TO 32B14-3-1-101

TECHNICAL MANUAL

OPERATION AND SERVICE INSTRUCTIONS
TORQUE INDICATING DEVICES

(ATOS)

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TO MAKE THIS A COMPLETE PUBLICATION

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SECTION I

INTRODUCTION

1-1. PURPOSE.

1-2. The purpose of this technical order is to provide operation and service instructions for standard Air Force torque devices used to obtain predetermined torque values on low, medium and high pressure hoses, tubing, nuts, bolts and related fasterners. These instructions are also applicable to torque devices used to obtain predetermined torque values on all types of fasterners wherever torque control is required. This technical order is applicable to all applicable federal stock classes.

NOTE

The term "devices" is used in this technical order to denote "handle", "wrench", "screwdriver", etc., as applicable.

1-3. GSA DISCREPANCY REPORT CENTER. 1-800-488-3111 for discrepancies concerning GSA and "SCIT" acquired torque devices.

SECTION II

DESCRIPTION

2-1. APPROVED TORQUE DEVICES.

2-2. The torque devices described herein are those which have been tested and satisfactorily passed the qualification requirements set forth in latest revisions and amendments of Specifications GGG-W-686 (impulse feel, manually operated torque wrenches), CID A-A-1274 (for deflection beam torque wrenches), CID A-A-2411 (for rigid case dial indicating wrenches), CID A-A-2414 (for screwdriver type wrenches), and GGG-N-1907 powered nutrunners and screwdrivers). Standard stock listed and other torque wrenches are not stock listed, but are produced by professional tool manufacturers that conform to referenced specification are deemed satisfactory for general application, quality and capacity to fulfill USAF torquing requirements. Shop designed and manufactured torque wrenches are not approved for use where close torquing accuracy is required. Under no circumstances shall a torque device that does not meet the minimum requirements of the above referenced specifications be used within the Air Force System unless it is a special torque device authorized for a specific application.

2-3. APPROVED TORQUE HANDLES AND WRENCHES.

2-4. Sweeney Torque Wrench, Part No. SWE51, National Stock No. 5120-00-819-1049, is authorized for use with B.K. Sweeney Power wrench, Model SWE8100, National Stock No. 5120-00-337-9652.

2-5. Typical examples of approved torque tools are not illustrated in this technical order. Illustrations contained in specifications referred to in paragraph 2-1 should suffice. Typical torque devices are demonstrated in training films referenced in paragraph 7-2.

SECTION III

DEFINITIONS

3-1. FORCE: A force is defined as any cause tending to produce or modify motion. The units by which a force is usually measured are ounces, pounds, grams, or kilograms. Besides force there is one other elementary quantity in mechanics from which numerous compound quantities are derived. This is distance, expressed as inches, feet, meters, or millimeters.

3-2. TORQUE: Torque in mechanics, is the product of a tangential force (weight) times the perpendicular distance to a center of rotation. This is usually expressed in units of distance and weight (force) as inch-ounces, inch-pounds, foot-pounds, gram-millimeters, and/or kilogram-meters. The above explanation is further explained in figure 4-1.

3-3. CHARACTERISTICS OF FORCE: Three characteristics which, when known, determine force. They are direction, place of application, and magnitude. The direction of a force is the direction in which it tends to move the body (nut or bolt) upon which it acts. The "place of application" is generally assumed to be a point, as the center of rotation. In reference to figure 4-1, the resulting torque is the applied force multiplied by its perpendicular distance to the center of the bolt or nut. The magnitude of this torque is expressed as inch-ounces, inch-pounds, foot-pounds, gram-millimeters, and/or kilogram-meters.

3-4. CALIBRATION. A checking operation to determine accuracy or inaccuracy of a torque tool using a suitable torque wrench tester.

3-5. ALIGNMENT. Actual adjustments necessary to bring a torque tool into acceptable tolerance.

3-6. IN USE: Torque devices removed from their normal storage location, during a work shift, to perform torquing tasks during the same work shift.

3-7. IN STORAGE. Torque devices in their normal storage location between work shifts.

3-8. REMOVED FROM SERVICE: Torque devices in supply stocks, or not being used for an extended period of time, due to lack of need, or in special storage, such as in a WRM or mobility package.

3-9. CLOCKWISE (CW): In the direction in which the hands of a clock rotate as viewed from the front.

3-10. COUNTERCLOCKWISE (CCW): In a direction opposite to which the hands of a clock rotate as viewed from the front.

SECTION IV

TORQUE PROBLEM

4-1. SIMPLE TORQUE PROBLEM.

4-2. Figure 4-1 illustrates a simple torque problem. Assuming that a 2-pound force was applied at a perpendicular (tangential to center of rotation) lever arm distance of 3-feet the torque applied is 2-pounds times 3-feet which equals 6 foot-pounds.

