BOMBARDIER

Toronto (de Havilland)

PROPRIETARY INFORMATION

PPS 14.01

PRODUCTION PROCESS STANDARD

Torquing & Tightening

Issue 26
- This standard supersedes PPS 14.01, Issue 25.
- Vertical lines in the left hand margin indicate technical changes over the previous issue.
- Direct PPS 14.01 related questions to michael.wright@aero.bombardier.com.
- This PPS is effective as of the distribution date.
- Validation of paper prints is the responsibility of the user. Signed original on file.

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1 Scope

1.1 This Production Process Standard (PPS) specifies the procedure and requirements for torquing bolts, nuts and screws and identifying torqued fasteners. This PPS also specifies the procedure and requirements for tightening of threaded parts/components where a torque value or range is not specified.

1.1.1 This PPS complements the engineering drawings that specify its use as an authorized instruction. The procedure specified in this PPS must be followed to ensure compliance with all applicable specifications. In general, if this PPS conflicts with the engineering drawing, follow the engineering drawing. The requirements specified in this PPS are necessary to fulfil the engineering design and reliability objectives.

1.1.2 Refer to PPS 13.26 for the subcontractor provisions applicable to this PPS.

1.1.3 Refer to PPS 6.03 for additional specific requirements for torquing of fluid line fittings and to PPS 13.09 for additional specific requirements for torquing of aircraft wheel nuts.

1.1.4 Procedure or requirements specified in a Bombardier BAPS, MPS, LES or P. Spec. **do not** supersede the procedure or requirements specified in this PPS.

2 Hazardous Materials

2.1 Before receipt at Bombardier Toronto (de Havilland), all materials must be approved and assigned Material Safety Data Sheet (MSDS) numbers by the Bombardier Toronto (de Havilland) Environment, Health and Safety Department. Refer to the manufacturer's MSDS for specific safety data on any of the materials specified in this PPS. If the MSDS is not available, contact the Bombardier Toronto (de Havilland) Environment, Health and Safety Department.

3 References

3.1 General

3.1.1 Unless a specific issue is indicated, the issue of the reference documents specified in this section in effect at the time of manufacture shall form a part of this specification to the extent indicated herein.

3.2 Bombardier Toronto (de Havilland) Process Specifications

3.2.1 PPS 2.20 - Installation of Bolts and Screws.

3.2.2 PPS 6.03 - Installation of Fluid Lines and Fittings.

3.2.3 PPS 9.22 - Assembly of Connectors.

3.2.4 PPS 9.39 - Installation and Termination of Braided Shields for EMI & HIRF Protection of Wire Harnesses on DASH 8 Series 400 Aircraft.

3.2.5 PPS 13.09 - Mounting and De-Mounting of Aircraft Tires.

3.2.6 PPS 13.26 - General Subcontractor Provisions.

3.2.7 PPS 13.28 - Storage Life of Adhesives, Sealants, Paints and Composite Products.

4 Materials and Equipment

4.1 Materials

4.1.1 Unless otherwise specified in this section, use only the materials specified; use of superseding or alternative materials is not allowed.

4.1.2 MIL-T-5544 anti-seize thread compound.

4.1.3 Tamper proof sealant, white:

- Dykem Cross Check tamper proof torque mark, p/n 83319 (white)
- Organic Products Co. F-900 or F-925 Torque Seal
- 3M EC-1252 tamper proof sealant

4.1.3.1 Refer to PPS 13.28 for the storage life of tamper proof sealant. The tamper proof sealants specified herein are resistant to splashes of hydraulic fluid (e.g., Skydrol) but are not resistant to immersion. After application, allow tamper proof sealant to cure undisturbed according to the manufacturer's recommendations. Apply tamper proof sealant sparingly, do not apply more than needed, especially in overhead applications.

4.2 Equipment

4.2.1 Torque drivers and torque wrenches (e.g., as shown in Figure 1). All torque drivers and torque wrenches must be calibrated and identified with a valid calibration label.

4.2.2 Sockets, adapters and extensions, as required (see Figure 2, Figure 3, Figure 4 and Figure 5).

4.2.3 Torque control power drivers (e.g., Ingress Rand 3RTNSI-VDS473, 4RTPSI, 3RTNSI/VDS-488).

4.2.4 Strap wrench for torquing of connector backshells and connector adapters (e.g., Daniels BT-BS-601 or Glenair TG70). See Figure 11 for a general description of a strap wrench.

4.2.5 Circular connector holding adapter or wrench kits (e.g., as specified in Table 1).

4.2.6 Connector holding boards, (e.g., as specified in Table 2).

4.2.7 Inspection aids (e.g., mirrors) with non-conductive or insulated handles for checking torquing where there is a risk of shorting or shock (e.g., torqued inter-cell connectors on Ni-Cd batteries).

