

## Instruction 51-1255

01-18-19

© 2003–2019

by S&S® Cycle, Inc.

All rights reserved.

Printed in the U.S.A.

# S&S® Cycle, Inc.

14025 Cty Hwy G

Viola, Wisconsin 54664

Phone: 608-627-1497 • Fax: 608-627-1488

Technical Service Phone: 608-627-TECH (8324)

Technical Service Email: [sstech@sscycle.com](mailto:sstech@sscycle.com)

Website: [www.sscycle.com](http://www.sscycle.com)



## Installation Instructions: S&S® Crankcase for HD® Twin Cam 88® Engines for all S&S Stock Bore, 4" Bore, & 4 $\frac{1}{8}$ " Bore Twin Cam 88® engine cases with 1999–'06 & 1984–'99 engine mounts

### DISCLAIMER:

Many 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. 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 an 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.

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® Twin Cam 88® non-counterbalanced engine applications. Installation can be performed by any Harley-Davidson® repair shop equipped to do complete engine overhauls. No special tools other than those used in normal engine building operations are required. Stock bore cases are perfect for stock replacement applications, 4" bore cases are a natural for use with the S&S® Hot Set Up Kit® for Twin Cam 88, and 4½" bore cases make it possible to build really large displacement custom engines.

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

## 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, and your choice of rear motor mount style - 1999–06 or 1984–1999.

## KIT CONTENTS

- Crankcase with camshaft bearings and cylinder studs installed
- Sprocket Shaft Bearings
- S&S Reed Valve Assembly
- Pinion Bearing
- Hardware Package
- Certificate of Origin
- Instructions

## POLISHING, PAINTING, PLATING, OR POWDERCOATING 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 or e-mail [sstech@sscycycle.com](mailto:sstech@sscycycle.com)

**NOTE:** Modification includes but is not limited to appearance changes such as painting, powdercoating, 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 powdercoat 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.**

**Powdercoating** — 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. Test-fit instructions for S&S crankcases with 1999–'06 engine mounts: 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.
- b. Test-fit instructions for S&S crankcases with 1984–1999 engine mounts: S&S crankcase for 1999–06 models being installed in 1984–1999 frames is essentially the same as stock, although additional clearancing and shimming may occasionally be required. When this style of case is solid mounted instead of rubber mounted, additional care must be taken in installing the case. Main areas of concern are between cases and frame motor mounts. Checking clearance around and between case mounting bosses and frame is necessary to ensure that crankcase rests squarely on motor mount pad and no stress is applied to crankcases when mounting bolts are tightened. Shimming may be required to compensate for variances between frames. The oil lines for the T124V engine connect to the engine on the bottom rear of the cam chest. The supply to the engine is the pipe thread on the right marked with an S. There are two pipe threads for the return oil located to the left of the supply pipe thread and marked with an R.

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

**CAUTION**

**Improper alignment of engine and frame mounts may cause abnormal stresses resulting in damage to crankcases or other parts.**

To check clearance perform following steps:

1. Assemble case halves using case bolts. Tighten to snug. Torquing bolts to final specification is not necessary.
2. Clean frame engine mounts and carefully remove any irregularities from mounting surfaces. Also inspect crankcase mounting bosses for burrs.
3. Position case assembly in frame.
4. Install engine mounting bolts in motor mounts, and check clearance between mounting bosses on cases and frame and any other areas where frame and cases may contact each other. Bolts may be difficult to install if contact is severe.
5. If cases contact frame, remove them and relieve just enough material in offending area to provide clearance.
6. Place cases in frame, install one rear mounting bolt and snug nut.
7. Measure gap between crankcase mounting bosses and frame motor mounts with feeler gauge to determine if shimming is required.
8. If gap exists, fabricate shim just thick enough to fill gap.
9. Install opposite corner shim and mounting bolt and nut, and tighten identical to other bolt.
10. Check other corners with feeler gauge to confirm thickness required is same as before. If not, determine cause and correct.

### 3. Pre-Assembly Cleaning

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.

