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Installation Instructions for S&S® Piston Rings

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.

Ring Identification

'Ring widths on S&S® pistons may change from time to time. Part numbers of rings originally supplied with pistons should be recorded for future reference in the event replacement rings are required.

1. The majority of ring kits presently supplied by S&S® contain a moly faced top ring, a cast, reverse torsion second ring, and a three piece oil ring. This may be confirmed as follows:
2. Top compression ring has a gray finish that is relatively light in color, and may or may not have a slight bevel along the inner edge. **See Figure 1**. It generally has no dot or other identifying mark. The light color can best be recognized by comparing compression rings to each other beneath a good light. Install light colored ring in top groove, bevel up. If there is no bevel, ring can be installed either side up.
3. Second compression ring has a darker, charcoal gray finish and may have slight bevel along inner surface, or a hook-like relief machined on the bottom of the outer diameter. **See Figures 2 and 3.** This ring may have a dot or letter on the top side. Install in second or middle groove with dot or letter up. Bevel on the inner surface or groove on outer diameter will face down.
4. Oil rings are three piece type with two rails and one expander. Do not shorten expander for any reason! Installation is straightforward with one rail placed above expander, other rail below expander. Rails may be shortened to correct gap, but burrs must be carefully removed.

NOTE: In some cases, same expander is used for several bore sizes. Oversize rings will not necessarily have a larger expander

⚠ CAUTION ⚠

Failure to remove burrs may cause engine damage.
Incorrect installation of rings may result in poor performance, excessive oil consumption or engine damage.

5. Rings supplied in some ring kits may differ from those described in point #1 above. Compression rings may be of plain cast iron type, chrome, or moly faced cast iron.
6. The most common combinations are:
   a. Two chrome faced cast rings
   b. One chrome faced cast ring & one plain cast ring.
   c. One moly faced cast ring & one plain cast ring.
   d. Some S&S Pistons have a ring support rail that must installed after the piston and wrist pin are installed on the connecting rod and before any other rings are installed. Install ring support rail in front piston so that the end gap is toward the rear of the cylinder (90° from wristpin). Install ring support rail on rear piston so that the end gap is toward front of the cylinder (90° from wristpin). The dimple in the ring must face down and be lined up with the wrist pin on both pistons.
7. Install as follows:
   a. Chrome faced or moly faced ring always goes in top groove
   b. Plain cast ring usually goes in second groove. Plain cast type is usually a reverse torsion ring. distinguished by an inside diameter bevel on one side of ring, and a dot, letter, or oversize mark on other side. **See Figure 2.** Some second rings may have a hook shaped groove machined around the bottom of the the outer diameter. If two cast iron compression rings are supplied in a set, check to see if one has mark and bevel or hook shaped groove. These rings always go in second groove with marking up if present and bevel or groove facing down.
8. The following general rules apply to compression ring identification and placement. Rules are listed in order of priority. In other words, if both Rule b and Rule d apply, for example, Rule b will be followed and Rule d is ignored.
   a. Chrome or moly ring goes in top groove.
   b. Cast iron regular or reverse torsion ring goes in second groove.
   c. Any identifying pip marks, dots, letters, or oversize marks go to top of piston.
   d. Ring with one dot goes in top groove, ring with two dots goes in second groove.
   e. If both rings are identical and have one dot or two dots, either ring can go in either groove.
   f. If ring has dot or letter and inside diameter bevel, dot or letter goes to top of piston. **See Figure 2 and 3.**
   g. If ring has no dot but does have inside diameter bevel, bevel goes to top of piston. **See Figure 1** below.
   h. If ring has no dots and no bevel, it can go either way. **See Figure 4** below.

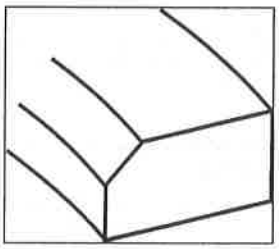


Figure 1

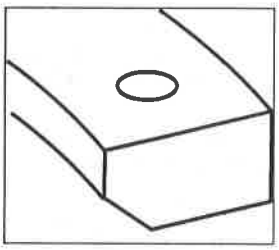


Figure 2

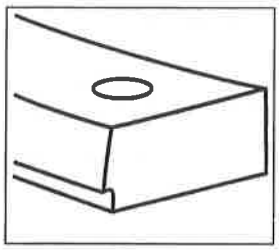


Figure 3

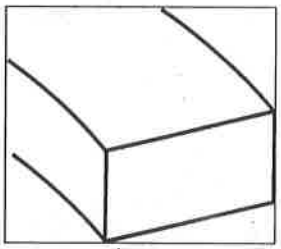
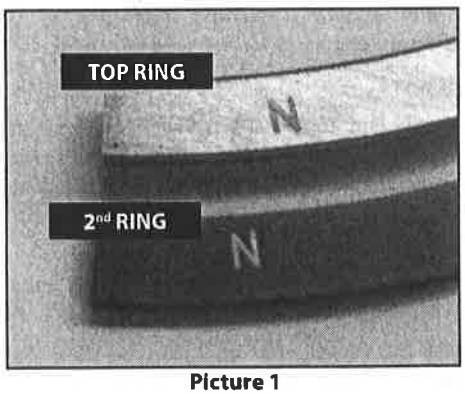


