

Instruction sheet No. 00-3885

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## Installation Instructions S&S V<sup>2</sup> Style Rocker Cover Assemblies

### Safe Installation and Operation Rules:

Before installing any S&S engine part, it is your responsibility to read and follow all instructions. The rules below are for your personal safety, and must be kept in mind at all times.

- Gasoline is extremely flammable and explosive under certain conditions, and toxic when inhaled. Do not smoke around gasoline. Perform the installation in a well-ventilated area away from sparks or open flame.
- After installation, be sure all fuel lines are routed correctly with clamps in place and tightened securely. Even with protective cover, gas lines must not contact extremely hot surfaces where they could melt or leak and catch fire.
- Compressed air and particles dislodged by compressed air are potentially harmful. Wear protective goggles when using compressed air and always direct the air stream away from yourself and others nearby.
- Some solvents, degreasers and other chemicals are harmful, especially to skin and eyes. Many chemical compounds such as lacquer thinner are also flammable and present a fire hazard. Read the manufacturer's instruction label for precautions and proper use. Use in a well ventilated area and wear protective clothing to avoid personal injury.
- If the motorcycle has been running, wait until the engine and exhaust pipes have cooled before performing any mechanical work.
- Before beginning the installation, disconnect and remove the battery to eliminate potential sparks and possible inadvertent engagement of the electric starter while working on the motorcycle.
- Read instructions thoroughly and carefully so all procedures are completely understood before beginning installation. Contact S&S if you have questions, if any steps are unclear, or if any abnormalities occur during final assembly, installation, or operation.
- Consult an authorized H-D service manual for correct disassembly, reassembly, and installation procedures for any parts that need to be removed or disassembled to facilitate the installation.
- Use good judgment during assembly, installation, and when operating the motorcycle. Good judgment begins with a clear head. Don't let alcohol, drugs, or fatigue impair judgment. Perform installation when fresh and alert.
- For optimum performance and safety and to minimize potential damage to the cylinder heads or other components, use correct hardware and follow procedures outlined in S&S instructions and authorized H-D service manual.
- Motorcycle exhaust fumes are toxic and must not be inhaled. Run motorcycle only in a well ventilated area where fumes can dissipate.

### 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 six (6) 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 S&S by the purchaser within the 6 month warranty period or within 10 days thereafter.

In the event warranty service is required, the original purchaser must notify S&S of the problem immediately. Some problems can be rectified by a telephone call and need no further action. A part that is suspected of being defective must not be replaced 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, it must be packaged properly to avoid 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 was made by S&S and the part was found to be defective, repair, replacement, or refund will be granted.

### ADDITIONAL WARRANTY PROVISIONS:

- (1) No part shall be returned to S&S without first contacting the company and obtaining a Return Authorization (RA) number.
- (2) S&S shall have no obligation in the event an S&S part is modified by any other person or organization, or if another manufacturer's part is substituted for one provided by S&S.
- (3) 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 break-in or maintenance, improper use, abnormal operation, or any other misuse or mistreatment.
- (4) 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.
- (5) S&S parts are designed exclusively for use on Harley-Davidson motorcycles. S&S shall have no warranty or liability obligation if an S&S part is used in any other application.

