

**Instruction 51-1022**  
**06-04-12**

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## **Installation Instructions: S&S® .590" Lift Valve Spring Kits #90-2060 and #90-2063 for 1948–1984 Big Twin 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.

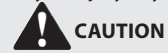
### **IMPORTANT NOTICE:**

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' 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.

**CAUTION**

High lift camshafts and related components require careful assembly of cylinder heads and rocker assemblies to assure that adequate clearances exist. Read these instructions completely before beginning installation. Failure to follow recommended procedures can cause extensive engine damage not covered under warranty.

S&S® valve spring and collar kits #90-2060, and, #90-2063 permit valve lifts up to .590" in 1948–1984 big twin engines. Valve guides will likely require modification to permit maximum lift. S&S .590 lift springs can be identified by a yellow stripe as well as the triple spring configuration.

Pressures for triple spring assembly are as follows: Closed valve—158 lbf; .540" lift - 339 lbf; .590" lift - 353 lbf. Kit #90-2060 is designed for use with stock 1948–early '81 cylinder heads, valve guides and associated parts. Kit #90-2063 is designed for 1981–'84 models and S&S Super Stock® cylinder heads for 1966–'84 big twin engines and associated parts. Kits accept stock valve keepers.

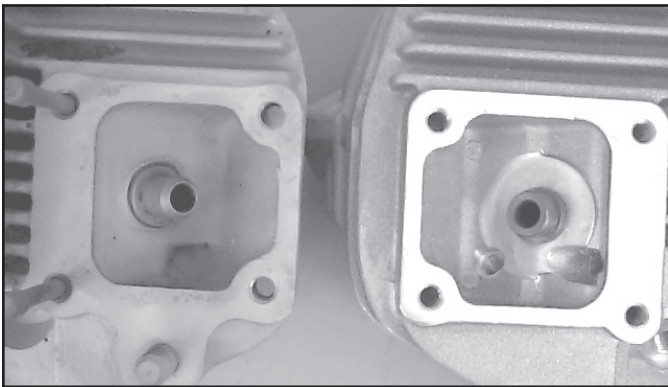
**NOTE:** S&S Spring Kits #90-2060 & 2063 can be used as assemblies to replace stock valve springs in stock cylinder heads, but individual parts from S&S and stock spring kits cannot be mixed.

**CAUTION**

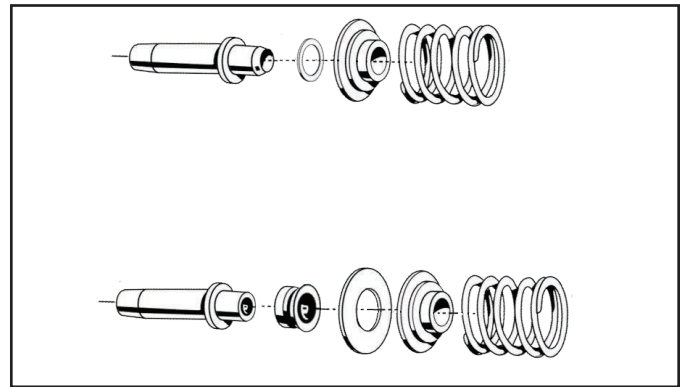
Mixing of springs or collars from other type spring kits may cause engine damage.

**Spring Installation Procedure**

1. Remove heads from engine and disassemble. If cylinder heads/valves are to be reconditioned, proceed at this time according to standard procedure. Refer to Harley-Davidson® service manual as necessary.



**Picture 1: 1948–Early '81 (left) and Late 1981–'84 (right) valve spring pockets.**



**Picture 2: This exploded view shows lower spring collar and shim stack-up for 1948-Early '81 (top) and Late 1981-'84 (bottom). Note early engines did not originally come with valve seals. If using aftermarket valve seals, follow manufacturers directions.**

**NOTES:**

- 1948-early '81 big twin cylinder heads have unmachined valve spring pocket and require S&S bottom collar #90-2059 designed to rest on valve guide flange rather than cylinder head. **See Pictures 1 & 2, above.** Because stock valve guides for these models are no longer manufactured, S&S lower collar is designed to fit aftermarket and Harley-Davidson® repair guides only. Flange of stock guide is too large for S&S lower collar.
- Late '81-'84 shovelhead has machined valve spring pocket and require S&S bottom collar #90-2062 designed to rest directly on cylinder head. **See Pictures 1 & 2, above.**

2. Using following procedure, determine installed spring height and clearance between top collar/valve keepers and valve guide for each valve and spring assembly. Once clearances have been measured, keep parts separate and use only in location where measurement was obtained. For example, valve and spring assembly used to measure clearances on intake side of front head must be installed in that location.

All reference to Harley-Davidson® 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 Harley-Davidson part number shown..