Figure 4

9. Rings for S&S 4⅛" bore pistons and Pistons for CVO 110 engines
   a. The 2nd compression ring is dark grey in color with a letter "N" on the top side. **(see Picture 1).**
   b. The top ring compression is a light grey or silver with a letter "N" on the top side **(see Picture 1).** The top ring will have a chamfer on the inside edge, this chamfer will face up.

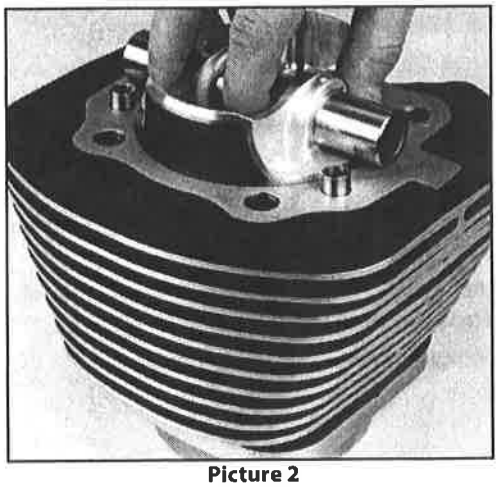


Picture 1

Setting Ring End Gaps

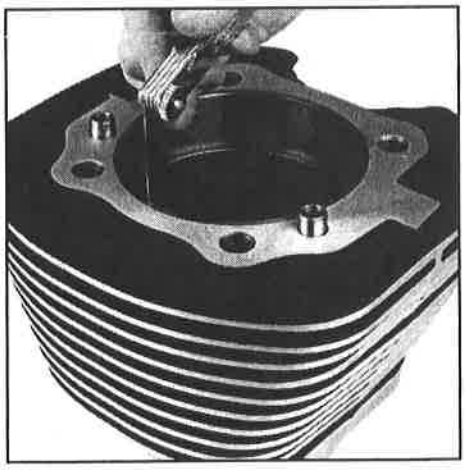
NOTES

1. Thoroughly wash cylinders with hot soapy water, then wash with brake cleaner and wipe with a clean white towel. Repeat until towel does not show evidence of debris and apply a light coat of oil immediately.
2. Check the ring end gap by placing the ring into the cylinder. Use a piston or caliper to ensure that the ring is placed squarely in the bore. **See Picture 2.**



Picture 2

3. Measure the ring end gap with a feeler gauge. **See Picture 3.**



Picture 3

4. See **Table 1** for proper end gap measurement. If adjustment to the gap must be made, use a proper ring end gap filing tool.

Ring End Gap			
Application	Top Ring	Second Ring	Oil Ring
Street/Hi Performance	Bore x 0.0045"	0.004"-0.008" Bigger than top ring	Minimum 0.015" Do not file
Drag Racing	Bore x 0.005"	0.004"-0.008" Bigger than top ring	Minimum 0.015" Do not file
Nitrous/Turbo Supercharged	Bore x 0.0055"	0.004"-0.008" Bigger than top ring	Minimum 0.015" Do not file

Table 1

5. Always file from the ring face towards the inside diameter to avoid damaging the face coating.
6. Remove material from only one end of the ring.
7. Ensure that ring end gaps are square.
8. Remove sharp edges and burrs.
9. Recheck gap measurement and adjust as necessary.
10. Repeat procedure with the other rings.

⚠ CAUTION ⚠

Failure to deburr rings may result in engine damage.

NOTES:

- *In certain instances, the next oversize ring set may be supplied with pistons, for example + .060" oversize rings with +.050" pistons. In this case end gaps must be measured and rings filed as necessary. Ends must then be carefully deburred.*
- *Important! The gap of the second ring should be larger than the top ring; this will help keep the top ring seated for improved performance.*
- *All rings should be fitted to the particular cylinder in which they will be installed.*
- *Oil rails can normally be installed without adjusting the end gap. The minimum gap should be 0.015"*
- *Never alter the end gap of the oil expander ring.*
- *Always install the ends of the expander facing up as shown in **Figure 5**.*

