

Instruction Sheet #00-2341
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Installation Instructions for S&S Camshafts for H-D Twin Cam 88 Engines

S&S camshafts #33-5160 provide significant power increases at 3000 RPM and above. Performance below that point is approximately the same as stock.

NOTE - Changing camshafts in Twin Cam 88 engine is different than in previous engines. Procedure requires use of hydraulic press and special tools. This installation should be undertaken only by experienced mechanic with access to Harley-Davidson service manual and all required Harley-Davidson tools or equivalent. Tightening fasteners to correct specifications with accurate torque wrench is mandatory.

CAUTION - Incorrect installation can cause engine damage not covered under warranty.

Specifications
S&S Camshafts #33-5160

	Lift	Duration	Open/Close	Centerline	TDC lift
Int.	.510"	238 deg.	20/38	99 deg.	0.187"
Exh.	.510"	252 deg.	52/20	106 deg.	0.179"

For reliable operation, S&S strongly recommends installing Andrews Sprocket Kit #33-4270 along with S&S camshafts. This kit is available from S&S and Andrews Products (773-992-4014), and through most aftermarket retailers. All S&S camshafts for TC88 engines include Loctite 272 (red) for cam sprocket flange bolts and Loctite 243 (blue) for other hardware. S&S Camshaft Installation Support Kit #33-5163 includes gaskets and bearings required for TC88 cam change and is strongly recommended. Support kit does not include oil pump o-rings, which generally may be reused if in good condition.

NOTES:

- Possible weakness in original parts may result in failure if Andrews Kit #33-4270 is not utilized or Loctite is not applied to cam drive sprocket flange bolts. Always prepare threads for Loctite according to instructions on container.
- Original cam bearings will likely be damaged during removal. S&S strongly recommends installing new bearings at same time as cam change.

CAUTION - Failure of camshaft bolt, sprocket, or related part can cause extensive, related damage not covered under warranty.

WARNING - Failure of camshaft bolt, sprocket, or related part can cause immediate seizure of engine. Engine seizure may result in serious injury to motorcycle operator, passenger, or others.

Installation

S&S camshafts for TC88 engines are compatible with stock pushrods. However, replacing stock pushrods with S&S adjustable pushrods #93-5096 will simplify installation.

1. To remove stock pushrods which will not be reused, remove pushrod cover clips, collapse pushrod covers, place motorcycle in gear, and rotate engine to place lifters and pushrods for either cylinder at lowest point on camshaft. Piston for same cylinder will be at TDC on Compression stroke and pushrods will spin with light finger pressure.

CAUTION - Cutting pushrods with saw may result in metal chips entering engine and causing extensive engine damage not covered under warranty.

WARNING - Proceeding without pushrods in proper position can cause bodily injury. Cut pushrods with bolt-cutter and remove from engine. Rotate engine to place pushrods for other cylinder at lowest point and repeat procedure.

If stock pushrods are to be reused, remove motorcycle gas tank and top rocker covers. Remove rocker assemblies and pushrods according to procedure described in Harley-Davidson TC88 Service Manual.

2. Remove engine gear cover and gasket. It is not necessary to remove ignition sensor from cover. Secure lifters with magnets or tool made from large binder clip spring. **See Picture 1.**
3. Rotate engine to align camshaft timing marks. **See Picture 2.**



Picture 1



Picture 2



Picture 3

4. Remove bolt and washer from 17 tooth crankshaft sprocket.
5. Remove bolt and washer from 34 tooth primary camshaft sprocket.

NOTE - S&S recommends using H-D Sprocket Locking Tool #HD42314 to secure sprockets while bolts are removed. See Picture 3.

6. Use H-D tool #HD42313 (Cam Chain Tensioner Unloader) to swing primary cam chain tensioner away from chain. Secure with retention pin. **See Picture 4.**
7. Working gradually around edge of sprocket, carefully pry sprockets off cams until loose on shaft. Remove sprocket/chain assembly and mark chain with arrow to indicate direction of travel. Chain should be reinstalled in same direction.
8. Remove chain guide. **See Picture 5.** Gradually loosen and remove four oil pump bolts according to sequence described in "Bottom End Overhaul" section of H-D Twin Cam 88 Service Manual. **See Figure 1.** Gradually loosen and remove six support plate bolts according to sequence described in "Bottom End Overhaul" section of Service Manual. **See Figure 2.**

NOTE- Failure to remove or install bolts according to correct procedure may result in parts damage not covered under warranty.