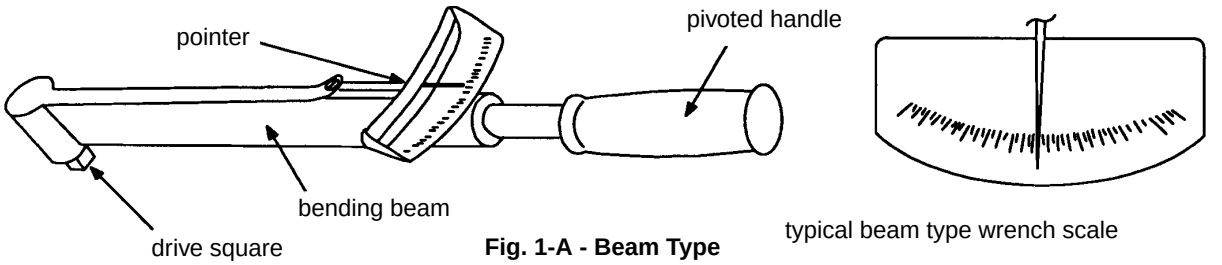


Fig. 1-A - Beam Type

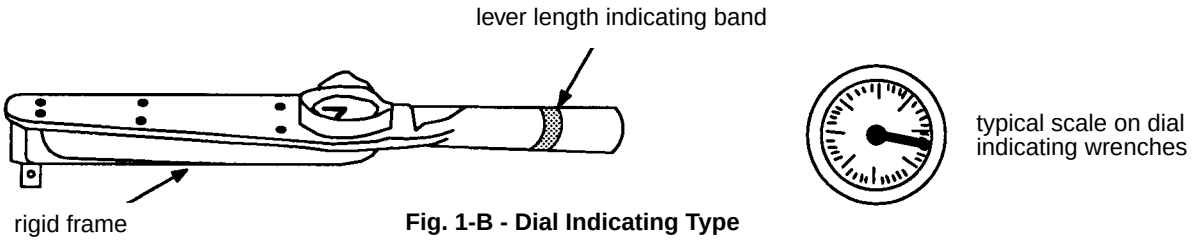


Fig. 1-B - Dial Indicating Type

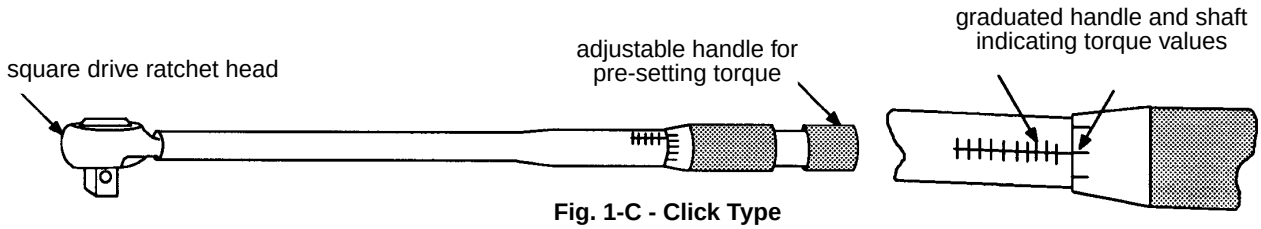


Fig. 1-C - Click Type

Figure 1 - General Description of Torque Wrenches

5 Procedure

5.1 General

5.1.1 The term “torquing” as used herein denotes the process of installing a threaded fastener, fitting or connector backshell/adapter to a specified torque value using a torque wrench. If the Engineering drawing, or a referencing PPS, specifies a torque value or range (e.g., “Torque to XX in. lbs.”) torquing according to this PPS is required even if direct reference to PPS 14.01 is not made by that drawing, or referencing PPS (ref. C8-1010 or C45-1010, as applicable). If installation according to PPS 14.01 is specified by the engineering drawing or a referencing PPS, torque to the specified torque value using a torque wrench according to the procedure specified herein.

5.1.2 The term “tightening” as used herein denotes the process of installing a threaded part/component without using a torque wrench and without reference to a specified torque value. Tightening according to section 5.7 is appropriate **only** when the engineering drawing, or a referencing PPS, does not specify a torque value or range.

5.1.3 Carry out torquing as specified herein if specified on the engineering drawing, Engineering Order or PPS.

5.1.4 When tightening and torquing, do not use lubricants or anti-seize compounds on threads unless specified by the engineering drawing, Engineering Order or PPS. If “Lub-Torque” is specified on the engineering drawing, apply a light film of MIL-T-5544 anti-seize thread compound to the bearing surfaces of washers and nuts, under bolt heads and the threads of bolts before installation.

5.1.5 Remove all paint, dirt and corrosion from threads before mating up and torquing. Ensure that mating parts and surfaces are smooth and clean.

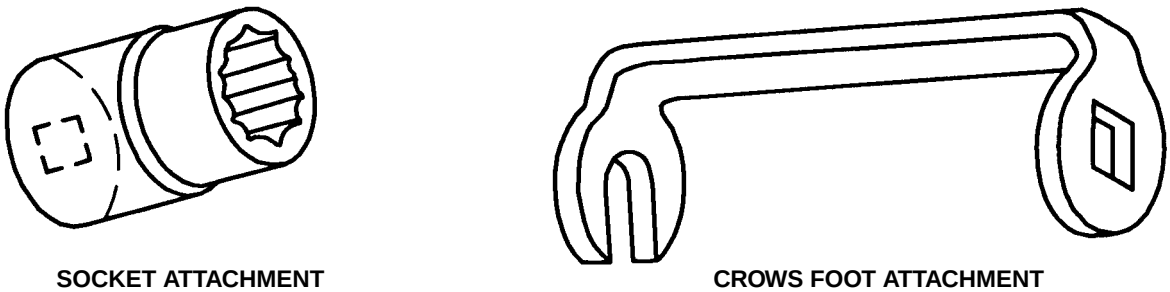
5.1.6 Ensure that threaded fasteners and fittings engage freely.

5.1.7 Power tools with one shot clutches certified to ±5% of the rated torque capacity (such as Ingress Rand Model Numbers 4RTPSI or 3RTNSI-VDS473) may be used to control final installation torque. Impact tools or tools with a ratchet type clutch may not be used on installations that require a specified torque. If stall type power tools are used, the stall torque must be less than the ultimate minimum fastener torque and final torquing must be accomplished using a certified tool. In cases where there is a risk of shorting or shock (e.g., torquing of inter-cell connectors on Ni-Cd batteries), use of a torque wrench with a non-conductive or insulated handle is recommended.

5.1.8 Before any use of a torque driver or torque wrench, ensure that the tool has been calibrated and validate that the calibration has not expired.

5.2 Attachments, Extensions and Adapters

5.2.1 An attachment is any shape or form of work engaging member that functions coaxial with, and is attachable to, the drive square of the torque wrench (see Figure 2). Some variations of attachments enable the operator to work around obstructions that would normally make a fastener inaccessible.



SOCKET ATTACHMENT

CROWS FOOT ATTACHMENT

Figure 2 - Typical Torque Wrench Attachments

5.2.2 Socket type extensions are attachments that enable the operator to torque fasteners in remote or inaccessible locations. These extensions are designed with a drive square on one end to accept standard sockets and adapters.

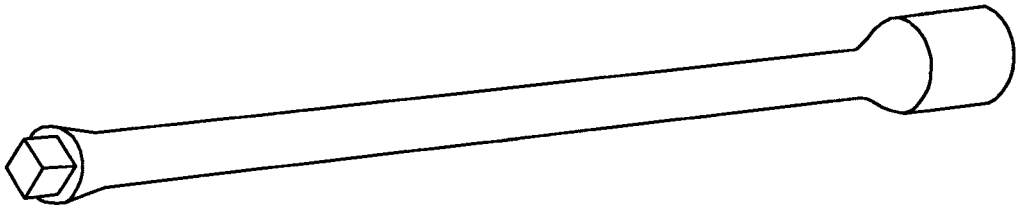


Figure 3 - Socket Type Extension

5.2.3 A lever type extension is a rigid bar or shape extending longitudinally forward from the axis of, and is attachable to, the drive square to provide accessibility to fasteners. At its extremity, is a drive square for the attachment of sockets (see Figure 4). When lever type extensions are used, it is necessary to calculate for a corrected torque reading due to the increased lever length. Refer to section 5.5 for the torque correction calculation. Only use lever type extensions to torque obstructed fasteners that would otherwise be inaccessible with the torque wrench.

