

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

CALIBRATION PROCEDURE FOR

TORQUE WRENCHES AND TORQUE SCREWDRIVERS

(GENERAL)

Headquarters, Department of the Army, Washington, DC
9 April 1985

REPORTING OF ERRORS

You can help improve this publication by calling attention to errors and by recommending improvements and stating your reasons for the recommendations. Your letter or DA Form 2028, Recommended Changes to Publications, should be mailed directly to Commander, US Army TMDE Support Group, ATTN: AMXTM-LPP, Redstone Arsenal, AL 35898-5400. A reply will be furnished directly to you.

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*This bulletin supersedes TB 9-5120-202-35, 17 May 1983.

This is a REPRINT including
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SECTION I

IDENTIFICATION AND DESCRIPTION

1. Test Instrument Identification. This bulletin provides instructions for the calibration of Torque Wrenches and Torque Screwdrivers (General). The manufacturer's manual and Federal Specifications, GGG-W-00686C (GSA-FSS) 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. Variations among models are described in table 2.

b. Time and Technique. The time required for this calibration is approximately 1 hour, using the physical technique.

2. DA Form 2416 (Calibration Data Card)

a. Forms, records, and reports required for calibration personnel at all levels are prescribed by TB 750-25-1. DA Form 2416 must be annotated in accordance with TB 750-25-1 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) 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 |
|---------------------------------------|--|
| Torque wrenches: Type I, II, and V | Range: 0 to 2000 ft-lb Accuracy: +/-4% of nominal reading from 20% of FS To FS |

See footnote at end of table.

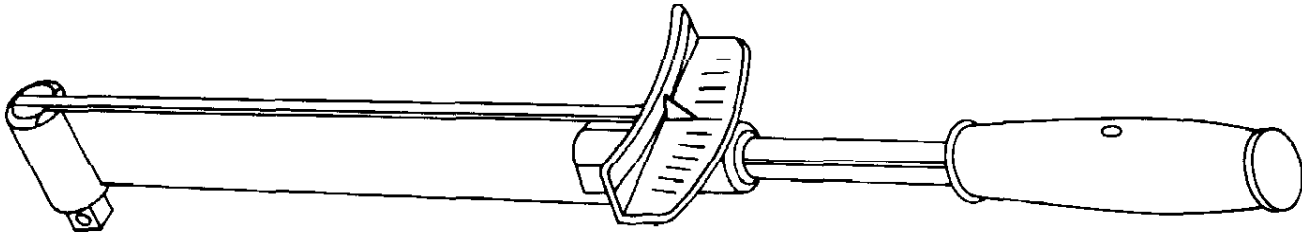
Table 1. Calibration Description

| Test instrument Parameters | Performance specifications |
|----------------------------|---|
| Type III Type IV | Accuracy: Cw: Same as Type I and II Ccw: +/-6% of nominal reading from 20% of FS ¹ Accuracy: +/-5% of setting or as specified below, whichever is greater from 20% of FS to FS Size 1: +/-1/2 in-oz Size 2: +/-1/2 in-lb |
| Torque screwdrivers | Range: 0 to 1600 in-oz and 0 to 100 in-lb Accuracy: +/-3% |

¹No accuracy requirement from 0 to 20% of scale of wrench.

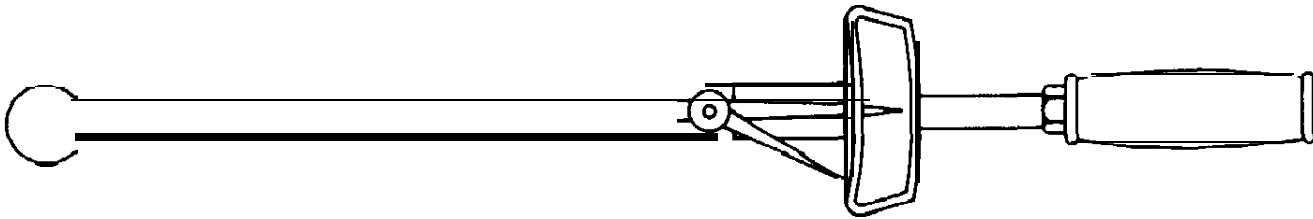
Table 2. Types, Classes and Styles of Torque Wrenches

| Type | Class | Style |
|--|--|--|
| Type I - deflecting beam | Class I - Indicator plate Class II - Indicator dial | Style A - direct reading (fig. 1) Style B - direct reading with audible signal (fig. 2) Style A - direct reading (fig. 3) Style B - direct reading with audible signal (fig. 4) |
| Type II - rigid case with indicator dial | --- | Style A - direct reading (fig. 5) Style B - direct reading, presetting audible signal (fig. 6) Style C - direct reading with flashlight signal (fig. 7) |
| Type III - rigid case, micrometer presetting, audible signal | Class I - plain head (fig. 8) Class 2 - ratchet, reversible head (fig. 9) | --- |
| Type IV - tee handle, rigid case, ratchet, audible signal | Class 1 - torque set and sealed (fig. 10) Class 2 - torque set adjustable (fig. 11) | --- |
| Type V - rigid case, preset audible signal (fig. 12) | --- | --- |



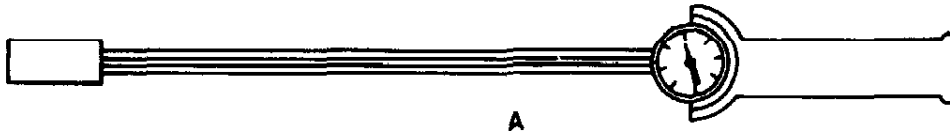
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Figure 1. Type I, class 1, style A torque wrench; deflecting beam with indicator plate (direct reading).

