



FEULING®

FEULINGPARTS.COM

OIL PUMP INSTALLATION INSTRUCTIONS

FOR H-D TWIN CAM ENGINES

PART # 7000, 7010, 7050 '99 - '06 EXCEPT '06 DYNA T/C MODELS
PART # 7030, 7060, 7062 '07 - '16 T/C MODELS INCLUDING '06 DYNA

OIL IS THE LIFE-BLOOD OF YOUR ENGINE. DON'T TAKE OFF WITHOUT IT!



THE FEULING® HIGH VOLUME OIL PUMPS UTILIZE AN OVERSIZED AND HIGHLY EFFICIENT GEROTOR GEAR DESIGN, PROVIDING AN INCREASE IN PRESSURE PUMP VOLUME AND AN INCREASE IN SCAVENGE (RETURN) VOLUME. THE FEULING® OIL PUMPS ELIMINATE WET SUMPING, BLOW-BY AND OILY AIR CLEANER PROBLEMS AND PROVIDE HIGH VOLUME OIL FLOW FOR OPTIMUM LUBRICATION AND COOLING. THE FEULING® OIL PUMPS WILL ALLOW USE OF FEULING® HIGH FLOW LIFTERS FOR CRITICAL, FULL FLOW TOP END LUBRICATION.

*FEULING® OIL PUMPS CAN BE USED ON FACTORY AND AFTERMARKET CAMPLATES

IMPORTANT NOTICE

THIS INSTALLATION SHOULD BE DONE BY AN EXPERIENCED MECHANIC WHO HAS ACCESS TO A FACTORY SERVICE MANUAL AND ALL REQUIRED TOOLS.

CAUTION

INCORRECT INSTALLATION CAN CAUSE ENGINE DAMAGE NOT COVERED UNDER WARRANTY. FAILURE TO INSTALL COMPONENTS CORRECTLY CAN CAUSE ENGINE SEIZURE. WHICH MAY RESULT IN SERIOUS INJURY TO MOTORCYCLE, OPERATOR, PASSENGER, AND/OR OTHERS.

IMPORTANT NOTICE

MEASURE FLYWHEEL PINION SHAFT RUN OUT. EXCESSIVE PINION SHAFT RUN OUT WILL CAUSE CAMPLATE AND OIL PUMP DAMAGE AND OR FAILURE. EXCESSIVE PINION SHAFT RUN OUT WILL VOID MANUFACTURER'S WARRANTY.



NOTE: OE+ OIL PUMPS DO NOT USE O-RINGS ON THE PUMP HOUSINGS, OE+ OIL PUMP HOUSINGS ARE DESIGNED TO MOUNT FLUSH TO THE APPROPRIATE MOUNTING SURFACE AND ASSEMBLY LIKE A FACTORY '07-'16 STYLE OIL PUMP.

1. Refer to H-D® manual, engine section, reference sub assembly service and repair bottom end, for removal of camplate, oil pump, cams and cam bearings. Refer to H-D manual engine section, reference oil pressure relief valve, for removal of the oil pressure relief valve and valve spring from the camplate, if using other than a Feuling® camplate.
2. Inspect flywheels for pinion shaft run out. Feuling® recommends a maximum run out tolerance of 0.0025". If installing gear drive camshafts the run out tolerance is very important as noise is greatly increased with run out, it is advisable to be under the maximum tolerance for engine reliability and longevity. Increased crank pinionshaft run out minimizes the oil pump gears clearances.
3. WASH AND CLEAN CAMPLATE THOROUGHLY. Inspect for scoring on oil pump mounting surface, any scoring will adversely effect oiling system operation. On '99 - '06 Except '06 Dyna models, inspect cam bearing bores for proper bearing fit.
4. Clean and flush oil tank and oil tank baffle, any residue/debris such as chain tensioner material in oil tank will flow directly through the newly installed oil pump causing damage.
5. If reusing a camplate inspect pressure relief valve plunger for burrs and debris. The plunger must move freely and seat properly. With the stock camplate, measure length of the stock pressure relief spring. Stretch spring to measure .050" longer than the stock length. Most aftermarket camplates come with a stiffer spring. Feuling® tool part #9010 can be used to bench test and set the camplates pressure relief pop off psi. Feuling® camplates come pressure tested and have the relief valve pre-set with a pop off psi of 50-60 psi.
6. Re-install pressure relief valve and spring in camplate according to H-D manual.
7. Install clean cam bearings and cams into camplate, '99 - '06 Except '06 Dyna. Reference H-D manual for assembly of stock cam chain drive system. Reference gear drive camshaft installation instructions where applicable.

CHECK CRANKSHAFT RUN OUT



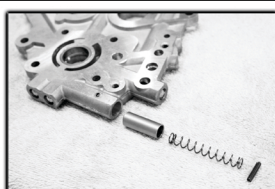
Dial indicator W/
Magnetic base



Feuling Runout Measuring
Tool #9015

Max run out 0.0025"

INSPECT CAMPLATE PRESSURE RELIEF VALVE

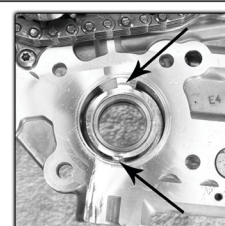


Verify the pressure relief valve moves freely. Any leakage @ the valve will cause a loss of oil pressure



Feuling camplate
pressure test tool
9010

INSPECT CAMPLATE FOR SCORING

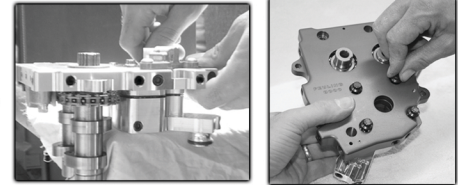


Scoring between the kidney shapes will cause low oil pressure and oil system cavitation problems

8. Reference the Oil Pump Assembly Parts Lists and Photos to verify all the proper components for the Feuling® Oil Pump.
9. **WASH, AND CLEAN OIL PUMP THOROUGHLY**, inspect each individual part of the Feuling® oil pump. Verify the oil pump has 3 Allen head plugs in the scavenge housing.
10. The O-rings supplied **ARE** the correct size. If required, gently stretch O-rings to fit in machined O-ring groove. **Extra O-rings** are included. Grease or assembly lube can be used to help hold the O-rings in proper position for installation. **DO NOT USE** a hardening compound to hold O-rings, the compound will interfere with the stack up tolerance and the pump will not work properly.
11. Assemble oil pump, install O-ring(s) into proper grooves of the scavenge pump housing.
12. Install O-ring(s) into proper grooves on both sides of pressure pump housing.
13. Install the two supplied dowel pins into pin holes on **SCAVENGE** pump housing to ensure proper alignment of the pump housings.
14. Apply engine assembly lube to both sets of Gerotor gears and pump housings.
15. Install gears into proper housing.
16. Position separator plate over dowel pins on scavenge housing.
17. Position pressure pump housing onto dowel pins on top of separator plate on the scavenge pump housing.
18. Install proper O-ring onto the back port of the oil pump (sub seal). Liberally lube the O-ring and scavenge port hole of engine case.



