STANDARD TORQUE VALUES - MAINTENANCE PRACTICES

1. <u>General</u>

- A. This procedure has one task:
 - (1) Standard Torque Values
- TASK 20-11-00-910-801

2. <u>Standard Torque Values</u>

(Figure 201, Figure 202, Figure 203, Figure 204, Figure 205, Figure 206, Figure 207, Figure 208, Figure 209)

A. General

- (1) Refer to the figures that follow for the torque data:
 - (a) (Figure 201): Torque Wrench Adapter
 - (b) (Figure 202): Nuts and Bolts
 - (c) (Figure 203): Self-Locking Nuts
 - (d) (Figure 204): Reduced-Head Bolts
 - (e) (Figure 205): Rigid Tube Coupling Connectors
 - (f) (Figure 206): Pipe Thread Fittings
 - (g) (Figure 207): Low Pressure and Return Line Fittings
 - (h) (Figure 208): Flareless Tube Fittings
 - (i) (Figure 209): Clamps, V-Band, and Channel-Band

B. Consumable Materials

Reference	Description	Specification
C00308	Compound - Corrosion Preventive, Petrolatum Ho Application	tMIL-C-11796
D00010	Compound - Thread Antiseize, High Temperature	MIL-PRF-907
D00013	Grease - Aircraft And Instrument Grease	MIL-PRF-23827 (NATO G-354) (Supersedes

C. Procedure

L

SUBTASK 20-11-00-420-001

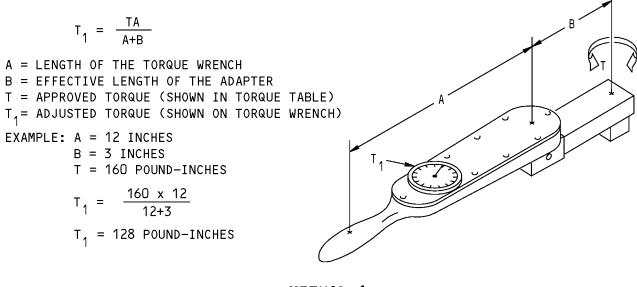
- (1) Tighten the bolt, nut, fitting, clamps, or connector ((Figure 201, Figure 202, Figure 203, Figure 204, Figure 205, Figure 206, Figure 207, Figure 208, Figure 209)).
 - (a) Lubricate the threads with one of these materials if necessary:
 - 1) corrosion preventive compound, C00308
 - 2) grease, D00013, or
 - 3) compound, D00010.
 - (b) Tighten the bolts, nuts, fitting, clamps, or connecters to the correct torque.
 - (c) Make sure that one male tread (minimun), plus the chamfer of the male tread, extends above the top of the nut.
 - <u>NOTE</u>: If the male thread does not have a chamfer, the male thread must extend one and one-half treads (minimum) above the top of the nut.

----- END OF TASK ------

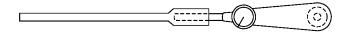
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20-11-00

MIL-G-23827)

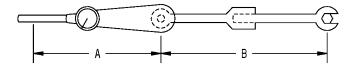






HANDLE EXTENSION ONLY. NO CORRECTION NECESSARY.

METHOD 2



ADAPTER WITH THE EXTENSION BETWEEN THE ADAPTER AND THE WRENCH. BOTH ARE IN LINE WITH THE WRENCH. INDICATED TORQUE T1:

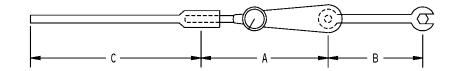
$$T_1 = \frac{TA}{A+B}$$

METHOD 3

Finding Torque Values for a Torque Wrench with an Adapter Figure 201 (Sheet 1 of 2)/20-11-00-990-801

20-11-00

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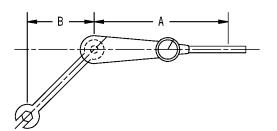
BOTH HANDLE EXTENSION AND ADAPTER, INDICATED TORQUE T1:



METHOD 4

IF POSSIBLE, METHODS 5 AND 6 SHOULD NOT BE USED. WHEN IT IS NECESSARY TO USE THESE METHODS, THE FOLLOWING CONDITIONS MUST BE APPLICABLE.

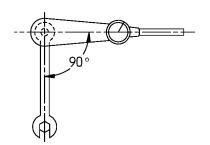
- 1. THE ADAPTER PLUS ANY EXTENSIONS USED BETWEEN THE WRENCH AND THE ADAPTER MUST NOT BE MORE THAN THE LENGTH OF THE WRENCH.
- 2. WHEN A FORCE IS APPLIED AT 90 \pm 3 degrees to the handle of the wrench, it is recommended that a stirrup-type handle with a pointer (indicating angle of Loading) be used to make sure loading is at the correct angle.



