THE SKIDMORE-WILHELM DIGITAL TORQUE TESTER

Dynamic Torque Tester -- for Impact Wrenches

Static Torque Tester -- for Hand Torque Wrenches

Introduction. Testing of power tools, especially impact wrenches, has been a difficult task. Because the applied force of an impact tool is not continuous, the friction in the joint alternates between a static and dynamic condition. Tests that tighten a nut and bolt, while simulating the way the tool is used, depend on a fixed torque-tension relationship. Any change in the coefficient of friction will effect test results. The new Skidmore-Wilhelm Digital Torque Tester removes all the variables, including thread friction, and creates a new standard in power tool testing. Consistent test results are now possible and a true picture of maximum tool output can be seen.

The DTT utilizes state of the art electronics and a specially designed mechanical beam. An adapter with a square hole is attached to the free end of the beam. The square drive of the power tool is inserted into the adapter and the tool is operated in its normal manner. The beam, which has been "tuned" to eliminate extraneous forces, senses the impulses delivered by the tool and transmits a signal to the digital meter. The digital meter converts the average peak impulse into a digital torque reading.

A three-position switch is located under the digital display. In the "Static" mode, the Digital Meter displays the torque applied to the beam. The display will increase or decrease in response to changing torque. The "Static" mode is used to check beam and dial torque wrenches and for calibration of the model T. The "DYNAMIC" position also displays torque, but has a peak hold feature. The display shows the highest torque applied and will return to zero only when the operator depresses the Zero button. The "DYNAMIC" position is used when testing impact tools or click-type torque wrenches. A third setting on the meter is "impacts per minute" which will display the blows per minute of the impact wrench.

When using the Digital Torque Tester to make comparisons between tester results and job specifications, it is important to understand the nature of tightening fasteners with impact wrenches. Impact wrenches are not torque tools, but rather impulse devices. An impulse is a high-energy blow delivered in a very short time. The effectiveness of an impulse is directly related to the nature of the struck mass, and in fact the wrench, the socket, the fastener, and the joint become a large system. The net result is that unless the joint conditions are the same as the test conditions, torque values from a testing device will not be the same as the job torque requirements.

How do you make the correlation between job specs and test, and what does the Digital Torque Tester do that could not be done before? First, the DTT will give consistent tests not obtainable up to now. All the variables have been eliminated and a true picture of tool output is seen. This means that variations in test results are due to the impact wrench only.

The next step is to develop a testing specification for a tool on a particular job. Inspect the installed fasteners and if the product is acceptable, then the power tools are working properly. Test these tools on the DTT and record their output. This test reading becomes the job specification for those tools. Remember that the Digital Torque Tester is a relatively hard joint and most test readings will be higher than actual assembly specifications.

OPERATION AND CONTROLS

1. OPERATION

Set the voltage selector located on the back of the display unit (DRO) to 110 vac or 220 vac. The tester is supplied with a power cord for one voltage or the other. Insert the power cord into the meter and connect the transducer cable to the meter and the transducer. Flip the toggle switch to on and the unit is ready to operate.

After the unit is turned on, the decimal point will roll across the display while the processor is initialized. After about 45 seconds, the decimal point will stop, indicating the processor is ready. Either an "S" or "L" will be displayed. Once "S" or "L" has been selected, you will not have to change. This setting is made at the factory. To go into the operating mode, push and release the Zero button, and the screen will clear.

Note: The DRO can be used with either the T-2000 or T-3000. To operate and calibrate the T-2000, select "S". To operate and calibrate the T-3000, select "L". To make this selection, push and release the Send button to toggle between "S" and "L". Push and release the Zero button to make the selection. Note that the 3-position switch can be in any position. Once the selection has been made, only turning off the display and following the procedure above can change it.

2. CONTROLS

1. On/Off toggle turns power to meter on and off.
2. Three position switch. Sets the display to Static, Impacts per minute, or DYNAMIC.
3. Units toggle. Sets torque units to foot pounds or Newton meters.
4. Send button. Used in calibration and in sending data through the RS 232 port.
5. Zero button. Sets the display to zero.

OPERATING INSTRUCTIONS

Operation of the DTT is simple, but a few rules should be followed. Because we are working with an impulse system, all connections and test stands must be positive and solid. Loose bolts on the tester will cause incorrect readings. Attach the Beam assembly to a bench so that it will remain secure during testing.

For testing Impact Wrenches:

1. Attach appropriately sized adapter to Beam coupling and secure with two socket head cap screws. To change remove the adapter, remove the two cap screws and insert a screwdriver on either side of the adapter. Gently pry out. Insert the new adapter. It may be necessary to lightly tap it home. Tighten the screws so they do not work loose during operation.

2. Turn Digital Meter on and allow one minute to warm up.

3. Insert square drive of impact wrench into adapter.

4. Turn mode switch to "DYNAMIC", and push reset button to obtain a zero reading.

5. Operate tool, making sure to hold it steady and on the centerline of the Beam. Run tool from 1 to 5 seconds, stop and observe reading.

6. Push the reset button to zero and operate tool again as needed.

7. To obtain impacts per minute, turn the mode switch to the center position and operate the tool until the maximum reading is obtained which should take 3 to 5 seconds. Note that this reading will go to zero when the tool is stopped.

For Testing Hand Torque Wrenches:

1. Insert the square drive of the torque wrench into the appropriate adapter and operate the wrench. With the mode switch set in the static position, the Meter reading will increase or decrease as force on the wrench changes.