19. Bolt oil pump to camplate. We recommend laying oil pump on bench with pressure gears facing up, set camplate onto oil pump then install oil pump bolts finger tight.



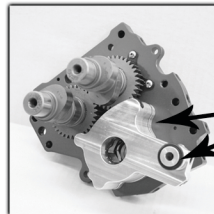
20. Use engine oil or assembly lube, **DO NOT USE LOCTITE OR HARDENING** compound on the oil pump or camplate bolts, it will interfere with the stack up tolerance, causing low oil pressure or poor scavenging.



21. Thread bolts finger tight into the oil pump, tight enough to hold the O-rings into place. Do not tighten.

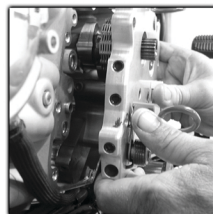
OE+ FEULING
NOTE: OE+ OIL PUMPS DO NOT USE O-RINGS ON THE PUMP HOUSINGS, OE+ OIL PUMP HOUSINGS ARE DESIGNED TO MOUNT FLUSH TO THE APPROPRIATE MOUNTING SURFACE AND ASSEMBLY LIKE A FACTORY '07-'16 STYLE OIL PUMP.

22. Check O-rings for proper installation.



Verify all the O-rings are installed correctly

23. Slide the complete oil pump/camplate assembly onto the crankshaft, align the oil pump gear flats with the crankshaft flats to ease installation. Using slight pressure slip oil pump sub seal into scavenge port hole of crankcase, it's helpful to use pressure from your thumb to push on scavenge housing to ensure proper fit into case scavenge port hole, at the same time wiggle assembly to align camplate with dowel pins in engine case.



Install Camplate & Oil pump as a complete assembly

24. Tighten camplate bolts first - finger tight, with camplate bolts finger tight, rotate engine over several times, this will center the camplate to the crankshaft. Alternately tighten all camplate bolts to 10 inch lbs. Then rotate engine over again and final torque the camplate bolts to 90-120 inch lbs.

25. With oil pump bolts only finger tight, rotate engine over several times. This will center the oil pump and gears to the crankshaft. This process eliminates the need for the factory 'centering pins'. Alternately tighten the four oil pump bolts to 10 inch lbs. Rotate engine again then final torque the oil pump bolts to 90-120 inch lbs.

26. Final torque on pump and camplate bolts should be 90-120 inch lbs.



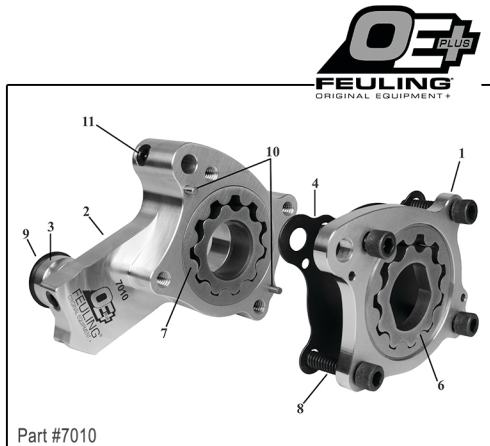
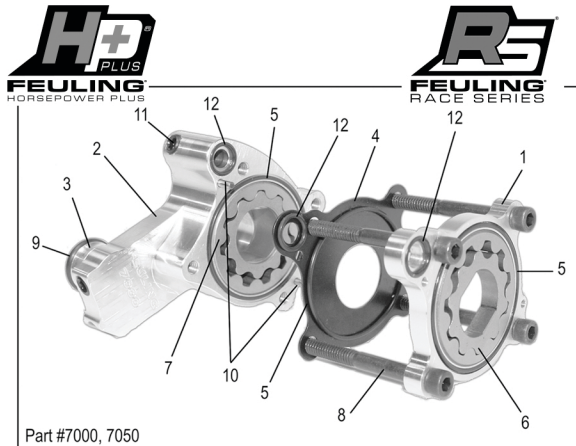
27. Refer to H-D manual for final assembly.

FEULING® OIL PUMP REBUILD KIT INSTRUCTIONS

PART # 7001 REBUILD KIT FOR OIL PUMPS #7000, 7050

PART # 7061 REBUILD KIT FOR OIL PUMPS #7060, 7062

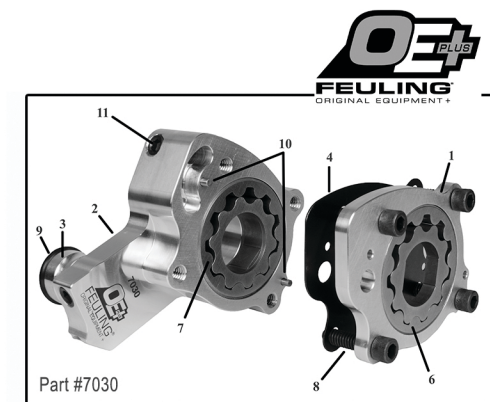
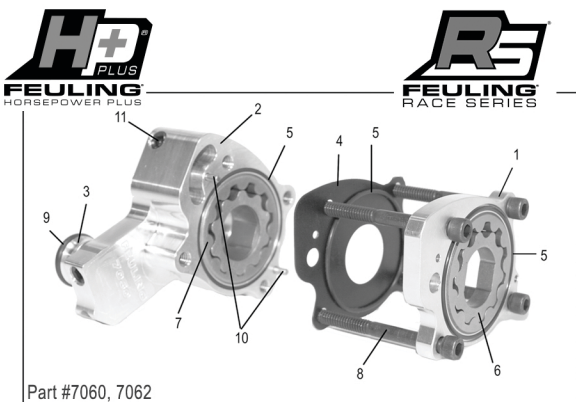
1. Disassemble Feuling® Oil Pump, wash and clean all components.
2. Inspect oil pump gears and oil pump housings, if scoring is present and can be felt with fingernail, the gears and housing must be replaced as a set. The Feuling oil pump gears and oil pump housings are matched as sets and the stack up tolerance is crucial to proper operation. The Feuling stack up tolerance is 0.0015" - 0.002" - thickness difference between the gears and aluminum housing. This must be measured accurately using a micrometer.
3. Inspect camplate oil pump mounting surface , if scoring is present on camplate and can be felt with fingernail the camplate must be replaced.
4. Inspect camplate pressure relief valve. The valve must move freely in bore and seat properly. We recommended pressure testing camplate with Feuling® psi test tool part #9010. Leakage at the camplate pressure relief valve will result in a loss of oil pressure.
5. Measure Pinion shaft run out. Feuling recommends a maximum run tolerance of 0.0025". Note *run out will not get better with miles
6. Re-assemble the Feuling® oil pump following oil pump instructions.
7. If gears and housings need to be replaced contact Feuling with part #'s. If the housing is free from scoring and only the gears have minor scoring the gears can be resurfaced and re-matched to the housing as a set by the Feuling® warranty/returns department. Ph. 1-866-966-9767