ADAPTER AT ANGLE OTHER THAN 90°. INDICATED TORQUE T_1 :

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

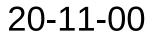
METHOD 5



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

METHOD 6

Finding Torque Values for a Torque Wrench with an Adapter Figure 201 (Sheet 2 of 2)/20-11-00-990-801



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	BACNTOY J NYLON NUT	ALL	ALL (EXCEPT REDUCED SHEAR AND B3OXD) B3OXD)		DRY OR LUBED BOLT	2	6-7				RQUE
	M10uC, Ms21245 (HEX SIZES 1/2 THUU 1-1/2) W10uD, M11W, M1414, M101L, CGASTELLATED-THEN STYLE ALL SIZES -103 THEU -120)	ארר	ALL (EXCEPT REDUCED SHEAR AND B3330))		LUBED BOLT			243-258 388-412 650-690 795-845	1600-1700 2320-2470 3630-3860 4460-4730		ING THE HEAD, SUCH AS WHEN YOU INSTALL BOLTS INTO PLATE-MUTS, CLEP-MUTS, BARREL-MUTS, INSERTS, OR TAPPED HIGLES, THE INSTALLATION TORQUE MUST BE THE MAXIMUM TORQUE
	PLATE-NUTS S, AND D-THICK THICK STYLE), (4) (HEX),	S OCKET HEAD	MS21262 MS24678 NAS1351 NAS1352 NAS1352		Ā						HE INSTALLATIO
	MOLC (SHEET METAL HEX-SIZES MF THRU 7/16 ONLY), ALL PLATE-NUTS TRPED HOLS, MOLB, AND MORAN, ALL LIPLANUTS, INERSTS, AND TAPPED HOLS, MC2102, HEX, MC2102, MUDD (CASTELLATED-THICK STYLE ALL SIZES 3716 THU 3/8), MS1404 (CASTELLATED-THICK STYLE), MUDD (HEX), MUTAG (HEX), MS2105 (HEX) MASAFO (FRV, MIN (CASTELLATED-THICK STYLE ALL SIZES 37/6 THRU 1-1/4)	100° HEAD	830LH 830LR 830LU 830Pc 830Ps 830Ps 830P 830P 830P 830P 830F 830F 830F 830F 830F 830F 830F 830F		LUBED BOLT		<u></u> 63-67 107-113 170-180	262-278 529-56 786-834 1070-1130	1860-1980 2910-3090 4410-4680 5620-5970	8340-8850 	APPED HOLES, T
	ES #4 THRU 7/ 110RM, ALL CLII MS21043, N10 3/8), MS14144 1AG (HEX), MS1 YLE ALL SIZES	PAN HEAD	B30BE B30B6 B30B7 B30LK B30LK B30LK B30L7 MA8220 MA81217 MA81217 MA81217 MA81217 MA81217 MA81217 MA82206 MA82206 MA82206								INSERTS, OR TA
	METAL HEX-SIZ NIOJB, AND N MS21042 HEX, MS21042 HEX, CES 3/16 THRU VIOYR (HEX) N1 -ATED-THICK ST	HEX HEAD	B30LJ B30NF B50NF B50NF B30PU B30PU B50NW B50NW B50XN MA5453 THRU 572 THRU	(H)	DRY BOLT		 52-35 120-130 194-206	65-67 120-130 194-206 616-654 946-1000 1260-1340	2570-2730 3390-3600 5430-7210	10600-113000 	BARREL-NUTS,
NUT TIGHTENING TORQUE 🗁 😒	NTOJC (SHEET EXCEPT NTOJA, TAPPED HOLES, STYLE ALL SIJ NTOR (HEX), NTOR (HEX), NTOR (CASTELL	Thereb Notes: Three ALL SITS MID (CASTEL) 12-POINT 12-POI	TORQUE RANGE (POUNDS-INCH)			751 121 25-	29(61(94(52 33 52 27 33	10	S, CLIP-NUTS,	
NUT TIC	NTOJA -NUT), OJD 1/4 ONLY), OINT),	INTERNAL WRENCHING	B30UG MS20004 MS20024 MS20024	TORQUE RA	Λ						VTO PLATE-NUT
	(12-POINT), 10JB (PLATE EL-NUT), N1 16 MTHRU 1- 112 (12-F	100° HEAD	830LP 830LP 830LL 830NU 830NU 830NU 830XJ		LUBED BOLT 3		 63-67 107-113 194-206	330-350 529-561 786-834 1060-1130	1790-190 2910-3090 4410-4680 5620-5970	8340-8850 	I STLL BOLTS I
	MK3180K-1805 (12-POINT)、N106W (12-POINT)、N101A 「PLATE-WUT)、N168 (12-POINT)、N1010 (12-NUT)、N1021 (12-NUT)、N168 (12-PUT)、N1020 (12-NUT) (12-NUT) N179 (12-NUT)、N1020 (12-NUT) (12-POINT)、N174 (12-POINT) (12-POINT)、AS345 (12-POINT)、(12-POINT)	PAN HEAD	B30EM B30LN B30NS NAS1216								N YOU INST
	05 (12-P01)), N10B (1) VTE-NUT), N TED NUT THI RREL NUT), X), AS3486	НЕХ НЕАD	B30LM B30NE B30NM B30XJ NAS6603 THRU NAS6620 NAS620 THRU NAS6703 THRU NAS6720		BOLT		50	6 6 280 700	040 210 260	13200-14000	SUCH AS WHE
	NAS1804-18 NIORM (PLA NIORM (PLA (CASTELLAT N102C (BAR AS3485 (HE	12-POINT	830Fb 830LE 830LF 830CL 830CL 830CL 830CL 8302C 8302C 8302C 8302C		DRY E	1111	82-88 82-88 165-175 310-330	214-546 825-876 825-876 546-546	2860-3040 4460-4730 6790-7210 8530-9060	13200-	G THE HEAD,
	WIOHR (12-POINT), WIOHZ (12-POINT), MIOHC (BARREL NUT), MIOW (12-POINT), MITX (BARREL NUT)	12-POINT	BEONT T		LUBED BOLT 3		53-57 73-77 155-165 290-310	388-412 558-592 873-927 1460-1550	2960-3140 4070-4520 6400-6800 8580-9110	11200-11800 16000-17000	ALLED BY WRENCHIN
	NTOHR (12-POINT), NTOJG (12-POINT), NTOJG (12-POINT), NTOYN (12-POINT), NTIX (BARREL NUT)	12⊣			DRY BOLT		82-88 107-115 204-216 388-412	655-695 1070-1140 1510-1590 2040-2160	3690-3910 5720-6070 8680-9210 11000-11600	17000-18000 21400-22600	TABLE FOR THE
	PART NUMBER AND STYLE	STYLE	PART NUMBER		THREAD SIZE	2-56 OR 2-64 4-40 OR 4-48 6-32 OR 6-40 8-32 OR 8-36	10-32 1/4-28 5/16-24 3/8-24	7/16-20 1/2-20 9/16-18 5/8-18	3/4-16 7/8-14 1-12 0R 1-14 1-1/8-12	1-1/4-12 1-3/8-12 1-1/2-12	WHEN ANY BOLT IS TO BE INSTALLED BY WRENCH SHOWN IN THE TABLE FOR <u>THE NUT ±102</u> .
	z ⊃ ⊢		нгов					1		~~~~	LД

