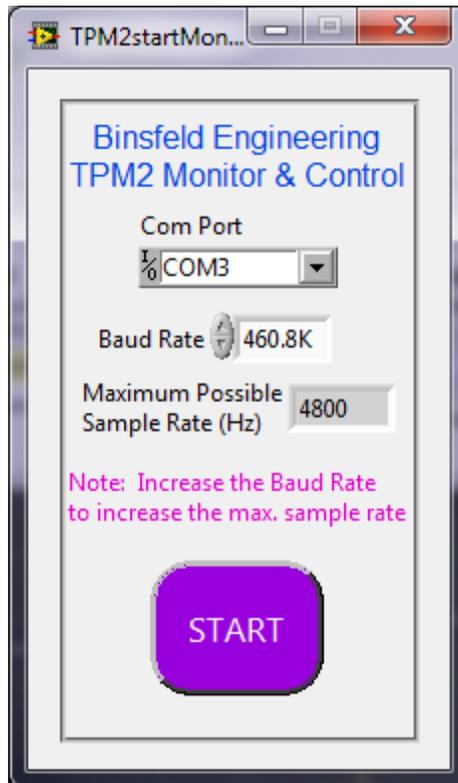




TorqueTrak TPM2 Configuration and Monitor



Software Manual

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1 General

The Binsfeld Engineering TPM2 Configuration and Monitor program is a software tool intended to initially configure and monitor a TPM2 system for proper operation. The program communicates with a TPM2 Stationary Unit through a RS-422 interface from a PC.

2 Communications Interface

The recommended RS-422 interface for a PC is the B&B Electronics USOPTL4-LS isolated RS-485/422 to USB adapter.

The RS-422 interface drivers must make the interface appear as a standard COM port to the PC. Follow the manufacturer's instructions for installing the RS-422 interface and driver.

3 Program Installation

The latest version of the TPM2 Configuration and Monitor program is available for download upon request.

4 Program Operation

4.1 Starting the program

The program can be started by double-clicking its executable filename or a shortcut to it. The program begins by displaying the Start window shown in Figure 1 - Program Start

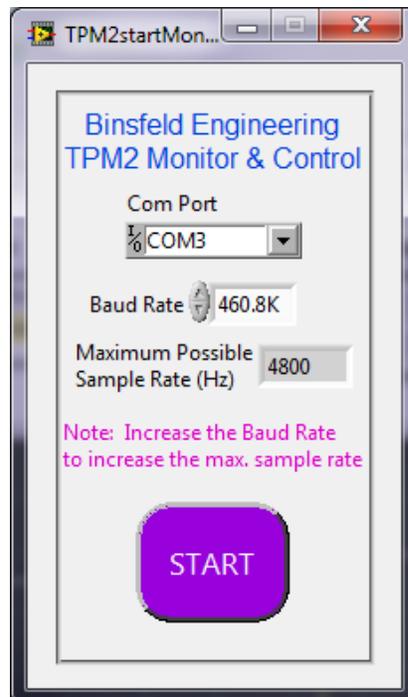


Figure 1 - Program Start

The COM port used by the RS-422 interface must be selected from the drop-down list of possible COM ports.

If uncertain which COM port is being used by the RS-422 interface, generally it can be found by entering Device Manager from the Control Panel and reviewing the COM ports as shown in Figure 1. Depending on the adapter and interface driver, the connection may be labeled as RS-485 (as shown in Figure 2) or something else. Unplugging the adapter from the PC (if it is a USB adapter) will typically make it disappear from the list. Plugging it back in will make it re-appear.

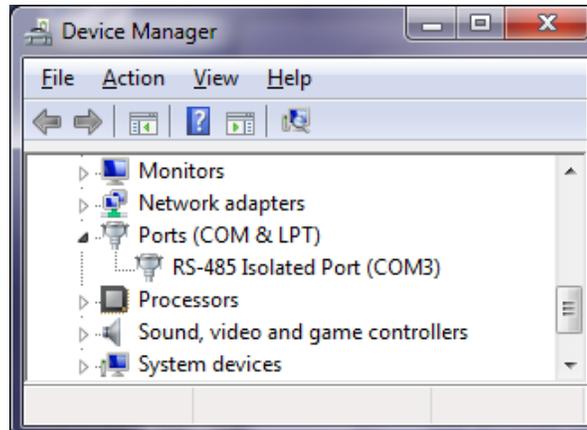


Figure 2 – COM ports in Device Manager

COM ports in Device Manager

If unsure how to open Device Manager, search Help on your PC for Device Manager or do an internet search for "open device manager" for the version of Windows you are using.