OIL PUMP ASSEMBLY PARTS

Ref. #	Description	Qty.	Part #
1	Pressure Pump Housing #7000	1	7000-01
1	Pressure Pump Housing #7050	1	7050-01
1	Pressure Pump Housing #7010	1	7010-01
2	Scavenge Pump Housing #7000	1	7000-02
2	Scavenge Pump Housing #7050	1	7050-02
2	Scavenge Pump Housing #7010	1	7010-02
3	Sub Seal, #7000, 7050	1	7000-03
3	Sub Seal, #7010	1	7010-03
4	Separator Plate	1	7000-04
5	O-Ring - Large	3	7000-05
6	Pressure Gerotor Set, #7000, 7050	1	7000-06
6	Pressure Gerotor Set, #7010	1	7010-06
7	Scavenge Gerotor Set, #7000, 7050	1	7000-07
7	Scavenge Gerotor Set, #7010	1	7010-07
8	Bolts 1/4" x 1 1/4", #7000, 7050	4	7000-08
8	Bolts 1/4" x 1", #7010	4	7010-08
9	O-Ring, Sub Seal	1	7000-09
10	Dowel Pin, 1/8" x 3/4", #7000, 7050	2	7000-10
10	Dowel Pin, 5/8" x 3/4", #7010	2	7010-10
11	Plug, 3/8" - 24	3	7000-11
12	O-Ring - Small	3	7000-12

Rebuild Kit Pumps #7000, 7050 1 7001



OIL PUMP ASSEMBLY PARTS

Ref. #	Description	Qty.	Part #
1	Pressure Pump Housing #7060	1	7060-01
1	Pressure Pump Housing #7062	1	7062-01
1	Pressure Pump Housing #7030	1	7030-01
2	Scavenge Pump Housing #7060	1	7060-02
2	Scavenge Pump Housing #7062	1	7062-02
2	Scavenge Pump Housing #7030	1	7030-02
3	Sub Seal, #7060, 7062	1	7000-03
3	Sub Seal, #7030	1	7010-03
4	Separator Plate	1	7060-04
5	O-Ring - Large	3	7000-05
6	Pressure Gerotor Set, #7060, 7062	1	7000-06
6	Pressure Gerotor Set, #7030	1	7010-06
7	Scavenge Gerotor Set, #7060, 7062	1	7000-07
7	Scavenge Gerotor Set, #7030	1	7010-07
8	Bolts 1/4" x 1 1/4", #7060/7062	4	7000-08
8	Bolts 1/4" x 1", #7030	4	7010-08
9	O-Ring, Sub Seal	1	7000-09
10	Dowel Pin, 1/8" x 3/4", #7060/7062	2	7000-10
10	Dowel Pin, 5/8" x 3/4", #7030	2	7010-10
11	Plug, 3/8" - 24	3	7000-11

Rebuild Kit Pumps #7060, 7062 1 7061

WARRANTY:

All parts are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of twelve (12) months from the date of purchase. Merchandise that fails to conform to these conditions will be repaired or replaced at FOP's option if the parts are returned to FOP by the purchaser within the (12) month warranty period. In the event warranty service is required, the original purchaser must notify FOP of the problem immediately. Some problems may be rectified by a telephone call and need no further action. A part that is suspect of being defective must not be replaced without prior authorization from FOP. If it is deemed necessary for FOP to make an evaluation to determine whether the part was defective, it must be packaged properly to avoid further damage, and be returned prepaid to FOP with a copy of the original invoice of purchase and a detailed letter outlining the nature of the problem, how the part was used and the circumstances at the time of failure. After an evaluation has been made by FOP and the part was found to be defective, repair, replacement or refund will be granted.

Excessive flywheel pinion shaft run out will damage camplate, oil pump, lifters and or cause engine damage and or failure. Damage to Feuling® products due to excessive pinion shaft run out will void manufacturer's warranty. Valve spring coil bind and spring surge will cause lifter and camshaft damage resulting in oil pump damage. Damage to Feuling® products due to valve spring coil bind and or spring surge will void manufacturer's warranty.

ADDITIONAL WARRANTY PROVISIONS:

FOP shall have no obligation in the event an FOP part is modified by any other person or organization, or if another manufacturer's part is substituted for one provided by FOP. FOP shall have no obligation if an FOP part becomes defective in whole or in part as a result of improper installation, improper break-in or maintenance, improper use, abnormal operation, or any other misuse or mistreatment. FOP shall not be liable for any consequential or incidental damages resulting from the failure of an FOP part, the breach of any warranties, the failure to deliver, delay in delivery, delivery in non-conforming condition, or any other breach of contract or duty between FOP and the customer. The installation of parts may void or otherwise adversely affect your factory warranty. In addition, such installation and use may violate certain federal, state and local laws, rules and ordinances as well as other laws when used on motor vehicles operated on public highways, especially in states where pollution laws may apply. Always check with federal, state, and local laws before modifying your motorcycle. It is the sole and exclusive responsibility of the user to determine the suitability of the product for his/her use, and the user shall assume all legal, personal injury risk and liability and all other obligations, duties and risks associated therewith. Our high performance parts, engines and motorcycles are intended for experienced riders only. Feuling® Oil Pump Corporation reserves the right to change prices and/or discounts without notice and to bill at the prevailing prices at the time of shipments. The words Harley®, Harley-Davidson® and H-D® and all H-D® part numbers and model designations are used in reference only. Feuling® Oil Pump Corporation is in no way associated with, or authorized by Harley-Davidson Motor Co®. To manufacture and sell any of the engine parts described in this instruction sheet.