Torque Values for Most Bolts and Nuts Figure 202 (Sheet 1 of 3)/20-11-00-990-802

AIRCRAFT MAINTENANCE MANUAL

USE THE INSTALLATION TORQUE SHOWN FOR N10GW NUTS. WHEN B30LE OR PN BOLTS ARE INSTALLED WITH N10HR NUTS,

LUBRICATED BOLTS INCLUDE DRY-FILM-LUBRICATED (MIL-L-5937) BOLTS WITH ANTI-FRICITON COMPOUNDS SUCH AS EASE-OFF 990, MIL-C-11796, AND MIL-PRI-2327 APPLIED TO THE THREADS. WHEN YOU SAFETY FINE CASTELLATED NUTS, TIGHTEN THE NUT TO THE LOW SIDE OF THE SELECTED TORQUE RANGE; IF NECESSARY, CONTINUE TO TIGHTEN IT UNTIL A SLOT ALIGNS WITH THE SAFETY HOLE. IF THE NUT AND BOLT ARE SHOWN, BUT NOT IN THE SAME COLUMN, USE THE TORQUE RANGE WITH THE LOWESS MAXIMUM LIMIT. $\operatorname{Alpha}_{\mathrm{Alpha}}$

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		NUT TIGHTENING TORQUE					
N U T	PART NUMBER AND STYLE	COARSE THREADED NUTS, INSERTS AND TAPPED HOLES					
	STYLE	ALL COARSE BOLTS	AND SCREWS				
ALL B C L T ALL ALL ALL ALL ALL ALL AL							
		TORQUE (POUND	TORQUE (POUND-INCHES)				
	THREAD SIZE	DRY BOLT	MAXIMUM 4				
	10–24 1/4–20 5/16–18 3/8–16	13.5-14.5 29-31 49-52 97-103	21 45 100 170				
	7/16–14 1/2–13 9/16–12 5/8–11	146 262–278 349–371 466–494	280 520 650 900				
3/4-10 7/8-9 1-8 1-1/8-7		800-850 1500-1590 2520-2670 3540-3760	1500 2700 4500 7200				
	1–1/4–7 	4360-4630 	10,000 				

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Torque Values for Most Bolts and Nuts Figure 202 (Sheet 2 of 3)/20-11-00-990-802

