



Installation Instructions: S&S[®] Crankcases for Harley-Davidson[®] 2007–Up Touring Models With Twin Cam 96™/103™ Engines *Including Crankcases For Stock Bore, 4 1/8" Bore, and 4 3/8" Bore Engines*

DISCLAIMER:

S&S parts are designed for high performance, closed course, racing applications and are intended for the very experienced rider only. The installation of S&S parts may void or 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 used on public highways, especially in states where pollution laws may apply. Always check 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 or her use, and the user shall assume all legal, personal injury risk and liability and all other obligations, duties, and risks associated therewith.

The words Harley[®], Harley-Davidson[®], H-D[®], Sportster[®], Evolution[®], and all H-D part numbers and model designations are used in reference only. S&S Cycle is not associated with Harley-Davidson, Inc.

SAFE INSTALLATION AND OPERATION RULES:

Before installing your new S&S part it is your responsibility to read and follow the installation and maintenance procedures in these instructions and follow the basic rules below for your personal safety.

- Gasoline is extremely flammable and explosive under certain conditions and toxic when breathed. Do not smoke. Perform installation in a well ventilated area away from open flames or sparks.
- If motorcycle has been running, wait until engine and exhaust pipes have cooled down to avoid getting burned before performing any installation steps.
- Before performing any installation steps disconnect battery to eliminate potential sparks and inadvertent engagement of starter while working on electrical components.
- Read instructions thoroughly and carefully so all procedures are completely understood before performing any installation steps. Contact S&S with any questions you may have if any steps are unclear or any abnormalities occur during installation or operation of motorcycle with a S&S part on it.
- Consult an appropriate service manual for your motorcycle for correct disassembly and reassembly procedures for any parts that need to be removed to facilitate installation.
- Use good judgment when performing installation and operating motorcycle. Good judgment begins with a clear head. Don't let alcohol, drugs or fatigue impair your judgment. Start installation when you are fresh.
- Be sure all federal, state and local laws are obeyed with the installation.
- For optimum performance and safety and to minimize potential damage to carb or other components, use all mounting hardware that is provided and follow all installation instructions.
- Motorcycle exhaust fumes are toxic and poisonous and must not be breathed. Run motorcycle in a well ventilated area where fumes can dissipate.

IMPORTANT NOTICE:

Statements in this instruction sheet preceded by the following words are of special significance.



WARNING

Means there is the possibility of injury to yourself or others.



CAUTION

Means there is the possibility of damage to the part or motorcycle.

NOTE

Other information of particular importance has been placed in italic type.

S&S recommends you take special notice of these items.

WARRANTY:

All S&S 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 S&S's option if the parts are returned to us by the purchaser within the 12 month warranty period or within 10 days thereafter.

In the event warranty service is required, the original purchaser must call or write S&S immediately with the problem. Some problems can be rectified by a telephone call and need no further course of action.

A part that is suspect of being defective must not be replaced by a Dealer without prior authorization from S&S. If it is deemed necessary for S&S to make an evaluation to determine whether the part was defective, a return authorization number must be obtained from S&S. The parts must be packaged properly so as to not cause further damage and be returned prepaid to S&S 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. If after an evaluation has been made by S&S and the part was found to be defective, repair, replacement or refund will be granted.

ADDITIONAL WARRANTY PROVISIONS:

- (1) S&S shall have no obligation in the event an S&S part is modified by any other person or organization.
- (2) S&S shall have no obligation if an S&S part becomes defective in whole or in part as a result of improper installation, improper maintenance, improper use, abnormal operation, or any other misuse or mistreatment of the S&S part.
- (3) S&S shall not be liable for any consequential or incidental damages resulting from the failure of an S&S part, the breach of any warranties, the failure to deliver, delay in delivery, delivery in non-conforming condition, or for any other breach of contract or duty between S&S and a customer.
- (4) S&S parts are designed exclusively for use in Harley-Davidson[®] and other American v-twin motorcycles. S&S shall have no warranty or liability obligation if an S&S part is used in any other application.

Please read these instructions thoroughly before starting work. Proceed with the installation only after they are completely understood. These instructions should be supplemented by the appropriate OEM service manual for your motorcycle. Follow all safety information.

Introduction

S&S® crankcase assemblies for Harley-Davidson® 2007-up noncounterbalanced big twin engine applications. Installation can be performed by any repair shop equipped to do complete Harley-Davidson® engine overhauls.