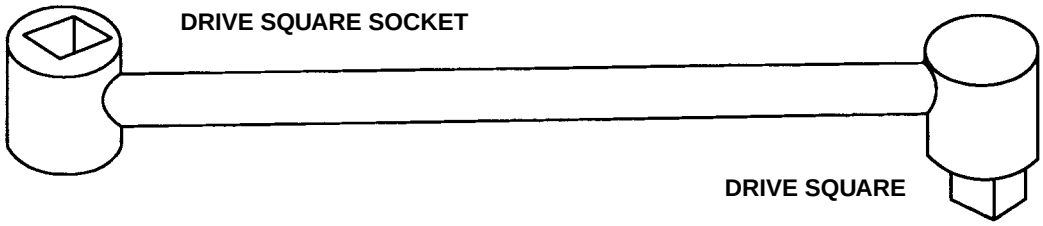


Figure 4 - Lever Type Extension

5.2.4 An adapter is any rigid shape or form of work engaging member extending longitudinally forward from the axis of, and is attachable to, the drive square of the torque wrench (see Figure 5). With the adapter extending beyond the wrench drive the actual torque value will be affected. To compensate for the increased lever length, a calculation must be made, as per section 5.5, to ensure the proper torque is applied.

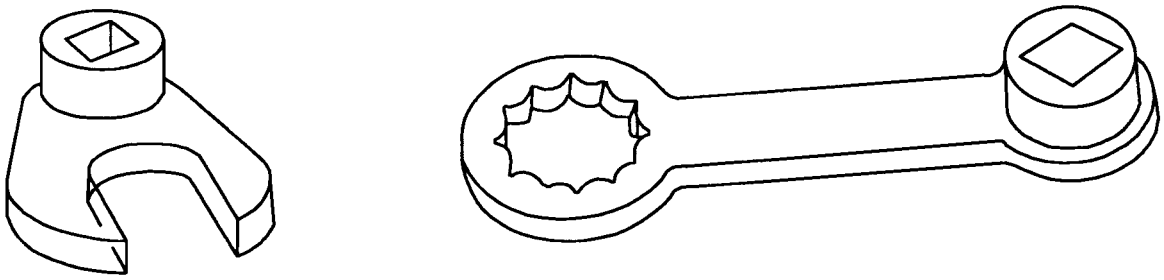


Figure 5 - Typical Torque Wrench Adapters

5.2.5 If it is necessary to use an adapter in combination with a socket type extension attachment, fix a universal joint between the adapter and extension drive square.

5.3 General Torquing Practices

5.3.1 Before torquing any fasteners, check the engineering drawing or the PPS to verify the specific torque values required.

5.3.2 Ensure the correct size of attachment or adapter is used and the extension (if applicable) is of a suitable length.

5.3.3 When using a socket type extension, keep the extension in line with the fastener being torqued and place the palm of the left hand on the head of the torque wrench to equalize the force being applied to the handle (see Figure 6).

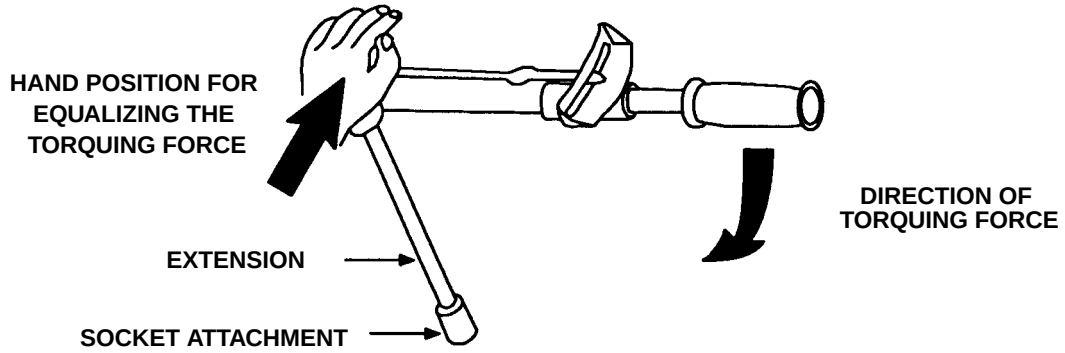


Figure 6 - Handling of Torque Wrenches Using an Extension

5.3.4 When using a socket type extension in conjunction with a universal joint, place the palm of the left hand at the head of the torque wrench to balance the assembly during torquing and to maintain the socket extension at a right angle to the adapter or lever type extension (see Figure 7).

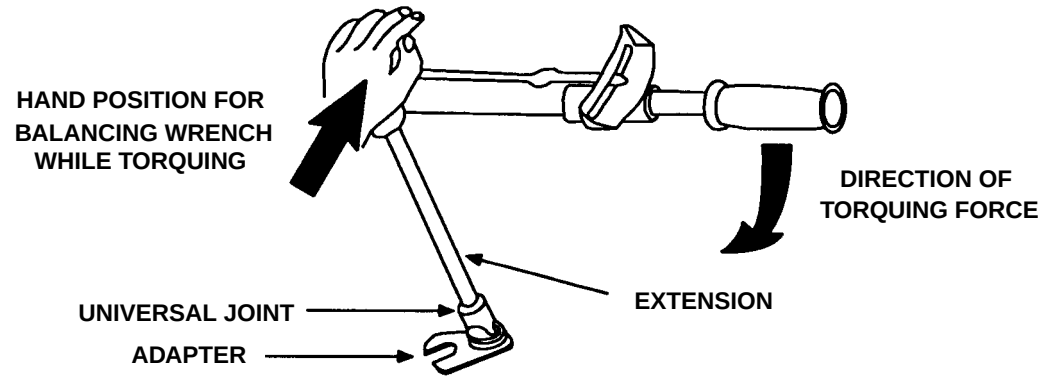


Figure 7 - Handling of Torque Wrenches Using a Universal Joint

5.3.5 Torque wrenches must be of suitable size and working capacity for the work being done. Select a torque wrench of such capacity that the required torque is within 20% - 100% of the torque wrench capacity (e.g., the acceptable working range of a torque wrench with a 0 - 200 inch pound capacity is 40 - 200 inch pounds).

5.3.6 When torquing, grip the wrench by the pivoting handle or the indicated grip area (usually marked by a knurl) and apply slow, steady pressure. Ensure that the lay of the wrench is parallel to the mating surface (see Figure 8). Apply the torquing force at approximately 90° to the handle of the torque wrench. When using a torque wrench fitted with a pivoted type handle, float the handle on the pivot so as to concentrate the pulling force on the pivot. Gripping the torque wrench by other than the handle or grip area will either increase or decrease the effective lever length and result in an inaccurate torque reading.