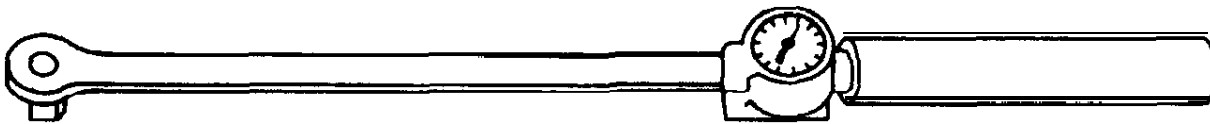


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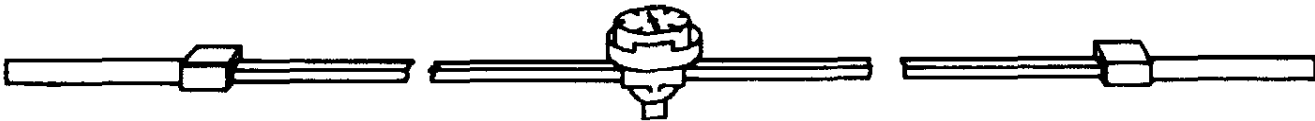
Figure 2. Type I, class 1, style B torque wrench; deflecting beam with indicator plate (direct reading with feel impulse and adjustable signal).



A



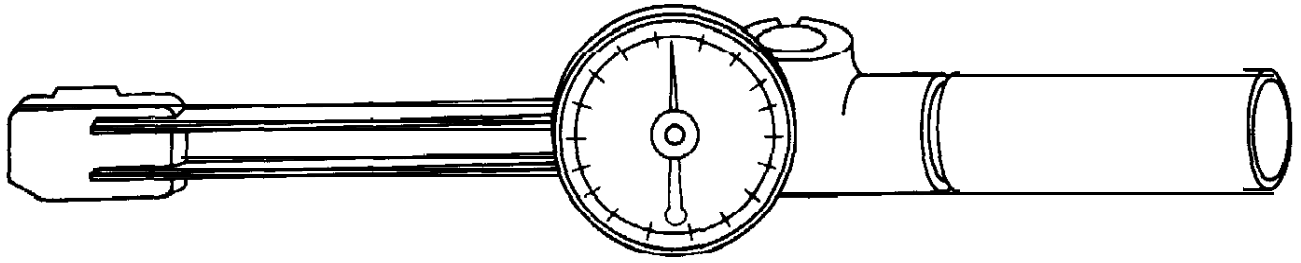
B



C

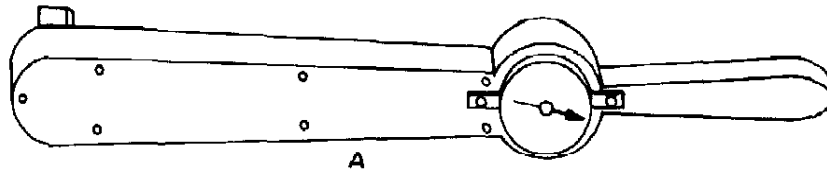
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Figure 3. Type I, class 2, style A torque wrenches; deflecting beam with indicating dial (direct reading).



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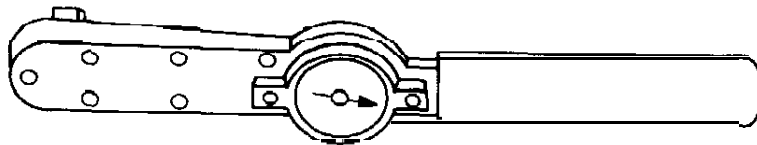
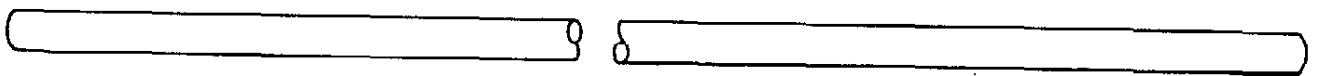
Figure 4. Type 1, class 2, style B torque wrench; deflecting beam with indicating dial (direct reading with audible signal).



A



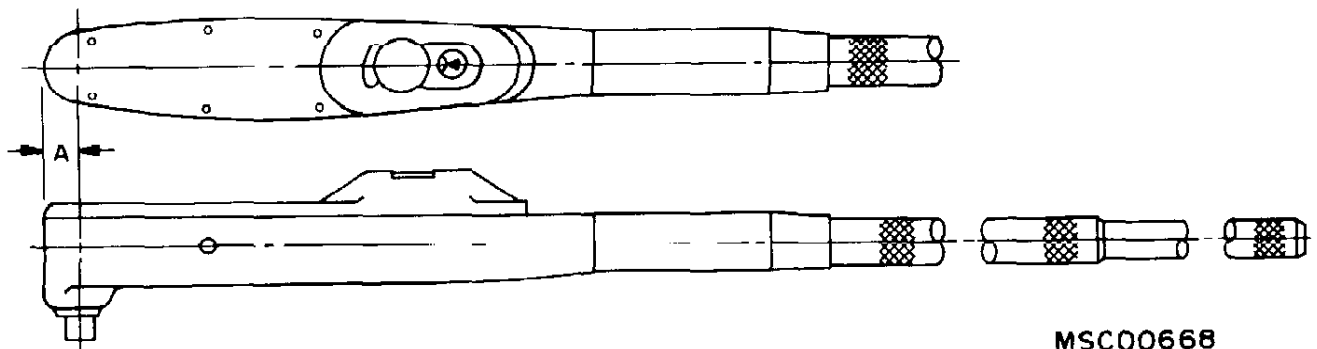
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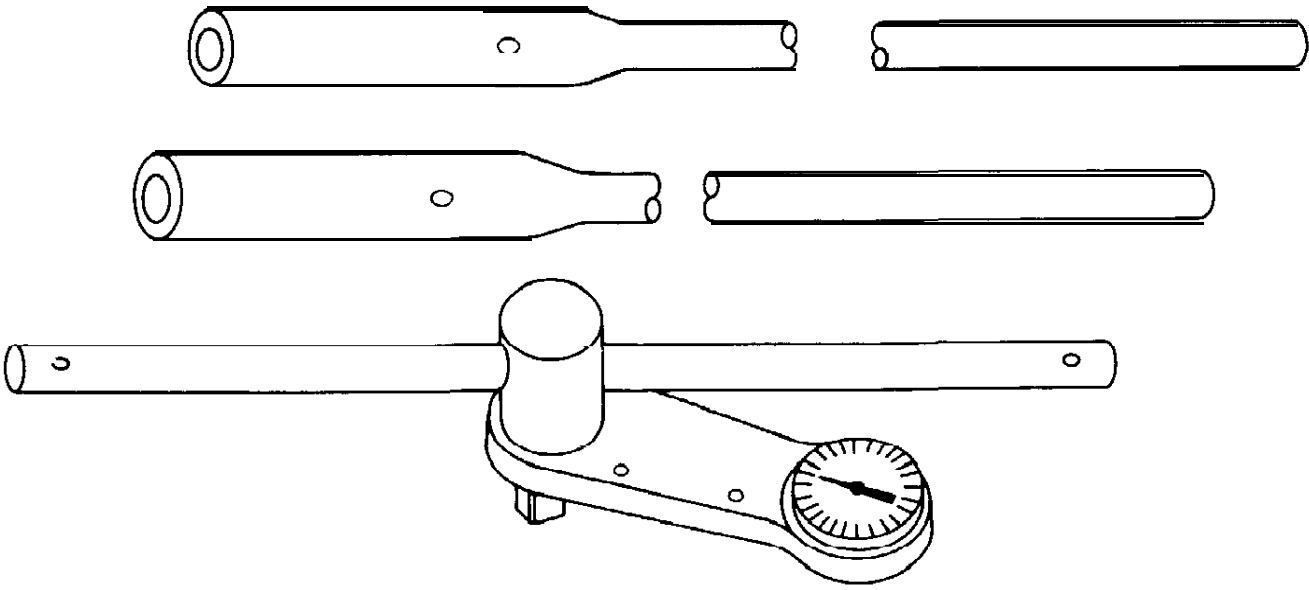
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Figure 5. Type II, style A torque wrench; rigid case with indicator dial (direct reading).