Stock bore cases are perfect for stock replacement applications, 4.125" bore cases are a natural for use with the S&S® Hot Set Up kit® for Twin Cam 96™ & 103™, and 4.375" bore cases make it possible to build really large displacement custom engines.

S&S crankcases for 2007-up big twins are available for stock bore engines as well as engines with 4.125" and 4.375" bore cylinders. Inspect these crankcases to make sure they are machined for the correct cylinders.

NOTE: S&S crankcases are sold in matched sets only. Individual case halves are not available.

ADDITIONAL OIL LINE INSTALLATION KIT REQUIRED

• FL - PN 310-0435

Additional features:

- Greater overall strength than stock crankcases, especially in the front motor mount, an important consideration in high performance applications.
- All oil passages between the crankcase and gear cover are o-ring sealed.
- Compatible with stock components. Use stock oil pump, cam support plate, gear cover, etc.
- 1999-2002 Timken® style sprocket shaft bearing. (Included)
- Uses 2003-up pinion shaft bearing
- Special order crankcases offer your choice of cylinder spigot bore, cylinder stud pattern.

Polishing, Painting, Plating, or Powder Coating S&S cases

S&S Cycle cautions against modifying these crankcases due to the possibility of damaging or weakening them. Modifying S&S crankcases in any fashion voids all manufacturer warranties. Should the customer elect to modify the crankcases regardless, it is imperative that they and the information tag attached to them be inspected beforehand to confirm that the correct model, style, bore size, etc. have been provided. The customer must confirm that crankcases and related parts are correct before assembling them or having them modified in any manner, and assumes all liability for modifications.

The customer must also verify that the serial numbers on the crankcase and attached information tag correspond with those on the certificate of origin and packing carton.

Under no circumstance will S&S be held responsible for expenses related to the modification of any S&S part in the event warranty service is required. Modified parts will not be accepted for credit or exchange. This will apply regardless of cause or fault: customer, retailer, manufacturer, or other.

For further information, contact S&S Technical Services at 608-627-8324, FAX 608-627-1488 or e-mail ssstech@sscycycle.com

NOTE: Modification includes but is not limited to appearance changes such as painting, Powder coating, plating, and polishing. Proper preparation for these procedures as well as the processes themselves may require the use of polishing compounds, chemicals or procedures that are potentially harmful to crankcases.



Passages and internal cavities may become obstructed by residues from materials used to polish, paint, plate or powder coat surfaces. Additionally, surface finishing processes can damage critical machined surfaces. Any of the above may cause premature wear, damage or failure of other engine components as well as the crankcases themselves.

Powder coating - Subjecting heat-treated alloys such as those used in S&S® crankcases to excessive heat can drastically alter their strength and their critical properties. The degree of change depends upon the temperatures reached and the duration of exposure. When powder coating or otherwise processing alloy parts, S&S exposes them to a maximum temperature of 370°F for no longer than 20 minutes. Under no circumstances should parts be heated past 400°F!

Preparation and Installation

1. Inspection

- a. Inspect crankcases to confirm that they are correct style and machined for correct bore size. Refer to tag wired to crankcases.
- b. Verify that serial numbers on crankcases match numbers on packing carton and certificate of origin. Contact S&S immediately if numbers do not match.

NOTE: Valid certificate of origin is required for any transfer or sale of aftermarket crankcases or complete engines built with aftermarket crankcases. Certificate of origin is required to title and license any motorcycle which is to be driven on public streets and highways.

2. Crankcase Test Fit

If possible, bare crankcase should be positioned in motorcycle frame before assembly to check clearances.

- a. Position case in frame, check for clearance at frame, and alignment to transmission. It is a good idea to replace rubber engine and transmission mounts at this time. Old mounts deform over time and may induce unwanted stresses on the engine case.

NOTE: Crankcases damaged by improper installation are not covered under warranty.

3. Pre-Assembly Cleaning

- a. Clean crankcases in hot soapy water or solvent to remove any dirt or contamination which may have been introduced during shipping, handling, or set-up. Dry components and check passages with compressed air.



Compressed air and particles dislodged by compressed air are potentially harmful. Wear protective goggles when using compressed air and always direct air stream away from yourself and others nearby.

Hardware Identification and Installation

NOTES

- When installing hardware, be careful not to cross-thread fittings or damage threads. Damage caused by improper installation of hardware will not be covered under warranty.
- To prevent galling, apply anti-seize compound, pipe sealant, or PTFE tape to threads of all steel fittings prior to installation in crankcase.
- If PTFE tape is used, loose tape must not enter crankcase or oil passages. Do not apply tape to first 2-3 threads that screw into hole. If fittings are removed or replaced be sure no tape shreds remain in holes. Tape shred could block oil passages causing restriction of oil flow.