20-11-00

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THREAD	DIAMETER	NAS	31423 AND N JAM NUTS [ALL OTHER NONSELF-LOCKING JAM NUTS 7		
SIZE	DASH NO.	TOR	QUE, INCH-F	OUNDS	TORQUI	E, INCH-PC	OUNDS
		MINIMUM	TARGET	MAXIMUM	MINIMUM	TARGET	MAXIMUM
0.1900-32	-3	13	13	15	18	19	20
0.2500-28	-4	18	18	20	24	25	26
0.3125-24	-5	34	35	36	49	50	52
0.3750-24	-6	40	45	46	63	65	67
0.4375-20	-7	63	65	67	97	100	103
0.5000-20	-8	78	80	82	112	115	118
0.5625-18	-9	87	90	93	130	135	140
0.6250-18	-10	97	100	103	146	150	155
0.7500-16	-12	155	160	165	233	240	247
0.8750-14	-14	213	220	227	320	330	340
1.0000-12	-16	272	280	288	407	420	433
1.1250-12	-18	359	370	380	534	550	567
1.2500-12	-20	437	450	464	655	675	695

JAM NUTS

> LOCKWIRED JAM NUTS > NON-LOCKWIRED JAM NUTS

D00506 S0006402586_V2

Torque Values for Most Bolts and Nuts Figure 202 (Sheet 3 of 3)/20-11-00-990-802

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LOCKING TORQUE - SELF-LOCKING NUTS								
		FINE THREADS (REF BPS-N-70)			COARSE THREADS (REF MIL-N-25027)			
	TORQ	UE (POUND-IN	CHES)		TORQUE (PO	OUND-INCHES)		
SIZE	USED	NUT	NEW NUT	SIZE				
	MINIMUM BREAKAWAY	MAXIMUM LOCKING	MINIMUM 1ST CYCLE BREAKAWAY		MINIMUM LOCKING	MAXIMUM LOCKING		
$\begin{array}{c} 4-48\\ 6-40\\ 8-36\\ 10-32\\ 1/4-28\\ 5/16-24\\ 3/8-24\\ 7/16-20\\ 9/16-18\\ 5/8-18\\ 3/4-16\\ 7/8-14\\ 1-14\\ 1-12\\ 1-1/8-12\\ 1-1/8-12\\ 1-1/4-12\\ 1-3/8-12\\ 1-3/8-12\\ 1-3/4-12\\ 2-12\\ \end{array}$	$\begin{array}{c} 1.0\\ 1.5\\ 2.0\\ 3.5\\ 6.5\\ 9.5\\ 14.0\\ 18.0\\ 24.0\\ 32.0\\ 50.0\\ 70.0\\ 90.0\\ 90.0\\ 117.0\\ 143.0\\ 165.0\\ 195.0\\ 245.0\\ 300.0\\ \end{array}$	- 10 15 18 30 60 80 100 150 200 300 400 600 800 800 800 900 1000 1100 1250 1450 1700	- - 7 12 18 26 34 46 60 90 135 180 135 180 180 234 285 330 386 490 600	$\begin{array}{c} 2-56\\ 4-40\\ 6-32\\ 8-32\\ 10-24\\ 1/4-20\\ 5/16-18\\ 3/8-16\\ 7/16-14\\ 1/2-13\\ 9/16-12\\ 5/8-11\\ 3/4-10\\ 7/8-9\\ 1-8\\ 1-1/8-7\\ 1-1/4-7\\ 1-3/8-6\\ 1-1/2-6\\ 1-3/4-5\\ 2-4.5\\ 2-1/4-4.5\\ \end{array}$	0.2 0.5 1.0 1.5 2.0 4.5 7.5 12.0 16.5 24.0 30.0 40.0 60.0 82.0 110.0 137.0 165.0 200.0 300.	2.5 5 10 15 18 30 60 80 100 150 200 300 400 600 800 900 1000 1200 1400 1800 2200 2600		

THE FOLLOWING CONDITIONS MUST BE USED FOR TORQUES (REF BPS-N-70):