Picture 4



Picture 5

9. Carefully remove cam support plate assembly from crankcase. **See Picture 6.** Use tool #HD42313 to swing remaining cam tensioner away from chain. Secure tensioner with second retention pin inserted through front of support plate. Do not remove pin until support plate assembly has been reinstalled in engine.

NOTE - It is not necessary to remove oil pump from engine to complete installation. However, installer must insure that oil pump o-rings are in good condition and remain in place during procedure. It is installer's responsibility to replace o-rings if necessary.

10. Remove screws that secure bearing retainer to support plate and remove retainer from plate.
11. Carefully support cam support plate on table of hydraulic press. Using Harley-Davidson camshaft remover/installer tool #HD-43644, remove stock cams and bearings from support plate. **See Picture 7.**

NOTES:

- Bearings are usually damaged during removal and should not be reused. If S&S Cam Installation Support Kit is not used, new cam bearings should be obtained from other source and installed with new cams.
- Mark secondary cam chain to indicate direction of travel. Chain should be reinstalled in same direction.

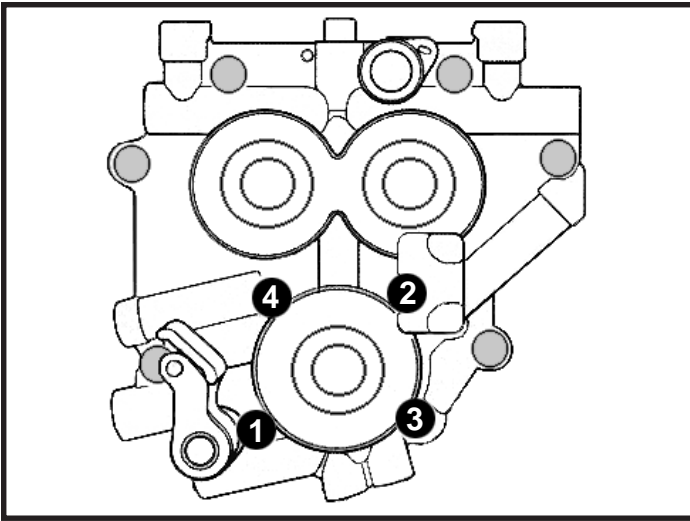


Figure 1

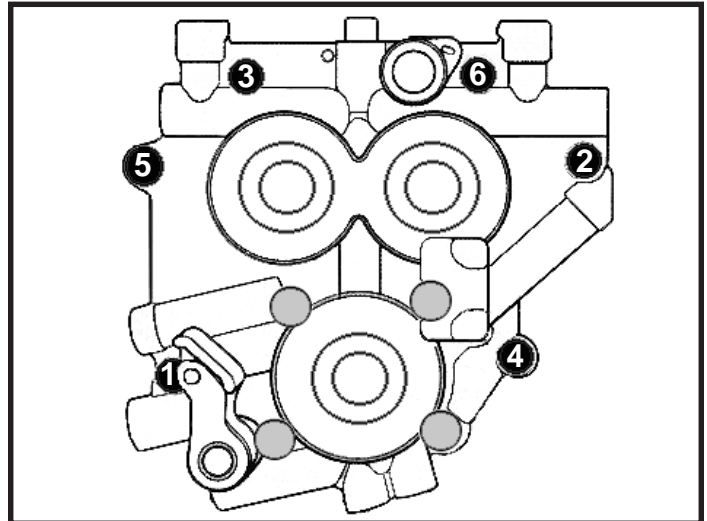


Figure 2

12. Apply assembly lube to outer race of cam bearing and inner race of support plate. Using tool #HD-43644 and hydraulic press, install cam bearings in support plate.
13. Apply thin film of assembly lube to bearing surface of S&S camshafts and inner race of new cam bearings. Support bearings by inner race. Using tool #HD-43644, press cams into bearings. **See Picture 8.**
14. Align cam timing marks and install secondary cam chain in original direction of travel. **See Picture 9.** Apply thin film of assembly lube to outer bearing race and bearing surface of cam support plate and press cam/bearing assemblies into cam support plate.