Once the proper COM port is selected, select the desired communications baud rate from the Baud Rate drop-down list. Generally this should be 460.8K unless the RS-422 cable is very long or electrically noisy. The higher the communications baud rate, the higher the maximum possible sample rate will be. If a high sample rate is not needed, a lower baud rate may be more reliable and less prone to errors. The Maximum Possible Sample Rate indicator (seen in Figure 1) shows the maximum possible sample rate based on the selected Baud Rate value.

After selecting the proper COM port and Baud Rate, click on the START button to continue to the Main Screen. If communications with the TPM2 cannot be established an error message will be displayed (wrong COM port, no power) and the program will terminate.

4.2 Main Screen

After establishing communications with the TPM2, the Main Screen is displayed as shown in Figure 3 - Main Screen.

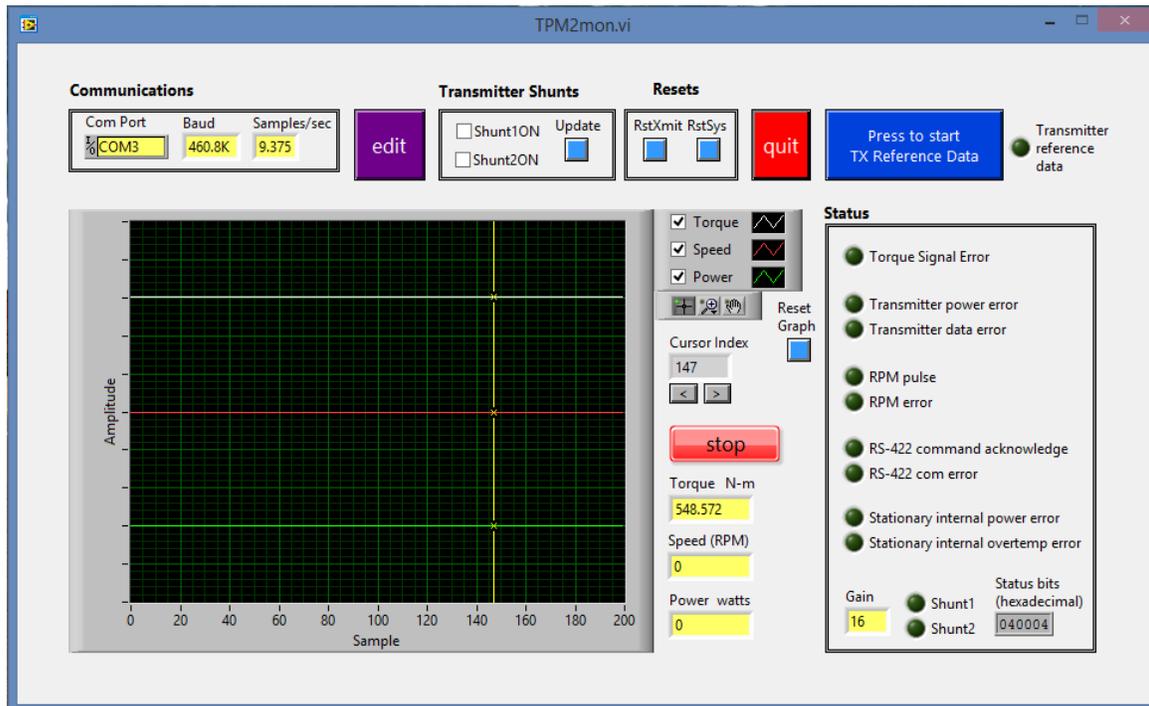


Figure 3 - Main Screen

The main screen has various controls and indicators as described in the following paragraphs. In general, values in yellow boxes are indicators and cannot be changed. Values in white boxes are controls and are editable.