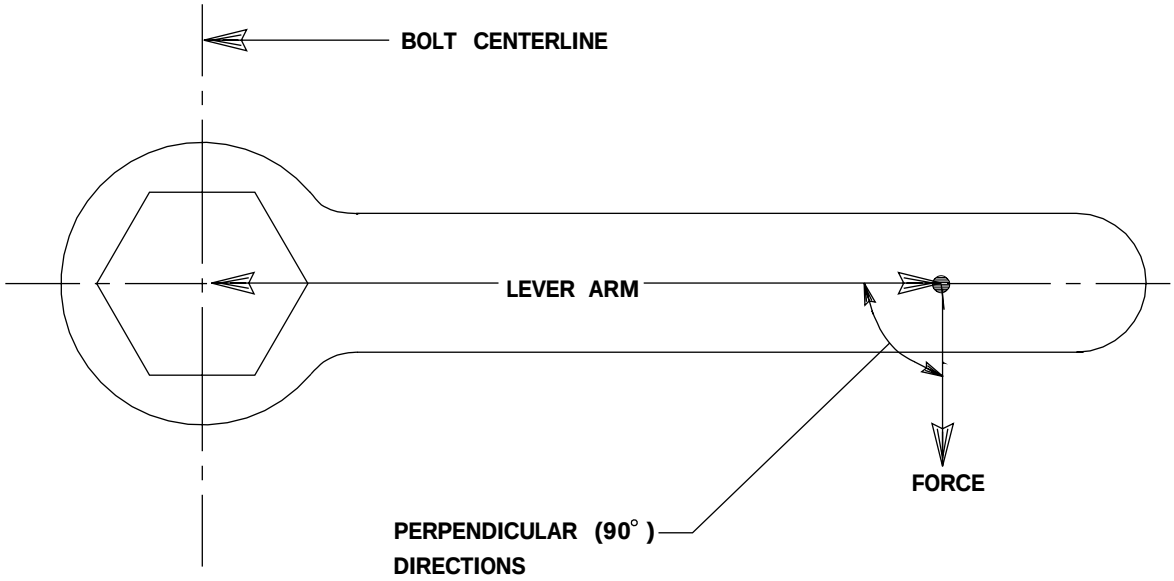


Figure 4-1. Simple Torque Problem

SECTION V

TORQUE CONVERSIONS

5-1. CONVERSION FACTORS. Occasionally, it is necessary to convert torque values to different units and different systems of linear measurments and weights. Multiplication factors as shown in table 5-1 are applicable for obtaining these conversions.

Table 5-1. Torque Conversion

UNIT	MULTIPLIED BY	EQUALS
Ounce (Av.) - Inches	720.09	Gram - Millimeters
Gram - Millimeters	0.0013887	Ounce (AV.) - Inches
Inch - Pounds (Av.)	0.0115214	Kilogram - Meters
Kilogram - Meters	86.7947	Inch-Pounds (Av.)
Foot - Pounds (Av.)	0.138257	Kilogram-Meters
Kilogram - Meters	7.23289	Foot-Pounds (Av.)
Inch - Pounds (Av.)	16	Inch-Ounces (Av.)
Inch - Ounces (Av.)	0.0625	Inch-Pounds (Av.)
Foot-pounds (Av.)	12	Inch-Pounds (Av.)

NOTE: Av. is avoirdupois weight; sixteen ounces equals one pound.

SECTION VI

TORQUE VALUES, AN AND MS NUTS

6-1. GENERAL. Torque values for installing AN castellated and self-locking steel nuts or steel bolts are listed in Table 6-1. This Table is based on threads of Class 3 fit, and non-lubricated. Unless otherwise specified, threads of bolts and nuts will be clean, dry, and free from oil or grease when torque tested.

6-2. The torque values shown are for general purpose installations, stressing bolts to approximately 40,000 psi. For special installations where bolts are to be preloaded, consult technical instructions covering equipment involved. Whenever possible, torque should be applied to nuts. However, when unable to torque a nut, the bolt will be torqued using the higher limit of the torque values of columns 2 and 3 of Table 6-1.

NOTE

Refer to Figure 6-1 for guidance on how to properly and sequentially torque hardware which is installed in rectangular, circular, or straight patterns.

6-3. When tightening castellated nuts on bolts, it is possible that the cotter pin holes will not line up with the slots in the nuts for the range of recommended installation listed in columns 2 and 3 of Table 6-1. In such a case, the nut may be over tighten just enough to line up the nearest slot with the cotter pin hole, but the maximum applied torque will not exceed the values listed in columns 4 and 5 as applicable.

6-4. These values are maximum for tightening nuts on AN bolts heat-treated to a minimum of 125,000 psi in tension, but are not necessarily the maximum tightening torques for higher strength bolts.

6-5. BOLTS LOADED IN SHEAR. Castellated steel nuts, AN310, and self-locking steel nuts, MS21042 and similar types, when installed on aircraft steel bolts, AN-3 and AN-20 series and equivalent types, will be tighten to within the values listed in column 2, Table 6-1, which stress the threaded section of the bolts to an initial tensile stress of approximately 40,000 psi. Shear type nut, such as AN320 and MS21083, installed on steel aircraft bolts wi11 be tightened (column 3, Table 6-1) approximately 60 percent of the values on thick nuts.

6-6. BOLT LOADED IN TENSION. AN310 and MS21042 nuts or similar tension nuts installed on aircraft bolts, AN-3 and AN-20 series and equivalent types, may be tightened to higher torque values than those listed in column 2, Table 6-1, provided yielding of the nut-bolt assembly does not occur while tightening the assembly.