NOTE: Rear cam has tapped hole in end of shaft. Front cam is slightly longer than rear cam. Place ram of press over front cam area of cam installation tool when beginning installation. Place ram over center of cam installation tool after both cams have engaged bearings and reached same installation height.

15. Using Loctite #243 (blue) on screw threads, reinstall bearing retainer and tighten screws to 20-30 in-lbs.
16. Remove cam needle bearings from crankcase with Harley-Davidson tool #HD42325 and replace with new bearings

provided in S&S Support Kit or obtained from other source. Lubricate with clean engine oil.

17. Apply thin layer of assembly lube to cam journals and lobe surfaces. Align cams with needle bearings and carefully slide support plate assembly over crankcase dowels. Apply Loctite 243 to six support plate screws, install screws, and gradually tighten to 95 in-lbs. in sequence illustrated in **Figure 2.**

NOTE - Support plate assembly should slide into place without resistance. If resistance is encountered, determine cause before proceeding. Do not force plate assembly!

CAUTION - S&S has stripped holes for support plate screws when using maximum 120 in-lb. maximum torque spec recommended by H-D. Holes stripped are those which pass through alignment dowels, Positions #1 & #2 in H-D diagram of Cam Support Plate/Oil Pump Torque Sequence.

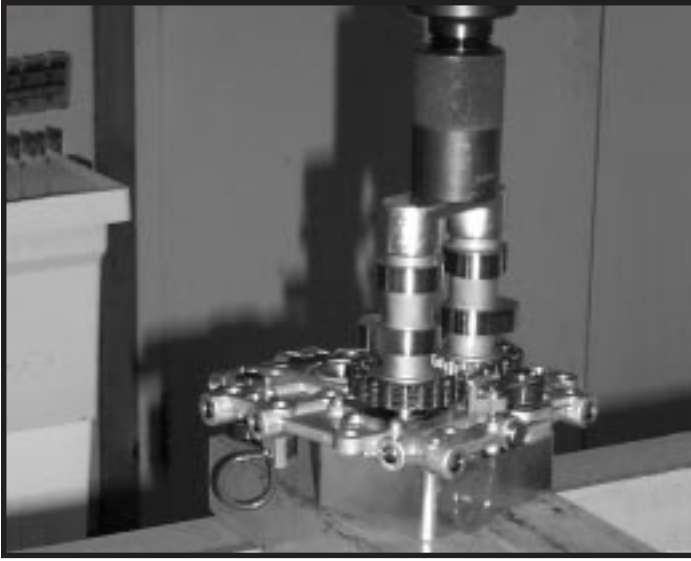
18. Apply Loctite 243 to threads and reinstall four oil pump bolts according to procedure in H-D service manual: Gently bottom screws, then back out 1/4 turn. Center pump by rotating engine while snugging screws. Tighten bolts to 90-120 in-lbs. in sequence illustrated in **Figure 1.**



