IO-550-A
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CONTINENTAL® AIRCRAFT ENGINE

PERMOLD SERIES ENGINE

MAINTENANCE AND OVERHAUL MANUAL

Technical Portions Accepted by the Federal Aviation Administration

Publication M-16

CHANGE 2

JUL 2015

Supersedure Notice

This manual is a revision of publication M-16, dated 31 August 2011. Instruction contained in the previous edition of M-16 and Forms X30634 and X30568 are superseded upon FAA acceptance and release of this document.

Effective Changes for this Manual

0 ..... 1 September 2014			
1 .....15 February 2015			
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List of Effective Pages

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Table 3-7. Sealants

Type	Application	Remarks
Loctite 592 Teflon PS/T Pipe Sealant	Use on all pipe threads except as noted All pressure relief valve housing threads Permold 2 studs engine mount 1-3-5 side bottom	where applicable
	All threaded fasteners installed in a through hole to an oil source	Apply before installing threaded fastener

Table 3-8. Adhesives

Type	Application	Remarks
Part No. 646940 Loctite 222 Sealant (optional Loctite Hydraulic Sealant 569)	Through stud holes on accessory end of crankcase	apply when installing studs
	Manifold valve to bracket screws	All models
	Studs 0.25 diameter and smaller	All models
	Manifold valve assembly data plate screws	All models
Part No. 646941 Loctite 271 High Strength Adhesive Sealant used with Part No. 653693 Loctite 7471 Primer	Cylinder deck studs	breakaway torque minimum 100 in-lbs. after two hours
	Crankcase nose seal retainer bolts	All models
	Squirt nozzle	All models
	Mechanical tachometer drive studs to an oil source	where applicable
	Oil gauge rod housing to crankcase	
Part No. 649366 Loctite 242	Magneto housing pressurization fitting	where applicable
Part No. 655700	Cylinder baffle isolators	As Required
Part No. 658493	Induction manifold Diverter Valve Brackets	As Required

17-2. Crankcase Assembly

17-2.1. Drive Train Installation

CAUTION: All parts must be clean and free of debris before the crankcase can be assembled. Perform the assembly in a clean, dry, dust-free environment.

1. Install the left (2-4-6) crankcase half on the engine stand with the open side up. Place the right (1-3-5) crankcase half on a workbench with the open side up.
2. With the exception of the crankshaft bearing saddles, thoroughly coat the crankcase camshaft bearing surfaces, propeller governor gear bearing surface, starter shaft gear bushing, and new idler gear bushing with clean, 50-weight aviation engine oil:
3. Shake or mix well full strength, non-thinned Part No. 654663 gasket sealant.
4. Apply Part No. 654663 and silk thread as illustrated in Figure 17-1. Do not apply Part No. 654663 gasket sealant to the crankshaft nose seal area. Apply Part No. 654663 gasket sealant to the 2-4-6 case half only in areas where thread is shown. Apply an even thin coat of Part No. 654663 gasket sealant using short light brush strokes. Part No. 654663 gasket sealant should be viscous enough for brush marks to disappear. If not, use a new container of Part No. 654663 gasket sealant.
5. Allow the gasket sealant to air dry to a tacky condition before threading.

   NOTE: Refer to Appendix C for detailed Part No. 646942 Gasket Maker application instructions.

6. Apply a thin translucent coat of Part No. 646942 Gasket Maker not to exceed 0.010 inch thick to 1-3-5 case half. Apply Gasket Maker in areas where Part No. 654663 was applied on the 2-4-6 case half.
7. Apply grade D silk thread on the 2-4-6 case half only as shown in Figure 17-1. Ensure the free ends of the thread are covered by gaskets except at the nose oil seal.

   CAUTION: Do not apply engine oil on the crankshaft bearing saddles. Bearing saddles must be dry when installing the crankshaft main bearings.

WARNING

Do not apply <u>any</u> form of sealant to the crankcase cylinder deck, chamfer, cylinder mounting flange, cylinder base O-ring, cylinder fastener threads or crankcase main bearing bosses. The use of RTV, silicone, Gasket Maker or <u>any</u> other sealant on the areas listed above during engine assembly will cause a loss of cylinder deck stud or through-bolt torque. Subsequent loss of cylinder attachment load, loss of main bearing crush and/or fretting of the crankcase parting surfaces will occur. The result will be cylinder separation, main bearing movement, oil starvation and catastrophic engine failure. USE ONLY CLEAN 50 WEIGHT AVIATION ENGINE OIL ON SURFACES LISTED.