6-7. Tension type nuts installed on AN-3 and AN-20 series bolts will not be tightened in excess of the values listed in column 4 of Table 6-1. These values give a combined tensile stress in the threaded shank of the bolt of approximately 90,000 psi, and apply to non-lubricated nuts and bolts.

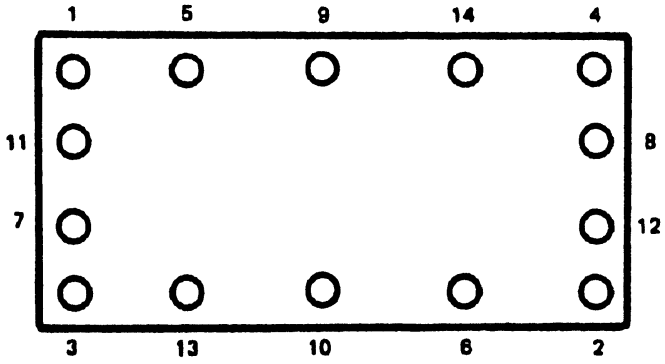
6-8. When higher torque values than those listed in columns 2 and 3 are necessary for proper installation, these higher torque values will be listed in the appropriate erection and maintenance manual for aircraft, and the overhaul manuals for engines and accessories.

6-9. If bolts or nuts under contractor's part numbers are to be torqued, these torque values will be listed in the appropriate erection and maintenance manual for aircraft, and the overhaul manual for engines and accessories.

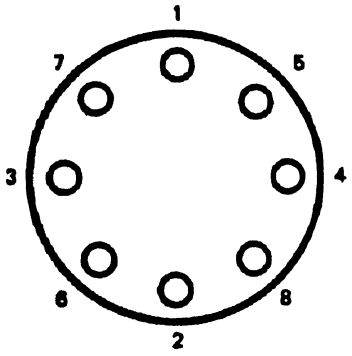
6-10. DIFFERENCE BETWEEN TABLE 6-1 AND OTHER MAINTENANCE INSTRUCTIONS. Table 6-1 is for use as a guide in the event of absence of particular values in other maintenance instructions. If there is a difference between values shown in Table 6-1 and values shown in maintenance instructions for particular systems or TO 1-1A-8, the values shown in these maintenance instructions and/or TO 1-1A-8 should take precedence over the values shown in Table 6-1.

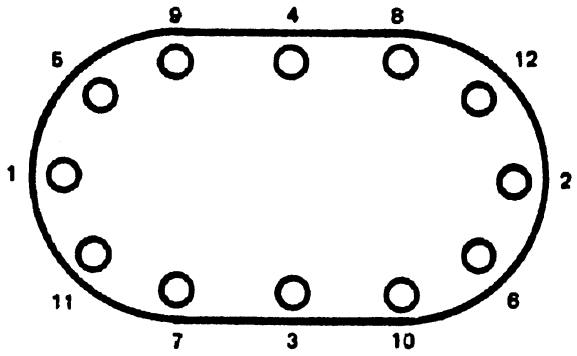
Table 6-1. Torque Values

1	2	3	4	5
Size	Torque Limits Recommended for Installation (Inch-pounds) (Bolts Loaded Primarily in Shear)		Maximum allowable Tightening Torque (Inch-pounds)	
Nut Bolt	Tension Type Nuts MS21042 and AN310(40,000 psi in bolt)	Shear type Nuts MS1083 and AN320 (approx 60 percent of column 2)	MS21042 and AN310 Nuts (90,000 psi in bolts)	MS21083 and AN320 Nuts approx 60 percent of column 4)
FINE THREAD SERIES				
8-36	12-15	7-9	20	12
10-32	20-25	12-15	40	25
1/4-28	50-70	30-40	100	60
5/16-24	100-140	60-85	225	140
3/8-24	160-190	95-110	390	240
7/16-20	450-500	270-300	840	500
1/2-20	480-690	290-410	1,100	660
9/16-18	800-1,000	480-600	1,600	960
5/8-18	1,100-1,300	660-780	2,400	1,400
3/4-16	2,300-2,500	1,300-1,500	5,000	3,000
7/8-14	2,500-3,000	1,500-1,800	7,000	4,200
1-14	3,700-5,500	2,200-3,300	10,000	6,000
1-1/8-12	5,000-7,000	3,000-4,200	15,000	9,000
1-1/4-12	9,000-11,000	5,400-6,600	25,000	15,000
COARSE THREAD SERIES				
8-32	12-15	7-9	20	12
10-24	20-25	12-15	35	21
1/4-20	40-50	25-30	75	45
5/16-18	80-90	48-55	160	100
3/8-16	160-185	95-110	215	170
7/16-14	235-255	140-155	475	280
1/2-13	400-480	240-290	880	520
9/16-12	500-700	300-420	1,100	650
5/8-11	700-900	420-540	1,500	900
3/4-10	1,150-1,600	700-950	2,500	1,500
7/8-8	2,200-3,000	1,300-1,800	4,600	2,700
1-8	3,700-5,000	2,200-3,000	7,600	4,500
1-1/8-8	5,500-6,500	3,300-4,000	12,000	7,200
1-1/4-8	6,500-8,000	4,000-5,000	16,000	10,000

