

STANDARD TORQUE VALUES

1. General

- A. The torque values listed in figure 202 apply to nut tightening only; however, when tightening must be accomplished by bolt tightening, use the high limit of the torque range values listed in the table. Restricted access often requires the use of an adapter having a torque length "B." This condition requires a corrected torque wrench reading "T." Follow the examples in figure 201 to determine the corrected torque wrench reading when using an adapter. All special torque values required for specific installations are given in the applicable text covering those items.
- B. The self-locking mechanism of nuts and nutplates shall develop the minimum locking torque at room temperature as shown in figure 203. Where there is an apparent torque looseness or torque drag when installing the nut on the bolt, the nut should be removed and tested per figure 203.
- C. Torque values are given in figure 204 for rigid tube coupling connector.
- D. Torque values are given in figure 205 for AN818 or equivalent BAC flared tube fittings.
- E. Torque values are given in figure 206 for flareless tube fittings.
- F. Torque values are given in figure 207 for pipe threaded fittings.

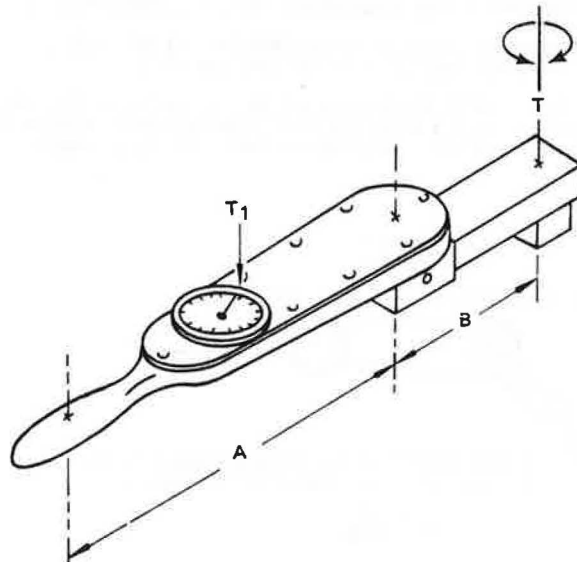
$$T_1 = \frac{TA}{A+B}$$

A = TORQUE LENGTH OF TORQUE WRENCH
 B = TORQUE LENGTH OF ADAPTER
 T = ACTUAL TORQUE OF NUT
 T₁ = INDICATED TORQUE OF WRENCH

EXAMPLE: A = 12 IN.
 B = 3 IN.
 T = 160 POUND-INCHES

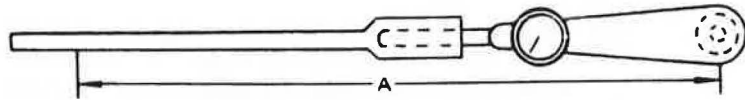
$$T_1 = \frac{160 \times 12}{12+3}$$

T₁ = 128 POUND-INCHES



METHOD II

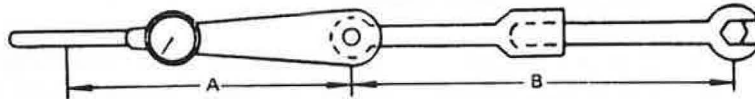
USING HANDLE EXTENSION ONLY.
NO CORRECTION NECESSARY.



METHOD III

USING ADAPTER WITH EXTENSION BETWEEN
ADAPTER AND WRENCH BOTH IN LINE WITH
WRENCH. CORRECTION REQUIRED:

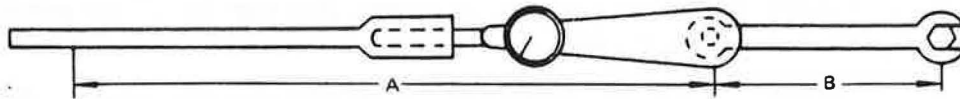
$$T_1 = \frac{TA}{A+B}$$



METHOD IV

USING BOTH HANDLE EXTENSION AND ADAPTER.
CORRECTION REQUIRED:

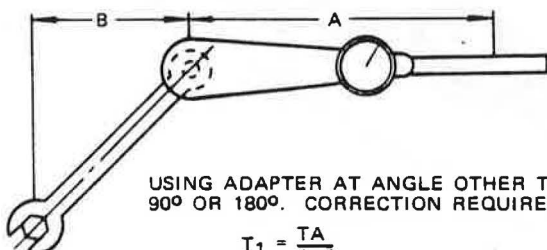
$$T_1 = \frac{TA}{A+B}$$



THE FOLLOWING CASES SHOULD BE AVOIDED WHERE POSSIBLE. WHEN NECESSARY TO USE EITHER OF THESE CASES, THE FOLLOWING RESTRICTIONS MUST BE MET.