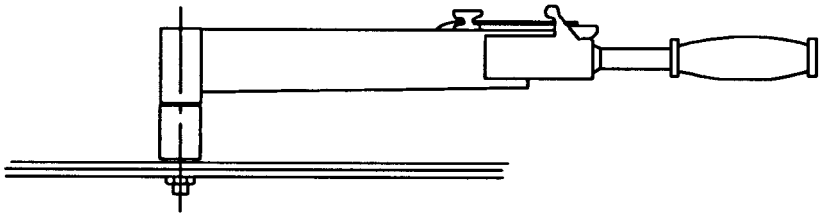


Figure 8 - Wrench Position While Torquing

5.3.7 If possible, apply the load in a pulling fashion as this permits less chance of hand injury should the wrench slip or the fastener fail.

5.3.8 Do not use unauthorized pipes, tubes, bars or other similar tools or devices on torque wrench handles to aid in torquing fasteners. Torque wrenches with dial indicators may be used with the approved extension handles only.

5.3.9 Read torque indicating dials and scales from directly above the indicator. Reading the indicator from an angle will result in an inaccurate torque reading (i.e., parallax error).

5.4 Torquing of Connector Backshells/Adapters

5.4.1 Except for connectors adapters or backshells assembled according to PPS 9.39, if a heat shrinkable boot is going to seal the connector or it is necessary to prevent loosening of the backshell during handling, assemble the backshell onto the connector with MIL-S-46163 Grade M anaerobic sealant according to PPS 19.02 immediately before torquing. **Do not** secure connector adapters or backshells assembled according to PPS 9.39 using **any** kind of adhesive or sealant as this could have a detrimental effect on EMI and HIRF protection of the wire harness.

5.4.2 Hold the connector in place using a suitable holding adapter or wrench (e.g., as specified in Table 1) or a suitably mounted mating connector (e.g., mounted on a board as a shop aid, see Table 2), if available. If necessary, it is also acceptable to use soft jawed pliers or another strap wrench to hold the connector or transition in place. See Figure 9 and Figure 10 for typical holding wrenches and adapters.

Table 1 - Holding Adapter or Wrench Selection

Shell Type	Specification	Glenair Holding Adapter or Wrench Set	DMC (Daniels) Holding Adapter Tool Sets	
			Plug	Receptacle
D38999	MIL-DTL-38999 series I	600F005	CM-S-389L	CM-S-389LR
	MIL-DTL-38999 series II	600FRF005 OR TG48	CM-S-389S	CM-S-389R
	MIL-DTL-38999 series III	600H005 OR TG90	CM-S-389T	CM-S-389TR
	MIL-DTL-38999 series IV	600HH005	CM-S-389B	CM-S-389BR
MS3120 - MS3128	MIL-C-26482 series 1	600D005 or TG39	CM-S-264	CM-S-264R
MS3450 - MS3459	MIL-C-5051	600B005 or TG38	CM-S-5015	CM-S-5015R
MS3470 - MS3477	MIL-C-26482 series 2	600D005 or TG39	CM-S-264	CM-S-264R
MS24264 - MS24266	MIL-C-26500	600E005 or TG37	CM-S-837	CM-S-837RB
MS27473	MIL-C-38999 series I	600F005	CM-S-389L	CM-S-389LR
	MIL-C-38999 series II	600FRF005 or TG48	CM-S-389S	CM-S-389R
	MIL-C-38999 series III	600H005 or TG90	CM-S-389T	CM-S-389TR
	MIL-C-38999 series IV	600HH005	CM-S-389B	CM-S-389BR
M83723-XX	MIL-C-83723 series II	600D005 or TG38	CM-S-5015	CM-S-5015R
	MIL-C-83723 series III	600E005 or TG37	CM-S-837	CM-S-837RB

Table 2 - Backshell Connector Holding Boards at Bombardier Toronto (de Havilland)

Backshell	Backshell Board	Backshell	Backshell Board
MS3476	A	M83723	D
MS3476	B	MS3459	E
MS3476	C	MS3459	F

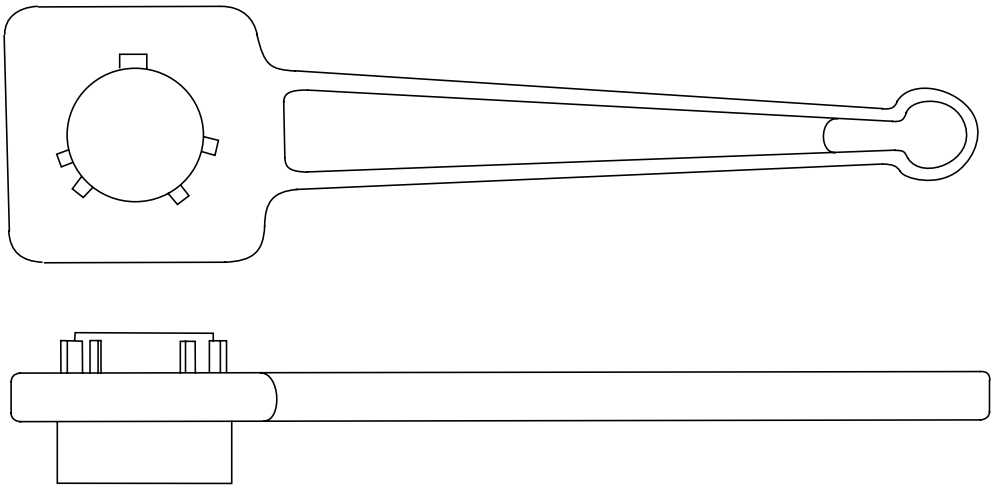


Figure 9 - Connector Holding Wrench (Typ.)

Figure 10 - Connector Holding Adapter Kit (Typ.)

5.4.3 Torque connector backshells/adapters using a strap wrench fitted into a torque wrench. When using a strap wrench, insert the square peg of the torque wrench into the square hole in the strap wrench (see Figure 11) so that the handles of the two wrenches are in line with one another as shown in Figure 12.

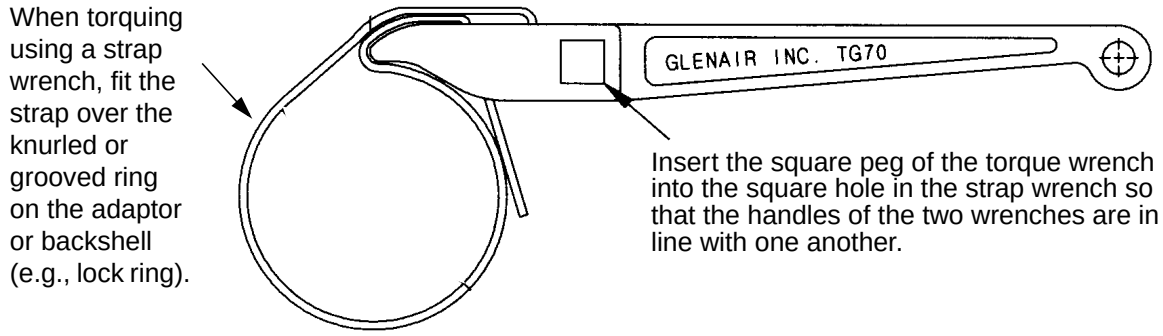


Figure 11 - Strap Wrench (Typ.)