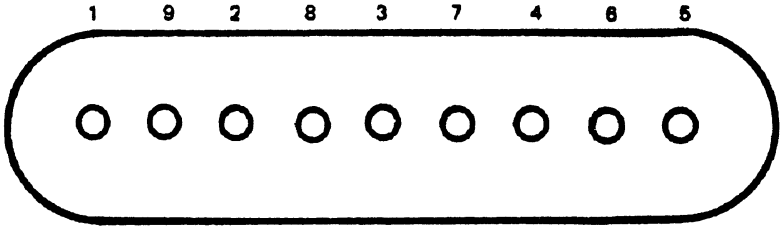


RECTANGULAR OR SQUARE FITTINGS





ROUND OR OVAL FITTINGS



STRAIGHT FITTINGS

ONCE THE PATTERN IS ESTABLISHED, THE SEQUENCE MUST BE ADHERED TO.

Figure 6-1. Torque Values

SECTION VII

OPERATION

7-1. GENERAL. The use of a torque device is not considered to be complicated. However, to properly use a torque device the mechanic must possess and demonstrate a basic knowledge of torquing technique. The importance of torque control must not be underestimated; neither should approved torquing practices be deviated from, nor disregarded.

7-2. To acquaint concerned personnel with the approved torquing practices, torque familiarization audiovisual (AV) productions or interactive multimedia instruction (IMI) products are available upon request for all field and depot level maintenance activities from the United States Army Visual Information Center (JVISDA), SAM-OPV-J-AS, Building 3/Bay 3, 11 Hap Arnold Blvd., Tobyhanna, PA 18466-5102 or http://www.redstone.army.mil/davis/. Requirements for these AV and IMI productions must be submitted in accordance with AFI 33-117, Jun 94. Referenced AV and IMI productions are:

AV = PRECISION MEASURING TOOLS, M1A1 TURRET REPAIR SPECIAL TOOLS, and USE AND CARE OF A TORQUE WRENCH

IMI= USE AND CARE OF TORQUE WRENCHES, TORQUE WRENCHES, MEASURING DEVICES, and JSEP GRAPHICS

TORQUE WRENCH TYPES:

Deflecting beam

Rigid case, dial indicating

Adjustable valve, snap-action, Impulse feel tee handle, ratcheting, preset (fixed valve), Impulse feel

Adjustable valve, snap-action, impulse feel, screwdriver

Direct reading, torque screwdriver

NOTE

The torque wrench types referenced in this TO correspond with the wrenches specified in GGG-W-686 in lieu of the types referenced in above AV and IMI productions.

7-2A. HOW TORQUE IS DEFINED FOR THE OPERATOR: When a Work Card, Technical Order, or Engineering Drawing refers to the amount of torque to be applied to a fastener, use the following examples:

If torque is stated "96 to 104" ftlb, apply torque at 100 plus or minus 4 ftlb. This application of torque would require the operator to use a torque wrench with an accuracy of plus or minus 4% or better. The value of 100 is the "Nominal" value, or torque value.

If torque is stated as "196 to 204" inlb, apply torque at 200 plus or minus 4 inlb. This application of torque would require the operator to use a torque wrench with an accuracy of plus or minus 2% or better. The value of 200 is the "Nominal" value, or torque value.

If a Work Card, Technical Order, or Engineering Drawing states the torque requirement as "100 plus or minus 4" or as "96 to 104", the "Nominal"value is "100". Use the "Nominal"value as the amount of torque to be applied. Any value outside of the "Nominal" value would be considered the tolerance for the torque requirement.

7-3. In all torque requirements, the desired torque value is predetermined and may be found in the applicable end item overhaul manual, or in the case of standard AN and MS bolts and nuts, in table 6-1.

CAUTION

Improper hand positioning will result in an inaccurate torque. Always apply force to the designated handle or handgrip.

NOTE

- Select proper size and capacity torque wrench so that the working range shall not be lower than 20 percent for impulse feel torque wrenches and 25 percent for screwdriver type torque wrenches, nor greater than the rated capacity of the torque wrench. Example: A torque wrench of which the lowest torquing value is 10 and the highest torquing value is 200, is considered to have a capacity of 200. The lowest 20 percent of this capacity would be 40, (20 percent of 200). Normal use of this wrench must be limited to values of 40 through 200. A torque wrench is not accurate below 20 percent of capacity.
- Prior to the use of any torque device (includes torque screwdrivers which may have multiple break points as the handle is rotated 360 degrees), the torque device to be used must be cycled through the breakaway torque as recommended in the manufacturer's brochure. If the manufacture's brochure is not available, set the torque device at the maximum setting and cycle through the breakaway torque at least six times. This can be accomplished by (typical example) securing the square tang of the wrench in a smooth jawed vise. This breakaway exercise can be performed at the beginning of a work shift or any time subsequent, however, it is not required more than once each shift (normally eight hours) on the specific torque wrench or wrenches to be used. The purpose of the breakaway procedure permits special internal lubricant to recoat internal working parts, eliminating internal resistance to give the most accurate reading possible.