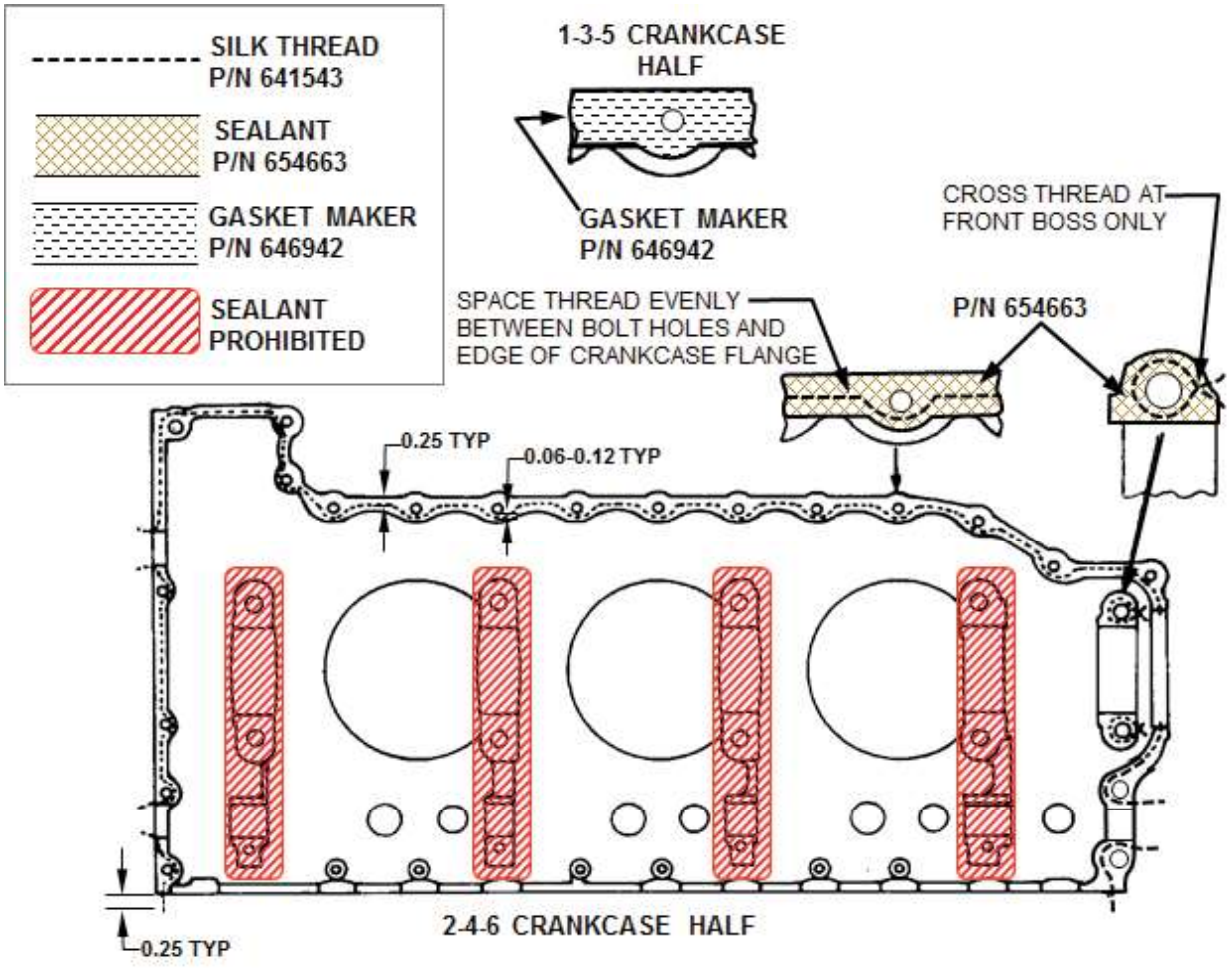

Figure 17-1. Crankcase Sealant and Threading

CAUTION: Do not apply engine oil to the crankshaft bearing saddles. Bearing saddles must be dry when installing the crankshaft main bearings.

