



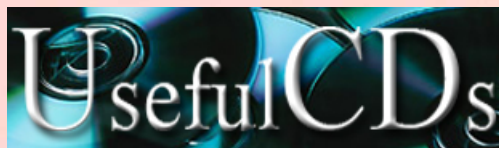
SERVICE BULLETIN

DIVISION OF ONAN CORPORATION
MINNEAPOLIS, MINNESOTA 55432

Eng.

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3-73



GENERAL TORQUE INFORMATION

When servicing Onan equipment be sure to torque all nuts, bolts, and studs according to recommendations contained in this bulletin. Two factors to consider when discussing torque are:

1. EXCESSIVE FRICTION
2. CLAMPING FORCE

FRICITION is a force opposing motion. CLAMPING FORCE is a force that holds or fastens two or more things together.

NOTE: EXCESSIVE FRICTION CAN CAUSE DECREASING CLAMPING FORCE

Figure 1 shows a cap screw with excessive friction and no clamping force. Figure 2 shows a cap screw with good clamping force because of clean, lubricated threads.

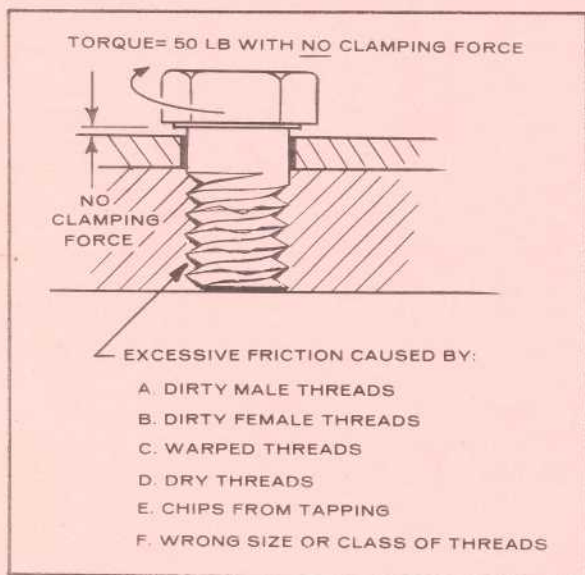


FIGURE 1. POOR CLAMPING FORCE

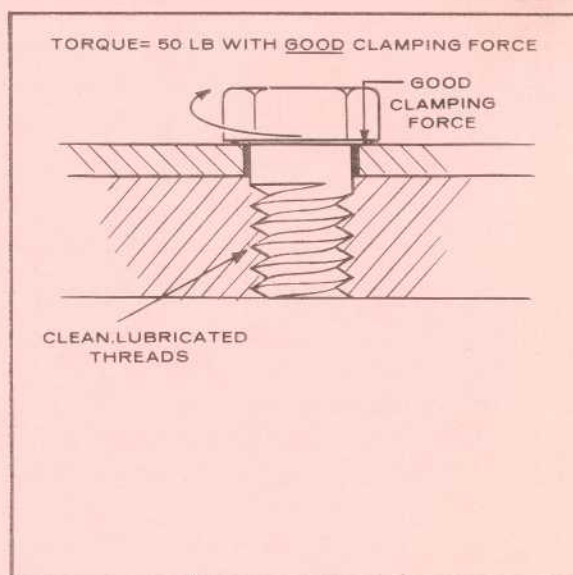


FIGURE 2. GOOD CLAMPING FORCE

TORQUE PROCEDURE

1. Clean all threads.
2. Lubricate threads with specified lubricant. (Assemble dry if specified).
3. Hand tighten all bolts.
4. Use the specified pattern (shown in Major Service Manual) for tightening sequence.
5. Tighten bolts to 1/2 the torque value.
6. Repeat pattern bringing all bolts up to full torque value. If no torque pattern is specified, start at centerline of gasket and torque bolts as shown in Figure 3, following numbered sequence.