7-4. On an impulse feel type wrench, to set the torque handle to the selected value, unlock, and adjust to the desired setting on the scale, then relock. Install required wrenching attachment on the square drive of the handle. Note the direction of the permanently etched arrow(s) on the barrel shaft of the torque wrench. This is the calibrated direction(s) of the torque wrench. Apply the wrench assembly to the fastener to be torqued and push or pull with a smooth and steady motion. When the torque applied reaches the predetermined torque setting of the handle, the handle will automatically release or "break" producing from approximately five (5) to 10 degrees free travel. This release is distinct, is easily detected by mechanic, and indicates completed torquing action on the fastener.

NOTE

A fast or jerky motion will result in an improperly torqued fastener.

CAUTION

- Do not make any wrench adjustments to settings lower than the equivalent of one incremental division lower than the lowest torque setting on the wrench assembly.
- Do not exceed applied torque on a wrench beyond the breakaway torque that the wrench is adjusted to. Do not use a torque wrench to apply a greater amount of torque than the rated capacity of the tool.
- The only extensions that may be used on torque wrench handles are to the manufactured extensions that are supplied as a part of the torque wrench assembly.
- When an adjustable value torque wrench is stored or removed from service, set it to its lowest increment torque value or mechanical stop, whichever comes first. Extreme care should be exercised when changing setting to lowest increment reading on wrench to prevent shearing of internal stop pins and possible disengagement of the internal mechanism.
- Due to the chance that impact loads might be involved at the time when release occurs, manually operated torque wrenches should not be used in breaking loose previously tightened nuts and bolts unless the torque wrench used is especially designed for this purpose.
- Do not use an offset extension with a T-handle or screwdriver type torque wrench. The use of offset extensions with these type torque wrenches will result in an incorrectly applied torque.
- Universals and universal sockets shall only be used for assembly. Universals and universal sockets will not be used for final torque unless specifically directed by technical data, or if a universal is permanently attached to the torque wrench when the torque wrench is calibrated. Torque applied using a universal at varying angles will apply incorrect torque on affected hardware.
- A FOD hazard may occur if the fusible plug or lead tape used to cover calibration access holes become chipped, damaged or lost.

7-5. USE OF AN EXTENSION ON A TORQUE WRENCH. (See figure 7-1 thru 7-3). Whenever possible, the use of extensions on torque wrenches should be avoided; however, where the use of extensions is necessary torque wrench settings can be accurately calculated, as follows:

A - Extension length between center of broached ends measured as shown in figure 7-1 thru 7-3. Use the effective length of the extension which must be measured along the centerline of the torque wrench.

B - Wrench length between center of drive plug to approximate center of hand grip.

T - Torque required on nut or bolt.

S - Torque wrench setting or reading (to be calculated).

7-6. CALCULATIONS WHEN EXTENSIONS ARE USED. Calculations applicable to use of extension are as follows:

NOTE

After determining correct torque, round decimals to the nearest whole number. Round up when 0.50 or higher. Round down when 0.49 or lower.

a. When wrenches are used similar to figure 7-1 the equation is:

$$S = \frac{T \times B}{A + B}$$

b. When extensions are perpendicular to wrench handles, similar to figure 7-2, then:

S equals T

c. When wrenches are attached similar to figure 7-3, the equation is:

$$S = \frac{T \times B}{B - A}$$

CAUTION

- When using wrench extensions along with above equations, torque forces exerted must be perpendicular to wrench handles.
- These torque wrench adapters must have their calibrated torque loads either etched onto them or shown on label stick-on tape applied to them and they must not be subjected to compressive forces while they are being used.

7-7. TORQUE WRENCH ADAPTER. Use of torque wrench adapters similar to Belknap, part No. 38A, and X-4 Corp., part No. 38A1 (NSN 5120-01-003-2366), that are not offset (attached onto wrenching sockets) does not require use of any calculation equations regardless of lengths of wrench handles or extension adapters used with it. The 38A and 38A1 adapters are guaranteed by the manufacturer to have a reliable, useful range of 24 to 180 in-lbs. Therefore, general treatment of conventional torque wrenches where lower 20% of maximum torque rating is unreliable, does not apply to the adapter, torque limiter.

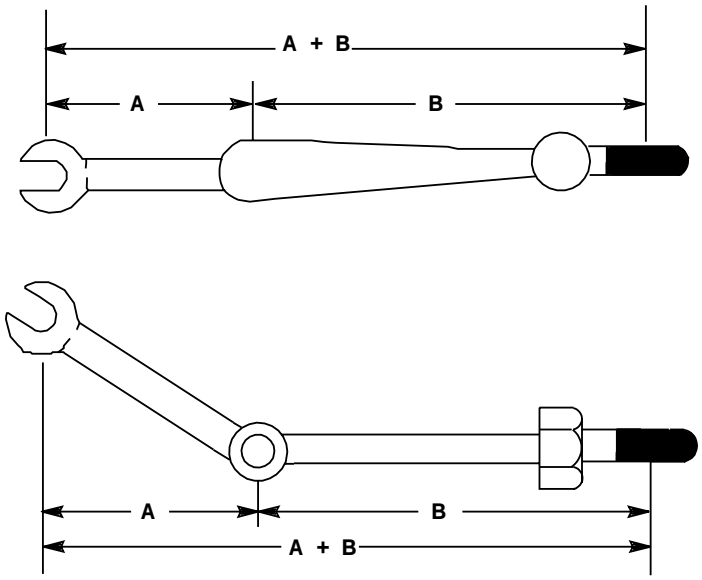


Figure 7-1. Extension Used When Total Length Exceeds Handle Length.