- a. THE ADAPTER PLUS ANY EXTENSIONS TO BE USED BETWEEN THE WRENCH AND ADAPTER SHALL NOT EXCEED THE LENGTH OF THE WRENCH.
- b. WHEN A FORCE IS APPLIED AT 90 ± 3 DEGREES TO THE HANDLE OF THE WRENCH, IT IS RECOMMENDED THAT A STIRRUP TYPE HANDLE WITH A POINTER, INDICATING ANGLE OF LOADING, BE USED TO ENSURE LOADING AT THE CORRECT ANGLE.

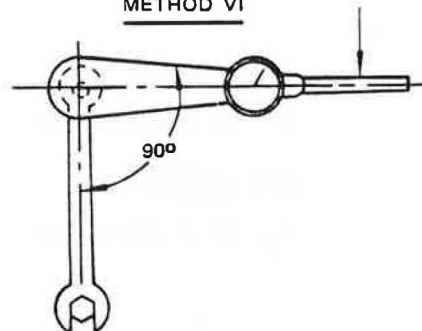
METHOD V



USING ADAPTER AT ANGLE OTHER THAN
 90° OR 180° . CORRECTION REQUIRED:

$$T_1 = \frac{TA}{A+B}$$

METHOD VI



USING ADAPTER AT RIGHT ANGLE TO THE
WRENCH. NO CORRECTION NECESSARY.



MAINTENANCE MANUAL

NUT TIGHTENING TORQUE 1 2 3										
BOLT AND NUT MATERIAL	STEEL, CORROSION RESISTANT STEEL AND TITANIUM				ALUMINUM (anodized, not lubricated)	STEEL CADMIUM FLUORBORATE PLATED (not lubricated)	HI TORQUE RECESS FASTENERS			
	SELF-LOCKING NUTS, PLATENUTS AND CASTELLATED NUTS 1		SELF-LOCKING EXTERNAL WRENCHING NUTS		SELF-LOCKING AND CASTELLATED NUTS	SELF-LOCKING				
NUT TYPE	TENSION	SHEAR	TENSION		TENSION	TENSION	TENSION			
NUT NUMBER EXAMPLES	AN310, AN363, MS20365, NAS679 and NAS102	AN320, MS20364 and NAS1022 BACN10BY	BACN10B		MS20365D AN320D	BACN10CT	BACB30EL BACB30DP REDUCED HEAD BOLT			
BOLT STRENGTH	125,000 psi MINIMUM	125,000 psi MINIMUM	160,000 psi MINIMUM		62,000 psi MINIMUM	220,000 psi MINIMUM				
TORQUE RANGE INCH-POUNDS										
THREAD SIZE	1	MAXIMUM 2	1	MAXIMUM 2	1	MAXIMUM 2	1	MAXIMUM 2	1	
8-32	12-15	20	7-9	12						
10-32	20-25	40	12-15	25	30-35					10-13
1/4-28	50-70	100	30-40	60	65-90					15-18
5/16-24	100-140	225	60-85	140	130-180	25-35	50	90-125	26-30	
3/8-24	160-190	390	95-110	240	220-360	50-70	100	180-250		
7/16-20	450-500	840	270-300	500	370-610	85-140	190	300-500	60-65	
1/2-20	480-690	1100	290-410	660	630-950	145-240	330	510-840		
9/16-18	800-1000	1600	480-600	960	1000-1300	250-370	500	870-1300	95-105	
5/8-18	1100-1300	2080	660-780	1400	1400-1700			1300-1800		
3/4-16	2300-2500	4000	1300-1500	3000	2400-3100			1900-2300		
7/8-14	2500-3000	4800	1500-1800	4200	3700-4900			3300-4300		
1-12 or 1-14	3700-5500	8800	2200-3300	6000	5100-7900			5100-6700		
1-1/8-12	5000-7000	11200	3000-4200	9000	6900-9500			7000-10900		
1-1/4-12	9000-11000	17600	5400-6600	15000	11500-14000			9500-13000		
1 3/8-12			7000-9000					15800-19200		
1-1/2-12			10000-12000							

- 1 THESE TORQUE VALUES APPLY TO NUT TIGHTENING ONLY. WHEN TIGHTENING IS TO BE DONE BY ROTATING THE BOLT, THE HIGH LIMIT \pm 10 PERCENT SHALL BE USED.
- 2 MAXIMUM TORQUE ALLOWED FOR ALIGNMENT OF CASTELLATED NUT AND HOLE FOR COTTER PIN OR OTHER SAFETY DEVICE INSERTION.
- 3 THIS TABLE OF TORQUE VALUES IS APPLICABLE TO THE INSTALLATION OF NUTS AND BOLTS PLATED IN ACCORDANCE WITH FED SPEC QQ-P-416A TYPE I OR II.