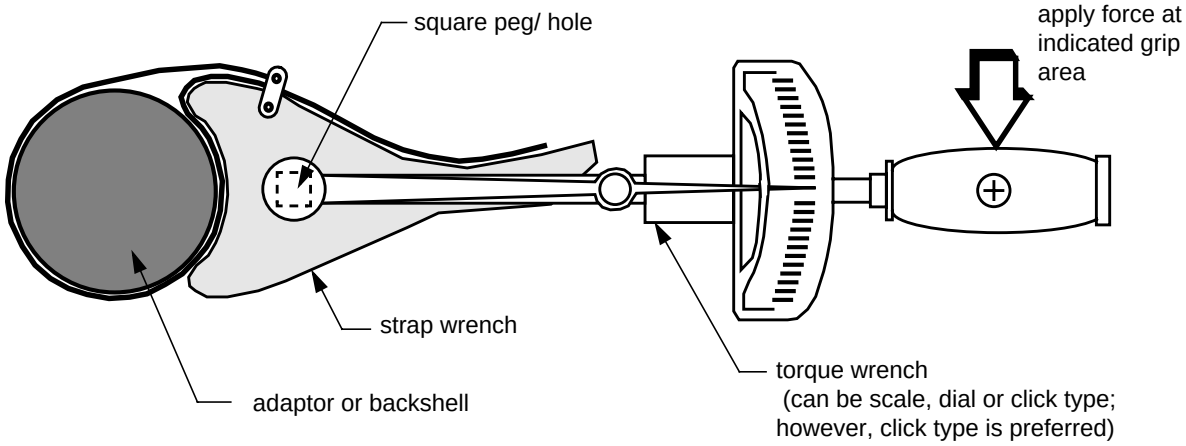


Figure 12 - Use of Strap Wrench with Torque Wrench

5.4.4 Torque connector backshells/adapters to the value specified by the engineering drawing or wiring list. **Only** if the engineering drawing or wiring list does not specify the torque value, torque the backshell/adapter to the value specified below. A torque correction for extension as described in section 5.5 is required when using a strap wrench with a torque wrench.

- For Cantwell Cullen and Icore backshell/adapters, if the engineering drawing or wiring list does not specify a torque value, torque the backshell/adapter to 30 ± 5 in. lbs.
- For Glenair backshell/adapters, if the engineering drawing or wiring list does not specify a torque value, torque the backshell/adapter to the value specified in Table 3.
- For backshell/adapters other than Cantwell Cullen, Icore or Glenair, if the engineering drawing or wiring list does not specify a torque value, refer to Liaison Engineering (in coordination with the EMC group) for the required torque value.

Table 3 - Torque Values for Glenair Connectors (Note 1)

Shell Size	Torque values for Group A Connectors (Note 2)		Torque values for Group B Connectors (Note 3)	
	Engine Harness	Non Engine Harness	Engine Harness	Non Engine harness
8, 9, A	40 ± 5 in. lbs.	35 ± 5 in. lbs.	70 ± 5 in. lbs.	56 ± 5 in. lbs.
3, 10, 10SL, 11, B	40 ± 5 in. lbs.	35 ± 5 in. lbs.	95 ± 5 in. lbs.	76 ± 5 in. lbs.
7, 12, 12S, 13, C	40 ± 5 in. lbs.	40 ± 5 in. lbs.	135 ± 5 in. lbs.	108 ± 5 in. lbs.
14, 14S, 15, D	40 ± 5 in. lbs.	40 ± 5 in. lbs.	145 ± 5 in. lbs.	116 ± 5 in. lbs.
16, 16S, 17, E	40 ± 5 in. lbs.	40 ± 5 in. lbs.	145 ± 5 in. lbs.	116 ± 5 in. lbs.
18, 19, 27, F	40 ± 5 in. lbs.	40 ± 5 in. lbs.	145 ± 5 in. lbs.	116 ± 5 in. lbs.
20, 21, 37, G	80 ± 5 in. lbs.	80 ± 5 in. lbs.	170 ± 5 in. lbs.	136 ± 5 in. lbs.
22, 23, H	80 ± 5 in. lbs.	80 ± 5 in. lbs.	170 ± 5 in. lbs.	136 ± 5 in. lbs.
24, 25, 61, J	80 ± 5 in. lbs.	80 ± 5 in. lbs.	170 ± 5 in. lbs.	136 ± 5 in. lbs.
28. 29	120 ± 5 in. lbs.	120 ± 5 in. lbs.	185 ± 5 in. lbs.	148 ± 5 in. lbs.
32, 33	120 ± 5 in. lbs.	120 ± 5 in. lbs.	185 ± 5 in. lbs.	148 ± 5 in. lbs.
36	120 ± 5 in. lbs.	120 ± 5 in. lbs.	185 ± 5 in. lbs.	148 ± 5 in. lbs.
40	170 ± 5 in. lbs.	160 ± 5 in. lbs.	205 ± 5 in. lbs.	164 ± 5 in. lbs.
44	170 ± 5 in. lbs.	160 ± 5 in. lbs.	205 ± 5 in. lbs.	164 ± 5 in. lbs.
48	170 ± 5 in. lbs.	160 ± 5 in. lbs.	205 ± 5 in. lbs.	164 ± 5 in. lbs.

Note 1. The torque values specified in this table are only applicable if a torque value is **not** specified by the engineering drawing or wiring list.

Note 2. For the purposes of this PPS **Group A Connectors** are considered to include:
Light & medium duty MIL-C-5015 (MS3100 Series); MIL-C-26482 Series I; MIL-C-26500; MIL-C-27599; MIL-C-38999 Series I and II; MIL-C-81511 Series I, II, III & IV; and MIL-C-81703 Series I.

Note 3. For the purposes of this PPS, **Group B Connectors** are considered to include: Heavy duty MIL-C-5015 (MS3400 Series); MIL-C-22992; MIL-C-26482 Series II; MIL-C-28840; MIL-C-38999 Series III & IV; MIL-C-81703 Series III; and MIL-C-83723 Series I, II & III.

5.4.5 For torqued connector backshells and connector adapters, after torquing apply a torque stripe mark of white tamper proof sealant (ref. para. 4.1.3) onto the adapter body overlapping onto the fitting. The mark must be a continuous stripe approximately 1/8" wide overlapping onto the backshell or adapter and the fitting (see Figure 13). For backshells or adapters which must be re-torqued, remove the original torque stripe mark before applying a new torque stripe mark.