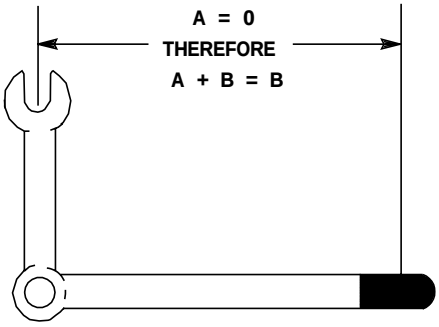


Figure 7-2. Extension Perpendicular to Wrench Handle

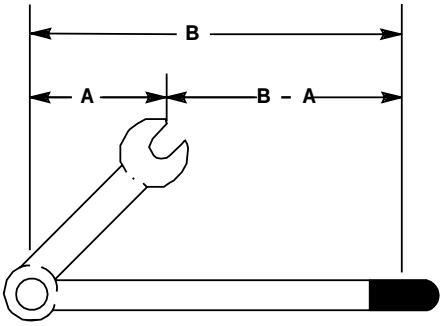


Figure 7-3. Extension Used When Total Length is Less Than Handle Length

CAUTION

When using a crowfoot on a torque wrench capable of CW and CCW torquing, certain orientations of the torque wrench drive, the crowfoot, and the fastener being torqued, can use the CCW capability of the torque wrench to torque a CW threaded fastener. Use extreme caution when torquing with a crowfoot and a CW/CCW capable torque wrench, to insure that the torque wrench is calibrated in the actual direction of travel of the torque wrench handle during torquing. For example, this problem is most evident when using a CW/CCW capable, adjustable value, impulse feel type torque wrench, with a crowfoot attached, and the torque wrench is calibrated in the CW direction only. If clearance to move the torque wrench becomes a problem and the torque wrench is removed, the barrel rotated 180 degrees, and then the crowfoot is reattached to the fastener to complete the torquing task, the uncalibrated CCW capability of the wrench can be inadvertently used to complete the CW torquing task.

7-8. OFFSET EXTENSIONS. If the use of offset wrenches such as crowfoot attachments where this offset could be considered as being a short extension, calculations must be made using the appropriate equation to determine wrench torque setting for assurance of accuracy of torque exerted.

NOTE

When a standard crowfoot attachment is used on a torque wrench, no torque correction is required. Torque to specified value or, if applicable, to center of specified range.

7-9. PREVAILING (RUNNING) TORQUE: To obtain the correct recommended torque value on a nut, the nut must be run down until it is one turn from the beginning of seating. At this point, the prevailing torque should be noted. If the prevailing torque is less than one-third of the recommended torque, it should be disregarded and the nut tightened to the recommended torque value. If the prevailing torque is one-third or more than one-third of the recommended torque, it should be added to the recommended torque. Example: The recommended torque is 50 to 70 inch-pounds. The prevailing torque at one turn from the beginning of seating is 30 inch-pounds. The correct torque wrench reading would be 80 to 100 inch-pounds. If the prevailing torque had been 10 inch-pounds, it would have been disregarded and the correct torque wrench reading would have been 50 to 70 inch-pounds.

NOTE

- Prevailing torque is usually associated with self-locking screws and nuts.
- It is not always necessary to account for prevailing torque. If the appropriate technical order specifies using a self-locking screw or nut and does not state that prevailing should be compensated for, it must be assumed that the manufacturer of the item has already taken it into consideration. As a result, prevailing torque will be compensated for only if required by specific technical data.

SECTION VIII

MAINTENANCE AND ADJUSTMENT

8-1. ROUTINE MAINTENANCE. Beyond the normal care of Test Measurement and Diagnostic Equipment (TMDE), there are no special requirements for torque devices.

CAUTION

If a torque device is dropped or otherwise abused, it shall be calibrated prior to further use.

8-2. CALIBRATION. The user is responsible for obtaining calibration whenever a torque device is issued from supply or stock, and at the intervals specified by TO 33K-1-100. Calibration procedures have been removed from T.O. 32B14-3-1-101 and have been placed in T.O. 33K6-4-2193-1 for Action, Impulse Feel Torque Wrenches; T.O. 33K6-4-3014-1 for Torque Screwdrivers; T.O. 33K6-4-3015-1 for Dial Indicating and Deflecting Beam Torque Wrenches; T.O. 33K6-4-3016-1 for Torque Multipliers, Limiters, and Limiting Devices; and T.O. 33K6-4-3017-1 for Torque "T" Handles. Any of these technical orders may be obtained from AFMETCAL Detachment 1/MLLW, 813 Irving-Wick Drive West Ste 4M, Heath Ohio 43056-6116. (DSN 366-5173, FAX: 366-5020).