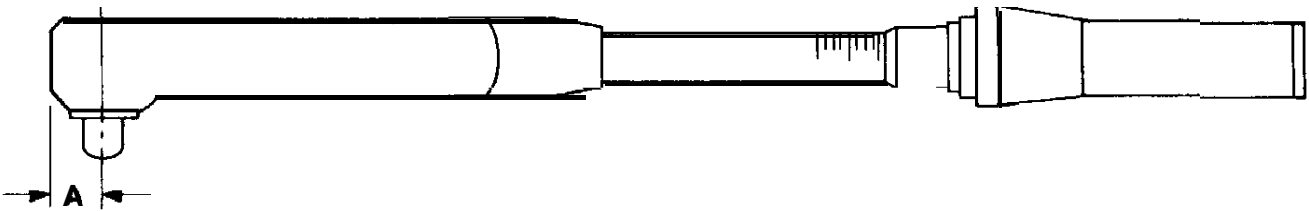
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Figure 6. Type II, style B torque wrench; rigid case with indicator dial, presetting torque dial (direct reading with audible signal).



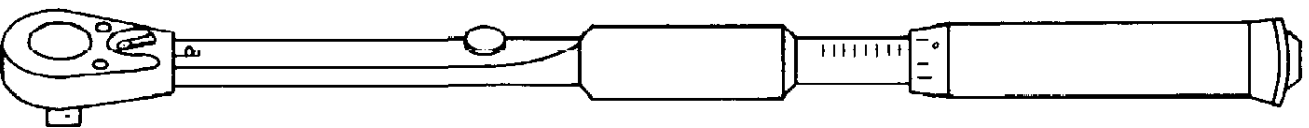
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Figure 7. Type II, style C torque wrench; rigid case with presetting dial (direct reading with flashlight signal).



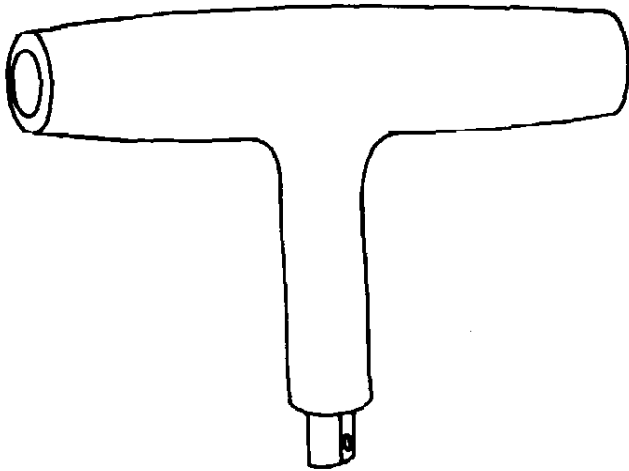
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Figure 8. Type III, class I torque wrench; rigid case, micrometer-style torque presetting, audible signal, plain head.



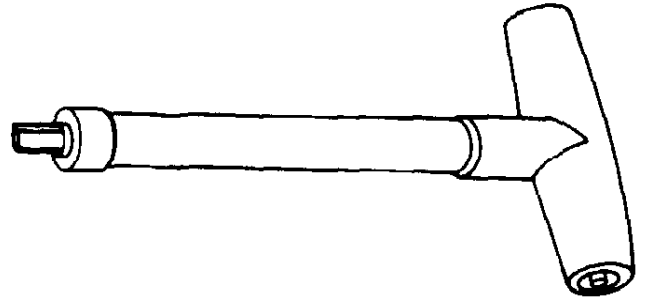
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Figure 9. Type III, class 2 torque wrench; rigid case, micrometer-style torque presetting, audible signal, ratchet reversible head.



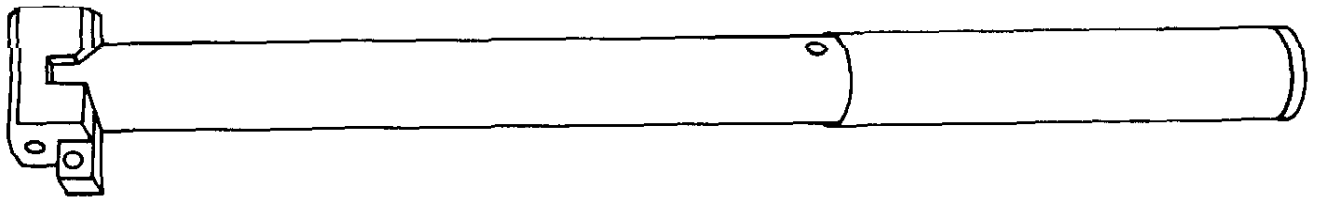
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Figure 10. Type IV, class 1 torque wrench; tee handle, rigid case, ratcheting, audible signal, torque value set and sealed.