### 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.**

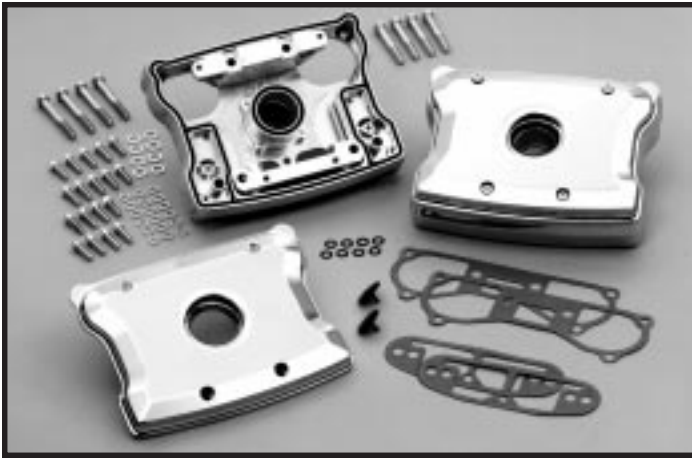
#### CAUTION

**Means there is the possibility of damage to the motorcycle or a component.**

#### NOTE

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

**S&S urges you to take special notice of these advisories.**



## Kit Contents

Base, rocker cover S&S	
Chrome billet (2 each) .....	#90-4051
Plain billet (2 each) .....	#90-4056
Cover, top rocker	
Chrome billet (2 each) .....	#90-4054
Plain billet .....	#90-4057
Support, rocker shaft left (2 each) .....	#90-4052
Support, rocker shaft right (2 each) .....	#90-4053
Capscrew, hex head, $\frac{5}{16}$ "-18 x $2\frac{1}{2}$ " (HD#3501) (4 each) .....	#50-0118
Capscrew, hex head, $\frac{5}{16}$ "-18 x $2\frac{1}{2}$ " (HD#3419) (4 each) .....	#50-0115
Capscrew, socket head, $\frac{1}{4}$ "-20 x $\frac{3}{8}$ " (HD#4069A) (18 each) .....	#50-0067
Washer, flat $\frac{1}{4}$ " x $\frac{7}{16}$ " x $\frac{1}{16}$ " (HD #6099) (18 each) .....	#50-7017
Washer, flat $\frac{5}{16}$ " x .548" x $\frac{1}{16}$ " (8 each) .....	#50-7026
Washer, flat fiber $\frac{1}{4}$ " x $\frac{7}{16}$ " x $1/32$ " (8 each) .....	#50-7016
Gasket, Viton rocker cover (2 each) .....	#90-4048
O-ring, $1\frac{1}{8}$ " x $1\frac{1}{8}$ " x $\frac{1}{8}$ " Viton (2 each) .....	#50-8044
Gasket, bottom rocker cover, right (HD#16778-84) (2 each) .....	#90-4058
Gasket, bottom rocker cover, left (HD#16779-84A) (2 each) .....	#90-4059
Valve, rocker cover umbrella (HD#26586-89) (2 each) .....	#90-4030

## Introduction

S&S billet rocker covers are two piece style assemblies designed to fit most Big Twin and Sportster style V<sup>2</sup> engines that accept stock style rocker covers.

*NOTE - At present, S&S billet rocker covers are not recommended for Buell motorcycles because of interference with the front cylinder head-frame mount. S&S is currently testing a modified mount. Call Technical Services at 608-627-1497 for additional information.*

S&S rocker covers are machined from billet aluminum, then polished and chromed to a show quality finish. O-ring sealing insures reliable, leakfree operation.

*NOTE - Plain, unpolished and unplated versions are available for custom applications. They may be powdercoated or otherwise finished to individual specifications. S&S plain billet aluminum rocker covers must be inspected and burrs/sharp edges carefully removed by customer before installation.*

S&S rocker covers are designed to accept valve springs up to 1.660" O.D. with no modification. In most instances, they will accept valve lifts to .710" (S&S street head or OEM) or .810" (S&S Special Application cylinder head) without modification.

*NOTE - It remains engine builder's responsibility to check operating clearances. Clearances should be checked between valve spring/collar and rocker cover base as well as between rocker arm and top rocker cover. S&S recommends minimum of .060". Cylinder head must also be "set up" for correct lift.*



Picture 1

**CAUTION - Failure to establish correct operating clearances can result in extensive engine damage not covered under warranty.**

S&S rocker covers are compatible with both crankcase and cylinder head vent arrangements. Provided umbrella valves #90-4030 must be installed for correct cylinder head vent operation, or combination crankcase-head venting as utilized in V2 Style S&S Long Blocks.

S&S rocker covers can usually be installed with engine in frame. Taller engines such as 98" and 103" S&S Long Blocks may require removal of engine for installation and removal of rocker covers.

## Installation

1. Wash motorcycle, taking care to remove sand and other abrasive debris from engine and area of frame around engine. Remove battery, gas tanks, and all parts required to access original rocker covers. Remove top and center sections of OEM rocker housings. Refer to authorized Harley-Davidson Service Manual as necessary.

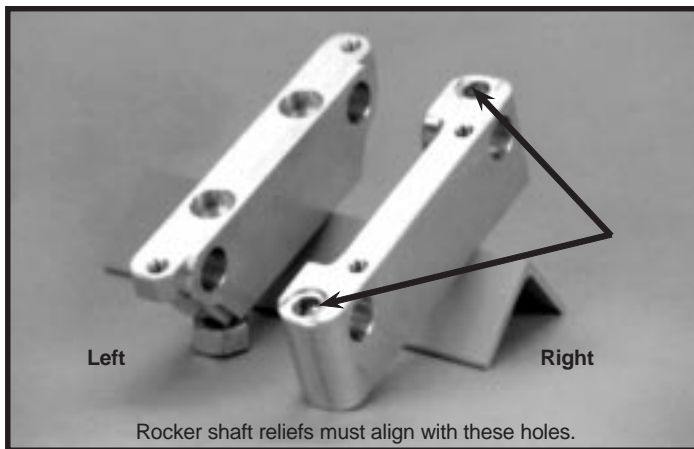
**WARNING - Sparks from motorcycle electrical system can ignite gasoline fumes. To prevent sparks as well as prevent electric starter from becoming engaged inadvertently and causing personal injury, disconnect battery and remove from motorcycle before proceeding.**