4.2.1 Communications status

The upper left corner of the Main window shows communications settings and the present sampling rate. The COM port and Baud Rate cannot be changed here. To change the COM port and/or Baud Rate, quit the program and start over. This will take you back to Figure 1 on page 2, where these settings were originally assigned.

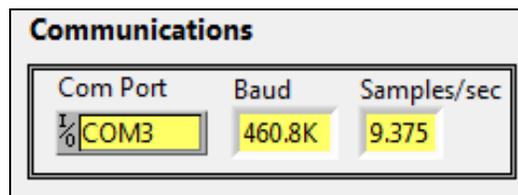
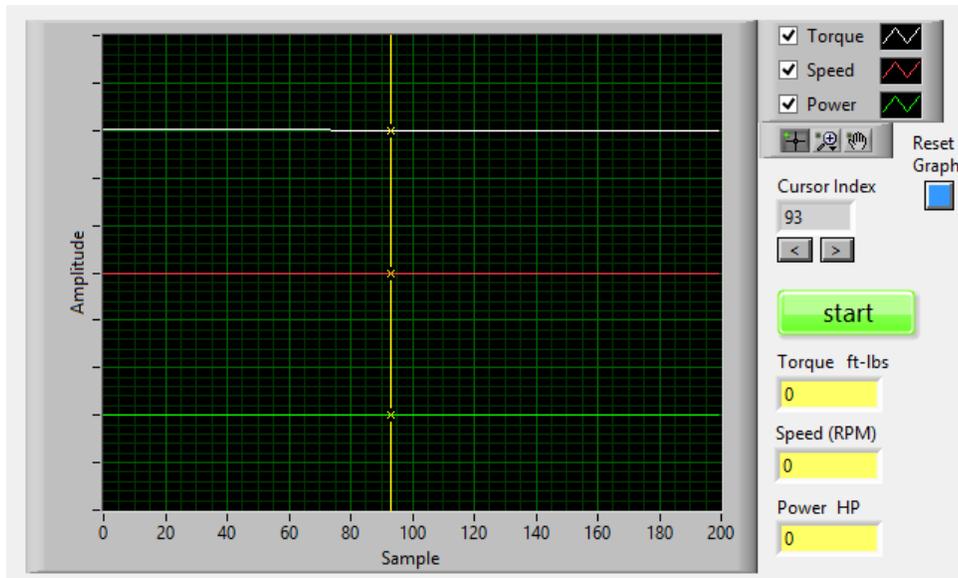


Figure 4- Communications Status

The sample rate cannot be changed here either but the edit window opened with the purple edit button does allow the sample rate to be changed.

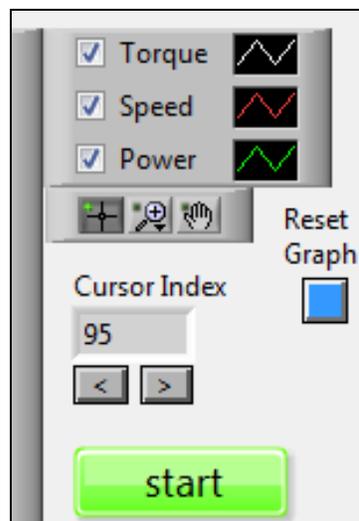
4.2.2 Graph

The graph in Figure 5 shows torque as measured by the strain gage. It also shows shaft RPM, and calculated power. These are shown in the graph by the white, red, and green traces respectively. Power is a calculated figure using the measured torque and speed.



4.2.2.1 Graph Controls

The controls for the graph, are located to the right of the graph. Each of the three traces of the graph (torque, speed, & power) can be toggled on/off using the check boxes. The three buttons directly under that are Cursor Movement, Zoom, and Pan Controls.