8-3. USER ADJUSTMENTS. There are no internal user adjustments for torque devices.

8-4. CALIBRATION ADJUSTMENTS. Calibration adjustments are only to be accomplished during calibration by a qualified technician.

8-5. ACCESS TO CALIBRATION ADJUSTMENT ON IMPULSE FEEL TYPE WRENCHES. Type III torque wrenches that are equipped with metal torque adjustment handles are frequently equipped with fusible plug access to calibration adjustments. These fusible plugs are located on extreme outer ends of wrench handles.

NOTE

Several screwdrivers and other type torque wrenches have exposed calibration adjustments holes which may be covered after calibration is complete. Positive sealing of these holes by use of torque seal, remelting fusible plug, lead tape, or placing a NOTICE CERTIFICATION VOID WHEN SEAL IS BROKEN label over the adjustment access is acceptable. The aforementioned positive sealing methods are examples; however, any other positive sealing methods may be used. The sealing method will be of sufficient security to detect tampering with TI (calibration) adjustment. Only qualified technicians may remove this seal. If tampering is detected, sealing is required for all torque TMDE calibrated by the PMEL for that Owning Work Center.

8-6. FUSIBLE PLUG REMOVABLE. Fusible plugs may be melted out by using a low-heat soldering iron.

CAUTION

Excessive heat of over 300 degrees F can cause damage to the torque device.

NOTE

The fusible plug material along with its accompanying metal disc should be caught and retained for reinstallation in the wrench handle. New fusible alloy may be procured under NSN 9650-00-224-8471, Part No. QQF838. This alloy, a lead/tin/bismuth/cadmium mixture, melts at 158 degrees F and is completely liquid at 170 degrees F. Lead, solder compounds, or RTV are not suitable substitutes and will not be used.

8-7. FUSIBLE PLUG REINSTALLATION. If fusible plug is to be reinstalled after calibration procedures are complete, the wrench handle must be held in an upright position, the metal disc must be placed on top of the adjustment or locking screw and by using the low-heat soldering iron the fusible material can then be remelted and reformed in its original shape and position.

NOTE

Some torque devices, noteably several small torque screwdrivers may require a sealant on the handle and do not lend themselves to use of the preferred lead/tin/bismuth/cadmium alloy. In these cases other sealant material can be used. Two such materials are: Torque seal and sealing wax. The torque seal is quite easy to apply. It comes in a liquid form and drys in 24 hours. The sealing wax comes in hard sticks, usually packaged in one pound boxes of 20 sticks. It is a little more difficult to apply, a heat gun may be used to melt it, but it drys almost immediately.

8-8. BELKNAP TORQUE WRENCH ADAPTER (NSN 5120-01-003-2366). Access to the torque

adjustment nut is obtained by removing a snap ring and then removing a locking plate. After torque adjustment and checking, reinstall the locking plate and then reinstall the snap ring.

8-9. JS TOOL CO. TORQUE WRENCHES. Access to and torque adjustment of JS Tool Company torque wrenches are accomplished by using the following steps.

NOTE

Adjustment tools, applicable to JS Tool Company drawing T51000 can either be locally manufactured or procured from JS Tool Company by using local procurement procedures. This drawing is available at WR-ALC/LKJTC.

a. Adjust the wrench to its lowest reading.

b. Melt out the fusible plug from the side of the hand grip with a soldering iron (save the fusible alloy for reuse) or if sealed with torque seal, sealing wax or similar substance, use appropriate tool to remove it.

c. Remove the knob retaining screw or rollpin that secures the knob assembly in place and remove the knob assembly by pulling it out. Removal of the rollpin can only be accomplished by pulling it out. In wrenches (with "B" handle) that are equipped with a second knob retention screw, access for removal of the second screw can be accomplished by sliding the grip toward the drive end of the wrench. If the crystal protrudes out, push it back into the grip.

d. Attach the wrench to the torque tester and take several readings. Notice the approximate average differences of the torque wrench readings and the tester torque readings and if these differences are high or low from the tester torque readings.

e. Adjust the wrench setting to the lowest torque value that recalibration will be accomplished on.

f. Using tools in accordance with JS Tool Company drawing T51000 adjust wrench as follows:

(1) Insert the spanner wrench into the slots of the scale drum.

(2) Insert the socket inside the spanner onto the locknut that is within the wrench.

(3) While keeping the spanner wrench from turning, loosen the locknut.

(4) Turn scale drum to compensate for difference noted in above step d. (for example if the wrench readings were two (2) inch-pounds to low, advance the scale drum to two inch-pounds higher value).

(5) While holding the scale drum in this position with the spanner wrench, retighten the locknut.

g. Recheck torque wrench readings for all torque readings required for recalibration. If additional adjustment is required, repeat step f. and the first sentence of this step.

h. Reassemble the knob assembly with its retention screw(s) or rollpin(s).

i. Check a few intermediate settings and the highest wrench setting. These settings should now be within tolerance. If some of these settings are out of tolerance some internal components may need replacing before the wrench can be calibrated.

NOTE

A small correction to the higher readings may be made by adjusting the low reading off the nominal but within the allowable tolerance.

j. If fusible plug is to be reinstalled after calibration procedures are complete, replace fusible plug removed in step b., and seal plug with torque seal, sealing wax or similar substance which will prevent loss but will not prevent removal of plug for future adjustments.

