*TB 9-6635-200-24

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR TORQUE TESTERS, PENDULUM-TYPE AND TORSIONAL-TYPE MIL-T-26639

Headquarters, Department of the Army, Washington, DC
30 August 2007

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can improve this manual. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also send in your comments electronically to our E-mail address: 2028@redstone.army.mil or by fax 256-842-6546/DSN 788-6546. For the World Wide Web use: https://amcom2028.redstone.army.mil. Instructions for sending an electronic 2028 can be found at the back of this manual.

*This bulletin supersedes TB 9-6635-200-35, dated 14 February 1992.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Torque Testers, Pendulum-Type and Torsional-Type MIL-T-26639. The manufacturer's manual and MIL-T-26639 were used as the prime data sources in compiling these instructions. The equipment being calibrated will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. Type E torsional-type torque testers do not have pointer pushers.

b. Time and Technique. The time required for this calibration is approximately 2 hours for each model, using the physical technique.

2. Forms, Records, and Reports

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25.

b. Adjustments to be reported are designated (R) at the end of the sentence in which they appear. When adjustments are in tables the (R) follows the designated adjustment. Report only those adjustments made and designated with (R).

3. Calibration Description. TI parameters and performance specifications which pertain to this calibration are listed in table 1.

Table 1. Calibration Description

Test instrument parameters	Performance specifications
Pendulum type testers[1]	Ranges: 50 to 500 ft-lbs (600 to 6000 in-lbs) 10 to 150 ft-lbs (120 to 1800 in-lbs) 0 to 15 ft-lbs (0 to 180 in-lbs) Accuracy: ±2% or 1 scale division, whichever is greater
Torsional type testers[1]	Ranges: 0 to 500 ft-lbs (0 to 6000 in-lbs) 0 to 150 ft-lbs (0 to 1800 in-lbs) 0 to 100 ft-lbs (0 to 1200 in-lbs) 0 to 250 in-lbs (0 to 4000 in-oz) 0 to 50 in-lbs (0 to 800 in-oz) Accuracy: ±1% of applied load or one dial graduation, whichever is greater Range: 0 to l000 ft-lbs Accuracy: Testers with 10 ft-lbs scale division, ±l scale division Testers with 5 ft-lbs scale division, ±2 scale division

[1]Torque testers with range not specifically listed in table 1 may be calibrated using the appropriate procedure and applicable range limits listed in table 3 or table 5. Accuracy must conform to the applicable accuracy listed in table 1.

SECTION II
EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 2 identifies the specific equipment to be used in this calibration procedure. This equipment is issued with Secondary Transfer Calibration Standards Set AN/GSM-286; AN/GSM-287; AN/GSM-421; or AN/GSM-705. Alternate items may be used by the calibrating activity. The items selected must be verified to perform satisfactorily prior to use and must bear evidence of current calibration. The equipment must meet or exceed the minimum use specifications listed in table 2. The accuracies listed in table 2 provide a four-to-one ratio between the standard and TI. Where the four-to-one ratio cannot be met, the actual accuracy of the equipment selected is shown in parenthesis.

5. Accessories Required. The accessories required for this calibration are common usage accessories, issued as indicated in paragraph **4** above, and are not listed in this calibration procedure.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
FORCE/TORQUE INDICATOR	Range: 0 to 12,000 counts Accuracy: ±0.05% reading	HBM, Model MGCplus (13589298)
TORQUE CELL NO. 1	Range: 0 to 60 in-lbs Accuracy: ±0.5% applied torque from 20% FS to FS (±0.5% of 20% FS below 20% FS)	Lebow Associates, Model 2133-214-5 (MIS-26485 Type 1 CL2)
TORQUE CELL NO. 2	Range: 0 to 20 ft-lbs Accuracy: ±0.5% applied torque from 20% FS to FS (±0.5% of 20% FS below 20% FS)	Lebow Associates, Model 2133-124-20 (MIS-26485 Type 1 CL1)
TORQUE CELL NO. 3	Range: 0 to 100 ft-lbs Accuracy: ±0.5% applied torque from 20% FS to FS (±0.5% of 20% FS below 20% FS)	Lebow Associates, Model 2133-125 (MIS-26485 Type 1 CL3)
TORQUE CELL NO. 4	Range: 0 to 500 ft-lbs Accuracy: ±0.5% applied torque from 20% FS to FS (±0.5% of 20% FS below 20% FS)	Lebow Associates, Model 2133-126 (MIS-26465 Type 1 CL4)
TORQUE CELL NO. 5	Range: 0 to 1000 ft-lb Accuracy: ±0.5% applied torque from 20% FS to FS (±0.5% of 20% FS below 20% FS)	Lebow Associates, Model 2133-127 (MIS-26485 Type 1 CL5)

SECTION III
CALIBRATION PROCESS

6. Preliminary Instructions

a. The instructions outlined in paragraphs **6** and **7** are preparatory to the calibration process. Personnel should become familiar with the entire bulletin before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name as listed in table 2.

c. Unless otherwise specified, verify the result of each test and, whenever the test requirement is not met, take corrective action before continuing with the calibration.