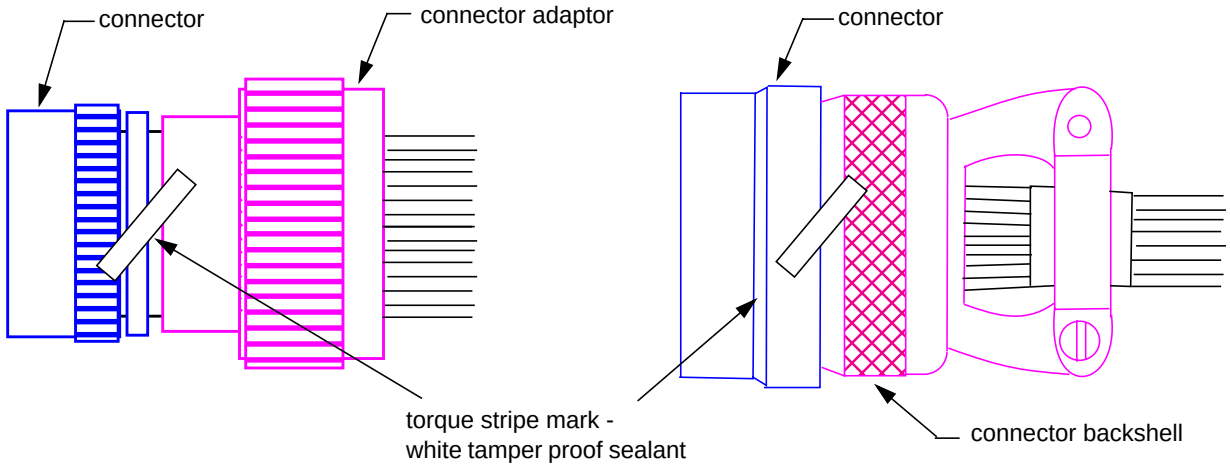


Figure 13 - Application of Torque Stripe Mark to Torqued Connector Backshells or Adapters (Typ.)

5.5 Torque Correction for Extensions, Adapters and Strap Wrenches

5.5.1 A torque correction calculation must be made when using adapters or lever type extensions or strap wrenches with torque wrenches unless the extension or adapter is attached perpendicular to the torque wrench.

5.5.2 In order to determine what the scale reading should be for the torque value required, use the following formula:

scale reading = (required torque) x (lever length/overall length)

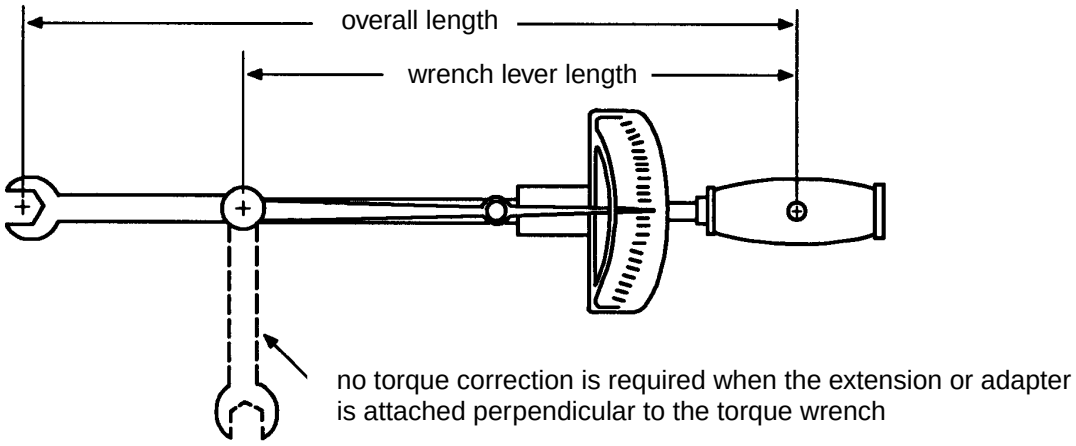
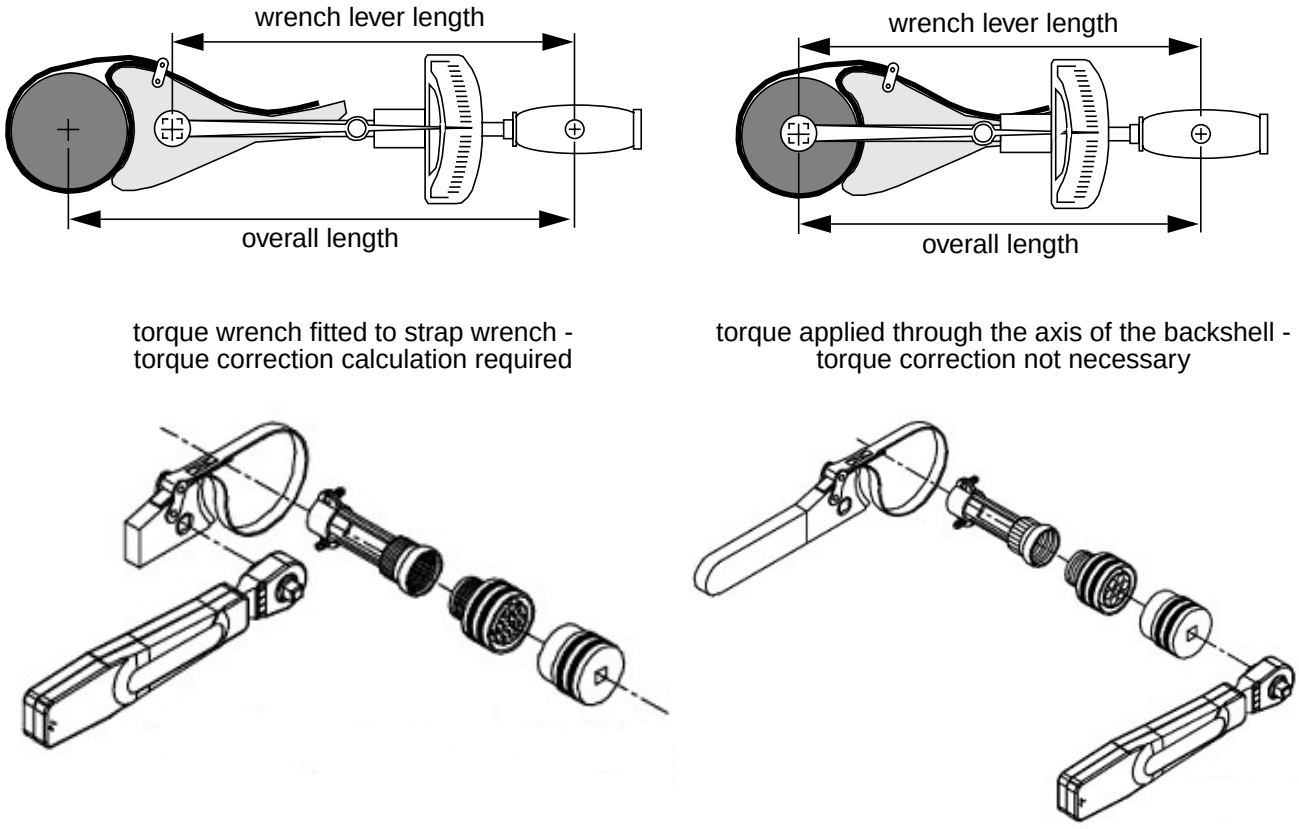