8-10. CONSOLIDATED DEVICES INC. TORQUE WRENCHES. Access to and torque adjustment of Consolidated Devices Inc. (CDI) adjustable torque and torque screwdrivers are accomplished by using the following steps:

ADJUSTING:

a. The wrench needs adjusting if the handle setting reads differently than the tester reading by (±) 4% or stated Manufacturer's Specifications.

Example: Tester reads 34 Ft. Lbs. and handle on torque wrench is set at 30 Ft. Lbs.

b. Remove the button plug (H) with a small blade screwdriver to expose the 1/8″ hex set screw.

c. To correct the setting follow the following procedure using figure 8-1.

(1) With the handle in the locked position (forward) position turn the setscrew (F) two revolutions counterclockwise this will disengage the internal mechanism of the hex assembly.

(2) Pull the handle (A) straight line to the rearmost position. Turn the handle four graduations clockwise until the handle is set at 34 Ft. Lbs.

(3) With the handle set at 34 Ft. Lbs., push the handle forward to the locked position, and tighten the setscrew (F).

(4) Pull the handle to the rearmost position and turn counterclockwise four graduations. Now the wrench will read 30 Ft. Lbs.

(5) Slide the handle forward to the locked position and test three more times. The average of these three readings must fall within 4% of the wrench setting (if not, repeat step c).

(6) If the readings fall within the allowable range, pull the handle to the rearmost position (unlocked) and turning the handle clockwise until the torque setting is at 60% of the scale. Lock the handle and repeat the test procedure by taking three readings at the setting. Record the average of the three readings.

(7) Following the above step c(6) procedure, set the handle to 100% of the scale and record the average of the three readings at 100% of the scale.

(8) Check the torque wrench at all torque values applicable and if further adjustments are needs with the wrench, set at a torque value where is it out of tolerance, repeat steps c(1) through c(7) and follow by rechecking at all torque values applicable. Continue to step c(9) and seal plug with torque seal, sealing wax or other similar substance that will prevent loss, but will not prevent later removal of plug for future adjustments.

(9) Some wrenches are equipped with an additional fulcrum adjustment located under a protective label between the handgrip and the driving end of the wrench. This fulcrum adjustment is provided for high torque ranges and may be used if the wrench cannot be adjusted by the above procedure. To use this adjustment, set the wrench at either 80 or 100% of its torque range and proceed as follows:

(a) Remove protective label.

(b) Loosen fulcrum setscrew.

(c) Slightly move the fulcrum (fulcrum movement toward the drive will increase true torque and movement away from the drive will decrease this torque).

(d) Securely tighten fulcrum setscrew.

(e) Repeat step c(9).

(f) Reinstall or replace protective label.

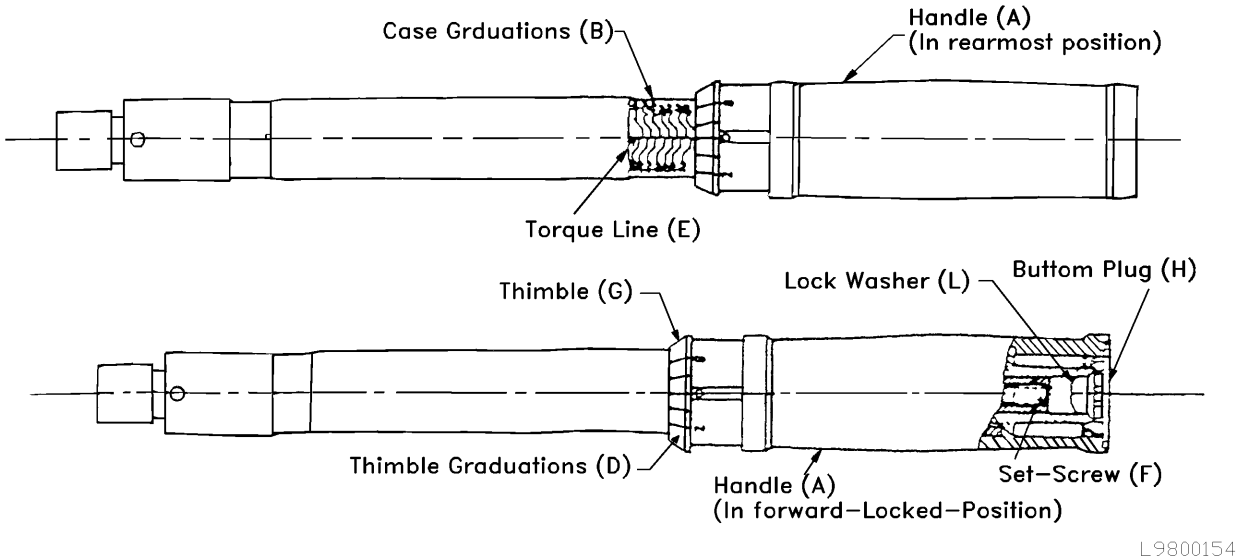


Figure 8-1. Access/Torque Adjustment of CDI Torque Wrenches

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