*TB 9-6635-208-40

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR TORQUE WATCH GAUGE, WATERS MANUFACTURING INC., MODEL 651( )

Headquarters, Department of the Army, Washington, D. C.
5 August 2008

REPORTING OF ERRORS AND RECOMMDENDING 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 9-6635-208-50, dated 30 May 1975, including all changes.

SECTION I
IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Torque Watch Gauge, Waters Manufacturing Inc., Model 651( ). The manufacturer's instruction manual was used as the prime data source in compiling these instructions. The torque watch gauge will be referred to as the TI (test instrument) throughout this bulletin.

a. Model Variations. Variations among models are described in text.

b. Time and Technique. The time required for this calibration is approximately 1.5 hours, 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 - Torque Parameters

Test instrument parameters	Performance specifications
651C-3 (10015920-001)	Range: 2 to 40 in/oz Accuracy: ± 5% FS
651C-1 (10015920-002)	Range: 0.05 to 1.2 in/oz Accuracy: ± 5% FS
651C-2 (special) (10015920-003)	Range: 1 to 20 in/oz Accuracy: ± 5% FS
651C-3 (special) (10015920-004)	Range: 2 to 40 in/oz Accuracy: ± 2% FS
651C-1 (special) (10015920-005)	Range: 0.05 to 1.2 in/oz Accuracy: ± 2% FS
651C2 (10015920-006)	Range: 1 to 20 in/oz Accuracy: ± 2% FS

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 Reference Calibration Standards Set NSN 4931-00-621-7878. 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 listed in table 3 are issued as indicated in paragraph **4** above and are used in this calibration procedure. When necessary, these items may be substituted by equivalent items, unless specifically prohibited.

Table 2. Minimum Specifications of Equipment Required

Common name	Minimum use specifications	Manufacturer and model (part number)
WEIGHT SET, STANDARD (AVOIRDUPOIS)	Range: 0.05 to 16 oz Accuracy: Class F	(7910419)
WEIGHT SET, BALANCE (AVOIRDUPOIS)	Range: 16 to 40 oz Accuracy: Class F	(7909056)

Table 3. Accessories Required

Common name	Description and part number
LOW TORQUE MEASURING PULLEY	2-in. diameter (7911301)
LOW TORQUE MEASURING PULLEY	4-in. diameter (7911302)
NYLON STRING[1]	20 feet, 5-lb test minimum

[1]Additional equipment required.

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 tables 2 and 3.

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 manufacturer's manual for this TI.

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

7. Equipment Setup

a. Select appropriate low torque measuring pulley and appropriate weight from weight set to yield a cardinal point indication on TI.

b. Connect low torque measuring pulley and weight to TI as shown in figure 1.

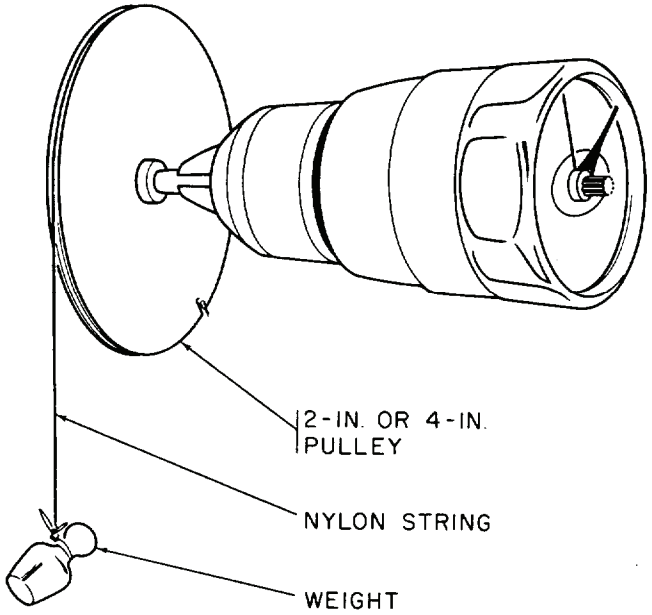

Figure 1. Bidirection and range checks - equipment setup.

8. Bidirection

a. Performance Check

(1) Hold the TI as near horizontal as possible with the face of the dial at eye level.

(2) Rotate the TI clockwise until knot of nylon string is on side of pulley opposite weight and slightly below center of pulley. Observe indication on TI.

(3) Rotate the TI counterclockwise until knot of nylon string is again opposite weight and slightly below center of pulley. Observe indication on TI.

(4) If the indications observed in (2) and (3) above are not the same, perform **b** below.

b. Adjustment

(1) Remove the bezel and crystal assembly by prying gently.

(2) Repeat **a** (l) through (3) above and adjust position of index to obtain equal indications in both directions (R).

9. Range

a. Performance Check

(1) Using weight and pulley combinations as specified in tables 4, 5, and 6 for appropriate range of the TI, check the TI in both directions.

(2) Indications obtained on the TI should be within the tolerances specified in the appropriate table.

b. Adjustments. If necessary prepare a correction chart for TI, delineating any corrections to be applied to obtained readings.

Table 4. Range Check (0 to 40 Inch-Ounce, 4-Inch Pulley)

Cardinal point	Required weight (oz)	Test instrument			
		± 5% of full scale		± 2% of full scale	
		Min	Max	Min	Max
6	3	4	8	5	7
12	6	10	14	11	13
18	9	16	20	17	19
24	12	22	26	23	25
30	15	28	32	29	31
36	18	34	38	35	37

Table 5. Range Check (0.05 to 1.2 Inch-Ounce, 2-Inch Pulley)

Cardinal point	Required weight (oz)	Test instrument			
		± 5% of full scale		± 2% of full scale	
		Min	Max	Min	Max
0.25	1/4	0.19	0.31	0.226	0.274
0.50	1/2	0.44	0.56	0.476	0.524
0.75	3/4	0.69	0.81	0.726	0.774
1.00	1	0.94	1.06	0.976	1.024

Table 6. Range Check (0 to 20 Inch-Ounce, 2-Inch Pulley)

Cardinal point	Required weight (oz)	Test instrument			
		± 5% of full scale		± 2% of full scale	
		Min	Max	Min	Max
3	3	2	4	2.6	3.4
6	6	5	7	5.6	6.4
9	9	8	10	8.6	9.4
12	12	11	13	11.6	12.4
15	15	14	16	14.6	15.4
18	18	17	19	17.6	18.4

10. Final Procedure

a. Disconnect all equipment and replace TI with in protective cover.

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

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By Order of the Secretary of the Army:

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

Official:

JOYCE E. MORROW
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Secretary of the Army

0816406

Distribution:

To be distributed in accordance with STD IDS No. RLC-1500, 2 January 2003, requirements for calibration procedure TB 9-6635-208-40.

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.

PIN: 084929-000