Restricted oil flow may result in extensive engine damage not covered under warranty.

4. Piston Jet Installation

- Apply a thin film of clean engine oil to new o-ring.
- Seat o-ring in groove of piston jet mounting flange.
- With pinhole in the jet pointing upward, install using two T20 TORX screws. Apply blue threadlocker, then tighten to 20-30 in-lbs.



Piston jets must be installed using the correct o-ring. Leaving out a piston jet o-ring, installing too small of an o-ring, or pinching an o-ring at assembly will cause oil to by-pass the jet, resulting in low oil pressure.

NOTE: Always use a new o-rings when re-installing jets.

5. Transmission Case Drilling

NOTE: If an S&S engine or crankcase is to be installed in a motorcycle, which has had a catastrophic engine failure, or if for any reason it is suspected that debris or contaminants have been introduced into the oiling system, the oil pan must be thoroughly cleaned or replaced. In order to ensure that all debris is removed from the oil pan, the baffle must be removed. In 2009 and later models, and in current production replacement oil pans for earlier models, the baffle is welded into the oil pan and is difficult to remove. It is recommended that oil pans with welded-in baffles be replaced. Harley-Davidson® replacement oil pan part number for touring bikes is 62489-99A.



Failure to remove debris or contaminants from the oil pan may result in serious damage to the engine.

These instructions assume that the engine has been installed, and that the inner primary cover and oil pan have been removed. However, transmission case drilling can be done before engine is installed. Tool Kit 530-0006 is recommended for easy and professional drilling and tapping of vent and return fittings.

If Tool Kit 530-0006 is not available, a $\frac{1}{16}$ " drill bit and a 3/8-18 NPT tap must be obtained. Refer to dimensions shown in **Figure 1** to determine the locations of the vent and return fitting holes. Once the holes are drilled and tapped, the rest of the installation is the same.

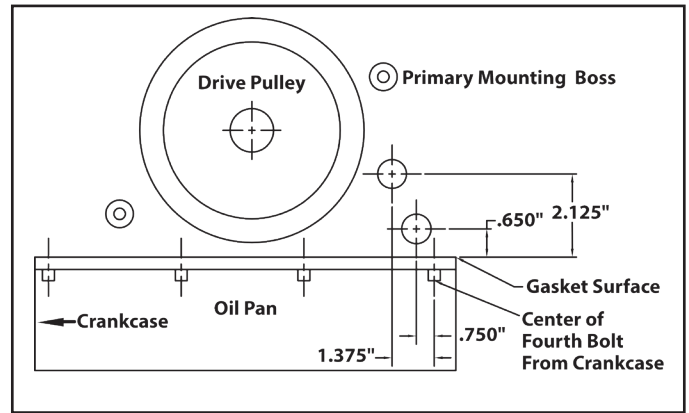
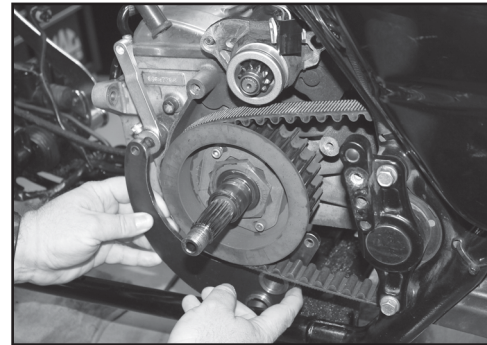
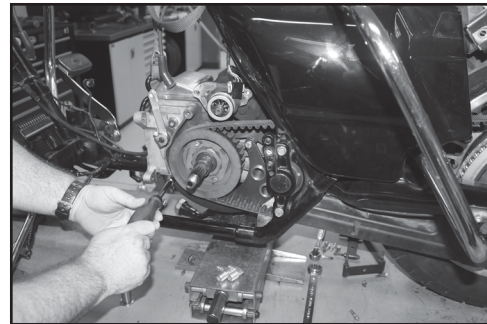


Figure 1

- Clean areas of drilling, gasket surfaces etc
- Install Drill jig as shown in **Picture 1**, above left with two 5/16-18 fasteners, snug fasteners enough to hold jig securely, **see Picture 2**, above right.