Picture 6



Picture 7



Picture 8

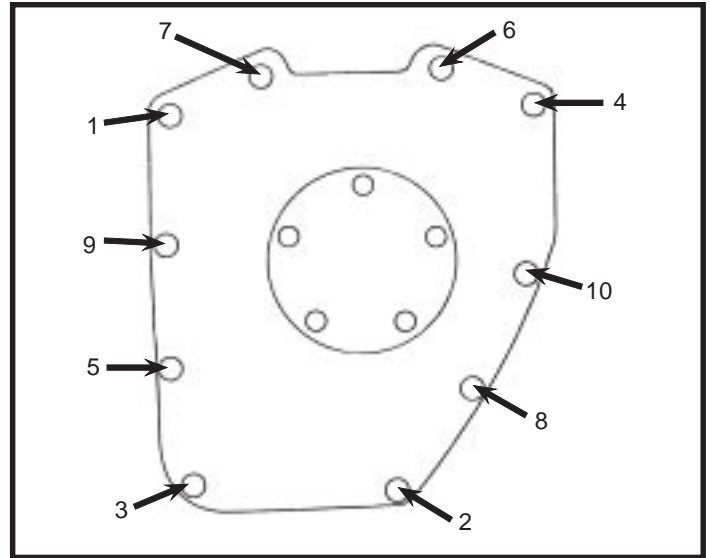


Figure 3

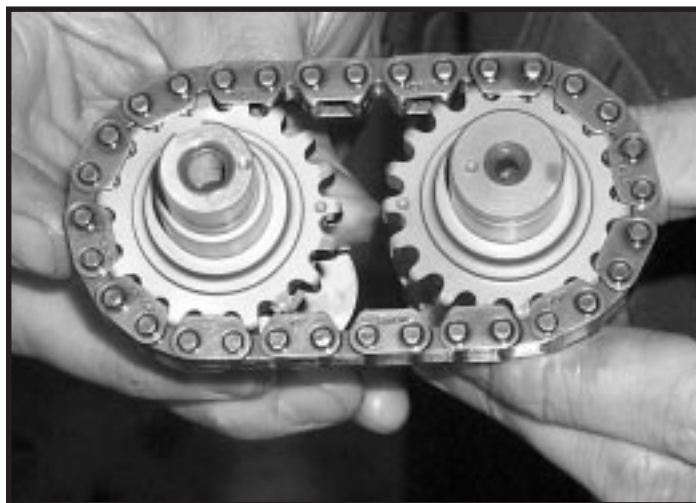
19. Instructions from Andrews Products must be followed to install new A/P sprocket:

One 3/16 drive key and three shims are supplied in each 34 tooth sprocket kit. Three shims are: .005", .010", and .020" thick. Andrews Products 34T sprockets are same length as stock sprockets plus .350" spacer (approximately .690" length). If stock sprocket used .350" spacer, no shim is required. If stock spacer is .355", use A/P .005" shim. If stock spacer is .360", use A/P .010" shim. If stock spacer is .365", use .005" and .010" A/P shim. If stock spacer is .370", use A/P .020" shim.

Key provided in kit will require light filing for correct, tight fit in rear cam and sprocket.

CAUTION: Forcing or driving key into position can damage parts and result in extensive engine damage not covered under warranty. Length of key must not interfere with retaining washer. Shorten key if necessary.

NOTE - Following above procedure should result in correct sprocket alignment. However, S&S recommends checking



Picture 9

alignment before proceeding. Temporarily install sprockets without chain and tighten sprocket bolts without Loctite to 25 ft-lbs. Straightedge can then be placed across sprocket faces and gap (if present) between straightedge and low sprocket measured with feeler gauge. Gap should be less than .005 in. If necessary, remove gear and install A/P shims to correct gap. Remove sprockets after alignment is confirmed and continue installation as described below.

20. Replace cam chain guide. Rotate cams until cam marks align. Confirm alignment with straightedge.
 21. Insert screwdriver through hole in top of support plate and carefully pry up on tensioner. Remove retaining pin from secondary cam chain and confirm position of cam marks.
 22. Maintaining original direction of travel indicated by arrow drawn in Step 7, place primary cam chain over sprockets. Rotate sprockets until marks align and slide sprockets over pinion shaft and rear cam.
- NOTE - Flat surface on end of pinion shaft must face up toward center of rear cam for timing marks to align.*
23. Apply red Loctite to threads of sprocket bolt and pinion bolt and a drop of clean 20W-50 engine oil beneath bolt heads. Use HD sprocket tool to secure sprockets and tighten bolts to 25 ft-lbs.
 24. Carefully remove retaining pin.
 25. Install outer cover with new gasket and tighten bolts to 90-120 in-lbs. in sequence illustrated in **Figure 3**. Replace any remaining parts removed to facilitate cam installation. Start engine and check for leaks.

Ride Safe!