Figure 14 - Torque Correction for Extensions or Adapters

scale reading = (required torque) x (lever length/overall length)



torque wrench fitted to strap wrench - torque correction calculation required

torque applied through the axis of the backshell - torque correction not necessary

Figure 15 - Torque Correction for Strap Wrenches

5.6 Torquing

5.6.1 Before use, pre-set click type torque wrenches to the specified value as follows.

Step 1. Release the locking mechanism located on the wrench handle.

Step 2. Adjust the wrench by rotating the handle until the desired setting is reached, as indicated by the graduated scale.

Step 3. Engage the locking mechanism and visually re-check the torque setting.

5.6.2 If possible, when torquing a bolt/nut combination, hold the bolt stationary and turn the nut. If it is necessary to tighten a fastener from the bolt or screw side, torque to the high side of the specified torque value range.

5.6.3 To torque fasteners with castellated nuts to be secured by means of cotter pins or lockwire, torque to the low side of the torque range and then tighten the fastener further so that the slot aligns with the hole without exceeding the maximum torque. If the maximum torque valued is reached and the slot in the nut does not align with the hole in the bolt, re-tighten with another washer or nut of the same type and size.

5.6.4 Unless otherwise specified, If the installation of a part involves tightening a group of more than three fasteners, torque as follows:

Step 1. Insert and start all fasteners by hand, engaging the first few threads.

Step 2. Pre-torque all fasteners to approximately 75% of the specified final torque value. For fasteners arranged in a linear pattern, torque in a crisis-cross fashion, beginning at the middle of the pattern and working toward the ends; for fasteners arranged in a circular pattern (flanges, access panels, etc.) torque in a crisis-cross fashion, alternately torquing opposite fasteners. See Figure 16.

Step 3. Using the same sequence as for pre-torquing, final torque all fasteners to 100% of the specified torque value.

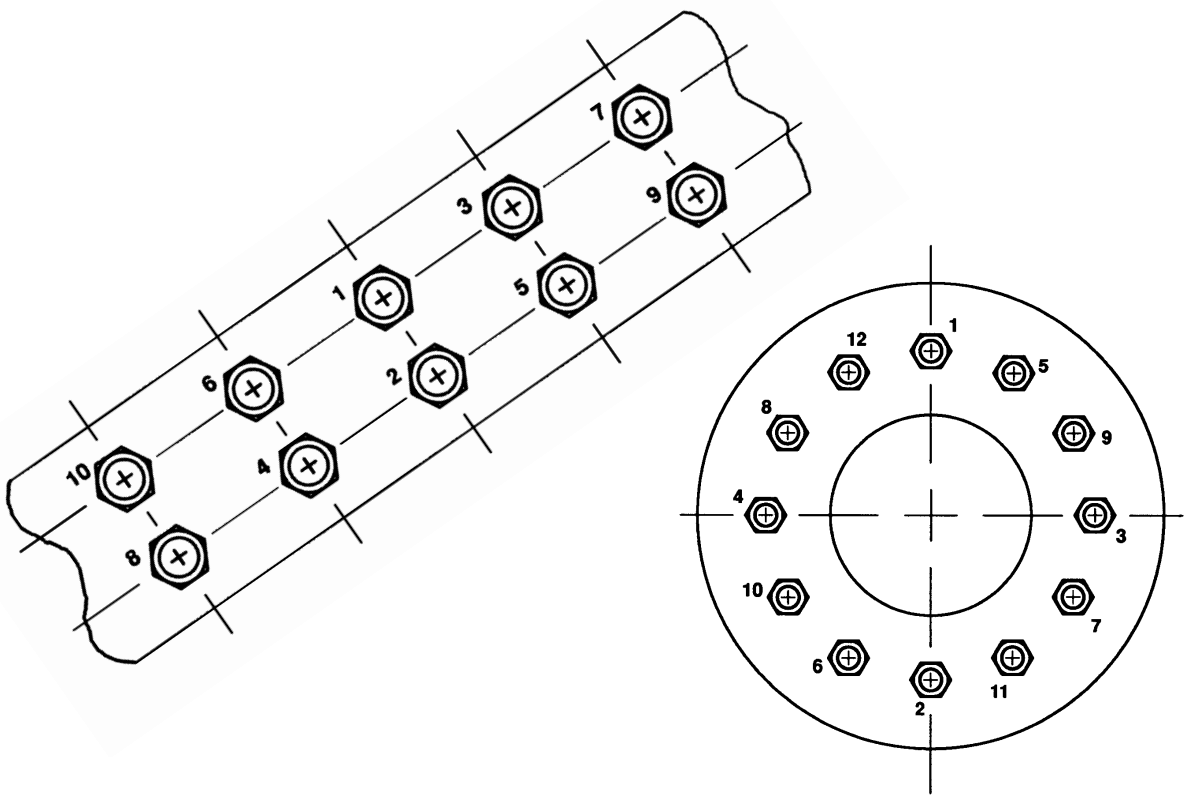


Figure 16 - Torquing Sequence for Linear and Circular Patterns

5.6.5 Fully torque sealed parts at least twice within the assembly life of the sealant, allowing a minimum time of 5 minutes between each torquing operations. For removable parts that are to have formed in-place gaskets, torque to 30% of the specified torque value at the time of installation and final torque to the specified final value after 24 hours.

5.6.6 If the engineering drawing specifies “Run-down Torque plus X in.lbs.” torque each nut as follows:

Step 1. Tighten the nut to the clamp-up position using a dial gauge type torque wrench. While tightening, establish the maximum run-down torque for that particular nut by observing the torque required to run-down the nut. Use of click type torque wrenches is not acceptable for this purpose since it would be impossible to determine the run-down torque.

Step 2. Final torque the nut to the established maximum run-down torque plus the additional torque specified by the engineering drawing (i.e., “X”). For example, if the maximum run-down torque established in step 1 is 380 in. lbs. and the drawing requires “Run-down torque plus 50 - 100 in. lbs.” then the final torque requirement would be to torque to 430 - 480 in. lbs.