FEULING® V-TWIN TROUBLE SHOOTING GUIDE

Have oiling, pressure, sumping or engine noise issues with your Twin Cam engine: please review the following guide that Feuling has compiled over the years to help assist you.

#1 FIRST AND FOREMOST CHECK YOUR OIL PRESSURE, COLD AND HOT. FEULING RECOMMENDS A MINIMUM OF 8-10 PSI PER 1,000 RPM

LOW OIL PRESSURE

1. Pressure gauge not reading properly – double check with another mechanical PSI gauge
2. Pressure relief valve in camplate leaking, sticking open or not seating properly – see Feuling camplate PSI test tool Part #9010
3. Pinched Oil Pump O-ring(s)
4. Camplate scored at oil pump mounting surface, pressure gears and or housing scored from debris running through oil pump
5. Stock camplate top plug not sealing, camplate leaking at oil passages – warped camplate
6. Excessive crankshaft pinion shaft run out causing oil cavitation
7. Intermittent oil psi loss on bagger/FL models during hard acceleration - oil tank baffle shifted & blocking oil pick up hole
8. Leaky camplate hydraulic tensioners ('07-'16 Including '06 Dyna models)
9. Leaky piston cooling jets
10. Miss alignment of oil pump – center camplate to pinion shaft then oil pump to pinion shaft by rotating engine over while tightening bolts

NO OIL PRESSURE

1. Pressure relief valve stuck open in camplate – see Feuling camplate PSI test tool Part #9010
2. Missing plug in camplate face (boss vs. no boss)
3. Air lock in oiling system – fill oil filter full of oil on initial engine start up
4. Broken oil pump gears - gears & housings not lubricated properly during install, debris running through engine & or excessive run out- in pinion shaft
5. Broken piston cooling jets
6. Stock oil pump installed on Feuling camplate

WET SUMPING / BLOW - BY

1. To verify if engine is wet sumping, run engine to operating temperature then shut down and immediately pull the allen head plug from the bottom of engine case, let drain for 1-2 minutes as you want an accurate reading of what is in the sump while the engine is running so not to include drain down from the top and walls of engine. Measure oil and if more than 5oz. drains from the sump then there is a wet sumping issue.
2. Oil level too high - run oil level no more than 3/4 - 7/8 full cold
3. Rear port of oil pump (sub seal) miss aligned with the scavenge port hole of the engine case or torn O-ring.
4. Piston rings not seated, causing blow by & oiling system cavitation, run cylinder leak down test - Vent oil tank - Feuling's oil tank breather kits
5. Scavenge gears, housing and or camplate scored from debris running through oil pump causing leakage and out of tolerance oil pump
6. Excessive run out in pinion shaft - causing oil pump/system cavitation
7. Pinched Oil Pump O-ring(s)
8. FL/Baggers – 6 speed trans with dipstick in rear of trans can allow more oil to be added to oil tank and not show on dipstick
9. Excessive RPM on rev limiter, de-seated rings
10. Flapper valves in breathers stuck
11. Return oil passages plugged, pick-up holes in crankcase plugged, allen plug in bottom of engine case screwed in too far blocking return port
12. Leaky oil lines and or fittings on '99-'06, leakage between engine and transmission cases on '07-'16 models, system pulling in air

DIPSTICK BLOW OUT

1. Excessive cylinder leak down – run a cylinder leak down test
2. Oil level too high, run oil level 3/4 - 7/8 full cold, check oil level after starting engine per owners manual
3. Rocker housing gaskets are wrong or installed improperly
4. Spark knock, piston detonation, rings not seated or coming unseated under hard acceleration-creating cylinder leak down
5. Excessive RPM on rev limiter, de-seating rings creating leak down
6. Vent oil tank – see Feuling oil tank breather kits
7. If excessive leak down inspect cylinder and rings, it may be time to bore/hone cylinders and re-ring

NOISY VALVE-TRAIN

1. Lifter to lifter bore clearance too large, Feuling recommends a clearance of 0.001" - 0.0015" for proper oil pressure at lifter.
2. Pushrods flexing and hitting pushrod tubes - look for a shiny ring witness mark around pushrod normally seen towards the cylinder head.
3. Low oil pressure
4. Gear drive camshafts, excessive crankshaft run out and or excessive gear backlash
5. Rocker arms/bushings out of tolerance
6. Valve spring to camshaft combination creating valve-train separation and harmonics – See Feuling Beehive valve springs
7. Leaky/broken piston cooling jets
8. Clearance for roller rocker arms on under side of rocker box cover
9. Steep ramped camshafts, valves closing so fast the valves bounce off valve seats
10. Pushrod center oil hole plugged

FEULING® CAMPLATE INSTALLATION INSTRUCTIONS FOR H-D TWIN CAM® ENGINES '99 - '16
HIGH FLOW Part #'s: 8000, 8010, 8011, 8015 **OE+** Part #'s 8030, 8031, 8032, 8033

Part #'s 8011 & 8032 See supplemental instruction sheet


#8000

#8010

#8011

#8015

The Feuling® HIGH FLOW camplates for Twin Cam® engines increases engine oil flow and volume by enlarging critical oil passages and oil pump reservoirs. The cam plate is blue printed and matched to the Feuling oil pumps; this allows the Twin Cam® Engine to take full advantage of the increased volume from the Feuling high volume oil pumps. Made from 7075 billet aluminum, the hard alloy increases the strength and hardness while maintaining tighter tolerances at operating temperature. The Alloy allows elimination of the pinion shaft bushing, and on part #8015 it also allows elimination of the cam bearings. HIGH FLOW camplates are anodized and OE+ camplates are natural finish.

Increased oil flow to pinion shaft and connecting rod bearings and optimized oil flow to the lifters, piston cooling jets, cam gears and or chain tensioners.

Cooler engine temperatures and more Horsepower and Torque to the rear wheel

Tighter cam bearing bore tolerance for improved press fit on #'s 8000, 8010, 8011, 8030, 8031, 8032

Pressure relief valve and spring are designed for increased volume and pressure, eliminating the need to stretch the spring or use a shim.

IMPORTANT NOTICE

This installation should be done by an experienced mechanic who has access to a factory service manual and all required tools. This procedure requires use of specialty tools.

CAUTION

Incorrect installation can cause engine damage not covered under warranty. Failure to install components correctly can cause engine seizure. Engine seizure may result in serious injury to motorcycle, operator, passenger, and/or others.

IMPORTANT NOTICE

Measure flywheel pinion shaft run out. Excessive pinion shaft run out will cause camplate, oil pump, cam chain, cam gear damage and or failure. Excessive pinion shaft run out will void manufacturer's warranty. Damage created by valvespring coil bind and or valvespring surge will void manufacturer's warranty.