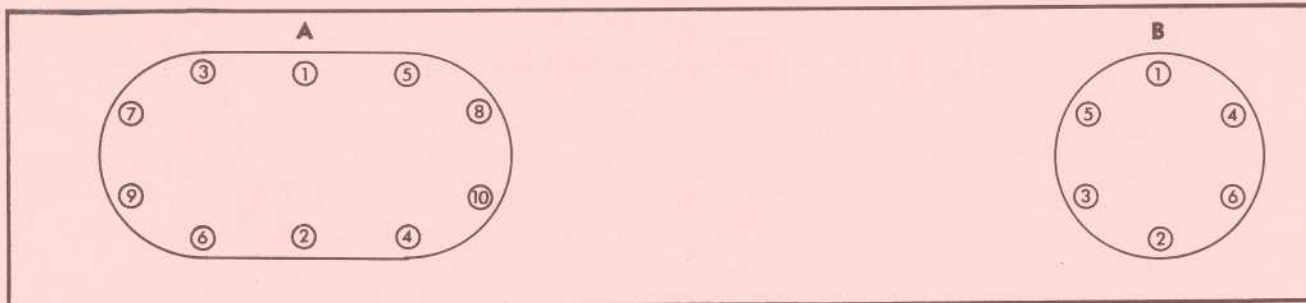


FIGURE 3. BASIC TORQUE PATTERN

TABLE 1. RECOMMENDED TORQUE IN FOOT-POUNDS

USE ENGINE LUBRICATING OIL AS A THREAD LUBRICANT						DO NOT USE ANY LUBRICANT ON THESE THREADS	
ENGINE SERIES	CYLINDER HEADS (COLD)	CONNECTING RODS	REAR BEARING PLATE	FLYWHEEL MOUNTING SCREW	OIL BASE	SPARK PLUGS	ARMATURE THRU STUD
AJ, MAJ	24-26	10-12	20-25	35-40	25-30	25-30	25-30
AK	24-26	10-12	20-25	35-40	25-30	25-30	25-30
LK, LKB	29-31	26-28	20-25	35-40	25-30	25-30	35-40
CCK, CCKB	29-31	*	20-25	35-40	43-48	25-30	35-40
NB	29-31	*	30-35	***30-35	38-43	15-20	35-40
NH	22-25	27-29	25-27	***30-35	18-23	15-20	35-40
NHA, B, C	8-20	27-29	20-23	35-40	18-23	15-20	35-40
BF	14-16	14-16	25-27	35-40	18-23	15-20	45-50
CCKA	29-30	**	20-25	35-40	43-38	25-30	35-40

* NB Aluminum Rods 24-26 #, Forged Rods 27-29 #

** CCK, CCKA and CCKB Forged Rods 27-29 #, Aluminum Rods 24-26 #

*** Zinc or Alum. Wheel 30-35, Cast Iron Wheel 40-45

CAUTION *Cylinder head bolts on "J" series water-cooled units that have been overhauled must be retorqued after 1/2 hour to 2 hours of operation. (Not necessary on new units from factory.) Cylinder head bolts on "J" series air-cooled units must be retorqued to specified torque value after 50 hours of operation. (Back off 1/2 turn and then retighten.)*

TABLE 2. RECOMMENDED TORQUE IN FOOT-POUNDS

USE ENGINE LUBRICATING OIL AS A THREAD LUBRICANT											DO NOT USE ANY LUBRICANT ON THESE THREADS			
ENGINE SERIES	CYL. HEAD (COLD)	CONN. ROD	REAR BRG. PLATE	MAIN BRG. (4 CYL.)	FLYWHEEL TO CRANKSHAFT	OIL BASE	EXHAUST MANIFOLD (Tighten Evenly)	INTAKE MANIFOLD	DAMPER FLYWHEEL ASSY. NUT (4 CYL.)	ROCKER ARM STUD IN HEAD	ARMATURE THROUGH STUD REVOLVING ARM. UNITS	REVOLVING FIELD UNITS	SPARK PLUGS	INJECTION NOZZLE
JA	28-30	27-29	40-45		65-70	32-38	13-15	13-15		25-30	30-40		25-30	
JB	28-30	27-29	40-45		65-70	45-50	13-15	13-15		25-30		55-60	25-30	
JC	28-30	27-29	40-45	97-102	65-70	45-50	13-15	13-15		25-30		55-60	25-30	
MJA	44-46	27-29	40-45		65-70	32-38	13-15	13-15		35-40	30-40		25-30	
MJB	44-46	27-29	40-45		65-70	45-50	13-15	13-15		35-40		55-60	25-30	
MJC	44-46	27-29	40-45	97-102	65-70	45-50	13-15	13-15	17-21	35-40		55-60	25-30	20-21
MDJA	44-46	27-29	40-45		65-70	32-38	13-15	13-15		35-40	30-40		25-30	20-21
DJA *	44-46	27-29	40-45		65-70	32-38	13-15	13-15		35-40	30-40		25-30	20-21
MDJB	44-46	27-29	40-45		65-70	45-50	13-15	13-15		35-40		55-60	25-30	20-21
DJB *	44-46	27-29	40-45		65-70	45-50	13-15	13-15		35-40		55-60	25-30	20-21
MDJE	44-46	27-29	40-45		65-70	45-50	13-15	13-15		35-40		55-60	25-30	20-21
MDJC	44-46	27-29	40-45	97-102	65-70	45-50	13-15	13-15	17-21	35-40		55-60	25-30	20-21
DJC *	44-46	27-29	40-45	97-102	65-70	45-50	13-15	13-15	17-21	35-40		55-60	25-30	20-21
MDJF	44-46	27-29	40-45	97-102	65-70	45-50	13-15	13-15	17-21	35-40		55-60	25-30	20-21
RJC	44-46	27-29	40-45	97-102	65-70	45-50	13-15	13-15	17-21	35-40		55-60	25-30	20-21
RDJC	44-46	27-29	40-45	97-102	65-70	45-50	13-15	13-15	17-21	35-40		55-60	25-30	20-21
RDJF	44-46	27-29	40-45	97-102	65-70	45-50	13-15	13-15	17-21	35-40		55-60	25-30	20-21

* - NOTE: Use Never-Seeze in Torqueing to this value.