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Figure 11. Type IV, class 2 torque wrench, tee handle, rigid case, ratcheting, audible signal, torque value setting, adjustable.



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Figure 12. Type V torque wrench; rigid case, preset torque, audible signal.

SECTION II

EQUIPMENT REQUIREMENTS

4. Equipment Required. Table 3 identifies the specific equipment to be used in this Calibration procedure. This equipment is Issued with Secondary Transfer Calibration Standards Set AN/GSM-287 (except as noted At end of table 3). Alternate items may be Used by the calibrating activity when the Equipment listed in table 3 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 3.

The accuracies listed in table 3 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 4 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. Other adapters may be used From standard tool sets.

Table 3. Minimum Specifications of Equipment Required

| Item | Common name | Minimum use specifications | Manufacturer and model (part number) |
|------|---------------------|--|--|
| A1 | LOAD CELL INDICATOR | Range: 0 to 12.000 counts Accuracy: +/-0.5% indication | BLH, Model 8200B (MIS-23155) |
| A2 | TORQUE CELL | Range: 0 to 60 in-lb Accuracy: +/-0.5% applied torque from 20% FS to FS +/-0.5% of 20% FS below 20% FS | Lebow Associates, Model 2133-124-5 (MIS-26485, Type 1, CL1) |
| A3 | TORQUE CELL | Range: 0 to 20 ft-lb 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-25484, Type 1, CL2) |
| A4 | TORQUE CELL | Range: 0 to 100 ft-lb 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) |
| A5 | TORQUE CELL | Range: 0 to 500 ft-lb Accuracy: +/-0.5% applied torque from 20% FS to FS +/-0.5% of 20% FS | Lebow Associates, Model 2133-126 (MIS-26485, Type 1, CL4) |

Table 3. Minimum Specifications of Equipment Required - Continued

| Item | Common name | Minimum use specifications | Manufacturer and model (part number) |
|------|----------------------------|---|--|
| A6 | TORQUE CELL | 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, CL 5) |
| A6.1 | TORQUE CELL | Range: 0 to 2000 ft-lb Accuracy: +/-0.5% applied torque from 20% FS to FS | Lebow Associates, Model 2351-102 (MIS-26485, Type II Cl 1) |
| A7 | TORQUE TESTER ¹ | Range: 0 to 800 in-oz; Accuracy: 0 to 50 in-lb | Sweeney, Model SWE-7095 (7907410) |
| A8 | TORQUE TESTER ¹ | Range: 0 to 15 ft-lb 0 to 180 in-lb | Sweeney, Model SWE-75 (8579433) |
| A9 | TORQUE TESTER ¹ | Range: 0 to 1000 ft-lb Accuracy: +/-1% (Testers w/10 ft-lb scale div +/-1 scale div. Testers with 5 ft-lb scale div +/-2 scale div) | Sweeney, Model SWE-7045 (7907410) |
| A10 | TORQUE TESTER ¹ | Range: 10 to 150 ft-lb; 100 to 1800 in-lb Accuracy: +/-1% (+/-2%) | Sweeney, Model SWE-73 |

¹Torque testers (A7, A8, A9, and A10 are not a part of the Secondary Transfer Calibration Standard Set. These items are Listed for information for calibration facilities and units that use torque testers as standards.

Table 4. Accessories Required

| Item | Common name | Description (part number) |
|------|-----------------------------|---|
| B1 | ADAPTER | Sweeney, Model SWE-73-606 (8598969) |
| B2 | ADAPTER ¹ | Sweeney, Model SWE-75-500 (7907276) |
| B3 | ADAPTER ¹ | Sweeney, Model SWE-73-500 (7907277) |
| B4 | ADAPTER SET | (GGG-W641) (GGG-W-660) |
| B5 | HOLDING FIXTURE | (7915871) |
| B6 | LOADER | Sweeney, Model SWE-7047 (7047) |
| B7 | SEALANT ² | 3-oz. Tube, white silicon rubber sealer (NSN 8040-00-877-9872) |
| B8 | TORQUE ADAPTER ³ | (13335428) |

¹Additional equipment required.

²To be used to reseal torque wrenches after adjustments, when applicable.

³Limited deployment.

**SECTION III
CALIBRATION PROCESS USING TORQUE CELL STANDARDS**

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 and item identification number as listed in tables 3 and 4. For the identification of equipment referenced by item numbers prefixed with A, see table 3, and for prefix B, see table 4.

NOTE

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 some of the TI's are included in this procedure. Additional maintenance information is contained in the manufacturer's manual for these TI's.

NOTE

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

7. Equipment Setup

- a. Remove TI from case.
- b. Visually check TI for bent or damaged pointers or needles. Pointers or needles must have freedom of movement during torquing.
- c. Remove any dirt or grime that may have accumulated around trigger or ratchet mechanism by using stiff, clean brush and wiping with clean rag.
- d. Visually check square drive for roundness of corners.
- e. Check head and yoke for looseness from measuring element.

f. Secure holding fixture (B5) or torque adapter (B8) to stable, rigid work surface.

g. Zero TI, if applicable.

NOTE

This procedure normally covers calibration in the cw direction. A ccw calibration can be accomplished by reversing directions outlined in each performance check. It will be necessary to torque the torque cell full scale in the direction of intended operation three times prior to calibration. Non-preset torque wrenches will be calibrated by applying increasing torque only in cw direction, unless ccw direction is specifically requested by owner/user.

h. Allow equipment to stabilize at ambient temperature.

i. Connect cable supplied with load cell indicator (A1) to appropriate connector on indicator and applicable torque cell (A2, A3, A4, A5, A6, or A6.1).

j. Attach torque cell to holding fixture (B5) or torque adapter (B8).

k. Connect load cell indicator to a 115-V ac power source. Set power switch to ON and allow unit to warm up for 30 minutes.

NOTE

Use one torque cell to calibrate entire range of TI.

CAUTION

The following instructions must be performed in sequence to prevent damage to torque cell.

1. Position load cell indicator controls and set up as indicated in (1) through (8) below:

(1) Press 3.6 MV/V pushbutton (or 2.4 MV/V pushbutton for torque cell (A6.1).