Adjustments required to calibrate the TI are included in this procedure. Additional maintenance information is contained in the manufacturers' manuals for these TIs.

d. Unless otherwise specified, all controls and control settings refer to the TIs.

7. Equipment Setup

a. Pendulum Type

(1) Mount TI in normal operating position. Use all mounting bolts to prevent TI from twisting when weight is applied.

(2) Align TI so that pendulum moves freely, and with no force applied, pointer indicates 0 while resting against dowel pin.

(3) Manually apply a ccw force to dowel pin against pointer to approximately one-half full scale deflection.

(4) Slowly release force until pendulum comes to a static position.

(5) Gently move pointer until it contacts dowel pin. If pointer does not indicate 0, repeat (2) through (4) above and this step.

b. Torsional Type

NOTE

Perform calibration in a cw direction only.

(1) Mount TI in its normal operating position level within one degree. Use all mounting bolts to prevent twisting of TI when weight is applied.

NOTE

One degree is equivalent to a three-fourths length of bubble from absolute level indication as observed on bench level.

(2) Loosen the three thumbscrews holding the plastic dial face in place.

(3) Rotate pointer cw against pointer pusher until all free movement stops.

NOTE

On models without pointer pushers, turn pointer cw until it stops; then turn dial face cw until 0 line on left-hand side lines up with pointer. Proceed to (7) below.

(4) Place thumbs against outer edge of dial face with palms of hands resting against outside of housing. Turn dial face until 0 lines are to left of pointer pusher.

(5) Turn pointer until it lines up with 0 lines on right-hand side of space.

(6) Gently turn plastic dial face cw until pointer is forced against pointer pusher. Continue turning dial face until pointer indicates 0 on 0 line to left of space.

NOTE

If dial face is rotated too far, repeat (4) through (6) above. Use left straight edge of pointer for all readings.

(7) Lock plastic dial face in place by tightening the three thumbscrews.

NOTE

Re-zero dial whenever it seems necessary to insure proper 0 setting.

c. Force/Torque Indicator and Load Cell

(1) Secure holding fixture or torque adapter to a stable, rigid work surface.

(1) Allow equipment to stabilize at ambient temperature.

(2) Connect cable supplied with force/torque indicator to appropriate connector on force/torque indicator and applicable torque cell.

(3) Attach torque cell to holding fixture or torque adapter.

(4) Position torque cell cable so no torque is applied to cell or TI.

(5) Connect force/torque indicator to a 115 V ac power source. Set power switch to **ON** and allow unit to warm-up for 30 minutes. Select channel **3** by using the **CHANNEL +** and – keys.

(6) Press the F4 key on the force/torque indicator until you see the ⇧ ⇩ soft keys. Press the ⇧ ⇩ soft keys as necessary to select the torque cell for the TI range, direction, and serial number being calibrated.

(7) Press the F4 key on the force/torque indicator until you see the **UNIT** soft key. Press the **UNIT** soft key as necessary to select the appropriate units to display.

NOTE

When possible use one torque cell to calibrate entire range of TI.

(8) Attach socket wrench (part of adapter set) to torque cell.

(9) Slowly apply torque to torque cell in clockwise direction until full-scale of torque cell is reached.

NOTE

The indicator will indicate + (positive) for clockwise torque and - (negative) for counterclockwise torque.

(10) Slowly release torque until only tare torque of wrench is applied.

(11) Repeat (9) and (10) above two more times.

(12) Remove socket wrench from torque cell and remove torque cell from holding fixture or torque adapter.

(13) Attach female end of torque cell to TI, using adapters as required.

(14) Position torque cell cable so no torque is applied to cell or TI.

(15) Attach torque calibrator or socket wrench handle to torque cell, using appropriate adapters.

(16) Apply torque to TI in cw direction to obtain an approximate full scale indication on TI. (Ensure that torque cell is not over torqued).

(17) Release torque to obtain 0 indication on TI.

(18) Repeat (16) and (17) above two more times.

(19) Remove torque arm or handle and verify that TI indicates 0.

(20) Verify that force/torque indicator indicates 0.

(21) If force/torque indicator does not indicate 0, press the F4 key on the force/torque indicator until you see →0← as soft key. Press the →0← soft key to zero force/torque indicator.

NOTE

Calibration points must be approached in the direction of increasing torque. Torque may be applied with a torque wrench handle, with or without a mechanical loader or arm and weights. If a calibration point is passed, release torque to approximately the previous calibration point, then reapply torque to calibration point.

