TB 9-6635-208-50

Change 1

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

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

Headquarters, Department of the Army, Washington, DC
10 October 1975

TB 9-6635-208-50, 30 May 1975, is changed as follows:

Title is changed as shown above.

Page 2, table 1, Test instrument model and part number, last entry. After 651C-2 add "(special)".

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*This bulletin supersedes TB ORD 1026/450, 29 January 1965.

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. Calibration Data Card, DA Form 2416

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TM 38-750. DA Form 2416 must be annotated in accordance with TM 38-750 for each calibration performed.

b. Adjustments to be reported on DA Form 2416 are designated (R) at the end of the sentence in which they appear. When adjustments are in tables, the (R) will follow the designated adjustment. Report only those adjustments made and designated with (R).

3. Reporting of Errors. The reporting of errors, omissions, and recommendations for improving this publication by individual user is encouraged. Reports should be submitted on DA Form 2028, Recommended Changes to Publications, and forwarded direct to Commander, U.S. Army Missile Command, ATTN: AMSMI-MFPB, Redstone Arsenal, AL 35809.

4. 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 model and part number	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

5. Equipment Required. Table 2 identifies the specific equipment used in this calibration procedure. This equipment is issued with the secondary transfer calibration standards set and is to be used in performing this procedure. Alternate items may be used by the calibrating activity when the equipment listed in table 2 is not available. 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 accuracy 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.

6. Accessories Required. The accessories listed in table 3 are issued with the secondary transfer calibration standards set and are to be 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

Item	Common name	Minimum use specifications	Manufacturer, model and part number
A1	WEIGHT SET (AVOIRDUPOIS)	Range: 0.05 to 16 oz Accuracy: Class C	Henry Troemmer, Model C1 (7910419)
A2	WEIGHT SET (AVOIRDUPOIS)	Range: 16 to 40 oz Accuracy: Class C	Sweeney, Model WT1 (7909056)

Table 3. Accessories Required

Item	Common name	Description and part number
B1	LOW TORQUE MEASURING PULLEY	2-in. diameter (7911301)
B2	LOW TORQUE MEASURING PULLEY	4-in. diameter (7911302)
B3	NYLON STRING[1]	20 feet, 5-lb test minimum

[1]Additional equipment required.

SECTION III
CALIBRATION PROCESS

NOTE

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

7. Preliminary Instructions

a. The instructions outlined in this section are preparatory to the calibration process. Personnel should become fa miliar with the entire bulletin before beginning the calibration.

b. Items of equipment used in this procedure are referenced within the text by common name and item identification number as listed in tables 2 and 3. For the identification of equipment referenced by item numbers prefixed with A, see table 2, and for prefix B, see table 3.

c. Select appropriate low torque measuring pulley (B1 or B2) and appropriate weight from weight set (A1 or A2) to yield a cardinal point indication on TI.

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

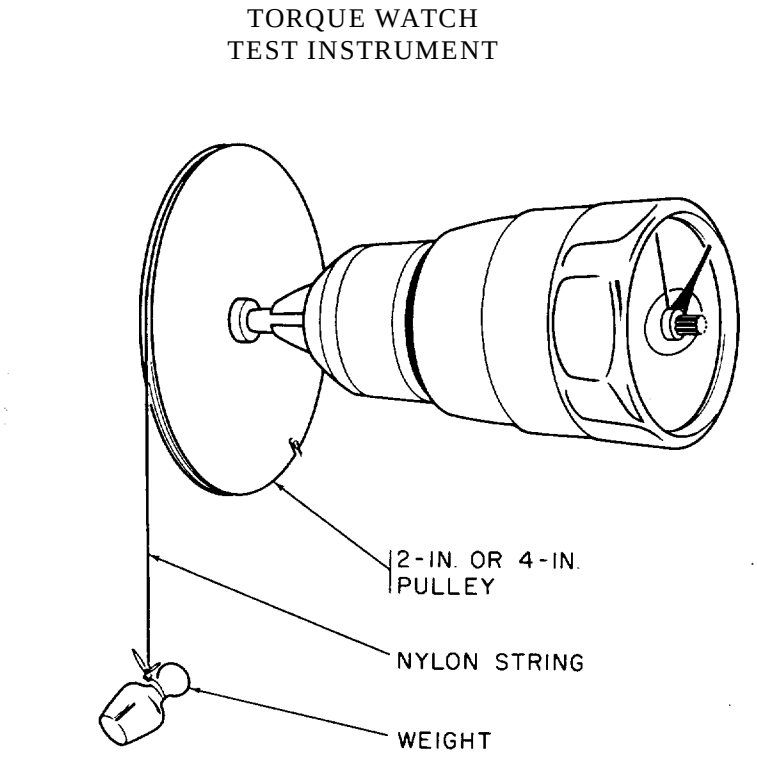

Figure 1. Bidirection and range checks - equipment setup.

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. Adjustment. 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. In accordance with TM 38-750, annotate and affix DA Label 80 (U.S. Army Calibration System). When the TI cannot be adjusted within tolerance, annotate and affix DA Form 2417 (Unserviceable or Limited Use) tag.

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By order of the Secretary of the Army:

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