INSTRUCTIONS

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For model fitment information, see the Zodiac Online Catalog at https://catalog.zodiac.nl (available in English, German, French, Spanish and Italian)

Genuine Zodiac oil pump

ZPN 301493 1936-1972 Big Twin

ZPN 301495 1973-1991 Shovelhead & Evolution Big Twin

ZPN 301497 1992-2000 Evolution Big Twin

READ INSTRUCTIONS THOROUGHLY BEFORE BEGINNING INSTALLATION!

This is a custom application and rider safety depends on proper installation. This product should only be installed by a knowledgeable and trained motorcycle technician. Zodiac accepts no responsibility for improper installation.

Zodiac Oil Pump Assembly features improved oil pump pressure regulation that will ensure correct oiling to all areas of BT engines. This pump kit includes all necessary fittings, snap rings, keys, gaskets and mounting bolts. Our Zodiac oil pumps can be used either on chain drive or belt drive models.

Note: On 1970-80 models a drilling operation is required.

Note: The installation of the Zodiac oil pump kits may require additional modification to your engines crankcases, depending on the year and application.

Note: All Zodiac oil pumps are listed by model year. It is the responsibility of the installer to carefully follow the step by step instructions listed for that particular oil pump.

Note: The installation instructions will vary from pump to pump depending on year and model. Zodiac is not responsible for incorrect installation of the oil pump and/or for incorrect crankcase modifications.

Note: Failure to perform all required steps as instructed will result in engine damage.

Note: The 1948-1962 and 1966-1972 crankcases will each require additional modifications in order to function like the 1973 & later style oiling systems. Step 3 applies to all 1948-1969 crankcases except 1963-1965 models. Step 4 applies to 1970-1972 crankcases. Both procedures separate oil supplied to top and bottom ends to increase oil pressure to hydraulic lifters and top end. This modification will help prevent the hydraulic lifers from collapsing while running at low RPM's. Although these two steps are not a requisite, Zodiac highly recommends them for all engines using hydraulic lifters with the exception of the 1963-1965 Panheads using outside oiler.

Oil Pump Installation Instructions:

Note: Be sure that you have properly identified your crankcases as this will be critical for the correct assembly. Also be advised that some aftermarket crankcases may not be consistent with that of a OEM stock year group. If you have any doubt as to the modifications needed for your aftermarket crankcases, contact the crankcase manufacturer. Improper oil pump installation due to incorrect identification of crankcase year group may result in engine damage.

Disassembly of Crankcases and Crankcase Model Identification all Years. - Refer to your OEM service manual for your specific model in order to remove the stock oil pump and mounting studs or bolts from the crankcase.

1. Crankcase Modification - 1970-1972 Models Only Plug 3/16" Oil Overflow Hole.

1.1. Carefully enlarge hole with a 13/64 drill bit (.203") (13⁄64") drill. Wrap masking tape around drill bit exactly .225" from the point of the drill bit to use as depth guide. Use extreme caution so as not to distort the hole.

1.2. Using 1/4-20 tap, carefully tap hole deep enough for 1/4-20 set screw to rest flush with or slightly below gasket surface. Use straight edge to confirm set screw does not protrude above the gasket surface. Use caution when tapping hole. Do not tap hole to deep otherwise the screw can be completely threaded through the hole. The screw should become tight in the threads when it is just below the gasket surface.

1.3. Using red Loctite, install the 1/4-20 set screw.

2. Crankcase Modification - 1970-1980 Only Drill Pressure Valve Relief Hole.

2.1. Install Oil Pump Drill Jig, Zodiac Part No. 234930, S&S 53-0013 on oil pump gasket surface of crankcase.

2.2. Use .125" (1/8") drill bit to drill pressure relief hole into gear cavity.

CAUTION - Do not perform Step 2. (Crankcase Modification - 1970-1980) on stock 1936-1969 crankcases or any crankcase with angled tappet screen. The drilling of this passage will intersect the tappet screen oil passage, which will result in loss of oil pressure. Loss of oil pressure will cause a lack of adequate lubrication which will lead to serious engine damage.

3. Optional Crankcase Modification – 1948-1962 - Plug and Re drill Crankshaft Feed Hole. The purpose of this modification is to alter 1948-1962 and 1966-1969 crankcases to the 1973 & later style oiling. With this oiling system heads and lifters get primary, unrestricted oil supply first. The lower end main and rod bearings get secondary, low pressure oil after the top end is supplied. This modification is only recommended when hydraulic lifters are being used. 1963-1965 and other Panheads with outside oilers cannot utilize the optional crankcase modification, due to the fact that they have a different oil supply system. If the modification is performed on Panheads with “outside oilers” as described in step 3 the result will be oil starvation to the top end which will result in sever engine damage.

3.1. Using a .203" (13⁄64") drill bit carefully drill a hole . 850" deep. Note: Wrap a piece of tape .850" from point of the drill bit to use as depth guide. Use caution so as not to distort the hole.