NOTE: ALL TORQUE LOADS ARE IN POUND-INCHES. ALL TORQUE WRENCH SETTINGS ARE FOR CLEAN NONLUBRICATED BOLTS AND NUTS AS LUBRICATED BY THE MANUFACTURER.

BOEING
Intercontinental 
MAINTENANCE MANUAL

LOCKING TORQUE - SELF-LOCKING NUTS					
THREAD SERIES					
SIZE	FINE		SIZE	COARSE	
	TORQUE (IN.-LBS)			TORQUE (IN.-LBS)	
	▶ MINIMUM LOCKING	▶ MAXIMUM LOCKING		▶ MINIMUM LOCKING	▶ MAXIMUM LOCKING
4-48		3	4-40		3
6-40	1.0	6	5-40	1.0	4
8-36	1.5	9	6-32	1.0	6
10-32	2.0	13	8-32	1.5	9
1/4-28	3.5	30	10-24	2.0	13
5/16-24	6.5	60	1/4-20	4.5	30
3/8-24	9.5	80	5/16-18	7.5	60
7/16-20	14.0	100	3/8-16	12.0	80
1/2-20	18.0	150	7/16-14	16.5	100
9/16-18	24.0	200	1/2-13	24.0	150
5/8-18	32.0	300	9/16-12	30.0	200
3/4-16	50.0	400	5/8-11	40.0	300
7/8-14	70.0	600	3/4-10	60.0	400
1-14	92.0	800	7/8-9	82.0	600
1-1/8-12	117.0	900	1-8	110.0	800
1-1/4-12	143.0	1000	1-1/8-8	137.0	900
			1-1/4-8	165.0	1000

▶ THE MINIMUM TO MAXIMUM LOCKING TORQUE RANGE IS USED FOR DETERMINING THE USABILITY OR REUSABILITY OF A NUT (SELF-LOCKING AND BOLT COMBINATION). LOCKING TORQUE IS THE TORQUE REQUIRED TO START THE NUT TURNING. WHEN:

- (a) THE NUT IS ENGAGED WITH AT LEAST TWO FULL BOLT THREADS EXTENDING BEYOND THE LOCKING DEVICE OF THE NUT.
- (b) THERE IS NO AXIAL LOAD ON THE NUT.

Locking Torque Values for Self-Locking Nuts
Figure 203

TUBE OD INCHES	ALUMINUM ALLOY FITTINGS NAS591-593 TORQUE POUND-INCHES		STAINLESS STEEL FITTINGS NAS594-596 TORQUE POUND-INCHES	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1	480	720	480	720
1-1/4	600	900	600	900
1-1/2	600	900	600	900
2	900	1200	900	1200
2-1/2	1500	1800	1800	2100
3			1800	2100
4			2400	2700

Standard Torque Values for Rigid Tube Coupling Connector
Figure 204



MAINTENANCE MANUAL

TUBE OD INCHES	ALUMINUM ALLOY TUBING AN818 TORQUE POUND-INCHES		STEEL TUBING * AN818 TORQUE POUND-INCHES	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1/8"	20	30	---	---
3/16"	---	---	90	100
1/4"	40	65	135	150
5/16"	60	80	180	200
3/8"	75	125	270	300
1/2"	150	250	450	500
5/8"	200	350	650	700
3/4"	300	500	900	1000
7/8"	400	600	1000	1100
1"	500	700	1200	1400
1-1/4"	600	900	1200	1400
1-1/2"	600	900	1500	1800
1-3/4"	700	1000		
2"	1100	2000		

* APPLICABLE TO EITHER STEEL OR ALUMINUM FITTINGS USED WITH STAINLESS STEEL TUBING

Standard Torque Values for AN818 or equivalent BAC Flared Tube Fittings
Figure 205

TUBING			TORQUE RANGE - INCH LBS.	
Size	OD Inch	Wall Thickness Inch	Aluminum 6061-T6 CREW MIL-T-8504 MIL-T-8606, MIL-T-8808	CREW MIL-T-6845 (304 1/8 hard)
-3	3/16	.020 and over	80 - 90	100 - 115
-4	1/4		100 - 115	125 - 145
-5	5/16	.028 and over	135 - 160	170 - 200
-6	3/8		170 - 200	225 - 265
-8	1/2		285 - 340	450 - 525
-10	5/8		370 - 440	540 - 630
-12	3/4		415 - 490	675 - 790

Standard Torque Values for Flareless Tube Fittings
Figure 206

PIPE THREAD SIZE, INCHES	WORKING TORQUE INCH - LBS	MAX TORQUE INCH - LBS
1/8	100	175
1/4	150	300
3/8	225	450