8. Install new crankshaft main bearings (Figure 17-2) (2) in the bearing saddles on both crankcase halves. Do not lubricate the crankshaft bearing saddles, lubricate only the crankshaft side of the main bearings with clean 50-weight aviation engine oil.
9. Install a new O-ring (21) in the oil transfer 2-4-6 side collar (20). Lubricate the O-ring (21) and oil transfer 2-4-6 side collar (20) area and bearing surface thoroughly with clean 50 weight aviation oil.
10. With the aid of an assistant, lift the crankshaft assembly by the No. 1 connecting rod and propeller flange.
11. Have the assistant hold the numbers 3 and 5 connecting rods upward while carefully lowering the crankshaft assembly into position. Guide the oil transfer collar into position in the crankcase.
12. Apply clean 50 weight aviation engine oil to the thrust washer lands in the crankcase to hold the thrust washer in place during assembly.
13. Install new thrust washers (1).
14. Ensure the bearing and thrust washer ends project equally.
15. Verify the new O-ring (21), new crankshaft main bearings (2), and new thrust washers (1) are seated properly.
16. Carefully place the odd-numbered connecting rods on the upper case flange. Connecting rod position numbers, if properly installed, will be toward the upper case flange.
17. Apply clean, 50-weight aviation engine oil to the governor driven gear (Figure 17-3) (7) and camshaft assembly (1).
18. Install the governor-driven gear (7) in the crankcase bore.

WARNING

Failure to install plugs in the camshaft prior to engine assembly will result in loss of internal oil pressure. With little or no lubrication of internal moving engine parts, engine failure will be imminent.