3.2. Using a 1⁄4 -20 tap, carefully tap the hole deep enough for the 1⁄4 -20 set screw to bottom out. The screw head should be between .550” to .600” below the cam cover gasket surface. Note: Do not tap hole to deep. If hole is tapped to deep the set screw will block the tappet screen oil feed passage. This will restrict the oil supply to the lifters and the cylinder heads which will result in sever engine damage.

3.3. On 1948-1952 crankcases make sure to blow air into intersecting hole in pump gasket surface to remove any metal filing which may be inside from the tapping procedure. On 1953-1969 crankcases remove oil plug and lifter screen filter assembly and blow air into passage to remove metal filings. Be sure to remove set screw to allow filings to escape.

A. Apply Loctite to threads of 1⁄4 -20 set screw and install to depth of .550” to .600” below the cam cover gasket surface.

B. Install Zodiac Oil Pump Drill Jig on crankcase oil pump gasket surface.

C. Using a .187" (3⁄16") drill bit drill hole into pump gasket surface .375" (3⁄8") deep. This will cause entry into passageway just tapped.

Note: Wrap a piece of tape .750" (3⁄4") from drill point to use as depth guide. Remember to add the thickness of the drill jig to the 3/8”. So if the jig is 3⁄8" thick, 3⁄8" + 3⁄8" = 3⁄4".

D. Use caution as to not drill the hole too deep. Hole cannot extend into gear cavity side of crankcases.

Note: An improperly drilled oil feed hole will cause oil to bleed off into gear cavity resulting in the loss of oil pressure which will result in sever engine damage.

E. Remove drill jig and blow air into passage to remove metal filings.

4. Optional Crankcase Modification – 1970-1972 Models only - Plug and Re-drill Crankshaft Feed Hole. The purpose of this modification is to alter 1970-1972 cases to 1973 and later style oiling and is recommended only if hydraulic lifters are used. With this oiling system lifters get primary, unrestricted oil pressure first. The lower end main and rod bearings get secondary, lower pressure oil after top end is supplied.

4.1. Using a .203" (13⁄64") drill bit carefully enlarge hole. Drill drill hole .375" (3⁄8") deep. Note: Wrap a piece of tape .375” (3⁄8") from tip of drill point to use as depth guide.

4.2. Using 1⁄4 -20 tap, CAREFULLY tap hole deep enough for 1⁄4 -20 allen head set screw to bottom out with screw head .130" to .150" below cam cover cover gasket surface. Note: Do not tap the hole to deep otherwise the screw will block the tappet screen oil feed passage thus restricting the oil supply to lifters and cylinder heads. Restricting oil supply to the the cylinder heads will result in severe engine damage.

4.3. Be sure to remove oil plug and lifter screen filter assembly and blow air in the top end supply hole directly below top right pump mounting bolt hole to remove any metal filings from the taping procedure and insure that there is no blockage.

4.4. Remove 1⁄4 -20 set screw and apply a drop of Loctite to threads and install to depth of .130" to .150" below cam cover gasket surface.

4.5. Install Zodiac Oil Pump Drill Jig on gear cover gasket surface.

4.6. Using a .125" (1⁄8") drill bit drill angle hole from the passage just plugged until it breaks through pump gasket surface.

4.7. Remove drill jig and blow compressed air into passage to remove metal filings.

5. Crankcase Modification – 1965-1969 Models Only - Drill Primary Chain Oil Supply Hole. The purpose of this modification is to update early engines to meter the oil to the primary chain automatically through the breather gear rather than manually through the metering screw device in the pump body. This update requires the use of the 1973 & later style breather gear.

5.1. Install the Zodiac Oil Pump Drill Jig on oil pump gasket surface.

5.2. Using .187" (3⁄16") drill bit CAREFULLY drill hole into pump gasket surface until bit breaks out in breather valve gear cavity. Use extreme caution so as not to contact the wall of the cavity when the drill breaks through. Contacting the breather cavity wall with the drill will damage the machined surface.

5.3. Remove drill jig and debur the hole in breather valve gear cavity then clear all the metal filings.

6. Oil Pump Cover Assembly

6.1. Oil Supply - Oil supply line fitting can be installed at either of two locations in most Zodiac Oil Pump covers.

6.2. Oil Return - Oil return line can be connected to pump at either of two locations. The hole marked "R" on top of cover is normally used for 1991-earlier engines. The hole in bottom of pump cover is normally used for 1992-up engines. Return hole not used must be plugged with 1⁄8 -27 pipe plug.

6.3. Primary Chain Oil Supply

A. 1936-1964 Models.

1. Install 1⁄16 -27 pipe plug in hole in top of cover.

2. Install adjuster screw, brass washer, and lock nut into threaded hole in side of pump body. Bottom screw two or three times to seat properly.

3. Turn screw out 1⁄2 turn and tighten locknut against brass washer and body. Note: The chain oiler adjusting screw has tapered end and must be used. Substituting standard machine screw for tapered screw will result in large oil loss out of the breather. Note: After engine has been run for a while it may be necessary to adjust screw to achieve desired oil flow to primary chain. Final screw setting is usually closer to fully closed position. Use caution when tightening screw. Over tightening may damage threads or adjusting screw seat in pump body.