8. Pendulum Type

a. Performance Check

(1) Mount appropriate torque cell and torque calibrator to drive of TI in an approximate horizontal position.

(2) Place amount of weight from weight set listed in table 3 for first cardinal point for specific TI on weight holder of torque calibrator, or apply force to socket handle.

Table 3. Pendulum Type Torque Testers Calibration Chart

Test instrument range	Standard	Torque calibrator arm and weights used to apply torque (accessory)		Nominal torque	Tolerance [1] (±)
		Torque calibrator arm	Weight [2] (lbs)		
50 to 500 ft-lbs (600 to 6000 in-lbs)	Torque cell No. 4 (0 to 500 ft-lbs)	(60 in = 5 ft)	Tare	ft-lbs 50 [3]	ft-lbs 5
			10	100	5
			30	200	5
			50	300	6
			70	400	8
			90	500	10

See footnotes at end of table.

Table 3. Pendulum Type Torque Testers Calibration Chart - Continued

Test instrument range	Standard	Torque calibrator arm and weights used to apply torque (accessory)		Nominal torque	Tolerance [1] (±)
		Torque calibrator arm	Weight [2] (lbs)		
10 to 150 ft-lbs (100 to 1800 in-lbs)	Torque cell No. 4 (0 to 500 ft-lbs)	(30 in = 2 1/2 ft)	Tare	ft-lbs 12.5 [3]	ft-lbs 1.0
			10	37.5	1.0
			20	62.5	1.25
			30	87.5	1.75
			40	112.5	2.25
			50	137.5	2.75
			55	150.0	3.0
0 to 15 ft-lbs (0 to 180 in-lbs)	Torque cell No. 2 (0 to 20 ft-lbs)	(12 in = 1 ft)	Tare	in-lbs 12	in-lbs 2
			2	36	2
			5	72	2
			7	96	2
			10	132	2.64
			14	180	3.60

[1]Difference between TI indication and force/torque indicator will not exceed tolerance.
[2]Weight plus tare when only weight given.
[3]Approximate tare torque.

(3) With weight holder or handle motionless, use pointer to apply force cw against pendulum dowel pin. Position pendulum approximately one-half the distance to 0.

(4) Gradually decrease force on pointer until pendulum and pointer rise to a static position. If difference between TI indication and force/torque indicator indication exceeds tolerance specified in table 3, perform **b** below.

NOTE

Torque may be applied with torque wrench without torque arms. Refer to table 3 for nominal value of applied torque for accuracy when calibration arm is not used.

(5) Repeat (2) through (4) above, adding weights or force and observing tolerances as specified in table 3.

(6) Carefully release force or remove weights and store in containers.

b. Adjustments

NOTE

Applicable only to adjustable models in the 0 to 15 ft-lbs and 0 to 180 in-lbs range.

(1) Place 10 lbs from weight set on weight holder of torque calibrator, or apply 132 in-lbs.

(2) With weight holder motionless, use pointer to apply force cw against pendulum dowel pin. Position pendulum approximately one-half the distance to 0.

(3) Gradually decrease force on pointer until pendulum and pointer rise to a static position. Record indication.

(4) Move pointer ccw to end of scale.

(5) Move pendulum cw to above one-half the distance to 0.

(6) Gradually decrease force on dowel pin, allowing pendulum to slowly rise to a static position.

(7) Gently move pointer cw until it just touches the dowel pin. Record indication.

(8) Subtract reading recorded in (3) above from reading recorded in (7) above. Difference will be between 3 to 5 in-lbs.

(9) Adjust setscrew on upper end of pointer (R).

(10) Repeat (1) through (8) above until indication in (8) is between 3 and 5 in-lbs.

(11) Repeat **a** (l) through (6) above.

9. Torsional Type

a. Performance Check

(1) Attach appropriate torque cell and torque calibrator or socket handle to TI approximately horizontal.

(2) Raise arm and weight carrier of torque calibrator or socket handle until only half the force is applied to TI.

(3) While force is held, move pointer cw until it is close to pointer pusher.

NOTE

For models without pointer pusher, move pointer cw to some value less than value listed in table 4.

(4) Allow arm and weight carrier to descend slowly or apply force until total torque is applied and force/torque indicator indicates normal value listed in table 5. If difference between TI indication and force/torque indicator indication is not within limits specified in table 5 for specific TI, perform **b** below if applicable.

(5) Repeat (2) through (4) above, adding or removing torque and observing tolerances specified in table 5.

(6) Carefully remove weight and store in container or release force.

NOTE

Refer to table 1 for accuracy when calibrating arm is not used.