5.6.7 Remove and discard fasteners or fastener combinations which have been tightened beyond the maximum torque value specified on the engineering drawing (i.e., over-torqued). DO NOT back off and re-torque over-torqued fasteners.

5.6.8 If it is necessary to re-torque a fastener assembly which has **not** been over-torqued, back-off the fastener one full turn and re-tightened to the specified torque value.

5.6.9 Except as noted below, identify torqued fasteners (including hose clamps, duct clamps, etc.) using a stripe of white tamper proof sealant (ref. para. 4.1.3) approximately 1/8” wide extending halfway across the fastener and onto the adjacent structure, as shown in Figure 17. In any bolt/nut or screw/nut combination, apply identification to the nut if possible; if marking the nut is not possible, mark the head of the bolt or screw.

- The identification stripe or blob is **prohibited** internally on systems such as fuel, hydraulic, pneumatic, engine hot area, etc. where degradation of the tamper proof sealant could have a detrimental effect on the system. In such areas special care shall be taken to ensure proper torquing (e.g., inspection witnessing).
- If the external appearance of the aircraft could be affected, identification may be omitted.
- Hi-Lok/Hi-Tigue, Hi-Lite and Hi-Lite ST fasteners installed according to PPS 2.67, PPS 2.68 and PPS 2.71, respectively, and torqued according to this PPS do not require torque identification.
- Torqued MS3320 circuit breaker attachment screws do not require torque identification.
- Identify torqued aircraft wheel nuts according to PPS 13.09.
- Alternatively, it is acceptable to identify torqued large bolts, nuts and screws using a “blob” of white tamper proof sealant (ref. para. 4.1.3) approximately 3/8” in diameter as shown instead of a stripe.

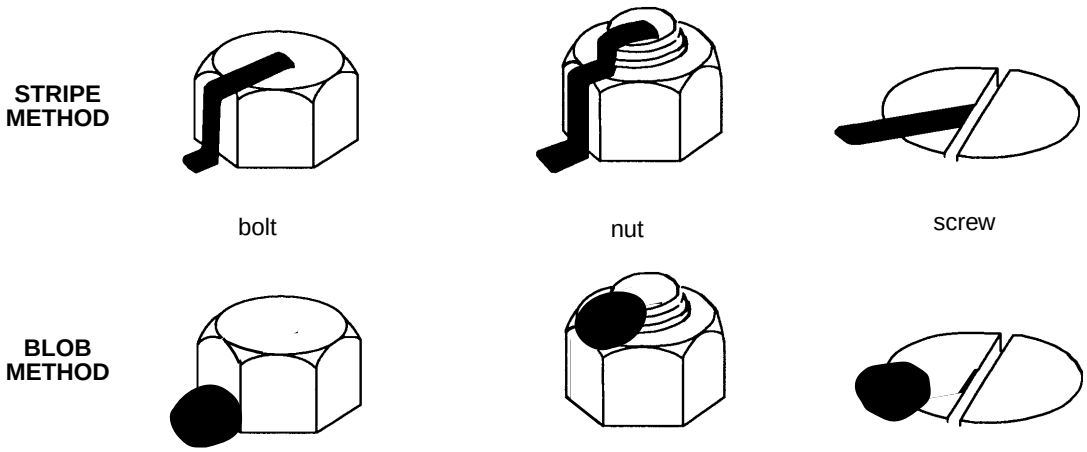


Figure 17 - Identification of Torqued Fasteners (Typ.)

5.7 Tightening

5.7.1 Except as noted in para. 5.7.1.1 or para. 5.7.1.2, if a torque value is **not** specified by the engineering drawing, or a referencing PPS, use a suitable tool (e.g., wrench) to tighten the threaded part/component until resistance increases sharply, then tighten a further 1/4 turn. Identification of tightened threaded parts/components with tamper proof sealant is not required. In case of doubt or concern regarding this procedure, refer to Liaison Engineering for assistance.

5.7.1.1 Refer to PPS 2.20 for the procedure and requirements for tightening of bolts and screws where a torque value or range is not specified by the engineering drawing, or a referencing PPS.

5.7.1.2 Refer to PPS 9.22 for the requirements for tightening and identification of tightened connector backshells and coupling rings where a torque value or range is not specified by the engineering drawing.

6 Requirements

6.1 When torque witnessing by inspection occurs, inspectors must also validate that the torque tool calibration is valid and has not expired.

6.2 Ensure that torqued bolts and screws do not engage the imperfect threads of tapped blind holes. The threads of tapped holes and nuts shall not engage the run-out of bolt or screw threads.

6.3 Ensure that torqued bolts, screws and nuts seat with mating surfaces, with no gap under the bolt head, screw head or nut.

6.4 Ensure torqued fasteners and connector backshells/adapters have been properly identified as specified in para. 5.4.5 and para. 5.6.9, respectively. If, at any time, a torque stripe is found misaligned, indicating movement after final torquing, the fastener or connector backshell/adapter must be re-torqued as specified herein and identification re-applied.

7 Safety Precautions

7.1 The safety precautions specified herein are specific to Bombardier Toronto to meet Canadian Federal and Provincial government environmental, health and safety regulations. It is recommended that other facilities consider these safety precautions; however, suppliers, subcontractors and partners are responsible for ensuring that their own environmental, health and safety precautions satisfy the appropriate local government regulations.

7.2 Observe general shop safety precautions when performing the procedure specified herein.

7.3 Where there is a risk of shorting or shock (e.g. torquing inter-cell connectors on Ni-Cd batteries), use of a torque wrench with a non-conductive or insulated handle is recommended. Similarly, when checking torquing where there is a risk of shorting or shock (e.g., torqued inter-cell connectors on Ni-Cd batteries), use of non-conductive or insulated inspection aids (e.g., mirrors) is recommended.

7.4 Ensure sufficient ventilation when applying tamper proof sealant, especially in confined areas.

7.5 Avoid skin and eye contact with tamper proof sealant. Wear chemical resistant protective gloves when applying tamper proof sealant. If skin contact occurs, wash the affected area immediately and thoroughly with soap and water. If eye contact occurs, immediately flush eyes with large quantities of water at an eye-wash station; after initial flushing, remove any contact lenses and continue flushing for at least 15 minutes. Report any contact with tamper proof sealant to the Health Centre. Take care when applying tamper proof sealant in overhead applications to avoid applying excess sealant, as drips may result.

8 Personnel Requirements

8.1 Personnel must have a good working knowledge of the applicable procedure and requirements as specified herein and must have exhibited their competency to their supervisor.

9 Additional Information

9.1 To prevent premature main spring wear, it is recommended that adjustable click type torque wrenches be adjusted to their lowest setting after use and before storage.