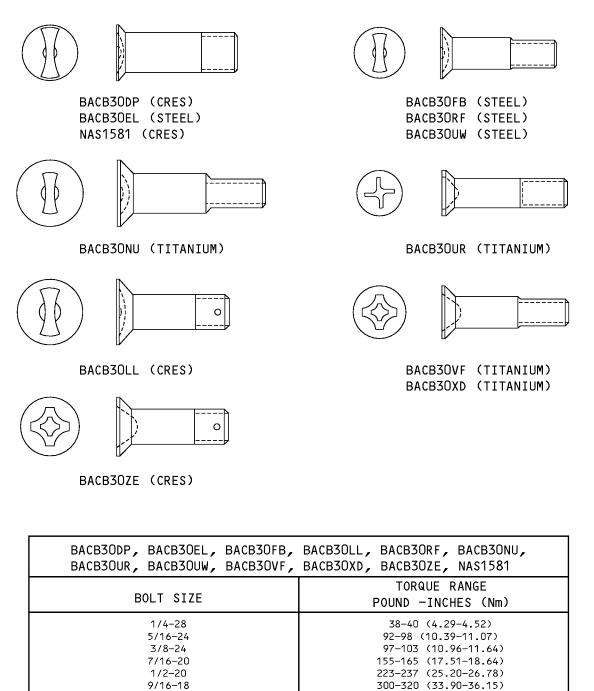
- A. THE MINIMUM-TO-MAXIMUM LOCKING TORQUE RANGE IS USED TO FIND THE CONDITION OF A USED SELF-LOCKING NUT AND BOLT SET.
- B. ALL NUT THREADS SHALL BE NEW OR UNDAMAGED. A NUT IS CONSIDERED INSTALLED WHEN A MINIMUM OF ONE THREAD PLUS THE CHAMFER OF THE MALE THREAD EXTENDS BEYOND THE TOP OF THE NUT. IF THE MALE THREAD DOES NOT HAVE A CHAMFER, THE MALE THREAD MUST EXTEND ONE AND ONE-HALF THREADS (MINIMUM) ABOVE THE TOP OF THE NUT.
- C. THE REMOVAL WILL BE COMPLETE WHEN THE LOCKING DEVICE IS DISENGAGED.
- D. THE MINIMUM BREAKAWAY TORQUE IS THE TORQUE REQUIRED TO TURN A NUT OR BOLT FROM AN INSTALLED POSITION. THIS CONDITION IS FOR BOLT THREADS WITH NO LOAD ON THE BASE OF THE NUT.
- E. THE MAXIMUM LOCKING TORQUE IS THE MAXIMUM TORQUE DURING INSTALLATION OR REMOVAL OF NUTS WITH NO LOAD ON THE BASE OF THE NUT.

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Locking Torque Values for Self-Locking Nuts Figure 203/20-11-00-990-803

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D00781 S0006402594_V3

407-433 (45.98-48.92)

660-700 (74.57-79.09)

1070-1130 (120.89-127.67)

1600-1700 (180.77-192.07)

Torque Values for Reduced-Head Bolts Figure 204/20-11-00-990-804

5/8-18

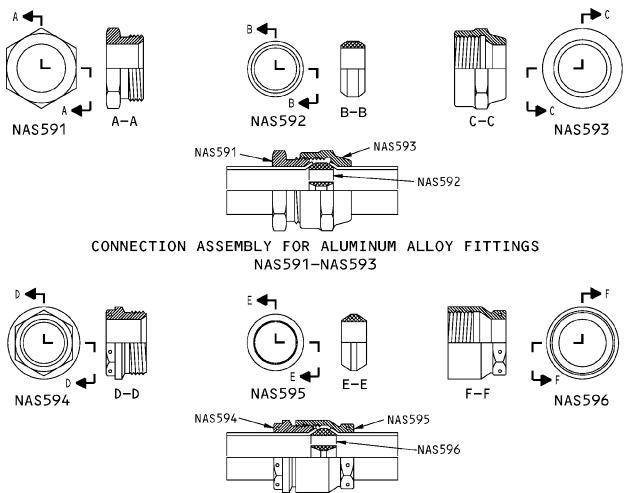
3/4-16

7/8-14

1-12 OR 1-14

20-11-00

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CONNECTION	ASSEMBLY	FOR	STAINLESS	STEEL	FITTINGS
	NAS	\$594-	-NAS596		

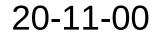
	TORQUE VALUE (POUND-INCHES)						
TUBE OD (INCHES)		LOY FITTINGS -NAS593		EEL FITTINGS -NAS596			
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM			
1 1-1/4 1-1/2	480 600 600	720 900 900	480 600 600	720 900 900			
2 2-1/2 3	900 1500	1200 1800	900 1800 1800	1200 2100 2100			
4			2400	2700			

Standard Torque Values for Rigid Tube Coupling Connectors Figure 205/20-11-00-990-805

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	TORQUE VALUE (POUND-INCHES)						
PIPE THREAD SIZE (INCHES)		EPT STAINLESS INLESS STEEL	STAINLESS STEEL TO STAINLESS STEEL PIPE FITTINGS				
	WORKING		MIN	МАХ			
1/8 1/4 3/8	100 150 225	175 300 450	100 100 100	150 275 400			
1/2 3/4 1			100 150 200	500 600 800			

Standard Torque Values for Pipe Thread Fittings Figure 206/20-11-00-990-806



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TUBE OD	FITTING	TORQUE	VALUE	
(INCHES)		(POUND-	INCHES)	
	NUT SIZE	1	2	
1/4	-4	110	65	
5/16	-5	140	90	
3/8	-6	170	130	
1/2	-8	280	260	
5/8	-10	360	360	
3/4	-12	450	500	
1	-16	750	700	
1-1/4	-20	900	900	
1-1/2	-24	900	900	
2	-32		2000	

NOTE: THE TORQUE VALUES ARE APPLICABLE TO ALL WALL THICKNESSES FOR A GIVEN DIAMETER TUBE. AND THE TORQUE VALUES HAVE A $\pm 5\%$ TOLERANCE.