19. Install the assembled camshaft assembly (1) in the crankcase.

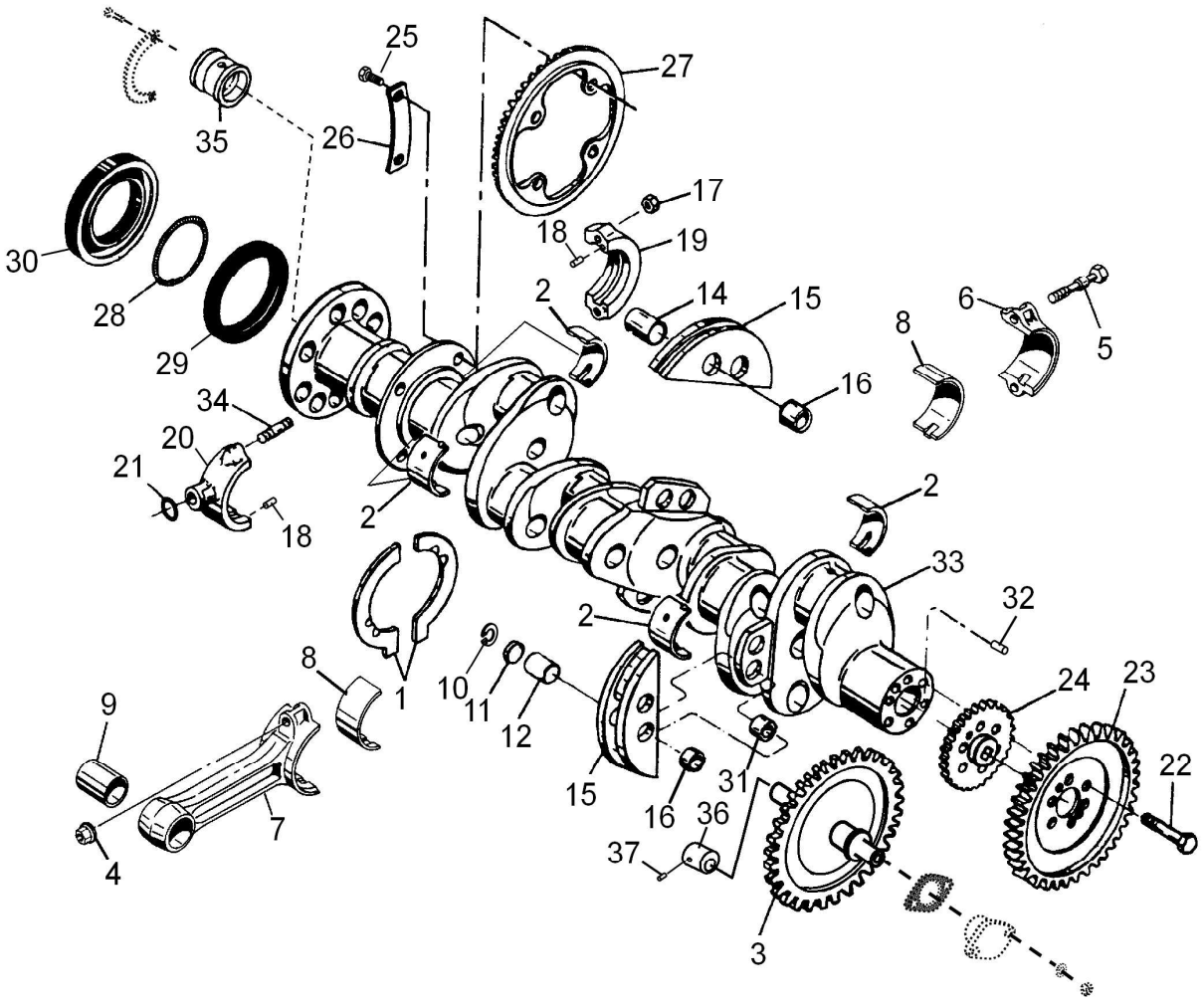

Figure 17-2. Crankshaft Assembly

1	Thrust Washer	11	Counterweight Plate	21	O-ring	31	Counterweight Bushing
2	Crankshaft Main Bearing	12	6th Order Counterweight Pin	22	Drilled Head Screw	32	Crankshaft Dowel
3	Idler Gear	13	4th Order Counterweight Pin	23	Large Gear Cluster	33	Crankshaft
4	Spiral Lock Nut	14	5th Order Counterweight Pin	24	Small Gear Cluster	34	Stud
5	Connecting Rod Bolt	15	Counterweight Assembly	25	Bolt	35	Oil Transfer Plug
6	Connecting Rod Cap	16	Counterweight Bushing	26	Tab Lock Plate	36	Idler Gear Bushing
7	Connecting Rod	17	Nut	27	Alternator Drive Gear	37	Dowel Pin
8	Connecting Rod Bearing	18	Dowel Pin	28	Spring		
9	Piston Pin Bushing	19	1-3-5 Side Collar	29	Reinforcing Ring		
10	Retaining Ring	20	2-4-6 Side Collar	30	Oil Seal		

17-2.2. Crankcase Hardware Installation

CAUTION: IO-550 crankcase assembly is the same for all engine models except external hardware fastener lengths vary. Refer to the instructions matching the engine model in Section 17-2.2.1 or Section 17-2.2.2

17-2.2.1. IO-550-A, B & C Crankcase Assembly A B C

1. Lubricate all studs and crankcase through-bolts according to instructions in Appendix B with approved lubricants (Chapter 3, Special Tools and Supplies).

WARNING

Lubricate fasteners and apply torque to the crankcase hardware in the proper sequence. Failure to do so may result in crankcase damage or engine failure.

NOTE: Positions cited in this procedure refer to Figure 17-8.

2. Use an O-ring Installation Tool ("Special Tools" in Section 3) to install eight new 0.5" x 10.75" through-bolts (Figure 17-9)(46) with new o-rings (47) in positions 37 through 44. If necessary, use a mallet to tap the through-bolts.
3. Install three new 0.31" x 4.00" tie bolts (62) with washers (32) in positions 69, 71 and 72; tighten, but do not torque the tie bolts (62).
4. Install a new 0.4375" x A B 5.31" (C 6.74") through-bolt (40) with new O-rings in position 45.
5. Install a new 0.4375" inch x A B 6.19" (C 6.96") through bolt (41) with new O-rings in position 46.
6. Install 0.88" flange washer on the 2-4-6 side of through-bolts (40 & 41) followed by 0.45" washers (42) and flange nuts (44) on both sides of the through bolts (40 & 41).
7. Install a 0.31" x 1.12" screw in position 54 and a 0.31" X 1.38" screw in position 53.