B. 1965-1984 engines with primary chain drive and dry clutch.

1. Install hose fitting in threaded hole on top of pump cover.

2. Connect fitting to primary chain oiler line after pump is installed.

3. For 1965-1972 engines install adjuster screw, brass washer, and lock nut into threaded hole in side of pump body. Be sure to bottom the screw two or three times to seat screw properly. Turn screw out approximately 1½ turns and tighten locknut against brass washer and oil pump body. This should provide approximately 1 to 1 ¾ oz's/minute oil flow to primary chain @ 2500 RPM. This can be confirmed after engine has reached operating temperature by disconnecting hose to primary chain, operating engine at 2500 RPM and measuring oil delivered into measuring container during one minute.

4. No adjusting screw is provided for 1965-1969 engines because primary chain oil is metered by breather gear.

a. 1984-later engines with sealed primary - Install 1⁄16-27 pipe plug in hole on top of pump cover.

b. All engines with primary belt drive.

1. Install 1⁄16-27 pipe plug in hole on top of pump cover.

2. For 1936-1964 engine loosen locknut and screw adjusting needle into side of pump body until oil supply to primary chain is completely shut off, then re tighten locknut. Do not over tighten locknut or adjusting screw. Note: Installing machine screw in pump body instead of adjusting screw will result in large oil losses out crankcase breather. Tapered adjusting screw must be used for proper adjustment of oil flow to primary chain. Use caution so as to not over tighten the adjustment screw as this will damage the oil pump body.

Oil Pump Installation - All Years

1. Be sure there that there is enough clearance between oil pump body and crankcase by temporarily installing pump assembly on crankcase and inspecting. Do not install oil pump drive shaft gear or snap ring at this time. It may prove necessary to remove a small amount of material from oil pump body to obtain correct fit.

2. Disassemble, clean, and inspect oil pump, then reassemble pump dry, without lubrication. The pump will be lubricated in during final step.

3. Rotate gears as preliminary check for bind, and to confirm that drive gear keys are properly installed.

4. If bind occurs, determine whether problem is with supply or return gears by removing idler gear from either side and rotating pump. When binding gear is removed, pump will rotate freely. Problem can usually be corrected by rotating gear 180°. Note: Failure to correct any binding will result in damage to oil pump and other vital engine components.

5. Apply 20W50 engine oil to oil pump drive shaft and drive shaft bushing in crankcase. Install oil pump in crankcase in normal fashion, placing the pump drive gear over drive shaft as shaft is passed through bushing and into crankcase gear compartment.

6. Install drive shaft gear key and snap ring, taking care not to stretch or otherwise damage snap ring. Be sure that the drive shaft key and snap ring are installed properly. If snap ring is installed incorrectly or otherwise damaged it may become dislodged or allow gear key to come out. Note: The loss of oil pump drive gear snap ring or key will result in the oil pump becoming disengaged thus causing loss of oil pressure which will result in severe engine damage.

7. Loosely install 2 each 1⁄4 x 1 1/2" bolts in upper holes in oil pump body followed by pump cover and 4 each 1/4x2 3/4" mounting bolts. Do not tighten at this time.

Note: Check thread fit by carefully installing bolts in crankcase before final assembly.

1⁄4-24 bolts must be used on 1948-1978 HD crankcases.

1⁄4-20 bolts must be used on later HD crankcases.

8. While turning oil pump drive gear to check pump for binding, gradually tighten 4 each 2 3/4" bolts in cross pattern to 10 ft-lbs. If pump binds, loosen screws and shift pump slightly while rotating gears. If correctly aligned on the crankcase the pump should operate without any binding. Re tighten bolts while turning drive shaft to confirm bind-free pump operation. Carefully tighten two remaining bolts.

9. Prime pump by removing oil pump check valve ball assembly and injecting clean motor oil into pump supply fitting while turning oil pump drive gear. Replace the check ball, spring, and cap after oil fills the check valve cavity. Be sure to release all the air from the oil pump to prevent an air lock. An air lock will cause cavitation if trapped air is not released from the oil pump after installation. This can occur with both new and used pumps that have been removed from engine. The result will cause restricted oil circulation. You must remove the trapped air by priming the oil pump prior to running the engine and to confirm correct oil pump operation.

10. As per your OEM service manual install the pinion shaft oil pump drive gear, pinion gear and remaining parts in gear case. Note: The pinion shaft oil pump drive gear has chamfer on one side. Place gear on pinion shaft with chamfer toward shoulder on shaft, facing center of engine.

Note: Installing pinion shaft oil pump drive gear backwards on pinion shaft may cause stress riser resulting in eventual failure of shaft.

11. Connect oil lines.

Initial Startup - All Years

1. After pump has been installed and primed, oil lines connected in correct manner and oil tank filled to correct level, confirm oil circulation with oil pressure gauge and by removing cap from oil tank and observing oil return to tank. If oil is not seen returning to tank, Zodiac recommends removing return line from tank and placing end in drain pan to confirm oil circulation.

A. After confirming oil circulation run engine for several minutes and check for leaks.

B. If applicable, adjust primary and rear chain oilers as needed.