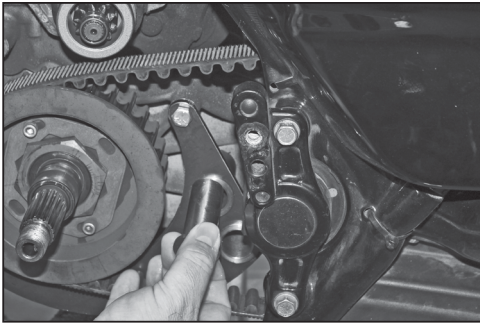


Picture 1

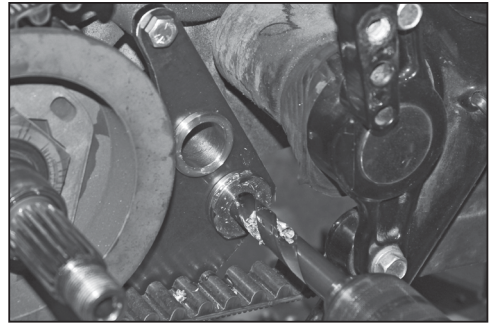


Picture 2

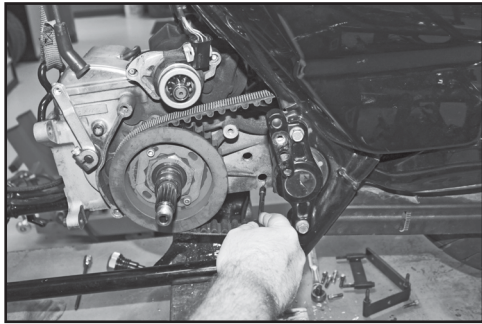
- Lubricate jig bushing hole and $\frac{1}{16}$ " drill with engine oil, install drill bushing into either hole in drill jig and drill hole. Repeat for second hole. **See Pictures 3 & 4, next page .**
- Remove Drill jig and de-burr both holes inside and out. **See Picture 5, next page**
- Mask pipe tap so .770" of thread is exposed, this marks the depth you want to tap the two holes
- Lubricate pipe tap with thread cutting oil or engine oil.
- Re-install drill jig. Using a $\frac{5}{8}$ " 12pt socket, guide the tap into the drill jig bushing and start the tap a couple of turns in each hole, be sure to tap far enough so that you will be able to re-start the tap to finish the holes. **See Picture 6, next page.**
- Remove drill jig. Finish tapping each hole to the 0.770" depth marked by the masking tape. **See Picture 7, next page.** De-burr and clean both holes inside and out with compressed air and a solvent such as brake cleaner.