**WARNING - Gasoline is toxic when fumes inhaled, extremely flammable, and explosive under certain conditions. Do not smoke around gasoline, and perform installation in a well ventilated area away from sparks and open flame.**

2. Remove pushrod cover retainer clips for front cylinder and collapse covers. Remove sparkplugs and rotate engine to place pushrods at lowest point on cam with front piston at TDC on compression stroke. Referring to Harley-Davidson Service Manual as necessary, remove rocker assemblies, pushrods and lower rocker cover from front cylinder head.



Picture 2



Picture 3

**NOTE** - Observe correct location of pushrods. S&S pushrod kits have longest pushrod for front exhaust, next longest for rear exhaust, shortest for rear intake, and remaining one for front intake.

Remove all traces of old rocker housing gaskets from cylinder head, taking care to contain debris.

**CAUTION** - Debris such as gasket material can interfere with oil circulation resulting in engine damage not covered under warranty.

3. Inspect S&S rocker cover assemblies. Remove rough or sharp edges from plain (unchromed) assemblies. Clean all metal parts with solvent. Dry with compressed air and remove any solvent residue with clean, lint free cloth.
4. Install umbrella valves in rocker cover bases. **See Picture 1.** Valves go in vent ports nearest intake manifold on both front and rear rocker cover bases.

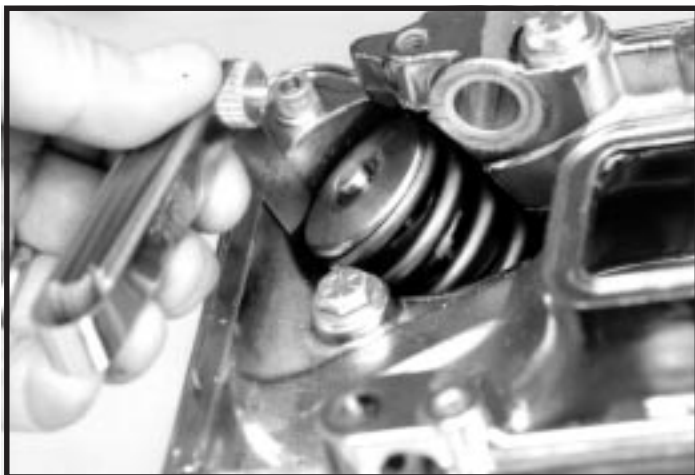
**NOTE** - Thin coat of motor oil or light grease on stem of valve will ease installation. Valve often makes audible "snap" when correctly seated. Tug valve gently and visually inspect to confirm proper, secure fit before proceeding.

5. Clean gasket surfaces of rocker cover base and cylinder head with lacquer thinner. Wipe dry with clean, dry cloth. Place right and left lower rocker cover gaskets on cylinder head with factory-applied silicone bead facing up.

**NOTE** - Small dab of grease or gasket sealant of choice in corners may be used to hold gaskets in place. Otherwise they should be installed dry.

6. Install  $\frac{1}{4}$ " flat washers on 5 ea. socket head cap screws (per head), apply Loctite 242 or equivalent to threads and install S&S rocker housing base on cylinder head. **See Picture 2.** Torque screws to 10-13 ft-lbs.

**NOTE** - If engine is in frame, it is easiest to place screws in housing base before placing housing base on head. Some screws are not accessible with



Picture 5



Picture 4

standard hex key. S&S recommends cutting or grinding short end of key for access. Screws not accessible with torque wrench must be tightened by feel, using tightness of properly torqued screw as guide. (Last applies only if engine is in frame. All screws are accessible with engine out of frame.) S&S recommends using torque wrench whenever possible.

**WARNING** - Improperly tightened fasteners may cause damage not covered under warranty.

7. Measure clearance between valve spring and rocker cover with feeler gauge. Minimum is .060". **See Picture 5.** Same clearance must exist between rocker arm and top cover.