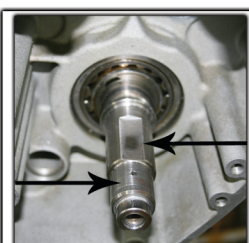


THE FEULING® HIGH FLOW CAMPLATES ARE ONLY COMPATIBLE WITH THE FEULING® HP+® & RACE SERIES® OIL PUMPS, DUE TO THE ENLARGED OIL PASSAGES & CAMPLATE KIDNEY SHAPES

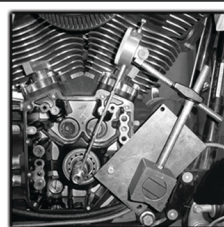


THE FEULING® OE+ CAMPLATES #8030, 8031, 8032, 8033 FOLLOW THE SAME INSTALLATION INSTRUCTIONS AS THE FEULING HIGH FLOW CAMPLATES WITH THE ADDITION OF THE 1/4" SELF TAPPING SCREW FOR USE ON 'A' ENGINES WHEN THE 'BOSS' IS NOT PRESENT, USE LOCTITE & TORQUE SCREW TO 35-45 IN-LBS. FEULING® OE+ CAMPLATES ARE COMPATIBLE WITH FEULING® OE+, FACTORY HD® AND AFTERMARKET OIL PUMPS

1. Refer to HD® manual, engine section, reference sub assembly service and repair bottom end, for removal of camplate, oil pump and cams.
2. Inspect the pinion shaft for burrs, use a scotch pad or emery cloth to assure smoothness of shaft. Measure the pinion shaft and pinion shaft bore of camplate, recommended clearance (+/- .0005" - .0025")
3. Inspect flywheels for pinion shaft run out. Feuling recommends a maximum run out tolerance of 0.0025". If installing gear drive camshafts the run out tolerance is very important, it is advisable to be under the maximum tolerance.

INSPECT PINION SHAFT


Remove burrs & scoring from pinion shaft to assure smoothness

MEASURE CRANK RUN OUT


Dial indicator with Magnetic base

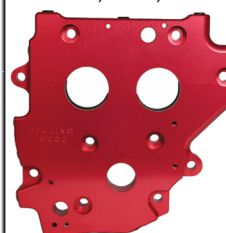


Feuling Runout Measuring Tool #9015

Max run out 0.0025"

WASH & INSPECT NEW CAMPLATE

#8000, 8010, 8011
#8030, 8031, 8032



10 Plugs

Inspect cam & pinion bores for size & fitment

verify camplate has all external plugs & pressure relief valve, spring & roll pin are installed

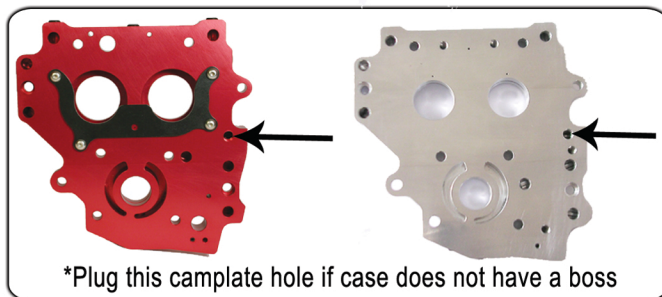
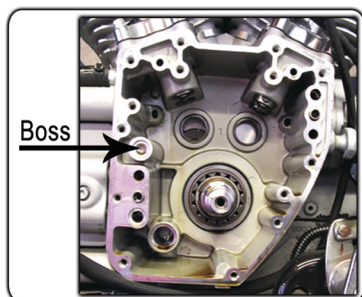
#8015 & 8033



12 plugs

4. Wash and clean Feuling camplate and all related components. Inspect cam & pinion shaft bores for burrs, if needed use a scotch pad to clean the surface. Clean camchest and all mating surfaces, it is recommended to clean and flush oil tank, any residue/debris in oil tank will flow directly through the newly installed oil pump & camplate, causing catastrophic damage not covered under warranty.

5. Refer to pictures, Examine the camchest and note the addition of a boss on the late 99A crankcase. The boss is designed to feed the B motor crank balance shaft chain tensioner. Note, 'A' motors with the boss will **NOT** have a through hole and 'B' motors will have a through hole including a screen.



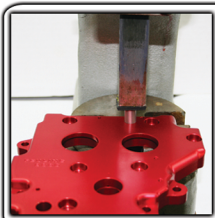
6. If the boss is present, as shown in figure 1, install the proper factory O-ring into the groove of the boss on the engine case.

7. If the boss is NOT present in the camchest then it is required to install the supplied 1/16" pipe plug (HIGH FLOW camplate), 1/4" Self tapping screw (OE+ Camplate) into the correct camplate hole as shown in pictures. Use Loctite and torque 1/16" plug to 55 – 60 in-lbs, 1/4" self taper 35-45 in-lbs. If the engine is an 'A' motor and the boss is present and is not a through hole you can install the supplied plug for added security if desired to prevent leakage. Tighten plug flush with camplate face and make sure there isn't an interference with the case boss. The use of the O-ring is still required.

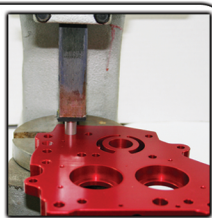
8. Camplates **#8010 & 8031** - Chain Drive Systems require tensioner pins, tensioner tower and fasteners, which are included in the #8010 & 8031 camplate kit, if needed Feuling sells the pins & tower separately see part #7078. If using a gear drive cam system no pins or tower are used.



Camplates
#8010 & 8031
Install guide
tower on
camplate for
Chain Drive
Cam Systems



Press
pins into
camplate
for
Chain Drive
Systems

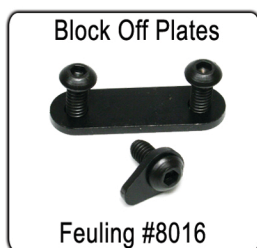


Apply extreme pressure lube
on pins prior to pressing
into camplate



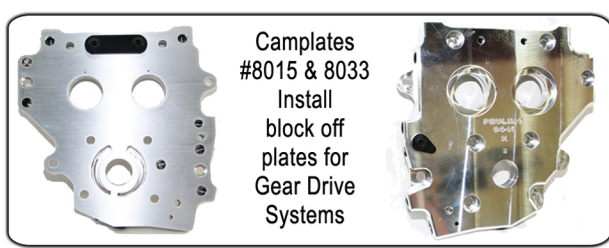
Feuling #7078

9. Camplate **#8015 & 8033** – If using gear drive cams the oil holes for the hydraulic chain drive tensioners must be blocked off. Feuling offers a block off plate kit part #8016



Block Off Plates

Feuling #8016



Camplates
#8015 & 8033
Install
block off
plates for
Gear Drive
Systems



Apply
Loctite
to block off
plate bolts

10. Camplates **#8000, 8010, 8030, 8031**. Install new cam bearings into camplate using the correct bearings for your model camshafts. Install camshafts and then install the Feuling bearing retainer plate. Install bearings and cams using the proper tools and extreme pressure lube, according to the appropriate H-D® manual.