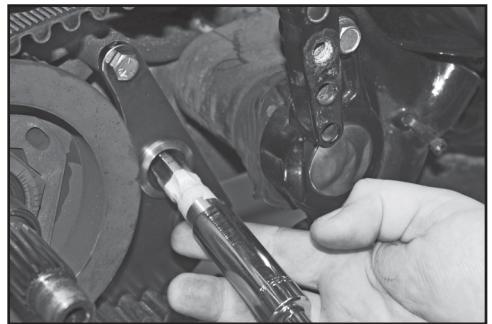
Picture 3



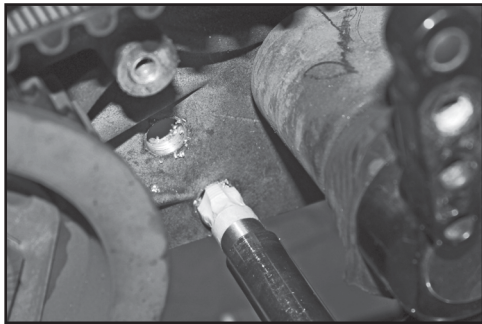
Picture 4



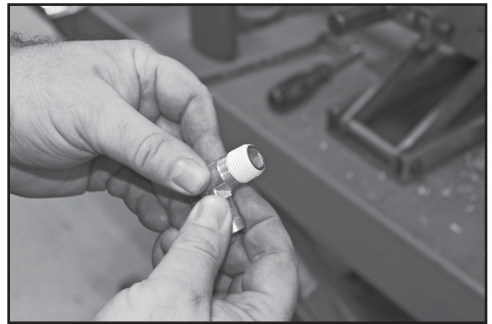
Picture 5



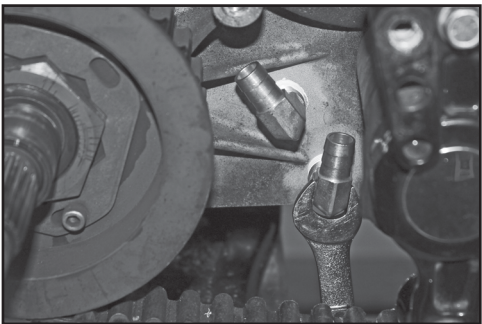
Picture 6



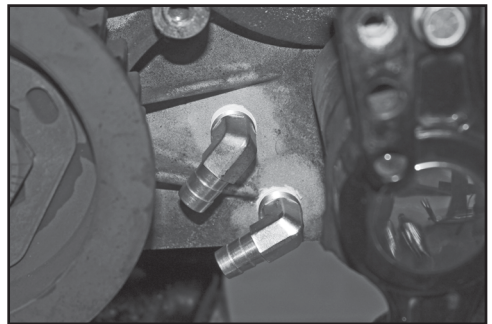
Picture 7



Picture 8



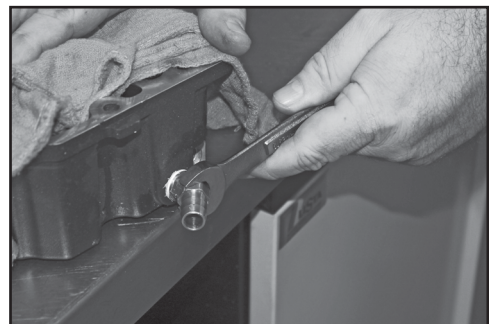
Picture 9



Picture 10



Picture 11



Picture 12

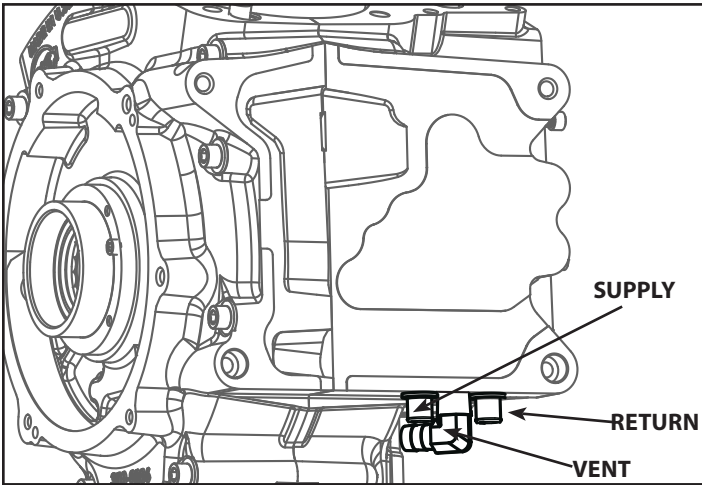


Figure 2

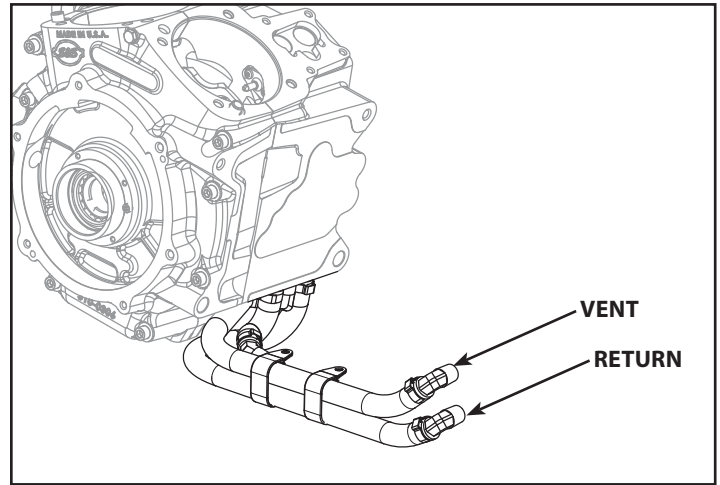


Figure 3

- i. Prep two 90° fittings with thread sealer or PTFE tape. **See Picture 8, previous page.**
- j. Install each fitting. One fitting will turn past the other fitting if properly positioned. **See Picture 9, previous page.** Tighten fittings to the finishing position of each shown in **Picture 10, previous page.**
- k. Remove pipe plug from stock oil pan, clean the threads with solvent and compressed air and flush out the pan. **See Picture 11, previous page.**
- l. Prep 45° fitting with pipe sealant or PTFE tape and install to position shown in **Picture 12, previous page.** Re flush the oil pan & reinstall oil pan to trans case using a new gasket.

6. Oil Line Installation

For 2007–up Harley-Davidson® FL models



Oil line installation is crucial to engine life. If you are not sure that you can properly perform this operation, please contact the S&S Tech Department for a referral to a shop in your area.