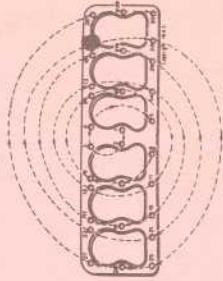
International TORQUE SPECIFICATIONS FOR ALL BOLTS

METRIC STANDARD

GRADE OF BOLT	TORQUE (IN FOOT POUNDS)			SOCKET OR WRENCH SIZE	
	5D	8G	10K	12K	
MIN. TENSILE STRENGTH P.S.I.	71,160	112,800	142,200	170,679	
GRADE MARKINGS ON HEAD	5D	8G	10K	12K	
METRIC	TORQUE (IN FOOT POUNDS)				
BOLT DIA.					BOLT HEAD
6mm	5	6	8	10	10mm
8mm	10	16	22	27	14mm
10mm	19	31	40	49	17mm
12mm	34	54	70	86	19mm
14mm	55	89	117	137	22mm
16mm	83	132	175	208	24mm
18mm	111	182	236	283	27mm
22mm	182	284	394	464	32mm
24mm	261	419	570	689	36mm

RECOMMENDED SEQUENCE FOR TIGHTENING CYLINDER HEAD BOLTS

- (1) Tighten all bolts to 1/3 final full Torque.
- (2) Re-tighten all bolts to 2/3 final Torque.
- (3) Re-tighten all bolts to full Torque and proper sequence.
- (4) Re-tighten to full Torque again in reverse sequence. (This insures that no bolts have been missed.)
- (5) Re-Torque to final specifications in normal sequence again after engine warm up.



U.S. STANDARD

GRADE OF BOLT	TORQUE (IN FOOT POUNDS)					SOCKET OR WRENCH SIZE
	SAE 1 & 2	SAE 5	SAE 6	SAE 8	SAE 10	
MIN. TENSILE STRENGTH P.S.I.	64,000	105,000	133,000	150,000	170,000	
GRADE MARKINGS ON HEAD						
U.S. STANDARD BOLT DIA.	TORQUE (IN FOOT POUNDS)					U.S. REGULAR BOLT HEAD
1/4	5	7	10	10.5	3/8	7/16
5/16	9	14	19	22	1/2	9/16
3/8	15	25	34	37	9/16	5/8
7/16	24	40	55	60	5/8	3/4
1/2	37	60	85	92	3/4	13/16
9/16	53	88	120	132	7/8	7/8
5/8	74	120	167	180	15/16	1.
3/4	120	200	280	296	1-1/8	1-1/8
7/8	190	302	440	473	1-5/16	1-5/16
1.	282	466	660	714	1-1/2	1-1/2

MULTIPLY READINGS BY 12 FOR INCH POUND VALUES

WHEN USING CHART:

1. Use FEL-PRO C5A compound or other high stress lubricant under the bolt head as well as on the threads. (Use torque-figures directly.)
2. Increase torque by 20% if engine oil or grease is used as lubricant. (Don't torque bolts dry.) (Follow manufacturers specific specs if available.)
3. Reduce torque by 20% when new Cadmium plated bolts are used.

CAUTION

Bolts threaded into aluminum may require much less torque.

WHITWORTH STANDARD

GRADE OF BOLT	A & B		S		T		V	
	MIN. TENSILE STRENGTH P.S.I.	GRADE MARKINGS ON HEAD	MIN. TENSILE STRENGTH P.S.I.	GRADE MARKINGS ON HEAD	MIN. TENSILE STRENGTH P.S.I.	GRADE MARKINGS ON HEAD	MIN. TENSILE STRENGTH P.S.I.	GRADE MARKINGS ON HEAD
1/4	.250	5	7	9	10	*1/4	*1/4	
5/16	.3125	9	15	18	21	*5/16	*5/16	
3/8	.375	15	27	31	36	*3/8	*3/8	
7/16	.4375	24	43	51	58	*7/16	*7/16	
1/2	.500	36	64	79	89	*1/2	*1/2	
9/16	.5625	52	94	111	128	*9/16	*9/16	
5/8	.625	73	128	155	175	*5/8	*5/8	
3/4	.750	118	213	259	287	*3/4	*3/4	
7/8	.875	186	322	407	459	*7/8	*7/8	
1.	1.000	276	497	611	693	*1.	*1.	

*Dimensions given on handles of U.S. wrenches refer to actual size of bolt head or nut. Dimension given on Whitworth wrenches refer to the shank or body diameter of the bolt. NOT THE BOLT HEAD OR NUT SIZE.

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