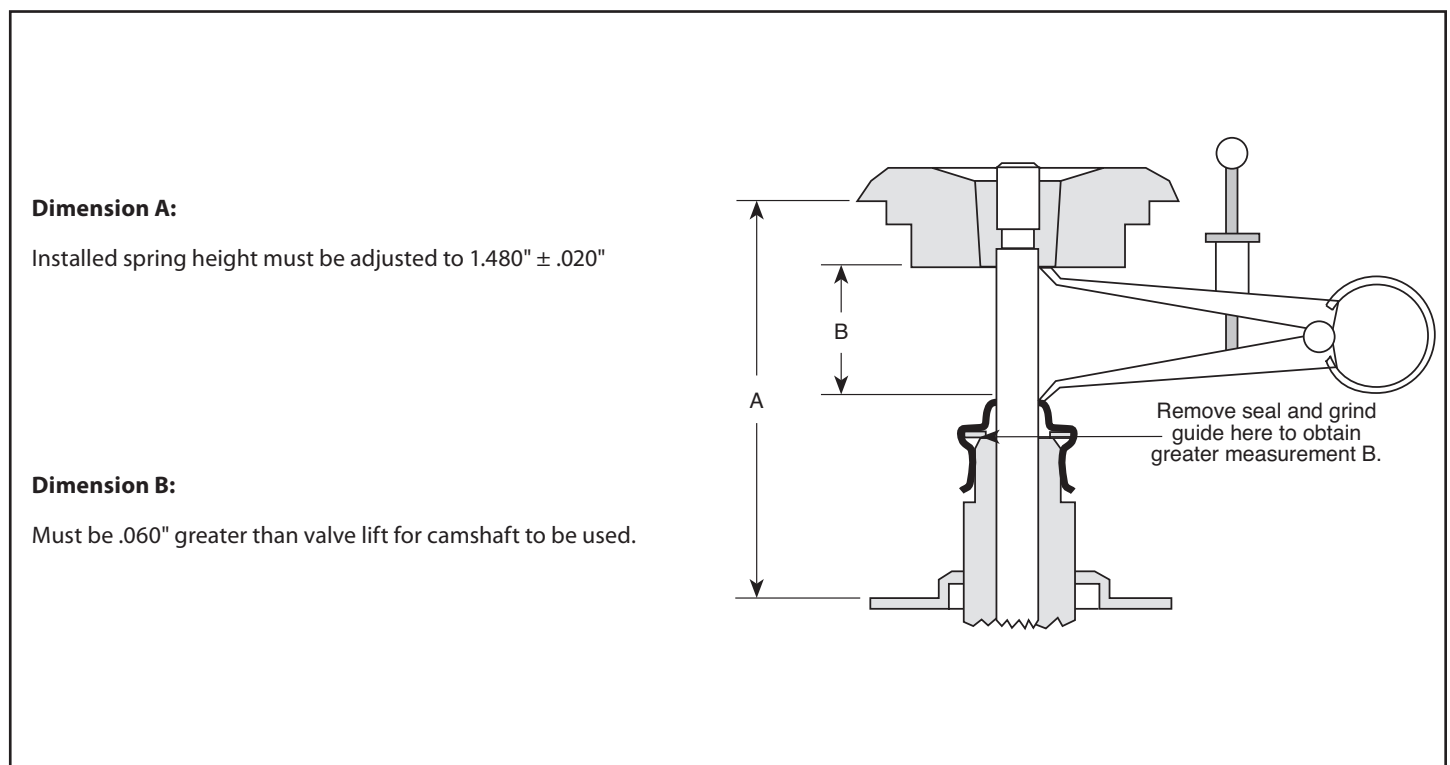
**NOTE:** With valve, collars, and keepers assembled and installed in head, installed spring height is distance from bottom of outside step of top collar to top surface of lower spring collar. **See Figure a, Dimension a.** This distance is same height as outer valve spring with spring assembly installed and valve in closed position.

- A. Apply thin coat of assembly lube or motor oil to valve stem. Install valve in guide, followed by lower collar and valve seal if applicable.
- B. Install top collar, and valve keepers. Pull top collar tightly against keepers to seat keepers in collar.
- C. Measure installed spring height while holding valve firmly against seat in closed position. Record measurement. **See Figure A, Dimension A.**
  - A.** Correct installed spring height for S&S kits #90-2060 and 90-2063 is  $1.480" \pm .020"$ .

**NOTES:**

- If spring height is greater than 1.500", place shims under lower collar to achieve correct spring height. Shims are available from S&S®. If spring height is less than 1.460", late '81-up heads may have material removed from machined spring pocket to achieve correct installed height. Otherwise, grind valves or seats to increase installed spring height.
- D. Measure distance between bottom of keepers and top of valve guide or seal. See **Figure A, Dimension B.** Measurement must equal or exceed valve lift + .060". In other words, for .590" lift cam, measurement B must be at least  $.590" + .060"$ , or .650" total.
  - E. Repeat Steps A-D for remaining valves and record all measurements. Be sure to keep track of all parts during assembly to assure they are installed in same location and with same valves that clearances were measured with.