NOTES: Installation instructions are based on an engine and transmission already in the chassis with oil pan installed and inner primary removed. Engine should be installed using a new transmission to engine gasket in place to seal the oil passages utilized by the stock case.

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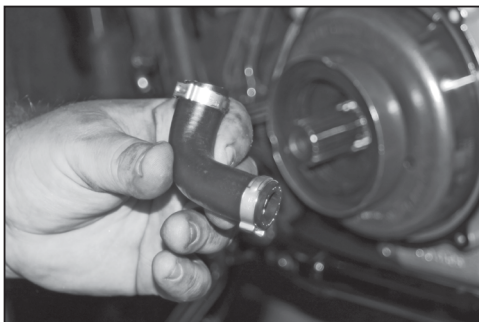
S&S Viola V-Twin #560-0094

- a. before cutting any oil line. Refer to **Figures 2 & 3, above** for correct placement on crankcase.
- b. The oil supply line is the short fully formed line that goes to the 45° fitting in the oil tank. Trim as needed, slide pinch clamps over hose ends, **See Picture 13 below**, and install Oil Supply line, crimp as shown in **Picture 14, below right**.
- c. Install and mark the long return and vent lines, **See Picture 15, next page**, and cut to length.
- d. Install pinch clamps and P-Clamps on the hoses keeping the vent line on top. **See Picture 16, next page.** Crimp the hose clamps on the fittings on the transmission and engine with a crimping tool. Top vent line to the top fitting and the return line to the bottom fitting.
- e. Remove the front two oil pan screws and reinstall them to hold the P-clamps in place. **See Picture 17, next page.** Once installed, push the clamps into the side of the oil pan to keep them tight to the pan using a wood handle or other non marring device. **See Picture 18, next page.**

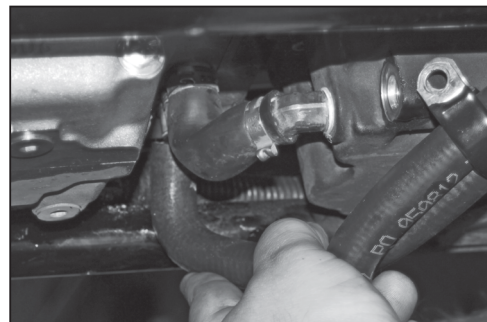
NOTES

- P-Clamps will be used to hold the vent and return oil lines in place running parallel and just below the oil pan gasket interface. (The vent line should be above the return line).
- S&S recommends replacing stock spring style hose clamps on oil cooler lines, where they attach to the filter adaptor, with crimp style clamps. Spring clamps do not provide adequate clamping force to keep oil lines secure on the hose nipples under extended high rpm operation.

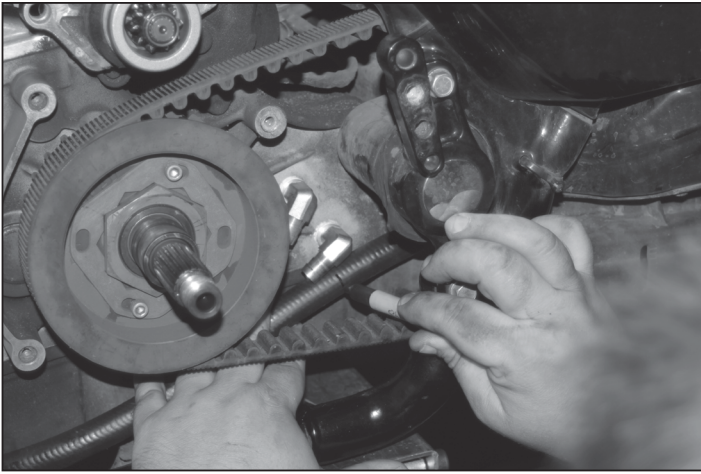
- a. Oil line mock-up is recommended to get an idea of final routing