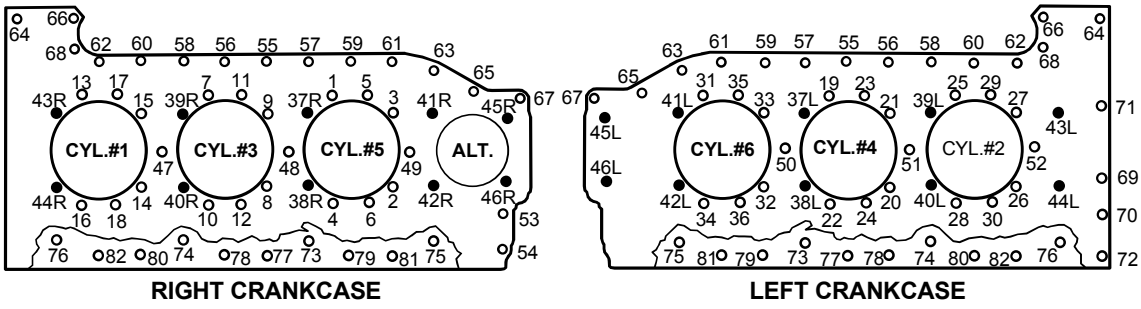

Figure 17-8. Crankcase Fastener Locations

8. Install a 0.38" x A 10.44" (B 11.67" C 12.14") through bolt (50), two o-rings (51), spacer (52), washers (53), and nuts (54) in position 64.

9. Rotate the engine on the stand to the upright position. With connecting rods supported by old cylinder o-rings, secure 1-3-5 side engine mounts to engine stand.

10. Install the fuel manifold valve bracket at positions **A** 55 and 57 (**B** **C** 55 & 56) and secure with 0.31 -24 x 1.59" bolts (68), washers (32) & nuts (56).

11. Install the forward lifting eye (not shown) at positions 56 & 58 on the crankcase backbone and secure with 0.31 -24 x 1.72" bolts (64), washers (32) & nuts (56).

    NOTE: The aft lifting eye (65) is installed with the accessory drive adapters; baffle supports (88 & 89) are installed after the cylinders and the 0.31" bolt at position 70 is installed with the oil cooler.

12. Install 1.34" backbone bolts (67) washers (32) & nuts (56) at position 68; finger tighten nuts (56), do not torque at this time.

13. Install remaining 1.47" backbone bolts (31), washers (32) & nuts (56) at positions 57 through 68 and tighten but do not torque the fasteners at this time.

14. Install six 0.31" bolts (55) in positions 77-82 with washers (63) and nuts (56); tighten, but do not torque at this time.

15. Install four 0.25" bolts (57) in positions 73-76 with washers (58) and nuts (59); tighten, but do not torque at this time.