**NOTE:** All four spring assemblies should have same installed height.



**Figure A**

**CAUTION**

- Installing springs at height less than recommended dimension will cause rapid spring fatigue resulting in possible engine damage. Engine should be frequently disassembled for spring tension measurement if springs are shimmed past recommended dimension.
- Installing springs at height above recommended dimension will decrease spring tension resulting in possible valve float and engine damage.
- Failure to establish required clearances may cause valve seal failure and other, more extensive engine damage not covered under warranty.

**WARNING**

Valve spring assembly is under considerable tension when compressed and is potentially dangerous. Wear eye protection and take due caution when checking for coil bind and during installation. After assembly, carefully strike tip of valve stem with soft hammer to insure that keepers are seated. Direct spring assembly away from face and body during this procedure.

4. If S&S valve spring kits 90-2060 and 90-2063 are installed according to instructions and specifications in this manual, cams with valve lifts of up to .590" may safely be used without coil bind. However, if you wish to check for coil bind, here is the procedure. This must be done for each spring individually. Observing previous warning, check for coil bind as follows:
  - A. Assemble one spring with top and bottom collars, and place in vise or spring checking device and carefully compress to length equal to installed height minus valve lift minus .060". Using .590" lift cam with springs installed at 1.480", for example, compress spring to 1.480" - .590" - .060", or .830". Confirm that spring can compress to at least this dimension without adjacent coils making contact (binding). If clearance between coils is insufficient, a different spring pack or cam with less lift must be used.
  - B. Repeat procedure for all remaining springs individually.
5. Lubricate valve stem with thin coat of assembly lube and install valve. Install lower collar, valve guide seal if applicable, then valve springs and top collar. Install all S&S® outer springs with O.D. chamfer toward top collar.
6. Check clearance between rocker housing and top collar. At same time confirm clearance between top collar and rocker arm.
  - A. Coat areas of rocker housing surrounding spring retainer with machinist's blue.
  - B. Place coat of putty approximately .060" thick on top of top collar, avoiding valve stem.
  - C. Carefully install rocker housings on heads and install head and pushrod assemblies on engine. Adjust pushrods according to manufacturer's instructions. If hydraulic lifters are used, lifter must be completely collapsed to check clearances, and pushrods adjusted to zero lash. For final installation pushrods will be adjusted according to manufacturer's instructions.
  - D. Rotate flywheels four complete revolutions in normal direction of travel. If resistance is encountered, disassemble engine and determine cause before proceeding.
  - E. Remove heads and carefully remove rocker housings from heads. Inspect machinist's dye and clay for evidence of contact. If rocker has contacted clay, thickness of clay beneath indentation should be at least .045".
  - F. Carefully remove metal from rocker housing or rocker arm to obtain .060" clearance. See Figures B & C. Spring and collars should not be modified in any fashion.

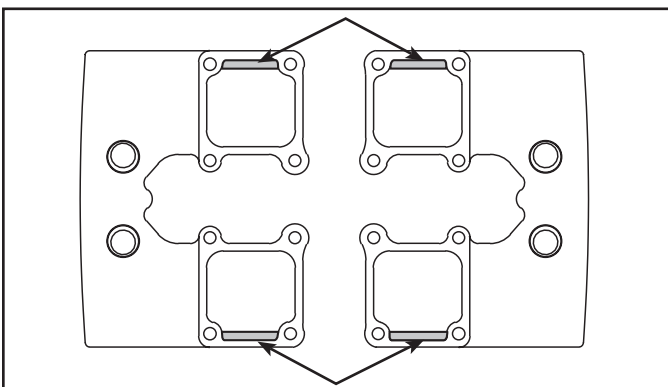


Figure B: Lines indicate areas most likely to require modification for spring retainer clearance. Relief should be cut at an angle, not vertical.

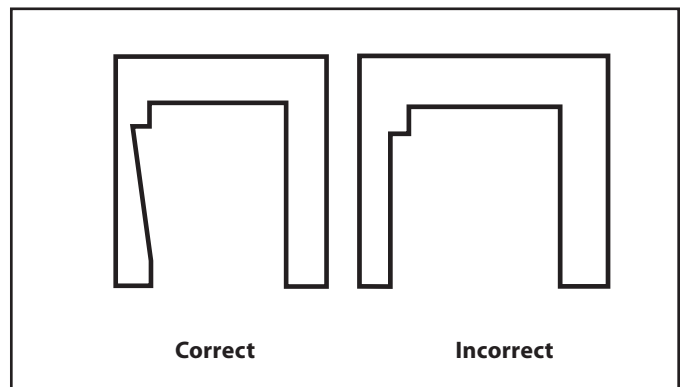


Figure C: Valve compartment of rocker housing (cross section). If required, relief should be cut at an angle approximately the same as angle of valve travel, not vertical. Remove least amount of material as possible to obtain proper clearance.