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FEULING® CAMSHAFT INSTALLATION INSTRUCTIONS FOR H-D TWIN CAM® ENGINES

'07-UP GEAR DRIVE

'99-'06 GEAR DRIVE

'07-UP CHAIN DRIVE

WAKE UP YOUR TWIN CAM® ENGINE WITH A SET OF FEULING® REAPER® SERIES CAMSHAFTS. FEULING® USES THE FORCE OF THE REAPER'S® SCYTHE TO PUT THE POWER BAND WHERE IT COUNTS, CREATING A REAL SEAT OF THE PANTS FEEL. THE REAPER® CAMSHAFT PROFILES PRODUCE MORE POWER AND MORE TORQUE INCREASING CRANKING COMPRESSION, IMPROVING THROTTLE RESPONSE, ACCELERATION AND FUEL MILEAGE. DYNO PROVEN AND TRACK TESTED.

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 CAM CHAIN, CAM GEAR, CAM SUPPORT PLATE AND OIL PUMP DAMAGE AND OR FAILURE. EXCESSIVE PINION SHAFT RUN OUT WILL VOID MANUFACTURER'S WARRANTY.

GRIND		VALVE LIFT	OPEN	CLOSE	DURATION @.053°	LIFT @ TDC	LOBE CENTERLINE	FITMENT
525	INTAKE	525"	4°	42°	226°	.099°	.109°	525 Cams are a direct bolt in replacement for T/C 88", 95" 96" & 103" engines, can be used with stock valve springs, pushrods & lifters
	EXHAUST	535"	51°	5°	236°	.112°	.113°	
543	INTAKE	543"	15°	43°	238°	.160°	.104°	543 Cams are a direct bolt in replacement for T/C 96", 103" & 110" engines. '99-'04 T/C 88" & 95" engines require higher lift valve springs, can be used with stock pushrods and lifters
	EXHAUST	553"	56°	12°	248°	.140°	.112°	
574	INTAKE	574"	15°	45°	240°	.163°	.105°	574 Cams are a direct bolt in replacement for T/C 96", 103" & 110" engines. Performance pushrods and lifters are recommended but not required. '99-'04 model 88" & 95" require higher lift valve springs
	EXHAUST	574"	61°	14°	255°	.143°	.113.5°	
594	INTAKE	594"	19°	56°	255°	.190°	.108.5°	594 Cams require performance valve springs, pushrods, lifters, clutch and Increased compression ratio.
	EXHAUST	604"	64°	16°	260°	.167°	.114°	
630	INTAKE	630"	20°	58°	258°	.188°	.109°	630 Cams require performance valve springs, pushrods, lifters and Increased compression ratio.
	EXHAUST	630"	60°	19°	263°	.171°	.112.5°	

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"

MEASURE VALVE SPRING COIL BIND CLEARANCE & VALVE SEAL TO RETAINER CLEARANCE

Installed valve spring height is critical!

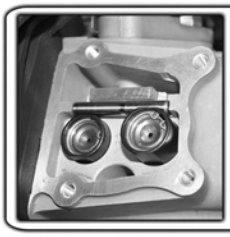
Too little clearance will create coil bind causing valve-train damage while too much will cause spring surge. Ideal valve spring clearance is achieved at open spring height. Reference your valve spring specs and recommendation

15. 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.

16. 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.

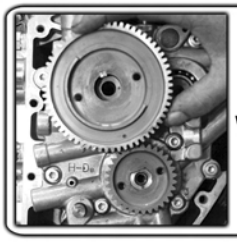
Final torque on pump and camplate bolts 90 - 120 Inch Lbs.

17. Inspect lifter to roll pin clearance. Cycle the camshafts and verify the lifter does not drop below the roll pin then verify the bottom of the lifter flats do not interfere with the roll pin at peak lift



Inspect lifter to roll pin clearance

18. Installing Gear Drive System - Line up gear timing marks then tighten with crank and pinion bolts and hardened spacers. Use new bolts and washers and use loctite on bolt threads and lube on bolt underhead flanges. Torque to spec. Gear drive systems require measuring back lash, measure in 4 locations taking the average. Gear drive systems may also require clearancing inside of cam cover.



Install gears with key way, line up timing marks

Part #3042

Use new crank and cam bolts and washers.

Use loctite on threads and lube on underhead flanges

Measure gear back lash

Inspect cam cover for gear clearance

19. Installing Chain Drive - Refer to your factory service manual. Line up sprocket timing marks use new cam and crank bolts and washers use loctite on bolt threads and lube on bolt underhead flanges. Chain drive systems require sprocket spacing for proper chain alignment - see dealer if different thickness spacers are required.