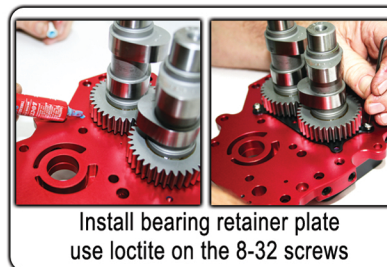
Press in new cam bearings with proper
tools using press lube on bearings & bores



Verify bearings are
flush with camplate



Press in camshafts use
lube & proper tools



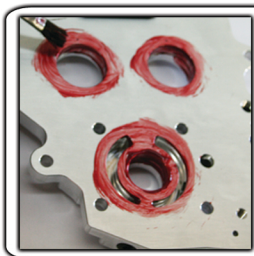
Install bearing retainer plate
use loctite on the 8-32 screws



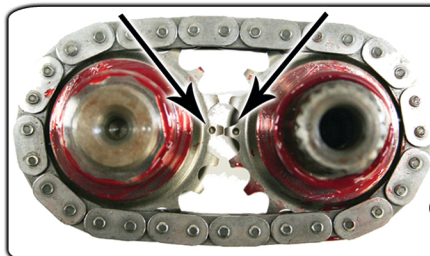
Bearing Retainer
Plate

Feuling #8001

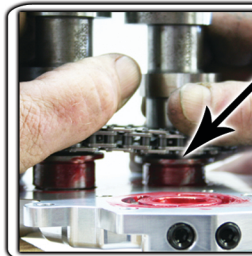
11. Camplate **#8015 8033** - Install camshafts into well lubed camshaft bores, lead with rear camshaft. Install spacer washers, front camshaft retaining ring and chain tensioners, for chain drive set-up. If different thickness spacers are desired for alignment of chains or gears see your H-D dealer for different thickness spacers.



Pre-Lube
camshaft bores,
thrust surfaces,
Pinion bore
and oil pump
mounting surface

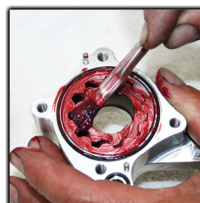


Line up
timing
marks
and
pre-lube
cam journals



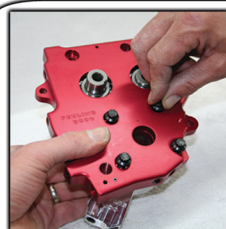
When installing
camshafts into
#8015 8033
camplate
lead with
the rear cam

12. Apply engine assembly lube to the pinion shaft, oil pump gears, oil pump housings, oil pump sub seal, camplate oil pump mating surface, camplate oil passages, pinion shaft bore, camshaft bores, camshafts, spacer washers, chain tensioners, scavenge port hole of engine case and apply engine oil or moly lubricant to the oil pump and camplate bolts and overhead flanges.

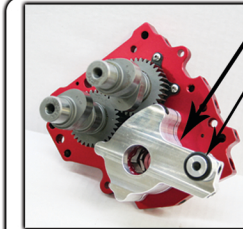


13. Bolt the complete Feuling Oil Pump to the camplate **finger tight**, with the pressure housing of the pump facing the camplate. **DO NOT** use loctite or any type of hardening compound on oil pump or camplate bolts or O-rings, the compound will interfere with stack up tolerance. Grease can be used to hold O-rings in place and moly lube or engine oil should be used on all bolts and overhead flanges

14. Check oil pump O-rings for proper fit.

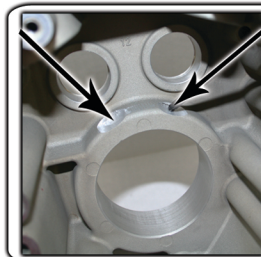


Bolt oil pump to camplate finger tight, **DO NOT** use loctite
or hardening compound on pump or camplate bolts or O-rings



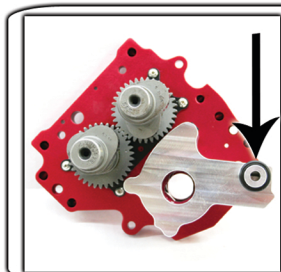
Verify all O-rings
are installed correctly

15. Verify camshaft lobes **DO NOT** interfere with the engine case. Install new O-rings into proper location on crankcase.



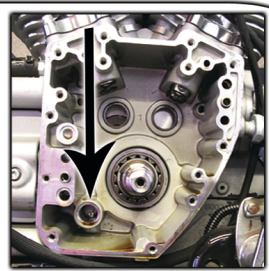
Verify
Intake lobes
of camshafts
clear engine
case

16. Pre-Lube scavenge port hole of engine case and rear pick up port of the oil pump, this connection is crucial for proper oil scavenging.



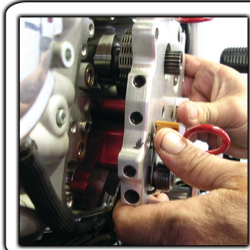
Installation of the rear oil pump port
into the scavenge port hole of the
engine case is crucial to for proper
oil scavenging

Pre-Lube O-ring and both ports and
make sure the back of the oil pump
fits securely into the case

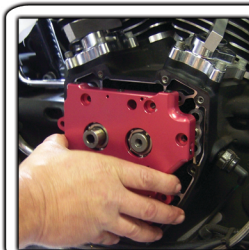


1620 B SABOVICH STREET, MOJAVE CA 93501 PH. 619-917-6222 FAX 760-487-1545

17. Installation - Align the Gerotor gear flats of the oil pump with the crankshaft flats. Slide the complete assembly onto the crankshaft, using slight pressure, slip oil pump pick up port into scavenge port hole of crankcase. It's helpful to use pressure from your thumb to push on the oil pump housing to assure proper fit into the scavenge port hole of case, at the same time wiggling assembly to align camplate with dowel pins on engine case. It's helpful to rotate the engine back and forth to help slide the assembly into position.