(2) Set MULTIPLIER switch setting for torque range to be measured as indicated in table 5.

Table 5. Torque Cell Calibration Units

| Torque cell (ft-lb) | Calibration range | MULTIPLIER SWITCH settings |
|----------------------|-------------------|----------------------------|
| 5 ¹ | 0-60 in-lb | 6 |
| 20 | 0-20 ft-lb | 2 |
| 100 | 0-100 ft-lb | 1 |
| 500 | 0-500 ft-lb | 5 |
| 1000 | 0-1000 ft-lb | 1 |
| 3000 (3600 in-lb) | 0-3000 ft-lb | 3 |

¹The 5 ft-lb torque cell, model 2133-124-5 is calibrated in inch-pound units. All other torque cells are calibrated in foot-pound units.

(3) Set +/SIG REV switch to + (positive).

(4) Set NORM/PEAK switch to NORM. (When PEAK is preferred, see note 3 below).

(5) Press MODE ZERO pushbutton and adjust BRIDGE ZERO FOR 0 indication on indicator.

(6) Press MODE LIN pushbutton and adjust LINEARITY control to value of torque cell lin number.

(7) Press MODE CAL pushbutton and adjust AMPL SPAN control to value of torque cell cal number.

(8) Press MODE OPR pushbutton and adjust BRIDGE ZERO for 0 indication on load cell indicator.

m. Exercise torque cell as described in (1) through (6) below:

(1) Attach socket wrench (part of B4) to torque cell.

(2) Slowly apply torque to torque cell in cw direction until full scale is reached.

NOTE

The indicator will indicate + (positive) for cw torque and - (negative) for ccw torque.

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

(4) Repeat (2) and (3) above two more times.

(5) Remove socket wrench from torque cell.

(6) If necessary, adjust BRIDGE ZERO for 0 indication on indicator.

n. Exercise TI as described in (1) through (5) below:

(1) Attach TI to torque cell.

(2) Slowly apply torque to TI and torque cell in a cw direction for full scale indication on TI. (Insure that torque cell is not over torqued.)

(3) Slowly release torque until only tare torque of TI is applied.

(4) Repeat (2) and (3) above two more times.

(5) Remove TI from torque cell. If indicator does not indicate 0 adjust BRIDGE ZERO for 0 indication.

NOTE

When applied torque changes from cw to ccw, repeat setup of steps **l** and **m** above for ccw.

NOTE

The stability of indicator can be verified at any time during use. This is done by verifying that linearity and span have not changed. This is not a part of setup but a check of equipment readiness.

o. To verify stability of indicator, perform (1) through (6) below:

- (1) Press MODE ZERO pushbutton.
- (2) Record digital display.
- (3) Adjust BRIDGE ZERO for 0 display.
- (4) Press MODE LINEARITY pushbutton. Display will equal torque cell lin number.
- (5) Press MODE CAL pushbutton. Display will equal torque cell cal number.
- (6) Return equipment to operating condition by performing (a) through (c) below:

- (a) Press MODE ZERO pushbutton.
- (b) Adjust BRIDGE ZERO control for digital display recorded in (2) above.
- (c) Press MODE OPERATE pushbutton.

NOTE 1

The calibration point must be approached in the direction of increasing torque. For higher capacity wrenches, loader (B6) should be used to apply a constant torque. If the calibration point is passed, release torque in opposite direction to approximately the previous point, then turn handle in increasing torque direction to the calibration point.

NOTE 2

Some micrometer preset torque wrenches indicate when the set torque has been reached by momentary release action of the drive for a few degrees. An audible "click" signal may also be present at high torque settings.

NOTE 3

The indicator may be operated in either of two modes. With NORM/PEAK switch in NORM mode indicator will track torque applied. Indicator and TI must be observed simultaneously to compare standard and TI. In NORM mode, indicator will indicate + (positive) for cw torque and - (negative) for ccw torque. With NORM/PEAK switch in PEAK mode, indicator will track increasing

torque and will hold and display maximum torque applied. Indicator, with setup as outlined in 1(1) through (8) above can be used for peak operation with minor exceptions listed. Prior to each measurement, PEAK RESET pushbutton is pressed. Indicator reads + (positive) for both cw and ccw torque in PEAK operation. The + REV switch must be set to SIG-REV for ccw torque. PEAK mode is preferred for snap and ratchet type torque wrenches. Apply torque slowly when making measurements.

NOTE 4

Throughout this procedure use torque cell A2, A3, A4, A5, A6, or A6.1 with adapters appropriate to TI range.

8. Torque Wrench, Direct Reading

a. Performance Check (figs. 1, 3, and 5)

- (1) Select cardinal point of 25 percent of maximum range of TI.
- (2) Insert TI in applicable torque cell, using adapter as required. Insert in horizontal position for cw torquing.
- (3) Gradually apply perpendicular force on handle of TI until indication in (1) above is obtained. Indicator reading will be within limits specified in table 1 for specific type torque wrench.
- (4) Slowly release force and record reading on indicator. Reset to ZERO.
- (5) Repeat (3) and (4) above at TI cardinal points of 50, 75, and 100 percent of maximum range.

b. Adjustments. Adjust in accordance with manufacturer's instruction manual.

9. Torque Wrench, Direct Reading with Audible Signal

a. Performance Check (figs. 2, 4, and 6)

- (1) Select cardinal point of 25 percent of maximum range of TI.
- (2) Adjust trigger finger of sensory signaling mechanism on TI to point selected in (1) above.

NOTE

The pointer tip and not the trigger finger is the reference which must be used when adjusting the sensory signaling mechanisms.

(3) Insert TI in applicable torque cell, using adapter as required. Insert in horizontal position for cw torquing.

(4) Gradually apply perpendicular force on handle of TI until sharp audible sound is heard and an impulse is felt in hand. Stop applying force at this point. Indicator reading will be within limits specified in table 1 for specific torque wrench.

(5) Slowly release force.

(6) Reset digital indicator to 0.

(7) Remove TI from torque cell.

(8) Repeat (3) through (6) above at TI cardinal points of 50, 75, and 100 percent of maximum range.

b. Adjustments. Adjust in accordance with manufacturer's instruction manual.