Install sprockets inspect spacing for proper chain alignment

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. 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.

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10. Camplate style '99-'06 Except '06 dyna - Install camshafts, press camshafts into camplate bearings using the proper tools then install the bearing retainer plate. Gear Drive systems - Install retaining ring on front camshaft.



Line up timing marks, press in camshafts using lube and the proper tools



Install bearing retainer plate using loctite

Feuling #8001


Bearing Retainer Plate


Install retaining ring

11. Installing gear drive camshafts in camplates with hydraulic chain tensioners - '07-present engines including '06 Dyna – 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

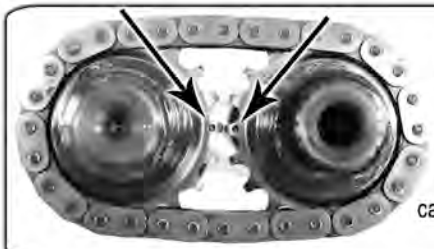

Feuling #8016


'07-Present engines
Install block off plates when installing gear drive cams in hydraulic tensioner style camplates


Apply Loctite to block off plate bolts

12. Installing camshafts into '06 Dyna and '07 - Up style camplate: 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 the late model camplate lead with the rear cam

13. Apply engine assembly lube to oil pump gears, oil pump housings, camplate oil pump mating surface, pinion shaft bore, camshaft bearings, camshaft bores. Bolt oil pump to camplate, Do not use loctite on oil pump & camplate bolts.



Apply engine assembly lube to oil pump housings & gears



Bolt oil pump to camplate finger tight
DO NOT use loctite or hardening compound


Verify all O-rings are installed correctly

14. Apply engine assembly lube to camshafts, inner cam bearings, pinion shaft, scavenge port hole of engine case and pick up port of oil pump. Installation of the rear oil pump port into the scavenge port hole of the engine case is crucial for proper oil scavenging. Install camplate assembly, align the oil pump gear flats with the crankshaft flats, slide assembly onto crankshaft, using slight pressure slip oil pump pick up port into port hole of case then slide camplate onto dowel pins.




Apply engine assembly lube to camshafts, inner cam bearings, scavenge port hole of case and pick up port of oil pump


Install camplate & oil pump as a complete assembly


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

4. Clean and inspect new camshafts. 

5. Clean and inspect camplate and all related components. Inspect camplate pressure relief valve & spring if re-using a camplate. Inspect camplate cam & pinion shaft bores for size and burrs. 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 & camshafts causing catastrophic damage not covered under warranty.


Inspect pressure relief valve

Feuling camplate pressure testing tool


Inspect camplate pinion & cam bores for size & fitment

verify camplate has all external plugs


Inspect camplate for scoring, if scoring is present replace camplate. Scoring will effect oil psi & oil scavenging

6. Verify cam lobes DO NOT interfere with the engine case, high lift cams with modified pistons will require measurement of valve to piston clearance. Clay pistons, install cylinder heads use lightweight checking springs, install proper gaskets, cycle engine then measure clay.


Verify Intake lobes of camshafts clear engine case

Crank bearing boss & lifter bosses

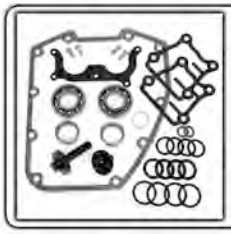

Measure valve to piston clearance

clay pistons and measure thickness of clay after cycling engine

7. Install new inner cam bearings into engine case, use the correct bearings for your model engine and use the proper installation tools. Feuling has a full line of camshaft installation kits for all T/C models.


Replace inner cam bearings use the proper tools

Apply extreme pressure lube on bearings & cams prior to pressing in


Feuling has a full line of cam installation kits

8. Install new outer cam bearings in '99-'06 Except '06 dyna style camplates, use the correct bearings, press lube and proper installation tools, verify the bearings are installed flush with camplate face. It is important that these bearings are installed straight.


Press in new cam bearings using the proper tools use high pressure press lube on bearings & bores


Verify bearings are flush with camplate

9. Gear Drive camshafts - Install the cam keys into camshafts then press the inner cam gears onto the camshafts. Use the proper tools.



Install cam keys - use arbor press or vise with soft jaws


Line up gear with camshaft


Press cam gears onto camshafts