Install
camplate
& oil pump
as a
complete
assembly



Wiggling
assembly
while rotating
engine back
& forth will
aid alignment
& installation

18. Tighten camplate bolts first - With camplate & oil pump bolts only finger tight rotate engine over several times. This will center the camplate assembly. Alternately tighten all camplate bolts to 10 inch lbs. Then rotate engine over again and final torque camplate bolts to 90 – 120 inch lbs.

19. With oil pump bolts only finger tight, rotate engine over several times. This will center the oil pump gerotors and pump housings to crankshaft. Alternately tighten the four oil pump bolts to 10 inch lbs. Rotate engine over again then final torque the oil pump bolts to 90 – 120 inch lbs.

THIS TIGHTENING SEQUENCE WILL CENTER THE CAMPLATE AND OIL PUMP TO THE CRANKSHAFT AND IS THE ONLY RECOMMENDED PROCEDURE. FIRST CENTER CAMPLATE THEN CENTER OIL PUMP



Final torque on pump and
camplate bolts 90 - 120 Inch Lbs.



PARTS LIST

PART #	DESCRIPTION	QTY.
8000	CAMPLATE ASSEMBLY-GEAR DRIVE '99-'06 EXC. '06 DYNA	1
8010	CAMPLATE ASSEMBLY-CHAIN DRIVE '99-'06 EXC. '06 DYNA	1
8015	CAMPLATE ASSEMBLY-'06 DYNA & NEWER MODELS	1
8000-01	RELIEF VALVE (PLUNGER)	1
8000-02	SPRING, RELIEF VALVE	1
8000-03	1/8" ROLL PIN	1
8000-04	3/8" - 24 PLUG, #8000, #8010	10
8000-05	3/8" - 24 PLUG, #8015	12
8000-06	PLATE, BEARING RETAINING, #8000, #8010	1
8000-07	8 - 32 X 3/8" SCREWS, RETAINING PLATE, #8000, #8010	4
8000-08	1/16" PIPE PLUG, (BOSS HOLE)	1
8000-09	CHAIN TOWER, #8010	1
8000-10	8-32 X 7/8" SCREWS, TOWER, #8010	2
8000-11	TENSIONER PINS #8010	2
8015-01	BLOCK OFF PLATES	2
8015-02	1/4"-20 BUTTON HEADS, BLOCK OFF PLATES	2

WARRANTY:

All parts are guaranteed to the original purchaser to be free of manufacturing defects in materials and workmanship for a period of twelve (12) months from the date of purchase. Merchandise that fails to conform to these conditions will be repaired or replaced at FOP's option if the parts are returned to FOP by the purchaser within the (12) month warranty period. In the event warranty service is required, the original purchaser must notify FOP of the problem immediately. Some problems may be rectified by a telephone call and need no further action. A part that is suspect of being defective must not be replaced without prior authorization from FOP. If it is deemed necessary for FOP to make an evaluation to determine whether the part was defective, it must be packaged properly to avoid further damage, and be returned prepaid to FOP with a copy of the original invoice of purchase and a detailed letter outlining the nature of the problem, how the part was used and the circumstances at the time of failure. After an evaluation has been made by FOP and the part was found to be defective, repair, replacement or refund will be granted.

Excessive flywheel pinion shaft run out will damage camplate, oil pump, lifters and or cause engine damage and or failure. Damage to Feuling® products due to excessive pinion shaft run out will void manufacturer's warranty.

ADDITIONAL WARRANTY PROVISIONS:

FOP shall have no obligation in the event an FOP part is modified by any other person or organization, or if another manufacturer's part is substituted for one provided by FOP. FOP shall have no obligation if an FOP part becomes defective in whole or in part as a result of improper installation, improper break-in or maintenance, improper use, abnormal operation, or any other misuse or mistreatment. FOP shall not be liable for any consequential or incidental damages resulting from the failure of an FOP part, the breach of any warranties, the failure to deliver, delay in delivery, delivery in non-conforming condition, or any other breach of contract or duty between FOP and the customer. The installation of parts may void or otherwise adversely affect your factory warranty. In addition, such installation and use may violate certain federal, state and local laws, rules and ordinances as well as other laws when used on motor vehicles operated on public highways, especially in states where pollution laws may apply. Always check with federal, state, and local laws before modifying your motorcycle. It is the sole and exclusive responsibility of the user to determine the suitability of the product for his/her use, and the user shall assume all legal, personal injury risk and liability and all other obligations, duties and risks associated therewith. Our high performance parts, engines and motorcycles are intended for experienced riders only. Feuling® Oil Pump Corporation reserves the right to change prices and/or discounts without notice and to bill at the prevailing prices at the time of shipments. The words Harley®, Harley-Davidson® and H-D® and all H-D® part numbers and model designations are used in reference only. Feuling® Oil Pump Corporation is in no way associated with, or authorized by Harley-Davidson Motor Co®. To manufacture and sell any of the engine parts described in this instruction sheet.



FEULING®
FEULINGPARTS.COM

LIFTER INSTALLATION INSTRUCTIONS

FULL TRAVEL HYDRAULIC LIFTERS #'s: 4000, 4025, 4050, 4051, 4052, 4061, 4062
SOLID LIFTERS #4055



FEULING performance lifters, when installed with proper lifter to lifter bore clearances, proper rocker arm/shaft/support clearances and a high volume oil pump will provide optimized oil flow to the top end of your engine extending valve train component life and minimizing valvetrain noise.



IMPORTANT NOTICE

This installation should be done by an experienced mechanic who has access to a factory service manual and all required tools.



CAUTION

Incorrect installation can cause engine damage not covered under warranty. Failure to install components correctly can cause engine seizure. Engine seizure may result in serious injury to motorcycle, operator, passenger, and/or others. Removal of the rocker arms and or pushrods with the valve train loaded can damage rocker arms, push rods, bushings and or camplate. Rotate engine to TDC of compression stroke on the servicing cylinder.

WARRANTY NOTE

Feuling offers an additional 12 month warranty for a total of 2 years if product is installed by a professional V-Twin installer, oil tank is dropped and cleaned at time of install and the WARRANTY REGISTRATION form is filled out - form can be found on www.Feulingparts.com

SOLID LIFTER NOTE

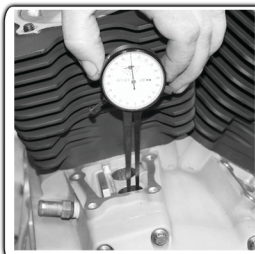
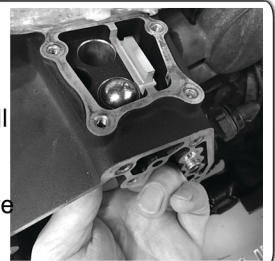
Feuling recommends starting with zero lash cold, then finding the sweet spot for your engine combination

1. For removal of lifters & inspection of lifter bores, refer to the factory service manual for your model & year engine.
2. Clean, inspect and measure lifter bores to make sure the tolerances are within specification. For maximum lifter performance Feuling® recommends a lifter to lifter bore clearance of 0.001"-0.0015". Feuling® offers oversized lifters part #'s 4051 & 4052.