2. Click-type torque wrenches can be tested with the mode switch set to "DYNAMIC". This will allow the maximum reading to be held after the torque wrench has released. Beam type torque wrenches can also be tested in this manner. However, be aware that the Meter will display the highest reading and hold that despite the torque wrench being released.

3. Push the reset button to zero and operate the tool again as required.

CALIBRATION

1. CALIBRATION

Prior to adjustment and calibration, run a test to determine if the unit requires adjustment. Apply a known torque with either a calibrated torque wrench, or through a bar and weights. Select your own test points and compare the readings. If the tester meets your specifications, then no adjustments are necessary. The system is calibrated to +/- .5%; +/- 1 count prior to shipment. Your specs may not be as stringent.

1.1 To calibrate the Digital Torque Tester, the display must be in the calibration mode. The meter cannot be calibrated by itself, but must be connected to the transducer. To enter the calibration mode, select the Static position on the 3-position switch and depress and hold the Zero button. While holding the button in, press and release the Send button. Then release the Zero button and "CAL" will be displayed on the LED's. To exit the calibration mode at any time, press and release either the Zero or the Send button after selecting either Static or Impacts.

1.2 Attach your torque bar to the transducer. Determine the maximum calibration torque. This value is the maximum torque developed by your calibration weights. Do not exceed the capacity of the transducer, which is 400 foot pounds for the T-2000, and 1000 foot pounds for the T-3000. The calibration point is set at 90% of the capacity of each tester.

1.3 Select "DYNAMIC" and read the current calibration torque. The calibration torque for the T-2000 is 360 foot pounds and 900 foot pounds for the T-3000. To increase the value, press and release the Send button. To decrease the value, press and release the Zero button. The final value will remain until the calibration is complete.

1.4 With the bar still attached to the transducer, but without any weights, set the zero calibration point. Select Static, then depress and hold the Zero button. While holding the Zero button, press and release the Send button, and then release the Zero button. The decimal point will move across the display for about one minute while the zero is being initialized. Do not bump the torque bar during this interval.

1.5 Now load the torque bar with your calibration weights. When the bar stabilizes, start the calibration by pressing and holding the Zero button. With the button held, press and release the Send button, and then release the Zero button. Again the decimal point will flash across the display while the processor sets the calibration. The bar must remain steady during this time. Calibration is complete when the decimal stops. Exit from the calibration mode is automatic. The unit is now ready for operation.

Turning the display off will not effect the calibration. Calibration will be stored in memory until changed by another calibration. The torque display can be calibrated for both the T-2000 and the T-3000 and will store both.

CALIBRATION SUMMARY

CALIBRATION STEPS	ZERO BUTTON (1)		SEND BUTTON (2)		3 POSITION SWITCH
Cal Mode	Push and Hold	1	then	2	Static
	Release	2	then	1	
Set Calibration Torque Value	Decrease		Increase		Output
Set Zero	Push	1	then	2	Static
	Release	2	then	1	
	Flashing stops when Zero is set.				
Load Weights	Do not move bar after loading completed. Allow 20 sec. to settle				
Calibrate Readout to Applied torque	Push	1	then	2	Static
	Release	2	then	1	
	System exits calibration mode automatically.				

"ADDITIONAL OPERATING INSTRUCTIONS"

FOR THE SKIDMORE-WILHELM DIGITAL TORQUE TESTER

1. Changing the Square Drive Adapter.

   To remove the square drive adapter, first take out the two 1/4-20 socket head cap screws. Next, insert two small screwdrivers into the slot behind the adapter. Carefully move the screwdrivers back and forth so as to pry the adapter away from its mating part. If this prying process causes the adapter to bind, then put the screwdrivers in different positions and continue the prying process.

2. Insertion of the New Square Drive Adapter.

   First, clean off the front surface of the coupling so that there is no dirt on the surface. It is vital to successful operation of the digital tester that the connection between the coupling and the square adapter be solid. With the square adapter lined up with the appropriate holes on the coupling, gently tap the adapter into place with a soft-faced hammer. Finally, insert the two 1/4-20 screws and tighten them so they will not work loose during the testing process. If the threads of these screws become worn through repeated usage, replace them so they do not damage the threads in the coupling. The adapter and coupling are designed to fit snugly and should not vibrate during the test. Also, the fit between the coupling and the end of the beam itself, should be snug. If either of these parts becomes loose through wear or damage, they should be replaced.

3. Observation of Readings.

   Before each test, whether you are using an impact wrench or a hand torque wrench, it is important to push the zero reset button every time. The peak hold circuit on the output side is designed to hold the maximum torque reading. However, the digital torque tester is not designed to hold this reading for an indefinite period of time and a small amount of drift in this reading is acceptable. The reading to be used for testing purposes is the first reading you see when the testing has been completed.

4. Cable Hook-up.

   The digital torque tester has been designed specifically for testing impact wrenches in factory environments. However, it is an electronic instrument and should be handled with appropriate care. The adapters on the cable are designed to provide a positive, electrical connection between the beam and the digital readout. Do not force the adapter in place if it is not lined up, because the pins will be bent. The cable adapter has a small tab which will line up with the adapter on the meter and/or beam. This tab lines up when inserted at the 6:00 position. After the tab is lined up, rotate the collar on the cable adapter clockwise to lock in place.