**WARNING**

**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.

**CAUTION**

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

### 4. Piston Jet Installation

- a. Apply a thin film of clean engine oil to new o-ring.
- b. Seat o-ring in groove of piston jet mounting flange.
- c. With pinhole in the jet pointing upward, install using two T20 TORX screws. Apply Loctite® 243 Blue, then tighten to 20-30 in-lbs.

**CAUTION**

**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.

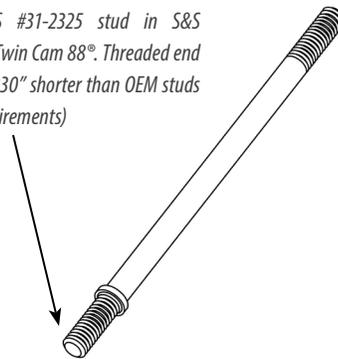
**CAUTION**

**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.**

### 5. Crankcase Cylinder Studs

S&S® crankcases for Harley-Davidson® Twin Cam 88® engines are shipped with cylinder studs installed. Before assembling engine, verify that the lower collar of each stud is contacting the case deck, and that the studs are torqued to 10 ft.-lbs.

Use only S&S #31-2325 stud in S&S crankcases for Twin Cam 88®. Threaded end with collar is .230" shorter than OEM studs (clearance requirements)



- a. Removal
  - i. Thread two 3/8"-16 nuts onto end of stud and tighten them together.
  - ii. Use a wrench on the lower nut to remove stud.
- b. Installation
  - i. Place a ball bearing into the end of a head bolt then place the head bolt on end of the stud without a collar.
  - ii. Screw stud into the case, collar side down, until collar contacts case. Torque stud to 10-ft.-lbs.

**CAUTION**

**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.**

**6. Flywheel Assembly**

S&S® crankcases for Harley-Davidson® Twin Cam 88® engines are designed to use any S&S flywheel assembly, or 1999–2002 Harley-Davidson flywheel assembly.

**NOTE:** 2003–up Harley-Davidson® flywheel assemblies will not fit in S&S crankcases. For 2003, Harley-Davidson started using a flat roller bearing on the sprocket shaft. S&S cases must use flywheel assemblies that use dual taper roller bearings.

**NOTE:** 2003–up flat roller sprocket shaft bearing is not compatible with S&S cases

**CAUTION**

**It is not recommended to attempt using a 2003–up flywheel assembly by changing the sprocket bearing from the flat roller style to the earlier dual taper style. The sprocket bearing inner race of the 2003–up sprocket shaft is a non-serviceable item, per the OEM service manual. Attempting to remove the pressed on sprocket bearing inner race from the sprocket shaft of 2003 Harley-Davidson® flywheel assemblies can easily result in serious damage to the flywheel assembly.**

- a. **Sprocket shaft bearings:** Use 1999–2002 style taper roller bearings, included with the crankcase. They must be used with a 1999–2002 style flywheel assembly, purchased separately.

**CAUTION**

**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.**

**NOTES:**

- S&S crankcases secure the pinion bearing in place with a snap ring. 2003–up Harley-Davidson cases do not.
- 1999–2002 pinion shaft bearing is not compatible with S&S crankcases. It has a larger outside diameter than the 2003–up style used by the S&S cases.

**7. Camshaft And Cam Plate Installation**

S&S Camshafts install using the instructions packaged with them. Harley-Davidson camshafts install per 1999–2003 Twin Cam 88® service manual.

**8. S&S Reed Valve Installation**

The S&S Reed Valve Assembly 31-2071 included with the crankcase is an effective way to control internal air pressures inside the crankcase, reducing oil carry over, blow-by, and oil leakage. It is a one-way valve that allows for the smooth passage of air through and out of the engine breathing system. Installation of the S&S Reed valve is optional. It is not required for crankcase assembly. However, its use is highly recommended. It installs easily, and requires no extra machining. A separate Instruction sheet is packaged with the Reed Valve. **See Picture 1.**



**Picture 1**

**9. Oil Pump, Lifters, Lifter Covers, and Cam Cover Installation**

These and any other crankcase components not listed install per 1999–2003 Harley-Davidson® Twin Cam 88® service manual.