**NOTE** - If less than .060" clearance exists between rocker and top cover, contact S&S Technical Services Dept.

8. Assemble right and left rocker shaft supports. **See Picture 3.** Inspect rocker shafts for burrs and deburr as necessary. Lubricate shaft for exhaust side rocker arm with assembly lube and pass through forward opening in right support. Relief in shaft must align with bolt hole indicated by arrow in **Picture 3.** Also note that relief in shaft support must face center of engine. Install flat washer on  $\frac{5}{16}$ " x 2  $\frac{1}{2}$ " bolt, pass bolt through opening in support and apply Loctite 242 or equivalent to threads. Lubricate rocker arm bushings and shaft and place exhaust side rocker arm on shaft. Repeat for intake and install second  $\frac{5}{16}$ " x 2  $\frac{1}{2}$ " bolt in support. **See Picture 4.**

**NOTE** - S&S has experienced minor clearance problems when installing some O.E.M. Harley-Davidson rocker arms in S&S billet rocker covers. Procedure described in Step 9 should be performed prior to pushrod installation.

9. To confirm adequate clearance between rocker arm and S&S rocker cover:
  - A. Place rocker/support assembly in rocker cover base. Place left side support over ends of shafts and install  $\frac{5}{16}$ " x 2  $\frac{1}{2}$ " bolts in support. Evenly tighten 4 support bolts in X-pattern to 15-18 ft-lbs. Slowly rotate rockers back and forth to insure that movement is free and without bind.

**NOTES** -

- Most Softails with OEM frames require that right support be placed in lower rocker housing with rockers attached, then tilted up for installation of left support. In some applications, notably those with "rubber mount" engines and/or custom frames, both rocker supports can be installed on shafts and assembly placed in rocker housing base as single unit.
- Rocker arm supports have locating dowels in bottom surface. Dowels must align with openings in rocker housing base. Supports must pull down evenly and without resistance. If resistance encountered, loosen screws and shift supports to align dowels with openings.

- B. Measure space between rocker arm and rocker cover with feeler gauge. **See Picture 6.** Minimum acceptable clearance is .025".
- C. If clearance is less than .025", remove rocker arm from cover and carefully file or grind rocker arm to obtain correct clearance. **See Picture 7.**



Picture 6

**WARNING - Metal particles are potentially hazardous, especially to hands and eyes. Always wear protective clothing such as goggles and gloves when grinding or filing metal. When using compressed air, always direct air stream away from yourself and others nearby.**

**CAUTION - S&S recommends clearancing rocker arm rather than rocker cover. However, removing excessive material may weaken rocker arm resulting in engine damage. In most instances, only a few thousandths of an inch of metal must be removed for correct clearance. Also, grind work piece for only brief periods to avoid overheating and possible alteration of heat treatment.**

- D. Remove burrs and rough areas of relieved area with fine file or polishing wheel on hand held grinder. Clean rocker arm thoroughly with solvent and compressed air observing warning above.

**CAUTION - Failure to remove burrs and metal chips may result in engine damage not covered under warranty.**

- E. Reinstall rocker arm and confirm correct clearance.
10. Check rocker arm endplay by sliding rocker arm as far to one side as possible and measuring gap between rocker arm and rocker arm support on opposite end. Acceptable endplay is .001-.012". If endplay is insufficient, carefully remove material from end of rocker shaft to achieve correct endplay, leaving smooth, nonabrasive surface.

*NOTE - If endplay insufficient, remove minimum amount of material required to achieve correct measurement.*

**CAUTION - Failure to establish correct end play can result in engine damage not covered under warranty.**



Picture 8



Picture 7

11. Remove rocker/support assembly and replace pushrods, insuring correct locations according to pushrod length. Lubricate valve tips and contact areas of rocker arms and reinstall rocker/support assembly as in previous step. Contact areas include roller, pushrod socket, and end thrust surfaces.

**CAUTION - Insufficient clearance between rocker covers and valvetrain components may cause engine damage not covered under warranty. It remains the engine builder's responsibility to verify all operating clearances.**

- 12. Confirm pushrod adjustment according to manufacturer's instructions and install pushrod cover retainers.
- 13. Place 1 1/8" o-ring and Viton gasket in rocker cover base. **See Pictures 8 and 9.** Install top cover with 4 ea. 1/4" socket head screws, flat washers and fiber washers provided. (Fiber washers go between flat washers and cover.) Apply Loctite 242 or equivalent to threads and tighten in X-pattern to 10-13 ft-lbs.
- 14. Remove covers from rear cylinder pushrods. Rotate engine to place pushrods at lowest point on cam with rear piston at TDC. Repeat procedures described in Steps 5-13.
- 15. Replace parts removed for installation, start motorcycle and inspect for gas and oil leaks.

*NOTE - Chrome scratches easily. Clean chrome with degreaser as necessary, then wash with hot soapy water. Rinse thoroughly before applying polish with a clean cotton cloth. Many waxes and polishes contain abrasives which will scratch chrome. S&S recommends non-abrasive polish specially formulated for chrome and has used Mother's Chrome Polish with good results.*



Picture 9