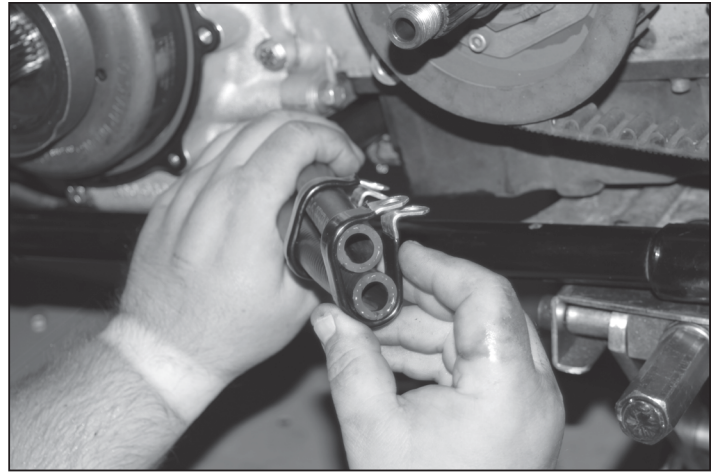
Picture 13



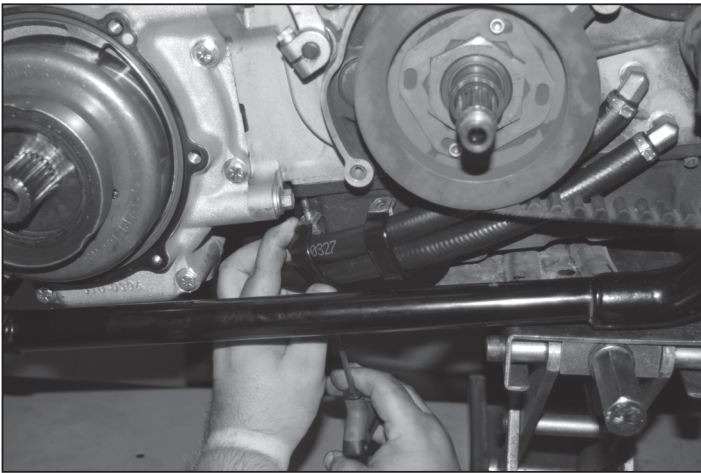
Picture 14



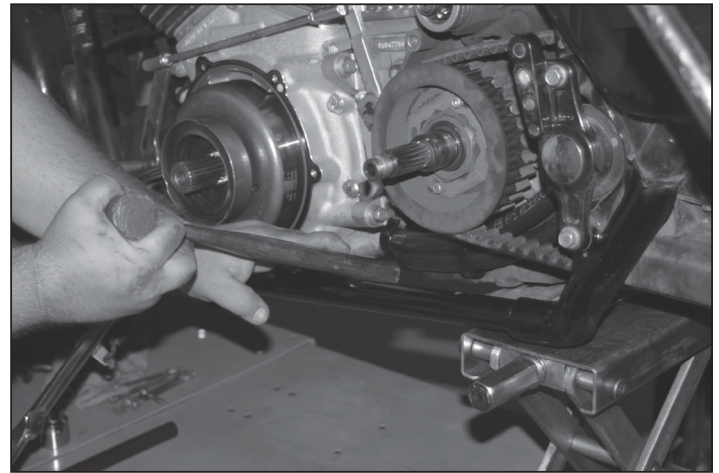
Picture 15



Picture 16



Picture 17



Picture 18

7. Crankcase Cylinder Studs

S&S® crankcases for 2007-later Harley-Davidson® models with all 96" and 103" engines are shipped with cylinder studs installed.



Do not carry the crankcase by the studs. It stresses the crankcase and studs in ways they are not designed to handle. Also, it is easy to drop and damage the case when it is carried by the studs.

8. Flywheel Assembly

S&S® crankcases for 2007- later Harley-Davidson® big twin touring models are designed to use any S&S flywheel assembly, or 1999-2002 Harley-Davidson flywheel assembly without sprocket shaft bearing race.

NOTE: S&S crankcases are designed for Timken® sprocket shaft bearings. 2003-up flat roller sprocket shaft bearing is not compatible with S&S cases. Stock flywheels with flat roller bearing races on sprocket shaft may be used if bearing race and thrust washer are removed.

- a. 1999-2002 style Timken® tapered roller bearings are included with the crankcase. Flywheel assembly must have a sprocket shaft without the stock flat roller bearing race and thrust washer. If a stock 2007-later flywheel is to be installed, the bearing race and thrust washer must be removed from the sprocket shaft.



Installing and setting the clearances for 1999-2002 style taper roller bearings is a critical operation. Install and set clearances per 1999-2002 Harley-Davidson service manual.

NOTE: Unlike stock engines, the pinion bearing is secured in place with a snap ring in S&S crankcases.

9. Camshaft And Cam Plate Installation

Install S&S camshafts using the instructions packaged with them. Install Harley-Davidson camshafts procedures in stock 2007-up service manual.

10. Oil Pump, Lifters, Lifter Covers, and Cam Cover Installation

Install these and any other crankcase components not listed per 2007-up Harley-Davidson® service manual.