The start/stop button in Figure 6 controls when display data is acquired. While acquisition is running, the display shows the most recent 200 samples with the sample at the cursor being the newest. The horizontal scale indicates the sample number. At slow sample rates the cursor appears to scan from left to right. As it moves it overwrites older samples in the sample buffer. In other words, the sample to the right of the cursor is the oldest sample, and the sample at the cursor is the newest sample. At higher sample rates, the cursor remains at the right edge of the graph and the display is a snapshot of the newest 200 samples.

When the display is stopped, the cursor (vertical line) can be moved incrementally by using the left/right arrows under Cursor Index. Optionally, with the Cursor Movement button selected the cursor can be moved back and forth by left clicking on the vertical line (and holding) and then moving your mouse left or right. The Cursor Index value corresponds to the scale at the bottom of the graph.

With acquisition stopped the last 200 samples acquired are held on the screen. The Magnification and Panning tools can be used to more closely examine parts of the graph. Values of the graph traces at the cursor (vertical line) are displayed in the yellow boxes under the graph controls as shown in Figure 7.

The blue Reset Graph button in the Graph Controls area (Figure 6) can be used to restore the graph display after panning and zooming.

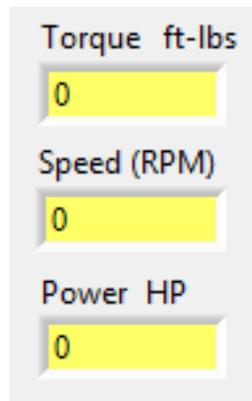


Figure 7 - Values at Cursor

4.2.3 Status Information

Figure 8 represents a summary of the 24 status indicators (Status Bits) associated with each sample.

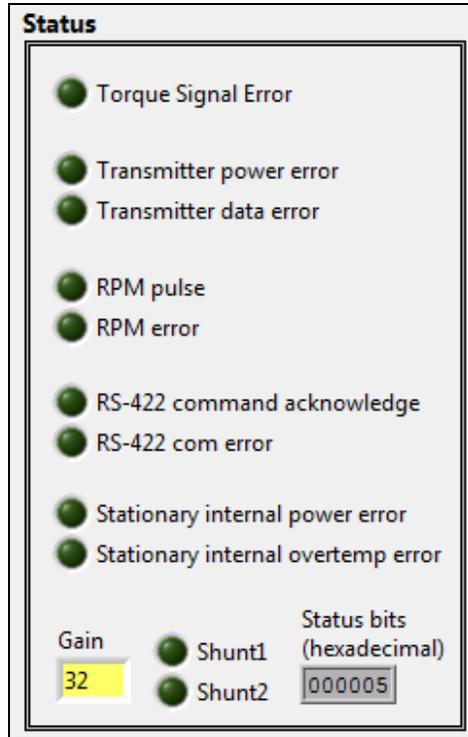


Figure 8 - Status Information

4.2.4 Misc. Controls

4.2.4.1 Transmitter Shunts

The Transmitter Shunt Controls can be used to verify system operation without directly accessing the strain gage. Checking/unchecking the Shunt check boxes *followed by clicking on the blue Update button* controls the connection of two shunt resistors internal to the transmitter. Shunt1 controls connection of a fixed precision resistance of 87,370 ohms between the –Sense and –Excitation terminals inside the transmitter (in parallel with one arm of the strain gage bridge) simulating strain that produces a torque signal output corresponding to 1 mV/V, or 500 μ e (assuming a gage factor of 2.00). Shunt2 controls connection of a fixed precision resistance of 437,500 ohms simulating 200 mV/V, or 100 μ e. When both shunt boxes are unchecked and Update is clicked, the internal shunt resistors are disconnected from the bridge circuit.

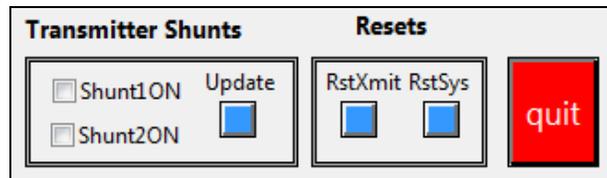


Figure 9 - Miscellaneous Controls

Note: The Shunt1 and Shunt2 Status Indicator lights in Figure 8 display the status of the shunt connections as reported by the transmitter for verification purposes.