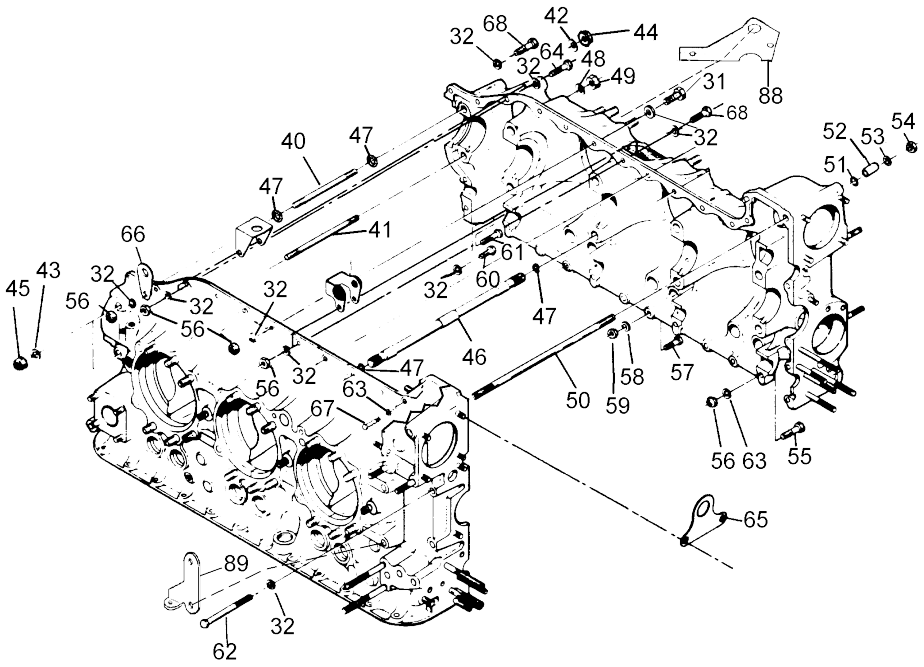

Figure 17-9. Permold Crankcase Fasteners

31	Bolt 0.31-24X1.47	46	Thru-bolt 0.50-20X10.75	54	Nut	62	Bolt 0.31-18X4.00
32	Washer	47	O-ring	55	Bolt 0.3125-24 UNF	63	Washer
40	Thru-bolt 0.4375-20X5.31	48	Washer	56	Nut	64	Bolt 0.31-24X1.72
41	Thru-bolt 0.44-20X6.19	49	Nut	57	Screw 0.25-28X1.63	65	Lifting Eye
42	Washer 0.45	50	Thru-bolt 0.38-24X11.67	58	Washer	66	Lifting Eye
43	Washer 0.88 thick X 0.43	51	O-ring	59	Nut	67	Bolt 0.31-24X1.34
44	Flanged Nut	52	Spacer	60	Screw 0.3125-18X1.12	68	Bolt 0.31-24X1.59
45	Nut	53	Washer	61	Screw 0.3125-18X1.38	88	Baffle Support

Table B-4. Component Specific Torque Specifications

Size	Fastener	Torque Value		Models Affected
		In-Lbs	Ft-Lbs	
Crankcase				
.25-28	Nut, Crankcase Flange-bottom	90-110	7.5-9.9	All Models (AR)
.31-18	Bolt, Oil Sump Flange	155-175	12.9-14.6	All Models (AR)
.31-24	Nut-Crankcase Flange	180-220	15.0-18.3	All Models (AR)
.31-24	Nut-Crankcase Backbone	240-280	20.0-20-3	(AR) Stainless Steel hardware Only
.31-24	Nut, Magneto to Crankcase	100-120	8.3-10.0	All Model (AR)
.38-16	Bolt-Engine Mount to Crankcase	220-260	18.3-21.7	IO-550-G
.38-24	Nut-Crankcase Through Bolts, Upper Rear	275-325	22.9-27.1	All Models (AR)
.38-24	Nut-Crankcase Tie Bolts	370-390	30.8-32.5	All Models (AR)
.38-24	Nut-Mounting Bracket to Crankcase	275-325	22.9-27.1	All Models (AR)
.44-20	Nut-Crankcase Tie-Bolts-Nose & Below Camshaft	440-460	36.7-38.3	All Models (AR)
.44-20	Nut-Cylinder to Crankcase Studs (including 7th stud)	490-510	40.8-42.5	All Models (AR)
.44-20	Nut-Through Bolt at Cadmium Plated Washer	440-460	36.7-38.3	All Models (AR)
.44-20	Nut-Through Bolt at Cylinder Flange	490-510	40.8-42.5	All Models (AR)
.44-20	Nut-Through Bolt at Front Mount Belt-Driven Alternator	490-510	40.8-42.5	All Models (AR)
.50-20	Nut-Crankcase Through Bolt at Cadmium Plated Washer	615-635	51.2-52.9	All Models (AR)
.50-20	Nut-Crankcase Through Bolt at Cylinder Flange, 6 point/0.33" tall (Part No. 634505)	690-710	57.5-59.2	All Models (AR)
.50-20	Nut-Crankcase Through Bolt at Cylinder Flange, 12 point (Part No. 652541)	790-810	65.8-67.5	All Models (AR)
.50-20	Nut-Crankcase Nose Tie Bolts	640-660	53.5-55.0	All Models (AR)
.62-18	Plug (with crush washer)	190-210	15.8-17.5	All Models (AR)
Gears				
.31-24	Bolt-Gear to Camshaft	240-260	20.0-21.7	All Models (AR)
.31-24	Bolt-Gear to Crankshaft (Bolt Hardness Rc 38-42)[1]	380-420	31.7-35.0	All Models (AR)
.31-24	Bolt, Face Gear to Crankshaft	140-150	11.7-12.5	All Models (AR)