10. Torque Wrench, Direct Reading with Flashlight Signal

a. Performance Check (fig. 7)

(1) Check standard dry-cell battery for possible current failure in flashlight attachment.

(2) Select cardinal point of 25 percent of maximum range of TI, and preset TI to actuate signal at this point.

(3) Insert TI in applicable torque cell, using adapter as required. Insert in horizontal position for cw torquing.

(4) Gradually apply perpendicular force on handle of TI until needle on indicator dial reaches preset pin, making contact and lighting bulb. Stop applying force at this point. Indicator reading will be within limits specified in table 1 for specific torque wrench.

(5) Slowly release force.

(6) Reset digital indicator to 0.

(7) Remove TI from torque cell.

(8) Repeat (3) through (6) above at TI cardinal points of 50, 75, and 100 percent of maximum range.

b. Adjustments. Adjust in accordance with manufacturer's instruction manual.

11. Torque Wrench, Audible Signal, Micrometer Preset

NOTE

These two classes of torque wrenches differ only in that one contains a ratchet mechanism enclosed in the drive head. The ratchet is a reversible mechanism and operates by manual movement of a lever.

a. Performance Check (figs. 8 and 9)

(1) Select cardinal point of 25 percent of maximum range of TI. Preset TI by rotating thimble to graduations on barrel to selected point.

(2) Insert TI in applicable torque cell, using adapter as required. Insert in horizontal position for cw torquing.

(3) Gradually apply perpendicular force on handle of TI until audible signal is heard. If indicator reading is not within limits specified in table 1 for specified torque wrench, perform b below.

(4) Slowly release force.

(5) Reset digital indicator to 0.

(6) Remove TI from torque cell. Repeat (1) through (5) above at TI cardinal points of 50, 75, and 100 percent of maximum range.

b. Adjustments

(1) Remove seal from adjusting mechanism.

(2) Set adjusting mechanism to applicable tolerance specified in a(3) above (R).

(3) Reseal adjusting mechanism.

12. Torque Wrench, Audible Signal, Tee Handle Preset

a. Performance Check (fig. 10)

(1) Note torque value setting on handle of TI.

(2) Insert TI in applicable torque cell, using adapter as required. Insert in perpendicular position for cw torquing.

(3) Gradually apply rotational force on handle of TI until sharp audible click is heard. If indication reading is not within limits specified in table 1 of value shown on handle, perform **b** below.

(4) Slowly release force and record reading indicated on digital indicator.

(5) Return digital indicator to 0.

b. Adjustments

(1) Remove seal from adjusting mechanism.

(2) Preset adjusting mechanism to read within accuracy specified in **a**(3) above (R).

(3) Reseal adjusting mechanism.

13. Torque Wrench, Audible Signal, Tee Handle Adjustable

a. Performance Check (fig. 11)

(1) Select cardinal point of 25 percent of maximum range of TI and preset its point on TI to actuate audible signal.

(2) Insert TI in applicable torque cell, using adapter as required. Insert in perpendicular position for cw torquing.

(3) Gradually apply rotational force on handle of TI until sharp audible click is heard. If indication reading is not within limits specified in table 1 for specific torque wrench, perform **b** below.

(4) Slowly release force.

(5) Return digital indicator to 0.

(6) Remove TI from torque cell. Repeat (1) through (5) above at TI cardinal points of 50, 75, and 100 percent of maximum range.

b. Adjustments

(1) Remove seal from adjusting mechanism.

(2) Preset adjusting mechanism to read within specified accuracy (R).

(3) Reseal adjusting mechanism.

14. Torque Wrench, Audible, Preset Torque

a. Performance Check (fig. 12)

(1) Note torque value setting on handle of TI.

(2) Insert TI in applicable torque cell, using adapter as required. Insert in horizontal position.

(3) Gradually apply perpendicular force on handle of TI until audible signal is heard. Indicator reading will be within limits specified in table 1 of value shown on handle.

(4) Slowly release force.

(5) Return digital indicator to 0.

15. Clutch-Type Torque Screwdrivers

a. Performance Check

(1) Insert TI into appropriate torque cell, using adapter (part of tool set) as required.

(2) Turn TI in cw direction and observe that torque sell indication remains at 0.

(3) Remove TI from torque cell.

(4) Adjust TI load to nearest major-increment indication for 1/4 of full range.

(5) Insert TI into appropriate adapter.

(6) Turn TI slowly in cw direction until clutch automatically releases.

(7) Record indication of torque cell indicator.

(8) Return indicator to 0.

(9) Repeat (6) through (8) above three times.

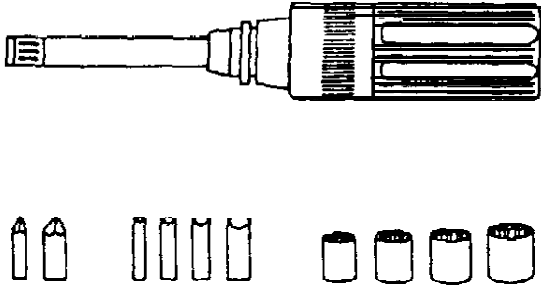
(10) Compute average reading of indications recorded in (7) above. Average reading will be within ± 3 percent indication in (4) above.

(11) Repeat (3) through (10) above the nearest 1/2 and 3/4 and full load settings, respectively, of TI. Average readings will be within ± 3 percent.

b. Adjustments. No adjustments can be made.

16. Direct-Reading Torque Screwdrivers

a. Performance Check (fig. 13)



MSC00675

Figure 13. Torque screwdriver kit (direct reading, typical).

- (1) Insert TI into appropriate torque cell, using adapter (part of tool set) as required.
- (2) Turn TI until indicator of TI is at point equivalent to 1/4 full load.
- (3) Record indication of torque cell indicator.
- (4) Return torque cell and TI indications to 0.
- (5) Repeat (2) through (4) above three times.
- (6) Compute average reading of indications recorded in (3) above. Average reading will be within ± 3 percent of 1/4 full load.

(7) Repeat (2) through (6) above for 1/2, 3/4, and full-load setting of TI. Average readings will be within ± 3 percent.

b. Adjustments. No adjustments can be made.