- 1 THESE TORQUE VALUES ARE APPLICABLE TO:
 - (1) FLARED ALUMINUM TUBE ENDS
 - (2) FLARELESS ALUMINUM TUBE ENDS WITH BACS13BD SWAGED SLEEVES
 - (3) FLARELESS TYPE HOSE END FITTINGS WITH ALUMINUM INSERTS
 - (4) STANDARD MS FLARELESS TUBE ENDS ON 6061-T6 ALUMINUM TUBING AND ON ANNEALED CRES TUBING. ANNEALED CRES TUBING IS IDENTIFIED BY A WIDE YELLOW BAND ADJACENT TO THE TUBING-USE IDENTIFICATION CODE MARKINGS.
- 2 THESE TORQUE VALUES ARE APPLICABLE TO FLARED HOSE END FITTINGS WITH ALUMINUM INSERTS.

Standard Torque Values for Low Pressure and Return Line Fittings Figure 207/20-11-00-990-807

20-11-00

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TUBING		INSTALLATION TORQUE ON FLARELESS TUBING FITTING (POUND-INCHES, $\pm 5\%$) 1 2		
OD SIZE (INCHES)	TUBE DASH NO.	STEEL AND TITANIUM TUBES 3	ALUMINUM AND ANNEALED CRES TUBES 4	
3/16	-3	100	80	
1/4	-4	140	110	
5/16	-5	190	140	
3/8	-6	270	170	
1/2	-8	500	280	
5/8	-10	700	360	
3/4	-12	900	450	
1	-16	1200	750	
1-1/4	-20	1600	900	
1-1/2	-24	2000	900	
2	-32	2000		

- <u>NOTE</u>: 1. TO USE ALUMINUM TUBE TORQUE VALUES FOR ALUMINUM, STEEL, OR TITANIUM FITTINGS IN ALUMINUM BOSSES.
 - 2. TO USE STEEL TUBE TORQUE VALUE FOR STEEL OR TITANIUM FITTINGS INSTALLED IN STEEL OR TITANIUM BOSSES.
- <u>NOTE</u>: YOU MUST USE CARE WHEN YOU SELECT THE CORRECT TORQUE FOR REDUCER FITTINGS. YOU MUST FIND THE CORRECT FITTINGS INSTALLATION TORQUE FOR THE SIZE OF THE BOSS OR BULKHEAD.
- 1 YOU MUST USE CARE WHEN YOU SELECT THE CORRECT TORQUE FOR REDUCER FITTINGS. YOU MUST FIND THE CORRECT FITTINGS INSTALLATION TORQUE FOR THE SIZE OF THE BOSS OR BULKHEAD.
- 2 TUBE MATERIAL SPECIFICATIONS:
 - A. 6061-T6 ALUMINUM MIL-T-7081, WW-T-700/6
 - B. ANNEALED CRES MIL-T-8504, MIL-T-8606, MIL-T-8808
 - C. 1/8 HARD CRES MIL-T-6845
 - D. 21-6-9 CRES BMS 7-185
 - E. TI-3AL-2.5V BMS 7-234
- 3 THESE TORQUE VALUES ARE APPLICABLE TO THESE TUBE ENDS:
 - A. 21-6-9 STEEL WITH BACS13BDX SWAGED SLEEVE
 - B. CRES STEEL WITH BACS13BDX SWAGED SLEEVE
 - C. MIL-T-6845 CRES WITH BACS13AP PRESET SLEEVE 5
 - D. HOSE END FITTINGS WITH STEEL INSERTS (NIPPLES)
 - E. ALL TITANIUM TUBE ENDS

4 THESE TORQUE VALUES ARE APPLICABLE TO THESE TUBE ENDS:

- A. ALUMINUM WITH BACS13BD AND BACS13BX SWAGED SLEEVES
- B. 6061-T6 ALUMINUM WITH PRESET BACS13AP SLEEVES 6
- C. ANNEALED CRES WITH PRESET BACS13AP SLEEVES 6
- D. HOSE END FITTINGS WITH ALUMINUM INSERTS (NIPPLES)

Installation Torque for Flareless Tubing Fittings Figure 208 (Sheet 1 of 2)/20-11-00-990-808

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5 THESE TORQUE VALUES ARE APPLICABLE TO STANDARD MS FLARELESS TUBE ENDS (BACS13AP SLEEVES) ON MIL-T-6845 (304-1/8 HARD) TUBING WITH THE MINIMUM WALL THICKNESS BELOW:

SIZE	-4	-5	-6	-8	-10	-12
WALL THICKNESS	0.020	0.020	0.028	0.034	0.049	0.049

USE THESE TORQUE VALUES FOR SPECIAL THIN WALL MIL-T-6845 (304-1/8h) TUBING:

SIZE	-8	-10	-12
WALL THICKNESS	0.028	0.035	0.042
TORQUE (POUND-INCHES)	375	575	725

6 USE THESE TORQUE VALUES FOR STANDARD MS FLARELESS TUBE ENDS (BACS13AP SLEEVES) ON 6061-T6 ALUMINUM AND ANNEALED CRES TUBING WITH THE MINIMUM WALL THICKNESS BELOW:

