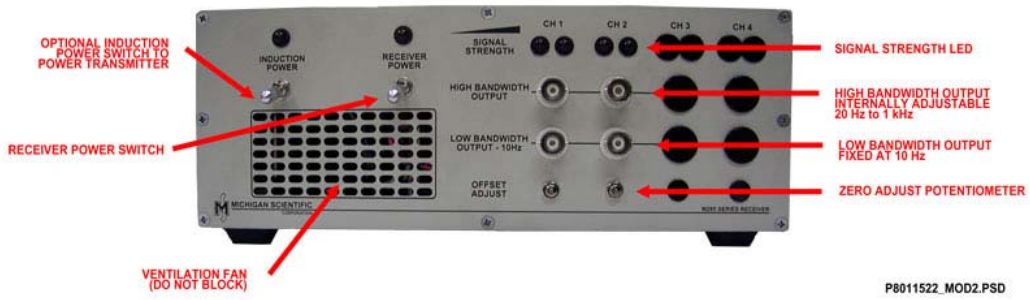

Figure-6
Multi-Channel Receiver Box Front Panel

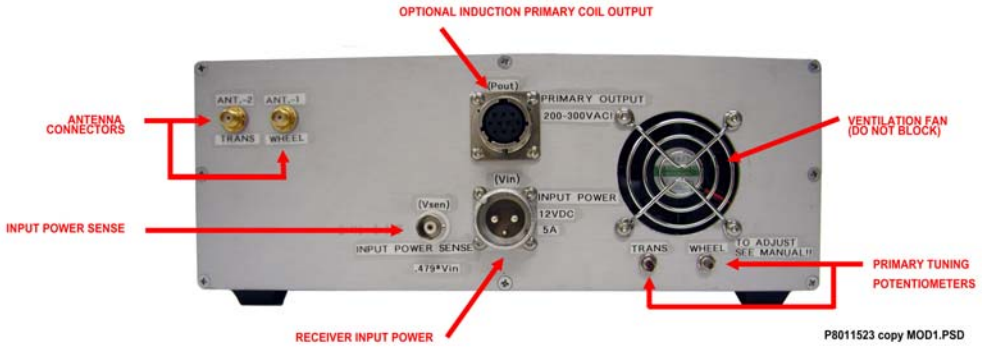

Figure-7
Multi-Channel Receiver Box with Optional Inductive Power Rear Panel

Figure-8
JJB Receiver Antenna

Telemetry Receiver and Antennas

The receiver box should be placed in an area protected from the weather. The power cable and the antenna cables need to connect to the rear panel. It is important for the receiver to have adequate ventilation. Do not block the front or rear ventilation fans. Transmitter and receiver temperature specifications are later in this section.

The power cable is connected directly to the battery due to the high current level required by the induction power system. The 12V DC supply should be able to provide a minimum of 5A of current.

The rear wheel receiver antenna should be mounted as close to the rotating wheel transmitter and antenna as possible. Position the antennas away from large bodies of metal that will weaken or block the transmitted and received RF signals. The signal strength LEDs on the front panel of the receiver box help determines the best antenna position and arrangement during installation.

The polarity of the antennas should be matched as displayed in Figure-12. The transmitter and receiver can be mounted at any distance to each other as long as the polarities are aligned.

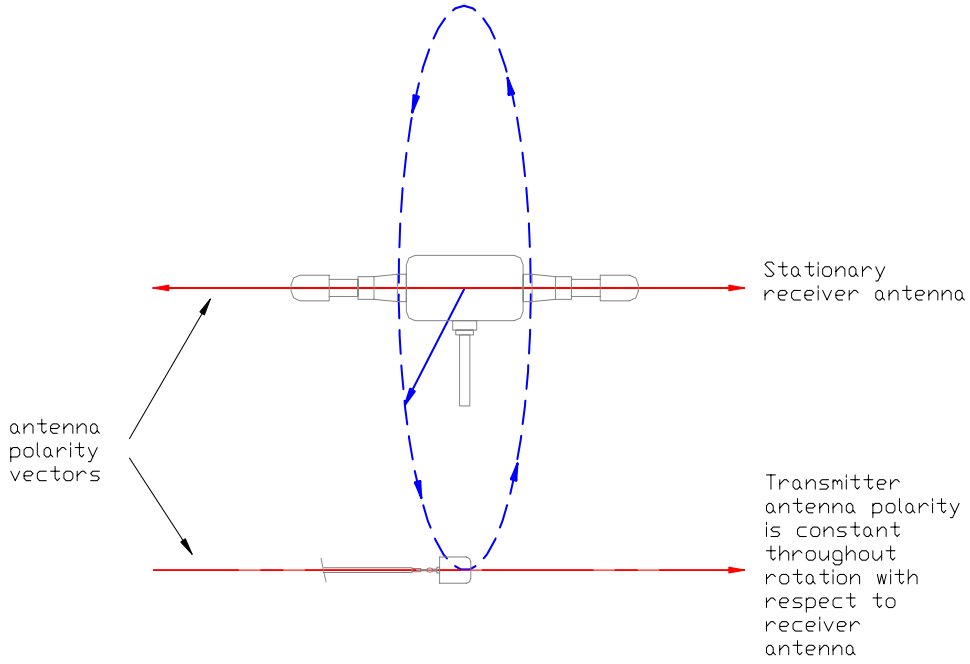

Figure-12
JJB Antenna polarity alignment