Table 4. Pointer Pusher Position

Test instrument	
Range	Pointer pusher position cw (less than)
0 to 1 000 ft-lbs	40 ft-lbs
0 to 6000 in-lbs, 0 to 500 ft-lbs	590 in-lbs
0 to 1200 in-lbs, 0 to 100 ft-lbs	148 in-lbs
0 to 800 in-oz, 0 to 50 in-lbs	190 in-oz
0 to 1800 in-lbs, 0 to 150 ft-lbs	100 in-lbs

Table 5. Torsional-Type Torque Testers Calibration Chart

Test instrument range	Standard	Torque calibrator arm and weights used to apply torque (accessory)		Nominal torque	Tolerance [1] (±)
		Torque calibrator arm	Weight [2] (lbs)		
0 to 50 in-lbs (0 to 800 in-oz)	Torque cell No. 1 (0 to 60 in-lbs)	(12 in = 1 ft) arm	Tare	in-lbs 12[3]	in-lbs 0.2
			1	24	0.3
			2	36	0.4
			3	48	0.5
0 to 250 in-lbs (0 to 4000 in-oz)	Torque cell No. 2 (0 to 20 ft-lbs)	(12 in = 1 ft) arm	Tare	in-lbs 12[3]	in-lbs 0.25
			4	60	0.6
			9	120	1.2
			14	180	1.8
			19	240	2.4
0 to 100 ft-lbs (0 to 1200 in-lbs)	Torque cell No. 3 (0 to 100 ft-lbs)	(30 in - 2.5 ft) arm	Tare	ft-lbs 12.5[3]	ft-lbs 0.2
			10	37.5	0.4
			20	62.5	0.6
			30	87.5	0.9
			35	100	1.0
0 to 150 ft-lbs) (0 to 1800 in-lbs)	Torque cell No. 4 (0 to 500 ft-lbs)	(30 in = 2.5 ft) arm	Tare	ft-lbs 12.5[3]	in-lbs 0.2
			10	37.5	0.4
			20	62.5	0.6
			30	87.5	0.9
			40	112.5	1.1
			50	137.5	1.4
			55	150.0	1.5
0 to 500 ft-lbs (0 to 6000 in-lbs)	Torque cell No. 4 (0 to 500 ft-lbs)	(60 in = 5 ft) arm	Tare	ft-lbs 50[3]	ft-lbs 0.5
			10	100	1.0
			30	200	2.0
			50	300	3.0
			70	400	4.0
			90	500	5.0
0 to 1000 ft-lbs	Torque cell No. 5 (0 to 1000 ft-lbs)	(60 in = 5 ft) arm	Tare	ft-lbs 50 [3]	ft-lbs 10
			40	250	10
			90	500	10
			140	750	10
			190	1000	10

[1]Difference between TI indication and force/torque indicator will not exceed tolerance.

[2]Weight plus tare when only weight given.

[3] Approximate tare torque.

b. Adjustments

NOTE

Applicable only to models that have a setscrew in adjusting knob.

(1) Remove torque from TI.

(2) Use an Allen wrench to loosen setscrew in adjusting knob of TI.

(3) Turn adjusting knob in appropriate direction to obtain desired indication (R).

NOTE

Turn adjusting knob cw to increase friction and ccw to decrease friction. It may be necessary to remove complete dial assembly and hold pointer while turning adjusting knob.

(4) Tighten setscrew and replace dial if removed.

(5) Repeat **a** (1) through (6) above.

10. Final Procedure

a. Deenergize and disconnect all equipment.

b. Annotate and affix DA label/form in accordance with TB 750-25.

By Order of the Secretary of the Army:

Official:

JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0718301

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Distribution:

To be distributed in accordance with the initial distribution number (IDN) 342297, requirements for calibration procedure TB 9-6635-200-24.

Instructions for Submitting an Electronic 2028

The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however, only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" whomever@redstone.army.mil
To: <2028@redstone.army.mil

Subject: DA Form 2028

1. **From**: Joe Smith
2. Unit: home
3. **Address**: 4300 Park
4. **City**: Hometown
5. **St**: MO
6. **Zip**: 77777
7. **Date Sent**: 19-OCT –93
8. **Pub no:** 55-2840-229-23
9. **Pub Title**: TM
10. **Publication Date**: 04-JUL-85
11. Change Number: 7
12. Submitter Rank: MSG
13. **Submitter FName**: Joe
14. Submitter MName: T
15. **Submitter LName**: Smith
16. **Submitter Phone**: 123-123-1234
17. **Problem**: 1
18. Page: 2
19. Paragraph: 3
20. Line: 4
21. NSN: 5
22. Reference: 6
23. Figure: 7
24. Table: 8
25. Item: 9
26. Total: 123
27. **Text**

This is the text for the problem below line 27.