17. Final Procedure

- a. Deenergize and disconnect all equipment.
- b. Unless otherwise specified by TI manufacturer, set audible (micrometer-type barrel) indicating torque wrenches at 20 percent of maximum range before storage.
- c. Replace TI in its protective case.

NOTE

Calibration of a torque wrench in both cw and ccw directions is considered special calibration.

d. When all parameters are within tolerance, annotate and affix DA Label 80 (US Army Calibrated Instrument). When the TI receives limited or special calibration, annotate and affix DA Label 163 (US Army Limited or Special Calibration). When the TI cannot be adjusted within tolerance, repair the TI in accordance with the maintenance manual. When repair is delayed for any reason or the TI cannot be repaired with local resources, annotate and affix DA Form 2417 (US Army Calibration System Rejected Instrument) and inform the owner/user accordingly in accordance with TB 750-25.

SECTION IV

CALIBRATION PROCESS USING TORQUE TESTER STANDARDS

18. Preliminary Instructions

a. The instructions outlined in paragraphs 18 and 19 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 and item identification number as listed in tables 3 and 4. For the identification of equipment referenced by item numbers prefixed with A, see table 3, and for prefix B, see table 4.

NOTE

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 some of the TI's are included in this procedure. Additional maintenance information is contained in the manufacturer's manual for this TI.

NOTE

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

19. Equipment Setup

- a. Remove TI from case.
- b. Visually check TI for bent or damaged pointers or needles. Pointers or needles must have freedom of movement during torquing.
- c. Remove any dirt or grime that may have accumulated around trigger or ratchet mechanism by using stiff, clean brush and wiping with clean rag.
- d. Visually check square drive for roundness of corners.
- e. Check head and yoke for looseness from measuring element.

NOTE

Secure torque tester to a stable rigid work surface, if not already accomplished.

- f. When applicable, perform (1) and (2) below:

- (1) Zero TI.
- (2) Attach appropriate adapter (B1, B2, or B3) to applicable torque tester (A7, A8, A9, or A10).

- g. Proceed to paragraph applicable to TI being calibrated.

NOTE 1

This procedure normally covers calibration in the cw direction. A ccw calibration can be accomplished by reversing directions outlined in each performance check. It will be necessary to torque the torque tester full scale in the direction of intended operation three times prior to calibration. Non-preset torque wrenches will be calibrated by

applying increasing torque only in cw direction, unless ccw direction is specifically requested by owner/user.

NOTE 2

The calibration point must be approached in the direction of increasing torque. For higher capacity wrenches, loader (B6) should be used to apply a constant torque. If the calibration point is passed, release in opposite direction to approximately the previous point, then turn handle in increasing torque direction to the calibration point.

NOTE 3

Some micrometer preset torque wrenches indicate when the set torque has been reached by momentary release action of the drive for a few degrees. An audible "click" signal may also be present at high torque settings.

20. Torque Wrench, Direct Reading

a. Performance Check (figs. 1,2, and 5)

(1) Select cardinal point at nearest major increment indication of approximately 25 percent of maximum range TI.

(2) Insert TI in applicable torque tester, using adapter as required.

(3) Gradually apply force on handle of TI until indication in (1) above is obtained.

(4) Slowly release force, and record reading indicated by stay-set indicator of torque tester.

(5) Return stay-set indicator of torque tester to where it contacts pointer pusher or pendulum dowel pin.

(6) Repeat (3) through (5) above three times.

(7) Compute average of readings made in (4) and (6) above. Average will be within limits specified in table 1 for specific type torque wrench.

(8) Remove TI from torque tester. Repeat technique of (1) through (8) above at TI cardinal points to nearest major increment indication of approximately 50, 75, and 100 percent of maximum range.

b. Adjustments. Adjust in accordance with manufacturer's instruction manual.

21. Torque Wrench, Direct Reading with Audible Signal

a. Performance Check (figs. 2, 4, and 6)

(1) Select cardinal point at nearest major increment indication of approximately 25 percent of maximum range TI.

(2) Adjust trigger finger of sensory signaling mechanism on TI to point selected in (1) above.

NOTE

The pointer tip and not the trigger finger is the reference which must be used when adjusting the sensory signaling mechanisms.

(3) Insert TI in applicable torque tester, using adapter as required.

(4) Gradually apply force on handle of TI until sharp audible sound is heard and an impulse is felt in hand. Stop applying force at this point.

(5) Slowly release force, and record reading indicated by stay-set indicator of torque tester.

(6) Return stay-set indicator of torque tester to where it contacts pointer pusher or pendulum dowel pin.

(7) Repeat (4) through (6) above three times.

(8) Compute average of readings. Average will be within limits specified in table 1 for specific type torque wrench.

(9) Remove TI from torque tester.

(10) Repeat technique of (1) through (9) above at TI cardinal points to nearest major increment indication of approximately 50, 75, and 100 percent of maximum range.

b. Adjustments. Adjust in accordance with manufacturer's instruction manual.

22. Torque Wrench, Direct Reading with Flashlight Signal

a. Performance Check (fig.7)

(1) Check standard dry-cell battery for possible current failure in flashlight attachment.

(2) Select Cardinal point at nearest major increment indication of approximately 25 percent of maximum range of TI, and preset TI to actuate signal at this point.

(3) Insert TI in applicable torque tester, using adapter as required.

(4) Gradually apply force on handle of TI until needle on indicator dial reaches preset pin, making contact, and lighting bulb. Stop applying force at this point.

(5) Slowly release force and record reading indicated by stay-set indicator of torque tester.

(6) Return stay-set indicator of torque tester to where it contacts pointer pusher or pendulum dowel pin.

(7) Repeat (4) through (6) above three times.

(8) Compute average of readings. Average will be within limits specified in table 1 for specific type torque wrench.

(9) Remove TI from torque tester.

(10) Repeat technique of (2) through (9) above at TI cardinal points to nearest major increment indication of approximately 50, 75, and 100 percent of maximum range.

b. Adjustments. Adjust in accordance with manufacturer's instruction manual.

23. Torque Wrench, Audible Signal, Micrometer Preset

NOTE

These two classes of torque wrenches differ only in that one contains a ratchet mechanism enclosed in the drive head. The ratchet is a reversible mechanism and operated by manual movement of a lever.

a. Performance Checks (figs. 8 and 9)

(1) Select cardinal point at nearest major increment indication of approximately 25 percent of maximum range of TI. Preset TI by rotating thimble to graduations on barrel to selected point.