4.2.4.2 Resets

The transmitter can be reset independently by clicking the *RstXmit* button. The entire system can be reset by clicking the *RstSys* button (Figure 9).

4.2.4.3 Quit

The red *quit* button closes the program when clicked (Figure 9).

4.2.4.4 Press to start TX Reference Data

This button causes the transmitter to send reference waveform data instead of actual strain gauge data. This is useful for troubleshooting the strain gauge data path through the system. The raw reference data values ramp between ± 24480 . The Torque values displayed in the graph are calculated using the equations found in the TPM2 Communications Specification ([TPM2 Communications Manual](#)). Each step has a duration of 2 seconds then increments or decrements by 240. The reference data passes through internal filtering and compensation. Offset and scale factors for each gain setting can be derived from the torque values reported. It is also a good check that data is being received from the transmitter correctly. Reference data continues to be transmitted until the transmitter is reset (see 4.2.4.2).

5 Edit Parameters

5.1 Units of Measure

Clicking the purple *edit* button (Figure 3) opens a small window labeled “Units”, allowing the opportunity to select between metric and English units of measure.

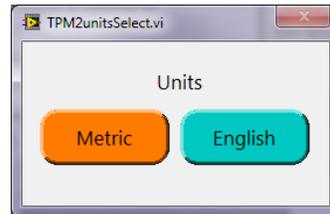


Figure 10 - Units Selection Prompt

5.2 Parameters

The shaft dimensions are determined by the specific shaft on which the customer intends to measure the torque and/or power. The dimensions are input in the white boxes labeled OD (outside dim.) and ID (inside dim.).

The screenshot shows a software window titled "TPM2paramEdit.vi" with a standard Windows-style title bar (minimize, maximize, close buttons). The window contains several sections of controls:

- Shaft Dimensions:** A section with a unit selector set to "inches". It contains three input fields: "OD" (value: 3.937), "ID" (value: 0), and "Collar OD" (value: 7.52).
- Gage Factor:** An input field with the value 2.000.
- Active Gages:** A dropdown menu currently showing "Full bridge, 4 active arms".
- Modulus of Elasticity (E):** An input field with the value 29.9936 and a unit selector set to "Mpsi".
- Poisson's Ratio (v):** An input field with the value 0.3.
- Speed PPR:** A spin control with the value 1.
- Gain Select:** A spin control with the value 16.
- Samples/sec:** A spin control with the value 9.375.
- RPM:** A separate section with two spin controls: "Zero Speed Threshold" (value: 40) and "Maximum Operational" (value: 200).
- Calculated Limits and Positive Full-Scale Values:** A section with four input fields: "PFS micro Strain" (value: 1000), "PFS Torque" (value: 23k) with a unit selector set to "ft-lb", "Max RPM" (value: 6900), and "PFS Power" (value: 877.3) with a unit selector set to "HP".
- Buttons:** At the bottom, there are two large buttons: a green "Accept" button and a red "Cancel" button.

Figure 11 - Parameters Edit Window

The Collar OD will be automatically calculated from the information entered in “Shaft Dimensions”.

The gage factor can be found on the gage package.

The active gages should be set to “4”. Please contact Binsfeld Engineering to discuss any other gage options.

The Modulus of Elasticity and Poisson’s Ratio are determined by the material of the shaft. If unknown, please contact the BEI sales staff for instructions on how to proceed.

Speed PPR should be set to “1”.

Gain Select is a user selectable adjustment that allows the user to scale the torque signal to fit within the window of the graph.

Samples/sec can be selected from the values available in the drop-down list.

5.2.1 RPM Parameters

5.2.1.1 Zero Speed Threshold

The zero speed threshold is the RPM value below which the RPM is reported as zero.

5.2.1.2 Maximum Operational RPM

The maximum operational RPM is the maximum real world expected RPM of the shaft.

5.2.2 Calculated Limits and Positive Full-Scale Values

The calculated limits and positive full-scale values are calculation results based on the parameter values in the white boxes. Changing values in the white parameter boxes will cause the calculated values in the yellow boxes to be updated accordingly.