SIZE	-3	-4	-5	-6	-8	-10	-12	-16
WALL THICKNESS	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.035

USE THESE TORQUE VALUES FOR SPECIAL THIN WALL ANNEALED CRES TUBING:

SIZE	-8	-10	-12
WALL THICKNESS	0.020	0.020	0.020
TORQUE (POUND-INCHES)	160	250	325

Installation Torque for Flareless Tubing Fittings Figure 208 (Sheet 2 of 2)/20-11-00-990-808



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AIRCRAFT MAINTENANG	CE MANUAL
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BOEING PART NUMBER	DASH NUMBER ()	TORQUE (INCH- POUNDS)	TORQUE (NEWTON- METERS)	
BACC10AC	150-200	40-50	4.52-5.65	
	225-300	60-70	6.78-7.91	
	315-550	120-140	14.01-15.81	
BACC10AUU()	250-275	70	7.91	
	300-500 550-600	100	11.30	
BACC10BR8()	100-900	100	11.30	
BACC10CT2()	100-600		11.50	
BACC10DP()A	150-250			
BACC10DP()B	300	50	5.65	
BACC10DP()AB	350-400			
	450-600	70	7.91	
BACC10DU()AB	100-175	50	5.65	
	200-275	55	6.21	
	300-450	60	6.78	
	500-600	65	7.34	
	700-1000	75	8.47	
BACC10EY()B	150-800 425-800	105	11.86	
	150-400	75	8.47	
BACC10EZ()B	125-275	1		
	300	105	11.86	
	125-300			
BACC10GY()	150-175	40	4.52	
	200-275	45	5.08	
	300-450	50	5.65	
	475-600	55	6.21	
	650-900	65	7.34	
BACC10HX()	100-300	10	1.13	
	325-500	15	1.69	
	550-800	20	2.26	

COUPLING CLAMPS, V-BAND,

AND CHANNEL-BAND 1

TABLE A

BOEING PART NUMBER	DASH NUMBER ()	TORQUE (INCH- POUNDS)	TORQUE (NEWTON- METERS)
васс10кн	200-275	45	5.08
	300-475	55	6.21
	500-550	60	6.78
	600-650	65	7.34
	700	70	7.91
BACC10LE()	500-600	55	6.21
	650-900	65	7.34
NUCO (U430453)	125	55-65	6.21-7.34

1 THE RECOMMENDED TIGHTENING PROCEDURE IS AS FOLLOWS:

- 1. APPLY THE INSTALLATION TORQUE AS GIVEN IN THE TABLE.
- 2. HIT THE ENTIRE CIRCUMFERENCE OF THE CLAMP LIGHTLY WITH A WOOD, LEATHER, OR SOFT PLASTIC MALLET.
- 3. DO STEPS 1 AND 2 UNTIL THE TORQUE WILL STAY CONSTANT.

Standard Torque Values for Clamps Figure 209 (Sheet 1 of 3)/20-11-00-990-809

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ТҮРЕ	DUCT OD INCHES (mm)	TORQUE INCH-POUNDS (NEWTON-METERS)	
BACC10CT	1.00-6.00 (25.4-152.40)	102.5 ±2.5 (11.6 ±0.3) [2]	

CHANNEL BAND CLAMPS

ТҮРЕ	DUCT OD INCHES (mm)	TORQUE INCH-POUNDS (NEWTON-METERS)
BACC10AD	2.00-8.00 (50.8-203.20)	22.5 ±2.5 (2.5 ±0.3)

DUCT-SUPPORT CLAMPS

ТҮРЕ	STRUCTURE OD INCHES (mm)	TORQUE INCH-POUNDS (NEWTON-METERS)
BACC10FY	1.20 (30.48)	32.5 ±1.5 (3.7 ±0.2)

BAND CLAMPS

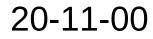
ТҮРЕ	DUCT OD INCHES (mm)	TORQUE INCH-POUNDS (NEWTON-METERS)
BACC10ET	4.00 AND LARGER (101.6 AND LARGER)	35.0 ±5.0 (4.0 ±0.6)

BRACKET MOUNTING CLAMPS

2 INSIDE OF COUPLING IS NOT LUBRICATED

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Standard Torque Values for Clamps Figure 209 (Sheet 2 of 3)/20-11-00-990-809



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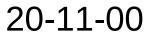
ТҮРЕ	HOSE OD INCHES (mm)	TORQUE INCH-POUNDS (NEWTON-METERS)
BACC10BN	1.75-20.00 (44.45-508)	20 (2)

HOSE CLAMPS

ТҮРЕ	DUCT OD INCHES (mm)/MATERIAL	TORQUE INCH-POUNDS (NEWTON-METERS)
BACR12H	1.50 (38.10)/5052-0	800 ±200 (90 ±23)
	1.50 (38.10)/STAINLESS	1050 ±150 (119 ±17)
	1.75 (44.45)/5052-0	1050 ±150 (119 ±17)
	2.00 (50.80)/5052-0	1400 ±1100 (158 ±124)
	2.50 (63.50)/5052-0	2500 ±500 (282 ±57)

ROYLYN COUPLING

Standard Torque Values for Clamps Figure 209 (Sheet 3 of 3)/20-11-00-990-809



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WRENCH ARC METHOD TIGHTENING TECHNIQUES - MAINTENANCE PRACTICES

- 1. <u>General</u>
 - A. This procedure contains one task:
 - (1) The wrench arc method.
 - B. This procedure gives the instructions to tighten ball-nose tube fittings.
 - C. Torque is the turn force that you apply to the fastener to install a part.