(2) Insert TI in applicable torque tester, using adapter as required.

(3) Gradually apply force on handle of TI until audible signal is heard.

(4) Slowly release force, and record reading indicated by stay-set indication of torque tester.

(5) Return stay-set indicator of torque tester to where it contacts pointer pusher or pendulum dowel pin.

(6) Repeat (3) through (5) above three times.

(7) Compute average of readings. If average is not within limits specified in table 1 for specific type wrench, perform **b** below.

(8) Remove TI from torque tester. Repeat technique of (1) through (8) above at TI cardinal points of nearest major increment indication of approximately 50, 75, and 100 percent of maximum range.

b. Adjustments

(1) Remove seal protection adjusting mechanism of TI.

(2) Set adjusting mechanism to applicable tolerances in **a**(7) or (8) above (R).

(3) Reseal adjusting mechanism.

24. Torque Wrench, Audible Signal, Tee Handle Preset

a. Performance Check (fig. 10)

(1) Note torque valve setting on handle of TI.

(2) Insert TI in applicable torque tester, using adapter as required.

(3) Gradually apply rotational force on handle of TI until sharp audible click is heard.

(4) Slowly release force, and record reading indicated by stay-set indicator of torque tester.

(5) Return stay-set indicator of torque tester to where it contact pointer pusher or pendulum dowel pin.

(6) Repeat (3) through (5) above three times.

(7) Compute average of readings. If average is not within limits specified in table 1 for specific type torque wrench, perform **b** below.

b. Adjustments

(1) Remove seal from adjusting mechanism.

(2) Preset adjusting mechanism to read within accuracy specified in **a**(7) above (R).

(3) Reseal adjusting mechanism.

25. Torque Wrench, Audible Signal, Tee Handle Adjustment

a. Performance Check (fig. 11)

(1) Select cardinal point to nearest major increment indication of approximately 25 percent of maximum range of TI and present this point on TI to accuate audible signal.

(2) Insert TI in applicable torque tester, using adapter as required.

(3) Gradually apply rotational force on handle of TI until sharp click is heard.

(4) Slowly release force, and record reading indicated by stay-set indicator of torque tester.

(5) Return stay-set indicator of torque tester to where it contacts pointer pusher or pendulum dowel pin.

(6) Repeat (3) through (5) above three times.

(7) Compute average of readings. If average is not within limits specified in table 1 for specific torque wrench, perform **b** below.

(8) Remove TI from torque tester. Repeat technique of (1) through (8) above at TI cardinal points to nearest major increment indication of approximately 50, 75, and 100 percent of maximum range.

b. Adjustments

(1) Remove seal from adjusting mechanism.

(2) Preset adjusting mechanism to read within specified accuracy (R).

(3) Reseal adjusting mechanism.

26. Torque Wrench, Audible, Preset Torque

a. Performance Check (fig. 12)

(1) Note torque value setting on handle of TI.

(2) Insert TI in applicable torque tester, using adapter as required.

(3) Gradually apply force on handle of TI until audible signal is heard.

(4) Slowly release force, and record reading indicated by stay-set indicator of torque tester.

(5) Return stay-set indicator of torque tester to where it contacts pointer pusher or pendulum dowel pin.

(6) Repeat (3) through (5) above three times.

(7) Compute average of readings. Average will be within limits specified in table 1 for specific torque wrench.

b. Adjustments. Adjust in accordance with manufacturer's instruction manual.

27. Clutch-Type Torque Screwdrivers

a. Performance Check

(1) Insert TI appropriate torque tester, using adapter (part of B4) as required.

(2) Turn TI in cw direction and observe that torque tester indication remains at 0.

(3) Remove TI from torque tester.

(4) Adjust TI load to nearest major increment indication for approximately 25 percent of maximum range of TI

(5) Insert into appropriate adapter.

(6) Turn TI slowly in cw direction until clutch automatically releases.

(7) Record indication of torque tester.

(8) Return torque test indicator to 0.

(9) Repeat (6) through (8) above three times.

(10) Compute average reading of indications recorded in (7) above. Average reading will be within ± 3 percent of range indicated in (4) above.

(11) Repeat (3) through (10) above for TI cardinal points nearest major increment indication of approximately 50, 75, and 100 percent of maximum range. Average readings will be within ± 3 percent.

b. Adjustments. Adjust in accordance with manufacturer's manual.

28. Direct-Reading Torque Screwdrivers

a. Performance Check (fig. 13)

(1) Insert TI into appropriate torque tester, using adapter (part of B4) as required.

(2) Turn TI until indicator of TI is at point equivalent to nearest major increment indication approximately 25 percent of maximum range of TI.

(3) Record indication of torque tester.

(4) Return torque tester and TI indications to 0.

(5) Repeat (2) through (4) above three times.

(6) Compute average reading of indications recorded in (3) above. Average reading will be within ± 3 percent.

(7) Repeat (2) through (6) above to nearest major increment indication of approximately 50, 75, and 100 percent of maximum range of TI. Average readings will be within ± 3 percent.

b. Adjustments. Adjust in accordance with manufacturer's instruction manual. If no procedures are found, no adjustments can be made.

29. Final Procedure

a. Deenergize and disconnect all equipment.

b. Unless otherwise specified by TI manufacturer, set audible (micrometer-type barrel) indicating torque wrenches at 20 percent of maximum range before storage.

c. Replace TI in its protective case.

NOTE

Calibration of a torque wrench in both cw and ccw directions is considered special calibration.

d. When all parameters are within tolerance, annotate and affix DA Label 80 (US Army Calibrated Instrument). When the TI receives limited or special calibration, annotate and affix DA Label 163 (US Army Limited or special Calibration). When the TI cannot be adjusted within tolerance, repair the TI in accordance with the maintenance manual. When repair is delayed for any reason or the TI cannot be repaired with local resources, annotate and affix DA Form 2417 (US Army Calibration System Rejected Instrument) and inform the owner/user accordingly in accordance with TB 750-25.

TB 9-5120-202-35

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