Replacement Parts for S&S® Crankcases for Harley-Davidson® Twin Cam 96™ & 103™ Engines

1. Bolt, stator 10-24 x1" SHC - 4 required (H-D®# 2720))		17. Bearing, pinion shaft – Fits all S&S and OEM 2000-'02 (Balanced models only) & all OEM 2003-up (H-D®# 24604-00D)	31-4085
Each.....	50-0044		
10 pack	50-0194		
2. Seal, sprocket shaft (H-D®# 12068).....	31-4035	18. Retaining Ring,Internal,2½",Black,Carbon Steel 2 required	56-3018-S
3. Bearing, Timken® sprocket shaft (H-D®# 9028)	31-4013	19. O-ring, oil pump 1½" I.D. x 1½" O.D. x ⅛" CS (H-D®# 11157, 11293)	50-8039
4. Timken Main Bearing Spacers		10 pack	93-4110
Fits 1¼" stock diameter shaft.		20. Plug, magnetic drain	50-8335
.0995" - .1005" (H-D®# 9124)	31-4071	21. Baffle plate	31-0119-S
.1015" - .1025" ((H-D®# 9125)	31-4072	22. Screw 10-24 x ⅜" pan head - 2 required	
.1035" - .1045" (H-D®# 9126).....	31-4073	Each.....	50-0050
.1055" - .1065" (H-D®# 9127).....	31-4074	10 pack	50-0139
.1075" - .1085" (H-D®# 9128).....	31-4075	23. Dowel, case alignment - 2 required (H-D®# 16573-83, 16574-99A, 16573-83A) Each.....	50-8023
.1195" - .1205" (H-D®# 9134)	31-4076	10 pack.....	50-8109
5. Bolt, case ⅝" -18 x 3½" HHC - 8 required		24. O-ring, case alignment,- 2 required (H-D®# 26432-76A) ⅝" I.D. x 1½" O.D. x ⅛" CS	50-8034-S
Chrome (each).....	50-0254-S	25. Piston Oiler Jet Kit (H-D®# 22307-99)	
6 pack.....	106-3452	Each	31-2025B
Zinc (H-D®# 3427) (each)	50-0117	2 pack	31-2026
6. Washer, flat ⅝" x 1½" x ⅛" - 8 required.....	50-7034	Piston Oiler Jet Kit includes:	
7. Bolt center case ¼" -28 x 6" HHC Grade 8		a. O-ring,(-014),.500" ID x .625" OD (H-D®# 11140)	
Each.....	50-0020	Each	50-8032
5 pack	50-0221	10 pack.....	50-8130
8. Washer, flat, ¼" x .474" x .050"		b. Jet, Assembly, Piston Cooling (H-D®# 22307-99)	
Each.....	50-7020	Each	31-2025B
10 pack	50-7076	c. Screw, Torx Panhead, 8-32 x ⅜", Zinc, Steel (H-D®# 68042-99)	
9. Nut ¼"-28 Grade 8 - 1 required (H-D®# 7683).....	50-5011	Each	50-0054-S
10. Cylinder stud - 8 required (H-D®# 16834-99A)		26. Pin Dowel, (H-D®# 18535-99) 2 pack	50-8195
Each.....	31-2325-S	27. Fitting, crankcase vent, 2 pack	50-0451
8 pack.....	31-2340	28. Fitting Pipe, 90°, Bared Male Pipe ⅜ NPT.....	50-8288
11. Pin, Dowel, .4377" x .500", Steel, 4 Pack	500-0219	29. O-ring, -13, .437 ID, X .565 OD, Viton (H-D®# 11105, 11273)	50-8008
12. Bolt, cam plate ¼" -20 x 1" SHC - 4 required (H-D®# 852)			
Each.....	50-0084		
10 pack	50-0244		
13. Bolt, cam plate ¼" -20 x 1¼" SHC - 2 required (H-D®# 4740A, 3482A)			
(each)	50-0008		
10 pack	50-0153		
14. O-ring, cam plate - 9 required (H-D®# 11301) (each)	50-8066-S		
10 pack	50-8066		
15. Dowel, cam plate - 2 required (H-D®# 16589-99A).....	50-8148-S		
16. Bearing,Inner,Needle,Cam,1.0" x 1.25" x .50"	31-4199-S		

All reference to H-D® part numbers is for identification purposes only. We in no way are implying that any of S&S Cycle's products are original equipment parts or that they are equivalent to the corresponding H-D® part number shown.