There are multiple methods to measure lifter to lifter bore clearance. Easy an accurate method is to use Feuling tool #9004, set of precision ground balls to accurately measure lifter bore diameter & roundness



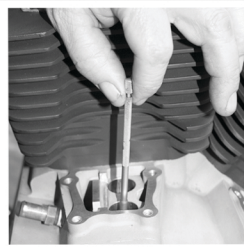
#9004 The correct size ball will pass through the lifter bore 'snugly', this will give you the correct bore size taking roundness of the bore into account



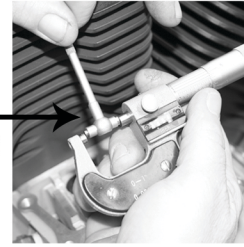
Measure Lifter Bore's

← Internal Dial Calipers

Snap Gauge →



Measure Gauge to get lifter bore diameter



Measure lifter O.D. & Subtract from Bore size to get clearance



3. Thoroughly clean and inspect each new Feuling® lifter, clean your pushrods and make sure the center oil through hole is open and free of debris.

4. Pump up each lifter before installing. Use an oil squirt can to fill the lifter with oil through the feed hole on the side of the lifter, push oil through the feed hole until the air bubbles are gone. If needed work the oil back and forth through the feed hole and pushrod seat of the lifter with the oil squirt can. Light weight oil can be helpful.



5. Apply engine assembly lube or liberal amounts of engine oil to the lifters, rollers and lifter bores.

6. We recommend that you fill the pushrod oil holes and rocker arms with engine oil before final installation.

7. Install lifters in the lifter bores of the crankcase, with the lifter flats facing forward and rearward. Avoid cam damage! Do not drop lifters onto cam lobes. We recommend facing the side feed hole in all the same direction

8. Check all clearances - lifter to camshaft lobe clearance, lifter to lifter blocks, lifter flats to roll pin, pushrod to pushrod tubes and if using one piece pushrods check length for proper pre load on lifters.

9. Assemble and adjust one cylinder at a time, the servicing cylinder needs to be on TDC of compression stroke so the cam lobes are at their lowest point.

10. Feuling® full travel hydraulic lifters run best at .090" - .100" of pre-load. If using adjustable pushrods, from zero lash adjust the pushrod longer .090" - .100". If using one piece pushrods make sure you have the correct lengths to get 0.090"-0.100" of pre-load.

11. If using adjustable pushrods we recommend adjusting Feuling® lifters starting with a fully pumped up lifter from zero lash and adjusting the pushrod .090"-.100" longer crushing the lifter. We **DO NOT** recommend bottoming the lifter and adjusting back upwards.

12. When using adjustable pushrods it is helpful to have the rocker arm in hand to feel for zero lash and it is a must to start with a fully pumped up lifter.

13. Feuling® full travel hydraulic lifters have a total travel of 0.200", correct pre load is at 1/2" travel = 0.100"

14. Know your adjustable pushrod thread pitch! Feuling® adjustable pushrods have changed throughout the years, Feuling has produced rods with 32, 24 & 20 threads per inch. Our current line up (1/30/19) HP+ and RS have 24TPI, QUICK install have 20TPI and FAST instal have 32TPI. - See adjustment chart below.

15. If adjusting valve lash with solid lifters see your camshaft recommendation or ask your camshaft manufacturer. Feuling recommends starting with zero lash cold, knowing you will need to find the sweet spot for your engine combination

16. Refer to your factory service manual for final assembly.

ADJUSTABLE PUSHRODS – REFERENCE ONLY – SEE THE INSTRUCTIONS THAT CAME WITH YOUR PUSHRODS

**CORRECT ADJUSTMENT
REQUIRES STARTING
WITH FULLY
PUMPED UP LIFTERS**

Threads per Inch	Distance per 1 Full Turn	Turns to .100"
20	0.050"	2
24	0.0417"	2.39
28	0.0357"	2.80
32	0.0313"	3.19
36	0.0275"	3.63
40	0.0250"	4

TROUBLE SHOOTING NOISY VALVE-TRAIN

1. Lifter adjustment - Starting with a fully pumped up lifter, from zero lash put 0.90" - 0.100" of pre-load on Feuling® hydraulic lifters
2. Lifter to lifter bore clearance out of spec, Feuling® recommends a clearance of 0.001" - 0.0015" for proper oil psi at lifter
3. Pushrods flexing and hitting pushrod tubes - look for a shiny ring witness mark around pushrod normally seen up towards the cylinder head
4. Low oil pressure - inspect pressure relief valve in camplate, oil pump/camplate wear
5. Pushrod center oil hole plugged
6. Clearance for roller rocker arms on under side of rocker box covers
7. Steep ramped camshafts, valves closing so fast the valves bounce off valve seats - see Feuling® Beehive® valve springs
8. Excessive crankshaft runout
9. Gear drive camshafts, excessive gear drive backlash or excessive crankshaft runout
10. Rocker arms/bushings out of tolerance
11. Valve spring clearance to lower rocker box housing
12. Valve spring coil bind and or valve spring harmonics - match up valve spring open height with camshaft peak lift
13. Leaky/broken piston cooling jets

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The installation of parts may void or otherwise adversely affect your factory warranty. In addition, such installation and use may violate certain federal, state and local laws, rules and ordinances as well as other laws when used on motor vehicles operated on public highways, especially in states where pollution laws may apply. Always check with federal, state, and local laws before modifying your motorcycle. It is the sole and exclusive responsibility of the user to determine the suitability of the product for his/her use, and the user shall assume all legal, personal injury risk and liability and all other obligations, duties and risks associated therewith. Our high performance parts, engines and motorcycles are intended for experienced riders only. Feuling Oil Pump Corporation reserves the right to change prices and/or discounts without notice and to bill at the prevailing prices at the time of shipments. The words Harley®, Harley-Davidson® and H-D® and all H-D® part numbers and model designations are used in reference only. Feuling Oil Pump Corporation is in no way associated with, or authorized by Harley-Davidson Motor Co®. To manufacture and sell any of the engine parts described in this instruction sheet.