TASK 20-11-10-910-802-001

2. Wrench Arc Method

(Figure 201)

- A. General
 - (1) The wrench arc method is used to tighten all ball-nose fittings on the engine-mounted components and tubing. The purpose is to obtain a total angle displacement of 30 degrees. The wrench arc method is done by a visual measurement of the angular displacement instead of a torque measurement. There are two methods of the wrench arc method:
 - (a) The turn of the B-nut method (use of an open end wrench, crowfoot or tubing wrench)
 - (b) The line of sight method (use a 15 degree offset open end wrench).

B. Procedure

SUBTASK 20-11-10-420-004-001

- (1) Prepare to tighten the ball-nose fitting:
 - (a) Clean the threads and the mating surfaces of the fitting.
 - (b) Make sure there is no nicks, burrs, and scratches on the fitting threads.

SUBTASK 20-11-10-420-005-001

(2) Use the turn of the B-nut method to tighten the ball-nose fitting:

NOTE: No lubricant is necessary for the ball-nose fitting.

- (a) Put the open end wrench, crowfoot or tubing wrench on the B-nut.
- (b) Turn the B-nut until you feel a sharp increase in the resistance.

NOTE: The sharp increase indicates that the mating surfaces touched.

- (c) Make sure the ball-nose fitting is correctly installed (not cross-threaded).
- (d) Make sure there is no looseness between the mating parts of the ball-nose fitting.
- (e) Set a reference point on the B-nut coupling.

NOTE: The reference point is always between the B-nut flat and the coupling.

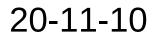
- (f) Tighten the B-nut with an open end wrench through an arc 30 degrees. NOTE: 1/2 flat turn of the B-nut is 30 degrees of a complete arc.
- (g) If this is new hardware, loosen the B-nut and then tighten it again to a complete arc of 30 degrees.

SUBTASK 20-11-10-420-006-001

(3) Use the line of sight method to tighten the ball-nose fitting:

NOTE: No lubricant is necessary for the ball-nose fitting.

(a) Put the open end wrench on the B-nut.



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(b) Turn the B-nut until you feel a sharp increase in the resistance.

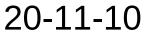
NOTE: The sharp increase indicates that the mating surfaces touched.

- (c) Make sure the ball-nose fitting is correctly installed (not cross-threaded).
- (d) Make sure there is no looseness between the mating parts of the ball-nose fitting.
- (e) Look at the position of the 15 degree open end wrench handle.
- (f) Set a reference point on the B-nut in line with the handle.

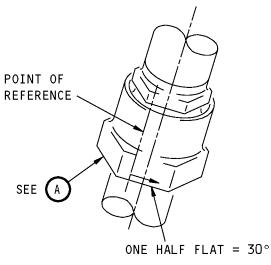
NOTE: The reference point is always between the B-nut flats and the wrench handle.

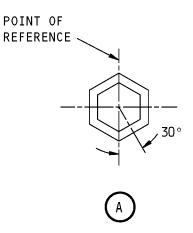
- (g) Tighten the B-nut 15 degrees.
- (h) Turn the wrench over.
- (i) Put the wrench on the same B-nut flats.
- (j) Tighten the B-nut an additional 15 degrees which aligns the wrench back to the original start position.
 - NOTE: If this is new hardware, loosen the new B-nut and then do the above procedure to tighten it again to a complete arc of 30 degrees.

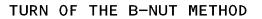
----- END OF TASK ------

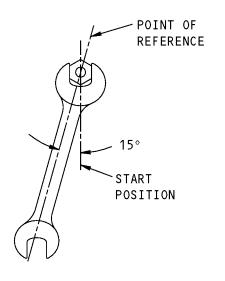


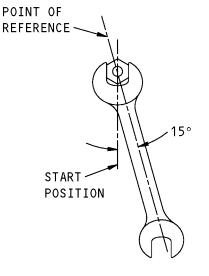
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TURN NUT 15° FROM THE START POSITION TURN WRENCH OVER (INVERT) TURN NUT 15° BACK TO THE START POSITION

LINE OF SIGHT METHOD

1120858-01-A

Tighten Ball-Nose Fittings with the Wrench Arc Method Figure 201/20-11-10-990-802-001

20-11-10

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