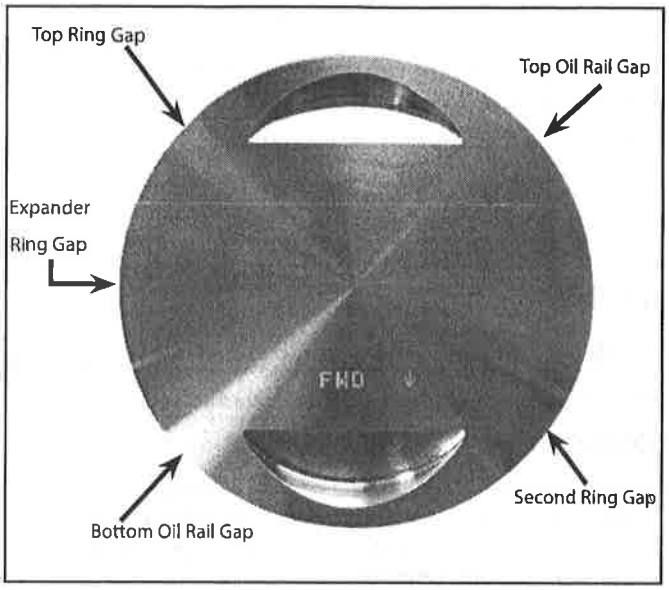
Piston Ring installation

1. Piston rings may be installed either before piston is installed on connecting rod or afterward. However, if piston has a oil ring support rail, pistons must be installed on rods before support rail and rings are installed.
2. Install the oil ring expander in the bottom ring groove of the piston. The expander ring has a silver finish. Make sure the ends of the expander ring are butted together and not overlapping (**Figure 5**, below). If the tips are overlapped, excessive oil consumption will result. .



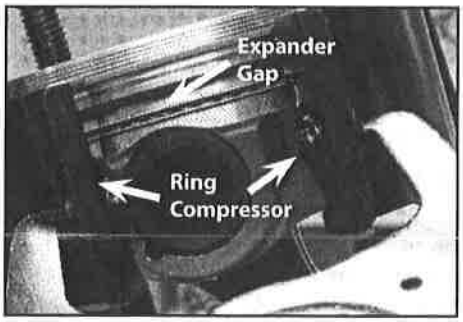
Figure 5

3. Install oil rails. The oil rails are the thinnest of all the rings. Either side can be placed up. Install the rails into the groove by hand. Install one rail above the expander, and one below. Orient the gaps according to **Picture 4**
4. Install the 2nd ring with the correct side facing up. Use a piston ring expander to install the ring in the 2nd groove in the piston. Orient the gap according to **Picture 4**.
5. Install the top ring with the correct side facing up. Use a ring expander tool to install the ring in the top groove. Orient the gap according to **Picture 4**.



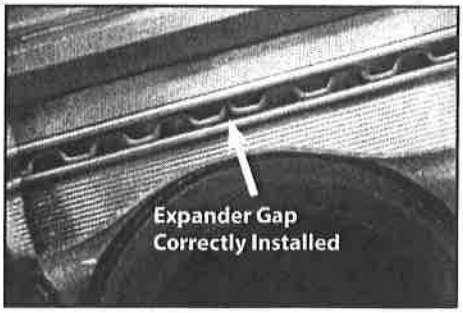
Picture 4

6. Compress ring pack using a suitable ring compressor. If possible, position the ring compressor so that you can see the oil expander gap during installation. See **Picture 5**.



Picture 5

7. Install cylinder on piston, making sure not to overlap ends of oil ring expander. See **Picture 6**.



Picture 6

8. Proceed with engine reassembly according to procedures described in service manual for that type of engine.

Break In Procedure

1. Initial start up. Run engine approximately one minute at 1250-1750 rpm. DO NOT crack throttle or subject to any loads during this period as head gaskets are susceptible to failure at this time. During this time, check to see that oil pressure is normal, that oil is returning the oil tank, and that no leaks exist.
2. Shut off engine and thoroughly check for any leaks or other problems. Let engine cool to the touch.
3. After engine has cooled, start up again and allow the motor to build some heat. Engine should be run no longer than three to four minutes. When the cylinders become warm/hot to the touch (approximately 150° F) shut the motor down and let it cool to room temp. Follow the same cautions as for the initial start-up, and continue to check for problems.
4. First 50 Miles -
   a. Street - Ride normally, do not lug the engine. Avoid high heat conditions and vary the RPM while riding. No stop and go traffic, extended idle periods, or high load or high RPM conditions. Max of 3,500 rpm or 60 mph.
   b. Dyno - A chassis dynamometer can be used to put the first 50 miles on a new engine.
5. 50-100 Miles- Ride normally, do not lug the engine. Avoid high heat conditions, no stop and go traffic or extended idle periods. Limited short bursts of throttle can aid in ring seating from this point forward during the break-in, but avoid continuous high speed or load conditions. Max of 4,250 RPM/70 mph.
6. 100-500 Miles- Avoid lugging the engine and high heat conditions. Max of 5,000 rpm. Change oil at 500 miles.
7. 500 to 1,000 miles - Ride bike normally, but avoid continuous high load operation and high heat conditions.
8. From 1,000 miles on – Break-in is complete, enjoy!